

Chapter 14A
Measures Analysis
Section 4: Fish Management and Predation

Table of Contents

FISH MANAGEMENT: Key Parameter for Restoring Salmonid Populations..... 1

Issue Background..... 1

 Factors for Decline

 Harvest Impacts to Spawning Escapement 2

 Illegal Steelhead Catch..... 26

 Steelhead Bycatch in Commercial Fisheries 28

 Ocean Productivity 30

 Loss of Genetic Adaptation of Wild Populations from Interbreeding with Genetically Dissimilar, Less Fit Hatchery Fish 34

 Competition with Hatchery Reared Fish 46

 Low Density Reproductive Failure of Wild Populations 50

 Reduced Nutrients (Carcass Nutrient Cycle) from Depressed Runs 54

PREDATION: Key Parameter for Restoring Salmonid Populations..... 57

Issue Background..... 57

 Factors for Decline

 Predation by Pinnipeds and Sea Birds..... 58

 Interactions with Exotic Fishes 61

Federal Agency Measures with General Application to Section 4..... 64

Attachment 1: Wild Fish Management Policy Strategies 66

Chapter 14A

Measures Analysis

Section 4: Fish Management and Predation

This section of the plan addresses issues of fish management and predation in two different parts. In each part, issues and factors for decline are described, then biological objectives and measures that will accomplish the biological objectives are listed. Measures are listed and described in some detail except that federal agency measures are only listed with a very brief description of each. Detailed descriptions of each federal agency measure can be found in a separate section of this chapter.

Fish Management: Key Parameter for Restoring Salmonid Populations

ISSUE BACKGROUND

Fishery management programs directed at steelhead and other fish in waters used by steelhead obviously have significant impacts to steelhead populations. ODFW is mandated by the Oregon Legislature through the Wildlife Policy (ORS 496.012) to manage fishery resources to prevent the serious depletion of any indigenous species and to provide the optimum recreational and aesthetic benefits for present and future generations of citizens. Prevention of serious depletion is the agency's overriding obligation, which thereby enables provision of the mandated recreational and aesthetic benefits. To accomplish its mandate, ODFW has been granted specific authority to control use and harvest through seasons, bag limits, license and tag requirements, restrictions on gear, area and time closures, etc., and to rear and distribute fish. Even before initiation of the Coastal Salmon Restoration Initiative (OCSRI) that led to development of *The Oregon Plan*, there was significant concern about declines in some Oregon steelhead populations, and management measures were initiated to halt the declines and begin restoration. Wild steelhead throughout the state were declared an Oregon Sensitive Species by ODFW in December 1997 under OAR 635-100-140.

Many management activities influence populations. One critical management objective is to ensure adequate numbers of adults return to spawn annually to maintain production. Because of concerns over declining abundance of some steelhead populations, regulations to reduce harvest impacts became more restrictive in the past decade. By 1992, anglers were required to release wild steelhead in most Oregon rivers. Starting in 1997, in the few remaining rivers open to take of wild steelhead, the bag limit is 1 wild steelhead per day and 5 per year for all open areas combined.

The other primary management activity, fish stocking, has also been evaluated and adjusted in light of the effects on wild steelhead populations, and more evaluation and adjustment is planned. Historically, steelhead hatchery programs were designed to produce fish for fisheries, and have generally been successful toward that objective. However, there is evidence that steelhead inadvertently selected over several generations for life in a hatchery are not well adapted to the

wild. There is a widespread concern, not isolated to steelhead, that the genetic makeup of wild fish may be altered by interbreeding with hatchery fish, reducing their fitness to natural conditions. Oregon has developed and adopted a Natural Production Policy (OAR 636-07-525) and a Wild Fish Management Policy (WFMP, OAR 636-07-521) that was most recently amended and adopted in 1994. These policies are expressly intended to emphasize the health of wild fish populations and to establish guidelines that protect wild populations from loss of productive capacity in natural stream conditions due to excessive interbreeding with hatchery fish that have become better adapted to hatchery conditions. WFMP has already been implemented for many hatchery programs with potential impacts on wild steelhead populations, and all programs will be brought into full compliance under this supplement to *The Oregon Plan*. In addition, as described in this plan, we will explore whether hatcheries can be successfully utilized to temporarily augment critically depressed wild populations and thus give an important boost toward restoration.

The fishery management measures described in this supplement, coupled with habitat protection and restoration measures in *The Oregon Plan* and this supplement, hold promise for sustaining the robust wild steelhead populations, restoring those populations that are in decline, and sustaining this economically valuable and aesthetic resource.

I. Factor for Decline: Harvest Impacts to Spawning Escapement

Natural mortality from the smolt to the adult stage in the ocean and natural mortality in freshwater, particularly during juvenile rearing stages and as affected by degradation of habitat and water quality, appear to be larger factors for decline of steelhead than harvest impacts in most cases. Unlike salmon, there are no fisheries targeted on steelhead in the ocean and little incidental catch in most commercial and sport fisheries for other species in the ocean. Until the early part of this century, commercial fisheries for steelhead existed in some Oregon bays and rivers associated with commercial salmon fisheries. The only remaining commercial fisheries are tribal fisheries in the Columbia River and specific numbers of steelhead are allocated to these fisheries annually through co-manager agreement based on scientific review of predicted run size. Steelhead are also far less susceptible than salmon to sport fisheries in estuaries where some of the most popular salmon fisheries occur. However, steelhead are more susceptible than salmon (and often over a longer period of time) to sport fisheries in rivers and streams. Juvenile steelhead are also more susceptible to harvest in streams than juvenile salmon because they generally live 1-3 years longer in freshwater, look more like resident trout, and reach larger sizes before smolting. Historically, it appears that excessive harvest has not been a significant factor in the decline of many populations of Oregon steelhead. Harvest-related impacts may have restricted escapement levels in some populations.

Setting appropriate harvest levels to meet population health goals is not simple. It is important to evaluate variation in the stock-recruitment function for wild fish, varying environmental factors, statistically valid assessments of spawning escapement, and accurate incidental, bycatch, and catch-and-release data in order to accurately determine total fishing mortality.

Biological Objective:

- A. *Manage harvest impacts to strive for attainment of population health goals (as defined in ODFW IA1) for wild steelhead.*

Managing harvest impact is important to attaining population health goals, which may include spawning escapement goals, but it is important to note that the effect of ocean conditions on natural mortality probably plays a larger role in determining smolt-to-adult survival and spawning escapement. Secondly, it is also important to note that on a per unit basis, freshwater habitat generally produces fewer steelhead smolts than coho salmon smolts. Therefore, normal levels of steelhead smolt production can be maintained by a lower density of spawners, and production is in general less dependent on the density of spawners than on the total amount of suitable habitat available and the annual variations in habitat and water conditions. Thirdly, steelhead populations are somewhat more resilient than coho salmon to temporary shortfalls in spawning escapement or smolt production because steelhead have a much more diverse life history. Within each population, they do not all smolt at the same age, age at first spawning ranges from 2 to 6 (generally 3 to 4), and some steelhead survive to spawn two or more times, resulting in life spans that may exceed 10 years in rare instances. As a result, the failure of spawners in any one year has less severe consequences than in coho salmon because the reproductive gap will be filled in the next generation by spawners with overlapping ages from different brood years.

Measures:

ODFW IIIA2S - Manage Steelhead Fisheries to Minimize Impact on Wild Steelhead

Phase 1. Manage Oregon estuary and river salmon/steelhead fisheries to minimize impact on wild steelhead returning to spawn. Work with appropriate tribal co-managers in each basin to develop agreement on any significant modifications to ODFW fishing regulations. Current information suggests hooking mortality amounts to only 0.5%-3.0% of each wild population where catch and release fishing is required. Anglers hook 15%-40% of wild steelhead in Oregon steelhead fisheries and studies in winter steelhead fisheries indicate only a 3%-7% mortality rate on released fish. Restrictive "marked-fish-only" steelhead fisheries or restrictions on gear, location and time will continue to be applied to steelhead and other fisheries to limit impacts to wild adult steelhead. Angling regulations will be reviewed for possible additional closures to protect steelhead in their spawning areas. We will continue to advise and encourage anglers to take care when handling and releasing wild steelhead, including continuing to distribute informative materials on how to increase survival of fish released during selective fisheries. Innovative ways will be sought to increase return of salmon/steelhead tags (angler catch records) to improve catch statistics.

Specifics/Priorities for the Two Coastal Steelhead ESUs

Klamath Mountains Province ESU. Further restrict all steelhead sport fisheries in this ESU starting in early 1998 so that only fin-marked hatchery fish may be harvested, except during a shortened season for winter steelhead on the Rogue River in which anglers will be allowed to keep 1 wild fish per day and 5 per year (the 1 and 5 limits are for all open areas of the entire state combined). If

monitoring demonstrates that additional wild steelhead populations are healthy and have only a minor influence from hatchery steelhead, ODFW staff will ask the Oregon Fish and Wildlife Commission to reduce restrictions. Restrictions on adult steelhead angling in 1997 included catch and release for wild summer steelhead in the Rogue basin, as well as restricted harvest of wild winter steelhead in those streams open to steelhead angling throughout the ESU (1 per day and 5 per year for all open areas of the entire state combined). These restrictions were implemented as follows:

- In recognition of the unique half-pounder life history of summer and winter steelhead in the Rogue River basin, any rainbow trout over 16 inches long are classified as adult steelhead, thereby reducing harvest rate on adult steelhead 16-20 inches long (implemented in 1990).
- Release of wild summer steelhead over 16 inches long in the Rogue and Applegate rivers (implemented in 1991).
- Release of all wild steelhead in the Illinois River (implemented in 1992).
- A bag limit of 1 per day and 5 per year restrictions on all wild steelhead in other streams of the Oregon part of the ESU (implemented in 1997).

Oregon Coast ESU. Pending approval by the Oregon Fish and Wildlife Commission, further restrict all steelhead sport fisheries in this ESU by 1999 so that only fin-marked hatchery fish may be harvested. If monitoring demonstrates that additional wild steelhead populations are healthy and have only a minor influence from hatchery steelhead in future years, ODFW staff will ask the Oregon Fish and Wildlife Commission to reduce restrictions. Current restrictions on adult steelhead angling include catch and release for wild steelhead throughout the ESU, except the Umpqua basin and four small basins south of Bandon where the 1 per day and 5 per year limits for wild steelhead are in effect (limits are for all open areas of the state combined). Current restrictions were implemented as follows:

- Release of wild winter steelhead in Neskowin Creek (implemented in 1986).
- Release of wild summer steelhead on the upper North Umpqua River in the fly angling section during June 1 to October 31 (implemented in 1990). Although this wild run is healthy and has remained relatively stable, anglers agreed that wild fish release was an appropriate strategy to maintain a strong conservation management program for this population.
- Release of wild steelhead was a restriction added to 19 additional north coast streams (implemented in 1992). These regulations were adopted on a variety of wild fish only and hatchery augmented streams, with others near by left unchanged (to act as control streams).
- Wild fish release regulations were so popular with north coast anglers that the remainder of NW Zone angling waters, and the entire Coquille River basin in the SW Zone, were added in 1994.
- Release of wild steelhead became a restriction on the rest of SW Zone streams in this ESU, with the exception of the Umpqua basin and four small basins

south of Bandon where the 1 per day and 5 per year limits for wild steelhead were imposed (implemented in 1997).

