7. Management Plan

As the core of the subbasin plan, the management plan contains the direction in which the subbasin needs to proceed in the future regarding enhancement of aquatic and terrestrial habitats over the next 10 to 15 years. It provides testable hypotheses, measurable objectives, and implementable strategies formulated upon the geographic priorities, biological priorities, and current conditions provided in the assessment and inventory. Following are the key components of the Tucannon Subbasin Management Plan provided in this chapter:

- Vision and Guiding Principles
- Management Plan Components and Prioritization
- Aquatic Habitats
  - Aquatic Working Hypotheses and Biological Objectives
  - Aquatic Strategies
  - Imminent Threats and Passage Barriers
  - Priority Restoration Area Strategies
  - Priority Protection Area Strategies
  - Bull Trout
  - Aquatic Strategy Special Topics
  - Numeric Fish Population Goals
  - Objectives Analysis
- Terrestrial Habitats
  - Terrestrial Working Hypotheses and Objectives
  - Terrestrial Strategies
  - Terrestrial Special Topics – Agriculture as a Cover Type of Interest
- Research, Monitoring and Evaluation

The various components of the Tucannon Subbasin Management Plan described in this chapter have been developed from information presented in the assessment and inventory. Chapters 3 and 4 of this document, the aquatic and terrestrial assessments, provide the primary supporting background information used to develop the management plan. Chapter 6, the inventory, also fed into the management plan in identifying specific areas where projects have occurred, and areas (geographical and biological) that remain in need of further work. This plan is intended to be implemented by landowners, conservation districts, agencies, tribes, and others that possess the appropriate responsibilities and authorities. Where possible, this is expected to occur on a voluntary basis, using BPA and other available funding sources.

Although the management plan components are based upon individual species and their habitats, none of these ecosystem components function independently. Strategies implemented to enhance species populations or habitats can impact other species in positive or negative ways, and will have social, political and economic implications.

Social, economic, and political factors in the Tucannon subbasin will be important considerations in determining the success of this management plan. A large proportion of strategies rely upon the cooperation of private landowners and their communities. As mentioned in the subbasin vision statement below, the social, cultural, and economic well-being of communities within the Subbasin and the broader Pacific Northwest is an ultimate goal. Such factors were considered during the comparison of alternative strategies, and will play a significant role in determining which strategies are ultimately implemented. Incorporating these considerations along with directives provided by the scientific assessment have provided the greatest opportunity for this subbasin plan to successfully enhance aquatic and terrestrial wildlife and their habitats.

7.1 Preliminary Management Plan Components

7.1.1 Vision

The vision provides general guidance and priorities for the long-term future of the subbasin. The vision describes the common desired future condition of the subbasin. The vision is qualitative and should reflect the policies, legal requirements and local conditions, values and priorities of the subbasin in a manner that is consistent with the vision described for the Columbia Basin in the Council's program. The vision will provide the guidance and priority for implementing actions in the future, therefore driving the development of biological objectives and strategies for the subbasin (NWPCC 2001).

The following vision statement and guiding principles for the Tucannon Subbasin were developed and approved by the Subbasin Planning Team through discussion with the WRIA 35 Planning Unit providing public review. Note that the Subbasin Planning Team includes representatives from the lead (Columbia Conservation District) and co-leads (Nez Perce Tribe; Confederated Tribes of the Umatilla Indian Reservation).

The vision for the Tucannon Subbasin is a healthy ecosystem with abundant, productive, and diverse populations of aquatic and terrestrial species that supports the social, cultural and economic well-being of the communities within the Subbasin and the Pacific Northwest.

Guiding Principles

Respect, recognize, and honor the legal authority, jurisdiction, treaty-reserved rights, and all legal rights of all parties.

Protect, enhance, and restore habitats in a way that will sustain and recover native aquatic and terrestrial species diversity and abundance with emphasis on the recovery (de-listing) of Endangered Species Act listed species.

Enhance species populations to a level of healthy and harvestable abundance to support tribal treaty and public harvest goals.

Foster ecosystem protection, enhancement, and restoration that result in ridgetop-to-ridgetop stewardship of natural resources, recognizing all components of the ecosystem, including the human component.

Provide information to residents of the Asotin, Tucannon, and Lower Snake Subbasins to promote understanding and appreciation of the need to protect, enhance, and restore a healthy and properly functioning ecosystem.

Provide opportunities for natural resource-based economies to recover in concert with aquatic and terrestrial species.

Promote and enhance local participation in, and contribution to, natural resource problem solving and subbasin-wide conservation efforts.

Assist in efforts to coordinate implementation of the Pacific Northwest Electric Power Planning and Conservation Act, the Endangered Species Act, the Clean Water Act, and other local, state, federal, and tribal programs, obligations, and authorities.

Coordinate and support planning efforts to eliminate duplication that results in prioritized protection, enhancement, and restoration projects in strategic areas.

Develop a scientific foundation, for diagnosing biological problems, for designing and prioritizing projects and for monitoring and evaluation to guide improving management to better achieve objectives.

7.1.2 Management Plan Components

The management plan consists of three primary components: working hypotheses, biological objectives, and strategies.

Working Hypotheses

Working hypotheses are statements regarding the identified limiting factors for aquatic species and terrestrial habitats. The limiting factors incorporated into the working hypotheses were those identified in the aquatic and terrestrial assessments (see Chapters 3 and 4, respectively). Working hypotheses are intended to be testable, in that future research and monitoring will enable evaluation of the accuracy of the working hypotheses. Hypotheses for aquatic species were developed at the level of life history stages for individual species in geographic areas that are priorities for restoration. Terrestrial working hypotheses were established for priority habitats. Although anadromous fish species and some terrestrial wildlife species are limited by out-of-subbasin factors such as migration success, in-subbasin factors related to habitat quantity, quality, complexity and connectivity were the focus of the working hypotheses.

Biological Objectives

Biological objectives are specific, measurable objectives for selected habitat components. Establishment of biological objectives will allow subbasin planners to track progress toward decreasing the impacts of the limiting factors identified in the working hypotheses. Consistent with Council guidance for development of subbasin plans, quantitative biological objectives were established wherever sufficient data and information was available to support development of such. Biological Objectives were developed within the context of EDT and with the EDT

attributes' numerical ranking cutoff criteria in mind. In the absence of sufficient data and/or information, subbasin planners established objectives based upon a desired trend (e.g. Show downward trend in summer maximum water temperatures). In these areas, the gathering of such information was typically identified as a strategy. Both quantitative and qualitative objectives are measurable, provided that baseline information exists, to allow demonstration of progress. Reference reach analyses to determine attribute potentials was not possible within budgetary and schedule constraints All biological objectives were developed by technical staff, reviewed and modified by the public as appropriate, with a limited set of assumptions and a 10 to 15 year planning horizon.

Strategies - General

Strategies identify the specific types of actions that can be implemented to achieve the biological objectives. After development of the working hypotheses and biological objectives, preliminary strategies were developed with the technical team. These were then reviewed and revised with joint meetings of technical staff and the public at the Aquatic Management Plan Workshop 1, the Aquatic Management Plan Workshop 2, and the Terrestrial Management Plan Workshop. Significant revisions to the strategies occurred at these workshops. These joint meetings of technical staff and the public were key to ensuring that strategies ultimately were both technically sound and consistent with public needs. Where received, written comments from the public were also used to revise the strategies.

Discussion of Land Acquisition Strategies

Land acquisition was identified and discussed extensively (in its various forms, e.g. fee simple title, conservation easements, and long-term leases) as an aquatic and terrestrial habitat protection strategy in the subbasin plan development process. Local stakeholders have been unable to reach consensus on inclusion of fee simple title land acquisition as a strategy. Conservation easements and long-term leases are supported aquatic and terrestrial strategies.

Hence, fee simple title land acquisition was deleted as strategy from the terrestrial and aquatic management plan sections, and majority and minority reports on the topic are provided in Appendix H. The appendix describes the position and basis for those against inclusion of fee simple title land acquisition strategy. The appendix also describes the position and basis for those supporting inclusion of fee simple title land acquisition strategy.

Strategies - Aquatic

Working directly from the biological objectives, aquatic strategies focus on methods to achieve improvements in aquatic habitat. The general assumption is that habitat improvements will enhance fish populations. Since biological objectives regarding specific numeric fish population goals were not developed, strategies for directly enhancing fish populations were not developed either in this subbasin plan. See Section 7.3.6 below for more detailed discussion of numeric fish population goals. For terrestrial species and habitats, the limited information available also precluded the development of biological objectives and strategies for individual focal species. Instead, terrestrial strategies focus on enhancement of priority habitat types, under the general assumption that improvements to terrestrial habitats will benefit terrestrial species.

Two general categories of aquatic strategies were developed: restoration and protection. Applied in their respective priority geographic areas, restoration strategies are focused on enhancing current conditions, while protection strategies are focused on the maintenance of current conditions. This distinction does not imply that restoration strategies will include only active work, while protection will only include passive work. Both active and passive measures may be implemented to achieve restoration and/or protection measures, where appropriate. Note that in priority geographic areas for restoration of aquatic habitats, both protection and restoration strategies will apply, because all priority restoration areas are also priority protection areas. In addition to the restoration priority areas, priority geographic areas for protection were identified in the Assessment section of the subbasin plan. These are areas that the EDT analysis or empirical data suggests would have the most negative impacts on the focal species if they were allowed to degrade further.

Strategies - Terrestrial

Two general categories of terrestrial strategies were also developed: protection and enhancement. Applied across priority habitats, protection strategies focus on maintaining functional habitat. Enhancement strategies focus on increasing the functionality of terrestrial habitats. In addition, selected strategies also focus on increasing the functionality of land that is currently under short-term conservation easements.

7.1.3 Prioritization

Prioritization of biological objectives and strategies was addressed in the Tucannon subbasin plan as follows. The priority objectives identified in this plan were selected from a broad range of alternative objectives that could be addressed in the Tucannon subbasin based upon the working hypotheses derived from the assessment. For aquatic species and habitats, geographic priorities were established through identification of priority geographic areas for restoration and/or protection. Because terrestrial species could potentially use all areas of the subbasin, selection of four priority habitat types established geographic priorities for management. The objectives have not been prioritized relative to each other. Subbasin planners did not attempt this level of prioritization because insufficient information was provided by the assessments to support it. Regardless, the objectives presented herein were evaluated by technical staff and the public and are considered to be those that could produce the greatest benefit over the next in 10 to 15 years, within practical sideboards and assumptions (see Section 7.2).

The aquatic and terrestrial strategy lists were developed to provide implementing entities with a menu of options. Not all strategies will be implemented, nor are all strategies appropriate in all portions of a subbasin. Determination of which strategies are implemented will depend on opportunities that become available and site-specific conditions over time. The listed strategies are intended to result in implementation of projects that will provide the most benefit to fish and wildlife species and their habitats under local ecological and social conditions at any given point in time. For this reason, strategies cannot, and should not, be prioritized in the subbasin plan. Prioritization of strategies is anticipated to occur at the provincial review level when proposals are considered for funding. At this time, projects that address specific strategies should be identified and ranked for funding based on biological and cost effectiveness.

Some broad categories of priorities have been established in this plan for both the aquatic and terrestrial components. These include:

- Strategies that provide long-term protection will be a higher priority than strategies that provide shorter-term protection, all other factors being equal.
- Strategies that meet multiple objectives are considered a higher priority than strategies that will provide benefit for a limited number of objectives.
- Terrestrial strategies that also provide benefit for aquatic focal species will be considered a higher priority than strategies that only benefit terrestrial wildlife.

In addition to specific strategies, approaches for management plan special topics have also been developed (see Sections 7.3.5 and 7.4.1). These topics include those for which insufficient information was available to enable development of working hypotheses, objectives, and strategies through the EDT model and those issues that are of special interest to local stakeholders, e.g. agriculture as a cover type of interest.

An additional significant component of the management plan includes cultural priorities of the Nez Perce Tribe and Confederated Tribes of the Umatilla Indian Reservation. Objectives established to support tribal culture, and projects proposed to achieve such objectives, will be considered as an overlay to the biologically-driven hypotheses, objectives, and strategies provided in the remainder of this management plan. As such, projects that support tribal culture should be considered a higher priority than projects that provide equivalent biological benefits with no cultural benefits. In support of this subbasin plan, the Nez Perce Tribe completed a study of sites of high cultural value due to historic and current use by tribal members. This study, provided in full in Appendix I, was based upon information gathered from reports of tribal members. A map of known high priority sites can be found in the appendix. Further funding to review additional sources and expand documentation of Nez Perce cultural priorities is suggested in the study.

7.2 Aquatic Working Hypotheses and Biological Objectives

Working hypotheses were developed for each limiting factor identified by EDT in each priority restoration geographic area. Example working hypotheses for each type of limiting factor are provided in Table 7-1. The full list of working hypotheses is provided in Section 7.3. A summary of the biological objectives derived for each limiting factor by geographic area is provided in Table 7-2. Descriptions of the reaches referenced in Table 7-2 and description of the various limiting factors can be found in Appendix B.

Working hypotheses and objectives were established in all priority geographic areas for restoration. Seven limiting factors were key in these areas: sediment (embeddedness), large woody debris, key habitat (pools), riparian function/confinement, summer water temperature, bedscour, and flow. A working hypothesis and one or more biological objectives were established for each limiting factors in each priority restoration geographic area where it was one of the top factors. Example working hypotheses for each type of limiting factor are provided in Table 7-1. The full list of working hypotheses is provided in Section 7.3. A summary of the

biological objectives derived for each limiting factor by geographic area is provided in Table 7-2. Descriptions of the reaches referenced in Table 7-2 and description of the various limiting factors can be found in Appendix B.

These limiting factors clearly are related to each other (e.g. flow and temperature, bedscour and embeddedness). As an example, bedscour and embeddedness are both listed as limiting factors in several geographic areas. These would appear contradictory, as increased bedscour would tend to decrease embeddedness. This is one example of where a closer look at the EDT model results will be needed to help evaluate the specific strategies that can be implemented to address all limiting factors within a geographic area. Another example is the relationship between flow and temperature. In some areas, increasing flow may not ameliorate elevated summer water temperatures to the degree necessary to support fish populations. Research will need to continue to clarify the causes and relationship between limiting factors. The causes of the limiting factors were developed through the best professional judgment of technical staff and the Subbasin Planning Team. Further analysis will need to occur on a site-specific basis to provided empirical data regarding the causes of these limiting factors by geographic area, and, potentially, by reach. This is discussed as a priority under the research, monitoring, and evaluation plan proposed for the subbasin.

The following assumptions were used by technical staff and the public during the development of biological objectives in the Tucannon Subbasin. Specific definitions of terms can be found in the glossary.

