2 Executive Summary

2.1 Purpose and Scope

The Lower Mid-Columbia Mainstem Subbasin management plan (including Rock Creek, Washington)—along with the supporting assessment and inventory —is one of 60 management plans currently being developed throughout the Columbia River Basin for the Northwest Power and Conservation Council (NPCC). This subbasin plan was crafted, in part, by the same team that is currently working on the Klickitat and Big White Salmon subbasins, and thus shares many elements in common with those plans, with the main exception that this subbasin encompasses the lower mid-Columbia mainstem river. The plan will be reviewed and adopted as part of the NPCC's Columbia River Basin Fish and Wildlife Program. The plan will help prioritize the spending of Bonneville Power Administration (BPA) funds for projects that protect, mitigate, and enhance fish and wildlife that have been adversely impacted by the development and operation of the Columbia River hydropower system.

The primary goal of subbasin planning in the Columbia Basin is to respond to the Independent Scientific Group's *Return to the River* report to the NPCC. Notable conclusions from that report were:

> Our review constitutes the first independent scientific review of the Fish and Wildlife Program…
>
> The Program's…lack of a process for prioritization provides little guidance for annual implementation…
>
> We recommend incorporation of an integrated approach based on an overall, scientifically credible conceptual foundation…

The NPCC responded to the ISG by creating the subbasin planning process, within the context of the 2000 Fish and Wildlife program. Subbasin plans provide the first basin-wide approach to developing locally informed fish and wildlife protection and restoration priorities.

An important objective of this subbasin plan is to identify management actions that promote compliance of the federal Endangered Species and the Clean Water acts. None of the recommended management strategies are intended nor envisioned to compromise or violate any federal, state or local laws or regulations. The intent of these management strategies is to provide local solutions that will enhance the intent and benefit of these laws and regulations. The NPCC, BPA, NOAA/Fisheries and the U.S. Fish and Wildlife Service (USFWS) intend to use adopted subbasin plans to help meet requirements of the 2000 Federal Columbia River Power System Biological Opinion. NOAA Fisheries and the USFWS have stated their intent to use subbasin plans as a foundation for recovery planning for threatened and endangered species.

The Lower Mid-Columbia Mainstem management plan's purposes include providing benefits to fish and wildlife where that help is most needed. The broad purposes of the plan and of the NPCC program mesh regarding fish and wildlife species.

From the Columbia River Basin Fish and Wildlife Program (NPPC 1994):

> The development of the hydropower system in the Columbia River Basin has affected many species of wildlife as well as fish. Some floodplain and riparian

> habitats important to wildlife were inundated when reservoirs were filled. In some cases, fluctuating water levels caused by dam operations have created barren vegetation zones, which expose wildlife to increased predation. In addition to these reservoir-related effects, a number of other activities associated with hydroelectric development have altered land and stream areas in ways that affect wildlife. These activities include construction of roads and facilities, draining and filling of wetlands, stream channelization and shoreline riprapping (using large rocks or boulders to reduce erosion along streambanks). In some cases, the construction and maintenance of power transmission corridors altered vegetation, increased access to and harassment of wildlife, and increased erosion and sedimentation in the Columbia River and its tributaries.
>
> The habitat that was lost because of the hydropower system was not just land, it was home to many different, interdependent species. In responding to the system's impacts, we should respect the importance of natural ecosystems and species diversity.
>
> Some species, such as some waterfowl species, have seemed to benefit from reservoirs and other hydropower development effects, but for many species, these initial population increases have not been sustained.

NOAA/ Fisheries and the USFWS have stated their intent to use subbasin plans as a foundation for recovery planning for Endangered Species Act (ESA)-listed species.

The Lower Mid-Columbia Mainstem management plan's purposes include providing benefits to fish and wildlife where that help is most needed. The broad purposes of the plan and of the NPCC program mesh regarding fish and wildlife species.

From the Columbia River Basin Fish and Wildlife Program (NPPC 1994):

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Some species, such as some waterfowl species, have seemed to benefit from reservoirs and other hydropower development effects, but for many species, these initial population increases have not been sustained.

