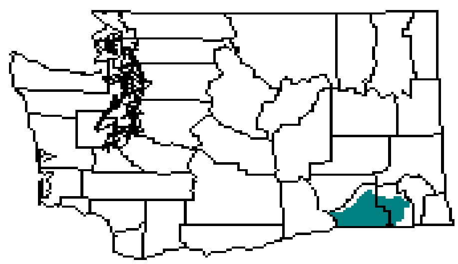
Assessment of Salmonids and Their Habitat Conditions in the Walla Walla River Basin within Washington:

2004 Annual Report

(from March 1, 2004 to March 1, 2005)



By

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For

U.S. Department of Energy
Bonneville Power Administration
Environment, Fish and Wildlife
P.O. Box 3621
Portland, OR 97208

Project Number 199802000
Contract Number 00006502

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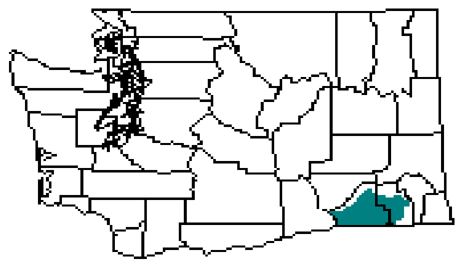

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Acknowledgments

Many people and organizations contributed to this project. First we would like to thank the Bonneville Power Administration (BPA) for funding this project, and Ben Zelinsky (BPA) for his patience and assistance.

We appreciate the assistance from the Washington Department of Fish and Wildlife (WDFW) Snake River Lab (SRL) in sharing equipment for this project. Other Fish Management personnel also provided valuable assistance: Chris Fulton, Derek Gloyn, Mark Lambert, Steve Jeffers, and Larabee Miller assisted with data collection as well as data entry and data summarization.

Bill Neve and John Covert, with the Department of Ecology (DOE), provided valuable assistance both establishing and operating the constant recording stream flow monitors. Jim Shaklee (WDFW) was in charge of DNA analyses. We thank them all.

Perhaps most importantly, we would like to thank all of the private landowners who granted permission for field activities to be carried out on their property. Without access to the streams on private property, this study would not have been possible.

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Executive Summary

This study began in 1998 to assess salmonid distribution, relative abundance, genetics, and the condition of salmonid habitats in the Walla Walla River basin within Washington.

Stream flows in the Walla Walla Basin continue to show a general trend that begins with a sharp decline in discharge in late June, followed by low summer flows and then an increase in discharge in fall and winter. Stream flows in the Walla Walla River have shown substantial increases in some areas in recent years. The increase is apparently associated with a 2000 settlement agreement between the U.S. Fish and Wildlife Service (USFWS) and the Irrigation Districts to leave minimum flows in the river.

Stream temperatures in 2004 in the Walla Walla River were similar to those in 2003. Upper montane tributaries maintained maximum summer temperatures below 65°F, while sites in the middle and lower Touchet and Walla Walla rivers frequently had daily maximum temperatures well above 68°F (high enough to inhibit migration in adult and juvenile salmonids, and to sharply reduce survival of their embryos and fry). High temperatures are possibly the most critical physiological barrier to salmonids in the Walla Walla basin, but other factors (available water, turbidity or sediment deposition, cover, lack of pools, etc.) also play a part in salmonid survival, migration, and breeding success. Increased flows in the Walla Walla River from the USFWS/Irrigation Districts settlement agreement, have not produced consistent improvements to stream temperatures.

Rainbow/steelhead (*Oncorhynchus mykiss*) trout represent the most common salmonid in the basin. Densities of Rainbow/steelhead in the Walla Walla River from the Washington/Oregon stateline to Mojonnier Rd. have increased since the USFWS/Irrigation Districts settlement agreement. In 2004, we switched to a new method of electrofishing in the Walla Walla River so direct comparisons with data from previous years could not be made, but densities are still considerably higher than before the USFWS settlement agreement. Other salmonids including; bull trout (*Salvelinus confluentus*), chinook salmon (*Oncorhynchus tshawytscha*), mountain whitefish (*Prosopium williamsoni*), and brown trout (*Salmo trutta*) had low densities, and limited distribution throughout the basin.

Steelhead spawning surveys were conducted on seven streams in the Walla Walla basin in 2004. Surveyors found 36 redds on Mill Creek, zero redds on Titus Creek, eight redds on Whiskey Creek and the Alyward Tributary, and 33 redds on the Coppei Creek system (15 on the South Fork Coppei, three on the North Fork Coppei, and 15 on the mainstem Coppei Creek). Bull trout spawning surveys in the upper Touchet River tributaries found a total of 93 redds and 127 live fish (71 redds and 71 fish in the Wolf Fork, 0 redds and 0 fish in the Burnt Fork, 22 redds and 56 fish in the North Fork Touchet, and 0 redds and 0 fish in Lewis Ck.). Numbers of bull trout redds and the number of live fish in the North Fork Touchet may have been affected by a siltation event in mid September from a construction project. Spring chinook spawning surveys were conducted in portions of the North Fork Touchet, Wolf Fork, and mainstem Touchet River in 2004, because 10 adults were seen at the adult trap in Dayton. No redds or adult spring chinook were seen during these surveys.

Recommendations for assessment activities in 2005 included:

1) reduce emphasis on stream flow monitoring because more gauges now exist in the basin and several years of data are now available from this project.
2) maintain temperature monitoring, but try to obtain more May temperature data; evaluate thermal barriers to migration in spring and fall.
3) reevaluate habitat inventory protocol and revise as necessary; try to get agreement with CTUIR regarding habitat inventory protocols and standards.
4) continue and expand habitat inventory and data use for EDT modeling.

Introduction

Concerns about the decline of native salmon and trout populations have increased among natural resource managers and the public in recent years. As a result, a multitude of initiatives have been implemented at the local, state, and federal government levels. These initiatives include management plans and actions intended to protect and restore salmonid fishes and their habitats.

In 1998 bull trout (*Salvelinus confluentus*) were listed under the Endangered Species Act (ESA) as "Threatened" for the Walla Walla River and its tributaries. Steelhead (*Oncorhynchus mykiss*) were listed as "Threatened" in 1999 for the mid-Columbia River and its tributaries. These ESA listings emphasize the need for information about these threatened salmonid populations and their habitats.

The Washington Department of Fish and Wildlife (WDFW) is entrusted with "the preservation, protection, and perpetuation of fish and wildlife...[and to] maximize public recreational or commercial opportunities without impairing the supply of fish and wildlife (WAC 77.12.010)." In consideration of this mandate, the WDFW submitted a proposal in December 1997 to the Bonneville Power Administration (BPA) to assess salmonid distribution, relative abundance, genetics, and the condition of salmonid habitats in the Walla Walla River basin.

The primary purposes of this project are to collect baseline biological and habitat data, to identify major data gaps, and to draw conclusions whenever possible. The study reported herein details the findings of the 2004 field season (March to December, 2004). All WDFW reports for this project are available on the BPA website at: www.efw.bpa.gov/searchpublications/ and then type in Mendel for the author's last name.

Background

The Walla Walla River and its major tributaries including the Touchet River, comprise a watershed of 1,758 square miles (ACOE 1997) and 2,454 major stream miles (Knutson et al. 1992). The majority of the watershed (73%) lies within the State of Washington, with the remainder in Oregon (Figure 1). The Walla Walla River originates from a fine network of deeply incised streams on the western slopes of the Blue Mountains. The Touchet River originates from similar streams on the northwestern slopes of the Blue Mountains, and also from seasonal streams draining Palouse hillsides to the north. The Touchet River drains into the Walla Walla River just west of the town of Touchet, WA. The Walla Walla River drains into the Columbia River near Wallula Gap, about 21 miles above McNary Dam and 6 miles above the Oregon border.

Historic and contemporary land-use practices have had a profound impact on the salmonid species abundance and distribution in the watershed. Fish habitat in area streams has been severely

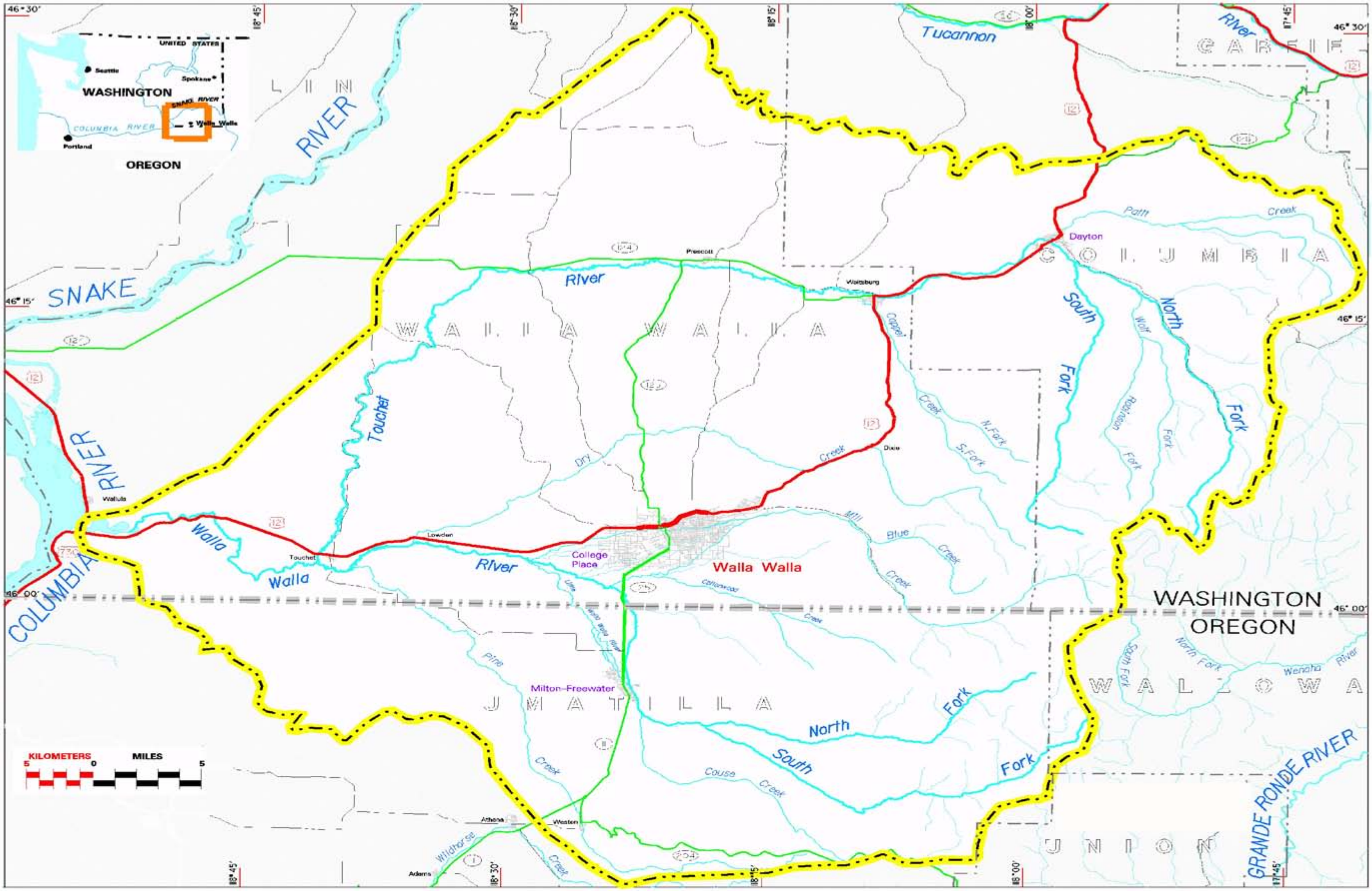

Figure 1. Walla Walla watershed (modified from map courtesy of USACE, Walla Walla District).

degraded by urban and agricultural development, grazing, tilling, logging, recreational activities and flood control. Agricultural diversions have severely impacted stream flows in the Walla Walla River since the 1880's (Nielson 1950). Nearly all (99%) of the surface water diversions within Washington are for the purpose of irrigation (Pacific Groundwater Group 1995). The reduced stream flows created by irrigation withdrawals adversely impact salmonid survival within the basin. Additionally, many unscreened or partially screened diversions and fish passage barriers exist within the basin, although most diversions have been screened recently (Dave Karl, WDFW, personal communication).

Out-of-basin manmade impacts to local fish populations have also been substantial. Salmon migrating to or from the ocean must pass through four dams (Bonneville, The Dalles, John Day, and McNary) and reservoirs in the Columbia River before reaching their destination. Juvenile and adult salmonid mortalities occur as they pass through each reservoir or dam. Other impacts include over-harvest, habitat destruction in the lower Columbia River and estuaries, predation, and industrial pollution. In addition, natural environmental fluctuations (droughts, floods, and ocean productivity) have significantly affected local fish populations.

Historically the basin probably produced substantial runs of both spring chinook (*Oncorhynchus tshawytscha*) and summer steelhead. The last substantial run of wild chinook took place in 1925; thereafter chinook populations continued a precipitous decline, and the species is considered extirpated in the basin (Nielson 1950, ACOE 1997). Anecdotal accounts and reports of historic fisheries in adjacent basins, indicate that chum (*Oncorhynchus keta*) and coho (*Oncorhynchus kisutch*) could have occurred in substantial numbers in the Walla Walla Basin (Pirtle 1957), but little written documentation exists. Endemic steelhead (*Oncorhynchus mykiss*) persist throughout much of the study area, populations in the Washington portion of the Walla Walla basin were considered depressed in 1992 and unknown in 2002, and populations in the Touchet basin were considered depressed in both 1992 and 2002 (WDF and WDW 1993, WDFW 2002). Historically as many as 300,000, and presently as many as 185,000, non-endemic hatchery steelhead (Lyons Ferry stock) and 50,000 endemic steelhead have been released annually in the middle Touchet and lower Walla Walla rivers under the Lower Snake River Compensation Program (LSRCP) to provide harvest mitigation for the four lower Snake River dams (Bumgarner et al. 2003).

Not all native salmonids in the basin are anadromous. Mountain whitefish (*Prosopium williamsoni*), bull trout and rainbow/redband trout exist within the basin. However, only rainbow/redband trout retain a wide distribution. In the past, bull trout are thought to have been widely distributed in the basin. Currently, bull trout distribution is generally limited to montane upper tributaries of the Touchet River, Walla Walla River, and Mill Creek (Mongillo 1993). However, bull trout are known to migrate into the middle or lower reaches of these rivers during winter months. Many factors have led to the decline of bull trout in southeast Washington. Damaged riparian vegetation, increased sedimentation, and decreased water flows have resulted in elevated water temperatures beyond the tolerance of this cold water species (Mongillo 1993). Introduced rainbow trout and brown trout (*Salmo trutta*) may have increased competition or predation for bull trout.

Several non-native fish species have been introduced to support recreational fishing, or have strayed into the basin. The Washington Department of Game (now WDFW) began stocking brown trout in the Touchet River in July, 1965. Stocking of brown trout was discontinued in 1999 due to concerns about competition, hybridization, and predation with native bull trout, and steelhead, or rainbow/redband trout. Common Carp (*Cyprinus carpio*) were introduced as early as 1884 (Walla Walla Daily Journal 1884). Channel catfish (*Ictalurus punctatus*), smallmouth bass (*Micropterus dolomieu*), and bluegill (*Lepomis macrochirus*) are some of the warm water fish that now occur in the lower basin. Additionally, since 1999, three-spine stickleback (*Gasterosteus aculeatus*) have been found in the Walla Walla River and some of its lower tributaries by WDFW personnel involved with this project.

Study Purpose and Objectives

The purpose of this study is to assess steelhead and bull trout distribution, densities, habitat, and genetic composition in the Walla Walla watershed. In addition we wanted to document fish passage, rearing, and spawning conditions for steelhead and to examine environmental factors for potential reintroduction of chinook salmon.

Specific objectives and tasks were outlined in WDFW's proposal and statement of work to the Bonneville Power Administration (BPA Project #199802000). Some tasks had to be scaled back or postponed. Multi-year study objectives include:

1. Assess baseline habitat conditions for salmonids in the Washington portion of the Walla Walla watershed;

2. Determine salmonid distribution and relative abundance in the Washington portion of the Walla Walla watershed; and

3. Identify genetic stocks of steelhead and bull trout in the Walla Walla watershed.

Specific objectives and tasks were outlined in the statement of work. Tasks included:

- Establish constant recording temperature and flow data loggers in the Walla Walla River basin, to identify available water, as well as temperature limitations for salmonid passage, spawning and rearing;

- Conduct biweekly manual stream flow and temperature measurements to calibrate the instream monitor data outputs, and to provide data for reaches that did not have instream discharge monitors in place;

- Monitor water quality by sampling dissolved oxygen, pH, turbidity, and conductivity (This task has been deferred);

- Conduct electrofishing to determine salmonid distribution, and abundance;
- Conduct snorkel surveys during the spring and summer to supplement electrofishing data and for seasonal density comparisons;
- Conduct general habitat surveys in portions of the stream with potential for salmonid use to quantify habitat conditions and identify limiting factors;
- Conduct steelhead and bull trout spawning surveys to determine spawning timing and distribution, and to establish an index of relative abundance; and
- Collect tissue samples from bull trout and steelhead for genetic analyses.

Methods

Study Area

The study area encompasses the greater Walla Walla River basin in Washington State (Figure 1). The Walla Walla River, the Touchet River, and Mill Creek are the major rivers within the basin.

Stream Reaches

Representative stream reaches were identified based on general physical characteristics and readily identifiable landmarks. General physical characteristics included: slope, width, depth, and temperature; as well as, predominant adjacent land use. Landmarks included towns, roads, and bridges.

Individual Site Selection

Most of the study streams are in private ownership, therefore it was necessary to obtain permission from landowners to access potential sites. Owners of property bordering the study streams were identified from county assessment records and contacted in person or by telephone. For convenience, public land was utilized whenever possible. Study sites were distributed to comprehensively cover the study area, and sites are listed and identified in order from upstream to downstream (Appendix A).

River miles were determined by measuring 1:24,000 USGS topographic maps with a digital map wheel. River miles were determined by measuring the distance between the confluence of each stream and the study site. These locations should be considered approximate due to the limited precision of this method.

Electrofishing sites were selected randomly from access areas. Selection of top and bottom net locations were also randomized. Site lengths sometimes had to be modified to avoid unsuitable stream features, such as deep pools, rapids, multiple channels, and/or safety concerns.

Habitat Assessment

Stream Flows

Stream discharge was measured using two methods. Manual flow measurements were taken at selected sites according to standard techniques (Armour and Platts 1983) using a Swoffer model 2100 flow meter. Discharge was calculated in cubic feet per second (cfs) with Quattro Pro© spreadsheets. The calculated manual discharge measurements (cfs) were put into table format by site for the report (Appendix B). The second method involved the use of continuous flow data loggers (Unidata America, Model KB/DSP 128K). The monitors collect stream discharge (water stage (based on pressure)) data every 15 seconds and stores the data every hour as averages. The monitors were placed at one site on the Walla Walla River, one site on Yellowhawk Creek, one site on East Little Walla Walla, and two sites on Titus Creek (Appendix A). WDFW contracted with the Washington Department of Ecology (WDOE) to maintain the monitors and collect the data. Manual flow measurements were taken approximately every two weeks by WDFW near each of the flow monitors to correlate the discharge and stage readings recorded by the monitors. An index site was a location where discharge measurements were taken approximately every two weeks, compared to periodic flow sites where flow measurements were taken occasionally (Appendix A).

Stream Temperatures

We used three methods to collect water temperatures. Water temperature (°F) was measured manually at each site using standard field thermometers. The second method involved the use of temperature data loggers (Onset Corporation, Optic StowAway, or TidbiT Temp Data Logger®), which were set to continuously measure temperatures in °F at 30 minute intervals. The monitors were placed at sites throughout the Walla Walla River basin (Appendix A). WDFW maintained the temperature monitors and downloaded the data using an Optic Stowaway Shuttle®. Temperature data was downloaded from the shuttle into BoxCar® Pro 4.0 software. BoxCar® Pro 4.0 was used to calculate daily minimum, maximum, and mean temperatures, which were exported to Quattro Pro© spreadsheets. Data in Quattro Pro© was used to make graphs showing minimum, maximum, and mean temperatures (Appendix C). The third method involved the use of continuous flow and temperature data loggers (Unidata America, Model KB/DSP 128K), which took hourly temperature measurements. The monitors were used to collect temperature as a substitute for the stowaway temperature loggers at their respective sites (Appendix A). The accuracy of field thermometers and data loggers was evaluated using a laboratory calibrated thermometer (Kessler Instrument).

Limiting Factor Identification

One of the study goals was to identify and document physical barriers to salmonid passage, spawning and rearing. Field personnel noted the presence of potential barriers and provided the information to local biologists to coordinate habitat rehabilitation efforts. The activity of two major irrigation diversion structures, Hofer Dam on the Touchet River, and Burlingame Diversion on the Walla Walla River, were also noted throughout the season.

Physiological barriers to salmonid passage and survival, in the form of excessive temperatures, inadequate flows, and degraded habitat were also identified by examining tables and graphs of data collected by instream monitors and manual sampling. Maximum temperatures, as well as the number of days with temperatures exceeding 75°F (lethal to salmonids if prolonged), and presence or absence of salmonid fishes at study sites, were factors taken into consideration.

Habitat Inventory

Habitat inventory surveys were conducted on East Little Walla Walla (within Washington), Titus Creek (from mouth to just above Five Mile Rd.), and Coppei Creek (from Meinburg Rd. to McCowan Rd.), in 2004. We started with smaller streams in our study area to test our survey method and structure. Surveys were conducted using a modified Oregon method (Appendix D). We modified the study and created our own forms (Appendix E) to include some data that they don't collect, and to restructure the data to fit into several models and planning processes currently being used in southeast Washington.

Fish Stock Assessment

Distribution and Abundance

Electrofishing

A Smith-Root Model 11A or 12B electrofishing backpack unit was used to collect fish so we could calculate densities at various study sites in the Walla Walla basin. We used pulse DC (direct current) between 200 and 600 volts. Three different types of electrofishing surveys (quantitative, single pass quantitative, and qualitative) were used during our sampling.

Quantitative Electrofishing

Quantitative electrofishing sites were delimited by placing block nets, spanning the channel, approximately 30 to 50 meters apart. Block nets prevented fish from entering or leaving the site, so that estimates of salmonid populations and densities could be calculated (Platts et al. 1983). The operator usually began at the upstream net and worked downstream, covering the entire wetted width. In sites with heavy sedimentation the operator would begin at the bottom net and work upstream to maintain enough water clarity to efficiently capture fish. One "pass" was completed when the net opposite the start was reached. All sites received at least two sequential passes. A 60% reduction was required between the first and second passes for each salmonid species and estimated age class. If the 60% reduction was not met, a third pass was conducted. Stunned fish were collected with dip nets and held separately in buckets by sampling "pass" until they could be measured and recorded. Collected fish were anesthetized with FINQUEL® (MS-222 tricane methane sulfonate). Once anesthetized the following information was collected; identification (genus or species) and fork length (mm).

Fork lengths collected during quantitative electrofishing were used to create length frequency histograms. The histograms were used to determine age classes (Mendel et al. 1999). Age class groupings were specific for each stream or stream reach.

A removal-depletion software program developed by the U.S. Forest Service (Van Deventer and Platts 1983) was used to calculate population densities (#/100m^2) for each salmonid species, by age class. The area sampled was determined by multiplying site length by the average of four or more site width measurements. A brief description of the riparian vegetation, bank stability, substrate, sedimentation, pool/riffle ratio, and the presence of large woody debris (LWD) was recorded for each site.

Single Pass Quantitative Electrofishing

Single pass quantitative electrofishing sites were conducted in six streams in the Walla Walla basin in 2004. These sites were longer (~100 meters vs. ~30 meters for multiple pass sites), but allowed us to sample a broader range of habitat types (pool, riffle, run, etc.) at each site. The use of single pass sites allowed us to still make density estimates while not having the fish shocked multiple times (less stress on the fish). Shallow riffles or barriers were used whenever possible to speed up the process, but block nets were used when needed so fish wouldn't enter or leave the site during the survey. While it may not be as quantitative or statistically valid as multiple pass electrofishing, these surveys were high intensity sampling efforts to try and capture all fish, and still allow us to calculate a density estimate over a much larger area. Sites were generally electrofished from upstream to downstream covering all the wetted area within the site. Going from upstream to downstream seemed to push the fish down if they were missed and gave us another chance to catch them, but going from downstream to upstream if a fish was missed and went downstream it usually was not caught. Using the same method at all sites was important for comparability between sites. Fish were captured and held in buckets until the site was completed. Once the survey was done the fish were anesthetized with FINQUEL® (MS-222 tricane methane sulfonate) and the following information was collected; identification (genus or species) and fork length (mm). DNA and scale samples were also taken from a certain number of fish at this time. When data collection on a fish was finished it was placed in a bucket of freshwater and allowed to recover from the anesthesia before it was returned to the stream. Site length, width(s), and stream temperature were recorded at each site along with a brief description of the riparian vegetation, bank stability, substrate, sedimentation, pool/riffle ratio, and the presence of large woody debris (LWD).

Fork lengths collected during quantitative electrofishing were used to create length frequency histograms. The histograms were used to determine age classes (Mendel et al. 1999) that were specific for each stream or stream reach. Once age class limits were set a total number of fish per age class per site could be calculated. Area sampled was calculated from the length and width(s) measured at the site. An estimate of fish density (#/100m^2) by age class was then calculated by dividing the number of fish in each age class by the area and multiplying by 100.

Qualitative Electrofishing

We also conducted qualitative electrofishing surveys at several sites in the Walla Walla basin. These surveys enabled us to cover larger areas relatively quickly as they did not entail the use of block nets or repeat sampling passes. We electrofished at these sites by moving upstream and capturing fish to determine species presence, size of fish (age class) and their relative abundance. The length and average width of area sampled were recorded as well as a brief description of the riparian vegetation, bank stability, substrate, sedimentation, pool/riffle ratio, and the presence of large woody debris (LWD). This method supplemented our more intensive quantitative electrofishing surveys to provide a more complete view of fish distribution and abundance.

Fish identification for both quantitative and qualitative electrofishing sites included genus and species for all *Salmonidae* (salmonids) and *Cyprinidae* (minnows); and genus only for *Cottidae* (sculpins), *Catostomidae* (suckers), and *Petromyzontidae* (lamprey). Our sampling protocol was to collect and measure 10-20 of each non-salmonid species at each site. Non-salmonid species were assigned a relative abundance ranking value based on general observations made during electrofishing (Table 1 and Table 2). Relative abundance for non-salmonid species were treated semi-quantitatively and varied based on the method of electrofishing used. For each species at each site, a relative abundance was determined. The relative abundance was assigned a corresponding ranking value, for multiple pass quantitative site and qualitative sites see Table 1, and for single pass quantitative sites see Table 2. Ranked values were averaged to determine a relative abundance for each species per designated reach. Relative abundance data were tabulated to provide qualitative comparisons between reaches and species (Appendix F).

Table 1. Categories of relative abundance (per site) for non–salmonids during **multiple pass quantitative and qualitative sites**.

Category	**Count** (individuals seen)	**Ranking Value**
Absent	0	0
Rare	1-3	1
Uncommon	4-10	2
Common	11-100	3
Abundant	100+	4

Table 2. Categories of relative abundance (per site) for non–salmonids during **single pass quantitative sites**.

Category	**Count** (individuals seen)	**Ranking Value**
Absent	0	0
Rare	0-10	1
Uncommon	11-30	2
Common	30-100	3
Abundant	100+	4

Mill Creek Channel Electrofishing/Salvage

Two large electrofishing events took place on Mill Creek in 2004. The first was a salvage that was conducted on June 29th and 30th and was participated in by WDFW, United States Army Corps of Engineers (USACE), WDOE, Confederated Tribes of the Umatilla Indian Reservation (CTUIR), United States Forest Service (USFS), and Tri State Steelheaders. This salvage was conducted from Roosevelt St. to the Yellowhawk Creek diversion above Tausick Way. The salvage consisted of using 2-5 electrofishers and dipnets to capture fish, and on the second day we also used a beach seine to capture fish.

The second event was a qualitative survey of the concrete channel from 9th Ave. up to Roosevelt St. on August 26th. This survey was to check for fish distribution and to get some channel measurements to evaluate the concrete channel for fish passage.

Spawning Surveys

WDFW conducted spawning surveys for steelhead, bull trout, and spring chinook in the Walla Walla Basin in 2004. Spawning surveys were conducted in the same manner for steelhead, bull trout, and spring chinook. Surveyors generally walked downstream and visually identified spawning fish and/or redds (nests). Redds were usually readily identified, characterized by an area of clean gravel with a large depression and mound. Each redd observed was assigned a two-part identification (ID) code representing the survey number and the redd number. A flag was hung in adjacent vegetation, and marked with the ID code, the date, and the surveyor's initials, so the same redd would not be counted again in subsequent surveys. Each redd was recorded in a notebook with the date, time, ID code, general description of the redd, size score of its observability and its location. Counts were tallied for each designated stream reach.

Genetic Sampling

Sampling of salmonid tissues was undertaken by WDFW personnel for later genetic analyses. Fin clips or opercle punches were obtained from adult steelhead, juvenile rainbow/steelhead trout, and bull trout. Tissue samples were placed in tubes of 95% ethanol for preservation, labeled and retained or transported to the WDFW Genetics Stock Identification Lab in Olympia. Fin clips provide sufficient DNA material for genetic analysis, without killing the fish (Olsen et al. 1996). A non-lethal method of genetic sampling was preferred due to the current ESA listings for bull trout and wild steelhead in the Walla Walla River basin.

Results and Discussion

Habitat Assessment

Stream Flows

The number and distribution of stream flow (discharge) and water temperature measurements by WDFW changed slightly in 2004. In 2003 we had 49 flow sites and 67 temperature sites, while in 2004 we had 63 flow sites and 70 temperature sites. There appears to be a drastic change in the number of flow sites, but if you look at the index flows (sites that are done every two weeks) there were 41 index flow sites in 2003 and 43 index flow sites in 2004. The additional non-index flows were added to assist with the Walla Walla Watershed Council as they conducted a seepage run in the Walla Walla River basin (Figure 2).

Stream flows in the Walla Walla River basin follow a fundamental pattern initiated by a rapid decline in discharge in late June, followed by low summer flows and increased discharge in the fall and winter. Heavy spring rains produced higher than usual spring flows, and made measuring discharge in parts of the Walla Walla River impossible (Appendix B). The reduced flows in late June generally represent the end of the spring runoff, activation of water diversions for agricultural irrigation, and the usual lack of summer precipitation in the basin. The recharge in the fall is usually generated because of fall precipitation and after most water diversions are discontinued or reduced. However, sites in proximity to major irrigation facilities exhibited more erratic stream flow patterns (Appendix B). Irrigation withdrawals included pumps, “push-up” dams for gravity diversions and irrigation district dams and canals.

Stream flow gauges were placed at five sites in 2004, but data was only obtained from the following three monitors; Yellowhawk Creek, East Little Walla Walla, and one on Titus Creek. The other two monitors that were in place had the batteries die, so there was no data available at those sites. The monitor in Yellowhawk Creek was very erratic, but is affected by the diversion from Mill Creek (Figure 3). East Little Walla Walla has two graphs, do to a rating curve shift during the first part of July. The graphs were relatively constant, generally between 10 and 25 cfs, throughout the time the monitor was in place (Figure 4 and 5). The Titus Creek graph was also very constant generally between 5 and 15 cfs (Figure 6).

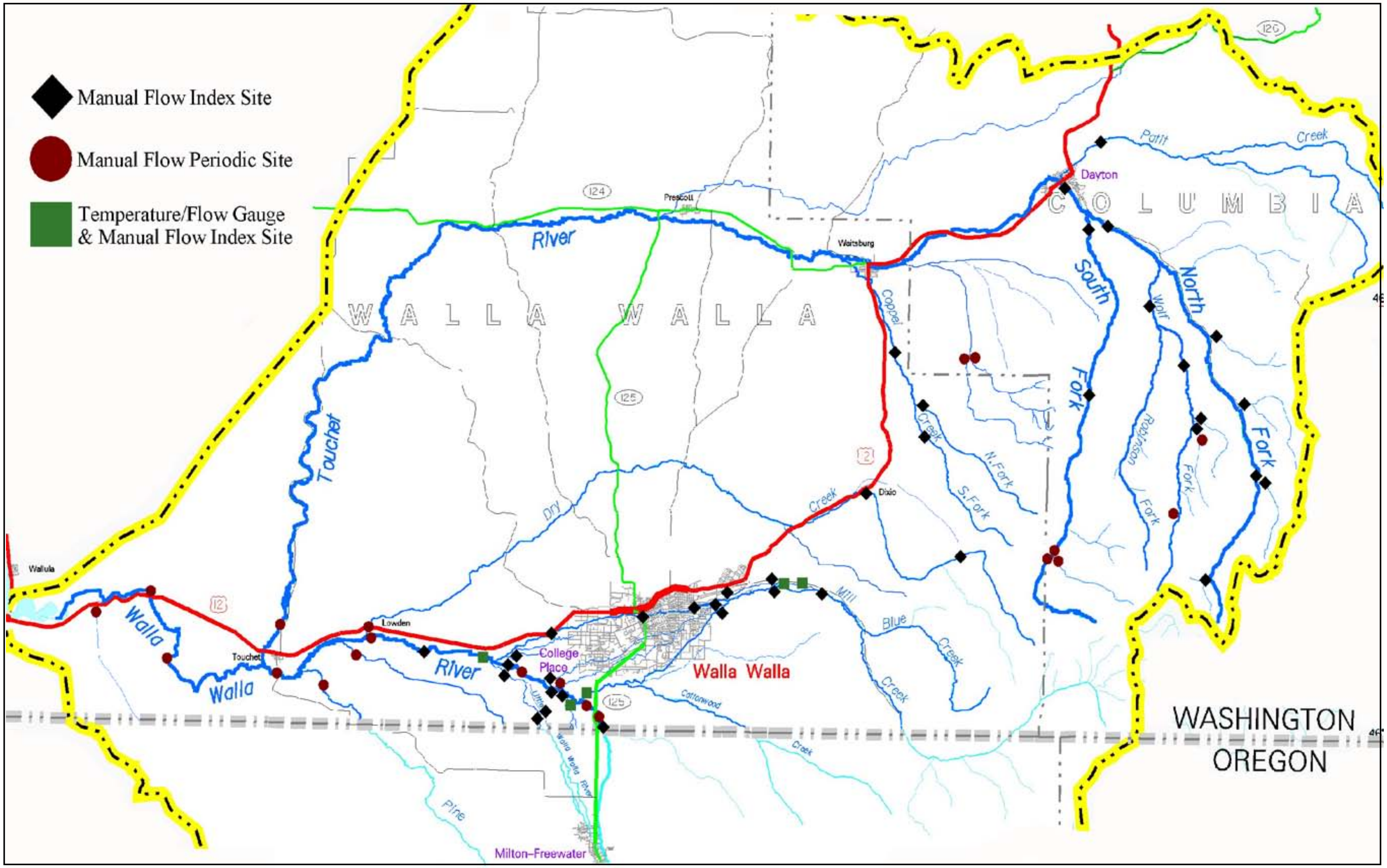

Figure 2. Relative locations of WDFW flow monitoring sites in the Walla Walla basin, 2004.

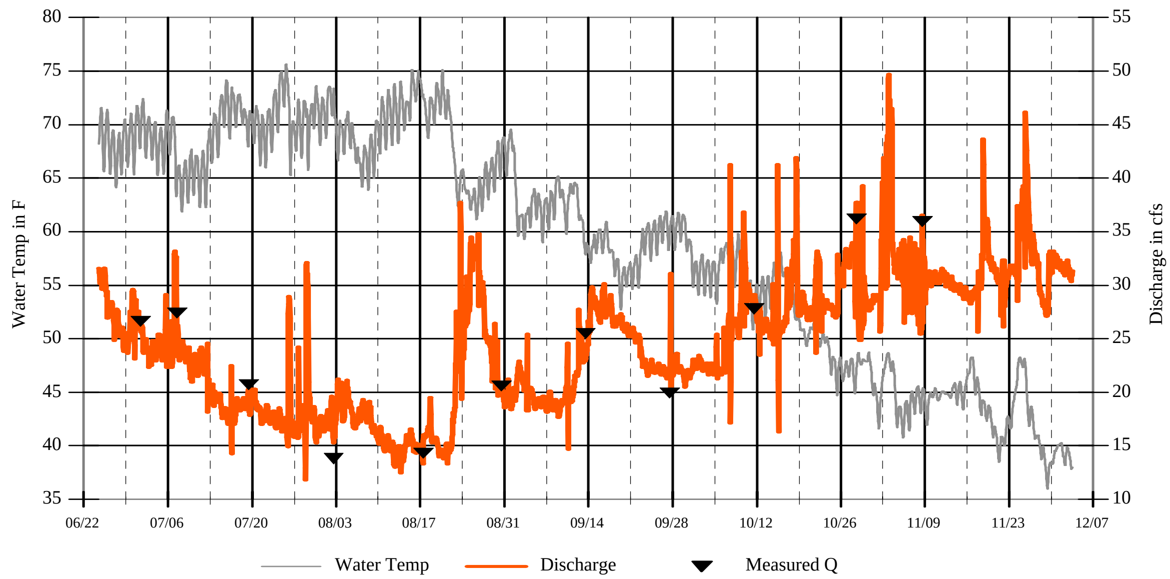

Figure 3. Yellowhawk Creek stream discharge (CFS) and hourly temperatures (°F) above mouth (YC-2), 2004. (Measured Q = manual stream discharge measurements)

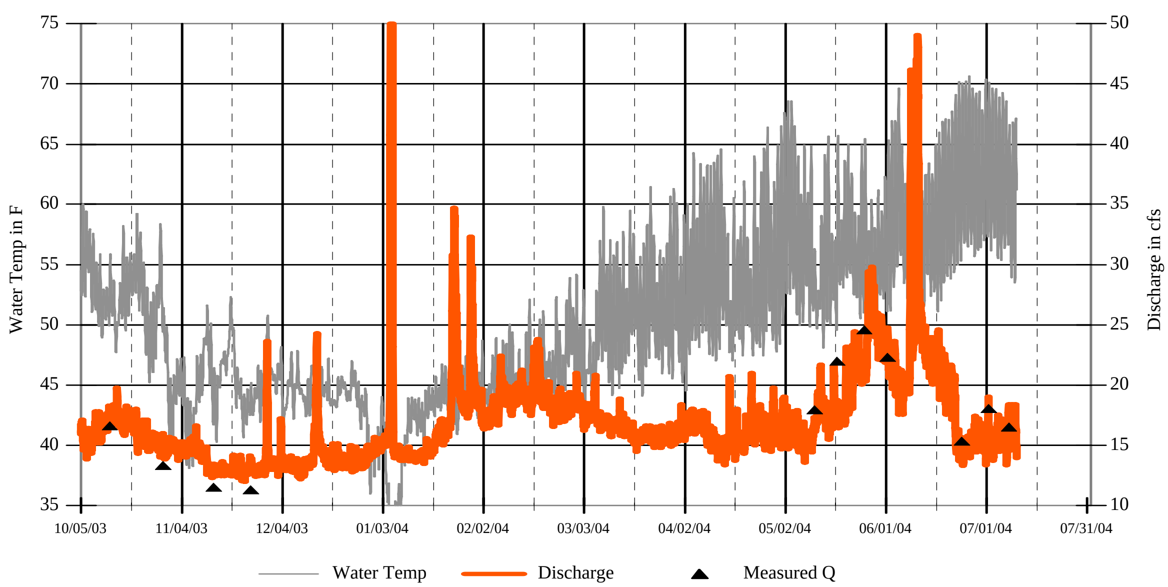

Figure 4. East Little Walla Walla (part 1 from October 2003 to July 2004) stream discharge (CFS) and hourly temperatures (°F) 0.2 miles above mouth (ELW-4), 2003-2004. (Measured Q = manual stream discharge measurements)

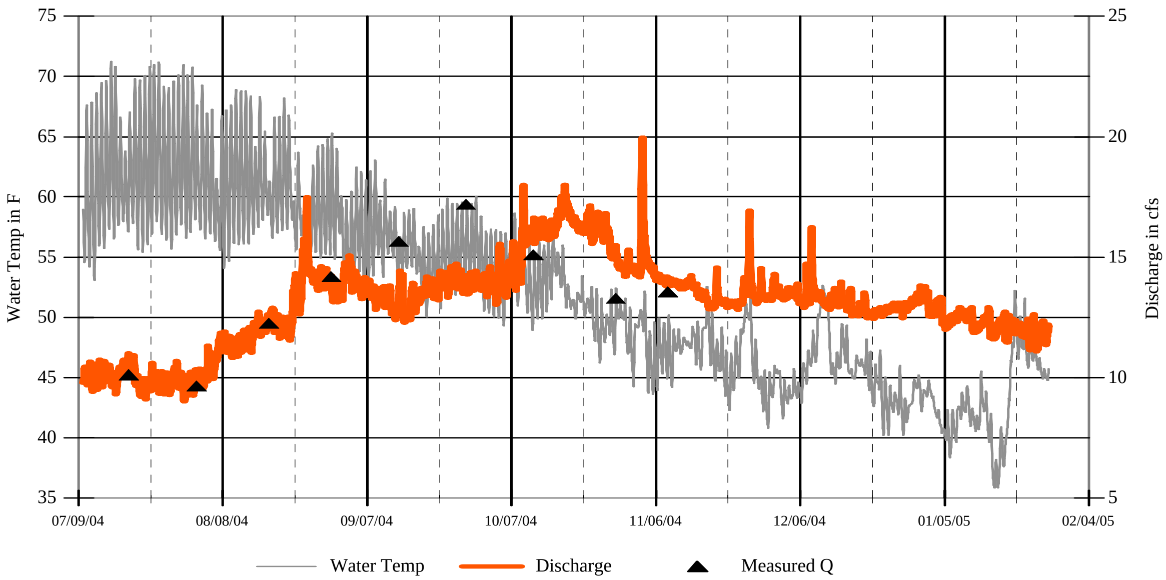

Figure 5. East Little Walla Walla (part 2 from July 2004 to January 2005) stream discharge (CFS) and hourly temperatures (°F) 0.2 miles above mouth (ELW-4), 2004-2005. (Measured Q = manual stream discharge measurements)

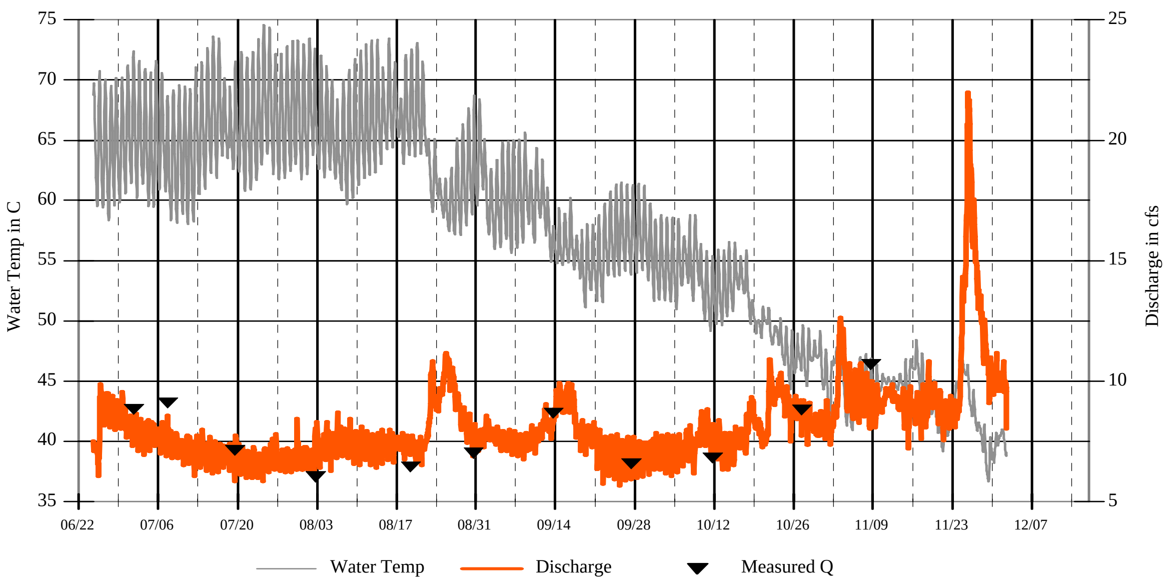

Figure 6. Titus Creek stream discharge (CFS) and hourly temperatures (°F) ~ 1.0 miles above Five Mile Rd. (TC-2), 2004. (Measured Q = manual stream discharge measurements)

Walla Walla Settlement Agreement

In 2000, under a settlement agreement with the U.S. Fish and Wildlife Service (USFWS), irrigation districts in Oregon maintained a minimum instream flow of 13 cfs at Nursery Bridge in Milton Freewater, OR. Nursery Bridge is approximately four miles upstream of the Washington/ Oregon state line. The minimum instream flow at Nursery Bridge was increased to 18 cfs in 2001, and then increased again to 25 in 2002. In 2003 and 2004, the minimum flow increased to 27 cfs through June 30th and then went back to 25 cfs for the remainder of the year. The additional water, in 2000, made an immediate impact in Oregon by considerably reducing the historic dewatered area from Nursery Bridge downstream to below Tumalum Bridge, near the stateline. With the additional water available in 2001 the Walla Walla River saw continuous overland flow from Nursery Bridge to the Washington/Oregon stateline for the first time in decades. Manual stream flow measurements taken at Pepper Rd. bridge (just below the Washington/Oregon State line) showed little or no increase in stream flows until July-September 2001 when flows increased 300 - 400% over summer flows documented the previous three years. In 2002, manual flows at Pepper Rd. bridge again showed increases of 110-185% from July through September (Appendix G). In 2004, a wet spring created above normal summer flows, but flows in October were the lowest seen since the settlement went into effect in 2000 (Appendix G). Also, under the auspices of the settlement agreement, Gardena Farms Irrigation District, in Washington, maintained at least a 10 cfs streamflow past Burlingame Dam (just above Mojonnier Rd.) during the spring, early summer, and fall irrigation season of 2000. In 2001 this 10 cfs was increased to 14 cfs, and then increased again to 18 cfs in 2002. In 2003 and 2004, the minimum flow increased to 19 cfs through June 30th and then went back to 18 cfs for the remainder of the year. Flows have shown a general increase from 1999 to 2001 at continuous flow monitoring sites near Mojonnier and Detour roads (Appendix H), especially in July and August, but this has not been consistent from 2002 to 2004.

Stream Temperatures

Temperature logger sites in 2004 were almost identical to 2003 with a couple additions. In 2003 we had 67 temperature loggers deployed in the basin, and in 2004 we had 70 temperature loggers deployed (Figure 7).

Water temperatures in 2004 were similar to water temperatures in 2003 throughout the Walla Walla basin (Appendix C). Sites where maximum water temperatures were less than or equal to 65°F during summer months were generally located in upper tributaries associated with the Blue Mountains; North Fork Touchet (NFT-1, 6), Spangler Creek (SC-1), Lewis Creek (LC-1), Wolf Fork (WF-2, 4), Whitney Creek (WH-5), Coates Creek (C-1), and North Fork Dry Creek (NFD-1). Maximum daily temperatures at some instream monitoring sites routinely exceeded temperatures that can be lethal for salmonids (75-84°F, Bjornn and Reiser 1991). This generally occurred during mid-summer, when the photo-period is long and evening cooling is brief. Sites with maximum water temperatures greater than 75°F included; Patit Creek (P-1), Touchet River (TR-5, 10, 17, 18, 19), Coppei Creek (CO-3), Walla Walla River within Washington (WW-3, 6, 8, 10, 11, 13, 16), upper Yellowhawk Creek (YC-1), Cottonwood Creek (CWC-1), Blue Creek (BLC-1), Mill Creek below Bennington Lake diversion dam (MC-11, 13, 15, 19, 20, 22), West Little Walla Walla (WLW-1, 3), Walsh Creek (WAC-1), Dry Creek (DRC-1, 10), Mud Creek (MD-1), and Pine Creek (PC-1, 2). Sites in the mid and lower Touchet and Walla Walla Rivers frequently had daily temperatures that were high enough (above 68°F) to inhibit migration of adults and young, and to sharply reduce survival of embryos and fry (Bjornn and Reiser 1991, Appendix C). However, at night, temperatures would usually decrease to within reasonable physiological limits for steelhead/rainbow trout (<65-70°F).

Walla Walla Settlement Agreement

Increases in streamflow did not consistently improve water temperatures during summer months from 1998 through 2002 (Table 3). We documented little or no change in temperatures at Pepper Br. even though stream flows increased several fold since 2001, compared to previous years. We documented some decreases in mean and maximum temperatures in August and September at Mojonnier Rd. from 1998-2002, but temperatures were higher in 2003 and 2004 than in 2002 at this site. Average and maximum temperatures at Swegle Rd. and Detour Rd. have shown no consistent changes (Table 3).

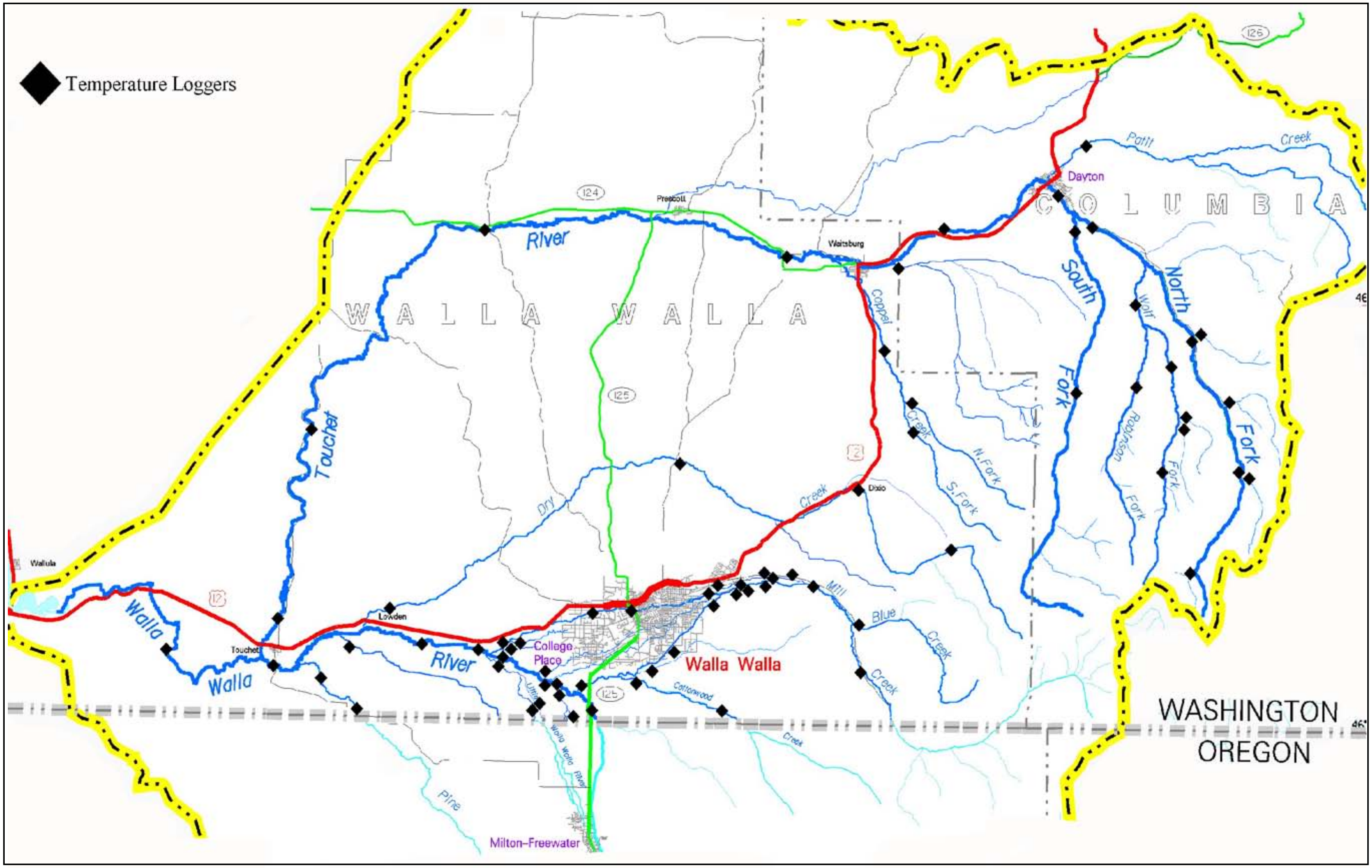

Figure 7. Relative locations of WDFW temperature logger sites in the Walla Walla basin, 2004.

Table 3. Average and mean maximum temperatures (°F and standard deviation) from temperature monitors at Pepper Rd., Mojonnier Rd., Swegle Rd., and Detour Rd. in the Walla Walla River, 1998-2004 (listed from upstream to downstream).														
	1998		1999		2000		2001		2002		2003		2004	
	Average Temp. (SD)	Mean Max. Temp. (SD)	Average Temp. (SD)	Mean Max. Temp. (SD)	Average Temp. (SD)	Mean Max. Temp. (SD)	Average Temp. (SD)	Mean Max. Temp. (SD)	Average Temp. (SD)	Mean Max. Temp. (SD)	Average Temp. (SD)	Mean Max. Temp. (SD)	Average Temp. (SD)	Mean Max. Temp. (SD)
Pepper Rd.														
April							46.38 (2.957)	50.26 (3.929)						
May					54.40 (3.425)	57.56 (4.264)	53.72 (4.877)	59.32 (6.177)			54.51 (3.624)	58.88 (4.134)	50.52 (1.253)	53.47 (2.312)
June			59.19 (3.861)	65.04 (5.361)	58.71 (4.539)	64.22 (5.636)	60.62 (2.773)	66.15 (4.209)			63.53 (2.358)	69.27 (2.885)	58.60 (5.430)	63.43 (6.642)
July			66.68 (2.592)	73.92 (3.276)	67.14 (1.960)	73.16 (2.191)	66.25 (2.047)	71.99 (3.466)	69.67 (1.228)	74.76 (0.795)	68.72 (2.018)	74.51 (2.569)	67.73 (1.307)	73.61 (1.584)
August			68.03 (2.280)	73.40 (3.042)	66.68 (2.273)	71.88 (2.576)	66.76 (1.659)	72.07 (2.213)	65.35 (1.206)	70.41 (1.878)	67.21 (1.397)	71.75 (1.933)	66.90 (2.220)	71.63 (3.310)
September			60.68 (1.999)	64.84 (2.564)	60.36 (2.604)	63.74 (2.923)	61.37 (2.329)	65.12 (2.754)	59.74 (2.747)	63.32 (3.225)	60.76 (2.610)	64.07 (2.974)	60.33 (1.701)	63.81 (2.149)
October			53.21 (2.560)	55.64 (2.810)	51.20 (2.496)	53.64 (2.755)	51.53 (2.592)	53.79 (3.193)	50.81 (3.832)	53.31 (4.178)	54.31 (3.061)	56.40 (3.407)	53.84 (2.925)	55.95 (3.703)

[a] Temps were not collected at Pepper Rd. or Detour Rd. due to lack of time and resources available in the first year of the project. The 1998 data was collected on continuous temp and flow monitors wich took reading every 15 seconds and stores the every four hours as averages.

Table 3. (Cont.) Average and mean maximum temperatures (°F and standard deviation) from temperature monitors at Pepper Rd., Mojonnier Rd., Swegle Rd., and Detour Rd. in the Walla Walla River, 1998-2004 (listed from upstream to downstream).

	1998		1999		2000		2001		2002		2003		2004	
	Average Temp (SD)	Mean Max Temp (SD)	Average Temp (SD)	Mean Max Temp (SD)	Average Temp (SD)	Mean Max Temp (SD)	Average Temp (SD)	Mean Max Temp (SD)	Average Temp. (SD)	Mean Max. Temp. (SD)	Average Temp. (SD)	Mean Max. Temp. (SD)	Average Temp. (SD)	Mean Max. Temp. (SD)
Mojonnier Rd.														
April							47.34 (3.079)	50.71 (3.875)						
May					55.91 (3.019)	59.34 (3.631)	54.63 (4.440)	59.03 (4.955)			56.11 (3.968)	60.04 (4.216)	51.62 (1.265)	54.47 (2.273)
June			62.81 (2.304)	68.64 (2.666)	59.46 (4.156)	64.22 (4.759)	60.03 (3.184)	63.71 (4.382)	62.16 (2.812)	66.28 (2.915)	64.37 (2.769)	69.13 (3.208)	60.05 (5.621)	64.37 (6.262)
July	71.97 (2.056)	78.23 (2.669)	66.82 (3.177)	74.78 (3.445)	66.76 (2.500)	72.35 (3.086)	66.70 (2.591)	71.83 (3.660)	68.21 (2.769)	73.25 (3.059)	69.36 (2.394)	74.90 (2.948)	68.57 (1.739)	73.88 (2.087)
August	69.72 (0.646)	75.17 (2.589)	68.28 (2.947)	74.77 (3.313)	65.52 (2.951)	70.97 (3.132)	67.16 (2.259)	71.66 (2.170)	65.40 (1.526)	70.57 (1.991)	67.34 (1.577)	71.88 (1.936)	67.12 (2.413)	71.41 (3.444)
September	64.63 (6.673)	71.21 (3.004)	59.28 (2.698)	64.61 (2.951)	58.19 (3.330)	61.21 (3.647)	60.72 (2.411)	64.56 (2.956)	59.41 (2.934)	62.80 (3.416)	60.48 (3.040)	63.58 (3.505)	59.64 (1.970)	62.48 (2.315)
October	49.61 (2.681)	51.48 (2.987)	51.52 (2.730)	54.48 (2.983)	51.87 (2.249)	53.76 (2.422)	51.98 (2.021)	53.73 (2.580)	50.31 (4.211)	52.72 (4.392)	54.04 (3.550)	55.99 (3.808)	53.80 (2.842)	55.57 (3.308)

[a] Temps were not collected at Pepper Rd. or Detour Rd. due to lack of time and resources available in the first year of the project. The 1998 data was collected on continuous temp and flow monitors wich took reading every 15 seconds and stores the every four hours as averages.

