4.0 Walla Walla Subbasin Aquatic Assessment

4.1 Selection of Focal Species

Three aquatic species were chosen as focal for Walla Walla Subbasin Planning: steelhead/rainbow trout *Oncorhynchus mykiss*; spring Chinook *Onchorynchus tshawytcha*; bull trout *Salvelinus confluentus*. The criteria used to select focal species were the aspects of the Walla Walla Subbasin ecosystem that the life histories represent; the Endangered Species Act (ESA) status; the cultural importance of the species and whether or not there was enough knowledge of the life history of the species to do an effective assessment. Those species of which too little was known to be included as focal at this time could be included as "species of interest" (see section 4.7). The WDFW suggested the above species as focal for the subbasin. These were then presented to the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) the citizens advisory group, subbasin planning team and other interested agencies and entities. Consensus was achieved on their selection. Walla Walla summer steelhead, spring Chinook and bull trout life histories intersect a broad range of the aquatic ecosystem. Spatially, the life histories of these four species cover the entire subbasin from the mouth to the headwaters. These species also occupy all levels of the water column including slack water, swift water and the hyporheic zone. Not only are they present but also the ability of these species to thrive is dependent on being able to successfully occupy these areas. Temporally, these species are present (or were assumed to be present in the past) at one lifestage or another throughout much of the watershed in all seasons. The ability of these species to be present at a particular time in a particular area is also key to the success of these species. Given the wide range of both the spatial and temporal aspects of these life histories it can be assumed that having habitat conditions that are appropriate for these three species will also produce conditions that allow for the prosperity of other aquatic life in the Walla Walla Subbasin.

The legal status of these species is important to the people of the Walla Walla Subbasin. All three species are listed as threatened under the ESA (see sections 4.3.4.3; 4.4.4.3; 4.5.4).Currently the citizens, governments, state and federal agencies and tribes are engaged in planning for the recovery of each of the salmonids through different processes. The intention of subbasin planning to address listed species within the subbasin supports the inclusion of the only four federally listed aquatic species within the subbasin as focal species.

4.2 Walla Walla Subbasin Habitat Assessment Methods

The Walla Walla Subbasin habitat was assessed using the Ecosystem Diagnosis and Treatment (EDT) method; EDT is an analytical model relating habitat features and biological performance to support conservation and recovery planning (Lichatowich et al. 1995; Lestelle et al. 1996; Mobrand et al. 1997; Mobrand et al. 1998). It acts as an analytical framework that brings together information from empirical observation, local experts, and other models and analyses.

The Information Structure and associated data categories are defined at three levels of organization. Together, these can be thought of as an information pyramid in which each level builds on information from the lower level (Figure 4-1). As we move up the through the three levels, we take an increasingly organism-centered view of the ecosystem. Levels 1 and 2 together characterize the environment, or ecosystem, as it can be described by different types of data. This provides the characterization of the environment needed to analyze biological performance for a species. The Level 3 category is a characterization of that same environment from a different perspective: "through the eyes of the focal species" (Mobrand et al. 1997). This category describes biological performance in relation to the state of the ecosystem described by the Level 2 ecological attributes.

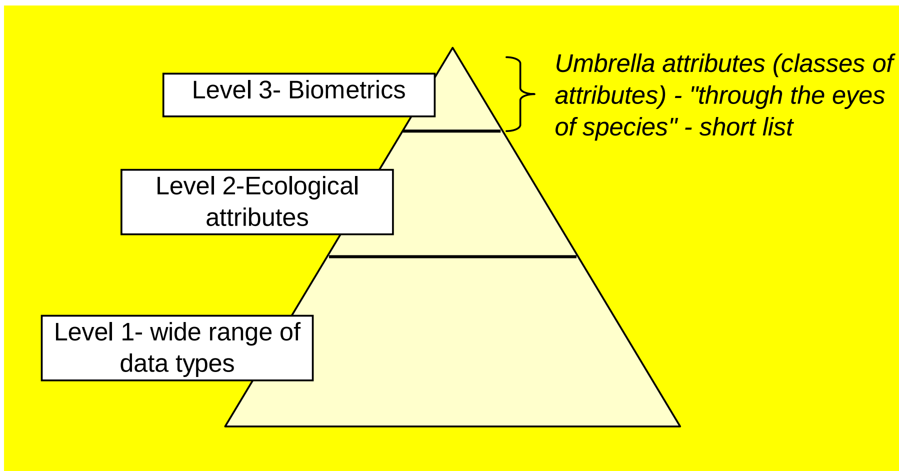

Figure 4-1. Data/information pyramid—information derived from supporting levels.

The organization and flow of information begins with a wide range of environmental data (Level 1 data) that describe a watershed, including all of the various types of empirically based data available. These data include reports and unpublished data. Level 1 data exist in a variety of forms and pedigrees. The Level 1 information is then summarized or synthesized into a standardized set of attributes (Level 2 ecological attributes, see Table 4-3) that refine the basic description of the watershed. The Level 2 attributes are descriptors that specify physical and biological characteristics about the environment relevant to the derivation of the survival and habitat capacity factors for the specific species in Level 3. Definitions for Level 2 and Level 3 attributes can be found at www.edthome.org , together with a matrix showing associations between the two levels and various life stages.

The Level 2 attributes represent conclusions that characterize conditions in the watershed at specific locations, during a particular time of year (season or month), and for an associated management scenario. Hence an attribute value is an assumed conclusion by site, time of year, and scenario. These assumptions become operating hypotheses for these attributes under specific scenarios. Where Level 1 data are sufficient, these Level 2 conclusions can be derived through simple rules. However, in many cases, experts are needed to provide knowledge about geographic areas and attributes where Level 1 data are incomplete. Regardless of the means whereby Level 2 information is derived, the characterization it provides can be ground-truthed and monitored over time through an adaptive process.

In the Walla Walla Subbasin process, conclusions regarding Level 2 attribute conditions were derived using empirical data, where available, and data gaps were filled by a group of natural resource-related professionals with knowledge of the watersheds of interest. These individuals had expertise in such disciplines as fish habitat, hydrology, geomorphology, water quality, and civil engineering.

To perform the assessment we first structured the entirety of the relevant geographic areas, including marine waters, into distinct habitat reaches. The Walla Walla drainage was subdivided into the 281 stream segments by an assembled technical workgroup in Oregon and Washington (Appendix ##). We identified reaches on the basis of similarity of habitat features, drainage connectivity, and land use patterns. Such a detailed reach structure, however, is counterproductive for displaying results. Therefore the reaches were regrouped into the 48 larger “geographic areas” (Table 4-1). A set of standard habitat attributes and reach breaks developed by MBI were used for the mainstem Columbia River, estuarine, nearshore, and deepwater marine areas. We then assembled baseline information on habitat and human-use factors and fish life history patterns for the watersheds of interest. The task required that all reaches be completely characterized by rating the relevant environmental attributes.

Table 4-1. Geographic Areas, locations and stream length inmiles used for Walla Walla River subbasin assessment 2003.

Geographic Area	Location	Length in Miles
Lower Walla Walla (mouth to Touchet)	Mouth of Walla Walla to Mouth of Touchet	20.79
Lower Touchet (mouth to Coppei)	Mouth of Touchet to mouth of Coppei Cr	50.83
Coppei Drainage	Mouth to presumed steelhead access limit	23.10
Touchet, Coppei to forks (plus Whiskey)*	Mouth of Coppei Cr to confluence of NF and SF Touchet Rivers	21.87
Patit Drainage	Mouth of Patit Cr to presumed steelhead access limit	19.29
NF Touchet Mainstem	Mouth of NF Touchet River to presumed steelhead access limit	18.85
NF Touchet Tribs (excluding Wolf Fork)	Rodgers, Jim, Weidman, Lewis, and Spangler Creeks; all from mouths to presumed steelhead access limit	8.11
Wolf Fork, mouth to Coates (plus Robinson & Coates)	Mouth of Wolf Fork to mouth of Coates Cr; also includes Robinson Cr and Coates Cr; mouths to presumed steelhead access limit	16.06
Wolf Fork, Coates to access limit (plus Whitney)	Wolf Fork, Mouth of Coates Cr to presumed steelhead access limit; also includes Whitney Cr mouth to presumed steelhead access limit	7.43

SF Touchet Mainstem	Mouth of SF Touchet River to presumed steelhead access limit	15.93
SF Touchet Tribs	Dry Fork SF Touchet, Griffin Fork North Griffin Fork, Beaver Slide, Green Fork and Burnt Fork; mouths to presumed steelhead access limits	9.86
Walla Walla, Touchet to Dry (plus Mud Cr)	Walla Walla River, Mouth of Touchet River to Mouth of Dry Cr and Mud Cr (trib to Walla Walla River) mouth to presumed steelhead access limit	9.54
Pine Cr mainstem (plus Swartz)	Pine Cr mouth to presumed steelhead access limit and Swartz Cr, mouth to presumed steelhead access limit	31.77
Dry Cr [Pine] Drainage	Dry Cr (trib to Pine Cr), mouth to presumed steelhead access limit.	19.04
Lower Dry Cr (mouth to Sapolil)	Dry Cr (trib to Walla Walla), mouth to Sapolil Rd crossing.	24.10
Upper Dry Cr (Sapolil to forks)	Dry Cr (trib to Walla Walla), Sapolil Rd crossing to confluence of NF and SF Dry Creeks.	10.87
Dry Cr Tribs (Mud[Dixie], Mud[Dry], NF Dry & SF Dry)	Mud Cr (trib to Lower Dry Cr), Mud Cr (trib to Upper Dry Creek near Dixie Wa), NF Dry Cr and SF Dry Cr; mouths to presumed steelhead access limit	15.20
Walla Walla, Dry to Mill	Walla Walla River, Mouth of Dry Cr (trib to Walla Walla River) to moth of Mill Creek	6.64
W Little Walla Walla Drainage (plus Walsh)	West Little Walla Walla River Drainage and Walsh Cr drainage	10.81
Mill Cr, mouth to start of Flood Control Project at Gose St	Mill Cr, mouth to start of US Army Corps of Engineers project at Gose St near Walla Walla Wa	5.39
Lower Mill Cr Tribs (Doan & Cold)	Doan Cr and Cold Cr, mouth to presumed steelhead access limit	7.78
Mill Cr, Gose Street to Bennington Dam	Mill Cr, Gose St to Bennington Diversion Dam	11.36
Mill Cr, Bennington Dam to Blue Cr (plusTitus)	Mill Cr, Bennington Diversion Dam to mouth of Blue Cr and Titus Cr drainage	6.00
Blue Cr Drainage (including L. Blue)	Blue Cr, mouth to presumed steelhead access limit and Little Blue Cr mouth to presumed steelhead access limit	1.57
Mill Cr, Blue Cr to Walla Walla water intake	Mill Cr, Mouth of Blue Cr to City of Walla Walla water intake	8.62
Middle Mill Cr Tribs (Henry Canyon, Webb &Tiger)	Henry Canyon Cr, Webb Canyon Cr, Tiger Canyon Cr; mouth to presumed access limit	7.87
Mill Cr, Walla Walla water intake to access limit	Mill Cr, City of Walla Walla water intake to presumed steelhead access limit	5.77
Upper Mill Tribs (NF, Low, Broken, Paradise)	NF Mill Cr, Low Cr, Broken Cr, Paradise Cr; mouth to presumed steelhead access limit	6.20

Walla Walla, Mill to E L. Walla Walla (plus MacAvoy & Springbranch)	Walla Walla River, mouth of Mill Cr to mouth of East Walla Walla River	5.97
Garrison Cr Drainage (plus Bryant)	Garrison Cr, Includes Bryant Cr and all Walla Walla urban streams	11.86
Stone Cr Drainage	Stone Cr drainage	7.84
E Little Walla Walla Drainage (plus Unnamed Spring & Big Spring Br)	East Little Walla Walla River drainage; Unnamed Spring; Big Spring Cr, mouth to presume steelhead access limit	12.17
Walla Walla, E Little Walla Walla to Tumalum Bridge	Walla Walla River, East Little Walla Walla River to Tumalum Bridge	4.87
Yellowhawk mainstem (mouth to source)	Yellowhawk Cr drainage	8.58
Yellowhawk Tribs (Lassater, Russell, Reser & Caldwell)	Lassater Cr; Russll Cr; Reser Cr; Caldwell Cr; mouths to presumed steelhead access limit	14.36
Cottonwood Cr Drainage (including NF, SF & MF)	Cottonwood Cr drainage, mouth to presumed steelhead access limit	18.06
Birch Creek Drainage	Birch Cr drainage, mouth to presumed steelhead access limit	7.72
Walla Walla, Tumalum Bridge to Nursery Bridge	Walla Walla River, Tumalum Bridge to Nursery Bridge	2.35
Walla Walla, Nursery Br to Little Walla Walla Diversion	Walla Walla River, Nursery Bridge to Little Walla Walla Diversion	1.25
Walla Walla, Little Walla Walla Diversion to forks	Walla Walla River, Little Walla Walla Diversion to confluence of NF and SF Walla Walla River	4.87
Couse Creek Drainage	Couse Cr drainage, mouth to presumed steelhead access limit	14.21
NF Walla Walla, mouth to L. Meadows Canyon Cr (plus L. Meadows)	NF Walla Walla River, mouth to Little Meadows Canyon Cr and Little Meadows Cr mouth to presumed steelhead limit	9.95
NF Walla Walla, L. Meadows to access limit (plus Big Meadows)	NF Walla Walla River, mouth of Little Meadows Canyon Cr and Big Meadows Cr mouth to presumed steelhead limit	11.51
SF Walla Walla, mouth to Elbow Creek	SF Walla Walla River, mouth to mouth of Elbow Cr	9.88
Lower SF Walla Walla Tribs (Flume Canyon, Elbow)	Flume Canyon Cr and Elbow Cr, mouth to presumed steelhead access limit	5.49
SF Walla Walla, Elbow to access limit	SF Walla Walla River, mouth of Elbow Cr to presumed steelhead access limit	17.9
Upper SF Walla Walla tribs (excluding Skiphorton & Reser)	Bear Cr, Kees Canyon Cr, Burnt Cabin Gulch, Swede Canyon, Table Cr, Husky Spring Cr, Bear Trap Springs; mouth to presumed steelhead access limit	14.42
Skiphorton & Reser Creek Drainages	Skiphorton Cr and Reser Cr, mouth to presumed steelhead access limit	4.76

A technical work group was formed for the Walla Walla subbasin for the purpose of rating the Level 2 habitat attributes for the freshwater stream reaches. Expert knowledge about habitat identification, habitat processes, hydrology, water quality, and fish biology was incorporated into the process. The work groups drew upon published and unpublished data and information for the basin to complete the task. Attribute rating for EDT was coordinated by WDFW in Washington and in Oregon by the Walla Walla Basin Watershed Council (WWBWC). Both entities used state, federal and tribal resources. Protocol for rating attributes was taken from "Attribute Ratings Guidelines (January 2003 revision) and "Attribute ratings Definitions" (January 2003); written and distributed by MBI. In addition MBI personnel were available for consultation and rated some attributes when local resources were not available. The sources used for rating the individual attributes are outlined in Table 4-2. The patient (current) condition attribute ratings represent a variety of sources and levels of proof (see **Appendix X** for complete ratings, levels of proof and explanations of specific attribute rating methods). Levels of proof (or confidence levels) assigned to ratings are directly from developed rating methods by MBI specifically for the EDT process. The attributes assigned to each reach are assigned a numerical value from 1 to 5 where: 1 is empirical observation; 2 is expansion of empirical observation; 3 is derived information; 4 is expert opinion; 5 is hypothetical. The mean and standard deviation for confidence levels assigned to attributes are presented in Table 4-2. The template (historic) conditions were all considered to be the hypothetical or expert opinion of the resource professional that rated the attribute. The rating sources presented in Table 4-2 are by the agency or organization for which the individual is employed, represents or is affiliated; or the data/published source that was used.

Table 4-2. Attributes, attribute rating level of proof means/standard deviations and rating sources used for EDT analysis of the Walla Walla River 2003. (Level of Proof ratings range from 1 to 5 where: 1 is empirical observation; 2 is expansion of empirical observation; 3 is derived information; 4 is expert opinion; 5 is hypothetical) (All Template ratings considered hypothetical or expert opinion; EO= Expert Opinion)

Attribute	Level of Proof		Template Sources		Patient Sources	
	Oregon	Washington	Oregon	Washington	Oregon	Washington
Alkalinity	Mean = 2.59 SD = .6	Mean = 2 SD = 0	Mobrand Biometrics Incorporated (MBI).	Mobrand Biometrics Incorporated (MBI).	Direct or derived from United States Environmental Protection Agency (EPA) STORET site and database.	Direct or derived from United States Geological Service (USGS) sample site and Environmental Protection Agency (EPA) STORET site and database.
Bed Scour	Mean = 3.65 SD =.76	Mean = 4 SD =0	ODFW Biologist	Mobrand Biometrics Incorporated (MBI) and WDFW Biologists.	ODFW Biologist	Mobrand Biometrics Incorporated (MBI) and WDFW Biologists.
Benthic Community Richness	Mean = 4.16 SD = 1.32	Mean = 3.95 SD = .21	Mobrand Biometrics Incorporated (MBI)	Mobrand Biometrics Incorporated (MBI) and WDFW Biologists.	Direct or derived WWBWC data	Mobrand Biometrics Incorporated (MBI) and WDFW Biologists.
Channel Length	Mean = 1 SD = 0	Mean = 1 SD = 0	WWBWC staff. Stream lengths increases proportionally with estimated decrease in gradients historically through Rosgen stream typing, or remain the same in naturally confined valleys.	WDFW Biologist. Stream lengths increases proportionally with estimated increase in sinuosity historically. Estimated sinuosity through Rosgen stream typing potential. Potentials (mainstem) estimated from TMDL/WQMP Oregon DEQ. 2001 Draft; others WDFW Biologist expert opinion.	CTUIR staff using Terrain Navigator mapping software.	Channel length measured using Terrain Navigator® mapping program by WDFW biologist.

Channel Width Max	Mean = 4.46 SD = 1.15	Mean = 3.31 SD = .84	Calculated widths based on Rosgen stream typing. WWBWC and ODEQ hydrologist and geomorphologist.	WDFW Biologist.	Direct or derived widths based on Rosgen stream typing and field measurements. WWBWC and ODEQ hydrologist and geomorphologist	Some mainstem Walla Walla estimated from Bower (WWBWC) WW morphology study data of current and potential BFW for Oregon DEQ TMDL and WQMP. 2001 1996 United States Forest Service (USFS) Stream survey data (upper Mill Creek); WDFW spawning surveys; WDFW Biologist; CTUIR Biologist estimates EO.
Channel Width Min	Mean = 4.17 SD = 1.38	Mean = 2.8 SD = .70	Calculated widths based on Rosgen stream typing. WWBWC and ODEQ hydrologist and geomorphologist.	WDFW Biologist.	Calculated widths based on Rosgen stream typing. WWBWC and ODEQ hydrologist and geomorphologist.	WDFW1998 to 2003 Electrofishing data, snorkel data and EO. 1996 United States Forest Service (USFS) Stream survey data (upper Mill Creek)
Confinement Hydromodifications	Mean = 3.96 SD = .78	Mean = 4 SD = 0	N/A	N/A	WWBWC staff and ODFW biologist EO.	WDFW Biologist EO.
Confinement Natural	Mean = 4.31 SD = .47	Mean = 4 SD = 0	WWBWC staff EO.	WDFW Biologist.	WWBWC staff EO.	WDFW Biologist EO.
Dissolved Oxygen	Mean = 2.72 SD = 1.39	Mean = 4 SD = 0	WWBWC staff EO	WDFW Biologist.	Direct or derived WWBWC data	WDFW Biologist derived from temperature data and EO.

Embeddedness	Mean = 4.40 SD = .49	Mean = 3.37 SD = .75	ODFW biologist EO	WDFW Biologist	ODFW biologist EO	1996 United States Forest Service (USFS) Stream survey data; CTUIR survey estimates 2002; WDFW survey estimates; WDFW Biologist EO.
Fine Sediment	Mean = 4.26 SD = .89	Mean = 4.00 SD = 0	WWBWC staff or ODFW biologist EO.	WDFW Biologist; MBI.	WWBWC staff or ODFW biologist EO, and direct ODFW data.	WDFW Biologist EO; CTUIR Biologist EO.
Fish Community Richness	Mean = 2.52 SD = .1.53	Mean = 1.35 SD = .81	ODFW Biologist EO.	WDFW Biologist.	ODFW Biologist EO.	From multiple year WDFW surveys.
Fish Pathogens	Mean = 1.00 SD = 0	Mean = 1.00 SD = 0	N/A	N/A	ODFW Biologist EO.	From WDFW, ODFW and CTUIR fish stocking records.
Fish Species Exotic	Mean = 1.00 SD = 0	Mean = 1.00 SD = 0	N/A	N/A	ODFW Biologist EO.	From multiple WDFW surveys.
Flow High	Mean = 4.28 SD = .45	Mean = 4 SD = 0	N/A	N/A	MBI and WWBWC staff EO.	MBI and WDFW Biologist EO.
Flow Low	Mean = 4 SD = 0	Mean = 4 SD = 0	N/A	N/A	MBI and WWBWC staff EO, and direct or derived WWBWC data.	MBI and WDFW Biologist EO.
Flow Diel Variation	Mean = 4.28 SD = .45	Mean = 4 SD = 0	N/A	N/A	WWBWC staff EO.	MBI and WDFW Biologist EO.

Flow Flashy	Mean = 4.28 SD = .45	Mean = 4 SD = 0	N/A	N/A	MBI and WWBWC staff EO.	MBI and WDFW Biologist EO.
Gradient	Mean = 2 SD = 0	Mean = 2 SD = 0	WWBWC/ODEQ staff adjusted gradients for increase in stream length (sinuosity) historically. Gradients decreased by proportion of stream length increase; potential or historic sinuosity dervied from Rosgen stream typing.	WDFW biologist adjusted gradients for increase in stream length (sinuosity) historically. Gradients decreased by proportion of stream length increase; potential or historic sinuosity derived from Rosgen stream typing.	Oregon TOAST staff estimations using Terrain Navigator.	WDFW Biologist estimations using Terrain Navigator.
Habitat Types (% of Backwater Pools, Glides, Beaver Ponds, Pools, Large Substrate Riffles, Small Substrate Riffles, Pool Tail-outs)	Mean = .3.40 SD = 1.20	Mean = 3.98 SD = .17	ODFW Biologist and WWBWC staff EO	WDFW Biologist	ODFW Biologist and WWBWC staff EO, 2001USFS Stream Survey Data	WDFW and CTUIR Biologist EO; 1995, 1996 USFS Stream Survey Data; WDFW survey data.
Habitat Off-Channel	Mean = 2.95 SD = .33	Mean = 4 SD = 0	ODFW Biologist and WWBWC staff EO	MBI and WDFW.	ODFW Biologist and WWBWC staff EO	MBI and WDFW EO.
Harassment	Mean = 4 SD = 0	Mean = 4 SD = 0	ODFW and CTUIR biologists, WWBWC staff	WDFW Biologist.	ODFW and CTUIR biologists, WWBWC staff	WDFW Biologist EO.
Hatchery Outplants	Mean = 1 SD = 0	Mean = 1 SD = 0	N/A	N/A	ODFW fish stocking records.	WDFW fish stocking records.
Hydrologic Regime Natural	Mean = 4 SD = 0	Mean = 4 SD = 0	MBI	MBI	MBI, Based on flow data from USGS station and MBI developed hydroregime categories.	MBI, Based on flow data from USGS station and MBI developed hydroregime categories.
Hydrologic Regime Regulated	N/A	N/A	N/A	N/A	WWBWC staff EO	MBI

Icing	Mean = 3.70 SD = .72	Mean = 4 SD = 0	ODFW Biologist and WWBWC staff EO	WDFW Biologist.	ODFW Biologist and WWBWC staff EO	WDFW Biologist EO.
Metals in Water Column	Mean = 5.00 SD = 0	Mean = 3.72 SD = .24	N/A	N/A	WWBWC staff EO, direct or derived ODEQ and EPA STORET data	WDFW Biologist EO; WDOE TMDL and other studies.
Metals in Soils and Sediment	Mean = 5.00 SD = 0	Mean = 3.67 SD = .30	N/A	N/A	WWBWC staff EO	WDFW Biologist EO; WDOE TMDL and other studies.
Misc Toxics	Mean = 5.00 SD = 0	Mean = 3.59 SD = .53	N/A	N/A	WWBWC staff EO, direct or derived ODEQ and EPA STORET data	WDFW Biologist EO; WDOE TMDL and other studies.
Nutrients	Mean = 4.28 SD = .45	Mean = 4 SD = 0	N/A	N/A	WWBWC staff EO.	WDFW Biologist EO.
Obstructions	*Obstruction rated by percent passage of average adult. Obstruction ratings were the expert opinion of WDFW biologists.	*Obstruction rated by percent passage of average adult. Obstruction ratings were the expert opinion of WDFW biologists.	N/A	N/A	Obstructions rated by ODFW and CTUIR Biologist EO.	Obstructions rated by WDFW Biologists EO.
Predation Risk	Mean = 4 SD = 0	Mean = 4 SD = 0	N/A	N/A	WWBWC staff and ODFW Biologist EO.	WDFW Biologist EO.
Riparian Function	Mean = 3.94 SD = .36	Mean = 4 SD = 0	N/A	N/A	WWBWC staff and ODFW Biologist EO.	WDFW Biologist EO.
Salmon Carcasses	Mean = 1 SD = 0	Mean = 4 SD = 0	ODFW Biologist EO.	WDFW Biologist.	WWBWC staff and ODFW Biologist EO.	WDFW Biologist EO.
Temperature Max	Mean = 2.86 SD = 1.21	Mean = 1.93 SD = 1.01	ODEQ/WWBC calculated temperature models.	WDFW Biologist; CTUIR Biologist.	Derived or inferred WWBWC, Forest Service, or ODEQ data.	2000, 2001, 2002 WDFW temperature data. WDOE TMDL, 2002. WDFW Biologist derived and EO.

Temperature Min	Mean = 4.33 SD = 1.32	Mean = 3.99 SD = .27	WWBWC staff EO.	WDFW Biologist; CTUIR Biologist.	Derived or inferred WWBWC, Forest Service, or ODEQ data.	WDFW/CTUIR Biologist EO.
Temperature Spatial Variation	Mean = 4.52 SD = .5	Mean = 4 SD = 0	WWBWC staff EO	WDFW Biologist.	WWBWC staff EO	WDFW Biologist EO and WDOE consultation.
Turbidity	Mean = 3.07 SD = 1.31	Mean = 4 SD = .0	WWBWC staff EO	WDFW Biologist.	Derived or Direct WWBWC data	WDFW Biologist EO.
Withdrawl	Mean = 1.46 SD = 1.23	Mean = 4 SD = 0	N/A	N/A	Direct WWBWC data	WDFW Biologist Eo and consultation with WDOE.
Woody Debris	Mean = 2.47 SD = .85	Mean = 3.61 SD = .78	ODFW Biologist EO.	WDFW Biologist.	ODFW Biologist EO.	WDFW/CTUIR Biologist EO; CTUIR survey data; 1996 USFS Stream Survey Data

The template or reference conditions for the watershed were estimated in order to rate attributes for the EDT analysis. Table 4-3 summarizes these conditions by geographic area. The lower elevations near the mouth of the subbasin were assumed to have moderate to heavy cottonwood galleries and a healthy beaver population. This would have created a somewhat complex habitat with long-lived large wood and many pools/backwater areas. Upstream of this area as you moved away from the Columbia River there would have been sparser cottonwood growth with heavier brush near the riparian giving way to grassland/shrub-steppe as you moved upland and neared the Touchet River. This character would have continued up the Touchet with brush growing thicker and woody growth becoming more common, grasslands replacing shrub-steppe and increased large wood in the stream as you approached present day Waitsburg and the mouth of Coppei Cr.

The Coppei drainage itself would have featured thick riparian growth of shrubs, cottonwoods, with some mixed conifers growing more prevalent as you reached the forks. Both SF and NF Coppei would have quickly given way to primarily conifer growth, which would have been thick on north facing slopes and more woodland/grasslands on south facing slopes. The riparian areas would have been heavily wooded giving the stream a steady input of LWD and adding to its complexity and pool ratios (which would have been high). The Touchet River upstream of the Coppei would have quickly changed from brushy/cottonwood riparian growth and grassland uplands to mixed conifer forest and woodlands as it approached the forks. The stream would have been thick with wood as input to the stream would have been more common and featured larger pieces than below; this combined with beaver and low gradients would have given the area long lived LWD with log jams being common.

The lower Patit drainage is typical of low gradient meadow type meandering streams. Beaver and off-channel/oxbow type habitat would have been more prevalent as this stream would have been free to roam the valley floor. Pools, both beaver and other, undercut banks and connected off-channel areas would have been been the most attractive feature for salmon in this area. Shrubs and cottonwood/mixed conifer growth would have been dominant in the lowland areas. The steep/short water sheds of Cougar and West Patit included brushy growth and some trees in the narrow valley floor that confines these streams. Large wood would have been short-lived and beaver not present, thus rock step-pools would predominate. North Patit would have been much like the lower Patit except for woodland being more dominant as the stream left the valley floor. Upstream form the mouth of the Patit Cr on the Touchet the mixed conifer forestland would have inter-mingled with cottonwood galleries. Large wood in the stream would have been very common here due to low gradients and input from upstream as well as locally. Logjams and beaver ponds would have been very frequent. Off-channel habitat would have increased as over the years the river cut and re-cut across the valley up to the forks.

Lower NF and SF Touchet would have been similar to the area below the fork, however, as elevation increased beaver would have decreased; riparian areas and side slopes change to heavier and heavier mixed conifer forest. Large wood would have been prevalent in the stream creating a pool/tail-out/riffle stream types with small cobble dominating giving way to more classic step-pool stream type as elevation increased. Sediment and embeddedness here, as throughout the upper Touchet watershed, would have been minimal due to heavy forested canopy and ground cover in the upland areas. Lower Wolf Fork would have been much like lower NF and SF Touchet. A great deal of wood would have deposited here; woody shrubs, cottonwood and mixed conifer would have cast a thick canopy over an ever changing beaver and wood engineered channel. This would quickly give way to the heavier wooded areas with interspersed meadows as elevation increased. The area from Robinson Cr up would look very much as the upper watershed does today (beginning a mile or two above Whitney). The stream would have been very complex with wood/step-pools and riffles very common. Movement along the stream would be difficult through the large wood and wood jams within and over the banks. Snow and water retention in the Touchet watershed would have been increased over current conditions. This would have increased summer flows throughout the system. The stream at this elevation would have been very complex with lots of wood of all sizes. Step pool reaches would have been very common. Temperatures would have remained cool even in the summer in most years.

Back on the mainstem Walla Walla upstream from the Touchet would still have been similar to below. Pools and side-channels would have been much more common as the stream formed, lost and reclaimed channels during its yearly lateral movement. The riparian area had a cottonwood gallery with associated shrubs and grasses. Outside of the riparian however, a shrub-steppe type ecosystem would quickly take over as you moved into the uplands. The riparian band of cottonwoods would have steadily grown wider as you gained elevation/rainfall approaching present day Walla Walla. Dry Cr would have been similar to the Walla Walla just above Touchet in its lower reaches. This would change as we approach present day Dixie; this short valley stretch to the forks has the rainfall and the gradient to have supported a very heavy growth of brush, grasses and mixed-conifer/cottonwood trees. Beaver and large quantities of wood would also have been prevalent here forming many pools with classic small-cobble riffles and tail-outs. This would have, in all likelihood have been the area with the highest concentration of fish use in Dry Creek. Temperatures would have been down and flows up during the summer as the upper watersheds and surrounding uplands would have had increased ground cover and a corresponding increase in ability to retain water into the summer, The stream would have changed quickly as it gained elevation and gradient at the forks. Small cobble riffles would turn to larger cobble riffles and wood formed step-pools would provide refuge. Bedscour in these areas would have been reduced as the hillsides and small riparian on the narrow valley floor would have held a larger quantity of wood and ground cover. This would have reduced the peak runoffs and given the canyon (particularly NF Dry Cr.) a much more stable bed and channel. SF Dry Cr would likely still have gone dry in most summers; however, it would have held water deeper into the year.