- General: Objectives were set at a level that can reasonably be achieved within the working horizon of this plan (10 to 15 years). Objectives were designed to achieve enough change to cause a measurable beneficial effect on salmonid populations, or to achieve a significant transition point in survival for the species. Any improvements in the mountain geographic area are assumed to benefit bull trout.
- Embeddedness: Any action taken to improve embeddedness will likely produce commensurate reductions in percent fines and turbidity. Reducing embeddedness to 20 percent or less should significantly increase egg survival in the gravel in all geographic areas.
- Large Woody Debris: LWD distribution within the geographic area will not necessarily need to be uniform. Large, complex aggregations of LWD can be beneficial and scattered throughout the area, at least some of which may move and re-aggregate annually. The intent is to have large pieces of woody debris available in the system that contribute to these aggregations, and will have significant influences on channel morphology. It is expected that LWD can increase throughout the state-owned reach of the Tucannon River above Cummings Creek to a greater extent than below. It is further expected that LWD density can increase throughout the federal/state owned reach from the Hatchery to Little Tucannon and in the mountain geographic area. Because of historic heavy recreational use, LWD increases in the mountain geographic area below Panjab Creek will require significant time and investment. Wilderness use and access will limit the ability to increase LWD artificially in the mountain geographic area above Panjab Creek. Note that Federal law prohibits active restoration work to occur in wilderness areas. Controlling access to campgrounds and setting campgrounds back from

the stream should allow natural LWD recruitment to occur over time in the mountain geographic area.

- Pools: LWD is often critical to the creation and stability of primary pools. Increasing pools in the Tumalum-Hatchery reach of the Tucannon River will be constrained by time and investment in the reach. Multiple actions will be needed to create pools in the near and long-term. Wilderness access in the mountain geographic area will limit the ability to increase primary pools artificially. Note that Federal law prohibits active restoration work to occur in wilderness areas. Controlling access to campgrounds and setting campgrounds back from the stream should allow natural LWD recruitment to occur in the Mountain geographic area, which will have a dominant effect on pool development and stability. The desire is to maintain a naturally functioning system in the Mountain geographic area.
- Confinement: Artificial confinement caused by road location and dikes perpetuates stream instability. Elimination of low priority man-made structures would encourage natural stream meandering that will benefit salmonids. Determination of low versus high priority dikes would occur through discussion with all stakeholders in the affected area(s). Greater dike setback or road relocation could significantly improve stream habitat and stability while continuing to provide protection for infrastructure and private property. Although identifying areas for improvement in the Hatchery-Little Tucannon reach may be difficult, dike setback and/or road relocation could also improve stream habitat and stability in this reach.
- Riparian Function: Riparian function depends on riparian area width, vegetative species diversity and age. Achievement of adequate riparian function will require addressing all of the following components: canopy cover, understory vegetation, wetlands, and floodplain connectivity. A continued recognition of the value and need for riparian function, as has occurred in recent years, will allow riparian function to increase. Some effort to stabilize the stream channel is needed before riparian enhancement is likely to be effective. This attribute is highly dependent on time for improvement throughout the subbasin. Due to extensive infrastructure and dwellings, only small improvements in riparian function are expected in the Marengo-Tumalum geographic area of the Tucannon River during the next 10 to 15 years. Managers desire to maximize improvements on State land in the Tumalum-Hatchery, Hatchery-Little Tucannon, and Mountain geographic areas during the time frame.
- Temperature: Only the daily maximum portion of this attribute was identified in the objectives below, but actions taken to address maximum daily temperature are expected to decrease daily average temperatures overall. Decreased temperatures are also expected to occur due to improvements in riparian function.

Table 7-1 Example Working Hypotheses

Factor	Example Working Hypothesis
Sediment	Reduction in sediment (turbidity, percent fines and embeddedness) will increase survival of steelhead (incubation, fry, subyearling rearing, and yearling rearing life history stages), spring chinook (fry, subyearling rearing, overwintering, and pre-spawning life history stages) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages).
Large Woody Debris	Increase in LWD densities will increase survival of steelhead (egg incubation, fry, subyearling rearing, and yearling rearing life history stages), spring chinook (fry, subyearling, overwintering, and pre-spawning life history stages) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages).
Pools	Increase in primary pool quantity, quality and complexity will increase survival of steelhead (egg incubation, fry, subyearling rearing, and yearling rearing), spring chinook (fry, subyearling, overwintering and pre-spawning), and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages).
Riparian Function	Increase in riparian function and a decrease in confinement will increase survival of steelhead (egg incubation, fry, subyearling rearing, and yearling rearing), spring Chinook (fry, subyearling, overwintering and pre-spawning) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages).
Summer Max. Water Temperature	Decrease in summer temperatures will increase survival of steelhead (fry, subyearling rearing, and yearling rearing), spring Chinook (fry, subyearling and pre-spawning) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages).
Flow	Increase in flow will increase survival of steelhead (fry, subyearling rearing and yearling rearing), spring chinook (fry, subyearling and pre-spawning), and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages).

Table 7-2 Summary of Biological Objectives by Geographic Area

Geographic Area		Habitat Element						
		Substrate Embeddedness (% of substrate)	LWD (# pieces per channel width)	Pools (% of stream surface area)	Riparian Function (% of maximum)	Confinement (% of streambank length)	Summer Maximum Water Temperature	Instream Flow
Pataha-Marengo		20%	2	15% or greater	75%	25%	Less than 4 days above 75F (24C)	Increase flow where possible
Marengo-Tumalum		*	2	10-15%	60%	50% or less	Less than 4 days above 75F (24C)	Increase flow where possible
Tumalum-Hatchery	Below Cummings Cr.	*	1 or more	10%	40-50%	Decrease Where Possible	Less than 4 days above 75F (24C)	Increase flow where possible
	Above Cummings Cr.	*	2	15%	75% or greater			
Hatchery-Little Tucannon		*	More than 2	10% or greater	75% or greater	Decrease Where Possible	*	*
Mountain	Below Panjab Cr	*	More than 1	15% or greater	75% or greater	Decrease Where Possible	*	*
	Above Panjab Cr	*	Achieve Naturally Functioning System **	Achieve Naturally Functioning System **	Achieve Naturally Functioning System **		*	*

* Not an EDT-identified limiting factor

** Naturally functioning system was defined ast he objective in these areas due to the fact tha the Mountain Tucannon geographi area is primarily wilderness. As such, passive strategies are the most applicable in the area due to access limitations. Further, it ismost likely tha tthis area, of any, will be able to approach historic habitat conditions. Progress toward achieving a naturally functioning system would involve allowing natural processes for wood recruitment, pool development, and riparian connectivity to occur without interference. Monitoring efforts would be focused around documenting an upward trend in the limiting factors.

7.3 Aquatic Strategies

The following three categories of aquatic strategies were developed:

- strategies to address imminent threats throughout the subbasin
- strategies for priority restoration areas
- strategies for priority protection areas.

All three are considered equally important for implementation. Active restoration will likely be needed to address most imminent threats, e.g. unscreened diversions, passage barriers, and human-caused dry stream reaches, although passive measures for flow enhancement may also be employed. Active restoration is the use of a structural improvement or direct instream work for the benefit of instream habitat. Examples include installation of large woody debris, rock weirs, and J-hook vanes. Activities such as riparian planting and upland infiltration enhancement are not considered active restoration actions as defined for the purposes of the subbasin plan. Note that this is the definition of passive restoration for this subbasin plan, and may not be consistent with the typical definition of what constitutes passive restoration. Passive restoration takes advantage of natural processes and out-of-stream actions to achieve instream habitat enhancement. Examples includs planting riparian vegetation, implementing conservation easements, increasing upland infiltration (e.g. direct seed/no-till), use of sediment basins, developing alternative livestock watering facilities, and water conservation. These results may be achieved only in part during the 10 to 15 year time-frame of this plan. Active restoration can show more immediate benefits, but those benefits can be short-lived and site-specific. Both active and passive restoration have their place, but the choice to use one over the other will be considered carefully with both short-term and long-term goals in mind.

7.3.1 Imminent Threats

As the management plan process was developing it became clear that some actions in the subbasin needed to be held apart from the process and given special status. The strategy of our management plan was to narrow the subbasin into a few geographic areas where the focal species would receive the most benefit by the work being done. While this is appropriate for most management actions it does not address conditions that are likely to cause immediate mortality to the salmonids that serve as our focal species. We identified three areas that fit into this category: passage obstructions, fish screens and areas of the stream that seasonally go dry. These conditions should be a priority for funding wherever they occur in the subbasin, regardless of whether they are located in a priority geographic area.

Obstructions

Passage obstructions are considered a potential source of immediate mortality to fish. Delay in passage can expose fish to habitat conditions that could be adverse to survival without the opportunity to escape. Delay in passage also can affect the ability of salmonids to successfully spawn. Fish can also be physically injured by inadequate passage facilities, increasing their exposure to disease or possibly causing direct mortality from the injuries. In the Tucannon

Subbasin, seven obstructions were identified during the EDT modeling process (Table 7-3). All of these obstructions are located in the Pataha Creek Drainage. The Tucannon drainage also had several obstructions; these were inadvertently left out of the EDT database and are outlined in Table 7-3 Obstructions should be removed or modified wherever they occur in the basin whenever the opportunity arises. Priority should be given to those obstructions that affect multiple focal species, occur lower in the basin and are considered to be the greatest obstructions to passage. A comprehensive inventory, analysis and prioritization of passage barriers are a high priority and needs to be completed on all locations within the subbasin that may limit migration of both anadromous/resident fish in their juvenile and adult life stages.

Though the management work groups did not rank obstructions in order of priority, the relatively small number of obstructions in the subbasin allows for the priority assumptions to be made from the data in the table.

- The culvert on Highway 261 at Delaney is located very low in the Pataha Creek system and is a reasonably high barrier at 70% passage.
- The Highway 12 Bridge at Dodge Junction is also low in the system and only an estimated 80% of adult steelhead are able to pass.
- The obstruction in the city of Pomeroy at 20th Street is located relatively high in the system.

While the geographic areas that these obstructions restrict passage to are not considered high priorities for restoration or protection, they are viable steelhead habitat; particularly the Mountain Pataha geographic Area. It is important that adult steelhead have unimpeded access to this area. For this reason the obstruction at 20th Street in Pomeroy also should be considered a priority for modification. It is the last major obstacle to adult steelhead to the upper reaches of the Pataha Drainage. On the Tucannon river most of the obstructions are considered only a minor impedance to passage The irrigation weir at river mile 13.5 would probably provide the greatest benefit to all focal species with modification.

Table 7-3 Salmonid fish passage obstructions in the Tucannon Subbasin

Drainage/Obstruction	River Mile	Fall Chinook % Passage	Spring Chinook % Passage	Steelhead % Passage
Pataha Drainage:				
Pataha Cr: Highway 261Culvert at Delaney[1]	1.3	NA	NA	70%
Pataha Cr: Dodge Bridge	10.8	NA	NA	80%
Pataha Cr: 20th St Sewer Line (City of Pomeroy)[1]	25.7	NA	NA	70%
Bihmaier Gulch Cr: Old Bihmaier Dam	1.1	NA	NA	50%
Pataha Cr: Rock Shelf	35.2	NA	NA	90%
Dry Pataha Cr: Dry Pataha Dam[1]	.4	NA	NA	40%
Pataha Cr: Steven's Ridge Culvert[2]	43.8	NA	NA	90%
Tucannon Drainage:[3]				
Tucannon R: Starbuck Dam[4]	5.5	90%	90%	95%
Tucannon R: Irrigation Weir	13.5	80%	85%	90%

Drainage/Obstruction	River Mile	Fall Chinook % Passage	Spring Chinook % Passage	Steelhead % Passage
Tucannon R: Tucannon Falls[4]	16	90%	90%	95%
Tucannon R: Hatchery Dam[4]	38.4	NA	90%	95%
Tucannon R: Curl Lake Weir	43.0	NA	90%	95%

[1] Considered passage barrier at high and low flows.

[2] Considered passage barrier at high flows only.

[3] Inadvertently, no obstruction barriers were entered into the EDT database. Given the small magnitude of the obstructions it is unlikely that the results would have changed.

[4] Entered as reach breaks in EDT database, but no obstruction rating given.

Note: Passage obstructions were identified and percentages were estimated for EDT analysis, these structures have not been evaluated for passage. This list is not to be considered comprehensive, as none of these creeks have been inventoried for passage barriers. Percentages represent the likelihood of adult passage in low flow conditions unless otherwise indicated. Obstructions are in order for each drainage: Top is closest to mouth while the bottom is farthest from mouth. (NA = Species not present).

Fish Diversions/Screens

Water diversions that are not screened or are inadequately screened are a well documented source of mortality to salmonids, particularly juveniles. If fish screens do not have the correct flows across the screen or if mesh sized is wrong, fish may be impinged on the surface. A water diversion, pump or gravity, that is not screened or has too large mesh may physically divert the fish out of the stream and into a waterway that is not suitable for survival. The installation of screens that meet current NOAA standards is considered a priority for the basin. In addition projects that move diversions out of salmonid bearing waters do, in affect, remove a potential source of mortality and should also be considered a priority under this management strategy. The EDT analysis rated reaches for water withdrawals as a habitat attribute. This rating was based on the number of withdrawals within a reach and the degree to which they were screened (see Appendix B for rating definitions). In the Tucannon subbasin the Marengo-Tumalum Geographic Area was rated as having; “Several sites of significant water withdrawals along the reach without screening or screening believed to be ineffective.” this is a rating of “3”. Lower Tucannon, Pataha-Marengo, Tumalum-Hatchery and Hatchery-Tucannon are all geographic areas that had a ranking of “2”. This is defined as; “Several or significant water withdrawals along reach though; all sites known or believed to be screened with effective screening devices”. There are also several areas that were rated as having minor withdrawals.

Dry Stream Reaches

There are some reaches within the Tucannon Subbasin that go dry on a seasonal basis. Some of these may be caused by the natural hydrological regime of the area; others may be anthropogenic in origin. Anthropogenic causes can be water diversions or vegetation removal, which reduces infiltration of water in the watershed. While this plan does not advocate the implementation of resources for introducing water to a section of the stream at a time of year when water historically was not present, every effort should be made to return water to areas that are de-watered due to the above mentioned man-caused reasons. Projects could include water leases or purchases. In addition, larger projects that restore the riparian areas or otherwise encourage the raising of the water table and water retention of the affected areas should be encouraged.

7.3.2 Priority Restoration Area Strategies

Strategies developed for the priority restoration geographic areas are provided in Table 7-4. This table lists the working hypotheses, associated biological objectives, and associated strategies for each geographic area. For example, in the Tucannon River, Pataha-Marengo Geographic Area, Strategies PM1.1.1 through PM1.1.23 are proposed to achieve Objective PM1.1, which was established as a measurable target for improvements in Hypothesis PM1. All related hypotheses, objectives, and strategies are numbered similarly. As discussed above, strategies are not prioritized and will be implemented based upon opportunities available. In Table 7-4, the historical and current estimates were derived from the EDT assessment. Proposed causes were developed by local technical staff.