Table 3. (Cont.) Average and mean maximum temperatures (°F and standard deviation) from temperature monitors at Pepper Rd., Mojonnier Rd., Swegle Rd., and Detour Rd. in the Walla Walla River, 1998-2004 (listed from upstream to downstream).

	1998		1999		2000		2001		2002		2003		2004	
	Average Temp (SD)	Mean Max Temp (SD)	Average Temp (SD)	Mean Max Temp (SD)	Average Temp (SD)	Mean Max Temp (SD)	Average Temp (SD)	Mean Max Temp (SD)	Average Temp. (SD)	Mean Max. Temp. (SD)	Average Temp. (SD)	Mean Max. Temp. (SD)	Average Temp. (SD)	Mean Max. Temp. (SD)
Swegle Rd.														
April			50.32 (1.757)	53.91 (2.753)			47.80 (3.364)	51.40 (4.204)						
May			52.54 (2.683)	55.99 (2.880)	57.74 (3.885)	61.060 (4.218)	54.57 (4.022)	58.79 (4.114)			57.23 (4.232)	60.88 (4.297)	52.36 (1.286)	54.46 (2.178)
June	69.22 (2.199)	75.46 (4.256)	62.38 (4.929)	67.95 (5.792)	61.31 (5.058)	66.12 (5.831)	61.80 (4.547)	66.33 (5.501)	66.00 (3.409)	70.75 (3.719)	66.08 (2.757)	71.21 (3.163)	60.88 (5.961)	64.36 (7.393)
July	73.41 (2.032)	79.61 (2.289)	68.83 (2.865)	75.13 (3.132)	69.18 (2.227)	74.45 (2.252)	68.22 (2.796)	72.73 (3.543)	69.79 (2.709)	74.53 (2.650)	70.99 (2.453)	75.91 (2.822)	69.86 (1.819)	74.72 (2.022)
August	71.09 (2.990)	76.23 (3.351)	69.70 (3.282)	74.68 (3.675)	67.59 (3.077)	71.44 (3.434)	68.23 (2.352)	72.68 (2.699)	66.33 (1.533)	70.05 (1.705)	68.74 (1.704)	72.67 (2.012)	68.46 (2.639)	72.39 (3.356)
September	64.23 (3.978)	68.20 (4.469)	59.90 (2.739)	64.00 (3.170)	59.36 (3.578)	62.23 (3.818)	60.51 (2.408)	64.36 (2.814)	60.16 (3.019)	62.40 (3.166)	61.36 (3.222)	64.41 (3.522)	60.60 (1.986)	63.35 (2.280)
October	52.97 (3.580)	55.98 (3.789)	51.41 (2.868)	54.19 (2.793)	51.83 (2.758)	53.94 (2.900)	50.62 (2.503)	53.64 (2.823)	51.95 (3.018)	53.16 (3.196)	54.71 (3.620)	56.80 (3.843)	54.56 (4.006)	57.11 (3.607)

[a] Temps were not collected at Pepper Rd. or Detour Rd. due to lack of time and resources available in the first year of the project. The 1998 data was collected on continuous temp and flow monitors wich took reading every 15 seconds and stores the every four hours as averages.

Table 3. (Cont.) Average and mean maximum temperatures (°F and standard deviation) from temperature monitors at Pepper Rd., Mojonnier Rd., Swegle Rd., and Detour Rd. in the Walla Walla River, 1998-2004 (listed from upstream to downstream).

	1998		1999		2000		2001		2002		2003		2004	
	Average Temp (SD)	Mean Max Temp (SD)	Average Temp (SD)	Mean Max Temp (SD)	Average Temp (SD)	Mean Max Temp (SD)	Average Temp (SD)	Mean Max Temp (SD)	Average Temp. (SD)	Mean Max. Temp. (SD)	Average Temp. (SD)	Mean Max. Temp. (SD)	Average Temp. (SD)	Mean Max. Temp. (SD)
Detour Rd.														
April							48.18 (3.503)	51.62 (4.283)						
May					59.03 (3.414)	62.56 (3.619)	57.19 (5.919)	62.53 (7.637)			59.53 (4.659)	62.99 (4.857)	55.19 (1.874)	58.16 (2.322)
June			66.12 (2.327)	71.53 (2.920)	62.38 (4.910)	66.97 (5.875)	63.70 (3.295)	68.79 (4.409)	66.44 (3.379)	71.44 (4.067)	66.85 (2.696)	72.40 (3.071)	63.03 (6.034)	67.29 (6.597)
July			69.22 (2.783)	75.73 (2.803)	69.76 (2.148)	75.60 (2.270)	68.84 (2.925)	73.89 (3.836)	70.77 (2.720)	76.16 (2.703)	71.50 (2.465)	76.65 (2.802)	70.25 (1.751)	75.142 (1.899)
August			70.18 (3.047)	75.36 (3.424)	68.13 (3.142)	72.57 (3.442)	68.61 (2.335)	73.12 (2.760)	67.36 (1.727)	71.96 (2.039)	69.22 (1.721)	73.25 (2.039)	68.78 (2.458)	72.17 (3.212)
September			60.27 (2.632)	64.18 (3.036)	59.89 (3.595)	62.79 (3.801)	61.81 (2.600)	64.86 (2.865)	60.57 (3.292)	63.67 (3.656)	61.84 (3.187)	64.94 (3.515)	60.92 (2.038)	62.68 (2.254)
October			51.71 (2.814)	54.32 (2.743)	52.91 (2.448)	54.79 (2.612)	52.45 (2.296)	54.48 (2.851)	50.98 (4.229)	53.49 (4.416)	55.31 (3.259)	57.38 (3.646)	55.05 (2.461)	56.15 (2.749)

[a] Temps were not collected at Pepper Rd. or Detour Rd. due to lack of time and resources available in the first year of the project. The 1998 data was collected on continuous temp and flow monitors wich took reading every 15 seconds and stores the every four hours as averages.

Limiting Factors Identification

A number of barriers or impediments to salmonid passage and rearing have been identified by this project since 1998 (Mendel et. al. 1999, 2000, 2001, 2002, 2003, 2004). A portion of those barriers were physical (e.g. structures or dewatered streambeds) that physically blocked salmonid movement see Mendel et al. (2003), others were physiological barriers (e.g. temperature, sediment, lack of pools, etc.). Four physical barriers were found by WDFW personell in 2004. These barriers included; a second falls on Whiskey Creek (above the Alyward Trib.), a concrete bridge footing under Lower Waitsburg Rd. on Dry Creek, and two man-made dams on Mill Creek (one above Five Mile Rd. and one at Wickersham bridge). Physiological barriers and impediments to salmonid passage and rearing were extensive in terms of stream miles affected. The primary physiological factor affecting fish in the Walla Walla River basin was water temperature. Temperature possibly represents the most critical physiological barrier to salmonids, particularly for passage or rearing. Seasonal temperature related barriers for salmonids generally occur in lower areas of the Touchet River, Mill Creek, and the Walla Walla Rivers and their tributaries. Stream reaches with mean water temperatures exceeding 75 °F during the summer are associated with low densities of salmonids (Mendel et. al.,1999). Most of the salmonids in these marginal thermal areas are age 0+ rainbow/steelhead trout. We have documented temperatures of 70 °F or higher in many lower mainstem reaches and in some tributaries during summer as might be expected, but also in mid to late May and June and again in early September when they may affect migration of salmonids. These temperatures likely adversely affect migrating juvenile salmonids and adult steelhead in spring, and adult steelhead returning in September. Turbidity, sedimentation, lack of pools and cover, and other habitat factors, may also present challenges to migrating, breeding and rearing salmonids.

Habitat Inventory

In 2004, we began our habitat inventory surveys on a few small streams in the Walla Walla basin. Surveys were conducted on East Little Walla Walla River from the mouth upstream to Springdale Rd. and from the forks upstream to the stateline (including Big Spring Branch) where access was granted by landowners, on Titus Creek from the mouth at Walla Walla Community College to the diversion above Five Mile Rd., and on Coppei Creek from Meinburg Rd (just above Waitsburg) to McCowan Rd. East Little Walla Walla was divided into three reaches and a total of 15 units (Table 4). Data has been summarized by unit and reach (Tables 4 and 5) to show trends throughout the surveyed area. The area of Titus Creek that was surveyed was broken into two reaches and a total of 40 units (Table 6). Unit and reach summaries have been calculated for the areas surveyed (Table 6 and 7), but there is still at least one reach above the diversion that has not been surveyed. The data for Coppei Creek has not yet been summarized but will be included in a future report.

Table 4. Length and width summaries (in meters) by unit and reach for East Little Walla Walla, 2004.

Reach[a]	Unit	Unit Type[b]	Unit Length	Avg. Depth	Min. Depth	Max. Depth	SD Depth	Avg. Width	Min. Width	Max. Width	SD Width	Area[c]	Notes: diversions, barriers, etc.
1	1	RI	23.7	0.28	0.20	0.33	0.050	3.40	3.0	4.1	0.430	80.58	
1	2	RU	24.5	0.74	0.60	0.90	0.136	4.63	3.1	7.7	1.818	113.31	
1	3	RI	153.0	0.49	0.30	0.80	0.185	4.50	3.5	5.1	0.604	688.50	
1	4	RU	18.4	0.56	0.30	0.90	0.215	4.80	4.7	4.9	0.071	88.32	
1	5	RI	205.3	0.54	0.30	0.80	0.206	4.53	4.2	4.9	0.327	928.98	
1	6	RU	91.8	0.58	0.40	0.90	0.172	5.80	4.8	6.8	0.791	532.44	1 small concrete dam between units 6 and 7, but is passable to fish
1	7	RI	528.9	0.70	0.60	1.00	0.155	7.15	5.2	10.8	2.165	3781.64	1 culvert, passable
Totals	**7**		**1045.6**	**0.55**	**0.20**	**1.00**	**0.219**	**4.97**	**3.0**	**10.8**	**1.593**	**6213.77**	
2	1	RU	1043	0.43	0.20	0.70	0.169	3.23	2.5	4.6	0.823	3363.68	
Totals	**1**		**1043**	**0.43**	**0.20**	**0.70**	**0.169**	**3.23**	**2.5**	**4.6**	**0.823**	**3363.68**	
3	10	RI	78.4	0.30	0.17	0.38	0.080	4.15	2.6	5.9	1.184	325.36	1 culvert, passable
3	11	DP	18.9	0.94	0.50	1.90	0.495	9.40	3.9	15.2	4.647	177.66	Manmade dam and in-channel pond, possible barrier at low flows
3	12	RI	37.4	0.32	0.20	0.40	0.076	4.40	3.7	5.3	0.592	164.56	
3	13	RU	189.3	0.52	0.40	0.60	0.076	5.83	5.3	6.4	0.415	1102.67	2 culverts, passable
3	14	RI	17.9	0.31	0.15	0.50	0.112	4.75	2.5	6.7	1.683	85.03	1culvert, passable
3	15	RU	40.2	0.44	0.30	0.60	0.107	6.93	6.7	7.2	0.228	278.39	
3	16	RU	133.5	0.56	0.30	1.00	0.244	4.90	3.9	6.3	0.883	654.15	1 culvert, passable
Totals	**7**		**515.6**	**0.48**	**0.15**	**1.9**	**0.307**	**5.76**	**2.5**	**15.2**	**2.619**	**2787.81**	

[a] Reach 1 (Mouth to Springdale Rd.), Reach 2 (Forks to Stateline on East Little Walla Walla), Reach 3 (Forks to Stateline on Big Spring Branch)
[b] RI=riffle, RU=run, DP=Dam Pool
[c] Area was calculated off original formulas so may not match if multiplying length and average width on this page, and is recorded in m^2.

Table 5. Reach summaries (in meters unless otherwise noted) for East Little Walla Walla, 2004.

Reach 1 (Mouth to Springdale Rd.)									
# of units	**Length**	**Area (m²)**	**Primary Channel Type[a]**	**% Primary Cannel Type[a]**	**Secondary Cannel Type[a]**	**% Secondary Cannel Type[a]**	**# of LWD**	**# of LWD/100m**	
7	1045.6	6213.77	00	100			18	1.72	
Avg. BFW	**Min. BFW**	**Max. BFW**	**SD BFW**	**Avg. BFD**	**Min. BFD**	**Max. BFD**	**SD BFD**	**Avg. Embeddedness**	**Avg. Spawning Area Fines**
N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]
Avg. Shade (°)	**Avg. % Eroding Bank**	**Avg. % Undercut Bank**	**Avg. % Man-made Confinement**	**Avg. % Natural Confinement**	**Avg. Gradient (%)**	**Min. Gradient (%)**	**Max. Gradient (%)**	**SD Gradient (%)**	
N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	
Pool Summaries for Reach 1									
# of Units	**Length**	**% of Total Length**	**Area (m²)**	**% of Total Area**	**Avg. Pool Crest Depth**	**Avg. Pool Quality**	**Min. Pool Quality**	**Max. Pool Quality**	**SD Pool Quality**
0	0	0	0	0	0	0	0	0	0
Riffle Summaries for Reach 1									
# of Units	**Length**	**% of Total Length**	**Area (m²)**	**% of Total Area**					
4	910.9	87.1	5479.70	88.2					
Run Summaries for Reach 1									
# of Units	**Length**	**% of Total Length**	**Area (m²)**	**% of Total Area**					
3	134.7	12.9	734.07	11.8					

[a] Primary channel type=most commonly seen channel type for the reach (00=No Multiple channels); % Primary channel type=% of units that were listed as the primary channel type; Secondary channel type=second most commonly seen channel type for the reach; % Secondary channel type=% of units that were listed as the secondary channel type.
[b] Not available for this reach because this data is only collected every tenth unit.

Table 5. (Cont.) Reach summaries (in meters unless otherwise noted) for East Little Walla Walla, 2004.

Reach 2 (Forks to Stateline on East Little Walla Walla)									
# of units	**Length**	**Area (m²)**	**Primary Channel Type[a]**	**% Primary Cannel Type[a]**	**Secondary Cannel Type[a]**	**% Secondary Cannel Type[a]**	**# of LWD**	**# of LWD/100m**	
1	1043.0	3363.68	00	100			1	0.10	
Avg. BFW	**Min. BFW**	**Max. BFW**	**SD BFW**	**Avg. BFD**	**Min. BFD**	**Max. BFD**	**SD BFD**	**Avg. Embeddedness**	**Avg. Spawning Area Fines**
N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]
Avg. Shade	**Avg. % Eroding Bank**	**Avg. % Undercut Bank**	**Avg. % Man-made Confinement**	**Avg. % Natural Confinement**	**Avg. Gradient (%)**	**Min. Gradient (%)**	**Max. Gradient (%)**	**SD Gradient (%)**	
N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	N/A[b]	
Pool Summaries for Reach 2									
# of Units	**Length**	**% of Total Length**	**Area (m²)**	**% of Total Area**	**Avg. Pool Crest Depth**	**Avg. Pool Quality**	**Min. Pool Quality**	**Max. Pool Quality**	**SD Pool Quality**
0	0	0	0	0	0	0	0	0	0
Riffle Summaries for Reach 2									
# of Units	**Length**	**% of Total Length**	**Area (m²)**	**% of Total Area**					
0	0	0	0	0					
Run Summaries for Reach 2									
# of Units	**Length**	**% of Total Length**	**Area (m²)**	**% of Total Area**					
1	1043.0	100	3363.68	100					

[a] Primary channel type=most commonly seen channel type for the reach (00=No Multiple channels); % Primary channel type=% of units that were listed as the primary channel type; Secondary channel type=second most commonly seen channel type for the reach; % Secondary channel type=% of units that were listed as the secondary channel type.
[a] Not available for this reach because this data is only collected every tenth unit.

Table 5. (Cont.) Reach summaries (in meters unless otherwise noted) for East Little Walla Walla, 2004.

Reach 3 (Forks To Stateline on Big Spring Branch)									
# of units	**Length**	**Area (m^2)**	**Primary Channel Type[a]**	**% Primary Cannel Type[a]**	**Secondary Cannel Type[a]**	**% Secondary Cannel Type[a]**	**# of LWD**	**# of LWD/100m**	
7	515.6	2787.81	00	100			2	0.39	
Avg. BFW	**Min. BFW**	**Max. BFW**	**SD BFW**	**Avg. BFD**	**Min. BFD**	**Max. BFD**	**SD BFD**	**Avg. Embeddedness**	**Avg. Spawning Area Fines**
4.3	4.3	4.3	0	0.55	0.50	0.60	0.035	2	0
Avg. Shade	**Avg. % Eroding Bank**	**Avg. Undercut Bank**	**Avg. % Man-made Confinement**	**Avg. % Natural Confinement**	**Avg. Gradient (%)**	**Min. Gradient (%)**	**Max. Gradient (%)**	**SD Gradient (%)**	
0	100	0	0	3					
Pool Summaries for Reach 3									
# of Units	**Length**	**% of Total Length**	**Area (m^2)**	**% of Total Area**	**Avg. Pool Crest Depth**	**Avg. Pool Quality**	**Min. Pool Quality**	**Max. Pool Quality**	**SD Pool Quality**
1	18.9	3.7	177.66	6.4	0.6	5	5	5	0
Riffle Summaries for Reach 3									
# of Units	**Length**	**% of Total Length**	**Area (m^2)**	**% of Total Area**					
3	133.7	25.9	574.95	20.6					
Run Summaries for Reach 3									
# of Units	**Length**	**% of Total Length**	**Area (m^2)**	**% of Total Area**					
3	363.0	70.4	2035.21	73.0					

[a] Primary channel type=most commonly seen channel type for the reach (00=No Multiple channels); % Primary channel type=% of units that were listed as the primary channel type; Secondary channel type=second most commonly seen channel type for the reach; % Secondary channel type=% of units that were listed as the secondary channel type.

Table 6. Length and width summaries (in meters) by unit and reach for Titus Creek, 2004.

Reach[a]	Unit	Unit Type[b]	Unit Length	Avg. Depth	Min. Depth	Max. Depth	SD Depth	Avg. Width	Min. Width	Max. Width	SD Width	Area[c]	Notes: diversions, barriers, etc.
1	1	RU	227.7	0.50	0.39	0.60	0.086	5.10	4.10	6.60	1.080	1161.27	Culvert at bottom, passable
1	2	BP	65.0	1.32	1.00	1.50	0.181	13.93	12.10	16.50	1.686	905.13	
1	3	RU	25.0	0.52	0.43	0.60	0.072	5.28	4.40	6.30	0.708	131.88	
1	4	BP	32.0	0.54	0.39	0.89	0.183	14.33	8.70	27.00	7.390	458.40	
1	5	Concrete Pond	42.4	0.30	0.30	0.30	0.000	12.75	12.50	13.00	0.250	540.60	In channel concrete pond at Walla Walla Community College
1	6	DP	15.58	0.55	0.45	0.62	0.067	4.18	2.80	6.10	1.207	64.71	
1	7	RU	149.0	0.40	0.30	0.52	0.094	3.13	2.50	3.70	0.438	465.63	2 culverts side-by-side, passable
1	8	RU	35.6	0.31	0.25	0.37	0.042	1.70	1.60	1.80	0.100	60.52	
1	9	RU	481.9	0.41	0.10	0.70	0.229	3.25	1.70	4.60	1.128	1566.18	
1	10	RI	148.6	0.19	0.15	0.25	0.037	2.35	1.70	4.10	1.014	349.21	Concrete culvert, passable
1	11	DP	43.6	0.94	0.50	1.40	0.301	6.20	4.10	8.20	1.629	270.32	
1	12	RU	26.8	0.31	0.25	0.40	0.049	4.78	4.30	5.20	0.383	127.97	
1	13	RI	11.3	0.22	0.15	0.30	0.058	4.03	2.00	5.10	1.213	45.48	
1	14	RU	64.8	0.38	0.20	0.53	0.132	3.15	2.00	4.50	1.001	204.12	
1	15	RI	48.1	0.25	0.15	0.40	0.105	2.85	2.40	4.00	0.669	137.09	
1	16	RU	191.1	0.44	0.20	0.53	0.121	3.40	1.20	6.10	1.851	649.74	Several sections of concrete culvert with some gaps, possible passage problem

[a] Reach 1(Mouth at WWCC to Diversion above Five Mile Rd.), Reach 2 (Mouth above Five Mile Rd. to Diversion above Five Mile Rd.)
[b] RU=Run, BP=Beaver Pool, DP=Dam Pool, RI=Riffle
[c] Area was calculated off original formulas so may not match if multiplying length and average width on this page.

Table 6. (Cont.) Length and width summaries (in meters) by unit and reach for Titus Creek, 2004.													
Reach[a]	Unit	Unit Type[b]	Unit Length	Avg. Depth	Min. Depth	Max. Depth	SD Depth	Avg. Width	Min. Width	Max. Width	SD Width	Area[c]	Notes: diversions, barriers, etc.
1	17	RI	100.3	0.24	0.15	0.30	0.058	2.33	1.60	3.20	0.572	233.20	
1	18	RU	211.8	0.31	0.20	0.43	0.088	2.63	0.50	3.80	1.262	555.98	2 culverts; one steel pipe not a fish barrier, one metal culvert very steep with little water appears to be total fish barrier.
1	19	DP	26.7	0.00?	0.00?	0.00?	0.000?	8.70	0.50	18.00	6.348	232.29	Very large almost a small pond, no depths taken
1	20	RU	470.0	0.32	0.23	0.45	0.077	4.08	2.00	6.30	1.580	1915.25	Culvert, passable
1	21	RI	53.5	0.29	0.20	0.40	0.072	2.33	2.00	2.60	0.217	124.39	Culvert at Rooks Park Rd, passable
1	22	RU	197.9	0.39	0.30	0.45	0.058	1.38	0.90	2.40	0.597	272.11	4 culverts, all passable
1	23	RI	123.3	0.20	0.05	0.40	0.122	1.63	1.10	2.20	0.396	200.36	2 culverts side-by-side, possible passage problem
1	24	RU	125.0	0.64	0.40	0.80	0.132	1.28	0.80	1.70	0.349	159.38	Culvert, passable
1	25	RI	174.4	0.22	0.20	0.30	0.040	1.28	1.00	1.70	0.268	222.36	
1	26	RU	224.8	0.47	0.30	0.70	0.133	2.08	1.70	2.60	0.390	466.46	3 culverts, all passable
1	27	RI	76.3	0.24	0.15	0.30	0.057	1.58	0.90	2.20	1.466	120.17	
1	28	RU	206.0	0.52	0.30	0.65	0.127	0.88	0.80	0.90	0.043	180.25	2 culverts, all passable
1	29	RU	466.2	0.44	0.20	0.80	0.206	1.80	1.00	3.00	0.787	839.16	2 culverts, all passable
1	30	RI	8.7	0.27	0.10	0.40	0.117	1.95	1.20	3.00	0.669	16.97	

[a] Reach 1(Mouth at WWCC to Diversion above Five Mile Rd.), Reach 2 (Mouth above Five Mile Rd. to Diversion above Five Mile Rd.)
[b] RU=Run, BP=Beaver Pool, DP=Dam Pool, RI=Riffle
[c] Area was calculated off original formulas so may not match if multiplying length and average width on this page.

Table 6. (Cont.) Length and width summaries (in meters) by unit and reach for Titus Creek, 2004.

Reach[a]	Unit	Unit Type[b]	Unit Length	Avg. Depth	Min. Depth	Max. Depth	SD Depth	Avg. Width	Min. Width	Max. Width	SD Width	Area[c]	Notes: diversions, barriers, etc.
1	31	RU	186.7	0.30	0.20	0.35	0.055	2.08	1.40	2.90	0.536	387.40	
1	32	RU	101.9	0.21	0.10	0.40	0.102	2.65	2.00	3.10	0.415	270.04	
Totals	**32**		**4361.9**	**0.40**	**0.00?**	**1.5**	**0.264**	**4.02**	**0.50**	**27.00**	**4.014**	**13,333.99**	
2	1	RU	25.0	0.41	0.28	0.61	0.127	5.50	4.40	7.10	.992	137.50	
2	2	DP	24.0	0.75	0.45	1.10	0.248	5.00	2.70	6.30	1.369	120.00	
2	3	RI	35.5	0.36	0.24	0.47	0.097	3.58	2.70	4.60	0.676	126.91	
2	4	DP	16.1	0.71	0.42	1.10	0.228	4.95	3.50	5.90	0.887	79.70	
2	5	RU	12.3	0.60	0.45	0.73	0.107	4.38	3.90	5.10	0.455	53.81	
2	6	RI	43.0	0.26	0.19	0.35	0.058	4.55	3.30	5.90	1.014	195.65	
2	7	RU	27.1	0.40	0.38	0.45	0.030	4.28	3.20	5.90	1.033	115.85	
2	8	RI	104.3	0.29	0.20	0.60	0.154	4.20	3.20	4.80	0.604	438.06	
Totals	**8**		**287.3**	**0.47**	**0.19**	**1.10**	**0.231**	**4.55**	**2.70**	**7.10**	**1.073**	**1267.48**	

[a] Reach 1(Mouth at WWCC to Diversion above Five Mile Rd.), Reach 2 (Mouth above Five Mile Rd. to Diversion above Five Mile Rd.)
[b] RU=Run, BP=Beaver Pool, DP=Dam Pool, RI=Riffle
[c] Area was calculated off original formulas so may not match if multiplying length and average width on this page.

Table 7. Reach summaries (in meters unless otherwise noted) for Titus Creek, 2004.

Reach 1 (Mouth at WWCC to Diversion above Five Mile Rd.)									
# of units	**Length**	**Area (m^2)**	**Primary Channel Type[a]**	**% Primary Cannel Type[a]**	**Secondary Cannel Type[a]**	**% Secondary Cannel Type[a]**	**# of LWD**	**# of LWD/100m**	
32	4,361.9	13,333.99	00	100			92	0.021	
Avg. BFW	**Min. BFW**	**Max. BFW**	**SD BFW**	**Avg. BFD**	**Min. BFD**	**Max. BFD**	**SD BFD**	**Avg. Embeddedness**	**Avg. Spawning Area Fines**
5.2	4.9	5.4	0.216	0.45	0.25	0.60	0.109	2.89	N/A
Avg. Shade (°)	**Avg. % Eroding Bank**	**Avg. % Undercut Bank**	**Avg. % Man-made Confinement**	**Avg. % Natural Confinement**	**Avg. Gradient (%)**	**Min. Gradient (%)**	**Max. Gradient (%)**	**SD Gradient (%)**	
14	10	0.0	16.67	3	1.53	0.10	2.50	1.034	
Pool Summaries for Reach 1									
# of Units	**Length**	**% of Total Length**	**Area (m^2)**	**% of Total Area**	**Avg. Pool Crest Depth**	**Avg. Pool Quality**	**Min. Pool Quality**	**Max. Pool Quality**	**SD Pool Quality**
5	182.8	4.19	1,930.85	14.48	0.25[b]	4.0[c]	3.0[c]	5.0[c]	1.000[c]
Riffle Summaries for Reach 1									
# of Units	**Length**	**% of Total Length**	**Area (m^2)**	**% of Total Area**					
9	744.5	17.07	1,449.22	10.87					
Run Summaries for Reach 1									
# of Units	**Length**	**% of Total Length**	**Area (m^2)**	**% of Total Area**					
17	3,392.2	77.77	9,413.32	70.60					

[a] Primary channel type=most commonly seen channel type for the reach (00=No Multiple channels); % Primary channel type=% of units that were listed as the primary channel type; Secondary channel type=second most commonly seen channel type for the reach; % Secondary channel type=% of units that were listed as the secondary channel type.
[b] Pool Crest depth only recorded on 1 pool
[c] Pool Quality only recorded on 2 of the 5 pools

Table 7. (Cont.) Reach summaries (in meters unless otherwise noted) for Titus Creek, 2004.									
Reach 2 (Mouth above Five Mile Rd. to Diversion above Five Mile Rd.)									
# of units	**Length**	**Area (m^2)**	**Primary Channel Type[a]**	**% Primary Cannel Type[a]**	**Secondary Cannel Type[a]**	**% Secondary Cannel Type[a]**	**# of LWD**	**# of LWD/100m**	
8	287.3	1,267.48	00	100			41	0.143	
Avg. BFW	**Min. BFW**	**Max. BFW**	**SD BFW**	**Avg. BFD**	**Min. BFD**	**Max. BFD**	**SD BFD**	**Avg. Embeddedness**	**Avg. Spawning Area Fines**
N/A[d]	N/A[d]	N/A[d]	N/A[d]	N/A[d]	N/A[d]	N/A[d]	N/A[d]	N/A[d]	
Avg. Shade	**Avg. % Eroding Bank**	**Avg. % Undercut Bank**	**Avg. % Man-made Confinement**	**Avg. % Natural Confinement**	**Avg. Gradient (%)**	**Min. Gradient (%)**	**Max. Gradient (%)**	**SD Gradient (%)**	
N/A[d]	N/A[d]	N/A[d]	N/A[d]	N/A[d]	N/A[d]	N/A[d]	N/A[d]	N/A[d]	
Pool Summaries for Reach 2									
# of Units	**Length**	**% of Total Length**	**Area (m^2)**	**% of Total Area**	**Avg. Pool Crest Depth**	**Avg. Pool Quality**	**Min. Pool Quality**	**Max. Pool Quality**	**SD Pool Quality**
2	40.1	13.96	199.70	15.76	.16	5.0	5.0	5.0	0.000
Riffle Summaries for Reach 2									
# of Units	**Length**	**% of Total Length**	**Area (m^2)**	**% of Total Area**					
3	182.8	63.63	760.62	60.01					
Run Summaries for Reach 2									
# of Units	**Length**	**% of Total Length**	**Area (m^2)**	**% of Total Area**					
3	64.4	22.42	307.17	24.23					

[a] Primary channel type=most commonly seen channel type for the reach (00=No Multiple channels); % Primary channel type=% of units that were listed as the primary channel type; Secondary channel type=second most commonly seen channel type for the reach; % Secondary channel type=% of units that were listed as the secondary channel type.
[d] Not available for this reach because this data is only collected every tenth unit.

Fish Stock Assessment

Distribution and Abundance

Densities of five salmonid species were calculated from quantitative electrofishing sites in the Walla Walla Basin (Table 8 and 9). Adult rainbow trout densities represent wild or unknown origin trout unless noted. Identified salmonid species included: rainbow/steelhead trout, bull trout, mountain whitefish, brown trout and chinook salmon. Other data collected by the WDFW Snake River Lab, that used to be included in our report will appear in their annual report (eg. see Bumgarner et al. 2004).

Rainbow/steelhead trout represent the most common salmonid found in the Walla Walla Basin. Age 0+ rainbow/steelhead densities are typically higher than for older age classes for most sites. Age 1+ rainbow/steelhead trout predominated in the following sites; Whitney Ck (WH-1, 2, 3, 4), Touchet River (TR-11, 15), South Fork Coppei (SFC-2, 3, 4), North Fork Coppei (NFC-1, 2, 3, 4), Coppei Creek (CO-1), Mill Creek (MC-2), Titus Creek (TC-2), and Dry Creek (DRC-6, 8, 9). Large or "legal sized" (≥8 in.) rainbow trout were found in very low densities throughout the basin. The numbers of age 0+ steelhead found in the mainstem Walla Walla River suggests that spawning is commonly occuring within the Washington portion of the river (Table 9).

Other salmonid species had a limited distribution (Table 8, 9, and 10). Bull trout distribution was greatest in the North Fork and the Wolf Fork of the Touchet River. Low densities of bull trout were found in Green Fly, and Mill Creek. Juvenile chinook salmon were only found in low densities in the Walla Walla River (WW-2, 4, 5, 8, 13). The presence of chinook salmon in Walla Walla system is primarily associated with the outplanting of adult spring chinook in late summer of 2003. These fish were released by the CTUIR and allowed to spawn freely in the upper portion of Mill Creek, and the Walla Walla River (CTUIR 2003). We have documented few whitefish in all our sampling efforts in 2004 or previous years.

Electrofishing

Quantitative Electrofishing

Quantitative electrofishing was conducted on three streams in the Walla Walla Basin from late July through the end of August and produced densities of rainbow/steelhead trout ranging from 0 to 48.1 fish per 100 m^2 (Figure 8 and Table 8). Sub-yearling (Age 0+) trout were the most abundant age class at sites in the mainstem and lower reaches. Yearling (Age 1+) rainbow/steelhead were most abundant in tributaries and upper mainstem, with densities between 0 and 24.7 fish per 100 m^2 (Table 8). Adult (≥8 in.) rainbow/steelhead were found in lower densities ranging from 0 to 3.6 fish per 100 m^2. Densities of bull trout ranged from 0 to 1.2 with sub-yearling and yearling age classes each dominating about half of the sites. One adult (≥8 in.) mountain whitefish was seen at a site on upper Mill Ck (Table 8).

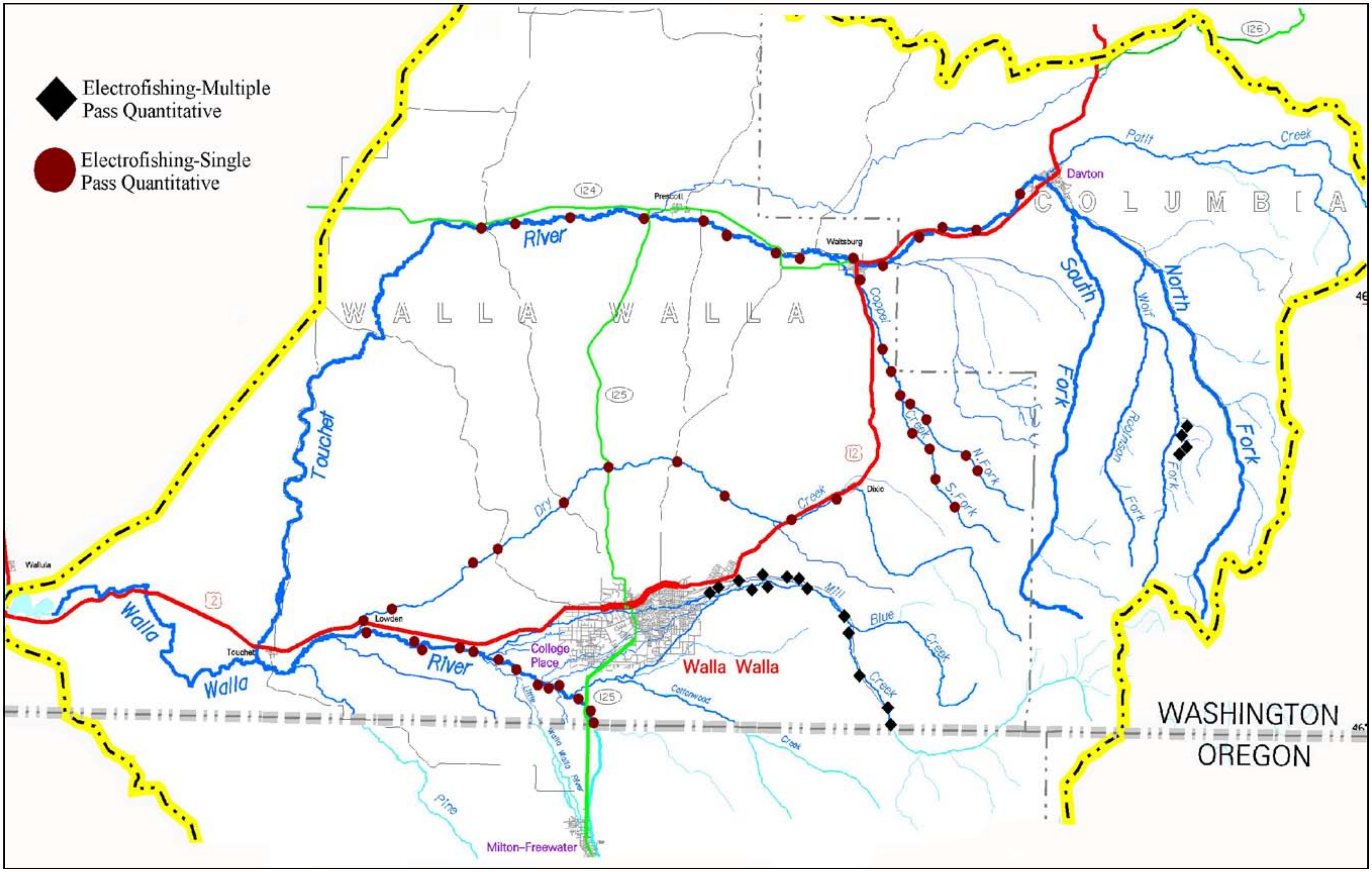

Figure 8. Relative locations of WDFW quantitative electrofishing sites in the Walla Walla basin, 2004.

Whitney Creek was sampled below the Forest Service line for the first time in 2004, to collect baseline stream information and fish distribution. WDFW has been denied access from the landowners for several years to sample this section. The abundance of sub-yearling (Age 0+) rainbow/steelhead trout suggest that some spawning may occur in this section, while the high numbers of yearling (Age 1+) rainbow/steelhead trout show that this provides good rearing habitat also. No bull trout or other salmonids were seen during these surveys (Table 8).

We continued multiple pass sampling on Mill Creek sites in 2004, because we have several years prior to this that were surveyed in this manner. This allows comparison of sections from year to year (Table 9). This population appears to be stable with relatively similar densities in the two sections from the Stateline to Bennington Dam. Densities of sub-yearling and yearling rainbow/steelhead trout indicate that spawning and rearing occurs throughout this section of Mill Creek (Table 8).

Emphasis was placed on Titus Creek in 2004, because little data exists on this creek and there have been questions by interested parties on how to manage this system. Some of the options considered for management include; screen off the entire creek as an irrigation ditch or leave the upper area for rearing and screen off the area below (or just above) Five Mile Rd. Above Five Mile Rd. densities are high enough that the area clearly has value for salmonid rearing and production. While densities were good above Five Mile Rd. further monitoring of the area is needed, because we moved fish captured during the Mill Creek flood channel salvage into this area and may have biased the sampling results for this year(Table 8).

Table 8. Densities of salmonids from multiple pass quantitative electrofishing sites in the Walla Walla Basin, summer 2004.

Stream Reach Site Name	Date (mm/dd)	Site Length (m)	Mean Width (m)	Area (m^2)	Densities (#/100 m^2) rainbow/steelhead Age/Size 0+	1+	≥8 in	Total	Other Species[a]	Age/Size 0+	1+	≥8 in
Whitney Creek												
WH-1	8/23	40.0	2.62	104.8	10.5	21.0	0.0	31.5				
WH-2	8/23	30.0	3.36	100.8	6.0	20.8	0.0	26.8				
WH-3	8/23	30.0	2.70	81.0	4.9	24.7	0.0	29.6				
WH-4	8/23	38.0	2.98	113.2	8.8	23.0	0.0	31.8				
Mill Creek												
Section 1–Stateline to above Blue Creek mouth												
MC-1	8/3	30.0	12.36	370.8	15.1	5.1	0.0	20.2	BT	0.0	0.8	0.0
MC-2	8/11	86.0	14.72	1265.9	6.7	8.1	0.0	14.8	BT	0.0	0.1	0.3
									MTW	0.0	0.0	0.1
MC-3	8/3	53.0	9.32	494.0	15.6	11.7	0.8	28.1	BT	0.0	0.4	1.2
MC-4	8/4	53.0	11.08	587.2	12.1[b]	5.6[b]	1.5[b]	19.2	BT	0.0	1.2[b]	0.5[b]
									WCH	0.0	0.2	0.0
Average Density					**12.38**	**7.63**	**0.56**	**20.58**				
Standard Deviation					**3.54**	**2.61**	**0.63**	**4.80**				
Section 2–Blue Creek mouth to Bennington Dam												
MC-5[c]	8/4	30.0	11.04	331.2	6.6	4.2	1.2	12.0				
MC-7	8/12	36.0	11.40	410.4	22.9[b]	3.7	0.2	26.8				
MC-9	8/3	30.0	9.16	274.8	26.2	9.8	0.7	36.7				
MC-10	8/12	46.0	7.34	337.6	32.6	11.9	3.6	48.1				
Average Density					**22.08**	**7.40**	**1.43**	**30.90**				
Standard Deviation					**9.59**	**3.53**	**1.30**	**13.26**				
Titus Creek[d]												
Section 1–Above Five Mile Rd.												
TC-1	8/5	52.0	3.74	194.5	14.4	10.3[b]	0.0	24.7				
TC-2	7/30	30.0	4.98	149.4	5.4	6.7	0.7	12.8				
Average Density					**9.90**	**8.50**	**0.35**	**18.75**				
Standard Deviation					**4.50**	**1.80**	**0.35**	**5.95**				
Section 2–Below Five Mile Rd.												
TC-6	8/5	31.0	1.74	53.9	13.0	0.0	0.0	13.0				
TC-8[e]	8/5	30.0	1.58	47.4	0.0	0.0	0.0	0.0				
TC-9[e]	7/30	30.0	4.50	135.0	0.0	0.0	0.0	0.0				
TC-10[e]	7/30	27.0	4.40	118.8	0.0	0.0	0.0	0.0				
Average Density					**3.25**	**0.00**	**0.00**	**3.25**				
Standard Deviation					**5.63**	**0.00**	**0.00**	**5.63**				

[a] BT=bull trout, MTW=mountain whitefish
[b] Calculated using the sum of the passes, due to poor reduction between successive passes.
[c] Calculated using the sum of the passes, due to processing error.
[d] High numbers of fish in Titus Creek above Five Mile Rd. may have been influenced by the salvage conducted in the Mill Creek flood channel, because this was our drop off point for those fish.
[e] Only one pass completed due to no salmonids being found.

Table 9. Comparison of summer rainbow/steelhead densities (fish/100 m^2) in Mill Creek between the Stateline and Bennington Dam from 2001 through 2004.

Year/ Reach	Mean Density	Standard Deviation	# of sites	Densities per Site (fish/100 m^2)	Other Salmonids Present
2001					
Stateline to Blue Creek mouth	33.5	0.00	1	33.5	bull trout and chinook
Blue Creek mouth to Bennington Dam	29.15	3.45	2	32.6, 25.7	whitefish and chinook
2002					
Stateline to Blue Creek mouth	18.30	10.94	5[a]	16.3, 10.0, 39.1, 17.4, 8.7	bull trout and chinook
Blue Creek mouth to Bennington Dam	23.42	9.66	5[b]	33.3, 37.0, 15.2, 15.3, 16.3	bull trout, whitefish, and chinook
2003					
Stateline to Blue Creek mouth	28.68	3.68	4	27.0, 24.5, 34.5, 28.7	bull trout and chinook
Blue Creek mouth to Bennington Dam	30.37	12.98	3	14.5, 46.3, 30.3	chinook
2004					
Stateline to Blue Creek mouth	20.58	4.80	4	20.2, 14.8, 28.1, 19.2	bull trout and whitefish
Blue Creek mouth to Bennington Dam	30.90	13.26	4	12.0, 26.8, 36.7, 48.1	none

[a] Four actual sites were surveyed, but one was done twice.
[b] Three actual sites were surveyed, but two were done twice.

Single Pass Quantitative Electrofishing

Single pass quantitative electrofishing was added as a new technique this year. We used this method on six streams in the Walla Walla Basin in 2004 to compare relative densities by stream reach for data collected from large sample sites (Figure 8). Surveys were conducted from early July through early September producing densities of rainbow/steelhead trout from 0 to 98.3 (Table 10). Sub-yearling (Age 0+) trout again dominated the mainstem and lower reaches, while yearling (Age 1+) rainbow/steelhead were most abundant in tributaries and upper mainstem, with densities between 0 and 41.2 fish per 100 m^2 (Table 10). Adult (≥8 in.) rainbow/steelhead were found in low densities ranging from 0 to 1.1 fish per 100 m^2. Low densities of chinook were seen at several sites in the Walla Walla River, and brown trout and mountain whitefish were found at one site each in the Touchet River.

Note that densities of rainbow/steelhead trout in the Touchet River decrease noticably in each downstream reach compared to the adjacent upstream reach. Very few rainbow/steelhead and no other salmonid species were found in the reaches below Waitsburg (Table 10).

The South Fork Coppei Creek contained the highest densities within the Coppei Creek watershed, but all reaches contained rainbow/steelhead densities in excess of 20 fish/100m^2 and each area contained young of the year fish (Table 10).

Similar trends were seen in the Walla Walla River and Dry Creek as were seen in the Touchet River. In the Walla Walla (within Washington) the highest densities are just below the stateline and extend down to McDonald Rd. with very few salmonids of any kind below this point. Dry Creek had high densities of rainbow/steelhead trout just below Dixie and then numbers decreased moving downstream, and at the bottom site at Highway 12 at Lowden no salmonids were found (Table 10).

Table 10. Densities of salmonids from single pass quantitiative electrofishing sites in the Walla Walla basin, summer 2004.

Stream Reach	Date	Site Length	Mean Width	Area	Densities (#/100 m²) rainbow/steelhead Age/Size					Age/Size		
Site Name	(mm/dd)	(m)	(m)	(m²)	0+	1+	≥8 in	Total	Other Species[a]	0+	1+	≥8 in
Touchet River												
Section 1–Dayton to Main Street Bridge in Waitsburg												
TR-3	8/24	123.0	13.85	1703.5	4.8	2.1	0.4	7.3	BRT	0.1	0.0	0.0
TR-4	8/27	90.0	11.68	1051.2	5.5	1.3	0.5	7.3				
TR-5	8/24	110.0	12.80	1408.0	12.1	1.9	0.3	14.3				
TR-6	8/26	100.0	12.62	1262.0	4.0	0.5	0.3	4.8				
TR-7	9/2	100.0	14.00	1400.0	1.0	0.1	0.5	1.6	MTW	0.0	0.1	0.0
Average Density					**5.48**	**1.18**	**0.4**	**7.06**				
Standard Deviation					**3.65**	**0.78**	**0.09**	**4.18**				
Section 2–Main Street Bridge in Waitsburg to Prescott												
TR-8	9/1	120.0	11.56	1387.2	0.8	0.8	0.0	1.6				
TR-9	9/2	155.0	14.54	2253.7	0.8	0.5	0.0	1.3				
TR-11	9/1	120.0	12.94	1552.8	0.3	0.5	0.1	0.9				
TR-12	9/1	110.0	11.52	1287.2	0.1	0.1	0.0	0.2				
TR-13	9/1	118.0	15.10	1781.8	0.1	0.1	0.0	0.2				
Average Density					**0.42**	**0.40**	**0.02**	**0.84**				
Standard Deviation					**0.32**	**0.27**	**0.04**	**0.57**				
Section 3–Below Prescott												
TR-14	9/9	100.0	15.40	1540.0	0.0	0.0	0.0	0.0				
TR-15	9/2	90.0	11.22	1009.8	0.0	0.2	0.0	0.2				
TR-16	9/9	110.0	10.02	1102.2	0.0	0.0	0.0	0.0				
TR-17	9/9	100.0	16.36	1636.0	0.0	0.0	0.0	0.0				
Average Density					**0.00**	**0.05**	**0.00**	**0.05**				
Standard Deviation					**0.00**	**0.09**	**0.00**	**0.09**				
SF Coppei												
SFC-1	7/13	100.0	4.30	430.0	6.5	5.1	0.0	11.6				
SFC-2	7/14	110.0	2.12	233.2	12.9	41.2	0.0	54.1				
SFC-3	7/14	111.0	2.76	306.4	6.9	22.2	0.0	29.1				
SFC-4	7/15	104.0	0.9	91.5	25.1	72.1	1.1	98.3				
Average Density					**12.85**	**35.15**	**0.28**	**48.28**				
Standard Deviation					**7.51**	**24.86**	**0.48**	**32.59**				
NF Coppei												
NFC-1	7/16	130.0	1.93	250.9	0.4	18.3	0.8	19.5				
NFC-2	7/12	100.0	2.58	258.0	5.0	8.1	0.0	13.1				
NFC-3	7/15	104.0	2.82	293.3	13.0	27.3	0.0	40.3				
NFC-4	7/12	100.0	2.87	287.0	8.4	13.6	0.0	22.0				
Average Density					**6.70**	**16.83**	**0.20**	**23.73**				
Standard Deviation					**4.61**	**7.04**	**0.35**	**10.11**				
Coppei Creek												
CO-1	7/15	115.0	2.52	289.8	16.6	31.4	0.0	48.0				
CO-2	7/13	100.0	4.73	473.0	12.3	9.5	0.0	21.8				
CO-3	7/12	100.0	3.65	365.0	8.2	5.8	0.0	14.0				
CO-4	7/13	100.0	3.56	356.0	11.5	5.6	0.0	17.1				
Average Density					**12.15**	**13.08**	**0.00**	**25.23**				
Standard Deviation					**2.99**	**10.69**	**0.00**	**13.44**				

[a] BRT=brown trout, MTW=mountain whitefish, WCH=wild chinookReach

Table 10. (Cont.) Densities of salmonids from single pass quantitiative electrofishing sites in the Walla Walla basin, summer 2004.

Stream Reach / Site Name	Date (mm/dd)	Site Length (m)	Mean Width (m)	Area (m^2)	Densities (#/100 m^2) rainbow/steelhead Age/Size 0+	1+	≥8 in	Total	Other Species[a]	Age/Size 0+	1+	≥8 in
Walla Walla River												
Section 1–Stateline to Mojonnier Rd.												
WW-2	7/21	100.0	6.31	631.0	6.7	2.4	0.2	9.3	WCH	1.1	0.0	0.0
WW-4	7/22	100.0	16.10	1610.0	3.4	0.4	0.0	3.8	WCH	0.1	0.0	0.0
WW-5	7/28	103.0	9.33	961.0	7.2	0.9	0.0	8.1	WCH	0.0	0.1	0.0
WW-6	7/22	136.0	14.20	1931.2	1.6	0.2	0.2	2.0				
WW-7	7/27	163.0	14.62	2383.1	1.1	0.2	0.0	1.3				
Average Density					**4.00**	**0.82**	**0.08**	**4.90**				
Standard Deviation					**2.53**	**0.83**	**0.10**	**3.23**				
Section 2–Mojonnier Rd. to McDonald Rd.												
WW-8	7/29	100.0	13.09	1309.0	1.2	0.2	0.2	1.6	WCH	0.1	0.0	0.0
WW-9	7/27	125.0	11.87	1483.8	1.7	0.3	0.0	2.0				
WW-10	7/20	146.0	11.95	1744.7	2.9	0.3	0.1	3.3				
WW-11	7/21	100.0	14.19	1419.0	1.1	0.1	0.0	1.2				
WW-12	7/29	100.0	12.24	1224.0	1.0	0.0	0.0	1.0				
WW-13	7/20	94.0	11.85	1113.9	1.2	0.4	0.0	1.6	WCH	0.1	0.0	0.0
Average Density					**1.52**	**0.22**	**0.05**	**1.78**				
Standard Deviation					**0.66**	**0.13**	**0.08**	**0.75**				
Section 3–McDonald Rd. to Lowden Gardeña Rd.												
WW-14	7/29	153.0	10.01	1531.5	0.0	0.0	0.0	0.0				
WW-15	7/28	196.0	10.69	2095.2	0.1	0.0	0.0	0.1				
Average Density					**0.05**	**0.00**	**0.00**	**0.05**				
Standard Deviation					**0.05**	**0.00**	**0.00**	**0.05**				
Dry Creek												
Section 1–Dixie to Middle Waitsburg Rd.												
DRC-2	7/6	80.2	3.90	312.8	19.5	13.1	0.0	32.6				
DRC-3	7/6	104.0	4.20	436.8	19.2	4.4	0.0	23.6				
DRC-4	7/7	110.0	5.20	572.0	4.4	3.5	0.0	7.9				
Average Density					**14.37**	**7.00**	**0.00**	**21.37**				
Standard Deviation					**7.05**	**4.33**	**0.00**	**10.21**				
Section 2–Middle Waitsburg Rd. to Harvey Shaw Rd.												
DRC-5	7/6	100.0	5.00	500.0	2.4	2.0	0.0	4.4				
DRC-6	7/8	100.0	3.00	300.0	1.0	2.7	0.0	3.7				
DRC-7	7/8	100.0	4.00	400.0	0.3	0.3	0.0	0.6				
Average Density					**1.23**	**1.67**	**0.00**	**2.90**				
Standard Deviation					**0.87**	**1.01**	**0.00**	**1.65**				
Section 3–Harvey Shaw Rd. to Mouth												
DRC-8	7/8	100.0	3.00	300.0	0.3	0.7	0.0	1.0				
DRC-9	7/7	72.0	3.10	223.2	0.0	0.9	0.0	0.9				
DRC-10	7/7	50.0	2.80	140.0	1.4	1.4	0.0	2.8				
DRC-11	7/7	50.0	4.90	245.0	0.0	0.0	0.0	0.0				
Average Density					**0.43**	**0.75**	**0.00**	**1.18**				
Standard Deviation					**0.58**	**0.50**	**0.00**	**1.02**				

[a] BRT=brown trout, MTW=mountain whitefish, WCH=wild chinook

Qualitative Electrofishing

Qualitative electrofishing surveys were conducted on 16 streams within the Walla Walla Basin in 2004 (Figure 9). Surveys were started in early April and ran through late August. The surveys in April were to determine fish distribution and abundance in streams that go completely or partially dry during summer months when most of the electrofishing surveys are usually conducted (Table 11). The qualitative surveys during the summer months were used to supplement the more intensive quantitative electrofishing surveys, to examine areas where quantitative surveys may not be feasible, and to assess streams where fish presence or use has little or no documentation.

Qualitative surveys on the North Fork Touchet (NFT-2, 3, 4, 5) and Wolf Fork (WF-1, 2, 3) were conducted to collect DNA samples from bull trout (Table 11). Tate Creek, Green Fly, Whitney Creek, and Robinson Fork, all tributaries to the Wolf Fork, were surveyed in 2004. Tate Creek was surveyed to determine presence or absence of salmonids above a barrier culvert that was later removed, and Green Fly was surveyed for species abundance and distribution. Whitney Creek and one of its tributaries, Spoonamore Canyon, were surveyed for fish distribution and abundance. Upper Robinson Fork (above RM 6.0) and one of its tributaries were surveyed to determine presence/absence of bull trout, and distribution and abundance of other salmonids. No bull trout were seen during the surveys on upper Robinson Fork.

Hatley Gulch, a tributary of the North Fork Touchet, was surveyed for the second straight year in 2004. In 2003 (Mendel et. al, 2004), we found high numbers of yearling (Age 1+) rainbow/steelhead trout in April showing that this small perenial stream has value for rearing in early spring. In 2004, we surveyed in June to see what fish distribution and abundance was and no salmonids were found.

Whiskey Creek and the Alyward Trib, a tributary of Whiskey Creek, were surveyed again in 2004. These streams were surveyed to continue monitoring of this system after a barrier dam was modified near the mouth of Whiskey Creek. These streams were surveyed both in the spring and summer, because water is limited during summer months. This was the first time that we have found salmonids in the Alyward Trib.

East Little Walla Walla, Big Spring Branch, and West Little Walla Walla are ongoing monitoring efforts to determine fish use and distribution in the Little Walla Walla System. Monitoring of this system will help to guide future management of the system.

A couple of qualitative sites were sampled on Titus Creek to supplement the density data. As described in the quantitative electrofishing section emphasis was placed on Titus Creek to collect baseline data and to guide future management of this creek.

One site was sampled on Mud Creek (a tributary of lower Dry Creek), to check for the presence of salmonids, since salmonids were found in Dry Creek in that area. No salmonids were found in our survey.

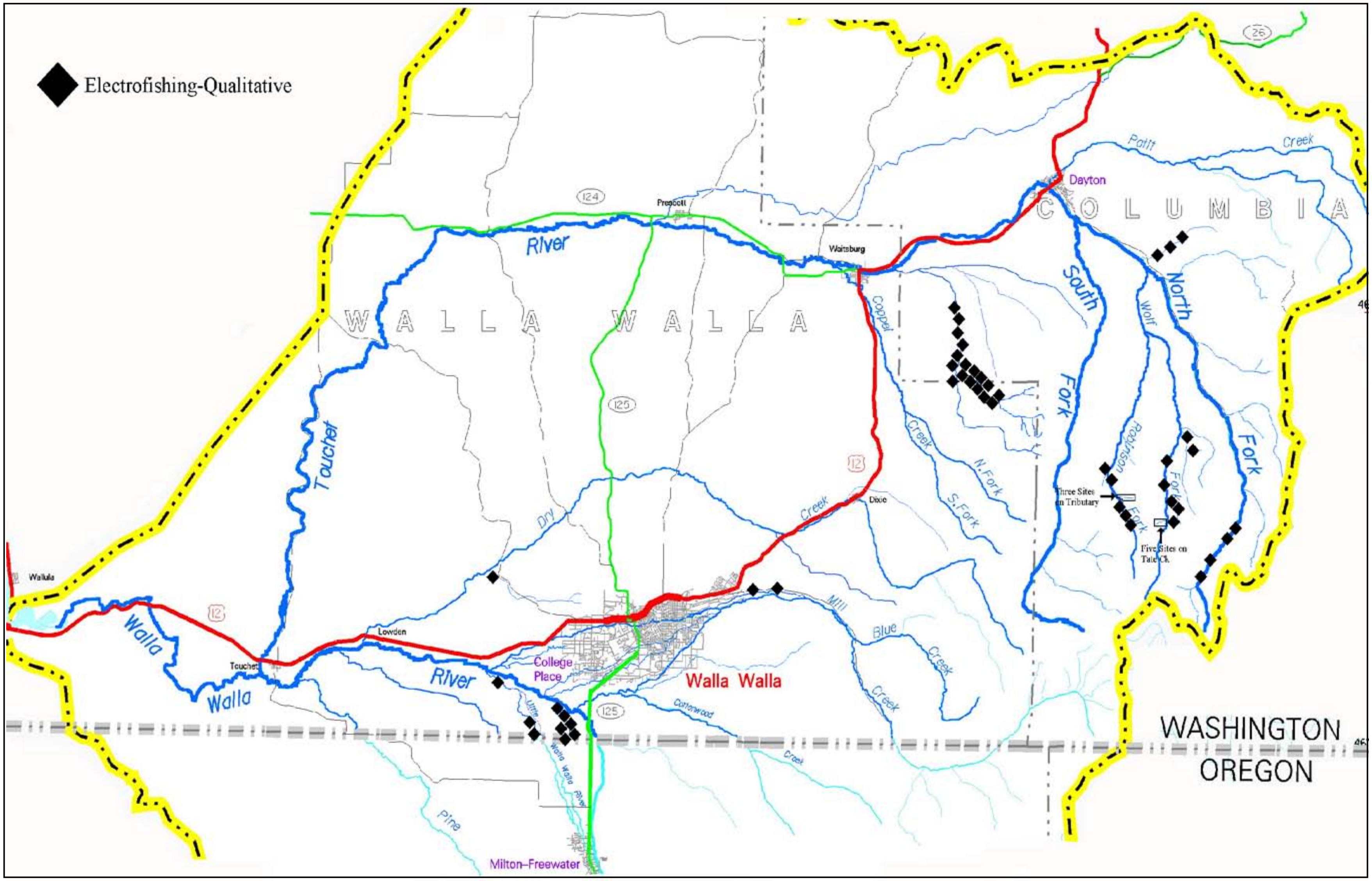

Figure 9. Relative locations of WDFW qualitative electrofishing sites in the Walla Walla basin, 2004.