As we approach the present day city of Walla Walla on the mainstem Walla Walla River the widening valley would likely have been an almost continuous cottonwood gallery with other associated vegetation. The many springs and streams that fed the Walla Walla in this area would have created a riparian area that stretched from the north banks of Mill Creek nearly to the Washington border near Milton-Freewater, Oregon. Large wood would have been long-lived in this low gradient area and would have been supplied locally as well as imported from upper Walla Walla and Mill Creek. Beaver would have been abundant in the area. The cool water input in the summer and the amazing complexity of the environment would have made this area a prime juvenile rearing nursery for salmonids of all types. It was assumed that the Native American encampments would have had some, but minimal impact on the streams in this area. On the south bank of the Walla Walla, above the Oregon border, Mill Creek has much less impact; the small spring fed streams (E Little Walla Walla, W Little Walla Walla, etc.) keep this area in cool water and provide for a wide riparian band that likely stretched from stream to stream broken up only by an occasional meadow. The Walla Walla would have dominated the hydrology of most of these streams, inputting wood and scouring the channels during high-water events. Mill Creek below present day Bennington Dam would have been a part of the Walla Walla Valley complex. It would have changed channels from time to time and in many springs flowed out of its banks to claim the smaller spring fed creeks such as Garrison, Stone and Yellowhawk for a short time; greatly influencing the health of the streams in this area by inputting conifer wood and providing scouring flows to these channels. As we travel up the Mill Creek valley the watershed quickly narrows and gains in both elevation and precipitation. A heavy mixed conifer forest quickly dominates both the valley floor and the hillsides. The stream from here and on through Oregon is a classic old growth forest stream. Lots of big wood dominates the hydrology of the stream, as beaver are much less prevalent than in the valley below. The frequency of pools is somewhat decreased as you move upstream from the low gradient valley, but long stretches of small cobble riffle and wood caused tail-outs offer prime salmonid habitat. The upper watershed (above the city of Walla Walla water intake) looks much like it does today. Steep rugged terrain dominated by thick woodlands and overgrown streams.

Upstream from the Yellowhawk-Mill Creek complex of springs and streams, the Walla Walla river consisted of a primary channel (called the “Tum-A-Lum” branch) and several branching “distributaries,” which are regarded as a series of progressively dividing prongs of the “Little Walla Walla River,” which in turn divides from the Tum-A-Lum branch near the present city of Milton-Freewater. The Little Walla Walla is often joined by spring-fed streams, and eventually re-joins the Main Stem Walla Walla River at various locations between the Mill Creek and Touchet River confluences.

As the largest conduit of flow in the system, the Tum-A-Lum branch would have maintained a large and complex riparian area, consisting of extended cottonwood galleries and smaller deciduous species such as well nearest the wetted channel. This area would have supported a substantial beaver population, and although high flows would have prevented large accumulations of woody debris, occasional log jams along the channel margins and continuous recruitment would have provided complexity to channel form and function. Pools and side-channels would have been much more common as the stream formed, lost and reclaimed channels during its yearly lateral movement.

Similar in form and function to the Yellowhawk-Mill Creek complex of streams and springs, the Little Walla Walla River system would have been heavily influenced by the

Walla Walla river main stem, although they would have remained as distributaries throughout the year. The many springs and streams in this area would have created a riparian zone that stretched from the Tum-A-Lum branch in the east to lower Pine Creek in the west, seperated in places by grasslands and shrub-steppe associations farther to the west. Moderate-sized wood would have been long-lived in this low gradient area and primarily supplied locally, although some large wood may have traveled from the Main Stem as well. Beaver would have been abundant in the area, exerting a profound influence on the hydrology of these small, low-gradient streams. The high influence of groundwater in this area enabled cool water input in the summer, and the complexity of the environment would have made this area a prime juvenile rearing nursery for salmonids of all types. The Main Stem Walla Walla would have influenced the hydrology of most of these streams to some extent, probably inputting wood and shaping the channels during high-water events, although the low gradient of the area would have discouraged extensive and frequent channel shaping events. It is assumed that the Little Walla Walla remained a distributary of the Walla Walla River in most years.

The Couse Creek drainage itself would have featured thick riparian growth of shrubs, cottonwoods, with some mixed conifers growing more prevalent in mid elevations. After several miles this would have quickly given way to primarily conifer growth, which would have been thick on north facing slopes and more woodland/grasslands on south facing slopes. The riparian areas would have been heavily wooded giving the stream a steady input of LWD and adding to its complexity and pool ratios (which would have been high).

The Mainstem Walla Walla River upstream of the Little Walla Walla River divergance would have quickly changed from brushy/cottonwood riparian growth and grassland uplands to mixed conifer and deciduous forest as it approached the forks. The stream would have been thick with wood as input to the stream would have been more common and featured larger pieces than below; this combined with beaver and low-to-moderate gradients would have given the area moderately long-lived LWD, with log jams being common.

The lower reaches of the Walla Walla Forks (North and South) would have been similar to the reaches below; however, as elevation increased beaver would have decreased; riparian areas and side slopes change to heavier and heavier mixed conifer forest. The riparian areas would have been heavily wooded giving the stream a steady input of LWD and adding to its complexity and pool ratios. Large wood would have been prevalent in the stream creating a pool/tail-out/riffle stream types with small cobble dominating giving way to more classic step-pool stream type as elevation and gradient increased. Sediment and embeddedness here, as throughout the upper Walla Walla watershed, would have been minimal during most periods due to extensive forest and grassland ground cover in the upland areas. Higher amounts of large wood dominates the hydrology of the stream, as beaver are much less prevalent than in the valley below. The frequency of pools is somewhat decreased as you move upstream from the low gradient valley, but long stretches of small cobble riffle and wood-related tail-outs offer prime salmonid habitat. The upper watershed above the National Forest boundary looks much like it does today. Steep rugged terrain dominated by thick woodlands and riparian vegetation extending well over most streams.

In many areas of moderate to high gradient, bed scour would have been reduced historically, as the hill sides and small riparian on the narrow valley floor would have held a larger quantity of wood and ground cover. This would have reduced the peak runoffs and given the canyon (particularly NF Walla Walla River.) a much more stable bed and channel.

The watershed as a whole was considered to have been ecologically fit for the species of fish that were likely to have resided here (i.e. the focal species) and would have allowed them to thrive. It was generally assumed that in the summer water temperatures would have been lower and flows higher. Large wood was assumed to have been much more prevalent throughout the watershed as were the pools they help to create. Beaver was also thought to have been present in good numbers, particularly in the lower elevations. Connection to the floodplain would have been complete (except natural confinement), increasing riparian function and particularly the complexity of the stream.

Table 4-3. Walla Walla River geographic areas and description of assumed conditions used for rating EDT template attributes.

Geographic Area	Assumed Template Conditions
Lower Walla Walla (mouth to Touchet)	Heavy cottonwood galleries near the Columbia, but willows and brush upstream to the Touchet; many beaver ponds, low gradient = persistent LWD; well developed and accessible floodplain; some increase in flow due to better ability to retain water in the watershed; increased bank-full widths due to increased floodplain access. Riparian area lessening in width as approaches Touchet.
Lower Touchet (mouth to Coppei)	Narrow, but intact cottonwood and willow riparian belt in lower section; widening and canopy thicker as it approaches Coppei Cr. Wood and beaver more prevalent, particularly in upper portion. Uplands shrub-steppe moving into grasslands.
Coppei Drainage	Mostly heavy brushed area with interspersed cottonwood galleries. Many beaver ponds, low gradient = persistent LWD; well developed and accessible floodplain; some increase in flow due to better ability to retain water in the watershed. North and south Fork would have less beaver influence, more step-pools and be heavily wooded in riparian.
Touchet, Coppei to forks (plus Whiskey)*	Wide, well developed riparian zone, beaver still present influencing the stream to a large degree. Frequent oxbows and greater off-channel habitat as the stream move laterally across the valley floor. Wood is persistent and diverse; frequent pools and increased small-cobble riffle
Patit Drainage	Lower section meandering meadow-type stream; undercut banks; many beaver ponds and frequent LWD. Upper section higher gradient LWD present but not as persistent; less beaver; more conifer growth
NF Touchet Mainstem	Woodland fading into heavy forest and beaver less common as move upstream; LWD common throughout; pools frequent in lower section; upper section extremely complex with wood/tees/heavy woody shrubs.
NF Touchet Tribs (excluding Wolf Fork)	All tribs lower gradient; upper tribs thick with "doghair" timber; lower tribs more woodland/meadow type; wood present; stream has few riffles, classic step-pool configuration in upper reaches

Wolf Fork, mouth to Coates (plus Robinson & Coates)	Well developed and occasionally very heavy forested area; large and long lived woody debris common with frequent jams; complex stream make up with frequent pools; well developed and diverse riparian with almost complete canopy cover;and cool water into summer.
Wolf Fork, Coates to access limit (plus Whitney)	very heavy forested area with occasional meadows; large and long lived woody debris; complex stream make up with frequent pools; well developed and diverse riparian with almost complete canopy cover; snow retention and cool water into summer.
SF Touchet Mainstem	Well developed and occasionally very heavy forested area; large and long lived woody debris common with frequent jams; complex stream make up with frequent pools; well developed and diverse riparian with almost complete canopy cover;and cool water into summer. Beaver present in lower sections
SF Touchet Tribs	All tribs lower gradient; upper tribs (Green and Burnt) are classic high mountain streams with lots of LWD and well developed pool/riffle ratio; lower tribs still high gradient; step-pools and heavy wood; stream has complete canopy cover
Walla Walla, Touchet to Dry (plus Mud Cr)	Narrow willow-cottonwood-shrub dominated riparian band bordered by shrub-steppe; very meandering in places; LWD present, though not thick; meander pools and oxbows relatively frequent.
Pine Cr mainstem (plus Swartz)	Stream meanders through a shrub-steppe/grassland transition area; wood infrequent, but long-lived; riparian band mostly shrubs and grasses with occasional cottonwood gallery; unconfined stream features meanders and occasional cutting. Higher elevation more woodland type; increased canopy cover in riparian area; increased ground cover in uplands.
Dry Cr [Pine] Drainage	Stream meanders through a shrub-steppe/grassland transition area; wood infrequent, but long-lived; riparian band mostly shrubs and grasses with occasional cottonwood gallery; unconfined stream features meanders and occasional cutting.
Lower Dry Cr (mouth to Sapolil)	Stream meanders through a shrub-steppe/grassland transition area; wood infrequent, but long-lived; riparian band mostly shrubs and grasses with occasional cottonwood gallery; unconfined stream features meanders and occasional cutting.
Upper Dry Cr (Sapolil to forks)	Lower end heavy brush; strong meander; some woody growth; frequent pools and beaver. Woody/brush growth much thicker near forks; pools still frequent and well-developed; LWD more common with local and outside input.
Dry Cr Tribs (Mud[Dixie], Mud[Dry], NF Dry & SF Dry)	NF and SF Dry steep, step-pool environment with a highly active channel and frequent wood. Riparian slope to slope and heavily timbered. Mud (Dixie) similar though upper reaches more heavily brushed than timbered. Mud (Dry) similar to Lower Dry.
Walla Walla, Dry to Mill	Heavy cottonwood galleries; many beaver ponds, low gradient = persistent LWD; well developed and accessible floodplain; some increase in flow due to better ability to retain water in the watershed;
W Little Walla Walla Drainage (plus Walsh)	Riparian and floodplain areas heavy with cottonwoods, willows and shrubs. Spring influenced stream with cool waters in summer; frequent floods in spring by the Walla Walla River maintains the channel; most years a distributary of the Walla Walla; LWD frequent and long-lived; beaver present
Mill Cr, mouth to start	Cottonwood galleries; many beaver ponds, low gradient = persistent

of Corps Project at Gose St	LWD; woody shrub growth present; well developed and accessible floodplain; stream probably frequently changed channels
Lower Mill Cr Tribs (Doan & Cold)	Spring fed streams; most likely cooler in summer and somewhat warmer in winter; brush and willows prevalent; some woody growth; off-channel prime beaver habitat, increased pools (beaver).
Mill Cr, Gose Street to Bennington Dam	Cottonwood galleries; many beaver ponds, low gradient = persistent LWD; woody shrub growth present; well developed and accessible floodplain; stream probably frequently changed channels.
Mill Cr, Bennington Dam to Blue Cr (plusTitus)	Heavy cottonwood and other tree growth giving way to mixed conifer. LWD frequent; pools frequent as well as long small cobble reffiles; weel-developed pool-tailouts; frequent off-channel created by dynamic stream channel
Blue Cr Drainage (including L. Blue)	Complex pooled area near mouth; LWD created pools higher up; areas of tail-outs and riffles (small to large) present; higher elevation thickly wooded and step-pool environment
Mill Cr, Blue Cr to Walla Walla water intake	Well developed mixed conifer/cottonwood to woodland conifer as elevation increases; well-developed and accessible riparian areas; increased LWD; sediment and flashiness of stream much less due to well developed forest canopy cover and ground cover.
Middle Mill Cr Tribs (Henry Canyon, Webb &Tiger)	All tribs lower gradient; upper tribs thick with “doghair” timber; lower tribs more woodland/meadow type; wood present; stream has few riffles, classic step-pool configuration in upper reaches
Mill Cr, Walla Walla water intake to access limit	Well developed and occasionally very heavy forested area; large and long lived woody debris; complex stream make up with frequent stepnad LWD pools; well developed and diverse riparian with almost complete canopy cover; snow retention and cool water into summer.
Upper Mill Tribs (NF, Low, Broken, Paradise)	Much like today; heavily forested and stream channel thick with woody debris. Cool flows all summer; snow retention in upper areas
Walla Walla, Mill to E L. Walla Walla (plus MacAvoy & Springbranch)	Cottonwood riparian area very wide and thick; LWD frequent and long-lived; beaver present though not as heavy as off the main channel; large pool; and long tai-louts predominate. Side springs cool all summer.
Garrison Cr Drainage (plus Bryant)	Present day Walla Walla urban area; cottonwood/willow/shrub riparian area extends through out are; frequent pools; wet meadows and deep undercut banks in all streams, spring source area provides cool rearing area in summer and modified temperatures in winter LWD frequent and long-lived.
Stone Cr Drainage	Present day Walla Walla urban area; cottonwood/willow/shrub riparian area extends through out are; frequent pools; wet meadows and deep undercut banks in all streams, spring source area provides cool rearing area in summer and modified temperatures in winter; LWD frequent and long-lived.
E Little Walla Walla Drainage (plus Unnamed Spring & Big Spring Br)	Riparian and floodplain areas heavy with cottonwoods, willows and shrubs. Spring influenced stream with cool waters in summer; frequent floods in spring by the Walla Walla River maintains the channel; most years a distributary of the Walla Walla; LWD frequent and long-lived; beaver present
Walla Walla, E Little Walla Walla to Tumalum Bridge	Heavy cottonwood galleries; extensive beaver activity but few ponds; lower gradient = persistent LWD; well developed and accessible floodplain; some increase in flow due to better ability to retain water in the watershed; increased bank-full widths due to increased floodplain access.

Yellowhawk mainstem (mouth to source)	Present day Walla Walla urban area; cottonwood/willow/shrub riparian area extends through out area connecting with the riparian areas of Mill Cr, Yellowhawk as well as the Stone and Garrison; frequent pools; wet meadows and deep undercut banks in all streams, spring source area provides cool rearing area in summer and modified temperatures in winter. Beaver frequent; lower area near Walla Walla River less heavily wooded; frequent shrubs and meadows; frequent channel changes.
Yellowhawk Tribs (Lassater, Russell, Reser & Caldwell)	All tribs feature running water in summer; mostly spring influenced; increased cover in uplands and riparian allows for better water retention. Frequent meandering in lower sections; riparian belts quite wide, at times intersecting with the riparian areas in what is present day Walla Walla and Yellowhawk forming an unbroken area of cottonwood galleries; LWD frequent and long-lived.
Cottonwood Cr Drainage (including NF, SF & MF)	Running water in summer; mostly spring influenced; increased cover in uplands and riparian, plus beaver allows for better water retention. Frequent meandering in lower sections; riparian belts quite wide. Upper sections forested and timbered in heavily brushed canyons. LWD present and prevalent.
Birch Creek Drainage	Heavy cottonwood galleries; extensive beaver activity but few ponds; lower gradient = persistent LWD; well developed and accessible floodplain; some increase in flow due to better ability to retain water in the watershed; increased bank-full widths due to increased floodplain access.
Walla Walla, Tumalum Bridge to Nursery Bridge	Heavy cottonwood galleries; extensive beaver activity but few ponds; lower gradient = persistent LWD; well developed and accessible floodplain; some increase in flow due to better ability to retain water in the watershed; increased bank-full widths due to increased floodplain access.
Walla Walla, Nursery Br to Little Walla Walla Diversion	Well developed cottonwood and willow-dominated riparian area; increased LWD; increased pools; higher flows and cooler water in summer due to well developed riparian and increased canopy cover in sub-watershed; increased pools; increased LWD; sediment reduced mainly due to better upland ground cover (forest and meadows) increased bank-full widths due to greater floodplain access (less confinement).
Walla Walla, Little Walla Walla Diversion to forks	Well developed cottonwood and willow-dominated riparian area; increased LWD; increased pools; higher flows and cooler water in summer due to well developed riparian and increased canopy cover in sub-watershed; increased pools; increased LWD; sediment reduced mainly due to better upland ground cover (forest and meadows) increased bank-full widths due to greater floodplain access (less confinement).
Couse Creek Drainage	well developed mixed conifer/cottonwood to woodland conifer as elevation increases; well-developed and accessible riparian areas; increased LWD; sediment and flashiness of stream somewhat less due to well developed forest canopy cover and ground cover.
NF Walla Walla, mouth to L. Meadows Canyon Cr (plus L. Meadows)	Some cottonwood growth changing to mixed conifer higher in area; LWD input locally and from above; increased pools; higher flows and cooler water in summer due to well developed riparian locally and upstream; some beaver; sediment reduced mainly due to better upland ground cover (forest and grasslands); increased bank-full widths due to greater floodplain access (less confinement).
NF Walla Walla, L. Meadows to access limit (plus Big Meadows)	Some cottonwood growth changing to mixed conifer higher in area; LWD input locally and from above; increased pools; higher flows and cooler

	water in summer due to well developed riparian locally and upstream; some beaver; sediment reduced mainly due to better upland ground cover (forest and grasslands); increased bank-full widths due to greater floodplain access (less confinement).
SF Walla Walla, mouth to Elbow Creek	Some cottonwood growth changing to mixed conifer higher in area; LWD input locally and from above; increased pools; higher flows and cooler water in summer due to well developed riparian locally and upstream; some beaver; sediment slightly reduced mainly due to better upland ground cover (forest and grasslands); increased bank-full widths due to greater floodplain access (less confinement).
Lower SF Walla Walla Tribs (Flume Canyon, Elbow)	Well developed and occasionally very heavy forested area; large and long lived woody debris; complex stream make up with frequent pools; well developed and diverse riparian with almost complete canopy cover; snow retention and cool water into summer.
Skiphorton & Reser Creek Drainages	Well developed and occasionally very heavy forested area; large and long lived woody debris; complex stream make up with frequent pools; well developed and diverse riparian with almost complete canopy cover; snow retention and cool water into summer.LWD.

We characterized three baseline reference scenarios for the Walla Walla Subbasin; predevelopment (historic or template as described above) conditions, current conditions, and properly functioning conditions (PFC). The comparison of these scenarios formed the basis for diagnostic conclusions about how the Walla Walla and associated summer steelhead performance have been altered by human development. The historic reference scenario also served to define the natural limits to potential recovery actions within the basin. Properly functioning conditions were a set of standardized guidelines that NOAA Fisheries provided that were designed to facilitate and standardize determinations of the effect for Endangered Species Act (ESA) conferencing, consultations, and permits focusing on anadromous salmonids (Stelle 1996). The objective of the diagnosis then became identifying the relative contributions of environmental factors to the losses in summer steelhead performance. To accomplish this, we performed two types of analyses, each at a different scale of overall effect.

The first analysis considered conditions within *individual stream reaches* and identified the most important factors contributing to a loss in performance corresponding to each reach. This analysis, called the *Stream Reach Analysis* (Appendix X), identified the factors (classes of Level 2 attributes) that, if appropriately moderated or corrected, would produce the most significant improvements in overall fish population performance. It identified the factors that should be considered in planning habitat restoration projects.

The second analysis was done *across geographic areas* relevant to populations, where each geographic area typically encompasses many reaches. This analysis, called the *Geographic Area Analysis*, identified the relative importance of each area for either restoration or protection actions. These results were available in two forms, scaled and unscaled. Briefly, scaled results take into account the length of the geographic area being analyzed. It does this by taking the original out put from EDT (i.e. percent productivity change, etc.) and dividing it by the length of stream in kilometers. This gives a value of the condition being measured per kilometer. The unmodified results are termed unscaled. Both results are presented here; though the scaled version was given more weight in the conclusions portion of the assessment.

A Reach Analysis identifies the life stages most severely impacted (relative to historical performance) on a reach-by-reach basis, as well as the environmental conditions most responsible for the impacts. This three-part diagnosis can then be used to develop a plan designed to protect areas critical to current production, and to implement effective restoration actions in reaches with the greatest production potential.

The first pair of charts in Appendix X describe this analysis in greater detail. The rest of the charts in Appendix X consist of the Reach Analysis for the Walla Walla Subbasin. The Reach Analysis is intended to serve as a reference tool to be used in all types of watershed planning related to salmon conservation and recovery.

4.3 Focal Species Summer Steelhead/ Rainbow Trout (O. mykiss)

Summer steelhead spawning in the Walla Walla subbasin include the Walla Walla and Touchet stocks.

4.3.1 Life history

Summer steelhead spawners generally enter the Walla Walla system from September through April or May. Steelhead are unable to ascend the Walla Walla and Touchet rivers beyond the mouth of the Touchet until December in most years because of insufficient stream flow (Glen Mendel, WDFW, personal communication).

Most spawners are age three or four, but a small proportion spawn at age five. Table 4-4 shows spawner ages and life histories in the Walla Walla at Nursery Bridge Dam. Figure 4-3 shows the age distribution and ocean classifications for the Touchet River.

Table 4-4. Analysis of scales collected from adult summer steelhead trapped at Nursery Bridge Dam on the Walla Walla River (Oregon Department of Fish and Wildlife data from CTUIR et al. 2001).

Life History Pattern	Percent		
	1992-1993	1993-1994	1994-1995
2/1	24.0	21.0	13.6
2/2	63.0	56.0	63.6
2/3	2.6	0.1	3.0
3/1	2.6	6.9	9.1
3/2	7.8	14.0	10.6
2/4	0.0	2.0	0.0
1 salt	26.0	27.8	22.7
2 salt	71.0	68.7	74.2
3 salt	3.0	1.7	3.0
4 salt	0.0	1.7	0.0
Repeat Spawners	8.0	3.5	9.1

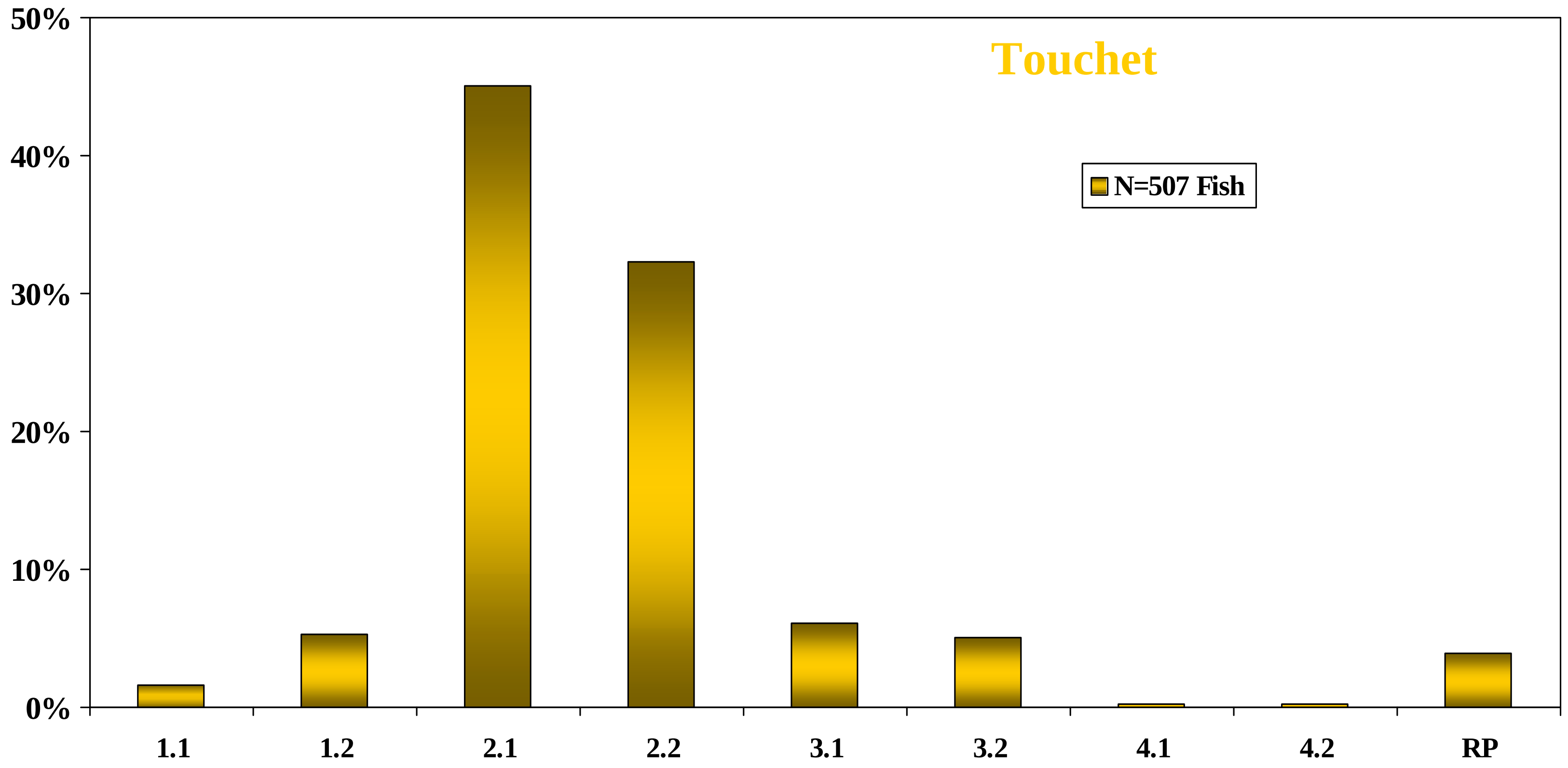

Figure 4-2. Percentages of freshwater and ocean age classifications of naturally-produced steelhead from the Touchet trap in Dayton, WA (1.2 means 1 year in fresh water and two years in salt water; RP means repeat spawner). Data from Joe Bumgarner, WDFW, Pers. Comm.

Most spawning occurs from February through May or early June (James and Scheeler 2001, Mendel et al. 2003) with a peak from April to mid-May. The percentage of repeat spawners in the Walla Walla system is higher than elsewhere in the mid-Columbia region, averaging about 7% on the Oregon side of the basin (James and Scheeler 2001).

Fry are thought to remain in spawning gravels through June or July (James and Sheeler 2001). Most juveniles in samples from Oregon spend two winters in freshwater. Less commonly juveniles spend one, three or four winters in freshwater.

4.3.2 Historical and Current Distribution

There is no information on historical distribution of summer steelhead in the Walla Walla basin. Currently steelhead are found wherever accessible suitable habitat exists (James and Scheeler 2001) (See Figure 4-3). It is likely that they were distributed more widely than at present.

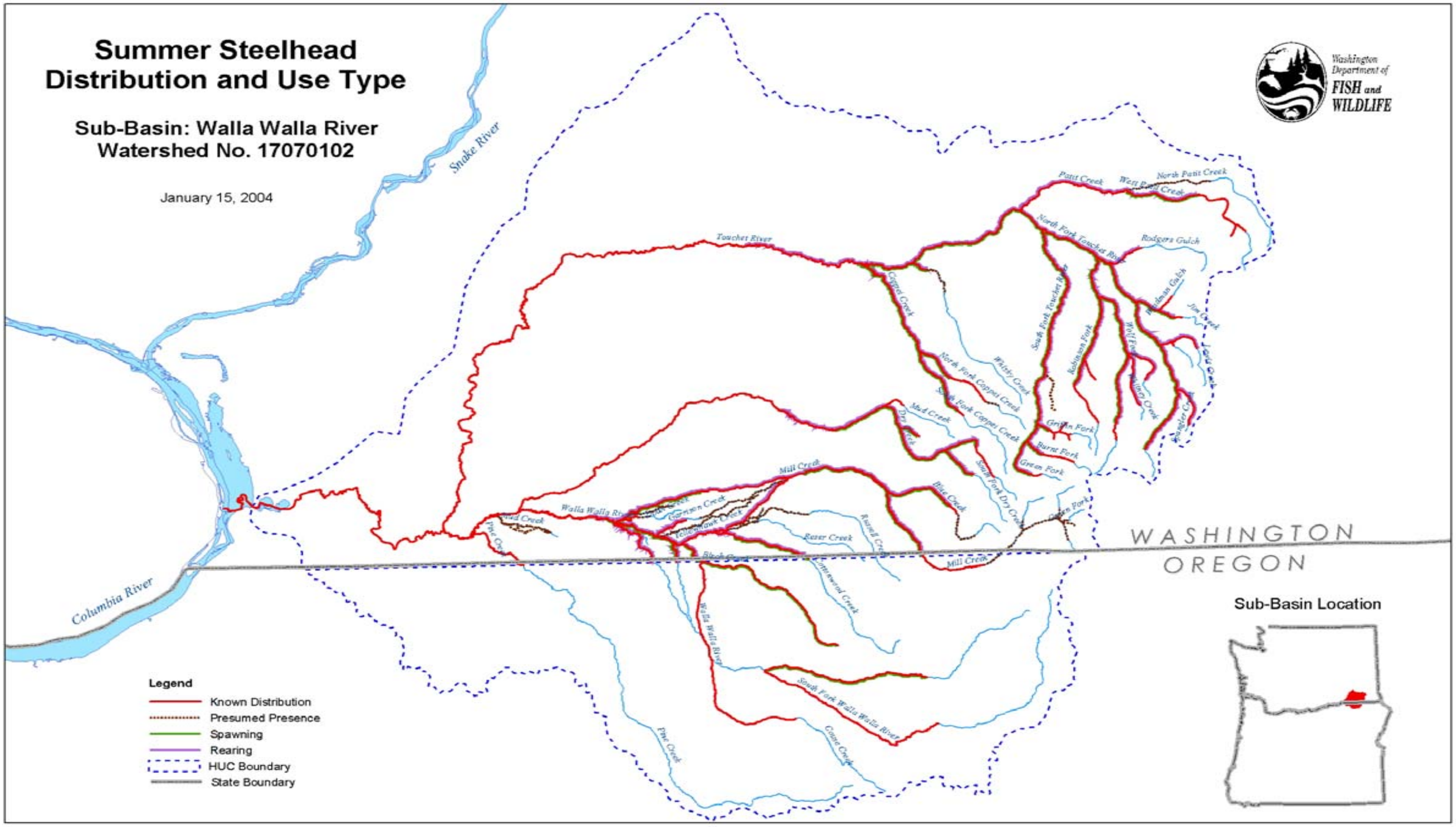

Figure 4-3. Current known and presumed distribution of summer steelhead in the Walla Walla River. Data from the WDFW Washington Lakes and Rivers Information System (WLRIS) database.

Distribution is limited by summer low flows and high water temperatures. In the Walla Walla River, juveniles are restricted in the summer to the mainstem Walla Walla and tributaries upstream from the mouth of Mill Creek and in Mill Creek and its tributaries. In the Touchet spawning occurs primarily upstream from the confluence with Coppei Creek, especially in the North Fork Touchet, South Fork Touchet, Wolf Fork and Robinson Fork, where water temperatures and fine sediments are lower than in the lower river (James and Scheeler 2001). Juveniles are occasionally found in the mainstem Touchet downstream from the confluence with Coppei Creek but not in the lower river in the summer (Mendel et al 2000). The lower Walla Walla and Touchet appear to be used only as migration corridors.

