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THE UMATILLA BASIN NATURAL PRODUCTION MONITORING AND EVALUATION PROJECT

2008 ANNUAL PROGRESS REPORT

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CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION ADMINISTRATIVE SUMMARY

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Cover Image

Darryl Thompson, May 2009, Meacham Creek.

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AOP-Annual Operating Plan
BOR-Bureau of Reclamation
BPA- Bonneville Power Administration
CBFWA-Columbia Basin Fish and Wildlife Authority
CTUIR-Confederated Tribes of the Umatilla Indian Reservation
EDT-Ecosystem Diagnosis and Treatment model
ESA-Endangered Species Act
NMFS-The National Marine Fisheries Service
NPCC-Northwest Power and Conservation Council
ODFW-Oregon Department of Fish and Wildlife
M&E-Monitoring and Evaluation
RM&E-Research, Monitoring and Evaluation
UBNPMEP-Umatilla Basin Natural Production Monitoring and Evaluation Project
UMMEOC-Umatilla Management, Monitoring, and Evaluation Oversight Committee
USFWS-United States Fish and Wildlife Service
USGS-United States Geological Survey

EXECUTIVE SUMMARY

Adult Returns and Spawning Surveys:

Natural origin adult steelhead returns to the Umatilla River declined from 2566 in 2007 to 2232 in 2008. Hatchery steelhead returns declined slightly from 914 in 2007 to 901 in 2008. Surveyors observed 137 steelhead redds during 2008 in the index sites for 9.4 redds/mile and down slightly from 9.7 redds/mile the year before. Adult spring Chinook returns were 2,009 in 2008, down from 2917 in 2007. Jack returns of 518 in 2007 suggest that adult spring Chinook returns in 2009 could be as high as 5600 provided the relationship between jack returns and subsequent adult returns to the Umatilla River continues. However, the linear relationship between jack and adult returns became more variable after 2004 (r^2 dropped from 0.8232 to 0.4053). Natural origin Chinook returns of 173 in 2008 compared to 134 in 2007. Surveyors observed 323 Chinook redds during 2008, down from 381 in 2007. Chinook spawners/redd improved from 4.6 spawners/redd in 2007 to 3.02 in 2008.

Harvest Monitoring

Estimated tribal harvest during 2008 was up from the previous year. An estimated 64 steelhead were harvested in 2008 in contrast to 32 in 2007. Spring Chinook harvest dropped from 284 in 2007 to 243 in 2008.

Age and Growth:

Scales collected from unmarked adult steelhead and spring Chinook salmon were pressed, read and added to existing data sets. Over 87% of natural adult summer steelhead returning to TMD had spent two years in freshwater before migrating to the ocean. Nearly equal numbers of total age 4 (46%) and age 5 (48%) adult steelhead returned in all years combined. Considerable variability occurs from year to year.

Temperature Monitoring

Water temperatures were monitored in 22 sites in the Umatilla Basin from July through October, 2008. Maximum summer water temperatures at monitoring sites in the upper Umatilla River were consistently cooler than in previous years by 1 to 3 C.

Outmigration Monitoring

Juvenile outmigration monitoring in Meacham Creek was delayed until April 2009 because of budget delays and a six week moratorium on purchasing at the end of the calendar year. However, the majority of the materials and equipment were procured and in place at the end of the project year (February 28, 2009).

Adult Passage Evaluations

The commencement of the adult steelhead passage evaluation study was delayed until February 2009 because of budget delays and a six week moratorium on purchasing at the end of the calendar year. However, 11 fixed site telemetry receivers were in place and seven steelhead were tagged.

INTRODUCTION

The Umatilla Basin Natural Production Monitoring and Evaluation Project (UBNPMEP) is funded by Bonneville Power Administration (BPA) as directed by section 4(h) of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (P.L.96-501). This project is in accordance with and pursuant to measures 4.2A, 4.3C.1, 7.1A.2, 7.1C.3, 7.1C.4 and 7.1D.2 of the Northwest Power Planning Council's (NPPC) Columbia River Basin Fish and Wildlife Program (NPPC 1994). Work was conducted by the Fisheries Program of the Confederated Tribes of the Umatilla Indian Reservation (CTUIR).

The UBNPMEP is coordinated with two Oregon Department of Fish and Wildlife (ODFW) research projects that also monitor and evaluate the success of the Umatilla Fisheries Restoration Plan. This project deals with the natural production component of the plan, and the ODFW projects evaluate hatchery operations (project No. 1990-005-00, Umatilla Hatchery M & E) and smolt outmigration (project No. 1989-024-01, Evaluation of Juvenile Salmonid Outmigration and Survival in the Lower Umatilla River). Collectively these three projects monitor and evaluate natural and hatchery salmonid production in the Umatilla River Basin.

The need for natural production monitoring has been identified in multiple planning documents including Wy-Kan-Ush-Mi Wa-Kish-Wit Volume I, 5b-13 (CRITFC 1996), the Umatilla Hatchery Master Plan (CTUIR & ODFW 1990), the Umatilla Basin Annual Operation Plan, the Umatilla Subbasin Summary (CTUIR & ODFW 2001), the Subbasin Plan (CTUIR & ODFW 2004), and the Comprehensive Research, Monitoring, and Evaluation Plan (CTUIR and ODFW 2006). Natural production monitoring and evaluation is also consistent with Section III, Basinwide Provisions, Strategy 9 of the *2000 Columbia River Basin Fish and Wildlife Program* (NPPC 1994, NPCC 2004).

The Umatilla Basin M&E plan developed along with efforts to restore natural populations of spring and fall Chinook salmon, (*Oncorhynchus tshawytsha),* coho salmon (*O. kisutch*), and enhance summer steelhead (*O. mykiss*). The need for restoration began with agricultural development in the early 1900's that extirpated salmon and reduced steelhead runs (Bureau of Reclamation, BOR 1988). The most notable development was the construction and operation of Three Mile Falls Dam (TMD) and other irrigation projects which dewatered the Umatilla River during salmon migrations. CTUIR and ODFW developed the Umatilla Hatchery Master Plan to restore fisheries to the basin. The plan was completed in 1990 and included the following objectives which were updated in 1999:

1) Establish hatchery and natural runs of Chinook and coho salmon.
2) Enhance existing summer steelhead populations through a hatchery program.
3) Provide sustainable tribal and non-tribal harvest of salmon and steelhead.
4) Maintain the genetic characteristics of salmonids in the Umatilla River Basin.
5) Increase annual returns to Three Mile Falls Dam to 31,500 adult salmon and steelhead.

In the past the M&E project conducted long-term monitoring activities as well as two and three-year projects that address special needs for adaptive management. Examples of these projects include adult passage evaluations, habitat assessment surveys (Contor et al. 1995, Contor et al. 1996, Contor et al. 1997, Contor et al. 1998), and genetic monitoring (Currens & Schreck 1995, Narum et al. 2004). The project's goal is to provide quality information to managers and researchers working to restore anadromous salmonids to the Umatilla River Basin. The status of completion of each of BPA's standardized work element was reported in "Pisces"(March 2008) and is summarized below.

A	165	Environmental Compliance
B	157	Spawning Surveys
C	157	Harvest Monitoring
D	157	Age and Growth
E	162	Analyze Data
F	189	Regional Coordination
G	160	Manage Data
H	183	Prepare Scientific Paper
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J	119	Manage Projects
K	185	Complete Pisces Status Reports
L	157	Steelhead Passage Evaluations
M	157	Outmigration Monitoring
N	70	Install Passage Monitoring Hardware
O	70	Install Smolt Trapping Equipment
P	70	Install PIT tag detectors
Q	160	Manage Radio Telemetry Data
R	157	Temperature Monitoring

Overview of the Umatilla River Basin

The Umatilla River originates in the west slopes of the Blue Mountains near Pendleton, Oregon and drains an area of approximately 2,290 square miles. Elevations in the basin range from about 260 to 5,800 feet above sea level (Figure 1). The mouth of the Umatilla River is located 3 miles below McNary Dam at river mile (RM) 289 on the Columbia River. The Umatilla River mainstem length is 89.5 miles and has been delineated into eleven management watersheds (Schwartz et al. 2005). Annual precipitation ranges from 10 inches/year in the lower reaches to 50 inches/year in the headwaters. Precipitation mainly occurs between late-fall and early-spring. Water runoff is typically highest in March and April, and lowest in September although extensive high flow events occasionally occur in November and December. The majority of land in the basin is privately owned (82%). Most public land is within the boundaries of the Umatilla National Forest.

The basin can be roughly divided into two physiographic regions located east and west of Pendleton. The Blue Mountains dominate the region south and east of Pendleton. Grasses and small shrubs dominate the drier, south facing slopes. Conifers dominate the north facing slopes and higher elevations. Miocene basalts are the dominant parent materials in this area. The combination of steep canyon walls and predominantly impervious bedrock leads to “flashy” runoff and poor ground water recharge. Extreme low flows are common during summer and winter drought. This effect is less pronounced in the North Fork which has a more persistent snow pack because of its higher elevation headwaters and has fewer anthropogenic stressors.

West of Pendleton the river has cut a low valley into a broad upland plain. The geology is dominated by basalt bedrock with loess, alluvial and glaciofluvial deposits (Walker & MacLeod 1991). Vegetation is predominately agricultural crops and sagebrush-grass communities. Historically, deciduous trees were abundant in riparian areas, but are now greatly reduced as a result of clearing and stream channelization for agriculture and urban development. Impacts of water diversion on river flow is most pronounced in the lower 35 river miles where six major irrigation dams were constructed in the early 20th century. Irrigation storage reservoirs were constructed in the Cold Springs and McKay Creek watersheds in 1917 and 1927, respectfully. Release of stored water from McKay Reservoir in summer significantly reduces water temperatures in the mainstem Umatilla River below RM 50. Surface water is diverted for irrigation, storage, or groundwater recharge almost year-round with highest removals occurring in April and May (over 400 cfs). Historically, irrigation withdrawals dewatered sections of the lower river during the summer. Dewatering also occurred during parts of the fall, winter, or spring depending on drought and other low flow scenarios. Currently a flow enhancement program provides Columbia River water to irrigators and allows more Umatilla River water to remain in channel for fish passage in the lower river. A thorough description of the watershed and associated management plans can be found in any one of the basin plans including the most recent (CTUIR & ODFW 2004). In addition, more details about the tributaries and the Umatilla Basin Salmonid Restoration Project initiated in the 1980s can be found in earlier reports (CTUIR 1984, ODFW 1986, Schwartz et al. 2005).

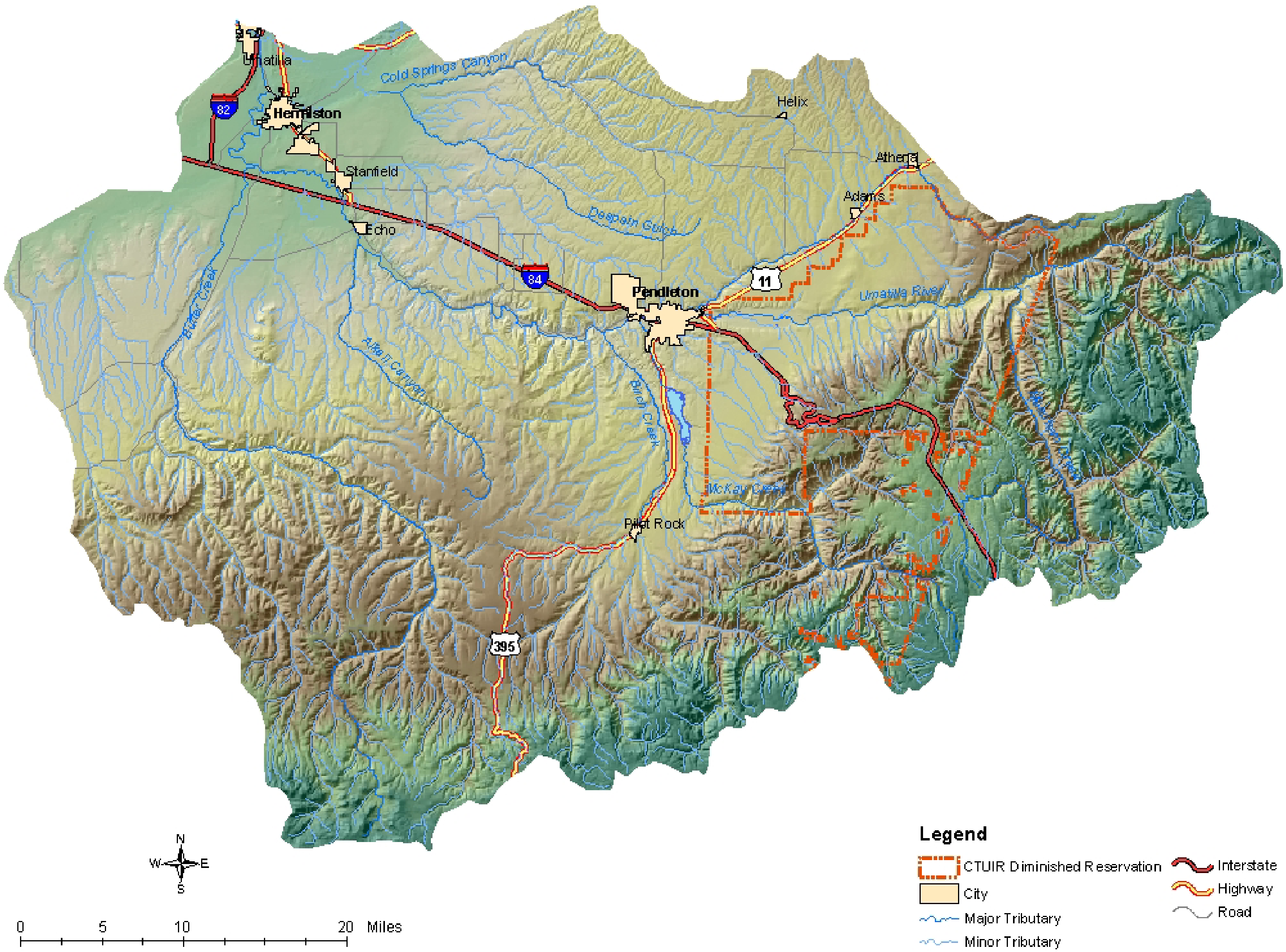

Figure 1. Topography of the Umatilla Basin

METHODS

Spawner Surveys and Adult Returns

Beginning in 1988 enumeration of returning adult salmonids at TMD improved and included the capturing, anesthetizing (CO_2) and handling of all fish. Since 2000 biologist have alternated between trapping and video taping every 5-12 days to reduce handling stress (Bronson 2007). Occasionally video taping is suspended if additional broodstock are needed for the hatchery programs of if passage conditions require trucking fish past passage impediments. Adult salmonids enumerated from video tape were apportioned by species, gender, origin, age and mark by using the percentage of the known fish in the immediate periods before and after video taping to the unknown fish from the video taping period. During early 2006 an improved video camera, better lighting and new software enhanced the resolution of the video and the ability to better distinguish species, sex, size, and fin clips. This has diminished the need for extrapolation (Bronson 2007).

On the spawning grounds, we used traditional visual spawning ground survey methods. Crews walked three to four mile reaches in established index areas. Most of the sites required a full day to access and sample. Crewmembers walked alone down smaller tributaries or in pairs on larger streams. Surveyors wore polarized glasses and hats to minimize glare and improve vision. To reduce stress on pre-spawning salmonids, surveyors moved carefully and quietly through holding and spawning areas. They did not probe debris jams or throw rocks into holding pools. High water, poor water clarity, or landowner denial prevented surveys at certain times and locations.

Redds were identified and judged to be complete based on redd size and depth, location, and amount and size of rock moved. Flagging was tied to nearby vegetation to mark redds and prevent recounting. The flagging was labeled with the date, location, species and number of males and females observed on or near redds. Crews also recorded information in data books or data loggers. For each redd, surveyors recorded the stream name, GPS coordinates, date of first observation, gender, number and origin (marked or unmarked) of fish observed on or near redds, carcasses sampled in the area, and habitat type. The GPS location of carcasses were recorded along with their MEHP length (middle of the eye to the terminus of the hypural plate), fork length, obvious injuries, and the cause of death in pre-spawning mortalities (if possible). Carcasses were cut open to determine egg retention of the females and spawning success of the males. Pre-spawning mortality was defined as death of a fish before spawning. Females that retained about 10% or more of their eggs and males with full and nearly full gonads were classified as pre-spawning mortalities. Tails of sampled fish were removed at the caudal peduncle to prevent re-sampling of the carcass.

