# 6. Hood River Subbasin Management Plan

This Chapter presents a vision that describes goals or desired future conditions for the subbasin. It also proposes measurable biological objectives for the recovery and protection of focal species, and prioritized strategies to meet the objectives based on limiting factors for focal populations described in the Assessment in Chapter 3. The planning horizon for this Management Plan is 10-15 years.

The Ecosystem Diagnosis and Treatment (EDT) model was used in the Hood River Subbasin as an assessment tool to evaluate fish habitat conditions. The EDT results were compared to those of earlier assessments, and to observed fish population and life history data collected in the Hood River Production Program and in other ongoing aquatic evaluation efforts.

In general, the EDT results were consistent with prior assumptions and assessments with regard to limiting factors. The EDT baseline model run suggested that the most influential limiting factors for subbasin chinook and steelhead populations were 1) key habitat quantity, 2) channel stability, 3) habitat complexity,
4) flow effects, and 5) fine sediment load. The model also found fish passage, juvenile entrainment and flow effects at Powerdale Dam to be influential in population abundance and productivity for these focal species. Among the six EDT future habitat restoration scenarios modeled, the largest gains in population abundance among the four focal species were achieved by basinwide large woody debris (LWD) restoration, and Powerdale Dam removal including full flow and passage restoration. However, the EDT model results appeared to underestimate the benefits of streamflow restoration for steelhead and spring chinook, based on 1) an analysis of 10 years of steelhead smolt trap data and August-October streamflow records; and 2) a habitat-population modeling effort recently completed for the BPA Hood River Production Program Review. Further, because streamflow assumptions in the EDT flow restoration scenario were based on flow measurements taken on August 8, 1998, typical lower late summer/early fall flow conditions may not have been adequately represented.

For bull trout population-habitat relationships, assessment information from the draft Mt Hood Bull Trout Recovery Plan was used along with local knowledge to develop assumptions about limiting factors for this focal species. Habitat connectivity is a key limiting factor for the bull trout population. In addition, though the EDT model was not run for bull trout because model rules for this species are not yet available, it is believed that many of the other limiting factors identified by the EDT for salmon and steelhead also apply to bull trout.

## 6.1 Vision for the Hood River Subbasin

An overall goal statement for the Hood River Subbasin was prepared by the Hood River Watershed Group and subbasin planners as follows:

> ***"A watershed where water is abundant, cool, and clean; where natural systems that create and sustain fish and wildlife and their habitat are respected; and where a healthy economy is compatible with healthy native fish and wildlife populations."***

Consistent with the vision for the 2000 Columbia Basin Fish and Wildlife Program, wherever feasible, this vision will be accomplished by protecting and restoring natural ecological functions, habitats, and biological diversity. Where this is not feasible, hatchery supplementation or other methods that are compatible with naturally reproducing fish and wildlife populations will be used. Where impacts have irreversibly changed the ecosystem, efforts will be made to protect and enhance the habitat and species that are compatible with the altered ecosystem.

### 6.1.1. Human Use of the Environment

Economically and environmentally sustainable agriculture and natural resource use will continue to be the foundation of the community. The high quality of life in the Hood River Valley will be maintained for future generations. Residential, recreation and tourism, and other future land uses and developments will occur with respect for agriculture as well as Oregon land use laws. Tribal treaty reserved fishing and other rights will be honored. The community and those doing business in the subbasin will recognize land stewardship as an important responsibility. Actions taken under this plan will be cost-effective, affordable, and consistent with a sustainable local economy.

### 6.1.2. Aquatic Species

The Hood River will maintain its current diversity of native anadromous and resident fish species, and restore species such as lamprey that may have been extirpated. Aquatic ecosystems will be protected and where possible, restored, including the natural physical processes that create habitat diversity, and hydrologic connections within stream systems including floodplains, wetlands, upslope areas, headwater tributaries, and intact refuge areas. Fish abundance will be restored to levels that approach the basin's natural productive capacity, and will continue to contribute to sport and tribal fisheries.

### 6.1.3. Terrestrial Species

Wildlife populations and their existing habitat in the Hood River Subbasin will be protected and improved where appropriate. Wildlife species diversity and viability will be maintained, and the health and integrity of forests, native plant communities, and special habitat areas will be protected and improved. Further extirpations or local extinctions will be avoided. Land use and transportation will insure retention of habitat connectivity among and between forest and riparian areas. Backcountry recreation and

trail use will be managed to consider the seasonal or other needs of wildlife species that may be sensitive to disturbance.

**Hood River Watershed Action Plan Goals**

A 5-year Hood River Watershed Action Plan was prepared in 2002 by the Hood River Watershed Group with broad local and stakeholder participation. Participants included irrigation and water districts, landowners, timber and other business interests, citizens, Confederated Tribes of the Warm Springs Reservation, and local, state and federal agencies involved in resource management. The Watershed Action Plan is part of Oregon statewide strategy to address endangered species and water pollution concerns using locally developed solutions. Action Plan measures and strategies help to address requirements of the federal Endangered Species Act, the Clean Water Act, and related state legislation. The Plan strongly supports or compliments state and tribal fish recovery plans for the Hood River Subbasin and the NWPPC Columbia Basin Fish and Wildlife Program. Numerous aspects of the Plan are being implemented with funding assistance from BPA through the Fish and Wildlife Program. The scientific basis of the Action Plan is based on a watershed assessment prepared in 1999 using the Oregon Watershed Enhancement Board Watershed Assessment Manual focusing on aquatic ecosystems (Watershed Professionals Network, 1998). The Subbasin Plan assessment findings are generally consistent with the limiting factors identified in the 1999 Watershed Assessment Report. Many of the strategies identified in the Action Plan will contribute to meeting biological objectives in the Hood River Subbasin Plan. The 2002 Hood River Watershed Action Plan is being submitted by the Hood River Watershed Group as an electronic file for inclusion and adoption as part of the Management Plan for the Hood River Subbasin. Because of their applicability and relevance, the goals of the Hood River Watershed Action Plan are incorporated into the Hood River Subbasin Management Plan.

2002 Hood River Watershed Action Plan - General Goals:

1) Protect stream reaches in good condition.
2) Restore stream reaches currently in degraded condition but with potential to support high-quality habitat and fish populations – and where impacts and opportunities are known.
3) Recommend ongoing education and awareness projects to educate the public about watershed issues and best management practices for improved stewardship.
4) Recommend further study or data collection as necessary.

2002 Hood River Watershed Action Plan - Specific Goals/Objectives:

A) Promote economically and environmentally sustainable agriculture and natural resource use; preserve the high quality of life in the Hood River Valley for future generations.
B) Reduce contaminants to protect aquatic life, human health, and beneficial uses. Comply with state water quality standards and/or EPA guidelines consistent with natural conditions.

C) Address requirements under the Endangered Species Act. Protect and restore abundance and diversity of native species. Provide improved sport and tribal fishing opportunity.

D) Improve streamflows where opportunities exist to do so, while also protecting existing water rights. Meet instream water rights on streams where these are established. Minimize alteration of natural hydrology. Where feasible, protect and restore the hydrologic functioning of upland, wetland, and riparian areas.

E) Improve fish passage conditions where affected by artificial impediments; protect and restore riparian vegetation; protect remaining natural floodplain areas; restore/enhance aquatic habitat structure; and restore channel interaction with historic floodplains where compatible with existing land use.

F) Promote preservation of native plant communities and viable wildlife populations.

G) Recommend ongoing education and awareness projects to educate the public about watershed issues and promote improved stewardship of land and water.

## 6.2 Biological Objectives

The Northwest Power Planning Council has defined biological objectives to have two components: (1) biological performance describing responses of focal species to habitat conditions and described in terms of capacity, abundance, productivity, and life history diversity, and 2) environmental conditions needed to achieve the desired biological performance. Where possible, the Council intends biological objectives to be measurable and based on a clear scientific rationale or working hypothesis (NWPPC, 2001).

### 6.2.1 Aquatic Species

**BULL TROUT OBJECTIVES**

The following objectives are adopted from the U.S. Fish and Wildlife Service Draft Bull Trout Recovery Plan for the Mt. Hood Recovery Unit (USFWS, 2003) and are based on assessment information from the Recovery Plan and background documents. EDT modeling was not conducted for bull trout because bull trout population modeling rules have yet to be completed.

**Biological Performance**

BuT-1. Maintain stable or increasing trends in bull trout abundance to contribute the long-term recovery goal criteria of 500 or more adult bull trout in the Mt. Hood Recovery Unit.

Discussion: The current adult bull trout population in the Hood River subbasin is estimated to be around 300. The assumption or working hypothesis is that adult bull trout abundance will increase in response to a set of habitat restoration and other measures, including the Priority 1Tasks under the Draft Bull Trout Recovery Plan. Priority 1 Tasks

will be completed in the next 5 years once the Recovery Plan is adopted and funding made available. Priority 1 tasks address critical fish passage barriers, fish screening at water diversions, flow restoration, restoration of channel conditions, improving water temperature, and bull trout ecology/trophic interactions in the Laurance Lake reservoir. Any expected increase in abundance was not predicted given data and modeling limitations. However, the assumption that this set of actions will meet the biological objective can be tested using data from bull trout snorkel surveys at existing long term index areas above Clear Branch Dam through the year 2019 (the next 15 years), and other monitoring methods. Additional performance indices may include the numbers of adult bull trout captured in the Powerdale fish trap until Powerdale Dam removal in 2010, in the Clear Branch Dam fish trap, surveys below the Clear Branch Dam, and possibly creel survey data to estimate incidental catch and release of bull trout in Laurance Lake and in the Hood River. Powerdale fish trap data from 1992-2003 and snorkel survey data from 1996-2003 can serve as a baseline to gauge success in meeting this objective. Additional recovery actions aimed at further life history research and population inventory data will be needed to meet this objective. An added assumption is that population diversity including resident, fluvial, and adfluvial life history forms will be maintained and strengthened. Capacity and productivity estimates were unavailable for bull trout in the Hood River Subbasin.

BuT-2. Conserve bull trout genetic diversity and maintain and expand opportunity for genetic exchange.

Discussion: Connectivity between existing bull trout populations is essential for continued survival and recovery by allowing for the potential of genetic exchange, migratory behavior, and the survival of individuals and re-colonization of areas vacated following stochastic events (USFWS, 2003). The assumption or working hypothesis is that restoring habitat connectivity by eliminating or ameliorating passage barriers to bull trout will ensure opportunities for connectivity within and among local populations of bull trout. Barriers include Clear Branch Dam, irrigation dams, diversion screening and seasonal water quality barriers. Further evaluations are needed to address passage issues at Clear Branch Dam. The fish trap at the base of the dam has not operated efficiently to attract and catch upstream migrants, and little is known about the effectiveness of downstream juvenile passage over the spillway.

BuT-3. Maintain the current distribution of bull trout and expand existing distribution to suitable habitat in the subbasin.

