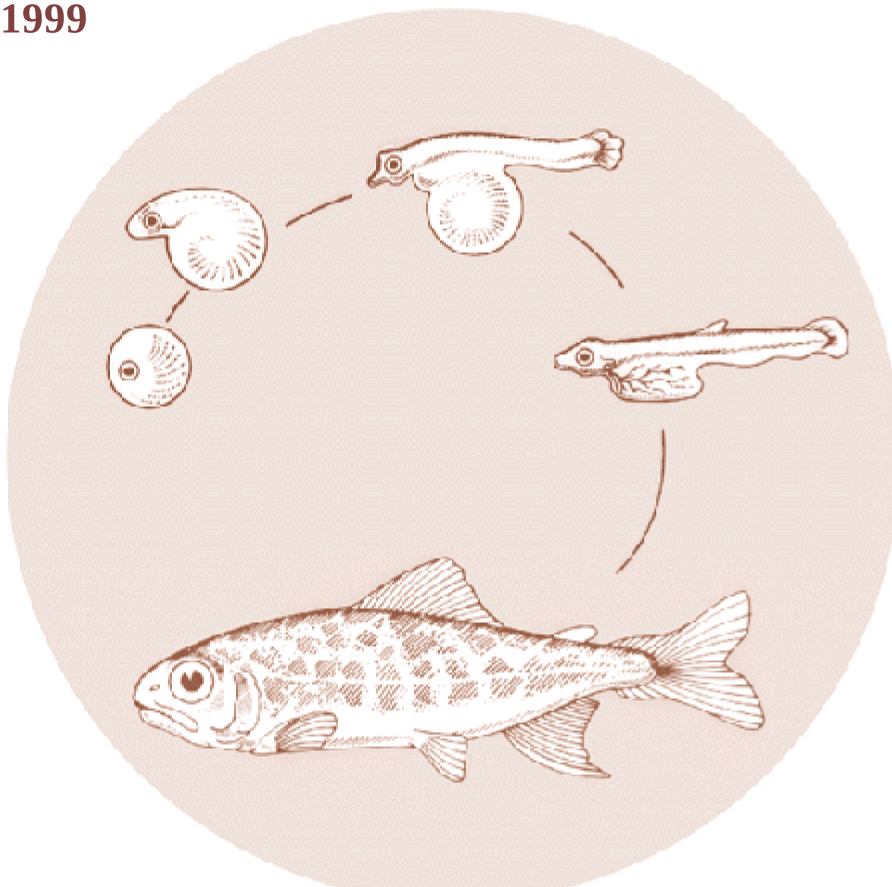
Monitoring and Evaluation for Grande Ronde Spring Chinook Salmon Program

Facility Operation and Maintenance

Annual Report
1999



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Facility Operation and Maintenance and Monitoring and Evaluation for Grande Ronde Spring Chinook Salmon Program

Annual Report

1 January 1999 through 31 December 1999

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EXECUTIVE SUMMARY

This is the second annual report of a multi-year, multi-agency project to restore spring chinook salmon populations in the Grande Ronde River Basin (Grande Ronde Endemic Chinook Salmon Program – GRESCP). The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) operates adult collection and juvenile acclimation facilities on Catherine Creek and the upper Grande Ronde River for Snake River spring chinook salmon. These two streams have historically supported populations that provided significant tribal and non-tribal fisheries. Supplementation using conventional and captive broodstock techniques is being used to increase natural production and restore fisheries in these two streams.

Statement of Work Objectives for 1999:

1. Participate in development and continued implementation of the comprehensive multi year operations plan for the Grande Ronde Endemic Supplementation Program.

2. Ensure proper construction and trial operation of semi-permanent adult and juvenile facilities for use in 2000.

3. Monitor adult endemic spring chinook salmon populations and collect broodstock.

4. Plan detailed Monitoring and Evaluation for future years.

5. Monitor population abundance and characteristics and local environmental factors that may influence abundance and run timing of Grande Ronde River spring chinook populations.

6. Participate in Monitoring and Evaluation of the captive brood component of the Program to assure this component is contributing to the Program.

7. Participate in data collection for incidentally-caught bull trout and summer steelhead and planning for recovery of summer steelhead populations.

8. Document accomplishments and needs to permitters, comanagers, and funding agencies.

9. Communicate project results to the scientific community.

Accomplishments and Findings for 1999

Project staff met formally and informally with comanagers during the year to coordinate project activities. The Lower Snake River Compensation Plan

(LSRCP) Annual Operations Plan is the most significant product that serves as a guide for project activities during the year.

Construction of the two acclimation facilities was completed in 1999 and facilities were ready to receive fish in the spring of 2000. Construction at the two adult collection facilities was delayed due to problems in obtaining necessary permits.

The Confederated Tribes of the Umatilla Indian Reservation operated picket-style weirs on Catherine Creek and the upper Grande Ronde River near La Grande, Oregon during 1999. Snake River spring chinook salmon (*Oncorhynchus tshawytscha*) were collected for conventional supplementation of stocks listed as threatened under the Endangered Species Act. Conventional supplementation is here defined as collection and spawning of unmarked, naturally-produced fish, incubation, rearing at production facilities and acclimation, and release of progeny into the stream of parental origin. Adult chinook collected were visually examined for marks and tags. We assumed if a fish was not fin-clipped, it was of wild origin, although fish were not scanned for coded wire or PIT tags. Life history data were collected from spring chinook salmon to monitor the population and evaluate the effects of supplementation.

Sixteen chinook salmon were collected from Catherine Creek during the period May 7-September 27, 1999, and one from the upper Grande Ronde during May 6-September 21, 1999. Four pre-spawn mortalities (3 female, one unknown sex) were found at or near the Catherine Creek weir. Preseason escapement estimates showed very low (<50 fish per stream) numbers returning and that it was unlikely that the minimum number needed (10 per stream) would be collected to conduct the conventional supplementation program. Comanagers decided to pass all fish collected upstream and only collect life history data.

Monitoring and evaluation planning took place during informal discussions with comanagers, at Technical Oversight Team (meetings), and the LSRCP AOP meetings.

Maximum water temperatures of 23°C were observed during July and August at the Catherine Creek and upper Grande Ronde River weirs. The daily temperature cycle in mid-July at both weirs followed a similar pattern; lowest temperatures were observed usually at 8 AM and increased throughout the day to a maximum near 5 PM. Gauge readings at the fish ladder below the Catherine Creek weir 1.1 m or greater during the spring freshet period.

The weirs trapped 25-35% of the estimated spawning runs from the upper Grande Ronde and Catherine Creek in 1999. Population estimates were derived using the number of marked fish released above the weirs and the numbers of marked and unmarked fish recaptured during spawning ground surveys conducted by comanagers in August and September. The low percentage collected from

Catherine Creek probably resulted from the washing out of the weirs during spring freshets or the inability of facility operators to keep debris off the weir at higher flows, resulting in small gaps at the bottom of the weir where fish could pass through. Only one fish was collected at the upper Grande Ronde River trap, and the spawning population estimate was only 4 fish.

Additional data collection carried out under this contract in 1999 involved the use of near-infrared spectroscopy to differentiate maturity and sex of Deschutes River rainbow trout (*Oncorhynchus mykiss*), Wallowa stock summer steelhead (*Oncorhynchus mykiss*), and Dungeness River spring chinook captive broodstock.

Additional contracted activities with comanagers included spawning ground surveys in the Grande Ronde Basin and maturity sorts and spawning activities for the captive broodstock component of the Program at Manchester Marine Laboratory and Bonneville Hatchery. These data and activities are reported in more detail in other annual project reports.

Life history data were obtained from incidentally-caught summer steelhead (*Oncorhynchus mykiss*) and bull trout (*Salvelinus confluentus*) to increase knowledge of these ESA-listed species. Thirteen post-spawn (including 3 adipose-clipped) summer steelhead were collected at the Catherine Creek weir. Four were collected at the upper Grande Ronde River weir. A single dead bull trout (fork length 25 cm) was impinged on the weir at Catherine Creek. Other species collected in the traps or wedged between pickets included suckers (*Catostomus* sp.) and mountain whitefish (*Prosopium williamsoni*).

A total of 38 surveys of about 1.6 km length were conducted downstream of both weirs in 1999. These resulted in observations of 8 live chinook salmon in Catherine Creek. No fish or redds were observed during the surveys on the upper Grande Ronde River. Fish were not concentrated in the sections immediately below the weirs.

Quarterly project reports were prepared and submitted to the Bonneville Power Administration (BPA). During the trapping season, weekly trapping summaries were provided to comanagers and other interested parties. Participation in regular TOT and comanager staff meetings provided opportunities for dissemination of project information.

