

**WATER QUALITY STATUS REPORT NO. 97**

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**NORTH FORK PAYETTE RIVER**  
**Valley County, Idaho**  
**1988**

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**Idaho Department of Health & Welfare**  
**Division of Environmental Quality**  
**Water Quality Bureau**  
**1420 N. Hilton**  
**Boise, Idaho 83706-1290**

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Division of Environmental Quality  
Water Quality Bureau

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## ABSTRACT

Cascade Reservoir has received substantial attention from the public who live by and/or use the reservoir for recreation, from various state and federal agencies, and the media as a result of its deteriorating water quality. The Idaho Department of Health & Welfare-Division of Environmental Quality determined that additional data was needed for the North Fork Payette River, which is a major tributary to Cascade Reservoir. A study of the North Fork Payette River's water quality was conducted July through September 1988 to better comprehend Cascade Reservoir's water quality problems. The study emphasized two point source discharges, the McCall Sewage Treatment Plant (STP) and the Idaho Department of Fish & Game Fish Hatchery. Both point sources have increased effluent levels since the last comprehensive study.

The North Fork Payette River conforms to most of the State's water quality standards for designated uses which include domestic water supply, agricultural water supply, cold water biota, salmonid spawning, and primary and secondary contact recreation. However, residual chlorine levels one mile below the McCall Sewage Treatment Plant (STP) were ten times the State standard and violated the regulations governing point source wastewater discharges. This elevated chlorine level raised the mean average for all six sampling dates to four times the acceptable state standard.

The Idaho Department of Fish & Game Fish Hatchery effluent levels do not appear to have an impact on the North Fork Payette River. The nutrients examined were ammonia, total Kjeldahl nitrogen, and nitrate-nitrite. The ammonia levels for the Fish Hatchery were the major concern and averaged .180 mg/l with a standard deviation of .012 mg/l and were within State water quality standards, .220 mg/l, one-half mile below the Fish Hatchery. The total Kjeldahl nitrogen average was .313 mg/l with a standard deviation of .090 mg/l, there is not a state standard set for total Kjeldahl nitrogen. The nitrate-nitrite average was .018 mg/l with a standard deviation of .012 mg/l. Total Phosphorus discharge levels ranged below detectable levels of .050 mg/l to .120 mg/l. Only two samples dates produced detectable total phosphorus limit, restricting the ability to obtain a loading for total phosphorus. Dissolved ortho-phosphorus levels ranged from .011 mg/l to .019 mg/l with an average of .015 mg/l and a standard deviation of .003. Dissolved ortho-phosphorus loadings were 48.5 pounds/month (21.9 kg/month) for the period of this study. Ortho-phosphorus was sampled only twice during the study, an average of .003 mg/l. was detectable, But with only two data points, no accurate conclusions can be made.

The McCall STP effluent levels do not appear to be having an impact on the North Fork Payette River. Sampled parameters for the McCall STP were; ammonia, total Kjeldahl nitrogen, nitrate-nitrite, total

phosphorus, dissolved ortho-phosphorus and ortho-phosphorus. The McCall STP operates under a NPDES permit that does not set standards for ammonia, total Kjeldahl nitrogen, or nitrate-nitrite concentrations discharge into the North Fork Payette River. Just one mile below McCall STP these sampled nutrients were all within the state standard and would indicate healthy biological assimilation in the area of the river between the McCall STP and Cascade Reservoir. The total phosphorus effluent concentrations average was 5.100 mg/l with a standard deviation of 3.370 mg/l. There is not a set standard for total phosphorus with the NPDES permit. Using an average of 5.100 mg/l total loading from the McCall STP was 850 pounds/month (386 kg/month) for the summer of 1988 (Loading was based on effluent discharge of .667 million gallons/day, 1.03 cfs). Samples for dissolved ortho-phosphorus averaged 3.55 mg/l and a standard deviation of 2.34 mg/l. With this data, a loading of dissolved ortho-phosphorus of 592 pounds/month (268 kg/month) was calculated. Ortho-phosphorus was also sampled, but with two data points no viable conclusion can be made.

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## INTRODUCTION

### Purposes

- 1 Generate recent data on the impact of the McCall STP and State fish hatchery of the North Fork Payette River.
- 2 Provide additional information on nutrient loading from the North Fork Payette River to Cascade Reservoir.
- 3 Provide the Idaho Department of Fish and Game with current water quality information for fishery management on the North Fork Payette River.
- 4 Provide information for wastewater discharge limits.

### Background

The North Fork Payette River drains from the southern end of Payette Lake in Valley County. The community of McCall, population of 2,005, is situated on the edge of Payette Lake at the outlet to the North Fork Payette River, as shown in Figure 3. The river meanders through sparsely populated farm and forested lands for eighteen miles before entering into Cascade Reservoir. The area along the river is known for flooding, which has discouraged the building of large residential tracts from McCall to Cascade Reservoir. The river is flanked by flood irrigated grazing lands along with mixed stands of Lodgepole pine, Pinus contorta, and Ponderosa pine, Pinus ponderosa. A majority of inflow streams are intermittent with little or no flow in the summer months.

The flow from Payette Lake is determined by irrigation demand in Emmett Valley. There are no minimum flow levels, however 1988 data indicates the river fluctuate from 57 cfs to 155 cfs during the summer months of 1988 (Figures 1 and 2). Annual Precipitation is 21.5 inches, which is mainly snow from November through March (SCS, 1976).

Past glacial action carved the river bed for the North Fork Payette River. The McCall soil type is located for approximately the first mile of the river after leaving Payette Lake. McCall soil is a glacial till that is a very cobble sandy loam that drains well. The remainder of the river soil type until it flows into Cascade Reservoir is Melton-Jurvannah-Roseberry. The Melton-Jurvannah-Roseberry soils are level to very gently sloping, very deep, poorly

drained soils that formed in alluvium and glacial outwash (SCS 1976).

The Idaho Department of Fish & Game Fish Hatchery is located on the North Fork Payette River approximately one mile downstream from the Payette Lake outlet. Water for the raceways is drawn from Payette Lake using surface and subsurface sources. The mixing of the two sources is used to maintain a proper temperature for rearing activity. The flow from the fish hatchery is maintained at 20 cfs.

Former data on the fish hatchery (Zimmer 1983 and Clark and Wroten 1975) determined that the fish hatchery made an insignificant impact on the North Fork Payette River water quality and no in-depth evaluation was required. The fish hatchery has continuously increased its production, as shown in Table 1. The annual production rose from 5,000 pounds of fish in 1979 to 50,000 pounds of chinook salmon smolts in 1987. This represents a ten fold increase in production from the fish hatchery in eight years.

The McCall Sewage Treatment Plant (STP) is located approximately two miles downstream from the Payette Lake outlet on the North Fork Payette River and provides services to the McCall area. The McCall STP operates under a National Pollution Discharge Elimination Systems (NPDES) permit as administered by the United States Environmental Protection Agency. The Daily effluent flow is 3 cfs or less. The discharge of 3 cfs or less allows for a minimal dilution factor of 10:1 when the effluent is discharged into the North Fork Payette River. Average discharge for summer months is .667 million gallons/day (1.08 cfs).

Excessive amounts of algae blooms occur on Cascade Reservoir during the late summer months when the reservoir undergoes a turn-over, releasing phosphorus from the sediment. Phosphorus is the limiting factor for the growth of these algae blooms (Zimmer 1983). These algae blooms create a water quality problem when they grow to excess. The need to determine the amount of phosphorus and other nutrients going into Cascade Reservoir from the point sources on the North Fork Payette River is the focus of this study.

