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BEFORE THE IDAHO DEPARTMENT OF WATER RESOURCES
OF THE STATE OF IDAHO

IN THE MATTER OF APPLICATION FOR PERMIT NO. 63-34614 (Micron Technology, Inc.)	**NOTICE OF FILING AND SERVICE OF IDAHO DEPARTMENT OF FISH & GAME'S EXPERT WITNESS REPORT**

Please take notice that the Idaho Department of Fish and Game ("IDFG"), by and through its counsel of record, and pursuant to the *Order Authorizing Discovery and Disclosure and Scheduling Order* issued on September 30, 2019, hereby files in the above-captioned matter and serves on the parties thereto IDFG's expert witness report. Please find attached the expert witness report of John D. Cassinelli, Regional Fisheries Manager for IDFG's Southwest Region. A copy of Mr. Cassinelli's resume is also attached.

Respectfully submitted this 6th day of January, 2020.

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CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 6th day of January, 2020, I caused the original of the foregoing Notice of Filing and Service of Idaho Department of Fish and Game's Expert Witness Report to be filed with the Idaho Department of Water Resources, and copies to be served via first-class mail, postage prepaid, addressed to the following:

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Rationale for recommended flow regimes for the Lower Boise River with respect to fish and wildlife management.

John Cassinelli, Regional Fisheries Manager
Idaho Department of Fish and Game Southwest Region
Nampa, Idaho

Introduction

The purpose of this document is to explain IDFG's rationale for recommended flow regimes for the Lower Boise River with respect to fish and wildlife resources. Fish and wildlife are property of all Idaho citizens, and the Idaho Department of Fish and Game ("IDFG") and the Idaho Fish and Game Commission are expressly charged with statutory responsibility to preserve, protect, perpetuate, and manage all fish and wildlife in Idaho (I.C. § 36-103(a)).

Micron Technology, Inc. ("Applicant") filed Application for Permit Number 63-34614 on September 18, 2018 for Industrial and Ground Water Recharge Beneficial Uses. The Applicant seeks year-round appropriation of surface water diverted at a maximum rate of 12 cfs from the Boise River to support industrial processes. The Applicant plans to inject diverted water to an aquifer and subsequently recover this water from a well under existing water right No. 63-31183. The Applicant identifies a point of diversion on the Boise River immediately downstream of the Highway 21 bridge. This point of diversion is approximately 63 miles above the mouth of the Boise River and 3 miles below Lucky Peak Dam.

In this report we will describe IDFG's fisheries management program for the Lower Boise River, areas of concern for optimizing flows to support fish and wildlife, IDFG's participation in managing discharge to the Lower Boise River, and IDFG's objectives for flows to support fish and wildlife resources.

Boise River Fisheries Management

The Boise River basin drains an area of approximately 4,100 square miles in southwestern Idaho. The headwaters are in the Sawtooth Mountains at elevations above 10,000 ft. The river flows in a westerly direction for about 200 miles to its mouth on the Snake River near Parma at an elevation of 2,100 ft. Major tributaries to the Boise River include the Middle Fork, North Fork, South Fork, and Mores Creek. This basin has an average annual runoff of 2,005,000 acre-feet of water. Lucky Peak, Arrowrock, and Anderson Ranch reservoirs are main-stem impoundments on the Boise River having a combined storage capacity of 1,058,500 acre-feet (active 959,800 acre-feet)(BOR Boise Project website).

Below Lucky Peak Dam to its mouth ("Lower Boise River") the river passes through the most populous region in Idaho. A wide variety of land- and water-management activities affect riverine and riparian conditions important to fish and wildlife populations below Lucky Peak Dam (MacCoy 2004, Mullins 1999). Management of the upstream reservoir complex has

comprehensive effects on flow characteristics, sediment dynamics, and water quality. Channel and bank modifications (e.g. for diversion works, property protection, public safety, etc.) affect local flow characteristics, riparian conditions, and the shape and complexity of the channel. Water diversion and discharge back to the river from a variety of urban, industrial, and agricultural activities influence flow volumes and water quality.