4.3.3 Population Identification

Genetic characteristics of Walla Walla River and Touchet River summer steelhead have been assessed using several methods and have been analyzed comparatively by WDFW and other researchers. Allozyme genetic data were obtained from juveniles sampled in both rivers in 1985 and were reported in Schreck et al. (1986). These same samples and data were analyzed by Currens (1997) and he found that Touchet River *O. mykiss* were genetically distinct from those elsewhere in the Walla Walla basin. Juvenile *O. mykiss* were sampled in the Touchet River again in 1995 and provided allozyme, microsatellite DNA, and intron DNA genetic data, and comparative genetic analyses showed the Touchet population to be significantly differentiated from all other Mid-Columbia and Snake River Basin steelhead populations included in the studies (Phelps et al. 1997; Winans et al. in press).

From 1999 to 2002 more extensive sampling for steelhead was done throughout the Walla Walla subbasin. Touchet River wild-origin summer steelhead adult samples were collected at the Touchet River trap at Dayton, and juveniles samples were collected in Coppei Creek, Robinson Creek, Wolf Fork, North Fork Touchet River and South Fork Touchet River. Walla Walla River wild-origin adult summer steelhead were sampled primarily from the Upper Walla Walla River, and upper Mill Creek. These samples have been analyzed for microsatellite DNA variation and results from these analyses confirmed genetic differentiation between Walla Walla and Touchet river populations (Narum et al. In press., Bumgarner et al. 2004) and between Lyons Ferry Hatchery and wild steelhead in the Walla Walla Basin (Bumgarner et al. 2004).

Walla Walla Basin steelhead were placed in the Mid-Columbia River Steelhead Evolutionarily Significant Unit (ESU; Busby et al. 1996). The Interior Columbia Technical Recovery Team (TRT), a work group organized by NOAA Fisheries (NMFS) for ESU recovery planning, has preliminarily identified Walla Walla River and Touchet River steelhead as independent populations in relation to all other Mid-Columbia River steelhead, based on consideration of genetic, geographic, phenotypic, environmental, and demographic data available (Interior Columbia Basin TRT, unpublished draft document July 2003). The TRT's 'independent population' designation does not preclude the existence of sub-populations that may still be relatively distinct genetically even though they may be less reproductively isolated from other such units. The pending analyses mentioned above may help distinguish sub-populations within either river if they occur.

4.3.4 Walla Walla River Steelhead/Rainbow Trout Population

4.3.4.1 Population Characterization.

4.3.4.1.1 Empirical Data

Steelhead are widely distributed within the Walla Walla Subbasin and exist wherever habitat is suitable. Generally, steelhead to do not use the lower stream reaches of the Walla Walla River, Dry Creek, or the Touchet River during summer because of poor habitat conditions and high water temperatures. WDFW, ODFW and CTUIR have collected fish distribution and relative abundance data for several years within the Walla Walla Subbasin. However, data are limited or are not available for some stream reaches.

Examination of the empirical juvenile steelhead data (Table 4-5) reveals that Coppei, Patit, the North Fork Touchet and its tributaries, Wolf Fork, South Fork Touchet and its tributaries, that portion of Mill Creek upstream of Bennington Dam, and Blue Creek, and the portion of the Walla Walla River from the East Little Walla Walla River mouth (in WA) to Tumalum Bridge (in Oregon) have the highest densities of age 1+ and older steelhead per mile. This tends to highlight the areas that likely produce the most smolts per mile within the WA portion of the subbasin. Many of the high age 1+ steelhead production areas (based on juveniles per mile) are listed by EDT has the highest restoration or protection priorities.

The adult run size of naturally produced steelhead in the subbasin can be roughly estimated by pooling various counts and spawning estimates. If the average number of naturally produced steelhead that escaped upstream of Nursery Bridge in Oregon (Table 4-6) for 1996/97 through 2000/01, plus the average estimated escapement above the Dayton trap for 1998 through 2001 (Table 4-7), plus the average escapement into Coppei Creek for 1999 and 2000 (39 redds on average x 2 fish per redd), plus another 100 steelhead for spawning elsewhere are combined, an estimate of 864 naturally produced fish generally spawn in the Walla Walla Subbasin:

441 from Nursery Bridge escapement estimate (ave. for ’96-01)
245 from Dayton escapement estimate (ave. for ’98-01)
78 from Coppei Creek (based on ave. redd surveys for ’99 and ‘00)
100 rough guess for spawning elsewhere in the subbasin (Dry Cr, Patit Cr, Mill Cr, Cottonwood Cr, Yellowhawk Cr., etc.)
-----
864 estimated total steelhead in the subbasin (naturally produced only)

Table 4-5. Walla Walla Subbasin juvenile steelhead/rainbow trout population estimates based on average juvenile densities per geographic area; from Glen Mendel, WDFW. * data is from Paul Sancovich WDFW.

Geographic Area	Length (miles)	km	Weighted Mean Width (ft)	m	Area ($100m^2$)	Rainbow/steelhead Ave. Total Density (#/$100m^2$)	Pop. Estimate	Age 1+ Ave. Total Density (#/$100m^2$)	Age 1+ Pop. estimate
Lower Walla Walla (mouth to Touchet)	20.79	33.4719	68.4	20.84832	6978.329	NA	NA	NA	NA
Lower Touchet (mouth to Coppei)	50.83	81.8363	43.9	13.38072	10950.29	0	0	0	0
Coppei Drainage	23.1	37.191	11.8	3.59664	1337.626	49.68	66,453	14.09	18,847
Touchet, Coppei to forks (plus Whiskey)	21.87	35.2107	26.7	8.13816	2865.503	17.77	50,920	1.57	4,499
Patit Drainage *	8.5	13.685	3.2	0.97536	133.478	101.1	13,495	61.1	8,156
NF Touchet Mainstem	18.85	30.3485	23.1	7.04088	2136.801	35.71	76,305	11.79	25,193
NF Touchet Tribs (excluding Wolf Fork)	8.11	13.0571	8.4	2.56032	334.3035	21.52	7,194	14.58	4,874
Wolf Fork, mouth to Coates (plus Robinson & Coates)	16.06	25.8566	17.3	5.27304	1363.429	37.89	51,660	11.45	15,611
Wolf Fork, Coates to access limit (plus Whitney)	7.43	11.9623	17.3	5.27304	630.7769	15.45	9,746	8.4	5,299
SF Touchet Mainstem	15.93	25.6473	18.7	5.69976	1461.835	36.34	53,123	12.65	18,492
SF Touchet Tribs	9.86	15.8746	7.4	2.25552	358.0548	46.94	16,807	12.31	4,408
Walla Walla, Touchet to Dry (plus Mud Cr)	9.54	15.3594	17.7	5.39496	828.6335	0	0	0	0
Pine Cr mainstem (plus Swartz)	31.77	51.1497	4.1	1.24968	639.2076	NA	NA	NA	NA
Dry Cr [Pine] Drainage	19.04	30.6544	0.2	0.06096	18.68692	0	0		0
Lower Dry Cr (mouth to Sapolil)	24.1	38.801	7.6	2.31648	898.8174	0	0	0	0
Upper Dry Cr (Sapolil to forks)	10.87	17.5007	5	1.524	266.7107	24.8	6,614	11.07	2,952
Dry Cr Tribs (Mud[Dixie], Mud[Dry], NF Dry & SF Dry)	15.2	24.472	3.1	0.94488	231.231	32	7,399	14.93	3,452
Walla Walla, Dry to Mill	6.64	10.6904	35.6	10.85088	1160.002	0.94	1,090	0.29	336
W Little Walla Walla Drainage (plus Walsh)	10.81	17.4041	3	0.9144	159.1431	0.8	127	0.17	27
Mill Cr, mouth to Gose St	5.39	8.6779	17.2	5.24256	454.9441	17.05	7,757	0.77	350
Lower Mill Cr Tribs (Doan & Cold)	7.78	12.5258	5.1	1.55448	194.7111	9.1	1,772	0	0
Mill Cr, Gose Street to Bennington Dam	11.36	18.2896	22.6	6.88848	1259.875	0.97	1,222	0.68	857
Mill Cr, Bennington Dam to Blue Cr (plusTitus)	6	9.66	32.6	9.93648	959.864	26.7	25,628	9.69	9,301
Blue Cr Drainage (including L. Blue)	7.57	12.1877	17.7	5.39496	657.5215	43.95	28,898	29.65	19,496
Mill Cr, Blue Cr to Walla Walla water intake	8.62	13.8782	24.3	7.40664	1027.908	24	24,670	9.02	9,272
Middle Mill Cr Tribs (Henry Canyon, Webb &Tiger)	7.87	12.6707	1.3	0.39624	50.20638				0
Mill Cr, Walla Walla water intake to access limit**	5.77	9.2897	17.2	5.24256	487.0181		1,731		1,731

Upper Mill Tribs (NF, Low, Broken, Paradise)***	6.2	9.982	3.7	1.12776	112.573		1,039		1,039
Walla Walla, Mill to E L. Walla Walla (plus MacAvoy & Springbranch)	5.97	9.6117	23.7	7.22376	694.3261	4.65	3,229	0.5	347
Garrison Cr Drainage (plus Bryant)	11.86	19.0946	7	2.1336	407.4024	0.47	191	0.19	77
Stone Cr Drainage	7.84	12.6224	3.2	0.97536	123.1138	0	0	0	0
E Little Walla Walla Drainage (plus Unnamed Spring & Big Spring Br)	12.17	19.5937	4	1.2192	238.8864	5.18	1,237	1.12	268
Walla Walla, E Little Walla Walla to Tumalum Bridge	4.87	7.8407	37.8	11.52144	903.3615	7.58	6,847	2.13	1,924
Yellowhawk mainstem (mouth to source)	8.58	13.8138	15.8	4.81584	665.2505	5.68	3,779	2.39	1,590
Yellowhawk Tribs (Lassater, Russell, Reser & Caldwell)	14.36	23.1196	3.7	1.12776	260.7336	2.1	548	2.1	548
Cottonwood Cr Drainage (including NF, SF & MF)****	18.06	29.0766	4.1	1.24968	363.3645	75.41	27,401	2.1	763
Birch Creek Drainage	7.72	12.4292	0.06	0.018288	2.273052				
Walla Walla, Tumalum Bridge to Nursery Bridge	2.35	3.7835	53	16.1544	611.2017				
Walla Walla, Nursery Br to Little Walla Walla Diversion	1.25	2.0125	30.6	9.32688	187.7035				
Walla Walla, Little Walla Walla Diversion to forks	4.87	7.8407	52	15.8496	1242.72				
Couse Creek Drainage	14.21	22.8781	0	0	0				
NF Walla Walla, mouth to L. Meadows Canyon Cr (plus L. Meadows)	9.95	16.0195	16.7	5.09016	815.4182				
NF Walla Walla, L. Meadows to access limit (plus Big Meadows)	11.51	18.5311	4.4	1.34112	248.5243				
SF Walla Walla, mouth to Elbow Creek	9.88	15.9068	59.1	18.01368	2865.4				
Lower SF Walla Walla Tribs (Flume Canyon, Elbow)	5.49	8.8389	0.5	0.1524	13.47048				
SF Walla Walla, Elbow to access limit	17.9	28.819	35.5	10.8204	3118.331				
Upper SF Walla Walla tribs (excluding Skiphorton & Reser)	14.42	23.2162	1.1	0.33528	77.83928				
Skiphorton & Reser Creek Drainages	4.76	7.6636	1.4	0.42672	32.70211				
							496,884		159,709

* Length and area reduced by to 8.5 miles (from 19.29) because most of the drainage is dry in summer.

** Total rainbow/steelhead trout population estimates for Mill Creek upstream of the Walla Walla intake dam in 2002 from Paul Sancovich, ODFW (March 2004).

*** Total rainbow/steelhead trout population estimates for Low, Paradise, North Fork and Bull Cr (upstream of of the Green Fork) in 2002 from Paul Sancovich, ODFW (March 2004).

**** Cottonwood Creek length reduced by 25% (from ### to ###) due to seasonally dry areas.

Table 4-6. Adult steelhead counts and escapement estimates for the Oregon portion of the Walla Walla River upstream of the Nursery Bridge Trap (Oregon Department of Fish and Wildlife 2004).

Run Year	Steelhead Counts				Estimated Escapement		
	Natural	Hatchery	Total	% Hatchery	Natural	Hatchery	Total
1992-1993	722	17	739	2.3	815	2	817
1993-1994	423	2	425	0.5	535	1	536
1994-1995	340	19	359	5.3	430	5	435
1995-1996	257	15	273	5.5	358	7	365
1996-1997	231	18	249	7.2	292	5	297
1997-1998	302	12	314	3.8	378	3	381
1998-1999	224	5	229	2.2	279	1	280
1999-2000	410	12	422	2.8	514	13	527
2000-2001	595	29	624	4.6	744	36	780
2001-2002	NA	NA	1205*	NA	NA	NA	1205*
2002-2003	NA	NA	547*	NA	NA	NA	547*

* Note: Counts in 2001-02 and 2002-03 were done by video taping through a viewing window. Hatchery versus wild fish are not distinguishable due to limited visibility. It is assumed that the count is total escapement. In 2002-03, poor passage conditions in the new right bank ladder prompted the reopening of the old west bank ladder with no fish sampling from February 21 through March 11. During this time it is unknown what number of fish may have passed upstream through the old ladder, therefore the 2002-03 count is incomplete.

It is important to note that the trap counts do not reflect actual escapement into the Oregon portion of the subbasin. Steelhead are able to jump over Nursery Bridge Dam and bypass the collection trap in the left bank fishway at some flows. Therefore, to provide an estimate of escapement, trapped steelhead have been marked with a punch either on the opercle or caudal fin. In some years, depending on conditions, kelts have been collected in the headworks of the Little Walla Walla Diversion or at the Nursery Bridge trap. Escapement estimates are based on the ratio of marked versus unmarked kelts. Mark recapture data have only been used in years when the number of kelt recoveries exceeded 5% of the trap count. Several years have had insufficient kelt recoveries. For these years, the escapement estimate is based on an average of data from years with sufficient recoveries. Of those recovered, unmarked kelts have ranged from 10 to 30% since 1992 (James and Scheeler 2001).

The WDFW Potential Parr Production model run in 2001estimated a carrying capacity of 1,390 naturally produced adult steelhead in the Washington portion of the Walla Walla Subbasin.

The empirical data suggests that about 864 steelhead escape on average to spawn in the subbasin, which is similar to the EDT estimate of 1,107 at the mouth of the Walla Walla River.

Table 4-7. Steelhead escapement estimates for portions of the Touchet River upstream of the Dayton Acclimation Dam trap site (J. Bumgarner, WDFW, February 2004).

Year	Natural	Hatchery	Total	% Natural
1987	334	29	363	92
1988	1006	88	1094	92
1989	214	19	233	92
1990	332	29	361	92
1991	193	17	210	92
1992	374	32	406	92
1993	484	36	520	93
1994	358	19	377	95
1995	388	96	484	80
1996			no information	
1997			no information	
1998	385	43	428	90
1999	184	27	211	87
2000	202	18	220	92
2001	211	47	258	82
2002	NA	NA	NA	NA
2003	NA	NA	NA	NA

Historically, the annual run size in the Walla Walla subbasin was estimated between 4,000–5,000 adults (Confederated Tribes of the Umatilla Indian Reservation 1990; Grettenberger 1992). Native steelhead are currently considered depressed in the Walla Walla subbasin (Washington Department of Fish and Wildlife 1993; Quigley and Arbelbide 1997b). ODFW believes the stock remains resilient and capable of reestablishment with limited or no hatchery intervention (Tim Bailey, ODFW, January 2001). The CTUIR believes that with the natural population experiencing a declining trend (currently at about 15% of previously estimated levels) and a closed fishery, hatchery supplementation and habitat actions will be necessary to achieve natural production and harvest objectives. The depressed status of native Walla Walla steelhead may be attributed to a variety of factors, but within the subbasin, most notably from habitat loss, insufficient water quantity, and poor water quality (specifically, stream temperatures in many areas). Their reduced abundance and distribution is also reflective of out-of-basin effects such as variable ocean conditions and migration losses at hydropower facilities.

4.3.4.1.2 EDT Analysis

Walla Walla Summer Steelhead Baseline Population Performance.—Two model runs were conducted for summer steelhead in the Walla Walla Subbasin, one for the mainstem (below the South Fork), and one for all the tributaries combined. These subpopulations were delineated based on differences in productivity between these habitat types and the effect that difference has on the Beverton-Holt stock recruitment curve used in the model.

Model results for Walla Walla Subbasin summer steelhead are based on life history assumptions summarized in (Table 4-8). The EDT model estimated a much smaller population in the mainstem, which is from the confluence of the North and South Fork Walla Walla to the mouth (41 adults) versus the tributaries (1066) and a productivity of just 1.3 adult returns per spawner in the mainstem versus 3.4 in the tributaries (Table 4-9). The life history diversity values indicated that only 1% (mainstem) and 8 % (tributaries) of the historic life history pathways could be successfully used under current conditions. The Walla Walla Subbasin had a much greater production potential for summer steelhead than it now displays, as historical abundance was estimated at 16,451 spawners, with a productivity of 14 and 19 returning adults per spawner in the mainstem and tributaries, respectively (Table 4-9). Historic life history diversity only reached 83 % because the population was modeled in two runs, and the cumulative life history diversity index would be 100%. With Properly Functioning Conditions (PFC) the population would yield 4,159 adults with a productivity of 3.8-4.6 returning adults per spawner, and a life history diversity index of 64-70%.

Table 4-8. Life history assumptions used to model summer steelhead in the Walla Walla watershed, Washington/Oregon. The information in the box below is not correct, although it may be what was used in the EDT process.

Stock Name:	Walla Walla River Summer Steelhead	
Geographic Area (spawning reaches):	All reaches except Walla Walla 1 & 2 (Walla Walla River, mouth to Mill Creek – there might be spawning to Touchet but probably not much – too muddy to confirm this)	
River Entry Timing (Columbia):	Bonneville Dam: mostly July-August, but as late as November	
River Entry Timing (Walla Walla R.):	September– May, with mean entry period of late-February.	
Adult Holding:	Almost all adults were modeled as holding in McNary Pool.	
Spawn Timing:	Late February – early June with a peak in mid-April	
Spawner Ages:	60% 1-salt, 40% 2-salt	
Emergence Timing (dates):	Late April – mid-July with a peak in late May or June	
Smolt Ages:	7.5% age-1, 76.3% age-2, 15.1% age-3, 1.1% age-4. see age data above	
Juvenile Overwintering:	Columbia River:	2% (late October – March)
	Walla Walla R.:	98% (late October – March)
***Stock Genetic Fitness:**	90% wild	
Harvest (In-watershed):	None targeted in basin; harvest rate 0% for EDT. There is however harvest on unmarked fish by catch and release mortality, as well as some juvenile harvest during trout season.	

Table 4-9. Baseline summer steelhead population performance parameters for the Walla Walla Subbasin, Washington/Oregon, as determined by EDT, 2003.

Scenario	Diversity Index	Productivity	Capacity	Adult Abundance
Walla Walla R.				
Patient (Current)	1 %	1.3	199	41
PFC	70 %	3.8	1,325	976
Template (Reference)	83 %	14.0	4,345	4,034
Tributaries				
Patient (Current)	8 %	3.4	1,509	1,066
PFC	64 %	4.6	4,063	3,183
Template (Reference)	83 %	19.1	13,101	12,417
Abundance Totals			Current PFC Reference	1,107 4,159 16,451

4.3.4.2. Population characteristics consistent with VSP.

The NOAA Fisheries Technical Recovery Team (TRT) has identified Touchet River and the Walla Walla River (and its other tributaries) summer steelhead as independent populations, based on genetic differences and geographic separation (101 km)(TRT 2003). The NOAA Fisheries Viable Salmonid Population (VSP) document (McElhany 2000) identified four parameters that are key in determining the long-term viability of a population, those are: abundance, population growth rate, population spatial structure and diversity. Specific targets for these parameters have not yet been developed by the TRT. However; the interim spawner abundance target for steelhead in Walla Walla Subbasin was 2600 adults (Lohn 2002). We discuss each of these parameters briefly.

Abundance

The interim target goal of 2600 fish does not differentiate between the Touchet River and the rest of the Walla Walla subbasin. The current EDT population estimate (1,107 adults) falls short of the combined interim target, but the EDT model predicted that 4,159 fish could be achieved under PFC. Likewise, combined estimates of escapement at Nursery Bridge in Oregon, and into the Upper Touchet above Dayton fall short of TRT and agencies' management goals. Recent data for escapement suggests increasing natural adult return to the basins. This suggests that current abundance may be sufficient to seed available habitat to promote continued increases in abundance.

Growth Rate (productivity)

The EDT model estimated a low productivity in the Walla Walla River mainstem (1.3 returning adults per spawner) that is not able to withstand ecological variability and stochastic events. Productivity in the tributaries was considerably higher (3.4 returning adults per spawner). This level of productivity strongly suggests that tributary segments of Walla Walla steelhead populations are capable of sustaining themselves in the long term, though specific productivity targets have not been established by either the co-managers or the TRT. Preserving existing productive tributary habitat and population segments is key to rebuilding the basin wide population growth rate. EDT model estimates predicted that if PFC was achieved, productivity could increase 3 fold in the mainstem, but only 35% in the tributaries. These predictions are consistent with empirical data and the logic associated with habitat improvement. However, substantially increasing productivity in mainstem areas will be difficult. Incremental improvements to tributaries, coupled with mainstem actions that will improve, or at least prevent further degradation, habitat conditions will likely be the most successful approach.

Spatial Structure

The Walla Walla subbasin is a large, spatially complex system with two presently recognized (TRT) steelhead subpopulations (Touchet River and Upper Walla Walla). Additional discrete spawning aggregates may exist in the basin but there is currently insufficient data to describe them. Spawning occurs in the lower mainstem, Mill Creek and numerous smaller tributaries. There remains substantial connectivity within the upper Walla Walla and Touchet systems, but large irrigation diversions and a USACE diversion dam within the City of Walla Walla have significantly prevented adult steelhead access to large stream reaches. Further, stream de-watering has isolated juvenile population segments within portions of the basin, limiting the potential for population interaction that may have occurred in the past. Other anthropogenic impacts have negatively affected fish habitat quality over time (e.g. road and levee construction, grazing, elimination of riparian vegetation and stream channel connectivity, urbanization, gravel mining). Likewise, stochastic environmental events (floods, log-jams, dewatered stream reaches) have affected habitat and fish distribution. Because of these factors, localized extirpations of small tributary populations, and possibly a lower mainstem spawning population, may have occurred. Despite these problems, two major population segments (subpopulations) remain. Such population responses seems to fit an island-mainland population structure as defined in the NMFS Technical memorandum describing a VSP (McElhany 2000), and suggests that sufficient spatial structure remains for the *O. mykiss* population to persist during the short term. Reestablishment of a full spatial structure within the population will require significant improvements in habitat quality and connectivity.

The VSP document cautions that salmonid habitat is dynamic, and for a population to persist, its “habitat patches should not be destroyed faster than they are naturally created” (McElhany 2000). It further cautions that VSP is defined for populations to persist over a 100 year period and that loss of spatial structure may eventually contribute to extirpation. Clearly the spatial structure of Walla Walla subbasin steelhead has been severely degraded. Tributary population productivity may currently be (or have been) sufficient to have prevented irrevocable harm to steelhead in the basin, but reestablishment of more complete spatial structure will be needed for the populations to achieve VSP status.

Diversity

Population diversity within the Walla Walla subbasin has been severely degraded by water withdrawal and dewatering, elimination of or passage barriers (dams, irrigation diversions) to significant reaches of habitat, generalized habitat degradation, urbanization, unscreened or improperly screened water diversions that injure or kill juvenile fish, and others. The EDT model estimated that life history diversity was severely depressed (1-8% of historic) in the Walla Walla Subbasin. If PFC were achieved the life history diversity was estimated to increase to 64-70%, a level that is much more likely to be acceptable for a VSP. It is clear from the EDT model that substantial improvements to the habitat are needed to increase life history pathways so that sufficient diversity in the population exists for stability.

4.3.4.3 Population Status

ESA Status

Summer steelhead in the Walla Walla basin are part of the Mid-Columbia ESU, which was listed as threatened under the ESA in 1999 (NMFS 1999). Threatened status means that the listed group is likely to become endangered (in danger of extinction) within the foreseeable future throughout all or a significant portion of its range. The threatened determination for the ESU was made based on the following considerations:

- continuing declines in abundance
- increases in the percentage of hatchery fish in natural escapements
- most of the land in the ESU is not subject to management designed to rebuild steelhead populations.

SaSI Status

In Washington the status of the Walla Walla stock was rated depressed in 1992. Although no systematic abundance data were available, WDFW biologists thought that low numbers of spawners observed sporadically merited a depressed rating. In 2002 the stock was rated unknown due inadequate abundance data for the stock. There have not yet been enough years of consistent spawner surveys to determine a trend in abundance.

The status of the Touchet stock was rated depressed in 1992 and again in 2002 due to chronically low escapement estimates. Escapement estimates for spawner survey index areas are shown in Table 4-10. A WDFW escapement goal of 600 spawners has been developed for this stock. A recent run of the Potential Parr Production Model (Gibbons et al. 1985) has generated an escapement goal of 1,081 spawners (Glen Mendel, WDFW, personal communication).

Table 4-10. Index escapement estimates for Touchet summer steelhead. Data from the WDFW SaSI database.

Year	Index Escapement
1987	287
1988	837
1989	178
1990	276
1991	161
1992	311
1993	402
1994	298
1995	323
1996	No data
1997	No data
1998	395
1999	226
2000	181
2001	211
2002	**Need**
2003	***Need***

4.3.4.4 Harvest Assessment

Coded-wire tagged (CWT) hatchery steelhead have been released in the Walla Walla River downstream of Mill Creek, and in the Touchet River at Dayton for many years. The CWT release groups can be used as a surrogate for wild unmarked steelhead for examination of harvest locations and harvest rates for net fisheries (Table 4-11). Columbia River net fisheries harvested an average 10.3% of the hatchery steelhead with cwts from the Walla Walla River, and 9.2% from the Touchet River for the 1993-1996 release years. The Touchet River average recovery in net fisheries declined to 2.2% after ESA restrictions were imposed on the net fisheries for 1997-1999 release years. Total harvest recovery averaged 60.2% for the Walla Walla releases and 51.4% for the Touchet River releases. Out-of-basin harvest recovery rates were 26.5% and 12.7% for the Walla Walla and Touchet rivers, respectively. Out-of-basin harvest declined for the Touchet River releases from 19% (1993-96) to 6.5% (1997-99).

Total exploitation rates cannot be determined because adult returns that escape to spawn are not accounted for in the table below. Sport harvest is restricted to adipose clipped steelhead in the Columbia, Snake and Walla Walla or Touchet rivers. Therefore, the sport harvest shown in the table below is not reflective of the sport harvest effects on unmarked wild steelhead.

Table 4-11. Percentages of expanded coded-wire tag recoveries, by location, for hatchery steelhead released as juveniles in the lower Walla Walla and Touchet rivers for 1992-1999 release years.

	Release Year								
Recovery Location	92	93	95	93	95	96	97	98	99
	Walla Walla River			Touchet River					
Ocean Fisheries	0.2	0.1	0	0	0.2	0.1	0	0	0
Columbia R. sport	15.2	11.8	5.3	9.03	5.2	6.3	3.5	4.0	3.5
Columbia R. net	19.5	6.0	5.3	16.1	2.7	8.7	1.6	1.5	3.4
Columbia R. trib. trap	1.4	0.3	0	0.8	0	0	0	0	0
Columbia R. trib. sport	5.5	8.5	0	0	1.6	3.3	0	0	0
Deschutes R. *	0.4	1.8	1.3	2.3	0.7	0.8	0.6	0.1	1.3
Snake R. sport	20.7	38.2	42.2	37.4	36.2	19.1	37.7	50.7	50.8
Snake R trap	37.2	33.8	47.0	34.4	53.4	61.6	56.6	43.7	41.0
Total expanded recoveries	508	1687	187	701	1528	727	318	677	1031

* All recovered at the mouth, except one recovered at Pelton Dam.

Harvest rates in the Columbia basin have been reduced since the late 1980s and early 1990s to protect ESA listed salmon and steelhead. The Technical Advisory Committee, under US v OR, estimates harvest rates for naturally produced “A” run steelhead in the Columbia Basin. Harvest rates averaged about 18% in the 1980s, 15% in the early 1990s, and it was reduced to 4-6% in the 2001-2002 fisheries (Cindy LeFleur, WDFW, pers. Communication).

Juvenile steelhead may be harvested as trout in the Walla Walla subbasin during June through October of each year in Washington, and from late May through October in Oregon. Resident trout fisheries are closed during the peak of the juvenile salmon and steelhead out-migration in the Columbia River (April, May and early June). Daily limits in the Washington portion of the Walla Walla Basin are 2 fish per day with an 8 in minimum size for trout. Daily limits in the Oregon portion of the basin are 5 fish per day with an 8 in minimum length for trout. Selective gear restrictions (no bait, single barbless hook, etc.) are in place to minimize mortality on wild steelhead in the Touchet River upstream of Dayton and in Mill Creek upstream of Roosevelt and for Walla Walla River and tributaries upstream of the state line in Oregon. Fisheries for hatchery steelhead (adipose clipped fish) are allowed only in the Walla Walla River up to the confluence of the North and South forks, in the Touchet up to the confluence of the North and South Forks, and in Mill Creek from the mouth to 9th Ave. Descriptions of fisheries and their estimated effects on listed species of fish in the Mid Columbia ESU are discussed in the WDFW Fishery Management and Evaluation Plan (FMEP) for the incidental Take of listed species in the Mid Columbia submitted under ESA Section 10/4d (submitted to NOAA-fisheries in 2002). Similarly, descriptions of fisheries and their estimated impacts in Oregon are described in the ODFW FMEP for Summer Steelhead and Trout Fisheries (Public Review Draft, March 2001).

4.3.4.5 Hatchery Assessment

Steelhead

Between 180,000 and 310,000 steelhead smolts were released annually into the Walla Walla/Touchet between 1990 and 2002. Through 2000 the releases were primarily for adult steelhead harvest augmentation. Lyons Ferry and Wells hatchery stocks have been the primary source for smolt releases in the past (**Appendix X**). Releases focused in two areas: Dayton Acclimation Pond located immediately below the confluence of the North and South Forks Touchet River, and Main stem Walla Walla River near the confluence of Mill Creek. Adult returns to the Walla Walla support fisheries throughout the lower river. Trapping and harvest data from ODFW showed a very low incidence of hatchery fish upstream of the release site. Further, a trap operated in Yellowhawk Creek recovered only an occasional hatchery steelhead. Although no intensive creel survey was completed to document the extent of hatchery fish penetration into the basin, available data supported the assumption that adult fish dead-ended in the mainstem. While anecdotal observations of spawning steelhead confirmed this activity in the main Walla Walla, extreme summer water conditions or complete dewatering, were believed to eliminate most potential hatchery origin offspring. No data for origin of steelhead spawning in small tributary streams in the area were available, so the presence of any hatchery steelhead cannot be confirmed. After the 1999 NOAA Biological Opinion, discussions among the co-managers were inconclusive about whether or how to initiate an endemic broodstock program to replace the LFH stock steelhead releases. An effort was begun to collect wild steelhead DNA samples for a stock analysis. This included both the Walla Walla and Touchet populations.

Within the Touchet River, adult steelhead return to their point of release near the Acclimation pond and support a strong sport fishery. Adult trapping conducted by WDFW showed that less than 10% of fish passing upstream of the pond were of hatchery origin. However, managers were concerned about the long-term impacts of the hatchery program on Touchet River steelhead. Work completed by Waples (NOAA) and Phelps (WDFW) in the early 1990s concluded that wild Tucannon steelhead remained genetically distinct from Lyons Ferry Hatchery stock steelhead after years of releases of hatchery stock smolts in the River. Phelps further concluded that the natural declining population was likely being suppressed through interbreeding with hatchery stock steelhead. This information, when coupled with the 1999 NOAA jeopardy opinion for the Lyons Ferry stock of steelhead spurred the WDFW and CTUIR managers to initiate new actions to reduce potential negative effects of the hatchery program. Beginning in 2001, WDFW initiated a Touchet River endemic steelhead broodstock development evaluation. Approximately 50,000 smolts from endemic Touchet River steelhead were released above the City of Dayton. The project will be evaluated over a five-year period to assess the stock's performance and WDFW's ability to successfully culture these fish. If successful, these fish will be used in the LSRCP program as the preferred stock for release into the Touchet River. This action would be consistent with RPA's from the Biological Opinion, and should help address ESA stock concerns over the use of Lyons Ferry and other out-of-basin hatchery stocks.