Figure 1. North Fork Flows at USGS Gage, 1988

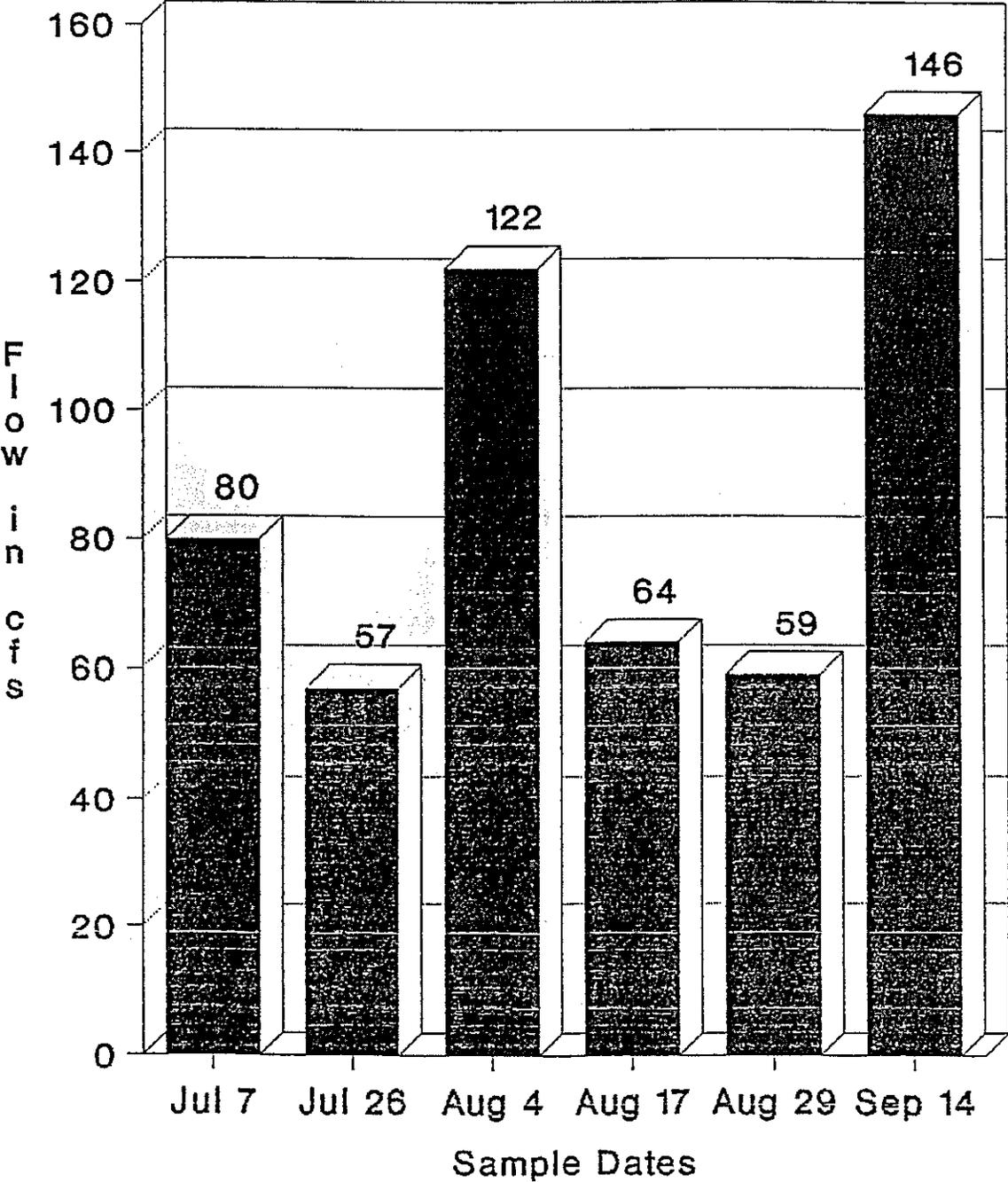


Figure 2. North Fork Flows at Hartzell, 1988

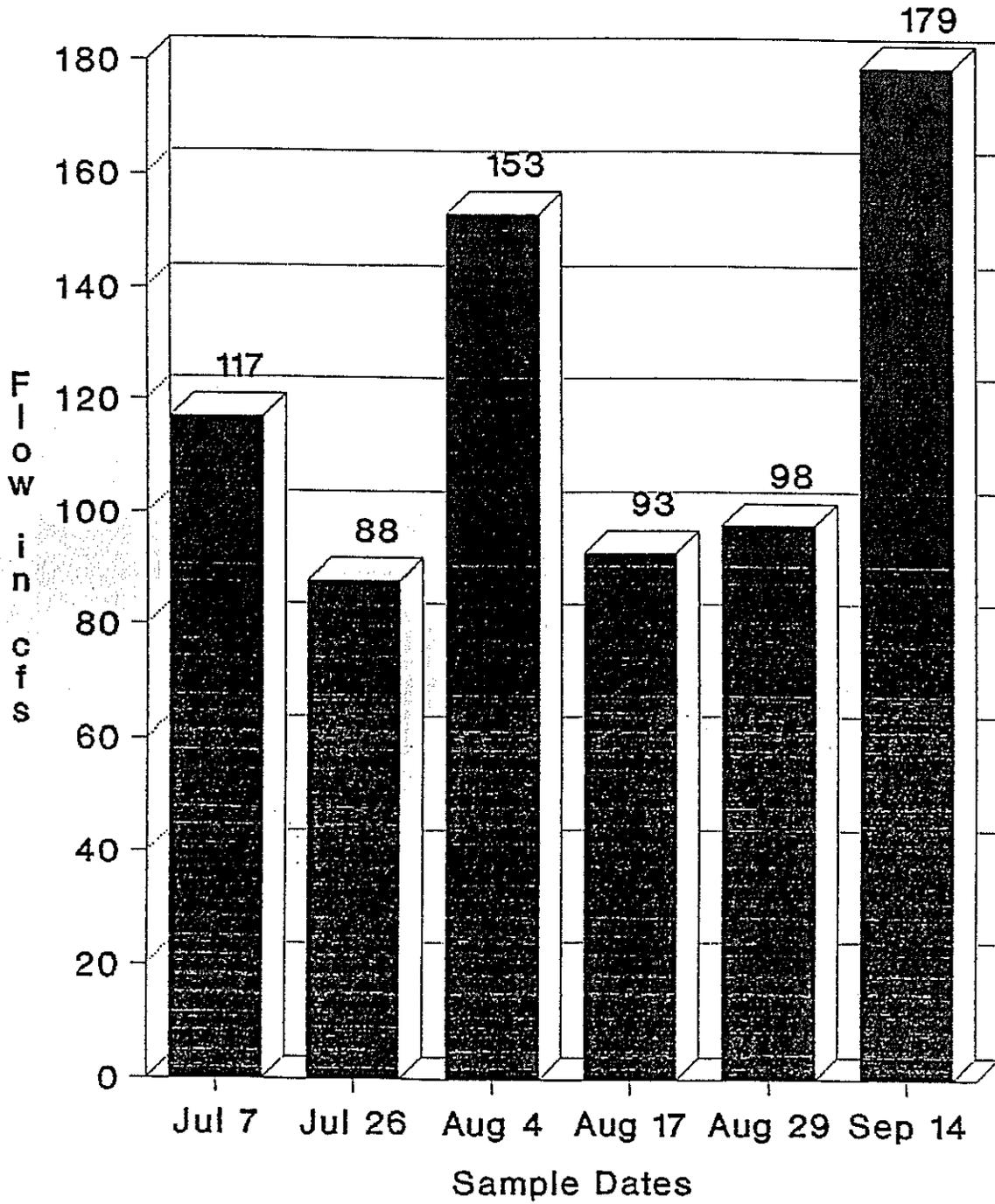


Table 1. Idaho Fish and Game Fish Hatchery Annual  
Production of Chinook Salmon Smolts  
In Pounds, from 1979 to 1987

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YEAR	Fish Production in Pounds
1979	5,000
1980	6,200
1981	13,000
1982	6,000
1983	9,500
1984	14,500
1985	24,000
1986	49,000
1987	50,000

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## METHODS AND MATERIALS

### Sampling Stations and Sampling Frequency:

There was a total of six sampling stations. Two monitored the effluent from the fish hatchery and McCall STP. Four were river sampling stations situated above, between, and below the effluent outlets.

Figures 3 and 4, shows maps of the sampling stations with the first sampling station located one-half mile downstream from the Payette Lake outlet into the North Fork Payette River at the United States Geological Survey, USGS, discharge measurement gauge. The second sampling station is located one mile downstream of the Payette Lake outlet and represents the effluent from fish hatchery. The third sampling station is located one-half mile downstream of the fish hatchery outlet. The fourth sampling station is located one-half mile farther downstream at the STP effluent. The fifth sampling station is located one mile downstream of the STP effluent outlet at Sheep Bridge. The sixth sampling station is located approximately nine miles downstream of Sheep Bridge at Hartzell Bridge, which is just above the confluence of the North Fork Payette River and Cascade Reservoir. Table 4 indicates station description, location, and STORET number.

The samples were taken in July, August and in September of 1988. The timing of the sampling was to reflect the increase of the population of McCall from summer residents, increase of effluent discharged at STP, and extreme low flows of the North Fork Payette River - i.e. "summer worst case scenario".

### Sample Collection and Analysis:

Stream flow was measured with a Marsh-McBirney Model 201 portable water current meter. Depth and width measurements were taken at Hartzell Bridge for discharge calculations.