Current management programs provide a popular and economically important recreational fishery in the Boise River below Lucky Peak Dam. Discharge from Lucky Peak Reservoir supports a cold-water fishery consisting of Mountain Whitefish, hatchery Rainbow Trout, wild Rainbow Trout, and Brown Trout. IDFG also periodically transplants hatchery Chinook Salmon adults in the summer and hatchery Steelhead adults to this reach in the fall when surplus hatchery stock are available to create additional fishing opportunity. Water quality and habitat characteristics change downstream (Mullins 1999, MacCoy 2004), and the fishery transitions from a cold-water to a warm-water species assemblage. The fishery occupying the lower reach of the river from approximately Middleton downstream to the mouth consists primarily of Smallmouth Bass and Channel Catfish at fair to moderate densities (Cassinelli 2018).

IDFG's "Fisheries Management Plan 2019-2024" (IDFG 2019) provides objectives and strategies for fisheries management by drainage. Objectives for the Boise River drainage relevant to land- and water-management programs include "Seek improved land and water management practices that significantly protect and enhance fish habitat" and "Seek changes to reservoir management and stream flows that benefit fish." Strategies for reaching these objectives include "Collaborate with other agencies and private entities for opportunities to protect or improve fish habitat, enhance flows, and remove migration barriers" and "Continue to seek moderation of rapid increases or decreases of flow in the Lower Boise River for flood control or due to Barber Dam operations."

IDFG conducts research and monitoring projects to develop information regarding demographics, abundance, and distribution of fish populations. Peterson et al. (2018) presented the most recent summary of research and monitoring findings for IDFG's Southwest Regional Fisheries Program, including a section summarizing monitoring activities and population status for the Lower Boise River (Cassinelli 2018). We have attached the Lower Boise River section to this report to provide detailed information regarding the Lower Boise sport-fishery.

Areas of concern

Winter fish survival

In northern latitude rivers, winter can be a stressful period for stream-dwelling fish. Overwinter survival may be the most prominent limiting factor for stream-dwelling salmonid populations (Cunjak 1996). Reduced flows during winter affects habitat availability, which may be especially relevant to survival of young Rainbow Trout (Mitro and Zale 2002, Mitro et al. 2003). Rainbow Trout spawn in the spring, and juvenile fish emerge from gravel spawning beds during summer months. Juvenile (i.e., age-0) trout enter winter with limited energy reserves accumulated in the fall, and survival rates are affected by habitat conditions (Smith and Griffith 1994). Juveniles preferentially use shallow, near-shore habitat having greater habitat complexity and concealment cover (Mitro and Zale 2002, Mitro et al. 2003). Flow reduction during the winter decreases

availability of concealment cover in shallow, structurally complex habitat at the river margins (Mitro and Zale 2002, Mitro et al. 2003). Mitro et al. (2003) found increased winter discharge on the Henry's Fork between January and March significantly increased winter survival of age-0 Rainbow Trout, concluding higher discharge in late winter likely provided more bank habitat at a critical time for survival.

Reduced channel dimensions may also affect access to food. In river reaches regulated by dam operations, discharge management has important effects on temperature, food availability, and available habitat. In the Lower Boise River, streamflow is reduced to the lowest levels of the year during winter, reducing channel cross-sectional area and, thus, habitat availability. In the Lower Boise River, limited habitat and availability of food resources relative to metabolic needs may particularly affect wild Rainbow Trout populations. Temperature stratification in the reservoir moderates the temperature of water discharged from the reservoir in the winter, and the relatively warm water may increase fish activity levels. Consequently, winter food resources may not be sufficient to meet metabolic demands. Low overwinter survival and poor condition of fish surviving winter may adversely affect fish populations (Annear et al. 2002).

Channel maintenance and fish habitat

High streamflows are a necessary component of the annual hydrograph because periodic high streamflows form and maintain channels and associated riverine and riparian habitat (Leopold et al. 1964, Schmidt and Potyondy 2004). High flow events are responsible for a number of important stream ecosystem processes (Poff et al. 1997) which maintain complex channel, bank, and floodplain characteristics. For example, high flows sustain and regenerate important streambank and floodplain vegetation, such as cottonwoods and willows. High flows also recruit new woody material to the channel and rearrange existing woody debris, creating a mosaic of complex habitat that is important for fish, invertebrates, and other animals. Mobilization of bed materials during high flows establish and maintain spawning habitat required by salmonids. These flows mobilize and reorganize sediments, creating sorted gravel beds. Salmonid eggs incubate in interstitial spaces in spawning gravel, and high flows clean fine sediment from the gravel beds (Kondolf and Wolman 1993). For example, Rainbow Trout deposit eggs in gravel beds comprising 10-50 mm pebbles. Thus, periodic high flows are crucial to the long-term sustainability of river and floodplain ecosystems (Schmidt and Potyondy 2004).

