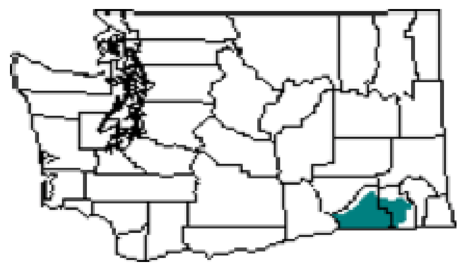
Assessment of Salmonids and Their Habitat Conditions in the Walla Walla River Basin within Washington:

2006 Annual Report

(From March 1, 2006 to March 1, 2007)



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 00021599

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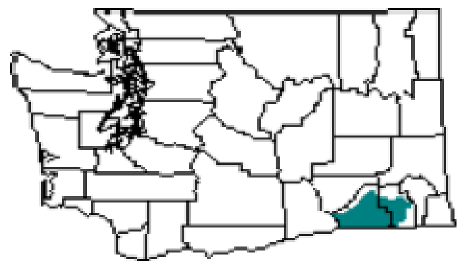

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Acknowledgments

Many people and organizations contributed to this project. First we would like to thank the Bonneville Power Administration (BPA) for funding this project, and Jamie Swan (BPA) for her 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, Larabee Miller, and Steve Jeffers assisted with data collection as well as data entry and data summarization.

Bill Neve and John Covert, with the Washington Department of Ecology (WDOE), provided valuable assistance both establishing and operating the constant recording stream flow monitors. 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, genetic characteristics (stock status and trends), and the condition of salmonid habitats in the Walla Walla River Subbasin within Washington.

Stream flows in the Walla Walla Subbasin continue to show a general trend that consists of a decline in discharge in late May or June, followed by low summer flows and usually an increase in discharge in fall, or later in winter. Stream flows in the mainstem 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 Walla Walla River. We documented low flows in the fall in the mainstem Walla Walla River that are far below the settlement agreement flows. The low flows we documented of less than 15 cfs likely create a severe limitation on salmonid survival, migration or use of this portion of the river. Additional emphasis needs to be placed on maintaining adequate stream flows in the fall, in addition to during summer and late spring.

Stream temperatures in 2006 in the Walla Walla Subbasin were similar to those in 2005. 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). We summarized the water temperature data for several sites in the lower reaches of the Walla Walla River, Mill Creek, Dry Creek and the Touchet River and compared seven day maximum temperatures with thermal criteria for unimpeded fish passage. We identified many sites and years with apparent thermal passage impediments in the lower portions of each of these stream systems. High temperature is possibly the most critical physiological barrier to salmonids in the Walla Walla Subbasin, but other factors (available water, turbidity or sediment deposition, cover, lack of pools, etc.) also affect salmonid distribution, 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 water temperatures in the settlement area within Washington, or to stream flows and water temperatures downstream.

Rainbow/steelhead trout (*Oncorhynchus mykiss*) represent the most common salmonid in the subbasin. Other salmonids including; bull trout (*Salvelinus confluentus*), chinook salmon (*Oncorhynchus tshawytscha*), and mountain whitefish (*Prosopium williamsoni*) had low densities and limited distribution throughout the subbasin. We began a detailed review of all the fish sampling data WDFW has available from several hundred sites since 1997 to examine distribution of rainbow/steelhead, whitefish, bull trout, chinook, brown trout and lamprey. The data summary provides an evaluation by stream reach of distribution and relative abundance for these species. All these species, except rainbow/steelhead, have fairly limited distribution within the Washington portion of the basin. Rainbow/steelhead have widespread distribution, although they are absent during summer in some of the portions of headwater areas and in the lower reaches of the basin where water temperatures are high.

Steelhead spawning surveys were conducted in four streams in the Walla Walla Subbasin in 2006. Surveyors found 46 redds on Mill Creek and only 9 redds in the Coppei Creek system (both South Fork and mainstem) and none in Yellowhawk Creek. Survey conditions were poor with high flows and turbid conditions during the first part of the spawning season. Therefore, the steelhead spawning surveys should be considered as minimum estimates. Bull trout spawning surveys in the upper Touchet River tributaries found a total of 46 redds and 12 live fish, which is a substantial decrease from the previous year (74 redds and 51 live fish). We did not survey any more than the Wolf Fork and North Fork in 2006, and surveys began later than usual because of the approximately 110,000 acre Columbia Complex Fire and associated access restrictions. Spring chinook spawning surveys were not conducted in portions of the Touchet River in 2006, because few adults were observed at the adult trap in Dayton, and no redds or adults were observed during bull trout spawning surveys.

After many years of collecting tissues from steelhead and bull trout, WDFW completed genetic characterizations using microsatellite DNA analyses for steelhead (as well as in the Tucannon River and at Lyons Ferry Hatchery) and bull trout in the Walla Walla Basin. Results of the steelhead analysis indicate that steelhead are quite genetically different in the Walla Walla and Touchet Basins and that there is little evidence to suggest hatchery introgression into the natural populations in the Walla Walla Basin. Results of the bull trout analysis show statistically significant genetic differences among migratory bull trout in the Walla Walla River near Milton-Freewater, upper Mill Creek and the Touchet River at Dayton. In addition, significant genetic differences were found for juvenile bull trout collected from five spawning areas of the upper Touchet River drainage.

Recommendations for assessment activities in 2007 include:

1) Monitor habitat conditions to develop an adequate baseline, improve values in the Ecosystem Diagnosis and Treatment (EDT) model, and to monitor changes that result from habitat improvements.
2) Continue bull trout and steelhead spawning surveys, and emphasize improving counts or estimates of returning adults to determine escapement annually at key locations within the subbasin.
3) Continue, and expand the compilation of fish distribution and relative abundance for fish or other aquatic species, including other data sets from CTUIR and others, as well as incorporation of GIS mapping of distribution and abundance.
4) Identify appropriate management units for bull trout based on genetic information available from this project, and determine causes for declines of bull trout in the Touchet River to prevent extirpation of these groups of salmonids.
5) Work with other managers in the Walla Walla Subbasin to compile fish and habitat data to fill gaps, improve planning, and evaluate efforts to restore salmonids in the subbasin.
6) Continue to work with CTUIR and others to develop a comprehensive RM&E plan for the subbasin.

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 development and implementation of 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" in the Columbia Basin (including the Walla Walla Subbasin). Steelhead (*Oncorhynchus mykiss*) were listed as "Threatened" in 1999 for the mid-Columbia River and its tributaries (which includes the Walla Walla Subbasin). These ESA listings, and uncertainty regarding stock status and trends, 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 Subbasin. This project was initiated in 1998 and continues to collect information regarding fish and habitat conditions in the Walla Walla Subbasin.

This WDFW project, Assessment of Salmonids and Their Habitat Conditions in the Walla Walla River Basin within Washington (project # 199802000) is one of two salmonid and habitat monitoring projects funded by the BPA in the Walla Walla Subbasin. The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) is conducting steelhead and chinook radio telemetry and smolt trapping studies, as well as other monitoring and evaluation activities in the subbasin (Contor and Sexton 2003, Schwartz et al. 2005) with the Walla Walla Basin Natural Production Monitoring and Evaluation Project (project # 200003900). In early 2006, WDFW, CTUIR and others worked together to combine these efforts into two proposals: 1) a collaborative habitat assessment/monitoring project proposal and 2) a fish assessment/monitoring project proposal, for implementation in 2007-2009. This collaborative effort is intended to improve coordination, planning and implementation of the status and trend monitoring for habitat and fish conditions in the subbasin, as well as to improve capabilities for conducting effectiveness monitoring and implementation of a regionally standardized research, monitoring and evaluation (RM&E) program that can be rolled up to the larger units or scales: evolutionarily significant unit (ESU) for steelhead, Distinct Population Segment (DPS) for bull trout, or at State or Regional scales.

The primary purposes of this project are to collect baseline, or status and trend, biological and habitat data to identify major data gaps and to draw conclusions whenever possible. The study reported herein details the findings of the 2006 field season (March to December, 2006). All WDFW reports for this project are available on the BPA and WDFW websites. They can be found on the BPA website at: www.efw.bpa.gov/searchpublications/ type in Mendel for the author's last name. They are also found on the WDFW website at: wdfw.wa.gov/fish/papers/se_wash_reports/index.htm with other fish monitoring reports from southeast Washington.

Background

The Walla Walla River and its major tributaries including the Touchet River and Mill Creek comprise a subbasin of 1,758 square miles (USACE 1997), including 2,454 stream miles in the larger streams and tributaries (Knutson et al. 1992). The majority of the watershed (73%) lies within the State of Washington (USACE 1992 and 1997), with the upper Walla Walla River Watershed and a small portion of the Mill Creek Watershed in Oregon (Figure 1). Approximately 15% of the subbasin is comprised of forestland, and 82% is used for cropland and grazing. Over 90% of the subbasin in Washington is privately owned. The primary physiographic features of the subbasin are the steep, lightly timbered Blue Mountains in the southeast, the rolling foothills, the Palouse Prairie throughout much of the rest of the landscape, and the incised valleys of area rivers and streams. The main streams in the subbasin include Mill Creek, and the Touchet and Walla Walla Rivers, plus many smaller tributaries (Figure 1). The Walla Walla River Watershed, including the Walla Walla River and Mill Creek, originates from a fine network of deeply incised streams on the western slopes of the Blue Mountains. The Touchet River Watershed 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, Washington. The Walla Walla River drains into the Columbia River near Wallula Gap, about 21 miles above McNary Dam and 6 miles from the Oregon border.

Historically the subbasin 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 subbasin (Nielson 1950, ACOE 1997). Anecdotal accounts and reports of historic fisheries in adjacent subbasins, indicate that chum (*Oncorhynchus keta*) and coho (*Oncorhynchus kisutch*) could have occurred in substantial numbers in the Walla Walla Subbasin (Pirtle 1957), but little written documentation exists. Endemic steelhead persist throughout much of the study area. Populations of steelhead in the Washington portion of the Walla Walla River Watershed (including Mill Creek) were considered depressed in 1992 and unknown in 2002, and populations in the Touchet River Watershed were considered depressed in both 1992 and 2002 (WDF and WDW 1993, WDFW 2002). Recently as many as 300,000, and presently up to 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 subbasin are anadromous. Mountain whitefish (*Prosopium williamsoni*), bull trout and rainbow/redband (*Onchorhynchus mykiss*) trout exist within the subbasin. However, only rainbow/redband trout retain a wide distribution. Whitefish are not common in the Walla Walla Subbasin and appear to have a clustered distribution. In the past,

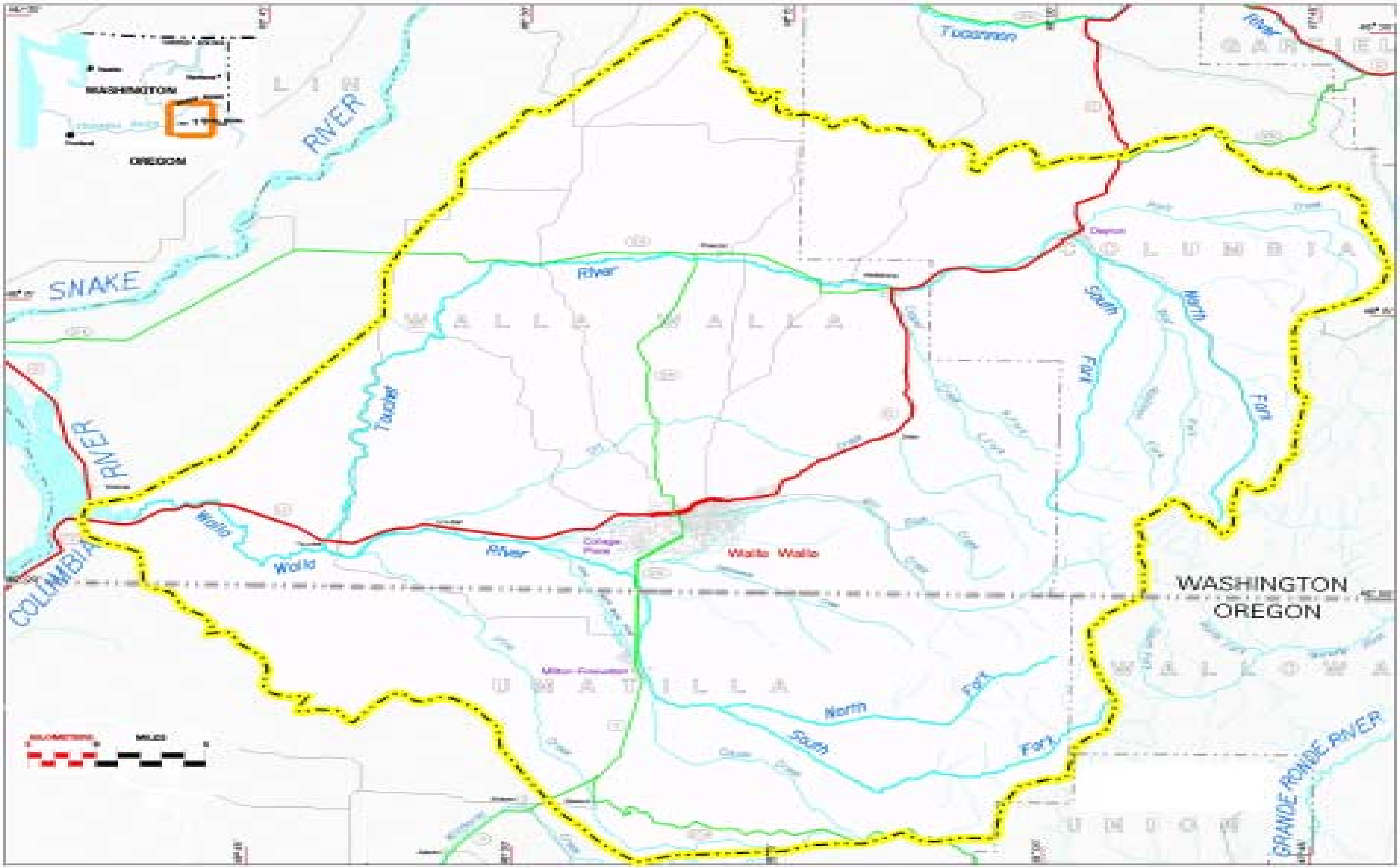


Figure 1. Walla Walla watershed (modified from map courtesy of USACE, Walla Walla District).

bull trout are thought to have been abundant and widely distributed in the subbasin. Currently, bull trout distribution is generally limited to montane upper tributaries of the Touchet River, Walla Walla River, and Mill Creek (Mongillo 1993, USFWS 2002, USFWS 2004). 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 subbasin. 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. Although stocking has been discontinued brown trout are still observed in the Touchet River and some natural reproduction is taking place. 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 reaches of the subbasin. 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.

Historic and contemporary land-use practices have had a profound impact on salmonid species abundance and distribution in the subbasin. Fish habitat in area streams has been severely degraded by urban and agricultural development, grazing, tilling, irrigation, logging, road building and maintenance, 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 abundance, survival and distribution within the subbasin. Additionally, many unscreened or partially screened diversions and fish passage barriers existed within the subbasin, although most diversions have been screened recently. Additional limiting factors for fish include loss of riparian habitat and function and poor fish passage conditions, as well as detrimental changes in hydrology, sediment transport, stream channel stability and summer water temperatures caused by local land use activities. Many habitat restoration projects are underway in both the Washington and Oregon portions of the subbasin under State or federal funding to address these habitat problems.

Out-of-basin anthropogenic impacts to local fish populations have also been substantial. Salmon and steelhead 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 and dam. Other out-of-basin impacts include over-harvest, habitat destruction in the lower Columbia River and estuary, predation, and industrial pollution. In addition, natural environmental fluctuations (droughts, floods, and ocean productivity) have significantly affected local fish populations.

WDFW fish management efforts in the Washington portion of the Walla Walla Subbasin are focused on protection and restoration of dwindling naturally produced steelhead and bull trout, assessment of the status and trends of indigenous salmonid stocks, implementation and evaluation of a large mitigation program for steelhead and resident trout under the LSRCP, and providing recreational fishing opportunities. Accurate estimates of adult natural escapement and juvenile production, as well as survival rates by life stage, are needed for adequate stock status and trend monitoring, ESA recovery planning and implementation, and for effectiveness monitoring. This information is needed before further planning and implementation of hatchery supplementation occurs in the subbasin. Because of the complex life history of steelhead, additional data describing survival rates by age class and smolt production estimates by brood year will be necessary to fully understand population dynamics. Estimates of smolt-to-adult and adult-to-adult survival for these wild steelhead populations will complete the data set needed to evaluate whether within-basin or out-of-basin factors are most significantly limiting production in these subbasins. Once these data are available, efforts to stabilize and rebuild the populations (whether through habitat improvement, hatchery intervention or both) can be effectively directed to ensure maximum success.

The WDFW habitat and salmonid assessment project (199802000) has been underway since the summer of 1998 to collect basic field data about habitat conditions such as summer water flows and temperatures, and to determine salmonid distributions and relative abundance levels. This project was originally scheduled to conclude after 2001, but in 2000 we determined that steelhead escapement, production, and survival information was necessary to complete the evaluation of the status of steelhead stocks in the subbasin, and evaluate their need for modified management or hatchery enhancement. We also recognized the need for modifying our broad scale sampling approach after four years, while maintaining some level of continued baseline monitoring, such as bull trout and steelhead spawning surveys. Unfortunately, BPA would not allow modification of any tasks or objectives in our project even though the Independent Science Review Panel (ISRP) and the fishery co-managers approved our 2001 modified proposal. Our current project continues assessment and monitoring for steelhead use in the mainstem Walla Walla River and tributaries in Washington, and for bull trout distribution and abundance in the Touchet River system. Over the past several years we have documented stream flows, temperatures and salmonid use in stream reaches that have been typically dewatered to leave stream channels dry or with very low flows in Washington. In 2000, a settlement agreement between irrigators and the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) that included maintaining stream flows at minimal levels for operation of fish ladders in portions of the Walla Walla River. We were able to collect stream flow, temperature and fish use data to compare with previous measurements from the same locations. The settlement agreement was renegotiated in 2001 to increase stream flow requirements for subsequent years. Therefore, we have a unique opportunity to evaluate the benefits for salmonids and their habitats by adding or maintaining water to these, and adjacent, stream reaches in the Walla Walla Subbasin.

Project History

In the 2005 Walla Walla annual report, we summarized the rational and significance to regional programs, the relationship to other projects, and the project history for this project (Assessment of Habitat and Salmonids in the Walla Walla Watershed in Washington – 199802000). In this report we add the 2006 data and results.

Year Nine: 2006

We continued to monitor effects of the Walla Walla Settlement Agreement on temperatures and flows in the Walla Walla River and began to summarize lower river temperature data and its affects on salmonid spawning, rearing, and migration. After many years of planning and collecting tissue samples we were able to complete genetic characterizations of steelhead (Blankenship et al. 2007) and bull trout (Kassler and Mendel 2007) in the Walla Walla Subbasin. We also compiled many years of distribution information for rainbow/steelhead, bull trout, whitefish, chinook, and brown trout. The 2005 Walla Walla annual report was completed (Mendel et al, 2006) and distributed. We also continued monitoring stream flows (25 sites), temperatures (51 sites), and conducted electrofishing (11 quantitative sites and 39 qualitative sites), bull trout spawning surveys (31.5 miles), and steelhead spawning surveys (81.3 miles).

The purpose of the WDFW Project (Assessment of Habitat and Salmonids in the Walla Walla Watershed in Washington – 199802000) has been to provide status and trend information for habitat conditions and salmonids in the Washington portion of the Walla Walla Subbasin. This project also provides technical support for salmonid and habitat planning and management.

Project objectives for the Washington portion of the Walla Walla Subbasin, as reflected in our 2006 BPA Statement of Work, were to: 1) Assess habitat conditions for anadromous and resident salmonids, 2) Determine salmonid distribution and relative abundance, 3) Identify and characterize genetic stocks of steelhead and bull trout, and 4) Compile and disseminate results and conclusions to guide habitat restoration efforts, fish management, and subbasin or recovery planning.

To date, this project has met its contractual obligations regarding project objectives and statement of work deliverables. Data summaries, compiled into annual reports from current and previous project efforts, have been submitted to BPA and are available on the BPA and WDFW websites.

Project results to date by Objective

Objective 1: Assess habitat conditions for anadromous and resident salmonids.

- This project initiated and assisted WDOE and WDFW flow specialists with implementation of IFIM flow modeling studies in lower Mill Creek and in reaches of the mainstem Walla Walla River. These studies were later expanded by WDOE/WDFW with other funding and further expanded by Walla Walla County and Columbia County (with WDOE funding) for use in setting minimum stream flows in various reaches of the Walla Walla River, Touchet River, and Mill Creek.

- This project annually deployed, operated and summarized data from up to 74 temperature monitors throughout the Washington portion of the Walla Walla Subbasin. These data substantially improved our understanding and identification of distribution of suitable and unsuitable salmonid spawning and summer rearing areas and why these areas are or are not used. These temperature data also aided us in determining the timing, frequency and duration of potential thermal blocks to migrating salmonids in lower river areas during late spring, early summer and fall. A summary of apparent thermal barriers is presented in this annual report.
- WDFW and WDOE collaboratively deployed and summarized data from continuous stream flow monitoring gauges at up to six sites per year. WDFW took periodic manual stream flow measurements at these gauge sites as calibration flows as well as up to 61 other sites throughout the subbasin in Washington to provide information on water availability throughout the low flow period (late spring, summer and fall each year). This information substantially improved knowledge of where and when reaches were water limited. We also participated in "seepage runs" with other partners to account for all tributary or spring inflows and water use, or loss, for the mainstem Walla Walla River from Milton-Freewater, Oregon to the mouth of the river. This was completed during late spring and summer when irrigation demands are highest to develop a water budget model (directed by Bob Bower of the Walla Walla Basin Watershed Council). Several of our flow monitoring sites are now used by WDOE for year round flow monitoring. Our data and other flow data have been used by agencies and local participants to set flow management points, as well as to establish minimum stream flow requirements in Washington State regulations, and for recommended flow targets.
- This project discovered and reported frequent chemical fish kills in lower Mill Creek caused by inappropriate chlorine use and uncoordinated government regulations. These regulations were changed and WDOE increased monitoring requirements, thereby substantially reducing or eliminating chemical fish kills in lower Mill Creek.
- Habitat conditions were inventoried and documented in Coppei Creek, the Washington portion of East Little Walla Walla, and lower Titus Creek to provide empirical data and a better understanding of habitat conditions.
- More than a dozen permanent and seasonal fish barriers that were previously undocumented have been identified by this project since 1998. We opened seasonal barriers to allow passage and reported them to appropriate habitat or enforcement staff for long term resolution. Permanent barriers were reported to others for removal or modification to provide adequate fish passage. For example, a barrier dam was located on lower Lewis Creek (North Fork Touchet River tributary). It was then removed by Columbia County Conservation District. Another dam was located in lower Whiskey Creek. WDFW removed that dam with other funding. In both cases, this project was able to locate these barriers and have them removed. This project has been documenting how successful these removal projects have been by monitoring steelhead and bull trout reestablishment in Lewis Creek, and recent steelhead use of upper Whiskey Creek. In 2006, WDFW took the lead to develop a list of known and potential barriers and circulate it to all resource managers and others in the basin. That draft list of barriers is included in this annual report.

- Our understanding of salmonid distribution, fish kills, water availability and water quality issues have been substantially improved in the Mill Creek Flood Control Channel. We provided fish and habitat data summaries for a multiple agency test of adding water flows during summer to benefit fish in the flood channel. Results showed that adding up to 10 cfs to the flood channel during summer actually caused fish kills in the lower concrete channel where fish were surviving in cool ground water. Overland flows from the wide, shallow weir section of the channel reached nearly 90^{o}F before entering the concrete channel that has groundwater inputs of about 55^{o}F.
- A settlement agreement was reached between the USFWS and irrigators that added water to a dewatered reach of the mainstem Walla Walla River. We have been fortunate to collect pre and post treatment data for stream flows, water temperatures and fish use in the Washington reaches affected by this agreement. Stream flows have increased near the Washington/Oregon state line, but water temperatures have not improved substantially because warm overland flow is mixing with cooler groundwater that was the only water available before the settlement agreement. Salmonid use and distribution has improved because of more water, with greater surface area and volume, even though water temperatures are marginal.

<u>Objective 2: Determine salmonid distribution and relative abundance.</u>

- Field sampling during summer and fall has substantially improved knowledge of bull trout distribution and relative abundance in the Touchet River and its tributaries. We expanded annual spawning survey distribution and increased the number of surveys per year. We discovered bull trout in previously undocumented areas such as Lewis Creek (North Fork Touchet tributary) and Burnt Fork (South Fork Touchet tributary). Previously, bull trout had not been documented spawning in the South Fork Touchet River Watershed. We have been able to add to the known spawning distribution and abundance of bull trout in the Wolf Fork of the Touchet River (approximately 5 miles) and refine it further in the North Fork Touchet (approximately 2.5 miles). The North Fork spawning population appears to be declining whereas the Wolf Fork population was increasing until recently.
- After many years of absence, spring chinook have periodically been documented entering the Touchet River since 1997. We have been able to document timing, distribution, relative abundance and frequency of periodic spring chinook returns to the Touchet River Watershed during trapping at the Dayton Dam (mostly under LSRCP funding), summer electrofishing and snorkel surveys, and by conducting spawning surveys when appropriate. These fish are generally unmarked and presumably from out-of-basin, although a few marked spring chinook from the Tucannon River have been documented in the Touchet River in recent years.
- WDFW coordinated a Mill Creek Flood Channel fish salvage effort with several other agencies and organizations. The salvage area covered approximately two miles of channel and captured and transported just over 600 salmonids. WDFW has participated as necessary in several other fish salvage efforts since 1998 in the Walla Walla Subbasin to try to move fish from dewatered stream reaches to suitable habitat.

- WDFW has been able to document steelhead spawning and relative abundance in many reaches or tributaries where they were not known to spawn, or where they spawn in higher numbers than expected. For example, we have documented up to 47 steelhead redds in the Coppei Creek Watershed where we previously thought only a few steelhead spawned each year.
- Summer electrofishing and snorkel surveys (usually 50-135 sites per year) have enabled WDFW to estimate juvenile steelhead summer rearing densities and population abundance for all areas of the Washington portion of the Walla Walla Subbasin (included in the Subbasin Plan). This information was useful for determining priority protection and restoration areas for the Subbasin Plan and the Snake River Salmon Recovery Plan in Southeast Washington. These sampling efforts also improved knowledge regarding distribution and relative abundance for other salmonid species. Summaries of distribution and relative abundance, by stream or stream reach, were compiled for salmonids and lamprey for the duration of this project and included in this annual report.
- This project has monitored steelhead spawning in Mill Creek upstream of Bennington Dam, a U.S. Army Corps of Engineers (USACE) flood control dam. After few steelhead redds or fish were found the first couple years of surveys, WDFW approached the USACE and worked with them and others to improve operation of the fishway and low flow channel at the dam and to coordinate temporary modifications to the fish ladder entrance to improve passage. Steelhead passage appears to be improved as reflected by substantially more redds and fish documented after fishway modification. WDFW is now working with the USACE as a sponsor of an 1135 project to modify the dam or fishway to provide fish passage that meets current state and federal passage criteria.
- WDFW has been monitoring reestablishment of bull trout and steelhead after Lewis Creek dam was removed, and steelhead reestablishment in Whiskey Creek after a small dam was modified to improve fish passage. Both of these passage improvement projects appear to have been successful at allowing reestablishment of salmonid populations in many miles of streams that had been blocked.
- Our summer electrofishing and snorkel sampling efforts have enabled us to determine non-salmonid fish distribution, species composition and relative abundance throughout much of the Washington portion of the subbasin.

Objective 3: Identify and characterize genetic stocks of steelhead and bull trout.

- We have collected tissue samples from adult steelhead at traps in the Walla Walla River in Oregon (from ODFW sampling), Mill Creek (from USFS sampling), and the Touchet River (WDFW SRL sampling), as well as from juvenile steelhead in Washington streams, to genetically characterize population structure. These samples were combined with other samples from CTUIR and analyzed and published by Narum et al. in 2004. They were combined with other WDFW (LSRCP funded) sampling and analyses and reported in WDFW annual reports. The results are summarized in this report. Touchet River steelhead and Walla Walla steelhead are genetically distinct and NMFS now recognizes these as two separate populations. WDFW has submitted a manuscript for publication that further evaluates the genetic composition and stability of steelhead in the Walla Walla Subbasin and elsewhere in southeast Washington (Blankenship et al. in prep).

- We have collected tissue samples from numerous migrating bull trout captured in each of the 3 major drainages (Walla Walla River through ODFW sampling, Mill Creek through USFS sampling, and Touchet River through WDFW SRL sampling) in the Walla Walla Subbasin for multiple years. We have also collected genetic samples from juvenile bull trout in each of the spawning areas of the Touchet River drainage. Our WDFW genetics lab assisted us by analyzing these samples in 2006 to genetically characterize these different groups and enable us to evaluate the fine scale population structure and reproductive interactions of bull trout within several areas of the Walla Walla Subbasin. The results are summarized in this annual report.
- WDFW has collected tissue samples from spring chinook adults returning to the Touchet River and archived them for possible later analysis.

Objective 4: Compile and disseminate results and conclusions to guide fish management and subbasin planning.

- This project has completed eight annual reports, as well as substantially contributed to two genetic analyses (Blankenship et al. 2007 and Kassler and Mendel 2007). We have shared these reports in hardcopy and electronic formats with the large number of management entities or interested parties in the Walla Walla Subbasin, and elsewhere. These reports are posted on the BPA and WDFW websites.
- We have contributed genetic samples used in a journal article published by Narum et al. 2004. WDFW has included genetic samples and data from this project in a manuscript submitted for publication regarding steelhead genetics in several portions of southeast Washington.
- This project has contributed data and summary information for the draft Bull Trout Recovery Plan, Walla Walla Subbasin Summary for the NPCC, Walla Walla Subbasin Plan, Washington State Limiting Factors Report for the Walla Walla Basin, and the Snake River Salmon Recovery Plan for Southeast Washington (includes the Walla Walla Subbasin), as well as other planning efforts such as the WDOE Watershed Planning Effort and the Total Maximum Daily Load (TMDL) planning process, or WDFW's Salmonid Stock Inventory (SaSI) stock inventory process.

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 Subbasin. In addition we wanted to document fish passage, rearing, and spawning conditions for steelhead and to examine environmental factors to guide reintroduction of chinook salmon. Specific objectives and tasks were outlined in WDFW's original proposal and statement of work in 1997/1998 to BPA (Project #199802000). Some tasks had to be scaled back or postponed. Attempts by WDFW to modify the objectives and tasks in 2001 to enable this project to evolve and meet the needs in the subbasin were denied by BPA due to lack of funds and restrictions on any new objectives or tasks. Multi-year study objectives include:

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

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

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

Our objectives and tasks were:

- Establish constant recording temperature and flow data loggers in the Walla Walla Subbasin, 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 (deferred so we could complete genetic analysis);

- Conduct steelhead and bull trout spawning surveys to determine spawn timing and distribution, and to establish an index of relative abundance; and

- Collect tissue samples and genetically characterize bull trout and steelhead in the Walla Walla Subbasin.

Methods

Study Area

The study area encompasses the Walla Walla Subbasin within Washington State (Figure 1). The Walla Walla River, the Touchet River, and Mill Creek are the major watersheds within the subbasin.

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 sample 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 calculated using Maptech's Terrain Navigator (version 5.03) or Terrain Navigator Pro (version 6.04a). River miles were determined by measuring the distance between the confluence of each stream, or a noted landmark if the confluence was in question, and the study site. Within these programs the track tool was used to trace streams and calculate river miles. The track tool measures in miles and feet, which we converted to miles and tenths of miles. Many of the sites had an associated global positioning system (GPS) location measured in D.D° with a Garmin GPS II plus, in WGS 84 datum. These GPS locations were plotted on the map and used for calculating river miles. These locations should be considered approximate due to the limited precision of this method.

Electrofishing sites were selected randomly from access areas. Selections of top and bottom net locations were also randomized. Site lengths sometimes had to be modified to avoid unsuitable stream features that affected the adequacy of data collection or surveyor safety (such as deep pools, rapids, or multiple channels).

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 Microsoft Excel 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, two sites on Yellowhawk Creek, one site on Titus Creek (Appendix A). WDFW collaborated with WDOE staff 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 Subbasin (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 Microsoft Excel spreadsheets. Data in Microsoft Excel was organized and transferred to Microsoft Word where it 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, both before and after field deployment, 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 restoration 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 70°F (lethal to salmonids if prolonged), and presence or absence of salmonid fishes at study sites, were factors taken into consideration.

We compiled temperature criteria for salmonids from the literature to evaluate likely spring, summer, and fall water temperature effects on migration and rearing of salmonids in the lower portions of the Touchet River, Walla Walla River, Mill Creek, and Dry Creek.

We began compilation of a list of known, or suspected fish barriers in the Walla Walla Subbasin from our files, other documents (reports from other managers in the basin), and our personal observations. The purpose of the fish passage barriers list was to develop a comprehensive accounting of present or past barriers, when and how they were removed or ameliorated, and to focus manager's efforts on eliminating or reducing those high priority barriers that remain.

Fish Stock Assessment

Distribution and Abundance

Electrofishing

A Smith-Root Model 11A or 12B electrofishing backpack unit was used to collect fish at various study sites in the Walla Walla Subbasin. We used pulse DC (direct current) between 200 and 600 volts. Two different types of electrofishing surveys (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), fork length (mm), scale and/or genetic samples, and any notation about any marks or tags.

Fork lengths collected during quantitative electrofishing were used to create length frequency histograms. The histograms were used to determine age classes of 0+ and 1+ fish (Mendel et al. 1999, Figure 2). Legal size fish were defined as any fish over 200mm in length. Age class groupings were specific for each stream or stream reach, and were checked against results from scale samples taken during electrofishing.

A removal-depletion software program developed by the USFS (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/run ratio, and the presence of large woody debris (LWD) were recorded for each site.

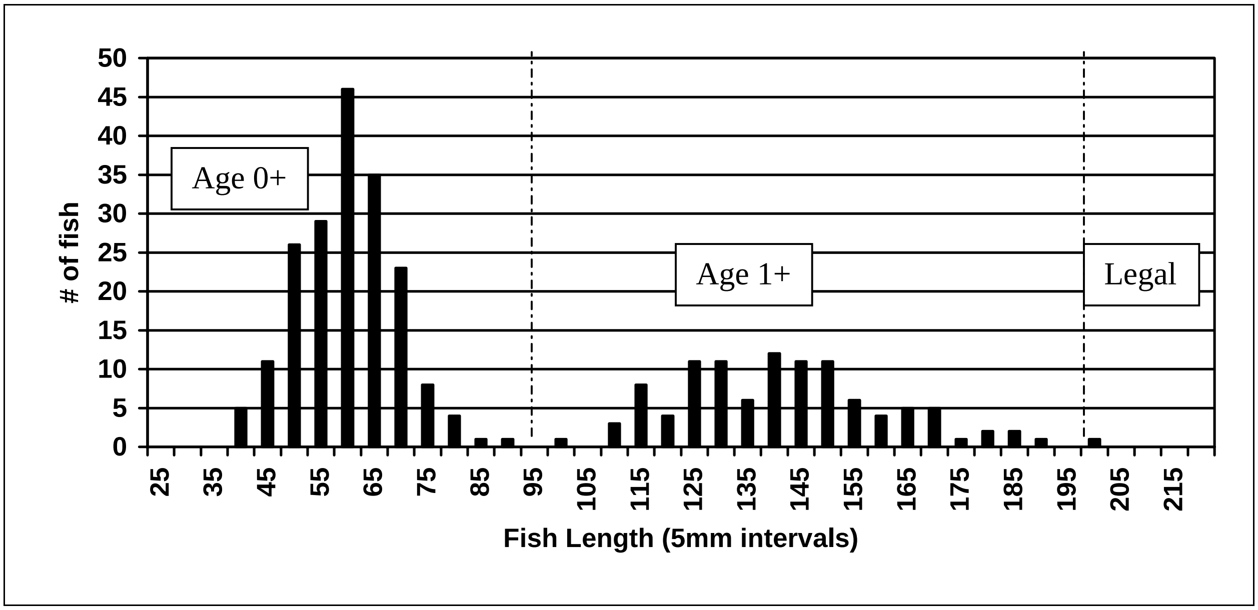


Figure 2. Length frequency and age class delineations for Dry Creek, from just below the town of Dixie, WA to just above the mouth. Data is from 294 fish that were collected at nine sites in 2004.

Qualitative Electrofishing

We also conducted qualitative electrofishing surveys at several sites in the Walla Walla Subbasin. 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/run ratio, and the presence of 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). 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 (Table 1). Ranked values were averaged to determine a relative abundance for each species per designated stream or stream reach. Relative abundance data were tabulated to provide qualitative comparisons between reaches and species (Appendix D).

Table 1. Categories of relative abundance (per site) for non–salmonids during electrofishing surveys.		
Category	**Count (individuals seen)**	**Ranking Value**
Absent	0	0
Rare	1-3	1
Uncommon	4-10	2
Common	11-100	3
Abundant	100+	4

Spawning Surveys

WDFW conducted spawning surveys for steelhead and bull trout in the Walla Walla Subbasin in 2006. Spawning surveys were conducted in the same manner for steelhead and bull trout. 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, description of the redd size, score of its observability and its location. Redd size was measured, in feet, for both the bowl and mound on every other redd. The redd score of observability was a measurement that we use to calculate redd life, or how long a redd would be visible (Table 2). Counts were tallied for each designated stream reach. We attempted to get GPS coordinates for each surveyors beginning and ending locations for spawning surveys.

During steelhead spawning surveys we attempted to capture, with dip nets, adult steelhead that were not actively spawning. These fish and any carcasses located were sampled for length, sex, marks (to determine wild or hatchery origin), tags, scales, and DNA fin clips.

Table 2. Criteria for scoring the observability of a redd.	
Score	**Criteria for scoring**
1	New Redd—very clean substrate and very distinct redd features (bowl and mound) and would be called a new redd on any survey.
2	Intermediate Redd—starting to color-up and may have begun to flatten out, but still would be noted as a new redd if it was the first survey through that section.
3	Old Redd—very colored up with poor features, may not be visible anymore, and would not be counted as a redd if encountered the first time in this condition.

Genetic and Scale Sampling and Analyses

WDFW continued to collect salmonid tissues in 2006 for genetic analyses of steelhead and bull trout. Fin clips or opercle punches were obtained from adult steelhead, juvenile rainbow/steelhead trout, and bull trout. Tissue samples were preserved in 100% ethanol, 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 Subbasin.

In 2006, WDFW conducted genetic analyses of many of the steelhead and bull trout tissue samples we had collected as part of this project since 1998. Methods are described in the respective reports (Blankenship et al. 2007, and Kassler and Mendel 2007). We combined our steelhead genetic samples with samples provided by the WDFW SRL to evaluate genetic characteristics for steelhead from the Walla Walla, Touchet, and Tucannon rivers, as well as from Lyons Ferry Hatchery (LFH stock), using DNA analyses at 14 microsatellite loci for 28 tissue sample collections. The first evaluation consisted of comparisons of 7-8 brood years of adult steelhead from the Tucannon and Touchet rivers, and Lyons Ferry Hatchery. Also we genetically characterized and compared juvenile and adult steelhead samples for numerous locations within the Walla Walla Basin (the Mainstem Walla Walla in Oregon -Nursery Bridge, Mill Creek trap in Oregon, Touchet River trap in Dayton, and tributaries of the Touchet River) with adult steelhead samples from the Tucannon River and Lyons Ferry Hatchery (Blankenship et al. 2007). In addition, we conducted microsatellite DNA genetic analyses using 12 standardized loci, plus two others, for most of the bull trout samples we had available for the Walla Walla, Mill Creek and the Touchet Basin (Kassler and Mendel 2007). The first objective was to compare migratory bull trout from the Walla Walla River (Nursery Bridge trap), upper Mill Creek (City intake trap) and the Touchet River (Dayton Dam trap) to determine if they were genetically similar. We then examined the genetic similarities and differences among juvenile bull trout from five streams, or stream reaches, in the Touchet River upstream of Dayton.

Also, scale samples were collected during electrofishing surveys in 2006. These samples were taken to verify the age class distributions that we created from length frequency histograms (Figure 2). Scale samples were placed on scale cards with the following information; stream of collection, date collected, species being sampled, fork length, and DNA vial number (if DNA was also collected from that fish). The information was entered into a database at our office, and then the samples were sent to Olympia to be aged. Once aged, the cards were returned to us and we were able to verify our estimated age breaks (based on length-frequency histograms) to the actual age from the scales.

Results and Discussion

Habitat Assessment

Stream Flows

The number and distribution of manual stream flow (discharge) measurement sites were reduced from 2005. In 2005, we had 41 sites of which 24 were index flow sites, while in 2006; we had 24 flow sites of which 19 were index sites. Index flow sites were those where manual flows measurements were taken every two weeks from early June through mid October. Non-index flows sites were discontinued after the first round of measurements or consisted of measurements at sites that we only visited occasionally because of difficult access (Figure 3).

Stream flows in the Walla Walla Subbasin generally follow a pattern consisting of a rapid decline in discharge in late June, followed by low summer flows, and increased discharge in the fall and winter. 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 subbasin. 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 four sites in 2006; one on the Walla Walla River, two on Yellowhawk Creek, and one on Titus Creek. The monitor at Detour Road shows a fairly normal late spring to early fall hydrograph through the first of October. The portion of the gauge that measures flow malfunctioned near the first of October so no flow data were included after that point (Figure 4). The monitors in Yellowhawk Creek were very erratic in the fall, but they were affected by the diversion from Mill Creek (Figure 5 and 6). The monitor on Titus Creek is in a branch below an irrigation diversion (that is located just above Five Mile Rd.) that flows back into Mill Creek. The flow at this site on Titus Creek is very constant between three and six cfs (Figure 7).

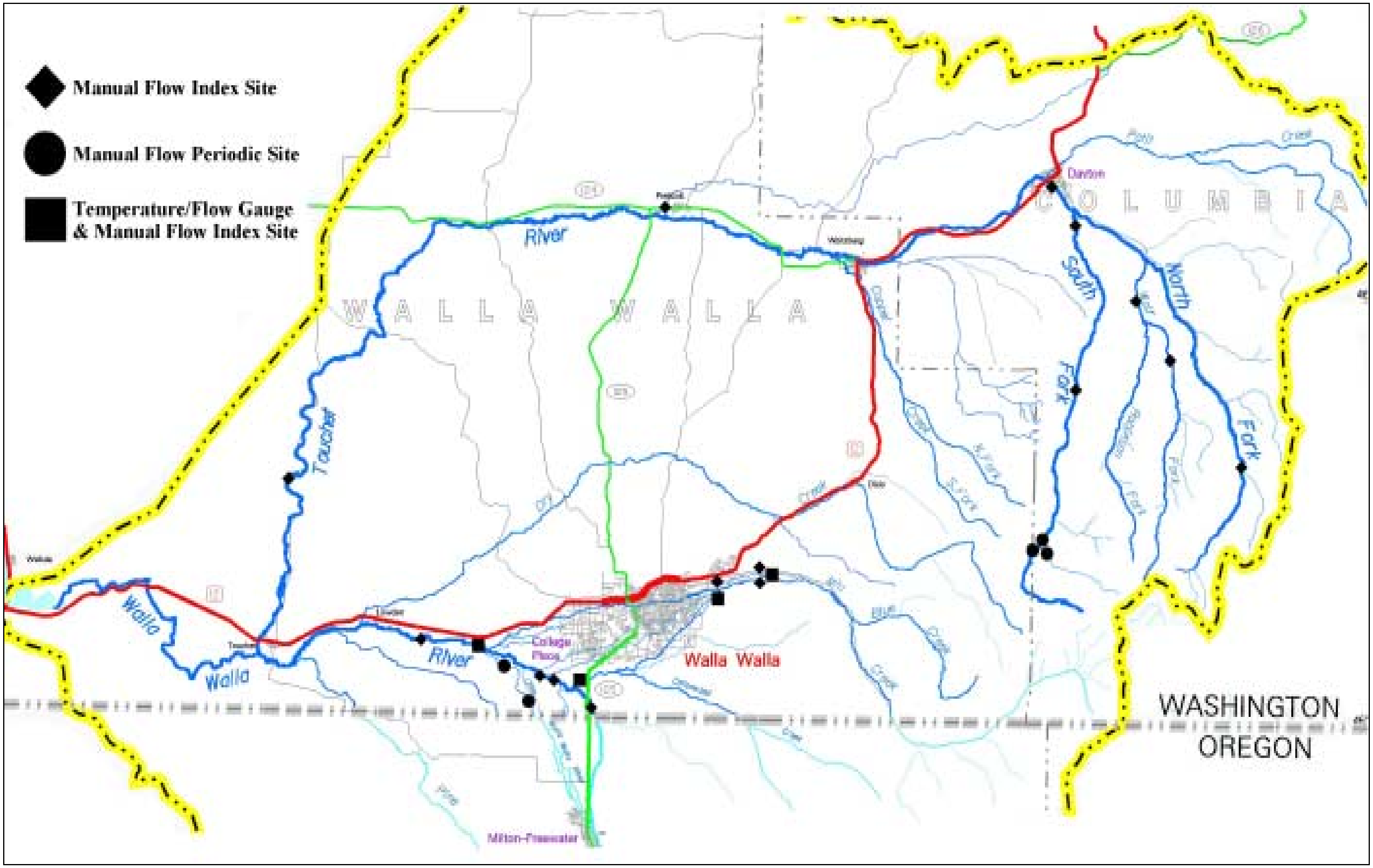


Figure 3. Relative locations of WDFW flow monitoring sites in the Walla Walla Subbasin, 2006.

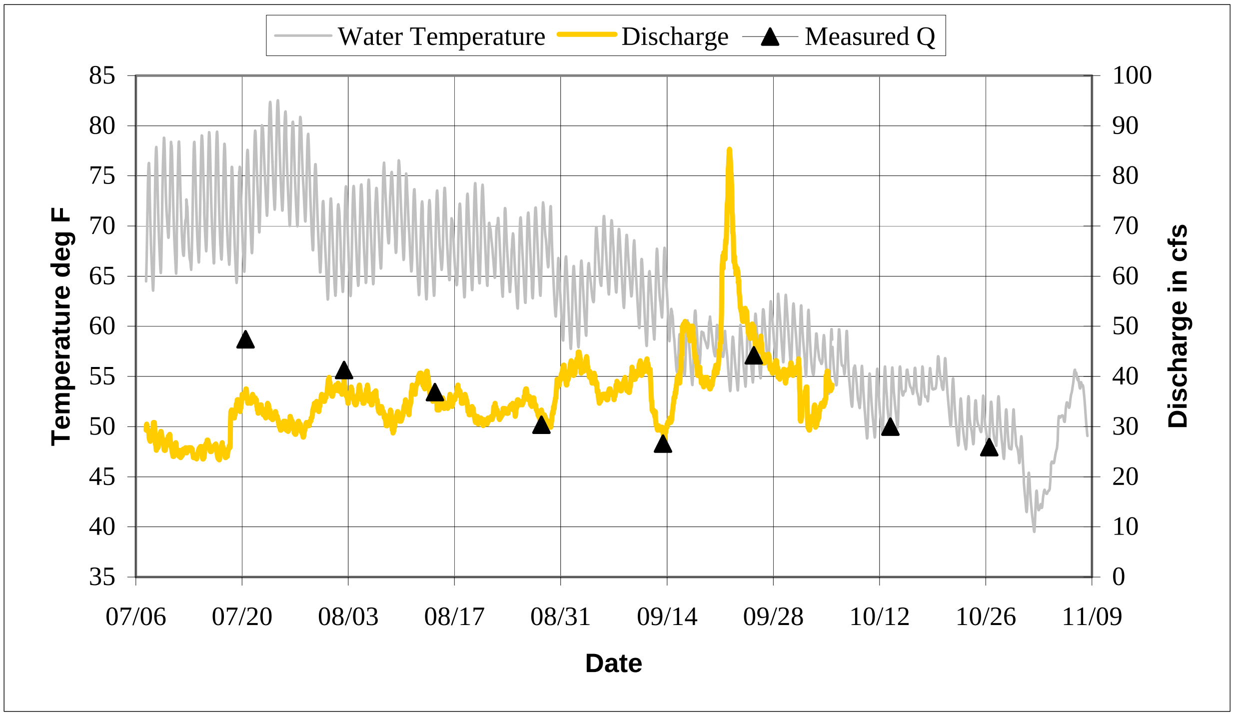


Figure 4. Walla Walla River stream discharge (cfs) and hourly temperatures (°F) ~0.5 miles above Detour Rd. bridge (WW-6), 2006. (Measured Q = manual stream discharge measurements)

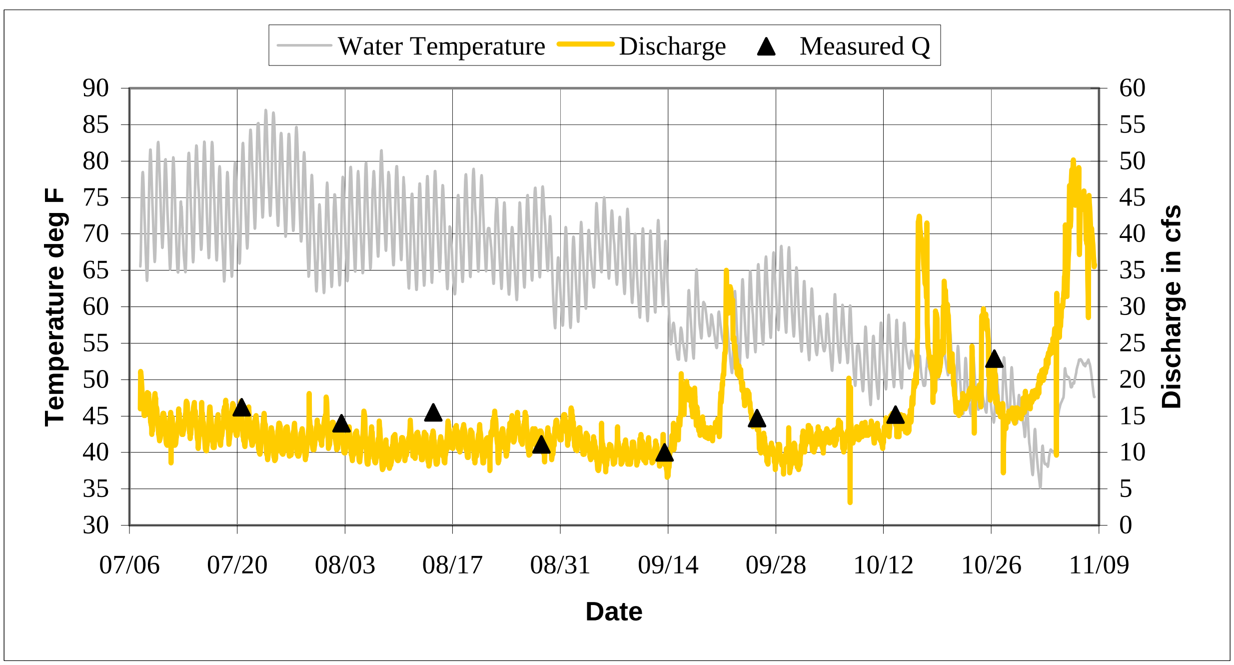


Figure 5. Yellowhawk Creek stream discharge (cfs) and hourly temperatures (°F) ~25 meters below diversion (YC-1), 2006. (Measured Q = manual stream discharge measurements)

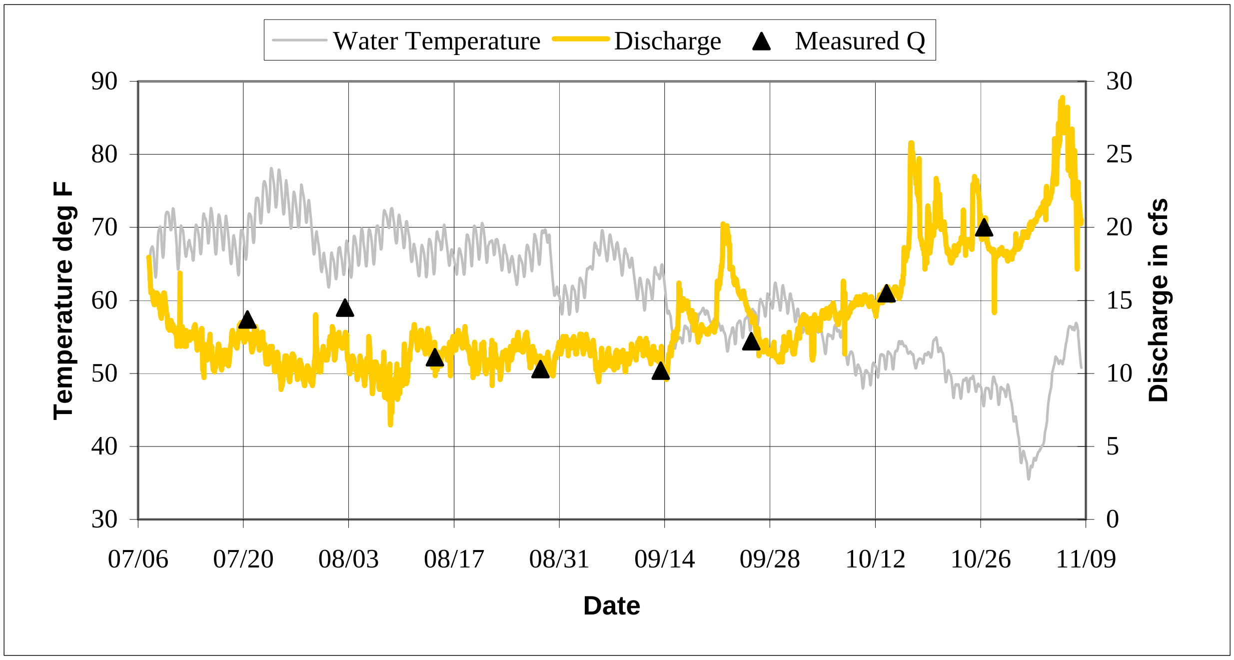


Figure 6. Yellowhawk Creek stream discharge (cfs) and hourly temperatures (°F) ~85 meters above mouth (YC-7), 2006. (Measured Q = manual stream discharge measurements)

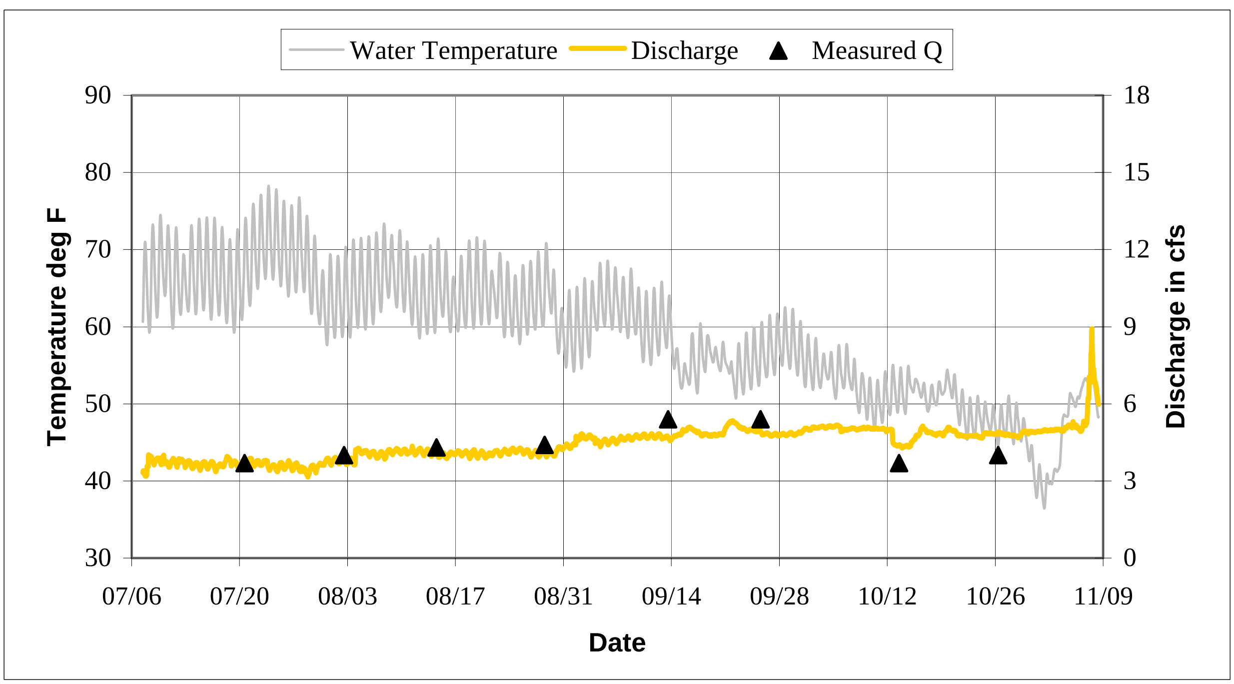


Figure 7. Titus Creek stream discharge (cfs) and hourly temperatures (°F) Covered bridge above Five Mile Rd. (TC-1), 2006. (Measured Q = manual stream discharge measurements)

Walla Walla Settlement Agreement

WDFW has been conducting flow monitoring in the Walla Walla basin since 1998, and has used this data to summarize the changes in flows in the Walla Walla River after a settlement agreement between the USFWS and two irrigation districts in 2000 (Mendel et al. 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006). The last few years have had no major changes to the settlement agreement and flows have been fairly similar throughout the Walla Walla River (Appendix E and F). However, in 2006, we did collect some manual stream flow measurements at Detour and McDonald Roads during September and October that were as low or lower than flows collected in 1998 and 1999 before the settlement agreement made. In particular the average stream flow for the month of October at McDonald Rd. was 7.0 cfs (with lows of 4.4 cfs on September 13th and 2.1 cfs on October 13th, see Appendix B, Table 1), average stream flow for this site has not been below 20.0 cfs since 2000 (based on limited data).

Stream Temperatures

Temperature logger sites in 2006 had similar (wide spread) distribution to those in 2005; we deployed 51 loggers in 2006 versus 54 in 2005. The number of loggers that were deployed in 2005 and 2006 is reduced from previous years for two main reasons: 1) we have collected several years of data at many of our sites, and 2) the batteries in many of our loggers have failed in the last year or two so the total number of monitors available has decreased (Figure 8).

Water temperatures in 2006 were similar to water temperatures in 2005 throughout the Walla Walla Subbasin (Appendix C, Mendel et al. 2006). 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; Spangler Creek (SC-7), North Fork Touchet (NFT-2), Lewis Creek (LC-5), Wolf Fork (WF-1), Whitney Creek (WH-1), and Coates Creek (C-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 or 70-79ºF in Table 3). This generally occurred during mid-summer, when the photoperiod is long and evening cooling is brief. Sites with maximum water temperatures greater than 75°F included; North Fork Touchet (NFT-4), South Fork Touchet (SFT-3, 4), Touchet River (TR-1, 3, 4, 5, 6, 8), Coppei Creek (CO-1), Walla Walla River within Washington (WW-3, 5, 6, 7, 8, 9, 10), Blue Creek (BC-1), Mill Creek (MC-5, 6, 7, 9, 10, 11, 12, 13), Titus Creek (TC-2), and Dry Creek (DRC-4, 5, 6). 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 (<65-68°F).

Maximum temperatures in the lower Walla Walla Subbasin; including the Touchet River below Waitsburg, Dry Creek below Dixie, Mill Creek below Five Mile Road, and the Walla Walla River below Burlingame Diversion appear to be high enough during certain times of the year to block, or impede the migration of adult salmonids. Steelhead would likely enter the Walla Walla Subbasin from September through June of the next year in preparation for spawning, with the key high temperature restrictions likely from September through October, and May through June. September through October is also the primary time for downstream migration of adult bull trout after spawning, while May through early July temperatures could affect adult spring chinook returning to spawning grounds.