Table 7-4 Priority Restoration Area Working Hypotheses, Limited Life History Stages, Causes, Biological Objectives, and Strategies

Hypothesis PM1: Reduction in sediment (turbidity, percent fines and embeddedness) will increase survival of steelhead (incubation, fry, subyearling rearing, and yearling rearing life history stages), spring chinook (fry, subyearling rearing, overwintering, and pre-spawning life history stages) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages).	
Causes: Land use: road management, cultivation, overgrazing, development, planning/regulation, lacking protection/vegetation removal in side draws; Increased width-to-depth ratio; Poor riparian condition; Altered stream hydrograph leading to excessive flashiness; Noxious weeds.	
Objective PM1.1- Reduce embeddedness within the area to 20%. This will also stimulate a corresponding decrease in percent fines and turbidity. Current estimate: up to 37%	**Note- Strategies are not prioritized and will be implemented based upon opportunities available**
	Strategy PM1.1.1-Improve the extent, structure, and function of riparian buffers through vegetation planting (native species unless otherwise required), managed grazing, selective livestock fencing, and similar practices, including tributaries (perennial and intermittent streams) that contribute to priority areas.
	Strategy PM1.1.2-Decrease sediment delivery from upland practices through expanded use of conservation tillage, sediment basins, mowing of road shoulders in place of herbicide use, road paving, implementation of managed grazing, limited grazing, other erosion control BMPs, and other practices.
	Strategy PM1.1.3-Continue development and implementation of watershed scale efforts (e.g. TMDLs) to remedy identified water quality factors.
	Strategy PM1.1.4-Reduce sediment inputs through implementation of additional forestry, agricultural, urban, stormwater and other BMPs.
	Strategy PM1.1.5-Restore perennial vegetation in upland cultivated and non-cultivated areas with native species and reforestation.
	Strategy PM1.1.6- Uphold existing land use regulations and instream work regulations (e.g. critical area ordinances, HPA requirements, etc.) that limit channel, floodplain, and riparian area impacts and educate the public regarding their implementation. *
	Strategy PM1.1.7-Identify jurisdictions with inadequate land use regulations, and work to strengthen existing or pass new regulations that better protect streams from floodplain development that leads to loss or degradation of riparian vegetation. *
	Strategy PM1.1.8-Increase stream flows through the lease and/or purchase of water rights (also see Objective PM6)
	Strategy PM1.1.9-Pave roads near the stream and in upland areas.
	Strategy PM1.1.10-Improve watershed conditions (e.g. upland water infiltration) through road obliteration, reduced soil compaction, direct seeding activities, increasing native vegetation cover, etc.
	Strategy PM1.1.11-Implement appropriate practices to stabilize roadcut slopes
	Strategy PM1.1.12-Implement appropriate road maintenance activities to decrease erosion.
	Strategy PM1.1.13- Decrease instream deposition by improving bank stability. The use of hard stabilization methods is discouraged.
	Strategy PM1.1.14-Maintain the occurrence of channel-forming flushing flows in spring months to flush sediment from the substrate, provided that developed areas and infrastructure are not damaged.
	Strategy PM1.1.15-Develop and implement strategy for monitoring improvements in embeddedness.
	Strategy PM1.1.16-Limit erosion due to recreational activities, e.g. campgrounds, ORV usage, etc.

Hypothesis PM1: Reduction in sediment (turbidity, percent fines and embeddedness) will increase survival of steelhead (incubation, fry, subyearling rearing, and yearling rearing life history stages), spring chinook (fry, subyearling rearing, overwintering, and pre-spawning life history stages) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages). Causes: Land use: road management, cultivation, overgrazing, development, planning/regulation, lacking protection/vegetation removal in side draws; Increased width-to-depth ratio; Poor riparian condition; Altered stream hydrograph leading to excessive flashiness; Noxious weeds.	
	Strategy PM1.1.17- Implement the most economical and effective treatment methods to control noxious weeds, including the encouragement of biological control methods where feasible and appropriate.
	Strategy PM1.1.18-Install properly designed instream structures, including boulders, vortex rock weirs, and LWD for short-term pool formation.
	Strategy PM1.1.19- Increase landowner participation in federal, state, tribal, and local programs that enhance watershed conditions (e.g. CRP, CREP, Wetlands Reserve Program, EQIP, Landowner Incentive Program, Partners for Fish & Wildlife, Conservation Security Program, etc.)
	Strategy PM1.1.20-Seek additional funding sources consistent with current CRP and CREP guidelines to increase individual landowner enrollment in programs that achieve similar goals.
	Strategy PM1.1.21-Seek funding sources to develop programs consistent with the goals of CRP and CREP in those areas where such programs are not available (e.g. smaller tributaries high in the subbasin).
	Strategy PM1.1.22-Implement permanent conservation easements in areas of high ecological value.
	Strategy PM1.1.23- Implement management practices for bridge and culvert design and maintenance activities to reduce build-up of sediment and other materials.

Priority Restoration Area Working Hypotheses, Limited Life History Stages, Causes, Biological Objectives, and Strategies, cont.

Hypothesis PM2: Increase in LWD densities will increase survival of steelhead (egg incubation, fry, subyearling rearing, and yearling rearing life history stages), spring chinook (fry, subyearling, overwintering, and pre-spawning life history stages) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages). Causes: Poor riparian diversity and maturity; Straightened channels; Diking; Flood management, including removal of LWD in developed areas; Tree removal	
Objective PM2.1-Reach or exceed one piece of LWD per channel width. Historic estimate: 4-6 pieces/CW. Current estimate: 1 piece/CW	**Note- Strategies are not prioritized and will be implemented based upon opportunities available**
	Strategy PM2.1.1 - Improve the extent, structure, and function of riparian buffers through vegetation planting (native species unless otherwise specified), managed grazing, selective livestock fencing, and similar practices, including tributaries (perennial and intermittent streams) that contribute to priority areas.
	Strategy PM2.1.2 - Increase the density of woody vegetation in riparian buffers for long-term recruitment of LWD
	Strategy PM2.1.3 - Add LWD in the form of rootwads, log jams, and similar structures that mimic natural formations.
	Strategy PM2.1.4 - Retain existing LWD and limit removal of newly-recruited LWD
	Strategy PM2.1.5 - Improve stream sinuosity (e.g. meander reconstruction) to slow stream velocities and facilitate retention of LWD.
	Strategy PM2.1.6 - Install properly designed instream structures, including boulders, vortex rock weirs, and LWD for short-term pool formation.

Priority Restoration Area Working Hypotheses, Limited Life History Stages, Causes, Biological Objectives, and Strategies, cont.
Hypothesis PM2: Increase in LWD densities will increase survival of steelhead (egg incubation, fry, subyearling rearing, and yearling rearing life history stages), spring chinook (fry, subyearling, overwintering, and pre-spawning life history stages) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages).
Causes: Poor riparian diversity and maturity; Straightened channels; Diking; Flood management, including removal of LWD in developed areas; Tree removal
Strategy PM2.1.7 - Increase the density of woody vegetation in riparian buffers for long-term recruitment of LWD.
Strategy PM2.1.8 - Uphold existing land use regulations and instream work regulations (e.g. critical area ordinances, HPA requirements, etc.) that limit channel, floodplain, and riparian area impacts and educate the public regarding their implementation. *
Strategy PM2.1.9 - Identify jurisdictions with inadequate land use regulations, and work to strengthen existing or pass new regulations that better protect streams from floodplain development that leads to loss or degradation of riparian vegetation. *
Strategy PM2.1.10 - Develop and implement strategy for monitoring improvements in LWD density
Strategy PM2.1.11 - Limit impacts to riparian woody vegetation associated with campgrounds.
Strategy PM2.1.12 - Increase landowner participation in federal, state, tribal, and local programs that enhance watershed conditions (e.g. CRP, CREP, Wetlands Reserve Program, EQIP, Landowner Incentive Program, Partners for Fish & Wildlife, Conservation Security Program, etc.)
Strategy PM2.1.13 - Seek additional funding sources consistent with current CRP and CREP guidelines to increase individual landowner enrollment in programs that achieve similar goals.
Strategy PM2.1.14 - Seek funding sources to develop programs consistent with the goals of CRP, EQIP, and CREP in those areas where such programs are not available (e.g. smaller tributaries high in the subbasin).
Strategy PM2.1.15-Implement management practices for bridge and culvert design and maintenance activities to reduce build-up of sediment and other materials.
Strategy PM2.1.16- Decommission, modify or relocate (i.e. setback) roads, low-priority dikes, bridges, culverts, other structures and land uses to facilitate greater floodplain accessibility.
Strategy PM2.1.17-Limit the cutting of firewood in riparian areas by a combination of upholding U.S. Forest Service firewood cutting regulations, providing firewood for purchase, public education, and prohibiting outdoor fires, where needed.
Strategy PM2.1.18- Implement permanent conservation easements in areas of high ecological value.

Priority Restoration Area Working Hypotheses, Limited Life History Stages, Causes, Biological Objectives, and Strategies, cont.

Hypothesis PM3: Increase in primary pool quantity, quality and complexity will increase survival of steelhead (egg incubation, fry, subyearling rearing, and yearling rearing), spring chinook (fry, subyearling, overwintering and pre-spawning), and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages).

Causes: Straightened channels; Unstable banks; High width-to-depth ratio; Poor riparian condition (limited woody vegetation); Removal of LWD in developed areas; Diminished beaver populations

Objective PM3.1- Increase the proportion of primary pools to 15% of stream surface area. This represents a near 100% increase based on current estimates.	**Note- Strategies are not prioritized and will be implemented based upon opportunities available**
	Strategy PM3.1.1-Improve the extent, structure, and function of riparian buffers through vegetation planting (native species unless otherwise specified), managed grazing, selective livestock fencing, and similar practices, including tributaries (perennial and intermittent streams) that contribute to priority areas.
	Strategy PM3.1.2-Increase the density of woody vegetation in riparian buffers for long-term recruitment of LWD.
	Strategy PM3.1.3-Add LWD in the form of rootwads, log jams, and similar structures that mimic natural formations.
	Strategy PM3.1.4-Retain existing LWD and limit removal of newly-recruited LWD
	Strategy PM3.1.5-Improve stream sinuosity (e.g. meander reconstruction) to facilitate long-term natural pool formation.
	Strategy PM3.1.6-Install properly designed instream structures, including boulders, vortex rock weirs, and LWD for short-term pool formation.
	Strategy PM3.1.7- Uphold existing land use regulations and instream work regulations (e.g. critical area ordinances, HPA requirements, etc.) that limit channel, floodplain, and riparian area impacts and educate the public regarding their implementation. *
	Strategy PM3.1.8-Identify jurisdictions with inadequate land use regulations, and work to strengthen existing or pass new regulations that better protect streams from floodplain development that leads to loss or degradation of riparian vegetation. *
	Strategy PM3.1.9- Where appropriate and feasible, manage beaver populations (increase, decrease, or maintain) to enhance primary pools, focusing primarily on small tributaries in upper reaches where beaver could be most beneficial, and educate the public regarding benefits of beaver.
	Strategy PM3.1.10-Increase landowner participation in federal, state, tribal, and local programs that enhance watershed conditions (e.g. CRP, CREP, Wetlands Reserve Program, EQIP, Landowner Incentive Program, Partners for Fish & Wildlife, Conservation Security Program, etc.)
	Strategy PM3.1.11-Seek additional funding sources consistent with current CRP and CREP guidelines to increase individual landowner enrollment in programs that achieve similar goals.
	Strategy PM3.1.12-Seek funding sources to develop programs consistent with the goals of CRP, EQIP, and CREP in those areas where such programs are not available (e.g. smaller tributaries high in the subbasin).
	Strategy PM3.1.13-Develop and implement strategy for monitoring improvements in primary pool quantity, quality and complexity
	Strategy PM3.1.14- Implement permanent conservation easements in areas of high ecological value.

Priority Restoration Area Working Hypotheses, Limited Life History Stages, Causes, Biological Objectives, and Strategies, cont.

Hypothesis PM4: Increase in riparian function and a decrease in confinement will increase survival of steelhead (egg incubation, fry, subyearling rearing, and yearling rearing), spring Chinook (fry, subyearling, overwintering and pre-spawning) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages).

Causes: Roads, dikes, residential development, overgrazing, other development/land use activities close to the stream leading to confinement and decreased floodplain accessibility; Tree removal

Objective PM4.1- Continue riparian recovery (increasing riparian complexity, width, and re-establishment) to achieve at least 75% riparian function.	**Note- Strategies are not prioritized and will be implemented based upon opportunities available**
	Strategy PM4.1.1-Improve the extent, structure, and function of riparian buffers through vegetation planting (native species unless otherwise specified), managed grazing, selective livestock fencing, and similar practices, including tributaries (perennial and intermittent streams) that contribute to priority areas.
	Strategy PM4.1.2-Increase the density of woody vegetation in riparian buffers for long-term recruitment of LWD.
	Strategy PM4.1.3- Protect high quality riparian habitats and riparian habitat in areas of high development pressure through conservation easements, long-term leases, land exchanges, public education, promotion of BMPs, promotion of alternative grazing strategies and the installation of alternative forms of water for livestock, where applicable.
	Strategy PM4.1.4-Increase understanding of the importance of riparian habitat through education and outreach programs for both the general public and road maintenance personnel.
	Strategy PM4.1.5-Protect riparian vegetation through promotion of livestock BMPs such as alternative grazing rotations and the installation of alternative forms of water for livestock
	Strategy PM4.1.6-Conduct appropriate shade restoration activities (e.g. replanting trees) where streamside shading has been reduced by anthropogenic activities.
	Strategy PM4.1.7- Protect wetland and riparian habitats through land conservation easements, long-term leases , land exchanges, public education, and promotion of urban, forestry, and agricultural BMPs, where applicable.
	Strategy PM4.1.8-Enhance the extent and function of wetlands and wet meadows.
	Strategy PM4.1.9- Uphold existing land use regulations and instream work regulations (e.g. critical area ordinances, HPA requirements, etc.) that limit channel, floodplain, and riparian area impacts and educate the public regarding their implementation. *
	Strategy PM4.1.10-Identify jurisdictions with inadequate land use regulations, and work to strengthen existing or pass new regulations that better protect streams from floodplain development that leads to loss or degradation of riparian vegetation. *
	Strategy PM4.1.11- Where appropriate and feasible, manage beaver populations (increase, decrease, or maintain) to enhance riparian areas, and educate the public regarding benefits of beaver.
	Strategy PM4.1.12-Develop and implement strategy for monitoring improvements in riparian function.
	Strategy PM4.1.13-Relocate concentrated recreational uses outside of the riparian area
	Strategy PM4.1.14- Increase landowner participation in federal, state, tribal, and local programs that enhance watershed conditions (e.g. CRP, CREP, Wetlands Reserve Program, EQIP, Landowner Incentive Program, Partners for Fish & Wildlife, Conservation Security Program, etc.)
	Strategy PM4.1.15- Seek additional funding sources consistent with current CRP and CREP guidelines to increase individual landowner enrollment in programs that achieve similar goals.

Priority Restoration Area Working Hypotheses, Limited Life History Stages, Causes, Biological Objectives, and Strategies, cont.	
Hypothesis PM4: Increase in riparian function and a decrease in confinement will increase survival of steelhead (egg incubation, fry, subyearling rearing, and yearling rearing), spring Chinook (fry, subyearling, overwintering and pre-spawning) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages). Causes: Roads, dikes, residential development, overgrazing, other development/land use activities close to the stream leading to confinement and decreased floodplain accessibility; Tree removal	
	Strategy PM4.1.16-Seek funding sources to develop programs consistent with the goals of CRP, EQIP, and CREP in those areas where such programs are not available (e.g. smaller tributaries high in the subbasin).
	Strategy PM4.1.17-Implement the most economical and effective treatment methods to control noxious weeds, including the encouragement of biological control methods where feasible and appropriate.
	Strategy PM4.1.18- Implement permanent conservation easements in areas of high ecological value.
	Strategy PM4.1.19- Limit the cutting of firewood in riparian areas by upholding U.S. Forest Service firewood cutting regulations, providing firewood for purchase, public education, and prohibiting outdoor fires, where needed.
Objective PM4.2-Decrease manmade confinement to no greater than 25% of stream bank length.	Strategy PM4.2.1- Uphold existing land use regulations and instream work regulations (e.g. critical area ordinances, HPA requirements, etc.) that limit channel, floodplain, and riparian area impacts and educate the public regarding their implementation. *
	Strategy PM4.2.2-Identify jurisdictions with inadequate land use regulations, and work to strengthen existing or pass new regulations that better protect streams from floodplain development that leads to loss or degradation of riparian vegetation. *
	Strategy PM4.2.3-Decrease the density of residential development through mechanisms such as low-density zoning.
	Strategy PM4.2.3-Decommission, modify or relocate (i.e. setback) roads, low-priority dikes, bridges, culverts, other structures and land uses to facilitate greater floodplain accessibility.
	Strategy PM4.2.4-Improve watershed conditions (e.g. upland water infiltration) through road obliteration, reduced soil compaction, direct seeding activities, increasing native vegetation cover, etc.
	Strategy PM4.2.5-Develop and implement strategy for monitoring improvements in reduction of confinement.
	Strategy PM4.2.6- Complete a detailed inventory of confinement throughout the subbasin with cooperation of all stakeholders, including prioritization of dikes based upon their function to protect infrastructure and private property.