Table 11. Relative abundance of fish from qualitative electrofishing sites in the Walla Walla River basin, 2004.

Stream	Site #	Date	Site Length	Average Width	Relative Abundance[a]	Comments
NF Touchet River	NFT-2 Sno-Park	8/9	150	5.0	One adult RBT[b] (208mm), two 0+ BT's (48-50mm), 26 1+ BT's (78-195mm), four adult BT's (208-405mm) found.	Moderate intensity
	NFT-3 1.1 miles below snow park	8/9	70	3.1	Three 1+ RBT's (176-199mm), one 0+ BT (45mm), 42 1+ Bt's (93-196mm) and one adult BT (200mm) found.	Moderate intensity
	NFT-4 0.3 miles above 2nd culvert	8/9	35	2.7	One 1+ RBT (162mm), one adult RBT (201mm), one 0+ BT (55mm), and 14 1+ BT's (96-150mm) found. SCP-rare	Low intensity survey
	NFT-5 Just below 2nd culvert	8/9	20	5.9	One 0+ BT (52mm) and one 1+ BT (113mm) found.	Low intensity survey
Wolf Fork	WF-1 Tate Ck	8/9	100	2.2	Five 0+ RBT's (62-89mm), 11 1+ RBT's (96-143mm), ten 0+ BT's (50-66mm), and eight 1+ BT's (105-150mm) found. TF-abundant	Moderate intensity
	WF-2 0.6miles below Green Fly Canyon	8/9	75	6.0	Five 0+ RBT's (69-83mm), eight 1+ RBT's (113-172mm), two adult RBT's (208-226mm[b]), five 0+ BT's (53-62mm) and 14 1+ BT's (95-165mm) found. SCP-rare	Moderate intensity
	WF-3 1.5 miles below Green Fly Canyon	8/9	120		Four 0+ BT's (62-72mm) and six 1+ BT's (113-122mm) found. SCP-common	Moderate intensity
Tate Creek	T-1 0.5 miles above mouth	6/14	20	1.0	No salmonids found. TF-common	Moderate intensity
	T-2 0.4 miles above mouth	6/14	15	0.8	No salmonids found. TF-common	Moderate intensity
	T-3 0.3 miles above mouth	6/14	20	0.7	No salmonids found. TF-common	Moderate intensity
	T-4 0.2 miles above mouth	6/14	15	0.5	No fish found.	Moderate intensity
	T-5 0.1 miles above mouth	6/14	20	0.3	No fish found.	Moderate intensity
Green Fly	GF-1 ~0.3 miles above mouth	8/17	35	2.3	Eight 1+ RBT's (70-110mm) found. TF-rare	Moderate intensity

[a] RBT=rainbow trout, BT=bull trout, MTW=mountain whitefish, TF=tailed frogs, SCP=sculpin, SD=speckled dace, CF=crayfish, BLS=bridgelip suckers, RSS=redside shiner, NPM=northern pikeminnow.
[b] Endemic hatchery stocked fish identified by an elastomer tag

Table 11. (Cont.) Relative abundance of fish from qualitative electrofishing sites in the Walla Walla River basin, 2004.

Stream	Site #	Date	Site Length	Average Width	Relative Abundance[a]	Comments
Green Fly (Cont.)	GF-2 ~0.2 miles above mouth	8/17	30	2.5	22 1+ RBT's (78-179mm) and three 1+ BT's (115-162mm) found. TF-rare	Moderate intensity
Whitney Creek	WH-5 ~0.2 miles up Whitney Ck Rd.	8/23	40	2.6	27 1+ RBT's (76-192mm) found. SCP-rare, CF-present	Moderate intensity
Spoonamore Canyon	SP-1 ~20 meters below 2nd crossing	8/23	20	0.5	No fish found.	Moderate intensity
Robinson Fk	RF-1 ~1.0 miles below FS Line	8/10	40	2.6	13 0+ RBT's (29-47mm) and 12 1+ RBT's (66-158mm) found.	Moderate intensity
	RF-2 ~1.1 miles below FS Line	8/10	32	2.1	Two 0+ RBT's (43-48mm), 10 1+ RBT's (77-143mm), and one adult RBT (203mm[b]) found. SCP-rare	Moderate intensity
	RF-3 ~1.5 miles below FS Line	8/10	40	2.3	Eight 1+ RBT's (80-130mm) found. SCP-uncommon	Moderate intensity
	RF-4 RM 6.4	8/10	40	2.2	16 0+ RBT's (33-55mm) and 27 1+ RBT's (74-135mm) found. SCP-common, CF-present	Moderate intensity
	RF-5 RM 6.1	8/10	35	1.7	Six 0+ RBT's (42-57mm) and 23 1+ RBT's (70-162mm) found. SCP-common	Low intensity survey
Robinson Fork Upper Trib.	RFT-1 RM 1.0	8/10	65	0.5	No salmonids found. TF-common	Low intensity survey
	RFT-2 RM 0.5	8/10	60	1.0	One 1+ RBT (197mm) and one adult RBT (213mm) found. TF-common	Low intensity survey
	RFT-3 RM 0.1, ~500 meters above culvert	8/10	50	0.9	Two 1+ RBT's (163-175mm) found. TF-rare	Low intensity survey
Hatley Gulch	HG-1 ~1.5 miles above 1st bridge	6/15	20	0.4	No fish found.	Moderate intensity
	HG-2 ~0.8 miles above 1st bridge	6/15	20	0.3	No fish found.	Moderate intensity
	HG-3 ~0.5 miles above 1st bridge	6/15	40	0.9	No fish found.	Moderate intensity
Whiskey Ck	WC-1 ~0.5 mi above Alyward Trib.	4/6	40	3.5	Nine 1+ RBT's (99-167mm) and one adult RBT (206mm) found.	Moderate intensity

[a] RBT=rainbow trout, BT=bull trout, MTW=mountain whitefish, TF=tailed frogs, SCP=sculpin, SD=speckled dace, CF=crayfish, BLS=bridgelip suckers, RSS=redside shiner, NPM=northern pikeminnow.
[b] Endemic hatchery stocked fish identified by an elastomer tag

Table 11. (Cont.) Relative abundance of fish from qualitative electrofishing sites in the Walla Walla River basin, 2004.						
Stream	**Site #**	**Date**	**Site Length**	**Average Width**	**Relative Abundance**[a]	**Comments**
Whiskey Ck (Cont.)	WC-2 ~0.2 miles above Alyward Trib.	6/7	50	3.8	One 0+ RBT (65mm) and one 1+ RBT (165mm) found. SD-common	Moderate intensity
	WC-4 Mouth of Alyward Trib.	4/6	5	3.5	14 1+ RBT's (90-170mm) found. SD-common	Moderate intensity
	WC-4 Mouth of Alyward Trib.	6/7	40	5.4	One 0+ RBT (46mm), eight 1+ RBT's (162-198mm) and one adult (230mm) found. SD-common	Moderate intensity
	WC-5 4th brg on Whiskey Ck Rd.	6/7	75	4.0	No salmonids found. SD-common	Moderate intensity
	WC-6 3rd brg on Whiskey Ck Rd	4/6	40	3.7	Three 1+ RBT's (132-177mm) and one adult RBT (205mm) found.	Moderate intensity
	WC-6 3rd brg on Whiskey Ck Rd	6/7	75.1	3.0	No salmonids found. SD-rare	Moderate intensity
	WC-7 0.8 miles below 3rd brg on Whiskey Ck Rd.	4/6	60	2.4	Seven 1+ RBT's (119-180) found. SCP-rare	Moderate intensity
	WC-8 2nd brg on Whiskey Ck Rd	4/6	58	3.2	13 1+ RBT's (103-188mm) and one adult RBT (210mm) found. SD-rare	Moderate intensity
Alyward Trib	AT-1 Just above forks	4/8	60	2.4	No salmonids found. SD-rare	Moderate intensity
	AT-1 Just above forks	6/11	60	0.4	No fish found.	Moderate intensity
	AT-2 0.3 miles below forks	4/8	60	2.0	No fish found.	Moderate intensity
	AT-2 0.3 miles below forks	6/11	20	3.5	No fish found.	Moderate intensity
	AT-3 0.6 miles below forks	4/8	30	3.5	No salmonids found. SD-uncommon	Moderate intensity
	AT-3 0.6 miles below forks	6/11	30	3.0	No salmonids found. SD-rare	Moderate intensity
	AT-4 0.9 miles below forks	4/8	40	3.5	No fish found.	Moderate intensity

[a] RBT=rainbow trout, BT=bull trout, MTW=mountain whitefish, TF=tailed frogs, SCP=sculpin, SD=speckled dace, CF=crayfish, BLS=bridgelip suckers, RSS=redside shiner, NPM=northern pikeminnow.
[b] Endemic hatchery stocked fish identified by an elastomer tag

Table 11. (Cont.) Relative abundance of fish from qualitative electrofishing sites in the Walla Walla basin, 2004.

Stream	Site #	Date	Site Length	Average Width	Relative Abundance[a]	Comments
Alyward Trib (Cont.)	AT-4 0.9 miles below forks	6/11	40	1.9	No salmonids found. SD-rare	Moderate intensity
	AT-5 1.2 miles below forks	6/11	30	4.0	No fish found.	Moderate intensity
	AT-6 1.5 miles below forks	6/11	30	2.5	No fish found.	Moderate intensity
	AT-7 1.7 miles below forks	4/8	40	2.0	No fish found.	Moderate intensity
	AT-7 1.7 miles below forks	6/11	35	0.9	No fish found.	Moderate intensity
	AT-8 0.4 miles above mouth	6/11	50	3.5	No salmonids found. SD-common	Moderate intensity
	AT-9 0.1 miles above mouth	6/7	50	1.6	One 0+ RBT (63mm) found. SD-common	Moderate intensity
	AT-10 Just above culvert at mouth	4/8	40	2.5	No salmonids found. SD-common	Moderate intensity
	AT-10 Just above culvert at mouth	6/7	45	1.8	21 0+ RBT's (48-72mm) found. SD-abundant	Moderate intensity
East Little Walla Walla	ELW-1 0.2 miles below stateline	6/9	15	3.3	No salmonids found. SD-rare, SCP-common, CF-presernt	Moderate intensity
	ELW-2 0.1 miles above Big Spring Branch	6/9	25	1.0	One 1+ RBT (127mm) found. SCP, BLS-uncommon, RSS, SD-rare	Moderate intensity
	ELW-3 0.4 miles above mouth	6/9	35	5.2	No salmonids found. SCP, SD-common, RSS, NPM-uncommon, BLS-rare	Moderate intensity
	ELW-4 0.2 miles above mouth	6/9	30	3.0	No salmonids found. SCP, SD-common, BLS-uncommon	Moderate intensity
Big Spring Branch	BSB-1 0.7 miles above mouth	6/9	40	2.5	One 0+ RBT (51mm), two adult RBT's (212-236mm), and one adult MTW (220mm) found. SCP-common, NPM-rare, CF-present	Moderate intensity
	BSB-3 0.3 miles above mouth	6/9	15	2.5	One 1+ RBT (124mm) found. SCP-common, SD-uncommon, RSS-rare, CF-present	Moderate intensity

[a] RBT=rainbow trout, BT=bull trout, MTW=mountain whitefish, TF=tailed frogs, SCP=sculpin, SD=speckled dace, CF=crayfish, BLS=bridgelip suckers, RSS=redside shiner, NPM=northern pikeminnow.
[b] Endemic hatchery stocked fish identified by an elastomer tag

Table 11. (Cont.) Relative abundance of fish from qualitative electrofishing sites in the Walla Walla basin, 2004.

Stream	Site #	Date	Site Length	Average Width	Relative Abundance[a]	Comments
Titus Creek	TC-3 0.3 miles above Five Mile Rd	7/30	30	7.1	15 0+ RBT's (48-83mm) and ten 1+ RBT's (97-185mm) found. SD, SCP-abundant, RSS-rare	High intensity survey net blew out
	TC-7 0.6 miles below Five Mile Rd	8/5	30	1.4	No salmonids found. SD-uncommon	High intensity survey too thick and too much debris for nets
West Little Walla Walla	WLW-1 0.5 miles up Valley Chapel Rd	6/9	30	2.3	No salmonids found. SD-common RSS-uncommon	Moderate intensity
	WLW-2 Just below Frog Hollow Rd.	6/9	100	2.3	No salmonids found. SD, RSS-rare	Moderate intensity
	WLW-5 WDFW property	6/9	10	1.5	No salmonids found. SD-rare	Moderate intensity
Mud Creek	MDC-1	7/8	100	4.0	No salmonids found. SD, SCP-abundant	Moderate intensity

[a] RBT=rainbow trout, BT=bull trout, MTW=mountain whitefish, TF=tailed frogs, SCP=sculpin, SD=speckled dace, CF=crayfish, BLS=bridgelip suckers, RSS=redside shiner, NPM=northern pikeminnow.
[b] Endemic hatchery stocked fish identified by an elastomer tag

Mill Creek Channel Electrofishing/Salvage

The Mill Creek salvage effort was conducted from just above Roosevelt St. to the Yellowhawk diversion over a two day period, June 29th to 30th. The salvage was specifically to capture and move salmonids and lamprey from this section to cooler waters of Mill Creek and Titus Creek near Five Mile Rd. The first day we salvaged fish from the top of the concrete channel (just above Roosevelt St.) to Tausick Way (1.45 miles), and salvaged 195 rainbow/steelhead trout and two juvenile lamprey. The rainbows were divided into the following size classes; Age 0+ (<3 inches, 75mm)=116, 3-8 inches (75-200mm)=10, 8-12 inches (200-300mm)=66, and >12 inches (>300mm)=3. The average for the first day was 134.5 rainbows/mile. The second day we worked from Tausick Way to the Yellowhawk Creek diversion (0.5 miles), and salvaged 407 rainbow/steelhead trout, eight juvenile lamprey, and we found one adult chinook carcass. The same size classes were used to categorize the rainbows as follows; Age 0+ (<3 inches)=318, 3-8 inches=45, 8-12 inches=39, and >12 inches=5. The average for day two was 814 rainbows/mile. On the second day a beach seine crew was also used and of the 407 rainbows they collected 181 rainbows in the following size categories; Age 0+ (<3 inches)=161, 3-8 inches=17, 8-12 inches=3, and >12 inches=0.

A fish sampling survey on Mill Creek was conducted within the concrete channel on August 26th from just below 9th Ave. to just above Roosevelt St. At 9th Ave. we captured three large rainbows

(220, 263, and 290mm), with one (263mm) being a hatchery fish with an "adipose" clip. We also found several dead shiners and far fewer Age 0+ rainbows and other species than past surveys. At 6th St. we missed one rainbow (~150mm). At 5th St. we found two rainbows (95 and 113mm), and found one dead shiner. At 4th St. we found several shiners, a sculpin, a dace, and one rainbow (112mm). East of 3rd St. we saw a school of shiners. Just below Main St. we saw a school of shiners and caught a 218mm rainbow. Just downstream of the Bon Macy's store, we caught two rainbows (108 and 246mm) in the underground concrete channel, and another rainbow (178mm) upstream in the daylight area. Above Whitman College we captured a 109mm rainbow. Two rainbows (128 and 251mm) were captured between Otis and Merriam streets. Above Wildwood Park the channel was dewatered, but damp with several stranded live fish. A large pulse of water returned to the concrete channel as we exited the top of the channel above Roosevelt Street. We found fewer trout and other species during this survey than we have in the past and it was obvious that fish were being killed in the channel during or shortly before this survey.

Walla Walla Settlement Agreement

Increased flows and/or decreased temperatures may have resulted in increased rainbow/steelhead densities between the Washington/Oregon Stateline and Mojonnier Rd. (Burlingame), the average density in 2003 was the highest seen to date (Appendix H). In 2004, a new method (single pass quantitative) was used to sample these areas. Total densities are down from previous years, but direct comparisons cannot be made since methods have changed. Densities below Mojonnier Rd. have not shown consistent increases since the settlement agreement was implemented (Appendix I, Table 10).

Non-Salmonid Species Abundance and Distribution

Speckled dace (*Rhinichthys osculus*) and sculpin (*Cottus spp.*) were the most common non-salmonids found at most of our sampling sites (Appendix G). Speckled dace generally did not exist at upper sites where water temperatures were relatively cool. Longnose dace (*Rhinichthys cataractae*) were observed during electrofishing surveys in Mill Creek and Titus Creek. Sculpin are found throughout the basin except in the lower sections of the mainstem Walla Walla and Touchet rivers and in cold headwater sites. Northern pikeminnow (*Ptychocheilus oregonesis*) and chiselmouth (*Acrocheilus alutaceus*) are found in low densities in lower sections of tributaries and mainstem rivers. Tailed frogs/tadpoles (*Ascaphus truei*) were found only in upper sites in cold, clean water. During our efforts we have generally found bull trout where tailed frogs were present, but we have also found tailed frogs in headwater areas where bull trout are not present.

Spawning Surveys

In 2004, spawning surveys were conducted for steelhead, bull trout, and spring chinook salmon. Steelhead spawning surveys occurred during the spring in several streams, while bull trout and spring chinook surveys were conducted in the upper Touchet River system in the fall (Figure 10).

Steelhead

Steelhead spawning surveys were conducted on Mill Creek, Titus Creek, Dry Creek, Whiskey Creek drainage (Whiskey Creek and one of its tributaries), and Coppei Creek drainage (Coppei Creek, South Fork Coppei, and North Fork Coppei) in 2004 between mid March and mid May (Table 12).

Fish Management personnel completed five surveys on sections of upper Mill Creek where access was allowed from the stateline down to Bennington Lake diversion (7.4 miles) and 36 redds and five live fish were observed. We also expanded the data for Mill Creek to estimate the total number of redds (Table 12). Upper Titus Creek was surveyed for 1.7 miles with no redds or fish observed. A section of upper Dry Creek was surveyed two times and two redds and one live fish were seen in 3.9 miles. Whiskey Creek was surveyed for 4.8 miles with eight redds and one live fish observed, while in the Alyward Trib. 2.4 miles were surveyed with no redds or fish observed. The lower 4.8 miles of the South Fork Coppei were surveyed four times and 15 redds and three live fish were observed. The lower 3.1 miles of the North Fork Coppei were surveyed twice and three redds were observed. Coppei Creek was surveyed five times from the confluence of the North and South Fork Coppei down to just above the town of Waitsburg (5.3 miles) and 15 redds and one live fish were observed (Table 12).

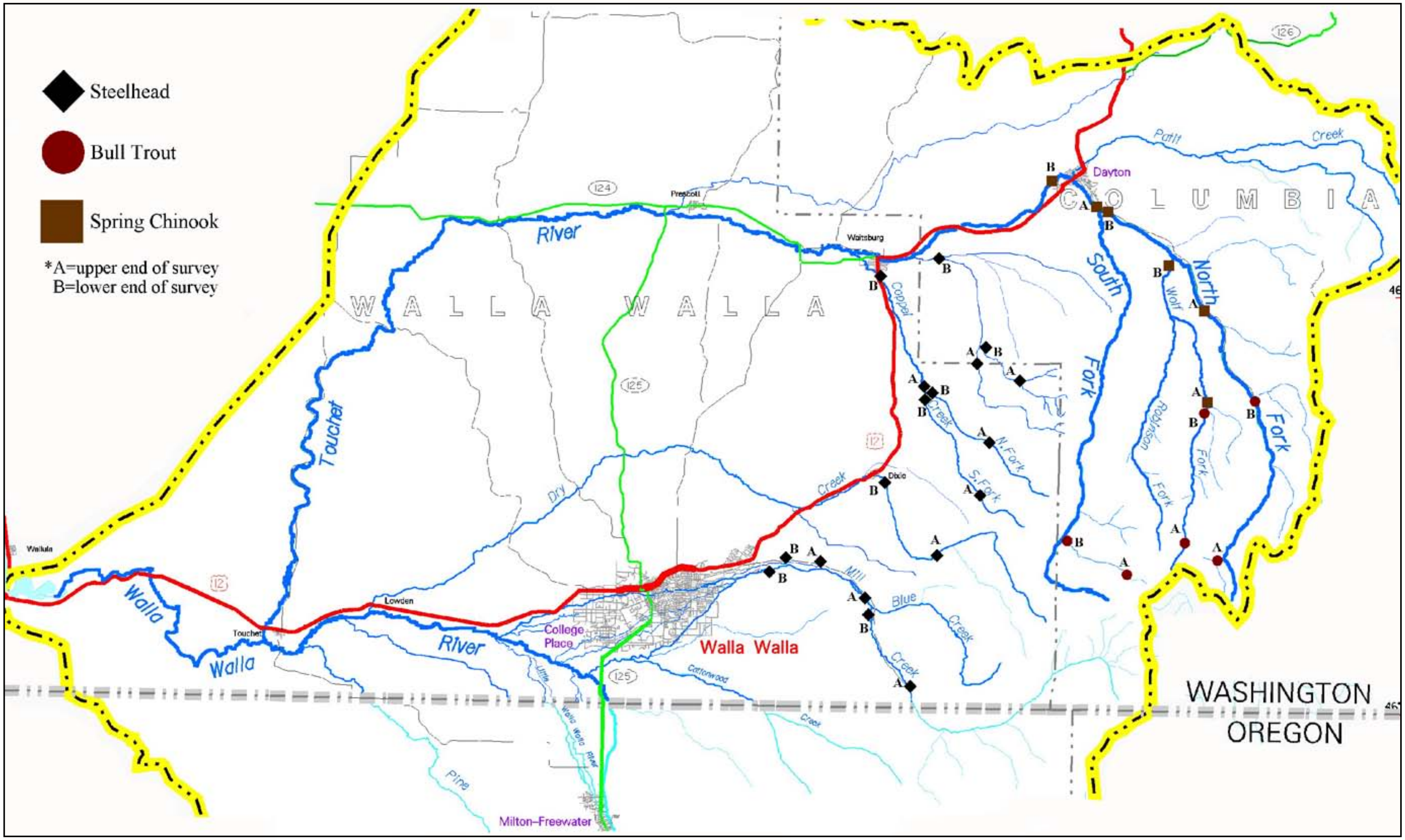

Figure 10. Relative locations of WDFW steelhead, bull trout, and spring chinook spawning survey areas in the Walla Walla basin, 2004.

Table 12. Steelhead spawning survey summary for the Walla Walla basin in Washington State , 2004.

Reach/ date	Survey	Stream section[a]	Miles	Redds	Redds per mile	Fish Observed Live	Fish Observed Dead
Mill Creek						**Live**	**Dead**
3/17	1	(A) River mile 19.9 to river mile 19.1	0.8	0	0	0	0
3/17	1	(B) River mile 19.1 to river mile 17.0	2.1	0	0	0	0
3/17	1	(C) River mile 16.4 to river mile 14.7	1.7	1	0.6	0	0
3/17	1	(D)River mile 14.7 to river mile 12.8	1.9	0	0	0	0
3/17	1	(E) River mile 12.8 to river mile 11.9	0.9	1	0.8	1	0
4/2	2	(A) River mile 19.9 to river mile 19.1	0.8	0	0	0	0
4/2	2	(B) River mile 19.1 to river mile 17.0	2.1	3	1.4	1	0
4/2	2	(C) River mile 16.4 to river mile 14.7	1.7	0	0	0	0
4/2	2	(D) River mile 14.7 to river mile 12.8	1.9	5	2.6	1	0
4/2	2	(E) River mile 12.8 to river mile 11.9	0.9	5	4.2	0	0
4/13	3	(A) River mile 19.9 to river mile 19.1	0.8	1	1.3	0	0
4/13	3	(B) River mile 19.1 to river mile 17.0	2.1	6	2.9	1	0
4/13	3	(C) River mile 16.4 to river mile 14.7	1.7	3	1.8	1	0
4/13	3	(D) River mile 14.7 to river mile 12.8	1.9	3	1.6	0	0
4/13	3	(E) River mile 12.8 to river mile 11.9	0.9	1	0.8	0	0
4/29	4	(A) River mile 19.9 to river mile 19.1	0.8	2	2.5	0	0
4/29	4	(B) River mile 19.1 to river mile 17.0	2.1	1	0.5	0	0
4/29	4	(C) River mile 16.4 to river mile 14.7	1.7	1	0.6	0	0
4/29	4	(D) River mile 14.7 to river mile 12.8	1.9	1	0.5	0	0
4/29	4	(E) River mile 12.8 to river mile 11.9	0.9	1	0.8	0	0
5/13	5	(A) River mile 19.9 to river mile 19.1	0.8	1	1.3	0	0
5/13	5	(B) River mile 19.1 to river mile 17.0	2.1	0	0	0	0
5/13	5	(C) River mile 16.4 to river mile 14.7	1.7	0	0	0	0
5/13	5	(D) River mile 14.7 to river mile 12.8	1.9	0	0	0	0
5/13	5	(E) River mile 12.8 to river mile 11.9	0.9	0	0	0	0
		Total	**7.4**	**36**	**4.9**	**5**	**0**
		Expanded Totals[b]	**10.2**	**50**			
Titus Creek							
4/2	1	(F) River mile 4.3 to river mile 2.6	1.7	0	0	0	0
4/13	2	(F) River mile 4.3 to river mile 2.6	1.7	0	0	0	0
4/29	3	(F) River mile 4.3 to river mile 2.6	1.7	0	0	0	0
5/13	4	(F) River mile 4.3 to river mile 2.6	1.7	0	0	0	0
		Total	**1.7**	**0**	**0.0**	**0**	**0**
Dry Creek							
4/7	1	(G) River mile 31.6 to river mile 29.5	2.1	2	1.0	1	0
4/7	1	(H) River mile 29.5 to river mile 27.7	1.8	0	0	0	0
5/6	2	(G) River mile 31.6 to river mile 29.5	2.1	0	0	0	0
5/6	2	(H) River mile 29.5 to river mile 27.7	1.8	0	0	0	0
		Total	**3.9**	**2**	**0.5**	**1**	**0**

[a] A: RM 19.9 to Wickersham bridge, B: Wickersham bridge to RM 17.0, C: 0.4 miles below Blue Ck to Seven Mile Rd., D: Seven Mile to Five Mile Rd., E: Five Mile Rd. to RM 11.9, F: Headwaters to just above Five Mile Rd., G: 2nd bridge on Biscuit Ridge Rd. to RM 29.5, H: RM 29.5 to RM 27.7

[b] Expanded data was created by multiplying the total redds per mile (4.9) by the miles that we could not survey above Bennington Dam (2.8) and adding that number of redds to the total.

Table 12. (Cont.) Steelhead spawning survey summary for the Walla Walla basin in Washington State , 2004.

Reach/ date	Survey	Stream section[a]	Miles	Redds	Redds per mile	Fish Observed	
						Live	Dead
Whiskey Ck							
3/18	1	(A) River Mile 5.7 to river mile 3.5	2.2	0	0	0	0
3/18	1	(B) River Mile 3.5 to river mile 1.4	2.1	7	3.3	1	0
4/6	1	(C) River Mile 6.2 to river mile 5.7	0.5	0	0	0	0
4/6	2	(A) River Mile 5.7 to river mile 3.5	2.2	0	0	0	0
4/6	2	(B) River Mile 3.5 to river mile 1.4	2.1	1	0.5	0	0
		Total	**4.8**	**8**	**1.7**	**1**	**0**
Alyward Trib.							
3/22	1	(D) River Mile 2.4 to river mile 0.0	2.4	0	0	0	0
		Total	**2.4**	**0**	**0**	**0**	**0**
SF Coppei							
3/15	1	(E) River mile 4.8 to river mile 2.3	2.5	0	0	0	0
3/15	1	(F) River mile 2.3 to river mile 0.0	2.3	0	0	0	0
3/30	2	(E) River mile 4.8 to river mile 2.3	2.5	7	2.8	2	0
3/30	2	(F) River mile 2.3 to river mile 0.0	2.3	8	3.5	1	0
4/12	3	(E) River mile 4.8 to river mile 2.3	2.5	0	0	0	0
4/12	3	(F) River mile 2.3 to river mile 0.0	2.3	0	0	0	0
4/27	4	(E) River mile 4.8 to river mile 2.3	2.5	0	0	0	0
4/27	4	(F) River mile 2.3 to river mile 0.0	2.3	0	0	0	0
		Total	**4.8**	**15**	**3.1**	**3**	**0**
NF Coppei							
3/30	1	(G) River mile 3.7 to river mile 1.9	1.8	0	0	0	0
3/30	1	(H) River mile 1.3 to river mile 0.0	1.3	3	0	0	0
4/12	2	(G) River mile 3.7 to river mile 1.9	1.8	0	0	0	0
4/12	2	(H) River mile 1.3 to river mile 0.0	1.3	0	0	0	0
		Total	**3.1**	**3**	**1.0**	**0**	**0**
Coppei Ck							
3/15	1	(I) River mile 7.5 to river mile 5.0	2.5	0	0	0	0
3/15	1	(J) River mile 5.0 to river mile 2.2	2.8	0	0	0	0
3/30	2	(I) River mile 7.5 to river mile 5.0	2.5	4	1.6	1	0
3/30	2	(J) River mile 5.0 to river mile 2.2	2.8	2	0.7	0	0
4/12	3	(I) River mile 7.5 to river mile 5.0	2.5	6	2.4	0	0
4/12	3	(J) River mile 5.0 to river mile 2.2	2.8	2	0.7	0	0
4/27	4	(I) River mile 7.5 to river mile 5.0	2.5	0	0	0	0
4/27	4	(J) River mile 5.0 to river mile 2.2	2.8	1	0.4	0	0
5/14	5	(I) River mile 7.5 to river mile 5.0	2.5	0	0	0	0
5/14	5	(J) River mile 5.0 to river mile 2.2	2.8	0	0	0	0
		Total	**5.3**	**15**	**2.8**	**1**	**0**

[a] A: Forks to 2nd bridge on Whiskey Ck. Rd., B: 2nd bridge on Whiskey Ck. Rd. to mouth of Hogeye Hollow, C: River mile 6.2 to forks, D: Left fork from forks to mouth (Alyward Trib), E: 0.4 miles below Barns Ck to RM 2.3, F: RM 2.3 to mouth, G: RM 3.7 to RM 1.9, H: RM 1.9 to mouth, I: Forks to McCowan Rd., J: McCowan Rd. to Meinberg Rd.

Bull Trout

Bull trout spawning surveys were conducted in the upper tributaries of the Touchet River in 2004. The surveyed areas included the Wolf Fork, North Fork Touchet, Lewis Creek, and the Burnt Fork. Surveys were conducted at least two times in each of these streams with the Wolf Fork and North Fork Touchet being surveyed five times.

Bull trout spawning surveys in the upper Wolf Fork in 2004 produced a total of 71 redds and 71 live fish between river mile (RM) 7.2 and river mile 13.5 (Table 13). This was the second lowest total redd count since 1998, with similar distribution and number of walks taking place (Figure 11, Table 14).

Table 13. Bull trout spawning survey summary for the Wolf Fork of the Touchet River, 2004.

Reach/ date	Survey	Stream section[a]	Miles	Redds	Redds per mile	Fish Observed Live	Fish Observed Dead
Wolf Fork							
8/31	1	(A) River mile 13.5 to river mile 12.0	1.5	0	0	5	0
8/31	1	(B) River mile 12.0 to river mile 10.7	1.3	3	2.3	11	0
8/31	1	(C) River mile 10.7 to river mile 9.8	0.9	8	8.9	18	0
8/31	1	(D) River mile 9.8 to river mile 8.7	1.1	1	0.9	0	0
8/31	1	(E) River mile 8.7 to river mile 7.2	1.5	0	0	0	0
9/14	2	(A) River mile 13.5 to river mile 12.0	1.5	4	2.6	6	0
9/14	2	(B) River mile 12.0 to river mile 10.7	1.3	11	8.5	5	0
9/14	2	(C) River mile 10.7 to river mile 9.8	0.9	13	14.4	16	0
9/14	2	(D) River mile 9.8 to river mile 8.7	1.1	7	6.4	3	0
9/14	2	(E) River mile 8.7 to river mile 7.2	1.5	0	0	0	0
9/29	3	(A) River mile 13.5 to river mile 12.0	1.5	6	4.0	1	0
9/29	3	(B) River mile 12.0 to river mile 10.7	1.3	9	6.9	2	0
9/29	3	(C) River mile 10.7 to river mile 9.8	0.9	4	4.4	1	0
9/29	3	(D) River mile 9.8 to river mile 8.7	1.1	2	1.8	0	0
9/29	3	(E) River mile 8.7 to river mile 7.2	1.5	0	0	0	0
10/13	4	(A) River mile 13.5 to river mile 12.0	1.5	1	0.7	1	0
10/13	4	(B) River mile 12.0 to river mile 10.7	1.3	2	1.5	0	0
10/13	4	(C) River mile 10.7 to river mile 9.8	0.9	0	0	0	0
10/13	4	(D) River mile 9.8 to river mile 8.7	1.1	0	0	0	0
10/13	4	(E) River mile 8.7 to river mile 7.2	1.5	0	0	0	0
10/26	5	(A) River mile 13.5 to river mile 12.0	1.5	0	0	0	0
10/26	5	(B) River mile 12.0 to river mile 10.7	1.3	0	0	1	0
10/26	5	(C) River mile 10.7 to river mile 9.8	0.9	0	0	0	0
10/26	5	(D) River mile 9.8 to river mile 8.7	1.1	0	0	1	0
10/26	5	(E) River mile 8.7 to river mile 7.2	1.5	0	0	0	0
		Total	**6.3**	**71**	**11.3**	**71**	**0**

[a] A: RM 13.5 to Forest Service Line, B: Forest Service Line to mouth of Tate Ck., C: Mouth of Tate Ck. to RM 9.8 D: RM 9.8 to old cabin, E: Old cabin to RM 7.2.

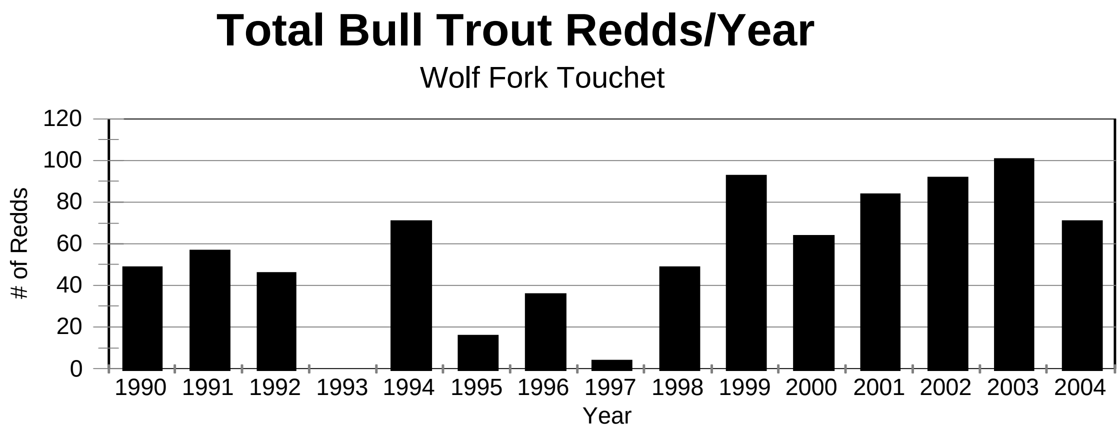

Figure 11. Bull trout redd counts for the Wolf Fork, 1990-2004.

Table 14. Bull trout spawning survey summary, redd count (number of times surveyed), for the Wolf Fork of the Touchet River, 1990-2004.

	Reach Surveyed[a]							
	A	B	C	D	E	F	G	
Year	RM 14.1-13.5	RM 13.5-12.0	RM 12.0-10.7	RM 10.7-9.8	RM 9.8-8.7	RM 8.7-7.5	RM 7.5-6.8	Total Redds
1990			18 (8)	31 (8)				49
1991			20 (5)	37 (5)				57
1992			46 (3)					46
1993[b]								0
1994			71 (?)					71
1995			16 (?)					16
1996			36 (?)					36
1997[c]					4 (1)			4
1998		11 (3)	7 (3)	18 (3)	12 (3)	0 (3)		48
1999		32 (4)	14 (5)	34 (5)	11 (5)	2 (4)		93
2000		3 (3)	17 (4)	33 (4)	7 (4)	4 (3)		64
2001		15 (4)	19 (4)	36 (4)	11 (4)	2 (3)	1 (2)	84
2002		25 (4)	15 (4)	39 (4)	8 (4)	5 (4)		92
2003	3 (4)	19 (4)	21 (5)	41 (5)	12 (4)	5 (4)		101
2004		11 (5)	25 (5)	25 (5)	10 (5)	0 (5)		71

[a] A: RM 14.1 to RM 13.5 (2nd meadow), B: RM 13.5 (2nd meadow) to Forest Service line, C: Forest Service Line to Mouth of Tate Ck., D: Mouth of Tate Ck to RM 9.8 (stream ford), E: RM 9.8 (stream ford) to Old cabin, F: Old cabin to Mouth of Whitney Ck., G: Mouth of Whitney Ck. to First bridge below yellow gate.
[b] No survey done.
[c] One survey done late in October and too far downstream.

The Burnt Fork, a tributary to the upper South Fork Touchet, was surveyed for the fifth consecutive year in 2004, but no redds or live bull trout were observed (Table 15). This is the second year in a row that no redds were seen (Figure12, Table 16). Continued monitoring of this population in the next couple years is essential to see if it will rebound or disappear.

Table 15. Bull trout spawning survey summary for the Burnt Fk. of the South Fork Touchet, 2004.

Reach/ date	Survey	Stream section[a]	Miles	Redds	Redds per mile	Fish Observed	
Burnt Fork						Live	Dead
9/16	1	(A) River mile 3.5 to river mile 1.4	2.1	0	0	0	0
9/16	1	(B) River mile 1.4 to river mile 0.0	1.4	0	0	0	0
10/12	2	(A) River mile 3.5 to river mile 1.4	2.1	0	0	0	0
10/12	2	(B) River mile 1.4 to river mile 0.0	1.4	0	0	0	0
		Total	**3.5**	**0**	**0**	**0**	**0**

[a] A: Just above forks to RM 1.4, B: RM 1.4 to mouth of Burnt Fk.

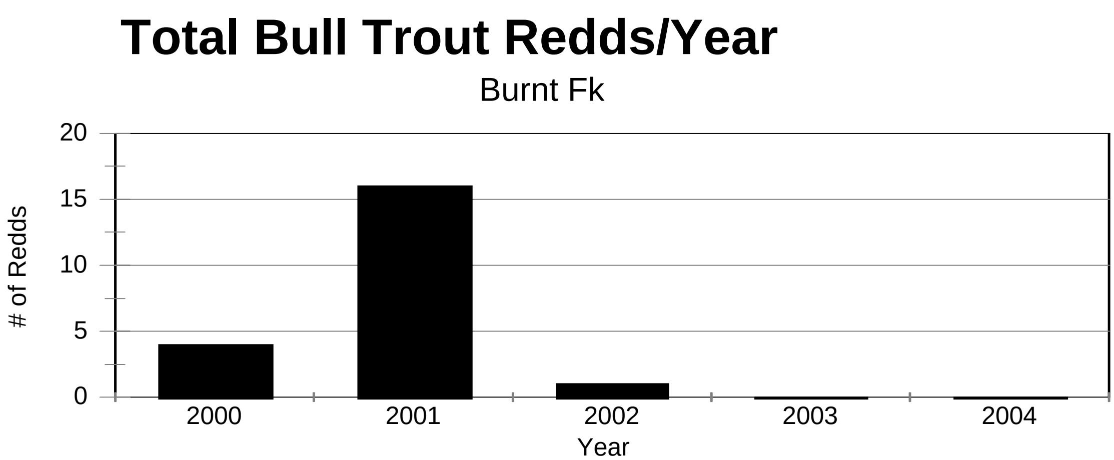

Figure 12. Bull trout redd counts for the Burnt Fork, 2000-2004.

Table 16. Bull trout spawning survey summary, redd count (number of times surveyed), for the Burnt Fork, 2000-2004.

Year	Reach Surveyed[a] A RM 3.5-3.3	Reach Surveyed[a] B RM 3.3-1.4	Reach Surveyed[a] C RM 1.4-0.0	Total Redds
2000	0 (1)[b]	4 (3)	0 (1)	4
2001	13 (4)		3 (4)	16
2002	2 (3)		0 (3)	2
2003	0 (3)		0 (3)	0
2004	0 (2)		0 (2)	0

[a] A: River Mile 3.5 to Forks (RM 3.3), B: Forks (RM 3.3) to Forest Service Line, C: Forest Service Line to Mouth of Burnt Fork.
[b] Survey this year actually went up to RM 3.6.

Bull trout spawning surveys were conducted in the North Fork Touchet and Lewis Creek again in 2004. Lewis Creek was surveyed two times, but no redds or fish were observed, and the North Fork was surveyed five times with 22 redds and 56 live bull trout being observed (Table 17). The second survey is a combination of two surveys; the first was on September 15th and was cut short due to a mud event that created zero visibility for most of the area surveyed, and the second was on September 17th to try and see what was missed on the 15th. This was the third year in a row that the total number of redds was below 30 (which hasn’t happened since the mid 1990's), but the number of fish seen was fairly high (Figure 13, Tables 17 and 18).

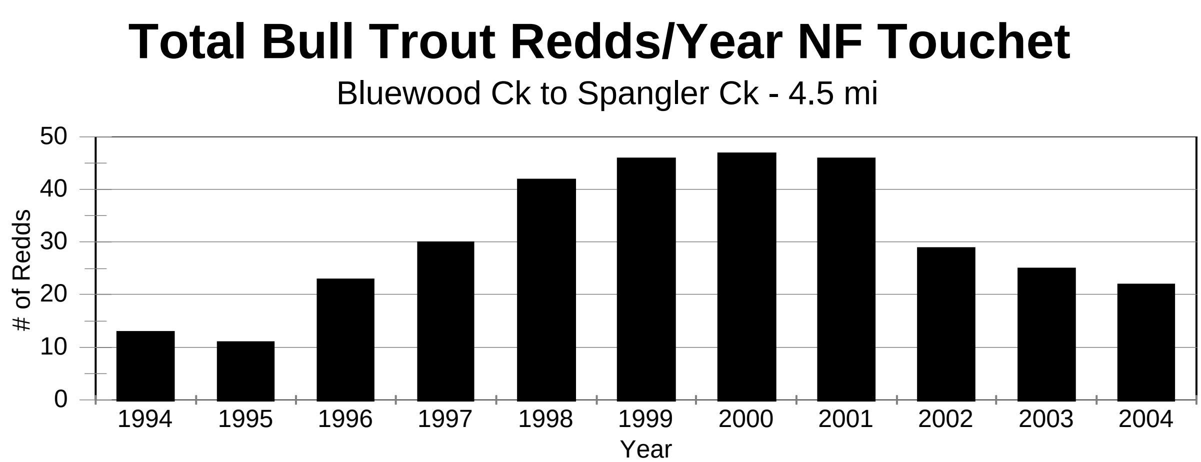

Figure 13. Bull trout redd counts for the North Fork Touchet, 1994-2004.

Table 17. Bull trout spawning survey summary for the North Fork Touchet and one of its tributaries, 2004.

Reach/ date	Survey	Stream section[a]	Miles	Redds	Redds per mile	Fish Observed Live	Fish Observed Dead
North Fork Touchet							
8/30	1	(A) River mile 19.1 to river mile 16.6	2.5	0	0.0	21	0
8/30	1	(B) River mile 16.6 to river mile 14.0	2.6	0	0.0	0	0
9/17[b]	2	(A) River mile 19.1 to river mile 16.6	2.5	4	1.6	29	0
9/17[b]	2	(B) River mile 16.6 to river mile 14.0	2.6	0	0.0	1	0
9/30	3	(A) River mile 19.1 to river mile 16.6	2.5	15	6.0	3	0
9/30	3	(B) River mile 16.6 to river mile 14.0	2.6	0	0.0	2	0
10/14	4	(A) River mile 19.1 to river mile 16.6	2.5	3	1.2	0	0
10/14	4	(B) River mile 16.6 to river mile 14.0	2.6	0	0.0	0	0
10/25	5	(A) River mile 19.1 to river mile 16.6	2.5	0	0.0	0	0
10/25	5	(B) River mile 16.6 to river mile 14.0	2.6	0	0.0	0	0
		Total	**5.1**	**22**	**4.3**	**56**	**0**
Lewis							
9/17	1	(C) River mile 2.6 to river mile 1.1	1.5	0	0	0	0
9/17	1	(D) River mile 1.1 to river mile 0.1	1.0	0	0	0	0
10/12	2	(C) River mile 2.6 to river mile 1.1	1.5	0	0	0	0
10/12	2	(D) River mile 1.1 to river mile 0.1	1.0	0	0	0	0
		Total	**2.5**	**0**	**0**	**0**	**0**

[a] A: Bluewood culvert to 2.5 miles below Bluewood culvert, B: 2.5 miles below Bluewood culvert to RM 14.0, C: 1.5 miles above Forest Service Line to Forest Service Line, D: Forest Service Line to North Fork Touchet Rd.
[b] This survey is a combination of two surveys (9/15 and 9/17), the first was cut short due to a mud event after heavy rains

Table 18. Bull trout spawning survey summary, redd count (number of times surveyed), for the North Fork Touchet River, 1994-2004.

	Reach Surveyed[a]		
	A	B	
Year	**River Mile 19.1-16.6**	**River Mile 16.6-14.0**	**Total Redds**
1994	10 (2)	3 (2)	13
1995	11 (2)	0 (1)	11
1996	21 (2)	2 (2)	23
1997	24 (2)	6 (1)	30
1998	24 (3)	18 (2)	42
1999	25 (2)	21 (2)	46
2000	47 (2)	0 (1)	47
2001	41(4)	5 (4)	46
2002	28 (4)	1 (4)	29
2003	23 (4)	2 (4)	25
2004	22 (5)	0 (5)	22

[a] A: Bluewood culvert to 2.5 miles below Bluewood culvert, B: 2.5 miles below Bluewood culvert to stream ford below mouth of Spangler Ck.

Spawning surveys have been conducted by the Oregon Department of Fish and Wildlife (ODFW) and the United States Forest Service (USFS) on Mill Creek since 1994 (Table 19), and on some of Mill Creek's upper tributaries since 1994 (Table 20). Surveys in Mill Ck in 1990-1992 were conducted by masters students Martin and Underwood in cooperation with WDFW. The tables and graphs in this report were derived from data provided by ODFW (Paul Sancovich personal communication), the USFS (Dave Crabtree personal communication), Martin et al. (1992), and Underwood et al. (1995). Since 1994 the number and distribution of walks on Mill Creek and its tributaries has been fairly constant (Tables 19 and 20). This allows for a good annual comparison of total redds for the Mill Creek system, with a peak of just over 220 redds in 2001 (Figure 14). In 2004, a total of 160 redds were seen in the Mill Creek system (Table 19 and 20, Figure 14). Ninty-three redds were seen on Mill Creek from the forks down to the intake dam (Table 19) and 67 redds were found in the tributaries, with 61 of those redds in Low Creek (Table 20)

Table 19. Bull trout spawning survey summary, redd count (number of times surveyed), for Mill Creek, 1990-2004.

	Reach Surveyed[a]									
Year	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**Total Redds**
1990		48(3)	15(3)	1(3)						64
1991	10(4)	14(4)	17(4)	11(5)						52
1992	6(4)	9(4)	51(4)							66
1993[b]										
1994	15(1)	28(2)	91(5)	26(1)		2(2)	0(1)	1(1)	0(1)	163
1995	28(2)	16(2)	68(3)	13(2)	1(2)	3(1)	0(1)	0(1)	0(1)	129
1996	3(2)	8(2)	48(2)	14(2)	4(2)	0(1)	0(1)	1(1)	0(1)	78
1997	16(4)	15(4)	36(4)	14(4)		5(4)	0(4)	0(4)		86
1998	17(4)	14(4)	45(4)	15(4)		3(4)	1(4)	0(4)		95
1999	14(4)	13(4)	58(5)	38(4)		4(4)	0(4)	0(4)	3(1)	130
2000	15(4)	10(4)	70(4)	13(4)		2(4)	0(4)	0(1)	1(4)	111
2001[c]	18(3)	27(4)	83(4)	32(4)		0(2)	3(3)	0(2)	2(1)	165
2002[c]	15(3)	24(3)	80(3)	40(3)		2(2)	0(2)	0(2)		161
2003	9(3)	12(3)	53(3)	18(3)		6(3)	0(2)	0(2)	4(2)	102
2004	12(3)	17(3)	45(3)	18(3)		1(3)	0(3)	0(3)		93

[a] A: Forks to Bull Ck., B: Bull Ck. to Deadman Ck., C: Deadman Ck. to N. Fork Mill Ck., D: N. Fork Mill Ck. to ½ way to Paradise Ck., E: ½ way to Paradise Ck. to Paradise Ck., F: Paradise Ck. to Broken Ck., G: Broken Ck. to Low Ck., H: Low Ck. to intake dam, I: Intake dam to forest boundary.
[b] No survey done.
[c] ODFW data only.

Table 20. Bull trout spawning survey summary, redd count (number of times surveyed), for tributaries to Mill Creek, 1994-2004.

	Reach Surveyed[a]								
	A	B	C	D	E	F	G	H	
	Bull Ck.	Green Fork	Burnt Fork	Deadman Ck.	N. Fork Mill Ck.	Paradise Ck.	Broken Ck.	Low Ck.	
Year	**RM[b] 0.0-0.5[1] or 0.6[2] or 1.0[3]**	**RM 0.0-0.7**	**RM[b] 0.0-0.3[1] or 0.7[2]**	**RM[b] 0.0-0.3[1] or 0.4[2] or 1.2[3]**	**RM[b] 0.0-0.5[1] or 0.9[2]**	**RM[b] 0.0-1.4[1] or 1.5[2] or 2.0[3]**	**RM 0.0-1.5**	**RM[b] 0.0-0.5[1] or 1.0[2] or 1.3[3] or 2.0[4]**	**Total Redds**
1994	0(1)[3]	4(1)	2(1)[2]	0(1)[3]	9(1)[1]	10(1)[3]	0(1)	3(1)[2]	28
1995	9(1)[3]	1(1)	3(1)[2]	2(1)[3]	12(1)[1]	9(1)[3]	0(1)	0(1)[1]	36
1996	10(2)[1]	0(1)	12(3)[2 c]	3(1)[1]	5(1)[1]	8(1)[2]	0(1)	18(2)[4]	56
1997	2(4)[1]		4(3)[1 c]	1(4)[1]	3(4)[1]	2(4)[2]	0(4)	20(4)[4]	32
1998	2(4)[1]		2(4)[1 c]	4(4)[1]	6(4)[1]	1(1)[2]	0(4)	27(3)[4]	42
1999	1(4)[1]		4(4)[1 c]	0(4)[1]	6(4)[1]	6(2)[2]		41(3)[4]	58
2000	1(4)[1]		14(4)[1 c]	7(4)[1]	17(4)[1]	5(4)[2]		39(4)[4]	83
2001[c]	1(3)[2]		3(3)[1 c]	0(2)[2]	17(4)[2]	3(4)[1]		33(4)[3]	57
2002[c]	1(3)[2]		2(3)[1 c]	0(2)[2]	12(3)[2]	5(3)[1]		32(3)[3]	52
2003	5(3)	0(1)	1(3)	0(?)	8(?)	1(2)		28(3)	43
2004	0(3)		0(1)		6(3)	0(1)		61(3)	67

[a] A: Mouth of Bull Ck. Upstream, B: Mouth of Green Fork upstream, C: Mouth of Burnt Fork upstream, D: Mouth of Deadman Ck. Upstream, E: Mouth of N. Fork Mill Ck. Upstream, F: Mouth of Paradise Ck. Upstream, G: Mouth of Broken Ck. Upstream, H: Mouth of Low Ck. Upstream.
[b]River Miles (RM) varied from year to year in some of the tributaries and are foot noted with numbers 1, 2, 3, or 4.
[c] ODFW data only.

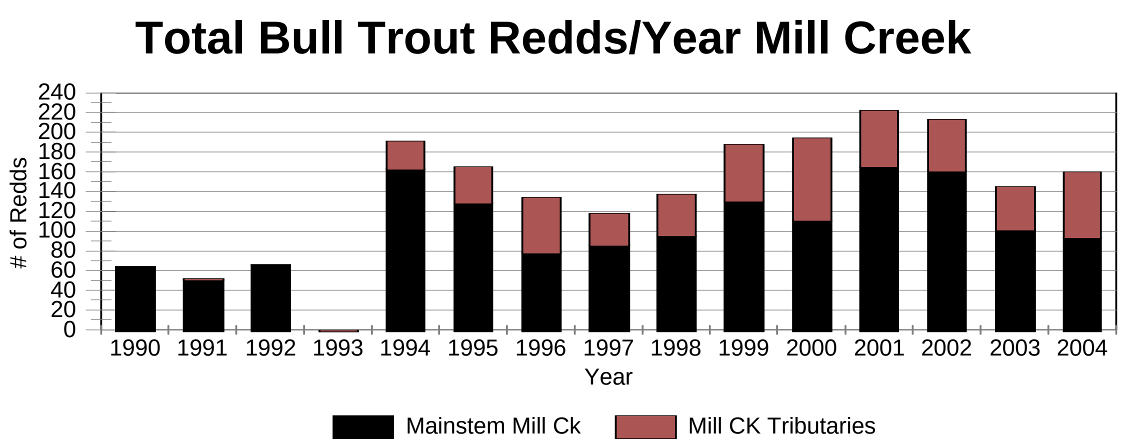

Figure 14. Bull trout redd counts for Mill Creek and its tributaries, 1990-2004.

Spring Chinook

Spawning surveys for spring chinook were conducted on the Touchet River, the North Fork Touchet, and the Wolf Fork in 2004. Surveys were conducted on the lower 6.3 miles of the North Fork Touchet, the lower 6.9 miles of the Wolf Fork, and the upper 2.6 miles of the mainstem Touchet River, but no redds or live fish were observed on any of the surveys (Table 21), in spite of the fact that 10 adults were observed passing upstream of Dayton trap by WDFW Snake River Lab personnel.

Table 21. Chinook spawning survey summary for the Touchet River basin, 2004.

Reach/ date	Survey	Stream section[a]	Miles	Redds	Redds per mile	Fish Observed	
NF Touchet River						**Live**	**Dead**
9/24	1	(A) River mile 6.3 to river mile 4.1	2.2	0	0	0	0
9/20	1	(B) River mile 4.1 to river mile 2.2	1.9	0	0	0	0
9/24	1	(C) River mile 2.2 to river mile 0.0	2.2	0	0	0	0
		Total	**6.3**	**0**	**0**	**0**	**0**
Wolf Fk							
9/22	1	(D) River mile 6.9 to river mile 2.7	4.2	0	0	0	0
9/20	1	(E) River mile 2.7 to river mile 0.0	2.7	0	0	0	0
		Total	**6.9**	**0**	**0**	**0**	**0**
Touchet River							
9/17	1	(F) River mile 54.8 to river mile 53.6	1.2	0	0	0	0
9/20	1	(G) River mile 53.6 to river mile 52.2	1.4	0	0	0	0
		Total	**2.6**	**0**	**0**	**0**	**0**

[a] A: RM 6.3 to Wolf Fk. Rd. bridge, B: Wolf Fk. Rd. bridge to Vernon Lane bridge, C: Vernon Lane bridge to mouth, D: 1st bridge below yellow gate to Robinson Fk. Rd. bridge, E: Robinson Fk. Rd. bridge to mouth, F: Confluence of the North and South Forks of the Touchet River to footbridge, G: Footbridge to Sewer treatment facility.

Genetic Sampling and Analyses

Fish Management personnel collected 481 fin clips in the Walla Walla basin in 2004. Juvenile and adult (≥8") rainbow/steelhead trout (RBT) comprised 377 samples, 86 samples were from juvenile bull trout (BT), 12 samples were from adult steelhead (SH), and six samples were from adult spring chinook mortalities in Mill Creek.

Of the 377 RBT samples, 345 were from juveniles and 32 were from adults. All of the 377 RBT's were sampled during electrofishing surveys, and were collected as follows; 73 juveniles and two adults from the Walla Walla River, 63 juveniles and 16 adults from Mill Creek, nine juveniles from Titus Creek, 83 juveniles and 11 adults from the Touchet River, 39 juveniles and one adult from the South Fork Coppei, 37 juveniles and two adults from the North Fork Coppei, and 41 juveniles from the mainstem Coppei Creek.