Specifics/Priorities for all Five Columbia Basin ESUs

Maintain catch and release regulations for unmarked steelhead in sport fisheries. Continue random creel checks on the Columbia River steelhead sport fisheries, reminding anglers of non-retention rule for wild fish and monitoring compliance with the rule (May 16-March 31 from Astoria to I-5 Bridge and June 16 to March 31 from I-5 Bridge to Pasco, WA). Seasons are closed April 1 through May 15 below the I-5 Bridge and April 1 through June 15 above the bridge. Sport harvest of summer steelhead in the Columbia River has been limited to hatchery fish starting in 1984 (dorsal fin had to be less than 2" high) and limited to finclipped hatchery fish since 1986. In 1994, this harvest restriction was applied to all steelhead runs in the Columbia River.

Maintain sampling and database on sport and commercial fisheries and the run crossing Bonneville Dam to estimate hatchery and wild run sizes, A and B stock composition, age composition, run timing, and harvest rates in the fisheries. ODFW will work through the US v Oregon process for renegotiating the Columbia River Fisheries Management Plan (CRFMP) to seek any needed adjustments to harvest rates or other aspects of the mainstem tribal fisheries that are currently allowed harvest rates of 15% and 32% on wild A-run and B-run summer steelhead, respectively (provisions of the CRFMP expire in December 1998).

This measure is very similar to what WDFW is proposing in their draft *Lower Columbia Steelhead Conservation Initiative* for the portions of the SW Washington and Lower Columbia ESUs that are in Washington.

SW Washington ESU. Catch and release regulations for wild steelhead in this ESU began first on the mainstem Columbia River where anglers were limited to keeping hatchery fish starting in 1984 (dorsal fin had to be less than 2" high) and have been limited to finclipped hatchery fish since 1986. Catch and release of wild steelhead was applied to the Lewis and Clark and Clatskanie rivers in 1992 and applied to the rest of the Columbia River tributaries in 1994.

Lower Columbia ESU. Pending approval by the Oregon Fish and Wildlife Commission (OFWC) to modify ODFW basin management plans so that releases of summer steelhead smolts can be moved from the upper Clackamas and Sandy basins to the lower basins by 1999, close the Clackamas River above North Fork Dam and the Sandy River above Marmot Dam to all steelhead angling when the last returns of hatchery summer steelhead can be expected from smolts released above these dams. Catch and release regulations for wild steelhead in this ESU were applied to the mainstem Columbia River in 1984 (see above), the Sandy River in 1990, and the rest of the Columbia River tributaries in 1992.

While the Hood River basin is within the ceded territory of the Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO), they do not currently exercise treaty secured fishing rights in the basin. CTWSRO is a partner with ODFW in the BPA-funded Hood River Production Plan to rebuild the fishery resources. Harvest guidelines will be developed between the State of Oregon and the CTWSRO in the context of the Hood River Production Plan to utilize the fish resources made available as implementation of the plan rebuilds fish abundance (there is currently no harvest on steelhead except finclipped hatchery fish taken by sport anglers under ODFW regulations).

Upper Willamette ESU. Pending approval by the OFWC to modify ODFW basin management plans, including moving releases of winter steelhead smolts from the Tualatin basin to the Clackamas basin, close all west-side Willamette River tributaries to steelhead angling by 1999 (delay the change in the Tualatin until the last returns of hatchery steelhead can be expected. Similarly, close the Molalla River to steelhead angling when the last returns of hatchery summer steelhead can be expected based of OFWC action (releases of hatchery winter steelhead were discontinued after 1996). Continue the steelhead angling closures on Thomas, Wiley, and Crabtree creeks and all tributaries of the South Santiam River adopted for 1997. Work with NMFS to develop criteria for re-opening closed areas of the ESU to steelhead angling based on health of winter steelhead populations. Catch and release regulations for wild steelhead in this ESU began first on the South Santiam River above Foster Dam in 1988 and were applied to the rest of the streams as emergency rules in 1992 and 1993 and permanent rules in 1994.

Middle Columbia ESU. Continue to require release of all non-finclipped steelhead in the Deschutes and Umatilla rivers. Work with appropriate tribal co-managers in each basin to develop criteria for determining when harvest of wild steelhead in the John Day and Walla Walla rivers should be allowed, using wild escapement to the basins, dam counts, and perhaps other measures of population health to set “triggers” for opening or closing these basins to wild steelhead harvest. Continue to keep the Walla Walla Basin closed to all steelhead angling until the wild population health “trigger” is reached or until hatchery steelhead are available and can be selectively harvested with only minor estimated impacts (3% or less) on wild fish escapements. Continue to keep the John Day Basin open to selective harvest of finclipped hatchery steelhead that stray into the basin as long as impacts on wild fish escapements are estimated to be minor (3% or less).

The Walla Walla River in Oregon has been closed to steelhead angling since 1995 due to low numbers of adults returning to the Oregon portion of the basin, and because there is no hatchery program in Oregon. Angling regulations in the John Day basin required catch and release for all wild steelhead starting in 1995. Prior to 1995, 3 of 5 years were under emergency angling regulations for steelhead due to poor wild counts at Bonneville Dam. Two different emergency regulations were in effect before 1995. One required catch and release for wild fish below

Cottonwood Bridge (RM 40) and a bag limit of 2 wild fish per year above Cottonwood Bridge. This allowed anglers to catch and keep up to 20 stray hatchery fish per year. Another year, more restrictive bag limits were 1 fish per day, 2 per year anywhere above Tumwater Falls. Upper reaches of the main forks of the John Day (main stem, Middle Fork, and North Fork) and the entire South Fork have been closed to steelhead angling.

In 1979, the Deschutes River was the first stream in the state where release of wild steelhead was required, and the rule has been applied to the Umatilla River since 1994 and the John Day River since 1995. Fifteenmile Creek contains the only winter steelhead population in this ESU and has been closed to steelhead angling since 1994.

Snake River Basin ESU. Continue to keep waters open for steelhead angling in this ESU only in areas where hatchery adults are likely to return based on location of smolt release sites. Work with appropriate tribal co-managers in each basin to develop agreement on any significant modifications to ODFW fishing regulations.

The Grande Ronde and Imnaha basins and the Snake river below Doug Bar were closed to steelhead angling in 1978. Some catch-and-release angling was allowed on all steelhead in parts of the Grande Ronde Basin starting in 1982. The Snake River, Imnaha River, and portions of the Grande Ronde River were reopened for harvest of hatchery steelhead in 1983, 1985, and 1986, respectively.

Phase 2. Conduct statistical creel sampling programs on selected streams to improve data on numbers of hatchery and wild adults caught and then released or kept. Develop a GSI (Genetic Stock Identification) sampling program to improve management of fishery impacts on various steelhead ESUs migrating through the Columbia River. Explore DNA sampling and analyses if GSI fails to provide adequate data for Columbia River fishery management.

ODFW IIIA3 - Manage Trout Fisheries to Reduce Ecological Interactions and Mortality on Juvenile Salmonids

With few exceptions, stocking of trout in rivers and streams has been relocated to standing waters to remove competition with juvenile salmonids in streams, reduce incidental impacts of trout angling on juvenile salmon and steelhead, and on wild cutthroat trout, and maximize the return of stocked trout to anglers. ODFW estimates that approximately 490 miles of stream in Oregon are currently stocked with trout, amounting to only 1.1% of total stream miles suitable for salmonids. Only 8% of Oregon's wild steelhead populations have any trout stocked in their habitats. As of 1997, no trout are stocked in waters used by wild steelhead in Oregon portions of the two coastal ESUs or the Southwest Washington ESU. Trout are stocked in waters used by only one of eleven populations of wild steelhead in the Lower Columbia ESU, two of eleven populations in the Middle Columbia ESU, and one of six populations in the Snake River Basin ESU. Trout are stocked in seven of nine populations in the Upper Willamette ESU (this includes stocking

in three of the five streams on the west side of the Willamette River where the populations are more likely naturalized hatchery steelhead, not indigenous wild steelhead). However, the number of trout stocked in the Upper Willamette ESU has been substantially reduced since 1985.

Phase 1. Continue to maintain and expand recent changes in trout management to reduce ecological interactions and harvest related mortality on juvenile salmonids. Work with appropriate tribal co-managers in each basin to develop agreement on any significant modifications to ODFW trout fishing regulations or hatchery trout stocking programs.

1. Maintain late May opening of trout season to allow smolts to migrate prior to trout angling season.
2. Maintain and expand year around closure to trout fishing in tributary streams that are important rearing areas for steelhead.
3. Maintain “no hatchery trout stocking” approach in tributaries (and some mainstems) where steelhead rear.
4. Publish news releases, post signs and explain rationale to public on restrictive trout regulations. Monitor early season trout fisheries to explain regulation change and document angler use.
5. Adopt further restrictions on trout fisheries, such as closing trout angling in streams entirely to create sanctuaries for juvenile steelhead and prohibiting the use of bait in summer trout fisheries. Bait is now banned in a few rivers, however, banning bait in all fisheries would significantly affect catch success of salmon and steelhead anglers.

Specifics/Priorities for the Two Coastal Steelhead ESUs

Klamath Mountains Province ESU. Maintain the policy (initiated in 1994) of no stocking of hatchery trout into streams of this ESU. Cease stocking upper Big Butte Creek. In the past, hatchery cutthroat trout were stocked in the Winchuck, Chetco, and Pistol rivers, and Hunter Creek, and hatchery rainbow trout were stocked in the Rogue and Applegate rivers and a few Illinois River tributaries. Rainbow trout stocking in the Illinois River ceased after 1976, cutthroat stocking in the four coastal streams was terminated after 1984, and rainbow trout stocking in the Rogue and Applegate rivers was discontinued after 1993.

Prohibit the use of bait during the summer trout season and close the season August 31 instead of October 31 except in the Rogue, Applegate, Elk, and Pistol Rivers. Close additional small streams to all angling to create sanctuaries for juvenile steelhead. Continue the closure to all angling from April 1 through last Saturday in May, with a few exceptions such as areas open to spring chinook angling, to protect migrating smolts (this restriction began in 1958). Continue restriction of a summer-only trout angling season with catch and release for all trout in those streams left open to trout angling, with the exception of harvest being allowed on hatchery “half-pounder” summer steelhead (8-16 inch fish) in the summer and winter trout seasons on the Rogue and Applegate rivers, and during

the fall-winter trout season on the Pistol and Elk Rivers. Most Rogue River tributaries were closed to all angling starting in 1994 to protect juvenile steelhead. The catch and release restrictions coastwide went into effect in 1997.

Oregon Coast ESU. Continue the policy of not stocking hatchery trout into streams of this ESU that was fully implemented after 1996. In the past, hatchery cutthroat trout were stocked in many basins within this ESU. ODFW began eliminating these releases in 1986 starting with three streams in the Coos, Coquille, and Tenmile Lakes basins. Cutthroat stocking was discontinued in three north coast streams in 1993, three more in 1994, and another three in 1995. Finally, stocking of cutthroat in the last four basins (Salmon, Siletz, Alsea, and Siuslaw on the mid-coast) was moved to standing waters in 1995 and 1996. Stocking of rainbow trout existed for many decades in the North and South Umpqua rivers, and was discontinued after 1996.