Cooperation of hatchery staff at Dungeness Creek (Washington Department of Fish and Wildlife) and Oak Springs Hatchery (Oregon Department of Fish and Wildlife) and attendance at the Oregon Chapter of the American Fisheries Society Annual Meeting provided opportunities to disseminate project information

Management Implications and Recommendations

1. Weirs utilized should be designed to be installed and fully functional in mid-April or sooner, in order to sample summer steelhead and the complete run of spring chinook salmon.

2. Below-weir surveys should be continued to determine if weirs are causing aggregation of fish below the weirs.

3. Assist BPA in negotiations with landowners and local government agencies to ensure that required easements and permits are obtained.

4. Use videography to record behavior of fish approaching or encountering the weirs or traps to determine if modifications need to be made to increase effectiveness or safety.

PART 1: OPERATION OF REMOTE ADULT SPRING CHINOOK SALMON BROODSTOCK COLLECTION FACILITIES ON CATHERINE CREEK AND THE UPPER GRANDE RONDE RIVER, OREGON

Introduction

Large populations of endemic fall and spring chinook salmon (*Oncorhynchus tshawytscha)*, sockeye (*O. nerka*), and coho (*O. kisutch*) salmon and steelhead salmon formerly existed in the Grande Ronde River basin (Nehlsen et al. 1991). Escapements of spring chinook salmon in excess of 10,000 occurred as recently as the late 1950's (USACOE 1975). Commercial and sport fisheries existed and fishing for salmon was a significant cultural component for indigenous peoples in the basin.

Severe declines in natural escapement of spring chinook salmon in the Grande Ronde basin have occurred in recent years, paralleling those of other stocks in the Snake River basin (Nehlsen et al. 1991). Grande Ronde River spring chinook salmon are considered part of the Snake River Spring and Summer Run evolutionarily significant unit (ESU) located in the Blue Mountains ecoregion (Myers et al. 1998). Estimated escapements for the Grande Ronde River basin during 1979-1984 ranged from 474-1,080 (Howell et al. 1985). Estimated escapement of adult spring chinook salmon in the Grande Ronde Basin in 1995 was only 261 (Parker et al. 1995). The decline in spring chinook salmon abundance resulted from several factors, including overexploitation, habitat destruction resulting from land use practices, construction and operation of hydroelectric facilities, and large-scale environmental changes. Snake River Basin spring/summer chinook salmon were listed as threatened in 1993 under the Endangered Species Act (58 Federal Register 49880, September 23, 1993). Continuing poor escapement levels and declining population trends indicated that Grande Ronde River spring chinook salmon were in imminent danger of extinction. Managers are presently in an emergency situation where dramatic and unprecedented efforts are needed to prevent extinction and preserve options for use of endemic fish stocks in future artificial propagation programs.

Estimates of escapement from spawning ground surveys for 1979-1984 showed Catherine Creek and the Lostine and upper Grande Ronde Rivers were three of the most productive populations in the Grande Ronde Basin (Howell et al. 1985). Declines in the numbers of spawning fish led to closures of sport fishing in 1974 and commercial fishing in 1977 (Howell et al. 1985). The initial management plan for these three tributaries under the Lower Snake River Compensation Plan (LSRCP) emphasized mitigation and implemented hatchery supplementation from Lookingglass Hatchery with nonendemic stocks (Rapid River and Carson). Smolts or presmolts stocked into Catherine Creek totaled 584,000 during 1982-1984, and 503,000 into the upper Grande Ronde River during the same period (Howell et al. 1985). The emphasis of the chinook salmon program in the Grande Ronde River basin has shifted to conservation with the short-term goal to prevent extinction and allow for the possibility of recovery of endemic stocks. Ultimately, further recovery of these populations is heavily dependent on improved juvenile and adult survival through mainstem dams and reservoirs.

The Grande Ronde Spring Chinook Salmon Program (Program) was developed with two components to supplement populations: captive and conventional broodstock. The Oregon Department of Fish and Wildlife, U. S. Fish and Wildlife Service, and Nez Perce Tribe in 1995 began development of captive broodstocks to reduce the demographic risk of extinction through genetic conservation and natural production enhancement. After initiation of the captive brood component, the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) joined comanagers to begin the second component (conventional broodstock development) of the Program. The conventional component was designed to increase adult returns with less genetic risk than the captive brood component by collecting a portion of the unmarked, naturally-produced adults across the run from each stream and using standard culture procedures. Because adults are removed from natural production, the demographic costs of the conventional component are higher. Success is therefore more dependent upon improved juvenile and adult survival through mainstem reservoirs and dams than captive brood. Adult collection weirs on Catherine Creek and the upper Grande Ronde River enable collection of broodstock and monitoring of returning adults to assess the effectiveness of both components of the supplementation program. The acclimation facilities are operated to maximize survival and return of captive and conventional broodstock progeny.

The use of captive brood is designed to reduce the probability of extinction, but at greater genetic risk than conventional supplementation. Parr collected for rearing to maturity may be progeny of a few adults and represent less genetic diversity than the conventional broodstock. Plans are for hatchery production from captive broodstock to decrease and conventional production increase as the number of adults returning increases and the demographic risk of extinction becomes smaller.

Adult Collection and Juvenile Acclimation Areas

The Grande Ronde River originates in the Blue Mountains of northeastern Oregon and flows for 341 kilometers (km) to join the Snake River near Lewiston, Idaho. Gradient is moderately steep in the upper reaches, becoming more gradual from La Grande, Oregon, to the mouth. The Grande Ronde River drains a sparsely populated watershed of approximately 13,727 km^2 dominated by agriculture, logging and outdoor recreation (Oregon DEQ 1995). The largest towns are La Grande (population 12,000), Union (population 1,880) and Elgin (population 1,600). Land ownership in the watershed is 53% private, 46% U. S. Forest Service, and less than 1% each by the Bureau of Land Management, and state and tribal agencies (Oregon DEQ 1995).

Adult collection weirs for the conventional supplementation component of the Program are located in the upper reaches of the Grande Ronde River and Catherine Creek (Figure 1). The Catherine Creek weir is located near the lower boundary of spring chinook spawning; about 95% of redds have historically been upstream of this location. The upper Grande Ronde River weir is also located near the lower end of the spring chinook spawning area; about 10% of redds have historically been observed below the weir site. These two tributaries, together with the Lostine River and Lookingglass Creek, have historically provided the highest numbers of spawning spring chinook salmon in the basin (Howell et al. 1985). Bull trout and summer steelhead are also present and spawn in these areas. The upper Grande Ronde River is considered to be the reach from the headwaters to the confluence with the Wallowa River, a distance of about 153 km. Watershed area for the upper Grande Ronde River is approximately 4,274 km^2. The upper Grande Ronde begins at an elevation of about 2,134 m and drops over 1,439 m over a distance of 158 km (average gradient of 9.1 m/km)to the confluence with the Wallowa River (Thompson and Haas 1960). Catherine Creek originates in the Wallowa Mountains, at an elevation similar to the upper Grande Ronde River, and drains a watershed of approximately 2,590 km^2. Average gradient over the 64 km stream length is 32.8 m. Catherine Creek is the major tributary of the upper Grande Ronde River and flows for about 48 km before joining the upper Grande Ronde 29 km below La Grande (Thompson and Haas 1960). The The North and South Forks of Catherine Creek extend for about 16 km each.