Snouts were collected from salmon and steelhead carcasses with clipped left or right pelvic and adipose fin clips to collect coded wire tags. Snouts were removed by cutting down to the mouth through or behind the orbit. Snouts were placed in plastic bags and given an individual snout number for identification. Snouts and accompanying biological data were sent to ODFW's Mark Process Center to extract and read the wire.

US Fish and Wildlife Service (USFWS) and ODFW conducted 2008 bull trout surveys during the fall. We coordinated field work and findings to avoid duplication of effort. Occasionally, bull trout and spring Chinook salmon spawning overlapped even though bull trout are generally higher in the basin and spawn later than Chinook. We surveyed the primary Chinook spawning areas and reported any bull trout redds observed to the state and federal biologists. In turn, the state biologists surveyed the primary bull trout spawning areas and reported Chinook redds to CTUIR.

Summer steelhead redd surveys were conducted on 26.2 miles during 2008 on 11 survey reaches on nine tributaries in the Umatilla River Basin (Table 1 and Figure 2). High flows and turbid water prevented additional surveys. Spring Chinook salmon escapement surveys were conducted along 53.7 miles of 15 reaches of the Umatilla River and Meacham Creek (Figure 3).

Table 1. Spawner survey index reaches for the Umatilla River (STS=Steelhead, CHS=Chinook; easting and northing coordinates are for the North American Datum of 1983; NAD83 Datum; Universal Transverse Mercator; UTM; Projection, Zone 11, in meters; see Figures 2 and 3)

Stream	Reach	Reach Length (mi)	Reach Site Code	Reach Start Easting	Reach Start Northing	Reach End Easting	Reach End Northing
Buckaroo Creek	1	3	BKR1	386,430	5,060,077	384,093	5,057,552
Boston Canyon	1	1	BOS1	393,801	5,059,883	394,765	5,059,163
Camp Creek	1	2	CMP1	396,673	5,047,601	398,593	5,049,956
East Meacham	1	1	EFM1	400,390	5,037,638	401,335	5,036,847
Iskuulpa Creek	1	3.3	ISK1	391,022	5,061,688	390,767	5,056,670
Iskuulpa Creek	2	3.4	ISK2	390,767	5,056,670	388,850	5,051,939
Meacham Creek	1	2	MCM1	394,127	5,061,955	393,779	5,059,868
Meacham Creek	2	3	MCM2	393,779	5,059,868	393,961	5,055,714
Meacham Creek	3	3.4	MCM3	393,961	5,055,714	394,431	5,051,933
Meacham Creek	4	3.4	MCM4	394,431	5,051,933	396,626	5,047,616
Meacham Creek	5	4.1	MCM5	396,626	5,047,616	399,174	5,042,490
North Fork Meacham	1	3.1	NFM1	403,478	5,043,335	399,167	5,042,484
Moonshine Creek	1	2.3	MNS1	377,979	5,059,335	378,264	5,055,912
North Fork Umatilla	1	2.8	NFU1	407,490	5,064,259	411,407	5,064,899
North Fork Umatilla	2	1.4	NFU2	411,407	5,064,899	413,492	5,064,594
East Birch Creek	4	3	EB1	369,242	5,026,771	365,142	5,028,428
Pearson Creek	1	3	PSN1	365,087	5,028,346	364,734	5,023,970
South Fork Umatilla	1	3.2	SFU1	407,490	5,064,259	406,190	5,060,073
Thomas Creek	1	2.6	TMS1	406,190	5,060,073	408,652	5,057,495
Umatilla	17	4.1	UMA16	362,969	5,059,377	368,844	5,059,254
Umatilla	18	3.5	UMA18	368,844	5,059,254	373,434	5,058,394
Umatilla	19	3.4	UMA19	373,434	5,058,394	377,991	5,059,285
Umatilla	20	2.5	UMA20	377,991	5,059,285	381,066	5,059,965
Umatilla	21	4	UMA21	381,066	5,059,965	386734	5,060,078
Umatilla	22	3.2	UMA22	386,734	5,060,078	391,023	5,061,687
Umatilla	23	3.3	UMA23	391,023	5,061,687	395,482	5,062,939
Umatilla	24	3.4	UMA24	395,482	5,062,939	399,677	5,064,253
Umatilla	25	2.7	UMA25	399,677	5,064,253	403,232	5,066,158
Umatilla	26	3.2	UMA26	403,232	5,066,158	407,490	5,064,259

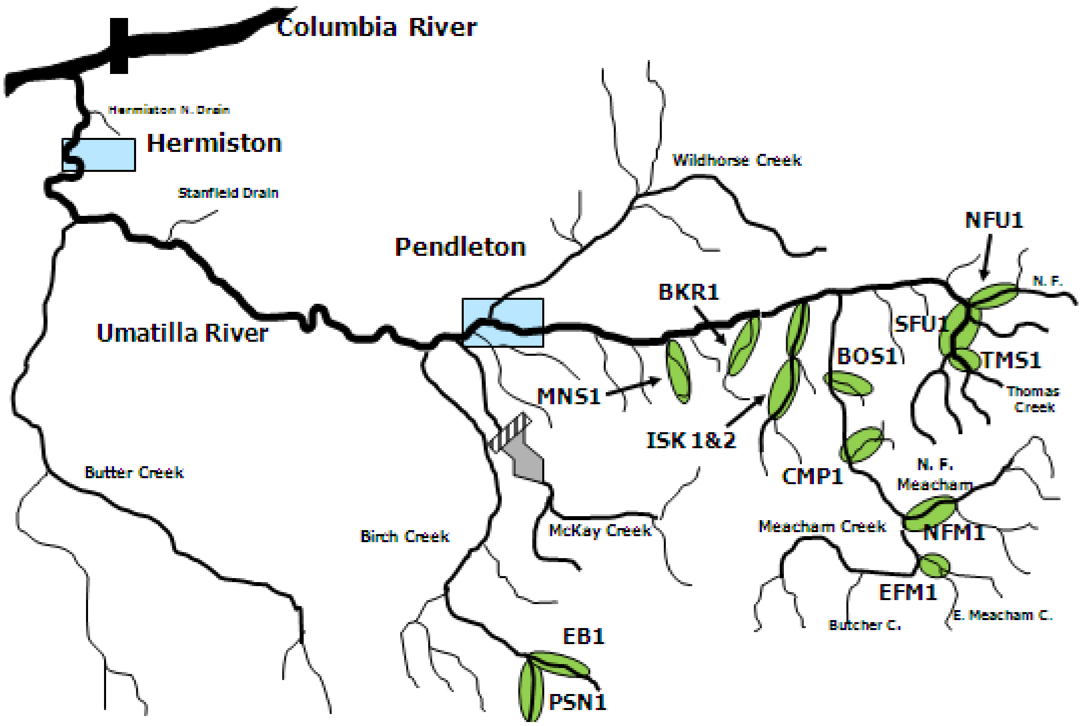

Figure 2. Summer steelhead redd survey sites, 2008 (see Table 1)

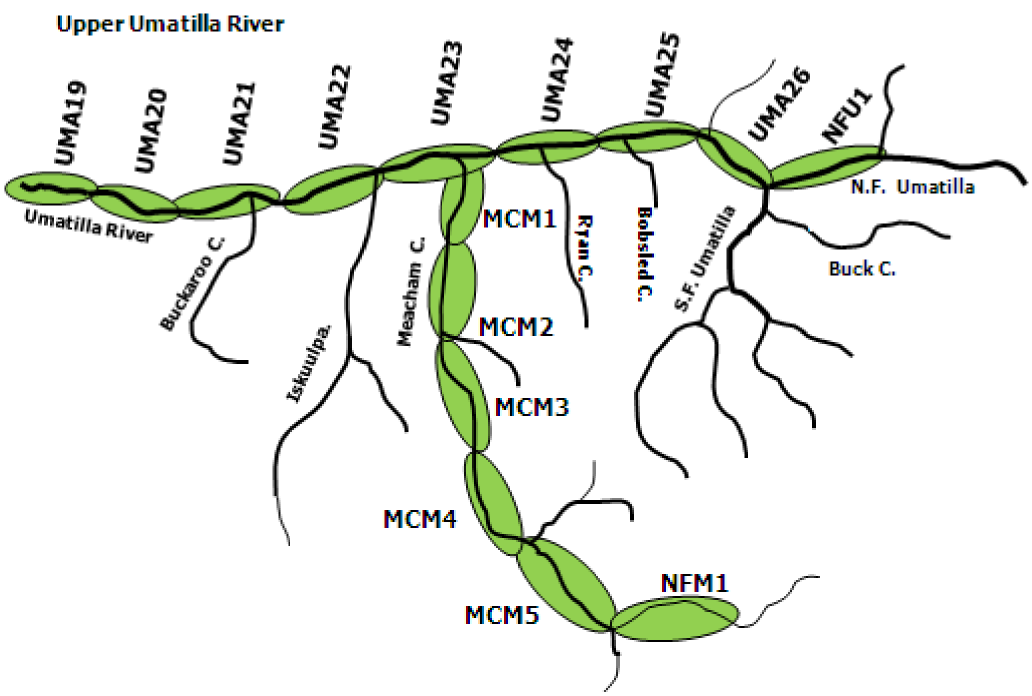

Figure 3. Spring Chinook redd and carcass survey reaches, 2008 (see Table 1)

Harvest Monitoring

Estimates of tribal harvest of adult spring Chinook salmon in the Umatilla River Basin were derived by summarizing and expanding data from creel surveys conducted in the field. A stratified, random roving creel survey design was used to allocate survey effort for the assessment of the Tribal spring Chinook fishery. The creel survey was employed for May, June and July patterned after methods described by (Malvestuto 1996).

Harvest monitoring efforts were allocated to designated reaches of the Umatilla River from the west boundary of the Umatilla Indian Reservation (RM 56.1) to Fred Gray's Bridge (RM 80.1) and on the lower ¼ mile of Meacham Creek. Stream and river reach above Fred Gray's Bridge and the rest of Meacham Creek and tributaries were not open to fishing during 2008 for spring Chinook. Primary areas accessible to anglers were surveyed by vehicle and on foot. Survey reaches and sites were based on salmon and fisherman distribution information collected during creel monitoring efforts from 1993 to 2007.

In 2008, survey monitoring sites were essentially the same as in 2007 but had different designations. Reach selections were influenced by ecosystem diagnosis and treatment (EDT) reach designations, and a revised understanding of fishing areas. Survey reaches were located downstream from the most productive spawning grounds. As in previous years, the refuge area was not surveyed often because it was closed to fishing. Chinook harvest survey reaches are depicted in Figure 4 and defined in Table 1.

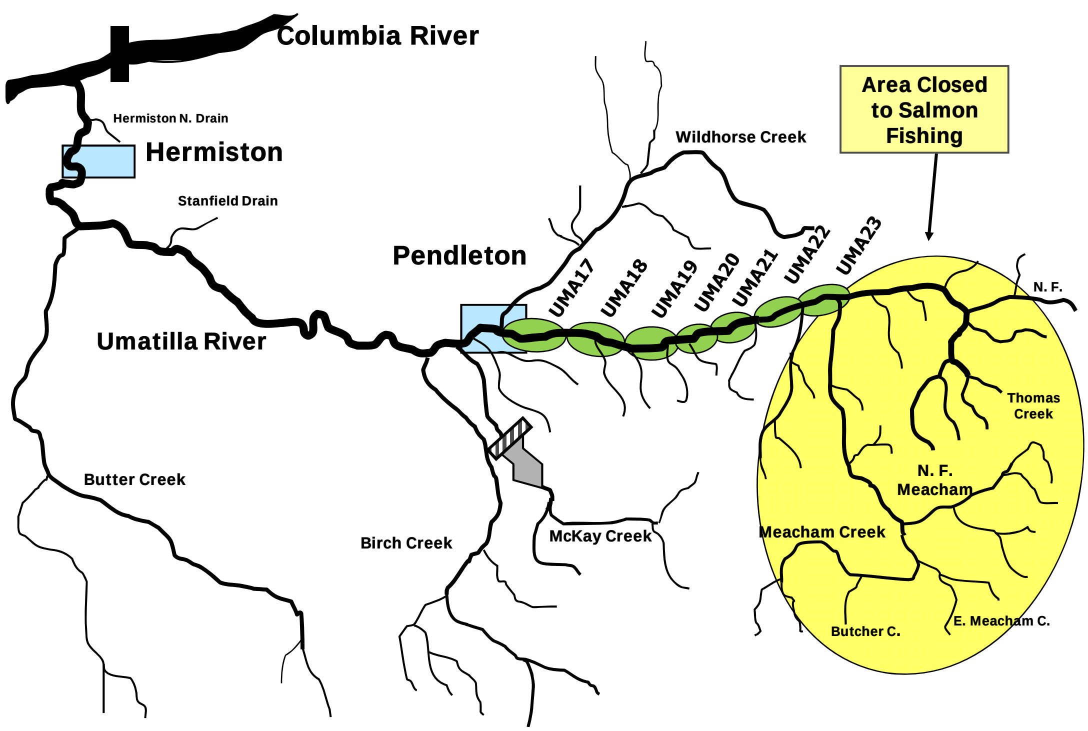

Figure 4. Location of creel survey reaches used to monitor the Tribal spring Chinook fishery during 2008 (see Table 1)

Data was recorded on a Trimble X-Geo Global Positioning System (GPS). Data was retained on the data logger in non-volatile memory and downloaded to a desk top computer.

Monitoring tribal steelhead harvest involved similar methods as used for the spring Chinook harvest. The steelhead season was protracted over 6.5 months from October to April 15. We began steelhead harvest monitoring in January because few fish arrive above Pendleton and few fishermen have been observed in past years before February, and because harvest estimates are also collected through phone surveys.

In 2008 a stratified-random algorithm was used select one or two weekend shifts and one to three weekday shifts. Shifts were selected without replacement within in a given week. Additional survey days were added during periods of peak angler effort. A random number generator was used to determine the day, starting point and survey direction of each shift.

When a reach was first approached, start-time was recorded by the surveyor. End-time was later recorded when the surveyor departed the reach. The amount of surveyor effort was dependent on length of reach, presence of anglers, number of interviews, and accessibility. As a result, survey time spent at each reach was variable. The total time spent at all reaches was later used to compute survey effort for expansions.

Two timeslots consisting of 5-8 hours each were established for weekday surveys and 5-15 hour timeslots were used for weekends and holidays. Timeslots to be surveyed were selected using Microsoft Excel's random number generator.

Surveys began at a randomly selected reach and progressed in an upstream or downstream manner. Work progressed throughout the circuit of all reaches for the entire timeslot.

One creel surveyor would conduct the field surveys on a given day and collect the following data at each reach: surveyor, reach number, date, timeslot, and number of fishermen present. During interviews we recorded the fisher's name, effort (nearest half-hour), time and GPS coordinates. Fish in the creel were identified, measured, weighed, and examined for marks. Scales samples were taken from the preferred area of unmarked fish for age and growth studies. To recover coded wire tags, the snouts were taken from fish with adipose and ventral fin clips

Harvest Survey Data Analysis: Harvest estimates for Umatilla Basin spring Chinook salmon and steelhead were calculated by expanding angler count, effort and harvest data. The amount of surveyor effort for a period (se) was tallied by summing $(\sum\ )$ the time spent at all reaches for a given period (Equation 1).

Equation 1. $(se) = \sum_{reach1}^{hr} + ... \sum_{reach6}^{hr}$

The surveyor effort (se) was divided into the total hours of daylight (dl) to generate a conversion factor (cf)(Equation 2). The conversion factor was later used in expansion formulas.

Equation 2. $(cf) = {dl}/{se}$

Mean estimates of angler effort per reach (mae) were calculated (when possible) by dividing the total angler effort in hours (tae) by the number of anglers interviewed (ai) in a particular reach and generate (mae) values, (Equation 3).

Equation 3. $(mae) = {tae}/{ai}$

The total angler effort (tae) was calculated by adding the sum $(\sum\ )$ of the time anglers spent at each reach. The same result could be achieved by multiplying the number of anglers interviewed (ai) by mean angler effort (mae) per reach (Equation 4). Summation of the angler effort values was generated to give a partial expansion estimate of angler hours for the time surveyed.

Equation 4. $(tae) = \sum_{reach1}^{hr} + ... \sum_{reach6}^{hr}$ **or** $(ai) \times (mae)$

Total angler hours (ce) were computed by multiplying the total time surveyed for a day (se) by the sum of total angler effort (tae), divided by the time surveyed (re) and multiplied by the conversion factor (cf) (Equation 5). This was done for each period and reach and added to achieve an expanded estimate.