Until the endemic stock evaluation study is complete and a decision made by the co-managers, releases of LFH stock steelhead will continue at a reduced level. A study in 1991 showed that up to 17 percent of the hatchery stock smolt releases did not migrate from the river, and some were shown to prey on juvenile salmonids (Schuck *et al.* 1994). The WDFW intends to manage the Touchet River above Dayton for wild or endemic salmonid production and will not release LFH hatchery steelhead into that area of the subbasin.

Trout

Rainbow and brown trout production were planted into some streams of the Walla Walla basin in the past. Brown Trout were used exclusively in the Touchet River. The program began in 1965 and was terminated in 1997. The fish were planted primarily as put-take catchable size trout in the main stem Touchet upstream of Waitsburg. In the 1970s and 1980s, some were planted into the Wolf Fork Touchet, but this was curtailed by the late 1980. The long lived and predatory nature of the brown trout was used to control a burgeoning shiner population in the Touchet, but their potential impact on steelhead and bull trout juveniles eventually led to the elimination of the program.

Rainbow trout have been planted in the Touchet River, and in Mill, Blue and Coppei creeks. The focus was to provide put-take trout fisheries near population centers. Increasing concern about the impacts of rainbow plants on naturally produced juveniles (including hooking mortality during sport fisheries) and over declining, and eventually ESA listed, steelhead and bull trout populations caused WDFW to redirect these production program releases to waters without listed populations, primarily lakes and ponds. The long-term impacts of these programs on the steelhead population are unknown. A summary of steelhead and trout releases by stream is provided in Table 4-12.

Table 4-12. Releases of steelhead and trout into the Walla Walla basin, 1990-2003.

			WATER NAME						
YEAR	**SPECIES**	**STOCK**	**BLUE CK**	**COPPEI CK**	**DRY CK**	**MILL CK**	**TOUCHET R**	**WALLA WALLA R**	**Grand Total**
1990	Brown Trout	Ford					10,829		10,829
	Rainbow Trout	Spokane	609	1,479	1,479	5,184			8,751
	Steelhead	Ringold				32,200	116,345	130,217	278,762
1990 Total			**609**	**1,479**	**1,479**	**37,384**	**127,174**	**130,217**	**298,342**
1991	Brown Trout	Ford					11,306		11,306
	Rainbow Trout	Spokane	1,152	2,884	2,884	13,848	4,531		25,299
	Steelhead	Lyons Ferry				29,950	148,520	198,749	377,219
1991 Total			**1,152**	**2,884**	**2,884**	**43,798**	**164,357**	**198,749**	**413,824**
1992	Brown Trout	Ford					3,300		3,300
	Rainbow Trout	Spokane		1,428	1,428	4,488	13,774		21,118
	Steelhead	Lyons Ferry					95,517	75,210	170,727
1992 Total				**1,428**	**1,428**	**4,488**	**112,591**	**75,210**	**195,145**
1993	Brown Trout	Ford					14,010		14,010
	Rainbow Trout	Spokane		1,530	1,530	6,816	4,980		14,856
	Steelhead	Lyons Ferry					110,999	83,240	194,239
1993 Total				**1,530**	**1,530**	**6,816**	**129,989**	**83,240**	**223,105**
1994	Brown Trout	Ford					6,006		6,006
	Rainbow Trout	Spokane		1,513	1,513	7,102	4,864		14,992
	Steelhead	Lyons Ferry				21,450	119,624	159,905	300,979
1994 Total				**1,513**	**1,513**	**28,552**	**130,494**	**159,905**	**321,977**
1995	Brown Trout	Ford					10,752		10,752
	Rainbow Trout	Spokane		1,521	1,521	7,036			10,078
	Steelhead	Lyons Ferry				15,200	120,710	158,875	294,785
1995 Total				**1,521**	**1,521**	**22,236**	**131,462**	**158,875**	**315,615**
1996	Brown Trout	Ford					10,505		10,505
	Rainbow Trout	Spokane		1,007	1,007	6,630			8,644
	Steelhead	Lyons Ferry				19,998	134,610	170,000	324,608
1996 Total				**1,007**	**1,007**	**26,628**	**145,115**	**170,000**	**343,757**
1997	Brown Trout	Ford					10,188		10,188
	Rainbow Trout	Spokane		972	972	7,000			8,944
	Steelhead	Lyons Ferry				21,900	142,824	170,980	335,704
1997 Total				**972**	**972**	**28,900**	**153,012**	**170,980**	**354,836**
1998	Brown Trout	Ford					9,205		9,205
	Rainbow Trout	Spokane				5,000	2,074		7,074
	Steelhead	Lyons Ferry				9,165	125,127	165,855	300,147
1998 Total						**14,165**	**136,406**	**165,855**	**316,426**
1999	Rainbow Trout	Spokane				2,015	2,014		4,029
	Steelhead	Lyons Ferry					124,651	176,000	300,651
1999 Total						**2,015**	**126,665**	**176,000**	**304,680**
2000	Rainbow Trout	Spokane					2,000		2,000
	Steelhead	Lyons Ferry					124,654	165,500	290,154
2000 Total							**126,654**	**165,500**	**292,154**
2001	Steelhead	Lyons Ferry					102,765	103,980	206,745
		Touchet					36,487		36,487
2001 Total							**139,252**	**103,980**	**243,232**
2002	Steelhead	Lyons Ferry					125,391	99,859	225,250
		Touchet					45,501		45,501
2002 Total							**170,892**	**99,859**	**270,751**
2003	Steelhead	Lyons Ferry					100,445	102,975	203,420
		Touchet					31,440		31,440
2003 Total							**131,885**	**102,975**	**234,860**
Species Totals	Brown Trout						86,101		86,101
	Rainbow Trout		1,761	12,334	12,334	65,119	34,237		125,785
	Steelhead					149,863	1,805,610	1,961,345	3,916,818
Grand Total			**1,761**	**12,334**	**12,334**	**214,982**	**1,925,948**	**1,961,345**	**4,128,704**

4.3.4.6 Steelhead EDT Habitat Assessment Summary

Restoration and Protection Potential

We assessed habitat priorities for Walla Walla Subbasin summer steelhead in three basic ways. Two of these ways emphasized the "where" of a fish management plan while the third emphasizes the "what". Places where a strategic plan should be focused were determined by identifying areas critical to preserving current production (viz., by identifying areas with high "Protection Value"), and by identifying areas with the greatest potential for restoring a significant measure of historical production (viz., by identifying areas with high "Restoration Potential"). The kinds of actions a management plan should include were determined by performing a "Reach Analysis" (Section 4.2).

The restoration potential within the Walla Walla watershed was 90% for life history diversity, 49% for productivity, and 55% for abundance (Figure 4-4). This suggests that improving performance of Walla Walla summer steelhead is strongly tied to actions in the mainstem Columbia River. Within the watershed, the Lower Touchet (mouth to Coppei [81%]) ranked the highest for restoration potential when summing all three-performance measures (abundance, productivity, and life history diversity)(Table 4-13). The next highest priority geographical areas for restoration were Lower Walla Walla (mouth to Touchet [65%]), Pine Creek mainstem (plus Swartz [47%]), and Touchet (Coppei to forks [35%]). The Lower Touchet and Lower Walla Walla were particularly important for abundance (23-28%), whereas the others mostly contributed to increased life history diversity (Table 4-13). When scaling the potential for restoration benefit on a per kilometer basis, Mill Creek (Gose St to Bennington Dam) ranked first (2.1% / km), followed by the Lower Walla Walla (mouth to Touchet [1.9% / km]), SF Walla Walla (mouth to Elbow Creek [1.9% / km), Walla Walla (Nursery bridge to Little WW diversion [1.8% / km]), and Walla Walla (Tumalum bridge to Nursery bridge [1.8%]) (Table 4-13).

Reaches within the Walla Walla watershed accounted for 68% of the total protection value for productivity, 69% of the total protection value for abundance and 71% for life history diversity (Figure 4-4). Within the Walla Walla watershed, the South Fork Walla Walla (Elbow to access limit) ranked first overall for degradation potential (protection value) with a cumulative potential of -228% [sum of degradation values for life history diversity (-46%), production (-82%), and abundance (-100%)](Table4-14). The other top priority Geographic Areas included Upper South Fork Tribs. (excluding Skiphorton and Reser [-41%]), South Fork of WW (Mouth to Elbow Ck [-35%]), and North Fork of

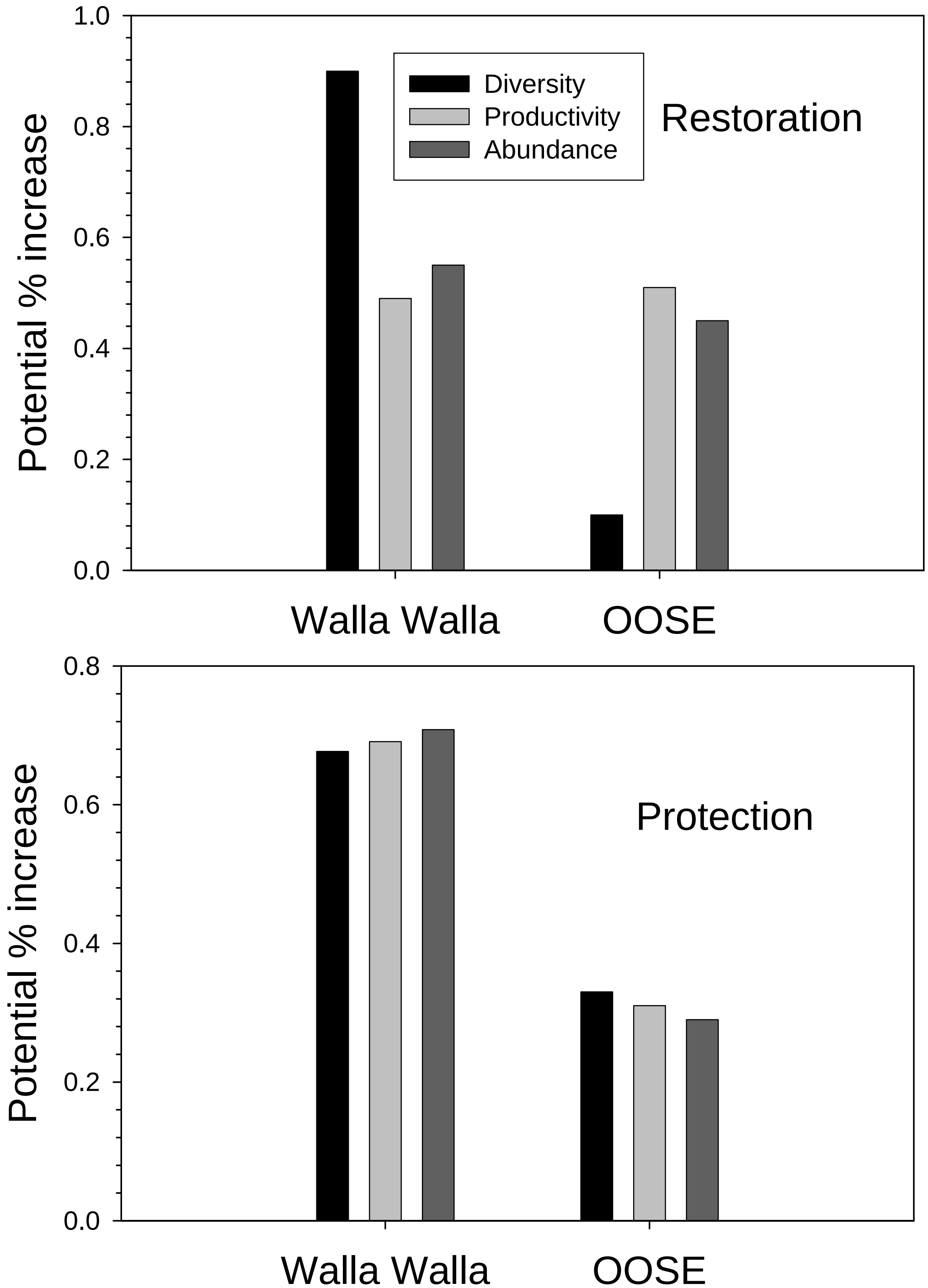

Figure 4-4. Contribution of reaches inside and outside (OOSE) the Walla Walla Subbasin to the total restoration and protection potential of Walla Walla Subbasin, Washington/Oregon summer steelhead.

Table 4-13. Ecosystem Diagnosis and Treatment Model predictions of restoration potential for summer steelhead in Geographic Areas of the Walla Walla Subbasin, Washington/Oregon. The scaled rank adjusted the unscaled rank by dividing by the length of stream in the geographic area to evaluate restoration potential on a per kilometer basis. N(eq) is the equilibrium abundance of returning adult spawners.

				Unscaled		Scaled (% / km)	
Geographic area	Diversity Index	Prod.	N(eq)	Sum	Rank	Sum	Rank
Columbia Mainstem	49%	45%	90%	184%	1	0.2%	31
Lower Touchet (mouth to Coppei)	58%	0%	23%	81%	2	1.0%	11
Lower Walla Walla (mouth to Touchet)	21%	16%	28%	65%	3	1.9%	2
Pine Cr mainstem (plus Swartz)	43%	0%	4%	47%	4	0.7%	17
Touchet, Coppei to forks (plus Whiskey)	33%	0%	1%	35%	5	1.0%	12
NF Touchet Mainstem	28%	1%	3%	32%	6	1.1%	9
SF Walla Walla, mouth to Elbow Creek	11%	13%	6%	30%	7	1.9%	3
Mill Cr, Gose Street to Bennington Dam	17%	0%	7%	24%	8	2.1%	1
Walla Walla, Touchet to Dry (plus Mud Cr)	7%	7%	7%	21%	9	1.4%	6
Coppei Drainage	16%	0%	4%	19%	10	0.5%	21
Pattit Drainage	17%	0%	2%	19%	11	0.6%	18
SF Touchet Mainstem	17%	0%	0%	18%	12	0.7%	15
Wolf Fork, mouth to Coates (plus Robinson & Coates)	16%	0%	1%	18%	13	0.7%	16
NF Walla Walla, mouth to L. Meadows Canyon Cr (plus L. Meadows)	14%	0%	3%	17%	14	1.1%	8
SF Touchet Tribs	15%	0%	0%	15%	15	0.9%	13
Lower Dry Cr (mouth to Sapolil)	13%	0%	2%	15%	16	0.4%	28
Cottonwood Cr Drainage (including NF, SF & MF)	11%	0%	3%	14%	17	0.5%	22
E Little Walla Walla Drainage (plus Unnamed Spring & Big Spring Br)	11%	0%	1%	11%	18	0.6%	20
Walla Walla, Dry to Mill	5%	1%	4%	11%	19	1.0%	10
Dry Cr [Pine] Drainage	9%	0%	1%	10%	20	0.3%	29
Yellowhawk Tribs (Lassater, Russell, Reser & Caldwell)	9%	0%	1%	10%	21	0.4%	26
Walla Walla, Little Walla Walla Diversion to forks	8%	1%	1%	10%	22	1.3%	7
Garrison Cr Drainage (plus Bryant)	8%	0%	0%	8%	23	0.4%	27
Walla Walla, Mill to E L. Walla Walla (plus MacAvoy & Springbranch)	4%	1%	2%	8%	24	0.7%	14

W Little Walla Walla Drainage (plus Walsh)	7%	0%	1%	8%	25	0.4%	25
Walla Walla, Tumalum Bridge to Nursery Bridge	5%	1%	1%	7%	26	1.8%	5
NF Touchet Tribs (excluding Wolf Fork)	6%	0%	0%	6%	27	0.5%	23
Wolf Fork, Coates to access limit (plus Whitney)	5%	0%	1%	5%	28	0.5%	24
Walla Walla, E Little Walla Walla to Tumalum Bridge	3%	1%	1%	5%	29	0.6%	19
Yellowhawk mainstem (mouth to source)	5%	0%	0%	5%	30	0.3%	30
Walla Walla, Nursery Br to Little Walla Walla Diversion	3%	0%	0%	4%	31	1.8%	4
Upper Dry Cr (Sapolil to forks)	3%	0%	1%	3%	32	0.2%	35
Dry Cr Tribs (Mud[Dixie], Mud[Dry], NF Dry & SF Dry)	2%	0%	1%	3%	33	0.1%	37
NF Walla Walla, L. Meadows to access limit (plus Big Meadows)	3%	0%	0%	3%	34	0.1%	36
Couse Creek Drainage	2%	0%	0%	3%	35	0.1%	38
Birch Creek Drainage	2%	0%	0%	3%	36	0.2%	32
Stone Cr Drainage	2%	0%	0%	3%	37	0.2%	33
Lower Mill Cr Tribs (Doan & Cold)	2%	0%	0%	2%	38	0.2%	34
Upper SF Walla Walla tribs (excluding Skiphorton & Reser)	0%	0%	0%	1%	39	0.0%	39
Skiphorton & Reser Creek Drainages	0%	0%	0%	0%	40	0.0%	40
Mill Cr, mouth to start of Corps Project at Gose St	0%	0%	0%	0%	41	0.0%	41
Lower SF Walla Walla Tribs (Flume Canyon, Elbow)	0%	0%	0%	0%	42	0.0%	42
Blue Cr Drainage (including L. Blue)	0%	0%	0%	0%	43	0.0%	43
Mill Cr, Bennington Dam to Blue Cr (plusTitus)	0%	0%	0%	0%	44	0.0%	44
Mill Cr, Blue Cr to Walla Walla water intake	0%	0%	0%	0%	45	0.0%	45
Coastal and Offshore	0%	0%	0%	0%	46	0.0%	50
Columbia Estuary	0%	0%	0%	0%	47	0.0%	49
Mill Cr, Walla Walla water intake to access limit	0%	0%	0%	0%	48	0.0%	46
Upper Mill Tribs (NF, Low, Broken, Paradise)	0%	0%	0%	0%	49	0.0%	47
Middle Mill Cr Tribs (Henry Canyon, Webb &Tiger)	0%	0%	0%	0%	50	0.0%	48
SF Walla Walla, Elbow to access limit	0%	0%	0%	0%	51	0.0%	51

Table 4-14. Ecosystem Diagnosis and Treatment Model predictions of degradation potential (protection benefit) for summer steelhead in Geographic Areas of the Walla Walla Subbasin, Washington/Oregon. The scaled rank adjusted the unscaled rank by dividing by the length of stream in the Geographic Area to evaluate restoration potential on a per kilometer basis. N(eq) is the equilibrium abundance of returning adult spawners.

				Unscaled		Scaled (% / km)	
Geographic area	Diversity Index	Prod.	N(eq)	Sum	Rank	Sum	Rank
SF Walla Walla, Elbow to access limit	-46%	-82%	-100%	-228%	1	-7.9%	1
Columbia Mainstem	-48%	-44%	-61%	-153%	2	-0.2%	18
Columbia Estuary	-16%	-11%	-14%	-41%	3	-0.5%	10
Upper SF Walla Walla tribs (excluding Skiphorton & Reser)	-16%	-15%	-10%	-41%	4	-1.8%	4
SF Walla Walla, mouth to Elbow Creek	-12%	-9%	-13%	-35%	5	-2.2%	2
NF Touchet Mainstem	-13%	-2%	-8%	-23%	6	-0.8%	9
Skiphorton & Reser Creek Drainages	-6%	-6%	-4%	-16%	7	-2.0%	3
NF Touchet Tribs (excluding Wolf Fork)	-8%	-1%	-3%	-12%	8	-0.9%	7
Wolf Fork, Coates to access limit (plus Whitney)	-6%	-2%	-4%	-12%	9	-1.0%	5
SF Touchet Mainstem	-4%	-1%	-6%	-11%	10	-0.4%	13
Lower SF Walla Walla Tribs (Flume Canyon, Elbow)	-5%	-1%	-2%	-8%	11	-0.9%	8
NF Walla Walla, mouth to L. Meadows Canyon Cr (plus L. Meadows)	-4%	0%	-4%	-8%	12	-0.5%	12
NF Walla Walla, L. Meadows to access limit (plus Big Meadows)	-5%	-1%	-2%	-8%	13	-0.4%	14
Walla Walla, Little Walla Walla Diversion to forks	-3%	-1%	-4%	-8%	14	-1.0%	6
SF Touchet Tribs	-4%	-1%	-2%	-6%	15	-0.4%	15
Wolf Fork, mouth to Coates (plus Robinson & Coates)	-1%	0%	-4%	-6%	16	-0.2%	17
Walla Walla, E Little Walla Walla to Tumalum Bridge	-2%	-1%	-1%	-4%	17	-0.5%	11
Touchet, Coppei to forks (plus Whiskey)	0%	0%	-3%	-3%	18	-0.1%	20
Coppei Drainage	0%	0%	-2%	-2%	19	-0.1%	23
Pattit Drainage	0%	0%	-2%	-2%	20	-0.1%	25
Pine Cr mainstem (plus Swartz)	0%	0%	-1%	-1%	21	0.0%	30
Walla Walla, Dry to Mill	0%	0%	-1%	-1%	22	-0.1%	21
Walla Walla, Tumalum Bridge to Nursery Bridge	0%	0%	-1%	-1%	23	-0.3%	16
Walla Walla, Mill to E L. Walla Walla (plus MacAvoy & Springbranch)	0%	0%	-1%	-1%	24	-0.1%	22
Cottonwood Cr Drainage (including NF, SF & MF)	0%	0%	-1%	-1%	25	0.0%	27

Yellowhawk mainstem (mouth to source)	0%	0%	-1%	-1%	26	-0.1%	24
Yellowhawk Tribs (Lassater, Russell, Reser & Caldwell)	0%	0%	-1%	-1%	27	0.0%	28
E Little Walla Walla Drainage (plus Unnamed Spring & Big Spring Br)	0%	0%	-1%	-1%	28	0.0%	26
Upper Dry Cr (Sapolil to forks)	0.0%	0.0%	-0.5%	-0.5%	29	0.0%	29
Lower Walla Walla (mouth to Touchet)	-0.4%	0.0%	0.0%	-0.4%	30	0.0%	31
Lower Touchet (mouth to Coppei)	0.0%	0.0%	-0.4%	-0.4%	31	0.0%	40
Walla Walla, Nursery Br to Little Walla Walla Diversion	0.0%	0.0%	-0.3%	-0.3%	32	-0.1%	19
Couse Creek Drainage	0.0%	0.0%	-0.2%	-0.2%	33	0.0%	35
W Little Walla Walla Drainage (plus Walsh)	0.0%	0.0%	-0.2%	-0.2%	34	0.0%	33
Dry Cr Tribs (Mud[Dixie], Mud[Dry], NF Dry & SF Dry)	0.0%	0.0%	-0.2%	-0.2%	35	0.0%	37
Stone Cr Drainage	0.0%	0.0%	-0.1%	-0.1%	36	0.0%	32
Lower Mill Cr Tribs (Doan & Cold)	0.0%	0.0%	-0.1%	-0.1%	37	0.0%	34
Birch Creek Drainage	0.0%	0.0%	-0.1%	-0.1%	38	0.0%	36
Dry Cr [Pine] Drainage	0.0%	0.0%	-0.1%	-0.1%	39	0.0%	43
Mill Cr, Walla Walla water intake to access limit	0.0%	0.0%	-0.1%	-0.1%	40	0.0%	38
Upper Mill Tribs (NF, Low, Broken, Paradise)	0.0%	0.0%	-0.1%	-0.1%	41	0.0%	39
Garrison Cr Drainage (plus Bryant)	0.0%	0.0%	0.0%	0.0%	42	0.0%	44
Mill Cr, Blue Cr to Walla Walla water intake	0.0%	0.0%	0.0%	0.0%	43	0.0%	42
Middle Mill Cr Tribs (Henry Canyon, Webb &Tiger)	0.0%	0.0%	0.0%	0.0%	44	0.0%	41
Mill Cr, Bennington Dam to Blue Cr (plusTitus)	0.0%	0.0%	0.0%	0.0%	45	0.0%	45
Lower Dry Cr (mouth to Sapolil)	0.0%	0.0%	0.0%	0.0%	46	0.0%	49
Blue Cr Drainage (including L. Blue)	0.0%	0.0%	0.0%	0.0%	47	0.0%	46
Mill Cr, mouth to start of Corps Project at Gose St	0.0%	0.0%	0.0%	0.0%	48	0.0%	47
Walla Walla, Touchet to Dry (plus Mud Cr)	0.0%	0.0%	0.0%	0.0%	49	0.0%	48
Coastal and Offshore	0.0%	0.0%	0.0%	0.0%	50	0.0%	50
Mill Cr, Gose Street to Bennington Dam	0.0%	0.0%	0.0%	0.0%	51	0.0%	51

Touchet mainstem (-23%). When scaling the potential benefit of protection on a per kilometer basis the South Fork Walla Walla (Elbow to access limit) still ranked first (-7.9% / km), followed by the South Fork of WW (Mouth to Elbow Ck [-2.2% / km]), Skiphorton and Reser Creek drainages (-2.0% / km), Upper South Fork Tribs (excluding

Skiphorton and Reser [-1.8% / km]), and Wolf Fork (Coates to access limit [-1.0% / km]) (Table 4-14).

Limiting Habitat Attributes

The below is a discussion of the limiting habitat attributes as determined by the EDT model. These are in no particular order of importance. Not all areas of the Walla Walla system are discussed. This section is intended to highlight important findings that are applicable to the entire watershed.

Walla Walla mainstem
Limiting factors from four geographic areas in the Walla Walla mainstem will be discussed because they ranked in the top ten for unscaled and/or scaled results (Table 4-13). In the Lower Walla Walla (mouth to Touchet) and Walla Walla (Touchet to Dry Creek) geographic areas the primary limiting factors were sediment load, key habitat quantity, and habitat diversity (Appendix A). Sediment load had high to extreme impacts on most life stages, except prespawn holding adults. There is no loss to spawning and incubation, due to sediment load, below reach Walla3 (river mile 24) because it was determined to be unlikely that steelhead ever spawned in that stretch of the Walla Walla River. Reduced key habitat quantity had the biggest impact to age-2 migrants and prespawn migrants, however, high losses to fry colonization also occurred in Walla4. Loss of habitat diversity had a moderate affect on juvenile migrants and a high to extreme affect on rearing juvenile life stages.

The two geographic areas in the Walla Walla mainstem from Tumalum Bridge to Nursery Bridge and Nursery Bridge to the Little Walla Walla diversion ranked high on the scaled priority list because they were relatively short in length, but are limiting to subyearling and yearling steelhead. Flow (low) and habitat diversity had the highest impacts to these lifestages in this area

Touchet River Watershed
In the Lower Touchet (mouth to Coppei); sediment load was the primary limiting factor, affecting most life stages at high to extreme levels (Appendix X). Other limiting factors included key habitat quantity, habitat diversity, flow, predation, temperature, channel stability, and obstructions. Key habitat quantity had high to extreme impacts on age-0 active rearing, age-2 migrants, and pre-spawn migrants. Habitat diversity had moderate affects on most life stages, but high losses occurred to spawning and fry colonization. Increased peak flows were a moderate problem for colonizing fry, whereas low summer flows were a moderate to high problem for other juvenile life history stages. Predation had high impacts to fry through Touchet3 (river mile 30) and moderate to small impacts to other juveniles throughout. Warm summer temperatures caused high losses to spawning, incubation, fry colonization, and 0-age rearing from Touchet3 to Touchet6, with moderate impacts to other juvenile rearing stages. Channel stability only had high impacts to egg incubation, with moderate impacts to other life history stages. The siphon diversion, Hofer dam, and a waterfall were the obstructions that partially blocked fish passage.

In the Touchet River (from Coppei to forks, including Whiskey Ck), habitat diversity and flow were the primary limiting factors, whereas temperature, sediment load, predation, and channel stability were secondary (Appendix x). Habitat diversity had high impacts to spawning, fry colonization, and age-1 active rearing, with lesser affects to most other life stages. Flow had high affects to fry colonization and age-0 active rearing with lesser effects on other juvenile life history stages. Warm temperatures, high sediment, and low channel stability had high impacts on egg incubation, with lesser affects to several other life stages. Sediment load was a more important factor in Whiskey Creek than in the rest of this geographic area.

The North Fork of the Touchet mainstem had no extreme losses and fewer high losses than the Touchet River geographic areas previously discussed (Appendix x). Habitat diversity, sediment load, temperature and flow were limiting factors, but they varied from reach to reach and it was difficult to identify primary versus secondary. Habitat diversity had high losses to spawning and fry colonization in the first couple of reaches, fading to moderate losses in the upper reaches. Conversely, sediment load was a small to moderate problem across most life stages in the lower reaches and increased to a high impact to egg incubation above reach NFTouchet3. Temperature had high impacts to egg incubation up to Lewis Creek, and increased peak flows had a high impact to fry colonization up to Rogers Gulch Creek.

Pine Creek Sub Watershed

In the Pine Creek mainstem; sediment load, habitat diversity, flow, temperature, and obstructions were the primary limiting factors (Appendix X). Other limiting factors included key habitat quantity (just for prespawn holding), channel stability, and food. Sediment affected most life stages at extreme levels in reach Pine1 (river mile 0-5), with greatly reduced impacts thereafter (high for egg incubation, moderate for most other life stages). Habitat diversity had moderate affects on most life stages, but high losses occurred to spawning, fry colonization, and age-0 and age-1 active rearing. Increased peak flows were a moderate to high impact to colonizing fry, and low summer flows had small to moderate affects on age-1 and age-2 active rearing. Warm summer temperatures were limiting to egg incubation, fry colonization, and 0-age active rearing in the lower reaches (~river mile 0-10) and eight obstructions were present that partially blocked fish passage. Channel stability and food had small to moderate impacts throughout most juvenile life history stages.

Mill Creek Sub Watershed

In the Mill Creek reach from Gose St to Bennington Dam the primary limiting factors included obstructions, sediment load, habitat diversity, flow, temperature, and key habitat quantity (Appendix X). Secondary limiting factors included channel stability and food. Numerous obstructions associated with the Corps project and diversion dams were modeled, with a cumulative affect that seems to all but eliminate the possibility of successful adult passage. It should be pointed out that actual passage to the upstream sections of Mill Creek either through this channel of Yellowhawk Creek is poorly understood. Sediment load and habitat diversity had high to extreme impacts to most life stages. Warm summer temperatures were limiting to egg incubation, fry colonization, and 0-age active rearing. Increased peak flows were a moderate to high impact to colonizing fry, and low summer flows had small to moderate affects on age-1 and age-2 active rearing. Food had a small to moderate effect on most juvenile life history stages.

South Fork of the Walla Walla (mouth to Elbow Creek)
In the South Fork of the Walla Walla (mouth to Elbow Creek) habitat diversity and key habitat quantity were the primary limiting factors (Appendix X). Channel stability, flow, sediment load, and temperature were secondary limiting factors. Habitat diversity had high losses to spawning and fry colonization in the first two reaches (river mile 0-9) and small to moderate impacts throughout other reaches and life stages. Increased peak flows were a moderate to high impact to colonizing fry, and low summer flows had small to moderate affects on age-1 and age-2 active rearing. Channel stability, sediment load, and temperature had high impacts to egg incubation and moderate to small impacts to several other life stages in the lower reaches.

Summary of Habitat Limiting Attributes
Throughout the Walla Walla Subbasin, sediment load, habitat diversity, key habitat quantity, and obstructions were the most common limiting factor for steelhead. For fry and sub yearling parr, habitat diversity is a function of gradient, confinement, riparian function, LWD density and icing. Loss of riparian function most commonly occurs through hydromodifications (roads, dikes, bank armoring, channelization, etc.) and altered riparian vegetation and reduced LWD (from agriculture, development, past forest practices). For key habitat quantity, lack of pools and reduced base flow (reducing stream width and depth) were most limiting to pre-spawning holding and juvenile rearing life stages of steelhead. Sediment load and channel stability were common limiting factors for egg incubation and early life history stages of summer steelhead throughout most of the Walla Walla Subbasin. Restoration efforts should focus on reducing sediment load within the Geographic areas identified in Table 4-13 and described in the previous section; however, reaches upstream of steelhead distribution should also be evaluated and considered for restoration, if they are determined to be major contributors of sediment to the system. Obstructions to fish migration were prevalent throughout the subbasin. An analysis to compare the affects and rank the importance of each obstruction is needed to guide restoration efforts aimed at providing passage. That analysis is possible with EDT, but was beyond the scope of this subbasin plan assessment.