Priority Restoration Area Working Hypotheses, Limited Life History Stages, Causes, Biological Objectives, and Strategies, cont.

Hypothesis PM5: Decrease in summer temperatures will increase survival of steelhead (fry, subyearling rearing, and yearling rearing), spring Chinook (fry, subyearling and pre-spawning) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages).

Causes: Natural climate (air temperature and low summer rainfall); Tree removal; Roads, dikes, residential development, overgrazing, agriculture, and other land use activities that have led to a high width-to-depth ratio, reduced sinuosity, poor riparian vegetative diversity, poor riparian vegetative maturity; Altered hydrology.

Objective PM5.1- Decrease summer daily maximum temperatures to no more than 4 days greater than 75 OF (24 OC) and show progress toward meeting Washington State temperature standards and TMDL goals.	**Note- Strategies are not prioritized and will be implemented based upon opportunities available**
	Strategy PM5.1.1-Improve the extent, structure, and function of riparian buffers through vegetation planting (native species unless otherwise specified), managed grazing, selective livestock fencing, and similar practices, including tributaries (perennial and intermittent streams) that contribute to priority areas.
	Strategy PM5.1.2-Increase the density of woody vegetation in riparian buffers for long-term recruitment of LWD.
	Strategy PM5.1.3- Protect high quality riparian habitats and riparian habitat in areas of high development pressure through conservation easements, long-term leases, land exchanges, public education, promotion of BMPs, promotion of alternative grazing strategies and the installation of alternative forms of water for livestock, where applicable..
	Strategy PM5.1.4-Increase understanding of the importance of riparian habitat through education and outreach programs for both the general public and road maintenance personnel.
	Strategy PM5.1.5-Protect riparian vegetation through promotion of livestock BMPs such as alternative grazing rotations and the installation of alternative forms of water for livestock
	Strategy PM5.1.6-Conduct appropriate shade restoration activities where streamside shading has been reduced by anthropogenic activities.
	Strategy PM5.1.7- Protect wetland and riparian habitats through land conservation easements, long-term leases , land exchanges, public education, and promotion of urban, forestry, and agricultural BMPs, where applicable.
	Strategy PM5.1.8-Enhance the extent and function of wetlands and wet meadows.
	Strategy PM5.1.9-Continue development and implementation of watershed scale efforts (e.g. TMDLs) to remedy identified water quality factors
	Strategy PM5.1.10-Decrease the width-to-depth ratio through instream improvements, selective bank stabilization and other methods. The use of “hard” stabilization methods such as rip rap, concrete, or railroad ties is discouraged.
	Strategy PM5.1.11-Improve stream sinuosity (e.g. meander reconstruction) to facilitate long-term natural pool formation.
	Strategy PM5.1.12-Install properly designed instream structures, including boulders, vortex rock weirs, and LWD for short-term pool formation.
	Strategy PM5.1.13- Uphold existing land use regulations and instream work regulations (e.g. critical area ordinances, HPA requirements, etc.) that limit channel, floodplain, and riparian area impacts and educate the public regarding their implementation. *
	Strategy PM5.1.14-Identify jurisdictions with inadequate land use regulations, and work to strengthen existing or pass new regulations that better protect streams from floodplain development that leads to loss or degradation of riparian vegetation. *
	Strategy PM5.1.15-Minimize surface water withdrawals through implementation of irrigation efficiencies, quantify legal withdrawals, identify and eliminate illegal withdrawals.

Strategy PM5.1.16-Increase stream flows through the lease and/or purchase of water rights
Strategy PM5.1.17-Investigate feasibility of instream water storage in coordination with federal, tribal, state and local stakeholders using non-hardened structures.
Strategy PM5.1.18-Improve watershed conditions (e.g. upland water infiltration) through road obliteration, reduced soil compaction, direct seeding activities, increasing native vegetation cover, etc.
Strategy PM5.1.19- Decrease sediment delivery from upland practices through expanded use of conservation tillage, sediment basins, mowing of road shoulders in place of herbicide use, road paving, implementation of managed grazing, limited grazing, other erosion control BMPs, and other practices.
Strategy PM5.1.20-Increase baseflows in summer months through shallow aquifer recharge programs, where appropriate.
Strategy PM5.1.21-Develop and implement strategy for monitoring improvements in summer water temperatures
Strategy PM5.1.22- Decommission, modify or relocate (i.e. setback) roads, low-priority dikes, bridges, culverts, other structures and land uses to facilitate greater floodplain accessibility.
Strategy PM5.1.23-Increase landowner participation in federal, state, tribal, and local programs that enhance watershed conditions (e.g. CRP, CREP, Wetlands Reserve Program, EQIP, Landowner Incentive Program, Partners for Fish & Wildlife, Conservation Security Program, etc.)
Strategy PM51.1.24-Seek additional funding sources consistent with current CRP and CREP guidelines to increase individual landowner enrollment in programs that achieve similar goals.
Strategy PM5.1.25-Seek funding sources to develop programs consistent with the goals of CRP, EQIP, and CREP in those areas where such programs are not available (e.g. smaller tributaries high in the subbasin).
Strategy PM5.1.26-Implement permanent conservation easements in areas of high ecological value.

Priority Restoration Area Working Hypotheses, Limited Life History Stages, Causes, Biological Objectives, and Strategies, cont.	
Hypothesis PM6: Increase in flow will increase survival of steelhead (fry, subyearling rearing and yearling rearing), spring chinook (fry, subyearling and pre-spawning), and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages).	
Causes: Natural climate (low summer rainfall, drought cycles, etc.); Inefficient irrigation practices; Reduction of ground and canopy cover in uplands; Reduced riparian function; Reduced infiltration	
Objective PM6.1-Increase flow where possible.	**Note- Strategies are not prioritized and will be implemented based upon opportunities available**
	Strategy PM6.1.1-Enhance the extent and function of wetlands and wet meadows
	Strategy PM6.1.2-Minimize surface water withdrawals through implementation of irrigation efficiencies, quantify legal withdrawals, identify and eliminate illegal withdrawals.
	Strategy PM6.1.3-Increase stream flows through the lease and/or purchase of water rights
	Strategy PM6.1.4-Investigate feasibility of instream water storage in coordination with federal, tribal, state and local stakeholders using non-hardened structures
	Strategy PM6.1.5-Implement shallow aquifer recharge programs, where appropriate
	Strategy PM6.1.6-Develop and implement strategy for monitoring improvements in streamflow
	Strategy PM6.1.7--Identify and implement various opportunities (e.g. Conservation District programs, WWBWC programs, BPA Nat'l Fish & Wildlife Program, etc.) to augment instream flows through water storage, conservation, irrigation efficiencies, water right purchase, shallow aquifer recharge, and source exchange.

Priority Restoration Area Working Hypotheses, Limited Life History Stages, Causes, Biological Objectives, and Strategies, cont.	
Hypothesis MT1: Increase in LWD densities will increase survival of steelhead (fry, subyearling rearing, overwintering, and yearling rearing), spring chinook (fry, subyearling rearing, overwinteirng and pre-spawning) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages).	
Causes: Poor riparian diversity and maturity; Straightened channels; Diking; Flood management, including removal of LWD in developed areas; Tree removal; Residential development	
Objective MT1.1-Reach or exceed two pieces of LWD/channel width Historic estimate: 3-4 pieces/CW. Current estimate: 1-2 pieces/CW	See Strategies for Objective PM2.1
Hypothesis MT2: Increase in primary pool quantity, quality and complexity will increase survival of steelhead (fry, subyearling rearing, overwintering and yearling rearing), spring chinook (fry, subyearling rearing, overwinteirng and pre-spawning) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages).	
Causes: Straightened channels; Flood control practices; Unstable banks; High width-to-depth ratio; Poor riparian condition (little woody vegetation); Removal of LWD in developed areas; Diminished beaver populations	
Objective MT2.1-Increase the proportion of primary pools to 10-15% of stream surface area. This represents a near 100% increase based on current estimates.	See Strategies for Objective PM3.1

Priority Restoration Area Working Hypotheses, Limited Life History Stages, Causes, Biological Objectives, and Strategies, cont.	
Hypothesis MT3: Increase in riparian function and a decrease in confinement will increase survival of steelhead (fry, subyearling rearing, overwintering, and yearling rearing), spring chinook (fry, subyearling rearing, overwinteirng and pre-spawning) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages).	
Causes: Roads, dikes, residential development, overgrazing, other development/land use activities close to the stream leading to confinement and decreased floodplain accessibility; Tree removal & timber harvest.	
Objective MT3.1-Initiate riparian recovery and re-establishment in heavily degraded areas to achieve 60% riparian function. Current estimate: >50%	See Strategies for Objective PM4.1
Objective MT3.2-Decrease man-made confinement to no greater than 50% of the stream bank length. Current estimate: 60%	See Strategies for Objective PM4.2
Hypothesis MT4: Decrease in summer temperatures will increase survival of steelhead (fry, subyearling rearing, and yearling rearing), spring chinook (fry, subyearling rearing and pre-spawning) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages).	
Causes: Natural climate (air temperature and low summer rainfall); Tree removal; Roads, dikes, residential development, overgrazing, agriculture, and other land use activities that have led to a high width-to-depth ratio, reduced sinuosity, poor riparian vegetative diversity, poor riparian vegetative maturity; Altered hydrology; Flood management.	
Objective MT4.1-Decrease summer daily maximum temperatures to no more than 4 days greater than 75 ^{O}F (24 ^{O}C) and show progress toward meeting Washington State temperature standards and TMDL goals.	See Strategies for Objective PM5.1
Hypothesis MT5: Increase in flow will increase survival of steelhead (fry, subyearling rearing, and yearling rearing), spring chinook (fry, subyearling rearing, and pre-spawning) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages).	
Causes: Natural climate (low summer rainfall, drought cycles, etc.); Inefficient irrigation practices; Reduction of ground and canopy cover in uplands; Reduced riparian function; Reduced infiltration	
Objective MT5.1-Increase flow where possible	See Strategies for Objective PM6.1

Priority Restoration Area Working Hypotheses, Limited Life History Stages, Causes, Biological Objectives, and Strategies, cont.	
Hypothesis TH1: Increase in LWD densities will increase survival of steelhead (fry, subyearling rearing, overwintering, and yearling rearing), spring chinook (fry, subyearling rearing, overwintering and pre-spawning) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages).	
Causes: Poor riparian diversity and maturity; Straightened channels; Diking; Flood management, including removal of LWD in developed areas; Tree removal; Residential development; Recreation impacts (e.g. campgrounds)	
Objective TH1.1-Maintain more than one piece of LWD/channel width below Cummings Creek.	See Strategies for Objective PM2.1
Objective TH1.2-Increase LWD to two pieces/channel width above Cummings Creek.	See Strategies for Objective PM2.1
Hypothesis TH2: Increase in primary pool quantity, quality and complexity will increase survival of steelhead (fry, subyearling rearing, overwinteirng, and yearling rearing), spring chinook (fry, subyearling rearing, overwinteirng and pre-spawning) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages).	
Causes: Straightened channels; Flood control practices; Unstable banks; High width-to-depth ratio; Poor riparian condition (little woody vegetation); Removal of LWD in developed areas; Diminished beaver populations; Tree removal.	
Objective TH2.1-Increase the proportion of primary pools to 10% of stream surface area below Cummings Creek. This represents a near 100% increase based on current estimates.	See Strategies for Objective PM3.1
Objective TH2.1-Increase the proportion of primary pools to 15% of stream surface area above Cummings Creek. This represents a near 200% increase based on current estimates.	See Strategies for Objective PM3.1

Priority Restoration Area Working Hypotheses, Limited Life History Stages, Causes, Biological Objectives, and Strategies, cont.	
Hypothesis TH3: Increase in riparian function and a decrease in confinement will increase survival of steelhead (fry, subyearling rearing, overwintering and yearling rearing), spring chinook (fry, subyearling rearing, overwinteirng and pre-spawning) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages). Causes: Roads, dikes, residential development, overgrazing, other development/land use activities close to the stream leading to confinement and decreased floodplain accessibility; Tree removal & timber harvest.	
Objective TH3.1- Continue riparian recovery (increasing riparian complexity, width, and re-establishment)to achieve 40-50% riparian function below Cummings Creek. Current estimate: 37%	See Strategies for Objective PM4.1
Objective TH3.2- Continue riparian recovery (increasing riparian complexity, width, and re-establishment)to achieve at least 75% riparian function and increased riparian complexity from Cummings Creek to the Hatchery. Current estimate: 50%	See Strategies for Objective PM4.1
Objective TH3.3-Decrease man-made confinement where possible.	See Strategies for Objective PM4.2
Hypothesis TH4: Decrease in summer temperatures will increase survival of steelhead (fry, subyearling rearing, and yearling rearing), spring chinook (fry, subyearling rearing, and pre-spawning) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages). Causes: Natural climate (air temperature and low summer rainfall); Tree removal; Roads, dikes, residential development, overgrazing, agriculture, and other land use activities that have led to a high width-to-depth ratio, reduced sinuosity, poor riparian vegetative diversity, poor riparian vegetative maturity; Altered hydrology; Flood management; Fish & Wildlife fishing ponds	
Objective TH4.1-Decrease summer daily maximum temperatures to no more than 4 days greater than 75 ^{O}F (24 ^{O}C) and show progress toward meeting Washington State temperature standards and TMDL goals.	See Strategies for Objective MT4.1
Hypothesis TH5: Increase in flow will increase survival of steelhead (fry, subyearling rearing, and yearling rearing), spring chinook (fry, subyearling rearing, and pre-spawning) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages). Causes: Natural climate (low summer rainfall, drought cycles, etc.); Inefficient irrigation practices; Reduction of ground and canopy cover in uplands; Reduced riparian function; Reduced infiltration	
Objective TH5.1-Increase flow where possible.	See Strategies for Objective PM6.1