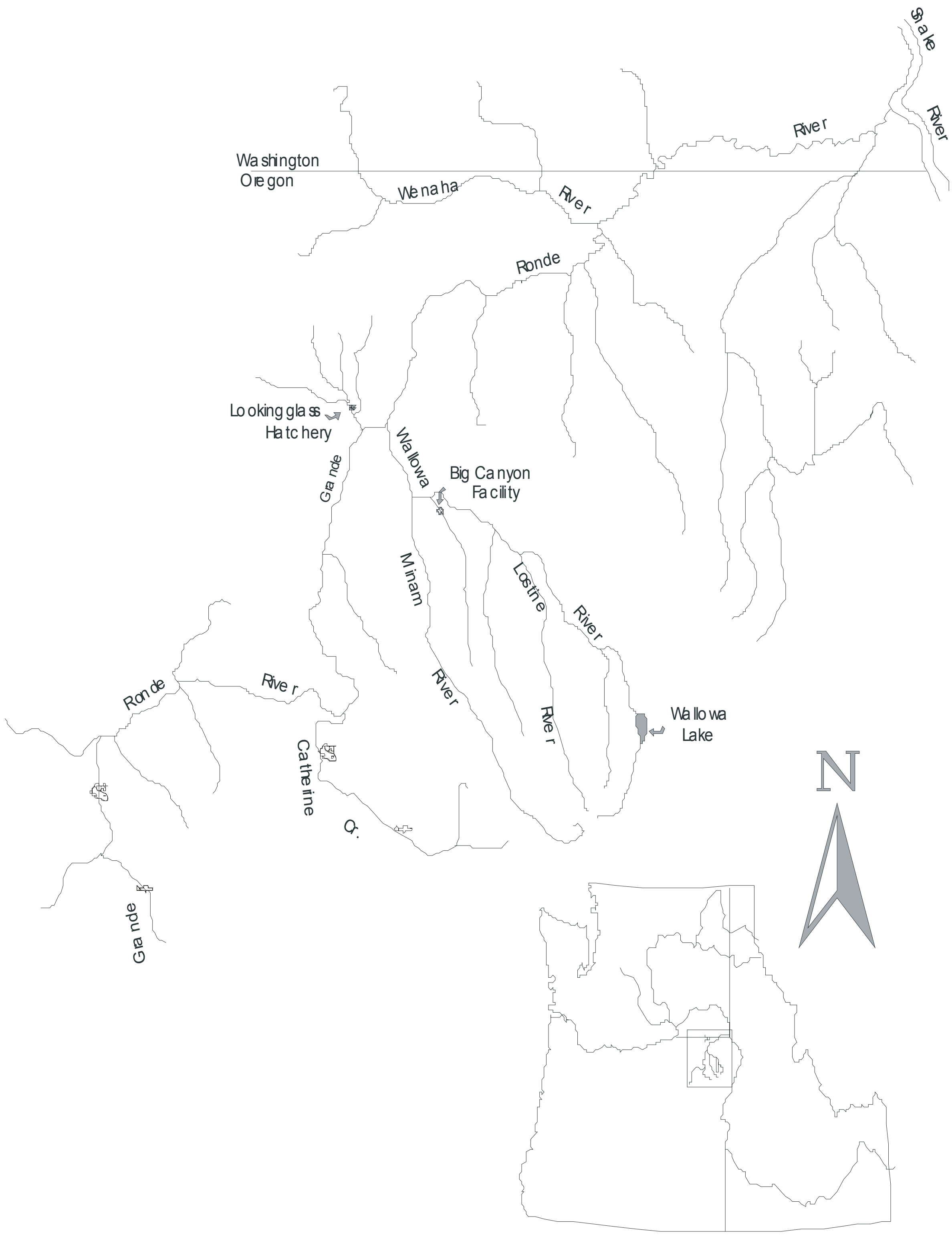

Figure 1. The Grande Ronde Basin, showing adult collection weirs ( ) and juvenile acclimation sites ( ).

Peak flows for Catherine Creek and the upper Grande Ronde usually occur in April or May (Figure 2). Flows for both streams diminish throughout the summer, usually reaching lows during September-October. Streamflows in the Grande Ronde Basin are dependent upon snowmelt at higher elevations. Typically, the Catherine Creek watershed receives more snow the upper Grande Ronde. Large amounts of snow at high elevations combined with periods of air temperatures above 32°C in the spring can cause water to rise rapidly and result in downstream transport of large amounts of sediment and debris. The Catherine Creek watershed is more prone to high flows and transport of large debris than the upper Grande Ronde. Rainfall events can produce similar results, and in combination with warm weather and snowmelt in the spring, can cause severe flooding in the watershed. Flows in both streams decrease as the snow depth diminishes during June, July, and August.

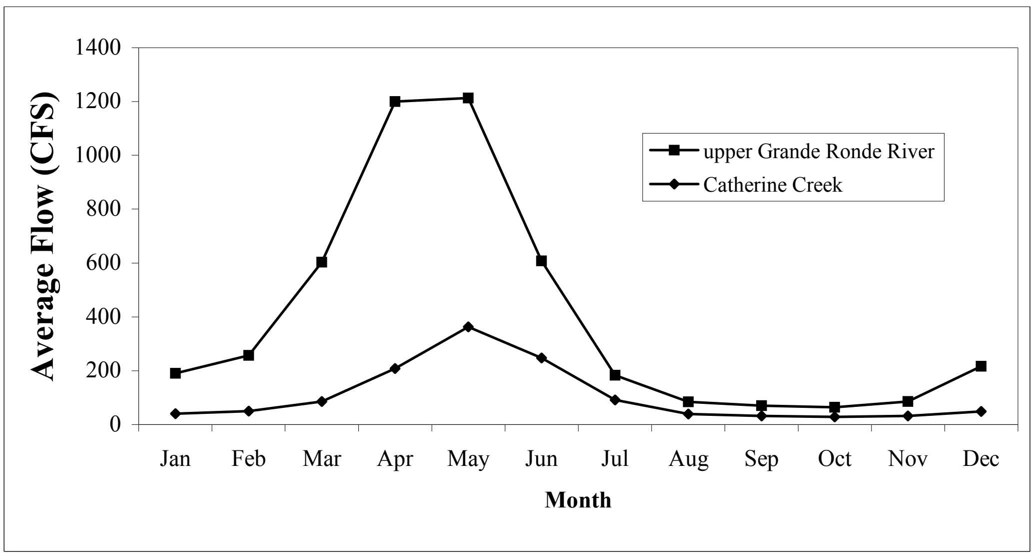

Figure 2. Monthly averages of daily stream flows for Catherine Creek and the upper Grande Ronde River, 1976-1980. (Data from http://waterdata.usgs.gov/nwis-w/OR/).

Headwater areas of both Catherine Creek and the upper Grande Ronde River are in the Wallowa-Whitman National Forest. Logging, livestock grazing and various forms of outdoor recreation are significant human activities in the region. These activities in the watershed have diminished degraded habitat quality for salmonids by increasing water temperatures and sedimentation and reducing the amount of large woody debris and deep pools and off-channel rearing areas (U.S. Forest Service et al. 1992; Mobrand and Lestelle 1997). Riparian areas consist of forested canyons, dominated by conifers in the upper Grande Ronde and upper reaches of Catherine Creek, and deciduous trees in the lower reaches of Catherine Creek. Substrates are primarily gravel, cobble and boulder and the gradient is moderately steep. Spring chinook spawning and rearing habitat in the upper Grande Ronde River watershed was severely degraded after the Tanner

Creek fire and subsequent flood in August of 1989. Large amounts of fine sediment were washed into the stream following the loss of vegetative cover, and still persist.

Stream temperatures in some reaches of Catherine Creek and the upper Grande Ronde may reach levels that salmonids will actively avoid during summer months, most likely the result of changes in riparian cover (Oregon DEQ 1999). Since 1990, at least four different agencies have accumulated 261 stream temperature data sets from at least 130 sites in the basin (Oregon DEQ 1998). Models are being developed to ascertain what kinds of actions will bring about lower stream temperatures and improve salmonid habitat. An attempt is also being made to identify all the organizations monitoring water quality in the basin, standardize methods, share data and avoid duplication of effort.

The adult collection site for the upper Grande Ronde River is located at the River Campground, at river km 318 in the Wallowa-Whitman National Forest, approximately 39 km above La Grande and about 24 km below the headwaters. The adult collection site for Catherine Creek is about 3 km upstream of Union on land owned by the City of Union. Both adult collection sites are below areas where most spawning activity historically occurred.

The juvenile acclimation facility for the upper Grande Ronde River is being constructed about 26 km upstream of Starkey on Forest Service property just above Vey Meadows. Considerable spawning activity has occured in some years within the Vey Meadows reach, but access on this private land to conduct spawning ground surveys has been denied since 1996. The Catherine Creek acclimation facility is being constructed about 3 km above Catherine Creek State Park, on land owned by Oregon State University and a private lumber company. Both juvenile acclimation facilities will be located in areas where the best spawning and rearing habitats are believed to exist.

Methods

Temporary picket weirs, similar to those described by Schroeder (1996) and comprised of aluminum and iron frameworks with galvanized iron pickets (electrical conduit) were used to block off the study streams and collect adult spring chinook salmon returning to spawn in 1997 and 1998. Pickets were 2.54-cm diameter and spaced 2.54 cm apart. After flows decreased in July, plastic sheeting and plywood were used to divert as much water as possible through the trap to attract and capture fish as quick as possible and reduce any delays.

Traps were checked at least once daily. In the morning, usually before 0900 h, fish were individually anesthetized using MS-222 and fork length was measured to the nearest mm. Later in the season, as water temperatures rose, fish were processed during the early morning when temperatures were lower, in order to reduce stress. A paper punch was used to mark fish and collect tissues for genetics samples. A single punch on the right opercle plate was used to mark fish for Catherine Creek and two punches were used for the upper Grande Ronde. Distinct marks were used in case fish were able to get below the weir and stray to other areas. Recoveries of marked fish recovered during spawning ground surveys conducted by comanagers during August and September were used to estimate the adult spawning population (Parker et al. 1995). Tissues from opercle punches and three additional caudal punches were collected for future analysis of genetic composition. Tissue samples were preserved in labeled vials with 95% ethanol. Each fish was examined externally for marks, injuries or other physical conditions, and a preliminary determination of sex was made. Due to the low escapement anticipated for 1999, comanagers decided to collect biological data from fish collected at the traps, and pass all fish upstream, rather than transport any to Lookingglass Hatchery for use as broodstock.