Pending approval by the OFWC, prohibit the use of bait during the summer trout season, close the season August 31 instead of October 31 (with exceptions for areas with spring chinook or summer steelhead fisheries), and close additional small streams to all angling to create sanctuaries for juvenile steelhead by 1999. Continue the closure to all angling from April 1 through last Saturday in May, with a few exceptions such as areas open to spring chinook angling, to protect emigrating smolts (this restriction began in 1958). Unless trout stocks are judged to be robust enough to sustain harvest and impacts on wild steelhead juveniles are judged to be minor, continue restricting trout angling to a summer-only season with catch and release for all trout in those streams left open to trout angling. The coastwide catch and release restrictions went into effect in 1997. Continue the closure to all trout angling in the streams of the Umpqua Basin, with the exception of the North Umpqua River above Soda Springs Dam (adopted in 1996).

Specifics/Priorities for the Three Lower Columbia ESUs. This measure is somewhat similar to what WDFW is proposing in their draft *Lower Columbia Steelhead Conservation Initiative* for the portions of the SW Washington and Lower Columbia ESUs that are in Washington.

SW Washington ESU. Continue the policy of not stocking hatchery trout in Lower Columbia tributaries below the Willamette River (initiated in 1994). The exception will be a cutthroat broodstock development program on Big Creek where 3,000-6,000 cutthroat smolts will continue to be released below Big Creek Hatchery as part of ODFW's effort to reintroduce searun cutthroat trout above the hatchery. In the past, four tributaries were be stocked with searun cutthroat, but this program was discontinued in the Lewis and Clark River in 1990, and discontinued in the Klaskanine River and in Big and Gnat creeks in 1993.

Continue the closure to all angling from April 1 through last Saturday in May, with a few exceptions such as areas open to spring chinook angling, to protect

emigrating smolts (this restriction began in 1958). Unless trout stocks are judged to be robust enough to sustain harvest and impacts on wild steelhead juveniles are judged to be minor, continue restricting trout angling to a summer-only season with catch and release for all trout in those streams left open to trout angling. The catch-and-release restriction in all Columbia River tributaries of this ESU was initiated in 1997. There is very little sport fishery impact on steelhead smolts in the mainstem Columbia River.

Lower Columbia ESU. Continue the prohibition on stocking hatchery trout in steelhead streams with the exception of 86,000 legal-size rainbow trout in the Clackamas River above North Fork Reservoir, which will be shifted from the river to lakes and ponds by 1999. All trout stocked in North Fork, Faraday, and River Mill reservoirs will be finclipped and regulations changed to require release of non-finclipped trout throughout the Clackamas River with no bait allowed above North Fork Reservoir by 1999, pending approval by the Oregon Fish and Wildlife Commission (OFWC). Also pending OFWC approval, change the trout regulation in the Sandy River up to Brightwood Bridge from 2/day to catch-and-release only by 1999. Stocking of legal-size rainbow trout in the Sandy River basin was shifted to standing water bodies starting in 1994. Two streams in this ESU used to be stocked with searun cutthroat, but stocking was discontinued in the Hood River in 1988 and in Scappoose Creek in 1993.

Continue the new increase in minimum length for keeping trout (6" increased to 8" in 1997). Continue the new restrictions on bag limit for trout (2 per day instead of 5) adopted for most steelhead streams for 1997 (the Hood River Basin and Clackamas River above North Fork Reservoir are exceptions). Continue the new catch and release regulations and ban on bait adopted for most of the Sandy River Basin for 1997. Continue restricting the trout season to late May through October with an April 1 to last Saturday in May closure to all angling in most steelhead streams. Scappoose and Milton Creeks are exceptions to the total angling closure during April and May because they remain open to steelhead angling year round, and areas of the Willamette, Clackamas, and Sandy rivers are exceptions because spring chinook fisheries are open.

Continue the Hood River restrictions where a late May angling season opening with an 8 inch minimum length was expanded to tributaries and the upper East Fork in 1997 to be consistent with regulations in place for the rest of the Hood River steelhead streams since 1986. Continue the restriction of no trout stocking in anadromous salmonid waters (the last trout were stocked in 1996). Only fin-clipped trout were legal to retain in the mainstem Hood River during 1994-1996, but the regulation is no longer needed since trout stocking was terminated. Work with CTWSRO to develop agreement on any significant modifications to ODFW trout fishing regulations or trout stocking programs in ceded areas of this ESU.

Upper Willamette ESU. Continue the restrictions on numbers of trout stocked in

wild steelhead streams (a 21% reduction since 1985). The stocking of trout is partly mitigation funded by the USACE for fish habitat lost due to dams they built in the Willamette River Basin. The Molalla, North Santiam, South Santiam, and Calapooia rivers are wild steelhead streams that were still being stocked with legal-size rainbow trout in 1997. Pending OFWC approval to modify ODFW basin plans, these stocking programs will be moved to lakes and ponds by 1999 and the areas will be changed to catch-and-release trout angling. In addition, the Little North Santiam will be closed to trout angling and no bait will be allowed in the Molalla and Calapooia rivers and the South Santiam River above Foster Reservoir by 1999, pending OFWC approval to modify ODFW basin plans.

Three steelhead bearing streams flowing off the Coast Range into the Willamette River are stocked with trout, and although they remain on ODFW's provisional list of wild steelhead populations, these steelhead may be populations initiated from hatchery releases, not indigenous wild populations. However, pending OFWC approval to modify ODFW basin plans, these stocking programs in the Luckiamute, Rickreall, and Yamhill basins will be moved to lakes and ponds by 1999.

Continue the new increase in minimum length for keeping trout (6" increased to 8" in 1997). Continue restricting the trout season to late May through October in steelhead streams on the east side of the Willamette (tributaries of the Molalla, Santiam, and Calapooia rivers were added to the list for 1997). Pending OFWC approval, move the opening date for trout angling from late April to late May in steelhead waters of the Luckiamute, Rickreall, Yamhill, and Tualatin basins, and restrict angling to catch-and-release only for trout with no bait allowed.

Specifics/Priorities for the Two Eastern Oregon ESUs

Middle Columbia ESU. Work with appropriate tribal co-managers in each basin to develop agreement on any significant modifications to ODFW trout fishing regulations and hatchery trout stocking programs. Terminate stocking in the last three locations of the John Day Basin that are wild steelhead habitat in 1998: These are Camas Creek (2,500 legals), Canyon Creek (1,500 legals), and the North Fork John Day River (3,000 legals). Continue restricting trout stocking in this ESU to only a short section of the mainstem Umatilla River (6,000 legals). The trout in the Umatilla River are stocked for a short seasonal fishery near Pendleton after wild smolts have migrated past. There appears to be no rearing of juvenile steelhead in this reach during summer because the water becomes too warm for survival of salmonids. Continue the prohibition on stocking Lake Simtustus with brown trout (stock with juvenile Deschutes summer steelhead instead) to reduce risks to wild steelhead from any fish that escape to the lower Deschutes River (initiated in 1997). Trout stocking was discontinued in the lower Deschutes River after 1977, in Fifteenmile Creek and the Walla Walla River after 1993, in the Middle and South Forks of the John Day River after 1994, and in Desolation Creek (North Fork John Day basin) after 1995.

Continue restricting anglers to the use of artificial flies and lures in the Umatilla River upstream from the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) reservation boundary and the South Fork Walla Walla River. Continue restricting the Umatilla River above the reservation boundary to catch and release only for trout. These regulations were implemented to protect redband trout, bull trout and juvenile wild steelhead.

Continue to restrict harvest in the Deschutes River to 2 trout/day between 10 inches and 13 inches year round and prohibit the use of bait except in the 3 mile reach below Sherars Falls (in effect since 1983). Continue the new (1997) regulations on tributaries of the Deschutes where a late May opening of trout season, 2 fish bag limit, and 8-inch minimum length were imposed to protect steelhead smolts. Continue the new regulations in Trout Creek that limit trout anglers to artificial flies and lures.

Snake River Basin ESU. Work with appropriate tribal co-managers in each basin to develop agreement on any significant modifications to ODFW trout fishing regulations or hatchery trout stocking programs. Terminate stocking of trout in Catherine Creek (4,000 legal) and the upper Grande Ronde River (5,000 legal) in 1998. Mileage and trout numbers stocked have been reduced compared to previous decades, but there are indications that less than 20% of fish stocked in these two streams are caught by anglers. These are the last two locations in the ESU where trout were being stocked in wild steelhead habitat. The stocking of fingerling rainbow trout (35,000 to 140,000 per year) in the lower Grande Ronde and Wallowa rivers was discontinued after 1984. Stocking of legal was discontinued in the Wallowa River after 1995. Stocking of legal was discontinued in Prairie Creek and Lostine River after 1992 and in Bear Creek after 1994.

Continue the new (1997) regulations requiring an 8 inch minimum for trout throughout the ESU. Continue the regulations on the lower Grande Ronde, lower Willowa, and lower Imnaha Rivers that require release of all unmarked rainbow trout and allow anglers to keep only adipose clipped residual hatchery steelhead to protect wild rainbow and steelhead while encouraging the harvest of residual hatchery steelhead.

Phase 2. No additional funds are needed to implement this measure, so no Phase 2 elements are listed.

ODFW IBIS - Assess Adult Escapement and Juvenile Production of Wild Steelhead

See description below under **Biological Objective B** that addresses review and adjustment of population health goals for wild steelhead.

ODFW IIC3S - Assess Marine Survival of Wild Steelhead

See description below under **Factor for Decline: Ocean Productivity, Biological Objective B**, regarding increasing our ability to measure and respond to changes in ocean conditions.

Federal Agency Measures:

NOAA-NMFS8 - Fisheries Harvest

Promote harvest plans that protect listed species; fund marking of hatchery steelhead to enable selective fisheries with minimal impacts to wild steelhead.

NOAA-COP23 - Pacific Northwest Coastal Ecosystem Regional Study

Fund \$5M for 5 years to study linkages between coastal and offshore waters near Coos Bay and two sites in Washington.

Biological Objective:

- B. Critically review and adjust spawning escapement or other population health goals for wild steelhead to ensure they are adequate to fully rebuild sustainable levels of natural production that utilize the available spawning and rearing habitat in Oregon's watersheds.*

Measures:

ODFW IAIS - Establish Population Health Goals for Wild Steelhead

Work with appropriate tribal co-managers in each basin and with NMFS to develop goals for adult escapement or other measures of wild steelhead population health for a representative sample of populations in each ESU. Measured population health in comparison with the goals will be used to determine progress toward restoration in each

ESU and to make adjustments in harvest management, hatchery programs, and habitat protection/restoration.

In setting population health goals, ODFW will place an emphasis on maintaining as many populations as possible because we believe the potential for a species to adapt to changing environmental conditions is more dependent on the number of populations than high abundance of a few populations. We are a long way from being able to establish realistic escapement goals for steelhead in most basins, are not convinced they are as useful as escapement goals are for coho salmon, and wish to look at other measures of population health in setting goals. We need to look at other indicators of population health such as juvenile seeding, geographic distribution, and life history diversity. Data needs include establishment of baseline index measures for all or some combination of adult/redd/smolt/presmolt population measures. These data needs are addressed by ODFW IB1S, *Assess Adult Escapement and Juvenile Production of Wild Steelhead*. For situations where we have inadequate data on fish abundance, we will investigate the utility of using habitat information and setting habitat-based goals calibrated from populations where we have both habitat and steelhead abundance data. Any habitat-based production goals must be conditioned with a desire and expectation that habitat will be improved through *The Oregon Plan*.