Priority Restoration Area Working Hypotheses, Limited Life History Stages, Causes, Biological Objectives, and Strategies, cont.	
Hypothesis HL1: Increase in LWD densities will increase survival of steelhead (fry, subyearling rearing, overwintering and yearling rearing), spring chinook (fry, subyearling rearing, overwinteirng and pre-spawning) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages). Causes: Poor riparian diversity and maturity; Straightened channels; Diking; Flood management, including removal of LWD in developed areas; Tree removal; Recreation impacts (e.g. campgrounds)	
Objective HL1.1-Reach or exceed two pieces of LWD/channel width	See Strategies for Objective PM2.1
Hypothesis HL2: Increase in primary pool quantity, quality, and complexity will increase survival of steelhead (fry, subyearling rearing, overwintering and yearling rearing), spring chinook (fry, subyearling rearing, overwinteirng and pre-spawning) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages). Causes: Roads; Straightened channels; Flood control practices; Unstable banks; High width-to-depth ratio; Poor riparian condition (little woody vegetation); Removal of LWD in developed areas; Diminished beaver populations; Tree removal.	
Objective HL2.1-Increase the proportion of primary pools to 10% or greater of stream surface area. This represents a 150% increase based on current estimates.	See Strategies for Objective PM3.1
Hypothesis HL3: Increase in riparian function and a decrease in confinement will increase survival of steelhead (fry, subyearling rearing, overwinteirng, and yearling rearing), spring chinook (fry, subyearling rearing, overwinteirng and pre-spawning) and bull trout (adult migration, juvenile outmigration, subadult rearing life history stages). Causes: Roads, dikes, other development/land use activities close to the stream leading to confinement and decreased floodplain accessibility; Tree removal & timber harvest; Recreation activities (e.g. campgrounds).	
Objective HL3.1-Continue riparian recovery (increasing riparian complexity, width, and re-establishment) to exceed 75% riparian function. Current estimate: 60-75%	See Strategies for Objective PM4.1
Objective HL3.2-Decrease man-made confinement where possible. Current estimate: 10-40%	See Strategies for Objective PM4.2

Priority Restoration Area Working Hypotheses, Limited Life History Stages, Causes, Biological Objectives, and Strategies, cont.	
Hypothesis MTN1: Increase in LWD densities will increase survival of steelhead (fry, subyearling rearing, overwintering, and yearling rearing), spring chinook (fry, subyearling rearing, overwinteirng and pre-spawning) and bull trout (adult migration, juvenile outmigration, spawning, subadult rearing, juvenile rearing life history stages).	
Causes: Poor riparian diversity and maturity; Straightened channels; Armored banks; Road/bridge development; Flood management (e.g. LWD removal from bridge abutments); Tree removal, including timber harvest; Recreation impacts (e.g. campgrounds)	
Objective MTN1.1-Increase LWD to more than one piece/channel width below Panjab Creek. Historic estimate: 4-6 pieces/CW. Current estimate: 1 piece/CW	See Strategies for Objective PM2.1
Objective MTN1.2-Increase LWD to achieve a naturally functioning system through natural recovery and recruitment above Panjab Creek.	See Strategies for Objective PM2.1
Hypothesis MTN2: Increase in primary pool quantity, quality and complexity will increase survival of steelhead (fry, subyearling rearing, overwintering, and yearling rearing), spring chinook (fry, subyearling rearing, overwinteirng and pre-spawning) and bull trout (adult migration, juvenile outmigration, spawning, subadult rearing, juvenile rearing life history stages).	
Causes: Roads; Flood control practices; Unstable banks; High width-to-depth ratio; Poor riparian condition (little woody vegetation); Diminished beaver populations; Tree removal; Historic land use activities (timber harvest, cabins, road development, mill)	
Objective MTN2.1-Increase the proportion of primary pools to 15% or greater of stream surface area below Panjab Creek. This represents a five-fold increase based on current estimates.	See Strategies for Objective PM3.1
Objective MTN2.2-Increase the proportion of primary pools to achieve a naturally functioning system through natural recruitment of LWD above Panjab Creek.	See Strategies for Objective PM3.1 Note: the road from Panjab to Sheep Creek should be considered for closure to motorized vehicles

Priority Restoration Area Working Hypotheses, Limited Life History Stages, Causes, Biological Objectives, and Strategies, cont.

Hypothesis MTN3: Increase in riparian function and a decrease in confinement will increase survival of steelhead (fry, subyearling rearing, overwintering, and yearling rearing), spring chinook (fry, subyearling, overwinteirng, and pre-spawning) and bull trout (adult migration, juvenile outmigration, spawning, subadult rearing, juvenile rearing life history stages).

Causes: Roads, dikes, other development/land use activities close to the stream leading to confinement and decreased floodplain accessibility; Tree removal & timber harvest; Recreation activities (e.g. campgrounds); Historic grazing activity.

Objective MTN3.1-Continue riparian recovery (increasing riparian complexity, width, and re-establishment) to achieve 75% or greater riparian function below Panjab Creek.	See Strategies for Objective PM4.1
Objective MTN3.2-Continue riparian recovery (increasing riparian function, complexity, width, and re-establishment) to achieve a naturally functioning system above Panjab Creek.	See Strategies for Objective PM4.1 Note: the road from Panjab to Sheep Creek should be considered for closure to motorized vehicles
Objective MTN3.3-Decrease man-made confinement where possible.	See Strategies for Objective PM4.2 Note: the road from Panjab to Sheep Creek should be considered for closure to motorized vehicles

* Pursuing regulations at the local level (e.g. County planning) prior to the state and/or federal level is preferred.

7.3.3 Priority Protection Areas

In addition to the restoration priority areas, priority geographic areas for protection were identified in the Assessment section of the subbasin plan. These are areas that the EDT analysis or empirical data suggests would have the most negative impacts on the focal species if they were allowed to degrade further. Within protection areas, "passive restoration" is considered the most appropriate action to take given the technical and social evidence, as well as the limited resources available in the subbasin. These are actions that will protect the habitat on which the focal species depend on from degrading any further. In most cases marginal improvements in habitat attributes can be expected from these measures. Protective actions are not limited to the priority protection areas, but may also be done in the priority restoration areas. It is, however, the intention of this subbasin plan to limit these actions outside of the priority geographic areas as outlined in the subbasin assessment.

Protection strategies were defined by the management technical and citizen groups. These are actions that will protect the habitat on which the focal species depend on from degrading any further.

The restoration strategy is understood to be inclusive of the activities and strategies outlined in this section. The protection strategy is intended to be applied to the priority protection areas and priority restoration areas. Proposed projects outside of these areas that are not located in restoration priority areas must show a direct benefit to the protection of these geographic areas in order to be considered under this strategy. Protection strategies presented below are organized in three main categories: riparian buffer implementation, upland enhancement, and alternative water development/water conservation.

Riparian Buffer Implementation

These are actions that provide a buffer area of reduced anthropogenic disturbance along the stream corridor. The intention is that these areas will be allowed to regenerate and repair with limited implementation of resources. It is understood by the subbasin group that many funding and regulatory entities require re-vegetation when placing streamside land into protected status. As such, riparian planting may be incorporated as part of a protection strategy. Installing riparian buffers can take many forms and the resources can come from many sources. Typically resources made available to the subbasin can be used to increase the area of stream in protective buffers by direct funding or providing assistance with landowner cost share. This has been and will continue to be an extremely effective method for stream buffer implementation in the subbasin. Riparian buffer strategies include, but are not limited to, the following.

- Conservation Reserve Enhancement Program (CREP) - The Conservation Reserve Enhancement Program is a joint partnership between the State of Washington and USDA, and is administered by the Washington State Conservation Commission and the Farm Services Agency (FSA). The agreement was signed in 1998 and provides incentives to restore and improve salmon and steelhead habitat on private land. The program is voluntary for landowners, the land enrolled in CREP is removed from production and grazing under 10 or 15 year contracts. In return, landowners plant trees and shrubs to

stabilize the stream bank and to provide a number of additional ecological functions. Landowners receive annual rent, incentive and maintenance payments and cost share for practice installations. This plan encourages the use of resources to assist in cost share in order to maximize participation in this program.

- Conservation Easements – The use of conservation easements has been somewhat limited in the Pacific Northwest but are common in other parts of the country. A conservation easement is a voluntary agreement that allows a landowner to limit the type or amount of development on their property while retaining private ownership of the land. The easement is signed by the landowner (who is the easement donor), and the funding or sponsoring entity (who is the party receiving the easement). The sponsoring entity accepts the easement with the understanding that it must enforce the terms of the easement in perpetuity. After the easement is signed, it is recorded with the County Register of Deeds, or similar agency, and applies to all future owners of the land. The activities allowed by a conservation easement depend on the landowner's wishes and the characteristics of the property. In some instances, no further development is allowed on the land. In other circumstances some additional development is allowed, but the amount and type of development is less than would otherwise be allowed. Conservation easements may be designed to cover all or only a portion of a property. Every easement is unique, tailored to a particular landowner's s goals and their land. Increasing conservation easements in streams bearing salmonids is considered a responsible use of subbasin resources. Conservation easement agreements that allow the least disturbance should have priority over less protective agreements.
- Continuous Conservation Reserve Program (CCRP) – This USDA program is similar to CREP as outlined above. The focus for this program, however, is on non-salmonid bearing streams, which are not eligible under CREP rules. CCRP projects should be encouraged and recommended for cost share status when the stream in question flows into a geographic area that is priority for protection. Within Southeast Washington, the reduction of sediment input from these small "feeder" streams and the maintenance of their seasonal flow input to salmonid streams is vital to the protection of the focal species. Minimum buffer widths are still required and vary by plan and location, as is the planting of appropriate vegetation. Contract length is similar to CREP as are the arrangements for payments and maintenance.
- Other Cost Share Programs –The three types of programs listed above do not represent a comprehensive list of the actions that can be taken to install riparian buffers. There are a myriad of funding sources and procedures out there. This strategy recommends that all programs and agreements that are similar to the above be eligible for cost-share or direct funding. This can include other federal or state funding entities or agreements signed with private funding sources. These should all require a minimum average buffer width not less than the minimum requirements under CREP, an agreement to maintain the fence or exclosures and a time length agreement similar to the CREP requirements.

There are other methods, such as simple riparian fencing and structures, that can help in herding or managing livestock in such as a way to reduce the impact to the stream Innovative methods that do not fit the above, but still result in a net protection increase for salmonid bearing streams, should be encouraged and be eligible for funding.

Upland Enhancement

In addition to the riparian areas above the citizen and technical groups recognize the importance of upland actions on the priority protection geographic areas. Sediment is a limiting factor on production for all of the focal species not just in this subbasin, but throughout the region. Programs designed to maintain ground cover in the upland areas that drain directly into priority protection areas are needed to control and reduce sediment input. Increased upland vegetation can also encourage infiltration of water, slowing runoff and preserving flows in the affected streams farther into the typically dry summer months. Many of the areas listed as priority for protection can benefit from greater summer flows as this increases living area for the focal species and can reduce temperatures. In addition to the upland areas that drain directly into priority areas other areas upstream should be considered for funding if a linkage can be established between these areas and the priority areas. Upland strategies include:

- Conservation Reserve Program (CRP) –CRP is a voluntary program available to agricultural producers to help them safeguard environmentally sensitive land. Producers enrolled in CRP plant long-term, resource-conserving covers to improve the quality of water and control soil erosion. In return, the Form Services Agency (FSA) provides participants with rental payments and cost-share assistance. Contract duration is between 10 and 15 years. CRP provides continuous ground cover over wide expanses of upland areas. Subbasin resources used to increase the amount of CRP would benefit the protection of these priority areas.
- Direct Seed/No-Till – Direct Seed and No-Till are a set of innovative farming practices designed to increase the amount of time that farmland has vegetative cover and to reduce the amount of soil disturbance, while still producing crops. Farming techniques such as these should be encouraged and eligible for direct or cost-share funding. These methods have been shown to be very effective in reducing the amount of sediment introduction into salmonid bearing streams.
- Sediment Basins - As the name implies these are depressions strategically placed on or near agriculture land to provide for “settling” of sediment in run-off. These are relatively inexpensive methods for reducing sediment and should be encouraged and eligible for cost-share or direct funding. Sediment basins should be designed and constructed in consultation with Conservation District, National Resources Conservation Service (NRCS) or other experienced personnel to ensure effectiveness. Agreements and procedures for maintenance (clean-out) of the basins should accompany any project.
- Upland Terrace Construction – This is a land reforming procedure designed to slow run-off from agricultural lands. These can be very effective, particularly in reducing the impacts from large rain events. The terracing of slopes redirects run-off and increases contact time with the upland soils thereby increasing infiltration and reducing sedimentation of streams. These project types can be very effective at reducing sedimentation. They are cost-effective as they often entail a one-time expenditure of money, but offer a permanent solution. Project such as this should be eligible for cost-share or direct funding.
- Other Upland Projects and Practices - The above types of projects do not represent a comprehensive list of actions that can be taken in the upland areas to benefit aquatic life

in streams. This subbasin plan encourages innovative techniques that can offer further protection these priority areas. There are also a variety of funding sources that should be considered in addition to CRP that can then be cost-shared with subbasin funds.

Alternative Water Development/Water Conservation

In the Blue Mountains and surrounding lowland areas, water is often the limiting factor for both fish and livestock operations. Quite often in order to provide protection for salmonid bearing streams, including this subbasin's priority protection areas, alternative sources of drinking water must be found or developed. Alternative water sources can greatly reduce the amount of time livestock spend in riparian areas, therefore, reducing the impacts to the stream. The subbasin management group recognizes this limitation on protection areas and encourages the development of off-stream water resources. These include, but are not limited to:

- Well Development out of riparian areas
- Spring Development
- Point of Diversion Transfer
- Water Transport Development

Projects that reduce the amount of water removed from the stream can also protect our priority areas. Some of the above project types both reduce grazing intensity and reduce water removal. In addition to the above when there are interested parties, water right lease or purchase should be encouraged and eligible for direct or cost share funding when it will directly benefit our priority protection areas. The Washington Water Trust is one organization that can help arrange for water leasing or purchase. Irrigation efficiency projects are also important to the protection of our priority areas. Water diversions that are able to extract as little water as possible from the stream while still satisfying the water rights of users provide a very needed protection for the focal species. Projects of this type include, but are not limited to:

- Lining Open Ditches
- Water Conveyance Piping
- Point of Diversion Transfers

7.3.4 Bull Trout

Goals, objectives, recovery criteria, and strategies for recovery of listed bull trout are being developed by the United State Fish and Wildlife Service in the Bull Trout Recovery Plan (USFWS 2002 draft; portions revised 2003). As of May 2004, progress on the draft Bull Trout Recovery Plan has been placed on-hold. Draft components of the Bull Trout Recovery Plan have been published, but will probably change prior to publication of the final plan expected at the end of this year.

Addressing bull trout in the context of subbasin planning is an issue that the Subbasin Planning Team, technical staff, and local stakeholders have been struggling with throughout development of this plan. First, there are many stakeholders that have not had an opportunity to review the

draft Bull Trout plan elements such as recovery criteria and strategies. Second, an attempt was made in the Walla Walla Subbasin to expand the size of the recovery effort to include additional local stakeholders. USFWS staff believed it was too late in the process to add new members to the team. Additionally, there are members of the local Bull Trout recovery unit team in Walla Walla who believe their legitimate comments and concerns have not been responded to, and are not supportive of the current set of strategies proposed in the draft Bull Trout Recovery Plan. Similar concerns exist in the Asotin, Lower Snake, and Tucannon Subbasins. Clearly, further discussion is needed with local stakeholders throughout the Bull Trout Recovery Plan process.