The possible effects of weirs on fish behavior were evaluated by walking approximately one-mile segments of the streams immediately downstream of the weirs several times a week. Live fish, carcasses, and evidence of spawning activities (redds, test digs) were recorded. The same information was collected during standard spawning surveys conducted in August and September (Parker et al. 1995). Water temperatures were taken with a pocket thermometer by CTUIR staff at approximately 0600-0700 h, 1200 h, and 1700-1800 h each day. Temperature loggers (Onset Stowaway ®[1]) were also used in 1999 at the upper Grande Ronde River acclimation site and weir, and the Catherine Creek weir (Appendix Figures 1-3). Gauge readings at Catherine Creek were taken to index stream flows.

Bull trout in the Columbia River Basin were listed as threatened under the Endangered Species Act on June 10, 1998 (63 Federal Register 111). Bull trout are found in both the upper Grande Ronde River and Catherine Creek (Buchanan et al. 1997). Data (estimated FL, any marks or tags) on incidentally caught bull trout was collected and mortalities frozen for later analysis. Data on incidentally caught steelhead were also obtained (FL, sex, genetics samples).

Results

The upper Grande Ronde weir was installed on May 6, 1999. This weir was rendered ineffective by high flows and debris the weekend of May 22-23, and was rebuilt on June 5. Effectiveness of the weir probably diminished as stream flows increased the few days prior to May 22. We removed the upper Grande Ronde River weir for the season on September 21, 1999. Only one spring chinook was collected from the upper Grande Ronde River (on July 14). This unmarked fish was passed upstream, but no data (FL, sex) were recorded.

The Catherine Creek weir was installed on May 7, 1999, and was also rendered ineffective by high flows and debris the weekend of May 22-23.

[1] Mention of this does not constitute endorsement of this product.

Effectiveness of this weir also probably diminished as stream flows increased prior to May 22. The weir was rebuilt and began fishing again on June 10. On June 15, high flows and debris loads occurred, and we decided to pull ½ the pickets, to reduce stress on the weir, and minimize the rebuilding required. Fish passage was possible during this period. The weir was rebuilt on June 22 and fished until September 27, 1999. A total of 16 spring chinook were collected and passed upstream. No spring chinook presumed to be three-year olds (<600 mm FL) were collected in either stream.

The first spring chinook was captured at the Catherine Creek weir on May 13, 1999 (Figure 3). The next spring chinook was not collected until June 15.

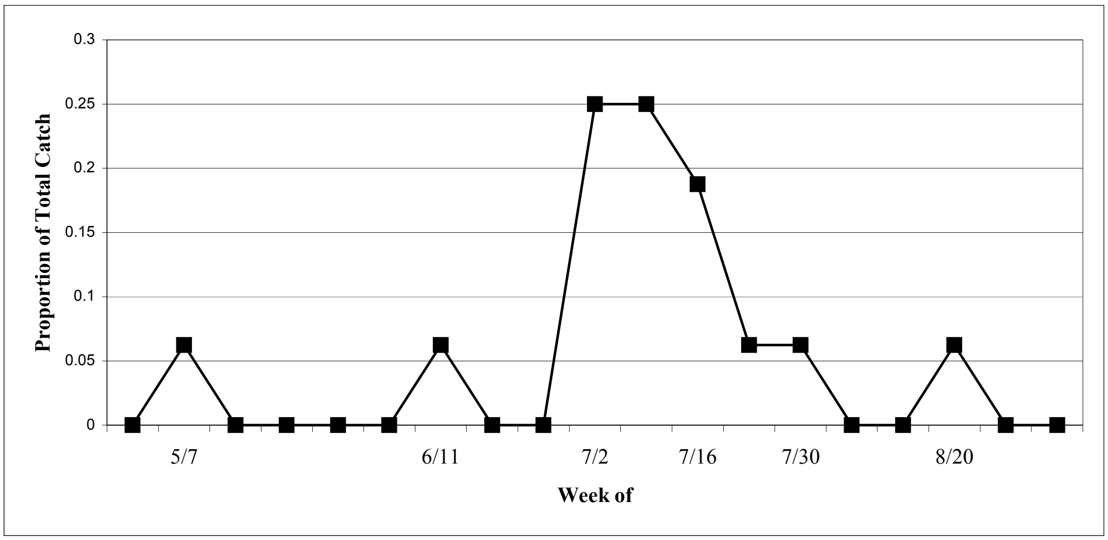

Figure 3. Proportions of spring chinook salmon caught by week of the year at Catherine Creek weir, 1999 (N = 16).

Twelve of the 16 spring chinook captured at Catherine Creek were caught between July 2 and July 28. Three weeks passed between the second-to-last and last fish collected.

Stream	Sex*	Mean FL (mm)	SD	Range	N
Catherine Creek	Both	731.6	46.6	610-805	16

* Sex determinations in the field were tentative; sex is difficult to assign to most spring chinook until later in the season.

Table 1. Summary statistics for all Snake River spring chinook salmon collected at Catherine Creek and the upper Grande Ronde River weirs, 1999.

Symptoms of "head burn" (Elston 1996) were observed on five spring chinook captured and passed upstream at the Catherine Creek weir in 1999. Of four prespawn mortalities found at or near the Catherine Creek weir, two were probably due to head burn, based on necropsies conducted by ODFW Fish Pathology (Table 2). These two had been trapped, marked and passed at the Catherine Creek weir, and lesions noted at that time. One of the fish dropped back downstream and entered the irrigation diversion and stayed in one of the ponds for about a week before dying. Extensive fungus was observed on the head of this fish. One spring chinook was found dead near the weir. Another was found below the fish ladder, badly decomposed and appeared to be partially eaten.

Date collected	**Sex**	**FL (mm)**	**Mature****	**Necropsy Clinical Findings (ODFW, unpublished data)**
7/10	U	-		None performed. Carcass mostly eaten by animals.
7/15*	F	805	Yes	Head, jaw, caudal lesions and fungus. Aeromonad/pseudomonad positive systemically. *Renobacterium salmoniarum* ELISA of 0.112. Heavy infestation of *Ceratomyxo shasta* in lower intestine.
7/20	F	685	Yes	Probable head burn. Whole head fungus. Aeromonad/pseudomonad positive. *Renibacterium salmoninarium* ELISA 0.133.
7/22*	F	740	Yes	Probable head burn. Severe head lesion and fungus. Aeromonad/pseudomonad positive. *Renibacterium salmoninarium* ELISA 0.133.

Table 2. Spring chinook salmon prespawn mortalities collected at or near the Catherine Creek weir, 1999. * Fish previously caught and passed at the weir. **Fish with easily visible gametes occupying a large volume of the body cavity were assumed to be mature.

Below-weir surveys on 19 dates yielded 8 live spring chinook, and 5 chinook carcasses at Catherine Creek (Table 3). Live spring Chinook were observed on July 26, August 5, September 3 and September 8. Four redds were observed on September 3. Suckers (*Catostomus* sp.) and *O. mykiss* were other species observed. No spring chinook or redds were observed on 19 surveys on the upper Grande Ronde River. Suckers (*Catostomus* sp.), bull trout, and *O. mykiss* were other species observed.

Stream	Surveys	Dates	Live Chinook Salmon Observed
Catherine Creek	19	July 1-Sept 20	8
upper Grande Ronde River	19	June 28-Sept 22	0

Table 3. Summary of below-weir surveys conducted on Catherine Creek and the upper Grande Ronde River, 1999.

Water temperatures observed (with pocket thermometers) at the adult trap sites on Catherine Creek and the upper Grande Ronde River were similar during the trapping season (Figures 4 and 5). The maximum temperatures observed at both the upper Grande Ronde River and Catherine Creek sites were 23^{o}C. A temperature of 21^{o}C or greater was observed on 23 of 152 dates sampled on the upper Grande Ronde, and all were in July or August. Temperatures of 21^{o}C or greater were observed on 28 of 154 dates on Catherine Creek, also all in July or August. The highest temperatures (temperature loggers) at the Catherine Creek and the upper Grande Ronde River weirs during midsummer were usually observed near 1700-1800 (5-6 PM) and the lowest at about 0700-0800) 7-8 AM (Figures 6 and 7).

