United States Department of Agriculture

Office of the General Counsel

RECEIVED
SEP 0 2 1998
t of Water Resources

By Hand

Karl Dreher
Director
Idaho Departi
1301 North O
Boise, ID 83

Re: W

Dear Director

ALLEN,
FOR YOUR INFORMATION — AND FILES — HERE ARE THE U.S. LETTERS RE BUSTERBACK + THE SUPPORTING ATTACHMENTS, WHICH CONTAIN SOME INFO ABOUT HOW THEY THINK THE RIGHTS WERE USED.
NBS

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Department of Water Resources
Southern Region

On Au
Department of [illegible] five water rights appurtenant to the Busterback Ranch property purchased by the United States in 1992 be forfeited because water was not diverted for irrigation purposes for the five year statutory period.[1] Forfeiture is inappropriate because circumstances beyond the control of the Forest Service have precluded diversion of water for irrigation purposes.

The preclusion of irrigation use constitutes a valid defense to forfeiture under Idaho law. As you know, forfeiture of water rights is not favored and is not to be presumed. Hodges v. Trail Creek Irrigation Co., 78 Idaho 10, 297 P.2d 524 (1956); Zezi v. Lightfoot, 57 Idaho 707, 68 P.2d 50 (1937) ("All intendments are to be indulged against a forfeiture.") As a means of mitigating the harsh results of forfeiture, the courts and statutes establish a number of defenses or exceptions to forfeiture. As the Idaho Supreme Court has recognized "[t]here can be no forfeiture if the nonuser of water is prevented from exercising his rights to the water by circumstances over which he has no control." Hodges, supra, 78 Idaho at 13, 297 P.2d at 527; Welch v. Garret, 5 Idaho 639, 51 P. 405 (1897).

Conditions beyond the control of the Forest Service precluded its application of water to irrigation from 1992 to 1998. This preclusion of irrigation negates any forfeiture

[1] On April 2, 1992 the Forest Service purchased the Busterback Ranch for 3.2 million dollars. This included the following water rights:

71-00059	25.60 CFS	12/31/1912	Salmon River
71-00061	40.00 CFS	8/30/1933	Salmon River
71-00064B	7.86 CFS	8/15/1915	Alturas Lake Creek
71-00066	10.75 CFS	7/1/1930	Alturas Lake Creek
71-00068	12.32 CFS	7/1/1935	Alturas Lake Creek

United States Department of Agriculture

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RECEIVED
SEP 0 2 1998
Department of Water Resources

September 2, 1998

By Hand

Karl Dreher
Director
Idaho Department of Water Resources
1301 North Orchard
Boise, ID 83709

Re: Water Rights For Busterback Ranch

Dear Director Dreher:

On August 12, 1998, your Adjudication Bureau Staff informed the United States Department of Agriculture, Forest Service ("Forest Service") that they may recommend five water rights appurtenant to the Busterback Ranch property purchased by the United States in 1992 be forfeited because water was not diverted for irrigation purposes for the five year statutory period. [1] Forfeiture is inappropriate because circumstances beyond the control of the Forest Service have precluded diversion of water for irrigation purposes.

The preclusion of irrigation use constitutes a valid defense to forfeiture under Idaho law. As you know, forfeiture of water rights is not favored and is not to be presumed. Hodges v. Trail Creek Irrigation Co., 78 Idaho 10, 297 P.2d 524 (1956); Zezi v. Lightfoot, 57 Idaho 707, 68 P.2d 50 (1937) ("All intendments are to be indulged against a forfeiture.") As a means of mitigating the harsh results of forfeiture, the courts and statutes establish a number of defenses or exceptions to forfeiture. As the Idaho Supreme Court has recognized "[t]here can be no forfeiture if the nonuser of water is prevented from exercising his rights to the water by circumstances over which he has no control." Hodges, supra, 78 Idaho at 13, 297 P.2d at 527; Welch v. Garret, 5 Idaho 639, 51 P. 405 (1897).

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71-00068	12.32 CFS	7/1/1935	Alturas Lake Creek

The Forest Service did not divert water for irrigation purposes for good cause based on circumstances beyond its control. This failure to act is excusable. The Endangered Species Act ("ESA") prohibits federal action that may jeopardize the existence of any threatened or endangered species. 16 U.S.C. 1531 et seq. Chinook salmon, sockeye salmon, steelhead trout, and bull trout spend part of their life cycle in and around the stream reaches from which the diversions occur. These species are listed as threatened and endangered under the ESA.[2] An endangered plant, the Ute ladies'-tresses, is known to grow in riparian habitat adjacent to streams affected by the diversions. Moreover, the westslope cutthroat trout, a species petitioned for listing as threatened under the ESA, utilizes stream habitat in the area surrounding Busterback.

Irrigation diversions by the Forest Service would constitute federal action. Had the Forest Service undertaken historic irrigation withdrawals during the 1992 through 1998 irrigation seasons, our fish biologists advise us that this action would have resulted in a "likely to adversely affect" determination. Resumption of such diversions could have resulted in the destruction of, or adverse modification of, critical habitat. Moreover, such action could have jeopardized the continued existence of the listed species. Finally, such diversions would have also placed the Forest Service at risk of violating the take prohibitions of the ESA. We have consulted with the relevant federal agencies, i.e., the National Marine Fisheries Service and the United States Fish and Wildlife Service, regarding the problems associated with diversion of this water and the affect on listed species and species petitioned for listing. Copies of their letters are attached.

In sum, the fact that threatened and endangered species use stream habitat adjacent to the diversions and that diversion of water would have been prevented by ESA is a circumstance beyond the control of the water rights owner. Thus, the Forest Service's non-use should be excused and the water rights be recommended.

In addition, the use of these water rights for irrigation would have been inconsistent with Governor Batt's recovery plans for bull trout and sockeye salmon.[3] Removal of the water for irrigation rather than leaving the water instream to aid recovery of listed threatened and endangered species would be in conflict with the policies, goals and objectives articulated in the Governor's Plan. Importantly, the goals in the Governor's Plan include, maintenance and strengthening of existing populations, as well as the restoration of species in appropriate areas. *Plan,* 1. The Governor's Plan

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[2] Snake River sockeye salmon (*Oncorhynchus nerka*) were listed as endangered by the National Marine Fishery Service on November 20, 1991. (57 FR 58619). Snake River Spring/Summer chinook (*Oncorhynchus tshawytscha*) and Snake River Fall chinook salmon (*Oncorhynchus tshawytscha*) were both listed as threatened April 22, 1992. (57 FR 14653) but their status was reclassified as endangered pursuant to Emergency Interim Rule August 18, 1994. (59 FR 42529). The classification of Snake River Spring/Summer and Fall chinook reverted to threatened on April 17, 1995. (60 FR 19342). Steelhead (*Oncorhynchus mykiss*) were listed as threatened October 17, 1997. (62 FR 43937-43954). Bulltrout (*Salvelinus confluentus*) were listed as threatened by the U.S. Fish and Wildlife Service on June 10, 1998. (Effective July 10, 1998, 63 FR 31647). Westslope cutthroat trout (*Oncorhyncus clarki lewisi*) were petitioned for listing as threatened species on June 6, 1997 (63 FR 31691).

[3] Governor Philip E. Batt's *State of Idaho: Bulltrout Conservation Plan* ("Governor's Plan")(July 1, 1996).

specifically designates the Upper Salmon River as a bull trout key watershed. Notably, the Governor's Plan acknowledges that "dam building and water diversions have isolated many populations." *Id.* Threats to bull trout restoration and recovery identified in the Governor's Plan such as highly variable stream flows, water quantity, sediment sources, reduced bank cover or stability, migration barriers, poaching or predation are ameliorated by leaving water instream. The threats identified in the Governor's Plan are equally applicable to threatened and endangered sockeye, chinook and steelhead.[4]

In summary, we believe that the Forest Service could not have used this water for irrigation purposes without violating federal law. In addition, such use would have been inconsistent with state water policy to protect endangered species.

Please do not hesitate to contact me if you have any questions regarding this matter. We look forward to hearing from you.

Sincerely,

Randall J. Bramer

Enclosures:

cc: Norm Young
David Tuthill
Phillip Rassier

[4] The bull trout's historic range approximates that of spring, summer, and fall chinook salmon. *Plan*, 3.

United States Department of Agriculture | Forest Service | Boise Adjudication Team Recreation and Lands Intermountain Region | 380 ParkCenter, Suite 330 Boise, ID 83706

Reply to: 2540

Date: September 1, 1998

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Department of Water Resources

Theodore Meyers
National Marine Fisheries Service
Boise Field Office
United States Department of Interior
1387 South Vinnell Way, Suite 377
Boise, ID 83709

Robert G. Ruesink
Supervisor
Fish and Wildlife Service
Snake River Basin Office
United States Department of Interior
1387 South Vinnell Way, Suite 368
Boise, ID 83709

Re: Water Rights For Busterback Ranch

Dear Mssrs. Meyers and Ruesink:

In 1992, the United States Department of Agriculture, Forest Service (Forest Service) purchased five water rights in the upper Stanley Basin on the Salmon River and Alturas Lake Creek. The seller used the rights for irrigation of pastures on the Busterback Ranch.

The water rights are being adjudicated in the Snake River Basin Adjudication (SRBA). The Idaho Department of Water Resources (IDWR) investigates water rights and makes recommendations to the SRBA Court. IDWR recently informed the Forest Service that they may recommend forfeiture of these rights because the Forest Service failed to divert water for irrigation purposes for five years.

The Forest Service believes forfeiture is inappropriate since use of these water rights for irrigation would be likely to violate provisions of the Endangered Species Act. Had the Forest Service undertaken historic irrigation withdrawals during the 1992 through 1998 irrigation seasons, our fish biologists advise us that this action would have resulted in a "likely to adversely affect" determination. Resumption of such diversions could have resulted in the destruction of or adverse modification of critical habitat. Moreover, such action could have jeopardized the continued existence of the listed species. Finally, resumption of these diversions would have placed the Forest Service at risk of violating the take prohibitions of the ESA.

The purpose of this letter is to request your advisory opinion of the potential ramifications had these water rights been diverted out of the stream for irrigation during this time period. Attached is a summary outlining the circumstances surrounding the purchase and describing the effect of the diversions on the relevant species in this area. A map showing the locations of these water rights and the diversions is also enclosed.

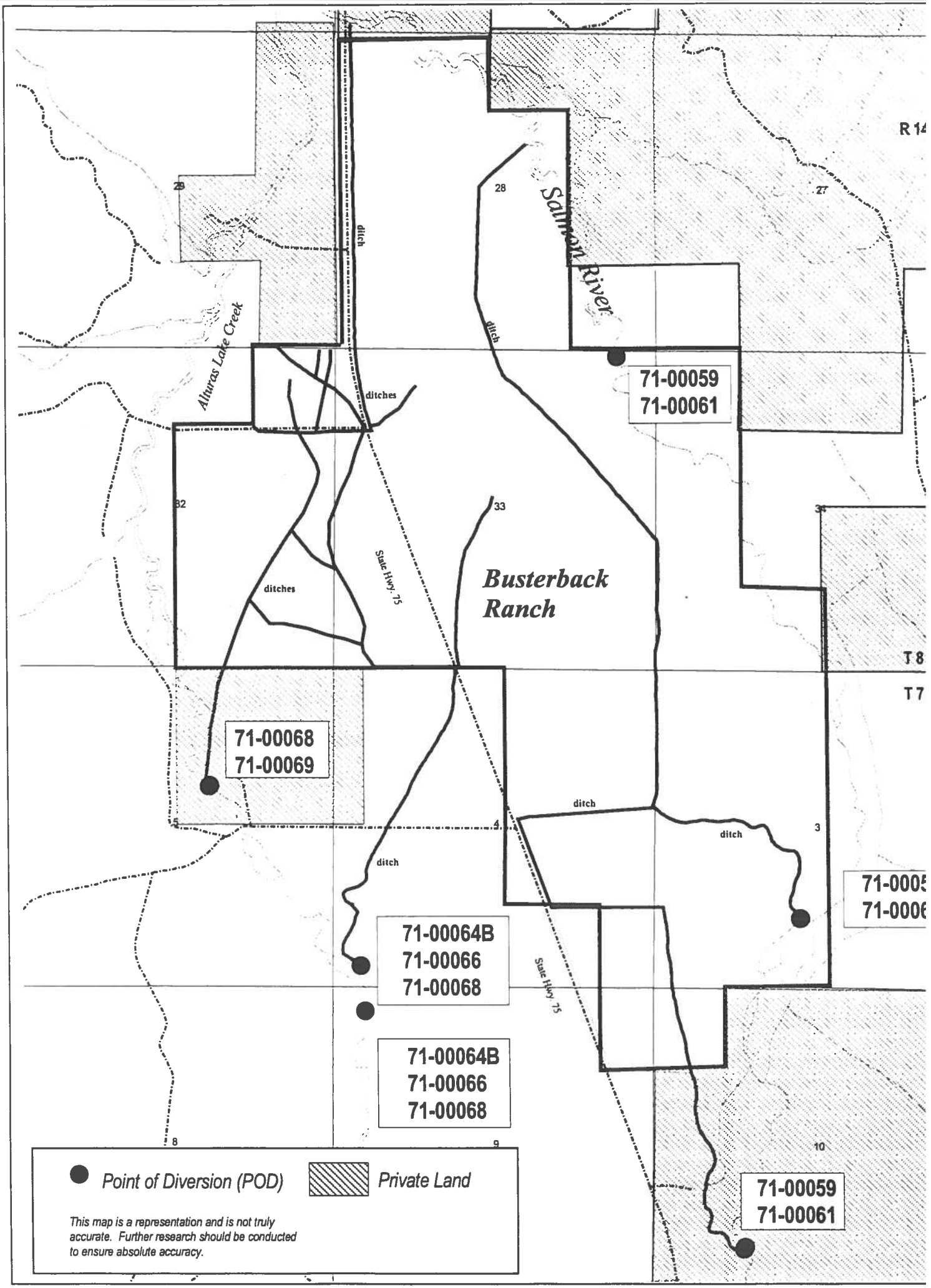
Please do not hesitate to contact Randy Bramer or myself if you have any questions regarding this matter. We look forward to hearing from you.

Sincerely,

Michael Collette
Team Leader
Boise Adjudication Team

Enclosures

cc: Bill LeVere
Paul Reis
Lois Witte
Bruce Bernard
Randy Bramer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State Hwy 75
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71-00061
Point of Diversion (POD)
Private Land
This map is a representation and is not truly accurate. Further research should be conducted to ensure absolute accuracy.

SUMMARY OF BUSTERBACK WATER RIGHTS

The Busterback Ranch had water rights from the Salmon River (65.6 cubic feet per second (cfs)) and Alturas Lake Creek (30.93 cfs). These include the following water rights:

71-00059	25.60 CFS	12/31/1912	Salmon River
71-00061	40.00 CFS	8/30/1933	Salmon River
71-00064B	7.86 CFS	8/15/1915	Alturas Lake Creek
71-00066	10.75 CFS	7/1/1930	Alturas Lake Creek
71-00068	12.32 CFS	7/1/1935	Alturas Lake Creek

As described below, the headwaters of the Salmon River and Alturas Lake Creek provide crucial spawning and rearing areas, juvenile migration corridors, areas for growth and development to adulthood, and adult migration corridors for proposed and listed species[1] under the Endangered Species Act of 1973. 16 U.S.C. 1531 *et seq.* Exercising these rights completely de-watered both the river and the creek during critical periods in anadromous fish migrating and spawning cycles.

The stream reaches contain several species that have been listed as threatened or endangered. These include chinook and sockeye salmon, bull trout, and steelhead. In addition, the westslope cutthroat trout (recently proposed for listing) occurs in these stream segments. An endangered orchid, the Ute ladies'-tresses, occurs in these areas.

Salmon River

Two diversion structures, known as S45 and S46, supplied water from the Salmon River to the ranch. S45 was a large diversion structure located in the Salmon River. S46, a smaller structure, was located approximately one mile upstream of S45. The Forest Service conducted several studies to evaluate the effects of diversions on anadromous fish within the Sawtooth Valley.[2] The Forest Service concluded that these two diversions had the "greatest irrigation related adverse impact on anadromous stocks of any within the SNRA." *Munther*, 13. Combined these two diversions precluded full utilization of between 22 and 32 miles of spawning habitat upstream from the diversions. *Munther*, 10-11; *Scott*, 15. Typically the diversions impeded passage from early July to late September. *Munther*, 12-13. Less than 70% of the rivers inherent production for anadromous fish species was realized under diverted conditions. *Scott*, 18. Both steelhead and chinook were affected by the diversion. *Scott*, 16.

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[1] Snake River sockeye salmon (*Oncorhynchus nerka*) were listed as endangered by the National Marine Fishery Service on November 20, 1991. (57 FR 58619). Snake River Spring/Summer chinook (*Oncorhynchus tshawytscha*) were listed as threatened April 22, 1992. (57 FR 14653) but their status was reclassified as endangered pursuant to Emergency Interim Rule August 18, 1994. (59 FR 42529). The classification of Snake River Spring/Summer chinook reverted to threatened on April 17, 1995. (60 FR 19342). Steelhead (*Oncorhynchus mykiss*) were listed as threatened October, 17 1997. (62 FR 43937-43954). Bulltrout (*Salvelinus confluentus*) were listed as threatened by the U.S. Fish and Wildlife Service on June 10, 1998. (Effective July 10, 1998, 63 FR 31647). Westslope Cutthroat (*Oncorhyndus clarki lewisi*) were petitioned for listing as a threatened species on June 6, 1997 (63 FR 31691).

[2] Greg L. Munther, *Effects of Irrigation Diversions and related structures in the Sawtooth National Recreation Area.* (1974) [hereinafter *Munther*]. Harv Forsgren, et al., *Anadromous Fish Instream Flow Needs and Conflicts within the Sawtooth National Recreation Area* (1981) [hereinafter *Scott*]. John Andrews et. al. *Alturas Lake Creek Flow Augmentation* (Final Report (1987).

When sufficient water was left instream in 1972 to provide upstream migration, 163 redds were counted above the diversions; whereas in 1973 when flows were completely eliminated below the diversion by June 30, only 50 redds were identified above the diversion. High redd counts below the diversion indicated above average concentration of spawners. *Munther*, 14.

S45 dewatered approximately 800-1500 feet of stream below the diversion. Chinook salmon spawning occurred both above and below the diversions indicating that the dewatered reach could also provide spawning and rearing habitat. Diversions depleted an estimated 3 ½ miles of "valuable" spawning habitat below the diversions. *Scott* at 15. In 1972, one half mile of spawning habitat was lost to dewatering. *Munther*, 14, 20. Approximately one half to two and one half miles of spawning habitat below the diversion was reduced due to lower flows. Id.at 20. In 1972 considerable spawning had occurred in the reach before dewatering, "which probably resulted in 100% loss of eggs in redds that were wholly or partially dewatered. *Munther*, 20. In addition to habitat loss and degradation, juvenile smolts were diverted onto irrigated fields. Id. at 28.

Alturas Lake Creek

A third diversion structure, ALC1, diverted water from Alturas Lake Creek to Busterback. This structure impacted both chinook and sockeye. *Munther*, 31. The diversion blocked upstream migration of adult chinook and depleted important habitat below the diversion. *Scott*, 20, 22. Fish passage is restricted at less than 52 cfs, which occurred as early as July 7, 1973. *Id.* Reduced flows probably impacted downstream spawning in Alturas Lake Creek. Furthermore, juvenile chinook were likely diverted onto irrigated pasturelands while sockeye smolts were not due to pre-irrigation season outmigration of sockeye. *Munther*, 35.

Alturas Lake is one of the four morainal lakes that once sustained sockeye salmon runs. It is believed that the diversion structure on Alturas Lake Creek may have been at least partially responsible for the disappearance of sockeye salmon, which once migrated to Alturas Lake. *Munther* at 31. The *Scott* report considered this diversion the "most significant" factor contributing to the decline of sockeye at Alturas Lake. *Scott*, 20. The diversion totally dewatered Alturas Lake Creek prior to the onset of the chinook spawning season and upstream migration period for sockeye. *Scott*, 22. Alturas Lake Creek diversion reduced the production capability for chinook to 46% of total and 0% for sockeye. *Scott*, 22.

Resident salmonids in this region include bull trout and westslope cutthroat trout. Little information is currently available regarding the impacts of these structures upon bull trout. In the Snake River basin, the bull trout's historic range approximates that of spring, summer, and fall chinook salmon. Dam building and water diversions have isolated many populations. *Governor Philip E. Batt's State of Idaho Bull Trout Conservation Plan* (1996). The Governor's Plan notes that the disruption of migratory corridors may reduce growth and survival of bull trout, and possibly lead to the loss of the migratory life-history types. *Plan* 5. It can be assumed that spawning and rearing habitat could be lost due to these structures. Early spawning and migration of bull trout may coincide with irrigation withdrawals. Highly variable stream flows, bedload movement, and channel instability negatively influence the survival of young bull trout. (Goetz 1989; Weaver 1985).

At a minimum, it may be assumed that bull trout were diverted onto irrigated pasturelands and that genetic diversity was impeded due to interference of migrating adults. Furthermore, flow depletion by irrigation and irrigation runoff may adversely impact water temperature, which, in turn, may increase chances for disease and stress. Low flows also increase chances for predation and poaching.

Moreover, the streams contain westslope cutthroat trout, a species that was recently petitioned for listing as threatened. Westslope cutthroat are spring spawners that probably would have suffered losses due to dewatered spawning areas as well as being diverted onto irrigated fields

Conclusion

As noted above, several species of fish currently classified as threatened or endangered under the Endangered Species Act are potentially affected by the water rights associated with the acquisition of Busterback Ranch. This area was designated critical habitat on December 28, 1993 for endangered species and this habitat is of vital importance to recovery of these protected species.[3] We are also concerned that resumption of historic diversion withdrawals would have had a significant detrimental impact to the ongoing efforts by the Sockeye Recovery Technical Oversight Committee's sockeye recovery in Alturas Lake.

Resumption of historic diversion withdrawals may frustrate the goals and objectives and actions articulated in the *Proposed Recovery Plan for Snake River Salmon* (Recovery Plan). United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (1995). Habitat restoration is a primary objective under the Recovery Plan. Rcovery and delisting criteria under the plan fall into two major categories: "remedying environmental factors that have reduced stocks to levels which are in danger of extinction and 2) rebuilding populations to levels of improved productivities." Recovery Plan, ES-3. The plan acknowledges that habitat restoration may be achieved by reducing losses of listed species at water withdrawal sites.

[3] Effective January 27, 1994, 58 FR 68543.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Snake River Basin Office, Columbia River Basin Ecoregion
1387 South Vinnell Way, Room 368
Boise, Idaho 83709

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Department of Water Resources

September 1, 1998

Michael Collette, Team Leader
Boise Adjudication Team
U.S.D.A. Forest Service
Intermountain Region
380 Parkcenter Blvd., Suite 330
Boise, Idaho 83706

Dear Mr. Collette:

This responds to your September 1, 1998, letter requesting U.S. Fish and Wildlife Service (Service) comments on the effects of diverting 65.6 cubic feet per second (cfs) from the Salmon River and 30.93 cfs from Alturas Lake Creek for irrigation of land known as the Busterback Ranch located in the Sawtooth National Recreation Area. Your letter explained that the Forest Service had purchased the ranch and associated water rights in 1992, and now faces possible forfeiture of the water rights through adjudication proceedings for failure to divert the water for irrigation purposes during the 1992-1998 irrigation seasons.

Species of concern to the Service in the area include the bull trout, listed as threatened June 10, 1998 and the Ute ladies'-tresses (*Spiranthes diluvialis*), an orchid species listed as threatened January 17, 1992. The bull trout was a candidate species being considered for listing by the Service beginning in 1985.

Bull trout occur in Alturas Lake Creek, apparently the strongest subpopulation in the Sawtooth Valley. The main stem Salmon River is likely a migratory corridor for bull trout movement into tributary streams like Alturas Lake Creek. The Governor's Bull Trout Conservation Plan identifies the Upper Salmon River, which includes Alturas Lake Creek, a key watershed.

The Ute ladies'-tresses was not known to occur in Idaho at the time of its listing in 1992; however, the September 1995 draft recovery plan recognized a high potential for the species to occur in Idaho. Subsequently, a population was discovered along the South Fork of the Snake River in 1996. The Busterback Ranch area has a high potential of having suitable habitat to support this native orchid according to recent mapping completed by the Sawtooth National Forest.

The Service reviewed the Forest Service proposal to acquire the land and water rights of the Busterback Ranch in 1992, and concluded that the action would benefit fish and wildlife resources in the area. That conclusion was based on the belief that the water would not be diverted for irrigation, but would remain in the stream. Conversely, if the Forest Service were to divert the water for irrigation in the future, it could constitute an adverse effect for bull trout and the Ute ladies'-tresses, which would require formal consultation under section 7 of the Endangered Species Act of 1973, as amended (ESA). It is not possible for the Service to determine the outcome of such consultation at this time, but irrigation diversions were considered a threat to bull trout in both the final rule listing the species (63 FR 31647) and the Governor's Bull Trout Conservation Plan. The Forest Service should complete consultation before taking any action to avoid the risk of violating sections 7 and 9 of the ESA.

We appreciate the opportunity to provide these comments regarding possible Forest Service changes in the use of water at the Busterback Ranch. If you have questions or need additional information please call Ray Vizgirdas at 378-5243. Your interest in the conservation of endangered and threatened species is appreciated.

Sincerely,

Robert D. Ruesink

Supervisor, Snake River Basin Office

cc: National Marine Fisheries Service, Boise

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Northwest Region
7600 Sand Point Way, N.E.
Bin C15700, Bldg.1
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Department of Water Resources

Michael Collette
Boise Adjudication Team
USDA Forest Service
Intermountain Region
380 Park Center Blvd, Suite 330
Boise, Idaho 83706

RE: Water Rights associated with Busterback Ranch

Dear Mr. Collette:

This responds to the September 1, 1998, letter requesting review of the potential ramifications associated with the Endangered Species Act (ESA) from implementing water rights acquired through the purchase of the Busterback Ranch. The letter explains that the Idaho Department of Water Resources (IDWR) informed the USDA Forest Service (USFS) that they may recommend forfeiture because the USFS failed to divert water for irrigation purposes for five years. The letter identifies five points of diversion in Salmon River and Alturas Lake Creek in the upper Stanley Basin.

The USFS letter identifies ESA listed fish species in the area and describes potential adverse effects from diverting the water. Snake River sockeye salmon, Snake River spring/summer chinook salmon, and Snake River steelhead all use the upper Salmon River for spawning, rearing, and overwintering habitat. The National Marine Fisheries Service (NMFS) has also designated critical habitat for these three species throughout the project area. Critical habitat includes all perennial streams in the Snake River basin historically accessible to these anadromous fish species below Hell's Canyon and Dworshak Dams.

Based on the information provided to NMFS in a letter dated September 1, 1998, the effects of using the five diversions with a cumulative total water withdraw of 96.53 CFS are as follows. In the Salmon River, the effects of removing 65.6 CFS of water during years when the Busterback Ranch was in use resulted in: (1) dewatering approximately 800-1500 feet of the Salmon river precluding full use of spawning habitat for 22-32 miles upstream from the points of diversion; and among other effects, (2) reduced significantly the reproductive capabilities of the aforementioned

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species using the river from early July through late September. In Alturus Lake Creek, the diverted water (30.93 CFS) significantly impaired reproductive capabilities for chinook salmon and likely prevented sockeye salmon from using Alturus Lake.

The USFS believes diversion of river flows as authorized in the water right would result in a likely to adversely affect determination for designated critical habitat and for anadromous fish species listed under the ESA. Based on the information provided, NMFS agrees with the USFS determination that the action is likely to adversely affect. Given this finding, the USFS would be required to initiate formal consultation with NMFS.

Formal consultation would involve the development of a biological opinion to determine whether the action is likely to jeopardize the continued existence of Snake River sockeye salmon, Snake River chinook salmon, Snake River steelhead, or result in the destruction or adverse modification of designated critical habitat. Prior to reaching such a conclusion, it would be necessary for an instream flow study be completed for the entire upper Salmon River to fully assess the cumulative impact the subject action would have on ESA listed species and their designated critical habitat. Until the results of this study addressing effects to listed anadromous fishes and their habitat were available, NMFS would recommend the USFS defer use of the 102.93 CFS to ensure the action does not violate the ESA by jeopardizing the continued existence of the listed species or resulting in the destruction or adverse modification of critical habitat. Non-compliance with the ESA regulations could also place the USFS at risk of the violating the take prohibitions.

Even without the cumulative effects assessment, the available information regarding adverse effects to critical habitat and ESA listed species is sufficient for NMFS to raise serious concern whether continued irrigation use at the sites would be consistent with the provisions of section 7 (50 CRF part 402) and section 9 (50 CFR Sec 217) the ESA.

If you have any questions concerning this informal consultation on ESA listed Snake River salmon or Snake River steelhead, please contact Ed Murrell at (208) 378-5696.

Sincerely,

Theodore F. Meyers

for/ William Stelle, Jr.
Regional Administrator

cc: P. Ries - SNRA
R. Ruesink - USFWS

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Department of Water Resources

QUESTIONS AND ANSWERS
90-DAY FINDING
WESTSLOPE CUTTHROAT TROUT

1. What is the westslope cutthroat trout? Westslope cutthroat trout is one of several subspecies of cutthroat trout native to the Rocky Mountain region. The westslope cutthroat trout often exhibits bright yellow, orange, and red colors. It is generally distinguishable from other inland subspecies of cutthroat trout by the particular pattern of black spots that appear on the body.

2. Where are westslope cutthroat trout found? Westslope cutthroat trout are native to western and central Montana (Columbia and Missouri River drainages), northern and central Idaho (Columbia and Snake River drainages); and a few small, scattered river drainages in Washington and Oregon and British Columbia and Alberta, Canada. Today, populations of westslope cutthroat trout occur almost exclusively in small, isolated streams in mountainous areas.

2. What is a 90-day finding? Publication in the *Federal Register* of a positive 90-day finding means that the Service has determined that the petitioners have provided substantial information to indicate that listing of a species as threatened or endangered under the Endangered Species Act may be warranted. Although a positive 90-day finding is an initial step in the process that could lead to listing of the species, it does not mean that listing is imminent.

3. Why do the petitioners think the westslope cutthroat is threatened? The petitioners state that populations of westslope cutthroat trout have been greatly reduced because of habitat destruction from logging and associated road building; adverse effects on habitat resulting from livestock grazing, mining, urban development, agricultural practices, and the operation of dams; historic and ongoing stocking of nonnative fish species that compete with or prey upon westslope cutthroat trout or jeopardize the genetic integrity of the subspecies through hybridization; and excessive harvest by anglers. The petitioners further assert that programs to protect and restore westslope cutthroat trout are inadequate or nonexistent and populations of this fish continue to be threatened by a wide variety of ongoing and proposed activities.

4. What is the next step in the process? The Service conducts a 12-month status review for westslope cutthroat trout. As part of that review, the Service seeks information on the present status of westslope cutthroat trout and measures now underway to protect the remaining populations of this fish, as well as comments and technical critiques pertaining to the petition and 90-day finding. Results of the status review will reveal whether or not listing of the westslope cutthroat trout as threatened under the Endangered Species Act is warranted.

5. When will we know if the westslope cutthroat trout will be proposed for listing? The status review should be completed by January 1999 and a summary finding published in the *Federal Register* about that time.

6. How will the listing of bull trout as a threatened species affect management of

westslope cutthroat trout? Except for the Missouri River drainage of Montana, the historic range of the westslope cutthroat trout (perhaps 65% of total) is entirely within that of bull trout. A proposed federal rule to list bull trout as threatened in the region of range overlap between bull trout and westslope cutthroat trout (i.e., Columbia River drainage) is imminent. Protection of habitat for bull trout that results from ESA listing will also benefit westslope cutthroat trout in the Columbia River drainage. Habitat Conservation Plans and other similar agreements for bull trout can also include management activities beneficial to westslope cutthroat trout.

7. **How will the genetics of westslope cutthroat trout be taken into account in the status review?** Today, many westslope cutthroat trout populations show evidence of some introduction of genetic material from other subspecies or species, such as introduced rainbow trout. In some cases this introgression of genetic material is slight, not outwardly evident in individual fish, and detectable only by electrophoresis or similar techniques of genetic analysis. The occurrence of genetically impure populations will be taken into account during the status review for the westslope cutthroat trout.

8. **If westslope cutthroat trout is a subspecies, why is it given consideration under the Endangered Species Act?** As defined in the Endangered Species Act, the term "species" includes any subspecies of fish, wildlife, or plants.

Westslope Cutthroat Trout (*Oncorhynchus clarki lewisi*) Facts

What is the westslope cutthroat trout? Westslope cutthroat trout is one of several subspecies of cutthroat trout native to the Rocky Mountain region. It often exhibits bright yellow, orange, and red colors and is generally distinguishable from other inland subspecies of cutthroat trout by the particular pattern of black spots that appear on the body. Lewis and Clark's Corps of Discovery caught westslope cutthroat from the Missouri River near present-day Great Falls, Montana, in 1805.

Where are westslope cutthroat trout found? Westslope cutthroat trout are native to streams and lakes in western and central Montana (Columbia and Missouri River drainages), northern and central Idaho (Columbia and Snake River drainages), and a few small, scattered river drainages in Washington and Oregon and British Columbia and Alberta, Canada. Today, populations of westslope cutthroat trout occur almost exclusively in small, isolated streams in mountainous areas.

What do westslope cutthroat trout eat? Most of the diet of westslope cutthroat trout of all ages consists of immature and mature forms a aquatic insects and other invertebrates.

What is the life cycle of westslope cutthroat trout? Westslope cutthroat trout usually reach maturity at 4 or 5 years of age. Spawning occurs primarily in small tributary streams between March and July, when water temperatures reach about 50 F. Fertilized westslope cutthroat eggs are deposited in stream gravels where they incubate for several weeks, the actual period of time dependent upon water temperature. Several days after hatching from the egg, when about one inch long, the fry emerge from the gravel and disperse into the stream. The fry may grow to maturity in the spawning stream or they may move downstream and mature in larger rivers or lakes. Thus three westslope cutthroat trout life-history types are recognized: *Resident* fish spend their lives entirely in the tributary; *fluvial* fish spawn in small tributaries and their resulting young migrate downstream to larger rivers where they grow and mature; and *adfluvial* fish spawn in streams but grow and mature in lakes.

Why are westslope cutthroat trout in trouble? Populations of westslope cutthroat trout have declined due to habitat destruction from logging and associated road building; adverse effects on habitat resulting from livestock grazing, mining, urban development, agricultural practices, and the operation of dams; historic and ongoing stocking of nonnative fish species that compete with or prey upon westslope cutthroat trout or jeopardize the genetic integrity of the subspecies through hybridization; and excessive harvest by anglers.

What is being done to protect westslope cutthroat trout? Many of the actions that will be taken to protect bull trout in the Columbia River basin will also benefit westslope cutthroat trout. Protection and restoration of stream habitat and modification of land-management practices to improve water quality are important. In some instances, barriers to the upstream movement of fish can be built to prevent nonnative fish species from invading river reaches occupied by westslope cutthroat trout. Fish stocking programs may need to be modified to assure that nonnative fishes are not directly or indirectly stocked into waters occupied by westslope cutthroat

trout. Several state agencies have enacted regulations reducing or prohibiting westslope cutthroat trout harvest. The Montana Department of Fish, Wildlife and Parks has drafted a conservation plan to protect and restore westslope cutthroat trout.

Chronology of Events Pertaining to the Petition to List Westslope Cutthroat Trout as a Threatened Species

June 6, 1997.--Fish and Wildlife Service receives a petition to list the westslope cutthroat trout as a threatened species throughout its range, pursuant to the Endangered Species Act. Petitioners are American Wildlands, Clearwater Biodiversity Project, Idaho Watersheds Project, Inc., Montana Environmental Information Center, Trout Unlimited's Madison-Gallatin Chapter, and Mr. Bud Lilly.

June 6, 1997.--Period of 90-day petition review begins. Service must decide whether or not the petition presents substantial information indicating that the requested action (listing) may be warranted.

July 2, 1997.--Service sends a letter to the petitioners stating that, on the basis of the Service's final listing priority guidance published in the December 5, 1996 *Federal Register*, the Service has determined that the petition falls into the Tier 3 category (i.e. low priority) and that westslope does not face "imminent, high-magnitude threats." The Service will proceed with the 90-day finding when completion of ongoing, higher-priority activities allows available funds to be allocated to westslope cutthroat trout.

September 4, 1997.--End of 90-day period for petition review.

September 24, 1997.--Petitioners send a letter (i.e. 60-day notice of intent) to Interior Secretary and Service stating that, unless the Service promptly issues the 90-day finding, the petitioners intend to pursue federal court litigation for alleged violations of the Endangered Species Act.

January 25, 1998.--Service receives from the petitioners an amended petition, which contains a substantial amount of new information on westslope cutthroat trout.

January 25, 1998.--Period of 90-day review for amended petition begins. Service must decide whether or not the amended petition presents substantial information that listing may be warranted.

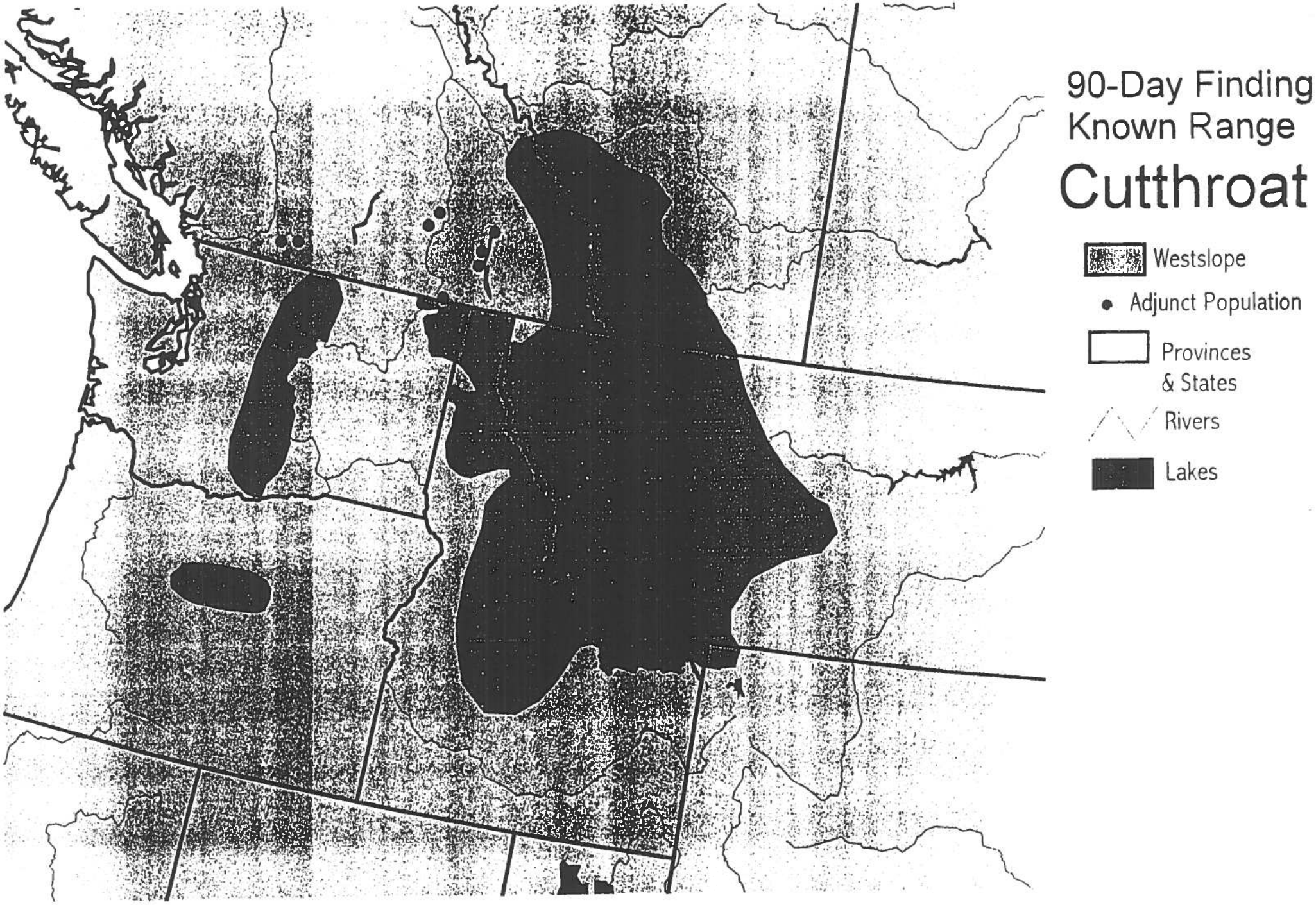
March 17, 1998.--Petitioners file a complaint in the U.S. District Court for the District of Columbia requesting that the court declare that the Service's failure to issue a 90-day finding is a violation of the ESA, its implementing regulations, and the Administrative Procedures Act, and that the court issue a preliminary and permanent injunction requiring the Service to issue a 90-day finding on the petition and promptly publish such finding in the *Federal Register*. The complaint was filed before the end of the 90-day review for the amended petition.

April 1, 1998.--Service sends a letter to the petitioners stating that, although the tier system for prioritizing listing actions remains in full force and effect, the Service is proceeding with preparation of a 90-day finding on the amended petition.

April 10, 1998.--The Service finds that the amended petition provides substantial scientific and

commercial information to indicate that listing of westslope cutthroat trout as threatened, throughout all or parts of its range, may be warranted.

June 8, 1998.--Service announces 90-day finding in *Federal Register*.


90-Day Finding
Known Range
Cutthroat
Westslope
Adjunct Population
Provinces
& States
Rivers
Lakes

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Snake River Basin Office, Columbia River Basin Ecoregion
1387 South Vinnell Way, Room 368
Boise, Idaho 83709

RECEIVED
SEP 0 2 1998
Department of Water Resources

June 10, 1998

Dear Interested Party:

The US Fish and Wildlife Service (Service) has taken several actions under the Endangered Species Act of 1973, as amended (Act). The Service has: 1) determined to list the Klamath River and Columbia River vertebrate population segments of the bull trout (*Salvelinus confluentus*) as threatened; 2) proposed to list the Coastal-Puget Sound, Jarbidge River, and Saint Mary-Belly River population segments of the bull trout as threatened; and 3) determined that a petition to list the westslope cutthroat trout (*Oncorhynchus clarki lewisi*) presented substantial information indicating that the requested action may be warranted. The purpose of this letter is to provide you with more detailed information on the petition to list the ***westslope cutthroat trout*** and request additional information concerning the subspecies.

Westslope Cutthroat Trout

The Service has determined that an amended petition to list the westslope cutthroat trout as threatened throughout its range provides substantial information to indicate that such listing may be warranted. The attached Federal Register Notice of this 90-day finding was published on June 10, 1998. The Service is **not** proposing to list the westslope cutthroat trout at this time. Instead, the Service seeks information on the present status of westslope cutthroat trout and measures now underway to protect the remaining populations of this subspecies, as well as comments and technical critiques pertaining to the amended petition and 90-day finding, for use in preparing a 12-month finding on the petition to list the westslope cutthroat trout. The Service's 12-month finding will determine whether listing the species is warranted or not warranted. If the Service determines that listing is warranted, that listing proposal may be precluded by other pending proposals of higher priority. To be considered in the status review and subsequent finding for the amended petition to list the westslope cutthroat trout as threatened, relevant information must be submitted to the Service by August 7, 1998.

The historic distribution of westslope cutthroat trout in streams and lakes can be summarized as follows: West of the Continental Divide, the subspecies is native to several major drainages of the Columbia River basin, including the upper Kootenai River drainage from its headwaters in British Columbia, through northwestern Montana, and into northern Idaho; the entire Clark Fork River drainage of Montana and Idaho downstream to the falls on the Pend Oreille River near the Idaho-Washington border; the Spokane River above Spokane Falls and into Idaho's Coeur d'Alene and St. Joe River drainages; and the Salmon and Clearwater River drainages of Idaho's Snake River basin.

The historic distribution of westslope cutthroat trout also includes disjunct areas in Washington (e.g., Methow, Entiat, and Wenatchee River drainages), in the John Day River drainage in Oregon, and in British Columbia. East of the Continental Divide, the historic distribution of westslope cutthroat trout includes the headwaters of the South Saskatchewan River drainage (U.S. and Canada); the entire Missouri River drainage upstream from Fort Benton, Montana, and extending into northwestern Wyoming; and the headwaters of the Judith, Milk, and Marias rivers, which join the Missouri River downstream from Fort Benton. Today, populations of westslope cutthroat trout occur almost exclusively in small, isolated streams in mountainous areas.

A copy of the notice announcing the Service's 90-day finding is enclosed for your information. The amended petition (including appendices and bibliography) is available for public inspection, by appointment, at the Montana Fish and Wildlife Management Assistance Office, 4052 Bridger Canyon Road, Bozeman, Montana 59715. Comments and information on the status of the westslope cutthroat trout should also be sent to the Service's Montana Fish and Wildlife Management Assistance Office at the same address.

Sincerely

Acting Project Leader

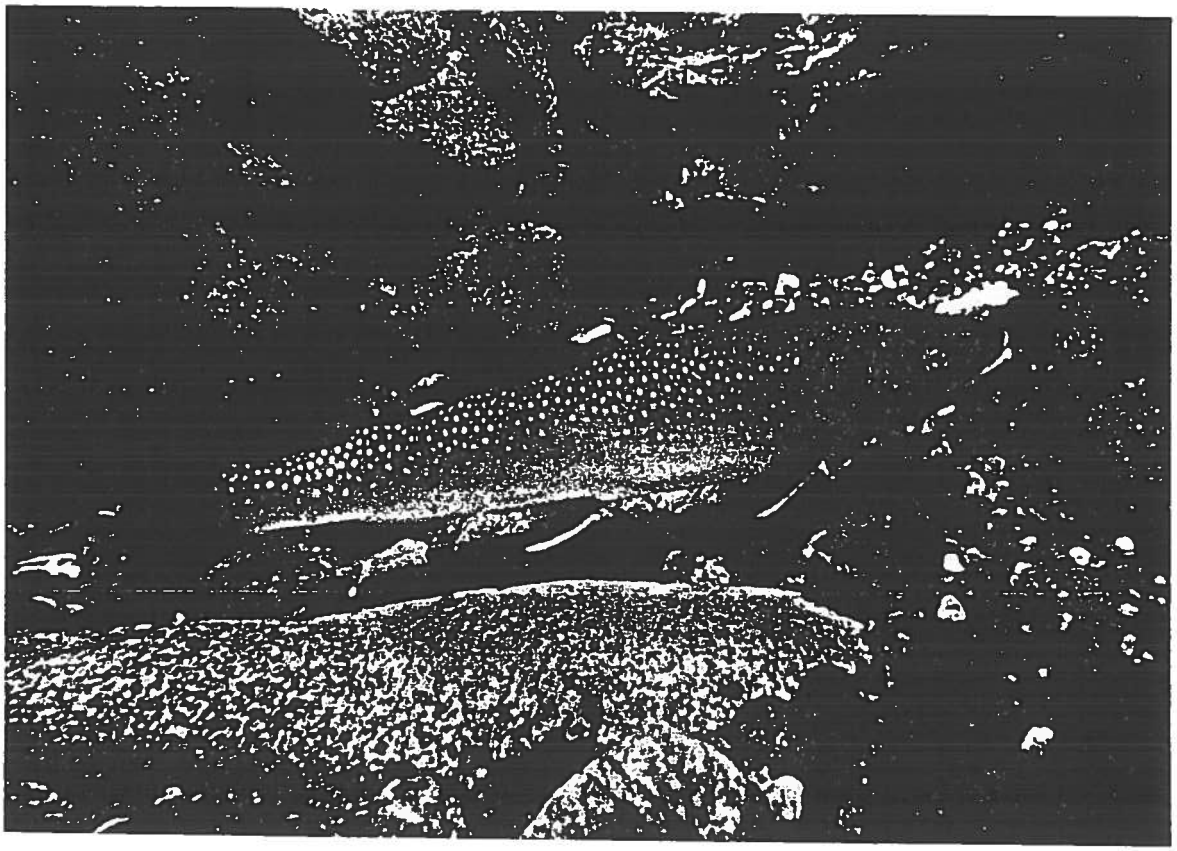
Enclosures

RECEIVED
SEP 0 2 1998
Department of Water Resources

GOVERNOR PHILIP E. BATT'S

STATE OF IDAHO

BULL TROUT CONSERVATION PLAN



July 1, 1996

OFFICE OF THE GOVERNOR
P.O. BOX 83720
BOISE 83720-0034

PHILIP E. BATT
GOVERNOR

(208) 334-2100

July 1, 1996

Dear Interested Party:

Enclosed is the final version of my bull trout plan. Months of work have resulted in a plan which I believe will successfully restore and protect Idaho's bull trout.

This plan is a public plan in every way. Comments from interested parties like yourselves were invaluable, but public involvement has only begun. Although state agencies will be there to help, the Watershed Advisory Groups that develop conservation and recovery plans will be made up of local citizens and will utilize their know-how and ingenuity. This conservation plan will work because it will have unique plans for unique environments. It is not a one-size-fits-all plan.

Another reason this plan will succeed is the strict timeline it contains. Necessary assessments for every key watershed will be done in the next two years. After that, the plan requires a minimum of six watershed recovery plans every year. I will also push my state agencies to beat all of these deadlines. Moreover, this plan does more than wait for degradation. Regardless of water quality, it requires a recovery plan for every key watershed. Even the most pristine habitat for the bull trout can be protected today--before this vital species becomes endangered.

My involvement in the plan is by no means over. I am committed to the protection and restoration of the trout, and look forward to working with state agencies, private partners, and local citizens toward that goal. Our work will not be done until there is a functional bull trout recovery plan in every key watershed in Idaho. Thank you for your interest and involvement.

Very truly yours,

Philip E. Batt

Philip E. Batt
Governor

PEB:vjm

GOVERNOR PHILIP E. BATT'S
STATE OF IDAHO
BULL TROUT CONSERVATION PLAN

EXECUTIVE SUMMARY

On June 12, 1995, the U. S. Fish and Wildlife Service found that while there was sufficient information available to warrant listing of bull trout as either "endangered" or "threatened" under the Endangered Species Act (ESA), that listing was precluded because of higher priority listing actions. This decision provided states the opportunity to take conservation actions necessary to recover the species. It is possible that action by the states to conserve or restore populations of bull trout may have a direct bearing on whether the fish is listed under the ESA. The agency now is obligated to review that decision in 1996, along with the progress of the individual state efforts to see if a change in the status of the fish is warranted.

In 1995, Idaho Governor Phil Batt designated two committees, a policy and steering committee and a biology committee, to prepare a Bull Trout Conservation Plan. In opening the first meeting of the team, Governor Batt outlined his goals for the plan, noting he wanted the plan to: (1) be workable, (2) focus on areas with the greatest potential for results at the lowest cost, (3) be based on sound science, (4) include public involvement, and, (5) maintain and strengthen existing populations, as well as restore the species in appropriate areas.

Bull trout are widely distributed in Idaho. They have populations which migrate long distances and others which remain in headwater streams their entire lives. Information about bull trout life history and habitat requirements is summarized in Part 1 of this plan.

The plan then discusses historical and current threats to the bull trout. Dam building and water diversions have isolated many populations. Past road building, agriculture, forestry, grazing, mining, stocking of exotic species and over-fishing have all contributed to habitat degradation and population declines. The impacts of land-use activities vary widely across the state and the plan outlines a framework for developing watershed-specific solutions to restoring areas degraded by past activities and to preventing degradation by ongoing or future activities.

There are 59 key watersheds identified in the plan. These watersheds contain the streams with the greatest potential for protecting and restoring bull trout populations through implementation of the plan. These watersheds provide the link between managing for the needs of bull trout, useful public involvement, and the state's obligations under the Clean Water Act. Problems such as sediment sources, reduced bank cover or stability, migration barriers, poaching or predation are most effectively identified and solved at the watershed level. The plan's strategy emphasizes protecting the healthy populations we have and focusing restoration efforts on areas which are not damaged beyond repair. The goal of the plan is to initiate locally developed common sense protection and restoration measures for watershed specific conditions.

Part II of this plan describes a process through which threats to bull trout restoration or protection can be identified and reduced. While there will be changes in land uses and management resulting from the plan, the protection and restoration measures will be developed locally.

Idaho Code §39-3601(95) provides the mechanism to make this happen. This legislation focuses on watersheds as the level where water quality problems are best identified and corrected through "watershed advisory groups" (WAGs). The development of these groups provides a way to identify and solve factors limiting bull trout populations. In addition, the Basin and Watershed Advisory Groups established through this law provide for public involvement, ensuring that bull trout watershed management plans are locally developed.

Implementing the Governor's plan will require changes not only in agency roles and management practices, but also in how private landowners conduct their business. While the plan's provisions should not be overly burdensome, there are public and private costs involved. For that reason, the plan identifies possible incentives to help assure that needed investments on behalf of bull trout are made.

Another goal of the Governor's plan is to facilitate development of "habitat conservation agreements". This provision of the Endangered Species Act allows landowners or agencies to develop and enter into agreements with the Fish and Wildlife Service that are designed to meet the needs of listed or candidate species. By adhering to those agreements, the landowner or agency is granted a "safe harbor" from land use restrictions or "taking" allegations should the species ultimately be listed.

Finally, the plan calls for a state Bull Trout Coordinator. If the plan is to be successful, there must be a number of changes in agency roles and the management of private and public lands. The need for these changes must be clearly communicated, along with the technical, financial and legal incentives that will make them acceptable. Coordinating these efforts and encouraging all that is necessary to make the plan a successful reality will be the responsibility of the bull trout coordinator.

PART I

BACKGROUND/PLAN OVERVIEW

July 1, 1996

PART I - BACKGROUND/PLAN OVERVIEW

INTRODUCTION

The bull trout (*Salvelinus confluentus*) is a federal candidate species currently under consideration for listing by the U.S. Fish and Wildlife Service (Service) as a threatened or endangered species. After initiation of a range-wide status review of the species, the Service published a 12-month finding on June 10, 1994 (59 FR 30254) that determined the listing of bull trout throughout its range was not warranted due to unavailable or insufficient data regarding threats to and status of the species within Alaska and Canada. The Service determined that sufficient information on the biological vulnerability and threats to the species was available to warrant listing of bull trout as a population segment within the conterminous United States. However, on June 12, 1995, the Service concluded that listing was precluded because of higher priority listing actions. This decision provided an opportunity for individual states to take conservation actions necessary to recover the species.

In 1995, Idaho Governor Phil Batt initiated development of a conservation plan to restore bull trout populations in Idaho. The mission of the Governor's Bull Trout Conservation Plan is to:

> Maintain and/or restore complex interacting groups of bull trout populations throughout their native range in Idaho.

To accomplish this mission, the goals of this plan include:

> Maintain the condition of those areas presently supporting critical bull trout habitat.
>
> Institute recovery strategies that produce measurable improvement in the status, abundance, and habitats of bull trout. Concentrate resources and recovery efforts in areas which will produce maximum cost-effective, short-term returns and which will also contribute to long-term recovery.
>
> Establish a secure, well-distributed set of sub-watersheds within key watersheds to achieve a stable or increasing population and to maintain options for future recovery; and
>
> Achieve the above goals while continuing to provide for the economic viability of Idaho's industries.

Idaho has long recognized the need and demonstrated the commitment to protect aquatic species. Land, water, and fisheries management practices throughout the state have been modified in a continuous, evolutionary process specifically to protect water quality and riparian habitat.

In 1995 the legislature passed a comprehensive amendment to Idaho Code (39-3601) designed to strengthen water quality protection in the state and improve compliance with the Federal Clean

Water Act (See Appendix E). This law mandates the formation of Basin Advisory Groups (BAGs) and Watershed Advisory Groups (WAGs) to address problems in water quality limited stream segments. The BAGs and WAGs, with their technical advisory groups, provide a source of technical guidance to help local communities develop standards for protection and/or maintenance of water quality.

The Governor's Bull Trout Conservation Plan utilizes the BAG and WAG framework to provide for local development of watershed specific plans to maintain and/or increase bull trout populations. State and federal agencies will provide technical assistance to BAGs and WAGs, and will make recommendations for protection of the bull trout. This will allow locally developed plans to meet the needs of both the bull trout and the community. While the state will not mandate how local communities protect the species, it will insist on meeting the goal of protecting and maintaining the species.

Although BAGs and WAGs will be the mechanism for establishing management practices for bull trout conservation in the majority of watersheds in Idaho, other efforts already underway, such as the Lemhi Model Watershed may serve the same purpose as the WAGs in some situations. In all instances the bull trout conservation goals and objectives will be met through locally developed site-specific programs and policies.

Since water quality and bull trout are closely linked, this approach is consistent with the governor's philosophy of agency coordination. It effectively provides for protection of both water quality and aquatic life forms.

The strategy for the protection and/or recovery of bull trout outlined in this plan is an ecosystem approach to riparian and aquatic management (Figure 2). While bull trout is the target species, many other aquatic and terrestrial species will also likely benefit from the proposed conservation actions.

BULL TROUT BIOLOGY

Taxonomy

Cavender (1978) identified bull trout *(Salvelinus confluentus)* as a distinct species of char, unique to western North America. Prior to the American Fisheries Society's acceptance of the description of *S. confluentus* in 1980, biologists considered bull trout and Dolly Varden, *S. malma*, to be of the same species. Local bull trout populations contain little genetic diversity relative to regional populations (Leary et al. 1993).

Historical Distribution

Bull trout occurred in all but the eastern section of Idaho, including the Snake River basin and tributaries of the upper Columbia River basin (Conley 1993). In the Snake River basin, their historical range approximates that of spring, summer, and fall chinook salmon (Thurow 1987; Rieman and McIntyre 1993) and possibly included the Owyhee River basin and other Snake River tributaries upstream as far as Salmon Falls Creek. They are not known to have occurred in the Snake River upstream of Shoshone Falls, the Wood River system, Birch Creek, or any stream in Idaho that drains the Centennial Mountains between Henry's Lake and the Bitterroot Range. An isolated population exists in the Little Lost River near Howe, Idaho between the Lost River and Lemhi mountain ranges.

In north Idaho bull trout were historically present in the Kootenai, Priest, Pend Oreille, and Spokane river drainages. Populations in the Kootenai River drainage had access to Kootenay Lake in British Columbia. Populations persist in Montana above Kootenai Falls. Adfluvial bull trout were abundant in Priest and Pend Oreille Lakes. Historical harvest exceeded 5,000 fish annually and fish heavier than 30 pounds were caught. Bull trout were caught in the Pend Oreille River and in the Priest River below Priest Lake. These areas may have supported fluvial populations as well as seasonal migrants from the lakes. Tributaries to the Clark Fork River upstream from Pend Oreille Lake supported the bulk of the spawning and rearing areas for Pend Oreille bull trout before Cabinet Gorge Dam blocked access in 1952.

Present Distribution

In 1992, Schill indicated that bull trout were the least studied salmonid in Idaho (Schill, 1992b). Presence/absence data is lacking in portions of the species' known or suspected range in north, central, and southern Idaho, although this situation is rapidly being rectified as biologists from State, Federal and private organizations pursue bull trout survey information at an accelerated pace (see Appendix F).

Biologists have encountered few new occurrences of bull trout, but have noted areas devoid of these fish where they once were known to occur. Additional survey work has documented bull trout in widely scattered segments of their known range in Idaho, mostly in headwater areas where only remnant resident populations may be surviving. Spawning activity of bull trout is

difficult to confirm in much of the species' range because remaining habitat is in isolated and inaccessible areas, numbers of fish are few, and redds are difficult to locate.

Life History

Bull trout exhibit two distinct life history forms, resident and migratory. Resident populations generally spend their entire lives in small headwater streams. Migratory bull trout rear in tributary streams for several years before either migrating into larger river systems (fluvial) or lakes (adfluvial). Research on bull trout has focused on bull trout stocks which migrate to lakes and reservoirs (especially Flathead Lake in Montana); less is known about stocks which migrate to mainstem river systems or remain resident in streams.

Outmigrating fluvial bull trout in Rapid River were primarily age 2 and 3, although younger fish may have outmigrated in the spring (Elle et al. 1994). Adfluvial juvenile bull trout migrated from upper Flathead River tributaries primarily at age 2 (49%), with smaller percentages emigrating at age 1 or 3 (18 and 32% respectively) (Pratt 1985).

Bull trout migrate to Pend Oreille lake from tributary streams at age 2 (Mason 1985). Adfluvial bull trout fry migrated from McKenzie Creek to Upper Arrow Lake during the spring freshet while older juveniles migrated in the spring and summer (McPhail and Murray 1979).

Shepard et al. (1984) speculate most juvenile migrants move quickly downstream along the stream margin to the mainstem Flathead or Flathead Lake beginning early as May and extending through the middle of July. Rapid River bull trout were sampled outmigrating in the fall. It is unknown if a spring outmigration occurs (Elle et al. 1994).

Migratory bull trout live several years in larger rivers or lakes, where they grow to much larger sizes than resident forms, before returning to tributaries to spawn. Resident and migratory forms may live together, but it is unknown if they represent a single population or separate populations (Rieman and McIntyre 1993). Generally, adfluvial fish are larger, fluvial fish tend to be slightly smaller and resident bull trout are much smaller (K.Pratt pers. comm.)

After hatching, bull trout fry rear in low velocity water (McPhail and Murray 1979). They find cover in substrate interstices, or within 0.03 meter (m) of the substrate and are associated with cobble and boulders or submerged fine debris where water velocity averages 0.09 meters per second (m/s) (Shepard et al. 1984). Juvenile bull trout prefer to be close to the substrate or some other cover which creates visual isolation (Pratt pers. comm.).

The presence of embryos, alevins and juvenile fish in the substrate during winter and spring indicates that highly variable stream flows, bedload movements, and channel instability negatively influence the survival of young bull trout (Goetz 1989; Weaver 1985). The redds of bull trout and other fall spawning fish are particularly vulnerable to flooding and scouring during winter and early spring (Elwood and Water 1969; Seegrist and Gard 1972; Wickett 1958), and to low

winter flows or freezing within the substrate. This association with substrate appears more important for bull trout than for other trout and char species (Nakano et al. 1992; Pratt 1984).

Juveniles live close to in-channel wood, substrate, or undercut banks (Goetz 1991; Pratt 1984, 1992). Adult resident bull trout also closely associate with the substrate but appear to select large cobble and boulder substrates (Jakober 1995, Goetz 1989), as well as lateral scour and pocket pools (Hoelscher and Bjornn 1989; Pratt 1984) and areas with complex woody debris and undercut banks (Graham et al. 1981; Oliver 1979; Pratt 1985; Shepard et al. 1984). Woody debris correlated significantly with densities of bull trout sampled in streams in the Bitterroot National Forest of Montana (Clancy 1992). Jakober (1995) found that stream resident bull trout of all sizes conceal themselves in the interstices of large cobble and boulder substrate and large woody debris accumulations during the day.

Although in-stream wood and substrate with clear interstitial spaces correlate with the distribution and abundance of bull trout, habitat complexity in any form can be important (Mullan et al. 1992). Strong bull trout populations will require high stream channel complexity. The amount of cover needed to maintain a strong bull trout population cannot, however, be quantified.

Migratory corridors provide access from over-wintering areas to spawning or foraging areas. Movement undoubtedly is important to the persistence and interaction of local populations within the metapopulation. Disruption of migratory corridors may reduce growth and survival, and possibly lead to the loss of the migratory life-history types. Resident stocks live upstream from natural barriers and an increasing number of barriers caused by human activities. Because these stocks are sometimes isolated in marginal or extreme habitats, they will be at increased risk of extinction (Horowitz 1978).

Reproduction

Bull trout generally mature between 5-7 years of age (Fraley and Shepard 1989, Goetz 1989, Leathe and Enk 1985). Bull trout spawn in the fall, primarily September and October (Heimer 1965, Leggett 1969, Oliver 1979, McPhail and Murray 1979, Shepard et al. 1984). Bull trout may spawn every year or in alternate years (Block 1955, Fraley and Shepard 1989, Pratt 1985, Ratliff 1992).

The migratory fish generally grow larger and have higher fecundity than resident forms. In the Rapid River drainage, fluvial bull trout are consecutive year spawners which grow an average of 54 millimeters (mm) during the 7 to 9 month over-wintering period and range from 290 to 540 mm in length (Elle et al. 1994, Elle 1995). Individuals in the Upper Salmon River spawning migrations ranged in size from 340 to 700 mm (Elle, pers. comm).

Adfluvial bull trout spawners ranged from 300 to 875 mm in length and 4 to 9 years old in the Flathead and Pend Oreille Systems (Shepard et al. 1984, Pratt 1985). Precocious males have been found in the Flathead and Pend Oreille drainages (Shepard et al. 1984, Pratt 1984).

Decreasing water temperatures may influence the onset of spawning (Shepard et al. 1984, Weaver and White 1985). Some bull trout spawn in streams with ground infiltration, particularly springs (Heimer 1965, Allan 1980, Shepard et al. 1984, Pratt 1984) or groundwater upwelling (McDonnel and Fidler 1985). However, spawning sites in Rapid River and other central Idaho systems show no evidence of groundwater influence (Elle 1995).

Upstream migration by bull trout in Rapid River appeared to coincide with temperatures >10° Centigrade (C) and a falling hydrograph following peak runoff, usually May through early July (Elle et al. 1994). In Alberta, Canada adult bull trout enter spawning streams in late July or August (Carl 1985). Bull trout leave Flathead Lake to begin their upstream migration in early spring, generally in April and May. Migrating bull trout remain in the Flathead River mainstem until mid-late August and then move into tributary streams to commence spawning (McDonnel and Fidler 1985).

McPhail and Murray (1979) found egg survival was highest at temperatures of 2 to 4°C. Egg mortality increased with increasing temperatures with only 0 to 20% survival in water 8 to 10°C. Under stable conditions, forty to fifty percent of eggs survive in the wild (Allan 1980). No specific work has been done on the oxygen requirements of bull trout eggs.

Spawning substrate is typically loosely compacted gravel and cobble (McPhail and Murray 1979, Shepard et al. 1984). Spawning sites include runs or tails or pools with water 0.2 to 0.8 m deep. Eggs were buried 10 to 20 centimeters (cm) in the gravel, and water velocities associated with redds were 0.2 to 0.6 m/s (Shepard et al. 1984). Substrate size has been shown to influence survival in laboratory tests, with survival at 0% with more than 50% fines (<6.35 mm) to about 40% with no fines (Shepard et al. 1984). Groundwater or stream bed recharge present may result in higher survival to emergence (Shepard et al. 1984).

Hatching is completed in 100 to 145 days, usually the end of January (Heimer 1965, McPhail and Murray 1979, Allan 1980, Weaver and White 1984). Yolk sac absorption requires 65 to 90 days (Shepard et al 1984). Parr marks develop and feeding begins while fry are still in the gravel. Bull trout reach lengths of 25 to 28 mm before filling their air bladders and emerging from the stream bed, approximately in April (Shepard et al 1984).

Habitat

Bull trout appear to have more specific habitat requirements than other salmonids. Channel stability, winter high flows, summer low flows, substrate, cover, temperature, and the presence of migration corridors consistently appear to influence bull trout distribution or abundance (Allan 1980; Fraley and Graham 1981; Leathe and Enk 1985; Oliver 1979; Thurow 1987; Ziller 1992).

Shifts in habitat use occur depending on the time of day. Bull trout often conceal themselves in cover (substrate and woody debris) during the day and move on or above the substrate at night (Goetz 1991, Jakober 1995). This pattern of daytime concealment is more pronounced as water temperatures decline below 7°C (45°F)(Jakober 1995, Schill 1991). Seasonal habitat shifts also

occur. During winter, activity and aggression are greatly reduced and survival depends on finding suitable shelter and minimizing energy costs (Cunjack and Power 1987).

Bull trout appear to seek large, deep pools with abundant cover in the autumn and winter (Jakober 1995). Adult bull trout over-wintering in the Salmon River used pool and run habitats (Schill et al. 1994, Elle et al. 1994). Most over-wintering bull trout showed high site fidelity after entering the main Salmon River. Individuals typically remained in the same habitat unit they selected after cessation of downstream movement (Elle et al. 1994). No published information exists regarding juvenile overwinter habitat use in large rivers.

Temperature represents a critical habitat characteristic for this species. Temperatures above about 15°C (59°F) are thought to limit bull trout distribution (Allan 1980; Brown 1992; Fraley and Shepard 1989; Goetz 1991; Oliver 1979; Pratt 1984; Ratliff 1992; Shepard et al. 1984). Goetz (1989) believed that optimum temperatures for rearing were about 7 to 8°C (45 to 46°F).

Increased temperature can limit the distribution of other char (Meissner a, 1990b) and likely will exacerbate fragmentation of bull trout populations. North Idaho bull trout appear to prefer streams with significant ground water recharge which relative to other streams in a basin are often the coldest in the summer and the warmest in the winter. This relationship is not as evident in Central Idaho (Elle, personal conversation). Bull trout in the Flathead Basin are not found in streams where maximum monthly water temperatures exceed 18°C (65°F) and are most abundant where water temperatures are 12°C(53°F) or less (Shepard et al. 1984).

Adult bull trout in Libby Reservoir live in open water in the summer and near shore during the fall (Chisholm et al. 1989). In Flathead Lake, bull trout tend to use the littoral zone (Block 1955). Bull trout occupy the lower portion of the thermocline at depths of 12.2 to 18.3 m in Priest Lake, where water temperatures are 7.2 to 12.8°C (45 to 54°F) and move to the surface when surface water temperatures drop to 12.8°C or lower (Bjornn 1961).

Food Habits

In the Flathead basin, juvenile bull trout (< 100 mm) were found feeding on macroinvertebrates (aquatic insects), with preference for mayflies (ephemeroptera) and flies (diptera) (Shepard et al. 1984). Mayflies, stoneflies (plecopterans), caddisflies (trichopterans) and beetles (coleopterans) are the preferred food of juvenile bull trout in the Muskeg River system of Western Alberta (Boag 1987). Adult bull trout are opportunistic fish eaters (piscivores). In Libby Reservoir, fish account for over 99% of the biomass consumed by bull trout (Chisholm et al. 1989).

Growth

Growth varies between the three bull trout forms. McPhail and Murray (1979) found bull trout grew to larger sizes at lower temperature and grew largest at 4°C. Bull trout rearing in streams are 100 to 150 mm by age 2 to 3 and growth increases once they enter lakes (McPhail and Murray 1979). Generally resident adults range from 150 to 300 mm in length (Goetz 1989,

Mullan et al. 1992) while migratory fish commonly exceed 600 mm in length (Goetz 1989, Pratt 1985, Shepard et al. 1984).

PROBLEMS/THREATS

The current distribution and abundance of bull trout suggest historical habitat modification has directly influenced many populations. The legacy of these historical activities may continue to degrade habitat conditions or depress bull trout populations. However, increased environmental awareness and technical knowledge have stimulated the development of management practices designed to protect water quality and riparian habitats.

Threats to bull trout persistence are linked to habitat modifications caused by timber harvest and associated road development, livestock grazing, mining, dams, hydro-electric development, and irrigation diversions (USDA Forest Service, 1994). Introduction of exotic species has impacted bull trout populations through competitive interaction, predation, and hybridization (Rieman and McIntyre 1993). Hatchery supplementation may introduce genetic threats to wild stocks (Leary et al. 1993). Bull trout have suffered from historical over-harvest. Poaching of spawning adults and mis-identification by fishermen may result in harvest. Any activity that results in significant modifications in the habitat characteristics of: 1) channel stability, 2) substrate composition, 3) cover, 4) temperature, and, 5) migratory corridors should be considered a threat to the persistence of a bull trout population (Rieman and McIntyre 1993). See Appendix C for a more complete discussion of potential threats.

Protection and/or restoration of bull trout in Idaho will require protecting the best remaining habitats, identifying threats from past land use activities, recognizing potential threats from future land use and recommending management practices that will meet the mission and goals of this plan.

BULL TROUT RECOVERY APPROACH

Fundamental to the protection and/or recovery of bull trout throughout their range in Idaho is the designation of bull trout key watersheds. These key watersheds have been identified as critical to the long-term persistence of bull trout populations. They define the land area where management actions will emphasize the maintenance and/or recovery of regionally important bull trout populations throughout Idaho. Bull trout key watersheds are designated on the basis of bull trout biology and life history needs, and not on land ownership. This plan identifies 59 key watersheds (table 6, Appendix F) that contain bull trout populations where protection and/or restoration activities are likely to produce measurable results. These watersheds range in size from 100 to 1000 square miles. The populations they support represent regional metapopulations. A metapopulation (Gilpin 1987) is a group of semi-isolated sub-populations which are interconnected and likely to share genetic material. Other watersheds in Idaho, such as the Coeur d'Alene basin, may contain bull trout, but habitat conditions are so badly degraded that restoration will be long term and potentially expensive (Dave Cross, Ned Horner, pers. comm).

The bull trout key watersheds in Idaho were selected based on five criteria (Rieman and McIntyre 1993):

1. Key watersheds must provide all critical bull trout habitat elements;

2. Key watersheds should be selected from the best available habitat with the best opportunity to be restored to high quality;

3. A key watershed must provide for replication of strong subpopulations within its boundaries. Conservatively, 5-10 subpopulations should be included within a key watershed. If multiple subpopulations cannot be incorporated, a system should not be eliminated from consideration. If strong subpopulations are not available, key watersheds should emphasize population restoration;

4. Key watersheds should be large enough to incorporate genetic and phenotypic diversity, but small enough to ensure that the component populations effectively connect;

5. Key watersheds must be distributed throughout the historical range of the species.

Strong subpopulations (source) within key watersheds, will contribute to weak (sink) subpopulations and should prevent local extinctions. The role of source and sink populations may vary over time.

Bull trout utilize different areas of the key watersheds at during different stages of their life history. Headwater areas are important for spawning and rearing, while mainstem rivers provide migratory corridors and overwintering habitat for fluvial and adfluvial fish. In addition, habitat

conditions within key watersheds will vary depending on natural conditions and land-use history. To most efficiently allocate resources and determine appropriate protection and restoration efforts, habitat conditions within key watershed sub-basins should be evaluated and classified as follows:

1) Focal habitats are critical areas with high-quality habitat, "the best of what is left". Securing focal areas supporting healthy sub-populations of several thousand individuals (source populations) can increase the persistence of adjacent populations in lower quality habitats (sink populations) (Frissell 1993, Rieman and McIntyre 1993, Pulliam 1988, Stacey and Taper 1992).

2) Adjunct habitats are areas adjacent to focal habitats which have been degraded by human or natural disturbances and do not presently support high diversity or abundance of native taxa. Restoration may be necessary to reestablish bull trout. Because of their close proximity to existing bull trout populations, chances are good bull trout populations can be established.

3) Nodal habitats are generally mainstem overwintering areas, and serve as a corridor for migratory life forms.

4) Critical contributing areas are portions of a watershed which are sources of water, wood and sediments to focal, nodal and adjunct habitats.

5) Lost cause habitats are areas so severely degraded that recovery is unlikely, at least within the time span of several human generations.

All the bull trout key watersheds fall within basins defined by Idaho Code 39-3601 as listed in Table 1 and illustrated in Figure 1.

TABLE 1: Listing of how Idaho Code 39-3601 Basins, Proposed DEQ Watersheds and Bull Trout Key Watersheds Nest Together. (Appendix F)

BASIN	PROPOSED DEQ WATERSHED ADVISORY GROUP	BULL TROUT KEY WATERSHED
Southeast		*No bull trout key watersheds*
Southwest/ Snake River	Lower Snake River	Jarbidge River
	Lost River	Little Lost River
	Weiser River	Weiser River
	Boise River	Arrowrock/ NF, MF, SF Boise
		Anderson Ranch/ SF Boise
	Payette River	Middle Fork Payette
		Squaw Creek
		Deadwood River
		Gold Fork
	Brownlee	Indian Creek
		Wildhorse Creek
	Hells Canyon	Hells Canyon - Sheep
Salmon Basin	Little Salmon River	Little Salmon
	Lower Salmon River	Whitebird/ Slate Creeks
		French Creek
		Wind River/ Crooked Creek
		Secesh
		Five Mile/ Sabe
		Lower SF Salmon
		Upper SF Salmon
		Johnson Creek
		Chamberlin Creek
		Horse Creek
		Owl Creek
	Middle Fork Salmon River	Lower Middle Fork
		Big Creek
		Marble Creek
		Upper Middle Fork
		Bear Valley Creek
		Big Creek to Wilson/Camas Creek
		Wilson/ Camas Creek
		Loon Creek
		Panther Creek
	North Fork Salmon River	NF Salmon
		Carmen Creek
		Hat/ Iron
		Indian Creek
	Upper Salmon River	Thompson/ Bayhorse
		Warm Springs Creek
		East Fork Salmon
		Yankee Fork
		Upper Salmon
	Pahsimeroi	Pahsimeroi
	Lemhi	Lemhi
Clearwater Basin	South Fork Clearwater	SF Clearwater
		Clear Creek
		Lolo Creek
	Lochsa River	Lochsa River
	Selway River	Meadow Creek
		Middle Selway
		Upper Selway
		Moose Creek
	North Fork Clearwater	Little North Fork
		Upper North Fork
		Kelly Forks
		Weitas Creek
	Mainstem Clearwater	*No BT key watersheds*
	Palouse River	*No BT key watersheds*
	Potlatch River	*No BT key watersheds*
	Hangman Creek	*No BT key watersheds*
Panhandle	St Joe/ St Marie	Upper St Joe
	Coeur d'Alene, Spokane, Rathdrum	*No BT key watersheds*
	Pend Oreille	Pend Oreille Lake
	Priest	Priest River
		Upper Priest Lake
	Kootenai River	Kootenai River

Figure 1 - Example of Bull Trout Basin/Watershed Hierarchy

Under the federal Clean Water Act (CWA), the State has the responsibility to set standards against which success in meeting the goals of the CWA can be measured. Inherent in the standard is the concept of "beneficial uses", and the biological or consumptive use depends upon the quality of the water or aquatic habitat values for each stream or water body. Idaho's general water quality standard requires water quality protection measures sufficient to support all beneficial uses fully.

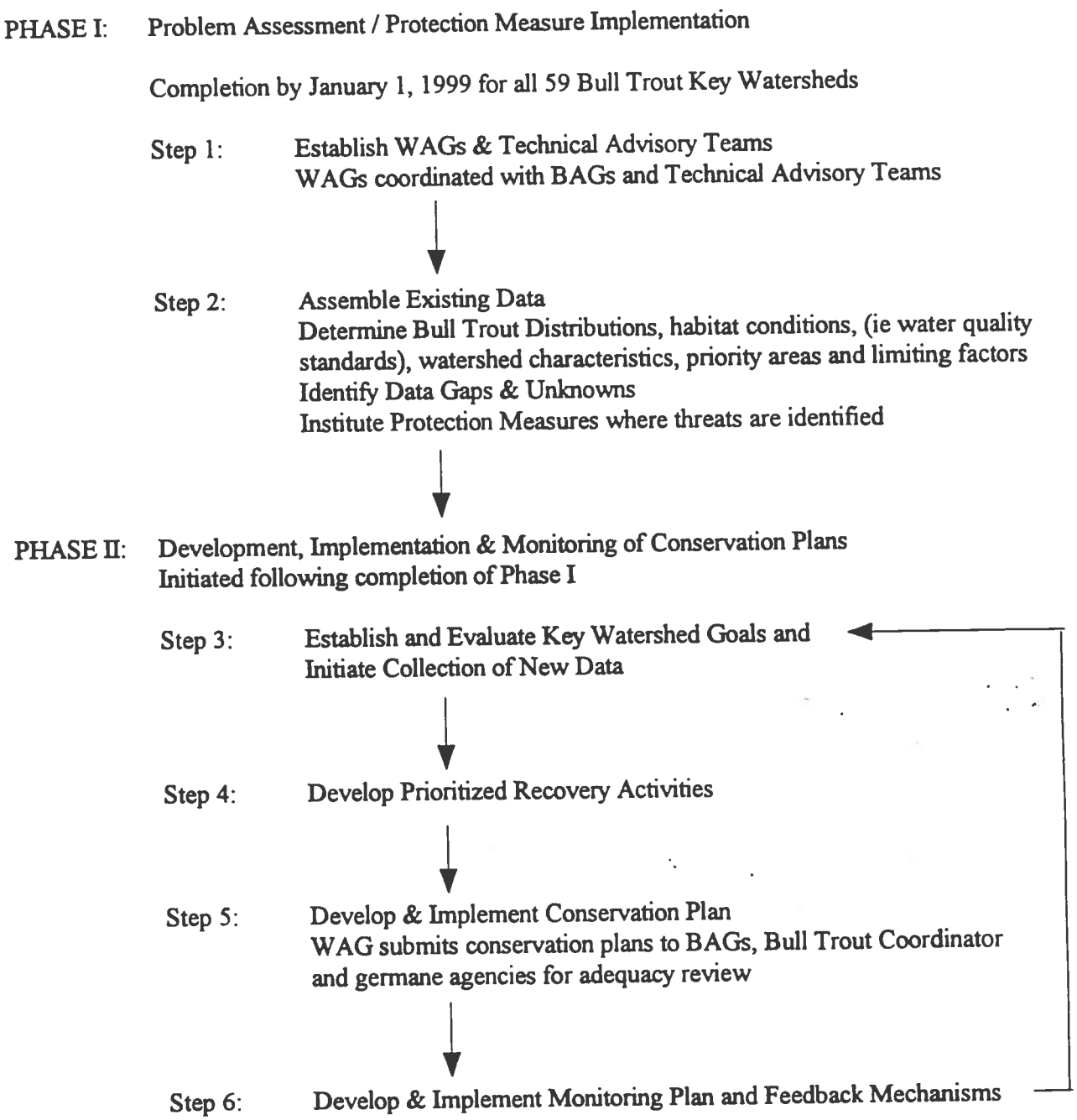
Beneficial uses can be expressed in terms of naturally occurring biological values inherent in a stream, e.g., salmonid spawning for streams with quality sufficient to support that biological use. Beneficial uses can also be designated through a rule. However, streams cannot be downgraded artificially by designating "beneficial uses" beneath its actual capability. For example, a stream's beneficial use cannot be designated as "warm water biota" (a use that may imply lower biological values, and, consequently, relatively minor protection measures) if that stream is capable of supporting "salmonid spawning", a use which requires more stringent water quality protection measures.

Coordination of bull trout and water quality protection efforts best occur at the watershed level. The entire watershed must be considered in order to develop effective site-specific, best management practices and other measures to protect high quality streams and to restore the quality of the streams not meeting standards. For water bodies key to the protection or restoration of bull trout, it is possible to designate "bull trout spawning and rearing" as a beneficial use. Not all water bodies within a bull trout key watershed may require such a designation. Water quality protection measures must be employed which are adequate to assure that the standard is met. The development and implementation of these measures are required by state and federal laws. The entire process is summarized in Figure 2.

The state of Idaho crafted legislation to prioritize water quality problems and implement solutions to those problems (SB1284, amendments to Idaho Code 39-3601, see Appendix E). The legislation is based upon citizen participation in the form of six basin advisory groups (BAGs) in each of Idaho's major hydrologic basins, and numerous watershed specific problem-solving groups within each basin, called watershed advisory groups (WAGS). With the technical support of state and federal agencies, and private industry, these citizen groups will establish priorities and recommend protection measures and appropriate best management practices (BMPs) or modifications of BMPs to resolve water quality problems within their designated watersheds and basins.

The vehicle provided by Idaho Code 39-3601 can also be used to protect and recover bull trout throughout its range in Idaho. It can be used either parallel to or in conjunction with efforts already under way to resolve water quality issues throughout the state.

Figure 2: Flow Diagram of Strategy to Implement Key Watershed Plans



APPENDIX C - THREATS TO BULL TROUT

Timber Harvest

Timber harvest and associated activities such as road construction and skidding can affect the amount, form and function of woody debris, the composition of substrate, and the stability and form of channels (Bisson et al. 1987; Hicks et al. 1991; Sullivan et al. 1987). Many systems exhibit impacts from historical activities such as splash damming, skidding and debris removal which often operated within the stream channel.

Clearcutting and watershed modification are linked to increased water yields, bed load movement, more frequent flooding or scour events (Chamberlain et al. 1991; King 1989; Sullivan and other 1987), and to channel instability (Kapesser 1992). Stream temperatures have been altered with changes in the forest canopy and riparian shading, in water yield and in hydrologic patterns (Beschta et. al. 1987; McGurk 1989 Rishel et. al. 1982).

Forest managers recognize the potential impacts of forest management and design practices to reduce impacts because of new operations (Bission et al. 1992). However, unique or previously impacted areas may be intolerant to any additional increases in sediment or reductions in forest canopy. Impacts from previous activities (legacy effects) may limit current management options.

Road Development

Edwards and Burns (1986) linked levels of fine sediments in streams to road densities. Weaver and Fraley (1991) and Shepard et al. (1984) linked levels of fine sediment to some ground disturbing activities. Many larger streams within key watersheds have roads of varying quality parallel to the channel. These roads often constrain channel meanders and are frequently a source of fine sediments. Also, on steep or unstable slopes, poorly planned, constructed or maintained roads have washed out or triggered large debris flows filling stream channels with sediments and resulting in instability even decades after the road has been abandoned, and they will continue to do so until they are identified and either upgraded or properly abandoned. Many roads were originally built for mining or timber harvest purposes and were subsequently taken over by counties or road districts for public use and residential access. Maintenance is often infrequent and not adequate to limit sediment delivery to streams. Construction of new roads may result in sedimentation if adequate sediment delivery mechanisms are not considered.

Livestock Grazing

The effects of improper livestock grazing include altering and reducing the vegetation adjacent to the stream, thereby reducing cover and shade, and weakening streambanks. This results in increasing bank instability, bank retreat, and bank erosion and sediment delivery to the stream. This alters channel morphology by increasing accumulated fine sediments, degrading stream substrates, reducing bed stability reducing habitat diversity, reducing over-wintering habitat, widening channels, and decreasing water depths. Other results include increasing water temperature extremes, suspended sediments, nutrients, bacteria and other adverse water chemistry parameters (Armour et al. 1991, Chaney, et al. 1993, and Platts 1991). Proper grazing management can provide opportunities to protect and/or restore riparian areas without large expenditures of money (Elmore and Beschta 1987).

The site specific nature of management is demonstrated by the wide range in predictions of allowable use riparian zones. These predictions vary from 25% to as much as 70% use (Platts 1991, Clary & Webster 1989, Bryant 1985). Careful consideration must be given to the amount of use and, in particular, to the

amount of foliage remaining after grazing in relation to the site specific system. The degree of allowable use clearly depends upon the characteristics and needs of the individual site.

Mining

There are areas in Idaho which have been impacted by historic open-pit, underground, and placer mining operations and effluent from these closed or abandoned mines. Tailings dams, waste dumps, and diversic provide barriers to bull trout migratory corridors and spawning sites. Toxic constituents (heavy metals) i drainages arising from historic sites may block migratory corridors or kill life stages of bull trout. Some current operations are permitted to alter stream channels. Increased sedimentation or release of toxins in surface or ground water may occur if specified site- specific BMPs are not designed, enforced and maintained.

Dams : Hydroelectric Development & Irrigation Diversion

Fragmentation and disruption of bull trout habitats isolate populations and isolate or eliminate life history forms, particularly fluvial and adfluvial forms. Those effects probably have influenced both local and regional extinctions. Where isolation has occurred, natural events such as floods and drought increase the risk of local extinctions (Horowitz 1978). Dams and irrigation diversion that dewater or block streams ar common in many interior basins. Dewatered stream sections and diversion structures can fragment and isolate bull trout populations from the rest of the drainage. Reduced flows below diversions reduce cover and can result in temperature increases to lethal levels.

Direct effects of water withdrawals for irrigation on bull trout habitats include effects on water quality (increased temperature, suspended sediment, nutrients, and pesticides), water quantity, blockage of migration corridors and direct losses of fish into water conveyance systems.

Bull trout are sympatric with resident salmonids, and anadromous species such as spring and summer chinook salmon and steelhead (Schutz and Northcote 1972; Thurow 1987; Ratliff 1992). Migratory conditions in the Snake and Columbia Rivers and habitat losses that have negatively impacted chinook an sockeye (*Oncorhynchus nerka*) salmon stocks in Idaho have also reduced distribution and numbers of bu trout. In watersheds which formerly supported anadromous fish, loss of the anadromous fish due to blockage by dams or population declines has resulted in a subsequent loss of prey for bull trout. This preybase cannot be restored in drainages which have permanently blocked anadromous migration. Drainages which have depressed anadromous populations have the potential to restore the food base if th anadromous fish populations are restored.

Urbanization

Some key watersheds have expanding housing subdivisions and urban development. Houses built along t stream can change runoff patterns and increase sedimentation. Vegetation is frequently cleared from stream banks to improve the view. Septic tanks and drain fields may seep into ground water, altering nutrient chemistry in the stream.

Catastrophic Fire

Past management activities and successful wildfire control have caused a shift in forest species compositi and stocking levels, predisposing them to large scale mortality. Recent recurrent drought conditions hav

further disposed these forests to increased wildfire incidence and intensity, resulting in significant negative impacts on water quality and fish habitat.

Sport Fishing

The Idaho Department of Fish and Game has declared all waters in the state closed to bull trout harvest beginning January 1, 1996. Most harvest opportunities were closed in 1994. Although seasons for harve have been closed throughout the state, mis-identification of bull trout as brook trout or lake trout does lea to incidental harvest. Poaching remains a problem in some areas.

Historically, bull trout were considered significant predators on other salmonid game fish species and harvest was encouraged. Bull trout spawners are particularly vulnerable to poaching because they often enter small tributary streams several months prior to spawning and congregate in pools. In developed watersheds, extensive road systems provide easy access to prime spawning areas.

Disease, Predation or Competition

Disease has not been identified as a significant factor in the decline of native bull trout. Introduction of hatchery fish may pose a disease risk to wild stocks of bull trout.

Interactions with introduced non-native fishes through competition, predation, and hybridization have decreased the likelihood that some bull trout populations will persist. Introduced brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*) have been associated with the decline of bull trout populations (Bond 1992; Mullan et al. 1992). Bull trout often appear restricted to waters upstream from those used by introduced rainbow trout and brown trout (Mullan et al. 1992; Pratt 1985). The expansior of lake trout (*Salvelinus namaycush*) may have severely depressed adfluvial bull trout in Priest Lake, Idal (Rieman and Lukens 1979) and in Flathead Lake, Montana (Weaver and Fraley 1991). Lake trout may prey on juvenile bull trout. Competitive displacement also seems likely where lake trout have been introduced.

Hybridization appears to be a common problem where isolated or remnant bull trout populations overlap with brook trout (Cavender 1978; Leary et al. 1983, 1991). Both species are likely to spawn at about th same time and in some of the same places (Balon 1984), and have similar temperature requirements for incubation (McPhail and Murray 1979). Hybrids are likely to be sterile and experience developmental problems (Leary et al. 1985, 1991). Brook trout likely have a reproductive advantage over resident bull trout because they mature earlier. Hybridization could eliminate a bull trout population (Leary et al. 199 Mullan et al. 1992).

Hatchery Supplementation

Supplementation of wild bull trout stocks with hatchery bull trout may be harmful by altering or reducing genetic diversity. Ryman and Laikre (1991) have shown the release of artificially reared progeny may reduce the effective population size of local populations because of the greater reproductive success of those adults used to provide hatchery progeny. Hatchery reared Dolly Varden were stocked on the Penc Oreille drainage, but genetic and morphometric measures of present bull trout populations in Pend Oreill show no signs of introgression. There currently is no stocking of hatchery reared bull trout in the state o Idaho.

Table 3: Summary of threats to bull trout habitat and populations.

Activity	Potential Disturbances	Potential Habitat Responses
HABITAT MODIFICATION		
Timber Harvest	- Removal of riparian zone canopy cover - Soil disturbance, increased erosion of fine sediments - Alteration of total basin vegetation cover	- Potentially increased summer water temperatures & formation of anchor i - Potential decrease in interstitial spaces pools (spawning and rearing habitat) - Potential alteration of timing and mag of peak flows (hydrology)
Road Development	- Surface erosion, increased fine sediment inputs - Destabilization of upslope areas, increased coarse and fine sediment inputs - Blockage of migratory corridors (culverts)	- Potential decrease in interstitial spaces pools (spawning and rearing habitat) - Potential for major channel disruption loss of all habitat with large erosion ev - Loss of migratory population compon
Livestock Grazing	- Bank damage - In-channel stream bed disruption - Removal of bank vegetation	- Decreased bank stability and direct inp fine sediments - Loss or disruption of summer rearing habitat - Loss of cover, potential for increased summer water temperatures and form of anchor ice
Mining	- Streambed disturbance - Fine sediment inputs - Chemical runoff	- Loss or disruption of spawning and su rearing habitat - Creation of chemical barriers and/or d fish mortality
Dams: Hydroelectric Development and Irrigation Diversion	- Blockage of migratory corridors - Increased temperatures, fine sediments and nutrients with waste water returns - Channel dewatering - Loss of anadromous fish	- Loss of migratory population compon - Overall decrease in habitat condition - Direct mortality of redds, loss of avail habitat - Loss of anadromous prey base
Urbanization, Recreation & Other	- Reduction/removal of riparian vegetation - Streambed damage - Dewatering - Channel stability	- Potentially increased summer water temperatures and formation of anchor
Catastrophic Fires	- Fine sediment inputs - Chemical runoff - Channel stability	- Loss or disruption of spawning and su rearing habitat - Decreased bank stability and direct inp fine sediments - Potential alteration of timing and mag of peak flows
UTILIZATION / HARVEST		
Fishing Harvest	- Direct mortality	- Direct mortality
DISEASE, PREDATION, COMPETITION		
Exotic species introductions	- Competition - Hybridization - Predation	- Displacement from most favorable ha - Sterile hybrids - Direct mortality

APPENDIX F - BULL TROUT METAPOPULATIONS, KEY WATERSHED DESCRIPTIONS

Gilpin (1987) defined a metapopulation as a group of semi isolated sub-populations which are interconnected so that individuals can migrate to other portions of the watershed and reproduce with other sub-populations.. Sedell and Everett (1993) describe a meta-population as a population comprising local populations that are linked by migrants, allowing for recolonization of unoccupied habitat patches after local extinction events.

Metapopulation principals form the base for selection of the bull trout key watersheds in Idaho. For many key watersheds, connectivity between populations has been lost due to habitat fragmentation. In other key watersheds where connectivity remains on a large scale basis, ie. Salmon River, the physical size of the key watershed and the likely distance a bull trout may travel and the ability to actually measure recovery impacts restricted the size the key watershed. In these cases the key watershed boundaries are somewhat arbitrary and may need adjustments as more information becomes available.

Using criteria suggested by Rieman and McIntyre (1993), bull trout key watersheds should meet at least five criteria.

A key watershed should provide all critical habitat elements. Ideally, a key watershed should meet the needs of migratory and resident life forms.

Key watersheds should represent the best remaining habitat or habitat with the best opportunity for restoration. As an example, a key watershed might consist of a collection of managed and unmanaged or carefully managed watersheds that remain connected by normal migratory corridors.

A key watershed should provide for replication of strong populations within its boundaries. To minimize the risk of extinction a system should consist of multiple, healthy sub-populations.

Key watersheds should be large enough to incorporate genetic and phenotypic diversity, but small enough to ensure theat the component populations effectively connect. If sub-populations are too close to one another, their response to environmental changes may be correlated, or they may become vulnerable to the same random threat. If sub-populations are too far apart, they will not support each other and suffer the long term consequences of genetic drift ro inbreeding. For bull trout, key watersheds should be from 250 to 2500 square kilometers.

Key watersheds must be distributed throughout the historic range of the species. The genetic variation for bull trout is contained among different populations rather than within any single population. Conservation of genetic diversity implies conservation of populations throughout the historic range.

Refugia or refuge habitats:

Locations and habitats that support populations of organisms that are limited to small fragments of their previous geographic range.

Figure 3: Bull Trout Key Watershed Boundaries

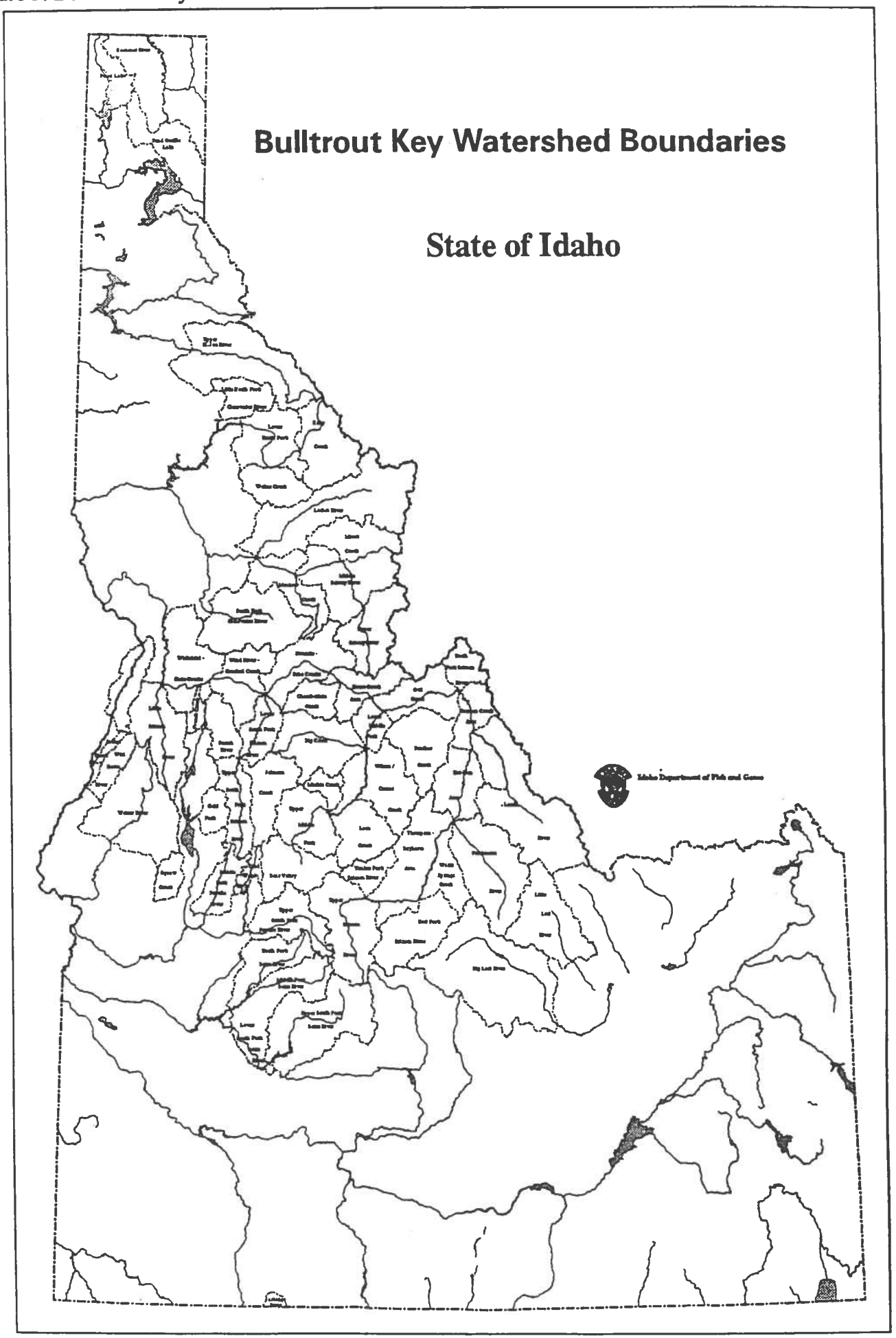


Table 6: Bull Trout Key Watersheds. All key watersheds include tributaries unless otherwise stated.

Basin: **Snake River**

Key Watershed	Description
Jarbidge River	Upstream of confluence of East Fork and West Fork Remaining known population in Nevada.
Little Lost River	Mouth to Headwaters. This is a remnant population and only known population upstream of Shoshone Falls.
Weiser River	Upstream of, and including, the Little Weiser River.
Boise River, Middle Fork	Upstream of Arrowrock Reservoir. Includes South Fork of the Boise Downstream of Anderson Ranch Reservoir.
Boise River, North Fork	From confluence with Middle Fork to Headwaters.
Boise River, South Fork	Upstream of Anderson Ranch Reservoir.
Payette River, South Fork	Upstream from the Mouth of the Deadwood River. Includes the Deadwood River downstream from Deadwood Reservoir.
Payette River, Middle Fork	Upstream from the mouth of Lightening Creek.
Squaw Creek	Upstream from confluence with 2nd. Fork Squaw Creek.
Deadwood River	Upstream from Deadwood Reservoir.
Gold Fork River (Payette Basin)	Upstream of the diversion dam.
Indian Creek	Upstream from its confluence with the Snake River near Oxbow Dam.
Wildhorse River	Upstream from its confluence with the Snake River near Brownlee Dam.
Hells Canyon	Main Snake River Downstream from Hells Canyon Dam
Basin: **Salmon**	
Whitebird/Slate	Whitebird Creek drainage, Slate Creek Drainage, and Partridge Creek Drainage.
Little Salmon River	Entire Little Salmon River drainage including Rapid River.
French Creek	Entire French Creek Drainage.
Wind River/Crooked River	Entire Wind River and Crooked River Drainage.

South Fork Salmon River, Lower	The South Fork of the Salmon River Drainage from its mouth upstream to the confluence with the East Fork of the South Fork, not including The Secesh River Drainage or The East Fork of the South Fork Drainage.
Secesh River	The entire Secesh River Drainage.
South Fork Salmon River, Upper	The South Fork of the Salmon River Drainage from the confluence with the East Fork of the South Fork upstream to its headwaters, not including the East Fork of the South Fork.
Johnson Creek	Entire East Fork of the South Fork of the Salmon River up stream to headwaters including entire Johnson Creek Drainage.
Five Mile/Sabe Creeks	The Main Salmon River encompassing the Mallard, Five Mile, Sabe, Bargamin Creek Drainage.
Chamberlain Creek	The entire Chamberlain Creek Drainage.
Horse Creek	The Main Salmon River encompassing the Horse Creek, Disappointment Creek and Cottonwood Creek Drainage.
Middle Fork of the Salmon River, Lower	The Main Salmon River and the Middle Fork of the Salmon River encompassing the Kitchen Creek, Roaring Creek, Papoose Creek and Ship Island Creek Drainage.
Wilson/Camas	The Middle Fork of the Salmon River encompassing the Wilson Creek, Camas Creek, Soldier Creek, Brush Creek, Sheep Creek, and Norton Creek Drainage.
Big Creek	The entire Big Creek Drainage, tributary to the Middle Fork of the Salmon River.
Marble Creek	The entire Marble Creek Drainage, tributary to the Middle Fork of the Salmon River.
Loon Creek	The entire Loon Creek Drainage, tributary to the Middle Fork of the Salmon River.
Middle Fork of the Salmon River, Upper	The Middle Fork of the Salmon River encompassing the Indian Creek, Pistol Creek, Rapid River, Elkhorn Creek and Sulphur Creek Drainage.
Bear Valley/Marsh Creek	The entire Bear Valley Creek and Marsh Creek Drainage.
Owl Creek	The Main Salmon River encompassing the Owl Creek, Boulder Creek, Indian Creek, Pine Creek and Moose Creek Drainage.
North Fork of the Salmon River	The entire North Fork of the Salmon River Drainage

Carmen Creek	The Main Salmon River encompassing the Fourth of July Creek and Carmen Creek Drainage.
Lemhi River	The entire Lemhi River Drainage.
Panther Creek	The entire Panther Creek Drainage.
Hat/Iron	The Main Salmon River encompassing the Hat Creek, Iron Creek, Twelvemile Creek, Warmsprings Creek, and Williams Creek Drainage.
Thompson/Bayhorse	The Main Salmon River encompassing the Thompson Creek, Bayhorse Creek, Morgan Creek, Challis Creek, Garden Creek, and Squaw Creek Drainage.
Pahsimeroi River	The entire Pahsimeroi River Drainage.
Warm Springs Creek	Entire Warm Springs Creek Drainage, tributary to the Main Salmon River.
East Fork, Salmon River	The entire East Fork of the Salmon River Drainage.
Yankee Fork, Salmon River	The entire Yankee Fork of the Salmon River Drainage.
Salmon River, Upper	Main Salmon River encompassing Basin Creek, Valley Creek, Warmsprings Creek, Redfish Creek, Fourth of July Creek, Alturas Creek and the Main Salmon River to its headwaters.
Basin: Clearwater	
North Fork Clearwater	The North Fork of the Clearwater River From Dworshack Reservoir upstream to Kelly Creek.
Little North Fork Clearwater	The Little North Fork of the Clearwater River upstream of Dworshack Reservoir.
Weitas Creek	Entire Weitas Creek Drainage, tributary to the North Fork of the Clearwater River.
Kelly Forks	The entire North Fork of the Clearwater River Drainage from the mouth of Kelly Creek upstream.
South Fork of the Clearwater	The entire South Fork of the Clearwater Drainage upstream from the Meadow Creek Drainage.
Lochsa River	The entire Lochsa River Drainage.
Meadow Creek	Selway River upstream from mouth of Lochsa River encompassing entire Meadow and Gadney Creek Drainages.

Selway River, Middle	The Selway River encompassing the Mink Creek, Marlen Creek, Three Links Creek, Petibone Creek, Bear Creek and Bad Luck Creek Drainage.
Moose Creek	The entire Moose Creek Drainage, tributary to the Selway River.
Selway River, Upper	The Selway River encompassing the White Cap Creek, Indian Creek, Clearwater Creek, Swet Creek, Deep Creek, and Selway River headwaters.
Basin: Panhandle	
St. Joe River	The entire St. Joe River Drainage upstream from Mica Creek.
Coeur d'Alene River	The entire Coeur d'Alene River Drainage.
Pend Oreille Lake	The entire drainage to Pend Oreille Lake.
Priest Lake	The entire drainage to Priest Lake excluding Soldier Creek.
Kootenai River	The entire Kootenai River drainage within Idaho.

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[Federal Register: August 18, 1997 (Volume 62, Number 159)]
[Rules and Regulations]
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BFO FILE COPY
Steelhead

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Parts 222 and 227

[Docket No. 960730210-7193-02; I.D. 050294D]
RIN 0648-XX65

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Endangered and Threatened Species: Listing of Several Evolutionary Significant Units (ESUs) of West Coast Steelhead

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Final rule.

SUMMARY: On August 9, 1996, NMFS completed a comprehensive status review of west coast steelhead (Oncorhynchus mykiss, or O. mykiss) populations in Washington, Oregon, Idaho, and California, and identified 15 Evolutionarily Significant Units (ESUs) within this range. NMFS is now issuing a final rule to list two ESUs as endangered and three ESUs as threatened under the Endangered Species Act (ESA). The endangered steelhead ESUs are located in California (Southern California) and Washington (Upper Columbia River). The threatened steelhead ESUs are located in California (Central California Coast and South-Central California Coast) and Idaho, Washington, and Oregon (Snake River Basin). For the endangered ESUs, section 9(a) prohibitions will be effective 60 days from the publication of this final rule. For the threatened ESUs, NMFS will issue shortly protective regulations under section 4(d) of the ESA, which will apply section 9(a) prohibitions with certain exceptions.

NMFS has examined the relationship between hatchery and natural populations of steelhead in these ESUs, and has assessed whether any hatchery

[[Page 43938]]

populations are essential for their recovery. Only the Wells Hatchery stock in the Upper Columbia River ESU is essential for recovery and included in this listing. Aside from the Wells Hatchery stock, only naturally spawned populations of steelhead (and their progeny) residing below long-term, naturally and man-made impassable barriers (i.e., dams) are listed in all five ESUs identified as threatened or endangered.

At this time, NMFS is listing only anadromous life forms of O. mykiss.

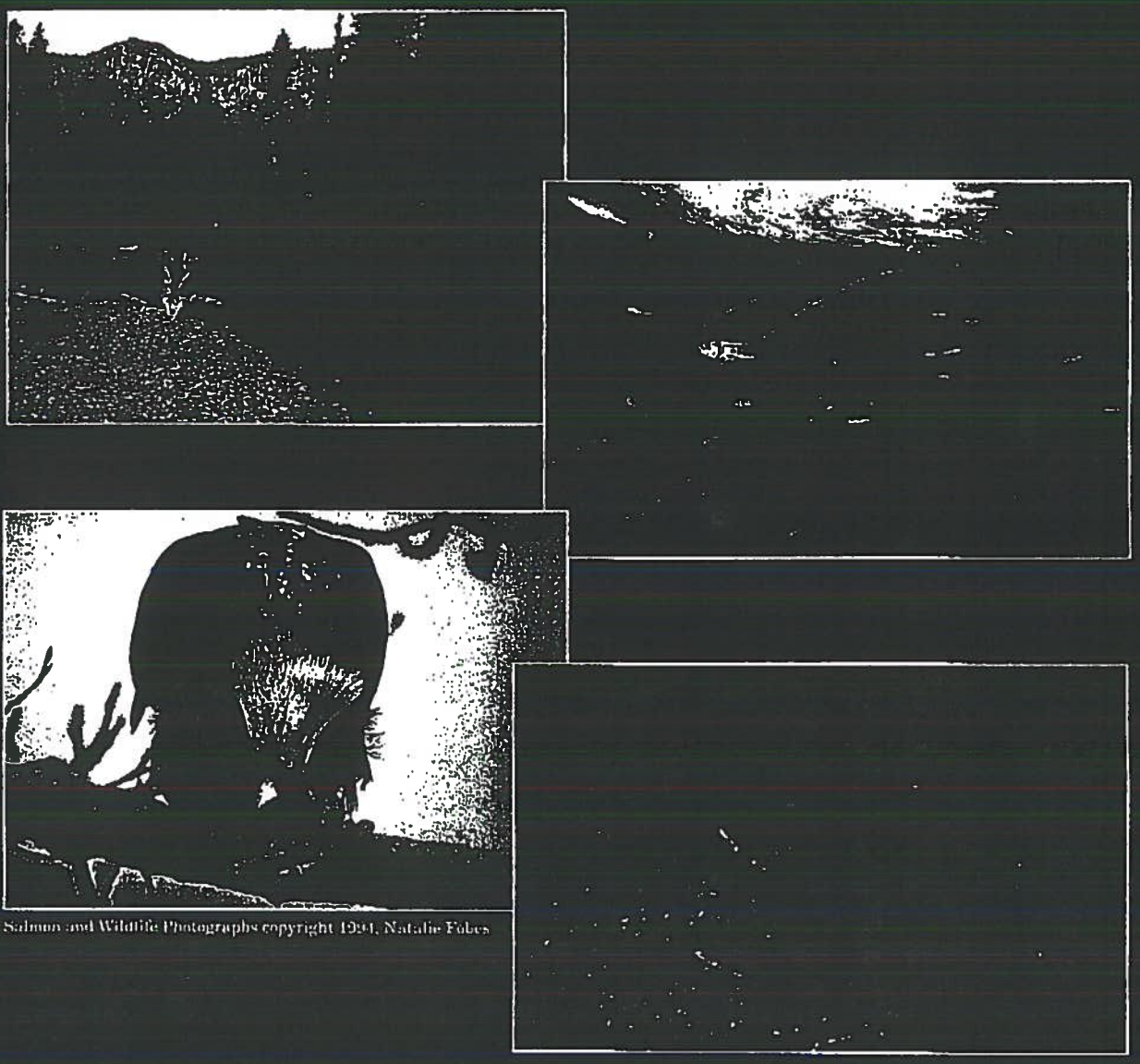
DATES: Effective October 17, 1997.

ADDRESSES: Protected Resources Division, NMFS, Northwest Region, 525 NE Oregon Street, Suite 500, Portland, OR 97232-2737.

FOR FURTHER INFORMATION CONTACT: Garth Griffin, 503-231-2005, Craig Wingert, 562-980-4021, or Joe Blum, 301-713-1401.

SUPPLEMENTARY INFORMATION:

Proposed Recovery Plan for Snake River Salmon



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U.S. Department of Commerce
National Oceanic and Atmospheric Administration

National Marine Fisheries Service

March, 1995

PROPOSED RECOVERY PLAN FOR SNAKE RIVER SALMON

U.S. Department of Commerce
National Oceanic and Atmospheric Administration

Rolland Schmitten, Assistant Administrator for Fisheries
William Stelle, Jr., Regional Director, Northwest Region
Robert P. Jones, Jr., Recovery Plan Coordinator

MARCH 1995

Executive Summary

Background

Salmon are culturally, economically, and symbolically important to the Pacific Northwest. Columbia River chinook populations were at one time acknowledged to be the largest in the world. Prior to the 1960s, the Snake River was the most important drainage in the Columbia River system for producing salmon. But in the 1990s, Snake River salmon struggle to exist. Snake River salmon have declined to such low levels that protection under the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 et seq.) is needed to prevent their extinction (November 20, 1991, 57 FR 58619; April 22, 1992, 57 FR 14653; August 18, 1994, 59 FR 42529; and December 28, 1994, 59 FR 66784). In the 1800s, there were approximately 1.5 million Snake River chinook salmon; by 1994, only 1,800 adults returned to the Snake River. Snake River fall chinook salmon numbered over 72,000 fifty years ago, but only 400 adults were counted at Lower Granite Dam in 1994. As many as 4,400 Snake River sockeye salmon could be found forty years ago, but last year only one returned to Redfish Lake.

The ESA requires that the agency responsible for a particular listed species develop and implement a recovery plan for its conservation (defined by the ESA as recovery to delisting) and survival, unless it is determined that such a plan will not promote the conservation of the species. Accordingly, NMFS appointed the Snake River Salmon Recovery Team (Team) to assist in the development of the recovery plan for the Snake River salmon. In May 1994, the Team submitted its final recommendations to NMFS. NMFS used these recommendations to formulate the Proposed Snake River Salmon Recovery Plan.

The conservation of natural salmon and their habitat has not been afforded balanced consideration in past resource allocation decisions. Natural salmon are those that are the progeny of naturally spawning parents. Development in the Pacific Northwest has often proceeded with the assumption that improved technology or management would mitigate impacts on natural salmon stocks. The Region's reliance on uncertain mitigation schemes (as opposed to fundamental conservation strategies) has been a very costly approach, both for natural salmon and the public.

Institutional Structure

NMFS believes (as did the Team) that an improved decision-making process is necessary to restore Columbia Basin ecosystem health and ensure Snake River salmon recovery. Such a process will also protect and improve habitat through the adaptive management process, prevent further listings, and conserve other fish and wildlife. To achieve these goals, NMFS will appoint, convene, and chair a Recovery Implementation Team which will represent state, tribal, and Federal policy leaders and thereby ensure effective coordination, teamwork, and communication among all entities having responsibility for Snake River salmon recovery. To ensure that salmon recovery actions remain scientifically based, NMFS will also consider appointing and convening a Scientific Advisory Panel and technical committees to provide scientific and technical support to the Recovery Implementation Team.

Delisting Criteria

The Team's and NMFS' recovery requirements and delisting criteria for ESA-listed Snake River Basin salmon are very similar and fall into two major categories: (1) Remedying the environmental (and other) factors that have reduced the stocks to levels which are in danger of extinction; and (2) rebuilding populations to levels where there is evidence of improved productivity, even when considering the potential impacts of severe stochastic environmental events (e.g., protracted drought, oceanic El Niño effects, etc.). Both of these categories must be achieved in order to consider delisting. To determine rebuilding levels above, NMFS proposes to use cohort replacement rates and numeric delisting criteria.

The cohort replacement rate describes the rate at which each subsequent cohort, or generation, replaces the previous one. When this rate is exactly 1.0, a population is neither increasing nor decreasing. If the ratio remains less than 1.0 for extended periods, a population is in decline, and could continue into extinction--a risk which originally led to listing Snake River salmon. For population rebuilding, the cohort replacement rate must be

greater than 1. For delisting to be considered, the eight-year geometric mean cohort replacement rate of a listed species must exceed 1.0. For Snake River spring/summer chinook salmon, this goal must also be met for 80 percent of the index areas available for estimating cohort replacement rates.

For sockeye salmon, the numerical escapement goal is an eight-year (approximately two-generation) geometric mean of at least 1,000 natural spawners returning annually to Redfish Lake and 500 natural spawners in each of two other Snake River Basin lakes. The numerical escapement goal for Snake River fall chinook salmon is an eight-year geometric mean of at least 2,500 natural spawners in the mainstem Snake River annually. Snake River spring/summer chinook salmon have two numeric delisting criteria; both must be met for delisting to be considered. The first numerical escapement goal for Snake River spring/summer chinook salmon is an eight-year geometric mean corresponding to at least 60 percent of the pre-1971 brood year average redd counts for 80 percent of the available index areas. The second numerical escapement goal for spring/summer chinook salmon is an eight-year geometric mean equal to 60 percent of the 1962-1967 brood year average count of natural spawners past Ice Harbor Dam (goal is equal to 31,440).

Tributary Ecosystem

Land and water management actions, including water withdrawals, unscreened water diversions, stream channelization, road construction, timber harvest, livestock grazing, mining, and outdoor recreation have degraded important salmon spawning and rearing habitats. To protect tributary ecosystem health, NMFS proposes a three-part approach: (1) Protect remaining high quality habitat by ceasing activities that would degrade ecosystem functions and values that listed fish need, (2) restore degraded habitats, and (3) provide connectivity between high quality habitats. Federal lands and Federal actions should bear, as much as possible, the burdens of recovering listed salmon species and their habitat. However, non-Federal lands constitute approximately 35 percent of the Snake River salmon critical habitat. Therefore, an ecosystem approach that emphasizes integrated Federal and non-Federal land management is needed. To achieve this, all stakeholders in a subbasin or watershed are encouraged to participate in management partnerships. The Plan also proposes actions that will reduce the loss of listed species at water withdrawal sites, rebuild salmon

SNAKE RIVER SALMON PROPOSED RECOVERY PLAN
SUMMARY TABLE

TASK NO.	PRIORITY	RECOVERY TASKS	RESPONSIBLE ENTITY	DURATION
		INSTITUTIONAL STRUCTURE, ACCOUNTABILITY, AND MONITORING		
0.1		**CREATE AND IMPLEMENT A COORDINATED INSTITUTIONAL STRUCTURE TO ENSURE A UNIFIED APPROACH TO RECOVERY OF ESA-LISTED STOCKS**		
0.1.a.	1	Appoint, convene, and chair a Salmon Recovery Implementation Team.	NMFS	One year to establish then ongoing
0.1.b.	1	Appoint and convene a Scientific Advisory Panel.	NMFS	One year to establish then ongoing
0.1.c.	1	Establish supportive committees and work groups.	NMFS	One year to establish then ongoing
0.1.d.	1	Establish a dispute resolution process.	NMFS	One year to establish then ongoing
0.2.		**COORDINATE CONSERVATION AND MANAGEMENT AMONG ALL RELATED COLUMBIA BASIN ANADROMOUS FISH STOCKS**		
0.2.a.	1	Evaluate and implement opportunities to integrate the scientific review, planning, and information management functions of this Recovery Plan with the NPPC Fish and Wildlife Program.	NMFS and NPPC	One year
0.3.		**PROVIDE A UNIFIED APPROACH FOR MANAGING INFORMATION AND DATA GATHERING SYSTEM**		
0.3.a.	1	Consolidate regional efforts to develop a coordinated information and data gathering system.	NMFS, in Consultation with the ISP, NPPC, and its Independent Scientific Group	One year to establish then ongoing
0.3.b.	1	Consolidate regional capabilities to establish a coordinated regional approach for biological analysis and modeling.	NMFS, in Consultation with the ISP, NPPC, and its Independent Scientific Group	One year to develop then ongoing
0.3.c.	1	Consolidate regional capabilities to establish regional approach to hydrological analysis.	NMFS in consultation with the NPPC	One year to establish then ongoing
0.3.d.	3	Prepare and disseminate an annual performance report on Plan implementation.	NMFS in consultation with the NPPC	Annual
		TRIBUTARY ECOSYSTEM		
1.1	1	**PRESERVE REMAINING LISTED SALMON POPULATIONS BY PROTECTING IMPORTANT HABITAT**		
1.1.a.	1	Develop a comprehensive inventory and summary of historic and present habitat quantity and quality.	Habitat Committee	One year
1.1.b.	1	Protect and restore important habitat on Federal lands.	USFS and BLM	Ongoing
1.1.b.1)	1	Establish specific Riparian Management Objectives	USFS and BLM	Ongoing
1.1.b.2)	1	Designate USFS & BLM riparian habitat conservation areas and protect them from activities that would degrade riparian or stream habitats or adversely affect listed salmon.	USFS and BLM	Ongoing

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TASK NO.	PRIORITY	RECOVERY TASKS	RESPONSIBLE ENTITY	DURATION
1.1.b.3)	1	Identify and protect watersheds that contain or support both high quality habitat and habitat that can be readily restored (Priority Watersheds)	NMFS, USFS, and BLM	
1.1.c.		Ensure that inwater activities do not result in habitat destruction.	COE, other Federal and state	Ongoing
1.2	1	**REDUCE LOSS OF LISTED SPECIES AT WATER WITHDRAWAL SITES**		
1.2.a.	1	Conduct site assessments to ascertain the extent and condition of water diversion screening.	IDFG, ODFW, WDFW, Fish Screen Oversight Committee	Three years
1.2.b.	1	Ensure that gravity and pumped water diversions to have operational screens that meet NMFS criteria.	Oregon	Two years
			Washington	One year
			Idaho	Eight years
1.3	2	**REBUILD LISTED SALMON POPULATIONS BY RESTORING HABITAT**		
1.3.a.	2	Fertilize Stanley Basin Lakes to improve sockeye productivity.	IDFG, USFS, Fish Production Committee	Ongoing
1.4	2	**ACCELERATE REBUILDING OF SALMON POPULATIONS THROUGH IMPROVED LAND MANAGEMENT PLANNING**		
1.4.a.	2	Develop long-term approaches for ecosystem management at the landscape and watershed scale on Federal lands	USFS, BLM	Two years
1.4.b.	2	Develop and implement subbasin habitat management plans.	Fishery agencies, tribes, BPA, EPA, BOR, USFS, BLM, NRCS, NPPC, local governments, private landowners	Two years
1.4.c.	2	Establish a process for developing habitat conservation plans and agreements that would help non-Federal land owners protect and restore Snake River salmon habitat. Develop and implement a training and outreach strategy.	NMFS, FWS	Two years
1.4.d.	2	Provide incentives to assist with protection of riparian areas on private lands where grazing occurs.	FWS, NRCS, and state Depts of Natural Resources and Ecology	One year
1.5.	2	**REBUILD SALMON POPULATIONS BY PROVIDING ADEQUATE INSTREAM FLOWS**		
1.5.a.	2	Determine instream flow protection levels needed to protect all salmon life stages, determine effects of water withdrawals on salmon survival, and develop hydrographs of the Columbia River Basin.	Federal, state, tribes, and NMFS	Two years
1.5.b.	2	Complete a subbasin by subbasin inventory and assessment of all water withdrawal sites and develop subbasin plans to conserve water.	Oregon, Washington, Idaho, BOR, NRCS, NMFS, COE, tribes, local entities	Two years
1.5.c.	2	Continue existing moratoria on issuing water rights in the Snake/Columbia River mainstems.	Oregon, Washington, Idaho	Ongoing
1.5.d.	2	Ensure that any diversions affecting salmon streams are equipped with lockable headgates and gauges that measure instantaneous and seasonal flows.	NMFS, Oregon, Washington, Idaho	Ongoing

TASK NO.	PRIORITY	RECOVERY TASKS	RESPONSIBLE ENTITY	DURATION
1.6	2	**REBUILD SALMON POPULATIONS BY IMPROVING FISH PASSAGE AT BARRIERS**		
1.6.a.	2	Identify and require improvements to small hydropower projects (licensed or unlicensed) that adversely affect fish habitat.	FERC	Reopen licenses by April 1997 then ongoing
1.6.b.	2	Eliminate "push-up" berms through development of alternatives, such as screened intakes and/or consolidation of withdrawal sites.	NRCS Conservation districts, irrigators	Two years
1.6.c.	2	Eliminate obstacles to fish passage in lakes that historically provided spawning habitat for sockeye salmon.	USFS and IDFG	One year
1.7	3	**REDUCE LOSSES OF LISTED SPECIES ASSOCIATED WITH POOR WATER QUALITY**		
1.7.a.	3	1) Develop and enforce non-point source pollution standards for areas supporting listed Snake River salmon. 2) Determine extent of effects of mixing/dilution zones allowed in current water quality regulations. (3) Review water quality standards, compliance, and enforcement procedures; and 4) Make necessary changes.	State and Federal Water Quality Authorities	EPA report to Habitat Committee by September 1996 then ongoing
1.8	3	**REDUCE IMPACTS ON SALMON FROM RECREATIONAL ACTIVITIES**		
1.8.a.	3	Control recreational activities that may impact habitat critical to Snake River salmon.	FWS, USFS, BLM, IDFG, and ODFW	Ongoing
2		**MAINSTEM AND ESTUARINE ECOSYSTEM**		
2.1	1	**REDUCE LOSS OF JUVENILE FISH THROUGH FLOW AUGMENTATION AND IMPROVED WATER MANAGEMENT**		
2.1.a.	1	Improve spring and summer flows in the Columbia and Snake Rivers through additional flow augmentation and manage these flows on an inseason basis.	COE, BPA, BOR	Ongoing
2.1.a.1)	1	Advise the operating agencies on dam and reservoir operations, incl. transportation and spill activities, to optimize passage conditions for juvenile and adult anadromous salmonids.	TMT	Ongoing
2.1.a.2)	1	Develop a water management plan by April 15 of each year based on the run-off forecast for that year.	TMT	Ongoing
2.1.a.3)	1	Incorporate the provisions of this plan into Pacific Northwest Coordination Agreement planning.	COE, BOR	Two years
2.1.b.	1	Recommend the shaping of flows inseason in accordance with the guidance described in 2.1.a. and consider the goal of meeting seasonal average flow objectives at the locations and for the time periods specified in the plan.	TMT	Ongoing
2.1.c	1	Implement operational guidelines to improve flows for migrating salmon, and manage those flows on an inseason basis to optimize fish survival.	Action agencies	Ongoing
2.1.c.1)	1	Operate the FCRPS during the fall and winter months in a manner that provides the following levels of confidence of refill to April 20 flood control elevations. 75% at Libby and Hungry Horse, 85% at Grand Coulee and 90% at Albeni Falls.	COE, BPA, BOR	Ongoing
2.1.c.2)	1	Negotiate to store water in non-treaty storage (NTS) during the spring for release in July and August.	BPA, BC Hydro, US NTS Agreement signatories	Ongoing
2.1.c.3)	1	Operate the FCRPS to meet flow objectives during the spring and summer salmon migrations with limits on reservoir elevations by August 31.	COE, BPA, BOR	Ongoing

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Null hypotheses should be developed for monitoring and evaluation in reference watersheds and in other watersheds where restoration and land management projects are more active.

1.1.c. The COE and other Federal and state agencies should ensure that inwater activities do not result in habitat destruction (ecological functions are maintained or increased), that methods are used (where possible) to increase habitat values, and that work will not adversely affect salmonids.

Habitat critical to salmonids can be substantially altered by inwater activities, including construction, erosion control, flood control, and gravel and sand mining.

Under the Rivers and Harbors Act of 1899 and section 404 of the Clean Water Act, the COE issues permits for inwater work. Under the Fish and Wildlife Coordination Act (FWCA), NMFS and USFWS have authority to review and comment on activities, permitted by the COE, that affect fish and wildlife. Under the FWCA, state agencies are also provided the opportunity to comment on COE-permitted projects.

To provide permit applicants with a clear understanding of what activities are acceptable, NMFS should, by January, 1996, develop criteria for the COE to use in permits for inwater activities in tributary habitat. These criteria should facilitate the permitting process.

1.2 Biological Objective: Reduce loss of listed species at water withdrawal sites.

As described in the Impediments to Recovery section, water withdrawals can directly harm listed salmon in unscreened or inadequately screened diversions and by dewatering streams where the species migrate, spawn, and rear.

As the SRSRT stated:

> There is an urgent need to develop effective diversion controls for all streams used for spawning, rearing, and migration of ESA-listed Snake River salmon. Diversions that are critical to the survival and migration of salmon should be brought up to standard with respect to: (a) approach velocity requirements and the adequacy of screening in excluding fish from diversion lines, (b) the adequacy of by-pass devices

in returning fish to streams from screened diversion lines, (c) the adequacy of fish passage in any "head" structures placed in streams to assist in diversion, (d) the adequacy of water left in streams, and (e) the adequacy of the quality of that water. All diversions should be screened with up-to-date equipment and be maintained in fully operable condition. The dewatering of salmon breeding and rearing habitat must be eliminated. Water quality standards must be reviewed for possible strengthening with respect to providing special protection for ESA-listed and other at-risk salmonids. If changes are required, they must be enforced. The monitoring of screen use, screen performance, and the quantity of water diverted must be greatly improved.

The following tasks are designed to address screening needs in tributary habitat. Tasks associated with water adequacy are addressed in Biological Objective 1.5, of this chapter.

1.2.a. The IDFG, ODFW, WDFW, and the Fish Screening Oversight Committee (FSOC), in coordination with the Habitat Committee and other state and Federal agencies as appropriate, should carry out site assessments to ascertain the extent and condition of water diversion screening in the Snake River Basin.

This task should be completed by October, 1997.

1.2.b. State fisheries and water resources agencies, in coordination with the Federal agencies and Tribes, should ensure that all gravity and pumped water diversions in Washington, Oregon, and Idaho within the designated critical habitat for listed Snake River salmon have operational screens that meet NMFS screening criteria (Appendix D).

State fisheries and water resources agencies, in coordination with the Federal agencies and Tribes, should ensure that gravity diversions are screened by 1995 in Washington, by 1996 in Oregon, and by 2002 in Idaho. The screens should meet NMFS' screening criteria (Appendix D). Pumped-water diversions in Oregon, Washington, and Idaho within designated critical habitat for listed Snake River salmon should be screened by October 1998. Highest priority should be placed on those projects that pose the greatest threat to listed Snake River salmon.

In the interim, these entities should immediately begin implementing a pilot program of installing pump diversion screens in the three states, concentrating first on the diversions that have the largest potential for affecting listed Snake River salmon.

Oregon, Idaho, and Washington have existing statutes that require adequate screening to protect fisheries resources. In addition, the COE has the authority for some diversions to require owners to expeditiously repair or replace screens that do not meet NMFS' screening criteria. The state water resource agencies and the COE should immediately increase monitoring and enforcement of juvenile fish screen use in critical habitat areas.

Beginning in 1996, the COE, NMFS and other appropriate entities, should ensure that all diversion screens are inspected annually during the diversion season. Inspections should be made by state or Federal agencies, the owners and operators, or through the cooperative effort of all parties.

State and Federal entities should require all screen/intake owners and operators to inspect screens yearly (remote video, diver/video, or dewatering/dry inspection are all acceptable methods) prior to juvenile outmigration. Inspections should be conducted in late summer during low water periods to facilitate repairs prior to the next juvenile outmigration. NMFS should conduct an annual survey that inspects at least 20 percent of all diversions to ensure owners/operators compliance.

By the end of FY 1995, NMFS and the NPPC should develop a plan to involve all state and Federal agencies with authority over water withdrawals (as well as the entities operating the withdrawals) in providing the necessary funding for screen construction.

The NPPC has called on all state and Federal agencies involved in water withdrawals to provide funding for screen construction on an accelerated time line. The FSOC should serve to coordinate this effort. The NPPC, in their Fish and Wildlife Program has called for funding at the level of 15 million dollars per year from all sources with the goal of screening all diversions by the end of 1996. In NMFS' Draft Report to Congress: Irrigation Diversion Screening in the Columbia River Basin Above Bonneville Dam (February 1995), an approach

to screening all diversions by 2002 was presented. This approach relies on NMFS being provided with funds adequate to ensure full utilization of the screen construction capabilities of the states of Oregon, Washington, and Idaho. Any funding beyond that provided by NMFS would help to accelerate the completion date.

As part of the ongoing FSOC activity, immediately begin to identify innovative alternative approaches to traditional screening of diversions.

Tasks to Begin Recovery

1.3. Biological Objective: Rebuild listed salmon populations by restoring habitat.

1.3.a. Beginning in 1995, IDFG and the USFS in consultation with the Fish Production Committee should fertilize Stanley Basin Lakes to improve sockeye productivity.

"Experiences elsewhere indicate that controlled fertilization of oligotrophic lakes with selected nutrients can significantly increase their carrying capacity for juvenile salmonids" (Koenings and Burkett 1987). NMFS is concerned that the highly oligotrophic character of the Stanley Basin lakes may not allow forage production at levels high enough to support reasonable populations of naturally-spawned sockeye salmon. For instance, Bjornn et al. (1968) estimated that Redfish Lake normally produced fewer than 65,000 sockeye salmon smolts annually. Calculations based on measured chlorophyll a levels indicate that Redfish Lake smolt carrying capacity may currently be less than 50,000 sockeye salmon smolts (Wurtzbaugh 1993).

The Stanley Basin Technical Oversight Committee is planning a lake fertilization project. This task is intended to support and, if necessary, augment that planning. It is emphasized that while there may be initial increases in juvenile production and outmigration, the ultimate benefits rest upon river and ocean survival and adult returns.

and Conservation Service in the form of cost-sharing for implementation of grazing use practices such as fencing, spring developments, and alternative watering facilities. Technical assistance is available from the NRCS for developing resource management plans and practices.

The Habitat Subcommittee should assist the agencies in developing a consistent, integrated education program for illustrating the benefits of maintaining a healthy riparian system. The agencies should also actively pursue new methods of providing assistance (e.g., the proposed West Coast Fish and Habitat Restoration Initiative). By December 1995, the Habitat Subcommittee should report to NMFS on the progress made in those areas.

The NRCS should provide the Habitat Committee with a yearly progress report (beginning in December of 1995 and submitted in December of each year thereafter) on the specific assistance provided for riparian area protection on private lands and how effective the program is in reducing grazing damage.

1.5 Biological Objective: Rebuild salmon populations by providing adequate instream flows.

The SRSRT recommended that the state fishery agencies "[e]nsure that actual streamflow withdrawals for diversions are not in excess of legal water rights. If insufficient streamflows are still occurring, reduction of irrigation withdrawals should be sought wherever such withdrawals lead to insufficient streamflow for habitat, impede downstream or upstream passage, or infringe upon water quality control at any downstream location."

The following tasks are designed to provide adequate flows for spawning, rearing and migration of listed salmon.

1.5.a. The state and Federal fisheries agencies and tribes should determine instream flow levels needed to meet listed salmon needs for all life stages. The state water resource agencies, BPA, COE, BOR and NMFS should determine the effects of water withdrawals, and develop hydrographs of the Columbia River basin.

By April 1996, the state and Federal fisheries agencies and Tribes should present a report to the Habitat Committee on methods and timelines for determining instream flow requirements for tributary and mainstem habitats. In addition, the states, Tribes, NMFS and other Federal agencies should fund and complete an evaluation of how water withdrawals, depletions, and return flows affect the natural Columbia and Snake River hydrographs and compare the magnitude of these effects to those caused by upstream storage.

1.5.b. The states of Oregon, Washington and Idaho, in conjunction with the COE, BOR, NRCS, NMFS, tribes and local entities, should complete a subbasin-by-subbasin inventory and assessment of all water withdrawal sites that affect critical habitat. These entities should assess the effects of withdrawals in the subbasin on listed species and critical habitat, and take actions, including the development of subbasin plans, to conserve irrigation water and increase stream flows.

By September 1995, the state and Federal agencies should construct an integrated data base that identifies all surface and groundwater irrigation withdrawal sites and all sites that affect critical habitat. Reports should include location, quantity, and priority date. Unperfected municipal and industrial water rights, agricultural water rights, and individual water rights should also be identified. The agencies should include in their inventory all Conservation Reserve Program (CRP) lands, and identify the existing water rights associated with these lands.

By October 1996, the state and Federal agencies should assess the effect these withdrawals have on fish passage, fish entrainment, and achievement of minimum flows.

State and Federal agencies, tribes and local governments in each subbasin should develop plans that identify opportunities for combining withdrawal sites, removing withdrawal structures from the rivers, enforcing water withdrawal amounts, and maintaining minimum stream flows and passage routes. The plans should also recommend where water rights should be purchased (on a willing seller basis). The listed salmon will benefit if there are fewer passage structures to delay fish passage, less entrainment of fish, fewer adverse modifications to water quality, and reductions in bed load trapping.

The states, tribes, and Federal agencies should use all available authorities to obtain increases in stream flows during critical low flow periods and to protect water provided for salmon habitat or passage. If existing authorities are inadequate, the agencies should identify needed authorities and seek legislative approval. In addition, a strategy should be developed to acquire and protect instream flow rights. The Habitat Subcommittee, working with the NPPC, should review existing state laws, regulations and practices and make recommendations to NMFS on actions the state, tribal and Federal governments can take to ensure adequate instream flows for all salmon life stages.

The BPA, BOR, NRCS and other Federal and state fish and water resource agencies should develop incentives (e.g., through cost sharing) to encourage irrigators to modify irrigation techniques and repair and update water delivery systems. They should also develop outreach and education programs that demonstrate the methods and benefits of updating water delivery systems.

By April 1996, the BPA, BOR, and NRCS, in coordination with local conservation districts and Federal and state extension services, should begin a public awareness and education program to help irrigators understand the benefits, both for the resource and the irrigator, of using more efficient water application systems. This forum should also be used to solicit input from irrigators on potential ways to modify irrigation techniques.

1.5.c. The states of Oregon, Idaho, and Washington should continue their existing moratoria on issuing water rights in the Snake/Columbia River mainstems and should extend those moratoria to include tributaries and ground water in continuity with surface flows.

There are many instances where designated critical habitat suffers from streamflow over-appropriation. Inadequate streamflow affects listed fish both in spawning and rearing areas and in the migration corridor. Additional withdrawals will only result in increased adverse affects on critical habitat. Oregon, Idaho, and Washington should extend their existing moratoria on issuing water rights to avoid exacerbating this problem.

1.5.d. The states of Oregon, Washington, and Idaho should ensure that any diversions affecting critical habitat are equipped with headgates that control and gauges that measure instantaneous and seasonal flows.

The cumulative impacts of unauthorized water withdrawals may manifest themselves in loss of spawning and rearing habitat, increased water temperatures, reduced bedload transport, and localized reduction in water velocity. In addition, invertebrate populations may decrease, and there may be adverse changes in stream bank morphology and riparian plant community structure.

Beginning in 1996, the Habitat Subcommittee should report to NMFS on the progress of headgate and gauge installation. The reports should be made every December. The gauges should be monitored to prevent excess water withdrawal.

1.5.e. Federal agencies and the states and Tribes should work to continue of the Conservation Reserve Program (CRP).

Although the CRP was developed to establish permanent vegetative cover on cropland that is highly erodible or contributing to serious water quality problems, the possible termination of the CRP may result in substantial erosion and additional water withdrawal from the Snake River. This could further degrade the ecological integrity of the mainstem Snake River.

If the CRP is continued, strong consideration should be given to including a provision in future CRP applications in critical habitat areas that prevents water in the program from being used to bring other land into production. Emphasis should also be placed on applications that would provide additional water to salmon-bearing streams.

1.6 Biological Objective: Rebuild salmon populations by improving fish passage at barriers.

1.6.a. To reduce impacts on tributary habitat from small hydropower development, the Federal Energy Regulatory Commission (FERC) should identify and require improvements to small hydropower projects (licensed or unlicensed) that adversely affect fish habitat.

Small hydropower projects may adversely affect listed salmon through: Dewatering affected stream reaches; providing insufficient minimum flows through the affected project reach; provides poor fish passage; having unscreened power canals; adversely modifying water quality (temperature, dissolved gas levels, temporal flows); impeding gravel and large and small woody debris recruitment; and limiting stream functions and habitat types. Improving conditions at these facilities could increase survival of both adult and juvenile fish.

As the responsible agency, FERC issues hydropower licenses and exemptions from licensing to a large number of public (non-Federal) and private entities engaged in building, maintaining, and operating hydropower facilities. By April 1996, FERC should conduct a watershed-by-watershed inventory and evaluation of existing and proposed small hydropower facilities in the designated critical habitat. In cooperation with the license holders, Federal and state fishery agencies, affected Tribes, and the appropriate land management agency, FERC should examine each license to determine if adverse conditions are fostered by operations under conditions specified in the license. NMFS and the USFWS should provide guidance to FERC on the criteria to be used for such an evaluation.

Where adverse conditions are present, those licenses should be reopened (by April 1997) and the problems rectified, or the project should be shut down and removed. Projects without a license should be licensed under conditions appropriate to protecting critical habitat or they should be removed. FERC should provide an annual report to NMFS (beginning in December of 1996 and in December of each year thereafter) on the results and progress of rectifying small hydropower projects that adversely affect salmon habitat.

1.6.b. The NRCS and the Conservation Districts should work with irrigators to eliminate "push-up" berms.

Many irrigation diversions are berms constructed by "pushing up" or piling streambed materials. These berms may prohibit adult spawning migrations and eliminate access to important juvenile rearing areas. Additional impacts include suspension of fine sediment during construction, channel erosion, potential destruction of spawning habitat, and depletion of spawning gravel.

By April 1996, the NRCS and the Conservation Districts should ascertain the current extent and locations of push-up berms and begin working to modify water withdrawal techniques. Such modifications might include screened intakes and/or consolidation of withdrawal sites. Concurrently with this effort, the COE, NMFS, and state agencies should consider actions to regulate this practice in waters affecting anadromous fish.

NRCS should prepare and submit, by September 1996, a report to the Habitat Committee on the results of the push-up berm site inventory.

1.6.c. The USFS and IDFG should eliminate obstacles to fish passage in lakes that historically provided spawning habitat for sockeye salmon.

Fish migration barriers were installed in the late 1950s and early 1960s on the outlets of Stanley, Pettit, and Yellow Belly Lakes. These barriers were installed to block migration into these lakes by nongame fish such as squawfish, suckers and sculpins which are highly predatory on juvenile salmonids (BPA 1994). Pearce (1992) describes these barriers as

having a water fall drop of approximately five feet onto a horizontal apron. The five-foot drop combined with the shallow flow over the apron effectively prevents adult salmonid migration into these lakes.

By September 1995, the IDFG, in consultation with NMFS and tribal biologists, should implement the best method for altering the barriers on the outlets of Stanley Basin lakes. Modifications should incorporate mechanisms for counting adult and juvenile fish passage (SRSRT 1994:V-22).

Tasks Needed to Sustain Recovery

1.7 Biological Objective: Reduce losses of listed species associated with poor water quality.

1.7.a. The EPA should: (1) Strongly encourage states to develop and enforce non-point source pollution control mechanisms in areas supporting listed Snake River salmon; (2) determine the extent of the effects resulting from the mixing/dilution zones allowed in current water quality regulations for municipal/corporate discharges; (3) in conjunction with state agencies, review water quality standards, compliance, and adequacy of enforcement for Idaho, Washington, and Oregon; and, (4) if necessary, make recommendations for changes to the appropriate state.

Non-point sources of pollution can degrade water quality. The EPA is currently encouraging states to develop control mechanisms for sediment, nutrients, biocriteria (non-point sources of pollution) and temperature. Implementation of appropriate standards should aid in increasing water quality, thereby improving habitat.

By April 1996, the EPA and state water quality agencies should evaluate current National Pollutant Discharge Elimination System permit standards for protecting fish. Specifically, the currently allowed mixing/dilution zones should be evaluated with regard to impacts on

sale or marketed. The phrase "limited quantities," in this context means:

(i) 200 or fewer units, provided the product is designed solely for operation within one of the Commission's authorized radio services for which an operating license is required to be issued by the Commission; or

(ii) 10 or fewer units for all other products.

(iii) Prior to importation of a greater number of units than shown above, written approval must be obtained from the Chief, Office of Engineering and Technology, FCC.

(iv) Distinctly different models of a product and separate generations of a particular model under development are considered to be separate devices.

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DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

RIN 1018–AB94

Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Klamath River and Columbia River Distinct Population Segments of Bull Trout

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: The Fish and Wildlife Service (Service) determines threatened status for the Klamath River and the Columbia River distinct population segments of bull trout (*Salvelinus confluentus*), with special rules, pursuant to the Endangered Species Act of 1973, as amended (Act). The Klamath River population segment is limited to seven geographically isolated stream areas representing a fraction of the historical habitat. The distribution and numbers of bull trout have declined in the Klamath River basin due to habitat isolation, loss of migratory corridors, poor water quality, and the introduction of non-native species. The Columbia River population segment is represented by relatively widespread subpopulations that have declined in overall range and numbers of fish. A majority of Columbia River bull trout occur in isolated, fragmented habitats that support low numbers of fish and are inaccessible to migratory bull trout. The few remaining bull trout "strongholds" in the Columbia River basin tend to be found in large areas of contiguous habitats in the Snake River basin of central Idaho mountains, upper Clark Fork and Flathead Rivers in Montana, and several streams in the Blue Mountains in Washington and Oregon. The decline of bull trout is primarily due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, and the introduction of non-native species. The special rules allow the take of bull trout in the Columbia River and Klamath River population segments if in accordance with applicable State and Native American Tribal fish and wildlife conservation laws and regulations and conservation plans approved by the Service.

The listing proposal was restricted by court order to information contained in the 1994 administrative record. This final determination was based on the best available scientific and commercial information including current data and new information received during the comment period. As a result, the threatened listing status for the Columbia River population segment has been retained, however, the listing status for the Klamath River population segment is changed from endangered to threatened. This listing status change occurred because bull trout interagency management and recovery efforts for the Klamath River basin are being implemented and, consequently, threats have been reduced. This rule implements the protection and conservation provisions afforded by the Act for the Klamath River and Columbia River population segments of bull trout.

DATES: Effective July 10, 1998.

ADDRESSES: The complete file for this rule is available for inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, Snake River Basin Field Office, 1387 S. Vinnell Way, Room 368, Boise, Idaho 83709.

FOR FURTHER INFORMATION CONTACT: Robert Ruesink, Supervisor, Snake River Basin Office (see **ADDRESSES** section) (telephone 208–378–5243, facsimile 208–378–5262).

SUPPLEMENTARY INFORMATION:

Background

Bull trout (*Salvelinus confluentus*), members of the family Salmonidae, are char native to the Pacific northwest and western Canada. Bull trout historically occurred in major river drainages in the Pacific Northwest from about 41° N to 60° N latitude, from the southern limits in the McCloud River in northern California and the Jarbidge River in Nevada to the headwaters of the Yukon River in Northwest Territories, Canada (Cavender 1978; Bond 1992). To the west, bull trout range includes Puget Sound, various coastal rivers of British Columbia, Canada, and southeast Alaska (Bond 1992). Bull trout are wide-spread throughout tributaries of the Columbia River basin, including its headwaters in Montana and Canada. Bull trout also occur in the Klamath River basin of south central Oregon. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta and the MacKenzie River system in Alberta and British Columbia (Cavender 1978; Brewin and Brewin 1997).

Bull trout were first described as *Salmo spectabilis* by Girard in 1856 from a specimen collected on the lower Columbia River, and subsequently described under a number of names such as *Salmo confluentus* and *Salvelinus malma* (Cavender 1978). Bull trout and Dolly Varden (*Salvelinus malma*) were previously considered a single species (Cavender 1978; Bond 1992). Cavender (1978) presented morphometric (measurement), meristic (geometrical relation), osteological (bone structure), and distributional evidence to document specific distinctions between Dolly Varden and bull trout. Bull trout and Dolly Varden were formally recognized as separate species by the American Fisheries Society in 1980 (Robins et al. 1980). Although bull trout and Dolly Varden co-occur in several northwestern Washington river drainages, there is little evidence of introgression (Haas and McPhail 1991) and the two species appear to be maintaining distinct genomes (Leary et al. 1993; Williams et al. 1995; Kanda et al. 1997; Spruell and Allendorf 1997).

Bull trout exhibit resident and migratory life-history strategies through much of the current range (Rieman and McIntyre 1993). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. Migratory bull trout spawn in tributary streams where juvenile fish rear from one to four years before migrating to either a lake (adfluvial), river (fluvial), or in certain coastal areas, to saltwater (anadromous), where maturity is reached in one of the three habitats (Fraley and Shepard 1989; Goetz 1989). Resident and migratory forms may be found together and it is suspected that bull trout give rise to offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993).

Bull trout have more specific habitat requirements compared to other salmonids (Rieman and McIntyre 1993). Habitat components that appear to influence bull trout distribution and

abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrates, and migratory corridors (Oliver 1979; Pratt 1984, 1992; Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Howell and Buchanan 1992; Rieman and McIntyre 1993, 1995; Rich 1996; Watson and Hillman 1997). Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide habitat requirements for bull trout to successfully spawn and rear, and that the characteristics are not necessarily ubiquitous throughout these watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993), the fish should not be expected to simultaneously occupy all available habitats (Rieman et al. *in press*).

Bull trout are found primarily in colder streams, although individual fish are found in larger river systems throughout the Columbia River basin (Fraley and Shepard 1989; Rieman and McIntyre 1993, 1995; Buchanan and Gregory 1997; Rieman et al. *in press*). Water temperature above 15° C (59° F) is believed to limit bull trout distribution, which may partially explain the patchy distribution within a watershed (Fraley and Shepard 1989; Rieman and McIntyre 1995). Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992; Rieman and McIntyre 1993; Rieman et al. *In press*). For example, the only stream with substantial bull trout spawning in the upper Blackfoot River in Montana was Copper Creek, which had maximum water temperatures less than 15° C (59° F) (Hillman and Chapman 1996). Goetz (1989) suggested optimum water temperatures for rearing of about 7 to 8° C (44 to 46° F) and optimum water temperatures for egg incubation of 2 to 4° C (35 to 39° F). In Granite Creek, Idaho, Bonneau and Scarnecchia (1996) observed that juvenile bull trout selected the coldest water available in a plunge pool, 8 to 9° C (46 to 48° F) within a temperature gradient of 8 to 15° C (46 to 60° F).

All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Oliver 1979; Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Pratt 1992; Thomas 1992; Rich 1996; Sexauer and James 1997; Watson and Hillman 1997). Jakober (1995) observed bull trout overwintering in deep beaver ponds or pools containing large woody debris in the Bitterroot River drainage, Montana, and suggested that suitable winter habitat may be more restrictive than summer habitat. Maintaining bull trout habitat requires stream channel and flow stability (Rieman and McIntyre 1993). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997). These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period and channel instability may decrease survival of eggs and young juveniles in the gravel during winter through spring (Fraley and Shepard 1989; Pratt 1992; Pratt and Huston 1993).

Preferred spawning habitat consists of low gradient streams with loose, clean gravel (Fraley and Shepard 1989) and water temperatures of 5 to 9° C (41 to 48° F) in late summer to early fall (Goetz 1989). Pratt (1992) indicated that increases in fine sediments reduce egg survival and emergence. High juvenile densities were observed in Swan River, Montana, and tributaries with diverse cobble substrate and low percentage of fine sediments (Shepard et al. 1984). Juvenile bull trout in four streams in central Washington occupied slow-moving water less than 0.5 m/sec (1.6 ft/sec) over a variety of sand to boulder size substrates (Sexauer and James 1997).

The size and age of bull trout at maturity depends upon life-history strategy. Growth of resident fish is generally slower than migratory fish; resident fish tend to be smaller at maturity and less fecund (Fraley and Shepard 1989; Goetz 1989). Bull trout normally reach sexual maturity in 4 to 7 years and live as long as 12 years. Repeat and alternate year spawning has been reported, although repeat spawning frequency and post-spawning mortality are not well known (Leathe and Graham 1982; Fraley and Shepard 1989; Pratt 1992; Rieman and McIntyre 1996).

Bull trout typically spawn from August to November during periods of decreasing water temperatures. However, migratory bull trout frequently begin spawning migrations as early as April, and have been known to move upstream as far as 250 kilometers (km) (155 miles (mi)) to spawning grounds (Fraley and Shepard 1989). In the Blackfoot River, Montana, bull trout began migrations to spawning areas in response to increasing temperatures (Swanberg 1996). Temperatures during spawning generally range from 4 to 10° C (39 to 51° F), with redds often constructed in stream reaches fed by springs or near other sources of cold groundwater (Goetz 1989; Pratt 1992; Rieman and McIntyre 1996). Bull trout require spawning substrate consisting of loose, clean gravel relatively free of fine sediments (Fraley and Shepard 1989). Depending on water temperature, incubation is normally 100 to 145 days (Pratt 1992), and after hatching, juveniles remain in the substrate. Time from egg deposition to emergence may surpass 200 days. Fry normally emerge from early April through May depending upon water temperatures and increasing stream flows (Pratt 1992; Ratliff and Howell 1992).

Growth varies depending upon life-history strategy. Resident adults range from 150 to 300 millimeters (mm) (6 to 12 inches (in)) total length and migratory adults commonly reach 600 mm (24 in) or more (Pratt 1985; Goetz 1989). The largest verified bull trout is a 14.6 kilogram (kg) (32 pound) specimen caught in Lake Pend Oreille, Idaho, in 1949 (Simpson and Wallace 1982).

Bull trout are opportunistic feeders with food habits primarily a function of size and life-history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton and small fish (Boag 1987; Goetz 1989; Donald and Alger 1993). Adult migratory bull trout are primarily piscivorous; known to feed on various fish species (Fraley and Shepard 1989; Donald and Alger 1993).

Bull trout evolved with, and, in some areas, co-occur with native cutthroat trout (*Oncorhynchus clarki* ssp.), resident (redband) and migratory rainbow trout (*O. mykiss*), chinook salmon (*O. tshawytscha*), sockeye salmon (*O. nerka*), mountain whitefish (*Prosopium williamsoni*), various sculpin (*Cottus* spp.), sucker (Catastomidae) and minnow species (Cyprinidae spp.) (Mauser et al. 1988; Rieman and McIntyre 1993). Bull trout habitat overlaps with the range of several fishes listed as threatened, endangered, proposed, and petitioned for listing under the Act, including the endangered Snake River sockeye salmon (November 20, 1991; 56 FR 58619); threatened Snake River spring and fall chinook salmon (April 22, 1992; 57 FR 14653); endangered Kootenai River white sturgeon (*Acipenser transmontanus*) (September 6, 1994, 59 FR 45989); threatened and endangered steelhead (August 18, 1997, 62 FR 43937); and westslope cutthroat trout (*O. c. lewisi*) (petitioned for listing in July 1997). Widespread introductions of non-native fishes, including brook trout

(*S. fontinalis*), lake trout (*S. namaycush*) (west of the Continental Divide), and brown trout (*Salmo trutta*), have also occurred across the range of bull trout. These non-native fish have caused local bull trout declines and extirpations (Bond 1992; Ziller 1992; Donald and Alger 1993; Leary et al. 1993; Montana Bull Trout Scientific Group (MBTSG) 1996h).

Bull trout habitat in the coterminous United States is composed of a complex mosaic of land ownership, including Federal lands administered by the U.S. Forest Service (USFS), U.S. Bureau of Land Management (BLM), U.S. National Park Service (NPS), and Department of Defense (DOD); numerous Indian tribal lands; State land in Montana, Idaho, Oregon, Washington and Nevada; and private lands. It is estimated that as much as half of present bull trout habitat is bordered by non-Federal lands.

Migratory corridors link seasonal habitats for all bull trout life-history forms. For example, in Montana, migratory bull trout make extensive migrations in the Flathead River system (Fraley and Shepard 1989) and resident bull trout move to overwinter in downstream pools in tributaries of the Bitterroot River (Jakober 1995). The ability to migrate is important to the persistence of local bull trout subpopulations (Rieman and McIntyre 1993; M. Gilpin, University of California, *in litt.* 1997; Rieman et al. *in press*). Migrations facilitate gene flow among local subpopulations because individuals from different subpopulations interbreed when some stray and return to non-natal streams. Subpopulations that are extirpated by catastrophic events may also become reestablished in this manner.

Metapopulation concepts of conservation biology theory are applicable to the distribution and characteristics of bull trout (Rieman and McIntyre 1993). A metapopulation is an interacting network of local subpopulations with varying frequencies of migration and gene flow among them (Meefe and Carroll 1994). Local subpopulations may become extinct, but can be reestablished by individuals from other subpopulations. Metapopulations provide a mechanism for spreading risk because the simultaneous loss of all subpopulations is unlikely. Habitat alteration, primarily through the construction of impoundments, dams, and water diversions that create unsuitable conditions, has fragmented habitats, eliminated migratory corridors, and isolated bull trout often in the headwaters of tributaries (Rieman et al. *in press*).

Though wide-ranging in parts of Oregon, Washington, Idaho and Montana, bull trout in the interior Columbia River basin presently occur in only about 44 to 45 percent of the historical range (Quigley and Arbelbide 1997; Rieman et al. *in press*). Declining trends and associated habitat loss and fragmentation have been documented rangewide (Bond 1992; Schill 1992; Thomas 1992; Ziller 1992; Rieman and McIntyre 1993; Newton and Pribyl 1994; Idaho Department of Fish and Game (IDFG), *in litt.* 1995; McPhail and Baxter 1996). Several local extirpations have been reported, beginning in the 1950s (Rode 1990; Ratliff and Howell 1992; Donald and Alger 1993; Goetz 1994; Newton and Pribyl 1994; Berg and Priest 1995; Light et al. 1996; Buchanan et al. 1997; Washington Department of Fish and Wildlife (WDFW) 1997). For example, bull trout were apparently extirpated around 1975 from the McCloud River, California, the southernmost range (Moyle 1976; Rode 1990).

Distinct Population Segments

The Service's June 13, 1997, proposal to list the Klamath River and the Columbia River population segments of bull trout (62 FR 32268) was based on the 1994 administrative record, as required by the court. The Service's original June 10, 1994 (59 FR 30254), 12-month petition finding found that listing the bull trout was warranted but precluded throughout the coterminous United States. As explained in the proposed rule, the approach to break the range of bull trout into distinct population segments in the reanalysis of the 1994 petition finding was undertaken because the fish occurs in widespread, but fragmented habitats and has several life-history patterns. In addition, the threats to bull trout are diverse, and the quality and quantity of information regarding the population status and trends varies greatly throughout the range. By examining bull trout distinct population segments, the Service was better able to evaluate proposed listing of those segments, based on the 1994 administrative record, that were a priority in need of Federal protection. Future listing actions could, thereby, be based on best available rather than outdated scientific information.

In the process of making this final listing determination, the Service reexamined the appropriateness of applying the bull trout distinct population segments (DPSs) for the purposes of listing. The joint National Marine Fisheries Service (NMFS) and Service policy regarding the recognition of distinct vertebrate populations published February 7, 1996 (61 FR 4722), was the basis for this reexamination. Three elements are considered in the decision on whether a population segment could be treated as threatened or endangered under the Act—discreteness, significance, and conservation status in relation to the standards for listing. Discreteness refers to the isolation of a population from other members of the species and is based on two criteria—(1) marked separation from other populations of the same taxon resulting from physical, physiological, ecological, or behavioral factors, including genetic discontinuity; and (2) populations delimited by international boundaries. Significance is determined either by the importance or contribution, or both, of a discrete population to the species throughout its range. Four criteria were used to determine significance—(1) persistence of the discrete population segment in an ecological setting unusual or unique for the taxon; (2) evidence that loss of the discrete population segment would result in a significant gap in the range of the taxon; (3) evidence that the discrete population segment represents the only surviving natural occurrence of the taxon that may be more abundant elsewhere as an introduced population outside its historic range; and (4) evidence that the discrete population segment differs markedly from other populations of the taxon in its genetic characteristics. If a population segment is discrete and significant, its evaluation for endangered or threatened status is based on the Act's standards.

Based on the best available information, numerous bull trout subpopulations are isolated from each other by either unsuitable habitat or impassible dams and diversions, or both. Although many subpopulations could be considered discrete, few meet the "significance" criteria. For example, although some genetic differences were identified among subpopulations of bull trout in specific watersheds of the Columbia River basin, the subpopulations did not differ markedly and they inhabit similar habitats. The best available current information supports designating five DPSs in the coterminous United States—(1) Klamath River, (2) Columbia River, (3) Coastal-Puget Sound, (4) Jarbidge River, and (5) St. Mary-Belly River. For purpose of this final determination only the Klamath River and Columbia River DPSs will be addressed. The three remaining DPSs

are the subject of a proposed rule published concurrently.

Although the range of bull trout extends into Canada and Alaska, subpopulations outside the coterminous United States are not being considered in this rulemaking. In accordance with the distinct vertebrate population policy, the Service may determine a population to be discrete at an international border where there are significant differences in the control of exploitation, management of habitat, conservation status, or regulatory mechanisms. Bull trout management and conservation strategy in Canada differs from the United States and such activities are beyond the regulatory scope of the Act. The best available information also disclosed uncertainty regarding the status of bull trout in Canada. Throughout British Columbia and Alberta, data on bull trout status, distribution, and the presence of ongoing threats is incomplete and covers only a portion of the species' range within the provinces. The status of bull trout in Alaska is unknown.

Within the coterminous United States, bull trout distribution is highly fragmented and many subpopulations are geographically isolated. The best available information indicates that bull trout in the coterminous United States, although still wide-ranging, have suffered a significant reduction in range. In addition, bull trout are faced with varying degrees of ongoing threats. The Service now determines that listing bull trout distinct population segments only within the coterminous United States is warranted at this time.

Klamath River

The Klamath River originates in south central Oregon near Crater Lake National Park, and flows southwest into northern California where it meets the Trinity River and empties into the Pacific Ocean. Bull trout in this drainage are discrete because of physical isolation from other bull trout by the Pacific Ocean and several small mountain ranges in central Oregon. Leary et. al. (1991) determined genetic characteristics of bull trout in the Klamath River and Columbia River drainages using protein electrophoresis. They concluded that these two groups of fish were reproductively isolated and evolutionarily distinct. In addition, Williams et al. (1995) separated bull trout in the Klamath and Columbia Rivers into different clades (i.e., groups derived from different lineages) based on genetic diversity patterns. As a result, the Klamath River DPS is significant because it differs markedly in genetic characteristics from bull trout in the Columbia River basin.

Columbia River

The Columbia River DPS occurs throughout the entire Columbia River basin within the United States and its tributaries, excluding bull trout found in the Jarbidge River, Nevada. Although Williams et al. (1995) identified two distinct clades in the Columbia River basin (upper and lower Columbia River) based on genetic diversity patterns, a discrete geographical boundary between the two clades was not documented. The Columbia River DPS is significant because the overall range of the species would be substantially reduced if this discrete population were lost.

Status and Distribution

The Service evaluated the status and distribution of bull trout for each subpopulation in the Klamath River and Columbia River population segments. The complete review of this evaluation is found in a status summary compiled by the Service (Service status summary 1998). A synopsis of the summary is presented in this rule.

To facilitate evaluation of current bull trout distribution and abundance for both the Klamath River and Columbia River population segments, the Service analyzed data on bull trout relative to subpopulations because fragmentation and barriers have isolated bull trout throughout their current range. A subpopulation is considered a reproductively isolated group of bull trout that spawns within a particular area of a river system. In areas where two groups of bull trout are separated by a barrier (e.g., an impassable dam or waterfall, or reaches of unsuitable habitat) that allows only individuals upstream access to those downstream (i.e., one-way passage), both groups were considered subpopulations. In addition, subpopulations were considered at risk of extirpation from naturally occurring events if they were—(1) unlikely to be reestablished by individuals from another subpopulation (i.e., functionally or geographically isolated from other subpopulations); (2) limited to a single spawning area (i.e., spatially restricted); and either (3) characterized by low individual or spawner numbers; or (4) primarily of a single life-history form. For example, a subpopulation of resident fish isolated upstream of an impassable waterfall would be considered at risk of extirpation from naturally occurring events if the subpopulation had low numbers of fish that spawn in a restricted area. In such cases, a natural event such as a fire or flood affecting the spawning area could eliminate the subpopulation, and reestablishment from fish downstream would be prevented by the impassable waterfall. However, a subpopulation residing downstream of the waterfall would not be considered at risk of extirpation from naturally occurring events because there would be establishment potential by fish from the subpopulation upstream. Because resident bull trout may exhibit limited downstream movement (Nelson 1996), the Service's determination of subpopulations at risk of extirpation from naturally occurring events may overestimate the number of subpopulations that are likely to be reestablished.

The status of subpopulations was based on modified criteria of Rieman et al. (*in press*), including the abundance, trends in abundance, and the presence of life-history forms of bull trout. The Service considered a subpopulation "strong" if 5,000 individuals or 500 spawners likely occur in the subpopulation, abundance appears stable or increasing, and life-history forms were likely to persist; and "depressed" if less than 5,000 individuals or 500 spawners likely occur in the subpopulation, abundance appears to be declining, or a life-history form historically present has been lost. If there was insufficient abundance, trend, and life-history information to classify the status of a subpopulation as either "strong" or "depressed," the status was considered "unknown."

Based on abundance, trends in abundance, and the presence of life-history forms, bull trout were considered strong (i.e., 5,000 individuals or 500 spawners likely occur in the subwatershed or larger area, abundance is stable or increasing with at a minimum of half of historic abundance, and the presence of all life-history forms historically present) in 13 percent of the occupied range in the interior Columbia River basin (Quigley and Arbelbide 1997). Using various estimates of bull trout range, Rieman et al. (*in press*) estimated that bull trout were strong in 6 to 24 percent of the subwatersheds in the Columbia River basin. Bull trout declines have been attributed to the effects of land and water management activities, including forest management and road building, mining, agricultural practices, and livestock grazing (Furniss et al. 1991; Meehan 1991; Nehlsen et al. 1991; Craig and Wissmar 1993; Frissell 1993; McIntosh et al. 1994; Platts et al. 1995). Isolation and habitat fragmentation from dams and agricultural diversions (Rode 1990; Mongillo 1993; Jakober 1995),

fisheries management practices, poaching and the introduction of non-native species (Rode 1990; Bond 1992; Howell and Buchanan 1992; WDFW 1992; Donald and Alger 1993; Leary et al 1993; Pratt and Huston 1993; Rieman and McIntyre 1993; MBTSG 1996h; Palmisano and Kaczynski, Northwest Forest Resources Council (NFRC), *in litt.* 1997) also threaten bull trout populations.

Klamath River Population Segment

Historical records suggest that bull trout were once widely distributed and exhibited diverse life-history traits in the Klamath River basin (Gilbert and Evermann 1894; Dambacher et al. 1992; Ziller 1992; Oregon Chapter of the American Fisheries Society (OCAFS) 1993). The earliest records of bull trout in the basin are from Fort Creek (formerly Linn Creek), a tributary to the Wood River (L. Dunsmoor and C. Bienz, Klamath Tribe, *in litt.* 1997). Records from the late 1800s suggest that migratory fish (adfluvial) inhabited Klamath Lake (OCAFS 1993). Other migratory bull trout (i.e., fluvial) were evidently present in some of the larger streams in the basin as recently as the early 1970s (Ziller 1992). Bull trout are thought to have been extirpated from the Sycan River, the South Fork of the Sycan River, and four streams in the Klamath River basin (Cherry, Sevenmile, Coyote, and Callahan creeks) since the 1970s.

Currently, bull trout in the Klamath River basin occur only as resident forms isolated in higher elevation headwater streams (Goetz 1989) within three watersheds—Upper Klamath Lake, Sprague River, and Sycan River (Light et al. 1996). Factors contributing to isolation include habitat degradation, water diversion, and habitat fragmentation (OCAFS 1993; Light et al. 1996). In addition, long distances separate each isolated subpopulation (Schroeder and Weeks, *in litt.* 1997). According to Light et al. (1996), bull trout occupy approximately 38.2 km (22.9 mi) of streams in the Klamath River basin. More recently, Buchanan et al. (1997) indicated that bull trout occupy approximately 34.1 km (20.5 mi) of streams. The risk of extinction for Klamath River bull trout over the next 100 years was recently estimated at 70 to 90 percent (K. Schroeder and H. Weeks, OCAFS, *in litt.* 1997). The Service identified seven bull trout subpopulations in three watersheds (number of subpopulations in each watershed)—Upper Klamath Lake (2), Sycan River (1), and Sprague River (4). The Service considers six of the subpopulations at risk of extirpation caused by naturally occurring events due to their isolation, single life-history form and spawning area, and low abundance (Service status summary 1997).

Columbia River Population Segment

The Columbia River DPS includes bull trout residing in portions of Oregon, Washington, Idaho, and Montana. Bull trout are estimated to have occupied about 60% of the Columbia River Basin, and presently occur in 45% of the estimated historical range (Quigley and Arbelbide 1997). The Columbia River population segment is composed of 141 subpopulations. For discussion and analysis, the Service considered four geographic areas of the Columbia River basin—(1) lower Columbia River (downstream of the Snake River confluence), (2) mid-Columbia River (Snake River confluence to Chief Joseph Dam), (3) upper Columbia River (upstream from Chief Joseph Dam), and (4) Snake River and its tributaries (including the Lost River drainage).

Lower Columbia River Geographical Area

The lower Columbia River area includes all tributaries in Oregon and Washington downstream of the Snake River confluence near the town of Pasco, Washington. The Service identified 20 subpopulations in watersheds of nine major tributaries of the lower Columbia River (number of subpopulations in each watershed)—the Lewis River (2), Willamette River (3), White Salmon River (1), Klickitat River (1), Hood River (2), Deschutes River (3), John Day River (3), Umatilla River (2), and Walla Walla River (3). The present distribution of bull trout in the lower Columbia River basin is less than the historic range (Buchanan et al. 1997; Oregon Department of Fish and Wildlife (ODFW) 1993). Bull trout are thought to be extirpated from several tributaries in five river systems in Oregon—the Middle Fork Willamette River, the North and South Forks of the Santiam River, the Clackamas River, the upper Deschutes River (upstream of Bend, Oregon) and the Crooked River (tributary to the Deschutes River) (Buchanan et al. 1997).

