

Variable: TMAX
Month: 01
Start year: 1900
Stop year: 1987
Units: F
Selected gridcell
Longitude: -113.642
Latitude: 44.952

Querying database... Done
[Show Chart](#)

Year	Month	Value
1900	01	36.45
1901	01	31.80
1902	01	27.16
1903	01	31.87
1904	01	28.76
1905	01	30.29
1906	01	29.07
1907	01	24.64
1908	01	32.49
1909	01	34.41
1910	01	25.07
1911	01	31.35
1912	01	31.51
1913	01	27.75
1914	01	36.30
1915	01	29.97
1916	01	19.85
1917	01	25.74
1918	01	33.13
1919	01	33.19
1920	01	28.74
1921	01	33.12
1922	01	20.12
1923	01	33.57

Average Maximum Temp
Data for Leadore, ID
1900-1987 for months of
Jan-Mar. collected From
Oregon Climate Service
<http://www.prism.oregonstate.edu>
collected 10/10/07
at 13:21

1924	01	25.34
1925	01	30.81
1926	01	25.20
1927	01	31.41
1928	01	29.77
1929	01	25.05
1930	01	16.66
1931	01	31.03
1932	01	26.11
1933	01	31.46
1934	01	39.22
1935	01	36.05
1936	01	28.15
1937	01	13.71
1938	01	30.11
1939	01	35.26
1940	01	27.14
1941	01	31.03
1942	01	20.61
1943	01	25.66
1944	01	27.12
1945	01	33.49
1946	01	32.68
1947	01	25.92
1948	01	32.58
1949	01	11.21
1950	01	27.52
1951	01	26.44
1952	01	26.51
1953	01	41.56
1954	01	37.13
1955	01	25.84
1956	01	29.95
1957	01	21.20
1958	01	28.29

1959	01	33.60
1960	01	24.75
1961	01	34.97
1962	01	24.91
1963	01	24.49
1964	01	28.49
1965	01	31.28
1966	01	33.37
1967	01	36.16
1968	01	29.17
1969	01	32.52
1970	01	33.37
1971	01	31.08
1972	01	28.58
1973	01	28.45
1974	01	26.56
1975	01	28.58
1976	01	30.31
1977	01	27.93
1978	01	33.71
1979	01	17.62
1980	01	28.76
1981	01	36.52
1982	01	28.29
1983	01	36.16
1984	01	24.85
1985	01	27.07
1986	01	30.40
1987	01	30.38

Variable: TMAX

Month: 02

Start year: 1900

Stop year: 1987

Units: F

Selected gridcell

Longitude -113.642
:
Latitude: 44.952

Querying database... Done

Show Chart

Year	Month	Value
1900	02	33.30
1901	02	32.40
1902	02	39.13
1903	02	27.86
1904	02	35.82
1905	02	31.96
1906	02	34.47
1907	02	39.49
1908	02	36.99
1909	02	36.63
1910	02	28.65
1911	02	29.39
1912	02	36.37
1913	02	26.17
1914	02	33.49
1915	02	40.78
1916	02	35.80
1917	02	33.04
1918	02	32.68
1919	02	32.72
1920	02	37.38
1921	02	36.43
1922	02	27.03
1923	02	31.96
1924	02	40.51
1925	02	39.40
1926	02	39.00
1927	02	37.51
1928	02	33.01
1929	02	27.30

1930	02	41.41
1931	02	35.89
1932	02	32.18
1933	02	25.48
1934	02	46.62
1935	02	37.87
1936	02	29.17
1937	02	33.04
1938	02	35.02
1939	02	30.69
1940	02	36.95
1941	02	37.94
1942	02	27.54
1943	02	34.48
1944	02	36.46
1945	02	39.40
1946	02	35.49
1947	02	38.75
1948	02	36.39
1949	02	31.84
1950	02	39.20
1951	02	35.15
1952	02	31.01
1953	02	38.10
1954	02	43.02
1955	02	29.53
1956	02	27.66
1957	02	38.28
1958	02	40.17
1959	02	36.75
1960	02	29.66
1961	02	43.47
1962	02	34.70
1963	02	45.09
1964	02	33.28

1965	02	37.92
1966	02	36.91
1967	02	39.24
1968	02	38.98
1969	02	33.39
1970	02	44.38
1971	02	37.02
1972	02	34.45
1973	02	38.79
1974	02	39.06
1975	02	32.29
1976	02	35.22
1977	02	43.09
1978	02	38.88
1979	02	36.32
1980	02	37.96
1981	02	41.05
1982	02	30.65
1983	02	39.45
1984	02	32.61
1985	02	28.45
1986	02	37.45
1987	02	40.01

Variable: TMAX

Month: 03

Start year: 1900

Stop year: 1987

Units: F

Selected gridcell

Longitude -113.642
:

Latitude: 44.952

Querying database... Done

[Show Chart](#)

Year Month Value

1900 03 52.09

1901 03	45.63
1902 03	42.35
1903 03	41.70
1904 03	41.09
1905 03	50.41
1906 03	37.65
1907 03	45.12
1908 03	45.95
1909 03	46.74
1910 03	54.82
1911 03	50.76
1912 03	41.04
1913 03	39.61
1914 03	51.08
1915 03	49.80
1916 03	49.82
1917 03	36.19
1918 03	48.04
1919 03	46.76
1920 03	41.79
1921 03	49.46
1922 03	39.16
1923 03	44.60
1924 03	41.79
1925 03	47.53
1926 03	49.57
1927 03	47.26
1928 03	46.92
1929 03	46.54
1930 03	46.76
1931 03	46.18
1932 03	41.58
1933 03	45.95
1934 03	56.28
1935 03	43.66

1936 03	43.99
1937 03	46.09
1938 03	41.67
1939 03	48.11
1940 03	49.03
1941 03	50.76
1942 03	40.21
1943 03	39.09
1944 03	41.11
1945 03	45.64
1946 03	49.33
1947 03	49.57
1948 03	42.03
1949 03	45.09
1950 03	43.02
1951 03	40.01
1952 03	35.19
1953 03	48.16
1954 03	42.08
1955 03	37.72
1956 03	42.96
1957 03	45.03
1958 03	41.86
1959 03	45.59
1960 03	41.85
1961 03	48.13
1962 03	42.26
1963 03	46.96
1964 03	39.34
1965 03	40.51
1966 03	48.42
1967 03	44.83
1968 03	51.53
1969 03	42.31
1970 03	42.85

1971 03	41.38
1972 03	49.21
1973 03	45.81
1974 03	43.72
1975 03	41.86
1976 03	40.17
1977 03	43.43
1978 03	50.63
1979 03	47.34
1980 03	45.05
1981 03	50.49
1982 03	44.31
1983 03	47.53
1984 03	43.39
1985 03	39.25
1986 03	53.44
1987 03	47.86

IDWR
JAMES WHITTAKER OCTOBER 10, 2007
74-341

A shoulder extending the season on Water Right #74-341, from January 15 to March 15, should be added on as verified by affidavits substantiating historical use of this water right.