Equation 5. $(ce) = \left[\frac{(se) \times (tae)}{(reach1)}\right] \times (cf) ... + \left[\frac{(se) \times (tae)}{(reach6)}\right] \times (cf)$

Data projections for days not surveyed were generated by assigning the average values from days surveyed for metrics such as; survey time, number of anglers, and fishing effort for the particular day of the week. Complete harvest expansions for days not surveyed were thus based on information from the survey days adjusted for the hours of daylight.

Post Season Interviews: Post season harvest interviews were conducted with enrolled CTUIR members via telephone and in person. Tribal harvest of fall Chinook, coho, and bull trout was estimated only through post-season telephone surveys and interviews. Telephone interviews were conducted by contacting known tribal fishermen. This list had been developed over time from past harvest interviews. Phone interviewers recorded name, date, interview type, harvest method and effort, and number of salmonid species kept in each basin.

Data acquired following the post season for spring Chinook salmon season was used to supplement and cross reference harvest estimates generated from the field survey data. Estimates of salmonid species other than spring Chinook and steelhead were based entirely on post season interview data. Post season interviews were also a valuable source for estimating relative trends of annual harvest of salmonid species in other tributaries by tribal members.

Age and Growth

Scale samples were collected opportunistically from adult salmonids for age, growth, and cohort determination during egg takes and spawner/carcass surveys by CTUIR personnel. Adult scales were collected from the preferred area two rows above the lateral line on the left side of the fish in a diagonal line between the posterior edge of the dorsal fin and the anterior end of the anal fin. Additional scales were often collected on the right side of adult fish in the same area because of the high percentage of regenerate scales observed. Scales were placed in coin envelopes with the appropriate biological data written on the front of the envelope (species, date collected, GPS coordinates, mid-eye to hypural length in mm, marks, gender, collector, and remarks).

Adult scales with a small round focus had the most complete life history data and were used for age analysis. Utilizing a dissecting microscope, the best one to five scales were removed from the coin envelope and mounted on gum cards. The gum cards were then pressed in cellulose acetate. Scales taken during hatchery spawning were mounted directly to gum cards. Scales were observed and interpreted under a microfiche reader at magnifications of 42X and/or 72X. The European method of age designation was utilized to record age data. An age 1.3 spring Chinook salmon spent one winter in fresh water and three winters in the ocean and returned to spawn at 4+ (age 5, fifth year after egg deposition). An age 2.2 summer steelhead spent two winters in freshwater and two winters in the ocean, migrated into the Columbia River during the summer or fall, held in the mainstem Columbia or Umatilla River and spawned the following spring at 5+ (age 5, fifth year after egg deposition).

Age information was used to assign proportions of the escapement to particular brood years. For example, a four year old fish returning in 2008 was assigned to the 2004 brood year. This partitioning allowed for the analysis of escapement, spawning, and carcasses metrics by brood year, and allowed for the estimation of productivity in terms of adult recruits per spawner.

Water Temperature Monitoring

Deployment of thermographs in the Umatilla River Basin was coordinated with other projects and agencies to maximize consistency and coverage without duplicating effort during 2007. Figure 5 shows the location of the UBNPME project thermographs. Table 2 is the key for Figure 5. Some of the thermograph locations have been monitored consistently since 1993 while other sites have only been monitored for one or two years. Twelve new sites were added in 2008 based on the "Stream temperature design for the Upper Umatilla River" completed by Scott O'Daniel (CTUIR 2008).

Table 2. Descriptions for 2008 temperature monitoring sites in the Umatilla Basin (see Figure 5)

Site Number	Stream	Location	River Mile	July-Sept. Maximum Temperature (C)
1	NF Umatilla	downstream of Coyote Cr	2.7	13.8
2	Umatilla River	downstream of Forks	89.2	16.9
3	Umatilla River	at Bar M Ranch	87	20.2
4	Umatilla River	upstream of Ryan Cr; below wooden Bridge	83	22.1
5	Umatilla River	upstream of Ryan Cr	82.5	21.8
6	Umatilla River	downstream of Ryan Cr; below house	80.8	21.5
7	Umatilla River	downstream of Imeques	79.4	24.5
8	Umatilla River	upstream of Thorn Hollow; off levee on Weathers' property	74.6	24.5
9	Umatilla River	at Thorn Hollow fish facility	73.1	24.7
10	Umatilla River	downstream of Thorn Hollow; below railroad/road crossing	70.9	25.1
11	Umatilla River	downstream of Thorn Hollow; off Cayuse Rd below Grey Lane	69.6	24.7
12	Umatilla River	upstream of Cayuse; thru Dick & Spino properties	67.7	26.2
13	Umatilla River	downstream of Cayuse off White Rd	65.3	27.3
14	Umatilla River	downstream of Hwy331; off Mission levee thru gate	57.8	29.5
15	Umatilla River	at west boundary; near ODFW storage area	56	30.8
16	Umatilla River	downstream of west boundary; at City's Water Intake building	55.3	30.5
17	Umatilla River	upstream of Stillman Park; between SE 5th and 6th St	53.5	30.2
18	Umatilla River	downstream of McKay Cr; behind Colby Plastic off levee	49.7	Logger lost
19	Umatilla River	upstream of Reith Bridge	49	20.8
20	Umatilla River	near Barnhart	42.5	22.1
21	Umatilla River	at Yoakum Bridge	37	22.6
22	Umatilla River	at Riverfront Park	8.7	25.6

Vemco Mini-Loggers and Onset Tidbits were used to record water temperatures at one hour intervals. Instruments were initialized in the office and anchored to large trees or boulders with steel cables in the field. Thermographs and cables were concealed where possible to minimize tampering by the public. Thermographs were checked mid season to ensure proper function and placement. In November 2008 all thermographs were retrieved and processed in the laboratory.

Water temperature data were checked against the deployment, mid season check, and recovery logs. Data was graphed and examined for errors and deployment problems. Protocols for deploying thermographs and summarizing data are outlined below.

Temperature Monitoring Protocol:

Calibration protocols for our temperature monitoring instruments consisted of deploying the units at 1 minute intervals for 30 minutes in a continuously mixing water bath. Water temperatures were monitored by a NIST traceable thermometer which is QA checked yearly (calibration certificate available at the USDA Forest Service Waterlab, Pendleton, OR). A cold water bath and warm water bath calibration were performed both preseason and postseason. Protocol details for preseason calibration, deployment, mid season checks, extraction, and postseason calibration are detailed in OPSW (1999). Some units were field checked more often than the mid season check. If staff was in the area of a temperature logger for another project, the logger was located to confirm proper placement.

The original raw data files were uploaded to a SQL Server-Based database, and later extracted for analysis using a Microsoft Access ™ front end. Automated algorithms generated data summaries for posting online for CTUIR use and for annual reports.

The temperatures recorded on the thermograph were compared with those recorded by the certified thermometer. The times and dates when units were deployed were also checked. The field data sheets were used to ensure that the instrument number was correct. Abnormal data was noted, and marked in the database including missing values or anomalies in temperature records suggesting that the unit was out of the water, buried in the substrate, or simply not recording information. Raw data (excluding data marked as abnormal) is online for public use (http://data.umatilla.nsn.us/).

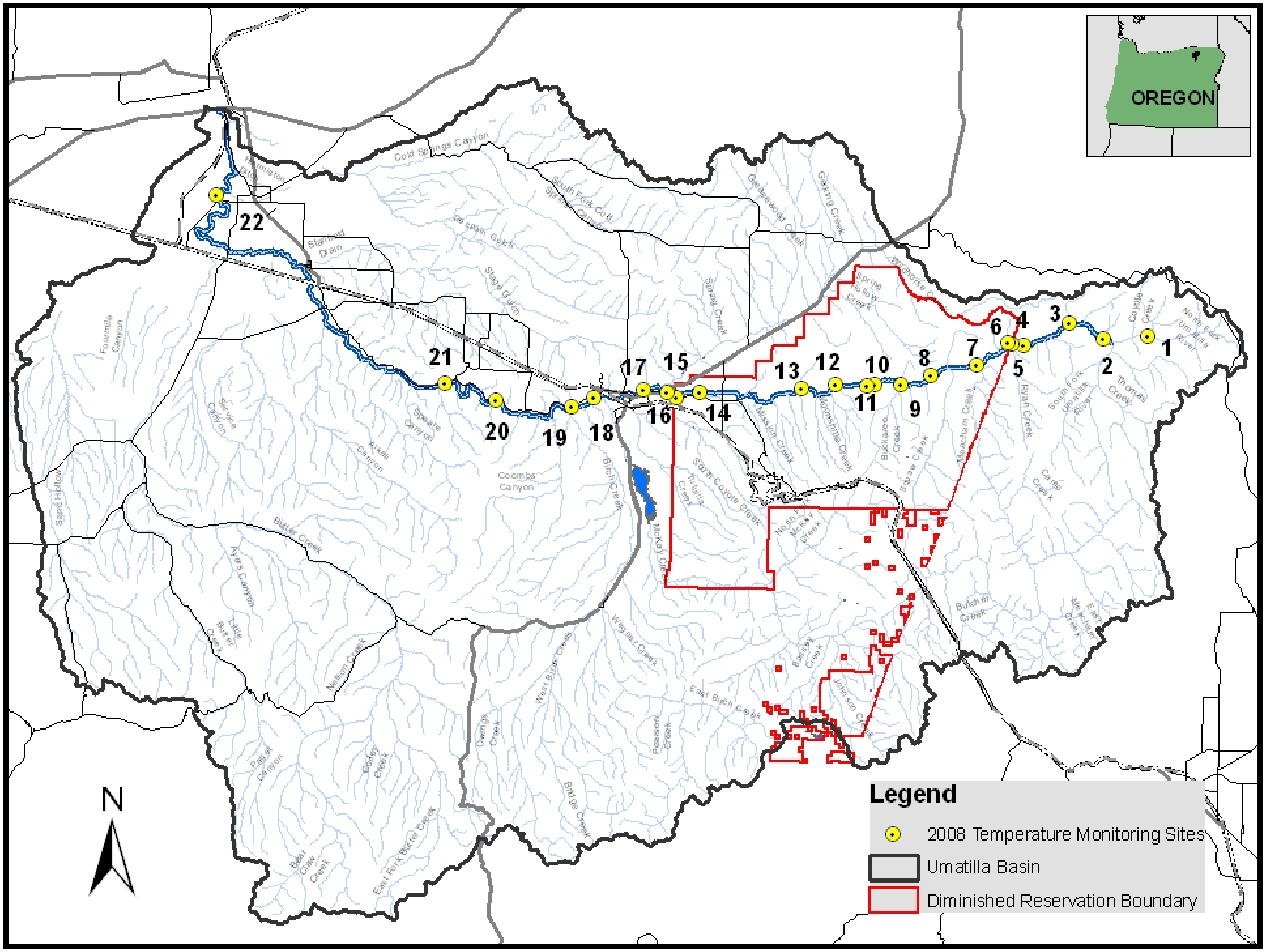

Figure 5. Location of thermographs deployed during the 2008 summer monitoring season

RESULTS AND DISCUSSION

Work for the 2008 contract period was outlined with the following BPA standardized work elements. The status of completion of each work element was reported in BPA's "Pisces" system and is summarized below:

A 165 Environmental Compliance: completed (except for PIT tag detector system that was delayed because of ESA and ODFW clearance issues that will be addressed in 2009).
C 157 Harvest Monitoring: completed
D 157 Age and Growth: completed
E 162 Analyze Data: completed
F 189 Regional Coordination: completed
G 160 Manage Data: completed
H 183 Prepare Scientific Paper: This work element was dropped after collaborative oral presentation was given by senior author Richard Carmichael of the Oregon Department of Fish and Wildlife.
I 132 Report 2007 Results: completed
J 119 Manage Projects: completed
K 185 Complete Pisces Status Reports: completed
L 157 Steelhead Passage Evaluations: budget delays postponed the procurement of equipment and delayed start of passage evaluations until February 2009.
M 157 Outmigration Monitoring: budget delays postponed the procurement of equipment and delayed the start of the outmigration study until March 2009
N 70 Install Passage Monitoring Hardware: completed February 2009
O 70 Install Smolt Trapping Equipment: completed March 2009. Delivery of winches critical for deploying the trap was delayed.
P 70 Install PIT tag detectors: delayed because of mixed signals about Oregon Department of Fish and Wildlife's preference for the PIT tag detectors and for clearance from National Marine Fisheries Service.
Q 160 Manage Radio Telemetry Data: completed
R 157 Temperature Monitoring: completed

Steelhead

Adult Returns: Total enumeration of summer steelhead adults at TMD began in 1988. The natural component of the return has varied between 724 and 3,658 and averaged 1,752 adults, and was 2,232 for the 2007-2008 return year. The hatchery returns have varied between 165 and 1861 and averaged 772 adults. Hatchery steelhead returns were 901 or 29% of the run in 2008 (Figure 6 and Table 3). Over the past twenty years both the natural and hatchery components of the summer steelhead run have demonstrated considerable variability in returns. The proportion of the run composed of hatchery fish has ranged from less than 10% in 1988 to almost 60% in 1997 (Figure 7).

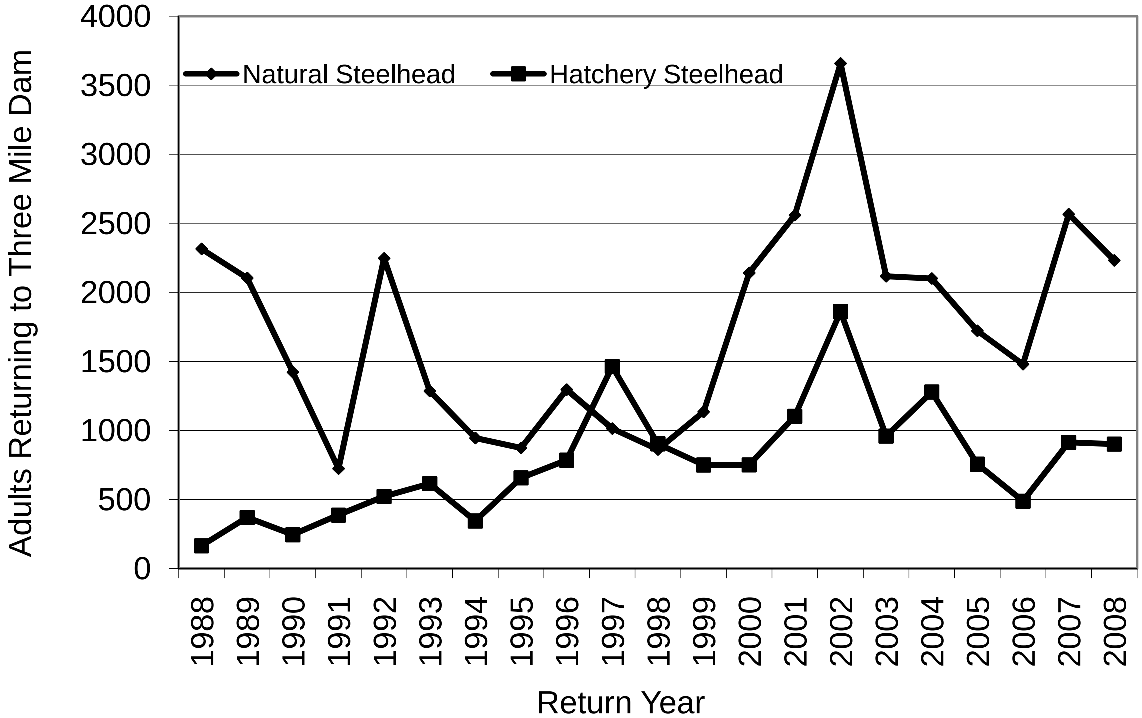

Figure 6. Natural and hatchery returns of summer steelhead to Three Mile Falls Dam, Umatilla River, 1988-2008