Discussion: Distribution of bull trout is geographically restricted to 2 local populations, the Clear Branch and Hood River local populations. The primary population is in the Clear Branch of the Middle Fork Hood River above Laurance Lake. This population is considered to be at risk of a random extinction event due to low numbers, and isolation (USFWS, 1998). The risk to the 2 existing local populations from catastrophic landslides and other stochastic natural events is further elevated by their narrow distribution, especially given the frequent natural debris flows on Mt Hood, including in Clear Branch and Middle Fork Hood River tributaries where bull trout spawning and rearing is

documented. Additional local populations, if they can be established, will help insure the long term persistence of bull trout in the subbasin. The assumption is that by expanding the distribution to the West Fork Hood River or possibly the East Fork Hood River watersheds, the risks to bull trout from stochastic events will be reduced. Recovery actions may lead to better-defined spawning and rearing areas for additional local populations. Further studies and a better understanding of bull trout fidelity to their natal streams are needed to better define local populations in the recovery unit (USFWS, 2003).

BuT-4. Maintain and restore suitable habitat conditions for all bull trout life history stages and life history strategies.

Discussion: The draft Recovery Plan states that bull trout recovery will entail reducing threats to the long-term persistence of populations and their habitats, ensuring the security of multiple interacting groups of bull trout, and providing habitat conditions and access that allows for the expression of various life-history forms.

**Environmental Conditions to Achieve Desired Biological Performance**
Achieving successful juvenile and adult fish passage connectivity at Clear Branch Dam and other dams and diversions at 95% passage and screening effectiveness or better. Maintaining or restoring healthy upland conditions including low road densities (e.g., <1.7 miles/sq. mile) in bull trout spawning and rearing areas; improving water temperature in Clear Branch below Laurance Lake reservoir to meet the bull trout standard of 52 degrees F. Increasing streamflows by a goal of 20% or more if feasible, especially during critical life stages such as spawning and migration, restoring fully functioning riparian, floodplain and instream channel conditions including side channel development and large woody debris at levels that approach template conditions characteristic to the Hood River. Improved rearing conditions in Laurance Lake include cool water temperatures, an adequate prey base, and natural predation levels. Depending on research results, this may necessitate reducing the abundance of non-endemic fishes present in bull trout habitats including smallmouth bass and brook trout.

## COASTAL CUTTHROAT TROUT OBJECTIVES

### Biological Performance

CuT- 1: Maintain or increase the abundance of cutthroat trout in the watershed.

CuT-2. Maintain the current distribution of cutthroat trout and restore habitat connectivity where affected by artificial barriers.

Discussion: Given limited information, the population of resident cutthroat in the subbasin is assumed to be stable. Productivity and capacity for cutthroat trout in subbasin streams is unknown. The population of sea-run cutthroat trout in the Hood River Subbasin is known to be severely depressed compared to historic levels based on

Powerdale Dam fish trap data. Poor survival of sea run cutthroat trout is a concern throughout the lower Columbia region, including populations in streams below Bonneville Dam. Out-of-subbasin factors, including conditions at the Bonneville Dam and in the estuarine or near shore marine environment, are assumed to be affecting the survival of sea-run cutthroat from the Hood River Subbasin. However very little life history information is available specific to Hood River fish. Sea-run cutthroat trout behavior and survival in the Lower Columbia River and estuary is under investigation by the USFWS (http://columbiariver.fws.gov/programs/cutthroat.htm) and others. The working hypothesis is that by protecting and restoring cutthroat stream habitat conditions, abundance and carrying capacity for cutthroat trout will be maintained or increased. The assumption is that by restoring habitat connectivity in cutthroat streams, the potential for expression of life history diversity and full utilization of carrying capacity will increase. Progress in meeting these objectives can be measured against baseline electrofishing data 1994 -2002 in resident fish/other index areas; adult and juvenile fish trap data until Powerdale Dam removal in 2010 compared to baseline data from 1992-2004; and future surveys and juvenile migrant trapping after Powerdale Dam removal.

**Environmental Conditions to Achieve Desired Biological Performance**

Environmental objectives for cutthroat trout include the protection and restoration of fully functioning natural riparian and instream processes in cutthroat trout habitats, including unimpeded corridors that link seasonal rearing habitats and spawning areas. A Qualitative Habitat Assessment (QHA) model ranked streams for protection and restoration values for cutthroat trout in the subbasin. According to the QHA, Bucket, Meadows, West Fork Neal, and upper Clear Branch had the highest rankings for protection while Odell, Indian, and Green Point (for rainbow trout) creeks were among the top priority for restoration. Artificial migration barriers affecting cutthroat trout habitat with high reference ratings for habitat quality are the most important priority for passage remediation.

## FALL CHINOOK SALMON OBJECTIVE

### Biological Performance

FCh-1. Achieve an increasing trend in the number of adult fall chinook returning to the Hood River by 2019.

Discussion: For the period from 1992 -2003 the annual return of fall chinook to Powerdale Dam has averaged 26 fish, with a range from 6 to 70. EDT baseline model run conducted for the assessment predicted a current fall chinook spawning population of 1,111 without harvest, 0 with harvest, and a historic spawning population of 6,979. The Lower Columbia Technical Recovery Team identified 1,400 as a target population level for fall chinook in the Hood River based on population viability.[1]. These EDT and TRT-identified population levels for fall chinook are considered unrealistically high by

[1] Paul McElhaney, PCC Targets file, untitled, via email from Patricia Dornbush, NOAA Fisheries, Recovery Plan Coordinator.

subbasin planners. The historical fall chinook run in the Hood River is believed to have always been low, although higher than current levels. Area fish managers believe that egg-to-fry and fry to smolt survival is extremely poor for fall chinook in the Hood River due to largely natural factors. Most fall chinook spawning occurs in the Hood River mainstem where high glacial sediment loading and a flashy peak flow pattern leads to poor overwinter incubation survival. Shallow stream margin and off-channel habitats important to emergent and early fry survival are scarce in the mainstem Hood River due natural channel morphology and habitat modification. It is as yet unclear what inputs into the EDT model caused it to overestimate fall chinook production in the Hood River by such a magnitude.

**Environmental Conditions to Achieve Desired Biological Performance**

The working hypothesis is that natural production of fall chinook in the Hood River will increase as a result of interim mitigation measures at the Powerdale Dam Hydroelectric Project and dam removal in 2010. Interim mitigation measures were instituted in April 2003. The EDT model predicted that Powerdale Dam removal and associated flow restoration would increase the fall chinook spawner population by 55%, and by 140% if combined actions including LWD restoration were implemented ("full restoration build out scenario"). Interim mitigation measures at the Powerdale Dam Hydroelectric Project include an April 15- June 30 diversion shutdown in lieu of fish screen replacement, and an increase in minimum streamflows below the dam in the bypass reach including during the fall chinook return period. After dam removal in 2010, the cessation of sediment sluicing into the bypass reach, elimination of delay and pre-spawning mortality associated with adult passage at the fish ladder, improved passage and reduced predation associated with low bypass reach flows, entrainment of fry and fingerlings into the power canal, and elimination of any pre-spawning mortality or reduced reproductive success are expected to contribute to an increase in fall chinook abundance in the Hood River. The Large Woody Debris scenario consisted of inputting maximum ratings for large wood in key restoration reaches believed to have high instream wood levels under pre-settlement conditions. Subbasin planners caution that the Hood River, being on the east slope of the Cascades, may have had somewhat lesser wood densities than those represented in the EDT model. Nevertheless, the working hypothesis is that increasing instream and riparian large woody debris would result in an increase in habitat carrying capacity for fall chinook.

## SPRING CHINOOK SALMON OBJECTIVES

### Biological Performance

SCh-1. Achieve an average spawning escapement of 125 natural-origin spring chinook returning to the Hood River by 2014, and an average spawning escapement of 200 by 2019.

SCh-2. Achieve a natural smolt production increase from the current estimated range of 15,700 smolts to 20,000 smolts by 2019. A one percent smolt to adult return will produce the adult objectives in SCh-1.

SCh-3. Achieve and maintain a naturally-spawning spring chinook population made up of a stock that is adapted to the Hood River.

SCh-4. Increase the smolt to adult survival rate of hatchery-reared stock spring chinook.

SCh-5. Provide an annual average harvest of 2,000 spring chinook for tribal and non-tribal fisheries by 2019.

Discussion: Native spring chinook were extirpated from the Hood River by the 1970s. A reintroduction program using spring chinook from the Deschutes River stock was initiated in 1995 under the BPA-funded Hood River Production Program. The goal of the program has been to reestablish a naturally-spawning population and include a harvest component to support tribal and non-tribal fisheries for spring chinook. Tribal and sport harvest opportunity is a priority for spring chinook in the Hood River and will likely depend on continued hatchery supplementation to fulfill harvest needs and reduce pressure on wild populations. Many of the same factors that affect fall chinook have a similar affect on spring chinook, such as glacial sediment, flashy peak fall and early winter flows, and limited distribution, but to a lesser extent since they spawn in the less glacial West Fork Hood River. The current actual wild or natural escapement of spring chinook in the Hood River ranged from 18 to 89 adults between 1992 and 2003, and averaged 54 fish. The EDT model estimated a current spawning population abundance of 197 spring chinook with harvest. Current juvenile carrying capacity was estimated at 54,090 and smolt abundance at 4,920. Actual smolt production estimates from screw trapping ranged from 873 to 1,723 during the period 1995 to 1999, with one exceptional year in 1994, when an estimated 11,745 smolts emigrated from the mainstem (Olsen, in Underwood, K.D. et al., 2003). In a recent HRPP review, an average annual production potential of 15,692 spring chinook smolts was estimated for the Hood River using the Unit Characteristic Method based on habitat conditions in 2003 (Underwood, K.D. et al. 2003). The spring chinook spawning escapement level needed to fully seed available subbasin habitat in that analysis was estimated at 125.

A goal of the supplementation program has been to establish a new spring chinook run in the Hood River that would become adapted over time to the environmental conditions in the Hood River. However, low smolt to adult survival of hatchery smolts, and poor in-basin production from naturally-spawning fish has not significantly increased run size since the program was initiated. A shortage of spring chinook adults returns to the Hood River necessitated the continued use or “backfilling” of Deschutes River broodstock. The shortage has been exacerbated by a high straying rate of Hood River program spring chinook back to the Deschutes River, despite smolt acclimation in the West Fork Hood River, and by health problems in smolts reared at Deschutes Basin rearing facilities. This has impeded progress toward the goal of creating a stock that can be allowed to evolve toward adaptation to the Hood River. The assumption is that there is a genetic

component to survival and productivity, and that stocks become adapted to the specific environmental conditions in their native streams. The further assumption is that it is possible, within some range, for a stock from one system to become adapted to a different system over time. The hypothesis is that egg to smolt survival will improve over time and natural production will increase in a broodstock program that uses only wild/naturally produced spring chinook returning to the Hood River, in combination with habitat restoration.