According to the Sherl L. Chapman report, done in 1975, information included within the report will show that even though water may be applied to crops in excess of the consumptive irrigation requirement there is no actual diminishment of water since the excess percolates downward, enters the ground water system and moves into the Lemhi River at a later date, augmenting low summer time flows. I think the only logical decision the court can make is to allow whatever figure we feel is adequate for irrigation of crops and that the application of high water or flood water to benches and spot land in the early part of the year would be recognized as a beneficial use. It is essentially the same as artificial recharge in the ground water system

Additionally, E.G. Crosthwaite in his open file report on the water resources of the upper Lemhi Valley states on page 9 that "practically all the water which percolates into the ground moves toward the river and reappears in numerous seeps and springs in the flood plain of the Lemhi River." It becomes very apparent that the water entering the alluvial fans and terraces adjacent to the valley floor and the water entering through application of irrigation water recharges the ground water system and the two are inseparably related.

In conclusions and recommendations number "6" states: In light of the evidence presented and the practices existent in the Lemhi Basin, 9.0 acre feet per acre is a much more reasonable figure for the annual irrigation water requirement in the Lemhi River Basin. The poor irrigation efficiency is not unusual nor adverse since nearly 80 percent of the 9.0 acre feet diverted is returned to the river at some future time.

Neighbors on both Big Eight Mile and Big Coulee benefit from this early diversion as it raises their springs and keeps their wells from going dry.

The crop consumptive use is affected by temperature, climate, type of plant, amount of water readily available, type of soil, solar radiation, etc.

According to Forest Service temperature records, between 1/15/03 and 3/15/03, and the years 2003 through 2007, temperatures were 28 degrees Fahrenheit or above, seventy nine percent of the time.

This allows us to make beneficial use of the water during the 1/15 through 3/15, time frame.

The above information should be sufficient to allow us to divert water during this time frame as we are making beneficial use of the water and not hurting any other water right holders.

~~7/1/11~~

28+	Days	28-	Unknown
53	days	14	3
45	days	11	5
57	"	2	1
45	"	13	2
<u>190</u>		<u>40</u>	<u>11</u>
		<u>190</u>	
		230	

Over 802,

	28 or above	Below 28	Unknown
2003 28+	43	14	3
4	45	11	5
5	57	2	1
6	45	13	2
7	41	19	
	<u>231</u>	<u>59</u>	<u>11</u>

1
59
231
290

Office Copy

Sherb L. Chapman

CONSULTANT

201 IDAHO BUILDING / BOISE, IDAHO 83702 / PHONE 344-1541

LEMHI RIVER BASIN

Geology and Hydrology

Irrigation Efficiency

Sherb L. Chapman
Heat Cornia

Consultant
Consultant

Sherb L. Chapman

The bound copy we had we sent to Nathan Liger
per letter request of 4-22-76

SPECIALIST IN

Sheri L. Chapman

CONSULTANT

201 IDAHO BUILDING / BOISE, IDAHO 83702 / PHONE 344-1541

January 29, 1976

Mr. Jim Herndon
Lemhi Water Users
P.O. Box 739
Salmon, Idaho 83437

Dear Mr. Herndon:

This firm in conjunction with Wiser Irrigation Service of Burley, Idaho, began an intensive investigation of irrigation practices and hydrology in the Lemhi Valley about March 1975. The attached report is the result of that study.

Several questions were raised upon review of the proposed findings of water rights in the Lemhi River Basin submitted to the 7th Judicial District by the Idaho Department of Water Resources. Item four under "Findings of Fact" states that the irrigation water requirement at the field head gate is found to be 3.0 acre feet per acre per calendar year. That subject will be addressed in another portion of this report. Additionally, under item five, "The Normal Irrigation Season", was found to be from April 1st to November 1st of each year. If flood water applications were to be accepted as beneficial uses and subsequently water rights, this irrigation season is far too short and should be extended, especially during the spring months.

Item fourteen admits by inference that the application of "high or flood waters" during the months of May and June is a beneficial use and also admits to the fact that the practice has been common on a historical basis. The Conclusions of Law, item six, refers specifically to the practice of diverting flood waters but limits that practice under two conditions: (a) The waters to be diverted are applied to a beneficial use, and (b) The existing quantified rights--including future appropriations of water--are first satisfied. To me, this is merely lip service to the prior statements of the Department that this diversion of high water or flood water will be recognized as a historical practice and that water rights will be granted for such practices. Item six, subsection A, limits such diversion to beneficial uses. Unfortunately, this type of diversion is unique and has never been

Mr. Jim Herndon
Page 2
January 25, 1975

specifically accounted as being a beneficial use. Subsection B, to me, totally eliminated the establishment of a vested water right because of the phrase, "including future appropriations of water". This is to say that any subsequent private, state or federal appropriation of water for any purpose, including minimum stream flow, recreation or inter-basin transfer would take precedent over the diversion of flood waters.

The items enumerated above are those questions that I feel are pertinent to the problem and that have a significant bearing on the future of water use in the Lemhi Basin. The report following will address the geologic make-up of the valley, the hydrologic setting and what happens to water either when it is applied to benches or to crop land adjacent to the Lemhi River. Information included within the report will show that even though water may be applied to crops in excess of the consumptive irrigation requirement there is no actual diminishment of water since the excess percolates downward, enters the ground water system and moves into the Lemhi River at a later date, augmenting low summer time flows. I think the only logical decision the court can make is to allow whatever figure we feel is adequate for irrigation of crops and that the application of high water or flood water to benches and spot land in the early part of the year would be recognized as a beneficial use. It is essentially the same as artificial recharge to the ground water system.

I will look forward to hearing from you with regard to the next actions we need to take prior to the hearing.

Very truly yours,



Sherl L. Chapman
Consultant

SLC/11

Attachments

TABLE OF CONTENTS

	<u>Page</u>
Introduction.....	1
Vegetation.....	2
Geology.....	3
Hydrology.....	5
Surface Water.....	5
Ground Water.....	9
Ground Water-Surface Water Relationship.....	10
Irrigation Efficiency.....	12
Introduction.....	12
Irrigation Water Requirement.....	13
Irrigation Efficiency.....	14
Investigations.....	15
Conclusions and Recommendations.....	16
References.....	18

LEMMI RIVER BASIN

Introduction

The Lemhi River Basin, located in north-east central Idaho, is formed by the confluence of 10-mile Creek and Texas Creek near the town of Leadore. The river flows northwestward at a meandering channel which lies in a flood plain ranging from 1 to 1 1/2 miles in width. It is bounded for most of its length by flat, low-lying terraces ranging from 50 to over 200 feet in height above the valley floor. Numerous alluvial fans formed by tributary streams intrude into the valley at several locations. The upper valley, which ranges in width from 4 to 8 miles, is floored by coarse alluvial and glacial outwash material. The primary use of water in the basin is for irrigation of agricultural lands. There exists approximately 50 to 55 thousand acres of land in the valley which is irrigated at the present time. Domestic and stock usage ranks second in the magnitude of water diverted.