This section has described the limiting factors for ten geographic areas that ranked in the top five priorities for either the scaled or unscaled output, or the top ten priorities for both scaled and unscaled results (Table 4-13). These ten geographic areas comprise 44% of the potential for restoration in the 48 geographic areas that were modeled. Reach analyses for the remaining geographic areas can be found in Appendix X.

4.4 Focal Species Spring Chinook

4.4.1 Life History

When native spring Chinook were present in the Walla Walla basin, they were said to enter the river in May and early June (Van Cleave and Ting 1960 cited in CTUIR et al.

1990). The life history characteristics of spring Chinook currently in the Walla Walla basin are probably similar to those of the adjacent Umatilla and Touchet spring Chinook (Glen Mendel, WDFW, personal communication). Spawning in the Touchet occurs from late August to late September.

4.4.2 Historical and Current Distribution

There is no information on the historical distribution of spring Chinook in the Walla Walla. Current distribution of introduced spring Chinook in the basin is shown in Figure 4-5. Spawning occurs in the upper mainstem Touchet River and its North and Wolf forks, in upper Mill Creek and the South Fork Walla Walla. The distribution in upper Mill Creek is probably solely the result of adult outplants by the CTUIR.

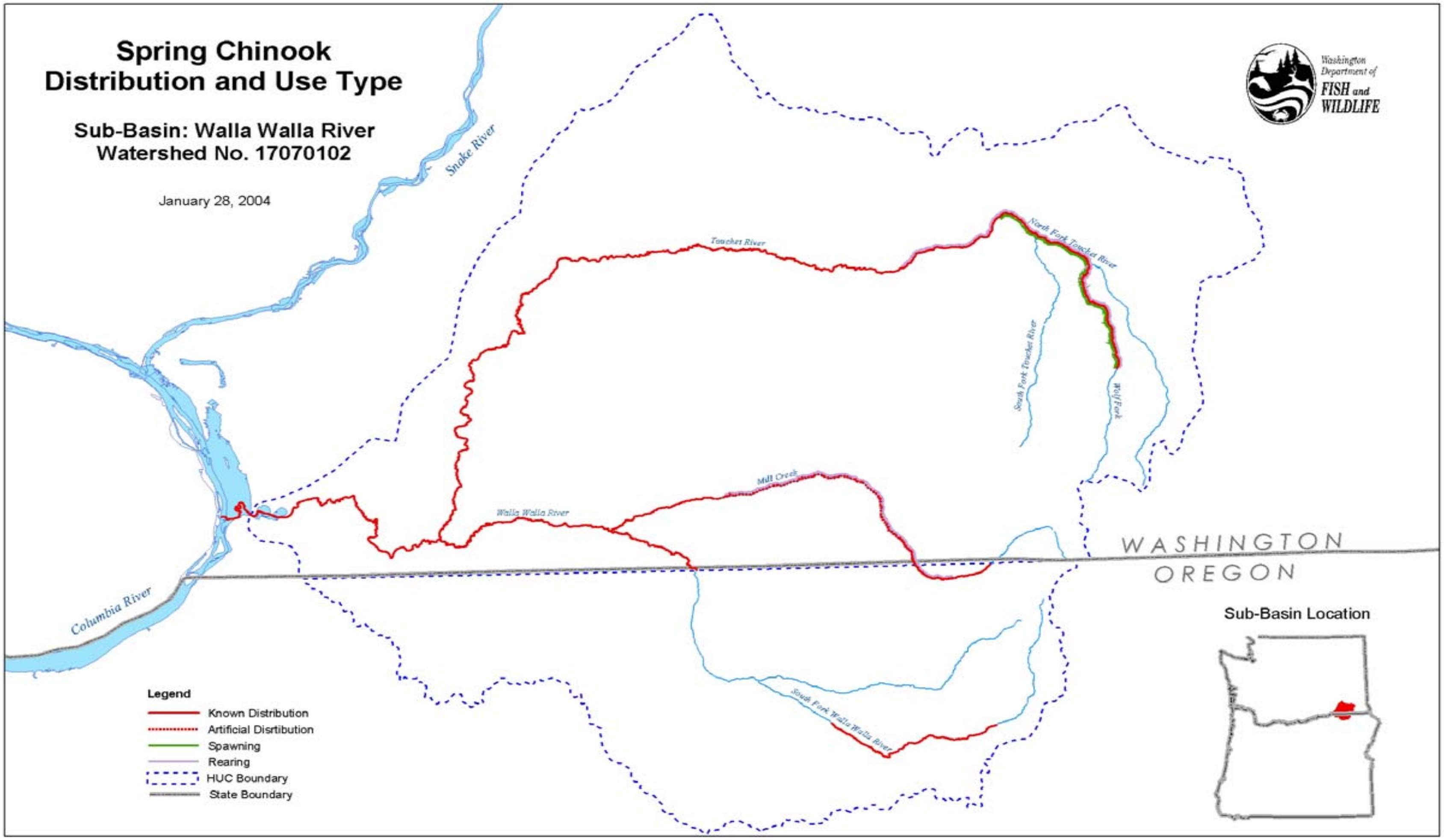

Figure 4-5. Presumed current distribution of spring Chinook in Tucannon River. Data from the WDFW Washington Lakes and Rivers Information System (WLRIS) database.

4.4.3 Population Identification

Spring Chinook were once abundant in the Walla Walla basin but have been extirpated (James and Scheeler 2001, Myers et al. 1998). The last large return occurred in 1925 (Van Cleave and Ting 1960 cited in CTUIR et al. 1990). Spring Chinook were last documented in the basin in the 1950s (James and Scheeler 2001).

Although the native run is thought to be extinct, some spring Chinook are currently observed in the basin. WDFW has been aware of adult spring Chinook in the Touchet River system since 1997 or 1998. Their origin is unknown. Very few of the fish captured in the Touchet River adult trap are marked or coded-wire tag. Most are probably strays from the Umatilla River, though natural origin cannot be excluded (Glen Mendel, WDFW personal communication). Limited genetics samples have been collected from spring chinook in the Touchet River trap but have not been analyzed.

In 2000, adult spring Chinook from the Ringold Hatchery (Carson National Fish Hatchery stock) were introduced as an experiment into the South Fork Walla Walla and Mill Creek by Confederated Tribes of the Umatilla Indian Reservation fisheries staff just prior to spawning in 2000. Subsequent spawner surveys found redds in both streams, indicating that the released fish had spawned (James and Scheeler 2001). No adult returns from this program have returned to Walla Walla yet (Glen Mendel, WDFW, personal communication).

In 2001, WDFW conducted spring Chinook spawner surveys in the Touchet River and tributaries following a unusually large return of Snake River spring Chinook. Redds, live spawners and spawned-out carcasses were documented (Mendel et al. 2002).

4.4.4. Walla Walla Spring Chinook Salmon Population

4.4.4.1 Population Characteristics

4.4.4.1.1 Empirical Data

Historically, salmon were abundant in the Walla Walla River Basin but annual returns of spring Chinook salmon were reduced dramatically following the construction of nine-mile dam at Reese, Washington in 1905 (Nielsen, 1950, Van Cleve and Ting 1960). Van Cleve and Ting (1960), while summarizing data for the period of 1935-36, wrote that it would be practically impossible for spring Chinook salmon to ascend the river under the present system of water use. The last spring Chinook salmon run of any significance was reported in 1925 (Van Cleave and Ting 1960). In 1955, only 18 spring Chinook salmon were reported in the sport harvest (Oregon Game Commission, 1956 and 1957).

Recently, the distribution and abundance of adult spring Chinook salmon in the Walla Walla River, Mill Creek and the Touchet River has been limited to a few adults (presumably strays) observed returning to Nursery Bridge and the Touchet River traps (Table 4-15). These traps were operated for steelhead and were only partially successful at capturing spring Chinook. The Nursery Bridge trap usually closed just as the spring Chinook would be expected to begin arriving. The Touchet trap captured only a portion of the fish passing and usually closed by mid to late June. The large run of spring chinook in 2001 in the Columbia Basin is reflected by the increase of spring Chinook observed return to traps at Nursery Bridge (Oregon) and the Touchet River. Spawning surveys in the Touchet River system in 2001 documented 32 spring Chinook redds (Mendel et al. 2002). The origin of spring Chinook entering the Walla Walla Subbasin is unknown, as most of the fish are unmarked. However, these fish are likely stray hatchery fish from out of basin, most likely from the Umatilla River. A few marked fish have been documented from the Tucannon River (where 100% were marked with CWTs).

Table 4-15 . Returning spring Chinook adults or jacks observed at Nursery Bridge trap on the Walla Walla River and the Dayton trap on the Touchet River in recent years.

Year and Location	Number of fish	Trap closed
Nursery Bridge Trap		
1993	1	June 7
1994	0	May 17
1995	0	May 29
1996	0	May 30
1997	5	May 30
1998	0	May 19
1999	0	June 11
2000	9	June 8
2001	47	June 7
2002	27	
2003	1	
Dayton Trap		
1999	0	June 21
2000	4	June 30
2001	31 (plus 4 recaptured)	June 17
2002	0	June 15
2003	3	June 27

Within the last four years (2000-2003) the CTUIR has out-planted adults into the South Fork of the Walla Walla River and in upper Mill Creek (Bronson and Duke 2003). CTUIR has conducted spawning surveys on the out-planted adult spring Chinook in the South Fork of the Walla Walla River and Mill Creek and has observed favorable survival to spawning with female to redd ratios of 1.2 to 1.9 in the South Fork and 1.1 to 1.4 in Mill Creek (Tables 4-16 and 4-17; Contor and Sexton 2003).

Table 4-16. South Fork Walla Walla River spring Chinook salmon redds from adults released at Harris Park, RM 7, 2000-2003 (redds observed in the reach/percent of total redds observed).

Stream Reach	**2000**	**2001**	**2002**	**2003**
Above Skiphorton Creek-RM 17.0+	0/0	16/5	0/0	0/0
Skiphorton to Burnt Cabin Creek, RM 14.1-17.0	5/5	75/22	7/5	16/13
Burnt Cabin Creek to BLM/FS Boundary, RM 12.0-14.1	16/16	61/18	35/24	29/24
BLM/FS Boundary to USGS Gage, RM 8.8 to 12.0	35/35	101/30	58/40	42/35
USGS Gage to Hatchery, RM 5.3- 8.8	38/38	86/25	45/31	33/28
Hatchery to Milton, WW RM 47 to SF RM 5.3	7/7	*	*	*
Total Redds	**101**	**339**	**145**	**120**
Estimated Egg Deposition	**377,000**	**1,400,000**	**554,000**	**458,000**
Spring Chinook Out-Planted				
Females	150	641	190	138
Adult Males	76	418	126	171
Jacks	33	33	13	4
Females/Redd	1.5	1.9	1.3	1.2
Adults/Redd	2.2	3.1	2.2	2.6
Total Chinook Out-Planted	**259**	**1092**	**329**	**313**

* not surveyed

Table 4-17. Mill Creek spring Chinook salmon redds (redds observed in the reach /percent of total redds observed for the year) from adults released 100 yards above Kiwanis Camp, RM 22.3, 2000-2002 (there were no adult out-plants in Mill Creek in 2003).

Stream Reach	**2000**	**2001**	**2002**
Paradise Creek to Diversion Dam, RM 25.2-28.9	6/15	9/17	0/0
Diversion Dam to Kiwanis Camp, RM 22.3-25.2	34/85	39/74	15/65
Below Kiwanis Camp, RM 20.8.5-22.3	0/0	5/9.4	8/35
Total Redds	**40**	**53**	**23**
Estimated Egg Deposition	**150,000**	**220,000**	**88,000**
Spring Chinook Out-Planted			
Adult Females	58	76	25
Males	31	72	25
Jacks	16	2	0
Females/Redd	1.4	1.4	1.1
Adults/Redd	2.2	2.8	2.2
Total Chinook Out-Planted	**105**	**150**	**50**

The first four-year-old adult returns from the out-planting experiment are expected in the spring of 2004. The initial adult to adult and redd to adult return rates will not be known until the June of 2005. The out-planted adults were from out-of-basin, Carson-origin hatchery broodstock, collected at the Ringold Springs Hatchery and Three Mile Falls

Dam on the Umatilla River. In 2003, only one jack spring Chinook salmon was observed at the Nursery Bridge Dam Passage Facility. This suggests that few adults will return to the Walla Walla Basin in 2004. Typically, jack returns can indicate general abundance of adult returns the following year and are often used as run predictors (ODFW and CTUIR 2003). However, substantial variation in jack to adult ratios exists between individual brood-years as well as between subbasin stocks. For example, jack to adult return ratios in the Umatilla River Basin ranged from 0.25% to 7.6% from 1989-2002 (Contor and Sexton 2003). Assuming that the same range of jack to adult return ratios observed in the Umatilla Basin are applicable to the Walla Walla Basin, the single jack observed at Nursery Bridge in 2003 would indicate that from 10 to 320 adult salmon may return in 2004 (assuming that 20% of expected returns of the 2000 brood-year would return in 2005 as five-year-old fish). However, the jack to adult return rates of primarily hatchery reared Chinook in the Umatilla Basin may not be applicable to naturally reared Chinook in the Walla Walla Basin. Hatchery reared spring Chinook salmon can have significantly different ages at return than naturally reared fish of the same stock. Adult hatchery reared spring Chinook salmon returning to Catherine Creek (Grande Ronde River Basin) had an age structure that was 14.2% age 3, 60.2% age 4, and 25.6% age 5 fish (1998 brood, n=211). This contrasts with the demographics of naturally produced adult spring Chinook salmon of the same endemic stock, stream and brood year that was 3.2% age 3, 38.5% age 4, and 58.3% age 5 fish (n=309; Mike McLean, personal communication, CTUIR Biologist, LaGrande, OR).

Both WDFW and CTUIR conducted surveys to evaluate juvenile salmonid abundance and distribution in the Walla Walla River Basin before and after adult spring Chinook salmon were first out-planted in Mill Creek and the SF Walla Walla River in 2000. Distribution and estimated abundance of juvenile spring Chinook remains limited within the Walla Walla subbasin (Table 4-18)

Table 4-18. Estimated spring Chinook juvenile abundance based on mean densities by geographic areas within the Walla Walla subbasin.

Geographic Area	Length (miles)	km	Weighted Mean Width (ft)	m	area $100m^2$	Ave chinook Density ($\#/100m^2$)	Chinook Pop. Estimate
Lower Walla Walla (mouth to Touchet)	20.79	33.4719	68.4	20.84832	6978.329	NA	NA
Lower Touchet (mouth to Coppei)	50.83	81.8363	43.9	13.38072	10950.29	0	0
Coppei Drainage	23.1	37.191	11.8	3.59664	1337.626	0	0
Touchet, Coppei to forks (plus Whiskey)*	21.87	35.2107	26.7	8.13816	2865.503	0.33	946
Patit Drainage	8.5	13.685	3.2	0.97536	133.478	0	0
NF Touchet Mainstem	18.85	30.3485	23.1	7.04088	2136.801	0.09	192
NF Touchet Tribs (excluding Wolf Fork)	8.11	13.0571	8.4	2.56032	334.3035	0	0
Wolf Fork, mouth to Coates (plus Robinson & Coates)	16.06	25.8566	17.3	5.27304	1363.429	1.11	1,513
Wolf Fork, Coates to access limit (plus Whitney)	7.43	11.9623	17.3	5.27304	630.7769	0	0
SF Touchet Mainstem	15.93	25.6473	18.7	5.69976	1461.835	0.009	13
SF Touchet Tribs	9.86	15.8746	7.4	2.25552	358.0548	0	0
Walla Walla, Touchet to Dry (plus Mud Cr)	9.54	15.3594	17.7	5.39496	828.6335	0	0
Pine Cr mainstem (plus Swartz)	31.77	51.1497	4.1	1.24968	639.2076	0	0
Dry Cr [Pine] Drainage	19.04	30.6544	0.2	0.06096	18.68692	0	0
Lower Dry Cr (mouth to Sapolil)	24.1	38.801	7.6	2.31648	898.8174	NA	NA
Upper Dry Cr (Sapolil to forks)	10.87	17.5007	5	1.524	266.7107	0	0
Dry Cr Tribs (Mud[Dixie], Mud[Dry], NF Dry & SF Dry)	15.2	24.472	3.1	0.94488	231.231	0	0
Walla Walla, Dry to Mill	6.64	10.6904	35.6	10.85088	1160.002	0.071	82
W Little Walla Walla Drainage (plus Walsh)	10.81	17.4041	3	0.9144	159.1431	0	0
Mill Cr, mouth to start of Corps Project at Gose St	5.39	8.6779	17.2	5.24256	454.9441	0.022	10
Lower Mill Cr Tribs (Doan & Cold)	7.78	12.5258	5.1	1.55448	194.7111	0	0
Mill Cr, Gose Street to Bennington Dam	11.36	18.2896	22.6	6.88848	1259.875	0.092	116
Mill Cr, Bennington Dam to Blue Cr (plusTitus)	6	9.66	32.6	9.93648	959.864	2.57	2,467
Blue Cr Drainage (including L. Blue)	7.57	12.1877	17.7	5.39496	657.5215	0	0
Mill Cr, Blue Cr to Walla Walla water intake	8.62	13.8782	24.3	7.40664	1027.908	6.11	6,281
Middle Mill Cr Tribs (Henry Canyon, Webb &Tiger)	7.87	12.6707	1.3	0.39624	50.20638		0
Mill Cr, Walla Walla water intake to access limit	5.77	9.2897	17.2	5.24256	487.0181		0

Upper Mill Tribs (NF, Low, Broken, Paradise)	6.2	9.982	3.7	1.12776	112.573		0
Walla Walla, Mill to E L. Walla Walla (plus MacAvoy & Springbranch)	5.97	9.6117	23.7	7.22376	694.3261	0.356	247
Garrison Cr Drainage (plus Bryant)	11.86	19.0946	7	2.1336	407.4024	0	0
Stone Cr Drainage	7.84	12.6224	3.2	0.97536	123.1138	0	0
E Little Walla Walla Drainage (plus Unnamed Spring & Big Spring Br)	12.17	19.5937	4	1.2192	238.8864	0.64	153
Walla Walla, E Little Walla Walla to Tumalum Bridge	4.87	7.8407	37.8	11.52144	903.3615	0.476	430
Yellowhawk mainstem (mouth to source)	8.58	13.8138	15.8	4.81584	665.2505	0.125	83
Yellowhawk Tribs (Lassater, Russell, Reser & Caldwell)	14.36	23.1196	3.7	1.12776	260.7336	0	0
Cottonwood Cr Drainage (including NF, SF & MF)	18.06	29.0766	4.1	1.24968	363.3645	0	0
Birch Creek Drainage	7.72	12.4292	0.06	0.018288	2.273052		0
Walla Walla, Tumalum Bridge to Nursery Bridge	2.35	3.7835	53	16.1544	611.2017		0
Walla Walla, Nursery Br to Little Walla Walla Diversion	1.25	2.0125	30.6	9.32688	187.7035		0
Walla Walla, Little Walla Walla Diversion to forks	4.87	7.8407	52	15.8496	1242.72		0
Couse Creek Drainage	14.21	22.8781	0	0	0		0
NF Walla Walla, mouth to L. Meadows Canyon Cr (plus L. Meadows)	9.95	16.0195	16.7	5.09016	815.4182		0
NF Walla Walla, L. Meadows to access limit (plus Big Meadows)	11.51	18.5311	4.4	1.34112	248.5243		0
SF Walla Walla, mouth to Elbow Creek	9.88	15.9068	59.1	18.01368	2865.4		0
Lower SF Walla Walla Tribs (Flume Canyon, Elbow)	5.49	8.8389	0.5	0.1524	13.47048		0
SF Walla Walla, Elbow to access limit	17.9	28.819	35.5	10.8204	3118.331		0
Upper SF Walla Walla tribs (excluding Skiphorton & Reser)	14.42	23.2162	1.1	0.33528	77.83928		0
Skiphorton & Reser Creek Drainages	4.76	7.6636	1.4	0.42672	32.70211		0
							12,533

During 1998 and 1999, WDFW found only two juvenile spring Chinook when they conducted their surveys in the mainstem Walla Walla River (State Line to near Lowden) and Yellowhawk Creek (18 sites in 1998 and 13 sites in 1999; Mendel et al. 1999 and 2000). No juvenile Chinook were found in 2000 when WDFW conducted more intensive surveys and included 57 snorkel or electrofishing sites in the mainstem Walla Walla from Peppers Bridge near the state line to Lowden, in lower Mill Creek, and smaller tributaries near the City of Walla Walla (Mendel et al 2001). In 2001, WDFW crews found juvenile Chinook during 14 of 88 snorkel and electrofishing surveys in these same areas. Densities of juvenile Chinook observed ranged from 0.1 to 13 fish/100m^2 (Mendel et al. 2002).

CTUIR conducted salmonid abundance surveys primarily in the intended spring Chinook salmon restoration area in Oregon which includes Mill Creek above the mouth of Blue Creek, and Walla Walla River and major tributaries above Milton-Freewater. Prior to out-planting adults, CTUIR crews observed only four juvenile spring Chinook salmon in sampling and salvage efforts (samplers examined more than 11,000 salmonids; Contor and Sexton 2003). Beginning in 2001, spring Chinook salmon juveniles were frequently observed in both Mill Creek and the Walla Walla River in the target restoration areas. In 2002, CTUIR observed densities of juvenile spring Chinook salmon in the S.F. Walla Walla river up to 29 fish/100m^2 (Figure 4-6; Contor and Sexton 2003). After out-planting adults, juvenile spring Chinook salmon were observed in all but one site within the intended restoration area in both 2001 (22 sites) and 2002 (34 sites). Juvenile Chinook were found by CTUIR outside of the expected rearing area in 3 of 17 sites in 2001 and in 5 of 43 sites in 2002 (Table 4-19).

Table 4-19. Summary of naturally produced juvenile spring Chinook salmon observations from adult out-plants in Mill Creek and the S.F. Walla Walla River (Target Area = expected area of juvenile spring Chinook summer rearing included the mainstem of the Walla Walla above Milton-Freewater, S.F. Walla Walla and Mill Creek above Blue Creek).

	1993	**1999**	**2001**	**2002**
Total Sites (including paired sites)	76	57	39	77
Total Sample Areas	4	47	34	42
Sites in Target Area	76	4	22	34
Sites in Target Area with Chinook	0	2	21	33
Sites Outside of Target Area	0	55	17	43
Sites Outside of Target Area With Chinook	0	0	3	5
Total Chinook Observed in All Sites	0	4	464	1764
Total Sites With Chinook	0	2	24	38

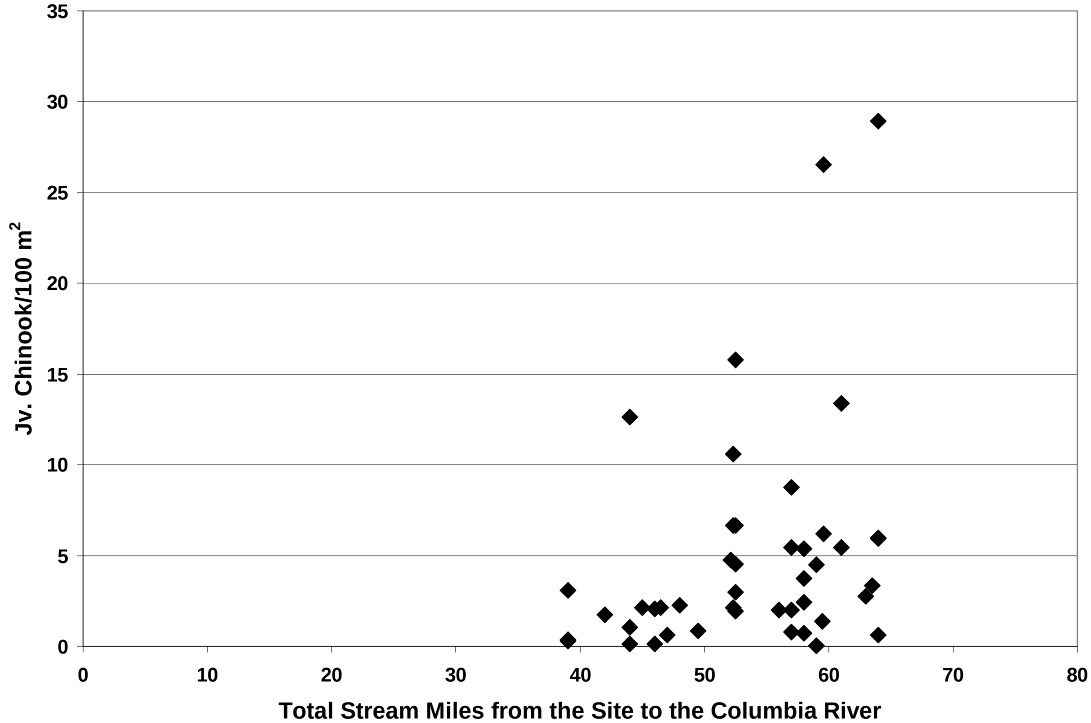

Figure 4-6. Densities of juvenile spring Chinook salmon observed during fish surveys in the Walla Walla River and tributaries, plotted by the approximate number of stream miles from the confluence with the Columbia River (Contor and Sexton 2003).

CTUIR began monitoring juvenile Chinook out-migration during the fall of 2001 when the first naturally produced juveniles (from the recent out-planting efforts) were large enough to begin moving downstream. Fish were collected from by-pass facilities at irrigation diversions and rotary screw traps. Trapping and tagging efforts during the past two migration years (2001-2002 and 2002-2003) indicate that many juvenile spring Chinook move into the mid reaches of the Walla Walla Basin in the fall. During the 2001-2002 migration season, 94% of the spring Chinook were PIT tagged during the fall (71% in the 2003 migration season). This skewed tagging record was influenced by trapping facility limitations and spring flow events, but it still indicates that a portion of the parr and pre-smolt spring Chinook salmon leave headwater rearing areas in the fall. Restoration and management strategies should consider winter rearing habitat in the mid and lower reaches. This is especially true of the slower velocity winter holding and rearing habitat in that is absent in many of the channelized reaches.

During the 2002 and 2003 migration years, CTUIR PIT tagged 1190 and 4801 spring Chinook salmon during the fall and spring. In 2002, 19% of PIT tagged fish were uniquely detected at the Columbia River PIT tag interrogation sites. During 2003, 35% of the PIT tagged spring Chinook juveniles were uniquely detected (Schwartz et al. 2004, draft in preparation). These detection rates are similar to Columbia River detection rates of spring Chinook salmon PIT tagged in the fall in the Umatilla River (16% in fall, 30% in the spring; Ackerman et al. 2003).

While sample sizes are modest, there was an apparent survival advantage for larger smolts for both steelhead and spring Chinook. Spring Chinook greater than 105 mm were detected at 24% (43 of 180) in contrast to 16% (164 of 1010) for those shorter than 105 mm.

Most of the spring Chinook tagged in the Walla Walla River passed through the lower Columbia from mid April to mid June (Figure 4-7). There was also a significant difference (P(t>= 7.577)<0.0001) in arrival times between spring Chinook PIT-tagged and released in the fall in comparison to those tagged and released in the spring (Figure 4-7). Fish tagged in the spring were up to 33 days behind the last arrival of fish tagged in the fall (May 21 compared to June 23, 2002; Contor and Sexton, 2003).

Travel times from release to detection were consistent with spring Chinook life-history characteristics observed in the Umatilla River (Ackerman et al. 2003). A large number of juvenile salmon move down from the headwaters in the fall when water temperatures in the mid and lower reaches become suitable for trout and salmon. Fish tagged in the fall left the headwaters early and moved at a slower pace, but arrived in the lower Columbia roughly a month before fish that leave the headwaters in the spring. First detection took as long as 245 days for some Chinook tagged in the fall. On the other hand, some Chinook tagged in the spring were detected in the Columbia seven days after tagging (Table 4-20 and Figures 4-8).

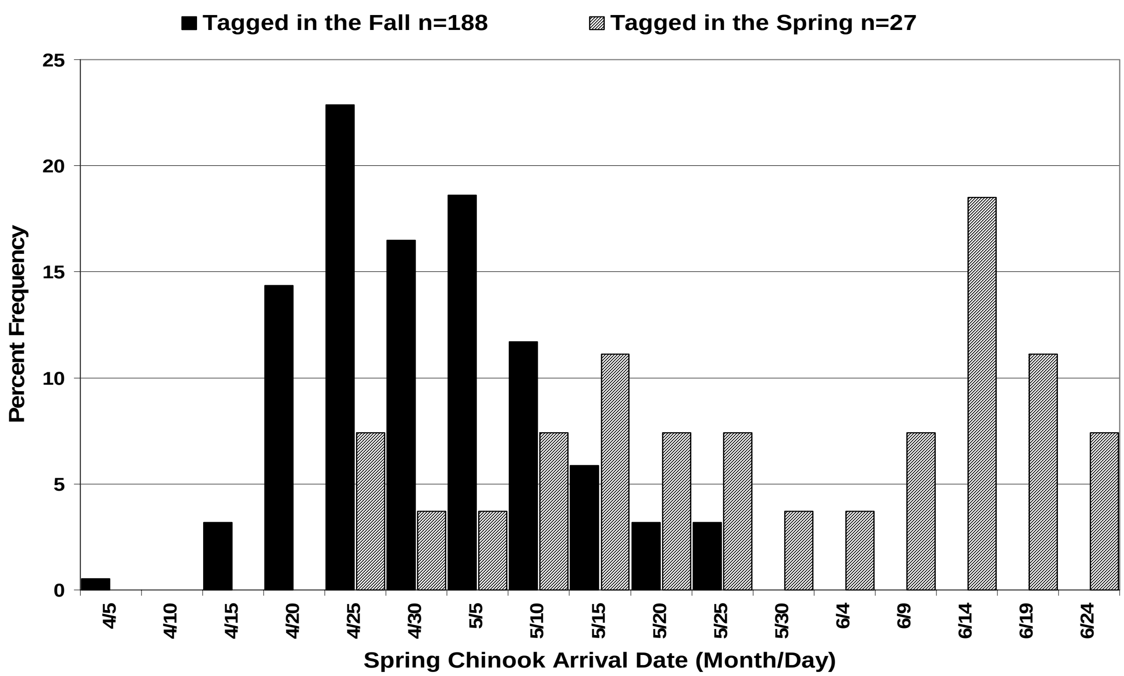

Figure 4-7 Percent frequency of spring Chinook detections at McNary, John Day and Bonneville Dams for migrants tagged and released in the fall of 2001 and the spring of 2002.

Table 4-20. Summary statistics for the travel times of spring Chinook salmon PIT-tagged in the Walla Walla River and detected in the Lower Columbia River.