Hydroelectric facilities and large expanses of unsuitable, fragmented habitat have isolated these subpopulations. Large dams, such as McNary, John Day, The Dalles, and Bonneville, separate four reaches of the lower Columbia River. Although fish may pass each facility in both upstream and downstream directions, the extent to which bull trout use the Columbia River is unknown. In addition, the nine major tributaries have numerous facilities, many of which do not provide upstream passage.

Migratory bull trout are present with resident fish or exclusively in at least 13 of the 20 subpopulations in the lower Columbia River. Many migratory fish are adfluvial and inhabit reservoirs created by dams. However, this area includes the only extant adfluvial subpopulation in Oregon, which exists in Odell Lake in the Deschutes River basin (Ratliff and Howell 1992; Buchanan et al. 1997). The Metolius River-Lake Billy Chinook subpopulation is also found in the Deschutes River basin. It is the only subpopulation considered "strong" and exhibits an increasing trend in abundance. The Service considers 5 of the 20 subpopulations at risk of extirpation caused by naturally occurring events exacerbated by isolation, single life-history form and spawning area, and low abundance.

Mid-Columbia River Geographical Area

The mid-Columbia River area includes watersheds of four major tributaries of the Columbia River in Washington, between the confluence of the Snake River and Chief Joseph Dam. The Service identified 16 bull trout subpopulations in the four watersheds (number of subpopulations in each watershed)—Yakima River (8), Wenatchee River (3), Entiat River (1), and Methow River (4). Historically, bull trout occurred in larger areas of the four tributaries and Columbia River. Bull trout are thought to have been extirpated in 10 streams within the area—Satus Creek, Nile Creek, Orr Creek, Little Wenatchee River, Napecqua River, Lake Chelan, Okanogan River, Eightmile Creek, South Fork Beaver Creek, and the Hanford Reach of the Columbia River. Most bull trout in the mid-Columbia River geographic area are isolated by dams or unsuitable habitat created by water diversions.

Bull trout in the mid-Columbia River area are most abundant in Rimrock Lake of the Yakima River basin and Lake Wenatchee of the Wenatchee River basin. Both subpopulations are considered "strong" and increasing or stable. The remaining 14 subpopulations are relatively low in abundance, exhibit "depressed" or unknown trends, and primarily have a single life-history form. The Service considers 10 of the 16 subpopulations at risk of extirpation because of naturally occurring events due to isolation, single life-history form and spawning area, and low abundance.

Upper Columbia River Geographic Area

The upper Columbia River geographic area includes the mainstem Columbia River and all tributaries upstream of Chief Joseph Dam in Washington, Idaho, and Montana. Bull trout are found in two large basins, the Kootenai River and Pend Oreille River, which include the Clark Fork River. Historically, bull trout were found in larger portions of the area. Numerous dams and degraded habitat have fragmented bull trout habitat and isolated fish into 71 subpopulations in 9 major river basins (number of subpopulations in each basin)—Spokane River (1), Pend Oreille River (3), Kootenai River (5), Flathead River (24), South Fork Flathead River (3), Swan River (3), Clark Fork River (4), Bitterroot River (27), and Blackfoot River (1). Bull trout are thought to be extirpated in 64 streams and lakes of various sizes—Nespelam, Sanpoil, and Kettle rivers; Barnaby, Hall, Stranger, and Wilmont creeks; 8 tributaries to Lake Pend Oreille; 5 tributaries to Pend Oreille River below Albeni Falls Dam; Lower Stillwater Lake; Arrow Lake (Montana); upper Clark Fork River, 12 streams in the Coeur d'Alene River basin; and approximately 25 streams in the St. Joe River basin (e.g., IDFG, *in litt.* 1995).

The upper Columbia River area contains "strongholds" for bull trout. Bull trout are considered "strong" in Hungry Horse Reservoir and Swan Lake. Trends in abundance are stable in Hungry Horse Reservoir, and increasing in Swan Lake. Although high numbers of bull trout are found in Lake Pend Oreille and the upper Kootenai River, trends in abundance are either negative or unknown. The high number of subpopulations (27) in the Bitterroot River basin, Montana, indicates a high degree of habitat fragmentation where numerous groups of resident bull trout are restricted primarily to headwaters. The Service considers 47 of the 71 subpopulations at risk of extirpation because of naturally occurring events due to isolation, single life-history form and spawning area, and low abundance.

Snake River Geographical Area

Bull trout occupy portions of 14 major tributaries in the Snake River basin of Idaho, Oregon, and Washington. The Service identified 34 bull trout subpopulations in the Snake River basin. The area consists of two primary portions separated by Hells Canyon Dam. Downstream of Hells Canyon Dam, major tributaries that support bull trout include (number of subpopulations in each tributary)—Tucannon River (2), Clearwater River (3), Asotin Creek (2), Grande Ronde River (1), Imnaha River (4), and Salmon River (2). Upstream of Hells Canyon Dam, major tributaries that support bull trout include—Pine Creek (4), Powder River (3), Malheur River (2), Payette River (4), Weiser River (2), and Boise River (2). Although bull trout distribution upstream of Hells Canyon Dam is limited primarily to the basin downstream of Shoshone Falls in southern Idaho, three geographically isolated bull trout subpopulations occur upstream of Shoshone Falls in the Little Lost River drainage. Bull trout subpopulations upstream of Hells Canyon Dam are generally low in abundance, fragmented, and isolated. The current distribution of bull trout in the Snake River basin is less than historically (Ratliff and Howell 1992; Batt 1996; Buchanan et al. 1997; Quigley and Arbelbide 1997), with recent extirpations documented in Eagle Creek (Powder River basin) and Wallowa Lake (Grande Ronde River basin) (Ratliff and Howell 1992; Batt 1996; Buchanan et al. 1997); and possibly in South Fork Asotin Creek (WDFW 1997). Numerous impassable dams and large expanses of unsuitable habitat have isolated subpopulations within the historic range. Isolation is most prominent upstream of Hells Canyon Dam (southwest Idaho and southeast Oregon). The basin downstream of Hells Canyon Dam is relatively intact, and connectivity among bull trout subpopulations may still occur.

Bull trout occupy large areas of contiguous habitat in the Snake River basin downstream of Hell's Canyon Dam, such as in the Clearwater River, and Salmon River basins. High numbers of bull trout have been observed in the Tucannon River, Imnaha River, Clearwater River, Salmon River, and Malheur River subpopulations, however, trends in abundance are largely unknown or declining. The Service considers 9 of the 34 subpopulations at risk of extirpation because of naturally occurring events due to isolation, single life-history form and spawning area, and low abundance.

In summary, the Columbia River population segment of bull trout has declined in overall range and numbers of fish. Though still widespread, there have been numerous local extirpations reported throughout the Columbia River basin. In Idaho, for example, bull trout have been extirpated from 119 reaches in 28 streams (IDFG *in litt.* 1995) . The population segment is composed of 141 subpopulations indicating habitat fragmentation, isolation, and barriers that limit bull trout distribution and migration within the basin. Although some strongholds still exist, bull trout, generally, occur as isolated subpopulations in headwater lakes or tributaries where migratory fish have been lost.

Previous Federal Action

On September 18, 1985, the Service published an animal notice of review in the Federal Register (50 FR 37958) designating the bull trout a category 2 candidate for listing in the coterminous United States. Category 2 taxa were those for which conclusive data on biological vulnerability and threats were not currently available to support proposed rules. The Service published updated notices of review for animals on January 6, 1989 (54 FR 554), and November 21, 1991 (56 FR 58804), reconfirming the bull trout category 2 status. The Service elevated bull trout in the coterminous United States to category 1 for Federal listing on November 15, 1994 (59 FR 58982). Category 1 taxa were those for which the Service had on file substantial information on biological vulnerability and threats to support preparation of listing proposals. Upon publication of the February 28, 1996, notice of review (61 FR 7596), the Service ceased using category designations and included the bull trout as a candidate species. Candidate species are those which the Service has on file sufficient information on biological vulnerability and threats to support proposals to list the species as threatened or endangered.

On October 30, 1992, the Service received a petition to list the bull trout as an endangered species throughout its range from the following conservation organizations in Montana—Alliance for the Wild Rockies, Inc., Friends of the Wild Swan, and Swan View Coalition (petitioners). The petitioners also requested an emergency listing and concurrent critical habitat designation for bull trout populations in select aquatic ecosystems where the biological information indicated that the species was in imminent threat of extinction. A 90-day finding, published on May 17, 1993 (58 FR 28849), determined that the petitioners had provided substantial information indicating that listing of the species may be warranted. The Service initiated a rangewide status review of the species concurrent with publication of the 90-day finding.

On June 6, 1994, the Service concluded in the original finding that listing of bull trout throughout its range was not warranted due to unavailable or insufficient data regarding threats to, and status and population trends of, the species within Canada and Alaska. However, the Service determined that

sufficient information on the biological vulnerability and threats to the species was available to support a warranted finding to list bull trout within the coterminous United States. Because the Service concluded that the threats were imminent and moderate to this population segment, the Service gave the bull trout within the coterminous United States a listing priority number of 9. As a result, the Service found that listing a distinct vertebrate population segment of bull trout residing in the coterminous United States was warranted but precluded due to higher priority listing actions.

On November 1, 1994, Friends of the Wild Swan, Inc. and Alliance for the Wild Rockies, Inc. (plaintiffs) filed suit in the U.S. District Court of Oregon (Court) arguing that the warranted but precluded finding was arbitrary and capricious. After the Service issued a "recycled" 12-month finding for the coterminous population of bull trout on June 12, 1995, the Court issued an order declaring the plaintiffs' challenge to the original finding moot. The plaintiffs declined to amend their complaint and appealed to the Ninth Circuit Court of Appeals, which found that the plaintiffs' challenge fell "within the exception to the mootness doctrine for claims that are capable of repetition yet evading review." On April 2, 1996, the circuit court remanded the case back to the district court. On November 13, 1996, the Court issued an order and opinion remanding the original finding to the Service for further consideration. Included in the instructions from the Court were requirements that the Service limit its review to the 1994 administrative record, and incorporate any emergency listings or high magnitude threat determinations into current listing priorities. In addition, reliance on other Federal agency plans and actions was precluded. The reconsidered 12-month finding based on the 1994 Administrative Record was delivered to the Court on March 13, 1997.

On March 24, 1997, the plaintiffs filed a motion for mandatory injunction to compel the Service to issue a proposed rule to list the Klamath River and Columbia River bull trout populations within 30 days based solely on the 1994 Administrative Record. In response to this motion, the Service "concluded that the law of this case requires the publication of a proposed rule" to list the two warranted populations. On April 4, 1997, the Service requested 60 days to prepare and review the proposed rule. In a stipulation between the Service and plaintiffs filed with the Court on April 11, 1997, the Service agreed to issue a proposed rule in 60 days to list the Klamath River population of bull trout as endangered and the Columbia River population of bull trout as threatened based solely on the 1994 record.

Based upon the Court agreement and stipulation, and information contained solely in the 1994 record, the Service proposed the Klamath River population of bull trout as endangered and Columbia River population of bull trout as threatened on June 13, 1997 (62 FR 32268). The proposal included a 60-day comment period and gave notice of five public hearings in Portland, Oregon; Spokane, Washington; Missoula, Montana; Klamath Falls, Oregon; and Boise, Idaho. The comment period on the proposal, which originally closed on August 12, 1997, was extended to October 17, 1997 (62 FR 42092), to provide the public with more time to compile information and submit comments.

On December 4, 1997, the Court ordered the Service to reconsider several aspects of the 1997 reconsidered finding. On February 2, 1998, the Court gave the Service until June 12, 1998, to respond. The final listing determination for the Klamath River and Columbia River population segments of bull trout and the concurrent proposed listing rule for the Coastal-Puget Sound, Jarbidge River, and St. Mary-Belly River DPSs constitute the Service's response.

The Service published Listing Priority Guidance for Fiscal Years 1998 and 1999 on May 8, 1998 (63 FR 25502). The guidance clarifies the order in which the Service will process rulemakings giving highest priority (Tier 1) to processing emergency rules to add species to the Lists of Endangered and Threatened Wildlife and Plants (Lists); second priority (Tier 2) to processing final determinations on proposals to add species to the Lists, processing new proposals to add species to the Lists, processing administrative findings on petitions (to add species to the Lists, delist species, or reclassify listed species), and processing a limited number of proposed or final rules to delist or reclassify species; and third priority (Tier 3) to processing proposed or final rules designating critical habitat. Processing of this proposed rule is a Tier 2 action.

Summary of Comments and Recommendations

In the June 13, 1997, proposed rule (62 FR 32268), all interested parties were requested to submit comments or information that might contribute to the final listing determination for bull trout. Announcements of the proposed rule and notice of public hearings were sent to at least 370 individuals, including Federal, State, county and city elected officials, State and Federal agencies, interested private citizens and local area newspapers and radio stations. Announcements of the proposed rule were also published in nine newspapers—the Oregonian, Portland, Oregon; the Spokesman Review, Spokane, Washington; the Yakima Herald, Yakima, Washington; the Missoulian, Missoula, Montana; the Kalispell Interlake, Kalispell, Montana; the Idaho Statesman, Boise, Idaho; the Lewiston Tribune, Lewiston, Idaho; the Post Register, Idaho Falls, Idaho; and the Herald and News, Klamath Falls, Oregon. Public hearings were held on July 1, 1997, in Portland, Oregon; July 8, 1997, in Spokane, Washington; July 10, 1997, in Missoula, Montana; July 15, 1997, in Klamath Falls, Oregon; and July 17, 1997, in Boise, Idaho. In response to numerous requests for additional time to complete compilation of information and meaningfully participate in the public comment process, the Service published a notice on August 5, 1997 (62 FR 42092), extending the comment period to October 17, 1997.

Eighty-four oral and 278 written (including electronic mail) comments were received on the proposed rule. These included comments from 7 Federal agencies, 9 State agencies, 6 counties in Oregon and Idaho, 2 Native American tribes, 6 private timber companies, and 20 industry or trade associations and bureaus. Comments were also received from the Idaho Congressional delegation, and Governors from the states of Montana, Idaho and Oregon.

The Service did not specifically solicit formal scientific peer review of the proposal as outlined in the Service's July 1, 1994, Interagency Cooperative Policy (59 FR 34270) because the proposal was based on the 1994 administrative record and not the best available scientific information. However, in the process of making this final listing determination, a number of professional fishery biologists were consulted and their comments and information were either incorporated into the listing decision as appropriate or are addressed below.

The Service considered all comments, including oral testimony at the five public hearings. A majority of comments supported the listing proposal and 65 comments were in opposition. Opposition was based on several concerns, including conflicts between ongoing State conservation efforts and Federal listing; possible economic impacts from listing the bull

trout; lack of solutions to the bull trout decline that would result from listing; and because the proposed rule was not peer-reviewed or based on the most current information. Seventy-three respondents provided new scientific information considered by the Service for this determination. The states of Idaho and Montana submitted conservation plans for bull trout for consideration by the Service in lieu of listing. The USFS (R. Joslin, USFS, *in litt.* 1997), BLM (A. Thomas, BLM, *in litt.* 1997) and U.S. Bureau of Reclamation (USBR) (M. McClendon, USBR, *in litt.* 1997) provided the Service with information on respective agency efforts to date to assess, evaluate, monitor, and conserve bull trout populations in habitats affected by each agency's management. Because multiple respondents offered similar comments in some cases, comments of a similar nature or point are grouped. These comments and the Service's response are discussed below—

Issue 1: Several respondents urged the Service to list bull trout throughout its entire range. Two respondents recommended that the Service include the Jarbidge River bull trout population as a threatened species. Another respondent stated that the proposal to list the entire Columbia River bull trout population was too broad and suggested that the area be analyzed for listing purposes by major river segments. Conversely, another respondent requested that the Service designate bull trout in the Clark Fork and Kootenai River basins as distinct population segments, citing geographic and historic isolation, and biological significance to the species as a whole as reasons. Additionally, several other commenters suggested that smaller, more manageable distinct population segments be established to avoid listing healthy populations so that conservation efforts can be applied to areas where restoration is truly needed. Other commenters, at the Federal, State and local level suggested other delineations for the distinct population segments, and questioned whether listing would afford protection of bull trout only in currently occupied habitat.

Service response: Based on the best available scientific and commercial information, and consistent with the distinct vertebrate population policy (61 FR 4722, February 7, 1997), the Service has determined that bull trout should be divided into five distinct vertebrate populations for listing purposes, but only in the coterminous United States (see Distinct Population Segment section). The Klamath River and the Columbia River population segments are the subject of this final rule and the remaining three population segments are addressed in an accompanying proposed rule.

In addressing the appropriateness in designating additional DPSs within the Columbia River basin, the Service reviewed new genetic and other biological data developed since 1994, and determined that there is insufficient information available to further divide this DPS. Although many bull trout groups in the Columbia River basin were discrete according to the DPS policy, they failed to meet criteria for significance (e.g. bull trout in the Little Lost River basin in Idaho and portions of the upper Columbia River basin). However, during the recovery process, further division of the Columbia River DPS into recovery units or zones including separation of the bull trout in the Kootenai River, Clark Fork-Pend Oreille River, Little Lost River, 17 potential genetic conservation groups (GCGs) in the State of Washington, and 8 additional GCGs in Oregon can be considered. For wide-ranging species, designation of recovery units can focus recovery objectives on the specific threats, status and habitat requirements within the defined geographic area. Although recovery units cannot be individually delisted without consideration of the entire listed entity (species or DPS), the Service can develop "special rules" (under section 4(d) of the Act) for individual recovery units (see issue #6 below for more information on special rules).

Issue 2: Several respondents stated that because the proposed rule was based on information gathered prior to June 1994, listing should be deferred until new information is analyzed and updated. Comments that "* * * quality of peer reviewed scientific data is noticeably lacking" were also received. Some respondents questioned why the bull trout is now being considered for listing when the Service's analysis in the proposed rule concluded that bull trout had a widespread range and threats to the fish were only moderate. Respondents also stated that conclusions in the proposed rule regarding population distribution and population trends were inaccurate.

Service response: The U.S. District Court of Oregon ordered the Service on November 13, 1996, to reconsider the original 1994 bull trout finding based only information available to the agency when it made the original 1994 finding. Therefore, the Service was mandated to move ahead with a listing proposal based on the information contained in the 1994 administrative record. In making this final listing determination, however, the Service has reviewed and considered new information regarding distribution and life history for the Klamath River and Columbia River population segments of bull trout. This includes, but is not limited to, new bull trout status, distribution, and threats information, and also descriptions of ongoing conservation actions, contained in reports and other written correspondence available since 1994 concerning bull trout in Idaho (Adams and Bjornn 1997; Batt 1996; Bonneau and Scarnecchia 1996; Corley 1997; Elle 1995; Espinoza et al. 1997; N. Horner, IDFG, *in litt.* 1997); Montana (Berg and Priest 1995; Hillman and Chapman 1996; Hansen and DosSantos 1997; Kanda et al. 1997; Long 1995, 1997; Mathieus 1996; McDowell et al 1997; MBTSG 1995a–e; MBTSG 1996a–h; Rich 1996; Swanberg 1996; Swanberg and Burns 1997); Oregon (Buchanan et al. 1997; Buchanan and Gregory 1997; Capruso 1997; Crabtree 1996; Germond et al. 1996a, b; Ratliff et al. 1996; Spruell and Allendorf 1997); Washington (Faler and Bair 1996; Northrop 1997; Raekes 1996; Sexauer and James 1997; WDFW 1997); the Klamath River basin (Buktenica 1997; Buktenica and Larson 1997; Light et al. 1996; ODFW 1996) and bull trout in the Columbia River basin (Platts et al. 1995; Quigley and Arbelbide 1997; Rieman et al *in press;* Rieman and McIntyre 1995, 1996; Watson and Hillman 1997; Williams et al 1995; R. Joslin, *in litt,* 1997; J. Kraft, Plum Creek, *in litt.* 1997; M. McClendon, *in litt,* 1997; Palmisano and Kacynski, *in litt,* 1997; Thomas, *in litt,* 1997).

Based on the best information currently available, bull trout in the Klamath River and Columbia River population segments are not more widespread or found in other areas of the Klamath or Columbia River basins than shown in the 1994 administrative record. Bull trout occur over a large geographic area in four states within the Columbia River drainage. However, bull trout display a generally patchy distribution (Rieman and McIntyre 1993). The best available information indicates that bull trout are in widespread decline across the historic range and restricted to numerous reproductively isolated subpopulations in the Columbia River basin with many recent local extirpations. The largest contiguous areas supporting bull trout are "strongholds" in central Idaho and Montana, such as the upper Flathead River basin. Many remaining bull trout subpopulations are characterized by declining trends, low relative subpopulation size, loss of migratory

fish or the presence of a single life-history form, and isolated from other bull trout by large geographic separation(s). Habitat loss, fragmentation and other changes that have isolated and continue to impact bull trout subpopulations also increase their susceptibility to naturally occurring processes (both demographically and environmentally). Many remaining subpopulations in both the Klamath River and Columbia River population segments are at risk of extirpation from the combined effects of habitat loss and fragmentation, loss of migration corridors, and inability to reestablish extirpated subpopulations through emigration, and recovery actions are required to slow the rate of habitat loss and continued reductions in range. Existing regulations have not arrested the decline of bull trout and newly developed State and local conservation strategies are largely not implemented.

Issue 3: Several respondents opposed the Federal listing or believed it not necessary, and expressed support for various State and local conservation plans developed for bull trout. Two respondents stated that State forest practice rules and regulations are adequate to conserve and restore bull trout. In addition, others recommended that if the bull trout is eventually listed, the Service should defer to the States for management and recovery.

Service response: Section 4(b)(1)(A) of the Act, requires that listing decisions be made solely on the best scientific and commercial data available after conducting a review of the status of the species. The Act also instructs the Service to consider "existing regulatory mechanisms, including taking into account those efforts by State, local and other entities to protect a species, including conservation plans or practices." However, several recent Federal court decisions have limited the extent to which the Service may rely upon land management plans, agreements and other documents that are under development and promise proposed future actions, as a basis for determining that listing is not warranted (Southwest Center for Biological Diversity v. Babbitt, 926 F. Supp. 920 (D. Ariz. 1996); Biodiversity Legal Foundation v. Babbitt, 943 F. Supp. 23 (D. D.C. 1996).

The Service has reviewed conservation plans developed by the States of Montana and Idaho, and other local conservation agencies for bull trout. These actions are encouraging for long term bull trout conservation and recovery. It is recognized that individual restoration projects have been undertaken by States (for instance, the Klamath River Basin Bull Trout Working Group has been implementing conservation activities and planning efforts since 1993), and harvest regulations for bull trout have become more restricted. However, based on the best available information, the Service cannot determine or predict the effectiveness of the conservation actions in reducing threats to the bull trout in the Klamath River and Columbia River population segments to the extent that listing is unnecessary.

The Idaho Bull Trout Conservation Plan (Plan) (Batt 1996), approved in July 1996, addresses bull trout conservation in 59 key watersheds to provide for the conservation and recovery of bull trout statewide. The Plan emphasizes locally developed, site-specific programs with technical assistance from appropriate State and Federal agencies. Although the Plan establishes a mechanism for generating 59 conservation plans by the year 2008, it lacks any description of how specific practices that currently affect bull trout (e.g., timber harvest, mining, grazing, hydropower operations) will be modified. This specificity would provide a basis for the development of future conservation plans and help ensure adequate protection for bull trout. It must also be clear how Federal agencies and private landowners in key watersheds will be required to institute bull trout conservation measures. Given the extent of Federal lands in Idaho, implementation of bull trout conservation measures by the USFS and BLM are critical to the Plan. The Plan also cites hydropower and irrigation practices contributing to the decline of bull trout, but the Plan needs to address these practices in light of the existing Idaho water law, USBR water commitments, and existing Federal Energy Regulatory Commission (FERC) licenses. The Plan provides potential future benefits to bull trout conservation and recovery once adequate funding and full implementation occurs.

The Montana bull trout conservation effort was initiated in 1994. Since 1994, 11 basin-specific status reports and two technical, peer-reviewed papers have been completed. Local watershed groups are being established; however, few on-the-ground local efforts have been completed or are underway. The Service is a member of the Montana Bull Trout Restoration Team which has been formed as part of the State's Montana Bull Trout Plan. Although actions taken to date under the Montana Plan have provided some benefits, not all threats to bull trout have been addressed, partly by lack of State jurisdiction, except in a few local areas. The Service is encouraged by State of Montana's progress in implementing the Montana plan and developing appropriate strategies to remove threats and promote conservation and recovery of bull trout.

The Wallowa County-Nez Perce Tribe Salmon Recovery Plan (Wallowa County and Nez Perce Tribe, *in litt.* 1997) in Oregon is intended to primarily aid in the recovery of listed chinook salmon and steelhead. Twenty-six stream segments in the County have been identified for restoration, with two to five stream segments scheduled to be addressed each year over the next 15 years. By 2008, some positive steps towards improved land and water management in Wallowa County should occur; however, the limited scope of the plan will not benefit bull trout outside the County or necessarily address threats on Federal lands.

Bull trout conservation and planning efforts in the Klamath River basin were initiated earlier than similar State conservation efforts, and incorporated all land owners of occupied bull trout habitat. The Klamath River Basin Bull Trout Working Group (Working Group) functions under a Memorandum of Understanding, and has been actively implementing portions of the Klamath Basin Bull Trout Conservation Strategy (Light et al. 1996). These proactive interagency efforts to stabilize and expand bull trout in the Klamath River basin are unique in their early initiation and multi-entity approach. The Service supports and encourages the Working Group to continue implementing phases I and II of the Conservation Strategy and complete a formal implementation plan for conservation of bull trout in the Klamath River basin.

Bull trout have declined across much of their former range due to a variety of factors, including effects of dam construction, agricultural practices, introduced non-native fishes, and forest practices. A thorough discussion of the factors affecting bull trout is found in "Summary of Factors Affecting the Species." Existing State law addressing forest practices is discussed under Factor D in the "Summary of Factors Affecting the Species." Although State rules and regulations governing forested land management activities are improving, they are generally not adequate to conserve and recover bull trout or remedy the effects of past damage to bull trout habitats.

Issue 4: Several respondents opposed the proposed listing of bull trout because possible "activity restrictions" and economic impacts might occur.

Service response: Section 4(b)(1)(A) of the Act, requires that a listing

determination be based solely on the best scientific and commercial information available. The legislative history of this provision clearly states the intent of Congress to "ensure" that listing decisions are "based solely on biological criteria and to prevent non-biological considerations from affecting such decisions" (H.R. Rep. No. 97–835, 97th Congress 2nd Session 19 (1982)). Because the Service is specifically prohibited from considering economic and other non-biological impacts of species listing, such impacts are not addressed in this final rule.

Issue 5: Some respondents suggested that bull trout listing and recovery may conflict with recovery of other listed fish, notably endangered Snake River salmon species.

Service response: Concerns regarding the possible adverse environmental and non-biological effects from implementing future recovery measures cannot be considered in a decision to list a species. However, these concerns are important in developing recovery measures that take into account environmental effects on other species, including listed Snake River salmon. The Service will fully evaluate the environmental effects and consequences of implementing future recovery measures for bull trout in the Columbia River and Klamath River basins. It should be noted that bull trout co-evolved with Snake River salmon and recovery actions that benefit one species may also benefit other native fishes.

Issue 6: The Service received several comments on the proposed special rule that would allow for take of bull trout within the Columbia River population segment when it is in accordance with applicable State fish and wildlife conservation laws and regulations. While some respondents supported the proposed special rule, others were opposed to the special rule in its current form. Various activities were cited that continue to threaten bull trout, including poaching, electrofishing, and mis-identification of bull trout by fisherman.

Service response: Based on comments received during the public comment period, the Service modified the special rule to address those concerns. The 4(d) special rule conditions in this final rule relate to existing State and Tribal conservation laws and harvest regulations pertaining to bull trout at the time of publication of this rule. The Service has determined that, as currently constituted, the applicable State and Tribal fishing regulations provide conservation of bull trout. In the event any of these laws and regulations are modified in a manner that is inconsistent with conservation of bull trout, the 4(d) rule would not allow the take of bull trout.

The Service also has discretion under section 4(d) of the Act to issue special regulations for activities other than harvest regulations for a threatened species that are deemed necessary and advisable for its conservation. The Service recognizes that on-going and future land-use activities will occur on non-Federal lands that may result in take of bull trout. In the future, the Service will consider issuing special rules that would define the conditions under which take associated with State permitted, or other activities deemed necessary and advisable for the species' conservation, would be authorized for bull trout. Special rules allow for more efficient management of threatened species, and encourage and enhance the conservation of species through the development of regulations the Service deems necessary and advisable to provide for conservation of the species. For example, conservation actions or other activities implemented as part of the Idaho Governor's bull trout plan, Wallowa County-Nez Perce Salmon Plan, Montana Bull Trout Recovery Plan, and Klamath Basin Bull Trout Conservation Strategy may qualify for consideration under a special rule. The Service will consider the development and approval of special rules that will lead to the conservation of bull trout, allowing certain specific land management activities that may allow take of bull trout to continue or occur, with certain restrictions. Under a special rule, this take of bull trout as a result of these activities would not be considered a violation of section 9 of the Act.

This process can provide non-Federal landowners with the flexibility to develop prescriptions or restrictions for their lands which would achieve the level of bull trout conservation consistent with the special rule.

Issue 7: Several respondents stated that since hatcheries will be relied on for bull trout restoration efforts, habitat threats would not be addressed and hatchery-reared fish could transmit and introduce disease to wild bull trout.

Service response: According to section 2(b) of the Act, one of the purposes of the Act is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." Once a species becomes listed as threatened or endangered, section 4(f) of the Act directs the Service to develop and implement recovery plans for that species. Recovery means improvement in the status of a listed species to the point at which listing is no longer appropriate under the criteria provided in section 4 of the Act (50 CFR 402.02). Two goals of the recovery process are: (1) The maintenance of secure, self-sustaining wild populations of the species; and (2) restoration of the species to the point where it is a viable, self-sustaining component of its ecosystem.

The Service recognizes that captive propagation and hatchery supplementation can be valid conservation tools and assist in recovery efforts, but by themselves, do not contribute to secure, self-sustaining bull trout populations in the wild. For example, the Service agrees with the findings of the Montana Bull Trout Scientific Group that stocking or supplementation is a potential tool in the restoration of bull trout and should only be used if the actual cause(s) of local extirpations are identified and corrected first (MBTSG 1996g). Any such project "* * * involving stocking must be appropriate in scope, judiciously applied, rigorously designed, and thoroughly monitored."

Issue 8: Several respondents stated that the introduction of exotic fishes, hybridization with brook trout, and past agency efforts to eradicate bull trout are the primary causes of decline.

Response: The Service agrees that the introduction of exotic fishes by fish management agencies, ongoing hybridization with brook trout, and past efforts to eradicate bull trout have contributed to the decline of the species. The significance of these threats, however, varies by subpopulation location and habitat characteristics (See Factors B, C and E of the "Summary of Factors Affecting the Species" section).

Issue 9: Several respondents requested that the Service designate critical habitat as part of the final rulemaking process. A representative of the Oregon Cattlemen's Association, stated that "* * * the delineation of critical habitat should be based on repeatable, verifiable scientific data followed by a common sense approach to economics."

Service response. A majority of the comments in this regard were standardized requests advocating critical habitat designation with special attention on roadless areas and riparian buffers. These comments included no sight-specific analysis and provided no information to aid the Service in delineation of critical habitat. The proposed rule included a "not determinable" finding for designation of critical habitat based on the 1994 administrative record and solicited comments on whether any habitat

should be determined critical bull trout habitat. The Service received no substantial new information regarding critical habitat during the open comment period for the proposed rule. Therefore, based on the best scientific information currently available, the Service finds in this final rule that critical habitat designation is "not determinable" (see Critical Habitat section).

Summary of Factors Affecting the Species

After a thorough review and consideration of all information available, the Service has determined that the Klamath River and Columbia River distinct population segments of bull trout should be classified as threatened. Procedures found at Section 4(a)(1) of the Act and regulations (50 CFR part 424) were followed. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1). These factors and their application to the Klamath River and Columbia River population segments of bull trout (*Salvelinus confluentus*) are as follows—

A. *The present or threatened destruction, modification, or curtailment of bull trout habitat or range.* Land and water management activities that degrade and continue to threaten bull trout and its habitat include dams, forest management practices, livestock grazing, agriculture and agricultural diversions, roads, and mining (Beschta et al. 1987; Chamberlain et al. 1991; Furniss et al. 1991; Meehan 1991; Nehlsen et al. 1991; Sedell and Everest 1991; Craig and Wissmar 1993; Frissell 1993; U.S. Department of Agriculture (USDA) and U.S. Department of the Interior (USDI) 1995; Henjum et al. 1994; McIntosh et al. 1994; Wissmar et al. 1994; Light et al. 1996; MBTSG 1995a–e, 1996a–h; USDA and USDI 1996, 1997).

Dams

Dams affect bull trout by changing various biological and physical processes. Dams can alter habitats; flow, sediment, and temperature regimes; migration corridors; and interspecific interactions, especially between bull trout and introduced species (Rode 1990; Washington Department of Wildlife (WDW) 1992; Craig and Wissmar 1993; ODFW, *in litt.* 1993; Rieman and McIntyre 1993; Wissmar et al. 1994; T. Bodurtha, Service, *in litt.* 1995; USDA and USDI 1996, 1997). Impassable dams have caused declines of bull trout primarily by preventing access of migratory fish to spawning and rearing areas in headwaters and precluding recolonization of areas where bull trout have been extirpated (Rieman and McIntyre 1993).

Existing dams can be passage and migratory barriers for bull trout and these structures may isolate bull trout subpopulations, eliminate individuals from subpopulations, reduce or eliminate genetic exchange, and separate spawning areas from productive overwintering and foraging areas (Ratliff and Howell 1992; Rieman and McIntyre 1993; MBTSG 1995a, 1996b,c). Dams have fragmented bull trout habitat and resulted in numerous isolated subpopulations. Within the Columbia River population segment, 66 percent of bull trout subpopulations are isolated by dams or indirectly by dam or water diversion operations that alter habitat conditions. Individuals that pass downstream over or through dams are often lost from the upstream subpopulations. Dams have converted historic rearing habitats for migratory fish in the larger river system to reservoirs with conditions that frequently are unsuitable for bull trout (MBTSG 1996b), especially where non-native salmonids occur.

Although the predominant effects of dams affect the long term viability of bull trout subpopulations (Rieman and McIntyre 1993; Gilpin, *in litt.* 1997), dams can benefit bull trout by preventing introduced non-native species access to upstream areas. For example, dams on the Swan River and South Fork Flathead River, Montana, have prevented lake trout from moving into these major river systems (MBTSG 1995e, 1996a). Dams may also increase the potential forage base for bull trout by creating reservoirs that support prey species (Faler and Bair 1991; Pratt 1992; ODFW, *in litt.* 1993).

The extirpation of bull trout in the McCloud River basin, California, has been attributed primarily to construction and operation of McCloud Dam, which began operation in 1965 (Rode 1990). McCloud Dam inundated bull trout spawning and rearing habitats, and isolated these fish from habitats used by migratory adults. The dam also altered the stream flow regime and elevated water temperature to levels detrimental to bull trout.

Klamath River Population Segment

Dams are not known to affect bull trout subpopulations in the Klamath River basin.

Columbia River Population Segment

Bull trout passage is prevented or inhibited at hydroelectric, flood-control, or irrigation dams in almost every major river in the Columbia River basin except the Salmon River in Idaho. For instance, six dams were constructed without fish passage in the Boise River, Idaho, and of these, Arrowrock and Anderson Ranch dams isolate bull trout subpopulations. Historically, bull trout in the Boise River likely functioned as a single subpopulation with migratory adults moving among areas that are now isolated (Rieman and McIntyre 1995). Similarly, bull trout were thought to have ranged throughout the Yakima River, Washington, prior to construction of several dams beginning in 1905 (WDFW 1997). Storage dams (Tieton, Bumping Lake, Keechelus Lake, Kachess Lake, and Cle Elum Lake dams) now isolate five of eight bull trout subpopulations in the Yakima River basin, with agricultural diversion dams isolating three additional bull trout subpopulations (WDFW 1997). Operation of irrigation diversion dams also disrupts annual migrations of fluvial bull trout in five of seven spawning streams in the Methow River basin, Washington (WDFW 1997). In the mainstem Methow River, up to 79 percent of the average flow is removed from a 64 km (40 mi) reach, occasionally stranding and killing bull trout (Mullan et al. 1992). Due primarily to temperature constraints in partially dewatered tributaries to the Methow River, 60 percent of the total spawning and rearing areas for bull trout has been lost (Mullan et al. 1992; WDFW, *in litt.* 1995). Also in Washington, bull trout in the North Fork Lewis River were separated into two subpopulations by the construction of Swift and Yale reservoirs, and the Condit Dam on the White Salmon River also isolated a subpopulation (WDFW 1997). In Oregon, bull trout were thought to have historically occurred throughout the Willamette River basin, but are presently found only in the McKenzie River basin. Dams in the basin (Trailbridge and Carmen) isolate bull trout into three subpopulations.

In the mainstem Clark Fork River, Idaho and Montana, bull trout moved and migrated freely from Lake Pend Oreille upstream to the headwaters of the Clark Fork and Flathead rivers prior to construction of five dams (Pratt and Huston 1993; MBTSG 1996b; Frissell 1997). The construction of Albeni Falls, Cabinet Gorge, Noxon Rapids, Thompson Falls, and Milltown dams isolated four bull trout subpopulations in the mainstem Clark Fork-Pend Oreille rivers. The uppermost dam, Milltown, isolates downstream fish from those in the upper Clark Fork River and prevents fish downstream of the dam from

moving into the Blackfoot River, a major tributary of the upper Clark Fork River. Annually, some bull trout congregate below Milltown Dam, attempting to move upstream. Radio-tagged bull trout collected below Milltown Dam and released above the dam moved into Rock Creek, a tributary to the upper Clark Fork system (Swanberg 1996). Movement of bull trout from the mainstem Clark Fork River to the Flathead Lake system is prevented by Kerr Dam on the lower Flathead River. Sport harvest of bull trout from Lake Pend Orielle, Idaho, abruptly declined more than 50 percent after Albeni Falls and Cabinet Gorge dams blocked access to historic spawning streams and reduced adult numbers (Ellis 1940; Pratt and Huston 1993).

Major tributaries of the Flathead River basin, Montana, were historically interconnected so that migratory bull trout were widely distributed throughout the drainage (MBTSG 1995d). Bull trout from the Flathead River system had access to the South Fork Flathead River drainage and the Swan River drainage. However, upstream passage from the Flathead River has been blocked by dams on the South Fork Flathead River (Hungry Horse Dam) and the Swan River (Bigfork Dam).

On the Kootenai River, Montana, Libby Dam is an upstream passage barrier to bull trout. The dam also has altered the flow regime, water temperature, and sediment load in the Kootenai River (MBTSG 1996e). Dam operation has typically reduced spring flows, which has made upstream passage over Kootenai Falls, located downstream of Libby Dam, impossible. Therefore, fish below the falls do not have the opportunity to interbreed with fish above (MBTSG 1996e).

An additional effect of dams on bull trout is the loss of individuals from a subpopulation. During a 7-month study in the Boise River, bull trout were marked in Arrowrock Reservoir and 5 percent of them were recaptured in Lucky Peak Reservoir (USBR, *in litt.* 1997). Lucky Peak Dam is downstream of the Arrowrock and Anderson Ranch subpopulations, and neither Lucky Peak Reservoir nor the reach downstream of the dam provide any known spawning habitat. Thus, fish entering Lucky Peak Reservoir are lost from the upstream subpopulations.

Forest Management Practices

Forest management activities, including timber extraction and road building, affect streams habitats by altering recruitment of large woody debris, erosion and sedimentation rates, runoff patterns, the magnitude of peak and low flows, and annual water yield (Cacek 1989; Furniss et al. 1991; Wissmar et al. 1994; Spence et al. 1996). Activities that promote excessive substrate movement lower bull trout production by increasing egg and juvenile mortality, and reduce or eliminate habitat important to later life-history stages, such as when pools are filled with substrates (Shepard et al. 1984; Fraley and Shepard 1989; Brown 1992). The length and timing of bull trout egg incubation and juvenile development (typically more than 200 days during winter and spring) and the strong association of juvenile fish with stream substrate make bull trout vulnerable to changes in peak flows and timing that affect channels and substrate (Shepard et al. 1984; Goetz 1989; Pratt 1992).

Logging and road building in riparian zones reduce stream shading and widen stream channels, allowing greater sunlight penetration, surface water warming, and winter anchor ice formation (Beschta et al. 1987; Chamberlain et al. 1991). Timber extraction in riparian areas that results in increased water temperatures in spawning and rearing areas may cause bull trout to decline (Goetz 1989; Pratt 1992; Rieman and McIntyre 1993). Logging in riparian areas reduces recruitment of large woody debris, thereby reducing stream habitat complexity. Loss of riparian vegetation destabilizes streambanks and increases erosion and sediment delivery to streams. Road construction that involves channelizing streams may cause reduced habitat complexity and increased sediment delivery.

Although bull trout occur in watersheds affected by past timber extraction, bull trout strongholds persist in a greater percentage of watersheds experiencing little or no past timber harvest, such as the wilderness areas of Central Idaho and the South Fork Flathead River drainage in Montana (Henjum et al. 1994; MBTSG 1995e; USDA and USDI 1997; Rieman et al. *in press*). One bull trout stronghold subject to extensive logging and road construction is in the Swan River basin (Watson and Hillman 1997). It is difficult to assess the overall effects of forestry practices on bull trout in parts of the basin because of the complex geomorphology and geology of the drainage (MBTSG 1996a). However, the Swan River tributaries also drain large areas of contiguous roadless lands that provide important protected bull trout habitat.

Timber harvest has occurred throughout the Columbia River (Henjum et al. 1994; USDA and USDI 1996, 1997) and Klamath River basins (Light et al. 1996; USDA and USDI 1996, 1997). The effects of timber harvest on streams are long lasting, and recovery is slow (Furniss et al. 1991; Henjum et al. 1994). The MBTSG ranked forestry, especially the legacy left by past forestry practices, as a limitation to bull trout restoration in all major watersheds in Montana (MBTSG 1995a–e, 1996a–f).

Klamath River Population Segment

Much of the forest in the Klamath River basin has been managed for timber production, with substantial activity beginning in 1940. Extensive harvesting, including partial cutting with overstory removal, clearcutting, and selective logging for old-growth pine occurred on private lands, and low intensity harvest occurred on some of the USFS lands. Past forest management activities in the Klamath River basin have temporarily reduced riparian vegetative cover and increased water temperature in some streams, including Threemile Creek (Light et al. 1996). Roads were built in the basin for access to timber, causing increased sedimentation and substrate embeddedness. Sediment from existing roads continues to degrade stream habitat (Light et al. 1996). Weyerhauser Timber Company began an improved road maintenance program in 1994 to reduce sediment inputs from roads on its lands adjacent to occupied bull trout stream reaches in the Klamath River basin, and U.S. Timberlands is presently continuing the practice (B. Johnson, pers. comm. 1997). Two recent timber harvest activities occurred on U.S. Timberlands property along Boulder Creek in 1994 and Long Creek in 1995 (Johnson, U.S. Timberlands, pers. comm. 1997). A review of the activities concluded that leaving buffer strips and obliterating existing roads left the riparian habitat in better condition than before the timber harvest (B. Johnson, pers. comm. 1997). No timber harvests are currently planned for areas adjacent to streams occupied by bull trout. Six of the seven bull trout subpopulations identified in the Klamath River basin have been affected by past forest management practices.

Columbia River Population Segment

Perhaps the greatest threat to bull trout involving forest practices and roads stems from the ongoing and latent adverse effects caused by over a century of logging. Latent threats are illustrated by approximately 2,300 land slides correlated with high logging road density on national forest lands in the Clearwater and Spokane rivers basins during high runoff events in 1995 and

1996 (L. McLaud, Idaho Conservation League, *in litt.* 1997; R. Patten, Panhandle National Forest, *in litt.* 1997). The same runoff events also triggered an estimated 2,000 land slides on adjacent non-Federal timber lands in the Clearwater River basin (McLaud, *in litt.* 1997). On over half of the non-wilderness lands within National Forests across northern Idaho and western Montana, the environmental effects of past forest practices now constrain forest management (USFS map, *in litt.* 1994). For example, 70 percent of stream miles on the Wallowa-Whitman National Forest are degraded beyond Land and Resource Management Plan (LRMP) standards for fine sediment and temperature parameters on the forest (Wissmar et al. 1994). On the Panhandle National Forest, Idaho, pool volumes, quality and frequency in managed watersheds (mainly watersheds with past timber extraction and road construction) were reduced compared to non-managed watersheds. Further, decreases in pool volume and frequency were correlated with decreases in the distribution and abundance of bull trout (Cross and Everest 1995). In the Lake Pend Oreille and Priest River basins, 31 percent of streams in National Forest lands are degraded beyond LRMP standards, and 51 percent of streams are in the most degraded category (B. Kasun, USFS, *in litt.* 1993). Streams in the most degraded category generally do not support bull trout because of stream morphology changes, increased cobble embeddedness and high summer temperatures. Jones and Espinosa (1992) determined that 71 percent of the stream or watershed areas in the managed portion of the Clearwater National Forest did not meet LRMP standards, and that streams in poor condition generally did not support bull trout. Similarly, 67 percent of the non-wilderness portion of the Nez Perce National Forest did not meet LRMP standards, and streams in the most degraded category increased 12 percent over a five year period between 1987 and 1992 (Gloss and Gerhardt 1992).

In the Wenatchee National Forest, Washington, bull trout spawning and rearing is correlated with streams not subject to past timber harvest (Brown 1992). Timber harvest activities were responsible in the decline and isolation of bull trout in Pataha Creek, Washington (WDFW 1997), a tributary in the Tucannon River drainage. In the North Fork Boise River basin, Idaho, the majority of bull trout spawning and rearing habitat for the Arrowrock Reservoir subpopulation exists in the roadless headwaters of the Crooked, Bear, and North Fork Boise rivers (Boise National Forest, *in litt.* 1995).

The long-lasting effects of past timber management activities on aquatic habitats is illustrated by conditions in the 3,289 km² (1,270 mi²) South Fork Salmon River watershed, Idaho. The watershed was first logged in the 1940's and logging activity peaked in 1961 (Chapman et al. 1991). Sedimentation in the South Fork Salmon River increased approximately 350 percent above pre-logging levels (Chapman et al. 1991). Resident and anadromous salmonids, including bull trout, declined after timber extraction and associated road building. Despite a 25-year logging moratorium in the watershed, fish habitat has not returned to pre-logging quality, and salmon production has not recovered (Chapman et al. 1991).

A relationship between forest management, watershed conditions, aquatic habitat degradation, and loss of occupied bull trout range has been documented in the Spokane River basin, Idaho. Streambed aggradation and loss of pool habitat are attributed to forest management and associated roads in the basin (G. Kappesser, Panhandle National Forest, *In litt.* 1993). The loss of pool habitat correlates to reductions in bull trout range and abundance in managed watersheds (Cross and Everest 1995). Sixty-one percent of the basin's managed watersheds do not meet forest plan standards (B. Kasum, Panhandle National Forest, *in litt.* 1992). The Nez Perce National Forest, Idaho, provides an example of the rate of watershed degradation. Significantly degraded watersheds with forest management increased by 12 percent in only 5 years; 40 percent of all non-wilderness land were in degraded condition (Gloss and Gearhardt 1992).

The USFS classified watersheds in the Bitterroot National Forest, Montana, into three categories, "healthy," "sensitive," and "high risk" based on sediment yield from road construction and increased water yield and peak flow from timber harvest (Decker 1991 *in* MBTSG 1995b). About one third of all watersheds were assigned to each of the three categories. Bull trout with estimable numbers were found only in watersheds rated as "healthy" or "sensitive drainages" (Clancy 1993). The effects of past forest practices, including road construction, continue to affect Bitterroot tributaries (MBTSG 1995b). Generally, bull trout numbers were higher where stream substrates were larger, but numbers tended to be lower in areas high in fine sediments (Clancy 1993). In contrast, habitat where brook trout were found were characteristic of areas degraded by land use activities (Rich 1996). Eighty-five percent of the drainages classified as "high risk" supported brook trout (Clancy 1993) (see Factor E).

Extensive logging activity has impaired water quality in many tributaries of the Blackfoot River, Montana, including the North Fork Blackfoot River (Montana Department of Health and Environmental Sciences (MDHES) 1994). Wide-spread canopy removal, alterations to riparian vegetation, and water irrigation returns have increased the historic temperature regime of the Blackfoot River (MBTSG 1995c; Pierce et al. 1997). Water temperatures in the mainstem Blackfoot frequently exceeded the bull trout preferred range of 15°C (60°F) in 1994, 1995 and 1996, making coldwater refuges during this time critical for bull trout (Pierce et al. 1997). The effect of forest practices was considered a limitation to bull trout restoration in the Blackfoot River drainage (MBTSG 1995c).

Timber management is the dominant land use in the Kootenai River watershed, Montana. Extensive road construction to support forestry activities exists throughout the watershed. Many reaches of streams in the Kootenai drainage have impaired water quality as a result of silviculture activities (MDHES 1994). As a result of salvage logging in 1996, the number of timber sales and clearcuts have substantially increased over the past three years (Kootenai National Forest 1997).

Past forest practices, including road construction, log skidding, riparian tree harvest, clearcutting, and splash dams, are considered a cause in the historic decline of bull trout and have limited restoration opportunities in the Flathead Lake basin (MBTSG 1995d). This basin supports over 30 subpopulations in wilderness, national park, national forest, and private lands of Montana. Because bull trout are sensitive to habitat and water quality degradation, Fraley and Shepard (1989) considered timber harvest and road construction in both the North and Middle Fork Flathead River drainages to be threats to bull trout spawning and rearing habitat. Although forest practices have improved, effects of past activities still affect bull trout because the existing road systems continue to erode, cause sedimentation, and increase water yield to streams. Silvicultural activities have contributed to 323.2 km (202 mi) in 17 streams being classified as water quality impaired in the Flathead basin (MDHES 1994). Existing roads in two National Forests of Idaho (Boise and Payette)

created slides and slumps during 1997, a high water year. In some areas of Montana and Idaho, culverts, that are passage barriers for bull trout, are being replaced at road crossings (P. Batt, Governor of Idaho, *in litt.* 1997, P. Graham, Montana Fish and Wildlife and Parks (MFWP), and B. Clinch, Montana Department of Natural Resources and Conservation (MDNRC), *in litt.* 1997).

Future proposed timber harvests also threaten bull trout. For instance, in Oregon, the Malheur National Forest proposes to salvage trees and build roads in a roadless area containing bull trout, site of the 1996 Summit Fire in the John Day River watershed, and a designated riparian habitat conservation area in the Environmental Assessment for the Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH) (USDA 1995). The project has not been completed, but it would likely degrade bull trout habitat if implemented as presently planned.

In summary, forestry activities that adversely affect bull trout and its habitat are primarily timber extraction and road construction, especially when impacting riparian areas. These activities, when conducted without adequate protective measures, alter bull trout habitat by increasing sedimentation, reducing habitat complexity, increasing water temperature, and promoting channel instability. Although certain forestry practices have been prohibited or altered in recent years to improve protection of aquatic habitats, the consequences of past activities continue to affect bull trout and their habitat. Within the Columbia River population segment, approximately 74 percent of bull trout subpopulations are threatened by forestry management practices.

Livestock Grazing

Livestock grazing degrades aquatic habitat by removing riparian vegetation, destabilizing streambanks, widening stream channels, promoting incised channels and lowering water tables, reducing pool frequency, increasing soil erosion, and altering water quality (Platts 1981; Kauffman and Krueger 1984; Henjum et al. 1994; Overton et al. 1993). These effects increase summer water temperatures, promote formation of anchor ice in winter, and increase sediment into spawning and rearing habitats. Cover for bull trout is reduced. Occupied bull trout habitat is also negatively affected by livestock grazing (Howell and Buchanan 1992; Mullan et al. 1992; Platts et al. 1993; R. Uberuaga, Payette National Forest, *in litt.* 1993; Henjum et al. 1994; MBTSG 1995a,b,c; USDA and USDI 1996,1997).

Livestock grazing impacts on bull trout habitat maybe minimized if grazing is managed appropriately for conditions at a specific site. Practices generally compatible with the preservation and restoration of bull trout habitat may include fences to exclude livestock from riparian areas, rotation schemes to avoid overuse of areas, and stock tanks so that livestock would concentrate outside of riparian areas for water.

Klamath River Population Segment

Intensive livestock grazing historically occurred throughout most of the Klamath River basin, and continues to be widespread (Light et al. 1996). Livestock grazing is a major land use within the Sprague River drainage, mostly in the lowland meadows and to a lesser extent in some forested areas. Grazing has been eliminated along bull trout streams on U.S. Timberlands property (B. Johnson, U.S. Timberlands, in litt. 1997) and adjacent National Forest lands. However, documented cattle trespass on Long and Deming creeks indicates that livestock continue to locally affect bull trout habitats (Light et al. 1996; Buchanan et al. 1997). The meadows in upper Long Creek exhibit bank instability and diminished availability of undercut banks caused by livestock (Buchanan et al. 1997). Channelization and intense grazing by cattle degraded lower Sun Creek and an adjoining stream in the Klamath River basin and may have contributed to the extirpation of migratory bull trout in Sun Creek (Dambacher et al. 1992).

Columbia River Population Segment

Livestock grazing has caused habitat degradation in stream reaches supporting bull trout. On Squaw Creek, a tributary of the Payette River, Idaho, livestock grazing has damaged streambank and riparian vegetation. While fencing and grazing changes are underway to reduce impacts in this area, future damage from grazing will not be eliminated (M. Huffman, Boise National Forest (BNF), in litt. 1997). Livestock grazing continues to affect bull trout habitat for spawning, rearing, and migration in Bear Valley Creek and its tributaries in the BNF, Idaho (T. Burton, BNF, pers. comm. 1997). Livestock grazing was a factor in the decline of bull trout habitat in Pataha Creek, Washington (WDFW 1997). In Montana, severe overgrazing occurs in the Bitterroot River valley bottom streams and along the mainstem Clark Fork River in the Deerlodge valley, Flint Creek valley, and parts of Rock Creek, and limits bull trout restoration in these drainages (MBTSG 1995a,b; Maxell 1996). Overall, livestock grazing in portions of the Wieser, Grande Ronde, Imnaha, and Malheur rivers has degraded streamside habitat (Adams 1994; Buchanan et al. 1997). Of the 141 subpopulations the Service identified in the Columbia River population segment, approximately 50 percent were threatened by ongoing livestock grazing.

Agricultural Practices

Agricultural practices, such as cultivation, irrigation, and chemical application can affect bull trout. Agriculture has been identified a source of nonpoint source pollution in some areas within the range of bull trout (Idaho Department of Health and Welfare (IDHW) 1991; Washington Department of Ecology (WDE) 1992; MDHES 1994). These practices can release sediment, nutrients, pesticides and herbicides into streams, increase temperature, reduce riparian vegetation, and alter the hydrologic regime, typically with low flows in the spring and summer. Irrigation diversions also affect bull trout by altering stream flow and through entrainment. Bull trout may enter unscreened irrigation diversions and become stranded in ditches and agricultural fields. Diversion dams, without proper passage facilities, prevent bull trout from migrating and may isolate subpopulations (Dorratcaque 1986; Light et al. 1996).

Klamath River Population Segment

Historical agricultural use in the Klamath River basin has had a profound effect on bull trout habitat in the larger tributaries and mainstem rivers (Buchanan et al. 1997). Channelization, water diversions, removal of streamside vegetarian, and disturbances have altered the aquatic environment by elevating water temperature, reducing water quantity and quality, and increasing sedimentation (Light et al. 1996). Deming, Long, Threemile, and Sun creeks have diversions immediately downstream of occupied bull trout habitat (Dunsmoor and Bienz, in litt. 1997). Unscreened diversions result in the transport of fish into irrigation canals (e.g., Deming and Sun creeks), often resulting in mortality (Light et al. 1996).

Columbia River Population Segment

In 1988, the Idaho Department of Environmental Quality (IDEQ) conducted an assessment of nonpoint source pollution of the Salmon River basin. Of 4,080 km (2,550 mi) of streams assessed, an estimated 2,059 km (1,287

mi) were affected by nonpoint sources, of which 1,374 km (859 mi) were affected by agricultural practices (IDHW 1991). Dewatering of stream reaches due to irrigation has restricted bull trout migration and isolated bull trout into subpopulations. Examples include the Powder, Malheur, Grande Ronde, Umatilla, and John Day rivers in Oregon (Buchanan et al. 1997); the Tucannon, Snake, Yakima, Methow, and Walla Walla rivers in Washington (WDW 1992; WDFW 1997); the upper Salmon and Lemhi rivers in Idaho (Dorratcaque 1986; Chapman et al. 1991); and the Clark Fork, Blackfoot, and Bitterroot rivers in Montana (Clancy 1993; MBTSG 1995a,b,c; 1996b,c; Swanberg 1996).

The mainstem Umatilla River is frequently dry during the irrigation season, effectively isolating bull trout (M. Northrop, Umatilla National Forest, pers. comm. 1997). Moreover, two diversion facilities in the Umatilla River inhibit migration during portions of the year (Buchanan et al. 1997). Walla Walla River basin bull trout subpopulations are segregated in the Touchet River, Mill Creek, and South Fork and North Fork of the Walla Walla River by four irrigation diversion dams (Buchanan et al 1997; WDFW 1997). Streams are also channelized in agricultural areas, reducing stream length and area of aquatic habitat, altering stream channel morphology, and diminishing aquatic habitat complexity.

In Idaho, Dorratcaque (1986) documented chronic flow and passage problems on the Lemhi River, where the stream has been dewatered during the irrigation season. An irrigation diversion dewaters the upper Salmon River in Idaho from mid-July to the end of the irrigation season, preventing chinook salmon access to spawning areas. Juvenile chinook salmon, which are used as prey by bull trout, are, thereby, no longer available (Chapman et al. 1991). Streamflows in the Umatilla River basin in Oregon have been fully appropriated during the irrigation season since 1920 (Oregon Water Resources Division (OWRD), in litt. 1988). Over-appropriations have resulted in dewatered stream reaches that limit bull trout distribution within the basin. Similarly, the Oregon State Game Commission (OSGC) first recognized the negative effects of irrigation diversions on fisheries resources in the Deschutes River as early as 1950 (OSGC, in litt. 1950). In Washington, over 80 percent of the annual stream flow in the Yakima River basin is seasonally diverted for irrigation (WDW 1992). Bull trout in the basin are isolated into eight subpopulations in upper watershed tributaries by reduced summer flows and dams (WDW 1992). The lower reaches of the Walla Walla River in Washington are often dewatered during the irrigation season, isolating three bull trout subpopulations in perennial headwater reaches (Martin et al. 1992).

In 1991, MFWP listed Montana streams that support or contribute to important fisheries and are substantially dewatered from diversions and appropriated streamflows (MFWP, in litt. 1991). Within the range of bull trout, 101 stream reaches totaling 958.4 km (599 mi) were listed as chronically dewatered due to irrigation withdrawals and an additional 220.8 km (138 mi) were listed as periodically dewatered. Although bull trout do not occur in all streams cited, all are within the range of bull trout and dewatering likely affects fish migration and connectivity among subpopulations.

The extirpation of bull trout in the mainstem Bitterroot River, Montana, and the loss of migratory fish are attributed to chronic dewatering of the mainstem Bitterroot and the lower reaches of most of its tributaries (Clancy 1993, 1996; MBTSG 1995b). Some diversions on the mainstem Bitterroot are fish passage barriers or entrain downstream migrants into irrigation ditches (MBTSG 1995b). Nearly 104 km (65 mi) of 18 tributary streams are chronically dewatered in the Bitterroot River basin (MBTSG 1995b). Dewatering of tributary streams is a limitation to restoration of bull trout in the Bitterroot River basin (MBTSG 1995b) and the cause of habitat fragmentation isolating 27 subpopulations.

In the Clark Fork River basin, Montana, irrigation diversions, canals, and dams in the Jocko and lower Flathead rivers eliminated bull trout access to spawning and rearing areas; however, some of these structures are in the process of being modified (MBTSG 1996c; Hansen and DosSantos 1997; MBTRT 1997). The lower reaches of the Jocko River are severely affected by grazing and irrigated agriculture (Hansen and DosSantos 1997). Because migratory bull trout can no longer ascend Grant Creek from the mainstem Clark Fork River due to irrigation diversions, only resident bull trout exist upstream (MBTSG 1996c; R. Berg, MFWP, pers. comm. 1997). Dewatering, irrigation return flows, and denuded riparian areas have increased water temperatures in the Blackfoot River and Clark Fork River basins, Montana (MBTSG 1995a,c). Water temperatures in the mainstem upper Clark Fork River frequently exceed 20°C (68° F) and temperatures in tributaries, including the Little Blackfoot and Flint Creek, may exceed bull trout tolerance limits (MBTSG 1995a). In the Blackfoot River basin, irrigation returns have contributed to the warming of this historic coldwater river (MBTSG 1995c; Pierce et al. 1997). Irrigation diversions, particularly in the Little Blackfoot River and in Flint Creek of the upper Clark Fork River, are physical and thermal passage barriers to bull trout (MBTSG 1995a). Diversion for irrigation is the primary cause of 622 km (389 mi) of streams in the upper Clark Fork basin being chronically dewatered (MDHES 1994). Irrigation diversions also continue to limit restoration of migratory bull trout in the Blackfoot River basin (MBTSG 1995c). Recently, several diversions have been renovated to provide passage and eliminate ditch entrainment (MBTRT 1997).

Unscreened irrigation diversions in eastern Washington are known to trap or divert bull trout in Ahtanan Creek (Yakima River basin), Ingalls and Peshastin creeks (Wenatchee River basin), Roaring Creek (Entiat River basin), and Buttermilk, Little Bridge, Eagle, and Wolf Creeks (Methow River basin) (J. Easterbrooks, WDFW, pers. comm. 1997). Channelization has altered 56 km (35 mi) of the Methow River (Mullan et al. 1992). Approximately 72 km (45 mi) of the lower Coeur d'Alene, St. Joe, and St. Maries rivers of the Spokane River basin have been channelized. These streams were once considered important rearing areas and migratory corridors for migratory (fluvial) bull trout.

Approximately 47 percent of the bull trout subpopulations in the Columbia River population segment are affected by the past and ongoing effects from agricultural practices, including diversions.

Road Construction and Maintenance

Non-forest roads degrade salmonid habitat by creating flow constraints in ephemeral, intermittent, and perennial channels; increasing erosion and sedimentation; creating passage barriers; channelization; and reducing riparian vegetation (Furniss et al. 1991; Ketcheson and Megahan 1996).

Klamath River Population Segment

Streamside roads may have multiple locations of elevated sediment delivery. Some level of sedimentation is normal, and can be documented along parts of Boulder, Deming, Threemile, Brownsworth, and Leonard creeks. In contrast, Long and Sun creeks have relatively little sediment delivery from roads in reaches occupied by bull trout (Light et al. 1996). Streamside roads inadequately constructed with

misplaced water bars and culverts still discharge sediment laden waters directly into streams. Over-road flow can lead to gullying and direct sediment delivery, as found in parts of Deming Creek (Light et al. 1996). Streamside roads can also reduce large woody debris recruitment and vegetation shade by occupying the growing space next to streams. In addition, road construction may require stream straightening or channel reconfiguration next to roads, resulting in channelization as along Boulder and Deming creeks (Light et al. 1996; Dunsmoor and Bienz, *in litt.* 1997). Habitat degradation from channelization includes decreased pool habitat, decreased sediment transport, increased embeddedness, and reduced interstitial space in substrates (Dunsmoor and Bienz, *in litt.* 1997).

Columbia River Population Segment

Construction and improvement of Interstate 90 is a contributing factor to the decline and suppression of bull trout in Gold Creek, a tributary of the Yakima River, Washington (Craig and Wissmar 1993). In Montana, Interstate 90 and a railroad system parallel to the Clark Fork and St. Regis rivers has contributed to channelization and increased the risk of hazardous spills (MBTSG 1996b,c). Approximately 18 percent of the bull trout subpopulations in the Columbia River basin are affected by road construction and ongoing maintenance.

Mining

Mining can degrade aquatic habitat by altering water acidity or alkalinity, changing stream morphology and flow, and causing sediment, fuel, and heavy metals to enter streams (Martin and Platts 1981; Spence et al. 1996). The types of mining that occur within the range of bull trout include extraction of hard rock minerals, coal, gas, oil, and nonminerals. Past and present mining activities have adversely affected bull trout and bull trout habitats in Idaho, Oregon, Montana, and Washington (Martin and Platts 1981; Johnson and Schmidt 1988; Moore et al. 1991; WDW 1992; Platts et al. 1993; MBTSG 1995a,c, 1996b,c).

Klamath River Population Segment

Mining effects are not known to be a factor affecting bull trout subpopulations in the Klamath River basin.

Columbia River Population Segment

Mining severely impacts large portions of the Spokane River basin. Effects include roading, stream diversion and alteration, watershed degradation from airborne emissions, and the discharge of massive quantities of waste materials, including the release into the South Fork Coeur d'Alene River of 72 million tons of hazardous mine wastes laden with heavy metals such as lead, zinc, and cadmium (Coeur d'Alene tribe of Idaho et al. 1991). During the early 1930s, the South Fork Coeur d'Alene River and about 20 miles of the lower Coeur d'Alene River were considered devoid of aquatic life due to mining waste discharge (Ellis 1940). Although some aquatic species have returned to the river, bull trout are not among them. In Montana, bull trout have not recolonized the upper mainstem Clark Fork River where mining-related stream degradation extirpated all fish prior to the turn of the century (MBTSG 1995a; Titan Environmental Corp. 1997). The lingering effects of mining done over the past century in the Butte and Anaconda reaches of the upper Clark Fork River has resulted in four Superfund sites being designated. Mining continues to impair water quality in 558 km (349 mi) of stream in these reaches (MDHES 1994). Eleven fish kills documented between 1959 and 1991 were attributed to mining contamination of the river (Titan Environmental Corporation 1997).

Numerous abandoned mines, such as the Blackbird and Cinnabar mines in the Salmon River drainage, Idaho, degrade water quality where toxic heavy metals continue to leach from mine sites into streams or groundwater. Old mine tailings in the floodplains of Newsome Creek, American River, and Crooked River, tributaries to the Clearwater River in Idaho, continue to prevent recovery of riparian areas (N. Gearhardt, Nez Perce National Forest, pers. comm. 1997). In Idaho, mine tailings abandoned decades ago contaminated a tributary of the Middle Fork Boise River with heavy metals, including arsenic, during flood flows in 1997 when migrating bull trout were present (R. Barker, Idaho Statesman, *in litt.* 1997; S. West, IDEQ, *in litt.* 1997). In Montana, historic mining in many tributaries of the Middle Clark Fork River has impaired water quality in 245 km (153 mi) of stream (MDHES 1994). The MBTSG (1995c) ranked mining in the Blackfoot River drainage as a limitation to bull trout restoration. Many mines exist in the western and southern portions of the Blackfoot River basin causing direct loss of bull trout habitat and contamination of waters from mine effluents (MBTSG 1995c). Fishes in the upper Blackfoot River are still affected by the washout of the Mike Horse tailings dam in 1975, which spilled contaminated tailings into the Blackfoot River (MBTSG 1995c). Research in the Blackfoot drainage demonstrated that heavy metal contaminants released in the headwaters affect chemical trends, metal concentrations, metal bioavailability, and fish for 25 km (15.6 mi) from the contaminant source (Moore et al. 1991).

New open-pit mines using cyanide leach pads are planned for watersheds currently occupied by bull trout in the Middle Fork Boise River basin, Idaho, and in the Stibnite area of the East Fork South Fork Salmon River, Idaho (G. Visconty, Boise National Forest, *in litt.* 1996; Payette National Forest (PNF), *in litt.* 1996). In Montana, a large underground copper-silver mine proposed for Rock Creek in the lower Clark Fork River basin is currently in the permitting process. Tailings would be stored at the confluence of Rock Creek and the Clark Fork River (MBTSG 1996b; R. Stewart, USDI, *in litt.* 1995). Rock Creek is one of only two bull trout "core" areas in this subpopulation (MBTSG 1996b). A proposal for a large open-pit gold mine using cyanide heap leach processing is proposed for the upper Blackfoot River basin, Montana. Much of the ore body occurs below the water table, requiring pumping of groundwater. Thus, the hydrology of the upper Blackfoot River system could be affected and an increase in contamination risks could result (S. Cody, Environmental Protection Agency (EPA), *in litt.* 1997; K. McMaster, Service, *in litt.* 1997).

The North Fork Flathead River headwaters in Canada contain a large coal deposit that could be developed (MBTSG 1995d). Mining this deposit could destroy spawning habitat and degrade water quality in the Montana portion of the Flathead River system (MBTSG 1995d).

Approximately 20 percent of the bull trout subpopulations in the Columbia River population segment are threatened by past, ongoing, or potential future mining activities.

Residential Development

Residential development is rapidly increasing within portions of the range of bull trout. Development increases threaten to alter stream and riparian habitats through streambank modification and destabilization, increased nutrient loads, and increased water temperatures (MBTSG 1995b). Indirectly, urbanization within floodplains alters groundwater recharge by routing water into streams through drains rather than through more gradual subsurface flow (Booth 1991).

Klamath River Population Segment

Residential development is not known to be factor affecting existing bull trout subpopulations in the Klamath River basin.

Columbia River Population Segment

In Montana, rural residential development is rapidly increasing, particularly in drainages of the Bitterroot, Blackfoot, and Flathead rivers (MBTSG 1995b,c,d). The lower Bitterroot River is a major non-point source of nutrient pollution, primarily from sewage effluent and land development (U.S. Environmental Protection Agency (EPA) 1993 in MBTSG 1995b). Efforts to mitigate effects of rural development in the Blackfoot River basin have been encouraged by an active local group, the Blackfoot Challenge, which has been working to acquire conservation easements, among other projects. Residential development in the Flathead Lake system is considered a limitation for restoration of bull trout because of the threat to water quality from domestic sewage and changes to stream morphology (MBTSG 1995d).

Approximately 26 percent of the bull trout subpopulations in the Columbia River population segment are threatened by the effects of residential development.

B. *Overutilization for commercial, recreational, scientific, or educational purposes.* Declines in bull trout have prompted states to institute restrictive fishing regulations on all waters throughout bull trout range. Recent observations of increased numbers of adult bull trout in some areas have been attributed to more restrictive regulations. However, illegal harvest and incidental harvest still continue to threaten bull trout.

Klamath River Population Segment

Legal harvest of bull trout in the Klamath River basin was eliminated in 1992 when ODFW imposed a fishing closure. Because recreational fishing for other trout species continues in the basin, incidental fishing mortality of bull trout likely occurs (OCAFS 1993). During recent ODFW angler surveys in the Klamath River basin, all anglers contacted were aware of the no harvest regulation for bull trout (D. Bertram, ODFW, *in litt.* 1995; Light et al. 1996). Incidental bull trout mortality due to angling is unknown, but is not suspected to be suppressing bull trout subpopulations in the Klamath River basin (Light et al. 1996). However, Dunsmoor and Bienz (*in litt.* 1997) consider angling to be a factor negatively affecting bull trout, especially subpopulations with low numbers and proximity to highway access, such as Threemile Creek.

Columbia River Population Segment

Overharvest of bull trout in the Columbia River basin, historically, likely contributed to their decline. In the past, harvest included legal recreational angling, poaching, and State-sponsored eradication programs (Thomas 1992). Bull trout were often targeted for removal by anglers and government agencies because bull trout preyed on salmon and other desirable species (Simpson and Wallace 1982; Bond 1992). As recently as 1990, State and Federal agencies instituted programs to eradicate bull trout through bounties and poisoning of waterways (Ratliff and Howell 1992; ODFW 1993; Newton and Pribyl 1994; Palmisano and Kaczynski, *in litt.* 1997). For instance, during the 1940's and 1950's in Oregon, several hundred bull trout migrating from Wallowa Lake to spawn in Wallowa River were trapped in a weir and exterminated (B. Smith, WDFW, *in litt.* 1997). Bull trout were recently re-introduced to Wallowa Lake in summer 1997 in an effort to re-establish the fish.

In recognition of the decline of bull trout, State management agencies in Idaho, Montana, Washington, and Oregon suspended harvest in the Columbia River basin except in Lake Billy Chinook (Oregon) and Swan Lake (Montana). State regulations still allow catch and release fishing for bull trout, and the harvest of other salmonid species is allowed in most bull trout waters. However, in Montana, (MFWP 1996), the revised regulations are believed to be partially responsible for increasing bull trout numbers in the Swan River basin where the taking or intentional fishing for bull trout is prohibited (MBTSG 1996a). Mortality from incidental catch and release angling of bull trout and harvest as a result of misidentification still continues under existing fishing regulations. For example, about half or fewer of anglers surveyed were able to correctly identify bull trout from other salmonids in west-central Montana (Kelly et al. 1996; M. Long and S.P. Whalen, MFWP, *in litt.* 1997). In 1997, the day after two radio tagged bull trout were released into Wallowa Lake, Oregon, one of the fish was unintentionally, but illegally harvested by a young angler. The MBTSG (1995d) is concerned with the catch and release mortality of bull trout as a result of intense fishing pressure on lake trout in Flathead Lake and the Flathead River. Legal and illegal harvest can seriously affect declining subpopulations already subjected to other factors such as competition, degraded habitat, and isolation (WDW 1992; Donald and Alger 1993; Pratt and Huston 1993; Swanberg and Burns 1997).

Poaching of bull trout likely continues, and can be especially detrimental to small, isolated subpopulations of migratory fish (WDFW 1992; Craig and Wissmar 1993; Pratt and Huston 1993; Long 1997). A study in the Metolius River suggested that 2 of 22 radio-tagged adult bull trout were illegally harvested (Ratliff et al. 1996). Illegal harvest of bull trout in northwest Montana has been a recurring problem for over 50 years, especially in drainages of the Blackfoot, Kootenai, South Fork Flathead, and Clark Fork rivers (MBTSG 1995e; Swanberg 1996; Long 1997). In response, the MFWP instituted a program in 1994 funded by the Bonneville Power Administration to reduce the illegal harvest of bull trout, disperse information to improve anglers' fish identification skills, and increase understanding of the importance of native species (Long 1994). Additionally, the Montana legislature increased the penalties for bull trout poaching, and the Bonneville Power Administration, until recently, funded increased enforcement (M. Racicot, Governor of Montana, *in litt.* 1995).

Approximately 21 percent of the bull trout subpopulations in the Columbia River population segment are threatened by the effects of poaching.

C. *Disease or predation:* Although diseases affecting salmonids are likely present in both the Klamath River and Columbia River basins, they are not thought to be a major factor affecting bull trout. However, interspecific interactions, including predation, are thought to negatively affect bull trout where non-native salmonids have been introduced (Palmisano and Kaczynski, in litt. 1997).

Klamath River Population Segment

Diseases have not been documented affecting bull trout in the Klamath River basin. However, brook trout and brown trout have been introduced in the basin, and either one or both species co-exist with bull trout in all subpopulations except Deming Creek (Buchanan et al. 1997). Brown trout predation on bull trout is evidenced by a direct observation in Boulder Creek (Light et al. 1996). Overall, bull trout co-occur with brown trout and brook trout in about half of the occupied habitat. Buchanan et al. (1997) indicated that bull trout occupy approximately 34.1 km (20.5 mi) of streams. However, allopatric (occurring in different

geographic areas or in isolation) bull trout have been estimated to occupy only 13.4 to 15.7 km (8.3 to 9.8 mi) within the basin (Buchanan et al. 1997; Schroeder and Weeks, *in litt.* 1997).

Columbia River Population Segment

Health samples from 207 juvenile bull trout collected from 8 streams in the Flathead River basin in 1992 and 1993 were negative in tests for furunculus, enteric redmouth, bacterial kidney disease, and viral hemorrhagic septicemia (VHS) or infectious pancreatic necrosis (IPN) (Fredenberg 1993). Bull trout are susceptible to whirling disease, caused by a protozoan parasite (*Myxobolus cerebralis*), and recently detected in bull trout waters in Montana (Montana Whirling Disease Task Force 1996). However, bull trout are less susceptible to whirling disease than rainbow trout (McDowell et al. 1997). Whirling disease is currently untreatable in the wild, and the parasite appears to be rapidly spreading into previously uninfected waters. The consequences of whirling disease on bull trout may not be apparent for years.

Bull trout are most vulnerable to predation as juveniles. Several non-native fishes, such as lake trout, brown trout, brook trout and northern pike (Esox lucius) are considered potential predators (and competitors, see Factor E below) of many bull trout subpopulations in the Columbia River basin (Donald and Alger 1992; Pratt and Huston 1993; Rieman and McIntyre 1993; MBTSG 1995d, 1996a; MFWP 1997).

Dramatic declines in the Priest Lake, Idaho, bull trout harvest began about 20 years ago. Between 1956 and 1970, an annual average of 1,200 fish were harvested. In 1978, a record 2,320 were harvested, declining in 1983 to 159 (Mauser et al. 1988). There has been no legal harvest of bull trout since 1984. Bull trout were extirpated from Priest Lake through interactions with introduced lake trout (Pratt and Huston 1993). Mauser et al. (1988) described bull trout in Priest Lake as "functionally extinct as long as lake trout abundance is high." Similarly, lake trout introduced into Flathead Lake feed on juvenile bull trout entering the lake from the Flathead River, and are thought to be a factor in recent declines of the bull trout subpopulation (MBTSG 1995d). Introduced non-native fishes limit bull trout restoration in all the major drainages in Montana (MBTSG 1995a-e, 1996a-f).

For bull trout in the Columbia River population segment, disease is not considered a listing factor; however, approximately 62 percent of the subpopulations are threatened by introduced non-native fishes, including the effects of predation.

D. *The inadequacy of existing regulatory mechanisms.* Although efforts are underway to conserve bull trout (e.g., Batt, *in litt.* 1997; Joslin, *in litt.* 1997; Thomas, *in litt.* 1997), the implementation and enforcement of existing Federal and State laws designed to conserve fishery resources, maintain water quality, and protect aquatic habitat have not prevented past and ongoing habitat degradation. This inadequacy has led to bull trout declines and isolation and is a factor in the determination to list bull trout population segments. Regulatory mechanisms, including the National Forest Management Act, the Federal Land Policy and Management Act, the Public Rangelands Improvement Act, the Clean Water Act, the National Environmental Policy Act, the Federal Power Act, State Endangered Species Acts and numerous State laws and regulations govern an array of land and water management activities that affect bull trout and their habitat.

National Forest Management Act

The National Forest Management Act (NFMA) and the Federal Land Policy and Management Act (FLPMA) require the USFS and BLM to develop and implement land and resource management plans (LRMPs) and Resource Management Plans (RMPs), respectively) to protect fish and wildlife resources and produce forest and range products. However, reviews by the U.S. Department of Agriculture (USDA) of LRMP monitoring and evaluation reports for 28 national forests indicate that many watersheds do not meet NFMA Forest Plan standards. Compliance with LRMPs and effectiveness of best management practices on current projects is improving, but, a majority of streams that had been affected by past practices were not healing as fast as anticipated (USDA 1995).

Reviews of existing LRMPs implemented outside the range of the northern spotted owl, even as amended by the Environmental Assessment for the Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH) (USDA 1995), have inadequately protected salmonid habitat on BLM and national forest lands (Henjum et al. 1994; R. Schmitten, NMFS, *in litt.* 1995; Espinosa et al. 1997). While the severe resource damage from forest management that occurred in the 1950s through the 1970s has ceased, the current LRMPs have not fully taken into account the habitat needs of salmonids and recovery of degraded habitats has not occurred as predicted. For example, most LRMPs were developed prior to listing the Snake River salmon stocks, and, consequently, the biological requirements of these fish are not fully considered under the parameters of the LRMPs. The NMFS noted that even though PACFISH provided some improvements in many standards and guidelines of the LRMPs, comprehensive, landscape-scale conservation strategies for salmonid survival and recovery are still lacking (Schmitten, NMFS, in litt, 1995). Espinosa et al. (1997) listed several reasons why the Clearwater National Forest Plan adopted in 1987 has failed to adequately protect salmonid habitats in forest watersheds. Reasons included for this failure were— projected timber harvests and levels of associated road construction too high to achieve fish habitat quality standards; inaccurate riparian habitat inventories; watershed recovery following disturbance was slower than expected; and inaccurate inventories of the timber resources.

Under the NFMA and the FLPMA, livestock grazing occurs on over 70 percent of federally-administered western rangeland, or about 108.5 million ha (268 million acres (ac)) of land in 16 western states (General Accounting Office (GAO) 1988). Ongoing livestock grazing on lands administered by the BLM and USFS continues to occur in watersheds occupied by bull trout (Henjum et al. 1994; McIntosh et al. 1994; USDA and USDI 1997). Technical solutions to improving riparian areas damaged by livestock grazing were available as early as 1988 (GAO 1988). However, the GAO (1988) noted that correcting damage from grazing was not readily solvable due to funding and political pressure to maintain the status quo grazing systems. Within the Interior Columbia River Basin, the BLM and USFS have had difficulty correcting practices that cause grazing damage to streams due to lack of funding, conflicting requirements of different laws, or budget allocations (USDA and USDI 1997). However, in some areas supporting federally listed fish or designated critical habitat, the BLM and the USFS have been able to improve livestock management in riparian areas, including habitat for shortnose sucker (*Chasmistes brevirostris*) and Lost River sucker (*Deltistes luxatus*) in the Klamath River basin, and the Lohontan cutthroat trout

(*Oncorhynchus clarki henshawi*) of the Great Basin.

Interior Columbia Basin Ecosystem Management Project

The USFS, BLM, EPA, NMFS, and Service are cooperating in development of the Interior Columbia Basin Ecosystem Management Project (ICBEMP), a large-scale land management plan for lands administered by these agencies in eastern Oregon and Washington, Idaho and western Montana. The alternatives described in the Draft Environmental Impact Statement (DEIS) do not specifically address bull trout conservation in "depressed" areas outside the range of steelhead and chinook salmon; the preferred alternative depends on subbasin review and ecosystem analysis at the watershed scale as the basis for decision-making within the Interior Columbia Basin (USDA and USDI 1997). The ICBEMP is in draft, and possible outcomes from implementing future bull trout conservation actions as part of an unapproved management alternative are not predictable. Funding and staffing to implement those components are also not secured.

Streamlined Consultation Procedures

On March 8, 1995, the USFS, Service, BLM, and NMFS, issued a memorandum directing the agencies to participate in "streamlined" consultation procedures. These procedures were initiated to address forest health and salvage projects (T. Dwyer, Service, *in litt.* 1995). By May 31, 1995, these procedures were extended indefinitely to include all consultation efforts (Dwyer, *in litt.* 1995). These procedures apply to Federal land management activities in Idaho, Oregon, Washington, Montana and California (California lands managed by BLM are subject to streamlined procedures only when forest ecosystem activities are involved). The purpose of the streamlined procedures is to improve the efficiency of the section 7 consultation process (C. Dunn, Service, *in litt.* 1997). Conservation and protection of bull trout habitat has been inconsistent due in part to the USFS and BLM discretionary option to review non-listed, candidate species or species of concern (R. Vizgirdas, Service, *in litt.* 1997; R. Strach, Service, *in litt.* 1997; P. Zenone, Service, *in litt.* 1997). In Idaho and eastern Oregon, Federal land management agencies have often not considered the effects of projects on bull trout through the streamlining process.

Endangered Species Act

In the Klamath River basin, the Service listed the shortnose sucker and Lost River sucker under the Act as endangered on August 26, 1987 (52 FR 32145), and proposed critical habitat for the species on December 1, 1994 (50 CFR 61744). Bull trout likely used portions of the proposed critical habitat in the past, including tributaries in the upper Klamath River, Crooked Creek, Sevenmile Creek, and Wood River. Although some of the earliest records of bull trout in the basin are from Fort Creek, a tributary of the Wood River (Dunsmoor and Bienz, *in litt.* 1997), bull trout do not presently occur within the habitat occupied by the two suckers. Therefore, conservation and recovery actions undertaken for the listed suckers will not directly benefit bull trout.

In the Columbia River basin, three species of salmon in the Snake River are listed—sockeye salmon (endangered), spring/summer chinook salmon (threatened) and fall chinook salmon (threatened). Critical habitat for all three salmon was designated, including the Columbia River migration corridor, and historically accessible streams in the Snake River basin upstream of Hell's Canyon Dam in Idaho, Oregon and Washington (58 FR 68543–68554). Downstream of Hell's Canyon and Dworshak Dam, the designation extends to reaches historically accessible to salmon, below historically impassible barriers (58 FR 68543–68554). The designation extends protection to bull trout habitat in areas where they co-occur with the salmon. However, in many areas bull trout tend to spawn and rear upstream of listed salmon habitats. For instance, Fall Creek, a tributary of the Salmon River, Idaho, has an impassible waterfall near its mouth, and habitat for the listed salmon ends at the impassible falls (58 FR 68543–68554), but bull trout spawn and rear above the falls. In this example, bull trout spawning and rearing habitat does not overlap with the listed salmon; thus, bull trout would not receive indirect protection under the Act.

On August 18, 1997, five evolutionarily significant units (ESUs) of steelhead were listed as threatened—three in California, one in Washington (Columbia River from the Yakima River to Grand Coulee Dam), and one in the Snake River basin in Oregon, Washington, and Idaho (62 FR 43937). Although protection for bull trout under the Act would be afforded where they co-occur with steelhead, measures to protect steelhead may be insufficient for bull trout due to differences in the life history between the species and lack of complete habitat overlap.

Northwest Forest Plan

The Northwest Forest Plan (NWFP) addresses management of USFS and BLM lands within the range of the northern spotted owl, and implementation began in April 1994 (Tuchmann et al. 1996). The NWFP includes an aquatic conservation strategy, consisting of four inter-related elements. The first element is riparian reserves, which is the system of lands along streams allocated toward the conservation and restoration of aquatic and riparian dependent species. The second is key watersheds, which are watersheds with special values and appropriate management standards. The third element is watershed analysis, which is required to help land managers understand the processes that maintain habitats and to manage to preserve these processes. The fourth element is watershed restoration projects, which are funded to move watersheds toward recovery. For instance, in 1994 through 1996, 1675 watershed restoration projects (or groups of projects) were funded under the NWFP (Tuchmann et al. 1996). The conservation strategy generally addresses the maintenance of the four elements. Although the strategy does not specifically address bull trout needs, it contains objectives for riparian and stream conservation and maintenance that may facilitate conservation of bull trout habitat (W. Cole, Service, *in litt*, 1997). Additionally, the implementation of the NWFP is dependent on interagency collaboration to achieve resource conservation and a sampling of projects unaffected by the 1995 Salvage Rider (see below) indicates that bull trout are generally protected by the NWFP. However, the NWFP covers only a minor portion of bull trout habitat for the Columbia River population segment.

PACFISH and INFish

The USFS and BLM developed the Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho and Portions of California, known as PACFISH. PACFISH is intended to be an ecosystem-based, aquatic habitat and riparian-area management strategy for Pacific salmon, steelhead, and sea-run cutthroat trout habitat on lands administered by the two agencies and outside the area subject to implementation of the NWFP (USDA and USDI 1995). PACFISH amended Regional Guides, forest plans and land use plans by applying management

measures for all ongoing and proposed or new projects that pose an unacceptable risk to anadromous fish involving the management of timber, roads, grazing, and other land uses. The Service is participating with NMFS, the USFS, and the BLM in reviewing action-agency PACFISH screening efforts for anadromous fish. Within the area of PACFISH where the habitats of salmon and bull trout overlap, the screening effort is to protect both anadromous fish and bull trout from major effects. However, efforts to include bull trout in the PACFISH review are not always successful (Vizgirdas, *in litt.* 1997; Strach, *in litt.* 1997; Zenone, *in litt.* 1997).

The Inland Native Fish Strategy (INfish) was developed by the USFS to provide an interim strategy for inland native fish in eastern Oregon and Washington, Idaho, western Montana and portions of Nevada (USDA and USDI 1995). It has not been determined whether INfish is an effective strategy for removing the threats for bull trout. In Idaho, the USFS does not place a priority on application of INfish and generally has determined that anadromous watersheds have a higher priority than bull trout watersheds (Vizgirdas, *in litt.* 1997; Strach *in litt.* 1997; Zenone, *in litt.* 1997).

Clean Water Act

Under sections 303 and 304 of the Clean Water Act (CWA), States or EPA set water quality standards, which combine designated beneficial uses and criteria established to protect those uses. Water bodies that are identified as failing water quality standards are designated by States under section 303(d) as water quality limited (MDHES 1994; EPA 1994; ODEQ 1996), and subject to development of management plans to restore water quality and protect designated uses. These management plans, or total maximum daily loads (TMDLs), address both point and non-point sources of pollutants within a watershed. Best Management Practices (BMPs) are used with TMDLs to address non-point sources of pollution, such as mining, forestry, and agriculture; however, regulatory authority to enforce the BMPs varies among the states. It is estimated that 10 percent of total length of streams within the ICBEMP assessment area, including the Klamath River and Columbia River basins, are listed as water quality limited. This may underestimate the true extent and distribution of streams with impaired water quality potentially affecting bull trout (USDA and USDI 1997). In the Klamath River basin, stream reaches designated as water quality limited (i.e., cited on the 303(d) list of Oregon for various water quality standards (ODEQ 1996)) are estimated to apply to six of the seven bull trout subpopulations. In the Columbia River basin, water bodies designated as water quality limited by Oregon, Washington, Idaho, and Montana are estimated to apply to at least 64 of the 141 bull trout subpopulations.

Relative to water temperature, Oregon established a water quality criterion of 10° C (50° F) as a weekly average based on daily maximum temperatures in bull trout spawning and rearing waters (OAR 340–41–685 and OAR 340–41–026); however, water bodies where these criteria would apply have not been identified. In Washington, temperature criteria for waters vary among the different classifications that are assigned to each waterbody, and range from 16 to 22° C (60.8 to 71.6° F) (Chapter 173–201 WAC). Washington is reviewing these standards with the intent of creating more appropriate water quality standards; however, whether the criteria specifically are for bull trout is unknown. In Idaho, EPA disapproved the state's temperature criteria applications within the geographic range of bull trout (EPA 1997). The EPA determined that the criteria did not provide adequate protection for bull trout relative to two designated uses—cold water biota and salmonid spawning (maximum daily average of 13° C (55.5° F) and 9° C (48.2° F) for each respective use). In July 1997, EPA promulgated a temperature criterion of 10° C (50° F) during June through September in designated stream areas, as a weekly average based on daily maximum temperatures for spawning and rearing of bull trout (EPA 1997). To date, the State has not adopted EPA's promulgated criterion, but has adopted 12° C as a daily average during June-August for juvenile rearing and 9° C for September and October for spawning. Additionally, Idaho has established a geographical area where these criteria would apply. It is unknown whether EPA will approve the State's criteria and withdraw the promulgated rule. In Montana, the temperature criterion applied to waters with bull trout is 19° C (66° F); temperature can be raised 0.6° C (1° F) by discharges, but water temperature may not exceed 19.5°C (67°F) (Administrative Rules of Montana 1996).

In accordance with Section 319 of the CWA, States also develop programs to address non-point sources of pollution such as agriculture, forestry, and mining. The effectiveness of controlling water pollution from these activities has been mixed. The State of Washington monitored the effectiveness in meeting water quality criteria for temperature in riparian areas on forest lands and concluded that regulations for stream shading were inadequate to meet criteria (Sullivan et al. 1990).

In summary, it is uncertain whether the CWA can provide sufficient protective measures for conservation of bull trout. Temperature regime is one of the most important factors affecting bull trout distribution (Adams and Bjornn 1997, Rieman and McIntyre 1995). Given the known temperature requirements of bull trout (Buchanan and Gregory 1997), criteria developed by the four States may not be conducive to either spawning, incubation, rearing, migration, or combinations of these life-history stages.

State Regulations and Conservation Planning Efforts

All four States within the range of the Klamath River and Columbia River population segments of bull trout have regulations affecting bull trout and their habitat. Idaho, Montana, and local or county organizations have recently developed or are developing conservation plans to maintain and restore bull trout, primarily through stream habitat protection.

In 1995, Idaho Governor Phil Batt initiated a conservation plan to restore bull trout populations in Idaho. The mission of the Governor's Plan, approved in July 1996, is to "... maintain and/or restore complex interacting groups of bull trout populations throughout their native range in Idaho" (Batt, *in litt.* 1997). A recent status report of implementation of the Plan stated that advisory groups, which will develop water quality and bull trout conservation measures, have formed only in some areas. Although the harvest of bull trout is closed throughout Idaho and State-sponsored survey and monitoring has increased (S. Mealey, IDFG, *in litt.* 1997), few on-the-ground recovery actions for bull trout have been implemented to date.

Other efforts include a 1994 conservation agreement (CA) between the Idaho Department of Transportation (IDOT) and the Service to protect bull trout (USDI and IDOT, *in litt.* 1994), and recent conservation activities by the IDFG that were funded by Section 6 of the Act. The IDOT finished only one passage restoration project under the CA, and recently declined to renew the CA (R. Howard, Service, pers. comm. 1997). Since 1994, IDFG has used Section 6 funds to begin several habitat restoration actions in northern and southwestern Idaho. Aside from enacting restrictive fishing regulations,

few protective or restoration projects have been completed that substantially reduce threats to bull trout throughout the Columbia River.

Beginning in 1992 and 1993, several interagency bull trout working groups were formed in Oregon (R. Rosen, ODFW, *in litt.* 1995). These working groups have been instrumental in gathering additional status information and developing preliminary conservation strategies for bull trout in their respective basins. These efforts are encouraging for bull trout conservation in the future, but the outcome has not yet been demonstrated.

In March 1997, Oregon also adopted the Oregon Coastal Salmon Restoration Initiative (OCSRI 1997) (Oregon Plan). The Oregon Plan is designed to "... restore salmon to a level at which they can once again be part of people's lives ..." in coastal Oregon. The Oregon Plan's initial focus is on areas within the range of Oregon coastal coho salmon, and does not overlap with presently occupied bull trout habitat. Oregon recently acknowledged support for developing future bull trout conservation measures by including bull trout in the Oregon Plan (J. Kitzhaber, Governor of Oregon, *in litt*, 1997), although no conservation measures specific to bull trout have been completed to date.

The Upper Klamath Basin Bull Trout Conservation Strategy (Light et al. 1996) was developed by the Klamath Basin Bull Trout Working Group in response to the limited and shrinking distribution and number of bull trout. The Working Group, formed in 1993, is composed of representatives from the Service, ODFW, Fremont and Winema National Forests, Crater Lake National Park, PacifiCorp, USBR, Sprague River Water Users Association, Klamath Basin Water Users Protective Association, U.S. Timberlands, and Klamath Tribes. The defined goals of this group as identified in the Conservation Strategy are—(1) secure existing bull trout populations and (2) restore populations to some of their former distribution (Light et al. 1996). Phase 1 has concentrated on addressing threats to bull trout from non-native salmonids, including eradication of brook trout and brown trout above barriers where isolated subpopulations of bull trout are found. Stream temperatures and sedimentation problems are being addressed concurrent with eradication of exotic species. Phase 2 will involve expanding the number of subpopulations by reestablishing bull trout in high quality headwater habitats, effectively increasing the size of the Klamath River metapopulation and making it more resilient to natural disturbance, variation in breeding success, disease outbreaks, and other environmental factors (Light et al. 1996). Future objectives likely will include establishing natural movement corridors between adjacent headwater streams.

All habitats currently occupied by bull trout in the Klamath River basin are managed by Working Group members. From 1993 through 1996, conservation actions (phase 1) were implemented by the Working Group, including—watershed assessments; fish distribution, abundance, and spawning surveys; collection of stream temperature and sediment data to help identify limiting factors; brook trout eradication efforts in Long, Sun, and Threemile creeks; reduction or elimination of grazing along bull trout habitat owned by U.S. Timberlands; road system improvements, closures, and rehabilitation; and barrier management to prevent access of non-native fishes (Johnson *in litt.* 1997; Buchanan et al. 1997). Habitat improvement projects have also been implemented in areas historically occupied by bull trout, such as the 9,700 ha (24,000 ac) Nature Conservancy preserve at Sycan Marsh (P. Rexroat, The Nature Conservancy, *in litt.* 1997) and the Sun Pass State Forest on lower Sun Creek. These ongoing conservation efforts have been complicated by recent private land ownership changes and lack of an approved recovery plan that identifies specific conservation tasks and actions.

In addition to the Klamath Basin Bull Trout Working Group, a federally-authorized, interagency and entity group, the Upper Klamath Basin Working Group, was established in 1994. This group, composed of Federal, State, county, city, tribal, environmental, local business, agricultural-ranching, and local community members, works on a consensus-based approach to Klamath basin ecosystem issues. The group focuses on ecosystem restoration projects and has funded bull trout conservation efforts, a high group priority, such as riparian fencing and road maintenance and obliteration projects.

Other State regulations and policies affect bull trout and their habitat in Oregon. For instance, Oregon has a policy "to prevent the serious depletion of any indigenous species" (ORS 496.012). As such, the Oregon Department of Fish and Wildlife's Wildlife Diversity Plan (OAR 635-100) provides for a Sensitive Species List. The Sensitive Species List (OAR-635-100-040) is maintained by ODFW, and is updated biennially. The Sensitive Species List is intended as a "watch list" of species potentially eligible for listing as endangered or threatened, and constitutes an early warning system for land managers and the public (ODFW 1996). There are no regulatory protections for species listed as sensitive, nor is the habitat on which they depend protected under OAR 635-100.

The Sensitive Species List has four categories—"critical" (species for which listing is appropriate or pending); "vulnerable" (species for which listing is not imminent and can be avoided via adequate protective measures); "peripheral or naturally rare" (occurring in Oregon at the edge of their range, in naturally low numbers due to limited in-state distribution); and "undetermined" status (species for which status is unclear). Bull trout is listed in the "critical" category (ODFW 1993).

The Washington Department of Fish and Wildlife released the final Environmental Impact Statement for the proposed Wild Salmonid Policy in September 1997 (WDFW 1997). Although the environmental impact statement (IS) focused on salmon and steelhead, referring to bull trout and other wild salmonids in an ancillary manner, it described problems and challenges facing the recovery of anadromous and resident salmonids throughout Washington. The IS presented five alternatives ranging from continuation of current management (i.e., policy generally based on maximum sustainable yield) to alternatives providing more protection for wild salmonids. Each alternative addressed harvest, hatcheries, and habitat relative to wild salmonids, and presented obstacles to recovery and possible actions to facilitate recovery. Regardless of the alternative ultimately selected by the Washington State Fish and Wildlife Commission as the Wild Salmonid Policy, implementation of the policy will suggest guidelines for actions taken by the WDFW and will not be binding on other State, tribal, and private entities. Because of uncertainties concerning implementation of the policy, the effect of the policy on bull trout conservation in Washington is unknown.

In Montana, Governor Marc Racicot appointed the Bull Trout Restoration Team in 1994 to produce a plan that maintains, protects, and increases bull trout populations. The team appointed a scientific group that has subsequently prepared eleven basin-specific status reports and two technical, peer-reviewed papers. A third technical

paper is presently undergoing peer review. A Montana Bull Trout Recovery Plan, including a recovery goal, is also nearing completion. Watershed groups are being established in some areas to lead local bull trout restoration efforts. As of October 1997, some localized habitat restoration projects, such as removal of fish passage barriers, screening irrigation diversions, riparian fencing, stream restoration projects, and habitat monitoring, had been completed or were underway (Graham and Clinch, *in litt.* 1997). Because of uncertainties concerning implementation of the restoration plan, the effect of the plan on future bull trout conservation in Montana is unknown.

Oregon, Washington, Idaho, and Montana each have adopted a Forest Practice Act (FPA) or other legislation consisting of rules and regulations addressing forest management on State, Federal, and private lands. In general, the legislation establishes best management practices (BMPs) to be implemented on forests, such as streamside management zones (Montana Department of State Lands 1994), activities allowed in riparian areas, restrictions on harvest adjacent to streams, and location of road construction. The application of BMPs is voluntary in some States. Although audits show that compliance with BMPs is high in Idaho (H. Malany, Idaho Forest Practice Act Advisory Committee Member, *in litt.* 1997) and Montana (Mathieus 1996), the Service is not aware of evaluations of various States' BMPs relative to the protection of bull trout habitat and processes affecting water quality, such as sediment delivery, water temperature, recruitment of woody debris, and bank stability. In Idaho, half of timber sales audited resulted in contributions of sediment to streams, largely from inadequately maintained roads (Zaroban et al. 1996). Even with high implementation rates, Idaho's forestry BMPs have been ineffective at maintaining beneficial uses, including cold water biota (McIntyre 1993). In Montana, McGreer (1994) noted that the Montana legislation may adequately provide for woody debris and bank stability, but it may be inadequate for temperature control and sedimentation. The MDNRC has discontinued timber harvest and grazing in areas directly adjacent to streams containing bull trout (P. Flowers, MDNRC, *in litt.* 1996). Based on current information, the Service is unable to conclude that State FPAs and related legislation are adequate to protect bull trout habitat.

E. *Other natural or manmade factors affecting their continued existence.* Natural and manmade factors affecting the continued existence of bull trout include—previous introductions of non-native species that compete or hybridize with bull trout; fragmentation and isolation of bull trout subpopulations from habitat changes caused by human activities, and subpopulation extirpations due to naturally occurring events such as droughts and floods.

Introduced Non-native Species

Introductions of non-native species by the Federal government, State fish and game departments, and private parties, across the range of bull trout has resulted in declines in abundance, local extirpations, and hybridization of bull trout (Bond 1992; Howell and Buchanan 1992; Leary et al. 1993; Donald and Alger 1993; Pratt and Huston 1993; MBTSG 1995b,d, 1996g; Platts et al 1995; Palmisano and Kaczynski, *in litt.* 1997). Non-native species may exacerbate stresses on bull trout from habitat degradation, fragmentation, and isolation (Rieman and McIntyre 1993). Introduced species, such as rainbow trout, may benefit large adult bull trout by providing supplemental forage (Faler and Bair 1991; Pratt 1992; ODFW, *in litt.* 1993). However, introductions of non-native game fish can be detrimental due to increased angling and subsequent incidental catch and illegal harvest of bull trout (Rode 1990; Bond 1992; WDW 1992; MBTSG 1995d).

Non-native fish also threaten bull trout in relatively secure and physically unaltered habitats, including roadless areas, wilderness, and national parks. For instance, brook trout occur in tributaries of the Middle Fork Salmon River within the Frank Church-River of No Return Wilderness, including Elk, Camas, Loon, and Big creeks (Thurow 1985; S. Achord, National Marine Fisheries Service (NMFS), *in litt.* 1994) and Sun Creek in Crater Lake National Park (Light et al. 1996). Glacier National Park has self-sustaining populations of introduced non-native species, including lake trout, brook trout, rainbow trout, Yellowstone cutthroat trout, lake whitefish (*Coregonus clupeaformis*), and northern pike (MBTSG 1995d). Although stocking in Glacier National Park was terminated in 1971, only a few headwaters lakes contain exclusively native species, including bull trout. The introduction and expansion of lake trout into the relatively pristine habitats of Kintla Lake and Lake McDonald in Glacier National Park nearly extirpated the bull trout subpopulation from predation and competition (L. Marnell, NPS, *in litt.* 1995; MBTSG 1995d).

Introduced brook trout threaten bull trout through hybridization, competition, and possibly predation (Leary et al. 1993; Thomas 1992; WDW 1992; Clancy 1993; Rieman and McIntyre 1993; MBTSG 1996). Hybridization between brook trout and bull trout has been reported in Montana (MBTSG 1995a,b, 1996a,c,e; Hansen and DosSantos 1997), Oregon (Markle 1992; Ratliff and Howell 1992), Washington (WDFW 1997), and Idaho (Adams 1996; T. Burton, BNF, pers. comm. 1997). Hybridization results in offspring that are frequently sterile (Leary et al. 1993), but some hybrids show gonadal development (Dunsmoor and Bienz, *in litt.* 1997), raising concern of potential introgression. Hybrids may be significant competitors; Dunsmoor and Bienz (*in litt.* 1997) noted that hybrids are aggressive and larger than resident bull trout, suggesting that hybrids may have a competitive advantage. Brook trout mature faster and have a higher reproductive rate than bull trout. This difference may favor brook trout over bull trout when they occur together, often leading to replacement of bull trout with brook trout (Leary et al. 1993; Clancy 1993; MBTSG 1995b). The threat of hybridization and replacement is likely exacerbated where larger, more fecund migratory forms of bull trout have been eliminated (Rieman and McIntyre 1993). The magnitude of threats from non-native fishes is highest for subpopulations supporting only resident fish because resident bull trout typically are small in number and isolated where the effects of interspecific interactions are likely more intense.

Brook trout apparently adapt better to degraded habitats than bull trout (Clancy 1993; Rich 1996). Brook trout likely have higher survival-to-emergence than bull trout in areas with elevated sediment (MBTSG 1996h), and brook trout also tend to occur in streams with higher water temperatures (Adams 1994; MBTSG 1996h). Because elevated water temperatures and sediments are often indicative of degraded habitat, bull trout may be subject to stresses from both interactions with brook trout and degraded habitat (MBTSG 1996h). Watson and Hillman (1997) found an inverse relationship between bull trout occurrence and the presence of brook trout. Dunsmoor and Bienz (*in litt.* 1997) noted that brook trout have a high probability of displacing bull trout in the Klamath River basin due to degraded bull trout habitat.

Introduced brown trout are established in several areas within the range of bull trout and likely compete with bull trout (Ratliff and Howell 1992;

Platts et al. 1993; Pratt and Huston 1993). Brown trout tend to spawn in the same areas as bull trout, though later in the season, and may compete for spawning and rearing areas and superimpose redds on bull trout redds (Pratt & Huston 1993; Light et al. 1996; MBTSG 1996h). Additionally, brown trout are typically more aggressive than native trout, and can displace brook trout and other native trout species (Fausch and White 1981; Wang and White 1994). Bull trout and brown trout rear in similar areas and may compete for food and space. Elevated water temperatures may favor brown trout over bull trout in competitive interactions (MBTSG 1996h). Brown trout are thought to have been a secondary factor in the decline and eventual extirpation of bull trout in the McCloud River, California, after dam construction altered bull trout habitat (Rode 1990).

Non-native lake trout also negatively affect bull trout (Donald and Alger 1993; MBTSG 1996h). A study of 34 lakes in Montana, Alberta, and British Columbia found lake trout likely limit foraging opportunities and reduce the distribution and abundance of migratory bull trout in mountain lakes (Donald and Alger 1993). Illegal introductions of lake trout and other species have occurred in more than 50 northwest Montana waters in recent years (J. Vashro, MFWP, *in litt.* 1995). The potential for illegal introduction of lake trout into the Swan River basin and Hungry Horse Reservoir on the South Fork Flathead River, both in Montana, is considered a threat to bull trout (MBTSG 1995e, 1996a), potentially affecting up to six subpopulations. In Idaho, lake trout and habitat degradation were factors in the decline of bull trout from Priest Lake (Mauser et al. 1988; Pratt and Huston 1993). Juvenile lake trout are also using river habitats in Montana, possibly competing with bull trout (MBTSG 1996h). State plans to manage lake trout to reduce interactions with bull trout are unknown.

Non-native northern pike (*Esox lucius*), bass (*Micropterus spp.*), and opossum shrimp (*Mysis relicta*) are also thought to negatively affect bull trout. Northern pike were illegally introduced into Swan Lake in the 1970s (MFWP 1997), and predation on juvenile bull trout has been documented (S. Rumsey, MFWP, pers comm. *in* MBTSG 1996a). Management of Swan Lake emphasizes protection of native salmonids, particularly bull trout, and control of northern pike to minimize effects on native species (MFWP 1997). Northern pike were also illegally introduced into Salmon, Inez, Seeley, and Alva lakes in the Clearwater River basin, a tributary to the Blackfoot River, Montana (MFWP 1997). Northern pike numbers have increased in Salmon Lake and Lake Inez, having a negative effect on bull trout (Berg, pers. comm. 1997). Northern pike in Seeley Lake and Lake Alva are also expected to increase in numbers (Berg, pers. comm. 1997).

Introduced bass may negatively affect bull trout where the species co-occur (MFWP 1997). In the Clark Fork River, Montana, Noxon Rapids Reservoir supports fisheries for both smallmouth bass (*Micropterus dolomieui*) and largemouth bass. Both are high priority species in current management of Noxon Rapids Reservoir unless more suitable bull trout habitat is created as a result of dam relicensing. The fishery management objective for Cabinet Gorge Reservoir, downstream of Noxon Rapids Reservoir, is to enhance bull trout while managing the existing bass fishery (MFWP 1997).

Opossum shrimp, a crustacean native to the Canadian Shield area, was widely introduced in the 1970s as supplemental forage for kokanee and other salmonids in several lakes and reservoirs across the northwest (Nesler and Bergerson 1991). The introduction of opossum shrimp in Flathead Lake changed the lake's trophic dynamics, and is widely believed to have been partially responsible for the expanding the lake trout population, resulting in increased competition and predation on bull trout (T. Weaver, MFWP, *in litt.* 1993) Thus, opossum shrimp have had an indirect, negative effect on bull trout. Conversely, in Swan Lake, Montana, opossum shrimp and kokanee have become established and increased the availability of forage for bull trout, contributing to the significant increase in bull trout numbers in the Swan River basin (MBTSG 1996a). Thus, the effects of introduced species on bull trout involve complex interactions that are dependent on several factors.

Klamath River Population Segment

Bull trout have been displaced by brook trout in portions of the Klamath River basin (Light et al. 1996), and hybrids of the two species have been verified in several of the streams (Ratliff and Howell 1992). Either brook trout, brown trout, or both species occur with bull trout in six of seven subpopulations. Where brook trout or brown trout co-occur with bull trout, the distribution of bull trout has contracted and that of introduced salmonids expanded (e.g., Brownsworth, Leonard, and Long creeks) (Buchanan et al. 1997). Only four subpopulations exist in the absence of brook trout, and these are the most abundant (Ratliff and Howell 1992; Ziller 1992). In 1992, chemical eradication of brook trout was initiated in Sun Creek (Buktenica 1997). The chemical treatment apparently killed a number of bull trout due to the difficulty of removing fish prior to treatment (Buktenica 1997). Other eradication programs relying on chemical treatments would likely have similar effects on bull trout. Ongoing management actions in Threemile and Long creeks focus on brook trout eradication via selective electrofishing, snorkel-spearing, trapping, and chemical treatments with the objective of expanding bull trout range. Brook trout have declined in Threemile Creek, but there has been no measurable change in brook trout numbers in Long Creek (Dunsmoor and Bienz, *in litt.* 1997).

Columbia River Population Segment

Within the upper Columbia River basin in Montana, brook trout are found in approximately 65 percent of the stream reaches where bull trout occur (J. Hutten, MFWP, *in litt.* 1993). Brook trout are found in all major basins in Montana that support bull trout except the South Fork of the Flathead River. Brook trout and bull trout hybridization was first documented in the early 1980s in South Fork Lolo Creek in the Bitterroot River basin, Montana (Clancy 1993; MBTSG 1996h). Bull trout have largely been replaced by brook trout.

Introduced brook, brown, and rainbow trout are present in the Bitterroot drainage in Montana (Clancy 1996). The presence of non-native fish may have been a factor causing the fragmentation of bull trout range in the Bitterroot drainage by restricting migratory movements by bull trout (Rich 1996). Brook trout appeared to be replacing bull trout in some streams in the Bitterroot. Bull trout-brook trout hybrids have been documented in at least nine tributaries (MBTSG 1995b). Rich (1996) found a strong negative correlation between the presence of bull trout and brook trout in tributaries of the Bitterroot River.

The MBTSG concluded that introduced species, particularly in the lower Clark Fork River pose a high threat to bull trout (MBTSG 1996b). Non-native fishes have been introduced throughout the Clark Fork River system and brook trout are found throughout. Bull trout-brook trout hybrids exist in the Middle and upper Clark Fork systems (MBTSG 1995a; Hansen and DosSantos 1997).

In Idaho, bull trout densities in Mica Creek, Spokane River basin, during 1972

ranged from 0.03 to 0.23 fish/100 m^2 (0.003 to 0.023 fish/100 ft^2) (Mauser et al. 1972 *in* Platts et al. 1993). Extensive electrofishing surveys in Mica Creek during 1993 did not find bull trout, but brook trout were numerous at one transect (Martin 1994). Brook trout are present or accessible to most of the Clearwater River basin in Idaho, with hybridization and competition the primary threat to bull trout (A. Espinosa, Clearwater National Forest, pers. comm. 1993; D. Johnson, Nez Perce Tribe, pers. comm. 1995). For example, Meadow Creek, a tributary to the North Fork Clearwater River, contained numerous bull trout in 1987 and 1988, but, currently, high numbers of brook trout occur and bull trout numbers have been sharply reduced (Johnson, pers. comm., 1995).

Negative effects of interactions with introduced non-native species may be the most pervasive threat to bull trout throughout the Columbia River basin. Of the 141 subpopulations of bull trout in the Columbia River population segment, approximately 62 percent were threatened by competition, predation, or displacement by non-native species. Often one or more non-native species have been introduced into bull trout habitats; interactions with bull trout are likely exacerbated by factors such as habitat conditions, water temperature, and isolation. The MBTSG concluded that non-native species pose a limitation to bull trout restoration (MBTSG 1995a-e, 1996a-f). The MBTSG is reviewing recommendations for removing or suppressing non-native fishes to benefit bull trout, but success of such an effort on a large scale is questionable (MBTSG 1996h).

Isolation and Habitat Fragmentation

Bull trout are widely distributed over a large geographic area, and exhibit a patchy distribution due, in part, to specific habitat requirements (Rieman and McIntyre 1993). However, the effects of human activities over the past 100 years have resulted in reductions in the overall distribution of bull trout. In general, habitat fragmentation results in reduction in available habitat and increased isolation from conspecifics (Saunders et al. 1991). In studies of extinction in fragmented landscapes, Burkey (1989) concluded that when species are isolated by fragmented habitats, low rates of population growth are typical in each local population (i.e., subpopulations) and their probability of extirpation is directly related to the degree of isolation and fragmentation. Without sufficient immigration, overall growth for subpopulations may be low and the overall probability of extirpation for subpopulations is high (Burkey 1989, 1995). Moreover, habitat fragmentation that isolates subpopulations may increase a species' susceptibility to both demographic and naturally occurring events (Rieman and McIntyre 1993).

Metapopulation concepts of conservation biology theory are applicable to the bull trout (Reiman and McIntyre 1993). A metapopulation is an interacting network of local populations with varying frequencies of migration and gene flow among them (Meffe and Carroll 1994). Subpopulations may be extirpated, but can be reestablished by individuals from other subpopulations. Metapopulations are thought to provide a mechanism for spreading risk because the simultaneous loss of all subpopulations is unlikely. Migratory corridors can also allow individuals access to unoccupied but suitable habitats, foraging areas, and refuges from perturbations (Saunders et al. 1990). Relative to bull trout, maintenance of migratory corridors is essential to provide connectivity among subpopulations thought to be sources and sinks, and enables the reestablishment of extirpated subpopulations. Where migratory bull trout are not present, disjunct subpopulations cannot be replenished when a disturbance makes local habitats unsuitable (Rieman and McIntyre 1993; USDA and USDI 1997). Moreover, limited downstream movement was observed for resident bull trout in the Bitterroot River basin (Nelson 1996) . suggesting low probability that extirpated bull trout would be reestablished by resident fish residing nearby. Of the 141 subpopulations in the Columbia River population segment, approximately 79 percent are unlikely to be reestablished if extirpated; and 50 percent are at risk of extirpation from naturally occurring events.

Passage barriers, degraded habitat, absence of migratory fish, and intensified stream perturbations, such as forest fires, floods, and droughts, reduce the ability of isolated bull trout subpopulations to persist following disturbances to streams (Rieman and McIntyre 1993; USDA and USDI 1997). Bull trout evolved with habitat perturbations to streams that were likely factors in shaping bull trout life history (Rieman and McIntyre 1993). Historically, areas suitable for bull trout spawning were likely distributed in a disjunct pattern (Fraley and Shepard 1989; Rieman and McIntyre 1995; USDA and USDI 1997) maintained by natural perturbations. Although the amount and distribution of spawning areas vary through time, sufficient spawning areas were accessible to bull trout to maintain the species (Rieman and McIntyre 1995; USDA and USDI 1997). Migratory bull trout tend to show fidelity to spawning streams, but they have been documented to spawn in different tributaries from one year to the next, including tributaries not previously known to have recent spawning (Ratliff et al. 1996). Thus, migratory bull trout have the ability to reestablish an area where extirpated previously as long as suitable migratory corridors exist (Rieman and McIntyre 1993).

Today, bull trout exhibiting migratory life histories have declined or are absent in many river systems (Bond, 1992; Schill 1992; Ziller 1992; Pratt and Huston 1993; Rieman and McIntyre 1993; Newton and Pribyl 1994; MBTSG 1995a,b; 1996b,c,e; USDA and USDI 1997). Passage barriers (e.g., dams and diversions) and other habitat alterations prevent bull trout migration from following historical patterns. Additionally, suitable spawning areas are more fragmented across the landscape than historically (USDA and USDI 1997). With fewer and more compressed spawning and rearing areas available, bull trout increasingly persist as small, isolated resident populations instead of few, large connected subpopulations (Bond, 1992; Schill 1992; Thomas 1992; Ziller 1992; Rieman and McIntyre 1993, 1995; Rich 1996 Newton and Pribyl 1994; MBTSG 1995a,b; 1996b,c,d,e; USDA and USDI 1997).

As discussed in Factor A, evidence suggests that landscape disturbances, such as floods and fires, have increased in frequency and magnitude of effects within the range of bull trout (Henjum et al. 1994; USDA and USDI 1997). Where recolonization is prevented by passage barriers and suitable habitat, bull trout subpopulations may be extirpated by perturbations (USDA and USDI 1997). Also, isolated subpopulations are typically small, and more likely to be extirpated by local events than larger populations (Rieman and McIntyre 1995). Small populations may be at risk of impaired genetic fitness, as in Gold Creek, Washington (Craig and Wissmar 1993).

An example of the effects of naturally occurring events, such as fire, on bull trout habitat is the Entiat River basin of central Washington. "Historical and current influences have been significant and include: localized compaction from sheep grazing and trailing; fire exclusion; timber salvage/road building from the early 1970's to present; and recreation. A portion of this (transitional or bull trout) zone has recently been impacted by a large, moderate high

intensity fire" (Wenatchee National Forest, *in litt.* 1996). This transitional or bull trout zone in the mainstem Entiat River has had a 30 to 60 percent loss of pools since initially surveyed by the U.S. Bureau of Fisheries during 1935 through 1937 (Wenatchee National Forest, *in litt.* 1996). Both bull trout densities and recruitment are depressed in the mainstem Entiat in response to habitat degradation.

Conversely, most bull trout recruitment in the Entiat River basin is now occurring in the transitional zone in the Mad River. Pool frequencies have increased dramatically, 85 percent in one reach surveyed, 1,000 percent in the other, since the 1935 through 1937 surveys (Wenatchee National Forest, *in litt.* 1996). A large fire occurred in the Mad River basin in 1888, and the basin had splash dams and log drives early in this century. It has taken 60 years for the habitat to recover.

Floods or high flows have also been altered by land management (USDA and USDI 1997). Roads and clear cutting forested areas tend to magnify the effects of floods, leading to higher flows, erosion and bedload that scour channels (Furniss et al. 1991; McIntosh et al. 1994; USDA and USDI 1997), and degrade bull trout habitat (Henjum et al. 1994). Erosion from road landslides increases bedload to high stream flows over bedload levels without roads (Furniss et al. 1991). Increased bedload increases the scouring effect of the high water, increasing channel instability, leading to a loss of habitat diversity, especially pools (Henjum et al. 1994; McIntosh et al. 1994). Bull trout eggs and fry in the gravels during the scouring likely survive at lower rates (Henjum et al. 1994). For instance, hundreds of landslides associated with roads on the Clearwater National Forest and Panhandle National Forests (R. Patten and J. Pengkover, Panhandle National Forests, *In litt.* 1996) resulted from high water in 1995, and the effects of flooding on isolated bull trout populations is unknown. Habitat degradation has reduced the number and size of bull trout spawning areas (USDA and USDI 1997).

The Service has carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to bull trout in the Klamath River and Columbia River distinct population segments of bull trout in developing this final rule. Based on this evaluation the preferred action is to list the Klamath River and the Columbia River population segments of bull trout as threatened.

Klamath River Population Segment

Bull trout are currently limited to seven geographically isolated subpopulations that occupy only a fraction of the historical habitat. The species distribution and numbers have declined due to habitat degradation, isolation, loss of migratory corridors, poor water quality, and the introduction of non-native species. Six of seven bull trout subpopulations are small in number, and unlikely to persist over the next 100 years unless conservation and other corrective actions are taken. Remaining Klamath River bull trout subpopulations are threatened by the effects of past, present and future land and water management practices. Most subpopulations also face more than one threat.

Despite the bull trout's current status, the Service is encouraged that recent conservation and recovery actions are being initiated at Federal, State and local levels to begin to reverse the long-term declining trend for bull trout in the Klamath River basin. Progress has already been made toward improving habitat conditions for bull trout. Although the Service proposed the Klamath River population segment as endangered based on the 1994 administrative record, new information indicates that interagency conservation programs are being implemented and have begun to reduce threats to bull trout. Included are efforts of the Klamath Basin Working Group to eradicate brook trout in Long, Sun and Threemile Creeks, reduce livestock grazing along bull trout streams, and monitor watershed conditions and bull trout status. Moreover, bull trout conservation in the Klamath Basin has benefitted from habitat restoration activities of the Upper Klamath Basin Working Group which began in 1994. Habitat improvements derived from these two programs have just begun to be realized. Thus the final determination is to list the Klamath River population of bull trout as threatened because it is no longer in danger of extinction in the foreseeable future and threats have been reduced.

Columbia River Population Segment

Bull trout in the Columbia River basin, despite their relatively widespread distribution, have declined in both their overall range and numbers. Numerous extirpations of local subpopulations have been reported, with bull trout eliminated from areas ranging in size from relatively small tributaries of currently occupied, though fragmented habitat, to large river systems comprising a substantial portion of the species' previous range. Bull trout in the Columbia River population segment are currently limited to 141 isolated subpopulations, which indicates habitat fragmentation and geographic isolation. Many remaining bull trout occur as isolated subpopulations in headwater lakes or tributaries with migratory life histories lost or restricted. Few bull trout subpopulations are considered "strong" in terms of relative abundance and subpopulation stability. These remaining important strongholds tend to be found in large areas of contiguous habitats in the Snake River basin of central Idaho Mountains, upper Clark Fork and Flathead rivers in Montana, and the Blue Mountains in Washington and Oregon. The decline of bull trout is due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices and the introduction of non-native species. Most bull trout subpopulations are affected by one or more threats.

Recent activities to address threats and reverse the long-term decline of bull trout are being initiated at Federal, State and local levels (e.g., restrictive angling regulations, adoption of various land management rules, and development of conservation strategies and plans). While these efforts are important to the long term conservation and recovery of bull trout, threats continue and subpopulation improvement throughout the Columbia River has yet to be demonstrated. Because bull trout in the Columbia River basin are still a wide-ranging species, with some "strongholds" in relatively protected areas, the Columbia River population segment is not in immediate danger of extinction. Therefore the Service's final determination is to list the Columbia River population segment of bull trout as threatened.

Critical Habitat

Critical habitat is defined in section 3 of the Act as—(i) the specific area within the geographical area occupied by a species, at the time it is listed in accordance with the Act, on which are found those biological features (I) essential to the conservation of the species and (II) that may require special management considerations or protection and; (ii) specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. "Conservation" means the use of all methods and procedures needed to bring the species to the point at

which listing under the Act is no longer necessary.

Section 4(a)(3) of the Act, as amended, and implementing regulations (50 CFR 424.12) require that, to the maximum extent prudent and determinable, the Secretary designate critical habitat at the time the species is determined to be endangered or threatened. Service regulations (50 CFR 424.12(a)) state that critical habitat is not determinable if information sufficient to perform required analysis of impacts of the designation is lacking or if the biological needs of the species are not sufficiently well known to permit identification of an area as critical habitat. Section 4(b)(2) of the Act requires the Service to consider economic and other relevant impacts of designating a particular area as critical habitat on the basis of the best scientific data available. The Secretary may exclude any area from critical habitat if he determines that the benefits of such exclusion outweigh the conservation benefits, unless to do such would result in the extinction of the species.

The Service finds that the designation of critical habitat is not determinable for these distinct population segments based on the best available information. When a "not determinable" finding is made, the Service must, within 2 years of the publication date of the original proposed rule, designate critical habitat, unless the designation is found to be not prudent. The Service reached a "not determinable" critical habitat finding for the proposed rule based on the 1994 administrative record. In the proposed rule the Service specifically requested comments on this issue. While the Service received a number of comments advocating critical habitat designation, none of these comments provided information that added to the Service's ability to determine critical habitat. Additionally, no new information regarding specific physical and biological features essential for bull trout in the Klamath River and Columbia River bull trout population segments was obtained during the open comment period including the five public hearings. The biological needs of bull trout in the two population segments are not sufficiently well known to permit identification of areas as critical habitat. Insufficient information is available on the number of individuals or spawning reaches required to support viable subpopulations throughout the distinct population segment. In addition, the extent of habitat required and specific management measures needed for recovery of these fish have not been identified. This information is considered essential for determining critical habitat for these population segments. Therefore, the Service finds that designation of critical habitat for the Klamath River and the Columbia River population segments is not determinable at this time. Protection of bull trout habitat will be addressed through the recovery process and through section 7 consultations to determine whether Federal actions are likely to jeopardize the continued existence of the species.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Endangered Species Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain activities. Recognition through listing encourages and results in conservation actions by Federal, State, and private agencies, groups, and individuals. The Act provides for possible land acquisition and cooperation with the states and requires that recovery actions be carried out for all listed species. The protection required of Federal agencies and the prohibitions against taking and harm are discussed, in part, below.

Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is being designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR Part 402. Section 7(a)(2) requires Federal agencies to insure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of a listed species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the Service.

The Klamath River and Columbia River bull trout population segments occur on lands administered by the USFS and BLM; various State-owned properties in Oregon, Washington, Idaho and Montana; and private lands. Federal agency actions that may require consultation as described in the preceding paragraph include Army Corps of Engineers (Corps) involvement in projects such as the construction of roads and bridges, and the permitting of wetland filling and dredging projects subject to section 404 of the Clean Water Act (33 U.S.C. 1344); Federal Energy Regulatory Commission licensed hydropower projects authorized under the Federal Power Act; USFS and BLM timber and grazing management activities; EPA authorized discharges under the National Pollutant Discharge System of the Clean Water Act; and U.S. Housing and Urban Development projects.

On January 27, 1998, an interagency memorandum between the USFS, BLM and the Service outlined a process for bull trout section 7 conferencing/consultation in recognition of the possibility of an impending listing. The process considers both programmatic actions (e.g., land management plans) and site-specific actions (e.g., timber sales and livestock grazing allotments) and incorporates conferencing/consultation at the watershed level. The process uses a matrix to determine the environmental baseline and the effects of projects on the environmental baseline of bull trout. The goal of this strategy is to complete conferences for all ongoing actions and proposed actions by the effective date of listing through a system of batching and aggregating of projects to the watershed level. A programmatic LRMP/RMP biological assessment would be used to assess ongoing projects for up to 9 months post-listing that result from implementation of Forest Plans/Resource Management Plans as amended in INFISH, PACFISH and the Northwest Forest Plan. The Service would determine in a programmatic biological opinion whether these issues would jeopardize the continued existence of bull trout, and would authorize incidental take. Part of the project description and evaluation process would stipulate that an ongoing project would be completed by May 10, 1999. For projects that are proposed after the initial 9 month post-listing period, the watershed approach, using the bull trout matrix incorporating local watershed biological data, would be project-specific applied in the section 7 process.

The Act and its implementing regulations found at 50 CFR 17.21 and 17.31 set forth a series of general trade prohibitions and exceptions that apply to all threatened wildlife. These prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to take (includes harass, harm, pursue, hunt, shoot, wound, kill, trap, or collect; or attempt any of these), import or export, ship in interstate commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. It is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been

taken illegally. Certain exceptions apply to agents of the Service and State conservation agencies.

Permits, authorized under section 10(a)(1) of the Act, may be issued to carry out otherwise prohibited activities involving endangered and threatened wildlife under certain circumstances. Regulations governing permits are at 50 CFR 17.22, 17.23 and 17.32. Such permits are available for scientific purposes, to enhance the propagation or survival of the species, and/or for incidental take in connection with otherwise lawful activities. For threatened species, permits are also available for zoological exhibition, educational purposes, or special purposes consistent with the purpose of the Act. Private landowners seeking permits under section 10 of the Act for incidental take are a means of protecting bull trout habitat through the voluntary development of habitat conservation plans. Information collections associated with these permits are approved under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.*, and assigned Office of Management and Budget clearance number 1018–0094. For additional information concerning these permits and associated requirements, see 50 CFR 17.32.

It is the policy of the Service published in the **Federal Register** on July 1, 1994, (59 FR 34272) to identify to the maximum extent practicable at the time a species is listed those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of this listing on proposed and ongoing activities within the species' range. The Service believes the following actions would not be likely to result in a violation of section 9, provided the activities are carried out in accordance with any existing regulations and permit requirements—

(1) Actions that may affect bull trout in the Klamath and Columbia River basins and are authorized, funded or carried out by a Federal agency when the action is conducted in accordance with an incidental take statement issued by the Service pursuant to section 7 of the Act;

(2) Possession of Columbia River basin bull trout caught legally in accordance with authorized State fishing regulations (see Special Rule section);

(3) State, local and other activities that have been approved by the Service through development of Conservation Plans and special rules under section 4(d) and section 6(c)(1) of the Act.

With respect to both the Klamath River and Columbia River bull trout population segments, the following actions likely would be considered a violation of section 9—

(1) Take of bull trout without a permit, which includes harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting, or attempting any of these actions, except in accordance with applicable State fish and wildlife conservation laws and regulations within the Columbia River bull trout population segment;

(2) To possess, sell, deliver, carry, transport, or ship illegally taken bull trout;

(3) Unauthorized interstate and foreign commerce (commerce across State and international boundaries) and import/export of bull trout (as discussed in the prohibition discussion earlier in this section);

(4) Introduction of non-native fish species that compete or hybridize with, or prey on bull trout;

(5) Destruction or alteration of bull trout habitat by dredging, channelization, diversion, in-stream vehicle operation or rock removal, or other activities that result in the destruction or significant degradation of cover, channel stability, substrate composition, temperature, and migratory corridors used by the species for foraging, cover, migration, and spawning;

(6) Discharges or dumping of toxic chemicals, silt, or other pollutants into waters supporting bull trout that result in death or injury of the species; and

(7) Destruction or alteration of riparian or lakeshore habitat and adjoining uplands of waters supporting bull trout by timber harvest, grazing, mining, hydropower development, or other developmental activities that result in destruction or significant degradation of cover, channel stability, substrate composition, temperature, and migratory corridors used by the species for foraging, cover, migration, and spawning.

Other activities not identified above will be reviewed on a case-by-case basis to determine if a violation of section 9 of the Act may be likely to result from such activity. The Service does not consider these lists to be exhaustive and provides them as information to the public.

Questions regarding whether specific activities may constitute a violation of section 9 should be directed to the Supervisor of the Service's Snake River Basin Office (see **ADDRESSES** section). Requests for copies of the regulations concerning listed species and inquiries regarding prohibitions and permits may be addressed to the U.S. Fish and Wildlife Service, Endangered Species Permits, 911 NE 11th Avenue, Portland, Oregon 97232–4181 (telephone 503 231–6241; facsimile 503 231–6243).

Special Rule

Section 4(d) of the Act provides authority for the Service to promulgate special rules for threatened species that would relax the prohibition against taking. The Service finds that statewide angling regulations have become more restrictive in an attempt to protect bull trout throughout Idaho, Montana, Nevada, Oregon, and Washington and are adequate to protect the species from excessive taking. The Service intends to continue to work with the States and Tribes in developing management plans and agreements with the objective of recovery and eventual delisting of the Klamath River and Columbia River distinct population segments. This special rule allows for take of bull trout within the Klamath River and Columbia River distinct population segments when it is in accordance with applicable State and Native American Tribal fish and wildlife conservation laws and regulations, as constituted in all respects relevant to protection of bull trout. The Service believes that this special rule will allow for more efficient management of the species, thereby facilitating its conservation.

National Environmental Policy Act

The Service has determined that an Environmental Assessment, as defined under the authority of the National Environmental Policy Act of 1969, need not be prepared in connection with regulations adopted pursuant to section 4(a) of the Endangered Species Act, as amended. A notice outlining the Service's reasons for this determination was published in the **Federal Register** on October 25, 1983 (48 FR 49244).

Required Determinations

This rule does not contain any new collections of information other than those already approved under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.*, and assigned Office of Management and Budget clearance number 1018–0094. For additional information concerning permit and associated requirements for threatened species, see 50 CFR 17.32.

References Cited

A complete list of all references cited herein is available upon request from the Snake River Basin Office (see Addresses section).

Author(s)

The primary authors of this final rule are: John Bowerman, Klamath Basin Fish and Wildlife Office, Klamath Falls, OR; Timothy Cummings, Columbia River Fisheries Office, Vancouver, WA; Stephen Duke, Snake River Basin Office, Boise, ID; Michael Faler, Idaho Fisheries Resource Office, Ahsahka, ID; Robert Hallock, Upper Columbia River Basin Office, Spokane, WA; Samuel Lohr, Snake River Basin Office, Boise, Idaho; Lori Nordstrom, Helena Field Office, Helena, MT; and Ron Rhew, Oregon State Office, Portland, OR.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Regulation Promulgation

PART 17—[AMENDED]

Accordingly, the Service amends part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below—

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 16 U.S.C. 1531–1544; 16 U.S.C. 4201–4245; Pub. L. 99–625, 100 Stat. 3500, unless otherwise noted.

2. Amend § 17.11(h) by adding the following, in alphabetical order under FISHES, to the List of Endangered and Threatened Wildlife to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
*	*	*	* *		*		*
FISHES							
*	*	*	* *		*		*
Trout, bull	*Salvelinus confluentus.*	U.S.A. (Pacific NW), Canada (NW Territories).	Klamath R. (U.S.A.-OR)	T	637	NA	17.44 (v)
Do	do	do	Columbia R. (U.S.A.—ID, MT, OR, WA) mainstem and its tributaries, excluding Jarbidge R., NV, and east of Continental Divide, MT.)	T	637	NA	Do.
*	*	*	* *		*		*

3. Amend § 17.44 by adding paragraph (v) to read as follows:

§ 17.44 Special rules—fishes.

* * * * *

(v) Bull trout (*Salvelinus confluentus*), Columbia River and Klamath River population segments.

(1) Prohibitions. Except as noted in paragraph (v)(2) of this section, all prohibitions of 50 CFR 17.31 and exemptions of 50 CFR 17.32 shall apply to the bull trout Columbia River and Klamath River population segments within the contiguous United States.

(2) Exceptions. No person shall take this species, except in accordance with applicable State and Native American Tribal fish and wildlife conservation laws and regulations, as constituted in all respects relevant to protection of bull trout in effect on June 10, 1998.

(3) Any violation of applicable State and Native American Tribal fish and wildlife conservation laws or regulations with respect to the taking of this species is also a violation of the Endangered Species Act.

(4) No person shall possess, sell, deliver, carry, transport, ship, import, or export, any means whatsoever, any such species taken in violation of this section or in violation of applicable State and Native American Tribal fish and game laws and regulations.

(5) It is unlawful for any person to attempt to commit, solicit another to commit, or cause to be committed, any offense defined in paragraphs (v) (2) through (4) of this section.

Dated: June 1, 1998.

Jamie Rappaport Clark,

Director, Fish and Wildlife Service.

[FR Doc. 98–15319 Filed 6–5–98; 8:45 am]

BILLING CODE 4310–55–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

Endangered and Threatened Wildlife and Plants; 90-day Finding and Commencement of Status Review for a Petition To List the Westslope Cutthroat Trout as Threatened

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of petition findings and initiation of status review.

SUMMARY: The U.S. Fish and Wildlife Service (Service) announces a 90-day finding for an amended petition to list the westslope cutthroat trout (*Oncorhynchus clarki lewisi*) as threatened throughout its range and designate critical habitat for this subspecies pursuant to the Endangered Species Act of 1973, as amended. The Service finds that the amended petition provides substantial scientific and commercial information to indicate that listing of this subspecies of cutthroat trout as threatened, throughout all or parts of its range, may be warranted.

DATES: The finding announced in this document was made on June 1, 1998. Comments and materials need to be submitted by August 10, 1998 to be considered in the 12-month finding.

ADDRESSES: Data, information, technical critiques, comments, or questions relevant to this amended petition should be sent to the Chief, Branch of Native Fishes Management, Montana Fish and Wildlife Management Assistance Office, 4052 Bridger Canyon Road, Bozeman, Montana 59715. The amended petition, its appendices, and bibliography are available for public inspection, by appointment, at the above address. Electronic copies of the amended petition and bibliography may be requested and received via e-mail from lynn_kaeding@fws.gov.

FOR FURTHER INFORMATION CONTACT: Lynn Kaeding, at the above address, or telephone (406) 582–0717.

SUPPLEMENTARY INFORMATION:

Background

Section 4(b)(3)(A) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*), requires that the U.S. Fish and Wildlife Service (Service) make a finding on whether a petition to list, delist, or reclassify a species, or to revise a critical habitat designation presents substantial scientific and commercial information to indicate that the petitioned action may be warranted. To the maximum extent practicable, this finding is to be made within 90 days of the receipt of the petition, and the finding is to be promptly published in the Federal Register. If the finding is positive, the Service also is required to commence a review of the status of the petitioned species.

On June 6, 1997, the Service received a formal petition to list the westslope cutthroat trout as threatened throughout its range and designate critical habitat for this subspecies pursuant to the Endangered Species Act of 1973, as amended. Copetitioners were American Wildlands, Clearwater Biodiversity Project, Idaho Watersheds Project, Inc., Montana Environmental Information Center, the Pacific Rivers Council, Trout Unlimited's Madison-Gallatin Chapter, and Mr. Bud Lilly.

On July 2, 1997, the Service notified the copetitioners that the Service's Final Endangered Species Act Listing Priority Guidance, published in the December 5, 1996, Federal Register (61 FR 64425), designated the processing of new listing petitions as a Tier 3 activity, i.e., of lower priority than completion of emergency listings (Tier 1) and processing of pending proposed listings (Tier 2). The Service further indicated that personnel and budget in the Service's Mountain-Prairie Region, which had been assigned responsibility for Service activities pertaining to the petition, would continue to be directed toward accomplishment of ongoing Tier 2 activities and Tier 3 activities for species judged to be in greater need of the Act's protection than westslope cutthroat trout. As these higher-priority activities were accomplished and personnel and funds became available, however, the Service would proceed with its 90-day finding on the westslope cutthroat trout listing petition.

On January 25, 1998, the Service received from the copetitioners an amended petition to list the westslope cutthroat trout as threatened throughout its range and designate critical habitat for this subspecies. The amended petition contained a substantial amount of new information in support of the requested action. In the amended petition, the copetitioners assert that the westslope cutthroat trout should be listed as threatened because the subspecies' present distribution and abundance are substantially reduced from historical conditions; remaining populations are small, widely separated, and continue to decline in abundance; and the threats to the survival of westslope cutthroat trout are pervasive and ongoing. The copetitioners indicate that threats to westslope cutthroat trout include habitat destruction from logging and associated road building; adverse effects on habitat resulting from livestock grazing, mining, urban development, agricultural practices, and the operation of dams; historic and ongoing stocking of nonnative fish species that compete with or prey upon westslope cutthroat trout or jeopardize the genetic integrity of the subspecies through hybridization; and excessive harvest by anglers. The copetitioners further assert that programs to protect and restore westslope cutthroat trout are inadequate or nonexistent, and populations of this fish continue to be threatened by a wide variety of ongoing and proposed activities.

The historic distribution of westslope cutthroat trout (Behnke 1992) in streams and lakes is not known precisely but can be summarized as follows: West of the Continental Divide, the subspecies is native to several major drainages of the Columbia River basin, including the upper Kootenai River drainage from its headwaters in British Columbia, through northwest Montana, and into northern Idaho; the entire Clark Fork River drainage of Montana and Idaho downstream to the falls on the Pend Oreille River near the Idaho-Washington border; the Spokane River above Spokane Falls and into Idaho's Coeur d'Alene and St. Joe River drainages; and the Salmon and Clearwater River drainages of Idaho's Snake River basin. The historic distribution of westslope cutthroat trout also includes disjunct areas in Washington (e.g., Methow, Entiat, and Wenatchee River drainages), in the John Day River drainage in Oregon, and in British Columbia. East of the Continental Divide, the historic distribution of westslope cutthroat trout includes the headwaters of the South Saskatchewan River drainage (United States and Canada); the entire Missouri River drainage upstream from Fort Benton, Montana, and extending into northwest Wyoming; and the headwaters of the Judith, Milk, and Marias Rivers, which join the Missouri River downstream from Fort Benton.

In the amended petition, the copetitioners assert that remaining, genetically pure populations of westslope cutthroat trout occur almost exclusively in small, isolated streams in mountainous areas, where the adverse effects of human activities on this subspecies and its habitat are negligible. In Montana, the region for which most data are provided, the copetitioners indicate that populations of genetically pure westslope cutthroat trout occur in about 3.5 percent and 1.5 percent of their historic stream habitat in the Kootenai River and upper Missouri River drainages, respectively. Similar percentages are reported for genetically

pure populations of the fish in other drainages in Montana. Additionally, only 8.3 percent of the 265 lakes believed to be historic habitat for westslope cutthroat trout in Montana are said to now have genetically pure populations. More common today are westslope cutthroat trout populations that have some degree of hybridization with introduced, nonnative trout. Recent investigations (Shepard et al. 1997) suggest that 90 percent of the remaining westslope cutthroat trout populations in Montana's upper Missouri River drainage have a high probability of becoming extinct within 100 years.

The copetitioners further assert that populations of westslope cutthroat trout now occur in 11 percent of historic habitat in Idaho and 41 percent in Oregon, although data on genetic purity are not available for most populations. The status of native populations of the species in Washington is largely unknown, although several populations were apparently confirmed by recent studies. About half of the few streams in Wyoming that are historic habitat for westslope cutthroat trout now have populations of this subspecies, but all are hybridized to some degree with stocked, nonnative trout. In Alberta and British Columbia, Canada, little is known about the status of native westslope cutthroat trout, although genetically pure populations have been found in the upper Kootenai River drainage.

Listing Factors

The following is a brief discussion of the five listing factors set forth in section 4(a)(1) of the Act and related regulations (50 CFR Part 424), and the applicability of these factors to the westslope cutthroat trout.

A. The Present or Threatened Destruction, Modification, or Curtailment of the Species' Habitat or Range

As indicated by the copetitioners, reproduction and survival of westslope cutthroat trout are adversely affected by increased stream sedimentation and temperatures and the alteration of natural stream flows that often result from logging and associated road building, livestock grazing, mining, urban development, agricultural practices, and the operation of dams. In many areas where this subspecies remains today, populations of westslope cutthroat trout are threatened by similar ongoing or proposed activities.

B. Overutilization for Commercial, Sporting, Scientific, or Educational Purposes

The copetitioners provide evidence that overfishing contributed to the decline in westslope cutthroat trout populations. Where present angling regulations and their enforcement are not adequate to protect remaining westslope cutthroat trout populations from overfishing, the continued existence of these populations may be threatened.

C. Disease or Predation

Whirling disease was recently detected in Montana and is believed to be responsible for a 90 percent decline in the rainbow trout population of the Madison River. The disease has also been found in Idaho, Oregon, and Washington. The copetitioners provide evidence that westslope cutthroat trout, close relatives to rainbow trout, are equally susceptible to whirling disease. Because there is presently no means to eliminate whirling disease or effectively control its spread, whirling disease may pose a threat to the continued existence of some westslope cutthroat trout populations. The copetitioners also provide evidence that, in some areas, nonnative fish species prey upon westslope cutthroat trout. Where the stocking of such nonnative species continues near areas inhabited by westslope cutthroat trout, and in areas where established populations of such nonnative fish species grow and spread, these nonnative fishes pose a threat to the continued existence of westslope cutthroat trout.

D. Inadequacy of Existing Regulatory Mechanisms

The copetitioners assert that the survival of westslope cutthroat trout is threatened by the absence of a comprehensive conservation strategy to protect and restore aquatic ecosystems and that designation of the subspecies as sensitive or of special concern by various management agencies has done little to control activities that degrade habitat and threaten remaining westslope cutthroat trout populations.

E. Other Natural or Manmade Mechanisms

The copetitioners provide evidence that hybridization with nonnative fish species is one of the most significant threats to the continued existence of westslope cutthroat trout. As the result of extensive stocking of nonnative species beginning in the 1800's and continuing in some areas today, such hybridization has occurred throughout much of the subspecies' range. Where the stocking of such nonnative species continues near areas inhabited by westslope cutthroat trout, and in areas where established populations of such nonnative fish species grow and spread, these nonnative fishes pose a threat to the continued existence of westslope cutthroat trout. The copetitioners also assert that the spatial separation of remaining westslope cutthroat trout populations precludes natural interbreeding and thereby increases the likelihood that these populations will become extinct due to limited genetic variability; and small sizes make these populations more vulnerable to extinction due to natural catastrophes such as floods, landslides, and fires.

Finding

The Service has reviewed the amended petition, as well as other available information, published and unpublished studies and reports, and agency files. On the basis of the best scientific and commercial information available, the Service finds that there is sufficient information to indicate that listing of the westslope cutthroat trout as threatened, throughout all or parts of its range, may be warranted. The Service believes that the decline of westslope cutthroat trout is due mainly to the destruction and adverse modification of habitat and the negative effects of stocked, nonnative fish species, as described above under the listing factors. However, the Service also believes that the present status of westslope cutthroat trout throughout its historic range is not well understood, particularly with regard to the genetic characteristics of many known populations, the possible occurrence of additional populations in areas that have not been studied, and the measures now underway to protect remaining populations. Within 1 year from the date the petition was received, a finding as to whether the petitioned action is warranted is required by section 4(b)(3)(B) of the Act. The petitioners also requested that critical habitat be designated for this species. If the Service's 12-month finding indicates that the petitioned action to list the westslope cutthroat trout is warranted, then designation of critical habitat will be addressed in the subsequent proposed rule.

References Cited

Behnke, R. J. 1992. Native trout of western North America. American Fisheries Society Monograph 6.

Shepard, B.B., D. Sanborn, L. Ulmer, and D.C. Lee. 1997. Status and risk of extinction for westslope cutthroat trout in the upper Missouri River basin, Montana.

North American Journal of Fisheries Management 17:1158–1172.

Author

The primary author of this 90-day finding is Lynn Kaeding (See **ADDRESSES** section).

Authority

The authority for this action is the Endangered Species Act of 1973, as amended (16 U.S.C. 1531–1544).

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Dated: June 1, 1998.

Jamie Rappaport Clark,

Director, Fish and Wildlife Service.

[FR Doc. 98–15317 Filed 6–5–98; 8:45 am]

BILLING CODE 4310–55–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

RIN 1018—AF01

Endangered and Threatened Wildlife and Plants: Proposal To List the Coastal-Puget Sound, Jarbidge River and St. Mary-Belly River Population Segments of Bull Trout as Threatened Species

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: The U.S. Fish and Wildlife Service (Service) proposes to list the Coastal-Puget Sound population segment of bull trout (*Salvelinus confluentus*) from the coastal drainages and Puget Sound in western Washington; the Jarbidge River population segment of bull trout from the Jarbidge River basin in southern Idaho and northern Nevada; and the St. Mary-Belly River population segment of bull trout in the St. Mary and Belly rivers in northwestern Montana as threatened with a special rule, pursuant to the Endangered Species Act of 1973 (Act). The Coastal-Puget Sound population segment, composed of 35 subpopulations of "native char", is threatened by habitat degradation, dams and diversions, and interactions with non-native fishes. The Jarbidge River population segment, composed of a single subpopulation, is threatened by habitat degradation from past and ongoing land management activities such as mining, road construction and maintenance, and grazing. The St. Mary-Belly River population segment, composed of four subpopulations, is threatened by the effects of water management such as dewatering, entrainment, and passage barriers at diversion structures, and interactions with introduced non-native fishes. The special rule allows for take of bull trout within the three population segments if in accordance with applicable State and Native American Tribal fish and wildlife conservation laws and regulations, and conservation plans. This proposal, if made final, would extend protection of the Act to these three bull trout population segments.

DATES: Comments from all interested parties must be received by October 8, 1998. Public hearings locations and dates are set forth in the **SUPPLEMENTARY INFORMATION** section.

ADDRESSES: Comments and material concerning this proposal should be sent to the U.S. Fish and Wildlife Service, Snake River Basin Field Office, 6 S. Vinnell Way, Room 368, Boise, Idaho 83709. Comments and material received will be available for public inspection, by appointment, during normal business hours at the above address.

FOR FURTHER INFORMATION CONTACT: Robert Ruesink, Supervisor, Snake River Basin Field Office, at the above address (telephone 208/378–5243; facsimile 208/378–5262).

SUPPLEMENTARY INFORMATION: Public hearings locations and dates are:

1. *Tuesday, July 7, 1998*, from 2:00–4:00 p.m. and from 6:00–8:00 p.m. at the Norman Worthington Conference Center at St. Martin's College, 5300 Pacific Avenue SE, Lacey, Washington.
2. *Thursday, July 9, 1998*, from 2:00–4:00 p.m. and from 6:00–8:00 p.m. at the Best Western Cotton Tree Inn, Mt. Adams Room, 2401 Riverside Dr, Mount Vernon, Washington.
3. *Tuesday, July 14, 1998*, from 2:00–until 4:00 p.m. and from 6:00–8:00 p.m. at Glacier Park Lodge, East Glacier, Montana.
4. *Tuesday, July 21, 1998*, from 2:00–4:00 p.m. and from 6:00–8:00 p.m. at Cactus Petes, 1385 US Highway 93, Jackpot, Nevada.

Background

Bull trout (*Salvelinus confluentus*), members of the family Salmonidae, are char native to the Pacific northwest and western Canada. Bull trout historically occurred in major river drainages in the Pacific northwest from about 41° N to 60° N latitude, from the southern limits in the McCloud River in northern California and the Jarbidge River in Nevada to the headwaters of the Yukon River in Northwest Territories, Canada (Cavender 1978; Bond 1992). To the west, bull trout range includes Puget Sound, various coastal rivers of British Columbia, Canada, and southeast Alaska (Bond 1992). Bull trout are wide-spread throughout tributaries of the Columbia River basin, including its headwaters in Montana and Canada. Bull trout also occur in the Klamath River basin of south central Oregon. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta and the MacKenzie River system in Alberta and British Columbia (Cavender 1978; McPhail and Baxter 1996; Brewin and Brewin 1997).

Bull trout were first described as *Salmo spectabilis* by Girard in 1856 from a specimen collected on the lower Columbia River, and subsequently described under a number of names such as *Salmo confluentus* and *Salvelinus malma* (Cavender 1978). Bull trout and Dolly Varden (*Salvelinus malma*) were previously considered a single species (Cavender 1978; Bond 1992). Cavender (1978) presented morphometric (measurement), meristic (geometrical relation), osteological (bone structure), and distributional evidence to document specific distinctions between Dolly Varden and bull trout. Bull trout and Dolly Varden were formally recognized as separate species distributional evidence to document specific distinctions between Dolly Varden and bull trout. Bull trout and Dolly Varden were formally recognized as separate species by the American Fisheries Society in 1980 (Robins et al. 1980). Although bull trout and Dolly Varden co-occur in several northwestern Washington River drainages, there is little evidence of introgression (Haas and McPhail 1991) and the two species appear to be maintaining distinct genomes (Leary et al. 1993; Williams et al. 1995; Kanda et al. 1997; Spruell and Allendorf 1997).

Bull trout exhibit resident and migratory life-history strategies through much of the current range (Rieman and McIntyre 1993). Resident bull trout complete their life cycles in the tributary (or nearby) streams in which they spawn and rear. Migratory bull trout spawn in tributary streams where juvenile fish rear from one to four years before migrating to either a lake (adfluvial), river (fluvial), or in certain coastal areas, to saltwater (anadromous), where maturity is reached in one of the three habitats (Fraley and Shepard 1989; Goetz 1989). Anadromy is the least studied life-history type in bull trout, and some biologists believe the existence of anadromous bull trout may be uncertain (McPhail and Baxter 1996).

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Department of Water Resources

EXECUTIVE SUMMARY

Current Status: The Ute ladies'-tresses (Spiranthes diluvialis) is an orchid that occurs in relatively low elevation riparian, spring, and lakeside wetland meadows in three general areas of the interior western United States: near the base of the eastern slope of the Rocky Mountains in southeastern and central Wyoming and north-central and central Colorado, and Montana; in the upper Colorado River basin, particularly in the Uinta Basin; and along the Wasatch Front and westward in the eastern Great Basin, in north-central and western Utah and extreme eastern Nevada. The total population is approximately 20,500 individuals. The riparian and wetland habitats required by this species have been heavily impacted by urban development, stream channelization, water diversions and other watershed and stream alterations that reduce the natural dynamics of stream systems, recreation, and invasion of habitat by exotic plant species. These activities are expected to intensify, threatening remaining Ute ladies'-tresses populations and habitats.

Habitat Requirements and Limiting Factors: The Ute ladies'-tresses is endemic to moist soils in mesic or wet meadows near springs, lakes, or perennial streams. The elevational range of known Ute ladies'-tresses occurrences is 4,300 and 7,000 feet (1,310 to 2,134 meters). Most of the occurrences are along riparian edges, gravel bars, old oxbows, and moist to wet meadows along perennial streams, but some localities in the eastern Great Basin are in similar situations near freshwater lakes or springs. Ute ladies'-tresses seem to require "permanent sub-irrigation", indicating a close affinity with floodplain areas where the water table is near the surface throughout the growing season and into the late summer or early autumn. The orchid occurs primarily in areas where the vegetation is relatively open and not overly dense or overgrown, although a few populations in eastern Utah and Colorado are found in riparian woodlands. Plants usually occur in small scattered groups and occupy relatively small areas within the riparian system. These preferred habitat features imply that the orchid requires early to mid-seral riparian habitats created and maintained by streams active within their floodplains. Suitable orchid habitat is being reduced in area and becoming increasingly fragmented due to conversion of land to urban and suburban uses and certain water and stream system management practices associated with municipal, agricultural, and recreational uses. The naturally small size and scattered distribution of Ute ladies'-tresses populations makes the species particularly vulnerable to the effects of habitat fragmentation and overall decline of suitable habitat.

Recovery Objective: The continued existence of the Ute ladies'-tresses along a stream system and in floodplain wet meadows requires either 1) direct manipulation of habitat to maintain necessary hydrologic and vegetation community conditions or 2) assurance of the continual creation and evolution of favorable habitat conditions resulting from natural stream dynamics. Of these options, the latter, ensuring the conditions that allow natural stream dynamics to create and maintain preferred orchid habitat, is in the long run the most dependable and ecologically desirable way to guarantee the viability of the orchid in perpetuity. Recovery objectives for the Ute ladies'-tresses include:

1. Obtaining information on life history, demographics, habitat requirements, and watershed processes that will allow specification of management and population goals and monitoring progress.

2. Managing watersheds to perpetuate or enhance viable populations of the orchid.

3. Protecting and managing Ute ladies'-tresses populations in wet meadow, seep, and spring habitats.

Actions Needed:

1. Define, manage, and restore watersheds, using watershed-based interagency, interdisciplinary teams as evaluation and planning aids.

2. Implement interim recovery actions for orchid populations associated with natural stream systems until watershed interdisciplinary teams are able to conduct evaluations and make planning and management recommendations.

3. Identify, protect, and manage populations that occur in wet meadow, seep, and spring sites.

4. Develop orchid population and habitat recovery goals and delisting criteria incorporating information from watershed evaluations and genetic, life history, ecology, and habitat management studies.

5. Inventory remaining potential habitat.

6. Conduct genetic, life history, ecology, and habitat management studies.

7. Reintroduce orchids into appropriate sites.

8. Conduct public education on watershed and riparian area management, use of recovery and interdisciplinary teams, and orchid ecology.

Date of Recovery: Unknown

Total Cost of Recovery: Unknown

winter months. Two or more plants often occur in clumps. It is not known whether these clumps are composed of separate individuals or whether all arise from a single underground organ.

Reproduction appears to be strictly sexual, with bumble bees (Bombus spp.) as the primary pollinators (Dresler 1981, Sheviak 1984, Sipes et al., 1993). Flowers are protandrus (functionally male first and then female). The inflorescence always begins blooming with the bottom flower and proceeds upwards, sequentially. These features tend to maximize outcrossing due to the tendency of bees to visit the bottommost flower first and then proceed vertically up the spike. Successful conservation of the orchid will require protecting pollinator habitat in and around orchid populations and suitable habitat.

The apparent tendency for populations of the Ute ladies'-tresses to fluctuate dramatically from one year to the next makes it difficult to assess the population status and distribution. Due to the difficulty in finding vegetative individuals, monitoring is typically done by counting the number of flowering individuals. Monitoring at the Van Vleet population by the City of Boulder Open Space Department has been conducted since its discovery in 1986, with the exception of 1991. During that time, apparent population size, as indicated by the number of flowering individuals, has gone from a high of 5,435 in 1986 to a low of 1,137 in 1989 (Arft 1993).

Previous work by Wells (1981) on S. spiralis indicated that population size did not fluctuate when both flowering and vegetative plants were surveyed. Preliminary results examining both vegetative and flowering individuals at the Van Vleet site and at Dinosaur National Monument suggest that population size of the Ute ladies'-tresses is more stable than indicated by monitoring only flowering individuals (Arft 1993, Riedel 1992).

Research is necessary to elucidate the early life history stages of the Ute ladies'-tresses (from seed dispersal to seedling emergence and from seedling emergence to mature reproducing individual), identify limiting or vulnerable stages, and understand factors influencing successful completion of each life history stage. No matter what the original cause(s) of reductions in population that resulted in listing as a federally threatened species, improving population status will require identifying vulnerable and limiting life history stages and implementing measures to enhance the successful passage of individuals through those stages (Schemske et al. 1994).

E. Habitat/Ecology

S. diluvialis is endemic to moist soils in mesic or wet meadows near springs, lakes, or perennial streams. The elevational range of known orchid occurrences is 4,300 and 7,000 feet (1,310 to 2,134 meters) (Stone 1993). Most of the occurrences are along riparian edges, gravel bars, old oxbows, and moist to wet meadows along perennial streams, but some localities in the eastern Great Basin are in similar situations near freshwater lakes or springs (U.S. Fish and Wildlife Service 1991). Jennings (1990) and Coyner (1989, 1990) observed that the orchid seems to require "permanent sub-irrigation", indicating a close affinity with floodplain areas where the water table is

near the surface throughout the growing season and into the late summer or early autumn. This observation has been corroborated by ground water monitoring research conducted in Dinosaur National Monument (Martin & Wagner 1992) and in Boulder, Colorado (Tamara Naumann, pers. comm. 1993).

Ute ladies'-tresses occur primarily in areas where the vegetation is relatively open and not overly dense or overgrown (Coyner 1989, 1990 and Jennings 1989, 1990). A few populations in eastern Utah and Colorado are found in riparian woodlands, but the orchid seems generally intolerant of shade, preferring open, grass and forb-dominated sites instead. Plants usually occur as small scattered groups and occupy relatively small areas within the riparian system (Stone 1993). Common associated species in the eastern range (Colorado's Front Range) of the orchid include Agalinis tenuifolia, Agrostis stolonifera, Asclepias incarnata, Calamagrostis spp., Cirsium arvense, Equisetum spp., Lobelia siphilitica, Sisyrinchium spp., Solidago spp., Triglochin spp., and Verbena hastata. In the central section of the orchid's range (the Uinta Basin), common associated species are Agrostis stolonifera, Calamagrostis spp., Carex spp., Cirsium spp., Dactylis glomerata, Epipactis gigantea, Equisetum spp., Oenothera elata, Prunella vulgaris, Salix exigua, and Solidago canadensis. Species commonly associated with the orchid in the western part of the range (the Wasatch Front and the eastern Great Basin) include Agrostis stolonifera, Alnus incana, Aster hesperius, Carex spp., Castilleja exilis, Cirsium arvense, Equisetum laevigatum, Juncus spp., Melilotus spp., Populus angustifolia, Salix spp., Solidago occidentalis, and Trifolium pratense.

Soils typically range from fine silt/sand to gravels and cobbles. The orchid is sometimes found in highly organic or peaty soils. It is not found in heavy or tight clay soils or in extremely saline or alkaline soils (pH >8.0).

The orchid appears to be well adapted to disturbances caused by water movement through floodplains over time (Tamara Naumann, pers. comm. 1992, Lynn Riedel, pers. comm. 1994). It often grows on point bars and other recently created or "raw" riparian habitat. It is tolerant of flooding and flood disturbance. For example, point bars and backwater areas (old oxbows, side channels, etc.) are often flooded for several months in the spring during snowmelt. At least one-third of the Hog Canyon population is buried under flood debris (1 to 8 cm of sandy debris was deposited by an August, 1993 flood) every few years (Lynn Riedel, pers. comm. 1994).

Once established, the orchid appears to be tolerant of somewhat drier conditions (Riedel 1992), but loses vigor and may gradually die out if the groundwater table begins to consistently drop during late summer (Riedel 1992, Anna Arft, University of Colorado, pers. comm. 1994).

Some of the sites where the orchid occurs have a history of and are currently managed for agricultural uses, typically late winter and early spring grazing and mowing for hay. These sites may be naturally wet meadows or may be supplied with irrigation water.

The habitat alteration resulting from agricultural use (such as from mowing, grazing, and burning) may be beneficial, neutral, or detrimental to the orchid

(McClaren and Sundt, 1992). In Colorado, the largest population of the orchid is on City of Boulder Open Space at the Van Vleet site, a floodplain meadow, which has been used agriculturally for the past 50-75 years. This site is still grazed each year in the winter from February to May, irrigated in the spring and early summer, and mown in the summer around the beginning of July. When these activities were discontinued at a similar site in Boulder, exotic species such as Canada thistle proliferated and the orchid disappeared. Resumption of traditional agricultural uses has since reduced the thistle infestation and the orchid has reappeared (Tamara Naumann, pers. comm. 1994). Grazing and mowing seem to promote flowering, presumably by opening the canopy to admit more sunlight. However, these management practices may impede fruit set by directly removing flowering stalks, enhancing conditions for herbivory of fruits by small mammals such as meadow voles, or altering habitat required by bumble bees, the primary pollinator (Arft 1993).

What is known about the habitat preferences of the Ute ladies'-tresses is consistent with the following model for natural population establishment and maintenance. This model is based upon observations and recent research since listing the Ute ladies'-tresses as a threatened species:

Ute ladies'-tresses habitat is found along freshwater streams emerging from the flanks of mountains where the streambed is beginning to level out and meander within a developing floodplain. These streams are very dynamic. They are subject to seasonal flooding from snowmelt and intermittent heavy thunderstorms. Due to variations in snowpack, these streams experience fairly frequent severe (overbank) flooding sufficient to cause movement of the stream channel within its floodplain.

The orchid colonizes early successional riparian habitats such as point bars, sand bars, and low lying gravelly, sandy, or cobbly edges. As the stream channel changes location and depth, the orchid persists in those areas where the hydrology provides continual dampness in the rooting zone throughout the growing season. These areas include old oxbows, side channels, or older stream channels that have been filled in with alluvial material but which still have a hydrologic connection, through groundwater, to the stream system.

The orchid is tolerant of a mix of wetland forb and grass species, is not tolerant of long term standing water, and does not compete with emergent plant species (e.g., cattails) or aggressive species that form dense monocultures such as Canada thistle or reed canarygrass.

Throughout the historical range of the orchid, the lower mountain flanks and associated riparian areas provide winter range for native ungulates. It is likely that late winter and early spring grazing by native ungulates (bison, elk, and deer along the Front Range, big horn sheep, elk, and deer along the south slope of the Uintas and west slope of the Wasatch Range) in riparian areas historically helped maintain the vegetation community in a condition favorable for the orchid (i.e., prevented excessive buildup of live and dead vegetation). Native ungulates typically follow the snowline (greenline) upslope as spring arrives, thus historically did not stay in orchid habitat in large numbers throughout the summer. Predators also likely kept native

ungulates from excessive congregation in riparian habitats throughout the year.

As the stream channel continues to change over time, becoming deeper relative to an orchid site due to downcutting or sediment deposition or moving laterally farther away from an orchid site, seasonal hydrology also changes so that an orchid site experiences drier conditions. This causes the vegetation community to become dominated by upland grass and forb species. With time, riparian trees may establish and shade orchid sites as well. Under these conditions, the orchid is less competitive and begins to die out.

Ute ladies'-tresses are expected to be scattered along stream systems and associated floodplain areas with appropriate hydrology. A particular orchid occurrence will persist as long as hydrologic and vegetation community conditions remain favorable. The longevity of an orchid occurrence at any particular location likely ranges from a few years to more than 100 years. Thus, over decades, it may not be possible to determine exactly where an orchid population will be encountered along a stream because the stream channel and associated riparian area will always be changing. However, as long as these dynamic conditions continue, the orchid will dependably occur along the stream system where favorable habitat is found.

As mentioned, the model described above is consistent with what is now known about the habitat preferences of the Ute ladies'-tresses. However, many populations of the orchid, particularly those along the Front Range of Colorado, exist under habitat conditions that are maintained by management activities such as irrigation and grazing rather than by natural stream processes. Other populations occur in association with isolated seeps and springs. Many aspects of this model have yet to be verified. It is expected that this model will be refined as new information becomes available through ongoing and proposed research.

Based on this model, the continued existence of the orchid along a stream system requires either (1) direct manipulation of habitat to maintain necessary hydrologic and vegetation community conditions (e.g., by irrigation or stream channel manipulation, and mowing, grazing, or other vegetation management methods) or (2) assurance of the continual creation and evolution of favorable habitat conditions resulting from natural stream dynamics. Of these options, the latter, ensuring the conditions that allow natural stream dynamics to create and maintain preferred orchid habitat, is in the long run the most dependable and ecologically desirable way to guarantee the viability of the orchid in perpetuity.

F. Reasons for Listing

Orchid species are never common. The Ute ladies'-tresses historically occurred over a wide range but was distributed as scatterings of small populations in suitable habitat within this range. It never dominated local vegetation communities. As previously described, the orchid depends upon natural stream processes, and likely also natural ungulate population levels and behavior, to create and maintain habitat. Both of these environmental

features have been dramatically altered since settlement of the west by Europeans. Ungulate populations have been driven from winter range by agricultural activities and urban development. Orchid habitat is now grazed by cows, sheep, or horses, and both timing and intensity are different, than grazing patterns of native ungulates. Stream processes have also been severely altered. Reservoirs, dams, and diversions have removed water from stream systems, completely dewatering some reaches, and changed their hydrographs (magnitude and timing of flow). Streams have been channelized, streambanks rip-rapped, and floodplains converted for agriculture or urban development. The Ute ladies'-tresses continues to survive either where streams are still in a somewhat natural condition within a floodplain, or where conditions mimic naturally created and maintained habitat. For example, the orchid can be found along old gravel pits that have been restored as wetlands, in irrigated pastures, and below leaky diversion dams and irrigation canals.

Urbanization is one of the primary threats to the orchid. Urbanization continues to expand along streams and within floodplains. Both undeveloped habitat and agricultural areas near where the orchid exists or where it could exist are being converted to urban and suburban land uses. This is limiting the distribution of habitats sufficient to support viable populations as well as restricting the range of the species. Colorado's Front Range and Utah's Wasatch Front are two of the fastest growing urban areas in the nation. The orchid has been extirpated from some areas along the Wasatch Front and the Front Range. For example, except for two small populations in wetlands near Utah Lake and the recently discovered population along Diamond Fork, all known historic populations of the orchid along the Wasatch Front are presumed extirpated, as are all but one (rediscovered in 1994) in the eastern Great Basin. Two of the four historic populations in Colorado are also extirpated (Coyner 1989, 1990; Jennings 1989, 1990, U.S. Fish and Wildlife Service 1991). The conversion of potential habitat is occurring at a rapid, and increasing, pace.

Increasing demand for water, both for agriculture and for municipal and industrial uses, is also a severe threat to the orchid. In Colorado and Utah, water developers are planning water projects on most of the remaining undammed streams or stream reaches. Water is managed to optimize urban and agricultural uses. Water law and precedent, and water development interests, make it difficult to retain or reinstitute instream flows, particularly flows that mimic or reflect natural hydrographs.

