Final Draft

Yakima Subbasin Plan

May 28, 2004

Prepared for the

Northwest Power and Conservation Council

Presented by the

YAKIMA SUBBASIN FISH AND WILDLIFE PLANNING BOARD

Cover photographer/artist John Holmgren, Ellensburg, WA and cover layout by Idea Marketing, Yakima, WA.

Disclaimer

The Northwest Power and Conservation Council intended the production of this subbasin plan to be a collaborative effort. Therefore, any party with information relevant to existing natural resources and conditions within the Yakima Subbasin was provided an opportunity to participate in the production of this document. Consequently, the document was created using information collected from many sources. The parties participating in the development and submission of this Plan do not imply that they agree with or otherwise support all or any of the information submitted by any other party. All parties reserve the right to respond to and refute any information within this plan or any document appended to the same, as they may deem appropriate.

May 27, 2004

Mark Walker, Director of Public Affairs
Northwest Power and Conservation Council
851 SW 6th Ave, Suite 1100
Portland, OR 97204

Subject: Submittal of the *Yakima Subbasin Plan* for ISRP Review and Comment

Dear Mr. Walker:

The Yakima Subbasin Fish and Wildlife Planning Board (YSPB) is pleased to submit the attached *Yakima Subbasin Plan* to the Northwest Power and Conservation Council for review by the Independent Science Review Panel (ISRP). The Board looks forward to a presentation of the plan to the ISRP on June 14 and 15, and to comments regarding the adequacy of the plan that the ISRP may forward to the Board upon the conclusion of its review. In submitting this plan, the Board recognizes the considerable contributions made by citizens, special interests, agencies, and participating governments within the basin over the past year.

To the extent practicable, the submitted plan has been prepared in accordance with the Council's Technical Guide for Subbasin Planners. Meaningful public participation in the planning process was aggressively pursued and achieved through a Public Involvement Program that included print and electronic media; internet access and web-site; distributed informational materials; staff presentations to interest groups and agencies; a newsletter, multiple local workshops and public meetings/hearings in each county jurisdiction and at the Yakama Nation; use of advisory committees; and a comment/response feed-back loop that included Board review, in open meetings, of all comments and responses on the *Public Review Draft of the Yakima Subbasin Plan*. This submittal includes the record of public comments and responses (see enclosed CD for this table and minority report).

At the conclusion of the ISRP review, the Board will conduct additional local public workshops for the general public, interest groups, and elected officials. In response to the ISRP comments, the Board will sponsor meetings with local City Councils, County Commissioners, and the Yakama Nation to review key findings in response to ISRP comments.

The Board notes that its submittal is voluminous. In order to present an adequate assessment, inventory, and management plan, the resulting length is unavoidable. The Yakima Basin is large: 200 miles long, 3.9 million acres, with elevations that range from 8,000 to 400 feet. The basin's geomorphology is complex and diverse and the precipitation pattern quite varied, as a consequence so is its biology. Within this landscape, there has been over one hundred years of water resources use and development in the basin that has resulted in a regulated flow. While the regulated flow and other land use development provides significant economic benefits to area communities, it may have in some cases and areas adversely impacted the productivity of aquatic and terrestrial species in the Yakima Subbasin. This plan addresses key limiting factors to fish and wildlife species in this watershed and provides strategies to address these factors.

We appreciate this opportunity to develop and submit the *Yakima Subbasin Plan* to the Council for your review. Let us know if we can be of further assistance.