All 86 juvenile BT's were also sampled during electrofishing surveys. The samples were collected as follows; 41 juveniles from the Wolf Fork and 45 juveniles from the North Fork Touchet.

Ten of the 12 steelhead were sampled at a temporary trap on Yellowhawk Creek, and the other two were sampled during a spawning survey on the South Fork Coppei.

The six adult spring chinook were all mortalities found in Mill Creek, and the data was turned over to CTUIR.

Recommendations

Information collected during this project has provided valuable baseline information and guidance for managers in the Walla Walla basin. Continued monitoring will provide a more complete picture of salmonid population status and their habitat conditions. The following is our list of recommended evaluation activities for 2005.

- Continue to work with CTUIR and others to complete a comprehensive research, monitoring and evaluation (RM&E) plan that will improve coordination and ensure collaborative, effective RM&E within the subbasin. Also, for the 2005 field season, improve coordination with CTUIR while the comprehensive RM&E plan is being completed to improve efficiency and usefulness of data collected in 2005 by both parties.
- Review the WDFW and CTUIR habitat evaluation protocols and modify as necessary to try to improve compatibility, sharing of data, and acceptance of each agency's standards and protocols.
- Continue habitat surveys on Coppei Ck from McCowan to Forks, and begin on North Fork and South Fork Coppei Creeks.
- Complete habitat surveys on Titus Creek to enable development of a management plan by the managers within the subbasin.
- Continue to annually monitor steelhead spawning in Mill Creek between the Stateline and Bennington Dam.
- Continue to annually monitor steelhead spawning in Coppei Creek, and elsewhere as time allows.
- Compile WDFW steelhead spawning surveys and develop a plan for areas that need to be sampled in the future or use of a probabilistic sampling approach (e.g. EMAP).
- Continue to annually monitor bull trout spawning in the Touchet River system.
- Reduce flow measurement sites within the subbasin. Use only those necessary to supplement the available gauging sites and to assist with evaluation of the effects of settlement agreement flows.
- Evaluate lower river flows and water temperatures for possible effects on migration in the Walla Walla and Touchet rivers in May, June, July, Sep, Oct and Nov.
- Evaluate the use of long single pass quantitative electrofishing , and develop guidelines to ensure similar methods and effort at all sites. Coordinate electrofishing protocols with the WDFW Snake River Lab and CTUIR. Work with CTUIR and ODFW try to establish EMAP sampling to monitor status, trends, and distribution of salmonids during summer low flows in 2005 or 2006.
- Check age categories from length frequency histograms against scales collected during electofishing, especially the break between age 0+ and 1+ salmonids.
- Continue to monitor East Little Walla Walla River and expand to monitor seasonally (summer, Nov., and Feb. to mid May) for fish distribution and abundance.
- Continue to monitor Mill Ck and expand to monitor seasonally for fish distribution and abundance.

- Continue efforts to determine fish distribution and abundance in Titus Creek for use in development of a Titus Creek management plan.
  - Above Five Mile Rd. – multiple pass quantitative electrofishing in summer, qualitative electrofishing in Nov. and Feb. to mid May.
  - Below Five Mile Rd. – qualitative electrofishing seasonally.
- Monitor Yellowhawk Creek seasonally for fish distribution and abundance (including bull trout use) and water availability.
- Monitor Coppei Creek seasonally for fish use, distribution and abundance.
- Evaluate upper NF Touchet
  - Above Bluewood culvert – for water availability and fish distribution and abundance
  - Below Bluewood culvert – to monitor effects of the siltation in the fall of 2004, and for bull trout emergence timing.
- Evaluate Burnt Fork, Griffin Fork, and upper SF Touchet for bull trout use and distribution. Do bull trout still exist there?
- Evaluate Coates Creek for fish use, abundance and distribution.
- Evaluate Corral Creek for water availability, fish use, distribution and abundance, and to document any barriers in the lower portion.
- Evaluate upper Spangler Creek for bull trout distribution and abundance.
- Re-evaluate Lewis Creek from headwaters down for bull trout distribution, abundance, and possible population refounding.
- Evaluate upper Wolf Fork above FS line for fish use, distribution and abundance.
- Continue to document the presence of newly discovered potential fish barriers.

This project was begun to provide baseline information regarding salmonid population status and general habitat conditions. In 2005, we need to do more to compile information, conclusions, and recommendations for this project from all years to aid us and other managers in developing and implementing a more comprehensive and rigorous monitoring strategy. It is time to change this project from general baseline evaluation of salmonids and their habitats to a more structured monitoring of population status, trends, habitat conditions, and change overtime. This will need to be a collaborative approach with co-managers and will require completion and implementation of a comprehensive monitoring plan in 2005 or 2006.

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Appendix A. Study Sites, 2004

Appendix A. Table 1. Study site locations for the Touchet River and tributaries, 2004.

Stream	Site #	RM[a]	Location (within sect. is listed as smallest qtr. sect. of qtr. sect.)	Sample Type[b]	GPS Coordinates[c]		Comments
					North	West	
NF Touchet River	NFT-1	19.1	T7N,R40E,Sect 18,NW¼,NE¼	T[d],F[e,d]	46.09154[f]	117.85211[f]	~15 meters below Bluewood culvert
	NFT-2	18.6	T7N,R40E,Sect 7,NE¼,SE¼	EL[d]	46.09553[f]	117.84579[f]	Sno-Park
	NFT-3	17.5	T7N,R40E,Sect 5,SE¼,SW¼	EL	46.10921	117.83508	1.1 miles below Sno-Park
	NFT-4	16.9	T7N,R40E,Sect 5,SW¼,NE¼	EL	46.11369[f]	117.82780[f]	0.3 miles above 2nd culvert
	NFT-5	16.6	T7N,R40E,Sect 5,NE¼,NE¼	EL	46.11832[f]	117.82269[f]	Just below 2nd culvert
	NFT-6	14.0	T8N,R40E,Sect 21,SE¼,SE¼	T[d],F[e,d]	46.15164[f]	117.80638[f]	~0.2 miles below Spangler Ck mouth
	NFT-7	7.6	T9N,R40E,Sect 30,SW¼,NE¼	T	46.23103[f]	117.85136[f]	~20 feet above Jim Ck mouth
	NFT-8	1.4	T9N,R39E,Sect 4,NW¼,NE¼	T[d],F[e,d]	46.29236[f]	117.93783[f]	Above Baileysburg
Spangler Ck	SC-1	0.2	T8N,R40E,Sect 27,NW¼,NW¼	T[d],F[e,d]	46.14799[f]	117.80253[f]	~0.2 miles above mouth
Lewis Ck	LC-1	0.1	T8N,R40E,Sect 9,NW¼,NW¼	T[d],F[e,d]	46.19088[f]	117.82307[f]	~15 feet above NF Touchet Rd
JimCk	JC-1	0.1	T9N,R40E,Sect 30,SW¼,NE¼	T[d],F[e,d]	46.23124[f]	117.85088[f]	~10 feet below NF Touchet Rd
Wolf Fork	WF-1	10.7	T8N,R39E,Sect 25,NW¼,SE¼	EL	46.1387[f]	117.8750[f]	Tate Ck mouth
	WF-2	9.8	T8N,R39E,Sect 25,SW¼,SE¼	T[d],EL	46.15100	117.87632	0.6 miles below Green Fly Canyon
	WF-3	8.9	T8N,R39E,Sect 24,NW¼,NE¼	EL	46.16292	117.87557	~1.5 miles below Green Fly Canyon
	WF-4	4.5	T9N,R39E,Sect 36,NW¼NW¼	T[d],F[e,d]	46.22172[f]	117.87458[f]	3rd bridge on Wolf Fork Rd
	WF-5	1.8	T9N,R39E,Sect 23,NW¼,NW¼	T[d],F[e,d]	46.25049[f]	117.90217[f]	Holmberg Rd
Tate Ck	T-1	0.5	T8N,R39E,Sect 25,SE¼SW¼	EL	46.13728	117.88088	~0.5 miles above mouth
	T-2	0.4	T8N,R39E,Sect 25,SE¼,SW¼	EL	46.13741	117.87993	~0.4 miles above mouth
	T-3	0.3	T8N,R39E,Sect 25,SE¼,SW¼	EL	46.13845	117.87898	~0.3 miles above mouth
	T-4	0.2	T8N,R39E,Sect 25,NE¼,SW¼	EL	46.13925	117.87730	~0.2 miles above mouth
	T-5	0.0	T8N,R39E,Sect 25,NW¼,SE¼	EL,F	46.13896	117.87561	~20 meters above mouth
Green Fly	GF-1	0.3	T8N,R39E,Sect 25,NE¼,SE¼	EL	46.14106	117.86961	~0.3 miles above mouth
	GF-2	0.2	T8N,R39E,Sect 25,NE¼,SE¼	EL	46.14166[f]	117.87131[f]	~0.2 miles above mouth
Whitney Ck	WH-1	1.3	T8N,R40E,Sect 18,SE¼,SW¼	EQ	46.16518	117.85766	Just above culvert
	WH-2	1.0	T8N,R40E,Sect 18,NE¼, SW¼	EQ	46.16870	117.85769	Just above Spoonamore Canyon

[a] River Mile
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[c] GPS were taken with a Garmin GPS II plus, in WSG 84 datum and in D.D°
[d] Same as previous year
[e] Index discharge site
[f] GPS was made using Maptech's Terrain Navigator (version 5.03) in WSG 84 datum
[g] Site locations for the Robinson Fork Tributary are estimates, no GPS was available for that crew on that day and landmarks used in descriptions are not identifiable on USGS maps or Maptech software.

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Stream	Site #	RM[a]	Location (within sect. is listed as smallest qtr. sect. of qtr. sect.)	Sample Type[b]	GPS Coordinates[c] North	GPS Coordinates[c] West	Comments
Whitney Ck	WH-3	0.9	T8N,R40E,Sect 18,NE¼,SW¼	EQ	46.17019	117.85856	Just below Spoonamore Canyon
(Cont.)	WH-4	0.7	T8N,R40E,Sect 18,SE¼,NW¼	EQ	46.17259	117.85745	~0.2 miles below Spoonamore Canyon
	WH-5	0.3	T8N,R40E,Sect 7,SE¼,SW¼	T[d],F,EL	46.17834	117.85784	0.2 miles up Whitney Ck Rd
	WH-6	0.1	T8N,R40E,Sect 7,SW¼,SW¼	F[e,d]	46.18103[f]	117.86222[f]	~20 meters above Wolf Fk Rd
Spoonamore Ck	SP-1	0.2	T8N,R40E,Sect 18,NW¼,SE¼	EL	46.17009[f]	117.85431[f]	~20 meters below 2nd crossing
Coates Ck	C-1	0.0	T8N,R40E,Sect 7,NW¼,SW¼	T[d],F[e,d]	46.18296[f]	117.86281[f]	Directly below Wolf Fork Rd
Robinson Fk	RF-1	7.9	T8N,R39E,Sect 34,NE¼,NE¼	EL	46.13341[f]	117.91253[f]	~1.0 miles below FS line
	RF-2	7.8	T8N,R39E,Sect 27,SE¼,SE¼	EL	46.13541	117.91370	~1.1 miles below FS line
	RF-3	7.4	T8N,R39E,Sect 27,NW¼,SE¼	EL	46.14087	117.91591	~1.5 miles below FS line
	RF-4	6.4	T8N,R39E,Sect 22,SW¼,SW¼	EL	46.15259	117.92764	River Mile 6.4
	RF-5	6.1	T8N,R39E,Sect 22,NW¼,SW¼	EL	46.15626	117.92847	River Mile 6.1
	RF-6	1.2	T9N,R39E,Sect 35,SW¼,NE¼	T[d]	46.21600[f]	117.89485[f]	Just above 3rd brg on Robinson Fk Rd
Robinson Fk	RFT-1	1.0	T8N,R39E,Sect 26,NE¼,SW¼	EL	46.13885[f]	117.90096[f]	River Mile 1.0
Tributary[g]	RFT-2	0.5	T8N,R39E,Sect 27,SE¼,NE¼	EL	46.14259[f]	117.90883[f]	River Mile 0.5
	RFT-3	0.1	T8N,R39E,Sect 27,SW¼,NE¼	EL	46.14352[f]	117.91690[f]	River Mile 0.1, ~500 meters above culvert
Hatley Gulch	HG-1	2.1	T9N,R39E,Sect 1,NE¼,NE¼	EL	46.29238	117.86797	~1.5 miles above 1st brg on Hatley Gulch Rd
	HG-2	1.3	T9N,R39E,Sect 1,NE¼,SW¼	EL	46.28519	117.88017	~0.8 miles above 1st brg on Hatley Gulch Rd
	HG-3	1.0	T9N,R39E,Sect 1,NW¼,SW¼	EL	46.28415	117.88507	~0.5 miles above 1st brg on Hatley Gulch Rd
Green Fk	GF-1	0.0	T7N,R39E,Sect 7,NE¼,NW¼	F[d]	46.10536[f]	117.98627[f]	~25 feet above mouth
Burnt Fk	BF-1	0.0	T7N,R39E,Sect 7,NE¼,NW¼	F[d]	46.10543[f]	117.98597[f]	~25 feet above mouth
SF Touchet	SFT-1	15.3	T7N,R39E,Sect 6,SE¼,SW¼	F[d]	46.10616[f]	117.98568[f]	~30 feet below Burnt Fk mouth
River	SFT-2	8.4	T8N,R39E,Sect 5,NW¼,SE¼	T[d],F[e,d]	46.19947[f]	117.95557[f]	Directly under Camp Nancy Lee brg
	SFT-3	0.5	T9N,R39E,Sec 5,NW¼,NE¼	T[d],F[e,d]	46.29406	117.95795	Gephart Rd
Touchet River	TR-1	53.8	T10N,R39E,Sect 30,SE¼,SE¼	T[d]	46.31137[f]	117.97227[f]	~20 feet below SRL trap
	TR-2	53.5	T10N,R39E,Sect 30,NW¼,SE¼	F[e,d]	46.31640[f]	117.98044[f]	~0.3 miles below SRL trap

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Stream	Site #	RM[a]	Location (within sect. is listed as smallest qtr. sect. of qtr. sect.)	Sample Type[b]	GPS Coordinates[c]		Comments
					North	West	
Touchet River (Cont.)	TR-3	51.7	T10N,R38E,Sect 36,NW¼,NW¼	SPQ	46.30755	118.00926	~0.5 miles above Ward Rd
	TR-4	49.7	T9N,R38E,Sect 3,SE¼,NW¼	SPQ	46.29006	118.04565	~30 meters below Rose Gulch Rd
	TR-5	48.5	T9N,R38E,Sect 4,SW¼,NW¼	T[d],SPQ	46.29052	118.07423	Behind the Lewis and Clark State Park
	TR-6	47.4	T9N,R38E,Sect 6,NE¼,SE¼	SPQ	46.28681	118.09613	~1.1 miles above Gallaher Rd
	TR-7	45.4	T9N,R38E,Sect 12,SE¼,SW¼	SPQ	46.26978	118.12831	Waitsburg Gun Club
	TR-8	44.1	T9N,R37E,Sect 11,NW¼,SW¼	SPQ	46.27267	118.15470	~15 meters below Main St brg in Waitsburg
	TR-9	41.4	T9N,R37E,Sect 8,NE¼,SE¼	SPQ	46.27241	118.20343	~0.9 miles above Bolles brg
	TR-10	40.5	T9N,R37E,Sect 8,SW¼,NW¼	T[d]	46.27396	118.22046	~40 meters above Bolles brg
	TR-11	40.4	T9N,R37E,Sect 7, SE¼,NE¼	SPQ	46.27402	118.22208	~100 meters below Bolles brg
	TR-12	38.4	T9N,R36E,Sect 1,SW¼,SW¼	SPQ	46.28388	118.26002	~1.8 miles above Hart Rd
	TR-13	36.6	T9N,R36E,Sect 3,NW¼,NE¼	SPQ	46.29313	118.29344	~20 meters above Hart Rd
	TR-14	34.3	T9N,R36E,Sect 5,NE¼,NW¼	SPQ	46.29472	118.34055	Just below Hwy. 125 brg
	TR-15	30.6	T9N,R35E,Sect 3,NE¼,NE¼	SPQ	46.29379	118.40823	Pettyjohn Rd
	TR-16	27.5	T9N,R35E,Sect 5,SE¼,NW¼	SPQ	46.28871	118.46525	~1.4 miles above Harvey Shaw Rd
	TR-17	26.1	T9N,R35E,Sect 6,NW¼,SW¼	T[d],SPQ	46.28740	118.48840	Just below Harvey Shaw Rd
	TR-18	11.5	T9N,R33E,Sect 23,NE¼,SW¼	T[d]	46.15558	118.64960	~0.1 miles below Sims Rd
	TR-19	2.0	T7N,R33E,Sect 27,NE¼,SW¼	T[d],F	46.05709	118.66883	Cummins Rd brg
Patit Ck	P-1	2.4	T10N,R39E,Sect 17,SE¼,SE¼	T[d],F[e,d]	46.34003[f]	117.95169[f]	1st brg on Patit Ck Rd
Whiskey Ck	WC-1	6.2	T9N,R38E,Sect 33,NE¼,SW¼	EL	46.21026[f]	118.06393[f]	~0.5 miles above mouth of Alyward Trib.
	WC-2	5.9	T9N,R38E,Sect 33,SE¼,NW¼	EL	46.21543	118.06576	~0.2 miles above mouth of Alyward Trib.
	WC-3	5.7	T9N,R38E,Sect 33,SE¼,NW¼	F[d]	46.21714[f]	118.06561[f]	~10 meters above mouth of Alyward Trib.
	WC-4	5.7	T9N,R38E,Sect 33,SE¼,NW¼	EL[d]	46.21762	118.06957	Mouth of Alyward Trib.
	WC-5	5.4	T9N,R38E,Sect 33,NE¼,NW¼	EL[d]	46.22096	118.06943	4th brg on Whiskey Ck Rd
	WC-6	4.9	T9N,R38E,Sect 29,SE¼,SE¼	EL[d]	46.22602	118.07603	3rd brg on Whiskey Ck Rd
	WC-7	4.1	T9N,R38E,Sect 29,NE¼,NE¼	EL[d]	46.23665	118.07822	~0.8 miles below 3rd brg on Whiskey Ck Rd

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Stream	Site #	RM[a]	Location (within sect. is listed as smallest qtr. sect. of qtr. sect.)	Sample Type[b]	GPS Coordinates[c]		Comments
					North	West	
Whiskey Creek	WC-8	3.5	T9N,R38E,Sect 20,SE¼,NE¼	EL[d]	46.24429	118.07910	2nd brg on Whiskey Ck Rd
(Cont.)	WC-9	0.0	T9N,R37E,Sect 12,NE¼,SE¼	T[d]	46.27257[f]	118.11795[f]	~20 feet above mouth
Alyward Trib.	AT-1	2.5	T8N,R38E,Sect 11,NE¼,NE¼	EL[d]	46.19962	118.02407	Just above Forks
(Tributary to	AT-2	2.2	T8N,R38E,Sect 2,SW¼,NW¼	EL	46.20157	118.02869	~0.3 miles below Forks
Whiskey Ck)	AT-3	1.9	T8N,R38E,Sect 3,SE¼,NE¼	EL	46.20375	118.03426	~0.6 miles below Forks
	AT-4	1.6	T8N,R38E,Sect 3,NW¼,NE¼	EL	46.20539	118.04017	~0.9 miles below Forks
	AT-5	1.3	T8N,R38E,Sect 3,NE¼,NW¼	EL	46.20710	118.04430	~1.2 miles below Forks
	AT-6	1.0	T9N,R38E,Sect 34,SE¼,SW¼	EL	46.20963	118.04785	~1.5 miles below Forks
	AT-7	0.8	T9N,R38E,Sect 34,NW¼,SW¼	EL	46.21109	118.05001	~1.7 miles below Forks
	AT-8	0.4	T9N,R38E,Sect 33,NE¼,SW¼	EL	46.21586	118.06047	~0.4 miles above mouth
	AT-9	0.1	T9N,R38E,Sect 33,SW¼,NE¼	EL	46.21642	118.06188	~0.1 miles above mouth
	AT-10	0.0	T9N,R38E,Sect 33,SE¼,NW¼	F[d],EL	46.21745	118.06531	Just above culvert at mouth
SF Coppei Ck	SFC-1	4.8	T8N,R38E,Sect 33,NE¼,NW¼	SPQ	46.13497[f]	118.06768[f]	~0.5 miles below Barns Ck
	SFC-2	3.2	T8N,R38E,Sect 20,SE¼,SE¼	SPQ	46.15145	118.08075	~2.3 miles above 2nd brg on SF Coppei Rd
	SFC-3	1.7	T8N,R38E,Sect 18,NE¼,SE¼	SPQ	46.17000	118.09645	~0.8 miles above 2nd brg on SF Coppei Rd
	SFC-4	0.9	T8N,R38E,Sect 18,NE¼,NW¼	T[d],F[e,d],SPQ	46.17887[f]	118.10680[f]	2nd brg on SF Coppei Rd
NF Coppei Ck	NFC-1	4.6	T8N,R38E,Sect 27,NW¼,NE¼	SPQ	46.14926	118.04114	~0.6 miles up into watershed
	NFC-2	3.9	T8N,R38E,Sect 22,SW¼,NW¼	SPQ	46.15904	118.05033	~10 meters above 3rd brg on NF Coppei Rd
	NFC-3	0.9	T8N,R38E,Sect 8,NW¼,SW¼	SPQ	46.18571	118.09265	Grain Elevator
	NFC-4	0.1	T8N,R38E,Sect 7,SE¼,NW¼	T[d],F[e,d],SPQ	46.19028	118.10894	Forks brg
Coppei Ck	CO-1	7.3	T8N,R38E,Sect 6,SW¼,SW¼	SPQ	46.19408	118.11047	~0.2 miles below Forks
	CO-2	6.1	T9N,R37E,Sect 36,SW¼,SE¼	SPQ	46.20836	118.12157	~1.0 miles above McCowan Rd
	CO-3	5.1	T9N,R37E,Sect 36,NE¼,NW¼	T[d],F[e,d],SPQ	46.22251	118.12860	McCowan Rd
	CO-4	2.3	T9N,R37E,Sect 14,NE¼,SW¼	SPQ	46.25925	118.15100	Meinburg Rd

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Stream	Site #	RM[a]	Location (within sect. is listed as smallest qtr. sect. of qtr. sect.)	Sample Type[b]	GPS Coordinates[c]		Comments
					North	West	
Walla Walla	WW-1	40.0	T6N,R35E,Sect 13,SW¼,NE¼	F[e,d]	46.00078[f]	118.37795[f]	Stateline
River	WW-2	39.9	T6N,R35E,Sect 13,SW¼,NE¼	SPQ	46.00177	118.37788	~100 meters below mouth of Birch Ck
	WW-3	39.6	T6N,R35E,Sect 13,NE¼,NW¼	T[d],F	46.00271	118.38316	~30 meters above Pepper Rd brg
	WW-4	38.9	T6N,R35E,Sect 11,NE¼,SW¼	SPQ	46.00959[f]	118.38662[f]	~0.7 miles below Pepper Rd brg
	WW-5	38.2	T6N,R35E,Sect 38,SE¼,NE¼	F,SPQ	46.01795	118.39928	Old Milton Hwy
	WW-6	37.1	T6N,R35E,Sect 39,SW¼,SE¼	T,F[e,d],SPQ	46.02195	118.41764	0.5 miles above Bulingame diversion
	WW-7	36.6	T6N,R35E,Sect 39,SW¼,NE¼	SPQ	46.02354	118.42622	Just below Bulingame diversion
	WW-8	36.5	T6N,R35E,Sect 39,NE¼,NW¼	T[d],F[e,d],SPQ	46.0250	118.42801	~45 meters below Mojonnier Rd
	WW-9	35.1	T6N,R35E,Sect 5,NE¼,NE¼	F,SPQ	46.03102	118.45102	Last Chance Rd
	WW-10	34.0	T7N,R35E,Sect 38,SE¼,SW¼	T[d],F[e,d],SPQ	46.03445	118.47198	Swegle Rd
	WW-11	33.3	T7N,R35E,Sect 31,east edge	T[d],F[e,d],SPQ,G[d]	46.04034	118.48330	~0.4 miles above Detour Rd
	WW-12	32.9	T7N,R35E,Sect 37,NE¼,SE¼	SPQ	46.04273	118.49225	Just below Detour Rd
	WW-13	29.4	T7N,R34E,Sect 34,NW¼,NW¼	T[d],F[e,d],SPQ	46.04795	118.55510	~50 meters above McDonald Rd
	WW-14	29.3	T7N,R34E,Sect 34,NW¼,NW¼	SPQ	46.04792	118.55502	Just below McDonald Rd
	WW-15	27.4	T7N,R34E,Sect 29,SE¼,SW¼	F,SPQ	46.05230	118.59130	Just above Lowden Gardena Rd
	WW-16	22.8	T7N,R33E,Sect 3,SE¼,NW¼	T[d],F	46.02922[f]	118.67099[f]	~15 feet below Touchet Gardena Rd
	WW-17	15.6	T7N,R32E,Sect 35,SE¼,SE¼	T[d],F	46.03785	118.76706	Byerley Rd
	WW-18	12.1	T7N,R32E,Sect 22,SE¼,NE¼	F	46.07449	118.78627	~0.1 miles below 9mile brg
Yellowhawk Ck	YC-1	8.0	T7N,R36E,Sect 23,NE¼,NW¼	T[d],F[e,d]	46.07528	118.27385	~25 meters below diversion
	YC-2	0.1	T6N,R35E,Sect 38,NE¼,NE¼	T[d],F[e,d],G[d]	46.01763	118.40032	~30 Meters above mouth
Caldwell Ck	CD-1	0.2	T7N,R36E,Sect 37,SE¼,NW¼	T[d]	46.03428	118.33566	Directly below 3rd Ave. culvert
Russel Ck	RC-1	0.2	T6N,R36E,Sect 37,SW¼,SW¼	T[d]	46.02964[f]	118.34470[f]	Plaza Way Rd
Cottonwood Ck	CWC-1	4.4	T6N,R36E,Sect 10,NE¼,SE¼	T[d]	46.01103	118.28383	~10 feet below Hood Rd
	CWC-2	0.9	T6N,R36E,Sect 6,NE¼,SE¼	T[d]	46.02591	118.34656	~10 feet below Braden Rd

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					North	West	
East Little	ELW-1	1.9	T6N,R35E,Sect 14,NW¼,NW¼	EL	46.00332	118.40817	~0.2 miles below stateline
Walla Walla	ELW-2	1.3	T6N,R35E,Sect 11,SW¼	EL[d]	46.00662	118.40832	~0.1 miles above Big Spring Branch
	ELW-3	0.4	T6N,R35E,Sect 38,SW¼,NW¼	EL[d]	46.01419	118.41285	~0.4 miles above mouth
	ELW-4	0.2	T6N,R35E,Sect 38,NE¼,NW¼	T[d],F[e,d],EL[d],G[d]	46.01698	118.41095	~0.2 miles above mouth
Big Spring	BSB-1	0.7	T6N,R35E,Sect 14,NW¼,NW¼	EL	46.00306	118.40478	0.7 miles up Big Spring Branch
Branch	BSB-2	0.4	T6N,R35E,Sect 14,NW¼,NW¼	T[d]	46.00506	118.40490	0.4 miles up Big Spring Branch
	BSB-3	0.3	T6N,R35E,Sect 11,SW¼	EL[d]	46.00644	118.40526	0.3 miles up Big Spring Branch
Stone Ck	STN-1	0.0	T6N,R35E,Sect 39,SW¼,NE¼	F	46.02495	118.42630	~40 meters above mouth
Garrison Ck	GC-1	9.1	T7N,R36E,Sect 23,NE¼,NW¼	F[e,d]	46.07518[f]	118.27386[f]	~10 meters below diversion
	GC-2	0.3	T6N,R35E,Sect 3,SW¼,NW¼	T[d],F[e,d]	46.02780	118.42958	Just above Mission Rd
Mill Ck	MC-1	21.7	T6N,R38E,Sect 18,SW¼,NW¼	EQ[d]	46.00113	118.11603	Stateline
	MC-2	20.4	T6N,R37E,Sect 12,NW¼,NE¼	EQ[d]	46.02642	118.13669	~1.3 miles below stateline
	MC-3	19.1	T6N,R37E,Sect 2,NW¼,NE¼	T[d],EQ[d]	46.03179[f]	118.14432[f]	~15 meters below Wickersham brg
	MC-4	17.0	T7N,R37E,Sect 26,SW¼,NW¼	EQ[d]	46.05832[f]	118.15542[f]	~0.2 miles above Blue Ck
	MC-5	16.4	T7N,R37E,Sect 22,SE¼,SE¼	EQ[d]	46.06515	118.15768	~0.4 miles below Blue Ck
	MC-6	14.7	T7N,R37E,Sect 16,SE¼,SW¼	T,F[e]	46.08126[f]	118.18982[f]	Seven Mile Rd
	MC-7	14.6	T7N,R37E,Sect 16,SE¼,SW¼	EQ	46.08323	118.19419	~0.1 miles below Seven Mile Rd
	MC-8	12.8	T7N,R37E,Donation Land Claim	T[d],F[e,d]	46.08568[f]	118.22836[f]	Five Mile Rd
	MC-9	12.8	T7N,R37E,Donation Land Claim	EQ[d]	46.08577	118.22928	~75 meters below Five Mile Rd
	MC-10	12.0	T7N,R36E,Donation Land Claim	EQ	46.08284	118.24462	~0.5 miles above Bennington Dam
	MC-11	11.3	T7N,R36E,Donation Land Claim	T[d]			~45 meters above cold return
	MC-12	11.3	T7N,R36E,Donation Land Claim	T[d]			In cold return
	MC-13	11.3	T7N,R36E,Donation Land Claim	T[d]			~45 meters below cold return
	MC-14	8.5-10.5	T7N,R36E,Sect 21,22,23	Fish Salvage			Yellowhawk diversion to Roosevelt St
	MC-15	10.0	T7N,R36E,Sect 23,NW¼,NW¼	T[d]	46.07622[f]	118.28351[f]	First weir above Tausick Way

[a] River Mile
[b] T-Temperature; F-Flow; EQ-Quantitative Electrofishing (density estimates); EL-Qualitative Electrofishing; SPQ-Single Pass Quantitative Electrofishing (density estimates); G-Flow Gauge
[c] GPS were taken with a Garmin GPS II plus, in WSG 84 datum and in D.D°
[d] Same as previous year
[e] Index discharge site
[f] GPS was made using Maptech's Terrain Navigator (version 5.03) in WSG 84 datum
[g] Site locations for the Robinson Fork Tributary are estimates, no GPS was available for that crew on that day and landmarks used in descriptions are not identifiable on USGS maps or Maptech software.

Appendix A. Table 1. Study site locations for the Walla Walla River and tributaries, 2004.

Stream	Site #	RM[a]	Location (within sect. is listed as smallest qtr. sect. of qtr. sect.)	Sample Type[b]	GPS Coordinates[c]		Comments
					North	West	
Mill Ck (Cont.)	MC-16	8.4	T7N,R36E,Sect 21,NW¼,SE¼	F[e,d]	46.06902[f]	118.31223[f]	~15 meters above Roosevelt St
	MC-17	6.7-8.4		EL			Concrete channel e-fish
	MC-18	6.7	T7N,R36E,Sect 19,SE¼,SE¼	F[e,d]	46.06589[f]	118.34981[f]	9th Ave.
	MC-19	6.6	T7N,R36E,Sect 19,SE¼,SE¼	T[d]	46.06577[f]	118.35057[f]	~60 meters below 9th Ave.
	MC-20	4.8	T7N,R35E,Sect 23,SE¼,SE¼	T	46.06451[f]	118.38817[f]	First Weir above Gose St.
	MC-21	2.7	T7N,R35E,Sect 28,NE¼,SE¼	F[e,d]	46.05417[f]	118.43078[f]	~10 meters above Wallula Rd
	MC-22	0.4	T7N,R35E,Sect 38,SE¼NW¼	T[d]	46.04169[f]	118.47106[f]	~20 meters below Swegle Rd
Blue Ck	BC-1	0.2	T7N,R37E,Sect 26,SE¼NW¼	T[d]	46.05974[f]	118.15163[f]	Under Mill Ck Rd brg
Titus Ck	TC-1	4.3	T7N,R37E,Sect 16,NW¼,SW¼	EQ	46.08411[f]	118.19864[f]	~1.6 miles above Five Mile Rd
	TC-2	3.6	T7N,R37E,Sect 17,SE¼,NE¼	T,F[e],EQ,G	46.08496	118.20292	~1.0 miles above Five Mile Rd
	TC-3	2.8	T7N,R37E,Sect 18,SE¼,NE¼	EL	46.08702	118.22311	~0.3 miles above Five Mile Rd
	TC-4	2.7	T7N,R37E,Sect 18,SE¼,NE¼	T,F[e],G	46.08625[f]	118.22682[f]	Covered bridge above Five Mile Rd
	TC-5	2.6	T7N,R37E,Sect 18,SW¼,NE¼	T[d],F[e,d]	46.08699[f]	118.22896[f]	Just above Five Mile Rd
	TC-6	2.3	T7N,R37E,Sect 18,SE¼,NW¼	EQ	46.08671[f]	118.23409[f]	~0.2 miles below Five Mile Rd
	TC-7	1.9	T7N,R37E,Sect 18,SW¼,NW¼	EL	46.08627[f]	118.24188[f]	~0.6 miles below Five Mile Rd
	TC-8	1.2	T7N,R37E,Sect 13,NE¼,SW¼	EQ	46.08379[f]	118.25772[f]	Looking Glass Rd
	TC-9	0.2	T7N,R36E,Sect 23,NE¼,NW¼	T,F[e,d],EQ	46.07870	118.27495	Behind WWCC Nursing Building
	TC-10	0.1	T7N,R36E,Sect 23,NE¼,NW¼	EQ	46.07719	118.27648	WWCC footbridge
Cold Ck	CC-1	0.6	T7N,R35E,Sect 32,NE¼,NE¼	T[d]	46.04570	118.45092	~30 meters below Last Chance Rd
Doan Ck	DNC-1	0.9	T7N,R35E,Sect 38,east edge	T[d],F[e,d]	46.04322	118.45910	~0.4 miles below Last Chance Rd
West Little	WLW-1	4.5	T7N,R35E,Sect 9,NE¼,SW¼	T[d],F[e,d],EL[d]	46.01205	118.44140	0.5 miles up Valley Chapel Rd
Walla Walla	WLW-2	3.4	T6N,R35E,Sect 5,SE¼,SE¼	EL[d]	46.02020[f]	118.45177[f]	Just below Frog Hollow Rd
	WLW-3	0.8	T6N,R35E,Sect 37,north edge	T[d]	46.03444[f]	118.47185[f]	~5 feet above Swegle Rd
	WLW-4	0.8	T6N,R35E,Sect 37,north edge	F[e]	46.03444	118.47196	~5 feet below Swegle Rd
	WLW-5	0.5	T6N,R35E,Sect 38,SE¼,SW¼	EL[d]	46.03565[f]	118.47604[f]	WDFW property

[a] River Mile
[b] T-Temperature; F-Flow; EQ-Quantitative Electrofishing (density estimates); EL-Qualitative Electrofishing; SPQ-Single Pass Quantitative Electrofishing (density estimates); G-Flow Gauge
[c] GPS were taken with a Garmin GPS II plus, in WSG 84 datum and in D.D°
[d] Same as previous year
[e] Index discharge site
[f] GPS was made using Maptech's Terrain Navigator (version 5.03) in WSG 84 datum
[g] Site locations for the Robinson Fork Tributary are estimates, no GPS was available for that crew on that day and landmarks used in descriptions are not identifiable on USGS maps or Maptech software.

Appendix A. Table 1. Study site locations for the Walla Walla River and tributaries, 2004.

Stream	Site #	RM[a]	Location (within sect. is listed as smallest qtr. sect. of qtr. sect.)	Sample Type[b]	GPS Coordinates[c]		Comments
					North	West	
Walsh Ck	WAC-1	1.2	T6N,R35E,Sect 9,NE¼	T[d],F[e,d]	46.01641[f]	118.44074[f]	~20 feet above Valley Chapel Rd
NF Dry Ck	NFD-1	0.2	T7N,R38E,Sect 8,NW¼,SE¼	T[d],F[e,d]	46.09978[f]	118.08117[f]	0.25 miles up Scott Rd
Dry Ck	DRC-1	26.8	T8N,R37E,Sect 26,NW¼,SW¼	T[d],F[e,d]	46.14043[f]	118.15458[f]	Hwy 12 brg in Dixie
	DRC-2	25.8	T8N,R37E,Sect 34,NE¼,NW¼	SPQ	46.13430	118.17249	0.4 miles below 1st brg on Hwy 12 west of Dixie
	DRC-3	23.8	T7N,R37E,Sect 5,NW¼,NE¼	SPQ	46.12178	118.20768	2nd brg on Hwy 12 west of Dixie
	DRC-4	20.7	T8N,R35E,Sect 35,NE¼,NE¼	SPQ	46.13383	118.26652	Middle Waitsburg Rd
	DRC-5	17.2	T8N,R36E,Sect 21,NW¼,SE¼	T[d],SPQ	46.15451	118.31512	~40 meters above Lower Waitsburg Rd
	DRC-6	14.1	T8N,R35E,Sect 25,NE¼,NE¼	SPQ	46.14968	118.37267	Hwy 125 brg
	DRC-7	11.4	T8N,R35E,Sect 34,NE¼,SE¼	SPQ	46.12852	118.41338	Harvey Shaw Rd
	DRC-8	7.7	T7N,R35E,Sect 8,SW¼,NW¼	SPQ	46.10132	118.46937	Sudbury Rd
	DRC-9	6.6	T7N,R35E,Sect 7,SW¼,SW¼	SPQ	46.09316	118.48864	Guy Fine Rd
	DRC-10	2.8	T7N,R34E,Sect 22,SW¼,SW¼	T[d],SPQ	46.06736	118.55013	Talbott Rd
	DRC-11	0.6	T7N,R34E,Sect 29,NE¼,SW¼	F,SPQ	46.05688	118.59040	Hwy 12 brg in Lowden
Mud Ck	MDC-1	0.2	T7N,R35E,Sect 18,NW¼,NE¼	EL	46.09251	118.47945	Lower Dry Ck Rd (trib. to lower Dry Ck)
Mud Ck	MD-1	0.5	T7N,R34E,Sect 31,NW¼,SW¼	T[d],F	46.04223	118.61497	Barney Rd (trib. to Walla Walla River)
Pine Ck	PC-1	4.8	T6N,R34E,Sect 17,SE¼,NW¼	T[d]	46.00102[f]	118.59075[f]	~10 feet below Stateline Rd
	PC-2	1.3	T6N,R33E,Sect 1,SW¼,NW¼	T[d],F	46.02775	118.63308	Directly under Sand Pit Rd
Vancycle Canyon Ck	VC-1	0.1	T7N,R32E,Sect 20,SW¼,SE¼	F	46.06574[f]	118.83595[f]	Just above Hwy 12

[a] River Mile
[b] T-Temperature; F-Flow; EQ-Quantitative Electrofishing (density estimates); EL-Qualitative Electrofishing; SPQ-Single Pass Quantitative Electrofishing (density estimates); G-Flow Gauge
[c] GPS were taken with a Garmin GPS II plus, in WSG 84 datum and in D.D°
[d] Same as previous year
[e] Index discharge site
[f] GPS was made using Maptech's Terrain Navigator (version 5.03) in WSG 84 datum
[g] Site locations for the Robinson Fork Tributary are estimates, no GPS was available for that crew on that day and landmarks used in descriptions are not identifiable on USGS maps or Maptech software.

Appendix B. Discharge Data, 2004

Appendix B. Table 1. Manual discharge (cfs) measurements 2004.

Stream	Site	Width	Date	CFS	Temp (F)	Time	Comments
NF Touchet R	NFT-1	3.1	5/4	**13.2**	38.0	08:35	~10 meters below Bluewood Trib
		2.7	5/17	**6.6**	38.0	10:47	
		4.4	5/25	**6.0**	42.0	11:48	
		4.4	6/2	**7.0**	40.0	11:18	
		4.0	6/21	**3.4**	43.0	11:02	
		4.1	7/6	**1.2**	45.0	10:54	
		N/A	7/19	**N/A**	N/A	N/A	Road closed
		N/A	8/2	**N/A**	N/A	N/A	Road closed
		3.0	8/16	**1.0**	47.0	11:40	
		N/A	8/30	**N/A**	N/A	N/A	Road closed
		2.0	9/15	**1.1**	42.0	10:05	
		1.8	9/28	**0.8**	40.0	09:45	
		1.8	10/11	**0.8**	40.0	11:30	
		2.6	10/25	**0.7**	39.0	12:48	
		1.9	11/9	**0.8**	39.0	10:57	
Spangler Ck	SC-1	3.2	5/4	**11.8**	41.0	09:02	0.2 miles up Spangler Creek
		2.6	5/17	**8.1**	41.0	11:08	
		2.8	5/25	**9.2**	51.0	12:32	
		3.2	6/2	**8.5**	46.0	11:46	
		2.8	6/21	**4.8**	48.0	11:38	
		2.2	7/6	**2.8**	54.0	11:19	
		2.1	7/19	**2.5**	53.0	09:34	
		2.4	8/2	**1.9**	58.0	12:10	
		2.1	8/16	**1.3**	57.0	12:09	
		N/A	8/30	**N/A**	N/A	N/A	Road closed
		2.1	9/15	**2.1**	47.0	12:54	
		2.0	9/28	**1.5**	50.0	13:05	
		2.1	10/11	**1.6**	44.0	11:55	
		2.2	10/25	**2.0**	39.0	11:54	
		2.1	11/9	**1.6**	41.0	11:25	
NF Touchet R	NFT-6	6.0	5/4	**43.0**	41.0	09:15	0.2 miles below mouth of Spangler Ck
		5.9	5/17	**28.2**	41.0	11:17	
		5.2	5/25	**27.3**	48.0	12:50	
		5.9	6/2	**32.4**	47.0	12:14	
		5.1	6/21	**15.3**	49.0	11:58	
		4.9	7/6	**10.1**	54.0	11:32	
		4.8	7/19	**8.8**	53..0	09:47	
		5.0	8/2	**5.8**	59.0	12:25	
		4.7	8/16	**2.6**	58.0	13:09	
		N/A	8/30	**N/A**	N/A	N/A	Road closed
		5.1	9/15	**7.4**	48.0	13:05	
		5.0	9/28	**4.8**	50.0	12:48	
		4.7	10/11	**2.3**	46.0	12:12	
		4.8	10/25	**5.7**	41.0	12:25	
		4.6	11/9	**4.9**	41.0	11:38	

Appendix B. Table 1. (Cont.) Manual discharge (cfs) measurements 2004.

Stream	Site	Width	Date	CFS	Temp (F)	Time	Comments
Lewis Creek	LC-1	3.5	5/4	**8.1**	46.0	09:30	~10 feet above N. Fork Touchet Rd
		3.5	5/17	**5.9**	46.0	11:30	
		3.2	5/25	**9.7**	51.0	13:26	
		3.9	6/2	**11.0**	49.0	12:31	
		3.3	6/21	**7.3**	51.0	N/A	Time not recorded
		3.0	7/6	**5.0**	54.0	11:48	
		3.1	7/19	**4.9**	53.0	10:00	
		3.0	8/2	**5.2**	57.0	12:45	
		2.8	8/16	**3.0**	56.0	13:54	
		3.0	8/30	**4.1**	52.0	11:05	
		2.9	9/15	**4.4**	50.0	13:20	
		2.7	9/28	**4.7**	51.0	13:39	
		2.6	10/11	**3.8**	47.0	12:30	
		2.6	10/25	**4.9**	44.0	11:23	
		3.0	11/9	**4.2**	45.0	11:58	
Jim Creek	JC-1	2.5	5/4	**1.8**	49.0	09:45	~15 feet below N. Fork Touchet Rd
		2.5	5/17	**1.7**	51.0	11:43	
		2.5	5/25	**4.1**	56.0	13:50	
		2.7	6/2	**4.8**	54.0	12:48	
		2.8	6/21	**3.4**	58.0	12:38	
		2.7	7/6	**1.5**	61.0	11:59	
		2.5	7/19	**1.1**	60.0	10:14	
		2.3	8/2	**0.8**	64.0	13:05	
		2.2	8/16	**0.8**	66.0	13:39	
		2.6	8/30	**0.7**	56.0	11:23	
		2.5	9/15	**1.0**	55.0	13:34	
		2.3	9/28	**0.8**	54.0	14:05	
		2.3	10/11	**1.0**	48.0	12:44	
		2.1	10/25	**1.0**	42.0	10:20	
		2.4	11/9	**0.8**	43.0	12:15	
Tate Creek	T-5	1.8	3/23	**0.9**	39.0	12:50	Wolf Fk Rd
Whitney Creek	WH-5	3.5	5/4	**8.6**	46.0	11:00	0.2 miles up Whitney Ck Rd
Whitney Creek	WH-6	2.6	5/17	**5.3**	46.0	12:11	~35 meters above mouth
		2.6	5/25	**8.7**	51.0	14:20	
		2.6	6/2	**6.6**	51.0	13:19	
		2.4	6/21	**4.7**	58.0	13:40	
		2.3	7/6	**4.3**	56.0	12:33	
		2.3	7/19	**3.9**	55.0	10:40	
		2.6	8/2	**2.9**	58.0	13:45	
		2.0	8/17	**2.8**	57.0	14:45	
		2.5	8/30	**2.1**	54.0	11:52	
		1.9	9/14	**3.4**	53.0	12:50	
		2.5	9/29	**2.5**	52.0	13:22	
		2.2	10/14	**3.0**	50.0	13:29	
		2.4	10/25	**2.7**	42.0	10:56	
		2.3	11/9	**3.1**	45.0	12:58	

Appendix B. Table 1. (Cont.) Manual discharge (cfs) measurements 2004.

Stream	Site	Width	Date	CFS	Temp (F)	Time	Comments
Coates Creek	C-1	4.1	5/4	**5.9**	46.0	11:16	~10 feet below Wolf Fork Rd
		3.2	5/17	**3.7**	46.0	12:19	
		2.5	5/25	**5.1**	49.0	14:40	
		3.5	6/2	**5.8**	54.0	13:34	
		3.4	6/21	**3.1**	54.0	14:06	
		2.8	7/6	**2.9**	57.0	12:46	
		2.9	7/19	**2.2**	56.0	10:52	
		3.3	8/2	**1.6**	58.0	14:20	
		2.7	8/17	**1.7**	58.0	15:00	
		3.0	8/30	**1.1**	54.0	12:06	
		2.6	9/14	**2.0**	52.0	13:08	
		2.6	9/29	**2.0**	50.0	13:41	
		2.5	10/14	**2.0**	48.0	13:09	
		2.8	10/25	**1.9**	42.0	11:12	
		2.6	11/9	**1.8**	44.0	12:45	
Wolf Fork	WF-4	7.0	5/4	**59.9**	47.0	11:37	~15 feet below 3rd bridge on Wolf Fk Rd
		7.1	5/17	**40.0**	48.0	12:34	
		6.7	5/25	**55.1**	54.0	15:03	
		6.6	6/2	**51.9**	54.0	13:54	
		7.3	6/21	**36.2**	59.0	14:29	
		6.9	7/6	**26.6**	59.0	13:03	
		6.5	7/19	**27.4**	55.0	11:07	
		6.2	8/2	**22.9**	62.0	14:40	
		6.3	8/17	**23.3**	58.0	15:20	
		6.4	8/30	**22.8**	56.0	12:25	
		7.1	9/14	**25.5**	52.0	13:35	
		6.7	9/29	**24.3**	54.0	14:02	
		6.0	10/14	**21.9**	51.0	14:00	
		6.2	10/25	**21.6**	44.0	11:30	
		6.3	11/9	**20.5**	45.0	13:22	
Wolf Fork	WF-5	9.4	5/4	**68.4**	50.0	12:07	Holmberg Rd bridge
		10.2	5/17	**54.5**	52.0	12:48	
		10.6	5/25	**66.1**	58.0	15:20	
		10.6	6/2	**70.1**	56.0	14:20	
		9.3	6/21	**35.5**	62.0	14:54	
		9.8	7/6	**27.6**	63.0	13:20	
		9.2	7/19	**27.9**	59.0	11:21	
		8.9	8/2	**19.2**	64.0	15:00	
		9.0	8/17	**22.0**	62.0	15:45	
		9.0	8/30	**18.8**	61.0	12:53	
		8.7	9/14	**25.6**	56.0	14:12	
		8.8	9/29	**20.6**	55.0	14:24	
		8.8	10/14	**18.0**	52.0	12:53	
		8.7	10/25	**17.5**	46.0	12:02	
		8.8	11/9	**19.8**	44.0	13:41	

Appendix B. Table 1. (Cont.) Manual discharge (cfs) measurements 2004.

Stream	Site	Width	Date	CFS	Temp (F)	Time	Comments
NF Touchet R	NFT-8	14.7	5/4	**136.7**	52.0	11:32	Above Baileysburg
		14.5	5/17	**103.1**	54.0	13:09	
		N/A	5/25	**N/A**	N/A	N/A	Water too high to take flow
		N/A	6/2	**N/A**	N/A	N/A	Water too high to take flow
		10.2	6/21	**79.1**	67.0	15:23	
		9.2	7/6	**52.4**	68.0	13:42	
		9.5	7/19	**49.4**	64.0	11:38	
		9.7	8/2	**38.1**	70.0	15:45	
		9.0	8/16	**40.0**	69.0	14:00	
		10.2	8/30	**38.6**	66.0	13:21	
		9.4	9/15	**46.6**	58.0	13:55	
		9.5	9/27	**43.4**	58.0	12:52	
		9.7	10/11	**41.8**	53.0	13:07	
		9.3	10/25	**46.7**	47.0	12:43	
		9.6	11/9	**46.4**	46.0	14:00	
Green Fork	GF-1	2.2	9/16	**1.6**	54.0	13:30	~10 meters above mouth
		2.0	10/12	**0.5**	0.0	13:47	Temp not taken
Burnt Fork	BF-1	5.2	9/16	**5.0**	51.0	13:35	~10 meters above mouth
		4.4	10/12	**2.7**	0.0	13:55	Temp not taken
SF Touchet R	SFT-1	7.6	9/16	**6.5**	52.0	13:44	~10 meters below Burnt Fk mouth
		5.2	10/12	**2.6**	0.0	13:59	Temp not taken
SF Touchet R	SFT-2	6.3	5/4	**48.5**	52.0	13:05	~50 feet above Camp Nancy Lee brg
		6.7	5/17	**32.5**	53.0	13:33	
		9.5	5/25	**63.9**	59.0	16:05	
		9.3	6/2	**73.9**	58.0	15:02	
		7.7	6/21	**22.9**	65.0	16:03	
		6.9	7/6	**9.6**	69.0	14:10	
		5.5	7/19	**7.6**	69.0	12:04	
		4.1	8/2	**3.5**	68.0	16:15	
		6.1	8/16	**2.8**	72.0	14:31	
		4.9	8/30	**4.1**	70.0	13:55	
		7.3	9/20	**8.4**	55.0	11:14	
		4.9	9/27	**4.6**	62.0	13:21	
		4.7	10/11	**5.3**	56.0	13:34	
		5.1	10/25	**8.9**	49.0	13:13	
		5.3	11/9	**7.5**	47.0	14:29	
SF Touchet R	SFT-3	10.4	5/4	**56.0**	58.0	13:30	Gephart Rd
		10.4	5/17	**36.1**	57.0	13:53	
		10.0	5/25	**63.7**	60.0	16:35	
		11.1	6/2	**75.2**	61.0	15:28	
		10.1	6/21	**22.9**	68.0	16:35	
		9.8	7/6	**9.0**	71.0	14:33	
		7.1	7/19	**5.7**	71.0	12:25	
		N/A	8/2	**N/A**	N/A	N/A	No flow taken due to thunderstorm
		5.5	8/16	**0.7**	69.0	14:56	

Appendix B. Table 1. (Cont.) Manual discharge (cfs) measurements 2004.

Stream	Site	Width	Date	CFS	Temp (F)	Time	Comments
SF Touchet R (Cont.)	SFT-3	9.4	8/30	**4.1**	70.0	14:15	Gephart Rd
		9.1	9/20	**6.7**	56.0	11:42	
		8.0	9/27	**4.0**	64.0	13:46	
		10.2	10/11	**4.6**	58.0	13:56	
		7.8	10/25	**8.5**	51.0	13:38	
		9.0	11/9	**11.1**	48.0	14:57	
Touchet River	TR-2	16.7	5/4	**186.2**	57.0	14:20	Football field in Dayton
		17.9	5/17	**120.3**	57.0	14:28	
		18.8	5/25	**219.6**	59.0	17:35	
		18.9	6/2	**215.2**	62.0	16:15	
		19.7	6/21	**104.1**	67.0	17:24	
		18.6	7/6	**54.0**	70.0	15:18	
		18.1	7/19	**51.6**	69.0	13:12	
		N/A	8/2	**N/A**	N/A	N/A	No flow taken due to thunderstorm
		18.6	8/16	**34.6**	71.0	15:34	
		17.4	8/30	**42.1**	69.0	14:50	
		19.2	9/20	**51.0**	55.0	12:33	
		17.5	9/27	**43.8**	60.0	14:30	
		17.6	10/11	**46.6**	55.0	14:41	
		17.8	10/25	**60.3**	48.0	14:16	
		17.7	11/9	**56.9**	47.0	15:28	
Patit Creek	P-1	4.8	5/4	**5.1**	60.0	13:53	Directly below Broughton bridge
		5.3	5/17	**3.9**	61.0	14:10	
		4.5	5/25	**7.4**	69.0	17:05	
		4.3	6/2	**11.9**	70.0	15:52	
		4.3	6/21	**4.3**	74.0	17:00	
		3.7	7/6	**0.5**	68.0	N/A	Time not recorded
		2.8	7/19	**0.2**	61.0	12:45	
		N/A	8/2	**N/A**	N/A	N/A	No flow taken due to thunderstorm
		1.8	8/16	**0.0**	65.0	15:13	Actual flow was 0.04
		N/A	8/30	**N/A**	N/A	N/A	No measurable flow
		2.8	9/20	**0.1**	53.0	12:02	
		2.9	9/27	**0.1**	54.0	14:11	
		2.5	10/11	**0.1**	48.0	14:18	
		N/A	10/25	**N/M**	0..0	13:56	No measurable flow
		N/A	11/9	**N/M**	0..0	15:12	No measurable flow
Whiskey Creek	WC-3	3.6	3/22	**2.5**	55.0	11:05	~15 feet above Alyward Tributary
		2.3	4/6	**1.3**	59.0	13:05	
		4.5	6/11	**14.6**	56.0	13:20	
Whiskey Creek (Alyward Trib)	AT-10	2.9	3/22	**2.0**	55.0	11:00	In tributary ~15ft above mouth
		2.8	4/6	**1.3**	60.0	13:11	
		3.1	6/11	**7.0**	59.0	13:10	
SF Coppei	SFC-4	4.2	5/10	**3.3**	51.0	13:20	2nd bridge on SF Coppei Rd
		3.9	5/17	**6.9**	51.0	09:27	
		4.1	5/25	**18.8**	53.0	09:55	

Appendix B. Table 1. (Cont.) Manual discharge (cfs) measurements 2004.

Stream	Site	Width	Date	CFS	Temp (F)	Time	Comments
SF Coppei	SFC-4	4.9	6/2	**15.6**	51.0	09:41	2nd bridge on SF Coppei Rd
(Cont.)		3.3	6/21	**3.9**	56.0	08:35	
		3.0	7/6	**1.4**	64.0	09:14	
		2.9	7/19	**1.2**	64.0	07:55	
		3.8	8/2	**0.9**	66.0	09:53	
		3.0	8/16	**1.2**	67.0	09:58	
		3.7	8/30	**1.6**	62.0	09:25	
		3.2	9/20	**1.9**	53.0	09:33	
		3.2	9/27	**1.4**	57.0	11:30	
		4.1	10/11	**1.8**	50.0	09:58	
		3.5	10/25	**1.8**	44.0	09:45	
		3.3	11/9	**1.9**	43.0	09:27	
NF Coppei	NFC-4	2.9	5/10	**1.9**	51.0	13:35	~10 meters above Forks bridge
		2.4	5/17	**3.2**	52.0	09:36	
		3.6	5/25	**9.6**	52.0	10:12	
		3.4	6/2	**6.3**	52.0	09:54	
		2.9	6/21	**2.6**	57.0	09:10	
		2.3	7/6	**1.3**	63.0	09:27	
		2.3	7/19	**1.2**	64.0	08:06	
		2.4	8/2	**0.9**	64.0	10:06	
		2.8	8/16	**0.9**	65.0	10:09	
		3.0	8/30	**1.1**	61.0	09:38	
		2.9	9/20	**1.1**	53.0	09:49	
		3.1	9/27	**1.1**	56.0	11:43	
		3.0	10/11	**1.1**	50.0	10:10	
		2.8	10/25	**1.3**	43.0	09:55	
		2.8	11/9	**1.5**	44.0	09:42	
Coppei Creek	CO-3	4.0	5/10	**5.5**	52.0	14:00	~10 meters above McCowan Rd brg
		4.0	5/17	**10.8**	53.0	09:47	
		6.0	5/25	**28.0**	55.0	10:35	
		6.0	6/2	**24.9**	56.0	10:11	
		4.7	6/21	**6.7**	60.0	09:40	
		3.5	7/6	**2.3**	65.0	09:42	
		4.2	7/19	**2.1**	65.0	08:20	
		3.8	8/2	**0.7**	67.0	10:25	
		4.5	8/16	**1.5**	69.0	10:25	
		4.0	8/30	**1.6**	63.0	09:55	
		5.0	9/20	**3.0**	54.0	10:08	
		4.0	9/27	**1.9**	58.0	12:00	
		4.1	10/11	**2.2**	50.0	10:21	
		4.2	10/25	**2.7**	44.0	10:08	
		4.1	11/9	**3.7**	44.0	09:56	
Touchet River	TR-19	16.6	6/23	**85.7**	79.0	15:02	Cummins Rd bridge

Appendix B. Table 1. (Cont.) Manual discharge (cfs) measurements 2004.