Bankfull flow is the discharge at which the river reaches the capacity of the channel and begins to flow across the floodplain (Leopold et al. 1964, Schmidt and Potyondy 2004). Bankfull flow is important for channel maintenance because it is the flow that performs the majority of bedload transport and vegetation scouring. Fundamentally, the shape and function of the river channel, and therefore the habitat for fish and other aquatic organisms, is determined by channel maintenance occurring primarily at or above bankfull discharge (Leopold et al. 1964, Schmidt and Potyondy 2004). Bankfull discharge for the Lower Boise River has not been empirically determined. Benjankar et al. (2013) cited an estimate of 6500 cfs, and Richardson and Guilinger (2015) suggested 7000 cfs to represent an approximated bankfull discharge.

The ability of a river to scour its channels and maintain functioning floodplains is dependent not only on regular attainment and exceedance of bankfull flows, but is also dependent on the duration of bankfull flow events. Although bankfull flows are not needed every year and do not

occur every year, attainment of bankfull discharge for only a few days each year may not be adequate for maintaining channel capacity and floodplain function (Schmidt and Potyondy 2004). The highest-magnitude streamflows recurring at an interval of 50 or more years may be necessary for creating important pool habitats and rearranging the largest bedload particles in rivers (Whiting 2002).

Floodplain connection and wildlife habitat

Floodplain vegetation in the Boise River includes black cottonwood as a dominant component. Black cottonwood provides important wildlife habitat and moderates summer water temperature by shading the river. Seed germination and seedling survival of cottonwoods is dependent on the combination of flood events, which provide necessary moisture at the right time, and flood scouring and deposition, which provides the ideal barren soil seed bed (Rood et al. 1995, Braatne et al. 1996, Rood et al. 2003). The timing and rate of decline of the falling limb of the hydrograph may determine cottonwood seedling success. Seedling mortality may be high when the rate of groundwater recession and soil desiccation outpaces the growth rate of the seedling root system (Mahoney and Rood 1998). Numerous studies have shown disrupting this process with flow alteration adversely affects cottonwood recruitment (e.g., Rood et al. 1995, Braatne et al. 1996, Rood et al. 2003, Braatne et al. 2007).

IDFG participation in managing Boise River flows

Boise River Streamflow Maintenance Releases

The United States Bureau of Reclamation (BOR) holds 3 water rights for Lucky Peak Reservoir Storage: 63-3618, 63-33734A, and 63-33734B. These water rights authorize the storage and release of 152,300 acre-feet for the beneficial use of streamflow maintenance, and provide that the Streamflow Maintenance Account will be refilled even in years when water is released from Lucky Peak Dam for flood control purposes. The partial decree for water right 63-3618 includes a condition that "The Bureau of Reclamation and Idaho Department of Fish and Game shall provide joint written instructions to the Department, for conveyance to the watermaster, regarding release of the Lucky Peak streamflow maintenance storage water."

Previous Boise River Flow Recommendations

Streamflows to support fish and wildlife populations of the Lower Boise River provided in "Stream Resource Maintenance Flow Studies, 1975" (White and Cochnauer 1975) represent the first published recommendations for this reach known to IDFG. This document contains a section by T. Cochnauer titled "Interim Stream Resource Maintenance Flows" in which he provides recommendations for minimum flows in many Idaho rivers. Regarding recommended Boise River flows, Cochnauer states:

> "The minimum stream resource maintenance flows from Barber Dam to Notus are flows recommended by the Regional Fishery Manager. Minimum stream resource maintenance flows of 240 cfs year are recommended for the period May through February. These flows should provide adequate conditions to maintain the fishery, fish populations, and spawning conditions for game fish."

Cochnauer recommended 380 cfs from Notus to the Snake River, also to support fish populations and water quality.

With respect to spring high flows, Cochnauer recommended a minimum flow rate of 4500 cfs during the first 2 weeks of March, a minimum flow rate of 1000 cfs minimum during the remainder of March through April, and a maximum flow of 5000 cfs during March and May for the Boise River below Barber Dam to support waterfowl production.