Measure	Fall Tagged Chinook	Spring Tagged Chinook
Mean Days	171.8	23.0
Minimum Days	140	7
Maximum Days	245	50
n	188	27
Standard Error	1.882	2.395
Standard Deviation	25.806	12.444
Sample Variance	665.960	154.846

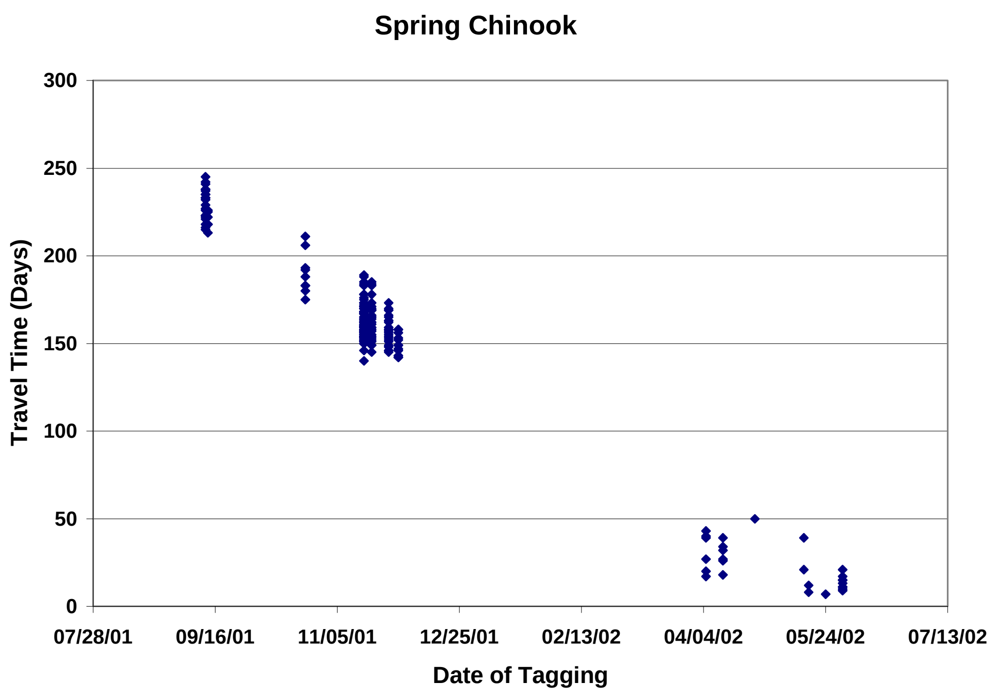

Figure 4-8 Travel time of PIT-tagged spring Chinook out-migrants in relation to tagging date. Fish were PIT-tagged in the Walla Walla River (RM 32.8, 38.2 and 46.3) and were detected at McNary, John Day and Bonneville Dams.

4.4.4.1.2 EDT Assessment

Walla Walla River Spring Chinook Baseline Population Performance.—Model results for Walla Walla Spring Chinook are based on life history assumptions summarized in Table 4-21. Separate model runs were conducted for several subpopulations of Walla Walla spring Chinook to more accurately capture the performance of the whole population; these included the Walla Walla River mainstem, Touchet River, the South Fork of the Walla Walla River, and Mill Creek (Table 4-21). The EDT model estimated the average spawning population size of the current spring Chinook to be 343 fish, with productivity ranging from 0 in Mill Creek to 6.1 in the South Fork of the Walla Walla River (Table 4-

21). Current condition for life history diversity was very low in Mill Creek (0%), the Touchet River (4%), and the Walla Walla mainstem (4%), and moderate in the South Fork (56%). The EDT model predicted that the Walla Walla Subbasin had a much greater production potential for spring Chinook than it now displays, as historical abundance was estimated at 17,929 spawners, with a productivity ranging from 13-25 returning adults per spawner and a life history diversity of 97-100% (Table 4-21). Under Properly Functioning Conditions (PFC), the EDT model predicted an abundance of 9,318 spawners, productivity ranging from 6.6-8.5, and a life history diversity of 90-100% (Table 4-21).

Table 4-21. Life history assumptions used to model spring Chinook in Walla Walla River, Washington.

Stock Name:	Walla Walla River Spring Chinook (Carson Stock)	
Geographic Area (spawning reaches):	Walla Walla mainstem: Touchet confluence to forks; NF Walla Walla: mouth to above Little Meadow Cr; SF Walla Walla: mouth to Bear Trap Spring; Mill Creek: mouth to Paradise Creek; Touchet River: mouth to forks; NF Touchet: mouth to Jim Creek; SF Touchet: mouth Burnt Fork; Wolf Creek: mouth to above Whitney Creek	
River Entry Timing (Columbia):	Bonneville Dam: late March – late May	
River Entry Timing (Walla Walla R.):	Late April – late June; by late June the lower River water temps would probably block them	
Adult Holding:	Entirely within the Walla Walla from late May – late September	
Spawn Timing:	Mid-August – 3rd week of September with peak ~September 1	
Spawner Ages:	3% jacks, 78% age-4, 19% age-5	
Emergence Timing (dates):	Early March – early April with peak in mid-March	
Smolt Ages:	All yearlings	
Juvenile Overwintering:	Columbia River:	9% (late October – March)
	Walla Walla R.:	91% (late October – March)
***Stock Genetic Fitness:**	90% wild (Though a 90% stock fitness was used to model population WDFW believes that this number shoulde be lower due to the origin of th current spring chinook stock.)	
Harvest (In-watershed):	No TargetedHarvest	

Table 4-21. Baseline spawner population performance parameters for Walla Walla River spring Chinook as determined by EDT, 2003. Assumed fitness was 90% and harvest 7%.

Population	Scenario	Diversity index	Productivity	Capacity	Abundance
Mill Cr SpChk	Historical	100%	14.8	2,860	2,667
	PFC with fitness & harvest impacts	100%	6.6	1,403	1,189
	Current without fitness & harvest impacts	0%	-	4	-
	Current with fitness & harvest impacts	0%	-	3	-
SF WW SpChk	Historical	100%	24.6	1,975	1,895
	PFC with fitness & harvest impacts	94%	8.5	1,159	1,023
	Current without fitness & harvest impacts	57%	7.2	299	258
	Current with fitness & harvest impacts	56%	6.1	259	217
Touchet SpChk	Historical	99%	14.0	9,096	8,447
	PFC with fitness & harvest impacts	97%	6.7	5,282	4,492
	Current without fitness & harvest impacts	4%	2.5	150	89
	Current with fitness & harvest impacts	4%	2.2	129	70
WW mainstem SpChk	Historical	97%	13.4	5,318	4,920
	PFC with fitness & harvest impacts	90%	6.3	3,109	2,614
	Current without fitness & harvest impacts	5%	2.3	130	74
	Current with fitness & harvest impacts	4%	2.0	112	56
	Sum, Abundance, Historical Template				17,929
	Sum, Abundance, PFC				9,318
	Sum, Abundance, Current, no Fitness or Harvest impacts				420
	Sum, Abundance, Current, with Fitness & Harvest impacts				343

4.4.4.2. Population characteristics consistent with VSP.

There are no TRT goals for spring Chinook in the Walla Walla as this population is extinct and therefore not listed under ESA.

Spring Chinook salmon have been extirpated, at least functionally, from the Walla Walla Basin since the early 1920s (Nielsen 1950, Van Cleave and Ting 1960) although some adults were recorded in steelhead creel surveys as late as 1955 (Oregon Game Commission, 1956 and 1957). Recently, a few adult spring Chinook have been observed in the Touchet River (Mendel et al. 2001, 2002) and in the mainstem of the Walla Walla River (Zimmerman and Duke 2001, 2002; Bronson and Duke 2003). These fish are presumed to be strays from other basins because they were extinct and most of the returning fish are generally unmarked and are likely from reintroduction efforts in the Umatilla River or elsewhere. Coded wire tags recovered from a few adults trapped in the Touchet River had Tucannon Hatchery codes (Mendel et al. 2002).

CTUIR out-planted Carson origin adult spring Chinook salmon into the SF Walla Walla and Mill Creeks during 2002-2003 to spawn naturally (Zimmerman and Duke 2001, 2002; Bronson and Duke 2003; Contor and Sexton 2003). It is too early to know if the recent habitat and flow improvements in the basin will provide suitable conditions for the progeny of the out-planted Chinook to return at or above replacement (2.0 returns per spawner). CTUIR documented successful spawning, juvenile rearing, and smolt migration of naturally reared progeny of out-planted Chinook salmon (Contor and Sexton 2003, Schwartz et al. 2004). However, 2004 will be the first year adult returns are expected from the out-planting experiment. The out-planted adults were hatchery stock (Carson stock) from out-of-basin and adult return rates will likely be lower than wild endemic stocks in the region. Wild endemic stocks such as John Day River Chinook often have substantial returns such as in 2000 when 1869 redds were observed of which 1411 were in index sites. Adult return estimated for the John Day River in 2000 was 6947 adults. However, only 94 redds were observed at index sites in 1995 (Carmichael et al. 2002). The wide variation of adult returns in the John Day from 1959 to 2000 as reported by Carmichael (et al. 2002) demonstrates that adult returns can be very low during some years even in relatively robust wild endemic stocks. Walla Walla Basin Chinook will have to contend with an additional mainstem Columbia River Dam and must be developed from available non-endemic stock. It is highly unlikely that a naturally reproducing population of spring Chinook salmon could be developed that would meet NOAA's "viable salmonid population" criteria (McElhany et al. 2000) without management intervention through reintroduction and continued habitat restoration.

EDT analysis of the Walla Walla basin identified higher quality salmonid habitat in headwater reaches with moderate to severe modification of habitat in the lower reaches. Habitat degradation has reduced the basins capacity for spring Chinook salmon from an estimated 17,000 returning adults under historical conditions to an abundance estimate of 343 adult Chinook under current conditions (EDT estimates, Section 4.4.4.1). For a population to meet NOAA's viable salmonid population criteria it must have "a negligible risk of extinction…over a 100-year time frame" (McElhany et al. 2000). A viable population would need to be large enough to withstand more than a decade of poor conditions. The original endemic stock is extinct and the preservation of unique genetic material is no longer an issue so small interim goals for "recovery" of an endemic population are not applicable in the Walla Walla Basin. Small adult returns would not provide surpluses for harvest opportunities, and would only provide moderate numbers for spawning, naturalization of a non-endemic stock, and nutrient enhancement.

The CTUIR master plan goals include continued ecosystem restoration and adult returns of over 8,000 adult spring Chinook salmon (CTUIR, 2004). The goals include 2,750 hatchery and 3,000 naturally-produced adults for the Oregon portion of the basin and

1,375 hatchery and 1,500 naturally-produced adults for Washington. These goals are not agreed to by all co-managers.

4.4.4.3 Population Status

The status of the unmarked spring Chinook entering the Walla Walla subbasin is currently unknown. These fish could very likely be unmarked hatchery strays from releases in the Umatilla Basin or elsewhere. The Carson stock hatchery fish released in the subbasin are not listed, nor are their progeny. However, the unmarked adult spring Chinook volitionally entering the Walla Walla subbasin could potentially be naturally produced, listed fish from outside the basin. NOAA fisheries will have to make a determination on the status of these fish.

ESA Status
NOAA Fisheries considers that native spring Chinook in the Walla Walla subbasin are extinct (Myers et al. 1998). Any spring Chinook currently spawning in the Walla Walla that are derived from Carson National Fish Hatchery broodstock would not be considered to belong to any ESU and are not listed under the ESA (Jim Myers, NOAA Fisheries, personal communication). However, the unmarked adult spring chinook volitionally entering the Walla Walla subbasin could be naturally-produced, ESA listed fish from outside the basin. NOAA Fisheries will have to make a determination on the origin and status of these fish.

SaSI Status
The Washington Department of Fish and Wildlife considers that native spring Chinook in the Walla Walla basin are extinct. WDFW does not recognize fish currently spawning in the basin as a distinct stock.

4.4.4.4 Harvest Assessment

No fisheries in the Walla Walla Subbasin target Chinook and it is illegal to retain Chinook in the Oregon or Washington portions of the basin. For more information about other fisheries in the basin, see the Harvest Assessment section under steelhead.

4.4.4.5 Hatchery Assessment

Nothing submitted.

4.4.4.6 Spring Chinook Habitat EDT Assessment Summary

Restoration and Protection Potential

We assessed strategic priorities for Walla Walla River spring Chinook in three basic ways. Two of these ways emphasized the "where" of a fish management plan while the third emphasizes the "what". Places where a strategic plan should be focused were determined by identifying areas critical to preserving current production (viz., by identifying areas with high "Protection Value"), and by identifying areas with the greatest potential for restoring a significant measure of historical production (viz., by identifying areas with high “Restoration Potential”). The kinds of actions a management plan should include were determined by performing a “Reach Analysis” (Section 4.3.4.1).

The restoration potential for spring Chinook within the Walla Walla watershed was 96% for life history diversity, 35% for productivity, and 91% for abundance (Figure 4-9). This suggests that 4-65% of the potential for improving performance of Walla Walla spring Chinook was tied to actions in the mainstem Columbia River.

Within the watershed, the Lower Touchet (mouth to Coppei) geographic area ranked first (529%) when summing the restoration potential for life history diversity (203%), productivity (0%), and abundance (325%)(Table 4-22); although this is a migration corridor currently. Other top priority geographic areas for spring Chinook included the South Fork (mouth to Elbow Ck [96%]), Touchet (Coppei to forks, plus Whiskey [94%]), Mill Creek (Gose St. to Bennington Dam [84%]), and the Lower Walla Walla (mouth to Touchet [83%]). When scaling the potential for restoration benefit on a per kilometer basis the Walla Walla (Tumalum bridge to Nursery bridge [9.2% / km]) ranked first, followed by Mill Creek (Gose St. to Bennington Dam [7.6% / km]), Lower Touchet (mouth to Coppei), Walla Walla (Mill Creek to E. Little Walla Walla, plus MacAvoy and Springbranch [6.4% / km]), and South Fork (mouth to Elbow Ck [6.1% / km] (Table 4-22).

Reaches within the Walla Walla watershed accounted for 89% of the total protection value for life history diversity, 86% of the total protection value for productivity, and 89% for abundance (Figure 4-9). This suggests that 11-14% of the potential for improving the performance of Walla Walla spring Chinook was tied to actions in the mainstem Columbia and Snake Rivers.

Within the Walla Walla watershed, the South Fork (Elbow to access limit) ranked first overall for protection value with a cumulative potential of -264% [sum of degradation values for life history diversity (-69%), productivity (-95%), and abundance (-100%)](Table 4-23). The South Fork (Elbow to access limit) also ranked first (-9.2% / km) when scaling the potential for restoration benefit on a per kilometer basis. Regardless of scaled or unscaled model output, the top five geographic areas for habitat protection also included the Walla Walla (Tumalum bridge to Nursery bridge), South Fork (mouth to Elbow Ck), SF Touchet mainstem, and Wolf Fork (Coates to access limit, plus Whitney)(Table 4-23).

Table 4-22. Ecosystem Diagnosis and Treatment Model predictions of restoration potential for spring Chinook in Geographic Areas of the Walla Walla River watershed, Washington. The scaled rank adjusted the unscaled rank by dividing by the length of stream in the geographic area to evaluate restoration potential on a per kilometer basis. N(eq) is the equilibrium abundance of returning adult spawners.

				Unscaled		Scaled (% / km)	
Geographic area	Diversity Index	Prod.	N(eq)	Sum	Rank	Sum	Rank
Lower Touchet (mouth to Coppei)	203%	0%	325%	529%	1	6.5%	3
Columbia Mainstem	24%	55%	84%	164%	2	0.2%	20
SF Walla Walla, mouth to Elbow Creek	29%	17%	51%	96%	3	6.1%	5
Touchet, Coppei to forks (plus Whiskey)	33%	0%	61%	94%	4	2.7%	12
Mill Cr, Gose Street to Bennington Dam	44%	0%	40%	84%	5	7.6%	2
Lower Walla Walla (mouth to Touchet)	19%	6%	58%	83%	6	2.5%	14
Walla Walla, Touchet to Dry (plus Mud Cr)	29%	0%	40%	69%	7	4.5%	8
Walla Walla, Mill to E L. Walla Walla (plus MacAvoy & Springbranch)	24%	4%	39%	67%	8	6.4%	4
Walla Walla, Dry to Mill	16%	0%	45%	61%	9	5.7%	6
SF Touchet Mainstem	25%	0%	25%	50%	10	2.0%	15
NF Walla Walla, mouth to L. Meadows Canyon Cr (plus L. Meadows)	22%	0%	20%	42%	11	2.6%	13
Mill Cr, mouth to start of Corps Project at Gose St	12%	0%	27%	40%	12	4.6%	7
NF Touchet Mainstem	21%	0%	18%	39%	13	1.3%	16
Walla Walla, Tumalum Bridge to Nursery Bridge	8%	5%	22%	35%	14	9.2%	1
Wolf Fork, mouth to Coates (plus Robinson & Coates)	22%	0%	11%	33%	15	1.3%	17
Walla Walla, Little Walla Walla Diversion to forks	9%	0%	22%	30%	16	3.9%	10
Walla Walla, E Little Walla Walla to Tumalum Bridge	11%	0%	16%	27%	17	3.4%	11
Wolf Fork, Coates to access limit (plus Whitney)	11%	0%	3%	14%	18	1.2%	18
Walla Walla, Nursery Br to Little Walla Walla Diversion	2%	0%	7%	9%	19	4.4%	9
NF Walla Walla, L. Meadows to access limit (plus Big Meadows)	8%	0%	1%	9%	20	0.5%	19
Mill Cr, Bennington Dam to Blue Cr (plusTitus)	0%	0%	0%	0.4%	21	0.02%	21
Mill Cr, Blue Cr to Walla Walla water intake	0%	0%	0%	0.3%	22	0.02%	22
Coastal and Offshore	0%	0%	0%	0.0%	23	0.00%	25
Columbia Estuary	0%	0%	0%	0.0%	24	0.00%	24
Mill Cr, Walla Walla water intake to access limit	0%	0%	0%	0.0%	25	0.00%	23
SF Walla Walla, Elbow to access limit	0%	0%	0%	0.0%	26	0.00%	26

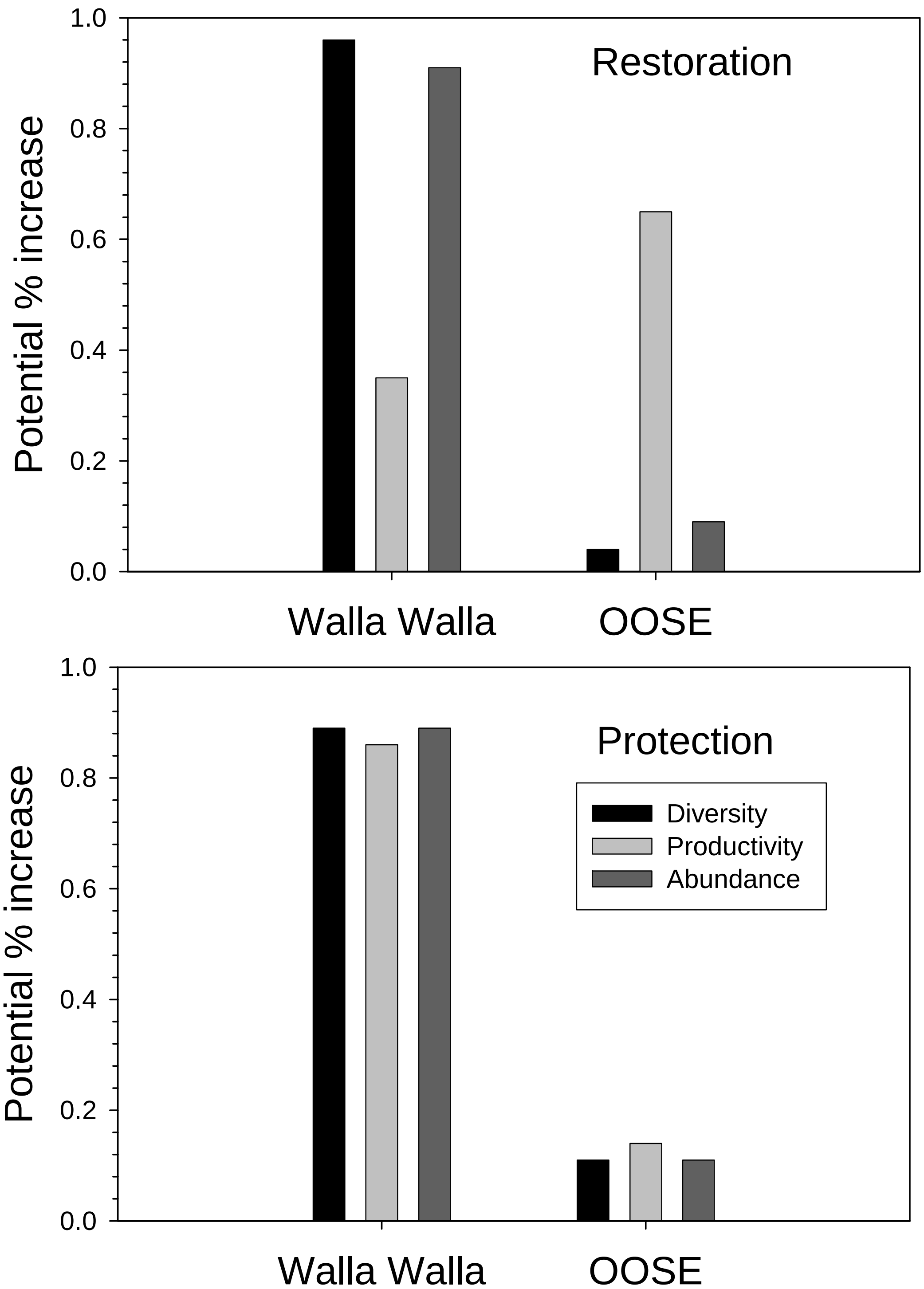

Figure 4-9. Contribution of reaches inside the Walla Walla Subbasin and Out of Subbasin Effects (OOSE) to the total restoration and protection potential of Walla Walla River, Washington/Oregon spring Chinook.

Table 4-23. Ecosystem Diagnosis and Treatment Model predictions of degradation potential (protection benefit) for spring Chinook in Geographic Areas of the Walla Walla River watershed, Washington. The unscaled rank adjusted the unscaled rank by dividing by the length of stream in the geographic area to evaluate restoration potential on a per kilometer basis. N(eq) is the equilibrium abundance of returning adult spawners.

				Unscaled		Scaled (% / km)	
Geographic area	**Diversity Index**	**Prod.**	**N(eq)**	**Sum**	**Rank**	**Sum**	**Rank**
SF Walla Walla, Elbow to access limit	-69%	-95%	-100%	-264%	1	-9.2%	1
Columbia Mainstem	-11%	-15%	-18%	-43%	2	-0.1%	17
SF Touchet Mainstem	-11%	-1%	-11%	-23%	3	-0.9%	5
Walla Walla, E Little Walla Walla to Tumalum Bridge	-8%	-2%	-10%	-20%	4	-2.5%	2
SF Walla Walla, mouth to Elbow Creek	-4%	-5%	-9%	-18%	5	-1.1%	3
Wolf Fork, Coates to access limit (plus Whitney)	-9%	0%	-4%	-12%	6	-1.0%	4
Columbia Estuary	-3%	-2%	-2%	-8%	7	-0.1%	16
Walla Walla, Dry to Mill	-2%	-1%	-5%	-8%	8	-0.7%	6
NF Walla Walla, L. Meadows to access limit (plus Big Meadows)	-3%	0%	-4%	-7%	9	-0.4%	9
Touchet, Coppei to forks (plus Whiskey)	-1%	0%	-6%	-7%	10	-0.2%	13
Walla Walla, Mill to E L. Walla Walla (plus MacAvoy & Springbranch)	-1%	-1%	-3%	-5%	11	-0.5%	8
Walla Walla, Little Walla Walla Diversion to forks	-2%	-1%	-2%	-5%	12	-0.6%	7
Wolf Fork, mouth to Coates (plus Robinson & Coates)	-2%	0%	-2%	-4%	13	-0.2%	14
NF Touchet Mainstem	-2%	0%	-2%	-4%	14	-0.1%	15
NF Walla Walla, mouth to L. Meadows Canyon Cr (plus L. Meadows)	-1%	0%	-3%	-3%	15	-0.2%	11
Lower Touchet (mouth to Coppei)	0%	0%	-2%	-2%	16	-0.03%	19
Walla Walla, Tumalum Bridge to Nursery	0%	0%	-1%	-1%	17	-0.2%	10
Walla Walla, Nursery Br to Little Walla Walla Diversion	0%	0%	0%	-0.4%	18	-0.2%	12
Mill Cr, mouth to start of Corps Project at Gose St	0%	0%	0%	-0.4%	19	-0.04%	18
Walla Walla, Touchet to Dry (plus Mud Cr)	0%	0%	0%	-0.3%	20	-0.02%	20
Lower Walla Walla (mouth to Touchet)	0%	0%	0%	-0.3%	21	-0.01%	21
Mill Cr, Blue Cr to Walla Walla water intake	0%	0%	0%	-0.04%	22	0.00%	22
Mill Cr, Walla Walla water intake to access limit	0%	0%	0%	-0.02%	23	0.00%	23
Mill Cr, Bennington Dam to Blue Cr (plusTitus)	0%	0%	0%	-0.02%	24	0.00%	24
Coastal and Offshore	0%	0%	0%	0.00%	25	0.00%	25
Mill Cr, Gose Street to Bennington Dam	0%	0%	0%	0.00%	26	0.00%	26

Limiting Habitat Attributes

Walla Walla River Mainstem

Throughout the three lower Walla Walla mainstem geographic areas (from the mouth to Mill Creek); sediment load, key habitat quantity, habitat diversity, and temperature were the primary limiting factors for spring Chinook, whereas flow and predation were secondary limiting factors, although currently this is a migration corridor only (Appendix ##) Sediment load and key habitat quantity had high and extreme impacts across most life stages and were clearly the dominant limiting factors in these geographic areas. Loss of habitat diversity had low to moderate impacts to most life stages but high impacts to fry colonization, prespawn holding, and age-0 inactive rearing. Warm summer temperatures caused high losses to spawning and prespawn holding adults in most reaches above the Touchet River, with lesser impacts to egg incubation and juvenile rearing throughout. Flow (including increased peak flows, flashiness, and reduced low flows) was a low to moderate problem for juvenile life stages and reduced low flow caused high losses to prespawn holding adults in all reaches above the Touchet River. Predation was a low to moderate problem for most life stages throughout the three lower geographic areas, but not in the upper reaches (from E. Little Walla Walla to the nursery bridge) (Appendix ##)

From Mill Creek to the nursery bridge (2 geographic areas) channel stability and obstructions became a secondary limiting factors (Appendix ##). Loss of channel stability resulted in moderate impacts to fry colonization and 0-age overwintering, and high losses to egg incubation. The Burlington diversion was a partial obstruction to age-1 migrants and prespawn migrants, whereas the nursery bridge was a partial obstruction to prespawn migrants.

Touchet River

In the Touchet River, from the mouth to Coppei; sediment load, key habitat quantity, habitat diversity, and temperature, were the primary limiting factors for spring Chinook, whereas flow, predation, and obstructions were secondary limiting factors (Appendix WWx) (currently only a migration corridor). Sediment load and key habitat quantity had high and extreme impacts across most life stages and were clearly the dominant limiting factors in this geographic areas. Loss of habitat diversity had low to moderate impacts to most life stages but high impacts to fry colonization and prespawn holding. Warm summer temperatures caused high to extreme losses to spawning and prespawn holding adults, with lesser impacts to egg incubation and juvenile rearing throughout. Flow (including increased peak flows, flashiness, and reduced low flows) was a low to moderate problem for juvenile life stages and reduced low flow caused high losses to prespawn holding adults in all reaches above the Touchet River. Predation was a low to moderate problem for most life stages (Appendix WWx).Limiting factors were similar from Coppei to forks (plus Whiskey Creek); however, sediment load dropped to a secondary limiting factor throughout and key habitat quantity was not a primary factor in reach Touchet8 (from Whiskey Creek to Pattit Creek) (Appendix WWx).

Mill Creek Sub Watershed

In Mill Creek, from Gose St. to Bennington Dam, obstructions, sediment load, key habitat quantity, habitat diversity, and temperature were the primary limiting factors for spring Chinook, whereas flow was a secondary limiting factor (Appendix WWx). There was numerous obstructions associated with the core project, along with the Yellowhawk and Bennington diversion dams. Sediment load, key habitat quantity, and habitat diversity had high and extreme impacts across most life stages (except age-0 and age-1 active rearing), with one exception in reach Millcreek9 (between Yellowhawk and Bennington diversions) were key habitat quantity had increased for all life stages due to warm summer temperatures caused high to extreme losses to spawning and prespawn holding adults, with lesser impacts to egg incubation and juvenile rearing throughout. Flow (including increased peak flows, flashiness, and reduced low flows) was a moderate to high (fry colonization) problem for juvenile life stages and reduced low flow caused high losses to prespawn holding adults (Appendix WWx).

South Fork Walla Walla River

In the South Fork, from the mouth to Elbow Creek, sediment load, key habitat quantity, and habitat diversity were the primary limiting factors for spring Chinook, although the losses were much less severe than in other areas of the basin (Appendix WWx). Flow and temperature were secondary limiting factors. Sediment load caused a low to moderate impact to most life stages, but had a high impact to egg incubation. Key habitat quantity was only a problem in reach WallaSF1, where there was high impacts to egg incubation, 1-age active rearing, and prespawn migrants. Habitat diversity had high and extreme impacts to spawning, fry colonization, 0-age active rearing, and prespawn holding life stages in reaches WallaSF 1 and 2, but only small to moderate impacts in WallaSF3. Warm summer temperatures were only a problem for spawning adults, with lesser impacts to egg incubation and prespawn holding in reach WallaSF1. Flow (including increased peak flows, flashiness, and reduced low flows) was a moderate to high (fry colonization) problem for juvenile life stages and reduced low flow was only a small problem for prespawn holding adults (Appendix WWx).

4.5 Focal Species Bull Trout

4.5.1 Life History

Migratory and resident bull trout are known to exist in the Walla Walla Subbasin. Migratory forms include fluvial fish that overwinter in the mainstem Walla Walla or Touchet rivers, or in mainstem Mill Creek. Migratory fish may also overwinter in the lower portions of these rivers or in the Columbia River, but that has not been confirmed. Migratory bull trout have been captured during their upstream migration in the spring and early summer at the Nursery Bridge trap on the Walla Walla River in Oregon, as well as in the Touchet River trap in Dayton, and at the City Intake Dam in upper Mill Creek. The degree of interaction among these populations is not well known at this time, and constitutes an important data gap. Any interchange between the populations would have to occur between late fall and spring when flows and temperatures permit movement.

Bull trout redd inventories in the Walla Walla, Mill Creek, and Touchet watersheds have been conducted by the ODFW, WDFW, and USFS since the early 1990s. ODFW data indicate that bull trout redd numbers have increased substantially in the South Fork Walla Walla since initiation of the surveys (Figure 4-10). The increase is a possible result of habitat access modification and harvest closure in 1994 (Tim Bailey, ODFW, January 2001). Bull trout harvest in Washington portions of the subbasin was closed in the early 1990s. Frequent observations of large (>20 inches) adult bull trout have been documented during redd surveys in Oregon (Tim Bailey, ODFW, January 2001) and Washington (Glen Mendel, WDFW, March 2003).

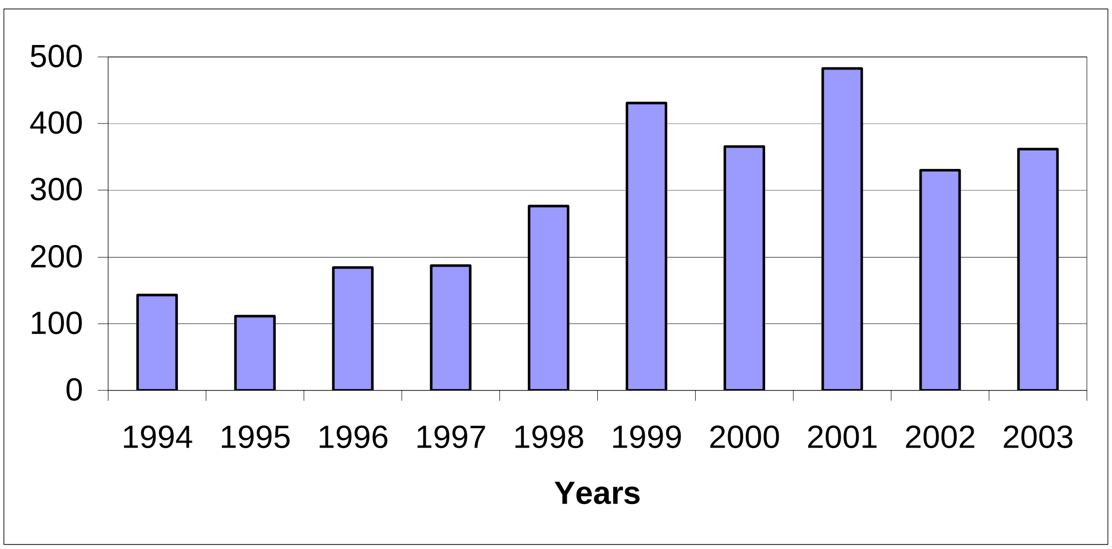

Figure 4-10. Bull trout redds observed in the South Fork Walla Walla River, 1994-2003 (data from Tim Bailey, ODFW).