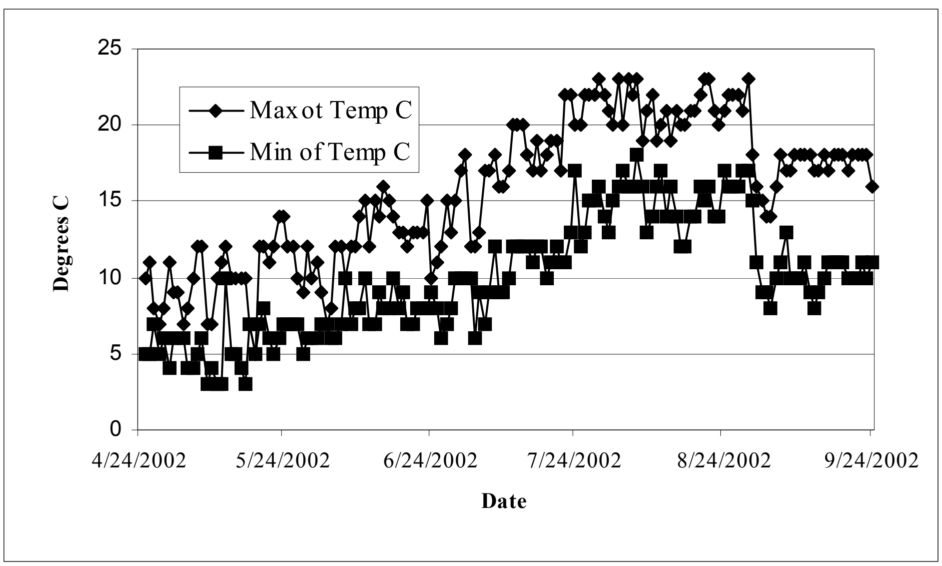

Figure 4. Maximum and minimum water temperatures observed at the Catherine Creek weir, 1999.

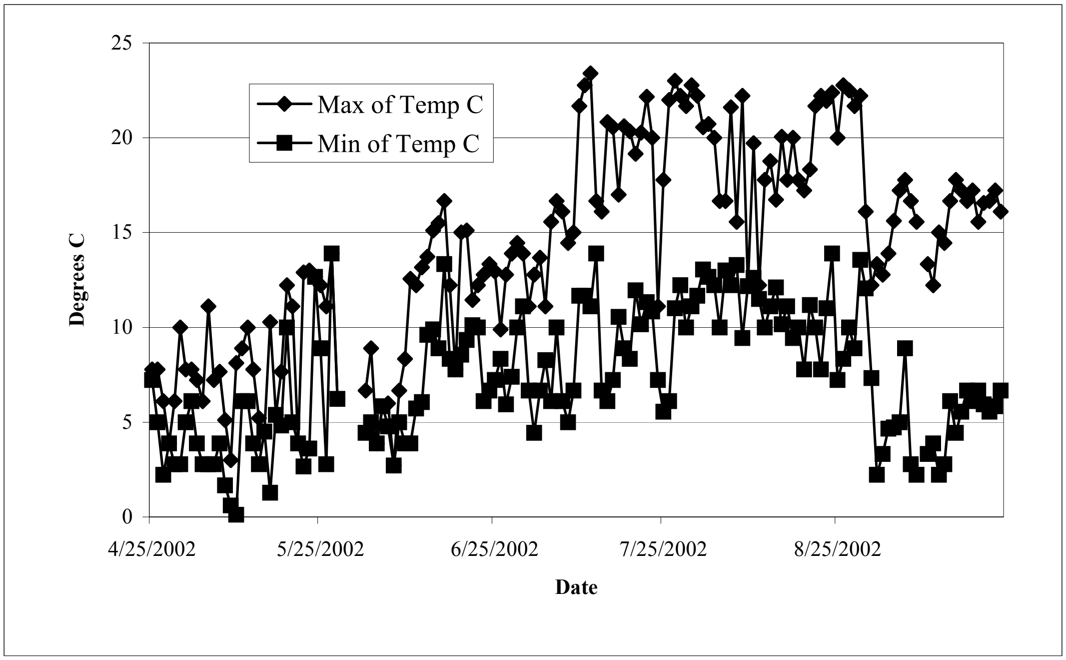

Figure 5. Maximum and minimum water temperatures observed at the upper Grande Ronde River weir, 1999.

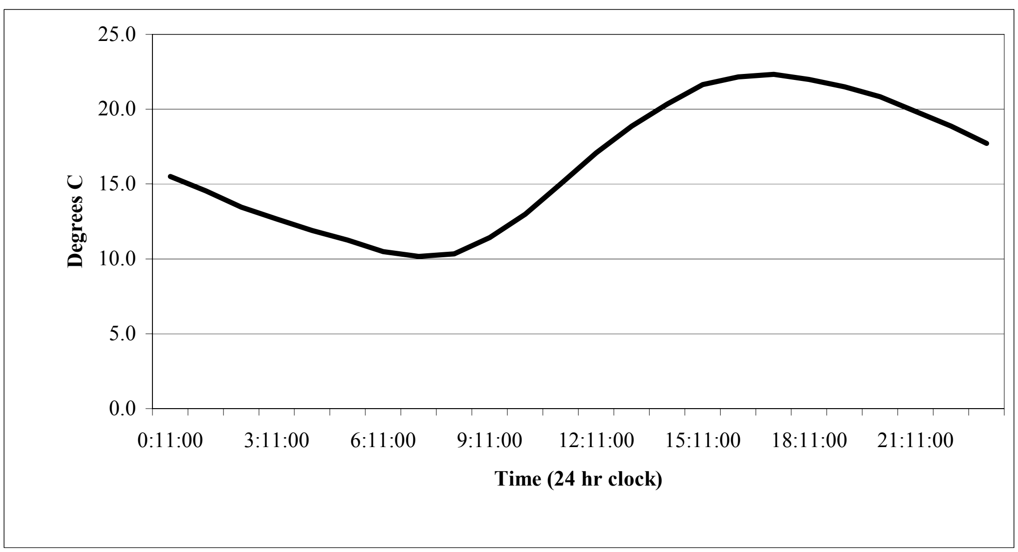

Figure 6. Daily sequence of water temperatures at the Catherine Creek weir, July 10, 1999.

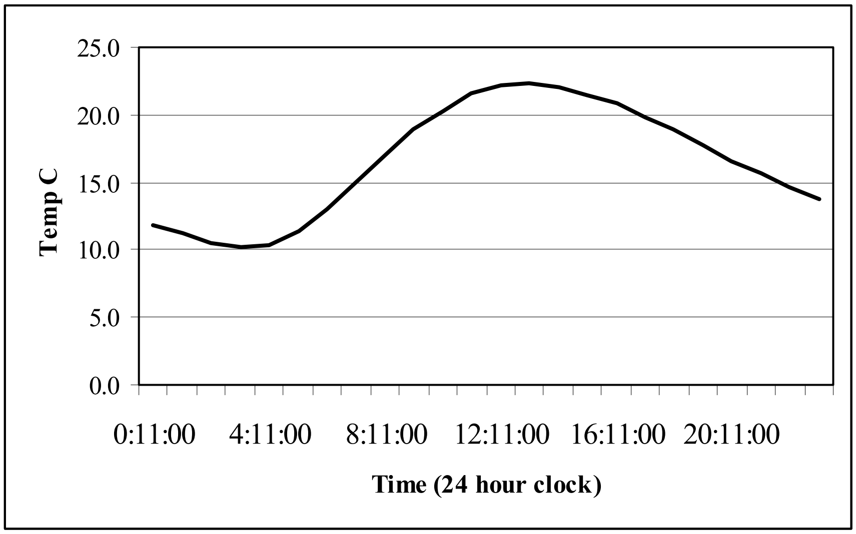

Figure 7. Daily sequence of water temperatures at the upper Grande Ronde River weir, July 10, 1999.

Stream gauge readings taken on 154 dates showed two periods of high flow (Figure 8). Measurements during those periods were exceeded the top of the gauge (about 1.1 m).

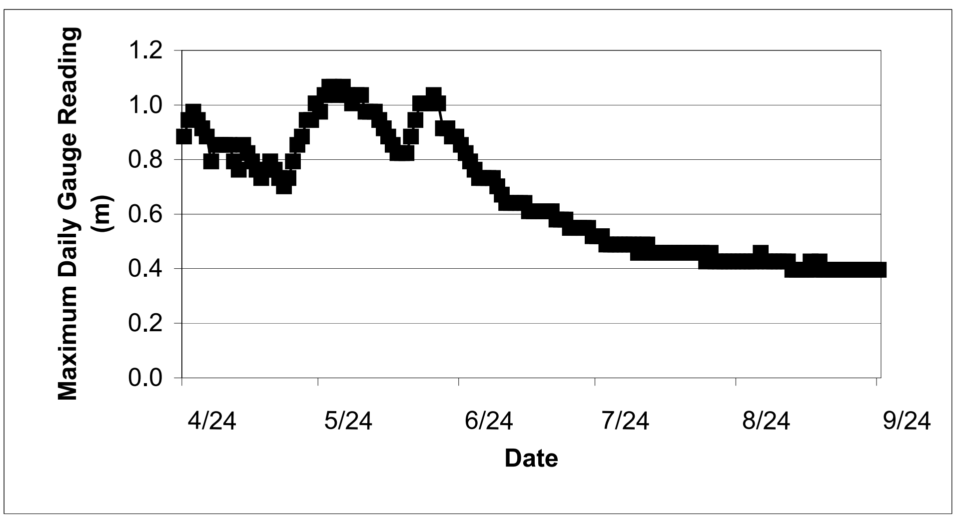

Figure 8. Daily maximum staff gauge readings near the Catherine Creek weir, 1999.