Recreational uses of streams and riparian areas are increasing as nearby urban populations increase. Management of streams for introduced game fish by moderating stream dynamics to produce even rather than varying flows and low sediment loads may impede creation and maintenance of orchid habitat. Recreational uses within riparian areas can trample orchids, cause compaction resulting in changes in hydrology, and encourage proliferation of weedy species. Although it is possible in some cases to manage streams to accommodate both the orchid and recreational activities including game fishing, efforts to do so have not been seriously initiated to date.

Invasion of exotic species into orchid habitat poses a serious threat to the species' viability. The Ute ladies'-tresses does not tolerate dense competing vegetation. In the large Boulder populations, unchecked Canada thistle growth prevents orchids from flowering and reproducing. Other exotic species common to Ute ladies'-tresses habitat that cause similar detrimental effects include purple loosestrife (Lythrum salicaria), whitetop (Cardaria spp.), Russian olive (Eleagnus angustifolia), and reed canarygrass (Phalaris arundinaceae).

The orchid's pattern of distribution as small, scattered, groups and its restricted habitat make it vulnerable to both natural and human-caused disturbances. Localized catastrophic events have the potential to extirpate individual populations. It is not known if many of the species' smaller scattered populations are of sufficient size to ensure their continued existence over the long term, particularly the populations in Capitol Reef National Park along the Fremont River (2 individuals in 1993), at Willow Springs, Utah (1 individual found) and along Bear Creek in Wyoming (16 individuals).

The Ute ladies'-tresses appears to have a very low reproductive rate under natural conditions (Coyner 1991). Many orchid species take 5 to 10 years to reach reproductive maturity, and this is probably true for S. diluvialis. Reproductively mature plants do not flower every year. These life history and demographic features make the species more vulnerable to the combined impacts of localized extirpations, diminishing potential habitat, increasing distance between populations, and decreasing population sizes (Belovsky et al., 1994).

The present condition of the Ute ladies'-tresses is indicative of the health and condition of watersheds and streams throughout its range. Other species dependent upon the same habitats, for example native fish and amphibian species, are also in trouble. Appropriate watershed and stream management can be beneficial to many species, not just the Ute ladies'-tresses, while improving other watershed functions such as water quality.

G. Conservation Measures

Many conservation measures have already been undertaken for this rare orchid, including expanded inventories, research projects, land management efforts, and development of regulatory mechanisms.

Inventory. Inventories for the species have been or are being conducted in Utah, Colorado, Nevada, Wyoming, and Montana. These inventories have resulted in several new discoveries or relocations of historic occurrences, including: every major drainage in the Uinta Basin (Franklin 1993); the Diamond Fork and Spanish Fork Rivers (Stone 1993, L. Gecy, RMI, in litt., 1994), and along the Provo River (Robert Johnson, Dugway Proving Grounds, pers. comm. 1994) on the Wasatch Front; at Willow Springs in Utah's west desert (eastern Great Basin) (Doug Stone, pers. comm. 1994); along St. Vrain Creek (Steven Peterson, Western Resource Development, pers. comm. 1993), upstream in Clear Creek (Chris Pague, Colorado Natural Heritage Program, pers. comm. 1993) and in the Cache La Poudre River drainage (K. Manci, City of Fort Collins, in litt., 1993) in Colorado's Front Range; and in the Bear Creek drainage in Wyoming (Ernie Nelson, Rocky Mountain Herbarium, pers. comm. 1994). These discoveries

PART II RECOVERY

A. Objective

Description and Rationale. This recovery plan seeks to address Ute ladies'-tresses recovery by maintaining and restoring the ecological processes that create and maintain good orchid habitat. It describes a process for watershed level planning and management designed to achieve the goal of maintaining and restoring watershed conditions for the long-term persistence of the orchid throughout its known historical range. This is an attempt to interpret and define "ecosystem management" and apply it to the recovery of a species. The focus on watershed level planning and management is necessary because it is watershed conditions and processes that create and maintain habitat for the orchid. Many other species of special concern are affected by watershed conditions and management, and their needs can be coordinated with and met through efforts made to recover the Ute ladies'-tresses. For natural viability, the orchid is considered to require, and to be, an indicator species of streams in a state of dynamic equilibrium with their physical settings. Therefore, accomplishment of Ute ladies'-tresses population goals is expected to require management of streams and their watersheds consistent with natural stream flows and hydrography, stream gradients, soils, etc. Both population levels and amount of suitable habitat for the orchid within a watershed are expected to fluctuate over time.

Recovery of the Ute ladies'-tresses and removal from the list of endangered and threatened species will be accomplished when it is demonstrated that:

1. Viable populations throughout its historic range and representative of its genetic endowment are maintained in riparian habitats of streams in a state of dynamic equilibrium.

2. Wet meadow, seep, and spring habitats are protected and managed so as to sustain viable populations.

The objectives of this recovery plan are to determine the number, size, and distribution of viable populations, level of protection, and watershed and habitat management practices required to achieve recovery of the orchid and establish procedures and processes for accomplishing recovery goals.

This recovery plan does not set specific population goals (Task 1.6) for the Ute ladies'-tresses at this time because:

1. Population levels and viability are determined by habitat conditions created and maintained by natural watershed processes. Therefore, the significance of population size and distribution within a watershed can only be assessed in terms of the ability of the watershed to perpetuate it. Recovery targets must include certain habitat and watershed factors as well as orchid population size. However, the linkages between watershed processes, habitat conditions, and population response are complex and not completely understood. As more information is obtained,

Strategic Goals and Guidelines. Strategic goals for achieving Ute ladies'-tresses population restoration and long-term, natural persistence of the orchid throughout its known historical range include:

1. Maintain options for future recovery by ensuring that secure, well-distributed, and diverse natural habitats and co-adapted populations, and local examples of natural ecosystem processes, remain in place over the long-term;

2. Secure existing populations of riparian and aquatic species, with particular emphasis on sensitive species, and maintain the critical areas supporting healthy ecosystem function;

3. Institute recovery measures that stand the greatest chance of producing measurable improvements in the status and abundance of the orchid and other associated riparian plant species, and improvement of ecosystem function, in the near term.

Population restoration guidelines include:

1. Identifying and securing habitats that are critical for maintaining existing populations of the orchid. (Note: securing includes actions such as purchase, easements, and management agreements that ensure that orchid viability needs are met.)

2. Controlling the cause rather than the symptoms of habitat degradation. In some cases mechanical restoration, such as recreating meander patterns or rerouting the stream back into an historical channel, may be beneficial in the short term to allow long term natural processes to take root.

3. The use of transplanting and ex-situ propagation and reintroduction of stocks of the orchid should only be used as a last resort or to restore extirpated populations and should be avoided where reproductive potential remains.

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effort involving the U.S. Fish and Wildlife Service Idaho Field Office, the Bureau of Land Management Idaho State Office, Regions 1 and 4 of the U.S. Forest Service, and the State of Idaho. The strategy was prepared by a Technical Work Group that included representatives from the U.S. Forest Service, Idaho Department of Fish and Game, Bureau of Land Management, Idaho Division of Environmental Quality, and the U.S. Fish and Wildlife Service. The Ute ladies'-tresses orchid Recovery Team would like to acknowledge and express appreciation for the contribution made by the interagency group that authored the Bull Trout Conservation Strategy. The document is an excellent example of ecosystem-level thinking applied to restoration and management of a species in trouble.

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Anadromous Fish Instream Flow Needs and Conflicts within the Sawtooth National Recreation Area

December 1981

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I. INTRODUCTION

Within the Sawtooth National Recreation Area (SNRA), the anadromous fishery includes migratory runs of chinook and sockeye salmon, and steelhead trout. Commonly occurring co-inhabitant resident gamefishes include rainbow, brook, and cutthroat trout, Dolly Varden and mountain whitefish. Each of these fish are characterized by different habitat management criteria necessary to provide for the species and its habitat requirements. Traditionally, U.S. Forest Service fishery programs concerned with the headwaters of the Salmon River have been oriented primarily toward chinook salmon and steelhead trout, both highly desirable game and commercial fish. However, management programs which have improved the condition of anadromous fish habitat most often benefited the resident (non-migratory) species present as well.

Historically, the upper Salmon River and its tributaries provided some of the highest quality spawning and rearing habitat for anadromous fish in the State of Idaho (Figure 1). Once, these migratory fish were destined to travel over 800 miles to the upper Salmon River spawning grounds on a journey relatively free of obstructions. Now both fish passage and critical life cycle phases essential to their existence are inhibited by Columbia and Snake River dams and degradation of habitat in much of the drainage.

Tributary dams, irrigation diversions, poor logging, farming and grazing practices, dredge mining, and a host of other factors eliminated, or severely degraded, valuable salmon and steelhead habitats throughout the Columbia Basin. Further development of these activities continues to threaten the existence and propagation of these fish, even in the Sawtooth National Recreation Area. With development of hydroelectric power in the Columbia and Snake Rivers accounting for mortalities of up to 15% of both adult and juvenile salmon and steelhead at each major dam, special concern regarding maintenance and management of headwaters habitat is essential.

Within the boundary of the SNRA, by far the greatest impacts on anadromous fish and their habitats are the effects of water diversions and related instream flow problems. Irrigation became a major impact affecting the upper Salmon River soon after the first ranch appeared in Sawtooth Valley in 1899. Irrigation grew rapidly between 1905 and 1930 as almost all valley lands were taken up under the Homestead Act. Since 1930, the number of acres of irrigated land has gradually increased and the demand for irrigation water has increased proportionately. In some cases the increased demand has resulted in the diversion of the entire stream, leaving the natural channel completely dry. The impacts of dewatering these natural channels below the diversions include (1) direct losses of valuable spawning and rearing habitats; (2) deprivation of access to historically important upstream spawning and rearing habitats; (3) impediments to downstream migration and dispersal of juvenile fish; (4) disruption of aquatic ecosystems brought about by the annual recurrence of unnaturally low flows.

LOCATION MAP

Figure 1

This map shows the location of the Sawtooth National Recreation Area and the Upper Main Salmon River Area within the Columbia River Basin Drainage.

Public Law 92-400 enacted in 1972 established the SNRA and directed the Secretary of Agriculture to administer the area in a manner that will best provide for the protection and conservation of the salmon and other fisheries. As a result, this investigation was initiated to evaluate the impacts of current irrigation demands on anadromous fish and their habitat within the SNRA.

Initially eight streams were known to be impacted by irrigation diversion. The eight streams selected for study include: Salmon River, Alturas Lake Creek, Pole Creek, Elk Creek, Trap Creek, Fourth of July Creek, Champion Creek and Fisher Creek (Figure 2). These streams were thought to include all of the most valuable anadromous fish habitat within the SNRA impacted by irrigation diversion. Further habitat inventory suggests similar investigations should be conducted in Beaver Creek and Iron Creek. Subsequent evaluation of the anadromous fish habitat in Fisher Creek determined that it offers little anadromous fish habitat and has a low potential for improvement; therefore, study of instream flow requirements for fish in Fisher Creek was deleted from this investigation.

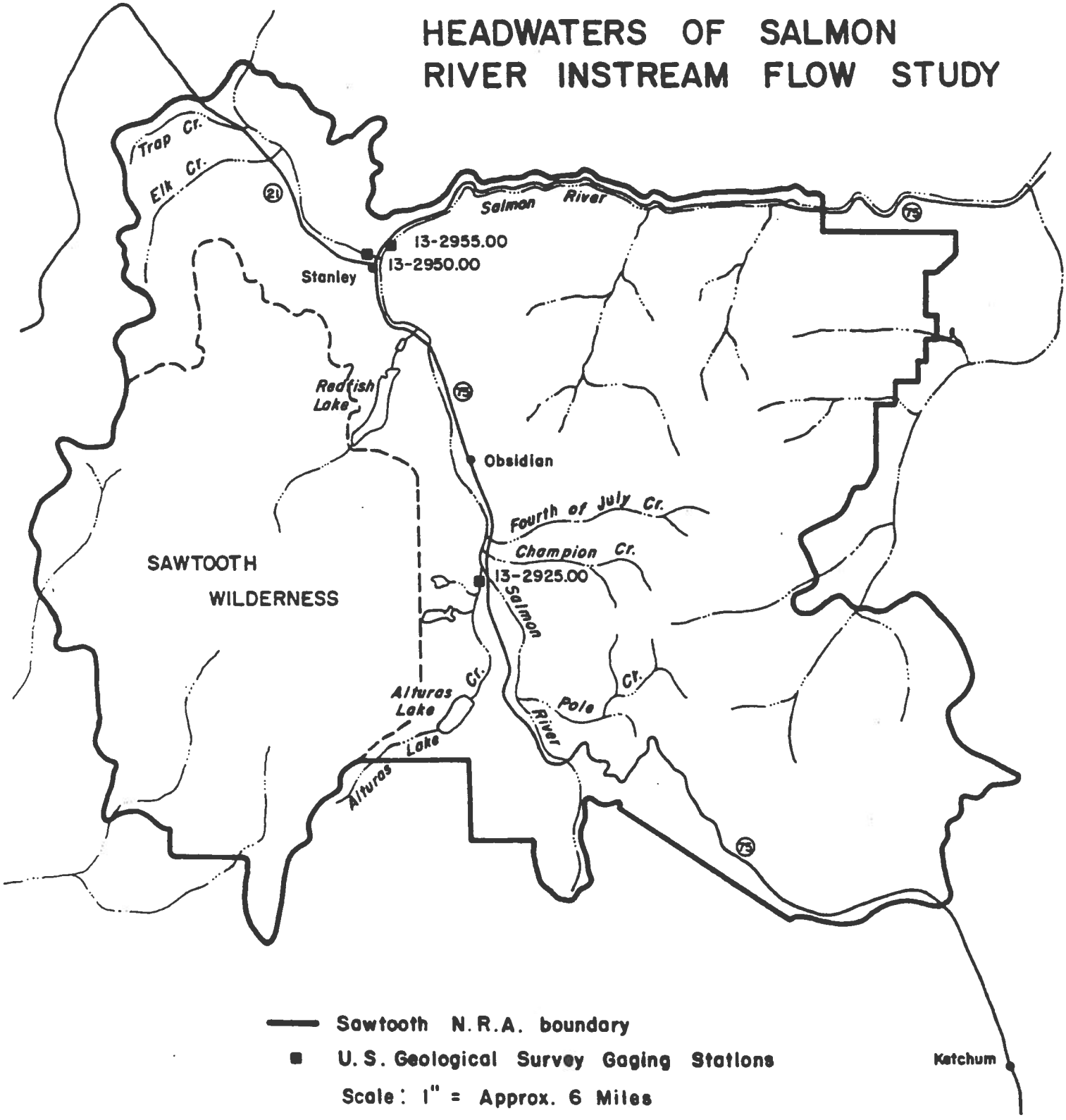

Figure 2

Map of study area. Study streams and gaging stations used for flow projections are labeled.

II. OBJECTIVES

The primary objective of the study is to identify the impacts of irrigation diversion practices on anadromous fish and their habitat within the SNRA. Information needs to meet this objective include definition of:

1. The amount of water that is naturally produced from the study watersheds, to determine how much water is available for all uses;

2. The amount of water being used for irrigation, to determine the portion of streamflow not available to fish;

3. The amount of water irrigators actually divert compared to their legal right, to determine any conflicts between actual and legal use;

4. The minimum streamflow to pass salmon through critical reaches and/or provide flow regimes for salmon spawning and egg survival needed to provide 90% or more of the habitat's inherent smolt production.

III. METHODS/ASSUMPTIONS

A. Flow Characterization. The purpose of this phase of data collection is to document the amount of water normally produced by the study watersheds above the diversions (i.e. virgin flows), to determine the total water available for all uses. This is evaluated in terms of the 75-percentile monthly flow characteristics. The 75-percentile monthly flows indicate that 75 percent of the days in that month will have an average daily flow equal to or greater than that flow. This type of flow characterization was selected for this study because flow estimates produced are more conservative than "mean monthly flow" values typically used. It is necessary to use these conservative figures in evaluating fishery needs because delays in spawning migration of anadromous fish have deleterious impacts on production. Using mean monthly flows would result in many days during which the flows were lower than indicated, and the fishery resource would be impacted by low flows much sooner than the mean monthly flow would indicate. This is especially true in the upper Salmon River basin where the hydrograph rises and descends rapidly during a short period of peak flows from relatively stable low flows.

Flow characteristics are derived by using statistical analyses on historical streamflow records from nearby, suitable gaging stations. Not all gaging stations within a watershed are suitable for flow determinations since these

flows are highly dependent on the watershed's physical and hydrologic characteristics. Of the thirteen U.S. Geological Survey streamflow gages that have been operated in the Salmon River basin above Challis, ten were discarded as being unrepresentative for the purposes of characterizing flows for the study watersheds.

To determine the gages which were representative of each study site, flow was correlated with drainage area several times using different combinations of the thirteen stations. The results of these regressions were then compared to actual virgin flow measurements. The resulting hydrograph of flows for a drainage area the size of the watershed above the virgin flow station was scrutinized for similarity to the measured runoff characteristics. The reasons for discarding the ten stations are:

a. Salmon River near Obsidian was too heavily impacted by diversions to give reliable summer flow estimates.

b. Yankee Fork Salmon River, Salmon River below Yankee Fork, Thompson Creek, Bruno Creek and Squaw Creek are hydrologically dissimilar to the Salmon River Basin above Stanley - the aspects of their watersheds produce hydrographs dissimilar to the Salmon River above Stanley.

c. Little Boulder Creek, Big Boulder Creek and East Fork of Salmon River are also hydrologically dissimilar to the Salmon River Basin above Stanley - the winters of East Fork Basin are much milder than the headwaters of the Salmon. Additionally, irrigation impacts affect the East Fork Salmon River summer flows.

d. Salmon River near Challis has such a large drainage area that the resulting flows regressed from the data of that gage were too large to comfortably use.

The three stations used are not perfect (Figure 2), but the representations appear reasonable and conservative. Alturas Lake Creek station has only four years of data, but the data is representative of the long term record. Valley Creek and Salmon River below Valley Creek are both impacted by diversions, but they are both far enough downstream from the diversions that recharge has reduced the impact on the gaged data.

Since only three stations remained, development of a relationship between flow and drainage area to predict flows for other sized watershed was judged to be unrealistic for most of the watersheds of interest.

For the Salmon River study site, however, flow predictions were based upon a regression of the data from Valley Creek, Salmon River below Valley Creek and Alturas Lake Creek because these three stations better represented its larger area.

The other study watersheds were considerably smaller, so flow characteristics were estimated from the nearest gaging station. Predicted flows are based on an areal proportion of the gaging station's measured flow. For example, if the watershed of interest is half the size of the gaged watershed, all predicted virgin flows were assumed to be half the gaged flows.

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Alturas Lake Creek flow predictions are based on an areal proportion of the Alturas Lake Creek flows. Pole Creek, Champion Creek, and Fourth of July Creek flow predictions are based on an areal proportion of the Salmon River below Valley Creek flows. Elk Creek and Trap Creek are based on an areal proportion of the Valley Creek flows.

The watershed areas above the "Virgin Flow Stations" were measured with an electronic planimeter. Drainage area was measured above the highest diversions to define the amount of water available for both irrigation and fish habitat maintenance. This results in a more conservative flow prediction, although not always significantly different, for the critical reach than if the entire watershed above the critical reach were considered. (A critical reach is a portion of the stream presenting a problem to anadromous fish passage because the water depth is too shallow, or it is a stream portion that presents a problem for spawning and/or egg incubation because the water velocity is too slow for egg survival. Typically, the critical reach is directly below the diversion, but sometimes it is further downstream where the channel widens and the stream gets shallower.)

B. Irrigation Practices. Quantification of the water diverted for irrigation began during the summer of 1979 and continued through the summer of 1980. Streamflow measurements were taken above the irrigation diversions on each priority stream and below the diversions in the critical reach. Consequently, this measurement takes into account both the water bypassing the diversion and the water recharged into the system between the diversion and the critical reach. This provides a better estimate of the water available for anadromous fish, and a more conservative estimate of the amount of water being diverted.

Discharge measurements were taken according to Book 3, Chapter A-8, Techniques of Water Resource Investigations of the United States Geological Survey, "Discharge Measurements at Gaging Stations". The midsection method was employed using a cloth tape to measure width, a top-set wading rod to measure depth and a Price current meter, a Pygmy current meter, or a Marsh-McBirney current meter to measure velocity, using at least 20 equi-distant sections.

The Idaho Department of Water Resources maintains files of water right applications, permits, licenses, and adjudications. Licensed and adjudicated water rights within the State of Idaho are tied to the land on which the water is put to beneficial use. Permitted water rights are the personal property of the applicant and may be disposed of separately from the land. The abstracts document the State filing number, the name of the original applicant, the name of the current owner of the property described as the place of use of the water, the state diversion number of the diversion that irrigates the place of use described in the right, the priority date of the right, the point of diversion and the place of use. Some of the points of diversion described in the water rights are not the current points of diversion. The water rights on file with the Department of Water Resources for the conflicting diversions are addressed in the following section for each study area.

C. Fishery Capability. In order to determine streamflows required to allow passage of adult anadromous fish upstream, a representative transect within the critical reach was selected for investigation on each stream. The transects selected are identified in Table 1 below.

Table 1. Representative transect selected within the critical reach on each study stream.

Stream	Station	Transect	Sample
Salmon River	3.6	3	2
Alturas Lake Creek	4.4	3	3
Pole Creek	2.0	3	1
Elk Creek	1.0	1	4
Trap Creek	3.0	3	1
Fourth of July Creek	1.0	5	3
Champion Creek	1.0	1	1

Stream stations were established below the lowest diversion on the stream system where the cumulative impact of multiple diversions could be evaluated. Each station consists of 5 transects 50 feet apart. The transect selected was most representative of the typical channel configuration of the impacted reach. Another important criteria considered in transect selection was that the projected required passage flows be reasonable considering historical fish passage flows.

Discharge data were collected at the selected transects for a variety of flows. The data sample chosen and analyzed for each station was most representative of what the investigators believed to be the marginally acceptable passage flow.

The Oregon Method (Thompson, 1972) was employed to guide establishment of criteria that would address adult passage requirements. For adult passage, the minimum depth criteria to be applied must be present over 25% of the stream width and contiguous over at least 10% of the stream width at a representative transect. The minimum depth criteria recommended by Thompson was 0.8 feet for chinook salmon, and 0.7 feet for sockeye salmon and steelhead trout.

Based on the experience of past and present Sawtooth NRA fish biologists it was felt that these criteria were high for marginally acceptable adult fish passage. The depth criteria used in this study to determine marginal adult passage is 0.6 feet for all anadromous species. Additionally, in a stream section the flow velocity should not exceed 8.0 feet/sec.

To facilitate downstream juvenile fish passage, a marginal flow condition was determined by the relationship of the wetted perimeter and discharge. An average of three transects (numbers 1, 3 and 5) at the critical reach station, identified for each study stream in Table 1 was used to determine marginal flow conditions for downstream migrants because SNRA fish biologists evaluating the data felt this average provided a better estimate of the required flow than a single transect. Considering these three representative transects, the point at which wetted perimeter increases slowly while discharge increases rapidly will be considered marginally acceptable to provide for juvenile migration. This flow should maintain stable aquatic invertebrate populations, serving additionally as an ecosystem protection flow. The migration of juvenile anadromous fish is heavily influenced

by peaks and lows in the natural flow regime, therefore, the optimum condition most often is the natural flow. It was determined that flow conditions that would marginally provide for passage of adult fish would also meet the requirements of passage for juvenile fish, facilitating downstream migration without appreciable losses.

Criteria established for the purposes of determining available spawning habitat at different flows and complimenting incubation flows proved to be unadaptable to the computer methodology available during the preparation of this report. Assessment of spawning capabilities at varied flows was evaluated on the basis of the SNRA fish biologist's best judgement. The rationale used for determining spawning habitat capabilities at different flows will be discussed later in this section.

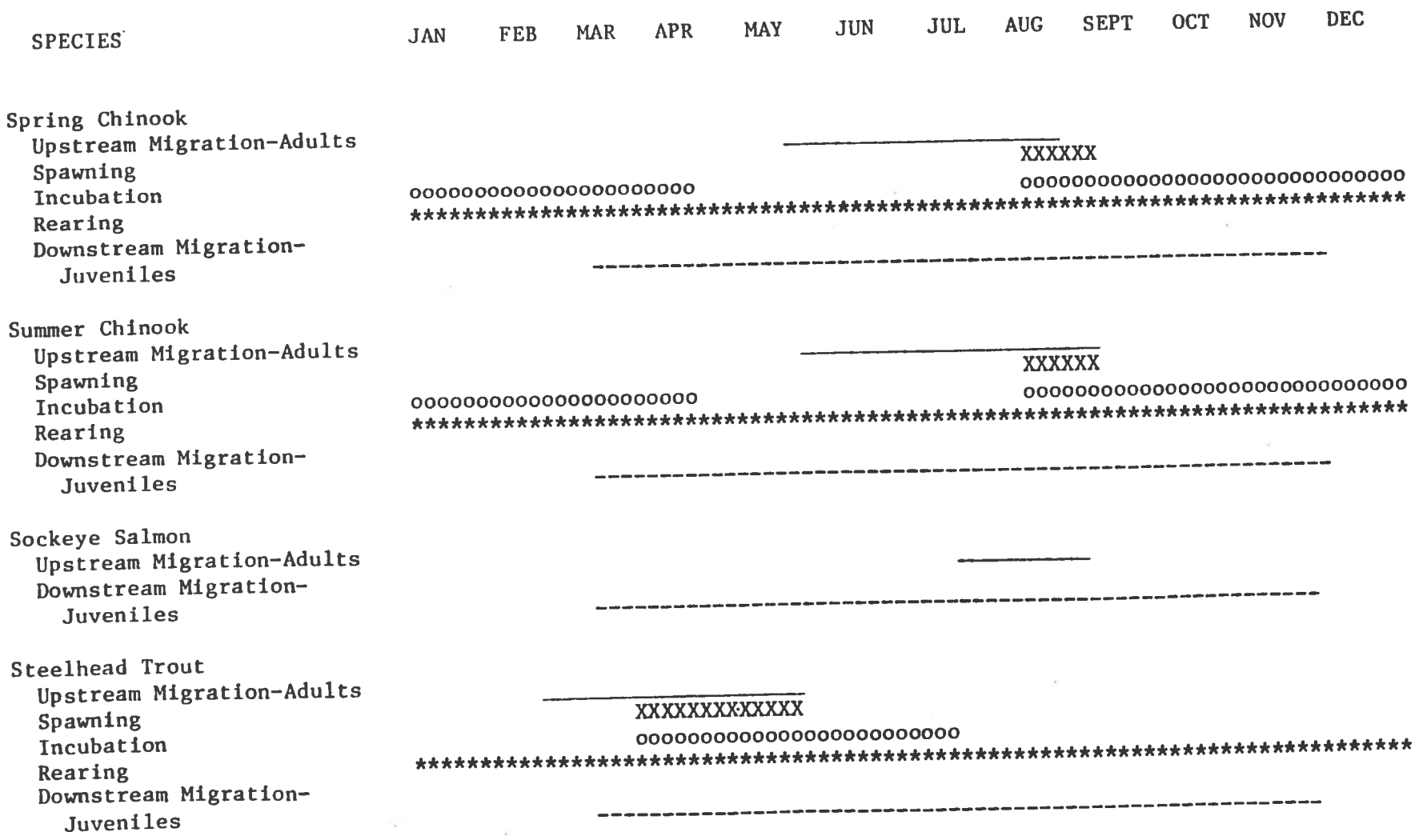
Also, current methodologies do not provide guidelines regarding reduced flows and freezing waters. Although at some study sites diversion does occur throughout the winter, it is not of beneficial use but due to faulty headgate structures and/or poor water management practices. Until techniques become available, a fish habitat maintenance flow equaling the natural flow will be recommended during periods November through April when freezing would be expected, and water isn't needed for irrigation.

Streamflows necessary to meet the marginal passage, spawning and incubation criteria were determined by use of the US Forest Service General Aquatic Wildlife System (GAWS) computer program as presented in The Transect Method of Stream Habitat Inventory: Guidelines and Applications (Dunham and Collotzi 1975). The portion of the GAWS output used for this study displays the channel cross-section and breaks down the discharge measurement into its depth and velocity components. Other desired surface water elevations can then be extrapolated over the channel cross-section to predict water depths, velocities and corresponding discharges. GAWS utilizes Manning's equation to make these predictions. In the program Manning's "n" (the roughness coefficient) and water surface slope are assumed constant because these variables are difficult to adjust with only one streamflow measurement. During this investigation each transect was measured at three different discharges which allowed for refinement of GAWS outputs by utilizing a variable roughness coefficient. The adjusted GAWS outputs are assumed to be relatively accurate predictions of streamflows required to meet the applied criteria.

The analysis of the impact on anadromous fish production due to reduced flows is presented relative to the capability of those flows to meet life history phase requirements for target anadromous species. A periodicity chart for these life history phases appears in Figure 3.

Stream reaches identified as anadromous fish habitat affected by altered flows were assigned capabilities of anadromous fish production assuming that the natural streamflow was always available. The productive capability is expressed as an estimate of the stream reach potential for accommodating redds of both chinook salmon and steelhead trout where appropriate. The estimated redd potential by stream reach was developed from the SNRA fish biologist's knowledge of: (1) amount of habitat available, (2) probable redd density (habitat quality) for that habitat based on redd densities in affected and similar stream reaches monitored by the Idaho Department of Fish and Game and Forest Service biologists (Salmon Spawning Ground Surveys, 1954-1979) (3) effects of inter-specific competition and predation, and (4) the ability of virgin flows to provide for the requirements of life history phases.

Figure 3. Periodicity Chart for Anadromous Fish Species Inhabiting Study Streams Within the Sawtooth National Recreation Area



Reducing instream flow below virgin flow can be expected to result in an impact on the potential for fish production. The value of the anadromous fishery resource in stream reaches affected by depletion of instream flow was determined by estimating spawning potential at reduced flows. This is based primarily on the amount of water remaining instream relative to the natural flow available. For example, the reach of the Salmon River from the S-45 diversion downstream to the confluence with Alturas Lake Creek is affected by reduced flows during the chinook spawning period. The potential for chinook redds in this reach was estimated by IDF&G and Forest Service biologists to be 650-750. Although the S-45 diversion dewaters a short reach of the Salmon River, recharge and other sources of water provide for a fraction of the spawning potential. IDF&G redd counts in this reach document up to 296 redds (nearly 50% of estimated potential in this reach) in the recent years of depressed chinook runs. If current water management can provide for 50% saturation of chinook redds, and the natural streamflow can provide for 100% of the potential; by passing 50% of the natural flow past the diversion approximately 75% of the spawning potential in this reach should be realized. Streamflows recommended to insure incubation of spawn deposited are assumed to be two-thirds of the flow available during the spawning period.

For cases where instream flow is reduced in the irrigation season beyond what is required during a life history phase a proportional impact on potential production is assumed. For example, dewatering a stream channel at the midpoint of the upstream migration period of adult chinook can be expected to result in a 50% reduction from saturation of redds beyond the diversion. In the absence of documentation, best judgement was used to construct curves describing percentage of the population completing a life history phase at any given point in time during the affected life history period for the entire population (Figure 4).

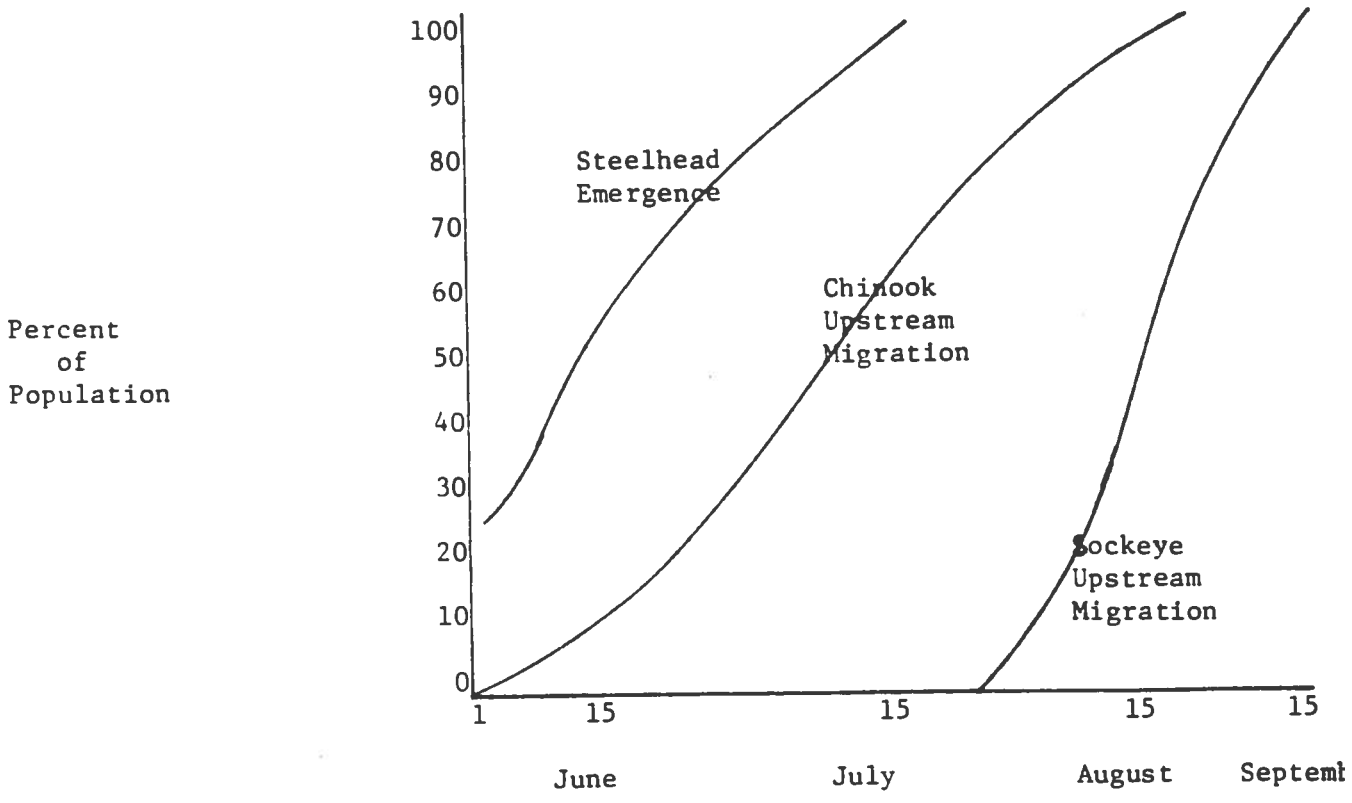


Figure 4. Percentage of the population completing a life history phase over time during the phase period for the entire population.

Because of life history cycle differences (i.e. steelhead migrate upstream earlier than salmon, bypassing critical reaches prior to reduced flows preventing passage), current water management practices have little impact on steelhead propagation relative to the impact on chinook salmon propagation. Therefore, estimates of redd potentials per stream reach for chinook salmon assume an existing viable population of steelhead trout for streams with suitable steelhead habitat. After fully or partially resolving the impacts of water management on chinook, the increased utilization by chinook will reduce the potential production of steelhead by some fraction as a result of competition and predation. Therefore, estimates of potential productive capability for steelhead trout assume chinook are not present, and as the chinook salmon utilization increases, it is assumed the potential for production of steelhead decreases as shown in Figure 5.

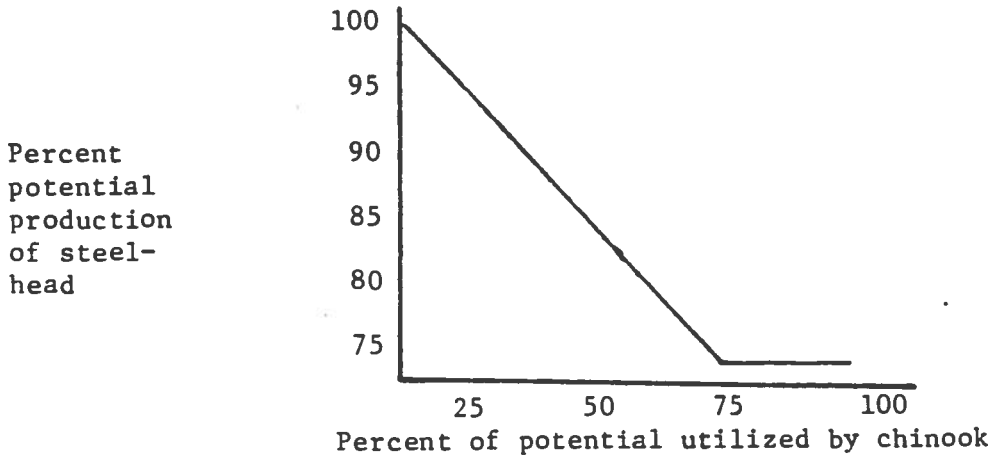


Figure 5. Decrease in steelhead production potential as utilization by chinook salmon increases.

For the purpose of evaluating diversion impacts on anadromous fish production a method of determining the economic value of the fishery resource was devised. It is assumed that each redd represents 2.5 adults escaping to the spawning grounds. Each escaping fish represents a net economic value of fish harvested elsewhere as calculated in Partial Net Economic Values for Salmon and Steelhead for the Columbia River Basin (Tuttle, Richards and Wahle, 1975). The 1977 net economic values, as yet unpublished but provided in 1980 by Reino Koski of National Marine Fisheries Service, are $294.23 per spring chinook and $271.26 per summer steelhead. Sockeye salmon are not valued for the assessment as sockeye numbers throughout the Columbia Basin are so depressed that they no longer provide for a viable commercial fishery. As sockeye runs are re-established the value of the fish will become an important factor to consider in economic analyses.

Perhaps some discussion should be presented here to assist the reader in understanding selection of "marginally acceptable" flows that provide for 90% or more of the habitat's inherent smolt production. This standard was

selected for two reasons. First, the Intermountain Regional Plan recognizes this as the minimum level of production we will manage for, and second, SNRA biologist evaluations suggest that as streamflow drops below these marginal conditions production rapidly becomes negligable.

IV. FINDINGS

Salmon River

The Salmon River originates high in the forested slopes of the Smoky Mountains. Draining some 89 square miles, the stream breaks into a broad U-shaped valley about six river miles above the virgin flow station. Most of the flow through the virgin flow station is the result of snowmelt. Several major tributaries contribute to the virgin flow.

Within the SNRA, the Salmon River proper provides water for nine active irrigation diversions. The uppermost two of these, designated as S-45 and S-46 (T7N, R14E, Sec. 3 and 10, Figure 6) have the greatest impact on anadromous fish production. These diversions regulate access by anadromous adults to 32 miles (65 acres) of ancestral spawning grounds and deplete water through 3.5 miles (15 acres) of valuable spawning beds below the diversions.

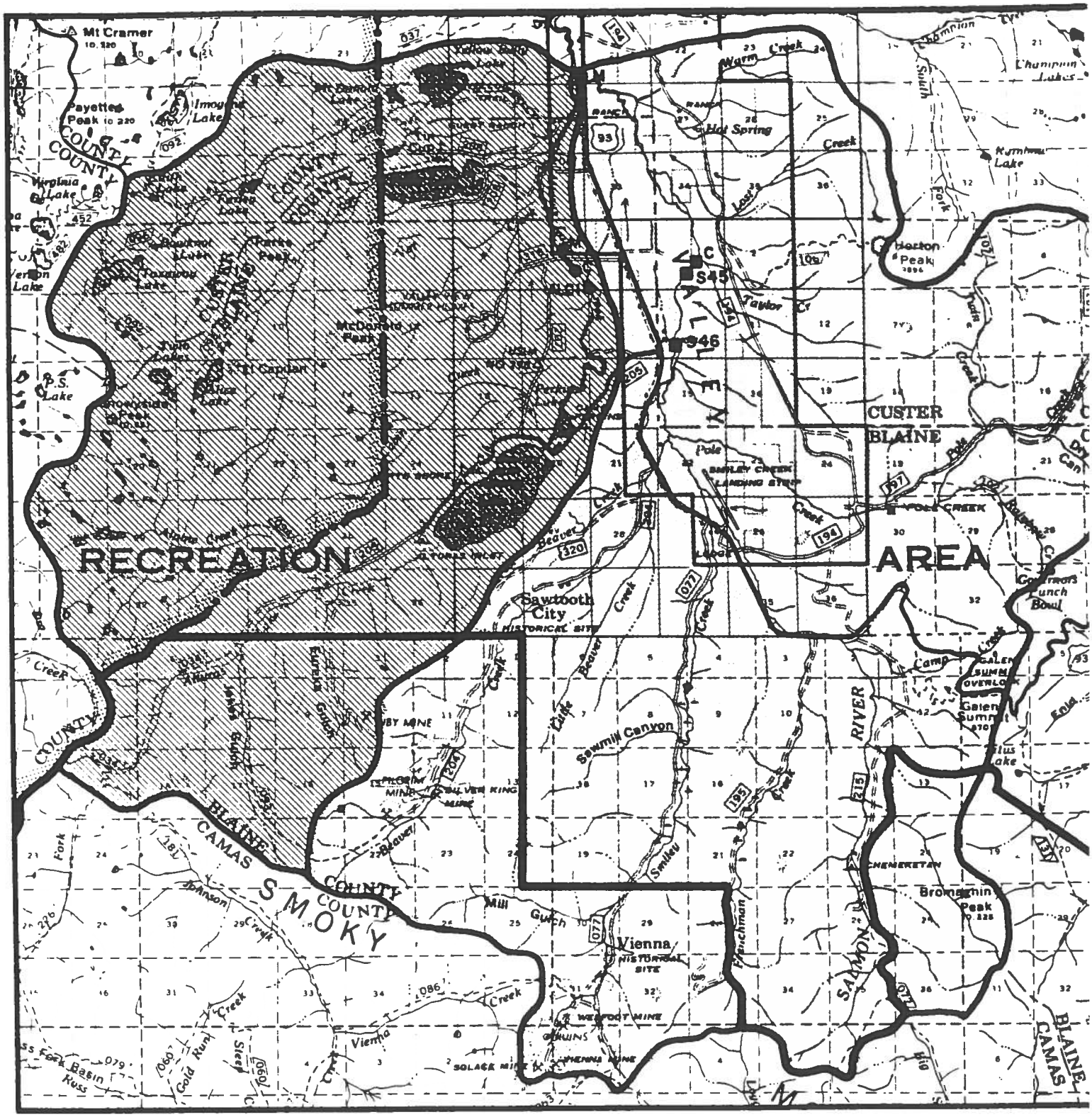
Flow Characteristics. Discharge above the uppermost Salmon River diversions (S-45, S-46) remains relatively constant from September through March, then rises dramatically to a peak in June, before more rapidly descending through July and August to the consistent low flows of fall and winter. The 75th percentile flows developed from a three point regression of USGS gage data from Valley Creek, Salmon River below Valley Creek and Alturas Lake Creek are presented in Table 2.

Table 2. Calculated 75th percentile flows in cfs for the Salmon River above S-46, developed from 3 point regression of USGS gages 132930.00, 132950.00, and 132955.00.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
52.1	42.4	44.2	59.0	231.9	316.4	104.5	50.7	37.6	46.3	48.5	44.9

Diversion Rights/Irrigation Needs. During the summer season, 16,010 acre-feet of water are diverted to irrigate 1,720 acres of pasture. The pasture is on well-drained, coarse textured soils with low to moderate water holding capacity. Permeability is moderate to rapid. The growing season is 80 to 100 days.

Watersheds of Alturas Lake Creek & Salmon River



LEGEND

(ALTURAS LAKE CREEK)		(SALMON RIVER)	
	Alturas Lake Creek Watershed		Salmon River Watershed
$\bullet^{M}$	Master Reference Station	$\blacksquare^{M}$	Master Reference Station
$\bullet^{C}$	Critical Reach	$\blacksquare^{C}$	Critical Reach
$\bullet_{ALC1}$	Alturas Lake Creek Diversions	$\blacksquare_{S45}$	Salmon River Diversions

The total abstracted water right for the two diversions (S-45, S-46) combined is 65.6 cubic feet per second (cfs). The capacities of the S-45 and S-46 ditches are 70 cfs and 50 cfs respectively. The combined volume of flow drawn by these ditches commonly exceeds the recorded rights. In June and July of 1979, when flows were below mean monthly flow values shown in Table 2, 80 to 105 cfs were diverted by S-45 and S-46 resulting in an almost complete dewatering of the Salmon River by the end of June. When available water is less than the demand at both points of diversion, diversion at S-46 is deferred downstream to S-45 so that the full water right or entire streamflow, whichever is less, is diverted at S-45. Consequently, aquatic habitat between the two diversions is not adversely affected.

The amount of water diverted to irrigate these 1720 acres is equivalent to spreading 9.31 feet (about 112 inches) of water over each acre during the period May through September. Article 15, section 42-220 of Idaho Water Laws and Regulations states "... that when water is used for irrigation, no such license or decree of the court allotting such water shall be issued confirming the right to the use of more than one second foot of water for each fifty acres of land so irrigated, unless it can be shown to the satisfaction of the Department of Water Administration in granting such license, and to the court in making such decree, that a greater amount is necessary, and neither such license nor any one claiming a right under such a degree, shall at any time be entitled to the use of more water than can be beneficially applied on the lands for the benefit of which such right may have been confirmed...". This law indicates that generally no more than 6.12 feet, or 73.5 inches of water could be applied per acre over a May through September irrigation season. The 16,010 acre feet actually diverted is 150% of the maximum legal standard of 1 cfs per 50 acres irrigated, or 10,526 acre feet for this pasture.

Fishery Capability/Requirements. As noted in the introduction diversions S-45 and S-46 regulate access to 32 miles of spawning grounds and deplete water downstream through 3.5 miles. Miles of stream, acres of habitat and estimated potential for density of redds are listed in Table 3 by affected stream reaches.

Table 3. Fishery capability impacted by main Salmon River diversions S-45, S-46. Miles of stream, acres of habitat and estimated potential for density of redds are displayed for each identified affected stream reach.

Stream Reach	Miles of Stream	Acres of Habitat	Density of redds/acre
Salmon River, S-45 downstream to the confluence of Alturas Lake Creek	3.5	15	40 salmon redds
Salmon River, S-45 upstream to the extent of anadromous fish habitat	11	30	35 salmon redds 20 steelhead redds

Pole Creek 1/	7.5	12.5	50 salmon redds 40 steelhead redds
Beaver Creek 1/	3	4	30 salmon redds 25 steelhead redds
Smiley Creek	7	13	40 salmon redds 30 steelhead redds
Frenchman Creek	4	5	25 salmon redds 25 steelhead redds

1/ Assumes irrigation diversions are screened and related instream flow problems are resolved.

On the basis of these assumptions, the habitat's inherent anadromous production potential is 7,600 chinook spawners and 3,216 spawning steelhead. The net annual resource value of the anadromous fishery resource would be $3,108,520.

GAWS outputs indicate 29 cfs instream would provide passage for 96% of the adults past the diversions, and for 75% of potential production in the dewatered reach below the diversions. Consideration of instream flow needs to pass juveniles migrating downstream is unnecessary because the fish screen installed on the S-45 ditch bypasses migrants beyond the point where recharge provides sufficient flow for downstream migration. Overall this flow would provide for about 90% of the habitat's inherent production potential. Under these marginal conditions a potential of 6,981 spawning chinook and 3,216 steelhead spawners may be produced. The net annual value of the anadromous fishery resource is $2,926,392.

If the water user draws the full water right (but no more) as long as it is available, then the total natural streamflow thereafter, instream flows favorable to passage of adult chinook through the critical reach will be unavailable near July 15 (Figure 7). This flow scheme prevents passage by about 50% of the chinook destined for spawning areas above the diversion. As a result chinook production above the diversion is 50% of the potential. Chinook production below the diversion is also 50% of the potential as a result of reduced flows during the spawning period. Steelhead production is 82% of the maximum potential that could be present in the absence of a chinook population. The 3,800 chinook and 3,516 steelhead produced represent an annual value of $2,071,824.

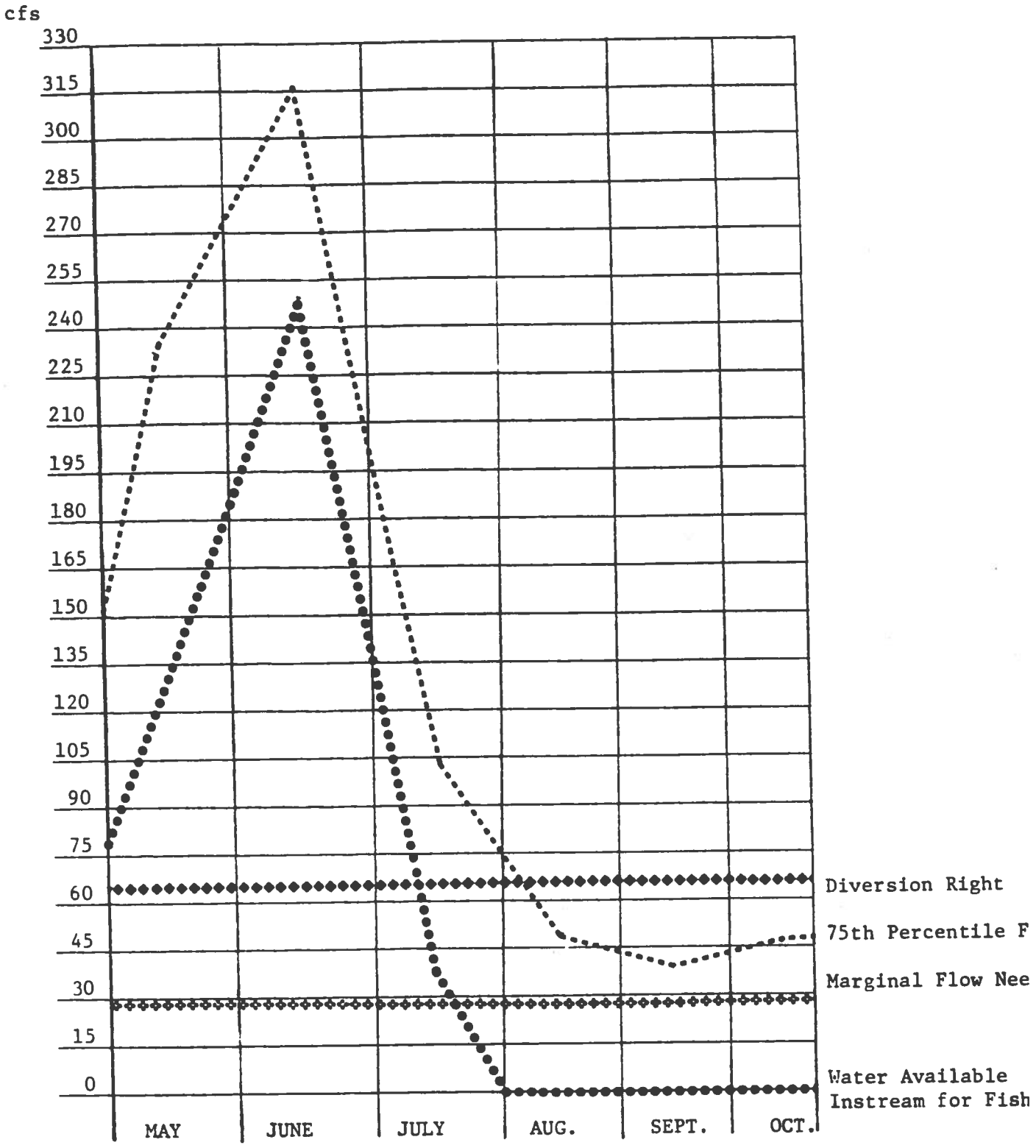


Figure 7.

Flow schedule for the Upper Salmon River. With the water user diverting the total water right from S-45 and S-46, the flow available instream for fish passage through the critical reach becomes inadequate near July 15.

Conflicts. Anadromous fish production in the stream reaches affected by S-45 and S-46 is impaired with the water user drawing the full water right or all the natural streamflow, whichever is less. Slightly less than 70% of the habitat's inherent anadromous production potential may be realized at this flow scheme. The net annual economic loss in value of this fishery is $1,036,696. It must be recognized that the impact is actually greater than this because the water user frequently draws more water than decreed by the existing water right.

If the amount of water diverted was limited to the maximum Idaho Water Law standard (1cfs/50 acres), irrigation/fishery conflicts created by S-45 and S-46 could be significantly reduced (Figure 8). Just over 80% of the habitat's inherent anadromous production potential could be realized. This represents an increase in the value of the anadromous fishery potential of $457,063 annually over the current situation.

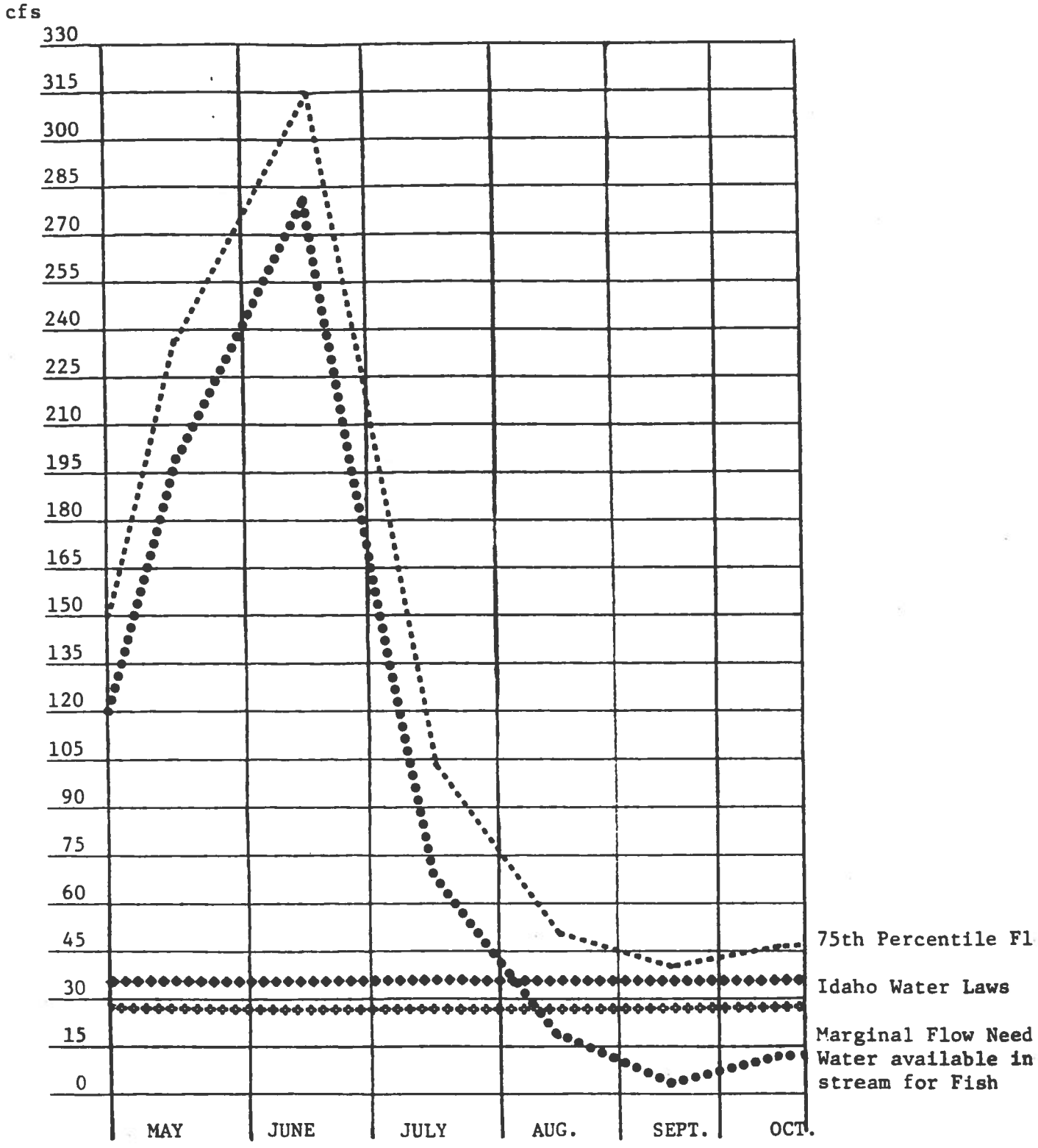


Figure 8.

Hypothetical flow schedule for the Upper Salmon River. If the water user was limite to diverting the maximum Idaho Water Law Standard (1cfs/50 acres irrigated), irrigat fishery conflicts created by S-45 and S-46 would be significantly reduced. Instream flows would not fall below marginal conditions until near the middle of August.

Alturas Lake Creek

Alturas Lake Creek drains 66 square miles of forested slope of the Sawtooth Range and the Smoky Mountains. Flows from this drainage generally originate as snowmelt and feed two morainal lakes (Alturas Lake and Perkins Lake) before reaching the virgin flow station. Total average annual water yield from Alturas Lake Creek is 99,400 acre-feet.

The Alturas Lake Creek drainage is of special historical significance to the anadromous fishery in the SNRA as Alturas Lake is one of four moraine lakes that once sustained runs of sockeye salmon. Many factors contributed to the decline of sockeye returning to Alturas Lake, the most significant being the diversion of water at the point designated as ALC-1 (T7N, R14E, Sec. 4 - Figure 6). For many years this diversion has totally dewatered a portion of Alturas Lake Creek during the entire upstream migration period of adult sockeye, blocking access to the lake and all ancestral spawning areas. This diversion also deprives access to headwaters spawning habitat to a significant portion of the chinook salmon run and depletes important chinook spawning habitat below the diversion. Alturas Lake Creek provides little suitable steelhead habitat and therefore steelhead production will be considered as insignificant.

Flow Characteristics. Flow characteristics taken from the USGS gage located on Alturas Lake Creek near Obsidian indicate relatively constant flow for the 7 month period September through March. Flows increase through April and May to a peak in June. This peak recedes quickly through July and August. Calculated 75th percentile flows for Alturas Lake Creek are shown in Table 4.

Table 4. Calculated 75th percentile flows in cfs for Alturas Lake Creek above the irrigation diversion based on data from USGS gage 13-2930.00.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec
18.3	17.2	16.2	22.3	121.7	213.1	62.9	22.3	14.2	15.2	18.3	19.

Diversion Rights/Irrigation Needs. The irrigation diversion structure along Alturas Lake Creek annually diverts some 9,233 acre-feet of water to irrigate 582 acres of pasture. This equates to 190 inches of water per acre during the irrigation season. The soils in this area are well drained, coarse textured with a low to moderate water holding capacity. Permeability is moderate to rapid.

The total of abstracted water rights of this diversion is 37.84 cfs while the capacity of the diversion ditch is 55 cfs. The flow diverted through this structure commonly exceeds the recorded water rights. Under Idaho Water Laws Art. XV Sec. 42-220, normal maximum limits for irrigation should not exceed 1 cfs per 50 acres. Under Idaho law this would entitle the irrigator to 11.6 cfs or 73 inches per acre for the irrigation season. Comparing the legal standard to what is actually diverted shows the irrigator diverting 260% of what the entitlement should be according to Idaho Water Laws.

Fishery Capability/Requirements

Some successful reproduction of chinook occurs each year in the stream reach below the confluence of Vat Creek because subsurface flows recharge Alturas Lake Creek. During the relatively good chinook run of 1978, 303 chinook redds were counted in this reach. Idaho Fish and Game and Forest Service biologists estimate potential for anadromous fish production as shown in Table 5.

Table 5. Fishery capability impacted by Alturas Lake Creek diversion ALC-1. Miles of stream, acres of habitat and estimated potential for density of redds are displayed for each identified affected stream reach.

Stream Reach	Miles of Stream	Acres of Habitat	Density of Redds/Acre
Alturas Lake Creek below diversion to confluence with Salmon River	35	18	35 chinook redds
Alturas Lake Creek Perkins Lake to point of diversion	1.5	3	15 chinook redds
Alturas Lake Creek Above Alturas Lake	7.3	12	25 chinook redds
Alpine Creek	1.5	3	25 chinook redds
Alturas Lake		800	3000-6000 adult sockeye salmon

On the basis of these assumptions, the habitat's inherent anadromous production potential is 2,625 chinook spawners and 3,000-6,000 spawning sockeye. The net inherent annual value of the chinook fishery resource would be $772,354. The sockeye are not considered in the economic evaluation, because currently sockeye are of little economic value to the Columbia River System sport and commercial fisheries.

GAWS outputs indicate that if at least 12 cfs remained instream, 95% of chinook destined to spawn above the diversion would reach the spawning grounds, and approximately 80% of chinook production below the diversion would be possible. This schedule of flows would also provide for 90% of the sockeye salmon production potential. The GAWS outputs also indicate that 5 cfs would be sufficient to pass juveniles migrating downstream. Under these marginal flow conditions a potential of 2,258 chinook and 2,700-5,400 sockeye salmon may be produced. The net annual value of the chinook is $664,371. This flow scheme provides for production of just less than 90% of the habitat's production potential.

If the water user draws the full water right (but no more) as long as it is naturally available, then the total natural streamflow thereafter, instream flows providing marginal passage conditions are no longer available by the

last week in July (Figure 9). ALC-1 totally dewaters Alturas Lake Creek prior to the onset of the chinook spawning season and the upstream migration period of sockeye. Marginal conditions for passage of downstream migrants are no longer available by the first of August. Impacts to up- and downstream migrant chinook reduce production above the diversion to 40 percent of the potential. Chinook production below the diversion is 50 percent of the potential. Re-establishment of sockeye salmon is not possible. Potential annual production of chinook is 1,208, worth $355,430.

Conflicts. Anadromous fish production in the Alturas Lake system is adversely impacted by existing diversion rights on Alturas Lake Creek. With the water user drawing the full water right, or the total natural streamflow, whichever is less, production potential is just over 46 percent of the habitat's capability for chinook and there is no capability for sockeye salmon production. The net annual economic loss in value of this fishery is $416,924. It should be recognized that the impact on the fishery is actually greater than this because frequently more water is diverted than is decreed by the existing water right.

If the amount of water diverted was limited to the maximum Idaho Water Law standard of 1 cfs/50 acres irrigated land, water use conflicts created by ALC-1 could be reduced (Figure 10). At this flow scheme the habitat could produce at about 70% of its inherent potential for chinook salmon. Although about 25% of the sockeye adults attempting to negotiate the critical reach could, it is unlikely the population would be able to sustain itself with such a low rate of escapement into Alturas Lake. The increase in chinook production potential represents an increase in the value of the anadromous fishery of $188,307 annually over the current situation.

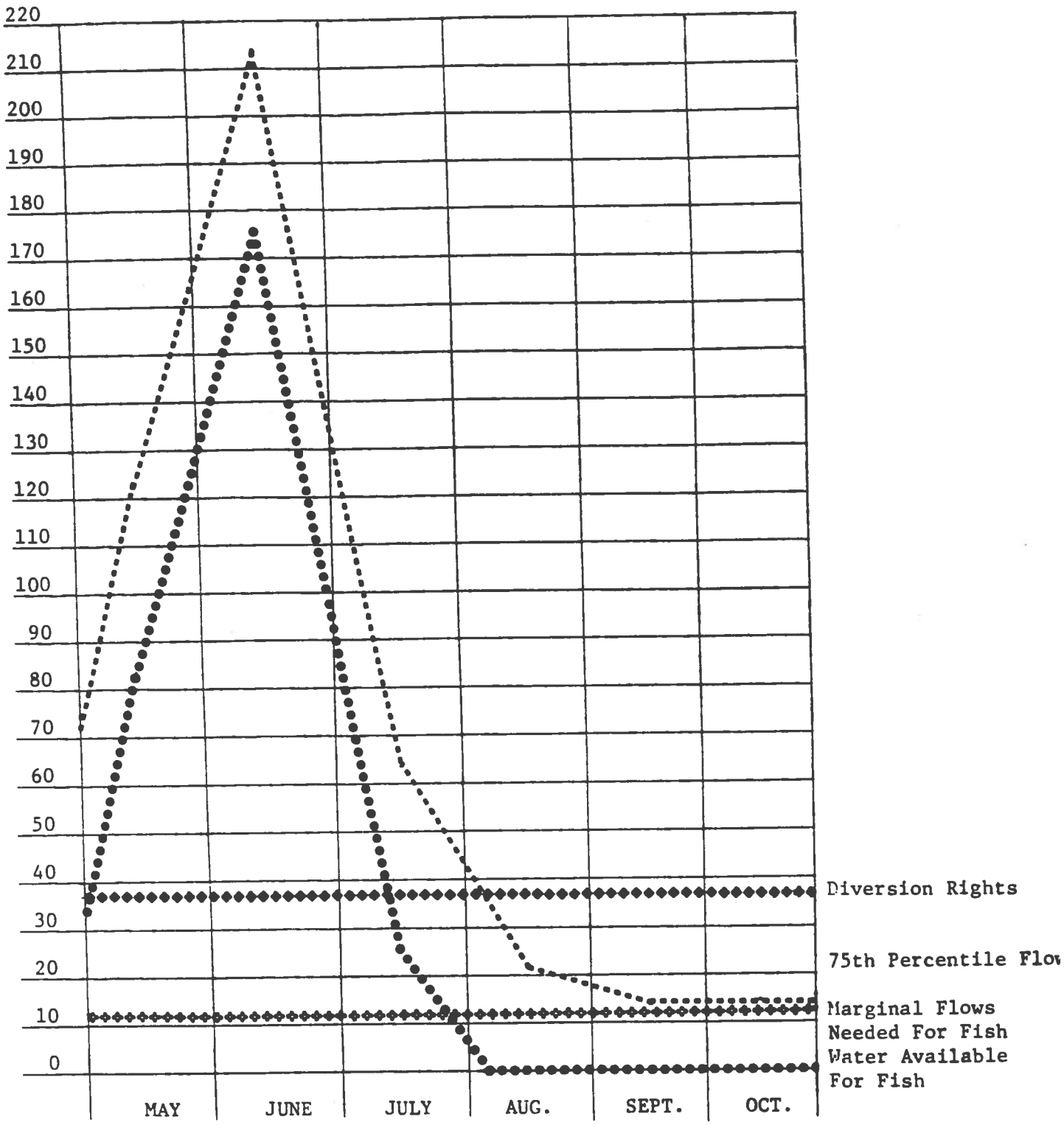


Figure 9.

Flow schedule for Alturas Lake Creek. With the water user diverting the total water right from ALC-1, the flow available instream for upstream fish passage through the critical reach becomes inadequate by the last week in July. Marginal conditions for passage of downstream migrants are no longer available by the first of August.

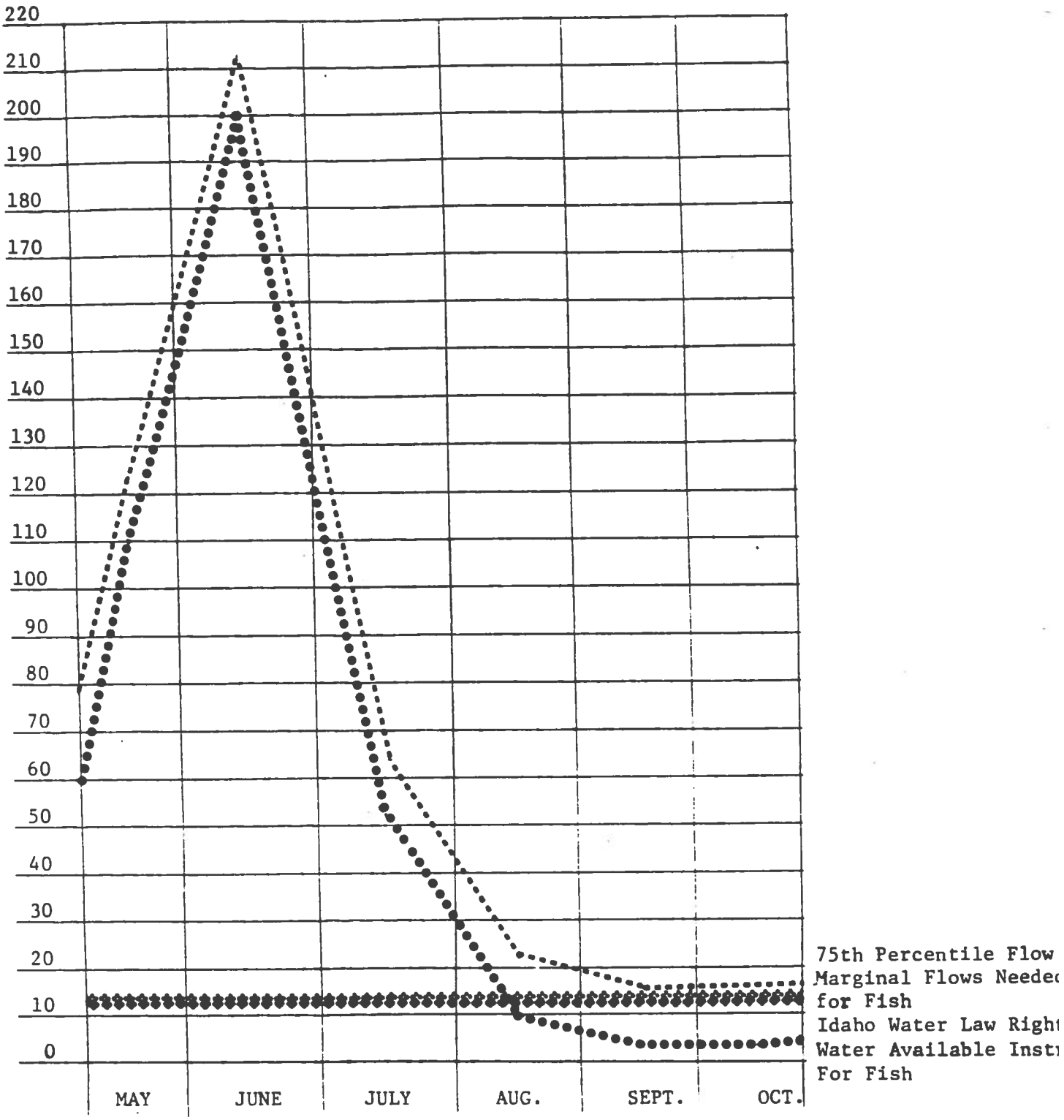


Figure 10.
Hypothetical flow schedule for Alturas Lake Creek. If the water user was limited to diverting the maximum Idaho Water Law Standard (1 cfs/50 acres irrigated), irrigation/fishery conflicts created by ALC-1 would be reduced. Instream flows would not fall below marginal conditions for adult passage until the middle of August, and juvenile passage would probably not be significantly impacted.

Champion Creek

Champion Creek is a spring-fed stream originating high in the Boulder-White Cloud Mountains and traveling through lodgepole pine and aspen stands before breaking into the Sawtooth Valley grasslands and flowing on to its confluence with the Salmon River. Virgin streamflow for the stream is the result of snowmelt in the 17-square mile drainage for the peak flows, while streamflow the rest of the year is very constant because of the moderating influence of springs.

Flow Characteristics. The watershed annually produces 15,405 acre-feet of water. Virgin flow remains essentially constant from August through March of the year, rising to a peak in June and falling off rapidly in July. The 75th percentile monthly flows, developed using aerial proportions and USGS gage data from the Salmon River station below Valley Creek, are presented in Table 6.

Table 6. Calculated monthly flows (75th percentile) in cfs, for Champion Creek above ChC-7, developed using the aerial proportion method of USGS gage 13-2955.00 data. The drainage area above ChC-7 is 15.40 square miles.

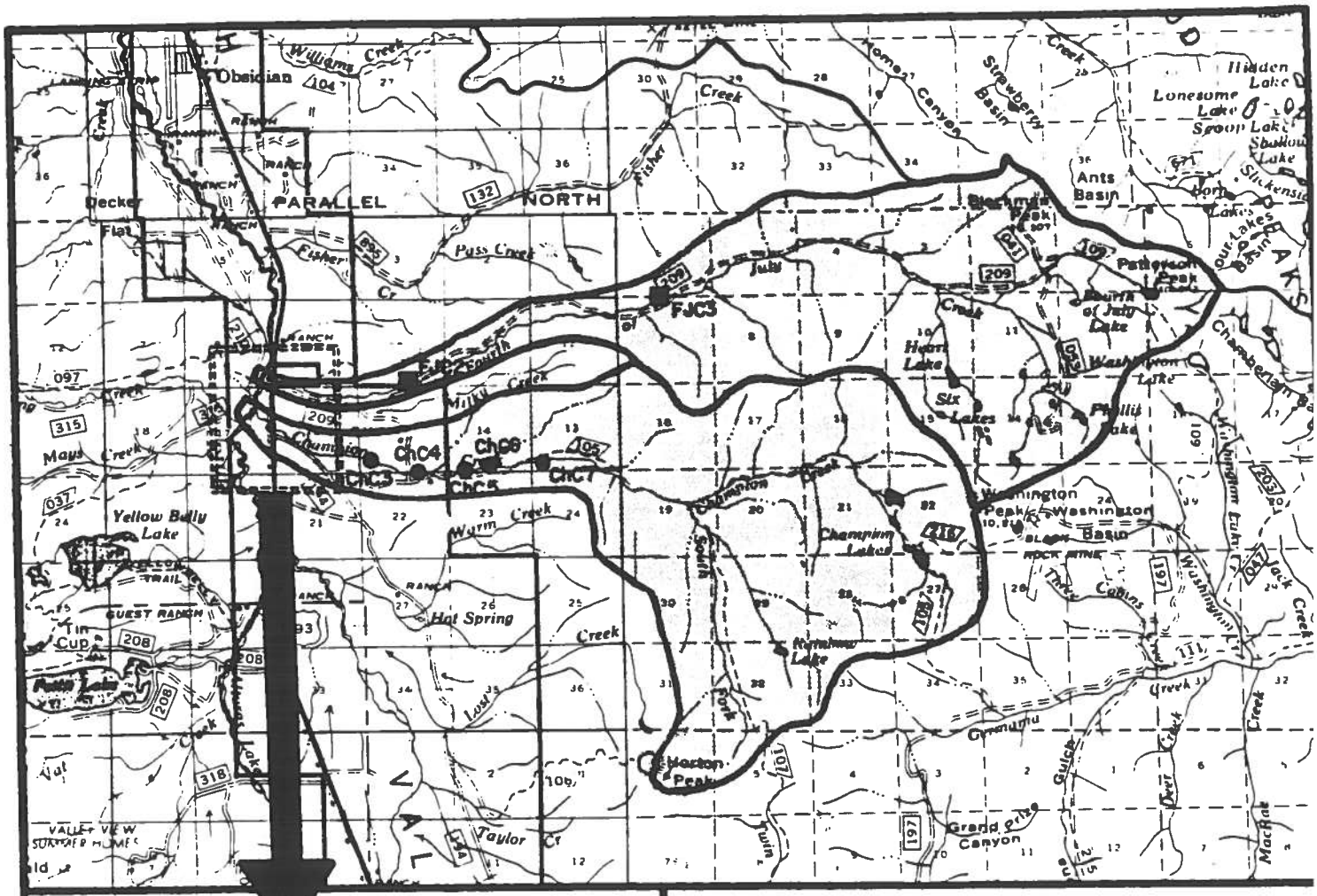
Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
7.8	7.8	8.1	10.1	29.8	40.3	15.0	8.6	7.8	8.3	8.6	7.8

Diversion Rights/Irrigation Needs. There are eight structures (Figure 11) diverting water for irrigation of private pasture lands from Champion Creek when the flow is sufficient to meet all needs. Combined diversion capacity of the ditches is 77 cfs, and the volume of water diverted often exceeds the total of abstracted water rights (14.74 cfs). Headgate structures are poorly constructed and as a result several of the diversions draw water throughout the winter, often totally dewatering the lowest two miles of the stream during the entire year.

During the summer season 3,597 acre-feet of water are used to irrigate 1,055 acres of pasture; this is equivalent to nearly 41" of water applied per acre. This figure is well within the Idaho Water Law standard of no more than 73.5 inches of water applied per acre during the May-October irrigation season.

Figure 11

Watersheds of Fourth of July & Champion Creeks



LEGEND

Fourth of July Creek and Champion Creek Watershed Areas.

(FOURTH OF JULY CREEK)

M — Master Reference Station

C — Critical Reach

FJC1 — Fourth of July Creek Diversions

(CHAMPION CREEK)

M — Master Reference Station

C — Critical Reach

ChC1 — Champion Creek Diversions

Fishery Capability/Requirements. In most years, anadromous fish are unable to utilize Champion Creek except when high streamflows occur naturally and a few chinook and steelhead may be found. Gradient, pool/riffle relationships, and other morphological characteristics of Champion Creek favor resident species, although there is a limited capability to produce anadromous fish. Miles of stream, acres of habitat and estimated potential for density of redds are listed in Table 7 by affected stream reaches.

Table 7. Fishery capability impacted by Champion Creek diversions ChC-7. Miles of stream, acres of habitat and estimated potential for density of redds are displayed for identified affected stream reaches.

Stream Reach	Miles of stream	Acres of Habitat	Density redds/acre
Champion Creek above the uppermost diversion (ChC-7)	2.0	2.0	10 salmon redds 15 steelhead redds
Champion Creek, below ChC-7	3.0	4.5	10 salmon redds 10 steelhead redds

GAWS outputs indicate 11 cfs instream would provide marginal passage for spawning adults, and 6.5 cfs would provide marginal passage for downstream migrating juveniles. Total natural streamflow is inadequate for steelhead migration and spawning until the middle of April and becomes inadequate for habitat utilization by chinook during the first week in August. As a consequence, inherent chinook production is only 80% of the estimates shown in Table 7, both above and below ChC-7. Steelhead production is 75% of the maximum potential throughout Champion Creek. Normal flows would generally result in 130 spawning chinook and 141 steelhead spawners annually, valued at $76,498.

If the water user draws the full water right (but no more) as long as it is available, then the total natural streamflow thereafter, instream flows favorable to passage of adult steelhead are available for only the last two weeks in May (Figure 12), and chinook production potential is only 25% of the estimates shown in Table 7. Under a flow regime such as this, it would not be possible to sustain runs of anadromous fish.

Conflicts. Anadromous fish production in Champion Creek has been eliminated by irrigation diversion practices. The net annual economic loss in value of this fishery resource is $76,498.

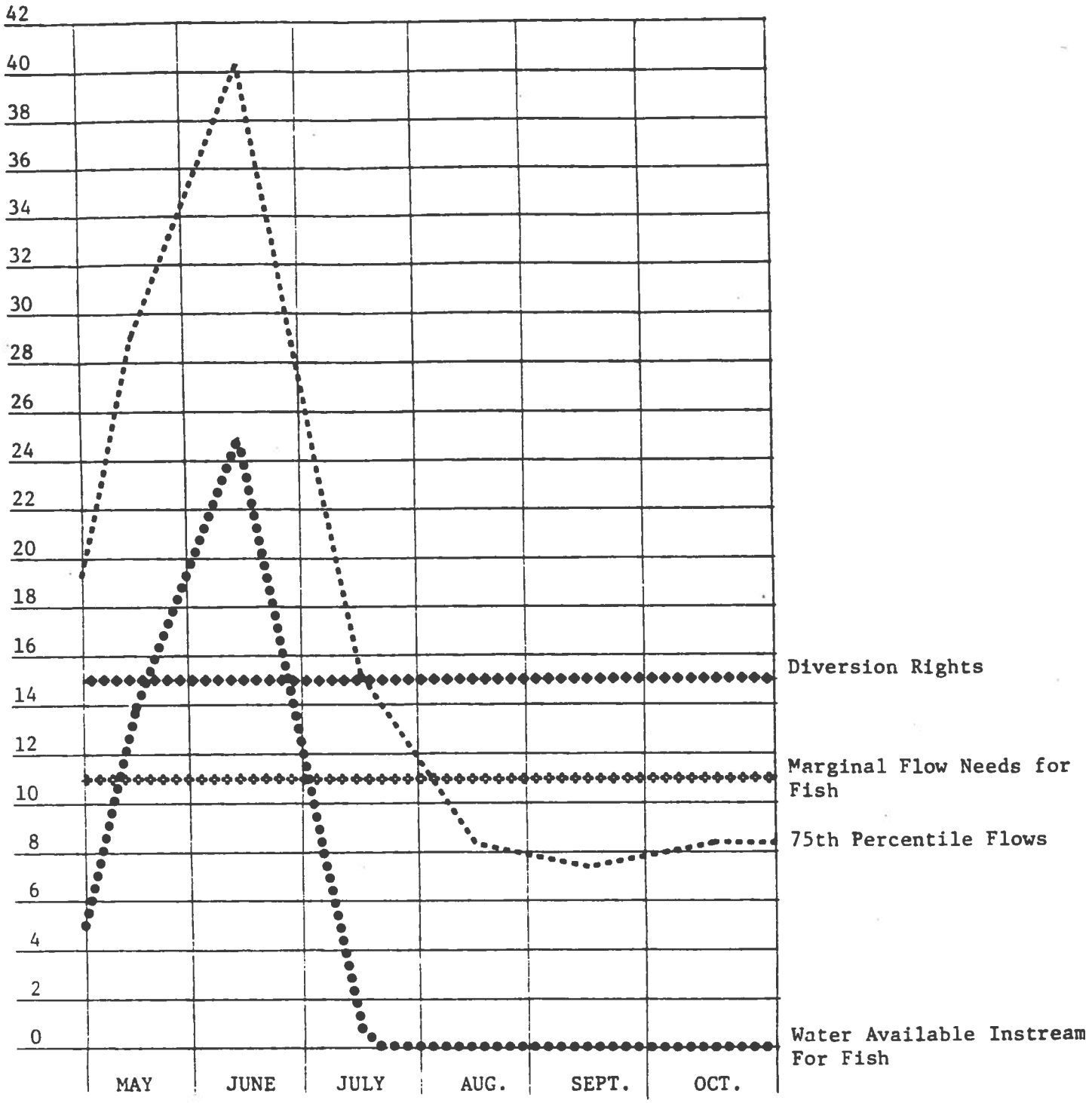


Figure 12.

Flow schedule for Champion Creek. With the water user diverting the total water right as long as it is available, then the total natural streamflow thereafter, instream flows favorable to passage of adult steelhead and chinook are virtually non-existent. Under this flow regime, it would not be possible to sustain runs of anadromous fish.

Fourth of July Creek

Fourth of July Creek origniates in the Boulder-White Cloud Mountains and flows through lodgepole and aspen stands before breaking into the Sawtooth Valley grasslands, where it joins with the Salmon River. Peak flow through the virgin flow station is the result of snowmelt in the 14 square mile watershed, while flows the remainder of the year are moderated by headwater springs. The watershed annually produces about 16,335 acre-feet of water.

Flow Characteristics. Flow characteristics derived for Fourth of July Creek indicate relatively constant flows for the nine month period of August through April. Flows dramatically increase in May to a peak in June. This peak recedes quickly in July to near base flow levels. Calculated 75th percentile flows for Fourth of July Creek are displayed in Table 8.

Table 8. Calculated 75th percentile flows in cfs for Fourth of July Creek above FJC-3; based on data from USGS gage 13-2955.00.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
7.2	7.2	7.4	9.3	26.6	37.2	13.8	8.0	7.2	7.7	8.0	7.2

Diversion Rights/Irrigation Needs. Approximately 7,637 acre-feet of water are diverted to irrigate 2,055 acres of pasture during the summer season. The total of the abstracted water rights for the three diversions on Fourth of July Creek is 31.34 cfs (Figure 11). However, at the 75th percentile, natural flows will provide sufficient water to meet all recorded rights for only a few weeks at the peak of the hydrograph.

Fishery Capability/Requirements. Fourth of July Creek no longer sustains runs of anadromous fish. Nearly every year this stream is dewatered in the lowermost two miles from July through the remainder of the irrigation season (Figure 13). Idaho Fish and Game and Forest Service biologists estimate potential for anadromous fish production as shown in Table 9.

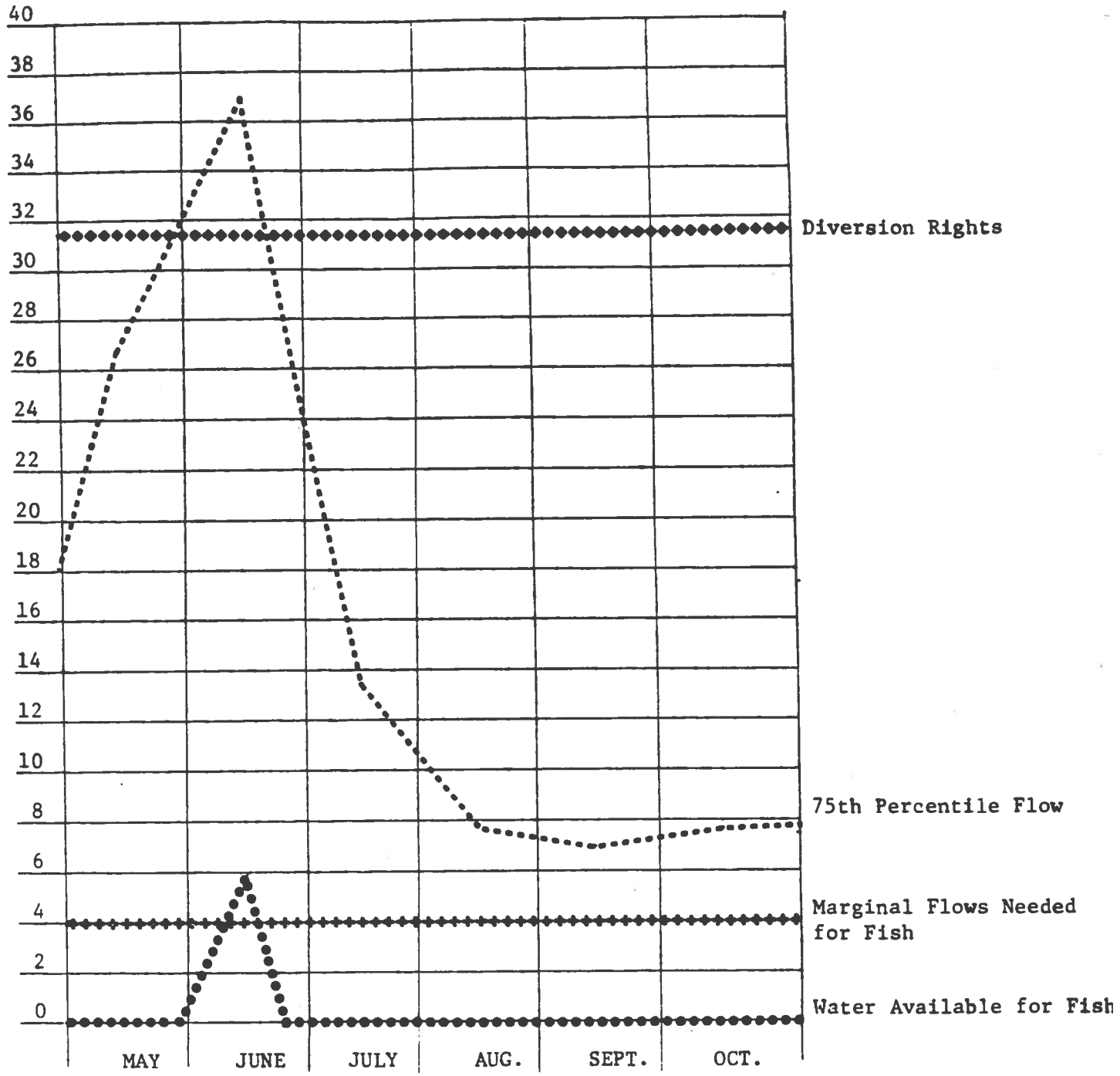


Figure 13.

Flow schedule for Fourth of July Creek. With the water user diverting the total water right as long as it is available, then the total natural streamflow thereafter, the stream is not capable of sustaining runs of anadromous fish.

Table 9. Fishery capability impacted by Fourth of July Creek irrigation diversion, FJC-1, 2 and 3. Miles of stream, acres of habitat and estimated potential for density of redds are displayed for each identified affected stream reach.

Stream Reach	Miles of Stream	Acres of Habitat	Density of Redds/Acre
Fourth of July Creek from FJC-3 downstream to confluence with the Salmon River	4.0	8	10 chinook redds 10 steelhead redds
Fourth of July Creek from FJC-3 upstream to extent of anadromous fish habitat	3.0	5	10 chinook redds 20 steelhead redds

On the basis of these assumptions, the habitat's inherent anadromous production potential is 235 chinook spawners and 338 spawning steelhead. The net annual value of the anadromous fishery resource would be $187,311.

GAWS outputs indicate 4 cfs instream would provide passage for 90% of the chinook destined to spawn above the diversions. Four cfs would provide for only about 50% utilization by chinook below the diversion. Steelhead production potential above FJC-3 is 75% of what it would be in the absence of chinook, and below the diversion 85% of the maximum potential. The marginal condition for downstream migrants exists when the flow is reduced to 2.5 cfs. Overall this flow regime would provide for about 90% of the habitat's inherent production potential. Under these marginal conditions a potential of 243 spawning chinook and 363 steelhead spawners may be produced. The net annual value of the anadromous fishery at this flow regime is $169,965.

Conflicts. Anadromous fish production in Fourth of July Creek has been eliminated by current water diversion practices. This represents an annual loss in the value of the fishery of over $185,000.

A marginal instream flow of 4 cfs has the potential of producing an annual fishery resource worth nearly $170,000.

Pole Creek

Pole Creek, a major tributary to the upper Salmon River, originates in the Boulder-White Cloud Mountains. The virgin streamflow in Pole Creek is the result of snowmelt for peak flows, while streamflow the rest of the year is consistent because of the moderating influence of the headwater spring sources. The watershed annually produces approximately 44,460 acre-feet of water.

Flow Characteristics. Discharge in Pole Creek remains relatively constant from August through April. Flows rise rapidly in May, peak in June and more rapidly descend in July. The 75th percentile flows developed by aerial proportion methods of USGS gage data from the Salmon River are presented in Table 10.

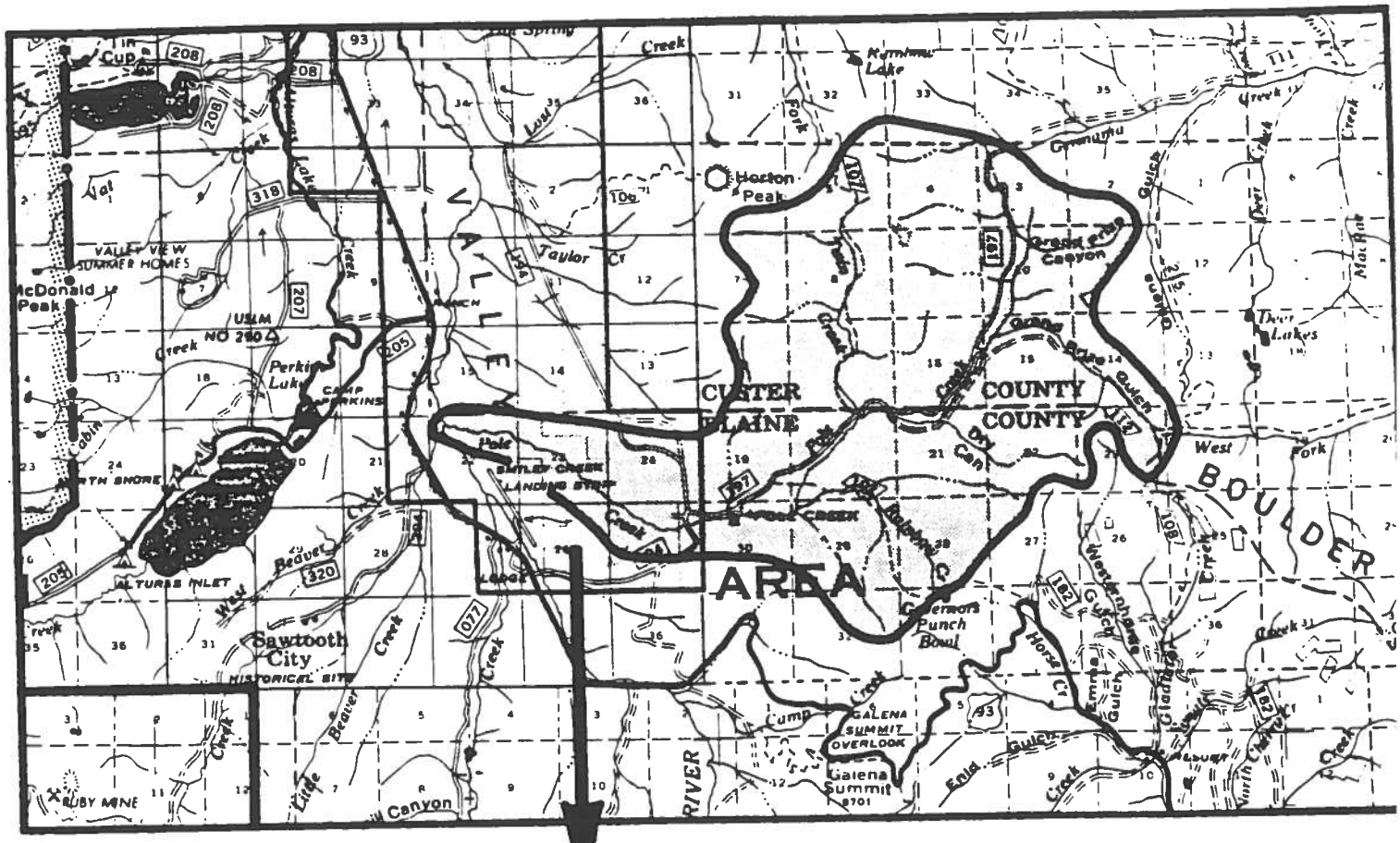
Table 10. Calculated 75th percentile flows in cfs for Pole Creek above the uppermost diversion (PC-7), based on data from USGS gage 13-2955.00.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
23.5	23.5	24.4	30.5	87.2	122.1	45.4	26.2	23.5	25.3	26.2	23.5

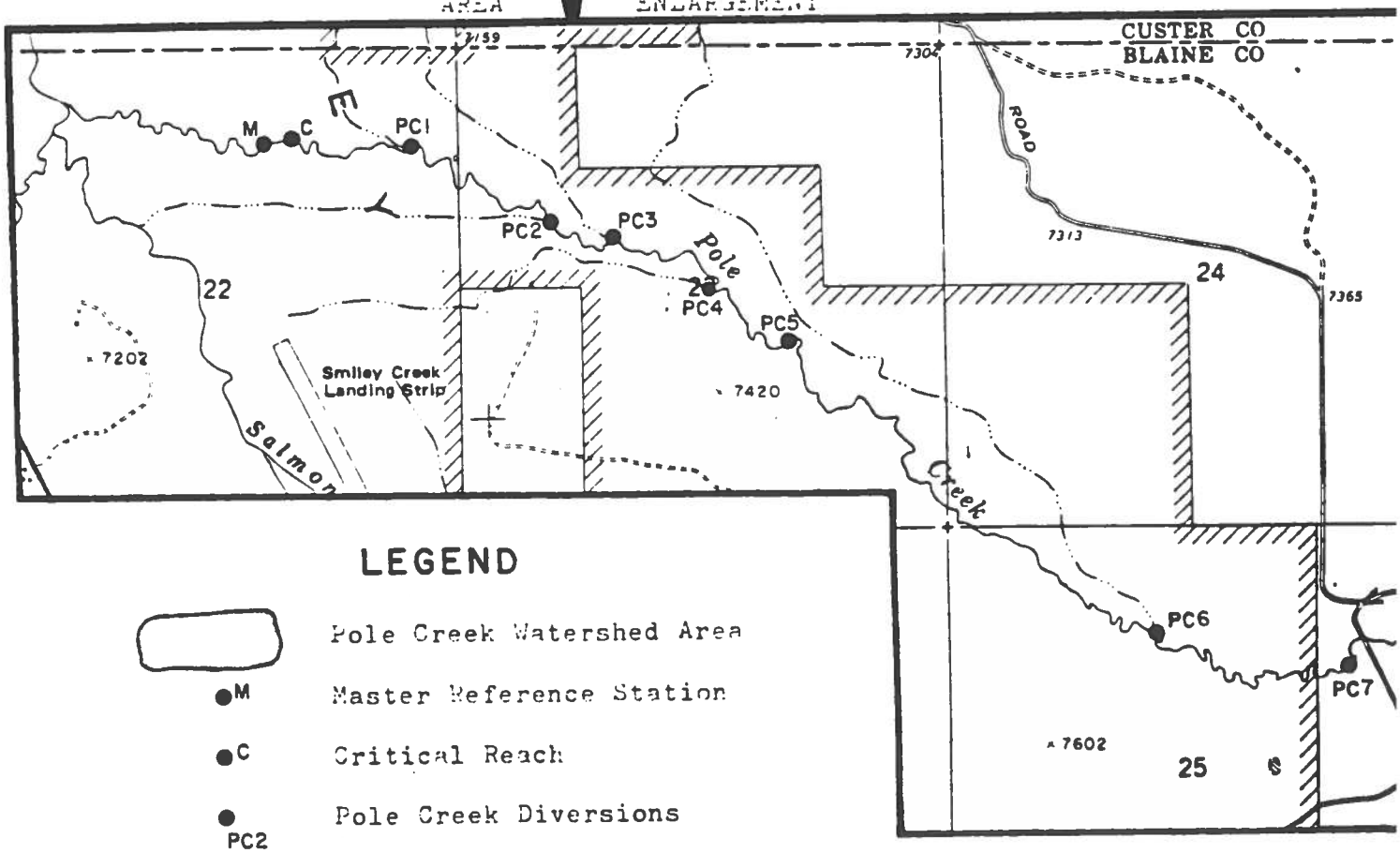
Diversion Rights/Irrigation Needs. During the summer season 16.010 acre-feet of water are diverted from Pole Creek to irrigate 3,020 acres of pasture land. Seven diversions occur in the lower three miles of the stream (Figure 14). The total abstracted right that may be drawn from Pole Creek is 65.6 cfs; however, of this total any amount may be alternately drawn from Smiley Creek on the Salmon River. Normally, of the total entitlement, 5 cfs is drawn from the Salmon River at S-45 and 1 cfs is drawn from Smiley Creek at SMC-1. For the purposes of this evaluation, it is assumed that the total of the abstracted rights will be drawn from Pole Creek.

Fishery Capability/Requirements. Among fishery biologists familiar with the streams of the SNRA, Pole Creek is considered the highest quality fishery habitat within the SNRA and has great potential to accommodate spawning of anadromous fish. Also, Pole Creek is a very popular resident fishery which is augmented by regular plants of hatchery reared trout. The estimated potential for anadromous production is displayed in Table 11.

Pole Creek Watershed



AREA ENLARGEMENT



LEGEND

- Pole Creek Watershed Area
- M — Master Reference Station
- C — Critical Reach
- PC2 — Pole Creek Diversions

Table 11. Fishery capability impacted by Pole Creek irrigation diversions PC-1-7. Miles of stream, acres of habitat and estimated potential for density of redds are displayed for each identified affected stream reach.

Stream Reach	Miles of Stream	Acres of Habitat	Density of Redds/Acre
Pole Creek above PC-7	3	5	50 chinook redds 40 steelhead redds
Pole Creek below PC-7	4.5	7.5	50 chinook redds 40 steelhead redds

On the basis of these assumptions, the habitat's inherent anadromous production potential is 1563 chinook spawners and 938 spawning steelhead. The net annual value of the anadromous fishery resource would be $714,323.

GAWS outputs indicate 23 cfs instream would provide passage for 90% of chinook destined to spawn above the diversions and for 90% utilization of the habitat below the diversions. Steelhead production potential both above and below the diversion is 75% of what it would be in the absence of chinook salmon. The marginal condition for downstream migrants exists when the flow is reduced to 4.5 cfs. Under these marginal flow conditions a potential of 1407 spawning chinook and 938 steelhead spawners may be produced. The net annual value of the anadromous fishery at this flow regime is $668,423.

The effect of current water diversion and associated instream flow problems on the anadromous fishery in Pole Creek has been devastating. Only occasionally over the years have individual salmon been observed in Pole Creek. The actual extent that steelhead are capable of utilizing Pole Creek is as yet undetermined. Upstream migration and spawning of steelhead should not be affected by current practices (Figure 15). However, below PC-7 at least 30% of the incubating steelhead would be lost prior to their emergence. It is also assumed that at least 25% of juvenile out-migrating steelhead would be lost due to insufficient flows. The annual value of the anadromous fishery resource is $208,599 for 769 steelhead trout.

Conflicts. Irrigation diversion practices in the Pole Creek drainage have eliminated chinook salmon utilization and have greatly reduced steelhead utilization potential. This represents an annual loss in the value of the fishery of over $500,000. A marginal instream flow of 23 cfs would increase the value of anadromous fishery potential nearly $460,000 annually over the existing situation.

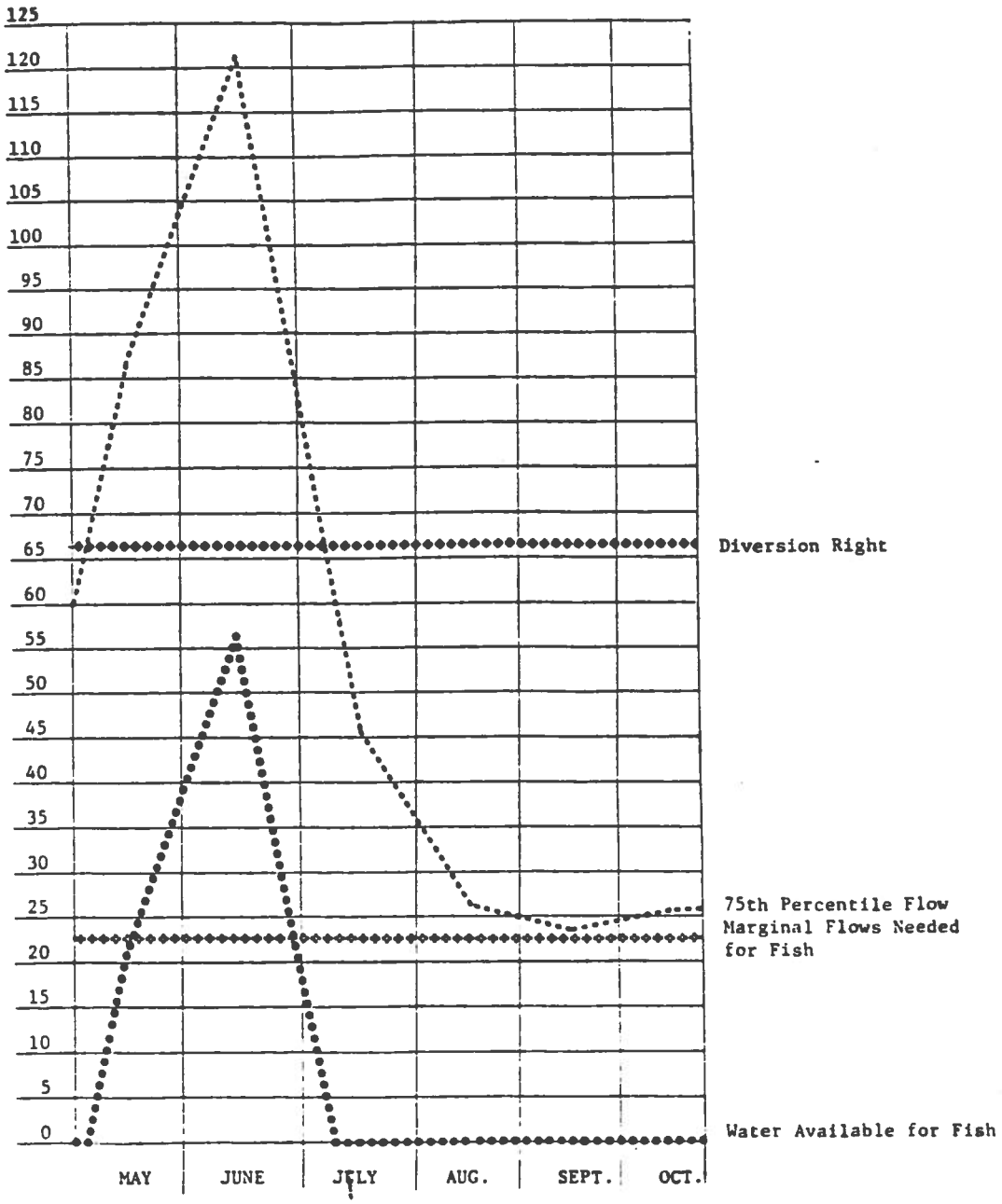


Figure 15.

Flow schedule for Pole Creek. With the water user diverting the total water right from Pole Creek as long as it is available, then the total natural streamflow thereafter, instream flows are inadequate to sustain a viable chinook salmon population and substantially reduce steelhead production potential.

Elk Creek

Elk Creek is a major tributary to Valley Creek; Valley Creek is tributary to the Salmon River at Stanley. The stream originates on the northern side of the Sawtooth Mountain Range in granitic soils before breaking into the marshy lowlands of Valley Creek. The flow of Elk Creek is mainly the result of snowmelt in the 24-square mile watershed. Some 19 square miles of the watershed lie above the virgin flow station. Total average annual water yield from Elk Creek is 24,280 acre-feet.

Flow Characteristics. The shallow soils and small drainage area above the virgin flow station produce droughty base flow periods. Flow characteristics calculated from the USGS gage located on Valley Creek indicate relatively constant flow for the 8-month period August through March. Flows increase slightly in April, rise rapidly during May to a June peak before rapidly falling off in July. The 75th percentile flows for Elk Creek, based on aerial proportion techniques, are shown in Table 12.

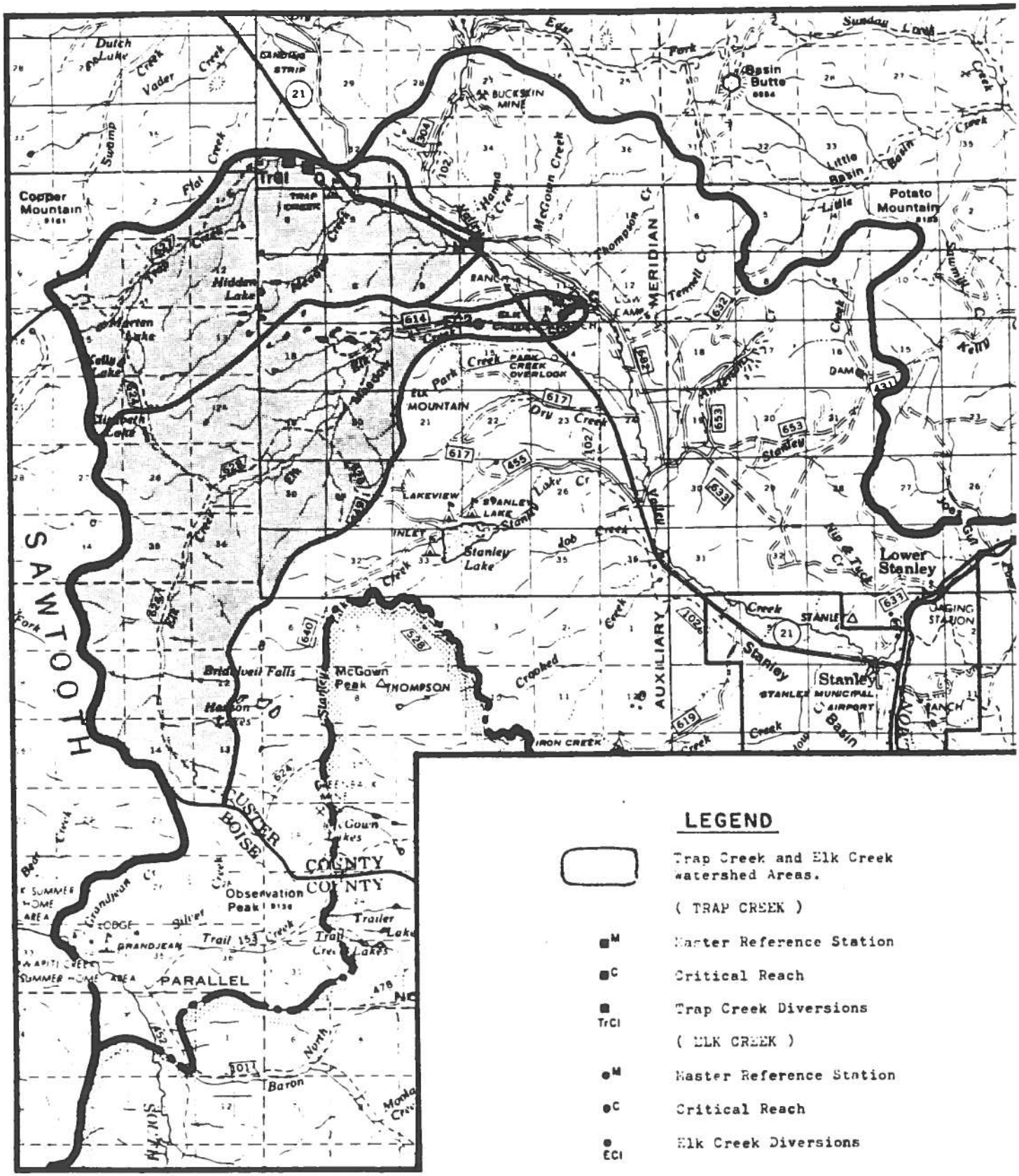
Table 12. Calculated mean monthly flows (75th percentile) in cfs for Elk Creek above EC-2, the highest point of diversion based on data from USGS gage 13-2950.00.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
8.9	9.1	9.8	13.1	47.0	56.1	19.6	10.7	9.9	10.6	10.7	9.5

Diversion Rights/Irrigation Needs. During the summer season two diversion structures on Elk Creek divert 2,059 acre-feet of water to irrigate 468 acres of pasture (Figure 16). This equates to about 53 inches of water per acre during the irrigation season. This figure is compatible with Idaho Water Law. The total of the abstracted water rights at the two points of diversion is 8.44 cfs; however, the volume of water actually diverted frequently exceeds the recorded right. As much as 17 cfs has been measured being diverted from Elk Creek.

Figure 16

Watersheds of Trap and Elk Creeks



Fishery Capability/Requirements. The removal of two log jams in 1978 made available five miles of habitat that had not been accessible in the several preceeding years. Habitat now available by stream reach, that is, miles of stream, acres of habitat and estimated potential for density of redds is listed in Table 13.

Table 13. Fishery capability impacted by Elk Creek diversions EC-1 and EC-2. Miles of stream, acres of habitat and estimated potential for density of redds are displayed for identified affected stream reaches.

Stream Reach	Miles of Stream	Acres of Habitat	Density of Redds/Acre
Elk Creek, EC-1 downstream to confluence with Valley Creek	0.5	2	25 salmon redds
Elk Creek, EC-1 upstream to EC-2	2.0	8	25 salmon redds 15 steelhead redds
Elk Creek above EC-2	6.0	20	25 salmon redds 20 steelhead redds

On the basis of these assumptions the habitat's inherent anadromous production potential is 1875 chinook salmon spawners and 975 spawning steelhead. The net annual economic value of these fish would be $816,160.

GAWS outputs indicate 4 cfs would provide for upstream passage of 90% of adult spawners through the critical reach and 2 cfs will marginally provide for downstream passage. At this flow regime chinook production both above and below the diversions would equal about 90% of the maximum potential; steelhead production in Elk Creek would be 75% of the maximum potential possible in the absence of chinook. These marginal conditions could produce approximately 1688 spawning chinook and 975 steelhead spawners annually. The net value of this anadromous resource is $761,139.

If the water user draws the full water right (but no more), marginal flows for upstream migration are no longer available by the end of the first week in August (Figure 17). This flow scheme prevents passage of about 20% of the chinook destined for spawning above the diversion. As a result, chinook production potential above the diversion is 80% of the maximum. Because of low flows below the diversions during the later part of August, September and October chinook production below EC-2 is 60% of maximum. Steelhead production above the diversion is 75% of the potential and 60% below EC-2. The 1375 salmon and 930 steelhead spawners produced represent an annual economic value of $656,838.

Conflicts. Anadromous fish production potential in Elk Creek is impaired with the water user drawing the full water right. Slightly greater than 80% of the habitat's inherent anadromous production potential may be realized with diversion of water at the decreased rate. The net annual economic loss in value of this fishery is $159,322. It must be recognized that the impact is actually greater than this because the amount of water diverted frequently exceeds the amount decreed by the existing water right.

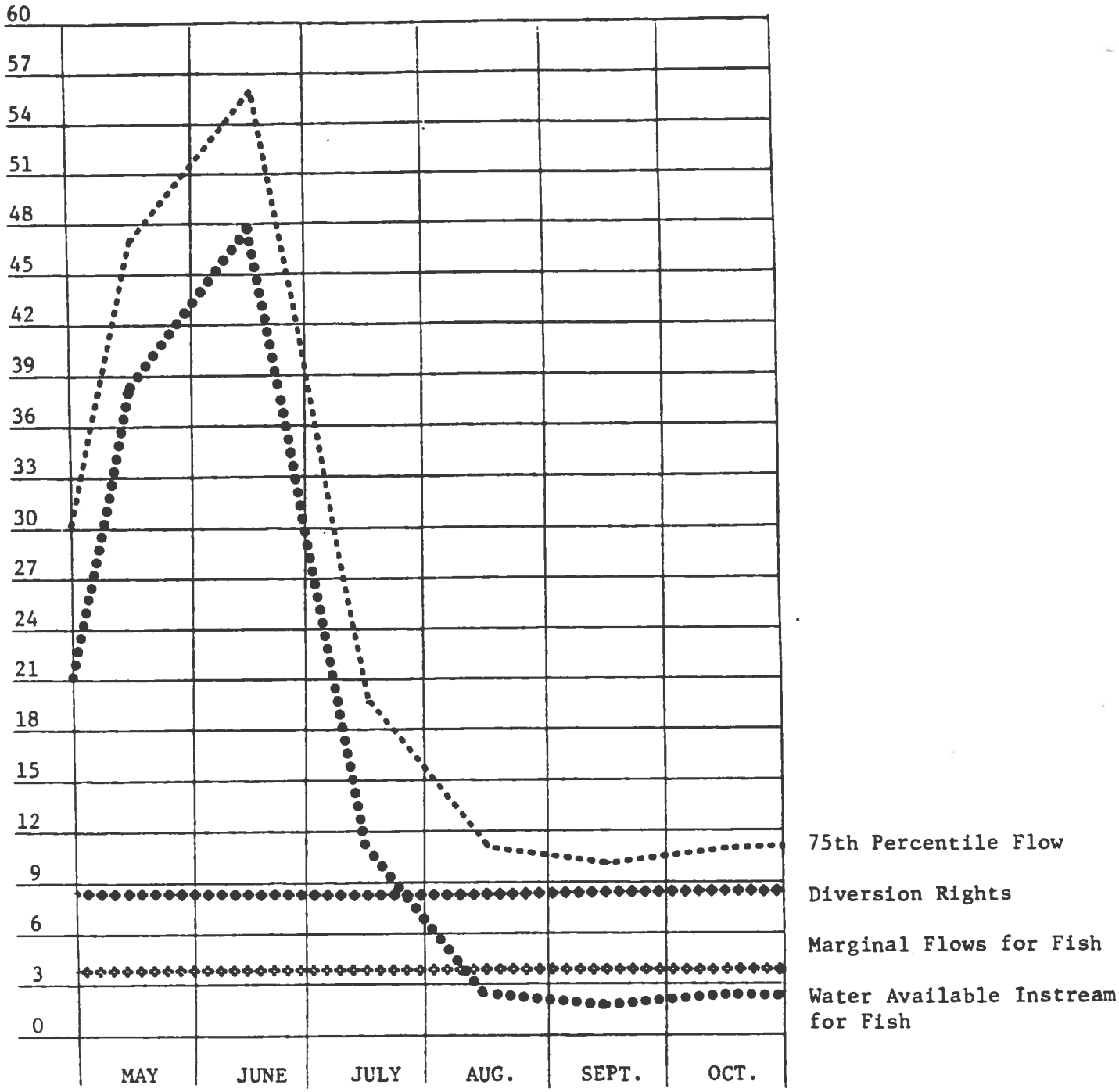


Figure 17.

Flow schedule for Elk Creek. With the water user diverting the total water right, marginal flows for upstream migration are no longer available by the end of the first week in August.

Trap Creek

Trap Creek originates on the northern side of the Sawtooth Mountain Range in granitic soils before breaking into the marshy lowlands of Valley Creek. The flow of the stream is mainly the result of snowmelt. The shallow soils and small drainage areas above the virgin flow station make the base flow periods quite droughty. This 15 square mile watershed annually produces 14,000 acre-feet of water.

Flow Characteristics. Flow characteristics derived for Trap Creek indicate consistent flows during the nine month period of August through April. Flows increase rapidly in May to a moderate peak in June. Flows drop rapidly during July. Calculated 75th percentile flows for Trap Creek are displayed in Table 14.

Table 14. Calculated 75th percentile flows in cfs for Trap Creek above the diversion (TrC-1); based on data from USGS gage 13-2950.00.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2.7	2.8	3.0	4.0	14.3	17.1	6.0	3.3	3.0	3.2	3.3	2.9

Diversion Rights/Irrigation Needs. During the summer irrigation season about 976 acre-feet of water are diverted to irrigate 280 acres of a Challis National Forest sheep allotment (Figure 16). Although the water right is only 4 cfs, the amount of water actually diverted commonly exceeds the recorded right. In June of 1979 as much as 23 cfs were being diverted from Trap Creek.

Fishery Capability/Requirements. SNRA and Idaho Department of Fish and Game fishery biologists estimate potential for anadromous fish production as shown in Table 15. It should be noted that the total natural streamflow will not always provide sufficiently for upstream passage or egg incubation or downstream passage conditions even if water is not diverted. Therefore the habitat's inherent anadromous production potential is significantly reduced.

Table 15. Fishery capability impacted by Trap Creek irrigation diversion TrC-1. Miles of stream, acres of habitat and estimated potential for density of redds are displayed for each identified affected stream reach.

Stream Reach	Miles of Stream	Acres of Habitat	Density of Redds/Acre
Trap Creek below TrC-1	3.0	6.0	25 chinook redds 25 steelhead redds
Trap Creek above TrC-1	2.0	3.7	25 chinook redds 25 sheelhead redds

On the basis of these assumptions and the flow characteristics of the stream, inherent anadromous production potential for chinook (182) is just 30% of the values shown in Table 15, and for steelhead (242) about 40% of the values displayed. These fish represent a net annual value of $119,195.

GAWS outputs indicate 6 cfs instream would provide upstream migration passage for 90% of spawning salmon, while 3.5 cfs is necessary to marginally provide for downstream migration. As was noted previously the total natural streamflow will not provide for 100% successful completion of all life history phases. The natural streamflow or 6 cfs, whichever is less, would provide for approximately 164 chinook and 218 steelhead, with an annual value of $107,388.

If the entire water right is diverted, but no more, flows fall below marginal passage conditions early in July, and only 25% of the chinook desiring to do so will be able to pass through the critical reach to spawning habitat above TrC-1 (Figure 18). Successful chinook spawning below TrC-1 is negligible. Steelhead production above the diversion will be reduced by 25% because of insufficient flows for downstream migration. Additionally there will be a loss of 25% of incubating steelhead below the diverison. Some 18 chinook and 182 steelhead spawners worth $54,665 would be produced at this flow regime.

Conflicts. Diversion of entire water right, or the entire streamflow, whichever is less, results in over a 60% reduction in inherent anadromous fish production potential. The annual economic loss is $64,530.

Impairment of the anadromous resource is actually greater than indicated because the amount of water diverted frequently exceeds the water right. A minimum instream flow of 6 cfs or the natural streamflow, whichever is less, would produce about 90% of the habitat's inherent potential.

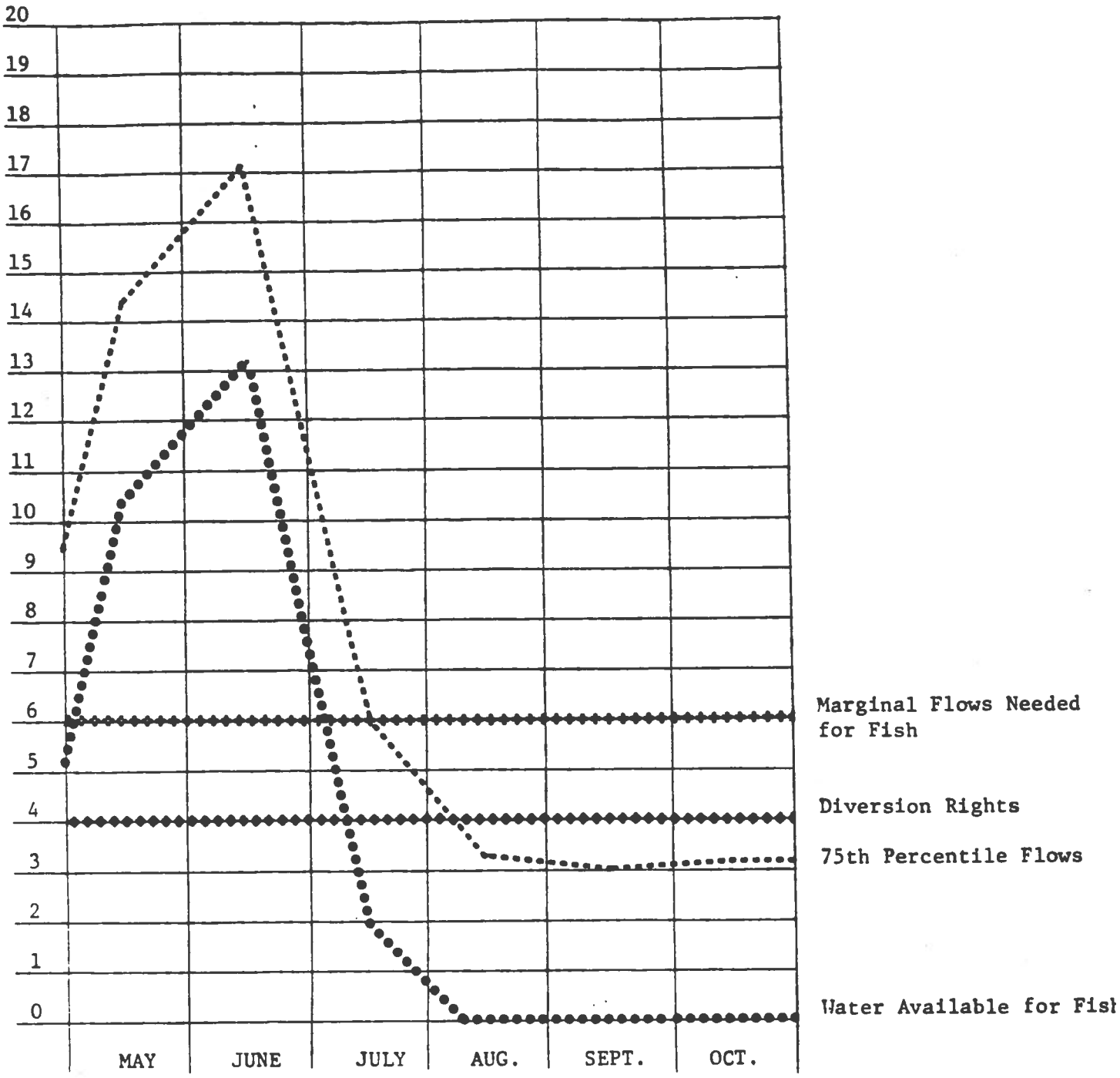


Figure 18.

Flow schedule for Trap Creek. With the water user diverting the total water right, only 25% of chinook desiring to do so will be able to pass through the critical reach to spawning habitat above TrC-1. Successful chinook spawning below the diversion is negligible. The low flows also adversely affect steelhead incubation and outmigration.

V. Potential Solutions and Effects

Present management direction for resolving instream flow conflicts states that the Forest Service will "cooperate with the State of Idaho in the establishment of stream resource protection flows". Identification and quantification of existing problems are critical to initiation of a program to resolve those conflicts. The present instream flow study is this first key step.

Now that background data on flow needs is available a strategy must be selected with which we can take the remaining steps forward to solve the problems. Four basic approaches to resolving instream flow conflicts have been identified. They include: (1) purchase or partial purchase of water rights, (2) cooperative agreements with water right holders to guarantee minimum instream flows, (3) take legal action to restrict water rights to State Water Law maximums, and (4) develop means to increase water supplies and file claims on that water for instream flow needs.

Opportunities to implement each strategy and expected effects are identified below.

Purchase or Partial Purchase of Water Rights. When scenic easements were being acquired on the SNRA the purchase of water rights through those easements was considered. A decision was made at that time not to attempt to purchase water rights through the scenic easement program. This decision was based on: (1) the urgent need to proceed with acquisition of scenic easements on parcels where development was imminent, and (2) the inability to quickly resolve questions as to the legality of purchasing a water right through the scenic easement process and the legality of using a water right for instream fish production.

Further legal advice and consultation with State of Idaho Water Resources Board personnel should be pursued to resolve the legal questions. However, in December 1974, the Idaho Supreme Court decreed recreation and preservation of scenic views as beneficial use of water in the Malad Canyon Springs decision. Other decisions since, such as the 1979 Silver Creek Court decision, seem to indicate retaining instream flows for fish production to be a beneficial use of water.

If this is a viable option, and if monies became available for such water rights purchases this option may possibly resolve all instream flow problems in the Upper Salmon River.

Cooperative Agreements with Water Right Holders. To date, only one water right holder in the Upper Salmon River Basin has, in cooperation with the SNRA, voluntarily reduced the amount of water diverted for irrigation. During the late summer and fall of 1981 the Salmon Falls Sheep Company reduced their number of diversions on Pole Creek from 7 to 1. Of the total abstracted water right of 65.6 cfs, the water right holder will draw only about 18 cfs. This reduction in number of diversions and amount of water diverted is the result of changing the irrigation mode from "flood" to "overhead sprinkler". Under this irrigation

scheme approximately 40% of the habitat's inherent ability to produce chinook salmon and 86% of its ability to produce steelhead can be met. Using 1980 figures, the potential fishery resource would have an annual value of more than $475,000.

If the Salmon Falls Sheep Company project is successful, similar arrangements by other landowners may be made. If diversion needs on Busterback Ranch (S-45/S-46) could be reduced to guarantee 5 cfs to operate a fishway around a dewatered portion of the main Salmon River, significant benefit to the anadromous fishery may result. Recent changes in channel configuration may have negated the viability of such an alternative for the Salmon River, however.

Legal Action to Limit Water Rights. Article 15, section 42-220 of Idaho Water Laws and Regulations states "...that when water is used for irrigation, no such license or decree of the court allotting such water shall be issued confirming the right to use of more than one second foot of water for each fifty acres of land so irrigated, unless it can be shown to the satisfaction of the Department of Water Administration in granting such license, and to the court in making such decree, that a greater amount is necessary, and neither such license nor any one claiming a right under such a degree, shall at any time be entitled to the use of more water than can be beneficially applied on the lands for the benefit of which such right may have been confirmed...".

If water rights on Alturas Lake Creek and the main Salmon River at S-45/S-46 were successfully challenged in court and forced to meet the State Water Law maximum standard, significant improvement in anadromous fish passage and production could be expected.

If the amount of water diverted at S-45/S-46 was limited to the maximum State standard, just over 80% of the habitat's inherent anadromous production potential could be realized. This represents an increase in the value of the anadromous fishery potential of at least $457,063 annually over the current situation. If the amount of water diverted from Alturas Lake Creek were similarly limited, the habitat could produce at about 70% of its inherent potential for chinook salmon. Although about 25% of the sockeye adults attempting to negotiate the critical reach could, it is unlikely the population could sustain itself with such a low rate of escapement into Alturas Lake. The potential increase in chinook production alone represents an increase in the value of the anadromous fishery of $188,307 annually over the current situation.

All other diversions on streams examined for this study were diverting less than the maximum State Water Law standard of 1 cfs/50 acres.

Other legal action may be appropriate on the Salmon River at S-45/S-46, on Alturas Lake Creek, Champion Creek, Elk Creek and Trap Creek where water diversion frequently exceeds the water right on the stream.

Water Development. A unique opportunity exists to mitigate the instream flow problem on Alturas Lake Creek, with no impact to the water user, and dramatically improve the anadromous fishery. Construction of a regulating dam at the outlet of Alturas Lake would store water during the peak of the hydrograph for the purpose of releasing water during periods when the natural flow is insufficient to meet the requirements for fish and demand for irrigation. The water user would draw the full entitlement as long as it is naturally available and the equilavent of the total natural streamflow when the full entitlement is not available. The water user would be required to leave instream the amount of stored water released for the purpose of fish production.

If the regulating dam is designed to store two feet of water over Alturas Lake (1600 acre feet), flow releases would allow for 96% of the chinook and 90% of the sockeye salmon to pass beyond the diversion. Chinook production below the diversion can be increased from 50% to 80% of the potential. With such a regulating structure the annual value of the anadromous fishery resource could be increased $281,137 over the current situation. It should be noted that this valuation does not include a dollar value for the 3000 to 6000 adult sockeye that Alturas Lake would then be capable of producing, because of the current minor economic importance of sockeye salmon returning to Snake River tributaries.

Before implementation of a project of this magnitude a number of concerns must be resolved. They include:

1. Environmental impacts to other resources.
2. Legality of claiming a water right on this storage of flood waters. We must ensure that downstream water rights would not be infringed upon.
3. Ensuring that water released from storage is not appropriated from the stream at the existing diversion on Alturas Lake Creek.

Alturas Lake Creek appears to be the only stream system studied in which there is potential to develop additional flows to alleviate instream flow conflicts.

VI. Conclusion

Anadromous salmonids are one of this nation's most valuable renewable resources. Resolution of the conflicts between these fisheries and another of the country's valuable resources, agriculture, will not be an easy task. However, enabling legislation to establish the SNRA provides emphatic direction that this difficult task will indeed be accomplished. This report is simply the beginning of the process. Much further work will be necessary to improve the present situation. The next step in the process will be for management to recommend strategies to be used to solve these instream flow conflicts.

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FISHERY EFFECTS OF IRRIGATION DIVERSION AND RELATED STRUCTURES IN THE SAWTOOTH NATIONAL RECREATION AREA

PROGRESS REPORT I

JUNE 1974

Greg L. Munther

Fisheries Biologist

Forest Service

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EFFECTS OF IRRIGATION DIVERSIONS AND RELATED STRUCTURES IN THE SAWTOOTH NATIONAL RECREATION AREA

Greg L. Munther
Fisheries Biologist

ABSTRACT

Selected irrigation diversions were investigated to evaluate their effects on spawning and rearing of salmon within Sawtooth Valley. Stream flows were measured from mid-summer to early fall during 1972 and 1973, and related to minimum flow needs to facilitate adult salmon and steelhead passage, spawning, and rearing of young as well as habitat for resident fish. Flows were insufficient for fish life from July to mid-September resulting from decreasing natural flows, increased demand by irrigators, peak numbers of salmon attempting to reach and spawn in ancestral spawning areas, and high oxygen demand by incubating salmon eggs. Alternative proposals to correct this situation were evaluated and the author's recommendations were made.

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OBJECTIVES

As a part of aquatic environment investigations designed to improve aquatic habitat within the Sawtooth National Recreation Area, a program was initiated in 1972 and 1973 to:

1. Assess effects of irrigation diversions and related developments on upstream passage and spawning conditions for adult sockeye and Chinook salmon.

2. Assess impact on same diversions and developments on production and migration of young salmon.

3. Obtain needed information for recommending alternatives to maintain or restore favorable aquatic habitat conditions that are compatible with the objectives of the NRA.

To meet the above objectives, the following investigations have been implemented to date. Some have not been completed.

1. Assess distribution of spawning and rearing habitat for anadromous stocks.

2. Identify those irrigation structures that have led to the degradation, or prevented utilization of, available habitat.

3. Determine habitat improvement needs to maximize potential production of anadromous stocks.

4. Evaluate alternatives for improvement of existing conditions.

gravel, valued at $100,000.00 annually per acre to commercial fishermen (Anonymous, 1965), is rendered unusable which eventually affects sport fishermen in the Sawtooth NRA who spend an estimated 17,700 fishermen hours annually in search of salmon (Platts, 1968).

As part of legislation creating the Sawtooth National Recreation Area in 1972, the Secretary of Agriculture was directed to administer the area in a manner that will best provide for the protection of salmon and other fisheries. As a result, this investigation was initiated.

It should be understood that this report is not a complete documentation of irrigation related fishery problems in the SNRA. While some streams were studied intensively, others were only investigated on a cursory level and should have priority for future documentation. Other streams adversely affected were not investigated because of time and manpower constraints.

Any fishery program recommended in this report will require the coordination and cooperation of the Idaho Fish & Game Department. As individual projects are developed, the input of state biologists will become increasingly valuable and necessary. While the two agencies are charged with different fishery roles, any program will be enhanced and more successful with a close working relationship of the two agencies.

METHODS

Spawning Distribution

Forest Service personnel walked all potential spawning streams above the established Idaho Fish and Game spawning survey areas between August 7 and August 21, 1972, and between August 27 and September 7, 1973. All redd observations were plotted on aerial photographs for future reference. In addition, live and dead fish observed were tallied in 1972. Findings of the Idaho Fish & Game Department are included in this report.

Juvenile Losses

Sample sections of ditches originating from three diversions were chosen which included one each from Alturas Creek, Upper Salmon River and Valley Creek. Sections between natural barriers such as headgates were selected to minimize re-entry into the sample section by downstream fish, and so that fish entering the sample section would have difficulty leaving by swimming upstream. Because it is probable that some fish would drift through the section and not be collected, the estimate of recruitment is only a minimum estimate. Sample sections only included a portion of flow originating from a diversion, estimates of total losses by the diversion were calculated by expanding the flow sampled to the total flow. Sample sections ranged from 948 to 1366 feet long.

Temperatures

During 1973 Twelve minimum-maximum thermometers were placed in various streams, tributaries, and irrigation returns and were read at irregular intervals.

Streamflow

Permanent stations were established at sites in diversion ditches and below diversions where accurate flow data could be obtained. Transects were semi-permanently marked using engineering stakes and flagging. Minimum flows for passage were calculated using the "Oregon Method" (Thompson, 1972), which is based on studies indicating Chinook salmon require flow at least .8 foot deep over 25 percent of the streambed for adequate passage. For this investigation, the shallow riffle considered to be most critical to salmon passage was identified and a station established at this riffle. Transects were also established to assess flows as they relate to spawning habitat. Stations were established at completed redds and habitat evaluated using the "Oregon Method" (Thompson, 1972). For spawning in suitable habitat is considered to be those waters having flows for 1-3 cfs with a minimum depth of .8 foot (Thompson, 1972). Water flows were measured at permanent sites throughout the season using a Price-Gurley current meter.

RESULTS

Spawning Distribution

According to spawning counts made by Forest Service personnel and the Idaho Fish and Game Department, over 1440 spring Chinook redds were constructed within the SNRA in 1972 and 963 redds in 1973. (Figures 1 & 2) This represents an estimated spawning population of 3600 adults in 1972 and 2408 in 1973, (based on 1 female and 1.5 males per redd). Spawning is confined to the Salmon River and to

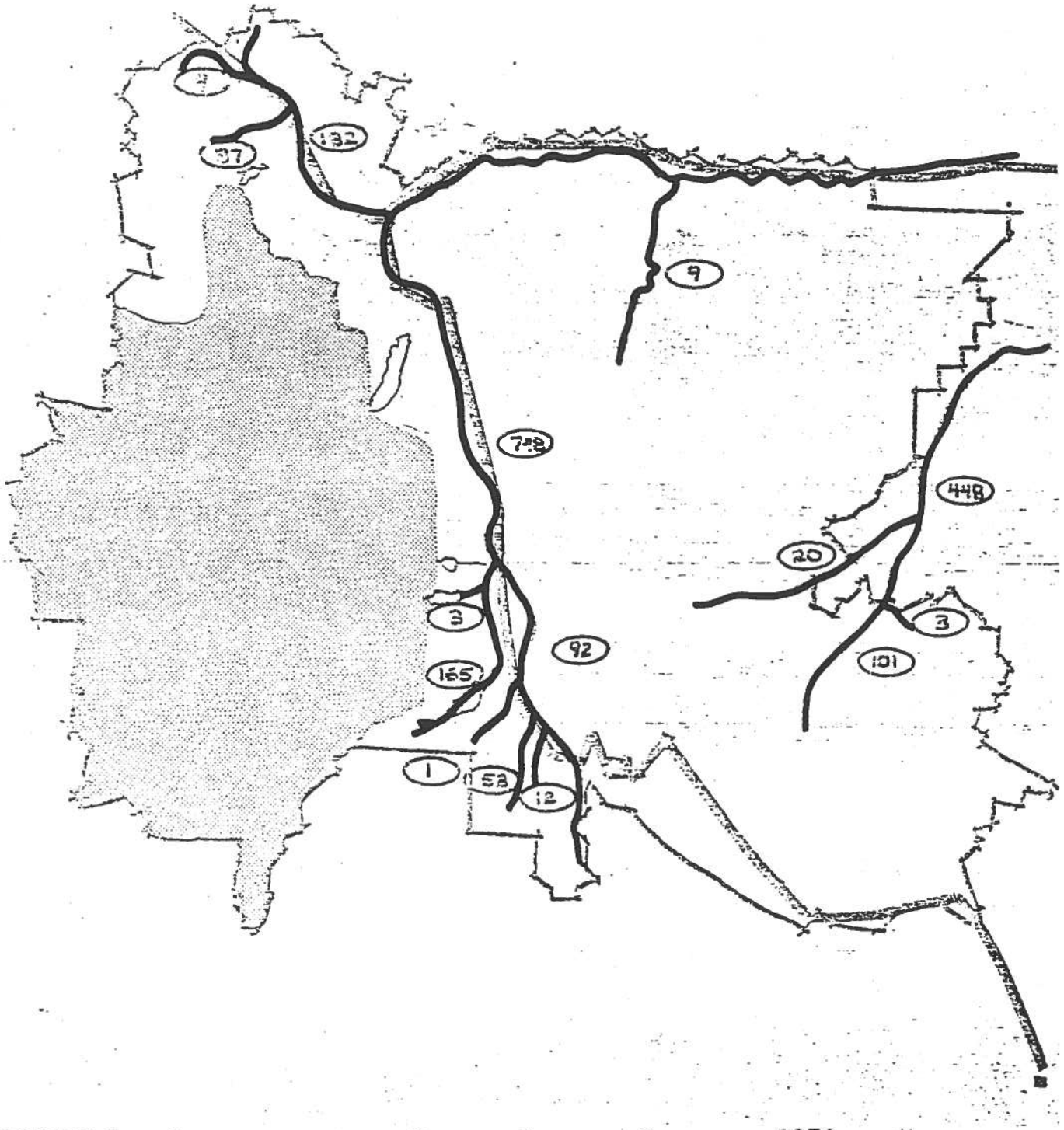


FIGURE 1 DISTRIBUTION OF SPRING CHINOOK REDDS IN 1972 ON UPPER SALMON RIVER AND TRIBUTARIES.

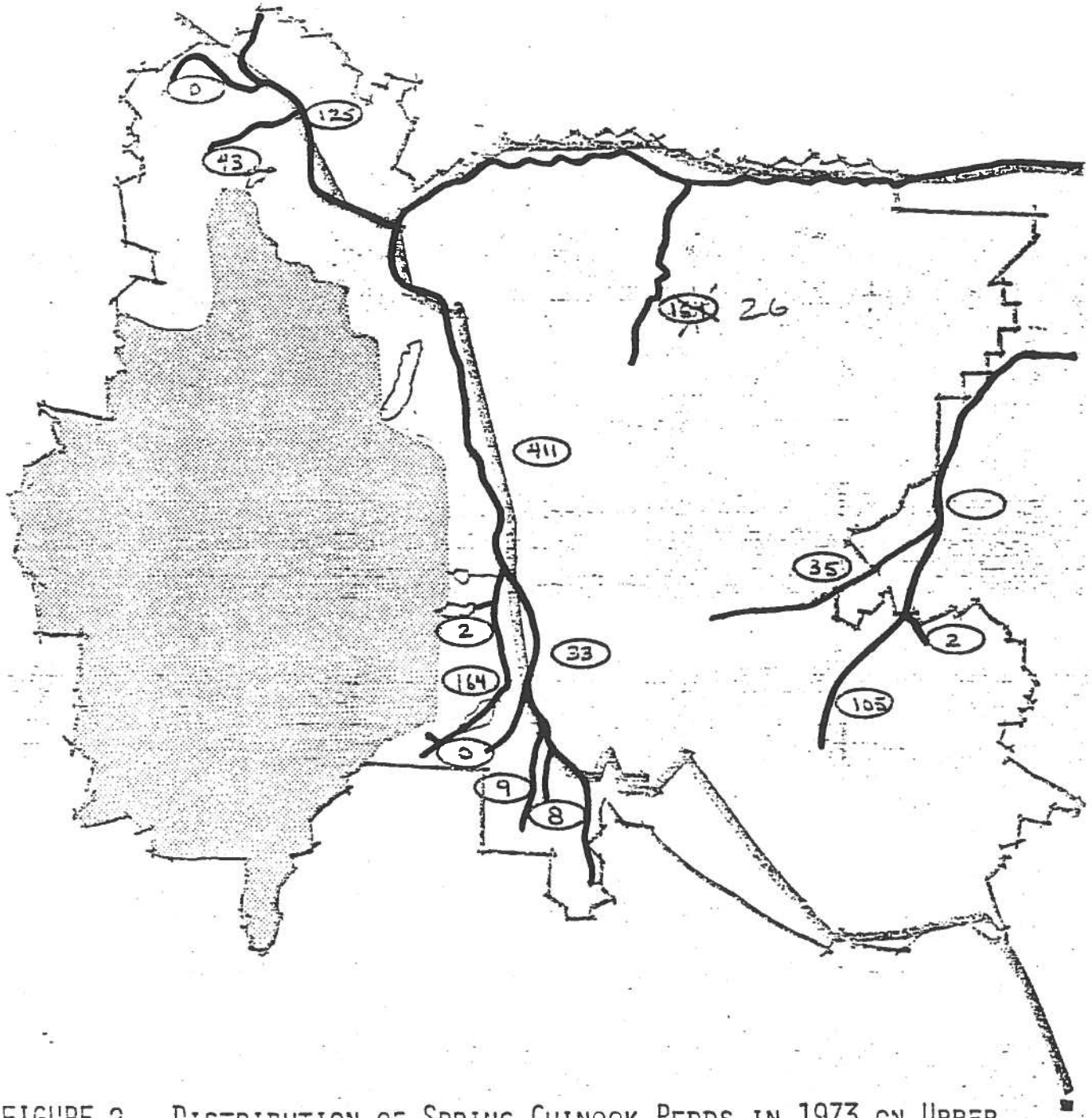


FIGURE 2 DISTRIBUTION OF SPRING CHINOOK REDDS IN 1973 ON UPPER SALMON RIVER AND TRIBUTARIES.

suitable tributaries generally having base flows exceeding 5 cfs. Highest average density of spring chinook spawning occurred in the area between Sunny Gulch and Breckenridge Diversion (Table 1), having approximately 34 redds per mile in 1972.

Summer chinook spawning is confined primarily to the main stem of the Salmon below Sunny Gulch and in lower Valley Creek. The Idaho Fish and Game Department counted 170 summer chinook redds on the main stem of the Salmon River within the SNRA and 147 redds in lower Valley Creek during 1971. Highest density of summer chinook spawning in the Salmon River within the SNRA is the 4.5 mile section immediately below Sunbeam Dam, which had approximately 24 redds per mile.

TABLE 1

SPAWNING DISTRIBUTION OF SPRING CHINOOK SALMON BY DRAINAGE WITHIN SAWTOOTH NATIONAL RECREATION AREA 1972 - 73

	1972	1973	% Change
Alturas Creek	165	164	0%
East Fork Salmon (above Bowery)	101	105	+4
Main Salmon (above Breckenridge Diversion)	92	33	-64
Smiley Creek	58	9	-84
Elk Creek	37	43	+16
Germania Creek	20	35	+75
Frenchman Creek	12	8	-33
Trap Creek	9	0	-100
Warm Springs Creek	9	26	+289
Pettit Lake Creek	3	2	-33
West Pass Creek	3	2	-33
Beaver Creek	1	0	-100
Main Salmon River (Breckenridge Diversion to Sunny Gulch)	748	411	-45
Upper Valley Creek	182	125	-31
TOTAL	1440 redds	963 redds	

STRUCTURES INVESTIGATED

Although 29 diversions structures have been identified as needing improvements (Platts, 1972), available time and manpower limited investigations to fifteen structures that appeared to have high adverse impact on anadromous fishery resources.

A. Breckenridge Diversion

Located on the J. R. Breckenridge Ranch (T7N, R14E, Section 3), this diversion presently has the greatest irrigation related adverse impact on anadromous stocks of any within the SNRA. This structure prevents full utilization of 21 miles of spawning habitat upstream from the diversion (Figures 3 & 4). Another smaller diversion located approximately one mile above this diversion has similar characteristics and is also owned by Breckenridge.

Streamflows

Water flows were measured in the main diversion ditch, as well as at a station approximately 300 yards below the diversion. From 7-16-72 to 9-10-72 40 to over 100 cfs of water was diverted (Figure 5), and from 6/27/73 to 8/28/73 29 to 84 cfs. was diverted (Figure 6). This water is used to surface or subirrigate approximately 950 acres of summer sheep pasture and hay meadows.

Minimum flows for fish passage were established for the area below the diversion using the "Oregon Method" (Thompson, 1972).

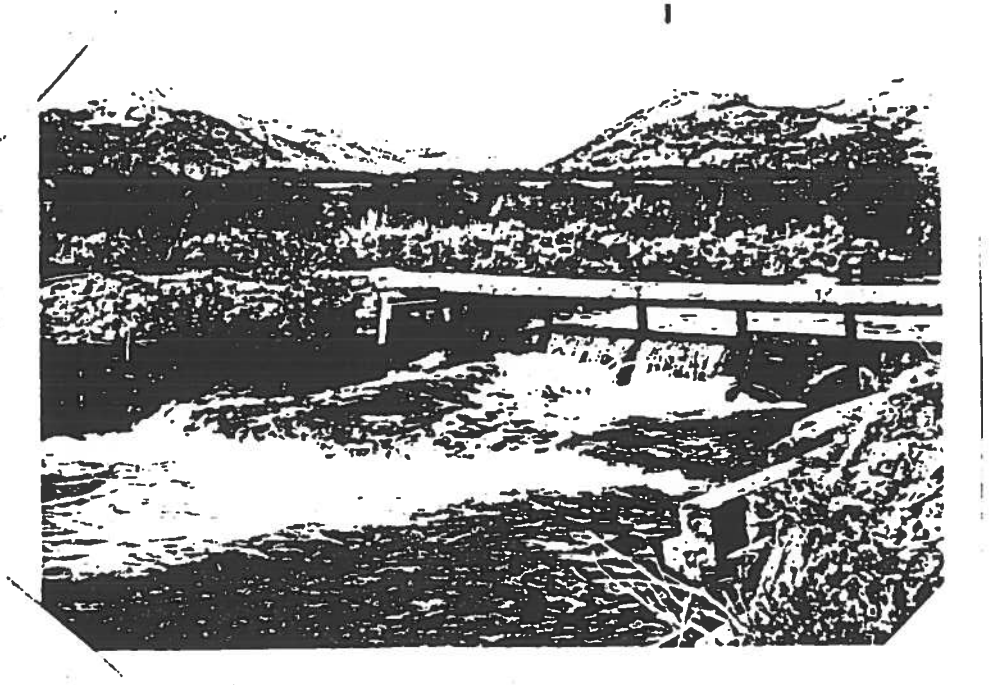


FIGURE 3 - BRECKENRIDGE DIVERSION WITH ADEQUATE STREAMFLOW (44 CFS.) TO PROVIDE FOR ADULT SALMON PASSAGE.

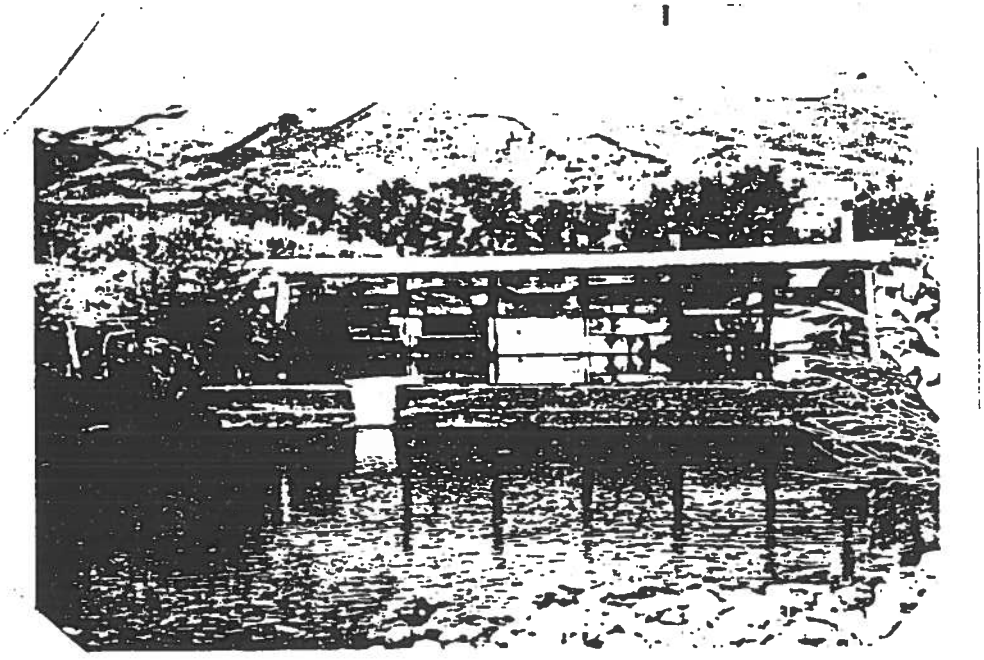


FIGURE 4 - BRECKENRIDGE DIVERSION WITH ALL GATES CLOSED. SALMON CANNOT MOVE UPSTREAM INTO 22 MILES OF SPAWNING STREAMS UNDER THIS CONDITION.

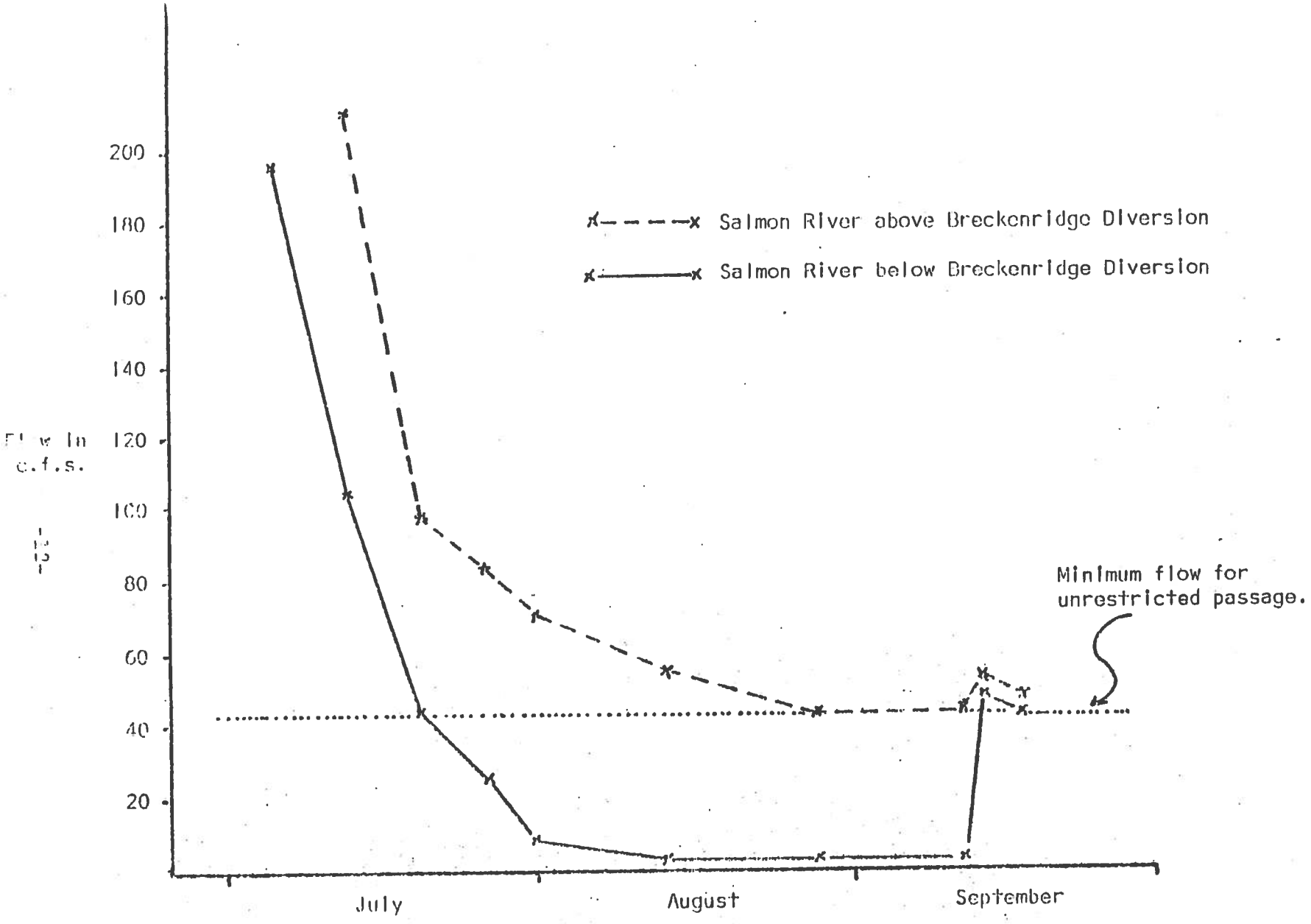


FIGURE 5 STREAMFLOWS AT BRECKENRIDGE DIVERSION, DURING SUMMER 1972.

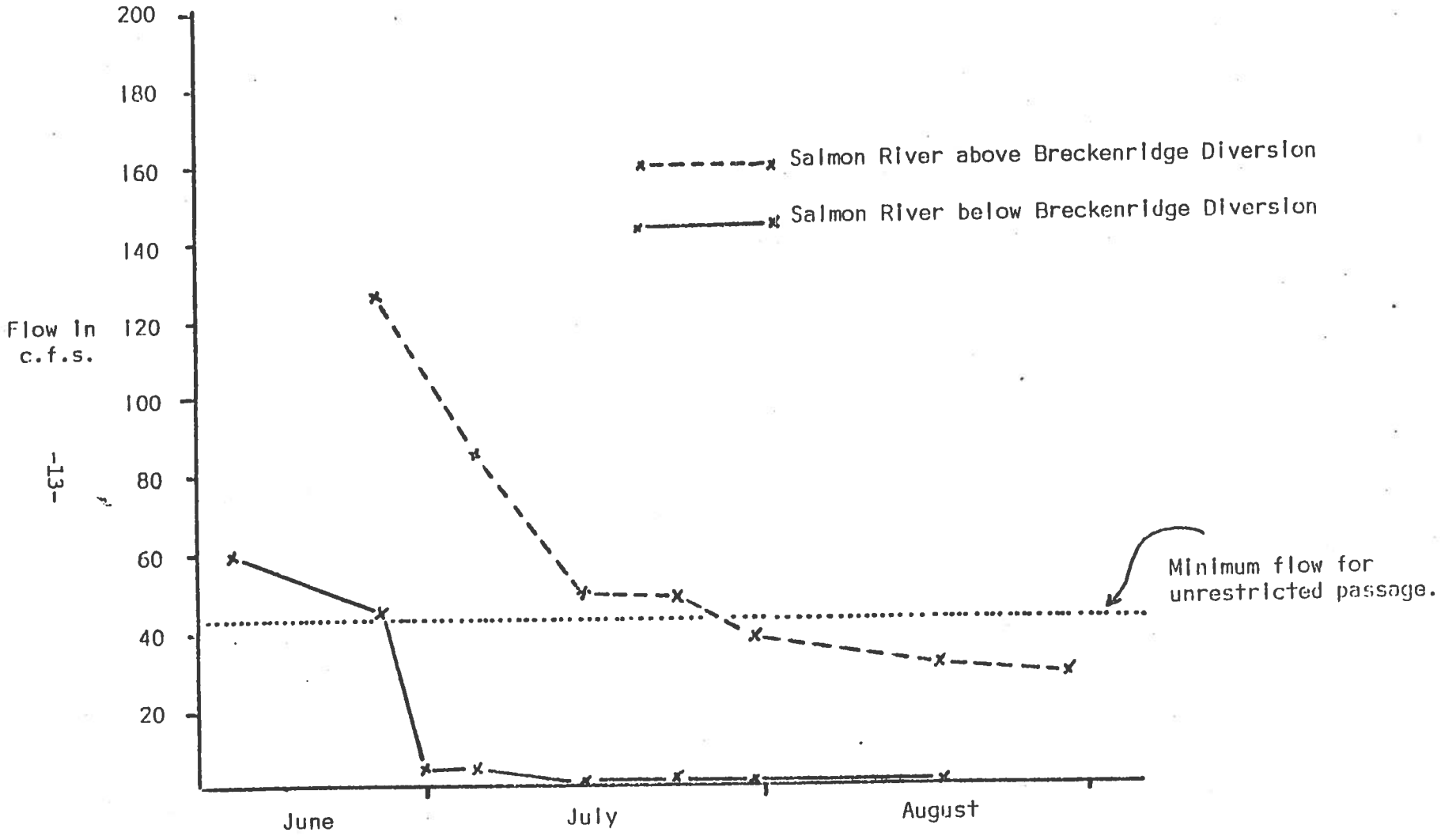


FIGURE 6 - STREAMFLOWS AT BRECKENRIDGE DIVERSION, DURING SUMMER 1973.

Three riffles located below the diversion were investigated. The most critical riffle located approximately 150 yards below the diversion, requires approximately 44 cfs as minimum flow to insure adequate passage of adult chinook (Table 2). To accommodate most upstream spring chinook movement, this flow should be maintained through August 25 if natural flows are present. During 1972, this flow could have been available through August 27, if diversion had not taken place (Figures 7 - 10).

Presently, as a result of diversion of water, minimum flow is not maintained throughout the time period of upstream salmon movement, consequently the timing of flow reduction in relation to fish movement is of major importance. The 1972 spring chinook spawners had the benefit of heavy late runoffs, providing sufficient waters past the diversion to meet both irrigation demand and flow requirements until sometime between July 20 and 27. As a result, at least 163 redds were successfully completed above the diversion (Table 3). Fish unsuccessfully attempted to move past the diversion after July 27, despite loss of flows and the diversion barrier. In 1973 flows were virtually shut off at the diversion June 30, resulting in only 50 redds being completed above the diversion. High redd counts below the diversion (Figure 11) indicate an above-average concentration of spawners.

Flow in 1972 was reduced to zero at the diversion and by August 13 flow was insufficient for any spawning for a distance of .5 miles

TABLE 2

STREAMFLOWS AT CRITICAL RIFFLE (SBP-1) BELOW BRECKENRIDGE DIVERSION AS RELATED TO PERCENTAGE OF USABLE STREAM WIDTH SUITABLE FOR SALMON PASSAGE.

FLOW	DATE	TOTAL WIDTH	WIDTH WETTED	WIDTH USABLE		LONGEST CONTINUOUS PORTION USABLE	PERCENT
				FEET	PERCENT		
197	7-6-72	86	86	67	78	67	78
106	7-13-72	86	85	38	44	38	44
60	6-13-73	86	85	9	10	9	10
44	7-20-72	86	82	18	21	18	21
40	6-26-73	86	85	0	0	0	0
27	7-26-72	86	81	0	0	0	0
9	8-1-72	86	65	0	0	0	0
5	7-5-73	86	45	0	0	0	0
4	8-11-72	86	56	0	0	0	0

FIGURE 7 - CRITICAL RIFFLE (SBP-1) BELOW BRECKENRIDGE DIVERSION WITH ADEQUATE FLOW FOR SALMON PASSAGE.

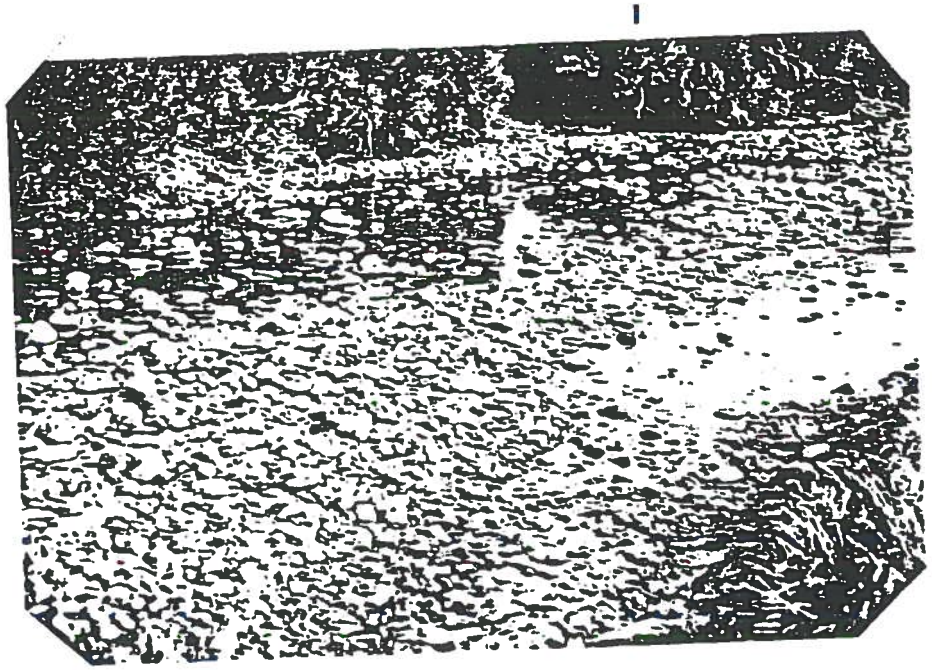


FIGURE 8 - CRITICAL RIFFLE (SBP-1) BELOW BRECKENRIDGE DIVERSION WHEN DIVERSION IS COMPLETELY CLOSED. ONLY SEEPAGE WATER REMAINS DOWNSTREAM FROM THE DIVERSION.

FIGURE 9 - VIEW DOWNSTREAM FROM BRECKENRIDGE DIVERSION WITH REDUCED, BUT ADEQUATE FLOWS.

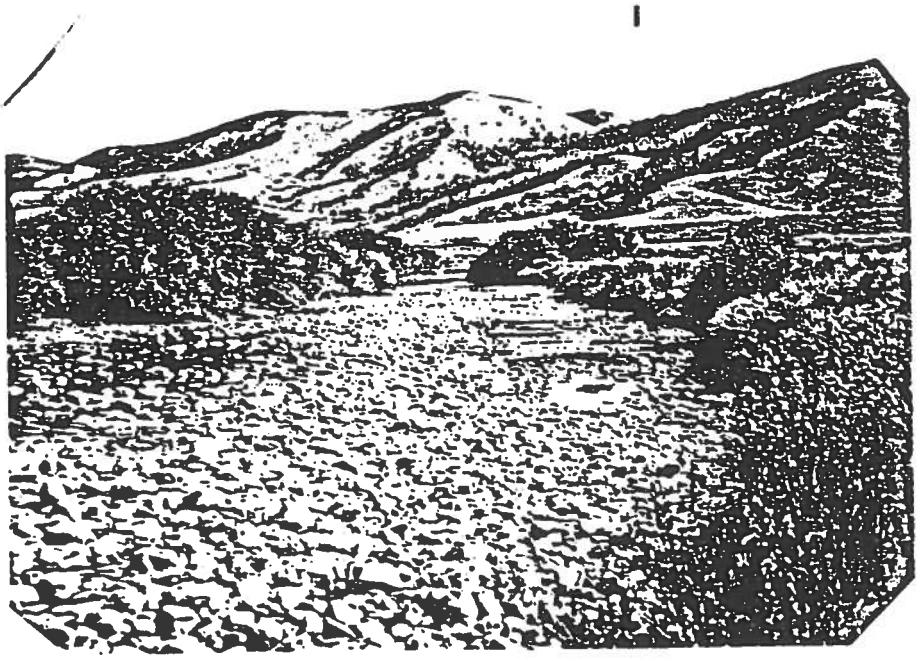


FIGURE 10 - VIEW DOWNSTREAM FROM BRECKENRIDGE DIVERSION WHEN DIVERSION IS COMPLETELY CLOSED. AT LEAST ONE-HALF MILE OF STREAM IS UNUSABLE TO ALMOST ALL AQUATIC LIFE UNDER THESE CONDITIONS.

TABLE 3

Salmon redds completed above Breckenridge Diversion by drainage.

Stream	Redds in 1972	Redds in 1973
Main Stem Salmon above diversion	92	33
Smiley Creek	58	9
Frenchman Creek	12	8
Beaver Creek	1	0
TOTAL	163	50

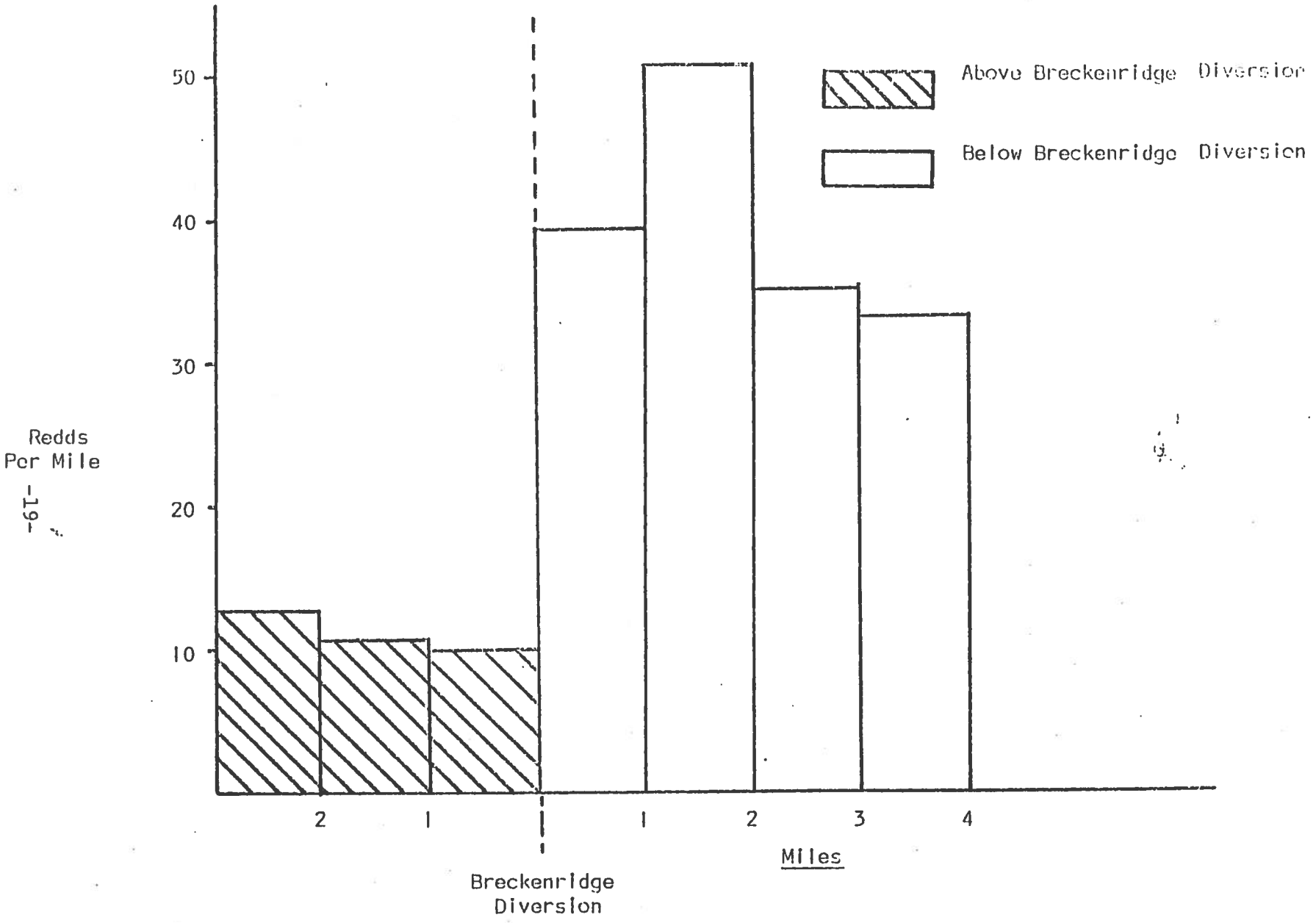


FIGURE 11 SPRING CHINOOK REDD COUNTS ABOVE AND BELOW BRECKENRIDGE DIVERSION (8-18-72)

below the diversion. Considerable spawning had occurred in this section before the dewatering, which probably resulted in 100 percent loss of eggs in redds that were wholly or partially dewatered. In 1973, flows had been stabilized at a reduced flow before spawning had been initiated, therefore losses to eggs below the dewatering should have been lower than in 1972, although no data was gathered.

Beginning approximately .5 miles below the diversion recharge and irrigation return water provides marginal conditions to induce some salmon spawning. Seven transects were established on sites used by salmon for spawning during 1972 from approximately .5 to 2.5 miles below the diversion. Early spawning salmon used these sites, but reduced flows later in the season reduced availability of suitable spawning conditions. Redd density in 1972 in this area was three times that of similar sites upstream from the diversion. This resulted from passage blockage at the diversion which prevented continued upstream movement by salmon.