2.2 Public Involvement

The Lower Mid-Columbia Mainstem Subbasin Plan could potentially have a great effect on fish and wildlife resources in the subbasin. It could have significant economic impacts on the communities within the subbasin as well. For these reasons, public involvement is considered a critical component in the development of the subbasin plans. Considerable time and effort was spent from the earliest meetings to craft a statement or "vision" of what the Washington participants would like to see in their subbasin as the result of efforts to restore, protect and enhance fish and wildlife populations and their habitat. The assessment and planning work for the Oregon side of the subbasin and the mainstem occurred in the fall of 2004—after the initial plan was submitted on May 28, 2004 and after ISPR and the public comment period was concluded. During the fall the technical writer and ODFW staff were not able to meet with local citizens about this Oregon area of the subbasin.

An important goal of the subbasin planning process continues to be to bring people together in a collaborative setting to improve communication, reduce conflicts, address problems and, where ever possible, reach consensus on biological objectives and strategies that will improve coordinated natural resource management on private and public lands.

The plan could potentially have a great effect on fish and wildlife resources in the subbasins, and could also have a significant economic impact on the communities within the subbasins. For these reasons, public involvement is considered a critical component in the development of the subbasin plans.

Public involvement in the subbasin planning processes the Washington side of the Lower Mid-Columbia Mainstem Subbasin (including Rock Creek) involved a public mailing, public meetings held at different locations and times in the subbasin (and towns near the subbasin), regular conference calls, use of a ftp site to store draft documents, posting draft subbasin plans on the NPCC website, and development and use of extensive e-mail lists that were intended to keep members of the public informed regarding the status of the subbasin planning process.

The White Salmon, Klickitat, and Lower Mid-Columbia Mainstem subbasin planning team, as a part of its public outreach effort, developed a brochure for the public mailing. The brochure was sent as bulk mail and delivered to all postal customers residing in the three subbasins.

There were also a total of seven public meetings in Washington held as a part of the subbasin planning effort. These meetings were held on March 9 and May 6 in Goldendale, on March 11 and May 4 in White Salmon, on March 10 and May 5 in Bickleton, and on May 3 in Klickitat, and while meetings focused on a particular subbasin, the meetings were open to citizens of the three closely connected subbasins and questions were taken regarding the three areas. Numerous technical and planning meetings, announced and open to the public, were held in many locations throughout the subbasins to facilitate collaboration, information flow and involvement by as diverse a group as possible. Throughout the subbasin planning process, Washington participants

worked on a vision statement that reflects their vision of the subbasin in 10 – 20 years. As previously indicated, given the time line, no public meetings were held in Oregon. The extent of Oregon public involvement has been the cooperation and/or contact with local offices of ODFW, USFWS, conservation districts and the Oregon Natural Heritage Program Information Center.

The participating agencies, the Yakama tribe, the citizens in the Washingon portion of the subbasin and ODFW leadership approved the vision statement for the Lower Mid-Columbia Mainstem Columbia River (including Rock Creek, Washington) The vision statement follows.

2.3 Vision Statement

We envision healthy self-sustaining populations of fish and wildlife indigenous to the Columbia Basin that support harvest and other purposes. Decisions and recommendations will be made in a community based, open and cooperative process that respects different points of view, and will adhere to all rights and statutory responsibilities. These efforts will contribute to a robust and sustainable economy.

2.4 Subbasin Goals

- Protect or enhance the structural attributes, ecological function, and resiliency of habitats needed to support healthy populations of fish and wildlife.
- To restore and maintain sustainable naturally producing populations of chinook, steelhead, coho and white sturgeon that support tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and the genetic diversity of the subbasin.

2.5 Focal Species and Habitats in the Current Planning Area

While the Lower Mid-Columbia Mainstem Subbasin as defined by the NPCC includes numerous Columbia River reaches, it is in the watersheds that drain into the Columbia where habitat and other restoration initiatives are most likely to be implemented and achieve benefits for fish and wildlife. But for anadromous fish species, in particular, the success of these initiatives also depends on the mitigation and restoration actions taken in the mid-Columbia mainstem, where three dams (in the current configuration of the subbasin) dominant the river environment.The critical tributaries primarily occur on the Washington portion of the subbasin between the mouth of the Walla Walla River and the town of White Salmon and include Rock, Pine, and Glade creeks. In Oregon, the fish-bearing streams in the current planning area of the subbasin are Spanish Hollow and Frank Fulton Canyon creeks, east of the Deschutes River subbasin and west of the John Day River Subbasin. For terrestrial and wildlife species, important shrubsteppe habitat occurs in the northern halves of Sherman and Gilliam counties, parts of Oregon within the Lower Mid-Columbia Mainstem Subbasin.