All chemical samples were collected with a DH-48 suspended sediment sampler. Composite samples were collected in a churn splitter. One liter cubitainers were filled from the churn splitter for laboratory analyses and preserved on ice to 4°C. Dissolved ortho-phosphorus was determined by a sample from the churn and filtered through a 20 micromillimeter filter with a syringe into a vial. Two milliliters of concentrated sulfuric acid was added to cubitainers for ammonia, nitrate-nitrite, total Kjeldahl nitrogen, and total phosphorus analyses. All analyses were conducted by the State of Idaho, Bureau of Laboratories following Standard Methods (APHA 1985).

Figure 3 Upper North Fork Payette River Stations

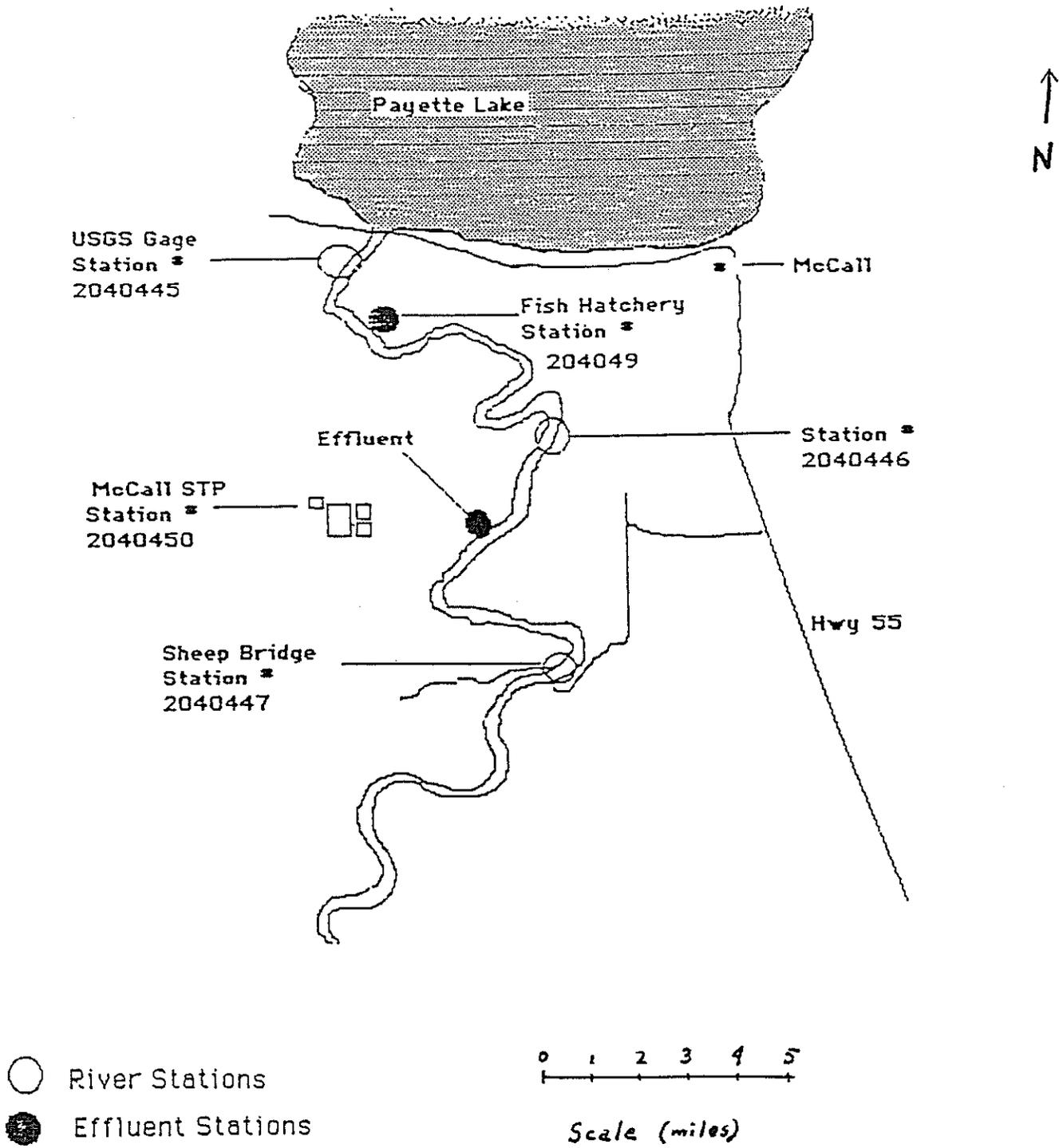
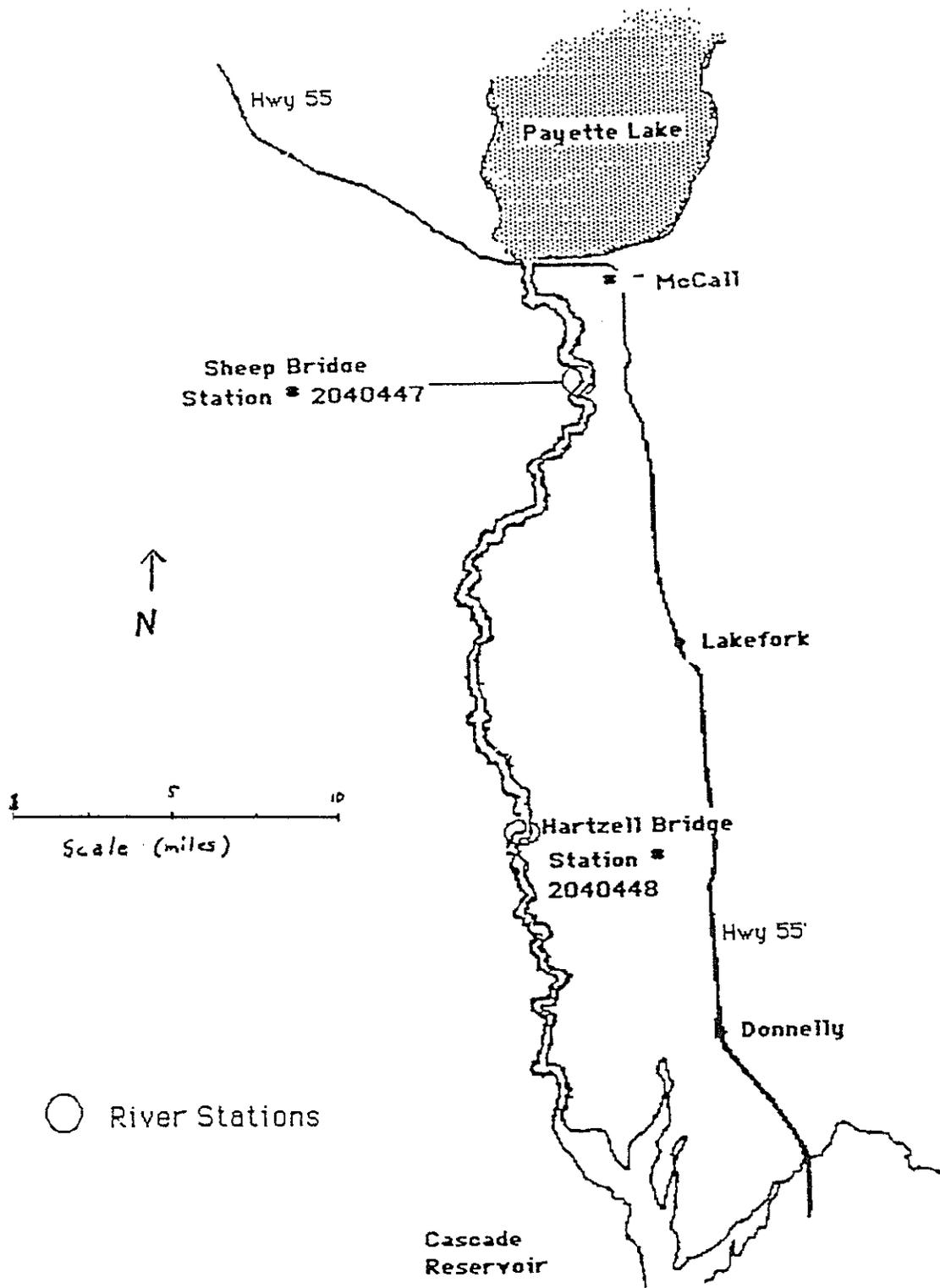


Figure 4 North Fork Payette River Stations



Total chlorine was measured with a portable Hach Test Kit with composite samples taken from the churn splitter.