The purposes for this investigation and report are:

- (1) to determine the geologic make-up of the river basin
- (2) to determine the hydrologic setting of the valley
- (3) to determine the relationship between the surface water and ground water systems in the Lemhi River Basin.

Vegetation

The Lemhi Valley is scantily covered with sagebrush, a few cacti and various weeds and grasses. This vegetative cover does not reflect so much the condition of aridity as the inability of the soil to retain water in sufficient amounts to support more abundant vegetation. In places the valley has a decidedly "desert" appearance. Along the better watered valley bottom and watercourses, brush and trees grow in profusion.

The mountain slopes are covered to a greater extent with sagebrush and grasses and evergreen trees appear on shielded north slopes. Areas underlain by the older rocks support trees while the younger better drained volcanics support little vegetation.

Geology

The Lemhi River Basin is bounded on the northeast by the Bitterroot Range and on the southwest on the Lemhi Range, both of which approach altitudes of nearly 11,000 feet above sea level. An elongate ridge of sediments protrude into the valley at its head near Leadore which has the name Middle Ridge. The Ridge separates the two creeks that form the main stem of the Lemhi River. Middle Ridge and the mountain ranges bordering the valley all have a northwest-southeast trend which is parallel with the regional trend in north central Idaho. The upper end of the valley lies at about 7200 feet above sea level of the river and slopes northward to about 3900 feet above sea level at the mouth of the river.

The rocks in both mountain ranges consist chiefly of dolomite, quartzite, limestone and phyllite of Precambrian and Paleozoic age. Although joints and fractures penetrate the rocks they are generally of low permeability and have historically provided low to very low yields to wells penetrating them. Tuffaceous sedimentary deposits of Tertiary age overlie some of the older rocks at some places in the mountains and underlie all of the Lemhi Valley. These deposits are exposed on both sides of the Lemhi River in a narrow intermittent band parallel to the river nearly all of the way to the town of Salmon on the north. Detailed geologic mapping, (Anderson 1967), geologic cross sections, (Anderson 1961), and an investigation conducted by E. G. Crosthwaite of the U.S. Geological Survey (open file report, 1965) demonstrate beyond a reasonable doubt that these Tertiary sediments underlie nearly all of the Lemhi River Basin.

at a shallow depth. Typically, these sediments consist of shales with sandy lenses, silty shales and some conglomerates, all containing bentonitic clays. Such rocks are typically quite impermeable and yield very little water to wells or allow only minor amounts of ground water to flow through them.

The valley floor is composed of coarse to fine sand and gravels and overlies the Tertiary sediments discussed previously. These deposits are believed to be relatively thin although no data has been discovered to give a definitive thickness at any particular location in the valley. The terraces adjacent to the valley floor are composed of coarse gravels, sand and silt. These deposits were emplaced when the Lemhi River was at a higher elevation than at present and are essentially remnants of the old flood plain or reworked alluvial deposits from tributary streams. The rock material present is that in the mountains that has been eroded and deposited through the various tributary streams. The generally coarse nature of these deposits provides great permeability and they yield water freely to properly constructed wells. The maximum thickness of these deposits is not been quantified but at no location in the valley were they observed as being more than 200 or 300 feet thick.

Hydrology

Surface Water

The Lemhi River is the primary drainage from the Basin with Hayden Creek next in size. The U.S. Geological Survey has gaged the Lemhi River for a number of years both near the town of Salmon and near Lemhi. These gages allow interpretation of the flow characteristics of the Lemhi River and also an assessment of the total quantity of outflow from the Basin for any given period. That data is available and on file in several publications from the U.S. Geological Survey. Based on the period of record at both gaging stations the highest flow occurs during the first part of June primarily because of snow melt of the bordering mountains. Voluminous discharge continues from mid June to July but generally does not extend more than a few weeks. However, high flows, those above 9000 cubic feet per second may last from 10 to 12 weeks. Low flow in the river, those less than 5000 cubic feet per second usually occurs during the month of August and the first part of September. These peak flows and their duration patterns are shown on figure 1.

Figures 2 and 3 show the percentage of time a given discharge is equalled or exceeded for Lemhi and Salmon respectively. Using a reference discharge of 300 c.f.s., figure 3 shows that the discharge will be equalled or exceeded 19% of the year. These figures are based on the mean monthly flow for the period of record shown. By comparing the percentage of time to a given flow, the amount in the river to satisfy existing water rights and new appropriations can be estimated. It is obvious from both figure 2 and figure 3 that even with existing irrigation