Subsequently, Pruitt and Nadeau (1978) provided monthly recommended minimum flows necessary to support salmonid populations based on empirical data collected under a variety of flows. Recommendations consisted of: 150 cfs for the months December through March; 225 cfs for the months April through June; 150 cfs during the months July through September; and 150 cfs during October and November.

In a letter dated February 5, 1999, IDFG summarized flow recommendations to IDWR concerning Micron's applications for permit 63-12300 and 63-12420. Recommendations were as follows:

> "Based upon our instream flow recommendation, we asked the applicants to agree not to divert flood waters when river flows at the proposed point of diversion were less than 240 cfs from June 16 through February 28 (29), less than 1,100 cfs from March 1 through May 31, or less than 4,500 cfs from June 1 through June 15."

Implementation of the Streamflow Maintenance Account

The Streamflow Maintenance Account has been implemented to support streamflow during the non-irrigation period, which largely coincides with the winter period. The account has not yet been applied toward supporting flows outside the low-flow non-irrigation period, such as maintaining periodic bankfull flows. IDFG is currently evaluating the use of the Streamflow Maintenance Account to support these high flows necessary to maintain riverine and riparian habitat.

Releases during initial application of the Streamflow Maintenance Account in 1986 established a winter flow of 150 cfs. Managers increased winter flow to 240 cfs in 1992, and the recommended winter flows have remained at that level since then. IDFG observed wild Rainbow Trout densities increase more than16-fold between 1994 and 2010, and although that trend has slowed, current wild Rainbow Trout densities have still increased nearly 6-fold from the 1994 estimates. Cassinelli (2018) summarized changes in the abundance of wild rainbow trout:

> Wild Rainbow Trout population abundance plateaued in 2010 in the lower Boise River after over two decades of population increases. The remarkable increase in wild trout abundance followed the establishment of a minimum winter flow in the mid-1980s. Low winter flows have been shown to inhibit survival of juvenile trout in numerous systems (Hurst 2007; Mitro et al. 2003). In addition, water quality has improved and catch-and-release practices have become more prevalent during the same period. Wild Rainbow Trout abundance declined slightly from 2010 to 2013 and remained stable from 2013 to 2016, while the proportion of larger fish continued to increase. The 2016 survey indicates that the wild trout populations in the lower Boise River appear to be stable with an increased proportion of larger trout.

Most recently, IDFG data indicate a decline in wild Rainbow Trout abundance back to densities similar to those observed in 2004.

Based on (1) a pattern of increasing population density following the increase from 150 to 240 cfs, (2) limited Rainbow Trout population growth during recent years, and (3) population responses and ecological patterns observed in response to winter flow manipulations elsewhere, IDFG expects increasing winter flows will further improve the fishery. Analysis of past streamflow maintenance account use and typical water availability indicates increasing base winter flows from 240 to 350 cfs may be feasible. More generally, however, future conditions may require adjustment of the rate and timing of discharge from the Streamflow Maintenance Account to maintain long-term ecological conditions and associated healthy fish and wildlife populations.

Coordination between BOR and IDFG (as outlined in both condition 4 and 10 of water right 63-03618) occurs annually. BOR determines water availability in relation to the streamflow maintenance account by assessing carryover and water supply predictions prior to the streamflow maintenance period. The coordinated letter from BOR and IDFG to the Director of the Department of Water Resources follows this meeting. An additional coordination meeting may take place in mid- to late-January to reevaluate the status of the account and assess the snowpack outlook and potential for refill.

IDFG objectives for Boise River streamflow maintenance
Winter streamflow is a key component of IDFG's management program for Lower Boise fisheries. Although the current winter flow of 240 cfs has been implemented for more than 25 years, IDFG has recently initiated discussions with BOR to evaluate increase winter flows using the Streamflow Maintenance Account based on monitoring data and improved understanding of effects of winter flow management on fish productivity. Adjustment of releases from the Streamflow Maintenance Account to optimize flows for Lower Boise River is an important tool for supporting IDFG management of the fisheries.

Thus, IDFG recommends IDWR apply conditions to protect water released from storage for the streamflow maintenance beneficial use. IDFG also recommends conditions acknowledge the potential for changes in flow rates established with releases from the Streamflow Maintenance Account.