Sincerely,

Leo Bowman
YSPB Chair
Benton County Commissioner

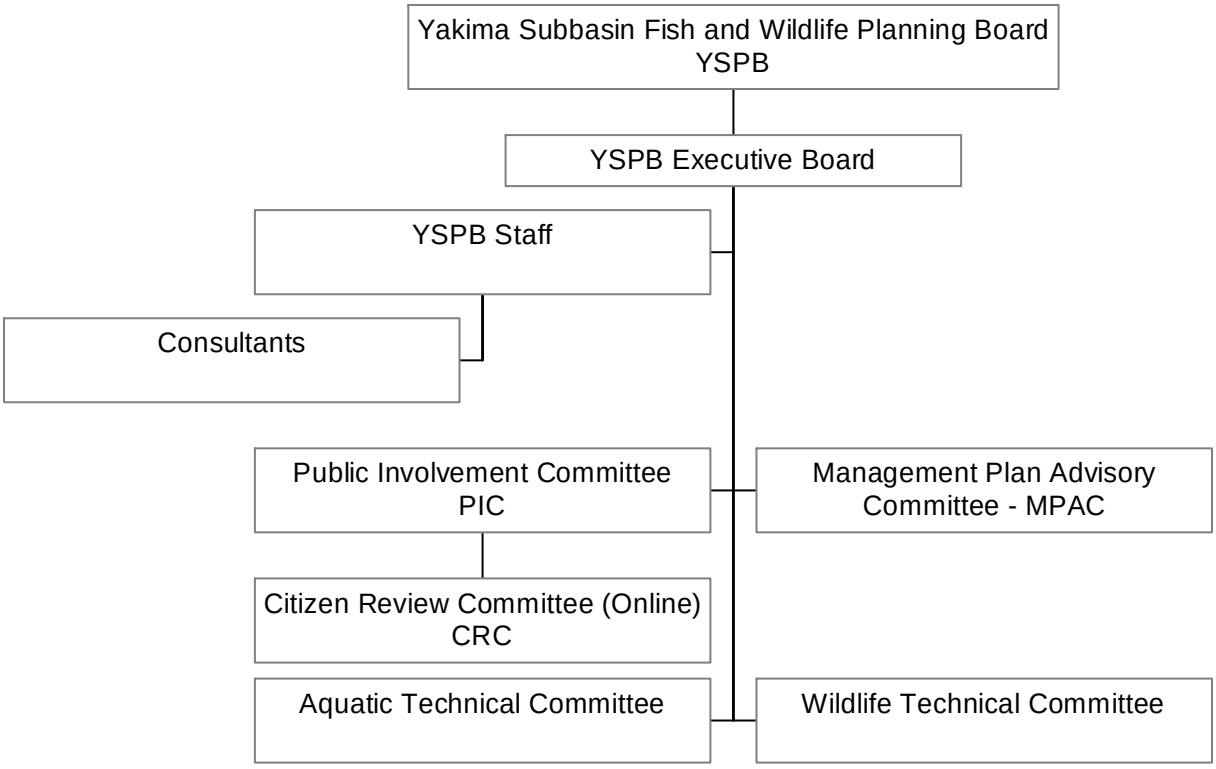
James Lewis
YSPB Vice Chair
Yakima County Commissioner

Acknowledgement

The Yakima Subbasin Fish and Wildlife Planning Board (YSPB) guided the planning process for the development of the 2004 *Yakima Subbasin Plan*. The Board is comprised of elected officials from local governments throughout the subbasin, and meets regularly to work with staff and the public. Throughout 2003 and 2004, the YSPB directed the development of the *Yakima Subbasin Plan* with the support of staff, consultants, and multiple committees. The general public assisted by reviewing the *Public Review Draft of the Yakima Subbasin* and providing significant input during the comment period, and at the onset and throughout this process. The public comments and responses to these comments are available on the enclosed CD.

The Board recognizes the considerable contributions made by citizens, interest groups, agencies, participating governments, and especially to the staff and committees of the YSPB. The Yakima Subbasin staff and the committee members dedicated significant time, energy, and expertise to this planning effort. The Board acknowledges the dedication, cooperation, and commitment needed in order to develop a plan that reflects local priorities, meets the requirements outlined by federal statues, and is technically sound. The organizational structure of the YSPB is depicted below.

Organization Structure of the
Yakima Subbasin Fish and Wildlife Planning Board



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Executive Summary

1 Purpose and Scope

The Yakima Subbasin Fish and Wildlife Planning Board (YSPB) consists of representatives from the Yakama Nation and local governments in the Yakima River basin (Table ES-1). The Mission of the Board is to:

> "Restore sustainable and harvestable populations of salmon, steelhead, and other at-risk species through collaborative, economically sensitive efforts, combined resources, and wise resource management of the Yakima Basin."

To implement this mission, the Board contracted with the Northwest Power and Conservation Council (Council) to draft a Yakima Subbasin Plan and submit that plan to the Council.

Table ES-1. Members of the Yakima Subbasin Fish and Wildlife Planning Board.

City of Ellensburg	Yakama Nation
City of West Richland	City of Richland
City of Yakima	Town of Granger
City of Sunnyside	Benton County
City of Kennewick	City of Selah
Yakima County	City of Benton City
City of Prosser	City of Union Gap
City of Roslyn	

The contractually required purpose of the Yakima Subbasin Plan (YSP) is the protection and restoration of fish and wildlife. It is not a comprehensive document that directly addresses other issues within the basin. The YSPB is aware of the narrow focus of the YSP, and intends to ensure that the plan will complement rather than conflict with other ongoing resource objectives within the basin. In addition, the implementation of the YSP can enhance the existing fabric of custom and culture, and economic objectives of the Yakima Basin.