Phase 1. Work with appropriate tribal co-managers in each basin to develop population health goals for index areas. These goals may be in terms of escapement past counting facilities or spawning ground counts, but should address other indicators of population health such as juvenile seeding, geographic distribution, and life history diversity, if possible. Use historic data and estimates of historic abundance to assist, and use what few stock-recruitment relationships we have to assist in setting initial goals. Assess utility of using coarse-scale habitat information to set habitat-based goals for escapement in basins lacking adequate adult or juvenile data. This would involve using existing data on habitat parameters and some form of WDFW's habitat-based production potential model, perhaps adjusted based on existing information on relationships between steelhead abundance and habitat parameters in Western Oregon basins.

Specifics/Priorities for the Two Coastal Steelhead ESUs Population health goals will be set for at least the following basins, index areas, or counting facilities by June 30, 1998:

- Upper Nehalem Basin winter steelhead (exact areas not yet determined)
- Salmonberry River winter steelhead
- North Fork Nehalem River winter steelhead at trap above hatchery
- Tillamook Bay Tributaries winter steelhead (exact areas not yet determined)
- Siletz River summer steelhead at Siletz Falls
- Siletz Basin winter steelhead (exact areas not yet determined)
- Alesea Basin winter steelhead (exact areas not yet determined)
- Siuslaw Basin winter steelhead (exact areas not yet determined)
- Smith River winter steelhead (exact areas not yet determined)
- North Umpqua River summer and winter steelhead at Winchester Dam

Coos Basin winter steelhead (exact areas not yet determined)
Coquille Basin winter steelhead (exact areas not yet determined)
Elk River winter steelhead (exact areas not yet determined)
Rogue River summer and winter steelhead at Gold Ray Dam
Upper Rogue Basin index streams (at least 7), may use redd counts
Rogue River summer steelhead at Huntley Park seining site
Ocean Tributaries south of the Rogue River (exact areas not yet determined)

Specifics/Priorities for the Three Lower Columbia ESUs

This measure is similar to what WDFW is proposing in their draft *Lower Columbia Steelhead Conservation Initiative* for the portions of the SW Washington and Lower Columbia ESUs that are in Washington. However, data sets are generally better for Washington steelhead populations due to more intensive monitoring of escapement in the past.

SW Washington ESU. Annually repeat redd count surveys initiated in a number of tributaries during 1996 to establish an index of escapement (see description under ODFW IB1), and use a value equal to twice the 1996 counts as an interim goal (set by June 30, 1998).

Lower Columbia ESU. Work with CTWSRO to use data from trap counts of wild adults at Powerdale Dam (and perhaps the relationship to the data from the smolt trap just above the dam) to periodically review, and revise as needed in light of improved habitat or new data on fish survival and abundance, the escapement goals for winter and summer steelhead set in the Hood River Production Project Master Plan . Those escapement goals are 1,200 wild winter adults and 1,200 wild summer adults at Powerdale Dam. Use available information to set escapement goals for the following streams by June 30, 1998:

Sandy River at Marmot Dam
Lower Sandy River tributary complex (exact areas not yet determined)
Clackamas River at North Fork Dam
Lower Clackamas/Abernathy Creek complex (exact areas not yet determined)
Scappoose/Milton creek complex (exact areas not yet determined)

Upper Willamette ESU. Review appropriateness of the existing escapement goal at Foster Dam for the upper South Santiam River population of winter steelhead and review the “unofficial” goal of 4,000 late-run winter steelhead at Willamette Falls for an aggregate goal of all populations in the ESU by June 30, 1998. Review existing spawning survey data for the lower South Santiam, North Santiam, Calapooia, and Molalla populations and set spawning escapement goals by June 30, 1998. Design programs and identify funding needs for improving the monitoring of abundance and establishing escapement goals for populations in east-side tributaries to the Willamette River. Do the same for west-side tributaries if further analysis indicates existence of indigenous populations (populations on the west side may have been initiated from hatchery releases).

Specifics/Priorities for the Two Eastern Oregon ESUs

Middle Columbia ESU. Continue to use the escapement goal for wild summer steelhead passing Sherars Falls that was recently adopted in the ODFW Fish Management Plan for the Deschutes River Basin. Work with appropriate tribal co-managers in each basin to review the redd count goal for index areas of the John Day Basin set by the ODFW John Day District staff and establish some form of population health goals for Fifteenmile Creek, the Umatilla River (consider an escapement goal at Threemile Dam), and the Walla Walla River (consider an escapement goal at Nursery Bridge Dam), by June 30, 1998,.

Snake River Basin ESU. Until new provisions of the CRFMP are developed through the US v Oregon process, use the escapement goal of 30,000 wild steelhead (20,000 A-run fish and 10,000 B-run fish) above Lower Granite Dam identified in the CRFMP as a short term goal for the entire Snake Basin above Lower Granite Dam (the Grande Ronde and Imnaha basins in Oregon are included). For a long-term restoration goal for population health plus in-basin fisheries, use a goal of 60,000 wild steelhead based on data presented in the Lower Snake River Compensation Plan that provided an estimated average escapement of 61,345 for 1954-70. We believe these goals would provide for recovery of wild populations in the Imnaha and Grande Ronde. ODFW would also review existing escapement goals for wild steelhead (such as the total number and ratio of hatchery:wild adults passing Little Sheep Creek trap in the Imnaha Basin) and establish some form of escapement goals for wild populations within the Imnaha and Grande Ronde Basins by June 30, 1998, coordinating with appropriate tribal co-managers in each basin.

Phase 2. Depending on funding obtained for ODFW IB1S, *Assess Adult Escapement and Juvenile Production of Wild Steelhead* and ODFW IB2S, *Inventory and Monitor Wild Steelhead Habitat and Distribution*, refine escapement goals as data become available and additional analyses can be examined.

ODFW IB1S - Assess Adult Escapement and Juvenile Production of Wild Steelhead

Collect critical information on the status and distribution of wild adult escapement and juvenile steelhead production on federal, non-federal and private lands with information summarized and presented using GIS techniques. Without substantial, accurate monitoring of numbers and distribution of spawning adults and juvenile steelhead it will remain difficult to estimate the production of steelhead, monitor population trends, and determine status relative to listing or delisting criteria. At a minimum, we need to monitor representative populations in each ESU to assess the abundance trends and status relative to listing or delisting criteria. Considerable data will be obtained on cutthroat

trout juveniles and some on searun cutthroat adults during steelhead sampling because of high overlap in geographic distribution and similar susceptibility to sampling methods.

Specifics/Priorities for the Two Coastal Steelhead ESUs

Phase 1. We have few existing adult and juvenile surveys so most work will be Phase 2 activities. We will continue to monitor smolt numbers migrating past traps in Cummins and Tenmile creeks on the mid-coast within the Oregon Coast ESU, and Elk River, Hunter Creek, Lobster Creek (Rogue River), and Winchuck River within the Klamath Mountains Province ESU. We will start trapping smolts in at least the Chetco River and Evans, Big Butte, and Little Butte Creeks. We will continue to count adults through viewing windows at Gold Ray Dam on the Rogue River and Winchester Dam on the North Umpqua River and through traps at Siletz Falls on the Siletz River and a cascade above the hatchery on the North Nehalem River. We will continue to conduct spawning surveys with the help of volunteers on the Salmonberry River in the Nehalem Basin. Summer steelhead abundance at entry to the Rogue River will continue to be estimated from the beach seining operation established in 1975. We will add several sampling sites in KMP ESU streams (to be determined) using traps, nets, spawning surveys, or other methods to index abundance of wild and hatchery adults. We will add sampling in the North Fork Nehalem, the North Umpqua, and several streams in mid-coast basins to test and validate methods for estimating adult abundance.

Phase 2. Utilize smolt data from traps that will be deployed largely to monitor coho as part of the *Oregon Plan*, and where these provide good quality data on steelhead smolt numbers, set up adult or redd sampling programs. As funding permits, expand adult and/or juvenile surveys, with priority sampling targeted on the following populations/areas:

- Tenmile, Cummins, or Big Creek in the mid-coast area
- Salmonberry River (add smolt trap)
- North Fork Nehalem River (add smolt trap)
- Sixes River (add smolt traps with funding assistance from USFS)

Specifics/Priorities for the Three Lower Columbia ESUs

This measure is similar to what WDFW is proposing in their draft *Lower Columbia Steelhead Conservation Initiative* for the portions of the SW Washington and Lower Columbia ESUs that are in Washington. However, monitoring of adult steelhead escapement has been more intensive while monitoring of steelhead smolt abundance has been less intensive compared with Oregon in the past.

SW Washington ESU

Phase 1. Establish a trapping operation on the Lewis and Clark River or other stream to monitor steelhead adults and smolts starting in 1999.

Phase 2. Restart the systematic spawning surveys which were conducted in 1996 on the following streams during March 1 through May 15 (these dates combined with examination of fish for fin-clips excludes the counting of nearly all hatchery fish):

Lewis and Clark River	2 reaches
S. Fk. Klaskanine River	1 reach
Plympton Creek	1 reach
Clatskanie River	4 reaches

Lower Columbia ESU

Phase 1. Establish a trapping operation on Scappoose Creek or similar stream to monitor steelhead adults and smolts starting in 1999. Continue monitoring steelhead smolt migrations and summer and winter steelhead adult returns in the Hood River in cooperation with CTWSRO. We have been trapping and separately counting wild and hatchery adults in the ladder trap at Powerdale Dam (river mile 4) since 1991. We have been estimating smolt numbers using a floating juvenile trap just above the dam since 1994. Continue statistical creel survey below Powerdale Dam to estimate catch of adults (initiated in 1995). Continue indexing juvenile steelhead/rainbow abundance in 14 tributary and mainstem sites of the Hood River (initiated in 1994). Continuation of BPA funding or replacement with another source needed for all of the above monitoring.

Continue monitoring winter steelhead adults at North Fork Dam on the Clackamas River and Marmot Dam on the Sandy River. Continue the monitoring of smolts migrating past North Fork Dam on the Clackamas River that began in the 1960s and repeat genetic sampling annually (or as warranted) to estimate the percentage of smolts originating from hatchery summer steelhead spawning in the wild.

Phase 2. Seek improved counting facilities at dams on the Sandy and Clackamas rivers through the FERC relicensing process (decisions possible over the next 2-5 years). Improvements at Marmot Dam on the Sandy River are a very high priority.

Upper Willamette ESU

Phase 1. Continue to monitor steelhead at Willamette Falls counting station and continue to count and pass winter steelhead, but not summer steelhead, at Foster Dam on the South Santiam River. Continue adult spawning surveys on the Calapooia, Molalla, and North Santiam rivers. Investigate feasibility and funding opportunities for establishing additional counting facilities at fishways and/or spawning surveys and juvenile sampling programs, especially at the Stayton Island complex on the North Santiam River and a site on the Calapooia River.

Phase 2. Construct counting facilities at fishways and/or establish spawning survey and juvenile sampling programs based on data needs and feasibility studies.

Specifics/Priorities for the Two Eastern Oregon ESUs

Phase 1. Continue to conduct annual steelhead redd counts in selected streams. In some basins, such as the Deschutes, Umatilla, and Walla Walla, these spawning surveys provide supplemental data on escapement, spawning timing, and distribution of spawners where the primary measure of escapement is by other methods (see below). In the John Day, Grande Ronde, and Imnaha basins spawning surveys are the primary method used to assess trends in adult escapement. Index spawning survey areas in these basins were established in the 1960s to monitor trends in wild steelhead spawning escapement expressed as redds/mile. Surveys cover 81 miles of 18 streams in the Grande Ronde basin, 5 miles of one stream in the Imnaha basin, and 100 miles of 34 streams in the John Day basin. Continue redd count surveys on Fifteenmile Creek and its tributaries (Eightmile and Ramsey creeks) to the extent funding allows (BPA and ODFW funds).