Transects results (Figures 13, 14, 16, 18), indicate that in 4 of 7 spawning site studies available suitable spawning area increased with increasing flows. In the other 3 sites (Figures 12, 15, 17), spawning area increased to until flows between 40 and 50 cfs were reached and then suitable area declined with increasing flows. This is due to flow characteristics which cause velocities to become excessive for spawning with increased flows. On this stream section a flow increase up to 40 to 50 cfs generally increases suitable spawning conditions, but greater flows do not substantially increase overall spawning area.

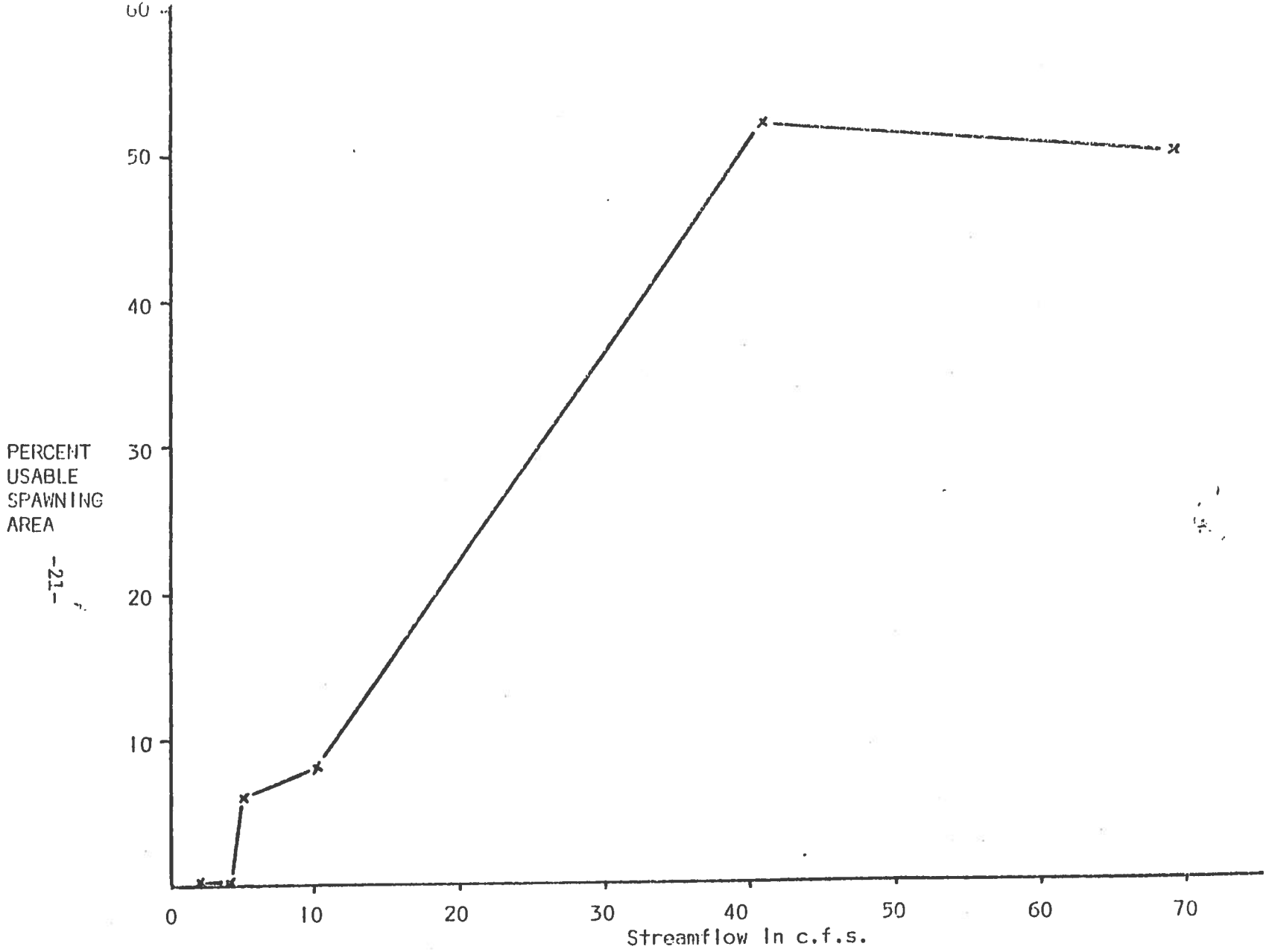


FIGURE 12 BRECKENRIDGE SPAWNING STATION 1-USABLE SPAWNING AREA RELATED TO STREAMFLOW.

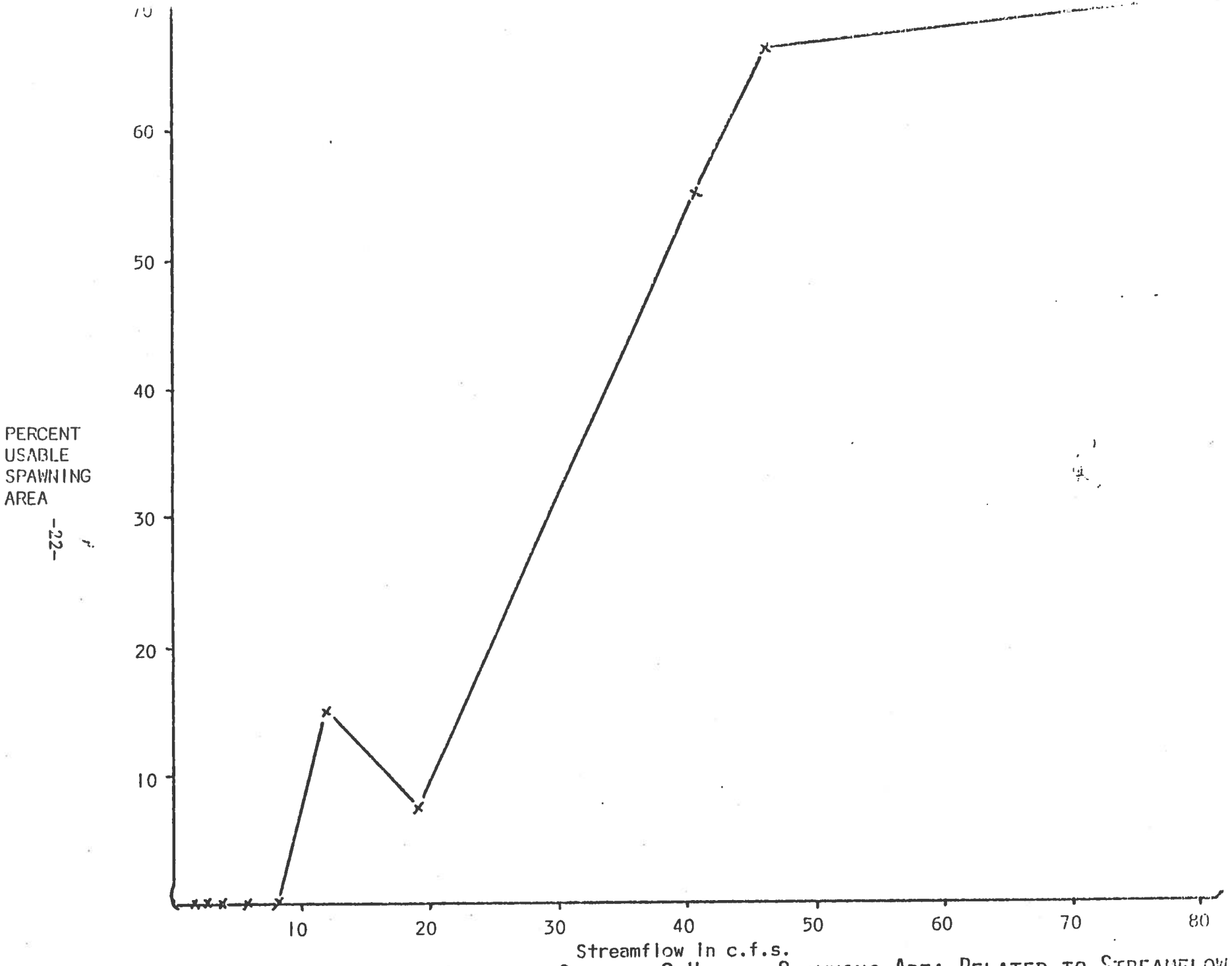


FIGURE 13 'BRECKENRIDGE SPAWNING STATION 2-USABLE SPAWNING AREA RELATED TO STREAMFLOW

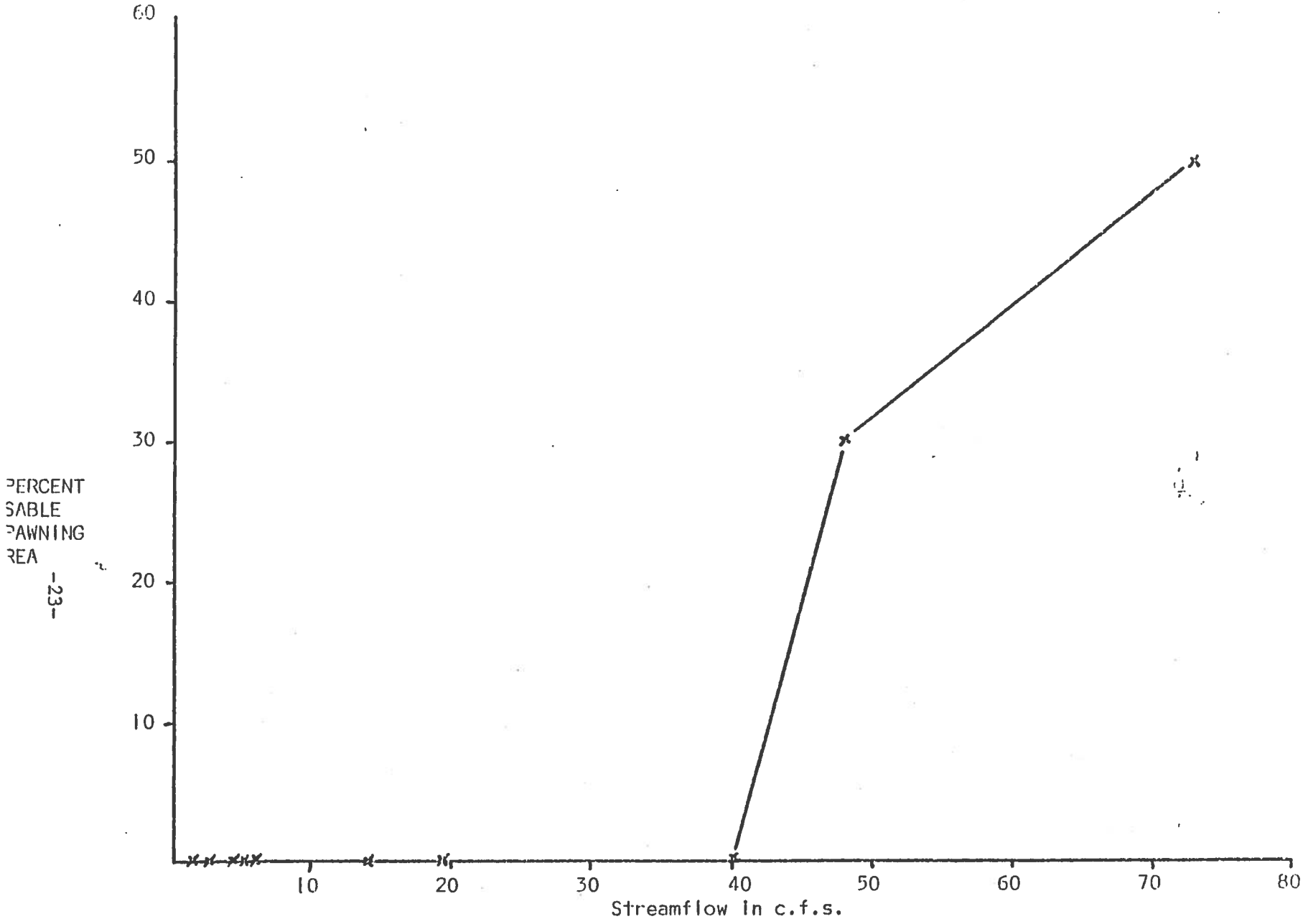


FIGURE 14 BRECKENRIDGE SPAWNING STATION 3-USABLE SPAWNING AREA RELATED TO STREAMFLOW

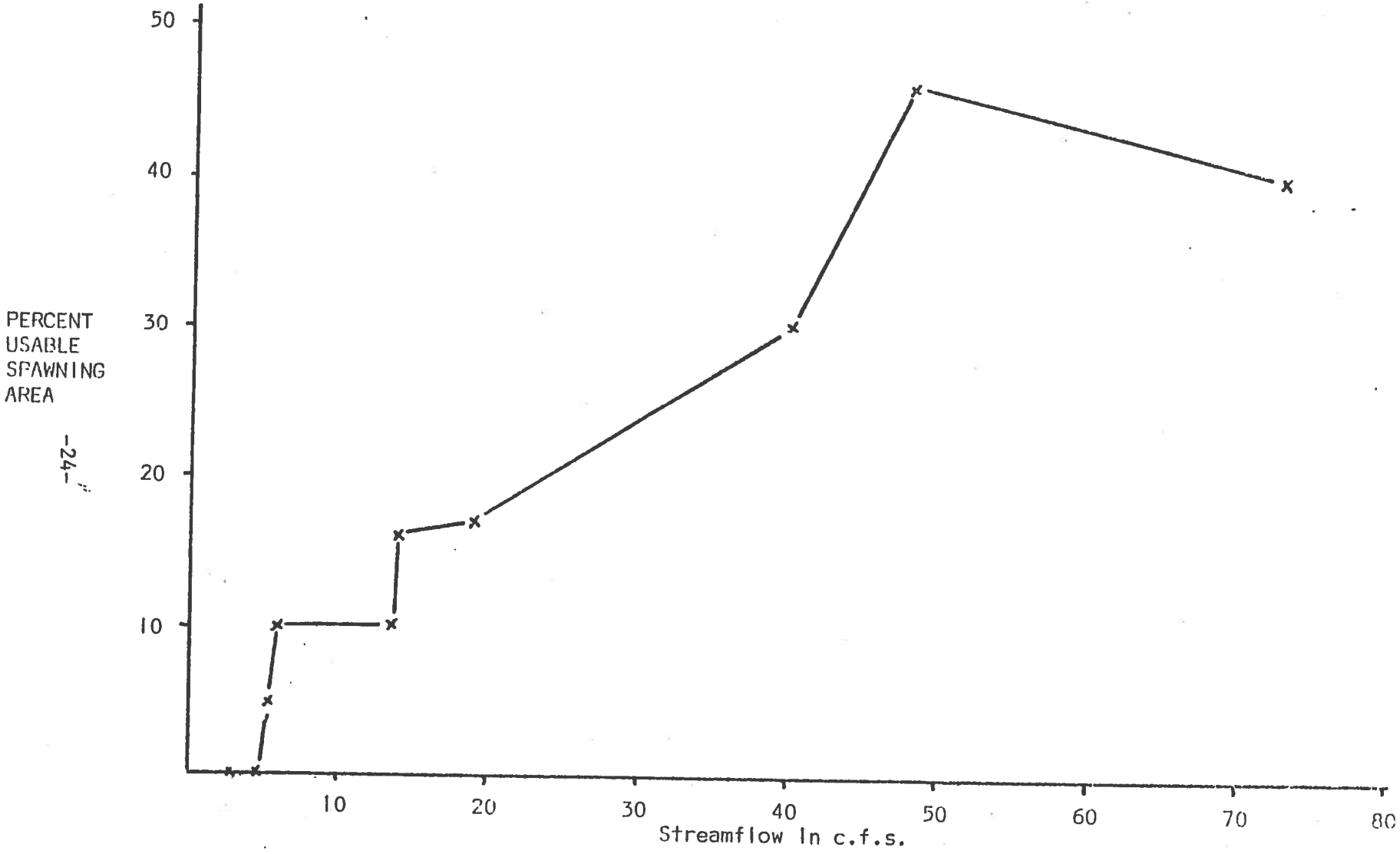


FIGURE 15 BRECKENRIDGE SPAWNING STATION 4-USABLE SPAWNING AREA RELATED TO STREAMFLOW.

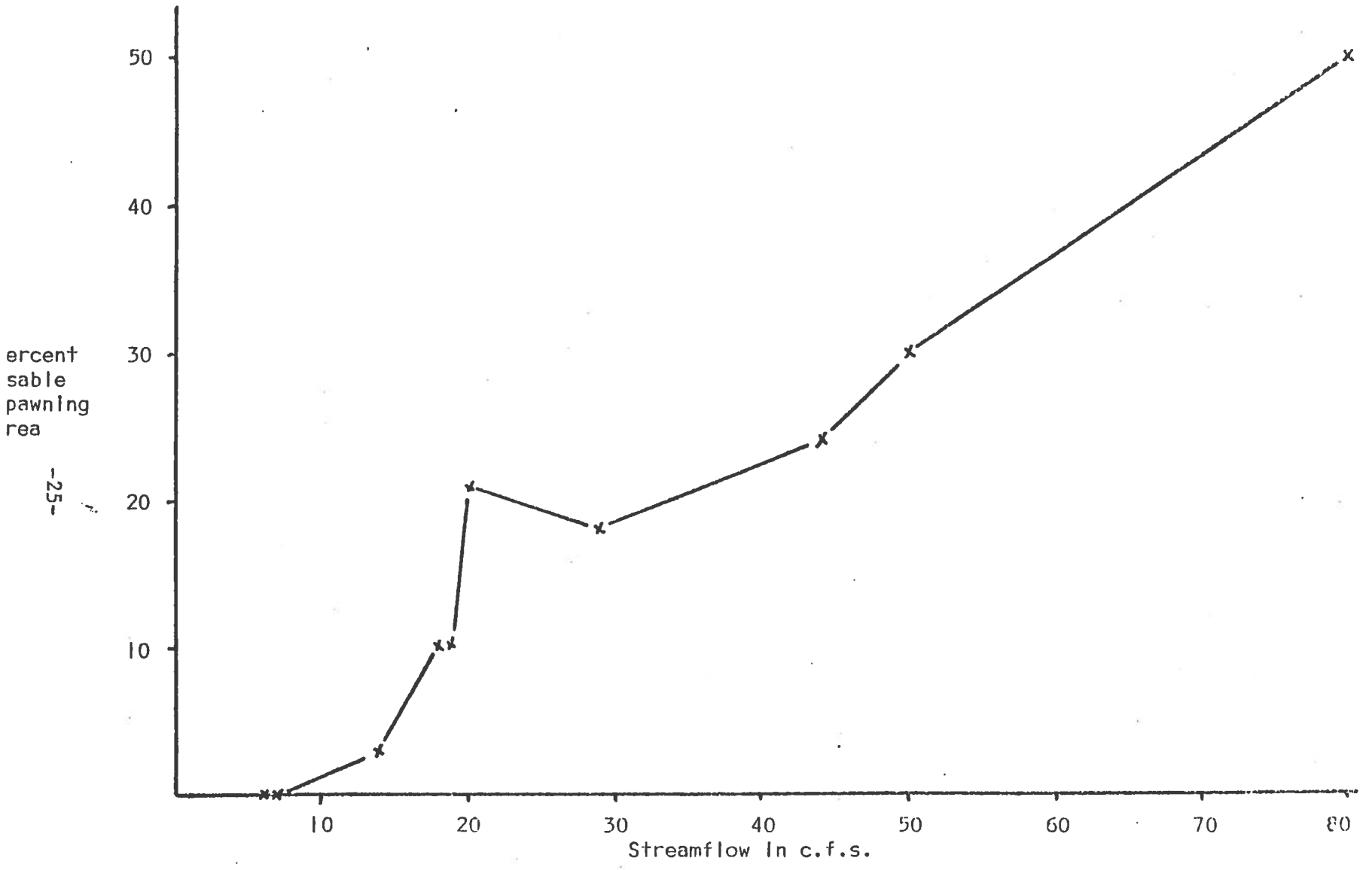


FIGURE 16 BRECKENRIDGE SPAWNING STATION 5-USABLE SPAWNING AREA RELATED TO STREAMFLOW.

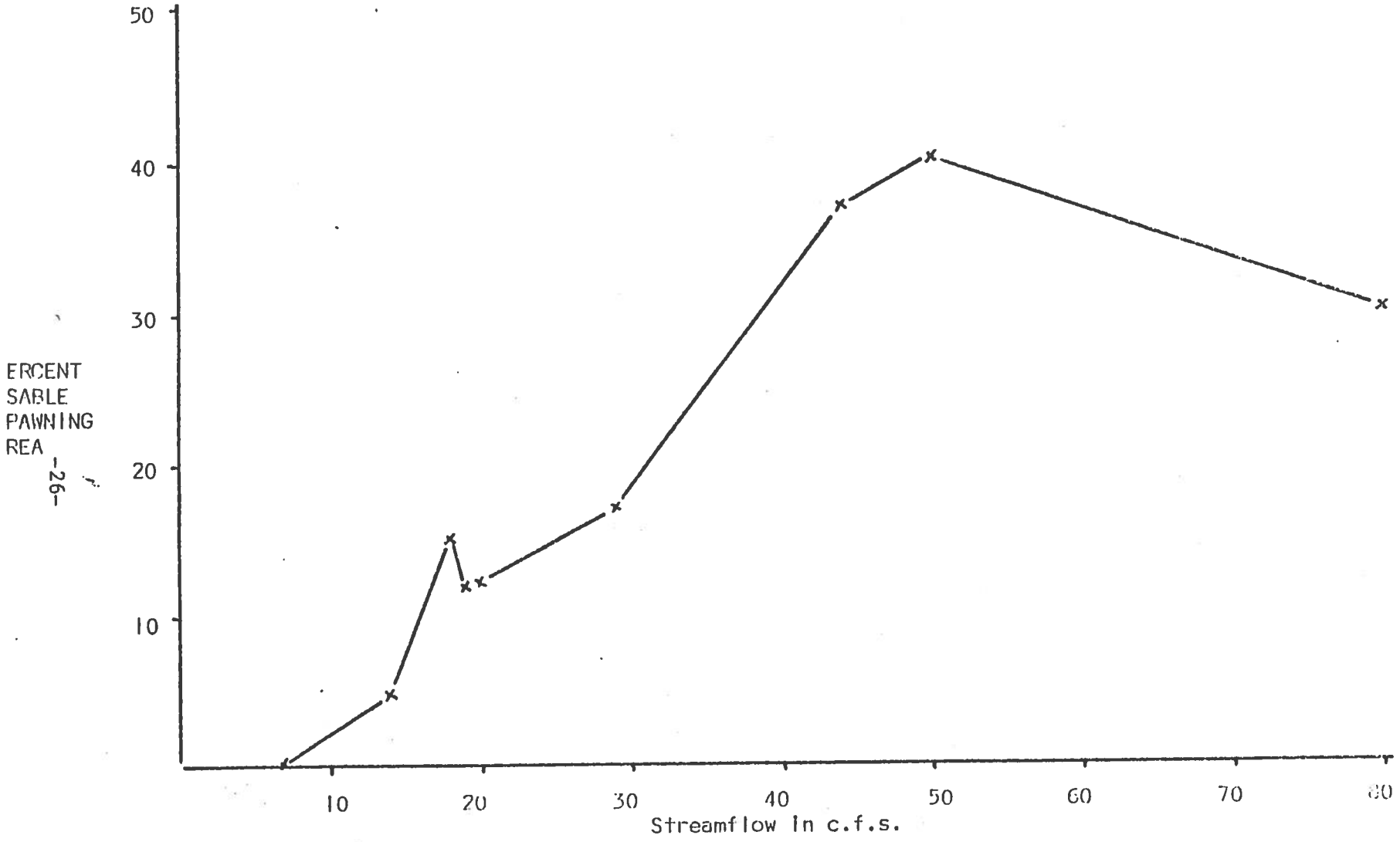


FIGURE 17 BRECKENRIDGE SPAWNING STATION 6-USABLE SPAWNING AREA RELATED TO STREAMFLOW.

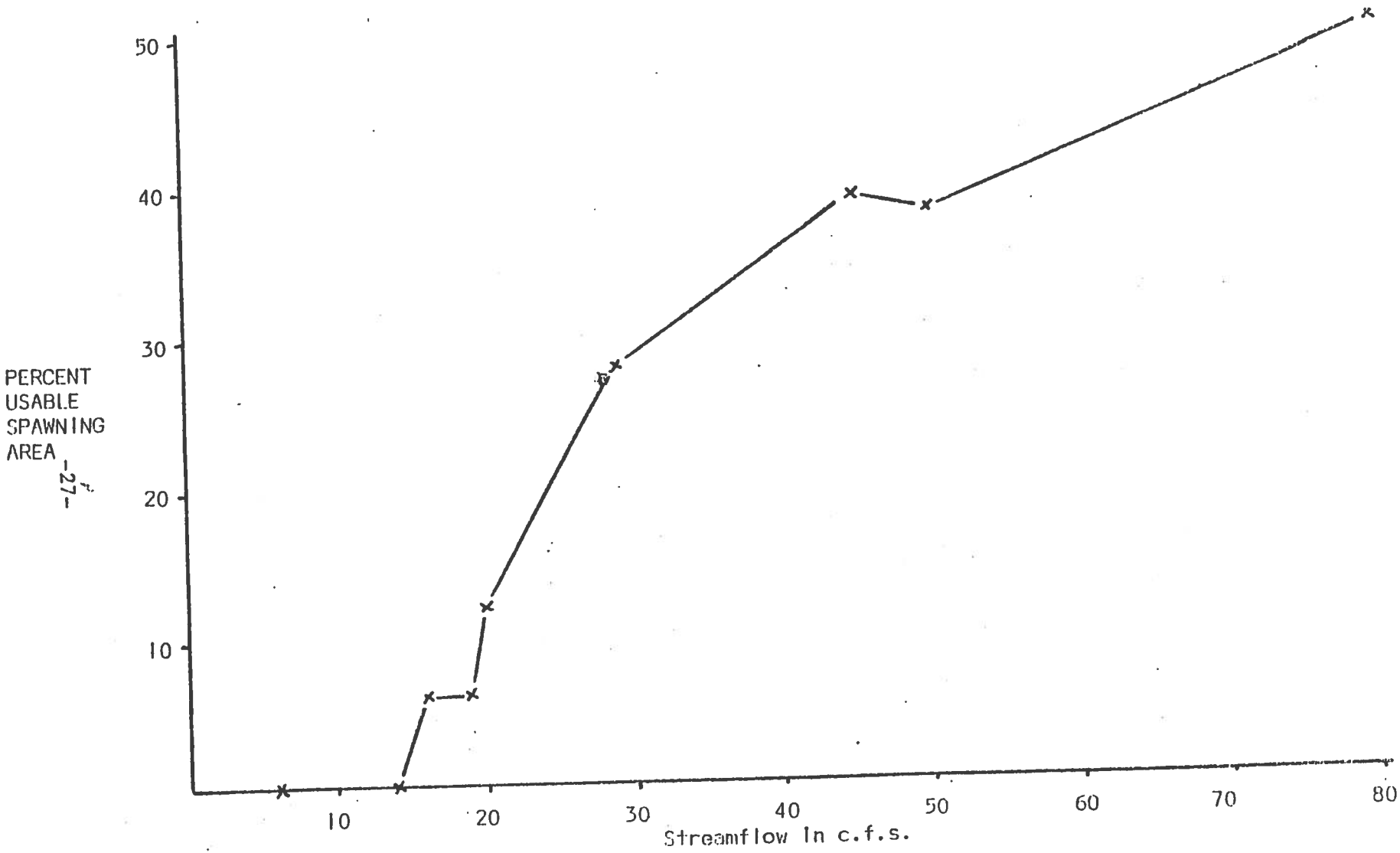


FIGURE 18 BRECKENRIDGE SPAWNING STATION 7-USABLE SPAWNING AREA RELATED TO STREAMFLOW.

Juvenile Loss

In addition to negative effects of this diversion on passage, spawning, and incubation of salmon eggs, losses of drifting and smolting spring chinook occur as a result of their being diverted into irrigated fields. Losses measured in one primary lateral ditch originating from the main diversion ditch were calculated at 12 juvenile chinook per day for July 1973 and 16 per day for August 1973. Assuming losses in this ditch are proportional to total flow of this diversion, and that losses are equal throughout the month, losses of young chinook resulting from the Breckenridge Diversion were calculated at 1440 per month for July and 1820 per month for August. Because of sample techniques, this is only a minimum estimate, and actual losses could be several times higher. It is expected that losses during the September and October irrigation season are several times higher, because low water temperatures generally stimulates downstream migration of young chinook. The extent of irrigation during this time depends on climatic conditions that affect the pastures growing season.

Temperatures

Flows entering the diversion reached a maximum of 64° on July 24 and maintained this maximum until August 13. However, irrigation waste water return flows maximum temperatures were between 70°F and 76°F during the period July 5 and August 13 (Figure 19).

At no time during summer 1973 did river temperatures reach levels detrimental or lethal to salmonoids (generally above 70°F) but did reach levels above those preferred by juvenile salmon (54° and 57°F) and juvenile rainbow trout (55° to 66°F), (Figure 20).

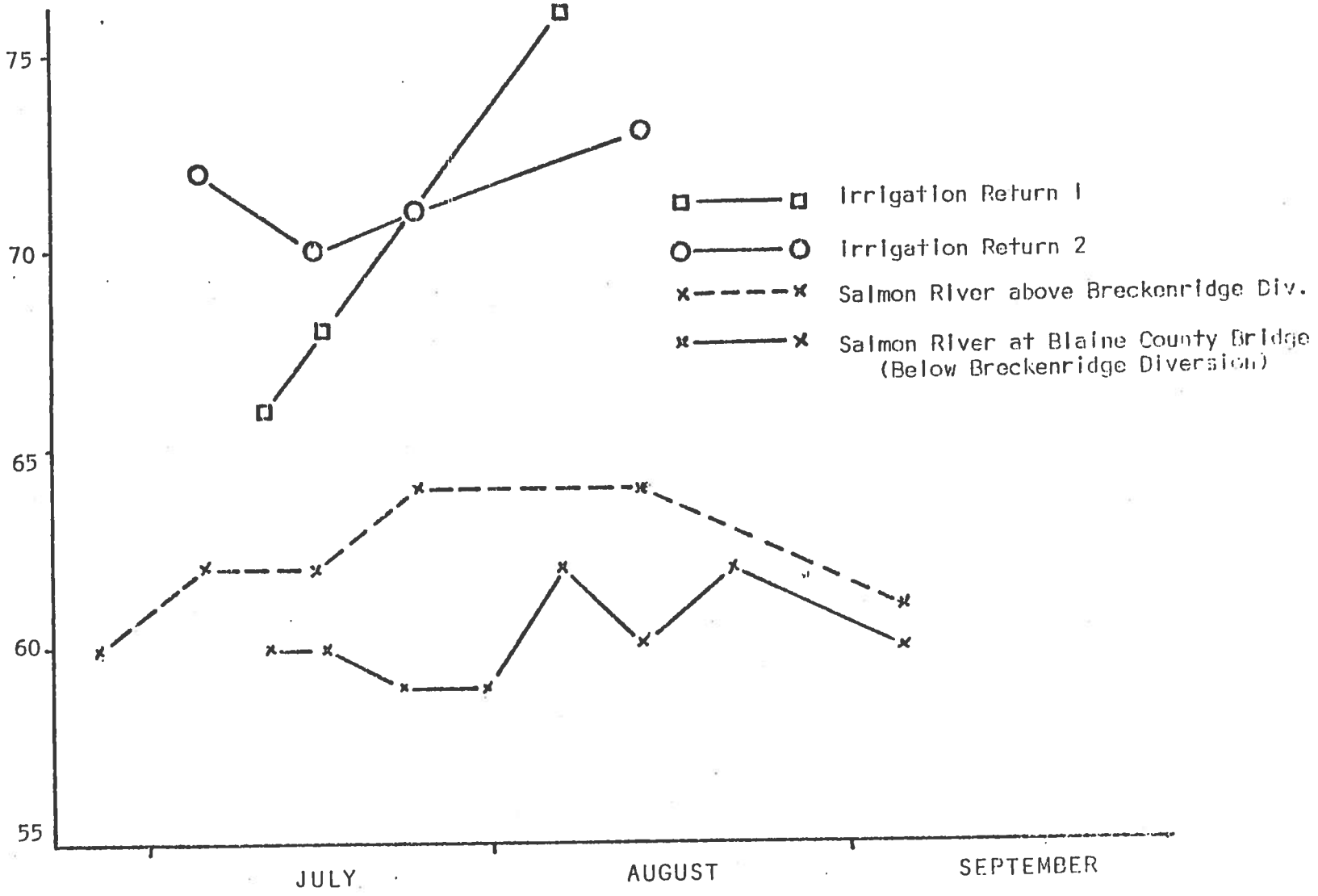


FIGURE 19 BRECKENRIDGE IRRIGATION RETURNS AND SALMON RIVER WATER TEMPERATURES AT BRECKENRIDGE RANCH DURING SUMMER, 1973.

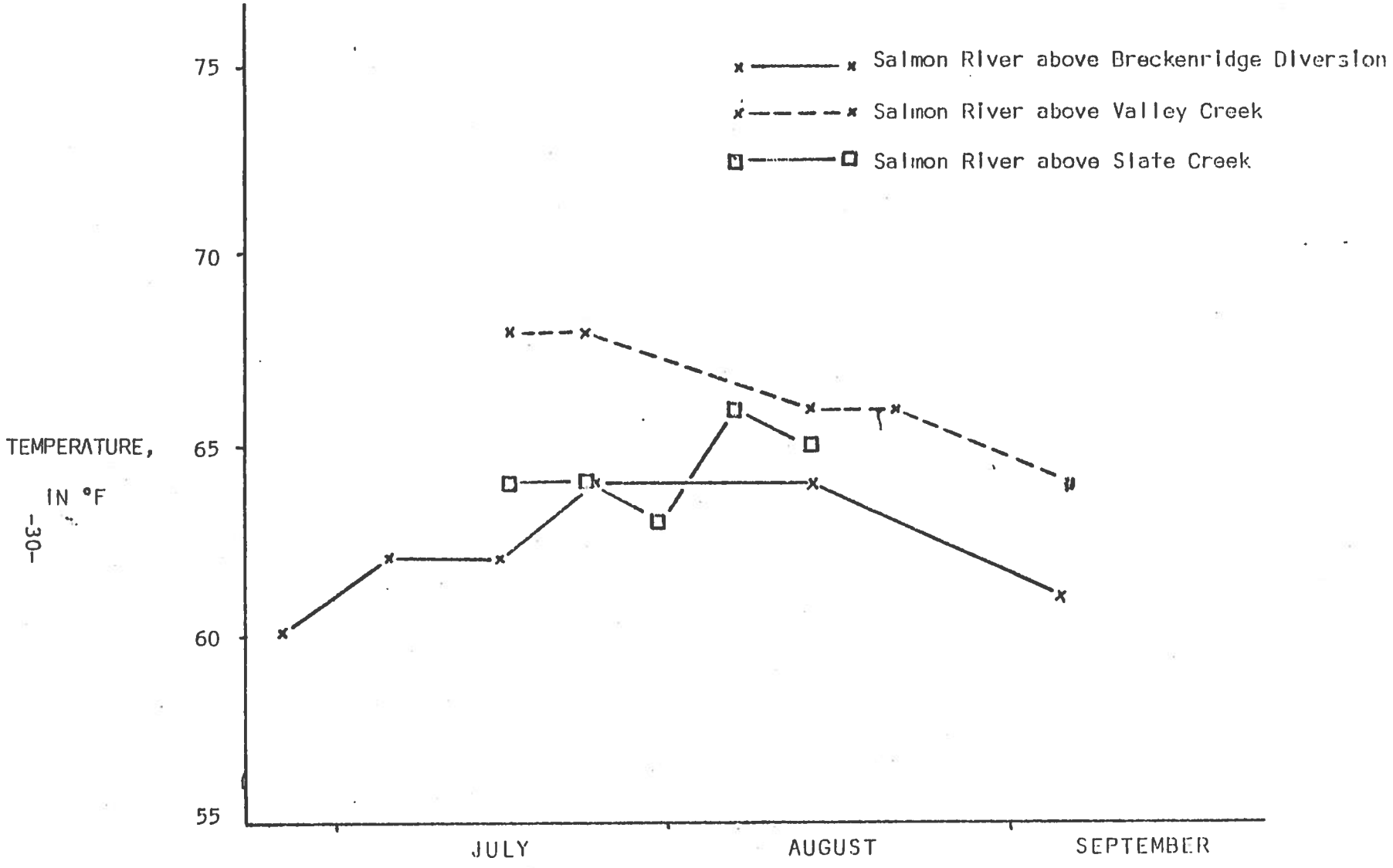


FIGURE 20 SALMON RIVER TEMPERATURES (°F) DURING SUMMER, 1973.

The results are not complete because many thermometers were periodically damaged, stolen, or were not always in water due to receding water levels.

B. Alturas Diversion

Located on Forest Service land (T7N, R14E, Sec. 4), this diversion is effective in stopping a considerable portion of the spring chinook run destined for upper Alturas Creek. It may also stop passage of summer chinook that may utilize these waters in a high water year. In addition, this structure may have been at least partially responsible for the disappearance of sockeye salmon which once migrated to Alturas Lake (Bjornn, et al., 1968).

Streamflows

In 1972, flows were measured approximately .5 miles below the diversion, and at the diversion. Records indicate 3 cfs (9/13/72) to 40 cfs (8/2/72) of water is diverted to irrigate (surface of subirrigate) approximately 500 acres of summer sheep pasture. Natural flows above the diversion during summer of 1972 ranged from 241 cfs to 26 cfs (Figure 21).

Minimum flow for passage of adult chinook was established at 52 cfs (Table 4), which if naturally available, should be maintained at least through August 25 (Figure 22). Altered flows below the diversion fell below this minimum sometime between July 2 and August 2, 1972 and about July 7, 1973. Natural flows above

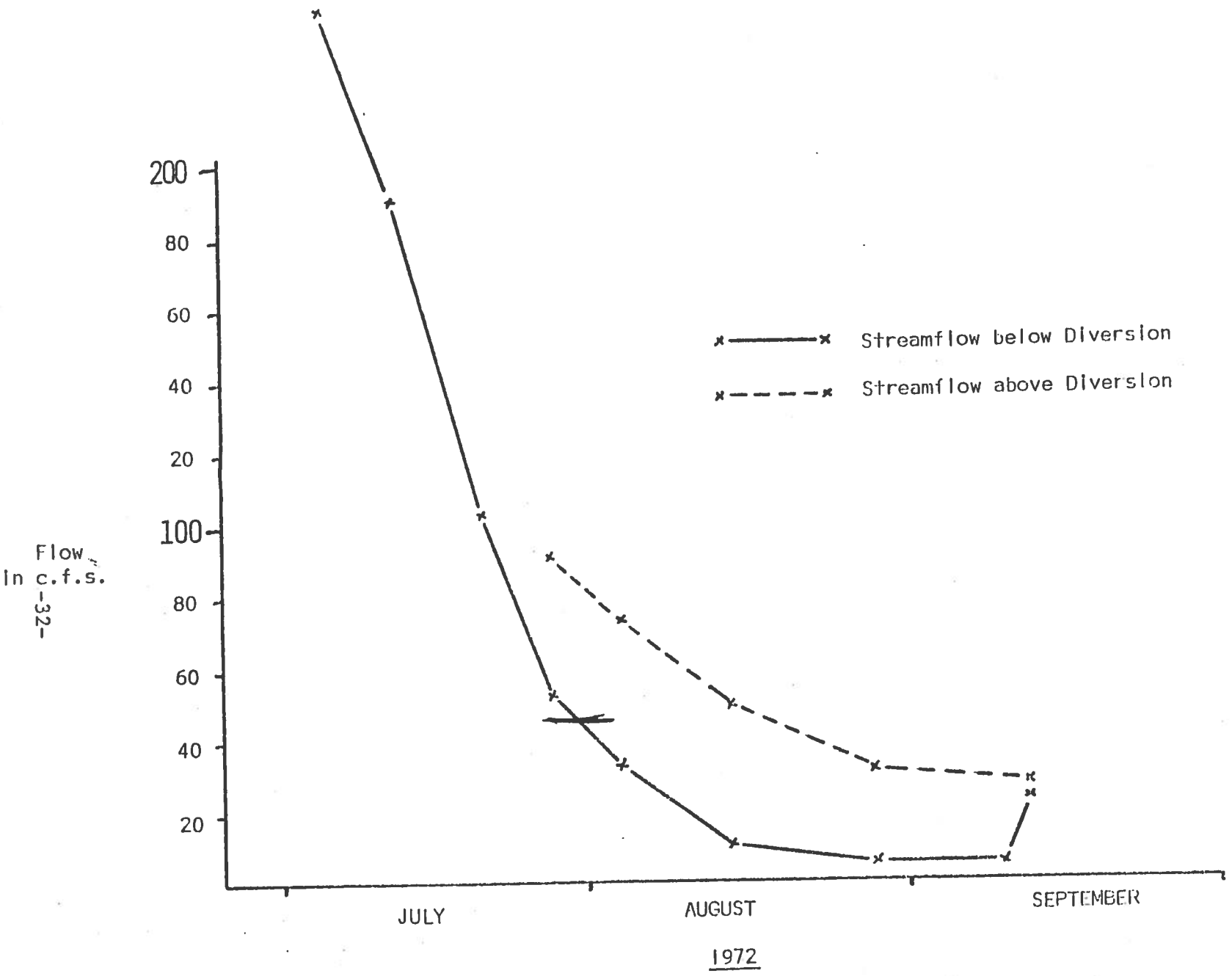


FIGURE 21 STREAMFLOWS OF ALTURAS CREEK ABOVE AND BELOW DIVERSION DURING SUMMER 1972.

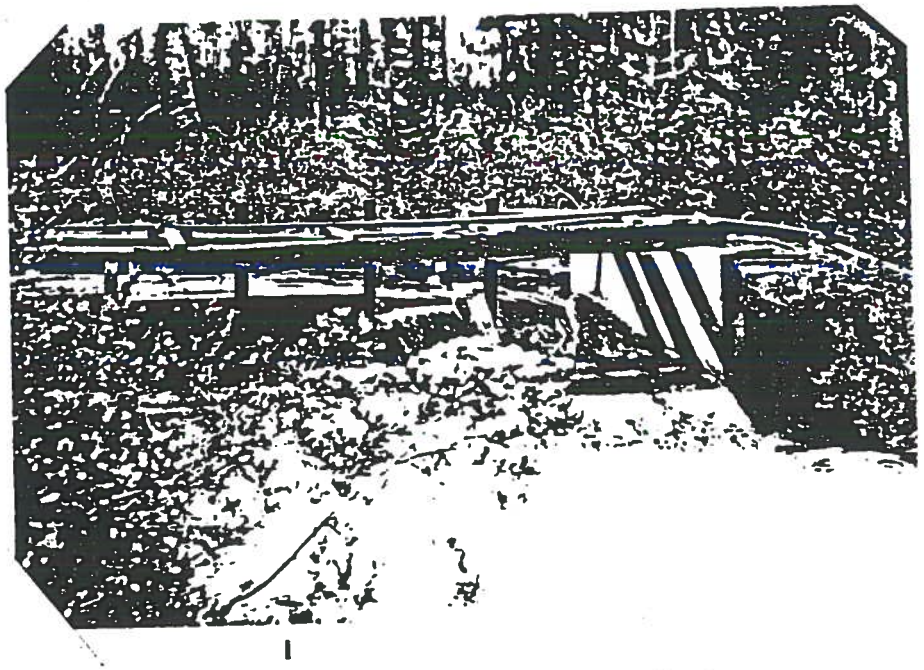


FIGURE 22 - ALTURAS DIVERSION WITH ONE SET OF SPLASH BOARDS OUT. A FLOW OF 52 CFS IS ADEQUATE PAST THIS DIVERSION.

FIGURE 23 - ALTURAS DIVERSION WHEN DIVERSION IS COMPLETELY CLOSED. STRANDED CHINOOK SALMON IS IN FOREGROUND.

TABLE 4

STREAMFLOWS AT CRITICAL RIFFLE (AP-1) BELOW ALTURAS DIVERSION AS RELATED TO PERCENTAGE OF USABLE STREAM WIDTH SUITABLE FOR SALMON PASSAGE.

FLOW	DATE	TOTAL WIDTH	WIDTH WETTED	WIDTH USABLE		LONGEST CONTINUOUS PORTION USABLE	PERCENT
				FEET	PERCENT		
266	7-6-72	68	68	48	70	34	50
190	7-12-72	68	65	41	60	34	50
180	6-19-73	68	68	34	50	34	50
105	7-20-72	68	67	20	29	20	29
81	6-26-73	68	66	20	29	20	29
53	7-5-73	68	66	6	10	6	10
52	7-27-72	68	66	14	21	14	21
33	8-2-72	68	65	0	0	0	0
28	7-15-73	68	36	3	4	3	4
23	9-12-72	68	34	3	4	3	4
13	7-23-73	68	29	3	4	3	4
10	8-14-72	68	25	0	0	0	0
8	7-30-73	68	24	0	0	0	0
6	8-28-72	68	26	0	0	0	0

the diversion met this minimum until approximately August 10, 1972 and July 23, 1973. Due to above normal flows during 1972, enough spring chinook passed Alturas diversion to complete 11 redds above the diversion, nine of which were above Alturas Lake. No redds were found above the diversion during 1973.

Because of an absence of spawning redds or extensive suitable spawning gravels immediately below the diversion no attempt was made to calculate minimum flows for spawning or rearing. Alturas diversion undoubtedly has detrimental effects on spawning success further downstream as a result of reduced flows; however, no attempt was made to quantify these effects.

Juvenile Loss

No juvenile chinook were found during sampling operations in ditches originating from this diversion in 1973. It is believed that the low escapement of adults upstream the year previously (9 redds) would result in such a low juvenile population that the chances of collecting a juvenile would be very low.

However, it was established that salmon smolts were diverted into pastures resulting from this diversion (Platts, 1968) and eventually perish, and it is also likely that some early fall downstream drift of pre-smolt spring chinook are diverted to fields. Sockeye smolting occurs in April and May which is before the irrigation season and therefore losses likely would not occur.

Temperature

Maximum temperatures were between 59°F and 71° for the period July 9 through September 5, 1973 at a sample station approximately 2.5 miles below Alturas Diversion (Figure 24).

C. Pole Creek Diversion

Little is known about anadromous stocks or potential salmon production in Pole Creek. Although there appears to be at least five miles of suitable spawning and rearing habitat upstream from the mouth, only one dead salmon and one old redd were found in 1972. According to some local residents, a few salmon have been observed in past years. This lack of a spawning population could be attributable to historic dewatering of the lower 2.5 miles of stream, which may have eliminated this stock. Seven diversions (Figure 25) are located within the lower three miles of stream (T7N, R14E, Secs. 26, 35, 36) to irrigate about 200 acres of private land belonging to the Salmon Falls Sheep Company and about 70 acres of Bureau of Land Management lands.

Streamflows

During 1972 flows were measured at the upper four diversions, plus at a station between the second and third diversion, and at another station approximately .25 miles upstream from the mouth. Flows in Pole Creek above all diversions varied from 88 cfs (7/20/72) to 45 cfs (9/12/72) while flows near the mouth during the same period varied from 15 cfs (7/20/72 to less than 1 cfs (8/14/72 and 9/12/72) (Figure 26). Minimum flow required for passage through the lower

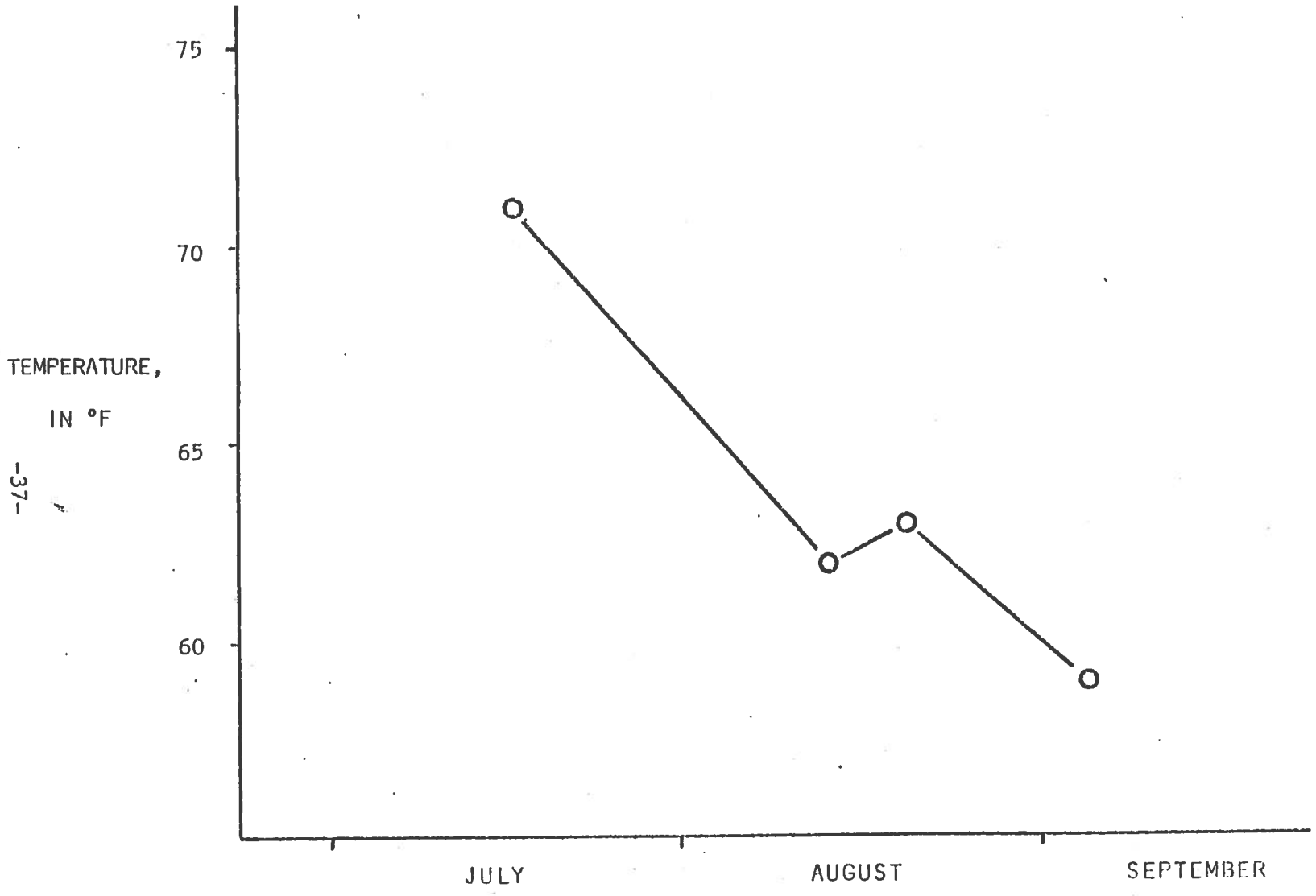


FIGURE 24 ALTURAS CREEK TEMPERATURES (°F) NEAR PETTIT LAKE ROAD DURING SUMMER, 1973.

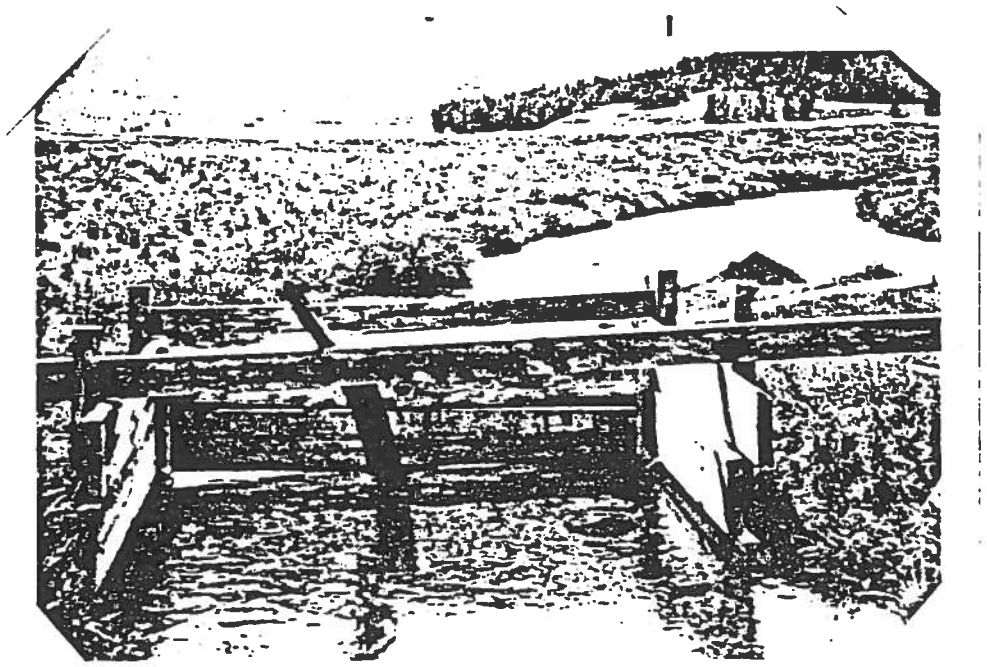
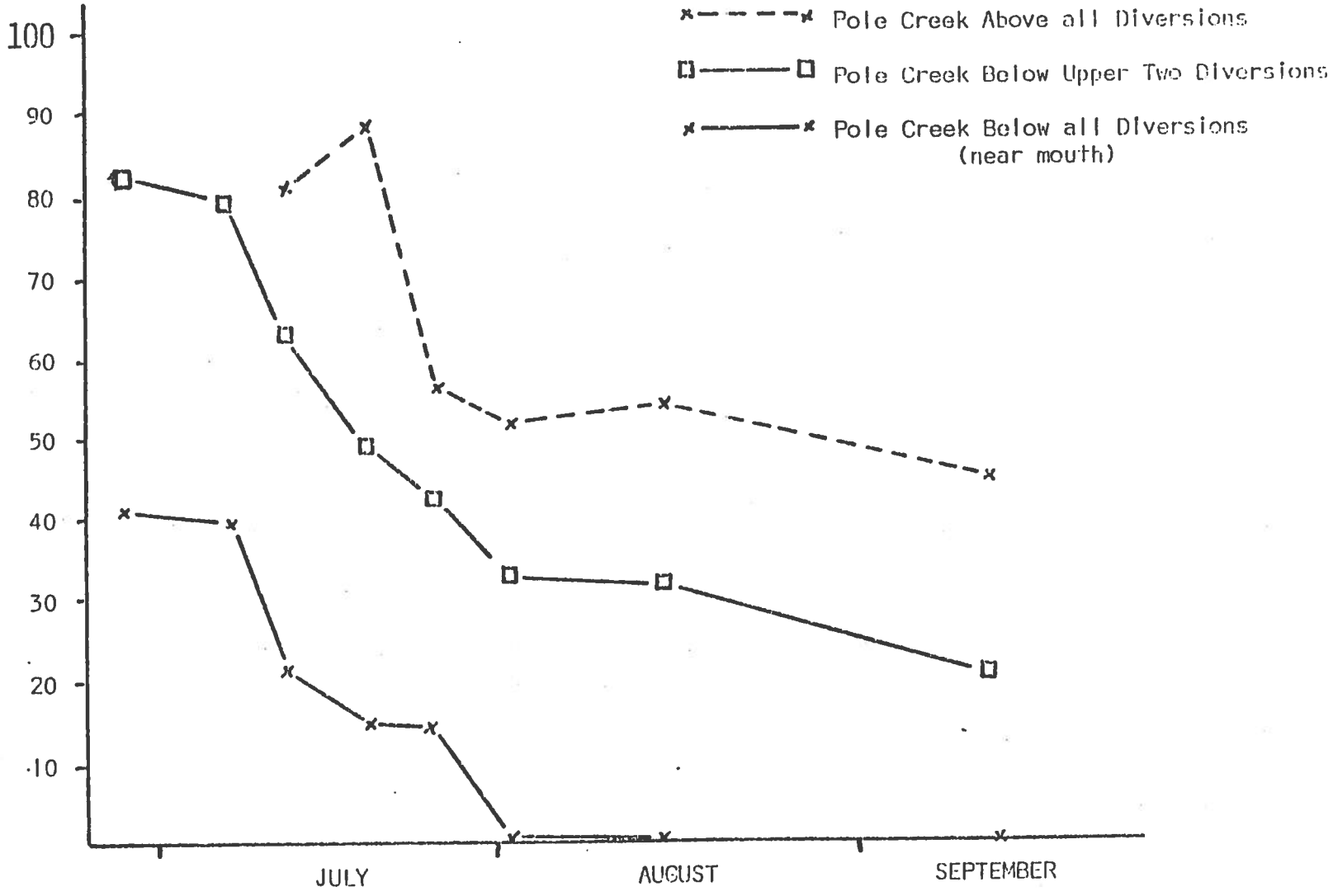


FIGURE 25 - ONE OF SEVEN DIVERSIONS ON POLE CREEK THAT LEAVES THE MOUTH OF THIS STREAM DRY DURING SUMMER.



STREAMFLOWS

FIGURE 26 POLE CREEK ABOVE AND BELOW DIVERSIONS DURING SUMMER 1972.

three miles was established at 42 cfs which was met all during the 1972 season by natural flows above all diversions, but flows near the mouth were insufficient for passage after about 7/7/72. This early reduction in flow probably precluded any potential movement into Pole Creek by salmon. No attempt was made to establish minimum spawning and rearing flows.

During 1973 flows above all diversions stabilized at about 20 cfs (Figure 27). However, at the mouth of Pole Creek, the stream had been reduced to flows less than 1 cfs from June 15 through at least mid-September. No salmon were observed in Pole Creek in 1973.

D. Champion Creek Diversions

It is likely that spring chinook could utilize the lower two or three miles of Champion Creek if sufficient waters were present to permit passage and facilitate spawning and rearing. However, complete dewatering of the lower portion of this stream occurs annually as a result of seven diversions (T8N, R14E, Sec. 14, 15, 17, 22, and 23) used to irrigate approximately 435 acres owned by three landowners.

Streamflows

During 1972, flows were measured at a station immediately above the upper diversion, plus flows of the upper three diversions, and at a station near the mouth of Champion Creek. Flows measured upstream from diversions between July 25 to September 8, 1972 varied from 38 to 18 cfs, while flows below all diversions varied from 4 to 9 cfs. (Figure 28). No minimum passage or spawning flows were calculated.

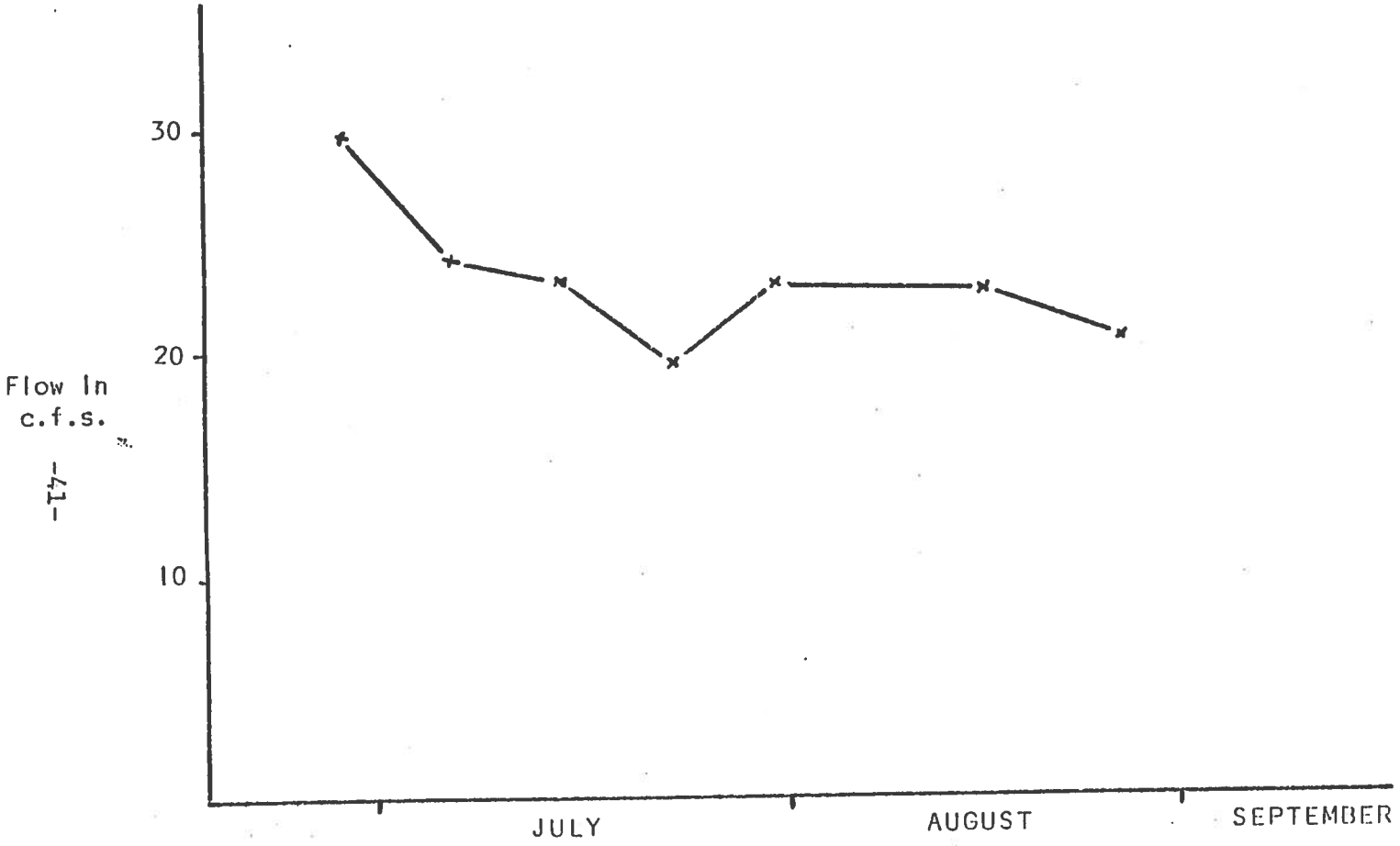


FIGURE 27 POLE CREEK STREAMFLOW ABOVE ALL DIVERSIONS DURING SUMMER, 1973.

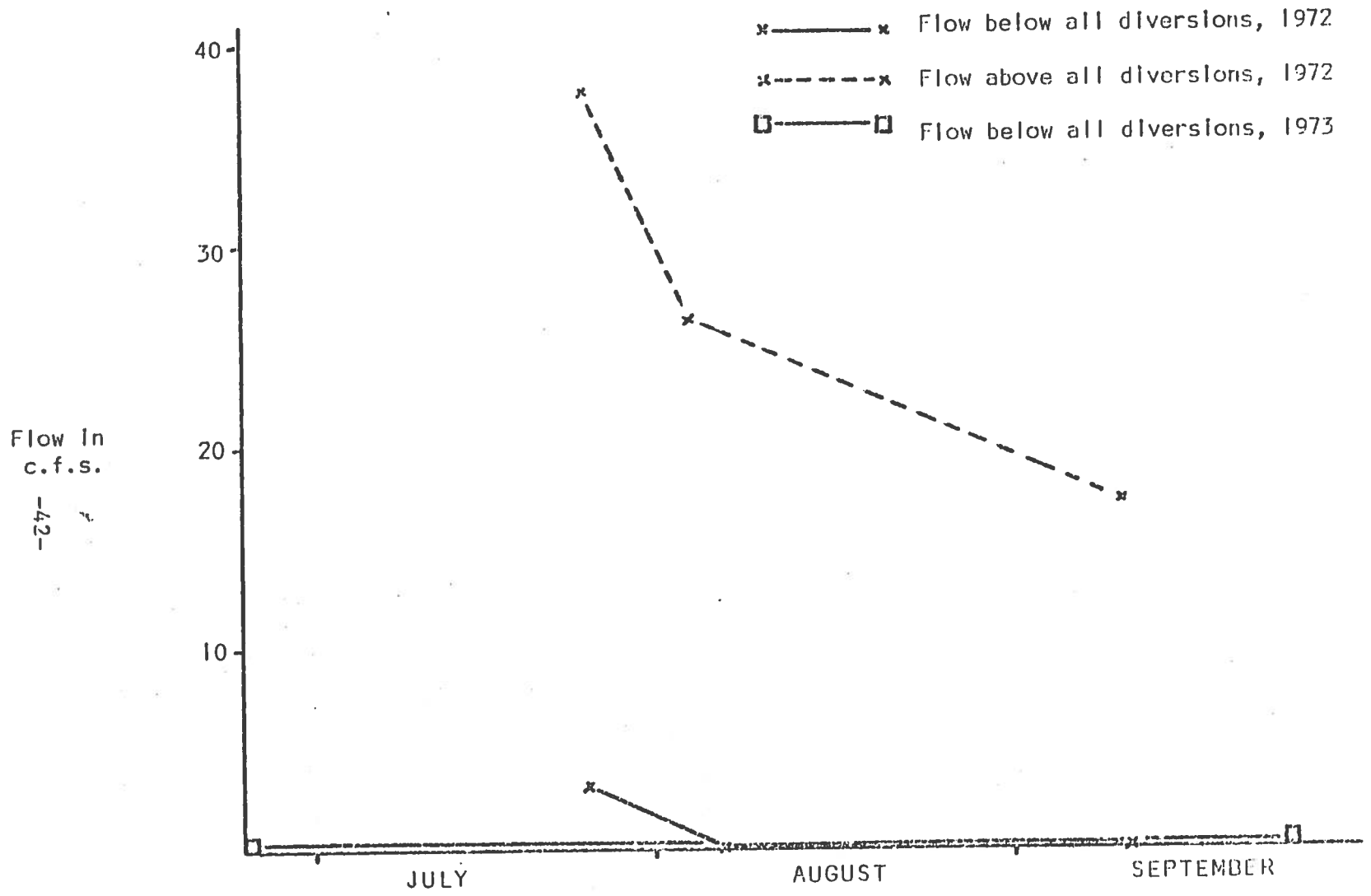


FIGURE 28 STREAMFLOWS OF CHAMPION CREEK ABOVE AND BELOW DIVERSIONS, 1972 AND 1973.

It was obvious, however, that existing flows downstream from the upper diversions were insufficient for either spawning or passage during any time of the summer investigation. During 1973, summer flows above all diversions were from 15.6 (July 13) to 11.0 cfs (September 5) (Figure 29). Below all diversions the stream was totally dry after June 15 (Figure 30).

E. Fourth of July Creek

This stream historically was an important Dolly Varden spawning stream. At least a remnant run remains. The three diversions located on the stream are capable of diverting the entire summer streamflow, which collects water from an 18.5 sq. mile drainage.

Water for the fishery is most important during the month of August, when Dolly Varden are migrating out of the Salmon River into tributary streams to spawn.

Streamflows

Figure 31 indicates discharge during 1972 above all diversions was in excess of 30 cfs during August, while flows below diversions dropped to about 10 cfs. During 1973, flows above diversions dropped to 10 cfs in August and 6 cfs. in September. Below diversions, flow was reduced to zero.

To insure passage of Dolly Varden, flows should be maintained at 15 cfs when natural flows of this magnitude are available (Table 5). This flow is required on the assumption of .6 foot of water over 25% of the streamwidth as necessary for passage (Thompson, 1972).

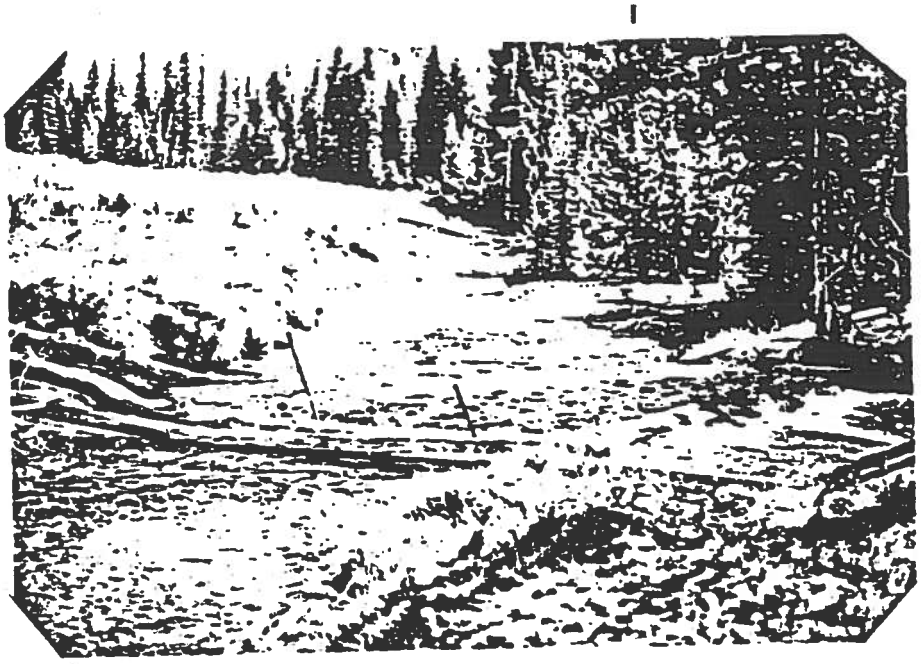


FIGURE 29 - STREAMFLOW ABOVE ALL CHAMPION CREEK DIVERSIONS. UNALTERED BASE FLOWS WERE 18 CFS IN 1972 AND 11 CFS IN 1973.

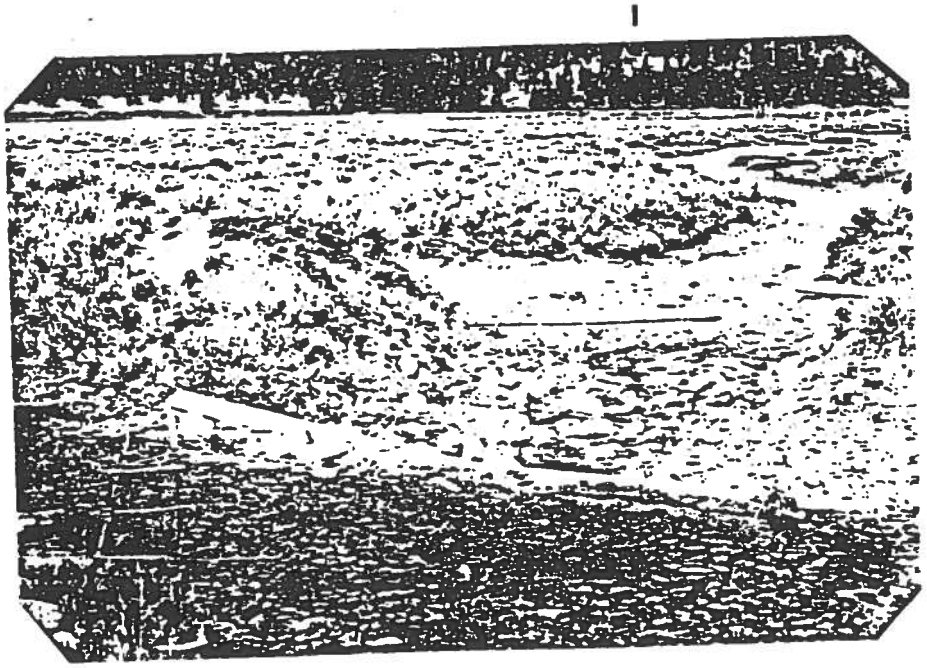


FIGURE 30 - CHAMPION CREEK AT LOWEST DIVERSION. CHANNEL WAS TOTALLY DRY AFTER JUNE 15 DURING 1972.

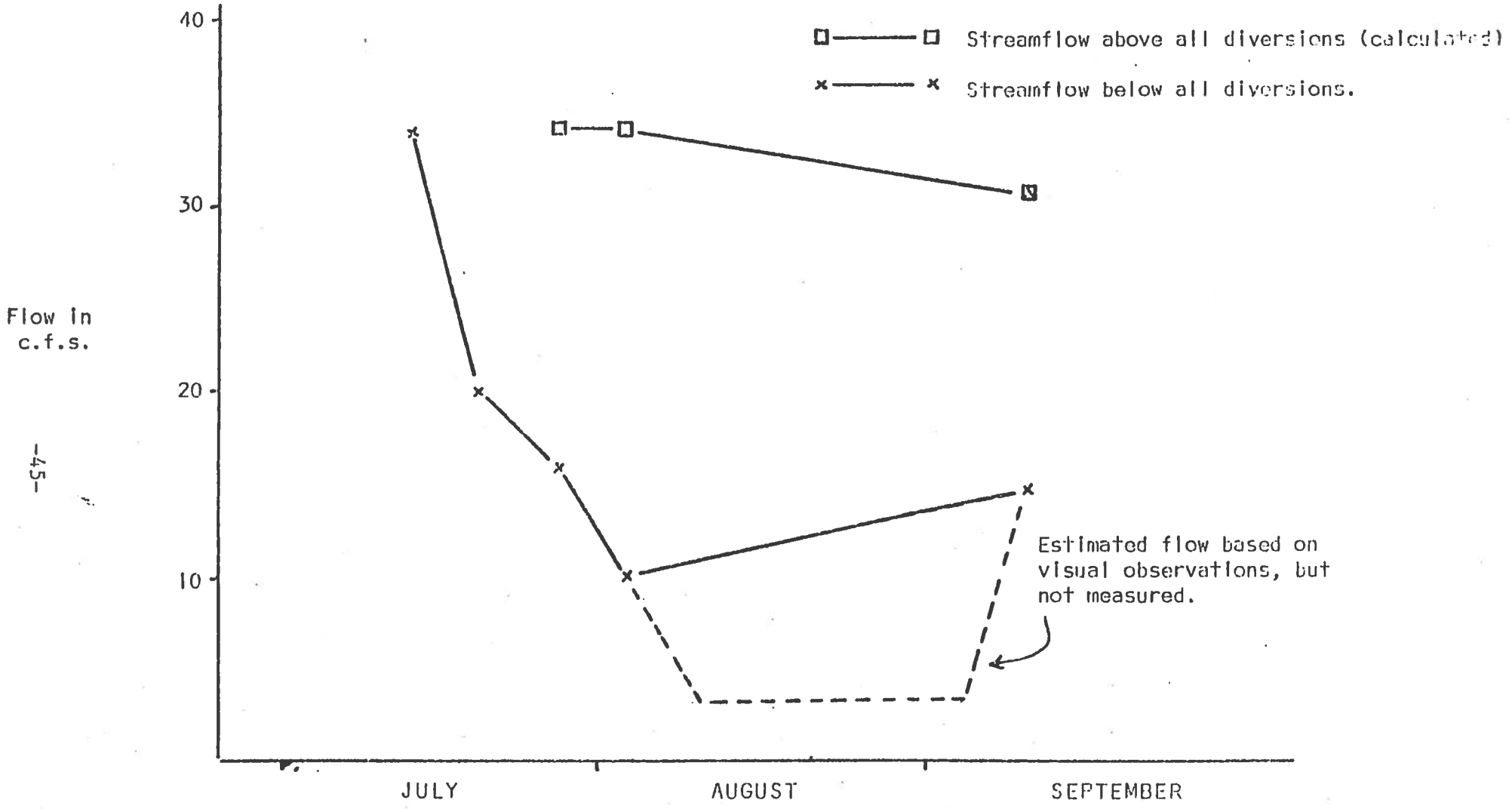


FIGURE 31 FOURTH OF JULY CREEK ABOVE AND BELOW DIVERSIONS DURING SUMMER 1972.

TABLE 5

Fourth of July Creek Streamflows at Critical Riffle Below all Diversions as Related to Percentage of Usable Stream Width Suitable for Large Trout Passage.

FLOW	DATE	TOTAL WIDTH	WIDTH WETTED	WIDTH USABLE		LONGEST CONTINUOUS PORTION USABLE	PERCENT
				FEET	PERCENT		
34	7-13-72	27	27	19	70	11	30
16	7-27-72	27	26	10	40	8	28
15	9-8-72	27	25	8	28	8	28
10	8-3-72	27	24	0	0	0	0

F. Smiley Creek Airport Diversion

Two small diversions located south of the Smiley Creek Airport (T7N, R14E, Sec. 26) divert water from the Salmon River. The waters are used to irrigate lands utilized as an airport for the Smiley Creek area.

Streamflows

During 1972, flows were measured from 5/30/72 to 8/14/72 at the two diversions and the Salmon River approximately 150 yards below the diversions. Flows in the river below the diversions during this period ranged from 101 cfs. (6/30/72) to 16 cfs (8/17/72) and combined flows of both diversions ranged from 1.5 cfs (8/1/72) to 5 cfs (7/12/72) (Figure 32).

Minimum flows for passage was established at 33 cfs. This flow does provide the minimum depth recommended (.8 foot) for only over 11 percent of the stream width, instead of the recommended 25 percent. However, because the transect is located at the upper reaches of the salmon spawning area and because the natural flow of the size of flows present represent near natural flows, that larger minimum flow may not be justified.

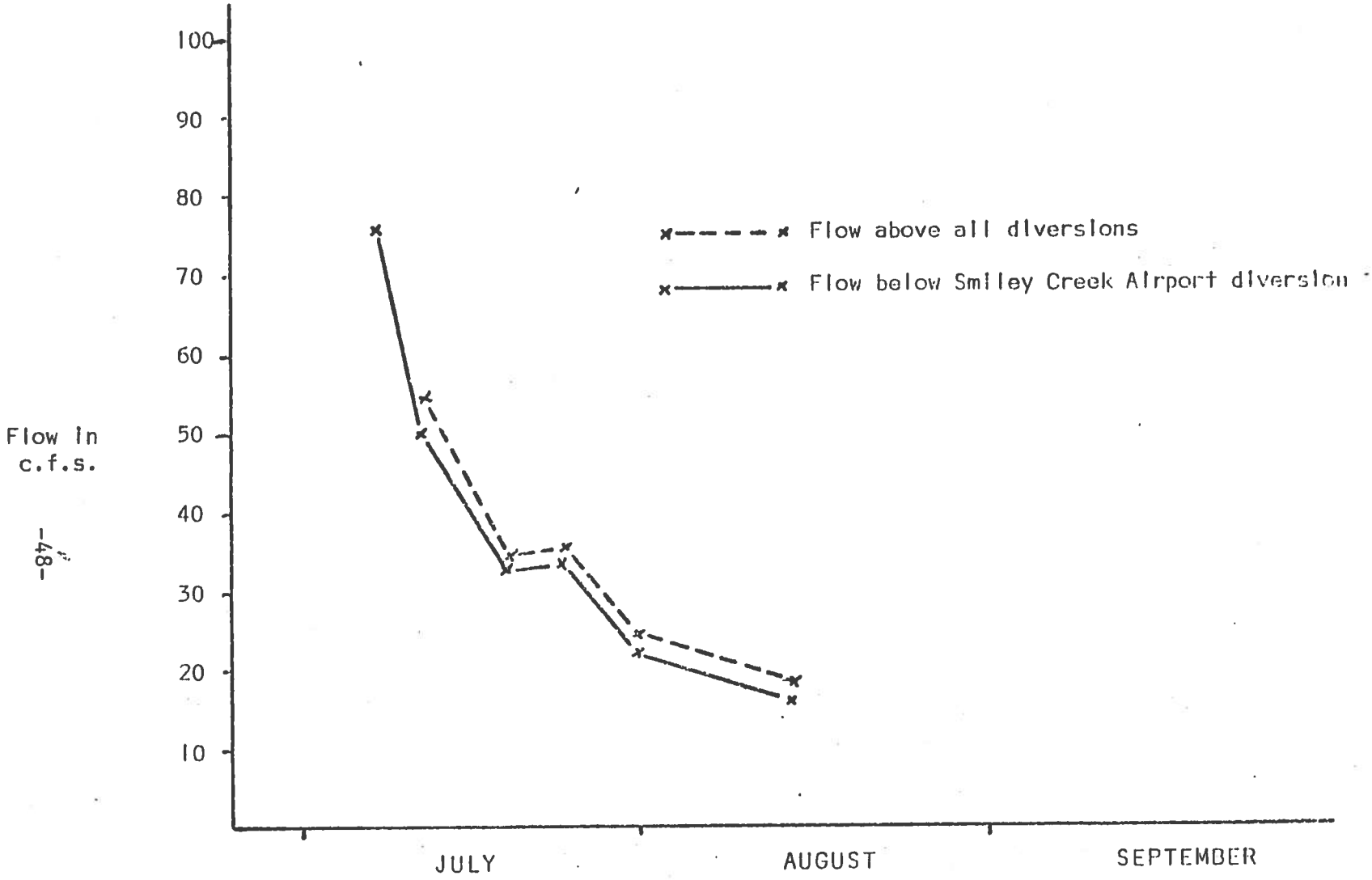


FIGURE 32 - SALMON RIVER STREAMFLOWS ABOVE AND BELOW SMILEY CREEK AIRPORT DIVERSIONS, 1972

C. Valley Creek

Valley Creek is a stream heavily used by spawning spring and summer chinook as well as one of the SNRA's more heavily used steelhead streams. Portions of Valley Creek and its tributaries are partially or wholly dewatered during the peak irrigation season. Six diversions exist on the main stream and six of its major tributary streams have one or more diversions (Table 6).

Diversions on the main stem originate on land belonging to D.J. Mahoney, Jr., Sawtooth Properties, Inc., and the Forest Service (two diversions).

Streamflows

Only scanty flow data was collected. However, it was noted that flows below the lowest diversion on Forest Service land was not passing sufficient water for salmon passage in late July and early August. Flows at this point were only 2-3 cfs. It appears that, at least during 1973, that irrigation diversions were inhibiting passage of late moving salmon.

Juvenile Loss

There are six diversions on Valley Creek proper. Flows measured on 7/20/73 ranged from 16 cfs. in the upper diversion to 3.5 cfs. in the smallest diversion.

The one diversion sampled for juvenile loss is located on land belonging to Sawtooth Properties, Inc. (T11N, R12E, Sec. 11). Flow was measured at 3-4 cfs. Data gathered indicates at this diversion there is a minimum loss of 1020 chinook for July and 2070 chinook for August. Fall losses are considered to be several times higher.

TABLE 6

Locations of Irrigation Diversions on Salmon River and Major Tributaries Within Sawtooth National Recreation Area

STREAM	NO. OF DIVERSIONS
Alturas Creek	1
Beaver Creek	2
Big Casino Creek	1
Burnt Creek	1
Champion Creek	7
Elk Creek	1
Fisher Creek	1
Fourth of July Creek	3
Gardner Creek	2
Gold Creek	1
Peach Creek	2
Pole Creek	7
Salmon River (above Alturas Creek)	6
Salmon River (below Alturas Creek)	5
Slate Creek	2
Smiley Creek	1
Thompson Creek	2
Valley Creek Proper	7
Anderson Creek	1
Crooked Creek	2
Elk Creek	1
Goat Creek	2
Iron Creek	2
Meadow Creek (near Stanley)	3
Tennell Creek	1
Trap Creek	1
Warm Springs Creek	1
Williams Creek	4
TOTAL	68

DISCUSSION

The flows recommended are based on biological needs of fish species that are presently being managed. There are other aspects of the aquatic environment that are affected, as well as other recreation and aesthetic values. It is certain that benefits would accrue to these other values by establishing the flows recommended.

In addition, flows recommended would significantly improve the aesthetics and recreation opportunities downstream from the immediate site. Float-boating is one of the recreation opportunities that would be enhanced by establishing the recommended resource maintenance flows upstream.

Breckenridge Diversion

This diversion partially inhibits salmon migration to about twenty one miles of ancestral spawning habitat. Depending on down-river conditions these fish move into the upper Salmon River from mid-June to through late August. If a heavy late runoff occurs, as in 1972, the diversion does not begin to block passage until about August 1. When low runoff occurs, as occured in 1973, blockage begins about the first of July. Depending on the timing of returning adults, the effect on upstream movement of adults is variable, but blockage undoubtedly occurs to some extent each year. The suggested passage flow of about 44 cfs should therefore be maintained from mid-June through late August, to insure uninterrupted passage of the total adult population.

Spawning in the area begins as early as August 1, and is continued through early September. Variability in spawning sites is reflected by optimum spawning flows for each site. However, it appears that a spawning flow

greater than 40-50 cfs through the spawning season at this site would not result in substantial gains in spawning habitat. Flows less than 40-50 cfs result in substantially reduced spawning area.

Incubation occurs as soon as the eggs are deposited, which would occur in the area between mid-July through early September, and continue into December when the eggs hatch. The alevins then remain in the gravel until February or March. Incubation success is at least, in part, dependent on oxygen availability and exchange of waste material. Both factors are related to sufficient intragravel water flow which is related to streamflow. Any substantial reduction would not only dry up a portion of the gravels, but would reduce the hydralic head at the redd and therefore reduce intragravel flows. Flows should therefore be as close to the natural unaltered flow as possible during this period.

Rearing space is as important, if not more important, to juvenile chinook production as any other factor. Smolt production is often directly related to amount of rearing space. Flows have not been determined for optimum rearing space, but it is thought that flows recommended for other life history periods would provide near-natural flows for rearing.

Alturas Diversions

This diversion not only affects sockeye and chinook production, but also lowers values for the resident fishery, which is in high demand from visitors in the Pettit Lake area.

A passage flow of 52 cfs should be maintained from mid-June through late August, which would accommodate both sockeye and chinook adult passage. A September flow only slightly lower (perhaps 40 cfs) should be maintained to

accommodate downstream spawning which occurs primarily from Pettit Lake bridge downstream. From October to June there is little or no demand for irrigation, and therefore maintenance of natural flows would appear to have little or no conflict with other water uses.

Pole Creek Diversions

Because these diversions are located above other damaging diversions, providing the recommended flows would help provide adequate flows needed at lower diversions.

In addition, the use of Pole Creek water is one of the least efficient in Sawtooth Valley. Assuming an average flow of 25 cfs and an 80 day irrigation season, irrigation water is currently being applied to lands at 14 acre feet annually. In other parts of Idaho with different drainage, land can be adequately irrigated with 3 to 4 acre feet.

Providing the recommended flows would provide good habitat for many resident species, including Dolly Varden spawning. In addition, the excellent stream habitat potential of this stream could provide some of the better anadromous spawning and rearing habitat in the Valley.

Champion Creek

No recommended flows have been calculated, and such determination should have high priority. Based on natural flows, it is expected that the recommended minimum flow would be at least 18 cfs from June through September. If anadromous stocks were reestablished, it would be expected that a higher flow would be needed from mid-June through late July if available.

A resource protection maintenance flow in this stream would result in an enhanced resident fishery, particularly Dolly Varden in the main Salmon River.

Fourth of July Creek

The recommended resource maintenance flow of 15 cfs could partially be obtained by discontinuing irrigation of the horse pasture at Sawtooth Valley Work Center. In addition, the recent slump on the bench above Sandy Brooks' ranch, as well as the past ditch blowouts, is indication that irrigation of these lands can cause resource damage.

The flows recommended could insure a healthy recruitment of Dolly Varden to the Salmon River resident fishery. Oldtimers recall these fish were common, and ranged from one to three pounds.

Valley Creek

Because data regarding Valley Creek diversions is scanty, obtaining additional data should receive high priority. During an above water year, adult passage is probably nearly sufficient. However, juvenile losses are extremely high. Juveniles of both spring and summer chinook, as well as steelhead are affected.

Diversion of many of the east side streams, such as Hanna and Thompson Creeks, is almost total, and results in elimination of these streams for even rearing habitat. One stream, Trap Creek, is diverted to be used to irrigate Forest Service lands under special use permits (Figure 33-34). Elk Creek is also diverted.

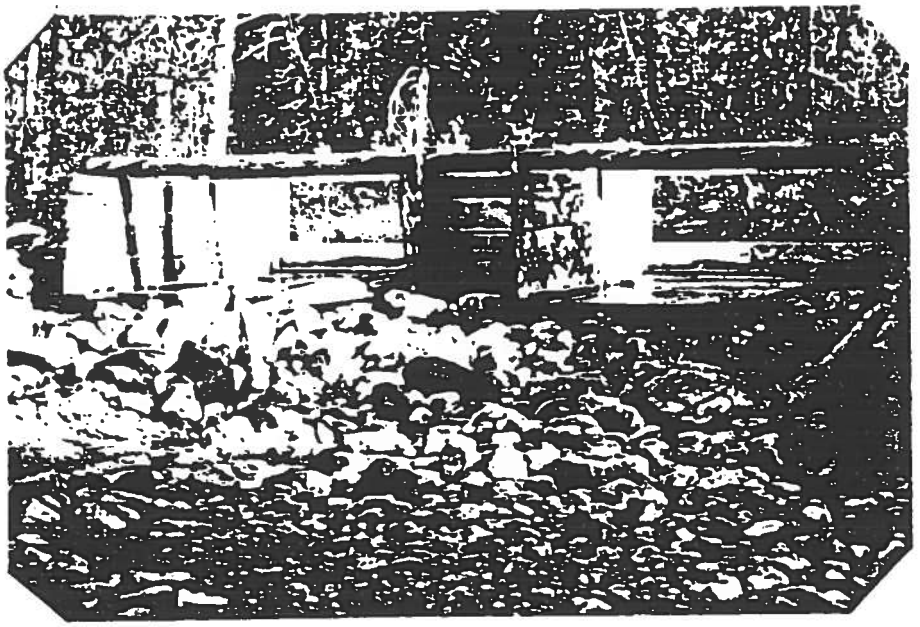


FIGURE 33 - TRAP CREEK DIVERSION LOCATED ON FOREST SERVICE LAND UNDER SPECIAL USE PERMIT.

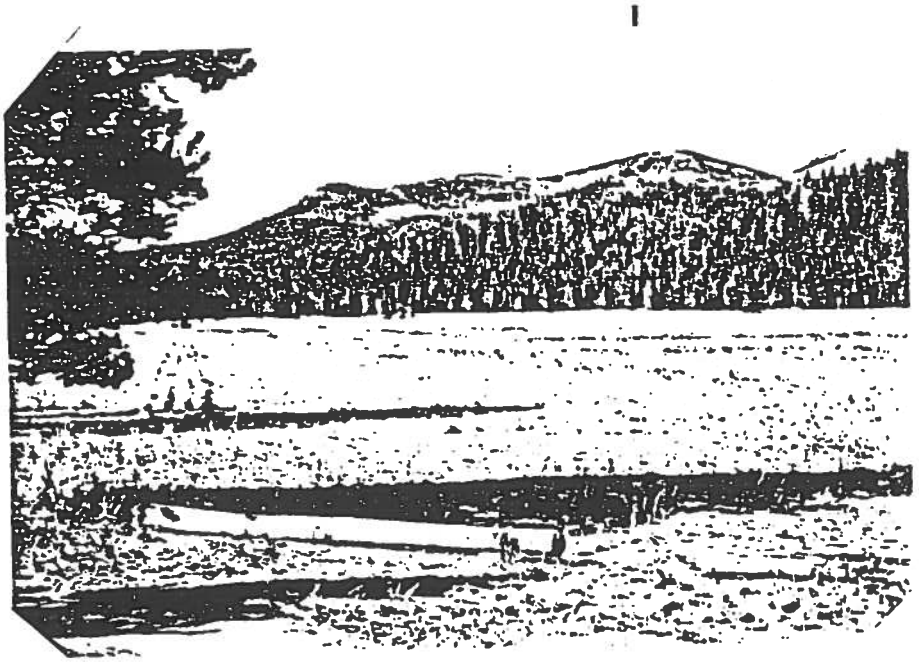


FIGURE 34 - FOREST SERVICE LAND NEAR BLIND SUMMIT IRRIGATED UNDER SPECIAL USE PERMIT BY TRAP CREEK WATER.

Diversions on Valley Creek are often quite crude (Figure 35). Gravel or rock dams are thrown completely across the stream and although some water seeps through, juveniles do not pass through and probably most of the juveniles are diverted (Figure 36-37).

FIGURE 35 - ONE OF SIX DIVERSIONS ON VALLEY CREEK. CRUDE CONSTRUCTION ALLOWS SOME WATER TO PASS, BUT GUIDES FISH INTO UNSCREENED DITCHES.

FIGURE 36 - DEAD JUVENILE CHINOOK IN IRRIGATED FIELDS. SUCH CHINOOK SALMON AND STEELHEAD BECOME TRAPPED AND EVENTUALLY PERISH.

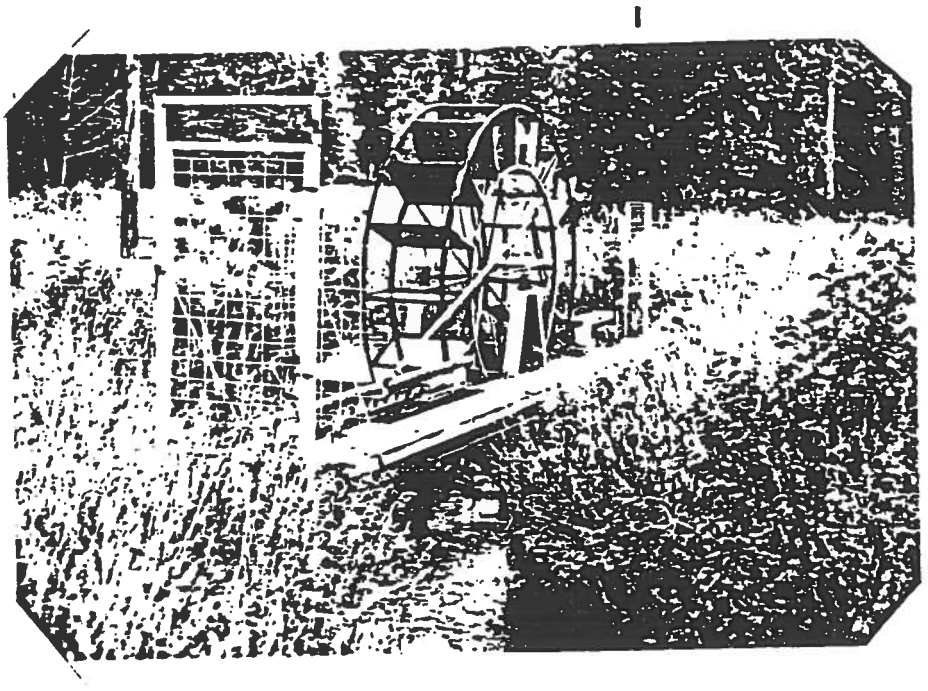


FIGURE 37 - SELF-CLEANING SCREENS CAN VIRTUALLY ELIMINATE JUVENILE CHINOOK AND STEELHEAD BECOMING DIVERTED INTO IRRIGATION DITCHES.

ALTERNATIVES FOR HABITAT ENHANCEMENT

At present, modification of irrigation practices within Sawtooth Valley could provide greater benefits to the fishery resource than any other project. It is assumed that correction of passage and nitrogen super-saturation problems on the Columbia and lower Snake River will permit greater anadromous fishery escapements upstream. When that occurs, availability of spawning and rearing space will become increasingly important.

It is recognized that any alternatives requiring modification of existing irrigation practices could have an adverse impact on the agricultural economy of the valley, the magnitude depending on the option chosen, and how it was implemented. However, it is believed that, in many cases, more judicious use of water would lessen the impact of irrigation on the fishery resource without reducing the agricultural output or economy of Sawtooth Valley. On some lands this may require structural improvement, while on others such things as better timing and seasons of use or reducing waste water could also be beneficial in reducing adverse fishery impacts.

The following are a full spectrum of alternatives that, if implemented, would restore and/or improve salmon habitat to varying degrees. Combinations or modifications of these alternatives are possible, and some are more practical and consistent with P. L. 92-400 than others.

Alternative 1:

Construct water storage reservoir on SNRA above all points of diversion.

Release waters to insure minimum flow during irrigation season. Install screening devices and fishways where needed.

Advantages:

A. More even flow regime of Salmon River.

B. Insures adequate flows in all years.

C. Helps age water, increasing productivity.

D. Permits landowner to continue present utilization of water.

Disadvantages:

A. High initial cost.

B. May not be acceptable alternative with regard to storage structures within NRA.

C. Maintenance requirement of dam, screening device and fishway.

D. Does not permit other recreation uses of river.

E. Loss of esthetics after drawdown of reservoir.

Alternative 2:

Establish wells near existing point of diversion. Allow owner of present diversion to continue to divert water. Install screening device for smolts and fishway around diversion for upstream imigrants. Operate wells only during inadequate flows.

Advantages:

A. Retains private ownership of lands.

B. Lower initial cost than Alternative 6 and possibly Alternative 5.

Disadvantages:

A. Requires well, screen, and fishway maintenance by Forest Service.

B. Does not provide for unhampered recreational floating.

C. May adversely affect water table of surrounding lands.

D. Requires gradual conditioning of fish during start and termination of well operation to avoid thermal shock.

Alternative 3:

Buy less than minimum water flow. Channel stream from diversion to area of adequate recharge points capable of sustaining fish life. Install fishway and screen.

Advantages:

A. Lower initial cost than Alternatives 5 and 6.

B. Would permit landowners to use water in much the same procedure as present.

Disadvantages:

A. Channel alteration would probably require annual alteration and repair.

B. Loss of spawning gravels and rearing areas below diversion.

C. Esthetically least acceptable.

D. Would not permit other uses of river, e.g., canoeing.

E. High maintenance costs of maintaining fishway, screen, and channel.

F. Channel alteration destructive to river below alteration.

G. Loss of resident fishery in altered area.

Alternative 4:

Install screening devices. Do not alter existing water use pattern.

Advantages:

A. Low initial cost.

Disadvantages:

A. Dependent on above average water years to provide sufficient passage past diversion for adults.

B. Requires screen maintenance by Forest Service

C. Some years (Following low water years) screening device would serve little purpose because there would be no juveniles upstream.

D. Production would vary widely from year to year, developing difficulty in management (ie., whether to manage upstream areas for resident or anadromous fish stocks).

E. Allows continued deteriorated conditions downstream and for spawning and rearing.

F. Allows possible damage to summer fish stocks downstream because of low flows.

Alternative 5:

Buy only enough water to permit passage, spawning, and rearing. Permit owner to divert all but resource protection maintenance flow. Screen diversion ditches.

Advantages:

A. Lower initial cost than Alternative 6.

B. Would permit escapement and would provide more rearing and spawning waters than at present.

Disadvantages:

A. Would necessitate installation of some screening and passage devices.

B. Owner would have undependable source of water in low water years. Landowner may need supplemental ground water for these periods.

C. Would not provide as much rearing or spawning space than Alternative 6. Theoretical production would be lower than Alternative 6.

D. Screening devices and fishways would need maintenance by Forest Service.

E. Resource protection flows could be diverted by others under present Idaho laws.

Alternative 6:

Buy complete water rights from landowners. Leave all water in stream. Develop ground water resources. Remove diversion dams.

Advantages:

A. No cost for screening or fishways.

B. Maximum natural flows to provide rearing, spawning and incubation for anadromous stocks.

C. Temperature benefits for summer chinook off site as a result of volumes of water and reduced overland flows returning to stream.

D. No maintenance.

E. Permit other forms of recreation (e.g., kayaking).

F. Aesthetically natural and pleasing.

Disadvantages:

A. High initial cost.

B. With existing water laws, water would likely be diverted elsewhere.

RECOMMENDATIONS

1. Acquire water rights on Pole Creek. At present 20 cfs. or more are used to irrigate only 270 acres of summer pasture. Acquiring water would provide almost half of needs for minimum passage at Breckenridge diversion as well as open approximately 5 miles of Pole Creek to salmon and Dolly Varden spawning.

2. Actively seek and support resource protection maintenance stream flow and anti-dam legislation as well as legislation giving fisheries beneficial use of water status. Such legislation would minimize further degradation to streams as well as strengthen safety of acquired water to refiling.

3. Acquire sufficient water rights to assure stream resource maintenance flows of 40 to 50 cfs past Breckenridge diversion. This flow is necessary for salmon passage after June 1.

4. Reject any new special use applications regarding diversion of water on the Salmon River or tributaries above the mouth of Alturas Creek such as transmission ditches, diversions, etc.

5. Eliminate irrigation of any federal lands which require reducing flows below stream resource maintenance flows levels. This includes all irrigated BLM lands and Forest Service lands such as the Fourth of July horse pasture and Blind Summit meadow irrigated by Trap Creek.

6. Establish resource maintenance flows on Champion Creek (1.4 cfs) and Fourth of July Creek (15 cfs), as anadromous rearing habitat, water supply to main Salmon River, and to restore Dolly Varden fishery to Salmon River.

7. Acquire minimum flow of 50 cfs for Alturas Creek at the present diversion to accommodate present chinook passage, plus restore sockeye salmon and Dolly Varden runs to Alturas Lake and Alturas Creek.

8. On lands where resource protection maintenance flows must be acquired, either cooperate with landowners to develop an alternative method of irrigation (such as wells or sprinklers) or if this is not feasible, then acquire such lands in fee. Priority should be given to headwater streams and those streams used for both spawning and rearing.

9. Complete acquisition of fish screening easements on all irrigation diversions in the Salmon River drainage. Seek funding and for initiate screening projects.

10. Acquire resource maintenance flows on the following streams utilized for salmon rearing and possible cutthroat spawning-rearing that are presently entirely diverted: Gardner Creek, Peach Creek, Williams Creek, Gold Creek, Thompson Creek, Hanna Creek. On most of these streams, resource maintenance flows would only be 1-3 cfs.

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TABLE 7

STREAMFLOWS OF MAIN SALMON RIVER AND DIRECT TRIBUTARIES WITHIN THE SAWTOOTH NATIONAL RECREATION AREA, 1973.

STREAM	FLOW IN c.f.s. JULY 13-16, 1973	SEPTEMBER 5-6, 1973
Badger Creek	Estimated 1.0	dry
Basin Creek	13.4	3.2
Beaver Creek	13.4	3.2
Big Casino Creek	5.5	3.4
Blind Creek	Estimated 2.0	-
Burnt Creek	dry	dry
Champion Creek	15.6	11.0
Copper Creek	dry	dry
Deer Springs	Estimated 1.0	1.0 (Estimated)
Elk Creek	Estimated 4.0	2.0 (Estimated)
Elkhorn Creek	Estimated 1.0	1.0 (Estimated)
Fisher Creek	6.5	3.9
Fourth of July Creek	11.5	6.1
Frenchman Creek	6.5	3.4
Gardner Creek	Estimated 1.0	1.0 (Estimated)
Gold Creek	Estimated 1.0	1.0 (Estimated)
Hell-roaring Creek	26.2	12.3
Huckleberry Creek	17.7	9.2
Joes Gulch	Estimated 1.0	1.0 (Estimated)
Little Casino Creek	5.5	2.4
Lost Creek	Estimated 1.0*	1.0*(Estimated)
Lower Hardin Creek	Estimated 1.0	1.0 (Estimated)
Lynch Creek	dry	dry
Marshall Creek	dry	dry
Mays Creek	Estimated 5.0	3.0 (Estimated)
Muley Creek	Estimated 1.0	1.0 (Estimated)
Nip and Tuck	Estimated 1.0	1.0 (Estimated)
Peach Creek	Estimated 2.0	1.0 (Estimated)
Pettit Lake Creek	20.0	2.0
Pole Creek	--	-
Redfish Lake Creek	117.3	40.1
Rough Creek	Estimated 10.0	5.0 (Estimated)
Salmon River (above Frenchman Creek)	15.5	6.4
Salmon River (above Redfish Creek)	266.1	174.3
Slate Creek	25.1	13.9

*Flow may have been altered by diversions upstream from point of observation.

(Continued--)

TABLE 7 Continued

STREAM	FLOW IN c.f.s. JULY 13-16, 1973	SEPTEMBER 5-6, 1973
Smiley Creek	10.6	1.9
Thompson Creek	Estimated 3.0*	1.0* (Estimated)
Upper Hardin Creek	Estimated 3.0	1.0 (Estimated)
Valley Creek	128.5*	66.8* (Estimated)
Vat Creek	Estimated 3.0	1.0 (Estimated)
Warm Springs Creek	70.9	43.8
Williams Creek	Estimated 4.0	2.0 (Estimated)
Yankee Fork	114.6	59.1

*Flow may have been altered by diversions upstream from points of observation.

State of Idaho
DEPARTMENT OF WATER RESOURCES
1301 North Orchard Street, Statehouse Mail, Boise, Idaho 83720-9000
Phone: (208) 327-7900 FAX: (208) 327-7866

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GOVERNOR

KARL J. DREHER
DIRECTOR

TRANSMITTAL COVER SHEET

FAX NUMBER: (208) 327-5400

DATE: 9-3-98

TO: ALLEN MERRITT @ IDWR SOUTHERN **FROM:** NICK SPENCER

DOCUMENT DESCRIPTION: LETTERS RE BUSTERBACK WATER RIGHTS

COVER SHEET + 13 **PAGES**

CONTACT: 327-7930 **IF YOU DO NOT RECEIVE ALL THE PAGES**

THANK YOU!

United States Department of Agriculture

Office of the General Counsel

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SEP 0 2 1998
Department of Water Resources

September 2, 1998

By Hand

Karl Dreher
Director
Idaho Department of Water Resources
1301 North Orchard
Boise, ID 83709

Re: Water Rights For Busterback Ranch

Dear Director Dreher:

On August 12, 1998, your Adjudication Bureau Staff informed the United States Department of Agriculture, Forest Service ("Forest Service") that they may recommend five water rights appurtenant to the Busterback Ranch property purchased by the United States in 1992 be forfeited because water was not diverted for irrigation purposes for the five year statutory period.[1] Forfeiture is inappropriate because circumstances beyond the control of the Forest Service have precluded diversion of water for irrigation purposes.

The preclusion of irrigation use constitutes a valid defense to forfeiture under Idaho law. As you know, forfeiture of water rights is not favored and is not to be presumed. Hodges v. Trail Creek Irrigation Co., 78 Idaho 10, 297 P.2d 524 (1956); Zezi v. Lightfoot, 57 Idaho 707, 68 P.2d 50 (1937) ("All intendments are to be indulged against a forfeiture.") As a means of mitigating the harsh results of forfeiture, the courts and statutes establish a number of defenses or exceptions to forfeiture. As the Idaho Supreme Court has recognized "[t]here can be no forfeiture if the nonuser of water is prevented from exercising his rights to the water by circumstances over which he has no control." Hodges, supra, 78 Idaho at 13, 297 P.2d at 527; Welch v. Garret, 5 Idaho 639, 51 P. 405 (1897).

Conditions beyond the control of the Forest Service precluded its application of water to irrigation from 1992 to 1998. This preclusion of irrigation negates any forfeiture

[1] On April 2, 1992 the Forest Service purchased the Busterback Ranch for 3.2 million dollars. This included the following water rights:

71-00059	25.60 CFS	12/31/1912	Salmon River
71-00061	40.00 CFS	8/30/1933	Salmon River
71-00064B	7.86 CFS	8/15/1915	Alturas Lake Creek
71-00066	10.75 CFS	7/1/1930	Alturas Lake Creek
71-00068	12.32 CFS	7/1/1935	Alturas Lake Creek

The Forest Service did not divert water for irrigation purposes for good cause based on circumstances beyond its control. This failure to act is excusable. The Endangered Species Act ("ESA") prohibits federal action that may jeopardize the existence of any threatened or endangered species. 16 U.S.C. 1531 et seq. Chinook salmon, sockeye salmon, steelhead trout, and bull trout spend part of their life cycle in and around the stream reaches from which the diversions occur. These species are listed as threatened and endangered under the ESA.[2] An endangered plant, the Ute ladies'-tresses, is known to grow in riparian habitat adjacent to streams affected by the diversions. Moreover, the westslope cutthroat trout, a species petitioned for listing as threatened under the ESA, utilizes stream habitat in the area surrounding Busterback.

Irrigation diversions by the Forest Service would constitute federal action. Had the Forest Service undertaken historic irrigation withdrawals during the 1992 through 1998 irrigation seasons, our fish biologists advise us that this action would have resulted in a "likely to adversely affect" determination. Resumption of such diversions could have resulted in the destruction of, or adverse modification of, critical habitat. Moreover, such action could have jeopardized the continued existence of the listed species. Finally, such diversions would have also placed the Forest Service at risk of violating the take prohibitions of the ESA. We have consulted with the relevant federal agencies, i.e., the National Marine Fisheries Service and the United States Fish and Wildlife Service, regarding the problems associated with diversion of this water and the affect on listed species and species petitioned for listing. Copies of their letters are attached.

In sum, the fact that threatened and endangered species use stream habitat adjacent to the diversions and that diversion of water would have been prevented by ESA is a circumstance beyond the control of the water rights owner. Thus, the Forest Service's non-use should be excused and the water rights be recommended.

In addition, the use of these water rights for irrigation would have been inconsistent with Governor Batt's recovery plans for bull trout and sockeye salmon.[3] Removal of the water for irrigation rather than leaving the water instream to aid recovery of listed threatened and endangered species would be in conflict with the policies, goals and objectives articulated in the Governor's Plan. Importantly, the goals in the Governor's Plan include, maintenance and strengthening of existing populations, as well as the restoration of species in appropriate areas. *Plan*, 1. The Governor's Plan

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[2] Snake River sockeye salmon (*Oncorhynchus nerka*) were listed as endangered by the National Marine Fishery Service on November 20, 1991. (57 FR 58619). Snake River Spring/Summer chinook (*Oncorhynchus tshawytscha*) and Snake River Fall chinook salmon (*Oncorhynchus tshawytscha*) were both listed as threatened April 22, 1992. (57 FR 14653) but their status was reclassified as endangered pursuant to Emergency Interim Rule August 18, 1994. (59 FR 42529). The classification of Snake River Spring/Summer and Fall chinook reverted to threatened on April 17, 1995. (60 FR 19342). Steelhead (*Oncorhynchus mykiss*) were listed as threatened October 17, 1997. (62 FR 43937-43954). Bulltrout (*Salvelinus confluentus*) were listed as threatened by the U.S. Fish and Wildlife Service on June 10, 1998. (Effective July 10, 1998, 63 FR 31647). Westslope cutthroat trout (*Oncorhyncus clarki lewisi*) were petitioned for listing as threatened species on June 6, 1997 (63 FR 31691).

[3] Governor Philip E. Batt's *State of Idaho: Bulltrout Conservation Plan* ("Governor's Plan")(July 1, 1996).

specifically designates the Upper Salmon River as a bull trout key watershed. Notably, the Governor's Plan acknowledges that "dam building and water diversions have isolated many populations." *Id.* Threats to bull trout restoration and recovery identified in the Governor's Plan such as highly variable stream flows, water quantity, sediment sources, reduced bank cover or stability, migration barriers, poaching or predation are amcliorated by leaving water instream. The threats identified in the Governor's Plan are equally applicable to threatened and endangered sockeye, chinook and steelhead.[4]

In summary, we believe that the Forest Service could not have used this water for irrigation purposes without violating federal law. In addition, such use would have been inconsistent with state water policy to protect endangered species.

Please do not hesitate to contact me if you have any questions regarding this matter. We look forward to hearing from you.

Sincerely,

Randall J. Bramer

Enclosures:

cc: Norm Young
David Tuthill
Phillip Rassier

[4] The bull trout's historic range approximates that of spring, summer, and fall chinook salmon. *Plan*, 3.

United States Department of Agriculture | Forest Service | Boise Adjudication Team, Recreation and Lands, Intermountain Region | 380 ParkCenter, Suite 330, Boise, ID 83706

Reply to: 2540

Date: September 1, 1998

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Department of Water Resources

Theodore Meyers
National Marine Fisheries Service
Boise Field Office
United States Department of Interior
1387 South Vinnell Way, Suite 377
Boise, ID 83709

Robert G. Ruesink
Supervisor
Fish and Wildlife Service
Snake River Basin Office
United States Department of Interior
1387 South Vinnell Way, Suite 368
Boise, ID 83709

Re: Water Rights For Busterback Ranch

Dear Mssrs. Meyers and Ruesink:

In 1992, the United States Department of Agriculture, Forest Service (Forest Service) purchased five water rights in the upper Stanley Basin on the Salmon River and Alturas Lake Creek. The seller used the rights for irrigation of pastures on the Busterback Ranch.

The water rights are being adjudicated in the Snake River Basin Adjudication (SRBA). The Idaho Department of Water Resources (IDWR) investigates water rights and makes recommendations to the SRBA Court. IDWR recently informed the Forest Service that they may recommend forfeiture of these rights because the Forest Service failed to divert water for irrigation purposes for five years.

The Forest Service believes forfeiture is inappropriate since use of these water rights for irrigation would be likely to violate provisions of the Endangered Species Act. Had the Forest Service undertaken historic irrigation withdrawals during the 1992 through 1998 irrigation seasons, our fish biologists advise us that this action would have resulted in a "likely to adversely affect" determination. Resumption of such diversions could have resulted in the destruction of or adverse modification of critical habitat. Moreover, such action could have jeopardized the continued existence of the listed species. Finally, resumption of these diversions would have placed the Forest Service at risk of violating the take prohibitions of the ESA.

The purpose of this letter is to request your advisory opinion of the potential ramifications had these water rights been diverted out of the stream for irrigation during this time period. Attached is a summary outlining the circumstances surrounding the purchase and describing the effect of the diversions on the relevant species in this area. A map showing the locations of these water rights and the diversions is also enclosed.

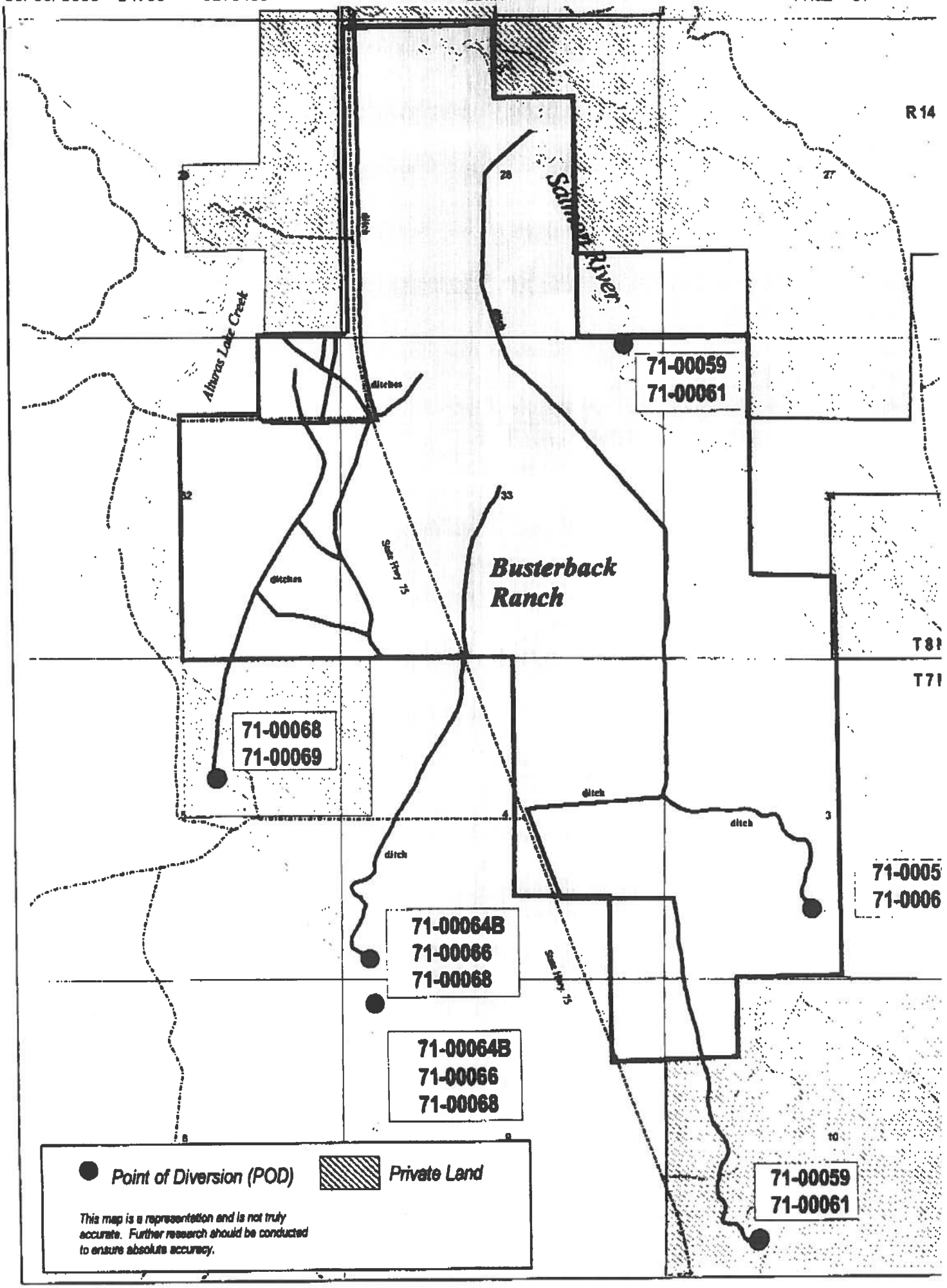
Please do not hesitate to contact Randy Bramer or myself if you have any questions regarding this matter. We look forward to hearing from you.

Sincerely,

Michael Collette
Team Leader
Boise Adjudication Team

Enclosures

cc: Bill LeVere
Paul Reis
Lois Witte
Bruce Bernard
Randy Bramer


R14
Salmon River
Alturas Lake Creek
ditches
71-00059
71-00061
Busterback
Ranch
State Hwy 75
ditches
71-00068
71-00069
ditch
ditch
ditch
71-0005
71-0006
71-00064B
71-00066
71-00068
71-00064B
71-00066
71-00068
71-00059
71-00061
Point of Diversion (POD)
Private Land
This map is a representation and is not truly accurate. Further research should be conducted to ensure absolute accuracy.

SUMMARY OF BUSTERBACK WATER RIGHTS

The Busterback Ranch had water rights from the Salmon River (65.6 cubic feet per second (cfs)) and Alturas Lake Creek (30.93 cfs). These include the following water rights:

71-00059	25.60 CFS	12/31/1912	Salmon River
71-00061	40.00 CFS	8/30/1933	Salmon River
71-00064B	7.86 CFS	8/15/1915	Alturas Lake Creek
71-00066	10.75 CFS	7/1/1930	Alturas Lake Creek
71-00068	12.32 CFS	7/1/1935	Alturas Lake Creek

As described below, the headwaters of the Salmon River and Alturas Lake Creek provide crucial spawning and rearing areas, juvenile migration corridors, areas for growth and development to adulthood, and adult migration corridors for proposed and listed species[1] under the Endangered Species Act of 1973. 16 U.S.C. 1531 *et seq.* Exercising these rights completely de-watered both the river and the creek during critical periods in anadromous fish migrating and spawning cycles.

The stream reaches contain several species that have been listed as threatened or endangered. These include chinook and sockeye salmon, bull trout, and steelhead. In addition, the westslope cutthroat trout (recently proposed for listing) occurs in these stream segments. An endangered orchid, the Ute ladies'-tresses, occurs in these areas.

Salmon River

Two diversion structures, known as S45 and S46, supplied water from the Salmon River to the ranch. S45 was a large diversion structure located in the Salmon River. S46, a smaller structure, was located approximately one mile upstream of S45. The Forest Service conducted several studies to evaluate the effects of diversions on anadromous fish within the Sawtooth Valley.[2] The Forest Service concluded that these two diversions had the "greatest irrigation related adverse impact on anadromous stocks of any within the SNRA." *Munther*, 13. Combined these two diversions precluded full utilization of between 22 and 32 miles of spawning habitat upstream from the diversions. *Munther*, 10-11; *Scott*, 15. Typically the diversions impeded passage from early July to late September. *Munther*, 12-13. Less than 70% of the rivers inherent production for anadromous fish species was realized under diverted conditions. *Scott*, 18. Both steelhead and chinook were affected by the diversion. *Scott*, 16.

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[1] Snake River sockeye salmon (*Oncorhynchus nerka*) were listed as endangered by the National Marine Fishery Service on November 20, 1991. (57 FR 58619). Snake River Spring/Summer chinook (*Oncorhynchus tshawytscha*) were listed as threatened April 22, 1992. (57 FR 14653) but their status was reclassified as endangered pursuant to Emergency Interim Rule August 18, 1994. (59 FR 42529). The classification of Snake River Spring/Summer chinook reverted to threatened on April 17, 1995. (60 FR 19342). Steelhead (*Oncorhynchus mykiss*) were listed as threatened October, 17 1997. (62 FR 43937-43954). Bulltrout (*Salvelinus confluentus*) were listed as threatened by the U.S. Fish and Wildlife Service on June 10, 1998. (Effective July 10, 1998, 63 FR 31647). Westslope Cutthroat (*Oncorhyndus clarki lewisi*) were petitioned for listing as a threatened species on June 6, 1997 (63 FR 31691).

[2] Greg L. Munther, *Effects of Irrigation Diversions and related structures in the Sawtooth National Recreation Area.* (1974) [hereinafter *Munther*]. Harv Forsgren, et al., *Anadromous Fish Instream Flow Needs and Conflicts within the Sawtooth National Recreation Area* (1981) [hereinafter *Scott*]. John Andrews et. al. *Alturas Lake Creek Flow Augmentation* (Final Report (1987).

When sufficient water was left instream in 1972 to provide upstream migration, 163 redds were counted above the diversions; whereas in 1973 when flows were completely eliminated below the diversion by June 30, only 50 redds were identified above the diversion. High redd counts below the diversion indicated above average concentration of spawners. *Munther*, 14.

S45 dewatered approximately 800-1500 feet of stream below the diversion. Chinook salmon spawning occurred both above and below the diversions indicating that the dewatered reach could also provide spawning and rearing habitat. Diversions depleted an estimated 3 ½ miles of "valuable" spawning habitat below the diversions. *Scott* at 15. In 1972, one half mile of spawning habitat was lost to dewatering. *Munther*, 14, 20. Approximately one half to two and one half miles of spawning habitat below the diversion was reduced due to lower flows. Id. at 20. In 1972 considerable spawning had occurred in the reach before dewatering, "which probably resulted in 100% loss of eggs in redds that were wholly or partially dewatered. *Munther*, 20. In addition to habitat loss and degradation, juvenile smolts were diverted onto irrigated fields. Id. at 28.

Alturas Lake Creek

A third diversion structure, ALC1, diverted water from Alturas Lake Creek to Busterback. This structure impacted both chinook and sockeye. *Munther*, 31. The diversion blocked upstream migration of adult chinook and depleted important habitat below the diversion. *Scott*, 20, 22. Fish passage is restricted at less than 52 cfs, which occurred as early as July 7, 1973. *Id.* Reduced flows probably impacted downstream spawning in Alturas Lake Creek. Furthermore, juvenile chinook were likely diverted onto irrigated pasturelands while sockeye smolts were not due to pre-irrigation season outmigration of sockeye. *Munther*, 35.

Alturas Lake is one of the four morainal lakes that once sustained sockeye salmon runs. It is believed that the diversion structure on Alturas Lake Creek may have been at least partially responsible for the disappearance of sockeye salmon, which once migrated to Alturas Lake. *Munther* at 31. The *Scott* report considered this diversion the "most significant" factor contributing to the decline of sockeye at Alturas Lake. *Scott*, 20. The diversion totally dewatered Alturas Lake Creek prior to the onset of the chinook spawning season and upstream migration period for sockeye. *Scott*, 22. Alturas Lake Creek diversion reduced the production capability for chinook to 46% of total and 0% for sockeye. *Scott*, 22.

Resident salmonids in this region include bull trout and westslope cutthroat trout. Little information is currently available regarding the impacts of these structures upon bull trout. In the Snake River basin, the bull trout's historic range approximates that of spring, summer, and fall chinook salmon. Dam building and water diversions have isolated many populations. *Governor Philip E. Batt's State of Idaho Bull Trout Conservation Plan* (1996). The Governor's Plan notes that the disruption of migratory corridors may reduce growth and survival of bull trout, and possibly lead to the loss of the migratory life-history types. *Plan* 5. It can be assumed that spawning and rearing habitat could be lost due to these structures. Early spawning and migration of bull trout may coincide with irrigation withdrawals. Highly variable stream flows, bedload movement, and channel instability negatively influence the survival of young bull trout. (Goetz 1989; Weaver 1985).

At a minimum, it may be assumed that bull trout were diverted onto irrigated pasturelands and that genetic diversity was impeded due to interference of migrating adults. Furthermore, flow depletion by irrigation and irrigation runoff may adversely impact water temperature, which, in turn, may increase chances for disease and stress. Low flows also increase chances for predation and poaching.

Moreover, the streams contain westslope cutthroat trout, a species that was recently petitioned for listing as threatened. Westslope cutthroat are spring spawners that probably would have suffered losses due to dewatered spawning areas as well as being diverted onto irrigated fields

Conclusion

As noted above, several species of fish currently classified as threatened or endangered under the Endangered Species Act are potentially affected by the water rights associated with the acquisition of Busterback Ranch. This area was designated critical habitat on December 28, 1993 for endangered species and this habitat is of vital importance to recovery of these protected species.[3] We are also concerned that resumption of historic diversion withdrawals would have had a significant detrimental impact to the ongoing efforts by the Sockeye Recovery Technical Oversight Committee's sockeye recovery in Alturas Lake.

Resumption of historic diversion withdrawals may frustrate the goals and objectives and actions articulated in the *Proposed Recovery Plan for Snake River Salmon* (Recovery Plan). United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (1995). Habitat restoration is a primary objective under the Recovery Plan. Recovery and delisting criteria under the plan fall into two major categories: "remedying environmental factors that have reduced stocks to levels which are in danger of extinction and 2) rebuilding populations to levels of improved productivities." Recovery Plan, ES-3. The plan acknowledges that habitat restoration may be achieved by reducing losses of listed species at water withdrawal sites.

[3] Effective January 27, 1994, 58 FR 68543.

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Snake River Basin Office, Columbia River Basin Ecoregion
1387 South Vinnell Way, Room 368
Boise, Idaho 83709

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Department of Water Resources

September 1, 1998

Michael Collette, Team Leader
Boise Adjudication Team
U.S.D.A. Forest Service
Intermountain Region
380 Parkcenter Blvd., Suite 330
Boise, Idaho 83706

Dear Mr. Collette:

This responds to your September 1, 1998, letter requesting U.S. Fish and Wildlife Service (Service) comments on the effects of diverting 65.6 cubic feet per second (cfs) from the Salmon River and 30.93 cfs from Alturas Lake Creek for irrigation of land known as the Busterback Ranch located in the Sawtooth National Recreation Area. Your letter explained that the Forest Service had purchased the ranch and associated water rights in 1992, and now faces possible forfeiture of the water rights through adjudication proceedings for failure to divert the water for irrigation purposes during the 1992-1998 irrigation seasons.

Species of concern to the Service in the area include the bull trout, listed as threatened June 10, 1998 and the Ute ladies'-tresses (*Spiranthes diluvialis*), an orchid species listed as threatened January 17, 1992. The bull trout was a candidate species being considered for listing by the Service beginning in 1985.

Bull trout occur in Alturas Lake Creek, apparently the strongest subpopulation in the Sawtooth Valley. The main stem Salmon River is likely a migratory corridor for bull trout movement into tributary streams like Alturas Lake Creek. The Governor's Bull Trout Conservation Plan identifies the Upper Salmon River, which includes Alturas Lake Creek, a key watershed.

The Ute ladies'-tresses was not known to occur in Idaho at the time of its listing in 1992; however, the September 1995 draft recovery plan recognized a high potential for the species to occur in Idaho. Subsequently, a population was discovered along the South Fork of the Snake River in 1996. The Busterback Ranch area has a high potential of having suitable habitat to support this native orchid according to recent mapping completed by the Sawtooth National Forest.

The Service reviewed the Forest Service proposal to acquire the land and water rights of the Busterback Ranch in 1992, and concluded that the action would benefit fish and wildlife resources in the area. That conclusion was based on the belief that the water would not be diverted for irrigation, but would remain in the stream. Conversely, if the Forest Service were to divert the water for irrigation in the future, it could constitute an adverse effect for bull trout and the Ute ladies'-tresses, which would require formal consultation under section 7 of the Endangered Species Act of 1973, as amended (ESA). It is not possible for the Service to determine the outcome of such consultation at this time, but irrigation diversions were considered a threat to bull trout in both the final rule listing the species (63 FR 31647) and the Governor's Bull Trout Conservation Plan. The Forest Service should complete consultation before taking any action to avoid the risk of violating sections 7 and 9 of the ESA.

We appreciate the opportunity to provide these comments regarding possible Forest Service changes in the use of water at the Busterback Ranch. If you have questions or need additional information please call Ray Vizgirdas at 378-5243. Your interest in the conservation of endangered and threatened species is appreciated.

Sincerely,

Robert D. Russi

Supervisor, Snake River Basin Office

cc: National Marine Fisheries Service, Boise

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Northwest Region
7600 Sand Point Way, N.E.
Bin C15700, Bldg.1
Seattle, Washington 98115-0070

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Department of Water Resources

Michael Collette
Boise Adjudication Team
USDA Forest Service
Intermountain Region
380 Park Center Blvd, Suite 330
Boise, Idaho 83706

RE: Water Rights associated with Busterback Ranch

Dear Mr. Collette:

This responds to the September 1, 1998, letter requesting review of the potential ramifications associated with the Endangered Species Act (ESA) from implementing water rights acquired through the purchase of the Busterback Ranch. The letter explains that the Idaho Department of Water Resources (IDWR) informed the USDA Forest Service (USFS) that they may recommend forfeiture because the USFS failed to divert water for irrigation purposes for five years. The letter identifies five points of diversion in Salmon River and Alturas Lake Creek in the upper Stanley Basin.

The USFS letter identifies ESA listed fish species in the area and describes potential adverse effects from diverting the water. Snake River sockeye salmon, Snake River spring/summer chinook salmon, and Snake River steelhead all use the upper Salmon River for spawning, rearing, and overwintering habitat. The National Marine Fisheries Service (NMFS) has also designated critical habitat for these three species throughout the project area. Critical habitat includes all perennial streams in the Snake River basin historically accessible to these anadromous fish species below Hell's Canyon and Dworshak Dams.

Based on the information provided to NMFS in a letter dated September 1, 1998, the effects of using the five diversions with a cumulative total water withdraw of 96.53 CFS are as follows. In the Salmon River, the effects of removing 65.6 CFS of water during years when the Busterback Ranch was in use resulted in: (1) dewatering approximately 800-1500 feet of the Salmon river precluding full use of spawning habitat for 22-32 miles upstream from the points of diversion; and among other effects, (2) reduced significantly the reproductive capabilities of the aforementioned

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species using the river from early July through late September. In Alturus Lake Creek, the diverted water (30.93 CFS) significantly impaired reproductive capabilities for chinook salmon and likely prevented sockeye salmon from using Alturus Lake.

The USFS believes diversion of river flows as authorized in the water right would result in a likely to adversely affect determination for designated critical habitat and for anadromous fish species listed under the ESA. Based on the information provided, NMFS agrees with the USFS determination that the action is likely to adversely affect. Given this finding, the USFS would be required to initiate formal consultation with NMFS.

Formal consultation would involve the development of a biological opinion to determine whether the action is likely to jeopardize the continued existence of Snake River sockeye salmon, Snake River chinook salmon, Snake River steelhead, or result in the destruction or adverse modification of designated critical habitat. Prior to reaching such a conclusion, it would be necessary for an instream flow study be completed for the entire upper Salmon River to fully assess the cumulative impact the subject action would have on ESA listed species and their designated critical habitat. Until the results of this study addressing effects to listed anadromous fishes and their habitat were available, NMFS would recommend the USFS defer use of the 102.93 CFS to ensure the action does not violate the ESA by jeopardizing the continued existence of the listed species or resulting in the destruction or adverse modification of critical habitat. Non-compliance with the ESA regulations could also place the USFS at risk of the violating the take prohibitions.

Even without the cumulative effects assessment, the available information regarding adverse effects to critical habitat and ESA listed species is sufficient for NMFS to raise serious concern whether continued irrigation use at the sites would be consistent with the provisions of section 7 (50 CRF part 402) and section 9 (50 CFR Sec 217) the ESA.

If you have any questions concerning this informal consultation on ESA listed Snake River salmon or Snake River steelhead, please contact Ed Murrell at (208) 378-5696.

Sincerely,

Theodore F. Meyers

for/ William Stelle, Jr.
Regional Administrator

cc: P. Ries - SNRA
R. Ruesink - USFWS

TeleFAX Transmission Cover Sheet

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Deliver only to: Allen Merritt

Organization/Location: IDWR Southern Regional Manager

Fax Number: (208) 736-3037

Voice Number:

Date: 8/31/98 **Time:**

Number of Pages *(incl. Cover)*: 31

From: Randy Bramer

Subject: Busterback Ranch

Message:

Boise Adjudication Team
U.S.D.A. Forest Service
Intermountain Region
380 Parkcenter Blvd, Suite 330
Boise, Id. 83706
Voice: (208) 387-0835
FAX (208) 387-0842

Boise Adjudication

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Southern Region

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United States
Department of
Agriculture

Office of the
General Counsel

By Facsimile

August 31, 1998

Allen Merritt
Regional Manager
Idaho Department of Water Resources – Southern Regional Office
1341 Fillmore Street, Suite 200
Twin Falls, ID 83301-3380

Dear Allen:

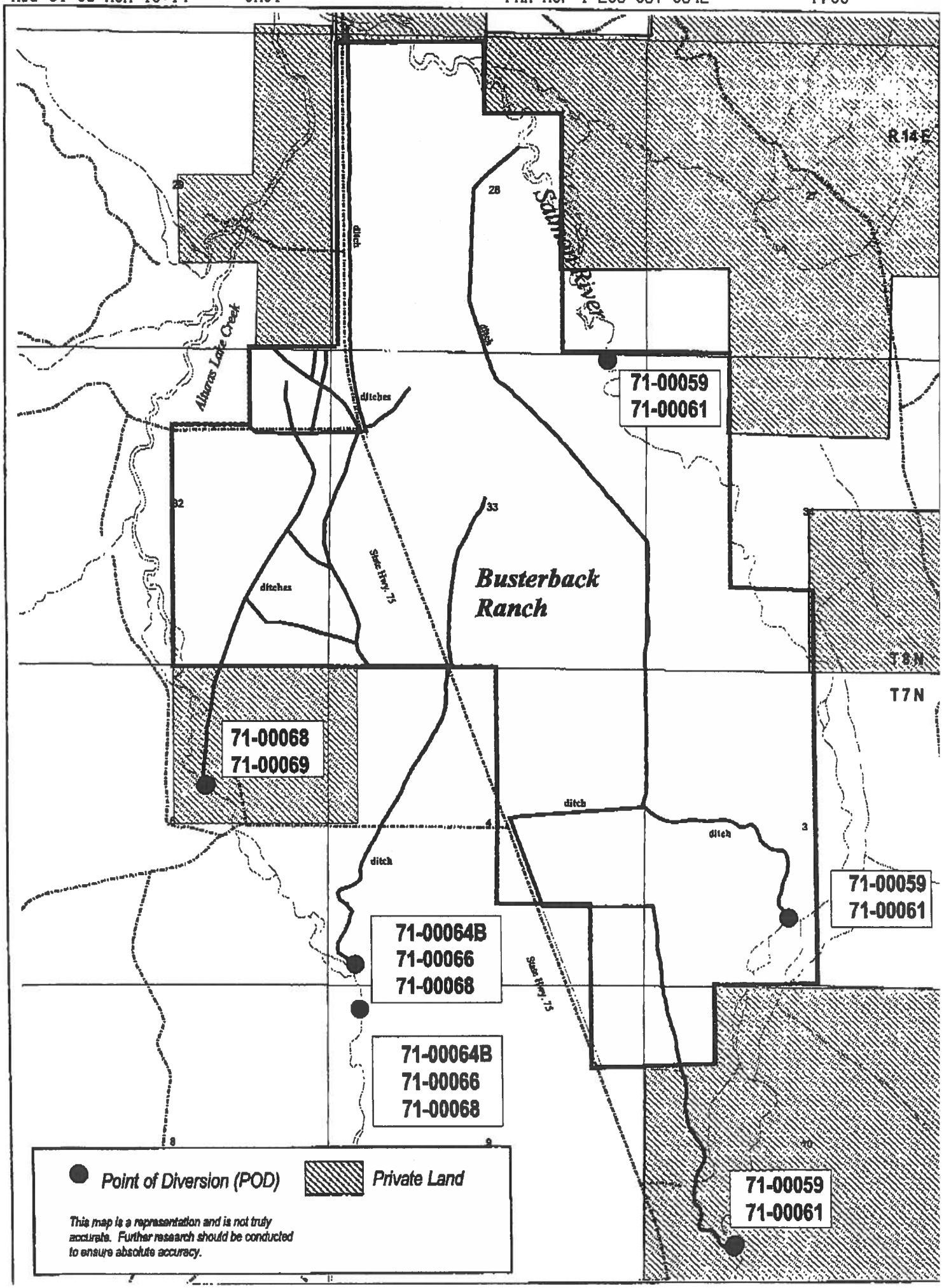
In accordance with our disclosures of August 12, 1998, please find enclosed records relating to use of water right numbers 71-00059, 71-00061, 71-00064B, 71-00066, and 71-00068 up until the time of purchase by the U.S.D.A. Forest Service in 1992. Please do not hesitate to call if you have any questions.

Very truly yours,

Randall J. Bramer

Enclosure

cc: David Tuthill
Peter Anderson


R14E
T8N
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Salmon River
Alturas Lake Creek
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Busterback Ranch
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71-00061
Point of Diversion (POD)
Private Land
This map is a representation and is not truly accurate. Further research should be conducted to ensure absolute accuracy.

BIOLOGICAL EVALUATION
INSTALLATION OF SPRINKLER IRRIGATION ON BUSTERBACK RANCH

July 23, 1991

Introduction

This Biological Evaluation is conducted at the request of the National Marine Fisheries Service (NMFS) to determine if the proposed irrigation system for Busterback Ranch will affect sockeye salmon (*Oncorhynchus nerka*) and chinook salmon (*O. tshawytscha*) in Alturas Lake Creek and the upper Salmon River. Steelhead trout (*O. mykiss*), westslope cutthroat trout (*O. clarki lewisi*), and bull trout (*Salvelinus confluentus*) are also included in this evaluation, as they have been designated "Sensitive Species" by the Forest Service. This irrigation project would occur on the Sawtooth National Recreation Area (SNRA), Sawtooth National Forest. The purpose for this action is to provide adequate fish flows in both Alturas Lake Creek and the upper Salmon River, reaches that are currently dewatered by flood irrigation diversions for the ranch.

Proposed Action

The proposed action is to install four pivot sprinklers near the river and improve flood irrigation on the west side of the property. Also the pastures on the ranch would be converted to more drought resistant species of grass. These actions would require less water to be diverted from the two streams.

It has been determined that 25 cfs in the upper Salmon River and 15 cfs in Alturas Creek would allow for adequate adult fish passage (Forsgren, 1983, 1985). Forsgren (1983, 1985) also felt these flows would allow for spawning and rearing opportunities in the dewatered reaches of both streams. All measurements are at the diversion sites.

Once the natural stream flows for the upper Salmon River and Alturas Lake Creek dropped to 25 cfs and 15 cfs (respectively), water would cease being diverted from the streams, and all irrigation water would come from wells.

Threatened, Endangered, and Sensitive Species

Sockeye and chinook salmon, steelhead, westslope cutthroat, and bull trout occur within the influence of the proposed project. The classification of these fish are as follows:

The Idaho sockeye salmon is currently proposed as "Endangered" by NMFS under the federal Endangered Species Act of 1973. Sockeye is also classified a "Sensitive Species" by the Forest Service (FSM 2670).

The upper Snake River chinook salmon have recently been proposed by NMFS as "threatened" under the Act and are considered a "Sensitive Species" by the Forest Service.

Steelhead, westslope cutthroat, and bull trout are also classified "Sensitive Species" by the Forest Service.

Habitat Affected by the Proposed Action

The project area includes Alturas Lake Creek and the upper Salmon River. Alturas Lake and tributaries to the upper Salmon, to include Pole, Frenchman, Beaver, and Smiley Creeks are also influenced by the project as these areas are presently inaccessible to migrating fish due to current irrigation practices.

Historically, Alturas Lake, like nearby Redfish, Pettit, Yellowbelly, and Stanley Lakes, was used by thousands of sockeye salmon that migrated inland hundreds of miles to spawn. The sockeye juvenile reared in the lake until they began their outmigration to the sea. Presently, Redfish Lake is the only lake known to currently support sockeye.

The upper Salmon River, its tributaries, and Alturas Lake Creek were valuable spawning and rearing streams for chinook salmon. Steelhead also used the upper Salmon and its tributaries, and to a lesser degree, Alturas Lake Creek, for spawning and rearing. Cutthroat and bull trout were fairly abundant in these stream systems.

Critical habitat for sockeye and chinook survival have not yet been identified by NMFS, so it is not known whether Alturas Lake, Alturas Lake Creek, or the upper Salmon River is considered "critical habitat" for either of these species. Alturas Lake and Alturas Lake Creek, however, may play an important role in the recovery program for sockeye.

Effects of Past and Present Activities

The Idaho sockeye run was greatly affected by the construction of Sunbeam Dam in 1913 on the upper Salmon River. Access to the morainal lakes in Sawtooth Valley, vital to the existence of sockeye, was virtually cut off. The dam was breached in 1934, but downstream impacts, such as from the mainstem dams and over-harvesting, continued to decrease the sockeye numbers to where only a token few fish currently enter the Sawtooth Valley.

Naturally spawning populations of chinook salmon in the Columbia River Basin are but a fraction of their historic size due to construction of large hydroelectric dams on the Columbia River and its major tributaries, over-harvesting, and degradation of vital spawning and rearing habitat. Natural production of chinook salmon in the Columbia Basin is estimated at only four to seven percent of historical levels (Nehlsen et al., 1991). Dams have decreased available spawning and rearing habitat to 45 percent of the original area (Columbia River Basin Fish and Wildlife Program, NWPPC, 1984). The development of natural resource based industries, such as agriculture, mining, logging, and power generation proportionately diminished fish habitat in the Basin, and many salmon runs were reduced or eliminated (Thompson, 1976).

Steelhead is a Pacific Northwest sea-run rainbow trout. The only populations occurring in Idaho are summer runs of Snake River stocks in the Snake, Clearwater, and Salmon drainages. The decline of native, naturally-spawning steelhead is a result primarily from inadequate smolt passage due to hydropower development and irrigation; habitat loss and degradation from land disturbing activities such as logging, mining, and grazing; overfishing weak and mixed stocks of ocean and river fisheries; and negative interactions with hatchery and other fish (Nehlsen et al., 1991).

Westslope cutthroat trout populations have greatly declined from historic levels due to loss and degradation of habitat, hybridization with introduced rainbow trout, interspecific competition, and overfishing. Only 11 percent of the historic westslope cutthroat trout habitat in Idaho is thought to contain a strong population of fish, and only four percent of this population is considered genetically pure (Rieman and Apperson, 1989).

Bull trout populations in the Pacific Northwest have also declined from historical levels. The decline in distribution and numbers of bull trout is thought to be related to negative effects on spawning and rearing habitat (Goetz, 1989).

The project area includes Busterback Ranch and reaches of the upper Salmon River and Alturas Lake Creek. Presently, the ranch diverts water from both of these streams to flood irrigate pasture land on the ranch. A water right of 37.8 cubic feet per second (cfs) from Alturas Lake Creek is used to irrigate 582 acres, and a water right of 65.6 cfs from the Salmon River is used to irrigate 1,720 acres (Scott et al., 1981). When irrigation diversions exceed natural flows, reaches in both streams become dry. This generally occurs in mid-July and often extends through October. Up to 13.8 miles (636 acres) of Alturas Lake Creek, plus the 835 acres of

Alturas Lake, and 32 miles (65 acres) of the upper Salmon River become inaccessible to anadromous fish. In addition, 3-1/2 miles (18 acres) of Alturas Lake Creek and 3-1/2 miles (15 acres) become totally dewatered below the diversion dams.

Dewatering both streams coincides with late summer/early fall salmon migration. Sockeye cannot access Alturas Lake to spawn, and chinook and bull trout cannot access upper Salmon River and Alturas Lake Creek for spawning purposes. The dewatered reaches in both streams cannot be used for spawning and rearing of chinook and bull trout. Incubation and rearing for steelhead and cutthroat trout, both spring spawners, in these dewatered reaches are denied.

Table 4b

Estimated Potential Production Yields
With Improved Irrigation Water Management, Fertilizer
and Improved Species (Sprinkler Only)

Soil	Approximate Acres	Projected Yield T/Ac	Estimated Production Potential		
			Hay[1] Equivalent	Carrying Capacity[2] Steers	Acres/ Steer
A	400	2.50	1,000	975	.4
B	500	2.50	1,250	1,218	.4
C	---*	---	---	---	---
D	250	2.50	625	609	.4
E	100	2.50	250	243	.4
F	100	2.50	250	243	.4
G	---*	---	---	---	---
H	---*	---	---	---	---
X	50	2.50	125	122	.4
			3,500 Ton	3,410 Head	

*Not irrigated. Production potential from these soils is assumed to be the same for all alternatives.

[1]Estimated hay production potential assumes every acre of a given soil receives sprinkler irrigation, fertilizer and improved species. Figures used in Table 1a, "Summary of Alternatives", are based on the actual acres treated and how they are treated.

[2]Based on the following:
Steers go on June 1 at 650 pounds,
Steers come off September 1 at 875 pounds.
Average steer weight = $\frac{650 + 875}{2}$ = 763 pounds

One animal unit = One 1,000 lb steer. These steers = $\frac{763}{1000}$ = .76 animal unit.

Feed requirement for one animal unit on a fattening basis is 900 lbs/month.
Feed requirement for these steers is .76 AU x 900 lb/AUM = 684 lbs/month.
This amount allows for about 150 lbs. per month wastage due to trampling and forage left in the field after steers are removed.

Irrigation Engineering Feasibility Report[1]

Introduction

By formal request, the Soil Conservation Service was asked by the Forest Service to make an irrigation feasibility study of the Busterback Ranch in Sawtooth Valley. Two alternatives were cited for investigation: (1) pivot sprinklers on the east side of State Highway 93, and improved surface irrigation on the west side of the same highway; and (2) pivot sprinklers on each side of State Highway 93.

Ranch land on both sides of the highway are presently surface irrigated.

The Forest Service specifically requested seven items be addressed for each alternative as a result of this study:

- Cost to install the irrigation system
- Cost to maintain the irrigation system
- Cost to operate the irrigation system
- Man-hours to operate the irrigation system
- Energy requirements to operate the irrigation system
- Water used and saved
- Estimated forage and grazing production

The first six of the above items are engineering in nature, while the last is agronomic. This immediate text addresses the engineering features of this study report.

Water Requirements

Seasonal plant consumptive use amount for Sawtooth Valley was determined by the SCS modified Blaney-Criddle equation. This equation used locally available climatological data from Stanley and site specific latitude data at Busterback Ranch. This procedure developed monthly values for consumptive use by standard computer methods.

Normal consumptive use for grass pasture in Sawtooth Valley is about 13.9 inches of water depth per year, with 11.3 inches required June through September. Peak consumptive use occurs in July. Refer to Exhibit A.

Normal seasonal application amounts are determined by dividing the normal consumptive use by irrigation system efficiency and are displayed in Table 6. System efficiencies were determined by field observation, knowledge of soils, experience and findings of irrigation system evaluations elsewhere in Idaho over the past few years.

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[1]By Neil D. Walton, SCS, Irrigation Engineer, Boise, Idaho.

Peak consumptive use data was calculated from data developed by Rick Allen of the University of Idaho in 1983. Mr. Allen analyzed the historical weather records of 98 weather stations in Idaho by a modified FAO Blaney-Criddle equation adjusted for elevation and corrected to measured lysimeter data at Kimberly, Idaho. Peak consumptive use for grass pasture in Sawtooth Valley is about 0.25 inches per day in the month of July, which converts to 4.72 gpm/acre steady flow need. Applying system efficiences, as was done in Table 6, yields the figures found in Table 5.

Caution must be expressed concerning the interpretation of data found in Tables 5 and 6, under improved surface of Alternative #1. Whereas, it may be reasonable to assume moving toward improved irrigation efficiency with the attendant water savings is positive, care must be taken to assess the agronomic benefit, or cost, due to porous soils and an aggravating high water table. Refer to the "Forage Production" section of this report to clarify this matter.

Pivot Locations

The pivot locations were made by field observation and photo map correlation to conform to physical constraint of roads, boundaries, and geologic features, and to maximize acreage. All distances were map measured and are subject to the errors of such work, sufficient for planning, but deficient for final design.

Diversion Structure

Two sites were selected in the field for possible diversion structure locations where the channel and banks of the Salmon River appeared stable. One site was about 3/4 of a mile south of the Busterback Ranch ranch house, and the other about one mile south of the ranch house. Both sites were cross-sectioned with a level and rod to provide preliminary design information on structure size and capacity. Structures at either site could be nearly identical.

Layout of Pipelines

Location of trunk line and pivot main lines were governed by the pivot locations and assumed to be laid from pivot center to pivot center, except for the pivots on the west side for Alternative #2. Refer to Exhibit B. All distances were determined from photo maps and an USGS topographic map.

Hydraulics

Pivot hydraulics were based on a Hazen-Williams "C" of 150, assuming an epoxy-lined lateral. A friction reduction factor of 0.36 was used along the pivot lateral based on a multiple outlet equation. Pressure at the pivot was determined by adding to the maximum ground elevation under the pivot, the nine feet to the spray head, plus the 42 feet of pressure (18 psi) at the nozzle, plus the pivot lateral loss.

This hydraulic design maximized the gravity potential of the elevations, pipe flows, and pipe sizes, so as to minimize the need for booster pumps.

Plastic trunk line and main line pipe was used throughout the system for the following reasons:

- Low friction flow values (C=150)
- Large sizes now available (up to 36")
- Cathodic analysis and protection not needed
- Variable pipe pressure ratings available.
- Ease of assembly
- Competitive in price with steel

Energy

Each alternative of this study assumed one horsepower, electric drive, pivot wheel motors. Since the hydraulic design maximized the gravity potential for nozzle pressures, booster pumping was minimized to four pumps at a total of 55 horsepower for Alternative #1, and three pumps at a total of 40 horsepower for Alternative #2. Other energy requirements of these proposed alternatives are displayed in Table 4.

Costs

Several manufacturers of irrigation equipment and dealers, as well as information from a list of bid abstracts of similar job proposals, were used in cost estimating these alternatives. Energy cost information came directly from Salmon River Electric Cooperative of Challis, Idaho.

All costs are not believed to be high, yet should return to a responsible contractor a reasonable margin of profit. Few construction problems are anticipated for either alternative to affect pricing. Refer to Tables 1, 2 and 3.

Easements

Easements from the point of diversion to Busterback Ranch property boundary will need to be acquired from Frank Hensley, as well as, at other locations, from the State Highway Department and the Forest Service. No attempt was made in this study to estimate the cost of acquiring such easements.

Summary

Alternatives #1 and #2 are physically feasible. Other alternatives, however, such as additional smaller pivots on the east side, or no improvement to the surface system on the west side, should be considered in a benefit/cost analysis.

The tabulated information in Tables 1 through 6 now needs to be weighed against the yield information in the "Forage Production" section of this report, Tables 1 through 4.

Sufficient information is presented in this combined report to develop an incremental benefit/cost analysis of the two proposed alternatives requested by the Forest Service or the Soil Conservation Service.

SALTOOTH VALLEY CONSUMPTIVE USE
SEP 1988
NORMAL YEAR

2
3
SPROG. DATE JAN. 6 , 1975

SUMMARY OF CONSUMPTIVE USE COMPUTATIONS FOR "NORMAL" CONDITIONS

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANNUAL
NORMAL TEMPERATURE	17.5	18.1	25.1	33.5	45.1	53.5	56.3	56.1	47.6	38.9	27.0	16.7	35.6
NORMAL PRECIPITATION	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

REF GRASS PA 1500.ACS. SOIL MOISTURE CAP. 2.0 IN. GROWING SEASON 5 24 TO 9 24 LENGTH 123 DAYS

EFF PRE		.40	.40	.40	.40	.51	.92	.92	.91	.78	.40	.46	.40	
NORMAL CONS. USE	(IN)	.10	.14	.25	.35	.98	2.76	3.67	3.25	1.58	.43	.21	.12	13.86
	(AF)	13.	18.	31.	45.	122.	345.	458.	407.	198.	53.	26.	15.	1732.
INCR USE CARRY OVR	(IN)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
EFFECTIVE PRECIP.	(IN)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
NORMAL NET IRR. REQ.	(IN)	.10	.14	.25	.35	.98	2.76	3.67	3.25	1.58	.43	.21	.12	13.86 *
	(AF)	13.	18.	31.	45.	122.	345.	458.	407.	198.	53.	26.	15.	

SSSSSSSSSSSSSSSSS SUMMARY FOR "ALL CROPS" NORMAL CONDITIONS *** TOTAL CROPLAND 1500. ACRES *** SSSSSSSSSSSSSSSSS

TOTAL CONS. USE	(AF)	13.	18.	31.	45.	122.	345.	458.	407.	198.	53.	26.	16.	1732.
TOT CONS. USE	(IN)	.10	.14	.25	.35	.98	2.76	3.67	3.25	1.58	.43	.21	.12	13.86
TOTAL NET IRR.	(AF)	13.	18.	31.	45.	122.	345.	458.	407.	198.	53.	26.	16.	
TOT NET IRR.	(IN)	.10	.14	.25	.35	.98	2.76	3.67	3.25	1.58	.43	.21	.12	13.86
CT. DAY		5.48	5.57	8.29	9.95	10.25	10.39	10.49	9.71	8.41	7.64	6.50	6.22	

DIF/ NO USE OF CARRY OVER MOISTURE IS ASSUMED, THE NEG. MONTHLY NORMAL IRR. REQ. INDICATES THE EFFECTIVE PREC. EXCEEDS THE MONTHLY USE

/ SUM OF POSITIVE NORMAL NET IRRIGATION REQUIREMENT

-51-

EXHIBIT A

Table 1c

Engineer's Installed Cost Estimate
East Side Pivot Sprinkler
West Side Improved Surface
Alternative #1

ITEM	COST
Diversion Structure	$ 28,750
Pipeline (buried plastic main lines)	$ 462,950
Pivots (7)	$ 451,350
Pumps (4)	$ 12,450
Easements	--- [1]
Improved Surface System West Side	$ 8,700
TOTAL	$964,200

[1] An unknown entity at this time.

SALMON RIVER
IRRIGATION WATER MANAGEMENT
REPORT

Prepared by Gale Roberts of the

USDA-Soil Conservation Service
Hailey, Idaho

With Assistance from the SCS
Boise and Salmon, Idaho

for

USDA Forest Service

Draft: September 1985

Final: February 1986

Introduction

On April 1, 1985, the USDA Forest Service entered into a formal agreement with the USDA Soil Conservation Service to evaluate alternative methods of irrigating the Busterback Ranch. This ranch, located in the south end of the Stanley Basin, contains approximately 1,400 acres of irrigated pastureland It is currently irrigated by a surface system. This system diverts 70-150 cubic feet per second (CFS) of water from the Salmon River and Lake Alturas Creek to irrigate native and improved species of grass. Currently, the pasture provides forage for about 1,000-1,200 head of 650-900 pound steers from approximately June 1 until September 1.

When the ranch is using their full water right, the in-stream flow of the Salmon River and Lake Alturas Creek is inadequate for the passage and spawning of salmon during the late summer. Due to the course texture of the soils, it is not feasible to adequately meet the water requirements of the grass with a surface irrigation methods. Therefore, the new alternatives evaluated were sprinkler systems.

Specifically, the agreement called for the evaluation of three systems:

1. Approximately 1,132 acres of center pivot sprinklers on the east side of the highway, and 427 acres of improved surface irrigation on the west side of the highway;

2. Approximately 1,526 acres of center pivot sprinklers located on both sides of the highway; and

3. The existing system.

Seven specific items were to be addressed for each alternative:

1. Cost to install the irrigation system,

2. Cost to maintain the irrigation system,

3. Cost to operate the irrigation system,

4. Man-hours to operate the irrigation system,

5. Energy requirements to operate the irrigation system,

6. Water used and saved, and

7. Estimated forage and grazing production.

Before the actual evaluation was started, a detailed soil survey was completed on the area by SCS Soil Scientists.

This report is separated into four parts:

1. The Summary,
2. Forage Report,
3. Irrigation Report, and
4. Soils Report.

Because each report was prepared by a different specialist, some duplication of materials is evident.

Summary

Table 1a summarizes the three alternatives evaluated in this report. In addition, several other statements can be made with this information:

1. Pressurized, overhead sprinkler systems are the only feasible method of efficiently applying irrigation water to the course-textured soils on the ranch. Center pivots greatly reduce the labor requirements over other methods, such as hand lines, or wheel lines.

2. The maximum increase in production can be achieved on the east side of the highway using sprinklers, fertilizer and improved plant species.

3. The increase in production on the west side of the road would be less than the east side even with sprinklers. This is due to the water table that is supplying some of the crops' water requirements.

4. The mound or hill located north of the house should be considered a barrier to center pivots unless physically altered.

5. Gravity pressure from the elevation differences could provide most of the pressure to operate the sprinkler system.

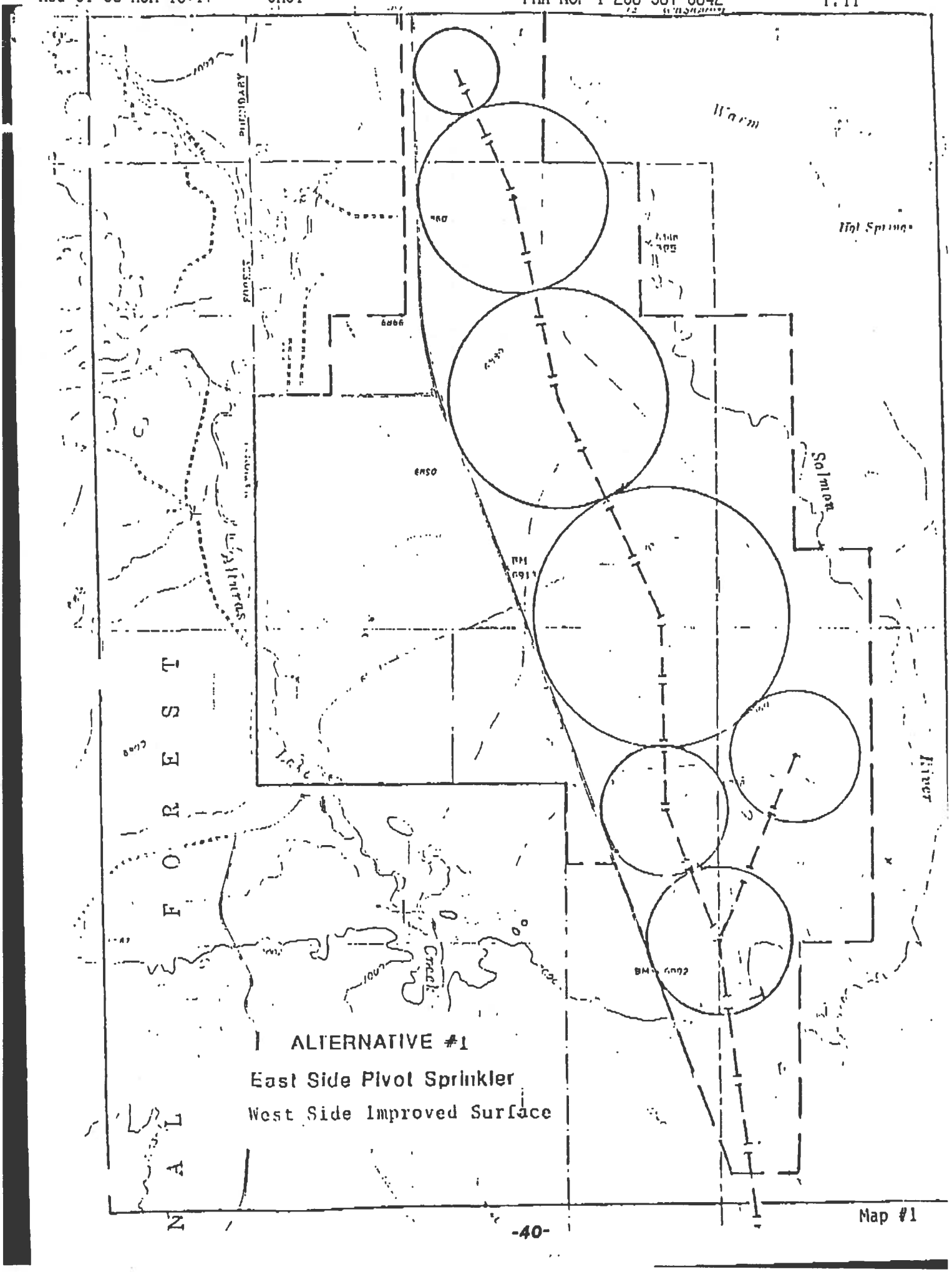
6. The two new alternatives evaluated are both feasible methods of achieving the objectives. Other feasible layouts also exist and can be evaluated based on the material in this report.

Table 1a

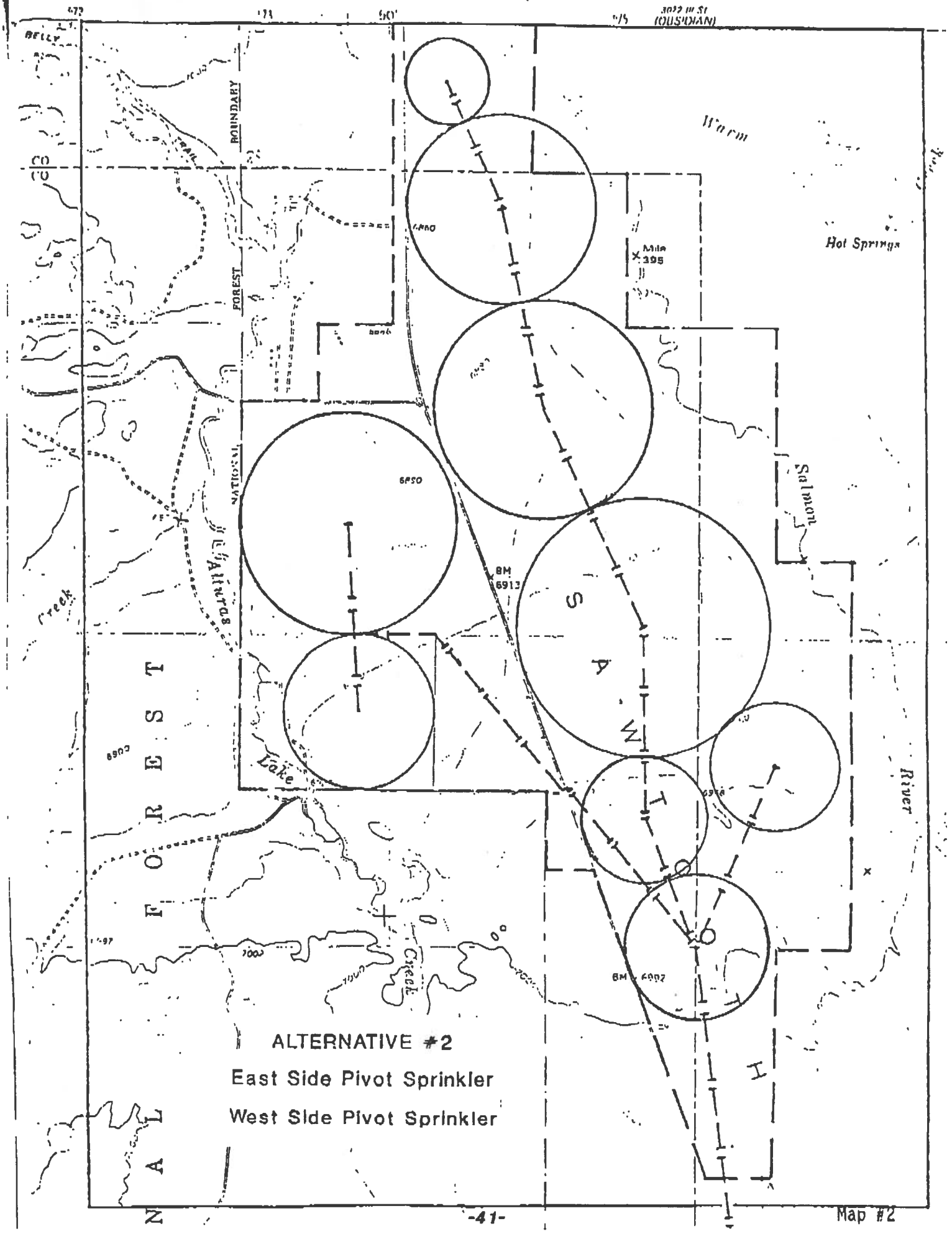
Summary of Alternatives

Item	Alternative #1 1,132 Acres* 427 Acres**	Alternative #2 1,526 Acres*	Present 1,400 Acres**
Cost to Install Irrigation System	$964,200	$1,388,250	$ -0-
Annual Cost to Operate Irrigation System (Energy)	$ 30,030	$ 40,010	$ 2,000
Annual Labor Hours to Operate Irrigation System	4,000	2,000	6,000
Annual Energy Requirements	100 KW	107 KW	-0-
Annual Cost to Maintain Irrigation Sytem	$ 20,850	$ 27,765	$ 14,545
Carrying Capacity (for 1,400 acres currently irrigated) Level 1	1,580 hd	1,635 hd	1,112 hd
Level 2	2,870 hd	2,890 hd	
Level 3	3,540 hd	3,720 hd	
Water Requirements	30 CFS	19 CFS	70-150 CFS

*Sprinkler Irrigated
**Surface Irrigated


Warm
Hot Springs
Salmon
River
Creek
FOREST
ALTERNATIVE #1
East Side Pivot Sprinkler
West Side Improved Surface

Map #1



ALTERNATIVE #2

East Side Pivot Sprinkler

West Side Pivot Sprinkler

Map #2

September 1985

Busterback Ranch Forage Production Report[1]

The Busterback Ranch is located in the south end of Idaho's Stanley Basin, about 20 miles south of the town of Stanley. It consists of approximately 1,400 acres of irrigated meadows along the Salmon River. Meadows on the ranch are used to graze steers from at least June 1 to September 1, each year. The normal stocking rate is from 1,000 to 1,200 head, or 1.4 to 1.2 acres per steer. Steers come onto the ranch in June at about 650 pounds and leave in September at about 850-900 pounds. Average daily gain is near 2.5 pounds per steer, per day.

Climate in the Stanley Basin is frigid. Frost may occur during any month of the year. Winters are severe with two to three feet of snow cover. The normal growing period is from 90 to 100 days for most grasses and forage plants. Summers are generally warm and dry. The annual precipitation is 20 inches per year.

Present vegetation on the ranch consists primarily of native and introduced grass and forb species. In areas where the water table supplies plant needs, production is near 1.0 to 1.35 ton per acre, per year. On the more droughty soils, vegetative production is about .5 to .75 ton per acre, per year.

A large amount of conservation work has been applied to Soil A. Vegetation on this soil is mainly introduced species of Orchard grass and smooth brome grass. Yield responses from these introduced species have not been significant. The improved flood irrigation system does not adequately meet the plant moisture needs or allow effective use of fertilizer; therefore, the production potential of these grasses is not being displayed.

Soils on the ranch are primarily very gravelly or gravelly, sandy loam soils. They tend to be droughty because the water holding capacity is very low. Water moves into and through them very fast. Soils west of the highway have a high wate table with some areas near Alturas Creek having a very high water table. Because of the coarse nature of these soils, they are very difficult to irrigate in a manner that will meet the plant water requirement. Even though a rather elaborate flood irrigation system of ditches and leveling has been applied on Soil A, the plant moisture needs are still not being properly met. It is almost impossible to adequately control soil moisture on these soils with a flood irrigation system.

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[1] By Floyd G. Bailey, State Conservation Agronomist, Soil Conservation Service, Boise, Idaho.

Present vegetative production estimates have been made for each soil group on the ranch. Numerous clipping measurements were made on each soil. These yield data correlated well with the current livestock stocking rates. Table 1b shows the current production rates and the estimated production in hay yield, head of steers carried, and acres needed to feed one steer from June 1 to September 1 for each soil group. Potential yields have also been estimated for the improved management conditions of: (1) irrigation water management using a sprinkler system to adequately meet the plant water needs (Table 2b); (2) a sprinkler system, plus adding fertilizer to the plant (Table 3b); and (3) a sprinkler system, plus fertilization and changing vegetation to genetically, higher-yielding, introduced species (Table 4b).

Clipping data under sprinkler on the Frank Hensley Ranch located just south of the Busterback Ranch was used as a guide for the potential that could be reached under each management situation. The maximum potential production was set at 2.5 tons of hay per acre. Clippings on the Frank Hensley ranch showed this to be a reachable goal when high-level management conditions are applied to the land.

Information in this report is based on best estimates and field measurements. It is intended to show present yields and potential yields under different management conditions. Actual production rates may vary from the estimates presented herein due to actual management quality applied to the land.

Conclusions

Because of the gravelly nature of the soils on the Busterback Ranch, flood irrigation systems do not permit management to adequately meet the plant requirements for moisture. Excessive leaching also makes use of fertilizer uneconomical. Without proper irrigation water management, it is not feasible to use fertilizer technology and obtain crop response from improved species of grass and legumes.