The assessment and management plan identify strategies that benefit three focal fish species that utilize the Washington, possibly the Oregon tributaries, and the mainstem Columbia, and one, white sturgeon, that inhabitats the mainstem exclusively. In addition to sturgeon, the focal fish species selected are steelhead, fall chinook, and coho. The Pacific lamprey was chosen as a fish species of special interest.

Because this was initially a Washington-driven subbasin planning effort, three focal habitats were chosen, interior riparian wetlands, shrub stepp/interior grasslands, and ponderosa

pine/Oregon white oak. Only the interior riparian wetlands and shrubsteppe grasslands occur in the Oregon portion of the subbasin. Agricultural lands and later the mainstem were selected as terrestrial and/or wildlife habitats of concern. Eight wildlife species from the Rock Creek watershed were chosen as focal species: Western gray squirrel, mule/black-tailed deer, grasshopper sparrow, Brewer's sparrow, white-headed woodpecker, Lewis' woodpecker, American beaver, and the yellow warbler.

The current planning area of the subbasin extends upstream from The Dalles Dam only as far as the Walla Walla River mouth. The portion that includes Hanford Reach and lands to the northeast and northwest are not within current planning boundardies. While there were no management plan strategies developed in this subbasin plan for the Hanford Reach area or its healthy and naturally spawning fall chinook, that population's status is addressed in the assessment section of the Lower Mid-Columbia Mainstem Plan because of its importance to the subbasin and the region. Also, Willow Creek and Juniper Canyon do not appear in this iteration of the Lower Mid-Columbia Subbasin Plan, as they were included in the Umatilla Subbasin Plan. See **Figure 1** for original and current subbasin boundaries.

2.6 Key Findings and Limiting Factors

The management plan and parts of the assessment are presented in tables that describe key findings, working hypotheses, and the objectives and strategies to address the findings. Many of the findings constitute the factors that unless dealt with, limit the ability of the subbasin to sustain the particular focal species and/or habitats.

2.6.1 Washington Area of the Subbasin

The terrestrial and wildlife limiting factors are based on IBIS information, the unpublished Ashley/Stovall Wildife Assessment Report, and the first hand knowledge of the Yakama Nation and its wildlife staff. The fish limiting factors for Rock Creek derives from an EDT (Ecosystem Diagnostic and Treatment) analysis and interpretation. The limiting factors for fish in the other Washington watersheds in the subbasin were taken from the Water Resource Inventory Area 31: Habitat Limiting Factors.

Interior Riparian Wetlands and Associated Focal Species

The major limiting factors for the interior riparian wetland and associated focal species, the yellow warbler, American beaver, and Lewis' woodpecker, are:

1. Reduction in overall habitat, including floodplain acreage

2. Loss of riparian vegetation and habitat and displacement of native riparian vegetation by non-native species

3. Fragmentation of habitat

4. Alterations in upper watershed hydrology

5. Incised stream reaches, loss of stream complexity and riparian function

6. For the the yellow warbler and Lewis' woodpecker, a reduced food base is also a limiting factor

7. Information is lacking to identify and prioritize all key areas for application of the appropriate strategies

Shrubsteppe/Interior Grasslands and Associated Focal Species

The major limiting factors for the shrubsteppe/interior grasslands and associated focal species, the Brewers' sparrow, mule/black-tailed deer, and grasshopper sparrow, are:

1. Loss of quality habitat, including soil damage

2. Loss or reduction in the age class native shrubsteppe vegetation and displacement of native vegetation by non-native species

3. Loss of ephermal wetlands

4. Overall loss and fragmentation of shrubsteppe/grassland habitat

5. For mule deer, additional limiting factors are loss of shrubsteppe habitat in winter range and hunting mortality

6. For the brewer's sparrow and grasshopper sparrow, addititional limiting factors are loss of shrubsteppe habitat within their breeding range