Work with CTWSRO to continue making mark-recapture estimates using trapping facilities at Sherars Falls and recapture facilities at Warm Springs and Round Butte hatcheries to estimate hatchery and wild steelhead escapement into the Deschutes basin above Sherars Falls (CTWSRO funds the maintenance of the Sherars Falls trap).

Continue to cooperatively operate an adult fish trap at Three Mile Falls Dam on the Umatilla River with the CTUIR. The trap has provided complete counts of wild and hatchery steelhead since 1988 (prior counts based on electronic counter estimates have undetermined accuracy). Also continue to make mark-recapture estimates of adult steelhead abundance in Birch Creek using the adult trap installed within the fish ladder of the Weinke diversion in January 1996.

Continue to operate an adult fish trap at the Nursery Bridge Dam on the Walla Walla River to count wild and hatchery steelhead (trapping began in December 1992). All trapped adults are marked with an identifying opercle punch. Enumeration of marked and unmarked kelt recoveries at a large diversion intake upstream from the trap is used to estimate the percentage of adults that pass over the Nursery Bridge Dam without being counted in the trap and to make a mark-recapture estimate of total escapement over Nursery Bridge Dam.

Continue to operate adult traps in Deer Cr. (Grande Ronde basin) and Little Sheep Cr. (Imnaha basin). These facilities are used to collect adult steelhead for hatchery programs and are also used to monitor wild steelhead escapement.

Continue working with tribes and USFS to estimate numbers of wild steelhead smolts passing downstream migrant traps in the Deschutes, Umatilla, Grande

Ronde, and Imnaha basins. In the Deschutes basin, CTWSRO is operating traps in Warm Springs River and Shitike Creek. In the Umatilla basin, CTUIR is operating two floating juvenile traps alternately in several locations in the Umatilla basin (mouth of Squaw and Meacham creeks and the mainstem Umatilla River just above the mouth of Meacham Creek), and ODFW has developed smolt migration estimates from trapping facilities at several large irrigation diversions and at a floating juvenile trap below Three Mile Dam. In the Grande Ronde basin, ODFW is operating floating juvenile traps in upper Grande Ronde, Catherine Creek, middle Grande Ronde, Lostine River, Wallowa River, and lower Grande Ronde. USFS and CTUIR are operating floating juvenile traps in Meadow Creek system (upper Grande Ronde) and Lookingglass Creek, respectively. In the Imnaha basin, Nez Perce Tribe (NPT) is operating floating juvenile traps in the upper and lower reaches of the Imnaha River. Trapping by ODFW and tribes in the Grande Ronde and Imnaha is primarily for collecting data on life history, abundance, and migration rates of spring chinook smolts but will also provide information on wild steelhead.

Phase 2. If funds are obtained, work with CTWSRO to coordinate investigations of the number of in-basin and out-of-basin hatchery steelhead spawning in natural production areas of the Deschutes Basin, not just the number migrating past Sherars Falls on the main river. This is a high priority need due to the high percentage of hatchery strays documented at Sherars Falls and analyses by ODFW showing very low recruitment from natural spawning in the Deschutes Basin. In the Grande Ronde and Imnaha basins, ODFW is developing a study of hatchery/wild steelhead ratios in natural spawning areas. Additional funding and personnel will be needed to assess the abundance of hatchery adults relative to wild adults in natural spawning areas of the Grande Ronde, Imnaha, Umatilla, John Day, Deschutes, and Fifteenmile Creek basins. If adequate funds are obtained, add adult and juvenile trap/count site in Fifteenmile Creek.

ODFW IIIC3S - Assess Marine Survival of Wild Steelhead

See description below under **Factor for Decline: Ocean Productivity, Biological Objective B**, regarding increasing our ability to measure and respond to changes in ocean conditions.

Federal Agency Measures:

NOAA-NMFS8 - Fisheries Harvest

Promote harvest plans that protect listed species; fund marking of hatchery steelhead to enable selective fisheries with minimal impacts to wild steelhead.

NOAA-NMFS25 - Population Status

Complete series of coastwide population status reviews of five species of Pacific salmonids, with information on biology and ecology of each species.

Biological Objective:

- C. *Conduct steelhead fisheries that do not interfere with the restoration of wild steelhead.*

This objective addresses the responsibility of ODFW to provide steelhead fisheries when it can do so without depletion of indigenous species, as called for by the Wildlife Policy (ORS 496.012). In order to carry out the part of the policy's direction that calls for ODFW to provide recreational benefits to citizens, the following measures will be implemented. The emphasis will be on maintaining or adding selective fisheries on finclipped hatchery steelhead in situations where there is low risk of depleting wild populations or interfering with their restoration.

Measures:

ODFW IIA4S - Continue to Mark All Hatchery Steelhead

Phase 1. Continue to externally mark all Oregon hatchery steelhead juveniles prior to release using the adipose finclip as the mark except in special circumstances. This program has been underway since 1992. Marking enhances the ability to monitor the incidence and magnitude of hatchery fish straying on spawning grounds, aids in the development of new hatchery broodstocks based on wild fish, allows monitoring of hatchery and wild fish passing counting stations such as dams on the Rogue, Umpqua, Willamette, Clackamas, Sandy, Hood, and Columbia rivers, and allows continuation of selective fisheries targeted on hatchery fish. This marking is consistent with WDFW efforts in the SW Washington and Lower Columbia ESUs shared with Oregon. Universal use of the adipose finclip reduces handling time and potential trauma of wild fish because anglers can quickly look for an adipose fin and release wild fish without examining for other marks.

Phase 2. No additional funds are needed to implement this measure, so no Phase 2 elements are listed.

This measure is very similar to what WDFW is proposing in their draft *Lower Columbia Steelhead Conservation Initiative* for the portions of the SW Washington and Lower Columbia ESUs that are in Washington.

ODFW IIIB1S - Maintain Selective Harvest Opportunities on Hatchery Steelhead

Selective sport harvest opportunities will be maintained primarily by continuing to externally mark 100% of all hatchery steelhead smolts and continuing to require release of all unmarked steelhead (except in a few areas where hatchery steelhead are rare or absent and wild populations are robust enough to sustain some level of harvest). Stocking or

acclimating smolts to river reaches or tributaries below wild spawning areas will be used in some cases to achieve some degree of segregation of hatchery fish from wild fish and attract anglers to areas where a more selective harvest can occur on hatchery fish. Recycling of hatchery adults (hauling adults back below hatcheries and traps) will be used in some cases to increase selective harvest.

Description of many of the hatchery programs and harvest regulations that contribute to maintaining selective fisheries are contained in measures ODFW IIA1S and ODFW IIIA2S, respectively. See ODFW IIA1S (Implement Wild Fish Management Strategies for Steelhead) below under **Factor for Decline: Loss of Genetic Adaptation of Wild Populations from Interbreeding with Genetically Dissimilar, Less Fit Hatchery Fish, Biological Objective A**. See ODFW IIIA2S (Manage Steelhead Fisheries to Minimize Impact on Wild Steelhead) above under **Factor for Decline: Harvest Impacts to Spawning Escapement, Biological Objective A**. The following is intended to add to those ODFW measures.

For all ESUs, review approaches to altering angling regulations (such as increased bag limits for hatchery steelhead) in specific areas to increase selective harvest on hatchery adults without unacceptable risk to wild adults. Work with appropriate tribal co-managers in each basin to develop agreement on any significant modifications to ODFW fishing regulations (any changes will be contingent upon approval by the Oregon Fish and Wildlife Commission).

Specifics/Priorities for the Two Coastal Steelhead ESUs

Phase 1. Continue to stock marked hatchery steelhead in lower reaches of Coquille, Coos, Siuslaw, Siletz, Nestucca, Wilson, Kilchis, and Nehalem basins where anglers have good access and stocking is distanced to varying extents from wild steelhead spawning areas (review need for acclimating smolts in each situation and eliminate or pursue adding acclimation, as needed). The Necanicum River is a priority for investigation of trapping adults or other ways to reduce straying to Necanicum basin spawning grounds and to the wild population in Ecola Creek (a neighboring coastal stream) so that the popular winter steelhead hatchery program for anglers in the Necanicum does not need to be reduced.

Continue to recycle surplus Rogue summer steelhead below Cole Rivers Hatchery to increase selective harvest until fish are near spawning time and then release in lakes to isolate from wild spawning population while providing angling opportunity. Continue to release all surplus Rogue and Applegate winter steelhead in lakes.

Phase 2. Where the need is clear, seek funding for capturing and recycling adults through fisheries and/or for acclimation facilities. Where cost-effectiveness is adequate and risk to wild populations is minimal, seek funding for additional hatchery production.

Specifics/Priorities for the Three Lower Columbia ESUs

This measure is very similar to what WDFW is proposing in their draft *Lower Columbia Steelhead Conservation Initiative* for the portions of the SW Washington and Lower Columbia ESUs that are in Washington.

Phase 1. Continue to recycle some portion of hatchery steelhead trapped at North Fork Dam on the Clackamas River, Powerdale Dam on the Hood River, and Foster Dam on the South Santiam River to increase harvest rate on them (cease when fish are too mature to migrate and then release in lakes to isolate from wild spawning population while providing angling opportunity). Initiate a similar practice at Marmot Dam for summer and winter steelhead in the Sandy River by installing a temporary trap by late 1998 and continuing to negotiate with PGE to fund installation and operation of a permanent trap. Seek to move the mitigation smolts for Scoggins Dam out of the Tualatin River by the year 2000 and move them into the lower Clackamas River where smolt-to-adult survival and contribution to anglers would be greater (depends on negotiations with Bureau of Reclamation and approval by the Oregon Fish and Wildlife Commission to change ODFW basin management plans). Identify adult trapping opportunities (and possibly smolt acclimation opportunities) in the Clatskanie, S. Fk. Klaskanine, and Lewis and Clark rivers to protect wild winter steelhead spawning areas from any increase in hatchery smolt releases for selective fisheries.

Phase 2. Locate funding to recycle summer steelhead in the Willamette Basin to areas of good angler access to increase harvest rate on them. In other situations where the need is clear, seek funding for capturing and recycling adults through fisheries and/or for acclimation facilities. Where cost-effectiveness is adequate and risk to wild populations is minimal, seek funding for additional hatchery production.

Specifics/Priorities for the Two Eastern Oregon ESUs

Phase 1. Continue to investigate feasibility, benefits, and impacts of either acclimated or direct release of steelhead smolts into White River below the falls, possibly combined with adult trapping and recycling below Sherars Falls, to increase selective harvest hatchery steelhead in the Deschutes River. Work with CTWSRO to reach agreement on any proposed program.

Continue to investigate feasibility, benefits, and impacts of either acclimated or direct release of steelhead smolts in the lower Umatilla River between Echo and Barnhart to increase selective contribution of hatchery fish to anglers, and continue to seek agreement from CTUIR to test this strategy of redistributing smolt releases.

Participate in the planning for a hatchery program to enhance steelhead production and fisheries in the Walla Walla River starting from a wild broodstock as part of the Northeast Oregon Hatchery Project (NEOH). ODFW will seek to shape the NEOH Master Plan to stay in compliance with WFMP so risks to the genetic fitness of the

wild population caused by hatchery adults spawning with wild fish are adequately limited and risks to indigenous fishes from competition and other ecological interactions are adequately limited.