Field parameters were determined with the use of portable meters. Dissolved oxygen and temperature were measured with a Yellow Springs Instrument Company Model 54A meter. The pH was determined with an Orion Model 231 digital pH/mV/temperature meter. The meters were calibrated at the beginning of each day to insure accuracy.

Table 5 lists parameters and STORET numbers associated with the North Fork Payette River study.

### Quality Assurance

Duplicate and spiked water samples were collected at all six stations on the dates samples were taken to assess the accuracy and precision of the data collected. The quality assurance (QA) element of the field work follows Bauer (1986) and Bauer et al (1986a, 1986b) guidelines.

Duplicate samples were collected to assess precision . At all the stations these QA samples were collected from the same composite collected for routine water chemistry samples.

Three sets of spiked samples were collected during the study from all the stations. Chemical spikes were prepared by the IDHW-Bureau of Laboratories, Boise, and sealed in Kimble 10 ml glass ampules. Spikes were prepared for ammonia, nitrate-nitrite, ortho-phosphate, total phosphorus and total Kjeldahl nitrogen. Celite was used for suspended solids spiking and was pre-weighed into plastic vials. In the field, these vials were opened and their contents mixed with 900 ml of sample water in 1 liter containers. All QA samples were then stored on ice at 4 °C and delivered to the IDHW-Laboratories in Boise for analysis following Standard Methods (APHA 1985). Percent recovery for spikes was determined by subtracting background concentrations (determined from routine samples) from known spike values.

## RESULTS AND DISCUSSION

### Idaho Department of Fish & Game Fish Hatchery

Even with the limited monitoring data on the fish hatchery (Zimmer 1983 and Clark-Wroten 1977) there has not been a marked increase of nutrient rich effluent from the fish hatchery. The data was examined in light of the ten fold increase in production at the fish hatchery, Table 1. The parameters and data from the Fish and Game Fish Hatchery effluent are shown on Table 9.

The fish hatchery is located approximately one mile downstream from the Payette Lake outlet. Water for the raceways is drawn from Payette Lake using surface and subsurface sources. The mixing of the two sources is used to maintain a proper temperature for rearing activity. The discharge from the fish hatchery is maintained at 20 cfs. Sampling results for the fish hatchery, USGS Gauge, and below the fish hatchery can be found in Tables 8, 9, and 10.

### Nitrogen Discharged From the Fish Hatchery

To determine possible impacts to the North Fork of the Payette River, samples were collected from the fish hatchery effluent and at a site approximately 1/2 mile downstream. No assurance is made to determine if total mixing has occurred at the down stream station.

The samples for total nitrogen as ammonia were significantly lower than the established EPA Standards (1986). With the increase of productivity, ammonia is a major concern for the fish hatchery effluent. The survival of desirable fish communities seldom exceed ammonia levels of 2.00 mg/l (Paller et al 1988). The average ammonia discharge from the fish hatchery was .108 mg/l, with a standard deviation of .012 mg/l. Figure 6 shows the dispersion of ammonia in the North Fork Payette River. Un-ionized ammonia levels ( $\text{NH}_3\text{-N}$ ) were below the .020 mg/l levels as recommended by the EPA (Willingham 1976). Un-ionized levels ranged from .00060 mg/l to .003 mg/l at the station 1/2 mi. below the fish hatchery. Average un-ionized ammonia levels were .003 mg/l with a standard deviation of .002 mg/l. Average temperature and pH for the study period below the fish hatchery was 19°C with pH levels averaging 8.24. EPA Water Quality Standard for un-ionized ammonia at these temperature and pH levels is .035 mg/l for a four day average. The average background level of ammonia at the sampling station above the fish hatchery was .025 mg/l with a standard deviation of .017 mg/l. Un-ionized ammonia levels at the USGS Gauge ranged from .00010 mg/l to .00050 mg/l with an average of .00030 mg/l and a

standard deviation of .00010 mg/l. Average temperature and pH at the USGS Gauge was 20.1°C and 7.7 respectively. EPA Water Quality Standard for un-ionized ammonia at this temperature and pH is .035 mg/l. Data for ionized-un-ionized ammonia comparison are located on Tables 16 and 17.

The background levels above and below the fish hatchery indicates that the ammonia discharged by the fish hatchery is having a insignificant impact on the North Fork Payette River. Data would indicate that nitrification of ammonia is occurring at a healthy level between the fish hatchery and the station 1/2 mile below the effluent. Data collected in the past (Zimmer 1983) did not include information about ammonia in July through September for a direct comparison.

Nitrate-nitrite show very little difference from upstream of the fish hatchery to below the fish hatchery. Above the fish hatchery nitrate-nitrite average levels were .018 mg/l with a standard deviation of .009 mg/l and at the fish hatchery effluent the average level was .018 mg/l with a standard deviation of .012 mg/l. The nitrate-nitrite average level downstream of the fish hatchery is slightly higher, .026 mg/l with a standard deviation of .014 mg/l. The slight increase in the average below the fish hatchery shows the process of nitrification is taking place with the ammonia not utilized by plants being converted into nitrite and nitrate, which is common in flowing water (Wetzel 1975).

The process of nitrification is further exemplified by looking at organic nitrogen (total Kjeldahl nitrogen). The average level above the fish hatchery was .152 mg/l with a standard deviation of .034 mg/l. The average level at the fish hatchery effluent was .313 mg/l with a standard deviation of .090 mg/l, which is twice the amount above the fish hatchery. Below the fish hatchery the average level dropped back down to .196 mg/l with a standard deviation of .330 mg/l. There is not a set EPA limit for Total Kjeldahl nitrogen.

The data would indicate the nitrogen being released by the fish hatchery is not presenting a problem to the North Fork Payette River. The nitrification process in the North Fork Payette is happening at a healthy level for the river biota (USGS 1985).

### Phosphorus Discharged from the Fish Hatchery

This study examined three chemical structures of phosphorus, these structures were dissolved ortho-phosphorus, ortho-phosphorus and total phosphorus. The total phosphorus is the forms of phosphorus that are dissolved, colloidal, and suspended in the river's water. The majority of the total phosphorus analyses were below the detectable level of .050 mg/l. All the data for total

phosphorus above the fish hatchery were in the less than detectable level. The fish hatchery effluent ranged from less than detectable level of .050 mg/l to .120 mg/l. Below the fish hatchery the total phosphorus level again dropped to the less than detectable level for all sampling dates. Recommended level for total phosphorus is less than .050 mg/l. A total-phosphorus loading cannot be determined with only two data points above detectable levels.

Dissolved ortho-phosphorus above the fish hatchery ranges from the less than detectable level of .001 mg/l to .004 mg/l. At the fish hatchery the effluent average dissolved ortho-phosphorus was .015 mg/l with a standard deviation of .003 mg/l. Below the fish hatchery the data was less than detectable to .006 mg/l. Loading for dissolved ortho-phosphorus for the fish hatchery, using the average of .015 mg/l, would be 48.5 pounds/month (21.9 kg/month). There is not a set limit for dissolved ortho-phosphorus recommended by EPA.

The data for ortho-phosphorus was only twice taken during the month of July. With only two measurements, the data collected is not complete enough to make a conjecture on ortho-phosphorus with this data.

The Fish Hatchery does contribute phosphorus to the North Fork Payette River which probably will eventually end up in Cascade Reservoir. It may be a relatively small amount but the cumulative effects may be significant.

#### McCall Sewage Treatment Plant

The McCall STP is located approximately two miles downstream from Payette Lake outlet. The McCall STP operates under a NPDES permit as administered by EPA. The NPDES permit stipulates the maximum concentrations of pollutants allowed in the effluent that can be discharged into the river and requires routine monitoring by the applicant with results sent to Idaho Department of Health & Welfare.

Daily effluent discharges are 3 cfs or less. The 3 cfs or less allows for a minimal dilution factor of 10:1 with the North Fork Payette River as determined by the NPDES permit. Average discharge at the time of the study is approximately .667 million gallons/day (1.030 cfs). Data for the McCall STP, Sheep Bridge, and Hartzell Bridge are located in Tables 11, 12, and 13.

## Nitrogen Discharged from McCall STP

According to data collected, total Kjeldahl nitrogen in the effluent from the McCall STP averaged 20.9 mg/l with a standard deviation of 18.7 mg/l. The NPDES permit does not set a standard for total Kjeldahl nitrogen concentration in the effluent. The total Kjeldahl nitrogen quickly fell back to normal levels after dilution just one mile downstream from the McCall STP at Sheep Bridge. The average at Sheep Bridge was .318 mg/l with a standard deviation of .105 mg/l. There are no EPA standards for levels of allowable total Kjeldahl nitrogen. The total nitrogen level was even lower nine miles farther downstream at Hartzell Bridge. The average at Hartzell Bridge was .280 mg/l with a standard deviation of .112 mg/l. The quick dissipation of the total Kjeldahl nitrogen levels reflects the rapid lowering of the levels of inorganic and organic nitrogen compounds after being introduced into the river.