During development of subbasin plan strategies (see Chapter 7), strategies from the draft Bull Trout Recovery Plan and other planning efforts were considered, re-written in more generic fashion, and were integrated with strategies developed specifically for the subbasin plan. Although the language has been modified, we believe the strategies identified in this subbasin plan are consistent with those outlined in the draft Bull Trout Recovery Plan.

Although the Subbasin Planning Team originally discussed incorporating Bull Trout Recovery Plan strategies by reference, the ultimate decision was made by the subbasin planning leads not to do so because local stakeholders and technical staff had insufficient time to review and discuss the current draft. Local stakeholders involved in the subbasin planning process were not willing to endorse the Bull Trout Recovery Plan approach without sufficient review time and without certainty regarding what changes will be made between now and publication of the final plan.

Despite these concerns, it is our intent to work with local stakeholders through the summer/fall subbasin planning revision period to add more information about bull trout consistent with the recovery plan. This could include recovery plan elements such as the recovery target range and abundance trends and bull trout strategies or selected strategies developed in the draft Bull Trout Recovery Plan. In the meantime, project proponents can use the draft Bull Trout Recovery Plan to demonstrate that their project is consistent with the draft plan and will benefit bull trout, which will provide greater support for such projects. Strategies and actions in the final Bull Trout Recovery Plan will be considered for their applicability to this subbasin when the final Bull Trout Recovery Plan is available.

7.3.5 Aquatic Special Topic – Instream Flow

Significant progress has been made on flow enhancement within the Tucannon Subbasin. A variety of programs have assisted in this effort, including irrigation efficiencies. Flow enhancement is an important priority for the subbasin. Within this subbasin planning process, flow was a limiting factor in several geographic areas. Other processes such as watershed planning have also identified flow enhancement as a priority, and are working in coordination with this subbasin plan to identify flow-limited reaches and those areas where increasing flow can have the greatest benefit for fish.

Approach:

- Implement flow enhancement objectives discussed in Section 7.3.2 for those geographic areas where flow was determined to be a limiting factor.
- Coordinate with flow enhancement efforts currently underway in the subbasin

- Complete further analyses to identify reaches where increasing flow will provide suitable habitat conditions
- Complete further analyses to determine which areas are naturally flow-limited. Limited irrigation withdrawals occur in the subbasin (supporting 30-40 irrigated acres).These withdrawals are taken from stream reaches that support migration life history stages only and occur during times of year when there are no fish migrating through these reaches. Given their limited As such would not limit life history stages of any focal species. These withdrawals do not dewater streams and are not believed to limit flows.

7.3.6 Preliminary Numeric Fish Population Goals

The management plan aquatic hypotheses, objectives and strategies in this subbasin were derived from the EDT modeling effort used in the assessment. As a habitat-based model, EDT is not designed to provide accurate projections of the numbers of fish present in a subbasin, geographic area, or reach. Adult return goals from other planning efforts (total, natural, hatchery and harvest components) are provided in Tables 7-5 and 7-6. Table 7-5 was developed by the Nez Perce Tribe. Table 7-6 was developed by the Nez Perce Tribe with brief review provided by the Washington Department of Fish and Wildlife. Since this plan is a culmination of numerous planning efforts, it is important to recognize anadromous fish goals from previous planning documents.

Inclusion of these tables in the subbasin plan does not imply consensus by all management agencies but merely gives a summary of previous goals The benefits of passive and active habitat restoration strategies presented in this chapter show that natural production alone in the Walla Walla Basin is not likely to achieve the magnitude of total adult goals listed in some of the past plans (see Objectives Analysis in Section 7.3.6). This would suggest that an artificial production component or objective may be required if return goals near the levels stated in Tables 7-5 and 7-6 are expected to be met.

The Columbia Conservation District Board (subbasin planning lead) expressed concern regarding the inclusion of numeric fish population goals in this subbasin plan. During their meeting on May 12, 2004, Board members noted that numeric fish population goals are not applicable to this habitat-based subbasin plan. They consider the Snake River Salmon Recovery Planning process to be the appropriate forum through which numeric fish population goals will be discussed and developed for the region. Their hope is that this process will include involvement by all co-managers interested in developing such goals, understanding that goals will be developed through other processes. Board members acknowlege that these goals re reflective of other planning processes currently underway, but subbasin planning is not obligated to meet these goals, as they are not considered part of the subbasin plan working hypotheses, goals, and strategies framework that focuses on habitat enhancement.

The NWPCC subbasin planning guidelines have identified a need for subbasin plans to describe how the objectives and strategies are reflective of, and integrated with, the recovery goals for listed species within the subbasin. Further, coordination with the National Marine Fisheries Service Technical Review Teams (TRT) and state water quality management plans is recommended to facilitate consistency with ESA and CWA requirements. The Tucannon Subbasin plan, although not having set direct fish population goals against which recovery can be measured, is supportive of

recovery through its goal of habitat enhancement. Integration with the draft Bull Trout Recovery Plan did occur in a limited fashion, as described in Section 7.1. Integration with the TRT was limited, as recovery goals have not yet been developed for the subbasin. The interim recovery goals provided by the TRT are presented later in this chapter within the context of preliminary numeric fish population goals, which also includes goals from tribal and state agency interests. The Columbia Conservation District and other entities within the subbasin intend to work with the TRT primarily through the Snake River Salmon Recovery Plan process.

Table 7-5 Nez Perce Tribe Anadromous Adult Return Goals for the Tucannon subbasin[1].

Species		Adult Escapement	Natural Spawning Component	Hatchery Component		
				Broodstock Need	Rack Return	Harvest Component
Spring Chinook	Future Goal	2,400 – 3,400	∞2,000	160	Undefined	1,200
	Existing Condition	500-700	500	150		0
Fall Chinook	Future	2,000	1,000	0	0	1,000
	Existing Condition	Redd counts	Redd counts	0	0	0
Coho	Future	Undefined	Undefined	Undefined	Undefined	Undefined
	Existing Condition	Undefined	Undefined	0	0	0
A-run Steelhead	Future	2,200 – 3,400	1,500		0	700 – 1,900
	Existing Condition	600	600			0
Lamprey	Future	Undefined	Unknown	Undefined	Undefined	Undefined
	Existing Condition	Unknown	Unknown	0	0	0

[1] Goals are derived from various management plans as described in Appendix A. This table does not necessarily imply consensus by all management agencies but merely gives direction to managers who must workout the restoration and recovery of each specie and population over time through implementation of the plan.

Table 7-6 Comparison of Draft Anadromous Fish Goals from Various Plans Pertaining to the Tucannon Subbasin

Species	Long-term Return Goals	Natural Spawning Component	Hatchery Spawning Component	Total Spawning Component	Harvest Component	Overall Goal/Notes
Spring chinook						
CRITFC	3,000	----	----	----	----	
1990 Plan	3,000	----	----	----	----	Parkhurst 1950
NMFS 2002	1,000	----	----	----	----	Interim Abundance Goal
CRFMP		25,0001	10,0001	35,0001		At Lower Granite
LSRCP	2,400 (1,152 hatchery produced)	----	-----	----	----	
Fall chinook						
CRITFC	2,000	----	----	----	----	
1990 Plan		----	----	----	----	

Species	Long-term Return Goals	Natural Spawning Component	Hatchery Spawning Component	Total Spawning Component	Harvest Component	Overall Goal/Notes
NMFS 2002	25002	----	----	----	----	Interim Abundance Goal (Snake River)
LSRCP	18,300 hatchery produced and 14,360 naturally produced	----	-----	----	----	To project area (Snake River)
A-Run Steelhead						
CRITFC	2,200	----	----	----	----	
1990 Plan	3,400	----	----	----	----	Thompson et al. 1958
NMFS 2002	1,300	----	----	----	----	Interim Abundance Goal
WDFW escapement goal	600 naturally produced					SaSi 2004
CRFMP	<62,2003					At Lower Granite
LSRCP	4,656 hatchery produced, 5,044 naturally produced for all of SE WA (875 hatchery produced in the Tucannon R and 948 naturally produced in the Tucannon)	----	-----	----	----	Lower/mid Snake and tributaries and the Walla Walla Basin
Bull Trout	See draft Bull Trout recovery plan					
Lamprey						
CW Tech. Group	10,0004	----	-----	----	----	Based on 60's count at L. Snake River dams

Note – these numbers are considered highly preliminary, and are subject to extensive modification.

[1] CRFMP, which has expired (US v. Oregon), establishes interim management goals for fish passing over the Lower Granite Dam; Snake River specific goals are not defined.

[2] Represents interim abundance goal for Snake River ESU

[3] CRFMP, which has expired (US v. Oregon), establishes interim management goals for fish passing over the Lower Granite Dam; Snake River specific goals are not defined.

[4] Interim goal is based on historic (late 1960's) counts >30,000 at Lower Snake River dams

Key:

- CRFMP=US v. Oregon (expired)
- CRITFC=Spirit of the Salmon (1996. Columbia River Inter-Tribal Fish Commission. *Wy-Kan-Ush-Mi Wa-Kish-Wit: Spirit of the Salmon.)*;
- 1990 Plan= 1990 Snake Subbasin Salmon and Steelhead Production Plan;
- NMFS 2002=2002. National Marine Fisheries Service Interim Abundance and Productivity Targets for Interior Columbia Basin Salmon and Steelhead Listed Under the Endangered Species Act. Website accessed January 30: http://www.nwppc.org/library/2002/NMFSTargets2002_0404.pdf;
- CRFMP=Columbia River Fish Management Plan,
- CW Tech. Group=Clearwater Subbasin Technical Planning Team

7.3.7 Objectives Analysis

Although numeric fish population objectives were not set in this plan, an analysis of the anticipated benefits of achieving the habitat enhancement objectives outlined above was generated. This work, completed by Mobrand Biometrics, Inc., made use of the same EDT model used during the aquatic assessment. Note that these numbers are provided for comparison between historic, current, properly functioning, and post-management plan implementation conditions only. They are not calibrated to reflect actual numeric fish populations within the subbasin. However, they are useful to compare the anticipated relative change in the subbasin upon achievement of the biological objectives.

Appendix J provides the full objectives analysis completed for the Tucannon Subbasin. This includes discussion of how close to historic conditions the basin would become if all objectives were implemented. Further, the analysis also provides relative estimates of improvements in adult abundance, adult productivity, adult carrying capacity, life history diversity, smolt productivity, and mean smolt abundance if all objectives were achieved. These results are summarized in Tables 7-7, 7-8, and 7-9 for steelhead, spring Chinook, and fall Chinook, respectively.

Table 7-7 Objectives Analysis – Tucannon Summer Steelhead

Scenario	Mean Adult Abundance	Adult Productivity	Adult Carrying Capacity	Life History Diversity	Mean Smolt Production	Productivity (smots/spawner)	Smolt Carrying Capacity
Current	634	1.84	1,392	26%	62,123	167	150,049
Historical	26,680	26.72	27,718	100%	277,663	274	288,638
PFC	1,316	2.48	2,207	83%	124,825	216	222,355
Passive Restoration	681	1.85	1,482	27%	65,152	167	152,325
Active Restoration	767	2.04	1,503	36%	75,212	184	160,718
Passive + Active Restoration	815	2.06	1,586	37%	78,132	185	162,456

Passive restoration=implementation of protection strategies.
Active restoration=implementation of restoration strategies.
PFC=Properly Functioning Conditions.

Table 7-8 Objectives Analysis – Tucannon Spring Chinook

Scenario	Mean Adult Abundance	Adult Productivity	Adult Carrying Capacity	Life History Diversity	Mean Smolt Production	Productivity (smots/spawner)	Smolt Carrying Capacity
Current	235	1.49	712	69%	39,190	232	140,069
Historical	12,215	26.86	12,688	100%	362,376	463	387,161
PFC	1,769	3.75	2,412	95%	208,300	342	317,529
Passive Restoration	260	1.54	743	72%	43,980	241	146,832
Active Restoration	532	2.24	962	90%	75,828	282	153,197

Scenario	Mean Adult Abundance	Adult Productivity	Adult Carrying Capacity	Life History Diversity	Mean Smolt Production	Productivity (smots/spawner)	Smolt Carrying Capacity
Passive + Active Restoration	564	2.30	999	91%	81,247	292	160,188

Passive restoration=implementation of protection strategies.
Active restoration=implementation of restoration strategies.
PFC=Properly Functioning Conditions.

Table 7-9 Objectives Analysis – Tucannon Fall Chinook

Scenario	Mean Adult Abundance	Adult Productivity	Adult Carrying Capacity	Life History Diversity	Mean Smolt Production	Productivity (smots/spawner)	Smolt Carrying Capacity
Current	83	1.18	543	17%	15,523	190	748,522
Historical	8,167	23.41	8,531	100%	840,283	776	968,785
PFC	844	4.16	1,111	57%	298,376	513	961,305
Passive Restoration	151	1.36	568	22%	30,334	210	757,813
Active Restoration	138	1.32	567	21%	28,745	217	771,531
Passive + Active Restoration	197	1.50	591	25%	44,184	238	780,295

Passive restoration=implementation of protection strategies.
Active restoration=implementation of restoration strategies.
PFC=Properly Functioning Conditions.

The following description of the objectives analysis is taken directly from Appendix J:

> "The impacts of the strategic habitat objectives…are consistent with the geographic areas targeted and the life histories of the focal species. The majority of Tucannon fall chinook spend the entirety of their freshwater life cycle in the lower Tucannon, and benefit only from passive restoration and a progressively diminishing impact of upstream temperature and sediment reduction actions. The most important elements of the fall chinook simulation are that adult productivity and life history diversity remain very low – 1.5 adult returns/spawner and 25%, respectively – even under the maximum restoration scenario. Such an unproductive and geographically inflexible population is not likely to be self-sustaining. The mean number of fall chinook spawning in the lower Tucannon would probably increase under the combined active/passive strategy, but only so long as the population was sustained by an infusion of strays from the core population in the Snake River.
>
> Because steelhead are much more likely to spawn and rear in small tributaries than either race of chinook salmon, and because all restoration actions targeted only the Tucannon mainstem, mainstem-spawning steelhead benefit from the proposed restoration actions much more than tributary spawners. An exclusive focus on mainstem steelhead is entirely appropriate in light of existing production areas and the obstacles to meaningful

habitat restoration in most of the tributaries. Even so, a consequence of this emphasis on the practicable is the fact that only 37% of the Historical life history patterns are viable under combined active/passive mainstem restoration. This fact emphasizes the importance of smaller tributaries to steelhead production in the Tucannon, and suggests a steelhead-specific program, should one ever be proposed, should probably have a somewhat broader focus.

Too much weight should not be given to the preceding caveat on steelhead benefits. Mean steelhead abundance is predicted to increase 30%, from 634 to 815 adults, while productivity and life history diversity increase 12 and 42%, respectively. The absolute increase in adult productivity from 1.8 to 2.1 is perhaps more important than the proportional increase, because a productivity less than 2.0 is all too frequently associated with populations in serious decline. The same kind of thing can be said of the increase in life history diversity from 26 to 37%: each percent of improvement in productivity and life history diversity is vital to a seriously depressed population.

Spring chinook is clearly the major beneficiary of the current strategy. Such a result was expected as both current and historical production areas coincide perfectly with the footprint of the strategic habitat objectives. Equilibrium abundance increases by a factor of 2.4, from 235 to 564 adults. The estimated improvements in spring chinook productivity, however, might result in a qualitative status change for the population. If natural productivity under the combined active/passive strategy does in fact increase from a value like 1.5 to one on the order of 2.3, it would not be implausible to suggest that Tucannon spring chinook would become at least marginally self-sustaining. The estimated increase in life history diversity from 69% to 91% buttresses such a contention considerably. A concrete illustration of the likely significance of the benefits forecast for Tucannon spring chinook is that spring chinook productivity under active/passive restoration is 25% greater than steelhead productivity under current conditions, and 11% greater than steelhead productivity even under active/passive restoration."