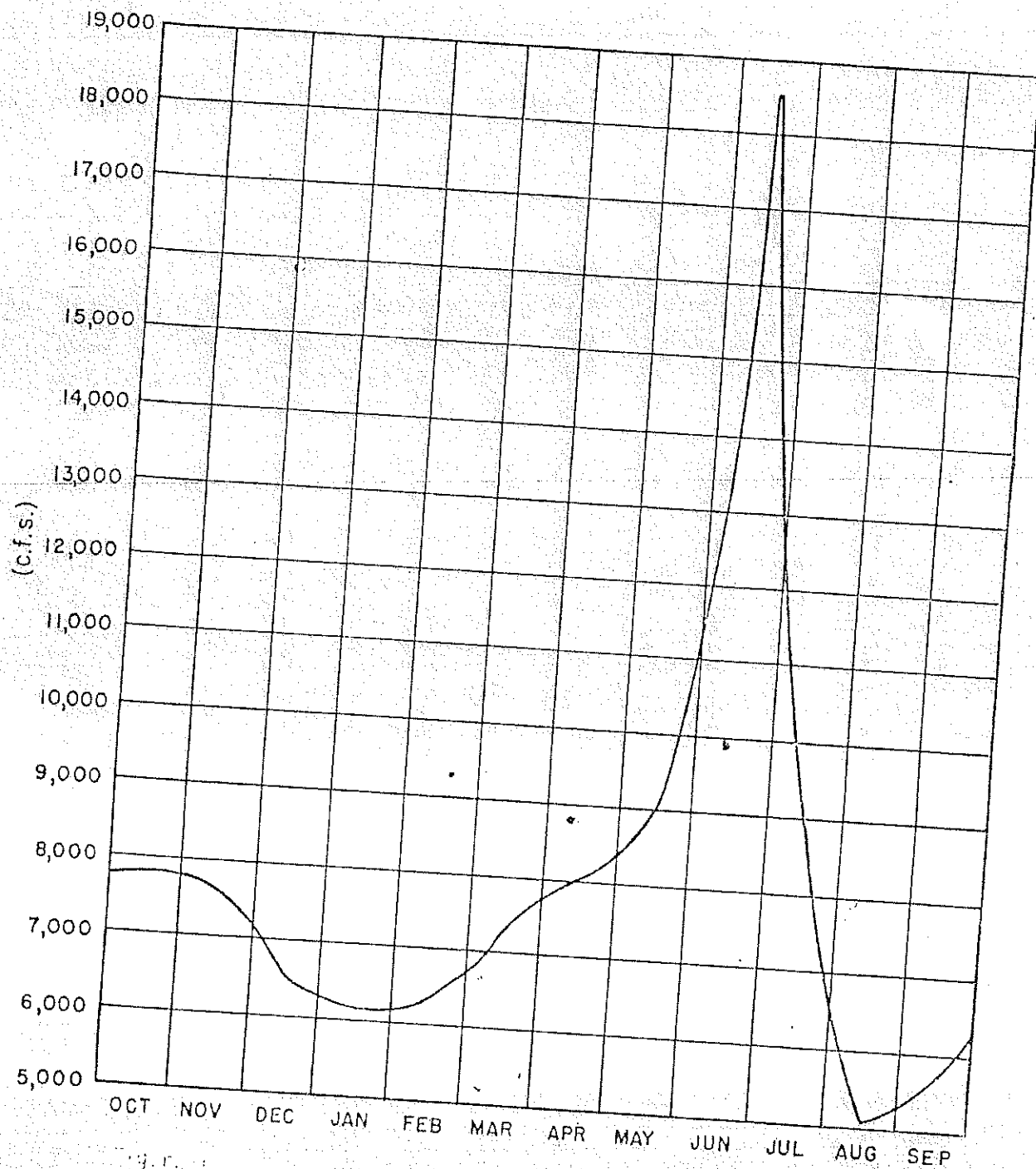
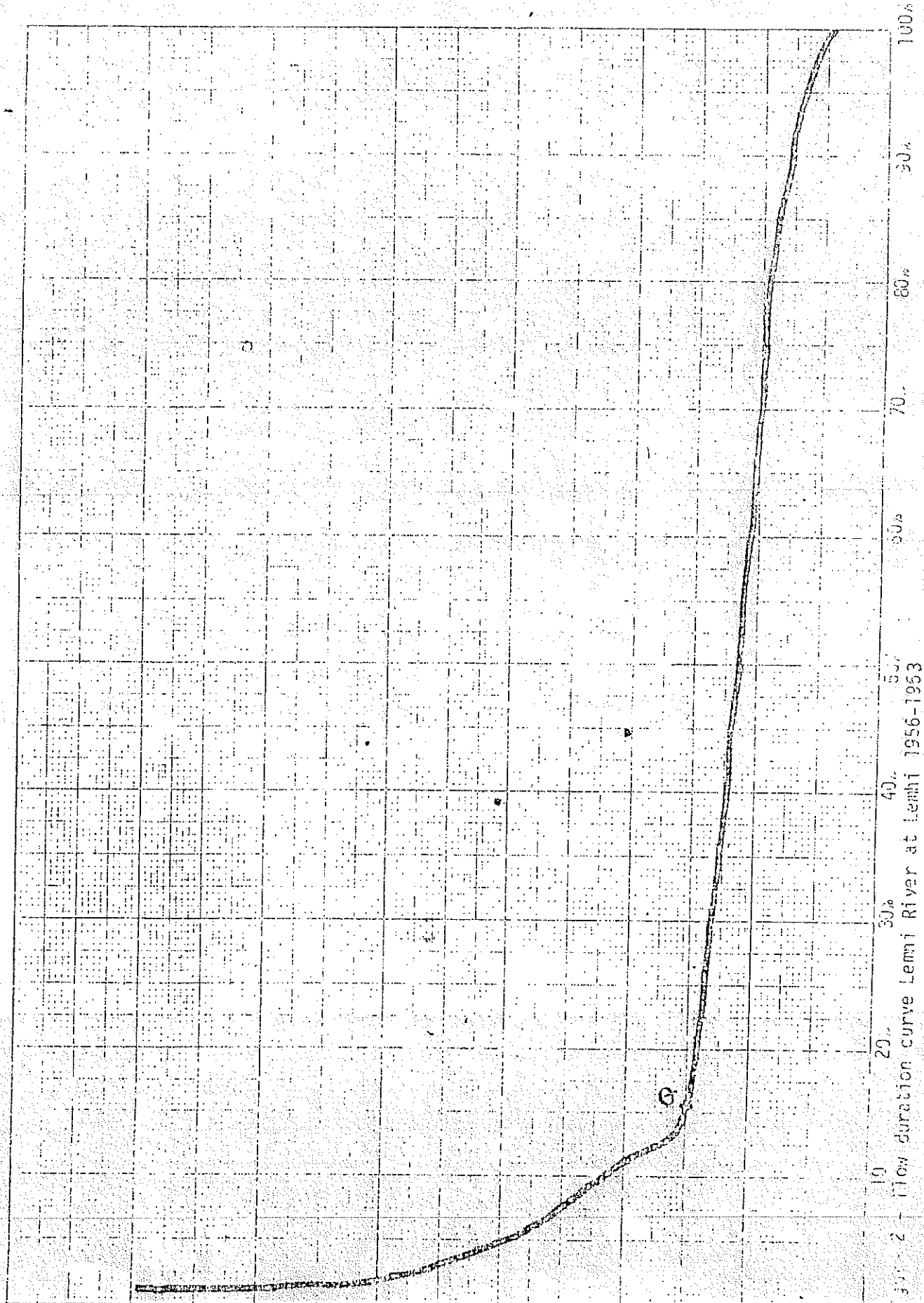


Fig. 1.

of 2100 ft.

(The ...)