Four steelhead were recovered at or near the upper Grande Ronde River weir (GR) and thirteen steelhead were recovered at the Catherine Creek (CC) weir (Table 4). All steelhead collected at both weirs appeared to be moving downstream after spawning.

Stream	Sex Ratio (M:F)	Hatchery:Wild Ratio	Mean FL (mm)	SD	Range	N
CC	1.5:1	0.3:1	685.4	69.5	580-805	12*
GR	0.3:1	0:1	567.0	94.0	450-673	4

* One fish not measured.

Table 4. Summary statistics for summer steelhead collected at Catherine Creek and the upper Grande Ronde River weirs, 1999.

One dead bull trout (about 25 cm) was found washed up on the Catherine Creek weir in early June. No other bull trout were captured or observed at either trap for the remainder of the season.

Other species collected at the weirs during 1999 included suckers (*Catostomus* sp.) and mountain whitefish. Suckers were usually observed during what appeared to be a spawning migration. Occasionally, suckers died from being wedged between the pickets, perhaps due to decreased post-spawning swimming ability.

Discussion

Too few spring chinook were collected from either Catherine Creek or the upper Grande Ronde River in 1999 to provide a conventional broodstock program and only a small amount of biological data. Comanagers agreed upon a minimum of 10 fish on hand at Lookingglass Hatchery on August 1. Comanagers agreed to only pass fish after collecting biological data in 1999, since preseason estimates of adult spring chinook escapement were very low.

The poor efficiency of weirs in 1999 (trapping only 25-35% of estimated escapement above the weirs) was probably due to poor functioningof the weirs. Picket-style weirs such as those used in during 1997-1999 are also known as Alaska-style weirs. Some salmon runs in Alaska occur later in the summer, after spring freshets have occurred. Scouring and high debris loads at that time are much lower, and weirs function effectively under those conditions. High stream flows and debris loads precluded efficient operation of weirs on Catherine Creek and the upper Grande Ronde River

All but one spring chinook collected in 1999 were age 4, based on length at age data from other streams (ODFW, unpublished data). Most Grande Ronde River spring chinook salmon carcass recoveries during 1966-1976 spawning ground surveys were age 4 (Howell et al. 1985).

Six adult spring chinook salmon were collected at Lower Granite Dam on April 24, 1999 (Figure 8). By June 1, 1999, about 50% of the total run of spring chinook salmon (non-jack) passing Lower Granite Dam had been observed.

The reliability of dam passage counts has been questioned but escapement estimates for spring chinook salmon are considered fairly accurate (Dauble and Mueller 2000). Catch data from Lower Granite Dam show that run timing varies from year to year, probably due to factors such as flow and temperature. Earlier trap installation and operation and a more effective weir design are required to consistently catch a high percentage of the run.

Migration timing data may aid in determining when to install weirs on Catherine Creek and the upper Grande Ronde River in order to capture an across-the-run sample of adult fish for conventional spawning, or explain inconsistencies in fish trapped at the weirs compared to carcass recoveries on the spawning grounds. The rate of migration for radio-tagged adults in the Snake River from Asotin, Washington to the Grande Ronde River was estimated at 29-35 km/day during 1991-1993 (Bjornn et al. 1998), but sample sized were small and may not be representative of the entire run. If adequate numbers of fish are tagged and tracked, they may provide valuable data on the migration timing of spring chinook fish spawning in Catherine Creek and the upper Grande Ronde River.

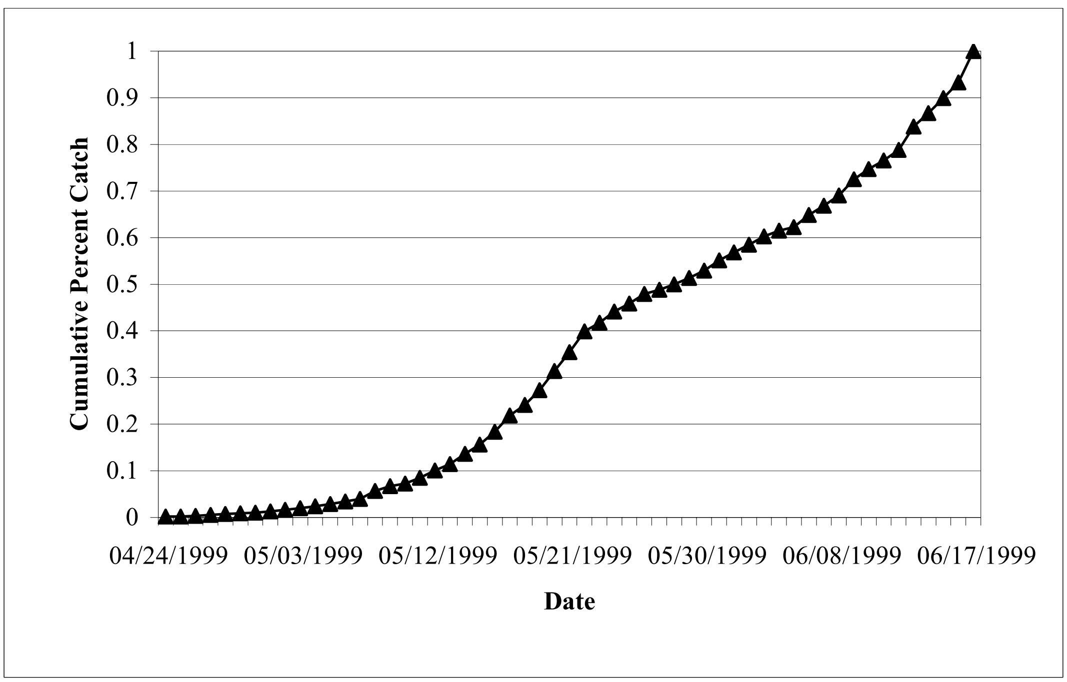

Figure 9. Cumulative percent catch of Snake River spring chinook salmon by date, Lower Granite Dam, 1999*. (* Sampling is not 100% efficient. The spring-run cutoff date is June 17. Total estimated run size (excluding jacks) was 3,296.)

Water temperatures observed during July-September 1999 frequently exceeded 20^{o} C, the water temperature standard established for the Grande Ronde River basin (Oregon Department of Environmental Quality 1995). Few fish were collected during the periods when temperatures were high. High water temperatures may present a thermal barrier to chinook salmon migration during midsummer. Fish may move into cooler tributaries (e.g. Minam River) and wait to return to the Grande Ronde River until water temperatures drop in September. It is also possible that environmental conditions in the Grande Ronde River have selected for spring chinook salmon tolerant of higher water temperatures.

It is unknown what role if any trapping and handling had in the four trap mortalities observed in 1999. Several changes in trap operation were made out of concern for the well being of the fish. Changes at both sites included foam insulation to cover sharp metal edges or corners on weir parts, a tarp inside the trap to inhibit jumping and provide cover, and more frequent checks of the trap. To compensate for the lack of shading riparian cover at the upper Grande Ronde River weir, camouflage netting was draped over the trap. Additional changes or modifications will be made as needed to reduce the possibility of injuries to fish resulting from trapping.

Below weir surveys on Catherine Creek suggested that weir placement resulted in little, if any, aggregating of fish below the weirs. The small number of fish observed below the weir makes interpretation of these data difficult. Past spawning ground surveys indicate that about 10% of redds occur below the weir location on the upper Grande Ronde River. An increase in the percentage of redds occurring below the weirs may be suggestive of the weirs impeding migration.

Earlier installation and better design of weirs will allow for trapping larger numbers of summer steelhead. Spawning of Grande Ronde River summer steelhead probably occurs from March through the end of May, with peak spawning in late April and May (Oregon Department of Fish and Wildlife et al. 1990). Steelhead are probably migrating past weir locations in Catherine Creek and the upper Grande Ronde River during these months. Data collected from 1964-1974 for Lookingglass Creek showed trap catches beginning in March and peaking in May (Howell et al. 1990). Similar migration patterns may occur for the upper Grande Ronde River and Catherine Creek. Some steelhead in the upper Grande Ronde River spawn in tributaries below the weir (e.g. Meadow Creek, Five Points Creek); the number of fish migrating to spawn above the weir is unknown. Fewer tributaries with suitable spawning areas exist below the weir in Catherine Creek, so a larger fraction of the population may be trapped. Wallowa Hatchery stock summer steelhead are used to augment harvest in both the upper Grande Ronde River and Catherine Creek. The National Marine Fisheries Service directed phasing out use of the Wallowa Hatchery stock in favor of an endemic stock by 2008, in order to reduce straying and genetic introgression problems within the Grande Ronde River and Deschutes River Basins (National Marine Fisheries Service 1999).