7. Information is lacking to identify and prioritize all key areas for application of the appropriate strategies

Ponderosa Pine/Oregon White Oak Habitat and Associated Focal Species

The major limiting factors for the ponderosa pine/Oregon white oak habitat and associated focal species, western gray squirrel and white-headed woodpecker, are:

1. Loss of large tracts of old growth or late seral forests, which has also resulted in the reduction of large diameter trees and snags

2. Increased stand density and decreased average tree diameter

3. Loss of native understory vegetation and composition

4. For the western gray squirrel, increased competition with introduced, non-native squirrels

5. Information is lacking to identify and prioritize all key areas for application of the appropriate strategies

Rock Creek and Focal Fish Species

The fish assessment and management plan for the Washington portion of the subbasin focus on Rock Creek, where an EDT (Ecosystem Diagnostic and Treatment) analysis was made. The limiting factors for Rock Creek and the associated focal species are steelhead, coho, and fall chinook are:

1. Altered thermal regimes have affected fish life histories such as spawn timing, incubation and rearing, and decreased suitable habitat

2. Juveniles redistribute themselves downstream in the summer and fall after emergence, with highest densities in fall being found well below the major spawning areas

3. Steelhead populations have been dramatically reduced from pre-settlement abundance levels

4. Population levels of Pacific lamprey have been dramatically reduced from pre-settlement levels

5. Tributary summer/early fall habitat availability lower in comparison with pre-settlement environment

6. Loss of habitat diversity and thermal refugia because of off-channel habitat losses

7. Hydrology has been altered to increase peak flows; loss of storage

8. In tributaries, lack of habitat diversity (pools with cover) and lack or decrease of large woody debris

9. Food web in lower river has been altered and/or reduced

10 Predation risk to salmonids from native fish (northern pike minnow), from non-native fish (walleye and smallmouth bass), and from birds is elevated

11. Survival of steelhead kelts (mature spawned out fish with the potential to spawn again) migrating out of the Rock Creek watershed and through the mainstem Columbia to the ocean is believed to be at or near zero

12. Hatchery fish compete with natural-origin fish for space and food resources

13. High temperatures in tributaries have resulted in increased susceptibility of native salmonids to pathogens

14. Loss of habitat diversity and thermal refugia because of off-channel habitat losses

15. Population and ecological effect of beavers have been significantly reduced and altered

16. Increased percentages of fine sediment from background levels in spawning gravels and interstitial spaces

Other Washington LMM Watersheds and Focal Fish Species

1. Barrier culverts at SR 14 on Pine Creek preclude access to potential steelhead habitat

2. Low or non-existent flows in all streams during the late summer, fall, and early winter will limit or preclude utilization by fall spawning adults (chinook, coho), and limit mobility of juveniles of all species

3. High stream temperatures in the lower portions of all streams during the summer and early fall limits mobility of juveniles of all salmonid species and can result in mortality due to thermal stress

4. Accelerated channel incision (entrenchment, downcutting) has reduced the quality and amount of available existing or potential fish habitat

5. Channel widening and obliteration of riparian zones

6. Locally poor habitat quality and riparian condition

7. Water quality diminished

8. Removal of or damage to riparian vegetation and compaction and erosion of stream banks and adjacent floodplain areas

9. Low or non-existent flows in all streams during the late summer, fall, and early winter limit or preclude utilization by fall spawning adults (chinook, coho), limit mobility of juveniles of all species, and may be resulting in mortality due to stranding

10. Information available for these findings is limited; additional data is needed on fish utilization and habitat availability and quality; investigation of barriers; more detailed evaluations of the condition of channels, floodplains, wetlands, and riparian areas; identification of sinks and sediments and sediment sources; the causes of high stream temperatures

2.6.2 Oregon Area of the Subbasin

The terrestrial and wildlife key findings and limiting factors are based on information from local ODFW and conservation district sources. Key findings and limiting factors for fish are based on local ODFW sources and the 2004 Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery and Conservation Management Act Essential Fish Habitat Consultation on Resource Management Systems for Dry Cropland and Range and Pastureland in Gilliam, Sherman, and Wasco Counties, Oregon. (Oregon and Washintong's terrestrial and wildlife limiting factors and management objectives and strategies are integrated into the same tables.)