The average ammonia, as nitrogen, level at the McCall STP was 11.2 mg/l with a standard deviation of 8.6 mg/l. There is not a maximum total nitrogen limit set for ammonia, as nitrogen, discharge allowed by the NPDES for the McCall STP.

At Sheep Bridge one mile below McCall STP the un-ionized average ammonia level were .021 mg/l with a standard deviation of .013 mg/l. Average temperature and pH for Sheep Bridge was 18.5°C and 8.23 respectively. With the temperature and pH dependent, EPA Water Quality Standard (1986) is approximately .035 mg/l for a four day period and .200 mg/l for a one hour period. The average level was reduced even more at Hartzell Bridge which was .004 mg/l with a standard deviation of .007 mg/l. These averages were within the EPA Standard with a average temperature of 16.4°C and a pH of 8.11, standard for this temperature and pH is .035 mg/l for a four day period, and .200 mg/l for an one hour period. Ionized-un-ionized comparison are located in Tables 14 and 15.

The nitrate-nitrite level averaged 18.6 mg/l with a standard deviation of 27.3 mg/l at the McCall STP. There are no set limits for nitrate-nitrite levels determined by the NPDES permit.

The average nitrate-nitrite level at Sheep Bridge was .549 mg/l with a standard deviation of .669 mg/l. The average was even lower at Hartzell Bridge, which was .472 mg/l with a standard deviation of .043 mg/l. The EPA does not set a recommended level for nitrate-nitrite in flowing waters.

The release of nitrogen based compounds do not appear to be impacting water quality or the biota of the North Fork of the Payette River. Further examination of the biota, fish and macroinvertebrates, would be needed to determine if the release of these levels of nitrogen compounds are having a significant impact.

## Phosphorus Discharged from McCall STP

The average total phosphorus at the McCall STP was 5.11 mg/l with a standard deviation of 3.37 mg/l. With data collected from this study, total phosphorus loading for the summer months is 850 pounds/month (386 kg/month). There is not a maximum total phosphorus discharge limit allowed by the NPDES for the McCall STP. Just one mile downstream of the McCall STP, at Sheep Bridge, half of the measurements were below the detectable level which makes any average unavailable. Table 2, shows the mean and standard deviation for parameters at and below McCall STP. All the measurements ten miles downstream of the McCall STP at Hartzell Bridge were below the detectable level. Total phosphorus loading to Cascade Reservoir cannot be determined with the data presented in this study. Non-detectable levels of total phosphorus at Hartzell Bridge well not allow for the accuracy needed to make a viable assessment.

Table 3, shows the amount of total phosphorus released from the McCall STP effluent from 1983-1988 as reported in the Monthly Discharge Reports. The table shows the McCall STP released on the average of 656 pounds/month (298 kg/month) of total phosphorus into the North Fork Payette River in 1988.

The dissolved ortho-phosphate average at the McCall STP was 3.58 mg/l with a standard deviation of 2.34 mg/l. This data can be used to assess the loading of dissolved ortho-phosphorus from the STP. The data indicates that on an average 592 pounds/month (268 kg/month) of dissolved ortho-phosphorus is being released from the McCall STP. One mile below the McCall STP the average drops to .021 mg/l with a standard deviation of .014 mg/l. This data would indicate 375 pounds/month (170 kg/month) pass the Sheep Bridgestation with a flow average of 111 cfs. Ten miles downstream of the McCall STP at Hartzell Bridge the average is .007 mg/l with a standard deviation of .003 mg/l. Using the average of .007 mg/l and an average flow of 121 cfs, dissolved ortho-phosphorus loading can be determined to be 137 pounds/month (62 kg/month).

During this study the ortho-phosphorus was only measured during July and August. With only two measurements the data collected is not complete enough to make a conjecture on ortho-phosphorus. The ortho-phosphorus average at the McCall STP was 2.80 mg/l with a standard deviation of 2.32 mg/l. One mile downstream of the McCall STP the ortho-phosphorus dropped to .008 mg/l with a standard deviation of .006 mg/l. Ten miles downstream of the McCall STP the average ortho-phosphorus is .009 mg/l with a standard deviation of .001 mg/l. There is no EPA standard for ortho-phosphorus.

## Chlorine Discharged from McCall STP

Total residual chlorine exceeded the maximum allowable limits set by the NPDES in July and August. The NPDES maximum level is 0.500 mg/l. In July the monthly average was 0.700 mg/l and in August the monthly average was 1.20 mg/l. In September the monthly average was 0.300 mg/l, below the maximum allowable level (Table 5).

The high chlorine levels in July and August effected the water quality downstream of McCall STP at Sheep Bridge (Figure 3). Chlorine was measured at the station one mile downstream of the McCall STP and the average at this station was 0.045 mg/l with a standard deviation of 0.032 mg/l. This average is four times the EPA standard of 0.011 mg/l for chlorine. The high chlorine levels can have a negative impact on the biological integrity of the biota in the river (Karr et al 1985).

Table 2. Mean and Standard Deviation for Parameters at  
and Below McCall STP

Parameter	McCall STP*		One Mile Below STP	
	Mean /	Standard Deviation	Mean /	Standard Deviation
	mg/l		mg/l	
Ammonia as NH3 & NH4	11.16	8.6	0.1	.006
Nitrogen as NO2 & NO3	18.59	24.26	0.55	0.67
Total KJEL as Nitrogen	20.89	18.41	0.318	0.015
Phosphorus Total	5.1	3.37	N/A	N/A
Phosphorus Dissolved- Ortho	3.55	2.34	0.02	0.014
Ortho Phosphorus as P	2.797	2.323	0.008	0.006

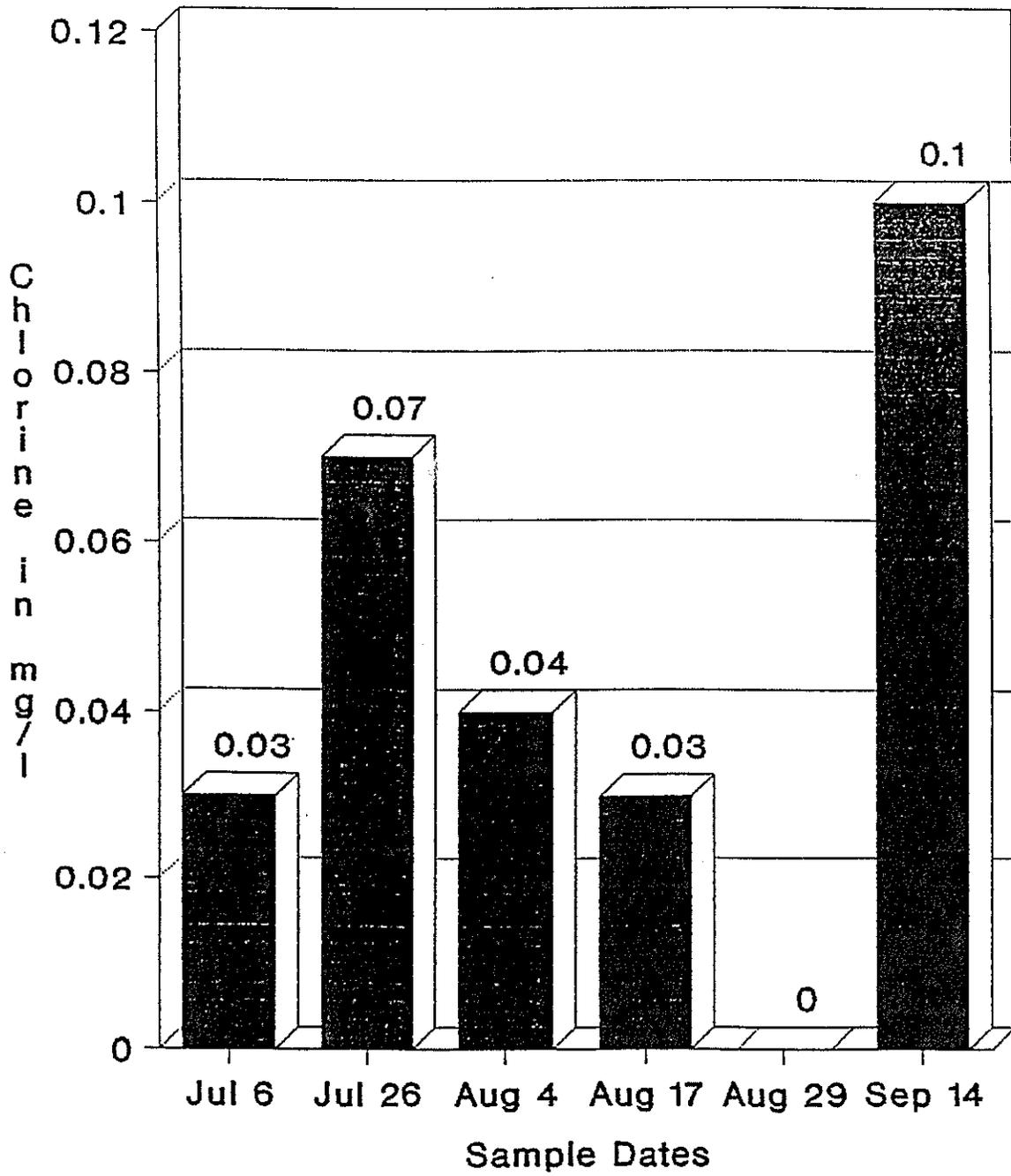
\* No maximum limits have been established by the NPDES Permit.