From the limited amount of trapping since 1997, it is uncommon to observe more than one or two bull trout each season at the Catherine Creek and upper Grande Ronde River weirs. Published information on the historical distribution of this species in the upper Grande Ronde River Basin is rare, but it appears that at one time they were widely distributed (Buchanan et al. 1997).

PART II. CONSTRUCTION OF REMOTE, SEMI-PERMANENT ADULT COLLECTION AND JUVENILE ACCLIMATION FACILITIES ON CATHERINE CREEK AND THE UPPER GRANDE RONDE RIVER, OREGON

No construction activity at either of the adult collection sites occurred in 1999. Slow progress in BPA's ability to get signed contracts with landowners for the Catherine Creek juvenile acclimation site has delayed construction. Disagreements among landowners over land boundaries have thus far prevented the construction of the permanent adult collection facility at Catherine Creek.

Construction at both acclimation sites was initiated and completed in 1999; fish will be acclimated at both facilities in February 2000.

PART III. EXPERIMENTS TO AID IN CULTURE OF SPRING CHINOOK SALMON CAPTIVE BROODSTOCK

Use of near-infrared spectroscopy to assess sex and maturity of salmonids

Cooperators - Anna Cavinato, Melissa Wenz, (Eastern Oregon State University), Peter Lofy and Stephen Boe (Confederated Tribes of the Umatilla Indian Reservation), Greg Davis and Randy Robart (Oregon Department of Fish and Wildlife), Dan Witczak (Washington Department of Fish and Wildlife).

Multiple handling and sorts of captive broodstock spring chinook salmon to assess sex and stage of maturity are required in the months prior to spawning, with increased stress and possibility of mortalities or disease problems. A noninvasive technique that would minimize handling would benefit the program. Near-infrared spectroscopy is a noninvasive technique that has been used for categorizing various types of materials, particularly in medicine, since first being described in 1977 (Delpy and Cope 1997). CTUIR has cooperated with comanagers and Eastern Oregon University to evaluate whether this technique may have a useful application for assessing sex and maturity of captive broodstock spring chinook.

CTUIR staff, in cooperation with ODFW, Eastern Oregon University, and the Washington Department of Fish and Wildlife, conducted preliminary experiments using near-infrared spectroscopy in 1999 on Deschutes River rainbow trout adults at the Oak Springs Hatchery (ODFW), summer steelhead at the Wallowa Hatchery (ODFW) and Dungeness Creek captive broodstock at the Dungeness Hatchery (WDFW) near Sequim, Washington.

PART IV. ASSISTANCE TO PROGRAM COOPERATORS

Program staff spent 15 person-days cooperating with comanagers to conduct spawning ground surveys on Catherine Creek, the upper Grande Ronde River, and other tributaries of the Grande Ronde River during 1999. Project staff also spent 2 person-days assisting in spawning ground surveys of the John Day River.

Program staff spent 10 person-days assisting comanagers in spawning of captive brood chinook salmon from Catherine Creek and the upper Grand Ronde river at Bonneville Fish Hatchery.

Program staff spent 2 person-days assisting in collecting spring chinook salmon parr from Catherine Creek.

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Barb Blanc, Rose Boyd, William Puterbaugh, and Dennis Cronen served as facility operators in 1999. Mike McLean and Ryan Seeker assisted in setting up weirs, trailers and other equipment. Bill Ricker, Vern Spencer, Dave Ricker, Leonard Almquist, (City of Union), and the U. S. Forest Service – La Grande Ranger District have allowed access and use of their property and facilities to carry out program activities. Pat Keniry (ODFW) provided unpublished spawning ground survey data. Warren Groberg and Sam Onjukka (ODFW) performed necropsy data. Gary James, Michelle Thompson, and Julie Burke (CTUIR) provided program administrative assistance. Anna Cavinato and Melissa Wenz (Eastern Oregon University) conducted near-infrared scanning. Greg Davis and Randy Robart (ODFW) and Dan Witczak (Washington Department of Game and Fish) allowed us to sample rainbow trout, summer steelhead and captive broodstock spring chinook for the near-infrared scanning project.

LITERATURE CITED

Bjornn, T. C., K. R. Tolotti, J. P. Hunt, P. J. Keniry, R. R. Ringe, and C. A. Peery. 1998. Passage of chinook salmon through the lower Snake River and distribution into the tributaries, 1991-1993. Part 1 of final report for migration of adult chinook salmon and steelhead past dams and through reservoirs in the lower Snake River and tributaries. Idaho Cooperative Fish and Wildlife Research Unit, University of Idaho, Moscow, Idaho 83843.

Buchanan, D. V., M. L. Hanson, and R. M. Hooton. 1997. Status of Oregon's bull trout. Oregon Department of Fish and Wildlife, Portland.

Dauble, D. D and R. P. Mueller. 2000. Upstream passage monitoring: difficulties in estimating survival for adult chinook salmon in the Columbia and Snake Rivers. Fisheries 25(8):24-34.

Delpy, D. T. and M. Cope. 1997. Quantification in tissue near-infrared spectroscopy. Philosophical Transactions of the Royal Society of London B 352:649-659.

Elston, R. 1996. Investigation of head burns in adult salmonids. Final Report 1996. DOE/BP-96-050-00. Bonneville Power Administration, Portland, Oregon.

Howell, P., K. Jones, D. Scarnecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Final Report. Stock assessment of Columbia River anadromous salmonids. Volume I: chinook, coho, chum and sockeye salmon stock summaries. Bonneville Power Administration Project Number 83-335, Portland, Oregon.

Howell, P., K. Jones, D. Scarnecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1990. Final Report. Stock assessment of Columbia River anadromous salmonids. Volume II: steelhead stock summaries. Bonneville Power Administration Project Number 83-335, Portland, Oregon.

Mobrand, L. and L. Lestelle. 1997. Application of the ecosystem diagnosis and treatment method to the Grande Ronde Model Watershed Project. Final report. Contract number 94AM332423. U. S. Department of Energy, Bonneville Power Administration, Portland, Oregon.

Myers, J. M., R. G. Kope, G. J. Bryant, D. Teel, L. J. Lierheimer, T. C. Wainwright, W. S. Grant, F. W. Waknitz, K. Neely, S. T. Lindley, and R. S. Waples. 1998. Status review of chinook salmon from Washington, Idaho, Oregon, and California. U. S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-35, 443 pp.

National Marine Fisheries Service. 1999. Biological Opinion on Artificial Propagation in the Columbia River Basin.

Nehlsen, W., J. E. Williams, and J. A. Lichatowich. 1991. Pacific salmon at a crossroads: stocks at risk from California, Oregon, Idaho and Washington. Fisheries 16(2):4-20.

Oregon Department of Fish and Wildlife, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe of Idaho, Washington Department of Fisheries, and Washington Department of Wildlife. 1990. Grande Ronde River subbasin salmon and steelhead production plan. Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon.

Oregon DEQ (Department of Environmental Quality). 1995. River basin assessment. Upper/Middle Grande Ronde River & Catherine Creek.

Oregon DEQ (Department of Environmental Quality). 1998. Grande Ronde River Basin water quality technical assessment (overview of water quality conditions).

Oregon DEQ (Department of Environmental Quality). 1999. Upper Grande Ronde River sub-basin temperature total maximum daily load (TMDL).

Parker, S. J., Keefe, ML, and R. W. Carmichael. 1995. Natural Escapement Monitoring of Spring Chinook Salmon in the Imnaha and Grande Ronde River Basins. Annual Progress Report for 1 January 1995 to 31 December 1995 to the U.S. Fish and Wildlife Service. Contract 14-48-0001-95560. Oregon Department of Fish and Wildlife, Portland, Oregon.

Schroeder, R. K. 1996. A review of capture techniques for adult anadromous salmonids. Oregon Department of Fish and Wildlife Information Report 96-5, Portland.

Thompson, R. N. and J. B. Haas. 1960. Environmental survey report pertaining to salmon and steelhead in certain rivers of eastern Oregon and the Willamette River and its tributaries. Part I. Survey reports of eastern Oregon rivers. Oregon Fish Commission, Clackamas, Oregon. 432 pp. + app.

USACOE (United States Army Corps of Engineers). 1975. Lower Snake River Fish and Wildlife Compensation Plan. U. S. Army Corps of Engineers Special Report. Walla Walla, Washington.