**Environmental Conditions to Achieve Desired Biological Performance**

The EDT model predicted a smolt increase of 53% and 375% for spring chinook smolts as a result of restoration scenarios Powerdale Hydroelectric Project removal and LWD restoration, respectively. The assumption is that flow restoration associated with Powerdale dam removal in 2010 and interim Powerdale hydropower mitigation measures will improve conditions for adult migration, reduce pre-spawning mortality, and improve outmigration survival of spring chinook. The LWD scenario consisted of inputting maximum ratings for large wood in key restoration reaches believed to have high instream wood levels under pre-settlement conditions. The working hypothesis is that increasing instream and riparian large woody debris will result in an increase in fry to smolt survival for spring chinook by increasing riparian-floodplain interactions and increasing the amount of key habitat including shallow backwaters, and slow velocity margin habitats. These habitats are scarce because habitat diversity and LWD supplies have been greatly reduced by past riparian management practices in spring chinook spawning and rearing areas. Subbasin planners caution that the Hood River, being on the east slope of the Cascade, may have had somewhat lesser wood densities than those represented in the EDT model. The modeling effort included in the HRPP review estimated a 7,500-12,500 increase in spring chinook parr (or 2,625 to 4,375 smolts at 35% parr-to-smolt survival) by restoring 10 cfs of flow at each of the major irrigation diversions as well as returning 250 cfs below Powerdale Dam. The modelers cautioned that given the methods used, this estimate of increased rearing capacity is likely useful only as an order of magnitude reference for flow restoration benefits (Underwood, K.D. et al, 2003). It is assumed that a combination of Powerdale Dam removal in 2010, interim hydropower mitigation initiated in 2003, flow restoration, and restoring habitat structure in the West Fork Hood River will increase habitat carrying capacity, reproductive success, and will lead to higher returns of natural origin spring chinook in the Hood River in the near term (by 2014) and long term (by 2019), especially when implemented together with strategies that address Objectives SCh-3 and SCh-4, and recommended changes in the spring chinook hatchery program detailed in the recent BPA Hood River Production Program 10-year review.

## SUMMER STEELHEAD OBJECTIVES

### Biological Performance

SSt-1. Achieve and maintain an average wild/natural origin spawning population of 600 adult summer steelhead returning to the Hood River by 2019.

SSt-2. Achieve and increase in habitat carrying capacity from 13,860 smolts to 20,000 by 2019. This assumes a 3% smolt to adult survival to meet the 600 adult objective.

SSt-3. Maintain the unique genetic character of wild summer steelhead in Hood River.

Discussion: Adult returns of wild/natural origin summer steelhead ranged from 79 to 650 fish for the years 1992 to 2003 with an average of 261 fish. The EDT model baseline report predicted a current spawner population abundance of 1,495 without harvest. The EDT predicted a baseline smolt abundance of 47,411 smolts. We believe the EDT estimates are high for summer steelhead. The spawning distribution of summer steelhead is naturally restricted to the West Fork Hood River. An annual average production of 13,860 summer steelhead smolts for the subbasin was estimated by S.P. Cramer and Associates in the Hood River Production Program review using the Unit Characteristic Method (UCM) habitat model and a life cycle model. The summer steelhead spawning escapement level needed to fully seed available habitat in the subbasin in that analysis was estimated at 304. Area fish managers believe that the summer steelhead adult capacity estimated by the UCM is too low as a spawning abundance goal. This is because 304 adults would not likely fully seed all available habitat, and mate selection and pairing would be difficult at the low density of spawners that were estimated by the UCM. The 600 spawner objective in SSt-1 is consistent with the Lower Columbia River Technical Recovery Team Hood River PCC target of 600 summer steelhead spawners by the year 2024, a target that is based on a NMFS-NWFSC population viability model. The summer steelhead rebuilding effort in the Hood River has suffered from low stock productivity due to past introgression with out of basin Skamania stock hatchery steelhead. The change to Hood River-origin-only summer steelhead broodstock in the hatchery supplementation program was recently implemented in 1999. As of 2004, not enough time has passed to assess the survival benefits of the program change in rebuilding the wild Hood River summer steelhead population.

**Environmental Conditions to Achieve Desired Biological Performance**

The EDT model predicted an increase of 43% in summer steelhead smolt abundance as a result of the “full restoration buildout scenario” scenario, which included fish passage barrier removal, flow restoration, Powerdale Hydroelectric Project removal, and LWD restoration. 39% of the increase was attributed to LWD. Summer steelhead would benefit from increased habitat diversity including more pool habitats for later rearing and holding, and riffles for spawning and early rearing. This population has experienced unscreened diversions in the past, low streamflows, limited pools, the effects of high natural sediment levels, low LWD levels, and a natural distribution limited to the West Fork alone. Increases in summer and fall streamflows are believed to be especially important for summer steelhead. Summer steelhead hold in the Hood River and the West Fork for extended periods prior to spawning, and are exposed to low flow conditions and high stream temperatures during summer and early fall. Based on ten years of smolt trap data, August- October streamflow levels in the Hood River in the first year of rearing are positively correlated with the abundance of 2 year old steelhead smolts (R-squared =. 69) the following year (Olsen, E. 2004, Figure 21 in Chapter 3). However, the EDT model

estimated only a 1% increase in smolt abundance in the restoration scenario that increased flows by 20% below all major diversions and by 100% below Powerdale Dam. In contrast, a modeling effort in the HRPP review estimated a 3,500 to 7,000 increase in summer and winter steelhead smolt production in the subbasin by restoring 10 c.f.s. of streamflow at each major irrigation diversion and 250 c.f.s. at below Powerdale Dam. The modelers cautioned that this estimate of benefit was likely inaccurate except as an order of magnitude reference for flow restoration benefits (Underwood et al, 2003).

## WINTER STEELHEAD OBJECTIVES

### Biological Performance

WSt-1. Achieve and maintain an average wild/natural origin spawning population of 1,100 adult winter steelhead returning to the Hood River by 2019.

WSt-2. Retain the genetic integrity of wild winter steelhead in the Hood River subbasin.

Discussion: Actual adult returns of wild/natural origin winter steelhead to Powerdale Dam ranged from 209 to 1,034 for the years 1993 through 2003, and averaged 529 fish for the same period. The EDT model estimated a baseline spawner population at 1,046. The EDT model estimated a current smolt abundance of 35,975, which is substantially higher than actual smolt production based on screw trap data. An average annual production of 16,970 winter steelhead smolts was estimated for the subbasin using the Unit Characteristic Method (UCM) (Underwood, K.D., 2003). The winter steelhead spawning escapement level needed to fully seed current available subbasin habitat in that analysis was estimated at 712. Due the relatively large amount of available winter steelhead habitat in the subbasin, it is believed this escapement estimated by the UCM is too low to fully seed the available habitat and promote mate selection and pairing. The 1,100 spawner abundance level selected by subbasin planners is less than the Lower Columbia River Technical Recovery Team PCC target of 1,400 for the year 2024 based on its population viability model. Area fish managers believe that an average winter steelhead population of 1,400 may be too high for the subbasin based on habitat modeling in the HRPP review, and stock-recruit data collected by the HRPP. These analyses suggest that less than 1,400 spawners are needed to fully seed available habitat. While it is possible to achieve a 1,400 population level under scenarios of high ocean survival, available juvenile habitat would likely be fully seeded at lower levels.

### Environmental Conditions to Achieve Desired Biological Performance

The working hypothesis is that a combination of Powerdale Dam removal in 2010, the interim hydropower mitigation measures initiated in 2003, flow restoration, habitat improvements in the East and Middle Fork Hood River and winter steelhead tributaries will increase habitat carrying capacity, reproductive success, and will increase egg to smolt survival ultimately leading to higher returns of winter steelhead in the Hood River.

The EDT model predicted an increase of 1% to 81% in winter steelhead smolt abundance as a result of different and combined restoration scenarios. The largest gain (58%) was associated with the LWD restoration scenario. An increase in pool habitat area and frequency would benefit steelhead juveniles and adults. Winter steelhead habitat in the subbasin, particularly in the East Fork Hood River and in Neal Creek, is severely lacking in pool habitat and habitat diversity due to past land management, channel modifications, and a lack of channel stability due to natural large-scale events. The least gain predicted by the EDT was a fish passage scenario excluding Powerdale Dam (1%), a 10% flow restoration scenario (1%) and a 20% flow restoration scenario. As with summer steelhead, the EDT model may underestimate the benefit of flow restoration to winter steelhead based on juvenile trap and life history data collected in the Hood River over the last 10 years. Increased streamflow is believed to be very important to winter steelhead in both the East and Middle Fork Hood River and their tributaries. Low flow conditions in the East Fork Hood River in summer and fall appear to cause juvenile winter steelhead to move to downstream areas in the mainstem Hood River where preferred habitats are occupied, or to exit the subbasin. Juvenile migrant trapping indicates that a significant number of winter steelhead presmolts migrate from the East and Middle Fork Hood River to overwinter in the mainstem Hood River, where density-dependent factors may limit survival and production potential. Again, based on ten years of smolt trap data, August-October streamflow levels in the Hood River in the first year of rearing are positively correlated with the abundance of 2 year old steelhead smolts (R-squared =. 69) the following year (Olsen, E. 2004, Figure 21 in Chapter 3). The HRPP review estimated a 10,000 to 20,000 increase in summer and winter steelhead parr in the subbasin by restoring 10 c.f.s. of streamflow at each major irrigation diversion and 250 c.f.s. at below Powerdale Dam. Again, the modelers cautioned that given the methods used, this estimate of increased rearing capacity is likely useful only as an order of magnitude reference for flow restoration benefits (Underwood et al, 2003).

High natural sediment loads decrease potential production especially in the Middle and East Fork Hood River. Improved access as well as riparian function, habitat complexity, and water quality conditions in tributaries are desired to provide juvenile steelhead with refuge areas from debris flows and flood events. Winter steelhead are the focal species whose habitat most overlaps with tributaries affected by water quality degradation. The Neal Creek system is degraded by both increased turbidity and fine sediment caused by an irrigation system that carries glacial silt into the creek, and pesticide contamination from orchard sprays. Improving water quality in Neal Creek and habitat diversity is important as it is the only accessible winter steelhead tributary in the Hood River mainstem.

## PACIFIC LAMPREY OBJECTIVES

Biological Performance

PL-1. Restore the historic distribution of lamprey to habitat above Powerdale Dam after dam removal 2010.