Hicks (2002) estimated that to fully protect (with no detrimental effect) adult steelhead and chinook migration the 7-day average maximum temperatures should not exceed 17.0-19.0°C (62.6-66.2°F), and that a barrier to migration appears when 7-day average maximum temperatures reach 20.1-24.6°C (68.1-76.3°F) (Table 3). We also reviewed McCullough (1999), Bjornn and Reiser (1991), and USEPA (2003) and found similar temperature ranges that impaired chinook or steelhead life stages consistent with those in Hicks (2002, Table 3). Bear et al. (2007) found survival declined to 72.8% for rainbow trout in 24 °C in 60-day thermal trials. They noted high survival by rainbow trout at 26°C for a short duration (7 days) and then a sharp decline in survival with only 2% survival at 26 °C, and no survival at 28 °C (after 60 days). They determined the ultimate upper incipient lethal temperature (UUILT) for rainbow trout was 23.3 °C, and the 7-day UUILT was 26 °C. Huff et al. (2005) documented a strong statistical relationship between rainbow trout distribution and relative abundance to temperature in the Blue Mountains of Eastern Oregon. They estimated the realized niche width upper limit (RNW) was 22.4 °C for rainbow trout in the Blue Mountains of Oregon.

Finally, we reviewed Selong et al. (2005) for evaluation of bull trout thermal requirements. They found no Age 0 bull trout survived temperatures of 20 °C or higher for up to 60 days, but survival was at least 98% for temperatures from 8-18 °C. The UUILT (or LD50 at 60 days) was 20.9 °C for these fish. Peak growth occurred at 13.2 °C (95 % CI of 10.9 to 15.4 °C). Feed consumption declined significantly at temperatures greater than 16 °C and fish held at 22 °C did not feed. They also found Age 1 bull trout survived at 20 and 21 °C at 53 and 46 % after 60 days, but no Age 1 bull trout survived 22 °C for that duration. Age 1 fish at 20 °C survived at a lower rate (53 vs. 79%) than Age 0 fish. The range of maximum-growth temperatures was 10.9-15.4 °C. In Idaho, analysis of bull trout occurrence revealed that most bull trout occurred where summer maximum temperatures were less than 13-14 °C (Rieman and Chandler 1999). Bull trout in temperatures greater than 18 °C in the Selong et al. study had significantly reduced food consumption, growth, and feed conversion efficiency and exhibited outward signs of stress, suggesting that extended exposure to elevated temperatures would rapidly deplete their energy reserves. Bull trout data summarized from Hicks (2002) shows that adult migration occurs between 10.0-14.0°C (50.0-57.2°F) (Table 3). This temperature range should be considered a very rough estimate, because of lack of information on temperature preferences and requirements of migratory bull trout (Hicks 2002).

Table 3. Ranges of temperatures likely to fully protect specific species and lifestages. (Taken from Hicks 2002 Table 4.25, and USEPA 2003)			
Species/Lifestage	**7-day avg. daily maximum temperature °C (°F) from Hicks 2002**	**7-day avg. daily maximum temperature °C (°F) from USEPA 2003**	**Recommended Threshold for 7-day avg. daily maximum temperature °C (°F) from USEPA 2003**
Steelhead/rainbow trout			
Juvenile rearing	15.18-18.05 (59.32-64.49)	10.00-18.00 (50.00-64.40)	16.00-18.00 (60.80-64.40)
No Detrimental impacts to adult migration	17.00-19.00 (62.60-66.20)		≤20.00 (68.00)
Barrier to adult migration	20.05-24.60 (68.09-76.28)	21.00-22.00 (69.80-71.60)	>20.00 (68.00)
Spawning	12.55-13.92 (54.59-57.06)	4.00-14.00 (39.20-57.20)[a]	13.00 (55.40)
Lethality (7-day exposure)	21.09-23.36 (69.96-74.05)	23.00-26.00 (73.40-78.8)[b]	
Upper lethal temperature (adults)	21.00-26.00 (69.80-78.80)[c]	21.00-22.00 (69.80-71.60)	
Bull trout			
Juvenile rearing	12.61-13.96 (54.70-57.13)	12.00-13.00 (53.60-55.40)[d]	12.00 (53.60)
Adult migration	10.00-14.00 (50.00-57.20)[e]		
Spawning	7.31-8.32 (45.16-46.98)	6.00-8.00 (42.80-46.40)[b]	9.00 (48.20)
Lethality (7-day exposure)	20.73-21.88 (69.31-71.38)	22.00-23.00 (71.60-73.40)	
Upper lethal temperature	24.00-26.00 (75.20-78.80)		
Chinook salmon			
Juvenile rearing	15.18-18.05 (59.32-64.49)	10.00-18.00 (50.00-64.40)	16.00 (60.80)
No Detrimental impacts to adult migration	17.00-19.00 (62.60-66.20)		≤20.00 (68.00)
Barrier to adult migration	20.05-24.60 (68.09-76.28)	21.00-22.00 (69.80-71.60)	>20.00 (68.00)
Spawning	12.55-13.92 (54.59-57.06)	4.00-14.00 (39.20-57.20)[a]	13.00 (55.40)
Lethality (7-day exposure)	21.09-23.36 (69.96-74.05)	23.00-26.00 (73.40-78.8)[b]	
Upper lethal temperature (adults)	21.00-26.00 (69.80-78.80)[c]	21.00-22.00 (69.80-71.60)	

[a] Temperature range for daily average temperature, 4.00-12.00°C for constant temperature, and 6.00-10.00°C is optimal temperature.
[b] Temperature range for constant temperatures.
[c] Temperature range was estimated from data summarized in Hicks 2002 and McCullough 1999.
[d] Temperature range based on daily maximum temperatures.
[e] Temperature range was estimated from within the text of Hicks 2002, and not taken from Table 4.25. This range should be considered a rough estimate, based on only a few studies.

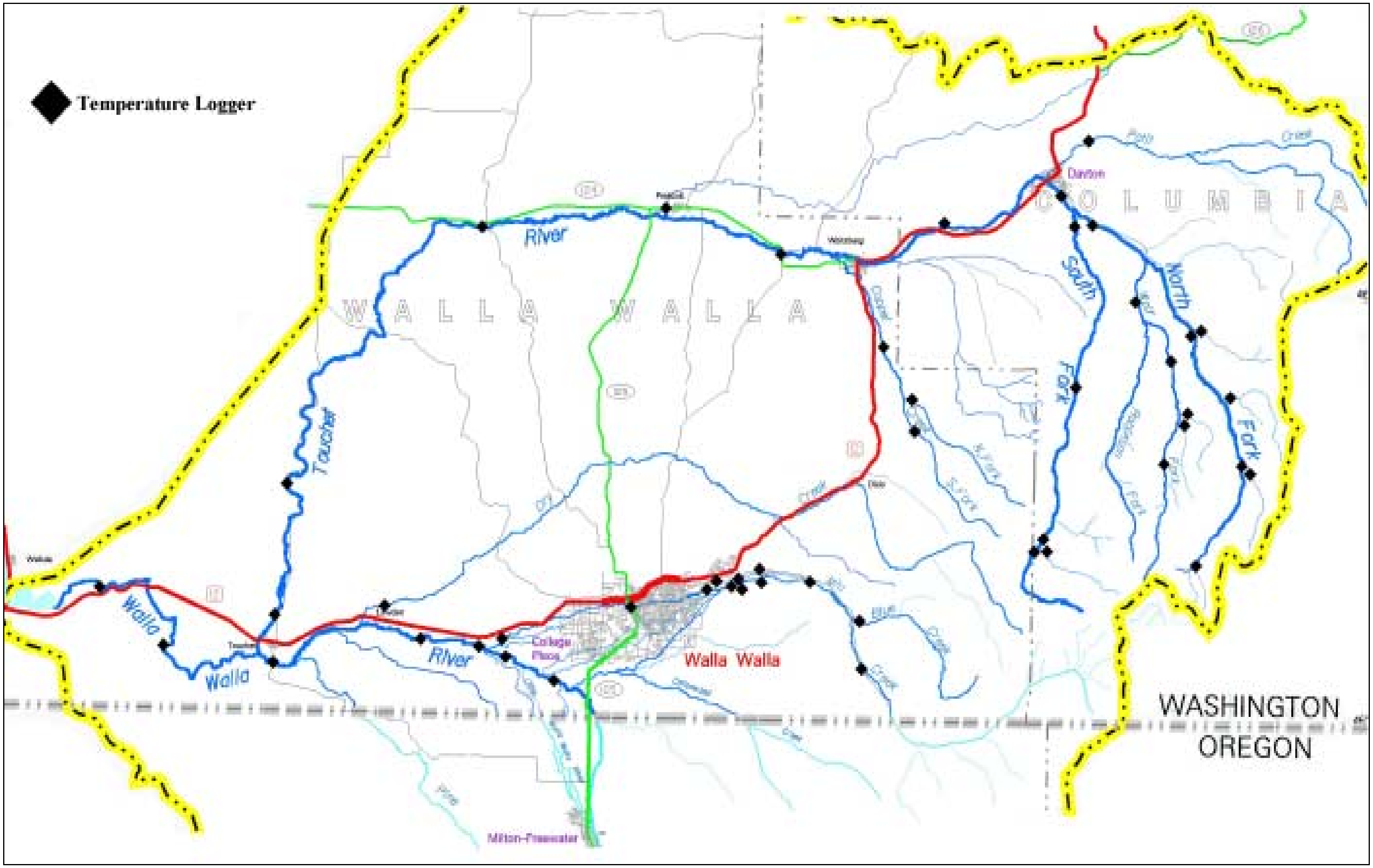


Figure 8. Relative locations of WDFW temperature logger sites in the Walla Walla Subbasin, 2006.

Based on temperature data collected since 2001, seasonal thermal barriers to steelhead migration apparently were present in the lower Touchet River, Dry Creek, Mill Creek, and the Walla Walla River. In the spring, detrimental temperatures to adult steelhead migration occur by late May and thermal barriers to passage (highlighted in Table 4) appeared by the first or second week in June for most streams. There is also limited rearing for steelhead in these sections by late May. In the fall, thermal barriers and detrimental impacts to migration appear to dissipate by early September, but can extend through the end of September depending on location (Table 4). Spring chinook entering the Walla Walla Subbasin meet even more severe temperature problems than steelhead during May through the middle of July. While the literature supports the temperatures in Table 3 as being barriers to adult migration, all the reports we reviewed above reference Bell (1973, 1986) showing that temperatures for spring chinook migrations should be between 3.3-13.3°C (37.94-55.94°F). The levels that Bell (1973, 1986) suggests would adversely affect migration into the Walla Walla Subbasin often occur by no later than the first of May. While observed temperatures decrease in the fall they likely negatively affect, or create thermal barriers to, downstream migration of bull trout in the Walla Walla Subbasin. Bull trout downstream migration in September through the end of October appears to be blocked above Bolles Bridge on the Touchet River (TR-5), between Five Mile Rd. (MC-4) and above the cold return (MC-5) on Mill Creek, and between Burlingame Diversion (WW-3) and Swegle Rd. (WW-6) on the Walla Walla River (Table 4).

Walla Walla Settlement Agreement

WDFW has been conducting temperature monitoring in the Walla Walla basin since 1998, and has summarized this data to determine if increased stream flows (after a settlement agreement between the USFWS and two irrigation districts in 2000) in the Walla Walla River has had an effect on temperature (Mendel et al. 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006). Increases in stream flow have not consistently improved water temperatures during summer months from 1998 through 2006 (Table 4).

Table 4. Seven day average maximum temperatures from May 1st –July 16th and September 1st –November 2nd for the lower portions of the Touchet River, Walla Walla River, Mill Creek, and Dry Creek, 2001-2006 (listed from upstream to downstream for each stream). Shaded cells suggest thermal barriers to migration (>68ºF from Table 3)

	Touchet River @ Bolles Bridge						**Touchet River @ Harvey Shaw Rd.**					
	2001	2002	2003	2004	2005	2006	2001[a]	2002	2003	2004	2005	2006
May 1-7	54.31				59.27[b]		55.38			63.28[c]		
May 8-14	59.79		60.71[d]	57.13[e]	60.70		63.28		64.03[d]	62.14		
May 15-21	58.12		56.36	59.98	58.97		60.39		60.03	64.00		
May 22-28	69.40		65.44	58.53	64.65		74.66		69.96	61.50		
May29-June 4	63.54		67.72	61.60	67.43		68.90		72.60	64.92	69.53[f]	
Max Temp for May	**71.86**		**69.68**	**62.26**	**72.52**		**77.43**		**75.03**	**66.85**		
Min of Max Temp for May	**49.28**		**53.42**	**52.42**	**54.37**		**50.44**		**57.18**	**54.06**		
June 5-11	64.79		72.76	60.33	64.77		69.04		78.34	64.05	69.61	
June 12-18	66.41		73.64	64.33	66.99		70.35		78.62	68.64	71.86	
June 19-25	72.20		68.37	74.45	74.27		76.68		72.49	80.07	79.75	
June 26-July 2	73.98		75.41	76.91	73.45	77.89[g]	79.85		79.96	81.28	78.39	83.52[g]
Max Temp for June	**78.33**		**78.23**	**78.07**	**77.15**	**80.57**	**83.84**		**84.95**	**83.45**	**81.97**	**87.25**
Min of Max Temp for June	**57.38**		**63.85**	**54.37**	**57.71**	**71.28**	**58.82**		**65.78**	**59.95**	**62.11**	**76.21**
July 3-9	79.53		76.06	75.10	75.69	79.10	85.38		80.30	79.47	79.94	83.85
July 10-16	77.92		78.87	77.86	76.36	77.51	82.94		82.81	82.47	81.32	80.93
Max Temp for July	**83.47**		**81.06**	**81.88**	**78.40**	**83.50**	**88.90**		**86.62**	**86.10**	**83.62**	**89.34**
Min of Max Temp for July	**71.26**		**71.78**	**71.61**	**70.72**	**72.48**	**74.62**		**74.72**	**75.83**	**75.07[h]**	**75.27**
Sept. 1-7	69.85		73.77	68.69	69.89	70.26	74.41		77.00	71.32		73.04
Sept. 8-14	69.36		64.44	65.61	65.45	68.24	74.69		67.45	67.53		70.25
Sept. 15-21	68.15		63.53	61.49	63.30	59.52	72.91		66.49	63.62		61.36
Sept. 22-28	64.56		65.68	64.65	60.15	62.55	68.75		68.96	68.01		64.62
Sept. 29-Oct. 5	60.34		63.52	61.94	57.88	60.59	64.43		66.12	64.44		61.94
Max Temp for Sept.	**73.66**		**76.05**	**70.71**	**73.13**	**72.18**	**78.06**		**79.73**	**73.97**		**75.27**
Min of Max Temp for Sept.	**61.06**		**60.71**	**59.98**	**59.13**	**57.38**	**64.55**		**62.59**	**61.65**		**59.36**
Oct. 6-12	53.36		58.95	59.09	57.55	55.39	54.90		59.64	61.17		56.47
Oct. 13-19	53.56		55.08	56.24	57.84	54.56	55.67		56.55	57.74		55.47
Oct. 20-26	50.37		55.70	50.75	55.34[i]	51.41	51.67		57.50	51.24		51.71
Max Temp for Oct.	**62.49**		**64.43**	**61.40**	**59.70**	**61.35**	**66.59**		**66.66**	**63.94**		**62.50**
Min of Max Temp for Oct.	**47.62**		**50.63**	**48.51**	**53.25**	**49.28**	**49.59**		**52.15**	**47.66**		**48.99**

[a] Site was actually 1.5miles above Harvey Shaw Rd.
[b] No data before May 6th.
[c] No data before May 5th.
[d] No data before May 14th.
[e] No data before May 10th.
[f] No data before June 1st.
[g] No data before June 26th.
[h] No data after July 21st.
[i] No data after October 21st.

Table 4. Cont. Seven day average maximum temperatures from May 1st –July 16th and September 1st –November 2nd for the lower portions of the Touchet River, Walla Walla River, Mill Creek, and Dry Creek, 2001-2006 (listed from upstream to downstream for each stream). Shaded cells suggest thermal barriers to migration (>68ºF from Table 3)

	Touchet River @ Simms Rd.						**Touchet River @ WDFW Access**					
	2001	2002	2003	2004	2005	2006	2001	2002	2003	2004	2005	2006
May 1-7	53.72			63.44[c]							64.87[b]	
May 8-14	62.64		64.75[d]	62.69							65.02	
May 15-21	59.71		60.21	64.69							62.70	
May 22-28	74.23		70.80	62.25							68.92	
May29-June 4	69.09		73.24	64.27							72.66	
Max Temp for May	**77.06**		**75.14**	**67.50**							**78.46**	
Min of Max Temp for May	**50.18**		**57.05**	**56.90**							**58.55**	
June 5-11	70.30		78.90	64.58							69.72	
June 12-18	69.61		78.28	67.44							71.28	
June 19-25	75.88		72.51	78.70							78.33	
June 26-July 2	77.85		80.02	79.31							77.15	83.88[g]
Max Temp for June	**81.80**		**84.06**	**81.22**							**80.37**	**87.73**
Min of Max Temp for June	**60.80**		**67.07**	**59.73**							**66.93**	**79.20**
July 3-9	83.50		79.77	77.13							79.19	83.19
July 10-16	82.38		82.11	78.67							80.20	80.58
Max Temp for July	**86.75**		**85.05**	**82.51**							**81.33**	**87.73**
Min of Max Temp for July	**75.20**		**74.52**	**74.33**							**75.33**	**75.14**
Sept. 1-7	73.31		76.26	69.60							70.38	71.73
Sept. 8-14	72.08		66.54	66.75							67.43	69.38
Sept. 15-21	72.05		65.17	62.25							65.13	61.87
Sept. 22-28	67.06		67.78	64.18							60.92	63.64
Sept. 29-Oct. 5	61.94		65.16	61.77							59.17	61.68
Max Temp for Sept.	**76.44**		**78.90**	**74.03**							**73.79**	**74.52**
Min of Max Temp for Sept.	**62.79**		**63.01**	**60.87**							**59.98**	**60.45**
Oct. 6-12	54.27		59.79	59.73							59.41	55.19
Oct. 13-19	54.75		55.35	57.26							58.62[j]	55.27
Oct. 20-26	50.61		57.21	51.13								50.96
Max Temp for Oct.	**63.94**		**65.91**	**62.86**							**60.55**	**63.58**
Min of Max Temp for Oct.	**49.33**		**50.65**	**48.26**							**56.58**	**48.13**

[b] No data before May 6th.
[c] No data before May 5th.
[d] No data before May 14th.
[g] No data before June 26th.
[j] No data after October 17th.

Table 4. Cont. Seven day average maximum temperatures from May 1st –July 16th and September 1st –November 2nd for the lower portions of the Touchet River, Walla Walla River, Mill Creek, and Dry Creek, 2001-2006 (listed from upstream to downstream for each stream). Shaded cells suggest thermal barriers to migration (>68ºF from Table 3)

	Touchet River @ Cummins Bridge						**Walla Walla River @ Below Mojonnier Rd.**					
	2001	2002	2003	2004	2005	2006	2001	2002	2003	2004	2005[k]	2006[k]
May 1-7	54.64			65.03[c]	65.85[b]		53.54				58.88[b]	
May 8-14	61.43		66.35[d]	63.95	66.17		57.69		59.99[d]	53.37[e]	59.86	
May 15-21	59.60		61.98	65.96	64.41		57.42		55.61	55.54	57.23	
May 22-28	75.49		71.75	63.65	70.13		65.37		63.02	54.23	62.95	
May29-June 4	69.23		73.51	65.85	72.72		61.83		64.83	58.58	65.37	
Max Temp for May	**79.56**		**76.23**	**69.20**	**78.31**		**68.22**		**66.03**	**58.33**	**69.11**	
Min of Max Temp for May	**52.10**		**59.73**	**59.12**	**60.06**		**49.24**		**53.81**	**49.97**	**53.99**	
June 5-11	70.47		77.88	65.90	69.83		61.22	61.56[l]	70.13	57.35	63.16	
June 12-18	69.74		77.39	69.20	71.19		61.10	65.35	70.90	61.29	65.03	
June 19-25	75.54		71.60	79.89	77.50		66.40	66.47	65.67	70.15	70.64	
June 26-July 2	77.11		79.11	81.03	77.02	83.35[g]	70.81	69.05	71.26	72.88	70.42	73.88[g]
Max Temp for June	**80.19**		**83.21**	**83.11**	**80.54**	**86.17**	**72.39**	**70.57**	**74.35**	**73.53**	**73.91**	**76.64**
Min of Max Temp for June	**61.63**		**67.51**	**59.98**	**66.44**	**80.29**	**56.76**	**59.85**	**61.98**	**54.43**	**59.02**	**68.76**
July 3-9	82.60		78.02	78.69	78.45	82.40	73.68	69.36	72.40	71.89	72.40	73.96
July 10-16	81.13		79.95	80.02	78.86	79.12	73.71	74.68	75.11	73.68	73.57	74.14
Max Temp for July	**85.74**		**81.58**	**83.77**	**80.54**	**86.84**	**76.68**	**76.05**	**76.53**	**76.62**	**74.83**	**77.89**
Min of Max Temp for July	**72.74**		**73.75**	**76.14**	**75.80**	**76.84**	**67.64**	**65.59**	**67.49**	**69.91**	**69.11**	**69.35**
Sept. 1-7	71.97		73.38	70.05	67.58	71.32	66.64	65.89	69.33	65.31	66.41	67.05
Sept. 8-14	70.81		65.81	67.21	64.90	69.29	65.81	65.30	62.18	63.09	62.98	65.31
Sept. 15-21	71.05		63.95	63.32	62.82	61.37	65.48	62.33	61.08	59.89	61.38	59.98
Sept. 22-28	65.46		65.43	64.80	58.75	62.89	61.95	59.64	62.55	61.80	59.19	60.12
Sept. 29-Oct. 5	59.89		62.63	61.61	59.04	61.30	58.42	56.53	60.64	59.72	56.94	58.91
Max Temp for Sept.	**76.74**		**75.92**	**73.37**	**69.10**	**74.35**	**69.10**	**69.68**	**70.73**	**66.69**	**68.52**	**69.35**
Min of Max Temp for Sept.	**60.78**		**62.59**	**60.83**	**57.49**	**60.04**	**58.73**	**55.92**	**58.27**	**58.33**	**57.89**	**57.52**
Oct. 6-12	54.32		59.07	59.81	59.08	55.11	54.10	56.56	57.29	57.90	56.18	54.89
Oct. 13-19	54.68		54.07[m]	57.48	59.56	55.19	53.79	52.36	54.69	56.30	57.46	54.14
Oct. 20-26	50.86			50.58	58.91[i]	51.73	51.80	51.02	55.37	51.72	55.66[i]	51.83
Max Temp for Oct.	**61.63**		**63.45**	**61.96**	**60.92**	**62.88**	**60.15**	**59.28**	**61.69**	**60.34**	**59.31**	**59.51**
Min of Max Temp for Oct.	**47.91**		**50.80**	**47.17**	**57.49**	**48.30**	**50.37**	**46.72**	**51.02**	**49.69**	**54.27**	**50.27**

[b] No data before May 6th.
[c] No data before May 5th.
[d] No data before May 14th.
[e] No data before May 10th.
[g] No data before June 26th.
[i] No data after October 21st.
[k] Site was actually 0.1 miles above Mojonnier Rd.
[l] No data before June 10th.
[m] No data after October 16th.

Table 4. Cont. Seven day average maximum temperatures from May 1st –July 16th and September 1st –November 2nd for the lower portions of the Touchet River, Walla Walla River, Mill Creek, and Dry Creek, 2001-2006 (listed from upstream to downstream for each stream). Shaded cells suggest thermal barriers to migration (>68ºF from Table 3)

	Walla Walla River @ Swegle Rd.						**Walla Walla River @ 0.4 Miles Above Detour Rd.**					
	2001	2002	2003	2004	2005	2006	2001	2002	2003	2004	2005[n]	2006
May 1-7	54.50						54.76					
May 8-14	58.79		60.46[d]	53.90[e]			59.37		61.60[d]	57.33[e]		
May 15-21	58.39		56.31	56.21			59.13		57.77	59.99		
May 22-28	63.87		63.75	53.74			73.49		66.39	57.77		
May29-June 4	57.76		67.19	55.14	66.33[f]		68.33		69.64	60.89	67.92[f]	
Max Temp for May	**67.52**		**67.11**	**58.81**			**80.58**		**70.32**	**61.90**		
Min of Max Temp for May	**49.90**		**54.27**	**50.73**			**50.17**		**55.97**	**53.75**		
June 5-11	65.14		72.66	57.42	65.19		66.62	64.07[l]	73.82	60.74	66.90	
June 12-18	65.66	63.35[o]	72.62	61.55	67.13		66.87	69.67	73.69	63.23	68.86	
June 19-25	69.95	69.97	67.46	71.59	73.02	71.32[p]	71.44	72.51	68.46	73.89	74.95	72.49[p]
June 26-July 2	71.98	72.95	72.76	74.22	72.27	76.26	73.43	74.87	73.63	75.34	74.03	77.18
Max Temp for June	**74.71**	**75.52**	**76.13**	**75.82**	**75.20**	**78.84**	**75.88**	**77.66**	**77.05**	**77.04**	**77.44**	**79.89**
Min of Max Temp for June	**54.94**	**63.35**	**63.61**	**54.06**	**61.06**	**67.86**	**58.26**	**61.90**	**64.47**	**56.81**	**62.83**	**68.89**
July 3-9	74.94	71.06	73.70	72.84	73.54	75.98	76.64	72.71	74.44	73.38	75.48	76.55
July 10-16	74.31	76.50	76.00	74.43	74.42	75.71	75.25	78.06	76.69	74.92	75.93	76.86
Max Temp for July	**77.21**	**78.96**	**77.38**	**77.38**	**76.14**	**79.79**	**78.68**	**80.48**	**78.30**	**77.66**	**77.75**	**80.52**
Min of Max Temp for July	**68.11**	**67.43**	**68.85**	**71.26**	**70.36**	**70.81**	**69.22**	**68.85**	**69.73**	**71.53**	**72.21**	**72.16**
Sept. 1-7	66.11	65.60	70.26	66.18	66.05	67.43	67.30	67.07	70.80	65.69	66.89	67.90
Sept. 8-14	65.39	64.47	63.29	63.95	62.99	65.93	65.67	66.32	63.86	63.63	63.54	66.36
Sept. 15-21	65.19	62.12	61.39	60.84	61.07	59.38	65.60	63.26	62.42	60.52	61.65	59.92
Sept. 22-28	62.34	59.08	63.04	62.63	58.39	60.56	62.54	60.08	63.61	61.29	58.76	60.85
Sept. 29-Oct. 5	57.74	56.35	61.23	60.76	57.23	60.73	58.84	57.15	61.88	59.54	58.00	60.69
Max Temp for Sept.	**68.89**	**68.59**	**71.84**	**67.13**	**68.01**	**69.91**	**69.22**	**70.93**	**72.42**	**67.68**	**68.93**	**70.37**
Min of Max Temp for Sept.	**58.85**	**55.99**	**59.89**	**59.38**	**57.38**	**58.32**	**58.83**	**56.27**	**60.75**	**59.05**	**57.71**	**58.82**
Oct. 6-12	54.38	56.59	58.20	59.66	57.34	56.92	55.00	57.59	58.78	58.33	58.15	56.71
Oct. 13-19	54.42	52.09	55.59	58.22	58.26	56.08	55.32	52.96	56.12	56.93	58.10[j]	55.91
Oct. 20-26	51.91	51.68	56.31	53.35	62.83[i]	53.88	52.61	51.57	56.78	53.23		53.57
Max Temp for Oct.	**60.00**	**58.51**	**62.17**	**61.93**	**67.14**	**63.19**	**60.25**	**60.49**	**62.74**	**59.91**	**59.41**	**61.66**
Min of Max Temp for Oct.	**50.75**	**47.90**	**52.04**	**49.33**	**55.15**	**52.16**	**51.29**	**47.36**	**52.63**	**51.52**	**56.32**	**52.41**

[d] No data before May 14th.
[e] No data before May 10th.
[f] No data before June 1st.
[i] No data after October 21st.
[j] No data after October 17th.
[l] No data before June 10th.
[n] Site was actually at Detour Rd.
[o] No data before June 18th.
[p] No data before June 21st.

Table 4. Cont. Seven day average maximum temperatures from May 1st –July 16th and September 1st –November 2nd for the lower portions of the Touchet River, Walla Walla River, Mill Creek, and Dry Creek, 2001-2006 (listed from upstream to downstream for each stream). Shaded cells suggest thermal barriers to migration (>68ºF from Table 3)

	Walla Walla River @ McDonald Rd.						**Walla Walla River @ Touchet-Gardena Rd.**					
	2001	2002	2003	2004	2005	2006	2001	2002	2003	2004	2005	2006
May 1-7	55.23				63.60[b]		55.69			60.50[c]		
May 8-14	60.20		61.45[d]		63.65		61.65		62.27[d]	59.11		
May 15-21	59.73		58.05		59.72		61.87		59.30	60.03		
May 22-28	73.50		66.99		65.97		78.92[q]		68.16	57.48		
May29-June 4	69.03		67.11		71.50		74.49[q]		69.87	61.09	69.88[r]	
Max Temp for May	**76.78**		**70.76**		**74.97**		**82.45[q]**		**72.22**	**62.30**		
Min of Max Temp for May	**51.01**		**55.81**		**57.49**		**51.57[q]**		**56.59**	**55.53**		
June 5-11	66.45	65.74[l]	77.45		70.69		70.15	66.60[l]	75.60	62.05	70.92	
June 12-18	66.92	72.44	77.41		73.19		69.25	72.56	76.57	64.22	71.54	
June 19-25	68.63	75.62	71.79		78.54		74.71	75.48	71.07	78.06	78.57	
June 26-July 2	71.64	78.39	77.86		77.36	81.25[g]	74.11	77.87	78.63	80.88	77.92	82.84[g]
Max Temp for June	**73.68**	**81.55**	**81.28**		**80.61**	**84.61**	**79.89**	**80.44**	**81.89**	**82.57**	**81.60**	**84.84**
Min of Max Temp for June	**60.53**	**63.41**	**61.17**		**66.94**	**73.52**	**61.93**	**64.42**	**66.62**	**56.64**	**65.48**	**80.29**
July 3-9	75.46	76.48	79.34	74.52[s]	79.17	82.33	78.59	75.02	76.35	78.61	79.65	83.55
July 10-16	74.57	82.96	81.75	79.03	79.89	80.95	78.61	82.00	81.45	79.30	80.69	79.86
Max Temp for July	**78.97**	**85.50**	**84.55**	**82.07**	**81.25**	**85.94**	**80.84**	**86.35**	**84.18**	**82.25**	**82.25**	**95.70**
Min of Max Temp for July	**71.28**	**72.81**	**74.38**	**74.52**	**75.59**	**75.68[t]**	**72.16**	**69.08**	**74.05**	**75.30**	**76.55**	**74.35**
Sept. 1-7	68.99	71.16	74.84	69.97	71.44		69.45	68.36	72.88	69.84	69.28	69.39
Sept. 8-14	68.57	70.38	65.95	67.53	67.53		67.50	68.00	65.53	67.03	66.45	67.58
Sept. 15-21	67.03	67.02	65.49	63.75	66.07		68.44	65.54	63.71	62.84	64.69	60.61[u]
Sept. 22-28	65.16	63.34	66.44	64.99	63.17		65.06	61.11	63.91	64.49	60.76	
Sept. 29-Oct. 5	62.72	59.26	64.15	63.96	60.60		60.15	57.27	61.94	61.66	59.22	
Max Temp for Sept.	**70.08**	**75.57**	**76.87**	**74.21**	**74.35**		**71.68**	**71.77**	**74.97**	**73.76**	**71.66**	**71.92**
Min of Max Temp for Sept.	**62.80**	**57.72**	**61.73**	**61.58**	**61.17**		**61.36**	**56.19**	**61.98**	**61.17**	**59.74**	**58.84**
Oct. 6-12	57.42	60.97	60.42	61.71	61.46		54.58	56.92	59.75	59.87	58.80	
Oct. 13-19	57.70	56.33	57.25	59.92	62.44		55.10	49.62	55.84	57.35	59.25	
Oct. 20-26	54.55	54.30	58.58	54.59	59.76[i]		52.16	49.75	57.12	51.81	62.62[i]	
Max Temp for Oct.	**63.66**	**63.99**	**65.48**	**64.45**	**64.61**		**61.93**	**59.87**	**61.98**	**62.30**	**66.07**	
Min of Max Temp for Oct.	**52.40**	**50.49**	**52.73**	**53.43**	**57.49**		**49.04**	**44.51**	**53.53**	**49.38**	**57.19**	

[b] No data before May 6th.
[c] No data before May 5th.
[d] No data before May 14th.
[g] No data before June 26th.
[i] No data after October 21st.
[l] No data before June 10th.
[q] Logger was found dry on June 4th and appears to have been dry since May 22nd.
[r] No data before June 2nd.
[s] No data before July 9th.
[t] No data after July 20th.
[u] No data after September 19th.

Table 4. Cont. Seven day average maximum temperatures from May 1st –July 16th and September 1st –November 2nd for the lower portions of the Touchet River, Walla Walla River, Mill Creek, and Dry Creek, 2001-2006 (listed from upstream to downstream for each stream). Shaded cells suggest thermal barriers to migration (>68ºF from Table 3)

	Walla Walla River @ Byerley Bridge						**Walla Walla River @ RV Park**					
	2001	2002	2003	2004	2005	2006	2001	2002	2003	2004	2005	2006
May 1-7					65.13[b]						65.12[b]	
May 8-14			61.70[d]		64.74						66.13	
May 15-21			58.45		62.20						62.37	
May 22-28			68.53		66.00						67.21	
May29-June 4			72.29		71.33						70.75	
Max Temp for May			**72.87**		**77.08**						**75.90**	
Min of Max Temp for May			**56.03**		**58.28**						**58.21**	
June 5-11			76.46		69.77						69.02	
June 12-18			76.41		70.25						71.43	
June 19-25			70.00		76.15						77.29	
June 26-July 2	77.35[v]		77.99		75.55	82.03[g]					76.80	83.40[g]
Max Temp for June	**78.28**		**81.01**		**78.01**	**84.47**					**79.35**	**86.08**
Min of Max Temp for June	**74.55**		**65.16**		**66.59**	**79.58**					**65.99**	**80.85**
July 3-9	80.58		77.53		79.55	79.04					78.27	81.46
July 10-16	79.07		81.99		78.56	78.25					79.04	78.78
Max Temp for July	**83.38**		**84.61**		**82.14**	**74.14**					**79.99**	**86.08**
Min of Max Temp for July	**72.43**		**73.79**		**73.99**	**72.39**					**75.27**	**76.15[t]**
Sept. 1-7	73.24		76.86		70.81	71.99					70.19	
Sept. 8-14	73.48		65.54		66.92	69.57					67.25	
Sept. 15-21	73.75		64.13		64.93	61.58					64.95	
Sept. 22-28	68.38		66.84		61.89	62.32					61.60	
Sept. 29-Oct. 5	61.94		64.29		59.60	62.28					60.05	
Max Temp for Sept.	**78.28**		**79.73**		**74.29**	**74.86**					**73.41**	
Min of Max Temp for Sept.	**61.65**		**61.41**		**59.98**	**60.06**					**60.50**	
Oct. 6-12	55.49		59.60		59.90	57.66					59.65	
Oct. 13-19	55.73		55.07		60.74	55.56					59.36	
Oct. 20-26	52.12		57.49		59.56[i]	51.54					59.36[i]	
Max Temp for Oct.	**63.94**		**65.46**		**61.69**	**64.38**					**61.93**	
Min of Max Temp for Oct.	**48.77**		**52.39**		**57.72**	**49.04**					**58.50**	

[b] No data before May 6th.
[d] No data before May 14th.
[g] No data before June 26th.
[i] No data after October 21st.
[t] No data after July 20th.
[v] No data before June 28th.

Table 4. Cont. Seven day average maximum temperatures from May 1st –July 16th and September 1st –November 2nd for the lower portions of the Touchet River, Walla Walla River, Mill Creek, and Dry Creek, 2001-2006 (listed from upstream to downstream for each stream). Shaded cells suggest thermal barriers to migration (>68ºF from Table 3)

	Mill Creek @ Five Mile Rd.						**Mill Creek @ Above Cold Return**					
	2001	2002	2003	2004	2005	2006	2001	2002	2003	2004	2005	2006
May 1-7					56.62[b]					57.34[c]		
May 8-14			57.14[d]	54.37[e]	57.74				58.33[d]	55.91		
May 15-21			54.08	55.51	55.13				55.03	56.11		
May 22-28			61.92	53.56	61.58				63.30	53.87		
May29-June 4			63.18	57.21	63.38			60.56[w]	65.20	57.61	64.78[f]	
Max Temp for May			**65.40**	**59.35**	**67.05**			**60.59**	**67.28**	**60.16**		
Min of Max Temp for May			**50.47**	**49.86**	**51.47**			**58.31**	**51.65**	**50.09**		
June 5-11			67.90	55.75	61.58			58.84	70.64	56.27	64.40	
June 12-18			68.65	59.81	62.59			66.90	71.85	60.42	66.12	
June 19-25	67.88[x]		63.61	67.78	68.04	68.34[p]		70.09	66.00	69.77	71.72	
June 26-July 2	70.09		69.49	70.34	67.56	71.79		71.96	72.59	73.31	71.71	75.51[g]
Max Temp for June	**72.59**		**71.57**	**71.23**	**70.88**	**74.06**		**75.29**	**75.38**	**73.91**	**75.23**	**78.32**
Min of Max Temp for June	**60.34**		**59.11**	**52.09**	**57.03**	**66.35**		**52.73**	**60.62**	**52.04**	**59.68**	**68.01**
July 3-9	73.51		70.25	69.53	69.36	71.92	74.49[y]	71.37	73.02	72.70	73.54	76.39
July 10-16	71.72		72.08	71.28	70.55	71.83	73.47	78.74	75.16	74.50	74.54	76.69
Max Temp for July	**75.97**		**73.66**	**73.33**	**72.38**	**75.29**	**77.62**	**80.95**	**76.94**	**77.02**	**76.16**	**80.53**
Min of Max Temp for July	**64.34**		**67.15**	**68.27**	**65.89**	**68.68**	**66.19[z]**	**67.81**	**69.91**	**70.90**	**69.49**	**71.87**
Sept. 1-7	65.97	64.32[aa]	66.89	64.20	64.35	64.94		67.19	74.02	66.16	68.33	69.53
Sept. 8-14	65.27	64.43	61.05	62.04	61.24	63.65		67.77	64.00	63.52	64.80	67.15
Sept. 15-21	64.69	61.19	60.00	58.46	58.84	57.60		63.57	63.67	59.39	62.21	59.30[ab]
Sept. 22-28	61.89	59.15	61.21	60.85	56.52	58.84		61.44	65.64	62.68	60.21	
Sept. 29-Oct. 5	59.49	55.21	59.79	58.86	55.05	57.64		56.64	63.65	60.45	57.46	
Max Temp for Sept.	**68.43**	**68.00**	**68.31**	**65.36**	**66.18**	**66.35**		**71.65**	**76.00**	**67.66**	**70.99**	**71.57**
Min of Max Temp for Sept.	**59.77**	**54.89**	**57.70**	**57.37**	**55.64**	**55.81**		**56.09**	**59.19**	**57.89**	**58.82**	**56.85**
Oct. 6-12	53.17	54.96	56.43	56.86	54.01	54.05		56.64	59.63	57.74	56.90	
Oct. 13-19	53.17	51.78	53.77	54.87	54.20[j]	53.01		53.01	54.90	55.34	57.10	
Oct. 20-26	50.73	49.95	54.40	50.46		50.75		51.18	56.69	50.29	62.16[i]	
Max Temp for Oct.	**60.63**	**57.66**	**60.24**	**58.78**	**56.75**	**58.03**		**59.45**	**64.06**	**59.88**	**67.45**	
Min of Max Temp for Oct.	**49.41**	**46.53**	**50.75**	**49.30**	**52.86**	**44.39**		**47.16**	**49.69**	**48.69**	**55.48**	

[b] No data before May 6th.
[c] No data before May 5th.
[d] No data before May 14th.
[e] No data before May 10th.
[f] No data before June 1st.
[g] No data before June 26th.
[i] No data after October 21st.
[j] No data after October 17th.
[p] No data before June 21st.
[w] No data before May 29th.
[x] No data before June 20th.
[y] No data before July 3rd.
[z] No data after July 31st.
[aa] No data before August 7th.
[ab] No data after September 20th.

Table 4. Cont. Seven day average maximum temperatures from May 1st –July 16th and September 1st –November 2nd for the lower portions of the Touchet River, Walla Walla River, Mill Creek, and Dry Creek, 2001-2006 (listed from upstream to downstream for each stream). Shaded cells suggest thermal barriers to migration (>68ºF from Table 3)

	Mill Creek @ In Cold Return						**Mill Creek @ Below Cold Return**					
	2001	2002	2003	2004	2005	2006	2001	2002	2003	2004	2005	2006
May 1-7				49.87[c]						56.71[c]		
May 8-14			49.78[d]	49.05					57.43[d]	55.74		
May 15-21			50.14	49.44					54.73	55.85		
May 22-28			51.54	50.09					61.37	54.22		
May29-June 4		59.14[w]	52.22	50.09				50.57[w]	62.23	56.99	59.21[f]	
Max Temp for May		**60.03**	**52.57**	**51.09**				**55.55**	**65.14**	**60.47**		
Min of Max Temp for May		**57.75**	**48.94**	**46.63**				**49.41**	**51.59**	**50.69**		
June 5-11		58.11	54.93	50.49				50.01	69.95	55.70	62.29	
June 12-18		65.85	54.29	52.12				52.32	71.66	60.32	65.14	
June 19-25		68.52	53.17	54.25				54.27	65.55	69.20	70.73	
June 26-July 2		70.34	54.17	59.89		55.54[g]		55.71	72.39	71.58	71.06	74.03[g]
Max Temp for June		**74.11**	**59.59**	**70.75**		**56.30**		**58.90**	**74.94**	**72.72**	**74.84**	**77.13**
Min of Max Temp for June		**52.45**	**51.46**	**47.74**		**54.35**		**48.29**	**57.99**	**52.35**	**55.35**	**65.44**
July 3-9	55.79[y]	69.92	54.25	56.89		59.05	61.38[y]	54.91	73.33	71.14	72.93	75.21
July 10-16	55.51	76.57	56.16	56.13		57.57	62.20	65.96	75.44	73.45	73.98	75.27
Max Temp for July	**56.66**	**80.07**	**57.31**	**65.48**		**68.90**	**65.40**	**74.76**	**77.13**	**77.05**	**75.46**	**79.96**
Min of Max Temp for July	**53.87**	**66.67**	**53.97[ac]**	**54.42**		**55.74**	**58.82**	**53.87**	**69.82**	**67.97**	**68.80**	**70.71**
Sept. 1-7	57.03	55.23		56.67		56.35	66.36	66.42	69.28	66.35	67.52	68.40
Sept. 8-14	57.81	53.35		55.29		55.59	65.57	66.46	62.47	63.99	62.84	66.40
Sept. 15-21	55.47	53.83		54.49		52.01	65.20	62.24	61.53	59.94	60.09	58.54[ab]
Sept. 22-28	52.68	52.00		53.13		51.58	60.66	60.03	52.88	63.36	59.55	
Sept. 29-Oct. 5	50.69	50.37		51.66		51.34	56.78	55.20	61.12	61.20	57.02	
Max Temp for Sept.	**66.10**	**56.93**		**57.31**		**61.66**	**68.89**	**71.09**	**71.31**	**68.26**	**70.29**	**70.41**
Min of Max Temp for Sept.	**49.97**	**51.09**		**52.29**		**50.46**	**56.86**	**54.96**	**59.12**	**58.47**	**57.85**	**56.33**
Oct. 6-12	48.66	50.85		51.46		50.26	52.06	55.92	57.21	58.56	56.58	
Oct. 13-19	47.42	48.45		50.38		48.70	51.35	52.45	54.45	55.65	56.78	
Oct. 20-26	46.07	46.71		48.42		47.59	49.55	49.50	55.09	50.85	60.20[i]	
Max Temp for Oct.	**51.09**	**51.65**		**52.29**		**51.30**	**57.70**	**59.17**	**61.98**	**60.75**	**65.89**	
Min of Max Temp for Oct.	**45.24**	**43.56**		**47.55**		**45.46**	**48.79**	**45.75**	**51.03**	**48.73**	**54.51**	

[c] No data before May 5th.
[d] No data before May 14th.
[f] No data before June 1st.
[g] No data before June 26th.
[i] No data after October 21st.
[w] No data before May 29th.
[y] No data before July 3rd.
[ab] No data after September 20th.
[ac] No data after July 22nd.

Table 4. Cont. Seven day average maximum temperatures from May 1st –July 16th and September 1st –November 2nd for the lower portions of the Touchet River, Walla Walla River, Mill Creek, and Dry Creek, 2001-2006 (listed from upstream to downstream for each stream). Shaded cells suggest thermal barriers to migration (>68ºF from Table 3)

	Mill Creek @ Tausick Way Bridge						**Mill Creek @ 9th Avenue**					
	2001	2002	2003	2004	2005	2006	2001	2002	2003	2004	2005	2006
May 1-7				59.20[c]								
May 8-14			59.27[d]	58.21					61.17[d]	60.35[e]		
May 15-21			55.75	58.12					59.11	61.74		
May 22-28			64.53	55.19					71.06	57.63		
May29-June 4		62.37[w]	67.61	59.20	66.11[f]				73.25	62.45	69.30[r]	
Max Temp for May		**61.90**	**68.51**	**62.81**					**75.97**	**68.08**		
Min of Max Temp for May		**59.61**	**52.55**	**51.57**					**54.10**	**52.45**		
June 5-11		67.00	76.10	58.01	65.18			72.61[ad]	75.58	61.07	68.13	
June 12-18	66.62[ae]	83.83	77.10	62.47	67.16			74.78	75.06	66.56	69.62	
June 19-25	69.73	77.26	73.08	73.90	73.32			77.15	68.08	80.01	74.15	
June 26-July 2	71.73	75.84	84.92	77.06	72.38	81.10[g]		75.42	73.70	76.40	72.89	77.03[g]
Max Temp for June	**74.78**	**93.00**	**89.55**	**77.11**	**76.12**	**84.80**		**80.69**	**78.79**	**82.88**	**77.21**	**80.62**
Min of Max Temp for June	**61.57**	**56.25**	**65.59**	**53.24**	**60.78**	**74.92**		**67.89**	**62.03**	**55.24**	**63.15**	**67.50**
July 3-9	75.63	74.09	83.04	77.06	74.89	80.52	78.27[af]	73.08	75.58	73.14	73.89	76.37
July 10-16	75.22	83.90	83.79	79.14	76.98	79.76	74.96	77.56	76.77	75.39	74.69	75.13
Max Temp for July	**79.44**	**88.43**	**86.44**	**82.17**	**78.93**	**85.80**	**80.53**	**81.65**	**79.42**	**77.78**	**76.27**	**79.98**
Min of Max Temp for July	**68.50**	**70.02**	**78.91**	**75.86**	**71.84**	**75.23**	**67.74[ag]**	**69.05**	**69.30**	**71.03**	**69.87**	**69.84**
Sept. 1-7	71.57	70.52	74.02	68.87	68.66	72.76		68.53	71.02	66.69	68.62	70.61
Sept. 8-14	71.12	72.39	65.44	66.63	64.96	69.60		69.52	63.55	65.55	66.11	67.92
Sept. 15-21	70.93	68.90	64.98	62.78	62.90	60.39[ab]		65.31	62.77	62.49	64.36	61.64
Sept. 22-28	66.84	67.55	67.39	66.87	61.51			63.49	65.25	66.05	62.66	65.76
Sept. 29-Oct. 5	63.12	60.43	65.22	64.26	58.72			59.66	63.14	63.89	59.90	64.02
Max Temp for Sept.	**75.09**	**75.47**	**76.09**	**70.39**	**69.75**	**76.16**		**72.61**	**72.90**	**69.54**	**71.07**	**72.23**
Min of Max Temp for Sept.	**63.85**	**57.92**	**60.69**	**61.10**	**59.93**	**57.69**		**57.28**	**59.74**	**60.01**	**61.15**	**60.01**
Oct. 6-12	55.46	61.72	60.16	62.16	58.42			60.00	59.06	61.96	59.76	59.72
Oct. 13-19	55.78	57.56	56.66	59.25	58.26			57.17	58.17	59.90	60.46	59.20
Oct. 20-26	53.08	54.27	57.85	51.33	60.79[i]			54.58	59.34	53.49	61.88[i]	56.11
Max Temp for Oct.	**65.01**	**65.64**	**66.18**	**64.83**	**64.21**			**63.24**	**64.62**	**64.30**	**64.02**	**64.59**
Min of Max Temp for Oct.	**51.22**	**47.34**	**52.55**	**49.61**	**56.27**			**48.65**	**54.39**	**52.17**	**56.62**	**54.96**

[c] No data before May 5th.
[d] No data before May 14th.
[e] No data before May 10th.
[f] No data before June 1st.
[g] No data before June 26th.
[i] No data after October 21st.
[r] No data before June 2nd.
[w] No data before May 29th.
[ab] No data after September 20th.
[ad] No data before June 11th.
[ae] No data before June 15th.
[af] No data before July 5th.
[ag] No data after August 15th.

Table 4. Cont. Seven day average maximum temperatures from May 1st –July 16th and September 1st –November 2nd for the lower portions of the Touchet River, Walla Walla River, Mill Creek, and Dry Creek, 2001-2006 (listed from upstream to downstream for each stream). Shaded cells suggest thermal barriers to migration (>68ºF from Table 3)

	Mill Creek @ Gose Street						**Mill Creek @ Swegle Rd.**					
	2001	2002	2003	2004	2005	2006	2001	2002	2003	2004	2005	2006
May 1-7				63.40[c]						61.31	63.80[b]	
May 8-14			62.31[d]	62.81					62.00[d]	60.32	63.59	
May 15-21			59.39	63.08					58.61	61.65	61.57	
May 22-28			69.81	58.19					67.97	58.62	66.42	
May29-June 4			71.16	63.19	68.75[f]			64.58	69.56	61.87	70.14	
Max Temp for May			**73.45**	**67.47**				**65.03**	**72.23**	**63.12**	**73.99**	
Min of Max Temp for May			**56.09**	**54.62**				**63.01**	**56.64**	**55.50**	**58.79**	
June 5-11			76.06	61.79	67.73			62.91	63.08	61.31	66.64	
June 12-18	70.25[ae]	67.65[o]	74.38	66.98	67.83		68.52[ae]	71.59	67.99	64.42	67.81	
June 19-25	72.83	78.29	68.37	78.88	70.19		70.10	73.83	65.67	74.59	71.67	72.29[p]
June 26-July 2	74.00	78.72	72.82	81.81	70.94	80.53[g]	72.47	75.21	66.38	76.01	71.72	75.15
Max Temp for June	**78.61**	**84.36**	**78.42**	**83.21**	**73.97**	**83.12**	**75.27**	**77.92**	**71.63**	**77.44**	**73.68**	**76.17**
Min of Max Temp for June	**66.19**	**67.65**	**65.19**	**56.30**	**63.64**	**73.36**	**65.16**	**57.33**	**60.59**	**56.88**	**63.94**	**70.66**
July 3-9	78.19[ah]	74.44	71.69	78.77	71.86	80.67	76.53	73.26	67.83	73.85	73.25	75.81
July 10-16	76.03[ah]	80.76	72.85	78.13	72.29	78.02	75.61	78.77	75.14	74.17	74.00	74.75
Max Temp for July	**80.51**	**84.36**	**74.06**	**83.21**	**73.66**	**85.43**	**78.40**	**80.44**	**75.90**	**76.82**	**74.92**	**78.67**
Min of Max Temp for July	**70.30**	**69.40[ai]**	**69.56**	**75.89**	**69.17**	**73.06**	**71.33**	**70.28**	**65.46**	**72.21**	**72.48**	**72.15**
Sept. 1-7	68.87		66.94	72.00	69.26	61.89	68.71	72.08	69.42	67.22	66.77	67.62
Sept. 8-14	68.02		67.86	69.07	67.63	62.13	67.04	71.27	65.84	65.07	63.98	66.87
Sept. 15-21	67.82		69.07	66.97	66.23	61.76[u]	67.25	68.73	64.01	62.43	62.67	62.12[u]
Sept. 22-28	65.94		70.11	70.97	64.34		64.34	66.89	64.09	62.92	60.13	
Sept. 29-Oct. 5	63.08		67.48	68.39	61.77		60.62	60.45	62.37	61.17	59.07	
Max Temp for Sept.	**70.00**		**71.35**	**73.73**	**70.96**	**63.07**	**70.13**	**74.19**	**70.13**	**68.35**	**68.60**	**68.88**
Min of Max Temp for Sept.	**63.86**		**63.74**	**65.42**	**63.64**	**61.35**	**61.43**	**60.45**	**62.58**	**61.41**	**59.07**	**61.04**
Oct. 6-12	59.08		63.35	66.34	61.72		56.62	59.20	60.30	59.58	58.71	
Oct. 13-19	60.22		61.06	63.09	61.60		56.98	54.56	57.80	58.01	59.07	
Oct. 20-26	57.75		63.56	54.14	62.50[i]		55.44	52.69	58.09	53.91	58.51[i]	
Max Temp for Oct.	**64.44**		**68.68**	**68.64**	**63.93**		**61.99**	**61.58**	**62.86**	**61.12**	**59.93**	
Min of Max Temp for Oct.	**55.36**		**55.54**	**52.38**	**59.64**		**54.40**	**48.70**	**54.98**	**51.88**	**57.38**	

[b] No data before May 6th.
[c] No data before May 5th.
[d] No data before May 14th.
[f] No data before June 1st.
[g] No data before June 26th.
[i] No data after October 21st.
[o] No data before June 18th.
[p] No data before June 21st.
[u] No data after September 19th.
[ae] No data before June 15th.
[ah] No data from July 6th to July 10th because of logger malfunction.
[ai] No data after July 23rd.

Table 4. Cont. Seven day average maximum temperatures from May 1st –July 16th and September 1st –November 2nd for the lower portions of the Touchet River, Walla Walla River, Mill Creek, and Dry Creek, 2001-2006 (listed from upstream to downstream for each stream). Shaded cells suggest thermal barriers to migration (>68ºF from Table 3)

	Dry Creek @ Lower Waitsburg Rd.						**Dry Creek @ Talbott Rd.**					
	2001	2002	2003	2004	2005	2006	2001	2002	2003	2004	2005	2006
May 1-7	52.26			59.71[c]			55.75					
May 8-14	59.01			57.82			63.32					
May 15-21	56.36		57.87[aj]	57.77			60.54		59.30[aj]			
May 22-28	66.78		66.72	56.09			71.93		68.23			
May29-June 4	64.02	65.95[w]	67.22	58.21	63.13[r]		65.93	69.31[w]	68.82		68.01[f]	
Max Temp for May	**70.13**	**67.78**	**70.36**	**61.41**			**75.16**	**69.68**	**71.91**			
Min of Max Temp for May	**47.95**	**65.44**	**56.00**	**52.43**			**51.21**	**68.79**	**57.41**			
June 5-11	63.90	60.44	69.90	58.12	62.56		66.89	64.40	71.49		67.82	
June 12-18	63.64	68.46	68.97	59.84	64.40		64.94	71.53	72.69		68.56	
June 19-25	69.15	69.09	63.54	70.63	69.87		70.30	72.36	87.87[ak]		74.56	
June 26-July 2	70.19	70.69	69.19	72.61	70.19	74.76[g]	69.70	74.13	95.98[ak]		73.10	79.83[g]
Max Temp for June	**74.04**	**74.03**	**72.16**	**74.64**	**72.83**	**77.33**	**73.93**	**77.61**	**100.72[ak]**		**77.09**	**81.10**
Min of Max Temp for June	**56.87**	**53.83**	**59.93**	**53.27**	**57.41**	**71.20**	**59.89**	**57.59**	**67.76[ak]**		**62.21**	**77.61**
July 3-9	73.67	67.83	68.71	70.18	71.62	73.73	74.78	69.79	96.63[ak]	71.87[s]	75.44	77.38
July 10-16	73.00	74.80	70.92	71.08	72.14	72.06	76.06	75.83	75.31[ak]	74.31	75.85	74.19
Max Temp for July	**76.22**	**77.76**	**72.76**	**74.64**	**74.04**	**78.27**	**77.98**	**79.17**	**99.94[ak]**	**77.08**	**77.40**	**83.71**
Min of Max Temp for July	**67.20**	**64.57**	**66.26**	**67.78**	**68.64**	**69.40**	**72.12**	**66.76**	**72.51[ak]**	**71.87**	**72.17**	**72.04**
Sept. 1-7	63.80	61.54	64.56	63.30	61.60	62.36	66.30	62.43	65.76	63.57	65.56	64.05
Sept. 8-14	60.72	58.85	60.54	61.87	58.91	60.96	61.88	59.29	61.39	61.64	61.93	62.72
Sept. 15-21	61.62	58.33	57.83	57.77	57.26	55.81[u]	63.48	59.53	57.73	58.58	60.33	56.27[u]
Sept. 22-28	59.33	53.91	58.47	59.30	53.87		59.44	52.58	56.69	57.60	55.59	
Sept. 29-Oct. 5	54.81	52.63	57.03	56.94	54.94		54.63	51.98	55.02	54.82	55.51	
Max Temp for Sept.	**67.20**	**64.57**	**65.97**	**66.32**	**62.54**	**64.74**	**69.42**	**65.30**	**67.47**	**67.46**	**68.88**	**66.72**
Min of Max Temp for Sept.	**55.49**	**52.43**	**56.28**	**55.77**	**52.95**	**55.37**	**56.22**	**61.47**	**55.18**	**56.05**	**54.32**	**55.26**
Oct. 6-12	51.22	52.51	55.44	55.17	54.63		49.88	51.63	54.58	53.94	54.88	
Oct. 13-19	51.50	45.51	52.30	53.91	55.31		51.37	43.24	51.19	53.02	54.72	
Oct. 20-26	48.94	45.86	53.93	48.69	53.35[i]		49.57	44.06	52.71	49.76	60.71[i]	
Max Temp for Oct.	**56.60**	**55.50**	**58.50**	**57.44**	**56.85**		**54.27**	**55.09**	**57.41**	**56.05**	**66.26**	
Min of Max Temp for Oct.	**47.12**	**39.59**	**47.93**	**46.03**	**51.28**		**47.58**	**37.78**	**46.53**	**46.30**	**54.04**	

[c] No data before May 5th.
[f] No data before June 1st.
[g] No data before June 26th.
[i] No data after October 21st.
[r] No data before June 2nd.
[s] No data before July 9th.
[u] No data after September 19th.
[w] No data before May 29th.
[aj] No data before May 19th.
[ak] Logger was found dry on July 10th and appears to have been dry since June 19th.

Limiting Factors Identification

A number of barriers or impediments to salmonid migration and rearing have been identified by this project since 1998 (Mendel et al. 1999, 2000, 2001, 2002, 2003b, 2004, 2005). A portion of those barriers were physical (e.g. structures or dewatered streambeds) that physically blocked salmonid movement (see Mendel et al. 2003b and Table 5), others were physiological barriers or limiting factors (e.g. temperature, sediment, etc. and Table 4). WDFW personnel found several physical barriers in 2006. WDFW, with the assistance of other managers in the basin, has compiled a list of barriers/potential barriers that have been documented since 1996. The list includes any barriers that have been removed or fixed, and a priority ranking that will help managers prioritize projects to eliminate these barriers (Table 5). Physiological barriers and impediments to salmonid migration and rearing were extensive in terms of stream miles affected. The primary physiological factor affecting fish in the Walla Walla Subbasin was water temperature. High water temperatures possibly represent the most critical physiological barrier to salmonids, particularly for migration or rearing. Seasonal temperature related barriers for salmonids generally occur in lower areas of the Touchet River, Mill Creek, Dry 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, adult steelhead and spring chinook in the 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.