Table 3. Total Phosphorus released from the McCall STP Effluent, 1983 through 1988 (Pounds/Month)

	1988	1987	1986	1985	1984	1983
January	660	807	720	615	630	600
February	582	660	768	756	690	270
March	621	711	588	690	687	630
April	291	324	285	700	450	480
May	367	423	193	300	420	144
June	525	852	510	620	669	555
July	642	1071	948	568	666	744
August	636	1098	1104	1116	682	849
September	1087	885	786	894	538	456
October	822	555	N/A	546	N/A	489
November	741	510	426	519	495	630
December	873	600	666	657	N/A	630
MEAN	655.5	708	635	665	591	539
S.D.	203	232	260	193	100	184

\* Data Calculated from Monthly STP Reports

Figure 5. Chlorine Levels at Sheep Br.,  
1988



## Conclusions and Recommendations

In conclusion the Idaho Department of Fish & Game fish hatchery is not making a significant impact on the North Fork Payette River. The recommendation to be made on the Idaho Department of Fish & Game fish hatchery in light of this study is to restrict any increases of nutrients that are released into the North Fork of the Payette River. Future monitoring of nutrient loading maybe essential if the fish hatchery anticipates an increase in production.

The McCall STP is currently releasing 650 to 850 pounds/month of total phosphorus into the North Fork Payette River. The impact of this amount of phosphorus being added to the North Fork the Payette River is substantial with the need to maintain or reduce the phosphorus entering the river.

The recommendations is to eliminate the discharge of effluent into the North Fork Payette River completely or at least during the summer months by land application and/or tertiary treatment.

By eliminating the discharge at least during the summer months it would reduce the amount of phosphorus available when the reservoir undergoes the phosphorus turn-over in late summer. The phosphorus is the limiting factor for the algae blooms during the summer (Zimmer 1983).

Due to insufficient data, mainly non-detectable levels of total phosphorus, lack of data for ortho-phosphorus data, and lack of a bioassessment it is recommended that the study be initiated again in the summer of 1991 or 1992. This data will be needed if the McCall STP goes to land application in the next few years.

## ACKNOWLEDGEMENTS

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TABLE 4. Sample Stations For North Fork Payette River Study

STORET #	DESCRIPTION	LATITUDE	LONGITUDE	RIVER MILE	ELEV. ft.
2040445	NF PAYETTE R. @ USGS GAGE STATION	44 54 27	116 07 05	324.3/365.6/75	4980
2040446	NF PAYETTE R. 1/2 MI. BELOW HATCHERY	44 54 27	116 06 35	324.3/365.6/74	4960
2040447	NF PAYETTE R. @ SHEEP BRIDGE	44 53 30	116 06 31	324.3/365.6/72.8	4920
2040448	NF PAYETTE R. @ HARTZELL BRIDGE	44 47 25	116 08 25	324.3/365.6/63	4840
2040449	Idaho Dept. of Fish & Game Fish Hatchery Effluent	44 54 27	116 06 54	324.3/365.6/74.9	4960
2040450	City of McCall STP Effluent	44 54 00	116 07 04	N/A	5020