Presently, yields are about 1/4 to 1/3 of the potential yield that can be expected when proper management conditions are applied. In order to take advantage of better management techniques, such as improved species and fertilization, a better system of managing irrigation will first have to be applied. Past experience has shown little response from either improved species or fertilizer when irrigation water cannot be adequately supplied. A realistic yield goal for the area under high-level management conditions is 2.5 tons of air-dry hay per acre. This is equivalent to approximately .4 acre per steer for the June 1 to September 1 grazing period.

Table 1b

Present Production Yields

Soil	Approximate Acres	Estimated Yield T/Ac	Estimated Production		
			Hay Equivalent	Carrying Capacity[1] Steers	Acres/ Steer
A	400	.60	240	234	1.7
B	500	.75	375	365	.7
C	---*	---	---	---	---
D	250	1.25	312	305	.8
E	100	.75	75	73	1.4
F	100	1.00	100	98	1.0
G	---*	---	---	---	---
H	---*	---	---	---	---
X	50	.75	38	37	1.4
			1,140 Ton	1,112 Head	

*Not irrigated. Production potential from these soils is assumed to be the same for all alternatives.

[1]Based on the following:

Steers go on June 1 at 650 pounds,
Steers come off September 1 at 875 pounds.
Average steer weight = $\frac{650 + 875}{2}$ = 763 pounds

One animal unit = One 1,000 lb. steer. These steers = $\frac{763}{1000}$ = .76 animal unit.

Feed requirement for one animal unit on a fattening basis is 900 lbs/month.
Feed requirement for these steers is .76 AU x 900 lb/AUM = 684 lbs/month.
This amount allows for about 150 lbs. per month wastage due to trampling and forage left in the field after steers are removed.

Table 2b
Level 1
Estimated Potential Production Yields
With Improved Irrigation Water Management
(Sprinkler Only)

Soil	Approximate Acres	Projected Yield T/Ac	Estimated Production Potential		
			Hay[1] Equivalent	Carrying Capacity[2] Steers	Acres/ Steer
A	400	1.00	400	390	1.0
B	500	1.00	500	487	1.0
C	---*	---	---	---	---
D	250	1.50	375	365	.7
E	100	1.00	100	98	1.0
F	100	1.25	125	122	.8
G	---*	---	---	---	---
H	---*	---	---	---	---
X	50	1.00	50	49	1.0
			1,550 Ton	1,511 Head	

*Not irrigated. Production potential from these soils is assumed to be the same for all alternatives.

[1]Estimated hay production potential assumes every acre of a given soil receives sprinkler irrigation. Figures used in Table 1a, "Summary of Alternatives", are based on the actual acres of a given soil that are sprinkler irrigated by an alternative.

[2]Based on the following:
Steers go on June 1 at 650 pounds,
Steers come off September 1 at 875 pounds.
Average steer weight = $\frac{650 + 875}{2}$ = 763 pounds

One animal unit = One 1,000 lb steer. These steers = $\frac{763}{1000}$ = .76 animal unit.

Feed requirement for one animal unit on a fattening basis is 900 lbs/month.
Feed requirement for these steers is .76 AU x 900 lb/AUM = 684 lbs/month.
This amount allows for about 150 lbs. per month wastage due to trampling and forage left in the field after steers are removed.

Table 3b
Level 2
Estimated Potential Production Yields
With Improved Irrigation Water Management and Fertilizer (Sprinkler)
or Improved IWM, Fertilizer and/or Improved Species (Surface)

Soil	Approximate Acres	Projected Yield T/Ac	Estimated Production Potential: Hay[1] Equivalent	Carrying Capacity[2] Steers	Acres/ Steer
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

With Improved Irrigation Water Management and Fertilizer (Sprinkler)
or Improved IWM, Fertilizer and/or Improved Species (Surface)

Soil	Approximate Acres	Projected Yield T/Ac	Estimated Production Potential: Hay[1] Equivalent	Carrying Capacity[2] Steers	Acres/ Steer
A	400	2.50	1,000	975	.4
B	500	1.50	750	731	.7
C	---*	---	---	---	---
D	250	2.00	500	487	.5
E	100	1.50	150	146	.7
F	100	2.00	200	195	.5
G	---*	---	---	---	---
H	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C	---*	---	---	---	---
D	250	2.00	500	487	.5
E	100	1.50	150	146	.7
F	100	2.00	200	195	.5
G	---*	---	---	---	---
H	---*	---	---	---	---

X	50	1.50	75	73	.7
			2,675 Ton	2,607 Head	

*Not irrigated. Production potential from these soils is assumed to be the same for all alternatives.

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[1]Estimated hay production potential assumes every acre of a given soil on the east side of the highway receives sprinkler irrigation and fertilization, and every acre of a given soil west of the highway benefits from improved water management (of the flood system), fertilizer and/or improved species. Figures used in Table 1a, "Summary of Alternatives", are based on the actual acres treated by an alternative, and how they are treated.

[2]Based on the following:

Steers go on June 1 at 650 pounds,
Steers come off September 1 at 875 pounds.
Average steer weight = $\frac{650 + 875}{2}$ = 763 pounds

One animal unit = One 1,000 lb steer. These steers = $\frac{763}{1000}$ = .76 animal unit.

Feed requirement for one animal unit on a fattening basis is 900 lbs/month.
Feed requirement for these steers is .76 AU x 900 lb/AUM = 684 lbs/month.
This amount allows for about 150 lbs. per month wastage due to trampling and forage left in the field after steers are removed.

Table 2a

Engineer's Installed Cost Estimate
East Side Pivot Sprinkler
West Side Pivot Sprinkler
Alternative #2

ITEM	COST
Diversion Structure	$ 28,750
Pipeline (buried plastic main lines)	$ 741,800
Pivots (9)	$ 607,700
Pumps (3)	$ 10,000
Easements	--- [1]
TOTAL	$1,388,250

[1] An unknown entity as this time.

Table 3c

Annual Maintenance Costs
and
Labor Requirements

	Alternatives		
	#1	#2	Present
Annual Maintenance (Surface)	$ 1,740	$ ---	$ 14,545
Annual Maintenance (Pivot)	$ 19,110	$ 27,765	---
TOTAL MAINTENANCE	$ 20,850	$ 27,765	$ 14,545
Man-Hours to Operate	4,000	2,000	6,000

Table 4c

Annual Energy Requirements and Costs

	Alternatives		
	#1	#2	Present
Number Booster Pumps	4	3	---
Horsepower	55	40	---
Number Pivot Motors	79	104	---
Horsepower	79	104	---
Total Horsepower	134	144	---
Total Kilowatts	100	107	---
Horsepower Charges	$ 1,730	$ 1,860	---
Estimated Energy Costs	$28,300	$38,150	$ 2,000
Total Annual Energy Costs	$30,030	$40,010	$ 2,000

Table 5c

Peak Consumptive Use (CU) Requirements

	Present Surface	Alternatives #1 Sprinkler	Alternatives #1 Surface	Alternatives #2 Sprinkler
Peak CU (gpm/ac)	4.72	4.72	4.72	4.72
Estimated Efficiency	10-22%*	86%**	30%	86%**
Application (gpm/ac)	21.6-46.2	5.50	15.73	5.50
Irrigated Acres	1,457	1,132	427	1,526
Water Used				
Gallons per minute	31,430-67,350	6,230	6,720	8,390
Cubic feet per second	70-150	13.9	15.0	18.7
Water Saved				
Gallons per minute	---	At least 18,480		At least 23,040
Cubic feet per second	---	41.2		51.3

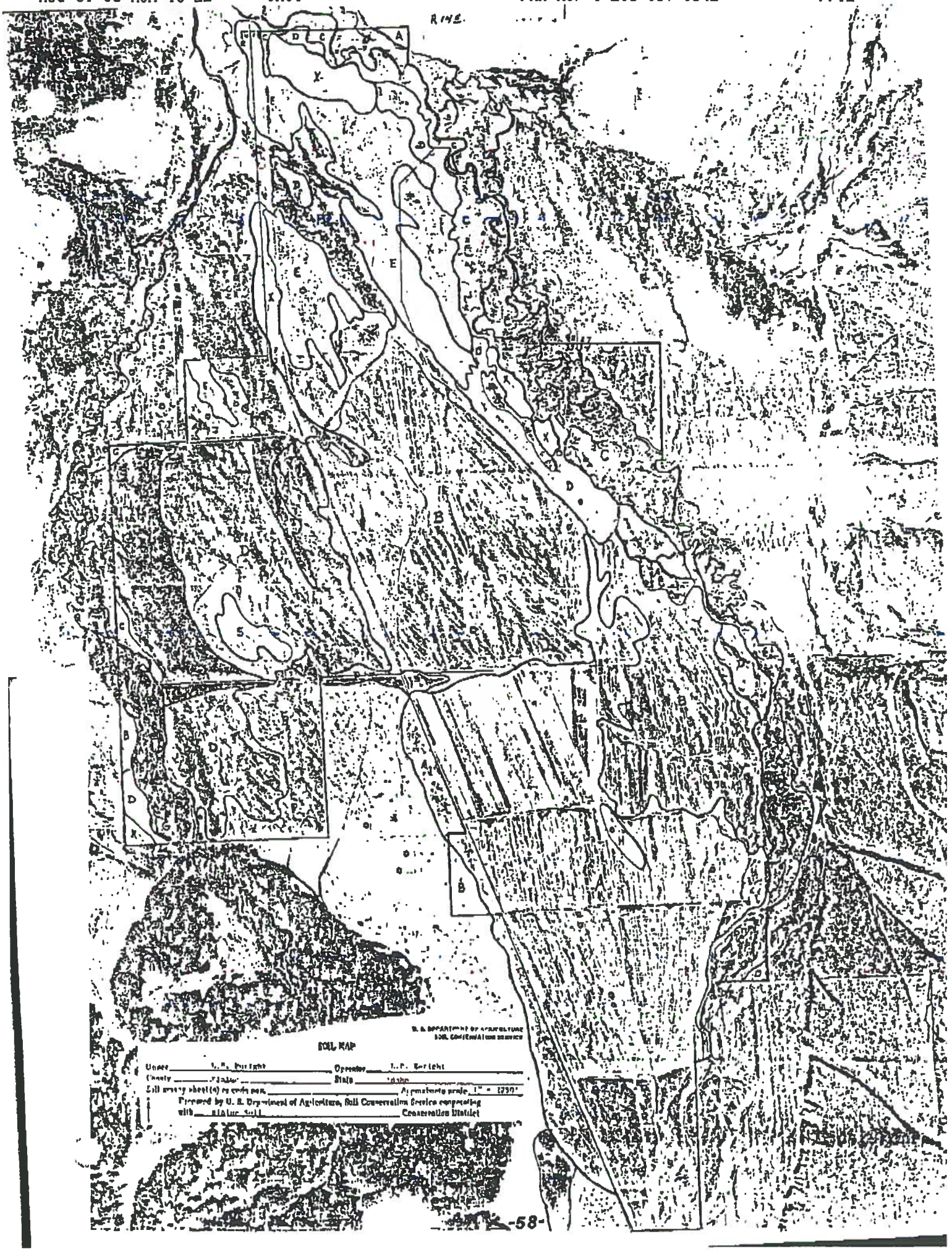
* Based on existing use of 70-150 CFS.
** Based on Frank Hensley's experience at Salmon Falls Sheep Company.

Table 6a

Seasonal Water Requirements
(Inches of Depth per Acre)

	Present Surface	Alternatives #1 Sprinkler	Alternatives #1 Surface	Alternatives #2 Sprinkler
Consumptive Use (inches)	13.86	13.86	13.86	13.86
Estimated Efficiency	10-22%	86%	30%	86%
Application (inches)	63.0-138.6	16.12	46.20	16.12
Irrigated Acres	1,457	1,132	427	1,526
Water Used (ac-ft)	7,649-16,828*	1,521	1,644	2,050
Water Saved (ac-ft)	---	At least 4,484		At least 5,599

* Scott, et al (1981), calculated actual water use for the existing irrigation system on Busterback Ranch at 16,010 acre feet/year


R14E.
SOIL MAP
Owner
Operator
County
State
Soil survey sheet(s) or soils map
Approximate scale 1" = 2750'
Prepared by U. S. Department of Agriculture, Soil Conservation Service cooperating with
Conservation District

SOIL DESCRIPTIONS

Soil Symbol

A These soils consist primarily of gravelly and very gravelly loams on slopes of zero to two percent. These soils are deep. Water holding capacity is very low, so they tend to be droughty.

Present vegetation is mainly introduced species of Orchard grass and smooth brome.

Most of these soils on the ranch have been leveled and have an improved surface, flood irrigation, water management system.

B These soils consist of very gravelly, sandy loam soils on slopes of zero to two percent. They are very deep. Water holding capacity is low, so they tend to be droughty. There are small areas of poorly drained soils located in this map unit.

Present vegetation is a mixture of native and introduced grass species and legumes. The irrigation system consists of ditches on the higher areas.

C These soils consist of mixed gravelly loams, fine sandy loams, and muck soils located along the Salmon River. Slopes are from zero to two percent. A high water table is present.

Present vegetation is primarily native aquatic shrubs, grasses and forbs, and introduced species, such as Kentucky bluegrass that invaded the site.

These soils are not irrigated, but are influenced by the high water table.

D These soils consist of gravelly loams and very gravelly loams that are somewhat poorly drained and have a high water table. Slopes are zero to two percent.

Present vegetation consists of primarily native aquatic grasses and forbs, and invaded, introduced species, such as Kentucky bluegrass. The irrigation systems consist of ditches running out on the higher points and ridges.

E These soils consist of very gravelly loams on slopes from zero to two percent. They are moderately well to well-drained. Water holding capacity is low. These soils tend to be droughty.

Present vegetation consists mainly of native shrubs and grasses with invaded, introduced species, such as Kentucky bluegrass.

Some of these soils are not irrigated, or only partially irrigated.

F These soils consist of gravelly loams and fine, sandy loams along Alturas Creek. Slopes are zero to two percent. They are very poorly drained and have a high water table during most of the growing season. Too much irrigation water keeps these soils very wet. Vegetation is primarily native, aquatic grasses and forbs.

Irrigation is primarily wild flooding.

G These are primarily sandy loam soil on slopes of zero to two percent. They are located along Alturas Creek and have a high water table.

Present vegetation is primarily native aquatic shrubs, forbs and grasses.

These soils are not irrigated.

H These soils consist of very cobbly, sandy loam on slopes of 25 to 40 percent. They are located on the hill near the center of the ranch.

These soils are not irrigated.

X These soils consist of very gravelly, course gravelly loams and sandy loams on zero to two percent slopes. They are somewhat poorly drained to well-drained, and may be influenced by a high water table.

Vegetation is primarily droughty shrubs, forbs and grasses where not irrigated, and Kentucky bluegrass where irrigated.

United States Department of Agriculture

Office of the General Counsel

RECEIVED
SEP 18 1998
Department of Water Resources

August 31, 1998

RECEIVED
SEP 18 1998
Department of Water Resources
Southern Region

Mr. Karl Dreher
Idaho Department of Water Resources
1301 North Orchard
PO Box 83720
Boise, ID 83720-0098

Dear Director Dreher:

In accordance with our recent conversation, we have enclosed amended claims for water rights numbers 71-00059, 71-00061, 71-00064B, 71-00066, and 71-00068. It is our understanding that the Department will recommend that these water rights be allowed, consistent with the amended claims.

Please do not hesitate to call if you have questions.

Very truly yours,

Randall J. Bramer

Enclosures

cc: Bruce Bernard

Claims
amended
9-24-98
Irish

Post-it® Fax Note 7671	Date 9-18-98	# of pages ▶
To Dana Jones	From Don Shaff	
Co./Dept. @ Southern	Co. @ IDWR - 30	
Phone #	Phone #	
Fax #	Fax #	

RECEIVED
SEP 18 1998
Department of Water Resources

VERIFICATION OF USDA-FOREST SERVICE CLAIMS

As the Regional Forester for the Intermountain Region of the USDA-Forest Service, I verify under penalty of perjury under the laws of the United States of America that the statements made in the claims filed herewith on behalf of the USDA-Forest Service are true and correct.

Executed on Sept 1, 1998.

Jack A. Blackwell

JACK A. BLACKWELL
Regional Forester
USDA-Forest Service
324 25th Street
Ogden, Utah 84401

SUBSCRIBED and SWORN before me this 1 day of Sept, 1998.

Glenna O. Prevedel

NOTARY PUBLIC FOR State of Utah
Residing at: Hooper, Ut
My Commission Expires: 7-22-2000

GIENNA O PREVEDEL
NOTARY PUBLIC • STATE of UTAH
324 - 25TH STREET
OGDEN, UT 84401
COMM. EXP. 7-22-2000

From: DWR03::DSHAFF 18-SEP-1998 14:53:04.33
To: DWR60::DJONES
CC: DTUTHILL PANDERSO NSPENCER,DSHAFF
Subj: Busterback

The USFS filed their amended claims today here in Boise. I am FAXing you the materials this afternoon. Presuming you can read the characters on the FAX the same as if you had the original, do you want any data entry done here? Of course, the originals will come to your office in the near future. I have not looked at the details of any of the claims or cover letter. However, if you have questions let me know. We can talk on the telephone later this afternoon after we each have the amended claim materials in hand. Thanks, Don

United States
Department of
Agriculture

Office of the
General Counsel

RECEIVED
SEP 18 1998
Department of Water Resources

RECEIVED
SEP 29 1998
Department of Water Resources
Southern Region

August 31, 1998

Mr. Karl Dreher
Idaho Department of Water Resources
1301 North Orchard
PO Box 83720
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Please do not hesitate to call if you have questions.

Very truly yours,

Randall J. Bramer

Enclosures

cc: Bruce Bernard

RECEIVED
SEP 29 1998
Department of Water Resources
Southern Region

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VERIFICATION OF USDA-FOREST SERVICE CLAIMS

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Executed on Sept 1, 1998.

Jack A. Blackwell

JACK A. BLACKWELL
Regional Forester
USDA-Forest Service
324 25th Street
Ogden, Utah 84401

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COMM. EXP. 7-22-2000

RECEIVED
SEP 18 1998
Department of Water Resources
RECEIVED
SEP 29 1998
Department of Water Resources
Southern Region

IN THE DISTRICT COURT OF THE FIFTH JUDICIAL DISTRICT OF THE STATE OF IDAHO, IN AND FOR THE COUNTY OF TWIN FALLS

IN RE THE GENERAL ADJUDICATION OF RIGHTS TO THE USE OF WATER FROM THE SNAKE RIVER BASIN WATER SYSTEM

CIVIL CASE NUMBER: 39576
Ident. Number: **71-00059**

FILED UNDER STATE LAW

1. Name of Claimant: UNITED STATES OF AMERICA on behalf of the U.S.D.A. Forest Service
   Address: 550 W. Fort Street MSC033
   Boise ID 83724
2. Date of Priority: 06/01/1912
3. Source of water: SALMON RIVER Tributary: SNAKE RIVER
4. Location Meridian BOISE
   Description of Diversion Works: Diversion Dam From: Stream
   Location of Point of Diversion

T: 07 N R: 14 E S: 3 SESW T: 07 N R: 14 E S: 10 NWSW

Location of Point of Use

T: 07	N R: 14	E S: 3	NENW	L: 3	Ac:	40	T: 07	N R: 14	E S: 3	NESW		Ac:	15
T: 07	N R: 14	E S: 3	NWNE		Ac:	9	T: 07	N R: 14	E S: 3	NWNW	L: 4	Ac:	39
T: 07	N R: 14	E S: 3	NWSW		Ac:	34	T: 07	N R: 14	E S: 3	SENW		Ac:	37
T: 07	N R: 14	E S: 3	SESW		Ac:	14	T: 07	N R: 14	E S: 3	SWNW		Ac:	39
T: 07	N R: 14	E S: 3	SWSW		Ac:	15	T: 07	N R: 14	E S: 4	NENE	L: 1	Ac:	39
T: 07	N R: 14	E S: 4	NENW		Ac:	20	T: 07	N R: 14	E S: 4	NESE		Ac:	39
T: 07	N R: 14	E S: 4	NWNE	L: 2	Ac:	40	T: 07	N R: 14	E S: 4	NWSE		Ac:	30
T: 07	N R: 14	E S: 4	SENE		Ac:	40	T: 07	N R: 14	E S: 4	SESE		Ac:	40
T: 07	N R: 14	E S: 4	SWNE		Ac:	35	T: 07	N R: 14	E S: 4	SWSE		Ac:	17
T: 07	N R: 14	E S: 9	NENE		Ac:	35	T: 07	N R: 14	E S: 10	NWNW		Ac:	30
T: 08	N R: 14	E S: 28	NENW		Ac:	25	T: 08	N R: 14	E S: 28	NWNE		Ac:	2
T: 08	N R: 14	E S: 28	NWNW		Ac:	35	T: 08	N R: 14	E S: 28	NWSE		Ac:	30
T: 08	N R: 14	E S: 28	SENW		Ac:	40	T: 08	N R: 14	E S: 28	SESW		Ac:	30
T: 08	N R: 14	E S: 28	SWNE		Ac:	15	T: 08	N R: 14	E S: 28	SWNW		Ac:	35
T: 08	N R: 14	E S: 28	SWSE		Ac:	20	T: 08	N R: 14	E S: 33	NENW		Ac:	20
T: 08	N R: 14	E S: 33	NESE		Ac:	35	T: 08	N R: 14	E S: 33	NESW		Ac:	18
T: 08	N R: 14	E S: 33	NWNE		Ac:	38	T: 08	N R: 14	E S: 33	NWNW		Ac:	8
T: 08	N R: 14	E S: 33	NWSE		Ac:	35	T: 08	N R: 14	E S: 33	SENE		Ac:	29
T: 08	N R: 14	E S: 33	SESE		Ac:	35	T: 08	N R: 14	E S: 33	SESW		Ac:	29
T: 08	N R: 14	E S: 33	SWNE		Ac:	39	T: 08	N R: 14	E S: 33	SWSE		Ac:	40
T: 08	N R: 14	E S: 34	NWSW		Ac:	38	T: 08	N R: 14	E S: 34	SESW		Ac:	25
T: 08	N R: 14	E S: 34	SWNW		Ac:	2	T: 08	N R: 14	E S: 34	SWSW		Ac:	40

5. Quantity claimed:

Period	Quantity	For
4/ 15 -- 10/ 15	25.60 CFS	Irrigation

6. Total Consumptive Use Claimed for Present and Future Use is:
   25.60 CFS
7. Present and future uses to which the water is or will be used:
   Irrigation
8. Attach the legal description of the reservation, and maps showing for each consumptive use the existing and proposed place of use and existing points of diversion.

   Bound separately
9. Remarks:
   State Basin: 71
   National Forest: Sawtooth
   Forest Service Record ID: 04 14 17040602 46 0159

Points of diversion are NESESW of Section 3 and NENWSW of Section 10. Other rights used: 71-00061, 71-00064B, 71-00066 and 71-00068. Approximately 1270 acres. Blaine and Custer Counties.

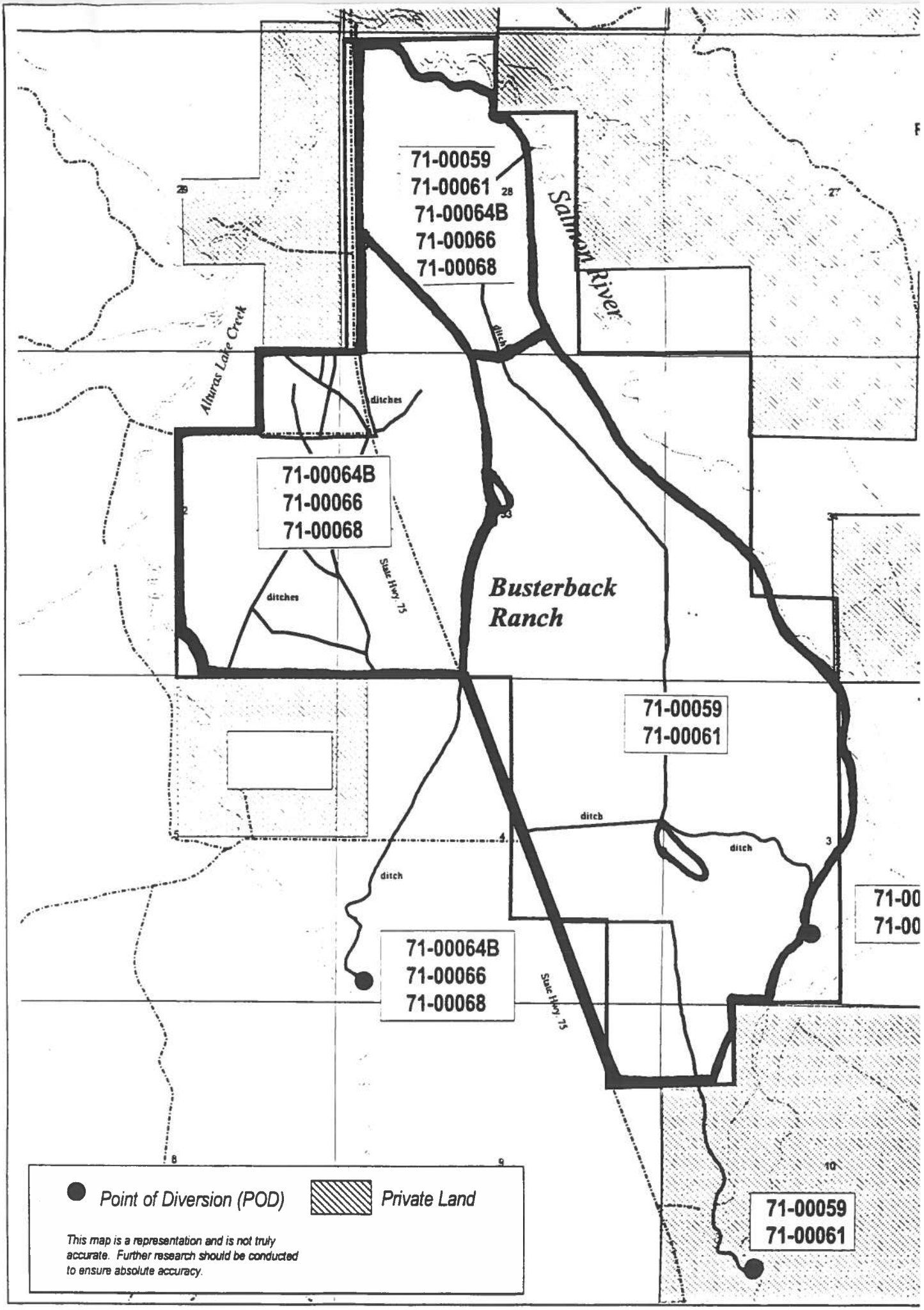
10. Describe any other water rights used at the same place and for the same purposes as described above: None

11. Counties within the reservation: Not available

Notice is hereby given that the United States Department of Justice will represent the Department of Agriculture, Forest Service, in all matters pertaining to the Snake River Basin Adjudication. All notices required by law to be mailed by the Director to the claimant should be mailed to the individuals at the address

Bruce Bernard
U.S. Department of Justice
Environment and Natural Resources Division
550 W. Fort Street, Box 33
Boise, ID 83724

This form is an attachment to a letter forwarding the claims of the U.S. Department of Agriculture, Forest Service. The signature and affirmation on such letter constitutes the signature of the authorized agent representing the United States of America required for each such claim.


71-00059
71-00061
71-00064B
71-00066
71-00068
Salmon River
Alturas Lake Creek
ditch
ditches
71-00064B
71-00066
71-00068
ditches
State Hwy 75
Busterback Ranch
71-00059
71-00061
ditch
ditch
ditch
71-00
71-00
71-00064B
71-00066
71-00068
State Hwy 75
71-00059
71-00061
Point of Diversion (POD)
Private Land
This map is a representation and is not truly accurate. Further research should be conducted to ensure absolute accuracy.

IN THE DISTRICT COURT OF THE FIFTH JUDICIAL DISTRICT OF THE STATE OF IDAHO, IN AND FOR THE COUNTY OF TWIN FALLS

IN RE THE GENERAL ADJUDICATION OF RIGHTS TO THE USE OF WATER FROM THE SNAKE RIVER BASIN WATER SYSTEM

CIVIL CASE NUMBER: 39576
Ident. Number: **71-00061**

RECEIVED
SEP 18 1998
Department of Water Resources
RECEIVED
SEP 29 1998
Department of Water Resources
Southern Region

FILED UNDER STATE LAW

1. Name of Claimant: UNITED STATES OF AMERICA on behalf of the U.S.D.A. Forest Service
   Address: 550 W. Fort Street MSC033
   Boise ID 83724
2. Date of Priority: 08/30/1933
3. Source of water: SALMON RIVER Tributary: SNAKE RIVER
4. Location Meridian BOISE
   Description of Diversion Works: Diversion Dam From: Stream
   Location of Point of Diversion

T: 07 N R: 14 E S: 3 SESW T: 07 N R: 14 E S: 10 NWSW

Location of Point of Use

T: 07	N R: 14	E S: 3	NENW	L: 3	Ac:	40	T: 07	N R: 14	E S: 3	NESW		Ac:	15
T: 07	N R: 14	E S: 3	NWNE		Ac:	9	T: 07	N R: 14	E S: 3	NWNW	L: 4	Ac:	39
T: 07	N R: 14	E S: 3	NWSW		Ac:	34	T: 07	N R: 14	E S: 3	SENW		Ac:	37
T: 07	N R: 14	E S: 3	SESW		Ac:	14	T: 07	N R: 14	E S: 3	SWNW		Ac:	39
T: 07	N R: 14	E S: 3	SWSW		Ac:	15	T: 07	N R: 14	E S: 4	NENE	L: 1	Ac:	39
T: 07	N R: 14	E S: 4	NENW		Ac:	20	T: 07	N R: 14	E S: 4	NESE		Ac:	39
T: 07	N R: 14	E S: 4	NWNE	L: 2	Ac:	40	T: 07	N R: 14	E S: 4	NWSE		Ac:	30
T: 07	N R: 14	E S: 4	SENE		Ac:	40	T: 07	N R: 14	E S: 4	SESE		Ac:	40
T: 07	N R: 14	E S: 4	SWNE		Ac:	35	T: 07	N R: 14	E S: 4	SWSE		Ac:	17
T: 07	N R: 14	E S: 9	NENE		Ac:	35	T: 07	N R: 14	E S: 10	NWNW		Ac:	30
T: 08	N R: 14	E S: 28	NENW		Ac:	25	T: 08	N R: 14	E S: 28	NWNE		Ac:	2
T: 08	N R: 14	E S: 28	NWNW		Ac:	35	T: 08	N R: 14	E S: 28	NWSE		Ac:	30
T: 08	N R: 14	E S: 28	SENW		Ac:	40	T: 08	N R: 14	E S: 28	SESW		Ac:	30
T: 08	N R: 14	E S: 28	SWNE		Ac:	15	T: 08	N R: 14	E S: 28	SWNW		Ac:	35
T: 08	N R: 14	E S: 28	SWSE		Ac:	20	T: 08	N R: 14	E S: 33	NENW		Ac:	20
T: 08	N R: 14	E S: 33	NESE		Ac:	35	T: 08	N R: 14	E S: 33	NESW		Ac:	18
T: 08	N R: 14	E S: 33	NWNE		Ac:	38	T: 08	N R: 14	E S: 33	NWNW		Ac:	8
T: 08	N R: 14	E S: 33	NWSE		Ac:	35	T: 08	N R: 14	E S: 33	SENE		Ac:	29
T: 08	N R: 14	E S: 33	SESE		Ac:	35	T: 08	N R: 14	E S: 33	SESW		Ac:	29
T: 08	N R: 14	E S: 33	SWNE		Ac:	39	T: 08	N R: 14	E S: 33	SWSE		Ac:	40
T: 08	N R: 14	E S: 34	NWSW		Ac:	38	T: 08	N R: 14	E S: 34	SESW		Ac:	25
T: 08	N R: 14	E S: 34	SWNW		Ac:	2	T: 08	N R: 14	E S: 34	SWSW		Ac:	40

5. Quantity claimed:

Period	Quantity	For
4/ 15 – 10/ 15	40.00 CFS	Irrigation

6. Total Consumptive Use Claimed for Present and Future Use is:
   40.00 CFS
7. Present and future uses to which the water is or will be used:
   Irrigation
8. Attach the legal description of the reservation, and maps showing for each consumptive use the existing and proposed place of use and existing points of diversion.

   Bound separately
9. Remarks:
   State Basin: 71
   National Forest: Sawtooth
   Forest Service Record ID: 04 14 17040602 46 0161

Points of diversion are NESESW of Section 3 and NENWSW of Section 10. Other rights used: 71-00059, 71-00064B, 71-00066 and 71-00068. Approximately 1270 acres. Blaine and Custer Counties.

10. Describe any other water rights used at the same place and for the same purposes as described above: None

11. Counties within the reservation: Not available

Notice is hereby given that the United States Department of Justice will represent the Department of Agriculture, Forest Service, in all matters pertaining to the Snake River Basin Adjudication. All notices required by law to be mailed by the Director to the claimant should be mailed to the individuals at the address

Bruce Bernard
U.S. Department of Justice
Environment and Natural Resources Division
550 W. Fort Street, Box 33
Boise, ID 83724

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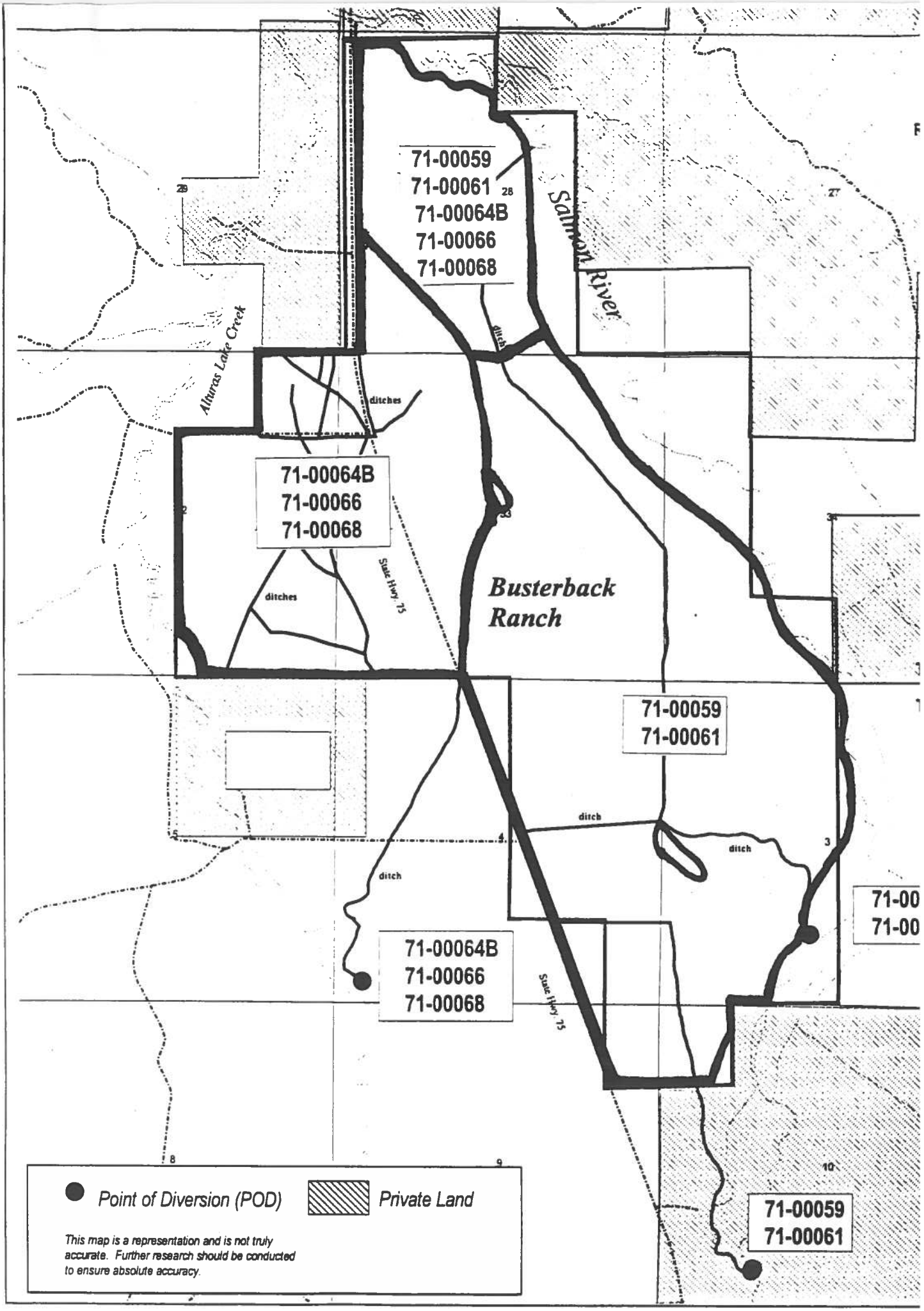
71-00059
71-00061
71-00064B
71-00066
71-00068
Salmon River
Alturas Lake Creek
ditches
ditch
71-00064B
71-00066
71-00068
State Hwy 75
ditches
Busterback Ranch
71-00059
71-00061
ditch
ditch
ditch
71-00
71-00
71-00064B
71-00066
71-00068
State Hwy 75
71-00059
71-00061
Point of Diversion (POD)
Private Land
This map is a representation and is not truly accurate. Further research should be conducted to ensure absolute accuracy.

IN THE DISTRICT COURT OF THE FIFTH JUDICIAL DISTRICT OF THE
STATE OF IDAHO, IN AND FOR THE COUNTY OF TWIN FALLS

IN RE THE GENERAL ADJUDICATION
OF RIGHTS TO THE USE OF WATER FROM
THE SNAKE RIVER BASIN WATER SYSTEM

CIVIL CASE NUMBER: 39576
Ident. Number: **71-00064B**

RECEIVED
SEP 18 1998
Department of Water Resourc
RECEIVED
SEP 29 1998
Department of Water Resources
Southern Region

FILED UNDER STATE LAW

1. Name of Claimant: UNITED STATES OF AMERICA on behalf of the U.S.D.A. Forest Service
   Address: 550 W. Fort Street MSC033
   Boise ID 83724
2. Date of Priority: 08/15/1915
3. Source of water: ALTURAS LAKE CREEK Tributary: SALMON RIVER
4. Location Meridian BOISE
   Description of Diversion Works: Diversion Dam From: Stream
   Location of Point of Diversion
   T: **07** **N** R: **14** **E** S: **4** **SWSW**
   Location of Point of Use

T: **08**	**N** R: **14**	**E** S: **28**	**NENW**	Ac: **25**	T: **08**	**N** R: **14**	**E** S: **28**	**NESW**	Ac: **35**
T: **08**	**N** R: **14**	**E** S: **28**	**NWNW**	Ac: **35**	T: **08**	**N** R: **14**	**E** S: **28**	**NWSE**	Ac: **10**
T: **08**	**N** R: **14**	**E** S: **28**	**NWSW**	Ac: **38**	T: **08**	**N** R: **14**	**E** S: **28**	**SENW**	Ac: **38**
T: **08**	**N** R: **14**	**E** S: **28**	**SESW**	Ac: **28**	T: **08**	**N** R: **14**	**E** S: **28**	**SWNE**	Ac: **16**
T: **08**	**N** R: **14**	**E** S: **28**	**SWNW**	Ac: **35**	T: **08**	**N** R: **14**	**E** S: **28**	**SWSE**	Ac: **12**
T: **08**	**N** R: **14**	**E** S: **28**	**SWSW**	Ac: **15**	T: **08**	**N** R: **14**	**E** S: **32**	**NENE**	Ac: **40**
T: **08**	**N** R: **14**	**E** S: **32**	**NESE**	Ac: **40**	T: **08**	**N** R: **14**	**E** S: **32**	**NWSE**	Ac: **40**
T: **08**	**N** R: **14**	**E** S: **32**	**SENE**	Ac: **40**	T: **08**	**N** R: **14**	**E** S: **32**	**SESE**	Ac: **40**
T: **08**	**N** R: **14**	**E** S: **32**	**SWNE**	Ac: **40**	T: **08**	**N** R: **14**	**E** S: **32**	**SWSE**	Ac: **32**
T: **08**	**N** R: **14**	**E** S: **33**	**NENW**	Ac: **20**	T: **08**	**N** R: **14**	**E** S: **33**	**NESW**	Ac: **22**
T: **08**	**N** R: **14**	**E** S: **33**	**NWNW**	Ac: **37**	T: **08**	**N** R: **14**	**E** S: **33**	**NWSW**	Ac: **37**
T: **08**	**N** R: **14**	**E** S: **33**	**SENW**	Ac: **24**	T: **08**	**N** R: **14**	**E** S: **33**	**SESW**	Ac: **17**
T: **08**	**N** R: **14**	**E** S: **33**	**SWNW**	Ac: **37**	T: **08**	**N** R: **14**	**E** S: **33**	**SWSW**	Ac: **40**

5. Quantity claimed:

Period	Quantity	For
5/ 01 -- 9/ 30	7.86 CFS	Irrigation

6. Total Consumptive Use Claimed for Present and Future Use is:
   7.86 CFS
7. Present and future uses to which the water is or will be used:
   Irrigation
8. Attach the legal description of the reservation, and maps showing for each consumptive use the existing and proposed place of use and existing points of diversion.

   Bound separately
9. Remarks:
   State Basin: 71
   National Forest: Sawtooth
   Forest Service Record ID: 04 14 17040602 47 0164
   Point of diversion is SWSWSW of Section 4. Other rights used: 71-00059, 71-00061, 71-00066 and 71-00068. Approximately 793 acres. Blaine and Custer Counties.
10. Describe any other water rights used at the same place and for the same purposes as described above: None
11. Counties within the reservation: Not available

Notice is hereby given that the United States Department of Justice will represent the Department of Agriculture, Forest Service, in all matters pertaining to the Snake River Basin Adjudication. All notices required by law to be mailed by the Director to the claimant should be mailed to the individuals at the address

Bruce Bernard
U.S. Department of Justice
Environment and Natural Resources Division
550 W. Fort Street, Box 33
Boise, ID 83724

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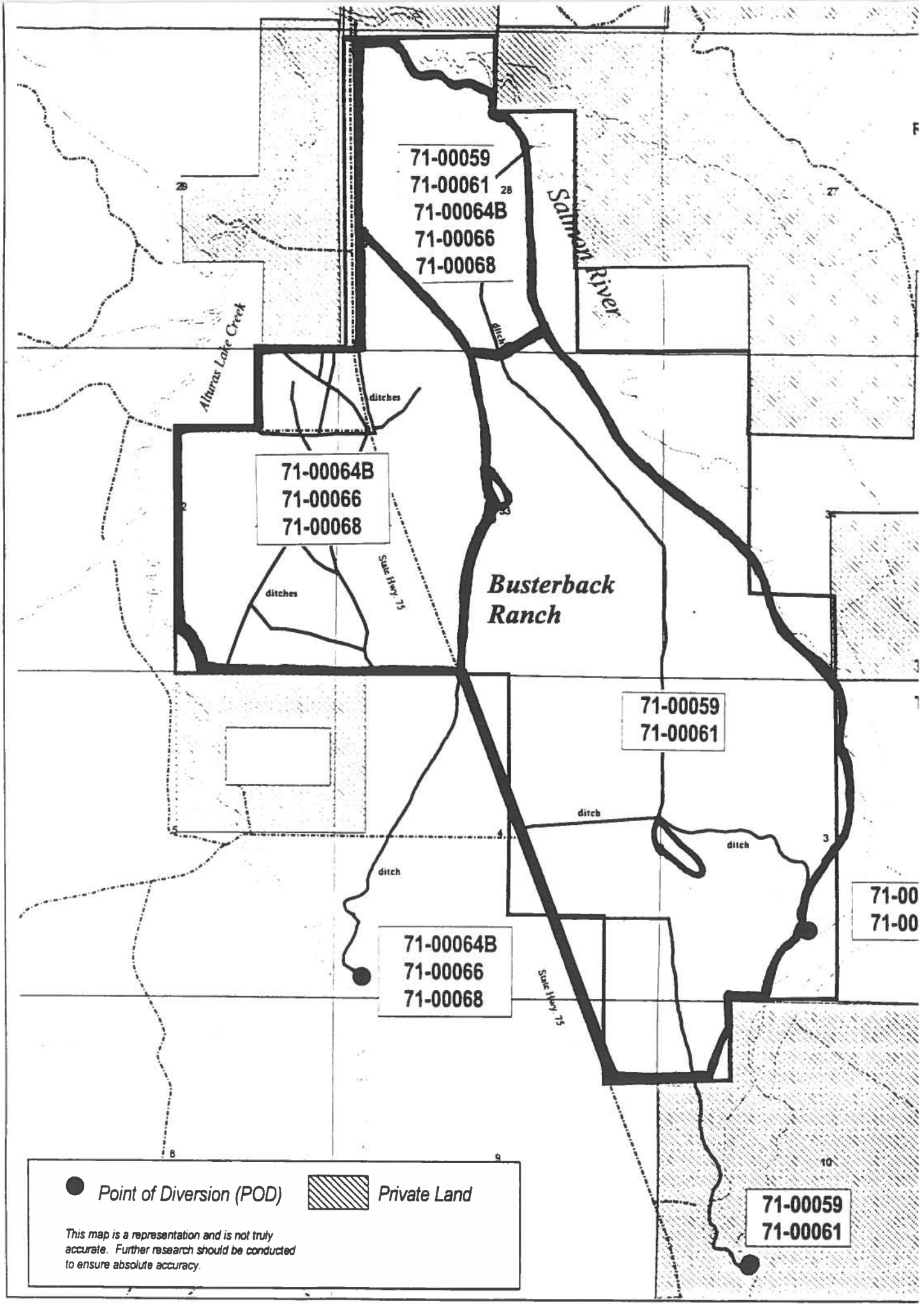

71-00059
71-00061
71-00064B
71-00066
71-00068
Salmon River
Alturas Lake Creek
ditches
ditch
71-00064B
71-00066
71-00068
ditches
State Hwy 75
Busterback Ranch
71-00059
71-00061
ditch
ditch
ditch
71-00
71-00
71-00064B
71-00066
71-00068
State Hwy 75
71-00059
71-00061
Point of Diversion (POD)
Private Land
This map is a representation and is not truly accurate. Further research should be conducted to ensure absolute accuracy.

IN THE DISTRICT COURT OF THE FIFTH JUDICIAL DISTRICT OF THE STATE OF IDAHO, IN AND FOR THE COUNTY OF TWIN FALLS

IN RE THE GENERAL ADJUDICATION OF RIGHTS TO THE USE OF WATER FROM THE SNAKE RIVER BASIN WATER SYSTEM

CIVIL CASE NUMBER: 39576
Ident. Number: **71-00066**

RECEIVED
SEP 18 1998
Department of Water Resources

RECEIVED
SEP 29 1998
Department of Water Resources
Southern Region

FILED UNDER STATE LAW

1. Name of Claimant: UNITED STATES OF AMERICA on behalf of the U.S.D.A. Forest Service
   Address: 550 W. Fort Street MSC033
   Boise ID 83724
2. Date of Priority: 07/01/1930
3. Source of water: ALTURAS LAKE CREEK Tributary: SALMON RIVER
4. Location Meridian BOISE
   Description of Diversion Works: Diversion Dam From: Stream
   Location of Point of Diversion
   T: **07** **N** R: **14** **E** S: **4** **SWSW**
   Location of Point of Use

T: **08**	**N** R: **14**	**E** S: **28**	**NENW**	Ac: **25**	T: **08**	**N** R: **14**	**E** S: **28**	**NESW**	Ac: **35**
T: **08**	**N** R: **14**	**E** S: **28**	**NWNW**	Ac: **35**	T: **08**	**N** R: **14**	**E** S: **28**	**NWSE**	Ac: **10**
T: **08**	**N** R: **14**	**E** S: **28**	**NWSW**	Ac: **38**	T: **08**	**N** R: **14**	**E** S: **28**	**SENW**	Ac: **38**
T: **08**	**N** R: **14**	**E** S: **28**	**SESW**	Ac: **28**	T: **08**	**N** R: **14**	**E** S: **28**	**SWNE**	Ac: **16**
T: **08**	**N** R: **14**	**E** S: **28**	**SWNW**	Ac: **35**	T: **08**	**N** R: **14**	**E** S: **28**	**SWSE**	Ac: **12**
T: **08**	**N** R: **14**	**E** S: **28**	**SWSW**	Ac: **15**	T: **08**	**N** R: **14**	**E** S: **32**	**NENE**	Ac: **40**
T: **08**	**N** R: **14**	**E** S: **32**	**NESE**	Ac: **40**	T: **08**	**N** R: **14**	**E** S: **32**	**NWSE**	Ac: **40**
T: **08**	**N** R: **14**	**E** S: **32**	**SENE**	Ac: **40**	T: **08**	**N** R: **14**	**E** S: **32**	**SESE**	Ac: **40**
T: **08**	**N** R: **14**	**E** S: **32**	**SWNE**	Ac: **40**	T: **08**	**N** R: **14**	**E** S: **32**	**SWSE**	Ac: **32**
T: **08**	**N** R: **14**	**E** S: **33**	**NENW**	Ac: **20**	T: **08**	**N** R: **14**	**E** S: **33**	**NESW**	Ac: **22**
T: **08**	**N** R: **14**	**E** S: **33**	**NWNW**	Ac: **37**	T: **08**	**N** R: **14**	**E** S: **33**	**NWSW**	Ac: **37**
T: **08**	**N** R: **14**	**E** S: **33**	**SENW**	Ac: **24**	T: **08**	**N** R: **14**	**E** S: **33**	**SESW**	Ac: **17**
T: **08**	**N** R: **14**	**E** S: **33**	**SWNW**	Ac: **37**	T: **08**	**N** R: **14**	**E** S: **33**	**SWSW**	Ac: **40**

5. Quantity claimed:

Period	Quantity	For
4/ 15 -- 10/ 15	10.75 CFS	Irrigation

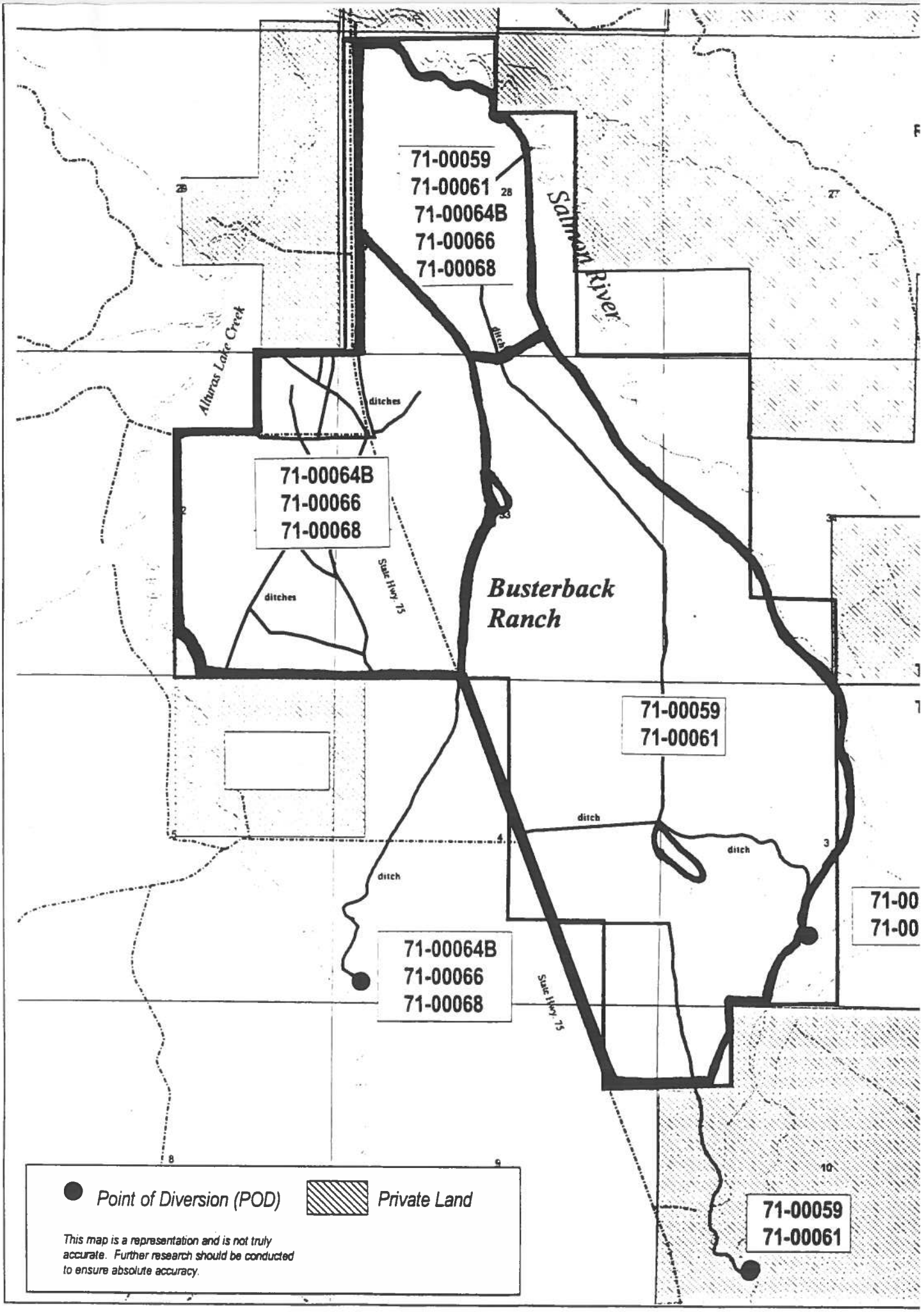
6. Total Consumptive Use Claimed for Present and Future Use is:
   10.75 CFS
7. Present and future uses to which the water is or will be used:
   Irrigation
8. Attach the legal description of the reservation, and maps showing for each consumptive use the existing and proposed place of use and existing points of diversion.

   Bound separately
9. Remarks:
   State Basin: 71
   National Forest: Sawtooth
   Forest Service Record ID: 04 14 17040602 47 0166
   Point of diversion is SWSWSW of Section 4. Other rights used: 71-00059, 71-00061, 71-00064B and 71-0068. Approximately 793 acres. Blaine County.
10. Describe any other water rights used at the same place and for the same purposes as described above: None
11. Counties within the reservation: Not available

Notice is hereby given that the United States Department of Justice will represent the Department of Agriculture, Forest Service, in all matters pertaining to the Snake River Basin Adjudication. All notices required by law to be mailed by the Director to the claimant should be mailed to the individuals at the address

Bruce Bernard
U.S. Department of Justice
Environment and Natural Resources Division
550 W. Fort Street, Box 33
Boise, ID 83724

This form is an attachment to a letter forwarding the claims of the U.S. Department of Agriculture, Forest Service. The signature and affirmation on such letter constitutes the signature of the authorized agent representing the United States of America required for each such claim.


71-00059
71-00061
71-00064B
71-00066
71-00068
Salmon River
Alturas Lake Creek
ditches
71-00064B
71-00066
71-00068
ditches
State Hwy 75
Busterback Ranch
71-00059
71-00061
ditch
ditch
ditch
71-00
71-00
71-00064B
71-00066
71-00068
State Hwy 75
71-00059
71-00061
Point of Diversion (POD)
Private Land
This map is a representation and is not truly accurate. Further research should be conducted to ensure absolute accuracy.

IN THE DISTRICT COURT OF THE FIFTH JUDICIAL DISTRICT OF THE STATE OF IDAHO, IN AND FOR THE COUNTY OF TWIN FALLS

IN RE THE GENERAL ADJUDICATION OF RIGHTS TO THE USE OF WATER FROM THE SNAKE RIVER BASIN WATER SYSTEM

CIVIL CASE NUMBER: 39576
Ident. Number: **71-00068**

RECEIVED
SEP 18 1998
Department of Water Resources

FILED UNDER STATE LAW

RECEIVED
SEP 29 1998
Department of Water Resource
Southern Region

1. Name of Claimant: UNITED STATES OF AMERICA on behalf of the U.S.D.A. Forest Service
   Address: 550 W. Fort Street MSC033
   Boise ID 83724
2. Date of Priority: 07/01/1935
3. Source of water: ALTURAS LAKE CREEK Tributary: SALMON RIVER
4. Location Meridian BOISE
   Description of Diversion Works: Diversion Dam From: Stream
   Location of Point of Diversion
   T: **07** **N** R: **14** **E** S: **4** **SWSW**
   Location of Point of Use

T: **08**	**N** R: **14**	**E** S: **28**	**NENW**	Ac: **25**	T: **08**	**N** R: **14**	**E** S: **28**	**NESW**	Ac: **35**
T: **08**	**N** R: **14**	**E** S: **28**	**NWNW**	Ac: **35**	T: **08**	**N** R: **14**	**E** S: **28**	**NWSE**	Ac: **10**
T: **08**	**N** R: **14**	**E** S: **28**	**NWSW**	Ac: **38**	T: **08**	**N** R: **14**	**E** S: **28**	**SENW**	Ac: **38**
T: **08**	**N** R: **14**	**E** S: **28**	**SESW**	Ac: **28**	T: **08**	**N** R: **14**	**E** S: **28**	**SWNE**	Ac: **16**
T: **08**	**N** R: **14**	**E** S: **28**	**SWNW**	Ac: **35**	T: **08**	**N** R: **14**	**E** S: **28**	**SWSE**	Ac: **12**
T: **08**	**N** R: **14**	**E** S: **28**	**SWSW**	Ac: **15**	T: **08**	**N** R: **14**	**E** S: **32**	**NENE**	Ac: **40**
T: **08**	**N** R: **14**	**E** S: **32**	**NESE**	Ac: **40**	T: **08**	**N** R: **14**	**E** S: **32**	**NWSE**	Ac: **40**
T: **08**	**N** R: **14**	**E** S: **32**	**SENE**	Ac: **40**	T: **08**	**N** R: **14**	**E** S: **32**	**SESE**	Ac: **40**
T: **08**	**N** R: **14**	**E** S: **32**	**SWNE**	Ac: **40**	T: **08**	**N** R: **14**	**E** S: **32**	**SWSE**	Ac: **32**
T: **08**	**N** R: **14**	**E** S: **33**	**NENW**	Ac: **20**	T: **08**	**N** R: **14**	**E** S: **33**	**NESW**	Ac: **22**
T: **08**	**N** R: **14**	**E** S: **33**	**NWNW**	Ac: **37**	T: **08**	**N** R: **14**	**E** S: **33**	**NWSW**	Ac: **37**
T: **08**	**N** R: **14**	**E** S: **33**	**SENW**	Ac: **24**	T: **08**	**N** R: **14**	**E** S: **33**	**SESW**	Ac: **17**
T: **08**	**N** R: **14**	**E** S: **33**	**SWNW**	Ac: **37**	T: **08**	**N** R: **14**	**E** S: **33**	**SWSW**	Ac: **40**

5. Quantity claimed:

Period	Quantity	For
4/ 15 -- 10/ 15	12.32 CFS	Irrigation

6. Total Consumptive Use Claimed for Present and Future Use is:
   12.32 CFS
7. Present and future uses to which the water is or will be used:
   Irrigation
8. Attach the legal description of the reservation, and maps showing for each consumptive use the existing and proposed place of use and existing points of diversion.

   Bound separately
9. Remarks:
   State Basin: 71
   National Forest: Sawtooth
   Forest Service Record ID: 04 14 17040602 47 0168
   Point of diversion is SWSWSW of Section 4. Other rights used: 71-00059, 71-00061, 71-00064B and 71-00066. Approximately 793 acres. Blaine County.
10. Describe any other water rights used at the same place and for the same purposes as described above: None
11. Counties within the reservation: Not available

Notice is hereby given that the United States Department of Justice will represent the Department of Agriculture, Forest Service, in all matters pertaining to the Snake River Basin Adjudication. All notices required by law to be mailed by the Director to the claimant should be mailed to the individuals at the address

Bruce Bernard
U.S. Department of Justice
Environment and Natural Resources Division
550 W. Fort Street, Box 33
Boise, ID 83724

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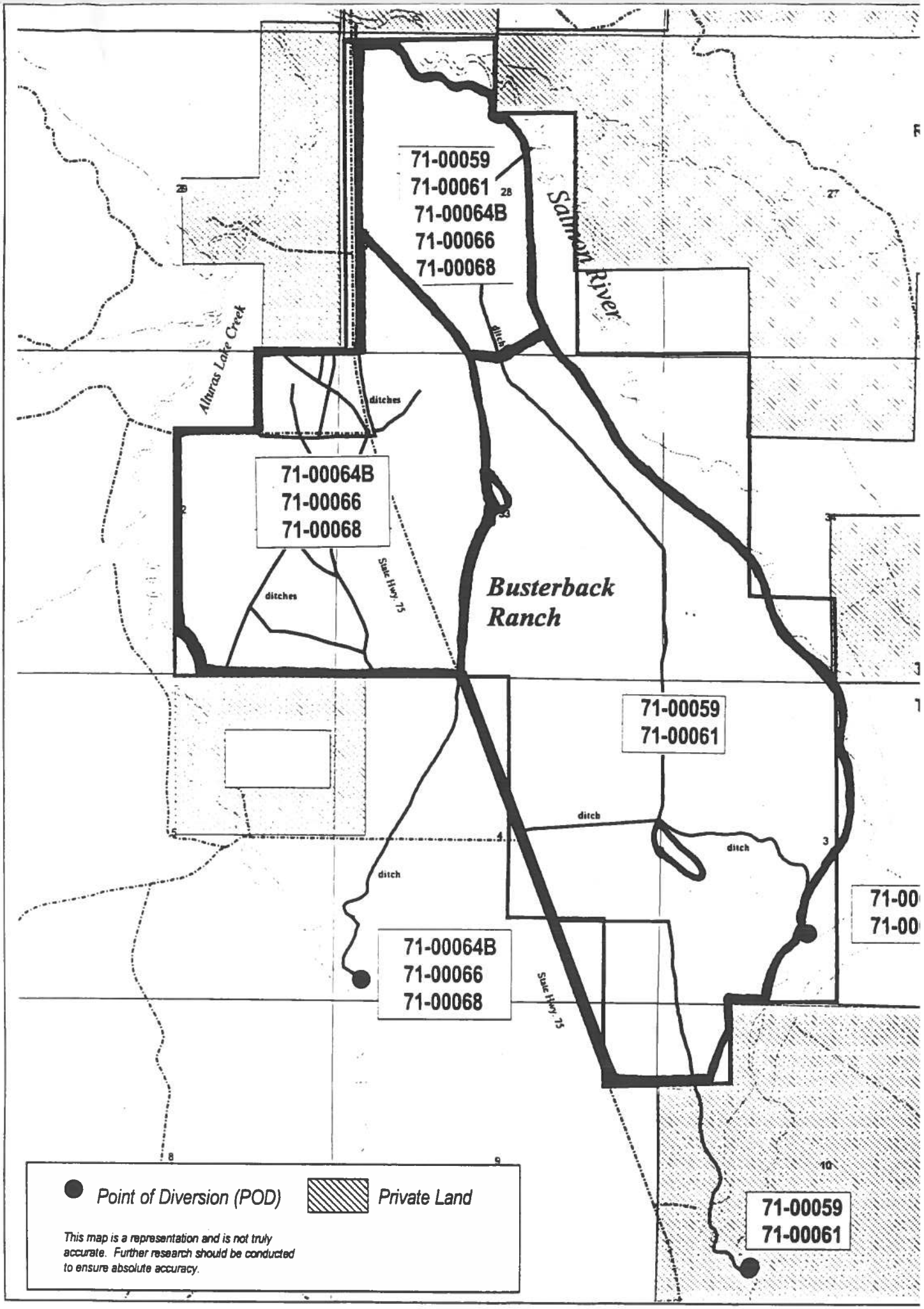

71-00059
71-00061
71-00064B
71-00066
71-00068
Salmon River
Alturas Lake Creek
ditches
71-00064B
71-00066
71-00068
ditches
State Hwy 75
Busterback Ranch
71-00059
71-00061
ditch
ditch
ditch
71-00064B
71-00066
71-00068
State Hwy 75
71-00059
71-00061
Point of Diversion (POD)
Private Land
This map is a representation and is not truly accurate. Further research should be conducted to ensure absolute accuracy.

United States Department of Agriculture

Office of the General Counsel

South

RECEIVED
SEP 0 2 1998
Department of Water Resources

September 2, 1998

By Hand

RECEIVED
SEP 2 9 1998
Department of Water Resources
Southern Region

Karl Dreher
Director
Idaho Department of Water Resources
1301 North Orchard
Boise, ID 83709

Re: Water Rights For Busterback Ranch

Dear Director Dreher:

On August 12, 1998, your Adjudication Bureau Staff informed the United States Department of Agriculture, Forest Service ("Forest Service") that they may recommend five water rights appurtenant to the Busterback Ranch property purchased by the United States in 1992 be forfeited because water was not diverted for irrigation purposes for the five year statutory period.[1] Forfeiture is inappropriate because circumstances beyond the control of the Forest Service have precluded diversion of water for irrigation purposes.

The preclusion of irrigation use constitutes a valid defense to forfeiture under Idaho law. As you know, forfeiture of water rights is not favored and is not to be presumed. Hodges v. Trail Creek Irrigation Co., 78 Idaho 10, 297 P.2d 524 (1956); Zezi v. Lightfoot, 57 Idaho 707, 68 P.2d 50 (1937) ("All intendments are to be indulged against a forfeiture.") As a means of mitigating the harsh results of forfeiture, the courts and statutes establish a number of defenses or exceptions to forfeiture. As the Idaho Supreme Court has recognized "[t]here can be no forfeiture if the nonuser of water is prevented from exercising his rights to the water by circumstances over which he has no control." Hodges, supra, 78 Idaho at 13, 297 P.2d at 527; Welch v. Garret, 5 Idaho 639, 51 P. 405 (1897).

Conditions beyond the control of the Forest Service precluded its application of water to irrigation from 1992 to 1998. This preclusion of irrigation negates any forfeiture

[1] On April 2, 1992 the Forest Service purchased the Busterback Ranch for 3.2 million dollars. This included the following water rights:

71-00059	25.60 CFS	12/31/1912	Salmon River
71-00061	40.00 CFS	8/30/1933	Salmon River
71-00064B	7.86 CFS	8/15/1915	Alturas Lake Creek
71-00066	10.75 CFS	7/1/1930	Alturas Lake Creek
71-00068	12.32 CFS	7/1/1935	Alturas Lake Creek

The Forest Service did not divert water for irrigation purposes for good cause based on circumstances beyond its control. This failure to act is excusable. The Endangered Species Act ("ESA") prohibits federal action that may jeopardize the existence of any threatened or endangered species. 16 U.S.C. 1531 et seq. Chinook salmon, sockeye salmon, steelhead trout, and bull trout spend part of their life cycle in and around the stream reaches from which the diversions occur. These species are listed as threatened and endangered under the ESA.[2] An endangered plant, the Ute ladies'-tresses, is known to grow in riparian habitat adjacent to streams affected by the diversions. Moreover, the westslope cutthroat trout, a species petitioned for listing as threatened under the ESA, utilizes stream habitat in the area surrounding Busterback.

Irrigation diversions by the Forest Service would constitute federal action. Had the Forest Service undertaken historic irrigation withdrawals during the 1992 through 1998 irrigation seasons, our fish biologists advise us that this action would have resulted in a "likely to adversely affect" determination. Resumption of such diversions could have resulted in the destruction of, or adverse modification of, critical habitat. Moreover, such action could have jeopardized the continued existence of the listed species. Finally, such diversions would have also placed the Forest Service at risk of violating the take prohibitions of the ESA. We have consulted with the relevant federal agencies, i.e., the National Marine Fisheries Service and the United States Fish and Wildlife Service, regarding the problems associated with diversion of this water and the affect on listed species and species petitioned for listing. Copies of their letters are attached.

In sum, the fact that threatened and endangered species use stream habitat adjacent to the diversions and that diversion of water would have been prevented by ESA is a circumstance beyond the control of the water rights owner. Thus, the Forest Service's non-use should be excused and the water rights be recommended.

In addition, the use of these water rights for irrigation would have been inconsistent with Governor Batt's recovery plans for bull trout and sockeye salmon.[3] Removal of the water for irrigation rather than leaving the water instream to aid recovery of listed threatened and endangered species would be in conflict with the policies, goals and objectives articulated in the Governor's Plan. Importantly, the goals in the Governor's Plan include, maintenance and strengthening of existing populations, as well as the restoration of species in appropriate areas. *Plan,* 1. The Governor's Plan

---

[2] Snake River sockeye salmon (*Oncorhynchus nerka*) were listed as endangered by the National Marine Fishery Service on November 20, 1991. (57 FR 58619). Snake River Spring/Summer chinook (*Oncorhynchus tshawytscha*) and Snake River Fall chinook salmon (*Oncorhynchus tshawytscha*) were both listed as threatened April 22, 1992. (57 FR 14653) but their status was reclassified as endangered pursuant to Emergency Interim Rule August 18, 1994. (59 FR 42529). The classification of Snake River Spring/Summer and Fall chinook reverted to threatened on April 17, 1995. (60 FR 19342). Steelhead (*Oncorhynchus mykiss*) were listed as threatened October 17, 1997. (62 FR 43937-43954). Bulltrout (*Salvelinus confluentus*) were listed as threatened by the U.S. Fish and Wildlife Service on June 10, 1998. (Effective July 10, 1998, 63 FR 31647). Westslope cutthroat trout (*Oncorhyncus clarki lewisi*) were petitioned for listing as threatened species on June 6, 1997 (63 FR 31691).

[3] Governor Philip E. Batt's *State of Idaho: Bulltrout Conservation Plan* ("Governor's Plan")(July 1, 1996).

specifically designates the Upper Salmon River as a bull trout key watershed. Notably, the Governor's Plan acknowledges that "dam building and water diversions have isolated many populations." *Id.* Threats to bull trout restoration and recovery identified in the Governor's Plan such as highly variable stream flows, water quantity, sediment sources, reduced bank cover or stability, migration barriers, poaching or predation are ameliorated by leaving water instream. The threats identified in the Governor's Plan are equally applicable to threatened and endangered sockeye, chinook and steelhead.[4]

In summary, we believe that the Forest Service could not have used this water for irrigation purposes without violating federal law. In addition, such use would have been inconsistent with state water policy to protect endangered species.

Please do not hesitate to contact me if you have any questions regarding this matter. We look forward to hearing from you.

Sincerely,

Randall J. Bramer

Enclosures:

cc: Norm Young
David Tuthill
Phillip Rassier

[4] The bull trout's historic range approximates that of spring, summer, and fall chinook salmon. *Plan*, 3.

United States Department of Agriculture | Forest Service | Boise Adjudication Team Recreation and Lands Intermountain Region | 380 ParkCenter, Suite 330 Boise, ID 83706

Reply to: 2540

Date: September 1, 1998

Theodore Meyers
National Marine Fisheries Service
Boise Field Office
United States Department of Interior
1387 South Vinnell Way, Suite 377
Boise, ID 83709

RECEIVED
SEP 0 2 1998
Department of Water Resources

RECEIVED
SEP 2 9 1998
Department of Water Resources
Southern Region

Robert G. Ruesink
Supervisor
Fish and Wildlife Service
Snake River Basin Office
United States Department of Interior
1387 South Vinnell Way, Suite 368
Boise, ID 83709

Re: Water Rights For Busterback Ranch

Dear Mssrs. Meyers and Ruesink:

In 1992, the United States Department of Agriculture, Forest Service (Forest Service) purchased five water rights in the upper Stanley Basin on the Salmon River and Alturas Lake Creek. The seller used the rights for irrigation of pastures on the Busterback Ranch.

The water rights are being adjudicated in the Snake River Basin Adjudication (SRBA). The Idaho Department of Water Resources (IDWR) investigates water rights and makes recommendations to the SRBA Court. IDWR recently informed the Forest Service that they may recommend forfeiture of these rights because the Forest Service failed to divert water for irrigation purposes for five years.

The Forest Service believes forfeiture is inappropriate since use of these water rights for irrigation would be likely to violate provisions of the Endangered Species Act. Had the Forest Service undertaken historic irrigation withdrawals during the 1992 through 1998 irrigation seasons, our fish biologists advise us that this action would have resulted in a "likely to adversely affect" determination. Resumption of such diversions could have resulted in the destruction of or adverse modification of critical habitat. Moreover, such action could have jeopardized the continued existence of the listed species. Finally, resumption of these diversions would have placed the Forest Service at risk of violating the take prohibitions of the ESA.

The purpose of this letter is to request your advisory opinion of the potential ramifications had these water rights been diverted out of the stream for irrigation during this time period. Attached is a summary outlining the circumstances surrounding the purchase and describing the effect of the diversions on the relevant species in this area. A map showing the locations of these water rights and the diversions is also enclosed.

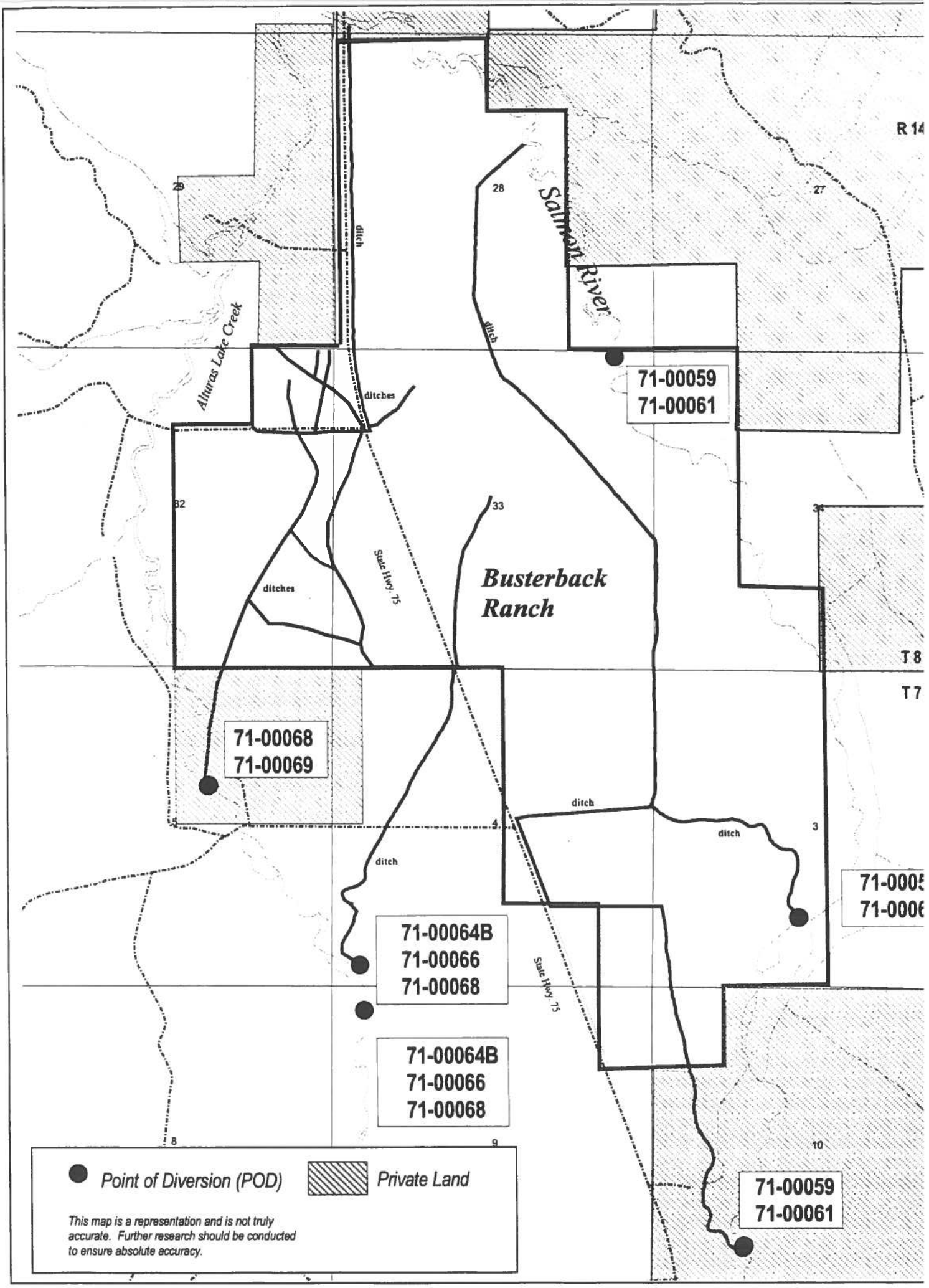
Please do not hesitate to contact Randy Bramer or myself if you have any questions regarding this matter. We look forward to hearing from you.

Sincerely,

Michael Collette
Team Leader
Boise Adjudication Team

Enclosures

cc: Bill LeVere
Paul Reis
Lois Witte
Bruce Bernard
Randy Bramer


R 14
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28
27
Salmon River
ditch
Alturas Lake Creek
ditch
ditches
71-00059
71-00061
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State Hwy 75
Busterback Ranch
ditches
T 8
T 7
71-00068
71-00069
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3
ditch
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ditch
71-0005
71-0006
71-00064B
71-00066
71-00068
State Hwy 75
71-00064B
71-00066
71-00068
8
9
10
71-00059
71-00061
Point of Diversion (POD)
Private Land
This map is a representation and is not truly accurate. Further research should be conducted to ensure absolute accuracy.

SUMMARY OF BUSTERBACK WATER RIGHTS

The Busterback Ranch had water rights from the Salmon River (65.6 cubic feet per second (cfs)) and Alturas Lake Creek (30.93 cfs). These include the following water rights:

71-00059	25.60 CFS	12/31/1912	Salmon River
71-00061	40.00 CFS	8/30/1933	Salmon River
71-00064B	7.86 CFS	8/15/1915	Alturas Lake Creek
71-00066	10.75 CFS	7/1/1930	Alturas Lake Creek
71-00068	12.32 CFS	7/1/1935	Alturas Lake Creek

As described below, the headwaters of the Salmon River and Alturas Lake Creek provide crucial spawning and rearing areas, juvenile migration corridors, areas for growth and development to adulthood, and adult migration corridors for proposed and listed species[1] under the Endangered Species Act of 1973. 16 U.S.C. 1531 *et seq.* Exercising these rights completely de-watered both the river and the creek during critical periods in anadromous fish migrating and spawning cycles.

The stream reaches contain several species that have been listed as threatened or endangered. These include chinook and sockeye salmon, bull trout, and steelhead. In addition, the westslope cutthroat trout (recently proposed for listing) occurs in these stream segments. An endangered orchid, the Ute ladies'-tresses, occurs in these areas.

Salmon River

Two diversion structures, known as S45 and S46, supplied water from the Salmon River to the ranch. S45 was a large diversion structure located in the Salmon River. S46, a smaller structure, was located approximately one mile upstream of S45. The Forest Service conducted several studies to evaluate the effects of diversions on anadromous fish within the Sawtooth Valley.[2] The Forest Service concluded that these two diversions had the "greatest irrigation related adverse impact on anadromous stocks of any within the SNRA." *Munther*, 13. Combined these two diversions precluded full utilization of between 22 and 32 miles of spawning habitat upstream from the diversions. *Munther*, 10-11; *Scott*, 15. Typically the diversions impeded passage from early July to late September. *Munther*, 12-13. Less than 70% of the rivers inherent production for anadromous fish species was realized under diverted conditions. *Scott*, 18. Both steelhead and chinook were affected by the diversion. *Scott*, 16.

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[1] Snake River sockeye salmon (*Oncorhynchus nerka*) were listed as endangered by the National Marine Fishery Service on November 20, 1991. (57 FR 58619). Snake River Spring/Summer chinook (*Oncorhynchus tshawytscha*) were listed as threatened April 22, 1992. (57 FR 14653) but their status was reclassified as endangered pursuant to Emergency Interim Rule August 18, 1994. (59 FR 42529). The classification of Snake River Spring/Summer chinook reverted to threatened on April 17, 1995. (60 FR 19342). Steelhead (*Oncorhynchus mykiss*) were listed as threatened October, 17 1997. (62 FR 43937-43954). Bulltrout (*Salvelinus confluentus*) were listed as threatened by the U.S. Fish and Wildlife Service on June 10, 1998. (Effective July 10, 1998, 63 FR 31647). Westslope Cutthroat (*Oncorhyndus clarki lewisi*) were petitioned for listing as a threatened species on June 6, 1997 (63 FR 31691).

[2] Greg L. Munther, *Effects of Irrigation Diversions and related structures in the Sawtooth National Recreation Area.* (1974) [hereinafter *Munther*]. Harv Forsgren, et al., *Anadromous Fish Instream Flow Needs and Conflicts within the Sawtooth National Recreation Area* (1981) [hereinafter *Scott*]. John Andrews et. al. *Alturas Lake Creek Flow Augmentation* (Final Report (1987).

When sufficient water was left instream in 1972 to provide upstream migration, 163 redds were counted above the diversions; whereas in 1973 when flows were completely eliminated below the diversion by June 30, only 50 redds were identified above the diversion. High redd counts below the diversion indicated above average concentration of spawners. *Munther*, 14.

S45 dewatered approximately 800-1500 feet of stream below the diversion. Chinook salmon spawning occurred both above and below the diversions indicating that the dewatered reach could also provide spawning and rearing habitat. Diversions depleted an estimated 3 ½ miles of "valuable" spawning habitat below the diversions. *Scott* at 15. In 1972, one half mile of spawning habitat was lost to dewatering. *Munther*, 14, 20. Approximately one half to two and one half miles of spawning habitat below the diversion was reduced due to lower flows. Id.at 20. In 1972 considerable spawning had occurred in the reach before dewatering, "which probably resulted in 100% loss of eggs in redds that were wholly or partially dewatered. *Munther*, 20. In addition to habitat loss and degradation, juvenile smolts were diverted onto irrigated fields. Id. at 28.

Alturas Lake Creek

A third diversion structure, ALC1, diverted water from Alturas Lake Creek to Busterback. This structure impacted both chinook and sockeye. *Munther*, 31. The diversion blocked upstream migration of adult chinook and depleted important habitat below the diversion. *Scott*, 20, 22. Fish passage is restricted at less than 52 cfs, which occurred as early as July 7, 1973. *Id.* Reduced flows probably impacted downstream spawning in Alturas Lake Creek. Furthermore, juvenile chinook were likely diverted onto irrigated pasturelands while sockeye smolts were not due to pre-irrigation season outmigration of sockeye. *Munther*, 35.

Alturas Lake is one of the four morainal lakes that once sustained sockeye salmon runs. It is believed that the diversion structure on Alturas Lake Creek may have been at least partially responsible for the disappearance of sockeye salmon, which once migrated to Alturas Lake. *Munther* at 31. The *Scott* report considered this diversion the "most significant" factor contributing to the decline of sockeye at Alturas Lake. *Scott*, 20. The diversion totally dewatered Alturas Lake Creek prior to the onset of the chinook spawning season and upstream migration period for sockeye. *Scott*, 22. Alturas Lake Creek diversion reduced the production capability for chinook to 46% of total and 0% for sockeye. *Scott*, 22.

Resident salmonids in this region include bull trout and westslope cutthroat trout. Little information is currently available regarding the impacts of these structures upon bull trout. In the Snake River basin, the bull trout's historic range approximates that of spring, summer, and fall chinook salmon. Dam building and water diversions have isolated many populations. *Governor Philip E. Batt's State of Idaho Bull Trout Conservation Plan* (1996). The Governor's Plan notes that the disruption of migratory corridors may reduce growth and survival of bull trout, and possibly lead to the loss of the migratory life-history types. *Plan* 5. It can be assumed that spawning and rearing habitat could be lost due to these structures. Early spawning and migration of bull trout may coincide with irrigation withdrawals. Highly variable stream flows, bedload movement, and channel instability negatively influence the survival of young bull trout. (Goetz 1989; Weaver 1985).

At a minimum, it may be assumed that bull trout were diverted onto irrigated pasturelands and that genetic diversity was impeded due to interference of migrating adults. Furthermore, flow depletion by irrigation and irrigation runoff may adversely impact water temperature, which, in turn, may increase chances for disease and stress. Low flows also increase chances for predation and poaching.

Moreover, the streams contain westslope cutthroat trout, a species that was recently petitioned for listing as threatened. Westslope cutthroat are spring spawners that probably would have suffered losses due to dewatered spawning areas as well as being diverted onto irrigated fields

Conclusion

As noted above, several species of fish currently classified as threatened or endangered under the Endangered Species Act are potentially affected by the water rights associated with the acquisition of Busterback Ranch. This area was designated critical habitat on December 28, 1993 for endangered species and this habitat is of vital importance to recovery of these protected species.[3] We are also concerned that resumption of historic diversion withdrawals would have had a significant detrimental impact to the ongoing efforts by the Sockeye Recovery Technical Oversight Committee's sockeye recovery in Alturas Lake.

Resumption of historic diversion withdrawals may frustrate the goals and objectives and actions articulated in the *Proposed Recovery Plan for Snake River Salmon* (Recovery Plan). United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (1995). Habitat restoration is a primary objective under the Recovery Plan. Rcovery and delisting criteria under the plan fall into two major categories: "remedying environmental factors that have reduced stocks to levels which are in danger of extinction and 2) rebuilding populations to levels of improved productivities." Recovery Plan, ES-3. The plan acknowledges that habitat restoration may be achieved by reducing losses of listed species at water withdrawal sites.

[3] Effective January 27, 1994, 58 FR 68543.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Snake River Basin Office, Columbia River Basin Ecoregion
1387 South Vinnell Way, Room 368
Boise, Idaho 83709

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Department of Water Resources
Southern Region

September 1, 1998

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SEP 02 1998
Department of Water Resources

Michael Collette, Team Leader
Boise Adjudication Team
U.S.D.A. Forest Service
Intermountain Region
380 Parkcenter Blvd., Suite 330
Boise, Idaho 83706

Dear Mr. Collette:

This responds to your September 1, 1998, letter requesting U.S. Fish and Wildlife Service (Service) comments on the effects of diverting 65.6 cubic feet per second (cfs) from the Salmon River and 30.93 cfs from Alturas Lake Creek for irrigation of land known as the Busterback Ranch located in the Sawtooth National Recreation Area. Your letter explained that the Forest Service had purchased the ranch and associated water rights in 1992, and now faces possible forfeiture of the water rights through adjudication proceedings for failure to divert the water for irrigation purposes during the 1992-1998 irrigation seasons.

Species of concern to the Service in the area include the bull trout, listed as threatened June 10, 1998 and the Ute ladies'-tresses (*Spiranthes diluvialis*), an orchid species listed as threatened January 17, 1992. The bull trout was a candidate species being considered for listing by the Service beginning in 1985.

Bull trout occur in Alturas Lake Creek, apparently the strongest subpopulation in the Sawtooth Valley. The main stem Salmon River is likely a migratory corridor for bull trout movement into tributary streams like Alturas Lake Creek. The Governor's Bull Trout Conservation Plan identifies the Upper Salmon River, which includes Alturas Lake Creek, a key watershed.

The Ute ladies'-tresses was not known to occur in Idaho at the time of its listing in 1992; however, the September 1995 draft recovery plan recognized a high potential for the species to occur in Idaho. Subsequently, a population was discovered along the South Fork of the Snake River in 1996. The Busterback Ranch area has a high potential of having suitable habitat to support this native orchid according to recent mapping completed by the Sawtooth National Forest.

The Service reviewed the Forest Service proposal to acquire the land and water rights of the Busterback Ranch in 1992, and concluded that the action would benefit fish and wildlife resources in the area. That conclusion was based on the belief that the water would not be diverted for irrigation, but would remain in the stream. Conversely, if the Forest Service were to divert the water for irrigation in the future, it could constitute an adverse effect for bull trout and the Ute ladies'-tresses, which would require formal consultation under section 7 of the Endangered Species Act of 1973, as amended (ESA). It is not possible for the Service to determine the outcome of such consultation at this time, but irrigation diversions were considered a threat to bull trout in both the final rule listing the species (63 FR 31647) and the Governor's Bull Trout Conservation Plan. The Forest Service should complete consultation before taking any action to avoid the risk of violating sections 7 and 9 of the ESA.

We appreciate the opportunity to provide these comments regarding possible Forest Service changes in the use of water at the Busterback Ranch. If you have questions or need additional information please call Ray Vizgirdas at 378-5243. Your interest in the conservation of endangered and threatened species is appreciated.

Sincerely,

Robert D. Ruesink

Supervisor, Snake River Basin Office

cc: National Marine Fisheries Service, Boise

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Southern Region

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Northwest Region
7600 Sand Point Way, N.E.
Bin C15700, Bldg.1
Seattle, Washington 98115-0070

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Department of Water Resources

Michael Collette
Boise Adjudication Team
USDA Forest Service
Intermountain Region
380 Park Center Blvd, Suite 330
Boise, Idaho 83706

RE: Water Rights associated with Busterback Ranch

Dear Mr. Collette:

This responds to the September 1, 1998, letter requesting review of the potential ramifications associated with the Endangered Species Act (ESA) from implementing water rights acquired through the purchase of the Busterback Ranch. The letter explains that the Idaho Department of Water Resources (IDWR) informed the USDA Forest Service (USFS) that they may recommend forfeiture because the USFS failed to divert water for irrigation purposes for five years. The letter identifies five points of diversion in Salmon River and Alturas Lake Creek in the upper Stanley Basin.

The USFS letter identifies ESA listed fish species in the area and describes potential adverse effects from diverting the water. Snake River sockeye salmon, Snake River spring/summer chinook salmon, and Snake River steelhead all use the upper Salmon River for spawning, rearing, and overwintering habitat. The National Marine Fisheries Service (NMFS) has also designated critical habitat for these three species throughout the project area. Critical habitat includes all perennial streams in the Snake River basin historically accessible to these anadromous fish species below Hell's Canyon and Dworshak Dams.

Based on the information provided to NMFS in a letter dated September 1, 1998, the effects of using the five diversions with a cumulative total water withdraw of 96.53 CFS are as follows. In the Salmon River, the effects of removing 65.6 CFS of water during years when the Busterback Ranch was in use resulted in: (1) dewatering approximately 800-1500 feet of the Salmon river precluding full use of spawning habitat for 22-32 miles upstream from the points of diversion; and among other effects, (2) reduced significantly the reproductive capabilities of the aforementioned

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species using the river from early July through late September. In Alturus Lake Creek, the diverted water (30.93 CFS) significantly impaired reproductive capabilities for chinook salmon and likely prevented sockeye salmon from using Alturus Lake.

The USFS believes diversion of river flows as authorized in the water right would result in a likely to adversely affect determination for designated critical habitat and for anadromous fish species listed under the ESA. Based on the information provided, NMFS agrees with the USFS determination that the action is likely to adversely affect. Given this finding, the USFS would be required to initiate formal consultation with NMFS.

Formal consultation would involve the development of a biological opinion to determine whether the action is likely to jeopardize the continued existence of Snake River sockeye salmon, Snake River chinook salmon, Snake River steelhead, or result in the destruction or adverse modification of designated critical habitat. Prior to reaching such a conclusion, it would be necessary for an instream flow study be completed for the entire upper Salmon River to fully assess the cumulative impact the subject action would have on ESA listed species and their designated critical habitat. Until the results of this study addressing effects to listed anadromous fishes and their habitat were available, NMFS would recommend the USFS defer use of the 102.93 CFS to ensure the action does not violate the ESA by jeopardizing the continued existence of the listed species or resulting in the destruction or adverse modification of critical habitat. Non-compliance with the ESA regulations could also place the USFS at risk of the violating the take prohibitions.

Even without the cumulative effects assessment, the available information regarding adverse effects to critical habitat and ESA listed species is sufficient for NMFS to raise serious concern whether continued irrigation use at the sites would be consistent with the provisions of section 7 (50 CRF part 402) and section 9 (50 CFR Sec 217) the ESA.

If you have any questions concerning this informal consultation on ESA listed Snake River salmon or Snake River steelhead, please contact Ed Murrell at (208) 378-5696.

Sincerely,

Theodore F. Meyers

for/ William Stelle, Jr.
Regional Administrator

cc: P. Ries - SNRA
R. Ruesink - USFWS

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Department of Water Resources
Southern Region

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QUESTIONS AND ANSWERS
90-DAY FINDING
WESTSLOPE CUTTHROAT TROUT

1. What is the westslope cutthroat trout? Westslope cutthroat trout is one of several subspecies of cutthroat trout native to the Rocky Mountain region. The westslope cutthroat trout often exhibits bright yellow, orange, and red colors. It is generally distinguishable from other inland subspecies of cutthroat trout by the particular pattern of black spots that appear on the body.

2. Where are westslope cutthroat trout found? Westslope cutthroat trout are native to western and central Montana (Columbia and Missouri River drainages), northern and central Idaho (Columbia and Snake River drainages); and a few small, scattered river drainages in Washington and Oregon and British Columbia and Alberta, Canada. Today, populations of westslope cutthroat trout occur almost exclusively in small, isolated streams in mountainous areas.

2. What is a 90-day finding? Publication in the *Federal Register* of a positive 90-day finding means that the Service has determined that the petitioners have provided substantial information to indicate that listing of a species as threatened or endangered under the Endangered Species Act may be warranted. Although a positive 90-day finding is an initial step in the process that could lead to listing of the species, it does not mean that listing is imminent.

3. Why do the petitioners think the westslope cutthroat is threatened? The petitioners state that populations of westslope cutthroat trout have been greatly reduced because of habitat destruction from logging and associated road building; adverse effects on habitat resulting from livestock grazing, mining, urban development, agricultural practices, and the operation of dams; historic and ongoing stocking of nonnative fish species that compete with or prey upon westslope cutthroat trout or jeopardize the genetic integrity of the subspecies through hybridization; and excessive harvest by anglers. The petitioners further assert that programs to protect and restore westslope cutthroat trout are inadequate or nonexistent and populations of this fish continue to be threatened by a wide variety of ongoing and proposed activities.

4. What is the next step in the process? The Service conducts a 12-month status review for westslope cutthroat trout. As part of that review, the Service seeks information on the present status of westslope cutthroat trout and measures now underway to protect the remaining populations of this fish, as well as comments and technical critiques pertaining to the petition and 90-day finding. Results of the status review will reveal whether or not listing of the westslope cutthroat trout as threatened under the Endangered Species Act is warranted.

5. When will we know if the westslope cutthroat trout will be proposed for listing? The status review should be completed by January 1999 and a summary finding published in the *Federal Register* about that time.

6. How will the listing of bull trout as a threatened species affect management of

westslope cutthroat trout? Except for the Missouri River drainage of Montana, the historic range of the westslope cutthroat trout (perhaps 65% of total) is entirely within that of bull trout. A proposed federal rule to list bull trout as threatened in the region of range overlap between bull trout and westslope cutthroat trout (i.e., Columbia River drainage) is imminent. Protection of habitat for bull trout that results from ESA listing will also benefit westslope cutthroat trout in the Columbia River drainage. Habitat Conservation Plans and other similar agreements for bull trout can also include management activities beneficial to westslope cutthroat trout.

7. **How will the genetics of westslope cutthroat trout be taken into account in the status review?** Today, many westslope cutthroat trout populations show evidence of some introduction of genetic material from other subspecies or species, such as introduced rainbow trout. In some cases this introgression of genetic material is slight, not outwardly evident in individual fish, and detectable only by electrophoresis or similar techniques of genetic analysis. The occurrence of genetically impure populations will be taken into account during the status review for the westslope cutthroat trout.

8. If westslope cutthroat trout is a subspecies, why is it given consideration under the Endangered Species Act? As defined in the Endangered Species Act, the term "species" includes any subspecies of fish, wildlife, or plants.

Westslope Cutthroat Trout (*Oncorhynchus clarki lewisi*) Facts

What is the westslope cutthroat trout? Westslope cutthroat trout is one of several subspecies of cutthroat trout native to the Rocky Mountain region. It often exhibits bright yellow, orange, and red colors and is generally distinguishable from other inland subspecies of cutthroat trout by the particular pattern of black spots that appear on the body. Lewis and Clark's Corps of Discovery caught westslope cutthroat from the Missouri River near present-day Great Falls, Montana, in 1805.

Where are westslope cutthroat trout found? Westslope cutthroat trout are native to streams and lakes in western and central Montana (Columbia and Missouri River drainages), northern and central Idaho (Columbia and Snake River drainages), and a few small, scattered river drainages in Washington and Oregon and British Columbia and Alberta, Canada. Today, populations of westslope cutthroat trout occur almost exclusively in small, isolated streams in mountainous areas.

What do westslope cutthroat trout eat? Most of the diet of westslope cutthroat trout of all ages consists of immature and mature forms a aquatic insects and other invertebrates.

What is the life cycle of westslope cutthroat trout? Westslope cutthroat trout usually reach maturity at 4 or 5 years of age. Spawning occurs primarily in small tributary streams between March and July, when water temperatures reach about 50 F. Fertilized westslope cutthroat eggs are deposited in stream gravels where they incubate for several weeks, the actual period of time dependent upon water temperature. Several days after hatching from the egg, when about one inch long, the fry emerge from the gravel and disperse into the stream. The fry may grow to maturity in the spawning stream or they may move downstream and mature in larger rivers or lakes. Thus three westslope cutthroat trout life-history types are recognized: *Resident* fish spend their lives entirely in the tributary; *fluvial* fish spawn in small tributaries and their resulting young migrate downstream to larger rivers where they grow and mature; and *adfluvial* fish spawn in streams but grow and mature in lakes.

Why are westslope cutthroat trout in trouble? Populations of westslope cutthroat trout have declined due to habitat destruction from logging and associated road building; adverse effects on habitat resulting from livestock grazing, mining, urban development, agricultural practices, and the operation of dams; historic and ongoing stocking of nonnative fish species that compete with or prey upon westslope cutthroat trout or jeopardize the genetic integrity of the subspecies through hybridization; and excessive harvest by anglers.

What is being done to protect westslope cutthroat trout? Many of the actions that will be taken to protect bull trout in the Columbia River basin will also benefit westslope cutthroat trout. Protection and restoration of stream habitat and modification of land-management practices to improve water quality are important. In some instances, barriers to the upstream movement of fish can be built to prevent nonnative fish species from invading river reaches occupied by westslope cutthroat trout. Fish stocking programs may need to be modified to assure that nonnative fishes are not directly or indirectly stocked into waters occupied by westslope cutthroat

trout. Several state agencies have enacted regulations reducing or prohibiting westslope cutthroat trout harvest. The Montana Department of Fish, Wildlife and Parks has drafted a conservation plan to protect and restore westslope cutthroat trout.

Chronology of Events Pertaining to the Petition to List Westslope Cutthroat Trout as a Threatened Species

June 6, 1997.--Fish and Wildlife Service receives a petition to list the westslope cutthroat trout as a threatened species throughout its range, pursuant to the Endangered Species Act. Petitioners are American Wildlands, Clearwater Biodiversity Project, Idaho Watersheds Project, Inc., Montana Environmental Information Center, Trout Unlimited's Madison-Gallatin Chapter, and Mr. Bud Lilly.

June 6, 1997.--Period of 90-day petition review begins. Service must decide whether or not the petition presents substantial information indicating that the requested action (listing) may be warranted.

July 2, 1997.--Service sends a letter to the petitioners stating that, on the basis of the Service's final listing priority guidance published in the December 5, 1996 *Federal Register*, the Service has determined that the petition falls into the Tier 3 category (i.e. low priority) and that westslope does not face "imminent, high-magnitude threats." The Service will proceed with the 90-day finding when completion of ongoing, higher-priority activities allows available funds to be allocated to westslope cutthroat trout.

September 4, 1997.--End of 90-day period for petition review.

September 24, 1997.--Petitioners send a letter (i.e. 60-day notice of intent) to Interior Secretary and Service stating that, unless the Service promptly issues the 90-day finding, the petitioners intend to pursue federal court litigation for alleged violations of the Endangered Species Act.

January 25, 1998.--Service receives from the petitioners an amended petition, which contains a substantial amount of new information on westslope cutthroat trout.

January 25, 1998.--Period of 90-day review for amended petition begins. Service must decide whether or not the amended petition presents substantial information that listing may be warranted.

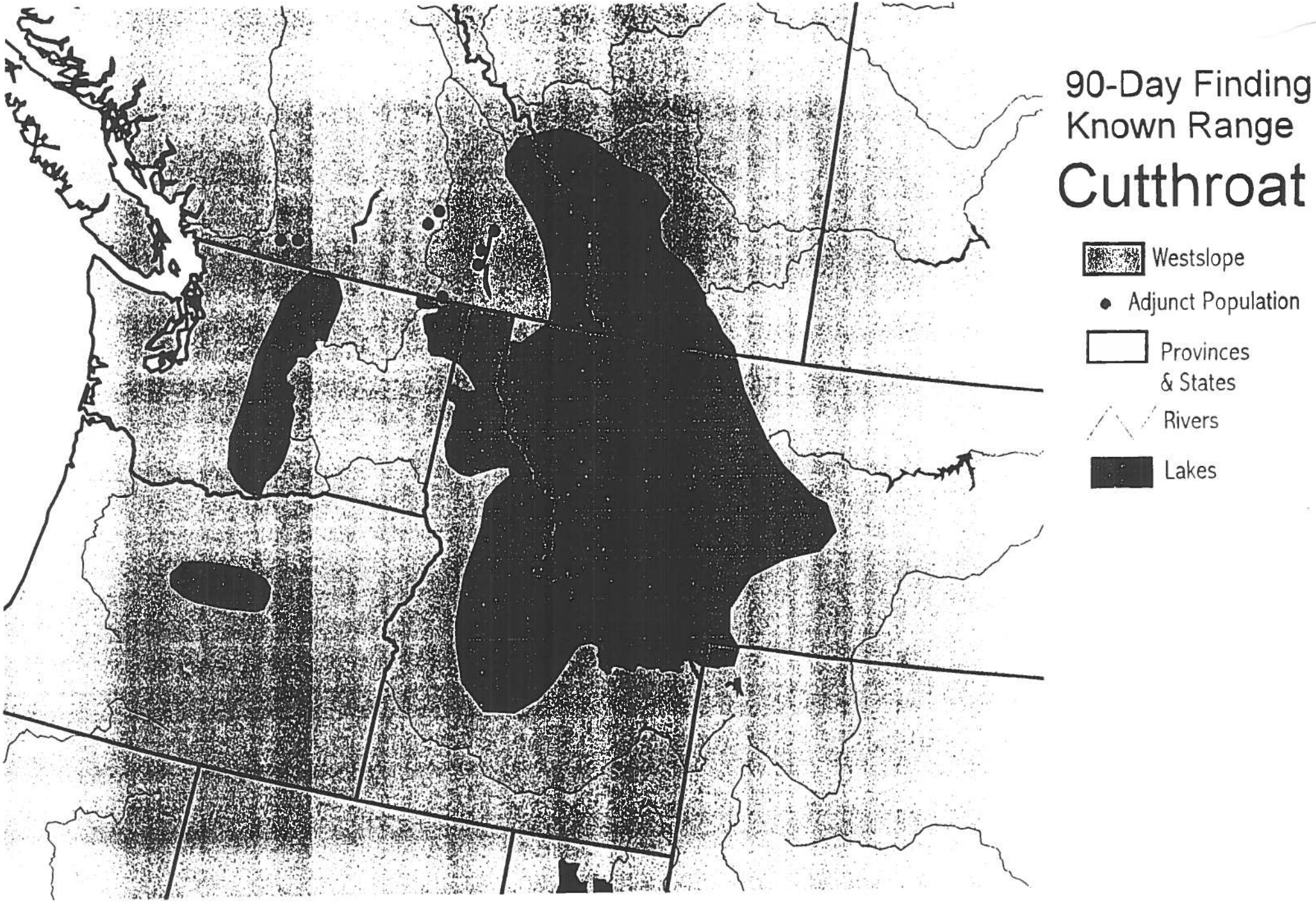
March 17, 1998.--Petitioners file a complaint in the U.S. District Court for the District of Columbia requesting that the court declare that the Service's failure to issue a 90-day finding is a violation of the ESA, its implementing regulations, and the Administrative Procedures Act, and that the court issue a preliminary and permanent injunction requiring the Service to issue a 90-day finding on the petition and promptly publish such finding in the *Federal Register*. The complaint was filed before the end of the 90-day review for the amended petition.

April 1, 1998.--Service sends a letter to the petitioners stating that, although the tier system for prioritizing listing actions remains in full force and effect, the Service is proceeding with preparation of a 90-day finding on the amended petition.

April 10, 1998.--The Service finds that the amended petition provides substantial scientific and

commercial information to indicate that listing of westslope cutthroat trout as threatened, throughout all or parts of its range, may be warranted.

June 8, 1998.--Service announces 90-day finding in *Federal Register*.


90-Day Finding
Known Range
Cutthroat
Westslope
Adjunct Population
Provinces
& States
Rivers
Lakes

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Snake River Basin Office, Columbia River Basin Ecoregion
1387 South Vinnell Way, Room 368
Boise, Idaho 83709

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Southern Region

June 10, 1998

Dear Interested Party:

The US Fish and Wildlife Service (Service) has taken several actions under the Endangered Species Act of 1973, as amended (Act). The Service has: 1) determined to list the Klamath River and Columbia River vertebrate population segments of the bull trout (*Salvelinus confluentus*) as threatened; 2) proposed to list the Coastal-Puget Sound, Jarbidge River, and Saint Mary-Belly River population segments of the bull trout as threatened; and 3) determined that a petition to list the westslope cutthroat trout (*Oncorhynchus clarki lewisi*) presented substantial information indicating that the requested action may be warranted. The purpose of this letter is to provide you with more detailed information on the petition to list the ***westslope cutthroat trout*** and request additional information concerning the subspecies.

Westslope Cutthroat Trout

The Service has determined that an amended petition to list the westslope cutthroat trout as threatened throughout its range provides substantial information to indicate that such listing may be warranted. The attached Federal Register Notice of this 90-day finding was published on June 10, 1998. The Service is **not** proposing to list the westslope cutthroat trout at this time. Instead, the Service seeks information on the present status of westslope cutthroat trout and measures now underway to protect the remaining populations of this subspecies, as well as comments and technical critiques pertaining to the amended petition and 90-day finding, for use in preparing a 12-month finding on the petition to list the westslope cutthroat trout. The Service's 12-month finding will determine whether listing the species is warranted or not warranted. If the Service determines that listing is warranted, that listing proposal may be precluded by other pending proposals of higher priority. To be considered in the status review and subsequent finding for the amended petition to list the westslope cutthroat trout as threatened, relevant information must be submitted to the Service by August 7, 1998.

The historic distribution of westslope cutthroat trout in streams and lakes can be summarized as follows: West of the Continental Divide, the subspecies is native to several major drainages of the Columbia River basin, including the upper Kootenai River drainage from its headwaters in British Columbia, through northwestern Montana, and into northern Idaho; the entire Clark Fork River drainage of Montana and Idaho downstream to the falls on the Pend Oreille River near the Idaho-Washington border; the Spokane River above Spokane Falls and into Idaho's Coeur d'Alene and St. Joe River drainages; and the Salmon and Clearwater River drainages of Idaho's Snake River basin.

The historic distribution of westslope cutthroat trout also includes disjunct areas in Washington (e.g., Methow, Entiat, and Wenatchee River drainages), in the John Day River drainage in Oregon, and in British Columbia. East of the Continental Divide, the historic distribution of westslope cutthroat trout includes the headwaters of the South Saskatchewan River drainage (U.S. and Canada); the entire Missouri River drainage upstream from Fort Benton, Montana, and extending into northwestern Wyoming; and the headwaters of the Judith, Milk, and Marias rivers, which join the Missouri River downstream from Fort Benton. Today, populations of westslope cutthroat trout occur almost exclusively in small, isolated streams in mountainous areas.

A copy of the notice announcing the Service's 90-day finding is enclosed for your information. The amended petition (including appendices and bibliography) is available for public inspection, by appointment, at the Montana Fish and Wildlife Management Assistance Office, 4052 Bridger Canyon Road, Bozeman, Montana 59715. Comments and information on the status of the westslope cutthroat trout should also be sent to the Service's Montana Fish and Wildlife Management Assistance Office at the same address.

Sincerely

Acting Project Leader

Enclosures

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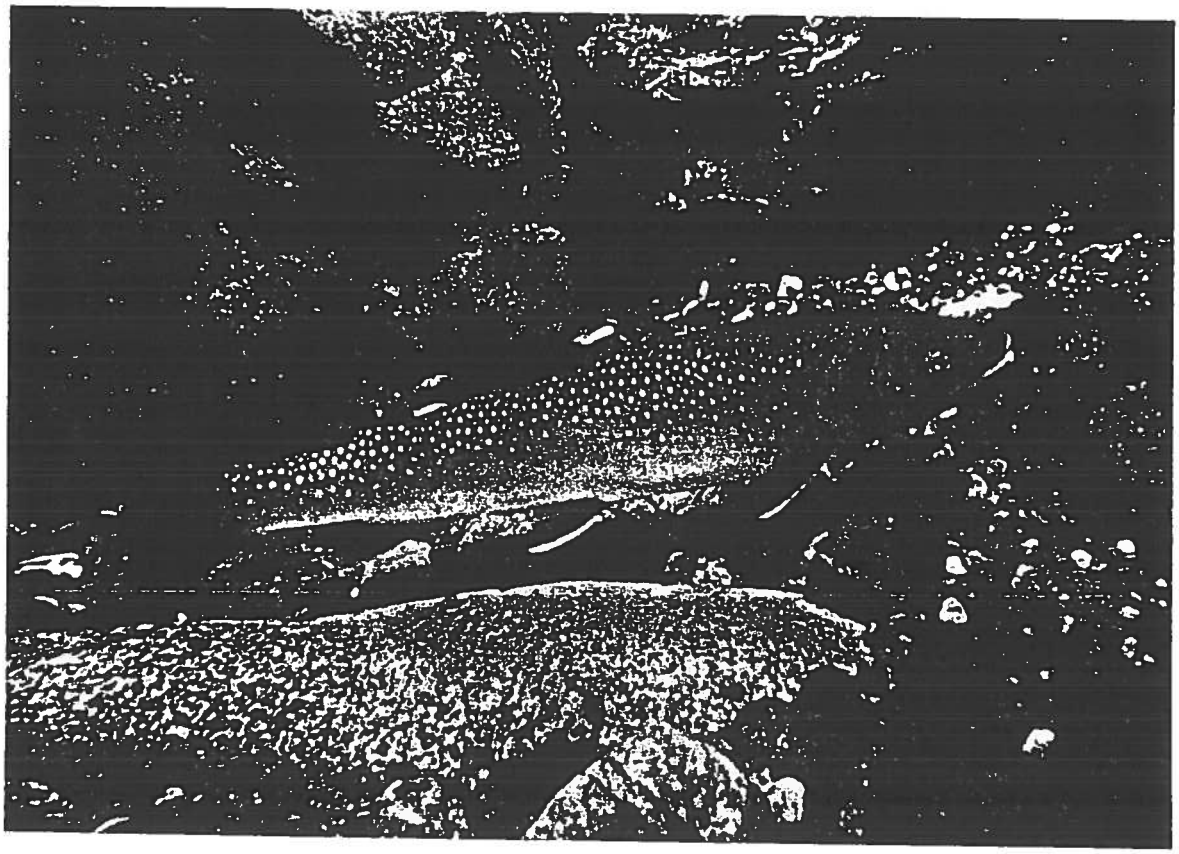
Department of Water Resources

GOVERNOR PHILIP E. BATT'S

STATE OF IDAHO

BULL TROUT CONSERVATION PLAN



July 1, 1996

OFFICE OF THE GOVERNOR
P.O. BOX 83720
BOISE 83720-0034

PHILIP E. BATT
GOVERNOR

(208) 334-2100

July 1, 1996

Dear Interested Party:

Enclosed is the final version of my bull trout plan. Months of work have resulted in a plan which I believe will successfully restore and protect Idaho's bull trout.

This plan is a public plan in every way. Comments from interested parties like yourselves were invaluable, but public involvement has only begun. Although state agencies will be there to help, the Watershed Advisory Groups that develop conservation and recovery plans will be made up of local citizens and will utilize their know-how and ingenuity. This conservation plan will work because it will have unique plans for unique environments. It is not a one-size-fits-all plan.

Another reason this plan will succeed is the strict timeline it contains. Necessary assessments for every key watershed will be done in the next two years. After that, the plan requires a minimum of six watershed recovery plans every year. I will also push my state agencies to beat all of these deadlines. Moreover, this plan does more than wait for degradation. Regardless of water quality, it requires a recovery plan for every key watershed. Even the most pristine habitat for the bull trout can be protected today--before this vital species becomes endangered.

My involvement in the plan is by no means over. I am committed to the protection and restoration of the trout, and look forward to working with state agencies, private partners, and local citizens toward that goal. Our work will not be done until there is a functional bull trout recovery plan in every key watershed in Idaho. Thank you for your interest and involvement.

Very truly yours,

Philip E. Batt

Philip E. Batt
Governor

PEB:vjm

GOVERNOR PHILIP E. BATT'S
STATE OF IDAHO
BULL TROUT CONSERVATION PLAN

EXECUTIVE SUMMARY

On June 12, 1995, the U. S. Fish and Wildlife Service found that while there was sufficient information available to warrant listing of bull trout as either "endangered" or "threatened" under the Endangered Species Act (ESA), that listing was precluded because of higher priority listing actions. This decision provided states the opportunity to take conservation actions necessary to recover the species. It is possible that action by the states to conserve or restore populations of bull trout may have a direct bearing on whether the fish is listed under the ESA. The agency now is obligated to review that decision in 1996, along with the progress of the individual state efforts to see if a change in the status of the fish is warranted.

In 1995, Idaho Governor Phil Batt designated two committees, a policy and steering committee and a biology committee, to prepare a Bull Trout Conservation Plan. In opening the first meeting of the team, Governor Batt outlined his goals for the plan, noting he wanted the plan to: (1) be workable, (2) focus on areas with the greatest potential for results at the lowest cost, (3) be based on sound science, (4) include public involvement, and, (5) maintain and strengthen existing populations, as well as restore the species in appropriate areas.

Bull trout are widely distributed in Idaho. They have populations which migrate long distances and others which remain in headwater streams their entire lives. Information about bull trout life history and habitat requirements is summarized in Part 1 of this plan.

The plan then discusses historical and current threats to the bull trout. Dam building and water diversions have isolated many populations. Past road building, agriculture, forestry, grazing, mining, stocking of exotic species and over-fishing have all contributed to habitat degradation and population declines. The impacts of land-use activities vary widely across the state and the plan outlines a framework for developing watershed-specific solutions to restoring areas degraded by past activities and to preventing degradation by ongoing or future activities.

There are 59 key watersheds identified in the plan. These watersheds contain the streams with the greatest potential for protecting and restoring bull trout populations through implementation of the plan. These watersheds provide the link between managing for the needs of bull trout, useful public involvement, and the state's obligations under the Clean Water Act. Problems such as sediment sources, reduced bank cover or stability, migration barriers, poaching or predation are most effectively identified and solved at the watershed level. The plan's strategy emphasizes protecting the healthy populations we have and focusing restoration efforts on areas which are not damaged beyond repair. The goal of the plan is to initiate locally developed common sense protection and restoration measures for watershed specific conditions.

Part II of this plan describes a process through which threats to bull trout restoration or protection can be identified and reduced. While there will be changes in land uses and management resulting from the plan, the protection and restoration measures will be developed locally.

Idaho Code §39-3601(95) provides the mechanism to make this happen. This legislation focuses on watersheds as the level where water quality problems are best identified and corrected through "watershed advisory groups" (WAGs). The development of these groups provides a way to identify and solve factors limiting bull trout populations. In addition, the Basin and Watershed Advisory Groups established through this law provide for public involvement, ensuring that bull trout watershed management plans are locally developed.

Implementing the Governor's plan will require changes not only in agency roles and management practices, but also in how private landowners conduct their business. While the plan's provisions should not be overly burdensome, there are public and private costs involved. For that reason, the plan identifies possible incentives to help assure that needed investments on behalf of bull trout are made.

Another goal of the Governor's plan is to facilitate development of "habitat conservation agreements". This provision of the Endangered Species Act allows landowners or agencies to develop and enter into agreements with the Fish and Wildlife Service that are designed to meet the needs of listed or candidate species. By adhering to those agreements, the landowner or agency is granted a "safe harbor" from land use restrictions or "taking" allegations should the species ultimately be listed.

Finally, the plan calls for a state Bull Trout Coordinator. If the plan is to be successful, there must be a number of changes in agency roles and the management of private and public lands. The need for these changes must be clearly communicated, along with the technical, financial and legal incentives that will make them acceptable. Coordinating these efforts and encouraging all that is necessary to make the plan a successful reality will be the responsibility of the bull trout coordinator.

PART I

BACKGROUND/PLAN OVERVIEW

July 1, 1996

PART I - BACKGROUND/PLAN OVERVIEW

INTRODUCTION

The bull trout (*Salvelinus confluentus*) is a federal candidate species currently under consideration for listing by the U.S. Fish and Wildlife Service (Service) as a threatened or endangered species. After initiation of a range-wide status review of the species, the Service published a 12-month finding on June 10, 1994 (59 FR 30254) that determined the listing of bull trout throughout its range was not warranted due to unavailable or insufficient data regarding threats to and status of the species within Alaska and Canada. The Service determined that sufficient information on the biological vulnerability and threats to the species was available to warrant listing of bull trout as a population segment within the conterminous United States. However, on June 12, 1995, the Service concluded that listing was precluded because of higher priority listing actions. This decision provided an opportunity for individual states to take conservation actions necessary to recover the species.

In 1995, Idaho Governor Phil Batt initiated development of a conservation plan to restore bull trout populations in Idaho. The mission of the Governor's Bull Trout Conservation Plan is to:

> Maintain and/or restore complex interacting groups of bull trout populations throughout their native range in Idaho.

To accomplish this mission, the goals of this plan include:

> Maintain the condition of those areas presently supporting critical bull trout habitat.
>
> Institute recovery strategies that produce measurable improvement in the status, abundance, and habitats of bull trout. Concentrate resources and recovery efforts in areas which will produce maximum cost-effective, short-term returns and which will also contribute to long-term recovery.
>
> Establish a secure, well-distributed set of sub-watersheds within key watersheds to achieve a stable or increasing population and to maintain options for future recovery; and
>
> Achieve the above goals while continuing to provide for the economic viability of Idaho's industries.

Idaho has long recognized the need and demonstrated the commitment to protect aquatic species. Land, water, and fisheries management practices throughout the state have been modified in a continuous, evolutionary process specifically to protect water quality and riparian habitat.

In 1995 the legislature passed a comprehensive amendment to Idaho Code (39-3601) designed to strengthen water quality protection in the state and improve compliance with the Federal Clean

Water Act (See Appendix E). This law mandates the formation of Basin Advisory Groups (BAGs) and Watershed Advisory Groups (WAGs) to address problems in water quality limited stream segments. The BAGs and WAGs, with their technical advisory groups, provide a source of technical guidance to help local communities develop standards for protection and/or maintenance of water quality.

The Governor's Bull Trout Conservation Plan utilizes the BAG and WAG framework to provide for local development of watershed specific plans to maintain and/or increase bull trout populations. State and federal agencies will provide technical assistance to BAGs and WAGs, and will make recommendations for protection of the bull trout. This will allow locally developed plans to meet the needs of both the bull trout and the community. While the state will not mandate how local communities protect the species, it will insist on meeting the goal of protecting and maintaining the species.

Although BAGs and WAGs will be the mechanism for establishing management practices for bull trout conservation in the majority of watersheds in Idaho, other efforts already underway, such as the Lemhi Model Watershed may serve the same purpose as the WAGs in some situations. In all instances the bull trout conservation goals and objectives will be met through locally developed site-specific programs and policies.

Since water quality and bull trout are closely linked, this approach is consistent with the governor's philosophy of agency coordination. It effectively provides for protection of both water quality and aquatic life forms.

The strategy for the protection and/or recovery of bull trout outlined in this plan is an ecosystem approach to riparian and aquatic management (Figure 2). While bull trout is the target species, many other aquatic and terrestrial species will also likely benefit from the proposed conservation actions.

BULL TROUT BIOLOGY

Taxonomy

Cavender (1978) identified bull trout *(Salvelinus confluentus)* as a distinct species of char, unique to western North America. Prior to the American Fisheries Society's acceptance of the description of *S. confluentus* in 1980, biologists considered bull trout and Dolly Varden, *S. malma*, to be of the same species. Local bull trout populations contain little genetic diversity relative to regional populations (Leary et al. 1993).

Historical Distribution

Bull trout occurred in all but the eastern section of Idaho, including the Snake River basin and tributaries of the upper Columbia River basin (Conley 1993). In the Snake River basin, their historical range approximates that of spring, summer, and fall chinook salmon (Thurow 1987; Rieman and McIntyre 1993) and possibly included the Owyhee River basin and other Snake River tributaries upstream as far as Salmon Falls Creek. They are not known to have occurred in the Snake River upstream of Shoshone Falls, the Wood River system, Birch Creek, or any stream in Idaho that drains the Centennial Mountains between Henry's Lake and the Bitterroot Range. An isolated population exists in the Little Lost River near Howe, Idaho between the Lost River and Lemhi mountain ranges.

In north Idaho bull trout were historically present in the Kootenai, Priest, Pend Oreille, and Spokane river drainages. Populations in the Kootenai River drainage had access to Kootenay Lake in British Columbia. Populations persist in Montana above Kootenai Falls. Adfluvial bull trout were abundant in Priest and Pend Oreille Lakes. Historical harvest exceeded 5,000 fish annually and fish heavier than 30 pounds were caught. Bull trout were caught in the Pend Oreille River and in the Priest River below Priest Lake. These areas may have supported fluvial populations as well as seasonal migrants from the lakes. Tributaries to the Clark Fork River upstream from Pend Oreille Lake supported the bulk of the spawning and rearing areas for Pend Oreille bull trout before Cabinet Gorge Dam blocked access in 1952.

Present Distribution

In 1992, Schill indicated that bull trout were the least studied salmonid in Idaho (Schill, 1992b). Presence/absence data is lacking in portions of the species' known or suspected range in north, central, and southern Idaho, although this situation is rapidly being rectified as biologists from State, Federal and private organizations pursue bull trout survey information at an accelerated pace (see Appendix F).

Biologists have encountered few new occurrences of bull trout, but have noted areas devoid of these fish where they once were known to occur. Additional survey work has documented bull trout in widely scattered segments of their known range in Idaho, mostly in headwater areas where only remnant resident populations may be surviving. Spawning activity of bull trout is

difficult to confirm in much of the species' range because remaining habitat is in isolated and inaccessible areas, numbers of fish are few, and redds are difficult to locate.

Life History

Bull trout exhibit two distinct life history forms, resident and migratory. Resident populations generally spend their entire lives in small headwater streams. Migratory bull trout rear in tributary streams for several years before either migrating into larger river systems (fluvial) or lakes (adfluvial). Research on bull trout has focused on bull trout stocks which migrate to lakes and reservoirs (especially Flathead Lake in Montana); less is known about stocks which migrate to mainstem river systems or remain resident in streams.

Outmigrating fluvial bull trout in Rapid River were primarily age 2 and 3, although younger fish may have outmigrated in the spring (Elle et al. 1994). Adfluvial juvenile bull trout migrated from upper Flathead River tributaries primarily at age 2 (49%), with smaller percentages emigrating at age 1 or 3 (18 and 32% respectively) (Pratt 1985).

Bull trout migrate to Pend Oreille lake from tributary streams at age 2 (Mason 1985). Adfluvial bull trout fry migrated from McKenzie Creek to Upper Arrow Lake during the spring freshet while older juveniles migrated in the spring and summer (McPhail and Murray 1979).

Shepard et al. (1984) speculate most juvenile migrants move quickly downstream along the stream margin to the mainstem Flathead or Flathead Lake beginning early as May and extending through the middle of July. Rapid River bull trout were sampled outmigrating in the fall. It is unknown if a spring outmigration occurs (Elle et al. 1994).

Migratory bull trout live several years in larger rivers or lakes, where they grow to much larger sizes than resident forms, before returning to tributaries to spawn. Resident and migratory forms may live together, but it is unknown if they represent a single population or separate populations (Rieman and McIntyre 1993). Generally, adfluvial fish are larger, fluvial fish tend to be slightly smaller and resident bull trout are much smaller (K.Pratt pers. comm.)

After hatching, bull trout fry rear in low velocity water (McPhail and Murray 1979). They find cover in substrate interstices, or within 0.03 meter (m) of the substrate and are associated with cobble and boulders or submerged fine debris where water velocity averages 0.09 meters per second (m/s) (Shepard et al. 1984). Juvenile bull trout prefer to be close to the substrate or some other cover which creates visual isolation (Pratt pers. comm.).

The presence of embryos, alevins and juvenile fish in the substrate during winter and spring indicates that highly variable stream flows, bedload movements, and channel instability negatively influence the survival of young bull trout (Goetz 1989; Weaver 1985). The redds of bull trout and other fall spawning fish are particularly vulnerable to flooding and scouring during winter and early spring (Elwood and Water 1969; Seegrist and Gard 1972; Wickett 1958), and to low

winter flows or freezing within the substrate. This association with substrate appears more important for bull trout than for other trout and char species (Nakano et al. 1992; Pratt 1984).

Juveniles live close to in-channel wood, substrate, or undercut banks (Goetz 1991; Pratt 1984, 1992). Adult resident bull trout also closely associate with the substrate but appear to select large cobble and boulder substrates (Jakober 1995, Goetz 1989), as well as lateral scour and pocket pools (Hoelscher and Bjornn 1989; Pratt 1984) and areas with complex woody debris and undercut banks (Graham et al. 1981; Oliver 1979; Pratt 1985; Shepard et al. 1984). Woody debris correlated significantly with densities of bull trout sampled in streams in the Bitterroot National Forest of Montana (Clancy 1992). Jakober (1995) found that stream resident bull trout of all sizes conceal themselves in the interstices of large cobble and boulder substrate and large woody debris accumulations during the day.

Although in-stream wood and substrate with clear interstitial spaces correlate with the distribution and abundance of bull trout, habitat complexity in any form can be important (Mullan et al. 1992). Strong bull trout populations will require high stream channel complexity. The amount of cover needed to maintain a strong bull trout population cannot, however, be quantified.

Migratory corridors provide access from over-wintering areas to spawning or foraging areas. Movement undoubtedly is important to the persistence and interaction of local populations within the metapopulation. Disruption of migratory corridors may reduce growth and survival, and possibly lead to the loss of the migratory life-history types. Resident stocks live upstream from natural barriers and an increasing number of barriers caused by human activities. Because these stocks are sometimes isolated in marginal or extreme habitats, they will be at increased risk of extinction (Horowitz 1978).

Reproduction

Bull trout generally mature between 5-7 years of age (Fraley and Shepard 1989, Goetz 1989, Leathe and Enk 1985). Bull trout spawn in the fall, primarily September and October (Heimer 1965, Leggett 1969, Oliver 1979, McPhail and Murray 1979, Shepard et al. 1984). Bull trout may spawn every year or in alternate years (Block 1955, Fraley and Shepard 1989, Pratt 1985, Ratliff 1992).

The migratory fish generally grow larger and have higher fecundity than resident forms. In the Rapid River drainage, fluvial bull trout are consecutive year spawners which grow an average of 54 millimeters (mm) during the 7 to 9 month over-wintering period and range from 290 to 540 mm in length (Elle et al. 1994, Elle 1995). Individuals in the Upper Salmon River spawning migrations ranged in size from 340 to 700 mm (Elle, pers. comm).

Adfluvial bull trout spawners ranged from 300 to 875 mm in length and 4 to 9 years old in the Flathead and Pend Oreille Systems (Shepard et al. 1984, Pratt 1985). Precocious males have been found in the Flathead and Pend Oreille drainages (Shepard et al. 1984, Pratt 1984).

Decreasing water temperatures may influence the onset of spawning (Shepard et al. 1984, Weaver and White 1985). Some bull trout spawn in streams with ground infiltration, particularly springs (Heimer 1965, Allan 1980, Shepard et al. 1984, Pratt 1984) or groundwater upwelling (McDonnel and Fidler 1985). However, spawning sites in Rapid River and other central Idaho systems show no evidence of groundwater influence (Elle 1995).

Upstream migration by bull trout in Rapid River appeared to coincide with temperatures >10° Centigrade (C) and a falling hydrograph following peak runoff, usually May through early July (Elle et al. 1994). In Alberta, Canada adult bull trout enter spawning streams in late July or August (Carl 1985). Bull trout leave Flathead Lake to begin their upstream migration in early spring, generally in April and May. Migrating bull trout remain in the Flathead River mainstem until mid-late August and then move into tributary streams to commence spawning (McDonnel and Fidler 1985).

McPhail and Murray (1979) found egg survival was highest at temperatures of 2 to 4°C. Egg mortality increased with increasing temperatures with only 0 to 20% survival in water 8 to 10°C. Under stable conditions, forty to fifty percent of eggs survive in the wild (Allan 1980). No specific work has been done on the oxygen requirements of bull trout eggs.

Spawning substrate is typically loosely compacted gravel and cobble (McPhail and Murray 1979, Shepard et al. 1984). Spawning sites include runs or tails or pools with water 0.2 to 0.8 m deep. Eggs were buried 10 to 20 centimeters (cm) in the gravel, and water velocities associated with redds were 0.2 to 0.6 m/s (Shepard et al. 1984). Substrate size has been shown to influence survival in laboratory tests, with survival at 0% with more than 50% fines (<6.35 mm) to about 40% with no fines (Shepard et al. 1984). Groundwater or stream bed recharge present may result in higher survival to emergence (Shepard et al. 1984).

Hatching is completed in 100 to 145 days, usually the end of January (Heimer 1965, McPhail and Murray 1979, Allan 1980, Weaver and White 1984). Yolk sac absorption requires 65 to 90 days (Shepard et al 1984). Parr marks develop and feeding begins while fry are still in the gravel. Bull trout reach lengths of 25 to 28 mm before filling their air bladders and emerging from the stream bed, approximately in April (Shepard et al 1984).

Habitat

Bull trout appear to have more specific habitat requirements than other salmonids. Channel stability, winter high flows, summer low flows, substrate, cover, temperature, and the presence of migration corridors consistently appear to influence bull trout distribution or abundance (Allan 1980; Fraley and Graham 1981; Leathe and Enk 1985; Oliver 1979; Thurow 1987; Ziller 1992).

Shifts in habitat use occur depending on the time of day. Bull trout often conceal themselves in cover (substrate and woody debris) during the day and move on or above the substrate at night (Goetz 1991, Jakober 1995). This pattern of daytime concealment is more pronounced as water temperatures decline below 7°C (45°F)(Jakober 1995, Schill 1991). Seasonal habitat shifts also

occur. During winter, activity and aggression are greatly reduced and survival depends on finding suitable shelter and minimizing energy costs (Cunjack and Power 1987).

Bull trout appear to seek large, deep pools with abundant cover in the autumn and winter (Jakober 1995). Adult bull trout over-wintering in the Salmon River used pool and run habitats (Schill et al. 1994, Elle et al. 1994). Most over-wintering bull trout showed high site fidelity after entering the main Salmon River. Individuals typically remained in the same habitat unit they selected after cessation of downstream movement (Elle et al. 1994). No published information exists regarding juvenile overwinter habitat use in large rivers.

Temperature represents a critical habitat characteristic for this species. Temperatures above about 15°C (59°F) are thought to limit bull trout distribution (Allan 1980; Brown 1992; Fraley and Shepard 1989; Goetz 1991; Oliver 1979; Pratt 1984; Ratliff 1992; Shepard et al. 1984). Goetz (1989) believed that optimum temperatures for rearing were about 7 to 8°C (45 to 46°F).

Increased temperature can limit the distribution of other char (Meissner a, 1990b) and likely will exacerbate fragmentation of bull trout populations. North Idaho bull trout appear to prefer streams with significant ground water recharge which relative to other streams in a basin are often the coldest in the summer and the warmest in the winter. This relationship is not as evident in Central Idaho (Elle, personal conversation). Bull trout in the Flathead Basin are not found in streams where maximum monthly water temperatures exceed 18°C (65°F) and are most abundant where water temperatures are 12°C(53°F) or less (Shepard et al. 1984).

Adult bull trout in Libby Reservoir live in open water in the summer and near shore during the fall (Chisholm et al. 1989). In Flathead Lake, bull trout tend to use the littoral zone (Block 1955). Bull trout occupy the lower portion of the thermocline at depths of 12.2 to 18.3 m in Priest Lake, where water temperatures are 7.2 to 12.8°C (45 to 54°F) and move to the surface when surface water temperatures drop to 12.8°C or lower (Bjornn 1961).

Food Habits

In the Flathead basin, juvenile bull trout (< 100 mm) were found feeding on macroinvertebrates (aquatic insects), with preference for mayflies (ephemeroptera) and flies (diptera) (Shepard et al. 1984). Mayflies, stoneflies (plecopterans), caddisflies (trichopterans) and beetles (coleopterans) are the preferred food of juvenile bull trout in the Muskeg River system of Western Alberta (Boag 1987). Adult bull trout are opportunistic fish eaters (piscivores). In Libby Reservoir, fish account for over 99% of the biomass consumed by bull trout (Chisholm et al. 1989).

Growth

Growth varies between the three bull trout forms. McPhail and Murray (1979) found bull trout grew to larger sizes at lower temperature and grew largest at 4°C. Bull trout rearing in streams are 100 to 150 mm by age 2 to 3 and growth increases once they enter lakes (McPhail and Murray 1979). Generally resident adults range from 150 to 300 mm in length (Goetz 1989,

Mullan et al. 1992) while migratory fish commonly exceed 600 mm in length (Goetz 1989, Pratt 1985, Shepard et al. 1984).

PROBLEMS/THREATS

The current distribution and abundance of bull trout suggest historical habitat modification has directly influenced many populations. The legacy of these historical activities may continue to degrade habitat conditions or depress bull trout populations. However, increased environmental awareness and technical knowledge have stimulated the development of management practices designed to protect water quality and riparian habitats.

Threats to bull trout persistence are linked to habitat modifications caused by timber harvest and associated road development, livestock grazing, mining, dams, hydro-electric development, and irrigation diversions (USDA Forest Service, 1994). Introduction of exotic species has impacted bull trout populations through competitive interaction, predation, and hybridization (Rieman and McIntyre 1993). Hatchery supplementation may introduce genetic threats to wild stocks (Leary et al. 1993). Bull trout have suffered from historical over-harvest. Poaching of spawning adults and mis-identification by fishermen may result in harvest. Any activity that results in significant modifications in the habitat characteristics of: 1) channel stability, 2) substrate composition, 3) cover, 4) temperature, and, 5) migratory corridors should be considered a threat to the persistence of a bull trout population (Rieman and McIntyre 1993). See Appendix C for a more complete discussion of potential threats.

Protection and/or restoration of bull trout in Idaho will require protecting the best remaining habitats, identifying threats from past land use activities, recognizing potential threats from future land use and recommending management practices that will meet the mission and goals of this plan.

BULL TROUT RECOVERY APPROACH

Fundamental to the protection and/or recovery of bull trout throughout their range in Idaho is the designation of bull trout key watersheds. These key watersheds have been identified as critical to the long-term persistence of bull trout populations. They define the land area where management actions will emphasize the maintenance and/or recovery of regionally important bull trout populations throughout Idaho. Bull trout key watersheds are designated on the basis of bull trout biology and life history needs, and not on land ownership. This plan identifies 59 key watersheds (table 6, Appendix F) that contain bull trout populations where protection and/or restoration activities are likely to produce measurable results. These watersheds range in size from 100 to 1000 square miles. The populations they support represent regional metapopulations. A metapopulation (Gilpin 1987) is a group of semi-isolated sub-populations which are interconnected and likely to share genetic material. Other watersheds in Idaho, such as the Coeur d'Alene basin, may contain bull trout, but habitat conditions are so badly degraded that restoration will be long term and potentially expensive (Dave Cross, Ned Horner, pers. comm).

The bull trout key watersheds in Idaho were selected based on five criteria (Rieman and McIntyre 1993):

1. Key watersheds must provide all critical bull trout habitat elements;

2. Key watersheds should be selected from the best available habitat with the best opportunity to be restored to high quality;

3. A key watershed must provide for replication of strong subpopulations within its boundaries. Conservatively, 5-10 subpopulations should be included within a key watershed. If multiple subpopulations cannot be incorporated, a system should not be eliminated from consideration. If strong subpopulations are not available, key watersheds should emphasize population restoration;

4. Key watersheds should be large enough to incorporate genetic and phenotypic diversity, but small enough to ensure that the component populations effectively connect;

5. Key watersheds must be distributed throughout the historical range of the species.

Strong subpopulations (source) within key watersheds, will contribute to weak (sink) subpopulations and should prevent local extinctions. The role of source and sink populations may vary over time.

Bull trout utilize different areas of the key watersheds at during different stages of their life history. Headwater areas are important for spawning and rearing, while mainstem rivers provide migratory corridors and overwintering habitat for fluvial and adfluvial fish. In addition, habitat

conditions within key watersheds will vary depending on natural conditions and land-use history. To most efficiently allocate resources and determine appropriate protection and restoration efforts, habitat conditions within key watershed sub-basins should be evaluated and classified as follows:

1) Focal habitats are critical areas with high-quality habitat, "the best of what is left". Securing focal areas supporting healthy sub-populations of several thousand individuals (source populations) can increase the persistence of adjacent populations in lower quality habitats (sink populations) (Frissell 1993, Rieman and McIntyre 1993, Pulliam 1988, Stacey and Taper 1992).

2) Adjunct habitats are areas adjacent to focal habitats which have been degraded by human or natural disturbances and do not presently support high diversity or abundance of native taxa. Restoration may be necessary to reestablish bull trout. Because of their close proximity to existing bull trout populations, chances are good bull trout populations can be established.

3) Nodal habitats are generally mainstem overwintering areas, and serve as a corridor for migratory life forms.

4) Critical contributing areas are portions of a watershed which are sources of water, wood and sediments to focal, nodal and adjunct habitats.

5) Lost cause habitats are areas so severely degraded that recovery is unlikely, at least within the time span of several human generations.

All the bull trout key watersheds fall within basins defined by Idaho Code 39-3601 as listed in Table 1 and illustrated in Figure 1.

TABLE 1: Listing of how Idaho Code 39-3601 Basins, Proposed DEQ Watersheds and Bull Trout Key Watersheds Nest Together. (Appendix F)

BASIN	PROPOSED DEQ WATERSHED ADVISORY GROUP	BULL TROUT KEY WATERSHED
Southeast		*No bull trout key watersheds*
Southwest/ Snake River	Lower Snake River	Jarbidge River
	Lost River	Little Lost River
	Weiser River	Weiser River
	Boise River	Arrowrock/ NF, MF, SF Boise
		Anderson Ranch/ SF Boise
	Payette River	Middle Fork Payette
		Squaw Creek
		Deadwood River
		Gold Fork
	Brownlee	Indian Creek
		Wildhorse Creek
	Hells Canyon	Hells Canyon - Sheep
Salmon Basin	Little Salmon River	Little Salmon
	Lower Salmon River	Whitebird/ Slate Creeks
		French Creek
		Wind River/ Crooked Creek
		Secesh
		Five Mile/ Sabe
		Lower SF Salmon
		Upper SF Salmon
		Johnson Creek
		Chamberlin Creek
		Horse Creek
		Owl Creek
	Middle Fork Salmon River	Lower Middle Fork
		Big Creek
		Marble Creek
		Upper Middle Fork
		Bear Valley Creek
		Big Creek to Wilson/Camas Creek
		Wilson/ Camas Creek
		Loon Creek
		Panther Creek
	North Fork Salmon River	NF Salmon
		Carmen Creek
		Hat/ Iron
		Indian Creek
	Upper Salmon River	Thompson/ Bayhorse
		Warm Springs Creek
		East Fork Salmon
		Yankee Fork
		Upper Salmon
	Pahsimeroi	Pahsimeroi
	Lemhi	Lemhi
Clearwater Basin	South Fork Clearwater	SF Clearwater
		Clear Creek
		Lolo Creek
	Lochsa River	Lochsa River
	Selway River	Meadow Creek
		Middle Selway
		Upper Selway
		Moose Creek
	North Fork Clearwater	Little North Fork
		Upper North Fork
		Kelly Forks
		Weitas Creek
	Mainstem Clearwater	*No BT key watersheds*
	Palouse River	*No BT key watersheds*
	Potlatch River	*No BT key watersheds*
	Hangman Creek	*No BT key watersheds*
Panhandle	St Joe/ St Marie	Upper St Joe
	Coeur d'Alene, Spokane, Rathdrum	*No BT key watersheds*
	Pend Oreille	Pend Oreille Lake
	Priest	Priest River
		Upper Priest Lake
	Kootenai River	Kootenai River

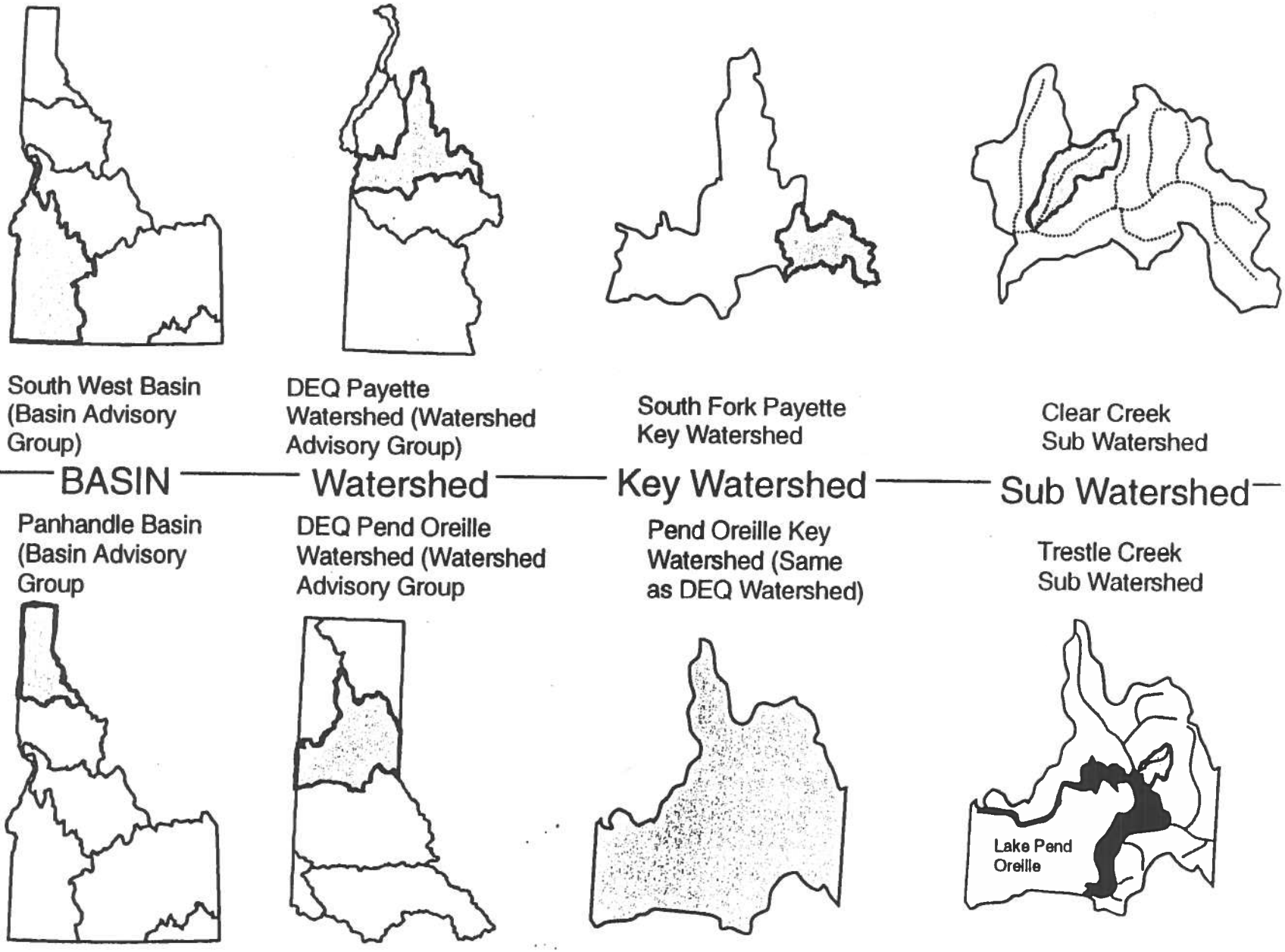


Figure 1 - Example of Bull Trout Basin/Watershed Hierarchy

Under the federal Clean Water Act (CWA), the State has the responsibility to set standards against which success in meeting the goals of the CWA can be measured. Inherent in the standard is the concept of "beneficial uses", and the biological or consumptive use depends upon the quality of the water or aquatic habitat values for each stream or water body. Idaho's general water quality standard requires water quality protection measures sufficient to support all beneficial uses fully.

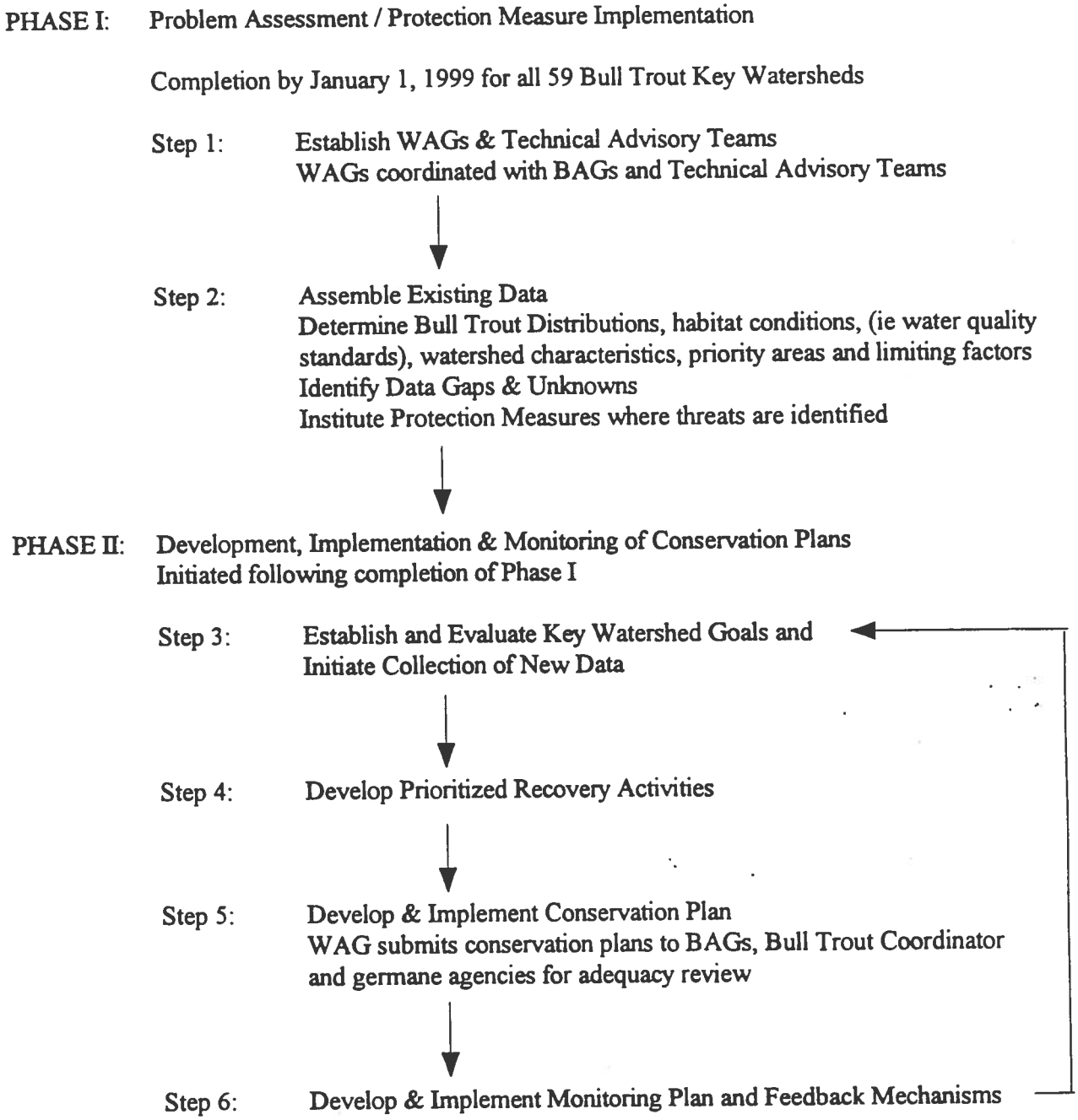
Beneficial uses can be expressed in terms of naturally occurring biological values inherent in a stream, e.g., salmonid spawning for streams with quality sufficient to support that biological use. Beneficial uses can also be designated through a rule. However, streams cannot be downgraded artificially by designating "beneficial uses" beneath its actual capability. For example, a stream's beneficial use cannot be designated as "warm water biota" (a use that may imply lower biological values, and, consequently, relatively minor protection measures) if that stream is capable of supporting "salmonid spawning", a use which requires more stringent water quality protection measures.

Coordination of bull trout and water quality protection efforts best occur at the watershed level. The entire watershed must be considered in order to develop effective site-specific, best management practices and other measures to protect high quality streams and to restore the quality of the streams not meeting standards. For water bodies key to the protection or restoration of bull trout, it is possible to designate "bull trout spawning and rearing" as a beneficial use. Not all water bodies within a bull trout key watershed may require such a designation. Water quality protection measures must be employed which are adequate to assure that the standard is met. The development and implementation of these measures are required by state and federal laws. The entire process is summarized in Figure 2.

The state of Idaho crafted legislation to prioritize water quality problems and implement solutions to those problems (SB1284, amendments to Idaho Code 39-3601, see Appendix E). The legislation is based upon citizen participation in the form of six basin advisory groups (BAGs) in each of Idaho's major hydrologic basins, and numerous watershed specific problem-solving groups within each basin, called watershed advisory groups (WAGS). With the technical support of state and federal agencies, and private industry, these citizen groups will establish priorities and recommend protection measures and appropriate best management practices (BMPs) or modifications of BMPs to resolve water quality problems within their designated watersheds and basins.

The vehicle provided by Idaho Code 39-3601 can also be used to protect and recover bull trout throughout its range in Idaho. It can be used either parallel to or in conjunction with efforts already under way to resolve water quality issues throughout the state.

Figure 2: Flow Diagram of Strategy to Implement Key Watershed Plans



APPENDIX C - THREATS TO BULL TROUT

Timber Harvest

Timber harvest and associated activities such as road construction and skidding can affect the amount, form and function of woody debris, the composition of substrate, and the stability and form of channels (Bisson et al. 1987; Hicks et al. 1991; Sullivan et al. 1987). Many systems exhibit impacts from historical activities such as splash damming, skidding and debris removal which often operated within the stream channel.

Clearcutting and watershed modification are linked to increased water yields, bed load movement, more frequent flooding or scour events (Chamberlain et al. 1991; King 1989; Sullivan and other 1987), and to channel instability (Kapesser 1992). Stream temperatures have been altered with changes in the forest canopy and riparian shading, in water yield and in hydrologic patterns (Beschta et. al. 1987; McGurk 1989; Rishel et. al. 1982).

Forest managers recognize the potential impacts of forest management and design practices to reduce impacts because of new operations (Bission et al. 1992). However, unique or previously impacted areas may be intolerant to any additional increases in sediment or reductions in forest canopy. Impacts from previous activities (legacy effects) may limit current management options.

Road Development

Edwards and Burns (1986) linked levels of fine sediments in streams to road densities. Weaver and Fraley (1991) and Shepard et al. (1984) linked levels of fine sediment to some ground disturbing activities. Many larger streams within key watersheds have roads of varying quality parallel to the channel. These roads often constrain channel meanders and are frequently a source of fine sediments. Also, on steep or unstable slopes, poorly planned, constructed or maintained roads have washed out or triggered large debris flows filling stream channels with sediments and resulting in instability even decades after the road has been abandoned, and they will continue to do so until they are identified and either upgraded or properly abandoned. Many roads were originally built for mining or timber harvest purposes and were subsequently taken over by counties or road districts for public use and residential access. Maintenance is often infrequent and not adequate to limit sediment delivery to streams. Construction of new roads may result in sedimentation if adequate sediment delivery mechanisms are not considered.

Livestock Grazing

The effects of improper livestock grazing include altering and reducing the vegetation adjacent to the stream, thereby reducing cover and shade, and weakening streambanks. This results in increasing bank instability, bank retreat, and bank erosion and sediment delivery to the stream. This alters channel morphology by increasing accumulated fine sediments, degrading stream substrates, reducing bed stability, reducing habitat diversity, reducing over-wintering habitat, widening channels, and decreasing water depths. Other results include increasing water temperature extremes, suspended sediments, nutrients, bacteria and other adverse water chemistry parameters (Armour et al. 1991, Chaney, et al. 1993, and Platts 1991). Proper grazing management can provide opportunities to protect and/or restore riparian areas without large expenditures of money (Elmore and Beschta 1987).

The site specific nature of management is demonstrated by the wide range in predictions of allowable use in riparian zones. These predictions vary from 25% to as much as 70% use (Platts 1991, Clary & Webster 1989, Bryant 1985). Careful consideration must be given to the amount of use and, in particular, to the

amount of foliage remaining after grazing in relation to the site specific system. The degree of allowable use clearly depends upon the characteristics and needs of the individual site.

Mining

There are areas in Idaho which have been impacted by historic open-pit, underground, and placer mining operations and effluent from these closed or abandoned mines. Tailings dams, waste dumps, and diversions provide barriers to bull trout migratory corridors and spawning sites. Toxic constituents (heavy metals) in drainages arising from historic sites may block migratory corridors or kill life stages of bull trout. Some current operations are permitted to alter stream channels. Increased sedimentation or release of toxins into surface or ground water may occur if specified site- specific BMPs are not designed, enforced and maintained.

Dams : Hydroelectric Development & Irrigation Diversion

Fragmentation and disruption of bull trout habitats isolate populations and isolate or eliminate life history forms, particularly fluvial and adfluvial forms. Those effects probably have influenced both local and regional extinctions. Where isolation has occurred, natural events such as floods and drought increase the risk of local extinctions (Horowitz 1978). Dams and irrigation diversion that dewater or block streams are common in many interior basins. Dewatered stream sections and diversion structures can fragment and isolate bull trout populations from the rest of the drainage. Reduced flows below diversions reduce cover and can result in temperature increases to lethal levels.

Direct effects of water withdrawals for irrigation on bull trout habitats include effects on water quality (increased temperature, suspended sediment, nutrients, and pesticides), water quantity, blockage of migration corridors and direct losses of fish into water conveyance systems.

Bull trout are sympatric with resident salmonids, and anadromous species such as spring and summer chinook salmon and steelhead (Schutz and Northcote 1972; Thurow 1987; Ratliff 1992). Migratory conditions in the Snake and Columbia Rivers and habitat losses that have negatively impacted chinook and sockeye (*Oncorhynchus nerka*) salmon stocks in Idaho have also reduced distribution and numbers of bull trout. In watersheds which formerly supported anadromous fish, loss of the anadromous fish due to blockage by dams or population declines has resulted in a subsequent loss of prey for bull trout. This preybase cannot be restored in drainages which have permanently blocked anadromous migration. Drainages which have depressed anadromous populations have the potential to restore the food base if the anadromous fish populations are restored.

Urbanization

Some key watersheds have expanding housing subdivisions and urban development. Houses built along the stream can change runoff patterns and increase sedimentation. Vegetation is frequently cleared from stream banks to improve the view. Septic tanks and drain fields may seep into ground water, altering nutrient chemistry in the stream.

Catastrophic Fire

Past management activities and successful wildfire control have caused a shift in forest species composition and stocking levels, predisposing them to large scale mortality. Recent recurrent drought conditions have

further disposed these forests to increased wildfire incidence and intensity, resulting in significant negative impacts on water quality and fish habitat.

Sport Fishing

The Idaho Department of Fish and Game has declared all waters in the state closed to bull trout harvest beginning January 1, 1996. Most harvest opportunities were closed in 1994. Although seasons for harvest have been closed throughout the state, mis-identification of bull trout as brook trout or lake trout does lead to incidental harvest. Poaching remains a problem in some areas.

Historically, bull trout were considered significant predators on other salmonid game fish species and harvest was encouraged. Bull trout spawners are particularly vulnerable to poaching because they often enter small tributary streams several months prior to spawning and congregate in pools. In developed watersheds, extensive road systems provide easy access to prime spawning areas.

Disease, Predation or Competition

Disease has not been identified as a significant factor in the decline of native bull trout. Introduction of hatchery fish may pose a disease risk to wild stocks of bull trout.

Interactions with introduced non-native fishes through competition, predation, and hybridization have decreased the likelihood that some bull trout populations will persist. Introduced brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*) have been associated with the decline of bull trout populations (Bond 1992; Mullan et al. 1992). Bull trout often appear restricted to waters upstream from those used by introduced rainbow trout and brown trout (Mullan et al. 1992; Pratt 1985). The expansion of lake trout (*Salvelinus namaycush*) may have severely depressed adfluvial bull trout in Priest Lake, Idaho (Rieman and Lukens 1979) and in Flathead Lake, Montana (Weaver and Fraley 1991). Lake trout may prey on juvenile bull trout. Competitive displacement also seems likely where lake trout have been introduced.

Hybridization appears to be a common problem where isolated or remnant bull trout populations overlap with brook trout (Cavender 1978; Leary et al. 1983, 1991). Both species are likely to spawn at about the same time and in some of the same places (Balon 1984), and have similar temperature requirements for incubation (McPhail and Murray 1979). Hybrids are likely to be sterile and experience developmental problems (Leary et al. 1985, 1991). Brook trout likely have a reproductive advantage over resident bull trout because they mature earlier. Hybridization could eliminate a bull trout population (Leary et al. 1993; Mullan et al. 1992).

Hatchery Supplementation

Supplementation of wild bull trout stocks with hatchery bull trout may be harmful by altering or reducing genetic diversity. Ryman and Laikre (1991) have shown the release of artificially reared progeny may reduce the effective population size of local populations because of the greater reproductive success of those adults used to provide hatchery progeny. Hatchery reared Dolly Varden were stocked on the Pend Oreille drainage, but genetic and morphometric measures of present bull trout populations in Pend Oreille show no signs of introgression. There currently is no stocking of hatchery reared bull trout in the state of Idaho.

Table 3: Summary of threats to bull trout habitat and populations.

Activity	Potential Disturbances	Potential Habitat Responses
HABITAT MODIFICATION		
Timber Harvest	- Removal of riparian zone canopy cover - Soil disturbance, increased erosion of fine sediments - Alteration of total basin vegetation cover	- Potentially increased summer water temperatures & formation of anchor ice. - Potential decrease in interstitial spaces and pools (spawning and rearing habitat) - Potential alteration of timing and magnitu of peak flows (hydrology)
Road Development	- Surface erosion, increased fine sediment inputs - Destabilization of upslope areas, increased coarse and fine sediment inputs - Blockage of migratory corridors (culverts)	- Potential decrease in interstitial spaces and pools (spawning and rearing habitat) - Potential for major channel disruption and loss of all habitat with large erosion event - Loss of migratory population component
Livestock Grazing	- Bank damage - In-channel stream bed disruption - Removal of bank vegetation	- Decreased bank stability and direct inputs fine sediments - Loss or disruption of summer rearing habitat - Loss of cover, potential for increased summer water temperatures and formatio of anchor ice
Mining	- Streambed disturbance - Fine sediment inputs - Chemical runoff	- Loss or disruption of spawning and summ rearing habitat - Creation of chemical barriers and/or direct fish mortality
Dams: Hydroelectric Development and Irrigation Diversion	- Blockage of migratory corridors - Increased temperatures, fine sediments and nutrients with waste water returns - Channel dewatering - Loss of anadromous fish	- Loss of migratory population component - Overall decrease in habitat condition - Direct mortality of redds, loss of available habitat - Loss of anadromous prey base
Urbanization, Recreation & Other	- Reduction/removal of riparian vegetation - Streambed damage - Dewatering - Channel stability	- Potentially increased summer water temperatures and formation of anchor ice
Catastrophic Fires	- Fine sediment inputs - Chemical runoff - Channel stability	- Loss or disruption of spawning and summ rearing habitat - Decreased bank stability and direct inputs fine sediments - Potential alteration of timing and magnitu of peak flows
UTILIZATION / HARVEST		
Fishing Harvest	- Direct mortality	- Direct mortality
DISEASE, PREDATION, COMPETITION		
Exotic species introductions	- Competition - Hybridization - Predation	- Displacement from most favorable habitat - Sterile hybrids - Direct mortality

APPENDIX F - BULL TROUT METAPOPULATIONS, KEY WATERSHED DESCRIPTIONS

Gilpin (1987) defined a metapopulation as a group of semi isolated sub-populations which are interconnected so that individuals can migrate to other portions of the watershed and reproduce with other sub-populations.. Sedell and Everett (1993) describe a meta-population as a population comprising local populations that are linked by migrants, allowing for recolonization of unoccupied habitat patches after local extinction events.

Metapopulation principals form the base for selection of the bull trout key watersheds in Idaho. For many key watersheds, connectivity between populations has been lost due to habitat fragmentation. In other key watersheds where connectivity remains on a large scale basis, ie. Salmon River, the physical size of the key watershed and the likely distance a bull trout may travel and the ability to actually measure recovery impacts restricted the size the key watershed. In these cases the key watershed boundaries are somewhat arbitrary and may need adjustments as more information becomes available.

Using criteria suggested by Rieman and McIntyre (1993), bull trout key watersheds should meet at least five criteria.

A key watershed should provide all critical habitat elements. Ideally, a key watershed should meet the needs of migratory and resident life forms.

Key watersheds should represent the best remaining habitat or habitat with the best opportunity for restoration. As an example, a key watershed might consist of a collection of managed and unmanaged or carefully managed watersheds that remain connected by normal migratory corridors.

A key watershed should provide for replication of strong populations within its boundaries. To minimize the risk of extinction a system should consist of multiple, healthy sub-populations.

Key watersheds should be large enough to incorporate genetic and phenotypic diversity, but small enough to ensure theat the component populations effectively connect. If sub-populations are too close to one another, their response to environmental changes may be correlated, or they may become vulnerable to the same random threat. If sub-populations are too far apart, they will not support each other and suffer the long term consequences of genetic drift ro inbreeding. For bull trout, key watersheds should be from 250 to 2500 square kilometers.

Key watersheds must be distributed throughout the historic range of the species. The genetic variation for bull trout is contained among different populations rather than within any single population. Conservation of genetic diversity implies conservation of populations throughout the historic range.

Refugia or refuge habitats:

Locations and habitats that support populations of organisms that are limited to small fragments of their previous geographic range.

Figure 3: Bull Trout Key Watershed Boundaries

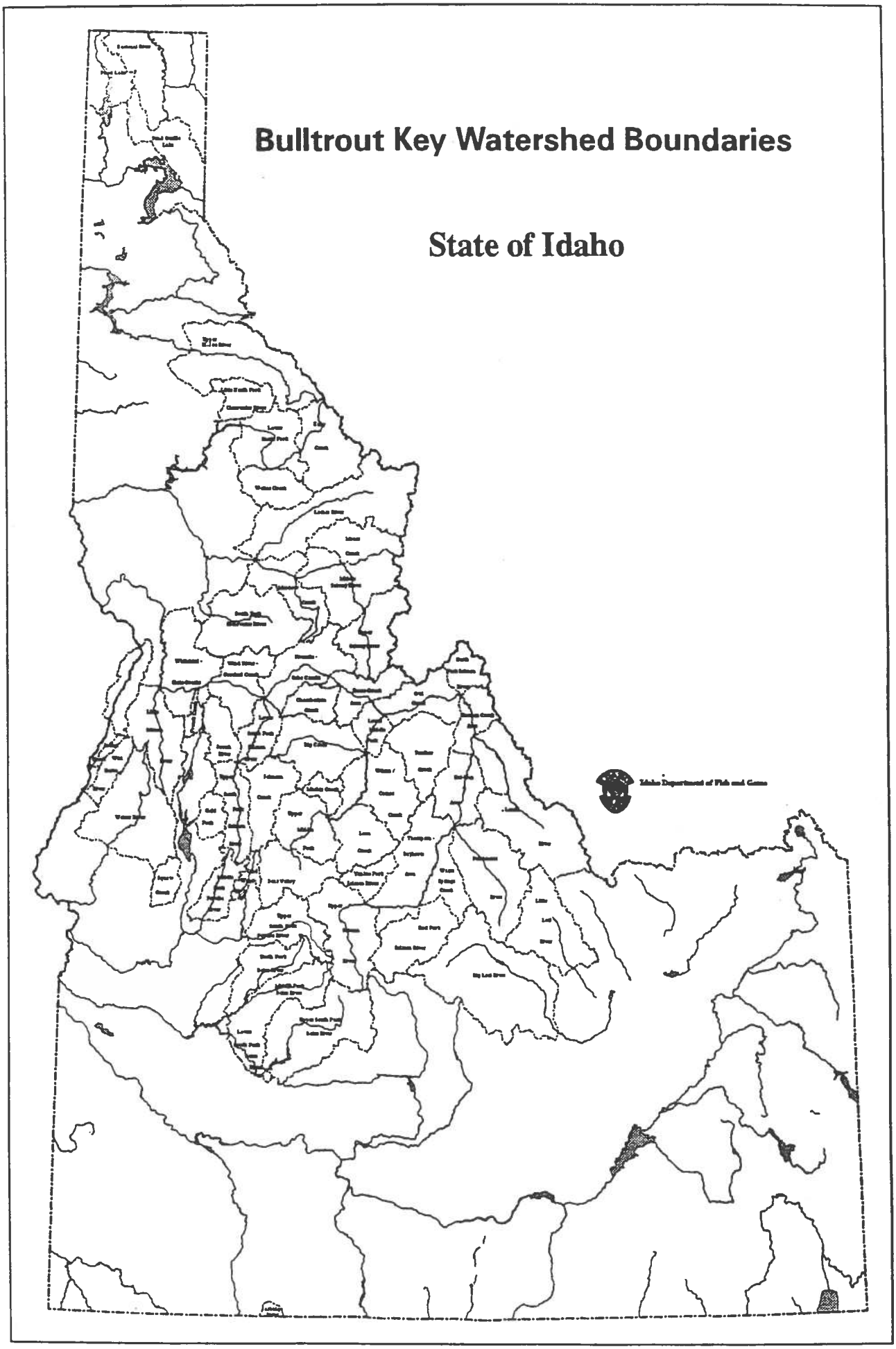


Table 6: Bull Trout Key Watersheds. All key watersheds include tributaries unless otherwise stated.

Basin: Snake River

Key Watershed	Description
Jarbidge River	Upstream of confluence of East Fork and West Fork Remaining known population in Nevada.
Little Lost River	Mouth to Headwaters. This is a remnant population and only known population upstream of Shoshone Falls.
Weiser River	Upstream of, and including, the Little Weiser River.
Boise River, Middle Fork	Upstream of Arrowrock Reservoir. Includes South Fork of the Boise Downstream of Anderson Ranch Reservoir.
Boise River, North Fork	From confluence with Middle Fork to Headwaters.
Boise River, South Fork	Upstream of Anderson Ranch Reservoir.
Payette River, South Fork	Upstream from the Mouth of the Deadwood River. Includes the Deadwood River downstream from Deadwood Reservoir.
Payette River, Middle Fork	Upstream from the mouth of Lightening Creek.
Squaw Creek	Upstream from confluence with 2nd. Fork Squaw Creek.
Deadwood River	Upstream from Deadwood Reservoir.
Gold Fork River (Payette Basin)	Upstream of the diversion dam.
Indian Creek	Upstream from its confluence with the Snake River near Oxbow Dam.
Wildhorse River	Upstream from its confluence with the Snake River near Brownlee Dam.
Hells Canyon	Main Snake River Downstream from Hells Canyon Dam
Basin: Salmon	
Whitebird/Slate	Whitebird Creek drainage, Slate Creek Drainage, and Partridge Creek Drainage.
Little Salmon River	Entire Little Salmon River drainage including Rapid River.
French Creek	Entire French Creek Drainage.
Wind River/Crooked River	Entire Wind River and Crooked River Drainage.