Low stream flows often prevent steelhead from ascending the lower Walla Walla and Touchet Rivers until November or later in some years. Diversion of up to 100 cfs is usually initiated by Gardena Farms Irrigation District at Bulingame Diversion about the first of October each year. This large diversion may affect bull trout and steelhead migration each fall. Manual flows collected in 2006 at McDonald Road Bridge were the lowest we have seen since 2000 (Appendix B).

Table 5. Draft list of actual and potential physical barriers (culverts, dams, falls, fords, and frequent temporary dams) since 1996. This list does not include dewatered reaches, temperature barriers, etc.						
Stream/Location	**River Mile**	**GPS Location**	**Barrier Type**	**Degree of Barrier**	**Modified/Improved (Year)**	**Priority for Repair[a]**
Touchet River Watershed						
North Fork Touchet						
Ski Bluewood Culvert	19.6	N46.0910734 W117.8533349	Culvert	Partial		Medium
Culvert Just Above Corral Creek	19.3	N46.0933921 W117.8473160	Culvert	Partial		Medium
Recreational Dams on USFS and Below			Temporary Dam	Partial		Medium
Corral Creek						
Trail Crossing/Fords			Stream Fords	Complete		Medium
Spangler Creek Tributary						
Road Crossing	0.0	N46.1436000 W117.7948408	Culvert	Complete		Low
Lewis Creek						
Dam Near Mouth	0.0	N46.1906627 W117.8239945	Dam	None	Modified For Passage (2000?)	Medium
Ireland Gulch						
Culvert and Pond			Culvert and Pond	Complete		Low
Jim Creek						
Culverts and Pond			Culvert and Pond	None	Passage Improved (2005)	None
Culvert Near Mouth	0.1	N46.2312577 W117.8496879	Culvert	Partial		Low
Wolf Fork						
12 Stream Fords on Private Road—Upper Creek	8.1-12.2	N46.1751792 W117.8651099 to N46.1227209 W117.8799144	Stream Fords	Partial		High
Failing Bridges	8.1, 8.9, 9.2	N46.1751792 W117.8651099 to N46.1661743 W117.8729530	Stream Fords	Potential?		Medium
Whitney Creek						
Upper Culvert	1.3	N46.1650113 W117.8577694	Culvert	Partial		Medium
Robinson Fork						
Stream Fords			Stream Fords	Partial		Low
Unscreened Pond on Tributary		N46.1592031 W117.9023817	Pond	Complete		Low
Green Fork						
Stream Fords and Failing Bridges			Stream Fords and Failing Bridges	Partial		Low
South Fork Touchet						
Recreational Dam ~0.1 Miles Below Burnt Fork Mouth	15.7	N46.1086292 W117.9825146	Temporary Dam	Partial		Low
Upper Stream Fords			Stream Fords	Partial		Low
Recreational Dam at Camp Nancy Lee	8.3	N46.1994574 W117.9557127	Temporary Dam	Partial		Medium
Griffen Fork						
Collapsed Bridge			Collapsed Bridge	Partial	Removed by CTUIR when?	None
Touchet River						
Dayton Dam	63.6	N46.3114160 W117.9722464	Fish Pond Diversion	Partial		High
Push-up Berms	63.3		Irrigation Diversion	Partial		Medium
Recreational Dam at Golf Course			Temporary Dam	Partial		Medium
Bedrock Falls	47.5	N46.2765199 W118.2286699[a]	Falls	Partial		Medium
Maiden Dam			Dam	None	Removed (1998)	None

[a] Criteria for priority ranking is based on the following: 1) is barrier located in a priority area, 2) does barrier affect many different focal species, 3) does barrier affect large numbers of individuals in a single focal species, and 4) is it important to fix for high fish benefits.

Table 5. Cont. Draft list of actual and potential physical barriers (culverts, dams, falls, fords, and frequent temporary dams) since 1996. This list does not include dewatered reaches, temperature barriers, etc.						
Stream/Location	**River Mile**	**GPS Location**	**Barrier Type**	**Degree of Barrier**	**Modified/Improved (Year)**	**Priority for Repair[a]**
Touchet River Watershed (Cont.)						
Touchet River						
Hofer Dam	5.1	N46.0847595 W118.6583856	Irrigation Diversion and Dam	None	New Ladder and Screen (2006)	None
Hofer Dam Siphon	3.7		Irrigation Pipe/Dam	None	Barrier Removed (2006)	None
Lower Railroad Bridge	0.75	N46.0412209 W118.6843162	Concrete Apron	Partial		Medium
Patit Creek						
Old Irrigation Dam Below Patit Creek Road Bridge			Dam	None	Removed (2001)	None
Whiskey Creek						
Bedrock Falls (2 sets)	4.1 & 6.2	N46.21026 W118.06393	Falls	Partial		Low
Culvert at Mouth of Alyward Trib	6.1	N46.2175736 W118.0661392	Culvert	Partial		Low
Dam Near Mouth			Dam	None	Removed (2000?)	None
South Fork Coppei Creek						
Stream Fords Above Barnes Creek	6.2 Upstream		Stream Fords	Partial		Low
Lower Barnes Creek Road Culvert			Culvert	Partial		Low
North Fork Coppei Creek						
Upper Falls			Falls	Complete		None
Upper Culvert?			Culvert	Potential?		Low
Coppei Creek						
Bedrock Falls Above McCowan Road			Falls	Partial		Medium
Beaver Dams—Mouth to Fair Grounds	0.0-2.3	N46.21026 W118.1507863 to N46.2720315 W118.1750669	Beaver Dams	Complete		Medium
Walla Walla River Watershed						
Cup Gulch (NF Walla Walla)						
NF Walla Walla River Road Culvert[b]		N45.89690017 W118.25279998	Culvert			
Couse Creek						
Culvert at Gravel Pit Entrance[b]	1.1	N45.8967514 W118.36978149	Culvert			
Walla Walla River						
Marie Dorian Dam	47.5		Dam	None	Removed (1997)	None
Milton Ditch	47.1			None	Consolidated into LWWR (2004) (There are still some issues here with old diversion site)	None
Smith Ditch	45.4		Irrigation Diversion	Partial	New Mitchell Act Screen—Date? (Still no bypass)	Medium
Nursery Bridge	44.7		Irrigation Diversion and Dam	Partial	New Ladder (2001) (Frost ditch currently inactive but unscreened if ever used again	High
Eastside Ditch	44.8		Irrigation Diversion	Partial	New Mitchell Act Screen—Date? (Still issues with seasonal diversion dam)	Medium

[a] Criteria for priority ranking is based on the following: 1) is barrier located in a priority area, 2) does barrier affect many different focal species, 3) does barrier affect large numbers of individuals in a single focal species, and 4) is it important to fix for high fish benefits.
[b] Taken from Oregon Recovery Plan.

Table 5. Cont. Draft list of actual and potential physical barriers (culverts, dams, falls, fords, and frequent temporary dams) since 1996. This list does not include dewatered reaches, temperature barriers, etc.

Stream/Location	River Mile	GPS Location	Barrier Type	Degree of Barrier	Modified/Improved (Year)	Priority for Repair[a]
Walla Walla River Watershed (Cont.)						
Walla Walla River (Cont.)						
Burlingame Dam	37.5		Irrigation Diversion and Dam	None	New Ladder (1998) and New Screen (1999)	Low
Smith/Nelson Diversion	36.0		Irrigation Diversion	Partial	New Screen (2000)	Medium
Bergevin/Williams Diversion	31.6		Irrigation Diversion	Partial		Medium
Garden City/Lowden	30.8		Irrigation Diversion	None	New Screens and Ladder (2002)	None
Old Lowden	29.1		Irrigation Diversion	Partial		Medium
Dry Creek (Walla Walla River Tributary in Oregon)						
Upper Dry Ck. Road Culvert[b]	13.3	N45.84577941 W118.38316345	Culvert			
Unnamed Dam[b]	12	N45.85702896 W118.40177154	Dam			
Unnamed Dam[b]	8.75	N45.90356063 W118.41124725	Dam			
Unnamed Dam[b]	6.75	N45.92193984 W118.43679809	Dam			
Hohn and Phillips Irrigation Dam[b]	5.75	N45.93013 W118.44455718	Dam			
Earnest Key Irrigation Dam[b]	5.25	N45.93603897 W118.45072174	Dam			
Marlatt-Shaw-Kelty Irrigation Dam[b]	3	N45.95537948 W118.48547363	Dam			
Cockburn and Ray Irrigation Dam[b]	1	N45.9645195 W118.51821136	Dam			
Little Dry Creek						
Winn Power Dam[b]	1.5	N45.8399887 W118.40193176	Dam			
Winn Road Culvert[b]	0.75	N45.84624862 W118.4035263	Culvert			
Birch Creek						
Culvert at Powerline Road	3.9		Culvert	Partial		Low
Waterfall	0.4		Waterfall	Complete		Low
Yellowhawk Creek						
Garrison Creek/Yellowhawk Creek Diversion	9.0	N46.0750960 W118.2737093	Dam	Partial		High
Old Diversion at Top of Channel Split	8.3		Dam and Ladder	Partial		Medium
Pond and Culverts Above Bernie Road (Right Bank Channel)			Culvert and Pond	Partial		Medium
Old Irrigation Dam above Bernie Road (Left Bank Channel)			Dam	Partial		Medium
Dam Above TSS Trap Site at Carl Street	7.7		Dam	Partial		High
Falbo Diversion	6.0		Irrigation Diversion	Partial		Medium
3rd Street Culvert	4.4	N46.0351202 W118.3356917	Culvert	Partial		Medium
Weirs at Plaza Way	4.0		Weirs	Partial		Medium
Williams Diversion	3.8		Irrigation Diversion	Partial		Medium
Russell Creek						
CCC Dam	5.6		Dam	Complete		Low
Old Irrigation Diversion Dam	0.9		Dam	Partial		Low
East Little Walla Walla						
Locust Road Culvert[b]		N45.95819854 W118.39649963	Culvert			

[a] Criteria for priority ranking is based on the following: 1) is barrier located in a priority area, 2) does barrier affect many different focal species, 3) does barrier affect large numbers of individuals in a single focal species, and 4) is it important to fix for high fish benefits.
[b] Taken from Oregon Recovery Plan.

Table 5. Cont. Draft list of actual and potential physical barriers (culverts, dams, falls, fords, and frequent temporary dams) since 1996. This list does not include dewatered reaches, temperature barriers, etc.						
Stream/Location	**River Mile**	**GPS Location**	**Barrier Type**	**Degree of Barrier**	**Modified/Improved (Year)**	**Priority for Repair**[a]
Walla Walla River Watershed (Cont.)						
East Little Walla Walla (Cont.)						
Appleton Road Culvert[b]		N45.96920013 W118.40000152	Culvert			
Crockett Road Culvert[b]		N45.97299957 W118.39969635	Culvert			
Ballou Road Culvert[b]		N45.98740005 W118.40440368	Culvert			
Stateline Road Culvert[b]		N46.00040054 W118.4083023	Culvert			
Hypothetical Representing Multiple Barriers Upstream[c,d]	1.7			Partial		Medium
Big Spring Creek						
Railroad Crossing and Other Barriers Upstream[c]	0.7			Complete		Medium
Unnamed Spring						
Railroad Crossing and Other Barriers Upstream[c]	0.3			Partial		Medium
Stone Creek						
Hypothetical Representing Multiple Barriers Upstream of Highway 125[c,e]	4.4-7.8			Partial		Low
Pond Dam	1.1		Dam and Pond	Partial		Low
Garrison Creek						
Top End Slide Gate at Certain Flows	10.1	N46.0751859 W118.2737125	Upper Control Gate	Partial		Low
Hypothetical Barrier Representing Many Upstream Obstructions	4.9-10.0			Partial		Low
Hypothetical Barrier Representing Many Barriers in Walla Walla Streams[c,e]	Garrison Creek 4.8			Partial		Low
Larch Street	3.8	N46.0414132 W118.3782091	Culvert	Partial		Low
Larch and Lyon's Ponds	3.7		Dams and Ponds	Complete		Low
Hamada Ditch			Intake Screen	Partial		Low
Bryant Creek/Walla Walla Urban Streams						
Jefferson Park Pond (Bryant Ck)	0.9			Complete		Low
Hypothetical Barrier Representing Many Barriers in Walla Walla Streams[c,e]				Complete		Low
Hypothetical Barrier Representing Many Barriers in Walla Walla Streams[c,e]				Partial		Low
West Little Walla Walla						
Winesap Road Culvert[b]		N45.96900177 W118.41320037	Culvert			
Appleton Road Culvert[b]		N45.96920013 W118.41390228	Culvert			
Sunquist Road Culvert[b]		N45.99110031 W118.42350006	Culvert			
Triangle Road Culvert[b]		N45.00049972 W118.43969726	Culvert			

[a] Criteria for priority ranking is based on the following: 1) is barrier located in a priority area, 2) does barrier affect many different focal species, 3) does barrier affect large numbers of individuals in a single focal species, and 4) is it important to fix for high fish benefits.
[b] Taken from Oregon Recovery Plan.
[c] Conglomeration of multiple barriers in stream reach or geographic area.
[d] Entered as reach break and obstruction in EDT database; rating in database indicates 100% passage. Status uncertain.
[e] Barrier at low and high flows.

Table 5. Cont. Draft list of actual and potential physical barriers (culverts, dams, falls, fords, and frequent temporary dams) since 1996. This list does not include dewatered reaches, temperature barriers, etc.						
Stream/Location	**River Mile**	**GPS Location**	**Barrier Type**	**Degree of Barrier**	**Modified/Improved (Year)**	**Priority for Repair[a]**
Walla Walla River Watershed (Cont.)						
North Fork Dry Creek						
NF Dry Creek Road Stream Fords	0.9-5.2		Stream Fords	Partial		Medium
Dry Creek (Walla Walla River Tributary in Washington)						
Cement Box Culvert Just Upstream of Sapolil Road [e]	24.1		Concrete Apron	Partial		Medium
Lower Waitsburg Road Bridge [f]	18.6	N46.1543332 W118.3148048	Concrete Apron	Partial		Medium
Irrigation Dam Below Talbott Road	3.0	N46.0673588 W118.5504969	Irrigation Dam	Partial		Medium
Concrete Grade Control Structures Below Highway 12			Irrigation Dams?	Partial		Medium
Numerous Summer Irrigation Dams			Temporary Irrigation Dams	Partial		Medium
Mud Creek (Dry Creek Tributary Near Dixie, WA)						
Abandoned Railroad Crossing Culvert	1.4	N46.1413089 W118.1324090	Culvert	Complete		Medium
Middle Branch Mud Creek						
Triangle Road Culvert[b]		N45.97399902 W118.4287033	Culvert			
County Road 332 Culvert[b]		N45.9748001 W118.43389892	Culvert			
County Road 332 Culvert[b]		N45.97660064 W118.43779754	Culvert			
Pine Creek						
Spring Reservoir Dam Elev. 2350 ft6	30.6		Dam			
Spring Reservoir Dam Elev. 2100 ft6	28.7		Dam			
Pine Ck. Road Culvert[b]	27	N45.78490066 W118.40599822	Culvert			
Culvert at Highway11	23.9	N45.83039855 W118.43309783	Culvert			
Culvert at Johnson Road[g]	23.6	N45.8337 W118.4354	Culvert			
Bridge on County Road 708	11	N45.9595 W118.5372	Bridge			
Irrigation Ditch Diversion[g]	10.8		Intake Screen			
Irrigation Dam[g]	8.1		Dam			
Bevans and Young Irrigation Dam[b]	7.5	N45.98413848 W118.56359863	Dam			
Grade Control Structure on County Road 707	7.1	N45.98669815 W118.56809997				
Bevans Irrigation Dam[b]	6.5	N45.9903984 W118.57524108	Dam			
Mill Creek Watershed						
Mill Creek						
City of Walla Walla Intake Screen	26.0		Intake Screen	None	New Screen (2001)	Low
City of Walla Walla Intake Dam and Ladder	26.0		Dam and Ladder	Partial		High
Kooskooskie Dam	23.1	N46.0060468 W118.1184448	Dam	None	Removed (2005)	None
Recreational Dams at Five Mile Road and Elsewhere	13.9	N46.0857488 W118.2265831	Temporary Dams	Partial		Medium

[a] Criteria for priority ranking is based on the following: 1) is barrier located in a priority area, 2) does barrier affect many different focal species, 3) does barrier affect large numbers of individuals in a single focal species, and 4) is it important to fix for high fish benefits.
[b] Taken from Oregon Recovery Plan.
[e] Barrier at low and high flows.
[f] Barrier at high flows only.
[g] Entered at request of Oregon TOAST, passage knowledge does not exist; full passage assumed.

Table 5. Cont. Draft list of actual and potential physical barriers (culverts, dams, falls, fords, and frequent temporary dams) since 1996. This list does not include dewatered reaches, temperature barriers, etc.						
Stream/Location	**River Mile**	**GPS Location**	**Barrier Type**	**Degree of Barrier**	**Modified/Improved (Year)**	**Priority for Repair[a]**
Mill Creek Watershed (Cont.)						
Mill Creek (Cont.)						
Concrete Capped Weirs and Diked Channel from Gose Street to Bennington Dam[c]	5.4-12.3	N46.0643619 W118.3885755 to N46.0798465 W118.2545118	Weirs/Wide Channel	Partial		Medium
Bennington Dam and Ladder	12.3	N46.0798465 W118.2545118	Dam and Ladder	Partial		High
Rooks Park Intake and Outlet				Partial		Low
Jones Diversion Below Rooks Park				Partial		Low
Yellowhawk Diversioin Dam and Ladder	11.4	N46.0765074 W118.2728611	Dam and Ladder	Partial		High
Concrete Channel—Velocity and Light Barriers[c]	5.4-9.3	N46.0643619 W118.3885755 to N46.0690741 W118.3124171	Concrete Channel	Partial		High
Blaylock Irrigation Diversion No. 3	6.2		Irrigation Diversion	Partial		Low
Gose Street Dam and Concrete Apron	5.4	N46.064361 W118.3885755	Dam and Concrete Apron	None	New Ladder (2006)	None
Stiller Ditch Diversion Dam and Pond	2.6		Irrigation Diversion Dam and Pond	Partial		Medium
Blue Creek						
Debris Jam/Headcut	1.2	N46.0599325 W118.1331471	Falls/Jam	Potential		Low
Titus Creek						
Upper Intake From Mill Creek			Push-up Dam	Potential		Low
Several Ponds/Irrigation Diversions and Other Barriers			Ponds/Irrigation Diversions and Other	Partial		Low
Diversion Dam Above Five Mile Road	2.9	N46.0866784 W118.2257951	Dam	Partial		Low
Culvert at Mouth	0.0	N46.0769249 W118.2782915	Culvert	Complete		Low
Doan Creek						
Underground Pipe in Which Doan Creek is Confined	2.1		Piped	Complete		Low
Ponds and Dams	0.1 & 0.5	N46.0408182 W118.4712813 & N46.0403020 W118.4621006	Dams and Ponds	Complete		Low

[a] Criteria for priority ranking is based on the following: 1) is barrier located in a priority area, 2) does barrier affect many different focal species, 3) does barrier affect large numbers of individuals in a single focal species, and 4) is it important to fix for high fish benefits.
[c] Conglomeration of multiple barriers in stream reach or geographic area.

Fish Stock Assessment

Distribution and Abundance

Densities of three salmonid species, rainbow/steelhead trout, bull trout, and chinook salmon, were calculated from quantitative electrofishing sites in the Walla Walla Subbasin, and two salmonid species, rainbow/steelhead trout and bull trout, were seen during qualitative electrofishing (Table 6 and 7). No whitefish or brown trout were observed during surveys in 2006. Additional data collected by the WDFW SRL, in the Touchet River and its tributaries (often included in our previous annual reports) will appear in their LSRCP annual report (eg. see Bumgarner et al. 2004).

Rainbow/steelhead trout represent the most common salmonid found in the Walla Walla Subbasin. Age 0+ rainbow/steelhead densities are typically higher than for older age classes for most sites, but some quantitative estimates were compiled in upper drainages where Age 1+ rainbow/steelhead dominate. Age 1+ rainbow/steelhead trout predominated in the following sites; Burnt Fork (BF- 1, 4), Dry Creek (DC- 2, 3) (Table 6). Legal size (≥ 200mm) rainbow trout densities represent wild or unknown origin trout unless noted.

Other salmonid species had a limited distribution from sampling conducted in 2006 (Table 6 and 7). Bull trout were found in Spangler Creek, Lewis Creek and Mill Creek in low densities, but sampling did not occur in major bull trout areas of the subbasin. Juvenile chinook salmon were found at three sites in 2006, all on upper Mill Creek. The presence of chinook salmon in the Walla Walla and Mill Creek Watersheds are primarily associated with the outplanting of adult spring chinook by the CTUIR. These fish were released and allowed to spawn freely in the upper portion of Mill Creek, and the South Fork of the Walla Walla River. Releases occurred from 2000 to present in the South Fork of the Walla Walla River, and 2000 through 2002 in upper Mill Creek. Juveniles now seen in upper Mill Creek are from adults returning to this portion of the stream. We documented no whitefish in all our sampling efforts in 2006.

Limited sampling in the Walla Walla Subbasin (Figure 9) compared to previous years (Mendel et al. 1999, 2000, 2001, 2002, 2003b, 2004, 2005, 2006) limited the species handled and their apparent distribution and abundance. Spatial distribution and number of electrofishing sites vary from year to year, allowing us to place emphasis on different areas in the subbasin. This may also cause annual variation in the apparent distribution and abundance of salmonid populations until all the information for all years is compiled and examined together.

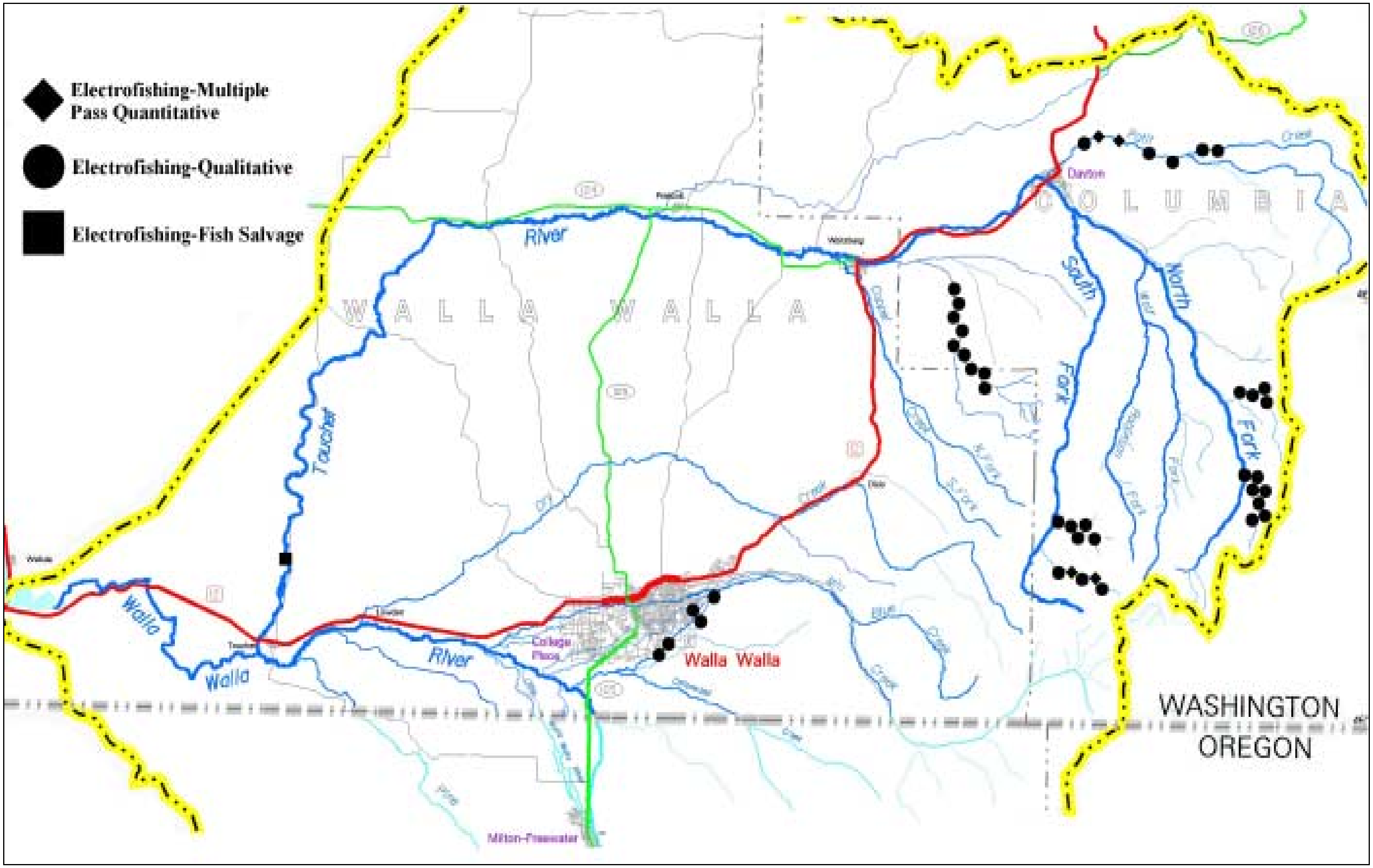


Figure 9. Relative locations of WDFW electrofishing sites in the Walla Walla Subbasin, 2006.

Electrofishing

Quantitative Electrofishing

Quantitative electrofishing was conducted on four streams in 2006. Rainbow/steelhead trout were found at all 11 sites in 2006, with densities of ranging from 7.3 to 74.2 fish per 100 m^2. Low densities of legal size bull trout and sub-yearling chinook were found in Mill Creek. Two surveys were conducted on the Burnt Fork in late July and produced densities of rainbow/steelhead trout ranging from 7.3 to 11.3 fish per 100 m^2 (Figure 9 and Table 6). Yearling (Age 1+) rainbow/steelhead were most abundant in both sites, which is common in tributaries and upper mainstem areas (Mendel et al. 2005); densities ranged from 5.9 and 11.3 fish per 100 m^2. Sub-yearling (Age 0+) and legal (≥ 200mm) rainbow/steelhead were found in low densities at one site (Table 6). Patit Creek also had two surveys conducted in mid-July. Sub-yearling rainbow/steelhead trout were the only salmonids found at these sites, but had fairly high densities of 21.2 and 45.3 fish per 100 m^2. These high densities of sub-yearlings would suggest that spawning is occurring in this perennial stream, but possibly with little rearing for older ages. Four surveys were conducted on Mill Creek during the first part of September and will be compared with densities gathered by ODFW and USFS during snorkeling surveys. Three salmonid species, rainbow/steelhead trout, bull trout, and chinook salmon were found during these surveys. Sub-yearling rainbow/steelhead trout were the most abundant with densities from 11.3 to 21.6 fish per 100 m^2, while yearling rainbow/steelhead trout had densities of 2.3 to 10.9 fish per 100 m^2. Legal size rainbow/steelhead trout were found at only one site with a density of 1.2 fish per 100 m^2. Legal size bull trout appeared in low densities at three of the four sites, while sub-yearling and yearling bull trout were not present at any site. Sub-yearling chinook salmon were also seen at low densities at three of the four sites. Three surveys were conducted on Dry Creek above Dixie, WA. Yearling rainbow/steelhead trout dominated at two of the three sites with densities of 10.4 to 30.1 fish per 100 m^2, and sub-yearling rainbow/steelhead trout dominated the other site, but had densities of 3.7 to 41.9 fish per 100 m^2 (Table 6).

Table 6. Densities of salmonids from multiple pass quantitative electrofishing sites in the Walla Walla Subbasin, 2006

Stream Reach / Site Name	Date (mm/dd)	Site Length (m)	Mean Width (m)	Area (m^2)	Densities (#/100m^2) rainbow/steelhead Age/Size 0+	1+	≥8 in	Total	Other Species[a]	Age/Size 0+	1+	≥8 in
Burnt Fork												
BF2	7/25/06	30	3.5	105.0	0.0	11.3	0.0	11.3				
BF4	7/25/06	30	5.1	153.0	0.7	5.9	0.7	7.3				
Patit Ck.												
PC3	7/10/06	30	1.6	48.0	45.3[b]	0.0	0.0	45.3				
PC4	7/10/06	33	1.9	62.7	21.2	0.0	0.0	21.2				
Mill Ck.												
MC1	9/6/06	30	14.5	435.0	20.2	5.7	0.0	25.9	BT	0.0	0.0	0.2
									WCH	0.7	0.0	0.0
MC2	9/6/06	30	13.0	390.0	11.3	4.4	0.0	15.7	BT	0.0	0.0	0.3
									WCH	2.6	0.0	0.0
MC3	9/8/06	40	8.3	332.0	14.5	10.9	1.2	26.6	BT	0.0	0.0	1.2
									WCH	4.8	0.0	0.0
MC4	9/8/06	30	12.8	384.0	21.6[b]	2.3[b]	0.0	23.9				
Dry Ck.												
DC1	9/1/06	30	3.1	93.0	41.9	30.1	2.2	74.2				
DC2	9/1/06	36	3.7	133.2	3.7	18.6	0.0	22.3				
DC3	9/1/06	30	4.1	123.0	9.3	10.4	0.0	19.7				

[a] BT=bull trout, WCH=chinook
[b] Calculated using the sum of the passes, due to poor reduction between successive passes.

Qualitative Electrofishing

Qualitative electrofishing surveys were conducted on 10 streams within the Walla Walla Subbasin in 2006 (Figure 9). Surveys were completed from July through the end of September (Table 7), and were used to supplement the more intensive quantitative electrofishing surveys, examine areas where quantitative surveys may not have been feasible, or to assess streams where fish distribution and abundance are not well documented.

Qualitative surveys on the Spangler Creek, Lewis Creek, and Burnt Fork were conducted to monitor and assess populations of bull trout in these streams and to collect genetic samples from all salmonids in these areas. Griffin Fork was surveyed to determine whether or not bull trout utilize this stream and to collect genetic samples from all salmonids. Bull trout were only found in Spangler Creek, but in very low numbers (Table 7).

The site surveyed on the Touchet River was a fish salvage effort for a construction project to improve fish passage at Hofer Dam. No salmonids were found during this salvage effort.

Surveys on the North Fork Patit Creek, Patit Creek, and Yellowhawk were to determine distribution and abundance of salmonids in these streams and to collect genetic samples. They were conducted in conjunction with more intensive quantitative surveys. No salmonids were found in the North Fork Patit Creek. In Patit Creek, salmonid were found in both quantitative sites and two of the three qualitative sites. The one site that did not have salmonids present had no fish because the stream was dry (Table 6 and 7). Low to moderate numbers of rainbow/steelhead trout were observed during surveys in Yellowhawk Creek.

The Alyward Trib (a tributary of Whiskey Creek) and Whiskey Creek were surveyed to continue to monitor distribution and abundance of salmonids after the removal of a barrier dam in 2001, and to collect genetic samples. Lack of water was the biggest issue in these surveys, but salmonids were found in high numbers in some areas (Table 7).

Table 7. Relative abundance of fish from qualitative electrofishing sites in the Walla Walla Subbasin, 2006.

Stream	Site #	Date	Site Length	Avg. Width	Relative Abundance[a]	Comments
Spangler Creek	SC-1 ~0.8 miles above the end of the road	7/13	50.0	3.6	One 1+ RBT (149mm), four 1+ BT (116-136mm), TF-common	Moderate intensity
	SC-2 ~0.4 miles above the end of the road	7/13	50.0	3.3	Seven 1+ RBT (96-167mm), two 1+ BT (85-96mm), TF-common	Moderate intensity
	SC-3 End of the road	7/13	50.0	2.8	Eleven 1+ RBT (68-158mm), TF-common	Moderate intensity
	SC-4 ~0.3 miles above right bank tributary	7/13	50.0	3.7	10 1+ RBT (74-164mm), three 1+ BT (104-108mm), TF-common	Moderate intensity
	SC-5 Just below right bank tributary	7/12	50.0	4.0	12 1+ RBT (59-178mm), six 1+ BT (88-109mm), TF-common	Moderate intensity
	SC-6 ~0.5 miles above the mouth	7/12	50.0	4.7	10 1+ RBT (63-180mm), one legal RBT (226mm), SCP-uncommon, TF-common	Moderate intensity
	SC-7 ~0.1 miles above the mouth	7/12	50.0	3.1	Seven 0+ RBT (26-29mm), two 1+ RBT (68-136mm), SCP-common, TF-uncommon	Moderate intensity
Lewis Creek	LC-1 ~1.1 miles above Forest Service line	8/17	41.0	2.7	Two 1+ RBT (98-134mm), TF-uncommon	Moderate intensity Ave BFW= 4.3m
	LC-2 ~0.8 miles above Forest Service line	8/17	60.0	2.6	11 1+ RBT (108-184mm), three 1+ BT (54-149mm), TF-common	Moderate intensity Ave BFW= 4.3m
	LC-3 ~0.5 miles above Forest Service line	8/17	30.0	2.7	Nine 1+ RBT (125-188mm), SCP-common, TF-uncommon	Moderate intensity Ave BFW= 4.3m
	LC-4 ~0.1 miles above the mouth	8/17	36.0	4.0	Four 0+ RBT (38-44mm), three 1+ RBT (90-126mm), SCP-common, TF-uncommon	Moderate intensity Ave BFW= 5.1m
Burnt Fork	BF-1 ~60 meters above right bank tributary	7/25	50.0	3.0	Seven 1+ RBT (60-130mm), TF-uncommon	Moderate intensity Ave BFW= 6.0m
	BF-3 ~1.1 miles below right bank tributary	7/25	50.0	4.4	Six 1+ RBT (69-178mm), SCP-common, TF-uncommon	Moderate intensity Ave BFW= 5.6m
	BF-5 ~2.0 miles below right bank tributary	7/25	50.0	5.0	12 1+ RBT (69-197mm), SCP-common, TF-rare	Moderate intensity Ave BFW= 6.2m

[a] RBT=rainbow trout, BT=bull trout, MTW=mountain whitefish, WCH=chinook, SD=speckled dace, LND=longnosed dace, SCP=sculpin, BLS=bridgelip suckers, NPM=northern pikeminnow, TF=tailed frogs, LPY=lamprey, CF=crayfish.
Rare=≤3, Uncommon=4-10, Common=11-100, and Abundant=≥101

Table 7. Cont. Relative abundance of fish from qualitative electrofishing sites in the Walla Walla Subbasin, 2006.						
Stream	**Site #**	**Date**	**Site Length**	**Avg. Width**	**Relative Abundance[a]**	**Comments**
Griffin Fork	G-1 Just below left bank tributary	7/25	30.0	2.5	10 1+ RBT (67-154mm), TF-rare	Moderate intensity Ave BFW= 4.0m
	G-2 ~0.2 miles up right bank tributary	7/25	30.0	2.1	Two 0+ RBT (33-35mm), 14 1+ RBT (84-145mm)	Moderate intensity Ave BFW= 3.4m
	G-3 ~0.1 miles below right bank tributary	7/25	30.0	3.3	One 0+ RBT (29mm), seven 1+ RBT (81-182mm), SCP-common, TF-rare	Moderate intensity Ave BFW= 4.5m
	G-4 ~0.7 miles below right bank tributary	7/25	30.0	4.1	21 1+ RBT (74-187mm), SCP-common	Moderate intensity Ave BFW= 5.7m
	G-5 ~0.2 miles above mouth	7/25	30.0	5.0	56 0+ RBT (30-54mm), 11 1+ RBT (73-141mm), SCP-common, CF-present	Moderate intensity Ave BFW= 6.4m
Touchet River	TR-7 Hofer Dam	8/31	N/A	N/A	No salmonids found. SMB-common	High intensity, sampled two pools totaling $160m^2$
North Fork Patit Creek	NP-1 ~1.5 miles above mouth	7/14	30.0	1.5	No salmonids found. SD-common	Moderate intensity
	NP-2 ~1.0 miles above the mouth	7/14	27.0	1.3	No salmonids found. SD-common	Moderate intensity
Patit Creek	P-1 ~1.2 miles below forks	7/10	30.0	2.4	Four 0+ RBT (55-68mm), SD-common	Moderate intensity
	P-2 Range Grade	7/10	30.0	N/A	Stream was dry.	No survey done
	P-5 First bridge on Patit Creek Rd.	7/10	30.0	3.3	Three 0+ RBT (46-82mm), SCP, SD-common, RSS-rare, CF-present	Moderate intensity
Alyward Trib	A-1 ~1.8 miles above Whiskey Creek Rd.	7/7	50.0	N/A	Stream was dry.	No survey done
	A-2 ~1.2 miles above Whiskey Creek Rd.	7/7	50.0	N/A	Stream was dry.	No survey done
	A-3 ~0.7 miles above Whiskey Creek Rd.	7/7	50.0	N/A	Stream was dry.	No survey done
	A-4 Above culvert at Whiskey Creek Rd.	7/7	38.2	1.4	No fish found.	Moderate intensity

[a] RBT=rainbow trout, BT=bull trout, MTW=mountain whitefish, WCH=chinook, SD=speckled dace, LND=longnosed dace, SCP=sculpin, BLS=bridgelip suckers, NPM=northern pikeminnow, TF=tailed frogs, LPY=lamprey, CF=crayfish.
Rare=≤3, Uncommon=4-10, Common=11-100, and Abundant=≥101

Table 7. Cont. Relative abundance of fish from qualitative electrofishing sites in the Walla Walla Subbasin, 2006.						
Stream	**Site #**	**Date**	**Site Length**	**Avg. Width**	**Relative Abundance[a]**	**Comments**
Whiskey Creek	WC-1 Mouth of Alyward Tributary	7/7	51.0	2.2	No salmonids found. SD-common	Moderate intensity
	WC-2 3rd bridge on Whiskey Creek Rd.	7/7	50.0	N/A	Stream was dry.	No survey done
	WC-3 ~0.7 miles below 3rd bridge on Whiskey Creek Rd.	7/7	35.0	2.7	80 0+ RBT (38-66mm), five 1+ RBT (176-190mm), six legal RBT (200-222mm), SD-abundant, SCP-rare	High intensity
	WC-4 2nd bridge on Whiskey Creek Rd.	7/7	50.0	N/A	Stream was dry.	No survey done
	WC-5 1st bridge on Whiskey Creek Rd.	7/7	35.0	2.7	53 0+ RBT (48-73mm), one 1+ RBT (192mm), SD-abundant, SCP-uncommon	Moderate intensity
Yellowhawk Creek	YC-2 ~200 meters below Diversion	7/11	50.0	6.1	Three 1+ RBT (128-191mm), SCP, SD, RSS-common, BLS-rare	
	YC-3 Just above left bank fork	7/11	50.0	4.1	14 0+ RBT (41-59mm), SCP-common, SD-uncommon, RSS, LND-rare, CF-present	
	YC-4 Just above right bank fork	7/11	30.0	2.2	Four 0+ RBT (43-55mm), one 1+ RBT (145mm), SCP-common, SD-uncommon, RSS-rare, CF-present	
	YC-5 Walla Walla High School property	7/11	50.0	5.5	14 0+ RBT (50-76mm), five 1+ RBT (144-181mm), one legal RBT (204mm), SCP-common, SD-uncommon, RSS, LPY-rare	
	YC-6 Cottonwood Rd.	7/11	50.0	3.9	Seven 0+ RBT (49-61mm), two 1+ RBT (81-166mm), SCP, SD-common, RSS-rare, CF-present	

[a] RBT=rainbow trout, BT=bull trout, MTW=mountain whitefish, WCH=chinook, SD=speckled dace, LND=longnosed dace, SCP=sculpin, BLS=bridgelip suckers, NPM=northern pikeminnow, TF=tailed frogs, LPY=lamprey, CF=crayfish.
Rare=≤3, Uncommon=4-10, Common=11-100, and Abundant=≥101

Compilation of Distribution and Abundance Data (1998-2006)

We began compiling data from WDFW electrofishing and snorkel surveys in the Washington portion of the Walla Walla Basin (Tables 8, 9, 10 and 11). These data came from 738 and 558 sites sampled in the Touchet and Walla Walla Watersheds, respectively. Sampling in the mainstem Touchet River was mostly upstream of Luckenbill Road (RM 21.7,with only 5 sites below there), and sampling in the mainstem Walla Walla River was all upstream of Dry Creek (RM 27.4), except for two sites. The data were collected mostly during summers, or late spring and early fall low flow periods, in 1998 through 2006. We began this compilation effort by summarizing the whitefish, bull trout, brown trout, chinook and lamprey data (Tables 8 and 9).

We then expanded the compilation effort to include rainbow/steelhead (Tables 10 and 11). In the future, we could include other species we have data for, plus this effort could be expanded to include the efforts and data from CTUIR, USFWS and others working in the basin and mapped using global information systems (GIS).

Mountain whitefish are not widely distributed or abundant in the Walla Walla River Subbasin within Washington as they were only found in only 5% of the Touchet River Watershed and 3.6% of the sites in the lower Walla Walla River Watershed (Tables 8 and 9). In the Touchet River Watershed, they were found or noted only in the lower North Fork Touchet (12 of 103 sites) between Jim Creek and the South Fork Touchet, in the lower Wolf Fork (3 of 77 sites) between the Robinson Fork and the Wolf Fork mouth, and in the mainstem Touchet River (23 of 130 sites) from the confluence of the North and South Forks downstream to Whetstone Creek (below Waitsburg). All ages or size classes were seen in the Touchet River watershed. They were never observed in the South Fork Touchet River, other small tributaries of the Touchet River Watershed, nor were they ever detected downstream of Whetstone Creek in the mainstem Touchet River. Their distribution and abundance were also very limited in the Walla Walla watershed within Washington as they were only found in less than 8% (9 of 116) of sites in the mainstem Walla Walla River (all upstream of Mill Creek). The 28 fish collected in the Walla Walla River were 65-125 mm fork length; no adults were detected there. Additional whitefish were observed in Big Spring Branch (3 of 13 sites) and the East Little Walla Walla (1 of 20 sites). Three subadult and three adult fish were observed in this small tributary system. Mill Creek, a major tributary of the Walla Walla River, contained 5 adults and 7 juveniles (in 7 sites of 302 sites sampled). All adults were between the state line and Blue Creek, but juveniles were detected between Blue Creek and Gose Street (lower end of the flood channel). No whitefish were collected or observed in any of the small tributaries of the Walla Walla River (other than East Little Walla Walla listed above), or in lower stream reaches of Mill Creek or the Walla Walla River.

Bull Trout distribution is mostly limited to the upper portions of the watersheds during low stream flow periods (Tables 8 and 9). They were relatively common in the North Fork of the Touchet River (59 of 103 sites), with all age and size classes present upstream of Spangler Creek, plus several sizes in Spangler and Corral Creeks. Lewis Creek contained all size classes, but only a few bull trout. The Wolf Fork contained all size and age classes of bull trout upstream of Whitney Creek, and most sizes in Green Fly (a tributary above Whitney Creek) and from Whitney Creek down to the Robinson Fork (total bull trout sites in the Wolf Fork was 56 of 77 sites). One bull trout was captured in upper Robinson Fork (below the forks) of the 61 sites sampled. Few sites in the South Fork Touchet had bull trout (3 of 71 sites) and they were all larger sizes of subadult to adult bull trout. The Burnt Fork had 4 of 21 sites containing bull trout, and none were found in Griffin Fork, although CTUIR has documented a bull trout in Griffin Fork in the past. Only one site of 130 contained bull trout in the mainstem Touchet River. Bull trout distribution was also limited in the mainstem Walla Walla River (1 subadult in one site of 116) and the distribution was limited to upstream of the East Little Walla Walla River. In addition, one site in Big Spring Branch of the East Little Walla Walla was found to have had two bull trout (1 of 13 sites). Mill Creek had bull trout in 23 sites of 302 sampled and all but three of the 53 fish were subadults or adults. Two of the bull trout in Mill Creek were captured below

Bennington Dam, but most were above Blue Creek during summer. Bull trout were not found anywhere else during these surveys.

Brown trout were released into the Touchet River for many years from the Tucannon Hatchery. We found brown trout to be relatively common (nearly 100 fish) in the North Fork Touchet River (31 of 103 sites), but they were only found in sites below Jim Creek. These observations included two years while hatchery releases were still occurring. All sizes were found in the North Fork Touchet River, from fry to large adults over 5 lbs. Obviously reproduction is occurring to some extent there. In the Wolf Fork, 53 brown trout of all sizes were found in 15 of 77 sites (mostly downstream of the Robinson Fork). One brown trout has been found in Robinson Fork and five adult brown trout were observed at four lower sites (of 71 total sites sampled) in the South Fork Touchet River. In the mainstem Touchet River over 150 brown trout were captured from 46 of 130 sites, but the sites with brown trout were all upstream of Coppei Creek. No brown trout were observed at any of the 558 sites in the Walla Walla River Watershed.

Juvenile chinook salmon exist in the Touchet River Watershed in very limited numbers. The majority of chinook were found in the North Fork Touchet River below Jim Creek (56 fish in 7 of 103 sites in the North Fork) and the Wolf Fork 117 fish present in 15 of the 77 sites mostly between Whitney Creek and the Robinson Fork. We did find one chinook each in lower Robinson Fork (1 site of 61) and the lower South Fork Touchet (1 site of 71). The mainstem Touchet River had low numbers of chinook in 11 of 130 sites (all above Whetstone Creek). We found 53 chinook in the mainstem Walla Walla River (27 of 116 sites) that were 65-125 mm in length. Most of these fish were upstream of the East Little Walla Walla, and all were upstream of Dry Creek. We also found two fish in two sites in Yellowhawk Creek (of 38 sites sampled), four fish in two sites in East Little Walla Walla River (of 20 sites) and three fish in two sites in Big Spring Branch of the East Little Walla Walla River (of 13 sites sampled). In Mill Creek, we found over 600 chinook in 50 sites of 302 sites sampled. All but one of those fish were upstream of Bennington Dam, and most were upstream of Blue Creek. Upstream of Five Mile Road, Titus Creek contained three fish in two sites (of 28 sampled). No other chinook were found in any other streams or reaches.

Lamprey locations and relative abundance are noted in Tables 8 and 9, although our electrofisher and survey techniques are not very effective at recovering lamprey. They tended not to be found in the headwaters of larger streams, or the lower portions of the mainstem Walla Walla and Touchet rivers.

Rainbow/steelhead were widely distributed (Tables 10 and 11). They were not found in some small tributaries of the Touchet River Basin (Corral Creek, Tate Creek, Spoonamore Canyon, Davis Hollow, Mustard Hollow, North Fork Patit Creek, Johnson Hollow, Bundy Hollow or Whetstone Creek). Some headwater sites did not contain rainbow/steelhead (e.g. some sites on the North Fork Touchet above Bluewood, upper portions of Lewis Creek, or the upper parts of the Wolf Fork). Few sites in the mainstem Touchet River below Whetstone Creek contained rainbow/steelhead during summer (2 sites of 19 sampled). In the mainstem Walla Walla River we found rainbow/steelhead at all 32 sites sampled from the state line downstream to the East Little Walla Walla River. The frequency of rainbow/steelhead presence decreased downstream until no rainbow/steelhead were found below Dry Creek (only two sites sampled). Rainbow/steelhead were present in all but one of the 38 sites sampled in Yellowhawk Creek and they were scattered through many of the small tributaries in the lower Walla Walla River Watershed.

Non-Salmonid Species Abundance and Distribution

Speckled dace (*Rhinichthys osculus*) and sculpin (*Cottus sp.*) were the most common non-salmonids found at most of our sampling sites (Appendix D). 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 Yellowhawk Creek. Sculpins are found throughout the subbasin except in the lower sections of the mainstem Walla Walla and Touchet Rivers, and in cold headwater sites. Tailed frogs/tadpoles (*Ascaphus truei*) were found only in upper sites in cold, clean water. During our efforts we have often found bull trout where tailed frogs were present, but we have also found tailed frogs in headwater areas where bull trout are not present.

Table 8. Distribution and relative abundance of whitefish, bull trout, brown trout, chinook, and lamprey in the Touchet River Watershed from Fish Management and Snake River Lab sampling, 1998-2006.

Stream/Reach	# of Years Sampled	# of Sites	Total Length (m)	Total Area (m^2)	# of Sites w/WF	Whitefish Size Classes (mm)[a] A	B	C	D	# of Sites w/BT	Bull Trout Size Classes (mm)[a] A	B	C	D	# of Sites w/BRT	Brown Trout Size Classes (mm)[a] A	B	C	D	# of Sites w/CH	Chinook Size Classes (mm)[a] A	B	C	D	# of Sites w/LPY	Lamprey Size Classes (mm)[a] A	B	C	D[b]
NF Touchet River																													
Above Bluewood Culvert	3	6	183	339	0	0	0	0	0	4	6	6	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bluewood Culvert to Spangler Ford	8	40	1607[c]	3712[c]	0	0	0	0	0	36	140	214	132	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spangler Ford to Jim Creek	8	17	933	4747[c]	0	0	0	0	0	7	0	0	5	4	0	0	0	0	0	0	0	0	0	0	7	0	4	6	0
Jim Creek to Wolf Fork Rd. bridge	9	25	1289[c]	6420[c]	3	0	0	0	4	8	0	0	8	9	14	0	13	2	4	1	0	1	0	0	17	0	26	67[d]	0
Wolf Fork Rd. bridge to SF Touchet	9	22	1154[c]	12051[c]	9	0	16	1	29	4	0	0	2	2	17	2	56	5	10	6	0	51	0	0	14	0	15	49[d]	0
Corral Creek																													
Headwaters to mouth	2	5	500	87[c]	0	0	0	0	0	3	11	1	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spangler Creek																													
Headwaters to mouth	3	17	654	2178	0	0	0	0	0	11	1	32	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spangler Creek Tributary																													
Headwaters to mouth	1	1	30	N/A[e]	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lewis Creek																													
Headwaters to Forest Service Line	6	30	933[c]	2077[c]	0	0	0	0	0	13	9	12	9	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Forest Service Line to mouth	5	17	506[c]	1271[c]	0	0	0	0	0	3	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ireland Gulch																													
Pond to mouth	1	2	N/A[e]	N/A[e]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jim Creek																													
Headwaters to mouth	1	3	60[c]	156[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Wolf Fork																													
Headwaters to Whitney Creek	7	25	1085	3213[c]	0	0	0	0	0	24	189	209	72	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Whitney Creek to Robinson Fork	9	30	1996	11137[c]	0	0	0	0	0	20	0	4	20	21	1	0	0	0	1	9	5	95	0	0	10	0	6	9	U
Robinson Fork to mouth	9	27	2062	12012[c]	3	0	1	0	3	12	0	2	17	7	14	13	31	1	7	6	0	17	0	0	11	1	10	65[d]	0
Tate Creek																													
Headwaters to mouth	1	5	90.0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green Fly Canyon																													
Headwaters to mouth	2	4	415	711	0	0	0	0	0	3	2	5	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Whitney Creek																													
Headwaters to mouth	2	6	178[c]	504[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spoonamore Canyon																													
Headwaters to mouth	1	1	20.0	10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coates Creek																													
Headwaters to mouth	1	6	507	N/A[e]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Robinson Fork																													
Headwaters to mouth	9	61	2488[c]	8430[c]	0	0	0	0	0	1	0	0	1	0	1	0	1	0	0	1	0	1	0	0	14	0	5	10	R
Robinson Fork Tribs.																													
Headwaters to mouth	2	5	925	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hatley Gulch																													
Headwaters to mouth	3	7	395	520[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Davis Hollow																													
Headwaters to mouth	1	1	N/A[e]	N/A[e]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[a] A: <65mm, B: 65-125mm, C: 126-200mm, D: >200mm
[b] There was no lamprey found above 200mm. Therefore this column is used when only relative abundance was recorded. R: <4, U: 4-10
[c] All lengths or area not accounted for
[d] Total includes lamprey that were counted but not measured.
[e] N/A=Not Available
[f] One site of approximately 0.5 miles converted to meters and included in total

Table 8. Cont. Distribution and relative abundance of whitefish, bull trout, brown trout, chinook, and lamprey in the Touchet River Watershed from Fish Management and Snake River Lab sampling, 1998-2006.

Stream/Reach	# of Years Sampled	# of Sites	Total Length (m)	Total Area (m^2)	# of Sites w/WF	Whitefish Size Classes (mm)[a] A	B	C	D	# of Sites w/BT	Bull Trout Size Classes (mm)[a] A	B	C	D	# of Sites w/BRT	Brown Trout Size Classes (mm)[a] A	B	C	D	# of Sites w/CH	Chinook Size Classes (mm)[a] A	B	C	D	# of Sites w/LPY	Lamprey Size Classes (mm)[a] A	B	C	D[b]
SF Touchet River																													
Burnt Fork to Griffin Fork	4	6	201	985	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	10	4	0
Griffin Fork to Camp Nancy Lee	9	24	1388	7442	0	0	0	0	0	3	0	0	9	1	0	0	0	0	0	0	0	0	0	0	16	0	14	44	U
Camp Nancy Lee to mouth	9	41	2749	14711[c]	0	0	0	0	0	0	0	0	0	0	4	0	0	2	3	1	0	1	0	0	24	0	58	51	U
Burnt Fork																													
Headwaters to mouth	6	21	1551[g]	2455[c]	0	0	0	0	0	4	1	4	6	10	0	0	0	0	0	0	0	0	0	0	1	0	0	3	0
Green Fork																													
Headwaters to mouth	2	10	426	616[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Griffin Fork																													
Headwaters to mouth	1	5	150	510	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RB Trib to Griffin Fork																													
Headwaters to mouth	1	1	35	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Touchet River																													
Confluence to Coppei Creek	8	65	5332	69055	15	1	28	14	4	1	0	0	1	0	35	6	77	22	21	7	0	10	0	0	23	1	17	76	0
Coppei Creek to Whetstone Creek	6	27	2507	29819	8	0	15	13	17	0	0	0	0	0	11	0	10	11	7	4	0	9	0	0	1	0	0	0	0
Whetstone Creek to Luckenbill Rd	3	13	986	12752	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Luckenbill Rd to mouth	1	5	184	3873	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustard Hollow																													
City of Dayton cemetery to mouth	1	1	10	N/A[e]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Fork Patit Creek																													
Lewis Gulch to mouth	1	2	57	81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
South Fork Patit Creek																													
Headwaters to mouth	2	6	193[c]	206[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Patit Creek																													
Forks to mouth	3	8	268[c]	157[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Johnson Hollow																													
Eager Rd. to mouth	1	1	100	N/A[e]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Whiskey Creek																													
Headwaters to mouth	4	21	974	1747[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alyward Tributary																													
Headwaters to mouth	3	24	1058	2027[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hogeye Hollow																													
Headwaters to mouth	1	5	116	212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dustin Hollow																													
Headwaters to mouth	1	4	143	222	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bundy Hollow																													
Headwaters to mouth	1	3	N/A[e]	N/A[e]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
South Fork Coppei Creek																													
Headwaters to mouth	5	20	990	2973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	19	16	0
North Fork Coppei Creek																													
Headwaters to mouth	5	21	837[c]	2283[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	2	2	0
Coppei Creek																													
Forks to mouth	6	21	1130	3040[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	8	17	0
Whetstone Creek																													
Headwaters to mouth	2	7	269	275[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[a] A: <65mm, B: 65-125mm, C: 126-200mm, D: >200mm
[b] There was no lamprey found above 200mm. Therefore this column is used when only relative abundance was recorded. R: <4, U: 4-10,
[c] All lengths or area not accounted for
[d] Total includes lamprey that were counted but not measured.
[e] N/A=Not Available
[f] One site of approximately 0.5 miles converted to meters and included in total

Table 9. Distribution and relative abundance of whitefish, bull trout, brown trout, chinook, and lamprey in the Walla Walla River Watershed from Fish Management sampling, 1998-2006.

Stream/Reach	# of Years Sampled	# of Sites	Total Length (m)	Total Area (m2)	Whitefish (WF) # of Sites w/WF	WF Size Classes (mm)[a] A	B	C	D	Bull Trout (BT) # of Sites w/BT	BT Size Classes (mm)[a] A	B	C	D	Brown Trout (BRT) # of Sites w/BRT	BRT Size Classes (mm)[a] A	B	C	D	Chinook (CH) # of Sites w/CH	CH Size Classes (mm)[a] A	B	C	D	Lamprey (LPY) # of Sites w/LPY	LPY Size Classes (mm)[a] A	B	C	D[b]
Walla Walla River																													
Stateline to East Little Walla Walla	7	32	2000	18051[c]	5	0	10[d]	0	0	1	0	0	0	1	0	0	0	0	0	15	0	42[d]	0	0	9	0	6	13	0
East Little Walla Walla to Mill Creek	7	47	4209	42360[c]	4	0	18[d]	0	0	0	0	0	0	0	0	0	0	0	0	7	0	3[d]	0	0	7	0	3	13	0
Mill Creek to Dry Creek	7	35	3452	30994[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	8[d]	0	0	4	0	0	1	R
Dry Creek to Touchet River	1	2	77	607[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Touchet River to mouth	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellowhawk Creek																													
Diversion to mouth	5	38	1557[c]	5076[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	19	1	20	30	U
Caldwell Creek																													
Headwaters to mouth	1	2	86	48[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
South Fork Russell Creek																													
Headwaters to mouth	1	1	30	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Russell Creek																													
Headwaters to mouth	2	11	611	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	R
Reeser Creek																													
Headwaters to mouth	1	1	30	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cottonwood Creek																													
Stateline to mouth	3	13	515	974[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
East Little Walla Walla																													
Stateline to mouth	6	20	855	1090	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	4	0	0	4	0	0	2	R
Big Spring Branch																													
Stateline to mouth	6	13	957	3157[c]	3	0	1	1	3	1	0	0	2	0	0	0	0	0	0	2	0	3	0	0	5	1	2	8	R
Stone Creek																													
Headwaters to mouth	2	5	328	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	U
Garrison Creek																													
Diversion to mouth	3	18	1118	759[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	5	9	U
Bryant Creek																													
Headwaters to mouth	2	2	80	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mill Creek																													
Stateline to Blue Creek	6	25	954[c]	10420[c]	3	0	0	0	5	19	0	1	20	28	0	0	0	0	0	22	3	470[d]	0	0	9	0	1	9	0
Blue Creek to Bennington Dam	5	22	832	6667[c]	3	0	5	0	0	2	0	0	0	2	0	0	0	0	0	15	0	139[d]	0	0	8	3	14	24	0
Bennington Dam to Gose St. bridge	7	111[e]	15693[c,f]	18036[c]	1	0	2	0	0	2	0	2	0	0	0	0	0	0	0	12	0	17	0	0	15	0	2	17[g]	0
Gose St. bridge to mouth	4	28	1212	4225[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0
Blue Creek																													
Headwaters to mouth	1	8	289[c]	110[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Titus Creek																													
Headwaters to return above Five Mile Rd	3	9	312	557[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	3	0	0	6	0	3	4	0
Diversion above Five Mile Rd. to mouth	4	19	576	517[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	3	0
Cold Creek																													
Headwaters to mouth	2	3	110	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[a] A: <65mm, B: 65-125mm, C: 126-200mm, D: >200mm
[b] There was no lamprey found above 200mm. Therefore this column is used when only relative abundance was recorded. R: <4, U: 4-10
[c] All lengths or area not accounted for
[d] Age 0+ included in this total
[e] Multiple sites within concrete channel counted as one site
[f] Salvage of two miles from Roosevelt Ave to the Yellowhawk diversion dam converted to meters and included in total
[g] Total includes lamprey that were counted but not measured

Table 9. Cont. Distribution and relative abundance of whitefish, bull trout, brown trout, chinook, and lamprey in the Walla Walla River Watershed from Fish Management sampling, 1998-2006.