Stream	Site	Width	Date	CFS	Temp (F)	Time	Comments
Walla Walla R	WW-1	24.0	5/10	**199.8**	51.0	15:30	Stateline
		21.7	5/17	**277.1**	54.0	12:44	
		N/A	5/24	**N/A**	N/A	N/A	Water too high to take flow
		N/A	6/1	**N/A**	N/A	N/A	Water too high to take flow
		16.0	6/23	**35.6**	62.0	N/A	Time not recorded
		14.2	7/1	**15.1**	70.0	12:42	
		14.4	7/7	**14.4**	67.0	12:22	
		14.7	7/19	**19.9**	67.0	11:09	
		14.5	8/2	**13.7**	74.0	13:24	
		13.9	8/17	**11.0**	68.0	13:05	
		14.0	8/30	**9.4**	68.0	12:38	
		14.6	9/13	**15.7**	61.0	13:40	
		14.3	9/27	**13.1**	63.0	13:16	
		14.5	10/11	**13.3**	53.0	13:16	
		14.6	10/28	**14.6**	51.0	14:57	
		15.1	11/8	**20.9**	50.0	13:31	
Walla Walla R	WW-3	7.5	6/23	**41.0**	60.0	07:15	Above Pepper Rd bridge
Walla Walla R	WW-5	11.2	6/23	**43.2**	60.0	08:00	Old Milton Hwy
		10.8	8/19	**13.5**	70.0	11:21	
Yellowhawk Ck	YC-1	5.4	5/10	**24.0**	50.0	10:45	Below Diversion
		4.9	5/17	**26.3**	60.0	14:17	
		4.8	5/24	**24.3**	53.0	13:00	
		4.9	6/1	**26.5**	55.0	12:43	
		4.9	6/23	**32.3**	67.0	12:36	
		4.9	7/1	**29.3**	77.0	14:22	
		4.7	7/7	**23.8**	70.0	14:11	
		4.8	7/19	**20.0**	73.0	12:43	
		4.8	8/2	**18.1**	77.0	15:44	
		5.0	8/17	**18.4**	70.0	14:27	
		4.7	8/30	**21.8**	72.0	13:58	
		5.0	9/13	**27.5**	60.0	17:13	
		4.6	9/27	**20.7**	65.0	14:51	
		4.6	10/11	**31.0**	58.0	14:28	
		4.8	10/28	**46.3**	52.0	16:31	
		5.1	11/8	**38.0**	47.0	12:24	
Yellowhawk Ck	YC-2	8.6	5/10	**38.4**	53.0	15:00	Above mouth
		8.0	5/17	**65.7**	54.0	12:17	
		N/A	5/24	**N/A**	N/A	N/A	Water too high to take flow
		N/A	6/1	**N/A**	N/A	N/A	Water too high to take flow
		7.8	6/23	**47.3**	62.0	07:43	
		7.8	7/1	**26.6**	69.0	12:17	
		7.9	7/7	**27.4**	64.0	12:02	
		7.9	7/19	**20.7**	68.0	10:46	
		6.1	8/2	**13.8**	73.0	12:51	
		6.4	8/17	**14.3**	72.0	12:42	
		7.8	8/30	**20.6**	67.0	12:08	
		7.8	9/13	**25.6**	59.0	13:15	

Appendix B. Table 1. (Cont.) Manual discharge (cfs) measurements 2004.							
Stream	**Site**	**Width**	**Date**	**CFS**	**Temp (F)**	**Time**	**Comments**
Yellowhawk Ck (Cont.)	YC-2	7.7	9/27	**20.0**	59.0	12:54	Above mouth
		7.8	10/11	**27.8**	53.0	12:50	
		7.7	10/28	**36.2**	49.0	14:19	
		7.8	11/8	**36.0**	46.0	13:07	
Walla Walla R.	WW-6	19.8	5/10	**253.7**	51.0	14:30	Above Burlingame Diversion
		N/A	5/17	**N/A**	N/A	N/A	Water too high to take flow
		N/A	5/24	**N/A**	N/A	N/A	Water too high to take flow
		N/A	6/1	**N/A**	N/A	N/A	Water too high to take flow
		10.9	6/23	**92.6**	61.0	08:30	
		10.9	7/1	**60.6**	72.0	11:59	
		10.6	7/7	**65.8**	65.0	11:47	
		10.6	7/19	**49.6**	67.0	10:31	
		10.5	8/2	**40.6**	73.0	12:38	
		10.4	8/17	**36.9**	68.0	12:23	
		10.6	8/30	**48.5**	66.0	11:52	
		10.7	9/13	**52.1**	59.0	13:00	
		10.4	9/27	**50.0**	60.0	12:38	
		10.5	10/11	**59.5**	54.0	12:35	
		10.8	10/28	**64.3**	52.0	14:02	
		10.8	11/8	**66.2**	49.0	12:51	
East Little Walla Walla	ELW-4	4.2	5/10	**18.0**	57.0	13:20	0.2 miles above mouth
		4.7	5/17	**22.0**	56.0	11:33	
		4.9	5/24	**24.6**	56.0	10:58	
		4.3	6/1	**22.3**	58.0	11:02	
		3.5	6/23	**15.3**	58.0	09:28	
		4.7	7/1	**18.1**	62.0	11:11	
		5.4	7/7	**16.6**	61.0	10:59	
		5.2	7/19	**10.1**	58.0	09:45	
		5.0	8/2	**9.7**	68.0	11:42	
		4.4	8/17	**12.3**	59.0	11:37	
		5.4	8/30	**14.2**	59.0	11:04	
		5.5	9/13	**15.7**	55.0	12:03	
		5.1	9/27	**17.2**	56.0	11:41	
		5.4	10/11	**15.1**	51.0	11:43	
		5.2	10/28	**13.3**	52.0	13:08	
		5.5	11/8	**13.6**	49.0	12:00	
Stone Ck	STN-1	1.0	6/23	**0.5**	62.0	08:55	Above mouth
		N/A	8/19	**N/A**	N/A	N/A	no measurable flow
Walla Walla R	WW-8	N/A	5/10	**N/A**	N/A	N/A	Below Mojonnier Rd
		N/A	5/17	**N/A**	N/A	N/A	Water too high to take flow
		N/A	5/24	**N/A**	N/A	N/A	Water too high to take flow
		N/A	6/1	**N/A**	N/A	N/A	Water too high to take flow
		13.9	6/23	**49.7**	63.0	10:13	
		13.9	7/1	**64.0**	68.0	11:31	
		14.1	7/7	**71.4**	66.0	11:18	
		14.0	7/19	**50.9**	66.0	10:03	
		14.0	8/2	**42.6**	73.0	12:03	

Appendix B. Table 1. (Cont.) Manual discharge (cfs) measurements 2004.

Stream	Site	Width	Date	CFS	Temp (F)	Time	Comments
Walla Walla R	WW-8	13.7	8/17	**37.2**	68.0	11:50	Below Mojonnier Rd
(Cont.)		13.9	8/30	**51.8**	66.0	11:26	
		9.4	9/13	**53.4**	59.0	12:29	
		13.9	9/27	**51.4**	60.0	12:13	
		14.2	10/11	**26.9**	53.0	12:03	
		13.0	10/28	**13.4**	50.0	13:30	
		14.1	11/8	**15.5**	50.0	12:18	
Garrison Ck	GC-1	3.8	5/10	**3.7**	50.0	10:55	Below Diversion
		3.1	5/17	**3.4**	60.0	14:05	
		3.1	5/24	**3.1**	53.0	12:45	
		2.9	6/1	**3.3**	56.0	12:28	
		3.2	6/23	**4.6**	67.0	12:17	
		3.2	7/1	**4.0**	76.0	14:07	
		3.2	7/7	**3.8**	70.0	13:59	
		3.1	7/19	**3.9**	73.0	12:31	
		2.9	8/2	**3.1**	77.0	15:26	
		3.1	8/17	**2.7**	70.0	14:16	
		3.1	8/30	**4.0**	72.0	13:41	
		3.1	9/13	**4.3**	60.0	16:58	
		3.1	9/27	**3.6**	65.0	14:40	
		3.1	10/11	**4.8**	58.0	14:14	
		3.0	10/28	**4.2**	52.0	16:15	
		3.1	11/8	**3.5**	47.0	12:17	
Garrison Ck	GC-2	2.6	5/10	**4.0**	60.0	14:00	Mission Rd
		2.1	5/17	**4.9**	62.0	11:44	
		1.6	5/24	**3.8**	56.0	11:14	
		2.1	6/1	**5.1**	59.0	11:19	
		1.6	6/23	**3.7**	63.0	09:08	
		1.3	7/1	**4.0**	67.0	11:42	
		1.2	7/7	**1.9**	66.0	11:28	
		1.2	7/19	**1.2**	70.0	10:14	
		1.0	8/2	**0.7**	72.0	12:20	
		0.9	8/17	**0.5**	72.0	12:07	
		1.5	8/30	**2.2**	65.0	11:38	
		1.6	9/13	**2.0**	62.0	12:42	
		1.4	9/27	**1.7**	63.0	12:24	
		1.6	10/11	**2.6**	58.0	12:18	
		2.3	10/28	**6.0**	58.0	13:46	
		1.5	11/8	**3.0**	49.0	12:32	
Walla Walla R	WW-9	7.5	6/23	**52.4**	62.0	09:55	Last Chance Rd
		7.0	8/19	**36.2**	68.0	10:59	
Walla Walla R	WW-10	18.4	5/10	**206.9**	51.0	11:37	Swegle Rd
		19.4	5/17	**323.8**	52.0	10:35	
		N/A	5/24	**N/A**	N/A	N/A	Water too high to take flow
		N/A	6/1	**N/A**	N/A	N/A	Water too high to take flow

Appendix B. Table 1. (Cont.) Manual discharge (cfs) measurements 2004.

Stream	Site	Width	Date	CFS	Temp (F)	Time	Comments
Walla Walla R	WW-10	15.8	6/23	**56.1**	63.0	10:21	Swegle Rd
(Cont.)		15.9	7/1	**63.9**	70.0	10:47	
		15.1	7/7	**75.0**	67.0	10:08	
		14.6	7/19	**77.7**	67.0	08:57	
		14.5	8/2	**45.8**	72.0	10:38	
		14.5	8/17	**30.7**	69.0	10:52	
		14.7	8/30	**47.1**	66.0	10:16	
		14.6	9/13	**58.7**	60.0	11:11	
		15.2	9/27	**56.3**	59.0	10:49	
		14.4	10/11	**28.3**	54.0	10:47	
		14.2	10/28	**22.7**	50.0	11:50	
		14.2	11/8	**18.7**	49.0	11:07	
Mill Creek	MC-6	13.3	7/1	**35.8**	71.0	16:03	Seven Mile
		13.7	7/7	**45.5**	67.0	15:58	
		13.0	7/19	**35.0**	71.0	14:28	
		12.7	8/2	**25.7**	67.0	17:10	
		12.5	8/17	**32.2**	67.0	15:45	
		12.9	8/30	**33.0**	69.0	14:45	
		13.1	9/13	**35.9**	58.0	15:42	
		12.1	9/27	**33.4**	56.0	10:22	
		12.8	10/11	**34.0**	55.0	16:20	
		13.1	10/27	**40.7**	47.0	11:46	
		12.7	11/8	**46.8**	47.0	13:39	
Mill Creek	MC-8	15.4	4/2	**132.1**	46.0	11:54	Five Mile Rd
		13.3	5/10	**86.2**	49.0	11:55	
		12.1	5/17	**108.7**	60.0	15:10	
		N/A	5/24	**N/A**	N/A	N/A	Water too high to take flow
		N/A	6/1	**N/A**	N/A	N/A	Water too high to take flow
		15.0	6/23	**54.6**	65.0	13:22	
		14.1	7/1	**36.8**	73.0	15:06	
		12.4	7/7	**33.1**	67.0	14:53	
		12.9	7/19	**30.0**	69.0	13:29	
		13.0	8/2	**23.8**	69.0	16:27	
		13.1	8/17	**21.6**	68.0	15:06	
		12.9	8/30	**23.1**	69.0	15:16	
		12.7	9/13	**32.8**	58.0	16:11	
		12.7	9/27	**31.2**	56.0	09:42	
		12.9	10/11	**33.4**	55.0	15:38	
		13.2	10/27	**41.5**	48.0	09:50	
		12.0	11/8	**44.8**	46.0	13:06	
Titus Creek	TC-2	5.3	7/1	**8.8**	71.0	15:43	~ 0.7 mi below Seven Mile
		5.3	7/7	**9.1**	66.0	15:26	
		5.1	7/19	**7.1**	70.0	14:01	
		4.8	8/2	**6.0**	68.0	16:57	
		5.3	8/19	**6.5**	69.0	12:11	

Appendix B. Table 1. (Cont.) Manual discharge (cfs) measurements 2004.

Stream	Site	Width	Date	CFS	Temp (F)	Time	Comments
Titus Creek	TC-2	5.1	8/30	**7.0**	68.0	14:29	~ 0.7 mi below Seven Mile
(Cont.)		5.3	9/13	**8.7**	58.0	15:08	
		4.9	9/27	**6.6**	56.0	10:00	
		5.1	10/11	**6.8**	56.0	16:01	
		5.3	10/27	**8.8**	47.0	11:08	
		5.0	11/8	**10.7**	47.0	13:27	
Titus Creek	TC-4	3.4	7/1	**5.6**	70.0	15:22	Covered Bridge
		3.5	7/7	**5.5**	66.0	15:08	
		3.2	7/19	**3.6**	68.0	13:41	
		3.1	8/2	**2.9**	70.0	16:39	
		3.3	8/17	**1.4**	66.0	15:20	
		2.8	8/30	**2.3**	68.0	15:31	
		3.4	9/13	**3.4**	58.0	16:25	
		3.1	9/27	**4.1**	55.0	09:25	
		2.9	10/11	**6.6**	54.0	15:44	
		3.6	10/22	**8.8**	46.0	12:16	
		3.2	10/27	**7.0**	47.0	10:13	
		3.5	11/8	**8.2**	46.0	12:54	
Titus Creek	TC-5	1.4	5/10	**3.5**	48.0	11:40	Five Mile
		1.5	5/17	**5.3**	59.0	14:55	
		2.2	5/24	**8.5**	52.0	13:41	
		1.8	6/1	**8.3**	53.0	13:23	
		1.2	6/23	**1.7**	64.0	13:01	
		1.3	7/1	**4.4**	70.0	14:51	
		1.2	7/7	**2.9**	64.0	14:40	
		1.3	7/19	**4.8**	68.0	13:18	
		0.9	8/2	**2.2**	70.0	16:14	
		1.5	8/17	**5.4**	66.0	14:54	
		1.3	8/30	**4.8**	68.0	15:01	
		1.3	9/13	**5.5**	58.0	15:57	
		1.2	9/27	**4.2**	55.0	09:15	
		0.9	10/11	**1.5**	54.0	15:21	
		1.2	10/22	**2.9**	46.0	12:31	
		1.1	10/27	**2.7**	46.0	10:29	
		1.3	11/8	**4.0**	48.0	13:12	
Titus Creek	TC-9	3.5	5/10	**3.3**	52.0	11:20	WWCC
		4.5	5/17	**0.8**	60.0	14:39	
		4.0	5/24	**3.3**	56.0	13:15	
		4.2	6/1	**6.2**	56.0	13:08	
		3.6	6/23	**2.3**	60.0	12:50	
		3.5	7/1	**2.1**	66.0	14:38	
		3.3	7/7	**2.2**	62.0	14:28	
		3.4	7/19	**1.7**	64.0	13:03	
		2.9	8/2	**1.9**	68.0	16:00	
		3.3	8/17	**1.7**	65.0	14:44	

Appendix B. Table 1. (Cont.) Manual discharge (cfs) measurements 2004.

Stream	Site	Width	Date	CFS	Temp (F)	Time	Comments
Titus Creek (Cont.)	TC-9	3.2	8/30	**2.7**	63.0	14:10	WWCC
		3.3	9/13	**3.3**	59.0	16:42	
		3.3	9/27	**2.8**	62.0	15:07	
		3.9	10/11	**1.5**	56.0	15:08	
		3.6	10/28	**1.5**	52.0	16:48	
		2.7	11/8	**2.1**	48.0	12:39	
Mill Creek	MC-16	3.1	5/10	**50.8**	52.0	10:30	Above Roosevelt St
		25.4	5/17	**72.0**	70.0	13:45	Taken at weir just before channel
		N/A	5/24	**N/A**	N/A	N/A	Water too high to take flow
		N/A	6/1	**N/A**	N/A	N/A	Water too high to take flow
		2.7	6/23	**18.0**	77.0	11:52	
		N/A	7/1	**N/A**	N/A	N/A	Stream was dry from 7/1 to 10/11
		0.9	10/28	**2.3**	53.0	15:49	
		2.7	11/8	**21.1**	49.0	14:29	
Mill Creek	MC-18	N/A	5/10	**N/A**	N/A	N/A	9th Ave
		N/A	5/17	**N/A**	N/A	N/A	Water too high to take flow
		N/A	5/24	**N/A**	N/A	N/A	Water too high to take flow
		N/A	6/1	**N/A**	N/A	N/A	Water too high to take flow
		3.7	6/23	**25.0**	69.0	11:34	
		3.1	7/1	**8.0**	72.0	13:11	
		2.5	7/7	**3.8**	69.0	12:57	
		2.7	7/19	**3.2**	68.0	11:35	
		2.7	8/2	**3.9**	74.0	14:10	
		2.7	8/17	**2.9**	67.0	13:34	
		2.6	8/30	**3.6**	69.0	13:00	
		2.5	9/13	**4.0**	61.0	14:20	
		2.7	9/27	**2.7**	63.0	13:44	
		0.9	10/11	**2.7**	58.0	13:37	
		1.0	10/28	**6.9**	55.0	15:27	
		2.7	11/8	**13.7**	51.0	14:00	
Mill Creek	MC-21	12.0	5/17	**92.0**	54.0	09:15	Above Wallula Rd bridge
		N/A	5/24	**N/A**	N/A	N/A	Water too high to take flow
		N/A	6/1	**N/A**	N/A	N/A	Water too high to take flow
		7.4	6/23	**30.4**	67.0	08:50	
		5.7	7/1	**8.0**	69.0	09:09	
		5.2	7/7	**6.7**	64.0	08:39	
		5.2	7/19	**5.2**	65.0	07:43	
		4.7	8/2	**4.2**	66.0	08:59	
		4.5	8/17	**3.9**	66.0	09:25	
		5.1	8/30	**7.6**	64.0	08:51	
		4.6	9/13	**7.1**	61.0	09:39	
		4.5	9/27	**6.2**	58.0	09:20	
		4.7	10/11	**7.9**	55.0	09:20	
		5.4	10/28	**13.6**	52.0	09:47	
		6.3	11/8	**19.8**	49.0	09:27	

Appendix B. Table 1. (Cont.) Manual discharge (cfs) measurements 2004.

Stream	Site	Width	Date	CFS	Temp (F)	Time	Comments
Doan Creek	DNC-1	1.0	5/10	**1.4**	54.0	12:10	Whitman Mission
		1.2	5/17	**1.5**	58.0	10:15	
		1.3	5/24	**1.9**	55.0	09:45	
		1.3	6/1	**1.0**	58.0	10:02	
		1.1	6/23	**1.3**	59.0	09:15	
		1.4	7/1	**1.3**	64.0	10:20	
		1.1	7/7	**0.7**	61.0	09:48	
		1.4	7/19	**0.5**	60.0	08:39	
		1.4	8/2	**0.7**	64.0	10:18	
		0.8	8/17	**0.5**	64.0	10:26	
		1.1	8/30	**0.3**	59.0	09:57	
		1.3	9/13	**0.6**	57.0	10:48	
		1.4	9/27	**0.4**	55.0	10:24	
		1.2	10/11	**0.4**	50.0	10:28	
		1.2	10/28	**0.5**	50.0	11:28	
		1.1	11/8	**0.5**	48.0	10:37	
West Little Walla Walla	WLW-1	2.2	5/10	**7.2**	52.0	12:50	0.6 miles up Valley Chapel Rd
		1.8	5/17	**3.6**	56.0	11:05	
		2.1	5/24	**6.3**	54.0	10:35	
		1.9	6/1	**3.2**	58.0	10:40	
		1.8	6/23	**3.0**	61.0	09:45	
		1.7	7/7	**1.8**	62.0	10:37	
		1.5	7/19	**0.7**	63.0	09:22	
		1.4	8/2	**0.7**	68.0	11:21	
		1.7	8/17	**2.1**	66.0	11:20	
		1.7	8/30	**2.3**	61.0	10:43	
		1.8	9/13	**3.0**	57.0	11:41	
		1.7	9/27	**2.9**	56.0	11:20	
		1.9	10/11	**3.9**	53.0	11:21	
		1.7	10/28	**3.4**	53.0	12:43	
		1.7	11/8	**2.6**	50.0	11:40	
Walsh Creek	WAC-1	0.8	5/10	**0.6**	58.0	12:35	Valley Chapel Rd
		0.9	5/17	**0.8**	62.0	11:15	
		1.1	5/24	**1.7**	58.0	10:15	
		1.3	6/1	**1.5**	59.0	10:28	
		0.6	6/23	**0.4**	64.0	09:31	
		0.8	7/7	**0.7**	64.0	10:27	
		0.6	7/19	**0.2**	68.0	09:14	
		0.4	8/2	**0.1**	71.0	11:06	
		0.7	8/17	**0.3**	68.0	11:05	
		0.7	8/30	**0.2**	63.0	10:31	
		0.7	9/13	**0.1**	58.0	11:29	
		0.8	9/27	**0.3**	60.0	11:09	
		0.8	10/11	**0.4**	53.0	11:11	

Appendix B. Table 1. (Cont.) Manual discharge (cfs) measurements 2004.							
Stream	**Site**	**Width**	**Date**	**CFS**	**Temp (F)**	**Time**	**Comments**
Walsh Creek	WAC-1	0.8	10/28	**0.5**	52.0	12:31	Valley Chapel Rd
(Cont.)		1.0	11/8	**0.6**	50.0	11:30	
West Little	WLW-4	1.8	5/10	**5.0**	56.0	11:50	Swegle Rd
Walla Walla		1.4	5/17	**2.9**	58.0	10:45	
		2.2	5/24	**5.7**	56.0	10:00	
		2.1	6/1	**5.0**	58.0	10:12	
		1.3	6/23	**2.4**	63.0	10:05	
		1.2	7/7	**0.5**	64.0	N/A	Time not recorded
		1.2	7/19	**0.2**	67.0	09:04	
		0.9	8/2	**0.0**	70.0	10:49	No measurable flow
		0.7	8/17	**0.0**	70.0	10:58	No measurable flow
		1.0	8/30	**0.0**	62.0	10:22	No measurable flow
		1.4	9/13	**0.0**	58.0	11:19	No measurable flow
		1.4	9/27	**0.6**	56.0	10:57	
		1.3	10/11	**1.5**	50.0	11:00	
		1.9	10/28	**2.8**	49.0	12:17	
		2.1	11/8	**3.1**	47.0	11:18	
Walla Walla R	WW-11	N/A	5/10	**N/A**	N/A	N/A	Above Detour Rd bridge
		N/A	5/17	**N/A**	N/A	N/A	Water too high to take flow
		N/A	5/24	**N/A**	N/A	N/A	Water too high to take flow
		N/A	6/1	**N/A**	N/A	N/A	Water too high to take flow
		14.5	6/23	**91.4**	64.0	10:54	
		16.6	7/1	**74.0**	70.0	10:00	
		18.8	7/7	**87.7**	66.0	09:25	
		18.3	7/19	**64.7**	67.0	08:16	
		18.8	8/2	**61.0**	71.0	09:53	
		16.1	8/17	**37.0**	72.0	10:08	
		16.0	8/30	**55.4**	66.0	09:35	
		16.1	9/13	**60.0**	60.0	10:22	
		15.8	9/27	**59.8**	59.0	10:04	
		15.1	10/11	**38.8**	53.0	10:04	
		15.6	10/28	**37.3**	50.0	11:00	
		15.7	11/8	**41.2**	47.0	10:13	
Walla Walla R	WW-14	27.9	5/10	**278.4**	54.0	09:34	Above McDonald Rd bridge
		31.1	5/17	**410.6**	57.0	09:45	
		N/A	5/25	**N/A**	N/A	N/A	Water too high to take flow
		N/A	6/1	**N/A**	N/A	N/A	Water too high to take flow
		7.0	6/23	**58.5**	66.0	11:16	
		13.6	7/1	**38.7**	72.0	09:35	
		12.4	7/7	**39.1**	67.0	09:02	
		13.4	7/19	**31.2**	67.0	07:55	
		12.4	8/2	**23.8**	74.0	09:22	
		6.4	8/17	**19.7**	72.0	09:45	
		6.8	8/30	**41.6**	67.0	09:11	
		6.7	9/13	**45.8**	62.0	10:03	

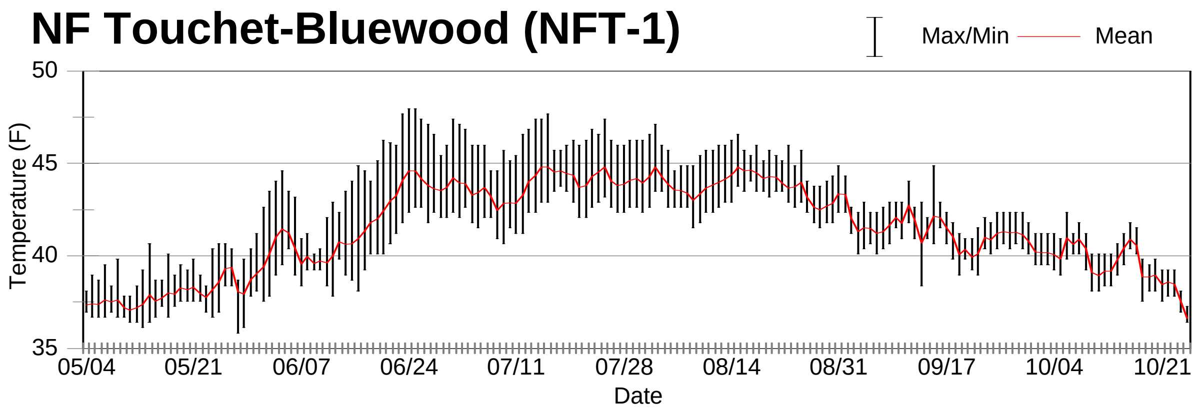
Appendix B. Table 1. (Cont.) Manual discharge (cfs) measurements 2004.

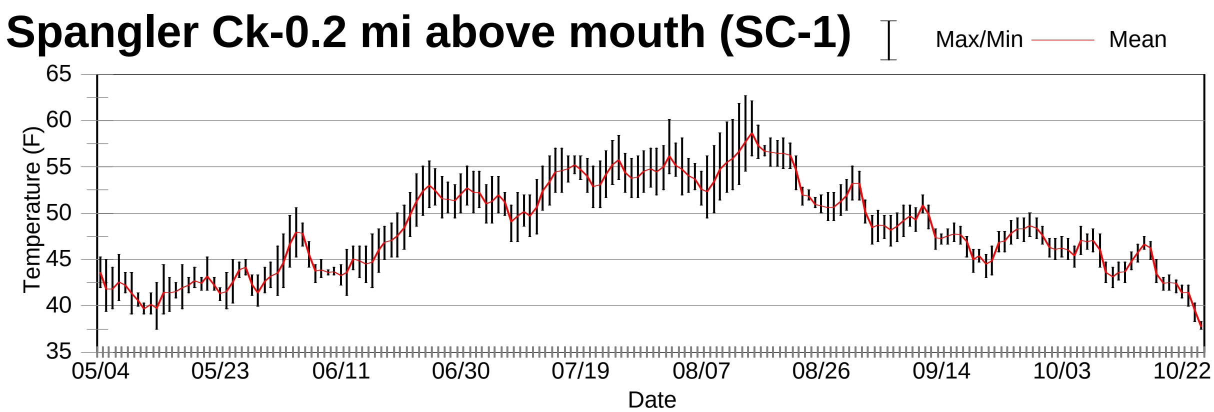
Stream	Site	Width	Date	CFS	Temp (F)	Time	Comments
Walla Walla R	WW-14	6.6	9/27	**43.6**	58.0	09:40	Above McDonald Rd bridge
(Cont.)		6.2	10/11	**21.7**	54.0	09:41	
		6.4	10/28	**20.8**	49.0	10:18	
		6.6	11/8	**26.9**	47.0	09:51	
Walla Walla	WW-15	18.3	6/23	**60.4**	71.0	11:44	Lowden Gardena Rd
		15.6	8/19	**11.5**	76.0	10:26	
NF Dry Creek	NFD-1	3.1	5/10	**3.1**	48.0	12:20	0.25 miles up Scott Rd
		3.1	5/17	**10.1**	46.0	08:57	
		5.2	5/25	**15.4**	48.0	08:51	
		3.5	6/2	**13.3**	48.0	08:45	
		3.1	6/23	**2.8**	63.0	14:19	
		2.7	7/6	**1.2**	58.0	08:36	
		2.7	7/19	**0.9**	58.0	07:32	
		2.8	8/2	**0.6**	57.0	09:17	
		2.7	8/16	**0.6**	58.0	09:15	
		3.0	8/30	**0.7**	54.0	08:56	
		2.8	9/20	**1.0**	50.0	08:49	
		2.8	9/27	**0.6**	54.0	11:05	
		2.8	10/11	**0.8**	48.0	09:28	
		2.6	10/25	**1.0**	44.0	09:18	
		2.8	11/9	**1.1**	44.0	08:55	
Dry Creek	DRC-1	3.9	4/7	**14.6**	49.0	13:00	Hwy 12 bridge in Dixie
		3.7	5/10	**9.1**	51.0	12:45	
		4.3	5/17	**25.0**	49.0	09:14	
		4.4	5/25	**39.9**	54.0	09:22	
		4.3	6/2	**31.0**	49.0	09:10	
		3.4	6/23	**5.8**	68.0	13:45	
		2.7	7/6	**3.6**	64.0	08:57	
		2.9	7/19	**1.7**	62.0	07:16	
		2.5	8/2	**1.3**	65.0	08:45	
		2.1	8/16	**1.1**	68.0	09:39	
		3.1	8/30	**2.8**	60.0	08:36	
		2.8	9/20	**2.3**	53.0	09:12	
		2.7	9/27	**1.6**	56.0	10:45	
		3.3	10/11	**2.2**	48.0	09:07	
		2.6	10/25	**2.7**	44.0	08:58	
		3.0	11/9	**2.9**	42.0	08:35	
Dry Creek	DRC-11	5.6	6/23	**10.3**	70.0	12:05	Hwy 12 bridge in Lowden
		N/A	8/19	**N/A**	63.0	10:33	No measurable flow
Mud Creek	MD-1	3.5	6/23	**3.6**	74.0	12:21	Barney Rd.
		1.7	8/19	**0.5**	70.0	10:08	
Pine Creek	PC-2	3.5	6/23	**0.8**	72.0	12:31	Sand Pit Rd.
		N/A	8/19	**N/A**	70.0	09:58	No measurable flow
Walla Walla	WW-16	N/A	6/23	**N/A**	N/A	N/A	Touchet Gardena
		N/A	8/19	**N/A**	N/A	N/A	water too deep both attempts

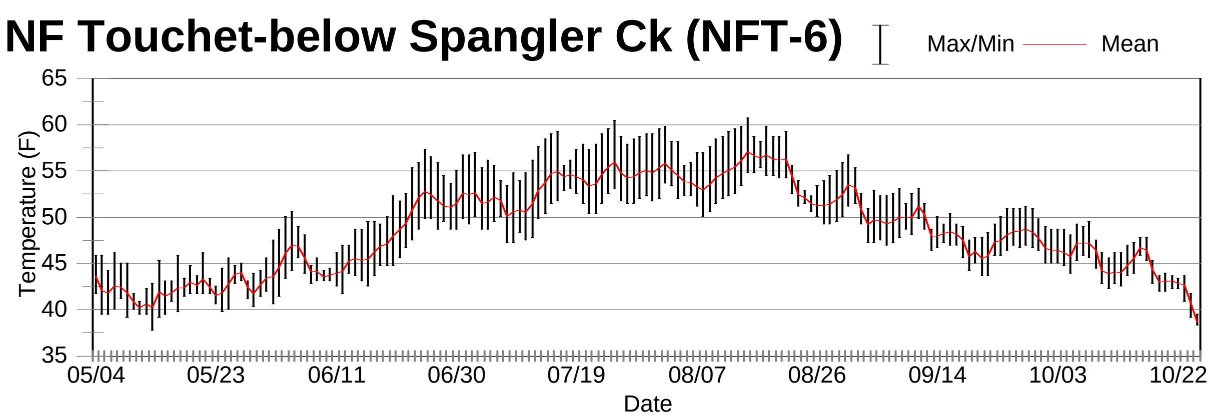
Appendix B. Table 1. (Cont.) Manual discharge (cfs) measurements 2004.

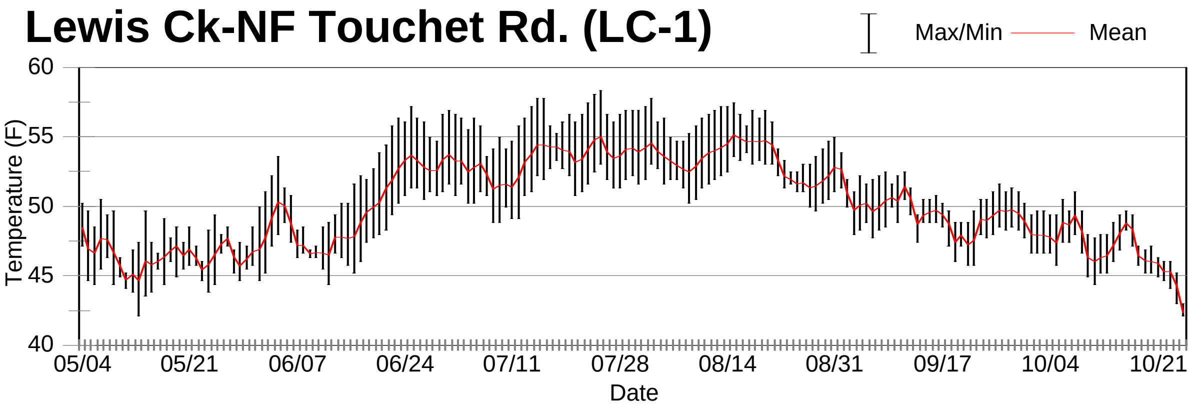
Stream	Site	Width	Date	CFS	Temp (F)	Time	Comments
Walla Walla R	WW-17	12.0	6/23	**184.6**	76.0	13:35	Byerley Rd brg
		11.8	8/19	**16.7**	76.0	09:37	
Walla Walla R	WW-18	31.0	6/23	**184.5**	76.0	14:20	Nine Mile
Vansycle	VC-1	0.0	6/23	**N/A**	N/A	N/A	Above Hwy 12
Canyon Ck		0.0	8/19	**N/A**	N/A	N/A	Stream was dry both attempts

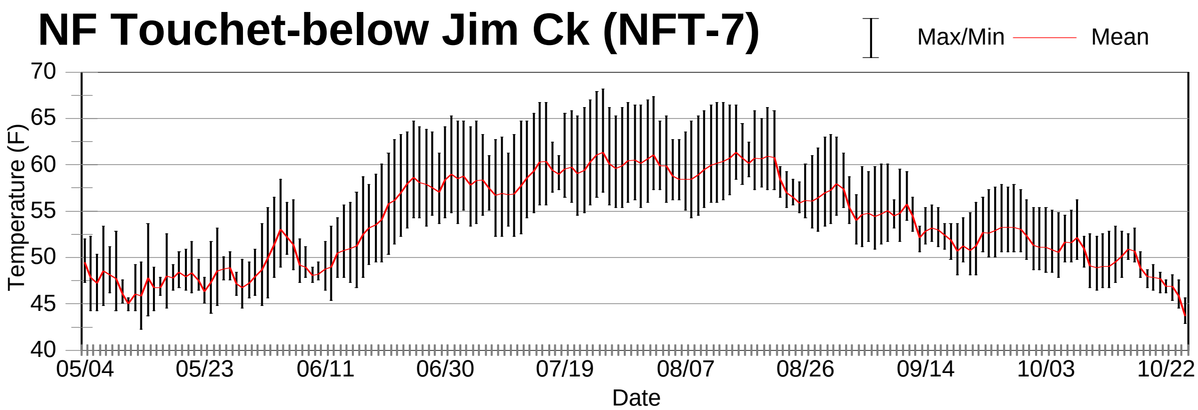
Appendix C. Stream Temperature Graphs (°F), 2004

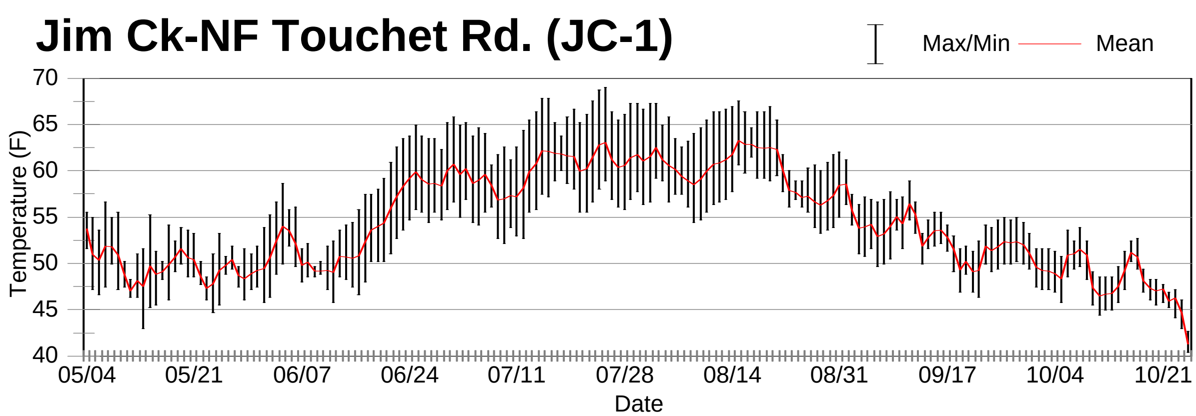

NF Touchet-Bluewood (NFT-1)
Max/Min
Mean
Temperature (F)
50
45
40
35
05/04
05/21
06/07
06/24
07/11
07/28
08/14
08/31
09/17
10/04
10/21
Date

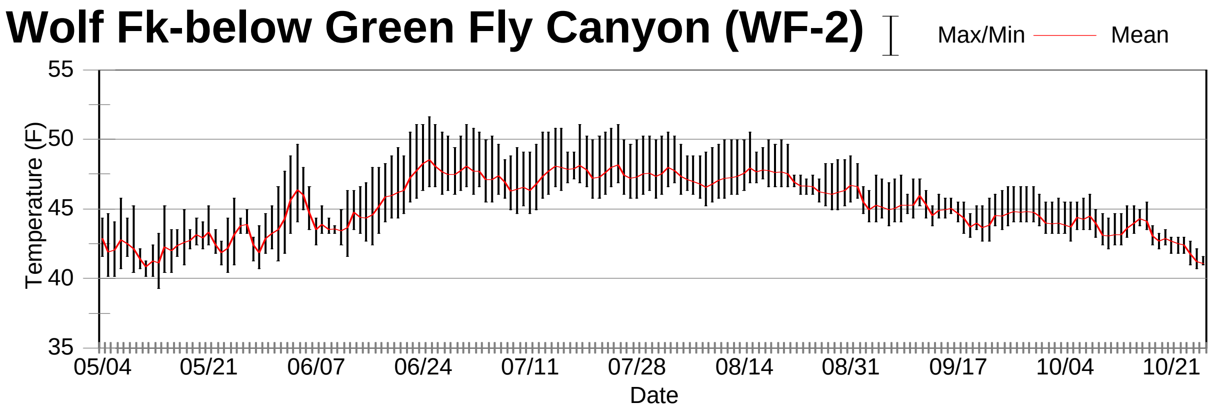

Spangler Ck-0.2 mi above mouth (SC-1)
Max/Min
Mean
Temperature (F)
65
60
55
50
45
40
35
05/04
05/23
06/11
06/30
07/19
08/07
08/26
09/14
10/03
10/22
Date

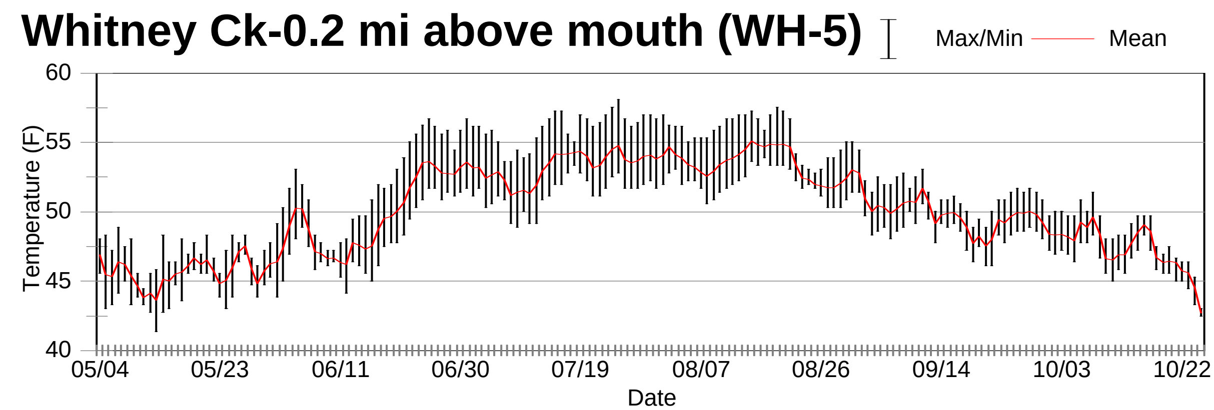

NF Touchet-below Spangler Ck (NFT-6)
Max/Min
Mean
Temperature (F)
65
60
55
50
45
40
35
05/04
05/23
06/11
06/30
07/19
08/07
08/26
09/14
10/03
10/22
Date

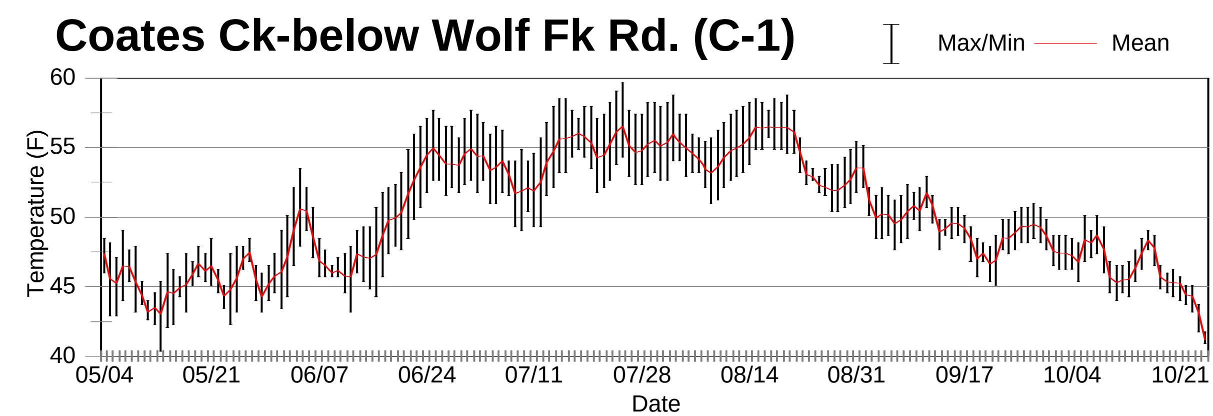

Lewis Ck-NF Touchet Rd. (LC-1)
Max/Min
Mean
60
55
50
45
40
Temperature (F)
05/04
05/21
06/07
06/24
07/11
07/28
08/14
08/31
09/17
10/04
10/21
Date

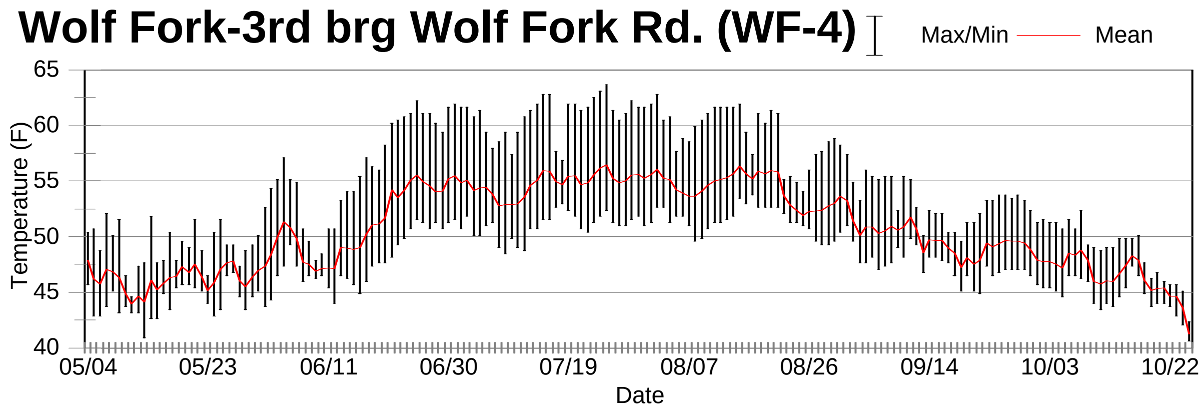

NF Touchet-below Jim Ck (NFT-7)
Max/Min
Mean
70
65
60
55
50
45
40
Temperature (F)
05/04
05/23
06/11
06/30
07/19
08/07
08/26
09/14
10/03
10/22
Date

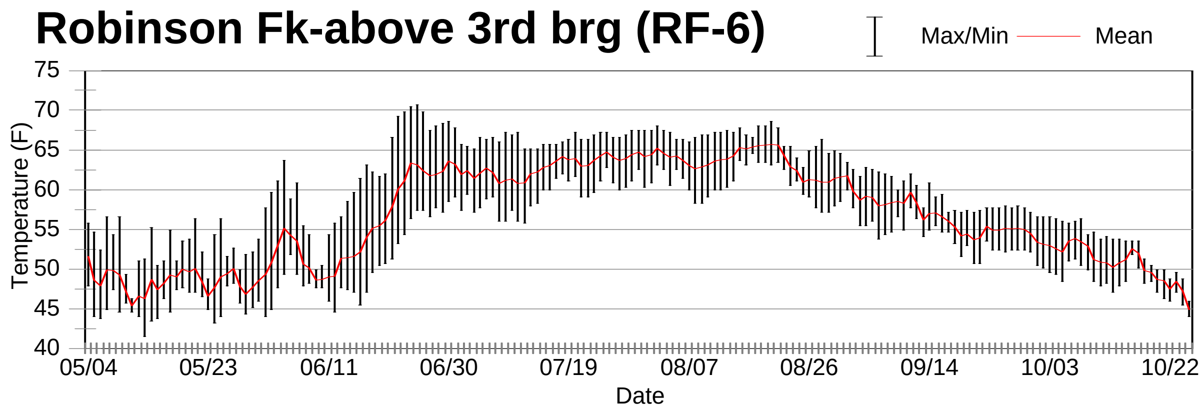

Jim Ck-NF Touchet Rd. (JC-1)
Max/Min
Mean
70
65
60
55
50
45
40
Temperature (F)
05/04
05/21
06/07
06/24
07/11
07/28
08/14
08/31
09/17
10/04
10/21
Date

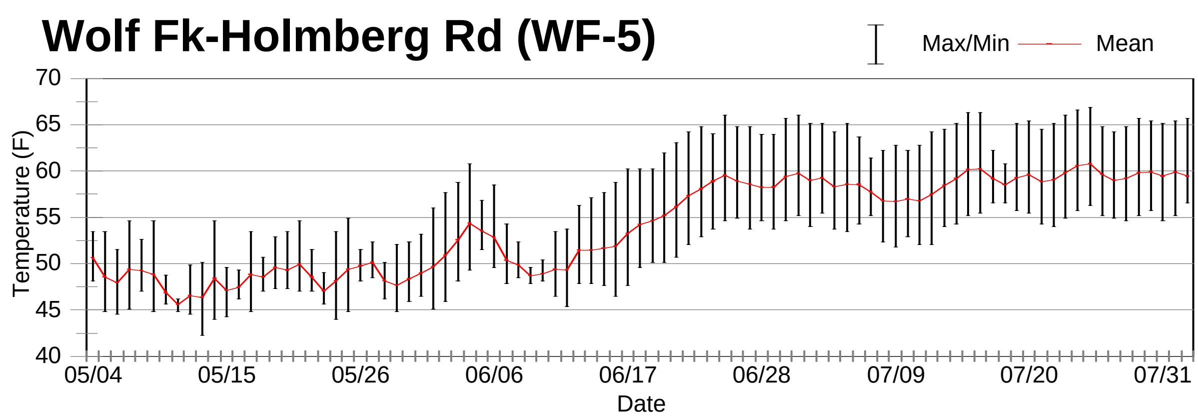

Wolf Fk-below Green Fly Canyon (WF-2)
Max/Min
Mean
Temperature (F)
55
50
45
40
35
05/04
05/21
06/07
06/24
07/11
07/28
08/14
08/31
09/17
10/04
10/21
Date

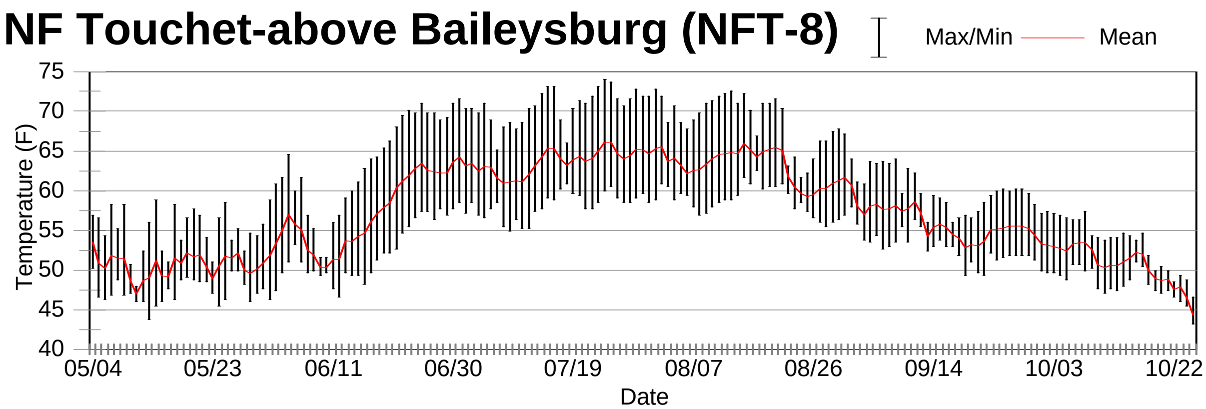

Whitney Ck-0.2 mi above mouth (WH-5)
Max/Min
Mean
Temperature (F)
60
55
50
45
40
05/04
05/23
06/11
06/30
07/19
08/07
08/26
09/14
10/03
10/22
Date

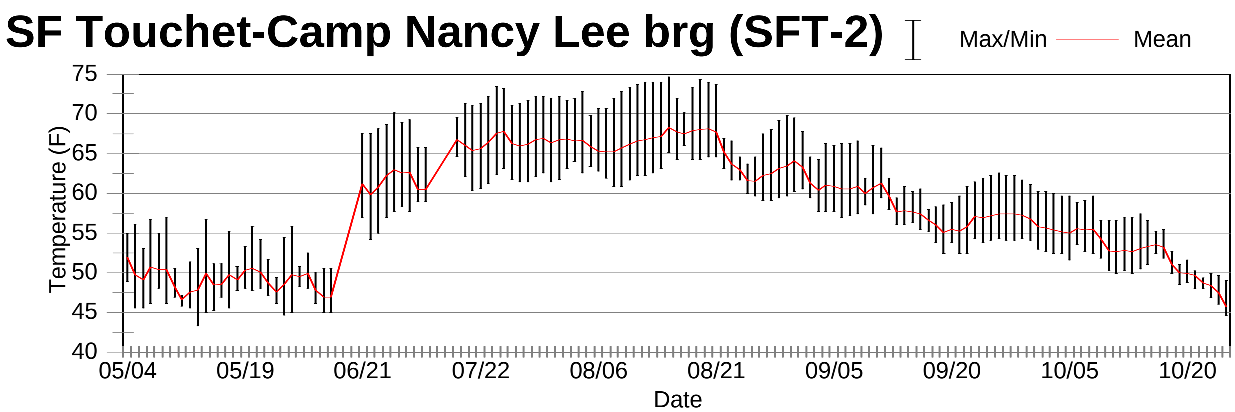

Coates Ck-below Wolf Fk Rd. (C-1)
Max/Min
Mean
Temperature (F)
60
55
50
45
40
05/04
05/21
06/07
06/24
07/11
07/28
08/14
08/31
09/17
10/04
10/21
Date

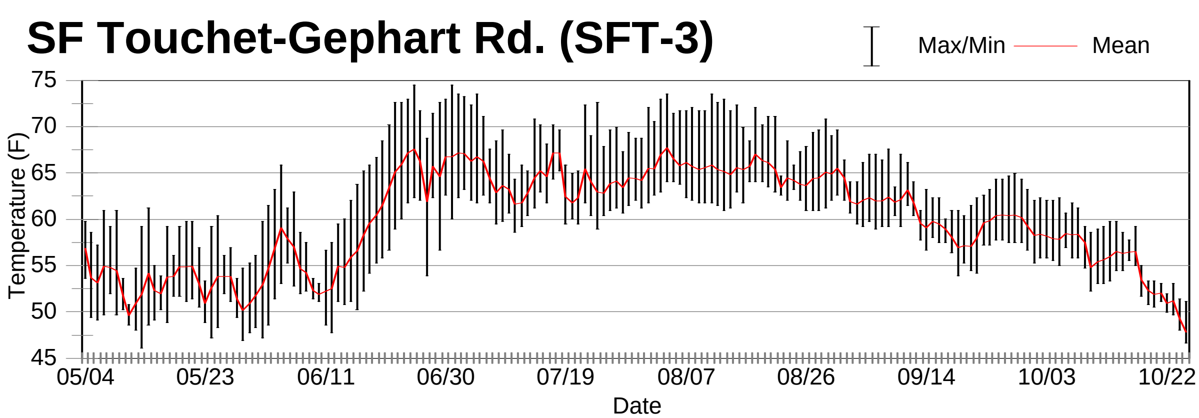

Wolf Fork-3rd brg Wolf Fork Rd. (WF-4)
Max/Min
Mean
Temperature (F)
65
60
55
50
45
40
05/04
05/23
06/11
06/30
07/19
08/07
08/26
09/14
10/03
10/22
Date

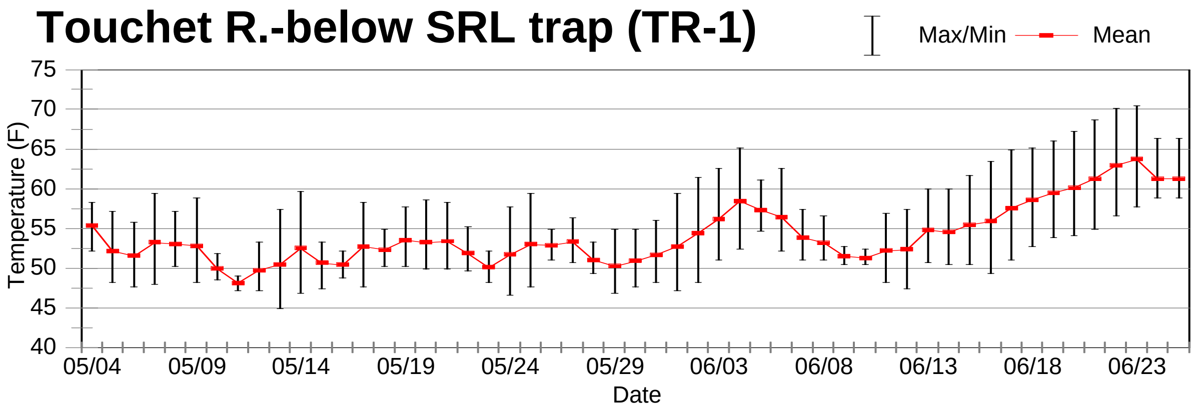

Robinson Fk-above 3rd brg (RF-6)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
40
05/04
05/23
06/11
06/30
07/19
08/07
08/26
09/14
10/03
10/22
Date