U. S. Forest Service, Oregon Department of Fish and Wildlife, Columbia River Inter-Tribal Fish Commission, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, and Oregon State University. 1992. Upper Grande Ronde River anadromous fish habitat protection, restoration and monitoring plan. U. S. Forest Service, Oregon Department of Fish and Wildlife, Columbia River Inter-Tribal Fish Commission, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, and Oregon State University. Corvallis, Oregon.

Appendix Table 1. Data for Snake River spring chinook salmon collected at weirs on Catherine Creek (CC) and the upper Grande Ronde River (GR), 1999. (All fish collected were unmarked and passed upstream to spawn naturally).

Stream	ID	Date	Sex[1]	FL (mm)	Opercle Punch	Genetics ID
GR	1		U	No data	2 ROP	None collected
CC	1	5/13	F	745	1 ROP	201W99-01
CC	2	6/15	U	805	1 ROP	201W99-02
CC	3	7/2	U	736	1 ROP	201W99-03
CC	4	7/2	U	708	1 ROP	201W99-04
CC	5	7/7	U	758	1 ROP	201W99-05
CC	6	7/8	U	665	1 ROP	201W99-06
CC	7	7/11	U	777	1 ROP	201W99-07
CC	8	7/13	F	768	1 ROP	201W99-08
CC	9	7/14	F	704	1 ROP	201W99-09
CC	10	7/15	F	716	1 ROP	201W99-10
CC	11	7/17	F	610	1 ROP	201W99-11
CC	12	7/17	M	730	1 ROP	201W99-12
CC	13	7/21	M	757	1 ROP	201W99-13
CC	14	7/28	F	720	1 ROP	201W99-14
CC	15	8/3	M	738	1 ROP	201W99-15
CC	16	8/25	F	768	1 ROP	201W99-16

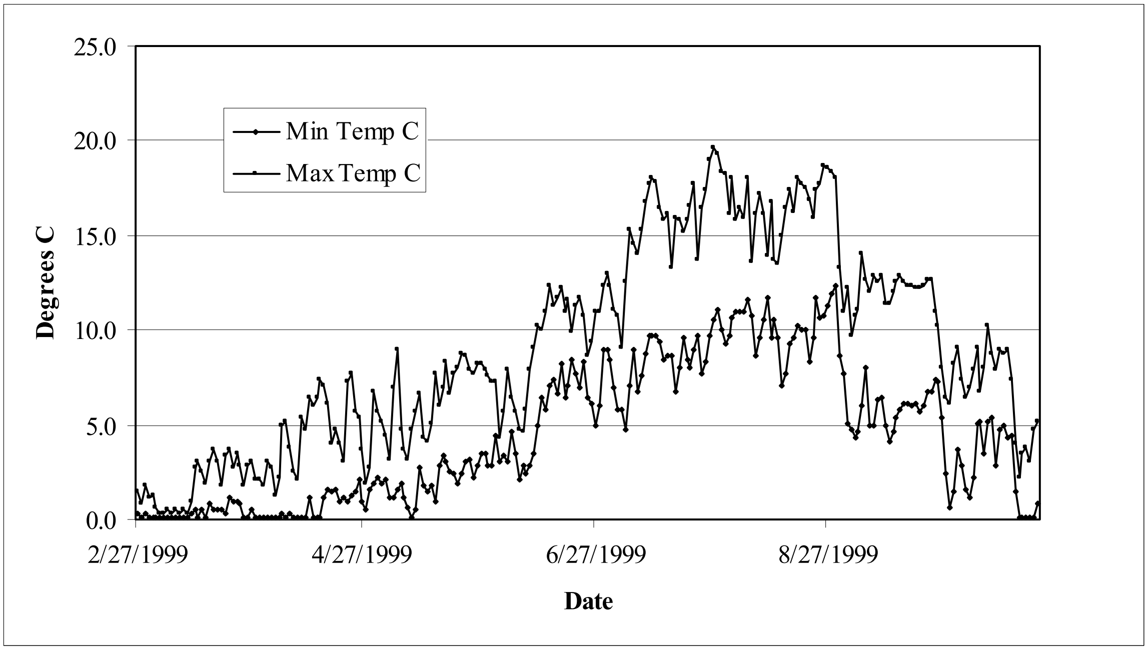
[1] Based on external examination.
M = male
F = female
ROP = right opercle punches

Appendix Table 2. Data for Snake River summer steelhead collected at weirs on Catherine Creek (CC) and the upper Grande Ronde River (GR), 1999.

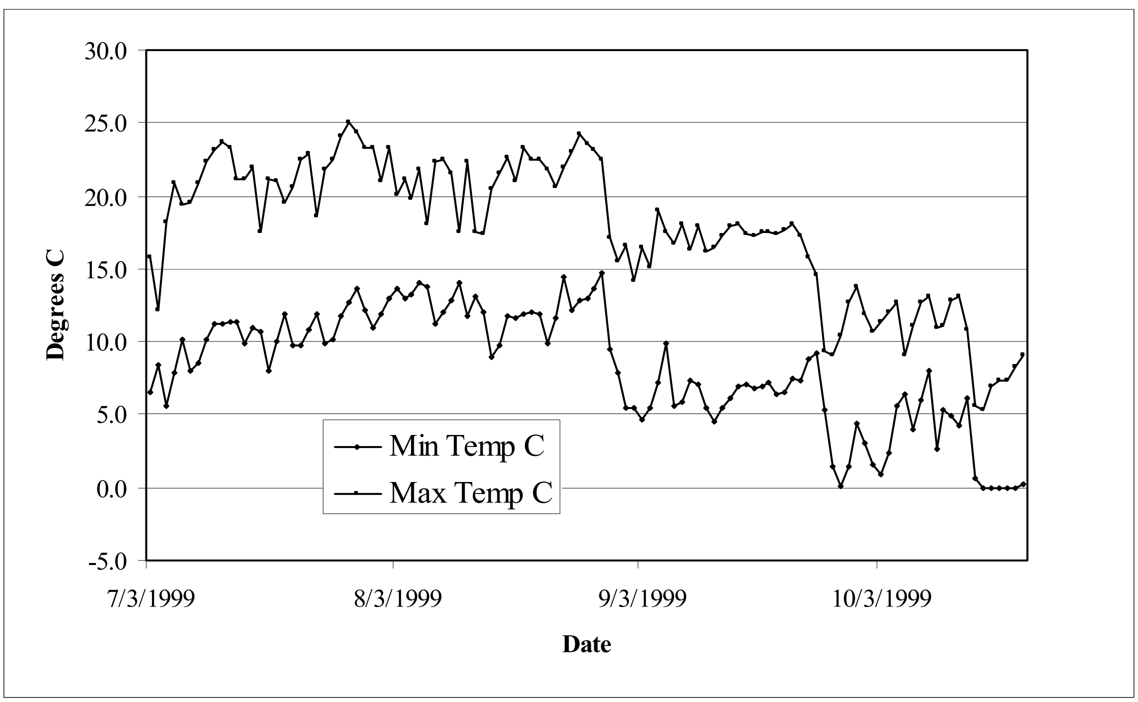
Stream	ID	Date	Marks	Sex	FL (mm)	Genetics ID	Notes
CC	1	5/11	None	U	735	None	PS, PD
CC	2	5/12	None	U	705	None	PS, PD
CC	3	5/12	None	M	740	None	M, against weir
CC	4	5/13	None	M	685	None	PS, PD
CC	5	5/17	None	U	-	None	PS, PD
CC	6	5/17	None	M	610	201W99STS01	PS, PD
CC	7	5/19	Ad	F	650	201W99STS02	E
CC	8	5/19	None	M	745	201W99STS03	M, against weir
CC	9	5/19	None	F	700	201W99STS04	PS, PD
CC	10	5/20	None	M	670	201W99STS05	PS, PD
CC	11	5/20	None	M	720	201W99STS06	M, against weir
CC	12	5/21	Ad	F	585	None	E
CC	13	5/21	AdLV	F	580	None	E
GR	1	5/18	U	M	686	None	Escaped
GR	2	6/25	U	U	673	None	M
GR	3	6/26	U	U	638 est	None	PS
GR	4	7/10	None	F	622 est	None	M
GR	5	7/13	None	F	545	80W99STS01	M
GR	6	7/13	None	M	540	80W99STS01	M
GR	7	7/30	U	U	673 est	None	PS

U = unknown
F = female (external determination)
M = male (external determination)
Ad = Wallowa hatchery stock mark
PS = postspawn
PD = passed downstream
M = mortality
E = euthanized to minimize spawning of hatchery stock with wild fish

Appendix Figure 1. Minimum and maximum daily water temperature graph for the upper Grande Ronde River acclimation site, 1999.



Appendix Figure 2. Minimum and maximum daily water temperature graph for the upper Grande Ronde adult collection site, 1999.



Appendix Figure 3. Minimum and maximum daily water temperature graph for the Catherine Creek adult collection site, 1999.