					Whitefish (WF)					Bull Trout (BT)					Brown Trout (BRT)					Chinook (CH)					Lamprey (LPY)				
	# of		Total	Total	# of					# of					# of					# of					# of				
	Years	# of	Length	Area	Sites	Size Classes (mm)[a]				Sites	Size Classes (mm)[a]				Sites	Size Classes (mm)[a]				Sites	Size Classes (mm)[a]				Sites	Size Classes (mm)[a]			
Stream/Reach	Sampled	Sites	(m)	(m2)	w/WF	A	B	C	D	w/BT	A	B	C	D	w/BRT	A	B	C	D	w/CH	A	B	C	D	w/LPY	A	B	C	D[b]
Doan Creek																													
Last Chance Rd. to mouth	3	8	557	364[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
West Little Walla Walla																													
Stateline to mouth	6	24	1508	636[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Fork Dry Creek																													
Headwaters to mouth	3	12	376	689[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry Creek																													
Forks to Middle Waitsburg Rd.	6	21	1046	2871[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	6	34	U
Middle Waitsburg Rd. to mouth	2	9	727	2108[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mud Creek (Upper Dry Creek Trib.)																													
Headwaters to mouth	2	12	466	432[c]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spring Valley Tribs																													
Headwaters to mouth	1	1	N/A	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mud Creek (Lower Dry Creek Trib.)																													
Headwaters to mouth	1	1	100	400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mud Creek (Walla Walla River Trib.)																													
Stateline to mouth	2	3	170	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pine Creek																													
Stateline to mouth	2	2	180	N/A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[a] A: <65mm, B: 65-125mm, C: 126-200mm, D: >200mm
[b] There was no lamprey found above 200mm. Therefore this column is used when only relative abundance was recorded. R: <4, U: 4-10
[c] All lengths or area not accounted for
[d] Age 0+ included in this total
[e] Multiple sites within concrete channel counted as one site
[f] Salvage of two miles from Roosevelt Ave to the Yellowhawk diversion dam converted to meters and included in total
[g] Total includes lamprey that were counted but not measured

Table 10. Distribution and relative abundance of juvenile rainbow/steelhead in the Touchet River Watershed from Fish Management and Snake River Lab sampling, 1998-2006.

Stream/Reach	# of Years Sampled	# of Sites	Total Length (m)	Total Area (m^2)	# of Sites w/ RBT	Size Classes: Age 0+	Age 1+	Legal (≥8in)	# of Fish w/out lengths[a]
North Fork Touchet River									
Above Bluewood Culvert	3	6	183	339	1	0	1	0	0
Bluewood Culvert to Spangler Ford	8	33	1607[b]	3712[b]	22	230	249	7	0
Spangler Ford to Jim Creek	8	17	933	4747[b]	17	2296	955	38	1C
Jim Creek to Wolf Fork Rd bridge	9	25	1289[b]	6420[b]	25	4023	1485	125	3C
Wolf Fork Rd. bridge to mouth	9	22	1154[b]	12051[b]	22	3580	760	290	2A, 1C
Corral Creek									
Headwaters to mouth	2	5	500	87[b]	0	0	0	0	0
Spangler Creek									
Headwaters to mouth	3	17	654	2178	17	36	173	3	0
Spangler Creek Tributary									
Headwaters to mouth	1	1	30	N/A[c]	1	0	1	0	0
Lewis Creek									
Headwaters to Forest Service Line	6	30	933[b]	2077[b]	27	74	250	2	1R
Forest Service Line to mouth	5	16	506[b]	1271[b]	16	165	244	6	0
Ireland Gulch									
Pond to mouth	1	2	N/A[c]	N/A[c]	2	0	7	0	1R
Jim Creek									
Headwaters to mouth	1	3	60[b]	156[b]	3	34	23	5	0
Wolf Fork									
Headwaters to Whitney Creek	7	23	1085	3213[b]	22	145	311	15	0
Whitney Creek to Robinson Fork	9	28	1996	11137[b]	28	3732	1625	25	3C
Robinson Fork to mouth	9	26	2062	12012[b]	26	4009	1016	39	3C
Tate Creek									
Headwaters to mouth	1	5	90	60	0	0	0	0	0
Green Fly Canyon									
Headwaters to mouth	2	4	415	711	4	33	81	0	0
Whitney Creek									
Headwaters to mouth	2	6	178[b]	504[b]	6	31	116	0	1C
Spoonamore Canyon									
Headwaters to mouth	1	1	20	10	0	0	0	0	0
Coates Creek									
Headwaters to mouth	1	6	507	N/A[c]	6	49	92	0	2C

[a] Column contains a number (indicating total number of fish unmeasured) or a number letter combination that combines number of sites without fish measured and the relative abundance of rainbow/steelhead. For relative abundance R: <4, U: 4-10, C: 11-99, A:>99.
[b] All lengths or area not accounted for
[c] N/A=Not Available
[d] One site of approximately 0.5 miles converted to meters and included in total

Table 10. Cont. Distribution and relative abundance of juvenile rainbow/steelhead in the Touchet River Watershed from Fish Management and Snake River Lab sampling, 1998-2006.

Stream/Reach	# of Years Sampled	# of Sites	Total Length (m)	Total Area (m^2)	# of Sites w/ RB	Size Classes: Age 0+	Size Classes: Age 1+	Size Classes: Legal (≥8in)	# of Fish w/out lengths[a]
Robinson Fork									
Headwaters to mouth	9	61	2488[b]	8430[b]	59	2584	1360	10	13C
Robinson Fork Tribs.									
Headwaters to mouth	2	5	925	N/A[c]	4	0	3	1	2C
Hatley Gulch									
Headwaters to mouth	3	7	395	520[b]	2	0	23	0	0
Davis Hollow									
Headwaters to mouth	1	1	N/A[c]	N/A[c]	0	0	0	0	0
SF Touchet River									
Burnt Fork to Griffin Fork	4	6	201	985	6	179	193	5	0
Griffin Fork to Camp Nancy Lee	9	24	1388	7442	24	2000	1608	39	0
Camp Nancy Lee to mouth	9	41	2749	14711[b]	41	3059	904	131	2C
Burnt Fork									
Headwaters to mouth	6	21	1551[d]	2455[b]	21	114	343	6	1C
Green Fork									
Headwaters to mouth	2	10	426	616[b]	9	243	207	3	2C
Griffin Fork									
Headwaters to mouth	1	4	120	450[b]	4	57	49	0	0
RB Trib to Griffin Fork									
Headwaters to mouth	1	1	35	75	1	2	14	0	0
Touchet River									
Confluence to Coppei Creek	9	84	5332	69055	83	12089	1776	716	3C
Coppei Creek to Whetstone Creek	6	27	2507	29819	10	196	27	12	0
Whetstone Creek to Lukenbill Rd	3	13	986	12752	2	0	2	0	0
Lukenbill Rd to mouth	2	6	184[b]	3873[b]	0	0	0	0	0
Mustard Hollow									
City of Dayton cemetery to mouth	1	1	10	N/A[c]	0	0	0	0	0
North Fork Patit Creek									
Lewis Gulch to mouth	1	2	57	81	0	0	0	0	0
South Fork Patit Creek									
Headwaters to mouth	2	6	193[b]	206[b]	5	76	111	0	1A, 1C

[a] Column contains a number (indicating total number of fish unmeasured) or a number letter combination that combines number of sites without fish measured and the relative abundance of rainbow/steelhead. For relative abundance R: <4, U: 4-10, C: 11-99, A:>99.
[b] All lengths or area not accounted for
[c] N/A=Not Available
[d] One site of approximately 0.5 miles converted to meters and included in total

Table 10. Cont. Distribution and relative abundance of juvenile rainbow/steelhead in the Touchet River Watershed from Fish Management and Snake River Lab sampling, 1998-2006.

						Size Classes			
Stream/Reach	**# of Years Sampled**	**# of Sites**	**Total Length (m)**	**Total Area (m^2)**	**# of Sites w/ RB**	**Age 0+**	**Age 1+**	**Legal (≥8in)**	**# of Fish w/out lengths[a]**
Patit Creek									
Forks to mouth	3	8	268[b]	157[b]	7	74	15	0	1C
Johnson Hollow									
Eager Road to mouth	1	1	100	N/A[c]	0	0	0	0	0
Whiskey Creek									
Headwaters to mouth	5	27	974	1747[b]	18	232	103	10	1C
Alyward Tributary									
Headwaters to mouth	3	25	1058	2027[b]	2	22	0	0	0
Hogeye Hollow									
Headwaters to mouth	1	5	116	212	3	1	14	0	0
Dustin Hollow									
Headwaters to mouth	1	4	143	222	3	45	3	0	0
Bundy Hollow									
Headwaters to mouth	1	3	N/A[c]	N/A[c]	0	0	0	0	0
South Fork Coppei Creek									
Headwaters to mouth	5	20	990	2973	20	733	525	1	10
North Fork Coppei Creek									
Headwaters to mouth	5	21	837[b]	2283[b]	21	551	361	7	1U
Coppei Creek									
Forks to mouth	6	21	1130	3040[b]	21	494	260	0	1R
Whetstone Creek									
Headwaters to mouth	2	7	269	275[b]	0	0	0	0	0

[a] Column contains a number (indicating total number of fish unmeasured) or a number letter combination that combines number of sites without fish measured and the relative abundance of rainbow/steelhead. For relative abundance R: <4, U: 4-10, C: 11-99, A:>99.
[b] All lengths or area not accounted for
[c] N/A=Not Available
[d] One site of approximately 0.5 miles converted to meters and included in total

Table 11. Distribution and relative abundance of juvenile rainbow/steelhead in the Walla Walla River Watershed from Fish Management sampling, 1998-2006.

						Size Classes			
Stream/Reach	**# of Years Sampled**	**# of Sites**	**Total Length (m)**	**Total Area (m^2)**	**# of Sites w/ RB**	**Age 0+**	**Age 1+**	**Legal (≥8in)**	**# of Fish w/out lengths[a]**
Walla Walla River									
Stateline to East Little Walla Walla	7	32	2000	18051[b]	32	1014	98	56	3C, 1U
East Little Walla Walla to Mill Creek	7	47	4209	42360[b]	44	996	130	39	1A, 1C, 2U
Mill Creek to Dry Creek	7	35	3452	30994[b]	24	555	22	32	1C, 1U
Dry Creek to Touchet River	1	2	77	607[b]	0	0	0	0	0
Touchet River to mouth	0	0	0	0	0	0	0	0	0
Yellowhawk Creek									
Diversion to mouth	5	38	1557[b]	5076[b]	37	225	173	11	1C, 1U
Caldwell Creek									
Headwaters to mouth	1	2	86	48[b]	1	0	26	0	0
South Fork Russell Creek									
Headwaters to mouth	1	1	30	N/A[c]	0	0	0	0	0
Russell Creek									
Headwaters to mouth	2	11	611	N/A[c]	7	90	13	11	1C, 1U
Reeser Creek									
Headwaters to mouth	1	1	30	N/A[c]	0	0	0	0	0
Cottonwood Creek									
Headwaters to mouth	3	13	515	974[b]	12	703	33	4	0
East Little Walla Walla									
Stateline to mouth	6	20	855	1090	12	11	24	4	0
Big Spring Branch									
Stateline to mouth	6	13	957	3157[b]	13	38	45	9	0
Stone Creek									
Headwaters to mouth	2	5	328	N/A[c]	0	0	0	0	0
Garrison Creek									
Diversion to mouth	3	18	1118	759[b]	3	3	3	2	0
Bryant Creek									
Headwaters to mouth	2	2	80	N/A[c]	1	0	0	0	1R

[a] Column contains a number (indicating total number of fish unmeasured) or a number letter combination that combines number of sites without fish measured and the relative abundance of rainbow/steelhead. For relative abundance R: <4, U: 4-10, C: 11-99, A:>99.
[b] All lengths or area not accounted for
[c] N/A=Not Available
[d] Multiple sites within concrete channel converted to meters and included in total.
[e] Salvage of two miles from Roosevelt Ave. to the Yellowhawk diversion dam converted to meters and included in total.

Table 11. Cont. Distribution and relative abundance of juvenile rainbow/steelhead in the Walla Walla River Watershed from Fish Management sampling, 1998-2006.									
						Size Classes			
Stream/Reach	**# of Years Sampled**	**# of Sites**	**Total Length (m)**	**Total Area (m^2)**	**# of Sites w/ RB**	**Age 0+**	**Age 1+**	**Legal (≥8in)**	**# of Fish w/out lengths[a]**
Mill Creek									
Stateline to Blue Creek	6	25	954[b]	10420[b]	25	1248	683	106	0
Blue Creek to Bennington Dam	5	22	832	6667[b]	22	1229	497	146	0
Bennington Dam to Gose St. bridge	7	111[d]	15693[b,e]	18036[b]	76	634	277	321	192
Gose St. bridge to mouth	4	28	1212	4225[b]	24	679	28	15	0
Blue Creek									
Headwaters to mouth	1	8	289[C]	110[b]	8	34	74	6	0
Titus Creek									
Headwaters to return above Five Mile Rd.	3	9	312	557[b]	8	65	60	4	0
Diversion above Five Mile Rd. to mouth	4	19	576	517[b]	5	8	5	3	0
Cold Creek									
Headwaters to mouth	2	3	110	N/A[c]	0	0	0	0	0
Doan Creek									
Last Chance Rd. to mouth	3	8	557	364[c]	3	3	5	0	0
West Little Walla Walla									
Stateline to mouth	6	24	1508	636[b]	4	3	2	0	0
North Fork Dry Creek									
Headwaters to mouth	3	12	376	689[b]	12	87	107	1	0
Dry Creek									
Forks to Middle Waitsburg Rd	6	21	1046	2871[b]	20	445	297	8	1C, 1U, 1R
Middle Waitsburg Rd to mouth	2	9	727	2108[b]	7	20	25	0	0
Mud Creek (Upper Dry Creek Trib.)									
Headwaters to mouth	2	12	466	432[b]	4	8	7	2	0
Spring Valley Tribs									
Headwaters to mouth	1	1	N/A[c]	N/A[c]	0	0	0	0	0
Mud Creek (Lower Dry Creek Trib.)									
Headwaters to mouth	1	1	100	400	0	0	0	0	0
Mud Creek (Walla Walla River Trib.)									
Headwaters to mouth	2	3	170	N/A[c]	0	0	0	0	0
Pine Creek									
Stateline to mouth	2	2	180	N/A[c]	0	0	0	0	0

[a] Column contains a number (indicating total number of fish unmeasured) or a number letter combination that combines number of sites without fish measured and the relative abundance of rainbow/steelhead. For relative abundance R: <4, U: 4-10, C: 11-99, A:>99.
[b] All lengths or area not accounted for
[c] N/A=Not Available
[d] Multiple sites within concrete channel converted to meters and included in total.
[e] Salvage of two miles from Roosevelt Ave. to the Yellowhawk diversion dam converted to meters and included in total.

Spawning Surveys

In 2006, spawning surveys were conducted for steelhead and bull trout (Figure 10), but not for spring chinook. Steelhead spawning surveys occurred during the spring in South Fork Coppei Creek, Coppei Creek, Yellowhawk Creek, and Mill Creek. Bull trout surveys were conducted in the upper Touchet River system in the fall, but the number, timing, and distribution of surveys were affected by the approximately 110,000 acre Columbia Complex Fire (Figure 10).

Steelhead

Steelhead spawning surveys were conducted in portions of the Coppei Creek Watershed (South Fork Coppei Creek, and Coppei Creek), Mill Creek, and Yellowhawk Creek in 2006 between late March and the middle of May. Coppei Creek and South Fork Coppei Creek were surveyed for the fourth consecutive year, while Mill Creek was surveyed for the sixth consecutive year. We are monitoring the Mill Creek population closely, because improvements to fish passage at Bennington Dam and to Yellowhawk Creek (another route fish can use to access upper Mill Creek) seem to be having a positive influence on the spawning population.

The lower 5.1 miles of the South Fork Coppei were surveyed two times; 9 redds and seven live fish were observed. Coppei Creek was surveyed from the confluence of the North and South Fork Coppei Creeks down to the mouth (8.1 miles), with two surveys from the confluence to Meinberg Road bridge and one survey from Meinberg Road bridge to the mouth. No redds or live fish were observed during these surveys (Table 12). The Coppei Creek Watershed has been surveyed six out of the last eight years. Total redds observed per year is highly variable and could be directly related to the sections and the number of times each section was surveyed in any given year (Table 13, 14, and Figure 11). Survey conditions in 2006 were poor with high water and turbidity during the first surveys. We consider the 2006 results to be minimum estimates because of these poor survey conditions.

Table 12. Steelhead spawning survey summary for the Coppei Creek Watershed, 2006.

Reach/ Date	Survey	Stream Section[a]	Surveyed Miles	Redds	Redds per mile	Fish Observed Live	Fish Observed Dead
SF Coppei							
3/20	1	(A) River mile 5.1 to river mile 2.5	2.6	2	0.8	1	0
3/20	1	(B) River mile 2.5 to river mile 0.0	2.5	0	0.0	0	0
4/24	2	(A) River mile 5.1 to river mile 2.5	2.6	7	2.7	6	0
4/24	2	(B) River mile 2.5 to river mile 0.0	2.5	0	0.0	0	0
		Total	**5.1**	**9**	**1.8**	**7**	**0**
Coppei Creek							
3/20	1	(C) River mile 8.1 to river mile 5.4	2.7	0	0.0	0	0
3/20	1	(D) River mile 5.4 to river mile 2.3	3.1	0	0.0	0	0
3/20	1	(E) River mile 2.3 to river mile 0.0	2.3	0	0.0	0	0
4/24	2	(C) River mile 8.1 to river mile 5.4	2.7	0	0.0	0	0
4/24	2	(D) River mile 5.4 to river mile 2.3	3.1	0	0.0	0	0
		Total	**8.1**	**0**	**0.0**	**0**	**0**

[a] A: 0.4 miles below Barns Ck to RM 2.5, B: RM 2.5 to mouth, C: Forks to McCowan Rd. bridge, D: McCowan Rd. bridge to Meinberg Rd. bridge, E: Meinberg Rd. bridge to mouth.

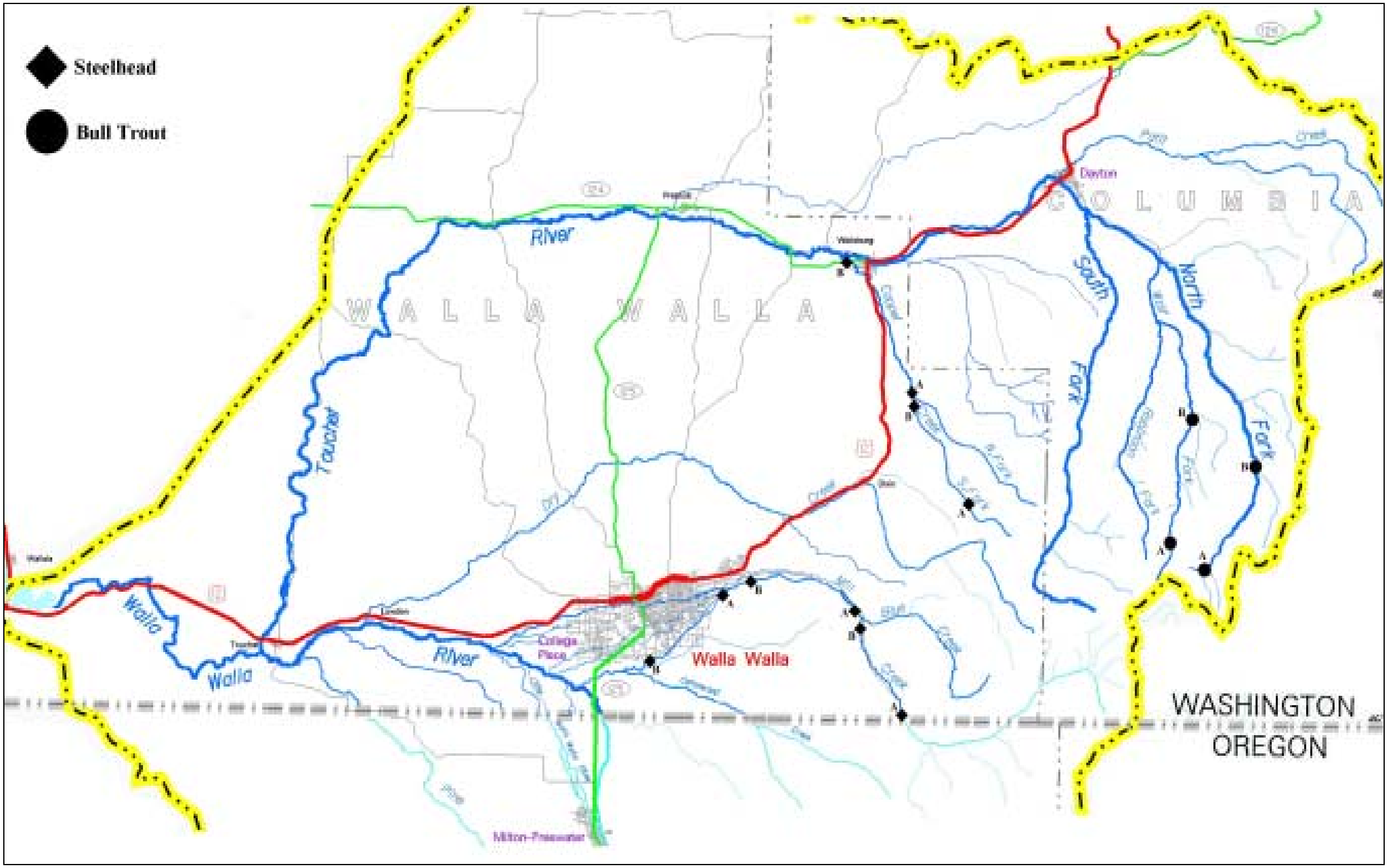


Figure 10. Relative locations of WDFW steelhead and bull trout spawning survey areas in the Walla Walla Subbasin, 2006.

Table 13. Steelhead spawning survey summary, redd count (number of times surveyed), for the South Fork and North Fork Coppei Creeks, 1999-2006.

<table>
<tr><th rowspan="4">Year</th><th colspan="8">Reach Surveyed[a]</th><th rowspan="4">Total Redds</th></tr>
<tr><th colspan="4">South Fork Coppei Creek</th><th colspan="4">North Fork Coppei Creek</th></tr>
<tr><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th><th>F</th><th>G</th><th>H</th></tr>
<tr><td>RM 5.5-5.1</td><td>RM 5.1- 4.9</td><td>RM 4.9- 2.5</td><td>RM 2.5- 0.0</td><td>RM 4.1-2.0</td><td>RM 2.0- 1.8</td><td>RM 1.8- 1.4</td><td>RM 1.4- 0.0</td></tr>
<tr><td>1999</td><td colspan="4">20 (2)</td><td colspan="4">11 (2)</td><td>31</td></tr>
<tr><td>2000</td><td colspan="2">1 (2)</td><td>8 (3)</td><td>7 (3)</td><td colspan="2">0 (3)</td><td></td><td>4 (3)</td><td>20</td></tr>
<tr><td>2001[b]</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>N/A</td></tr>
<tr><td>2002[b]</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>N/A</td></tr>
<tr><td>2003</td><td></td><td colspan="2">3 (2)</td><td>4 (2)</td><td>3 (2)</td><td></td><td></td><td>11 (2)</td><td>21</td></tr>
<tr><td>2004</td><td></td><td colspan="2">7 (4)</td><td>8 (4)</td><td colspan="2">0 (2)</td><td></td><td>3 (2)</td><td>18</td></tr>
<tr><td>2005</td><td></td><td colspan="2">11 (2)</td><td>11 (2)</td><td></td><td></td><td></td><td>5 (2)</td><td>27</td></tr>
<tr><td>2006[c]</td><td></td><td colspan="2">9 (2)</td><td>0 (2)</td><td></td><td></td><td></td><td></td><td>9</td></tr>
</table>

[a] A: Barns Rd. to 0.4 miles below Barns Rd., B: 0.4 miles below Barns Rd. to 0.6 miles below Barns Rd., C: 0.6 miles below Barns Rd. to 1.6 miles above 2nd bridge on SF Coppei Rd., D: 1.6 miles above 2nd bridge on SF Coppei Rd. to mouth, E: 0.1 miles above 3rd bridge on NF Coppei Rd. to RM 2.0, F: RM 2.0 to RM 1.8, G: RM 1.8 to RM 1.4, H: RM 1.4 to mouth.

[b] No survey done in the North or South Forks of Coppei Creek.

[c] No survey done in North Fork Coppei Creek. Poor survey condition, counts should be considered minimum estimates.

Table 14. Steelhead spawning survey summary, redd count (number of times surveyed), for Coppei Creek, 1999-2006.

<table>
<tr><th rowspan="3">Year</th><th colspan="8">Reach Surveyed[a]</th><th rowspan="3">Total Redds</th></tr>
<tr><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th><th>F</th><th>G</th><th>H</th></tr>
<tr><td>RM 8.1- 7.1</td><td>RM 7.1- 6.6</td><td>RM 6.6- 5.4</td><td>RM 5.4- 4.1</td><td>RM 4.1- 3.3</td><td>RM 3.3-2.3</td><td>RM 2.3- 1.8</td><td>RM 1.8- 0.0</td></tr>
<tr><td>1999[b]</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0</td></tr>
<tr><td>2000</td><td>8(5)</td><td colspan="2">3 (4)</td><td>0(4)</td><td colspan="2">0 (3)</td><td></td><td></td><td>11</td></tr>
<tr><td>2001[b]</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>N/A</td></tr>
<tr><td>2002[b]</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>N/A</td></tr>
<tr><td>2003</td><td colspan="2">3 (1)</td><td>0(1)</td><td colspan="3">0 (1)</td><td></td><td></td><td>3</td></tr>
<tr><td>2004</td><td colspan="3">10 (5)</td><td colspan="3">5 (5)</td><td></td><td></td><td>15</td></tr>
<tr><td>2005</td><td colspan="3">9 (2)</td><td colspan="2">2 (2)</td><td>3(4)</td><td>0(4)</td><td>3(3)</td><td>17</td></tr>
<tr><td>2006[c]</td><td colspan="3">0 (2)</td><td colspan="3">0 (2)</td><td colspan="2">0 (1)</td><td>0</td></tr>
</table>

[a] A: Forks to old railroad trestle, B: Old railroad trestle to 1.2 miles above McCowan Rd. bridge, C: 1.2 miles above McCowan Rd. bridge to McCowan Rd. bridge, D: McCowan Rd. bridge to 1.3 miles below McCowan Rd. bridge, E: 1.3 miles below McCowan Rd. bridge to 1.0 miles above Meinberg Rd. bridge, F: 1.0 miles above Meinberg Rd. bridge to Meinberg Rd. bridge, G: Meinberg Rd. bridge to Orchard Street in Waitsburg, H: Orchard Street in Waitsburg to mouth.

[b] No survey done.

[c] Poor survey condition, counts should be considered minimum estimates.

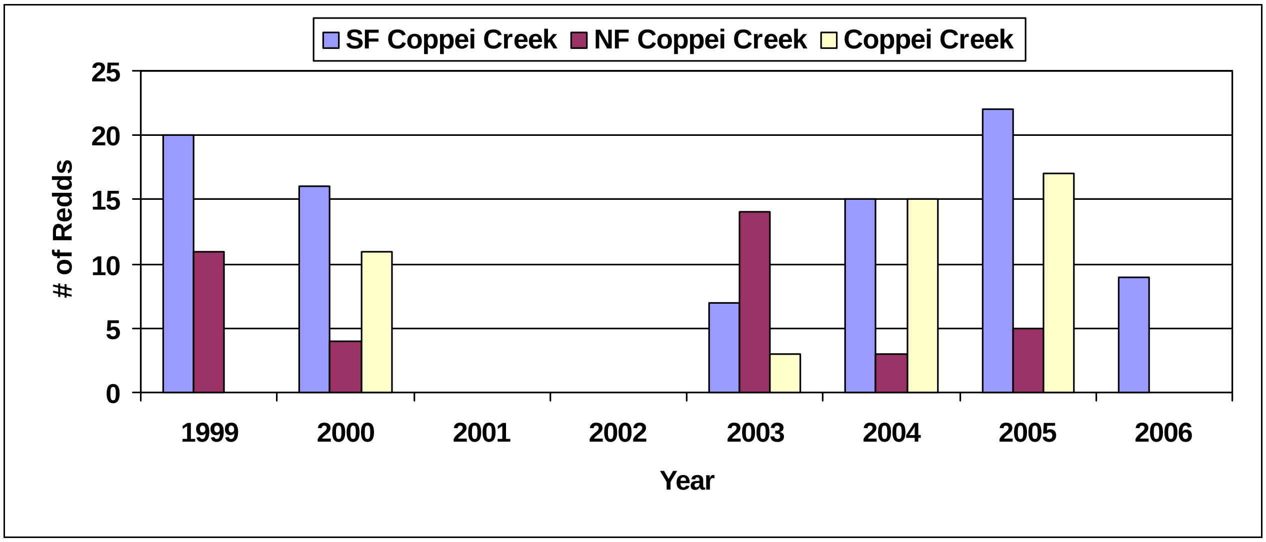


Figure 11. Steelhead spawning survey summary for number of redds observed in South Fork Coppei Creek, North Fork Coppei Creek, and Coppei Creek, 1999-2006.

We completed four surveys on sections of upper Mill Creek where access was allowed by private landowners from the state line down to 0.1 miles above Bennington Dam (10.4 miles surveyed); 43 redds and three live fish were observed. We expanded the redd counts by applying redds/mile in surveyed areas to reaches where we were denied access (0.7 miles), to estimate total redds from the state line downstream to 0.1 miles above Bennington Dam (11.1 miles). The expanded estimate was 46 redds in the total reach (Table 15, Figure 12). This is the second highest redd count on upper Mill Creek since we began surveys in 2001 (Table 16, Figure 12), but is well below the 80 redds observed in 2005. The increase in redds in the last few years could be related to improved passage in the lower river making it easier for adult steelhead to access spawning areas. Spawning survey estimates in 2002 and 2003 were low, but could be attributed to limited number and distribution of surveys. These surveys were delayed or limited because of high, turbid stream flows that make accurate observations of fish and redds nearly impossible (Mendel et al. 2003b and 2004). Stream conditions were generally good on Mill Creek in 2007 with some sections occasionally noted as having poor survey conditions.

Table 15. Steelhead spawning survey summary for Mill Creek within Washington State, 2006.							
Reach/ Date	**Survey**	**Stream Section[a]**	**Surveyed Miles**	**Redds**	**Redds per mile**	**Fish Observed**	
Mill Creek						Live	Dead
3/15	1	(A) River mile 23.5 to river mile 20.8	2.7	0	0.0	0	0
3/15	1	(B) River mile 20.8 to river mile 18.7	2.1	2	1.0	1	0
3/15	1	(C) River mile 18.0 to river mile 15.9	2.1	4	1.9	0	0
3/15	1	(D) River mile 15.9 to river mile 13.8	2.1	2	1.0	0	0
3/15	1	(E) River mile 13.8 to river mile 12.4	1.4	0	0.0	0	0
4/3	2	(A) River mile 23.5 to river mile 20.8	2.7	2	0.7	0	0
4/3	2	(B) River mile 20.8 to river mile 18.7	2.1	1	0.5	0	0
4/3	2	(C) River mile 18.0 to river mile 15.9	2.1	0	0.0	0	0
4/3	2	(D) River mile 15.9 to river mile 13.8	2.1	0	0.0	0	0
4/3	2	(E) River mile 13.8 to river mile 12.4	1.4	4	2.9	0	0
4/26	3	(A) River mile 23.5 to river mile 20.8	2.7	2	0.7	0	0
4/26	3	(B) River mile 20.8 to river mile 18.7	2.1	3	1.4	2	0
4/26	3	(C) River mile 18.0 to river mile 15.9	2.1	4	1.9	0	0
4/26	3	(D) River mile 15.9 to river mile 13.8	2.1	0	0.0	0	0
4/26	3	(E) River mile 13.8 to river mile 12.4	1.4	0	0.0	0	0
5/8	4	(A) River mile 23.5 to river mile 20.8	2.7	5	1.9	0	0
5/8	4	(B) River mile 20.8 to river mile 18.7	2.1	0	0.0	0	0
5/8	4	(C) River mile 18.0 to river mile 15.9	2.1	12	5.7	0	0
5/8	4	(D) River mile 15.9 to river mile 13.8	2.1	2	1.0	0	0
5/8	4	(E) River mile 13.8 to river mile 12.4	1.4	0	0.0	0	0
		Total	**10.4**	**43**	**4.1**	**3**	**0**
		Expanded Totals[b]	**11.1**	**46**			

[a] A: State line to Wickersham bridge, B: Wickersham bridge to 0.4 miles above Blue Creek, C: 0.3 miles below Blue Creek to Seven Mile Rd bridge, D: Seven Mile Rd bridge to Five Mile Rd bridge, E: Five Mile Rd bridge to 0.1 miles above Bennington Dam

[b] Expanded data was created by multiplying the total redds per mile (4.1) by the miles that we could not survey (0.7) and adding that number of redds to the total.

<table>
<tr><td colspan="15">Table 16. Steelhead spawning survey summary, redd count (number of times surveyed), for Mill Creek, 2001-2006.</td></tr>
<tr><td rowspan="3">Year</td><td colspan="13">Reach Surveyed[a]</td><td rowspan="3">Total Redds</td></tr>
<tr><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td><td>G</td><td>H</td><td>I</td><td>J</td><td>K</td><td>L</td><td>M</td></tr>
<tr><td>RM 23.5-21.6</td><td>RM 21.6-20.8</td><td>RM 20.8-18.7</td><td>RM 18.7-18.3</td><td>RM 18.3-18.0</td><td>RM 18.0-15.9</td><td>RM 15.9-13.8</td><td>RM 13.8-12.9</td><td>RM 12.9-12.4</td><td>RM 4.9-4.7</td><td>RM 4.7-3.0</td><td>RM 3.0-2.0</td><td>RM 2.0-0.0</td></tr>
<tr><td>2001</td><td colspan="2">4 (3)</td><td colspan="2">3 (3)</td><td colspan="2">9 (3)</td><td>3 (2)</td><td>2 (2)</td><td></td><td></td><td>0 (1)</td><td>0 (1)</td><td>1 (1)</td><td>22</td></tr>
<tr><td>2002</td><td colspan="2">0 (2)</td><td>1 (2)</td><td></td><td colspan="2">0 (2)</td><td>0 (2)</td><td>0 (2)</td><td></td><td colspan="3">0 (2)</td><td>0 (2)</td><td>1</td></tr>
<tr><td>2003</td><td></td><td>0 (2)</td><td>5 (2)</td><td></td><td colspan="2">2 (2)</td><td>2 (2)</td><td>0 (2)</td><td></td><td></td><td></td><td></td><td></td><td>9</td></tr>
<tr><td>2004</td><td></td><td>4 (5)</td><td>10 (5)</td><td></td><td></td><td>5 (5)</td><td>9 (5)</td><td>8 (5)</td><td></td><td></td><td></td><td></td><td></td><td>36</td></tr>
<tr><td>2005</td><td></td><td>10 (3)</td><td>33 (3)</td><td></td><td></td><td></td><td>26 (3)</td><td>10 (3)</td><td>1 (3)</td><td></td><td></td><td></td><td></td><td>80</td></tr>
<tr><td>2006</td><td colspan="2">9 (4)</td><td>6 (4)</td><td></td><td></td><td>20 (4)</td><td>4 (4)</td><td colspan="2">4 (4)</td><td></td><td></td><td></td><td></td><td>43</td></tr>
</table>

[a] A: state line to 0.8 miles above Wickersham bridge, B: 0.8 miles above Wickersham bridge to Wickersham bridge, C: Wickersham bridge to 0.4 miles above Blue Creek mouth, D: 0.4 miles above Blue Creek mouth to Blue Creek mouth, E: Blue Creek mouth to 0.3 miles below Blue Creek mouth, F: 0.3 miles below Blue Creek mouth to Seven Mile Rd., G: Seven Mile Rd. to Five Mile Rd., H: Five Mile Rd. to 0.6 miles above Bennington Dam, I: 0.6 miles above Bennington Dam to 0.1 miles above Bennington Dam, J: Hussey St. to Campbell Rd., K: Campbell Rd. to Wallula Rd., L: Wallula Rd. to Last Chance Rd., M: Last Chance Rd. to Mouth.

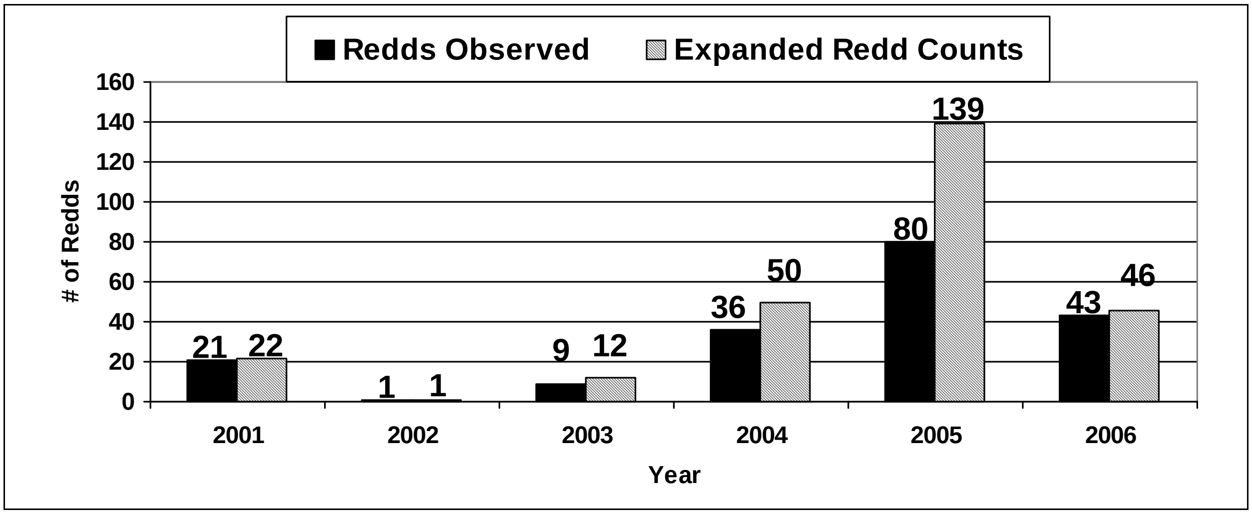


Figure 12. Steelhead spawning survey summary for redds observed and expanded redd counts in Mill Creek above Bennington Dam, 2001-2006.

Yellowhawk Creek was surveyed for the first time since limited surveys were conducted in 2000, with authorization granted by well over a hundred landowners. Since this area may not be surveyed again for several years surveyors took notes and photos of stream condition and any possible barriers observed during the surveys (Appendix G). Three surveys were completed in 2006 from the Garrison Creek diversion to the bottom of each split channel (RM 7.2), and from Sturm Avenue to Plaza Way. We had intended on surveying below Plaza Way but water conditions were not suitable for surveys. No redds or live fish were observed during any of these surveys (Table 17). Survey conditions were fair to poor on the first survey with high turbidity, but were good to fair for the second and third surveys. The three upper sections had better conditions during all the surveys.

Table 17. Steelhead spawning survey summary for Yellowhawk Creek, 2006.							
Reach/ Date	**Survey**	**Stream Section[a]**	**Surveyed Miles**	**Redds**	**Redds per mile**	**Fish Observed**	
Yellowhawk Creek						Live	Dead
4/4	1	(A) River mile 9.0 to river mile 8.3A	0.7	0	0.0	0	0
4/4	1	(B) River mile 8.3A to river mile 7.2	1.1	0	0.0	0	0
4/4	1	(C) River mile 8.2B to river mile 7.2	1.0	0	0.0	0	0
4/4	1	(D) River mile 6.4 to river mile 5.8	0.6	0	0.0	0	0
4/4	1	(E) River mile 5.7 to river mile 5.1	0.6	0	0.0	0	0
4/4	1	(F) River mile 5.1 to river mile 3.9	1.2	0	0.0	0	0
5/1	2	(A) River mile 9.0 to river mile 8.3A	0.7	0	0.0	0	0
5/1	2	(B) River mile 8.3A to river mile 7.2	1.1	0	0.0	0	0
5/1	2	(C) River mile 8.2B to river mile 7.2	1.0	0	0.0	0	0
5/1	2	(D) River mile 6.4 to river mile 5.8	0.6	0	0.0	0	0
5/1	2	(E) River mile 5.7 to river mile 5.1	0.6	0	0.0	0	0
5/1	2	(F) River mile 5.1 to river mile 3.9	1.2	0	0.0	0	0
5/17	3	(A) River mile 9.0 to river mile 8.3A	0.7	0	0.0	0	0
5/17	3	(B) River mile 8.3A to river mile 7.2	1.1	0	0.0	0	0
5/17	3	(C) River mile 8.2B to river mile 7.2	1.0	0	0.0	0	0
5/17	3	(D) River mile 6.4 to river mile 5.8	0.6	0	0.0	0	0
5/17	3	(E) River mile 5.7 to river mile 5.1	0.6	0	0.0	0	0
5/17	3	(F) River mile 5.1 to river mile 3.9	1.2	0	0.0	0	0
		Total	**5.2**	**0**	**0.0**	**0**	**0**

[a] A: Garrison Creek diversion to Yellowhawk Creek split on east edge of section 22, B: Left bank (looking downstream) split of Yellowhawk Creek, C: Right bank (looking downstream) split of Yellowhawk Creek, D: Sturm Ave. to Fern Ave., E: Abbott Ave. to Cottonwood Rd., F: Cottonwood Rd. to Plaza Way.

We have been conducting steelhead spawning surveys in the Walla Walla Subbasin since 1999, and have sampled many streams to try and determine distribution of spawning in the subbasin. Steelhead redds have been documented over the years in a variety of areas we have surveyed (Table 18) that are additional to those summarized above.

Table 18. Compilation of miscellaneous steelhead spawning surveys conducted as part of this project since 1999.

Watershed/Stream	Year	Miles	Number of Surveys	Number of Redds
Touchet River Watershed				
Lewis Creek	2000	2.1	1	0
Jim Creek	2000	0.3	1	0
Touchet River	2001	10.7	1	7
South Fork Patit Creek	1999	6.8	2	2
	2000	2.5	2	5
Patit Creek	1999	2.5	2	0
Whiskey Creek	2003	4.8	1-2[a]	4
	2004	4.8	2	8
Alyward Tributary	2003	2.4	1-2[a]	0
	2004	2.4	1	0
Walla Walla River Watershed				
Walla Walla River	2001	12.6	1	6
Yellowhawk Creek	2000	2.7	1-2[a]	1
Russel Creek	2000	3.9	1	0
Cottonwood Creek	2000	4.5	3	1
	2001	4.5	1	1
	2002	4.5	3	0
East Little Walla Walla	2000	1.1	3	0
	2001	1.1	1	1
	2002	1.4	0	0
West Little Walla Walla	2000	1.1	3	1
	2001	1.1	1	0
	2002	2.9	0	0
Mill Creek Watershed				
Blue Creek	2001	4.2	1	0
Titus Creek	2004	1.7	4	0
Dry Creek Watershed				
North Fork Dry Creek	2000	1.4	1-2[a]	2
Upper Dry Creek	1999	5.9	1-2[a]	6
	2000	7.2	1-3[a]	5
	2004	3.9	2	2

[a] Total area sampled was broke into multiple sections with number of surveys varying for each section.

Bull Trout

Bull trout spawning surveys were conducted in two upper tributaries of the Touchet River in 2006. The surveyed areas included the Wolf Fork and North Fork Touchet. WDFW also planed on surveying the Burnt Fork (another upper Touchet River tributary) but access was restricted in this area because of the Columbia Complex fire. Timing of the first surveys was delayed by 7-17 days because of fire related restricted access. Surveys were conducted three times, with the exception of one section of the Wolf Fork above the Forest Service boundary that was not accessible on our first survey (because of the Columbia Complex fire). Redd counts are typically used to evaluate abundance and distribution of adult bull trout and trends in population size (Dunham et al. 2001, Hemmingsen et al. 2001, Starcevich et al. 2005, Mendel et al. 2006). Redd counts can be compared to other methods of estimating adult population abundance. Although redd counts for bull trout can have substantial sampling errors (Dunham et al. 2001, Hemmingsen et al. 2001, Starcevich et al. 2005), a strong relationship between the estimated number of mature fluvial bull trout females, or total mature adults, and the total number of redds observed has been documented in the South Fork Walla Walla River and elsewhere in northeast Oregon (Starcevich et al. 2005, Al-Chockhachy et al. 2005). Redd counts can have substantial bias in relation to abundance of resident bull trout because of the small size of redds and associated redd enumeration errors (Starcevich et al. 2005, Al-Chockhachy et al. 2005). WDFW biologists have found spawning surveys to be useful for determining spawn timing, distribution and relative abundance of redds or mature adults, particularly for fluvial (migratory) bull trout, as well as for monitoring relative abundance trends in southeast Washington (Mendel et al. 2004, 2005, 2006).

Bull trout spawning surveys in the upper Wolf Fork in 2006 produced a total of 37 redds and 9 live fish between river mile 7.6 and river mile 13.5 (Table 19). This was the lowest total redd count since 1998, with similar distribution and number of surveys per year. While we have included data back to 1990 in the table and figure, the data prior to 1998 was sporadic in both areas surveyed and the number of surveys completed in any given year and should not be compared directly to the surveys conducted after 1997. Since 1998, WDFW has tried to standardize surveys in this area so comparisons can be made from year to year (Table 20, Figure 13).

Table 19. Bull trout spawning survey summary for the Wolf Fork of the Touchet River, 2006.

Reach/ Date	**Survey**	**Stream Section**[a]	**Surveyed Miles**	**Redds**	**Redds per mile**	**Fish Observed**	
Wolf Fork						Live	Dead
9/28	1	(A) River mile 13.5 to river mile12.0	1.5	3	2.0	0	0
9/12	1	(B) River mile 12.0 to river mile 10.7	1.3	4	3.1	4	0
9/12	1	(C) River mile 10.7 to river mile 9.8	0.9	9	10.0	2	0
9/12	1	(D) River mile 9.8 to river mile 8.7	1.1	2	1.8	0	0
9/12	1	(E) River mile 8.7 to river mile 7.6	1.1	3	2.7	0	0
10/12	2	(A) River mile 13.5 to river mile12.0	1.5	0	0.0	0	0
9/28	2	(B) River mile 12.0 to river mile 10.7	1.3	4	3.1	0	0
9/28	2	(C) River mile 10.7 to river mile 9.8	0.9	2	2.2	1	0
9/28	2	(D) River mile 9.8 to river mile 8.7	1.1	6	5.5	2	0
9/28	2	(E) River mile 8.7 to river mile 7.6	1.1	1	0.9	0	0
10/12	3	(B) River mile 12.0 to river mile 10.7	1.3	0	0.0	0	0
10/12	3	(C) River mile 10.7 to river mile 9.8	0.9	2	2.2	0	0
10/12	3	(D) River mile 9.8 to river mile 8.7	1.1	0	0.0	0	0
10/12	3	(E) River mile 8.7 to river mile 7.6	1.1	1	0.9	0	0
		Total	**5.9**	**37**	**6.3**	**9**	**0**

[a] A: RM 14.1 to Forest Service Line, B: Forest Service Line to mouth of Tate Ck, C: Mouth of Tate Ck. to RM 10.0, D: RM 10.0 to Old Cabin, E: Old Cabin to Whitney Ck mouth

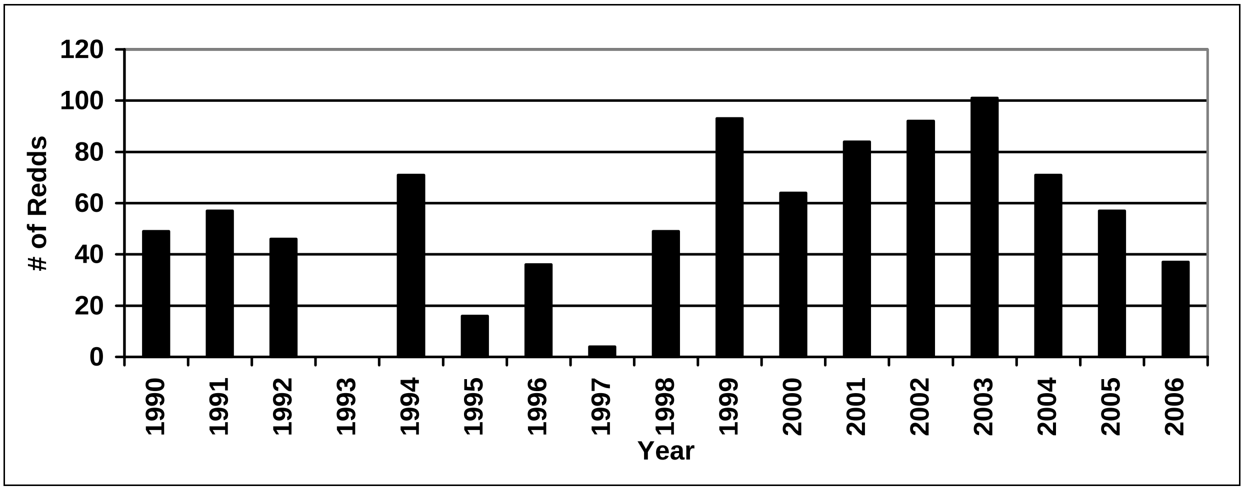


Figure 13. Bull trout redd counts for the Wolf Fork, 1990-2006.

Table 20. Bull trout redd counts (number of times surveyed) for the Wolf Fork of the Touchet River, 1990-2006.

	Reach Surveyed[a]							
	A	B	C	D	E	F	G	
Year	RM 14.5-14.1	RM 14.1-12.3	RM 12.3-10.9	RM 10.9-10.0	RM 10.0-8.9	RM 8.9-7.7	RM 7.7-7.1	Total Redds
1990[b]			18 (8)	31 (8)				49
1991[b]			20 (5)	37 (5)				57
1992[b]			46 (3)					46
1993[c]								N/A
1994[d]			71 (?)					71
1995[d]			16 (?)					16
1996[d]			36 (?)					36
1997[d,e]					4 (1)			4
1998[f]		11 (3)	7 (3)	18 (3)	12 (3)	0 (3)		48
1999[f]		32 (4)	14 (5)	34 (5)	11 (5)	2 (4)		93
2000[f]		3 (3)	17 (4)	33 (4)	7 (4)	4 (3)		64
2001[f]		15 (4)	19 (4)	36 (4)	11 (4)	2 (3)	1 (2)	84
2002[f]		25 (4)	15 (4)	39 (4)	8 (4)	5 (4)		92
2003[f]	3 (4)	19 (4)	21 (5)	41 (5)	12 (4)	5 (4)		101
2004[f]		11 (5)	25 (5)	25 (5)	10 (5)	0 (5)		71
2005[f]		1 (2)	5 (3)	38 (4)	10 (4)	3 (4)		57
2006[f]		3 (2)	8 (3)	13 (3)	8 (3)	5 (3)		37

[a] A: RM 14.5 to RM 14.1 (2nd meadow), B: RM 14.1 (2nd meadow) to Forest Service line, C: Forest Service Line to Mouth of Tate Ck., D: Mouth of Tate Ck to RM 10.0 (stream ford), E: RM 10.0 (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] Surveys conducted by masters student (Martin et al. 1992 and Underwood et al. 1995)
[c] No survey.
[d] Surveys conducted by USFS
[e] Only one survey, late in October and too far downstream.
[f] Surveys conducted by WDFW

The North Fork Touchet River was surveyed three times in 2006 with only 9 redds, and 3 live bull trout, observed (Table 21). This was the fifth straight year that the total number of redds was below 30, and the first time the total number of redds was below 10 since surveys began in

1994 (Tables 22, Figure 14). The next year of surveying will be very important to see if the redd counts increase or diminish further. Decreases in this population could be attributed to limited spawning and juvenile rearing area, as well as recent mortalities to bull trout (from USFS bridge work, radio telemetry studies, or chemical spills see Mendel et al. 2003a) or negative impact to their spawning habitat (severe sedimentation from USFS road construction project in 2004). Our surveys cover 5.4 miles, but the majority of the spawning occurs in the upper 2.6 miles of that section. Any decrease in water quality or fish habitat (chemical spills, sediment load, etc.) in that area that may be caused by high recreational use or the transportation system could have severe adverse impacts to the population. WDFW is very concerned about the declines of this and the other bull trout spawning groups in the Touchet River Watershed. We have distributed a bull trout alert notice to other agencies, tribes and resource managers in an effort to make everyone aware of the precarious status of these fish and to try to initiate action to save them (Appendix H).

Table 21. Bull trout spawning survey summary for the North Fork Touchet River and one of its tributaries, 2006.

Reach/ Date	**Survey**	**Stream Section[a]**	**Surveyed Miles**	**Redds**	**Redds per mile**	**Fish Observed**	
North Fork Touchet						Live	Dead
9/22	1	(A) River mile 19.1 to river mile 16.6	2.5	3	1.2	0	0
9/22	1	(B) River mile 16.6 to river mile 14.0	2.6	0	0.0	0	0
10/3	2	(A) River mile 19.1 to river mile 16.6	2.5	6	2.4	3	0
10/3	2	(B) River mile 16.6 to river mile 14.0	2.6	0	0.0	0	0
10/18	3	(A) River mile 19.1 to river mile 16.6	2.5	0	0.0	0	0
10/18	3	(B) River mile 16.6 to river mile 14.0	2.6	0	0.0	0	0
		Total	**5.1**	**9**	**1.8**	**3**	**0**

[a] A: Bluewood culvert to 2.6 miles below Bluewood culvert, B: 2.6 miles below Bluewood culvert to Stream ford below mouth of Spangler Ck.

Table 22. Bull trout redd counts (number of times surveyed) for the North Fork Touchet River, 1994-2006.			
	Reach Surveyed[a]		
	A	B	
Year	River Mile 19.7-17.1	River Mile 17.1-14.3	Total Redds
1994[b]	10 (2)	3 (2)	13
1995[b]	11 (2)	0 (1)	11
1996[b]	21 (2)	2 (2)	23
1997[b]	24 (2)	6 (1)	30
1998[b]	24 (3)	18 (2)	42
1999[b]	25 (2)	21 (2)	46
2000[c]	47 (2)	0 (1)	47
2001[d]	41 (4)	5 (4)	46
2002[d]	28 (4)	1 (4)	29
2003[d]	23 (4)	2 (4)	25
2004[d]	22 (5)	0(5)	22
2005[d]	13 (4)	2 (4)	15
2006[d]	9 (3)	0 (3)	9

[a] A: Bluewood culvert to 2.6 miles below Bluewood culvert, B: 2.6 miles below Bluewood culvert to Stream ford below mouth of Spangler Ck.
[b] Surveys conducted by USFS
[c] Surveys conducted jointly by USFS and WDFW
[d] Surveys conducted by WDFW

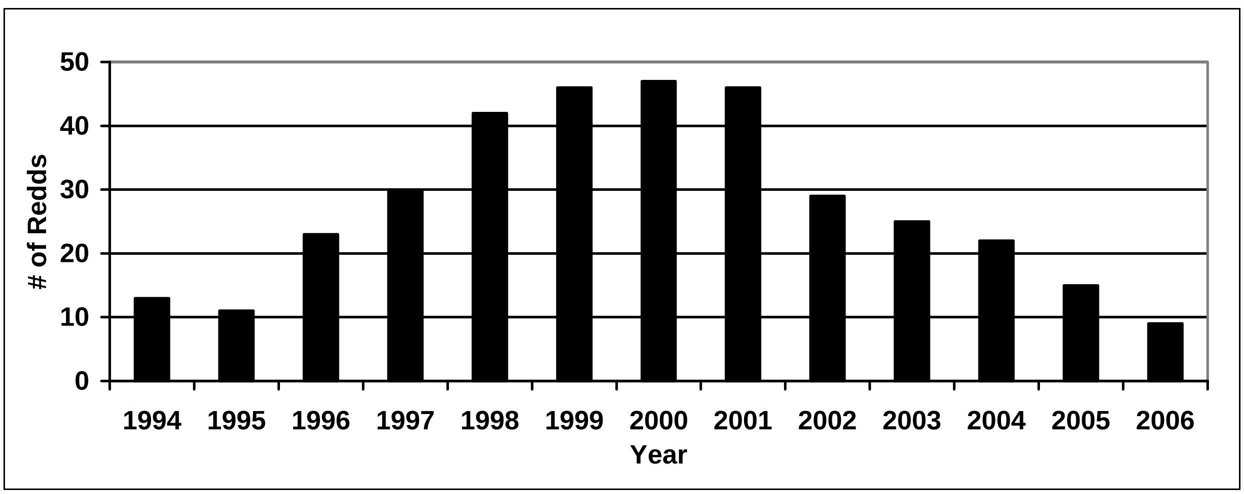


Figure 14. Bull trout redd counts for the North Fork Touchet, 1994-2006.

No surveys were conducted in the Burnt Fork in 2006 because of fire restrictions (Table 23). In the past, we have also surveyed other areas to determine possible spawning locations (Table 24).

Table 23. Bull trout redd counts (number of times surveyed) for the Burnt Fork, 2000-2006.				
	Reach Surveyed[a]			
	A	B	C	
Year	RM 3.5-3.3	RM 3.3-1.6	RM 1.6-0.0	Total Redds
2000[b]	0 (1)[c]	4 (3)	0 (1)	4
2001[b]	13 (4)		3 (4)	16
2002[b]	2 (3)		0 (3)	2
2003[b]	0 (3)		0 (3)	0
2004[b]	0 (2)		0 (2)	0
2005[b]	1(2)		1(2)	2
2006[b, d]				N/A

[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] Surveys conducted by WDFW Fish Management
[c] Survey this year actually went up to RM 3.6.
[d] No survey done.

Table 24. Bull trout redd counts (number of times surveyed), for Spangler Creek, Lewis Creek, South Fork Touchet River, and Griffen Fork, 2001-2006.									
	Reach Surveyed[a]								
	Spangler Creek	Lewis Creek			South Fork Touchet		Griffen Fork		
	A	B	C	D	E	F	G	H	
Year	RM 3.5-0.0	RM 2.6-2.1	RM 2.1-1.1	RM 1.1-0.1	RM 15.4-14.8	RM14.8-14.2	RM 1.3-0.5	RM 0.5-0.0	Total
2001	2 (1)				0 (2)	0 (2)	0 (1)	0 (2)	2
2002			2 (2)	0 (2)	0 (2)	0 (2)			2
2003		0 (3)		0 (3)	0 (3)				0
2004		0 (2)		0 (2)					0
2005[b]									N/A
2006[b]									N/A

[a] A: River Mile 3.5 to Mouth, B: 1.5 miles above Forest Service line to 1.0 miles above Forest Service line, C: 1.0 miles above Forest Service Line to Forest Service Line, D: Forest Service Line to North Fork Touchet Rd., E: Confluence of Burnt Fork and Green Fork to stream ford below cabins, F: Stream ford below cabins to mouth of Griffen Fork, G: Rive r Mile 1.3 to River Mile 0.5, H: River Mile 0.5 to Mouth.
[b] No survey done.

Spawning surveys have been conducted by the ODFW and the USFS on Mill Creek (Table 25), and on some of Mill Creek's upper tributaries since 1994 (Table 26). Surveys in Mill Creek 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 USFWS (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 surveys on Mill Creek and its tributaries has been fairly consistent (Tables 25 and 26). This allows for annual comparisons of total redds for the Mill Creek system, with a peak of just over 220 redds in 2001 (Figure 15). In 2006, a total of 93 redds were seen in the Mill Creek system (Table 25 and 26, Figure 15) with 53 redds observed in Mill Creek (Table 25), and 40 redds found in tributaries (Table 26). This is the first time since 1994 that the total number of redds for the Mill Creek system has dropped below 100. With declines in the populations in the Touchet

River watershed, monitoring the Mill Creek Population should be a priority over the next few years.