1.1 Adoption and implementation of the Subbasin Plan

The Council has published recommendations for the form and content of Subbasin Plans. Table ES-2). The Subbasin Plan describes to the Council the most effective ways that the Council and the Bonneville Power Administration (BPA) can meet their obligations in the Yakima Subbasin to mitigate the impacts on fish and wildlife resources from the construction and operation of the Federal Columbia River Power System (FCRPS). The Pacific Northwest Electric Power Planning and Conservation Act requires that such impacts be mitigated. The Subbasin Plan consists of prioritized, non-regulatory strategies to restore lost or degraded habitat functions using BPA ratepayer funds that are currently spent annually for restoration in the basin, but not according to any deliberately

conceived approach that defines and prioritizes clear objectives, and can measure results. Strategies in the Subbasin Plan are directed at protecting and restoring the functions of natural processes within the basin. They include ways to restore and reconnect fragmented habitat areas; protect existing critical habitat areas that are currently functioning at a high level; increase instream flows and return seasonal flows to a more natural flow regime; augment natural and artificial water storage; restore water temperatures in different parts of the basin to more natural levels; and restore sediment transport and sources of large woody debris. The plan also identifies the need to fund personnel to improve management of natural resources, to monitor and research the relationships between management actions and the health of the resource, and other actions that protect or restore natural resources functions that have been negatively impacted by the FCRPS.

The strategies identified within the plan do not involve land use regulation, but instead rely on willing parties to voluntarily apply for grant funds, participate in BPA funded programs, or use BPA funding to supplement existing programs that benefit fish and wildlife resources

Table ES-2. Outline of the Subbasin Plan recommended by the Council.

I.	Introduction	Introduction to the plan and subbasin overview
II.	Subbasin Assessment	Focal Species, Environmental Conditions, Ecological Relationships, Limiting Factors, Synthesis
III.	Inventory	Summary of existing projects and programs
IV.	Management Plan	Development of subbasin **vision** Development of subbasin **biological objectives** Development and prioritization of subbasin **strategies** Research, Monitoring, and Evaluation plan Endangered Species and Clean Water Act considerations
V.	Technical Appendices	References, maps, supporting documentation

The Yakima Subbasin Plan will be submitted to the Council on May 28, 2004. The Council will then undertake both scientific and public review of the almost 60 Subbasin Plans that will be submitted from across the entire Columbia Basin. Following this review process, the Council will adopt these plans as amendments to the Columbia Basin Fish and Wildlife Program in late 2004.

2 Foundations of Subbasin Plan

2.1 Vision for the Subbasin

The Vision and Guiding Principles were crafted by the YSPB as the local policy input to the Subbasin Plan and the driver for selection of Plan's objectives and strategies for restoration of fish and wildlife habitat and populations.

The Vision describes the desired future condition in terms of a common goal for the subbasin. The Vision is qualitative and reflects the policies, legal requirements and local conditions, and 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 for implementing actions intended to carry out the Plan's biological objectives and strategies for the subbasin.

Table ES-3. Vision for the Year 2020

Yakima River Basin communities have restored the Yakima river basin sufficiently to support self-sustaining and harvestable populations of indigenous fish and wildlife while enhancing the existing customs, cultures, and economies within the basin. Decisions that continuously improve the river basin ecosystem are made in an open and cooperative process that respects different points of view and varied statutory responsibilities, and benefits current and future generations.

Guiding Principles for the Yakima Subbasin Plan

1) That the natural environment including its fish and wildlife resources is the cultural heritage that is common to the diversity of human existence. The underlying premise of the YSPB's *Mission* and *Vision* is to prepare and implement a balanced plan of action that plays a key role in the long-term sustainability of our common cultural heritage within the Yakima Basin.
2) That the quality of water and a near natural timing and quantity of water flow (normative hydrograph) are principle indicators of a healthy river ecosystem.
3) That the Yakima Subbasin Plan enhances the Yakama Nation's continued exercise of Treaty Reserved and aboriginal rights for religious, subsistence, commercial and recreational use of natural resources;
4) That the Yakima Subbasin Plan is based on voluntary participation;
5) That the processes of plan preparation, implementation, and amendment, be open and equitable;
6) That the costs of plan actions be estimated in relation to benefits. Alternatives that achieve the benefits relative to costs are preferred. Costs of habitat/species restoration should be mitigated and distributed equitably;
7) That the science, strategies and art of restoring ecosystems is yet evolving, hence programs and actions must be monitored and evaluated for effect and may be altered as necessary;
8) That balanced sustainable resources management recognizes these basic precepts: a) that the physical and biological environments are functionally interdependent relative to productivity; b) that at any level of function, productivity is finite; c) without actions to restore degraded functions, and to protect, avoid and mitigate impacts to the physical and biological environment, the increasing demands of human population growth would reduce productivity to zero, with unacceptable costs to the cultures and economies of the subbasin.

2.2 Scientific Conceptual Foundations

A conceptual foundation is a set of theories, principles, and assumptions which describe the current scientific understanding of how a system functions. It determines how information is interpreted, what problems are identified and, as a consequence, it also determines the range of appropriate solutions to achieve desired management goals. The Conceptual Foundation for the Yakima Subbasin Plan (see Chapter 2, pages 2-11 to 2-19) recognizes the need for integrated management of fish and wildlife resources, which includes consideration of the human-based economic and cultural aspects of the ecosystem. It also discusses the ways in which the environment in the subbasin has changed since the 1850s, and how understanding these changes is key to understanding both the changes in fish and wildlife populations and the most effective methods to restore those populations.