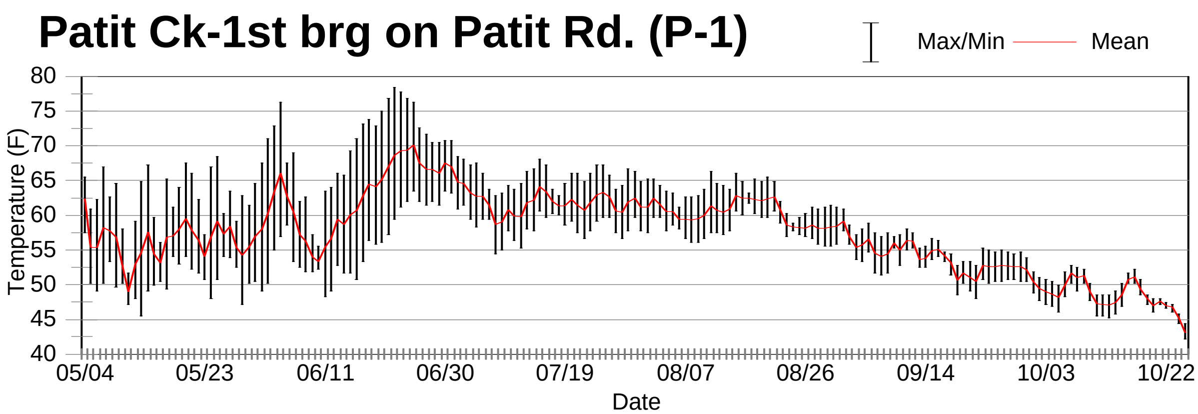

Wolf Fk-Holmberg Rd (WF-5)
Max/Min
Mean
Temperature (F)
70
65
60
55
50
45
40
05/04
05/15
05/26
06/06
06/17
06/28
07/09
07/20
07/31
Date

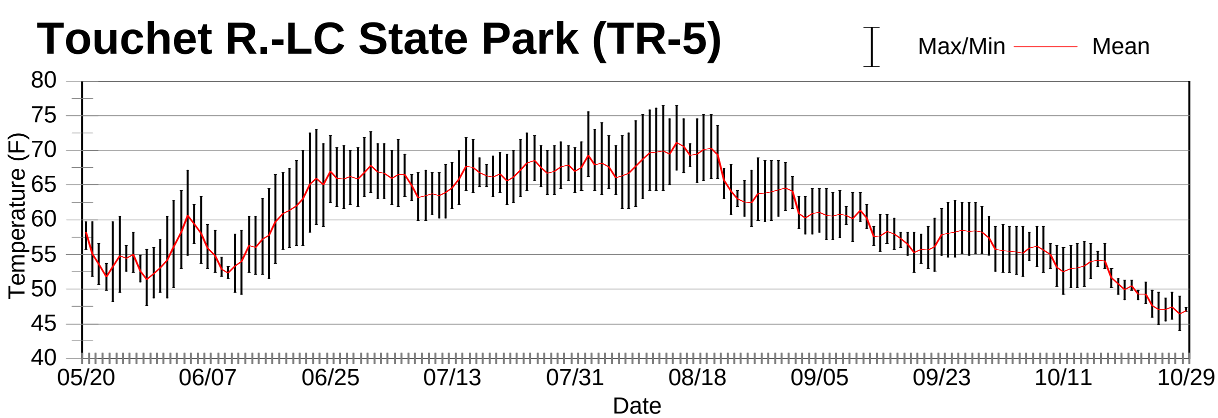

NF Touchet-above Baileysburg (NFT-8)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
40
05/04
05/23
06/11
06/30
07/19
08/07
08/26
09/14
10/03
10/22
Date

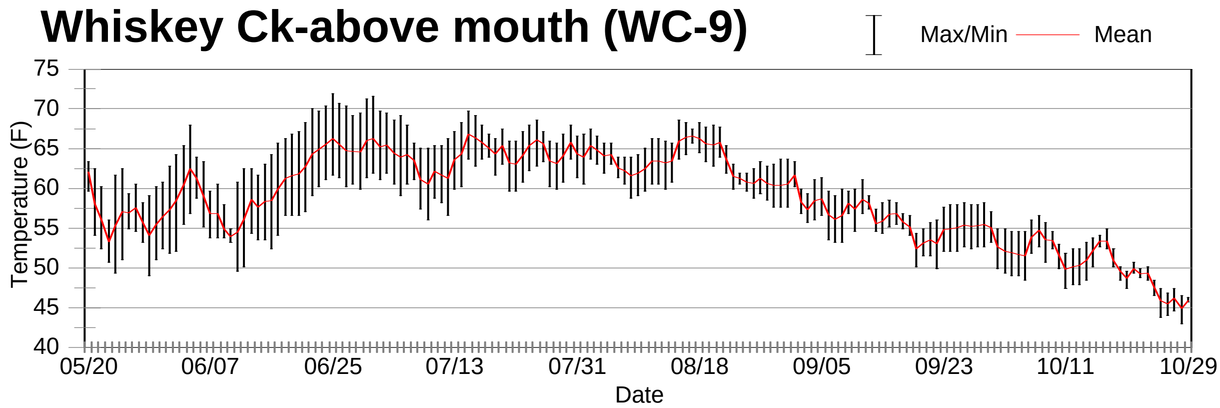

SF Touchet-Camp Nancy Lee brg (SFT-2)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
40
05/04
05/19
06/21
07/22
08/06
08/21
09/05
09/20
10/05
10/20
Date

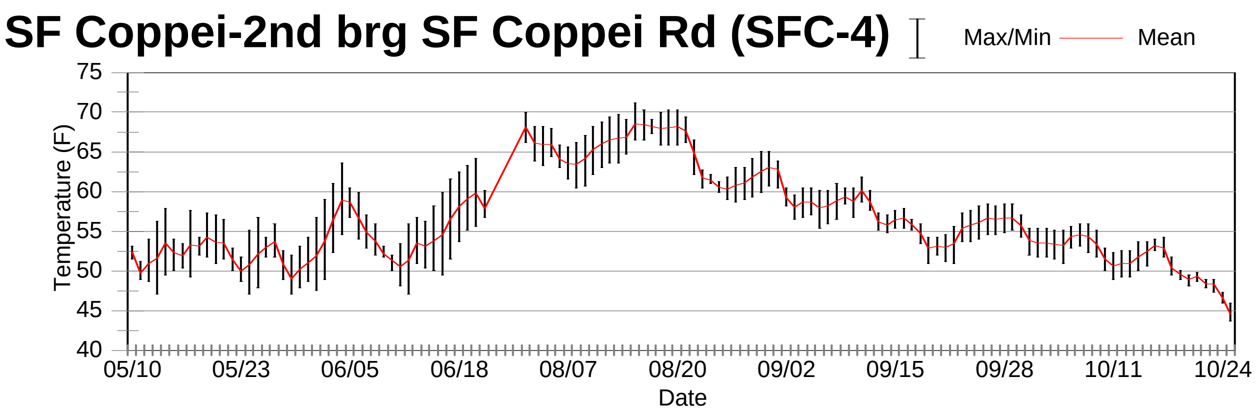

SF Touchet-Gephart Rd. (SFT-3)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
05/04
05/23
06/11
06/30
07/19
08/07
08/26
09/14
10/03
10/22
Date

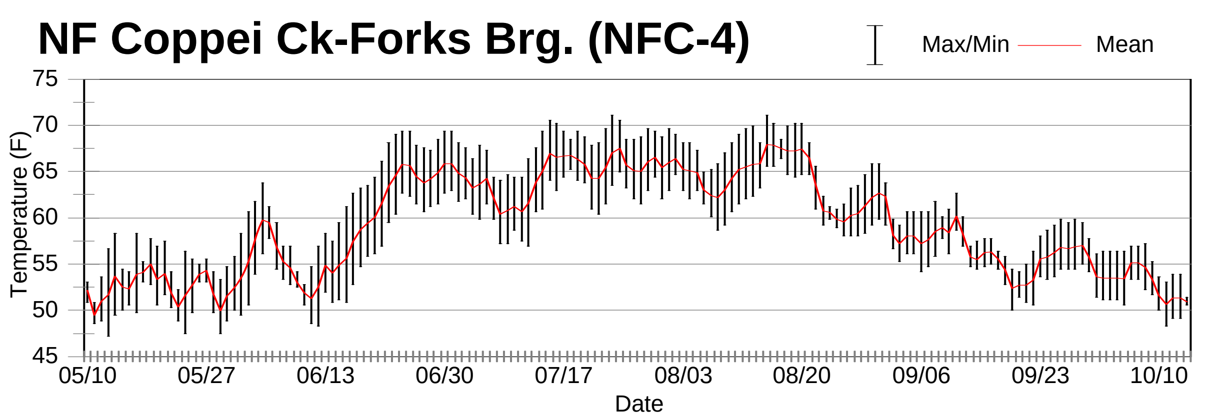

Touchet R.-below SRL trap (TR-1)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
40
05/04
05/09
05/14
05/19
05/24
05/29
06/03
06/08
06/13
06/18
06/23
Date

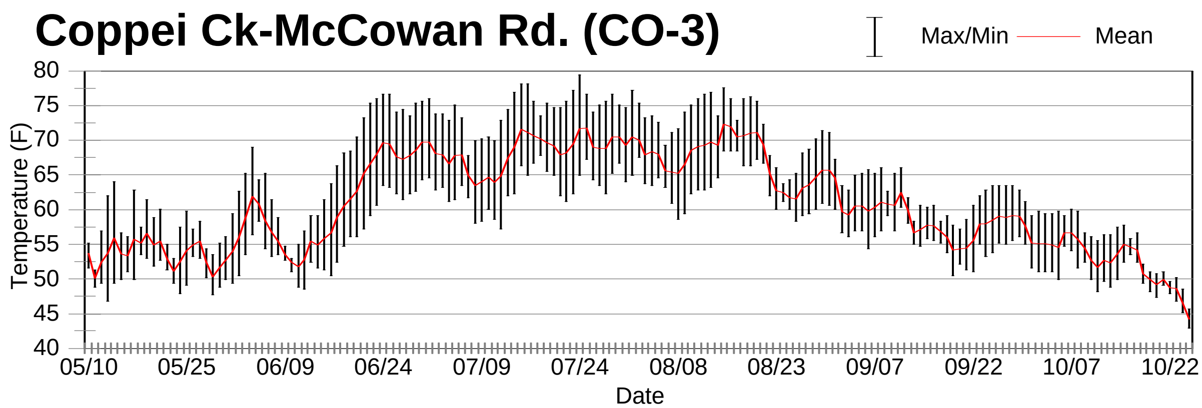

Patit Ck-1st brg on Patit Rd. (P-1)
Max/Min
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
05/04
05/23
06/11
06/30
07/19
08/07
08/26
09/14
10/03
10/22
Date

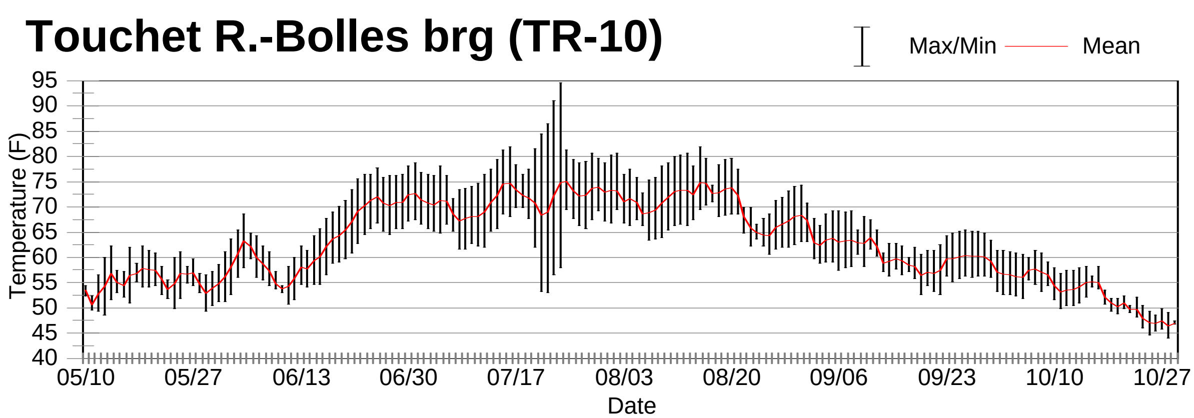

Touchet R.-LC State Park (TR-5)
Max/Min
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
05/20
06/07
06/25
07/13
07/31
08/18
09/05
09/23
10/11
10/29
Date

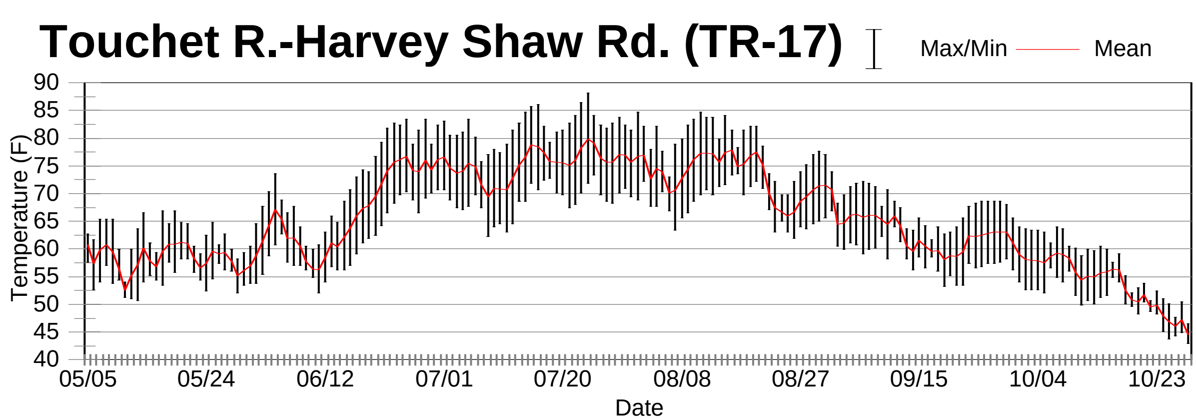

Whiskey Ck-above mouth (WC-9)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
40
05/20
06/07
06/25
07/13
07/31
08/18
09/05
09/23
10/11
10/29
Date

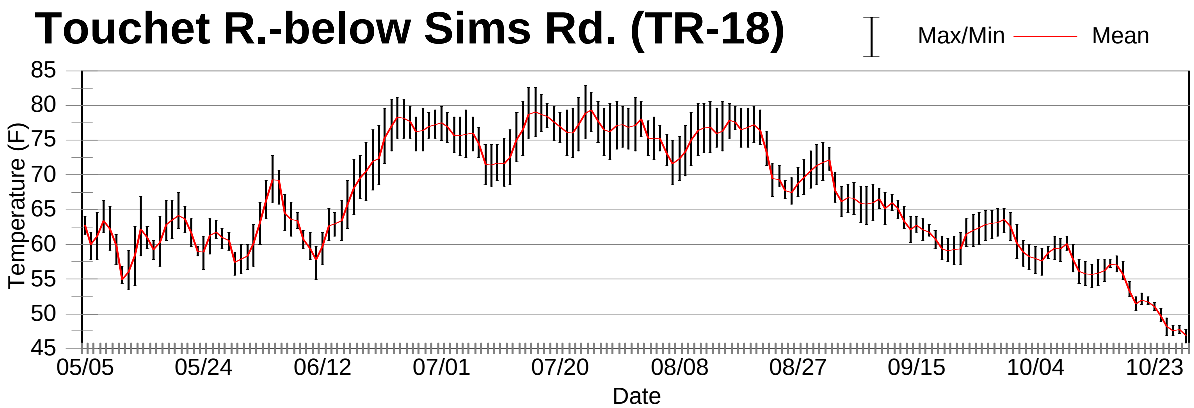

SF Coppei-2nd brg SF Coppei Rd (SFC-4)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
40
05/10
05/23
06/05
06/18
08/07
08/20
09/02
09/15
09/28
10/11
10/24
Date

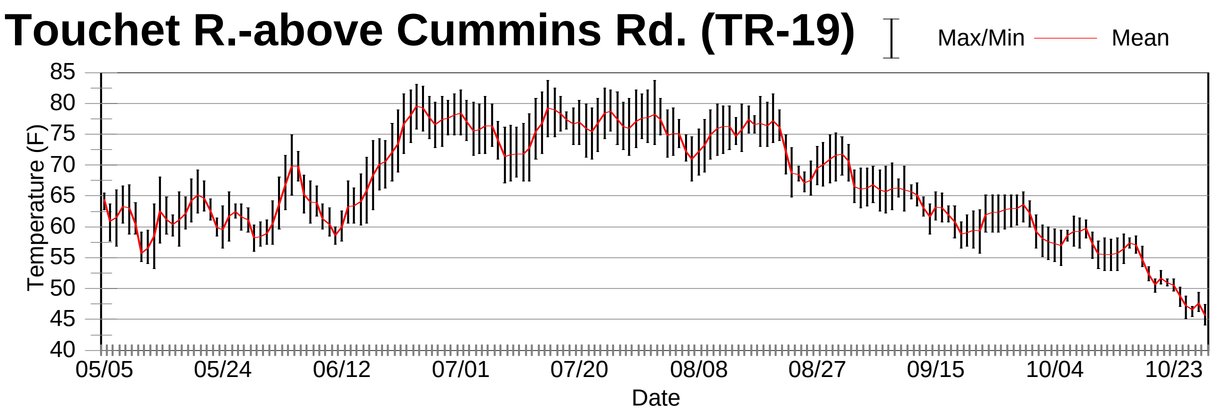

NF Coppei Ck-Forks Brg. (NFC-4)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
05/10
05/27
06/13
06/30
07/17
08/03
08/20
09/06
09/23
10/10
Date

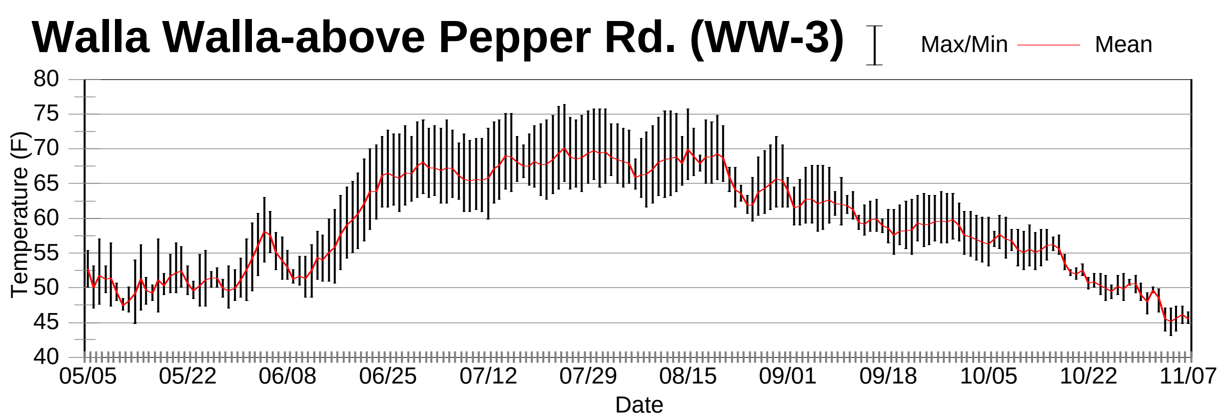

Coppei Ck-McCowan Rd. (CO-3)
Max/Min
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
05/10
05/25
06/09
06/24
07/09
07/24
08/08
08/23
09/07
09/22
10/07
10/22
Date

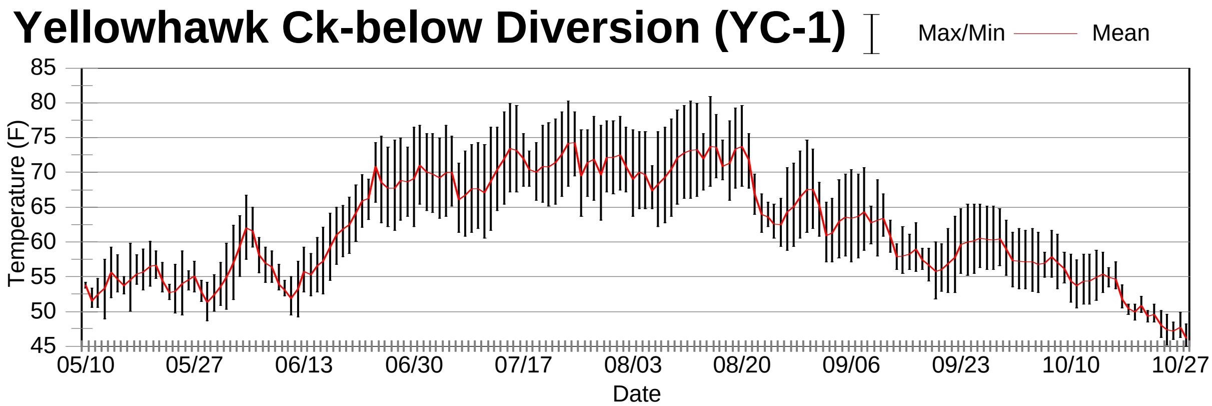

Touchet R.-Bolles brg (TR-10)
Max/Min
Mean
Temperature (F)
95
90
85
80
75
70
65
60
55
50
45
40
05/10
05/27
06/13
06/30
07/17
08/03
08/20
09/06
09/23
10/10
10/27
Date

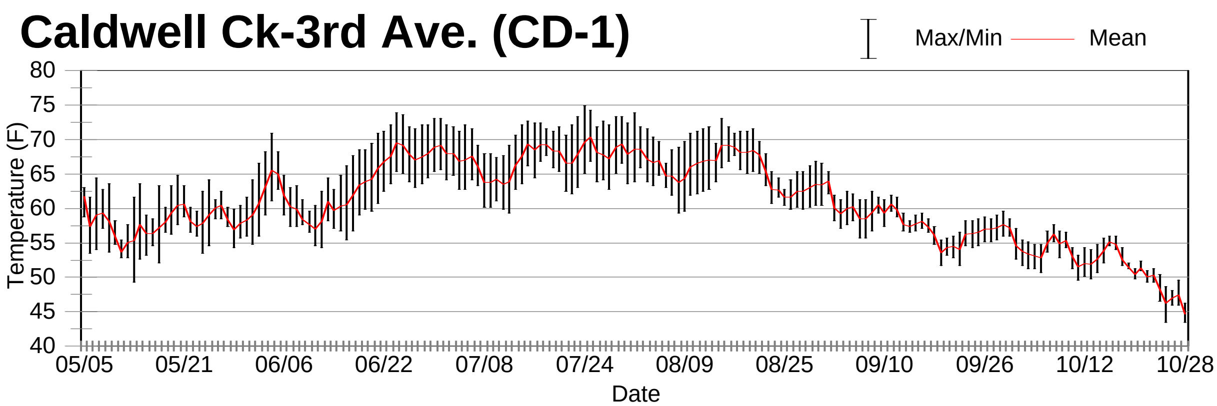

Touchet R.-Harvey Shaw Rd. (TR-17)
Max/Min
Mean
Temperature (F)
90
85
80
75
70
65
60
55
50
45
40
05/05
05/24
06/12
07/01
07/20
08/08
08/27
09/15
10/04
10/23
Date

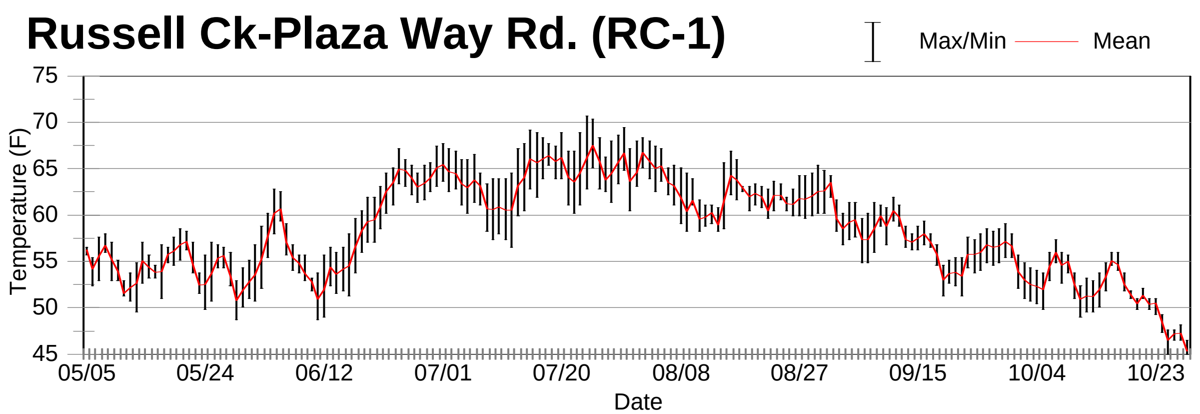

Touchet R.-below Sims Rd. (TR-18)
Max/Min
Mean
Temperature (F)
85
80
75
70
65
60
55
50
45
05/05
05/24
06/12
07/01
07/20
08/08
08/27
09/15
10/04
10/23
Date

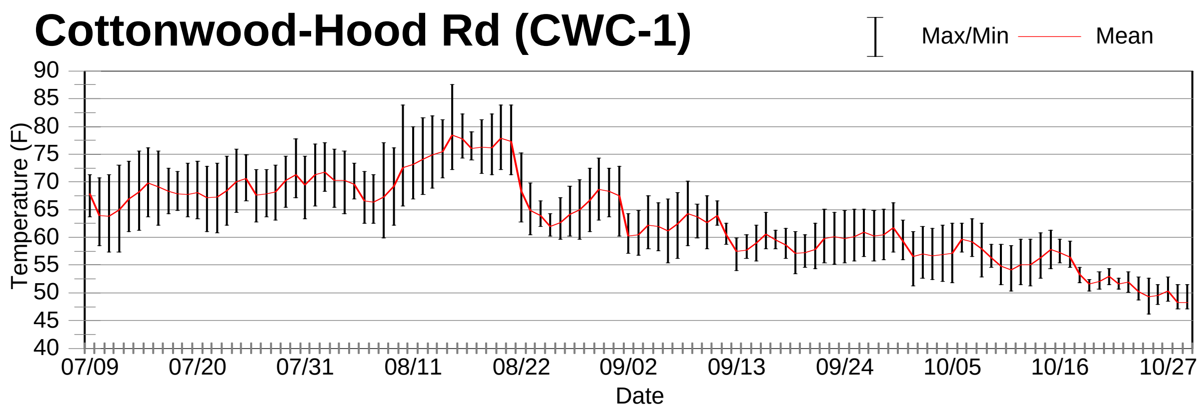

Touchet R.-above Cummins Rd. (TR-19)
Max/Min
Mean
Temperature (F)
85
80
75
70
65
60
55
50
45
40
05/05
05/24
06/12
07/01
07/20
08/08
08/27
09/15
10/04
10/23
Date

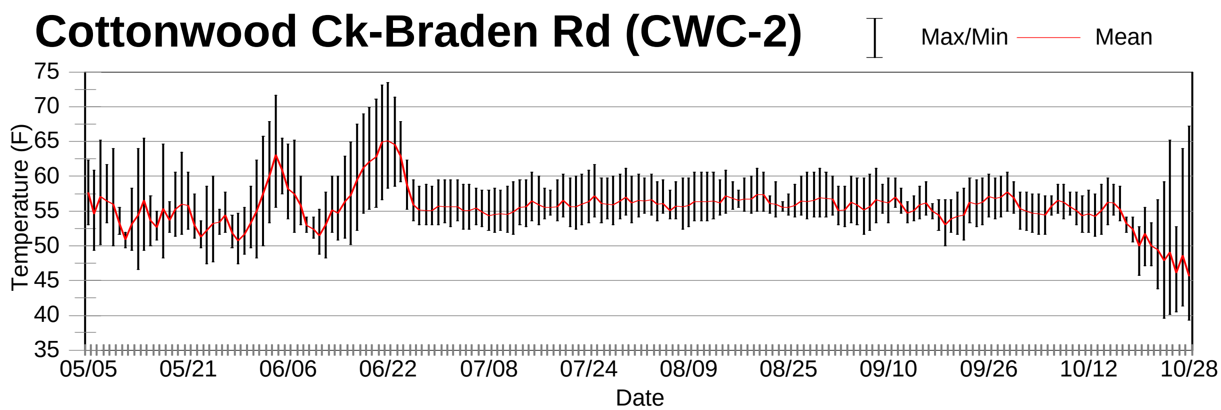

Walla Walla-above Pepper Rd. (WW-3)
Max/Min
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
05/05
05/22
06/08
06/25
07/12
07/29
08/15
09/01
09/18
10/05
10/22
11/07
Date

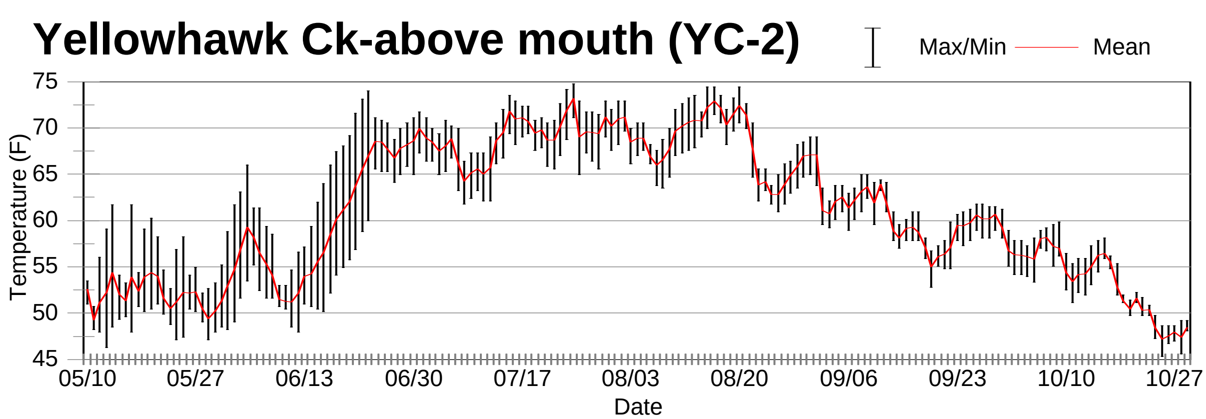

Yellowhawk Ck-below Diversion (YC-1)
Max/Min
Mean
Temperature (F)
85
80
75
70
65
60
55
50
45
05/10
05/27
06/13
06/30
07/17
08/03
08/20
09/06
09/23
10/10
10/27
Date

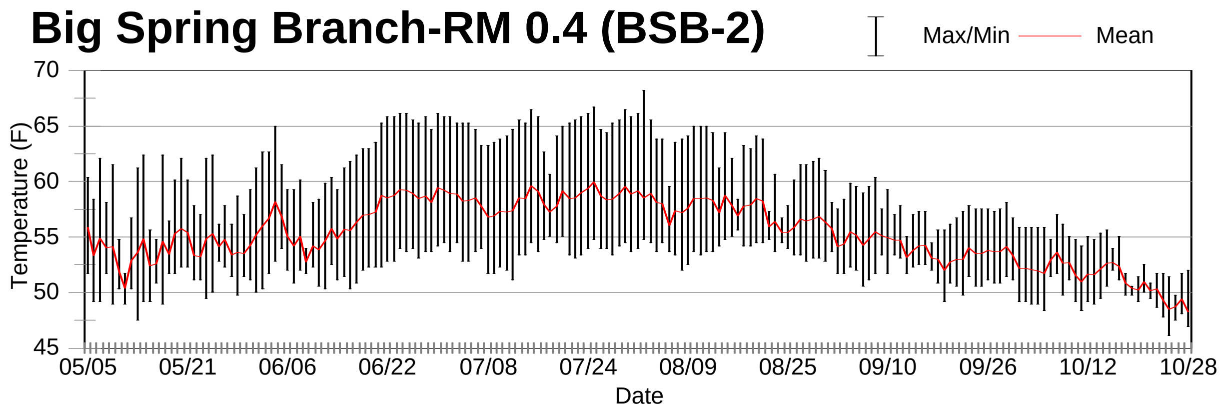

Caldwell Ck-3rd Ave. (CD-1)
Max/Min
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
05/05
05/21
06/06
06/22
07/08
07/24
08/09
08/25
09/10
09/26
10/12
10/28
Date

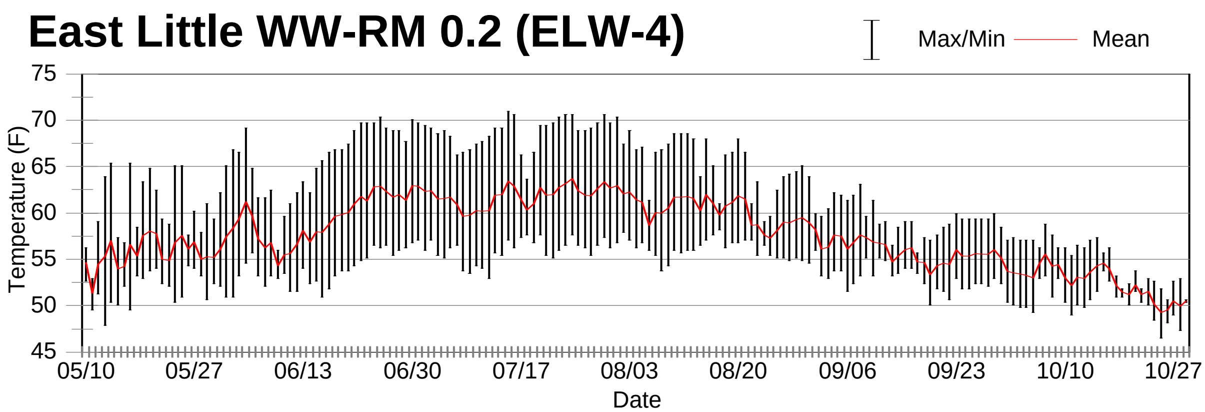

Russell Ck-Plaza Way Rd. (RC-1)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
05/05
05/24
06/12
07/01
07/20
08/08
08/27
09/15
10/04
10/23
Date

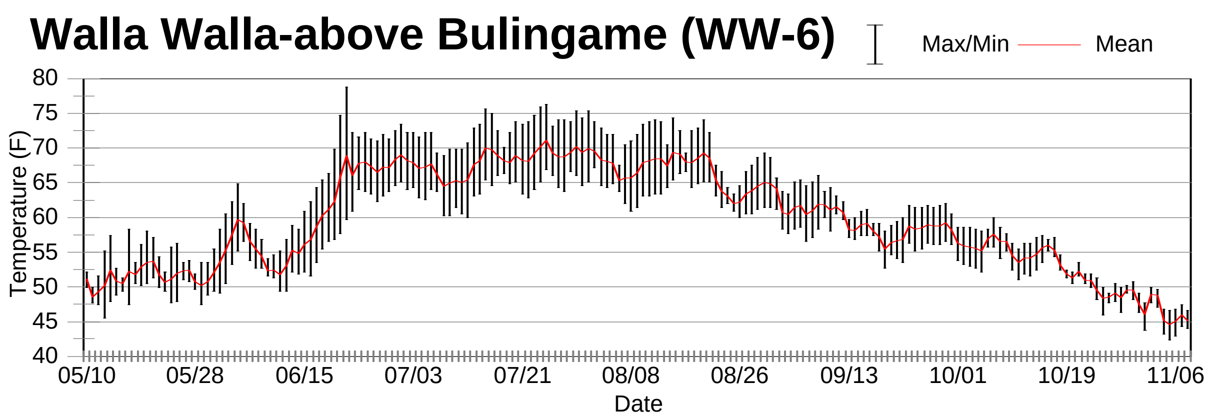

Cottonwood-Hood Rd (CWC-1)
Max/Min
Mean
Temperature (F)
90
85
80
75
70
65
60
55
50
45
40
07/09
07/20
07/31
08/11
08/22
09/02
09/13
09/24
10/05
10/16
10/27
Date

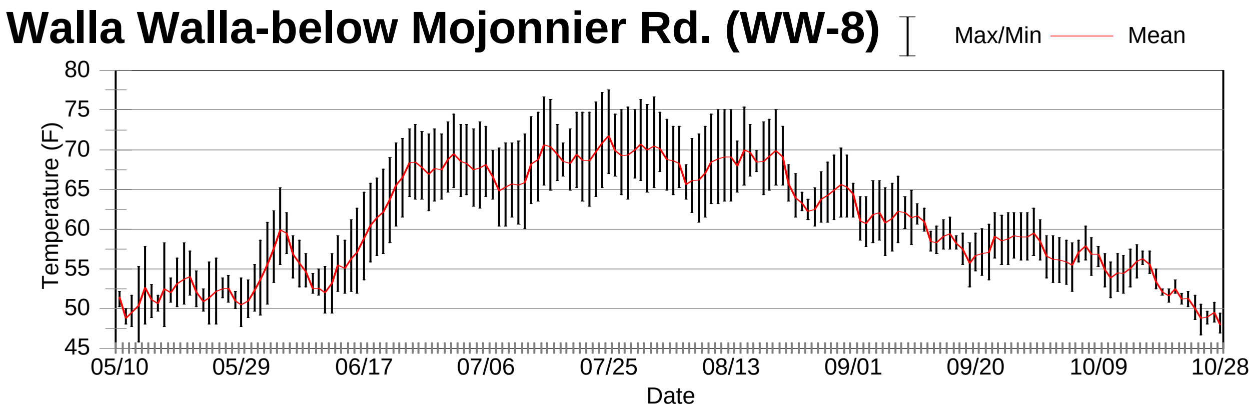

Cottonwood Ck-Braden Rd (CWC-2)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
40
35
05/05
05/21
06/06
06/22
07/08
07/24
08/09
08/25
09/10
09/26
10/12
10/28
Date

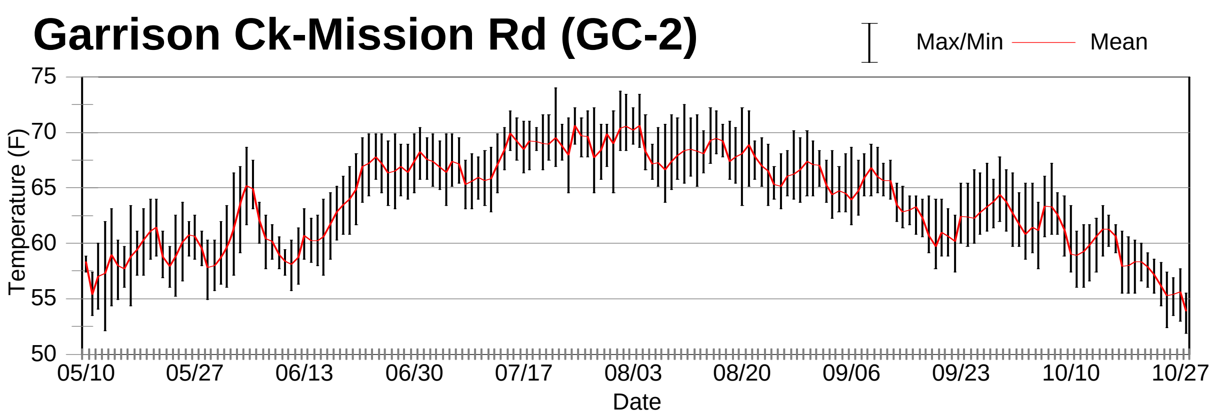

Yellowhawk Ck-above mouth (YC-2)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
05/10
05/27
06/13
06/30
07/17
08/03
08/20
09/06
09/23
10/10
10/27
Date

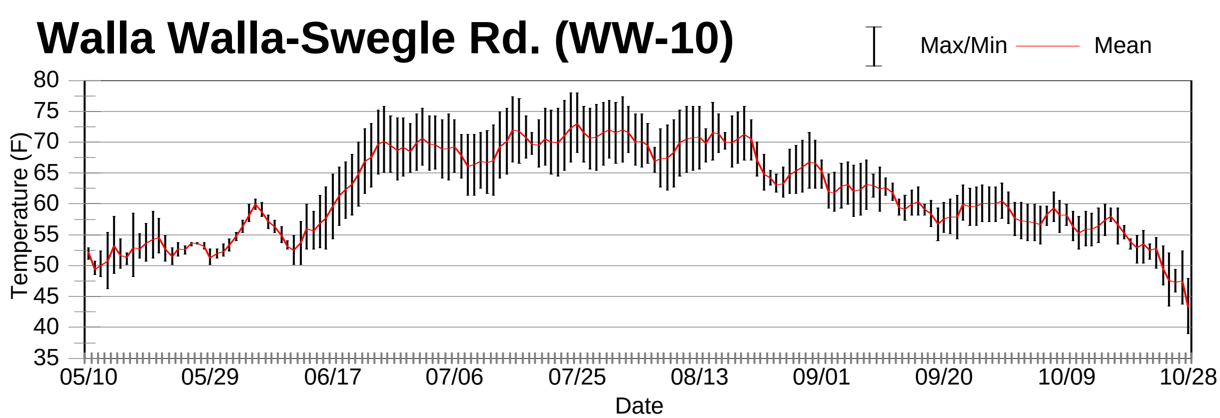

Big Spring Branch-RM 0.4 (BSB-2)
Max/Min
Mean
Temperature (F)
70
65
60
55
50
45
05/05
05/21
06/06
06/22
07/08
07/24
08/09
08/25
09/10
09/26
10/12
10/28
Date

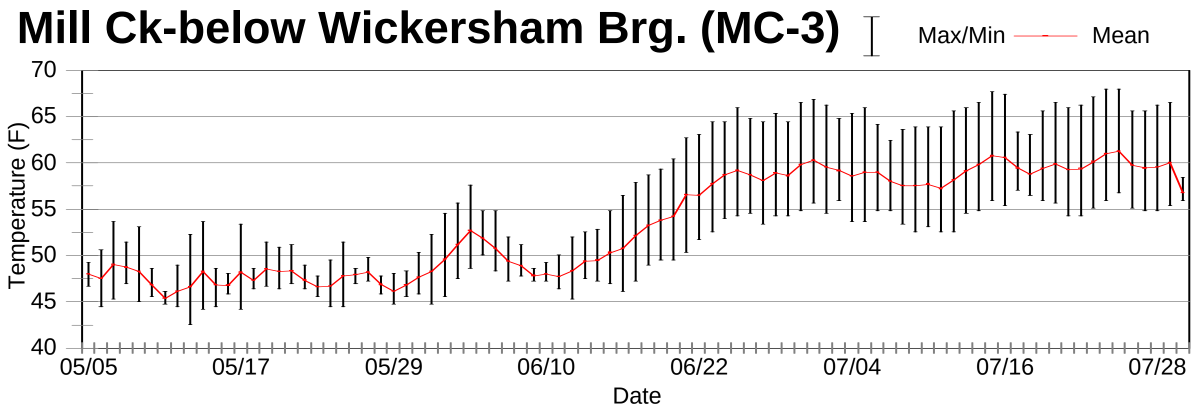

East Little WW-RM 0.2 (ELW-4)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
05/10
05/27
06/13
06/30
07/17
08/03
08/20
09/06
09/23
10/10
10/27
Date

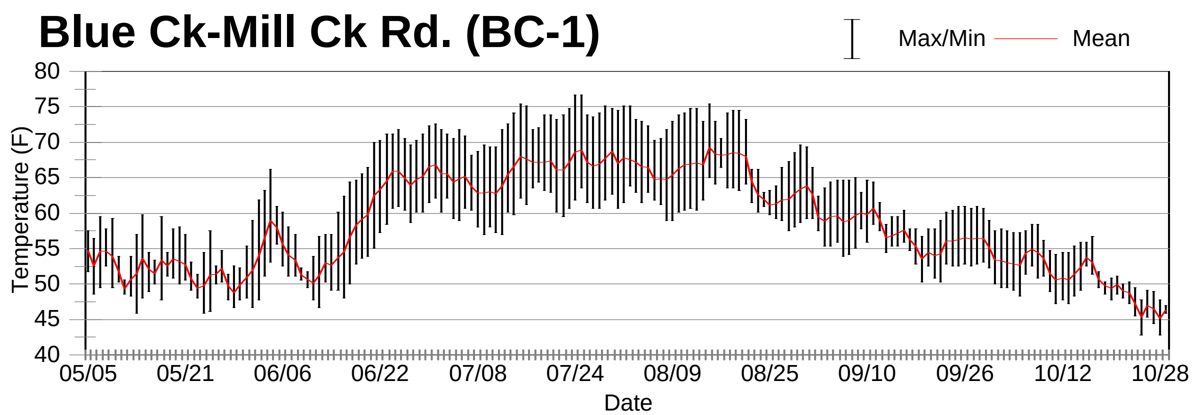

Walla Walla-above Bulingame (WW-6)
Max/Min
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
05/10
05/28
06/15
07/03
07/21
08/08
08/26
09/13
10/01
10/19
11/06
Date

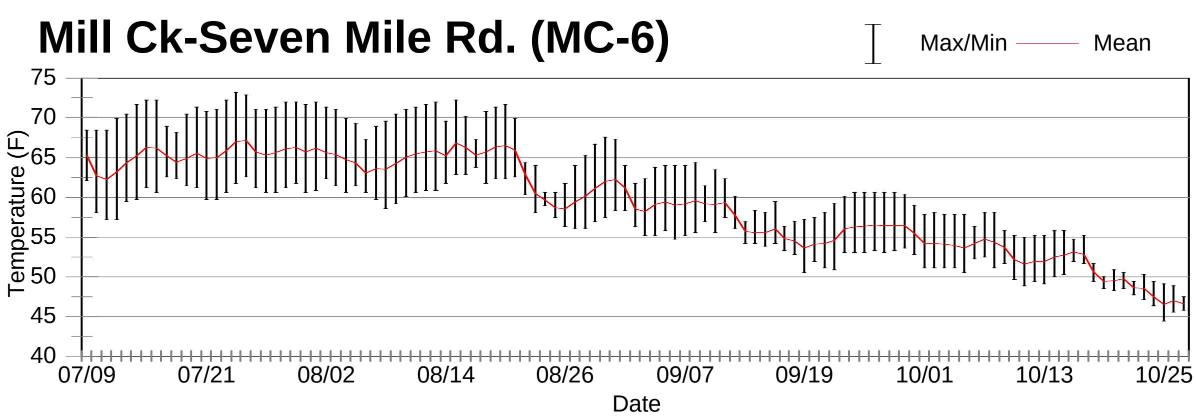

Walla Walla-below Mojonnier Rd. (WW-8)
Max/Min
Mean
Temperature (F)
80
75
70
65
60
55
50
45
05/10
05/29
06/17
07/06
07/25
08/13
09/01
09/20
10/09
10/28
Date

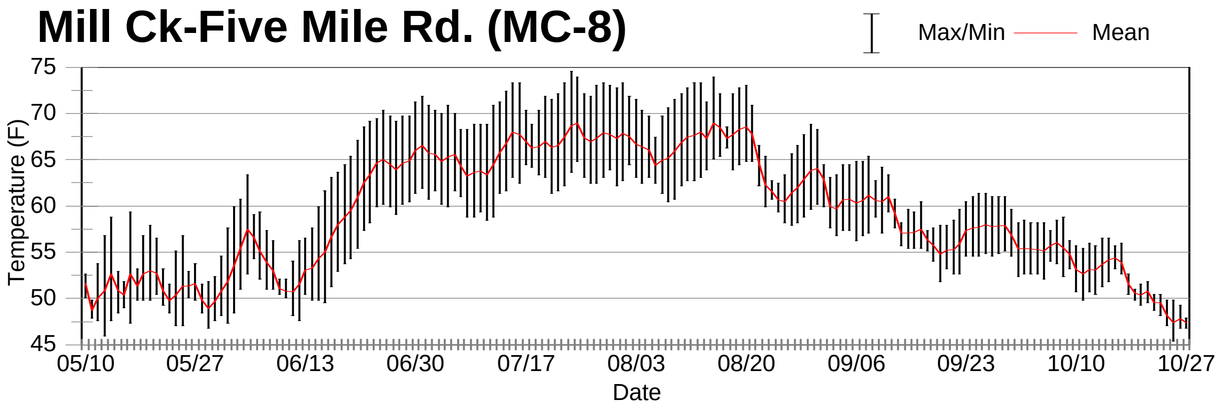

Garrison Ck-Mission Rd (GC-2)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
05/10
05/27
06/13
06/30
07/17
08/03
08/20
09/06
09/23
10/10
10/27
Date

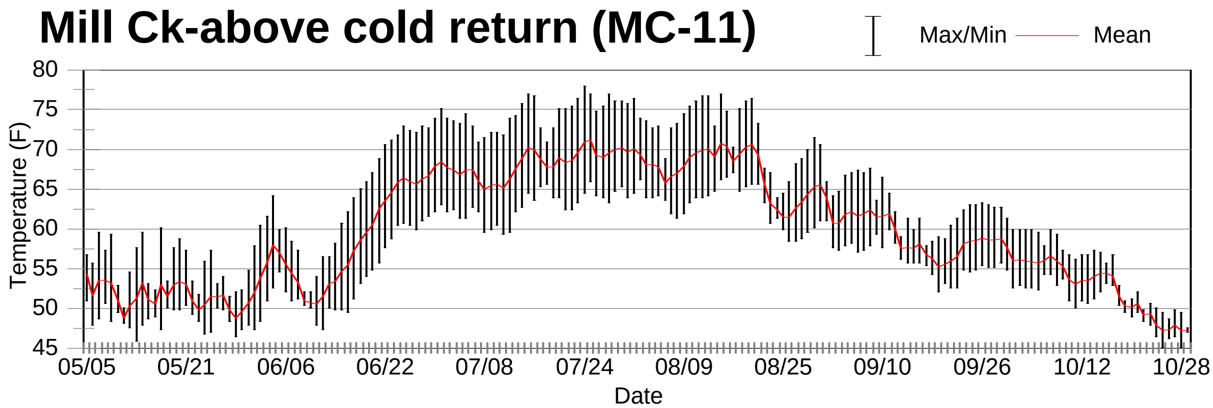

Walla Walla-Swegle Rd. (WW-10)
Max/Min
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
35
05/10
05/29
06/17
07/06
07/25
08/13
09/01
09/20
10/09
10/28
Date

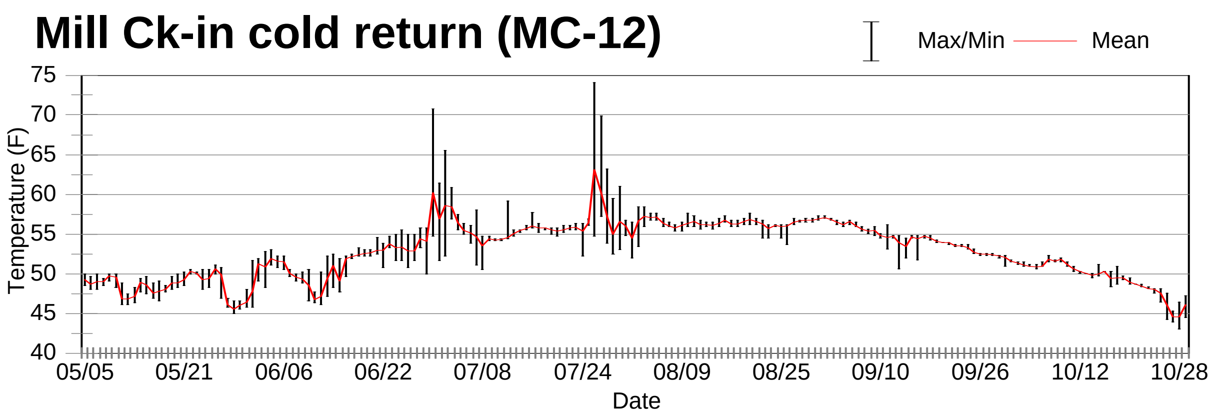

Mill Ck-below Wickersham Brg. (MC-3)
Max/Min
Mean
Temperature (F)
70
65
60
55
50
45
40
05/05
05/17
05/29
06/10
06/22
07/04
07/16
07/28
Date

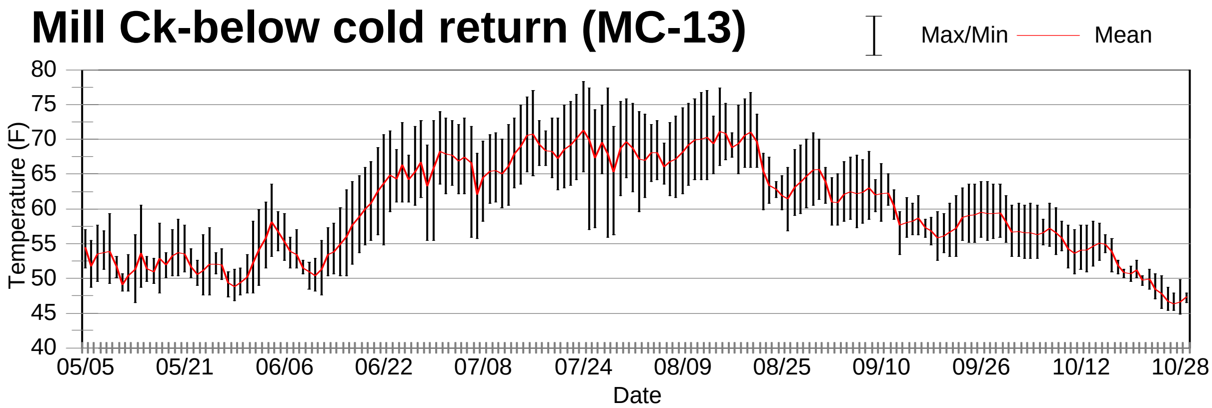

Blue Ck-Mill Ck Rd. (BC-1)
Max/Min
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
05/05
05/21
06/06
06/22
07/08
07/24
08/09
08/25
09/10
09/26
10/12
10/28
Date

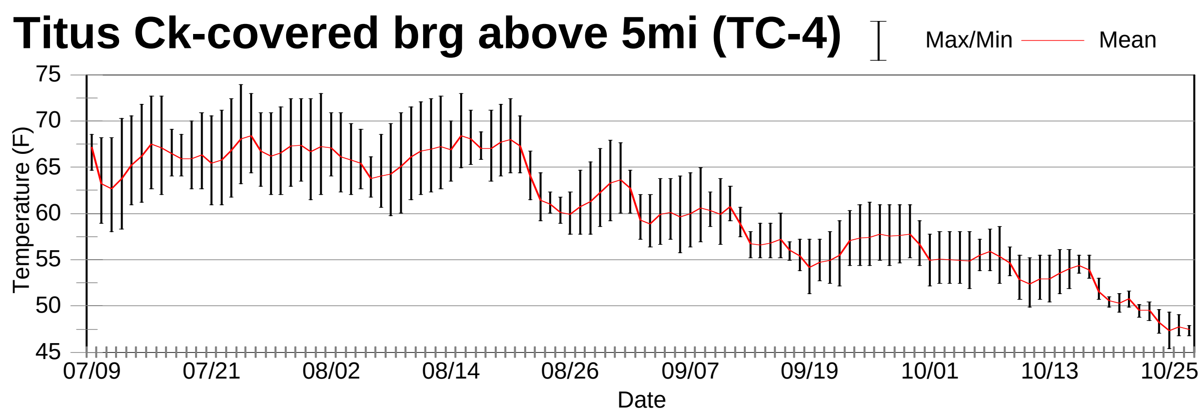

Mill Ck-Seven Mile Rd. (MC-6)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
40
07/09
07/21
08/02
08/14
08/26
09/07
09/19
10/01
10/13
10/25
Date

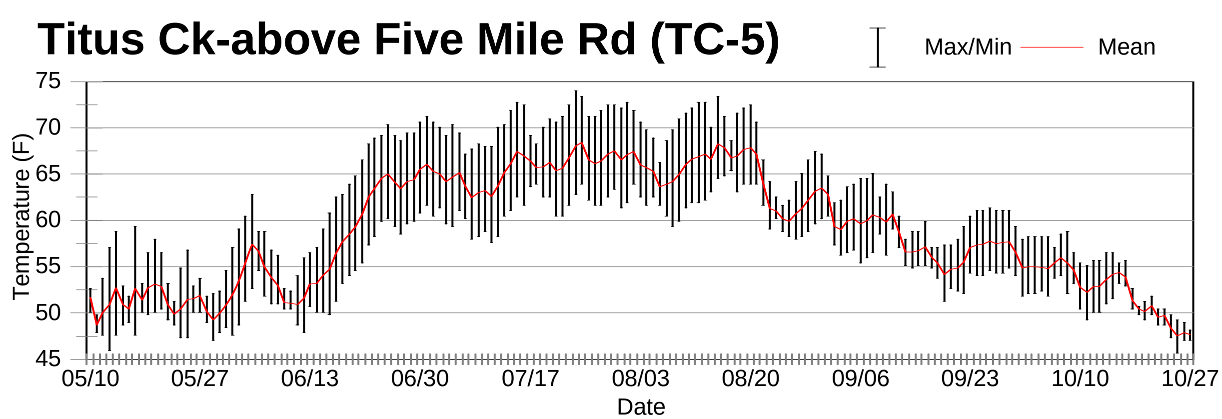

Mill Ck-Five Mile Rd. (MC-8)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
05/10
05/27
06/13
06/30
07/17
08/03
08/20
09/06
09/23
10/10
10/27
Date

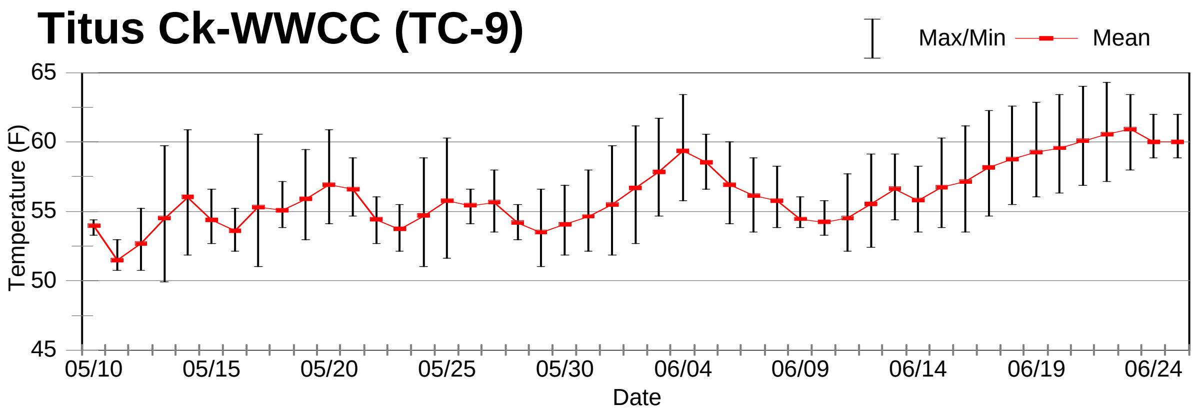

Mill Ck-above cold return (MC-11)
Max/Min
Mean
Temperature (F)
80
75
70
65
60
55
50
45
05/05
05/21
06/06
06/22
07/08
07/24
08/09
08/25
09/10
09/26
10/12
10/28
Date