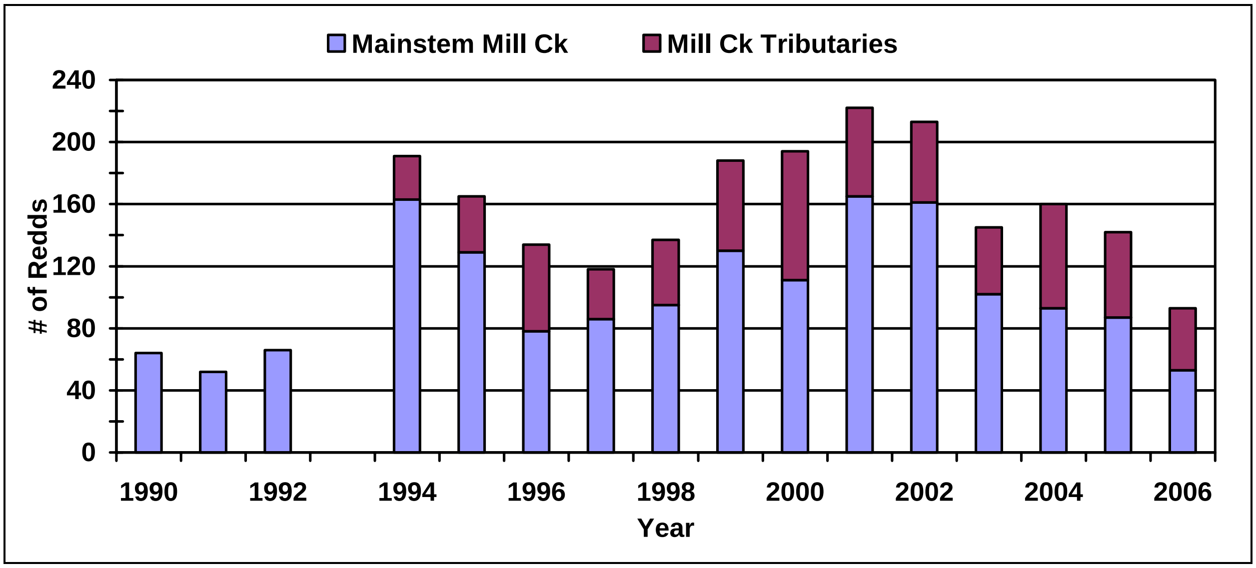


Figure 15. Bull trout redd counts for Mill Creek and its tributaries, 1990-2006.

Table 25. Bull trout spawning survey summary, redd count (number of times surveyed), for Mill Creek, 1990-2006.

	Reach Sureyed[a]									
Year	A	B	C	D	E	F	G	H	I	Total Redds
1990[b]		48 (3)	15 (3)	1 (3)						64
1991[b]	10 (4)	14 (4)	17 (4)	11 (5)						52
1992[b]	6 (4)	9 (4)	51 (4)							66
1993[c]										N/A
1994[d]	15 (1)	28 (2)	91 (5)	26 (1)		2 (2)	0 (1)	1 (1)	0 (1)	163
1995[d]	28 (2)	16 (2)	68 (3)	13 (2)	1 (2)	3 (1)	0 (1)	0 (1)	0 (1)	129
1996[d]	3 (2)	8 (2)	48 (2)	14 (2)	4 (2)	0 (1)	0 (1)	1 (1)	0 (1)	78
1997[d]	16 (4)	15 (4)	36 (4)	14 (4)		5 (4)	0 (4)	0 (4)		86
1998[d]	17 (4)	14 (4)	45 (4)	15 (4)		3 (4)	1 (4)	0 (4)		95
1999[d]	14 (4)	13 (4)	58 (5)	38 (4)		4 (4)	0 (4)	0 (4)	3 (1)	130
2000[d]	15 (4)	10 (4)	70 (4)	13 (4)		2 (4)	0 (4)	0 (1)	1 (4)	111
2001[d]	18 (3)	27 (4)	83 (4)	32 (4)		0 (2)	3 (3)	0 (2)	2 (1)	165
2002[d]	15 (3)	24 (3)	80 (3)	40 (3)		2 (2)	0 (2)	0 (2)		161
2003[d]	9 (3)	12 (3)	53 (3)	18 (3)		6 (3)	0 (2)	0 (2)	4 (2)	102
2004[d]	12 (3)	17 (3)	45 (3)	18 (3)		1 (3)	0 (3)	0 (3)		93
2005[d]	6 (3)	10 (3)	33 (3)	34 (3)		3 (3)	0 (3)	0 (3)	1 (3)	87
2006	7 (3)	7 (3)	29 (3)	8 (3)		0 (3)	0 (3)	0 (3)	2 (3)	53

[a] A: Forks to Bull Ck., B: Bull Ck. to Deadman Ck., C: Deadman Ck. to North Fork Mill Ck, D: North 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 Forestry Boundary.
[b] Surveys conducted by masters student (Martin et al. 1992 and Underwood et al. 1995)
[c] No survey.
[d] ODFW, USFWS, and USFS data.

Table 26. Bull trout spawning survey summary, redd count (number of times surveyed), for tributaries to Mill Creek, 1994-2006.

	Reach Surveyed[a]								
	A	B	C	D	E	F	G	H	
	Bull Creek	Green Fork	Burnt Fork	Deadman Creek	N.F. Mill Creek	Paradise Creek	Broken Creek	Low Creek	
Year	RM[b] 1.0[1] or 0.6[2] or 0.5[3]-0.0	RM 0.7-0.0	RM[b] 0.7[1] or 0.3[2]-0.0	RM[b] 1.2[1] or 0.4[2] or 0.3[3]-0.0	RM[b] 0.9[1] or 0.5[2]-0.0	RM[b] 2.0[1] or 1.5[2] or 1.4[3]-0.0	RM 1.5-0.0	RM[b] 2.0[1] or 1.3[2] or 1.0[3] or 0.5[4]-0.0	Total Redds
1994[c]	0 (1)[1]	4 (1)	2 (1)[1]	0 (1)[1]	9 (1)[2]	10 (1)[1]	0 (1)	3 (1)[3]	28
1995[c]	9 (1)[1]	1 (1)	3 (1)[1]	2 (1)[1]	12 (1)[2]	9 (1)[1]	0 (1)	0 (1)[4]	36
1996[c]	10 (2)[3]	0 (1)	12 (3)[1]	3 (1)[3]	5 (1)[2]	8 (1)[2]	0 (1)	18 (2)[1]	56
1997[c]	2 (4)[3]		4 (3)[2]	1 (4)[3]	3 (4)[2]	2 (4)[2]	0 (4)	20 (4)[1]	32
1998[c]	2 (4)[3]		2 (4)[2]	4 (4)[3]	6 (4)[2]	1 (1)[2]	0 (4)	27 (3)[1]	42
1999[c]	1 (4)[3]		4 (4)[2]	0 (4)[3]	6 (4)[2]	6 (2)[2]		41 (3)[1]	58
2000[c]	1 (4)[3]		14 (4)[2]	7 (4)[3]	17 (4)[1]	5 (4)[2]		39 (4)[1]	83
2001[c]	1 (3)[2]		3 (3)[2]	0 (2)[2]	17 (4)[1]	3 (4)[3]		33 (4)[2]	57
2002[c]	1 (3)[2]		2 (3)[2]	0 (2)[2]	12 (3)[1]	5 (3)[3]		32 (3)[2]	52
2003[c]	5 (3)	0 (1)	1 (3)	0 (?)	8 (?)	1 (2)		28 (3)	43
2004[c]	0 (3)		0 (1)		6 (3)	0 (1)		61 (3)	67
2005[c]	0 (2)		0 (2)	0 (2)	9 (3)	3 (3)		43 (3)	55
2006	0 (3)				5 (3)	0 (3)		35 (3)	40

[a] A: RM 1.0, 0.6, or 0.5 to mouth, B: RM 0.7 to mouth, C: RM 0.7 or 0.3 to mouth, D: RM 1.2, 0.4, or 0.3 to mouth, E: RM 0.9 or 0.5 to mouth, F: RM 2.0, 1.5, or 1.4 to mouth, G: RM 1.5 to mouth, H: RM 2.0, 1.3, 1.0, or 0.5 to mouth.
[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, USFWS, and USFS data.

Genetic and Scale Sampling

WDFW Fish Management personnel collected 271 fin clips and 196 scale samples from salmonids in the Walla Walla Subbasin in 2006. Juvenile rainbow/steelhead trout comprised the largest group sampled with 251 fin clips and 181 scale samples. Seventeen fin clips and 15 scale samples were from juvenile bull trout, and three genetic samples were from adult steelhead.

Of the 251 rainbow/steelhead trout genetic samples, 242 were from juveniles and 9 were from legal size fish. All of the 251 rainbow/steelhead trout genetic samples were collected during electrofishing surveys, and were collected as follows; 43 juveniles and one legal size fish from Spangler Creek, 19 juveniles from Lewis Creek, 39 juveniles and one legal from the Burnt Fork, 50 juveniles from Griffin Fork, 15 juveniles from Patit Creek, 12 juveniles and 4 legals from Whiskey Creek, 26 juveniles and one legal from Yellowhawk Creek, and 38 juveniles and two legals on Dry Creek. During our electrofishing surveys we also collected scale samples as follows; 40 from Spangler Creek, 18 from Lewis Creek, 24 from Burnt Fork, 46 from Griffin Fork, 4 from Whiskey Creek, 10 from Yellowhawk Creek, and 39 from Dry Creek.

Bull trout genetic and scale samples were also collected during electrofishing surveys. All bull trout samples were collected from juvenile fish. Fourteen genetic samples and 13 scale samples were collected in Spangler Creek, and three genetic samples and two scale samples were collected in Lewis Creek.

Tissue samples were collected from three adult steelhead during spawning surveys on the South Fork Coppei Creek.

Genetic Analyses

After several years of planning and sampling steelhead and bull trout in the Walla Walla Basin, WDFW was finally able to secure the necessary funding, make arrangements for genetic analyses, and complete the genetic characterization and reporting for steelhead and bull trout in the Walla Walla Basin.

Steelhead

Adult steelhead tissue collections were analyzed (Blankenship et al. 2007) from five locations, plus a likely mixed resident trout/juvenile steelhead collection on Mill Creek, as well as from numerous Touchet River tributaries (not indicated on Figure 16).

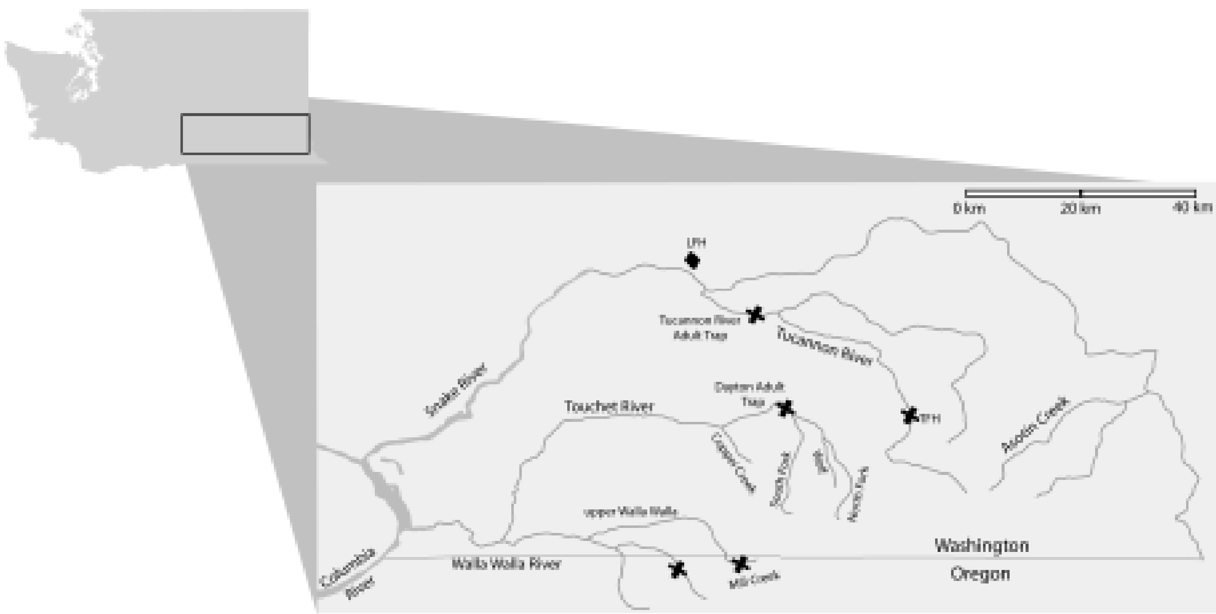


Figure 16. Collection locations for natural Tucannon, Touchet, and Walla Walla River summer steelhead, and the hatchery Lyons Ferry stock. Diamond symbol identifies LFH, X symbols identify trap locations.

A WDFW steelhead genetic summary report was produced (Blankenship et al. 2007) and a revised manuscript was submitted for journal publication (Blankenship et al. in press). The most pertinent genetic results for the Walla Walla Basin from the steelhead analyses are summarized as follows (Tables and Figures below were clipped from Blankenship et al. 2007, and renumbered for this report):

1) Most of the steelhead groups were genetically different, with the Touchet, Tucannon and Walla Walla samples genetically distinct, although closely related. Lyons Ferry Hatchery stock steelhead adults were genetically different from Touchet and Walla Walla adult steelhead, and usually different from Tucannon adults. Table 27 below (Table 3 from Blankenship et al. 2007) shows the probability values for these comparisons and Figures 17 and 18 show these comparisons in chord distance trees or dendrograms (Blankenship et al. 2007).

Table 27. Genetic differentiation. P-values for between population pairwise tests of allelic differentiation are shown for Tucannon, Touchet, Lyons Ferry Hatchery, and Walla Walla collections.

	98/99 LFH	99 LFH	03 LFH	04 LFH	05 LFH	99 Tou	00 Tou	01 Tou	02 Tou	03 Tou	04 Tou	05 Tou	98 Walla	99 Walla	98 Mill
98/99 Tuc	0.1978	*	*	*	*	*	*	*	0.0004	*	*	*	*	*	*
2000 Tuc	0.6952	*	*	*	*	0.0216	*	*	*	*	*	*	*	*	*
2001 Tuc	0.1947	*	*	*	*	*	*	*	*	*	*	*	*	*	*
2002 Tuc	0.6204	*	*	*	*	0.0034	*	*	*	*	*	*	*	*	*
2003 Tuc	0.4730	*	*	*	*	0.0003	*	*	*	*	*	*	*	*	*
2004 Tuc	0.4855	*	*	*	*	*	*	*	*	*	*	*	*	*	*
2005 Tuc	0.0009	*	*	*	*	0.0003	*	*	*	*	*	*	*	*	*

	99 Tou	00 Tou	01 Tou	02 Tou	03 Tou	04 Tou	05 Tou	98 Walla	99 Walla	98 Mill
98/99 LFH	*	*	*	*	*	*	*	*	*	*
1999 LFH	*	*	*	*	*	*	*	*	*	*
2003 LFH	*	*	*	*	*	*	*	*	*	*
2004 LFH	*	*	*	*	*	*	*	*	*	*
2005 LFH	*	*	*	*	*	*	*	*	*	*

	98 Walla	99 Walla	98 Mill
99TouA	0.0012	0.0492	0.0036
00TouA	*	0.0004	*
01TouA	*	*	*
02TouA	*	*	*
03TouA	*	*	*
04TouA	*	*	*
05TouA	*	*	*

	98 - 05 Tuc	98 - 05 LFH	99 Tou	00 Tou	01 Tou	02 Tou	03 Tou	04 Tou	05 Tou	98 Walla	99 Walla	98 Mill
99NFTouJ	*	*	0.0075	*	*	*	*	*	*	*	*	*
00NFTouJ	*	*	0.0774	0.0003	*	*	*	*	*	*	*	*
99SFTouJ	*	*	0.0489	*	*	*	*	*	*	*	*	*
99WFTouJ	*	*	0.1852	*	*	*	*	*	*	*	*	*
00CoppJ	*	*	*	*	*	*	*	*	*	*	*	*
00RobTouJ	*	*	0.0004	*	*	*	*	*	*	*	*	*

Note - * denotes a p-value of 0.0001 or less. Tuc = Tucannon, LFH = Lyons Ferry Hatchery, Tou = Touchet, Walla = Walla Walla

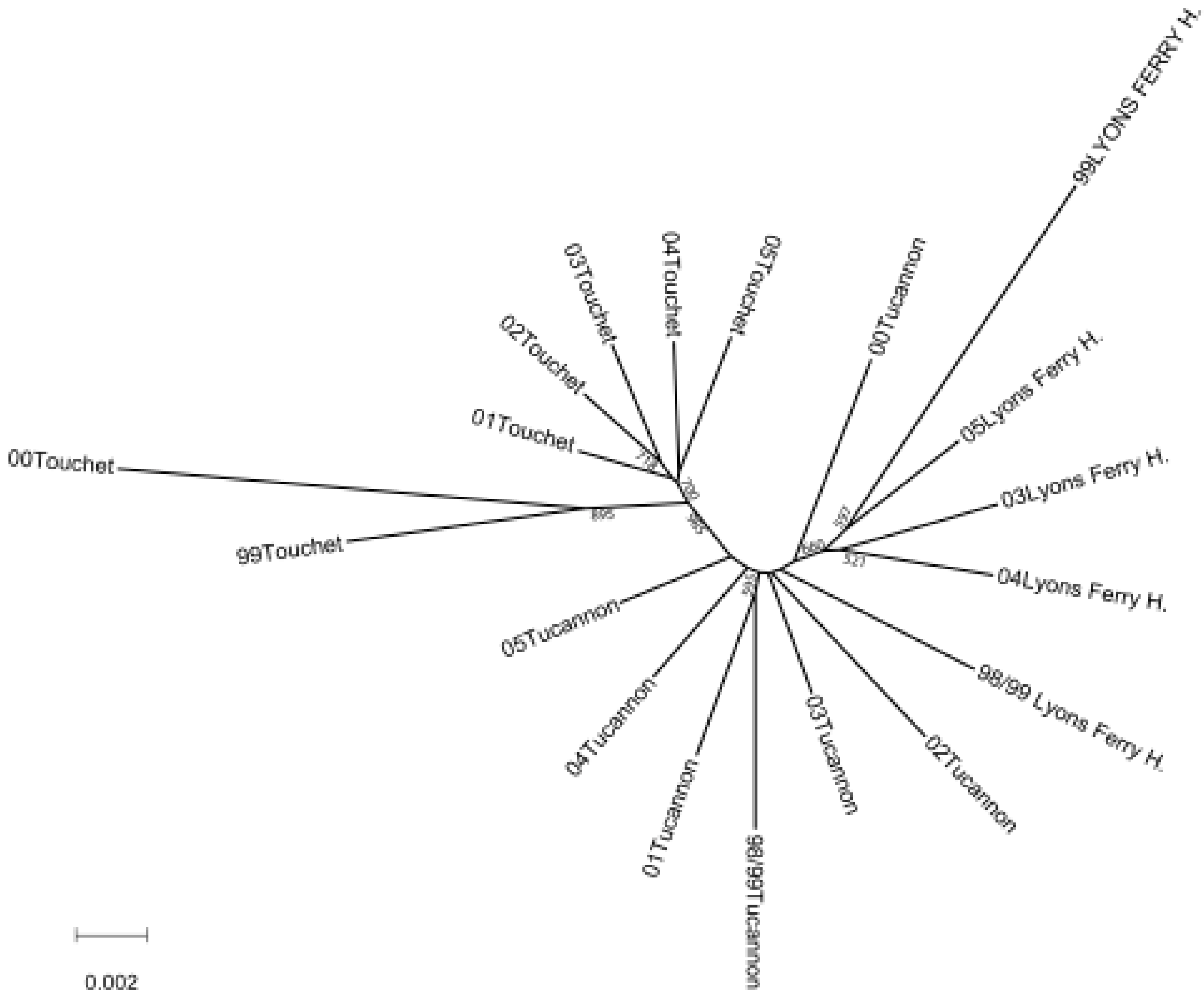


Figure 17. Chord-distance tree for temporally stratified adult samples. Node support numbers are values from bootstrap analysis (1000 bootstraps). Note: only 1999 LFH samples were from juveniles.

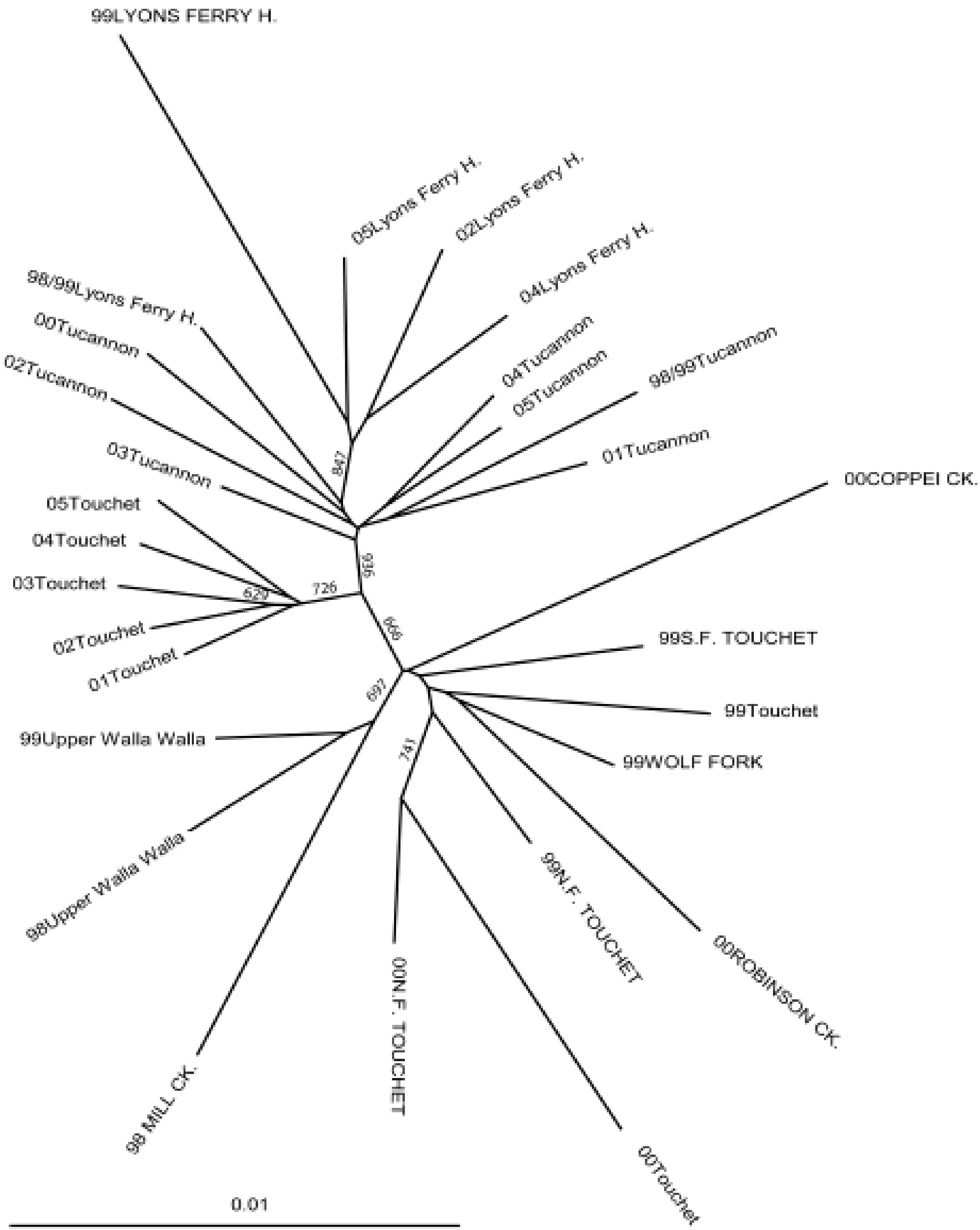


Figure 18. Chord distance tree that includes temporally stratified samples (from Figure 2), plus samples from Touchet River tributaries, Mill Creek, and Walla Walla River. Sample labels with all letters capitalized are juvenile samples. Node support numbers are values from bootstrap analysis (1000 bootstraps).

2) The Walla Walla River samples were significantly different genetically from the Touchet River samples, and the one collection from Mill Creek (probably a mixture of juvenile steelhead and resident rainbow trout) was different than steelhead in both the Touchet and Walla Walla rivers (see Table 27 above and Figures 17 and 18).

3) The Walla Walla River collections tended to group together when compared with other Columbia Basin stocks (Figure 19).

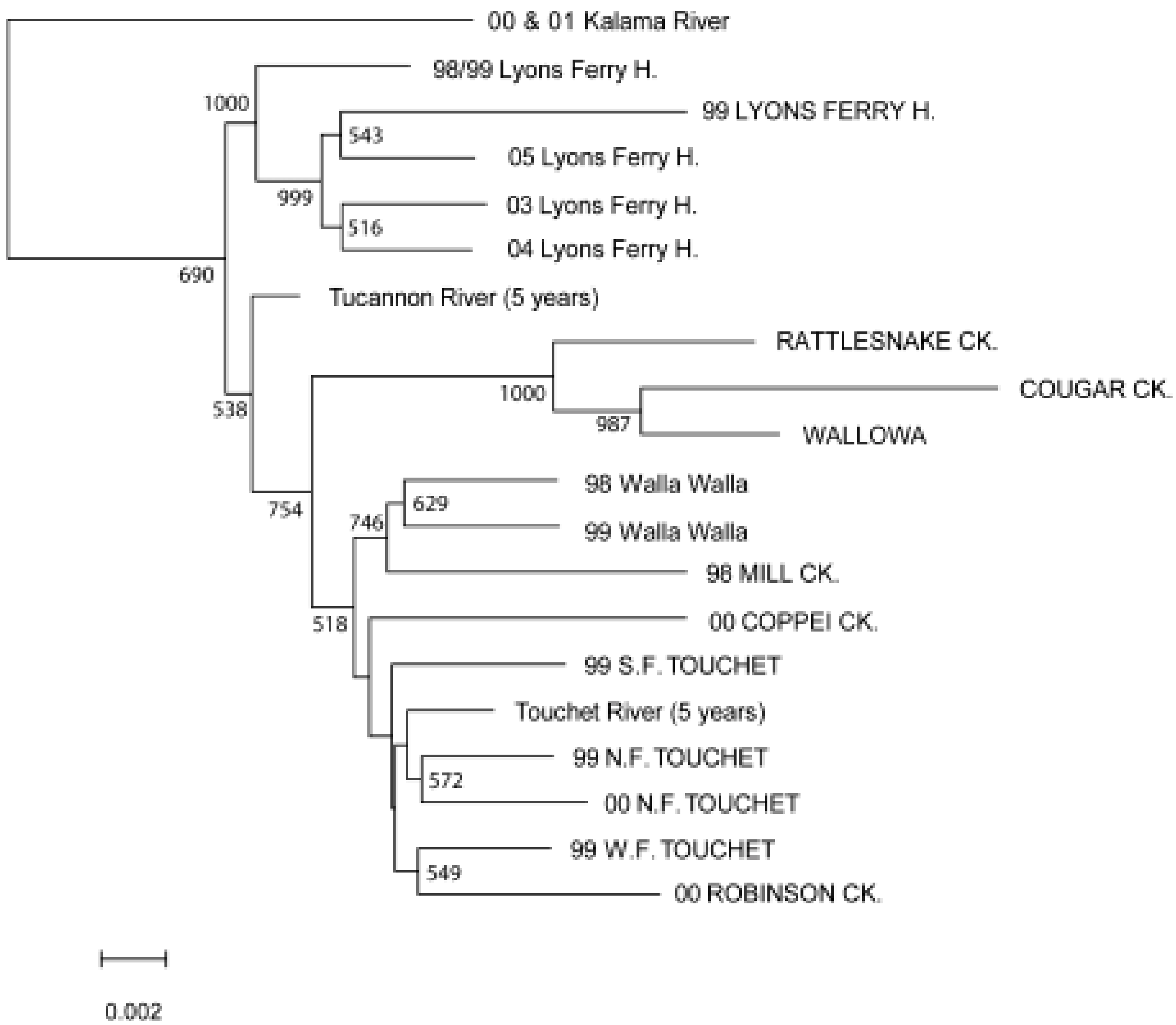


Figure 19. Chord distance tree from steelhead samples from Lower Columbia River (Kalama River), Walla Walla River Basin, and Snake River Basin (Grande Ronde tributaries, Tucannon River and Lyons Ferry Hatchery). Sample labels with all letters capitalized are juvenile samples. Node support numbers are values from bootstrap analysis (1000 bootstraps).

4) No strong evidence was found of hatchery introgression in the Touchet, Coppei, or Walla Walla steelhead from LFH based on individual assignments results. The Walla Walla samples (which includes Mill Creek) had the highest self assignment rate for the

larger stream groups (56%), with the fewest assigning to LFH (1%), and the least unassigned (27% - see Table 28). This would suggest that the Walla Walla samples are more distinct from LFH than the other groups (Blankenship et al. 2007). Individual assignment results for the Touchet River have a slightly higher mis-assignment rate to LFH than the Walla Walla sample. Coppei Creek had a self assignment rate of 86.7%.

Table 28. Individual assignment results reported are the proportions of individuals assigned to each population category, given the assignment LOD was greater than one and the individual's likelihood resided within the 95% confidence interval for the estimated population of origin.

	N	Tucannon	LFH	Touchet	Walla Walla	Unassigned
Tucannon River ……	451	0.29	0.14	0.09	0.05	0.43
Lyons Ferry Hatchery	333	0.10	0.46	0.13	0.01	0.31
Touchet River………	987	0.06	0.05	0.53	0.05	0.30
Walla Walla ………	177	0.04	0.01	0.12	0.56	0.27

5) Effective breeding population sizes (N_b) for steelhead were calculated for several areas in the Walla Walla Basin. The N_b for the Touchet River adults at the Dayton Dam for 1996-2002 was 173.8. The N_b for Coppei Creek through the North Fork of the Touchet was 81-206 (Table 29).

Table 29. Estimates of the effective number of breeders (N_b) for the parental cohorts contributing to juvenile steelhead samples from the Upper Touchet River. Single samples were analyzed using the linkage disequilibrium method (Bartley et al. 1992; Waples 1991).

Sample	N_b	Confidence Interval
1999 NF Touchet	118.1	(107.6 – 130.4)
2000 NF Touchet	206.2	(172.3 – 254.9)
1999 SF Touchet	157.7	(139.0 – 181.2)
1999 Wolf F Touchet	100.8	(92.7 – 110.1)
2000 Coppei Creek	81.2	(71.5 – 93.3)
2000 Robinson Creek	93.8	(81.0 – 110.6)

Bull Trout

After 9 years of planning and collecting tissue samples, plus securing the funding and genetics expertise, we were finally able to genetically characterize and compare bull trout collections or populations in the Walla Walla Basin. A total of 25 collections of bull trout (Table 30) were analyzed from eight different collection sites within the Walla Walla Basin (Figure 20), and compared to two sites in the Yakima Basin. Sixteen nuclear microsatellite DNA loci (including the 12 standardized loci) were used to examine the levels and patterns of genetic variation and to determine population structure of the adult and juvenile bull trout collections.

Table 30. Collection code, collection location, identification as an adult or juvenile collection, total number of samples collected, and number analyzed for collections of adult and juvenile bull trout taken from the Walla Walla River and Yakima River Basins.

Walla Walla River Basin – Adult Collections

Collection code	Collection location	Adult/ Juvenile	N = Total	N = Analyzed
99AL	Dayton Dam - Touchet River	adult	16	11
00AN	Dayton Dam - Touchet River	adult	21	11
03LC	Dayton Trap - Touchet River	adult	40	39
03LM [A]	Dayton Dam - Touchet River	adult	23	16
Dayton Dam - Touchet River - Total			100	77[B]

[A] samples from the 03LM collection were taken in 2001 and 2002

[B] 15 samples were dropped because an identical genotype was detected at another sample indicating the same fish had been sampled twice

[B] 8 samples were dropped because of missing data

Touchet River Basin – Juvenile Collections

Collection code	Collection location	Adult/ Juvenile	N = Total	N = Analyzed
00AN	Burnt Fork	juvenile	9	9
Burnt Fork - Total			9 [A, B]	9

[A] samples from the 00AN collection were taken in 2000 (N = 8) and 2005 (N = 1)

[B] Samples > 200 mm, but < 300 mm, and one was 340 mm

99EW	Lewis Creek	juvenile	1	1
02AAA	Lewis Creek	juvenile	2	1
03LR	Lewis Creek	juvenile	7	4
05GV	Lewis Creek	juvenile	4	4
06HS	Lewis Creek	juvenile	3	3
Lewis Creek - Total			17 [B]	13[A]

[A] 4 samples were dropped because of missing data

[B] One sample was > 200 mm (231mm)

03LQ	Spangler Creek .	juvenile	5	5
06HR	Spangler Creek .	juvenile	14	14
Spangler Creek - Total			19 [A]	19

[A] All samples less than 171 mm

03LO	Wolf Fork	juvenile	46[A]	38			
04DG	Wolf Fork	juvenile	41[B]	41			
Wolf Fork - Total			87	79[C]			
[A] Samples were less than 133 mm, plus three samples > 200 mm, but < 300 mm, and three were > 300mm (343, 365, 553 mm)							
[B] All less than 133 mm							
[C] 1 sample was dropped because an identical genotype was detected at another sample indicating the same fish had been sampled twice							
[C] 7 samples were dropped because of missing data							

03LP	N.F. Touchet River	juvenile	27[A]	20			
04DF	N.F. Touchet River	juvenile	45[B]	45			
N.F. Touchet River - Total			72	65[C]			
[A] Samples were < 200 mm, plus one sample was > 200, but < 300 mm, and three samples were > 300 mm (310, 350, 430 mm)							
[B] All samples < 141 mm							
[C] One sample was dropped because an identical genotype was detected at another sample indicating the same fish had been sampled twice							
[C] 6 samples were dropped because of missing data							

Yakima River Basin – Adult Collections

Collection code	Collection location	Adult/ Juvenile	N = Total	N = Analyzed			
01AAE	S.F. Ahtanum Creek	adult	6	5			
01AAF	M.F. Ahtanum Creek	adult	16	16			
01AAG	N.F. Ahtanum Creek	adult	8	8			
Ahtanum Creek - Total			30	29[A]			
[A] 1 sample was dropped because of missing data							

03GG	Naches River	adult	22	22			
Naches River - Total			22	22			

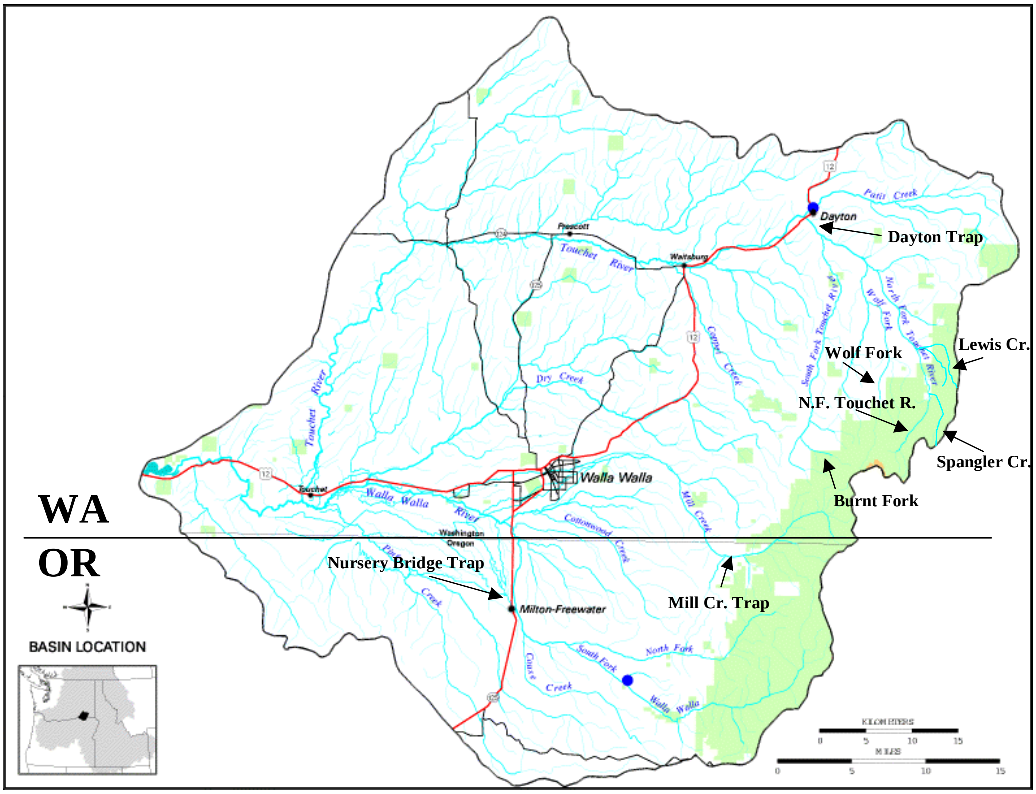


Figure 20. Bull Trout tissue collection sites for genetic analyses in the Walla Walla Basin.

The pertinent results and conclusions from Kassler and Mendel (2007) are presented below (Tables and Figures were clipped from Kassler and Mendel 2007, and renumbered for this report):

> 1) We first compared collections of migratory bull trout from traps at dams on the three major drainages in the Walla Walla Basin (Walla Walla River, Mill Creek and the Touchet River). The migratory adults from these three drainages were very significantly different and showed no overlap in the factorial analysis (Figure 21). The genetic information and the geographic isolation of these three groups of bull trout lends strong support for treating them as separate, and generally unrelated, populations.

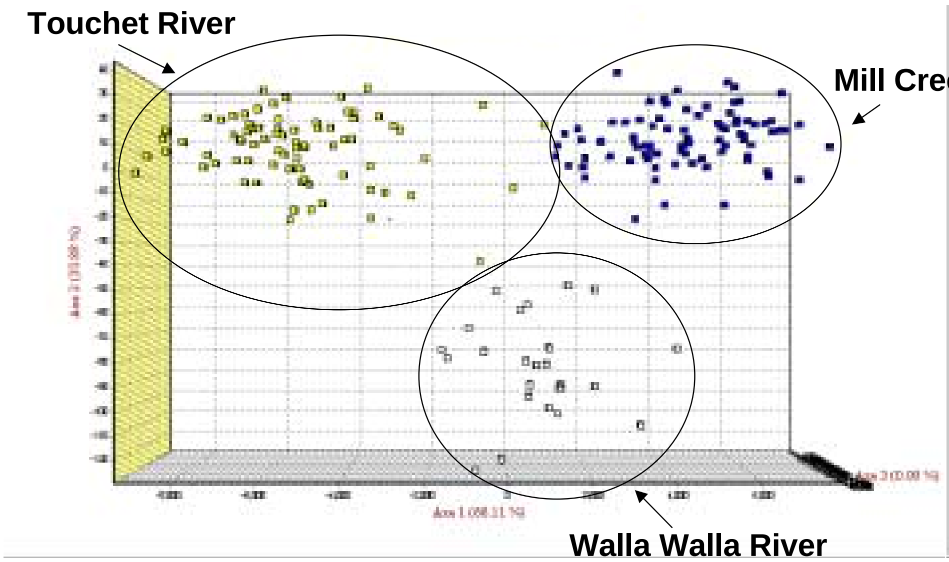


Figure 21. Factorial correspondence Analysis conducted with GENETIX showing the distribution of individual migratory adult bull trout from three primary watersheds of the Walla Walla River Basin. All the variation is distributed on axes 1 and 2.

2) We also compared juvenile (generally less than 200 mm fork length) bull trout collected from five Touchet River tributary spawning areas upstream of Dayton (Figure 16). Analysis of bull trout from these five spawning areas were highly significantly different from one another with the genotypic differentiation tests; especially the Burnt Fork group. The difference of the Burnt Fork group from the others is not surprising given the geographic isolation of this group in the upper South Fork Touchet River, while all the others are in the North Fork Touchet River and its tributaries. The neighbor-joining tree does not separate the juvenile collections in the North Fork and its tributaries with any statistical significance or support, although the Burnt Fork is separated from those groups with 98% bootstrap support (Figure 22). The factorial correspondence analysis of juvenile bull trout collections for the three major drainages of the Touchet River (Figure 23) does show strong separation between the North Fork, Wolf Fork and Burnt Fork (South Fork drainage). However, sample sizes for the Burnt Fork, Spangler and Lewis Creeks (both are tributaries of the North Fork Touchet River) were quite small. There appears to be good genetic support for managing the Wolf Fork, North Fork and Burnt Fork (South Fork) bull trout groups as separate populations.

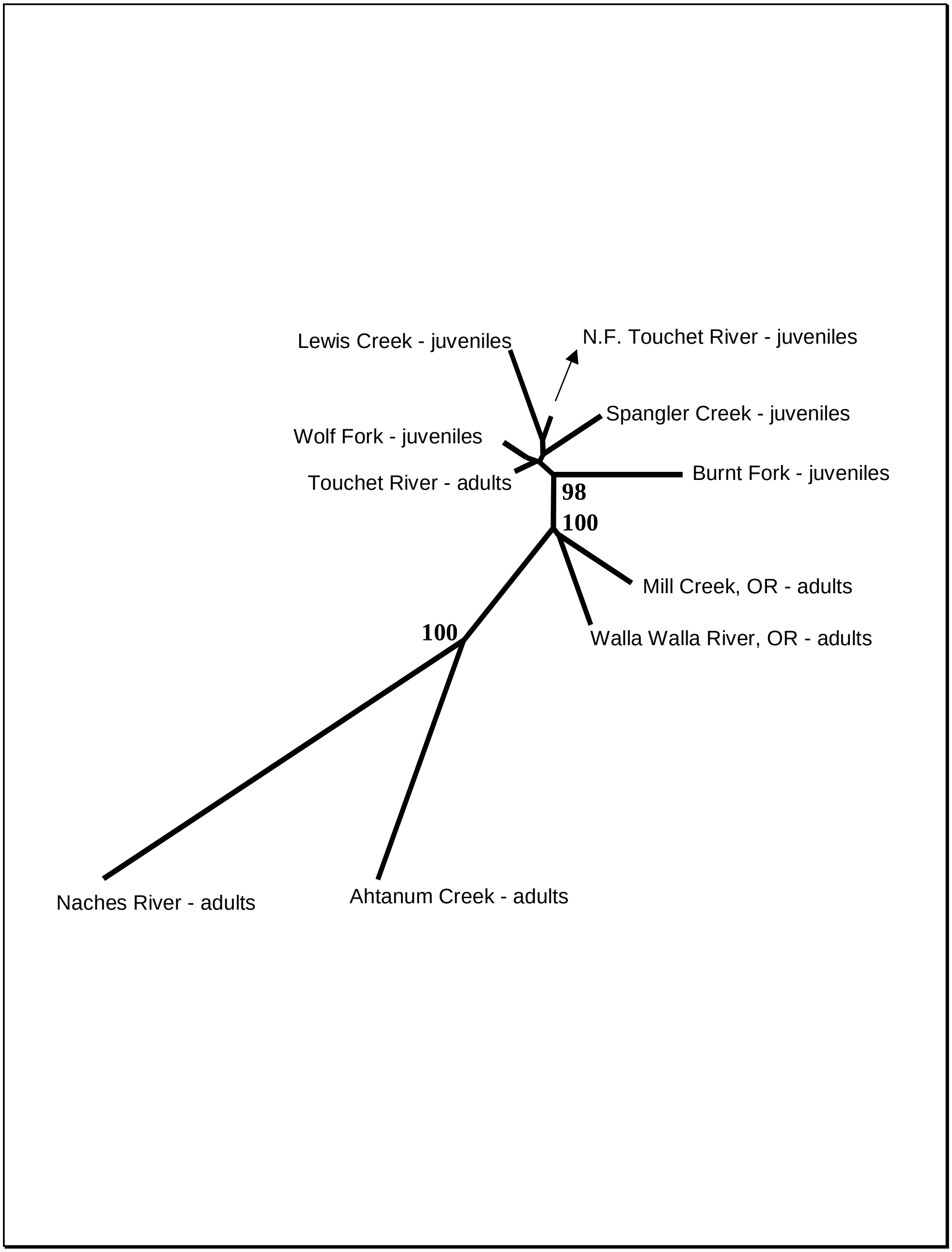
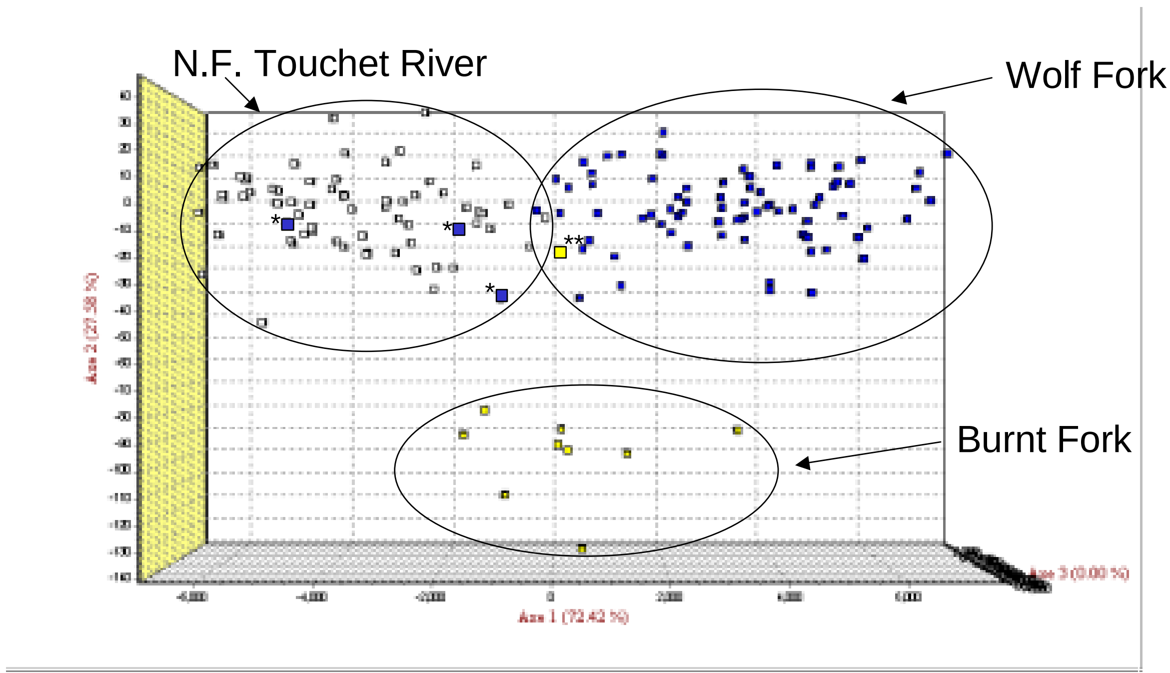


Figure 22. Relationship of adult migratory bull trout from the Walla Walla River and Yakima River Basins and juvenile bull trout from the Touchet River Basin based on the genetic distance matrix using Cavalli-Sforza and Edwards (1967) chord distance. Clusters with bootstrap values over 90% are shown.



*Three samples from the Wolf Fork that fall within the N.F. Touchet River polygon
**One individual from Burnt Fork that falls within the Wolf Fork polygon.

Figure 23. Factorial correspondence Analysis conducted with GENETIX showing the distribution of individual juvenile bull trout from three primary watersheds in the Touchet River drainage. All the variation is distributed on axes 1 and 2.

3) We used a jackknife analysis to try to genetically assign migratory bull trout from the Dayton Dam trap, and the various juveniles to the likely spawning group. None of the migratory adults were assigned to the Burnt Fork group, even though our previous radio telemetry study (Mendel et al. 2003) confirmed that migratory bull trout do spawn in the Burnt Fork. The assignment tests attributed most of the migratory fish to the Wolf Fork (50.6%) and North Fork (39.0%); with about 5% each to Lewis Creek and Spangler Creek (Table 31). This genetic information tends to be consistent with the bull trout spawning distributions we have observed in the Touchet Basin. The juveniles had high assignment rates of 69.2-93.8% to their correct collection locations (Table 31). Lewis and Spangler creek collections that did not assign correctly to their collection location assigned to the North Fork, or one of its minor tributaries.

4) The analysis to determine if the collections have undergone a bottleneck indicates the populations have not undergone any recent reductions in population size and suggests

that the populations of bull trout have been small and distinct for some time. Evaluation of the effective population size was not conducted due to the small sample sizes for some collections and the lack of temporal samples; however evaluation on the collections with larger samples sizes (e.g. N. Fork Touchet, Wolf Fork, and Mill Creek) hopefully will be conducted at a later date.

5) As expected, the genetic differences between the bull trout collections in the Walla Walla and Yakima basins are quite significant and indicate that the populations in the two basins have been separated for longer than the separations within the Walla Walla Basin.

Table 31. Results of the jackknife analysis for five collection areas where juvenile bull trout spawn in the Touchet River Basin and stock-of-origin assignments for a mixture sample of adult bull trout collected at Dayton Dam Trap on the mainstem Touchet River. Shading indicates correct assignment back to stock-of-origin in the jackknife analysis.

Baseline Juvenile Collections – Counts						
	Burnt Fork	Lewis Creek	Spangler Creek	Wolf Fork	N.F. Touchet R.	Total N
Burnt Fork	7	0	0	2	0	9
Lewis Creek	0	9	2	0	2	13
Spangler Creek	0	0	17	0	2	19
Wolf Fork	1	2	3	71	2	79
N.F. Touchet R.	0	1	1	2	61	65
Touchet River Adults	0	4	4	39	30	77
Baseline Juvenile Collections – Percentages						
	Burnt Fork	Lewis Creek	Spangler Creek	Wolf Fork	N.F. Touchet R.	
Burnt Fork	77.8%	0.0%	0.0%	22.2%	0.0%	
Lewis Creek	0.0%	69.2%	15.4%	0.0%	15.4%	
Spangler Creek	0.0%	0.0%	89.5%	0.0%	10.5%	
Wolf Fork	1.3%	2.5%	3.8%	89.9%	2.5%	
N.F. Touchet R.	0.0%	1.5%	1.5%	3.1%	93.8%	
Touchet River Adults	0.0%	5.2%	5.2%	50.6%	39.0%	

Recommendations

Information collected during this project has provided valuable baseline information and guidance for managers in the Walla Walla Subbasin. Continued monitoring will provide a more complete picture of salmonid population status and their habitat conditions. In late 2006, WDFW joined with CTUIR and wrote a collaborative proposal for fish monitoring in the Walla Walla Basin, plus a separate collaborative habitat monitoring proposal with CTUIR and the Walla Walla Basin Watershed Council. The Bonneville Power Administration (BPA) opted not to fund the habitat monitoring project and BPA delayed approval of the fish monitoring project. The following recommendations for 2007 and 2008 are based on the results of our monitoring activities since 1997 and the proposals submitted to BPA in 2007.

- Habitat conditions must be monitored and the values used in the Ecosystem Diagnosis and Treatment (EDT) model for Subbasin and Salmon Recovery Planning must be verified for adequate planning and modeling. If BPA will not fund these activities, then other funding must be secured to continue to monitor water temperatures and stream flow changes over time, and to monitor changes that result from habitat improvement efforts in the basin, as well as to continue to develop an adequate baseline of habitat conditions and to improve the values used in the EDT model.

- Additional evaluations of habitat limitations should be completed that would help guide planning and habitat protection or restoration. Thermal barriers and flow limitations have been identified in many areas, but additional information is needed to help resolve these limiting factors.

- Substantial uncertainty still exists as to what fish monitoring activities will be funded by BPA in 2007 or beyond, and how to maintain adequate monitoring of ESA listed steelhead and bull trout populations to determine their status and trends over time. Bull trout and steelhead spawning surveys should be continued annually. Steelhead redd counts could be reduced if and when we are able to obtain good estimates of spawning escapement in each of the major stream systems (Walla Walla, Mill Creek, Touchet River) of the subbasin. Additional emphasis should be placed on improving counting returning adults to estimate escapement annually at key locations within the basin. This effort may be substantially improved by construction and operation of a new ladder and trap on the Touchet River in Dayton, and improving accuracy of counts in Mill Creek at Bennington Dam. This should be a primary focus in 2008. Another emphasis should be improving monitoring of production and survival of salmonids by using out-migrants traps in the Touchet River and Walla Walla River. These components should provide estimates of fish returning to the streams and the basin, estimates of juveniles produced by each basin, as well as survival estimates at various life stages (e.g. smolt to adult). Continuation and expansion of fish distribution and relative abundance summarization should be completed for other species, other data sets from CTUIR and others, as well as incorporation of GIS mapping.

- Identification of appropriate management units for bull trout must be determined by fish managers based on the new genetic information available from this project. In addition, the causes of the bull trout declines, and very low numbers of redds, must be determined for the Touchet River to prevent extirpation of these groups of salmonids.

- We will work with other managers in the Walla Walla Subbasin to help compile fish and habitat data and fill data gaps to improve planning and evaluation of the effectiveness of the actions to restore salmon and steelhead or bull trout in the subbasin.

- We will continue to work with CTUIR and others to complete a comprehensive RM&E plan for the Walla Walla Subbasin.

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Appendix A. Study Sites, 2006

Appendix A. Table 1. Study site locations for the Touchet River and tributaries, 2006.

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
North Fork	NFT-1	19.6	T7N,R40E,Sect 18,NW¼,NE¼	T[d]	46.09125	117.85275	~15 meters below Bluewood Culvert
Touchet River	NFT-2	14.3	T8N,R40E,Sect 21,SE¼,SE¼	T[d], F[d,e]	46.15143	117.80642	0.2 miles below mouth of Spangler Ck.
	NFT-3	7.9	T9N,R40E,Sect 30,SW¼,NE¼	T[d]	46.23098	117.85134	~20 feet above mouth of Jim Ck.
	NFT-4	1.4	T9N,R39E,Sect 4,NW¼,NE¼	T[d]	46.29249	117.93590	~1.0 miles above Baileysburg
Spangler Creek	SC-1	2.0	T8N,R40E,Sect 34,NW¼,SE¼	EL	46.12619	117.78809	~0.8 miles above the end of the road
	SC-2	1.6	T8N,R40E,Sect 34,NW¼,NE¼	EL	46.13178	117.78688	~0.4 miles above the end of the road
	SC-3	1.2	T8N,R40E,Sect 27,SW¼,SE¼	EL	46.13726	117.79056	End of the road
	SC-4	1.0	T8N,R40E,Sect 27,NE¼,SW¼	EL	46.14005[f]	117.79209[f]	~0.3 miles above right bank tributary
	SC-5	0.7	T8N,R40E,Sect 27,SE¼,NW¼	EL	46.14349[f]	117.79531[f]	Just below right bank tributary
	SC-6	0.5	T8N,R40E,Sect 27,SW¼,NW¼	EL	46.14574	117.79799	~0.5 miles above the mouth
	SC-7	0.1	T8N,R40E,Sect 28,NE¼,NE¼	EL, T[d]	46.14830	117.50881	~0.1 miles above the mouth
Lewis Creek	LC-1	2.2	T8N,R40E,Sect 10,NE¼,NE¼	EL	46.19286	117.78404	~1.1 miles above the Forest Service line
	LC-2	1.9	T8N,R40E,Sect 3,SW¼,SE¼	EL	46.19585	117.78830	~0.8 miles above the Forest Service line
	LC-3	1.6	T8N,R40E,Sect 3,NE¼,SW¼	EL	46.19748	117.79434	~0.5 miles above the Forest Service line
	LC-4	1.3	T8N,R40E,Sect 3,SW¼,SW¼	EL	46.19627	117.80003	~0.1 miles above the Forest Service line
	LC-5	0.1	T8N,R40E,Sect 9,NW¼,NW¼	T[d]	46.19085	117.82310	~15 meters above the NF Touchet Rd.
Jim Creek	JC-1	0.0	T9N,R40E,Sect 30,SW¼,NE¼	T[d]	46.23108	117.85053	~85 meters below the NF Touchet Rd.
Wolf Fork	WF-1	10.1	T8N,R39E,Sect 24,SW¼,SE¼	T[d]	46.14990	117.87619	~0.7 miles below Green Fly Canyon
	WF-2	4.7	T9N,R39E,Sect 36,NW¼,NW¼	T[d], F[d,e]	46.22169	117.87488	~15 feet below 3rd bridge on Wolf Fork Rd.
	WF-3	1.9	T9N,R39E,Sect 23,NE¼,NW¼	T[d], F[d,e]	46.25070	117.90200	Holmberg Rd.
Whitney Creek	WH-1	0.3	T8N,R40E,Sect 7,SE¼,SW¼	T[d]	46.17845	117.85775	~0.3 miles up Whitney Ck. Rd.
Coates Creek	C-1	0.0	T8N,R40E,Sect 7,NW¼,SW¼	T[d]	46.18352	117.86292	Directly below Wolf Fork Rd.
Green Fork	GF-1	0.0	T7N,R39E,Sect 6,SE¼,SW¼	T[d], F[d]	46.10594	117.98584	~10 meters above mouth
Burnt Fork	BF-1	3.3	T7N,R39E,Sect 16,NE¼,SE¼	EL	46.08295	117.93180	~60 meters above right bank tributary
	BF-2	2.8	T7N,R39E,Sect 16,SE¼,NW¼	EQ	46.08708	117.94110	~0.5 miles below right bank tributary
	BF-3	2.2	T7N,R39E,Sect 17,NE¼,NE¼	EL	46.08926	117.95235	~1.1 miles below right bank tributary
	BF-4	1.8	T7N,R39E,Sect 17,NW¼,NE¼	EQ	46.09028	117.96034	~1.5 miles below right bank tributary
	BF-5	1.3	T7N,R39E,Sect 8,SW¼,SW¼	EL	46.09261	117.97121	~2.0 miles below right bank tributary
	BF-6	0.0	T7N,R39E,Sect 6,NE¼,NW¼	T[d], F[d]	46.10576[f]	117.98562[f]	~10 meters above mouth
South Fork	SFT-1	15.9	T7N,R39E,Sect 6,SE¼,SW¼	F[d]	46.10601[f]	117.98543[f]	~30 feet below confluence of Burnt Fork
Touchet River	SFT-2	15.8	T7N,R39E,Sect 6,SE¼,SW¼	T[d]	46.10755	117.98338	~0.1 miles below confluence of Burnt Fork
	SFT-3	8.3	T8N,R39E,Sect 5,NW¼,SE¼	T[d], F[d,e]	46.19956	117.95574	Directly under Camp Nancy Lee Bridge
	SFT-4	0.5	T9N,R39E,Sect 5,NW¼,NE¼	T[d], F[d,e]	46.29406	117.95795	Gephart Rd.
Griffin Fork	G-1	2.0	T7N,R39E,Sect 4,NW¼,SE¼	EL	46.11009	117.93874	Just below left bank tributary

[a] River Mile
[b] EL-Qualitative Electrofishing, EQ-Quantitative Electrofishing, F-Flow, T-Temp
[c] GPS were taken with Garmin II plus, in WGS 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) program in WSG 84 datum

Appendix A. Table 1. Study site locations for the Touchet River and tributaries, 2006.