Periodic high flows are a component of a flow regime necessary for the creation and maintenance of riverine and riparian habitat supporting fisheries and wildlife resources. Methods for determining ecological flow regimes have been described, e.g., by Tennant (1975) and recently by Williams et al. (2019). IDFG is concerned with cumulative effects of diversions on the high-flow component of the flow regime. Cumulatively, current and future diversions have the potential to remove the high-flow component of the annual flow regime, adversely affecting riverine and riparian habitat. IDFG recommends IDWR consider conditions that maintain periodic flows near bankfull flow in the Lower Boise flow regime.

Summary

- IDFG provides management direction for Lower Boise River fisheries intended to optimize the economic and recreational value of the fishery.
- IDFG-recommended river management considerations are linked to biological principles and understanding of habitat maintenance and dynamics.
- Streamflow maintenance is an important tool for managing sportfish populations. Winter flows affect sportfish density, and implementation of a Streamflow Maintenance Account has supported winter flows.
- Winter flow established with the Streamflow Maintenance Account in the lower Boise River has promoted overwinter survival of salmonids (especially Rainbow Trout) in the cold-water section from Lucky Peak Dam downriver to around Middleton.
- Changing conditions and adaptive management of the Streamflow Maintenance Account may result in adjustment of the rate and timing of discharge from reservoir storage to maintain long-term ecological conditions and associated healthy fish and wildlife populations
- A condition applied to water rights allowing periodic bankfull flows and allow management of streamflow maintenance flows to adjust to changing conditions or new information would support IDFG fish and wildlife management programs and management plans.

Literature Cited

Annear, T.C., W. Hubert, D. Simpkins, and L. Hebdon. 2002. Behavioural and physiological response of trout to winter habitat in tailwaters in Wyoming, USA. Hydrological Processes 16: 915-925.

Benjankar, R., Koenig, F. and Tonina, D., 2013. Comparison of hydromorphological assessment methods: application to the Boise River, USA. Journal of Hydrology 492:128-138.

Braatne, J. H., S. B. Rood, and P. E. Heilman. 1996. Life history, ecology and conservation of riparian cottonwoods in North America. pp 57-86 *in* Biology of *Populus* and its implications for Management and Conservation. Eds. R.F. Stettler, H. D. Bradshaw, Jr., P. E. Heilman and T. M. Hinckley. NRC Research Press, National Research Council of Canada, Ottawa, ON.

Braatne, J. H., R. Jamieson, K. M. Gill, and S. B. Rood. 2007. Instream flows and the decline of riparian cottonwoods along the Yakima River, Washington, USA. River Research and Applications 23:247–267.

Casinelli, J. D. 2018. Rivers and streams investigations, Lower Boise River. 2018. pp. 105-135 *in* Fisheries Management Annual Report, Southwest Region 2016. Idaho Department of Fish and Game, Boise, ID. 192 + xii pp.

Cunjak, R. A. 1996. Winter habitat of selected stream fishes and potential impacts from land-use activity. Canadian Journal of Fisheries and Aquatic Sciences 53(Supplement 1):267-282.

Cunjak R. A., R. A. Curry, and G. Power. 1987. Seasonal energy budget of brook trout in streams: implications of a possible deficit in early winter. Transactions of the American Fisheries Society 116:817-828.

Cunjak, R. A., and G. Power. 1987. The feeding and energetics of stream-resident trout in winter. Journal of Fish Biology 31:493-511.

Huusko, A., L. Greenberg, M. Stickler, T. Linnansaari, M. Nykänen, T. Vehanen, S. Koljonen, P. Louhi, and K. Alfredsen. 2007. Life in the ice lane: the winter ecology of stream salmonids. River Research and Applications 23:469-491.

Idaho Department of Fish and Game (IDFG). 2019. Fisheries Management Plan 2019 – 2024. Idaho Department of Fish and Game, Boise, USA.

Kondolf, G.M., and M.G. Wolman. 1993. The sizes of salmonid spawning gravels. Water Resources Research 29:2275-2285.

Leopold L. B., M. G. Wolman, and J. P. Miller. 1964. Fluvial Processes in Geomorphology. San Francisco: W. H. Freeman and Sons.

MacCoy, D.E. 2004. Water-quality and biological conditions in the Lower Boise River, Ada and Canyon Counties, Idaho, 1994-2002. U.S. Geological Survey Scientific Investigations Report 2004-5128.)