Interior Riparian Wetlands and Associated Focal Species

The major limiting factors for the interior riparian wetland and associated focal species, the yellow warbler, American beaver, and Lewis' woodpecker, are:

1. Reduction in overall habitat, including floodplain acreage

2. Loss of riparian vegetation and habitat and displacement of native riparian vegetation by non-native species

3. Fragmentation of habitat

4. Information is lacking to identify and prioritize key areas for application of the appropriate strategies, in particular, information about losses in and changes to riparian and floodplain areas and function, stream complexity, and food base sources for the yellow warbler and Lewis' woodpecker

Shrubsteppe/Interior Grasslands and Associated Focal Species

The major limiting factors for the shrubsteppe/interior grasslands and associated focal species, the Brewers' sparrow, mule/black-tailed deer, and grasshopper sparrow, are:

1. Fragmentation of shrubsteppe/grassland habitat and wildlife populations

2. Loss of habitat, particularly quality habitat

3. Soil damage

4. Loss or reduction in the age class native shrubsteppe vegetation and displacement of native vegetation by non-native species

5. Information is lacking to identify and prioritize key areas for application of the appropriate strategies, in particular, information about loss of ephermal wetlands and existing habitat for and habitat use by the brewer's sparrow and grasshopper sparrow, including the status of subbasin shrubsteppe habitat within their breeding range

Fulton Canyon and Spanish Hollow Watersheds

1. Watershed hydrology is altered

2. Columbia River dams have reduced potential anadromous fish spawners in these watersheds

3. Summer/early fall habitat availability diminished in comparison with pre-settlement environment

4. Increased fine sediment from background levels in spawning gravels and interstitial spaces

5. Altered riparian and wetland structure

6. Steelhead populations have been dramatically reduced from pre-settlement abundance levels

7. Tributary high temperatures have reduced fish mobility and resulted in increased susceptibility of native salmonids to pathogens

8. Information available for these findings is limited; additional data is needed on fish utilization and habitat availability and quality; investigation of barriers and culverts; more detailed evaluation of the condition of channels, floodplains, wetlands, and riparian areas; identification of sediments and sediment sources; high stream temperature occurrences and causes

2.6.3 Mainstem Area of the Subbasin

The key findings limiting are based on information from ODFW, CRITFC, the 2000 Biological Opinion, the Fish Passage Center, the 2001 LMM Subbasin Summary, the fish agency and tribes' Comments on the "All H Paper," and other professional, agency, and technical sources.

Lower Mid-Columbia Mainstem and Focal Species Steelhead, Fall Chinook, and Coho

1. Hydropower system has altered the historic hydrograph, which has a negative impact on juvenile salmon, including steelhead, coho, and fall chinook

2. Downsteam passage conditions at the hydroelectric dams can result in high mortalities

3. Peak demand flows and fluctuations in flow can have a deleterious effect on juvenile salmon migration

4. Fluctuations in flow can delay adult salmon migration

4. Weir technology is new and has been installed only at Lower Granite Dam. Not all dams and reservoirs have the same passage conditions

5. Prolonged exposure to elevated water temperatures is stressful for upstream migrants and can delay migration

6. When monitored, adult fish passage perfomance criteria are often not in compliance

7. Adult steelhead fallback is occurring at the dams

8. Contaminant input from upstream land-use activities are often trapped in the reservoirs behind dams. Dredging suspends contaminants accumulated in sediments

9. Rapid changes in reservoir levels are occur frequently with harmful results to fish and those who harvest fish

10. Irrigation withdrawals contribute to stranding of rearing juveniles

11. Juveniles can be entrained into irrigation pumps

12. Commercial gillnets used in The Dalles and John Day pools may break free, get lost, and trap fish

13. Juvenile salmon are being harvested by bird and fish predators at higher rates than prior to hydro operations

Lower Mid-Columbia Mainstem and Focal Species White Sturgeon

1. Spawning occurs in the mainstem but can be limited by hydrograph and water temperatures

2. Impounded white sturgeon populations incur periodic year-class failures

3. Egg, larval stage, and YOY white sturgeon are susceptible to predation

4. Impounded white sturgeon populations are less productive than the unimpounded lower Columbia River population

5. The health of white sturgeon populations show up in density, condition factor, reproductive potential, age structure, and fish growth rates