The term pre-1850s was used in the plan to identify a baseline describing the environmental conditions that sustained fish and wildlife in the basin prior to the major alterations of the basin ecosystem that began at the onset of increased settlement in the latter half of the 19th century. Identification of a baseline or benchmark against which to measure existing conditions is fundamental to the design, implementation, and monitoring of restoration and protection strategies identified in the plan.

3 Subbasin Description and Assessment

3.1 Geography

The Yakima River basin is located in south central Washington and contains a diverse landscape of rivers, ridges, and mountains totaling just over 6,100 square miles. Along the western portion of the basin, the glaciated peaks and deep valleys of the Cascade Mountains exceed 8,000 feet. East and south from the Cascade crest, the elevation decreases to the broad valleys and the lowlands of the Columbia Plateau. The lowest elevation in the basin is 340 feet at the confluence of the Yakima and Columbia Rivers at Richland. Precipitation is highly variable across the basin, ranging from approximately 7 inches per year in the eastern portion to over 140 inches per year near the crest of the Cascades. Total runoff from the basin averages approximately 3.4 million acre-feet per year, ranging from a low of 1.5 to a high of 5.6 million acre-feet.

3.2 Population and Land Ownership

Private ownership totals over 1.2 million acres of the nearly 4 million acres in the Yakima subbasin. The single largest landowner is the U.S government with 1.5 million acres, or 38 percent of the land area. Most of the federal land is within the Wenatchee National Forest. Other large federal land holdings include the U.S. Army Yakima Training Center, a portion of the Department of Defense Hanford Nuclear Reservation, and Bureau of Land Management lands. Other public ownership (state, county, and local governments) total over 400,000 acres.

The entire Yakima Basin lies within areas either ceded to the United States by the Yakama Nation or areas reserved for the use of the Yakama Nation. The Yakama Reservation occupies about 40 percent of Yakima County and about 15 percent of the basin.

The basin's population is projected to increase about 45 percent by 2020. Most of the growth is anticipated to occur in the cities and communities along the river corridor and floodplains, from the city of Cle Elum downstream to the confluence with the Columbia River. Projected population growth in the subbasin will continue to put pressure on natural resources that provide habitat for fish and wildlife. Conversion of land and water resources to uses such as housing, roads, agriculture, industry, commercial development, recreation, energy, and related infrastructure means increased pressure on fish and wildlife habitat.

3.3 Water

Six major reservoirs are located in the subbasin and form the storage component of the federal Yakima Project, managed by the Bureau of Reclamation (Table ES-4) Total storage capacity of all reservoirs is approximately 1.07 million acre feet, total diversions average over 2.5 million acre feet. The construction and operation of the irrigation reservoirs have significantly altered the natural seasonal hydrograph of all downstream reaches of the mainstem and some tributaries.

Table ES-4. Major reservoirs in the Yakima Subbasin.

Reservoir	River system	Storage Capacity (acre-feet)
Keechelus Lake	Upper Yakima	157,800
Kachess Lake	Upper Yakima	239,000
Cle Elum Lake	Upper Yakima	436,900
Rimrock Lake	Naches	198,000
Bumping Lake	Naches	33,700
Clear Lake	Naches	5,300

Historically, the hydrologic cycle in this basin was characterized by extensive and complex exchange of water between the surface, hyporheic (shallow groundwater made up of downwelling surface water) and groundwater zones. Under pre-1850s conditions, vast alluvial flood plains were connected to complex webs of braids and distributary channels. These large hydrological buffers spread and diminished peak flows, promoting infiltration of cold water into the underlying gravels. Side channels and sloughs provided a large area of edge habitat and a variety of thermal and velocity regimes. For salmon and steelhead, these side channel complexes increased productivity, carrying capacity, and life history diversity by providing suitable habitat for all freshwater life stages in close physical proximity.

3.4 Focal Species and Habitats

The final Subbasin Plan will be a comprehensive strategy for the management of all fish and wildlife in the Yakima Subbasin. To reduce the complexity of dealing with large amounts of information about the hundreds of species in the region, the Plan will concentrate on a few "focal species" that will be used as indicators of overall wildlife and habitat conditions and to characterize and evaluate management actions in the Subbasin. For each focal species, the Plan will provide detailed information about historic and current conditions, why a certain species is considered a good indicator, and known causes of decline if such is the case. Proposed management strategies will then be evaluated by their likely effects on the focal species.

The rationale for focal species selection is: a focal species has special ecological, cultural or legal status and is used to evaluate the health of the ecosystem and the effectiveness of management actions. Criteria used in selecting focal species include, in order of priority a) designation as endangered or threatened under the Endangered Species Act (ESA) of 1973, b) ecological significance c) cultural significance, and d) local significance. Six fish species and 11 wildlife species were chosen as focal species.