Stream Name	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
Griffin Fork	G-2	0.2	T7N,R39E,Sect 4,SW¼,NW¼	EL	46.11612	117.94681	~0.2 miles up right bank tributary
(Cont.)	G-3	1.4	T7N,R39E,Sect 4,NW¼,SW¼	EL	46.11243	117.95025	~0.1 miles below right bank tributary
	G-4	0.8	T7N,R39E,Sect 5,SW¼,NE¼	EL	46.11431	117.96003	~0.7 miles below right bank tributary
	G-5	0.2	T7N,R39E,Sect 6,NE¼,NE¼	EL	46.11914	117.97104	~0.2 miles above mouth
Touchet River	TR-1	63.5	T10N,R39E,Sect 30,SE¼,SE¼	T[d]	46.31226	117.97314	~20 feet below Snake River Lab Trap
	TR-2	63.0	T10N,R39E,Sect 30,NW¼,SE¼	F[d,e]	46.31640[f]	117.98044[f]	~0.5 miles below Snake River Lab Trap
	TR-3	57.2	T9N,R38E,Sect 4,SW¼,NW¼	T[d]	46.29007	118.07143	Lewis and Clark State Park
	TR-4	48.1	T9N,R37E,Sect 7,SE¼,NE¼	T[d]	46.27411	118.22095	On the downstream end of Bolles Bridge
	TR-5	31.5	T9N,R35E,Sect 6,NW¼,SW¼	T[d]	46.28741	118.48896	~100 meters below Harvey Shaw Rd. Bridge
	TR-6	10.1	T8N,R33E,Sect 34,NE¼,NE¼	T[d], F[d,e]	46.13556	118.66211	Public Access on Touchet North Rd.
	TR-7	5.1	T7N,R33E,Sect 15,NE¼,SE¼	Fish Salvage	46.08473[f]	118.65837[f]	Hofer Dam
	TR-8	2.5	T7N,R33E,Sect 27,NE¼,SW¼	T[d]	46.05654	118.66873	Cummins Rd. Bridge
North Fork	NP-1	1.5	T10N,R40E,Sect 20,NW¼,NE¼	EL	46.33784	117.83089	~1.5 miles above mouth
Patit Creek	NF-2	1.0	T10N,R40E,Sect 20,NW¼,NW¼	EL	46.33688	117.84114	~1.0 miles above mouth
Patit Creek	P-1	6.7	T10N,R39E,Sect 24,SE¼,NW¼	EL	46.33457	117.87836	~1.2 miles below NF Patit Ck. confluence
	P-2	5.6	T10N,R39E,Sect 23,NW¼,NE¼	EL	46.33797	117.89678	Range Grade
	P-3	4.4	T10N,R39E,Sect 15,SW¼,SE¼	EQ	46.34167	117.91605	Private Bridge
	P-4	3.3	T10N,R39E,Sect 17,NE¼,SE¼	EQ	46.34497	117.93220	Lewis and Clark Monument
	P-5	2.5	T10N,R39E,Sect 17,SE¼,SE¼	EL, T[d]	46.34026	117.95183	1st bridge on Patit Ck. Rd.
Alyward Tributary	A-1	1.8	T8N,R38E,Sect 3,NE¼,NE¼	EL	46.20445	118.03715	~1.8 miles above Whiskey Ck. Rd.
	A-2	1.2	T9N,R38E,Sect 34,SE¼,SW¼	EL	46.20817	118.04629	~1.2 miles above Whiskey Ck. Rd.
	A-3	0.7	T9N,R38E,Sect 34,NW¼,SW¼	EL	46.21283	118.05354	~0.7 miles above Whiskey Ck. Rd.
	A-4	0.0	T9N,R38E,Sect 33,SE¼,NW¼	EL	46.21740	118.06535	Upstream of culvert at Whiskey Ck. Rd.
Whiskey Creek	WC-1	6.1	T9N,R38E,Sect 33,SE¼,NW¼	EL	46.21763	118.06580	Mouth of Alyward Tributary
	WC-2	5.3	T9N,R38E,Sect 29,SE¼,SE¼	EL	46.22612	118.07592	3rd bridge on Whiskey Ck. Rd.
	WC-3	4.4	T9N,R38E,Sect 29,NE¼,NE¼	EL	46.23675	118.07825	~0.7 miles below 3rd bridge on Whiskey Ck. Rd
	WC-4	3.9	T9N,R38E,Sect 20,SE¼,NE¼	EL	46.24443	118.07906	2nd bridge on Whiskey Ck. Rd.
	WC-5	2.9	T9N,R38E,Sect 17,NW¼,SE¼	EL	46.25553	118.08135	1st bridge on Whiskey Ck. Rd.
South Fork Coppei Creek	SFC-1	0.9	T8N,R38E,Sect 18,NE¼,NW¼	T[d]	46.34026	118.95202	2nd Bridge South Fork Coppei Rd.
North Fork Coppei Creek	NFC-1	0.1	T8N,R38E,Sect 7,SE¼,NW¼	T[d]	46.19028	118.10894	~0.1 mile above mouth
Coppei Ck.	CO-1	5.4	T9N,R37E,Sect 36,NE¼,NW¼	T[d]	46.22251	118.12860	McCowan Rd. Bridge
Whetstone Creek	WS-1	0.6	T10N,R36E,Sect 32,SE¼,SE¼	T[d], F[d,e]	46.29901	118.32845	HWY 124 Bridge

[a] River Mile
[b] EL-Qualitative Electrofishing, EQ-Quantitative Electrofishing, F-Flow, T-Temp
[c] GPS were taken with Garmin II plus, in WGS 84 datum and in D.D^{o}
[d] Same as previous year
[e] Index discharge site
[f] GPS was made using Maptech's Terrain Navigator (version 5.03) program in WGS 84 datum

Appendix A. Table 2. Study site locations for the Walla Walla River and tributaries, 2006.

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 River	WW-1	40.7	T6N,R35E,Sect 13,NE¼,NW¼	F[e]	46.00271	118.38316	Pepper Rd. Bridge
	WW-2	37.9	T6N,R35E,Sect 39,SE¼,NE¼	F[d,e]	46.02195	118.41764	0.5 miles above Burlingame Diversion
	WW-3	37.4	T6N,R35E,Sect 39,SW¼,NE¼	T[d]	46.02349	118.42594	Just below Burlingame Diversion
	WW-4	37.4	T6N,R35E,Sect 39,SW¼,NE¼	F[d,e]	46.02376	118.42704	Mojonnier Rd. Bridge
	WW-5	34.5	T6N,R35E,Sect 38,SE¼,SW¼	T[d]	46.03749	118.47206	Swegle Rd.
	WW-6	33.7	T7N,R35E,Sect 31,east edge	F[d,e], T, G	46.03703[f]	118.47130[f]	~0.5 miles above Detour Rd.
	WW-7	29.6	T7N,R34E,Sect 34,NW¼,NW¼	F[d,e], T	46.04792	118.55505	McDonald Rd. Bridge
	WW-8	20.5	T7N,R33E,Sect 3,SE¼,NW¼	T[d]	46.02903	118.67080	Touchet Gardena Rd. Bridge
	WW-9	12.8	T7N,R32E,Sect 35,SE¼,SE¼	T[d]	46.03789	118.76670	Byerley Rd.
	WW-10	5.5	T7N,R32E,Sect 20,SE¼,SE¼	T[d]	46.06871	118.82645	RV Park
Yellowhawk Creek	YC-1	8.9	T7N,R36E,Sect 23,NE¼,NW¼	F[d,e], G[d]	46.07528	118.27385	~25 meters below diversion
	YC-2	8.9	T7N,R36E,Sect 23,SE¼,NW¼	EL	46.07411	118.27482	~200 meters below diversion
	YC-3	7.2	T7N,R36E,Sect 27,SE¼,NW¼	EL	46.05942	118.29557	Just above left bank fork
	YC-4	7.2	T7N,R36E,Sect 27,SE¼,NW¼	EL	46.05971	118.29604	Just above right bank fork
	YC-5	5.5	T7N,R36E,Sect 33,SE¼,NW¼	EL	46.04404	118.31988	Walla Wall High School property
	YC-6	4.0	T6N,R36E,Sect 37,NW¼,SW¼	EL	46.03278	118.34399	Cottonwood Rd.
	YC-7	0.1	T6N,R35E,Sect 38,NE¼,NE¼	F[d,e], G	46.01763	118.40032	~85 meters above mouth
Mill Creek	MC-1	23.3	T6N,R38E,Sect 18,NW¼,NW¼	EQ	46.00340	118.11678	~0.2 miles below Stateline
	MC-2	21.4	T6N,R37E,Sect 1,NW¼,SW¼	EQ	46.02581	118.13488	~0.8 miles above Wickersham Bridge
	MC-3	20.7	T6N,R37E,Sect 2,NW¼,NE¼	EQ, T[d]	46.03172	118.14515	~15 meters below Wickersham Bridge
	MC-4	18.1	T7N,R37E,Sect 23,SW¼,SW¼	EQ	46.06494	118.15747	~0.3 miles below Blue Ck.
	MC-5	15.9	T7N,R37E,Sect 16,SE¼,SW¼	T[d]	46.08115	118.18974	Seven Mile Rd.
	MC-6	13.8	T7N,R37E,Donation Land Claim	F[d,e], T[d]	46.08588	118.22847	Five Mile Rd.
	MC-7	11.3	T7N,R36E,Donation Land Claim	T[d]	46.08004	118.25885	~45 meters above cold return
	MC-8	11.3	T7N,R36E,Donation Land Claim	T[d]	46.07992	118.25971	In cold return
	MC-9	11.3	T7N,R36E,Donation Land Claim	T[d]	46.07974	118.26049	~45 meters below cold return
	MC-10	10.9	T7N,R36E,Sect 23,NW¼,NW¼	T[d]	46.07609	118.28367	Tausick Way
	MC-11	7.3	T7N,R36E,Sect 19,SE¼,SE¼	T[d]	46.06563	118.35138	~60 meters below 9th Ave.
	MC-12	5.5	T7N,R35E,Sect 23,SE¼,SE¼	T[d]	46.06448	118.38821	Gose St.
	MC-13	0.5	T7N,R35E,Sect 38,SE¼,NW¼	T[d]	46.04163	118.47133	Swegle Rd.
Blue Creek	BC-1	0.2	T7N,R37E,Sect 26,SE¼,NW¼	T[d]	46.05994	118.15208	Mill Ck. Rd.

[a] River Mile
[b] EL-Qualitative Electrofishing, EQ-Quantitative Electrofishing, F-Flow, T-Temp, G-Flow Gauge
[c] GPS were taken with Garmin II plus, in WGS 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) program in WGS 84 datum

Appendix A. Table 2. Study site locations for the Walla Walla River and tributaries, 2006.

Stream Name	Site #	RM[a]	Location (within sect. is listed as smallest qtr. sect. Of qtr. sect.)	Sample Type[b]	GPS Coordinates[c] North	West	Comments
Titus Creek	TC-1	2.7	T7N,R37E,Sect 18,SW¼,NE¼	F[d,e], G[d]	46.08639	118.22639	Covered Bridge
	TC-2	2.6	T7N,R37E,Sect 18,SW¼,NE¼	F[d,e], T[d]	46.08699[f]	118.22926[f]	Five Mile Rd.
	TC-3	1.0	T7N,R36E,Sect 14,SE¼,SW¼	F[d,e], T[d]	46.07870	118.27495	Behind WWCC Nursing Building
West Little	WLW-1	4.8	T7N,R35E,Sect 9,NE¼,SW¼	F[d]	46.01205	118.44140	~0.6 miles up Valley Chapel Rd.
Walla Walla	WLW-2	0.9	T7N,R35E,Sect 37,north edge	F[d]	46.03444	118.47196	Swegle Rd.
Dry Creek	DRC-1	35.1	T7N,R38E,Sect 8,NW¼,SW¼	EQ	46.09743	118.09018	~0.3 miles below NF Dry Ck. confluence
	DRC-2	32.8	T7N,R37E,Sect 12,NE¼,SW¼	EQ	46.09912	118.12804	~3.3 miles up Biscuit Ridge Rd.
	DRC-3	30.8	T7N,R37E,Sect 35,NE¼,SE¼	EQ	46.12562	118.14171	~1.4 miles up Biscuit Ridge Rd.
	DRC-4	29.3	T8N,R37E,Sect 26,NW¼,SW¼	T[d]	46.14050	118.15467	HWY 12 Bridge in Dixie
	DRC-5	18.6	T8N,R36E,Sect 21,SW¼,SE¼	T[d]	46.15451	118.31512	Lower Waitsburg Rd.
	DRC-6	3.0	T7N,R34E,Sect 22,SW¼,SW¼	T[d]	46.06736	118.55013	Talbott Rd.

[a] River Mile
[b] EL-Qualitative Electrofishing, EQ-Quantitative Electrofishing, F-Flow, T-Temp, G-Flow Gauge
[c] GPS were taken with Garmin II plus, in WGS 84 datum and in D.D^{o}
[d] Same as previous year
[e] Index discharge site
[f] GPS was made using Maptech's Terrain Navigator (version 5.03) program in WGS 84 datum

Appendix B. Discharge Data, 2006

Appendix B. Table 1. Manual discharge (cfs) measurements 2006.							
Stream	**Site**	**Width**	**Date**	**CFS**	**Temp (F)**	**Time**	**Comments**
NF Touchet	NFT-2	5.8	6/20	15.2	45.0	10:10	0.2 miles below mouth of Spangler Creek
		5.6	7/5	905	53.0	09:20	
		5.4	7/19	7.35	52.0	12:23	
		5.0	8/2	5.6	48.0	09:24	
		4.9	8/14	4.4	51.0	08:42	
		N/A	8/28	N/A	N/A	N/A	No access due to Columbia Complex Fire
		N/A	9/14	N/A	N/A	08:55	No access due to Columbia Complex Fire
		5.4	9/27	3.3	45.0	09:50	
		5.5	10/9	3.2	38.0	09:05	
		5.6	10/25	3.6	43.0	12:38	
		7.5	11/7	59.6	49.0	10:49	
Wolf Fork	WF-2	6.7	6/21	29.2	53.0	11:45	~15 feet below 3rd bridge on Wolf Fk Rd
		6.6	7/5	26.6	54.0	09:54	
		6.5	7/19	23.7	60.0	13:53	
		6.5	8/2	22.2	49.0	09:55	
		6.3	8/14	19.6	51.0	09:14	
		N/A	8/28	N/A	N/A	N/A	No access due to Columbia Complex Fire
		5.3	9/14	21.7	43.0	09:27	
		5.2	9/27	19.7	47.0	10:24	
		5.5	10/9	22.2	40.0	09:38	
		5.9	10/25	19.9	46.0	11:53	
Wolf Fork	WF-3	9.2	6/20	32.5	56.0	12:00	Holmberg Rd bridge
		9.0	7/5	22.3	59.0	10:12	
		8.7	7/19	19.5	63.0	14:17	
		8.4	8/2	18.0	52.0	10:11	
		8.6	8/14	19.2	58.0	09:33	
		N/A	8/28	N/A	N/A	N/A	No access due to Columbia Complex Fire
		8.7	9/14	16.4	49.0	09:41	
		8.7	9/27	18.1	50.0	10:43	
		8.6	10/9	16.7	45.0	09:57	
		8.6	10/25	16.1	47.0	12:08	
Green Fork	GF-1	2.5	6/29	1.5	58.0	10:46	~10 meters above mouth
		2.1	7/25	0.2	67.0	16:25	
Burnt Fork	BF-6	6.9	6/29	6.5	53.0	10:58	~10 meters above mouth
		5.7	7/25	3.6	62.0	16:40	
SF Touchet R	SFT-1	7.1	6/29	6.6	54.0	11:09	~10 meters below Burnt Fk mouth
		6.1	7/25	2.3	64.0	16:50	
SF Touchet R	SFT-3	5.3	6/20	16.0	62.0	12:50	Directly under Camp Nancy Lee bridge
		5.0	7/5	7.1	67.0	10:45	
		5.3	7/19	4.1	70.0	14:58	
		4.9	8/2	2.6	64.0	10:43	
		4.7	8/14	2.6	65.0	10:06	
		4.5	8/28	1.9	65.0	09:42	
		4.8	9/14	2.0	54.0	10:23	
		4.8	9/27	3.2	55.0	11:12	
		4.9	10/9	3.3	50.0	10:36	
		4.9	10/25	3.9	51.0	13:17	
SF Touchet R	SFT-4	11.3	6/20	14.8	65.0	13:17	Gephart Rd
		9.8	7/5	4.3	69.0	11:10	
		5.6	7/19	2.0	73.0	15:28	
		5.6	8/2	0.85	66.0	11:06	
		4.2	8/14	0.062	67.0	10:28	
		5.2	8/28	0.3	64.0	10:10	
		3.3	9/14	0.2	54.0	10:50	
		5.5	9/27	1.8	59.0	11:35	
		5.8	10/9	2.6	52.0	11:01	
		5.8	10/25	3.0	55.0	13:38	

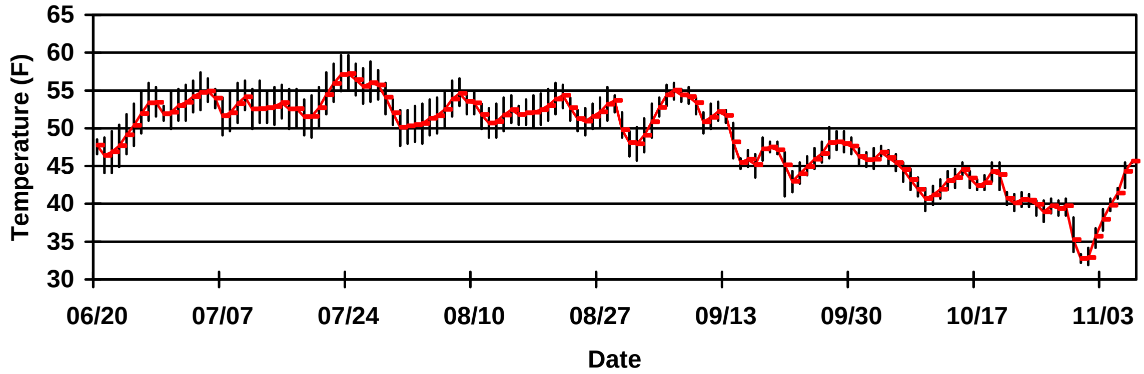
Appendix B. Table 1. Manual discharge (cfs) measurements 2006.							
Stream	**Site**	**Width**	**Date**	**CFS**	**Temp (F)**	**Time**	**Comments**
Touchet River	TR-2	16.1	6/20	87.9	63.0	13:58	0.5 miles below Snake River Lab Trap
		16.0	7/5	57.2	65.0	11:32	
		16.0	7/20	45.9	63.0	10:12	
		17.1	8/2	35.5	61.0	11:29	
		13.7	8/14	35.7	64.0	10:53	
		13.3	8/28	35.8	63.0	10:28	
		17.0	9/14	34.5	53.0	11:21	
		17.5	9/27	41.4	55.0	11:58	
		17.1	10/9	61.8	48.0	11:27	
		17.4	10/25	51.5	50.0	14:00	
Whetstone Creek	WS-1	1.7	6/21	0.8	55.0	10:10	Highway 124 bridge
		1.6	7/6	0.6	63.0	08:53	
		1.6	7/20	0.4	56.0	08:46	
		1.5	8/2	0.4	57.0	08:44	
		1.4	8/14	0.2	53.0	08:29	
		1.5	8/28	0.2	55.0	08:58	
		1.4	9/13	0.3	51.0	08:49	
		1.6	9/25	0.4	45.0	09:16	
		1.6	10/13	0.5	41.0	08:54	
		1.6	10/26	0.5	N/A	12:50	
Touchet River	TR-6	15.1	6/21	84.0	68.0	11:02	Public access on Touchet North Rd
		12.8	7/6	35.7	74.0	09:40	
		12.2	7/20	22.0	70.0	09:54	
		11.8	8/2	19.9	69.0	09:31	
		11.8	8/14	19.5	68.0	09:16	
		11.8	8/28	14.7	68.0	09:45	
		11.7	9/13	18.6	63.0	09:43	
		12.3	9/25	35.0	54.0	10:06	
		12.3	10/13	34.6	48.0	09:40	
		12.5	10/26	43.8	N/A	12:15	
Walla Walla River	WW-1	8	7/6	24.7	65.0	12:01	Above Pepper Rd bridge
		6.6	7/20	19.1	68.0	12:55	
		6.9	8/2	20.8	67.0	11:57	
		6.9	8/14	17.7	64.0	11:28	
		6.1	8/28	13.7	67.0	12:04	
		5.4	9/13	5.6	64.0	12:09	
		6.1	9/25	13.8	56.0	12:20	
		6.2	10/13	16.1	52.0	11:53	
		6.7	10/26	19.7	49.0	10:24	
Yellowhawk Creek	YC-1	4.9	6/21	24.5	69.0	14:37	~25 meters below Diversion
		4.8	7/6	21	69.0	12:35	
		4.7	7/20	16.2	74.0	13:53	
		4.8	8/2	14	72.0	12:37	
		4.7	8/14	15.5	67.0	11:59	
		4.7	8/28	11.1	72.0	12:48	
		4.8	9/13	10.0	65.0	12:52	
		4.8	9/25	14.7	59.0	13:15	
		4.4	10/13	15.2	53.0	12:33	
		4.7	10/26	22.9	47.0	09:56	
Yellowhawk Creek	YC-7	7.1	6/21	30.7	63.0	14:06	~85 meters above mouth
		6.8	7/6	23.2	65.0	11:40	
		3.5	7/20	13.7	67.0	12:35	
		2.6	8/2	14.5	65.0	11:34	
		2.2	8/14	11.1	63.0	11:06	
		2.3	8/28	10.3	68.0	11:46	
		2.4	9/13	10.2	64.0	11:50	
		2.3	9/25	12.2	54.0	12:05	
		2.5	10/13	15.5	50.0	11:37	
		2.8	10/26	20.0	48.0	10:38	

Appendix B. Table 1. Manual discharge (cfs) measurements 2006.							
Stream	**Site**	**Width**	**Date**	**CFS**	**Temp (F)**	**Time**	**Comments**
Walla Walla River	WW-2	11.5	6/21	95.9	63.0	13:47	0.5 miles above Burlingame Diversion
		10.3	7/6	57.4	65.0	11:25	
		10	7/20	38.9	68.0	12:16	
		9.9	8/2	40.8	66.0	11:19	
		9.7	8/14	33.4	62.0	10:49	
		9.6	8/28	34.2	65.0	11:20	
		9.5	9/13	24.5	61.0	11:32	
		10.0	9/25	39.0	54.0	11:51	
		9.9	10/13	49.2	50.0	11:21	
		10.0	10/26	50.5	49.0	10:51	
Walla Walla River	WW-4	9.4	7/6	28.4	64.0	11:08	Below Mojonnier Rd
		9.9	7/20	40.1	67.0	11:50	
		8.9	8/2	42.0	65.0	11:01	
		9.2	8/14	38.6	63.0	10:33	
		9.0	8/28	36.5	66.0	11:04	
		9.2	9/13	26.0	61.0	11:16	
		9.5	9/25	40.1	55.0	11:31	
		9.3	10/13	19.0	51.0	11:04	
		9.6	10/26	14.2	49.0	11:03	
Mill Creek	MC-6	11.4	6/21	41.4	N/A	15:35	Five Mile Rd
		11.3	7/6	30.9	66.0	13:40	
		11.2	7/20	18.5	71.0	15:00	
		11.1	8/2	22.4	68.0	13:28	
		12.7	8/14	22	64.0	12:49	
		12.5	8/28	19.9	68.0	13:42	
		12.0	9/13	18.5	63.0	13:52	
		11.5	9/25	20.9	57.0	14:05	
		11.3	10/13	21.9	51.0	13:29	
		11.5	10/26	24.8	46.0	09:35	
Titus Creek	TC-1	3.8	6/21	4.0	N/A	15:20	Covered Bridge
		3.8	7/6	5.0	64.0	13:21	
		3.7	7/20	3.7	68.0	14:43	
		3.3	8/2	4.0	65.0	13:12	
		3.4	8/14	4.3	62.0	12:32	
		3.6	8/28	4.3	65.0	13:21	
		3.5	9/13	5.4	60.0	13:37	
		3.8	9/25	5.4	55.0	13:50	
		3.9	10/13	3.7	50.0	13:11	
		3.7	10/26	4.0	46.0	09:26	
Titus Creek	TC-2	1.1	6/21	3.4	63.0	15:13	Five Mile Rd
		1.1	7/6	4.1	65.0	13:10	
		1.0	7/20	4.55	68.0	14:28	
		0.9	8/2	2.7	66.0	13:01	
		1.2	8/14	3.3	62.0	12:22	
		1.2	8/28	1.75	65.0	13:12	
		1.1	9/13	3.0	60.0	13:25	
		1.1	9/25	4.7	55.0	13:40	
		1.1	10/13	2.5	50.0	13:00	
		1.2	10/26	3.3	46.0	09:17	
Titus Creek	TC-3	2.8	6/21	1.9	62.0	14:55	Behind WWCC Nursing Building
		2.8	7/6	1.6	63.0	12:50	
		2.8	7/20	1.5	64.0	14:11	
		2.4	8/2	1.2	64.0	12:49	
		2.5	8/14	1.0	60.0	12:11	
		2.5	8/28	1.2	64.0	13:01	
		2.7	9/13	1.5	61.0	13:13	
		3.1	9/25	1.6	55.0	13:29	
		2.8	10/13	1.6	53.0	12:47	
		N/A	10/26	N/A	N/A	N/A	No flow taken due to construction at site

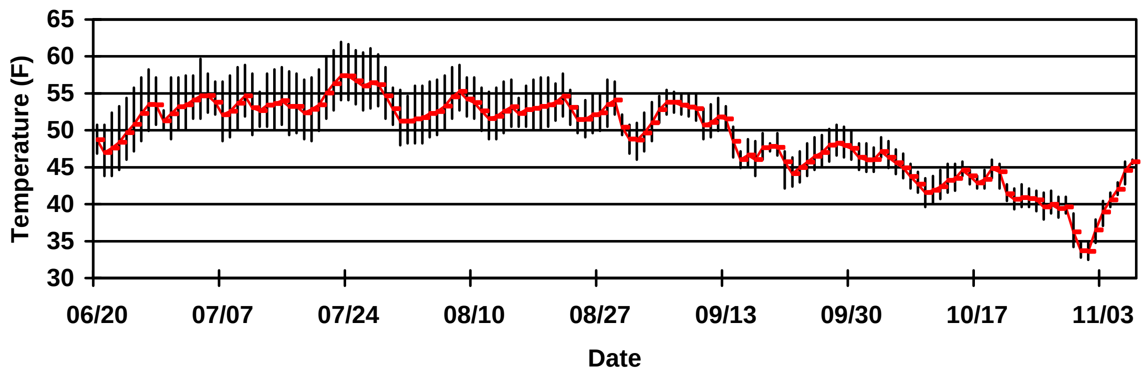
Appendix B. Table 1. Manual discharge (cfs) measurements 2006.							
Stream	**Site**	**Width**	**Date**	**CFS**	**Temp (F)**	**Time**	**Comments**
West Little Walla Walla	WLW-1	1.7	2/8	2.0	46.0	13:15	0.6 miles up Valley Chapel Rd
West Little Walla Walla	WLW-2	2.1	2/8	2.4	42.0	12:40	Swegle Rd
Walla Walla River	WW-6	21.1	6/21	92.7	65.0	12:20	0.5 miles above Detour Rd Bridge
		14.3	7/6	35.3	68.0	10:37	
		18.8	7/20	47.4	68.0	11:21	
		19.4	8/2	41.3	68.0	10:32	
		19.3	8/14	36.9	64.0	10:09	*actual wetted width = 17.0 meters
		21.1	8/28	30.4	67.0	10:39	
		20.9	9/13	26.6	64.0	10:47	
		21.1	9/25	44.2	54.0	11:05	
		21.2	10/13	30.0	51.0	10:36	
		20.6	10/26	25.9	N/A	11:20	
Walla Walla River	WW-7	24.9	6/21	78.4	66.0	11:41	Below McDonald Rd bridge
		14.6	7/6	5.2	73.0	10:15	
		24.3	7/20	15.6	72.0	10:44	
		24.2	8/2	22.3	70.0	10:07	
		11.4	8/14	10.7	68.0	09:49	
		11.4	8/28	15.8	69.0	10:14	
		11.1	9/13	4.4	65.0	10:18	
		11.4	9/25	24.8	58.0	10:40	
		11.1	10/13	2.1	53.0	10:09	
		11.4	10/26	11.9	N/A	11:40	

Appendix C. Stream Temperature Graphs (ºF), 2006

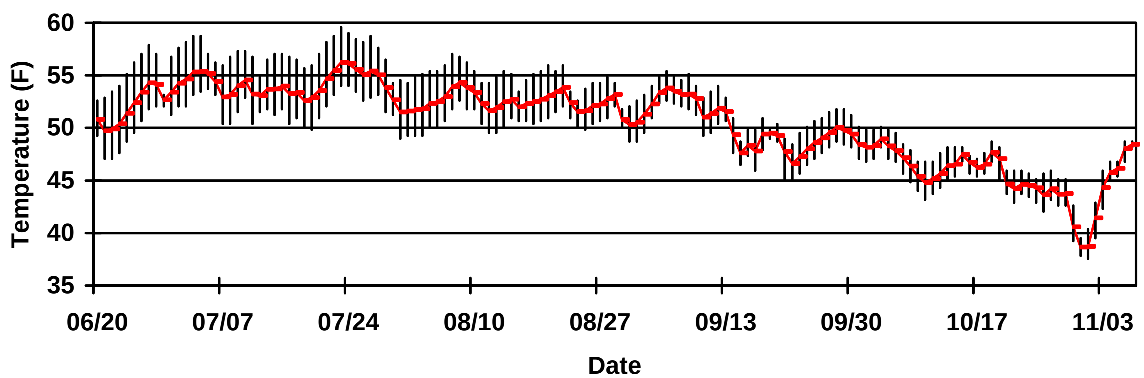
Spangler Ck--0.1 mi above mouth (SC-7)



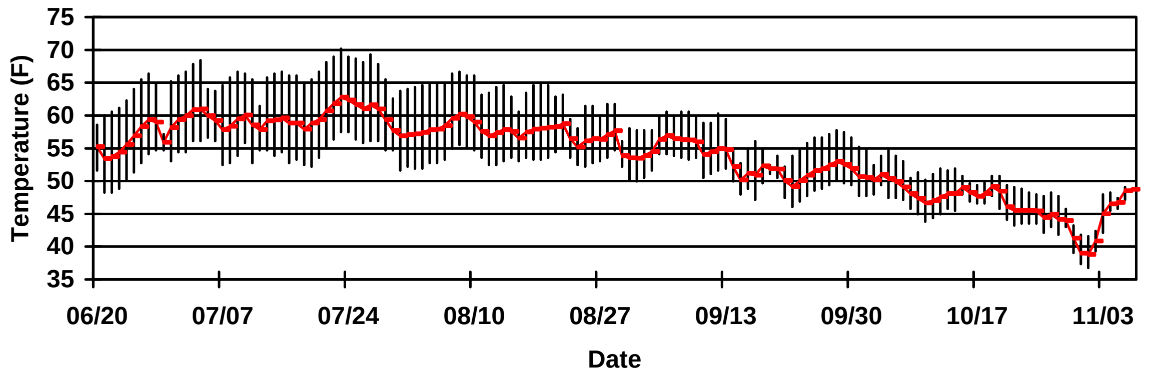
NF Touchet--below Spangler Ck (NFT-2)



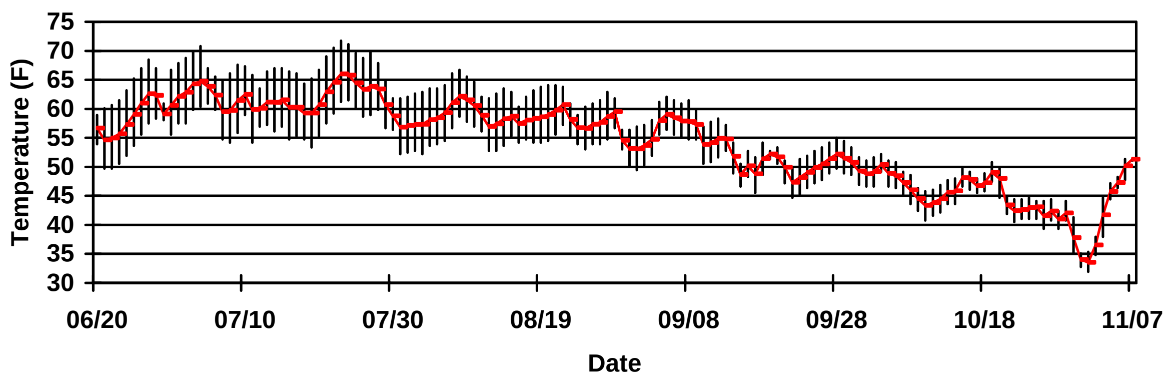
Lewis Ck--above NF Touchet Rd. (LC-5)



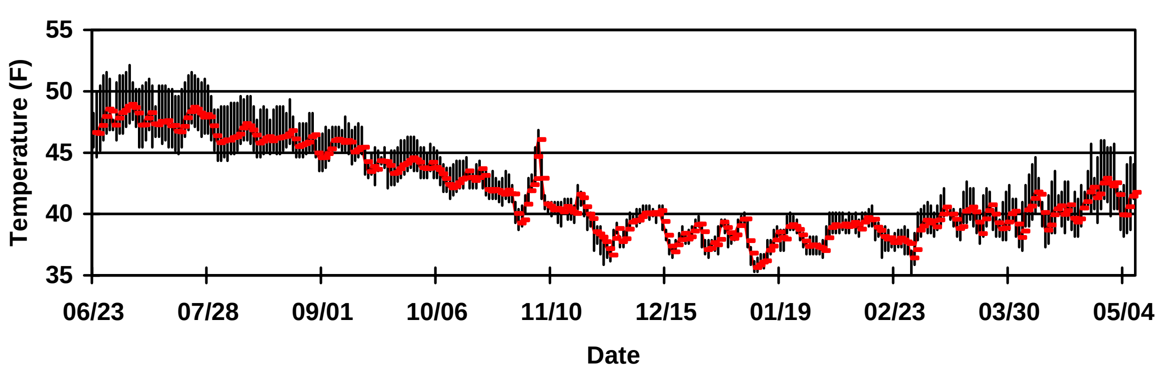
NF Touchet--above Jim Ck (NFT-3)



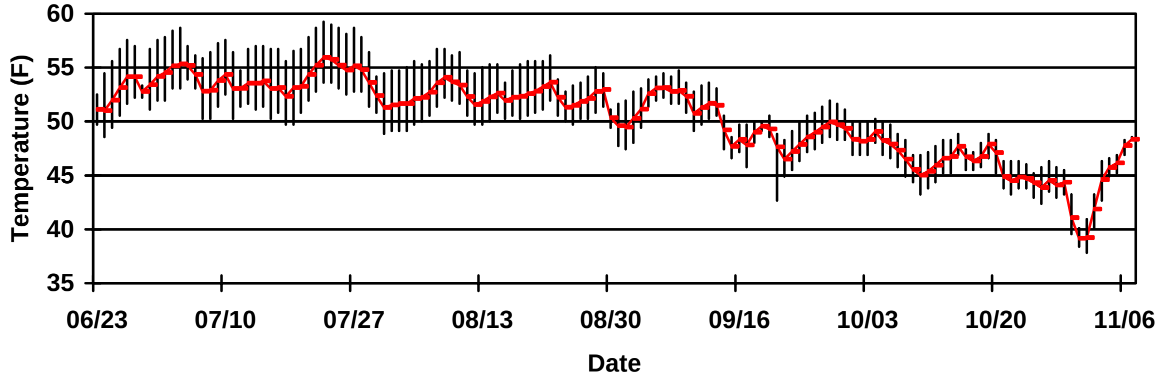
Jim Ck--below NF Touchet Rd. (JC-1)



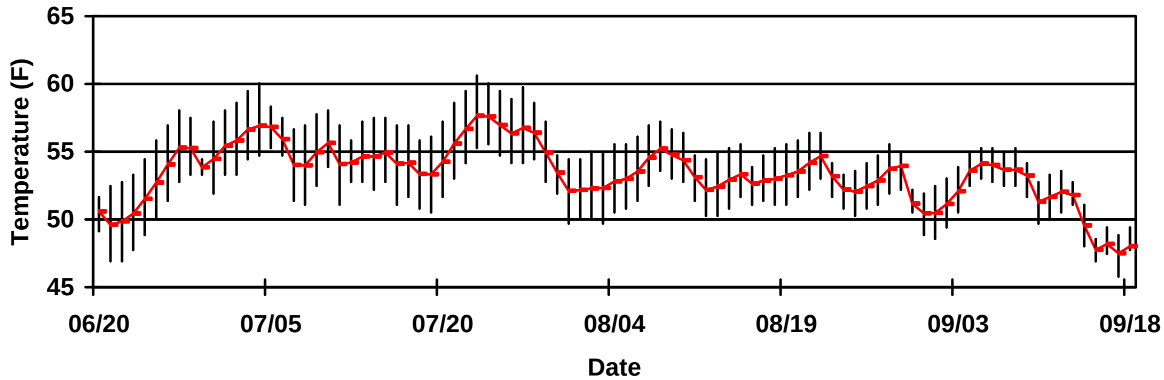
Wolf Fork--0.7 mi below Green Fly (WF-1)



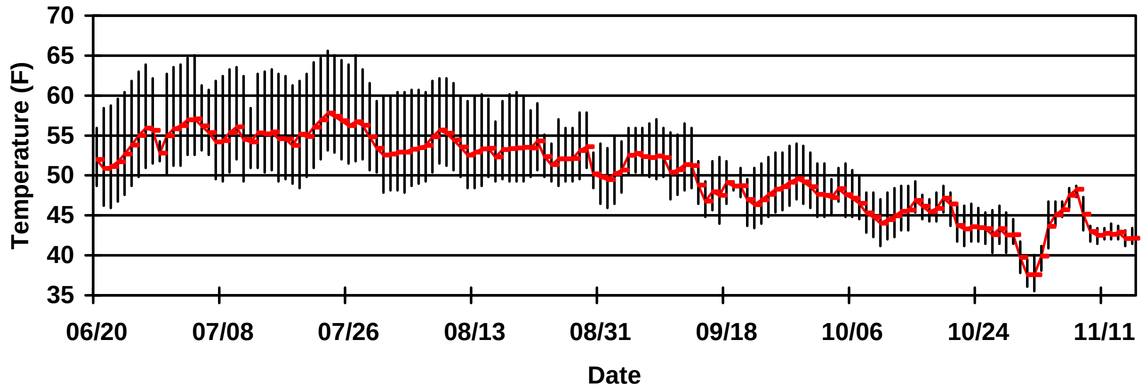
Whitney Ck--0.3 mi above mouth (WH-1)



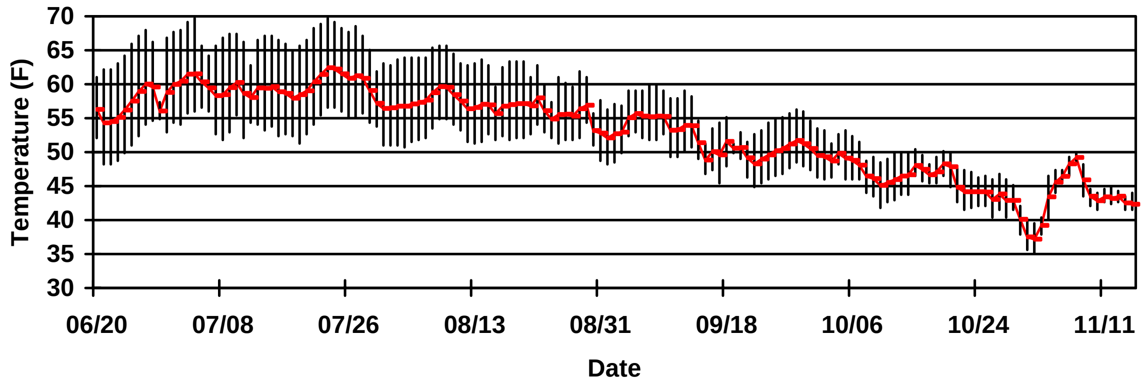
Coates Ck--below Wolf Fk Rd. (C-1)



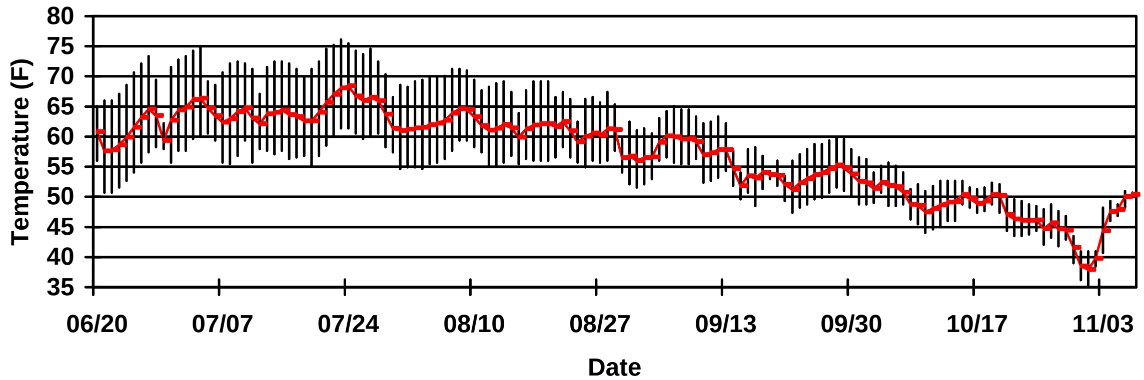
Wolf Fork--3rd bridge on Wolf Fk Rd. (WF-2)



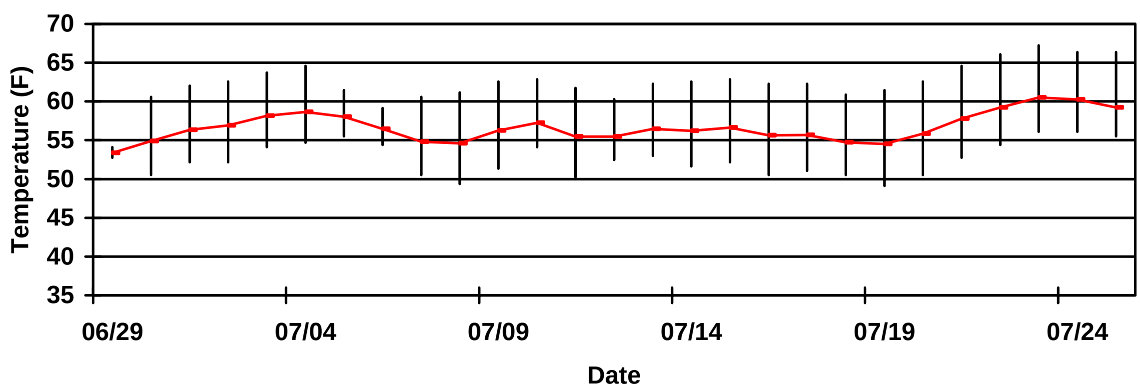
Wolf Fk--Holmberg Rd. (WF-3)

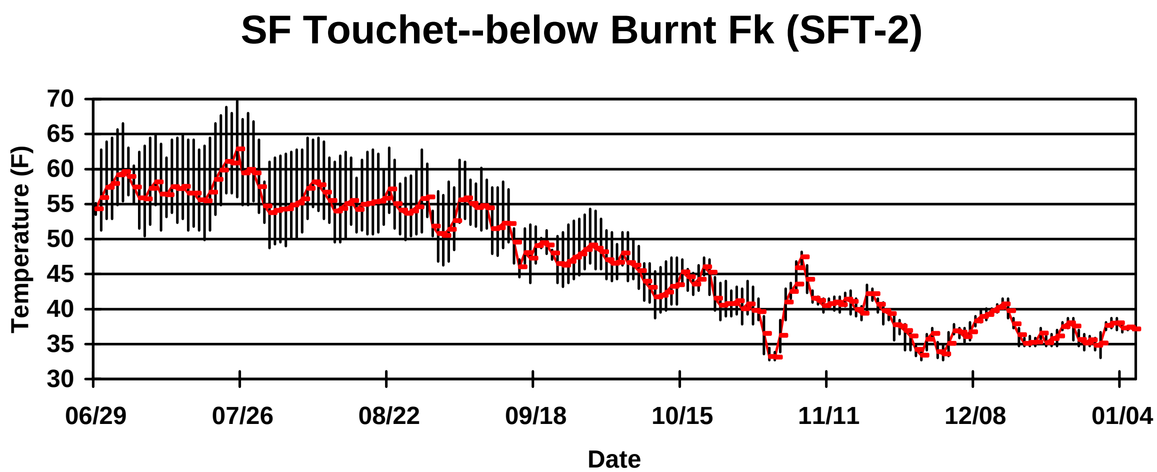


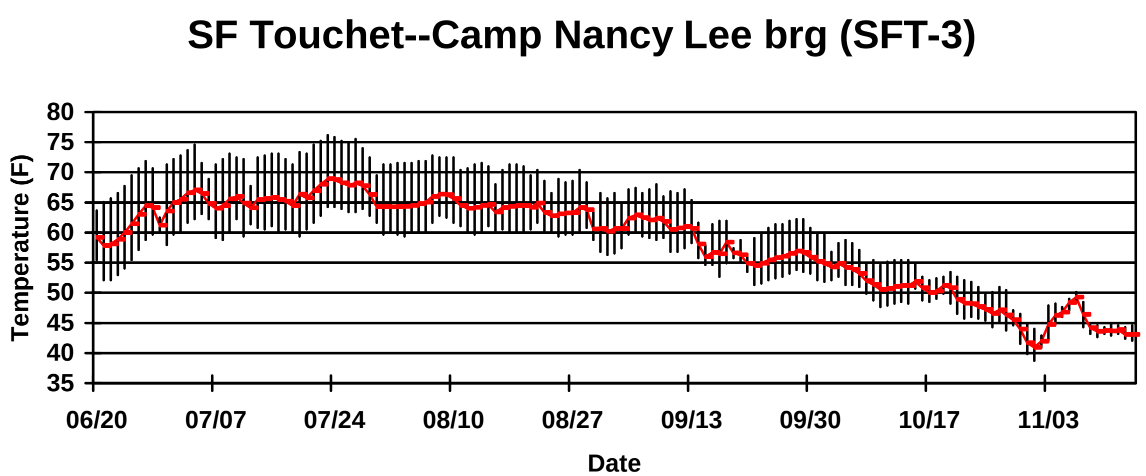
NF Touchet--above Baileysburg (NFT-4)

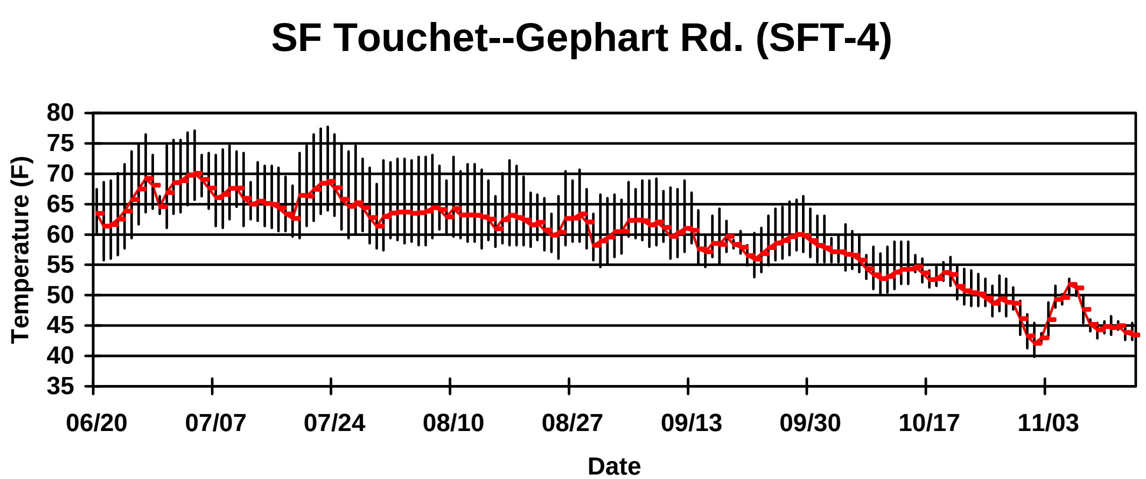


Burnt Fk--just above mouth (BF-6)

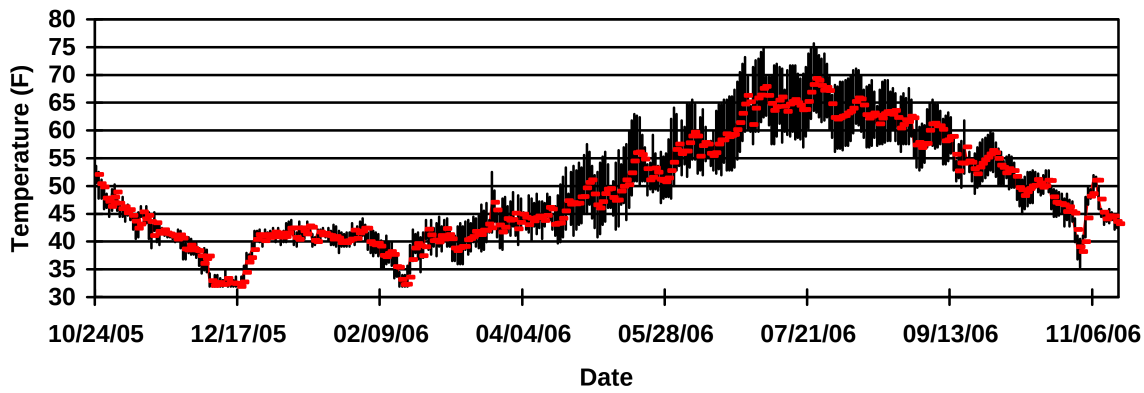



SF Touchet--below Burnt Fk (SFT-2)
Temperature (F)
70
65
60
55
50
45
40
35
30
06/29
07/26
08/22
09/18
10/15
11/11
12/08
01/04
Date

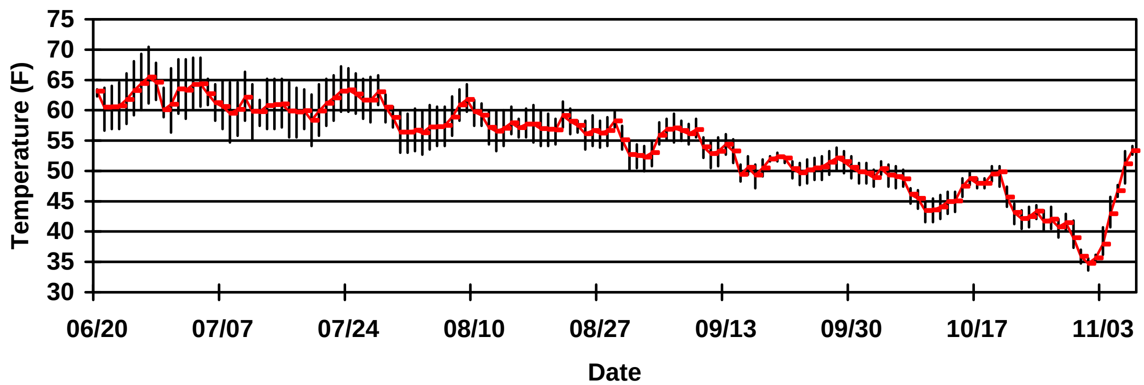

SF Touchet--Camp Nancy Lee brg (SFT-3)
Temperature (F)
80
75
70
65
60
55
50
45
40
35
06/20
07/07
07/24
08/10
08/27
09/13
09/30
10/17
11/03
Date


SF Touchet--Gephart Rd. (SFT-4)
Temperature (F)
80
75
70
65
60
55
50
45
40
35
06/20
07/07
07/24
08/10
08/27
09/13
09/30
10/17
11/03
Date

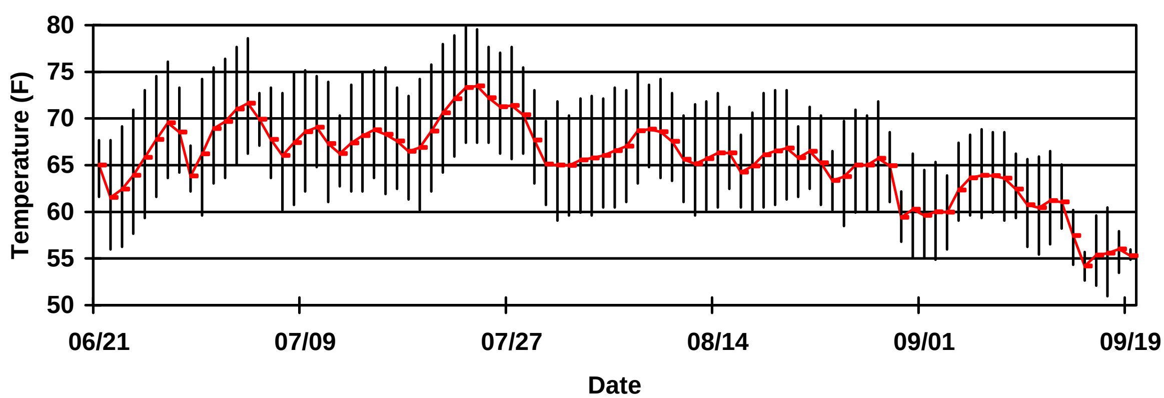
Touchet River--below SRL trap (TR-1)



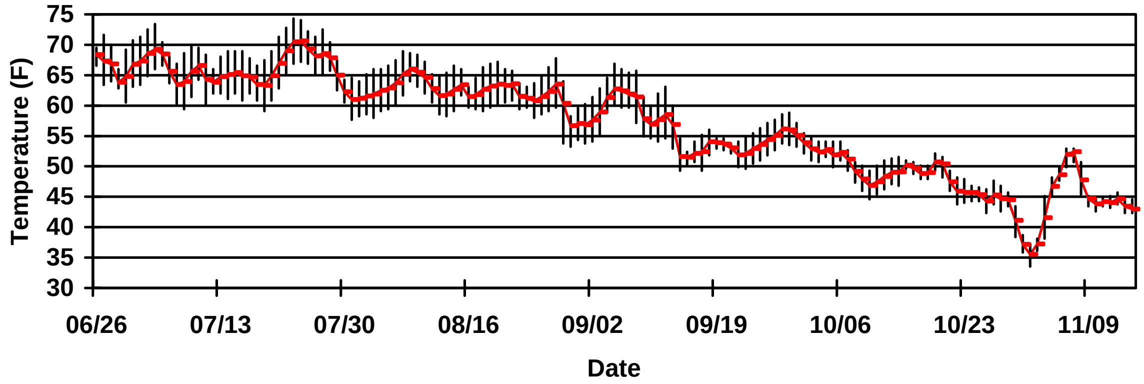
Patit Ck--1st brg on Patit Rd. (P-5)



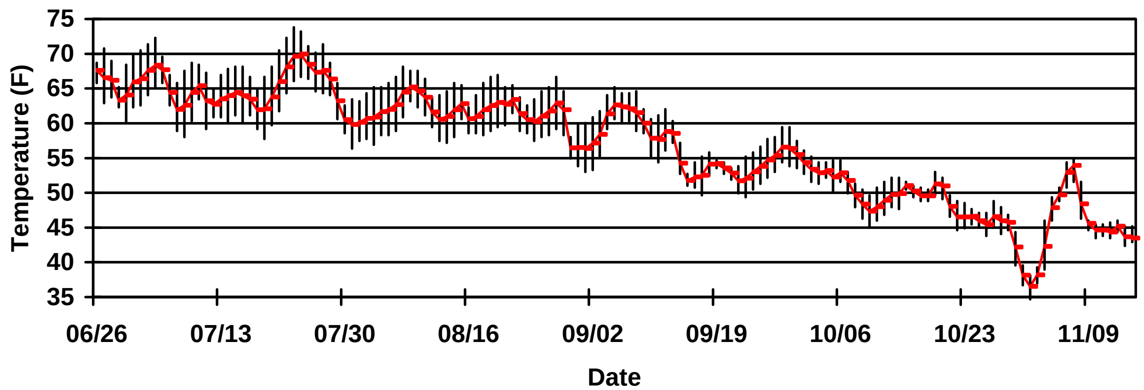
Touchet River--Lewis and Clark State Park (TR-3)



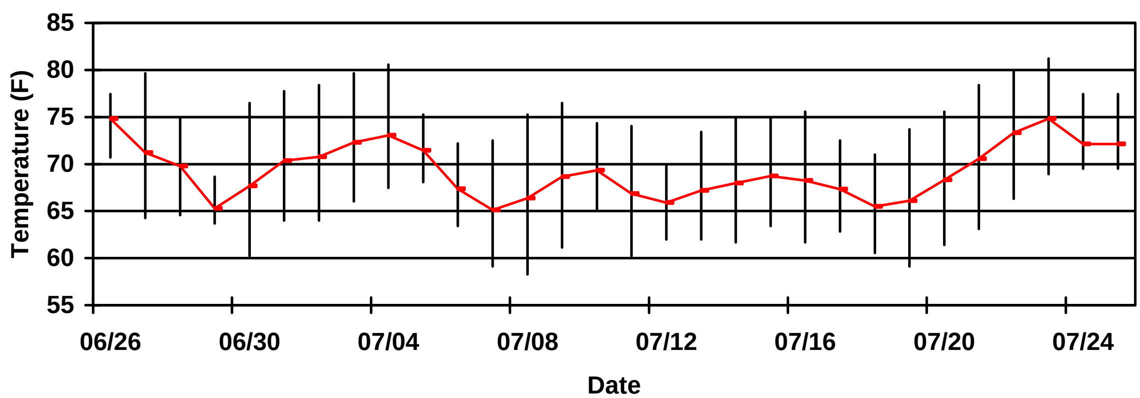
SF Coppei--2nd brg on SF Coppei Rd. (SFC-1)



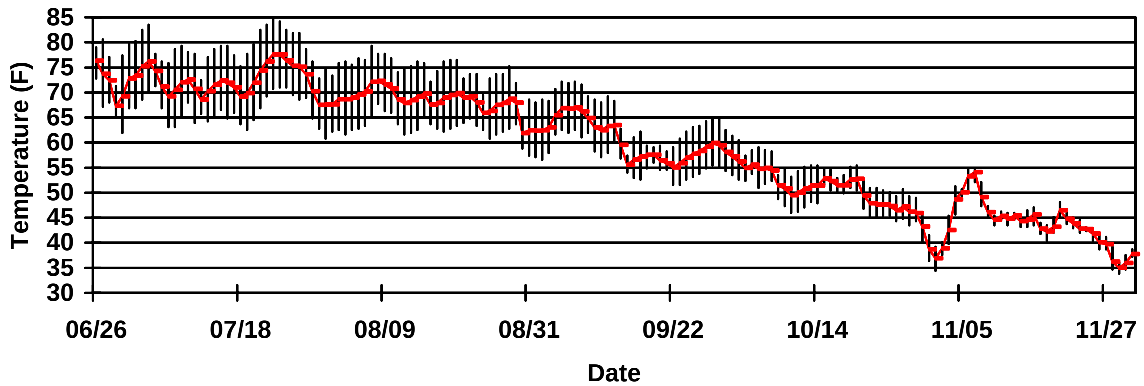
NF Coppei--0.1 mi above mouth (NFC-1)



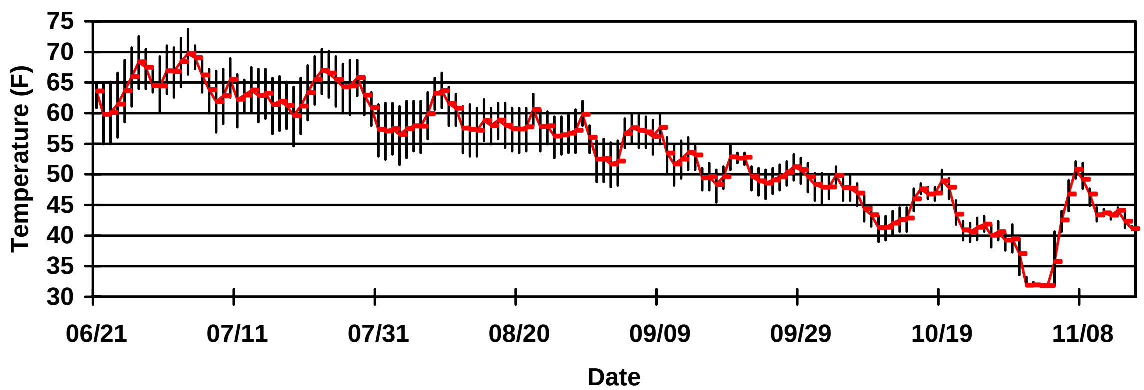
Coppei Ck--McCowan Rd. (CO-1)