Mitro, M.G., and Zale, A.V. 2002a. Seasonal survival, movement, and habitat use of age-0 rainbow trout in the the Henrys Fork of the Snake River, Idaho. Transactions of the American Fisheries Society 131:271–286.

Mitro, M.G., A.V. Zale, and B.A. Rich. 2003. The relation between age-0 rainbow trout (*Oncorhynchus mykiss*) abundance and winter discharge in a regulated river. Canadian Journal of Fisheries and Aquatic Sciences 60:135-139.

Mullins, W.H. 1999. Biological assessment of the lower Boise River, October 1995 through January 1998, Ada and Canyon Counties, Idaho. Water-Resources Investigations Report 99-4178. US Geological Survey, Idaho Department of Environmental Quality, and Lower Boise River Water Quality Plan, Inc. Boise, ID. 37 pp.

Peterson, M.P., J.D. Cassinelli, A.E. Butts, J.R. Kozfkay, D. Hardy, J. Kunz, and K. Kinkead. 2018. Fisheries Management Annual Report, Southwest Region 2016. Idaho Department of Fish and Game, Boise, ID. 192 + xii pp.

Poff, N.L., J.D. Allan, M.B. Bain, J.R. Karr, K.L. Prestegaard, B.D. Richter, R.E. Sparks, and J.C. Stromberg. 1997. The natural flow regime. Bioscience 47:769-784.

Pruitt, T.A. and R.L. Nadeau. 1978. Recommended stream resource maintenance flows on seven southern Idaho streams. Cooperative Instream Flow Service Group. Instream Flow Information Paper No. 8. 60 pp.

Rood, S. B., J. M. Mahoney, D. E. Reid, and L. Zilm. 1995. Instream flows and the decline of riparian cottonwoods along the St. Mary River, Alberta. Canadian Journal of Botany 73(8):1250-1260.

Rood, S. B., J. H. Braatne, and F. M. R. Hughes. 2003. Ecophysiology of riparian cottonwoods: stream flow dependency, water relations and restoration. Tree Physiology 23:1113-1124.

Schmidt, L.J., and J.P. Potyondy. 2004. Quantifying channel maintenance instream flows: an approach for gravel-bed streams in the Western United States. Gen. Tech. Rep. RMRS-GTR-128. Fort Collins, CO. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 33 pp.

Smith. R.W., and J.S. Griffith. 1994. Survival of Rainbow Trout during their first winter in the Henry's Fork of the Snake River, Idaho. Transactions of the American Fisheries Society 123:747-756.

Tennant, D.L. 1976. Instream flow regimens for fish, wildlife, recreation and related environmental resources. Fisheries 1: 6-10.

Cochnauer, T., and R.G. White. 1975. Stream resource maintenance flow studies, 1975. Idaho Department of Fish and Game, Idaho Department of Water Resources, and Idaho Cooperative Fisheries Unit. 136 pp.

Whiting, P. J. 2002. Streamflow necessary for environmental maintenance. Annual Review of Earth and Planetary Sciences 30:181-206.

Williams, J.G., P.B Moyle, J.A. Webb, and G.M. Kondolf. 2019. Environmental Flow Assessment: Methods and Applications. John Wiley & Sons.

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PROFESIONAL EXPERIENCE

REGIONAL FISHERIES MANAGER (April 2019 – present)
Idaho Department of Fish and Game
Nampa, Idaho

- Act as regional fisheries manager for the Nampa sub-region of IDFG's southwest region.
- Prepare and evaluate management plans and access priorities for the fisheries program.
  - Develop and implement data collection and monitoring
  - Recommend fishing seasons, regulations, and stocking programs
- Review and provide feedback for processes impacting regional fisheries including fishing tournaments, private ponds stocking, commercial fish farm production, stream alterations, suction dredging, and stream discharge
- Supervise two regional fisheries biologist and one access site foreman

REGIONAL FISHERIES BIOLOGIST (December 2016 – April 2019)
Idaho Department of Fish and Game
Nampa, Idaho

- Act as regional fisheries management biologist for the northeast half of IDFG's southwest region.
- Conduct fish routine population surveys on rivers and streams within the Payette and Boise river drainages.
  - Canoe elecrofishing surveys
  - Raft electrofishing surveys
  - Backpack electrofishing surveys
  - Snorkel surveys
- Conduct lake and reservoir surveys within the Payette and Boise river drainages.
  - Gill net surveys
  - Limnology assessment
- Conduct creel surveys and check station to monitor angler catch and effort.
- Present findings to various angler groups, general public, and peers.
- Complete annual reports summarizing all projects and findings.