Discussion: Lamprey were reported as widespread "throughout the basin" in a 1963 Oregon Game Commission Report on the Hood River (USFS, 1996a), but have not been observed above Powerdale Dam in at least the last decade. Several modifications in the fish ladder configuration at Powerdale Dam occurred between the 1960s and the present, and any effect of such changes on adult lamprey migration are unknown but presumed to have had a detrimental effect on this species. Incidental and limited observations of lamprey have been reported below the dam by local agency fish biologists. However, specialized field surveys for lamprey ammocoetes have not been conducted and the distribution and abundance of lamprey either above the dam or below the dam is uncertain. It will be necessary to collect field survey information for lamprey ammocoetes, including species identification and subbasin distribution above and below Powerdale Dam prior to and after dam removal in 2010. Powerdale Dam may be a migration barrier to adult lamprey as they have not been captured in the fish ladder trap which has been continuously monitored since 1991. Very few adult lamprey have been observed downstream from the ladder, which could indicate that factors other than Powerdale Dam may affect lamprey. At present, the working hypothesis is that lamprey distribution will expand upstream in the subbasin after dam removal.

**Environmental Conditions to Achieve Desired Biological Performance**
Additional life history information is needed to better understand habitat conditions needed for lamprey passage at Powerdale and condition of available upstream spawning habitat. Fish passage at artificial barriers is well documented as a factor limiting for lamprey populations. The objective is to achieve an unimpeded stream migration corridor in the Hood River so that lamprey have the opportunity to recolonize formerly used habitats in the subbasin. The degree of fidelity of lamprey to natal streams is unknown, along with whether lamprey will actually return to former spawning areas after being extirpated from an area. Other risks to the lamprey population include the degradation of stream habitat including erratic or intermittent flow, decreased flows, increased water temperatures and poor riparian areas, predation in all life stages. Lamprey are particularly vulnerable to pollution and erratic stream flows during their juvenile or ammocoete life stage because of the length of time they reside in the stream substrate.

## 6.2.2. Terrestrial Species – Biological Objectives

**Northern Spotted Owl**

1. Continue to help meet Northwest Forest Plan objectives for spotted owl on federal lands that establish or maintain >25% of landscape units in mixed conifer stands as moving towards dominance of old growth and mature forest conditions in appropriate land allocations.

2. Maintain or improve juvenile dispersal habitat conditions on federal lands in low and mid elevations, as defined as tree stands averaging 11to 16 inches in diameter and $\geq$ 40% canopy cover.

3. Maintain or work toward multiple vegetative layers (herbaceous, shrub-sapling, and two tree layers) and promote healthy old-growth and mature forest conditions on federal lands in lower to mid elevations.

4. Retain sufficient habitat components such as live and dead standing and fallen trees with cavities and coarse woody debris in various diameter classes and stages of decay on private and county forest lands where opportunities exist and where consistent with land management objectives.

**Black Tailed Deer and Elk**
Maintain current summer population objectives for deer and elk consistent with the ODFW goal of 1,500 deer and 400 elk for the Hood Wildlife Management Unit (Hwy 35 to Cascade Crest). Maintain viable migration corridors for deer, elk, and other wildlife to access winter range and other movement purposes. Protect the amount and integrity of winter range available for deer and elk. Maintain a "hunt-able" or harvestable population to control damages to orchards and minimize conflicts with humans.

**Lark Sparrow**
Protect the amount and integrity of grasslands and oak woodlands used by the lark sparrow. Maintain preferred conditions of scattered shrubs, bunchgrass, saplings and oaks, with vegetation structure as scattered shrub cover at 5-15% and variable grass heights <46 cm. Patch size is >8 hectare. (Source: Altman, Bob. 1999. Conservation Strategies for Westsde Lowlands and Valleys Landbird Conservation Planning Region. Oregon-Washington PIF.)

**Clarks Nutcracker**
Protect and re-establish viable populations of white-bark pine. Where ecologically appropriate, initiate actions in white-bark pine habitats to maintain or provide >30% trees in late-successional stage with >10% cover in early-succession stages (seedlings and saplings).

**Western Gray Squirrel**
Maintain prairies, wetlands, oak woodlands, and continuous cover in variable-age conifer forests. Oak-conifer forests are transitional communities that require continued management for their maintenance. Western grays preferr larger stands (> 0.8 ha) closer to water (<600 m). Control invasion of Scotch broom, retain native plant species, reduce the invasion by Douglas-fir, invading grasses, and lessen the amount of brush in oak woodlands in order to allow oaks to regenerate. Retaining some coarse woody debris provides moist microhabitat for fungi, an important food item. Lastly, manage road locations, speed limits, and density carefully in these areas to reduce squirrel mortality.

## 6.3. Prioritized Strategies

Proposed habitat protection and restoration strategies to meet the biological objectives for the focal fish and wildlife species are listed in the section below. These strategies are intended address the limiting factors and issues identified in the assessment for all species. In the next section, species- specific strategies for focal fish species are provided, including harvest and hatchery-related strategies to help meet the objectives.

### 6.3.1 Aquatic Species

## PRIORITY 1 HABITAT RESTORATION STRATEGIES

The assessment indicates that the following 4 restoration strategies will lead to the largest gains in abundance of the focal species, especially when implemented together. Where appropriate, strategies will be implemented according to the geographic priorities identified in the assessment.

**Powerdale Interim Operation and Decommissioning Agreement**

The implementation of the Powerdale Hydroelectric Project Interim Operation and Decommissioning Agreement is a key strategy to achieve biological objectives for all species. This is included by default as a high priority strategy, and will be funded by PacifiCorp as part of FERC requirements. Interim measures including increased minimum flow releases and a spring diversion shutdown to protect migrants began in April 2003. The dam is scheduled for removal in June 2010 after which the dam site will be restored to a pre-dam river morphology, and the hydropower water rights will be transferred instream according to the relevant state statutes.

**Flow Restoration**

The flow restoration strategy seeks to increase summer and fall instream flows that are available for fish while protecting human water uses, principally through partnership projects that increase irrigation system and user efficiency and reduce waste. The strategy consists of 1) continued conversion of open ditches and canals to pipe and mutually acceptable agreements with irrigation districts that instream flows will benefit from water savings; 2) Education, technical and financial assistance to promote water conservation awareness and efficiency

measures on farms, pastures, and urban/residential lands; 3) Improve metering, measurement, and monitoring capabilities and correct excessive irrigation water system pressures where they exist; 4) Help insure that legal water right amounts are not exceeded and that water uses are authorized; 5) development and implementation of water conservation plans by water providers including the Farmers Irrigation District Water Conservation and Management Plan (1995) and Sustainability Plan (2000); and 6) Restore healthy watershed hydrologic conditions (floodplain and riparian storage, wetlands, mature forest canopy, low road density) where feasible to slow runoff, promote aquifer recharge, and increase summer stream flows

**Large Woody Debris Restoration**

As a single action, the EDT model predicted the largest gain significant gains from restoring LWD to the Hood River subbasin as a way to increase habitat diversity and key habitat quantity. This strategy would use EDT reach data and other information to identify historic locations of high wood densities. Evaluate opportunities and constraints to LWD placement at each site. Plan and implement projects that treat floodplain and riparian areas as well as instream areas. Wherever possible, use whole trees and rootwads and avoid use of cable or anchoring. Develop a monitoring plan to assess effectiveness in increasing habitat diversity, complexity, and amounts of key habitats for focal species life stages.

**Habitat Connectivity**

This inclusion of this strategy as a high prrority is driven in part by the Bull Trout Recovery Plan, but it believed that it will benefit the focal species habitat modeled by EDT more than the model results may indicate, particularly when implemented together with other Priority 1 strategies. This strategy consists of the following types of activities: Implement actions to reconnect aquatic habitats now disconnected by structures that interfere with upstream or downstream migration and full utilization of fish habitat. Assist Middle Fork Irrigation District in a cooperative partnership arrangement to improve upstream and downstream passage at Clear Branch Dam. Work with irrigation districts and others in a cooperative partnerships to upgrade or install fish screens on remaining unscreened or inadequately screen water diversions in the subbasin, conduct fish passage evaluations if needed, and insure upstream passage at push up and other dams. Continue to work with Hood River County Public Works Department and ODOT on culvert replacement using geographic priorities developed in the Watershed Action Plan.

## PRIORITY 1 HABITAT PROTECTION STRATEGIES

The following protection strategies are essential to meet biological objectives over the long term. Where appropriate, strategies will be implemented according to the geographic priorities identified in the assessment.

**Protection of Riparian and Floodplain Function**

- Prevent the spread of Japanese knotweed by supporting and actively assisting Hood River County Weed and Pest Department and others in a multi-year inventory and eradication campaign.
- Promote awareness and implement projects designed to protect and establish system potential riparian vegetative communities. Conduct and support educational activities to increase awareness and enforcement of state and local land use, Statewide Planning Goal 5 riparian corridor protection, and timber harvest rules designed to protect riparian forest stands, and encourage voluntary actions to restore habitat where opportunities exist.
- Encourage Hood River County to amend its floodplain ordinance to include channel migration zones on the East Fork Hood River. Implement projects in the Hood River Watershed Action Plan that address floodplain confinement and function, particularly along State Highway 35.

**Protection and Improvement of Water Quality**

- Assist the East Fork Irrigation District to complete Central Canal Pipeline to eliminate the historic use of Neal Creek to carry turbid glacial irrigation water.
- Implement water quality management plans outlined in the Western Hood Subbasin Total Maximum Daily Load study (ODEQ 2001), including County stream corridor protection ordinance, the Forest Practices Act riparian standards, and Northwest Forest Plan riparian reserves.
- Support and assist outreach, research and implementation activities by the Hood River Grower-Shipper Association, Oregon State University Extension and Mid-Columbia Agricultural Research and Experiment Center, and DEQ aimed at improved pesticide, fertilizer, irrigation, and other orchard practices
- Apply the Hood River Agricultural Water Quality Area Management Plan (ODA 2000) and rules (OAR 603-095-1100 through 603-095-1160). Implement landowner projects and conduct education activities to promote best management practices designed to control pollution of ground and surface waters by animal and human waste and fertilizers
- Promote road management and maintenance (including road closure and obliteration) on all land ownerships to control fine sediment delivery

Focal-species specific strategies are proposed below, in order of priority for that species where appropriate.

**BULL TROUT STRATEGIES**

1) Implement all Priority 1 Tasks in the Draft Bull Trout Recovery Plan as follows:

- reestablish up and downstream connectivity at Clear Branch Dam;
- provide passage at Coe Branch Diversion;
- determine passage options at Tony Creek diversion;
- Develop and implement a reservoir management or modification plan to improve water temperatures for bull trout below Laurance Lake Reservoir;
- improve fish passage at road crossings;
- improve instream flows;
- restore channel conditions (LWD in historical locations, floodplain connectivity)
- screen diversions
- investigate bull trout ecology in Laurance Lake

This strategy addresses key factors including restoring the physical and biological connection between the Clear Branch and Hood River Local Populations. This strategy consists of measures including evaluating and improving the effectiveness of the upstream fish trap at the base of the dam; providing adequate outlet screening to protect downstream migrants from entrainment into irrigation systems; determining whether and when bull trout attempt to migrate downstream; determining the effectiveness of the dam spillway to evaluate the need for spillway modifications or bypass system. This strategy also reestablishes connectivity in Coe Branch, Eliot Branch, and Tony Creek through effective fish screening and upstream juvenile and adult passage at water diversions. Implementation of this strategy is advanced by a partnership funding approach with the Middle Fork Irrigation District. Conduct the studies necessary to develop and implement a reservoir management or dam modification plan to improve in-stream temperatures for bull trout below Laurance Lake Reservoir.