7.3.8 Additional Fish Enhancement Efforts

According to the objectives analysis provided in the previous section, the EDT-based in-basin habitat enhancement strategies proposed in this plan will not be sufficient to achieve the interim fish production objectives suggested by various entities as described above. A combination of other enhancement efforts will be needed if these numeric objectives are to be achieved.

If the most aggressive subbasin restoration scenario were implemented and all objectives outlined in this plan were achieved, EDT predicts increases in mean adult abundance of 28 percent for steelhead, 140 percent for spring Chinook, and 147 percent for fall Chinook over the time period of the plan (see Tables 7-7, 7-8, and 7-9). However, these percentage increases as predicted will not be sufficient to meet even the lowest of numeric fish goals for naturally-produced fish as outlined in Table 7-2.

As discussed in Section 3.5.6, out-of-subbasin factors—including estuarine and ocean conditions, hydropower impacts such as water quality and fish passage, mainstem Snake/Columbia river water quality and quantity conditions, and downriver and oceanic

fisheries—are key factors limiting recruitment of anadromous spawners to the Tucannon subbasin. Out-of-subbasin work combined with in-subbasin work is needed to achieve any of the proposed numeric fish population goals listed above. Achieving these goals for anadromous species will reflect progress made toward improving out-of-basin conditions. Increases in both anadromous adult escapement and habitat carrying capacity will be required to achieve numeric anadromous fish goals. Minimizing the impact of out-of-subbasin effects on subbasin restoration efforts will require coordination and cooperation in province- and basinwide efforts to address problems impacting Tucannon subbasin fish stocks.

Increasing anadromous fish productivity and production, as well as life stage-specific survival, through artificial production may need to continue or expand within the subbasin. Specific strategies to accomplish this can include the following:

- Maximize hatchery effectiveness in the subbasin--continue existing and/or implement innovative hatchery production strategies in appropriate areas to support fisheries, natural production augmentation and rebuilding, reintroduction, and research.
- Apply safety net hatchery intervention based on extinction risk analysis and benefit risk assessments
- Implement artificial propagation measures and continue existing artificial and natural production strategies
- Monitor and evaluate effectiveness of implementation of hatchery and natural production strategies

Salmonid recovery planning in the Washington portion of the Snake River Region (includes Washington portions of Asotin, Lower Snake, Tucannon, Walla Walla, and Grand Ronde subbasins) is occurring under the guidance of the Snake River Salmon Recovery Board. The Board will be exploring the development of a common set of numeric fish population goals that addresses all four H's (habitat, hydropower, harvest and hatcheries). Fish population goals identified by the Board could include additional artificial propagation and/or out-of-subbasin strategies needed to meet those goals. These numeric fish population goals will be aimed at recovery and delisting of ESA listed salmonids. Preliminary numeric fish population goals have been identified by the co-managers (state and federal fish and wildlife agencies and tribes; see previous section) to meet the needs of production and harvest. These goals assume that a combination of natural and artificial production will be used in the subbasin and are expected to evolve over time.

7.4 Terrestrial Habitats

Section 7.3 reviewed strategies unique to aquatic species and their habitats. This section reviews those strategies unique to terrestrial habitats. Priority habitats within the Tucannon Subbasin include riparian riverine, ponderosa pine, and interior grasslands. Note that canyon grasslands are a subset of interior grasslands.

Appendix K includes the full management plan developed by WDFW for the Tucannon Subbasin, including background on its development and assumptions used. Selected portions of this Attachment are provided below.

7.4.1 Terrestrial Working Hypotheses and Objectives

Three ecoregion focal habitat types occur in the Tucannon Subbasin including riparian/riverine wetlands, ponderosa pine, and interior grasslands. The recommended range of management conditions provided in Table 4 of Appendix K describes the conditions that must be met for a habitat to be considered "functional." These parameters will be key when evaluating the relative success of particular strategies.

Similar to aquatics, the working hypotheses for focal terrestrial habitat types are based on factors that affect/limit focal habitats (the term, "factors that affect habitat" is synonymous with "limiting factors"). Working hypotheses were developed that capture the primary factors that affect the habitat.

Riparian/Riverine Wetlands Working Hypothesis

The near term or major factors affecting this focal habitat type are direct loss of habitat due primarily to urban/agricultural development, reduction of habitat diversity and function resulting from exotic vegetation, livestock overgrazing, fragmentation and recreational activities. The principal habitat diversity stressor is the spread and proliferation of invasive exotics. This coupled with poor habitat quality of existing vegetation has resulted in extirpation and or significant reductions in riparian habitat obligate wildlife species.

Factors Affecting the Habitat

- Loss of habitat due to numerous factors including riverine recreational developments, inundation from impoundments, cutting and spraying of riparian vegetation, etc.
- Alteration of natural hydrology due to diking, channelization, etc. resulting in reduced stream flows, reduction of overall area and extent of riparian habitat, streambank stabilization, and loss of vegetative structure, narrowed stream channels.
- Habitat alteration from 1) hydrological diversions, dams, and control of natural flooding regimes resulting in reduced stream flows and reduction of overall area of riparian habitat, loss of riparian vegetative structure, and lack of recruitment of young cottonwoods, ash, willows, etc., and 2) stream bank stabilization which narrows stream channel, reduces the flood zone, and reduces extent of riparian vegetation.
- Habitat degradation from livestock overgrazing which can widen channels, raise water temperatures, reduce understory cover, etc.
- Habitat degradation from conversion of native riparian shrub and herbaceous vegetation to invasive exotics.
- Fragmentation and loss of large tracts necessary for area-sensitive species.

- Landscapes in proximity to agricultural, residential, and recreational development may be subject to high levels of human disturbance and disproportionately support non-native species that displace and/or impact native species productivity, e.g. nest competitors (European starlings and house sparrows), nest parasites (brown headed cowbird), and domestic predators (cats and dogs).
- Recreational disturbances (e.g., ORVs), particularly during nesting season, and particularly in high-use recreation areas.

Ponderosa Pine Working Hypothesis

The near term or major factors affecting this focal habitat type are direct loss of habitat due primarily to timber harvesting, fire reduction/wildfires, mixed forest encroachment, development, recreational activities, reduction of habitat diversity and function resulting from invasion by exotic species and vegetation and overgrazing. The principal habitat diversity stressor is the spread and proliferation of mixed forest conifer species within ponderosa pine communities due primarily to fire reduction and intense wildfires. Habitat loss and fragmentation (including fragmentation resulting from extensive areas of undesirable vegetation) coupled with poor habitat quality of existing vegetation have resulted in extirpation and or significant reductions in ponderosa pine habitat obligate wildlife species.

Factors Affecting the Habitat

- Timber harvesting has reduced the amount of old growth forest and associated large diameter trees and snags.
- Changes in land use for urban, residential, and agricultural purposes have contributed to loss and degradation of properly functioning ecosystems.
- Fire suppression/exclusion has contributed towards habitat degradation, particularly declines in characteristic herbaceous and shrub understory from increased density of small shade-tolerant trees. High risk of loss of remaining ponderosa pine overstories from stand-replacing fires due to high fuel loads in densely stocked understories.
- Overgrazing has resulted in loss of properly functioning conditions, including recruitment of sapling trees and modification of understory vegetation.
- Invasion of exotic plants has altered understory conditions and increased fuel loads.
- Fragmentation of remaining tracts has negatively impacted species with large area requirements.
- Landscapes in proximity to agricultural, residential, and recreational areas may be subject to high levels of human disturbance and disproportionately support non-native species that displace and/or impact native species productivity, e.g. nest competitors (European starlings and house sparrows), nest parasites (brown headed cowbird), and domestic predators (cats and dogs).
- Spraying insects that are detrimental to forest health may have negative ramifications on beneficial moths, butterflies, and non-focal bird species.

Interior Grassland Working Hypothesis

The near term or major factors affecting this focal habitat type are direct loss of habitat due primarily to conversion to agriculture and urban development, reduction of habitat diversity and function resulting from invasion of exotic vegetation and wildfires, and overgrazing. The principal habitat diversity stressor is the spread and proliferation of annual grasses and noxious weeds such as cheatgrass and yellow-star thistle that either supplant and/or radically alter entire native bunchgrass communities significantly reducing wildlife habitat quality. Habitat loss and fragmentation (including fragmentation resulting from extensive areas of undesirable vegetation) coupled with poor habitat quality of existing vegetation have resulted in extirpation and or significant reductions in grassland obligate wildlife species.

Factors Affecting the Habitat

- Extensive permanent habitat conversions of grassland habitats resulting in fragmentation of remaining tracts.
- Changes in land use for urban, residential, and agricultural purposes have contributed to loss and degradation of properly functioning ecosystems.
- Degradation of habitat from overgrazing and invasion of exotic plant species.
- Fire management, either suppression or over-use, and wildfires.
- Invasion and seeding of crested wheatgrass and other introduced plant species which reduces wildlife habitat quality and/or availability.
- Loss and reduction of cryptogamic crusts, which help maintain the ecological integrity of grassland communities.
- Conversion of CRP lands back to cropland.
- Landscapes in proximity to agricultural, residential, and recreational areas may be subject to high levels of human disturbance and disproportionately support non-native species that displace and/or impact native species productivity, e.g. nest competitors (European starlings and house sparrows), nest parasites (brown headed cowbird), and domestic predators (cats and dogs).

Biological Objectives

Biological objectives are organized into two categories: 1) protection of habitats and 2) habitat function (enhancement and maintenance). Protection objectives focus primarily on identification and protection of focal habitats through education and outreach, leases, easements, and upholding existing land use and environmental protection regulations. Habitat enhancement objectives focus on improving habitat function based on recommended habitat management conditions. Subbasin planners also took into account three broad land categories when developing objectives. These include:

- Ecoregion assessment and conservation identified lands
- Lands currently assigned GAP protection status

- Other lands of ecological importance

Objectives are based primarily upon the ECA and GAP databases reviewed in the terrestrial assessment (Chapter 4). In addition to ECA identified lands and GAP protection status areas, subbasin planners support and encourage protection and enhancement of private lands that:

- directly contribute to the restoration of aquatic focal species
- have high ecological function
- are adjacent to public lands
- contain rare or unique plant communities
- support threatened or endangered species/habitats
- provide connectivity between high quality habitat areas
- have high potential for reestablishment of functional habitats

Table 7-10 provides the biological objectives for priority habitat types in the Tucannon Subbasin. Further detail on the relationship between these objectives and strategies can be found in Appendix K.

7.4.2 Terrestrial Strategies

Subbasin planners examined a number of alternate strategies from which preferred strategies were identified i.e., easements, leases, existing/new environmental regulations, USDA programs (CRP and CREP), cooperative projects and programs, and research. The rationale behind this flexible approach is to simultaneously employ a variety of non-prioritized conservation "tools" to accomplish subbasin objectives in order to make the most of habitat protection/enhancement opportunities. For example, in addition to using conservation easements as a habitat protection tool, habitat managers will concurrently examine whether habitat objectives can be achieved all or in part on extant public lands, with USDA programs, and/or through cooperative projects/programs.

Subbasin planners also recognized the efficacy of focusing future protection efforts around large blocks of extant public lands and adjacent private lands. Clearly, a multi-tiered, flexible, cooperative approach to protecting wildlife/aquatic habitats and associated species is key to the success of any long-term habitat protection/enhancement plan.

Terrestrial habitat strategies are summarized in Table 7-11. Note that terrestrial strategies are focused entirely upon improvements in functional habitat. Strategies for specific focal species were not identified, due to lack of adequate information upon which to base biological objectives. However, the population numbers and strategies developed in state mule deer and elk management plans (see Chapter 6 for discussion) will provide direction for management of these species. These and other focal species that are not actively managed impact the strategies through the use of their needs to define "functional" habitat and in the research, monitoring, and evaluation component of this plan (see Section 7.7).

Table 7-10 Summary of Terrestrial Biological Objectives

Habitat	Objectives	Biological Objectives NOTE - Objectives are not prioritized within or between habitat types.
Riparian Riverine	R-A	Protect riparian riverine function on a minimum of 7,881 acres (conservative estimated historic acreage), with an initial focus on areas that directly contribute to the restoration of aquatic focal species.
Ponderosa Pine	P-A	Protect P. Pine habitat classified as ECA Class 1& 2 (9,000 acres), within protected areas (GAP) and areas of private land that meet one or more of the following conditions: directly contribute to the restoration of aquatic focal species, have high ecological function, are adjacent to public land, contain rare or unique plant communities, have threatened, endangered, or sensitive species habitat or populations, or provide connectivity between high quality habitat areas.
	P-B	Enhance P. Pine functionality to achieve habitat parameters for focal and other obligate species within habitat classified as ECA Class 1 & 2 (9,000 acres), in protected areas (GAP), and areas of private land that meet one or more of the following conditions: directly contribute to the restoration of aquatic focal species, have high ecological function, are adjacent to public land, contain rare or unique plant communities, have threatened, endangered, or sensitive species habitat or populations, or provide connectivity between high quality habitat areas.
Interior Grassland	G-A	Protect Interior Grassland habitat classified as ECA Class 1 &2 (2,800 acres), within protected areas (GAP), and areas of private land that meet one or more of the following conditions: directly contribute to the restoration of aquatic focal species, have high ecological function, are adjacent to public land, contain rare or unique plant communities, have threatened, endangered, or sensitive species habitat or populations, or provide connectivity between high quality habitat areas.
	G-B	Enhance Interior Grassland functionality to achieve habitat parameters for focal and other obligate species within habitat classified as ECA Class 1 &2 (2,800 acres), in protected areas (GAP) and areas of private land that meet one or more of the following conditions: directly contribute to the restoration of aquatic focal species, have high ecological function, are adjacent to public land, contain rare or unique plant communities, have threatened, endangered, or sensitive species habitat or populations, or provide connectivity between high quality habitat areas.
	G-C	Show an upward trend in CRP acreage and functionality.

NOTE: The working horizon for accomplishing objectives is 2004-2020. These objectives were developed from a larger group of potential objectives based on the subbasin assessment and resulting working hypotheses.