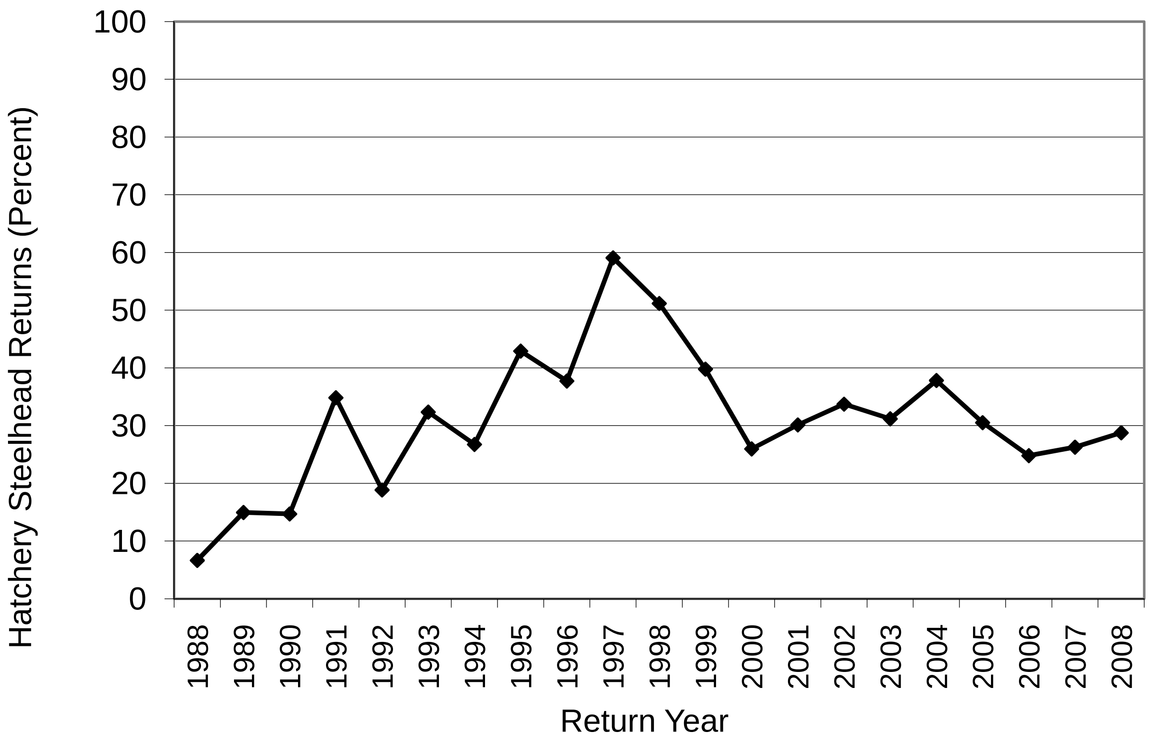

Figure 7. Percent of summer steelhead returning to Three Mile Falls Dam that were of hatchery origin by return year (1988-2008; the inverse of the natural component of the run)

Table 3 Summer steelhead (STS) adult returns to the Umatilla River above Three Mile Falls Dam 1987-2008 (* high water limited redd surveys)

RUN YEAR	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total Steelhead	**2480**	**2474**	**1667**	**1111**	**2769**	**1901**	**1290**	**1531**	**2081**	**2477**	**1765**	**1885**	**2892**	**3662**	**5516**	**3080**	**3388**	**2478**	**1968**	**3480**	**3133**
Natural STS	**2315**	**2104**	**1422**	**724**	**2247**	**1286**	**945**	**874**	**1296**	**1014**	**862**	**1135**	**2141**	**2559**	**3658**	**2117**	**2101**	**1722**	**1480**	**2566**	**2232**
Hatchery STS	**165**	**370**	**245**	**387**	**522**	**615**	**345**	**657**	**785**	**1463**	**903**	**750**	**751**	**1103**	**1861**	**959**	**1278**	**756**	**488**	**914**	**901**
Natural STS Sacrificed or Mort	**20**	**12**	**25**	**2**	**3**	**0**	**0**	**0**	**7F-1M**	**5F**	**1F-1M**	**1F**	**0**	**2F**	**1F**	**1F**	**2F**	**2F 2M**	**1F**	**0**	**1F**
Hatchery STS Sacrificed or Mort	**5**	**17**	**143**	**50**	**112**	**49F-21M**	**45F-6M**	**19F-14M**	**57F-16M**	**51F-44M**	**43F-27M**	**51F-24M**	**29F-13M**	**69F 28M**	**26F 23M**	**54F 28M**	**10F-2M**	**21F 16M**	**26F 14M**	**22F 24M**	**33F 49M**
Natural STS Females in Brood	**78**	**88**	**57**	**53**	**116**	**61**	**45**	**48**	**49**	**44**	**44**	**59**	**55**	**50**	**50**	**51**	**53**	**46**	**50**	**50**	**50**
Natural STS Males in Brood	**73**	**72**	**49**	**46**	**109**	**64**	**47**	**38**	**56**	**48**	**42**	**52**	**60**	**55**	**50**	**48**	**49**	**54**	**49**	**50**	**50**
Hatchery STS Females in Brood	**0**	**0**	**0**	**56**	**46**	**2**	**25**	**35**	**12**	**1**	**11**	**0**	**1**	**0**	**0**	**0**	**10**	**10**	**10**	**10**	**5**
Hatchery STS Males in Brood	**0**	**0**	**0**	**47**	**49**	**1**	**18**	**33**	**16**	**12**	**19**	**17**	**14**	**10**	**10**	**10**	**9**	**9**	**10**	**10**	**5**
Natural Females Available to Spawn	**1436**	**1232**			**1193**	**862**	**638**	**598**	**863**	**687**	**546**	**715**	**1303**	**1709**	**2164**	**1453**	**1217**	**1020**	**632**	**1508**	**1478**
Hatchery Females Available to Spawn	**114**	**216**			**161**	**241**	**169**	**269**	**343**	**639**	**453**	**383**	**309**	**544**	**842**	**471**	**545**	**378**	**153**	**371**	**389**
Total Females Available to Spawn	**1550**	**1448**			**1354**	**1103**	**807**	**867**	**1206**	**1326**	**999**	**1098**	**1612**	**2253**	**3006**	**1924**	**1762**	**1398**	**785**	**1879**	**1867**
Natural Males Available to Spawn	**708**	**702**			**814**	**291**	**209**	**185**	**323**	**222**	**223**	**304**	**723**	**742**	**1343**	**515**	**740**	**593**	**743**	**951**	**635**
Hatchery Males Available to Spawn	**46**	**137**			**154**	**165**	**58**	**246**	**274**	**661**	**305**	**191**	**282**	**365**	**853**	**342**	**637**	**251**	**199**	**336**	**317**
Total Males Available to Spawn	**754**	**839**			**968**	**456**	**267**	**431**	**597**	**883**	**528**	**495**	**1005**	**1107**	**2196**	**857**	**1377**	**844**	**942**	**1287**	**952**
Natural STS Available to Spawn	**2144**	**1934**	**1290**	**623**	**2007**	**1161**	**847**	**783**	**1186**	**909**	**769**	**1019**	**2025**	**2463**	**3509**	**2010**	**1991**	**1613**	**1375**	**2459**	**2113**
Hatchery STS Available to Spawn	**160**	**353**	**102**	**234**	**315**	**406**	**227**	**515**	**617**	**1300**	**758**	**574**	**591**	**909**	**1695**	**810**	**1181**	**629**	**352**	**707**	**706**
Total STS Available to Spawn	**2304**	**2287**	**1392**	**857**	**2322**	**1559**	**1074**	**1298**	**1803**	**2209**	**1527**	**1593**	**2617**	**3360**	**5202**	**2777**	**3138**	**2242**	**1727**	**3166**	**2819**
Redds Observed in Index Reaches	**138**	**77**	*****	*****	**135**	*****	**64**	**74**	**119**	**138**	**126**	**218**	**238**	**382**	**347**	**322**	**208**	**218**	**50***	**190***	**137***
Index Reaches Miles Surveyed	**18.5**	**20**	*****	*****	**21.4**	*****	**21.4**	**21.4**	**21.4**	**21.4**	**21.4**	**21.4**	**21.4**	**21.4**	**19.4**	**21.4**	**19.9**	**21.4**	**17***	**19.5***	**18.3***
Total Redds Per Mile in Index R.	**7.5**	**3.9**	*****	*****	**6.3**	*****	**3.0**	**3.5**	**5.6**	**6.4**	**5.9**	**10.2**	**11.1**	**17.9**	**17.9**	**15.0**	**10.5**	**10.2**	**3.1***	**9.7***	**9.4***

Steelhead Spawning Ground Surveys: During 2008, 145 redds were enumerated during **s**pawning ground surveys from 14 sites (12 tributaries, 31.7 miles, 4.5 redds/ mile, all sites). Within the index sites, 137 redds were observed (18.3 miles, 9.4 redds/ mile). Average annual redd counts in index areas have varied between 3.0 and 17.9 redd/mile from 1993-2008 (Figures 8 and 9). Turbidity and high flows frequently prevented the observations of redds during the season. Redd counts during 2008 were below actual redd abundance in index reaches.

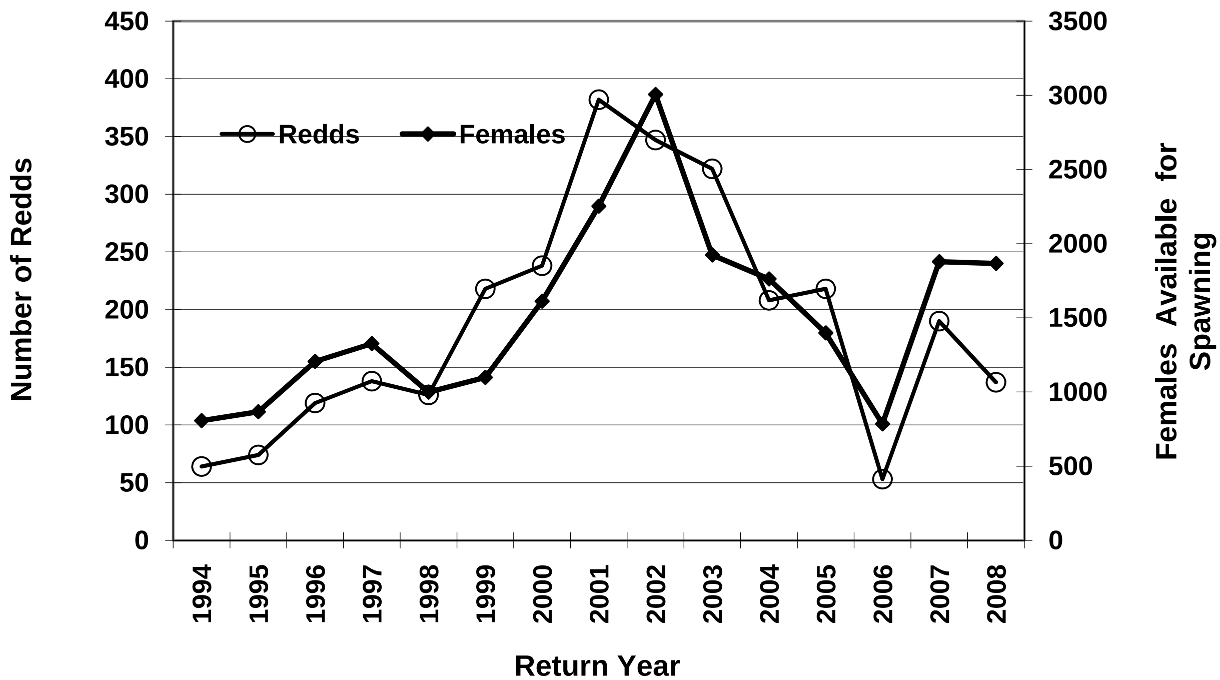

Figure 8 Summer steelhead redds enumerated in index reaches of the Umatilla River and females available to spawn 1994-2008

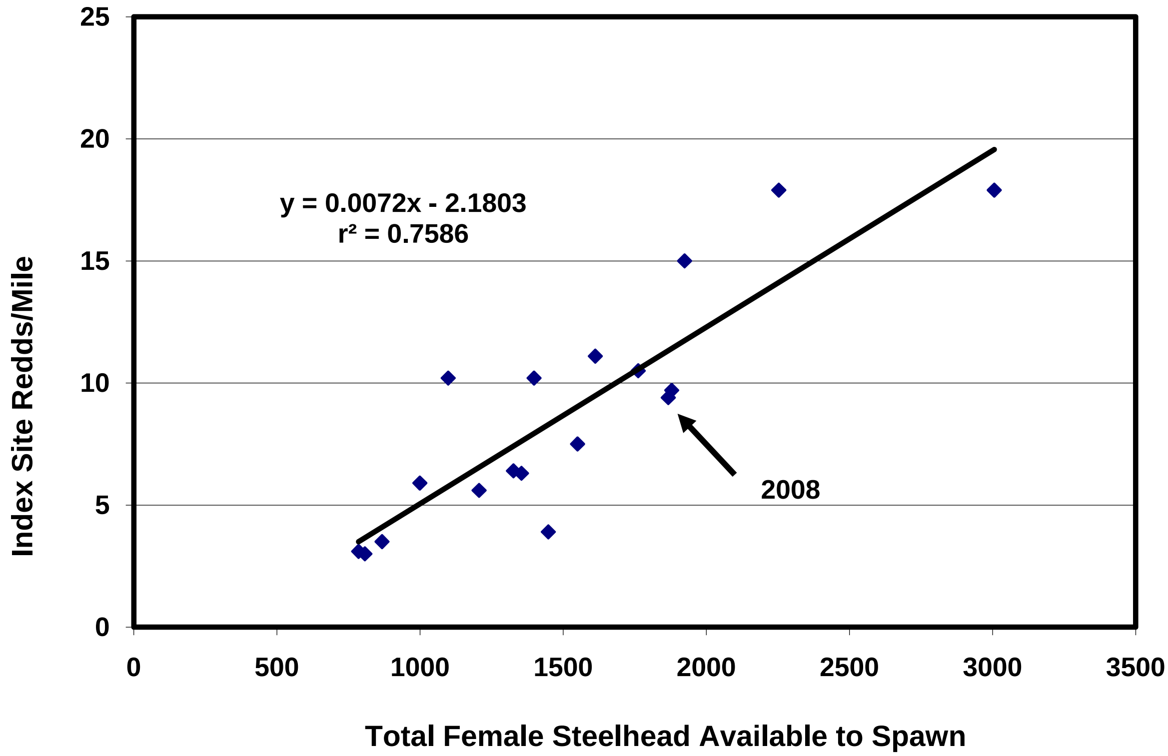

Figure 9 Female summer steelhead potentially available to spawn above Three Mile Falls Dam and redds per mile observed in index reaches, Umatilla River, 1988-2008

Spring Chinook

Adult Returns: The natural component of the adult spring Chinook salmon return to TMD has varied between 22 in 1999 and 345 in 2000 (mean of 182; Figure 10 and Table 4). Spring Chinook returns have been dominated by hatchery-origin adults. In 2008, an estimated 173 unmarked and 1836 hatchery adults returned to TMD. The total return of spring Chinook to the Umatilla River has ranged from 68 in 1989 to 5064 in 2002 (mean 2220; Figure 11). Jacks returns have been a moderately reliable predictor of adult returns the following year prior to 2005 (r^2 = 0.8232). However, combining the 2005-2008 return years the record reduces the reliability (r^2 = 0.4053) of jacks as an estimator for adult returns the following year (Figures 11, 12A and 12B). We didn't include the best fitting equation because it was obtained by using a second order polynomial (r^2 = 0.6573). The heavy influence of two atypical years (2005 and 2008) greatly affect the polynomial correlation which is probably coincidental (Figure 12A).