South Fork Salmon River, Lower	The South Fork of the Salmon River Drainage from its mouth upstream to the confluence with the East Fork of the South Fork, not including The Secesh River Drainage or The East Fork of the South Fork Drainage.
Secesh River	The entire Secesh River Drainage.
South Fork Salmon River, Upper	The South Fork of the Salmon River Drainage from the confluence with the East Fork of the South Fork upstream to its headwaters, not including the East Fork of the South Fork.
Johnson Creek	Entire East Fork of the South Fork of the Salmon River up stream to headwaters including entire Johnson Creek Drainage.
Five Mile/Sabe Creeks	The Main Salmon River encompassing the Mallard, Five Mile, Sabe, Bargamin Creek Drainage.
Chamberlain Creek	The entire Chamberlain Creek Drainage.
Horse Creek	The Main Salmon River encompassing the Horse Creek, Disappointment Creek and Cottonwood Creek Drainage.
Middle Fork of the Salmon River, Lower	The Main Salmon River and the Middle Fork of the Salmon River encompassing the Kitchen Creek, Roaring Creek, Papoose Creek and Ship Island Creek Drainage.
Wilson/Camas	The Middle Fork of the Salmon River encompassing the Wilson Creek, Camas Creek, Soldier Creek, Brush Creek, Sheep Creek, and Norton Creek Drainage.
Big Creek	The entire Big Creek Drainage, tributary to the Middle Fork of the Salmon River.
Marble Creek	The entire Marble Creek Drainage, tributary to the Middle Fork of the Salmon River.
Loon Creek	The entire Loon Creek Drainage, tributary to the Middle Fork of the Salmon River.
Middle Fork of the Salmon River, Upper	The Middle Fork of the Salmon River encompassing the Indian Creek, Pistol Creek, Rapid River, Elkhorn Creek and Sulphur Creek Drainage.
Bear Valley/Marsh Creek	The entire Bear Valley Creek and Marsh Creek Drainage.
Owl Creek	The Main Salmon River encompassing the Owl Creek, Boulder Creek, Indian Creek, Pine Creek and Moose Creek Drainage.
North Fork of the Salmon River	The entire North Fork of the Salmon River Drainage

Carmen Creek	The Main Salmon River encompassing the Fourth of July Creek and Carmen Creek Drainage.
Lemhi River	The entire Lemhi River Drainage.
Panther Creek	The entire Panther Creek Drainage.
Hat/Iron	The Main Salmon River encompassing the Hat Creek, Iron Creek, Twelvemile Creek, Warmsprings Creek, and Williams Creek Drainage.
Thompson/Bayhorse	The Main Salmon River encompassing the Thompson Creek, Bayhorse Creek, Morgan Creek, Challis Creek, Garden Creek, and Squaw Creek Drainage.
Pahsimeroi River	The entire Pahsimeroi River Drainage.
Warm Springs Creek	Entire Warm Springs Creek Drainage, tributary to the Main Salmon River.
East Fork, Salmon River	The entire East Fork of the Salmon River Drainage.
Yankee Fork, Salmon River	The entire Yankee Fork of the Salmon River Drainage.
Salmon River, Upper	Main Salmon River encompassing Basin Creek, Valley Creek, Warmsprings Creek, Redfish Creek, Fourth of July Creek, Alturas Creek and the Main Salmon River to its headwaters.
Basin: Clearwater	
North Fork Clearwater	The North Fork of the Clearwater River From Dworshack Reservoir upstream to Kelly Creek.
Little North Fork Clearwater	The Little North Fork of the Clearwater River upstream of Dworshack Reservoir.
Weitas Creek	Entire Weitas Creek Drainage, tributary to the North Fork of the Clearwater River.
Kelly Forks	The entire North Fork of the Clearwater River Drainage from the mouth of Kelly Creek upstream.
South Fork of the Clearwater	The entire South Fork of the Clearwater Drainage upstream from the Meadow Creek Drainage.
Lochsa River	The entire Lochsa River Drainage.
Meadow Creek	Selway River upstream from mouth of Lochsa River encompassing entire Meadow and Gadney Creek Drainages.

Selway River, Middle	The Selway River encompassing the Mink Creek, Marlen Creek, Three Links Creek, Petibone Creek, Bear Creek and Bad Luck Creek Drainage.
Moose Creek	The entire Moose Creek Drainage, tributary to the Selway River.
Selway River, Upper	The Selway River encompassing the White Cap Creek, Indian Creek, Clearwater Creek, Swet Creek, Deep Creek, and Selway River headwaters.
Basin: Panhandle	
St. Joe River	The entire St. Joe River Drainage upstream from Mica Creek.
Coeur d'Alene River	The entire Coeur d'Alene River Drainage.
Pend Oreille Lake	The entire drainage to Pend Oreille Lake.
Priest Lake	The entire drainage to Priest Lake excluding Soldier Creek.
Kootenai River	The entire Kootenai River drainage within Idaho.

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[Rules and Regulations]
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Steelhead

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Parts 222 and 227

[Docket No. 960730210-7193-02; I.D. 050294D]
RIN 0648-XX65

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Endangered and Threatened Species: Listing of Several Evolutionary Significant Units (ESUs) of West Coast Steelhead

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Final rule.

SUMMARY: On August 9, 1996, NMFS completed a comprehensive status review of west coast steelhead (Oncorhynchus mykiss, or O. mykiss) populations in Washington, Oregon, Idaho, and California, and identified 15 Evolutionarily Significant Units (ESUs) within this range. NMFS is now issuing a final rule to list two ESUs as endangered and three ESUs as threatened under the Endangered Species Act (ESA). The endangered steelhead ESUs are located in California (Southern California) and Washington (Upper Columbia River). The threatened steelhead ESUs are located in California (Central California Coast and South-Central California Coast) and Idaho, Washington, and Oregon (Snake River Basin). For the endangered ESUs, section 9(a) prohibitions will be effective 60 days from the publication of this final rule. For the threatened ESUs, NMFS will issue shortly protective regulations under section 4(d) of the ESA, which will apply section 9(a) prohibitions with certain exceptions.

NMFS has examined the relationship between hatchery and natural populations of steelhead in these ESUs, and has assessed whether any hatchery

[[Page 43938]]

populations are essential for their recovery. Only the Wells Hatchery stock in the Upper Columbia River ESU is essential for recovery and included in this listing. Aside from the Wells Hatchery stock, only naturally spawned populations of steelhead (and their progeny) residing below long-term, naturally and man-made impassable barriers (i.e., dams) are listed in all five ESUs identified as threatened or endangered.

At this time, NMFS is listing only anadromous life forms of O. mykiss.

DATES: Effective October 17, 1997.

ADDRESSES: Protected Resources Division, NMFS, Northwest Region, 525 NE Oregon Street, Suite 500, Portland, OR 97232-2737.

FOR FURTHER INFORMATION CONTACT: Garth Griffin, 503-231-2005, Craig Wingert, 562-980-4021, or Joe Blum, 301-713-1401.

SUPPLEMENTARY INFORMATION:

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Southern Region

Proposed Recovery Plan for Snake River Salmon

Salmon and Wildlife Photographs copyright 1994, Natalie Fobes

U.S. Department of Commerce
National Oceanic and Atmospheric Administration

National Marine Fisheries Service

March, 1995

PROPOSED RECOVERY PLAN FOR SNAKE RIVER SALMON

U.S. Department of Commerce
National Oceanic and Atmospheric Administration

Rolland Schmitten, Assistant Administrator for Fisheries
William Stelle, Jr., Regional Director, Northwest Region
Robert P. Jones, Jr., Recovery Plan Coordinator

MARCH 1995

Executive Summary

Background

Salmon are culturally, economically, and symbolically important to the Pacific Northwest. Columbia River chinook populations were at one time acknowledged to be the largest in the world. Prior to the 1960s, the Snake River was the most important drainage in the Columbia River system for producing salmon. But in the 1990s, Snake River salmon struggle to exist. Snake River salmon have declined to such low levels that protection under the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 et seq.) is needed to prevent their extinction (November 20, 1991, 57 FR 58619; April 22, 1992, 57 FR 14653; August 18, 1994, 59 FR 42529; and December 28, 1994, 59 FR 66784). In the 1800s, there were approximately 1.5 million Snake River chinook salmon; by 1994, only 1,800 adults returned to the Snake River. Snake River fall chinook salmon numbered over 72,000 fifty years ago, but only 400 adults were counted at Lower Granite Dam in 1994. As many as 4,400 Snake River sockeye salmon could be found forty years ago, but last year only one returned to Redfish Lake.

The ESA requires that the agency responsible for a particular listed species develop and implement a recovery plan for its conservation (defined by the ESA as recovery to delisting) and survival, unless it is determined that such a plan will not promote the conservation of the species. Accordingly, NMFS appointed the Snake River Salmon Recovery Team (Team) to assist in the development of the recovery plan for the Snake River salmon. In May 1994, the Team submitted its final recommendations to NMFS. NMFS used these recommendations to formulate the Proposed Snake River Salmon Recovery Plan.

The conservation of natural salmon and their habitat has not been afforded balanced consideration in past resource allocation decisions. Natural salmon are those that are the progeny of naturally spawning parents. Development in the Pacific Northwest has often proceeded with the assumption that improved technology or management would mitigate impacts on natural salmon stocks. The Region's reliance on uncertain mitigation schemes (as opposed to fundamental conservation strategies) has been a very costly approach, both for natural salmon and the public.

Institutional Structure

NMFS believes (as did the Team) that an improved decision-making process is necessary to restore Columbia Basin ecosystem health and ensure Snake River salmon recovery. Such a process will also protect and improve habitat through the adaptive management process, prevent further listings, and conserve other fish and wildlife. To achieve these goals, NMFS will appoint, convene, and chair a Recovery Implementation Team which will represent state, tribal, and Federal policy leaders and thereby ensure effective coordination, teamwork, and communication among all entities having responsibility for Snake River salmon recovery. To ensure that salmon recovery actions remain scientifically based, NMFS will also consider appointing and convening a Scientific Advisory Panel and technical committees to provide scientific and technical support to the Recovery Implementation Team.

Delisting Criteria

The Team's and NMFS' recovery requirements and delisting criteria for ESA-listed Snake River Basin salmon are very similar and fall into two major categories: (1) Remedying the environmental (and other) factors that have reduced the stocks to levels which are in danger of extinction; and (2) rebuilding populations to levels where there is evidence of improved productivity, even when considering the potential impacts of severe stochastic environmental events (e.g., protracted drought, oceanic El Niño effects, etc.). Both of these categories must be achieved in order to consider delisting. To determine rebuilding levels above, NMFS proposes to use cohort replacement rates and numeric delisting criteria.

The cohort replacement rate describes the rate at which each subsequent cohort, or generation, replaces the previous one. When this rate is exactly 1.0, a population is neither increasing nor decreasing. If the ratio remains less than 1.0 for extended periods, a population is in decline, and could continue into extinction--a risk which originally led to listing Snake River salmon. For population rebuilding, the cohort replacement rate must be

greater than 1. For delisting to be considered, the eight-year geometric mean cohort replacement rate of a listed species must exceed 1.0. For Snake River spring/summer chinook salmon, this goal must also be met for 80 percent of the index areas available for estimating cohort replacement rates.

For sockeye salmon, the numerical escapement goal is an eight-year (approximately two-generation) geometric mean of at least 1,000 natural spawners returning annually to Redfish Lake and 500 natural spawners in each of two other Snake River Basin lakes. The numerical escapement goal for Snake River fall chinook salmon is an eight-year geometric mean of at least 2,500 natural spawners in the mainstem Snake River annually. Snake River spring/summer chinook salmon have two numeric delisting criteria; both must be met for delisting to be considered. The first numerical escapement goal for Snake River spring/summer chinook salmon is an eight-year geometric mean corresponding to at least 60 percent of the pre-1971 brood year average redd counts for 80 percent of the available index areas. The second numerical escapement goal for spring/summer chinook salmon is an eight-year geometric mean equal to 60 percent of the 1962-1967 brood year average count of natural spawners past Ice Harbor Dam (goal is equal to 31,440).

Tributary Ecosystem

Land and water management actions, including water withdrawals, unscreened water diversions, stream channelization, road construction, timber harvest, livestock grazing, mining, and outdoor recreation have degraded important salmon spawning and rearing habitats. To protect tributary ecosystem health, NMFS proposes a three-part approach: (1) Protect remaining high quality habitat by ceasing activities that would degrade ecosystem functions and values that listed fish need, (2) restore degraded habitats, and (3) provide connectivity between high quality habitats. Federal lands and Federal actions should bear, as much as possible, the burdens of recovering listed salmon species and their habitat. However, non-Federal lands constitute approximately 35 percent of the Snake River salmon critical habitat. Therefore, an ecosystem approach that emphasizes integrated Federal and non-Federal land management is needed. To achieve this, all stakeholders in a subbasin or watershed are encouraged to participate in management partnerships. The Plan also proposes actions that will reduce the loss of listed species at water withdrawal sites, rebuild salmon

SNAKE RIVER SALMON PROPOSED RECOVERY PLAN
SUMMARY TABLE

TASK NO.	PRIORITY	RECOVERY TASKS	RESPONSIBLE ENTITY	DURATION
		INSTITUTIONAL STRUCTURE, ACCOUNTABILITY AND MONITORING		
0.1		**CREATE AND IMPLEMENT A COORDINATED INSTITUTIONAL STRUCTURE TO ENSURE A UNIFIED APPROACH TO RECOVERY OF ESA-LISTED STOCKS**		
0.1.a.	1	Appoint, convene, and chair a Salmon Recovery Implementation Team.	NMFS	One year to establish then ongoing
0.1.b.	1	Appoint and convene a Scientific Advisory Panel.	NMFS	One year to establish then ongoing
0.1.c.	1	Establish supportive committees and work groups.	NMFS	One year to establish then ongoing
0.1.d.	1	Establish a dispute resolution process.	NMFS	One year to establish then ongoing
0.2.		**COORDINATE CONSERVATION AND MANAGEMENT AMONG ALL RELATED COLUMBIA BASIN ANADROMOUS FISH STOCKS**		
0.2.a.	1	Evaluate and implement opportunities to integrate the scientific review, planning, and information management functions of this Recovery Plan with the NPPC Fish and Wildlife Program.	NMFS and NPPC	One year
0.3.		**PROVIDE A UNIFIED APPROACH FOR MANAGING INFORMATION AND DATA GATHERING SYSTEM**		
0.3.a.	1	Consolidate regional efforts to develop a coordinated information and data gathering system.	NMFS, in Consultation with the ISP, NPPC, and its Independent Scientific Group	One year to establish then ongoing
0.3.b.	1	Consolidate regional capabilities to establish a coordinated regional approach for biological analysis and modeling.	NMFS, in Consultation with the ISP, NPPC, and its Independent Scientific Group	One year to develop then ongoing
0.3.c.	1	Consolidate regional capabilities to establish regional approach to hydrological analysis.	NMFS in consultation with the NPPC	One year to establish then ongoing
0.3.d.	3	Prepare and disseminate an annual performance report on Plan implementation.	NMFS in consultation with the NPPC	Annual
		TRIBUTARY ECOSYSTEM		
1.1	1	**PRESERVE REMAINING LISTED SALMON POPULATIONS BY PROTECTING IMPORTANT HABITAT**		
1.1.a.	1	Develop a comprehensive inventory and summary of historic and present habitat quantity and quality.	Habitat Committee	One year
1.1.b.	1	Protect and restore important habitat on Federal lands.	USFS and BLM	Ongoing
1.1.b.1)	1	Establish specific Riparian Management Objectives	USFS and BLM	Ongoing
1.1.b.2)	1	Designate USFS & BLM riparian habitat conservation areas and protect them from activities that would degrade riparian or stream habitats or adversely affect listed salmon.	USFS and BLM	Ongoing

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TASK NO.	PRIORITY	RECOVERY TASKS	RESPONSIBLE ENTITY	DURATION
1.1.b.3)	1	Identify and protect watersheds that contain or support both high quality habitat and habitat that can be readily restored (Priority Watersheds)	NMFS, USFS, and BLM	
1.1.c.		Ensure that inwater activities do not result in habitat destruction.	COE, other Federal and state	Ongoing
1.2	1	**REDUCE LOSS OF LISTED SPECIES AT WATER WITHDRAWAL SITES**		
1.2.a.	1	Conduct site assessments to ascertain the extent and condition of water diversion screening.	IDFG, ODFW, WDFW, Fish Screen Oversight Committee	Three years
1.2.b.	1	Ensure that gravity and pumped water diversions to have operational screens that meet NMFS criteria.	Oregon	Two years
			Washington	One year
			Idaho	Eight years
1.3	2	**REBUILD LISTED SALMON POPULATIONS BY RESTORING HABITAT**		
1.3.a.	2	Fertilize Stanley Basin Lakes to improve sockeye productivity.	IDFG, USFS, Fish Production Committee	Ongoing
1.4	2	**ACCELERATE REBUILDING OF SALMON POPULATIONS THROUGH IMPROVED LAND MANAGEMENT PLANNING**		
1.4.a.	2	Develop long-term approaches for ecosystem management at the landscape and watershed scale on Federal lands	USFS, BLM	Two years
1.4.b.	2	Develop and implement subbasin habitat management plans.	Fishery agencies, tribes, BPA, EPA, BOR, USFS, BLM, NRCS, NPPC, local governments, private landowners	Two years
1.4.c.	2	Establish a process for developing habitat conservation plans and agreements that would help non-Federal land owners protect and restore Snake River salmon habitat. Develop and implement a training and outreach strategy.	NMFS, FWS	Two years
1.4.d.	2	Provide incentives to assist with protection of riparian areas on private lands where grazing occurs.	FWS, NRCS, and state Depts of Natural Resources and Ecology	One year
1.5.	2	**REBUILD SALMON POPULATIONS BY PROVIDING ADEQUATE INSTREAM FLOWS**		
1.5.a.	2	Determine instream flow protection levels needed to protect all salmon life stages, determine effects of water withdrawals on salmon survival, and develop hydrographs of the Columbia River Basin.	Federal, state, tribes, and NMFS	Two years
1.5.b.	2	Complete a subbasin by subbasin inventory and assessment of all water withdrawal sites and develop subbasin plans to conserve water.	Oregon, Washington, Idaho, BOR, NRCS, NMFS, COE, tribes, local entities	Two years
1.5.c.	2	Continue existing moratoria on issuing water rights in the Snake/Columbia River mainstems.	Oregon, Washington, Idaho	Ongoing
1.5.d.	2	Ensure that any diversions affecting salmon streams are equipped with lockable headgates and gauges that measure instantaneous and seasonal flows.	NMFS, Oregon, Washington, Idaho	Ongoing
		Advocate continuation of the Conservation Reserve Program.	Federal agencies	Ongoing

TASK NO.	PRIORITY	RECOVERY TASKS	RESPONSIBLE ENTITY	DURATION
1.6	2	**REBUILD SALMON POPULATIONS BY IMPROVING FISH PASSAGE AT BARRIERS**		
1.6.a.	2	Identify and require improvements to small hydropower projects (licensed or unlicensed) that adversely affect fish habitat.	FERC	Reopen licenses by April 1997 then ongoing
1.6.b.	2	Eliminate "push-up" berms through development of alternatives, such as screened intakes and/or consolidation of withdrawal sites.	NRCS Conservation districts, irrigators	Two years
1.6.c.	2	Eliminate obstacles to fish passage in lakes that historically provided spawning habitat for sockeye salmon.	USFS and IDFG	One year
1.7	3	**REDUCE LOSSES OF LISTED SPECIES ASSOCIATED WITH POOR WATER QUALITY**		
1.7.a.	3	1) Develop and enforce non-point source pollution standards for areas supporting listed Snake River salmon. 2) Determine extent of effects of mixing/dilution zones allowed in current water quality regulations. (3) Review water quality standards, compliance, and enforcement procedures; and 4) Make necessary changes.	State and Federal Water Quality Authorities	EPA report to Habitat Committee by September 1996 then ongoing
1.8	3	**REDUCE IMPACTS ON SALMON FROM RECREATIONAL ACTIVITIES**		
1.8.a.	3	Control recreational activities that may impact habitat critical to Snake River salmon.	FWS, USFS, BLM, IDFG, and ODFW	Ongoing
		MAINSTEM AND ESTUARINE ECOSYSTEM		
2.1	1	**REDUCE LOSS OF JUVENILE FISH THROUGH FLOW AUGMENTATION AND IMPROVED WATER MANAGEMENT**		
2.1.a.	1	Improve spring and summer flows in the Columbia and Snake Rivers through additional flow augmentation and manage these flows on an inseason basis.	COE, BPA, BOR	Ongoing
2.1.a.1)	1	Advise the operating agencies on dam and reservoir operations, incl. transportation and spill activities, to optimize passage conditions for juvenile and adult anadromous salmonids.	TMT	Ongoing
2.1.a.2)	1	Develop a water management plan by April 15 of each year based on the run-off forecast for that year.	TMT	Ongoing
2.1.a.3)	1	Incorporate the provisions of this plan into Pacific Northwest Coordination Agreement planning.	COE, BOR	Two years
2.1.b.	1	Recommend the shaping of flows inseason in accordance with the guidance described in 2.1.a. and consider the goal of meeting seasonal average flow objectives at the locations and for the time periods specified in the plan.	TMT	Ongoing
2.1.c	1	Implement operational guidelines to improve flows for migrating salmon, and manage those flows on an inseason basis to optimize fish survival.	Action agencies	Ongoing
2.1.c.1)	1	Operate the FCRPS during the fall and winter months in a manner that provides the following levels of confidence of refill to April 20 flood control elevations. 75% at Libby and Hungry Horse, 85% at Grand Coulee and 90% at Albeni Falls.	COE, BPA, BOR	Ongoing
2.1.c.2)	1	Negotiate to store water in non-treaty storage (NTS) during the spring for release in July and August.	BPA, BC Hydro, US NTS Agreement signatories	Ongoing
2.1.c.3)	1	Operate the FCRPS to meet flow objectives during the spring and summer salmon migrations with limits on reservoir elevations by August 31.	COE, BPA, BOR	Ongoing

Null hypotheses should be developed for monitoring and evaluation in reference watersheds and in other watersheds where restoration and land management projects are more active.

1.1.c. The COE and other Federal and state agencies should ensure that inwater activities do not result in habitat destruction (ecological functions are maintained or increased), that methods are used (where possible) to increase habitat values, and that work will not adversely affect salmonids.

Habitat critical to salmonids can be substantially altered by inwater activities, including construction, erosion control, flood control, and gravel and sand mining.

Under the Rivers and Harbors Act of 1899 and section 404 of the Clean Water Act, the COE issues permits for inwater work. Under the Fish and Wildlife Coordination Act (FWCA), NMFS and USFWS have authority to review and comment on activities, permitted by the COE, that affect fish and wildlife. Under the FWCA, state agencies are also provided the opportunity to comment on COE-permitted projects.

To provide permit applicants with a clear understanding of what activities are acceptable, NMFS should, by January, 1996, develop criteria for the COE to use in permits for inwater activities in tributary habitat. These criteria should facilitate the permitting process.

1.2 Biological Objective: Reduce loss of listed species at water withdrawal sites.

As described in the Impediments to Recovery section, water withdrawals can directly harm listed salmon in unscreened or inadequately screened diversions and by dewatering streams where the species migrate, spawn, and rear.

As the SRSRT stated:

> There is an urgent need to develop effective diversion controls for all streams used for spawning, rearing, and migration of ESA-listed Snake River salmon. Diversions that are critical to the survival and migration of salmon should be brought up to standard with respect to: (a) approach velocity requirements and the adequacy of screening in excluding fish from diversion lines, (b) the adequacy of by-pass devices

in returning fish to streams from screened diversion lines, (c) the adequacy of fish passage in any "head" structures placed in streams to assist in diversion, (d) the adequacy of water left in streams, and (e) the adequacy of the quality of that water. All diversions should be screened with up-to-date equipment and be maintained in fully operable condition. The dewatering of salmon breeding and rearing habitat must be eliminated. Water quality standards must be reviewed for possible strengthening with respect to providing special protection for ESA-listed and other at-risk salmonids. If changes are required, they must be enforced. The monitoring of screen use, screen performance, and the quantity of water diverted must be greatly improved.

The following tasks are designed to address screening needs in tributary habitat. Tasks associated with water adequacy are addressed in Biological Objective 1.5, of this chapter.

1.2.a. The IDFG, ODFW, WDFW, and the Fish Screening Oversight Committee (FSOC), in coordination with the Habitat Committee and other state and Federal agencies as appropriate, should carry out site assessments to ascertain the extent and condition of water diversion screening in the Snake River Basin.

This task should be completed by October, 1997.

1.2.b. State fisheries and water resources agencies, in coordination with the Federal agencies and Tribes, should ensure that all gravity and pumped water diversions in Washington, Oregon, and Idaho within the designated critical habitat for listed Snake River salmon have operational screens that meet NMFS screening criteria (Appendix D).

State fisheries and water resources agencies, in coordination with the Federal agencies and Tribes, should ensure that gravity diversions are screened by 1995 in Washington, by 1996 in Oregon, and by 2002 in Idaho. The screens should meet NMFS' screening criteria (Appendix D). Pumped-water diversions in Oregon, Washington, and Idaho within designated critical habitat for listed Snake River salmon should be screened by October 1998. Highest priority should be placed on those projects that pose the greatest threat to listed Snake River salmon.

In the interim, these entities should immediately begin implementing a pilot program of installing pump diversion screens in the three states, concentrating first on the diversions that have the largest potential for affecting listed Snake River salmon.

Oregon, Idaho, and Washington have existing statutes that require adequate screening to protect fisheries resources. In addition, the COE has the authority for some diversions to require owners to expeditiously repair or replace screens that do not meet NMFS' screening criteria. The state water resource agencies and the COE should immediately increase monitoring and enforcement of juvenile fish screen use in critical habitat areas.

Beginning in 1996, the COE, NMFS and other appropriate entities, should ensure that all diversion screens are inspected annually during the diversion season. Inspections should be made by state or Federal agencies, the owners and operators, or through the cooperative effort of all parties.

State and Federal entities should require all screen/intake owners and operators to inspect screens yearly (remote video, diver/video, or dewatering/dry inspection are all acceptable methods) prior to juvenile outmigration. Inspections should be conducted in late summer during low water periods to facilitate repairs prior to the next juvenile outmigration. NMFS should conduct an annual survey that inspects at least 20 percent of all diversions to ensure owners/operators compliance.

By the end of FY 1995, NMFS and the NPPC should develop a plan to involve all state and Federal agencies with authority over water withdrawals (as well as the entities operating the withdrawals) in providing the necessary funding for screen construction.

The NPPC has called on all state and Federal agencies involved in water withdrawals to provide funding for screen construction on an accelerated time line. The FSOC should serve to coordinate this effort. The NPPC, in their Fish and Wildlife Program has called for funding at the level of 15 million dollars per year from all sources with the goal of screening all diversions by the end of 1996. In NMFS' Draft Report to Congress: Irrigation Diversion Screening in the Columbia River Basin Above Bonneville Dam (February 1995), an approach

to screening all diversions by 2002 was presented. This approach relies on NMFS being provided with funds adequate to ensure full utilization of the screen construction capabilities of the states of Oregon, Washington, and Idaho. Any funding beyond that provided by NMFS would help to accelerate the completion date.

As part of the ongoing FSOC activity, immediately begin to identify innovative alternative approaches to traditional screening of diversions.

Tasks to Begin Recovery

1.3. Biological Objective: Rebuild listed salmon populations by restoring habitat.

1.3.a. Beginning in 1995, IDFG and the USFS in consultation with the Fish Production Committee should fertilize Stanley Basin Lakes to improve sockeye productivity.

"Experiences elsewhere indicate that controlled fertilization of oligotrophic lakes with selected nutrients can significantly increase their carrying capacity for juvenile salmonids" (Koenings and Burkett 1987). NMFS is concerned that the highly oligotrophic character of the Stanley Basin lakes may not allow forage production at levels high enough to support reasonable populations of naturally-spawned sockeye salmon. For instance, Bjornn et al. (1968) estimated that Redfish Lake normally produced fewer than 65,000 sockeye salmon smolts annually. Calculations based on measured chlorophyll a levels indicate that Redfish Lake smolt carrying capacity may currently be less than 50,000 sockeye salmon smolts (Wurtzbaugh 1993).

The Stanley Basin Technical Oversight Committee is planning a lake fertilization project. This task is intended to support and, if necessary, augment that planning. It is emphasized that while there may be initial increases in juvenile production and outmigration, the ultimate benefits rest upon river and ocean survival and adult returns.

and Conservation Service in the form of cost-sharing for implementation of grazing use practices such as fencing, spring developments, and alternative watering facilities. Technical assistance is available from the NRCS for developing resource management plans and practices.

The Habitat Subcommittee should assist the agencies in developing a consistent, integrated education program for illustrating the benefits of maintaining a healthy riparian system. The agencies should also actively pursue new methods of providing assistance (e.g., the proposed West Coast Fish and Habitat Restoration Initiative). By December 1995, the Habitat Subcommittee should report to NMFS on the progress made in those areas.

The NRCS should provide the Habitat Committee with a yearly progress report (beginning in December of 1995 and submitted in December of each year thereafter) on the specific assistance provided for riparian area protection on private lands and how effective the program is in reducing grazing damage.

1.5 Biological Objective: Rebuild salmon populations by providing adequate instream flows.

The SRSRT recommended that the state fishery agencies "[e]nsure that actual streamflow withdrawals for diversions are not in excess of legal water rights. If insufficient streamflows are still occurring, reduction of irrigation withdrawals should be sought wherever such withdrawals lead to insufficient streamflow for habitat, impede downstream or upstream passage, or infringe upon water quality control at any downstream location."

The following tasks are designed to provide adequate flows for spawning, rearing and migration of listed salmon.

1.5.a. The state and Federal fisheries agencies and tribes should determine instream flow levels needed to meet listed salmon needs for all life stages. The state water resource agencies, BPA, COE, BOR and NMFS should determine the effects of water withdrawals, and develop hydrographs of the Columbia River basin.

By April 1996, the state and Federal fisheries agencies and Tribes should present a report to the Habitat Committee on methods and timelines for determining instream flow requirements for tributary and mainstem habitats. In addition, the states, Tribes, NMFS and other Federal agencies should fund and complete an evaluation of how water withdrawals, depletions, and return flows affect the natural Columbia and Snake River hydrographs and compare the magnitude of these effects to those caused by upstream storage.

1.5.b. The states of Oregon, Washington and Idaho, in conjunction with the COE, BOR, NRCS, NMFS, tribes and local entities, should complete a subbasin-by-subbasin inventory and assessment of all water withdrawal sites that affect critical habitat. These entities should assess the effects of withdrawals in the subbasin on listed species and critical habitat, and take actions, including the development of subbasin plans, to conserve irrigation water and increase stream flows.

By September 1995, the state and Federal agencies should construct an integrated data base that identifies all surface and groundwater irrigation withdrawal sites and all sites that affect critical habitat. Reports should include location, quantity, and priority date. Unperfected municipal and industrial water rights, agricultural water rights, and individual water rights should also be identified. The agencies should include in their inventory all Conservation Reserve Program (CRP) lands, and identify the existing water rights associated with these lands.

By October 1996, the state and Federal agencies should assess the effect these withdrawals have on fish passage, fish entrainment, and achievement of minimum flows.

State and Federal agencies, tribes and local governments in each subbasin should develop plans that identify opportunities for combining withdrawal sites, removing withdrawal structures from the rivers, enforcing water withdrawal amounts, and maintaining minimum stream flows and passage routes. The plans should also recommend where water rights should be purchased (on a willing seller basis). The listed salmon will benefit if there are fewer passage structures to delay fish passage, less entrainment of fish, fewer adverse modifications to water quality, and reductions in bed load trapping.

The states, tribes, and Federal agencies should use all available authorities to obtain increases in stream flows during critical low flow periods and to protect water provided for salmon habitat or passage. If existing authorities are inadequate, the agencies should identify needed authorities and seek legislative approval. In addition, a strategy should be developed to acquire and protect instream flow rights. The Habitat Subcommittee, working with the NPPC, should review existing state laws, regulations and practices and make recommendations to NMFS on actions the state, tribal and Federal governments can take to ensure adequate instream flows for all salmon life stages.

The BPA, BOR, NRCS and other Federal and state fish and water resource agencies should develop incentives (e.g., through cost sharing) to encourage irrigators to modify irrigation techniques and repair and update water delivery systems. They should also develop outreach and education programs that demonstrate the methods and benefits of updating water delivery systems.

By April 1996, the BPA, BOR, and NRCS, in coordination with local conservation districts and Federal and state extension services, should begin a public awareness and education program to help irrigators understand the benefits, both for the resource and the irrigator, of using more efficient water application systems. This forum should also be used to solicit input from irrigators on potential ways to modify irrigation techniques.

1.5.c. The states of Oregon, Idaho, and Washington should continue their existing moratoria on issuing water rights in the Snake/Columbia River mainstems and should extend those moratoria to include tributaries and ground water in continuity with surface flows.

There are many instances where designated critical habitat suffers from streamflow over-appropriation. Inadequate streamflow affects listed fish both in spawning and rearing areas and in the migration corridor. Additional withdrawals will only result in increased adverse affects on critical habitat. Oregon, Idaho, and Washington should extend their existing moratoria on issuing water rights to avoid exacerbating this problem.

1.5.d. The states of Oregon, Washington, and Idaho should ensure that any diversions affecting critical habitat are equipped with headgates that control and gauges that measure instantaneous and seasonal flows.

The cumulative impacts of unauthorized water withdrawals may manifest themselves in loss of spawning and rearing habitat, increased water temperatures, reduced bedload transport, and localized reduction in water velocity. In addition, invertebrate populations may decrease, and there may be adverse changes in stream bank morphology and riparian plant community structure.

Beginning in 1996, the Habitat Subcommittee should report to NMFS on the progress of headgate and gauge installation. The reports should be made every December. The gauges should be monitored to prevent excess water withdrawal.

1.5.e. Federal agencies and the states and Tribes should work to continue of the Conservation Reserve Program (CRP).

Although the CRP was developed to establish permanent vegetative cover on cropland that is highly erodible or contributing to serious water quality problems, the possible termination of the CRP may result in substantial erosion and additional water withdrawal from the Snake River. This could further degrade the ecological integrity of the mainstem Snake River.

If the CRP is continued, strong consideration should be given to including a provision in future CRP applications in critical habitat areas that prevents water in the program from being used to bring other land into production. Emphasis should also be placed on applications that would provide additional water to salmon-bearing streams.

1.6 Biological Objective: Rebuild salmon populations by improving fish passage at barriers.

1.6.a. To reduce impacts on tributary habitat from small hydropower development, the Federal Energy Regulatory Commission (FERC) should identify and require improvements to small hydropower projects (licensed or unlicensed) that adversely affect fish habitat.

Small hydropower projects may adversely affect listed salmon through: Dewatering affected stream reaches; providing insufficient minimum flows through the affected project reach; provides poor fish passage; having unscreened power canals; adversely modifying water quality (temperature, dissolved gas levels, temporal flows); impeding gravel and large and small woody debris recruitment; and limiting stream functions and habitat types. Improving conditions at these facilities could increase survival of both adult and juvenile fish.

As the responsible agency, FERC issues hydropower licenses and exemptions from licensing to a large number of public (non-Federal) and private entities engaged in building, maintaining, and operating hydropower facilities. By April 1996, FERC should conduct a watershed-by-watershed inventory and evaluation of existing and proposed small hydropower facilities in the designated critical habitat. In cooperation with the license holders, Federal and state fishery agencies, affected Tribes, and the appropriate land management agency, FERC should examine each license to determine if adverse conditions are fostered by operations under conditions specified in the license. NMFS and the USFWS should provide guidance to FERC on the criteria to be used for such an evaluation.

Where adverse conditions are present, those licenses should be reopened (by April 1997) and the problems rectified, or the project should be shut down and removed. Projects without a license should be licensed under conditions appropriate to protecting critical habitat or they should be removed. FERC should provide an annual report to NMFS (beginning in December of 1996 and in December of each year thereafter) on the results and progress of rectifying small hydropower projects that adversely affect salmon habitat.

1.6.b. The NRCS and the Conservation Districts should work with irrigators to eliminate "push-up" berms.

Many irrigation diversions are berms constructed by "pushing up" or piling streambed materials. These berms may prohibit adult spawning migrations and eliminate access to important juvenile rearing areas. Additional impacts include suspension of fine sediment during construction, channel erosion, potential destruction of spawning habitat, and depletion of spawning gravel.

By April 1996, the NRCS and the Conservation Districts should ascertain the current extent and locations of push-up berms and begin working to modify water withdrawal techniques. Such modifications might include screened intakes and/or consolidation of withdrawal sites. Concurrently with this effort, the COE, NMFS, and state agencies should consider actions to regulate this practice in waters affecting anadromous fish.

NRCS should prepare and submit, by September 1996, a report to the Habitat Committee on the results of the push-up berm site inventory.

1.6.c. The USFS and IDFG should eliminate obstacles to fish passage in lakes that historically provided spawning habitat for sockeye salmon.

Fish migration barriers were installed in the late 1950s and early 1960s on the outlets of Stanley, Pettit, and Yellow Belly Lakes. These barriers were installed to block migration into these lakes by nongame fish such as squawfish, suckers and sculpins which are highly predatory on juvenile salmonids (BPA 1994). Pearce (1992) describes these barriers as

having a water fall drop of approximately five feet onto a horizontal apron. The five-foot drop combined with the shallow flow over the apron effectively prevents adult salmonid migration into these lakes.

By September 1995, the IDFG, in consultation with NMFS and tribal biologists, should implement the best method for altering the barriers on the outlets of Stanley Basin lakes. Modifications should incorporate mechanisms for counting adult and juvenile fish passage (SRSRT 1994:V-22).

Tasks Needed to Sustain Recovery

1.7 Biological Objective: Reduce losses of listed species associated with poor water quality.

1.7.a. The EPA should: (1) Strongly encourage states to develop and enforce non-point source pollution control mechanisms in areas supporting listed Snake River salmon; (2) determine the extent of the effects resulting from the mixing/dilution zones allowed in current water quality regulations for municipal/corporate discharges; (3) in conjunction with state agencies, review water quality standards, compliance, and adequacy of enforcement for Idaho, Washington, and Oregon; and, (4) if necessary, make recommendations for changes to the appropriate state.

Non-point sources of pollution can degrade water quality. The EPA is currently encouraging states to develop control mechanisms for sediment, nutrients, biocriteria (non-point sources of pollution) and temperature. Implementation of appropriate standards should aid in increasing water quality, thereby improving habitat.

By April 1996, the EPA and state water quality agencies should evaluate current National Pollutant Discharge Elimination System permit standards for protecting fish. Specifically, the currently allowed mixing/dilution zones should be evaluated with regard to impacts on

sale or marketed. The phrase "limited quantities," in this context means:

(i) 200 or fewer units, provided the product is designed solely for operation within one of the Commission's authorized radio services for which an operating license is required to be issued by the Commission; or

(ii) 10 or fewer units for all other products.

(iii) Prior to importation of a greater number of units than shown above, written approval must be obtained from the Chief, Office of Engineering and Technology, FCC.

(iv) Distinctly different models of a product and separate generations of a particular model under development are considered to be separate devices.

* * * * *

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DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

RIN 1018–AB94

Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Klamath River and Columbia River Distinct Population Segments of Bull Trout

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: The Fish and Wildlife Service (Service) determines threatened status for the Klamath River and the Columbia River distinct population segments of bull trout (*Salvelinus confluentus*), with special rules, pursuant to the Endangered Species Act of 1973, as amended (Act). The Klamath River population segment is limited to seven geographically isolated stream areas representing a fraction of the historical habitat. The distribution and numbers of bull trout have declined in the Klamath River basin due to habitat isolation, loss of migratory corridors, poor water quality, and the introduction of non-native species. The Columbia River population segment is represented by relatively widespread subpopulations that have declined in overall range and numbers of fish. A majority of Columbia River bull trout occur in isolated, fragmented habitats that support low numbers of fish and are inaccessible to migratory bull trout. The few remaining bull trout "strongholds" in the Columbia River basin tend to be found in large areas of contiguous habitats in the Snake River basin of central Idaho mountains, upper Clark Fork and Flathead Rivers in Montana, and several streams in the Blue Mountains in Washington and Oregon. The decline of bull trout is primarily due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, and the introduction of non-native species. The special rules allow the take of bull trout in the Columbia River and Klamath River population segments if in accordance with applicable State and Native American Tribal fish and wildlife conservation laws and regulations and conservation plans approved by the Service.

The listing proposal was restricted by court order to information contained in the 1994 administrative record. This final determination was based on the best available scientific and commercial information including current data and new information received during the comment period. As a result, the threatened listing status for the Columbia River population segment has been retained, however, the listing status for the Klamath River population segment is changed from endangered to threatened. This listing status change occurred because bull trout interagency management and recovery efforts for the Klamath River basin are being implemented and, consequently, threats have been reduced. This rule implements the protection and conservation provisions afforded by the Act for the Klamath River and Columbia River population segments of bull trout.

DATES: Effective July 10, 1998.

ADDRESSES: The complete file for this rule is available for inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, Snake River Basin Field Office, 1387 S. Vinnell Way, Room 368, Boise, Idaho 83709.

FOR FURTHER INFORMATION CONTACT: Robert Ruesink, Supervisor, Snake River Basin Office (see **ADDRESSES** section) (telephone 208–378–5243, facsimile 208–378–5262).

SUPPLEMENTARY INFORMATION:

Background

Bull trout (*Salvelinus confluentus*), members of the family Salmonidae, are char native to the Pacific northwest and western Canada. Bull trout historically occurred in major river drainages in the Pacific Northwest from about 41° N to 60° N latitude, from the southern limits in the McCloud River in northern California and the Jarbidge River in Nevada to the headwaters of the Yukon River in Northwest Territories, Canada (Cavender 1978; Bond 1992). To the west, bull trout range includes Puget Sound, various coastal rivers of British Columbia, Canada, and southeast Alaska (Bond 1992). Bull trout are wide-spread throughout tributaries of the Columbia River basin, including its headwaters in Montana and Canada. Bull trout also occur in the Klamath River basin of south central Oregon. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta and the MacKenzie River system in Alberta and British Columbia (Cavender 1978; Brewin and Brewin 1997).

Bull trout were first described as *Salmo spectabilis* by Girard in 1856 from a specimen collected on the lower Columbia River, and subsequently described under a number of names such as *Salmo confluentus* and *Salvelinus malma* (Cavender 1978). Bull trout and Dolly Varden (*Salvelinus malma*) were previously considered a single species (Cavender 1978; Bond 1992). Cavender (1978) presented morphometric (measurement), meristic (geometrical relation), osteological (bone structure), and distributional evidence to document specific distinctions between Dolly Varden and bull trout. Bull trout and Dolly Varden were formally recognized as separate species by the American Fisheries Society in 1980 (Robins et al. 1980). Although bull trout and Dolly Varden co-occur in several northwestern Washington river drainages, there is little evidence of introgression (Haas and McPhail 1991) and the two species appear to be maintaining distinct genomes (Leary et al. 1993; Williams et al. 1995; Kanda et al. 1997; Spruell and Allendorf 1997).

Bull trout exhibit resident and migratory life-history strategies through much of the current range (Rieman and McIntyre 1993). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. Migratory bull trout spawn in tributary streams where juvenile fish rear from one to four years before migrating to either a lake (adfluvial), river (fluvial), or in certain coastal areas, to saltwater (anadromous), where maturity is reached in one of the three habitats (Fraley and Shepard 1989; Goetz 1989). Resident and migratory forms may be found together and it is suspected that bull trout give rise to offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993).

Bull trout have more specific habitat requirements compared to other salmonids (Rieman and McIntyre 1993). Habitat components that appear to influence bull trout distribution and

abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrates, and migratory corridors (Oliver 1979; Pratt 1984, 1992; Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Howell and Buchanan 1992; Rieman and McIntyre 1993, 1995; Rich 1996; Watson and Hillman 1997). Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide habitat requirements for bull trout to successfully spawn and rear, and that the characteristics are not necessarily ubiquitous throughout these watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993), the fish should not be expected to simultaneously occupy all available habitats (Rieman et al. *in press*).

Bull trout are found primarily in colder streams, although individual fish are found in larger river systems throughout the Columbia River basin (Fraley and Shepard 1989; Rieman and McIntyre 1993, 1995; Buchanan and Gregory 1997; Rieman et al. *in press*). Water temperature above 15° C (59° F) is believed to limit bull trout distribution, which may partially explain the patchy distribution within a watershed (Fraley and Shepard 1989; Rieman and McIntyre 1995). Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992; Rieman and McIntyre 1993; Rieman et al. *in press*). For example, the only stream with substantial bull trout spawning in the upper Blackfoot River in Montana was Copper Creek, which had maximum water temperatures less than 15° C (59° F) (Hillman and Chapman 1996). Goetz (1989) suggested optimum water temperatures for rearing of about 7 to 8° C (44 to 46° F) and optimum water temperatures for egg incubation of 2 to 4° C (35 to 39° F). In Granite Creek, Idaho, Bonneau and Scarnecchia (1996) observed that juvenile bull trout selected the coldest water available in a plunge pool, 8 to 9° C (46 to 48° F) within a temperature gradient of 8 to 15° C (46 to 60° F).

All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Oliver 1979; Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Pratt 1992; Thomas 1992; Rich 1996; Sexauer and James 1997; Watson and Hillman 1997). Jakober (1995) observed bull trout overwintering in deep beaver ponds or pools containing large woody debris in the Bitterroot River drainage, Montana, and suggested that suitable winter habitat may be more restrictive than summer habitat. Maintaining bull trout habitat requires stream channel and flow stability (Rieman and McIntyre 1993). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997). These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period and channel instability may decrease survival of eggs and young juveniles in the gravel during winter through spring (Fraley and Shepard 1989; Pratt 1992; Pratt and Huston 1993).

Preferred spawning habitat consists of low gradient streams with loose, clean gravel (Fraley and Shepard 1989) and water temperatures of 5 to 9° C (41 to 48° F) in late summer to early fall (Goetz 1989). Pratt (1992) indicated that increases in fine sediments reduce egg survival and emergence. High juvenile densities were observed in Swan River, Montana, and tributaries with diverse cobble substrate and low percentage of fine sediments (Shepard et al. 1984). Juvenile bull trout in four streams in central Washington occupied slow-moving water less than 0.5 m/sec (1.6 ft/sec) over a variety of sand to boulder size substrates (Sexauer and James 1997).

The size and age of bull trout at maturity depends upon life-history strategy. Growth of resident fish is generally slower than migratory fish; resident fish tend to be smaller at maturity and less fecund (Fraley and Shepard 1989; Goetz 1989). Bull trout normally reach sexual maturity in 4 to 7 years and live as long as 12 years. Repeat and alternate year spawning has been reported, although repeat spawning frequency and post-spawning mortality are not well known (Leathe and Graham 1982; Fraley and Shepard 1989; Pratt 1992; Rieman and McIntyre 1996).

Bull trout typically spawn from August to November during periods of decreasing water temperatures. However, migratory bull trout frequently begin spawning migrations as early as April, and have been known to move upstream as far as 250 kilometers (km) (155 miles (mi)) to spawning grounds (Fraley and Shepard 1989). In the Blackfoot River, Montana, bull trout began migrations to spawning areas in response to increasing temperatures (Swanberg 1996). Temperatures during spawning generally range from 4 to 10° C (39 to 51° F), with redds often constructed in stream reaches fed by springs or near other sources of cold groundwater (Goetz 1989; Pratt 1992; Rieman and McIntyre 1996). Bull trout require spawning substrate consisting of loose, clean gravel relatively free of fine sediments (Fraley and Shepard 1989). Depending on water temperature, incubation is normally 100 to 145 days (Pratt 1992), and after hatching, juveniles remain in the substrate. Time from egg deposition to emergence may surpass 200 days. Fry normally emerge from early April through May depending upon water temperatures and increasing stream flows (Pratt 1992; Ratliff and Howell 1992).

Growth varies depending upon life-history strategy. Resident adults range from 150 to 300 millimeters (mm) (6 to 12 inches (in)) total length and migratory adults commonly reach 600 mm (24 in) or more (Pratt 1985; Goetz 1989). The largest verified bull trout is a 14.6 kilogram (kg) (32 pound) specimen caught in Lake Pend Oreille, Idaho, in 1949 (Simpson and Wallace 1982).

Bull trout are opportunistic feeders with food habits primarily a function of size and life-history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton and small fish (Boag 1987; Goetz 1989; Donald and Alger 1993). Adult migratory bull trout are primarily piscivorous; known to feed on various fish species (Fraley and Shepard 1989; Donald and Alger 1993).

Bull trout evolved with, and, in some areas, co-occur with native cutthroat trout (*Oncorhynchus clarki* ssp.), resident (redband) and migratory rainbow trout (*O. mykiss*), chinook salmon (*O. tshawytscha*), sockeye salmon (*O. nerka*), mountain whitefish (*Prosopium williamsoni*), various sculpin (*Cottus* spp.), sucker (Catastomidae) and minnow species (Cyprinidae spp.) (Mauser et al. 1988; Rieman and McIntyre 1993). Bull trout habitat overlaps with the range of several fishes listed as threatened, endangered, proposed, and petitioned for listing under the Act, including the endangered Snake River sockeye salmon (November 20, 1991; 56 FR 58619); threatened Snake River spring and fall chinook salmon (April 22, 1992; 57 FR 14653); endangered Kootenai River white sturgeon (*Acipenser transmontanus*) (September 6, 1994, 59 FR 45989); threatened and endangered steelhead (August 18, 1997, 62 FR 43937); and westslope cutthroat trout (*O. c. lewisi*) (petitioned for listing in July 1997). Widespread introductions of non-native fishes, including brook trout

(*S. fontinalis*), lake trout (*S. namaycush*) (west of the Continental Divide), and brown trout (*Salmo trutta*), have also occurred across the range of bull trout. These non-native fish have caused local bull trout declines and extirpations (Bond 1992; Ziller 1992; Donald and Alger 1993; Leary et al. 1993; Montana Bull Trout Scientific Group (MBTSG) 1996h).

Bull trout habitat in the coterminous United States is composed of a complex mosaic of land ownership, including Federal lands administered by the U.S. Forest Service (USFS), U.S. Bureau of Land Management (BLM), U.S. National Park Service (NPS), and Department of Defense (DOD); numerous Indian tribal lands; State land in Montana, Idaho, Oregon, Washington and Nevada; and private lands. It is estimated that as much as half of present bull trout habitat is bordered by non-Federal lands.

Migratory corridors link seasonal habitats for all bull trout life-history forms. For example, in Montana, migratory bull trout make extensive migrations in the Flathead River system (Fraley and Shepard 1989) and resident bull trout move to overwinter in downstream pools in tributaries of the Bitterroot River (Jakober 1995). The ability to migrate is important to the persistence of local bull trout subpopulations (Rieman and McIntyre 1993; M. Gilpin, University of California, *in litt.* 1997; Rieman et al. *in press*). Migrations facilitate gene flow among local subpopulations because individuals from different subpopulations interbreed when some stray and return to non-natal streams. Subpopulations that are extirpated by catastrophic events may also become reestablished in this manner.

Metapopulation concepts of conservation biology theory are applicable to the distribution and characteristics of bull trout (Rieman and McIntyre 1993). A metapopulation is an interacting network of local subpopulations with varying frequencies of migration and gene flow among them (Meefe and Carroll 1994). Local subpopulations may become extinct, but can be reestablished by individuals from other subpopulations. Metapopulations provide a mechanism for spreading risk because the simultaneous loss of all subpopulations is unlikely. Habitat alteration, primarily through the construction of impoundments, dams, and water diversions that create unsuitable conditions, has fragmented habitats, eliminated migratory corridors, and isolated bull trout often in the headwaters of tributaries (Rieman et al. *in press*).

Though wide-ranging in parts of Oregon, Washington, Idaho and Montana, bull trout in the interior Columbia River basin presently occur in only about 44 to 45 percent of the historical range (Quigley and Arbelbide 1997; Rieman et al. *in press*). Declining trends and associated habitat loss and fragmentation have been documented rangewide (Bond 1992; Schill 1992; Thomas 1992; Ziller 1992; Rieman and McIntyre 1993; Newton and Pribyl 1994; Idaho Department of Fish and Game (IDFG), *in litt.* 1995; McPhail and Baxter 1996). Several local extirpations have been reported, beginning in the 1950s (Rode 1990; Ratliff and Howell 1992; Donald and Alger 1993; Goetz 1994; Newton and Pribyl 1994; Berg and Priest 1995; Light et al. 1996; Buchanan et al. 1997; Washington Department of Fish and Wildlife (WDFW) 1997). For example, bull trout were apparently extirpated around 1975 from the McCloud River, California, the southernmost range (Moyle 1976; Rode 1990).

Distinct Population Segments

The Service's June 13, 1997, proposal to list the Klamath River and the Columbia River population segments of bull trout (62 FR 32268) was based on the 1994 administrative record, as required by the court. The Service's original June 10, 1994 (59 FR 30254), 12-month petition finding found that listing the bull trout was warranted but precluded throughout the coterminous United States. As explained in the proposed rule, the approach to break the range of bull trout into distinct population segments in the reanalysis of the 1994 petition finding was undertaken because the fish occurs in widespread, but fragmented habitats and has several life-history patterns. In addition, the threats to bull trout are diverse, and the quality and quantity of information regarding the population status and trends varies greatly throughout the range. By examining bull trout distinct population segments, the Service was better able to evaluate proposed listing of those segments, based on the 1994 administrative record, that were a priority in need of Federal protection. Future listing actions could, thereby, be based on best available rather than outdated scientific information.

In the process of making this final listing determination, the Service reexamined the appropriateness of applying the bull trout distinct population segments (DPSs) for the purposes of listing. The joint National Marine Fisheries Service (NMFS) and Service policy regarding the recognition of distinct vertebrate populations published February 7, 1996 (61 FR 4722), was the basis for this reexamination. Three elements are considered in the decision on whether a population segment could be treated as threatened or endangered under the Act—discreteness, significance, and conservation status in relation to the standards for listing. Discreteness refers to the isolation of a population from other members of the species and is based on two criteria—(1) marked separation from other populations of the same taxon resulting from physical, physiological, ecological, or behavioral factors, including genetic discontinuity; and (2) populations delimited by international boundaries. Significance is determined either by the importance or contribution, or both, of a discrete population to the species throughout its range. Four criteria were used to determine significance—(1) persistence of the discrete population segment in an ecological setting unusual or unique for the taxon; (2) evidence that loss of the discrete population segment would result in a significant gap in the range of the taxon; (3) evidence that the discrete population segment represents the only surviving natural occurrence of the taxon that may be more abundant elsewhere as an introduced population outside its historic range; and (4) evidence that the discrete population segment differs markedly from other populations of the taxon in its genetic characteristics. If a population segment is discrete and significant, its evaluation for endangered or threatened status is based on the Act's standards.

Based on the best available information, numerous bull trout subpopulations are isolated from each other by either unsuitable habitat or impassible dams and diversions, or both. Although many subpopulations could be considered discrete, few meet the "significance" criteria. For example, although some genetic differences were identified among subpopulations of bull trout in specific watersheds of the Columbia River basin, the subpopulations did not differ markedly and they inhabit similar habitats. The best available current information supports designating five DPSs in the coterminous United States—(1) Klamath River, (2) Columbia River, (3) Coastal-Puget Sound, (4) Jarbidge River, and (5) St. Mary-Belly River. For purpose of this final determination only the Klamath River and Columbia River DPSs will be addressed. The three remaining DPSs

are the subject of a proposed rule published concurrently.

Although the range of bull trout extends into Canada and Alaska, subpopulations outside the coterminous United States are not being considered in this rulemaking. In accordance with the distinct vertebrate population policy, the Service may determine a population to be discrete at an international border where there are significant differences in the control of exploitation, management of habitat, conservation status, or regulatory mechanisms. Bull trout management and conservation strategy in Canada differs from the United States and such activities are beyond the regulatory scope of the Act. The best available information also disclosed uncertainty regarding the status of bull trout in Canada. Throughout British Columbia and Alberta, data on bull trout status, distribution, and the presence of ongoing threats is incomplete and covers only a portion of the species' range within the provinces. The status of bull trout in Alaska is unknown.

Within the coterminous United States, bull trout distribution is highly fragmented and many subpopulations are geographically isolated. The best available information indicates that bull trout in the coterminous United States, although still wide-ranging, have suffered a significant reduction in range. In addition, bull trout are faced with varying degrees of ongoing threats. The Service now determines that listing bull trout distinct population segments only within the coterminous United States is warranted at this time.

Klamath River

The Klamath River originates in south central Oregon near Crater Lake National Park, and flows southwest into northern California where it meets the Trinity River and empties into the Pacific Ocean. Bull trout in this drainage are discrete because of physical isolation from other bull trout by the Pacific Ocean and several small mountain ranges in central Oregon. Leary et. al. (1991) determined genetic characteristics of bull trout in the Klamath River and Columbia River drainages using protein electrophoresis. They concluded that these two groups of fish were reproductively isolated and evolutionarily distinct. In addition, Williams et al. (1995) separated bull trout in the Klamath and Columbia Rivers into different clades (i.e., groups derived from different lineages) based on genetic diversity patterns. As a result, the Klamath River DPS is significant because it differs markedly in genetic characteristics from bull trout in the Columbia River basin.

Columbia River

The Columbia River DPS occurs throughout the entire Columbia River basin within the United States and its tributaries, excluding bull trout found in the Jarbidge River, Nevada. Although Williams et al. (1995) identified two distinct clades in the Columbia River basin (upper and lower Columbia River) based on genetic diversity patterns, a discrete geographical boundary between the two clades was not documented. The Columbia River DPS is significant because the overall range of the species would be substantially reduced if this discrete population were lost.

Status and Distribution

The Service evaluated the status and distribution of bull trout for each subpopulation in the Klamath River and Columbia River population segments. The complete review of this evaluation is found in a status summary compiled by the Service (Service status summary 1998). A synopsis of the summary is presented in this rule.

To facilitate evaluation of current bull trout distribution and abundance for both the Klamath River and Columbia River population segments, the Service analyzed data on bull trout relative to subpopulations because fragmentation and barriers have isolated bull trout throughout their current range. A subpopulation is considered a reproductively isolated group of bull trout that spawns within a particular area of a river system. In areas where two groups of bull trout are separated by a barrier (e.g., an impassable dam or waterfall, or reaches of unsuitable habitat) that allows only individuals upstream access to those downstream (i.e., one-way passage), both groups were considered subpopulations. In addition, subpopulations were considered at risk of extirpation from naturally occurring events if they were—(1) unlikely to be reestablished by individuals from another subpopulation (i.e., functionally or geographically isolated from other subpopulations); (2) limited to a single spawning area (i.e., spatially restricted); and either (3) characterized by low individual or spawner numbers; or (4) primarily of a single life-history form. For example, a subpopulation of resident fish isolated upstream of an impassable waterfall would be considered at risk of extirpation from naturally occurring events if the subpopulation had low numbers of fish that spawn in a restricted area. In such cases, a natural event such as a fire or flood affecting the spawning area could eliminate the subpopulation, and reestablishment from fish downstream would be prevented by the impassable waterfall. However, a subpopulation residing downstream of the waterfall would not be considered at risk of extirpation from naturally occurring events because there would be establishment potential by fish from the subpopulation upstream. Because resident bull trout may exhibit limited downstream movement (Nelson 1996), the Service's determination of subpopulations at risk of extirpation from naturally occurring events may overestimate the number of subpopulations that are likely to be reestablished.

The status of subpopulations was based on modified criteria of Rieman et al. (*in press*), including the abundance, trends in abundance, and the presence of life-history forms of bull trout. The Service considered a subpopulation "strong" if 5,000 individuals or 500 spawners likely occur in the subpopulation, abundance appears stable or increasing, and life-history forms were likely to persist; and "depressed" if less than 5,000 individuals or 500 spawners likely occur in the subpopulation, abundance appears to be declining, or a life-history form historically present has been lost. If there was insufficient abundance, trend, and life-history information to classify the status of a subpopulation as either "strong" or "depressed," the status was considered "unknown."

Based on abundance, trends in abundance, and the presence of life-history forms, bull trout were considered strong (i.e., 5,000 individuals or 500 spawners likely occur in the subwatershed or larger area, abundance is stable or increasing with at a minimum of half of historic abundance, and the presence of all life-history forms historically present) in 13 percent of the occupied range in the interior Columbia River basin (Quigley and Arbelbide 1997). Using various estimates of bull trout range, Rieman et al. (*in press*) estimated that bull trout were strong in 6 to 24 percent of the subwatersheds in the Columbia River basin. Bull trout declines have been attributed to the effects of land and water management activities, including forest management and road building, mining, agricultural practices, and livestock grazing (Furniss et al. 1991; Meehan 1991; Nehlsen et al. 1991; Craig and Wissmar 1993; Frissell 1993; McIntosh et al. 1994; Platts et al. 1995). Isolation and habitat fragmentation from dams and agricultural diversions (Rode 1990; Mongillo 1993; Jakober 1995),

fisheries management practices, poaching and the introduction of non-native species (Rode 1990; Bond 1992; Howell and Buchanan 1992; WDFW 1992; Donald and Alger 1993; Leary et al 1993; Pratt and Huston 1993; Rieman and McIntyre 1993; MBTSG 1996h; Palmisano and Kaczynski, Northwest Forest Resources Council (NFRC), *in litt.* 1997) also threaten bull trout populations.

Klamath River Population Segment

Historical records suggest that bull trout were once widely distributed and exhibited diverse life-history traits in the Klamath River basin (Gilbert and Evermann 1894; Dambacher et al. 1992; Ziller 1992; Oregon Chapter of the American Fisheries Society (OCAFS) 1993). The earliest records of bull trout in the basin are from Fort Creek (formerly Linn Creek), a tributary to the Wood River (L. Dunsmoor and C. Bienz, Klamath Tribe, *in litt.* 1997). Records from the late 1800s suggest that migratory fish (adfluvial) inhabited Klamath Lake (OCAFS 1993). Other migratory bull trout (i.e., fluvial) were evidently present in some of the larger streams in the basin as recently as the early 1970s (Ziller 1992). Bull trout are thought to have been extirpated from the Sycan River, the South Fork of the Sycan River, and four streams in the Klamath River basin (Cherry, Sevenmile, Coyote, and Callahan creeks) since the 1970s.

Currently, bull trout in the Klamath River basin occur only as resident forms isolated in higher elevation headwater streams (Goetz 1989) within three watersheds—Upper Klamath Lake, Sprague River, and Sycan River (Light et al. 1996). Factors contributing to isolation include habitat degradation, water diversion, and habitat fragmentation (OCAFS 1993; Light et al. 1996). In addition, long distances separate each isolated subpopulation (Schroeder and Weeks, *in litt.* 1997). According to Light et al. (1996), bull trout occupy approximately 38.2 km (22.9 mi) of streams in the Klamath River basin. More recently, Buchanan et al. (1997) indicated that bull trout occupy approximately 34.1 km (20.5 mi) of streams. The risk of extinction for Klamath River bull trout over the next 100 years was recently estimated at 70 to 90 percent (K. Schroeder and H. Weeks, OCAFS, *in litt.* 1997). The Service identified seven bull trout subpopulations in three watersheds (number of subpopulations in each watershed)—Upper Klamath Lake (2), Sycan River (1), and Sprague River (4). The Service considers six of the subpopulations at risk of extirpation caused by naturally occurring events due to their isolation, single life-history form and spawning area, and low abundance (Service status summary 1997).

Columbia River Population Segment

The Columbia River DPS includes bull trout residing in portions of Oregon, Washington, Idaho, and Montana. Bull trout are estimated to have occupied about 60% of the Columbia River Basin, and presently occur in 45% of the estimated historical range (Quigley and Arbelbide 1997). The Columbia River population segment is composed of 141 subpopulations. For discussion and analysis, the Service considered four geographic areas of the Columbia River basin—(1) lower Columbia River (downstream of the Snake River confluence), (2) mid-Columbia River (Snake River confluence to Chief Joseph Dam), (3) upper Columbia River (upstream from Chief Joseph Dam), and (4) Snake River and its tributaries (including the Lost River drainage).

Lower Columbia River Geographical Area

The lower Columbia River area includes all tributaries in Oregon and Washington downstream of the Snake River confluence near the town of Pasco, Washington. The Service identified 20 subpopulations in watersheds of nine major tributaries of the lower Columbia River (number of subpopulations in each watershed)—the Lewis River (2), Willamette River (3), White Salmon River (1), Klickitat River (1), Hood River (2), Deschutes River (3), John Day River (3), Umatilla River (2), and Walla Walla River (3). The present distribution of bull trout in the lower Columbia River basin is less than the historic range (Buchanan et al. 1997; Oregon Department of Fish and Wildlife (ODFW) 1993). Bull trout are thought to be extirpated from several tributaries in five river systems in Oregon—the Middle Fork Willamette River, the North and South Forks of the Santiam River, the Clackamas River, the upper Deschutes River (upstream of Bend, Oregon) and the Crooked River (tributary to the Deschutes River) (Buchanan et al. 1997).

Hydroelectric facilities and large expanses of unsuitable, fragmented habitat have isolated these subpopulations. Large dams, such as McNary, John Day, The Dalles, and Bonneville, separate four reaches of the lower Columbia River. Although fish may pass each facility in both upstream and downstream directions, the extent to which bull trout use the Columbia River is unknown. In addition, the nine major tributaries have numerous facilities, many of which do not provide upstream passage.

Migratory bull trout are present with resident fish or exclusively in at least 13 of the 20 subpopulations in the lower Columbia River. Many migratory fish are adfluvial and inhabit reservoirs created by dams. However, this area includes the only extant adfluvial subpopulation in Oregon, which exists in Odell Lake in the Deschutes River basin (Ratliff and Howell 1992; Buchanan et al. 1997). The Metolius River-Lake Billy Chinook subpopulation is also found in the Deschutes River basin. It is the only subpopulation considered "strong" and exhibits an increasing trend in abundance. The Service considers 5 of the 20 subpopulations at risk of extirpation caused by naturally occurring events exacerbated by isolation, single life-history form and spawning area, and low abundance.

Mid-Columbia River Geographical Area

The mid-Columbia River area includes watersheds of four major tributaries of the Columbia River in Washington, between the confluence of the Snake River and Chief Joseph Dam. The Service identified 16 bull trout subpopulations in the four watersheds (number of subpopulations in each watershed)—Yakima River (8), Wenatchee River (3), Entiat River (1), and Methow River (4). Historically, bull trout occurred in larger areas of the four tributaries and Columbia River. Bull trout are thought to have been extirpated in 10 streams within the area—Satus Creek, Nile Creek, Orr Creek, Little Wenatchee River, Napecqua River, Lake Chelan, Okanogan River, Eightmile Creek, South Fork Beaver Creek, and the Hanford Reach of the Columbia River. Most bull trout in the mid-Columbia River geographic area are isolated by dams or unsuitable habitat created by water diversions.

Bull trout in the mid-Columbia River area are most abundant in Rimrock Lake of the Yakima River basin and Lake Wenatchee of the Wenatchee River basin. Both subpopulations are considered "strong" and increasing or stable. The remaining 14 subpopulations are relatively low in abundance, exhibit "depressed" or unknown trends, and primarily have a single life-history form. The Service considers 10 of the 16 subpopulations at risk of extirpation because of naturally occurring events due to isolation, single life-history form and spawning area, and low abundance.

Upper Columbia River Geographic Area

The upper Columbia River geographic area includes the mainstem Columbia River and all tributaries upstream of Chief Joseph Dam in Washington, Idaho, and Montana. Bull trout are found in two large basins, the Kootenai River and Pend Oreille River, which include the Clark Fork River. Historically, bull trout were found in larger portions of the area. Numerous dams and degraded habitat have fragmented bull trout habitat and isolated fish into 71 subpopulations in 9 major river basins (number of subpopulations in each basin)—Spokane River (1), Pend Oreille River (3), Kootenai River (5), Flathead River (24), South Fork Flathead River (3), Swan River (3), Clark Fork River (4), Bitterroot River (27), and Blackfoot River (1). Bull trout are thought to be extirpated in 64 streams and lakes of various sizes—Nespelam, Sanpoil, and Kettle rivers; Barnaby, Hall, Stranger, and Wilmont creeks; 8 tributaries to Lake Pend Oreille; 5 tributaries to Pend Oreille River below Albeni Falls Dam; Lower Stillwater Lake; Arrow Lake (Montana); upper Clark Fork River, 12 streams in the Coeur d'Alene River basin; and approximately 25 streams in the St. Joe River basin (e.g., IDFG, *in litt.* 1995).

The upper Columbia River area contains "strongholds" for bull trout. Bull trout are considered "strong" in Hungry Horse Reservoir and Swan Lake. Trends in abundance are stable in Hungry Horse Reservoir, and increasing in Swan Lake. Although high numbers of bull trout are found in Lake Pend Oreille and the upper Kootenai River, trends in abundance are either negative or unknown. The high number of subpopulations (27) in the Bitterroot River basin, Montana, indicates a high degree of habitat fragmentation where numerous groups of resident bull trout are restricted primarily to headwaters. The Service considers 47 of the 71 subpopulations at risk of extirpation because of naturally occurring events due to isolation, single life-history form and spawning area, and low abundance.

Snake River Geographical Area

Bull trout occupy portions of 14 major tributaries in the Snake River basin of Idaho, Oregon, and Washington. The Service identified 34 bull trout subpopulations in the Snake River basin. The area consists of two primary portions separated by Hells Canyon Dam. Downstream of Hells Canyon Dam, major tributaries that support bull trout include (number of subpopulations in each tributary)—Tucannon River (2), Clearwater River (3), Asotin Creek (2), Grande Ronde River (1), Imnaha River (4), and Salmon River (2). Upstream of Hells Canyon Dam, major tributaries that support bull trout include—Pine Creek (4), Powder River (3), Malheur River (2), Payette River (4), Weiser River (2), and Boise River (2). Although bull trout distribution upstream of Hells Canyon Dam is limited primarily to the basin downstream of Shoshone Falls in southern Idaho, three geographically isolated bull trout subpopulations occur upstream of Shoshone Falls in the Little Lost River drainage. Bull trout subpopulations upstream of Hells Canyon Dam are generally low in abundance, fragmented, and isolated. The current distribution of bull trout in the Snake River basin is less than historically (Ratliff and Howell 1992; Batt 1996; Buchanan et al. 1997; Quigley and Arbelbide 1997), with recent extirpations documented in Eagle Creek (Powder River basin) and Wallowa Lake (Grande Ronde River basin) (Ratliff and Howell 1992; Batt 1996; Buchanan et al. 1997); and possibly in South Fork Asotin Creek (WDFW 1997). Numerous impassable dams and large expanses of unsuitable habitat have isolated subpopulations within the historic range. Isolation is most prominent upstream of Hells Canyon Dam (southwest Idaho and southeast Oregon). The basin downstream of Hells Canyon Dam is relatively intact, and connectivity among bull trout subpopulations may still occur.

Bull trout occupy large areas of contiguous habitat in the Snake River basin downstream of Hell's Canyon Dam, such as in the Clearwater River, and Salmon River basins. High numbers of bull trout have been observed in the Tucannon River, Imnaha River, Clearwater River, Salmon River, and Malheur River subpopulations, however, trends in abundance are largely unknown or declining. The Service considers 9 of the 34 subpopulations at risk of extirpation because of naturally occurring events due to isolation, single life-history form and spawning area, and low abundance.

In summary, the Columbia River population segment of bull trout has declined in overall range and numbers of fish. Though still widespread, there have been numerous local extirpations reported throughout the Columbia River basin. In Idaho, for example, bull trout have been extirpated from 119 reaches in 28 streams (IDFG *in litt.* 1995) . The population segment is composed of 141 subpopulations indicating habitat fragmentation, isolation, and barriers that limit bull trout distribution and migration within the basin. Although some strongholds still exist, bull trout, generally, occur as isolated subpopulations in headwater lakes or tributaries where migratory fish have been lost.

Previous Federal Action

On September 18, 1985, the Service published an animal notice of review in the Federal Register (50 FR 37958) designating the bull trout a category 2 candidate for listing in the coterminous United States. Category 2 taxa were those for which conclusive data on biological vulnerability and threats were not currently available to support proposed rules. The Service published updated notices of review for animals on January 6, 1989 (54 FR 554), and November 21, 1991 (56 FR 58804), reconfirming the bull trout category 2 status. The Service elevated bull trout in the coterminous United States to category 1 for Federal listing on November 15, 1994 (59 FR 58982). Category 1 taxa were those for which the Service had on file substantial information on biological vulnerability and threats to support preparation of listing proposals. Upon publication of the February 28, 1996, notice of review (61 FR 7596), the Service ceased using category designations and included the bull trout as a candidate species. Candidate species are those which the Service has on file sufficient information on biological vulnerability and threats to support proposals to list the species as threatened or endangered.

On October 30, 1992, the Service received a petition to list the bull trout as an endangered species throughout its range from the following conservation organizations in Montana—Alliance for the Wild Rockies, Inc., Friends of the Wild Swan, and Swan View Coalition (petitioners). The petitioners also requested an emergency listing and concurrent critical habitat designation for bull trout populations in select aquatic ecosystems where the biological information indicated that the species was in imminent threat of extinction. A 90-day finding, published on May 17, 1993 (58 FR 28849), determined that the petitioners had provided substantial information indicating that listing of the species may be warranted. The Service initiated a rangewide status review of the species concurrent with publication of the 90-day finding.

On June 6, 1994, the Service concluded in the original finding that listing of bull trout throughout its range was not warranted due to unavailable or insufficient data regarding threats to, and status and population trends of, the species within Canada and Alaska. However, the Service determined that

sufficient information on the biological vulnerability and threats to the species was available to support a warranted finding to list bull trout within the coterminous United States. Because the Service concluded that the threats were imminent and moderate to this population segment, the Service gave the bull trout within the coterminous United States a listing priority number of 9. As a result, the Service found that listing a distinct vertebrate population segment of bull trout residing in the coterminous United States was warranted but precluded due to higher priority listing actions.

On November 1, 1994, Friends of the Wild Swan, Inc. and Alliance for the Wild Rockies, Inc. (plaintiffs) filed suit in the U.S. District Court of Oregon (Court) arguing that the warranted but precluded finding was arbitrary and capricious. After the Service issued a "recycled" 12-month finding for the coterminous population of bull trout on June 12, 1995, the Court issued an order declaring the plaintiffs' challenge to the original finding moot. The plaintiffs declined to amend their complaint and appealed to the Ninth Circuit Court of Appeals, which found that the plaintiffs' challenge fell "within the exception to the mootness doctrine for claims that are capable of repetition yet evading review." On April 2, 1996, the circuit court remanded the case back to the district court. On November 13, 1996, the Court issued an order and opinion remanding the original finding to the Service for further consideration. Included in the instructions from the Court were requirements that the Service limit its review to the 1994 administrative record, and incorporate any emergency listings or high magnitude threat determinations into current listing priorities. In addition, reliance on other Federal agency plans and actions was precluded. The reconsidered 12-month finding based on the 1994 Administrative Record was delivered to the Court on March 13, 1997.

On March 24, 1997, the plaintiffs filed a motion for mandatory injunction to compel the Service to issue a proposed rule to list the Klamath River and Columbia River bull trout populations within 30 days based solely on the 1994 Administrative Record. In response to this motion, the Service "concluded that the law of this case requires the publication of a proposed rule" to list the two warranted populations. On April 4, 1997, the Service requested 60 days to prepare and review the proposed rule. In a stipulation between the Service and plaintiffs filed with the Court on April 11, 1997, the Service agreed to issue a proposed rule in 60 days to list the Klamath River population of bull trout as endangered and the Columbia River population of bull trout as threatened based solely on the 1994 record.

Based upon the Court agreement and stipulation, and information contained solely in the 1994 record, the Service proposed the Klamath River population of bull trout as endangered and Columbia River population of bull trout as threatened on June 13, 1997 (62 FR 32268). The proposal included a 60-day comment period and gave notice of five public hearings in Portland, Oregon; Spokane, Washington; Missoula, Montana; Klamath Falls, Oregon; and Boise, Idaho. The comment period on the proposal, which originally closed on August 12, 1997, was extended to October 17, 1997 (62 FR 42092), to provide the public with more time to compile information and submit comments.

On December 4, 1997, the Court ordered the Service to reconsider several aspects of the 1997 reconsidered finding. On February 2, 1998, the Court gave the Service until June 12, 1998, to respond. The final listing determination for the Klamath River and Columbia River population segments of bull trout and the concurrent proposed listing rule for the Coastal-Puget Sound, Jarbidge River, and St. Mary-Belly River DPSs constitute the Service's response.

The Service published Listing Priority Guidance for Fiscal Years 1998 and 1999 on May 8, 1998 (63 FR 25502). The guidance clarifies the order in which the Service will process rulemakings giving highest priority (Tier 1) to processing emergency rules to add species to the Lists of Endangered and Threatened Wildlife and Plants (Lists); second priority (Tier 2) to processing final determinations on proposals to add species to the Lists, processing new proposals to add species to the Lists, processing administrative findings on petitions (to add species to the Lists, delist species, or reclassify listed species), and processing a limited number of proposed or final rules to delist or reclassify species; and third priority (Tier 3) to processing proposed or final rules designating critical habitat. Processing of this proposed rule is a Tier 2 action.

Summary of Comments and Recommendations

In the June 13, 1997, proposed rule (62 FR 32268), all interested parties were requested to submit comments or information that might contribute to the final listing determination for bull trout. Announcements of the proposed rule and notice of public hearings were sent to at least 370 individuals, including Federal, State, county and city elected officials, State and Federal agencies, interested private citizens and local area newspapers and radio stations. Announcements of the proposed rule were also published in nine newspapers—the Oregonian, Portland, Oregon; the Spokesman Review, Spokane, Washington; the Yakima Herald, Yakima, Washington; the Missoulian, Missoula, Montana; the Kalispell Interlake, Kalispell, Montana; the Idaho Statesman, Boise, Idaho; the Lewiston Tribune, Lewiston, Idaho; the Post Register, Idaho Falls, Idaho; and the Herald and News, Klamath Falls, Oregon. Public hearings were held on July 1, 1997, in Portland, Oregon; July 8, 1997, in Spokane, Washington; July 10, 1997, in Missoula, Montana; July 15, 1997, in Klamath Falls, Oregon; and July 17, 1997, in Boise, Idaho. In response to numerous requests for additional time to complete compilation of information and meaningfully participate in the public comment process, the Service published a notice on August 5, 1997 (62 FR 42092), extending the comment period to October 17, 1997.

Eighty-four oral and 278 written (including electronic mail) comments were received on the proposed rule. These included comments from 7 Federal agencies, 9 State agencies, 6 counties in Oregon and Idaho, 2 Native American tribes, 6 private timber companies, and 20 industry or trade associations and bureaus. Comments were also received from the Idaho Congressional delegation, and Governors from the states of Montana, Idaho and Oregon.

The Service did not specifically solicit formal scientific peer review of the proposal as outlined in the Service's July 1, 1994, Interagency Cooperative Policy (59 FR 34270) because the proposal was based on the 1994 administrative record and not the best available scientific information. However, in the process of making this final listing determination, a number of professional fishery biologists were consulted and their comments and information were either incorporated into the listing decision as appropriate or are addressed below.

The Service considered all comments, including oral testimony at the five public hearings. A majority of comments supported the listing proposal and 65 comments were in opposition. Opposition was based on several concerns, including conflicts between ongoing State conservation efforts and Federal listing; possible economic impacts from listing the bull

trout; lack of solutions to the bull trout decline that would result from listing; and because the proposed rule was not peer-reviewed or based on the most current information. Seventy-three respondents provided new scientific information considered by the Service for this determination. The states of Idaho and Montana submitted conservation plans for bull trout for consideration by the Service in lieu of listing. The USFS (R. Joslin, USFS, *in litt.* 1997), BLM (A. Thomas, BLM, *in litt.* 1997) and U.S. Bureau of Reclamation (USBR) (M. McClendon, USBR, *in litt.* 1997) provided the Service with information on respective agency efforts to date to assess, evaluate, monitor, and conserve bull trout populations in habitats affected by each agency's management. Because multiple respondents offered similar comments in some cases, comments of a similar nature or point are grouped. These comments and the Service's response are discussed below—

Issue 1: Several respondents urged the Service to list bull trout throughout its entire range. Two respondents recommended that the Service include the Jarbidge River bull trout population as a threatened species. Another respondent stated that the proposal to list the entire Columbia River bull trout population was too broad and suggested that the area be analyzed for listing purposes by major river segments. Conversely, another respondent requested that the Service designate bull trout in the Clark Fork and Kootenai River basins as distinct population segments, citing geographic and historic isolation, and biological significance to the species as a whole as reasons. Additionally, several other commenters suggested that smaller, more manageable distinct population segments be established to avoid listing healthy populations so that conservation efforts can be applied to areas where restoration is truly needed. Other commenters, at the Federal, State and local level suggested other delineations for the distinct population segments, and questioned whether listing would afford protection of bull trout only in currently occupied habitat.

Service response: Based on the best available scientific and commercial information, and consistent with the distinct vertebrate population policy (61 FR 4722, February 7, 1997), the Service has determined that bull trout should be divided into five distinct vertebrate populations for listing purposes, but only in the coterminous United States (see Distinct Population Segment section). The Klamath River and the Columbia River population segments are the subject of this final rule and the remaining three population segments are addressed in an accompanying proposed rule.

In addressing the appropriateness in designating additional DPSs within the Columbia River basin, the Service reviewed new genetic and other biological data developed since 1994, and determined that there is insufficient information available to further divide this DPS. Although many bull trout groups in the Columbia River basin were discrete according to the DPS policy, they failed to meet criteria for significance (e.g. bull trout in the Little Lost River basin in Idaho and portions of the upper Columbia River basin). However, during the recovery process, further division of the Columbia River DPS into recovery units or zones including separation of the bull trout in the Kootenai River, Clark Fork-Pend Oreille River, Little Lost River, 17 potential genetic conservation groups (GCGs) in the State of Washington, and 8 additional GCGs in Oregon can be considered. For wide-ranging species, designation of recovery units can focus recovery objectives on the specific threats, status and habitat requirements within the defined geographic area. Although recovery units cannot be individually delisted without consideration of the entire listed entity (species or DPS), the Service can develop "special rules" (under section 4(d) of the Act) for individual recovery units (see issue #6 below for more information on special rules).

Issue 2: Several respondents stated that because the proposed rule was based on information gathered prior to June 1994, listing should be deferred until new information is analyzed and updated. Comments that "* * * quality of peer reviewed scientific data is noticeably lacking" were also received. Some respondents questioned why the bull trout is now being considered for listing when the Service's analysis in the proposed rule concluded that bull trout had a widespread range and threats to the fish were only moderate. Respondents also stated that conclusions in the proposed rule regarding population distribution and population trends were inaccurate.

Service response: The U.S. District Court of Oregon ordered the Service on November 13, 1996, to reconsider the original 1994 bull trout finding based only information available to the agency when it made the original 1994 finding. Therefore, the Service was mandated to move ahead with a listing proposal based on the information contained in the 1994 administrative record. In making this final listing determination, however, the Service has reviewed and considered new information regarding distribution and life history for the Klamath River and Columbia River population segments of bull trout. This includes, but is not limited to, new bull trout status, distribution, and threats information, and also descriptions of ongoing conservation actions, contained in reports and other written correspondence available since 1994 concerning bull trout in Idaho (Adams and Bjornn 1997; Batt 1996; Bonneau and Scarnecchia 1996; Corley 1997; Elle 1995; Espinoza et al. 1997; N. Horner, IDFG, *in litt.* 1997); Montana (Berg and Priest 1995; Hillman and Chapman 1996; Hansen and DosSantos 1997; Kanda et al. 1997; Long 1995, 1997; Mathieus 1996; McDowell et al 1997; MBTSG 1995a–e; MBTSG 1996a–h; Rich 1996; Swanberg 1996; Swanberg and Burns 1997); Oregon (Buchanan et al. 1997; Buchanan and Gregory 1997; Capruso 1997; Crabtree 1996; Germond et al. 1996a, b; Ratliff et al. 1996; Spruell and Allendorf 1997); Washington (Faler and Bair 1996; Northrop 1997; Raekes 1996; Sexauer and James 1997; WDFW 1997); the Klamath River basin (Buktenica 1997; Buktenica and Larson 1997; Light et al. 1996; ODFW 1996) and bull trout in the Columbia River basin (Platts et al. 1995; Quigley and Arbelbide 1997; Rieman et al *in press;* Rieman and McIntyre 1995, 1996; Watson and Hillman 1997; Williams et al 1995; R. Joslin, *in litt,* 1997; J. Kraft, Plum Creek, *in litt.* 1997; M. McClendon, *in litt,* 1997; Palmisano and Kacynski, *in litt,* 1997; Thomas, *in litt,* 1997).

Based on the best information currently available, bull trout in the Klamath River and Columbia River population segments are not more widespread or found in other areas of the Klamath or Columbia River basins than shown in the 1994 administrative record. Bull trout occur over a large geographic area in four states within the Columbia River drainage. However, bull trout display a generally patchy distribution (Rieman and McIntyre 1993). The best available information indicates that bull trout are in widespread decline across the historic range and restricted to numerous reproductively isolated subpopulations in the Columbia River basin with many recent local extirpations. The largest contiguous areas supporting bull trout are "strongholds" in central Idaho and Montana, such as the upper Flathead River basin. Many remaining bull trout subpopulations are characterized by declining trends, low relative subpopulation size, loss of migratory

fish or the presence of a single life-history form, and isolated from other bull trout by large geographic separation(s). Habitat loss, fragmentation and other changes that have isolated and continue to impact bull trout subpopulations also increase their susceptibility to naturally occurring processes (both demographically and environmentally). Many remaining subpopulations in both the Klamath River and Columbia River population segments are at risk of extirpation from the combined effects of habitat loss and fragmentation, loss of migration corridors, and inability to reestablish extirpated subpopulations through emigration, and recovery actions are required to slow the rate of habitat loss and continued reductions in range. Existing regulations have not arrested the decline of bull trout and newly developed State and local conservation strategies are largely not implemented.

Issue 3: Several respondents opposed the Federal listing or believed it not necessary, and expressed support for various State and local conservation plans developed for bull trout. Two respondents stated that State forest practice rules and regulations are adequate to conserve and restore bull trout. In addition, others recommended that if the bull trout is eventually listed, the Service should defer to the States for management and recovery.

Service response: Section 4(b)(1)(A) of the Act, requires that listing decisions be made solely on the best scientific and commercial data available after conducting a review of the status of the species. The Act also instructs the Service to consider "existing regulatory mechanisms, including taking into account those efforts by State, local and other entities to protect a species, including conservation plans or practices." However, several recent Federal court decisions have limited the extent to which the Service may rely upon land management plans, agreements and other documents that are under development and promise proposed future actions, as a basis for determining that listing is not warranted (Southwest Center for Biological Diversity v. Babbitt, 926 F. Supp. 920 (D. Ariz. 1996); Biodiversity Legal Foundation v. Babbitt, 943 F. Supp. 23 (D. D.C. 1996).

The Service has reviewed conservation plans developed by the States of Montana and Idaho, and other local conservation agencies for bull trout. These actions are encouraging for long term bull trout conservation and recovery. It is recognized that individual restoration projects have been undertaken by States (for instance, the Klamath River Basin Bull Trout Working Group has been implementing conservation activities and planning efforts since 1993), and harvest regulations for bull trout have become more restricted. However, based on the best available information, the Service cannot determine or predict the effectiveness of the conservation actions in reducing threats to the bull trout in the Klamath River and Columbia River population segments to the extent that listing is unnecessary.

The Idaho Bull Trout Conservation Plan (Plan) (Batt 1996), approved in July 1996, addresses bull trout conservation in 59 key watersheds to provide for the conservation and recovery of bull trout statewide. The Plan emphasizes locally developed, site-specific programs with technical assistance from appropriate State and Federal agencies. Although the Plan establishes a mechanism for generating 59 conservation plans by the year 2008, it lacks any description of how specific practices that currently affect bull trout (e.g., timber harvest, mining, grazing, hydropower operations) will be modified. This specificity would provide a basis for the development of future conservation plans and help ensure adequate protection for bull trout. It must also be clear how Federal agencies and private landowners in key watersheds will be required to institute bull trout conservation measures. Given the extent of Federal lands in Idaho, implementation of bull trout conservation measures by the USFS and BLM are critical to the Plan. The Plan also cites hydropower and irrigation practices contributing to the decline of bull trout, but the Plan needs to address these practices in light of the existing Idaho water law, USBR water commitments, and existing Federal Energy Regulatory Commission (FERC) licenses. The Plan provides potential future benefits to bull trout conservation and recovery once adequate funding and full implementation occurs.

The Montana bull trout conservation effort was initiated in 1994. Since 1994, 11 basin-specific status reports and two technical, peer-reviewed papers have been completed. Local watershed groups are being established; however, few on-the-ground local efforts have been completed or are underway. The Service is a member of the Montana Bull Trout Restoration Team which has been formed as part of the State's Montana Bull Trout Plan. Although actions taken to date under the Montana Plan have provided some benefits, not all threats to bull trout have been addressed, partly by lack of State jurisdiction, except in a few local areas. The Service is encouraged by State of Montana's progress in implementing the Montana plan and developing appropriate strategies to remove threats and promote conservation and recovery of bull trout.

The Wallowa County-Nez Perce Tribe Salmon Recovery Plan (Wallowa County and Nez Perce Tribe, *in litt.* 1997) in Oregon is intended to primarily aid in the recovery of listed chinook salmon and steelhead. Twenty-six stream segments in the County have been identified for restoration, with two to five stream segments scheduled to be addressed each year over the next 15 years. By 2008, some positive steps towards improved land and water management in Wallowa County should occur; however, the limited scope of the plan will not benefit bull trout outside the County or necessarily address threats on Federal lands.

Bull trout conservation and planning efforts in the Klamath River basin were initiated earlier than similar State conservation efforts, and incorporated all land owners of occupied bull trout habitat. The Klamath River Basin Bull Trout Working Group (Working Group) functions under a Memorandum of Understanding, and has been actively implementing portions of the Klamath Basin Bull Trout Conservation Strategy (Light et al. 1996). These proactive interagency efforts to stabilize and expand bull trout in the Klamath River basin are unique in their early initiation and multi-entity approach. The Service supports and encourages the Working Group to continue implementing phases I and II of the Conservation Strategy and complete a formal implementation plan for conservation of bull trout in the Klamath River basin.

Bull trout have declined across much of their former range due to a variety of factors, including effects of dam construction, agricultural practices, introduced non-native fishes, and forest practices. A thorough discussion of the factors affecting bull trout is found in "Summary of Factors Affecting the Species." Existing State law addressing forest practices is discussed under Factor D in the "Summary of Factors Affecting the Species." Although State rules and regulations governing forested land management activities are improving, they are generally not adequate to conserve and recover bull trout or remedy the effects of past damage to bull trout habitats.

Issue 4: Several respondents opposed the proposed listing of bull trout because possible "activity restrictions" and economic impacts might occur.

Service response: Section 4(b)(1)(A) of the Act, requires that a listing

determination be based solely on the best scientific and commercial information available. The legislative history of this provision clearly states the intent of Congress to "ensure" that listing decisions are "based solely on biological criteria and to prevent non-biological considerations from affecting such decisions" (H.R. Rep. No. 97–835, 97th Congress 2nd Session 19 (1982)). Because the Service is specifically prohibited from considering economic and other non-biological impacts of species listing, such impacts are not addressed in this final rule.

Issue 5: Some respondents suggested that bull trout listing and recovery may conflict with recovery of other listed fish, notably endangered Snake River salmon species.

Service response: Concerns regarding the possible adverse environmental and non-biological effects from implementing future recovery measures cannot be considered in a decision to list a species. However, these concerns are important in developing recovery measures that take into account environmental effects on other species, including listed Snake River salmon. The Service will fully evaluate the environmental effects and consequences of implementing future recovery measures for bull trout in the Columbia River and Klamath River basins. It should be noted that bull trout co-evolved with Snake River salmon and recovery actions that benefit one species may also benefit other native fishes.

Issue 6: The Service received several comments on the proposed special rule that would allow for take of bull trout within the Columbia River population segment when it is in accordance with applicable State fish and wildlife conservation laws and regulations. While some respondents supported the proposed special rule, others were opposed to the special rule in its current form. Various activities were cited that continue to threaten bull trout, including poaching, electrofishing, and mis-identification of bull trout by fisherman.

Service response: Based on comments received during the public comment period, the Service modified the special rule to address those concerns. The 4(d) special rule conditions in this final rule relate to existing State and Tribal conservation laws and harvest regulations pertaining to bull trout at the time of publication of this rule. The Service has determined that, as currently constituted, the applicable State and Tribal fishing regulations provide conservation of bull trout. In the event any of these laws and regulations are modified in a manner that is inconsistent with conservation of bull trout, the 4(d) rule would not allow the take of bull trout.

The Service also has discretion under section 4(d) of the Act to issue special regulations for activities other than harvest regulations for a threatened species that are deemed necessary and advisable for its conservation. The Service recognizes that on-going and future land-use activities will occur on non-Federal lands that may result in take of bull trout. In the future, the Service will consider issuing special rules that would define the conditions under which take associated with State permitted, or other activities deemed necessary and advisable for the species' conservation, would be authorized for bull trout. Special rules allow for more efficient management of threatened species, and encourage and enhance the conservation of species through the development of regulations the Service deems necessary and advisable to provide for conservation of the species. For example, conservation actions or other activities implemented as part of the Idaho Governor's bull trout plan, Wallowa County-Nez Perce Salmon Plan, Montana Bull Trout Recovery Plan, and Klamath Basin Bull Trout Conservation Strategy may qualify for consideration under a special rule. The Service will consider the development and approval of special rules that will lead to the conservation of bull trout, allowing certain specific land management activities that may allow take of bull trout to continue or occur, with certain restrictions. Under a special rule, this take of bull trout as a result of these activities would not be considered a violation of section 9 of the Act.

This process can provide non-Federal landowners with the flexibility to develop prescriptions or restrictions for their lands which would achieve the level of bull trout conservation consistent with the special rule.

Issue 7: Several respondents stated that since hatcheries will be relied on for bull trout restoration efforts, habitat threats would not be addressed and hatchery-reared fish could transmit and introduce disease to wild bull trout.

Service response: According to section 2(b) of the Act, one of the purposes of the Act is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." Once a species becomes listed as threatened or endangered, section 4(f) of the Act directs the Service to develop and implement recovery plans for that species. Recovery means improvement in the status of a listed species to the point at which listing is no longer appropriate under the criteria provided in section 4 of the Act (50 CFR 402.02). Two goals of the recovery process are: (1) The maintenance of secure, self-sustaining wild populations of the species; and (2) restoration of the species to the point where it is a viable, self-sustaining component of its ecosystem.

The Service recognizes that captive propagation and hatchery supplementation can be valid conservation tools and assist in recovery efforts, but by themselves, do not contribute to secure, self-sustaining bull trout populations in the wild. For example, the Service agrees with the findings of the Montana Bull Trout Scientific Group that stocking or supplementation is a potential tool in the restoration of bull trout and should only be used if the actual cause(s) of local extirpations are identified and corrected first (MBTSG 1996g). Any such project "* * * involving stocking must be appropriate in scope, judiciously applied, rigorously designed, and thoroughly monitored."

Issue 8: Several respondents stated that the introduction of exotic fishes, hybridization with brook trout, and past agency efforts to eradicate bull trout are the primary causes of decline.

Response: The Service agrees that the introduction of exotic fishes by fish management agencies, ongoing hybridization with brook trout, and past efforts to eradicate bull trout have contributed to the decline of the species. The significance of these threats, however, varies by subpopulation location and habitat characteristics (See Factors B, C and E of the "Summary of Factors Affecting the Species" section).

Issue 9: Several respondents requested that the Service designate critical habitat as part of the final rulemaking process. A representative of the Oregon Cattlemen's Association, stated that "* * * the delineation of critical habitat should be based on repeatable, verifiable scientific data followed by a common sense approach to economics."

Service response. A majority of the comments in this regard were standardized requests advocating critical habitat designation with special attention on roadless areas and riparian buffers. These comments included no sight-specific analysis and provided no information to aid the Service in delineation of critical habitat. The proposed rule included a "not determinable" finding for designation of critical habitat based on the 1994 administrative record and solicited comments on whether any habitat

should be determined critical bull trout habitat. The Service received no substantial new information regarding critical habitat during the open comment period for the proposed rule. Therefore, based on the best scientific information currently available, the Service finds in this final rule that critical habitat designation is "not determinable" (see Critical Habitat section).

Summary of Factors Affecting the Species

After a thorough review and consideration of all information available, the Service has determined that the Klamath River and Columbia River distinct population segments of bull trout should be classified as threatened. Procedures found at Section 4(a)(1) of the Act and regulations (50 CFR part 424) were followed. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1). These factors and their application to the Klamath River and Columbia River population segments of bull trout (*Salvelinus confluentus*) are as follows—

A. *The present or threatened destruction, modification, or curtailment of bull trout habitat or range.* Land and water management activities that degrade and continue to threaten bull trout and its habitat include dams, forest management practices, livestock grazing, agriculture and agricultural diversions, roads, and mining (Beschta et al. 1987; Chamberlain et al. 1991; Furniss et al. 1991; Meehan 1991; Nehlsen et al. 1991; Sedell and Everest 1991; Craig and Wissmar 1993; Frissell 1993; U.S. Department of Agriculture (USDA) and U.S. Department of the Interior (USDI) 1995; Henjum et al. 1994; McIntosh et al. 1994; Wissmar et al. 1994; Light et al. 1996; MBTSG 1995a–e, 1996a–h; USDA and USDI 1996, 1997).

Dams

Dams affect bull trout by changing various biological and physical processes. Dams can alter habitats; flow, sediment, and temperature regimes; migration corridors; and interspecific interactions, especially between bull trout and introduced species (Rode 1990; Washington Department of Wildlife (WDW) 1992; Craig and Wissmar 1993; ODFW, *in litt.* 1993; Rieman and McIntyre 1993; Wissmar et al. 1994; T. Bodurtha, Service, *in litt.* 1995; USDA and USDI 1996, 1997). Impassable dams have caused declines of bull trout primarily by preventing access of migratory fish to spawning and rearing areas in headwaters and precluding recolonization of areas where bull trout have been extirpated (Rieman and McIntyre 1993).

Existing dams can be passage and migratory barriers for bull trout and these structures may isolate bull trout subpopulations, eliminate individuals from subpopulations, reduce or eliminate genetic exchange, and separate spawning areas from productive overwintering and foraging areas (Ratliff and Howell 1992; Rieman and McIntyre 1993; MBTSG 1995a, 1996b,c). Dams have fragmented bull trout habitat and resulted in numerous isolated subpopulations. Within the Columbia River population segment, 66 percent of bull trout subpopulations are isolated by dams or indirectly by dam or water diversion operations that alter habitat conditions. Individuals that pass downstream over or through dams are often lost from the upstream subpopulations. Dams have converted historic rearing habitats for migratory fish in the larger river system to reservoirs with conditions that frequently are unsuitable for bull trout (MBTSG 1996b), especially where non-native salmonids occur.

Although the predominant effects of dams affect the long term viability of bull trout subpopulations (Rieman and McIntyre 1993; Gilpin, *in litt.* 1997), dams can benefit bull trout by preventing introduced non-native species access to upstream areas. For example, dams on the Swan River and South Fork Flathead River, Montana, have prevented lake trout from moving into these major river systems (MBTSG 1995e, 1996a). Dams may also increase the potential forage base for bull trout by creating reservoirs that support prey species (Faler and Bair 1991; Pratt 1992; ODFW, *in litt.* 1993).

The extirpation of bull trout in the McCloud River basin, California, has been attributed primarily to construction and operation of McCloud Dam, which began operation in 1965 (Rode 1990). McCloud Dam inundated bull trout spawning and rearing habitats, and isolated these fish from habitats used by migratory adults. The dam also altered the stream flow regime and elevated water temperature to levels detrimental to bull trout.

Klamath River Population Segment

Dams are not known to affect bull trout subpopulations in the Klamath River basin.

Columbia River Population Segment

Bull trout passage is prevented or inhibited at hydroelectric, flood-control, or irrigation dams in almost every major river in the Columbia River basin except the Salmon River in Idaho. For instance, six dams were constructed without fish passage in the Boise River, Idaho, and of these, Arrowrock and Anderson Ranch dams isolate bull trout subpopulations. Historically, bull trout in the Boise River likely functioned as a single subpopulation with migratory adults moving among areas that are now isolated (Rieman and McIntyre 1995). Similarly, bull trout were thought to have ranged throughout the Yakima River, Washington, prior to construction of several dams beginning in 1905 (WDFW 1997). Storage dams (Tieton, Bumping Lake, Keechelus Lake, Kachess Lake, and Cle Elum Lake dams) now isolate five of eight bull trout subpopulations in the Yakima River basin, with agricultural diversion dams isolating three additional bull trout subpopulations (WDFW 1997). Operation of irrigation diversion dams also disrupts annual migrations of fluvial bull trout in five of seven spawning streams in the Methow River basin, Washington (WDFW 1997). In the mainstem Methow River, up to 79 percent of the average flow is removed from a 64 km (40 mi) reach, occasionally stranding and killing bull trout (Mullan et al. 1992). Due primarily to temperature constraints in partially dewatered tributaries to the Methow River, 60 percent of the total spawning and rearing areas for bull trout has been lost (Mullan et al. 1992; WDFW, *in litt.* 1995). Also in Washington, bull trout in the North Fork Lewis River were separated into two subpopulations by the construction of Swift and Yale reservoirs, and the Condit Dam on the White Salmon River also isolated a subpopulation (WDFW 1997). In Oregon, bull trout were thought to have historically occurred throughout the Willamette River basin, but are presently found only in the McKenzie River basin. Dams in the basin (Trailbridge and Carmen) isolate bull trout into three subpopulations.

In the mainstem Clark Fork River, Idaho and Montana, bull trout moved and migrated freely from Lake Pend Oreille upstream to the headwaters of the Clark Fork and Flathead rivers prior to construction of five dams (Pratt and Huston 1993; MBTSG 1996b; Frissell 1997). The construction of Albeni Falls, Cabinet Gorge, Noxon Rapids, Thompson Falls, and Milltown dams isolated four bull trout subpopulations in the mainstem Clark Fork-Pend Oreille rivers. The uppermost dam, Milltown, isolates downstream fish from those in the upper Clark Fork River and prevents fish downstream of the dam from

moving into the Blackfoot River, a major tributary of the upper Clark Fork River. Annually, some bull trout congregate below Milltown Dam, attempting to move upstream. Radio-tagged bull trout collected below Milltown Dam and released above the dam moved into Rock Creek, a tributary to the upper Clark Fork system (Swanberg 1996). Movement of bull trout from the mainstem Clark Fork River to the Flathead Lake system is prevented by Kerr Dam on the lower Flathead River. Sport harvest of bull trout from Lake Pend Orielle, Idaho, abruptly declined more than 50 percent after Albeni Falls and Cabinet Gorge dams blocked access to historic spawning streams and reduced adult numbers (Ellis 1940; Pratt and Huston 1993).

Major tributaries of the Flathead River basin, Montana, were historically interconnected so that migratory bull trout were widely distributed throughout the drainage (MBTSG 1995d). Bull trout from the Flathead River system had access to the South Fork Flathead River drainage and the Swan River drainage. However, upstream passage from the Flathead River has been blocked by dams on the South Fork Flathead River (Hungry Horse Dam) and the Swan River (Bigfork Dam).

On the Kootenai River, Montana, Libby Dam is an upstream passage barrier to bull trout. The dam also has altered the flow regime, water temperature, and sediment load in the Kootenai River (MBTSG 1996e). Dam operation has typically reduced spring flows, which has made upstream passage over Kootenai Falls, located downstream of Libby Dam, impossible. Therefore, fish below the falls do not have the opportunity to interbreed with fish above (MBTSG 1996e).

An additional effect of dams on bull trout is the loss of individuals from a subpopulation. During a 7-month study in the Boise River, bull trout were marked in Arrowrock Reservoir and 5 percent of them were recaptured in Lucky Peak Reservoir (USBR, *in litt.* 1997). Lucky Peak Dam is downstream of the Arrowrock and Anderson Ranch subpopulations, and neither Lucky Peak Reservoir nor the reach downstream of the dam provide any known spawning habitat. Thus, fish entering Lucky Peak Reservoir are lost from the upstream subpopulations.

Forest Management Practices

Forest management activities, including timber extraction and road building, affect streams habitats by altering recruitment of large woody debris, erosion and sedimentation rates, runoff patterns, the magnitude of peak and low flows, and annual water yield (Cacek 1989; Furniss et al. 1991; Wissmar et al. 1994; Spence et al. 1996). Activities that promote excessive substrate movement lower bull trout production by increasing egg and juvenile mortality, and reduce or eliminate habitat important to later life-history stages, such as when pools are filled with substrates (Shepard et al. 1984; Fraley and Shepard 1989; Brown 1992). The length and timing of bull trout egg incubation and juvenile development (typically more than 200 days during winter and spring) and the strong association of juvenile fish with stream substrate make bull trout vulnerable to changes in peak flows and timing that affect channels and substrate (Shepard et al. 1984; Goetz 1989; Pratt 1992).

Logging and road building in riparian zones reduce stream shading and widen stream channels, allowing greater sunlight penetration, surface water warming, and winter anchor ice formation (Beschta et al. 1987; Chamberlain et al. 1991). Timber extraction in riparian areas that results in increased water temperatures in spawning and rearing areas may cause bull trout to decline (Goetz 1989; Pratt 1992; Rieman and McIntyre 1993). Logging in riparian areas reduces recruitment of large woody debris, thereby reducing stream habitat complexity. Loss of riparian vegetation destabilizes streambanks and increases erosion and sediment delivery to streams. Road construction that involves channelizing streams may cause reduced habitat complexity and increased sediment delivery.

Although bull trout occur in watersheds affected by past timber extraction, bull trout strongholds persist in a greater percentage of watersheds experiencing little or no past timber harvest, such as the wilderness areas of Central Idaho and the South Fork Flathead River drainage in Montana (Henjum et al. 1994; MBTSG 1995e; USDA and USDI 1997; Rieman et al. *in press*). One bull trout stronghold subject to extensive logging and road construction is in the Swan River basin (Watson and Hillman 1997). It is difficult to assess the overall effects of forestry practices on bull trout in parts of the basin because of the complex geomorphology and geology of the drainage (MBTSG 1996a). However, the Swan River tributaries also drain large areas of contiguous roadless lands that provide important protected bull trout habitat.

Timber harvest has occurred throughout the Columbia River (Henjum et al. 1994; USDA and USDI 1996, 1997) and Klamath River basins (Light et al. 1996; USDA and USDI 1996, 1997). The effects of timber harvest on streams are long lasting, and recovery is slow (Furniss et al. 1991; Henjum et al. 1994). The MBTSG ranked forestry, especially the legacy left by past forestry practices, as a limitation to bull trout restoration in all major watersheds in Montana (MBTSG 1995a–e, 1996a–f).

Klamath River Population Segment

Much of the forest in the Klamath River basin has been managed for timber production, with substantial activity beginning in 1940. Extensive harvesting, including partial cutting with overstory removal, clearcutting, and selective logging for old-growth pine occurred on private lands, and low intensity harvest occurred on some of the USFS lands. Past forest management activities in the Klamath River basin have temporarily reduced riparian vegetative cover and increased water temperature in some streams, including Threemile Creek (Light et al. 1996). Roads were built in the basin for access to timber, causing increased sedimentation and substrate embeddedness. Sediment from existing roads continues to degrade stream habitat (Light et al. 1996). Weyerhauser Timber Company began an improved road maintenance program in 1994 to reduce sediment inputs from roads on its lands adjacent to occupied bull trout stream reaches in the Klamath River basin, and U.S. Timberlands is presently continuing the practice (B. Johnson, pers. comm. 1997). Two recent timber harvest activities occurred on U.S. Timberlands property along Boulder Creek in 1994 and Long Creek in 1995 (Johnson, U.S. Timberlands, pers. comm. 1997). A review of the activities concluded that leaving buffer strips and obliterating existing roads left the riparian habitat in better condition than before the timber harvest (B. Johnson, pers. comm. 1997). No timber harvests are currently planned for areas adjacent to streams occupied by bull trout. Six of the seven bull trout subpopulations identified in the Klamath River basin have been affected by past forest management practices.

Columbia River Population Segment

Perhaps the greatest threat to bull trout involving forest practices and roads stems from the ongoing and latent adverse effects caused by over a century of logging. Latent threats are illustrated by approximately 2,300 land slides correlated with high logging road density on national forest lands in the Clearwater and Spokane rivers basins during high runoff events in 1995 and

1996 (L. McLaud, Idaho Conservation League, *in litt.* 1997; R. Patten, Panhandle National Forest, *in litt.* 1997). The same runoff events also triggered an estimated 2,000 land slides on adjacent non-Federal timber lands in the Clearwater River basin (McLaud, *in litt.* 1997). On over half of the non-wilderness lands within National Forests across northern Idaho and western Montana, the environmental effects of past forest practices now constrain forest management (USFS map, *in litt.* 1994). For example, 70 percent of stream miles on the Wallowa-Whitman National Forest are degraded beyond Land and Resource Management Plan (LRMP) standards for fine sediment and temperature parameters on the forest (Wissmar et al. 1994). On the Panhandle National Forest, Idaho, pool volumes, quality and frequency in managed watersheds (mainly watersheds with past timber extraction and road construction) were reduced compared to non-managed watersheds. Further, decreases in pool volume and frequency were correlated with decreases in the distribution and abundance of bull trout (Cross and Everest 1995). In the Lake Pend Oreille and Priest River basins, 31 percent of streams in National Forest lands are degraded beyond LRMP standards, and 51 percent of streams are in the most degraded category (B. Kasun, USFS, *in litt.* 1993). Streams in the most degraded category generally do not support bull trout because of stream morphology changes, increased cobble embeddedness and high summer temperatures. Jones and Espinosa (1992) determined that 71 percent of the stream or watershed areas in the managed portion of the Clearwater National Forest did not meet LRMP standards, and that streams in poor condition generally did not support bull trout. Similarly, 67 percent of the non-wilderness portion of the Nez Perce National Forest did not meet LRMP standards, and streams in the most degraded category increased 12 percent over a five year period between 1987 and 1992 (Gloss and Gerhardt 1992).

In the Wenatchee National Forest, Washington, bull trout spawning and rearing is correlated with streams not subject to past timber harvest (Brown 1992). Timber harvest activities were responsible in the decline and isolation of bull trout in Pataha Creek, Washington (WDFW 1997), a tributary in the Tucannon River drainage. In the North Fork Boise River basin, Idaho, the majority of bull trout spawning and rearing habitat for the Arrowrock Reservoir subpopulation exists in the roadless headwaters of the Crooked, Bear, and North Fork Boise rivers (Boise National Forest, *in litt.* 1995).

The long-lasting effects of past timber management activities on aquatic habitats is illustrated by conditions in the 3,289 km² (1,270 mi²) South Fork Salmon River watershed, Idaho. The watershed was first logged in the 1940's and logging activity peaked in 1961 (Chapman et al. 1991). Sedimentation in the South Fork Salmon River increased approximately 350 percent above pre-logging levels (Chapman et al. 1991). Resident and anadromous salmonids, including bull trout, declined after timber extraction and associated road building. Despite a 25-year logging moratorium in the watershed, fish habitat has not returned to pre-logging quality, and salmon production has not recovered (Chapman et al. 1991).

A relationship between forest management, watershed conditions, aquatic habitat degradation, and loss of occupied bull trout range has been documented in the Spokane River basin, Idaho. Streambed aggradation and loss of pool habitat are attributed to forest management and associated roads in the basin (G. Kappesser, Panhandle National Forest, *in litt.* 1993). The loss of pool habitat correlates to reductions in bull trout range and abundance in managed watersheds (Cross and Everest 1995). Sixty-one percent of the basin's managed watersheds do not meet forest plan standards (B. Kasum, Panhandle National Forest, *in litt.* 1992). The Nez Perce National Forest, Idaho, provides an example of the rate of watershed degradation. Significantly degraded watersheds with forest management increased by 12 percent in only 5 years; 40 percent of all non-wilderness land were in degraded condition (Gloss and Gearhardt 1992).

The USFS classified watersheds in the Bitterroot National Forest, Montana, into three categories, "healthy," "sensitive," and "high risk" based on sediment yield from road construction and increased water yield and peak flow from timber harvest (Decker 1991 *in* MBTSG 1995b). About one third of all watersheds were assigned to each of the three categories. Bull trout with estimable numbers were found only in watersheds rated as "healthy" or "sensitive drainages" (Clancy 1993). The effects of past forest practices, including road construction, continue to affect Bitterroot tributaries (MBTSG 1995b). Generally, bull trout numbers were higher where stream substrates were larger, but numbers tended to be lower in areas high in fine sediments (Clancy 1993). In contrast, habitat where brook trout were found were characteristic of areas degraded by land use activities (Rich 1996). Eighty-five percent of the drainages classified as "high risk" supported brook trout (Clancy 1993) (see Factor E).

Extensive logging activity has impaired water quality in many tributaries of the Blackfoot River, Montana, including the North Fork Blackfoot River (Montana Department of Health and Environmental Sciences (MDHES) 1994). Wide-spread canopy removal, alterations to riparian vegetation, and water irrigation returns have increased the historic temperature regime of the Blackfoot River (MBTSG 1995c; Pierce et al. 1997). Water temperatures in the mainstem Blackfoot frequently exceeded the bull trout preferred range of 15°C (60°F) in 1994, 1995 and 1996, making coldwater refuges during this time critical for bull trout (Pierce et al. 1997). The effect of forest practices was considered a limitation to bull trout restoration in the Blackfoot River drainage (MBTSG 1995c).

Timber management is the dominant land use in the Kootenai River watershed, Montana. Extensive road construction to support forestry activities exists throughout the watershed. Many reaches of streams in the Kootenai drainage have impaired water quality as a result of silviculture activities (MDHES 1994). As a result of salvage logging in 1996, the number of timber sales and clearcuts have substantially increased over the past three years (Kootenai National Forest 1997).

Past forest practices, including road construction, log skidding, riparian tree harvest, clearcutting, and splash dams, are considered a cause in the historic decline of bull trout and have limited restoration opportunities in the Flathead Lake basin (MBTSG 1995d). This basin supports over 30 subpopulations in wilderness, national park, national forest, and private lands of Montana. Because bull trout are sensitive to habitat and water quality degradation, Fraley and Shepard (1989) considered timber harvest and road construction in both the North and Middle Fork Flathead River drainages to be threats to bull trout spawning and rearing habitat. Although forest practices have improved, effects of past activities still affect bull trout because the existing road systems continue to erode, cause sedimentation, and increase water yield to streams. Silvicultural activities have contributed to 323.2 km (202 mi) in 17 streams being classified as water quality impaired in the Flathead basin (MDHES 1994). Existing roads in two National Forests of Idaho (Boise and Payette)

created slides and slumps during 1997, a high water year. In some areas of Montana and Idaho, culverts, that are passage barriers for bull trout, are being replaced at road crossings (P. Batt, Governor of Idaho, *in litt.* 1997, P. Graham, Montana Fish and Wildlife and Parks (MFWP), and B. Clinch, Montana Department of Natural Resources and Conservation (MDNRC), *in litt.* 1997).

Future proposed timber harvests also threaten bull trout. For instance, in Oregon, the Malheur National Forest proposes to salvage trees and build roads in a roadless area containing bull trout, site of the 1996 Summit Fire in the John Day River watershed, and a designated riparian habitat conservation area in the Environmental Assessment for the Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH) (USDA 1995). The project has not been completed, but it would likely degrade bull trout habitat if implemented as presently planned.

In summary, forestry activities that adversely affect bull trout and its habitat are primarily timber extraction and road construction, especially when impacting riparian areas. These activities, when conducted without adequate protective measures, alter bull trout habitat by increasing sedimentation, reducing habitat complexity, increasing water temperature, and promoting channel instability. Although certain forestry practices have been prohibited or altered in recent years to improve protection of aquatic habitats, the consequences of past activities continue to affect bull trout and their habitat. Within the Columbia River population segment, approximately 74 percent of bull trout subpopulations are threatened by forestry management practices.

Livestock Grazing

Livestock grazing degrades aquatic habitat by removing riparian vegetation, destabilizing streambanks, widening stream channels, promoting incised channels and lowering water tables, reducing pool frequency, increasing soil erosion, and altering water quality (Platts 1981; Kauffman and Krueger 1984; Henjum et al. 1994; Overton et al. 1993). These effects increase summer water temperatures, promote formation of anchor ice in winter, and increase sediment into spawning and rearing habitats. Cover for bull trout is reduced. Occupied bull trout habitat is also negatively affected by livestock grazing (Howell and Buchanan 1992; Mullan et al. 1992; Platts et al. 1993; R. Uberuaga, Payette National Forest, *in litt.* 1993; Henjum et al. 1994; MBTSG 1995a,b,c; USDA and USDI 1996,1997).

Livestock grazing impacts on bull trout habitat maybe minimized if grazing is managed appropriately for conditions at a specific site. Practices generally compatible with the preservation and restoration of bull trout habitat may include fences to exclude livestock from riparian areas, rotation schemes to avoid overuse of areas, and stock tanks so that livestock would concentrate outside of riparian areas for water.

Klamath River Population Segment

Intensive livestock grazing historically occurred throughout most of the Klamath River basin, and continues to be widespread (Light et al. 1996). Livestock grazing is a major land use within the Sprague River drainage, mostly in the lowland meadows and to a lesser extent in some forested areas. Grazing has been eliminated along bull trout streams on U.S. Timberlands property (B. Johnson, U.S. Timberlands, in litt. 1997) and adjacent National Forest lands. However, documented cattle trespass on Long and Deming creeks indicates that livestock continue to locally affect bull trout habitats (Light et al. 1996; Buchanan et al. 1997). The meadows in upper Long Creek exhibit bank instability and diminished availability of undercut banks caused by livestock (Buchanan et al. 1997). Channelization and intense grazing by cattle degraded lower Sun Creek and an adjoining stream in the Klamath River basin and may have contributed to the extirpation of migratory bull trout in Sun Creek (Dambacher et al. 1992).

Columbia River Population Segment

Livestock grazing has caused habitat degradation in stream reaches supporting bull trout. On Squaw Creek, a tributary of the Payette River, Idaho, livestock grazing has damaged streambank and riparian vegetation. While fencing and grazing changes are underway to reduce impacts in this area, future damage from grazing will not be eliminated (M. Huffman, Boise National Forest (BNF), in litt. 1997). Livestock grazing continues to affect bull trout habitat for spawning, rearing, and migration in Bear Valley Creek and its tributaries in the BNF, Idaho (T. Burton, BNF, pers. comm. 1997). Livestock grazing was a factor in the decline of bull trout habitat in Pataha Creek, Washington (WDFW 1997). In Montana, severe overgrazing occurs in the Bitterroot River valley bottom streams and along the mainstem Clark Fork River in the Deerlodge valley, Flint Creek valley, and parts of Rock Creek, and limits bull trout restoration in these drainages (MBTSG 1995a,b; Maxell 1996). Overall, livestock grazing in portions of the Wieser, Grande Ronde, Imnaha, and Malheur rivers has degraded streamside habitat (Adams 1994; Buchanan et al. 1997). Of the 141 subpopulations the Service identified in the Columbia River population segment, approximately 50 percent were threatened by ongoing livestock grazing.

Agricultural Practices

Agricultural practices, such as cultivation, irrigation, and chemical application can affect bull trout. Agriculture has been identified a source of nonpoint source pollution in some areas within the range of bull trout (Idaho Department of Health and Welfare (IDHW) 1991; Washington Department of Ecology (WDE) 1992; MDHES 1994). These practices can release sediment, nutrients, pesticides and herbicides into streams, increase temperature, reduce riparian vegetation, and alter the hydrologic regime, typically with low flows in the spring and summer. Irrigation diversions also affect bull trout by altering stream flow and through entrainment. Bull trout may enter unscreened irrigation diversions and become stranded in ditches and agricultural fields. Diversion dams, without proper passage facilities, prevent bull trout from migrating and may isolate subpopulations (Dorratcaque 1986; Light et al. 1996).

Klamath River Population Segment

Historical agricultural use in the Klamath River basin has had a profound effect on bull trout habitat in the larger tributaries and mainstem rivers (Buchanan et al. 1997). Channelization, water diversions, removal of streamside vegetarian, and disturbances have altered the aquatic environment by elevating water temperature, reducing water quantity and quality, and increasing sedimentation (Light et al. 1996). Deming, Long, Threemile, and Sun creeks have diversions immediately downstream of occupied bull trout habitat (Dunsmoor and Bienz, in litt. 1997). Unscreened diversions result in the transport of fish into irrigation canals (e.g., Deming and Sun creeks), often resulting in mortality (Light et al. 1996).

Columbia River Population Segment

In 1988, the Idaho Department of Environmental Quality (IDEQ) conducted an assessment of nonpoint source pollution of the Salmon River basin. Of 4,080 km (2,550 mi) of streams assessed, an estimated 2,059 km (1,287

mi) were affected by nonpoint sources, of which 1,374 km (859 mi) were affected by agricultural practices (IDHW 1991). Dewatering of stream reaches due to irrigation has restricted bull trout migration and isolated bull trout into subpopulations. Examples include the Powder, Malheur, Grande Ronde, Umatilla, and John Day rivers in Oregon (Buchanan et al. 1997); the Tucannon, Snake, Yakima, Methow, and Walla Walla rivers in Washington (WDW 1992; WDFW 1997); the upper Salmon and Lemhi rivers in Idaho (Dorratcaque 1986; Chapman et al. 1991); and the Clark Fork, Blackfoot, and Bitterroot rivers in Montana (Clancy 1993; MBTSG 1995a,b,c; 1996b,c; Swanberg 1996).

The mainstem Umatilla River is frequently dry during the irrigation season, effectively isolating bull trout (M. Northrop, Umatilla National Forest, pers. comm. 1997). Moreover, two diversion facilities in the Umatilla River inhibit migration during portions of the year (Buchanan et al. 1997). Walla Walla River basin bull trout subpopulations are segregated in the Touchet River, Mill Creek, and South Fork and North Fork of the Walla Walla River by four irrigation diversion dams (Buchanan et al 1997; WDFW 1997). Streams are also channelized in agricultural areas, reducing stream length and area of aquatic habitat, altering stream channel morphology, and diminishing aquatic habitat complexity.

In Idaho, Dorratcaque (1986) documented chronic flow and passage problems on the Lemhi River, where the stream has been dewatered during the irrigation season. An irrigation diversion dewaters the upper Salmon River in Idaho from mid-July to the end of the irrigation season, preventing chinook salmon access to spawning areas. Juvenile chinook salmon, which are used as prey by bull trout, are, thereby, no longer available (Chapman et al. 1991). Streamflows in the Umatilla River basin in Oregon have been fully appropriated during the irrigation season since 1920 (Oregon Water Resources Division (OWRD), in litt. 1988). Over-appropriations have resulted in dewatered stream reaches that limit bull trout distribution within the basin. Similarly, the Oregon State Game Commission (OSGC) first recognized the negative effects of irrigation diversions on fisheries resources in the Deschutes River as early as 1950 (OSGC, in litt. 1950). In Washington, over 80 percent of the annual stream flow in the Yakima River basin is seasonally diverted for irrigation (WDW 1992). Bull trout in the basin are isolated into eight subpopulations in upper watershed tributaries by reduced summer flows and dams (WDW 1992). The lower reaches of the Walla Walla River in Washington are often dewatered during the irrigation season, isolating three bull trout subpopulations in perennial headwater reaches (Martin et al. 1992).

In 1991, MFWP listed Montana streams that support or contribute to important fisheries and are substantially dewatered from diversions and appropriated streamflows (MFWP, in litt. 1991). Within the range of bull trout, 101 stream reaches totaling 958.4 km (599 mi) were listed as chronically dewatered due to irrigation withdrawals and an additional 220.8 km (138 mi) were listed as periodically dewatered. Although bull trout do not occur in all streams cited, all are within the range of bull trout and dewatering likely affects fish migration and connectivity among subpopulations.

The extirpation of bull trout in the mainstem Bitterroot River, Montana, and the loss of migratory fish are attributed to chronic dewatering of the mainstem Bitterroot and the lower reaches of most of its tributaries (Clancy 1993, 1996; MBTSG 1995b). Some diversions on the mainstem Bitterroot are fish passage barriers or entrain downstream migrants into irrigation ditches (MBTSG 1995b). Nearly 104 km (65 mi) of 18 tributary streams are chronically dewatered in the Bitterroot River basin (MBTSG 1995b). Dewatering of tributary streams is a limitation to restoration of bull trout in the Bitterroot River basin (MBTSG 1995b) and the cause of habitat fragmentation isolating 27 subpopulations.

In the Clark Fork River basin, Montana, irrigation diversions, canals, and dams in the Jocko and lower Flathead rivers eliminated bull trout access to spawning and rearing areas; however, some of these structures are in the process of being modified (MBTSG 1996c; Hansen and DosSantos 1997; MBTRT 1997). The lower reaches of the Jocko River are severely affected by grazing and irrigated agriculture (Hansen and DosSantos 1997). Because migratory bull trout can no longer ascend Grant Creek from the mainstem Clark Fork River due to irrigation diversions, only resident bull trout exist upstream (MBTSG 1996c; R. Berg, MFWP, pers. comm. 1997). Dewatering, irrigation return flows, and denuded riparian areas have increased water temperatures in the Blackfoot River and Clark Fork River basins, Montana (MBTSG 1995a,c). Water temperatures in the mainstem upper Clark Fork River frequently exceed 20°C (68° F) and temperatures in tributaries, including the Little Blackfoot and Flint Creek, may exceed bull trout tolerance limits (MBTSG 1995a). In the Blackfoot River basin, irrigation returns have contributed to the warming of this historic coldwater river (MBTSG 1995c; Pierce et al. 1997). Irrigation diversions, particularly in the Little Blackfoot River and in Flint Creek of the upper Clark Fork River, are physical and thermal passage barriers to bull trout (MBTSG 1995a). Diversion for irrigation is the primary cause of 622 km (389 mi) of streams in the upper Clark Fork basin being chronically dewatered (MDHES 1994). Irrigation diversions also continue to limit restoration of migratory bull trout in the Blackfoot River basin (MBTSG 1995c). Recently, several diversions have been renovated to provide passage and eliminate ditch entrainment (MBTRT 1997).

Unscreened irrigation diversions in eastern Washington are known to trap or divert bull trout in Ahtanan Creek (Yakima River basin), Ingalls and Peshastin creeks (Wenatchee River basin), Roaring Creek (Entiat River basin), and Buttermilk, Little Bridge, Eagle, and Wolf Creeks (Methow River basin) (J. Easterbrooks, WDFW, pers. comm. 1997). Channelization has altered 56 km (35 mi) of the Methow River (Mullan et al. 1992). Approximately 72 km (45 mi) of the lower Coeur d'Alene, St. Joe, and St. Maries rivers of the Spokane River basin have been channelized. These streams were once considered important rearing areas and migratory corridors for migratory (fluvial) bull trout.

Approximately 47 percent of the bull trout subpopulations in the Columbia River population segment are affected by the past and ongoing effects from agricultural practices, including diversions.

Road Construction and Maintenance

Non-forest roads degrade salmonid habitat by creating flow constraints in ephemeral, intermittent, and perennial channels; increasing erosion and sedimentation; creating passage barriers; channelization; and reducing riparian vegetation (Furniss et al. 1991; Ketcheson and Megahan 1996).

Klamath River Population Segment

Streamside roads may have multiple locations of elevated sediment delivery. Some level of sedimentation is normal, and can be documented along parts of Boulder, Deming, Threemile, Brownsworth, and Leonard creeks. In contrast, Long and Sun creeks have relatively little sediment delivery from roads in reaches occupied by bull trout (Light et al. 1996). Streamside roads inadequately constructed with

misplaced water bars and culverts still discharge sediment laden waters directly into streams. Over-road flow can lead to gullying and direct sediment delivery, as found in parts of Deming Creek (Light et al. 1996). Streamside roads can also reduce large woody debris recruitment and vegetation shade by occupying the growing space next to streams. In addition, road construction may require stream straightening or channel reconfiguration next to roads, resulting in channelization as along Boulder and Deming creeks (Light et al. 1996; Dunsmoor and Bienz, *in litt.* 1997). Habitat degradation from channelization includes decreased pool habitat, decreased sediment transport, increased embeddedness, and reduced interstitial space in substrates (Dunsmoor and Bienz, *in litt.* 1997).

Columbia River Population Segment

Construction and improvement of Interstate 90 is a contributing factor to the decline and suppression of bull trout in Gold Creek, a tributary of the Yakima River, Washington (Craig and Wissmar 1993). In Montana, Interstate 90 and a railroad system parallel to the Clark Fork and St. Regis rivers has contributed to channelization and increased the risk of hazardous spills (MBTSG 1996b,c). Approximately 18 percent of the bull trout subpopulations in the Columbia River basin are affected by road construction and ongoing maintenance.

Mining

Mining can degrade aquatic habitat by altering water acidity or alkalinity, changing stream morphology and flow, and causing sediment, fuel, and heavy metals to enter streams (Martin and Platts 1981; Spence et al. 1996). The types of mining that occur within the range of bull trout include extraction of hard rock minerals, coal, gas, oil, and nonminerals. Past and present mining activities have adversely affected bull trout and bull trout habitats in Idaho, Oregon, Montana, and Washington (Martin and Platts 1981; Johnson and Schmidt 1988; Moore et al. 1991; WDW 1992; Platts et al. 1993; MBTSG 1995a,c, 1996b,c).

Klamath River Population Segment

Mining effects are not known to be a factor affecting bull trout subpopulations in the Klamath River basin.

Columbia River Population Segment

Mining severely impacts large portions of the Spokane River basin. Effects include roading, stream diversion and alteration, watershed degradation from airborne emissions, and the discharge of massive quantities of waste materials, including the release into the South Fork Coeur d'Alene River of 72 million tons of hazardous mine wastes laden with heavy metals such as lead, zinc, and cadmium (Coeur d'Alene tribe of Idaho et al. 1991). During the early 1930s, the South Fork Coeur d'Alene River and about 20 miles of the lower Coeur d'Alene River were considered devoid of aquatic life due to mining waste discharge (Ellis 1940). Although some aquatic species have returned to the river, bull trout are not among them. In Montana, bull trout have not recolonized the upper mainstem Clark Fork River where mining-related stream degradation extirpated all fish prior to the turn of the century (MBTSG 1995a; Titan Environmental Corp. 1997). The lingering effects of mining done over the past century in the Butte and Anaconda reaches of the upper Clark Fork River has resulted in four Superfund sites being designated. Mining continues to impair water quality in 558 km (349 mi) of stream in these reaches (MDHES 1994). Eleven fish kills documented between 1959 and 1991 were attributed to mining contamination of the river (Titan Environmental Corporation 1997).

Numerous abandoned mines, such as the Blackbird and Cinnabar mines in the Salmon River drainage, Idaho, degrade water quality where toxic heavy metals continue to leach from mine sites into streams or groundwater. Old mine tailings in the floodplains of Newsome Creek, American River, and Crooked River, tributaries to the Clearwater River in Idaho, continue to prevent recovery of riparian areas (N. Gearhardt, Nez Perce National Forest, pers. comm. 1997). In Idaho, mine tailings abandoned decades ago contaminated a tributary of the Middle Fork Boise River with heavy metals, including arsenic, during flood flows in 1997 when migrating bull trout were present (R. Barker, Idaho Statesman, *in litt.* 1997; S. West, IDEQ, *in litt.* 1997). In Montana, historic mining in many tributaries of the Middle Clark Fork River has impaired water quality in 245 km (153 mi) of stream (MDHES 1994). The MBTSG (1995c) ranked mining in the Blackfoot River drainage as a limitation to bull trout restoration. Many mines exist in the western and southern portions of the Blackfoot River basin causing direct loss of bull trout habitat and contamination of waters from mine effluents (MBTSG 1995c). Fishes in the upper Blackfoot River are still affected by the washout of the Mike Horse tailings dam in 1975, which spilled contaminated tailings into the Blackfoot River (MBTSG 1995c). Research in the Blackfoot drainage demonstrated that heavy metal contaminants released in the headwaters affect chemical trends, metal concentrations, metal bioavailability, and fish for 25 km (15.6 mi) from the contaminant source (Moore et al. 1991).

New open-pit mines using cyanide leach pads are planned for watersheds currently occupied by bull trout in the Middle Fork Boise River basin, Idaho, and in the Stibnite area of the East Fork South Fork Salmon River, Idaho (G. Visconty, Boise National Forest, *in litt.* 1996; Payette National Forest (PNF), *in litt.* 1996). In Montana, a large underground copper-silver mine proposed for Rock Creek in the lower Clark Fork River basin is currently in the permitting process. Tailings would be stored at the confluence of Rock Creek and the Clark Fork River (MBTSG 1996b; R. Stewart, USDI, *in litt.* 1995). Rock Creek is one of only two bull trout "core" areas in this subpopulation (MBTSG 1996b). A proposal for a large open-pit gold mine using cyanide heap leach processing is proposed for the upper Blackfoot River basin, Montana. Much of the ore body occurs below the water table, requiring pumping of groundwater. Thus, the hydrology of the upper Blackfoot River system could be affected and an increase in contamination risks could result (S. Cody, Environmental Protection Agency (EPA), *in litt.* 1997; K. McMaster, Service, *in litt.* 1997).

The North Fork Flathead River headwaters in Canada contain a large coal deposit that could be developed (MBTSG 1995d). Mining this deposit could destroy spawning habitat and degrade water quality in the Montana portion of the Flathead River system (MBTSG 1995d).

Approximately 20 percent of the bull trout subpopulations in the Columbia River population segment are threatened by past, ongoing, or potential future mining activities.

Residential Development

Residential development is rapidly increasing within portions of the range of bull trout. Development increases threaten to alter stream and riparian habitats through streambank modification and destabilization, increased nutrient loads, and increased water temperatures (MBTSG 1995b). Indirectly, urbanization within floodplains alters groundwater recharge by routing water into streams through drains rather than through more gradual subsurface flow (Booth 1991).

Klamath River Population Segment

Residential development is not known to be factor affecting existing bull trout subpopulations in the Klamath River basin.

Columbia River Population Segment

In Montana, rural residential development is rapidly increasing, particularly in drainages of the Bitterroot, Blackfoot, and Flathead rivers (MBTSG 1995b,c,d). The lower Bitterroot River is a major non-point source of nutrient pollution, primarily from sewage effluent and land development (U.S. Environmental Protection Agency (EPA) 1993 in MBTSG 1995b). Efforts to mitigate effects of rural development in the Blackfoot River basin have been encouraged by an active local group, the Blackfoot Challenge, which has been working to acquire conservation easements, among other projects. Residential development in the Flathead Lake system is considered a limitation for restoration of bull trout because of the threat to water quality from domestic sewage and changes to stream morphology (MBTSG 1995d).

Approximately 26 percent of the bull trout subpopulations in the Columbia River population segment are threatened by the effects of residential development.

B. *Overutilization for commercial, recreational, scientific, or educational purposes.* Declines in bull trout have prompted states to institute restrictive fishing regulations on all waters throughout bull trout range. Recent observations of increased numbers of adult bull trout in some areas have been attributed to more restrictive regulations. However, illegal harvest and incidental harvest still continue to threaten bull trout.

Klamath River Population Segment

Legal harvest of bull trout in the Klamath River basin was eliminated in 1992 when ODFW imposed a fishing closure. Because recreational fishing for other trout species continues in the basin, incidental fishing mortality of bull trout likely occurs (OCAFS 1993). During recent ODFW angler surveys in the Klamath River basin, all anglers contacted were aware of the no harvest regulation for bull trout (D. Bertram, ODFW, *in litt.* 1995; Light et al. 1996). Incidental bull trout mortality due to angling is unknown, but is not suspected to be suppressing bull trout subpopulations in the Klamath River basin (Light et al. 1996). However, Dunsmoor and Bienz (*in litt.* 1997) consider angling to be a factor negatively affecting bull trout, especially subpopulations with low numbers and proximity to highway access, such as Threemile Creek.

Columbia River Population Segment

Overharvest of bull trout in the Columbia River basin, historically, likely contributed to their decline. In the past, harvest included legal recreational angling, poaching, and State-sponsored eradication programs (Thomas 1992). Bull trout were often targeted for removal by anglers and government agencies because bull trout preyed on salmon and other desirable species (Simpson and Wallace 1982; Bond 1992). As recently as 1990, State and Federal agencies instituted programs to eradicate bull trout through bounties and poisoning of waterways (Ratliff and Howell 1992; ODFW 1993; Newton and Pribyl 1994; Palmisano and Kaczynski, *in litt.* 1997). For instance, during the 1940's and 1950's in Oregon, several hundred bull trout migrating from Wallowa Lake to spawn in Wallowa River were trapped in a weir and exterminated (B. Smith, WDFW, *in litt.* 1997). Bull trout were recently re-introduced to Wallowa Lake in summer 1997 in an effort to re-establish the fish.

In recognition of the decline of bull trout, State management agencies in Idaho, Montana, Washington, and Oregon suspended harvest in the Columbia River basin except in Lake Billy Chinook (Oregon) and Swan Lake (Montana). State regulations still allow catch and release fishing for bull trout, and the harvest of other salmonid species is allowed in most bull trout waters. However, in Montana, (MFWP 1996), the revised regulations are believed to be partially responsible for increasing bull trout numbers in the Swan River basin where the taking or intentional fishing for bull trout is prohibited (MBTSG 1996a). Mortality from incidental catch and release angling of bull trout and harvest as a result of misidentification still continues under existing fishing regulations. For example, about half or fewer of anglers surveyed were able to correctly identify bull trout from other salmonids in west-central Montana (Kelly et al. 1996; M. Long and S.P. Whalen, MFWP, *in litt.* 1997). In 1997, the day after two radio tagged bull trout were released into Wallowa Lake, Oregon, one of the fish was unintentionally, but illegally harvested by a young angler. The MBTSG (1995d) is concerned with the catch and release mortality of bull trout as a result of intense fishing pressure on lake trout in Flathead Lake and the Flathead River. Legal and illegal harvest can seriously affect declining subpopulations already subjected to other factors such as competition, degraded habitat, and isolation (WDW 1992; Donald and Alger 1993; Pratt and Huston 1993; Swanberg and Burns 1997).

Poaching of bull trout likely continues, and can be especially detrimental to small, isolated subpopulations of migratory fish (WDFW 1992; Craig and Wissmar 1993; Pratt and Huston 1993; Long 1997). A study in the Metolius River suggested that 2 of 22 radio-tagged adult bull trout were illegally harvested (Ratliff et al. 1996). Illegal harvest of bull trout in northwest Montana has been a recurring problem for over 50 years, especially in drainages of the Blackfoot, Kootenai, South Fork Flathead, and Clark Fork rivers (MBTSG 1995e; Swanberg 1996; Long 1997). In response, the MFWP instituted a program in 1994 funded by the Bonneville Power Administration to reduce the illegal harvest of bull trout, disperse information to improve anglers' fish identification skills, and increase understanding of the importance of native species (Long 1994). Additionally, the Montana legislature increased the penalties for bull trout poaching, and the Bonneville Power Administration, until recently, funded increased enforcement (M. Racicot, Governor of Montana, *in litt.* 1995).

Approximately 21 percent of the bull trout subpopulations in the Columbia River population segment are threatened by the effects of poaching.

C. *Disease or predation.* Although diseases affecting salmonids are likely present in both the Klamath River and Columbia River basins, they are not thought to be a major factor affecting bull trout. However, interspecific interactions, including predation, are thought to negatively affect bull trout where non-native salmonids have been introduced (Palmisano and Kaczynski, in litt. 1997).

Klamath River Population Segment

Diseases have not been documented affecting bull trout in the Klamath River basin. However, brook trout and brown trout have been introduced in the basin, and either one or both species co-exist with bull trout in all subpopulations except Deming Creek (Buchanan et al. 1997). Brown trout predation on bull trout is evidenced by a direct observation in Boulder Creek (Light et al. 1996). Overall, bull trout co-occur with brown trout and brook trout in about half of the occupied habitat. Buchanan et al. (1997) indicated that bull trout occupy approximately 34.1 km (20.5 mi) of streams. However, allopatric (occurring in different

geographic areas or in isolation) bull trout have been estimated to occupy only 13.4 to 15.7 km (8.3 to 9.8 mi) within the basin (Buchanan et al. 1997; Schroeder and Weeks, *in litt.* 1997).

Columbia River Population Segment

Health samples from 207 juvenile bull trout collected from 8 streams in the Flathead River basin in 1992 and 1993 were negative in tests for furunculus, enteric redmouth, bacterial kidney disease, and viral hemorrhagic septicemia (VHS) or infectious pancreatic necrosis (IPN) (Fredenberg 1993). Bull trout are susceptible to whirling disease, caused by a protozoan parasite (*Myxobolus cerebralis*), and recently detected in bull trout waters in Montana (Montana Whirling Disease Task Force 1996). However, bull trout are less susceptible to whirling disease than rainbow trout (McDowell et al. 1997). Whirling disease is currently untreatable in the wild, and the parasite appears to be rapidly spreading into previously uninfected waters. The consequences of whirling disease on bull trout may not be apparent for years.

Bull trout are most vulnerable to predation as juveniles. Several non-native fishes, such as lake trout, brown trout, brook trout and northern pike (Esox lucius) are considered potential predators (and competitors, see Factor E below) of many bull trout subpopulations in the Columbia River basin (Donald and Alger 1992; Pratt and Huston 1993; Rieman and McIntyre 1993; MBTSG 1995d, 1996a; MFWP 1997).

Dramatic declines in the Priest Lake, Idaho, bull trout harvest began about 20 years ago. Between 1956 and 1970, an annual average of 1,200 fish were harvested. In 1978, a record 2,320 were harvested, declining in 1983 to 159 (Mauser et al. 1988). There has been no legal harvest of bull trout since 1984. Bull trout were extirpated from Priest Lake through interactions with introduced lake trout (Pratt and Huston 1993). Mauser et al. (1988) described bull trout in Priest Lake as "functionally extinct as long as lake trout abundance is high." Similarly, lake trout introduced into Flathead Lake feed on juvenile bull trout entering the lake from the Flathead River, and are thought to be a factor in recent declines of the bull trout subpopulation (MBTSG 1995d). Introduced non-native fishes limit bull trout restoration in all the major drainages in Montana (MBTSG 1995a-e, 1996a-f).

For bull trout in the Columbia River population segment, disease is not considered a listing factor; however, approximately 62 percent of the subpopulations are threatened by introduced non-native fishes, including the effects of predation.

D. *The inadequacy of existing regulatory mechanisms.* Although efforts are underway to conserve bull trout (e.g., Batt, *in litt.* 1997; Joslin, *in litt.* 1997; Thomas, *in litt.* 1997), the implementation and enforcement of existing Federal and State laws designed to conserve fishery resources, maintain water quality, and protect aquatic habitat have not prevented past and ongoing habitat degradation. This inadequacy has led to bull trout declines and isolation and is a factor in the determination to list bull trout population segments. Regulatory mechanisms, including the National Forest Management Act, the Federal Land Policy and Management Act, the Public Rangelands Improvement Act, the Clean Water Act, the National Environmental Policy Act, the Federal Power Act, State Endangered Species Acts and numerous State laws and regulations govern an array of land and water management activities that affect bull trout and their habitat.

National Forest Management Act

The National Forest Management Act (NFMA) and the Federal Land Policy and Management Act (FLPMA) require the USFS and BLM to develop and implement land and resource management plans (LRMPs) and Resource Management Plans (RMPs), respectively) to protect fish and wildlife resources and produce forest and range products. However, reviews by the U.S. Department of Agriculture (USDA) of LRMP monitoring and evaluation reports for 28 national forests indicate that many watersheds do not meet NFMA Forest Plan standards. Compliance with LRMPs and effectiveness of best management practices on current projects is improving, but, a majority of streams that had been affected by past practices were not healing as fast as anticipated (USDA 1995).

Reviews of existing LRMPs implemented outside the range of the northern spotted owl, even as amended by the Environmental Assessment for the Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH) (USDA 1995), have inadequately protected salmonid habitat on BLM and national forest lands (Henjum et al. 1994; R. Schmitten, NMFS, *in litt.* 1995; Espinosa et al. 1997). While the severe resource damage from forest management that occurred in the 1950s through the 1970s has ceased, the current LRMPs have not fully taken into account the habitat needs of salmonids and recovery of degraded habitats has not occurred as predicted. For example, most LRMPs were developed prior to listing the Snake River salmon stocks, and, consequently, the biological requirements of these fish are not fully considered under the parameters of the LRMPs. The NMFS noted that even though PACFISH provided some improvements in many standards and guidelines of the LRMPs, comprehensive, landscape-scale conservation strategies for salmonid survival and recovery are still lacking (Schmitten, NMFS, in litt, 1995). Espinosa et al. (1997) listed several reasons why the Clearwater National Forest Plan adopted in 1987 has failed to adequately protect salmonid habitats in forest watersheds. Reasons included for this failure were— projected timber harvests and levels of associated road construction too high to achieve fish habitat quality standards; inaccurate riparian habitat inventories; watershed recovery following disturbance was slower than expected; and inaccurate inventories of the timber resources.

Under the NFMA and the FLPMA, livestock grazing occurs on over 70 percent of federally-administered western rangeland, or about 108.5 million ha (268 million acres (ac)) of land in 16 western states (General Accounting Office (GAO) 1988). Ongoing livestock grazing on lands administered by the BLM and USFS continues to occur in watersheds occupied by bull trout (Henjum et al. 1994; McIntosh et al. 1994; USDA and USDI 1997). Technical solutions to improving riparian areas damaged by livestock grazing were available as early as 1988 (GAO 1988). However, the GAO (1988) noted that correcting damage from grazing was not readily solvable due to funding and political pressure to maintain the status quo grazing systems. Within the Interior Columbia River Basin, the BLM and USFS have had difficulty correcting practices that cause grazing damage to streams due to lack of funding, conflicting requirements of different laws, or budget allocations (USDA and USDI 1997). However, in some areas supporting federally listed fish or designated critical habitat, the BLM and the USFS have been able to improve livestock management in riparian areas, including habitat for shortnose sucker (*Chasmistes brevirostris*) and Lost River sucker (*Deltistes luxatus*) in the Klamath River basin, and the Lohontan cutthroat trout

(*Oncorhynchus clarki henshawi*) of the Great Basin.

Interior Columbia Basin Ecosystem Management Project

The USFS, BLM, EPA, NMFS, and Service are cooperating in development of the Interior Columbia Basin Ecosystem Management Project (ICBEMP), a large-scale land management plan for lands administered by these agencies in eastern Oregon and Washington, Idaho and western Montana. The alternatives described in the Draft Environmental Impact Statement (DEIS) do not specifically address bull trout conservation in "depressed" areas outside the range of steelhead and chinook salmon; the preferred alternative depends on subbasin review and ecosystem analysis at the watershed scale as the basis for decision-making within the Interior Columbia Basin (USDA and USDI 1997). The ICBEMP is in draft, and possible outcomes from implementing future bull trout conservation actions as part of an unapproved management alternative are not predictable. Funding and staffing to implement those components are also not secured.

Streamlined Consultation Procedures

On March 8, 1995, the USFS, Service, BLM, and NMFS, issued a memorandum directing the agencies to participate in "streamlined" consultation procedures. These procedures were initiated to address forest health and salvage projects (T. Dwyer, Service, *in litt.* 1995). By May 31, 1995, these procedures were extended indefinitely to include all consultation efforts (Dwyer, *in litt.* 1995). These procedures apply to Federal land management activities in Idaho, Oregon, Washington, Montana and California (California lands managed by BLM are subject to streamlined procedures only when forest ecosystem activities are involved). The purpose of the streamlined procedures is to improve the efficiency of the section 7 consultation process (C. Dunn, Service, *in litt.* 1997). Conservation and protection of bull trout habitat has been inconsistent due in part to the USFS and BLM discretionary option to review non-listed, candidate species or species of concern (R. Vizgirdas, Service, *in litt.* 1997; R. Strach, Service, *in litt.* 1997; P. Zenone, Service, *in litt.* 1997). In Idaho and eastern Oregon, Federal land management agencies have often not considered the effects of projects on bull trout through the streamlining process.

Endangered Species Act

In the Klamath River basin, the Service listed the shortnose sucker and Lost River sucker under the Act as endangered on August 26, 1987 (52 FR 32145), and proposed critical habitat for the species on December 1, 1994 (50 CFR 61744). Bull trout likely used portions of the proposed critical habitat in the past, including tributaries in the upper Klamath River, Crooked Creek, Sevenmile Creek, and Wood River. Although some of the earliest records of bull trout in the basin are from Fort Creek, a tributary of the Wood River (Dunsmoor and Bienz, *in litt.* 1997), bull trout do not presently occur within the habitat occupied by the two suckers. Therefore, conservation and recovery actions undertaken for the listed suckers will not directly benefit bull trout.

In the Columbia River basin, three species of salmon in the Snake River are listed—sockeye salmon (endangered), spring/summer chinook salmon (threatened) and fall chinook salmon (threatened). Critical habitat for all three salmon was designated, including the Columbia River migration corridor, and historically accessible streams in the Snake River basin upstream of Hell's Canyon Dam in Idaho, Oregon and Washington (58 FR 68543–68554). Downstream of Hell's Canyon and Dworshak Dam, the designation extends to reaches historically accessible to salmon, below historically impassible barriers (58 FR 68543–68554). The designation extends protection to bull trout habitat in areas where they co-occur with the salmon. However, in many areas bull trout tend to spawn and rear upstream of listed salmon habitats. For instance, Fall Creek, a tributary of the Salmon River, Idaho, has an impassible waterfall near its mouth, and habitat for the listed salmon ends at the impassible falls (58 FR 68543–68554), but bull trout spawn and rear above the falls. In this example, bull trout spawning and rearing habitat does not overlap with the listed salmon; thus, bull trout would not receive indirect protection under the Act.

On August 18, 1997, five evolutionarily significant units (ESUs) of steelhead were listed as threatened—three in California, one in Washington (Columbia River from the Yakima River to Grand Coulee Dam), and one in the Snake River basin in Oregon, Washington, and Idaho (62 FR 43937). Although protection for bull trout under the Act would be afforded where they co-occur with steelhead, measures to protect steelhead may be insufficient for bull trout due to differences in the life history between the species and lack of complete habitat overlap.

Northwest Forest Plan

The Northwest Forest Plan (NWFP) addresses management of USFS and BLM lands within the range of the northern spotted owl, and implementation began in April 1994 (Tuchmann et al. 1996). The NWFP includes an aquatic conservation strategy, consisting of four inter-related elements. The first element is riparian reserves, which is the system of lands along streams allocated toward the conservation and restoration of aquatic and riparian dependent species. The second is key watersheds, which are watersheds with special values and appropriate management standards. The third element is watershed analysis, which is required to help land managers understand the processes that maintain habitats and to manage to preserve these processes. The fourth element is watershed restoration projects, which are funded to move watersheds toward recovery. For instance, in 1994 through 1996, 1675 watershed restoration projects (or groups of projects) were funded under the NWFP (Tuchmann et al. 1996). The conservation strategy generally addresses the maintenance of the four elements. Although the strategy does not specifically address bull trout needs, it contains objectives for riparian and stream conservation and maintenance that may facilitate conservation of bull trout habitat (W. Cole, Service, *in litt*, 1997). Additionally, the implementation of the NWFP is dependent on interagency collaboration to achieve resource conservation and a sampling of projects unaffected by the 1995 Salvage Rider (see below) indicates that bull trout are generally protected by the NWFP. However, the NWFP covers only a minor portion of bull trout habitat for the Columbia River population segment.

PACFISH and INFish

The USFS and BLM developed the Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho and Portions of California, known as PACFISH. PACFISH is intended to be an ecosystem-based, aquatic habitat and riparian-area management strategy for Pacific salmon, steelhead, and sea-run cutthroat trout habitat on lands administered by the two agencies and outside the area subject to implementation of the NWFP (USDA and USDI 1995). PACFISH amended Regional Guides, forest plans and land use plans by applying management

measures for all ongoing and proposed or new projects that pose an unacceptable risk to anadromous fish involving the management of timber, roads, grazing, and other land uses. The Service is participating with NMFS, the USFS, and the BLM in reviewing action-agency PACFISH screening efforts for anadromous fish. Within the area of PACFISH where the habitats of salmon and bull trout overlap, the screening effort is to protect both anadromous fish and bull trout from major effects. However, efforts to include bull trout in the PACFISH review are not always successful (Vizgirdas, *in litt.* 1997; Strach, *in litt.* 1997; Zenone, *in litt.* 1997).

The Inland Native Fish Strategy (INfish) was developed by the USFS to provide an interim strategy for inland native fish in eastern Oregon and Washington, Idaho, western Montana and portions of Nevada (USDA and USDI 1995). It has not been determined whether INfish is an effective strategy for removing the threats for bull trout. In Idaho, the USFS does not place a priority on application of INfish and generally has determined that anadromous watersheds have a higher priority than bull trout watersheds (Vizgirdas, *in litt.* 1997; Strach *in litt.* 1997; Zenone, *in litt.* 1997).

Clean Water Act

Under sections 303 and 304 of the Clean Water Act (CWA), States or EPA set water quality standards, which combine designated beneficial uses and criteria established to protect those uses. Water bodies that are identified as failing water quality standards are designated by States under section 303(d) as water quality limited (MDHES 1994; EPA 1994; ODEQ 1996), and subject to development of management plans to restore water quality and protect designated uses. These management plans, or total maximum daily loads (TMDLs), address both point and non-point sources of pollutants within a watershed. Best Management Practices (BMPs) are used with TMDLs to address non-point sources of pollution, such as mining, forestry, and agriculture; however, regulatory authority to enforce the BMPs varies among the states. It is estimated that 10 percent of total length of streams within the ICBEMP assessment area, including the Klamath River and Columbia River basins, are listed as water quality limited. This may underestimate the true extent and distribution of streams with impaired water quality potentially affecting bull trout (USDA and USDI 1997). In the Klamath River basin, stream reaches designated as water quality limited (i.e., cited on the 303(d) list of Oregon for various water quality standards (ODEQ 1996)) are estimated to apply to six of the seven bull trout subpopulations. In the Columbia River basin, water bodies designated as water quality limited by Oregon, Washington, Idaho, and Montana are estimated to apply to at least 64 of the 141 bull trout subpopulations.

Relative to water temperature, Oregon established a water quality criterion of 10° C (50° F) as a weekly average based on daily maximum temperatures in bull trout spawning and rearing waters (OAR 340–41–685 and OAR 340–41–026); however, water bodies where these criteria would apply have not been identified. In Washington, temperature criteria for waters vary among the different classifications that are assigned to each waterbody, and range from 16 to 22° C (60.8 to 71.6° F) (Chapter 173–201 WAC). Washington is reviewing these standards with the intent of creating more appropriate water quality standards; however, whether the criteria specifically are for bull trout is unknown. In Idaho, EPA disapproved the state's temperature criteria applications within the geographic range of bull trout (EPA 1997). The EPA determined that the criteria did not provide adequate protection for bull trout relative to two designated uses—cold water biota and salmonid spawning (maximum daily average of 13° C (55.5° F) and 9° C (48.2° F) for each respective use). In July 1997, EPA promulgated a temperature criterion of 10° C (50° F) during June through September in designated stream areas, as a weekly average based on daily maximum temperatures for spawning and rearing of bull trout (EPA 1997). To date, the State has not adopted EPA's promulgated criterion, but has adopted 12° C as a daily average during June-August for juvenile rearing and 9° C for September and October for spawning. Additionally, Idaho has established a geographical area where these criteria would apply. It is unknown whether EPA will approve the State's criteria and withdraw the promulgated rule. In Montana, the temperature criterion applied to waters with bull trout is 19° C (66° F); temperature can be raised 0.6° C (1° F) by discharges, but water temperature may not exceed 19.5°C (67°F) (Administrative Rules of Montana 1996).

In accordance with Section 319 of the CWA, States also develop programs to address non-point sources of pollution such as agriculture, forestry, and mining. The effectiveness of controlling water pollution from these activities has been mixed. The State of Washington monitored the effectiveness in meeting water quality criteria for temperature in riparian areas on forest lands and concluded that regulations for stream shading were inadequate to meet criteria (Sullivan et al. 1990).

In summary, it is uncertain whether the CWA can provide sufficient protective measures for conservation of bull trout. Temperature regime is one of the most important factors affecting bull trout distribution (Adams and Bjornn 1997, Rieman and McIntyre 1995). Given the known temperature requirements of bull trout (Buchanan and Gregory 1997), criteria developed by the four States may not be conducive to either spawning, incubation, rearing, migration, or combinations of these life-history stages.

State Regulations and Conservation Planning Efforts

All four States within the range of the Klamath River and Columbia River population segments of bull trout have regulations affecting bull trout and their habitat. Idaho, Montana, and local or county organizations have recently developed or are developing conservation plans to maintain and restore bull trout, primarily through stream habitat protection.

In 1995, Idaho Governor Phil Batt initiated a conservation plan to restore bull trout populations in Idaho. The mission of the Governor's Plan, approved in July 1996, is to "... maintain and/or restore complex interacting groups of bull trout populations throughout their native range in Idaho" (Batt, *in litt.* 1997). A recent status report of implementation of the Plan stated that advisory groups, which will develop water quality and bull trout conservation measures, have formed only in some areas. Although the harvest of bull trout is closed throughout Idaho and State-sponsored survey and monitoring has increased (S. Mealey, IDFG, *in litt.* 1997), few on-the-ground recovery actions for bull trout have been implemented to date.

Other efforts include a 1994 conservation agreement (CA) between the Idaho Department of Transportation (IDOT) and the Service to protect bull trout (USDI and IDOT, *in litt.* 1994), and recent conservation activities by the IDFG that were funded by Section 6 of the Act. The IDOT finished only one passage restoration project under the CA, and recently declined to renew the CA (R. Howard, Service, pers. comm. 1997). Since 1994, IDFG has used Section 6 funds to begin several habitat restoration actions in northern and southwestern Idaho. Aside from enacting restrictive fishing regulations,

few protective or restoration projects have been completed that substantially reduce threats to bull trout throughout the Columbia River.

Beginning in 1992 and 1993, several interagency bull trout working groups were formed in Oregon (R. Rosen, ODFW, *in litt.* 1995). These working groups have been instrumental in gathering additional status information and developing preliminary conservation strategies for bull trout in their respective basins. These efforts are encouraging for bull trout conservation in the future, but the outcome has not yet been demonstrated.

In March 1997, Oregon also adopted the Oregon Coastal Salmon Restoration Initiative (OCSRI 1997) (Oregon Plan). The Oregon Plan is designed to "... restore salmon to a level at which they can once again be part of people's lives ..." in coastal Oregon. The Oregon Plan's initial focus is on areas within the range of Oregon coastal coho salmon, and does not overlap with presently occupied bull trout habitat. Oregon recently acknowledged support for developing future bull trout conservation measures by including bull trout in the Oregon Plan (J. Kitzhaber, Governor of Oregon, *in litt.* 1997), although no conservation measures specific to bull trout have been completed to date.

The Upper Klamath Basin Bull Trout Conservation Strategy (Light et al. 1996) was developed by the Klamath Basin Bull Trout Working Group in response to the limited and shrinking distribution and number of bull trout. The Working Group, formed in 1993, is composed of representatives from the Service, ODFW, Fremont and Winema National Forests, Crater Lake National Park, PacifiCorp, USBR, Sprague River Water Users Association, Klamath Basin Water Users Protective Association, U.S. Timberlands, and Klamath Tribes. The defined goals of this group as identified in the Conservation Strategy are—(1) secure existing bull trout populations and (2) restore populations to some of their former distribution (Light et al. 1996). Phase 1 has concentrated on addressing threats to bull trout from non-native salmonids, including eradication of brook trout and brown trout above barriers where isolated subpopulations of bull trout are found. Stream temperatures and sedimentation problems are being addressed concurrent with eradication of exotic species. Phase 2 will involve expanding the number of subpopulations by reestablishing bull trout in high quality headwater habitats, effectively increasing the size of the Klamath River metapopulation and making it more resilient to natural disturbance, variation in breeding success, disease outbreaks, and other environmental factors (Light et al. 1996). Future objectives likely will include establishing natural movement corridors between adjacent headwater streams.

All habitats currently occupied by bull trout in the Klamath River basin are managed by Working Group members. From 1993 through 1996, conservation actions (phase 1) were implemented by the Working Group, including—watershed assessments; fish distribution, abundance, and spawning surveys; collection of stream temperature and sediment data to help identify limiting factors; brook trout eradication efforts in Long, Sun, and Threemile creeks; reduction or elimination of grazing along bull trout habitat owned by U.S. Timberlands; road system improvements, closures, and rehabilitation; and barrier management to prevent access of non-native fishes (Johnson *in litt.* 1997; Buchanan et al. 1997). Habitat improvement projects have also been implemented in areas historically occupied by bull trout, such as the 9,700 ha (24,000 ac) Nature Conservancy preserve at Sycan Marsh (P. Rexroat, The Nature Conservancy, *in litt.* 1997) and the Sun Pass State Forest on lower Sun Creek. These ongoing conservation efforts have been complicated by recent private land ownership changes and lack of an approved recovery plan that identifies specific conservation tasks and actions.

In addition to the Klamath Basin Bull Trout Working Group, a federally-authorized, interagency and entity group, the Upper Klamath Basin Working Group, was established in 1994. This group, composed of Federal, State, county, city, tribal, environmental, local business, agricultural-ranching, and local community members, works on a consensus-based approach to Klamath basin ecosystem issues. The group focuses on ecosystem restoration projects and has funded bull trout conservation efforts, a high group priority, such as riparian fencing and road maintenance and obliteration projects.

Other State regulations and policies affect bull trout and their habitat in Oregon. For instance, Oregon has a policy "to prevent the serious depletion of any indigenous species" (ORS 496.012). As such, the Oregon Department of Fish and Wildlife's Wildlife Diversity Plan (OAR 635-100) provides for a Sensitive Species List. The Sensitive Species List (OAR-635-100-040) is maintained by ODFW, and is updated biennially. The Sensitive Species List is intended as a "watch list" of species potentially eligible for listing as endangered or threatened, and constitutes an early warning system for land managers and the public (ODFW 1996). There are no regulatory protections for species listed as sensitive, nor is the habitat on which they depend protected under OAR 635-100.

The Sensitive Species List has four categories—"critical" (species for which listing is appropriate or pending); "vulnerable" (species for which listing is not imminent and can be avoided via adequate protective measures); "peripheral or naturally rare" (occurring in Oregon at the edge of their range, in naturally low numbers due to limited in-state distribution); and "undetermined" status (species for which status is unclear). Bull trout is listed in the "critical" category (ODFW 1993).

The Washington Department of Fish and Wildlife released the final Environmental Impact Statement for the proposed Wild Salmonid Policy in September 1997 (WDFW 1997). Although the environmental impact statement (IS) focused on salmon and steelhead, referring to bull trout and other wild salmonids in an ancillary manner, it described problems and challenges facing the recovery of anadromous and resident salmonids throughout Washington. The IS presented five alternatives ranging from continuation of current management (i.e., policy generally based on maximum sustainable yield) to alternatives providing more protection for wild salmonids. Each alternative addressed harvest, hatcheries, and habitat relative to wild salmonids, and presented obstacles to recovery and possible actions to facilitate recovery. Regardless of the alternative ultimately selected by the Washington State Fish and Wildlife Commission as the Wild Salmonid Policy, implementation of the policy will suggest guidelines for actions taken by the WDFW and will not be binding on other State, tribal, and private entities. Because of uncertainties concerning implementation of the policy, the effect of the policy on bull trout conservation in Washington is unknown.

In Montana, Governor Marc Racicot appointed the Bull Trout Restoration Team in 1994 to produce a plan that maintains, protects, and increases bull trout populations. The team appointed a scientific group that has subsequently prepared eleven basin-specific status reports and two technical, peer-reviewed papers. A third technical

paper is presently undergoing peer review. A Montana Bull Trout Recovery Plan, including a recovery goal, is also nearing completion. Watershed groups are being established in some areas to lead local bull trout restoration efforts. As of October 1997, some localized habitat restoration projects, such as removal of fish passage barriers, screening irrigation diversions, riparian fencing, stream restoration projects, and habitat monitoring, had been completed or were underway (Graham and Clinch, *in litt.* 1997). Because of uncertainties concerning implementation of the restoration plan, the effect of the plan on future bull trout conservation in Montana is unknown.

Oregon, Washington, Idaho, and Montana each have adopted a Forest Practice Act (FPA) or other legislation consisting of rules and regulations addressing forest management on State, Federal, and private lands. In general, the legislation establishes best management practices (BMPs) to be implemented on forests, such as streamside management zones (Montana Department of State Lands 1994), activities allowed in riparian areas, restrictions on harvest adjacent to streams, and location of road construction. The application of BMPs is voluntary in some States. Although audits show that compliance with BMPs is high in Idaho (H. Malany, Idaho Forest Practice Act Advisory Committee Member, *In litt.* 1997) and Montana (Mathieus 1996), the Service is not aware of evaluations of various States' BMPs relative to the protection of bull trout habitat and processes affecting water quality, such as sediment delivery, water temperature, recruitment of woody debris, and bank stability. In Idaho, half of timber sales audited resulted in contributions of sediment to streams, largely from inadequately maintained roads (Zaroban et al. 1996). Even with high implementation rates, Idaho's forestry BMPs have been ineffective at maintaining beneficial uses, including cold water biota (McIntyre 1993). In Montana, McGreer (1994) noted that the Montana legislation may adequately provide for woody debris and bank stability, but it may be inadequate for temperature control and sedimentation. The MDNRC has discontinued timber harvest and grazing in areas directly adjacent to streams containing bull trout (P. Flowers, MDNRC, *In litt.* 1996). Based on current information, the Service is unable to conclude that State FPAs and related legislation are adequate to protect bull trout habitat.

E. *Other natural or manmade factors affecting their continued existence.* Natural and manmade factors affecting the continued existence of bull trout include—previous introductions of non-native species that compete or hybridize with bull trout; fragmentation and isolation of bull trout subpopulations from habitat changes caused by human activities, and subpopulation extirpations due to naturally occurring events such as droughts and floods.

Introduced Non-native Species

Introductions of non-native species by the Federal government, State fish and game departments, and private parties, across the range of bull trout has resulted in declines in abundance, local extirpations, and hybridization of bull trout (Bond 1992; Howell and Buchanan 1992; Leary et al. 1993; Donald and Alger 1993; Pratt and Huston 1993; MBTSG 1995b,d, 1996g; Platts et al 1995; Palmisano and Kaczynski, *in litt.* 1997). Non-native species may exacerbate stresses on bull trout from habitat degradation, fragmentation, and isolation (Rieman and McIntyre 1993). Introduced species, such as rainbow trout, may benefit large adult bull trout by providing supplemental forage (Faler and Bair 1991; Pratt 1992; ODFW, *in litt.* 1993). However, introductions of non-native game fish can be detrimental due to increased angling and subsequent incidental catch and illegal harvest of bull trout (Rode 1990; Bond 1992; WDW 1992; MBTSG 1995d).

Non-native fish also threaten bull trout in relatively secure and physically unaltered habitats, including roadless areas, wilderness, and national parks. For instance, brook trout occur in tributaries of the Middle Fork Salmon River within the Frank Church-River of No Return Wilderness, including Elk, Camas, Loon, and Big creeks (Thurow 1985; S. Achord, National Marine Fisheries Service (NMFS), *in litt.* 1994) and Sun Creek in Crater Lake National Park (Light et al. 1996). Glacier National Park has self-sustaining populations of introduced non-native species, including lake trout, brook trout, rainbow trout, Yellowstone cutthroat trout, lake whitefish (*Coregonus clupeaformis*), and northern pike (MBTSG 1995d). Although stocking in Glacier National Park was terminated in 1971, only a few headwaters lakes contain exclusively native species, including bull trout. The introduction and expansion of lake trout into the relatively pristine habitats of Kintla Lake and Lake McDonald in Glacier National Park nearly extirpated the bull trout subpopulation from predation and competition (L. Marnell, NPS, *in litt.* 1995; MBTSG 1995d).

Introduced brook trout threaten bull trout through hybridization, competition, and possibly predation (Leary et al. 1993; Thomas 1992; WDW 1992; Clancy 1993; Rieman and McIntyre 1993; MBTSG 1996). Hybridization between brook trout and bull trout has been reported in Montana (MBTSG 1995a,b, 1996a,c,e; Hansen and DosSantos 1997), Oregon (Markle 1992; Ratliff and Howell 1992), Washington (WDFW 1997), and Idaho (Adams 1996; T. Burton, BNF, pers. comm. 1997). Hybridization results in offspring that are frequently sterile (Leary et al. 1993), but some hybrids show gonadal development (Dunsmoor and Bienz, *in litt.* 1997), raising concern of potential introgression. Hybrids may be significant competitors; Dunsmoor and Bienz (*in litt.* 1997) noted that hybrids are aggressive and larger than resident bull trout, suggesting that hybrids may have a competitive advantage. Brook trout mature faster and have a higher reproductive rate than bull trout. This difference may favor brook trout over bull trout when they occur together, often leading to replacement of bull trout with brook trout (Leary et al. 1993; Clancy 1993; MBTSG 1995b). The threat of hybridization and replacement is likely exacerbated where larger, more fecund migratory forms of bull trout have been eliminated (Rieman and McIntyre 1993). The magnitude of threats from non-native fishes is highest for subpopulations supporting only resident fish because resident bull trout typically are small in number and isolated where the effects of interspecific interactions are likely more intense.

Brook trout apparently adapt better to degraded habitats than bull trout (Clancy 1993; Rich 1996). Brook trout likely have higher survival-to-emergence than bull trout in areas with elevated sediment (MBTSG 1996h), and brook trout also tend to occur in streams with higher water temperatures (Adams 1994; MBTSG 1996h). Because elevated water temperatures and sediments are often indicative of degraded habitat, bull trout may be subject to stresses from both interactions with brook trout and degraded habitat (MBTSG 1996h). Watson and Hillman (1997) found an inverse relationship between bull trout occurrence and the presence of brook trout. Dunsmoor and Bienz (*in litt.* 1997) noted that brook trout have a high probability of displacing bull trout in the Klamath River basin due to degraded bull trout habitat.

Introduced brown trout are established in several areas within the range of bull trout and likely compete with bull trout (Ratliff and Howell 1992;

Platts et al. 1993; Pratt and Huston 1993). Brown trout tend to spawn in the same areas as bull trout, though later in the season, and may compete for spawning and rearing areas and superimpose redds on bull trout redds (Pratt & Huston 1993; Light et al. 1996; MBTSG 1996h). Additionally, brown trout are typically more aggressive than native trout, and can displace brook trout and other native trout species (Fausch and White 1981; Wang and White 1994). Bull trout and brown trout rear in similar areas and may compete for food and space. Elevated water temperatures may favor brown trout over bull trout in competitive interactions (MBTSG 1996h). Brown trout are thought to have been a secondary factor in the decline and eventual extirpation of bull trout in the McCloud River, California, after dam construction altered bull trout habitat (Rode 1990).