3.4.1 Fish Focal Species

The aquatic technical committee identified a number of fish species and stocks that potentially warranted consideration as focal species for subbasin planning purposes. An initial list of eight species/stocks was evaluated by the Yakima Subbasin Fish and Wildlife Planning Board and later narrowed to six species (Table ES-5).

Table ES-5. Fish Focal Species and Their Selection

Focal Species Criteria	Bull trout	Steelhead/ Rainbow trout	Spring Chinook	Fall Chinook	Sockeye	Pacific Lamprey
ESA Status	Threatened	Threatened	None	None	None*	None
Has Ecological Significance	Yes	Yes	Yes	Yes	Yes	Yes
Has Cultural Significance		Yes	Yes	Yes	Yes	Yes
Anadromous and/or Resident	R	A and R	A	A	A	A
* Sockeye were extirpated from the Yakima Subbasin ca 1920						

Yakima Basin **bull trout** populations were listed as threatened under the ESA, effective 10 July 1998. Nine distinct bull trout stocks have been identified in the Yakima Basin by WDFW. Of these nine stocks, six are classified as "Critical," one as "Depressed," one as "Healthy," and one as "Unknown".

Spring chinook populations have been dramatically reduced from pre-1850s abundance levels. Introductions of spring chinook from the Cle Elum Supplementation and Research Facility (CERSF) have increased the abundance of spawning fish in the Upper Yakima spring chinook population.

Fall chinook populations have also been dramatically reduced from pre-1850s abundance levels. There are two genetically distinct stocks recognized in the Yakima Basin. The

mainstem stock is found throughout the lower Yakima River (roughly the lower 100 miles), and a stock is endemic to the Marion Drain, a man-made drainage ditch for the Wapato Irrigation Project (WIP). Environmental conditions have changed since the early 1930s, which has resulted in decreased production of fall chinook and a shift in juvenile out-migration shifting to earlier in the year.

Steelhead and rainbow trout are widely but thinly distributed across the Yakima Basin and have been dramatically reduced from pre-1850s abundance levels. Yakima Basin steelhead were listed as threatened under the ESA, effective 24 May 1999. Production of steelhead within the Yakima Basin is heavily weighted towards Satus and Toppenish Creeks, which have healthy populations. Anadromy in rainbow trout populations, and the overall size of the population in the Upper Yakima River is presently much decreased from historic levels.

The historical total run size of Yakima River **sockeye** salmon has been estimated at either 100,000 or 200,000. Sockeye were extirpated following the completion of impassible storage dams below all natural rearing lakes in the late teens and early 1920s. Because sockeye salmon were extirpated from the Yakima Subbasin so long ago, little is known about genetic or life history variation that may have occurred in individual stocks or populations.

Pacific lamprey, once an important food source for Native Americans in the subbasin, is a Washington State species of concern and is under consideration for ESA listing by USFWS. They are currently found in the mainstem Yakima and Naches Rivers, but fewer than 15 have been observed in the Yakima system since 1992.

3.4.2 Focal Wildlife Habitats and Species

Because of the large number of wildlife species and habitats in the subbasin, the subbasin wildlife assessment focuses on specific focal habitats as well as focal species. Focal habitats were selected based on the amount of decline and sensitivity of the habitat to alteration or destruction. Planners also felt that these habitats are ecologically important for healthy fish and wildlife populations. Focal species were selected because of their status as listed as threatened and endangered at either the federal or state level, cultural significance, and/or their value as indicators of overall habitat conditions. The selection criteria for focal habitats and species are shown in Table ES-6 and ES-7.

Table ES-6. Focal species selection matrix for the Yakima Subbasin Plan.

Common Name	Focal Habitat	Status*		Native Species	PHS**	Partners in Flight	Game Species
		Federal	State				
Western Toad	Montane Coniferous Wetlands	SC	C	Yes	Yes	No	No
Sandhill Crane			E	Yes	Yes	No	No
White-headed Woodpecker	Ponderosa Pine / Oregon White Oak		C	Yes	Yes	Yes	No
Lewis' Woodpecker			C	Yes	Yes	Yes	No
Western Gray Squirrel		SC	T	Yes	Yes	No	No
Mule Deer	Interior (Eastside) Grassland Shrub steppe			Yes	Yes	No	Yes
Sage Grouse		C	T	Yes	Yes	No	No
Brewer's Sparrow				Yes	No	Yes	No
Yellow Warbler	Eastside (Interior) Riparian Wetland			Yes	No	No	No
Mallard				Yes	No	No	Yes
American Beaver	Numerous Habitats			Yes	No	No	Yes

* C = Candidate; SC = Species of Concern; T = Threatened; E = Endangered

** Priority Habitat Species (Washington Department of Fish and Wildlife)

Montane Coniferous Wetlands

Historically the Yakima subbasin contained significant amounts of this habitat, but the effects of roads and road drainage have significantly degraded large areas. A variety of wildlife is dependent upon this habitat. Western toads, now uncommon in much of their former range, depend on montane coniferous wetlands for breeding. Sandhill cranes occupy breeding territories in wetlands adjacent to riverine systems, closed drainage basins at the base of desert mountain ranges, and isolated mountain meadows. Sandhill cranes are listed as endangered by the State of Washington.