2) Continue to support road closures, treatment, and obliteration meet the Mt Hood National Forest road density objective of 2 miles per sq. mile in bull trout areas, or $\leq$1.7 miles per sq. mi, and where not possible, conduct road maintenance activities to eliminate forest road sediment runoff into potential and known bull trout habitats.

**SUMMER STEELHEAD STRATEGIES**

Increase rearing capacity and improve adult holding conditions through flow restoration and projects that increase pools and habitat complexity. Remove artificial barriers to tributaries within the summer steelhead distribution, such as at Red Hill Creek.

Increase egg to smolt survival of summer steelhead by preventing interbreeding between Hood River stock and Skamania stock fish in order to eliminate any further genetic influence of Skamania stock on Hood River summer steelhead population. Continue to block access of Skamania stock returns from summer steelhead spawning areas in the West Fork. The egg to smolt survival of Skamania stock spawning in the wild is very low. Continue to eliminate out of basin hatchery fish at Powerdale Dam. Maintain genetic monitoring program with hatchery broodstock to protect unique stock identity. Determine the feasibility of collecting hatchery broodstock, monitoring run size, and removing excess hatchery fish at the Punchbowl Falls fish ladder after Powerdale Dam removal in 2010 (Table 40).

**WINTER STEELHEAD STRATEGIES**
Increase rearing capacity in the East and Middle Fork Hood River through flow restoration, and by improving habitat structure and complexity. Provide refugia from floods and debris flows by improving habitat conditions in and access to small tributaries where artificially impeded. Improve conditions in Neal Creek by completing the Central Canal Pipeline Project to remove chronic turbidity and fine sediment loading from the 100-year old irrigation water delivery system.

**SPRING CHINOOK STRATEGIES**
Investigate the cause of low egg-to-smolt survival in the spring chinook population to confirm the factors limiting production. Depending on the results of the investigation, increase egg-to-smolt survival in the West Fork Hood River drainage and potentially in downstream spawning and rearing habitats by improved stock fitness and habitat diversity. Restore LWD to key restoration reaches in the West Fork Hood River drainage and potentially in mainstem spawning and rearing habitats to increase rearing capacity and low velocity stream margin and lateral habitats for emergent fry and parr. Reduce the straying rate of hatchery spring chinook by using only broodstock returning to the Hood River in the hatchery program. Increase egg-to-fry and fry to smolt survival by increasing habitat diversity and the availability of key habitats such as low velocity lateral early rearing areas. Improve hatchery smolt to adult survival with improved disease control, smolt size control. Incorporate naturally produced fish into the broodstock.

Continue to monitor the health and stock fitness of the natural population to determine if there are adaptive changes that are occurring over time to improve survival. Consider moving production to Parkdale Fish Facility if it will better achieve the overall goal of spring chinook reintroduction. Improve fish passage at the Dee diversion in the West Fork Hood River.

**LAMPREY STRATEGY**
Conduct before and after field surveys to document lamprey distribution relative to Powerdale Dam after dam removal in 2010. Investigate habitat suitability of Hood River for lamprey. Evaluate further actions based on this information.

**HARVEST AND HATCHERY SUPPLEMENTATION STRATEGIES**
Hatchery Genetics and Management Plans for Hood River hatchery programs were submitted to the NWPPC as part of the subbasin plan as electronic files.

The HRPP currently uses a supplementation strategy to help rebuild steelhead and spring chinook populations while providing tribal and sport harvest opportunity when available after population recovery objectives are met. Harvest occurs on hatchery fish in excess of broodstock and escapement needs. Based on a hatchery smolt to adult escapement goal of 3.5%, the current steelhead smolt release levels leave approximately 1,150

hatchery winter steelhead and 1,100 hatchery summer steelhead available for harvest after meeting spawner escapement and broodstock collection goals.

The spring chinook reintroduction program has not yet met with much success and harvest opportunity has been limited at best. As with steelhead, former harvest objectives have been revised downward. Recommended revisions to the spring chinook program were made in a recent HRPP 10 year review completed for BPA by SP Cramer and Associates (Underwood, K.D. et al, 2003). As a result, revisions to the program will include: (1) boodstock will be taken only from Hood River returning adults to Powerdale Dam, this has happened in only two of the past ten years. In past years, broodstock were taken from Deschutes fish returning to Round Butte Hatchery; (2) achieve a smolt size of about 15 per pound which should reduce the problem of unusually high percentage of jacks and mini-jacks; (3) reduce the incidence of fish straying to the Deschutes by either moving juveniles to Hood River earlier or moving all Hood River production to Parkdale; and (4) eliminate disease problems of juveniles reared in Pelton Ladder. Currently the spring chinook program does not meet the disease standard developed by the Pacific Northwest Fish Health Protection Committee. If it appears the disease problems cannot be overcome in Pelton Ladder, production should be moved to a disease-free station, preferably in the Hood River subbasin.

The current HRPP supplementation strategy is scheduled to continue through 2010 when Powerdale Dam is removed. It will then be reevaluated to determine whether to continue the strategy or modify it (Table 40). The interim strategy is to continue acclimating and volitionally releasing spring chinook smolts (now using Hood River returns as broodstock) into historic spring chinook habitat in the Hood River. The interim strategy will continue to supplement the indigenous wild winter and summer steelhead populations with a hatchery program consisting of Hood River origin broodstock and the volitional release of acclimated smolts (50,000 WSt and 40,000 SSt) to historic distribution areas to enhance natural production. Broodstock for both the spring chinook and steelhead hatchery programs will be collected from fish returning to the Powerdale Dam Fish Facility.

Following the removal of Powerdale Dam in 2010, hatchery production release numbers will be evaluated and be adjusted if needed, based upon monitoring and evaluation results from the HRPP (Table 40). Feasibility studies of potential hatchery broodstock collection sites, and run monitoring facilities, will be conducted in the interim period before the removal of Powerdale Dam.

Potential broodstock acquisition and run monitoring sites include:

- Constucting an adult fish trap in the fish ladder at Punchbowl Falls on the West Fork. Installing a weir and trap on Rogers Spring Creek at the Parkdale Fish Facility in the Middle Fork.
- Installing temporary weirs and traps at tributary sites throughout the subbasin.

Table 40. Proposed hatchery and harvest strategies before/after Powerdale Dam removal scheduled in 2010 (adapted from Underwood 2003).

| Allocation Scheme | Time Frame | Summer Steelhead | Winter Steelhead | Spring Chinook |
|---|---|---|---|---|
| **Escapement Number above Powerdale Dam** | **Before Dam Removal in 2010**<br>---<br>***After Dam Removal 2010-2019*** | Allow all wild fish above Dam except for hatchery broodstock allocation. Based on wild adult run size, allow only up to 50% of spawners upstream of Powerdale to be composed of known Hood River origin hatchery fish.<br>---<br>*Allow all returning wild fish to spawn in historic habitat except for hatchery broodstock allocation to be collected at an undetermined site. Hatchery fish allowed to spawn at only up to 50% of spawning population..* | Allow all wild fish above Dam except for hatchery broodstock allocation. Based on wild adult run size, allow only up to 50% of spawners upstream of Powerdale to be composed of known Hood River origin hatchery fish.<br>---<br>*Allow all returning wild fish to spawn in historic habitat except for hatchery broodstock allocation to be collected at an undetermined site. Hatchery fish allowed to spawn at only up to 50% of spawning population..* | Allow all wild and hatchery fish above Dam except for hatchery broodstock allocation.<br>---<br>*Current program will be evaluated, continued supplementation likely.* |
| **Hatchery Allocation** | **Before Dam Removal In 2010**<br>---<br>***After Dam Removal 2010-2019*** | 40 adult collection target collected at Powerdale to produce 40,000 smolts. Wild fish will make up 100% of brood, not to exceed 25% of wild run. 50% of brood are females. Brood taken over the entire run period.<br>---<br>*Smolt production target to be determined based on achieving a spawning run not exceeding 50% hatchery fish, or not exceeding estimated carrying capacity. Smolt production likely to remain similar to pre-removal goals. Feasibility of trapping broodstock at Punchbowl Falls on West Fork will be evaluated.* | 70 adult collection target collected at Powerdale to produce 50,000 smolts. Wild fish will make up 100% of brood, not to exceed 25% of wild run. 50% of brood are females. Brood taken over the entire run period.<br>---<br>*Smolt production target to be determined based on achieving a spawning run not exceeding 50% hatchery fish or not exceeding estimated carrying capacity. Broodstock Collection at Parkdale Fish Facility will be evaluated. Temporary adult weirs in the East or Middle Fork will be evaluated. Angler harvest of broodstock will be evaluated.* | 110 adult collection target collected at Powerdale to produce 125,000 smolts. Hatchery fish will make up 100% of the brood. 50% of brood are females. Brood will be taken over the entire run period.<br>---<br>*Continued supplementation likely. Feasibility of trapping broodstock at Punchbowl Falls on West Fork will be evaluated.* |
| **Harvest** | **Before 2010 Dam Removal**<br>---<br>***After Dam Removal 2010-2019*** | Hatchery only. No harvest above Dam.<br>---<br>*Hatchery only. Upper extent of harvest in Hood River to be determined by fish agencies and tribes. Harvest is a key component to maintain ratio of hatchery and wild spawners.* | Hatchery only. No harvest above Dam<br>---<br>*Hatchery only. Upper extent of harvest in Hood River to be determined by fish agencies and tribes Harvest is a key component to maintain ratio of hatchery and wild spawners.* | Hatchery only, harvest depending on run size prediction. Tribal-only harvest above Dam. 2000 hatchery fish harvest goal.<br>---<br>*Harvest will be evaluated based upon goals of program.* |

## 6.3. 2. Terrestrial Species

**Priority A**

Protect remaining undeveloped winter range from incompatible development through acquisition, conservation easements, education, and development standards.

Minimize further fragmentation of remaining habitats. Avoid road and trail development impacts on big game winter range and riparian habitats. Seasonal roads should be closed to reduce harassment to wildlife during stress periods of winter and early spring. Roads no longer used for fire protection or logging should be closed permanently. Areas designated as big game winter range should be maintained in low density or forest uses.

Implement actions to retain forested wildlife travel corridors such as land acquisition, conservation easements, and landowner education.

Prevent the spread invasive plant species into high value habitat areas.

Conduct a wildlife habitat inventory on non-federal lands to identify and prioritize restoration and enhancement opportunities, inform future land use actions and plans, and fulfill statewide goals to protect wildlife habitat.