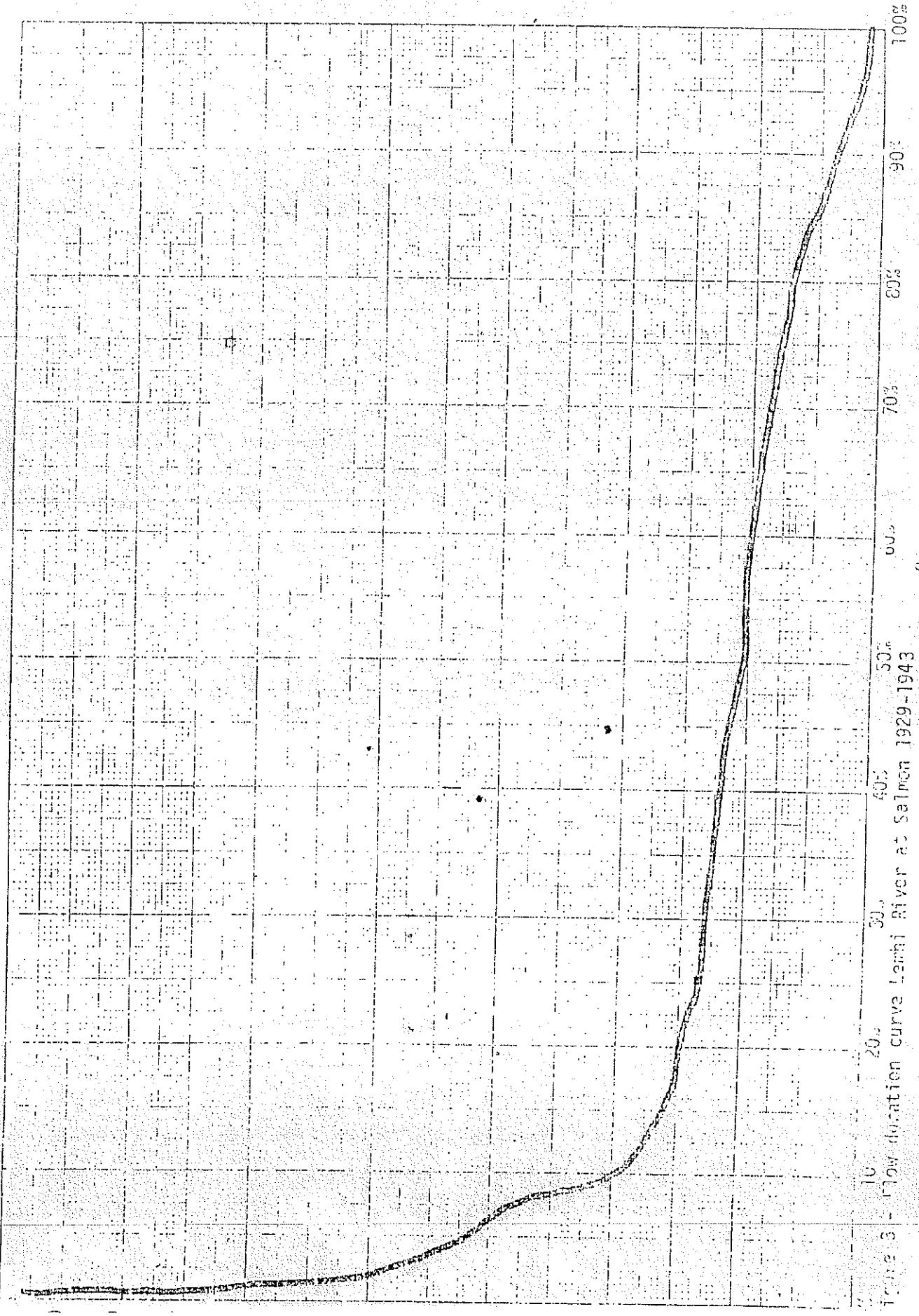


Figure 3 - flow duration curve Lemhi River at Salmon 1929-1943

diversions using historical practices the river has not gone dry either at Lemhi in the period 1956-63 or at Salmon during the period 1929-43. In fact, the discharge at Salmon during the period 1923-43 did not fall below 120 cubic feet per second over 85% of the time. This further demonstrates the actuality of return flow both from a ground water system and from over-land runoff from irrigated fields since existing water rights on the River Basin far exceed the natural flow of the river during low flow periods.

Tributary inflow during the peak runoff period is relatively minor. Most sink into the coarse alluvium on the valley floor and reach the river only as underflow and others are diverted by residents of the valley onto the River terraces adjacent to the valley floor. Hayden Creek is the only major tributary that contributes significantly to the flow of the Lemhi River on a year round basis. During peak runoff it may contribute as much as 50% of the total flow of the river and as much as 20% during the rest of the year.

Ground Water

Data from 44 wells in the Lemhi River Basin were utilized for this report. Well head and water surface elevations are utilized in order to determine the general ground water flow pattern and direction. Forty-three of the wells are located on or near the valley floor and are developed in alluvial materials. Depth of the wells range from 14 feet to 180 feet and the depth-to-water from 4 to 57 feet. One well, drilled into the Paleozoic rocks along the mountain front is approximately 900 feet deep. Depth to water is 56 feet below land surface and the yield is very low. There appears to be no significant correlation between the depth of the well and the depth of water. All of the wells except the very deep one are utilized for domestic or stock watering purposes, therefore no yield data were available for this report.

Ground water flow in the Lemhi River Basin is generally from the bounding mountains toward the center of the valley and then northward sub-parallel to the Lemhi River. A large percentage of the ground water enters the river as sub-surface flow and spring discharge. The rest of the ground water that is not captured by wells moves out of the valley at the mouth and into the Salmon River Basin, presumably to enter the Salmon River as sub-surface flow.

Ground water levels in the Lemhi River Basin are generally highest in August and September. Typically, ground water levels in most basins are highest in February and March and decline through the summer months. The reason that the reverse situation exists in the Lemhi River Basin is that irrigation water applied to lands in the upper valley reach the ground water systems in these months causing the level to rise. Ground water levels slowly decline after this period to their spring level with fluctuations from spring to fall commonly in the range of 4 to 10 feet. This reaction to recharge from the application of irrigation water is significant in that it demonstrates the sensitivity of the aquifer, its limit as to water holding capacity and demonstrates the contention that over application of irrigation water does not deprive downstream water users of their right to divert, but merely increases the lag time between runoff and the availability of water at any particular downstream point.

Ground Water-Surface Water Relationship

The ground water and surface water systems in the Lemhi River Basin can not be treated as two separate entities because they are directly connected. This can be most easily demonstrated by observing the effect of diversion of peak flows of tributaries onto the river terraces during the spring months. The flow of

Ground water flow in the Lemhi River Basin is generally from the bounding mountains toward the center of the valley and then northward sub-parallel to the Lemhi River. A large percentage of the ground water enters the river as sub-surface flow and spring discharge. The rest of the ground water that is not captured by wells moves out of the valley at the mouth and into the Salmon River Basin, presumably to enter the Salmon River as sub-surface flow.

Ground water levels in the Lemhi River Basin are generally highest in August and September. Typically, ground water levels in most basins are highest in February and March and decline through the summer months. The reason that the reverse situation exists in the Lemhi River Basin is that irrigation water applied to lands in the upper valley reach the ground water systems in these months causing the level to rise. Ground water levels slowly decline after this period to their spring level with fluctuations from spring to fall commonly in the range of 4 to 10 feet. This reaction to recharge from the application of irrigation water is significant in that it demonstrates the sensitivity of the aquifer, its limit as to water holding capacity and demonstrates the contention that over application of irrigation water does not deprive downstream water users of their right to divert, but merely increases the lag time between runoff and the usability of water at any particular downstream point.

Ground Water-Surface Water Relationship

The ground water and surface water systems in the Lemhi River Basin can not be treated as two separate entities because they are directly connected. This can be most easily demonstrated by observing the effect of diversion of peak flows of tributaries onto the river terraces during the spring months. The flow of

these tributaries sink into the coarse terrace gravels and move downward through the terrace gravels and valley floor alluvium to enter the Lemhi River as underflow or as spring discharge during the summer months. This and the application of irrigation water in excess of the consumptive irrigation requirements is believed to be the primary reason for the rise in ground water levels in August and September. The Lemhi River gains water from the ground water system throughout most of its length. Measurements taken for the Department of Water Administration during an investigation in 1972 demonstrate that the only reach that loses water to the ground water system is between Hayden Creek and Baker during the late summer and fall months. During the rest of the year, it either gains slightly or remains in equilibrium. Additionally, E.G. Crosthwaite in his open file report on the water resources of the upper Lemhi Valley states on page 9 that "practically all the water which percolates into the ground moves toward the river and reappears in numerous seeps and springs in the flood plain of the Lemhi River". It becomes very apparent that the water entering the alluvial fans and terraces adjacent to the valley floor and the water entering through application of irrigation water recharges the ground water system and the two are inseparably related.