Ponderosa Pine/Oregon White Oak

Ponderosa pine/Oregon white oak habitat has experienced the strongest declines and degradation of any habitat type. The wildlife communities have suffered from the reductions of dead standing trees (snags), and old-growth forest conditions. Fire suppression has led to dense forest stands, while harvest has removed the largest trees. The white-headed woodpecker and western gray squirrel are dependant upon large cone bearing pines, particularly in winter. White-headed woodpeckers use large ponderosa pine snags for nesting. Western gray squirrels use large pines and Oregon white oaks for important life stages, such as nesting and feeding.

Shrub Steppe/ Interior Grasslands

It has been estimated that only 40 percent remains of the roughly 10.4 million acres of shrub-steppe that once existed in Washington prior to the 1850s. This has substantially reduced the amount of habitat available for shrub steppe-associated wildlife. The greater sage grouse requires large landscapes for cover and forage. Bunchgrasses conceal nests and provide cover for broods. Pre-nesting hens and young chicks consume forbs and associated insects. The Brewer's sparrow needs dense sagebrush for nesting and post-fledging success. Although they do not require large landscapes typically associated with sage grouse, breeding success has been shown to decrease as patch size decreases. Mule deer utilize forests in the summer and migrate to grassland and shrub steppe habitat in fall and winter. They depend on a variety of native shrubs, forbs, and grasses.

Interior Riparian

Riparian areas support a high diversity of fish and wildlife. They also have intrinsic values related to aesthetics, flood control, and water purification. Fish and wildlife are provided with breeding habitat, movement corridors and seasonal ranges. The yellow warbler, mallard duck, and American beaver represent key attributes related to the health of this focal habitat. The yellow warbler represents the shrub component, while the mallard represents the wetland, side channel and associated floodplain grassland components. Beavers play an important part representing the hydrologic, forest and vegetation components. Land use practices, such as, roads, dams, and agriculture, remove important riparian vegetation while also affecting the structural and functional diversity of riparian habitat.

4 Management Plan

4.1 Limiting Factors, Biological Objectives, and Strategies

The Technical Guide for Subbasin Planners recommends that the Management Plan contain Biological Objectives and Strategies to meet those Objectives. Biological Objectives should:

- Be consistent with basin-level visions, objectives, and strategies adopted in the program.
- Be based on the subbasin assessment and resulting working hypothesis.
- Be consistent with legal rights and obligations of fish and wildlife agencies and tribes with jurisdiction over fish and wildlife in the subbasin, and agreed upon by co-managers in the subbasin. Where there are disagreements among co-managers that translate into differing biological objectives, the differences and the alternative biological objectives should be fully presented.
- Be complementary to programs of tribal, state and federal land or water quality agencies in the subbasin.
- Be consistent with the Endangered Species Act recovery goals and Clean Water Act requirements as fully as possible.
- Be quantitative and have measurable outcomes.

Strategies must:

- Explain the linkage of the strategies to the subbasin biological objectives, vision and the subbasin assessment Explain how and why the strategies presented were selected over other alternative strategies (e.g. passive restoration strategies v. intervention strategies)
- Describe a proposed sequence and prioritization of strategies
- If necessary, describe additional steps required to compile more complete or detailed assessment

The Management Plan strategies are based upon the Key Findings that are identified in the Assessment chapter, and the Working Hypotheses that are proposed as the causes of these observed conditions. Each Key Finding and Working Hypothesis is listed along with its level of confidence and an estimate of the significance of the impact of the key finding upon focal species or the ecosystem. The Key Finding and Working Hypotheses are then matched with Biological Objectives, which then lead to short and long-term strategies intended to eliminate or mitigate undesirable conditions, or protect and improve desirable conditions. The sections below present an abbreviated version of the major key findings and strategies from the Subbasin Plan.

4.2 Major Key Findings and Management Strategies

4.2.1 Aquatic Habitats

The loss of floodplain habitat, especially side channels and springs adjacent to the mainstem Naches and Yakima rivers, were identified as a significant limiting factor for the productivity of aquatic habitat in the subbasin. Actions to reverse this habitat loss are to relocate infrastructure (where possible) to allow natural processes to operate and reconnection of side channels by removal of obstructions. Artificial channels should be constructed where current conditions allow.