Figure 6. Ammonia Concentration on 9/14,  
STP Effluent 23.4 mg/l

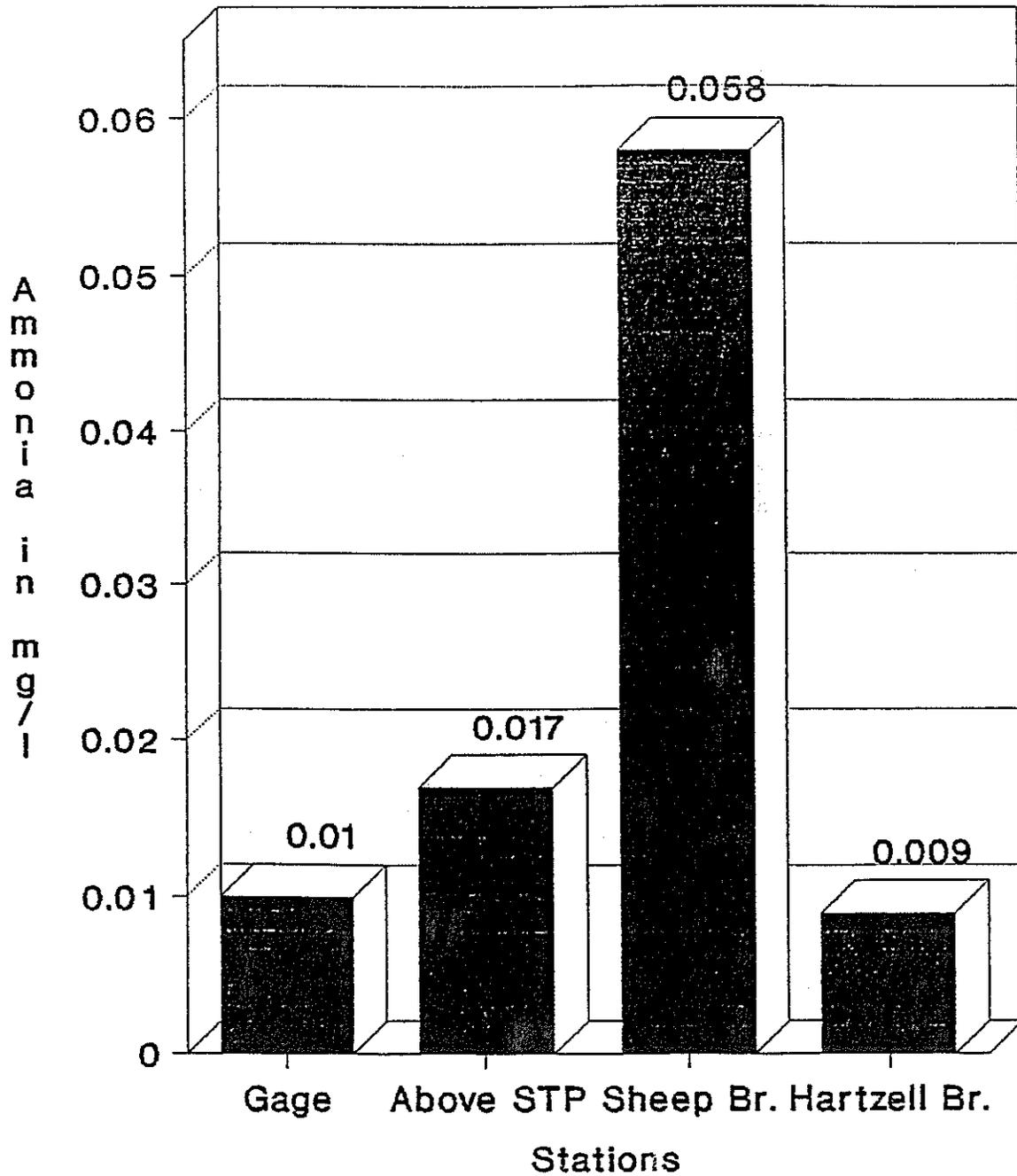


Figure 7. Temp. at River Stations

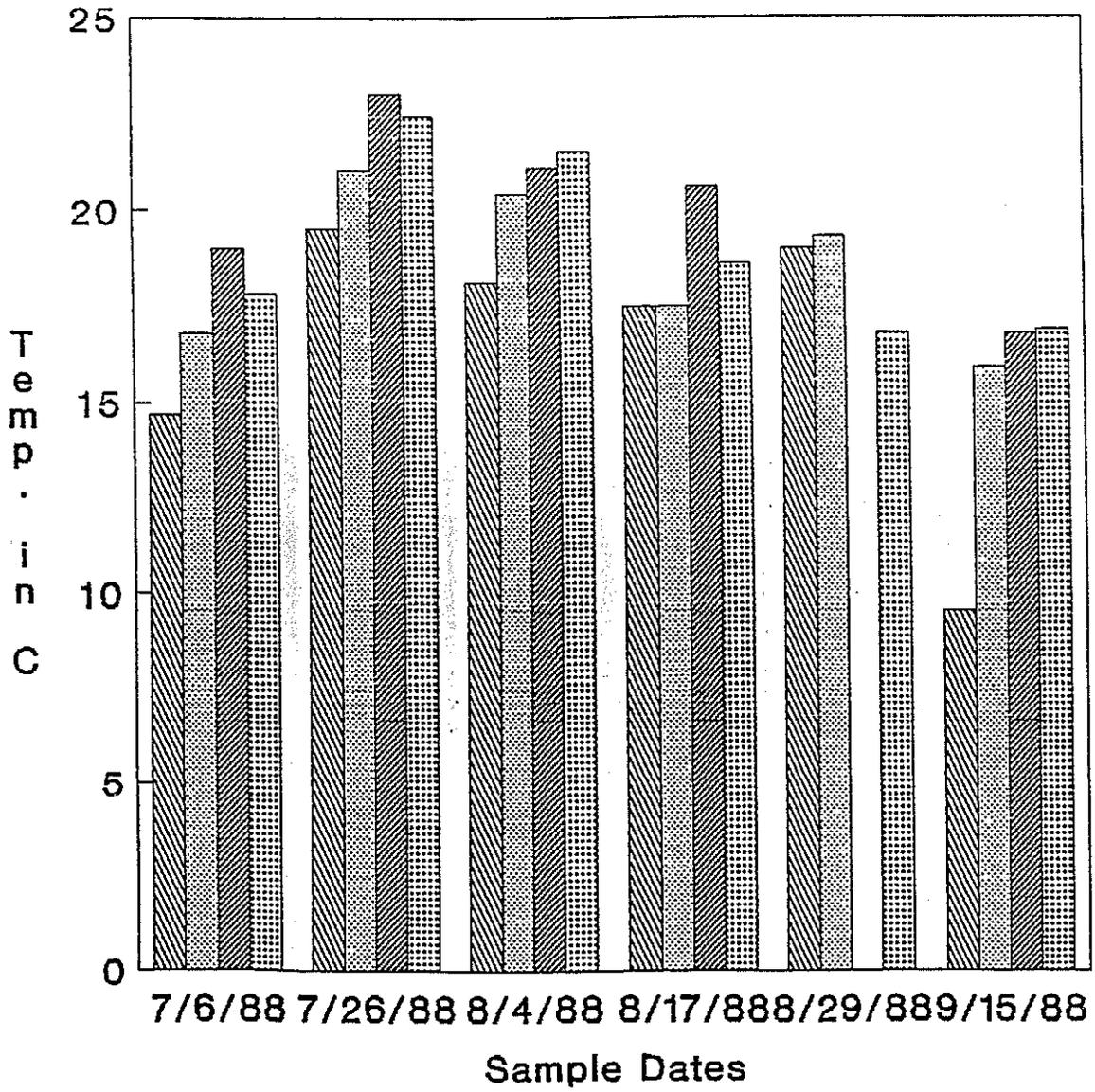


Table 6. Field Data Parameters, Stations: USGS Gage, 1/2mi. Below Fish Hatchery and Fish Hatchery Effluent.

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NORTH FORK PAYETTE RIVER, USGS GAGE, LAKE OUTLET  
STORET # 2040445

DATE	TEMPERATURE C	DO mg/l	pH su	FLOW cfs
7/6/88	19.0	7.50	7.50	80
7/26/88	23.0	6.90	7.20	57
8/4/88	21.1	7.70	7.50	122
8/17/88	20.6	8.10	7.50	64
8/29/88			8.30	59
9/14/88	16.8	8.30	8.20	146

NORTH FORK PAYETTE RIVER, IDAHO F&G FISH HATCHERY  
STORET # 2040449

DATE	TEMPERATURE C	DO mg/l	pH su	FLOW cfs
7/6/88				20
7/26/88	11.9	8.80	7.40	20
8/4/88				20
8/17/88			7.00	20
8/29/88			8.00	20
9/14/88				20

NORTH FORK PAYETTE RIVER, 1/2mi. BELOW FISH HATCHERY  
STORET # 2040466

DATE	TEMPERATURE C	DO mg/l	pH su	FLOW cfs
7/6/88	17.8	8.08	8.20	
7/26/88	22.4	7.50	7.50	
8/4/88	21.5	8.34	7.60	
8/17/88	18.6	8.90	7.80	
8/29/88	16.8	8.30	7.50	
9/14/88	16.9	8.80	8.20	

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Table 7. Field Data Parameters, Stations: STP, Hartzell Bridge and Sheep Bridge.

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NORTH FORK PAYETTE RIVER, McCALL STP EFFLUENT  
STORET # 2040450

DATE	TEMPERATURE C	DO mg/l	pH su	FLOW cfs
7/6/88				
7/26/88			5.50	
8/4/88			6.30	
8/17/88			5.80	
8/29/88			7.10	
9/14/88			7.70	

NORTH FORK PAYETTE RIVER, SHEEP CREEK BRIDGE  
STORET # 2040447

DATE	TEMPERATURE C	DO mg/l	pH su	FLOW cfs
7/6/88	16.8	8.90	8.70	
7/26/88	21.0	8.70	7.10	
8/4/88	20.4	9.40	7.90	
8/17/88	17.5	10.70	8.70	
8/29/88	19.3	10.00	8.70	
9/15/88	15.9	9.10	8.30	

NORTH FORK PAYETTE RIVER, HARTZELL BRIDGE  
STORET # 2040448

DATE	TEMPERATURE C	DO mg/l	pH su	FLOW cfs
7/6/88	14.7	8.50	7.80	118
7/26/88	19.5	9.00	7.80	88
8/4/88	18.1	10.00	8.60	153
8/17/88	17.5	10.90	8.00	93
8/29/88	19.0	12.20	8.50	99
9/15/88	9.6	9.60	8.00	179

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Table 8. Chemical Data For USGS Gage (Payette Lake Outlet)