SENIOR FISHERIES RESEARCH BIOLOGIST (November 2012 - December 2016)
Idaho Department of Fish and Game
Nampa, Idaho

- Acted as the research biologist for IDFG's statewide resident trout hatchery program.

- Conducted large scale, multi-year T-bar anchor tagging studies evaluating return-to-creel of catchable rainbow trout across the top 60% of waters stocked throughout Idaho as part of IDFG's Tag-You're-It! tagging program.
    - Resulting changes included rearing fewer, larger catchables, resulting in a higher portion of hatchery trout being utilized by Idaho anglers
- Evaluated triploid vs. diploid hatchery Kokanee performance in lowland reservoirs including:
    - Pressure treating Kokanee eggs to create triploids
    - Sampling with gill net curtains
    - Otolith pulling, preparing, and reading, including identification of thermal marks
- Evaluated triploid vs. diploid Westslope Cutthroat Trout in high mountain lakes throughout Idaho.
- Evaluated triploid vs. diploid fall Chinook Salmon in lowland reservoirs throughout Idaho.
- Coordinated all evaluations with regional and headquarters staff as well as hatchery managers and provided subsequent in-study updates.
- Produced annual reports summarizing all research and results.

REGIONAL FISHERIES BIOLOGIST (Jan. 2008 – November 2012)
Idaho Department of Fish and Game
Nampa, Idaho

- Acted as the monitoring and evaluation biologist for IDFG's hatchery spring/summer Chinook salmon programs.
- Monitored, summarized, and reported hatchery-origin Chinook salmon life history from hatchery spawning through adult return for LSRCP and Idaho Power funded facilities including:
        - Spawning and on-station rearing at IDFG hatcheries
        - Juvenile releases and survival estimates to Lower Granite Dam
        - Stock- and age-specific adult returns to Columbia River and Snake River dams as well as to terminal areas and hatchery traps
        - Stock and age-specific harvest estimates in all fisheries including the Pacific Ocean, Columbia River, Snake River, and all sport fisheries in Idaho
    - Completed reports in conjunction with Idaho Power Company's Monitor and Evaluation Biologist
- Generated complete hatchery-specific run reconstructions on an annual basis and provided summaries of this information to regional and headquarters staff.
- Generated hatchery-specific tagging, marking, and loading plans on an annual basis for Chinook salmon Coded Wire tagging, PIT tagging, and adipose clipping.
- Coordinated the Separation-by-Code PIT tag process for all IDFG hatchery Chinook salmon and steelhead with both the Fish Passage Center (FPC) and Pacific States Marine and Fish Commission (PSMFC) on an annual basis.
- Generated and maintained stock- and age-specific in-season hatchery Chinook salmon return estimates over Columbia River and Snake River dams

    - Presented data during weekly multi-agency teleconference calls to aid in real-time fishery and broodstock management at all of Idaho's Chinook salmon facilities including those managed and run by the U.S. Fish and Wildlife Service and the Nez Perce Tribe.
- Initiated the installation of, monitored, and maintained four PIT tag array systems in hatchery traps and uploaded data in-season as well as summary data post season to the PTAGIS database.
    - These systems enabled stock- and age-specific estimates (corrected for tag loss) of adult returns to Lower Granite Dam
    - Methods and results were later coordinated with and implemented by the U.S. Fish and Wildlife Service and the Nez Perce Tribe
- Directly or jointly supervised four employees included three permanent full-time staff and one seasonal position.
- Both contributed to, and supervised the analysis and summary of, all historic trapping, spawning, rearing, and release data for the five spring/summer Chinook salmon hatcheries operated by IDFG.
- Served on steering committee to aid in the development of a regional anadromous hatchery database (FINS) along with staff from U.S. Fish and Wildlife Service, Oregon Department of Fish and Wildlife, Nez Perce Tribe, and Idaho Power Company.
    - Provided direct input to developers and tested early versions of the database
- Assisted in the implementation of data collection for baseline Parental Based Tagging sampling so that almost all hatchery Chinook smolt released were genotyped at LSRCP, Idaho Power, and USFWS hatcheries.
- Routinely met and coordinated with biologists from the Shoshone-Bannock Tribe, Nez Perce Tribe, U.S fish and Wildlife Service (Dworshak Hatchery), Idaho Power Company, Washington Department of Fish and Wildlife, and Oregon Department of Fish and Wildlife.
    - Examples include collaboration for LSRCP hatchery Chinook salmon program review and collaboration for standardized data table reporting for the LSRCP website