Bull trout are known to spawn in the upper Walla Walla River (North and South Forks), upper Mill Creek and its upper tributaries, and upper Touchet River tributaries (North Fork, Wolf Fork, Burnt Fork of the South Fork, Lewis Creek, and Spangler Creek) (Tables 4-24, 25, 26, 27, 28 from Mendel et al. 2004). Spawning occurs from late August through October (USFWS 2002, Chapter 10, Umatilla/Walla Walla Recovery Unit, In

Fish and Wildlife Service, Bull Trout Draft Recovery Plan, Portland, OR.). Emergence may not occur until June or later because of cold water temperatures. Juvenile rearing generally occurs in the spawning areas, but subadult and adult bull trout may wander or migrate to other areas of the drainage during fall, winter, and spring.

Table 4-24. Bull trout spawning survey summary, redd count (number of times surveyed), for the North Fork Touchet River, 1994-2003 (from Mendel et al. 2004).

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

[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.

Table 4-25. Bull trout spawning survey summary, redd count (number of times surveyed), for the Burnt Fork, 2000-2003 (from Mendel et al. 2004).

	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

[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.

Table 4-26. Bull trout spawning survey summary, redd count (number of times surveyed), for the Wolf Fork of the Touchet River, 1990-2002 (from Mendel et al. 2004).

Year	Reach Surveyed[a]							Total Redds
	A	B	C	D	E	F	G	
	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	
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

[a] A: River Mile (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.

Table 4-27. Bull trout spawning survey summary, redd count (number of times surveyed), for Mill Creek, 1990-2003 (from Mendel et al. 2004).

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

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

Table 4-28. Bull trout spawning survey summary, redd count (number of times surveyed), for tributaries to Mill Creek, 1994-2003 (from Mendel et al. 2004).

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

[a] A: Mouth of Bull Ck. Upstream.
B: Mouth of Green Fork upstream.
C: Mouth of Burnt Fork upstream.
D: Mouth of Deadman Ck. Upstream.
E: Mouth of N. Fork Mill Ck. Upstream.
F: Mouth of Paradise Ck. Upstream.
G: Mouth of Broken Ck. Upstream.
H: Mouth of Low Ck. Upstream.
[b] Not surveyed.
[c] ODFW data only.
[1, 2, 3] superscript in table refers to column headings and indicated distance of stream surveyed.

4.5.2 Historical and Current Distribution

Little was known about bull trout in the Walla Walla subbasin prior to the 1990s. Over the past decade or so surveys by federal, state, tribal, and local entities have provided important information regarding their distribution and status. Current distribution is generally limited to the upper portion of the subbasin in summer and early fall. Bull trout spawning and rearing in the Walla Walla subbasin is restricted to the upper watersheds of the Walla Walla River, Touchet River, Mill Creek, and some of the associated upper tributaries. Figures 4-11 and 4-12 indicate bull trout distribution.

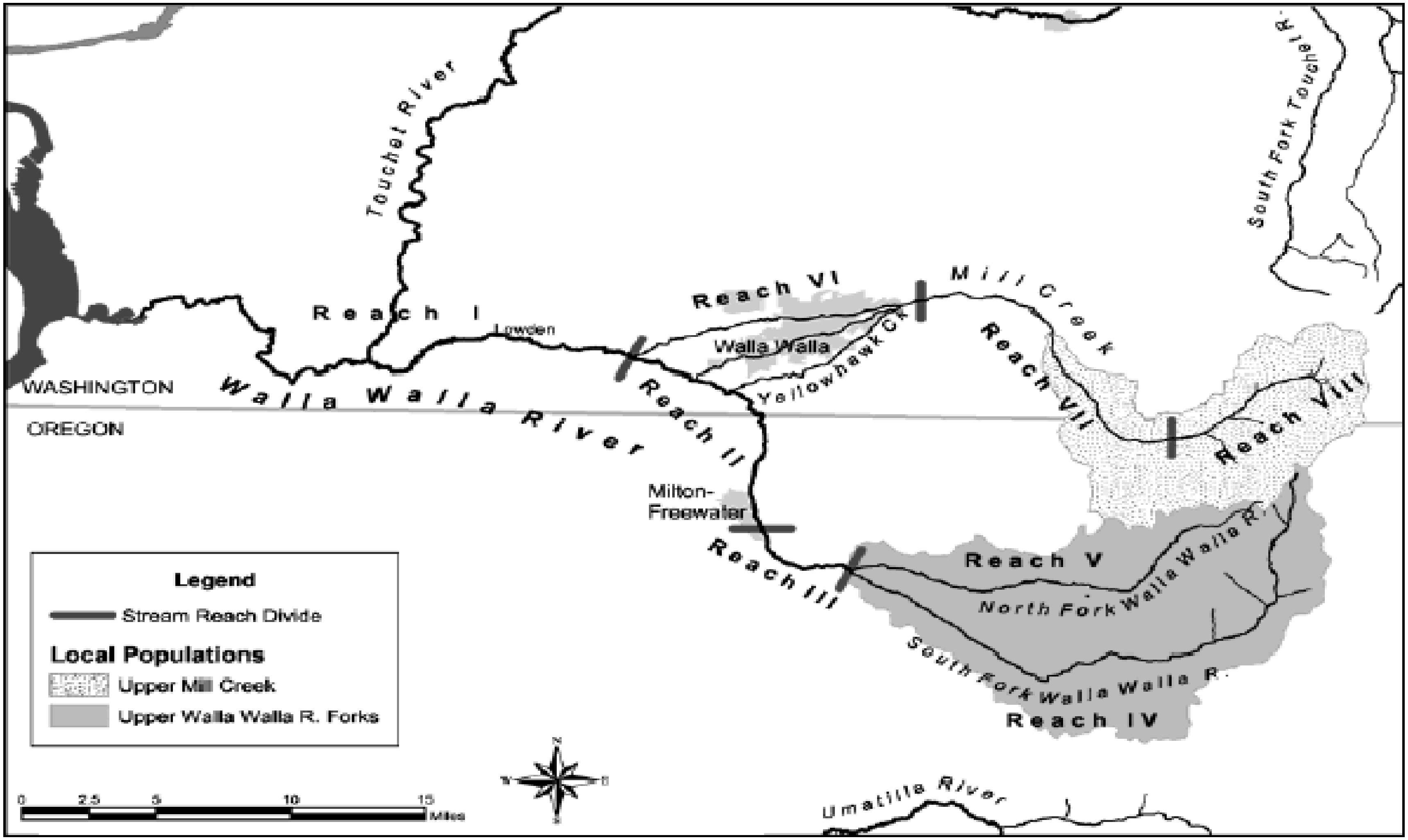

Figure 4-11. Bull trout reaches and distribution in Mill Creek and the Walla Walla River (From Draft Bull Trout Recovery Plan, Chapter 10, USFWS, 2003.

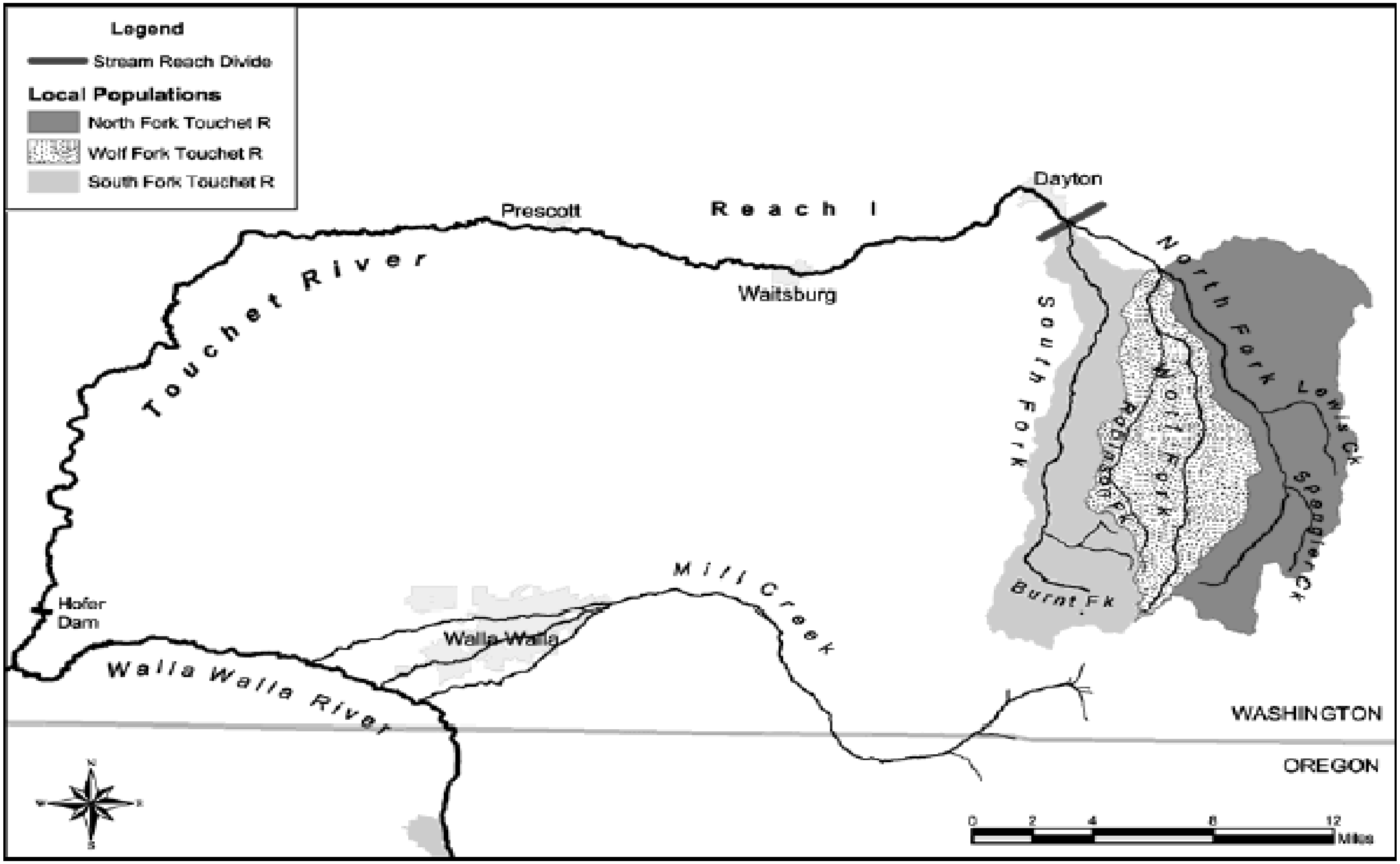

Figure4-12. Bull trout reaches and distribution in Mill Creek and the Walla Walla River (From Draft Bull Trout Recovery Plan, Chapter 10, USFWS, 2003.

4.5.3 Population Identification

Three local bull trout populations in the Walla Walla River, Touchet River and Mill Creek were grouped into a Core Area in the Draft Bull Trout Recovery Plan (Chapter 10, USFWS 2002).

4.5.4 Population Status

Bull Trout in the Columbia Basin (including the Walla Walla Subbasin) were listed as threatened under the Endangered Species Act in 1998. Buchanan et al. (1997) described the South Fork Walla Walla River population as at low risk of extinction and the bull trout population in the North Fork Walla Walla River as at high risk of extinction. Bull trout status is uncertain ("unknown") in the Touchet River system (Washington Department of Fish and Wildlife 1998). The Mill Creek population was rated as of special concern (Buchanan et al. 1997), but WDFW considered it to be "Healthy" (WDFW 1998). This population continues to support a stronghold designation (Quigley and Arbelbide 1997b; G. Mendel and M. Schuck, WDFW, 1999). Similar to the other populations of bull trout in the subbasin, the Mill Creek fish are thought to be largely isolated from genetic exchange within the metapopulation—a factor of particular concern to some biologists (Buchanan et al. 1997).

4.5.5 Integrated Assessment

Bull trout in the Wallla Walla Subbasin are not at immediate risk of extinction (USFWS 2002). They spawn and rear in the headwaters of the Walla Walla Subbasin and most of its tributaries but some fish migrate downstream as far as the lower mainstem Walla Walla River. The extent of their downstream movements is presently unknown in the Walla Walla and Touchet basins, but it is currently under study in the Walla Walla River through use of radio telemetry. Barrier removal, reduction of instream sediment, and reducing or maintaining stream temperatures are some of the primary habitat recommendations in the draft bull trout recovery plan. This is consistent with the EDT analyses for steelhead and spring Chinook, and with the results of the Walla Walla Basin Limiting Factors Report.

4.6 Integrated Assessment Analysis

Spring Chinook and Summer Steelhead EDT analysis limiting attributes

EDT identified that sediment load, habitat diversity, and obstructions were the most common and severe limiting habitat attributes for both steelhead and spring Chinook in the Walla Walla subbasin. Warm summer temperatures, channel stability, and flow were also common limiting factors and no life stage was exempt from the effects of the degraded conditions related to these factors. Sediment load was a severe cause of direct mortality for egg incubation, but commonly impacted all life stages in indirect ways such as by reducing feeding rates for juveniles. Habitat diversity is a function of gradient, confinement, riparian function, LWD density and icing. Loss of riparian function most commonly occurs through hydromodifications (roads, dikes, bank armoring, channelization, etc.) and altered riparian vegetation and reduced LWD (from agriculture, development, past forest practices). For key habitat quantity, lack of pools and reduced base flow (reducing stream width and depth) were most limiting to pre-spawning holding and juvenile rearing life stages of both steelhead and spring Chinook. Warm summer temperatures were a common problem for spawning (pre-spawn holding) and egg incubation for spring Chinook, but also negatively impacted steelhead fry and age-0 summer rearing. Increased peak flows and reduced low flows were consistently moderate to high limiting factors for fry colonization and juvenile rearing life stages. Food (reduced salmon carcasses and benthic productivity) was a minor secondary limiting factor. The cumulative impact of these low-level limiting attributes could be important to the overall reduced productivity in the Walla Walla River Subbasin.

Priority Areas for Restoration from EDT Analysis

In providing the final analysis of priority areas for restoration and protection for this assessment it was decided to use primarily the scaled version of the output. While there is value to be obtained in some venues by using both outputs; it was decided that in a truncated planning effort such as this that the value of a given attribute/or restoration project per kilometer of stream would give the greatest benefit. It gives us the best chance to provide the basis for a plan for the subbasin the most restoration/protection value for each dollar spent.

EDT predicted considerable overlap within the top twelve priority geographic areas (scaled output) for restoration for steelhead and spring Chinook in the Walla Walla River Subbasin. Geographic areas that ranked in the top twelve for steelhead but not spring Chinook included the Lower Walla Walla (mouth to Touchet), NF Walla Walla (mouth to L. Meadows Canyon Cr, plus L. Meadows), and NF Touchet Mainstem (Table 4-29). Conversely, geographic areas that ranked in the top twelve for spring Chinook but not for steelhead included the Walla Walla (Mill to E L. Walla Walla, plus MacAvoy and Springbranch) and Mill Cr (mouth to start of Corps Project at Gose St.). The EDT model predicted greater relative benefit of restoration actions in priority areas for spring Chinook (2.7-9.2% / km) than for steelhead (1.0-2.1 % / km) (Table 4-29).

Several other geographic areas need mentioning here, because of their high importance in the unscaled output, even though the model did not predict that it would be as efficient to work in these geographic areas. These areas could still be critical to the recovery of listed stocks and there may be short stretches within these large geographic areas where restoration actions could achieve similar results when scaled on a per kilometer basis. The Lower Touchet (mouth to Coppei) was the number one restoration priority for both steelhead and spring Chinook in the unscaled model output, though only eleventh (steelhead) and third (spring Chinook) on the scaled (Section 4.4.4.6 and 4.3.4.6). The Touchet River (from Coppei to forks) was fifth (steelhead) and fourth (spring Chinook) for the unscaled output, but only twelfth for both species in the scaled output. Some additional consideration should also be given to the Pine Creek mainstem for steelhead, where it ranked fourth in the unscaled, but only seventeenth in the scaled (Section 4.3.4.6). Finally, the Lower Walla Walla (mouth to Touchet) was more important to spring Chinook in the unscaled output (sixth) than the scaled (fourteenth) (Section 4.4.4.6).

Table 4-29. Priority geographic areas for restoration of spring Chinook (Spr Chk) and summer steelhead (Stlhd) in the Walla Walla River Subbasin, Washington/Oregon. Potential performance increase was the sum of the model predicted increases in life history diversity, productivity, and abundance for the scaled (% benefit/ km) EDT output. Results are sorted by steelhead ranking and do not represent an integrated priority list for all species.

	EDT Restoration Priority Rank		Potential Performance Increase (% / km)	
Geographic Area	Stlhd	Spr Chk	Stlhd	Spr Chk
Mill Cr, Gose Street to Bennington Dam	1	2	2.1%	7.6%
Lower Walla Walla (mouth to Touchet)	2	14	1.9%	2.5%
SF Walla Walla, mouth to Elbow Creek	3	5	1.9%	6.1%
Walla Walla, Nursery Br to Little Walla Walla Diversion	4	9	1.8%	4.4%
Walla Walla, Tumalum Bridge to Nursery Bridge	5	1	1.8%	9.2%
Walla Walla, Touchet to Dry (plus Mud Cr)	6	8	1.4%	4.5%
Walla Walla, Little Walla Walla Diversion to forks	7	10	1.3%	3.9%
NF Walla Walla, mouth to L. Meadows Canyon Cr (plus L. Meadows)	8	13	1.1%	2.6%
NF Touchet Mainstem	9	16	1.1%	1.3%
Walla Walla, Dry to Mill	10	6	1.0%	5.7%
Lower Touchet (mouth to Coppei)	11	3	1.0%	6.5%
Touchet, Coppei to forks (plus Whiskey)	12	12	1.0%	2.7%
SF Touchet Tribs	13		0.9%	
Walla Walla, Mill to E L. Walla Walla (plus MacAvoy & Springbranch)	14	4	0.7%	6.4%
SF Touchet Mainstem	15	15	0.7%	2.0%
Wolf Fork, mouth to Coates (plus Robinson & Coates)	16	17	0.7%	1.3%
Pine Cr mainstem (plus Swartz)	17		0.7%	

Pattit Drainage	18		0.6%	
Walla Walla, E Little Walla Walla to Tumalum Bridge	19	11	0.6%	3.4%
E Little Walla Walla Drainage (plus Unnamed Spring & Big Spring Br)	20		0.6%	
Coppei Drainage	21		0.5%	
Cottonwood Cr Drainage (including NF, SF & MF)	22		0.5%	
NF Touchet Tribs (excluding Wolf Fork)	23		0.5%	
Wolf Fork, Coates to access limit (plus Whitney)	24	18	0.5%	1.2%
W Little Walla Walla Drainage (plus Walsh)	25		0.4%	
Yellowhawk Tribs (Lassater, Russell, Reser & Caldwell)	26		0.4%	
Garrison Cr Drainage (plus Bryant)	27		0.4%	
Lower Dry Cr (mouth to Sapolil)	28		0.4%	
Dry Cr [Pine] Drainage	29		0.3%	
Yellowhawk mainstem (mouth to source)	30		0.3%	
Columbia Mainstem	31	20	0.2%	0.2%
Birch Creek Drainage	32		0.2%	
Stone Cr Drainage	33		0.2%	
Lower Mill Cr Tribs (Doan & Cold)	34		0.2%	
Upper Dry Cr (Sapolil to forks)	35		0.2%	
NF Walla Walla, L. Meadows to access limit (plus Big Meadows)	36	19	0.1%	0.5%
Dry Cr Tribs (Mud[Dixie], Mud[Dry], NF Dry & SF Dry)	37		0.1%	
Couse Creek Drainage	38		0.1%	
Upper SF Walla Walla tribs (excluding Skiphorton & Reser)	39		0.0%	
Skiphorton & Reser Creek Drainages	40		0.0%	
Mill Cr, mouth to start of Corps Project at Gose St	41	7	0.0%	4.6%
Lower SF Walla Walla Tribs (Flume Canyon, Elbow)	42		0.0%	
Blue Cr Drainage (including L. Blue)	43		0.0%	
Mill Cr, Bennington Dam to Blue Cr (plusTitus)	44	21	0.0%	0.0%
Mill Cr, Blue Cr to Walla Walla water intake	45	22	0.0%	0.0%
Mill Cr, Walla Walla water intake to access limit	46	23	0.0%	0.0%
Upper Mill Tribs (NF, Low, Broken, Paradise)	47		0.0%	
Middle Mill Cr Tribs (Henry Canyon, Webb &Tiger)	48		0.0%	
Columbia Estuary	49	24	0.0%	0.0%
Coastal and Offshore	50	25	0.0%	0.0%
SF Walla Walla, Elbow to access limit	51	26	0.0%	0.0%

Priority Areas for Protection from EDT Analysis

EDT analysis recommended geographic areas for protection in the Walla Walla for both steelhead and spring Chinook. Protection here is defined as "protection of these areas in such a way as to prevent further degradation of the habitat attributes that are important to the focal species" (MBI products refer to this as "preservation"; for the purposes of this assessment the terms are synonymous). EDT predicted considerable overlap within the top twelve priority geographic areas for protection of steelhead and spring Chinook in the Walla Walla River Subbasin (Table 4-30). The highest priority Geographic areas for protection of both species were the SF Walla Walla (Elbow to access limit) and (mouth to Elbow Creek), Wolf Fork (Coates to access limit, plus Whitney), and the Walla Walla mainstem (Little Walla Walla Diversion to forks). The biggest discrepancies in priorities included the Walla Walla River mainstem (E. Little Walla Walla to Tumalum Bridge) that was second highest priority for spring Chinook, but only eleventh for steelhead. Also, the Walla Walla mainstem (Dry Creek to Mill Creek) and (Mill to E. Little Walla Walla plus MacAvoy & Springbranch) were much more important to spring Chinook (sixth and eighth, respectively) than to steelhead (21st and 22nd respectively)(Table 4-30).

Table 4-30. Priority geographic areas for habitat protection for spring Chinook (Spr Chk) and summer steelhead (Stlhd) in the Walla Walla River Subbasin, Washington/Oregon. Potential performance decrease was the sum of the model predicted degradation in life history diversity, productivity, and abundance for the scaled (% benefit/ km) EDT output. Results are sorted by steelhead ranking and do not represent an integrated priority list for all species.

	EDT Protection Priority Rank		Potential Performance Decrease (% / km)	
Geographic Area	**Stlhd**	**Spr Chk**	**Stlhd**	**Spr Chk**
SF Walla Walla, Elbow to access limit	1	1	-7.9%	-9.2%
SF Walla Walla, mouth to Elbow Creek	2	3	-2.2%	-1.1%
Skiphorton & Reser Creek Drainages	3		-2.0%	
Upper SF Walla Walla tribs (excluding Skiphorton & Reser)	4		-1.8%	
Wolf Fork, Coates to access limit (plus Whitney)	5	4	-1.0%	-1.0%
Walla Walla, Little Walla Walla Diversion to forks	6	7	-1.0%	-0.6%
NF Touchet Tribs (excluding Wolf Fork)	7		-0.9%	
Lower SF Walla Walla Tribs (Flume Canyon, Elbow)	8		-0.9%	
NF Touchet Mainstem	9	15	-0.8%	-0.1%
Columbia Estuary	10	16	-0.5%	-0.1%
Walla Walla, E Little Walla Walla to Tumalum Bridge	11	2	-0.5%	-2.5%
NF Walla Walla, mouth to L. Meadows Canyon Cr (plus L. Meadows)	12	11	-0.5%	-0.2%
SF Touchet Mainstem	13	5	-0.4%	-0.9%
NF Walla Walla, L. Meadows to access limit (plus Big Meadows)	14	9	-0.4%	-0.4%
SF Touchet Tribs	15		-0.4%	
Walla Walla, Tumalum Bridge to Nursery Bridge	16	10	-0.3%	-0.2%

Wolf Fork, mouth to Coates (plus Robinson & Coates)	17	14	-0.2%	-0.2%
Columbia Mainstem	18	17	-0.2%	-0.1%
Walla Walla, Nursery Br to Little Walla Walla Diversion	19	12	-0.1%	-0.2%
Touchet, Coppei to forks (plus Whiskey)	20	13	-0.1%	-0.2%
Walla Walla, Dry to Mill	21	6	-0.1%	-0.7%
Walla Walla, Mill to E L. Walla Walla (plus MacAvoy & Springbranch)	22	8	-0.1%	-0.5%
Coppei Drainage	23		-0.1%	
Yellowhawk mainstem (mouth to source)	24		-0.1%	
Pattit Drainage	25		-0.1%	
E Little Walla Walla Drainage (plus Unnamed Spring & Big Spring Br)	26		0.0%	
Cottonwood Cr Drainage (including NF, SF & MF)	27		0.0%	
Yellowhawk Tribs (Lassater, Russell, Reser & Caldwell)	28		0.0%	
Upper Dry Cr (Sapolil to forks)	29		0.0%	
Pine Cr mainstem (plus Swartz)	30		0.0%	
Lower Walla Walla (mouth to Touchet)	31	21	0.0%	0.0%
Stone Cr Drainage	32		0.0%	
W Little Walla Walla Drainage (plus Walsh)	33		0.0%	
Lower Mill Cr Tribs (Doan & Cold)	34		0.0%	
Couse Creek Drainage	35		0.0%	
Birch Creek Drainage	36		0.0%	
Dry Cr Tribs (Mud[Dixie], Mud[Dry], NF Dry & SF Dry)	37		0.0%	
Mill Cr, Walla Walla water intake to access limit	38	23	0.0%	0.0%
Upper Mill Tribs (NF, Low, Broken, Paradise)	39		0.0%	
Lower Touchet (mouth to Coppei)	40	19	0.0%	0.0%
Middle Mill Cr Tribs (Henry Canyon, Webb &Tiger)	41		0.0%	
Mill Cr, Blue Cr to Walla Walla water intake	42	22	0.0%	0.0%
Dry Cr [Pine] Drainage	43		0.0%	
Garrison Cr Drainage (plus Bryant)	44		0.0%	
Mill Cr, Bennington Dam to Blue Cr (plusTitus)	45	24	0.0%	0.0%
Blue Cr Drainage (including L. Blue)	46		0.0%	
Mill Cr, mouth to start of Corps Project at Gose St	47	18	0.0%	0.0%
Walla Walla, Touchet to Dry (plus Mud Cr)	48	20	0.0%	0.0%
Lower Dry Cr (mouth to Sapolil)	49		0.0%	
Coastal and Offshore	50	25	0.0%	0.0%
Mill Cr, Gose Street to Bennington Dam	51	26	0.0%	0.0%

Analysis Discussion

The subbasin assessment has many findings that are comparable to other recent assessments and planning efforts. Riparian Function, LWD, Pools, Confinement; Sediment and Temperature were the most common limiting attribute identified with the assessment. These same habitat attributes were identified by virtually all the assessments performed on the Walla Walla in the last seven years (Table 4-31). Particularly pronounced in these assessments is the mention of attributes having to do with floodplain connectivity, flow, riparian health (both of which are related to the EDT attribute Riparian Function) and LWD.

Table 4-31. Assessments performed in the Tucannon Subbasin and the key limiting factors identified.

Assessment	Key Limiting Factors Identified
EDT	Habitat Diversity (Includes: riparian Function, confinement, gradient, LWD density for most life stages); Key Habitat (pools, pool tail-outs and small cobble riffles); Temperature; Low-Flows; Sediment; Channel Stability.
Limiting Factors Analysis	LWD; pools (quality & frequency); embeddedness; floodplain connectivity; temperature; streambank condition; riparian condition; instream flow; diversion screens
Subbasin Summary	Streamflows; stream temperatures; passage impediments; riparian habitats; instream habitat diversity; sediment.
Bull Trout Recovery Plan (draft)	LWD; temperatures; sediment; channel modification; loss of riparian, barrier removal.

The Limiting Factors Analysis (LFA) performed for WRIA 32 (Kuttle, 2002) identified many of the same habitat problems as EDT or the other documents (such as sediment; confinement; lack of primary pools, flow and temperature). The LFA was not specific as to which reaches to restore. It instead outlined conditions that were poor in specific areas and highlighted them for improvement. It did outline lower areas as migration corridors. The report did recommend areas for protection: N.F. Touchet above Lewis Cr; Wolf Fork above Whitney Cr; Mill Cr above Blue Cr; Yellowhawk Cr; SF Coppei Cr above the confluence; SF Walla Walla River from confluence to headwaters; NF Walla Walla River on USFS land.

The Subbasin Summary (James and Scheeler 2001) identified many of the same habitat issues as the EDT or Limiting factors reports, but it was not reach specific. The Summary identified key factors that occur at the local and regional level limiting fish production. These included water quality, geomorphic instability, riparian function, sedimentation, insufficient instream habitat, out-of-basin effects, the introduction and proliferation of non-native species, and ecological productivity.

The draft Bull Trout Recovery Plan (Chaper 10, USFWS 2002) lists many of the same habitat issues, but as with the Summary it is not reach specific. Because bull trout are remaining in the headwater areas, the report tends to emphasize those areas. Results from EDT and the above works appear to generally compliment the results of the Recovery Plan when complete.

<u>Assessment Conclusions</u>

<u>Restoration Priority Geographic Areas</u>

The following geographic areas (GA's) have the highest restoration value in the Walla Walla subbasin according to the EDT analysis of steelhead and spring chinook and taking into account other factors, such as previous planning efforts and empirical data:

a) **Walla Walla, Mill to E L. Walla Walla**
b) **Walla Walla, E L. Walla Walla to Tumalum Bridge**
c) **Walla Walla, Tumalum Bridge to Nursery Bridge**
d) **Walla Walla, Nursery Br to Little Walla Walla Diversion**
e) **Walla Walla, Little Walla Walla Diversion to forks**
f) **SF Walla Walla, mouth to Elbow Creek**
g) **NF Walla Walla, mouth to L. Meadows Canyon Cr (plus L. Meadows)**
h) **Coppei Drainage**
i) **Touchet, Coppei to forks**
j) **SF Touchet Mainstem**
k) **SF Touchet Tribs**
l) **NF Touchet Mainstem**
m) **NF Touchet Tribs (excluding Wolf Fork)**
n) **Wolf Fork, mouth to Coates (plus Robinson & Coates)**
o) **Wolf Fork, Coates to access limit (plus Whitney)**

These are not in ranked order. These 15 areas are, as a group, considered a priority for restoration. The assessment team did not believe that the information available was at a fine enough detail to rank the geographic areas in order of restoration. The priority geographic areas were identified by considering first their rankings by the EDT analysis for restoration for steelhead and spring Chinook. Only GA's with an EDT devised restoration potential of .5% or greater were considered for inclusion as priority for restoration. Then these were considered in the light of past planning efforts and empirical data within the subbasin.

The priority restoration GA's can be categorized into Walla Walla River areas and the Touchet River areas. As can be seen, the restoration areas for the Walla Walla forms one continuous block on the mainstem from the mouth of Mill Cr to the confluence of the North and South Forks of the Walla Walla and then up both forks (SF to Elbow Cr; NF to L. Meadows Canyon). The Touchet River also has contiguous restoration GA's from Coppei Cr (including Coppei Cr) up both SF and NF Touchet and their tributaries and all of the Wolf Fork system .

Divergence from EDT - Mill Cr, Gose Street to Bennington and Lower Walla Walla (mouth to Touchet) were the two highest ranking GA's for restoration according to the EDT output; neither were included in the final recommendation. The recommended section of Mill Cr was the only portion of the Mill Cr/Yellowhawk complex to have a restoration potential of .5% or greater. None of the Mill Cr GA's showed any protection potential (see below) and that led us to believe that the multiple barriers on Mill Cr and the distributary function of Yellowhawk Cr were not allowing the EDT model to accurately portray the value of the Mill Cr system. It is recommended to the subbasin planning participants that the Mill Cr/Yellowhawk complex needs to be given special consideration. For full explanation and recommendations see below. The Lower Walla Walla GA was excluded from our final priorities due to empirical data and practicality. While it did not seem off base for the EDT model to see this area as prime for restoration given its degraded condition; it does seem impractical at this time to do restorative work in the area. Currently, only portions of the focal species life histories are spent in this portion of the river. Primarily it is a migration corridor for adult and out-migrating steelhead and chinook salmon. It also provides some winter rearing for all three focal species. To include this area as priority for restoration would have meant excluding areas upstream that host a far greater diversity of life stages of our focal species. It should also be noted that doing work upstream should benefit the Lower Walla Walla by addressing three of its most limiting habitat attributes: sedimentation, low flows and temperature.