Promote a policy of "no net loss" of oak-pine woodland habitat by mitigating habitat conversions and natural losses with equal or greater replanting and restoration efforts. Prioritize and maintain existing moderate to high quality oak-pine woodland stands, and actively mange to promote their sustainability, regardless of size. Emphasize conservation of large patches of oak-pine woodland habitat with large-diameter and open-form oaks. Prioritize retention of oak and ponderosa pine trees and snags >53 cm diameter. Initiate actions to minimize conifer intrusion into oak stands and ensure <10% canopy cover of conifers in stands where pure oak stands are ecologically appropriate. Maintain or initiate actions to provide young, subcanopy oaks and young regenerating pine saplings (recruitment trees) and native shrubs and herbaceous vegetation in the understory. Improve the quality of degraded oak-pine woodland habitat through appropriate management actions. Initiate actions to enhance size and connectivity of existing oak-pine woodland patches (reduce fragmentation) through restoration and acquisition efforts. Evaluate the feasibility of using prescribed low intensity fire to maintain natural characteristic conditions in grasslands and oak stands.

Provide protection for federal and state threatened, endangered, and sensitive wildlife species in all resource management plans and land use proposals. Implement state and local land use rules and policies designed to protect wildlife habitat. Continue enforcement of wildlife laws.

Support recommendations for wildlife habitat protection, enhancement and restoration specified in the U.S. Forest Service Watershed Analysis and Northwest Forest Plan allocations and activities for Hood River Ranger District.

Support adequate funding for Hood River Ranger District, ODFW, and Oregon State Police secure staff resources to address wildlife issues, enforce wildlife harvest regulations, and manage increasing recreation to protect wildlife and sensitive habitats.

**Priority B**

Work with Hood River County Forestry Department, ODFW, and recreation groups to evaluate the feasibility and need for selective seasonal forest road and/or recreation trail closures to protect the integrity of wildlife habitat and control disturbance and/or harassment due to rising recreation use. Educate and enforce against the unauthorized development of recreation trails on private and public forest lands.

Promote and support development and implementation of coordinated wildfire hazard and forest fuels reduction plans across all land ownerships, with integration of wildlife habitat and forest health needs and benefits.

Involve wildlife biologists, land managers, local communities, recreation groups and businesses, and elected officials in developing a Gorge-wide plan to identify data gaps and manage trail, backcountry, and shoreline recreation activities and developments in a manner that is sensitive to wildlife populations. The goal of such a plan would be to have and enjoy recreational opportunities that are compatible with the long-term maintenance of healthy wildlife communities.

## 6.4 Consistency with ESA/CWA Requirements

The Management Plan proposes objectives and strategies that are consistent with the Endangered Species Act (ESA) requirements for listed species. Specific strategies in the Management Plan seek to continue, and if possible, enhance existing habitat protection of spotted owl on forest lands. Several strategies confirm or support mandatory measures such as Riparian and Late Successional Forest Reserve allocations and protection of special habitat areas on federal land under the Northwest Forest Plan. Other strategies seek to implement voluntary habitat protection for listed species on non-federal land, such as the retention of snags and downed wood, and provision of dispersal habitat for spotted owl. As for bull trout, the proposed objectives and strategies are adopted directly from the US Fish and Wildlife's 2003 Draft Mt Hood Unit Recovery Plan for Bull Trout. Local stakeholders, state, federal and tribal agencies had collaborated for several years on action measures in the plan with the USFWS. As for listed chinook and steelhead, each of the proposed management objectives and strategies will promote habitat protection and restoration or otherwise support recovery of the populations. Major strategies include

restoring stream connectivity, protecting and restoring riparian vegetation, and restoring instream flow and habitat diversity.

In the Hood River Subbasin the Federal Clean Water Act is implemented largely through State water quality standards, Total Maximum Daily Loads (TMDLs) and TMDL implementation by designated management agencies. The Western Hood Subbasin TMDL for temperature was approved by EPA in January, 2002. Since completion of the TMDL, stream segments have been identified as water quality limited for chlorpyrifos (Indian Creek, Neal Creek, Lenz Creek), Guthion (Neal Creek), zinc (Lenz Creek, Mitchell Creek), and iron (Neal Creek). TMDLs for these parameters will be developed by ODEQ after 2010. This document recognizes that both the Subbasin Plan and TMDL processes are adaptive in nature. When TMDLs are re-evaluated by ODEQ, the Subbasin Plan will also be re-evaluated as part of its review process to incorporate new findings and ensure consistency with future TMDLs and/or new 303(d) listings.

Management strategies in the Hood River Subbasin Plan are consistent with the Western Hood Subbasin Temperature TMDL, and in fact, anticipate management strategies that will likely be needed to address future TMDLs for pesticides (chlorpyrifos and Guthion). With regard to temperature, effective shade surrogate measures were identified in the TMDL based on the establishment of System Potential riparian vegetation. Attainment of the effective shade measures is equivalent to attainment of the nonpoint source load allocations. Management strategies identified in the Subbasin Plan under "Protection and Restoration of Riparian and Floodplain Function" and "Protect and Improve Water Quality" are consistent with the System Potential riparian vegetation goals in the TMDL. The bull trout strategy to develop and implement a plan to reduce temperatures below Laurance Lake reservoir is also consistent with the TMDL. The Subbasin Plan and the Western Hood Subbasin Temperature TMDL are also consistent in their recognition of the importance of stream flow restoration. Although the TMDL does not base allocations on any changes in flow diversions, modeling runs were done to demonstrate the thermal effects of increased instream flows. Based on TMDL modeling scenarios for the East Fork Hood River and Hood River, restoring flows to the river appeared to have a bigger impact on improving instream temperatures than did restoring riparian conditions.

Achievement of the TMDL, in part, occurs through implementation of nonpoint source management plans: the Agricultural Water Quality Management Area Plans (SB 1010), the Oregon Forest Practices Act, County Comprehensive plans, and Federal policies/plans on Forest Service lands. These plans vary from voluntary to proscriptive but all have reasonable assurance of implementation. Management oversight is normally conducted through the local, state or federal land use authority. It is also worth noting that there are numerous NPDES permits regulated by ODEQ within the Hood Subbasin. These permits are primarily for fruit packing plant and wastewater treatment plant discharges. These discharges typically occur on smaller tributaries to the Hood River. ODEQ is presently working on re-writing the permits for these facilities to be in compliance with the TMDL. Initiative-based restoration/protection and public funding dovetails with TMDL implementation and is an important implementing mechanism.

ODEQ recognizes that Subbasin Planning is a key effort that supports TMDL implementation.

## 6.5 Research, Monitoring and Evaluation

This section describes critical research needs, monitoring and data gaps for monitoring focal habitats and focal species to determine achievement of the biological objectives. These activities will measure trends and improvements in habitat conditions and populations, conduct research to address critical uncertainties, and validate assumptions about limiting factors, and provide information for adaptive management of all aspects of the Subbasin Plan.

This section begins with a background on the Hood River Production Program and then describes eight aquatic research, monitoring, and evaluation (RME) strategies along with a comprehensive justification for each strategy. These materials were contributed by Erik Olsen of ODFW. Following the comprehensive discussion, nine specific RME measures are listed that address other questions and assumptions about habitat restoration, or ecological uncertainties.

The objective of the BPA research, monitoring, and evaluation in the Hood River subbasin is to determine if the Hood River Production Program has achieved its biological fish objectives relative to populations of wild and hatchery salmonids in the Hood River subbasin. The Northwest Power Planning Council (Council) was directed to develop and adopt "a program to protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat, on the Columbia River and its tributaries" (Section 100; NPPC 1987). The Council subsequently developed the Columbia River Basin Fish and Wildlife Program (Program; NPPC 1987). The Council's Program set doubling runs to the Columbia River Basin "as a reasonable interim goal to guide program planning, implementation, measurement and evaluation" (Section 203(a); NPPC 1987). As an integral part of achieving this goal, the Council Program directed Bonneville Power Administration (BPA) to fund development of a master plan for artificial production facilities that could be used to rear hatchery production for the Hood River subbasin (Section 703(f)(5)(A) in NPPC 1987). Upon completion of the master plans, the Council Program further directed BPA to fund the planning, design, construction, operation, maintenance, and evaluation of these facilities (Section 703(f)(5) in NPPC 1987). Additionally, the Council Program directed BPA to fund the propagation of either spring chinook salmon or steelhead smolts in Pelton ladder (Section 703(g)(3) in NPPC 1987). Part of the Pelton ladder spring chinook salmon smolt production is currently released into the Hood River subbasin.

The various BPA funded projects that were an outgrowth of the Council directives, as well as the action items identified in CRITFC (1996), have come to be defined as the Hood River Production Program (HRPP). The HRPP is currently composed of seven inter-related BPA funded contracts. They are as follows: Hood River Production Program PGE: O&M, Hood River Production Program - CTWSRO M&E, Hood River

Production Program - ODFW M&E, Hood River Fish Habitat, Parkdale Fish Facility, Powerdale/Oak Springs O&M, and Hood River Steelhead Genetics Study. These seven contracts primarily provide funding for three broad categories of activities. They include hatchery supplementation, habitat restoration, and Monitoring and Evaluation (M&E).

The HRPP's M&E program is comprehensively outlined and defined in the Hood River and Pelton ladder master plans (O'Toole and ODFW 1991a, O'Toole and ODFW 1991b, and Smith and CTWSRO 1991) and in the Hood River/Pelton Ladder Master Agreement (ODFW and CTWSRO Undated). The master plans were approved by the Council in 1992 and the Master Agreement was submitted to BPA in 1993. The need for an M&E component to the HRPP is also identified in the Columbia River Anadromous Fish Restoration Plan of the Nez Perce, Umatilla, Warm Springs and Yakama Tribes (CRITFC 1996); as one of several actions required to improve natural production in the Hood River subbasin.

The primary goals of the HRPP are 1) to increase production of wild summer and winter steelhead (Oncorhynchus mykiss) commensurate with the subbasins current carrying capacity, 2) to reintroduce spring chinook salmon (O.tshawytscha) into the Hood River subbasin, and 3) provide in-basin sustainable harvest opportunities. The HRPP's performance goals relative to it's biological fish objectives (i.e., numerical harvest and escapement goals) are identified in the Hood River Subbasin Summary (Coccoli, 2000). Strategies for achieving the HRPP's biological fish objectives are based on various assumptions about subbasin smolt and spawner escapement carrying capacities, egg-to-smolt survival rates, smolt-to-adult survival rates, pre-spawning mortality rates, and current escapements of anadromous salmonids to the mouth of the Hood River subbasin. A comprehensive monitoring and evaluation program is needed to collect the life history and escapement information needed to 1) evaluate the HRPP relative to it's performance goals and 2) determine whether or not the assumptions used to develop the HRPP's biological fish objectives are valid, or need to be revised.