SENIOR FISHERIES TECHNICIAN (May 2004 – Feb. 2005, May 2005 – Sept. 2005)
Idaho Department of Fish and Game
Nampa Idaho

- Performed high-mountain and lowland lake surveys including hook and line sampling, gill netting, and boat electrofishing.
- Performed stream surveys using electrofishing (removal and mark-recapture) and snorkeling as part of the Native Salmonid Assessment Project.
- Measured and aged sculpin and trout otoliths.
- Supervised five employees throughout the field season.

FISHERIES TECHNICIAN (June 2002 – Jan. 2003, April 2003 – Feb. 2004)
Idaho Department of Fish and Game
Nampa, Idaho

- Performed stream surveys including electrofishing and habitat evaluations

- Installed thermographs and other data recording devices.
- Performed reptile, bird, mammal, vegetation, fish, and macro invertebrate identification.
- Analyzed sexual maturity through gonad extraction.

CONSERVATION AID III (August 2001 – December 2001)
Nevada Division of Wildlife
Winnemucca, Nevada

- Performed stream surveys including electrofishing and habitat evaluations.
- Performed reptile, bird, mammal, vegetation, fish, and macro invertebrate identification.
- Performed water quality analysis including salinity, PH, and conductivity.
- Performed exotic fish eradications in order to improve native fish habitat.

EDUCATION

University of Nevada, Reno, 1996 - 2000
Bachelor of Science in Biology
Relevant Course Work

- Principles of Genetics
- Comparative Animal Physiology
- Ecology and Population Biology
- Conservation Biology
- Biological Diversity
- Evolution
- Parasitology
- Western Water Development
- Principals of Biological Investigation

University of Idaho, 2005 - 2007
Masters of Science in Fisheries Resources
Relevant Course Work

- Fisheries Management
- Advanced Fisheries Management
- Limnology
- Fish Physiology
- Statistical Methods
- Multivariate Analysis
- Experimental Design
- Fish Population Ecology

SKILLS AND TRAINING

- Idaho Division of Human Resources Supervisor Academy *Boise 2017*
- Boat, engine, and trailer maintenance and repair, *College of Western Idaho*, 2014
- Extensive experience using Microsoft Excel and Word as well as experience with Microsoft Access
    - Moving To Office 2007 *ExecuTrain* 2008
    - Advanced Microsoft Excel *ExecuTrain* 2010
- Experience querying anadromous fish data through PTAGIS and RMIS
- Boat Electrofishing: Principles and Practices *Northwest Environmental Training Center* 2009

AWARDS/RECOGNITION

- 2013 Idaho Department of Fish and Game Resource Management Employee of the Year.
- 2013 Western Division of the American Fisheries Society Conference, Best Professional Presentation.
- University of Idaho College of Natural Resources Outstanding Graduate Student in Fisheries Resources – 2008.
- University of Idaho Alumni Association Award for Excellence in Outstanding Academic Achievement – 2007.

PUBLICATIONS

- Cassinelli, J. D. and C. M. Moffitt. 2010. Comparison of growth and stress in resident redband trout held in laboratory simulations of montane and desert summer temperature cycles. Transactions of the American Fisheries Society 139:339-352.
- Cassinelli, J. D., K. A. Meyer, and M. K. Koenig. 2016. Effects of rearing density on return to creel of hatchery catchable Rainbow Trout stocked in Idaho lentic waters. North American Journal of Fisheries Management 78:208-217.
- Cassinelli, J. D., and K. A. Meyer. 2018. Factors influencing return-to-creel of hatchery catchable-sized Rainbow Trout stocked in Idaho lentic waters. Fisheries Research 204:316-323.
- Cassinelli, J. D., K. A. Meyer, and M. K. Koenig. 2018. Performance of diploid and triploid Westslope Cutthroat Trout fry stocked into Idaho alpine lakes. North American Journal of Fisheries Management 39:112-123.