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=====
STATION No:    2040445
LAT/LONG:     44 54 00.0 116 07 5.0 2
LOCATION:       USGS Gage
COUNTY:      VALLEY
BASIN No:     130700
BASIN:        CENTRAL SNAKE RIVER
SURVEY DATE:  880211
  
```

DATE	00610 NH3+NH4 N Total mg/l	00630 NO2&NO3 N-Total mg/l	00625 TOT KJEL N mg/l	00665 PHOS-TOT mg/l	00671 PHOS-DIS ORTHO mg/l	80154 SUSP SED CONC	00095 CNDUCTVY AT 25C	70507 Ortho-Phos as P mg/l
7/6/88	0.023	0.009	0.20	0.05K		3.0K	19.3	0.001
7/26/88	0.052	0.027	0.15	0.05K	0.004			0.001K
8/4/88	0.014	0.008	0.10	0.05K	0.001K	2.0	17.6	
8/17/88	0.010	0.009	0.13	0.05K	0.002K	4.0	18.2	
8/29/88	0.046	0.027	0.19	0.05K	0.001	2.0K	19.0	
9/14/88	0.010	0.022	0.14	0.05K	0.001	12.0	19.0	

K= LESS THAN

Table 9. Chemical Data For Fish and Game Hatchery

STATION No: 2040449  
 LAT/LONG: 44 54 00.0 116 06 54.0 2  
 LOCATION: Fish Hatchery  
 COUNTY: VALLEY  
 BASIN No: 130700  
 BASIN: CENTRAL SNAKE RIVER  
 SURVEY DATE: 880211

DATE	00610 NH3+NH4 N Total mg/l	00630 NO2&NO3 N-Total mg/l	00625 TOT KJEL N mg/l	00665 PHOS-TOT mg/l	00671 PHOS-DIS ORTHO mg/l	80154 SUSP SED CONC	00095 CNDUCTVY AT 25C	70507 Ortho-Phos as P mg/l
7/6/88	0.082	0.007	0.20	0.05K		6.0	20.4	0.003
7/26/88	0.139	0.014	0.32	0.05K	0.017	2.0K		0.003
8/4/88	0.122	0.017	0.44	0.12	0.019	6.0	19.4	
8/17/88	0.115	0.009	0.30	0.05K	0.017	6.0	20.4	
8/29/88	0.107	0.023	0.41	0.07	0.011	4.0	21.0	
9/14/88	0.084	0.043	0.21	0.05K	0.013	10.0	19.0	

K= LESS THAN

Table 10. Chemical Data For 1/2 Mi. Below Fish Hatchery

STATION No: 2040446  
 LAT/LONG: 44 54 00.0 116 06 35.0 2  
 LOCATION: 1/2 mi. Below Fish Hatchery  
 COUNTY: VALLEY  
 BASIN No: 130700  
 BASIN: CENTRAL SNAKE RIVER  
 SURVEY DATE: 880211

DATE	00610 NH3+NH4 N Total mg/l	00630 NO2&NO3 N-Total mg/l	00625 TOT KJEL N mg/l	00665 PHOS-TOT mg/l	00671 PHOS-DIS ORTHO mg/l	80154 SUSP SED CONC	00095 CNDUCTVY AT 25C	70507 Ortho-Phos as P mg/l
7/6/88	0.033	0.007	0.21	0.05K		4.0	20.3	0.001
7/26/88	0.044	0.035	0.18	0.05K	0.006	2.0K		0.001
8/4/88	0.014	0.013	0.15	0.05K	0.001K	6.0	18.3	
8/17/88	0.013	0.016	0.19	0.05K	0.002	8.0	19.4	
8/29/88	0.045	0.042	0.25	0.05K	0.003	20.0		
9/14/88	0.017	0.043	0.21	0.05K	0.003	10.0	19.0	

K= LESS THAN

Table (11). Chemical Data For McCall STP Effluent

STATION No: 2040450  
 LAT/LONG: 44 54 00.0 116 07 4.0 2  
 LOCATION: McCall STP EFFLUENT  
 COUNTY: VALLEY  
 BASIN No: 130700  
 BASIN: CENTRAL SNAKE RIVER  
 SURVEY DATE: 880211

DATE	00610 NH3+NH4 N Total mg/l	00630 NO2&NO3 N-Total mg/l	00625 TOT KJEL N mg/l	00665 PHOS-TOT mg/l	00671 PHOS-DIS ORTHO mg/l	80154 SUSP SED CONC	00095 CNDUCTVY AT 25C	70507 Ortho-Phos as P mg/l	CHLORINE mg/l
7/6/88	17.300	0.370	54.90	11.10		18	360.0	5.120	
7/26/88	0.279	69.400	1.92	0.64	0.45	2K		0.474	0.120
8/4/88	6.010	24.600	8.80	3.05	2.41	12	411.0		
8/17/88	2.600	13.400	4.34	3.03	2.36	6	304.0		
8/29/88	17.400	3.200	29.20	6.02	5.87	10	444.0		1.300
9/14/88	23.400	0.560	26.20	6.80	6.66	18	959.0		

K= LESS THAN

Table 12. Chemical Data For 1 mi. Below STP

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=====
STATION No:      2040447
LAT/LONG:       44 54 00.0 116 06 31.0 2
LOCATION:         NF Payette lmi. Below STP @ Sheep Cr. Bridge
COUNTY:        VALLEY
BASIN No:       130700
BASIN:          CENTRAL SNAKE RIVER
SURVEY DATE:    880211
  
```

DATE	00610 NH3+NH4 N Total mg/l	00630 NO2&NO3 N-Total mg/l	00625 TOT KJEL N mg/l	00665 PHOS-TOT mg/l	00671 PHOS-DIS ORTHO mg/l	80154 SUSP SED CONC	00095 CNDUCTVY AT 25C	70507 Ortho-Phos as P mg/l	CHLORINE mg/l
7/6/88	0.125	0.044	0.43	0.06		4.0	23.9	0.014	0.030
7/26/88	0.052	0.060	0.16	0.05K	0.004	2.0K		0.002	0.070
8/4/88	0.058	0.496	0.27	0.05K	0.012	4.0	24.6		0.040
8/17/88	0.084	0.715	0.31	0.09	0.042	6.0	33.5		0.030
8/29/88	0.225	1.930	0.47	0.09	0.032	2.0	46.0		0.000
9/14/88	0.058	0.047	0.28	0.05K	0.015	10.0	21.0		0.100

K= LESS THAN

Table 13. Chemical Data for NF Payette R. @ Hartzell Br.

```

=====
STATION No:      2040447
LAT/LONG:       44 54 00.0 116 08 25.0  2
LOCATION:         NF Payette @ Hartzell Bridge
COUNTY:        VALLEY
BASIN No:       130700
BASIN:          CENTRAL SNAKE RIVER
SURVEY DATE:   880211
  
```

DATE	00610 NH3+NH4 N Total mg/l	00630 NO2&NO3 N-Total mg/l	00625 TOT KJEL N mg/l	00665 PHOS-TOT mg/l	00671 PHOS-DIS ORTHO mg/l	80154 SUSP SED CONC	00095 CNDUCTVY AT 25C	70507 Ortho-Phos as P mg/l
7/6/88	0.014	0.076	0.40	0.05K		8.0	34.0	0.008
7/26/88	0.033	0.044	0.20	0.05K	0.004	2.0K		0.010
8/4/88	0.026	0.096	0.21	0.05K	0.008	2.0	30.0	
8/17/88	0.026	0.048	0.47	0.05K	0.012	8.0	38.0	
8/29/88	0.177	0.164	0.18	0.05K	0.006	2.0	35.0	
9/14/88	0.009	0.044	0.22	0.05K	0.005	12.0	31.0	

K= LESS THAN

Table 14. Ionized (NH<sub>3</sub>+NH<sub>4</sub>)-Unionized(NH<sub>3</sub>-N) Comparison

=====  
 Station No: 2040447  
 Location NF Payette River 1mi Below McCall STP at Sheep Br.

DATE	Temperature in Celsius	pH s.u.	Ionized NH <sub>3</sub> -NH <sub>4</sub> as N	Un-Ionized NH <sub>3</sub> -N
7/6/88	16.8	8.7	0.125	0.01875
7/26/88	21.0	7.1	0.052	0.00026
8/4/88	20.4	7.9	0.058	0.00200
8/17/88	17.5	8.7	0.084	0.01226
8/29/88	19.3	8.7	0.225	0.03623
9/14/88	15.9	8.3	0.058	0.00328

Table 15. Ionized (NH<sub>3</sub>+NH<sub>4</sub>)-Unionized(NH<sub>3</sub>-N) Comparison

=====  
 Station No: 2040448  
 Location NF Payette River at Hartzell Bridge

DATE	Temperature in Celsius	pH s.u.	Ionized NH <sub>3</sub> -NH <sub>4</sub> as N	Un-Ionized NH <sub>3</sub> -N
7/6/88	14.7	7.8	0.014	0.00023
7/26/88	19.5	7.8	0.033	0.00088
8/4/88	18.1	8.6	0.026	0.00299
8/17/88	17.5	8.0	0.026	0.00083
8/29/88	19.0	8.5	0.177	0.01895
9/14/88	9.6	8.0	0.009	0.00016

Table 16. Ionized (NH<sub>3</sub>+NH<sub>4</sub>)-Unionized(NH<sub>3</sub>-N) Comparison

=====  
 Station No: 2040445  
 Location NF Payette River at USGS Gage Station

DATE	Temperature in Celsius	pH s.u.	Ionized NH <sub>3</sub> -NH <sub>4</sub> as N	Un-Ionized NH <sub>3</sub> -N
7/6/88	19.0	7.5	0.023	0.00026
7/26/88	23.0	7.2	0.052	0.00036
8/4/88	21.1	7.5	0.014	0.00019
8/17/88	20.6	7.5	0.010	0.00013
8/29/88		8.3	0.046	
9/14/88	16.8	8.2	0.010	0.00048

=====  
 Table 17. Ionized (NH<sub>3</sub>+NH<sub>4</sub>)-Unionized(NH<sub>3</sub>-N) Comparison

=====  
 Station No: 2040446  
 Location NF Payette River 1/2 mi. Below F&G Hatchery

DATE	Temperature in Celsius	pH s.u.	Ionized NH <sub>3</sub> -NH <sub>4</sub> as N	Un-Ionized NH <sub>3</sub> -N
7/6/88	17.8	8.2	0.033	0.00159
7/26/88	22.4	7.5	0.044	0.00065
8/4/88	21.5	8.3	0.014	0.00106
8/17/88	18.6	8.9	0.013	0.00306
8/29/88	16.8	8.3	0.045	0.00258
9/14/88	16.9	8.8	0.017	0.00304

=====