Irrigation Efficiency

Introduction

Mr. Sherl Chapman and the Lemhi Irrigation District approached Wiser Irrigation, Burley, Idaho, with a request to investigate the following statement from the PROPOSED FINDING OF WATER RIGHTS IN THE LEMHI RIVER BASIN, "Findings of Fact", Item 4, Page 4.

The irrigation water requirement at the field headgate is found to be 3.0 acre feet per acre per calendar year regardless of the source or sources of supply. The loss in acre-feet from the point of diversion at the source to the field headgate varies dependent on length, slope and capacity of ditch together with the type of soil through which it passes.

Consumptive use or evapotranspiration of water from the land and crops is a total of 1.8 AF/acre to be applied from some water source. The balance of 1.55 AF/acre (3.0 acre feet per acre minus 1.45 acre feet per acre) reflects application losses that under present physical and economical conditions may be liberal, but are not unreasonable for the present methods of water application in the Lemhi River Basin.

To accomplish the task assigned a meeting was held with the Lemhi Irrigation District Board of Directors and three sites were selected at different locations within the valley where adequate measuring stations could be established to determine the amount of water diverted onto the three acreages. Measuring stations were also established at several locations so that any surface runoff from the three acreages could be measured.

The three sites selected are outlined on the attached maps with the measuring sites also indicated. The sites are typical of

uneven terrain. This component is regulated by management. This report assumes that management and irrigating methods will remain as they are presently.

Item 4 of "Findings of Fact" states that 3.0 acre feet per acre is the maximum amount of water required to be diverted at the head of the field or field headgate. Of the 3.0 acre feet diverted, 1.8 acre feet is consumptive use, or used by the crop. The report also claims that .35 acre feet per acre is provided by precipitation. Normal precipitation for the area does provide that amount of water, except that precipitation cannot be relied upon to provide the same amount of water every year, nor can it be guaranteed that the precipitation can be used by the crops when it comes. ~~This being the case, precipitation should be ignored when determining the irrigation water requirement of the area.~~

Irrigation Efficiency

Irrigation efficiency is a term defined by the industry as the ratio of the total amount of water diverted divided by the amount of water used by the crop expressed in percent. As an example, if 3.0 acre feet are diverted and 1.8 acre feet is used by the crop, the irrigation efficiency is $1.8/3.0$ or 60 percent.

The irrigation industry recognizes and acknowledges certain irrigation efficiencies with regard to the various irrigation methods. Sprinkler irrigation with all of the water enclosed in pipes, etc., is designed on the basis of 65 to 75 percent irrigation efficiency. Land that is leveled and corrugated or border diked can be surface irrigated with efficiencies in the range of 40 to 65 percent depending primarily upon type of soil, condition of the distribution system and the quantity or volume of water available. Land that is surface irrigated

the entire valley with bottom land and bench land represented. The irrigation practices on the sites are typical as are the diversions on the distribution systems.

Comments will first be presented on the paragraph from the adjudication report above and then the findings that will verify or disclaim the statement.

Irrigation Water Requirement

The irrigation water requirement is that amount of water required to be diverted from a source, either ground water or surface water, which is distributed upon the land in such a manner that the crops receive the required amount of water for their development and growth.

The irrigation water requirement consists of two major components. The first is known as crop consumptive use, (C.U.). This is the amount of water that is taken from the soil and used by the plant to sustain life. The crop consumptive use is affected by temperature, climate, type of plant, amount of water readily available, type of soil, solar radiation, etc. Because of the many variables involved, exact measurement of C.U. is extremely difficult. Several empirical or experimental methods have been developed by scientists. This report uses the consumptive use requirements shown in Bulletin 516, Consumptive Irrigation Requirements for Crops in Idaho. The 1.8 acre foot/acre figure for C.U. in the Lemhi Valley is realistic. It may be low according to more recent methods of determining C.U. but it is not an unrealistic figure.

The second major component of the irrigation water requirement is the losses--seepage in laterals, deep percolation, distribution losses, evaporation, use by non-crop plants, and excess water required to allow uniform distribution over rough, steep and

and is steep, rough, coarse and relatively uncultivated and is irrigated from earthen ditches with little or no artificial means of control as is the case in the majority of the Lemhi River Basin has an irrigation efficiency of less than 30 percent.

Irrigation practices, terrain, and conditions in the Lemhi Basin are such that irrigation efficiencies are not likely to be greater than 30 percent and are likely to be much less.

Investigations

Three areas were located where measurements were taken to determine the quantity of water diverted onto the three areas. The measurements were made by use of a current meter or weirs where the sites allowed. Measurements were recorded for approximately 50 days beginning June 26, 1975, and ending August 15, 1975. The actual irrigation season varies, but is recognized to extend at least from April 1 to November 1 or for 190 to 210 days.

Site No. 1 contained 1209 acres near Baker. Three and one tenths (3.1) acre feet per acre were diverted onto the land during the 50 day period for an irrigation efficiency of 28 percent. Irrigation efficiencies are typically lower than this during early and late season applications.

Site No. 2 consisted of 413 acres near Lemhi. Seven and three tenths (7.3) acre feet per acre were diverted during the 50 day period of measurement for an irrigation efficiency of 12 percent.

Site No. 3 contained 66 acres of coarse steep benchland near Leadore. Eight and three tenths (8.3) acre feet per acre were diverted for an irrigation efficiency of 10 percent.

Conclusions and Recommendations

Based on the data generated by these authors, other researchers and the Department of Water Resources, several conclusions and recommendations can be made regarding the Lemhi River Basin.

These are as follows:

- (1) The normal irrigation season of April 1 to November 1 of each year should be extended because of the possibility of flood runoff occurring prior to the April 1st date which would allow the diversion of those flood flows onto crop land on the terraces.
- (2) That the diversion of high waters or flood waters onto the benches and the application of irrigation water to the crop land provides recharge to the aquifers in the Lemhi River Basin and subsequently contributes to the stream flow during the late summer and fall months.
- (3) That the court should declare diversion of such high waters or flood waters as a beneficial use. Since that diversion tends to provide water diverted by wells for domestic and stock usage, as well as augmenting summertime flows that are in turn diverted in the lower basin for irrigation.
- (4) The investigations showed that actual irrigation efficiencies in the Lemhi River Basin range from 10 to 28 percent. This correlates very well with the industry's general assumption of less than 30 percent for the type of terrain and methods used in the Lemhi Basin.

(5) The consumptive use should not be reduced by the amount of precipitation. Reducing the C.U. assumes that all precipitation is used by the crop. This is erroneous because the precipitation very often comes at a time when the crop cannot utilize it.