6. Reservoir specific intensive harvest management can influence white sturgeon abundance levels

Lower Mid-Columbia Mainstem and Species of Concern Pacific Lamprey

1. Recent counts of Pacific lamprey at The Dalles, John Day and McNary dams indicate a serious decline in abundance. Low abundances limits lamprey populations in upstream tributaries

2. Adult fishways are difficult for lamprey to negotiate

3. Juvenile lamprey suffer from high impingement rates on bypass screens because they are relatively poor swimmers. John Day Dam, in particular, impinges large numbers of lamprey

4. Contaminants input from upstream land-use activities are often trapped in the reservoirs behind dams. Dredging suspends contaminants accumulated in sediments. Dredging can also lead to direct mortalities

5. Rapid changes in reservoir levels can isolate or dewater rearing areas and lead to juvenile mortalities

Habitats of Concern: Mainstem Wildlife Habitat and Agriculture

The lower mid-Columbia mainstem contains some prime wildlife habitat—islands, embayments, and mudflats, primarily—where a diversity of avian species use the area to stop-over, breed, nest, and winter. This section of the assessment lists nearly 40 important wildlife habitat areas in The Dalles, John Day, and McNary reservoirs, including the Umatilla National Wildife Refuge in the John Day pool. This section discusses the recent invasion of the exotic false indigo that has further degraded riparian areas along the shoreline and on the islands.

Agriculture is briefly discussed as a habitat of important economic significance to the subbasin. This section notes that agriculture is becoming more environmentally friendly. It also mentions that in Oregon's Sherman, Gilliam, and Wasco counties, successful consultation with NOAA/Fisheries has resulted in plans for conservation-oriented Resource Management Systems for dry cropland and range and pastureland as part of helping to protect ESA threatened and endangered salmon species.

2.7 Management Objectives and Strategies

The fish and wildife species addressed in the 8. Management Plan are affected by many of the same limiting factors. Not surprisingly, subbasin planners have identified some of the same or closely related objectives and strategies to eliminate or reduce threats and to maintain and restore species and habitat viability. The strategic themes that bridge both fish and wildlife include an emphasis on restoring and maintaining native species, including vegetation; eliminating or reducing exotic species and the predator threat they pose; restoring and reducing threats to riparian areas, wetlands, and floodplains; reducing exposure to contaminants; reducing anthropogenic disturbance to water, land, plants, and animals; and acquiring the scientific information that is currently lacking.

Primary strategies in both the fish and wildlife portions of this management plans are proposed acations to restore beaver habitat and, where possible, to prepare for reintroduction of a species whose numbers are greatly reduced from historic levels. Restored habitat would benefit beaver, whose activities would in turn benefit the salmon and steelhead that use the watershed for a portion of their life history. Beaver dams result in the creation of off channel habitat and increased channel stability, which would provide a benefit to the fish focal species that utilize the Rock Creek and other tributary watersheds.

Restoring riparian wetland habitat structure and hydrology increases ecological function, bringing benefits to both fish and wildlife. Rehabilation involves increasing native vegetation and creating adequate hydrological conditions, which together help reconnect habitats in tributary and mainstem floodplain areas.

Other objectives and strategies are specific to wildlife or fish, and they are summarized below.

Generally, the areas and actions identified in the primary tier category of the focal fish and wildlife species management plans could be implemented within the next five years and have a high likelihood of achieving the targeted biological objectives. The geographical areas in the primary tier of the fish and wildlife tables are the most appropriate areas for that strategy to be employed.The white sturgeon table is also ordered according to the confidence level associated with particular strategies.

2.7.1 Wildlife

A general wildlife theme identified across the subbasin is stop the reduction in the quantity and quality of all types of terresterial and riverine habitat that the wildlife focal and other species need to flourish.

Reconnecting currently fragmented wildlife habitats types is a common objective of all three focal habitats. The solutions range from changing silvicultural, grazing practices, and other land use practices to purchasing easements and properties with intact habitats.