Riparian zone (the area adjacent to the river which is influenced by the river itself) problems include lack of shade and large woody debris (LWD), bank instability, and the inability of black cottonwood to reproduce under existing flow regimes. The Subbasin Plan calls for restoration of riparian zones and reduction of chronic bed instability through revegetation, introduction of LWD, protection of riparian areas by purchase or easement, improved riparian area management, and restoration of natural flow regime.

Channel confinement by levees, bridges and roads leads to altered floodplain functions and habitat loss. Multi-jurisdictional floodplain restoration and flood hazard reduction projects are necessary to reconnect floodplain side channels and to restore "unmanaged" or natural floodplain habitats.

The presence of reservoirs in the system has reduced peak flows and may have either increased or decreased energy available for sediment transport. The effect the natural glacial lakes had on flow and other attributes such as temperature is not well understood, and therefore we do not have accurate guides to pre-1850s conditions. Characterizations

of the pre-1850s flow regimes are important for evaluation of how system function has changed, and how those changes have affected fish and wildlife populations. An objective is to find or create a new model to simulate the physical, chemical, thermal effects of lakes in the pre-1850s environment so that we can better understand the difference between current conditions and conditions that existed before the lakes were dammed.

Altered flows of water, sediment and water temperature changes (mostly summer increases) severely reduce the quantity and quality of aquatic habitats. The Plan contains objectives to replicate basin wide temperature variability by returning the timing and quantity of river flow to a more natural state. This restoration of a normative flow regime can be accomplished by the purchase, transfer, or lease of water rights; changes in flow management, conservation; and increased natural and artificial storage.

There is a high predation risk for juvenile salmonids in the Subbasin. To reduce the effect of elevated predation it is recommended to increase the number of spawning fish in the Yakima Subbasin, reduce populations of smallmouth bass in the lower Yakima River, improve cover and off channel habitats, and implement further control on predator populations in mainstem reservoirs.

Passage barriers and unscreened diversions and pumps have significant negative effects on salmon productivity. Related objectives of the plan are to improve passage and design of irrigation diversions to allow fish and sediment to pass through diversion points. The strategies recommended are to reduce or eliminate operational spill to tributaries during migration periods, increase irrigation efficiency, relocate or consolidate existing structures, replace or rebuild existing diversion dams, move or consolidate diversions, and provide pump screens to landowners.

Kachess, Kecheelus, Cle Elum and Bumping Dams block passage for sockeye and bull trout and Tieton Dam blocks passage for bull trout. A high priority objective is to restore passage to at least one dam by 2007, possibly through various fish passage options such as ladders, trap and haul, and modification of outlets for downstream passage.

4.2.2 Key Findings for Fish Focal Species

Spring chinook populations have been dramatically reduced from pre-1850s abundance levels. An important objective in the plan is to restore spring chinook population abundance, productivity and spatial distribution to viable, harvestable and sustainable levels over the next 30 years. This will require research on habitat restoration and population management activities such as harvest management and hatchery supplementation. Habitat improvements, especially side channel reconnection, should be concentrated in middle and lower alluvial floodplains

Fall chinook populations have been dramatically reduced from pre-1850s abundance levels. To increase Tribal and sport harvest opportunities there should be an annual release of 1.8 million out-of-basin acclimated hatchery smolt releases from the Prosser Hatchery.

Extirpation of **sockeye salmon** from the Yakima Subbasin has reduced the productivity of the watershed and ecosystem as a whole, and eliminated a significant source of commercial and subsistence harvest. The Plan contains an Objective to reintroduce sockeye to two reservoir systems by 2015, and to establish self-sustaining populations by 2030. The first steps are to study the feasibility of this objective and perform initial studies on closely related sockeye stocks. This will also require study of the potential to establish passage at the dams, and the development of appropriate broodstock with which to establish the population.

Steelhead populations have been reduced from pre-1850s abundance levels because of habitat loss and alteration and changes in the biotic community. These factors have reduced habitat suitability, which in turn has reduced productivity, abundance, and spatial distribution of the species. To increase the abundance, productivity, and genetic diversity (and therefore stability), of the species it is recommended to increase distribution of healthy steelhead populations in areas that are currently suitable but inaccessible, such as Cowiche Creek and possibly Taneum Creek, and improve habitat in those areas currently accessible but of low quality. Steelhead population should be monitored for abundance, distribution, and genetic diversity.

Steelhead abundance and productivity have also been reduced due to a severe reduction in repeat spawning. To increase the number of repeat spawning steelhead in Yakima Subbasin, collect spawned out steelhead kelts and 1) recondition these kelts for release in the subbasin for natural spawning, and/or 2) transport kelts below the Columbia River dams to increase repeat spawning.

Population levels of **Pacific lamprey** have been dramatically reduced from pre-1850s levels. Improve passage and study specific habitat relationships for lamprey.