Phase 2. Where the need is clear, seek funding for capturing and recycling adults through fisheries and/or for acclimation facilities. Where cost-effectiveness is adequate and risk to wild populations is minimal, seek funding for additional hatchery production.

Federal Agency Measures:

NOAA-NMFS8 - Fisheries Harvest

Promote harvest plans that protect listed species; fund marking of hatchery steelhead to enable selective fisheries with minimal impacts to wild steelhead.

Biological Objective:

D. Minimize hook and release fishery impacts in steelhead fisheries.

Measures:

ODFW IIIC2S - Evaluate Hook and Release Mortality on Wild Steelhead

Current studies indicate a 3%-7% mortality rate on fish hooked and released in winter steelhead fisheries, but there are few studies and the mortality rate could be higher in the warmer water periods of summer steelhead fisheries. Because anglers hook in the range of 15%-40% of wild steelhead in Oregon steelhead fisheries, the current information suggests hooking mortality amounts to only 0.5%-3.0% of each wild population where catch and release fishing is allowed.

Phase 1. Monitor and assess studies done elsewhere and if they raise new concerns regarding catch and release mortality, investigate feasibility of doing evaluations and then develop proposals to seek funding. Consider possible need to conduct studies by run type (summer or winter) and gear type and size (bait, artificial lures, flies, etc.).

Specifics/Priorities for the Two Coastal Steelhead ESUs

Coordinate with California Department of Fish and Game on any proposed research.

Specifics/Priorities for the Three Lower Columbia ESUs

Coordinate with WDFW on any proposed research. This measure is very similar to what WDFW is proposing in their draft *Lower Columbia Steelhead Conservation Initiative* for the portions of the SW Washington and Lower Columbia ESUs that are in Washington.

Specifics/Priorities for the Two Eastern Oregon ESUs

Coordinate with Idaho Department of Fish and Game and WDFW on any proposed

research. In the Snake River Basin ESU, continue working with NMFS to address this issue through development of fish management and monitoring plans under a 4(d) ESA rule.

Phase 2. Conduct evaluations if needed and funded.

Monitoring:

The monitoring of steelhead harvest and monitoring of wild steelhead escapement is described in part above under ODFW IIIA2S and ODFW IB1S, respectively. Monitoring of wild steelhead harvested illegally or as bycatch in other fisheries is described in part below under **Factor for Decline: Illegal Steelhead Catch** and **Factor for Decline: Steelhead Bycatch in Commercial Fisheries**, respectively. Additional detail on monitoring of harvest and escapement of wild steelhead will be provided in a separate chapter on monitoring.

Adequacy:

Objective A will further reduce the low harvest impacts experienced since non-retention angling for wild steelhead was imposed throughout most of the state in 1992. Given a return to normal ocean survival conditions, this plan will deliver adults back to spawning areas at levels suitable to attain the population health goals while limiting future harvest impacts to a rate commensurate with rebuilding those populations that have declined from historical levels.

Objective B will establish and revise goals for adult spawning escapement or other measures of population health to assure habitats are fully seeded and will provide for the needed adult and juvenile monitoring to ensure progress towards meeting goals is being made. The currently funded level of monitoring is less than adequate in the Oregon Coast and SW Washington ESUs, and should also be increased in the other ESUs.

Objective C establishes that steelhead fisheries targeted on hatchery stocks be maintained, but modified as needed to minimize impacts on wild populations.

Objective D establishes a goal for assessing non-landed catch mortality, commonly known as hook-and-release mortality to get a better accounting of total harvest-related mortality factors. The information will also allow assessment of the adequacy of regulations requiring release of unmarked fish.

Taken together, these objectives and the measures developed to meet them represent an approach to managing steelhead harvest that should maintain those populations that are healthy and help rebuild those that are in decline.

II. Factor for Decline: Illegal Steelhead Catch

In past decades, much concern has been expressed about high seas fisheries in the north Pacific Ocean conducted by Japan and other nations. These fisheries are now regulated or banned by international agreements. Data for steelhead collected from these past fisheries indicate that Oregon's steelhead, and most other Northwest salmonids, were not significantly affected, and thus these fisheries were not a factor in the declines. This conclusion was based upon the location of these fisheries and the distribution of Northwest steelhead and salmon in the north Pacific.

Other forms of illegal steelhead take in fisheries are not well documented. Oregon's fishing regulations are enforced by the Oregon State Police (OSP). Compliance with regulations in tribal commercial fisheries above Bonneville Dam is monitored and enforced by the Columbia River Inter-Tribal Fisheries Enforcement office in Hood River. For Columbia River and Oregon coastal streams, OSP reports of poaching activities are not uncommon, but poaching is not likely to have been a primary factor for the decline of steelhead. There can, however, be localized impacts in small streams with smaller steelhead populations.

Biological Objectives:

- A. *Adequately assess rates of illegal take for the purpose of attaining more complete information on overall harvest-related impact and exploitation of steelhead.*
- and
- B. *Ensure that illegal recreational and commercial takes do not have unacceptable impacts on steelhead protection and restoration.*

Measures:

The Fish and Wildlife Division of Oregon State Police and ODFW are involved in gaining compliance through the following measures:

Inland-Recreational: Recreational fisheries in streams, rivers, and estuaries are monitored for season, species, size, and bag limit compliance by the OSP. Appropriate licenses and tags are also checked. ODFW also conducts recreational creel surveys in the lower Columbia and several other rivers and streams. These activities provide an additional opportunity to monitor angling activities and gain information on both targeted catch rates and prohibited species caught and released.

Inland-Commercial: Commercial salmon fisheries in the lower Columbia River are monitored by OSP and tribal commercial fisheries above Bonneville Dam are monitored by the Columbia River Inter-Tribal Fisheries Enforcement office in Hood River. OSP's effort also requires the monitoring of fish dealers and processors. ODFW also conducts extensive lower river commercial catch sampling of river gill netters and monitoring of

processing stations. This provides an important partnership link with OSP to monitor salmon catch and fishing activities.

ODFW IIID1S - *Emphasize Wild Steelhead Restoration in Annual Cooperative Enforcement Planning Process with Oregon State Police*

Phase 1. ODFW and the Fish and Wildlife Division of the Oregon State Police annually conduct a joint Cooperative Enforcement Planning (CEP) process at the district level to coordinate fishery monitoring and sampling activities and to establish enforcement priorities. The interaction of OSP and ODFW provides an effective linkage of enforcement, monitoring, and sampling activities. OSP is committed to implementing *The Oregon Plan* and is aware of the need to concentrate on illegal activities that might impact salmon and steelhead recovery. CEP efforts in 1997 and beyond will focus enforcement activities into priority locations and times to support salmon and steelhead restoration objectives. An area of growing emphasis will be enforcement of existing laws protecting fish during activities associated with resource extraction (logging, road construction, mining, grazing, etc.). ODFW and OSP will work with appropriate regulatory agencies to develop programs to routinely spot check extraction operations for compliance with fish and wildlife protection rules.

Specifics/Priorities for the Two Coastal Steelhead ESUs. Siletz and North Umpqua summer steelhead are highest priority because summer-steelhead are an uncommon and publicly prized resource on the Oregon coast, the Siletz population is depressed, and there is a history of illegal harvest in these areas. A "Fish Watch" program involving volunteers in the North Umpqua Basin was initiated in 1992.

Specifics/Priorities for the Three Lower Columbia ESUs. Winter steelhead populations of the Upper Willamette are the highest priority, followed by winter steelhead of the Clackamas, Sandy, and Hood rivers.

This measure is similar to what WDFW is proposing in their draft *Lower Columbia Steelhead Conservation Initiative* for the portions of the SW Washington and Lower Columbia ESUs that are in Washington.

Specifics/Priorities for the Two Eastern Oregon ESUs. The intensive steelhead and trout fisheries in the Deschutes River where summer steelhead population status is weak will be a high priority. Popular fisheries in the Grande Ronde and Wallowa rivers will also be high priorities.

Phase 2. No additional funding needs have been identified at this time to implement this measure, so no Phase 2 elements are listed.

SMB 2 - Enforce New Outfitter and Guide Laws

The Marine Board adopted rules authorized by ORS 704 on April 4, 1996. The rules require all guides to display a decal on boats and provide for revocation and suspension of

registrations for violations of state or federal wildlife laws. Rules now in effect are OAR Chapter 250 Division 16. The Marine board will work with OSP and county sheriffs to fully implement these new rules. Compliance is expected to be high.

ODFW IIIA2S - Manage Steelhead Fisheries to Minimize Impact on Wild Steelhead

See description above under **Factor for Decline: Harvest Impacts to Spawning Escapement, Biological Objective A**, regarding managing harvest impacts to strive for attainment of spawning escapement or other population health goals.

ODFW ID1 - Use of Volunteers

See description below under **Factor for Decline: Loss of Genetic Adaptation of Wild Populations, Biological Objective A**, regarding reducing the percentage of hatchery fish spawning in the wild.

Measures from Section 5: Large Storage Dams and Hydroelectric Projects:

PGE 14 - Fund Game Officer Position to Decrease Poaching in the Clackamas And Sandy

Phase 1: PGE will provide at least \$5,000 a year and fund raising assistance for the next five years to the Clackamas/Sandy Stewardship Fund. The purpose of this fund is to provide a State Police Game Officer with responsibilities restricted to the Clackamas and Sandy Basins to help decrease poaching.

Monitoring:

Current monitoring of illegal steelhead catch in recreational fisheries around the state and lower Columbia River commercial fisheries is described above. OSP is developing a compliance monitoring plan as part of *The Oregon Plan* to provide a more thorough and representative assessment of compliance rate with fishing regulations.

Adequacy:

Through continuing OSP enforcement and ODFW fishery sampling described above, the level of illegal harvest can be effectively minimized. The new compliance monitoring plan being developed will provide an improved tool for assessing the level and distribution of illegal harvest problems so that regulations, angler education, and enforcement activities can be improved and focused as needed.

III. Factor for Decline: Steelhead Bycatch in Commercial Fisheries

Steelhead bycatch is the incidental catch of steelhead during legal harvesting of other species in commercial fisheries. Oregon, California and Washington, have extensive shoreside and at-sea trawl fisheries that could potentially be a factor in the total impact and exploitation on salmon and steelhead. Current fisheries include a directed shoreside and at-sea whiting fishery and a shore-based domestic fishery for all other species collectively. However, existing at-sea observer and port sampling programs indicate that steelhead are a negligible portion of the total salmonid bycatch, and bycatch is not likely to be a significant factor in overall harvest exploitation for steelhead. Bycatch of steelhead appears to be an issue only for some Columbia River fisheries,

potentially having minor impacts on the Southwest Washington, Lower Columbia, Upper Willamette, Middle Columbia, and Snake River ESUs.

Biological Objective:

- A. *Keep steelhead bycatch at or below the presently low levels estimated in Oregon fisheries.*

Measures:

ODFW IIIA4S - Manage Non-steelhead Fisheries in the Columbia River to Minimize Bycatch of Wild Steelhead

Bycatch of steelhead in Columbia River commercial fisheries (mostly as fish caught and released from nets) can occur from December through April on wild winter steelhead, and from April through December on wild summer steelhead. Restrictions imposed in recent year commercial fisheries for other species have reduced steelhead bycatch to less than 1% of winter and summer steelhead runs. Commercial salmon seasons have been timed to maximize the ratio of salmon to steelhead and the change in recent years from 8 inch mesh to 9 inch mesh nets for the early fall seasons has reduced steelhead bycatch rate by about a third. Shad fishing gear was modified to shorter and shallower nets starting in 1995, substantially reducing salmonid handling rates, and commercial sturgeon seasons and gear size has been adjusted to further reduce incidental catch of steelhead.