(6) In light of the evidence presented and the practices existent in the Lemhi Basin, 9.0 acre feet per acre is a much more reasonable figure for the annual irrigation water requirement in the Lemhi River Basin. The poor irrigation efficiency is not unusual nor adverse since nearly 80 percent of the 9.0 acre feet diverted is returned to the river at some future time.

REFERENCES

order 1
Anderson, A.L., 1957, Geology and Mineral Resources of the Baker Quadrangle, Lemhi County, Idaho: Idaho Bureau of Mines and Geology, Pamphlet #112.

order 1
Anderson, A.L., 1961, Geology and Mineral Resources of the Lemhi Quadrangle, Lemhi County, Idaho: Idaho Bureau of Mines and Geology, Pamphlet #124.

Corey, G.L., Suttler, R.J., 1970, Consumptive Irrigation Requirements for Crops in Idaho: University of Idaho College of Agriculture Bulletin #516.

order 1
Crostliwaite, E.G., George, R.S., 1965, Reconnaissance of the Water Resources of the Upper Lemhi Valley, Lemhi County, Idaho: U.S. Geological Survey, open file report.

STATION (Climate only)		(River Station, if different)		MONTH	
LEADORE RANGER STATION				January, 2003	
STATE	IDAHO	COUNTY	LEMHI	RIVER	
TIME (local) OF OBSERVATION	TEMP.	PRECIPITATION		STANDARD TIME IN USE	
		800		M	
TYPE OF RIVER GAGE	ELEVATION OF RIVER GAGE ZERO FT	800		FLOOD STAGE (ft)	
				NORMAL POOL STAGE	

[illegible]

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

STATE		COUNTY		LEADORE RANGER STATION		RIVER		MONTH		YEAR	
TIME (local) OF OBSERVATION		TEMP.		PRECIPITATION		STANDARD TIME IN USE		PRECIPITATION		M	
TYPE OF RIVER GAGE		ELEVATION OF RIVER GAGE ZERO FT		800		FLOOD STAGE (ft)		800		NORMAL POOL STAGE	
Temperature F		AT OBSN.		24 HRS ENDING AT OBSERVATION		PRECIPITATION		Draw a straight line (—) through hours precipitation was observed, and a wavy line (~~~~) through hours of precipitation probably occurred unobserved		PRECIPITATION	
Date		Max		Min		24 HRS AMOUNTS		Snow, melted snow, etc (ins. and hundreds)		Snow, ice pellets (ins. and tenths)	
1		46		19							
2		30		2							
3		50		2		11		0.09		1.3	
4		25		10							
5		23		1							
6		27		4		5		0.00		T	
7		21		-8		-4		0.00		0.0	
8		22		1							
9		27		7							
10		27		-4		16		0.00		0.0	
11		34		-1		0		0.00		0.0	
12		38		-1							
13		35		20							
14		38		6		26		0.09		1.0	
15		35		8							
16		38		11							
17		37		7							
18		38		6		12		0.00		T	
19		12		3							
20		30		7		20		0.00		0.0	
21		37		20		21		T		T	
22		32		10							
23		30		18							
24		39		-28		-24		0.23		3.0	
25		11		-21							
26		26		-24							
27		27		-8		6		0.00		0.0	
28		30		-6		4		0.00		0.0	
29											
30											
31											
Sum						SUM		0.00		5.3	
CONDITION OF RIVER GAGE		A. Observation by rough ice.		B. Frozen, but open at gage.		C. Upper surface at smooth ice.		D. Ice gorge above gage.		E. Ice gorge below gage.	
F. Shora ice.		G. Floating ice.		H. Pool stage.		Check Bar (for wire-weight)		Normal CK. Bar		Reading	
Date											
OBSERVER											
SUPERVISING OFFICE		WFO MISSOULA									
STATION INDEX NO.		10-5177-08									

7 days
18
1 days
1 days
below
78

TEMPERATURE RECORD 1115104 3113104

STATE: IDAHO
COUNTY: LEMHI
RIVER: LEADORE RANGER STATION
MONTH: Jan-04
STANDARD TIME IN USE: M
PRECIPITATION: 800
RIVER STAGE: 800
ELEVATION OF RIVER GAGE ZERO FT: 800
TYPE OF RIVER GAGE: 1115104

Temperature F		PRECIPITATION		WEATHER (Calendar Day)		RIVER STAGE		REMARKS (Special observations, etc)	
Date	24 HRS ENDING AT OBSERVATION	24-HR AMOUNTS	AT OBSN.	Draw a straight line (—) through hours precipitation was observed, and a wavy line (~) through hours of precipitation probably occurred unobserved		Time of observation, if different from above	GAGE READING AT A.M.	TENDENCY	
		Rain, melted snow, etc (ins and hundredths)	Snow, ice pellets (ins. and tenths)	At obs. (ins. on ground, hail, ice pellets)					
Max	Min								
1	30	4	0	0.00	0.0	2			Overcast, no precipitation
2	30	7	11	T	T	2			Windy, overcast and cold.
3	21	-8	0	0.00	0.0	2			Partly cloudy, no precipitation.
4	17	-27	0	0.00	0.0	2			Overcast, no precipitation
5	25	-27	-24	T	T	2			Sunny, clear, extremely cold.
6	5	-24	-3	0.00	0.0	2			Partly cloudy, no precipitation.
7	19	-3	19	0.00	0.0	2			Overcast, windy, no precipitation
8	22	9	18	0.00	0.0	2			Cloudy, breezy, no precipitation
9	29	17	25	0.00	0.0	1			Overcast, no new snow or percip.
10									Could not document, problem w/ weather thermometer
11									Could not document, problem w/ weather thermometer
12	39	4	5	0.00	0.0	1			Overcast, dry, no percip.
13	34	4	17	0.00	0.0	1			Sunny, clear, no new snow.
14	40	9	9	0.00	0.0	1			Partly cloudy, no precipitation.
15	37	1	1	0.00	0.0	1			Cloudy, no precipitation or snow.
16	37	1	21	T	T	1			Cloudy, trace of new snow.
17	32	-1	0	0.00	0.0	1			
18	28	2	0	0.00	0.0	1			
19	30	17	0	T	T	1			
20	33	17	18	0.00	0.0	1			Overcast, no new snow or percip.
21	32	-2	0	0.00	0.0	1			Partly cloudy, no precipitation
22	26	-2	-2	0.00	0.0	1			Clear with few high thin clouds
23	30	-2	11	0.00	0.0	1			Cloudy and breezy
24	25	2				1			Overcast and windy
25	23	2				1			Sunny and mild
26	25	2	12	0.04		1			Overcast, trace of new snow
27	26	8	14	0.00	0.0	1			Overcast and breezy
28	27	14	21	0.00	0.0	1			Overcast and breezy
29	33	17	25	0.00	0.0	1			Overcast, no new snow or precipitation.
30	37	22	30	0.00	0.0	1			Overcast, breezy, no precipitation.
31	26	1				1			Partly cloudy, no precipitation
Sum	27	1				1			Partly cloudy, no precipitation
CONDITION OF RIVER GAGE									
A. Obstruction by rough ice.									
B. Frozen, but open at gage.									
C. Upper surface at smooth ice.									
D. Ice gorge above gage.									