We propose collecting species, race, and stock specific life history, production, escapement, run size, morphometric, meristic, and genetic information at juvenile and adult migrant traps located at various sites in the Hood River subbasin. Information collected at the trapping facilities will be used to 1) refine the numerical fish objectives for wild summer and winter steelhead and natural spring chinook salmon, to more accurately reflect the subbasins current and potential species and race specific spawner escapement and smolt production carrying capacities; 2) refine the numerical fish objectives for subbasin run size and harvest of hatchery summer and winter steelhead and spring chinook salmon, 3) more accurately estimate species, race, and stock specific estimates of subbasin smolt-to-adult survival rates; 4) evaluate acclimation as a management tool for increased post release survival; 5) develop guidelines for implementing the HRPP in a biologically sound manner, 6) evaluate both the Pelton ladder rearing facilities and the proposed expanded hatchery facility at Parkdale, 7) develop guidelines for implementing the hatchery supplementation program in a manner that will minimize the HRPP's impact on indigenous populations of resident and anadromous salmonids; and 8) develop and refine strategies and guidelines for

implementing the HRPP in a manner that will improve program efficiency and benefits.

**Strategy 1. Monitor harvest of hatchery summer and winter steelhead and spring chinook salmon in the Hood River subbasin.**

Justification: One of the primary goals of the HRPP is to provide increased Hood River subbasin recreational and tribal harvest opportunities for summer and winter steelhead and spring chinook salmon. Consumptive recreational fisheries currently harvest summer and winter steelhead and spring chinook salmon (i.e., as run size permits) in the Hood River subbasin. Tribal fisheries are known to have historically existed in the subbasin but there is no information to determine historical harvest rates.

The HRPP's numerical harvest objectives were defined in the Hood River Subbasin Summary (Coccoli, 2000) for summer and winter steelhead and spring chinook salmon. The harvest objectives were revised downward in 2004, based on data collected on the current M&E program, and are defined in this subbasin plan in terms of making 1,100 summer steelhead, 1,150 winter steelhead, and 2,000 spring chinook salmon available for harvest in both non-tribal and tribal fisheries located in the Hood River subbasin.

We primarily propose implementing creel surveys in the Hood River subbasin to collect information needed to evaluate whether or not the HRPP is achieving it's numerical harvest objectives. Harvest would be estimated for both non-tribal and tribal fisheries located throughout the subbasin. The exploitation rates associated with each fishery would then be used to determine if fisheries located in the Hood River subbasin limit or constrain the HRPP's ability to consistently achieve the spawner escapement objectives for summer and winter steelhead and spring chinook salmon. Additionally, harvest estimates will be used in conjunction with estimates of run size (see Strategy 2) in order to allocate harvest opportunities among potential fisheries. This is a particularly critical need with respect to the spring chinook salmon run. Between year variation in subbasin escapements of hatchery spring chinook salmon have been highly variable over the past 10 years and in-season estimates of harvest and escapement have provided information critical to developing season opening and closure dates designed to ensure that the HRPP would achieve both it's spawner escapement objectives for spring chinook salmon (see Strategy 2) and it's broodstock collection needs for spring chinook salmon.

In addition to estimating harvest, creel surveys will be used to collect the biological information required to evaluate 1) the fisheries impact on selected life history patterns of returning wild, natural, and hatchery produced fish; 2) estimate both the harvest and exploitation rate of coded wire and PIT tagged experimental hatchery groups; 3) estimate smolt-to-adult survival rates for wild, natural, and hatchery produced salmonids; and 4) provide demographic information on both non-tribal and tribal anglers.

**Strategy 2. Monitor escapements of wild and hatchery summer and winter steelhead and spring chinook salmon to the mouth of the Hood River subbasin.**

Justification: The primary goals of the HRPP are 1) to increase production of wild

summer and winter steelhead (Oncorhynchus mykiss) commensurate with the subbasins current carrying capacity, 2) to reintroduce spring chinook salmon (Oncorhynchus tshawytscha) into the Hood River subbasin, and 3) to provide in-basin sustainable harvest opportunities. The HRPP's numerical escapement objectives associated with the above two goals were defined in the Hood River Subbasin Summary (Coccoli, 2000) for summer and winter steelhead and spring chinook salmon. The escapement objectives were revised in 2004, based on data collected on the current M&E program, and are defined in this subbasin plan as follows: to achieve and maintain a spawner escapement of no less than 6000 wild summer steelhead, 1100 wild winter steelhead, and 200 natural spring chinook salmon.

The approach taken to achieve the HRPP's numerically defined fish objectives has been to 1) restrict harvest of unmarked summer and winter steelhead and spring chinook salmon and 2) supplement the Hood River subbasin with Hood River stock hatchery summer and winter steelhead and Deschutes stock spring chinook salmon. The HRPP's ability to achieve the programs numerical escapement objectives are based on the general hypothesis that subbasin spawner escapements are currently below the level needed to fully seed the subbasin (see Strategy 3). Fishery managers consider the information required to reject or accept this hypothesis as critically important in refining the approach ultimately taken to implement the HRPP over the time frame of this subbasin plan. We propose monitoring adult escapements at Powerdale Dam, and at other proposed adult trapping facilities that come on-line after Powerdale Dam has been de-commissioned.

The HRPP's current M&E program is just beginning to collect the complete juvenile and adult life history information required to answer the above hypothesis, but continued monitoring of adult escapements is required to obtain the complete brood return numbers required for the more recent years estimates of subbasin smolt production. Maintaining the existing data string is also considered particularly important in light of an increase in subbasin production capacity anticipated as a consequence of 1) revised changes in guidelines for implementing the hatchery supplementation component of the HRPP, 2) several proposed habitat improvement projects, and 3) the de-commissioning and removal of Powerdale Dam.

**Strategy 3. Monitor production of wild and naturally produced anadromous salmonids in the Hood River subbasin.**

Justification: The primary goals of the HRPP are 1) to increase production of wild summer and winter steelhead (Oncorhynchus mykiss) commensurate with the subbasins current carrying capacity, 2) to reintroduce spring chinook salmon (O. tshawytscha) into the Hood River subbasin, and 3) provide in-basin sustainable harvest opportunities. There are no numerically defined subbasin smolt production objectives for the HRPP, but the subbasins smolt carrying capacity is inextricably linked with the HRPP's numerical fish objectives for subbasin spawner escapement (see Strategy 2). The HRPP's defined spawner escapement objectives for summer and winter steelhead and spring chinook are implicitly based on two general hypotheses 1) that the Hood River subbasin is currently under seeded in terms of summer and winter steelhead smolt production and 2) that the

Hood River subbasin is capable of supporting a self-sustaining population of spring chinook salmon.

The HRPP's current M&E program has annually estimated Hood River subbasin steelhead smolt production. Estimates are available in Olsen (2003) for the 1994-2001 years of migration and in Olsen (draft) for the 2002-2003 years of migration. The M&E programs estimates of subbasin steelhead smolt production were used to refine the HRPP's initial numerical fish objectives for steelhead spawner escapement; as defined during the early planning and implementation stages of the HRPP (see Strategy 2). The revised spawner escapement objectives have been incorporated into this subbasin plan. Fishery managers consider the continuation of this particular component of the M&E program to be highly critical given the fact that it is anticipated that subbasin carrying capacity will increase as a consequence of 1) revised changes in guidelines for implementing the hatchery supplementation component of the HRPP, 2) several proposed habitat improvement projects, and 3) de-licensing and removal of Powerdale Dam. Information gathered from the continued monitoring of subbasin smolt production will be used to 1) refine the HRPP's numerical fish objectives for spawner escapement (see Strategy 2) and 2) refine the approach for implementing the HRPP's hatchery supplementation program. These refinements will occur as subbasin carrying capacity increases in response to those actions implemented by the HRPP to increase the Hood River subbasins carrying capacity. We propose estimating subbasin smolt production at juvenile downstream migrant trapping facilities located at various sites throughout the Hood River subbasin.

In addition to determining subbasin carrying capacity, data collected from the smolt monitoring component of the proposed M&E program will be used to estimate egg-to-smolt and smolt-to-adult survival rates for wild steelhead. The numerical fish objectives for wild and hatchery run size (see Strategy 2), harvest of hatchery fish (see Strategy 1), and subbasin spawner escapement (see Strategy 2) are currently based on the M&E programs estimates of the current egg-to-smolt and smolt-to-adult survival rates for both wild and hatchery components of the run. Continued monitoring and refinement of the smolt-to-adult survival rates for both wild and hatchery components of the summer and winter steelhead and spring chinook salmon runs is considered critical to implementing the HRPP in a manner that will continue to 1) minimize the programs impact on indigenous populations of anadromous salmonids and 2) optimize the benefits associated with the program. Also, preliminary data from the HRPP's M&E program would suggest that removal of Powerdale Dam will significantly increase the smolt-to-adult survival rate for both wild and hatchery smolts. Accurately determining the degree of change will provide the basis for fishery managers to re-assess the level of hatchery supplementation required to achieve the HRPP's numerical fish objectives, both in a biologically sound and cost effective manner.

**Strategy 4. Monitor selected life history and morphometric and meristic characteristics of juvenile and adult wild and hatchery anadromous salmonids and resident trout in the Hood River subbasin**.

Justification: The Northwest Power Planning Council (NPPC) expressed a concern that the HRPP should be designed and implemented in a manner that minimized any negative impact the program might have on indigenous populations of fish in the Hood River subbasin. As a consequence, the hatchery supplementation component of the HRPP was designed within the context of achieving two basic principles: 1) to produce a hatchery product that would be both biologically and genetically suited to the Hood River subbasin and 2) that all actions implemented under the umbrella of the HRPP would have a minimal negative impact on indigenous populations of fish. Preliminary data collected from the M&E component of the HRPP indicated that specific management decisions may have resulted in 1) modifying the run timing of wild and Hood River stock hatchery runs of summer and winter steelhead, 2) the cross breeding of summer and winter steelhead in the hatchery broodstock, 3) impacted genetic fitness of indigenous populations of summer and winter steelhead, and 4) increased straying rates for spring chinook salmon. The above problems occurred as an unintended consequence of ongoing activities related to the implementation of the HRPP, but more importantly the existing M&E program provided data that identified these problems during the early stages of implementation and fishery managers were able to use the data to develop biologically sound measures for correcting the problems.

The current M&E program has provided, and continues to provide, data that can be used to monitor changes in genetically heritable life history and morphometric and meristic characteristics. Without the M&E program, it is doubtful that fishery managers would be able to identify any negative impact the HRPP might have on indigenous populations of fish, and there would be no bio-data available to develop biologically sound corrective measures for rectifying the problems. Fishery managers consider the on-going collection of bio-data on the HRPP's target species as critical to implementing the HRPP in a biologically sound manner. We propose bio- sampling salmonids collected in 1) non-tribal and tribal fisheries (see Strategy 1), 2) juvenile (see Strategy 3) and adult (see Strategy 2) migrant traps, and 3) stream reaches that we propose electro-shocking to estimate both rearing densities and species composition of both resident and anadromous salmonids. We also propose bio- sampling jack and adult salmonids collected from 1) radio telemetry studies we propose implementing to more accurately define the spatial distribution of indigenous populations of wild and hatchery salmonids, 2) wild and hatchery salmonids that we propose either CWT or PIT tagging to gather both in-basin and out-of-basin life history information, and 3) spawning ground surveys we propose conducting to monitor temporal and spatial distribution of both spawning and the habitat utilized for spawning.