This measure is similar to what WDFW is proposing in their draft *Lower Columbia Steelhead Conservation Initiative* for the portions of the SW Washington and Lower Columbia ESUs that are in Washington.

Phase 1. ODFW will continue to work with all co-managers of Columbia River commercial fisheries to maintain time, area, and gear restrictions that minimize bycatch of wild steelhead. If monitoring indicates a need, ODFW will seek new restrictions.

Phase 2. Develop a GSI (Genetic Stock Identification) sampling program to improve ability to manage fishery impacts on various steelhead ESUs migrating through the Columbia River. Explore DNA sampling and analyses if GSI fails to provide adequate data for fishery management.

Federal Agency Measures:

NOAA-NMFS8 - Fisheries Harvest

Promote harvest plans that protect listed species; fund marking of hatchery steelhead to enable selective fisheries with minimal impacts to wild steelhead.

NOAA-NMFS34 - Hire the Fisher Data Collection Program

Continue to support a program that received \$4.9 million during the fiscal year 1997 to hire fishers to gather data off the coast of Oregon, California and Washington. The

projects funded often include data important to salmon management and conservation. Projects range from testing the effects of a selective fishery in Young Bays on incidental take levels of wild stocks of spring chinook and steelhead, to tagging sea lions, a salmonid predator, in the Columbia River at Astoria.

Monitoring:

ODFW will continue to monitor sturgeon, salmon, shad, smelt, and anchovy fisheries in Oregon waters for bycatch of wild steelhead, including Young's Bay and other terminal area fisheries. We will continue to conduct on-board monitoring of Lower Columbia River gillnet fisheries targeting sturgeon, salmon, and shad to determine the rate at which steelhead are caught and released by season, area, and mesh size.

Steelhead have been a negligible part of the total salmonid bycatch in ocean fisheries. However, Oregon, in coordination with other West Coast states, is committed to continue the existing whiting shoreside sampling program that includes bycatch observation and analysis. This shoreside program and the companion federal (NMFS) at-sea observer program will provide the necessary monitoring of steelhead catch in the whiting fishery. Secondly, Oregon is coordinating a new West Coast Enhanced Data Collection Program in the domestic shore-based groundfish fishery to evaluate trawl fishery bycatch.

Adequacy:

Steelhead bycatch has been documented to be very low in most fisheries, but monitoring programs are in place and expanding to address bycatch of salmon in fisheries which also have potential impacts on steelhead. Any major change in steelhead bycatch will be detected by the monitoring that is described in a separate chapter of this supplement to *The Oregon Plan*.

IV. Factor for Decline: Ocean Productivity

Many conditions in the ocean affect ocean survival of Oregon anadromous salmonids. They can vary on annual, decadal and longer time scales, and at irregular intervals. Several environmental changes caused by the interaction of global atmospheric and oceanic conditions have been well studied, such as El Nino, but our ability to predict such future changes is not well developed.

For steelhead from Oregon rivers, ocean survival rate varies substantially from year to year, but the oceanographic factors affecting steelhead are not as apparent as they are for coho salmon. Part of the reason is that steelhead from a few southern Oregon rivers appear to migrate south in the ocean similar to all Oregon coho, but steelhead from most Oregon rivers migrate north as far as Alaskan waters. The data are not as extensive for steelhead as salmon because hatchery fish marking/tagging programs have not been as elaborate and extensive over the decades as for salmon where adults returning to hatcheries can be more clearly compared with the number of smolts released. Secondly, relatively few steelhead are caught in ocean fisheries to document where fish from a particular river or hatchery migrate for comparison with oceanographic conditions to which they are exposed. And finally, wild steelhead smolts are more difficult to capture than salmon smolts for monitoring abundance entering the ocean, and wild steelhead spawners are more difficult to enumerate than salmon for calculation of smolt-to-adult survival. Carcasses of salmon can be counted after they spawn, but steelhead live for extended periods after

spawning and some survive to make repeat spawning migrations from the ocean.

Since steelhead populations will decline during periods when ocean conditions are unfavorable for their survival, and it is not possible to influence the magnitude or frequency of unfavorable conditions, it is imperative to stabilize and improve freshwater survival and production to help buffer natural fluctuations in ocean survival. That is the core intent of *The Oregon Plan* for all anadromous species. Managing fisheries so that harvest impacts are not a significant contributor to failures to meet spawning escapement or population health goals (set under ODFW IA1S) will also play a key role in protecting wild steelhead populations in periods of unfavorable ocean conditions. Those population health goals will result in more angling restrictions if populations are below the goals as a result of persistent unfavorable ocean conditions.

Biological Objectives:

- A. *Manage steelhead harvest in response to ocean survival conditions*
- and
- B. *Increase our ability to measure and respond to changes in ocean conditions*

Measures:

ODFW IIIC3S - Assess Marine Survival of Wild Steelhead

Monitor marine survival of wild steelhead produced in selected Oregon index streams. Studies of the ocean survival rates for wild steelhead will allow more accurate assessment of ocean conditions and marine survival of smolts to adults. This will then allow increased accuracy and precision in separating changes in freshwater survival from changes in marine survival leading to an improved ability to assess factors for decline or recovery and an improved ability to assess effects of changes in freshwater habitat and fish management practices. In the absence of data on wild populations, use marine survival estimates for hatchery populations to infer relative year-to-year changes in survival rates for neighboring wild populations. However, it must be recognized that current data and the proposed methods provide estimates of survival in the estuarine and marine environment combined. Due to differences in habitat and the abundance and kinds of species that interact with juvenile and adult steelhead migrating through estuaries, survival rates may vary substantially among estuaries. Survival in estuaries may be a large component of total estuarine/marine survival in some cases, and may vary independently of survival in the marine environment. The degree of impact on estimates of marine survival may be small, but is unknown and would require very difficult and expensive sampling of smolts as they exit the estuary and adults as they re-return from the ocean.

Phase 1.

Specifics/Priorities for the Two Coastal Steelhead ESUs. Continue those smolt trapping operations that are associated with adult return sampling in the same watershed that are a subset of sampling identified under ODFW IB1S - *Assess Adult Escapement and Juvenile Production of Wild Steelhead*.

Specifics/Priorities for the Three Lower Columbia ESUs. Continue adult and smolt monitoring in the Hood and Clackamas rivers so estimates of marine survival can be made. Establish reliable smolt migration monitoring in the SW Washington and Upper Willamette ESUs to complement adult monitoring as identified in ODFW IB1S - *Assess Adult Escapement and Juvenile Production of Wild Steelhead*.

Phase 2.

Specifics/Priorities for the Two Coastal Steelhead ESUs. Sample steelhead smolts at additional sites associated with coho smolt sampling funded through the *Oregon Plan* by the legislature.

Specifics/Priorities for the Three Lower Columbia ESUs. Establish reliable smolt migration monitoring on representative streams/rivers in the SW Washington, Lower Columbia, and Upper Willamette ESUs to complement adult monitoring on the same streams/rivers. The smolt trapping capability at Marmot Dam on the Sandy River, (possibly in the canal screens/bypass system) needs to be developed. Smolt data from the floating trap operated in Still Creek (Sandy Basin) by the USFS will be reviewed for its utility and the need to maintain it as a monitoring site determined. Improvements in facilities and/or methodologies for monitoring smolts at Willamette Falls need to be explored to see if total wild winter steelhead smolts migrating from the Willamette River could be estimated.

ODFW IIIA2S - Manage Steelhead Fisheries to Minimize Impact on Wild Steelhead

See description above under **Factor for Decline: Harvest Impacts to Spawning Escapement, Biological Objective A**, regarding managing harvest impacts to strive for attainment of spawning escapement or other population health goals.

Federal Agency Measures:

NOAA-COP23 - Pacific Northwest Coastal Ecosystem Regional Study

Fund \$5M for 5 years to study linkages between coastal and offshore waters near Coos Bay and two sites in Washington.

NOAA-NMFS25 - Population Status

Complete series of coastwide population status reviews of five species of Pacific salmonids, with information on biology and ecology of each species.

NOAA-NMFS26 - Estuarine and Ocean Ecology Research

Fund and staff new program investigating relationship of the environment to marine life; initial research is on juvenile salmonids in Oregon estuaries.

NOAA-COP27 - U.S. Global Ocean Ecosystem Dynamics Program (GLOBEC)

Fund and participate in long-term studies of ocean circulation and climate change, and their effects on ecosystem functions, including productivity and salmon abundance. These projects include one that will seek to formulate models for certain species of salmon

influenced by the Californian current, with the purpose of linking changes in the physical environment to population projections, and another that will try to reconstruct trends in salmon abundance over the past 500 2000 years and determine the relationship between salmon abundance and climate change.

NOAA-NMFS31 - Access Remote Sensing Data through the Global Fiducial Program

Submit a proposal to use the remote sensing capability available through the Global Fiducial Program (GFP) to monitor watershed and river reach changes over time. The purpose of the GFP is to utilize the unique capabilities of classified remote sensing assets to create a legacy of long term environmental data to benefit the environmental missions of civil federal agencies. This data would be combined with data on steelhead and salmon abundance and distribution to understand the influence of habitat conditions on salmon populations.

NOAA-NOPP32 - National Ocean Partnership Program

Research on relationship of ocean climate to ecosystem effects.

NOAA-OAR33 - Effects of El Nino

Fund \$1.5M of proposals to capture unusual conditions or impacts of El Nino, to increase our understanding of effects of climate on marine ecosystems.

Monitoring:

Several data series related to ocean productivity are maintained by ODFW, and sites are being established to provide representative estimates of smolt production and adult returns to allow calculation of smolt to adult survival rates. ODFW will continue working with ocean environmental parameters in testing new approaches to determining factors affecting ocean survival of steelhead populations.

Adequacy:

The increased monitoring proposed for salmon and steelhead smolt and adult return numbers in conjunction with oceanographic data will substantially help in determining factors affecting ocean survival of steelhead and potentially lead to predictors of adult abundance. Because information will remain sparse on where steelhead from different parts of the state are rearing in the ocean, statistically-based and accurate pre-season steelhead predictive models may not be possible. However, coarse-scale predictions of relative changes in adult abundance should be possible and will be helpful in managing harvest impacts on steelhead to adjust for major changes in ocean survival. If the proposed monitoring of adult and juvenile abundance is not funded, the plan will not adequately address this factor for decline.

V. Factor for Decline: Loss of Genetic Adaptation of Wild Populations from Interbreeding with Genetically Dissimilar, Less Fit Hatchery Fish

Wild fish, over eons, have developed specialized adaptations to their specific environments through the process of natural selection. This is especially important to anadromous salmonids because of their complex life cycles. Research has demonstrated that local adaptation, sometimes on a surprisingly small geographic or even within-basin scale, can play a critical role in the dynamics of specific local populations. Some of these locally important adaptations include life history traits such as run timing, emergence timing, movement within the basin, timing of smoltification and migratory patterns in the ocean. These and other genetically influenced factors can play a significant role in the success of each population based on their "fitness" for their specific habitats.

As fish are brought into hatcheries, subtle changes in selection of genetic traits can take place. Selection for changed run timing can take place if care is not taken to represent all portions of the natural run in the egg take. Growth environments in hatcheries are different from the wild, resulting in different growth and smolting patterns. This can change the ultimate survival of the hatchery reared fish, thus selecting for different traits. It is possible that individual fish that are more docile or tolerant of crowded conditions are likely to survive at higher rates in hatchery environments, leading to domestication and producing fish less fit to meet the rigors of the wild environment. Of even greater impact was the practice of using fish from a different location for stocking, thus introducing fish adapted to different environments.