Among the causes of the diminution and fragmentation of shrub steppe habitat are agriculture and other human development, altered fire frequencies and invasive weed species. Habitat quality can be improved by controlling the frequency and thus the intensity of fire (restoring more natural fire cycles), encouraging appropriate grazing practices, prioritizing weed control areas, and implementing native plant restoration. Restoration and protection of exisiting habitats are key strategies.

Habitat quality and ecological function in ponderosa pine/Oregon white oak habitat has been reduced because of altered forest species composition and age structure. Harvest practices have resulted in removal of late seral stands and large overstory trees across the landscape. Biological objectives and strategies for the ponderosa pine/white oak habitat include retaining any presented late seral stands and large decadent wildlife trees and managing these stands to restore functional habitat. Such strategies include identifying areas where thinning and/or prescribed burning would help achieve habitat objectives and thinning appropriate stands to decrease stand density.

2.7.2 Fish

Many proposed actions focus on restoring riparian function (reconnect side channels, re-establish or enhance native vegetation, increase channel roughness, artificially introduce large woody debris as well implement practices that allow large woody debris to naturally enter and remain in the system). Such actions would contribute beneficially to lowering stream temperatures, increasing wetted perennial areas in the lower watersheds, improving food availability, filtering fine sediment levels, attenuating peak flows and otherwise improve conditions for fish in the subbasin’s tributaries.

There is significant need for ongoing monitoring and evaluation within the Rock Creek watershed. Although there is a high level of certainty with several key findings and strategies, without concerted monitoring and evaluation there is a margin of uncertainty that the best strategies will achieve the most benefit possible. Therefore, along with the actions suggested in the management plan tables, an extensive monitoring and evaluation effort within Rock Creek is considered a high priority.

This plan urges the supplementation of less productive focal fish populations in the subbasin’s Washington tributaries by capturing juveniles below the lower most dam in the system, Bonneville, then transporting and releasing them in upstream reservoirs. The Rock Creek and mainstem Columbia plans call for strategies to improve the survival of steelhead kelts, which are mature, spawned out fish that have the potential to spawn again.

For Spanish Hollow and Fulton Canyon what is particularly needed and called for is the collection and analyses of base line data about the watershed and fish utilization.

Water quality in the lower mid-Columbia mainstem, in Rock Creek, Spanish Hollow and Fulton Canyon and other watersheds are impacted by excessive sedimentation, which can negatively affect steelhead and salmon rearing and egg incubatio. in the mainstem are Strategies identified in the plan include an assessment of the relative contribution of the various sources of that increased sedimentation and implementation of actions to reduce sedimentation. Those actions include improved road and off-road vehicle management and the implementation of upland management practices that mimic natural runoff and sediment production.

In the mainstem, contaminants are suspended in sediments and accumulate in the reservoirs behind the dams. The recommended strategy for the mainstem includes eventually eliminating dredging. Mainstem strategies targeting contaminants call for the full development of TMDLs, including identifying remedial actions.

Many of the mainstem strategies address the critical limiting factor for anadromous fish: up- and downstream passage of salmonids. Because the mainstem plans are not expected to fully plan the restoration and remedial actions that would make the Columbia River habitat more suitable to anadromous fish, this subbasin plan addresses passage and flow issues in a general way. Nonetheless, the mainstem management plan identifies aggressive actions that acknowledge the strategic location of the lower mid-Columbia River and its three hydroelectric dams. Strategies offered in this document's management plan suggest hydrosystem operational shifts that are expected to increase migration survival and spawning success particularly in the Hanford Reach.The plan recommends actions to restore a more natural hydrograph to improve migration conditions; use flow augmention to increase water velocities during fish critical times; use spill to maximize downstream passasge and spread the risk among several strategies for juvenile migration; minimize fluctuations in flows and rapid changes in reservoir levels; and halt additional water withdrawals.

2.8 Adaptive Management of the Subbasin

It is important to recognize that the Lower Mid-Columbia Mainstem Subbasin Plan reflects current understanding of conditions within the subbasin. The strategies recognize uncertainty and lay out a series of processes for improving the scientific understanding of those conditions, as well as implementing actions that the planners feel certain will succeed in meeting plan goals. 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 project review cycles established by the NPCC.

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 are encouraged to recognize that the specific strategies within the plan may soon be out of date, and that newly developed strategies that are derived from and are consistent with biological objectives are intended as components of the subbasin plan.