Non-native lake trout also negatively affect bull trout (Donald and Alger 1993; MBTSG 1996h). A study of 34 lakes in Montana, Alberta, and British Columbia found lake trout likely limit foraging opportunities and reduce the distribution and abundance of migratory bull trout in mountain lakes (Donald and Alger 1993). Illegal introductions of lake trout and other species have occurred in more than 50 northwest Montana waters in recent years (J. Vashro, MFWP, *in litt.* 1995). The potential for illegal introduction of lake trout into the Swan River basin and Hungry Horse Reservoir on the South Fork Flathead River, both in Montana, is considered a threat to bull trout (MBTSG 1995e, 1996a), potentially affecting up to six subpopulations. In Idaho, lake trout and habitat degradation were factors in the decline of bull trout from Priest Lake (Mauser et al. 1988; Pratt and Huston 1993). Juvenile lake trout are also using river habitats in Montana, possibly competing with bull trout (MBTSG 1996h). State plans to manage lake trout to reduce interactions with bull trout are unknown.

Non-native northern pike (*Esox lucius*), bass (*Micropterus spp.*), and opossum shrimp (*Mysis relicta*) are also thought to negatively affect bull trout. Northern pike were illegally introduced into Swan Lake in the 1970s (MFWP 1997), and predation on juvenile bull trout has been documented (S. Rumsey, MFWP, pers comm. *in* MBTSG 1996a). Management of Swan Lake emphasizes protection of native salmonids, particularly bull trout, and control of northern pike to minimize effects on native species (MFWP 1997). Northern pike were also illegally introduced into Salmon, Inez, Seeley, and Alva lakes in the Clearwater River basin, a tributary to the Blackfoot River, Montana (MFWP 1997). Northern pike numbers have increased in Salmon Lake and Lake Inez, having a negative effect on bull trout (Berg, pers. comm. 1997). Northern pike in Seeley Lake and Lake Alva are also expected to increase in numbers (Berg, pers. comm. 1997).

Introduced bass may negatively affect bull trout where the species co-occur (MFWP 1997). In the Clark Fork River, Montana, Noxon Rapids Reservoir supports fisheries for both smallmouth bass (*Micropterus dolomieui*) and largemouth bass. Both are high priority species in current management of Noxon Rapids Reservoir unless more suitable bull trout habitat is created as a result of dam relicensing. The fishery management objective for Cabinet Gorge Reservoir, downstream of Noxon Rapids Reservoir, is to enhance bull trout while managing the existing bass fishery (MFWP 1997).

Opossum shrimp, a crustacean native to the Canadian Shield area, was widely introduced in the 1970s as supplemental forage for kokanee and other salmonids in several lakes and reservoirs across the northwest (Nesler and Bergerson 1991). The introduction of opossum shrimp in Flathead Lake changed the lake's trophic dynamics, and is widely believed to have been partially responsible for the expanding the lake trout population, resulting in increased competition and predation on bull trout (T. Weaver, MFWP, *in litt.* 1993) Thus, opossum shrimp have had an indirect, negative effect on bull trout. Conversely, in Swan Lake, Montana, opossum shrimp and kokanee have become established and increased the availability of forage for bull trout, contributing to the significant increase in bull trout numbers in the Swan River basin (MBTSG 1996a). Thus, the effects of introduced species on bull trout involve complex interactions that are dependent on several factors.

Klamath River Population Segment

Bull trout have been displaced by brook trout in portions of the Klamath River basin (Light et al. 1996), and hybrids of the two species have been verified in several of the streams (Ratliff and Howell 1992). Either brook trout, brown trout, or both species occur with bull trout in six of seven subpopulations. Where brook trout or brown trout co-occur with bull trout, the distribution of bull trout has contracted and that of introduced salmonids expanded (e.g., Brownsworth, Leonard, and Long creeks) (Buchanan et al. 1997). Only four subpopulations exist in the absence of brook trout, and these are the most abundant (Ratliff and Howell 1992; Ziller 1992). In 1992, chemical eradication of brook trout was initiated in Sun Creek (Buktenica 1997). The chemical treatment apparently killed a number of bull trout due to the difficulty of removing fish prior to treatment (Buktenica 1997). Other eradication programs relying on chemical treatments would likely have similar effects on bull trout. Ongoing management actions in Threemile and Long creeks focus on brook trout eradication via selective electrofishing, snorkel-spearing, trapping, and chemical treatments with the objective of expanding bull trout range. Brook trout have declined in Threemile Creek, but there has been no measurable change in brook trout numbers in Long Creek (Dunsmoor and Bienz, *in litt.* 1997).

Columbia River Population Segment

Within the upper Columbia River basin in Montana, brook trout are found in approximately 65 percent of the stream reaches where bull trout occur (J. Hutten, MFWP, *in litt.* 1993). Brook trout are found in all major basins in Montana that support bull trout except the South Fork of the Flathead River. Brook trout and bull trout hybridization was first documented in the early 1980s in South Fork Lolo Creek in the Bitterroot River basin, Montana (Clancy 1993; MBTSG 1996h). Bull trout have largely been replaced by brook trout.

Introduced brook, brown, and rainbow trout are present in the Bitterroot drainage in Montana (Clancy 1996). The presence of non-native fish may have been a factor causing the fragmentation of bull trout range in the Bitterroot drainage by restricting migratory movements by bull trout (Rich 1996). Brook trout appeared to be replacing bull trout in some streams in the Bitterroot. Bull trout-brook trout hybrids have been documented in at least nine tributaries (MBTSG 1995b). Rich (1996) found a strong negative correlation between the presence of bull trout and brook trout in tributaries of the Bitterroot River.

The MBTSG concluded that introduced species, particularly in the lower Clark Fork River pose a high threat to bull trout (MBTSG 1996b). Non-native fishes have been introduced throughout the Clark Fork River system and brook trout are found throughout. Bull trout-brook trout hybrids exist in the Middle and upper Clark Fork systems (MBTSG 1995a; Hansen and DosSantos 1997).

In Idaho, bull trout densities in Mica Creek, Spokane River basin, during 1972

ranged from 0.03 to 0.23 fish/100 m^2 (0.003 to 0.023 fish/100 ft^2) (Mauser et al. 1972 *in* Platts et al. 1993). Extensive electrofishing surveys in Mica Creek during 1993 did not find bull trout, but brook trout were numerous at one transect (Martin 1994). Brook trout are present or accessible to most of the Clearwater River basin in Idaho, with hybridization and competition the primary threat to bull trout (A. Espinosa, Clearwater National Forest, pers. comm. 1993; D. Johnson, Nez Perce Tribe, pers. comm. 1995). For example, Meadow Creek, a tributary to the North Fork Clearwater River, contained numerous bull trout in 1987 and 1988, but, currently, high numbers of brook trout occur and bull trout numbers have been sharply reduced (Johnson, pers. comm., 1995).

Negative effects of interactions with introduced non-native species may be the most pervasive threat to bull trout throughout the Columbia River basin. Of the 141 subpopulations of bull trout in the Columbia River population segment, approximately 62 percent were threatened by competition, predation, or displacement by non-native species. Often one or more non-native species have been introduced into bull trout habitats; interactions with bull trout are likely exacerbated by factors such as habitat conditions, water temperature, and isolation. The MBTSG concluded that non-native species pose a limitation to bull trout restoration (MBTSG 1995a-e, 1996a-f). The MBTSG is reviewing recommendations for removing or suppressing non-native fishes to benefit bull trout, but success of such an effort on a large scale is questionable (MBTSG 1996h).

Isolation and Habitat Fragmentation

Bull trout are widely distributed over a large geographic area, and exhibit a patchy distribution due, in part, to specific habitat requirements (Rieman and McIntyre 1993). However, the effects of human activities over the past 100 years have resulted in reductions in the overall distribution of bull trout. In general, habitat fragmentation results in reduction in available habitat and increased isolation from conspecifics (Saunders et al. 1991). In studies of extinction in fragmented landscapes, Burkey (1989) concluded that when species are isolated by fragmented habitats, low rates of population growth are typical in each local population (i.e., subpopulations) and their probability of extirpation is directly related to the degree of isolation and fragmentation. Without sufficient immigration, overall growth for subpopulations may be low and the overall probability of extirpation for subpopulations is high (Burkey 1989, 1995). Moreover, habitat fragmentation that isolates subpopulations may increase a species' susceptibility to both demographic and naturally occurring events (Rieman and McIntyre 1993).

Metapopulation concepts of conservation biology theory are applicable to the bull trout (Reiman and McIntyre 1993). A metapopulation is an interacting network of local populations with varying frequencies of migration and gene flow among them (Meffe and Carroll 1994). Subpopulations may be extirpated, but can be reestablished by individuals from other subpopulations. Metapopulations are thought to provide a mechanism for spreading risk because the simultaneous loss of all subpopulations is unlikely. Migratory corridors can also allow individuals access to unoccupied but suitable habitats, foraging areas, and refuges from perturbations (Saunders et al. 1990). Relative to bull trout, maintenance of migratory corridors is essential to provide connectivity among subpopulations thought to be sources and sinks, and enables the reestablishment of extirpated subpopulations. Where migratory bull trout are not present, disjunct subpopulations cannot be replenished when a disturbance makes local habitats unsuitable (Rieman and McIntyre 1993; USDA and USDI 1997). Moreover, limited downstream movement was observed for resident bull trout in the Bitterroot River basin (Nelson 1996) suggesting low probability that extirpated bull trout would be reestablished by resident fish residing nearby. Of the 141 subpopulations in the Columbia River population segment, approximately 79 percent are unlikely to be reestablished if extirpated; and 50 percent are at risk of extirpation from naturally occurring events.

Passage barriers, degraded habitat, absence of migratory fish, and intensified stream perturbations, such as forest fires, floods, and droughts, reduce the ability of isolated bull trout subpopulations to persist following disturbances to streams (Rieman and McIntyre 1993; USDA and USDI 1997). Bull trout evolved with habitat perturbations to streams that were likely factors in shaping bull trout life history (Rieman and McIntyre 1993). Historically, areas suitable for bull trout spawning were likely distributed in a disjunct pattern (Fraley and Shepard 1989; Rieman and McIntyre 1995; USDA and USDI 1997) maintained by natural perturbations. Although the amount and distribution of spawning areas vary through time, sufficient spawning areas were accessible to bull trout to maintain the species (Rieman and McIntyre 1995; USDA and USDI 1997). Migratory bull trout tend to show fidelity to spawning streams, but they have been documented to spawn in different tributaries from one year to the next, including tributaries not previously known to have recent spawning (Ratliff et al. 1996). Thus, migratory bull trout have the ability to reestablish an area where extirpated previously as long as suitable migratory corridors exist (Rieman and McIntyre 1993).

Today, bull trout exhibiting migratory life histories have declined or are absent in many river systems (Bond, 1992; Schill 1992; Ziller 1992; Pratt and Huston 1993; Rieman and McIntyre 1993; Newton and Pribyl 1994; MBTSG 1995a,b; 1996b,c,e; USDA and USDI 1997). Passage barriers (e.g., dams and diversions) and other habitat alterations prevent bull trout migration from following historical patterns. Additionally, suitable spawning areas are more fragmented across the landscape than historically (USDA and USDI 1997). With fewer and more compressed spawning and rearing areas available, bull trout increasingly persist as small, isolated resident populations instead of few, large connected subpopulations (Bond, 1992; Schill 1992; Thomas 1992; Ziller 1992; Rieman and McIntyre 1993, 1995; Rich 1996 Newton and Pribyl 1994; MBTSG 1995a,b; 1996b,c,d,e; USDA and USDI 1997).

As discussed in Factor A, evidence suggests that landscape disturbances, such as floods and fires, have increased in frequency and magnitude of effects within the range of bull trout (Henjum et al. 1994; USDA and USDI 1997). Where recolonization is prevented by passage barriers and suitable habitat, bull trout subpopulations may be extirpated by perturbations (USDA and USDI 1997). Also, isolated subpopulations are typically small, and more likely to be extirpated by local events than larger populations (Rieman and McIntyre 1995). Small populations may be at risk of impaired genetic fitness, as in Gold Creek, Washington (Craig and Wissmar 1993).

An example of the effects of naturally occurring events, such as fire, on bull trout habitat is the Entiat River basin of central Washington. "Historical and current influences have been significant and include: localized compaction from sheep grazing and trailing; fire exclusion; timber salvage/road building from the early 1970's to present; and recreation. A portion of this (transitional or bull trout) zone has recently been impacted by a large, moderate high

intensity fire" (Wenatchee National Forest, *in litt.* 1996). This transitional or bull trout zone in the mainstem Entiat River has had a 30 to 60 percent loss of pools since initially surveyed by the U.S. Bureau of Fisheries during 1935 through 1937 (Wenatchee National Forest, *in litt.* 1996). Both bull trout densities and recruitment are depressed in the mainstem Entiat in response to habitat degradation.

Conversely, most bull trout recruitment in the Entiat River basin is now occurring in the transitional zone in the Mad River. Pool frequencies have increased dramatically, 85 percent in one reach surveyed, 1,000 percent in the other, since the 1935 through 1937 surveys (Wenatchee National Forest, *in litt.* 1996). A large fire occurred in the Mad River basin in 1888, and the basin had splash dams and log drives early in this century. It has taken 60 years for the habitat to recover.

Floods or high flows have also been altered by land management (USDA and USDI 1997). Roads and clear cutting forested areas tend to magnify the effects of floods, leading to higher flows, erosion and bedload that scour channels (Furniss et al. 1991; McIntosh et al. 1994; USDA and USDI 1997), and degrade bull trout habitat (Henjum et al. 1994). Erosion from road landslides increases bedload to high stream flows over bedload levels without roads (Furniss et al. 1991). Increased bedload increases the scouring effect of the high water, increasing channel instability, leading to a loss of habitat diversity, especially pools (Henjum et al. 1994; McIntosh et al. 1994). Bull trout eggs and fry in the gravels during the scouring likely survive at lower rates (Henjum et al. 1994). For instance, hundreds of landslides associated with roads on the Clearwater National Forest and Panhandle National Forests (R. Patten and J. Pengkover, Panhandle National Forests, *in litt.* 1996) resulted from high water in 1995, and the effects of flooding on isolated bull trout populations is unknown. Habitat degradation has reduced the number and size of bull trout spawning areas (USDA and USDI 1997).

The Service has carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to bull trout in the Klamath River and Columbia River distinct population segments of bull trout in developing this final rule. Based on this evaluation the preferred action is to list the Klamath River and the Columbia River population segments of bull trout as threatened.

Klamath River Population Segment

Bull trout are currently limited to seven geographically isolated subpopulations that occupy only a fraction of the historical habitat. The species distribution and numbers have declined due to habitat degradation, isolation, loss of migratory corridors, poor water quality, and the introduction of non-native species. Six of seven bull trout subpopulations are small in number, and unlikely to persist over the next 100 years unless conservation and other corrective actions are taken. Remaining Klamath River bull trout subpopulations are threatened by the effects of past, present and future land and water management practices. Most subpopulations also face more than one threat.

Despite the bull trout's current status, the Service is encouraged that recent conservation and recovery actions are being initiated at Federal, State and local levels to begin to reverse the long-term declining trend for bull trout in the Klamath River basin. Progress has already been made toward improving habitat conditions for bull trout. Although the Service proposed the Klamath River population segment as endangered based on the 1994 administrative record, new information indicates that interagency conservation programs are being implemented and have begun to reduce threats to bull trout. Included are efforts of the Klamath Basin Working Group to eradicate brook trout in Long, Sun and Threemile Creeks, reduce livestock grazing along bull trout streams, and monitor watershed conditions and bull trout status. Moreover, bull trout conservation in the Klamath Basin has benefitted from habitat restoration activities of the Upper Klamath Basin Working Group which began in 1994. Habitat improvements derived from these two programs have just begun to be realized. Thus the final determination is to list the Klamath River population of bull trout as threatened because it is no longer in danger of extinction in the foreseeable future and threats have been reduced.

Columbia River Population Segment

Bull trout in the Columbia River basin, despite their relatively widespread distribution, have declined in both their overall range and numbers. Numerous extirpations of local subpopulations have been reported, with bull trout eliminated from areas ranging in size from relatively small tributaries of currently occupied, though fragmented habitat, to large river systems comprising a substantial portion of the species' previous range. Bull trout in the Columbia River population segment are currently limited to 141 isolated subpopulations, which indicates habitat fragmentation and geographic isolation. Many remaining bull trout occur as isolated subpopulations in headwater lakes or tributaries with migratory life histories lost or restricted. Few bull trout subpopulations are considered "strong" in terms of relative abundance and subpopulation stability. These remaining important strongholds tend to be found in large areas of contiguous habitats in the Snake River basin of central Idaho Mountains, upper Clark Fork and Flathead rivers in Montana, and the Blue Mountains in Washington and Oregon. The decline of bull trout is due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices and the introduction of non-native species. Most bull trout subpopulations are affected by one or more threats.

Recent activities to address threats and reverse the long-term decline of bull trout are being initiated at Federal, State and local levels (e.g., restrictive angling regulations, adoption of various land management rules, and development of conservation strategies and plans). While these efforts are important to the long term conservation and recovery of bull trout, threats continue and subpopulation improvement throughout the Columbia River has yet to be demonstrated. Because bull trout in the Columbia River basin are still a wide-ranging species, with some "strongholds" in relatively protected areas, the Columbia River population segment is not in immediate danger of extinction. Therefore the Service's final determination is to list the Columbia River population segment of bull trout as threatened.

Critical Habitat

Critical habitat is defined in section 3 of the Act as—(i) the specific area within the geographical area occupied by a species, at the time it is listed in accordance with the Act, on which are found those biological features (I) essential to the conservation of the species and (II) that may require special management considerations or protection and; (ii) specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. "Conservation" means the use of all methods and procedures needed to bring the species to the point at

which listing under the Act is no longer necessary.

Section 4(a)(3) of the Act, as amended, and implementing regulations (50 CFR 424.12) require that, to the maximum extent prudent and determinable, the Secretary designate critical habitat at the time the species is determined to be endangered or threatened. Service regulations (50 CFR 424.12(a)) state that critical habitat is not determinable if information sufficient to perform required analysis of impacts of the designation is lacking or if the biological needs of the species are not sufficiently well known to permit identification of an area as critical habitat. Section 4(b)(2) of the Act requires the Service to consider economic and other relevant impacts of designating a particular area as critical habitat on the basis of the best scientific data available. The Secretary may exclude any area from critical habitat if he determines that the benefits of such exclusion outweigh the conservation benefits, unless to do such would result in the extinction of the species.

The Service finds that the designation of critical habitat is not determinable for these distinct population segments based on the best available information. When a "not determinable" finding is made, the Service must, within 2 years of the publication date of the original proposed rule, designate critical habitat, unless the designation is found to be not prudent. The Service reached a "not determinable" critical habitat finding for the proposed rule based on the 1994 administrative record. In the proposed rule the Service specifically requested comments on this issue. While the Service received a number of comments advocating critical habitat designation, none of these comments provided information that added to the Service's ability to determine critical habitat. Additionally, no new information regarding specific physical and biological features essential for bull trout in the Klamath River and Columbia River bull trout population segments was obtained during the open comment period including the five public hearings. The biological needs of bull trout in the two population segments are not sufficiently well known to permit identification of areas as critical habitat. Insufficient information is available on the number of individuals or spawning reaches required to support viable subpopulations throughout the distinct population segment. In addition, the extent of habitat required and specific management measures needed for recovery of these fish have not been identified. This information is considered essential for determining critical habitat for these population segments. Therefore, the Service finds that designation of critical habitat for the Klamath River and the Columbia River population segments is not determinable at this time. Protection of bull trout habitat will be addressed through the recovery process and through section 7 consultations to determine whether Federal actions are likely to jeopardize the continued existence of the species.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Endangered Species Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain activities. Recognition through listing encourages and results in conservation actions by Federal, State, and private agencies, groups, and individuals. The Act provides for possible land acquisition and cooperation with the states and requires that recovery actions be carried out for all listed species. The protection required of Federal agencies and the prohibitions against taking and harm are discussed, in part, below.

Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is being designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR Part 402. Section 7(a)(2) requires Federal agencies to insure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of a listed species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the Service.

The Klamath River and Columbia River bull trout population segments occur on lands administered by the USFS and BLM; various State-owned properties in Oregon, Washington, Idaho and Montana; and private lands. Federal agency actions that may require consultation as described in the preceding paragraph include Army Corps of Engineers (Corps) involvement in projects such as the construction of roads and bridges, and the permitting of wetland filling and dredging projects subject to section 404 of the Clean Water Act (33 U.S.C. 1344); Federal Energy Regulatory Commission licensed hydropower projects authorized under the Federal Power Act; USFS and BLM timber and grazing management activities; EPA authorized discharges under the National Pollutant Discharge System of the Clean Water Act; and U.S. Housing and Urban Development projects.

On January 27, 1998, an interagency memorandum between the USFS, BLM and the Service outlined a process for bull trout section 7 conferencing/consultation in recognition of the possibility of an impending listing. The process considers both programmatic actions (e.g., land management plans) and site-specific actions (e.g., timber sales and livestock grazing allotments) and incorporates conferencing/consultation at the watershed level. The process uses a matrix to determine the environmental baseline and the effects of projects on the environmental baseline of bull trout. The goal of this strategy is to complete conferences for all ongoing actions and proposed actions by the effective date of listing through a system of batching and aggregating of projects to the watershed level. A programmatic LRMP/RMP biological assessment would be used to assess ongoing projects for up to 9 months post-listing that result from implementation of Forest Plans/Resource Management Plans as amended in INFISH, PACFISH and the Northwest Forest Plan. The Service would determine in a programmatic biological opinion whether these issues would jeopardize the continued existence of bull trout, and would authorize incidental take. Part of the project description and evaluation process would stipulate that an ongoing project would be completed by May 10, 1999. For projects that are proposed after the initial 9 month post-listing period, the watershed approach, using the bull trout matrix incorporating local watershed biological data, would be project-specific applied in the section 7 process.

The Act and its implementing regulations found at 50 CFR 17.21 and 17.31 set forth a series of general trade prohibitions and exceptions that apply to all threatened wildlife. These prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to take (includes harass, harm, pursue, hunt, shoot, wound, kill, trap, or collect; or attempt any of these), import or export, ship in interstate commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. It is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been

taken illegally. Certain exceptions apply to agents of the Service and State conservation agencies.

Permits, authorized under section 10(a)(1) of the Act, may be issued to carry out otherwise prohibited activities involving endangered and threatened wildlife under certain circumstances. Regulations governing permits are at 50 CFR 17.22, 17.23 and 17.32. Such permits are available for scientific purposes, to enhance the propagation or survival of the species, and/or for incidental take in connection with otherwise lawful activities. For threatened species, permits are also available for zoological exhibition, educational purposes, or special purposes consistent with the purpose of the Act. Private landowners seeking permits under section 10 of the Act for incidental take are a means of protecting bull trout habitat through the voluntary development of habitat conservation plans. Information collections associated with these permits are approved under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.*, and assigned Office of Management and Budget clearance number 1018–0094. For additional information concerning these permits and associated requirements, see 50 CFR 17.32.

It is the policy of the Service published in the **Federal Register** on July 1, 1994, (59 FR 34272) to identify to the maximum extent practicable at the time a species is listed those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of this listing on proposed and ongoing activities within the species' range. The Service believes the following actions would not be likely to result in a violation of section 9, provided the activities are carried out in accordance with any existing regulations and permit requirements—

(1) Actions that may affect bull trout in the Klamath and Columbia River basins and are authorized, funded or carried out by a Federal agency when the action is conducted in accordance with an incidental take statement issued by the Service pursuant to section 7 of the Act;

(2) Possession of Columbia River basin bull trout caught legally in accordance with authorized State fishing regulations (see Special Rule section);

(3) State, local and other activities that have been approved by the Service through development of Conservation Plans and special rules under section 4(d) and section 6(c)(1) of the Act.

With respect to both the Klamath River and Columbia River bull trout population segments, the following actions likely would be considered a violation of section 9—

(1) Take of bull trout without a permit, which includes harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting, or attempting any of these actions, except in accordance with applicable State fish and wildlife conservation laws and regulations within the Columbia River bull trout population segment;

(2) To possess, sell, deliver, carry, transport, or ship illegally taken bull trout;

(3) Unauthorized interstate and foreign commerce (commerce across State and international boundaries) and import/export of bull trout (as discussed in the prohibition discussion earlier in this section);

(4) Introduction of non-native fish species that compete or hybridize with, or prey on bull trout;

(5) Destruction or alteration of bull trout habitat by dredging, channelization, diversion, in-stream vehicle operation or rock removal, or other activities that result in the destruction or significant degradation of cover, channel stability, substrate composition, temperature, and migratory corridors used by the species for foraging, cover, migration, and spawning;

(6) Discharges or dumping of toxic chemicals, silt, or other pollutants into waters supporting bull trout that result in death or injury of the species; and

(7) Destruction or alteration of riparian or lakeshore habitat and adjoining uplands of waters supporting bull trout by timber harvest, grazing, mining, hydropower development, or other developmental activities that result in destruction or significant degradation of cover, channel stability, substrate composition, temperature, and migratory corridors used by the species for foraging, cover, migration, and spawning.

Other activities not identified above will be reviewed on a case-by-case basis to determine if a violation of section 9 of the Act may be likely to result from such activity. The Service does not consider these lists to be exhaustive and provides them as information to the public.

Questions regarding whether specific activities may constitute a violation of section 9 should be directed to the Supervisor of the Service's Snake River Basin Office (see **ADDRESSES** section). Requests for copies of the regulations concerning listed species and inquiries regarding prohibitions and permits may be addressed to the U.S. Fish and Wildlife Service, Endangered Species Permits, 911 NE 11th Avenue, Portland, Oregon 97232–4181 (telephone 503 231–6241; facsimile 503 231–6243).

Special Rule

Section 4(d) of the Act provides authority for the Service to promulgate special rules for threatened species that would relax the prohibition against taking. The Service finds that statewide angling regulations have become more restrictive in an attempt to protect bull trout throughout Idaho, Montana, Nevada, Oregon, and Washington and are adequate to protect the species from excessive taking. The Service intends to continue to work with the States and Tribes in developing management plans and agreements with the objective of recovery and eventual delisting of the Klamath River and Columbia River distinct population segments. This special rule allows for take of bull trout within the Klamath River and Columbia River distinct population segments when it is in accordance with applicable State and Native American Tribal fish and wildlife conservation laws and regulations, as constituted in all respects relevant to protection of bull trout. The Service believes that this special rule will allow for more efficient management of the species, thereby facilitating its conservation.

National Environmental Policy Act

The Service has determined that an Environmental Assessment, as defined under the authority of the National Environmental Policy Act of 1969, need not be prepared in connection with regulations adopted pursuant to section 4(a) of the Endangered Species Act, as amended. A notice outlining the Service's reasons for this determination was published in the **Federal Register** on October 25, 1983 (48 FR 49244).

Required Determinations

This rule does not contain any new collections of information other than those already approved under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.*, and assigned Office of Management and Budget clearance number 1018–0094. For additional information concerning permit and associated requirements for threatened species, see 50 CFR 17.32.

References Cited

A complete list of all references cited herein is available upon request from the Snake River Basin Office (see Addresses section).

Author(s)

The primary authors of this final rule are: John Bowerman, Klamath Basin Fish and Wildlife Office, Klamath Falls, OR; Timothy Cummings, Columbia River Fisheries Office, Vancouver, WA; Stephen Duke, Snake River Basin Office, Boise, ID; Michael Faler, Idaho Fisheries Resource Office, Ahsahka, ID; Robert Hallock, Upper Columbia River Basin Office, Spokane, WA; Samuel Lohr, Snake River Basin Office, Boise, Idaho; Lori Nordstrom, Helena Field Office, Helena, MT; and Ron Rhew, Oregon State Office, Portland, OR.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Regulation Promulgation

PART 17—[AMENDED]

Accordingly, the Service amends part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below—

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 16 U.S.C. 1531–1544; 16 U.S.C. 4201–4245; Pub. L. 99–625, 100 Stat. 3500, unless otherwise noted.

2. Amend § 17.11(h) by adding the following, in alphabetical order under FISHES, to the List of Endangered and Threatened Wildlife to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
*	*	*	* *		*		*
FISHES							
*	*	*	* *		*		*
Trout, bull	*Salvelinus confluentus.*	U.S.A. (Pacific NW), Canada (NW Territories).	Klamath R. (U.S.A.-OR)	T	637	NA	17.44 (v)
Do.....	do.....	do	Columbia R. (U.S.A.—ID, MT, OR, WA) mainstem and its tributaries, excluding Jarbidge R., NV, and east of Continental Divide, MT.)	T	637	NA	Do.
*	*	*	* *		*		*

3. Amend § 17.44 by adding paragraph (v) to read as follows:

§ 17.44 Special rules—fishes.

* * * * *

(v) Bull trout (*Salvelinus confluentus*), Columbia River and Klamath River population segments.

(1) Prohibitions. Except as noted in paragraph (v)(2) of this section, all prohibitions of 50 CFR 17.31 and exemptions of 50 CFR 17.32 shall apply to the bull trout Columbia River and Klamath River population segments within the contiguous United States.

(2) Exceptions. No person shall take this species, except in accordance with applicable State and Native American Tribal fish and wildlife conservation laws and regulations, as constituted in all respects relevant to protection of bull trout in effect on June 10, 1998.

(3) Any violation of applicable State and Native American Tribal fish and wildlife conservation laws or regulations with respect to the taking of this species is also a violation of the Endangered Species Act.

(4) No person shall possess, sell, deliver, carry, transport, ship, import, or export, any means whatsoever, any such species taken in violation of this section or in violation of applicable State and Native American Tribal fish and game laws and regulations.

(5) It is unlawful for any person to attempt to commit, solicit another to commit, or cause to be committed, any offense defined in paragraphs (v) (2) through (4) of this section.

Dated: June 1, 1998.

Jamie Rappaport Clark,

Director, Fish and Wildlife Service.

[FR Doc. 98–15319 Filed 6–5–98; 8:45 am]

BILLING CODE 4310–55–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

Endangered and Threatened Wildlife and Plants; 90-day Finding and Commencement of Status Review for a Petition To List the Westslope Cutthroat Trout as Threatened

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of petition findings and initiation of status review.

SUMMARY: The U.S. Fish and Wildlife Service (Service) announces a 90-day finding for an amended petition to list the westslope cutthroat trout (*Oncorhynchus clarki lewisi*) as threatened throughout its range and designate critical habitat for this subspecies pursuant to the Endangered Species Act of 1973, as amended. The Service finds that the amended petition provides substantial scientific and commercial information to indicate that listing of this subspecies of cutthroat trout as threatened, throughout all or parts of its range, may be warranted.

DATES: The finding announced in this document was made on June 1, 1998. Comments and materials need to be submitted by August 10, 1998 to be considered in the 12-month finding.

ADDRESSES: Data, information, technical critiques, comments, or questions relevant to this amended petition should be sent to the Chief, Branch of Native Fishes Management, Montana Fish and Wildlife Management Assistance Office, 4052 Bridger Canyon Road, Bozeman, Montana 59715. The amended petition, its appendices, and bibliography are available for public inspection, by appointment, at the above address. Electronic copies of the amended petition and bibliography may be requested and received via e-mail from lynn_kaeding@fws.gov.

FOR FURTHER INFORMATION CONTACT: Lynn Kaeding, at the above address, or telephone (406) 582–0717.

SUPPLEMENTARY INFORMATION:

Background

Section 4(b)(3)(A) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*), requires that the U.S. Fish and Wildlife Service (Service) make a finding on whether a petition to list, delist, or reclassify a species, or to revise a critical habitat designation presents substantial scientific and commercial information to indicate that the petitioned action may be warranted. To the maximum extent practicable, this finding is to be made within 90 days of the receipt of the petition, and the finding is to be promptly published in the Federal Register. If the finding is positive, the Service also is required to commence a review of the status of the petitioned species.

On June 6, 1997, the Service received a formal petition to list the westslope cutthroat trout as threatened throughout its range and designate critical habitat for this subspecies pursuant to the Endangered Species Act of 1973, as amended. Copetitioners were American Wildlands, Clearwater Biodiversity Project, Idaho Watersheds Project, Inc., Montana Environmental Information Center, the Pacific Rivers Council, Trout Unlimited's Madison-Gallatin Chapter, and Mr. Bud Lilly.

On July 2, 1997, the Service notified the copetitioners that the Service's Final Endangered Species Act Listing Priority Guidance, published in the December 5, 1996, Federal Register (61 FR 64425), designated the processing of new listing petitions as a Tier 3 activity, i.e., of lower priority than completion of emergency listings (Tier 1) and processing of pending proposed listings (Tier 2). The Service further indicated that personnel and budget in the Service's Mountain-Prairie Region, which had been assigned responsibility for Service activities pertaining to the petition, would continue to be directed toward accomplishment of ongoing Tier 2 activities and Tier 3 activities for species judged to be in greater need of the Act's protection than westslope cutthroat trout. As these higher-priority activities were accomplished and personnel and funds became available, however, the Service would proceed with its 90-day finding on the westslope cutthroat trout listing petition.

On January 25, 1998, the Service received from the copetitioners an amended petition to list the westslope cutthroat trout as threatened throughout its range and designate critical habitat for this subspecies. The amended petition contained a substantial amount of new information in support of the requested action. In the amended petition, the copetitioners assert that the westslope cutthroat trout should be listed as threatened because the subspecies' present distribution and abundance are substantially reduced from historical conditions; remaining populations are small, widely separated, and continue to decline in abundance; and the threats to the survival of westslope cutthroat trout are pervasive and ongoing. The copetitioners indicate that threats to westslope cutthroat trout include habitat destruction from logging and associated road building; adverse effects on habitat resulting from livestock grazing, mining, urban development, agricultural practices, and the operation of dams; historic and ongoing stocking of nonnative fish species that compete with or prey upon westslope cutthroat trout or jeopardize the genetic integrity of the subspecies through hybridization; and excessive harvest by anglers. The copetitioners further assert that programs to protect and restore westslope cutthroat trout are inadequate or nonexistent, and populations of this fish continue to be threatened by a wide variety of ongoing and proposed activities.

The historic distribution of westslope cutthroat trout (Behnke 1992) in streams and lakes is not known precisely but can be summarized as follows: West of the Continental Divide, the subspecies is native to several major drainages of the Columbia River basin, including the upper Kootenai River drainage from its headwaters in British Columbia, through northwest Montana, and into northern Idaho; the entire Clark Fork River drainage of Montana and Idaho downstream to the falls on the Pend Oreille River near the Idaho-Washington border; the Spokane River above Spokane Falls and into Idaho's Coeur d'Alene and St. Joe River drainages; and the Salmon and Clearwater River drainages of Idaho's Snake River basin. The historic distribution of westslope cutthroat trout also includes disjunct areas in Washington (e.g., Methow, Entiat, and Wenatchee River drainages), in the John Day River drainage in Oregon, and in British Columbia. East of the Continental Divide, the historic distribution of westslope cutthroat trout includes the headwaters of the South Saskatchewan River drainage (United States and Canada); the entire Missouri River drainage upstream from Fort Benton, Montana, and extending into northwest Wyoming; and the headwaters of the Judith, Milk, and Marias Rivers, which join the Missouri River downstream from Fort Benton.

In the amended petition, the copetitioners assert that remaining, genetically pure populations of westslope cutthroat trout occur almost exclusively in small, isolated streams in mountainous areas, where the adverse effects of human activities on this subspecies and its habitat are negligible. In Montana, the region for which most data are provided, the copetitioners indicate that populations of genetically pure westslope cutthroat trout occur in about 3.5 percent and 1.5 percent of their historic stream habitat in the Kootenai River and upper Missouri River drainages, respectively. Similar percentages are reported for genetically

pure populations of the fish in other drainages in Montana. Additionally, only 8.3 percent of the 265 lakes believed to be historic habitat for westslope cutthroat trout in Montana are said to now have genetically pure populations. More common today are westslope cutthroat trout populations that have some degree of hybridization with introduced, nonnative trout. Recent investigations (Shepard et al. 1997) suggest that 90 percent of the remaining westslope cutthroat trout populations in Montana's upper Missouri River drainage have a high probability of becoming extinct within 100 years.

The copetitioners further assert that populations of westslope cutthroat trout now occur in 11 percent of historic habitat in Idaho and 41 percent in Oregon, although data on genetic purity are not available for most populations. The status of native populations of the species in Washington is largely unknown, although several populations were apparently confirmed by recent studies. About half of the few streams in Wyoming that are historic habitat for westslope cutthroat trout now have populations of this subspecies, but all are hybridized to some degree with stocked, nonnative trout. In Alberta and British Columbia, Canada, little is known about the status of native westslope cutthroat trout, although genetically pure populations have been found in the upper Kootenai River drainage.

Listing Factors

The following is a brief discussion of the five listing factors set forth in section 4(a)(1) of the Act and related regulations (50 CFR Part 424), and the applicability of these factors to the westslope cutthroat trout.

A. The Present or Threatened Destruction, Modification, or Curtailment of the Species' Habitat or Range

As indicated by the copetitioners, reproduction and survival of westslope cutthroat trout are adversely affected by increased stream sedimentation and temperatures and the alteration of natural stream flows that often result from logging and associated road building, livestock grazing, mining, urban development, agricultural practices, and the operation of dams. In many areas where this subspecies remains today, populations of westslope cutthroat trout are threatened by similar ongoing or proposed activities.

B. Overutilization for Commercial, Sporting, Scientific, or Educational Purposes

The copetitioners provide evidence that overfishing contributed to the decline in westslope cutthroat trout populations. Where present angling regulations and their enforcement are not adequate to protect remaining westslope cutthroat trout populations from overfishing, the continued existence of these populations may be threatened.

C. Disease or Predation

Whirling disease was recently detected in Montana and is believed to be responsible for a 90 percent decline in the rainbow trout population of the Madison River. The disease has also been found in Idaho, Oregon, and Washington. The copetitioners provide evidence that westslope cutthroat trout, close relatives to rainbow trout, are equally susceptible to whirling disease. Because there is presently no means to eliminate whirling disease or effectively control its spread, whirling disease may pose a threat to the continued existence of some westslope cutthroat trout populations. The copetitioners also provide evidence that, in some areas, nonnative fish species prey upon westslope cutthroat trout. Where the stocking of such nonnative species continues near areas inhabited by westslope cutthroat trout, and in areas where established populations of such nonnative fish species grow and spread, these nonnative fishes pose a threat to the continued existence of westslope cutthroat trout.

D. Inadequacy of Existing Regulatory Mechanisms

The copetitioners assert that the survival of westslope cutthroat trout is threatened by the absence of a comprehensive conservation strategy to protect and restore aquatic ecosystems and that designation of the subspecies as sensitive or of special concern by various management agencies has done little to control activities that degrade habitat and threaten remaining westslope cutthroat trout populations.

E. Other Natural or Manmade Mechanisms

The copetitioners provide evidence that hybridization with nonnative fish species is one of the most significant threats to the continued existence of westslope cutthroat trout. As the result of extensive stocking of nonnative species beginning in the 1800's and continuing in some areas today, such hybridization has occurred throughout much of the subspecies' range. Where the stocking of such nonnative species continues near areas inhabited by westslope cutthroat trout, and in areas where established populations of such nonnative fish species grow and spread, these nonnative fishes pose a threat to the continued existence of westslope cutthroat trout. The copetitioners also assert that the spatial separation of remaining westslope cutthroat trout populations precludes natural interbreeding and thereby increases the likelihood that these populations will become extinct due to limited genetic variability; and small sizes make these populations more vulnerable to extinction due to natural catastrophes such as floods, landslides, and fires.

Finding

The Service has reviewed the amended petition, as well as other available information, published and unpublished studies and reports, and agency files. On the basis of the best scientific and commercial information available, the Service finds that there is sufficient information to indicate that listing of the westslope cutthroat trout as threatened, throughout all or parts of its range, may be warranted. The Service believes that the decline of westslope cutthroat trout is due mainly to the destruction and adverse modification of habitat and the negative effects of stocked, nonnative fish species, as described above under the listing factors. However, the Service also believes that the present status of westslope cutthroat trout throughout its historic range is not well understood, particularly with regard to the genetic characteristics of many known populations, the possible occurrence of additional populations in areas that have not been studied, and the measures now underway to protect remaining populations. Within 1 year from the date the petition was received, a finding as to whether the petitioned action is warranted is required by section 4(b)(3)(B) of the Act. The petitioners also requested that critical habitat be designated for this species. If the Service's 12-month finding indicates that the petitioned action to list the westslope cutthroat trout is warranted, then designation of critical habitat will be addressed in the subsequent proposed rule.

References Cited

Behnke, R. J. 1992. Native trout of western North America. American Fisheries Society Monograph 6.

Shepard, B.B., D. Sanborn, L. Ulmer, and D.C. Lee. 1997. Status and risk of extinction for westslope cutthroat trout in the upper Missouri River basin, Montana.

North American Journal of Fisheries Management 17:1158–1172.

Author

The primary author of this 90-day finding is Lynn Kaeding (See **ADDRESSES** section).

Authority

The authority for this action is the Endangered Species Act of 1973, as amended (16 U.S.C. 1531–1544).

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Dated: June 1, 1998.

Jamie Rappaport Clark,

Director, Fish and Wildlife Service.

[FR Doc. 98–15317 Filed 6–5–98; 8:45 am]

BILLING CODE 4310–65–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

RIN 1018—AF01

Endangered and Threatened Wildlife and Plants: Proposal To List the Coastal-Puget Sound, Jarbidge River and St. Mary-Belly River Population Segments of Bull Trout as Threatened Species

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: The U.S. Fish and Wildlife Service (Service) proposes to list the Coastal-Puget Sound population segment of bull trout (*Salvelinus confluentus*) from the coastal drainages and Puget Sound in western Washington; the Jarbidge River population segment of bull trout from the Jarbidge River basin in southern Idaho and northern Nevada; and the St. Mary-Belly River population segment of bull trout in the St. Mary and Belly rivers in northwestern Montana as threatened with a special rule, pursuant to the Endangered Species Act of 1973 (Act). The Coastal-Puget Sound population segment, composed of 35 subpopulations of "native char", is threatened by habitat degradation, dams and diversions, and interactions with non-native fishes. The Jarbidge River population segment, composed of a single subpopulation, is threatened by habitat degradation from past and ongoing land management activities such as mining, road construction and maintenance, and grazing. The St. Mary-Belly River population segment, composed of four subpopulations, is threatened by the effects of water management such as dewatering, entrainment, and passage barriers at diversion structures, and interactions with introduced non-native fishes. The special rule allows for take of bull trout within the three population segments if in accordance with applicable State and Native American Tribal fish and wildlife conservation laws and regulations, and conservation plans. This proposal, if made final, would extend protection of the Act to these three bull trout population segments.

DATES: Comments from all interested parties must be received by October 8, 1998. Public hearings locations and dates are set forth in the **SUPPLEMENTARY INFORMATION** section.

ADDRESSES: Comments and material concerning this proposal should be sent to the U.S. Fish and Wildlife Service, Snake River Basin Field Office, 1387 S. Vinnell Way, Room 368, Boise, Idaho 83709. Comments and material received will be available for public inspection, by appointment, during normal business hours at the above address.

FOR FURTHER INFORMATION CONTACT: Robert Ruesink, Supervisor, Snake River Basin Field Office, at the above address (telephone 208/378–5243; facsimile 208/378–5262).

SUPPLEMENTARY INFORMATION: Public hearings locations and dates are:

1. *Tuesday, July 7, 1998*, from 2:00–4:00 p.m. and from 6:00–8:00 p.m. at the Norman Worthington Conference Center at St. Martin's College, 5300 Pacific Avenue SE, Lacey, Washington.
2. *Thursday, July 9, 1998*, from 2:00–4:00 p.m. and from 6:00–8:00 p.m. at the Best Western Cotton Tree Inn, Mt. Adams Room, 2401 Riverside Dr, Mount Vernon, Washington.
3. *Tuesday, July 14, 1998*, from 2:00–until 4:00 p.m. and from 6:00–8:00 p.m. at Glacier Park Lodge, East Glacier, Montana.
4. *Tuesday, July 21, 1998*, from 2:00–4:00 p.m. and from 6:00–8:00 p.m. at Cactus Petes, 1385 US Highway 93, Jackpot, Nevada.

Background

Bull trout (*Salvelinus confluentus*), members of the family Salmonidae, are char native to the Pacific northwest and western Canada. Bull trout historically occurred in major river drainages in the Pacific northwest from about 41° N to 60° N latitude, from the southern limits in the McCloud River in northern California and the Jarbidge River in Nevada to the headwaters of the Yukon River in Northwest Territories, Canada (Cavender 1978; Bond 1992). To the west, bull trout range includes Puget Sound, various coastal rivers of British Columbia, Canada, and southeast Alaska (Bond 1992). Bull trout are wide-spread throughout tributaries of the Columbia River basin, including its headwaters in Montana and Canada. Bull trout also occur in the Klamath River basin of south central Oregon. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta and the MacKenzie River system in Alberta and British Columbia (Cavender 1978; McPhail and Baxter 1996; Brewin and Brewin 1997).

Bull trout were first described as *Salmo spectabilis* by Girard in 1856 from a specimen collected on the lower Columbia River, and subsequently described under a number of names such as *Salmo confluentus* and *Salvelinus malma* (Cavender 1978). Bull trout and Dolly Varden (*Salvelinus malma*) were previously considered a single species (Cavender 1978; Bond 1992). Cavender (1978) presented morphometric (measurement), meristic (geometrical relation), osteological (bone structure), and distributional evidence to document specific distinctions between Dolly Varden and bull trout. Bull trout and Dolly Varden were formally recognized as separate species distributional evidence to document specific distinctions between Dolly Varden and bull trout. Bull trout and Dolly Varden were formally recognized as separate species by the American Fisheries Society in 1980 (Robins et al. 1980). Although bull trout and Dolly Varden co-occur in several northwestern Washington River drainages, there is little evidence of introgression (Haas and McPhail 1991) and the two species appear to be maintaining distinct genomes (Leary et al. 1993; Williams et al. 1995; Kanda et al. 1997; Spruell and Allendorf 1997).

Bull trout exhibit resident and migratory life-history strategies through much of the current range (Rieman and McIntyre 1993). Resident bull trout complete their life cycles in the tributary (or nearby) streams in which they spawn and rear. Migratory bull trout spawn in tributary streams where juvenile fish rear from one to four years before migrating to either a lake (adfluvial), river (fluvial), or in certain coastal areas, to saltwater (anadromous), where maturity is reached in one of the three habitats (Fraley and Shepard 1989; Goetz 1989). Anadromy is the least studied life-history type in bull trout, and some biologists believe the existence of anadromous bull trout may be uncertain (McPhail and Baxter 1996).

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EXECUTIVE SUMMARY

Current Status: The Ute ladies'-tresses (Spiranthes diluvialis) is an orchid that occurs in relatively low elevation riparian, spring, and lakeside wetland meadows in three general areas of the interior western United States: near the base of the eastern slope of the Rocky Mountains in southeastern and central Wyoming and north-central and central Colorado, and Montana; in the upper Colorado River basin, particularly in the Uinta Basin; and along the Wasatch Front and westward in the eastern Great Basin, in north-central and western Utah and extreme eastern Nevada. The total population is approximately 20,500 individuals. The riparian and wetland habitats required by this species have been heavily impacted by urban development, stream channelization, water diversions and other watershed and stream alterations that reduce the natural dynamics of stream systems, recreation, and invasion of habitat by exotic plant species. These activities are expected to intensify, threatening remaining Ute ladies'-tresses populations and habitats.

Habitat Requirements and Limiting Factors: The Ute ladies'-tresses is endemic to moist soils in mesic or wet meadows near springs, lakes, or perennial streams. The elevational range of known Ute ladies'-tresses occurrences is 4,300 and 7,000 feet (1,310 to 2,134 meters). Most of the occurrences are along riparian edges, gravel bars, old oxbows, and moist to wet meadows along perennial streams, but some localities in the eastern Great Basin are in similar situations near freshwater lakes or springs. Ute ladies'-tresses seem to require "permanent sub-irrigation", indicating a close affinity with floodplain areas where the water table is near the surface throughout the growing season and into the late summer or early autumn. The orchid occurs primarily in areas where the vegetation is relatively open and not overly dense or overgrown, although a few populations in eastern Utah and Colorado are found in riparian woodlands. Plants usually occur in small scattered groups and occupy relatively small areas within the riparian system. These preferred habitat features imply that the orchid requires early to mid-seral riparian habitats created and maintained by streams active within their floodplains. Suitable orchid habitat is being reduced in area and becoming increasingly fragmented due to conversion of land to urban and suburban uses and certain water and stream system management practices associated with municipal, agricultural, and recreational uses. The naturally small size and scattered distribution of Ute ladies'-tresses populations makes the species particularly vulnerable to the effects of habitat fragmentation and overall decline of suitable habitat.

Recovery Objective: The continued existence of the Ute ladies'-tresses along a stream system and in floodplain wet meadows requires either 1) direct manipulation of habitat to maintain necessary hydrologic and vegetation community conditions or 2) assurance of the continual creation and evolution of favorable habitat conditions resulting from natural stream dynamics. Of these options, the latter, ensuring the conditions that allow natural stream dynamics to create and maintain preferred orchid habitat, is in the long run the most dependable and ecologically desirable way to guarantee the viability of the orchid in perpetuity. Recovery objectives for the Ute ladies'-tresses include:

1. Obtaining information on life history, demographics, habitat requirements, and watershed processes that will allow specification of management and population goals and monitoring progress.

2. Managing watersheds to perpetuate or enhance viable populations of the orchid.

3. Protecting and managing Ute ladies'-tresses populations in wet meadow, seep, and spring habitats.

Actions Needed:

1. Define, manage, and restore watersheds, using watershed-based interagency, interdisciplinary teams as evaluation and planning aids.

2. Implement interim recovery actions for orchid populations associated with natural stream systems until watershed interdisciplinary teams are able to conduct evaluations and make planning and management recommendations.

3. Identify, protect, and manage populations that occur in wet meadow, seep, and spring sites.

4. Develop orchid population and habitat recovery goals and delisting criteria incorporating information from watershed evaluations and genetic, life history, ecology, and habitat management studies.

5. Inventory remaining potential habitat.

6. Conduct genetic, life history, ecology, and habitat management studies.

7. Reintroduce orchids into appropriate sites.

8. Conduct public education on watershed and riparian area management, use of recovery and interdisciplinary teams, and orchid ecology.

Date of Recovery: Unknown

Total Cost of Recovery: Unknown

winter months. Two or more plants often occur in clumps. It is not known whether these clumps are composed of separate individuals or whether all arise from a single underground organ.

Reproduction appears to be strictly sexual, with bumble bees (Bombus spp.) as the primary pollinators (Dresler 1981, Sheviak 1984, Sipes et al., 1993). Flowers are protandrus (functionally male first and then female). The inflorescence always begins blooming with the bottom flower and proceeds upwards, sequentially. These features tend to maximize outcrossing due to the tendency of bees to visit the bottommost flower first and then proceed vertically up the spike. Successful conservation of the orchid will require protecting pollinator habitat in and around orchid populations and suitable habitat.

The apparent tendency for populations of the Ute ladies'-tresses to fluctuate dramatically from one year to the next makes it difficult to assess the population status and distribution. Due to the difficulty in finding vegetative individuals, monitoring is typically done by counting the number of flowering individuals. Monitoring at the Van Vleet population by the City of Boulder Open Space Department has been conducted since its discovery in 1986, with the exception of 1991. During that time, apparent population size, as indicated by the number of flowering individuals, has gone from a high of 5,435 in 1986 to a low of 1,137 in 1989 (Arft 1993).

Previous work by Wells (1981) on S. spiralis indicated that population size did not fluctuate when both flowering and vegetative plants were surveyed. Preliminary results examining both vegetative and flowering individuals at the Van Vleet site and at Dinosaur National Monument suggest that population size of the Ute ladies'-tresses is more stable than indicated by monitoring only flowering individuals (Arft 1993, Riedel 1992).

Research is necessary to elucidate the early life history stages of the Ute ladies'-tresses (from seed dispersal to seedling emergence and from seedling emergence to mature reproducing individual), identify limiting or vulnerable stages, and understand factors influencing successful completion of each life history stage. No matter what the original cause(s) of reductions in population that resulted in listing as a federally threatened species, improving population status will require identifying vulnerable and limiting life history stages and implementing measures to enhance the successful passage of individuals through those stages (Schemske et al. 1994).

E. Habitat/Ecology

S. diluvialis is endemic to moist soils in mesic or wet meadows near springs, lakes, or perennial streams. The elevational range of known orchid occurrences is 4,300 and 7,000 feet (1,310 to 2,134 meters) (Stone 1993). Most of the occurrences are along riparian edges, gravel bars, old oxbows, and moist to wet meadows along perennial streams, but some localities in the eastern Great Basin are in similar situations near freshwater lakes or springs (U.S. Fish and Wildlife Service 1991). Jennings (1990) and Coyner (1989, 1990) observed that the orchid seems to require "permanent sub-irrigation", indicating a close affinity with floodplain areas where the water table is

near the surface throughout the growing season and into the late summer or early autumn. This observation has been corroborated by ground water monitoring research conducted in Dinosaur National Monument (Martin & Wagner 1992) and in Boulder, Colorado (Tamara Naumann, pers. comm. 1993).

Ute ladies'-tresses occur primarily in areas where the vegetation is relatively open and not overly dense or overgrown (Coyner 1989, 1990 and Jennings 1989, 1990). A few populations in eastern Utah and Colorado are found in riparian woodlands, but the orchid seems generally intolerant of shade, preferring open, grass and forb-dominated sites instead. Plants usually occur as small scattered groups and occupy relatively small areas within the riparian system (Stone 1993). Common associated species in the eastern range (Colorado's Front Range) of the orchid include Agalinis tenuifolia, Agrostis stolonifera, Asclepias incarnata, Calamagrostis spp., Cirsium arvense, Equisetum spp., Lobelia siphilitica, Sisyrinchium spp., Solidago spp., Triglochin spp., and Verbena hastata. In the central section of the orchid's range (the Uinta Basin), common associated species are Agrostis stolonifera, Calamagrostis spp., Carex spp., Cirsium spp., Dactylis glomerata, Epipactis gigantea, Equisetum spp., Oenothera elata, Prunella vulgaris, Salix exigua, and Solidago canadensis. Species commonly associated with the orchid in the western part of the range (the Wasatch Front and the eastern Great Basin) include Agrostis stolonifera, Alnus incana, Aster hesperius, Carex spp., Castilleja exilis, Cirsium arvense, Equisetum laevigatum, Juncus spp., Melilotus spp., Populus angustifolia, Salix spp., Solidago occidentalis, and Trifolium pratense.

Soils typically range from fine silt/sand to gravels and cobbles. The orchid is sometimes found in highly organic or peaty soils. It is not found in heavy or tight clay soils or in extremely saline or alkaline soils (pH >8.0).

The orchid appears to be well adapted to disturbances caused by water movement through floodplains over time (Tamara Naumann, pers. comm. 1992, Lynn Riedel, pers. comm. 1994). It often grows on point bars and other recently created or "raw" riparian habitat. It is tolerant of flooding and flood disturbance. For example, point bars and backwater areas (old oxbows, side channels, etc.) are often flooded for several months in the spring during snowmelt. At least one-third of the Hog Canyon population is buried under flood debris (1 to 8 cm of sandy debris was deposited by an August, 1993 flood) every few years (Lynn Riedel, pers. comm. 1994).

Once established, the orchid appears to be tolerant of somewhat drier conditions (Riedel 1992), but loses vigor and may gradually die out if the groundwater table begins to consistently drop during late summer (Riedel 1992, Anna Arft, University of Colorado, pers. comm. 1994).

Some of the sites where the orchid occurs have a history of and are currently managed for agricultural uses, typically late winter and early spring grazing and mowing for hay. These sites may be naturally wet meadows or may be supplied with irrigation water.

The habitat alteration resulting from agricultural use (such as from mowing, grazing, and burning) may be beneficial, neutral, or detrimental to the orchid

(McClaren and Sundt, 1992). In Colorado, the largest population of the orchid is on City of Boulder Open Space at the Van Vleet site, a floodplain meadow, which has been used agriculturally for the past 50-75 years. This site is still grazed each year in the winter from February to May, irrigated in the spring and early summer, and mown in the summer around the beginning of July. When these activities were discontinued at a similar site in Boulder, exotic species such as Canada thistle proliferated and the orchid disappeared. Resumption of traditional agricultural uses has since reduced the thistle infestation and the orchid has reappeared (Tamara Naumann, pers. comm. 1994). Grazing and mowing seem to promote flowering, presumably by opening the canopy to admit more sunlight. However, these management practices may impede fruit set by directly removing flowering stalks, enhancing conditions for herbivory of fruits by small mammals such as meadow voles, or altering habitat required by bumble bees, the primary pollinator (Arft 1993).

What is known about the habitat preferences of the Ute ladies'-tresses is consistent with the following model for natural population establishment and maintenance. This model is based upon observations and recent research since listing the Ute ladies'-tresses as a threatened species:

Ute ladies'-tresses habitat is found along freshwater streams emerging from the flanks of mountains where the streambed is beginning to level out and meander within a developing floodplain. These streams are very dynamic. They are subject to seasonal flooding from snowmelt and intermittent heavy thunderstorms. Due to variations in snowpack, these streams experience fairly frequent severe (overbank) flooding sufficient to cause movement of the stream channel within its floodplain.

The orchid colonizes early successional riparian habitats such as point bars, sand bars, and low lying gravelly, sandy, or cobbly edges. As the stream channel changes location and depth, the orchid persists in those areas where the hydrology provides continual dampness in the rooting zone throughout the growing season. These areas include old oxbows, side channels, or older stream channels that have been filled in with alluvial material but which still have a hydrologic connection, through groundwater, to the stream system.

The orchid is tolerant of a mix of wetland forb and grass species, is not tolerant of long term standing water, and does not compete with emergent plant species (e.g., cattails) or aggressive species that form dense monocultures such as Canada thistle or reed canarygrass.

Throughout the historical range of the orchid, the lower mountain flanks and associated riparian areas provide winter range for native ungulates. It is likely that late winter and early spring grazing by native ungulates (bison, elk, and deer along the Front Range, big horn sheep, elk, and deer along the south slope of the Uintas and west slope of the Wasatch Range) in riparian areas historically helped maintain the vegetation community in a condition favorable for the orchid (i.e., prevented excessive buildup of live and dead vegetation). Native ungulates typically follow the snowline (greenline) upslope as spring arrives, thus historically did not stay in orchid habitat in large numbers throughout the summer. Predators also likely kept native

ungulates from excessive congregation in riparian habitats throughout the year.

As the stream channel continues to change over time, becoming deeper relative to an orchid site due to downcutting or sediment deposition or moving laterally farther away from an orchid site, seasonal hydrology also changes so that an orchid site experiences drier conditions. This causes the vegetation community to become dominated by upland grass and forb species. With time, riparian trees may establish and shade orchid sites as well. Under these conditions, the orchid is less competitive and begins to die out.

Ute ladies'-tresses are expected to be scattered along stream systems and associated floodplain areas with appropriate hydrology. A particular orchid occurrence will persist as long as hydrologic and vegetation community conditions remain favorable. The longevity of an orchid occurrence at any particular location likely ranges from a few years to more than 100 years. Thus, over decades, it may not be possible to determine exactly where an orchid population will be encountered along a stream because the stream channel and associated riparian area will always be changing. However, as long as these dynamic conditions continue, the orchid will dependably occur along the stream system where favorable habitat is found.

As mentioned, the model described above is consistent with what is now known about the habitat preferences of the Ute ladies'-tresses. However, many populations of the orchid, particularly those along the Front Range of Colorado, exist under habitat conditions that are maintained by management activities such as irrigation and grazing rather than by natural stream processes. Other populations occur in association with isolated seeps and springs. Many aspects of this model have yet to be verified. It is expected that this model will be refined as new information becomes available through ongoing and proposed research.

Based on this model, the continued existence of the orchid along a stream system requires either (1) direct manipulation of habitat to maintain necessary hydrologic and vegetation community conditions (e.g., by irrigation or stream channel manipulation, and mowing, grazing, or other vegetation management methods) or (2) assurance of the continual creation and evolution of favorable habitat conditions resulting from natural stream dynamics. Of these options, the latter, ensuring the conditions that allow natural stream dynamics to create and maintain preferred orchid habitat, is in the long run the most dependable and ecologically desirable way to guarantee the viability of the orchid in perpetuity.

F. Reasons for Listing

Orchid species are never common. The Ute ladies'-tresses historically occurred over a wide range but was distributed as scatterings of small populations in suitable habitat within this range. It never dominated local vegetation communities. As previously described, the orchid depends upon natural stream processes, and likely also natural ungulate population levels and behavior, to create and maintain habitat. Both of these environmental

features have been dramatically altered since settlement of the west by Europeans. Ungulate populations have been driven from winter range by agricultural activities and urban development. Orchid habitat is now grazed by cows, sheep, or horses, and both timing and intensity are different, than grazing patterns of native ungulates. Stream processes have also been severely altered. Reservoirs, dams, and diversions have removed water from stream systems, completely dewatering some reaches, and changed their hydrographs (magnitude and timing of flow). Streams have been channelized, streambanks rip-rapped, and floodplains converted for agriculture or urban development. The Ute ladies'-tresses continues to survive either where streams are still in a somewhat natural condition within a floodplain, or where conditions mimic naturally created and maintained habitat. For example, the orchid can be found along old gravel pits that have been restored as wetlands, in irrigated pastures, and below leaky diversion dams and irrigation canals.

Urbanization is one of the primary threats to the orchid. Urbanization continues to expand along streams and within floodplains. Both undeveloped habitat and agricultural areas near where the orchid exists or where it could exist are being converted to urban and suburban land uses. This is limiting the distribution of habitats sufficient to support viable populations as well as restricting the range of the species. Colorado's Front Range and Utah's Wasatch Front are two of the fastest growing urban areas in the nation. The orchid has been extirpated from some areas along the Wasatch Front and the Front Range. For example, except for two small populations in wetlands near Utah Lake and the recently discovered population along Diamond Fork, all known historic populations of the orchid along the Wasatch Front are presumed extirpated, as are all but one (rediscovered in 1994) in the eastern Great Basin. Two of the four historic populations in Colorado are also extirpated (Coyner 1989, 1990; Jennings 1989, 1990, U.S. Fish and Wildlife Service 1991). The conversion of potential habitat is occurring at a rapid, and increasing, pace.

Increasing demand for water, both for agriculture and for municipal and industrial uses, is also a severe threat to the orchid. In Colorado and Utah, water developers are planning water projects on most of the remaining undammed streams or stream reaches. Water is managed to optimize urban and agricultural uses. Water law and precedent, and water development interests, make it difficult to retain or reinstitute instream flows, particularly flows that mimic or reflect natural hydrographs.

Recreational uses of streams and riparian areas are increasing as nearby urban populations increase. Management of streams for introduced game fish by moderating stream dynamics to produce even rather than varying flows and low sediment loads may impede creation and maintenance of orchid habitat. Recreational uses within riparian areas can trample orchids, cause compaction resulting in changes in hydrology, and encourage proliferation of weedy species. Although it is possible in some cases to manage streams to accommodate both the orchid and recreational activities including game fishing, efforts to do so have not been seriously initiated to date.

Invasion of exotic species into orchid habitat poses a serious threat to the species' viability. The Ute ladies'-tresses does not tolerate dense competing vegetation. In the large Boulder populations, unchecked Canada thistle growth prevents orchids from flowering and reproducing. Other exotic species common to Ute ladies'-tresses habitat that cause similar detrimental effects include purple loosestrife (Lythrum salicaria), whitetop (Cardaria spp.), Russian olive (Eleagnus angustifolia), and reed canarygrass (Phalaris arundinaceae).

The orchid's pattern of distribution as small, scattered, groups and its restricted habitat make it vulnerable to both natural and human-caused disturbances. Localized catastrophic events have the potential to extirpate individual populations. It is not known if many of the species' smaller scattered populations are of sufficient size to ensure their continued existence over the long term, particularly the populations in Capitol Reef National Park along the Fremont River (2 individuals in 1993), at Willow Springs, Utah (1 individual found) and along Bear Creek in Wyoming (16 individuals).

The Ute ladies'-tresses appears to have a very low reproductive rate under natural conditions (Coyner 1991). Many orchid species take 5 to 10 years to reach reproductive maturity, and this is probably true for S. diluvialis. Reproductively mature plants do not flower every year. These life history and demographic features make the species more vulnerable to the combined impacts of localized extirpations, diminishing potential habitat, increasing distance between populations, and decreasing population sizes (Belovsky et al., 1994).

The present condition of the Ute ladies'-tresses is indicative of the health and condition of watersheds and streams throughout its range. Other species dependent upon the same habitats, for example native fish and amphibian species, are also in trouble. Appropriate watershed and stream management can be beneficial to many species, not just the Ute ladies'-tresses, while improving other watershed functions such as water quality.

G. Conservation Measures

Many conservation measures have already been undertaken for this rare orchid, including expanded inventories, research projects, land management efforts, and development of regulatory mechanisms.

Inventory. Inventories for the species have been or are being conducted in Utah, Colorado, Nevada, Wyoming, and Montana. These inventories have resulted in several new discoveries or relocations of historic occurrences, including: every major drainage in the Uinta Basin (Franklin 1993); the Diamond Fork and Spanish Fork Rivers (Stone 1993, L. Gecy, RMI, in litt., 1994), and along the Provo River (Robert Johnson, Dugway Proving Grounds, pers. comm. 1994) on the Wasatch Front; at Willow Springs in Utah's west desert (eastern Great Basin) (Doug Stone, pers. comm. 1994); along St. Vrain Creek (Steven Peterson, Western Resource Development, pers. comm. 1993), upstream in Clear Creek (Chris Pague, Colorado Natural Heritage Program, pers. comm. 1993) and in the Cache La Poudre River drainage (K. Manci, City of Fort Collins, in litt., 1993) in Colorado's Front Range; and in the Bear Creek drainage in Wyoming (Ernie Nelson, Rocky Mountain Herbarium, pers. comm. 1994). These discoveries

PART II RECOVERY

A. Objective

Description and Rationale. This recovery plan seeks to address Ute ladies'-tresses recovery by maintaining and restoring the ecological processes that create and maintain good orchid habitat. It describes a process for watershed level planning and management designed to achieve the goal of maintaining and restoring watershed conditions for the long-term persistence of the orchid throughout its known historical range. This is an attempt to interpret and define "ecosystem management" and apply it to the recovery of a species. The focus on watershed level planning and management is necessary because it is watershed conditions and processes that create and maintain habitat for the orchid. Many other species of special concern are affected by watershed conditions and management, and their needs can be coordinated with and met through efforts made to recover the Ute ladies'-tresses. For natural viability, the orchid is considered to require, and to be, an indicator species of streams in a state of dynamic equilibrium with their physical settings. Therefore, accomplishment of Ute ladies'-tresses population goals is expected to require management of streams and their watersheds consistent with natural stream flows and hydrography, stream gradients, soils, etc. Both population levels and amount of suitable habitat for the orchid within a watershed are expected to fluctuate over time.

Recovery of the Ute ladies'-tresses and removal from the list of endangered and threatened species will be accomplished when it is demonstrated that:

1. Viable populations throughout its historic range and representative of its genetic endowment are maintained in riparian habitats of streams in a state of dynamic equilibrium.

2. Wet meadow, seep, and spring habitats are protected and managed so as to sustain viable populations.

The objectives of this recovery plan are to determine the number, size, and distribution of viable populations, level of protection, and watershed and habitat management practices required to achieve recovery of the orchid and establish procedures and processes for accomplishing recovery goals.

This recovery plan does not set specific population goals (Task 1.6) for the Ute ladies'-tresses at this time because:

1. Population levels and viability are determined by habitat conditions created and maintained by natural watershed processes. Therefore, the significance of population size and distribution within a watershed can only be assessed in terms of the ability of the watershed to perpetuate it. Recovery targets must include certain habitat and watershed factors as well as orchid population size. However, the linkages between watershed processes, habitat conditions, and population response are complex and not completely understood. As more information is obtained,

Strategic Goals and Guidelines. Strategic goals for achieving Ute ladies'-tresses population restoration and long-term, natural persistence of the orchid throughout its known historical range include:

1. Maintain options for future recovery by ensuring that secure, well-distributed, and diverse natural habitats and co-adapted populations, and local examples of natural ecosystem processes, remain in place over the long-term;

2. Secure existing populations of riparian and aquatic species, with particular emphasis on sensitive species, and maintain the critical areas supporting healthy ecosystem function;

3. Institute recovery measures that stand the greatest chance of producing measurable improvements in the status and abundance of the orchid and other associated riparian plant species, and improvement of ecosystem function, in the near term.

Population restoration guidelines include:

1. Identifying and securing habitats that are critical for maintaining existing populations of the orchid. (Note: securing includes actions such as purchase, easements, and management agreements that ensure that orchid viability needs are met.)

2. Controlling the cause rather than the symptoms of habitat degradation. In some cases mechanical restoration, such as recreating meander patterns or rerouting the stream back into an historical channel, may be beneficial in the short term to allow long term natural processes to take root.

3. The use of transplanting and ex-situ propagation and reintroduction of stocks of the orchid should only be used as a last resort or to restore extirpated populations and should be avoided where reproductive potential remains.

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effort involving the U.S. Fish and Wildlife Service Idaho Field Office, the Bureau of Land Management Idaho State Office, Regions 1 and 4 of the U.S. Forest Service, and the State of Idaho. The strategy was prepared by a Technical Work Group that included representatives from the U.S. Forest Service, Idaho Department of Fish and Game, Bureau of Land Management, Idaho Division of Environmental Quality, and the U.S. Fish and Wildlife Service. The Ute ladies'-tresses orchid Recovery Team would like to acknowledge and express appreciation for the contribution made by the interagency group that authored the Bull Trout Conservation Strategy. The document is an excellent example of ecosystem-level thinking applied to restoration and management of a species in trouble.

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Anadromous Fish Instream Flow Needs and Conflicts within the Sawtooth National Recreation Area

December 1981

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I. INTRODUCTION

Within the Sawtooth National Recreation Area (SNRA), the anadromous fishery includes migratory runs of chinook and sockeye salmon, and steelhead trout. Commonly occurring co-inhabitant resident gamefishes include rainbow, brook, and cutthroat trout, Dolly Varden and mountain whitefish. Each of these fish are characterized by different habitat management criteria necessary to provide for the species and its habitat requirements. Traditionally, U.S. Forest Service fishery programs concerned with the headwaters of the Salmon River have been oriented primarily toward chinook salmon and steelhead trout, both highly desirable game and commercial fish. However, management programs which have improved the condition of anadromous fish habitat most often benefited the resident (non-migratory) species present as well.

Historically, the upper Salmon River and its tributaries provided some of the highest quality spawning and rearing habitat for anadromous fish in the State of Idaho (Figure 1). Once, these migratory fish were destined to travel over 800 miles to the upper Salmon River spawning grounds on a journey relatively free of obstructions. Now both fish passage and critical life cycle phases essential to their existence are inhibited by Columbia and Snake River dams and degradation of habitat in much of the drainage.

Tributary dams, irrigation diversions, poor logging, farming and grazing practices, dredge mining, and a host of other factors eliminated, or severely degraded, valuable salmon and steelhead habitats throughout the Columbia Basin. Further development of these activities continues to threaten the existence and propagation of these fish, even in the Sawtooth National Recreation Area. With development of hydroelectric power in the Columbia and Snake Rivers accounting for mortalities of up to 15% of both adult and juvenile salmon and steelhead at each major dam, special concern regarding maintenance and management of headwaters habitat is essential.

Within the boundary of the SNRA, by far the greatest impacts on anadromous fish and their habitats are the effects of water diversions and related instream flow problems. Irrigation became a major impact affecting the upper Salmon River soon after the first ranch appeared in Sawtooth Valley in 1899. Irrigation grew rapidly between 1905 and 1930 as almost all valley lands were taken up under the Homestead Act. Since 1930, the number of acres of irrigated land has gradually increased and the demand for irrigation water has increased proportionately. In some cases the increased demand has resulted in the diversion of the entire stream, leaving the natural channel completely dry. The impacts of dewatering these natural channels below the diversions include (1) direct losses of valuable spawning and rearing habitats; (2) deprivation of access to historically important upstream spawning and rearing habitats; (3) impediments to downstream migration and dispersal of juvenile fish; (4) disruption of aquatic ecosystems brought about by the annual recurrence of unnaturally low flows.

LOCATION MAP

Figure 1

This map shows the location of the Sawtooth National Recreation Area and the Upper Main Salmon River Area within the Columbia River Basin Drainage.

Public Law 92-400 enacted in 1972 established the SNRA and directed the Secretary of Agriculture to administer the area in a manner that will best provide for the protection and conservation of the salmon and other fisheries. As a result, this investigation was initiated to evaluate the impacts of current irrigation demands on anadromous fish and their habitat within the SNRA.

Initially eight streams were known to be impacted by irrigation diversion. The eight streams selected for study include: Salmon River, Alturas Lake Creek, Pole Creek, Elk Creek, Trap Creek, Fourth of July Creek, Champion Creek and Fisher Creek (Figure 2). These streams were thought to include all of the most valuable anadromous fish habitat within the SNRA impacted by irrigation diversion. Further habitat inventory suggests similar investigations should be conducted in Beaver Creek and Iron Creek. Subsequent evaluation of the anadromous fish habitat in Fisher Creek determined that it offers little anadromous fish habitat and has a low potential for improvement; therefore, study of instream flow requirements for fish in Fisher Creek was deleted from this investigation.

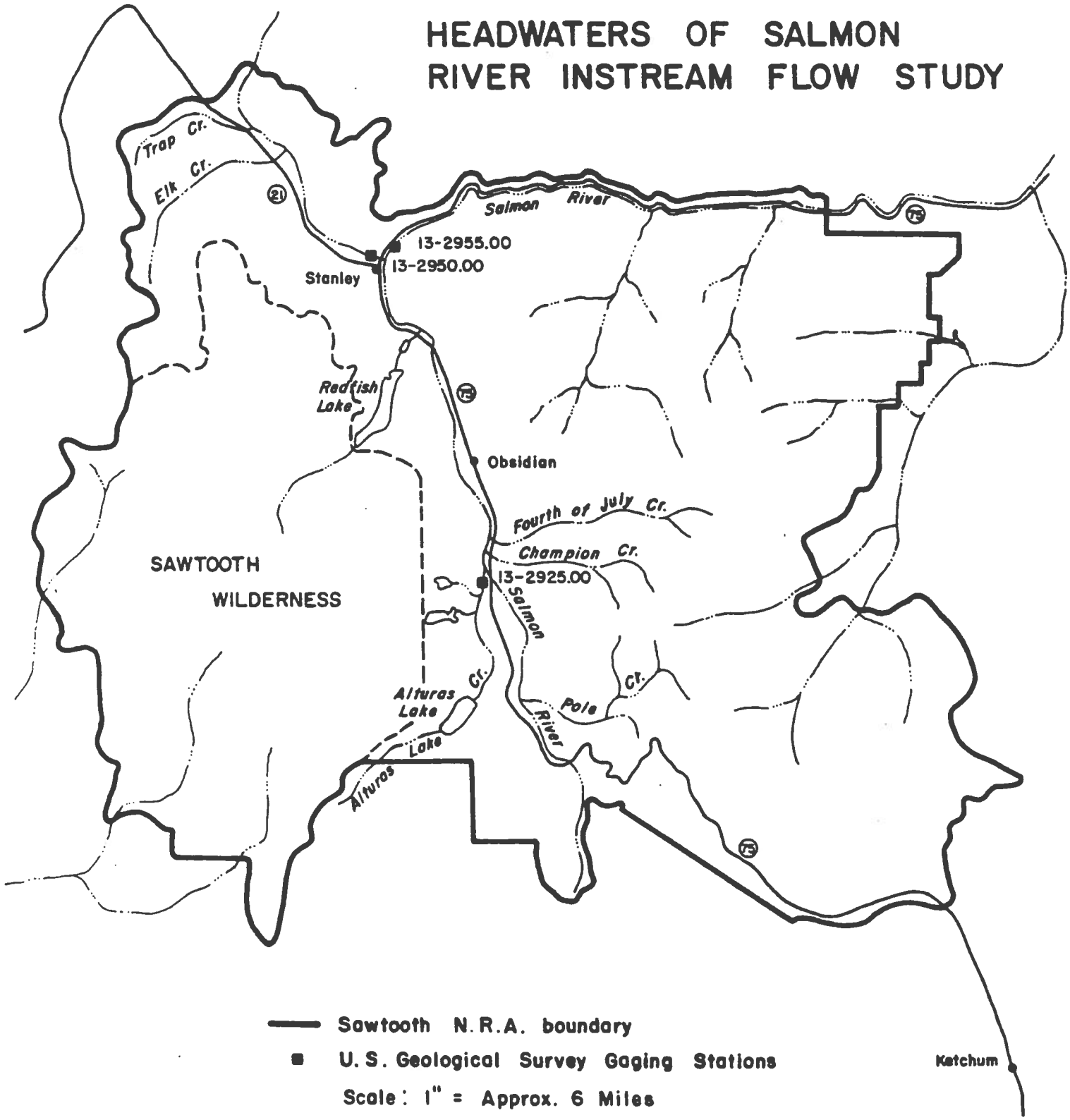

Figure 2

Map of study area. Study streams and gaging stations used for flow projections are labeled.

II. OBJECTIVES

The primary objective of the study is to identify the impacts of irrigation diversion practices on anadromous fish and their habitat within the SNRA. Information needs to meet this objective include definition of:

1. The amount of water that is naturally produced from the study watersheds, to determine how much water is available for all uses;

2. The amount of water being used for irrigation, to determine the portion of streamflow not available to fish;

3. The amount of water irrigators actually divert compared to their legal right, to determine any conflicts between actual and legal use;

4. The minimum streamflow to pass salmon through critical reaches and/or provide flow regimes for salmon spawning and egg survival needed to provide 90% or more of the habitat's inherent smolt production.

III. METHODS/ASSUMPTIONS

A. Flow Characterization. The purpose of this phase of data collection is to document the amount of water normally produced by the study watersheds above the diversions (i.e. virgin flows), to determine the total water available for all uses. This is evaluated in terms of the 75-percentile monthly flow characteristics. The 75-percentile monthly flows indicate that 75 percent of the days in that month will have an average daily flow equal to or greater than that flow. This type of flow characterization was selected for this study because flow estimates produced are more conservative than "mean monthly flow" values typically used. It is necessary to use these conservative figures in evaluating fishery needs because delays in spawning migration of anadromous fish have deleterious impacts on production. Using mean monthly flows would result in many days during which the flows were lower than indicated, and the fishery resource would be impacted by low flows much sooner than the mean monthly flow would indicate. This is especially true in the upper Salmon River basin where the hydrograph rises and descends rapidly during a short period of peak flows from relatively stable low flows.

Flow characteristics are derived by using statistical analyses on historical streamflow records from nearby, suitable gaging stations. Not all gaging stations within a watershed are suitable for flow determinations since these

flows are highly dependent on the watershed's physical and hydrologic characteristics. Of the thirteen U.S. Geological Survey streamflow gages that have been operated in the Salmon River basin above Challis, ten were discarded as being unrepresentative for the purposes of characterizing flows for the study watersheds.

To determine the gages which were representative of each study site, flow was correlated with drainage area several times using different combinations of the thirteen stations. The results of these regressions were then compared to actual virgin flow measurements. The resulting hydrograph of flows for a drainage area the size of the watershed above the virgin flow station was scrutinized for similarity to the measured runoff characteristics. The reasons for discarding the ten stations are:

a. Salmon River near Obsidian was too heavily impacted by diversions to give reliable summer flow estimates.

b. Yankee Fork Salmon River, Salmon River below Yankee Fork, Thompson Creek, Bruno Creek and Squaw Creek are hydrologically dissimilar to the Salmon River Basin above Stanley - the aspects of their watersheds produce hydrographs dissimilar to the Salmon River above Stanley.

c. Little Boulder Creek, Big Boulder Creek and East Fork of Salmon River are also hydrologically dissimilar to the Salmon River Basin above Stanley - the winters of East Fork Basin are much milder than the headwaters of the Salmon. Additionally, irrigation impacts affect the East Fork Salmon River summer flows.

d. Salmon River near Challis has such a large drainage area that the resulting flows regressed from the data of that gage were too large to comfortably use.

The three stations used are not perfect (Figure 2), but the representations appear reasonable and conservative. Alturas Lake Creek station has only four years of data, but the data is representative of the long term record. Valley Creek and Salmon River below Valley Creek are both impacted by diversions, but they are both far enough downstream from the diversions that recharge has reduced the impact on the gaged data.

Since only three stations remained, development of a relationship between flow and drainage area to predict flows for other sized watershed was judged to be unrealistic for most of the watersheds of interest.

For the Salmon River study site, however, flow predictions were based upon a regression of the data from Valley Creek, Salmon River below Valley Creek and Alturas Lake Creek because these three stations better represented its larger area.

The other study watersheds were considerably smaller, so flow characteristics were estimated from the nearest gaging station. Predicted flows are based on an areal proportion of the gaging station's measured flow. For example, if the watershed of interest is half the size of the gaged watershed, all predicted virgin flows were assumed to be half the gaged flows.

II. OBJECTIVES

The primary objective of the study is to identify the impacts of irrigation diversion practices on anadromous fish and their habitat within the SNRA. Information needs to meet this objective include definition of:

1. The amount of water that is naturally produced from the study watersheds, to determine how much water is available for all uses;

2. The amount of water being used for irrigation, to determine the portion of streamflow not available to fish;

3. The amount of water irrigators actually divert compared to their legal right, to determine any conflicts between actual and legal use;

4. The minimum streamflow to pass salmon through critical reaches and/or provide flow regimes for salmon spawning and egg survival needed to provide 90% or more of the habitat's inherent smolt production.

III. METHODS/ASSUMPTIONS

A. Flow Characterization. The purpose of this phase of data collection is to document the amount of water normally produced by the study watersheds above the diversions (i.e. virgin flows), to determine the total water available for all uses. This is evaluated in terms of the 75-percentile monthly flow characteristics. The 75-percentile monthly flows indicate that 75 percent of the days in that month will have an average daily flow equal to or greater than that flow. This type of flow characterization was selected for this study because flow estimates produced are more conservative than "mean monthly flow" values typically used. It is necessary to use these conservative figures in evaluating fishery needs because delays in spawning migration of anadromous fish have deleterious impacts on production. Using mean monthly flows would result in many days during which the flows were lower than indicated, and the fishery resource would be impacted by low flows much sooner than the mean monthly flow would indicate. This is especially true in the upper Salmon River basin where the hydrograph rises and descends rapidly during a short period of peak flows from relatively stable low flows.

Flow characteristics are derived by using statistical analyses on historical streamflow records from nearby, suitable gaging stations. Not all gaging stations within a watershed are suitable for flow determinations since these

flows are highly dependent on the watershed's physical and hydrologic characteristics. Of the thirteen U.S. Geological Survey streamflow gages that have been operated in the Salmon River basin above Challis, ten were discarded as being unrepresentative for the purposes of characterizing flows for the study watersheds.

To determine the gages which were representative of each study site, flow was correlated with drainage area several times using different combinations of the thirteen stations. The results of these regressions were then compared to actual virgin flow measurements. The resulting hydrograph of flows for a drainage area the size of the watershed above the virgin flow station was scrutinized for similarity to the measured runoff characteristics. The reasons for discarding the ten stations are:

a. Salmon River near Obsidian was too heavily impacted by diversions to give reliable summer flow estimates.

b. Yankee Fork Salmon River, Salmon River below Yankee Fork, Thompson Creek, Bruno Creek and Squaw Creek are hydrologically dissimilar to the Salmon River Basin above Stanley - the aspects of their watersheds produce hydrographs dissimilar to the Salmon River above Stanley.

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Alturas Lake Creek flow predictions are based on an areal proportion of the Alturas Lake Creek flows. Pole Creek, Champion Creek, and Fourth of July Creek flow predictions are based on an areal proportion of the Salmon River below Valley Creek flows. Elk Creek and Trap Creek are based on an areal proportion of the Valley Creek flows.

The watershed areas above the "Virgin Flow Stations" were measured with an electronic planimeter. Drainage area was measured above the highest diversions to define the amount of water available for both irrigation and fish habitat maintenance. This results in a more conservative flow prediction, although not always significantly different, for the critical reach than if the entire watershed above the critical reach were considered. (A critical reach is a portion of the stream presenting a problem to anadromous fish passage because the water depth is too shallow, or it is a stream portion that presents a problem for spawning and/or egg incubation because the water velocity is too slow for egg survival. Typically, the critical reach is directly below the diversion, but sometimes it is further downstream where the channel widens and the stream gets shallower.)

B. Irrigation Practices. Quantification of the water diverted for irrigation began during the summer of 1979 and continued through the summer of 1980. Streamflow measurements were taken above the irrigation diversions on each priority stream and below the diversions in the critical reach. Consequently, this measurement takes into account both the water bypassing the diversion and the water recharged into the system between the diversion and the critical reach. This provides a better estimate of the water available for anadromous fish, and a more conservative estimate of the amount of water being diverted.

Discharge measurements were taken according to Book 3, Chapter A-8, Techniques of Water Resource Investigations of the United States Geological Survey, "Discharge Measurements at Gaging Stations". The midsection method was employed using a cloth tape to measure width, a top-set wading rod to measure depth and a Price current meter, a Pygmy current meter, or a Marsh-McBirney current meter to measure velocity, using at least 20 equi-distant sections.

The Idaho Department of Water Resources maintains files of water right applications, permits, licenses, and adjudications. Licensed and adjudicated water rights within the State of Idaho are tied to the land on which the water is put to beneficial use. Permitted water rights are the personal property of the applicant and may be disposed of separately from the land. The abstracts document the State filing number, the name of the original applicant, the name of the current owner of the property described as the place of use of the water, the state diversion number of the diversion that irrigates the place of use described in the right, the priority date of the right, the point of diversion and the place of use. Some of the points of diversion described in the water rights are not the current points of diversion. The water rights on file with the Department of Water Resources for the conflicting diversions are addressed in the following section for each study area.

C. Fishery Capability. In order to determine streamflows required to allow passage of adult anadromous fish upstream, a representative transect within the critical reach was selected for investigation on each stream. The transects selected are identified in Table 1 below.

Table 1. Representative transect selected within the critical reach on each study stream.

Stream	Station	Transect	Sample
Salmon River	3.6	3	2
Alturas Lake Creek	4.4	3	3
Pole Creek	2.0	3	1
Elk Creek	1.0	1	4
Trap Creek	3.0	3	1
Fourth of July Creek	1.0	5	3
Champion Creek	1.0	1	1

Stream stations were established below the lowest diversion on the stream system where the cumulative impact of multiple diversions could be evaluated. Each station consists of 5 transects 50 feet apart. The transect selected was most representative of the typical channel configuration of the impacted reach. Another important criteria considered in transect selection was that the projected required passage flows be reasonable considering historical fish passage flows.

Discharge data were collected at the selected transects for a variety of flows. The data sample chosen and analyzed for each station was most representative of what the investigators believed to be the marginally acceptable passage flow.

The Oregon Method (Thompson, 1972) was employed to guide establishment of criteria that would address adult passage requirements. For adult passage, the minimum depth criteria to be applied must be present over 25% of the stream width and contiguous over at least 10% of the stream width at a representative transect. The minimum depth criteria recommended by Thompson was 0.8 feet for chinook salmon, and 0.7 feet for sockeye salmon and steelhead trout.

Based on the experience of past and present Sawtooth NRA fish biologists it was felt that these criteria were high for marginally acceptable adult fish passage. The depth criteria used in this study to determine marginal adult passage is 0.6 feet for all anadromous species. Additionally, in a stream section the flow velocity should not exceed 8.0 feet/sec.

To facilitate downstream juvenile fish passage, a marginal flow condition was determined by the relationship of the wetted perimeter and discharge. An average of three transects (numbers 1, 3 and 5) at the critical reach station, identified for each study stream in Table 1 was used to determine marginal flow conditions for downstream migrants because SNRA fish biologists evaluating the data felt this average provided a better estimate of the required flow than a single transec Considering these three representative transects, the point at which wetted perimeter increases slowly while discharge increases rapidly will be considered marginally acceptable to provide for juvenile migration. This flow should maintain stable aquatic invertebrate populations, serving additionally as an ecosystem protection flow. The migration of juvenile anadromous fish is heavily influenced

by peaks and lows in the natural flow regime, therefore, the optimum condition most often is the natural flow. It was determined that flow conditions that would marginally provide for passage of adult fish would also meet the requirements of passage for juvenile fish, facilitating downstream migration without appreciable losses.

Criteria established for the purposes of determining available spawning habitat at different flows and complimenting incubation flows proved to be unadaptable to the computer methodology available during the preparation of this report. Assessment of spawning capabilities at varied flows was evaluated on the basis of the SNRA fish biologist's best judgement. The rationale used for determining spawning habitat capabilities at different flows will be discussed later in this section.

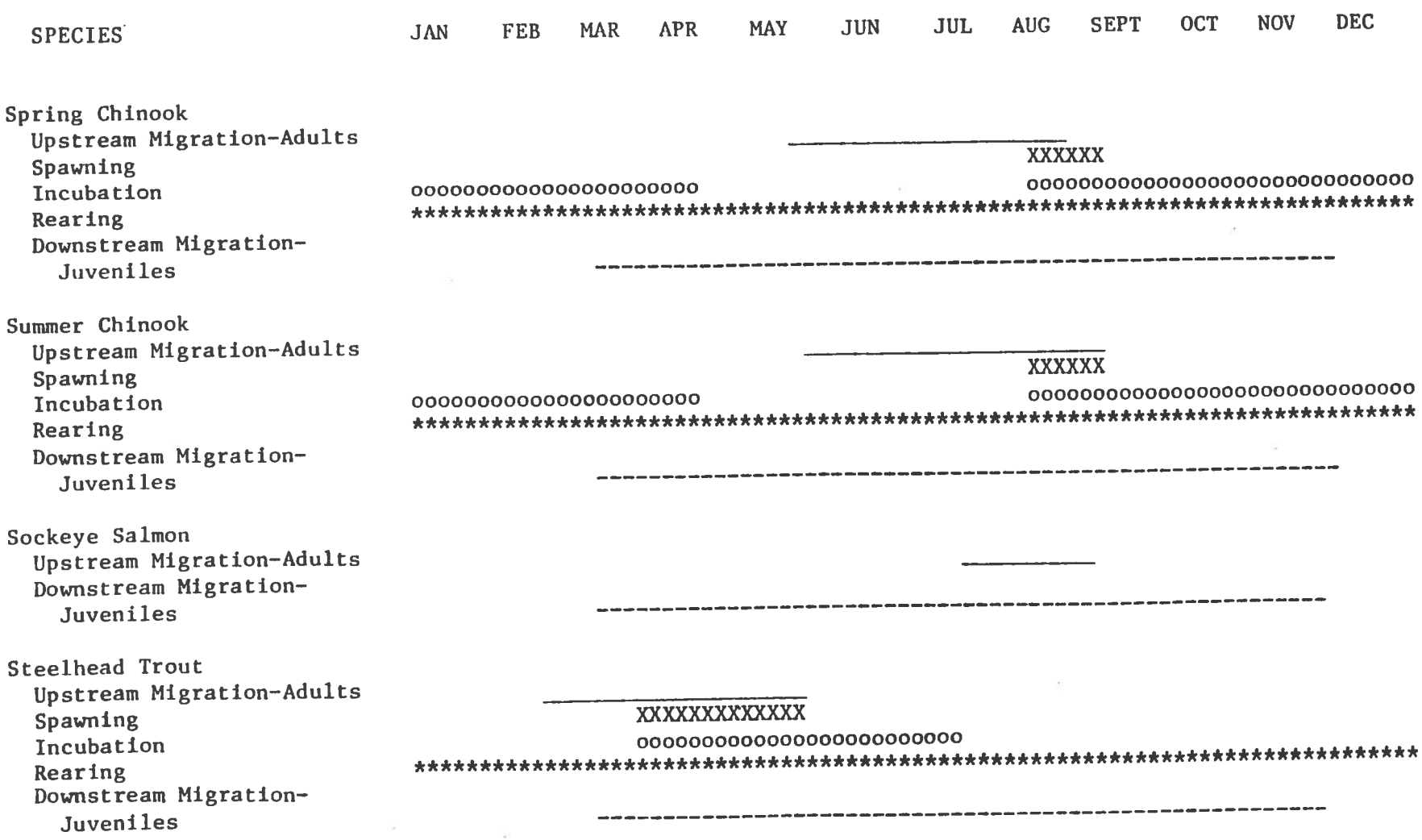
Also, current methodologies do not provide guidelines regarding reduced flows and freezing waters. Although at some study sites diversion does occur throughout the winter, it is not of beneficial use but due to faulty headgate structures and/or poor water management practices. Until techniques become available, a fish habitat maintenance flow equaling the natural flow will be recommended during periods November through April when freezing would be expected, and water isn't needed for irrigation.

Streamflows necessary to meet the marginal passage, spawning and incubation criteria were determined by use of the US Forest Service General Aquatic Wildlife System (GAWS) computer program as presented in The Transect Method of Stream Habitat Inventory: Guidelines and Applications (Dunham and Collotzi 1975). The portion of the GAWS output used for this study displays the channel cross-section and breaks down the discharge measurement into its depth and velocity components. Other desired surface water elevations can then be extrapolated over the channel cross-section to predict water depths, velocities and corresponding discharges. GAWS utilizes Manning's equation to make these predictions. In the program Manning's "n" (the roughness coefficient) and water surface slope are assumed constant because these variables are difficult to adjust with only one streamflow measurement. During this investigation each transect was measured at three different discharges which allowed for refinement of GAWS outputs by utilizing a variable roughness coefficient. The adjusted GAWS outputs are assumed to be relatively accurate predictions of streamflows required to meet the applied criteria.

The analysis of the impact on anadromous fish production due to reduced flows is presented relative to the capability of those flows to meet life history phase requirements for target anadromous species. A periodicity chart for these life history phases appears in Figure 3.

Stream reaches identified as anadromous fish habitat affected by altered flows were assigned capabilities of anadromous fish production assuming that the natural streamflow was always available. The productive capability is expressed as an estimate of the stream reach potential for accommodating redds of both chinook salmon and steelhead trout where appropriate. The estimated redd potential by stream reach was developed from the SNRA fish biologist's knowledge of: (1) amount of habitat available, (2) probable redd density (habitat quality) for that habitat based on redd densities in affected and similar stream reaches monitored by the Idaho Department of Fish and Game and Forest Service biologists (Salmon Spawning Ground Surveys, 1954-1979) (3) effects of inter-specific competition and predation, and (4) the ability of virgin flows to provide for the requirements of life history phases.

Figure 3. Periodicity Chart for Anadromous Fish Species Inhabiting Study Streams Within the Sawtooth National Recreation Area



Reducing instream flow below virgin flow can be expected to result in an impact on the potential for fish production. The value of the anadromous fishery resource in stream reaches affected by depletion of instream flow was determined by estimating spawning potential at reduced flows. This is based primarily on the amount of water remaining instream relative to the natural flow available. For example, the reach of the Salmon River from the S-45 diversion downstream to the confluence with Alturas Lake Creek is affected by reduced flows during the chinook spawning period. The potential for chinook redds in this reach was estimated by IDF&G and Forest Service biologists to be 650-750. Although the S-45 diversion dewaters a short reach of the Salmon River, recharge and other sources of water provide for a fraction of the spawning potential. IDF&G redd counts in this reach document up to 296 redds (nearly 50% of estimated potential in this reach) in the recent years of depressed chinook runs. If current water management can provide for 50% saturation of chinook redds, and the natural streamflow can provide for 100% of the potential; by passing 50% of the natural flow past the diversion approximately 75% of the spawning potential in this reach should be realized. Streamflows recommended to insure incubation of spawn deposited are assumed to be two-thirds of the flow available during the spawning period.

For cases where instream flow is reduced in the irrigation season beyond what is required during a life history phase a proportional impact on potential production is assumed. For example, dewatering a stream channel at the midpoint of the upstream migration period of adult chinook can be expected to result in a 50% reduction from saturation of redds beyond the diversion. In the absence of documentation, best judgement was used to construct curves describing percentage of the population completing a life history phase at any given point in time during the affected life history period for the entire population (Figure 4).

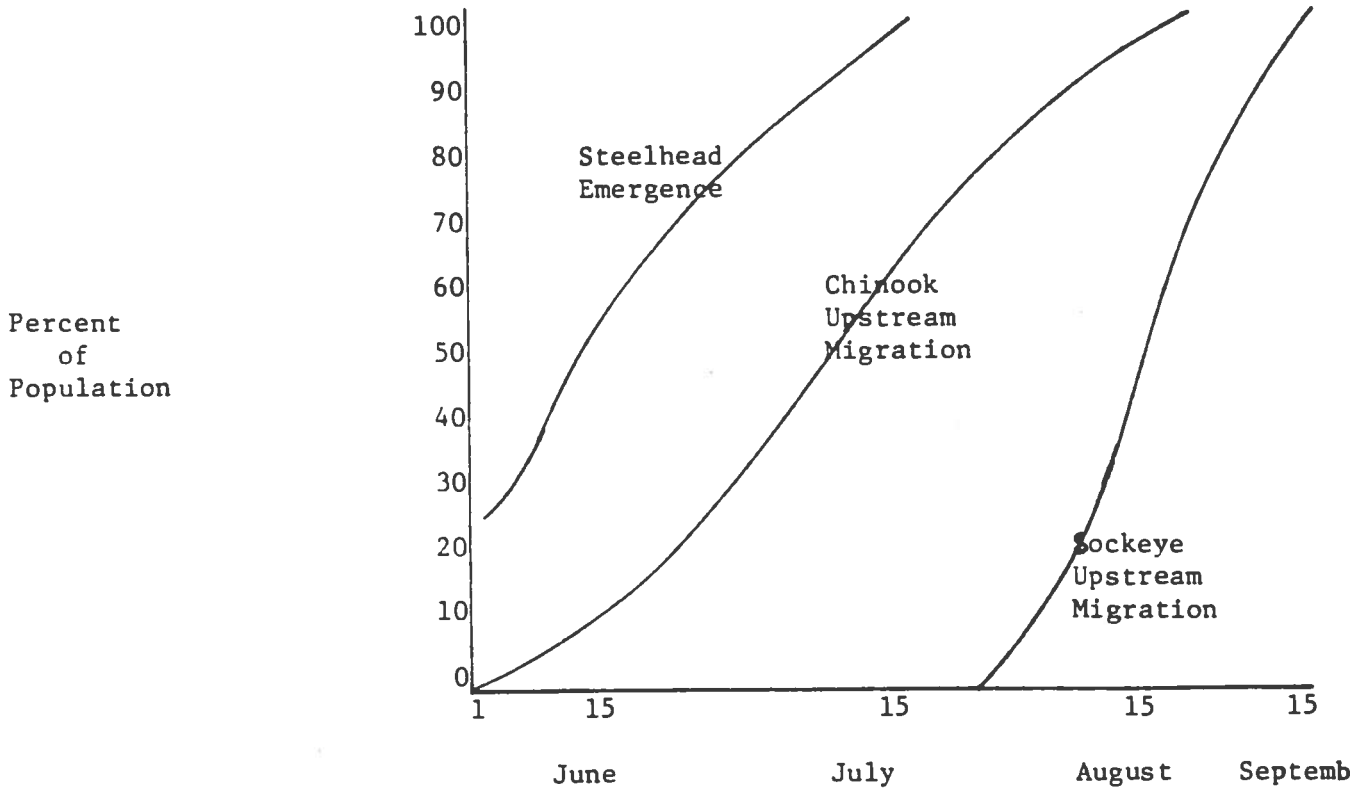


Figure 4. Percentage of the population completing a life history phase over time during the phase period for the entire population.

Because of life history cycle differences (i.e. steelhead migrate upstream earlier than salmon, bypassing critical reaches prior to reduced flows preventing passage), current water management practices have little impact on steelhead propagation relative to the impact on chinook salmon propagation. Therefore, estimates of redd potentials per stream reach for chinook salmon assume an existing viable population of steelhead trout for streams with suitable steelhead habitat. After fully or partially resolving the impacts of water management on chinook, the increased utilization by chinook will reduce the potential production of steelhead by some fraction as a result of competition and predation. Therefore, estimates of potential productive capability for steelhead trout assume chinook are not present, and as the chinook salmon utilization increases, it is assumed the potential for production of steelhead decreases as shown in Figure 5.

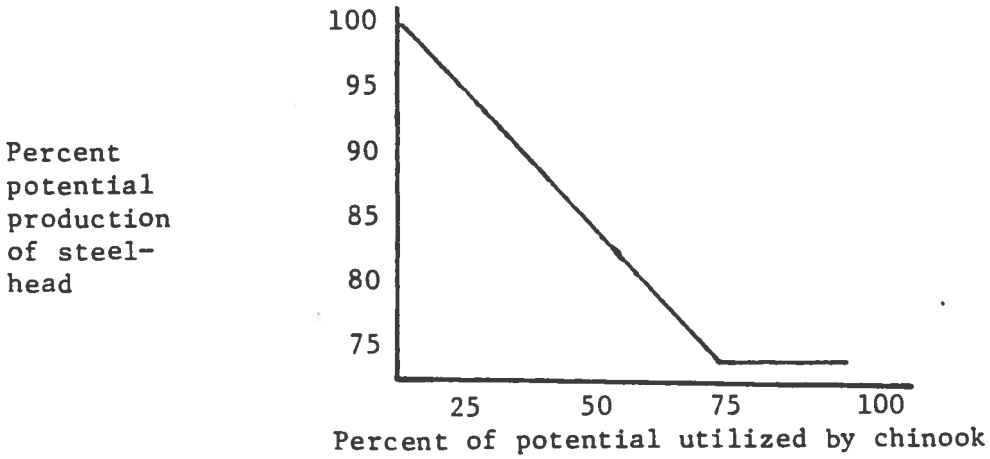


Figure 5. Decrease in steelhead production potential as utilization by chinook salmon increases.

For the purpose of evaluating diversion impacts on anadromous fish production a method of determining the economic value of the fishery resource was devised. It is assumed that each redd represents 2.5 adults escaping to the spawning grounds. Each escaping fish represents a net economic value of fish harvested elsewhere as calculated in Partial Net Economic Values for Salmon and Steelhead for the Columbia River Basin (Tuttle, Richards and Wahle, 1975). The 1977 net economic values, as yet unpublished but provided in 1980 by Reino Koski of National Marine Fisheries Service, are $294.23 per spring chinook and $271.26 per summer steelhead. Sockeye salmon are not valued for the assessment as sockeye numbers throughout the Columbia Basin are so depressed that they no longer provide for a viable commercial fishery. As sockeye runs are re-established the value of the fish will become an important factor to consider in economic analyses.

Perhaps some discussion should be presented here to assist the reader in understanding selection of "marginally acceptable" flows that provide for 90% or more of the habitat's inherent smolt production. This standard was

selected for two reasons. First, the Intermountain Regional Plan recognizes this as the minimum level of production we will manage for, and second, SNRA biologist evaluations suggest that as streamflow drops below these marginal conditions production rapidly becomes negligable.

IV. FINDINGS

Salmon River

The Salmon River originates high in the forested slopes of the Smoky Mountains. Draining some 89 square miles, the stream breaks into a broad U-shaped valley about six river miles above the virgin flow station. Most of the flow through the virgin flow station is the result of snowmelt. Several major tributaries contribute to the virgin flow.

Within the SNRA, the Salmon River proper provides water for nine active irrigation diversions. The uppermost two of these, designated as S-45 and S-46 (T7N, R14E, Sec. 3 and 10, Figure 6) have the greatest impact on anadromous fish production. These diversions regulate access by anadromous adults to 32 miles (65 acres) of ancestral spawning grounds and deplete water through 3.5 miles (15 acres) of valuable spawning beds below the diversions.

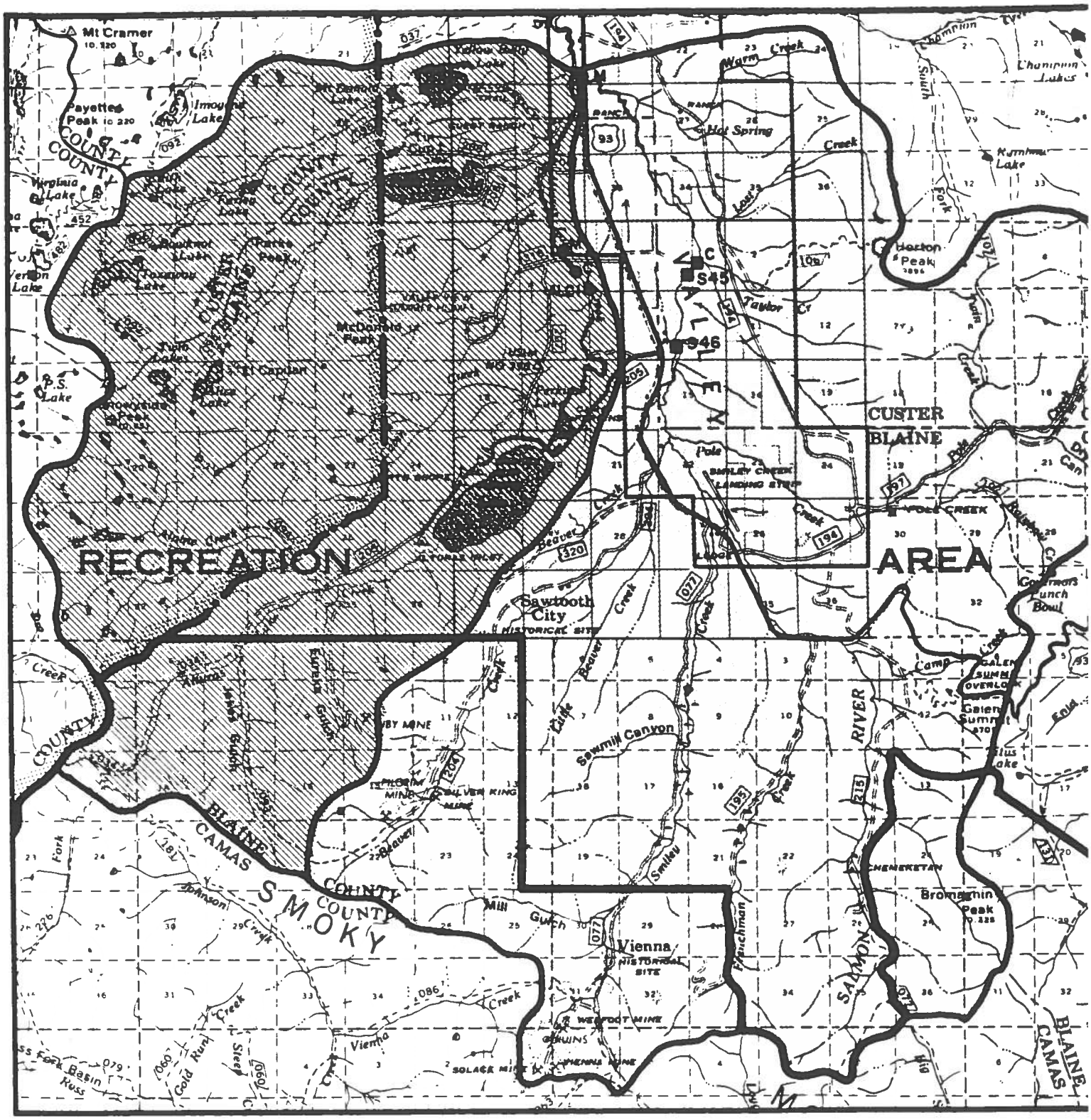
Flow Characteristics. Discharge above the uppermost Salmon River diversions (S-45, S-46) remains relatively constant from September through March, then rises dramatically to a peak in June, before more rapidly descending through July and August to the consistent low flows of fall and winter. The 75th percentile flows developed from a three point regression of USGS gage data from Valley Creek, Salmon River below Valley Creek and Alturas Lake Creek are presented in Table 2.

Table 2. Calculated 75th percentile flows in cfs for the Salmon River above S-46, developed from 3 point regression of USGS gages 132930.00, 132950.00, and 132955.00.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
52.1	42.4	44.2	59.0	231.9	316.4	104.5	50.7	37.6	46.3	48.5	44.9

Diversion Rights/Irrigation Needs. During the summer season, 16,010 acre-feet of water are diverted to irrigate 1,720 acres of pasture. The pasture is on well-drained, coarse textured soils with low to moderate water holding capacity. Permeability is moderate to rapid. The growing season is 80 to 100 days.

Watersheds of Alturas Lake Creek & Salmon River



LEGEND

(ALTURAS LAKE CREEK)		(SALMON RIVER)	
	Alturas Lake Creek Watershed		Salmon River Watershed
$\bullet^{M}$	Master Reference Station	$\blacksquare^{M}$	Master Reference Station
$\bullet^{C}$	Critical Reach	$\blacksquare^{C}$	Critical Reach
$\bullet_{ALCI}$	Alturas Lake Creek Diversions	$\blacksquare_{S45}$	Salmon River Diversions

The total abstracted water right for the two diversions (S-45, S-46) combined is 65.6 cubic feet per second (cfs). The capacities of the S-45 and S-46 ditches are 70 cfs and 50 cfs respectively. The combined volume of flow drawn by these ditches commonly exceeds the recorded rights. In June and July of 1979, when flows were below mean monthly flow values shown in Table 2, 80 to 105 cfs were diverted by S-45 and S-46 resulting in an almost complete dewatering of the Salmon River by the end of June. When available water is less than the demand at both points of diversion, diversion at S-46 is deferred downstream to S-45 so that the full water right or entire streamflow, whichever is less, is diverted at S-45. Consequently, aquatic habitat between the two diversions is not adversely affected.

The amount of water diverted to irrigate these 1720 acres is equivalent to spreading 9.31 feet (about 112 inches) of water over each acre during the period May through September. Article 15, section 42-220 of Idaho Water Laws and Regulations states "... that when water is used for irrigation, no such license or decree of the court allotting such water shall be issued confirming the right to the use of more than one second foot of water for each fifty acres of land so irrigated, unless it can be shown to the satisfaction of the Department of Water Administration in granting such license, and to the court in making such decree, that a greater amount is necessary, and neither such license nor any one claiming a right under such a degree, shall at any time be entitled to the use of more water than can be beneficially applied on the lands for the benefit of which such right may have been confirmed...". This law indicates that generally no more than 6.12 feet, or 73.5 inches of water could be applied per acre over a May through September irrigation season. The 16,010 acre feet actually diverted is 150% of the maximum legal standard of 1 cfs per 50 acres irrigated, or 10,526 acre feet for this pasture.

Fishery Capability/Requirements. As noted in the introduction diversions S-45 and S-46 regulate access to 32 miles of spawning grounds and deplete water downstream through 3.5 miles. Miles of stream, acres of habitat and estimated potential for density of redds are listed in Table 3 by affected stream reaches.

Table 3. Fishery capability impacted by main Salmon River diversions S-45, S-46. Miles of stream, acres of habitat and estimated potential for density of redds are displayed for each identified affected stream reach.

Stream Reach	Miles of Stream	Acres of Habitat	Density of redds/acre
Salmon River, S-45 downstream to the confluence of Alturas Lake Creek	3.5	15	40 salmon redds
Salmon River, S-45 upstream to the extent of anadromous fish habitat	11	30	35 salmon redds 20 steelhead redds

Pole Creek 1/	7.5	12.5	50 salmon redds 40 steelhead redds
Beaver Creek 1/	3	4	30 salmon redds 25 steelhead redds
Smiley Creek	7	13	40 salmon redds 30 steelhead redds
Frenchman Creek	4	5	25 salmon redds 25 steelhead redds

1/ Assumes irrigation diversions are screened and related instream flow problems are resolved.

On the basis of these assumptions, the habitat's inherent anadromous production potential is 7,600 chinook spawners and 3,216 spawning steelhead. The net annual resource value of the anadromous fishery resource would be $3,108,520.

GAWS outputs indicate 29 cfs instream would provide passage for 96% of the adults past the diversions, and for 75% of potential production in the dewatered reach below the diversions. Consideration of instream flow needs to pass juveniles migrating downstream is unnecessary because the fish screen installed on the S-45 ditch bypasses migrants beyond the point where recharge provides sufficient flow for downstream migration. Overall this flow would provide for about 90% of the habitat's inherent production potential. Under these marginal conditions a potential of 6,981 spawning chinook and 3,216 steelhead spawners may be produced. The net annual value of the anadromous fishery resource is $2,926,392.

If the water user draws the full water right (but no more) as long as it is available, then the total natural streamflow thereafter, instream flows favorable to passage of adult chinook through the critical reach will be unavailable near July 15 (Figure 7). This flow scheme prevents passage by about 50% of the chinook destined for spawning areas above the diversion. As a result chinook production above the diversion is 50% of the potential. Chinook production below the diversion is also 50% of the potential as a result of reduced flows during the spawning period. Steelhead production is 82% of the maximum potential that could be present in the absence of a chinook population. The 3,800 chinook and 3,516 steelhead produced represent an annual value of $2,071,824.

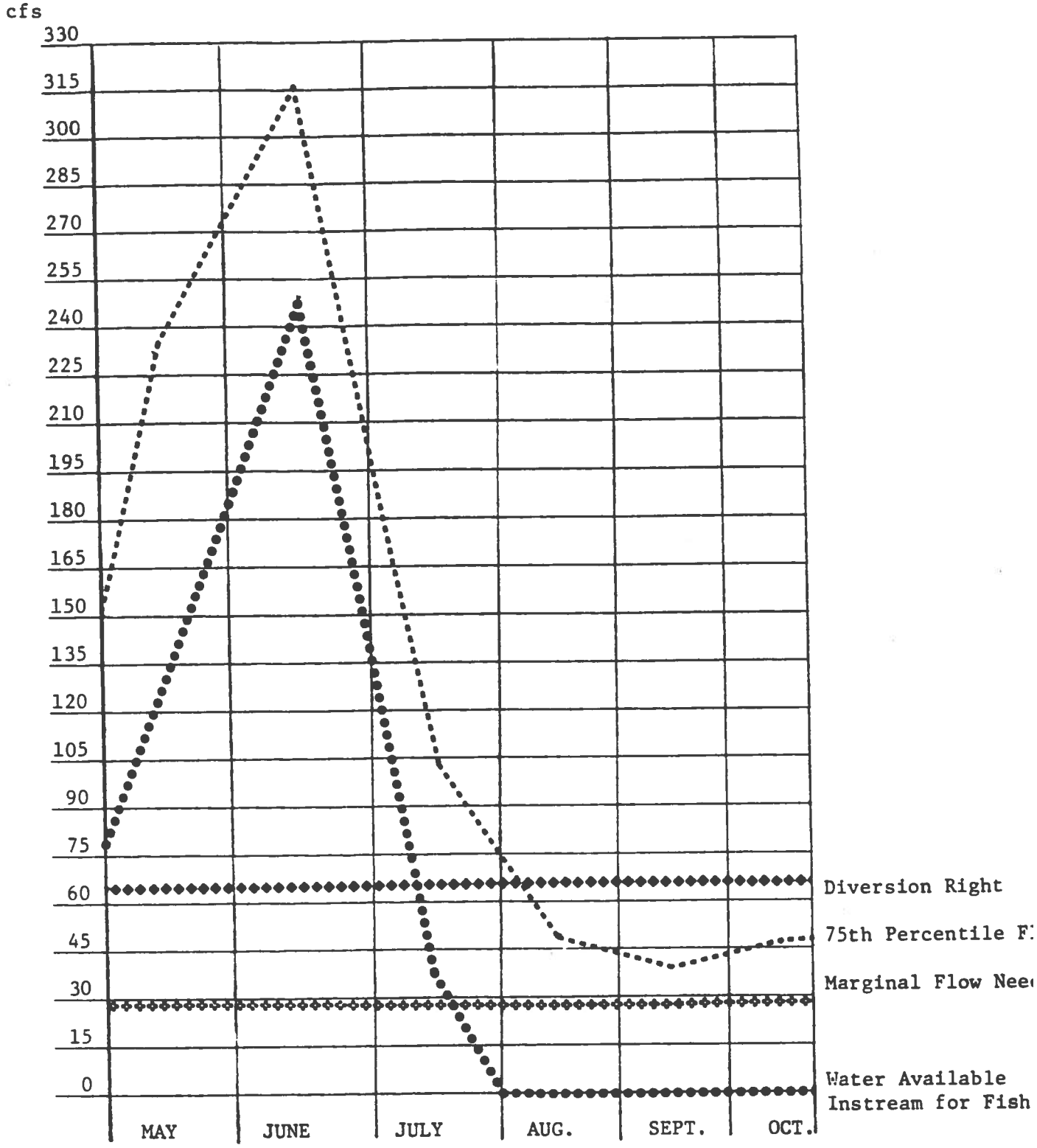


Figure 7.

Flow schedule for the Upper Salmon River. With the water user diverting the total water right from S-45 and S-46, the flow available instream for fish passage through the critical reach becomes inadequate near July 15.

Conflicts. Anadromous fish production in the stream reaches affected by S-45 and S-46 is impaired with the water user drawing the full water right or all the natural streamflow, whichever is less. Slightly less than 70% of the habitat's inherent anadromous production potential may be realized at this flow scheme. The net annual economic loss in value of this fishery is $1,036,696. It must be recognized that the impact is actually greater than this because the water user frequently draws more water than decreed by the existing water right.

If the amount of water diverted was limited to the maximum Idaho Water Law standard (1cfs/50 acres), irrigation/fishery conflicts created by S-45 and S-46 could be significantly reduced (Figure 8). Just over 80% of the habitat's inherent anadromous production potential could be realized. This represents an increase in the value of the anadromous fishery potential of $457,063 annually over the current situation.

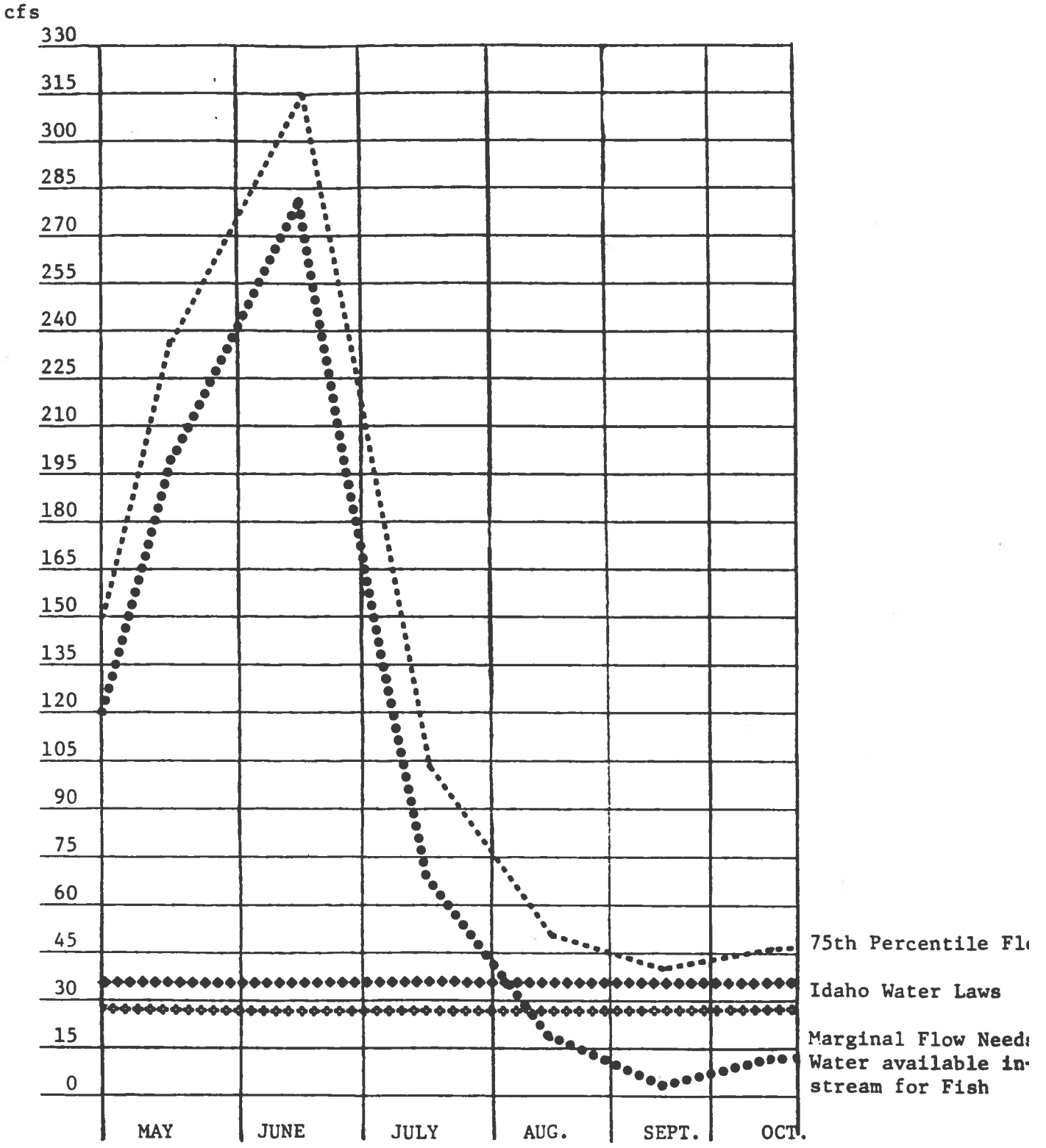


Figure 8.

Hypothetical flow schedule for the Upper Salmon River. If the water user was limited to diverting the maximum Idaho Water Law Standard (1cfs/50 acres irrigated), irrigati fishery conflicts created by S-45 and S-46 would be significantly reduced. Instream flows would not fall below marginal conditions until near the middle of August.

Alturas Lake Creek

Alturas Lake Creek drains 66 square miles of forested slope of the Sawtooth Range and the Smoky Mountains. Flows from this drainage generally originate as snowmelt and feed two morainal lakes (Alturas Lake and Perkins Lake) before reaching the virgin flow station. Total average annual water yield from Alturas Lake Creek is 99,400 acre-feet.

The Alturas Lake Creek drainage is of special historical significance to the anadromous fishery in the SNRA as Alturas Lake is one of four moraine lakes that once sustained runs of sockeye salmon. Many factors contributed to the decline of sockeye returning to Alturas Lake, the most significant being the diversion of water at the point designated as ALC-1 (T7N, R14E, Sec. 4 - Figure 6). For many years this diversion has totally dewatered a portion of Alturas Lake Creek during the entire upstream migration period of adult sockeye, blocking access to the lake and all ancestral spawning areas. This diversion also deprives access to headwaters spawning habitat to a significant portion of the chinook salmon run and depletes important chinook spawning habitat below the diversion. Alturas Lake Creek provides little suitable steelhead habitat and therefore steelhead production will be considered as insignificant.

Flow Characteristics. Flow characteristics taken from the USGS gage located on Alturas Lake Creek near Obsidian indicate relatively constant flow for the 7 month period September through March. Flows increase through April and May to a peak in June. This peak recedes quickly through July and August. Calculated 75th percentile flows for Alturas Lake Creek are shown in Table 4.

Table 4. Calculated 75th percentile flows in cfs for Alturas Lake Creek above the irrigation diversion based on data from USGS gage 13-2930.00.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec
18.3	17.2	16.2	22.3	121.7	213.1	62.9	22.3	14.2	15.2	18.3	19.

Diversion Rights/Irrigation Needs. The irrigation diversion structure along Alturas Lake Creek annually diverts some 9,233 acre-feet of water to irrigate 582 acres of pasture. This equates to 190 inches of water per acre during the irrigation season. The soils in this area are well drained, coarse textured with a low to moderate water holding capacity. Permeability is moderate to rapid.

The total of abstracted water rights of this diversion is 37.84 cfs while the capacity of the diversion ditch is 55 cfs. The flow diverted through this structure commonly exceeds the recorded water rights. Under Idaho Water Laws Art. XV Sec. 42-220, normal maximum limits for irrigation should not exceed 1 cfs per 50 acres. Under Idaho law this would entitle the irrigator to 11.6 cfs or 73 inches per acre for the irrigation season. Comparing the legal standard to what is actually diverted shows the irrigator diverting 260% of what the entitlement should be according to Idaho Water Laws.

Fishery Capability/Requirements

Some successful reproduction of chinook occurs each year in the stream reach below the confluence of Vat Creek because subsurface flows recharge Alturas Lake Creek. During the relatively good chinook run of 1978, 303 chinook redds were counted in this reach. Idaho Fish and Game and Forest Service biologists estimate potential for anadromous fish production as shown in Table 5.

Table 5. Fishery capability impacted by Alturas Lake Creek diversion ALC-1. Miles of stream, acres of habitat and estimated potential for density of redds are displayed for each identified affected stream reach.

Stream Reach	Miles of Stream	Acres of Habitat	Density of Redds/Acre
Alturas Lake Creek below diversion to confluence with Salmon River	35	18	35 chinook redds
Alturas Lake Creek Perkins Lake to point of diversion	1.5	3	15 chinook redds
Alturas Lake Creek Above Alturas Lake	7.3	12	25 chinook redds
Alpine Creek	1.5	3	25 chinook redds
Alturas Lake		800	3000-6000 adult sockeye salmon

On the basis of these assumptions, the habitat's inherent anadromous production potential is 2,625 chinook spawners and 3,000-6,000 spawning sockeye. The net inherent annual value of the chinook fishery resource would be $772,354. The sockeye are not considered in the economic evaluation, because currently sockeye are of little economic value to the Columbia River System sport and commercial fisheries.

GAWS outputs indicate that if at least 12 cfs remained instream, 95% of chinook destined to spawn above the diversion would reach the spawning grounds, and approximately 80% of chinook production below the diversion would be possible. This schedule of flows would also provide for 90% of the sockeye salmon production potential. The GAWS outputs also indicate that 5 cfs would be sufficient to pass juveniles migrating downstream. Under these marginal flow conditions a potential of 2,258 chinook and 2,700-5,400 sockeye salmon may be produced. The net annual value of the chinook is $664,371. This flow scheme provides for production of just less than 90% of the habitat's production potential.

If the water user draws the full water right (but no more) as long as it is naturally available, then the total natural streamflow thereafter, instream flows providing marginal passage conditions are no longer available by the

last week in July (Figure 9). ALC-1 totally dewaters Alturas Lake Creek prior to the onset of the chinook spawning season and the upstream migration period of sockeye. Marginal conditions for passage of downstream migrants are no longer available by the first of August. Impacts to up- and downstream migrant chinook reduce production above the diversion to 40 percent of the potential. Chinook production below the diversion is 50 percent of the potential. Re-establishment of sockeye salmon is not possible. Potential annual production of chinook is 1,208, worth $355,430.

Conflicts. Anadromous fish production in the Alturas Lake system is adversely impacted by existing diversion rights on Alturas Lake Creek. With the water user drawing the full water right, or the total natural streamflow, whichever is less, production potential is just over 46 percent of the habitat's capability for chinook and there is no capability for sockeye salmon production. The net annual economic loss in value of this fishery is $416,924. It should be recognized that the impact on the fishery is actually greater than this because frequently more water is diverted than is decreed by the existing water right.

If the amount of water diverted was limited to the maximum Idaho Water Law standard of 1 cfs/50 acres irrigated land, water use conflicts created by ALC-1 could be reduced (Figure 10). At this flow scheme the habitat could produce at about 70% of its inherent potential for chinook salmon. Although about 25% of the sockeye adults attempting to negotiate the critical reach could, it is unlikely the population would be able to sustain itself with such a low rate of escapement into Alturas Lake. The increase in chinook production potential represents an increase in the value of the anadromous fishery of $188,307 annually over the current situation.

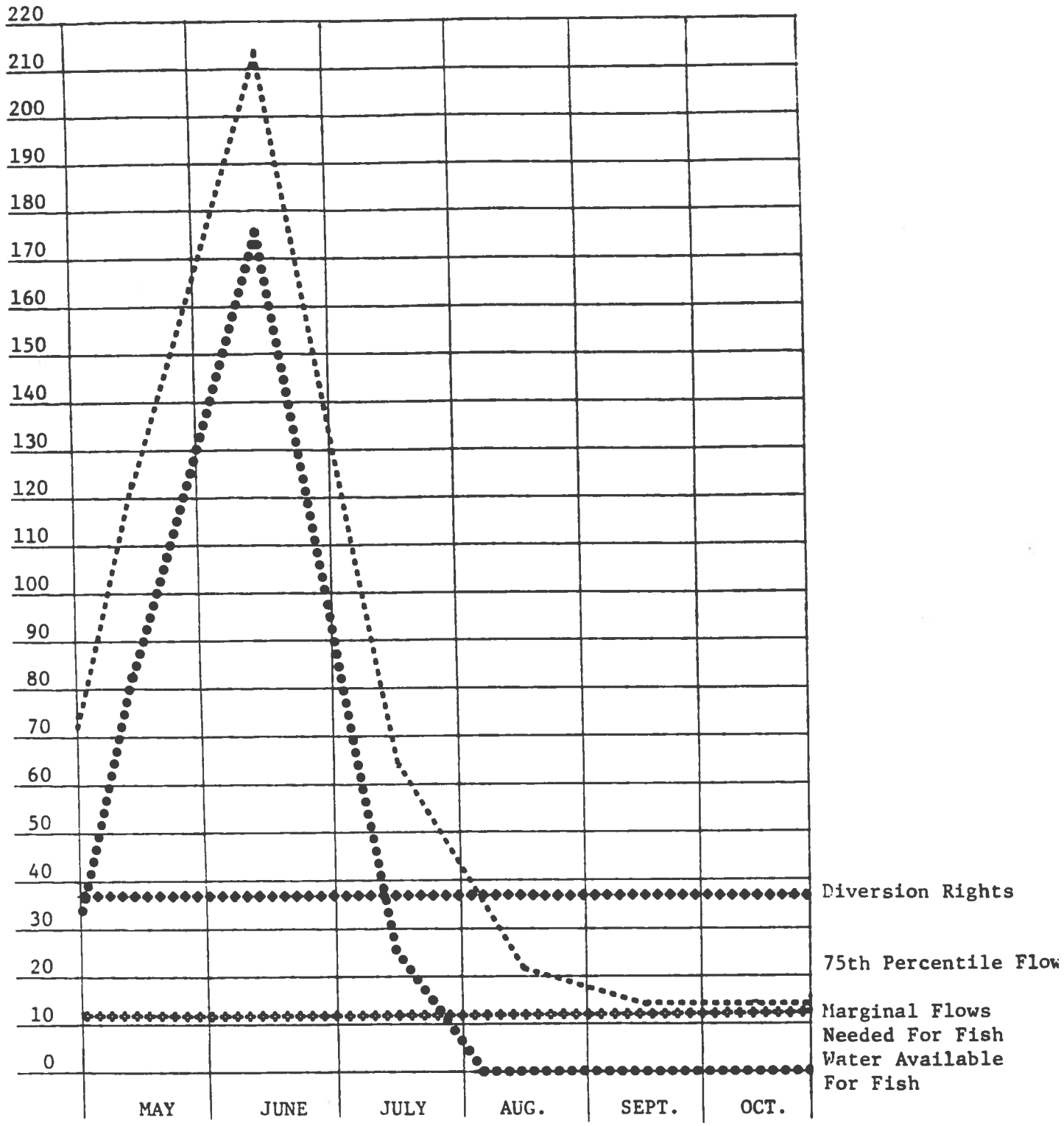


Figure 9.

Flow schedule for Alturas Lake Creek. With the water user diverting the total water right from ALC-1, the flow available instream for upstream fish passage through the critical reach becomes inadequate by the last week in July. Marginal conditions for passage of downstream migrants are no longer available by the first of August.

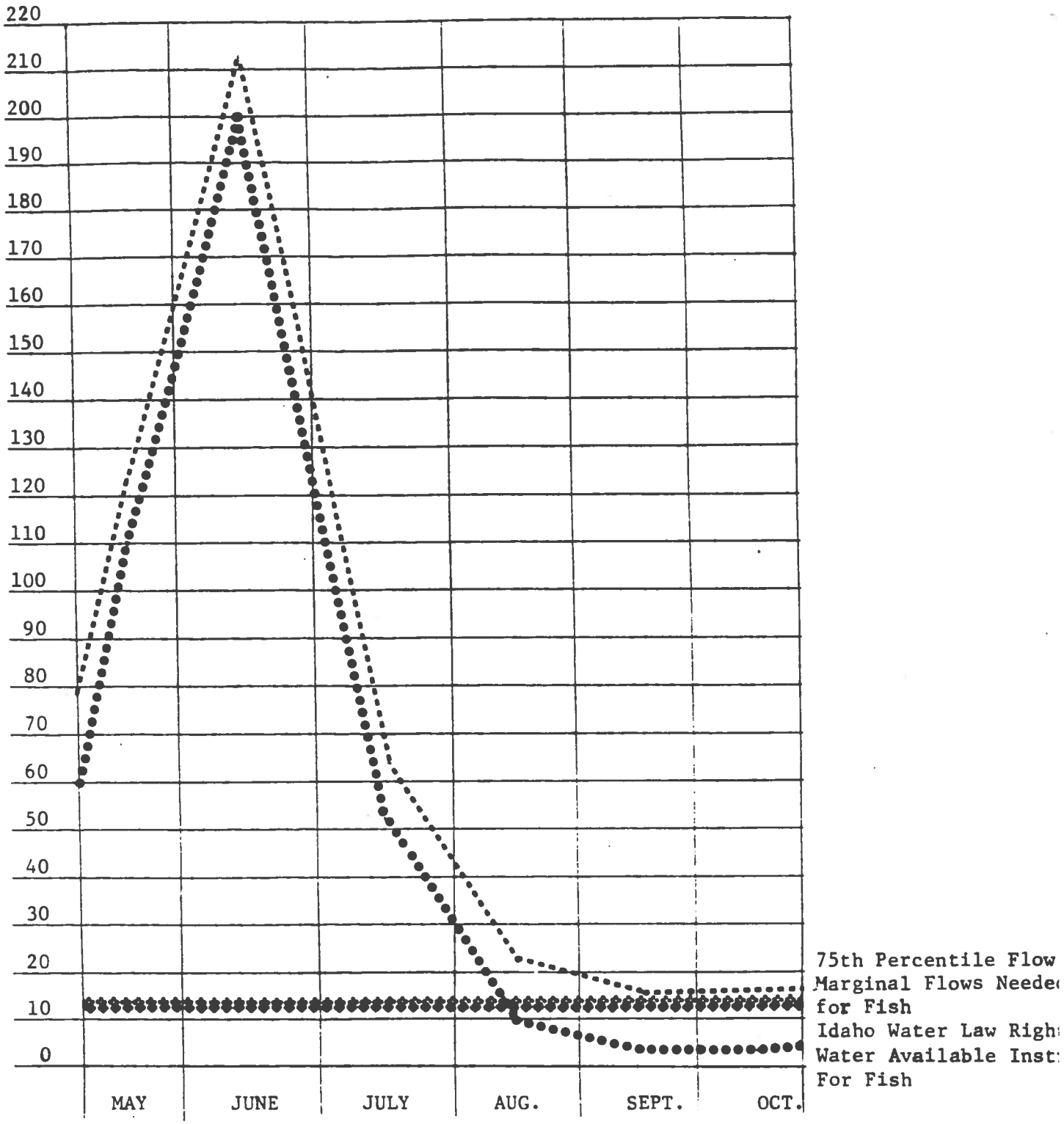


Figure 10.
Hypothetical flow schedule for Alturas Lake Creek. If the water user was limited to diverting the maximum Idaho Water Law Standard (1 cfs/50 acres irrigated), irrigation/fishery conflicts created by ALC-1 would be reduced. Instream flows would not fall below marginal conditions for adult passage until the middle of August, and juvenile passage would probably not be significantly impacted.

Champion Creek

Champion Creek is a spring-fed stream originating high in the Boulder-White Cloud Mountains and traveling through lodgepole pine and aspen stands before breaking into the Sawtooth Valley grasslands and flowing on to its confluence with the Salmon River. Virgin streamflow for the stream is the result of snowmelt in the 17-square mile drainage for the peak flows, while streamflow the rest of the year is very constant because of the moderating influence of springs.

Flow Characteristics. The watershed annually produces 15,405 acre-feet of water. Virgin flow remains essentially constant from August through March of the year, rising to a peak in June and falling off rapidly in July. The 75th percentile monthly flows, developed using aerial proportions and USGS gage data from the Salmon River station below Valley Creek, are presented in Table 6.

Table 6. Calculated monthly flows (75th percentile) in cfs, for Champion Creek above ChC-7, developed using the aerial proportion method of USGS gage 13-2955.00 data. The drainage area above ChC-7 is 15.40 square miles.

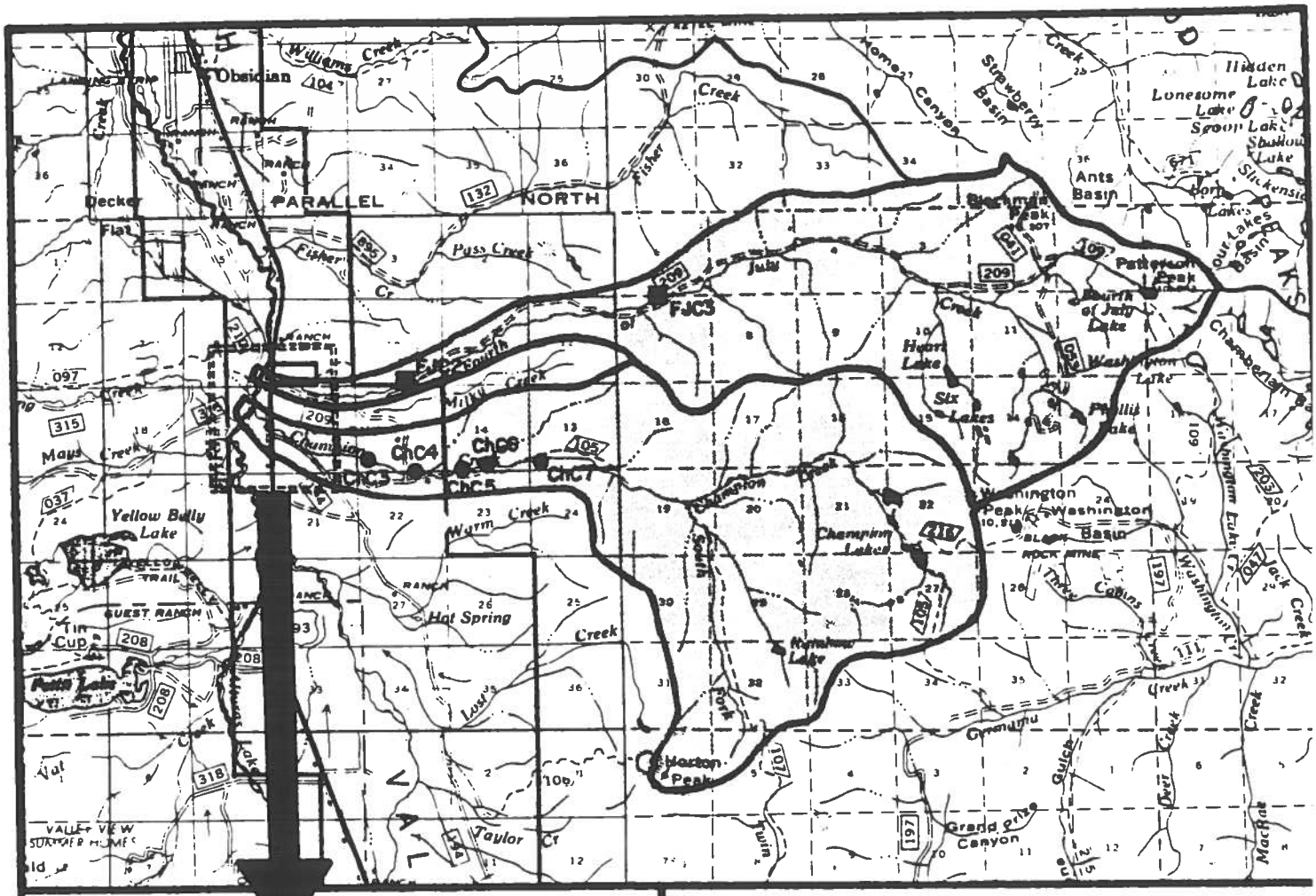
Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
7.8	7.8	8.1	10.1	29.8	40.3	15.0	8.6	7.8	8.3	8.6	7.8

Diversion Rights/Irrigation Needs. There are eight structures (Figure 11) diverting water for irrigation of private pasture lands from Champion Creek when the flow is sufficient to meet all needs. Combined diversion capacity of the ditches is 77 cfs, and the volume of water diverted often exceeds the total of abstracted water rights (14.74 cfs). Headgate structures are poorly constructed and as a result several of the diversions draw water throughout the winter, often totally dewatering the lowest two miles of the stream during the entire year.

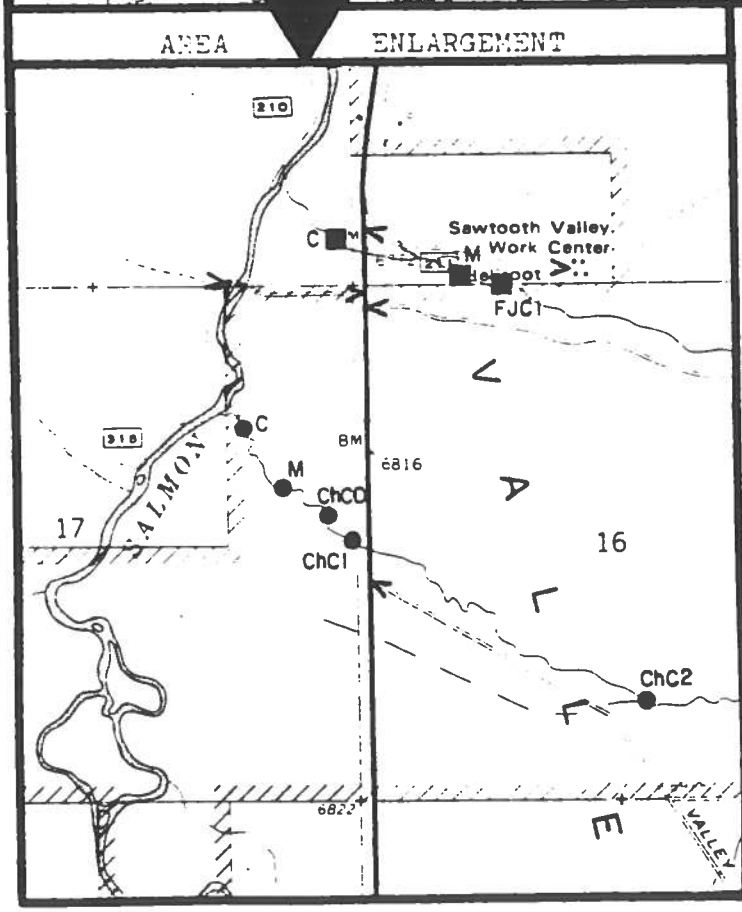
During the summer season 3,597 acre-feet of water are used to irrigate 1,055 acres of pasture; this is equivalent to nearly 41" of water applied per acre. This figure is well within the Idaho Water Law standard of no more than 73.5 inches of water applied per acre during the May-October irrigation season.

Figure 11

Watersheds of Fourth of July & Champion Creeks



AREA ENLARGEMENT



LEGEND

Fourth of July Creek and Champion Creek Watershed Areas.

(FOURTH OF JULY CREEK)

M — Master Reference Station

C — Critical Reach

FJC1 — Fourth of July Creek Diversions

(CHAMPION CREEK)

M — Master Reference Station

C — Critical Reach

ChC1 — Champion Creek Diversions

Fishery Capability/Requirements. In most years, anadromous fish are unable to utilize Champion Creek except when high streamflows occur naturally and a few chinook and steelhead may be found. Gradient, pool/riffle relationships, and other morphological characteristics of Champion Creek favor resident species, although there is a limited capability to produce anadromous fish. Miles of stream, acres of habitat and estimated potential for density of redds are listed in Table 7 by affected stream reaches.

Table 7. Fishery capability impacted by Champion Creek diversions ChC-7. Miles of stream, acres of habitat and estimated potential for density of redds are displayed for identified affected stream reaches.

Stream Reach	Miles of stream	Acres of Habitat	Density redds/acre
Champion Creek above the uppermost diversion (ChC-7)	2.0	2.0	10 salmon redds 15 steelhead redds
Champion Creek, below ChC-7	3.0	4.5	10 salmon redds 10 steelhead redds

GAWS outputs indicate 11 cfs instream would provide marginal passage for spawning adults, and 6.5 cfs would provide marginal passage for downstream migrating juveniles. Total natural streamflow is inadequate for steelhead migration and spawning until the middle of April and becomes inadequate for habitat utilization by chinook during the first week in August. As a consequence, inherent chinook production is only 80% of the estimates shown in Table 7, both above and below ChC-7. Steelhead production is 75% of the maximum potential throughout Champion Creek. Normal flows would generally result in 130 spawning chinook and 141 steelhead spawners annually, valued at $76,498.

If the water user draws the full water right (but no more) as long as it is available, then the total natural streamflow thereafter, instream flows favorable to passage of adult steelhead are available for only the last two weeks in May (Figure 12), and chinook production potential is only 25% of the estimates shown in Table 7. Under a flow regime such as this, it would not be possible to sustain runs of anadromous fish.

Conflicts. Anadromous fish production in Champion Creek has been eliminated by irrigation diversion practices. The net annual economic loss in value of this fishery resource is $76,498.

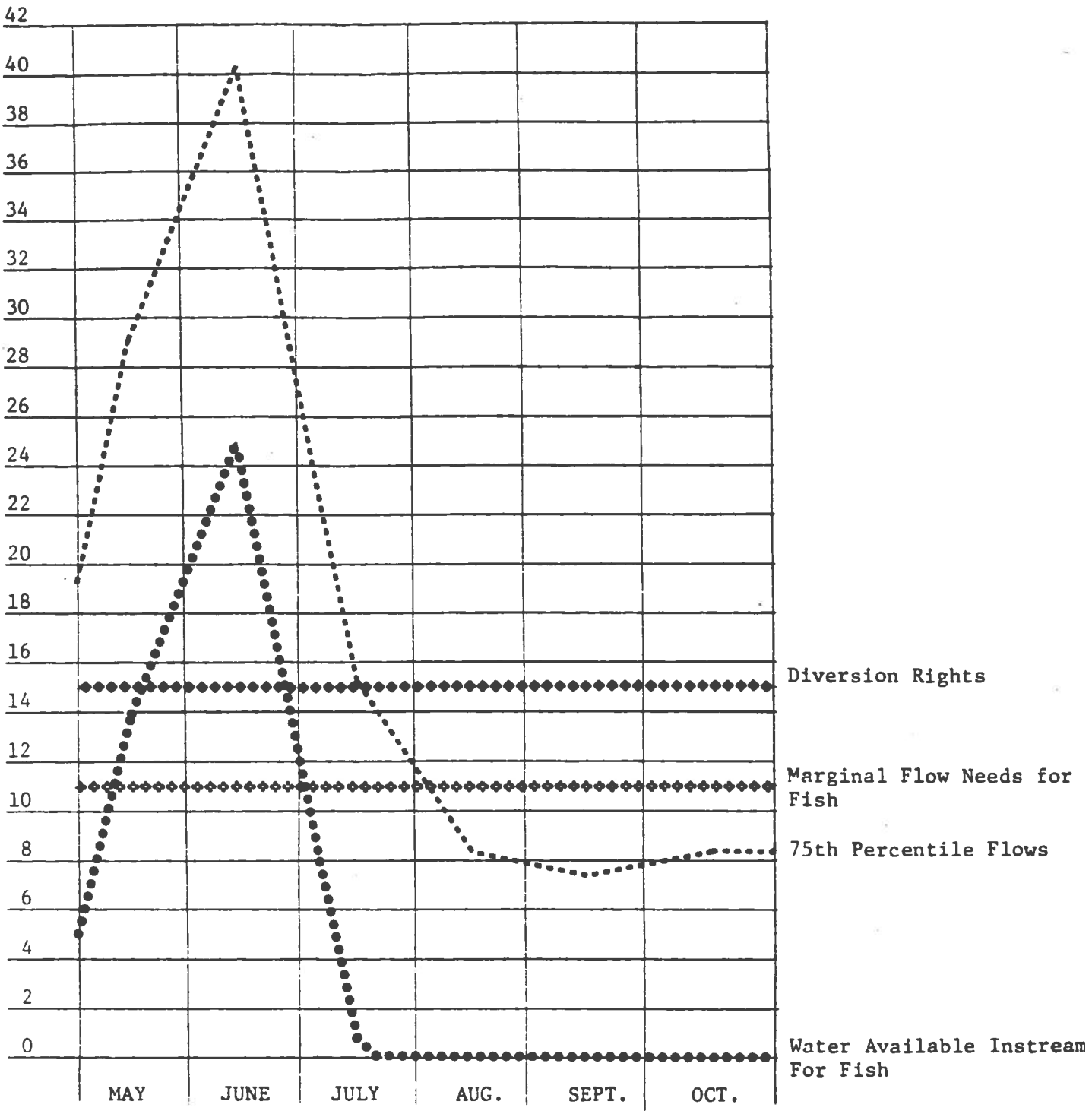


Figure 12.

Flow schedule for Champion Creek. With the water user diverting the total water right as long as it is available, then the total natural streamflow thereafter, instream flows favorable to passage of adult steelhead and chinook are virtually non-existent. Under this flow regime, it would not be possible to sustain runs of anadromous fish.

Fourth of July Creek

Fourth of July Creek origniates in the Boulder-White Cloud Mountains and flows through lodgepole and aspen stands before breaking into the Sawtooth Valley grasslands, where it joins with the Salmon River. Peak flow through the virgin flow station is the result of snowmelt in the 14 square mile watershed, while flows the remainder of the year are moderated by headwater springs. The watershed annually produces about 16,335 acre-feet of water.

Flow Characteristics. Flow characteristics derived for Fourth of July Creek indicate relatively constant flows for the nine month period of August through April. Flows dramatically increase in May to a peak in June. This peak recedes quickly in July to near base flow levels. Calculated 75th percentile flows for Fourth of July Creek are displayed in Table 8.

Table 8. Calculated 75th percentile flows in cfs for Fourth of July Creek above FJC-3; based on data from USGS gage 13-2955.00.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
7.2	7.2	7.4	9.3	26.6	37.2	13.8	8.0	7.2	7.7	8.0	7.2

Diversion Rights/Irrigation Needs. Approximately 7,637 acre-feet of water are diverted to irrigate 2,055 acres of pasture during the summer season. The total of the abstracted water rights for the three diversions on Fourth of July Creek is 31.34 cfs (Figure 11). However, at the 75th percentile, natural flows will provide sufficient water to meet all recorded rights for only a few weeks at the peak of the hydrograph.

Fishery Capability/Requirements. Fourth of July Creek no longer sustains runs of anadromous fish. Nearly every year this stream is dewatered in the lowermost two miles from July through the remainder of the irrigation season (Figure 13). Idaho Fish and Game and Forest Service biologists estimate potential for anadromous fish production as shown in Table 9.

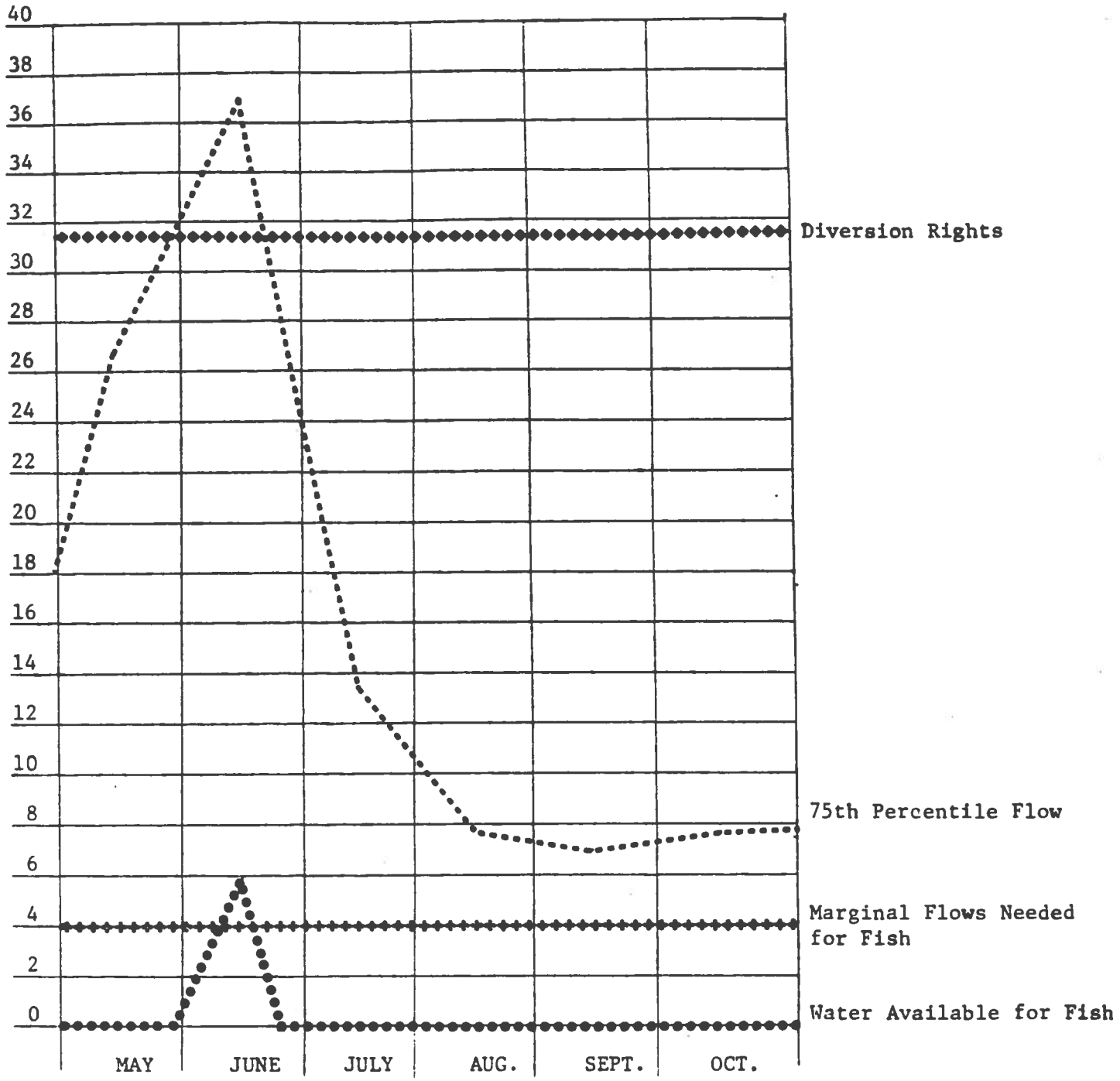


Figure 13.

Flow schedule for Fourth of July Creek. With the water user diverting the total water right as long as it is available, then the total natural streamflow thereafter, the stream is not capable of sustaining runs of anadromous fish.

Table 9. Fishery capability impacted by Fourth of July Creek irrigation diversion, FJC-1, 2 and 3. Miles of stream, acres of habitat and estimated potential for density of redds are displayed for each identified affected stream reach.

Stream Reach	Miles of Stream	Acres of Habitat	Density of Redds/Acre
Fourth of July Creek from FJC-3 downstream to confluence with the Salmon River	4.0	8	10 chinook redds 10 steelhead redds
Fourth of July Creek from FJC-3 upstream to extent of anadromous fish habitat	3.0	5	10 chinook redds 20 steelhead redds

On the basis of these assumptions, the habitat's inherent anadromous production potential is 235 chinook spawners and 338 spawning steelhead. The net annual value of the anadromous fishery resource would be $187,311.

GAWS outputs indicate 4 cfs instream would provide passage for 90% of the chinook destined to spawn above the diversions. Four cfs would provide for only about 50% utilization by chinook below the diversion. Steelhead production potential above FJC-3 is 75% of what it would be in the absence of chinook, and below the diversion 85% of the maximum potential. The marginal condition for downstream migrants exists when the flow is reduced to 2.5 cfs. Overall this flow regime would provide for about 90% of the habitat's inherent production potential. Under these marginal conditions a potential of 243 spawning chinook and 363 steelhead spawners may be produced. The net annual value of the anadromous fishery at this flow regime is $169,965.

Conflicts. Anadromous fish production in Fourth of July Creek has been eliminated by current water diversion practices. This represents an annual loss in the value of the fishery of over $185,000.

A marginal instream flow of 4 cfs has the potential of producing an annual fishery resource worth nearly $170,000.

Pole Creek

Pole Creek, a major tributary to the upper Salmon River, originates in the Boulder-White Cloud Mountains. The virgin streamflow in Pole Creek is the result of snowmelt for peak flows, while streamflow the rest of the year is consistent because of the moderating influence of the headwater spring sources. The watershed annually produces approximately 44,460 acre-feet of water.

Flow Characteristics. Discharge in Pole Creek remains relatively constant from August through April. Flows rise rapidly in May, peak in June and more rapidly descend in July. The 75th percentile flows developed by aerial proportion methods of USGS gage data from the Salmon River are presented in Table 10.

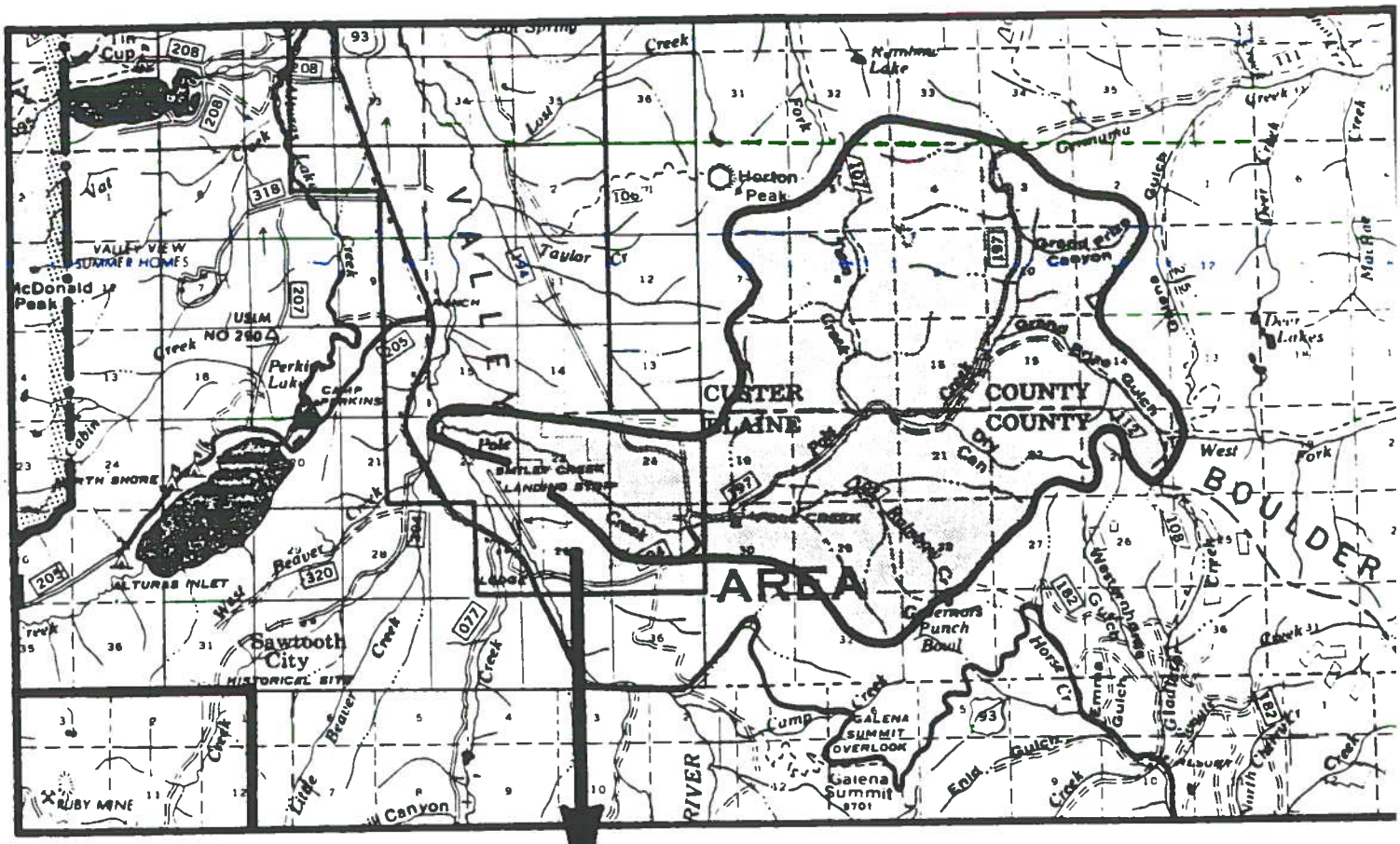
Table 10. Calculated 75th percentile flows in cfs for Pole Creek above the uppermost diversion (PC-7), based on data from USGS gage 13-2955.00.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
23.5	23.5	24.4	30.5	87.2	122.1	45.4	26.2	23.5	25.3	26.2	23.5

Diversion Rights/Irrigation Needs. During the summer season 16.010 acre-feet of water are diverted from Pole Creek to irrigate 3,020 acres of pasture land. Seven diversions occur in the lower three miles of the stream (Figure 14). The total abstracted right that may be drawn from Pole Creek is 65.6 cfs; however, of this total any amount may be alternately drawn from Smiley Creek on the Salmon River. Normally, of the total entitlement, 5 cfs is drawn from the Salmon River at S-45 and 1 cfs is drawn from Smiley Creek at SMC-1. For the purposes of this evaluation, it is assumed that the total of the abstracted rights will be drawn from Pole Creek.

Fishery Capability/Requirements. Among fishery biologists familiar with the streams of the SNRA, Pole Creek is considered the highest quality fishery habitat within the SNRA and has great potential to accommodate spawning of anadromous fish. Also, Pole Creek is a very popular resident fishery which is augmented by regular plants of hatchery reared trout. The estimated potential for anadromous production is displayed in Table 11.

Pole Creek Watershed



LEGEND

- Pole Creek Watershed Area
- M — Master Reference Station
- C — Critical Reach
- PC2 — Pole Creek Diversions

Table 11. Fishery capability impacted by Pole Creek irrigation diversions PC-1-7. Miles of stream, acres of habitat and estimated potential for density of redds are displayed for each identified affected stream reach.

Stream Reach	Miles of Stream	Acres of Habitat	Density of Redds/Acre
Pole Creek above PC-7	3	5	50 chinook redds 40 steelhead redds
Pole Creek below PC-7	4.5	7.5	50 chinook redds 40 steelhead redds

On the basis of these assumptions, the habitat's inherent anadromous production potential is 1563 chinook spawners and 938 spawning steelhead. The net annual value of the anadromous fishery resource would be $714,323.

GAWS outputs indicate 23 cfs instream would provide passage for 90% of chinook destined to spawn above the diversions and for 90% utilization of the habitat below the diversions. Steelhead production potential both above and below the diversion is 75% of what it would be in the absence of chinook salmon. The marginal condition for downstream migrants exists when the flow is reduced to 4.5 cfs. Under these marginal flow conditions a potential of 1407 spawning chinook and 938 steelhead spawners may be produced. The net annual value of the anadromous fishery at this flow regime is $668,423.

The effect of current water diversion and associated instream flow problems on the anadromous fishery in Pole Creek has been devastating. Only occasionally over the years have individual salmon been observed in Pole Creek. The actual extent that steelhead are capable of utilizing Pole Creek is as yet undetermined. Upstream migration and spawning of steelhead should not be affected by current practices (Figure 15). However, below PC-7 at least 30% of the incubating steelhead would be lost prior to their emergence. It is also assumed that at least 25% of juvenile out-migrating steelhead would be lost due to insufficient flows. The annual value of the anadromous fishery resource is $208,599 for 769 steelhead trout.

Conflicts. Irrigation diversion practices in the Pole Creek drainage have eliminated chinook salmon utilization and have greatly reduced steelhead utilization potential. This represents an annual loss in the value of the fishery of over $500,000. A marginal instream flow of 23 cfs would increase the value of anadromous fishery potential nearly $460,000 annually over the existing situation.

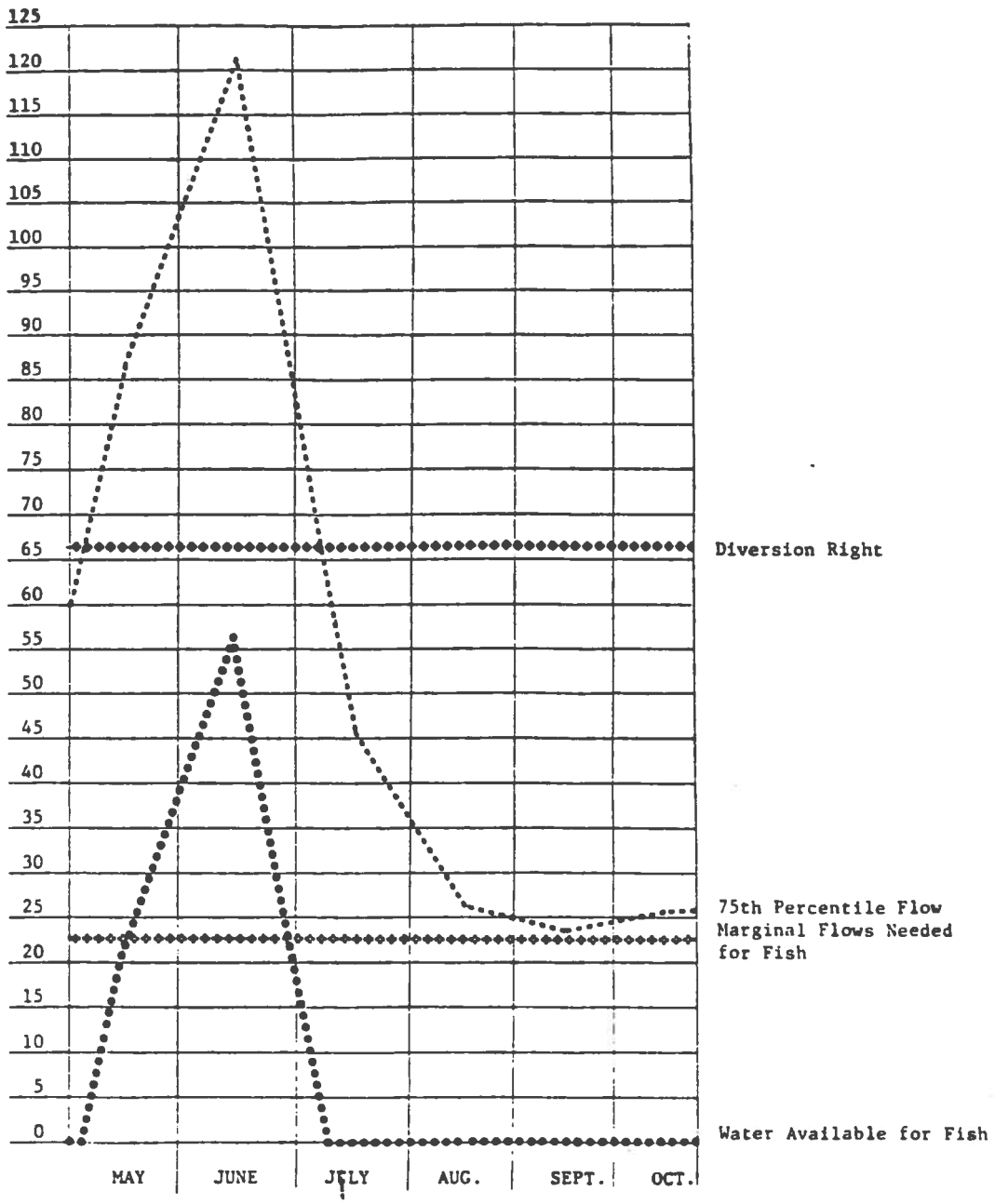


Figure 15.

Flow schedule for Pole Creek. With the water user diverting the total water right from Pole Creek as long as it is available, then the total natural streamflow thereafter, instream flows are inadequate to sustain a viable chinook salmon population and substantially reduce steelhead production potential.

Elk Creek

Elk Creek is a major tributary to Valley Creek; Valley Creek is tributary to the Salmon River at Stanley. The stream originates on the northern side of the Sawtooth Mountain Range in granitic soils before breaking into the marshy lowlands of Valley Creek. The flow of Elk Creek is mainly the result of snowmelt in the 24-square mile watershed. Some 19 square miles of the watershed lie above the virgin flow station. Total average annual water yield from Elk Creek is 24,280 acre-feet.

Flow Characteristics. The shallow soils and small drainage area above the virgin flow station produce droughty base flow periods. Flow characteristics calculated from the USGS gage located on Valley Creek indicate relatively constant flow for the 8-month period August through March. Flows increase slightly in April, rise rapidly during May to a June peak before rapidly falling off in July. The 75th percentile flows for Elk Creek, based on aerial proportion techniques, are shown in Table 12.