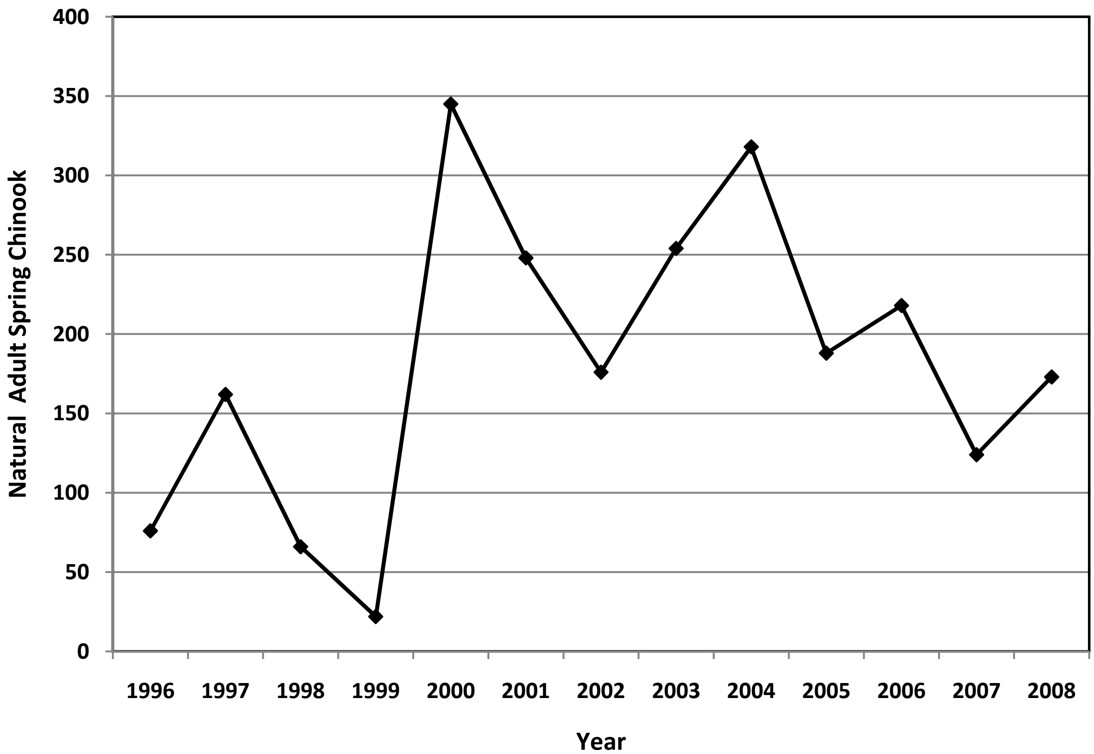

Figure 10 Estimated number of naturally produced adult spring Chinook salmon returning to the Umatilla River (1996-2008)

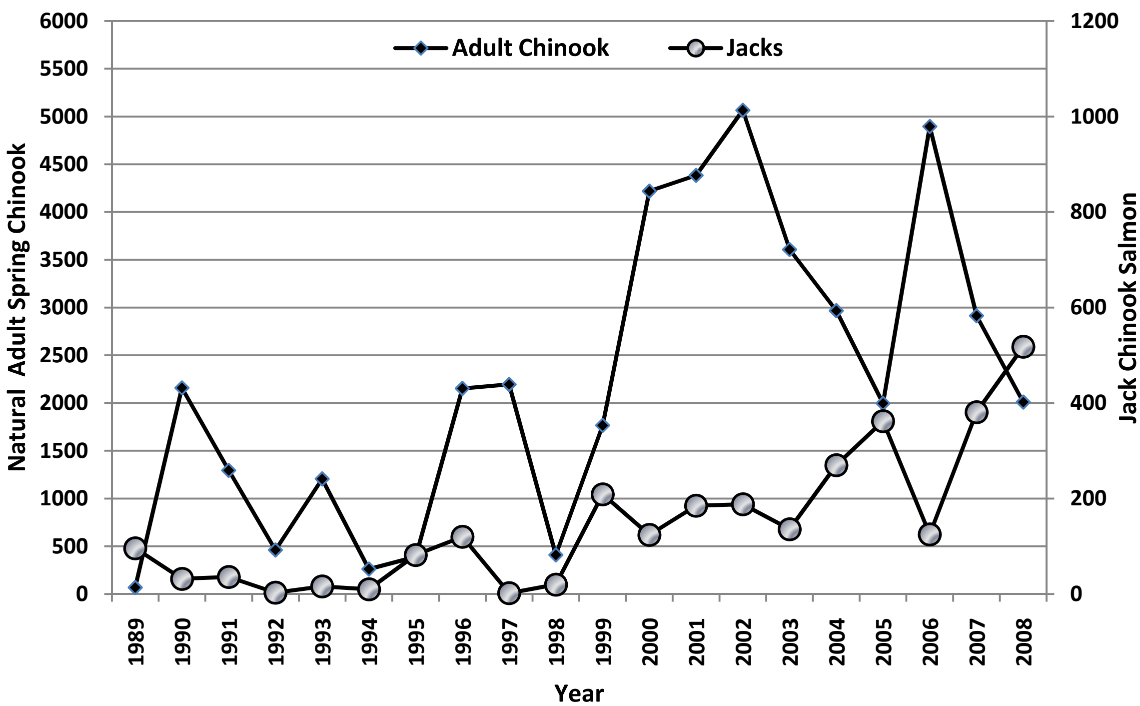

Figure 11 Adult and jack spring Chinook salmon returning to Three Mile Falls Dam, Umatilla River (1989-2008)

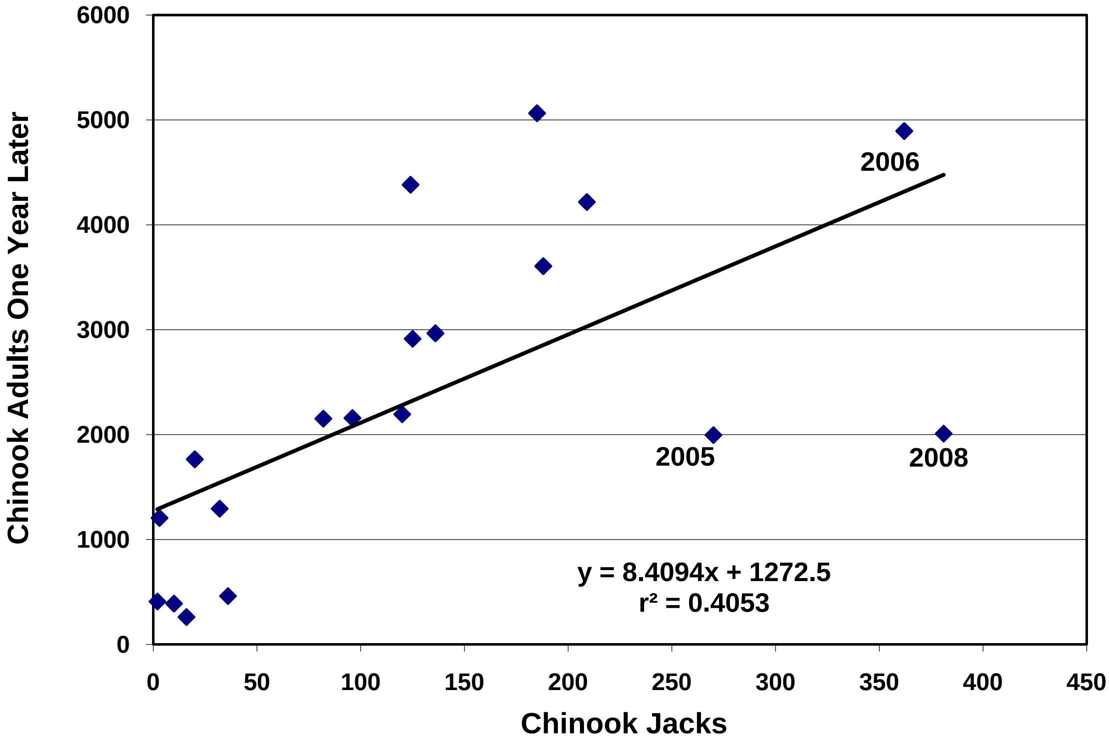

Figure 12A The relationship between the number of jacks returning (1989-2007) to Three Mile Falls Dam and the number of adults returning the following year (1990-2008)

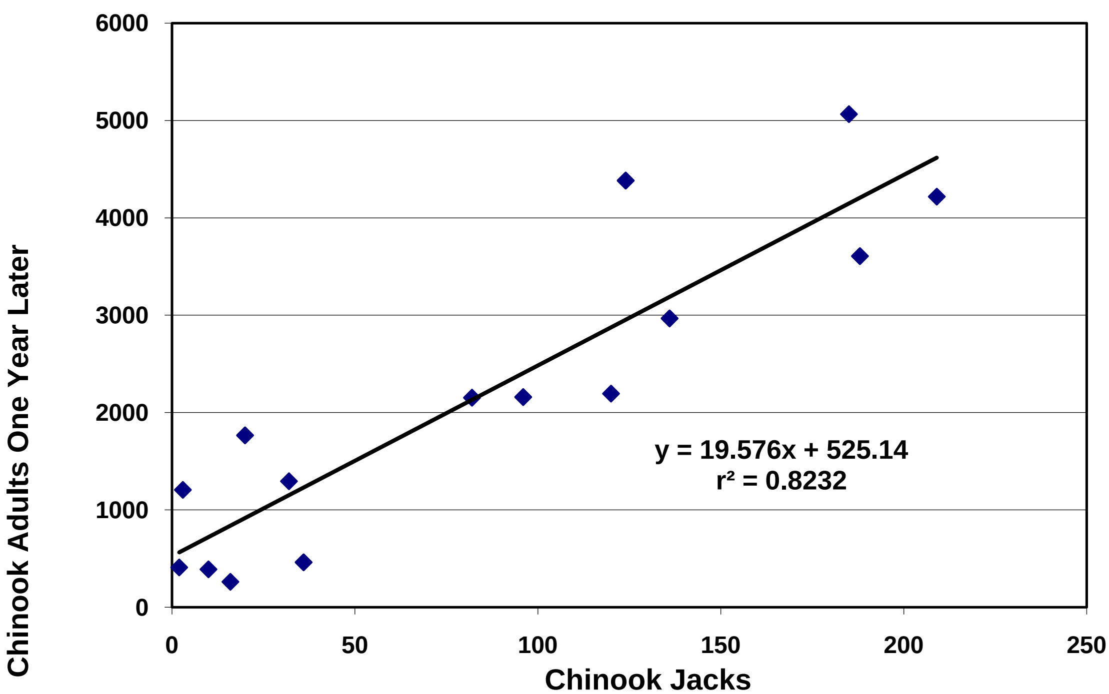

Figure 12B The relationship between the number of jacks returning (1989-2003) to Three Mile Falls Dam and the number of adults returning the following year (1990-2004)

Table 4. Spring Chinook disposition, returns, and escapement in the Umatilla Basin

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Hatchery adults enumerated at TMD	68	2158	1294	461	1205	261	389	2076	2032	343	1743	3872	4134	4888	3352	2648	1808	4676	2789	1836
Estimated natural adults at TMD [1]								76	162	66	22	345	248	176	254	318	188	218	124	173
Total adults at TMD	68	2158	1294	461	1205	261	389	2152	2194	409	1765	4217	4382	5064	3606	2966	1996	4894	2913	2009
Hatchery jacks at TMD								120	2	20	207	118	159	174	130	246	357	121	363	505
Estimated natural jacks at TMD [1]								1	0	0	2	6	26	14	6	24	5	4	18	13
Total jacks at TMD	96	32	36	3	16	10	82	120	2	20	209	124	185	188	136	270	362	125	381	518
Sacrificed or mortalities at TMD	36	25	234	200	165	31	10a- 45j	18a- 39j	56a- 2j	9a- 2j	29a- 50j	21a- 8j	16a- 25j	16a- 12j	33a- 23j	5a- 38j	16a 45j	19a 6j	9a 19j	3a 4j
Taken for brood stock (a = adults)	0	200	0	0	0	0	0	0	600a	194a -8j	600a -31j	581a -17j	646a- 31j	560a -28j	560a -28j	561a -29j	561a -29j	604a 28j	586a 27j	560a 28j
Taken for outplants (j = jacks)												31a- 5j		168a -8j	281a -1j	219a -20j	0 0	381 17	250 13	241a 15j
Harvested above TMD- CTUIR	0	0*	82	0	176	0	0	167	187	0	110	695	247	245	234	460	345	597	347	243
Harvested below TMD-ODF&W												443	463	639	578	314	156	261	246	27
Harvested above TMD- ODF&W	0	20	23	0	18	0	0	206	31	0	11	143	80	110	110	20	0	315	33	92
Adults potentially available to spawn	64	1929	981	263	859	235	378	1772	1319	207	1030	2769	3113	3598	2244	1737	1249	2959	1724	974
Adults sampled on spawning grounds	6	272	228	78	471	112	194	715	667	89	539	1388	986	1269	582	373	378	220	303	160
Jacks (<609 mm) sampled			2	1	3	1	22	24	1	2	40	32	13	30	23	29	50	0	40	32
Adult percent recovered (after harvest)	4.7	13.8	23.3	29.7	55.0	47.7	51.3	40.6	50.6	43.0	52.8	51.0	29.1	32.0	25.9	21.4	30.3	7.4	17.6	16.4
Prespawning mortalities (adults)			88	22	124	19	60	256	230	28	157	227	460	372	268	75	65	40	64	56
Prespawning mortalities (jacks)			1	1	1	1	10	5	0	0	13	7	3	13	7	15	38	0	6	22
Spawned adults sampled			130	48	336	93	126	440	401	61	361	1102	501	772	307	271	312	166	239	104
Spawned jacks sampled			1		2	0	11	19	1	1	27	20	10	15	16	11	11	0	34	10
Redds observed	14	289	144	59	224	74	90	347	288	60	292	721	626	828	354	534	335	371	381	323
Spawned females sampled			81	37	205	56	73	267	244	41	228	689	335	513	166	177	195	81	121	62

Spring Chinook Spawning Ground Surveys: The number of spring Chinook redds have fluctuated throughout the monitoring period (Figure 13 and Table 4). Total escapement above TMD (less up-river harvest estimates) and total redds enumerated have tracked closely throughout the monitoring period (Figure 13 and 14). This suggests that spawners are making it to the spawning grounds, and that they effectively deposit eggs in redds in correlation with their densities; and that redd surveys approximate spawner abundance status and trends.

The number of spring Chinook salmon redds enumerated in the Umatilla River has varied between 14 in 1989 and 828 in 2002 (mean of 317). In 2008, a total of 323 redds were enumerated and 199 carcasses were sampled. From 1991 to 2000 the correlation between redds enumerated and carcasses sampled was very robust r^2=0.987. With the addition of data through 2008 the correlation declined to r^2=0.6949 (Figure 15). Beginning in 2000 we stopped conducting carcass surveys in June and July due to reductions in funding. Furthermore, observations on the spawning grounds suggest that more and more of these carcasses are being consumed by black bears, *Ursus americanus* before they can be processed by surveyors.

Pre-spawn and post-spawn mortalities have roughly paralleled each other during the monitoring period (Figure 16), while the numbers of both groups generally increased until 2000 and then decreased until 2008. The fraction of pre-spawn mortalities observed has been fairly variable through the years and was higher in 2008 (Figure 17). Based on carcasses examined, pre-spawning mortality is significant in the Umatilla and has averaged 28.8% for the period of record (n=2611/9052). The average Chinook salmon (potentially available to spawn) per redd per year has varied between 3.2 and 7.4 and was 3.02 in 2008 (Figure 18) with an average of 4.63 fish/redd for the period of record (1989-2008).

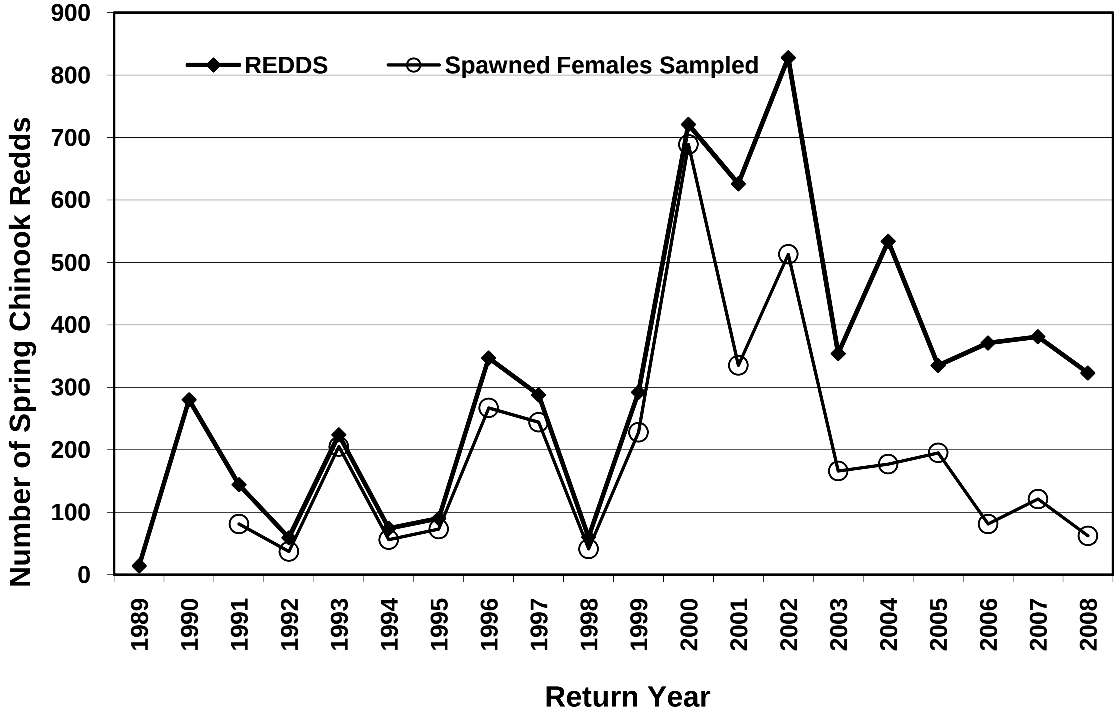

Figure 13 Redds enumerated and spawned female carcasses sampled in the spring Chinook index reaches, 1991-2008