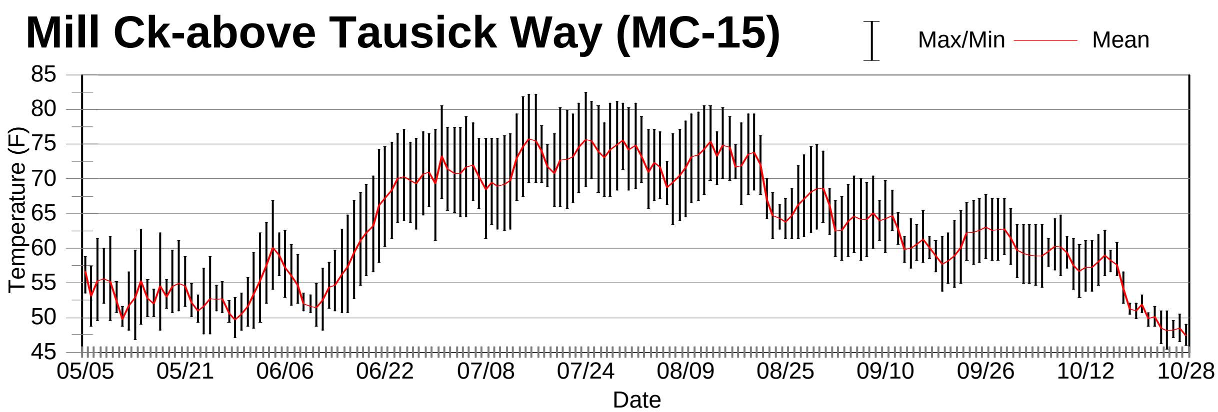

Mill Ck-in cold return (MC-12)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
40
05/05
05/21
06/06
06/22
07/08
07/24
08/09
08/25
09/10
09/26
10/12
10/28
Date

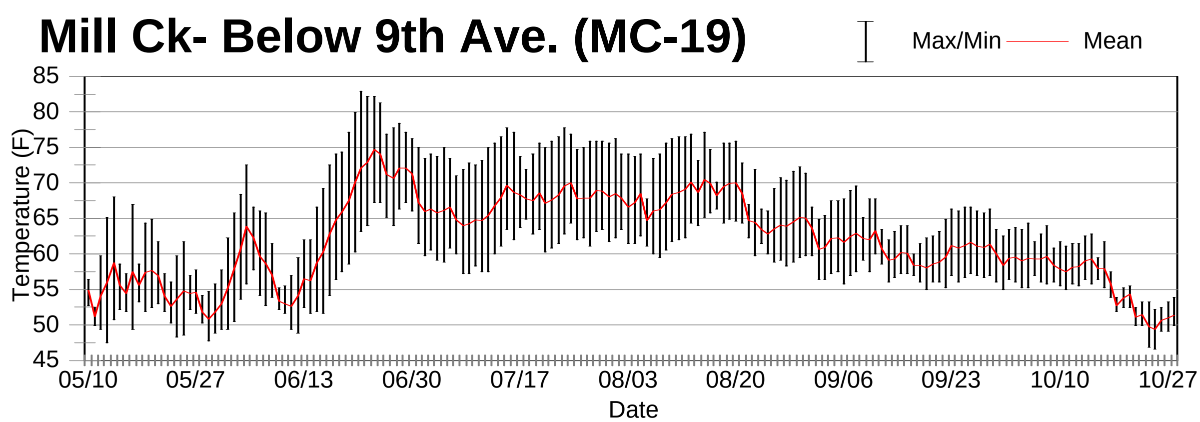

Mill Ck-below cold return (MC-13)
Max/Min
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
05/05
05/21
06/06
06/22
07/08
07/24
08/09
08/25
09/10
09/26
10/12
10/28
Date

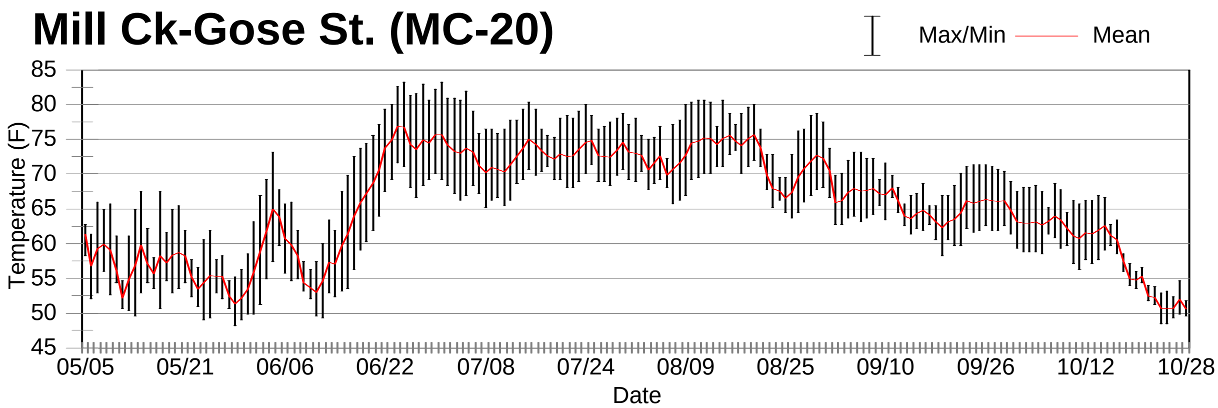

Titus Ck-covered brg above 5mi (TC-4)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
07/09
07/21
08/02
08/14
08/26
09/07
09/19
10/01
10/13
10/25
Date

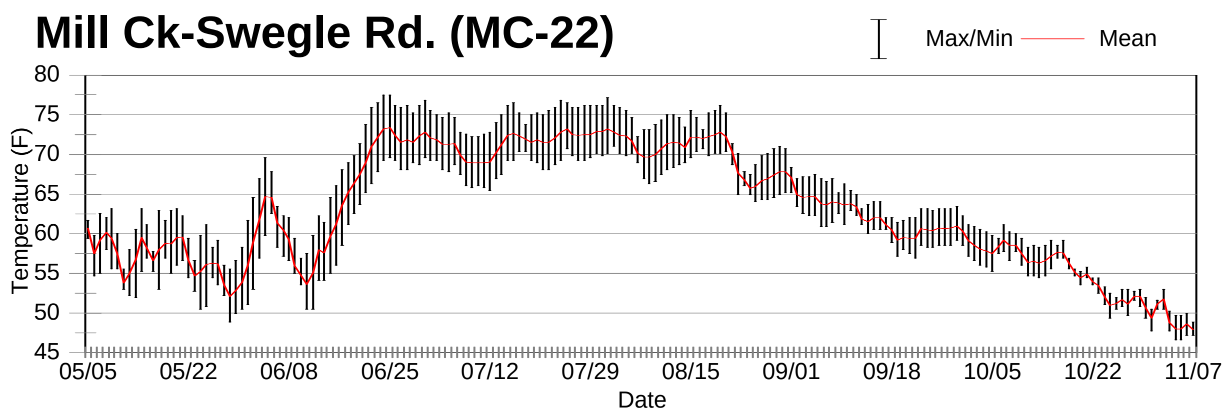

Titus Ck-above Five Mile Rd (TC-5)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
05/10
05/27
06/13
06/30
07/17
08/03
08/20
09/06
09/23
10/10
10/27
Date

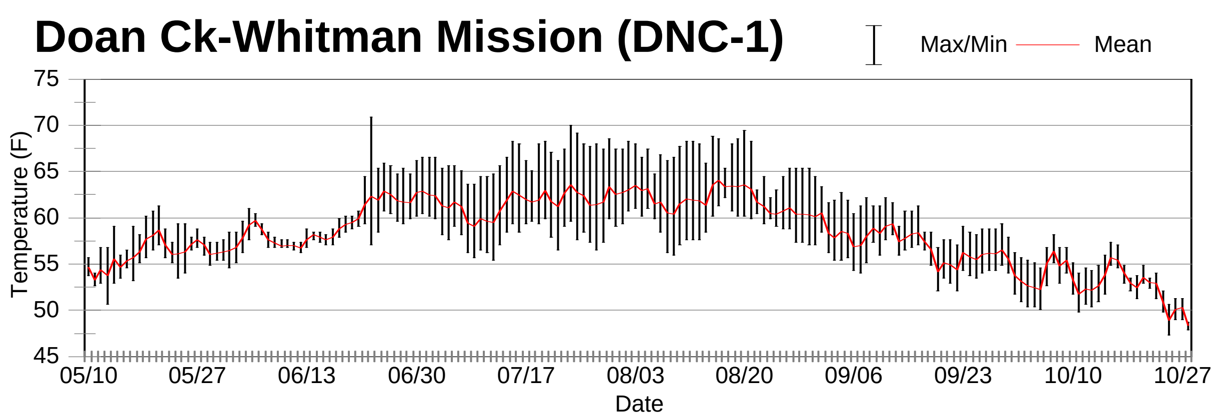

Titus Ck-WWCC (TC-9)
Max/Min
Mean
65
60
55
50
45
Temperature (F)
05/10
05/15
05/20
05/25
05/30
06/04
06/09
06/14
06/19
06/24
Date

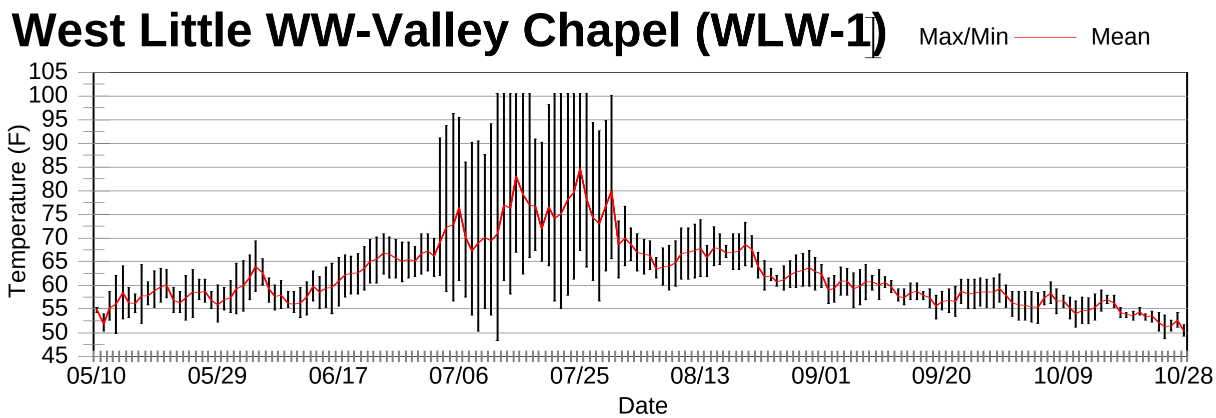

Mill Ck-above Tausick Way (MC-15)
Max/Min
Mean
85
80
75
70
65
60
55
50
45
Temperature (F)
05/05
05/21
06/06
06/22
07/08
07/24
08/09
08/25
09/10
09/26
10/12
10/28
Date

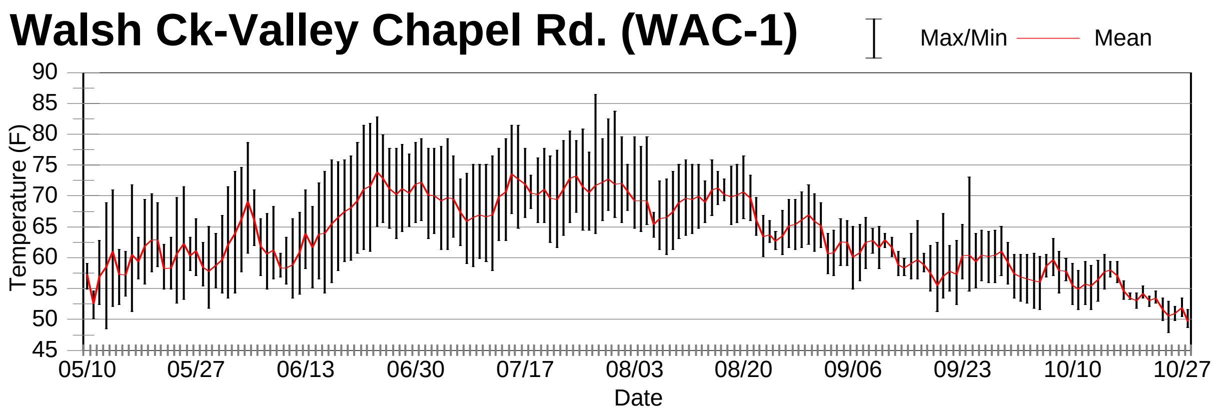

Mill Ck- Below 9th Ave. (MC-19)
Max/Min
Mean
85
80
75
70
65
60
55
50
45
Temperature (F)
05/10
05/27
06/13
06/30
07/17
08/03
08/20
09/06
09/23
10/10
10/27
Date

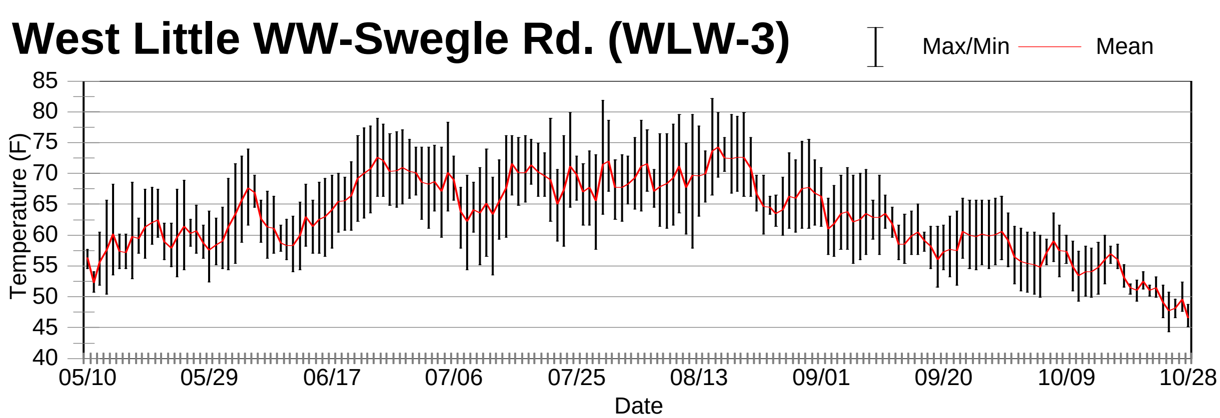

Mill Ck-Gose St. (MC-20)
Max/Min
Mean
Temperature (F)
85
80
75
70
65
60
55
50
45
05/05
05/21
06/06
06/22
07/08
07/24
08/09
08/25
09/10
09/26
10/12
10/28
Date

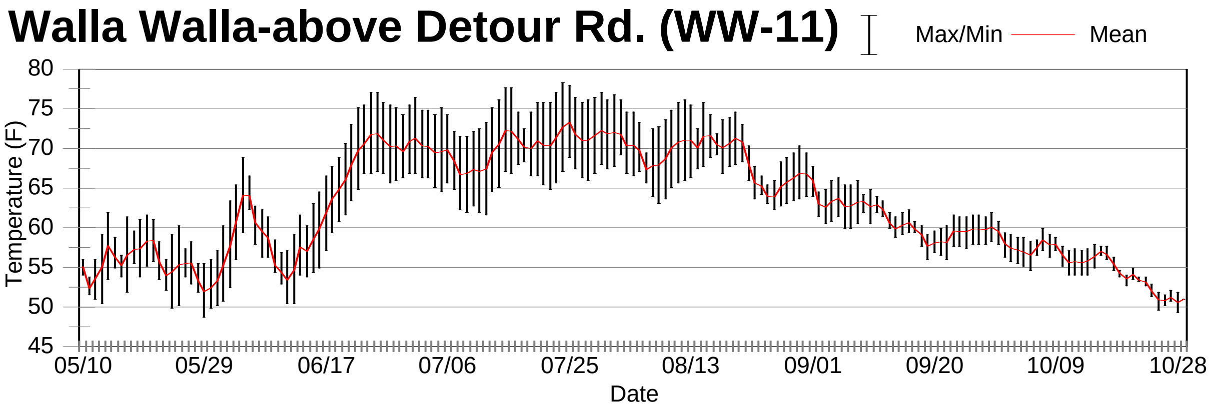

Mill Ck-Swegle Rd. (MC-22)
Max/Min
Mean
Temperature (F)
80
75
70
65
60
55
50
45
05/05
05/22
06/08
06/25
07/12
07/29
08/15
09/01
09/18
10/05
10/22
11/07
Date

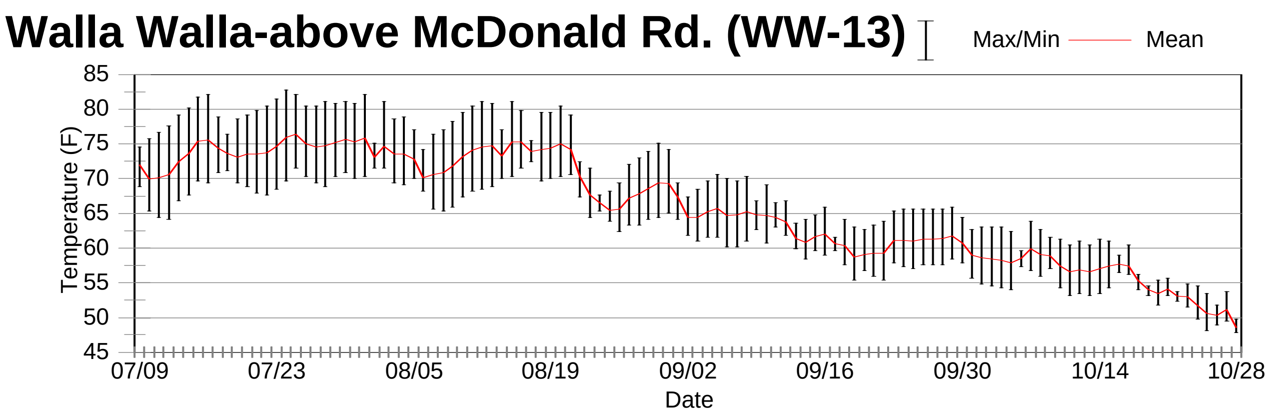

Doan Ck-Whitman Mission (DNC-1)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
05/10
05/27
06/13
06/30
07/17
08/03
08/20
09/06
09/23
10/10
10/27
Date

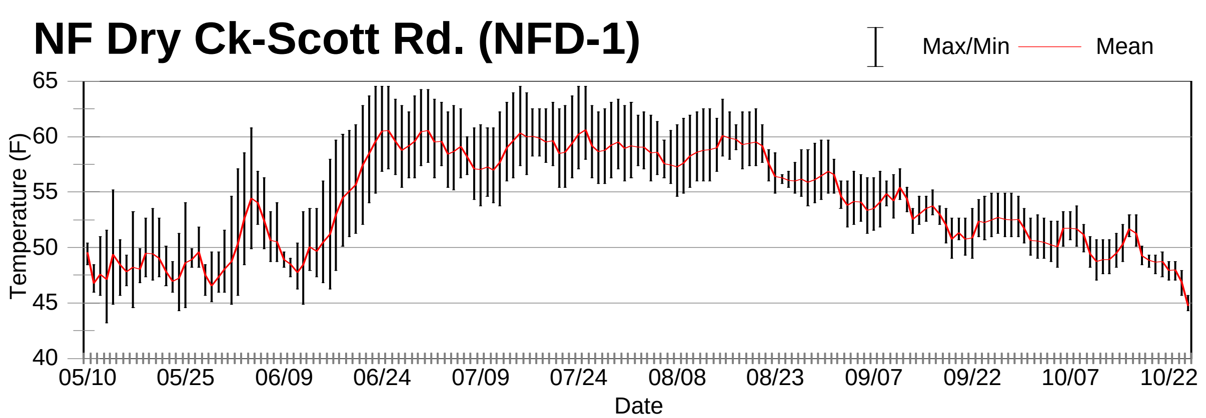

West Little WW-Valley Chapel (WLW-1)
Max/Min
Mean
105
100
95
90
85
80
75
70
65
60
55
50
45
Temperature (F)
05/10
05/29
06/17
07/06
07/25
08/13
09/01
09/20
10/09
10/28
Date

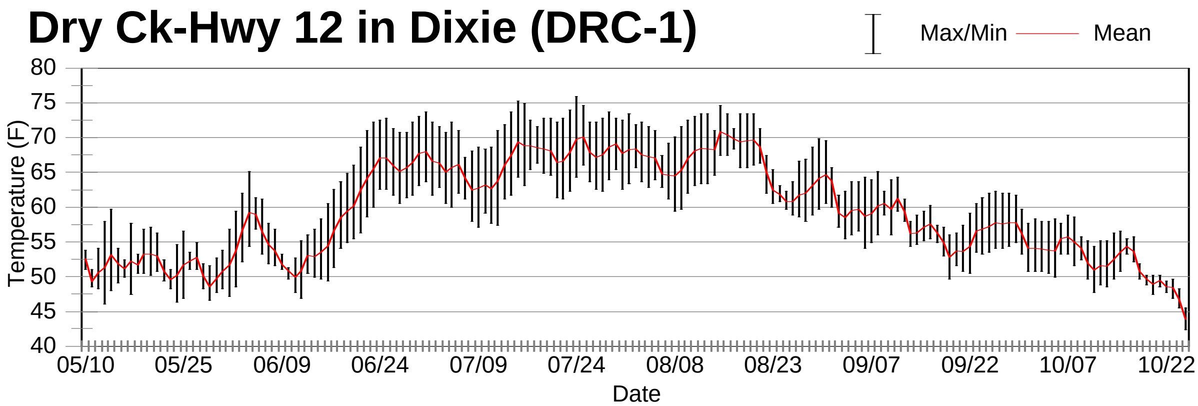

Walsh Ck-Valley Chapel Rd. (WAC-1)
Max/Min
Mean
90
85
80
75
70
65
60
55
50
45
Temperature (F)
05/10
05/27
06/13
06/30
07/17
08/03
08/20
09/06
09/23
10/10
10/27
Date

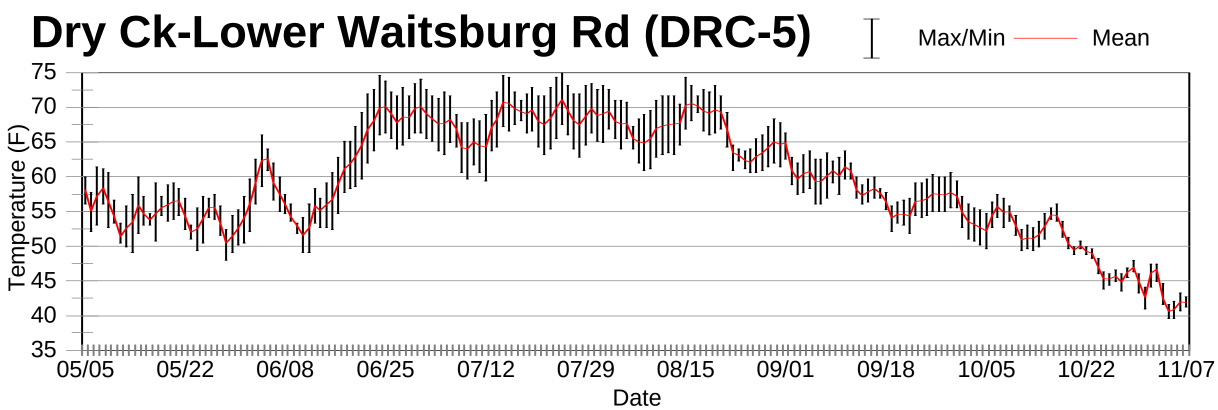

West Little WW-Swegle Rd. (WLW-3)
Max/Min
Mean
85
80
75
70
65
60
55
50
45
40
Temperature (F)
05/10
05/29
06/17
07/06
07/25
08/13
09/01
09/20
10/09
10/28
Date

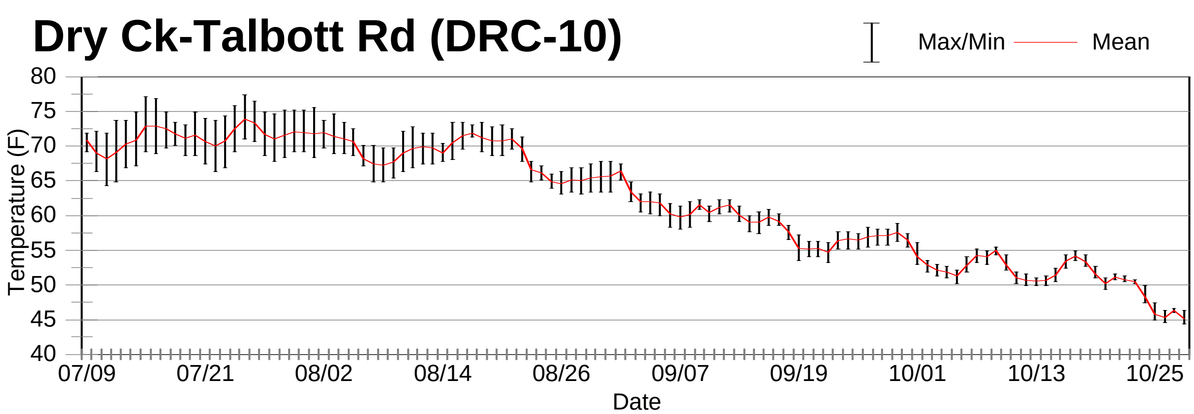

Walla Walla-above Detour Rd. (WW-11)
Max/Min
Mean
80
75
70
65
60
55
50
45
Temperature (F)
05/10
05/29
06/17
07/06
07/25
08/13
09/01
09/20
10/09
10/28
Date

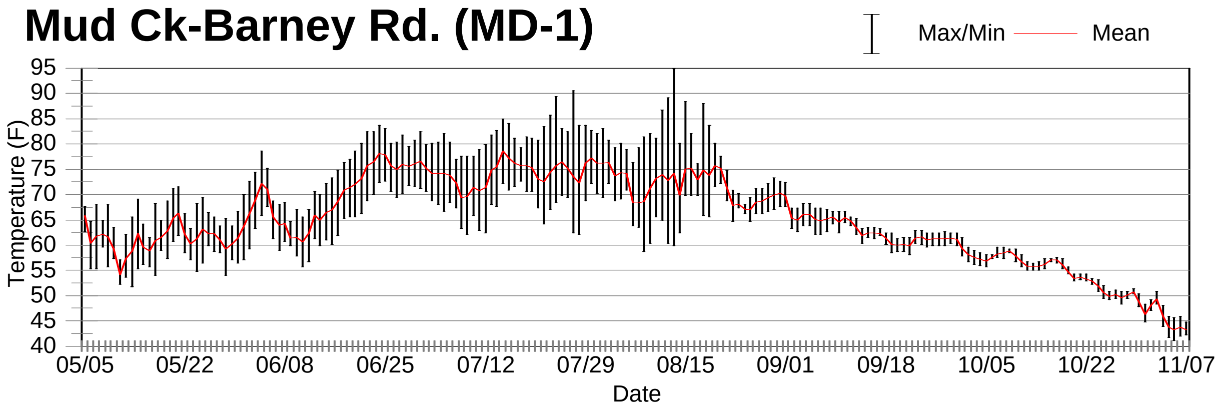

Walla Walla-above McDonald Rd. (WW-13)
Max/Min
Mean
85
80
75
70
65
60
55
50
45
Temperature (F)
07/09
07/23
08/05
08/19
09/02
09/16
09/30
10/14
10/28
Date

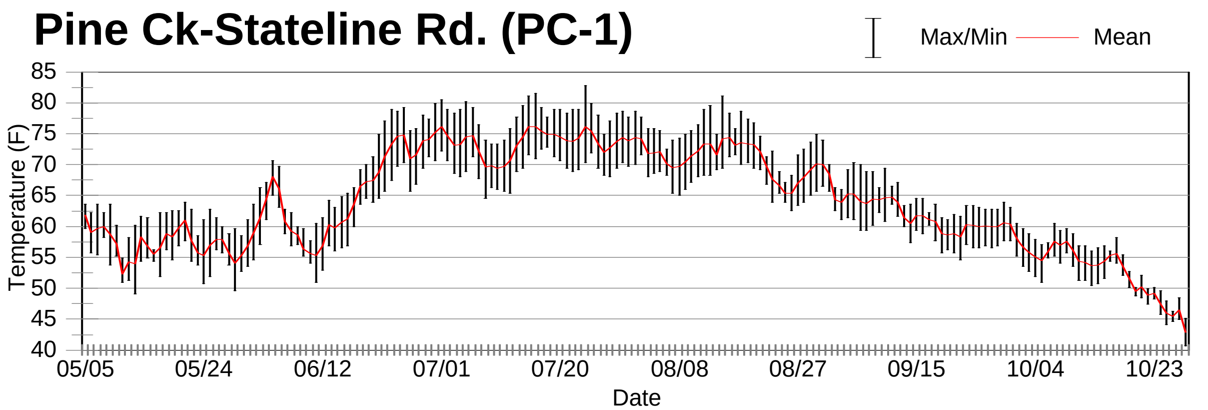

NF Dry Ck-Scott Rd. (NFD-1)
Max/Min
Mean
65
60
55
50
45
40
Temperature (F)
05/10
05/25
06/09
06/24
07/09
07/24
08/08
08/23
09/07
09/22
10/07
10/22
Date

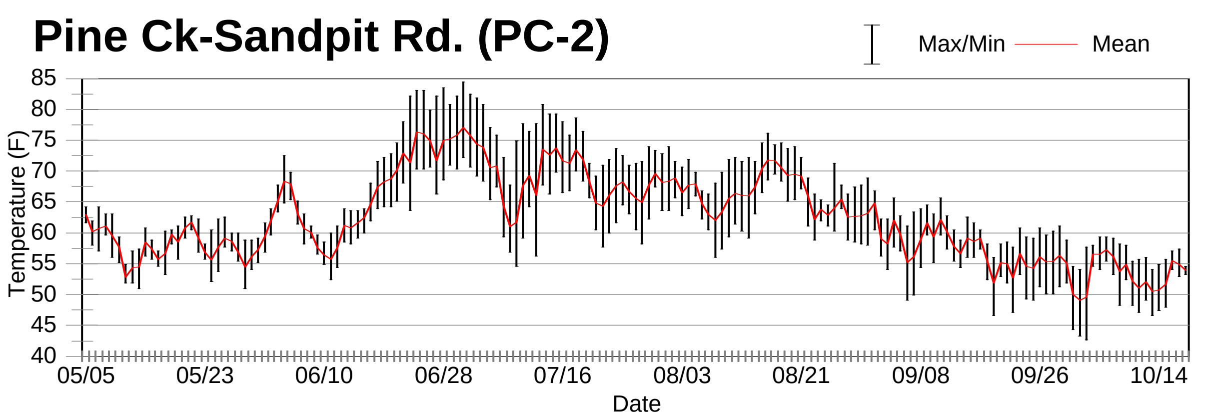

Dry Ck-Hwy 12 in Dixie (DRC-1)
Max/Min
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
05/10
05/25
06/09
06/24
07/09
07/24
08/08
08/23
09/07
09/22
10/07
10/22
Date

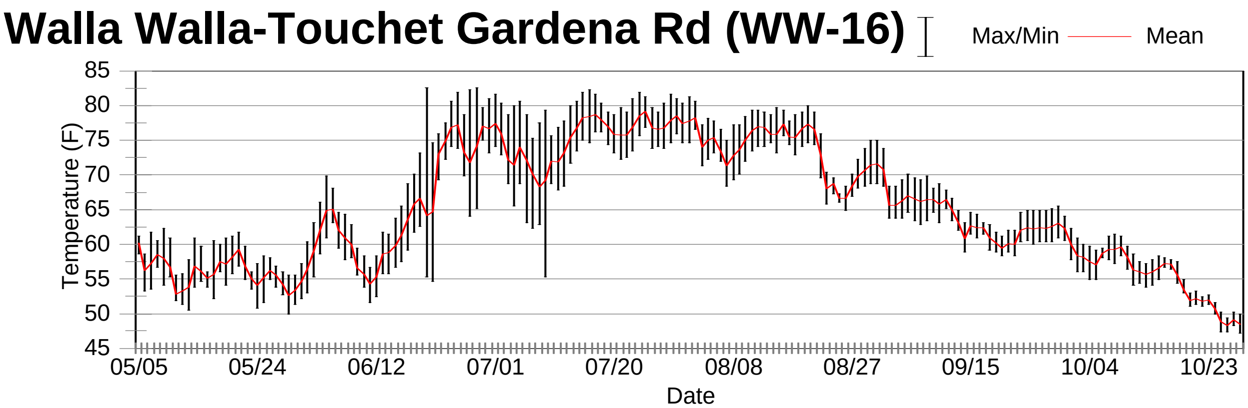

Dry Ck-Lower Waitsburg Rd (DRC-5)
Max/Min
Mean
Temperature (F)
75
70
65
60
55
50
45
40
35
05/05
05/22
06/08
06/25
07/12
07/29
08/15
09/01
09/18
10/05
10/22
11/07
Date


Dry Ck-Talbott Rd (DRC-10)
Max/Min
Mean
Temperature (F)
80
75
70
65
60
55
50
45
40
07/09
07/21
08/02
08/14
08/26
09/07
09/19
10/01
10/13
10/25
Date


Mud Ck-Barney Rd. (MD-1)
Max/Min
Mean
Temperature (F)
95
90
85
80
75
70
65
60
55
50
45
40
05/05
05/22
06/08
06/25
07/12
07/29
08/15
09/01
09/18
10/05
10/22
11/07
Date


Pine Ck-Stateline Rd. (PC-1)
Max/Min
Mean
Temperature (F)
85
80
75
70
65
60
55
50
45
40
05/05
05/24
06/12
07/01
07/20
08/08
08/27
09/15
10/04
10/23
Date


Pine Ck-Sandpit Rd. (PC-2)
Max/Min
Mean
Temperature (F)
85
80
75
70
65
60
55
50
45
40
05/05
05/23
06/10
06/28
07/16
08/03
08/21
09/08
09/26
10/14
Date



List of lost or stolen loggers, and loggers with only partially collected data or data that has inconsistencies, 2004.

Spangler Creek @ 0.2 miles above mouth (SC-1)

- Logger was downloaded on 08/02, and then was found out of the water on 08/16
- Logger was put back into water on 08/16

Wolf Fork @ Holmberg Rd (WF-5)

- Logger was deployed on 05/04
- Logger collected data from 05/04 to 08/02
- Logger was pulled on 10/25, but wouldn't download, so no data after 08/02

South Fork Touchet @ Camp Nancy Lee Brg. (SFT-2)

- Deployed logger # 98-4 on 05/04
- Holes in data?

Touchet River @ below SRL Trap (TR–1)

- Deployed logger on 05/04
- Logger collected data from 05/04 to 06/24
- Logger was to be pulled on 10/25, but was not found so no data available after 06/24

Touchet River @ Lewis and Clark State Park (TR-5)

- Deployed logger on 05/20
- Logger was found dry on 06/24 and was relocated, but data is suspect from 05/20 to 06/24
- Logger remained in water after is was relocated until it was pulled on 10/29

South Fork Coppei Creek @ 2nd bridge on SF Coppei Rd (SFC-4)

- Deployed logger on 05/10
- Logger collected data from 05/10 to 06/21
- Downloaded logger on 08/02, but logger malfunctioned and no data was present
- Logger worked from 08/02 until pulled on 10/25

Touchet River @ Bolles bridge (TR-10)

- Logger appears to have gone dry in late July for ~5 days causing maximum temperatures up to ~94°F, but we can't confirm this because logger was not seen at this time

Cottonwood Creek @ Hood Rd. (CWC-1)

- Deployed logger on 05/05
- Went to download logger on 06/21, but logger was missing
- Deployed new logger on 07/09
- Logger collected data from 07/09, until 10/28 when pulled

Cottonwood Creek @ Braden Rd. (CWC-2)

- Low variation from late June to mid October, assume it is spring fed or ground recharge water
- Logger appears to have gone dry in late October, because of increased variation and it was dry when pulled on 10/28, but we can't confirm this because logger was not seen at this time

Mill Creek @ Wickersham Bridge (MC-3)

- Deployed logger on 05/05
- Downloaded logger on 07/30
- Pulled logger on 10/29, but logger wouldn't download so no data available after 07/30

Mill Creek @ Cold return at Rooks Park (MC-14)

- Deployed logger on 5/14
- Logger collected data from 5/14 to 7/21
- Logger was to be pulled on 11/14, but was not found, so no data is available after 7/21

Titus Creek @ ~1.0 miles above Five Mile Rd (TC-2)

- Deployed logger on 07/19
- Downladed on 08/02 (don't have data?)
- Pulled on 10/27 but wouldn't download

Titus Creek @ Behind WWCC Nursing Building (TC-9)

- Deployed logger on 05/10
- Downloaded logger on 06/24
- Went to download on 08/02, but logger was missing so no data after 06/24

Cold Creek @ Last Chance Rd. (CC-1)
- Deployed logger on 05/05
- Couldn't find on 10/28
- No data collected

West Little Walla Walla River @ Valley Chapel Rd (WLW-5)
- Logger appears to have gone dry for most of the month of July with the graph showing high variation in daily temperatures and maximum temps over 100°F, but we can't confirm this because logger was not seen at this time

Walla Walla River @ McDonald Rd (WW-13)
- Deployed logger on 5/14
- Went to download logger on 06/24, but logger was missing after high water
- Deployed new logger on 07/09

Dry Creek @ Talbott Rd. Brg. (DRC-5)
- Deployed logger on 05/05
- No data?
- Deployed new logger on 07/09

Pine Creek @ Sand Pit Rd
- Deployed logger on 05/05
- When logger was downloaded on 10/28 it was partially out of water, so all data is suspect because it wasn't seen between 05/05 and 10/28

Walla Walla River @ Byerley bridge (WW-17)
- Deployed logger on 05/05
- Went to download logger on 06/24, but logger was missing after high water
- Deployed new logger on 07/09
- Went to download on 10/28, but logger was missing
- No data collected

Appendix D. Habitat Survey Methods, 2004

Reach Form

A reach is a length of stream defined by some functional characteristics. A reach may be simply the distance surveyed. More frequently, reaches are defined as: stream segments between named tributaries, changes in valley and channel form, major changes in vegetation type, or changes in land use or ownership.

Enter a new line on the reach data sheet at any significant change in any one of the reach variables (valley type, channel form, adjacent landform, valley width index, vegetation, or land use) and/or at the confluence with tributaries named on 7.5 minute topographic maps. When a new reach is identified by a named tributary, write the name in the Reach Note column. Also describe a new reach if an unnamed tributary contributes significant flow (approx. 15-20% of the total). Do not invent names for unnamed tributaries, instead identify them as Trib. 1, Trib. 2, etc. and record them on the data sheet and the map.

Changes in reach characteristics are used to verify survey location and to identify reach and stream segments within our basin classification system. Circle the variable that resulted in the new reach entry.

Flagging is used to mark specific points during a survey. Hang a strip of plastic flagging at each reach change, named tributary junction, and at riparian transects. Mark the flagging with the unit number, unit type, and date. These flags will be used to locate specific reaches and units for fish sampling and to link units and locations for repeat surveys during the field season. Results will be compared to check on variability between crews and for habitat changes at different stream flow.

The following sequence corresponds to the listing of variables on the data sheet:

1. **Date.**

2. **Reach.** The numbered sequence of reaches as they are encountered. Each reach is comprised of variable number of channel units.

3. **Unit Number.** Sequence number of the first habitat unit recorded in a reach.

4. **Channel Form.** Determined by the morphology of the active channel, hill slopes, terraces, and flood plains. Identify the channel form and enter the appropriate two-letter code in this column. *Refer to Valley and Channel Classification in the appendix for definitions, allowable combinations, and examples.*

First look at the ratio of the active channel width to the valley width to determine the **Valley Width Index** (see next page, #6). This ratio determines if you are in a broad or narrow valley floor type. If the VWI is 2.5 or less you have a narrow valley type and if the VWI is greater than 2.5 you have a broad valley type.

Next, look at the types of land forms adjacent to the stream channel to characterize and complete your classification.

The channel is constrained when adjacent land forms restrict the lateral movement of the channel. In constrained channels, stream flows associated with all but the largest flood events are confined to the existing channel configuration.

- Narrow Valley Floor Types (VWI $\leq$ 2.5)—Always constrained, defined by the characteristics of the constraining feature.

CB **C**onstrained by **B**edrock (bedrock dominated gorge)
CH **C**onstrained by **H**ill slope
CF **C**onstrained by alluvial **F**an

- Broad Valley Floor Types (VWI > 2.5)—The valley is several times wider than the active channel. The channel, however, may be either unconstrained for constrained depending on the height and configuration of the adjacent landforms.

1. Unconstrained Channel (terrace height is less than the flood prone height and the flood prone width is > than 2.5X active channel width). Low terraces, overflow channels, and flood plains adjacent to the active channel.

US **U**nconstrained-predominantly **S**ingle channel.
UA **U**nconstrained-**A**nastomosing (several complex, interconnecting channels)
UB **U**nconstrained-**B**raided channel (numerous, small channels often flowing over alluvial deposits)

2. Constrained Channel (terrace height is greater than the flood prone height). Adjacent land forms (terraces, hill slopes) are not part of the active flood plain.

CT **C**onstraining **T**erraces. (terrace height > flood prone height and flood prone width < 2.5X active channel width).
CA **C**onstrained by **A**lternating terraces and hill slope. Same rule for terrace height but the channel may meander across the valley floor. The stream channel is confined by contact with hill slopes and high terraces.
CL **C**onstrained by **L**and use (road, dike, landfill)

5. **Valley Form.** General description of the valley cross section with emphasis on the configuration of the valley floor. Divided into types with a narrow valley floor (valley floor width (VWI) ≤ 2.5 times stream active channel width (ACW) and types with a broad valley floor (VWI >2.5 times ACW).

Narrow Valley Floor (VWI ≤ 2.5)

SV **S**teep **V**-shaped valley or bedrock gorge (side slopes ≥ 60°).
MV **M**oderate **V**-shaped valley (side slopes > 30°, < 60°).
OV **O**pen **V**-shaped valley (side slopes ≤ 30°).

Broad Valley Floor (VWI > 2.5)

CT **C**onstraining **T**erraces. Terraces typically high and close to the active channel. Terrace surface is unlikely to receive flood flows and lacks water dependent (hydrophilic) vegetation.
MT **M**ultiple **T**erraces. Surfaces with varying height and distance form the channel. High terraces may be present but they are a sufficient distance from the channel that they have little impact.
WF **W**ide-Active **F**lood plain. Significant portion of valley floor influenced by annual floods, and has water dependant vegetation (mesic meadow). Any terraces present do not impinge on the lateral movement and expansion of the channel.

6. **Valley Width Index.** Ratio of the width of the active stream channel to the width of the valley floor. The Valley Width Index (VWI) is estimated for the reach by dividing the *average active channel width* into the *average valley floor width*. In practice, the number of active channels that could fit across the valley floor.

Do not start a new reach for minor changes in valley width index. However, always start a new reach when the channel changes from a VWI < 2.5 to a VWI > 2.5; or VWI > 5.

When the valley width changes repeatedly within a short distance, select an average value for the VWI. For example, when the valley floor gradually widens from a hill slope constrained reach to a broad valley reach, make one reach change, not new reach designations every few channel units.

It is possible to have an unconstrained channel but a VWI of 1. This may occur in some meadow reaches and other situations where the multiple channels and the flood plain spread across the entire valley floor.

Observations of valley floor surfaces and characteristics can be done as part of the riparian vegetation survey. Getting out of the stream channel will help you to accurately estimate VWI, identify flood plain and terrace surfaces, and to classify reach types.

7. **Streamside Vegetation (Veg. Class).** A two letter code based on the composition of riparian zone vegetation. Definitions of the riparian zone differ. Generally, we consider the vegetation observed in the area within one active channel width of either side of the channel to represent the riparian zone. The first letter identifies the plant community. The second part of the code will refer to the size of trees within identified dbh classes. Do not enter a size or age class for shrubs, brush, or grasses.

Example: riparian zone with 15-30 cm diameter alder = D15.

Separate entries are made for the dominant and subdominant plant communities as estimated from crown density. (Note: In some instances grass can be the dominant plant taxa).

Example: C30 (dominant) and G (subdominant) in ponderosa pine/grass communities.

Vegetation Type:

N **N**o Vegetation (bare soil, rock)
B Sage**B**rush (sagebrush, greasewood, rabbit brush, etc.)
G Annual **G**rasses, herbs, and forbs
P **P**erennial grasses, sedges, and rushes
S **S**hrubs (willow, salmonberry, some alder)
D **D**eciduous Dominated (canopy more that 70% alder, cottonwood, big leaf maple, or other deciduous spp.)
M **M**ixed conifer/deciduous (approx. A 50:50 distribution)
C **C**oniferous Dominated (canopy more than 70% conifer)

Size Class. Use groupings for the estimated diameter at breast height (dbh) expressed in centimeters of the dominant trees. Estimate diameter of young conifers below the first whorl of branches. Enter just the first number(s) of any choice.

1-3 Seedlings and new plantings.
3-15 Young established trees or saplings.
15-30 Typical size for second growth stands. West side communities may have fully closed canopy at this stage.
30-50 Large trees in established stands.

50-90 Mature timber. Developing understory of trees and shrubs.

90+ Old growth. Very large trees, nearly always conifers. Plant community likely to include a combination of big trees, snags, down woody debris, and a multi-layered canopy.

These size classes correspond to diameter breast height (dbh) estimated in inches of: <1, 1-5, 6-11, 12-20, 21-35, and 36+ respectively.

8. **Land Use.** Determined from observations of terraces and hill slopes beyond the riparian zone. Code subdominant land use where appropriate. Separate entries for the dominant and subdominant land uses (i.e. PT (dominant) and HG (subdominant) = **P**artial cut **T**imber and **H**eavy **G**razing).

AG **AG**ricultural crop or dairy land.

TH **T**imber **H**arvest. Active timber management including tree felling, logging, etc. Not yet replanted.

YT **Y**oung Forest **T**rees. Can range from recently planted harvest units to stands with trees up to 15 cm dbh.

ST **S**econd growth **T**imber. Trees 15-30 cm dbh in generally dense, rapidly growing uniform stands.

LT **L**arge **T**imber (30-50 cm dbh)

MT **M**ature **T**imber (50-90 cm dbh)

OG **O**ld **G**rowth Forest. Many trees with 90+ cm dbh and plant community with old growth characteristics.

PT **P**artial cut **T**imber. Selection cut or shelterwood cut with partial removal of large trees. Combination of stumps and standing timber. If only a few live trees or snags in the unit, describe in note column.

FF **F**orest **F**ire. Evidence of recent charring and tree mortality.

BK **B**ug **K**ill. Eastside forests with > 60% mortality from pests and diseases. Enter bug kill as a comment on the unit, describe in note column.

LG **L**ight **G**razing Pressure. Grasses, forbes, and shrubs present, banks not broken down, animal presence obviously only at limited points such as water crossings. Cow pies evident.

HG **H**eavy **G**razing Pressure. Broken banks, well established cow paths. Primarily bare earth or early successional stages of grasses and forbs present.

EX **EX**closure. Fenced area that excludes cattle from a portion of range land.

GN **G**ree**N** way. Designated Green Way areas, Parks (city, county, state).

UR **UR**ban

RR **R**ural **R**esidential

IN **IN**dustrial

CR **C**onservation area or wildlife **R**efuge.

MI **MI**ning

WL **W**et**L**and
NU **N**o **U**se identified
WA Designated **W**ilderness **A**rea

9. **Water Temperature.** Stream temperature recorded at each reach change or a minimum of once per page of Unit data. Record time. Note if temperature is °C or °F.

At named tributary junctions record the stream temperature just above the tributary and in the tributary. Identify and record each temperature in the appropriate line of the Unit Note column.

10. **Stream Flow.** Description of observed discharge condition. Best observed in riffles. If a gauging station is present, be sure to record the stage height.

DR **DR**y
PD **P**u**D**dled. Series of isolated pools connected by surface trickle or subsurface flow.
LF **L**ow **F**low. Surface water flowing across 50 to 75 percent of the active channel surface. Consider general indications of low flow conditions.
MF **M**oderate **F**low. Surface water flowing across 75 to 90 percent of the active channel surface.
HF **H**igh **F**low. Stream flowing completely across active channel surface but not at bankfull.
BF **B**ankfull **F**low. Stream flowing at the upper level of the active channel bank.
FF **F**lood **F**low. Stream flowing over banks onto low terraces or flood plain.

11. **Location.** GPS location put into the Reach Note column.

12. **Photo Number and Time.** Take a photograph that shows the stream and riparian zone at each reach change. Record the exposure number and the time shown on the camera on the reach sheet and the photo record sheet.

13. **Reach Note.** Additional space for comments, names of tributaries, land ownership, and reach start location. Abbreviate by ownership code or use names of forest, timber companies, ranches, etc. when known.

P **P**rivate
M **M**unicipal
C **C**ounty
T **T**ribal
GN **G**ree**N** way
FW Washington Department of **F**ish and **W**ildlife
BL **B**ureau of **L**and Management

SF **S**tate **F**orest
NF **N**ational **F**orest
US **US** Fish and Wildlife Service
WA **W**ilderness **A**rea

Unit Form

This data is collected on one form that includes short units and long units. All the data is measured none is estimated.

- Crews work upstream, identifying and characterizing the sequence of habitat units.

- **At tributary junctions:**

Tributary channel junctions (confluence with a tributary) are identified and noted. Record the active channel width and temperature of the tributary in the note column.

At each channel junction, estimate the percentage of total flow in each channel. Proceed up the named stream on the USGS topographic map regardless of flow. If neither channel is named, proceed up the channel with the greatest flow.

Survey the portion of the tributaries that flow across the active channel up to the bankfull level. Tributary channel units will be numbered and sequenced from the point where the tributary enters the main channel. Be sure to use the proper channel type code. Survey and record a minimum of one unit for each tributary and additional units (if applicable) that would become part of the main channel at bankfull flow. Mark the topo map referencing the unit number of the unit into which the tributary flows.

- **In braided channels:**

Continue upstream, always taking the channel with the greatest flow, until reaching the unit where the stream again forms a single channel. Backtrack, then survey the sequence of units in the secondary channel, then the sequence of units in the tertiary channel, etc.

For particularly complex areas, make a simple sketch in the field book showing the sequence of channel units (type and number) and location of channels.

1. **Reach.** The number of the reach; links unit data to reach data.

2. **Unit.** The sequential number describing the order of channel habitat units. A reach is comprised of many channel units.

3. **Unit Type.**

The concept of a channel habitat unit is the basic level of notation for our survey methodology. We subdivided the stream into two general classes of unit types: channel geomorphic units and special case units.

Channel geomorphic units are relatively homogeneous lengths of the stream that are classified by channel bedform, flow characteristics, and water surface slope. With some exceptions, channel geomorphic units are defined to be at least as long as the active channel width. Individual units are formed by the interaction of discharge and sediment load with the channel resistance (roughness characteristics such as bedrock, boulders, and large woody debris). Channel units are defined (in priority order) based on characteristics of (1) bedform, (2) gradient, and (3) substrate.

Special case units describe situations where, because of stream flow level or a road crossing, the usual channel geomorphic unit types do not occur. Special case units include dry or partly dry channels, and culverts.

GEOMORPHIC CHANNEL UNITS

Characteristic water surface slopes are given for each group of habitat unit types. However, channel bedform and flow characteristics are the primary determinant of unit classification. Use the unit's slope to help make determinations when the other characteristics are ambiguous.

POOLS (water surface slope usually zero)

PP **P**lunge **P**ool: Formed by scour below a complete or nearly complete channel obstruction (logs, boulders, or bedrock). Substrate is highly variable. Frequently, but not always, shorter than the active channel width.

SP **S**traight scour **P**ool: Formed by mid-channel scour. Generally with a broad scour hole and symmetrical cross section.

LP **L**ateral scour **P**ool: Formed by flow impinging against one stream bank or partial obstruction (logs, root wad, or bedrock). Asymmetrical cross section. Includes corner pools in meandering lowland or valley bottom streams.

TP **T**rench **P**ool: Slow flow with U or V-shaped cross section typically flanked by bedrock walls. Often very long and narrow with at least half of the substrate comprised of bedrock.

DP **D**ammed **P**ool: Water impounded upstream of channel blockage (debris jams, rock landslides).

BP **B**eaver dam **P**ool: Dammed pool formed by beaver activity. In most cases this will be preceded by a SD (step over beaver dam).

SUBUNIT POOLS

Alcoves, backwaters, and isolated pools are types of habitat subunits; generally not as long as the full channel width. They are, however, generally easy to identify and are important habitat types. Alcoves, backwaters, and isolated pools are formed by eddy scour flow near lateral obstructions.

AL **AL**cove: Most protected type of subunit pool. Alcoves are laterally displaced from the general bounds of the active channel. Substrate is typically sand and organic matter. Formed during extreme flow events or by beaver activity; not scoured during typical high flows.

BW **B**ack**W**ater Pool: Found along channel margins; created by eddies around obstructions such as boulders, root wads, or woody debris. Part of active channel at most flows; scoured at high flow. Substrate typically sand, gravel, and cobble.

IP **I**solated **P**ool: Pools formed outside the primary wetted channel, but within the active channel. Isolated pools are usually associated with gravel bars and may dry up or be dependent on inter-gravel flow during late summer. Substrate is highly variable. Isolate pool subunits do not include pools of ponded or perched water found in bedrock depressions.

GLIDES

GL **GL**ide: An area with generally uniform depth and flow with no surface turbulence. Low gradient; 0-1% slope. Glides may have some small scour areas but are distinguished from pools by their overall homogeneity and lack of structure. Generally deeper than riffles with few major flow obstructions and low habitat complexity. There is a general lack of consensus regarding the definition of glides (Hawkins et al. 1993).

RUN

RU **RU**n: rapid, non-turbulent flow, too deep to be a riffle and too fast to be a pool (Platts 1983); no residual depth or laminar flow (USFS)

RIFFLES

RI **RI**ffle: Fast, turbulent, shallow flow over submerged or partially submerged gravel and cobble substrates. Generally broad, uniform cross section. Low gradient; usually 0.5-2.0% slope, rarely up to 6%.

RP **R**iffle with **P**ockets: Same flow and gradient as Riffle but with numerous sub-unit sized pools or pocket water created by scour associated with small boulders, wood, or stream bed dunes and ridges. Sub-unit sized pools comprise 20% or more of the total unit area.

RAPIDS

RB **R**apid with protruding **B**oulders: Swift, turbulent flow including chutes and some hydraulic jumps swirling around boulders. Exposed substrate composed of individual boulders, boulder clusters, and partial bars. Moderate gradient; usually 2.0-4.0% slope, occasionally 7.0-8.0%.

RR **R**apid over Bed**R**ock: Swift, turbulent, "sheeting" flow over smooth bedrock. Sometimes called chutes. Little or no exposed substrate. Moderate to steep gradient; 2.0-3.0% slope.

CASCADES

CB **C**ascade over **B**oulders: Much of the exposed substrate composed of boulders organized into clusters, partial bars, or step-pool sequences. Fast, turbulent, flow; many hydraulic jumps, strong chutes, and eddies; 30-80% white water. High gradient; usually 3.5-10.0% slope, sometimes greater.

CR **C**ascade over Bed**R**ock: Same flow characteristics as Cascade over Boulders but structure is derived from sequence of bedrock steps. Slope 3.5% or greater.

STEPS

Steps are abrupt, discrete breaks in channel gradient. Steps are usually much shorter than the channel width. However, they are important, discrete breaks in channel gradient with 10->100% slope. Steps can separate sequential units of the same type. Low steps (<0.3m high) in moderate to high gradient reaches formed by gravel and small cobbles on the face of transverse bars can usually be included in the next fast water unit upstream. However, small steps (<0.3m high) that separate pools may be important features in very low gradient reaches and should be recorded as individual habitat units.

Steps are classified by the type of structure forming the step.

SR **S**tep over Bed**R**ock (include hardpan and clay steps)
SB **S**tep over **B**oulders
SC **S**tep over face of **C**obble bar
SL **S**tep over **L**og(s), branches

SS **S**tep created by **S**tructure (culvert, weir, artificial dams)

SD **S**tep created by Beaver **D**am

⇨ Record the estimated height of the step in the note column and take a picture of any steps that are potential barriers to fish passage. (Note: always record a step height in the note column for the **SS** unit type regardless if a passage problem cannot be determined).

SPECIAL CASE UNIT TYPES

DU **D**ry **U**nit: Dry section of stream separating wetted channel units. Typical examples are riffles with subsurface flow or portions of side channels separated by large isolated pools. Record the length, active channel width, and all other variables for the dry areas.

PD **P**u**D**dled: Nearly dry channel but with sequence of small isolated pools less than one channel width in length or width.

DC **D**ry **C**hannel: Sectioin of the main channel or side channel that is completely dry at time of survey. Record all unit data, use active channel width for width.

CC **C**ulvert **C**rossing: Stream flowing through a culvert. Record all data for metal bottom culverts. However, record the substrate of the surrounding fill material when estimating the composition of substrate material.

⇨ Record the height from the culvert lip to the stream surface (drop), diameter, material, and shape of culvert in the note column. Take a picture of any culvert that is a potential fish barrier. If possible, have a depth staff or person in the photo to reference the step height.

⇨ All Culvert Crossing unit types should have a Step Structure unit type immediately preceding it unless there is absolutely no drop to the water below. If a drop exists, record a step height in the note column regardless of the height. Write "no drop" in the note column if a drop does not exist.

4. **Channel Type.** Channel ordering code based on channel by size and location. Orders the sequence of single, multiple, and side channels.