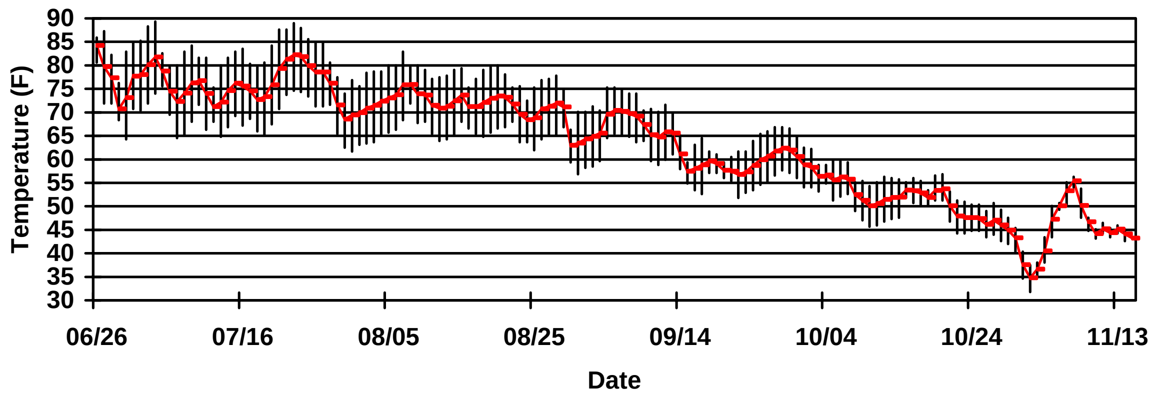
Touchet River--under Bolles brg (TR-4)



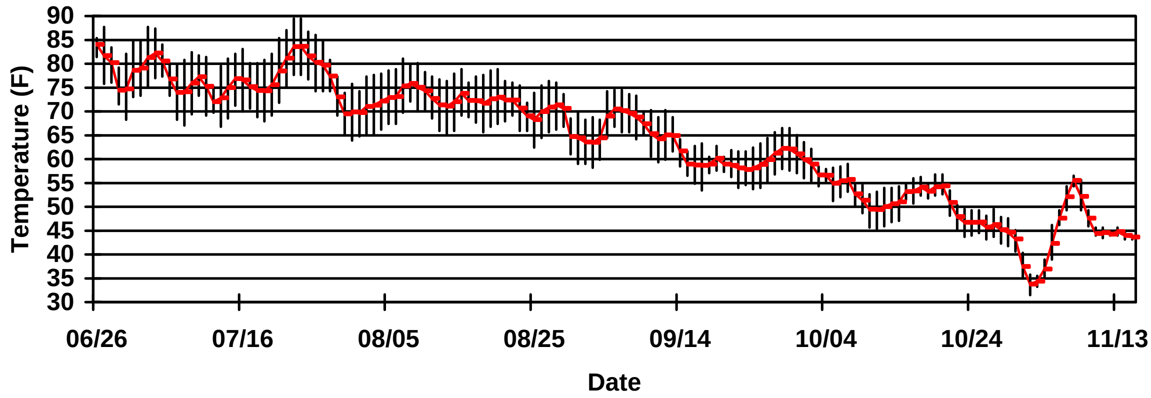
Whetstone Ck--Highway 124 brg (WS-1)



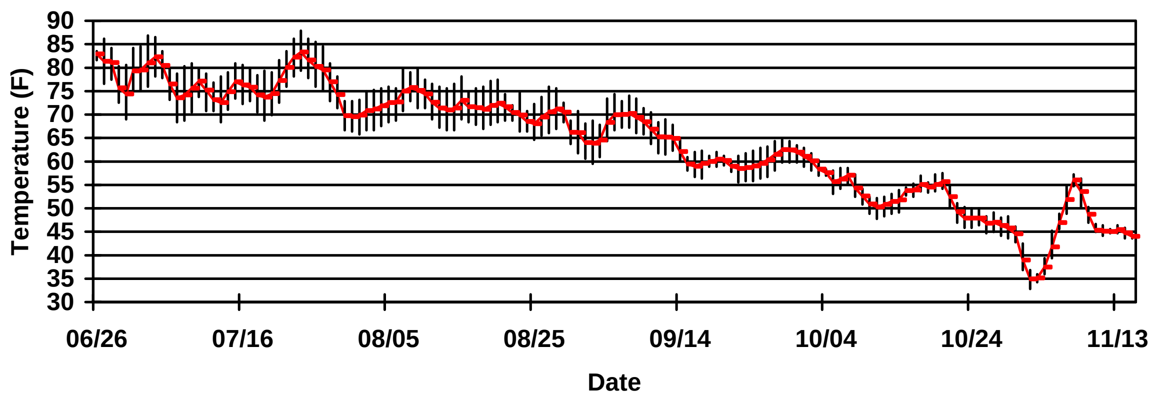
Touchet River--below Harvey Shaw Rd. (TR-5)



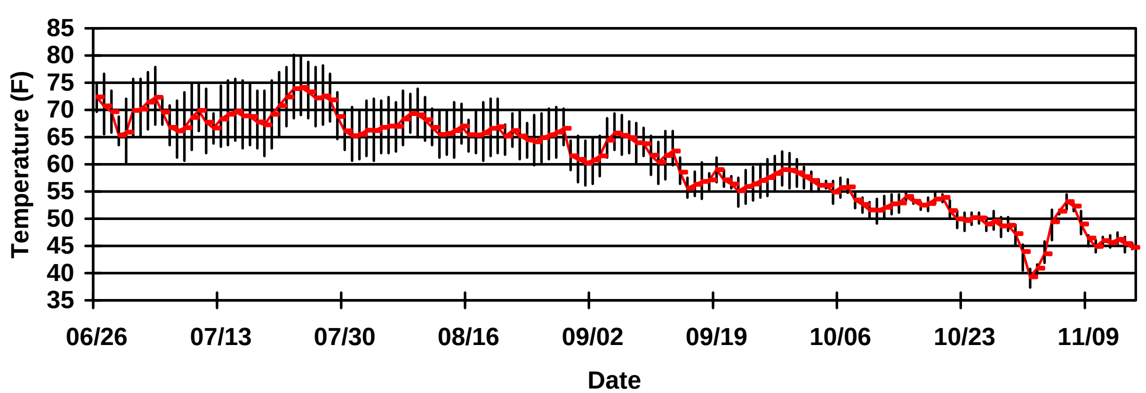
Touchet River--WDFW Public Access (TR-6)

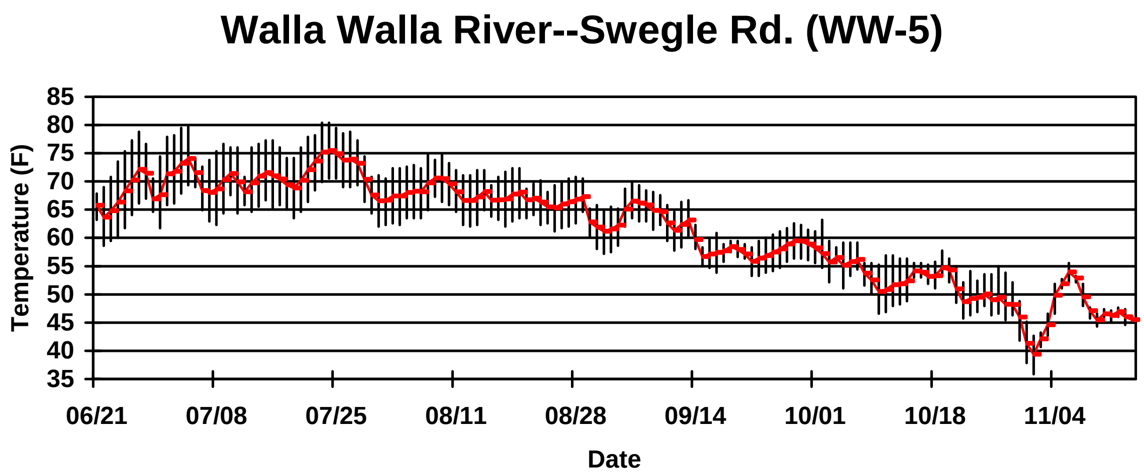


Touchet River--Cummins Rd. brg (TR-8)

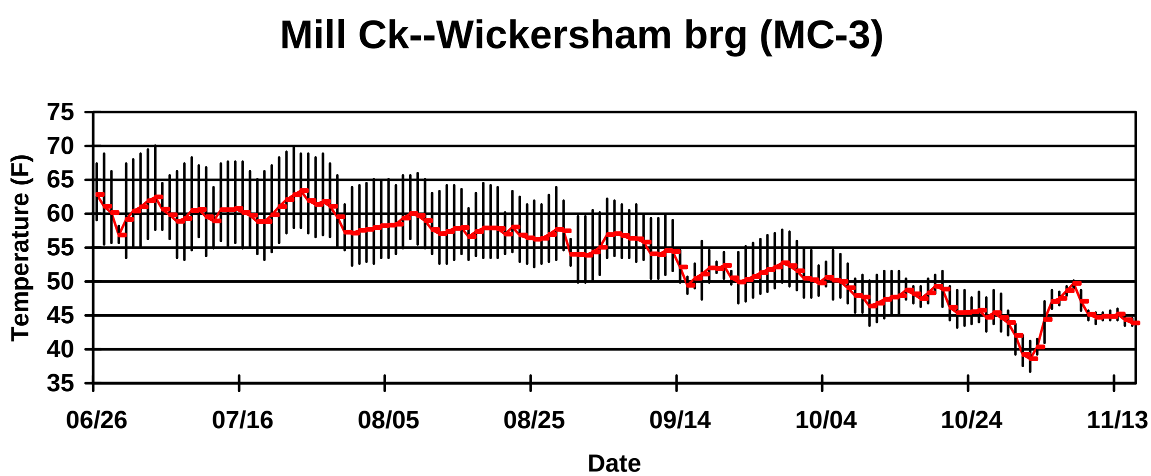


Walla Walla River--below Burlingame (WW-3)

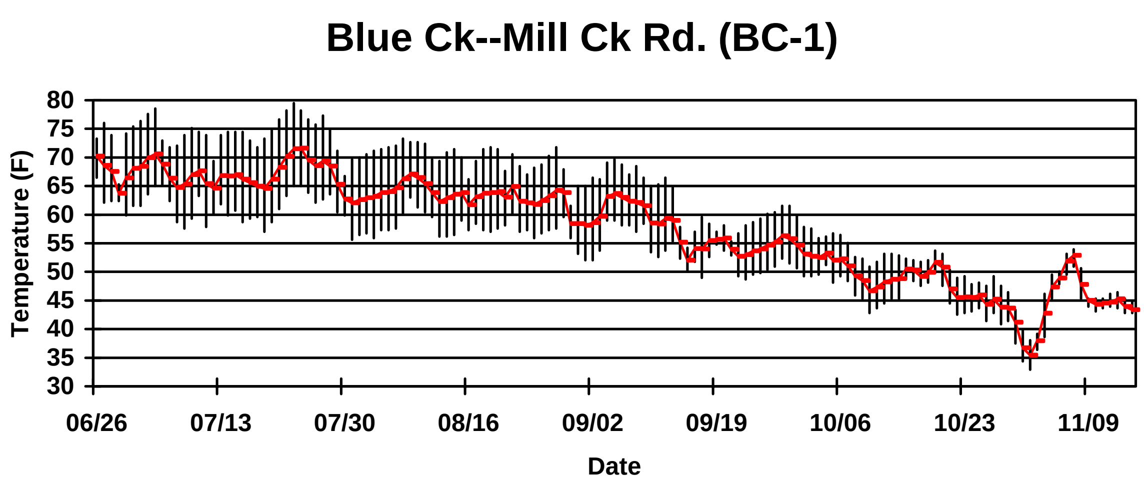




Walla Walla River--Swegle Rd. (WW-5)
85
80
75
70
65
60
55
50
45
40
35
Temperature (F)
06/21
07/08
07/25
08/11
08/28
09/14
10/01
10/18
11/04
Date

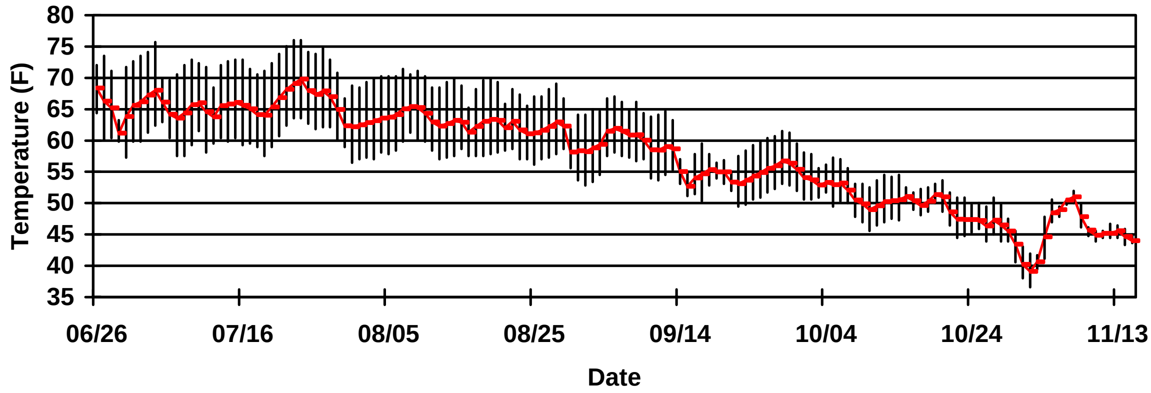


Mill Ck--Wickersham brg (MC-3)
75
70
65
60
55
50
45
40
35
Temperature (F)
06/26
07/16
08/05
08/25
09/14
10/04
10/24
11/13
Date

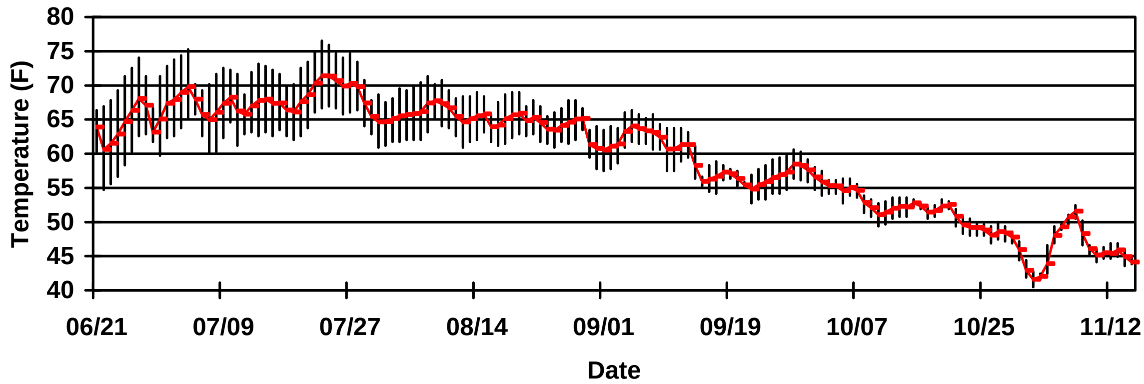


Blue Ck--Mill Ck Rd. (BC-1)
80
75
70
65
60
55
50
45
40
35
30
Temperature (F)
06/26
07/13
07/30
08/16
09/02
09/19
10/06
10/23
11/09
Date

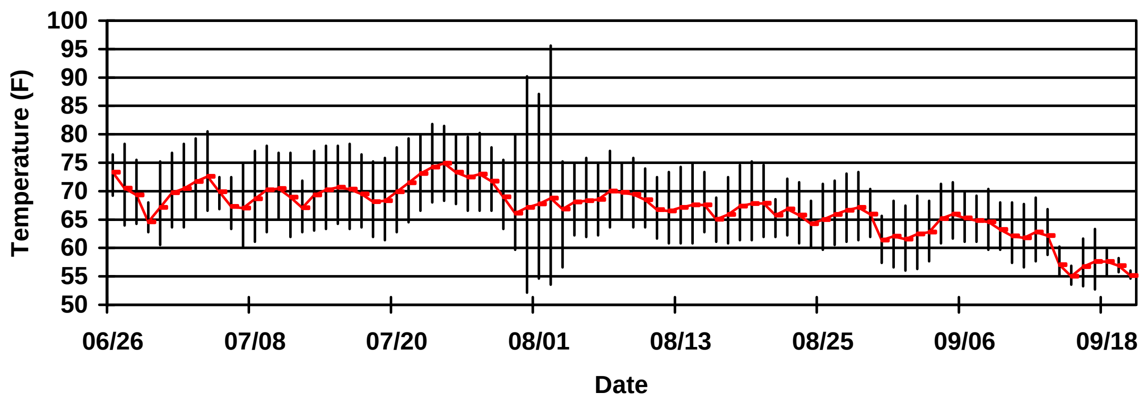
Mill Ck--Seven Mile Rd. (MC-5)

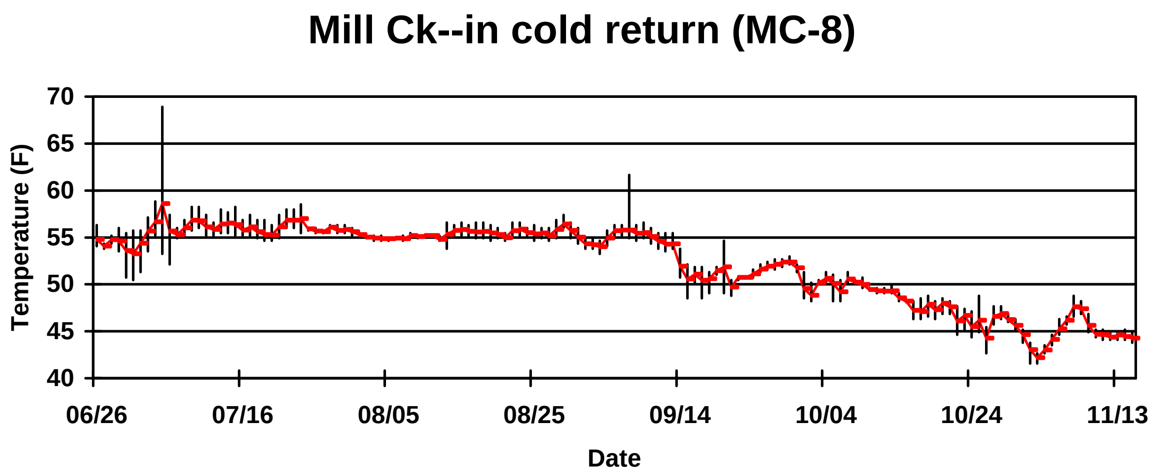


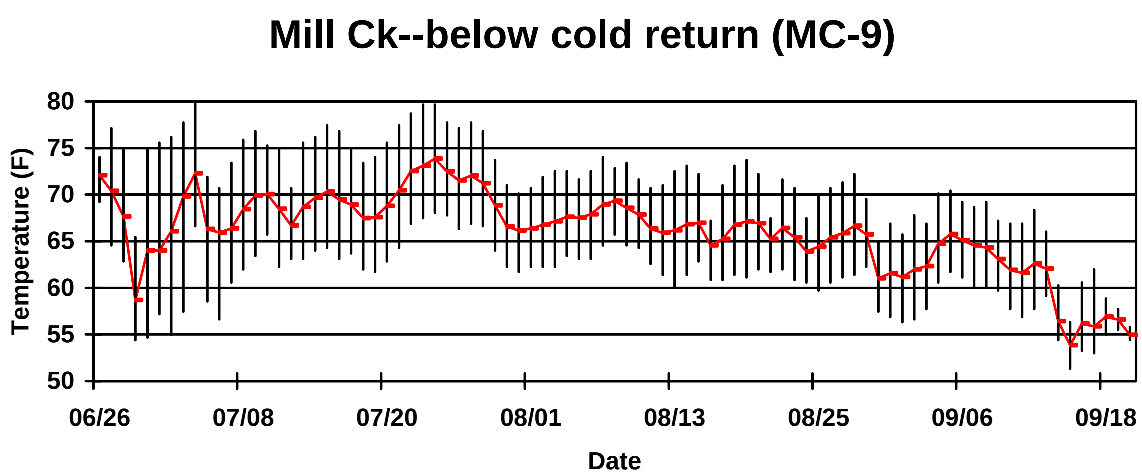
Mill Ck--Five Mile Rd. (MC-6)

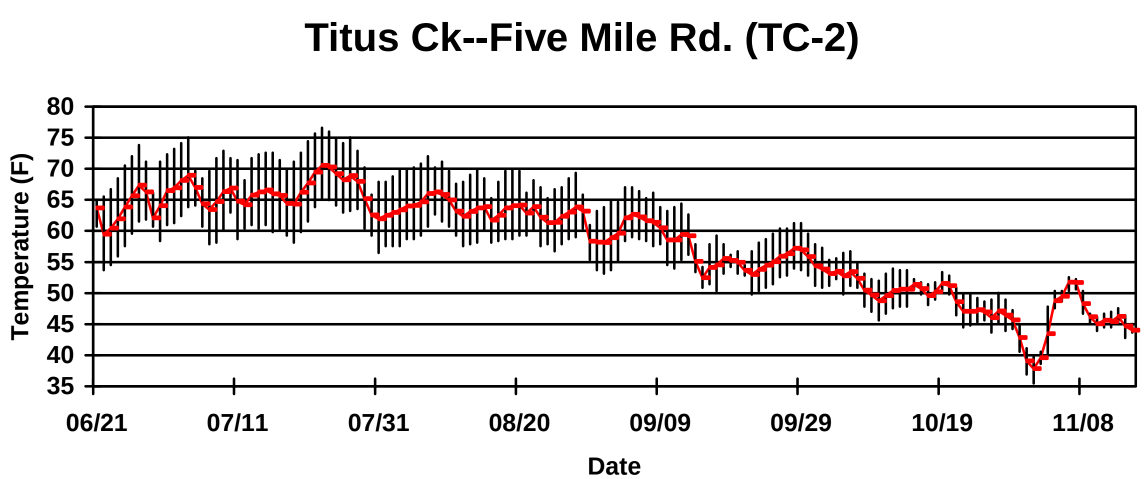


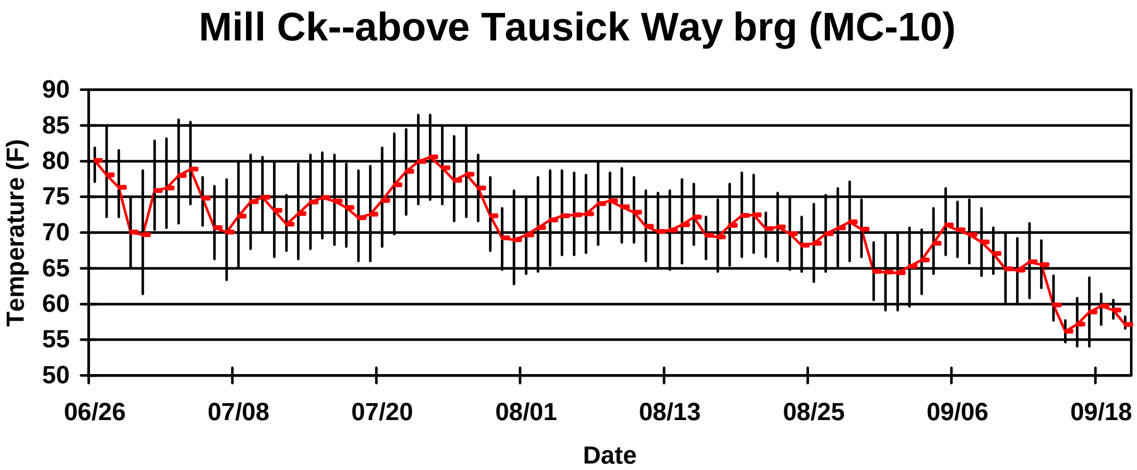
Mill Ck--above cold return (MC-7)

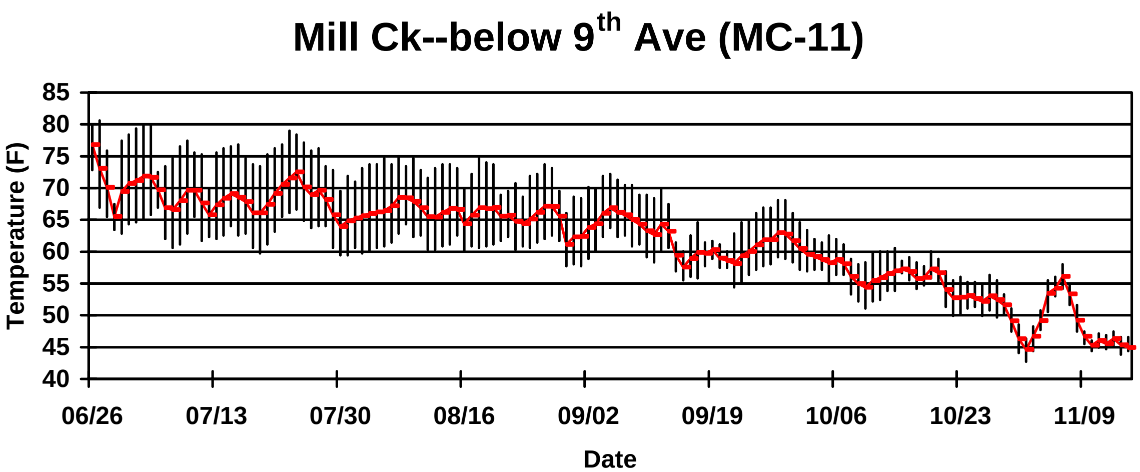


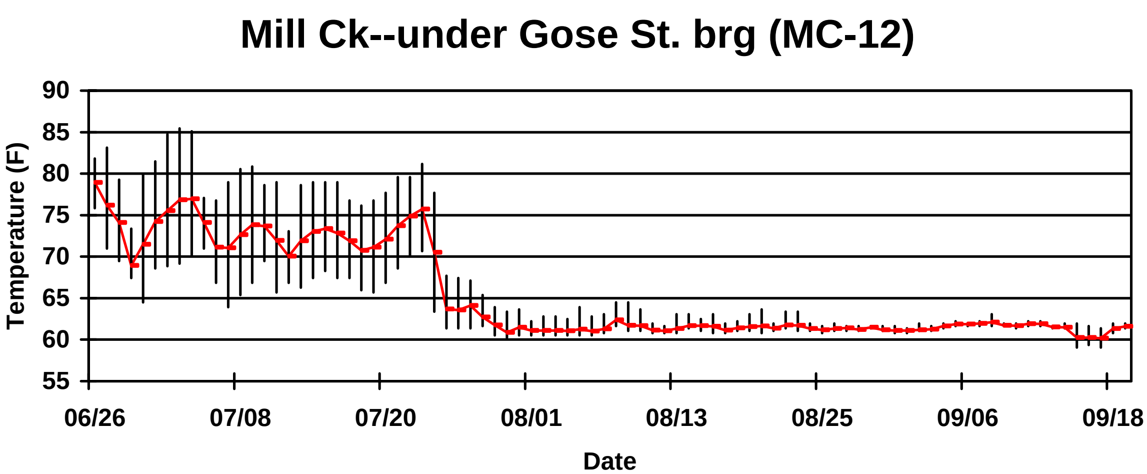

Mill Ck--in cold return (MC-8)
70
65
60
55
50
45
40
Temperature (F)
06/26
07/16
08/05
08/25
09/14
10/04
10/24
11/13
Date


Mill Ck--below cold return (MC-9)
80
75
70
65
60
55
50
Temperature (F)
06/26
07/08
07/20
08/01
08/13
08/25
09/06
09/18
Date

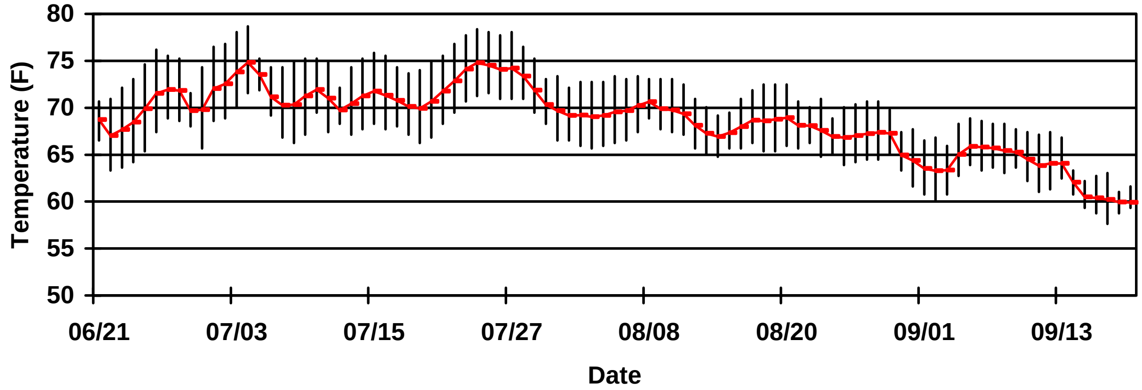

Titus Ck--Five Mile Rd. (TC-2)
80
75
70
65
60
55
50
45
40
35
Temperature (F)
06/21
07/11
07/31
08/20
09/09
09/29
10/19
11/08
Date


Mill Ck--above Tausick Way brg (MC-10)
Temperature (F)
90
85
80
75
70
65
60
55
50
06/26
07/08
07/20
08/01
08/13
08/25
09/06
09/18
Date

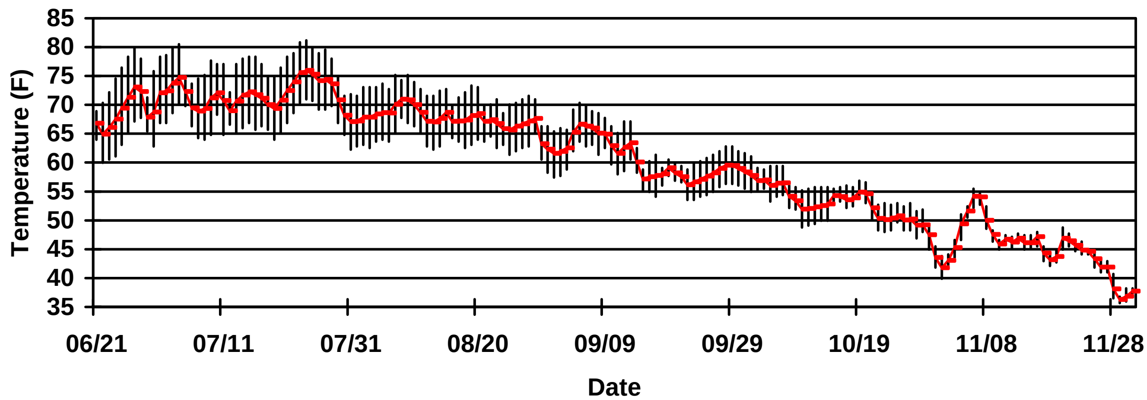

Mill Ck--below 9th Ave (MC-11)
Temperature (F)
85
80
75
70
65
60
55
50
45
40
06/26
07/13
07/30
08/16
09/02
09/19
10/06
10/23
11/09
Date


Mill Ck--under Gose St. brg (MC-12)
Temperature (F)
90
85
80
75
70
65
60
55
06/26
07/08
07/20
08/01
08/13
08/25
09/06
09/18
Date

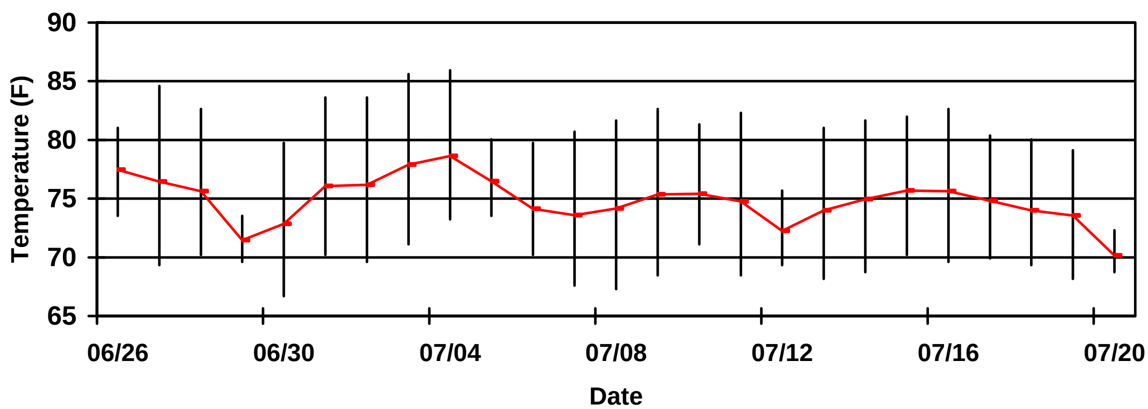
Mill Ck--below Swegle Rd. brg (MC-13)

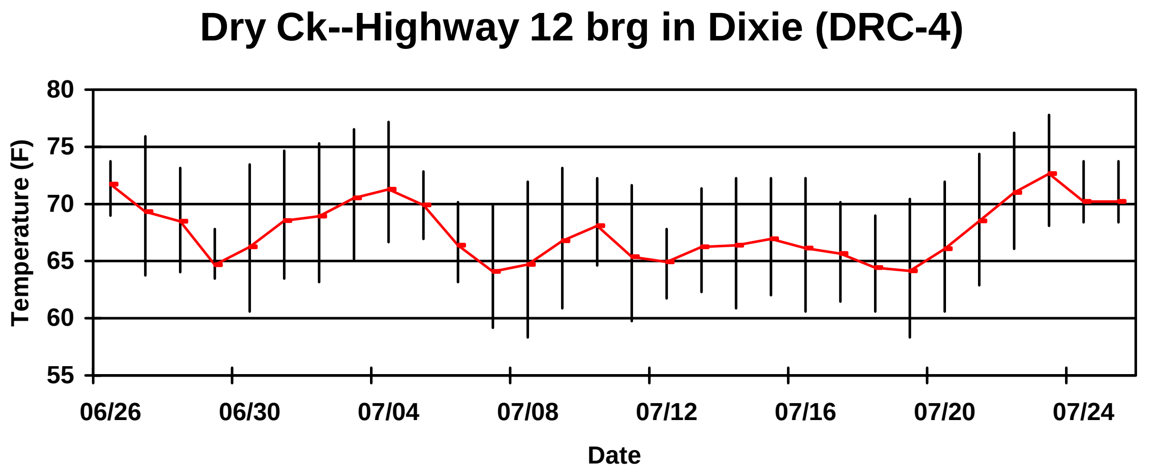


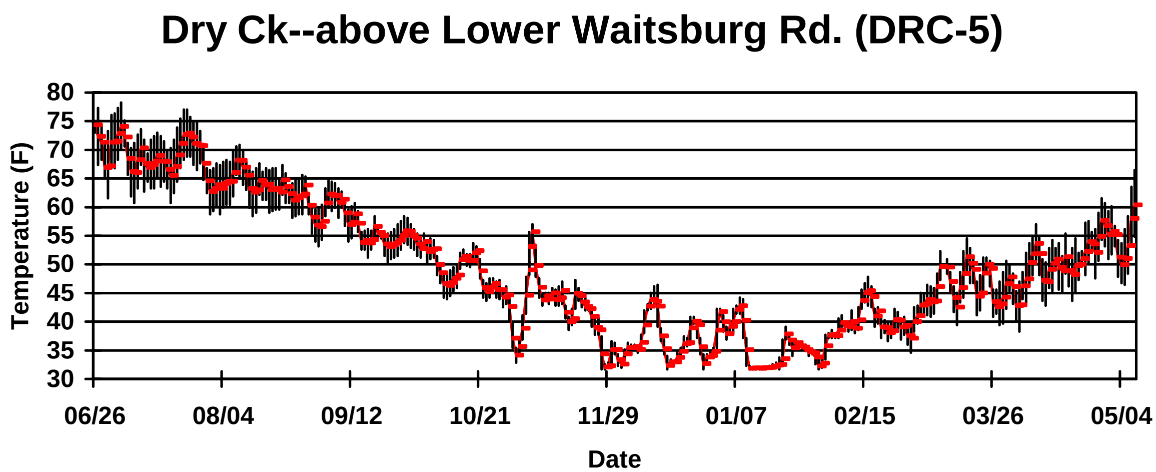
Walla Walla River--above Detour Rd. (WW-6)

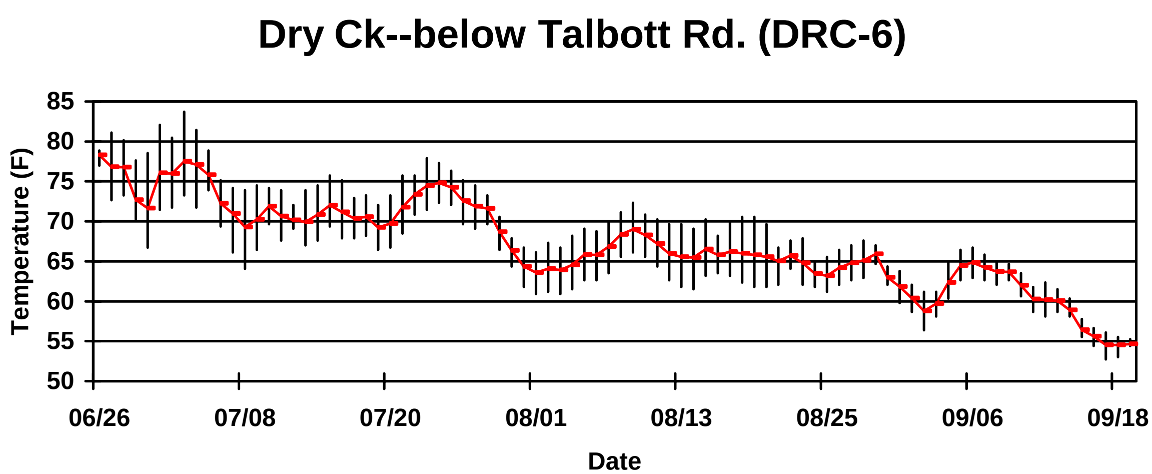


Walla Walla River--under McDonald Rd. (WW-7)

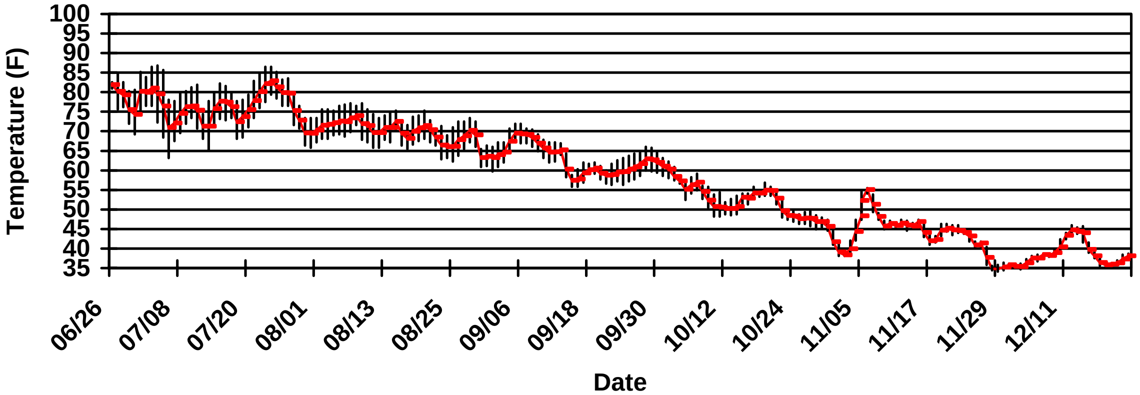



Dry Ck--Highway 12 brg in Dixie (DRC-4)
80
75
70
65
60
55
Temperature (F)
06/26
06/30
07/04
07/08
07/12
07/16
07/20
07/24
Date

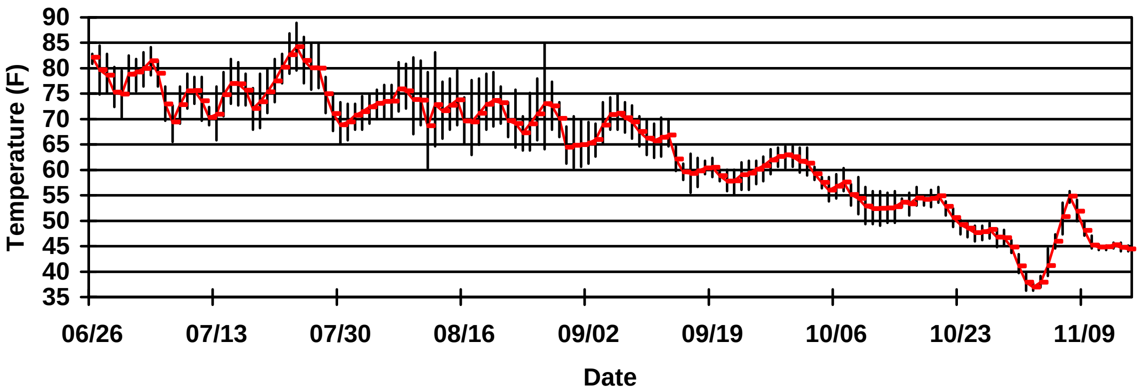

Dry Ck--above Lower Waitsburg Rd. (DRC-5)
80
75
70
65
60
55
50
45
40
35
30
Temperature (F)
06/26
08/04
09/12
10/21
11/29
01/07
02/15
03/26
05/04
Date


Dry Ck--below Talbott Rd. (DRC-6)
85
80
75
70
65
60
55
50
Temperature (F)
06/26
07/08
07/20
08/01
08/13
08/25
09/06
09/18
Date

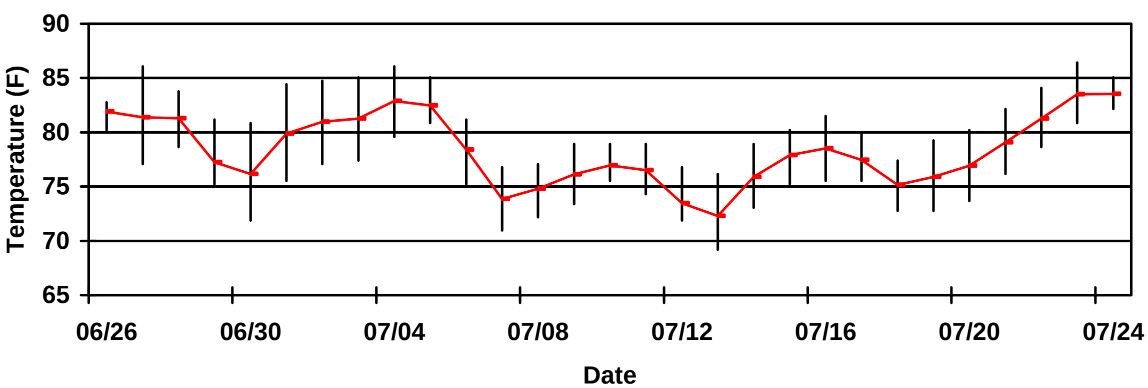
Walla Walla River--Touchet Gardena Rd. (WW-8)



Walla Walla River--Byerley Rd. (WW-9)



Walla Walla River--RV Park (WW-10)



List of lost or stolen loggers, and loggers with only partially collected data or data that has inconsistencies, 2006.

NF Touchet—Bluewood culvert (NFT-1)

- Logger was deployed on 06/20
- Went to download logger on 07/19, but logger was dead and would not download so was pulled for the season
- No data collected

Coates Ck—below Wolf Fk Rd. (C-1)

- Logger was deployed on 06/20
- Downloaded on 07/19 and 09/18
- Went to download and pull logger for the season on 11/15, but logger could not be found
- Checked again for logger on 12/01, but logger still was not found
- No data after 09/18

Green Fk—just above mouth (GF-1)

- Logger was deployed on 06/29
- Logger was downloaded on 07/25, but logger was setup to take readings every 5 minutes instead of every 30 minutes so only had limited data
- No data reported

Coppei Ck—McCowan Rd. (CO-1)

- Logger was deployed on 06/26
- Downloaded on 07/24
- Went to download logger on 09/20, but logger was dead and would not download so was pulled for the season
- No data after 07/24

Mill Ck—above cold return (MC-7)

- Logger was deployed on 06/26
- Downloaded on 07/24 and 09/20, it appears to have gone dry for a short time during late July and early August
- Went to download and pull logger for the season on 11/15, but logger could not be found
- Checked again for logger on 12/01, but logger still was not found
- No data after 09/20

Mill Ck—below cold return (MC-9)

- Logger was deployed on 06/26
- Downloaded on 07/24 and 09/20
- Went to download and pull logger for the season on 11/15, but logger could not be found
- Checked again for logger on 12/01, but logger still was not found
- No data after 09/20

Titus Ck—WWCC campus (TC-4)
- Logger was deployed on 06/21
- Went to download logger on 07/20, but logger could not be found
- No data collected

Mill Ck—above Tausick Way bridge (MC-10)
- Logger was deployed on 06/26
- Downloaded on 07/24 and 09/20
- Went to download and pull logger for the season on 11/15, but logger could not be found
- Checked again for logger on 12/01, but logger still was not found
- No data after 09/20

Mill Ck—under Gose St. bridge (MC-12)
- Logger was deployed on 06/26
- Downloaded on 07/24 and 09/19
- Went to download and pull logger for the season on 11/15, but water was high and logger could not be found
- Checked again for logger on 12/01, but water was still high and logger was not found
- No data after 09/19

Mill Ck—below Swegle Rd. bridge (MC-13)
- Logger was deployed on 06/21
- Downloaded on 07/24 and 09/19
- Went to download and pull logger for the season on 11/15, but water was high and logger could not be found
- Checked again for logger on 12/01, but logger still was not found
- No data after 09/19

Walla Walla River—under McDonald Rd. (WW-7)
- Logger was deployed on 06/26
- Downloaded on 07/20
- Went to download logger on 09/19, but logger was not found
- No data after 07/20

Dry Ck—Highway 12 bridge in Dixie (DRC-4))
- Logger was deployed on 06/26
- Downloaded on 07/24
- Went to download logger on 09/20, but logger was dead and would not download so was pulled for the season
- No data after 07/24

Dry Ck—below Talbott Rd. (DRC-6)

- Logger was deployed on 06/26
- Downloaded on 07/24 and 09/19
- Went to download and pull logger for the season on 11/15, but water was high and logger could not be found
- Checked again for logger on 12/01, but water was still high and logger was not found
- No data after 09/19

Walla Walla River—RV Park (WW-10)

- Logger was deployed on 06/26
- Downloaded on 07/24
- Went to download logger on 09/19, but logger could not be found
- Checked again for logger on 11/15, but water was high and logger was not found
- No data after 07/24

Appendix D. Relative Abundance of Non-Salmonids, 2006

Appendix D. Relative abundance[a] of non-salmonids in the Walla Walla Subbasin, 2006.												
	Touchet River and Tributaries									Walla Walla River and Tributaries		
	Spangler Creek	Lewis Creek	Burnt Fork	Griffin Fork	Touchet River	North Fork Patit Creek	Patit Creek	Alyward[b] Tributary	Whiskey Creek	Yellowhawk Creek	Mill Creek	Dry Creek
Petromyzontidae lamprey larvae	0	0	0	0	0	0	0	0	0	1[c]	1	0
Cyprinidae speckled dace *Rhinichthys osculus*	0	0	0	0	0	3	3	0	4	2	1	3
longnose dace *Rhinichthys alutaceus*	0	0	0	0	0	0	0	0	0	1[c]	3	0
redside shiner *Richardsonius balteatus*	0	0	0	0	0	0	2	0	0	1	0	0
Centrarchidae smallmouth bass *Micropterus dolomieu*	0	0	0	0	3	0	0	0	0	0	0	0
Catostomidae Suckers[d] *Catostomus sp.*	0	0	0	0	0	0	0	0	0	1[c]	1[c]	0
Cottidae Sculpin[d] *Cottus sp.*	3[e]	3[e]	2	2	0	0	3[c]	0	1	3	4	3
Crayfish[d] *Pacifastacus sp.*	0	0	0	P[c]	0	0	P[c]	0	0	P	P	P
tailed frogs *Ascaphus truei*	3	2	2	1	0	0	0	0	0	0	0	0

[a] Categories of relative abundance are: 1=1 to 3 fish, 2=4 to 10, 3=11 to 100, 4=100+, P=present
[b] No fish found, only one of four sites had water.
[c] Only found at one site.
[d] Noted by genus only, not identified by species.
[e] Only found at two bottom sites.

Appendix E. Manual Flow Summary for the Walla Walla River, 1998-2006

Appendix E. Table 1. Manual flow summary (average monthly cfs and standard deviation) from June through October, 1998-2002, on the Walla Walla River at state line, Pepper Rd., 0.4 mi above Hwy 125, 0.5 mi above Burlingame Diversion, Mojonnier Rd., Swegle Rd., Detour Rd., McDonald Rd., and McKay Rd.

	1998		1999		2000		2001		2002	
	Day	cfs	Day	cfs	Day	cfs	Day	cfs	Day	cfs
state line										
June									18	117.8
									24	35.1
Avg. Monthly CFS										76.5
(SD)										(58.478)
July							17	14.6	8	20.2
							24	8.5	22	18.8
							31	9.7		
Avg. Monthly CFS								10.9		19.5
(SD)								(3.232)		(0.990)
August							7	13.9	5	15.8
							20	13.9	20	12.5
Avg. Monthly CFS								13.9		14.2
(SD)								(0.000)		(2.333)
September							4	12.8	4	13.2
							17	12.9	17	26.6
Avg. Monthly CFS								12.9		19.9
(SD)								(0.071)		(9.475)
October							2	23.4	1	18.6
							8	18.9	15	15.7
							16	36.9	31	16.9
							23	55.2		
							31	73.0		
Avg. Monthly CFS								41.5		17.1
(SD)								(22.580)		(1.457)

[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 E. Table 1. Manual flow summary (average monthly cfs and standard deviation) from June through October, 1998-2002, on the Walla Walla River at state line, Pepper Rd., 0.4 mi above Hwy 125, 0.5 mi above Burlingame Diversion, Mojonnier Rd., Swegle Rd., Detour Rd., McDonald Rd., and McKay Rd.

	1998		1999		2000		2001		2002	
	Day	cfs	Day	cfs	Day	cfs	Day	cfs	Day	Cfs
Pepper Rd.										
June			14	78.5	20	79.3	12	27.1	24	36.7
			30	9.9	29	5.5	21	12.0		
							26	17.6		
Avg. Monthly CFS				44.2		42.4		18.9		N/A[b]
(SD)				(48.508)		(52.184)		(7.633)		
July	27	3.2	13	5.1	11	3.6	5	13.7	8	21.0
			28	2.3	20	4.0	11	14.5	22	16.5
							17	14.2		
							24	9.2		
							31	9.7		
Avg. Monthly CFS		N/A[b]		3.7		3.8		12.3		18.8
(SD)				(1.980)		(0.283)		(2.587)		(3.182)
August	03	3.4	10	3.1	7	4.1	7	12.5	5	17.7
	17	3.1					20	14.8	20	12.4
Avg. Monthly CFS		3.3		N/A[b]		N/A[b]		13.7		15.1
(SD)		(0.212)						(1.626)		(3.748)
September	01	2.8	15	2.7			4	11.1	4	16.1
	16	3.3	28	2.7			17	12.9	17	27.5
Avg. Monthly CFS		3.1		2.7				12.0		21.8
(SD)		(0.354)		(0.000)				(1.273)		(8.061)
October	16	2.9	5	2.6	4	81.0	2	26.0	1	17.4
	28	3.2	13	2.7	19	23.7	16	39.1	15	13.6
							23	65.6	31	17.5
							31	81.8		
Avg. Monthly CFS		3.1		2.7		52.4		53.1		16.2
(SD)		(0.212)		(0.071)		(40.517)		(25.235)		(2.223)

[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 E. Table 1. Manual flow summary (average monthly cfs and standard deviation) from June through October, 1998-2002, on the Walla Walla River at state line, Pepper Rd., 0.4 mi above Hwy 125, 0.5 mi above Burlingame Diversion, Mojonnier Rd., Swegle Rd., Detour Rd., McDonald Rd., and McKay Rd.

	1998		1999		2000		2001		2002	
	Day	cfs	Day	cfs	Day	cfs	Day	cfs	Day	Cfs
0.4 mi above Hwy 125										
June							12	29.6	24	35.4
							26	16.3		
Avg. Monthly CFS								23.0		N/A[b]
(SD)								(9.405)		
July							5	13.7	8	21.2
							11	14.6	22	15.1
							17	13.4		
							24	7.9		
							31	9.8		
Avg. Monthly CFS								11.9		18.2
(SD)								(2.880)		(4.313)
August							7	13.3	5	16.3
							20	12.9	20	12.5
Avg. Monthly CFS								13.1		14.4
(SD)								(0.283		(2.687)
September							4	11.3	4	14.2
							17	13.2	17	27.0
Avg. Monthly CFS								12.3		20.6
(SD)								(1.344)		(9.051)
October							2	22.1	1	19.5
							8	19.4	15	16.0
							16	37.5	31	16.3
							23	60.9		
							31	70.2		
Avg. Monthly CFS								42.0		17.3
(SD)								(22.801)		(1.940)

[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 E. Table 1. Manual flow summary (average monthly cfs and standard deviation) from June through October, 1998-2002, on the Walla Walla River at state line, Pepper Rd., 0.4 mi above Hwy 125, 0.5 mi above Burlingame Diversion, Mojonnier Rd., Swegle Rd., Detour Rd., McDonald Rd., and McKay Rd.

	1998		1999		2000		2001		2002	
	Day	cfs	Day	cfs	Day	cfs	Day	cfs	Day	cfs
0.5 mi above Burlingame Div.										
June					26	83.0	12	78.6	24	81.0
							28	68.2		
Avg. Monthly CFS						N/A[b]		73.4		N/A[b]
(SD)								(7.354)		
July					11	45.1	10	41.9	8	61.6
							24	36.0	22	41.0
							31	43.9		
Avg. Monthly CFS						N/A[b]		40.6		51.3
(SD)								(4.107)		(14.566)
August					7	27.6	6	48.6	5	36.3
					8	33.1	20	54.6	20	36.6
Avg. Monthly CFS						30.4		51.6		36.5
(SD)						(3.889)		(4.243)		(0.212)
September					5	48.7	4	46.8	4	39.5
					18	48.1	17	41.6	17	52.2
Avg. Monthly CFS						48.4		44.2		45.9
(SD)						(0.424)		(3.677)		(8.980)
October					19	81.9	2	62.4	1	50.8
							16	90.2	15	49.1
							31	136.6	31	40.2
Avg. Monthly CFS						N/A[b]		96.4		46.7
(SD)								(37.487)		(5.693)

[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 E. Table 1. Manual flow summary (average monthly cfs and standard deviation) from June through October, 1998-2002, on the Walla Walla River at state line, Pepper Rd., 0.4 mi above Hwy 125, 0.5 mi above Burlingame Diversion, Mojonnier Rd., Swegle Rd., Detour Rd., McDonald Rd., and McKay Rd.

	1998		1999		2000		2001		2002	
	Day	cfs	Day	cfs	Day	cfs	Day	cfs	Day	cfs
Mojonnier Rd.										
June			1	296.0	20	104.6	12	32.7	24	30.1
			9	83.7	29	10.5	26	31.2		
			30	5.9						
Avg. Monthly CFS				128.5		57.6		32.0		N/A[b]
(SD)				(150.157)		(66.539)		(1.061)		
July	9	29.5	13	15.5	11	16.4	5	24.3	8	41.7
	20	36.1	28	25.7	20	42.2	10	43.3	22	43.9
							11	49.9		
							17	45.2		
							24	33.4		
							31	42.7		
Avg. Monthly CFS		32.8		20.6		29.3		39.8		42.8
(SD)		(4.667)		(7.212)		(18.243)		(9.306)		(1.556)
August	3	25.8	10	22.6	7	29.9	7	46.4	5	42.5
	17	25.1	23	25.0	21	32.2	20	51.3	20	38.1
Avg. Monthly CFS		25.5		23.8		31.1		48.9		40.3
(SD)		(1.495)		(1.697)		(1.626)		(3.465)		(3.111)
September	1	28.3	15	21.7	5	49.0	4	45.5	4	40.7
	16	35.0	28	26.1	18	47.7	17	37.1	17	61.8
Avg. Monthly CFS		31.7		23.9		48.4		41.3		51.3
(SD)		(4.738)		(3.111)		(0.919)		(5.940)		(14.920)
October	16	1.8	5	31.4	4	93.4	2	40.9	1	57.9
	28	13.7	13	15.1	19	16.5	8	26.0	15	22.7
			18	8.4			16	18.6	31	17.9
							23	55.6		
							31	68.7		
Avg. Monthly CFS		7.8		18.3		55.0		42.0		32.8
(SD)		(8.415)		(11.829)		(54.377)		(20.631)		(21.841)

[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 E. Table 1. Manual flow summary (average monthly cfs and standard deviation) from June through October, 1998-2002, on the Walla Walla River at state line, Pepper Rd., 0.4 mi above Hwy 125, 0.5 mi above Burlingame Diversion, Mojonnier Rd., Swegle Rd., Detour Rd., McDonald Rd., and McKay Rd.

	1998		1999		2000		2001		2002	
	Day	cfs	Day	cfs	Day	cfs	Day	cfs	Day	cfs
Swegle Rd.										
June			1	287.6	26	42.9	11	28.0	24	34.3
			9	85.6			27	26.6		
			30	7.0						
Avg. Monthly CFS				126.7		N/A[b]		27.3		N/A[b]
(SD)				(144.752)				(0.990)		
July	2	3.4	13	17.5	11	22.2	10	43.7	8	41.1
	9	31.7	28	23.7			24	33.2	22	46.4
	20	35.5					31	45.9		
Avg. Monthly CFS		23.5		20.6		N/A[b]		40.9		43.8
(SD)		(17.539)		(4.384)				(6.787)		(3.748)
August	3	27.2	10	23.6	7	29.1	6	40.6	5	45.4
	17	21.7	23	24.9	21	36.7	20	42.5	20	32.4
Avg. Monthly CFS		24.5		24.3		32.9		41.6		38.9
(SD)		(3.889)		(0.919)		(5.374)		(1.344)		(9.192)
September	1	25.6	15	26.6	5	54.8	4	43.0	4	35.1
	16	37.3	28	31.3	18	56.3	17	45.8	17	50.6
Avg. Monthly CFS		31.5		29.0		55.6		44.4		42.9
(SD)		(8.273)		(3.323)		(1.061)		(1.980)		(10.960)
October	16	8.3	13	20.4	4	97.1	1	49.8	1	54.8
	26	20.4			19	23.7	16	28.4	15	26.5
							31	48.0	31	21.7
Avg. Monthly CFS		14.4		N/A[b]		60.4		42.1		34.3
(SD)		(8.556)				(51.902)		(11.870)		(17.886)

[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 E. Table 1. Manual flow summary (average monthly cfs and standard deviation) from June through October, 1998-2002, on the Walla Walla River at state line, Pepper Rd., 0.4 mi above Hwy 125, 0.5 mi above Burlingame Diversion, Mojonnier Rd., Swegle Rd., Detour Rd., McDonald Rd., and McKay Rd.