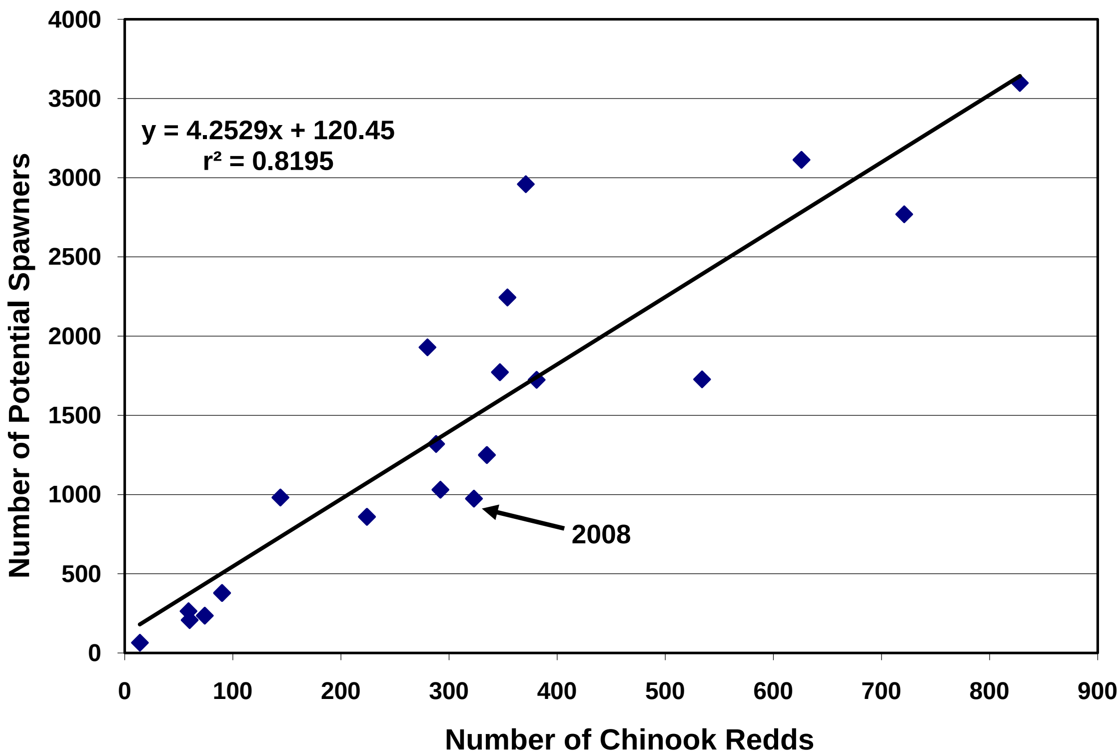

Figure 14 Spring Chinook salmon available to spawn vs. redds enumerated in the Umatilla Basin, 1991-2008

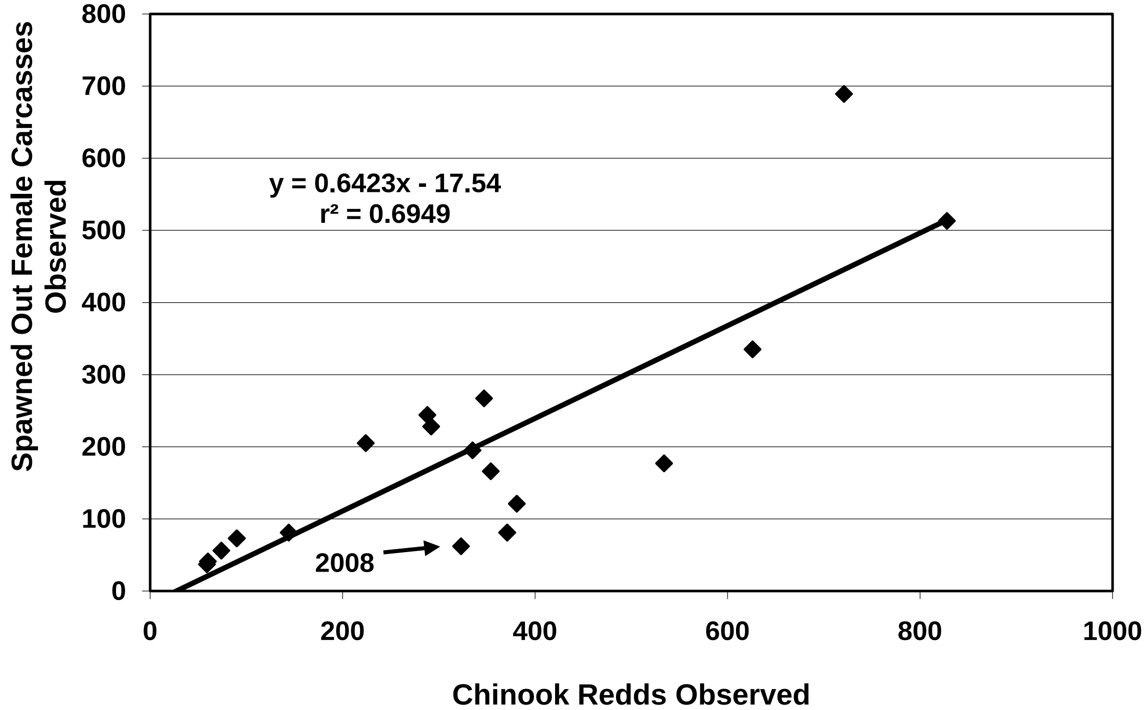

Figure 15 Spring Chinook salmon redds enumerated vs. female spawned out carcasses sampled in the Umatilla Basin 1991-2008

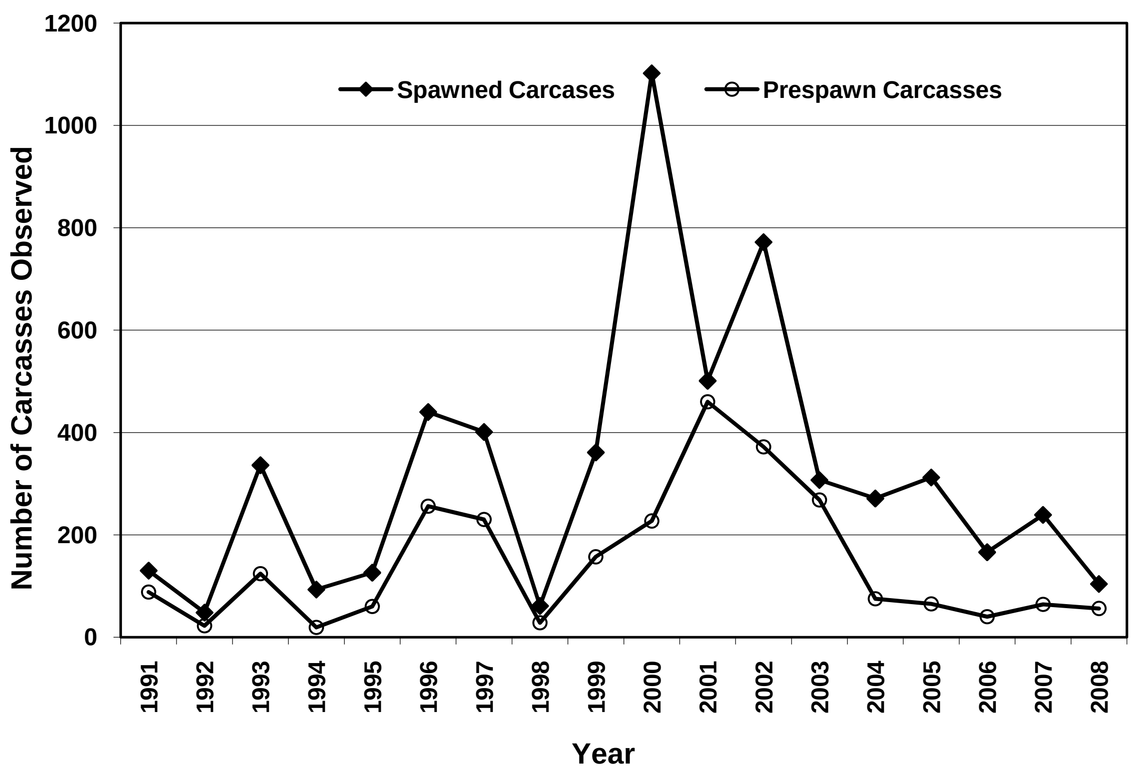

Figure 16 Pre-spawn and post-spawn mortalities for spring Chinook carcasses sampled in the Umatilla Basin, 1991-2008

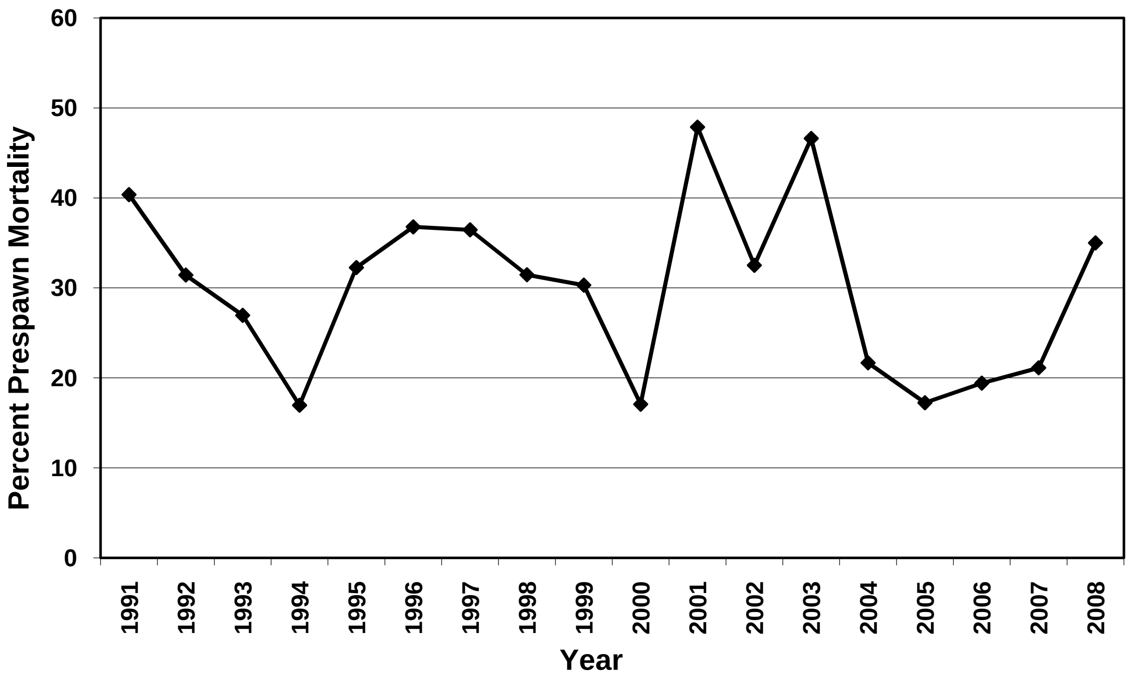

Figure 17 Percent spring Chinook salmon carcasses that were classified as prespawn mortalities by year in the Umatilla River 1991-2008 (n=2611/9052 for a mean of 28.8% for the period of record)

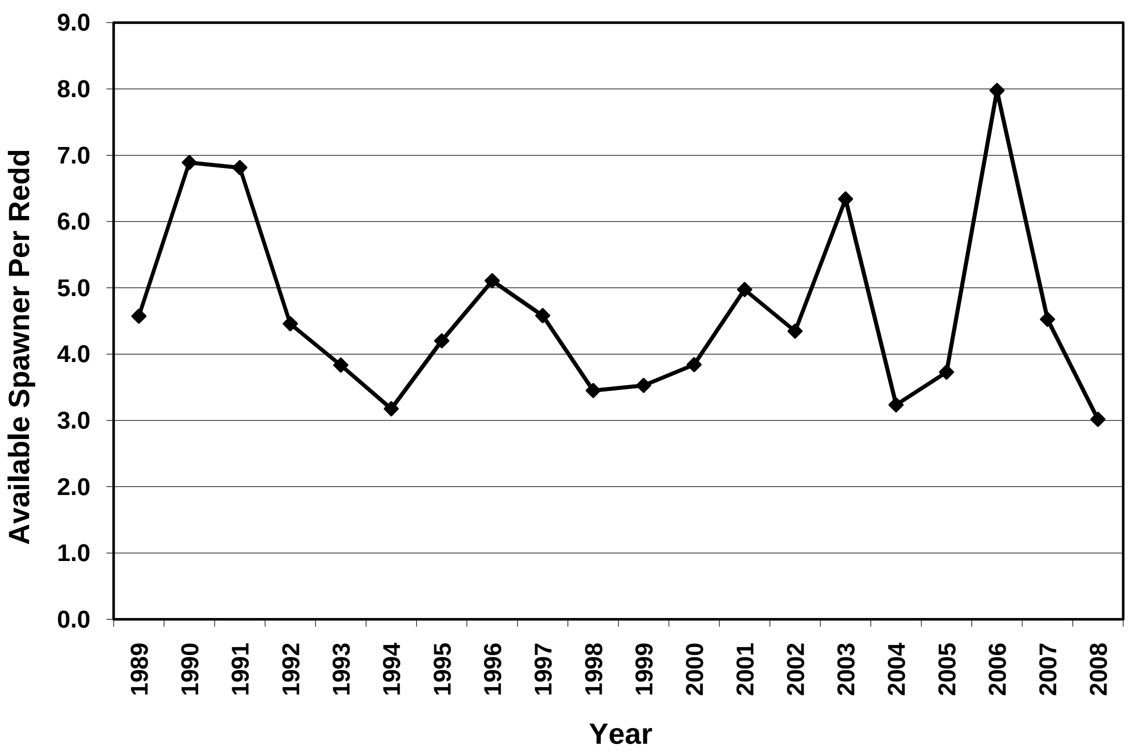

Figure 18. Potential spring Chinook spawners per redd by return year, Umatilla Basin, 1989-2008 (mean of 4.63)

Harvest Monitoring

Summer Steelhead Harvest Field Surveys: During the 2007-2008 tribal summer steelhead fishing season the Umatilla River was opened from October 1, 2007 through April 1, 2008 along the entire Umatilla Basin. Fishing remained open for steelhead in the Umatilla River below Cayuse Bridge until April 15, 2008. During 2008, field surveys were conducted from January 2 to April 15. A total of 1,245 individual reach surveys were conducted and crews were on the river monitoring harvest for 310 hours and 38 minutes (15.18% of the daylight time for the period; from U.S. Naval Observatory data for Pendleton, OR http://www.usno.navy.mil/). Surveyors observed and interviewed 52 fishers on or near the river (Table 5). Catch per unit effort was estimated at 0.157 fish per hour (6.37 hours/fish) and the total harvest estimate was 64 steelhead (33 wild and 31 hatchery; Table 6).

Table 5 Summer steelhead creel survey effort and angler count summary by reach, January 2 to April 15, 2008

River	Reach	Surveys	Anglers Observed	Harvest Estimate
Umatilla	1*	47	6	8
	2	61	10	7
	3	60	4	2
	4	59	3	2
	6	62	5	2
	8	60	0	0
	9	58	0	0
	10	20	3	6
	17	29	3	4
	18	42	4	3
	19	43	2	5
	20	43	0	0
	21	43	2	1
	22	44	5	14
	23	77	3	8
	24	44	1	1
	25	44	0	0
	26	36	0	0
S F. Umatilla	1	9	0	0
Meacham	1	227	0	0
Iskuulpa	1	107	1	1
Total	**24**	**1215**	**52**	**64**

* Reaches 1-4, 6, 8-10 were reorganized during 2008 and were included in new Umatilla River Reaches 17-26. Old reach 5 was Iskuulpa Creek, Old Reach 7 was Meacham Creek.

Spring Chinook Harvest Field Surveys: During 2008, the tribal spring Chinook salmon fishing season monitoring began April 19 and ended July 23. A total of 849 reach surveys were conducted during 2008 (Table 6). Harvest was monitored on survey reaches for 223 hours and 21 minutes (14.8 % of the total daylight hours). Surveyors observed 97 fishermen on the river. Fishers interviewed had 31spring Chinook salmon in their creel and reported a total of 110 hours of fishing effort.

Based on field surveys, tribal anglers fished 3.54 hours (0.282 fish/hour) on average to catch a spring Chinook salmon during 2008 compared to 6.4, 10.8, 7.05 and 4.35 hours for 2004, 2005, 2006 and 2007 respectively. Expanding effort and harvest data provided an estimate of 243 spring Chinook salmon caught during the survey period (Table 6).