00 No Multiple Channels (all flow in one channel)

01 Primary Channel (or multiple channel reach or in the unit where a tributary enters the channel)

02 Secondary Channel (of multiple channel reach)

03 Tertiary Channel (of multiple channel reach)

04-06 Continue pattern for 04, 05, 06 level channels
10 Isolated Pools, Alcoves, or Backwater Pools.
11 Primary channel of valley floor tributary. If the tributary has a name, write it in the note column.
12 Secondary channel of valley floor tributary.

It is very important that the primary channel be identified with the proper code. This information is used in a critical step of the data analysis to calculate channel length and sinuosity.

The inventory considers the stream as the system of all channels that transport water down the drainage. The intention is to survey and quantify all aquatic habitats located within a channel code and an estimate of the percent of total flow carried in each channel.

5. **Percent Flow.** Visual estimate of the relative amount of flow in the channel, in each channel where multiple channels occur, or the contribution to total flow from a tributary. Record 0% for alcove, backwater and isolated pool unit types.

This is difficult to measure accurately. In the past, crews have tended to overestimate the contribution from tributaries. Don't be concerned about balancing your totals for flow to 100 percent. The information is used only to identify the relative contribution or distribution of flow. Record the active channel width (ACW) of the tributary in the note column as well.

6. **Unit Length.** Length of each unit in meters. The length is measured for each unit.

7. **Depth.** Four random depths are taken throughout the unit and used to calculate an average depth, along with a maximum depth.

8. **Depth at Pool Tail Crest.** Measure the maximum depth to the nearest 0.01 meter at the pool tail crest for every pool habitat unit, with the exception of subunit pools (**BW**, **AL**, **IP**). This location is at the point where the water surface slope breaks into the downstream habitat unit. This point is the deepest point along the hydraulic control feature that forms the pool. For beaver ponds unit type (**BP**) that have no water flowing over the top of the dam yet there is subsurface flow through the sticks and logs of the dam, record the PTC depth as 0.01 meter.

9. **Unit Width.** Width of wetted channel (estimated every unit; estimated and verified every 10th unit). Measure the average width of the entire unit. On multiple wetted channel units, such as steps over bedrock where there are several wetted slots carved into the rock, record the sum of the wetted widths.

10. **Slope (Gradient).** Gradient of water surface in the unit. Expressed ast the **percent** change in elevation over the length of the unit. Estimated with a clinometer using the scale on the right side in the viewfinder.

11. **Channel Shade.** (Measured separately for Left Bank and Right Bank). Measured with the clinometer as the **degrees** (left side in the viewfinder) above horizontal to the top of riparian vegetation or land forms ($\leq$90°). Measured perpendicular to the channel unit on the left and right banks. This variable requires integration of topographic shading and canopy closure.

12. **Percent Actively Eroding Bank.** Estimate the percent of the lineal distance of both sides of the habitat unit that is actively eroding at the active channel height. Active erosion is defined as actively, recently eroding, or collapsing banks and may have the following characteristics: exposed soils and inorganic material, evidence of tension cracks, active sloughing, or superficial vegetation that does not contribute to bank stability.

13. **Percent Undercut Bank.** An estimate of the percent of the perimeter of the habitat unit composed of undercut banks. Estimate at the margins of the wetted channel as an index of cover habitat.

14. **Active Channel Width (Bankfull Width).** Distance across channel at "bank full" flow. Bankfull flow is the level the stream flow attains every 1.5 years on average. The boundary of the active channel can be difficult to determine; use changes in vegetation, slope breaks, or high water marks as clues. Sum the width of all active channels in multichannel situation.

15. **Active Channel Height (Bankfull Depth).** Vertical distance from the streambed to the top of the active channel. Stretching a tape tight across the top of Bankfull Width will give the top of Active Channel Height across the stream. Bankfull Depths are taken at 25, 50, and 75% of the distance across the Active Channel Width, as well as a maximum Bankfull Depth.

16. **Substrate.** Substrate was measured in four rock/type samples at each of 3 sites (25, 50, and 75% of width) in 0.5 meter cells and was divided into the following categories:

M	**M**ud (silt or fine organic material)
S	**S**and
G	**G**ravel (BB to baseball size, 2-64mm)
SC	**S**mall **C**obble (64-128mm)
LC	**L**arge **C**obble (128-256mm)
B	**B**oulder (>256mm)
BR	**B**ed**R**ock (includes hardpan)

17. **Embeddedness.** Done at substrate sample sites (but not in pools, unless the transect is through the tailout) with one measurement for 25, 50, and 75% of the width. An estimate of embeddedness at each area was give a number code for the approximate %.

1=<10%
2=10-<25%
3=25-<50%
4=50-<90%
5=90+%

18. **Spawning Area Fines.** % of fines at embeddedness sites that correspond with spawnable habitat. Like Embeddedness a number code was assigned for an approximate %.

1=<6%
2=6-<11%
3=11-<18%
4=18-<30%
5=30+%

19. **Man-made Channel Confinement.** Estimate the percent of the lineal distance of both sides (sum of both banks) of the habitat unit that are confining the channel do to human intervention (dikes, bridges, etc.).

20. **Natural Channel Confinement.** A number code was assigned based on the following criteria:

1=Confined: average valley width is <2 bankfull channel widths of flood plain
2=Moderate: average valley width is 2-4 bankfull channel widths of flood plain
3=Unconfined: average valley width is >4 bankfull channel widths of flood plain

21. **Notes (Comments).** Area to note important features that may not be accounted for under any other criteria.

Comment Codes. Enter as many codes as appropriate. Separate items that apply to the left bank (looking upstream) from those for the right bank using a slash. If a code does not exist for an observation, do not invent a code, write a description in the note column if necessary.

BC **B**ridge **C**rossing. Record road name or number in note.
BD **B**eaver **D**am. Helps to identify steps created by beavers.
BK **B**ug **K**ill. Patches of insect or disease tree mortality.

BV **B**ea**V**er Activity (beaver den, cut trees, etc.)
CC **C**ulvert **C**rossing. Same as Bridge Crossing except the stream passes through a culvert. Record road name or number.
CE **C**ulvert **E**ntry. Tributary entering through a culvert. Record diameter, length, slope, and height of drop.
CS **C**hannelized **S**treambanks. Rip-rap or other artificial bank stabilization and stream control.
DJ **D**ebris **J**am. Accumulation of large woody debris that fills the majority of the stream channel and traps additional debris and sediment.
FC **F**ence **C**rossing.
GS **G**auging **S**tation.
HS Artificial **H**abitat **S**tructure. Describe type: gabion, log weir, cabled or uncabled LWD, etc. in note. If a habitat structure spans across several habitat units record it only once. Put the comment code in the unit that is most affected by the habitat structure.
MI **MI**ning
PA **P**otential **A**rtificial Barrier. Potential artificial or human created barrier to upstream or downstream migration of fish. Document height, take photo and notes.
PN **P**otential **N**atural Barrier. Potential natural barrier to upstream or downstream migration of fish. Document height, take photos and notes.
(Note: Barriers are relative to stream size and fish species encountering them. Consider these variables when using this comment code).
RF **R**oad **F**ord. Road that crosses within the active channel of the stream (no bridge).
SD **S**creened **D**iversion (pump or canal). Give some indication of size or capacity.
SS **S**pring or **S**eep. Usually small amounts of flow (<5% of total flow) directly entering from hill slope. For large springs, estimate the contribution to flow.
TJ **T**ributary **J**unction with named and unnamed tributaries. Use the **TJ** class only for tributaries with clearly developed channels.
UD **U**nscreened **D**iversion (pump or canal). Give some indication of size or capacity.
WL **W**ild**L**ife use of stream or riparian zone (note species). This code refers to anything except fish species. Record fish observations only in the note column. Identify species if possible.

Mass Movements: Use a two-part code. The first letter identifies the type of mass movement failure. The second letter evaluates the apparent activity of the failure. (Example: AI = inactive debris avalanche.)

Type:

E **E**arthflow: general movement and encroachment of hillslope upon the channel. These can be identified by groups of unusually leaning trees on a hillslope.

L **L**andslide: failure of locally adjacent hillslope. Usually steep, broad, often shaped like a half oval, with exposed soils.

A **A**valanche: failure of small, high gradient, tributary. Often appear "spoon shaped" looking upslope. Water may flow in these intermittent or ephemeral channels that contribute alluvial soils and debris.

Condition:

A **A**ctive: contributing material now.

I **I**nactive: evidence of contribution of material during previous winter or high flows.

S Stabilized: vegetated scars, no evidence of recent activity.

A rating for all pools should also be included in the comments area. The rating is based off of the following table from Platts (1983).

Appendix D. Table 1. Rating of pool quality; designed for streams between 20 and 60 ft in width (6.1-18.3 m)		
	Description	**Pool Rating**
1A	If the maximum pool diameter is within 10 percent of the average stream width of the study site . . . . . Go to 2A, 2B	
1B	If the maximum pool diameter exceeds the average stream width of the study site by 10 percent or more . . . . . Go to 3A, 3B	
1C	If the maximum pool diameter is less than the average stream width of the study site by 10 percent or more . . . . . Go to 4A, 4B, 4C	
2A	If the pool is less than 2 ft (60.9 cm) in depth . . . . . Go to 5A, 5B	
2B	If the pool is more than 2 ft in depth . . . . . Go to 3A, 3B	
3A	If the pool is over 3 ft (91.4 cm) in depth or the pool is over 2 ft in depth and has abundant fish cover[1]	Rate 5
3B	If the pool is less than 2 ft in depth, or if the pool is between 2 and 3 ft and the pool lacks fish cover	Rate 4
4A	If the pool is over 2 ft with intermediate[2] or better cover	Rate 3
4B	If the pool is less than 2 ft in depth but pool cover for fish is intermediate or better	Rate 2
4C	If the pool is less than 2 ft in depth and pool cover is classified as exposed[3]	Rate 1
5A	If the pool has intermediate to abundant cover	Rate 3
5B	If the pool has exposed cover conditions	Rate 2

[1] If cover is abundant, the pool has excellent instream cover and most of the perimeter of the pool has fish cover.
[2] If cover is intermediate, the pool has moderate instream cover and one-half of the pool perimeter has fish cover.
[3] If cover is exposed, the pool has poor instream cover and less than one-fourth of the pool perimeter has any fish cover.

For pools <20 ft wide (6.1 m) deduct 1ft (35 cm) from all entries with foot values and add 1 ft to the values for streams wider thatn 60 ft (18.3 m)

Wood Form

Objective of this effort is to apply a standardized and consistent methodology to each unit to obtain quantitative estimates of wood volume and distribution within stream reaches. Information will be used to evaluate effects on fish habitat and channel structure and to make quantitative comparisons between streams.

- Minimum size to consider is 10 cm (4 in) diameter by 2 m (6.6 ft) length. Exception is root wads with cut ends which may be less than 2 m long.

- Collect data for all wood that meets the minimum size criteria. Do not attempt to evaluate its effectiveness as fish habitat.

- Count all dead pieces that are within, partially within, or suspended over the active channel, regardless of height above channel. Any live woody material is not counted.

- Estimate the entire length of all pieces; include portion outside the active channel.

- Use additional lines for each unit when more than one configuration, type, or size class of wood is present.

- Indicate grouping of pieces in individual accumulations and jams by drawing brackets around the appropriate rows in the note column.

- Location of all wood pieces within a jam is identified by the primary location or function of the jam.

- Make no entry for units where woody debris is absent.

1. **Unit Number.**

2. **Unit Type.**

3. **Debris Configuration.**

S **S**ingle piece.
A **A**ccumulation. Two to four pieces.
J **J**am. More that four pieces.

4. **Debris Type.**

N **N**atural. Broken ends or whole tree.
C **C**ut end.
A **A**rtificial. Part of man-made structure.
RN **R**oot wad attached to **N**atural bole.
RC **R**oot wad opposite end **C**ut.

5. **Debris Location.**

S **S**ide of the channel.
M **M**id-channel.
I **I**sland. At upstream end of mid-channel island.
F **F**ull channel. Completely across channel within active channel. Pieces may be above the wetted channel at the time of the survey. When part of a jam, include all pieces regardless if they are touching the water, piled up, or submerged.
O **O**ver channel. Suspended over the active channel with the ends above the active channel. Include debris with suspended bole but with branches in water.

6. **Diameter Class.** Estimate diameter of each piece at 2 meters above the base of the stem. Assign each piece or group of pieces to the closest size class (0.15, 0.30, 0.45). For pieces greater than 0.60 diameter be as accurate as possible when determining diameter and length. Measure diameter in meters.

7. **Length Class.** Count and tally the number of pieces within each length class. Root wad less than two meters long (usually with a cut end) is a special case.

8. **Wood Note.** Note the tree species if known and any other information or assessments of the source, influence, or character of the woody debris.

When estimating very large amounts of wood in debris jams, visually group it into length and diameter classes then count and tally onto the data sheet. Assign all jams to one unit number. Indicate in the note column if the jam spans more than one unit. Do not try to evaluate one piece at a time. **Record and tally** all countable pieces.

Riparian Form

Purpose: The riparian inventory is designated to provide additional quantitative information on the species composition, abundance, and size distribution of riparian zone vegetation. The riparian inventory will consist of a type of belt transect extending across the riparian zone perpendicular to the stream channel on each side.

Frequency: Transects will be conducted at least every tenth unit. **Every** identified reach has to have at least one riparian transect. Begin the transect exactly where the new unit or new reach starts. Do not select starting point elsewhere in the unit because of ease of access or to get a "better" sample. **The location of each transect must be marked on the 7.5 minute topo map. Transects must occur at least every 1 kilometer.** Discuss transect spacing with your field supervisor if you are surveying a large stream.

Transects will begin at the margin of the active channel or where the initial band of riparian trees starts, whichever comes first. The transects will be perpendicular to the main axis of the stream and extend 30 m as measured on the ground. The transects will be 5 m wide and will be subdivided into three 10 meter long sections or zones (see the following diagrams).

1. **Unit Number.**

2. **Zone.** Subdivision of the transect.

1 = 0-10 meters
2 = 10-20 meters
3 = 20-30 meters

3. **Side.** Left or right side of the channel, looking upstream.

4. **Surface Type.** Geomorphic surfaces observed within the zone. If more than one surface is observed, record the more dominant feature and make a note of the other feature in the note column. Note length of each feature. Explain any ambiguous observations in the note column.

FP Flood plain.
LT **L**ow **T**errace (height is < Flood Prone Height)
HT **H**igh **T**errace (height is > Flood Prone Height)
HS **H**ill **S**lope.
SC **S**econdary **C**hannel.
TC **T**ributary **C**hannel.
IP **I**solated **P**ool or unconnected valley wall channel.
WL **W**et**L**and, bog, or marsh with no obvious channel.

RB **R**oad **B**ed (indicate surface type in note column i.e. paved, rock).
RG **R**ailroad **G**rade.
RR **R**ip **R**ap.

5. **Slope.** Measure the **percent** slope (NOT degrees) of the dominant surface in the zone.

6. **Canopy Closure.** The percent canopy closure estimated by looking up while standing in the middle of the zone. Include the influence of both conifer and hardwood species. Estimate within broad categories (20% increments).

7. **Shrub Cover.** The percentage of ground cover provided by shrubs. Include blackberry, salmonberry, devils club, willow, sage, etc. Small trees (seedlings and saplings less than 8 feet high) should be included in shrub cover. Estimate within broad categories (20% increments).

8. **Grass and Forb Cover.** The percentage of ground cover provided by grasses, ferns, moss, herbs, sedges, rushes, etc. Estimate within broad categories (20% increments).

9. **Tree Group.** The percent of cover that is composed of trees, conifer or hardwood. Estimate within broad categories (20% increments).

10. **EDT.** Rating based on the following EDT categories:

A = Strong linkages with no anthropogenic influences.
B = >75% and <90% of stream reach with functional riparian present.
C = >50% and <75% of stream reach with functional riparian present.
D = >25% and <50% of stream reach with functional riparian present.
E = <25% of stream reach with functional riparian present.

11. **Comments.** Optional comments on dominant vegetation species (especially for trees), large woody debris, or characteristics of snags or old stumps. Note presence or absence of large down wood in riparian zone. Record photo numbers if any are taken.

Special Cases Form

This form was taken form USFS Stream Inventory Handbook (Form # R6-2500/2600-23), as a way to reference special cases in the stream (culverts, dams, waterfalls, etc.). The form was taken directly from USFS, but the way the data was collected was slightly different.

1. **Reach Number.**

2. **Unit Number.**

3. **Unit Type.**

4. **Type of Structure.** List the structure that is observed (culvert, dam, waterfall, etc.), and for culverts use one of the following abbreviation to describe the culvert:

RP **R**ound **P**ipe
BX **B**o**X**
AR **AR**ch
OA **O**pen **A**rch (or bottomless arch)
OB **O**pen **B**ox
EL **EL**iptical

5. **Length of the Structure.**

6. **Diameter or Width.**

7. **% Gradient.**

8. **Jumping Distance.** Height from the top of the water to the entrance of the structure.

9. **Spill Pool Depth.** Maximum depth of the pool below the structure.

10. **Height.** Height of the structure.

11. **Baffles Present.** Are baffles present in the structure (Y-yes, N-no).

12. **Migration Barrier.** Is the structure a barrier to upstream or downstream fish passage (Y-yes, N-no).

13. **Comments.**

Appendix E. Habitat Inventory Forms, 2004

Habitat Data Form

Habitat Data Form	Stream:	Date:	Surveyors:

Reach-Unit #	Unit Type	Chan. Type	% Flow	Unit length	Depths						Wetted Widths				Notes:
					1	2	3	4	Max	Pool Crest	1	2	3	4	

Reach-Unit #	Unit Type	Chan. Type	% Flow	Unit length	Depths						Wetted Widths				Notes:
					1	2	3	4	Max	Pool Crest	1	2	3	4	

Reach-Unit #	Unit Type	Chan. Type	% Flow	Unit length	Depths						Wetted Widths				Notes:
					1	2	3	4	Max	Pool Crest	1	2	3	4	

Reach-Unit #	Unit Type	Chan. Type	% Flow	Unit length	Depths						Wetted Widths				Notes:
					1	2	3	4	Max	Pool Crest	1	2	3	4	

Reach-Unit #	Unit Type	Chan. Type	% Flow	Unit length	Depths						Wetted Widths				Grad.	chan. shade (º)		% Erod. Bank		% undrct bank	
					1	2	3	4	Max	Pool Crest	1	2	3	4							

BFW	Bank Full Depths				Substrate												Embeddedness			
	1	2	3	Max	25-1	25-2	25-3	25-4	50-1	50-2	50-3	50-4	75-1	75-2	75-3	75-4	25	50	75	

Spawning Area Fines			Man-Made Chan. Conf.	Nat. Chan. Conf.	Notes:
25	50	75			

Reach Form			**Stream:**					**Date:**		**Surveyors:**		**USGS 7.5' Map Names:**	
Date	Reach #	Unit #	Chan Form	Valley Form	VWI	Veg Class		Land Use		Water Temp	Stream Flow	Photo# / Time	Reach Note (include start GPS)
						Dom.	Sub-Dom.	Dom.	Sub-Dom.				

Riparian Form

Stream: **Date:** **Surveyors:**

Reach & Unit #	10M Zone	Side	Surface Type[a]	% Slope	% Canopy Closure	% Grass/Shrub Cover (N,G,S)[b]	% Tree Cover (N,D,C)[b]	EDT (A,B,C,D,E)[c]	Comments (Dom. Veg Species, etc.)
	1	L							
		R							
	2	L							
		R							
	3	L							
		R							
	1	L							
		R							
	2	L							
		R							
	3	L							
		R							
	1	L							
		R							
	2	L							
		R							
	3	L							
		R							
	1	L							
		R							
	2	L							
		R							
	3	L							
		R							

[a] FP=floodplain, LT=low terrace, HT=high terrace, HS=hillslope, SC=secondary channel, TC=tributary channel, IP=isolated pool, WL=wetland, RB=road bed, RG=railroad grade, RR=rip rap

[b] N=none, G/F=grass and forbs, S=shrubs, D=deciduous, C=conifer—if D or C is selected also choose the dominant size category A=>5" (~13cm), B=5" (~13cm)-21" (~53cm), or C=>21" (~53cm). **Measured in 20% increments.**

[c] A=Strong linkages with no anthropogenic influences, B=>75% and <90% of stream reach with functional riparian present, C=>50% and <75% of stream reach with functional riparian present, D=>25% and <50% of stream reach with functional riparian present, or E=<25% of stream reach with functional riparian present. **Measured in 20% increments.**

Wood Form		Stream Name:				Date:		Surveyors:		
Reach-Unit #	Unit Type	Debris			DBH Class	Length Class (m)				Notes:
		Confi	Type	Locat		2-3	3-6	6-15	>15	

Appendix F. Relative Abundance of Non-Salmonids, 2004

Appendix F. Table 1. Relative abundance of non-salmonids in the Walla Walla River Basin, 2004.

Species	Walla Walla River	East Little Walla Walla	Big Spring Branch	Mill Ck ↑ Bennington Div.	Titus Creek	West Little Walla Walla	Dry Creek	Mud Creek
Petromyzontidae Lamprey larvae	1	0	0	1	1	0	1	0
Cypinidae Speckled dace *Rhinichtys osculus*	4	2	1	3	3	2	3	4
Longnose dace *Rhinichtys cataractae*	0	0	0	3	1	0	0	0
Chiselmouth *Acroheilus alutaceus*	1	0	0	0	0	0	1	0
Redside shiner *Richardsonius balteatus*	4	1	1	1	1	1	3	0
Northern pikeminnow *Ptychocheilus oregonesis*	1	1	1	0	0	0	2	0
Catostomidae Suckers[a] *Catostomus sp.*	2	1	1	1	1	0	2	0
Centrarchidae Smallmouth bass *Micropterus dolomieu*	1	0	0	0	0	0	1	0
Largemouth bass *Micropterus salmoides*	0	0	0	0	0	0	1	0
Cottidae Margined sculpin *Cottus marginatus*	2	3	0	4	2	0	1	4
Paiute sculpin *Cottus beldingi*	0	0	0	2	1	0	0	0
Torrent sculpin *Cottus rhotheus*	3	0	0	0	0	0	0	0
Gasterosteidae Threespine stickleback *Gasterosteus aculeatus*	1	0	0	0	0	0	0	0
Ictaluridae Tadpole Madtom *Notorus gyrinus*	1	0	0	0	0	0	0	0
Crayfish *Pacifastacus sp.*	P	P	P	P	P	0	P	0

[a] Noted by genus only, not identified by species.
P=present

Appendix F. Table 2. Relative abundance of non-salmonids in the Touchet River Basin, 2004.

Species	NF Touchet	Wolf Fork	Tate Creek	Green Fly	Whitney Creek	Robinson Fork	Robinson Fork Trib.	Touchet River	Whiskey Creek	Alyward Trib.	South Fork Coppei	North Fork Coppei	Coppei Creek
Petromyzontidae Lamprey	0	0	0	0	0	0	0	0	0	0	1	0	2
Cypinidae Speckled dace *Rhinichtys osculus*	0	0	0	0	0	0	0	4	3	3	4	2	4
Redside shiner *Richardsonius balteatus*	0	0	0	0	0	0	0	3	0	0	0	0	2
Northern pikeminnow *Ptychocheilus oregonesis*	0	0	0	0	0	0	0	2	0	0	0	0	1
Catostomidae Suckers[a] *Catostomus sp.*	0	0	0	0	0	0	0	3	0	0	1	0	1
Centrarchidae Smallmouth bass *Micropterus dolomieu*	0	0	0	0	0	0	0	1	0	0	0	0	0
Bluegill *Lepomus macrochirus*	0	0	0	0	0	0	0	1	0	0	0	0	0
Cottidae Margined sculpin *Cottus marginatus*	1	1	0	0	2	2	0	3	1	0	4	4	4
Paiute sculpin *Cottus beldingi*	0	0	0	0	1	0	0	2	0	0	0	0	0
Torrent sculpin *Cottus rhotheus*	0	0	0	0	0	0	0	2	0	0	0	0	0
Tailed frogs *Ascaphus truei*	0	4	2	1	1	1	2	0	0	0	0	0	0
Crayfish *Pacifastacus sp.*	0	0	0	0	P	P	0	P	0	0	P	P	P

[a] Noted by genus only, not identified by species.
P=present

Table 2. Categories of relative abundance.

Category	Count	Ranking Value
Absent	0	0
Rare	1-3	1
Uncommon	4-10	2
Common	11-100	3
Abundant	100+	4

Appendix G. Manual Flow Summary for the Walla Walla River, 1998-2004

Appendix G. Table 1. Manual flow summary (average monthly CFS and standard deviation) from June through September, 1998-2004, on the Walla Walla River at Stateline, Pepper Rd., 0.4 mi above hyw. 125, Mojonnier Rd., Swegel Rd., Detour Rd., McDonald Rd., and Mckay Rd.

	1998		1999		2000		2001		2002		2003		2004	
	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS
Stateline														
June									18	117.8	10	18.7	1	N/M[a]
									24	35.1	24	11.8	23	35.6
Avg. Monthly CFS										76.45		15.25		N/A[b]
(SD)										(41.350)		(3.450)		
July							17	14.59	8	20.2	7	12.0	1	15.1
							24	8.5	22	18.8	21	9.0	7	14.4
							31	9.68					19	19.9
Avg. Monthly CFS								10.92		19.50		10.50		16.47
(SD)								(2.637)		(0.700)		(1.500)		(2.444)
August							7	13.91	5	15.8	6	16.7	2	13.7
							20	13.88	20	12.5	19	14.6	17	11.0
													30	9.4
Avg. Monthly CFS								13.90		14.15		15.65		11.37
(SD)								(0.015)		(1.650)		(1.050)		(1.775)
September							4	12.79	4	13.2	2	16.2	13	15.7
							17	12.93	17	26.6	15	12.4	27	13.1
											29	23.9		
Avg. Monthly CFS								12.86		19.90		17.50		14.40
(SD)								(0.070)		(6.700)		(4.784)		(1.300)
October							2	23.35	1	18.6	13	19.0	11	13.3
							8	18.91	15	15.7	29	27.3	28	14.6
							16	36.88	31	16.9				
							23	55.16						
							31	73.02						
Avg. Monthly CFS								41.46		17.07		23.15		13.95
(SD)								(20.205)		(1.190)		(4.150)		(0.650)

[a] Flow was unmeasurable (water was high, not enough water, etc.).
[b] N/A- only one measurement was taken during the month so no average or standard deviation was calculated.
[c] No data was collected in June at these sites.

Appendix G. Table 1. (Cont.) Manual flow summary (average monthly CFS and standard deviation) from June through September, 1998-2004, on the Walla Walla River at Stateline, Pepper Rd., 0.4 mi above hyw. 125, Mojonnier Rd., Swegel Rd., Detour Rd., McDonald Rd., and Mckay Rd.

	1998		1999		2000		2001		2002		2003		2004	
	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS
Pepper Rd.														
June			14	78.5	20	79.3	12	27.13	24	36.7			23	41.0
			30	9.9	29	5.5	21	11.98						
							26	17.60						
Avg. Monthly CFS				44.2		42.4		18.9		N/A[b]				N/A[b]
(SD)				(34.300)		(36.900)		(6.253)						
July	27	3.16	13	5.1	11	3.6	5	13.65	8	21.0				
			28	2.3	20	4.0	11	14.45	22	16.5				
							17	14.16						
							24	9.19						
							31	9.66						
Avg. Monthly CFS		N/A[b]		3.7		3.8		12.22		18.75				
(SD)				(1.400)		(0.200)		(2.303)		(2.250)				
August	03	3.42	10	3.1	7	4.1	7	12.51	5	17.7				
	17	3.09					20	14.79	20	12.4				
Avg. Monthly CFS		3.26		N/A[b]		N/A[b]		13.65		15.05				
(SD)		(0.165)						(1.140)		(2.650)				
September	01	2.79	15	2.7			4	11.13	4	16.1				
	16	3.32	28	2.7			17	12.87	17	27.5				
Avg. Monthly CFS		3.06		2.7				12.00		21.80				
(SD)		(0.265)		(0.000)				(0.870)		(5.700)				
October	16	2.86	5	2.6	4	81.0	2	26.00	1	17.4				
	28	3.22	13	2.7	19	23.7	16	39.08	15	13.6				
							23	65.61	31	17.5				
							31	81.84						
Avg. Monthly CFS		3.04		2.65		52.35		53.13		16.17				
(SD)		(0.180)		(0.050)		(28.650)		(21.872)		(1.815)				

[a] Flow was unmeasurable (water was high, not enough water, etc.).
[b] N/A- only one measurement was taken during the month so no average or standard deviation was calculated.
[c] No data was collected in June at these sites.

Appendix G. Table 1. (Cont.) Manual flow summary (average monthly CFS and standard deviation) from June through September, 1998-2004, on the Walla Walla River at Stateline, Pepper Rd., 0.4 mi above hyw. 125, Mojonnier Rd., Swegel Rd., Detour Rd., McDonald Rd., and Mckay Rd.

	1998		1999		2000		2001		2002		2003		2004	
	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS
0.4 mi above hwy. 125														
June							12	29.58	24	35.4				
							26	16.28						
Avg. Monthly CFS								22.93		N/A[b]				
(SD)								(6.650)						
July							5	13.74	8	21.2				
							11	14.62	22	15.1				
							17	13.35						
							24	7.86						
							31	9.82						
Avg. Monthly CFS								11.88		18.15				
(SD)								(2.590)		(3.050)				
August							7	13.34	5	16.3				
							20	12.92	20	12.5				
Avg. Monthly CFS								13.13		14.40				
(SD)								(0.210)		(1.900)				
September							4	11.29	4	14.2				
							17	13.15	17	27.0				
Avg. Monthly CFS								12.22		20.60				
(SD)								(0.930)		(6.400)				
October							2	22.06	1	19.5				
							8	19.42	15	16.0				
							16	37.47	31	16.3				
							23	60.90						
							31	70.22						
Avg. Monthly CFS								42.01		17.27				
(SD)								(20.404)		(1.584)				

[a] Flow was unmeasurable (water was high, not enough water, etc.).
[b] N/A- only one measurement was taken during the month so no average or standard deviation was calculated.
[c] No data was collected in June at these sites.

Appendix G. Table 1. (Cont.) Manual flow summary (average monthly CFS and standard deviation) from June through September, 1998-2004, on the Walla Walla River at Stateline, Pepper Rd., 0.4 mi above hyw. 125, Mojonnier Rd., Swegel Rd., Detour Rd., McDonald Rd., and Mckay Rd.

	1998		1999		2000		2001		2002		2003		2004	
	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS
0.5 mi above Buringame Div.														
June					26	83.0	12	78.6	24	81.0	10	55.5	1	N/M[a]
							28	68.2			24	41.0	23	92.6
Avg. Monthly CFS						N/A[b]		73.40		N/A[b]		48.25		N/A[b]
(SD)								(5.200)				(7.250)		
July					11	45.1	10	41.9	8	61.6	7	55.4	1	60.6
							24	36.0	22	41.0	21	43.0	7	65.8
							31	43.9					19	49.6
Avg. Monthly CFS						N/A[b]		40.60		51.30		49.20		58.67
(SD)								(3.354)		(10.300)		(6.200)		(6.753)
August					7	27.6	6	48.6	5	36.3	6	53.7	2	40.6
					8	33.1	20	54.6	20	36.6	19	44.1	17	36.9
													30	48.5
Avg. Monthly CFS						30.35		51.60		36.45		48.90		42.00
(SD)						(2.750)		(3.000)		(0.150)		(4.800)		(4.838)
September					5	48.7	4	46.8	4	39.5	2	44.3	13	52.1
					18	48.1	17	41.6	17	52.2	15	52.3	27	50.0
											29	50.0		
Avg. Monthly CFS						48.40		44.20		45.85		48.87		51.05
(SD)						(0.300)		(2.600)		(6.350)		(3.363)		(1.050)
October					19	81.9	2	62.4	1	50.8	13	64.6	11	59.6
							16	90.2	15	49.1	29	66.6	28	64.3
							31	136.6	31	40.2				
Avg. Monthly CFS						N/A[b]		96.40		46.70		65.60		61.95
(SD)								(30.608)		(4.648)		(1.000)		(2.350)

[a] Flow was unmeasurable (water was high, not enough water, etc.).
[b] N/A- only one measurement was taken during the month so no average or standard deviation was calculated.
[c] No data was collected in June at these sites.

Appendix G. Table 1. (Cont.) Manual flow summary (average monthly CFS and standard deviation) from June through September, 1998-2004, on the Walla Walla River at Stateline, Pepper Rd., 0.4 mi above hyw. 125, Mojonnier Rd., Swegel Rd., Detour Rd., McDonald Rd., and Mckay Rd.

	1998		1999		2000		2001		2002		2003		2004	
	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS
Mojonnier Rd.														
June			1	296.0	20	104.6	12	32.69	24	30.1	4	23.9	1	N/M[a]
			9	83.7	29	10.5	26	31.22			10	36.4	23	49.7
			30	5.9							24	31.7		
Avg. Monthly CFS				128.53		57.55		31.96		N/A[b]		30.67		N/A[b]
(SD)				(122.602)		(47.050)		(0.735)				(5.155)		
July	9	29.48	13	15.5	11	16.4	5	24.26	8	41.7	7	45.3	1	64.0
	20	36.05	28	25.7	20	42.2	10	43.28	22	43.9	21	37.3	7	71.4
							11	49.88					19	50.9
							17	45.24						
							24	33.42						
							31	42.65						
Avg. Monthly CFS		32.77		20.60		29.30		39.79		42.80		41.30		62.10
(SD)		(3.285)		(5.100)		(12.900)		(8.501)		(1.100)		(4.000)		(8.476)
August	3	25.77	10	22.6	7	29.9	7	46.42	5	42.5	6	57.1	2	42.6
	17	25.14	23	25.0	21	32.2	20	51.26	20	38.1	19	38.7	17	37.2
													30	51.8
Avg. Monthly CFS		25.46		23.80		31.05		48.84		40.30		47.90		43.87
(SD)		(0.315)		(1.200)		(1.150)		(2.420)		(2.200)		(9.200)		(6.027)
September	1	28.30	15	21.7	5	49.0	4	45.48	4	40.7	2	42.5	13	53.4
	16	35.01	28	26.1	18	47.7	17	37.08	17	61.8	15	45.8	27	51.4
											29	46.9		
Avg. Monthly CFS		31.66		23.90		48.35		41.28		51.30		45.07		52.4
(SD)		(3.355)		(2.200)		(0.650)		(4.200)		(10.550)		(1.870)		(1.000)
October	16	1.83	5	31.4	4	93.4	2	40.86	1	57.9	13	38.9	11	26.9
	28	13.72	13	15.1	19	16.5	8	25.97	15	22.7	29	34.5	28	13.4
			18	8.4			16	18.58	31	17.9				
							23	55.64						
							31	68.74						
Avg. Monthly CFS		7.78		18.30		54.95		41.96		32.83		36.70		20.15
(SD)		(5.945)		(9.659)		(38.450)		(18.481)		(17.833)		(2.200)		(6.750)

[a] Flow was unmeasurable (water was high, not enough water, etc.).
[b] N/A- only one measurement was taken during the month so no average or standard deviation was calculated.
[c] No data was collected in June at these sites.

Appendix G. Table 1. (Cont.) Manual flow summary (average monthly CFS and standard deviation) from June through September, 1998-2004, on the Walla Walla River at Stateline, Pepper Rd., 0.4 mi above hyw. 125, Mojonnier Rd., Swegel Rd., Detour Rd., McDonald Rd., and Mckay Rd.

	1998		1999		2000		2001		2002		2003		2004	
	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS
Swegel Rd.														
June			1	287.6	26	42.9	11	27.95	24	34.3	10	48.4	1	N/M[a]
			9	85.6			27	26.64			24	36.2	23	56.1
			30	7.0										
Avg. Monthly CFS				126.73		N/A[b]		27.30		N/A[b]		42.30		N/A[b]
(SD)				(118.189)				(0.655)				(6.100)		
July	2	3.43	13	17.5	11	22.2	10	43.74	8	41.1	7	41.0	1	63.9
	9	31.65	28	23.7			24	33.21	22	46.4	21	42.3	7	75.0
	20	35.52					31	45.93					19	77.7
Avg. Monthly CFS		23.53		20.60		N/A[b]		40.96		43.75		41.65		72.20
(SD)		(14.303)		(3.100)				(5.553)		(2.650)		(0.650)		(5.972)
August	3	27.22	10	23.6	7	29.1	6	40.58	5	45.4	6	54.3	2	45.8
	17	21.66	23	24.9	21	36.7	20	42.52	20	32.4	19	40.4	17	60.7
													30	47.1
Avg. Monthly CFS		24.44		24.25		32.90		41.55		38.90		47.35		51.20
(SD)		(2.780)		(0.650)		(3.800)		(0.970)		(6.500)		(6.950)		(6.738)
September	1	25.55	15	26.6	5	54.8	4	42.95	4	35.1	2	38.7	13	58.7
	16	37.28	28	31.3	18	56.3	17	45.80	17	50.6	15	54.8	27	56.3
											29	56.2		
Avg. Monthly CFS		31.42		28.95		55.55		44.38		42.85		49.90		57.50
(SD)		(5.865)		(2.350)		(0.750)		(1.425)		(7.750)		(7.940)		(1.200)
October	16	8.32	13	20.4	4	97.1	1	49.81	1	54.8	13	40.8	11	28.3
	26	20.43			19	23.7	16	28.41	15	26.5	29	33.0	28	22.7
							31	47.96	31	21.7				
Avg. Monthly CFS		14.38		N/A[b]		60.40		42.06		34.33		36.90		25.50
(SD)		(6.055)				(36.700)		(9.682)		(14.604)		(3.900)		(2.800)

[a] Flow was unmeasurable (water was high, not enough water, etc.).
[b] N/A- only one measurement was taken during the month so no average or standard deviation was calculated.
[c] No data was collected in June at these sites.

Appendix G. Table 1. (Cont.) Manual flow summary (average monthly CFS and standard deviation) from June through September, 1998-2004, on the Walla Walla River at Stateline, Pepper Rd., 0.4 mi above hyw. 125, Mojonnier Rd., Swegel Rd., Detour Rd., McDonald Rd., and Mckay Rd.

	1998		1999		2000		2001		2002		2003		2004	
	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS
Detour Rd.														
June			1	403.4	20	171.7	11	34.10	18	148.4	4	43.6	1	N/M[a]
			9	121.9	29	22.7	27	46.95	24	50.8	10	47.7	23	91.4
			30	15.9							24	47.5		
Avg. Monthly CFS				180.40		97.20		40.53		99.60		46.27		N/A[b]
(SD)				(163.515)		(74.500)		(6.425)		(48.800)		(1.887)		
July			13	19.2	10	25.6	10	57.32	8	45.9	7	54.4	1	74.0
			28	26.8	20	38.5	24	38.75	22	41.8	21	38.2	7	87.7
							31	52.82					19	64.7
Avg. Monthly CFS				23.00		32.05		49.63		43.85		46.30		75.47
(SD)				(3.800)		(6.450)		(7.910)		(2.050)		(8.100)		(9.447)
August			10	30.6	7	29.3	6	43.55	5	45.9	6	53.6	2	61.0
			24	32.6	21	38.1	20	41.11	20	32.4	19	41.7	17	37.0
													30	55.4
Avg. Monthly CFS				31.6		33.70		42.33		39.15		47.65		51.13
(SD)				(1.000)		(4.400)		(1.220)		(6.750)		(5.950)		(10.252)
September			15	29.0	5	55.0	4	44.29	4	35.9	2	46.3	13	60.0
			28	35.4	18	59.9	17	44.25	17	50.6	15	63.6	27	59.8
											29	59.4		
Avg. Monthly CFS				32.20		57.45		44.27		43.25		56.43		59.9
(SD)				(3.200)		(2.450)		(0.020)		(7.350)		(7.368)		(0.100)
October			13	31.8	4	128.2	1	54.34	1	56.3	13	45.7	11	38.8
					19	41.7	8	35.71	15	30.5	29	41.7	28	37.3
							16	35.43	31	37.7				
							23	69.66						
							31	69.10						
Avg. Monthly CFS				N/A[b]		84.95		52.85		41.50		43.70		38.05
(SD)						(43.250)		(15.140)		(10.870)		(2.000)		(0.750)

[a] Flow was unmeasurable (water was high, not enough water, etc.).
[b] N/A- only one measurement was taken during the month so no average or standard deviation was calculated.
[c] No data was collected in June at these sites.

Appendix G. Table 1. (Cont.) Manual flow summary (average monthly CFS and standard deviation) from June through September, 1998-2004, on the Walla Walla River at Stateline, Pepper Rd., 0.4 mi above hyw. 125, Mojonnier Rd., Swegel Rd., Detour Rd., McDonald Rd., and Mckay Rd.

	1998		1999		2000		2001		2002		2003		2004	
	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS
McDonald Rd.														
June					26	36.6	11	18.62	24	20.4	10	21.1	1	N/M[a]
							27	27.61			24	23.3	23	58.5
Avg. Monthly CFS						N/A[b]		23.12		N/A[b]		22.20		N/A[b]
(SD)								(4.495)				(1.100)		
July	9	4.09	13	6.73	10	5.9	10	17.50	8	19.5	7	9.8	1	38.7
	20	4.92					23	21.83	22	17.3	21	12.0	7	39.1
													19	31.2
Avg. Monthly CFS		4.51		N/A[b]		N/A[b]		19.67		18.40		10.90		36.33
(SD)		(0.415)						(2.165)		(1.100)		(1.100)		(3.633)
August	3	0.00	10	9.1	7	11.0	6	23.71	5	18.9	6	24.7	2	23.8
	17	7.96	23	11.4	21	17.8	20	16.23	20	9.9	19	12.5	17	19.7
													30	41.6
Avg. Monthly CFS		3.98		10.25		14.40		19.97		14.40		18.60		28.37
(SD)		(3.98)		(1.150)		(3.400)		(3.740)		(4.500)		(6.100)		(9.506)
September	1	9.97	15	12.1	5	34.3	4	17.73	4	16.2	2	16.7	13	45.8
	17	17.31	28	14.5	18	41.0	17	21.26	17	30.9	15	32.6	27	43.6
											29	44.4		
Avg. Monthly CFS		13.64		13.30		37.65		19.50		23.55		31.23		44.70
(SD)		(3.670)		(1.200)		(3.350)		(1.765)		(7.350)		(11.350)		(1.100)
October			13	15.8	4	112.2	1	38.2	1	33.3	13	34.5	11	21.7
					19	27.3	16	26.68	15	20.3	29	26.9	28	20.8
							31	54.9	31	18.5				
Avg. Monthly CFS				N/A[b]		69.75		39.93		24.03		30.70		21.25
(SD)						(42.450)		(11.585)		(6.594)		(3.800)		(0.450)

[a] Flow was unmeasurable (water was high, not enough water, etc.).
[b] N/A- only one measurement was taken during the month so no average or standard deviation was calculated.
[c] No data was collected in June at these sites.

Appendix G. Table 1. (Cont.) Manual flow summary (average monthly CFS and standard deviation) from June through September, 1998-2004, on the Walla Walla River at Stateline, Pepper Rd., 0.4 mi above hyw. 125, Mojonnier Rd., Swegel Rd., Detour Rd., McDonald Rd., and Mckay Rd.														
	1998		1999		2000		2001		2002		2003		2004	
	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS	Day	CFS
McKay Rd.[c]														
July	27	3.80												
Avg. Monthly CFS (SD)		N/A[b]												
August	17	0.00												
Avg. Monthly CFS (SD)		N/A[b]												
September	1	2.42												
	28	15.21												
Avg. Monthly CFS (SD)		8.82 (6.395)												
October	16	0.76												
	28	7.63												
Avg. Monthly CFS (SD)		4.20 (3.435)												

[a] Flow was unmeasurable (water was high, not enough water, etc.).
[b] N/A- only one measurement was taken during the month so no average or standard deviation was calculated.
[c] No data was collected in June at these sites.

Appendix H. Mean Monthly Streamflow (cfs) and Standard Deviation from Continuous Flow Monitors in the Walla Walla Basin, 1998-2004

Appendix H. Table 1. Mean monthly streamflow (cfs) and standard deviation from continuous flow monitors in the Walla Walla basin, 1998-2004.														
	1998		1999		2000		2001		2002		2003		2004	
	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation
Walla Walla River														
Stateline														
June (20th-30th)							N/A	N/A	29.15	19.302				
July							11.95[a]	2.152[a]	12.71	1.369				
August							11.40	1.354	13.39	1.478				
September							14.48	5.415	16.80	2.028				
October							31.37	16.736	17.68	1.868				
Nov. (1st-14th)							11.37	6.413	21.86[b]	3.817[b]				
Pepper Rd.														
June (20th-30th)					35.42	28.261	15.22[d]	3.853[d]						
July					5.75[c]	1.227[c]	10.71[d]	3.404[d]						
August					N/A	N/A	12.05[d]	2.946[d]	See DOE Graph		See DOE Graph		See DOE Graph	
September					N/A	N/A	15.55[d]	6.198[d]						
October					N/A	N/A	30.85[d]	10.331[d]						
Nov. (1st-14th)					N/A	N/A	27.13[d]	7.235[d]						

[a] Monitor in the Walla Walla River (Stateline) in 2001 was put in place on July 17th.
[b] Monitor in the Walla Walla River (Stateline) in 2002 was removed on November 13th.
[c] Monitor in the Walla Walla River (Pepper Rd.) in 2000 quit working on July 27th, so no data was available after that point.
[d] Monitor in the Walla Walla River (Pepper Rd.) in 2001 was actually 0.7 miles below Pepper Rd. brg.

Appendix H. Table 1. (Cont.) Mean monthly streamflow (cfs) and standard deviation from continuous flow monitors in the Walla Walla basin, 1998-2004.														
	1998		1999		2000		2001		2002		2003		2004	
	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation
Walla Walla River (Cont.)														
Mojonnier Rd.														
June (20th-30th)	N/A	N/A	14.55	6.979	46.33	33.203	26.45	7.094	28.58[f,g]	7.408[f,g]	33.90	5.150		
July	N/A	N/A	16.52	5.156	20.63	4.270	36.91	9.335	32.52[g]	5.582[g]	33.37	2.559		
August	N/A	N/A	18.97	4.608	26.40	1.925	40.88	5.206	34.62[g]	3.725[g]	37.35	2.415	See DOE Graph	
September	N/A	N/A	24.14	3.131	51.73	9.259	43.50	8.350	45.91[g]	5.324[g]	48.95	7.722		
October	N/A	N/A	20.06	13.970	24.71[e]	14.075[e]	29.37	13.222	29.59[g]	11.364[g]	35.94	6.162		
Nov. (1st-14th)	N/A	N/A	11.23	5.038	58.44	42.236	18.93	4.513	28.43[g]	9.012[g]	31.64	7.039		
Swegle Rd.														
June (20th-30th)	N/A	N/A	19.92	8.530										
July	25.73[h]	3.968[h]	20.90	5.121										
August	21.24	3.318	22.40	5.036										
September	37.54	10.234	24.48	2.684										
October	13.49	7.902	21.99	12.220										
Nov. (1st-14th)	18.79	11.444	14.34	5.090										

[e] At least one measurement for the month was removed as an outlier.
[f] Monitor in the Walla Walla River (Mojonnier Rd.) in 2002 was put in place on June 26th.
[g] Data collected by the Department of Ecology as part of TMDL monitoring.
[h] Monitor in the Walla Walla River (Swegle Rd.) in 1998 was put in place on until July 9th.

Appendix H. Table 1. (Cont.) Mean monthly streamflow (cfs) and standard deviation from continuous flow monitors in the Walla Walla basin, 1998-2004.

	1998		1999		2000		2001		2002		2003		2004	
	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation
Walla Walla River (Cont.)														
Detour Rd.														
June (20th-30th)			35.49	13.353	69.05	41.052	45.70	10.362	51.75	22.947	50.80	1.437	N/A	N/A
July			24.73	3.447	30.77	3.028	41.72	4.159	31.00	6.433	51.17[i]	1.045[i]	N/A	N/A
August			26.18	5.855	31.12	1.575	38.12	3.601	26.09	6.729	N/A[i]	N/A[i]	N/A	N/A
September			29.15	2.762	53.57[e]	9.922[e]	43.16	8.530	44.37	8.041	52.29[i]	2.814[i]	N/A	N/A
October			32.29	11.496	52.48[e]	21.484[e]	43.33	12.052	27.35	13.092	36.79	7.162	N/A	N/A
Nov. (1st-14th)			26.93	6.417	96.89	57.287	46.82	9.649	55.62	8.792	43.21	9.788	N/A	N/A
Touchet River														
Simms Rd.														
June (20th-30th)			86.63	11.482	101.25	18.396	80.65	10.636						
July			50.20	7.812	45.86	16.762	28.22	11.905						
August			41.15	3.861	19.27	3.906	9.54	6.246						
September			39.75	2.358	43.92	9.700	14.56	12.565						
October			48.73	8.624	69.08	20.896	53.05	11.915						
Nov. (1st-14th)			55.58	2.544	75.36	9.877	67.17	12.911						

[e] At least one measurement for the month was removed as an outlier.
[i] Monitor in the Walla Walla River (Detour Rd.) malfunctioned from July 21st through September 25th, so no data was collected during this period.

Appendix H. Table 1. (Cont.) Mean monthly streamflow (cfs) and standard deviation from continuous flow monitors in the Walla Walla basin, 1998-2004.

	1998		1999		2000		2001		2002		2003		2004	
	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation
Touchet River (Cont.)														
Cummins Brg.														
June (20th-30th)	N/A[j]	N/A[j]	108.68[l]	22.531[l]	89.42	23.612	67.09	41.993						
July	9.21[j,k]	5.504[j,k]	30.27[l]	14.450[l]	23.61	15.674	10.51	7.525						
August	7.48[j]	6.107[j]	12.97[l]	5.017[l]	3.85	1.219	5.24	4.287	See DOE Graph		See DOE Graph		See DOE Graph	
September	12.15[j]	9.280[j]	13.75[l]	2.165[l]	24.12	9.815	3.62[m]	3.746[m]						
October	35.71[j]	5.827[j]	30.06[l]	16.732[l]	99.26	145.013	N/A	N/A						
Nov. (1st-14th)	75.44[j]	11.912[j]	47.70[l]	3.988[l]	104.51	36.490	N/A	N/A						
Above Hofer Dam														
June (20th-30th)							N/A	N/A	104.50	27.347				
July							N/A	N/A	51.75[n]	16.333[n]				
August							N/A	N/A	26.35[n]	2.376[n]				
September							N/A	N/A	27.93	2.611				
October							N/A	N/A	39.66	3.257				
Nov. (1st-14th)							N/A	N/A	61.30[n]	10.344[n]				

[j] Monitor in the Touchet River (Cummins Brg.) was at the Touchet River Gun Club __miles above Cummins Brg.
[k] Monitor in the Touchet River (Cummins Brg.) in 1998 was put in place on July 9th.
[l] Monitor in the Touchet River (Cummins Brg.) was 0.3 miles above Markham Rd.
[m] Monitor in the Touchet River (Cummins Brg.) in 2001 quit working on September 25th.
[n] Monitor above Hofer dam in 2002 quit working from July 21st to August 23rd, and then was pulled on November 13th.

Appendix H. Table 1. (Cont.) Mean monthly streamflow (cfs) and standard deviation from continuous flow monitors in the Walla Walla basin, 1998-2004.

	1998		1999		2000		2001		2002		2003		2004	
	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation
Yellowhawk Creek														
Below Diversion														
June (20th-30th)							N/A	N/A	30.14	3.100	36.23	7.735		
July							21.11[o]	1.540[o]	16.47	3.620	23.06	3.016		
August							19.95	7.037	12.95	1.700	21.76[p]	1.745[p]		
September							16.53	2.628	16.07	2.647	N/A	N/A		
October							27.91	5.995	19.09	2.086	N/A	N/A		
Nov. (1st-14th)							36.72	2.210	26.45	3.639	N/A	N/A		
Just above mouth														
June (20th-30th)					44.20	3.274	26.53	0.893	31.47[g]	3.423[g]	28.83	3.152	27.53[q]	2.043[q]
July					28.05	5.754	23.87	1.905	14.02[g]	6.324[g]	22.01	3.076	20.49	3.035
August					17.66	1.962	18.58	4.687	12.93[g]	3.722[g]	19.84	2.421	19.06	5.107
September					28.56[e]	4.589[e]	13.75	1.606	14.95[g]	2.889[g]	24.65	4.850	22.73	3.055
October					50.51	9.115	19.97	3.484	9.88[g]	4.397[g]	32.12	5.046	27.37	3.108
Nov. (1st-14th)					56.07	9.347	21.80	3.213	22.14[g]	6.042[g]	38.47	4.070	31.75	2.703

[e] At least one measurement for the month was removed as an outlier.
[g] Data collected by the Department of Ecology as part of TMDL monitoring.
[o] Monitor in Yellowhawk Creek (below diversion) in 2001was put in place on July 17th.
[p] Monitor in Yellowhawk Creek (below diversion) in 2003 was removed on August 28th.
[q] Monitor in Yellowhawk Creek (just above mouth) in 2004 was put in place on June 24th.

Appendix H. Table 1. (Cont.) Mean monthly streamflow (cfs) and standard deviation from continuous flow monitors in the Walla Walla basin, 1998-2004.

	1998		1999		2000		2001		2002		2003		2004	
	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation
East Little Walla Walla River														
0.2 miles above mouth														
June (20th-30th)									10.67	0.934	12.52	0.378	15.88	1.587
July									9.40	2.093	11.68	0.824	9.98[t]	0.275[t]
August									9.34	0.903	10.10	0.296		
September									11.33[r]	1.495[r]	10.79[s]	0.197[s]		
October									N/A	N/A	N/A	N/A		
Nov. (1st-14th)									N/A	N/A	N/A	N/A		
Mill Creek														
Wallula Rd.														
June (20th-30th)							N/A	N/A	12.61	6.871	5.05	0.192		
July							5.28[u]	0.387[u]	5.05	1.535	4.68	0.281		
August							3.09	1.017	3.99	0.328	6.65	0.343		
September							4.13	0.910	5.07	0.373	10.29	19.491		
October							9.13	3.107	11.17	10.342	8.70	1.264		
Nov. (1st-14th)							13.92	3.527	43.38[v]	27.774[v]	12.95	3.164		

[r] Monitor in East Little Walla Walla (0.2 miles above mouth) in 2002 quit working on September 10th.
[s] Monitor in East Little Walla Walla (0.2 miles above mouth) in 2003 was quit working on September 5th.
[t] Monitor in East Little Walla Walla (0.2 miles above mouth) in 2004 had rating curve shift, so data in this table is form 10th to 31st.
[u] Monitor in Mill Creek (Wallula Rd.) in 2001was put in place on July 17th.
[v] Monitor in Mill Creek (Wallula Rd.) in 2002 was removed on November 13th.

Appendix H. Table 1. (Cont.) Mean monthly streamflow (cfs) and standard deviation from continuous flow monitors in the Walla Walla basin, 1998-2004.

	1998		1999		2000		2001		2002		2003		2004	
	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation	Mean Flow	Standard Deviation
Titus Creek														
~1.0 miles above Five Mile Rd.														
June (20th-30th)													8.43[w]	0.641[w]
July													7.22	0.447
August													7.89	0.934
September													7.77	0.650
October													8.02	0.751
Nov. (1st-14th)													9.49	0.744
Covered bridge above Five Mile Rd.														
June (20th-30th)													N/A	N/A
July													N/A	N/A
August													N/A	N/A
September													N/A	N/A
October													N/A	N/A
Nov. (1st-14th)													N/A	N/A

[w] Monitor in Titus Creek (~1.0 miles above Five Mile Rd.) in 2004 was put in place on June 24th.

Appendix I. Comparison of summer rainbow/steelhead densities (fish/100 m^2) in the Walla Walla River from the Stateline to Lowden, 1998-2003

Appendix I. Comparison of summer rainbow/steelhead densities (fish/100 m^2) in the Walla Walla River between the Stateline and Lowden from 1998 through 2003.

Year/ Reach	Mean Density	Standard Deviation	# of sites	Densities per Site (fish/100 m^2)	Other Salmonids Present
1998					
Stateline to just below Burlingame	0.3333	0.3215	3	0.7,0.1,0.2	none
down to McDonald Rd.	0.4	N/A	1	0.4	none
1999					
Stateline to just below Burlingame	3.6714	5.1068	7	1.8,1.4,2.8,0.5,15. 1.0,0.3	chinook & whitefish
down to McDonald Rd.	3.4500	2.3193	6	6.5,1.6,5.5,1.7,4.4,1.0	none
down to Lowden Gardena Rd.	0	N/A	1	0[b]	none
2000					
Stateline to just below Burlingame	4.0000	7.2596	4	2.4,4.5,14.5,17.1	whitefish
down to McDonald Rd.	1.5	2.213	2	3.0,0,+1 qual[a]	none
down to Lowden Gardena Rd.	0	N/A	1	0[b]	none
2001					
Stateline to just below Burlingame	7.633	6.4488	9	15.9,15.7,5.2,2.5,6.8,15. 5,6.1,0.9,0.1	chinook & whitefish
down to McDonald Rd.	0.4667	0.6429	3	1.2,0,0.2,+3 qual[a]	none
down to Lowden Gardena Rd.	0.0	0.0	2	0,0	none
2002					
Stateline to just below Burlingame	6.000	5.0413	4	8.0, 13.3, 2.1, 0.6	chinook & whitefish
2003					
Stateline to just below Burlingame	7.775	2.8039	4	5.8, 11.8, 4.6, 8.9	chinook
down to McDonald Rd.	2.850	0.7500	2	3.6, 2.1	none

[a] Plus qualitative sites with rainbow/steelhead.
[b] High densities (31.4 to 101 fish/100 m^2) existed in June and the first couple days of July for mainly Age 0+ rainbow/steelhead.