	1998		1999		2000		2001		2002	
	Day	cfs	Day	cfs	Day	cfs	Day	cfs	Day	cfs
Detour Rd.										
June			1	403.4	20	171.7	11	34.1	18	148.4
			9	121.9	29	22.7	27	47.0	24	50.8
			30	15.9						
Avg. Monthly CFS				180.4		97.2		40.6		99.6
(SD)				(200.264)		(105.359)		(9.122)		(69.014)
July			13	19.2	10	25.6	10	57.3	8	45.9
			28	26.8	20	38.5	24	38.8	22	41.8
							31	52.8		
Avg. Monthly CFS				23.0		32.1		49.6		43.9
(SD)				(5.374)		(9.122)		(9.648)		(2.899)
August			10	30.6	7	29.3	6	43.6	5	45.9
			24	32.6	21	38.1	20	41.1	20	32.4
Avg. Monthly CFS				31.6		33.7		42.4		39.2
(SD)				(1.414)		(6.223)		(1.768)		(9.546)
September			15	29.0	5	55.0	4	44.3	4	35.9
			28	35.4	18	59.9	17	44.3	17	50.6
Avg. Monthly CFS				32.2		57.5		44.3		43.3
(SD)				(4.525)		(3.465)		(0.000)		(9.546)
October			13	31.8	4	128.2	1	54.3	1	56.3
					19	41.7	8	35.7	15	30.5
							16	35.4	31	37.7
							23	69.7		
							31	69.1		
Avg. Monthly CFS				N/A[b]		85.0		52.8		41.5
(SD)						(61.165)		(16.946)		(13.313)

[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 E. Table 1. Manual flow summary (average monthly cfs and standard deviation) from June through October, 1998-2002, on the Walla Walla River at state line, Pepper Rd., 0.4 mi above Hwy 125, 0.5 mi above Burlingame Diversion, Mojonnier Rd., Swegle Rd., Detour Rd., McDonald Rd., and McKay Rd.

	1998		1999		2000		2001		2002	
	Day	cfs	Day	cfs	Day	cfs	Day	cfs	Day	cfs
McDonald Rd.										
June					26	36.6	11	18.6	24	20.4
							27	27.6		
Avg. Monthly CFS						N/A[b]		23.1		N/A[b]
(SD)								(6.364)		
July	9	4.1	13	6.7	10	5.9	10	17.5	8	19.5
	20	4.9					23	21.8	22	17.3
Avg. Monthly CFS		4.5		N/A[b]		N/A[b]		19.7		18.4
(SD)		(0.566)						(3.041)		(1.556)
August	3	0.00	10	9.1	7	11.0	6	23.7	5	18.9
	17	8.0	23	11.4	21	17.8	20	16.2	20	9.9
Avg. Monthly CFS		4.0		10.3		14.4		20.0		14.4
(SD)		(5.657)		(1.626)		(4.808)		(5.303)		(6.364)
September	1	10.0	15	12.1	5	34.3	4	17.7	4	16.2
	17	17.3	28	14.5	18	41.0	17	21.3	17	30.9
Avg. Monthly CFS		13.7		13.3		37.7		19.5		23.6
(SD)		(5.162)		(1.697)		(4.738)		(2.546)		(10.394)
October			13	15.8	4	112.2	1	38.2	1	33.3
					19	27.3	16	26.7	15	20.3
							31	54.9	31	18.5
Avg. Monthly CFS				N/A[b]		69.8		39.9		24.0
(SD)						(60.033)		(14.180)		(8.075)

[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 E. Table 1. Manual flow summary (average monthly cfs and standard deviation) from June through October, 1998-2002, on the Walla Walla River at state line, Pepper Rd., 0.4 mi above Hwy 125, 0.5 mi above Burlingame Diversion, Mojonnier Rd., Swegle Rd., Detour Rd., McDonald Rd., and McKay Rd.

	1998		1999		2000		2001		2002	
	Day	cfs	Day	cfs	Day	cfs	Day	cfs	Day	cfs
McKay Rd.[c]										
July	27	3.8								
Avg. Monthly CFS		N/A[b]								
(SD)										
August	17	0.00								
Avg. Monthly CFS		N/A[b]								
(SD)										
September	1	2.4								
	28	15.2								
Avg. Monthly CFS		8.8								
(SD)		(9.051)								
October	16	0.8								
	28	7.6								
Avg. Monthly CFS		4.2								
(SD)		(4.808)								

[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 E. Table 2. Manual flow summary (average monthly cfs and standard deviation) from June through October, 2002-2006, on the Walla Walla River at state line, Pepper Rd., 0.4 mi above Hwy 125, 0.5 mi above Burlingame Diversion, Mojonnier Rd., Swegle Rd., Detour Rd., and McDonald Rd.

	2002		2003		2004		2005		2006	
	Day	cfs	Day	cfs	Day	cfs	Day	cfs	Day	cfs
state line										
June	18	117.8	10	18.7	1	N/M[a]				
	24	35.1	24	11.8	23	35.6				
Avg. Monthly CFS		76.5		15.3		N/A[b]				
(SD)		(58.478)		(4.879)						
July	8	20.2	7	12.0	1	15.1				
	22	18.8	21	9.0	7	14.4				
					19	19.9				
Avg. Monthly CFS		19.5		10.5		16.5				
(SD)		(0.990)		(2.121)		(2.994)				
August	5	15.8	6	16.7	2	13.7				
	20	12.5	19	14.6	17	11.0				
					30	9.4				
Avg. Monthly CFS		14.2		15.7		11.4				
(SD)		(2.333)		(1.485)		(2.173)				
September	4	13.2	2	16.2	13	15.7				
	17	26.6	15	12.4	27	13.1				
			29	23.9						
Avg. Monthly CFS		19.9		17.5		14.4				
(SD)		(9.475)		(5.859)		(1.838)				
October	1	18.6	13	19.0	11	13.3				
	15	15.7	29	27.3	28	14.6				
	31	16.9								
Avg. Monthly CFS		17.1		23.2		14.0				
(SD)		(1.457)		(5.869)		(0.919)				

[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 E. Table 2. Manual flow summary (average monthly cfs and standard deviation) from June through October, 2002-2006, on the Walla Walla River at state line, Pepper Rd., 0.4 mi above Hwy 125, 0.5 mi above Burlingame Diversion, Mojonnier Rd., Swegle Rd., Detour Rd., and McDonald Rd.

	2002		2003		2004		2005		2006	
	Day	cfs	Day	cfs	Day	cfs	Day	cfs	Day	cfs
Pepper Rd.										
June	24	36.7			23	41.0				
Avg. Monthly CFS (SD)		N/A[b]				N/A[b]				
July	8	21.0							6	24.7
	22	16.5							20	19.1
Avg. Monthly CFS (SD)		18.8 (3.182)								21.9 (3.960)
August	5	17.7							2	20.8
	20	12.4							14	17.7
									28	13.7
Avg. Monthly CFS (SD)		15.1 (3.748)								17.4 (3.559)
September	4	16.1							13	5.6
	17	27.5							25	13.8
Avg. Monthly CFS (SD)		21.8 (8.061)								9.7 (5.798)
October	1	17.4							13	16.1
	15	13.6							26	19.7
	31	17.5								
Avg. Monthly CFS (SD)		16.2 (2.223)								17.9 (2.546)

[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 E. Table 2. Manual flow summary (average monthly cfs and standard deviation) from June through October, 2002-2006, on the Walla Walla River at state line, Pepper Rd., 0.4 mi above Hwy 125, 0.5 mi above Burlingame Diversion, Mojonnier Rd., Swegle Rd., Detour Rd., and McDonald Rd.

	2002		2003		2004		2005		2006	
	Day	cfs	Day	cfs	Day	cfs	Day	cfs	Day	cfs
0.4 mi above Hwy 125										
June	24	35.4								
Avg. Monthly CFS (SD)		N/A[b]								
July	8	21.2								
	22	15.1								
Avg. Monthly CFS (SD)		18.2 (4.313)								
August	5	16.3								
	20	12.5								
Avg. Monthly CFS (SD)		14.4 (2.687)								
September	4	14.2								
	17	27.0								
Avg. Monthly CFS (SD)		20.6 (9.051)								
October	1	19.5								
	15	16.0								
	31	16.3								
Avg. Monthly CFS (SD)		17.3 (1.940)								

[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 E. Table 2. Manual flow summary (average monthly cfs and standard deviation) from June through October, 2002-2006, on the Walla Walla River at state line, Pepper Rd., 0.4 mi above Hwy 125, 0.5 mi above Burlingame Diversion, Mojonnier Rd., Swegle Rd., Detour Rd., and McDonald Rd.

	2002		2003		2004		2005		2006	
	Day	cfs	Day	cfs	Day	cfs	Day	cfs	Day	cfs
0.5 mi above Burlingame Div.										
June	24	81.0	10	55.5	1	N/M[a]	22	57.9	21	95.9
			24	41.0	23	92.6				
Avg. Monthly CFS		N/A[b]		48.3		N/A[b]		N/A[b]		N/A[b]
(SD)				(10.253)						
July	8	61.6	7	55.4	1	60.6	5	49.1	6	57.4
	22	41.0	21	43.0	7	65.8	20	37.1	20	38.9
					19	49.6				
Avg. Monthly CFS		51.3		49.2		58.7		43.1		48.2
(SD)		(14.566)		(8.768)		(8.271)		(8.485)		(13.081)
August	5	36.3	6	53.7	2	40.6	9	32.4	2	40.8
	20	36.6	19	44.1	17	36.9	22	31.7	14	33.4
					30	48.5			28	34.2
Avg. Monthly CFS		36.5		48.9		42.0		32.1		36.1
(SD)		(0.212)		(6.788)		(5.925)		(0.495)		(4.061)
September	4	39.5	2	44.3	13	52.1	6	38.8	13	24.5
	17	52.2	15	52.3	27	50.0	19	43.3	25	39.0
			29	50.0						
Avg. Monthly CFS		45.9		48.9		51.1		41.1		31.8
(SD)		(8.980)		(4.119)		(1.485)		(3.182)		(10.253)
October	1	50.8	13	64.6	11	59.6	3	54.2	13	49.2
	15	49.1	29	66.6	28	64.3	17	44.4	26	50.5
	31	40.2								
Avg. Monthly CFS		46.7		65.6		62.0		49.3		49.9
(SD)		(5.693)		(1.414)		(3.323)		(6.930)		(0.919)

[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 E. Table 2. Manual flow summary (average monthly cfs and standard deviation) from June through October, 2002-2006, on the Walla Walla River at state line, Pepper Rd., 0.4 mi above Hwy 125, 0.5 mi above Burlingame Diversion, Mojonnier Rd., Swegle Rd., Detour Rd., and McDonald Rd.

	2002		2003		2004		2005		2006	
	Day	cfs	Day	cfs	Day	cfs	Day	cfs	Day	Cfs
Mojonnier Rd.										
June	24	30.1	4	23.9	1	N/M[a]	13	20.3		
			10	36.4	23	49.7				
			24	31.7						
Avg. Monthly CFS		N/A[b]		30.7		N/A[b]		N/A[b]		
(SD)				(6.314)						
July	8	41.7	7	45.3	1	64.0			6	28.4
	22	43.9	21	37.3	7	71.4			20	40.1
					19	50.9				
Avg. Monthly CFS		42.8		41.3		62.1				34.3
(SD)		(1.556)		(5.657)		(10.381)				(8.273)
August	5	42.5	6	57.1	2	42.6			2	42.0
	20	38.1	19	38.7	17	37.2			14	38.6
					30	51.8			28	36.5
Avg. Monthly CFS		40.3		47.9		43.9				39.0
(SD)		(3.111)		(13.011)		(7.382)				(2.775)
September	4	40.7	2	42.5	13	53.4			13	26
	17	61.8	15	45.8	27	51.4			25	40.1
			29	46.9						
Avg. Monthly CFS		51.3		45.1		52.4				33.1
(SD)		(14.920)		(2.290)		(1.414)				(9.970)
October	1	57.9	13	38.9	11	26.9			13	19.0
	15	22.7	29	34.5	28	13.4			26	14.2
	31	17.9								
Avg. Monthly CFS		32.8		36.7		20.2				16.6
(SD)		(21.841)		(3.111)		(9.546)				(3.394)

[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 E. Table 2. Manual flow summary (average monthly cfs and standard deviation) from June through October, 2002-2006, on the Walla Walla River at state line, Pepper Rd., 0.4 mi above Hwy 125, 0.5 mi above Burlingame Diversion, Mojonnier Rd., Swegle Rd., Detour Rd., and McDonald Rd.

	2002		2003		2004		2005		2006	
	Day	cfs	Day	cfs	Day	Cfs	Day	cfs	Day	cfs
Swegle Rd.										
June	24	34.3	10	48.4	1	N/M[a]				
			24	36.2	23	56.1				
Avg. Monthly CFS		N/A[b]		42.3		N/A[b]				
(SD)				(8.627)						
July	8	41.1	7	41.0	1	63.9	20	37.1		
	22	46.4	21	42.3	7	75.0				
					19	77.7				
Avg. Monthly CFS		43.8		41.7		72.2		N/A[b]		
(SD)		(3.748)		(0.919)		(7.314)				
August	5	45.4	6	54.3	2	45.8	22	30.5		
	20	32.4	19	40.4	17	60.7				
					30	47.1				
Avg. Monthly CFS		38.9		47.4		51.2		N/A[b]		
(SD)		(9.192)		(9.829)		(8.253)				
September	4	35.1	2	38.7	13	58.7				
	17	50.6	15	54.8	27	56.3				
			29	56.2						
Avg. Monthly CFS		42.9		49.9		57.5				
(SD)		(10.960)		(9.725)		(1.697)				
October	1	54.8	13	40.8	11	28.3				
	15	26.5	29	33.0	28	22.7				
	31	21.7								
Avg. Monthly CFS		34.3		36.9		25.5				
(SD)		(17.886)		(5.515)		(3.960)				

[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 E. Table 2. Manual flow summary (average monthly cfs and standard deviation) from June through October, 2002-2006, on the Walla Walla River at state line, Pepper Rd., 0.4 mi above Hwy 125, 0.5 mi above Burlingame Diversion, Mojonnier Rd., Swegle Rd., Detour Rd., and McDonald Rd.

	2002		2003		2004		2005		2006	
	Day	cfs	Day	cfs	Day	cfs	Day	cfs	Day	Cfs
Detour Rd.										
June	18	148.4	4	43.6	1	N/M[a]	13	28.8	21	92.7
	24	50.8	10	47.7	23	91.4	22	27.8		
			24	47.5						
Avg. Monthly CFS		99.6		46.3		N/A[b]		28.3		N/A[b]
(SD)		(69.014)		(2.312)				(0.707)		
July	8	45.9	7	54.4	1	74.0	5	37.6	6	35.3
	22	41.8	21	38.2	7	87.7	20	41.2	20	47.4
					19	64.7				
Avg. Monthly CFS		43.9		46.3		75.5		39.4		41.4
(SD)		(2.899)		(11.455)		(11.570)		(2.546)		(8.556)
August	5	45.9	6	53.6	2	61.0	9	28.7	2	41.3
	20	32.4	19	41.7	17	37.0	22	32.2	14	36.9
					30	55.4			28	30.4
Avg. Monthly CFS		39.2		47.7		51.1		30.5		36.2
(SD)		(9.546)		(8.415)		(12.556)		(2.475)		(5.484)
September	4	35.9	2	46.3	13	60.0	6	39.2	13	26.6
	17	50.6	15	63.6	27	59.8	19	48.9	25	44.2
			29	59.4						
Avg. Monthly CFS		43.3		56.4		59.9		44.1		35.4
(SD)		(10.394)		(9.023)		(0.141)		(6.859)		(12.445)
October	1	56.3	13	45.7	11	38.8	3	50.4	13	30.0
	15	30.5	29	41.7	28	37.3	17	30.9	26	25.9
	31	37.7								
Avg. Monthly CFS		41.5		43.7		38.1		40.7		28.0
(SD)		(13.313)		(2.828)		(1.061)		(13.789)		(2.899)

[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 E. Table 2. Manual flow summary (average monthly cfs and standard deviation) from June through October, 2002-2006, on the Walla Walla River at state line, Pepper Rd., 0.4 mi above Hwy 125, 0.5 mi above Burlingame Diversion, Mojonnier Rd., Swegle Rd., Detour Rd., and McDonald Rd.

	2002		2003		2004		2005		2006	
	Day	cfs	Day	cfs	Day	cfs	Day	cfs	Day	cfs
McDonald Rd.										
June	24	20.4	10	21.1	1	N/M[a]			21	78.4
			24	23.3	23	58.5				
Avg. Monthly CFS		N/A[b]		22.2		N/A[b]				N/A[b]
(SD)				(1.556)						
July	8	19.5	7	9.8	1	38.7			6	5.2
	22	17.3	21	12.0	7	39.1			20	15.6
					19	31.2				
Avg. Monthly CFS		18.4		10.9		36.3				10.4
(SD)		(1.556)		(1.556)		(4.450)				(7.354)
August	5	18.9	6	24.7	2	23.8			2	22.3
	20	9.9	19	12.5	17	19.7			14	10.7
					30	41.6			28	15.8
Avg. Monthly CFS		14.4		18.6		28.4				16.3
(SD)		(6.364)		(8.627)		(11.642)				(5.814)
September	4	16.2	2	16.7	13	45.8			13	4.4
	17	30.9	15	32.6	27	43.6			25	24.8
			29	44.4						
Avg. Monthly CFS		23.6		31.2		44.7				14.6
(SD)		(10.394)		(13.900)		(1.556)				(14.425)
October	1	33.3	13	34.5	11	21.7			13	2.1
	15	20.3	29	26.9	28	20.8			26	11.9
	31	18.5								
Avg. Monthly CFS		24.0		30.7		21.3				7.0
(SD)		(8.075)		(5.374)		(0.636)				(6.930)

[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 F. Mean Monthly Stream Flow (cfs) and Standard Deviation from Continuous Flow Monitors in the Walla Walla Subbasin, 1998-2006

Appendix F. Table 1. Mean Monthly stream flow (cfs) and standard deviation (SD) from continuous flow monitors in the Walla Walla Subbasin, 1998-2002.

	1998		1999		2000		2001		2002	
	cfs	SD	cfs	SD	cfs	SD	cfs	SD	cfs	SD
Walla Walla River										
state line										
June (20th-30th)							N/A	N/A	29.15	20.244
July							11.95[a]	2.228[a]	12.71	1.391
August							11.40	1.377	13.39	1.502
September							14.48	5.508	16.80	2.062
October							31.37	17.013	17.68	1.899
Nov. (1st-14th)							11.37	6.655	21.86[b]	3.972[b]
Pepper Rd.										
June (20th-30th)					35.42	29.641	15.22[d]	4.041[d]	13.56[e,f]	2.365[e,f]
July					5.75[c]	1.251[c]	10.71[d]	3.461[d]	12.86[f]	1.411[f]
August					N/A	N/A	12.05[d]	2.999[d]	12.18[f]	2.174[f]
September					N/A	N/A	15.55[d]	6.304[d]	13.50[f]	1.791[f]
October					N/A	N/A	30.85[d]	10.502[d]	20.27[f]	4.577[f]
Nov. (1st-14th)					N/A	N/A	27.13[d]	7.508[d]	25.38[f]	4.640[f]
Mojonnier Rd.										
June (20th-30th)	N/A	N/A	14.55	7.320	46.33	34.824	26.47	7.441	28.58[h,i]	8.283[h,i]
July	N/A	N/A	16.52	5.241	20.63	4.340	36.91	9.490	32.52[i]	5.674[i]
August	N/A	N/A	18.97	4.684	26.40	1.957	40.88	5.292	34.62[i]	3.787[i]
September	N/A	N/A	24.14	3.185	51.73[e]	9.423[e]	43.50	8.493	45.91[i]	5.415[i]
October	N/A	N/A	20.06	14.197	24.71[g]	14.333[g]	29.37	13.441	29.59[i]	11.552[i]
Nov. (1st-14th)	N/A	N/A	11.23	5.228	58.44	43.831	18.93	4.683	28.43[i]	9.352[i]
Swegle Rd.										
June (20th-30th)	N/A	N/A	19.92	8.947						
July	25.73[j]	4.057[j]	20.90	5.205						
August	21.24	3.373	22.40	5.119						
September	37.54	10.409	24.48	2.730						
October	13.49	8.032	21.99	12.422						
Nov. (1st-14th)	18.79	11.876	14.34	5.282						

[a] Monitor in the Walla Walla River (state line) in 2001 was put in place on July 17th.
[b] Monitor in the Walla Walla River (state line) 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 0.6 miles below Pepper Rd. bridge.
[e] Monitor in the Walla Walla River (Pepper Rd.) in 2002 was put in place on June 26th.
[f] Data collected by the Washington Department of Ecology, on a continuous flow monitor.
[g] At least one measurement for the month was removed as an outlier.
[h] Monitor in the Walla Walla River (Mojonnier Rd.) in 2002 was put in place on June 26th.
[i] Data collected by the Department of Ecology as part of TMDL monitoring.
[j] Monitor in the Walla Walla River (Swegle Rd.) in 1998 was put in place on July 9th.

Appendix F. Table 1. Mean Monthly stream flow (cfs) and standard deviation (SD) from continuous flow monitors in the Walla Walla Subbasin, 1998-2002.

	1998		1999		2000		2001		2002	
	cfs	SD	cfs	SD	cfs	SD	cfs	SD	cfs	SD
Walla Walla River										
Detour Rd.										
June (20th-30th)			35.49	14.004	69.05	43.056	45.70	10.868	51.75	24.067
July			24.73	3.504	30.79	3.078	41.72	4.228	31.00	6.540
August			26.18	5.951	31.12	1.601	38.12	3.660	26.09	6.840
September			29.14	2.809	53.57	10.092	43.16	8.676	44.37	8.179
October			32.29	11.686	52.48[g]	21.878[g]	43.33	12.252	27.35	13.309
Nov. (1st-14th)			26.93	6.659	96.89	59.449	46.82	10.013	55.62	9.151
Touchet River										
Simms Rd.										
June (20th-30th)			86.63	12.043	101.25	19.294	80.65	11.156		
July			50.19	7.941	45.86	17.039	28.22	12.101		
August			41.15	3.924	19.27	3.971	9.54	6.350		
September			39.75	2.398	43.92	9.866	14.56	12.779		
October			48.73	8.767	69.08	21.242	53.05	12.112		
Nov. (1st-14th)			55.58	2.640	75.36	10.249	67.17	13.389		
Cummins Bridge										
June (20th-30th)	N/A[k]	N/A[k]	108.68[m]	23.631[m]	89.42	38.859	67.09	44.043	73.80[f,o]	2.651[f,o]
July	15.51[k,l]	9.327[k,l]	30.27[m]	14.688[m]	23.61	15.933	10.51	7.649	36.86[f]	25.041[f]
August	7.48[k]	6.208[k]	12.96[m]	5.100[m]	3.85	1.239	5.24	4.358	12.25[f]	22.848[f]
September	12.15[k]	9.439[k]	13.75[m]	2.202[m]	24.12	9.983	3.62[n]	3.823[n]	10.74[f]	3.114[f]
October	36.48[k]	6.471[k]	30.06[m]	17.008[m]	99.26	147.410	N/A	N/A	25.82[f]	8.683[f]
Nov. (1st-14th)	75.44[k]	12.362[k]	47.70[m]	4.139[m]	104.51	37.867	N/A	N/A	87.06[f]	22.219[f]
Above Hofer Dam										
June (20th-30th)							N/A	N/A	104.50	28.681
July							N/A	N/A	51.75[p]	16.758[p]
August							N/A	N/A	26.35[p]	2.520[p]
September							N/A	N/A	27.93	2.656
October							N/A	N/A	39.66	3.311
Nov. (1st-14th)							N/A	N/A	61.30[p]	10.766[p]

[f] Data collected by the Washington Department of Ecology, on a continuous flow monitor.
[g] At least one measurement for the month was removed as an outlier.
[k] Monitor in the Touchet River (Cummins Bridge) in 1998 was at the Touchet River Gun Club ~1.7 miles above Cummins Bridge.
[l] Monitor in the Touchet River (Cummins Bridge) in 1998 was put in place on July 9th.
[m] Monitor in the Touchet River (Cummins Bridge) in 1999 was 0.9 miles above Cummins Bridge.
[n] Monitor in the Touchet River (Cummins Bridge) in 2001 quit working on September 25th, so no data was available after that point.
[o] Monitor in the Touchet River (Cummins Bridge) in 2002 was put in place on June 28th.
[p] Monitor in the Touchet River (above Hofer Dam) in 2002 quit working from July 21st to August 23rd, and then was pulled on November 13th.

Appendix F. Table 1. Mean Monthly stream flow (cfs) and standard deviation (SD) from continuous flow monitors in the Walla Walla Subbasin, 1998-2002.

	1998		1999		2000		2001		2002	
	cfs	SD	cfs	SD	cfs	SD	cfs	SD	cfs	SD
Yellowhawk Creek										
Below Diversion										
June (20th-30th)							N/A	N/A	30.14	3.252
July							21.05[q]	1.434[q]	16.47	3.680
August							19.95	7.154	12.95	1.728
September							16.52	2.673	16.07	2.692
October							27.91	6.094	19.09	2.121
Nov. (1st-14th)							36.73	2.294	26.45	3.776
Just above mouth										
June (20th-30th)					44.20	3.434	26.53	0.937	31.47[i]	3.590[i]
July					28.05	5.849	23.87	1.936	14.02[i]	6.428[i]
August					17.66	1.994	18.58	4.764	12.93[i]	3.784[i]
September					28.56[g]	4.671[g]	13.75	1.633	14.95[i]	2.939[i]
October					50.29[g]	9.192[g]	19.97	3.542	9.88[i]	4.470[i]
Nov. (1st-14th)					56.07	9.700	21.80	3.408	22.14[i]	6.270[i]
East Little Walla Walla										
0.3 miles above mouth										
June (20th-30th)									10.67	0.980
July									9.40	2.128
August									9.34	0.918
September									11.33[r]	1.576[r]
October									N/A	N/A
Nov. (1st-14th)									N/A	N/A

[g] At least one measurement for the month was removed as an outlier.
[i] Data collected be the Department of Ecology as part of TMDL monitoring.
[q] Monitor in Yellowhawk Creek (Below Diversion) in 2001 was put in place on July 17th.
[r] Monitor in East Little Walla Walla (0.3 miles above mouth) in 2002 quit working on September 10th, so no data is available after that point.

Appendix F. Table 1. Mean Monthly stream flow (cfs) and standard deviation (SD) from continuous flow monitors in the Walla Walla Subbasin, 1998-2002.

	1998		1999		2000		2001		2002	
	cfs	SD	cfs	SD	cfs	SD	cfs	SD	cfs	SD
Mill Creek										
Wallula Rd.										
June (20th-30th)							N/A	N/A	12.61	7.207
July							5.28[s]	0.400[s]	5.05	1.560
August							3.09	1.034	3.99	0.334
September							4.13	0.925	5.07	0.379
October							9.13	3.158	11.17	10.513
Nov. (1st-14th)							13.92	3.661	43.38[t]	28.908[t]

[s] Monitor in Mill Creek (Wallula Rd.) in 2001 was put in place on July 17th.
[t] Monitor in Mill Creek (Wallula Rd.) in 2002 was removed on November 13th.

Appendix F. Table 2. Mean Monthly stream flow (cfs) and standard deviation (SD) from continuous flow monitors in the Walla Walla Subbasin, 2002-2006.

	2002		2003		2004		2005		2006	
	cfs	SD	cfs	SD	cfs	SD	cfs	SD	cfs	SD
Walla Walla River										
state line										
June (20th-30th)	29.15	20.244								
July	12.71	1.391								
August	13.39	1.502								
September	16.80	2.062								
October	17.68	1.899								
Nov. (1st-14th)	21.86[a]	3.972[a]								
Pepper Rd.										
June (20th-30th)	13.56[b,c]	2.365[b,c]	14.05[c]	1.668[c]	52.15[c]	26.529[c]	18.47[c]	2.981[c]	32.28[c]	30.001[c]
July	12.86[c]	1.411[c]	13.12[c]	1.491[c]	17.52[c]	21.296[c]	14.23[c]	2.775[c]	16.92[c]	2.313[c]
August	12.18[c]	2.174[c]	16.88[c]	1.980[c]	15.72[c]	5.681[c]	13.95[c]	1.634[c]	18.20[c]	2.783[c]
September	13.50[c]	1.791[c]	22.72[c]	10.735[c]	15.57[c]	1.827[c]	19.70[c]	2.546[c]	17.97[c,d]	5.873[c,d]
October	20.27[c]	4.577[c]	26.38[c]	4.717[c]	24.62[c]	8.284[c]	27.51[c]	10.051[c]	22.43[c,e]	5.725[c,e]
Nov. (1st-14th)	25.38[c]	4.640[c]	34.64[c]	10.931[c]	36.56[c]	11.609[c]	30.25[c]	21.193[c]	146.93[c]	117.948[c]
Mojonnier Rd.										
June (20th-30th)	28.58[f,g]	8.283[f,g]	33.90	5.402	55.56[c]	47.603[c]	22.12[c]	1.420[c]	33.19[c]	21.786[c]
July	32.52[g]	5.674[g]	33.37	2.602	47.89[c]	6.414[c]	31.38[c]	5.203[c]	48.19[c]	23.226[c]
August	34.62[g]	3.787[g]	37.35	2.455	46.16[c]	13.972[c]	31.57[c]	2.093[c]	86.93[c]	7.630[c]
September	45.91[g]	5.415[g]	48.95	7.854	52.96[c]	5.440[c]	41.49[c]	3.329[c]	91.29[c,d]	15.856[c,d]
October	29.59[g]	11.552[g]	35.94	6.264	27.72[c]	7.724[c]	21.62[c]	10.341[c]	42.08[c]	19.590[c]
Nov. (1st-14th)	28.43[g]	9.352[g]	31.64	7.304	24.41[c]	12.468[c]	19.26[c]	8.866[c]	136.60[c]	156.011[c]

[a] Monitor in the Walla Walla River (state line) in 2002 was removed on November 13th.
[b] Monitor in the Walla Walla River (Pepper Rd.) in 2002 was put in place on June 26th.
[c] Data collected by the Washington Department of Ecology, on a continuous flow monitor.
[d] Monitors in the Walla Walla River (Pepper Rd. and Mojonnier Rd.) in 2006 had no available data on September 29th or 30th.
[e] Monitor in the Walla Walla River (Pepper Rd.) in 2006 had no available data on October 3rd.
[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.

Appendix F. Table 2. Mean Monthly stream flow (cfs) and standard deviation (SD) from continuous flow monitors in the Walla Walla Subbasin, 2002-2006.

	2002		2003		2004		2005		2006	
	cfs	SD	cfs	SD	cfs	SD	cfs	SD	cfs	SD
Walla Walla River (Cont.)										
Detour Rd.										
June (20th-30th)	51.57	24.067	50.80	1.507	N/A	N/A	26.82	2.865	N/A	N/A
July	31.00	6.540	51.17[h]	1.072[h]	N/A	N/A	31.99	3.450	29.78[j]	4.018[j]
August	26.09	6.840	N/A[h]	N/A[h]	N/A	N/A	31.82	2.338	34.75	2.535
September	44.37	8.179	52.29[h]	3.146[h]	N/A	N/A	43.64	3.604	42.91	9.135
October	27.35	13.309	36.79	7.281	N/A	N/A	36.98	7.765	35.18[k]	2.906[k]
Nov. (1st-14th)	55.62	9.151	43.21	10.157	N/A	N/A	52.88[i]	9.299[i]	N/A[j]	N/A[j]
Touchet River										
Cummins Bridge										
June (20th-30th)	73.80[c,l]	2.651[c,l]	24.60[c]	6.742[c]	69.91[c]	21.380[c]	N/A	N/A	N/A	N/A
July	36.86[c]	25.041[c]	6.91[c]	4.766[c]	14.97[c]	11.573[c]	N/A	N/A	N/A	N/A
August	12.25[c]	22.848[c]	3.99[c]	3.035[c]	13.04[c]	13.515[c]	N/A	N/A	N/A	N/A
September	10.74[c]	3.114[c]	6.90[c]	7.179[c]	11.02[c]	7.780[c]	N/A	N/A	N/A	N/A
October	25.82[c]	8.683[c]	22.52[c]	16.038[c]	N/A	N/A	N/A	N/A	N/A	N/A
Nov. (1st-14th)	87.06[c]	22.219[c]	56.66[c]	5.512[c]	N/A	N/A	N/A	N/A	N/A	N/A
Above Hofer Dam										
June (20th-30th)	104.50	28.681								
July	51.75[m]	16.758[m]								
August	26.35[m]	2.520[m]								
September	27.93	2.656								
October	39.66	3.311								
Nov. (1st-14th)	61.30[m]	10.766[m]								

[c] Data collected by the Washington Department of Ecology, on a continuous flow monitor.
[g] Data collected be the Department of Ecology as part of TMDL monitoring.
[h] Monitor in the Walla Walla River (Detour Rd.) malfunctioned from July 12th through September 25th, so no data was collected during this period.
[i] Monitor in the Walla Walla River (Detour Rd.) was removed on November 9th.
[j] Monitor in the Walla Walla River (Detour Rd.) was put in place on July 7th , and was removed on November 8th.
[k] Monitor malfunctioned and no data was available after October 5th.
[l] Monitor in the Touchet River (Cummins Rd.) in 2002 was put in place on June 28th.
[m] Monitor in the Touchet River (above Hofer Dam) in 2002 quit working from July 21st to August 23rd, and then was pulled on November 13th.

Appendix F. Table 2. Mean Monthly stream flow (cfs) and standard deviation (SD) from continuous flow monitors in the Walla Walla Subbasin, 2002-2006.

	2002		2003		2004		2005		2006	
	cfs	SD	cfs	SD	cfs	SD	cfs	SD	cfs	SD
Yellowhawk Creek										
Below Diversion										
June (20th-30th)	30.14	3.252	33.08	4.367			22.33	1.841	N/A	N/A
July	16.47	3.680	23.06	3.066			17.53	3.050	13.26[j]	1.538[j]
August	12.95	1.728	21.76[n]	1.777[n]			12.10	1.468	11.44	0.940
September	16.07	2.692	N/A	N/A			13.36	2.614	12.86	4.710
October	19.09	2.121	N/A	N/A			19.98[o]	2.397[o]	16.89	5.746
Nov. (1st-14th)	26.45	3.776	N/A	N/A			N/A	N/A	33.88[j]	9.752[j]
Just above mouth										
June (20th-30th)	31.47[g]	3.590[g]	28.83	3.306	27.54[p]	2.207[p]			N/A	N/A
July	14.02[g]	6.428[g]	22.01	3.127	20.49	3.085			12.00[j]	1.560[j]
August	12.93[g]	3.784[g]	19.84	2.461	19.06	5.191			11.06	0.939
September	14.95[g]	2.939[g]	24.65	4.933	22.73	3.107			12.65	2.038
October	9.88[g]	4.470[g]	32.12	5.129	27.37	3.159			17.06	2.964
Nov. (1st-14th)	22.14[g]	6.270[g]	38.47	5.152	31.75	2.805			22.74[j]	2.472[j]
East Little Walla Walla										
0.3 miles above mouth										
June (20th-30th)	10.67	0.980	12.52	0.397	15.88	1.665	10.47	0.739		
July	9.40	2.128	11.67	0.838	9.98[q]	0.281[q]	8.36	1.210		
August	9.34	0.918	10.10	0.301	12.22	1.473	7.10	0.890		
September	11.33[r]	1.576[r]	10.79[s]	0.220[s]	13.67	0.436	11.24	1.255		
October	N/A	N/A	N/A	N/A	15.51	1.053	16.23	1.023		
Nov. (1st-14th)	N/A	N/A	N/A	N/A	14.31	0.813	15.69[t]	0.561[t]		

[g] Data collected be the Department of Ecology as part of TMDL monitoring.
[j] Monitor in the Walla Walla River (Detour Rd.) was put in place on July 7th , and was removed on November 8th.
[n] Monitor in Yellowhawk Creek (Below Diversion) in 2003 was removed on August 28th.
[o] Monitor in Yellowhawk Creek (Below Diversion) in 2005 was removed on October 24th.
[p] Monitor in Yellowhawk Creek (Just above mouth) in 2004 was put in place on June 24th.
[q] Monitor in East Little Walla Walla (0.3 miles above mouth) in 2004 had a rating curve shift, so data for July is from the 10th to the 31st.
[r] Monitor in East Little Walla Walla (0.3 miles above mouth) in 2002 quit working on September 10th, so no data is available after that point.
[s] Monitor in East Little Walla Walla (0.3 miles above mouth) in 2003 quit working on September 5th, so no data is available after that point.
[t] Monitor in East Little Walla Walla (0.3 miles above mouth) in 2005 was removed on November 9th.

Appendix F. Table 2. Mean Monthly stream flow (cfs) and standard deviation (SD) from continuous flow monitors in the Walla Walla Subbasin, 2002-2006.	2002		2003		2004		2005		2006	
	cfs	SD	cfs	SD	cfs	SD	cfs	SD	cfs	SD
Mill Creek										
Wallula Rd.										
June (20th-30th)	12.61	7.207	5.05	0.201						
July	5.05	1.560	4.68	0.286						
August	3.99	0.334	4.64	0.349						
September	5.07	0.379	10.29	19.824						
October	11.17	10.513	8.70	1.285						
Nov. (1st-14th)	43.38[u]	28.908[u]	12.95	3.283						
Titus Creek										
~1.4 miles above Five Mile Rd.										
June (20th-30th)					8.43[v]	0.693[v]	7.35[w]	0.301[w]		
July					7.22	0.454	6.78	0.609		
August					7.89	0.950	7.56	0.220		
September					7.77	0.661	9.07	0.437		
October					8.02	0.763	10.56	0.487		
Nov. (1st-14th)					9.49	0.772	12.65[w]	0.246[w]		
Covered bridge above Five Mile Rd.										
June (20th-30th)					N/A	N/A	N/A	N/A	N/A	N/A
July					N/A	N/A	N/A	N/A	3.63[j]	0.131[j]
August					N/A	N/A	2.91[x]	0.264[x]	4.08	0.123
September					N/A	N/A	2.89	0.816	4.79	0.177
October					N/A	N/A	8.48	0.616	4.88	0.189
Nov. (1st-14th)					N/A	N/A	9.97[x]	0.416[x]	5.48[j]	0.834[j]

[j] Monitor in the Walla Walla River (Detour Rd.) was put in place on July 7th , and was removed on November 8th.
[u] Monitor in Mill Creek (Wallula Rd.) in 2002 was removed on November 13th.
[v] Monitor in Titus Creek (~1.4 miles above Five Mile Rd.) in 2004 was put in place on June 24th.
[w] Monitor in Titus Creek (~1.4 miles above Five Mile Rd.) in 2005 was put in place on June 22nd and removed on November 9th.
[x] Monitor in Titus Creek (Covered bridge above Five Mile Rd.) in 2005 had problems due to a beaver dam until August 22nd and was removed on November 9th.

Appendix G. Steelhead Spawning Surveys of Yellowhawk Creek, 2006

Steelhead Spawning Surveys of Yellowhawk Creek

Survey from Plaza Way Bridge upstream to 2nd St./Cottonwood Rd. on 04/04/06.

This section of Yellowhawk Creek, like most of the stream, flows through numerous residences. The stream channel is uniform in width, very few meanders, high sedimentation, high velocity and deep water, and very few areas of spawning habitat. The riparian canopy, which was very sparse in areas, consisted of cottonwood, alders, and hawthorns with a dense brush (blackberry) understory. As mentioned before this stream flows through many residences which leads to many different land uses, such as agriculture (alfalfa, grapes, and livestock) and lawns that are maintained to the waters edge. There are many areas where the water is approximately three to four feet deep for long stretches and is virtually impossible to see through due to the depth, high velocity, and sedimentation. There were few areas (tail outs with spawnable gravel) where one could see but the embeddedness of the cobble was fairly high. There were a couple of debris jams noted in this section but fish passage was not an issue. Few fish may spawn in Yellowhawk Ck. but it acts as an excellent migration corridor to and from the Walla Walla River and Mill Ck.

Photos 1-10 show area between Plaza Way Bridge and 2nd St./Cottonwood Rd. Bridge taken on 05/01/06.

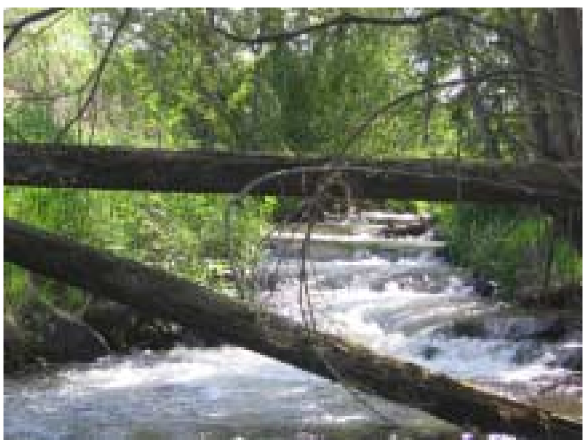


Photo 1. ~100 yards above Plaza Way Bridge series of step weirs with pump at top.

Photo 2. Above Plaza Way Bridge looking at landscaping to edge of stream.

Photo 3. Above Plaza Way Bridge two log weirs and heavily armored bank.

Photo 4. ~0.25 mile above 3rd Ave. debris jam and garbage.

Photo 5. Debris jam between 3rd Ave. and Cottonwood Rd. Good passage on right bank.

Photo 6. Debris jam between 3rd Ave. and Cottonwood Rd. Good passage on right bank.

Photo 7. Debris jam between 3rd Ave. and Cottonwood Rd. Good passage on right bank.

Photo 8. Picture of riparian ~0.25 miles below Cottonwood Rd. looking downstream.

Photo 9. Picture of riparian ~0.25 miles below Cottonwood Rd. looking upstream.

Photo 10. Picture of riparian ~0.25 miles below Cottonwood Rd. looking upstream.

Survey from Cottonwood Rd. to Abbot Ave. and from Fern Ave. to Sturm Ave. on 04/04/06.

Two potential barriers exist in this section. The first is just above Cottonwood Rd. there was a concrete flow control structure on the east side of Cottonwood Rd. that may pose a migration barrier. The second is just above Fern Rd. beaver activity coupled with natural tree growth/placement pose a possible migration barrier adjacent to WW high school baseball field.

This section of stream consisted of approximately 90% riffle and 10% pool with primarily medium cobble and silt along stream margins and in pools. Very few spawning areas were available with marginal spawning habitat in those areas. Primary riparian condition was manicured lawns and landscaping including some bank stabilization with rip-rap and railroad tie retaining walls. The section through Walla Walla school property has steep banks and is shaded primarily from Locust trees, and some willow and reed canary grass understory. Almost no LWD exists other than a small amount through the section owned by Walla Walla School District (at Walla Walla High School). In general, this section of Yellowhawk Creek poses no significant barrier to adult anadromous fish migration, but the spawning and rearing habitat quality is poor.

Photos 11-13 show possible barriers described above between Cottonwood Rd. and Sturm Ave. taken by Chris on 05/01/06.

Photo 11. Concrete flow control structure adjacent to Cottonwood Rd. slightly upstream of bridge over creek on the same road. Debris collects here and may be a passage barrier.

Photo 12. Natural debris jam enhanced by beaver and human activity, may be a passage barrier, adjacent to WW High School ball field.

Photo 13. Natural debris jam enhanced by beaver and human activity, may be a passage barrier, adjacent to WW High School ball field.

Survey and Photos 14-24 of the left bank (LB) fork on 04/04/06.

From the mouth of the left bank fork to ~0.1 miles below Berney Rd. the stream was mostly deep slow moving runs with several small beaver dams and debris jams, none of which were passage problems at current flows. There were high amounts of sediment and LWD. From ~0.1 miles below Berney Rd. up to just below the diversion at the top of the forks, the stream was very homogeneous: mostly riffle, medium to large cobble, moderate sedimentation, fair bank stability. Above Berney Rd. (most of this section) the riparian was a single row of Locust trees on each bank until just below the top of the forks where there had been a fire and little functional riparian existed. Just below the top of the forks ~300 meters of stream there were several small debris jams creating slow deep runs with high sedimentation. Overall the stream lacks pools and has very little area suitable for spawning.

Photo 14. Bottom of forks looking downstream.

Photo 15. Looking up right bank fork from bottom.

Photo 16. Looking up left bank fork from bottom.

Photo 17. Left bank fork showing pool above beaver dam.

Photo 18. Left bank fork showing pool above beaver dam and water flowing through field in background.

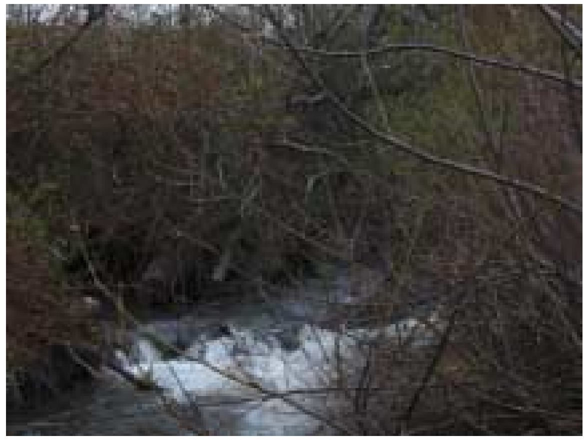


Photo 19. Left bank fork slow deep water spilling over log and very thick cover, unable to survey for a short section.

Photo 20. Left bank fork ~0.1 miles below Berney Rd. (Carl St.) small dam may be barrier to juveniles.

Photo 21. Left bank fork above Berney Rd. showing old irrigation dam passable for adults at current flow but not juveniles, and may not be passable at lower flows.

Photo 22. Left bank fork above Berney Rd. to the top of the forks had a thin riparian belt of locust trees.

Photo 23. Left bank fork showing wide channel and 100% riffle, most of stream above Berney Rd. looks like this.

Photo 24. Left bank fork just below top of forks in fire area, small debris jam (not a passage issue) with slow deep run above.

Survey and Photos 25-38 of the right bank (RB) fork on 04/04/06.

A steelhead spawning survey was conducted from the mouth of the right bank fork of Yellowhawk Creek upstream to the diversion point of the forks (GPS: N46.05932 W118.29603 up to N46.07052 W118.28354). Water visibility was fair to poor and weather conditions were poor with overcast and rain. The water temp was 45ºF @ 10:18. No fish or redds were observed during this survey. Habitat conditions in this section were dependent upon the proximity of development to the stream. In the areas where homes have been built directly along the stream, very little to no riparian vegetation exists, bank stability is fair to poor, and several small manmade rock dams exist. All dams are currently passable at current flows. The majority of the stream banks in these developed areas are “beautified” with flowerbeds, grass, bark, etc. At one point (approximately 25 minutes into the survey—above Berney Drive) the right bank fork splits into two channels. One channel flows through a small pond, water wheel, and two small culverts. However, there is passage around this area in the other channel. In areas where development is not directly against the stream the habitat conditions include a narrow riparian belt consisting of primarily of blackberries and cottonwoods and fair to poor bank stability. Throughout the entire survey area, sedimentation is high, embeddedness is high, and very little spawning habitat is present. The majority of this fork is riffle (at least 80%).

Photo 25. ~5 minutes up the right bank fork two small weirs.

Photo 26. ~10 minutes up the right bank fork.

Photo 27. Right bank fork at Carl Street looking downstream at culverts.

Photo 28. Right bank fork looking upstream from Carl St.

Photo 29. Right bank fork upstream of Pleasant St.

Photo 30. Right bank fork showing left channel within the right bank fork.

Photo 31. Right bank fork showing split channel.

Photo 32. Right bank fork shoring right Channel within the right bank fork.

Photo 33. Right bank fork of pump station weir at church.

Photo 34. Right bank fork ~10 min above church looking upstream.

Photo 35. RB fork ~10 min above church looking downstream.

Photo 36. Right bank fork boulder vortex.

Photo 37. Right bank fork looking upstream from boulder vortex.

Photo 38. Right bank fork debris jam.

Photos 39-41 show concrete flow control structure at the top of the forks taken on 04/04/06.

Photo 39. Concrete flow control structure at the top of the forks.

Photo 40. Looking downstream at top of right bank fork.

Photo 41. Looking downstream at top of left bank fork.

Photos 42-48 show area from top of forks to the top of Yellowhawk Creek at USACE property taken on 04/04/06.

Photo 42. Fire area above forks.

Photo 43. Top of fire area above forks looking upstream.

Photo 44. Above forks, fence across stream.

Photo 45. Pasture between forks and USACE property, poor banks.

Photo 46. Pasture between forks and USACE property, poor banks.

Photo 47. Looking downstream just below Yellowhawk/Garrison diversion.

Photo 48. Culverts just upstream of Yellowhawk/Garrison diversion.

Appendix H. Touchet River Watershed Bull Trout Summary and Population Alert, 2006

SE WA District Fish Management, Region 1,
529 W Main St., Dayton, WA 99328, Phone (509) 382-1005, Fax (509) 382-1267

Date: November 7, 2006

To: Michelle Eames, USFWS

From: Glen Mendel

Subject: Touchet River Basin Bull Trout Summary and POPULATION ALERT

I thought it was time to provide you a summary of bull trout redd counts and alert you that the Touchet bull trout populations appear to be declining rapidly, and we may lose one or more portions, or populations, within the next couple of years.

WDFW is currently running genetic samples and we should have our analyses completed for the Touchet Basin, as well as the rest of the Walla Walla Basin, within 2-3 months. This will help us determine if we have one or more populations of bull trout in the Touchet Basin, and how reproductively isolated they may be from one another.

I will provide a summary for each of the three major drainages. The intent of this memo is to alert you to the current bull trout population conditions and trends so we can begin discussions about the possible imminent extirpation of some of these groups. We then need to discuss possible emergency actions that the managers would take within the next two-three years that might be necessary to save these populations or groups of fish. The potential actions that could be taken include habitat restoration actions or further restrictions, closing all fishing seasons in the area, and possibly taking fish into a hatchery to try to protect them and increase numbers of bull trout for outplanting.

South Fork bull trout

You will see that the Burnt Fork (South Fork Touchet tributary) population is near zero and just hanging on, as far as we can tell (Table 1 and Fig. 1). This population does include migratory and resident fish (based on our past radio telemetry, fish and redd size). This group spawns in about 2.6 miles of stream in the entire South Fork drainage. No surveys were conducted in 2006 because of the Columbia County Complex Fire. Note: no bull trout found at 5 electrofishing sites in the Burnt Fork and none in 5 sites in Griffin Fork in 2006. CTUIR found one bull trout while electrofishing in the upper South Fork in 2006.

Table 1. Bull trout spawning survey summary, redd count (number of times surveyed), for the Burnt Fork, 2000-2005.

	Reach Surveyed[a]			
	A	B	C	
Year	RM 3.5-3.3	RM 3.3-1.4	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
2005	1(2)		1(2)	2
2005	NA		NA	2

[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.

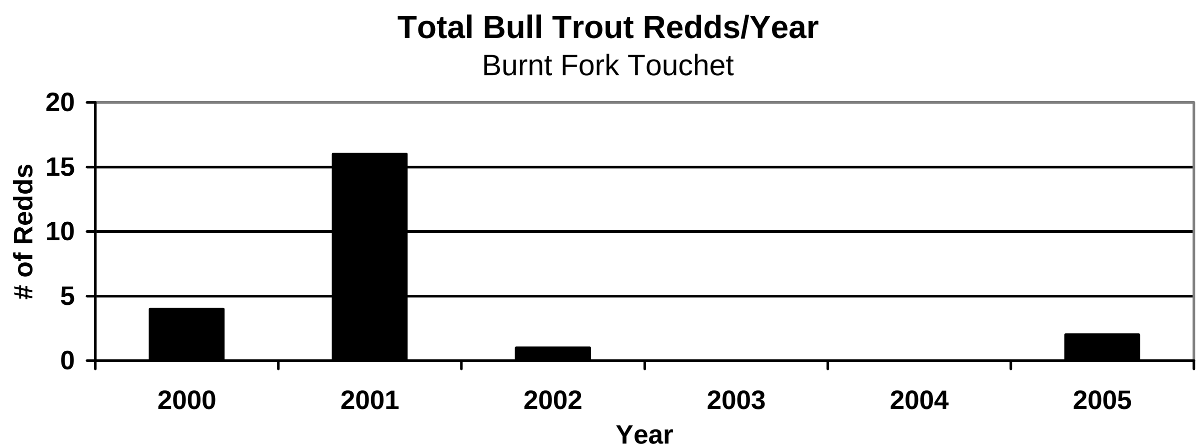


Figure 1. Bull Trout redd counts per year in the Burnt Fork Touchet River.

North Fork bull trout
The North Fork Touchet spawning group was increasing for several years, but now it has been declining for several years (Table 2, Fig. 2). The number of redds per year is getting into dangerously low levels now. Please note, that the number or surveys per year increased in 2001, so the validity of comparisons from year to year are somewhat in question. This group spawns in only about 2.5 miles of the North Fork Touchet, just below Ski Bluewood. The number of redds has declined over the past five years and is now less than 10 redds.

Several significant habitat and fish mortality issues have occurred in the North Fork in the past 6 years or so. We had an unacceptable bull trout mortality level from our radio telemetry study over a period of two years so we terminated the study. We also documented unexpected movements of bull trout and mortalities that may be related to a chemical spill or poisoning of fish. The USFS construction for modification on the road to Ski Bluewood had a significant sediment discharge on spawning bull trout and their habitat in 2004, plus several bull trout died during bridge construction in 2004. Substantial development has, and is, occurring along the North Fork Touchet River. Many new homes are currently under construction and many other plots of land along the river have "For Sale" signs indicating additional development is likely soon. In 2005, the Department of Natural Resources traded to Bennett Lumber their 600 acre holdings just north of the USFS boundary along the Touchet River. That area burned in the Columbia Complex Fire of 2006 and Bennett is scheduling logging now. It is likely this land will be sold for development after logging.

Some additional components of this spawning group may exist in tributaries. Very small numbers of fish are known to spawn in Lewis and Spangler creeks (upper tributaries of the North Fork Touchet). Redd counts in these tributaries are approximately 2-6 per year.

Table 2. Bull trout spawning survey summary, redd count (number of times surveyed), for the North Fork Touchet River, 1994-2006.

	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
2005	13(4)	2 (4)	15
2006	9(3)	0 (3)	9

[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.

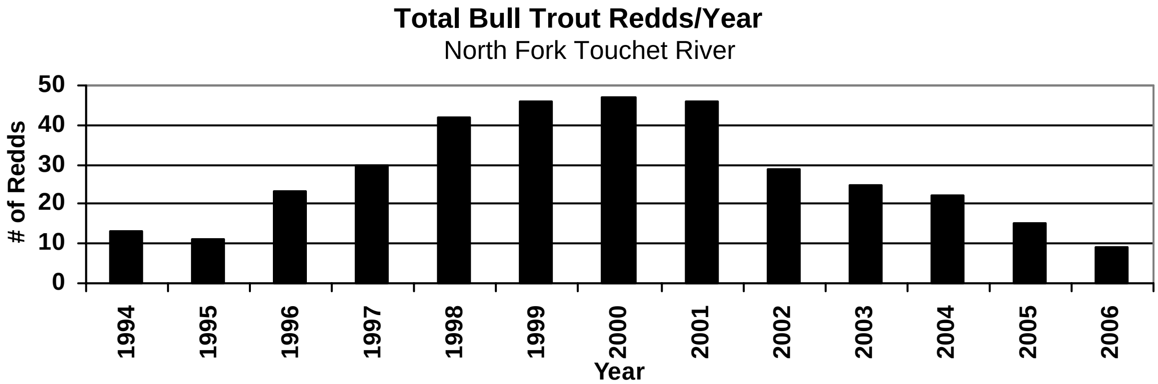


Figure 2. Bull trout redd counts per year in the North Fork Touchet River.

Wolf Fork bull trout

The Wolf Fork has been the stronghold of the Touchet bull trout with up to 101 redds per year (Table 3, Fig. 3). Partial redd surveys were conducted in this drainage until 1998 when more intensive and extensive surveys were initiated. It may be inappropriate to compare redd counts prior to 1998 to those after 1998 because of differing levels of survey intensity or geographic area included. You can see a three year decline in numbers of redds observed. The number of redds found in 2006 (37) is less than half the eight year average number of redds (76) from 1998 through 2005. Spawning area used here is about six miles long.

Several significant habitat and fish mortality issues have occurred in the Wolf Fork Touchet River in the past 6 years or so, and some chronic habitat issues remain. We have a private road upstream of the locked gate near Whitney Creek that is in poor condition. It has many springs that cross it that should be in culverts and most of the bridges are failing so they are being bypassed with stream fords. Some of these bridges are likely to fall into the stream in the next few years. Tate Creek is a tributary drainage from the west that enters the Wolf Fork upstream of Greenfly Canyon. This channel has been modified several times over the past 10 years and flow from Tate Creek often flows down the road for some distance before it enters the Wolf Fork. Sediment is added to the Wolf Fork whenever vehicles use this private road. The 2006 Columbia Complex Fire burned parts of the upper Wolf Fork drainage where spawning and rearing exist. The new fire line reopened the road above Tate Creek and created new disturbed areas along the stream. There are now approximately 12 or more stream fords along the upper Wolf Fork (7 above Tate Cr and 5 below) and traffic may increase at least to Tate Creek since many of these fords and the road were recently cleared to create a fire line.

In addition to the habitat problems listed above, the DNR land trade with Bennett Lumber for the 760 acre parcel just north of the USFS boundary (Reach C, Table 3) is in the heart of the bull trout spawning and rearing area. This parcel is likely to be at least partially logged now that part of it burned in 2006. Loss of this land from public ownership is likely to increase its probability for development and subsequently more use of the poor road in the upper Wolf Fork. Additional effort should be made to trade this land with Bennett Lumber to keep it in federal, state or tribal ownership to protect the entire bull trout population within the Touchet River Basin.

I wish to note that bull trout spawning may be cyclic and we may see an increase in redd counts in the next year or two. However, if redd counts continue to decline over the next 2-4 years, especially in the North Fork and South Fork drainages we may see extirpation in those areas.

I believe that it is time that we begin working together to prioritize actions to improve the chances for persistence and recovery of the Touchet bull trout population. I recommend we initiate discussions immediately for actions to take, and that we continue to emphasize monitoring of spawning activities. I ask for your assistance with this effort.

Table 3. Bull trout spawning survey summary, redd count (number of times surveyed), for the Wolf Fork of the Touchet River, 1990-2006.

	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
2005		1(2)	5(3)	38(4)	10(4)	3(4)		57
2006		3(2)	8(3)	13(3)	8(3)	5(3)		37

[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.

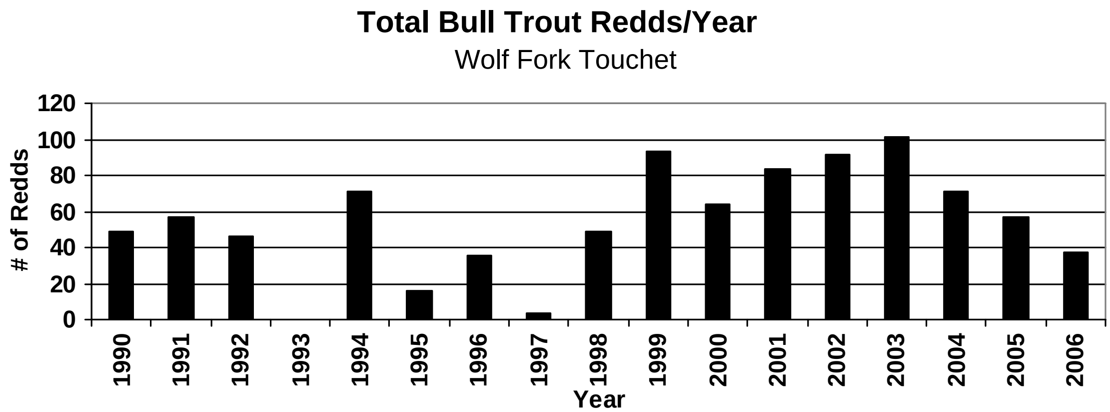


Figure 3. Bull trout redd counts per year in the Wolf Fork Touchet River.