Table 6 Spring Chinook salmon creel survey summary and harvest estimates by reach, April 19 to July 23, 2008

River	Reach	Surveys	Anglers Observed	Harvest Estimate
Umatilla	17	76	0	0
	18	96	5	1
	19	92	2	10
	20	94	6	19
	21	100	0	0
	22	102	11	9
	23	121	71	194
	24	62	0	0
	25	60	0	0
	26	49	2	10
S F. Umatilla	1	7	0	0
Meacham	1	35	0	0
Total	**12**	**849**	**97**	**243**

Post Season Phone Survey: Post season interviews provided an estimate of annual harvest separately from the field surveys. They also provide additional information on the harvest of a variety of species in the Umatilla and surrounding rivers (Tables 7 and 8). During the 2008 interviews, we contacted 92 out of 145 known tribal fishers. Fifty reported fishing during 2008. The reported harvest of adult spring Chinook from the Umatilla River was 91 with an additional 13 caught and released. The expanded harvest for spring Chinook was 167 with an additional 24 caught and released. This is well below the creel survey expanded estimate of 243. The estimated tribal harvest of summer steelhead from the Umatilla River during 2008 was 64 from the creel survey and 57 from the post season survey (Table 9). These post survey expansion estimates may be influenced by the violation of three assumptions: 1) the list of active tribal fishers was inclusive; 2) harvest was equal between fisherman interviewed and fisherman not interviewed, and 3) fishers remembered and reported harvest accurately. We did not test the validity of these assumptions.

Table 7 Summary of postseason interviews of the tribal fishers fishing during 2008; areas include Umatilla, John Day and Imnaha and their tributaries

Number of Contacts		Percent
145	active fishers listed	100
53	not contacted	37
92	contacted	63
Of the 92 Individuals Contacted		
50	fished	54
42	did not fish	46
Of the 50 Individuals that Fished		
4	fished in two basins	4.3
1	fished in three basins	1.1
35	reported catch	70
15	reported no catch	30
24	caught spring Chinook	57
0	caught fall Chinook	0
2	caught coho	2.2
9	caught steelhead	18
11	caught rainbow trout	22
0	caught Bull Trout	0
0	caught Lamprey	0
0	caught mountain whitefish	0

Table 8. Summary of expanded harvest derived from postseason interviews of tribal fisherman, 2008

River	Number of Fisherman	Spring Chinook	Steelhead	Coho	Rainbow Trout	Bull Trout	Mountain Whitefish
Umatilla Catch	45	191	120	18	261	0	0
Harvest		167	57	18	94	0	0
Granit Creek Catch.	4	6					
Harvest		6					
Grande Ronde Catch	0	0					
Harvest		0					
Imnaha Catch	1	1					
Harvest		1					
Total Catch		**204**	**120**	**18**	**261**	**0**	**0**
Total Harvest		**180**	**57**	**18**	**94**	**0**	**0**

Table 9 Trends in Umatilla River tribal harvest estimates by species and method

Species, Method	2001	2002	2003	2004	2005	2006	2007	2008
Summer Steelhead, Creel	84	129	61	82	*	*	17	64
Post season survey			107	75	50	104	32	57
Spring Chinook, Creel	554	639	398	460	52	524	284	243
Post season survey			234	251	203	597	375	167

*Creel surveys were conducted but no catch/effort data was generated because no catch was observed.

Age and Growth

Scales collected from salmon and steelhead were pressed and read. Based on scale analysis, over 87% of natural adult summer steelhead returning to TMD spent two years in freshwater before outmigration (Figures 19 and 20). Nearly equal numbers of total age 4 (45.6%) and age 5 (48.7%) adult steelhead returned in all years combined. There is considerable variability from year to year as shown by the 2008 data (Figure 19).

From the 13 unmarked adult spring Chinook scales collected during 2008, 11 were suitable for aging. None were age 1.2 and 10 were age 1.3 (91%) with a mean fork length of 780 mm. The only age 1.4 had a fork length of 930 mm respectively (Figure 21).

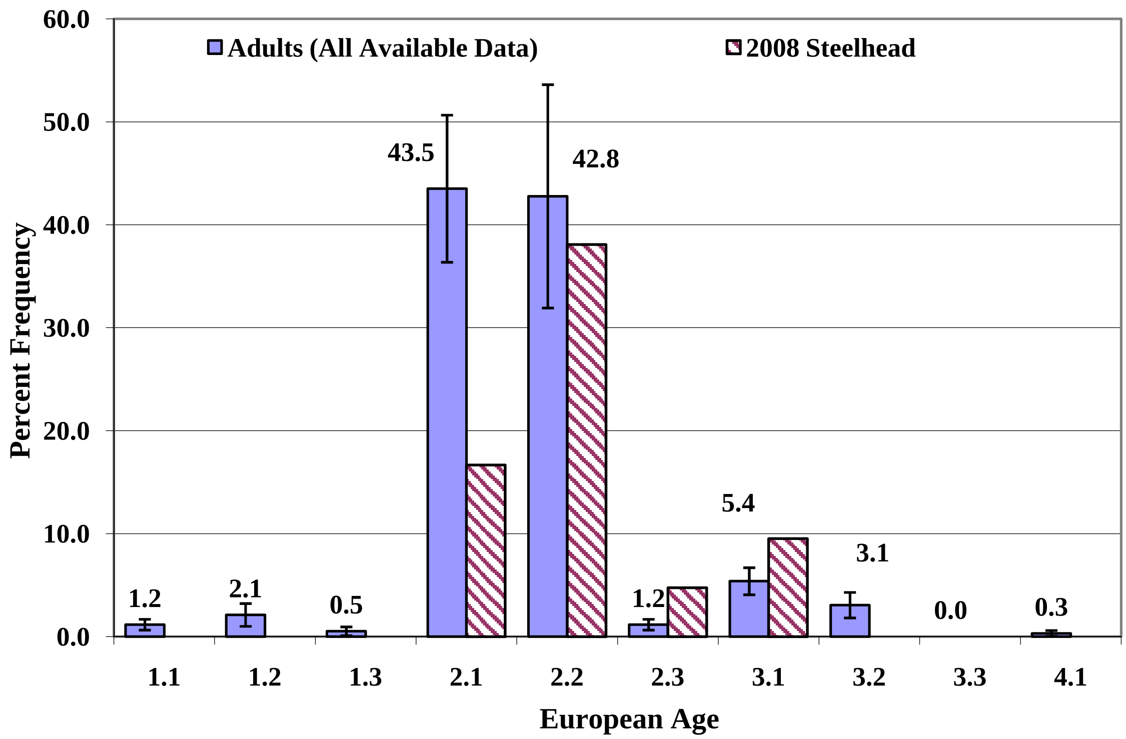

Figure 19. Combined European age (years of freshwater and salt water rearing) of natural summer steelhead adults returning to the Umatilla River, during 1983, 1989, 1990, 1992, and 1994-2004, 2006-2008 return years, n=947 (solid bars), plus and minus one standard deviation, in contrast to the ages of sampled steelhead returning in 2008 (banded bars, n =29)

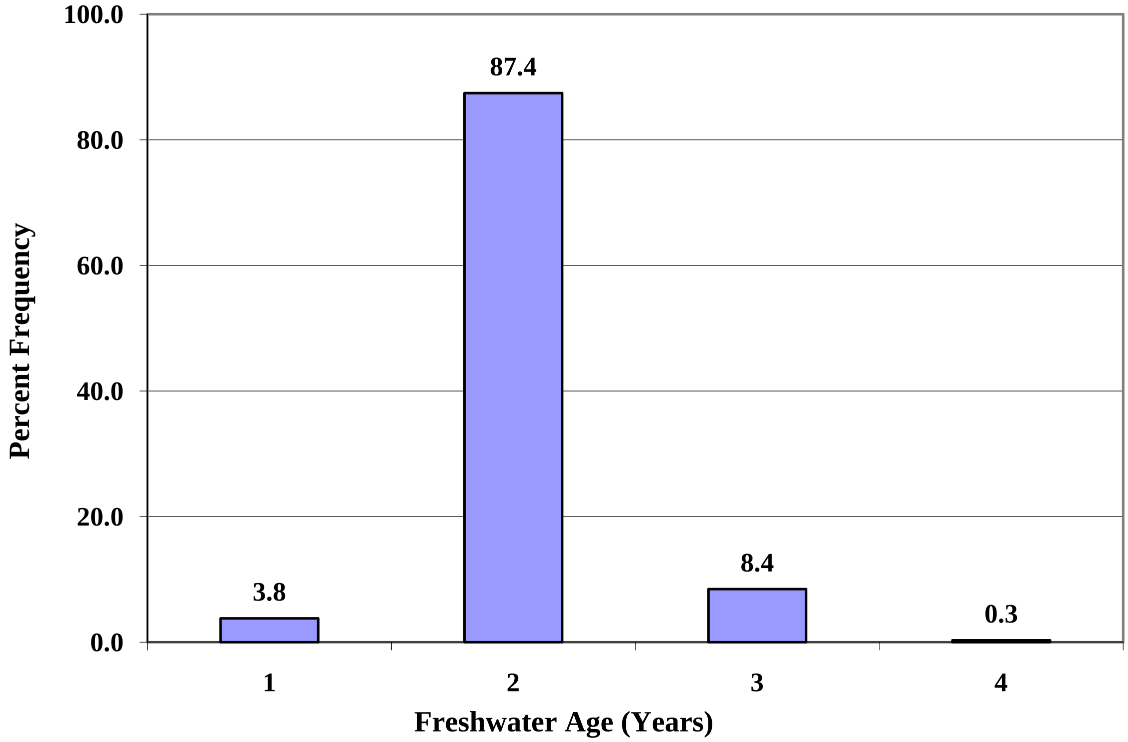

Figure 20. Years of freshwater rearing of natural summer steelhead adults returning to the Umatilla River, 1983, 1989, 1990, 1992, and 1994-2004, 2006-2008 return years (n=947)

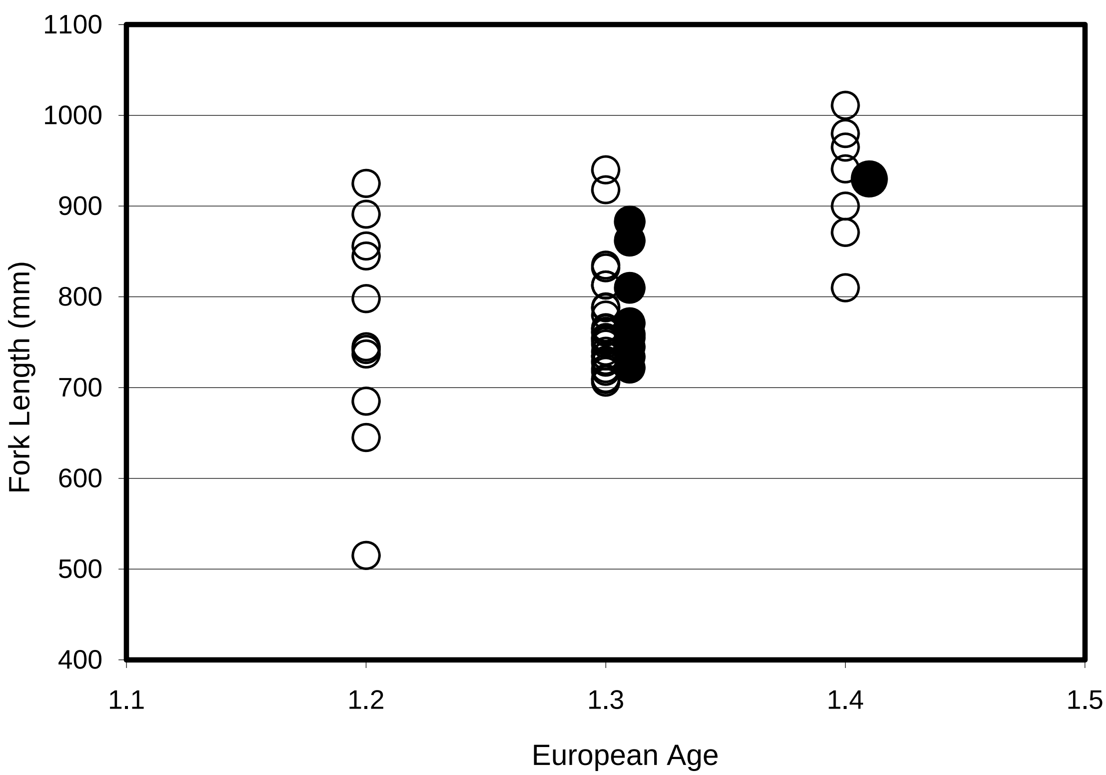

Figure 21. European age of unmarked Umatilla spring Chinook returns from 2006-2008, 2008 samples are denoted by solid symbols just to the side of the open symbols

Water Temperature Monitoring

Quality control protocols: Temperature loggers which did not meet Level "A" data quality during the preseason calibration were not used during the 2008 field season, with one exception. Level "A" data quality is described in OPSW (1999) as an accuracy of +/- 0.5 ^{o}C measured against a NIST traceable thermometer. One temperature logger with a cold water bath accuracy of 0.51 ^{o}C was deployed due to a lack of loggers with better accuracy. During the postseason calibration, eight loggers did not meet Level "A" data quality in the cold water bath. These loggers returned postseason calibration measurements with an accuracy range of 0.53^{o}C to 0.64^{o}C.

During the 2008 field season, 22 units were deployed and data was recovered from 21 units. One unit was missing when staff returned to the site in November to retrieve the unit (Umatilla River downstream of McKay Cr; behind Colby Plastic off levee). Another unit was found out of the water in November. Upon review of the data, staff determined the unit had been removed from the water on September 9th (Umatilla River downstream of west boundary; at City's Water Intake building).

Water Temperature Data: Hourly data from each thermograph deployment from 1993-2008 are currently available through the CTUIR website **http://data.umatilla.nsn.us/.** The website also lists water temperature from other projects with additional data being added regularly. July to September maximum water temperatures for all sites are included in Table 2. Examples of several 2008 data sets are shown in Figures 22 through 24. Collated water temperature data in Figure 25 provides an overview of Umatilla River maximum water temperatures by river mile for 2008 imposed on top of data from 1995-2007. Figure 25 shows a general trend of cooler maximum temperatures in 2008 compared to 1995-2007.