Walla Walla mainstem Touchet to Mill Cr and tributaries encompasses four GA's; Walla Walla, Touchet to Dry Cr, Walla Walla, Dry Cr to Mill Cr., Lower Touchet, mouth to Coppei Cr and Pine Cr mainstem All four of these GA's had restoration potentials greater than .5%, but were not included in the final recommendation. The reasoning for this is similar to the Lower Walla Walla reasoning above. This area simply currently doesn't support enough life history stages for inclusion as a priority restoration area when compared to the rest of the subbasin. It is primarily a migration corridor and winter rearing area. This area also would benefit greatly from upstream restoration work given that temperature, flow and sediment are three of the most limiting habitat factors. Pine Cr is the exception as there are not upstream GA's where work would benefit this stream. For Pine Cr it was determined that the multiple barriers, the presence of only steelhead and the relatively small potential contribution to the Walla Walla population as a whole were reasons enough for exclusion.

Patit Drainage includes all of the Patit Cr and its steelhead bearing tributaries. It had a restoration potential of .7%, which warranted its consideration as a priority restoration area. Patit Cr currently supports a small population of steelhead. Given that only one of the three focal species are present here and the relatively small contribution to the Walla Walla population it was determined to exclude the Patit Drainage GA.

E.Little Walla Walla Drainage rated high in restoration potential but was not included in the final recommendation. As with the previous drainage it supports only a small population of steelhead. It is unknown whether spawning in the tributary is successful or if it is primarily used for rearing. Given those two factors it was excluded.

<u>Cottonwood Cr Drainage</u> also had a high potential for restoration according to EDT. Empirical data for the Cottonwood drainage is very limited. While there appears to be successful spawning, how much and where is still uncertain. Given that this stream supports only the single focal species, the uncertainty of the status of steelhead there and that portions of the stream go dry in summer ; it was determined not to include this drainage for priority restoration at this time.

<u>Impacted Life Stages</u>

Within the priority restoration geographic areas above the following life stages are the most impacted according to the EDT analysis (STS = steelhead; CHS = Spring Chinook):

a) **Walla Walla, Mill to E L. Walla Walla**
    i. Incubation (CHS)
    ii. Fry (CHS)
    iii. Overwintering (STS)
    iv. Yearling Migrant (STS)
    v. Yearling rearing (STS)
    vi. Age-2 Rearing (STS)
    vii. Pre spawning (CHS)
    viii. Spawning (CHS)

b) **Walla Walla, E L. Walla Walla to Tumalum Bridge**
    i. Incubation (STS & CHS)
    ii. Fry (STS & CHS)
    iii. Subyearling rearing (STS & CHS)
    iv. Yearling Rearing (STS)
    v. Pre spawning (CHS)

c) **Walla Walla, Tumalum Bridge to Nursery Bridge**
    i. Incubation (CHS)
    ii. Fry (STS & CHS)
    iii. Subyearling rearing (STS & CHS)
    iv. Overwintering (STS)
    v. Yearling Rearing (STS)
    vi. Pre Spawning (CHS)

d) **Walla Walla, Nursery Br to Little Walla Walla Diversion**
    i. Incubation (CHS)
    ii. Fry (STS & CHS)
    iii. Subyearling rearing (STS & CHS)
    iv. Overwintering (STS)
    v. Yearling (STS)
    vi. Pre Spawning (CHS)

e) **Walla Walla, Little Walla Walla Diversion to forks**

i. Incubation (STS & CHS))
ii. Fry (CHS)
iii. Sub-yearling rearing (STS* & CHS)
iv. Overwintering (STS)
v. Yearling (STS)
vi. Pre Spawning (CHS)

f) **SF Walla Walla, mouth to Elbow Creek**
i. Incubation (STS & CHS)
ii. Fry (CHS)
iii. Subyearling rearing (STS & CHS)
iv. Overwintering (STS)
v. Yearling rearing (STS)
vi. Pre spawning (CHS)

g) **NF Walla Walla, mouth to L. Meadows Canyon Cr (plus L. Meadows)**
i. Fry (STS & CHS)
ii. Subyearling rearing (STS & CHS)
iii. Overwintering (STS & CHS)
iv. Yearling Rearing (STS)
v. Pre spawning (CHS)

h) **Coppei Drainage**
i. Incubation (STS)
ii. Fry (STS)
iii. Subyearling rearing (STS)
iv. Overwintering (STS)

i) **Touchet, Coppei to forks (plus Whiskey)**
i. Incubation (STS)
ii. Fry (STS & CHS)
iii. Subyearling rearing (STS & CHS)
iv. Yearling (STS)
v. Pre Spawning (CHS)
vi. Spawning (CHS)

j) **SF Touchet Mainstem**
i. Incubation (STS & CHS)
ii. Fry (CHS)
iii. Sub-yearling rearing (STS)
iv. Overwintering (STS)
v. Yearling (STS)
vi. Pre Spawning (CHS)
vii. Spawning (CHS)

k) **SF Touchet Tribs**
i. Incubation (STS)
ii. Fry (STS)
iii. Subyearling rearing (STS)
iv. Overwintering (STS)

l) **NF Touchet Mainstem**

i. Incubation (STS)
ii. Fry (STS & CHS)
iii. Subyearling rearing (STS & CHS)
iv. Overwintering (CHS)
v. Yearling Rearing (STS)
vi. Pre Spawning (CHS)

m) **NF Touchet Tribs (excluding Wolf Fork)**

i. Incubation (STS)
ii. Fry (STS)
iii. Subyearling rearing (STS)
iv. Overwintering (STS)

n) **Wolf Fork, mouth to Coates (plus Robinson & Coates)**

i. Incubation (STS & CHS)
ii. Fry (CHS)
iii. Subyearling rearing (STS & CHS)
iv. Overwintering (STS)
v. Yearling (STS)
vi. Pre Spawning (CHS)

o) **Wolf Fork, Coates to access limit (plus Whitney)**

i. Incubation (STS & CHS)
ii. Fry (STS & CHS)
iii. Sub-yearling rearing (STS)
iv. Overwintering (STS & CHS)
v. Pre Spawning (CHS)

* Steelhead Age1 migrant outranked subyearling rearing. Substitution made because of large productivity change difference (30% and < 2% respectively).

The impacted life stages are strictly from the EDT analysis. These represent the top four by life stage rank for the geographic areas as determined from the reach analysis. Life stage ranks are determined through EDT for each reach by considering all three EDT population performance measures (life history diversity, abundance and production). The individual reach analysis that make up the geographic areas were then considered in determining the top four life stages. Those life stages that were ranked in the top four within the reaches most often were determined to be the four most impacted life stages for the geographic areas. It should be noted that in order to develop a well targeted subbasin plan we determined to make this distinction in life stage impacts. However, throughout the system the habitat factors that were identified as most limiting to these life stages actually impact all life stages of salmonids to one degree or another. The previous assessment and planning documents did not usually go into this fine of detail, in that limited life stages were not clearly defined within specific reaches. These results are not inconsistent with previous assessments given that there appears to be general agreement on the limiting factors for the Walla Walla Subbasin and that the affected life stages are determined for the EDT analysis using the latest literature.

The consistency with which limited life stages are common to geographically related areas stands out. In each of the geographic areas on the mainstem Walla Walla from the E. Little Walla Walla to the confluence of the North and South Forks of the Walla Walla the same life stages are identified as limited (with the exception of overwintering; unique to E. Little Walla Walla to Tumalum Bridge). The Walla Walla, Mill Cr to E. Little Walla Walla geographic area is the only mainstem Walla Walla GA that includes yearling migrants (steelhead), age 2 rearing (steelhead) and spawning (spring chinook) as limited. NF Walla Walla and SF Walla had identical limited life stages.

The Touchet GA limited life stages are somewhat more diverse. Incubation, fry, subyearling and yearling rearing were common to the mainstem Touchet, NF Touchet and SF Touchet. The exception is that overwintering was more limited in the South Fork than the fry stage. The Coppei Drainage, NF Touchet Tribs, SF Touchet Tribs and Wolf Fork, Coates to steelhead access limit, had the same limited life stages as the mainstem Touchet with the exception that overwintering was more limited than yearling rearing.

Limiting Habitat Attributes
The following habitat attributes are considered to have the most impact within the above Walla Walla River geographic areas and key life stages listed above:

a) **Walla Walla, Mill to E L. Walla Walla**
    i. LWD
    ii. Confinement
    iii. Riparian Function
    iv. Sediment (embeddedness, turbidity and % fines)
    v. Key Habitat (pools)
    vi. Temperature
    vii. Flow
    viii. Bedscour
b) **Walla Walla, E L. Walla Walla to Tumalum Bridge**
    i. LWD
    ii. Confinement
    iii. Riparian Function
    iv. Sediment (embeddedness, turbidity and % fines)
    v. Key Habitat (pools)
    vi. Temperature
    vii. Flow
    viii. Bedscour
c) **Walla Walla, Tumalum Bridge to Nursery Bridge**
    i. LWD
    ii. Confinement
    iii. Riparian Function
    iv. Key Habitat (pools)
    v. Flow
    vi. Bedscour

d) **Walla Walla, Nursery Br to Little Walla Walla Diversion**
   i. LWD
   ii. Confinement
   iii. Riparian Function
   iv. Key Habitat (pools)
   v. Flow
   vi. Bedscour
e) **Walla Walla, Little Walla Walla Diversion to forks**
   i. LWD
   ii. Confinement
   iii. Riparian Function
   iv. Key Habitat (pools)
   v. Temperature
   vi. Flow
f) **SF Walla Walla, mouth to Elbow Creek**
   i. LWD
   ii. Confinement
   iii. Riparian Function
   iv. Sediment (embeddedness, turbidity and % fines)
   v. Key Habitat (pools)
   vi. Temperature
   vii. Flow
   viii. Bedscour
g) **NF Walla Walla, mouth to L. Meadows Canyon Cr (plus L. Meadows)**
   i. LWD
   ii. Confinement
   iii. Riparian Function
   iv. Sediment (embeddedness, turbidity and % fines)
   v. Key Habitat (pools)
   vi. Temperature
   vii. Flow
   viii. Bedscour
h) **Coppei Drainage**
   i. LWD
   ii. Confinement
   iii. Riparian Function
   iv. Sediment (embeddedness, turbidity and % fines)
   v. Key Habitat (pools)
   vi. Temperature
   vii. Flow
   viii. Bedscour
i) **Touchet, Coppei to forks (plus Whiskey)**
   i. LWD
   ii. Confinement
   iii. Riparian Function
   iv. Sediment (embeddedness, turbidity and % fines)

v. Key Habitat (pools)
vi. Temperature
vii. Flow
viii. Bedscour

j) **SF Touchet Mainstem**
   i. LWD
   ii. Confinement
   iii. Riparian Function
   iv. Sediment (embeddedness, turbidity and % fines)
   v. Key Habitat (pools)
   vi. Temperature
   vii. Bedscour

k) **SF Touchet Tribs**
   i. LWD
   ii. Confinement
   iii. Riparian Function
   iv. Sediment (embeddedness, turbidity and % fines)
   v. Key Habitat (pools)

l) **NF Touchet Mainstem**
   i. LWD
   ii. Confinement
   iii. Riparian Function
   iv. Sediment (embeddedness, turbidity and % fines)
   v. Key Habitat (pools)
   vi. Temperature

m) **NF Touchet Tribs (excluding Wolf Fork)**
   i. LWD
   ii. Key Habitat (pools)

n) **Wolf Fork, mouth to Coates (plus Robinson & Coates)**
   i. LWD
   ii. Confinement
   iii. Riparian Function
   iv. Sediment (embeddedness, turbidity and % fines)
   v. Key Habitat (pools)
   vi. Temperature

o) **Wolf Fork, Coates to access limit (plus Whitney)**
   i. LWD
   ii. Confinement
   iii. Riparian Function
   iv. Key Habitat (pools)
   v. Bedscour

These habitat attributes were taken from the EDT analysis. The limiting attributes identified appeared to be consistent with what is known about the subbasin. The mainstem Walla Walla GA's all identified LWD, confinement, riparian function, key habitat (pools) and flow (low) as limiting habitat factors. Sediment, temperature and bedscour were present in at least one of the geographic areas. As with the limited life stages, the NF and SF Walla Walla had identical limiting habitat attributes.

The mainstem Touchet, Coppei Cr to the forks and Coppei Cr had identical limiting attributes for steelhead. LWD, Confinement, Riparian Function, Key Habitat (pools), Sediment and Temperature were common to the NF and SF Touchet mainstem and Wolf Fork. The NF and SF Touchet Tribs GA's had LWD and key habitat (pools) as common limiting habitat attributes.

Protection Priority Geographic Areas
The following geographic areas have the highest protection value in the Walla Walla Subbasin according to the EDT analysis, empirical data and taking into account other assessment work:

a. All Priority Restoration Geographic Areas
b. SF Walla Walla, Elbow to access limit
c. Skiphorton & Reser Creek Drainages
d. Lower SF Walla Walla Tribs (Flume Canyon, Elbow)
e. Upper SF Walla Walla Tribs (excluding Skiphorton & Reser)
f. NF Walla Walla, L. Meadows to access limit (plus Big Meadows)
g. Patit Drainage
h. Walla Walla, Dry to Mill
i. Yellowhawk mainstem (mouth to source)*
j. Headwaters**
k. Couse Creek Drainage

*Yellowhawk mainstem assessment conclusions is outlined in the Mill Creek/Yellowhawk Complex section below.
**Headwaters is a conglomeration of reaches covering the Bull Trout bearing (present or potential) waters upstream of the present reaches designated through the EDT process (see discussion in below).

All GA's that showed a performance decrease with simulated degradation from the EDT analysis are identified as priority by this assessment. Note that all of the GA's that were priority for restoration also were identified in the EDT assessment and in this assessment conclusion as priority for protection. This accentuates the importance of these areas for, particularly, steelhead and spring chinook production. The result also stresses the need to protect these areas from further degradation while restorative work is completed.

Divergence from EDT - The priority areas above are consistent with the EDT output priorities for steelhead and spring Chinook with the exception of the Couse Creek Drainage. Couse Creek was identified by the technical group from Oregon as being an important area for steelhead production within the Walla Walla subbasin. Empirical evidence suggests that this is a high use area and that degradation would have a particularly harmful impact on the Walla Walla population. It also appeared highly likely that erroneous entries into the EDT database accounted for its low rating for protection potential.

Mill Creek/Yellowhawk Complex

When the Mill Creek/Yellowhawk complex was analyzed with the rest of the subbasin by EDT, the results were inconsistent with previous watershed or restoration planning documents. The geographic areas above Bennington Dam are known to have some of the best habitat in the subbasin came, but their EDT results were very low for protection and restoration (see Table 4-31). In fact they showed no measurable protection value at all. A second run of EDT was made for steelhead; this time all of the obstructions for the subbasin were turned off. In this second run all of the geographic areas above Bennington came out in the top five for protection and in the top 15 for restoration (see Appendix ##). The potential performance decrease changed dramatically (Table 4-31). The conclusion by WDFW and MBI was that the multiple obstructions in lower Mill Creek did not allow the model to fairly analyze the upper portions of Mill Creek. Given this result and the unique challenges of the Mill Creek system (see description following) the assessment recommends that a special strategy be developed for Mill Creek according to the conclusions in the final paragraph of this section.

Table 4-31. Mill Creek Geographic Areas above Bennington Dam and the potential performance decrease of steelhead with and without obstructions as modeled by EDT, 2003. Potential performance decrease was the sum of the model predicted degradation in life history diversity, productivity, and abundance for the scaled (% benefit/ km) EDT output.

	Potential Performance Decrease (% / km) (without obstructions)	Potential Performance Decrease (% / km) (with obstructions)
Geographic Area	Stlhd	Stlhd
Mill Cr, Walla Walla water intake to access limit	-22.0%	0.0%
Mill Cr, Blue Cr to Walla Walla water intake	-8.0%	0.0%
Mill Cr, Bennington Dam to Blue Cr (plusTitus)	-1.0%	0.0%

As described above, the Mill Creek system together with Yellowhawk Creek presented unique challenges during the assessment. The entire lower portion of Mill Creek from Bennington Dam to Gose Street has been modified and continues to be managed for flood control. The area from Gose St to Bennington Dam (6.9 miles) is managed by the Mill Creek Flood Control District and the US Army Corps of Engineers (USACE). It is channelized and confined over its entire length. The Gose Street Bridge consists of a concrete dam resting on a large concrete apron that is now difficult for fish to access because the stream below the apron is severely downcutting. Passage is difficult because fish that are able to access the apron then must jump the dam from shallow, fast water on the concrete apron. The flood control channel consists of a wide channelized stream section with riprapped dikes and with full channel width energy dissipation weirs at regular intervals, for over a mile upstream of Gose Street. At Ninth Avenue, the channel becomes a narrow, stepped concrete channel for several miles upsteam to Roosevelt Street. From there upstream the stream is channelized, with riprapped dikes and full spanning weirs for several miles up to Bennington Dam. The flood control channel was built in the early 1940's and together with Bennington Dam upstream, it is designed to provide flood protection for the City of Walla Walla. From Ninth Avenue to just above Roosevelt St (RM 9.3) the concrete flood channel runs through the heart of downtown Walla Walla. The width in this area varies little and is approximately 40 feet; it averages about 10 feet deep. A nearly continuous reach of a little less than 1500 feet is subterranean, running underneath buildings and streets. The concrete flood channel extends through town to just upstream of Roosevelt St . At this point the channel widens quickly to over 200 feet. It is still contained by riprapped reinforced banks, but features a gravel/silt substrate. From this point upstream to the end of the project at Bennington Dam the channel is cross-thatched by two to three foot high concrete weirs at 60 foot spacing. The channel width through the same area varies from a minimum of 120 feet to a maximum of 250 feet at the Dam. At river mile 11.3 is the Yellowhawk Division Dam. This structure spans the entire width of Mill Creek and is about 3 feet high. This is the main source of Yellowhawk Creek and has a manually operated diversion gate to control flow in to Yellowhawk Creek from Mill Creek. The upper end of the project is Bennington Dam. This is a 250 foot wide concrete structure designed to have a method of controlling diversion to Bennington Lake during high water events.

The Mill Creek project represents many obstructions to fish passage (Table 4-32) as identified in the EDT analysis. The beginning of the project at Gose St is the first obstruction. Access to the flood channel by fish entails a 5-8 foot change in channel height (dependant on flow levels). This portion of the project has a fish ladder that does not meet criteria. Observation of this ladder indicates that it is a severe barrier as steelhead frequently strike the concrete structure in an attempt to pass. It is almost certainly a complete barrier to spring chinook. Upstream of Gose Steet are sheet pile weirs that are likely barriers at low flows. The concrete channel is considered a velocity barrier at most stream flows . This is a several mile stretch that is in effect a concrete sluice box with few or no areas for fish to rest and the flow is concentrated by design in the center of the channel. The next obstruction is the subterranean section of the concrete channel. It is several hundred feet of dark channel. Long portions of covered and relatively dark areas have been shown to be an obstruction to passage. From the subterranean area to the end of the concrete channel is another velocity barrier. The configuration of this area is very similar to the first velocity barrier described above. It is expected to be an obstruction to passage at most flows that adult steelhead would encounter. As described above the channel above this confined concrete channel widens out quickly and considerably (over 200 feet). This area is an immanent threat and likely accounts for a large numbers of juvenile salmonids that are stranded here in late spring and the summer to die because of predators or poor water quality as stream flows are diverted into Yellowhawk Creek for irrigation. As spring flows begin to recede this area becomes for all intents and purposes a large slackwater swamp. The lack of a clearly defined channel does not allow juvenile salmonids adequate passage. As is noted below very little water from upstream is flows to this area. The only water available during this time is quite likely groundwater input. The weirs through this section and that extend to Bennington Dam are also a source of obstruction, particularly to juvenile salmonids and adult spring chinook. The Yellowhawk Division Dam is the next obstruction that adult fish encounter. The dam features one ladder that does not meet passage criteria for adult steelhead. It is possible that fish are able to clear the dam but a shallow approach to the structure makes successful passage unlikely. Above the Yellowhawk Division the stream continues to be bisected by weirs up to the next obstruction, which is Bennington Dam. This flood control diversion dam has a ladder that does not currently meet passage criteria. Actual passage at this facility is unknown, as it currently contains no counting mechanism. The CTUIR has been radio tracking fish tagged in Yellowhawk Creek and Mill Creek for the past three migration years (2002, 2003 and 2004). Thus far they have tracked only a few radio tracked steelhead successfully passing the dam. The USACE has had a video camera operating in the ladder for portions of the 2004 migration season and have observed passage by as many as 28 adult steelhead as of this writing.

Table 4-32. Obstructions in the USACE Mill Creek Project, Walla Walla Washington and estimated percent passage as used in EDT modeling. Passage is an estimate of natural resource professionals; none of the obstructions have been formally evaluated for passage.

	Steelhead % passage	Spring Chinook % passage
Gose Street Dam and Concrete Apron	50	20
Concrete channel, velocity and light barriers	30	10
Concrete capped weirs and diked channel from Gose St to Bennington Dam	80	60
Titus Cr culvert at mouth	0	0
Yellowhawk Division Dam and Ladder	80	60
Bennington Dam and Ladder	20	10
Kooskooskie Dam (outside of project)	100	90

Yellowhawk Creek has its current origins at Mill Creek by way of the Yellowhawk Division Dam. Water input from Mill Creek to Yellowhawk is controlled by the Washington Department of Ecology. Generally it is maintained at 25 to 35 cfs in both summer and winter. In the summer the maintenance of this flow in order to satisfy senior water rights downstream, allows Mill Creek downstream of the Division to go dry. Most of the flow experienced in the Mill Creek project is from leak through at the dam or by the input of spring water. Yellowhawk Creek flows about 8.5 miles until it joins the Walla Walla almost 5 miles upstream of the Mill Creek mouth. Yellowhawk flows through urban and semi-rural areas. It has largely been confined and is missing much of the riparian structure. Passage by adults through Yellowhawk Creek does occur, but it is poorly understood as to what degree this passage is successful. Water temperatures in Yellowhawk are marginal to acceptable to rearing juvenile steelhead. The input of relatively cool water from several spring fed tributaries modifies the temperature in the downstream portion. These tributaries (Cottonwood, Russell and Caldwell Creeks) all have confirmed steelhead rearing and presumed limited spawning. They have all had much of their length channelized and have poor riparian conditions. The upstream portion of Cottonwood is the only section of these tributaries that has good to marginal conditions. It is assumed that some spawning does occur in Yellowhawk but the amount and success is largely unknown. Given all that, Yellowhawk does provide the best habitat downstream of Bennington Dam in the Mill Creek/Yellowhawk complex.

Titus Creek is a sometime distributary of Mill Creek. It has its origins about 2.5 miles above Bennington Dam and runs parallel to Mill Creek for 4.6 miles before rejoining. The inlet to Titus from Mill Creek is not constant. Currently this inlet is maintained in the spring and summer to provide water for water rights that are drawn from Titus. Several springs near this same area also contribute to the flow and, in fact, maintain the flow even when the inlet from Mill Creek is obstructed. Titus flows through semi-rural areas that has both good riparian areas and poor. The point at which it rejoins Mill Creek is currently perched about ## feet above Mill Creek itself and represents a total barrier to fish access.

Upstream from Bennington Dam Mill Creek has fair to excellent steelhead habitat throughout the Washington portion and into Oregon up to the City of Walla Walla water intake. There is one minor obstruction (see Table 4-32, above) near where the creek crosses the Oregon/Washington border at Kooskooskie. It is an old water diversion dam that is about 6 feet high at low water. This facility diverts water for municipal use. The City of Walla Walla water intake dam is at RM 26.9 and pipes water overland to the City's water plant. Much of the diversion is in the winter and spring and is stored in the Walla Walla aquifer by the City for recovery in the summer when flows are low. The amount that the City can withdraw is controlled by the FERC license they hold (as limited power is produced at the water facility). Minimum flows are set at the Kooskooskie Water Gauging site currently maintained by the USGS near the above-mentioned Kooskooskie dam. Above the Intake is the protected Walla Walla Watershed. This area has limited access and is in near-pristine condition.

Given the above conditions this assessment recommends the following:

- The geographic areas above Bennington Dam be considered as priority for protection. The EDT results support the conclusion that if this area be protected from further degradation until the barriers and flow problems in lower Mill Creek be resolved. The geographic areas involved are:
    - Mill Creek, Bennington to Blue Creek
    - Mill Creek, Blue Creek to Walla Walla water intake
    - Mill Creek, Walla Walla water intake to steelhead access limit
    - Upper Mill Creek Tribs
    - Middle Mill Creek Tribs
    - Blue Creek Drainage
- The geographic area containing Yellowhawk Creek remain as a priority for protection as noted in the Protection Priority Geographic Areas section above. Yellowhawk Creek is the only viable migration corridor for adult steelhead and salmon to access the good habitat above Bennington Dam. In order to preserve what population exists above the dam it is vital that this corridor is maintained. Yellowhawk Creek also contains valuable rearing area and serves as an escape alternative for juvenile salmonids that might otherwise rear in Mill Creek, but are unable to because of lack of water and high temperatures.

- The geographic area containing the USACE Mill Creek Project obstructions and immanent threats be considered as a priority to be addressed. This presents some difficulty as all work within this area must take into consideration a wide array of stakeholders including city governments, tribal interests, state agencies, federal agencies and citizens. The Mill Creek Working Group has been meeting since 2002 in attempt to foster ideas and solutions to the problems associated with the Mill Creek Project. It enjoys a wide involvement, including all of the groups mentioned above. The assessment recommends that this group be considered as an avenue by which to continue to work.
- The geographic area (Mill Creek, mouth to start of Corps Project at Gose St) containing the area from the mouth of Mill Creek to the start of the Mill Creek Project at Gose St be considered a priority for protection. If resources are to be expended modifying the project to allow safer fish passage then it would be imprudent not to protect the channel that allows access to this project.
- A solution for the Mill Creek Project should include Titus Creek. This area has the potential to be a summer rearing area for steelhead and chinook; providing them refuge from the warmer temperatures in the Mill Creek project.

Walla Walla Spring Source Creeks and Distributaries

The spring source and distributaries that enter the Walla Walla in the stateline area south and west of the town of Walla Walla are of special concern in this assessment. These streams include: East Little Walla Walla system; West Little Walla Walla system; MacAvoy Creek; Spring Branch. Of these only East Little Walla Walla came out high for restoration in the EDT analysis and none came out high in protection value. The concern is that the real worth of these streams that have most of there flow from groundwater/springs may not be well expressed in the EDT analysis. All but West Little Walla Walla run year around and in the summer have temperatures that are much cooler than the mainstem. As an example, in 2002 temperatures in E. Little Walla Walla reached only 70 degrees F; temperatures on the mainstem Walla Walla at Mojonnier Rd (less than 1 mile downstream) exceeded 75 degrees F (Mendel et al. 2003). In all likelihood these streams offer refuge for juvenile salmonids, both within the streams and at the mouths, from the higher temperature mainstem. These spring source creeks are impacted by water diversion activities in Oregon. The West and East Little Walla Walla are controlled by the Little Walla Walla diversion off of the mainstem Walla Walla. In recent years less water has been diverted down the Little Walla Walla in the summer to satisfy a minimum instream flow requirement from the Walla Walla Agreement (see BELOW). While East Little Walla Walla maintains flow due to groundwater influence the West Little Walla in Washington has gone dry the past three summers.

The influence that these streams can have on the steelhead and chinook salmon populations is largely unknown. The assumption for this assessment is that the cool water input to the mainstem and opportunity for refuge should not be ignored. All of the the streams, with the exception of West Little Walla Walla, flow into geographic areas that are priority for restoration and protection *and* that have flow and temperature as limiting factors. West Little Walla Walla flows into the Walla Walla just downstream of the priority geographic areas. Given the complicated nature of this area, not to mention the bi-state implications, this assessment recommends that the combined citizen and technical groups consider the issue for inclusion within the management plan.

Bull Trout

The assessment of Bull Trout and its habitat presented some difficulty in the Walla Walla Subbasin. Rules for Bull Trout in EDT had not been developed in time for this assessment. This coupled with a lack of knowledge of even the basic life history of Bull Trout in the Walla Walla River put the fish at a distinct disadvantage when it came to naming priority habitats for protection and restoration. EDT reaches and the geographic areas described thus far in the document were developed based on the distribution of steelhead and spring chinook, not Bull Trout. Given that, and to be consistent with other assessments such as the list of priority streams from the Bull Trout Recovery Plan, the following reaches are to be considered as priority for Protection under the geographic area named "Headwaters":

- NF Touchet above EDT reaches
- Burnt and Green Forks above EDT reaches
- Wolf Fork above EDT reaches
- Mill Creek above EDT reaches
- SF Walla Walla above EDT reaches
- NF Walla Walla above EDT reaches

These reaches do not reflect the extent of Bull Trout habitat. Many of the reaches defined for EDT should also take into account Bull Trout needs when formulating management plans. In addition, it is assumed by this assessment team that actions within those reaches that benefit the other focal species will also benefit Bull Trout.

EDT Analysis

The EDT analysis used in this assessment has proved to be a valuable tool. While conducting this assessment we have tried to use this tool in a responsible manner. We believe that the most value from EDT is in the future. The time frame that we operated under and the shortage of data available for some key attributes (see below) encouraged us to use caution with the results. It is our determination that the current data set used for this EDT run should be re-examined and revised between each rolling provincial review. This should also occur before it is used for other planning efforts. We believe that its use in its present state for this Subbasin Plan was necessary, however, with more time and better data the model results can certainly be improved upon.

Habitat Data

While conducting this assessment and particularly while performing the attribute ratings for EDT, it became quite clear that in many cases we were lacking even the most basic habitat information. This made the assessment work quite difficult, particularly outside of the Forest Service lands where at least some basic surveys had been conducted. In order to properly assess the subbasin and provide better information for the management strategy process it is vital that additional habitat and life history surveys be conducted. For most reaches we had no empirical data on habitat types (pools:riffles:glides, etc.), embeddedness, LWD density, winter temperature or percent fines. The entire subbasin is lacking in, bedscour, bankfull widths, and riparian function data. Gradient measurements for individual reaches was also a concern. Gradients were measured using Terrain Navigator; the accuracy of these gradients is unknown and needs to be ground-truthed.

4.6 Species of Interest

4.6.1 Introduction

Species of Interest (SOI) was included within the plan to provide a venue to present species that may have ecological and/or cultural significance but for which there is not enough known about the species to include them in the focal species category for planning purposes. SOI were submitted to the subbasin planning team for approval to be included within the plan. SOI that are submitted have an unknown quantity of ecological significance; in order to determine whether or not these species should be considered as focal for the subbasin more must be learned about subbasin specific life histories and conditions that may be limiting there productivity. Each SOI has a corresponding section within the research, monitoring and evaluation section that includes either a research plan for the SOI or a place holder with the intention of inserting a plan in a later iteration of the subbasin plan. Species of Interest were not to be submitted without either a research plan or the intention of developing one.

4.6.2 Species of Interest

Mountain Whitefish (submitted by WDFW)
Mountain Whitefish (Prosopium williamsoni) are often a forgotten member of the salmonidae family in southeast Washington. A popular winter fishery used to exist for whitefish in parts of southeast Washington. Few anglers target whitefish now days.

Extensive sampling for salmon and steelhead by WDFW in the Washington portion of the Walla Walla Subbasin during the past two decades suggests that whitefish are not very common or well distributed in the subbasin. When whitefish are found, WDFW tends to observe occasional clusters of adult whitefish in pools, and occasional, isolated juveniles scattered in the Walla Walla Subbasin. The age classes between adult whitefish and subyearlings are rarely captured or observed.

WDFW has concerns that mountain whitefish in southeast Washington are not maintaining themselves and may vanish in the next decade or two. WDFW intends to propose a project to compile the literature about whitefish life history and habitat use and compare that with a compilation of WDFW sampling efforts and observations of whitefish for southeast Washington. The compilation of information would form the basis to help determine what additional sampling efforts and methods are needed to develop a more complete understanding of whitefish ecology, distribution and abundance in the Walla Walla Basin within Washington, the Tucannon River and other southeast Washington streams.

Lamprey (CTUIR)
Nothing submitted
Freshwater Mussels (CTUIR)
Nothing submitted.

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