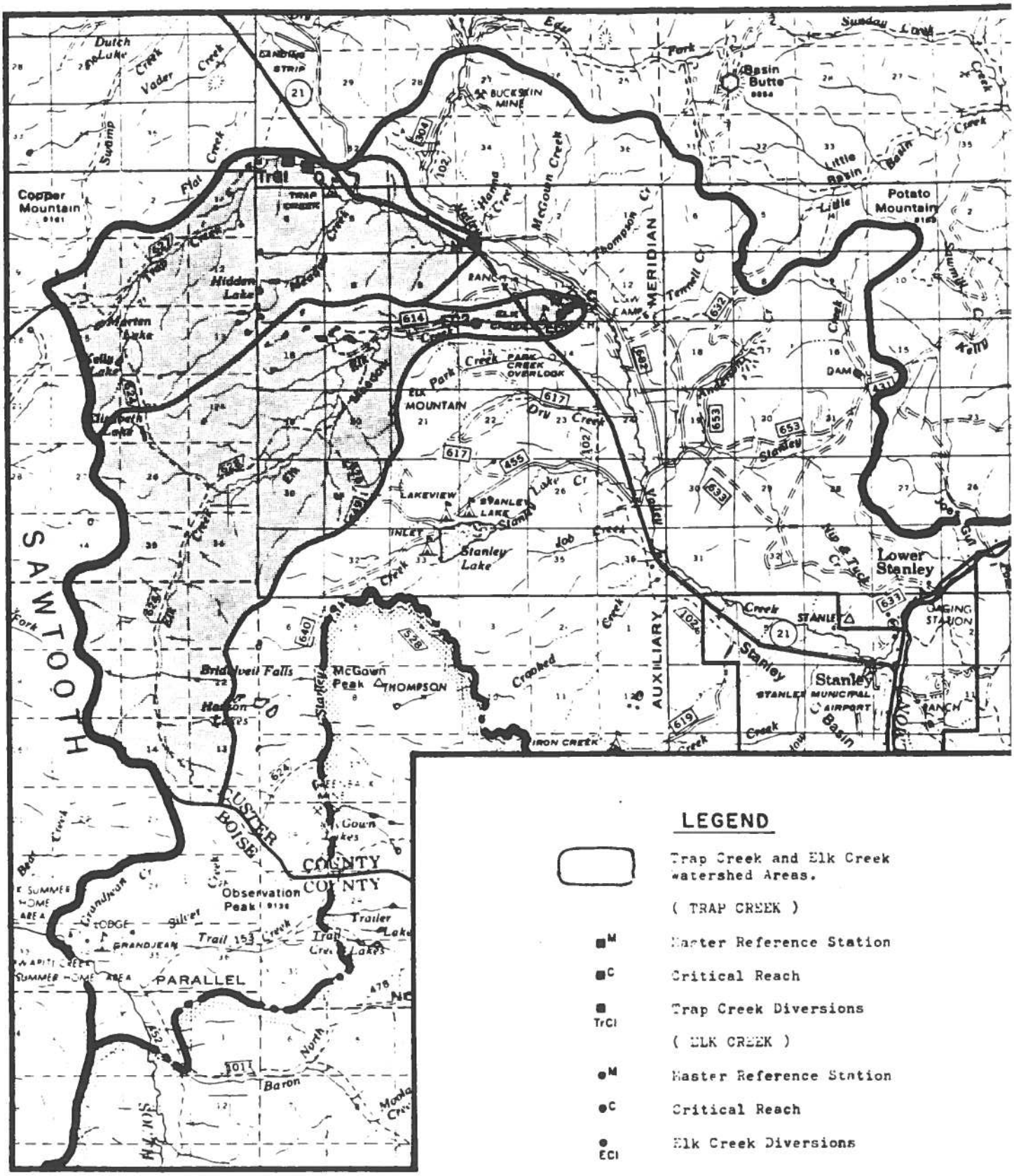
Table 12. Calculated mean monthly flows (75th percentile) in cfs for Elk Creek above EC-2, the highest point of diversion based on data from USGS gage 13-2950.00.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
8.9	9.1	9.8	13.1	47.0	56.1	19.6	10.7	9.9	10.6	10.7	9.5

Diversion Rights/Irrigation Needs. During the summer season two diversion structures on Elk Creek divert 2,059 acre-feet of water to irrigate 468 acres of pasture (Figure 16). This equates to about 53 inches of water per acre during the irrigation season. This figure is compatible with Idaho Water Law. The total of the abstracted water rights at the two points of diversion is 8.44 cfs; however, the volume of water actually diverted frequently exceeds the recorded right. As much as 17 cfs has been measured being diverted from Elk Creek.

Figure 16

Watersheds of Trap and Elk Creeks



Fishery Capability/Requirements. The removal of two log jams in 1978 made available five miles of habitat that had not been accessible in the several preceeding years. Habitat now available by stream reach, that is, miles of stream, acres of habitat and estimated potential for density of redds is listed in Table 13.

Table 13. Fishery capability impacted by Elk Creek diversions EC-1 and EC-2. Miles of stream, acres of habitat and estimated potential for density of redds are displayed for identified affected stream reaches.

Stream Reach	Miles of Stream	Acres of Habitat	Density of Redds/Acre
Elk Creek, EC-1 downstream to confluence with Valley Creek	0.5	2	25 salmon redds
Elk Creek, EC-1 upstream to EC-2	2.0	8	25 salmon redds 15 steelhead redds
Elk Creek above EC-2	6.0	20	25 salmon redds 20 steelhead redds

On the basis of these assumptions the habitat's inherent anadromous production potential is 1875 chinook salmon spawners and 975 spawning steelhead. The net annual economic value of these fish would be $816,160.

GAWS outputs indicate 4 cfs would provide for upstream passage of 90% of adult spawners through the critical reach and 2 cfs will marginally provide for downstream passage. At this flow regime chinook production both above and below the diversions would equal about 90% of the maximum potential; steelhead production in Elk Creek would be 75% of the maximum potential possible in the absence of chinook. These marginal conditions could produce approximately 1688 spawning chinook and 975 steelhead spawners annually. The net value of this anadromous resource is $761,139.

If the water user draws the full water right (but no more), marginal flows for upstream migration are no longer available by the end of the first week in August (Figure 17). This flow scheme prevents passage of about 20% of the chinook destined for spawning above the diversion. As a result, chinook production potential above the diversion is 80% of the maximum. Because of low flows below the diversions during the later part of August, September and October chinook production below EC-2 is 60% of maximum. Steelhead production above the diversion is 75% of the potential and 60% below EC-2. The 1375 salmon and 930 steelhead spawners produced represent an annual economic value of $656,838.

Conflicts. Anadromous fish production potential in Elk Creek is impaired with the water user drawing the full water right. Slightly greater than 80% of the habitat's inherent anadromous production potential may be realized with diversion of water at the decreased rate. The net annual economic loss in value of this fishery is $159,322. It must be recognized that the impact is actually greater than this because the amount of water diverted frequently exceeds the amount decreed by the existing water right.

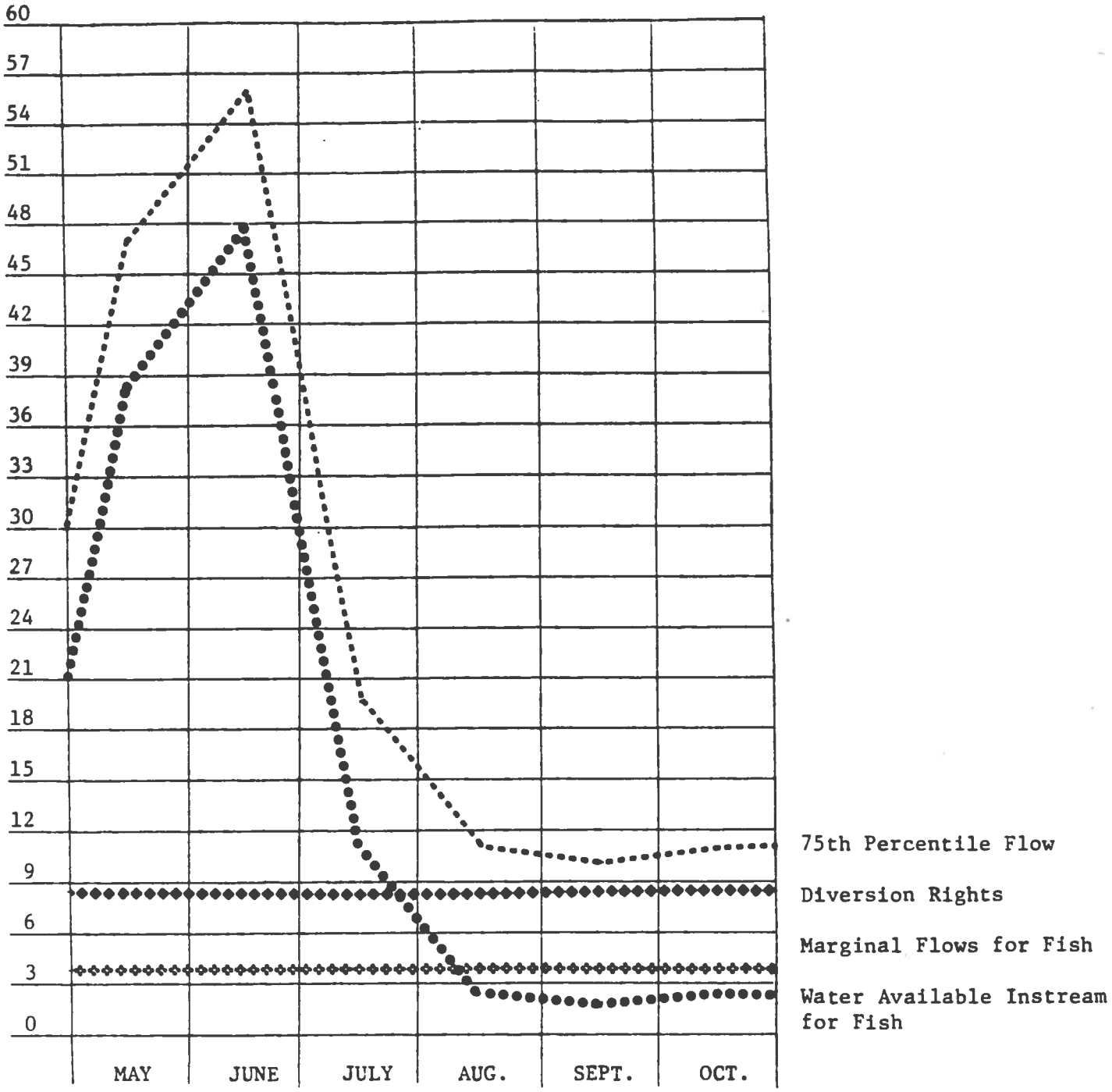


Figure 17.

Flow schedule for Elk Creek. With the water user diverting the total water right, marginal flows for upstream migration are no longer available by the end of the first week in August.

Trap Creek

Trap Creek originates on the northern side of the Sawtooth Mountain Range in granitic soils before breaking into the marshy lowlands of Valley Creek. The flow of the stream is mainly the result of snowmelt. The shallow soils and small drainage areas above the virgin flow station make the base flow periods quite droughty. This 15 square mile watershed annually produces 14,000 acre-feet of water.

Flow Characteristics. Flow characteristics derived for Trap Creek indicate consistent flows during the nine month period of August through April. Flows increase rapidly in May to a moderate peak in June. Flows drop rapidly during July. Calculated 75th percentile flows for Trap Creek are displayed in Table 14.

Table 14. Calculated 75th percentile flows in cfs for Trap Creek above the diversion (TrC-1); based on data from USGS gage 13-2950.00.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2.7	2.8	3.0	4.0	14.3	17.1	6.0	3.3	3.0	3.2	3.3	2.9

Diversion Rights/Irrigation Needs. During the summer irrigation season about 976 acre-feet of water are diverted to irrigate 280 acres of a Challis National Forest sheep allotment (Figure 16). Although the water right is only 4 cfs, the amount of water actually diverted commonly exceeds the recorded right. In June of 1979 as much as 23 cfs were being diverted from Trap Creek.

Fishery Capability/Requirements. SNRA and Idaho Department of Fish and Game fishery biologists estimate potential for anadromous fish production as shown in Table 15. It should be noted that the total natural streamflow will not always provide sufficiently for upstream passage or egg incubation or downstream passage conditions even if water is not diverted. Therefore the habitat's inherent anadromous production potential is significantly reduced.

Table 15. Fishery capability impacted by Trap Creek irrigation diversion TrC-1. Miles of stream, acres of habitat and estimated potential for density of redds are displayed for each identified affected stream reach.

Stream Reach	Miles of Stream	Acres of Habitat	Density of Redds/Acre
Trap Creek below TrC-1	3.0	6.0	25 chinook redds 25 steelhead redds
Trap Creek above TrC-1	2.0	3.7	25 chinook redds 25 sheelhead redds

On the basis of these assumptions and the flow characteristics of the stream, inherent anadromous production potential for chinook (182) is just 30% of the values shown in Table 15, and for steelhead (242) about 40% of the values displayed. These fish represent a net annual value of $119,195.

GAWS outputs indicate 6 cfs instream would provide upstream migration passage for 90% of spawning salmon, while 3.5 cfs is necessary to marginally provide for downstream migration. As was noted previously the total natural streamflow will not provide for 100% successful completion of all life history phases. The natural streamflow or 6 cfs, whichever is less, would provide for approximately 164 chinook and 218 steelhead, with an annual value of $107,388.

If the entire water right is diverted, but no more, flows fall below marginal passage conditions early in July, and only 25% of the chinook desiring to do so will be able to pass through the critical reach to spawning habitat above TrC-1 (Figure 18). Successful chinook spawning below TrC-1 is negligible. Steelhead production above the diversion will be reduced by 25% because of insufficient flows for downstream migration. Additionally there will be a loss of 25% of incubating steelhead below the diverison. Some 18 chinook and 182 steelhead spawners worth $54,665 would be produced at this flow regime.

Conflicts. Diversion of entire water right, or the entire streamflow, whichever is less, results in over a 60% reduction in inherent anadromous fish production potential. The annual economic loss is $64,530.

Impairment of the anadromous resource is actually greater than indicated because the amount of water diverted frequently exceeds the water right. A minimum instream flow of 6 cfs or the natural streamflow, whichever is less, would produce about 90% of the habitat's inherent potential.

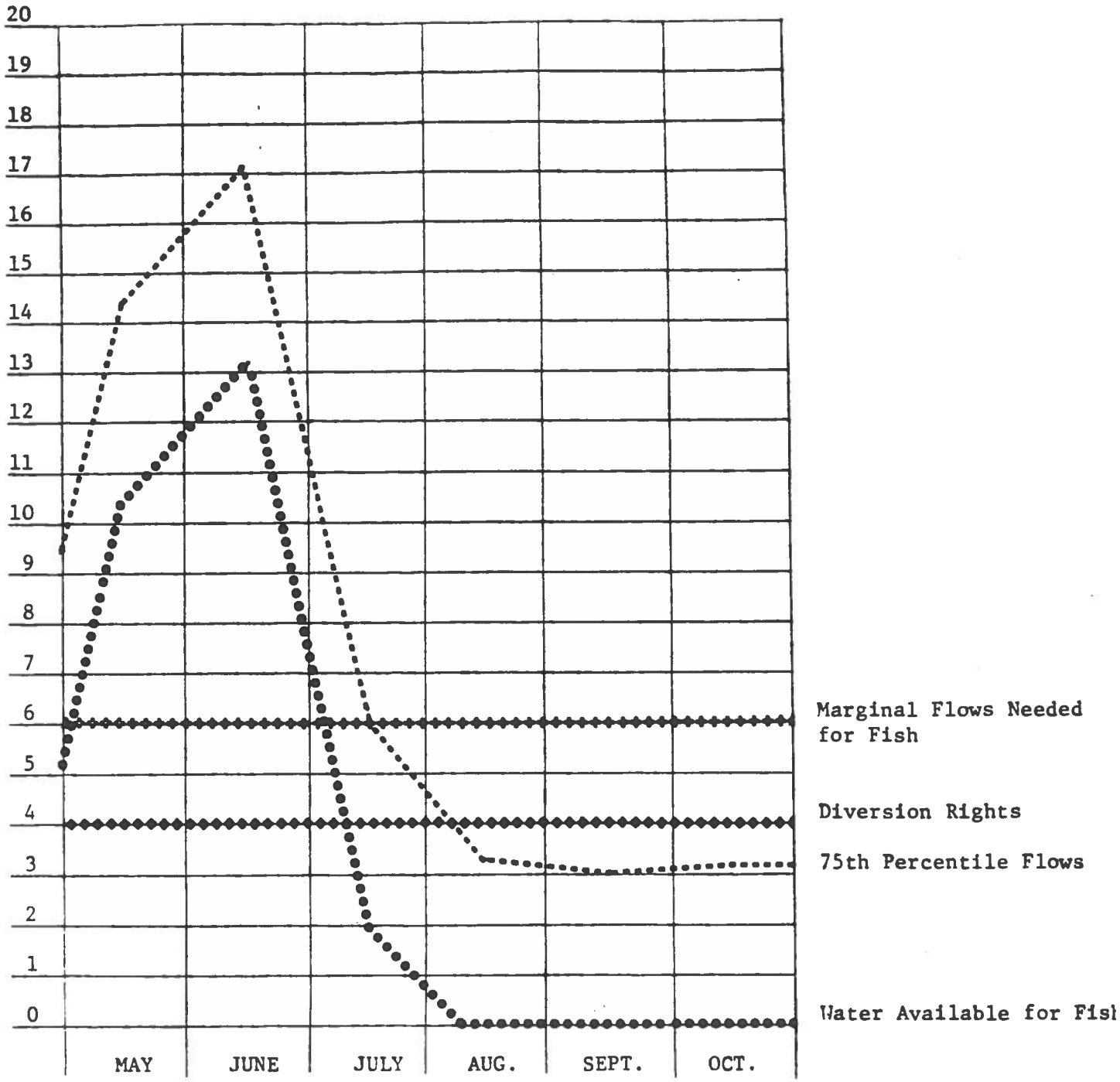


Figure 18.

Flow schedule for Trap Creek. With the water user diverting the total water right, only 25% of chinook desiring to do so will be able to pass through the critical reach to spawning habitat above TrC-1. Successful chinook spawning below the diversion is negligible. The low flows also adversely affect steelhead incubation and outmigration.

V. Potential Solutions and Effects

Present management direction for resolving instream flow conflicts states that the Forest Service will "cooperate with the State of Idaho in the establishment of stream resource protection flows". Identification and quantification of existing problems are critical to initiation of a program to resolve those conflicts. The present instream flow study is this first key step.

Now that background data on flow needs is available a strategy must be selected with which we can take the remaining steps forward to solve the problems. Four basic approaches to resolving instream flow conflicts have been identified. They include: (1) purchase or partial purchase of water rights, (2) cooperative agreements with water right holders to guarantee minimum instream flows, (3) take legal action to restrict water rights to State Water Law maximums, and (4) develop means to increase water supplies and file claims on that water for instream flow needs.

Opportunities to implement each strategy and expected effects are identified below.

Purchase or Partial Purchase of Water Rights. When scenic easements were being acquired on the SNRA the purchase of water rights through those easements was considered. A decision was made at that time not to attempt to purchase water rights through the scenic easement program. This decision was based on: (1) the urgent need to proceed with acquisition of scenic easements on parcels where development was imminent, and (2) the inability to quickly resolve questions as to the legality of purchasing a water right through the scenic easement process and the legality of using a water right for instream fish production.

Further legal advice and consultation with State of Idaho Water Resources Board personnel should be pursued to resolve the legal questions. However, in December 1974, the Idaho Supreme Court decreed recreation and preservation of scenic views as beneficial use of water in the Malad Canyon Springs decision. Other decisions since, such as the 1979 Silver Creek Court decision, seem to indicate retaining instream flows for fish production to be a beneficial use of water.

If this is a viable option, and if monies became available for such water rights purchases this option may possibly resolve all instream flow problems in the Upper Salmon River.

Cooperative Agreements with Water Right Holders. To date, only one water right holder in the Upper Salmon River Basin has, in cooperation with the SNRA, voluntarily reduced the amount of water diverted for irrigation. During the late summer and fall of 1981 the Salmon Falls Sheep Company reduced their number of diversions on Pole Creek from 7 to 1. Of the total abstracted water right of 65.6 cfs, the water right holder will draw only about 18 cfs. This reduction in number of diversions and amount of water diverted is the result of changing the irrigation mode from "flood" to "overhead sprinkler". Under this irrigation

scheme approximately 40% of the habitat's inherent ability to produce chinook salmon and 86% of its ability to produce steelhead can be met. Using 1980 figures, the potential fishery resource would have an annual value of more than $475,000.

If the Salmon Falls Sheep Company project is successful, similar arrangements by other landowners may be made. If diversion needs on Busterback Ranch (S-45/S-46) could be reduced to guarantee 5 cfs to operate a fishway around a dewatered portion of the main Salmon River, significant benefit to the anadromous fishery may result. Recent changes in channel configuration may have negated the viability of such an alternative for the Salmon River, however.

Legal Action to Limit Water Rights. Article 15, section 42-220 of Idaho Water Laws and Regulations states "...that when water is used for irrigation, no such license or decree of the court allotting such water shall be issued confirming the right to use of more than one second foot of water for each fifty acres of land so irrigated, unless it can be shown to the satisfaction of the Department of Water Administration in granting such license, and to the court in making such decree, that a greater amount is necessary, and neither such license nor any one claiming a right under such a degree, shall at any time be entitled to the use of more water than can be beneficially applied on the lands for the benefit of which such right may have been confirmed...".

If water rights on Alturas Lake Creek and the main Salmon River at S-45/S-46 were successfully challenged in court and forced to meet the State Water Law maximum standard, significant improvement in anadromous fish passage and production could be expected.

If the amount of water diverted at S-45/S-46 was limited to the maximum State standard, just over 80% of the habitat's inherent anadromous production potential could be realized. This represents an increase in the value of the anadromous fishery potential of at least $457,063 annually over the current situation. If the amount of water diverted from Alturas Lake Creek were similarly limited, the habitat could produce at about 70% of its inherent potential for chinook salmon. Although about 25% of the sockeye adults attempting to negotiate the critical reach could, it is unlikely the population could sustain itself with such a low rate of escapement into Alturas Lake. The potential increase in chinook production alone represents an increase in the value of the anadromous fishery of $188,307 annually over the current situation.

All other diversions on streams examined for this study were diverting less than the maximum State Water Law standard of 1 cfs/50 acres.

Other legal action may be appropriate on the Salmon River at S-45/S-46, on Alturas Lake Creek, Champion Creek, Elk Creek and Trap Creek where water diversion frequently exceeds the water right on the stream.

Water Development. A unique opportunity exists to mitigate the instream flow problem on Alturas Lake Creek, with no impact to the water user, and dramatically improve the anadromous fishery. Construction of a regulating dam at the outlet of Alturas Lake would store water during the peak of the hydrograph for the purpose of releasing water during periods when the natural flow is insufficient to meet the requirements for fish and demand for irrigation. The water user would draw the full entitlement as long as it is naturally available and the equilavent of the total natural streamflow when the full entitlement is not available. The water user would be required to leave instream the amount of stored water released for the purpose of fish production.

If the regulating dam is designed to store two feet of water over Alturas Lake (1600 acre feet), flow releases would allow for 96% of the chinook and 90% of the sockeye salmon to pass beyond the diversion. Chinook production below the diversion can be increased from 50% to 80% of the potential. With such a regulating structure the annual value of the anadromous fishery resource could be increased $281,137 over the current situation. It should be noted that this valuation does not include a dollar value for the 3000 to 6000 adult sockeye that Alturas Lake would then be capable of producing, because of the current minor economic importance of sockeye salmon returning to Snake River tributaries.

Before implementation of a project of this magnitude a number of concerns must be resolved. They include:

1. Environmental impacts to other resources.
2. Legality of claiming a water right on this storage of flood waters. We must ensure that downstream water rights would not be infringed upon.
3. Ensuring that water released from storage is not appropriated from the stream at the existing diversion on Alturas Lake Creek.

Alturas Lake Creek appears to be the only stream system studied in which there is potential to develop additional flows to alleviate instream flow conflicts.

VI. Conclusion

Anadromous salmonids are one of this nation's most valuable renewable resources. Resolution of the conflicts between these fisheries and another of the country's valuable resources, agriculture, will not be an easy task. However, enabling legislation to establish the SNRA provides emphatic direction that this difficult task will indeed be accomplished. This report is simply the beginning of the process. Much further work will be necessary to improve the present situation. The next step in the process will be for management to recommend strategies to be used to solve these instream flow conflicts.

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FISHERY EFFECTS OF IRRIGATION DIVERSION AND RELATED STRUCTURES IN THE SAWTOOTH NATIONAL RECREATION AREA

PROGRESS REPORT I

JUNE 1974

Greg L. Munther

Fisheries Biologist

Forest Service

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EFFECTS OF IRRIGATION DIVERSIONS AND RELATED STRUCTURES IN THE SAWTOOTH NATIONAL RECREATION AREA

Greg L. Munther
Fisheries Biologist

ABSTRACT

Selected irrigation diversions were investigated to evaluate their effects on spawning and rearing of salmon within Sawtooth Valley. Stream flows were measured from mid-summer to early fall during 1972 and 1973, and related to minimum flow needs to facilitate adult salmon and steelhead passage, spawning, and rearing of young as well as habitat for resident fish. Flows were insufficient for fish life from July to mid-September resulting from decreasing natural flows, increased demand by irrigators, peak numbers of salmon attempting to reach and spawn in ancestral spawning areas, and high oxygen demand by incubating salmon eggs. Alternative proposals to correct this situation were evaluated and the author's recommendations were made.

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OBJECTIVES

As a part of aquatic environment investigations designed to improve aquatic habitat within the Sawtooth National Recreation Area, a program was initiated in 1972 and 1973 to:

1. Assess effects of irrigation diversions and related developments on upstream passage and spawning conditions for adult sockeye and Chinook salmon.

2. Assess impact on same diversions and developments on production and migration of young salmon.

3. Obtain needed information for recommending alternatives to maintain or restore favorable aquatic habitat conditions that are compatible with the objectives of the NRA.

To meet the above objectives, the following investigations have been implemented to date. Some have not been completed.

1. Assess distribution of spawning and rearing habitat for anadromous stocks.

2. Identify those irrigation structures that have led to the degradation, or prevented utilization of, available habitat.

3. Determine habitat improvement needs to maximize potential production of anadromous stocks.

4. Evaluate alternatives for improvement of existing conditions.

gravel, valued at $100,000.00 annually per acre to commercial fishermen (Anonymous, 1965), is rendered unusable which eventually affects sport fishermen in the Sawtooth NRA who spend an estimated 17,700 fishermen hours annually in search of salmon (Platts, 1968).

As part of legislation creating the Sawtooth National Recreation Area in 1972, the Secretary of Agriculture was directed to administer the area in a manner that will best provide for the protection of salmon and other fisheries. As a result, this investigation was initiated.

It should be understood that this report is not a complete documentation of irrigation related fishery problems in the SNRA. While some streams were studied intensively, others were only investigated on a cursory level and should have priority for future documentation. Other streams adversely affected were not investigated because of time and manpower constraints.

Any fishery program recommended in this report will require the coordination and cooperation of the Idaho Fish & Game Department. As individual projects are developed, the input of state biologists will become increasingly valuable and necessary. While the two agencies are charged with different fishery roles, any program will be enhanced and more successful with a close working relationship of the two agencies.

METHODS

Spawning Distribution

Forest Service personnel walked all potential spawning streams above the established Idaho Fish and Game spawning survey areas between August 7 and August 21, 1972, and between August 27 and September 7, 1973. All redd observations were plotted on aerial photographs for future reference. In addition, live and dead fish observed were tallied in 1972. Findings of the Idaho Fish & Game Department are included in this report.

Juvenile Losses

Sample sections of ditches originating from three diversions were chosen which included one each from Alturas Creek, Upper Salmon River and Valley Creek. Sections between natural barriers such as headgates were selected to minimize re-entry into the sample section by downstream fish, and so that fish entering the sample section would have difficulty leaving by swimming upstream. Because it is probable that some fish would drift through the section and not be collected, the estimate of recruitment is only a minimum estimate. Sample sections only included a portion of flow originating from a diversion, estimates of total losses by the diversion were calculated by expanding the flow sampled to the total flow. Sample sections ranged from 948 to 1366 feet long.

Temperatures

During 1973 Twelve minimum-maximum thermometers were placed in various streams, tributaries, and irrigation returns and were read at irregular intervals.

Streamflow

Permanent stations were established at sites in diversion ditches and below diversions where accurate flow data could be obtained. Transects were semi-permanently marked using engineering stakes and flagging. Minimum flows for passage were calculated using the "Oregon Method" (Thompson, 1972), which is based on studies indicating Chinook salmon require flow at least .8 foot deep over 25 percent of the streambed for adequate passage. For this investigation, the shallow riffle considered to be most critical to salmon passage was identified and a station established at this riffle. Transects were also established to assess flows as they relate to spawning habitat. Stations were established at completed redds and habitat evaluated using the "Oregon Method" (Thompson, 1972). For spawning in suitable habitat is considered to be those waters having flows for 1-3 cfs with a minimum depth of .8 foot (Thompson, 1972). Water flows were measured at permanent sites throughout the season using a Price-Gurley current meter.

RESULTS

Spawning Distribution

According to spawning counts made by Forest Service personnel and the Idaho Fish and Game Department, over 1440 spring Chinook redds were constructed within the SNRA in 1972 and 963 redds in 1973. (Figures 1 & 2) This represents an estimated spawning population of 3600 adults in 1972 and 2408 in 1973, (based on 1 female and 1.5 males per redd). Spawning is confined to the Salmon River and to

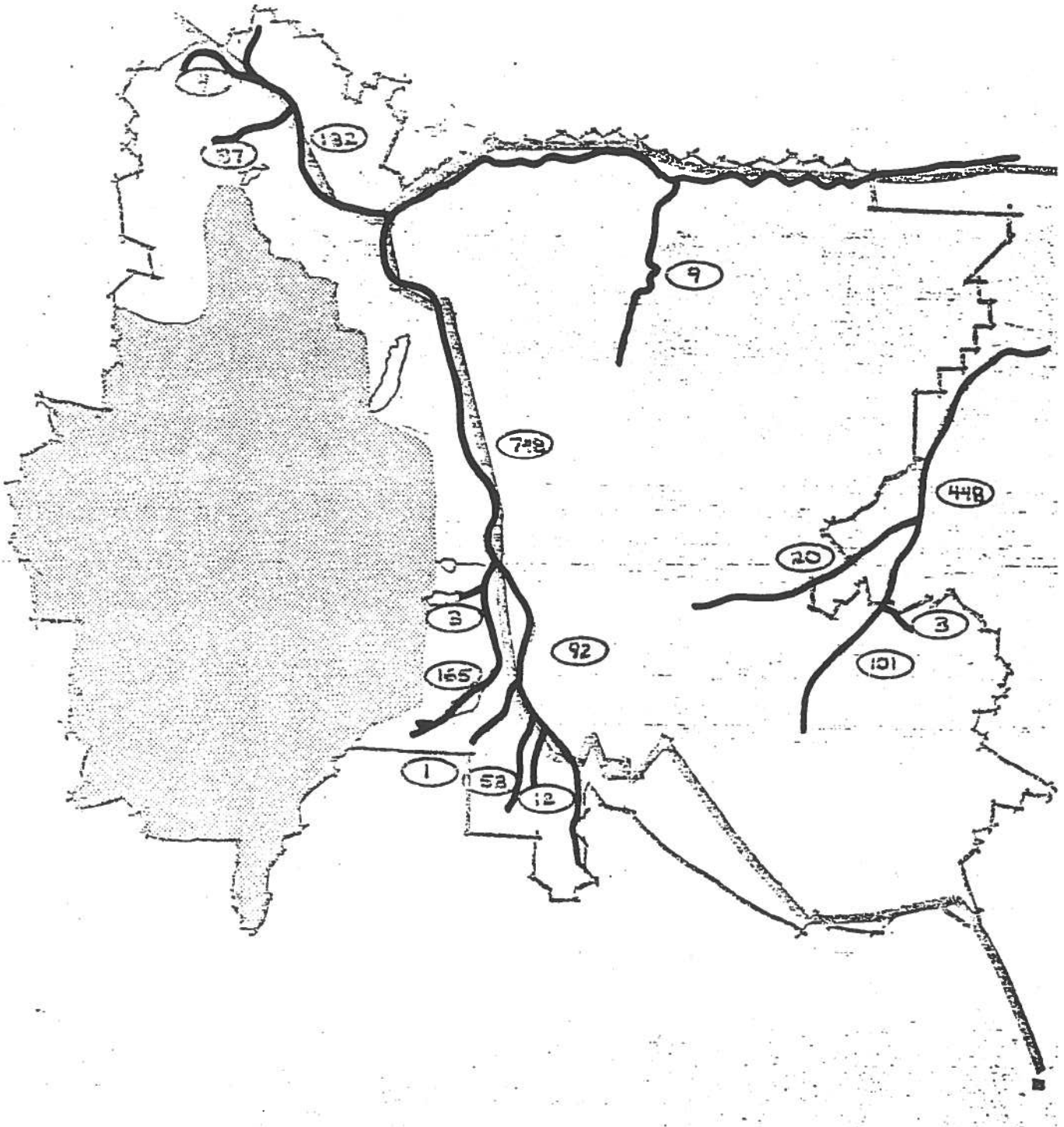


FIGURE 1 DISTRIBUTION OF SPRING CHINOOK REDDS IN 1972 ON UPPER SALMON RIVER AND TRIBUTARIES.

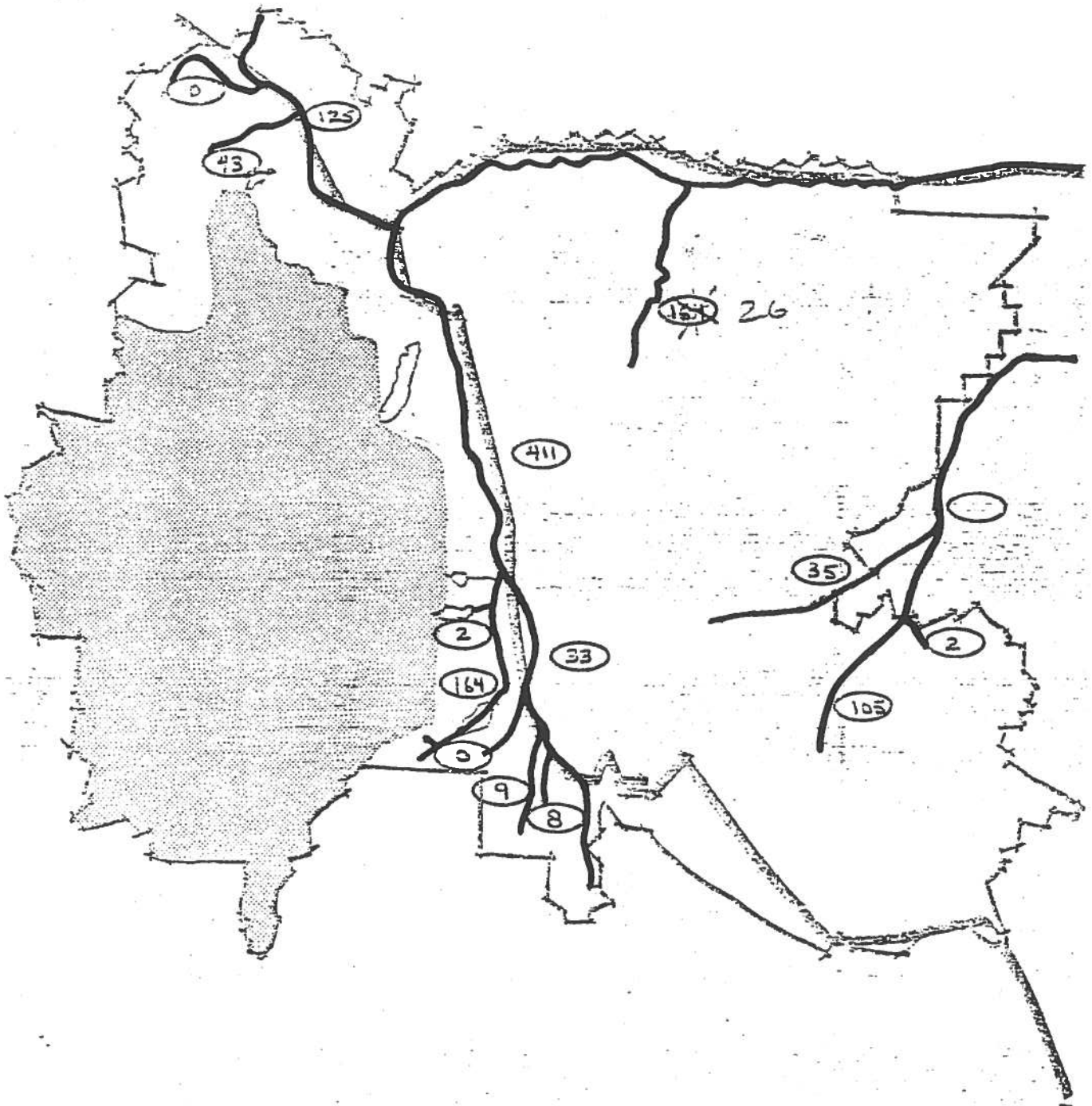


FIGURE 2 DISTRIBUTION OF SPRING CHINOOK REDDS IN 1973 ON UPPER SALMON RIVER AND TRIBUTARIES.

suitable tributaries generally having base flows exceeding 5 cfs. Highest average density of spring chinook spawning occurred in the area between Sunny Gulch and Breckenridge Diversion (Table 1), having approximately 34 redds per mile in 1972.

Summer chinook spawning is confined primarily to the main stem of the Salmon below Sunny Gulch and in lower Valley Creek. The Idaho Fish and Game Department counted 170 summer chinook redds on the main stem of the Salmon River within the SNRA and 147 redds in lower Valley Creek during 1971. Highest density of summer chinook spawning in the Salmon River within the SNRA is the 4.5 mile section immediately below Sunbeam Dam, which had approximately 24 redds per mile.

TABLE 1

SPAWNING DISTRIBUTION OF SPRING CHINOOK SALMON BY DRAINAGE WITHIN SAWTOOTH NATIONAL RECREATION AREA 1972 - 73

	1972	1973	% Change
Alturas Creek	165	164	0%
East Fork Salmon (above Bowery)	101	105	+4
Main Salmon (above Breckenridge Diversion)	92	33	-64
Smiley Creek	58	9	-84
Elk Creek	37	43	+16
Germania Creek	20	35	+75
Frenchman Creek	12	8	-33
Trap Creek	9	0	-100
Warm Springs Creek	9	26	+289
Pettit Lake Creek	3	2	-33
West Pass Creek	3	2	-33
Beaver Creek	1	0	-100
Main Salmon River (Breckenridge Diversion to Sunny Gulch)	748	411	-45
Upper Valley Creek	182	125	-31
TOTAL	1440 redds	963 redds	

STRUCTURES INVESTIGATED

Although 29 diversions structures have been identified as needing improvements (Platts, 1972), available time and manpower limited investigations to fifteen structures that appeared to have high adverse impact on anadromous fishery resources.

A. Breckenridge Diversion

Located on the J. R. Breckenridge Ranch (T7N, R14E, Section 3), this diversion presently has the greatest irrigation related adverse impact on anadromous stocks of any within the SNRA. This structure prevents full utilization of 21 miles of spawning habitat upstream from the diversion (Figures 3 & 4). Another smaller diversion located approximately one mile above this diversion has similar characteristics and is also owned by Breckenridge.

Streamflows

Water flows were measured in the main diversion ditch, as well as at a station approximately 300 yards below the diversion. From 7-16-72 to 9-10-72 40 to over 100 cfs of water was diverted (Figure 5), and from 6/27/73 to 8/28/73 29 to 84 cfs. was diverted (Figure 6). This water is used to surface or subirrigate approximately 950 acres of summer sheep pasture and hay meadows.

Minimum flows for fish passage were established for the area below the diversion using the "Oregon Method" (Thompson, 1972).

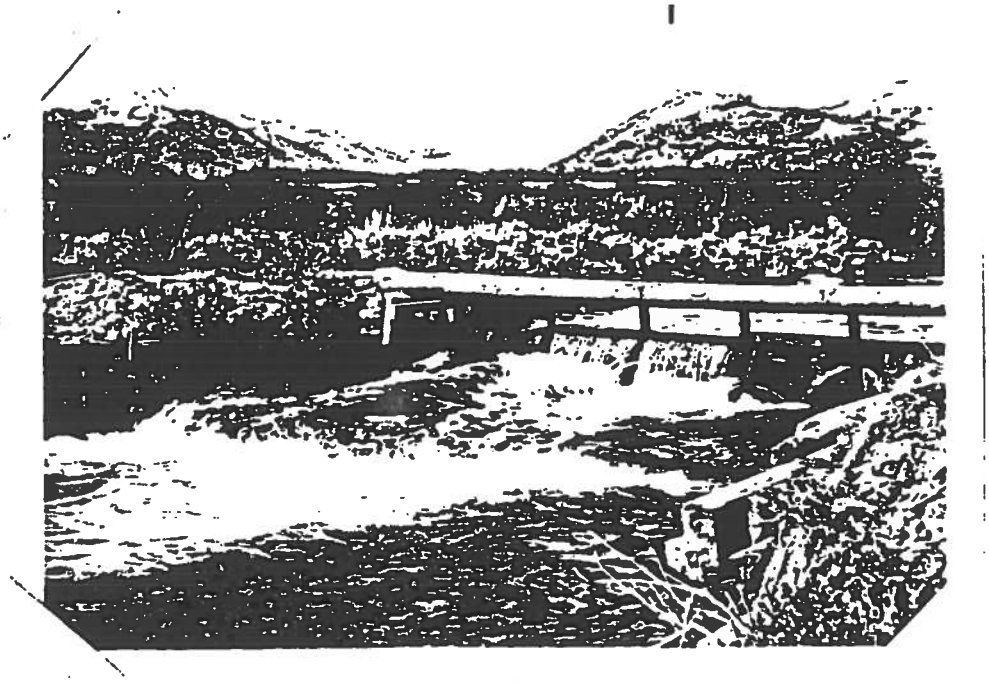


FIGURE 3 - BRECKENRIDGE DIVERSION WITH ADEQUATE STREAMFLOW (44 CFS.) TO PROVIDE FOR ADULT SALMON PASSAGE.

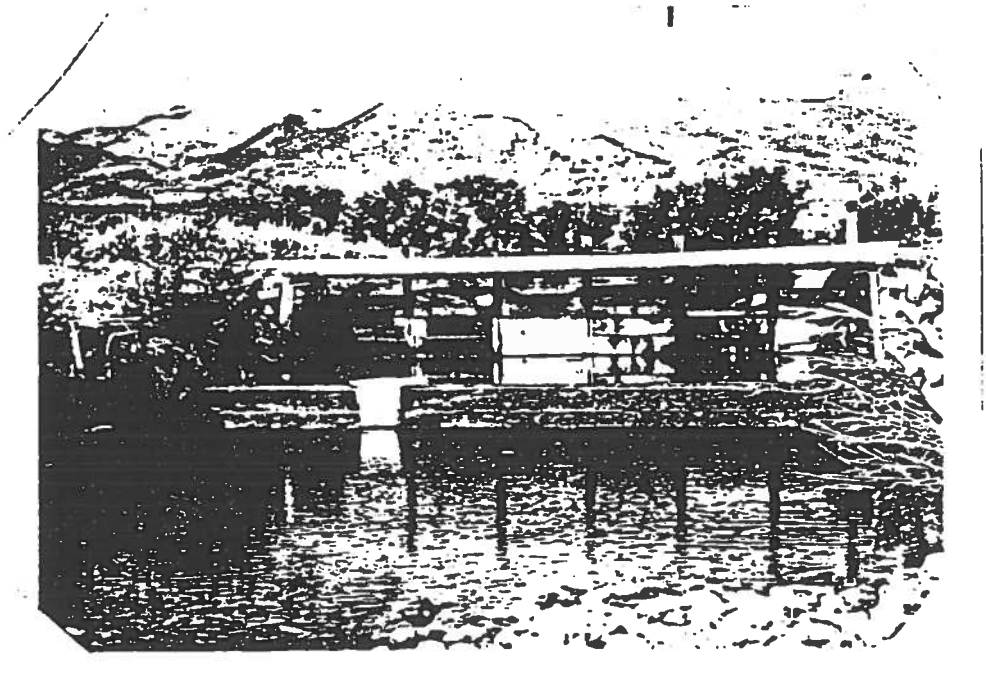


FIGURE 4 - BRECKENRIDGE DIVERSION WITH ALL GATES CLOSED. SALMON CANNOT MOVE UPSTREAM INTO 22 MILES OF SPAWNING STREAMS UNDER THIS CONDITION.

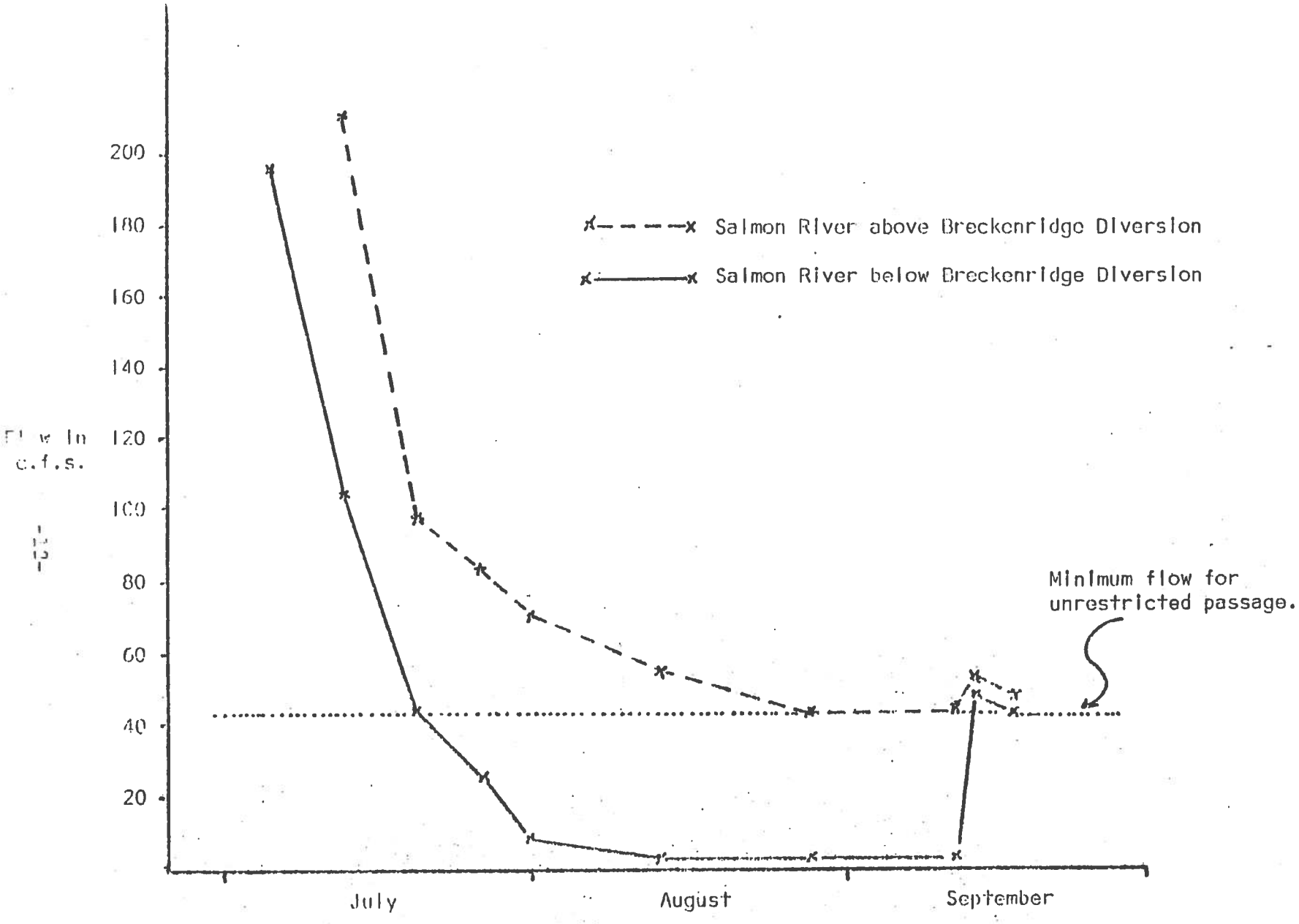


FIGURE 5 STREAMFLOWS AT BRECKENRIDGE DIVERSION, DURING SUMMER 1972.

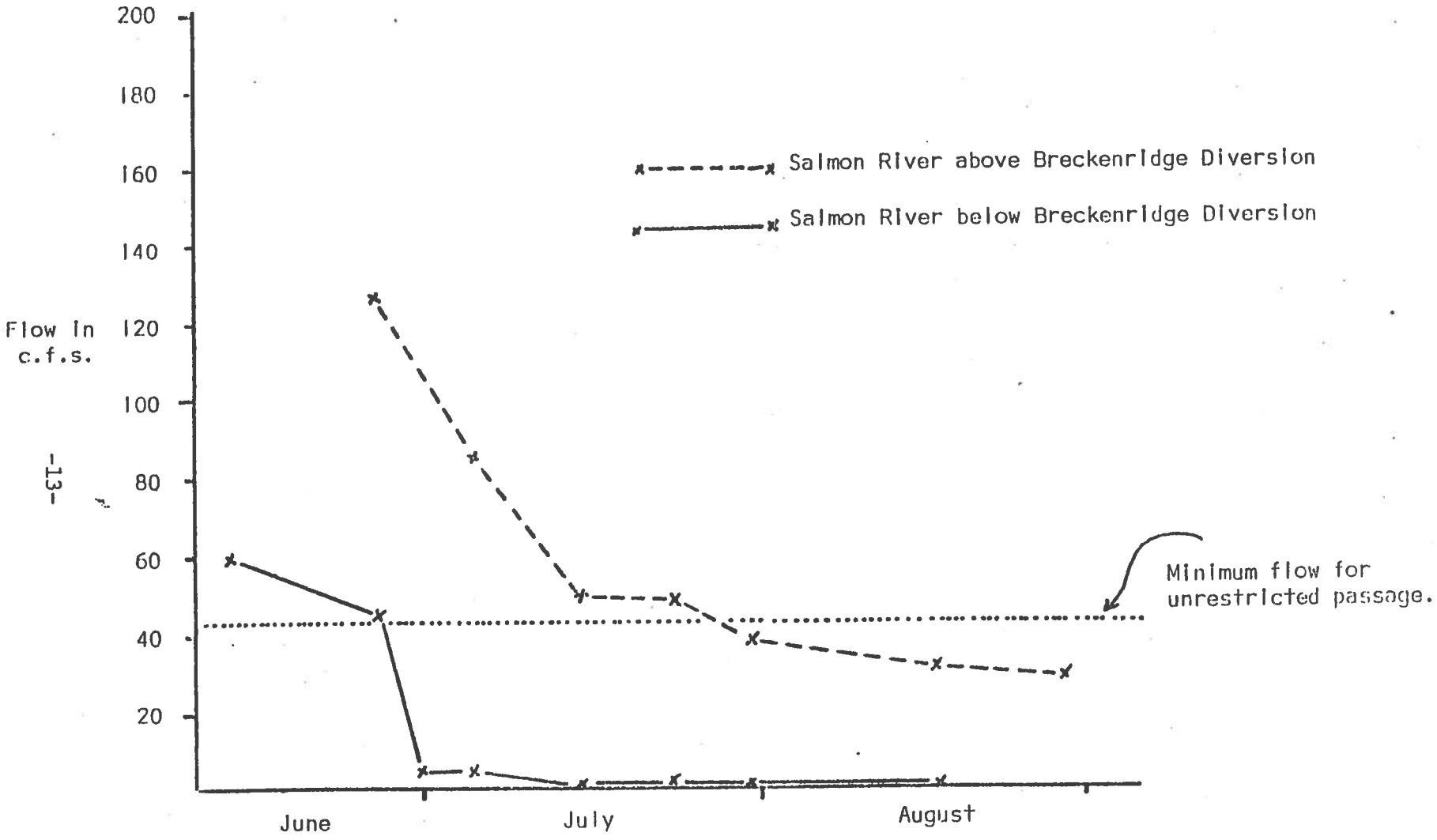


FIGURE 6 - STREAMFLOWS AT BRECKENRIDGE DIVERSION, DURING SUMMER 1973.

Three riffles located below the diversion were investigated. The most critical riffle located approximately 150 yards below the diversion, requires approximately 44 cfs as minimum flow to insure adequate passage of adult chinook (Table 2). To accommodate most upstream spring chinook movement, this flow should be maintained through August 25 if natural flows are present. During 1972, this flow could have been available through August 27, if diversion had not taken place (Figures 7 - 10).

Presently, as a result of diversion of water, minimum flow is not maintained throughout the time period of upstream salmon movement, consequently the timing of flow reduction in relation to fish movement is of major importance. The 1972 spring chinook spawners had the benefit of heavy late runoffs, providing sufficient waters past the diversion to meet both irrigation demand and flow requirements until sometime between July 20 and 27. As a result, at least 163 redds were successfully completed above the diversion (Table 3). Fish unsuccessfully attempted to move past the diversion after July 27, despite loss of flows and the diversion barrier. In 1973 flows were virtually shut off at the diversion June 30, resulting in only 50 redds being completed above the diversion. High redd counts below the diversion (Figure 11) indicate an above-average concentration of spawners.

Flow in 1972 was reduced to zero at the diversion and by August 13 flow was insufficient for any spawning for a distance of .5 miles

TABLE 2

STREAMFLOWS AT CRITICAL RIFFLE (SBP-1) BELOW BRECKENRIDGE DIVERSION AS RELATED TO PERCENTAGE OF USABLE STREAM WIDTH SUITABLE FOR SALMON PASSAGE.

FLOW	DATE	TOTAL WIDTH	WIDTH WETTED	WIDTH USABLE		LONGEST CONTINUOUS PORTION USABLE	PERCENT
				FEET	PERCENT		
197	7-6-72	86	86	67	78	67	78
106	7-13-72	86	85	38	44	38	44
60	6-13-73	86	85	9	10	9	10
44	7-20-72	86	82	18	21	18	21
40	6-26-73	86	85	0	0	0	0
27	7-26-72	86	81	0	0	0	0
9	8-1-72	86	65	0	0	0	0
5	7-5-73	86	45	0	0	0	0
4	8-11-72	86	56	0	0	0	0

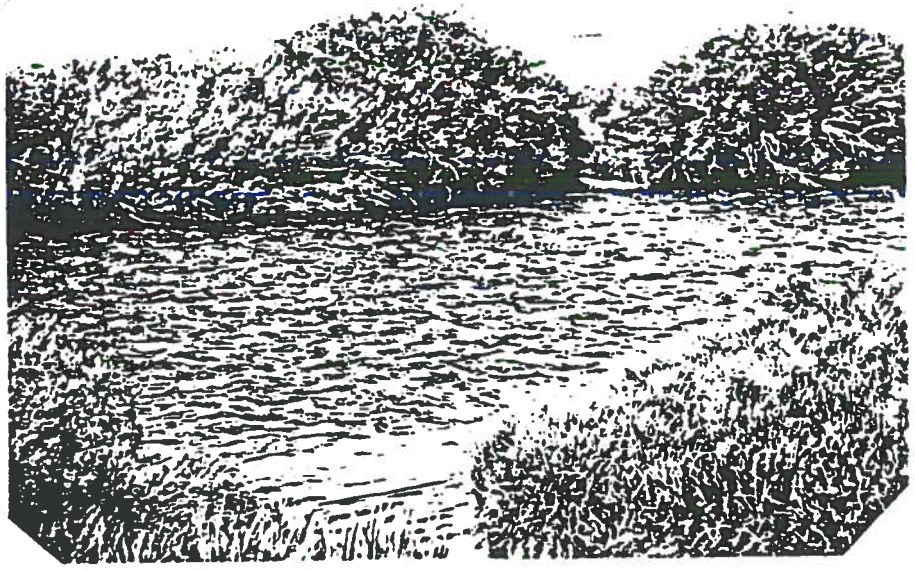


FIGURE 7 - CRITICAL RIFFLE (SBP-1) BELOW BRECKENRIDGE DIVERSION WITH ADEQUATE FLOW FOR SALMON PASSAGE.

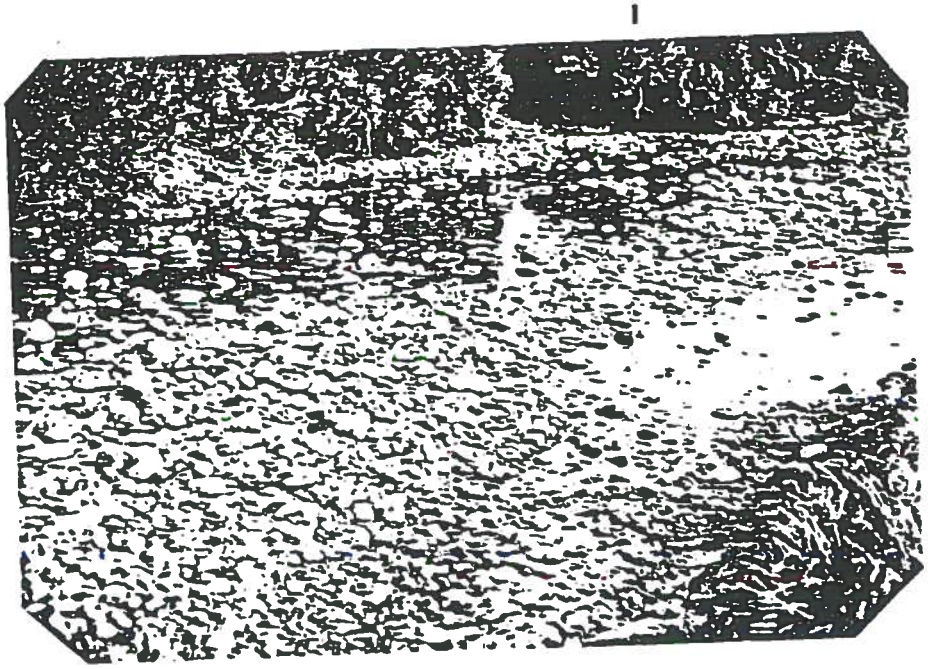


FIGURE 8 - CRITICAL RIFFLE (SBP-1) BELOW BRECKENRIDGE DIVERSION WHEN DIVERSION IS COMPLETELY CLOSED. ONLY SEEPAGE WATER REMAINS DOWNSTREAM FROM THE DIVERSION.

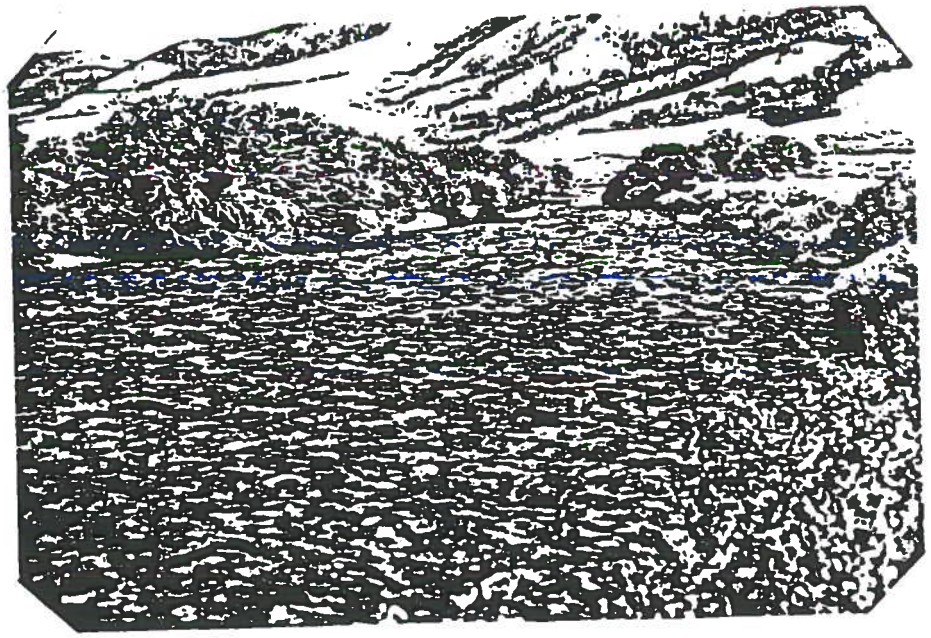


FIGURE 9 - VIEW DOWNSTREAM FROM BRECKENRIDGE DIVERSION WITH REDUCED, BUT ADEQUATE FLOWS.

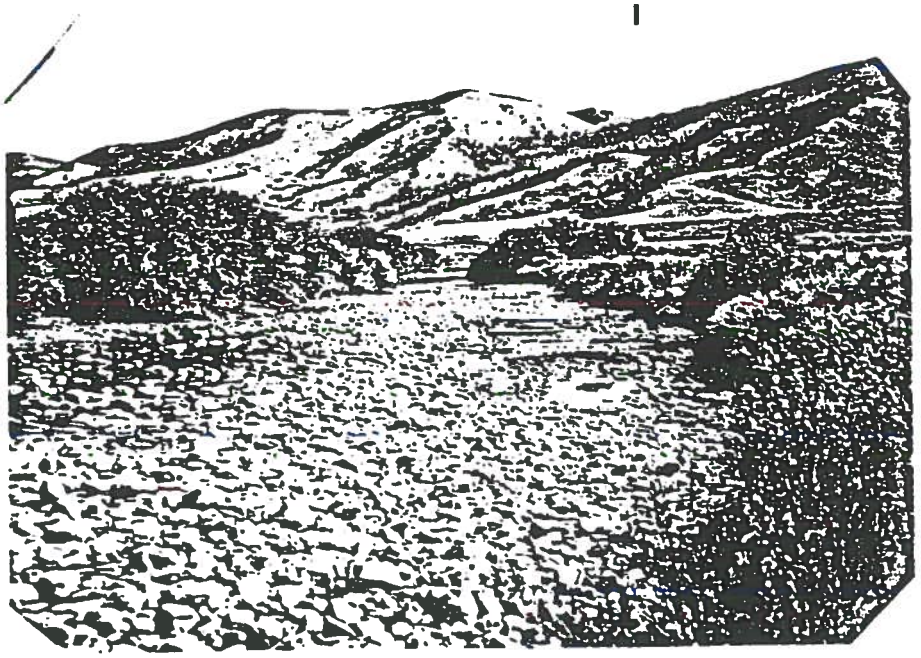


FIGURE 10 - VIEW DOWNSTREAM FROM BRECKENRIDGE DIVERSION WHEN DIVERSION IS COMPLETELY CLOSED. AT LEAST ONE-HALF MILE OF STREAM IS UNUSABLE TO ALMOST ALL AQUATIC LIFE UNDER THESE CONDITIONS.

TABLE 3

Salmon redds completed above Breckenridge Diversion by drainage.

Stream	Redds in 1972	Redds in 1973
Main Stem Salmon above diversion	92	33
Smiley Creek	58	9
Frenchman Creek	12	8
Beaver Creek	1	0
TOTAL	163	50

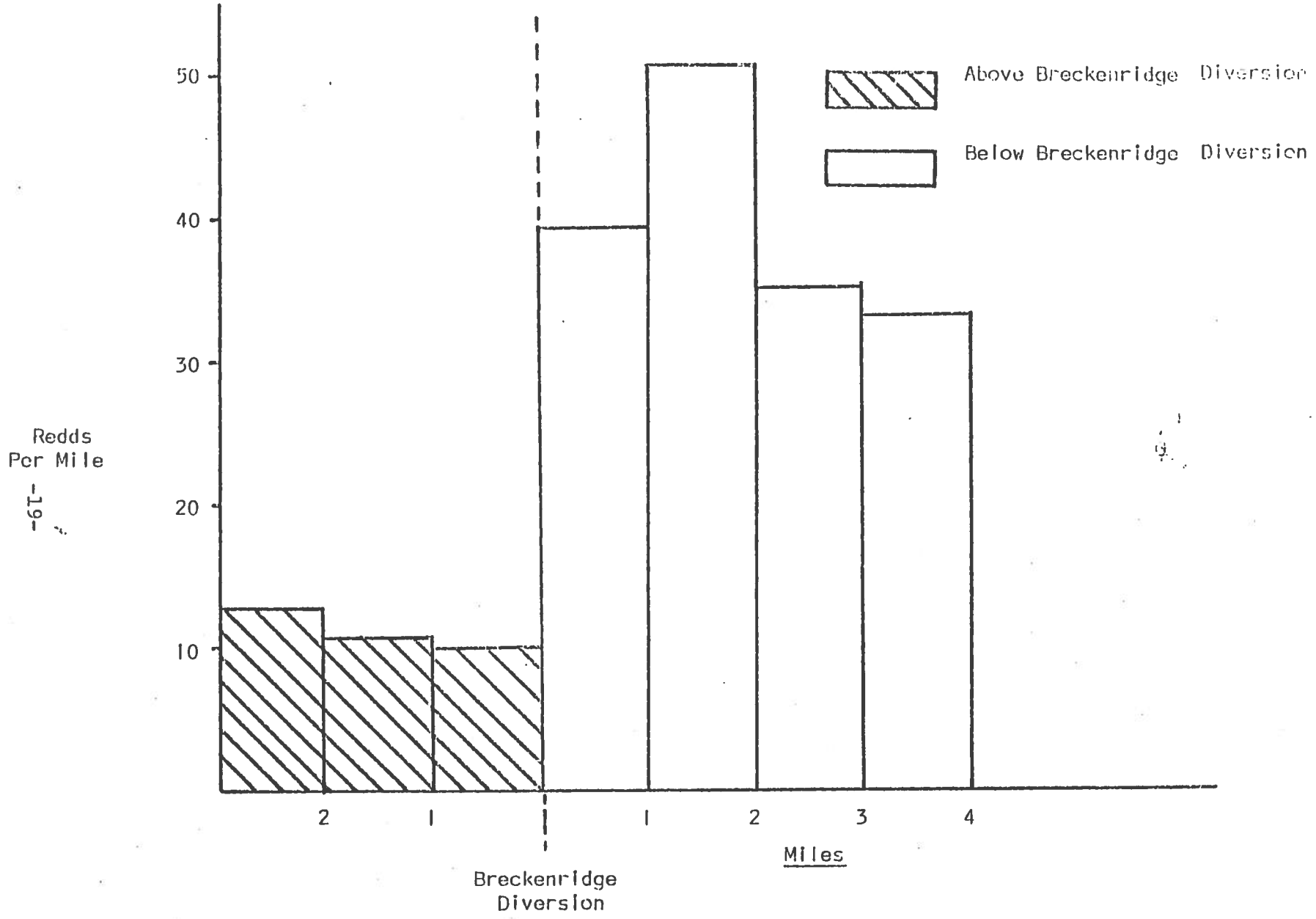


FIGURE 11 SPRING CHINOOK REDD COUNTS ABOVE AND BELOW BRECKENRIDGE DIVERSION (8-18-72)

below the diversion. Considerable spawning had occurred in this section before the dewatering, which probably resulted in 100 percent loss of eggs in redds that were wholly or partially dewatered. In 1973, flows had been stabilized at a reduced flow before spawning had been initiated, therefore losses to eggs below the dewatering should have been lower than in 1972, although no data was gathered.

Beginning approximately .5 miles below the diversion recharge and irrigation return water provides marginal conditions to induce some salmon spawning. Seven transects were established on sites used by salmon for spawning during 1972 from approximately .5 to 2.5 miles below the diversion. Early spawning salmon used these sites, but reduced flows later in the season reduced availability of suitable spawning conditions. Redd density in 1972 in this area was three times that of similar sites upstream from the diversion. This resulted from passage blockage at the diversion which prevented continued upstream movement by salmon.

Transects results (Figures 13, 14, 16, 18), indicate that in 4 of 7 spawning site studies available suitable spawning area increased with increasing flows. In the other 3 sites (Figures 12, 15, 17), spawning area increased to until flows between 40 and 50 cfs were reached and then suitable area declined with increasing flows. This is due to flow characteristics which cause velocities to become excessive for spawning with increased flows. On this stream section a flow increase up to 40 to 50 cfs generally increases suitable spawning conditions, but greater flows do not substantially increase overall spawning area.

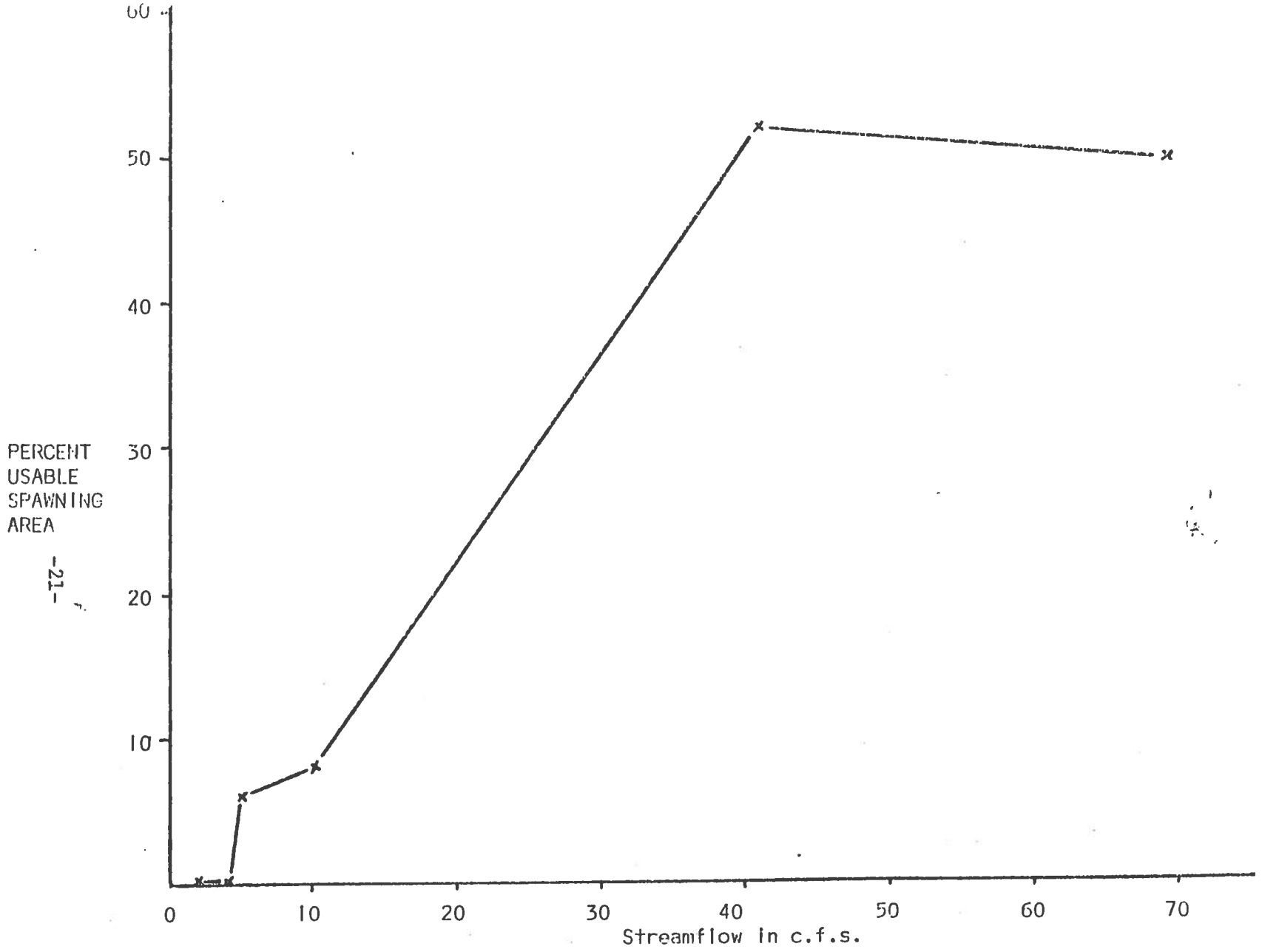


FIGURE 12 BRECKENRIDGE SPAWNING STATION 1-USABLE SPAWNING AREA RELATED TO STREAMFLOW.

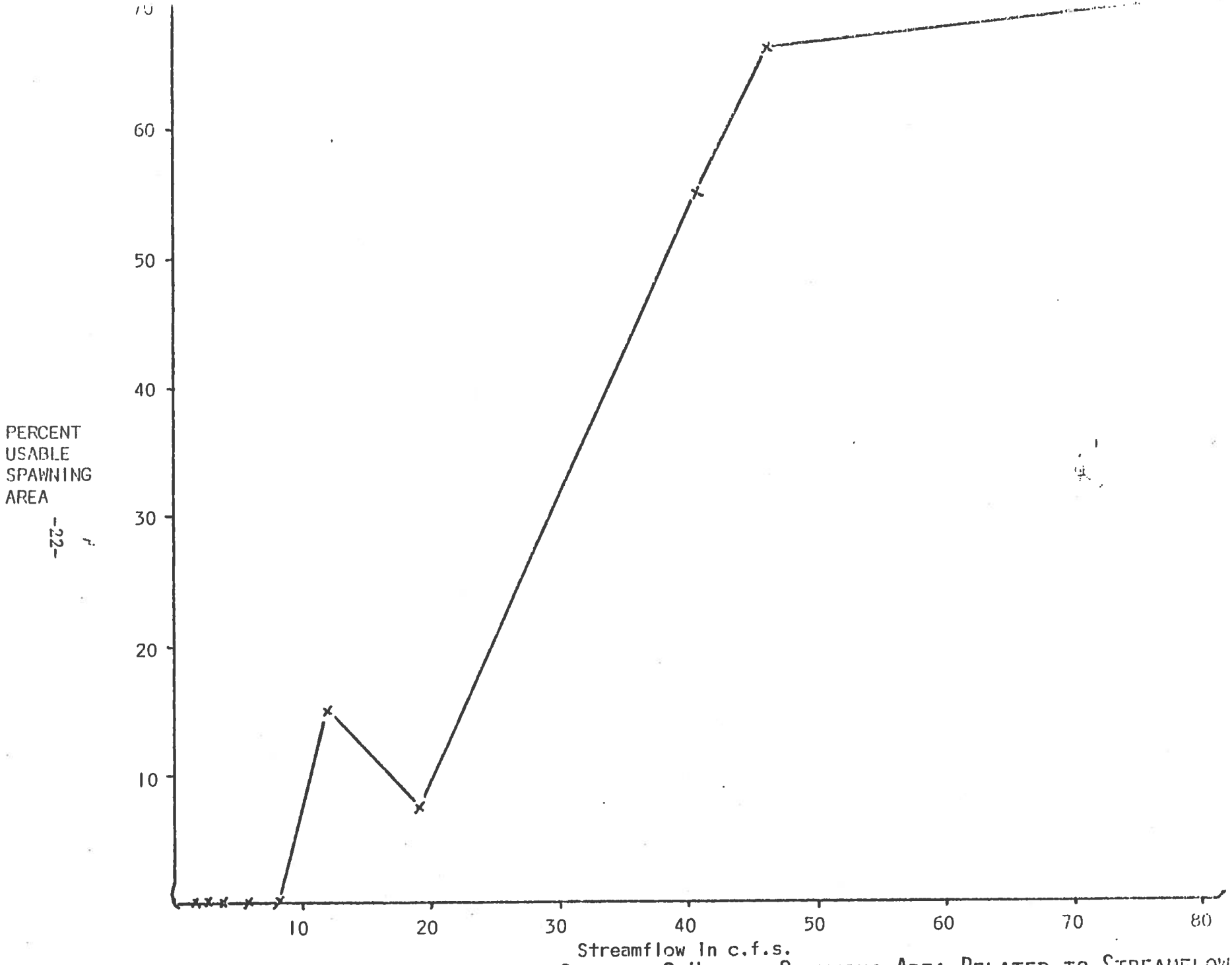


FIGURE 13 'BRECKENRIDGE SPAWNING STATION 2-USABLE SPAWNING AREA RELATED TO STREAMFLOW

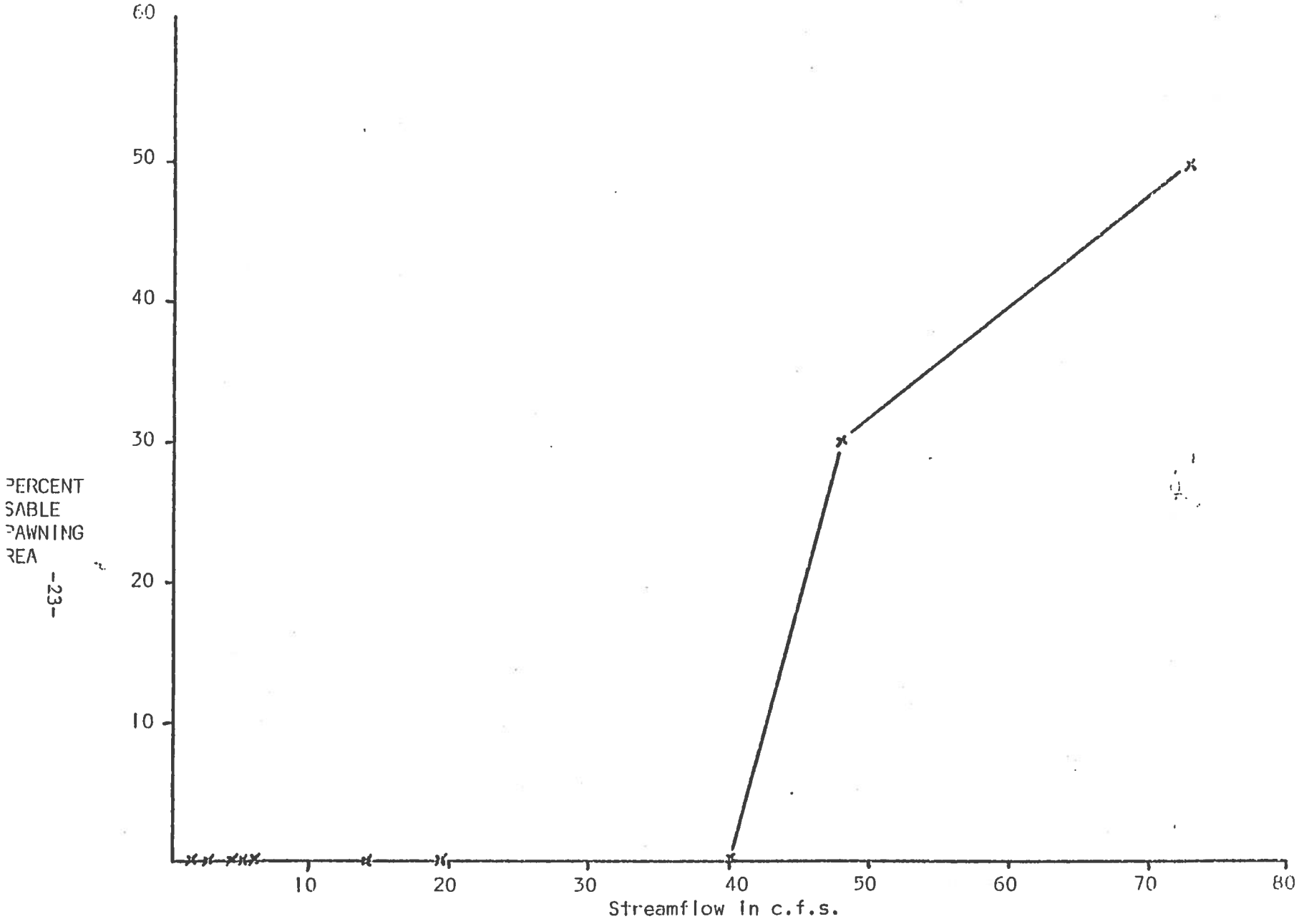


FIGURE 14 BRECKENRIDGE SPAWNING STATION 3-USABLE SPAWNING AREA RELATED TO STREAMFLOW

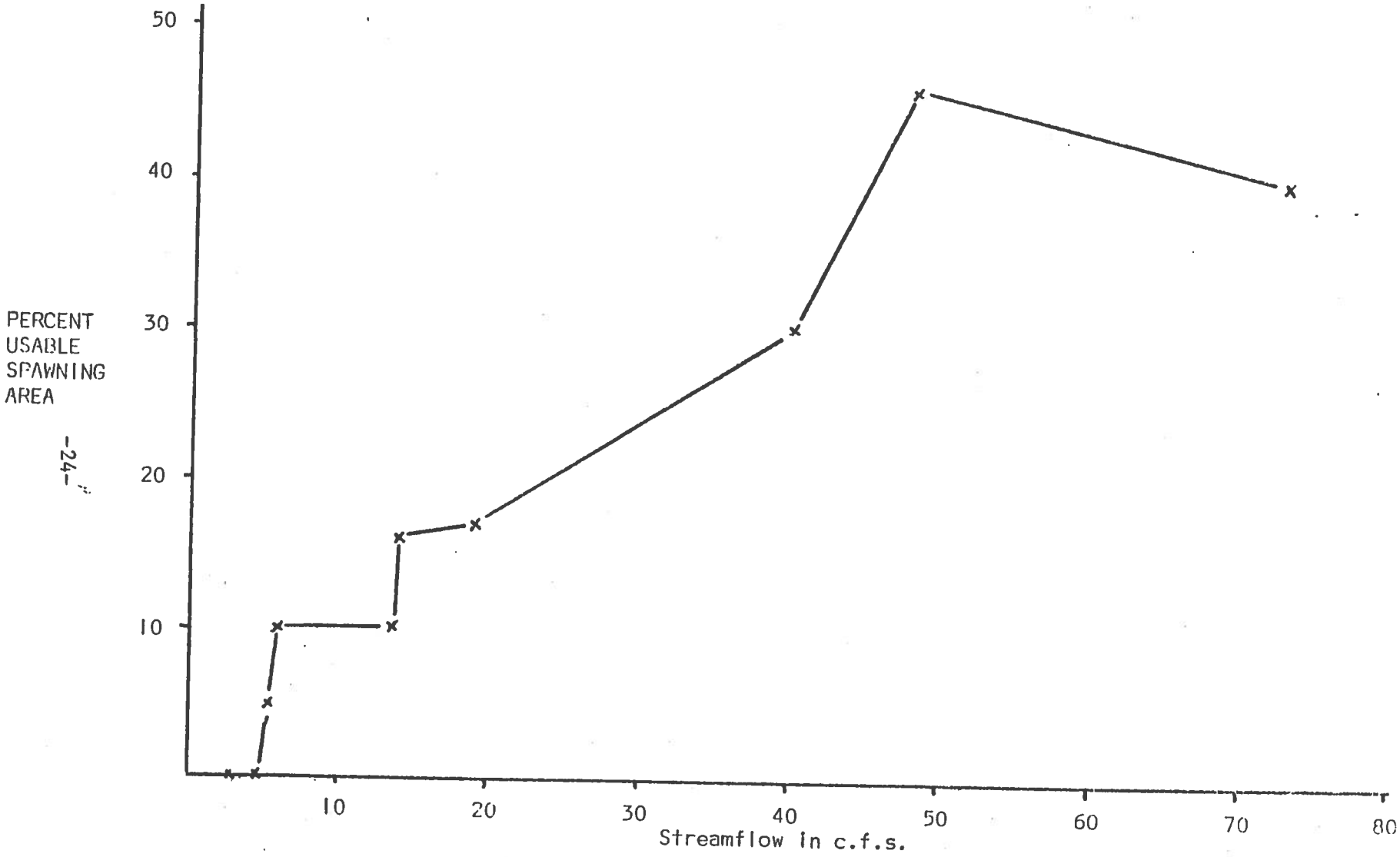


FIGURE 15 BRECKENRIDGE SPAWNING STATION 4-USABLE SPAWNING AREA RELATED TO STREAMFLOW.

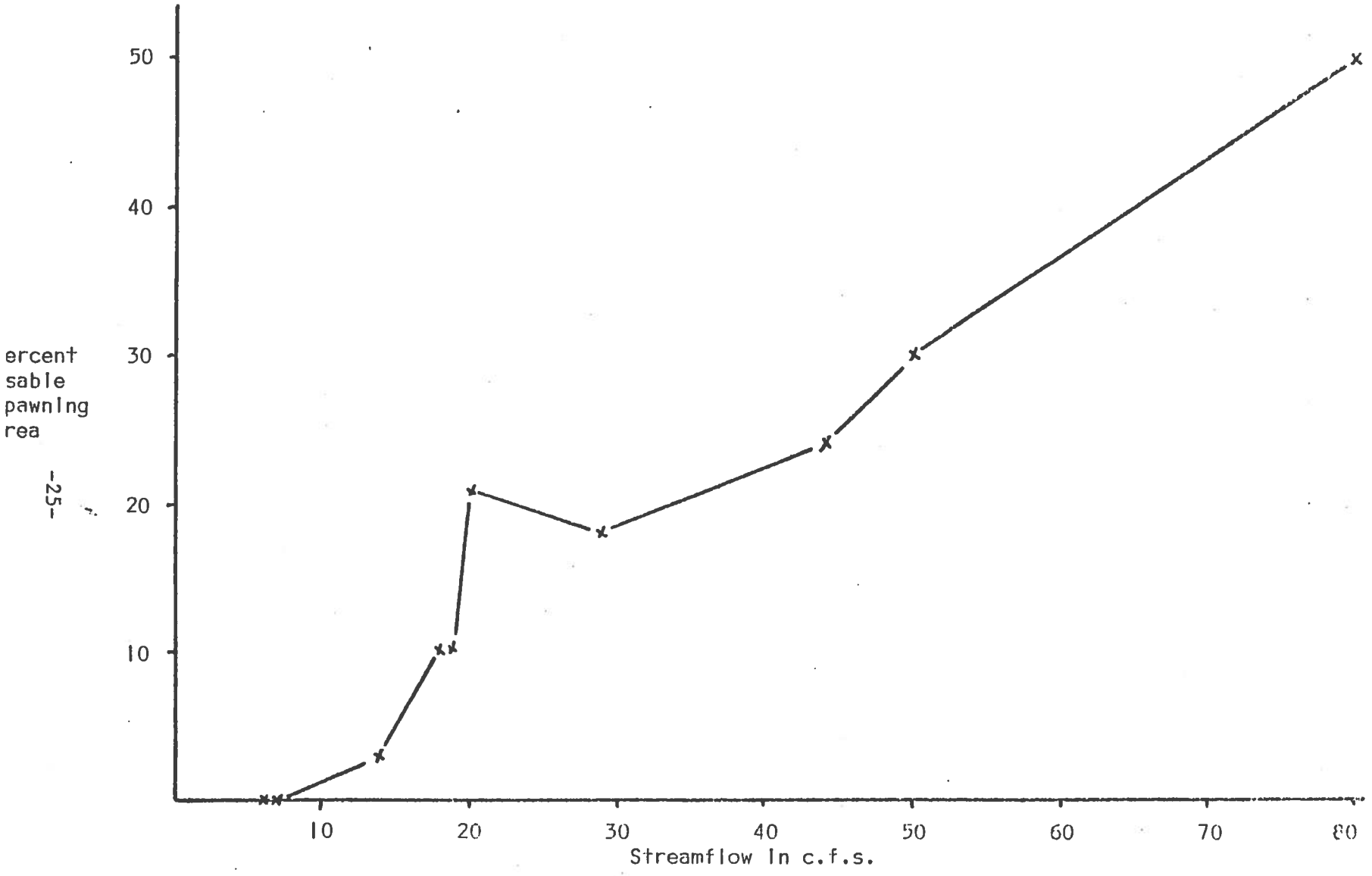


FIGURE 16 BRECKENRIDGE SPAWNING STATION 5-USABLE SPAWNING AREA RELATED TO STREAMFLOW.

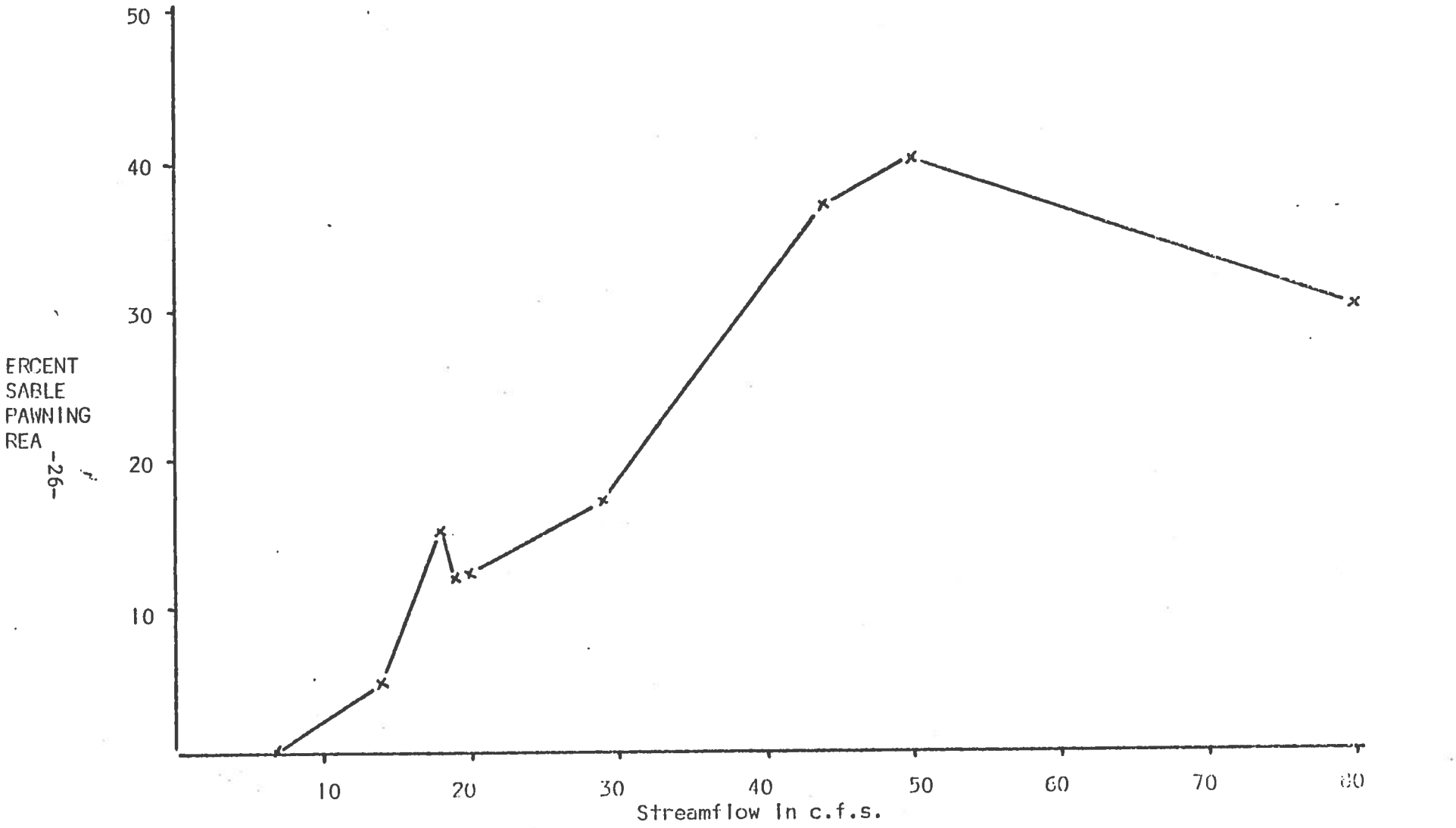


FIGURE 17 BRECKENRIDGE SPAWNING STATION 6-USABLE SPAWNING AREA RELATED TO STREAMFLOW.

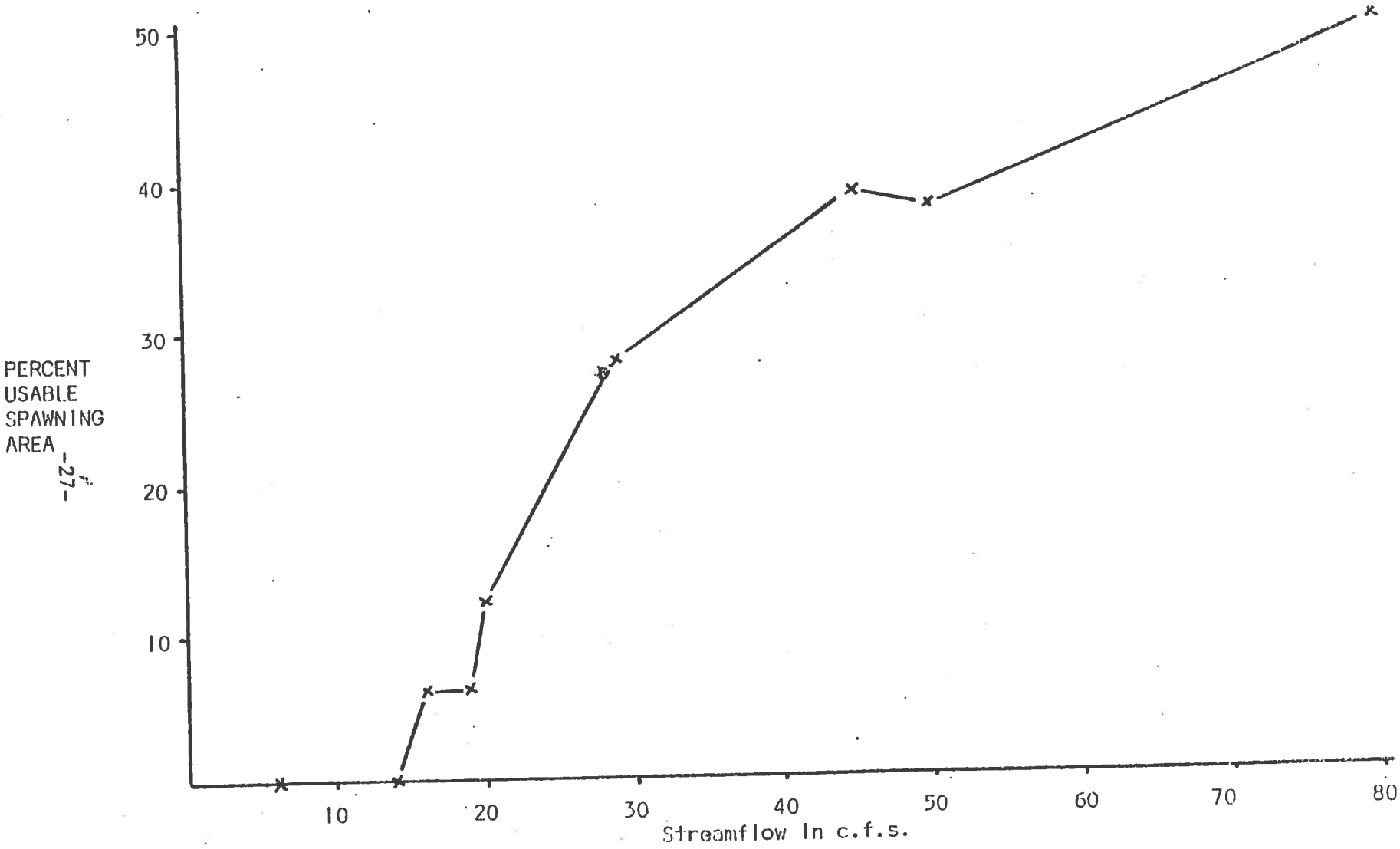


FIGURE 18 BRECKENRIDGE SPAWNING STATION 7-USABLE SPAWNING AREA RELATED TO STREAMFLOW.

Juvenile Loss

In addition to negative effects of this diversion on passage, spawning, and incubation of salmon eggs, losses of drifting and smolting spring chinook occur as a result of their being diverted into irrigated fields. Losses measured in one primary lateral ditch originating from the main diversion ditch were calculated at 12 juvenile chinook per day for July 1973 and 16 per day for August 1973. Assuming losses in this ditch are proportional to total flow of this diversion, and that losses are equal throughout the month, losses of young chinook resulting from the Breckenridge Diversion were calculated at 1440 per month for July and 1820 per month for August. Because of sample techniques, this is only a minimum estimate, and actual losses could be several times higher. It is expected that losses during the September and October irrigation season are several times higher, because low water temperatures generally stimulates downstream migration of young chinook. The extent of irrigation during this time depends on climatic conditions that affect the pastures growing season.

Temperatures

Flows entering the diversion reached a maximum of 64° on July 24 and maintained this maximum until August 13. However, irrigation waste water return flows maximum temperatures were between 70°F and 76°F during the period July 5 and August 13 (Figure 19).

At no time during summer 1973 did river temperatures reach levels detrimental or lethal to salmonoids (generally above 70°F) but did reach levels above those preferred by juvenile salmon (54° and 57°F) and juvenile rainbow trout (55° to 66°F), (Figure 20).

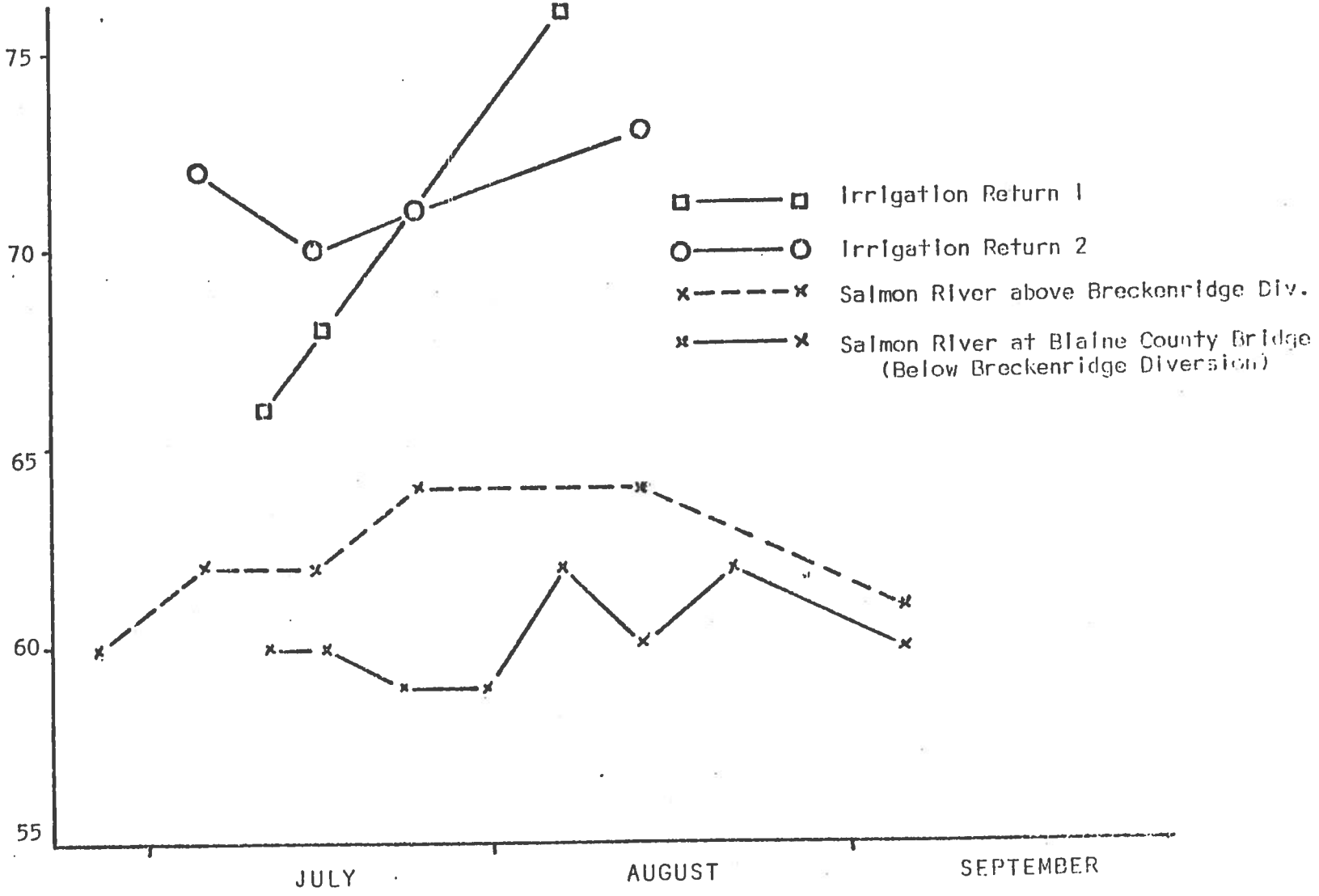


FIGURE 19 BRECKENRIDGE IRRIGATION RETURNS AND SALMON RIVER WATER TEMPERATURES AT BRECKENRIDGE RANCH DURING SUMMER, 1973.

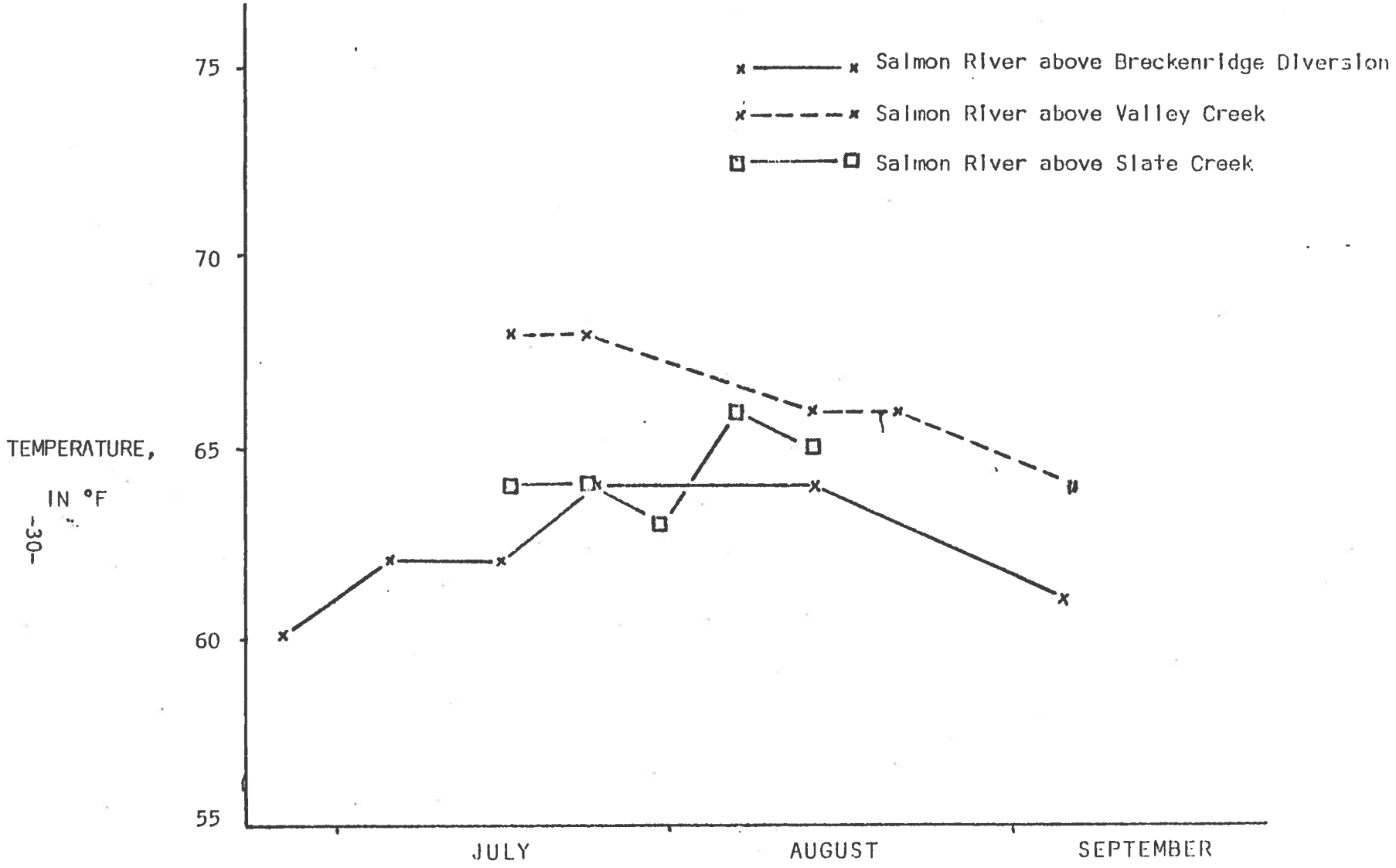


FIGURE 20 SALMON RIVER TEMPERATURES (°F) DURING SUMMER, 1973.

The results are not complete because many thermometers were periodically damaged, stolen, or were not always in water due to receding water levels.

B. Alturas Diversion

Located on Forest Service land (T7N, R14E, Sec. 4), this diversion is effective in stopping a considerable portion of the spring chinook run destined for upper Alturas Creek. It may also stop passage of summer chinook that may utilize these waters in a high water year. In addition, this structure may have been at least partially responsible for the disappearance of sockeye salmon which once migrated to Alturas Lake (Bjornn, et al., 1968).

Streamflows

In 1972, flows were measured approximately .5 miles below the diversion, and at the diversion. Records indicate 3 cfs (9/13/72) to 40 cfs (8/2/72) of water is diverted to irrigate (surface of subirrigate) approximately 500 acres of summer sheep pasture. Natural flows above the diversion during summer of 1972 ranged from 241 cfs to 26 cfs (Figure 21).

Minimum flow for passage of adult chinook was established at 52 cfs (Table 4), which if naturally available, should be maintained at least through August 25 (Figure 22). Altered flows below the diversion fell below this minimum sometime between July 2[illegible] and August 2, 1972 and about July 7, 1973. Natural flows above

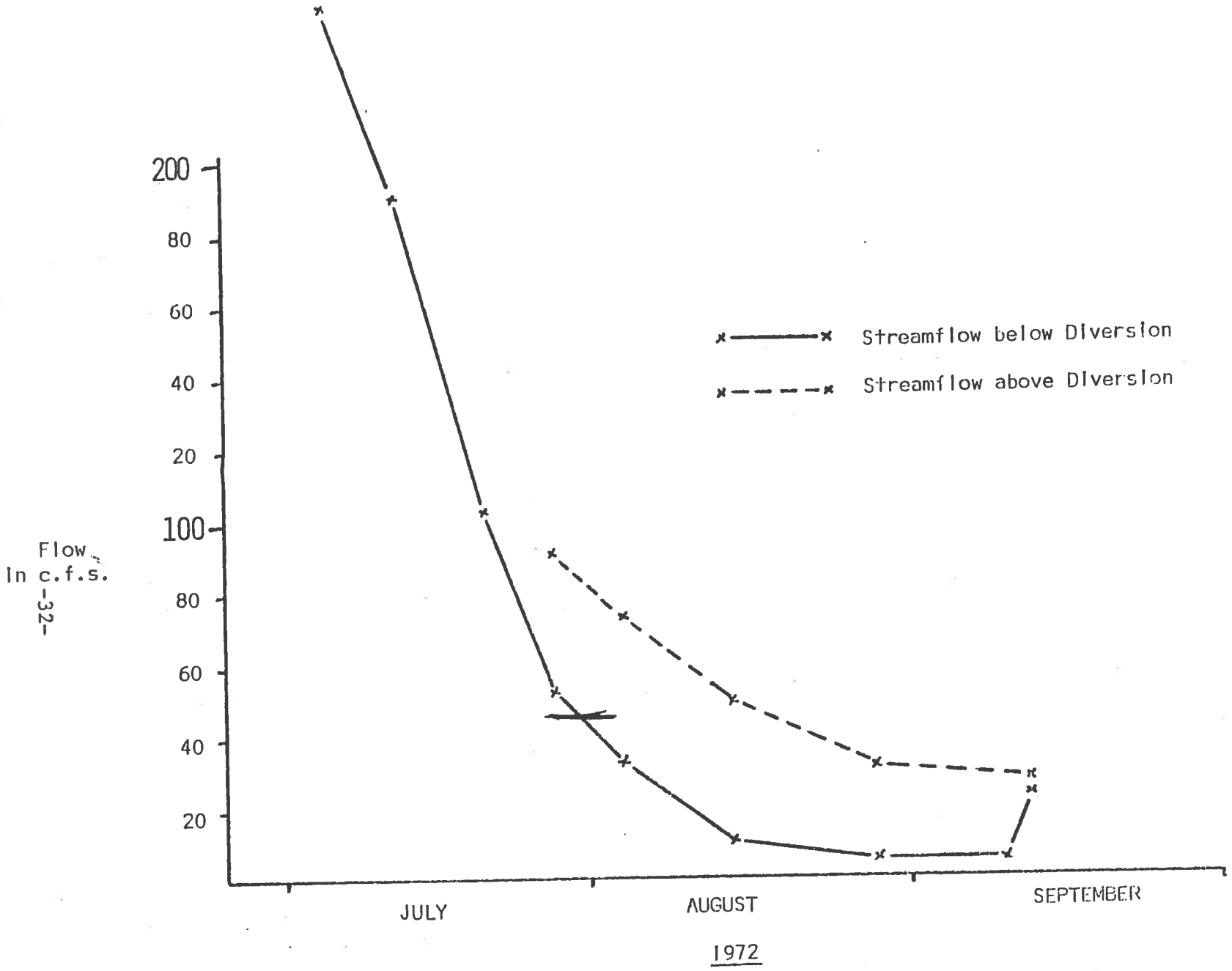


FIGURE 21 STREAMFLOWS OF ALTURAS CREEK ABOVE AND BELOW DIVERSION DURING SUMMER 1972.

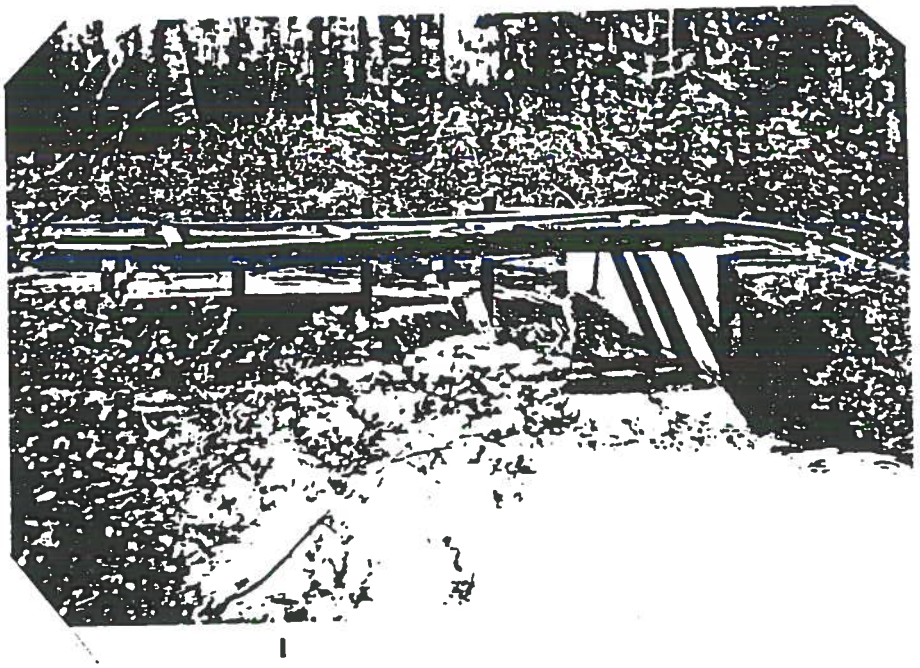


FIGURE 22 - ALTURAS DIVERSION WITH ONE SET OF SPLASH BOARDS OUT. A FLOW OF 52 CFS IS ADEQUATE PAST THIS DIVERSION.

FIGURE 23 - ALTURAS DIVERSION WHEN DIVERSION IS COMPLETELY CLOSED. STRANDED CHINOOK SALMON IS IN FOREGROUND.

TABLE 4

STREAMFLOWS AT CRITICAL RIFFLE (AP-1) BELOW ALTURAS DIVERSION AS RELATED TO PERCENTAGE OF USABLE STREAM WIDTH SUITABLE FOR SALMON PASSAGE.

FLOW	DATE	TOTAL WIDTH	WIDTH WETTED	WIDTH USABLE		LONGEST CONTINUOUS PORTION USABLE	PERCENT
				FEET	PERCENT		
266	7-6-72	68	68	48	70	34	50
190	7-12-72	68	65	41	60	34	50
180	6-19-73	68	68	34	50	34	50
105	7-20-72	68	67	20	29	20	29
81	6-26-73	68	66	20	29	20	29
53	7-5-73	68	66	6	10	6	10
52	7-27-72	68	66	14	21	14	21
33	8-2-72	68	65	0	0	0	0
28	7-15-73	68	36	3	4	3	4
23	9-12-72	68	34	3	4	3	4
13	7-23-73	68	29	3	4	3	4
10	8-14-72	68	25	0	0	0	0
8	7-30-73	68	24	0	0	0	0
6	8-28-72	68	26	0	0	0	0

the diversion met this minimum until approximately August 10, 1972 and July 23, 1973. Due to above normal flows during 1972, enough spring chinook passed Alturas diversion to complete 11 redds above the diversion, nine of which were above Alturas Lake. No redds were found above the diversion during 1973.

Because of an absence of spawning redds or extensive suitable spawning gravels immediately below the diversion no attempt was made to calculate minimum flows for spawning or rearing. Alturas diversion undoubtedly has detrimental effects on spawning success further downstream as a result of reduced flows; however, no attempt was made to quantify these effects.

Juvenile Loss

No juvenile chinook were found during sampling operations in ditches originating from this diversion in 1973. It is believed that the low escapement of adults upstream the year previously (9 redds) would result in such a low juvenile population that the chances of collecting a juvenile would be very low.

However, it was established that salmon smolts were diverted into pastures resulting from this diversion (Platts, 1968) and eventually perish, and it is also likely that some early fall downstream drift of pre-smolt spring chinook are diverted to fields. Sockeye smolting occurs in April and May which is before the irrigation season and therefore losses likely would not occur.

Temperature

Maximum temperatures were between 59°F and 71° for the period July 9 through September 5, 1973 at a sample station approximately 2.5 miles below Alturas Diversion (Figure 24).

C. Pole Creek Diversion

Little is known about anadromous stocks or potential salmon production in Pole Creek. Although there appears to be at least five miles of suitable spawning and rearing habitat upstream from the mouth, only one dead salmon and one old redd were found in 1972. According to some local residents, a few salmon have been observed in past years. This lack of a spawning population could be attributable to historic dewatering of the lower 2.5 miles of stream, which may have eliminated this stock. Seven diversions (Figure 25) are located within the lower three miles of stream (T7N, R14E, Secs. 26, 35, 36) to irrigate about 200 acres of private land belonging to the Salmon Falls Sheep Company and about 70 acres of Bureau of Land Management lands.

Streamflows

During 1972 flows were measured at the upper four diversions, plus at a station between the second and third diversion, and at another station approximately .25 miles upstream from the mouth. Flows in Pole Creek above all diversions varied from 88 cfs (7/20/72) to 45 cfs (9/12/72) while flows near the mouth during the same period varied from 15 cfs (7/20/72 to less than 1 cfs (8/14/72 and 9/12/72) (Figure 26). Minimum flow required for passage through the lower

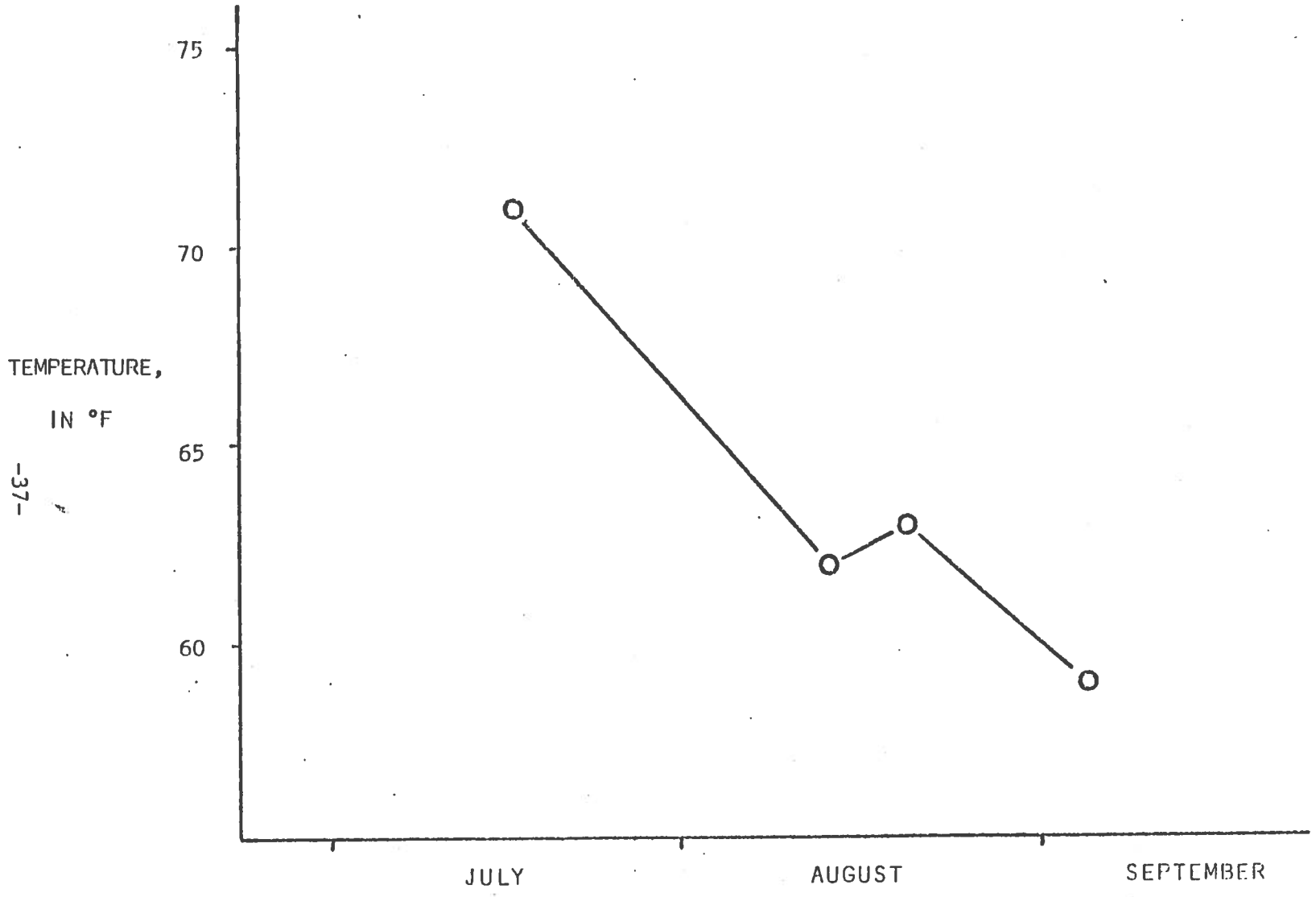


FIGURE 24 ALTURAS CREEK TEMPERATURES (°F) NEAR PETTIT LAKE ROAD DURING SUMMER, 1973.

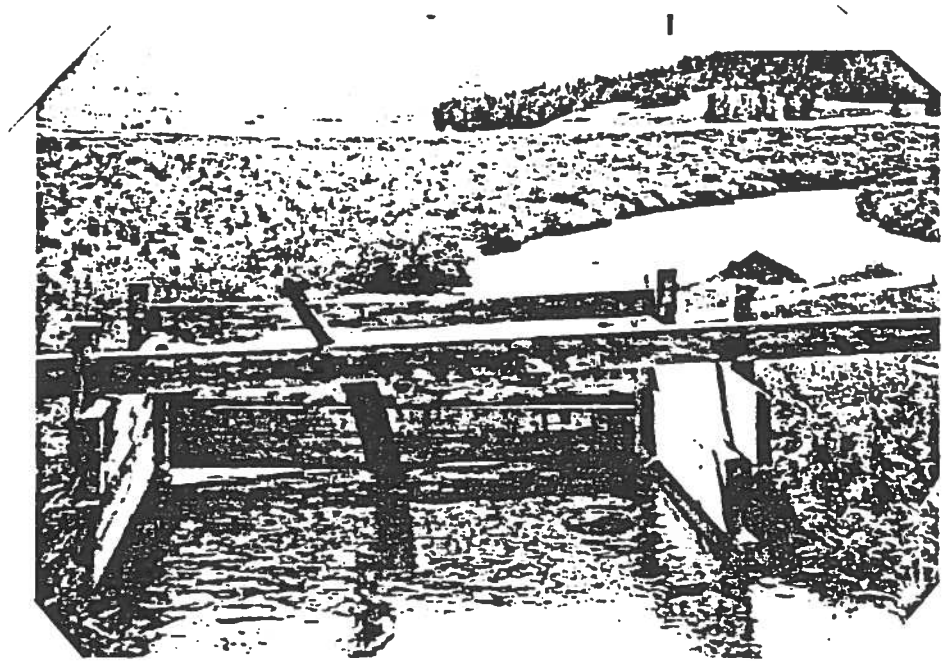
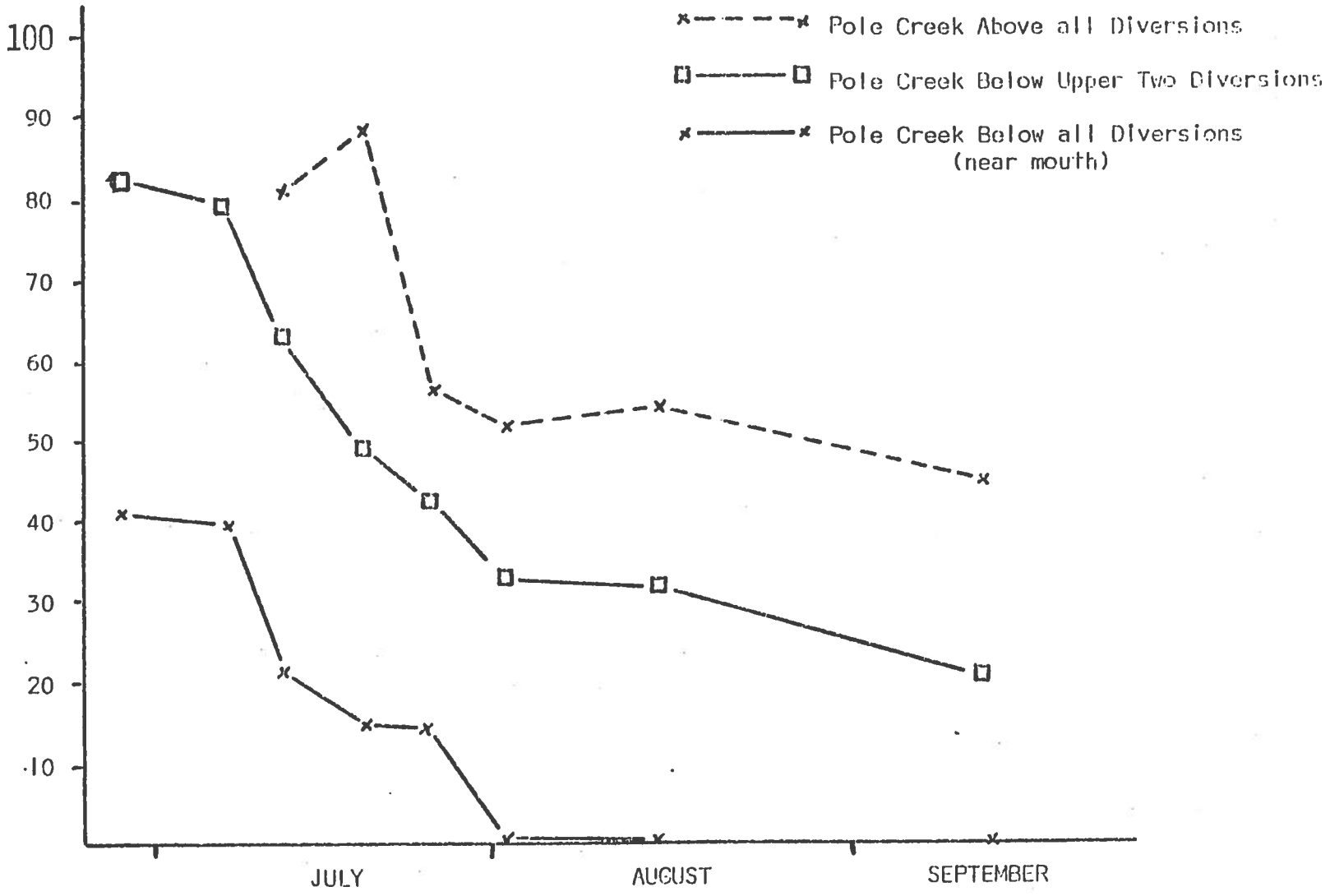


FIGURE 25 - ONE OF SEVEN DIVERSIONS ON POLE CREEK THAT LEAVES THE MOUTH OF THIS STREAM DRY DURING SUMMER.



STREAMFLOWS

FIGURE 26 POLE CREEK ABOVE AND BELOW DIVERSIONS DURING SUMMER 1972.

three miles was established at 42 cfs which was met all during the 1972 season by natural flows above all diversions, but flows near the mouth were insufficient for passage after about 7/7/72. This early reduction in flow probably precluded any potential movement into Pole Creek by salmon. No attempt was made to establish minimum spawning and rearing flows.

During 1973 flows above all diversions stabilized at about 20 cfs (Figure 27). However, at the mouth of Pole Creek, the stream had been reduced to flows less than 1 cfs from June 15 through at least mid-September. No salmon were observed in Pole Creek in 1973.

D. Champion Creek Diversions

It is likely that spring chinook could utilize the lower two or three miles of Champion Creek if sufficient waters were present to permit passage and facilitate spawning and rearing. However, complete dewatering of the lower portion of this stream occurs annually as a result of seven diversions (T8N, R14E, Sec. 14, 15, 17, 22, and 23) used to irrigate approximately 435 acres owned by three landowners.

Streamflows

During 1972, flows were measured at a station immediately above the upper diversion, plus flows of the upper three diversions, and at a station near the mouth of Champion Creek. Flows measured upstream from diversions between July 25 to September 8, 1972 varied from 38 to 18 cfs, while flows below all diversions varied from 4 to 9 cfs. (Figure 28). No minimum passage or spawning flows were calculated.

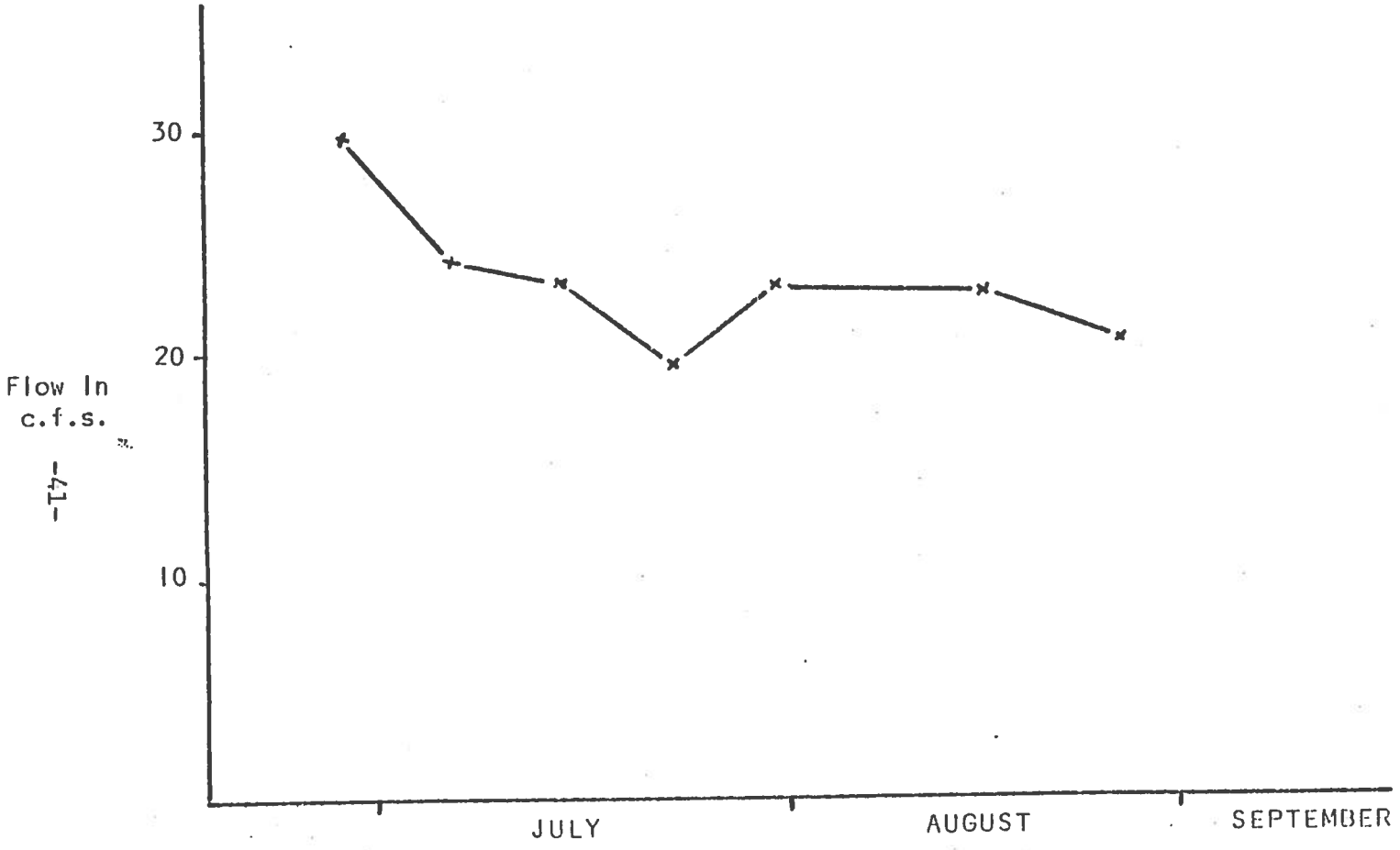


FIGURE 27 POLE CREEK STREAMFLOW ABOVE ALL DIVERSIONS DURING SUMMER, 1973.

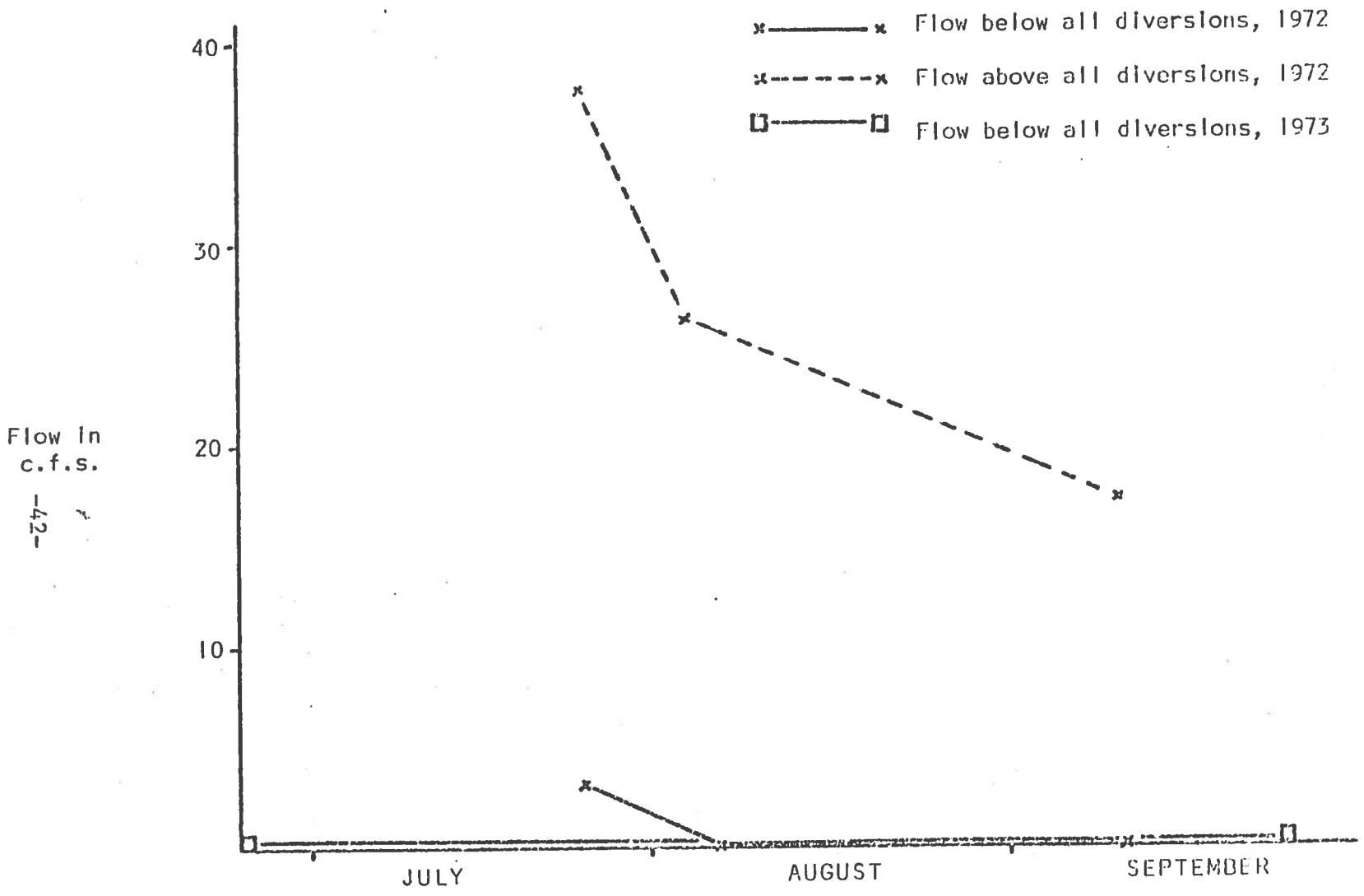


FIGURE 28 STREAMFLOWS OF CHAMPION CREEK ABOVE AND BELOW DIVERSIONS, 1972 AND 1973.

It was obvious, however, that existing flows downstream from the upper diversions were insufficient for either spawning or passage during any time of the summer investigation. During 1973, summer flows above all diversions were from 15.6 (July 13) to 11.0 cfs (September 5) (Figure 29). Below all diversions the stream was totally dry after June 15 (Figure 30).

E. Fourth of July Creek

This stream historically was an important Dolly Varden spawning stream. At least a remnant run remains. The three diversions located on the stream are capable of diverting the entire summer streamflow, which collects water from an 18.5 sq. mile drainage.

Water for the fishery is most important during the month of August, when Dolly Varden are migrating out of the Salmon River into tributary streams to spawn.

Streamflows

Figure 31 indicates discharge during 1972 above all diversions was in excess of 30 cfs during August, while flows below diversions dropped to about 10 cfs. During 1973, flows above diversions dropped to 10 cfs in August and 6 cfs. in September. Below diversions, flow was reduced to zero.

To insure passage of Dolly Varden, flows should be maintained at 15 cfs when natural flows of this magnitude are available (Table 5). This flow is required on the assumption of .6 foot of water over 25% of the streamwidth as necessary for passage (Thompson, 1972).

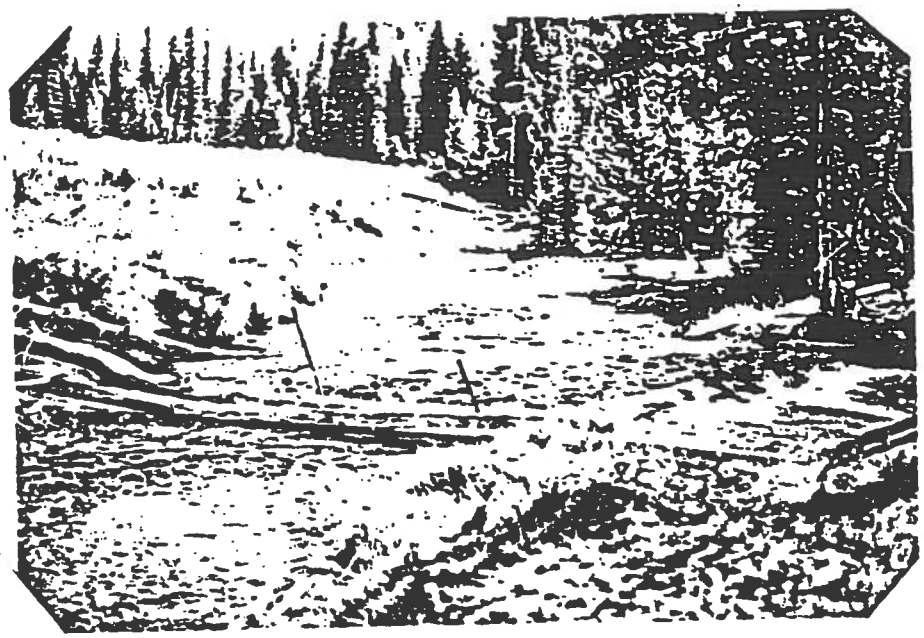


FIGURE 29 - STREAMFLOW ABOVE ALL CHAMPION CREEK DIVERSIONS. UNALTERED BASE FLOWS WERE 18 CFS IN 1972 AND 11 CFS IN 1973.

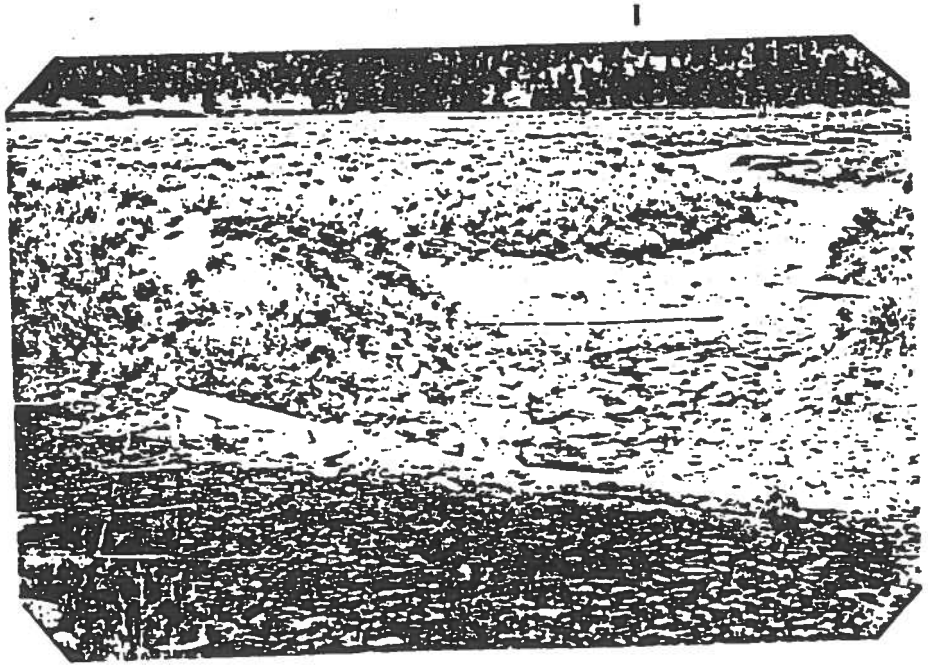


FIGURE 30 - CHAMPION CREEK AT LOWEST DIVERSION. CHANNEL WAS TOTALLY DRY AFTER JUNE 15 DURING 1972.

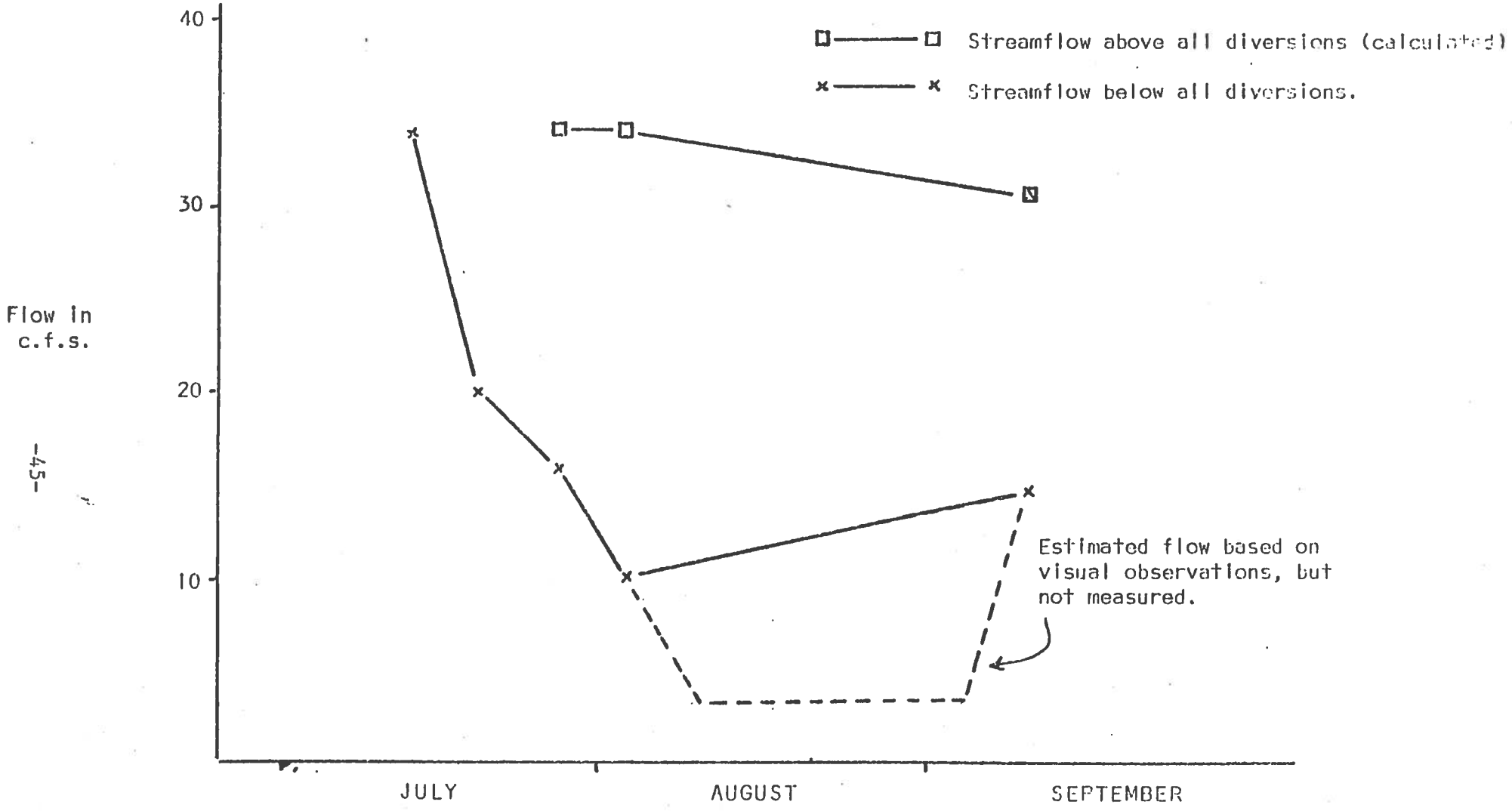


FIGURE 31 FOURTH OF JULY CREEK ABOVE AND BELOW DIVERSIONS DURING SUMMER 1972.

TABLE 5

Fourth of July Creek Streamflows at Critical Riffle Below all Diversions as Related to Percentage of Usable Stream Width Suitable for Large Trout Passage.

FLOW	DATE	TOTAL WIDTH	WIDTH WETTED	WIDTH USABLE		LONGEST CONTINUOUS PORTION USABLE	PERCENT
				FEET	PERCENT		
34	7-13-72	27	27	19	70	11	30
16	7-27-72	27	26	10	40	8	28
15	9-8-72	27	25	8	28	8	28
10	8-3-72	27	24	0	0	0	0

F. Smiley Creek Airport Diversion

Two small diversions located south of the Smiley Creek Airport (T7N, R14E, Sec. 26) divert water from the Salmon River. The waters are used to irrigate lands utilized as an airport for the Smiley Creek area.

Streamflows

During 1972, flows were measured from 5/30/72 to 8/14/72 at the two diversions and the Salmon River approximately 150 yards below the diversions. Flows in the river below the diversions during this period ranged from 101 cfs. (6/30/72) to 16 cfs (8/17/72) and combined flows of both diversions ranged from 1.5 cfs (8/1/72) to 5 cfs (7/12/72) (Figure 32).

Minimum flows for passage was established at 33 cfs. This flow does provide the minimum depth recommended (.8 foot) for only over 11 percent of the stream width, instead of the recommended 25 percent. However, because the transect is located at the upper reaches of the salmon spawning area and because the natural flow of the size of flows present represent near natural flows, that larger minimum flow may not be justified.

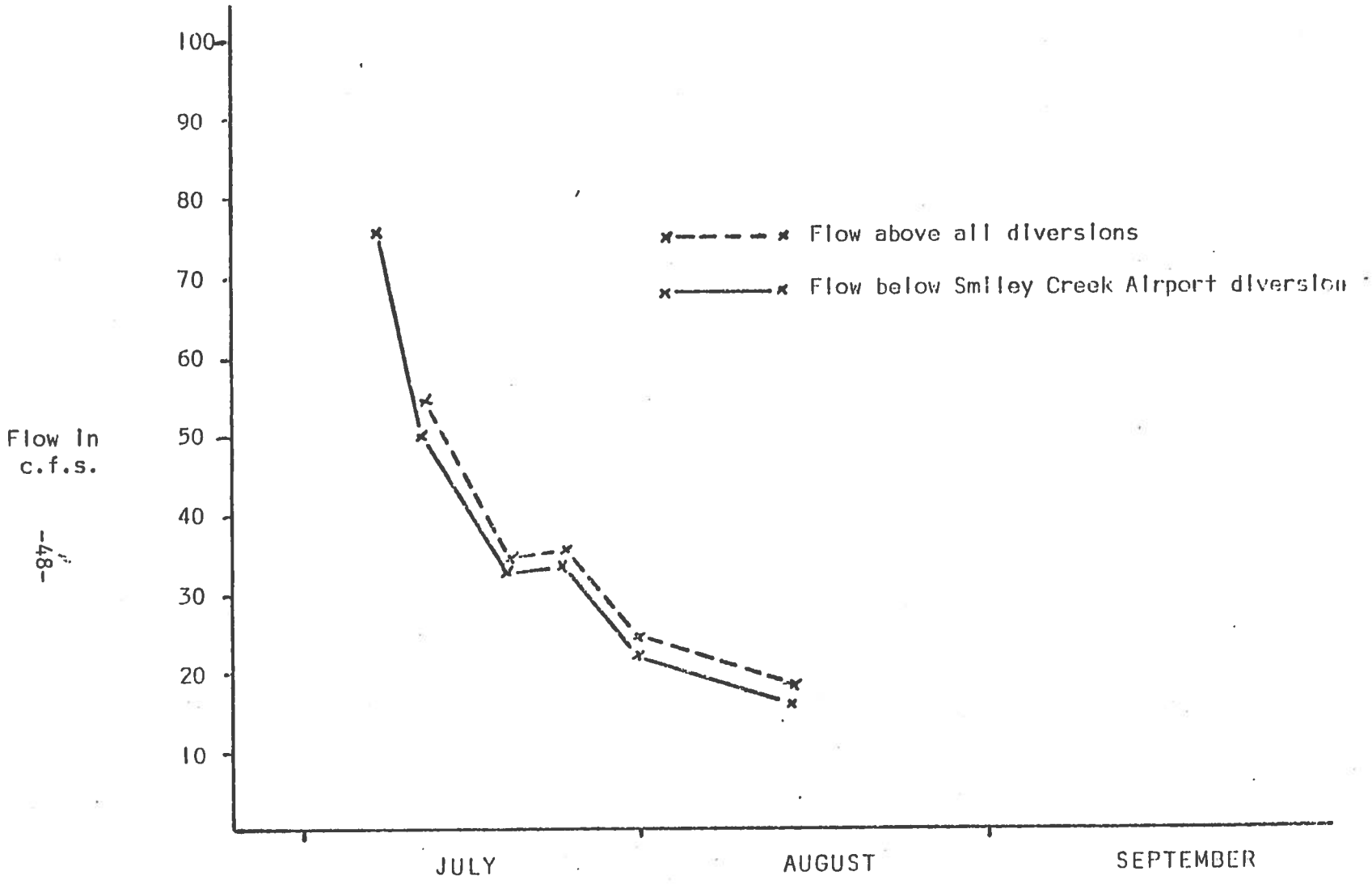


FIGURE 32 - SALMON RIVER STREAMFLOWS ABOVE AND BELOW SMILEY CREEK AIRPORT DIVERSIONS, 1972

C. Valley Creek

Valley Creek is a stream heavily used by spawning spring and summer chinook as well as one of the SNRA's more heavily used steelhead streams. Portions of Valley Creek and its tributaries are partially or wholly dewatered during the peak irrigation season. Six diversions exist on the main stream and six of its major tributary streams have one or more diversions (Table 6).

Diversions on the main stem originate on land belonging to D.J. Mahoney, Jr., Sawtooth Properties, Inc., and the Forest Service (two diversions).

Streamflows

Only scanty flow data was collected. However, it was noted that flows below the lowest diversion on Forest Service land was not passing sufficient water for salmon passage in late July and early August. Flows at this point were only 2-3 cfs. It appears that, at least during 1973, that irrigation diversions were inhibiting passage of late moving salmon.

Juvenile Loss

There are six diversions on Valley Creek proper. Flows measured on 7/20/73 ranged from 16 cfs. in the upper diversion to 3.5 cfs. in the smallest diversion.

The one diversion sampled for juvenile loss is located on land belonging to Sawtooth Properties, Inc. (T11N, R12E, Sec. 11). Flow was measured at 3-4 cfs. Data gathered indicates at this diversion there is a minimum loss of 1020 chinook for July and 2070 chinook for August. Fall losses are considered to be several times higher.

TABLE 6

Locations of Irrigation Diversions on Salmon River and Major Tributaries Within Sawtooth National Recreation Area

STREAM	NO. OF DIVERSIONS
Alturas Creek	1
Beaver Creek	2
Big Casino Creek	1
Burnt Creek	1
Champion Creek	7
Elk Creek	1
Fisher Creek	1
Fourth of July Creek	3
Gardner Creek	2
Gold Creek	1
Peach Creek	2
Pole Creek	7
Salmon River (above Alturas Creek)	6
Salmon River (below Alturas Creek)	5
Slate Creek	2
Smiley Creek	1
Thompson Creek	2
Valley Creek Proper	7
Anderson Creek	1
Crooked Creek	2
Elk Creek	1
Goat Creek	2
Iron Creek	2
Meadow Creek (near Stanley)	3
Tennell Creek	1
Trap Creek	1
Warm Springs Creek	1
Williams Creek	4
TOTAL	68

DISCUSSION

The flows recommended are based on biological needs of fish species that are presently being managed. There are other aspects of the aquatic environment that are affected, as well as other recreation and aesthetic values. It is certain that benefits would accrue to these other values by establishing the flows recommended.

In addition, flows recommended would significantly improve the aesthetics and recreation opportunities downstream from the immediate site. Float-boating is one of the recreation opportunities that would be enhanced by establishing the recommended resource maintenance flows upstream.

Breckenridge Diversion

This diversion partially inhibits salmon migration to about twenty one miles of ancestral spawning habitat. Depending on down-river conditions these fish move into the upper Salmon River from mid-June to through late August. If a heavy late runoff occurs, as in 1972, the diversion does not begin to block passage until about August 1. When low runoff occurs, as occured in 1973, blockage begins about the first of July. Depending on the timing of returning adults, the effect on upstream movement of adults is variable, but blockage undoubtedly occurs to some extent each year. The suggested passage flow of about 44 cfs should therefore be maintained from mid-June through late August, to insure uninterrupted passage of the total adult population.

Spawning in the area begins as early as August 1, and is continued through early September. Variability in spawning sites is reflected by optimum spawning flows for each site. However, it appears that a spawning flow

greater than 40-50 cfs through the spawning season at this site would not result in substantial gains in spawning habitat. Flows less than 40-50 cfs result in substantially reduced spawning area.

Incubation occurs as soon as the eggs are deposited, which would occur in the area between mid-July through early September, and continue into December when the eggs hatch. The alevins then remain in the gravel until February or March. Incubation success is at least, in part, dependent on oxygen availability and exchange of waste material. Both factors are related to sufficient intragravel water flow which is related to streamflow. Any substantial reduction would not only dry up a portion of the gravels, but would reduce the hydralic head at the redd and therefore reduce intragravel flows. Flows should therefore be as close to the natural unaltered flow as possible during this period.

Rearing space is as important, if not more important, to juvenile chinook production as any other factor. Smolt production is often directly related to amount of rearing space. Flows have not been determined for optimum rearing space, but it is thought that flows recommended for other life history periods would provide near-natural flows for rearing.

Alturas Diversions

This diversion not only affects sockeye and chinook production, but also lowers values for the resident fishery, which is in high demand from visitors in the Pettit Lake area.

A passage flow of 52 cfs should be maintained from mid-June through late August, which would accommodate both sockeye and chinook adult passage. A September flow only slightly lower (perhaps 40 cfs) should be maintained to

accommodate downstream spawning which occurs primarily from Pettit Lake bridge downstream. From October to June there is little or no demand for irrigation, and therefore maintenance of natural flows would appear to have little or no conflict with other water uses.

Pole Creek Diversions

Because these diversions are located above other damaging diversions, providing the recommended flows would help provide adequate flows needed at lower diversions.

In addition, the use of Pole Creek water is one of the least efficient in Sawtooth Valley. Assuming an average flow of 25 cfs and an 80 day irrigation season, irrigation water is currently being applied to lands at 14 acre feet annually. In other parts of Idaho with different drainage, land can be adequately irrigated with 3 to 4 acre feet.

Providing the recommended flows would provide good habitat for many resident species, including Dolly Varden spawning. In addition, the excellent stream habitat potential of this stream could provide some of the better anadromous spawning and rearing habitat in the Valley.

Champion Creek

No recommended flows have been calculated, and such determination should have high priority. Based on natural flows, it is expected that the recommended minimum flow would be at least 18 cfs from June through September. If anadromous stocks were reestablished, it would be expected that a higher flow would be needed from mid-June through late July if available.

A resource protection maintenance flow in this stream would result in an enhanced resident fishery, particularly Dolly Varden in the main Salmon River.

Fourth of July Creek

The recommended resource maintenance flow of 15 cfs could partially be obtained by discontinuing irrigation of the horse pasture at Sawtooth Valley Work Center. In addition, the recent slump on the bench above Sandy Brooks' ranch, as well as the past ditch blowouts, is indication that irrigation of these lands can cause resource damage.

The flows recommended could insure a healthy recruitment of Dolly Varden to the Salmon River resident fishery. Oldtimers recall these fish were common, and ranged from one to three pounds.

Valley Creek

Because data regarding Valley Creek diversions is scanty, obtaining additional data should receive high priority. During an above water year, adult passage is probably nearly sufficient. However, juvenile losses are extremely high. Juveniles of both spring and summer chinook, as well as steelhead are affected.

Diversion of many of the east side streams, such as Hanna and Thompson Creeks, is almost total, and results in elimination of these streams for even rearing habitat. One stream, Trap Creek, is diverted to be used to irrigate Forest Service lands under special use permits (Figure 33-34). Elk Creek is also diverted.

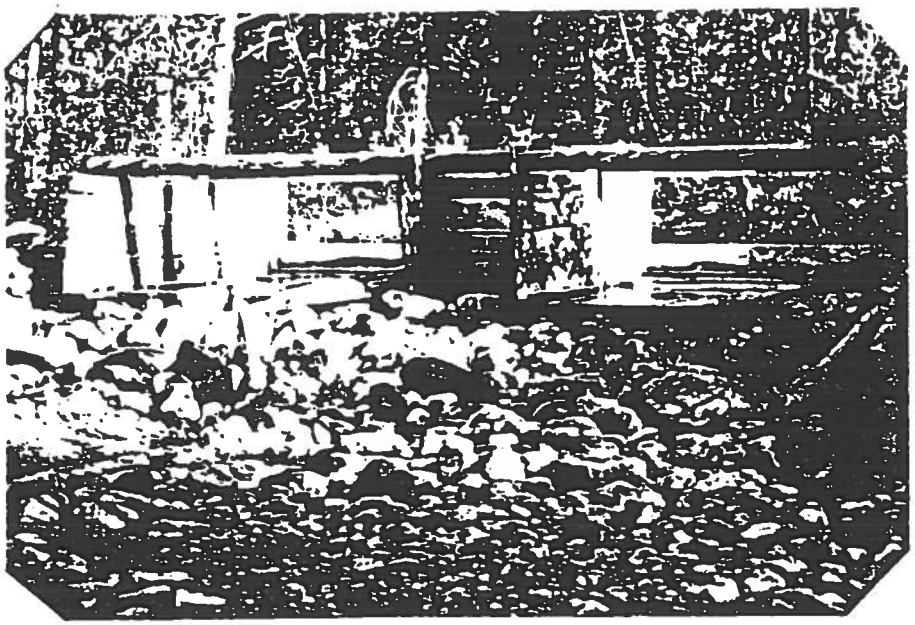


FIGURE 33 - TRAP CREEK DIVERSION LOCATED ON FOREST SERVICE LAND UNDER SPECIAL USE PERMIT.

FIGURE 34 - FOREST SERVICE LAND NEAR BLIND SUMMIT IRRIGATED UNDER SPECIAL USE PERMIT BY TRAP CREEK WATER.

Diversions on Valley Creek are often quite crude (Figure 35). Gravel or rock dams are thrown completely across the stream and although some water seeps through, juveniles do not pass through and probably most of the juveniles are diverted (Figure 36-37).

FIGURE 35 - ONE OF SIX DIVERSIONS ON VALLEY CREEK. CRUDE CONSTRUCTION ALLOWS SOME WATER TO PASS, BUT GUIDES FISH INTO UNSCREENED DITCHES.

FIGURE 36 - DEAD JUVENILE CHINOOK IN IRRIGATED FIELDS. SUCH CHINOOK SALMON AND STEELHEAD BECOME TRAPPED AND EVENTUALLY PERISH.

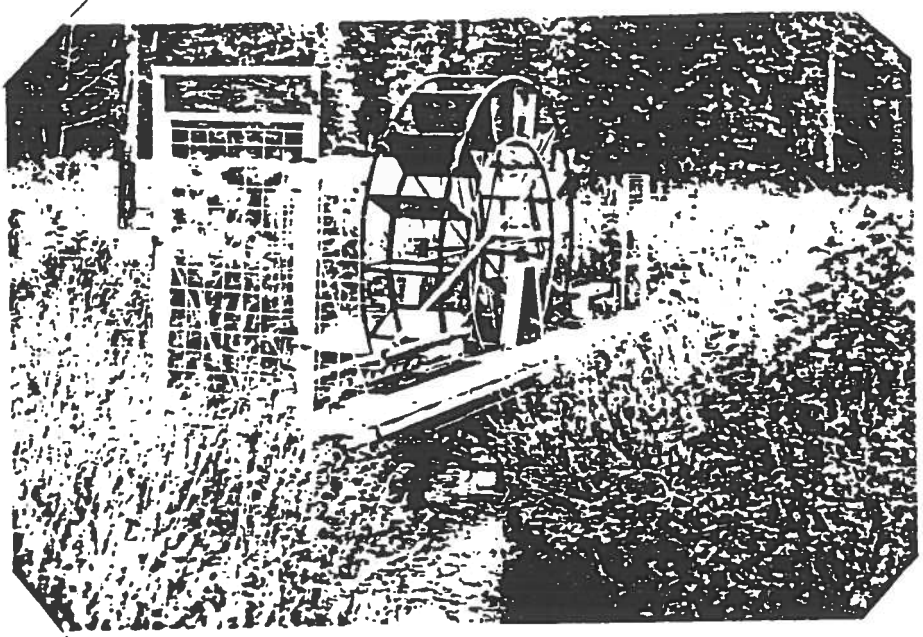


FIGURE 37 - SELF-CLEANING SCREENS CAN VIRTUALLY ELIMINATE JUVENILE CHINOOK AND STEELHEAD BECOMING DIVERTED INTO IRRIGATION DITCHES.

ALTERNATIVES FOR HABITAT ENHANCEMENT

At present, modification of irrigation practices within Sawtooth Valley could provide greater benefits to the fishery resource than any other project. It is assumed that correction of passage and nitrogen super-saturation problems on the Columbia and lower Snake River will permit greater anadromous fishery escapements upstream. When that occurs, availability of spawning and rearing space will become increasingly important.

It is recognized that any alternatives requiring modification of existing irrigation practices could have an adverse impact on the agricultural economy of the valley, the magnitude depending on the option chosen, and how it was implemented. However, it is believed that, in many cases, more judicious use of water would lessen the impact of irrigation on the fishery resource without reducing the agricultural output or economy of Sawtooth Valley. On some lands this may require structural improvement, while on others such things as better timing and seasons of use or reducing waste water could also be beneficial in reducing adverse fishery impacts.

The following are a full spectrum of alternatives that, if implemented, would restore and/or improve salmon habitat to varying degrees. Combinations or modifications of these alternatives are possible, and some are more practical and consistent with P. L. 92-400 than others.

Alternative 1:

Construct water storage reservoir on SNRA above all points of diversion.

Release waters to insure minimum flow during irrigation season. Install screening devices and fishways where needed.

Advantages:

A. More even flow regime of Salmon River.

B. Insures adequate flows in all years.

C. Helps age water, increasing productivity.

D. Permits landowner to continue present utilization of water.

Disadvantages:

A. High initial cost.

B. May not be acceptable alternative with regard to storage structures within NRA.

C. Maintenance requirement of dam, screening device and fishway.

D. Does not permit other recreation uses of river.

E. Loss of esthetics after drawdown of reservoir.

Alternative 2:

Establish wells near existing point of diversion. Allow owner of present diversion to continue to divert water. Install screening device for smolts and fishway around diversion for upstream imigrants. Operate wells only during inadequate flows.

Advantages:

A. Retains private ownership of lands.

B. Lower initial cost than Alternative 6 and possibly Alternative 5.

Disadvantages:

A. Requires well, screen, and fishway maintenance by Forest Service.

B. Does not provide for unhampered recreational floating.

C. May adversely affect water table of surrounding lands.

D. Requires gradual conditioning of fish during start and termination of well operation to avoid thermal shock.

Alternative 3:

Buy less than minimum water flow. Channel stream from diversion to area of adequate recharge points capable of sustaining fish life. Install fishway and screen.

Advantages:

A. Lower initial cost than Alternatives 5 and 6.

B. Would permit landowners to use water in much the same procedure as present.

Disadvantages:

A. Channel alteration would probably require annual alteration and repair.

B. Loss of spawning gravels and rearing areas below diversion.

C. Esthetically least acceptable.

D. Would not permit other uses of river, e.g., canoeing.

E. High maintenance costs of maintaining fishway, screen, and channel.

F. Channel alteration destructive to river below alteration.

G. Loss of resident fishery in altered area.

Alternative 4:

Install screening devices. Do not alter existing water use pattern.

Advantages:

A. Low initial cost.

Disadvantages:

A. Dependent on above average water years to provide sufficient passage past diversion for adults.

B. Requires screen maintenance by Forest Service

C. Some years (Following low water years) screening device would serve little purpose because there would be no juveniles upstream.

D. Production would vary widely from year to year, developing difficulty in management (ie., whether to manage upstream areas for resident or anadromous fish stocks).

E. Allows continued deteriorated conditions downstream and for spawning and rearing.

F. Allows possible damage to summer fish stocks downstream because of low flows.

Alternative 5:

Buy only enough water to permit passage, spawning, and rearing. Permit owner to divert all but resource protection maintenance flow. Screen diversion ditches.

Advantages:

A. Lower initial cost than Alternative 6.

B. Would permit escapement and would provide more rearing and spawning waters than at present.

Disadvantages:

A. Would necessitate installation of some screening and passage devices.

B. Owner would have undependable source of water in low water years. Landowner may need supplemental ground water for these periods.

C. Would not provide as much rearing or spawning space than Alternative 6. Theoretical production would be lower than Alternative 6.

D. Screening devices and fishways would need maintenance by Forest Service.

E. Resource protection flows could be diverted by others under present Idaho laws.

Alternative 6:

Buy complete water rights from landowners. Leave all water in stream. Develop ground water resources. Remove diversion dams.

Advantages:

A. No cost for screening or fishways.

B. Maximum natural flows to provide rearing, spawning and incubation for anadromous stocks.

C. Temperature benefits for summer chinook off site as a result of volumes of water and reduced overland flows returning to stream.

D. No maintenance.

E. Permit other forms of recreation (e.g., kayaking).

F. Aesthetically natural and pleasing.

Disadvantages:

A. High initial cost.

B. With existing water laws, water would likely be diverted elsewhere.

RECOMMENDATIONS

1. Acquire water rights on Pole Creek. At present 20 cfs. or more are used to irrigate only 270 acres of summer pasture. Acquiring water would provide almost half of needs for minimum passage at Breckenridge diversion as well as open approximately 5 miles of Pole Creek to salmon and Dolly Varden spawning.

2. Actively seek and support resource protection maintenance stream flow and anti-dam legislation as well as legislation giving fisheries beneficial use of water status. Such legislation would minimize further degradation to streams as well as strengthen safety of acquired water to refiling.

3. Acquire sufficient water rights to assure stream resource maintenance flows of 40 to 50 cfs past Breckenridge diversion. This flow is necessary for salmon passage after June 1.

4. Reject any new special use applications regarding diversion of water on the Salmon River or tributaries above the mouth of Alturas Creek such as transmission ditches, diversions, etc.

5. Eliminate irrigation of any federal lands which require reducing flows below stream resource maintenance flows levels. This includes all irrigated BLM lands and Forest Service lands such as the Fourth of July horse pasture and Blind Summit meadow irrigated by Trap Creek.

6. Establish resource maintenance flows on Champion Creek (12+ cfs) and Fourth of July Creek (15 cfs), as anadromous rearing habitat, water supply to main Salmon River, and to restore Dolly Varden fishery to Salmon River.

7. Acquire minimum flow of 52 cfs for Alturas Creek at the present diversion to accommodate present chinook passage, plus restore sockeye salmon and Dolly Varden runs to Alturas Lake and Alturas Creek.

8. On lands where resource protection maintenance flows must be acquired, either cooperate with landowners to develop an alternative method of irrigation (such as wells or sprinklers) or if this is not feasible, then acquire such lands in fee. Priority should be given to headwater streams and those streams used for both spawning and rearing.

9. Complete acquisition of fish screening easements on all irrigation diversions in the Salmon River drainage. Seek funding and for initiate screening projects.

10. Acquire resource maintenance flows on the following streams utilized for salmon rearing and possible cutthroat spawning-rearing that are presently entirely diverted: Gardner Creek, Peach Creek, Williams Creek, Gold Creek, Thompson Creek, Hanna Creek. On most of these streams, resource maintenance flows would only be 1-3 cfs.

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TABLE 7

STREAMFLOWS OF MAIN SALMON RIVER AND DIRECT TRIBUTARIES WITHIN THE SAWTOOTH NATIONAL RECREATION AREA, 1973.

STREAM	FLOW IN c.f.s. JULY 13-16, 1973	SEPTEMBER 5-6, 1973
Badger Creek	Estimated 1.0	dry
Basin Creek	13.4	3.2
Beaver Creek	13.4	3.2
Big Casino Creek	5.5	3.4
Blind Creek	Estimated 2.0	-
Burnt Creek	dry	dry
Champion Creek	15.6	11.0
Copper Creek	dry	dry
Deer Springs	Estimated 1.0	1.0 (Estimated)
Elk Creek	Estimated 4.0	2.0 (Estimated)
Elkhorn Creek	Estimated 1.0	1.0 (Estimated)
Fisher Creek	6.5	3.9
Fourth of July Creek	11.5	6.1
Frenchman Creek	6.5	3.4
Gardner Creek	Estimated 1.0	1.0 (Estimated)
Gold Creek	Estimated 1.0	1.0 (Estimated)
Hell-roaring Creek	26.2	12.3
Huckleberry Creek	17.7	9.2
Joes Gulch	Estimated 1.0	1.0 (Estimated)
Little Casino Creek	5.5	2.4
Lost Creek	Estimated 1.0*	1.0*(Estimated)
Lower Hardin Creek	Estimated 1.0	1.0 (Estimated)
Lynch Creek	dry	dry
Marshall Creek	dry	dry
Mays Creek	Estimated 5.0	3.0 (Estimated)
Muley Creek	Estimated 1.0	1.0 (Estimated)
Nip and Tuck	Estimated 1.0	1.0 (Estimated)
Peach Creek	Estimated 2.0	1.0 (Estimated)
Pettit Lake Creek	20.0	2.0
Pole Creek	--	-
Redfish Lake Creek	117.3	40.1
Rough Creek	Estimated 10.0	5.0 (Estimated)
Salmon River (above Frenchman Creek)	15.5	6.4
Salmon River (above Redfish Creek)	266.1	174.3
Slate Creek	25.1	13.9

*Flow may have been altered by diversions upstream from point of observation.

(Continued--)

TABLE 7 Continued

STREAM	FLOW IN c.f.s. JULY 13-16, 1973	SEPTEMBER 5-6, 1973
Smiley Creek	10.6	1.9
Thompson Creek	Estimated 3.0*	1.0* (Estimated)
Upper Hardin Creek	Estimated 3.0	1.0 (Estimated)
Valley Creek	128.5*	66.8* (Estimated)
Vat Creek	Estimated 3.0	1.0 (Estimated)
Warm Springs Creek	70.9	43.8
Williams Creek	Estimated 4.0	2.0 (Estimated)
Yankee Fork	114.6	59.1

*Flow may have been altered by diversions upstream from points of observation.