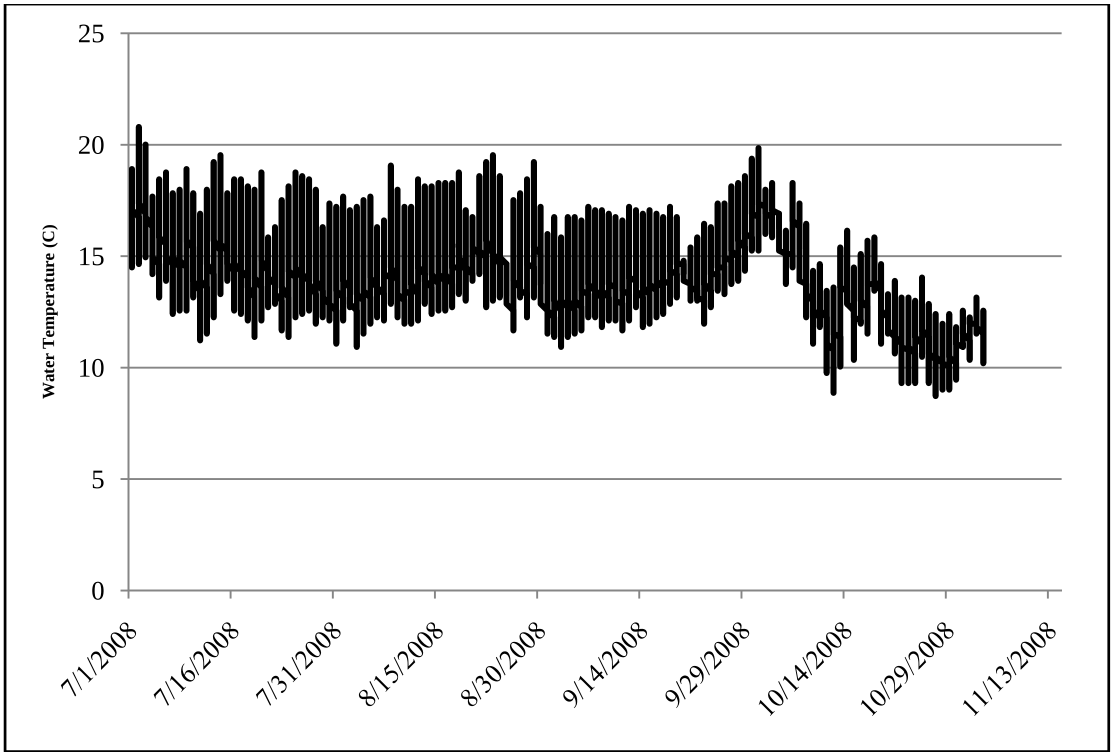

Figure 22 Hourly water temperatures from the Umatilla River at RM 49, upstream of Reith Bridge, July 1 through November 5, 2008

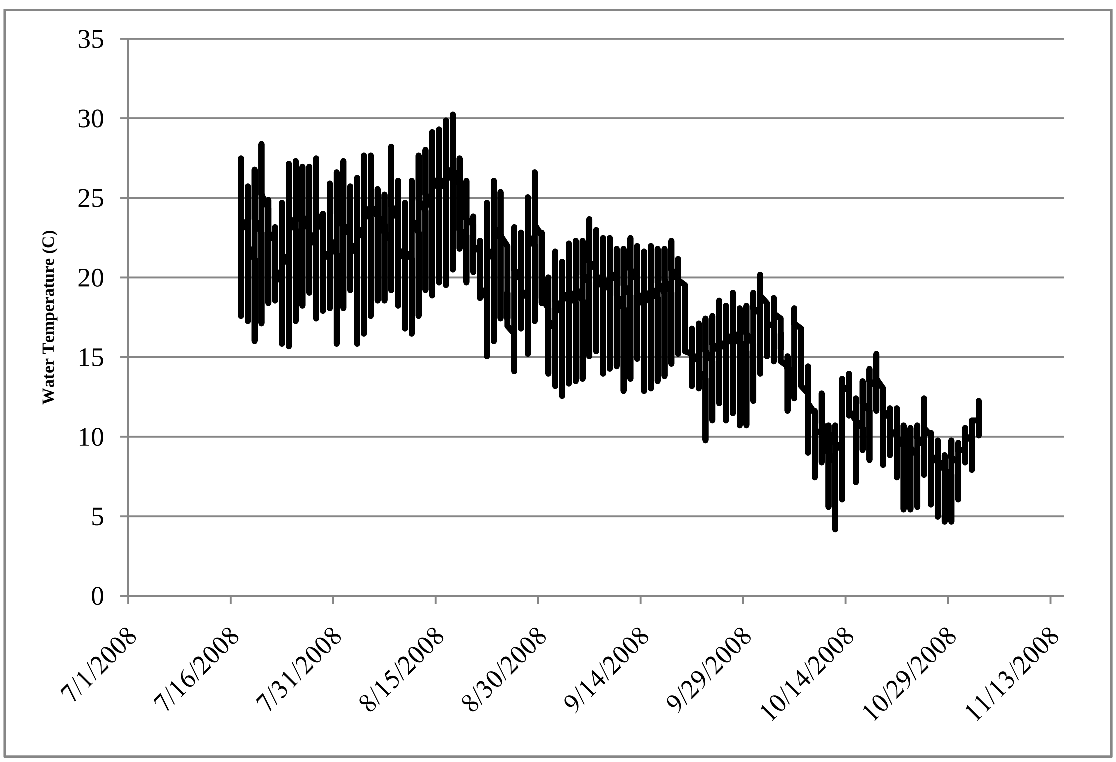

Figure 23 Hourly water temperature data from the Umatilla River at RM 53.5, upstream of Stillman Park, between 5th and 6th streets in Pendleton, July 17 through November 2, 2008

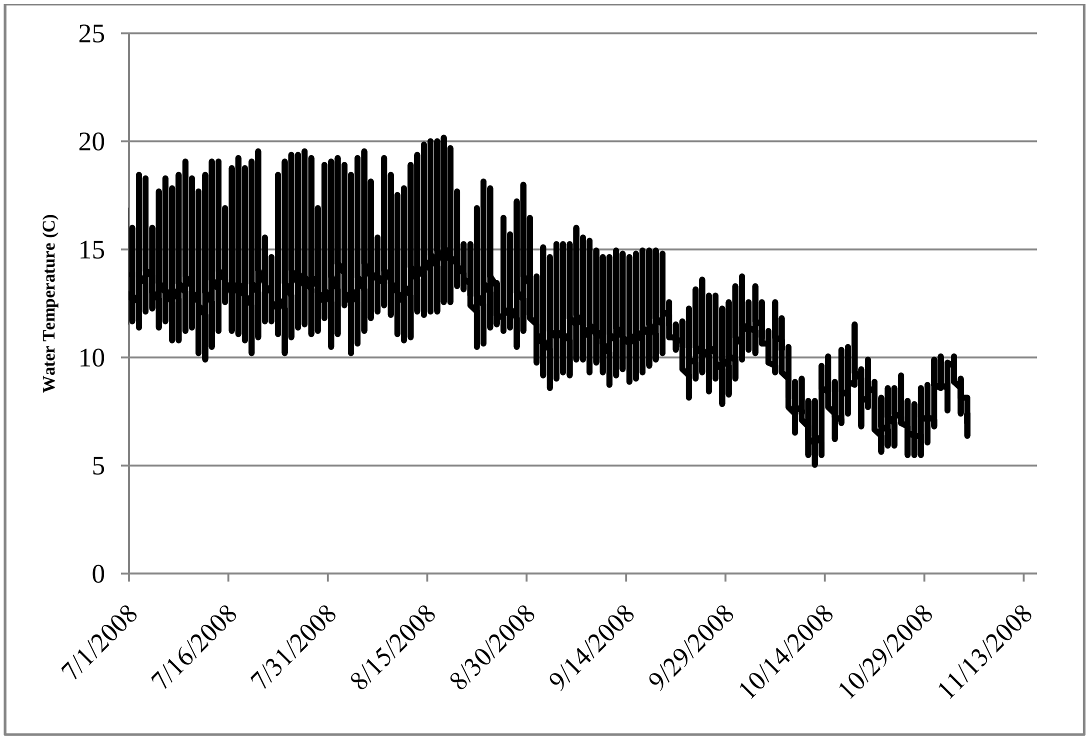

Figure 24 Hourly water temperature data from the Umatilla River at RM 87.0 at Bar M Ranch, July 1 through November 4, 2008

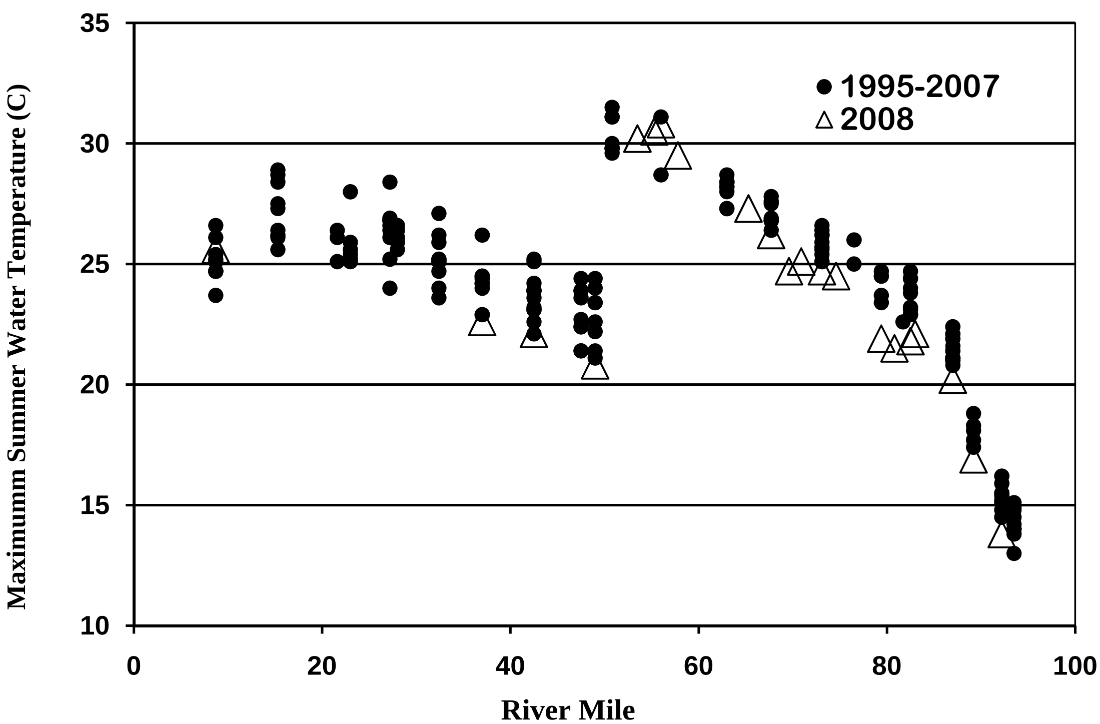

Figure 25 Summary of Umatilla River maximum water temperatures for July-September 2008, denoted by large triangles (superimposed on 1995-2007 data, denoted by small black circles)

Temperature Limited Habitat: Water temperatures in the Umatilla River are suitable or marginally suitable for salmonids during the summer in two major sections. The upper reach (RM 80-90) includes the mainstem Umatilla River above the mouth of Meacham Creek; and the lower reach (RM 30-50) includes the river above Feed Canal Dam and up to the mouth of McKay Creek. All but the lower reaches of most tributaries in the upper basin have suitable water temperatures for *O mykiss*. The upper river has naturally cool water from the N. F. Umatilla River, and provides spawning and rearing habitat for summer steelhead, bull trout, and spring Chinook salmon. The lower Umatilla River (RM 30 -50) is artificially cooler during the summer because cold water is released from McKay Reservoir for irrigation and fish benefits. This lower reach usually has suitable temperatures, but temperatures can increase significantly when flows from McKay Reservoir are minimized or when the cool hypolimnetic waters in McKay Reservoir are expended.

High water temperatures and related dewatering during the summer appear to be the primary factors limiting juvenile salmonid distribution and abundance in the Umatilla Basin (Contor et al. 1995, Contor et al. 1996, Contor et al. 1997, Contor et al. 1998, Contor & Kissner 2000, Contor 2003). Bret 1952, Black 1953 are credited with one of the first reports of the water temperatures for lethal limits for salmonids near 24-25^{o}C. The Umatilla River below the mouth of Meacham Creek (RM 78.9) is often warmer than 24-25^{o}C (Figure 25).

Temperature-limited Habitat Recommendations: In order to increase available spawning and rearing habitat for spring Chinook, excessive stream temperatures will need to be addressed. Habitat restoration efforts designed specifically to reduce summer maximum daily water temperatures should be considered for reaches above and inclusive of spring Chinook salmon spawning areas. Forest, agriculture and livestock management practices should include basin-wide stream and riparian protection and rehabilitation actions. The need for healthy watersheds and riparian habitats for salmonid bearing streams has been well established. Quality uplands benefit the entire watershed and combined with quality riparian and stream habitat can produce natural salmonids in abundance. Land use practices and riparian vegetation have dramatic influences on water temperatures and water quality (Brown & Krygier 1970, Beschta & Taylor 1988, Hicks et al. 1991, Hostetler 1991). We estimate that many stream reaches currently providing marginal salmonid habitat could be improved and provide additional salmonid rearing habitat.

Meanders and other features that optimize connectivity and interchange between instream and hyporheic flows could further improve instream water temperature profiles during the summer and winter in channelized reaches. Hyporheic and bank-storage water has been shown to be closely related to instream flows and can influence instream water temperatures (Mertes 1997, Fraser & Williams 1998, Hayashi & Rosenberry 2002, Kasahara & Wondzell 2003).

Bull Trout Observations

We did not encounter bull trout during 2008 field activities except when assisting Paul Sankovich (USFWS) with bull trout spawning surveys in the North Fork Umatilla River. Tribal members did not report catching bull trout in the creel as in earlier years. Bull trout redds have declined during the last 7 years (Paul Sankovich data; USFWS 2009; Figure 26). The decline of bull trout in the Umatilla River Basin is similar to patterns observed in other streams in the region (Figure 27).

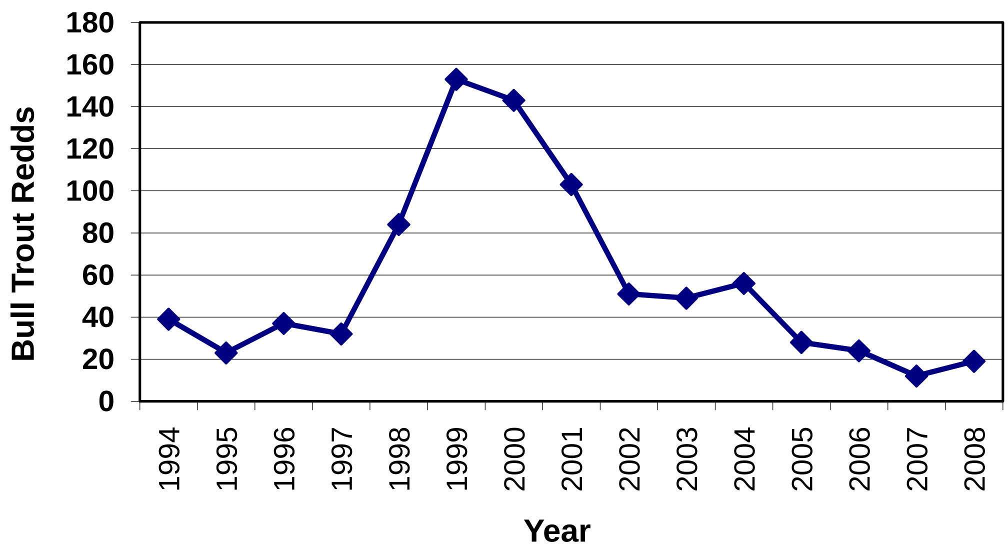

Figure 26. Bull trout redds observed in the Umatilla River Basin, data provided by Paul Sankovich, (USFWS 2009).

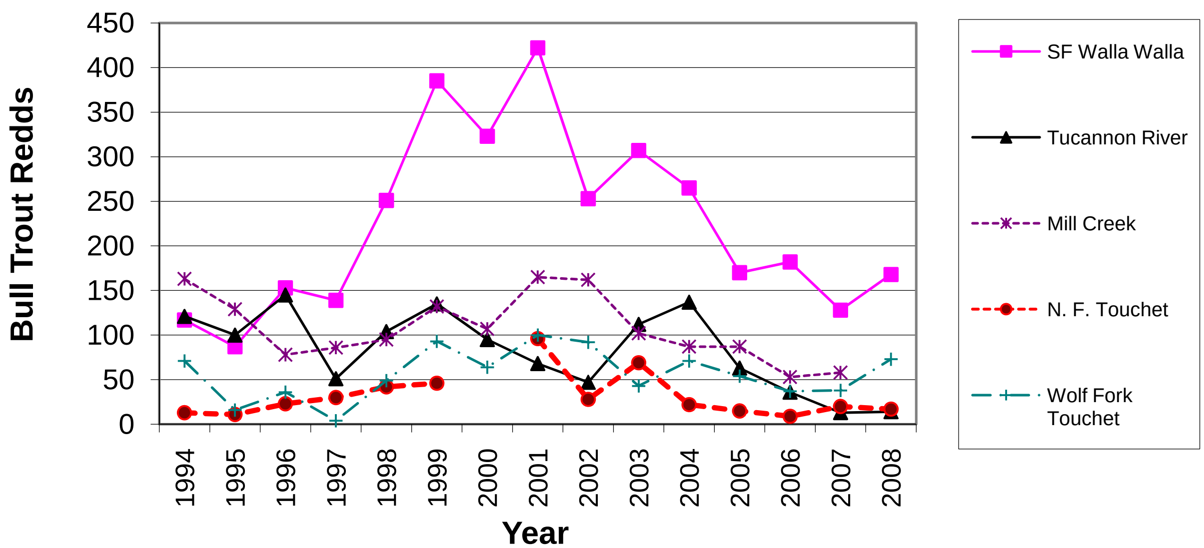

Figure 27. Bull trout redds observed in the Blue Mountain Region, data provided by Paul Sankovich, (USFWS 2009).

Coordination and Planning

The 2008 contract period included a variety of coordination and planning activities. The Umatilla Management, Monitoring, and Evaluation Committee (UMMEOC) met regularly. These meetings facilitated the completion of the Annual Operations Plan (AOP) and enhanced communication and collaboration among the co-management entities including CTUIR, ODFW, BOR, BLM, USFWS, NMFS, and BPA. Throughout the year a number issues regarding fish salvage, fish passage, installation of PIT tag detectors, adult out-planting, and other pressing management and monitoring activities have been discussed, planned, implemented, and reported upon during UMMEOC meetings.

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