Management of reservoir water levels can create obstructions to tributary access for **bull trout** spawning migrations. The plan objective is to allow unimpeded access of bull trout to spawning areas. It will be necessary to study methods for the construction of permanent channels or paths and monitoring of conditions so that migration can be maintained. In the short term, trapping and hauling of spawning bull trout may be beneficial.

Bull trout have reduced population viability due to competition and interbreeding with brook trout. The plan recommends eliminating brook trout from presently occupied or suitable bull trout habitat and the termination of brook trout stocking within the subbasin.

4.2.3 Focal Wildlife Habitats and Species

Altered fire frequencies, poor grazing practices, invasive weed species, and human development (agriculture and urban) in **shrub steppe** has caused habitat fragmentation, isolation of wildlife populations, and local species extirpations. Small blocks of native shrub steppe have lost functionality and species diversity. The recommended strategy to reduce this fragmentation is to assess key connectivity areas, acquire easements or fee title from interested landowners in targeted areas, and cooperation with landowners, tribes and public agencies on projects. Habitat quality can be improved by improving the

ability to control fires, prioritizing weed control areas, and implementing native plant restoration.

Riparian wetlands have been lost on a large scale because floodplain habitats have been converted to human uses such as development, irrigated agriculture, pasture, or gravel mining. Loss of riparian wetland habitat structure and hydrology reduce or eliminate ecological function.

The objectives and strategies recommended to restore riparian wetland habitat are essentially the same as those for restoring floodplain habitat for fish. The main objective is to restore ecologically functional floodplains and riparian wetlands by creating adequate hydrological conditions to reconnect habitats in tributary and mainstem floodplain areas by 2015. Strategies to achieve these objectives include immediately implementing protection and restoration activities in important areas, educating landowners in best management practices and means of reducing impacts in focal habitats, purchasing water rights from willing sellers in unregulated tributaries and exploring opportunities for alterations in hydrologic management.

Habitat quality and ecological function in **ponderosa pine/oak woodlands** has been reduced because of altered forest species composition and age structure. Harvest practices have resulted in removal of older stands and large overstory trees across the landscape. Fire suppression has altered stand structures, favoring shade tolerant species and promoting overstocking of stands.

The objectives are to restore functional habitat with an overstory of large Ponderosa pine on ecologically significant portions of focal habitat area by the year 2104, and to restore functional fire regime on a meaningful scale in the Yakima Subbasin by 2020. Strategies to achieve these objectives include identifying areas where thinning and/or prescribed burning would help achieve habitat objectives, increasing the use of prescribed fire on public lands by 100 percent by year 2015, and thinning appropriate stands.

The **montane wetland** habitat suffers from altered plant species composition due to overgrazing, altered fire frequencies, and off-road vehicle use, as well as altered hydrology due to roads, culverts and off-road vehicle use. Disturbance from human presence is also a factor. The plan objectives are to improve vegetative condition of public land meadows by year 2010 and correct the impaired hydrologic functions, especially those occurring in unregulated tributaries. The primary strategies recommended to achieve these objectives include identifying and fencing montane wetlands important to focal species, purchasing grazing leases in identified areas, implementing controlled burns in meadows suffering from tree encroachment, relocating or modifying 50 percent of roads negatively impacting publicly owned montane wetlands, and eliminating vehicular access and campsites in all wetland areas identified as potential sandhill crane habitat.

5 Research Monitoring and Evaluation

5.1 Adaptive Management of the Subbasin

It is important to recognize that the Subbasin Plan is a snapshot in time of the current understanding of the conditions within the Subbasin. The Management Strategies are designed to recognize uncertainty and lay out a process for improvement of our understanding of the Subbasin, as well as implement actions that we feel confident will succeed within the context of the goals of the Subbasin Plan. The purpose of ongoing research and monitoring is to reduce uncertainty regarding subbasin function and to move from uncertainty to action items. As results of research and monitoring become known, or in some cases as projects are further refined, more specific action strategies are expected to be formulated at points in time which do not precisely coincide with updates to the Subbasin Plan or provincial reviews. If adaptive management (i.e. a structured process to actively learn from ongoing management as well as research) is to work and improve our decision-making ability over time, research and monitoring programs must be allowed to occur within each planning cycle. Therefore the agencies that use the Subbasin Plan as a guide for funding decisions need to recognize that the specific strategies within the Plan will soon be out of date, and that newly developed strategies that are derived from and consistent with Biological Objectives should still be considered as components of the Subbasin Plan.

Successful implementation of this plan will be ongoing, challenging, and long term. This will not be an easy or simplistic process. Fundamental changes to the current institutional, legal, and policy framework are beyond the scope of the YSP, and require a commitment by all parties to work together into the future. This commitment is articulated in the YSP Vision statement, “Decisions that continuously improve the river basin ecosystem are made in an open and cooperative process that respects different points of view and varied statutory responsibilities, and benefits current and future generations.”