Table 7-11 Terrestrial Habitat Strategies

Habitat Type	Objectives	Strategies NOTE – Strategies are not prioritized and will be implemented based upon available opportunities.
Riparian- Riverine Wetland	RA	Strategies listed under riparian function for aquatic species are incorporated herein by reference. (aquatic riparian function strategies are listed under Objective PM4.1 in Table 7-4)
Ponderosa Pine	P-A	Strategy P-A.1-Identify functioning ponderosa pine habitats, corridors, and linkages classified as ECA Class 1&2 for protection.
		Strategy P-A.2-Provide information, education, and outreach to protect habitats.
		Strategy P-A.3-Use easements, leases, and cooperative agreements to protect habitat (long-term protection strategies are preferred over short-term).
		Strategy P-A.4-Uphold existing land use and environmental regulations (e.g. critical area ordinances, etc.).
		Strategy P-A.5-Identify inadequate land use regulations. Work to strengthen existing regulations or pass new regulations to improve protection of habitats.
		Strategy P-A.6-Complete a more detailed assessment of focal species, focal species assemblages, and obligate species needs to determine their habitat requirements (quantity and quality). Assessment/research would ultimately determine what acreage and distribution of functional habitat is necessary to achieve habitat recovery in the context of focal species needs.
		Strategy P-A.7-Identify functioning ponderosa pine habitats, corridors, and linkages within protected areas (GAP) and areas of private land that meet one or more of the following conditions: directly contribute to the restoration of aquatic focal species, have high ecological function, are adjacent to public land, contain rare or unique plant communities, have threatened, endangered, or sensitive species habitat or populations, or provide connectivity between high quality habitat areas

Habitat Type	Objectives	Strategies NOTE – Strategies are not prioritized and will be implemented based upon available opportunities.
Ponderosa Pine	P-B	Strategy P-B.1-Identify non-functioning ponderosa pine habitats, corridors, and linkages within ECA Class 1 & 2 areas. Strategy P-B.2-Identify sites that are currently not in ponderosa pine habitat that have the potential to be of high ecological value, if restored. Strategy P-B.3-Provide information, outreach, and coordination with public and private land managers on the use of prescribed fire and silviculture practices to restore and conserve habitat functionality. Strategy P-B.4-Enter into cooperative projects and management agreements with Federal, State, Tribal, and private landowners to restore and conserve habitat function. Strategy P-B.5-Assist in long-term development and implementation of a Southeast Washington Comprehensive Weed Control Management Plan in cooperation with local weed boards. Strategy P-B.6-Fund noxious weed control projects to improve habitat function. Strategy P-B.7-Work with county, state, and federal agencies and private landowners to develop livestock grazing programs on federal and private lands that do not contribute to the invasion of noxious weeds or negatively alter understory vegetation. Strategy P-B.8-Identify non functioning ponderosa pine habitats, corridors and linkages within protected areas (GAP) and areas of private land that meet one or more of the following conditions: directly contribute to the restoration of aquatic focal species, have high ecological function, are adjacent to public land, contain rare or unique plant communities, have threatened, endangered, or sensitive species habitat or populations, or provide connectivity between high quality habitat areas.
Grassland	G-A	Strategy G-A.1. Identify functioning interior grassland habitats, corridors, and linkages classified as ECA Class 1&2 for protection. Strategy G-A.2. Provide information, education, and outreach to protect habitats. Strategy G-A.3. Use easements, leases, and cooperative agreements to protect habitats (long-term protection strategies are preferred over short-term). Strategy G-A.4. Uphold existing land use and environmental regulations (e.g. critical area ordinances, etc.). Strategy G-A.5. Identify inadequate land use regulations. Work to strengthen existing regulations or pass new regulations to improve protection of habitats. Strategy G-A.6. Complete a more detailed assessment of focal species, focal species assemblages, and obligate species needs to determine their habitat requirements (quantity and quality). Assessment/research would ultimately determine what acreage and distribution of functional habitat is necessary to achieve habitat recovery in the context of focal species needs. Strategy G-A.7. Identify functioning interior grassland habitats, corridors and linkages within protected areas (GAP) and areas of private land that meet one or more of the following conditions: directly contribute to the restoration of aquatic focal species, have high ecological function, are adjacent to public land, contain rare or unique plant communities, have threatened, endangered, or sensitive species habitat or populations, or provide connectivity between high quality habitat areas.

Habitat Type	Objectives	Strategies NOTE – Strategies are not prioritized and will be implemented based upon available opportunities.
Grassland	G-B	Strategy G-B.1. Identify non-functioning interior grassland habitats, corridors, and linkages within ECA Class 1 & 2 areas. Strategy G-B.2. Identify sites that are currently not in grassland habitat that have the potential to be of high ecological value, if restored. Strategy G-B.3. Provide information, outreach and-coordination with public and private land managers on management practices and the use of prescribed fire to restore and conserve habitat function. Strategy G-B.4. Enter into cooperative projects and management agreements with Federal, State, Tribal, and private landowners to restore and conserve habitat function. Strategy G-B.5. Assist in long-term development and implementation of a Southeast Washington Comprehensive Weed Control Management Plan in cooperation with local weed boards. Strategy G-B.6. Fund noxious weed control projects to improve habitat function. Strategy G-B.7. Work with county, state, and federal agencies and private landowners to develop livestock grazing programs on public and private lands that do not contribute to the invasion of noxious weeds or negatively alter habitats. Strategy G-B.8. Restore viable populations of obligate wildlife species where possible. Strategy G-B.9. Work with USDA programs (e.g. CRP) to maintain and enhance habitat quality. Strategy G-B.10. Identify non functioning interior grassland habitats, corridors and linkages within protected areas (GAP) and areas of private land that meet one or more of the following conditions: directly contribute to the restoration of aquatic focal species, have high ecological function, are adjacent to public land, contain rare or unique plant communities, have threatened, endangered, or sensitive species habitat or populations, or provide connectivity between high quality habitat areas.
Grassland	G-C	Strategy G-E.1. Increase landowner participation in federal, state, tribal, and local programs that enhance watershed health (e.g. CRP, CREP, Wetlands Reserve Program, EQIP, Partners for Fish & Wildlife, WDFW Landowner Incentive Program, Conservation Security Program, etc.) Strategy G-E.2. Seek additional funding sources consistent with current CRP and CREP guidelines to increase individual landowner enrollment in programs that achieve similar goals. Strategy G-E.3. Seek funding sources to develop programs consistent with the goals of CRP, EQIP, and CREP in those areas where such programs are not available. Strategy G-E.4. During re-enrollment, convert CRP land to more functional plant communities. Strategy G-E.5. Enroll areas with documented wildlife damage and areas directly adjacent to high-quality wildlife habitat into CRP using cover practices 2, 3, and/or 4.

7.4.3 Terrestrial Special Topic - Agriculture – as a Cover Type of Interest

Given its predominance within the subbasin and potential to positively and negatively impact terrestrial wildlife, agriculture is a cover type of special interest to stakeholders and subbasin planners. The primary concern regarding the interface between agriculture and wildlife was that of wildlife damage to agricultural crops. To remedy this concern, one objective was set for agricultural habitats: A1-Limit elk and deer damage on private agricultural lands.

Strategies to achieve this objective were established as follows:

Strategy A1.1-Improve quality of focal habitats on public and private lands e.g. prescribed burns, CRP, and other focal habitat strategies

Strategy A1.2-Implement strategies in Washington elk and mule deer management plans (note-not all sub-strategies will apply in all areas), including the following:

- Salting in backcountry
- Manage recreation activities during calving season
- Limit road densities
- Quantify & fund mitigation for damages
- Maintain existing wildlife fences
- Build new wildlife fences
- Utilize radio collars to track herds for direct movement back to public land
- Forage plot development

Strategy A1.3-Limit the impacts of urban, rural residential, and agricultural development in elk and deer habitat uses that result in increased conflicts

Strategy A1.4-Implement additional strategies to attract and retain elk and deer on public lands.

7.5 Research, Monitoring, and Evaluation

This section provides an overview of the research, monitoring, and evaluation (RM&E) approach proposed for aquatic and terrestrial habitats and species in the Tucannon Subbasin. The RM&E activities proposed herein will help fill existing data gaps and will facilitate implementation of an adaptive management approach in the subbasin. Although general in nature due to limitations of the Subbasin planning process, this RM&E plan is intended to be refined over time.

- **Research** activities generally are intended to fill existing data gaps and establish baseline habitat conditions.
- **Monitoring** activities are intended to track individual project effectiveness, to document the extent to which strategies are being implemented, and to identify habitat and species responses to such actions.

- **Evaluation** activities enable subbasin planners to integrate research and monitoring data in a feedback loop to determine if strategies are contributing to achievement of the biological objectives, to assess the ability of objectives to address the working hypotheses, and to test accuracy of the working hypotheses.

The RM&E plan is split into two sections: aquatic (Section 7.7.1) and terrestrial (Section 7.7.2). Both the terrestrial and aquatics portion of the proposal describe high priority RM&E needs that will support achievement of the plan's vision. These needs are defined as programs that 1) gather data or conduct research that furthers our understanding of ecosystem function, 2) fill existing knowledge or data gaps, 3) answer questions critical to successful management of species or communities, 4) test or develop innovative restoration/management techniques, 5) identify the accuracy of assumptions, or 6) allow evaluation of the relative success of ongoing restoration/management activities, thereby facilitating adaptive management. Although they are discussed separately, each section follows the same general framework:

- Identification of research needs to fill data gaps and establish baseline conditions
- Identification of monitoring and evaluation needs to track progress on achievement of biological objectives and to support adaptive management in the subbasin.

The RM&E program summarized below is presented in full in Appendices L (terrestrial components), and D (aquatic components). Due to out of subbasin effects, habitat enhancement within the subbasin may not spur a direct increase in focal species populations. As such, the RM&E plan outlined below tracks improvements in both habitat quality and focal species populations. This plan is not intended to provide the full details needed for research and monitoring activities within the subbasin, but instead to provide direction and key areas in which such activities should focus. The intent is for this program to grow and develop as data gaps are filled, fed back into an adaptive management program to improve the information upon which this plan is based, and plan data needs change. However, cooperation among the various entities involved in aquatic and terrestrial species population and habitat enhancement is currently a high priority, and will likely continue as such well into the future.

7.5.1 Aquatic Habitats and Species

The full aquatic RM&E plan for the Tucannon Subbasin is provided in Appendix K. Information regarding RM&E priorities for aquatic species of interest is provided in Appendix M. Following are the guiding principles and priorities outlined in the plan:

- Fill EDT data gaps and establish baseline habitat conditions - focusing on filling data gaps that have the greatest leverage on EDT model outputs, those that are within priority protection or restoration stream reaches, attributes that have a broad effect on populations or habitat status, and data gaps that are identified specifically in the management plan). This includes gathering information on aquatic species of interest.
- Focus RM&E efforts on critical data needs for VSP attributes - improve understanding of abundance, diversity, spatial structure, and productivity

- Implementation and effectiveness monitoring to document actions should be funded/undertaken within the basin – document the why, where, how much and whether of habitat recovery actions completed in the subbasin
- Address critical uncertainties – critical uncertainties must be answered if populations are to be rebuilt and delisted. Such uncertainties may include habitat/life history stage relationships, causal relationships for degraded habitat and depressed or extirpated populations, and understanding the relationship between resident and anadromous O. mykiss subpopulations.
- Coordinate with regional efforts – as noted in Chapter 6, a wide variety of groups participate in habitat and species enhancement efforts within the subbasin. These efforts should be coordinated to the maximum extent possible both within the subbasin and at a regional scale.
- Data management and coordination are crucial to meet regional data accessibility needs
- Methodologies should provided data of known quality (accuracy and precision)
- Validation of the EDT model as a reliable measure of habitat and population response to recovery actions taken in the Tucannon Subbasin
- A systematic approach to project selection and funding will be used that is consistent with and complementary to other RM&E efforts within the Columbia Basin

The Tucannon subbasin technical staff, managers, and stakeholders have initiated an effort to coordinate RM&E activities. Table 1 of Appendix L provides a detailed assessment of ongoing and needed RM&E activities. Following are broad RM&E recommendations based on guiding principles and priorities and the items listed in Table 1 of Appendix L:

- Fund habitat inventories to collect data necessary to fill data gap for attributes with high EDT model leverage and evaluation of progress toward subbasin plan objectives.
- Continue to fund existing monitoring and evaluation actions within the subbasin that fulfill critical VSP data needs.
- Fund additional actions to complete basic population status monitoring needs for the subbasin
- Accountability for restoration actions needs to occur for each project. Basic documentation should be completed in a cost effective manner. A systematic approach to documenting effectiveness is required that provides sufficient accountability without unnecessary redundancy.
- Fund research on critical uncertainties represented in the Tucannon for a broader ESU relevance if not being funded or conducted in other subbasins (opportunity for a coordinated regional effort)
- Fund and implement RM&E that shows a clear link to resolving uncertainty regarding population abundance and management goals

7.5.2 Terrestrial Habitats and Species

The full aquatic RM&E plan for the Tucannon Subbasin is provided in Appendix L. The intent of the terrestrial RM&E plan is to:

- evaluate success of focal habitat management strategies, via monitoring of focal wildlife species (The results of focal species monitoring and evaluation efforts are expected to function as potential performance measures to monitor and evaluate the results of implementing management strategies and actions on focal habitats).
- determine if management strategies undertaken are achieving recommended range of habitat management conditions, via monitoring and assessment of habitat conditions over time
- allow for evaluation of the assumptions and working hypotheses upon which the management plan is based, by determining if a correlation does indeed exist between focal habitat management conditions and focal species population trends

The terrestrial RM&E plan provided in Appendix L consists of two main components: 1) research; and 2) monitoring and evaluation. The research component identifies research needs, with their justification. Detailed research project design is not presented, however, being beyond the scope of the current planning effort. Existing data gaps, as identified through the subbasin planning process, are listed in this section, because many will require effort above routine monitoring and evaluation to address

Key research needs, a strategy to address the need, and the recommended agency/personnel to implement the strategy are identified by habitat type in Table 1 of Appendix L. General research needs that cross all habitat types include the following:

- Testing of the assumption that focal habitat are functional if a focal species assemblage's recommended management conditions are achieved
- Testing of the assumption that selected species assemblages adequately represent focal habitats
- Compilation of current, broad-scale habitat data through spatial data collection and GIS analysis

All three of these general research needs would be a coordinated effort between federal, state, and local government agencies and NGOs.

The monitoring and evaluation component reviews focal habitat and focal species monitoring methodologies, and identifies monitoring needs for individual management strategies. Specifically, a monitoring and evaluation approach is provided for each terrestrial habitat enhancement strategy in Table 3 of Appendix L. Three key approaches regarding monitoring and evaluation are found throughout this table:

1. Identification of functional habitat. Current data provides a reasonable estimate of the extent of habitat types, but the functionality of those habitat types is unknown.

2. Track and report accomplishments of various entities.

3. Cooperative efforts among the various entities involved in species population and habitat enhancement work are encouraged wherever possible.

As mentioned above, this terrestrial RM&E program is intended to grow and develop as improvements are realized and strategies change. Tracking the results of project implementation and feeding those into an adaptive management program will facilitate more efficient use of project funds, and will help target such funds to those areas and projects that can provide the greatest benefit for terrestrial wildlife.

7.6 Plan Implementation

The purpose of this subsection is to briefly describe some considerations for plan implementation. Significant cooperation and coordination has occurred among local, state, federal and tribal agencies, and with individual land owners during development of this subbasin plan, and for other ongoing planning efforts. Temporary committees and other coordination structures were established. These cooperative efforts should continue. The following recommendations can guide successful subbasin implementation:

- Task the subbasin planning team with developing a more detailed implementation plan that includes a prioritization of strategy, RM&E, planning tools update, and administrative activities for the next one to three years;
- Designate or establish a permanent plan implementation oversight committee comprised of agency technical staff and interested citizens. This committee could monitor and update annually the three-year implementation plan (see bullet); review project funding requests prior to submittal; assist with coordinating/integrating efforts with other planning efforts; and take on other needed activities, as identified. This could be a new committee, or an existing committee or organization structure established through subbasin planning, watershed planning, salmon recovery planning, or HCP planning. Additional subcommittees or adhoc workgroups might be established for addressing specific implementation actions.