6 days
45 days
11 days
5 days
61 days

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

[illegible]

Temperature record 1/15/05 - 3/15/05
57 days 28+
3 days below 28
1 day 28+
60 day Total

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

STATION (Climatological)
LEADORE NO. 2
STATE ID
COUNTY LEMHI
TEMPERATURE 0800
PRECIPITATION 0800
STANDARD TIME IN USE M
YEAR 2005
MONTH JAN
RIVER

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

ID		TIME (local) OF OBSERVATION		TEMPERATURE 0800		PRECIPITATION 0800		STANDARD TIME IN USE		FLOOD STAGE		ELEVATION OF GAGE		TYPE OR RIVER GAGE		TEMPERATURE		24 HRS ENDING AT OBSERVATION		24 HR AMOUNTS		AT OB		Snow, ice pellets (in and tenths)		Rain, melted (in and tenths)		Snow, ice pellets on ground (in)		Draw a straight line (---) through hours precipitation was observed and a wavy line (----) through hours precipitation probably occurred unobserved		A.M.		NOON		P.M.		Fog		Ice Pellets		Glaze		Thunder		Hail		Damaging Winds if different from above		Condition		Gage reading at AM		Tendency		REMARKS (SPECIAL OBSERVATIONS, ETC.)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																</	

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

[illegible]

Temperature record 1/15/06 - 3/12/06
WS FORM 591 (12-93)
45 days 28 +
13 " below 28
13 " unknown
60 day total

STATION (Climatological) LEADORE NO. 2		(River Station, if different) MONTH JAN		YEAR 2006	
STATE	COUNTY LEMHI	RIVER			
TIME (local) OF OBSERVATION		TEMPERATURE 0800	PRECIPITATION 0800	STANDARD TIME IN USE M	
TYPE OR RIVER GAGE		ELEVATION OF GAGE ZERO	FLOOD STAGE	NORMAL POOL STAGE	
TEMPERATURE		PRECIPITATION			
24 HRS ENDING AT OBSERVATION		Draw a straight line (---) through hours precipitation was observed and a wavy line (----) through hours precipitation probably occurred unobserved			
MAX MIN		A.M.		P.M.	
1 37 26		1 2 3 4 5 6 7 8 9 10 11		1 2 3 4 5 6 7 8 9 10 11	
2 34 25					
3 37 12					
4 35 10					
5 35 6					
6 28 18					
7 28 23					
8 32 17					
9 42 -4					
10 32 12					
11 32 21					
12 39 6					
13 32 17					
14 M M M					
15 M M M					
16 M M M					
17 M M 18					
18 26 18					
19 29 -2					
20 29 8					
21 32 -2					
22 32 -2					
23 25 2					
24 36 3					
25 37 3					
26 38 7					
27 32 7					
28 M M M					
29 M M M					
30 M M 24					
31 31 0					
SUM					
CONDITION OF RIVER AT GAGE		CHECK BAR (for wire weight) NORMAL CHECK BAR			
E. Ice gorge below gage		DATE			
F. Frozen, but open at gage					
G. Upper surface smooth ice					
H. Ice gorge above gage					
A. Obstructed by rough ice					
B. Frozen, but open at gage					
C. Upper surface smooth ice					
D. Ice gorge above gage					
OBSERVER		10-5177-08			
SUPERVISING OFFICE		WFO Missoula			
STATION INDEX NO.		10-5177-08			

12 days
28 days
1 day
below 28
2 unknown

[illegible]

16 days
28 +
12 days
below
28

STATION (Climatological) LEADORE NO. 2										COUNTY		LEMH		(River Station, if different)		MONTH		MAR		YEAR		2006	
STATE		ID		OF OBSERVATION		TEMPERATURE		PRECIPITATION		RIVER		STANDARD TIME IN USE		M		NORMAL POOL STAGE							
TYPE OR RIVER GAGE		ELEVATION OF GAGE		ZERO		FLOOD STAGE																	
TEMPERATURE		24 HR AMOUNTS		AT OB		PRECIPITATION																	
24 HRS ENDING AT OBSERVATION		Snow, ice pellets (in and tenths)		Snow, ice pellets (in and tenths)		Snow, ice pellets (in and tenths)		Snow, ice pellets (in and tenths)		Snow, ice pellets (in and tenths)		Snow, ice pellets (in and tenths)		Snow, ice pellets (in and tenths)		Snow, ice pellets (in and tenths)		Snow, ice pellets (in and tenths)		Snow, ice pellets (in and tenths)			
MAX		MIN		OBSN		AT		OBSN		AT		OBSN		AT		OBSN		AT		OBSN			
1		47		21		29		T		0.0		0		1		2		3		4			
2		39		19		27		0.00		0.0		0		5		6		7		8			
3		42		25		M		0.00		0.0		0		9		10		11		12			
4		45		25		M		0.00		0.0		0		13		14		15		16			
5		35		18		M		0.00		0.0		0		17		18		19		20			
6		45		18		31		0.00		0.0		0		21		22		23		24			
7		42		21		38		0.00		0.0		0		25		26		27		28			
8		39		18		19		0.02		0.5		1		29		30		31		32			
9		38		14		17		0.01		0.8		1		33		34		35		36			
10		25		0		9		0.00		0.0		1		37		38		39		40			
11		27		7		M		0.00		0.0		0		41		42		43		44			
12		31		2		M		0.00		0.0		0		45		46		47		48			
13		32		5		14		0.00		0.0		0		49		50		51		52			
14		31		14		21		0.00		0.0		0		53		54		55		56			
15		33		18		22		0.01		0.3		0		57		58		59		60			
16		37		16		25		0.00		0.0		0		61		62		63		64			
17		36		22		28		0.00		0.0		0		65		66		67		68			
18		37		22		M		0.00		0.0		0		69		70		71		72			
19		33		14		M		0.00		0.0		0		73		74		75		76			
20		38		14		19		0.03		0.0		0		77		78		79		80			
21		40		19		27		T		0.1		0		81		82		83		84			
22		39		3		22		0.06		1.2		1		85		86		87		88			
23		43		21		30		0.00		0.0		0		89		90		91		92			
24		45		29		32		0.00		0.0		0		93		94		95		96			
25		48		27		M		0.00		0.0		0		97		98		99		100			
26		37		11		M		0.00		0.0		0		101		102		103		104			
27		50		11		25		0.00		0.0		0		105		106		107		108			
28		42		25		38		0.00		0.0		0		109		110		111		112			
29		47		35		37		0.02		0.0		0		113		114		115		116			
30		47</																					

Temperature record 1/15/07 - 3/15/07

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

41 days 28° +
19 days below 28°
60 day total

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

U.S. FORM B-91
(12-93)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

60 day AP 12601

[illegible]

6 days + 28 = 34 days below 28

10-5177-08

[illegible]

23 days + 28 days = 51 days