**Strategy 5. Monitor population genetic structure, systematics, and distribution of steelhead, cutthroat, resident rainbow trout, and bull trout populations indigenous to the Hood River subbasin.**

Justification: State and federal agencies have established laws and guidelines that identify measures for protecting populations of anadromous salmonids and resident trout. The problem with implementing these measures in the Hood River subbasin is the lack of any information to indicate where reproductively isolated populations exist. For some

species, the Hood River subbasin is on the boundary between subspecies, and the taxonomic designation is uncertain.

There are several species of anadromous and resident salmonids indigenous to the Hood River subbasin. They include summer and winter steelhead, spring and fall chinook, coho salmon, rainbow/redband trout, cutthroat and bull trout, and mountain whitefish. We propose focusing genetic studies on populations of steelhead, rainbow/redband trout, cutthroat trout, and bull trout. We do not propose sampling for coho or fall chinook salmon at this time, but may propose analyzing existing samples, and collecting additional samples in the future, if a review of existing allozyme data indicates that sampling is warranted. There are currently no plans to study mountain whitefish.

The Hood River subbasin is geographically located on the boundary between two subspecies of Oncorhynchus mykiss. They include O. mykiss irideus (coastal rainbow/steelhead) and O. mykiss gairdneri (Columbia River redband/steelhead). The identity of the O. mykiss subspecies native to the Hood River subbasin is unknown. The Hood River subbasin and the adjacent Fifteenmile Creek subbasin are thought to be the most inland Columbia River subbasins containing the coastal cutthroat (O. clarki clarki). It is alternatively conceivable that the Hood River subbasin contains members of the Westslope Cutthroat (O. clarki lewisi), which is found in the John Day River subbasin. Consequently, because of the uncertainty in O. clarki taxonomy two alternative hypothesis exist: 1) O. clarki may be a natural hybrid of two of the species or 2) O. clarki may be an artificial hybrid caused by past hatchery programs. For the above reasons, the identity of the O. clarki subspecies native to the Hood River subbasin warrants investigation.

We propose sampling both steelhead and resident trout because of the risks associated with introgression within species, and hybridization between species, of wild and hatchery populations. Some subspecies of O. mykiss and O. clarki are naturally sympatric without cross species hybridization. Others, including coastal rainbow and some inland cutthroat subspecies, readily hybridize and then introgress when artificially brought into contact as a result of hatchery supplementation programs. Hybrid zones do occur naturally along the boundary of some species and subspecies. Hybridization caused by the introduction of hatchery produced fish is considered to pose a significant risk to the wild population. Interbreeding between resident trout and anadromous life histories of O. mykiss appears to occur naturally as well. Direct interbreeding between resident and anadromous populations is rarely observed (generally involving resident males interbreeding with steelhead females) but both steelhead and resident trout life history patterns are thought to produce offspring with the alternative life history pattern; thus facilitating gene flow between both populations. Therefore, both the resident and migratory life histories types of O. mykiss need to be studied.

We propose studying both the migratory and resident life history patterns of both O. mykiss and O. clarki and also the resident trout of uncertain taxonomic status discussed above. Both species will be studied because of the potential for interbreeding between both the wild and hatchery fish. The results will provide the information needed to

develop and refine hatchery guidelines to protect populations located in the Hood River subbasin.

**Strategy 6. Monitor the physical, chemical, and environmental biology parameters limiting wild and natural production of anadromous salmonids in the Hood River.**

Justification: Carrying capacity for the Hood River subbasin is currently estimated based on two computer models: 1) the Unit Characteristic Method (UCM) model and 2) the Ecosystem Diagnosis and Treatment (EDT) model. Output from both models was derived from subbasin specific physical; environmental; and species, race and stock specific biological data collected from the HRPP's current M&E program, and other available data. Information provided in the modeling efforts include: 1) annual estimates of subbasin juvenile and adult salmonid production (see Strategies 1-3); 2) selected life history and morphometric and meristic characteristics of indigenous populations of salmonids (see Strategy 4); 3) the quantity, quality, and diversity of available habitat in the subbasin; and 4) summer flows at selected sites in the subbasin. However, none of the data used in the modeling efforts should be treated as static. Habitat improvement work, proposed under the umbrella of the HRPP, is designed to increase subbasin carrying capacity. The EDT model provides the basis for evaluating the percent change in subbasin carrying capacity that might be anticipated from the proposed habitat improvement projects, but both the UCM and EDT models would lack the empirical data required to accurately quantify the numerical increase in salmonid production that occurs in response to the proposed habitat improvement work. Fishery managers consider it critically important to monitor both the individual and cumulative benefits of each project, and that the evaluation takes into consideration other land management activities in the drainage that may have the potential for reducing project benefits. We propose monitoring physical, chemical, and environmental biology parameters that limit subbasin production of indigenous populations of anadromous and resident salmonids. Parameters we propose monitoring include, but are not limited to: 1) turbidity; 2) temperature; 3) total dissolved solids; 4) pesticides; 5) pesticide effects on aquatic life (physiological and biochemical measurements); 6) macroinvertebrates; 7) streamflow; 8) precipitation; 9) bedload movement; 10) sediment movement; and 11) quantity, quality, and diversity of available habitat.

**Strategy 7. Monitor and evaluate the health of wild and hatchery juvenile and adult summer and winter steelhead and spring chinook salmon spring in the HRPP and Hood River subbasin.**

Justification: A fish health monitoring program at HRPP hatchery facilities is necessary to monitor for parasitic and infections disease agents that can reduce egg-to-smolt and post release survival rates of hatchery fish. The program will primarily focus on monitoring for Bacterial Kidney Disease (BKD), Erythrocytic Inclusion Body Syndrome (EIBS), and cultured viruses. These are the primary infectious disease agents that are known to effect egg-to-adult survival rates. Parasitic disease agents will be monitored to determine if they have become a problem at HRPP hatchery facilities. Information will be used to anticipate disease problems and 1) provide the basis for implementing

remedial measures before serious losses might occur and 2) determine the disease status of HRPP production groups prior to transfer to the Hood River subbasin. Information on the disease status of HRPP production groups will be used to determine whether or not the production groups can be transferred to the Hood River subbasin without having a significant impact on native populations of anadromous and resident salmonids. The decision to approve transfer of HRPP production groups to the Hood River subbasin would be based in part on a combination of both the parasitic and infectious disease agents identified in each production group and the incidence level found in each production group.

Several species of resident and anadromous salmonids are presently found in the Hood River subbasin. Endemic species include summer and winter steelhead; spring and fall chinook salmon; coho salmon; rainbow/redband, cutthroat, and bull trout; and mountain whitefish. The current status of each population varies for each species and race. The endemic populations of summer and winter steelhead are considered to be at depressed levels; the spring chinook population is considered to be functionally extinct; and although the current status for populations of rainbow/redband trout, cutthroat trout, bull trout, and fall chinook and coho salmon is unknown. The primary concern with respect to the HRPP is the potential health risk the hatchery supplementation program poses to the Hood River subbasins endemic populations of salmonids. Biological systems are highly complex in nature and are not completely understood. While it is believed that guidelines for implementing the HRPP will minimize the health risks to the above species, it is likely that some level of interaction will take place that will pose a potential health risk. We propose monitoring the same infectious disease agents in the subbasins wild populations of salmonids, that are monitored at the HRPP's various hatchery facilities.

**Strategy 8. Monitor indigenous populations of redband/rainbow, cutthroat, and bull trout in the Hood River subbasin.**

Justification: The hatchery supplementation component of the HRPP has the potential for negatively impacting species of resident and anadromous salmonids in the Hood River subbasin that are not the main target of the program. Non- target indigenous populations of salmonids that are of critical concern include rainbow/redband, cutthroat, and bull trout. Limited information is available to characterize the status of these populations. It is difficult to either quantify or qualify the potential risks the HRPP may pose to these populations, primarily because biological systems are highly complex in nature and are not completely understood. However, hatchery summer and winter steelhead can hybridize with indigenous populations of wild steelhead and rainbow trout (see Strategy 5) and the potential for interaction between wild and hatchery salmonids raises a health issue with respect to all three of the identified non- target populations of salmonids (see Strategy 7). Fishery managers consider some level of population monitoring as critically important for developing biologically sound guidelines that will minimize any negative impacts the HRPP may have on populations of rainbow/redband, cutthroat, and bull trout. A considerable amount of population and bio- data relative to these indigenous species can be collected in association with activities outlined in Strategies 1-7, strategies which

are primarily intended to collect information on the HRPP's target species. We also propose collecting additional population density and biological data from 1) stream reaches we propose either electro-shocking or conducting snorkel surveys in to estimate both rearing densities and species composition, 2) radio telemetry studies we propose implementing to more accurately define the spatial distribution of each population, 3) wild salmonids we propose PIT tagging to gather both in-basin and out-of-basin life history information, 4) spawning ground surveys we propose conducting to monitor temporal and spatial distribution of both spawning and the habitat utilized for spawning, and 5) creel surveys we propose conducting to monitor incidental hook mortality in steelhead, salmon, and rainbow trout fisheries located in the Hood River subbasin.

**Additional Research, Monitoring, and Evaluation for Fish and Wildlife**

1. Investigate bull trout ecology in Laurance Lake reservoir including fish species interactions and lake trophic state.

2. Monitor the abundance, distribution, habitat utilization, and life history of bull trout using juvenile and adult spawner surveys to provide a means to monitor future trends and evaluate restoration actions, including the potential use of PIT tagging bull trout and using an array of PIT tag receivers to obtain specific life history and abundance information.

3. Evaluate and determine the feasibility of bull trout passage at Clear Branch Dam.

4. Continue pesticide monitoring in streams to evaluate effectiveness of best management practices

5. Conduct a wildlife habitat inventory on non-federal lands to identify and prioritize restoration and enhancement opportunities, inform future land use actions and plans, and fulfill statewide goals to protect wildlife habitat.

6. Research effects of recreation on wildlife in the subbasin and what actions are need to avoid or minimize effects.

7. Monitor stream temperatures to identify trends and evaluate success of measures such as flow and shade restoration.

8. Conduct the studies necessary to develop and implement a reservoir management or outlet modification plan to improve stream temperatures for bull trout below Laurance Lake Reservoir .

9. Monitor the effectiveness of LWD placement and other habitat projects to determine fish utilization, changes in fish distribution, physical habitat development, and the movements of structures in high flow events.