The potential impact of these genetic effects on local wild populations can vary. If hatchery fish are intercepted in fisheries or removed at fish traps, little impact will occur to wild populations. When hatchery fish, particularly those derived from out of basin sources or domesticated in hatcheries for many years, stray to interbreed with wild fish, the subsequent fitness of the wild population to its native habitat may decline.

In 1994, the Oregon Fish and Wildlife Commission adopted strategies for implementing the Wild Fish Management Policy (WFMP) as it relates to hatchery fish impacts on wild populations in coastal basins. Nearly all the strategies have been fully implemented, but effects on the percentage of hatchery adults spawning with wild fish can not yet be expected in some cases, and sampling has not been completed in many other cases to detect the effect on percentage hatchery fish that should have began occurring in the last year or two (see Attachment 1). These strategies were based on guidelines described in the WFMP concerning the amount of straying of hatchery fish into spawning areas and the degree of difference of the hatchery stocks from local wild populations. In many Oregon streams, hatchery steelhead being used now were derived from the wild populations where the fish are stocked. But some were not, and many broodstocks have not received significant input of wild genes recently, and thus are not considered in the highest category under the WFMP that would allow up to 50% hatchery fish on spawning grounds. Instead, they are categorized in a lower category, and under the policy must be limited to some percentage between 5% and 30%, depending on how different from the wild population the hatchery stock is judged to be.

The magnitude of genetic impact on wild steelhead populations caused by hatchery fish is debatable in most Oregon streams, due partly to a lack of information on changes in the productive capacity of wild populations over time. It has been shown that hatchery fish can alter fitness of wild steelhead populations if wild adults are not a substantial portion of the hatchery broodstock each year, but no studies have been completed to show the rate of recovery of fitness in a wild steelhead population when hatchery fish no longer spawn with the wild population due to discontinued stocking or removal of hatchery adults before they reach spawning grounds. There are Oregon streams where stocking of hatchery steelhead occurred for a period of years and was then discontinued earlier in this century. In addition, some Oregon basins have received little (or zero) historical stocking, yet populations have declined along with basins receiving numerous hatchery fish. This suggests that in many Oregon basins, hatchery fish are not the primary cause of the decline in wild steelhead. Nonetheless, hatchery fish appear to be a contributor to decline in some basins and steps are being taken to further reduce the potential of genetic impact to wild steelhead populations statewide. There are even some Oregon streams where stocking of hatchery steelhead has been entirely eliminated in recent years.

Biological Objective:

- A. *Reduce the genetic risk to wild steelhead populations by controlling the percentage of hatchery fish spawning with wild fish consistent with guidelines of the Wild Fish Management Policy.*

Measures:

ODFW IIAIS - Implement Wild Fish Management Strategies for Steelhead

Complete the implementation of Wild Fish Management Policy (WFMP) strategies for coastal steelhead as approved by the Oregon Fish and Wildlife Commission in 1994 (complete by December 31, 1998). For the rest of Oregon, develop WFMP strategies for all steelhead hatchery programs in a cooperative process with tribal co-managers, funding entities, and the public by December 31, 2000 and commence implementing the strategies. Emphasize an adaptive management approach whereby programs will be monitored and then adjusted based on evaluation.

Unless part of a specific program to rebuild or reestablish wild runs, ODFW will release hatchery steelhead juveniles only in areas where we expect the majority of the returning adults to either be caught in fisheries or subsequently trapped and prevented from entering natural spawning areas in proportions excessive to the guidelines in the Wild Fish Management Policy (WFMP). Where adult trapping sites are not available ODFW will use local hatchery broodstocks and scale smolt release numbers to wild fish abundance to meet fishery needs and guidelines in the WFMP. Capture of local wild broodstock will follow restrictions in the WFMP, and may be done through cooperative collection activities (e.g., angling or trapping) by volunteers to overcome cost impediments in some situations.

Where the objective is prevention of straying by hatchery steelhead adults to wild fish spawning areas, ODFW will place a higher priority on funds for adult trapping facilities than for acclimation facilities because recent research suggests steelhead released directly into a tributary will return to the tributary as accurately as fish that are acclimated there. Acclimation may be an advantage over direct release when trying to increase survival of smolts after a long haul from a hatchery or when trying to attract and “hold” adults in a lower reach of a river below natural spawning areas in the absence of a substantial tributary where smolts could be released. We will emphasize an adaptive management approach whereby programs will be monitored and then adjusted based on evaluation.

We will continue, and expand where possible, programs to release surplus hatchery adults into selected lakes or ponds where impacts on indigenous fish are very unlikely and anglers have a good opportunity to harvest the adults.

Specifics/Priorities for the Two Coastal Steelhead ESUs. By December 31, 1998, complete the implementation of Wild Fish Management Policy (WFMP) strategies for coastal steelhead as approved by the Oregon Fish and Wildlife Commission in 1994. Nearly all the strategies have been fully implemented, but effects on the percentage of hatchery adults spawning with wild fish can not yet be expected in some cases, and sampling has not been completed in many other cases to detect the effect on percentage hatchery fish that should have begun occurring in the last year or two (see Attachment 1).

The Oregon portion of the KMP ESU contains 16 populations, of which only 4 have hatchery programs. In all cases these hatchery programs are now based upon broodstocks developed from local wild populations. In accordance with restrictions under the WFMP, these programs are being implemented such that hatchery fish comprise no more than 30% of the natural spawning population.

Of the 71 wild populations in the Oregon Coast ESU, only 24 had hatchery programs prior to 1994. Recent actions have eliminated 8 of these 24 hatchery programs. Of the remaining 16 programs, 9 are now based upon broodstocks developed from local wild populations which under WFMP guidelines are being implemented such that hatchery fish comprise no more than 30% of the natural spawning population. The remaining 7 hatchery programs are based upon domesticated broodstock with rearing, release, and recapture strategies to limit the percentage of hatchery fish to less than 10% of the naturally spawning population.

WFMP strategies for the two coastal ESUs have included: 1) Incorporation of wild fish into hatchery broodstocks, 2) Reduced percentage of hatchery fish spawning with wild fish by relocation of smolt release sites farther from wild spawning areas (with acclimation, if need for it is clear), 3) Reduced numbers of hatchery fish released, and 4) Improved adult capture facilities to remove hatchery fish below wild spawning areas. ODFW will also work to develop smolt rearing and release strategies that reduce residualism of smolts (a much greater concern for programs intended to benefit harvest than those intended entirely or partially to restore wild fish production).

Phase 1. Steelhead hatchery programs will be adjusted as needed to meet Wild Fish Management Policy goals (most are nearly in compliance now, with nearly all broodstocks from local origin, stocking limited to only a few drainages, and reduced numbers of smolts stocked; see Attachment 1).

Rogue and Applegate steelhead: Continue to incorporate all wild steelhead captured at Cole Rivers Hatchery and at the Applegate Dam trap into hatchery summer and winter steelhead broodstocks. Trap additional wild broodstock at Gold Ray Dam for incorporation into Rogue summer and winter steelhead broodstocks, if needed for compliance with WFMP. Continue hand grading Rogue and Applegate two-year winter steelhead smolts to remove precocial males and small fish (less than 18 cm at release) to minimize residualism in wild fish rearing areas. Continue to recycle surplus Rogue summer steelhead below Cole Rivers Hatchery to increase selective harvest until fish are near spawning time and then release in lakes to isolate from wild spawning population. Continue to release all surplus Rogue and Applegate winter steelhead in lakes.

Siletz summer steelhead: See description below under **Factor for Decline: Low Density Reproductive Failure of Wild Populations, Biological Objective A, Measure ODFW IIB1S.**

Wilson River winter steelhead: A priority, with wild broodstock collection initiated in winter-spring of 1997.

Phase 2. Will expand monitoring of hatchery : wild ratios on spawning grounds to more streams, improve adult capture facilities to collect hatchery fish for direct removal or recycling back through fisheries for removal by anglers, and provide additional acclimation facilities if the need for them is clear.

Specifics/Priorities for the Three Lower Columbia ESUs. The following approaches and actions are consistent with those being proposed by WDFW in their draft *Lower Columbia Steelhead Conservation Initiative* for the portions of the SW Washington and Lower Columbia ESUs that are in Washington. ODFW will also track success of WDFW programs that strive to select for separate spawning time of hatchery steelhead compared with wild steelhead in tributaries of the Lower Columbia River and consider implementing in selected Oregon streams.

SW Washington ESU. Continue to evaluate the re-introduction program that is placing late-run Big Creek Hatchery steelhead above the barrier at Big Creek Hatchery. The basin above the hatchery includes 15-16 miles of high-quality steelhead spawning and rearing habitat. Evaluation will include impacts to the hatchery (disease) and amount of steelhead production above the hatchery.

Investigate ways to provide controlled passage of adult steelhead above Gnat Creek

and Klaskanine hatcheries. This would open up approximately five to six miles of spawning and rearing habitat on each stream. ODFW will not alter the natural falls below Gnat Creek Hatchery which impedes adult migration during low flow periods (steelhead can pass during normal peaks in winter flow).

Phase 1. Steelhead hatchery programs will be adjusted to meet WFMP guidelines. A team will be established to investigate possibilities of a program for placing hatchery steelhead along with the wild steelhead above Gnat Creek and Klaskanine hatcheries, and to evaluate the results of the hatchery steelhead re-introduction program above Big Creek Hatchery. If expected funding is available, a technician will be employed to continue the trap operation on the North Fork Nehalem River and to initiate trapping operations on the Lewis and Clark River fishway. Results of the Lewis and Clark trapping would determine if the wild run is of sufficient magnitude to serve as a donor stream for wild brood stock development. Investigate potential of trapping at Clatskanie Falls fishway for both broodstock development and hatchery fish removal (the barrier may not be a total block to fish passage).

Phase 2. Expand monitoring of hatchery : wild ratios on spawning grounds to more streams, improve adult capture facilities to collect hatchery fish for direct removal or recycling back through fisheries for removal by anglers, and provide additional acclimation facilities if the need for them is clear. Initiate trapping and broodstock development on Lewis and Clark River if it proves to be a practical and acceptable source of wild brood fish for Gnat Creek, Klaskanine River, and possibly other streams in SW Washington ESU.

Lower Columbia ESU

Phase 1. Steelhead hatchery programs will be adjusted to meet WFMP guidelines. We will begin implementing the recently developed smolt quality guidelines (using fish length frequency and K-factor) for hatchery steelhead released in the Lower Willamette District waters to reduce residualism and competition with wild winter steelhead.

Clackamas winter steelhead: Continue the wild broodstock program initiated in 1991 for hatchery winter steelhead on the Clackamas River and replace the program of 165,000 Big Creek stock smolts in areas below North Fork Dam at a rate of 40,000 marked smolts per year starting in 1998. The USFWS program of releasing 255,000 marked smolts from Eagle Creek National Fish Hatchery (Eagle Creek broodstock) is expected to be continued.

Sandy River winter steelhead: Install a temporary trap for winter steelhead at Marmot Dam on the Sandy River by late 1998 to control the percentage of hatchery fish spawning with wild fish in the main spawning area of the Sandy basin and continue to negotiate with PGE to fund installation and operation of a permanent trap. Use the trap to capture wild adults for a broodstock to replace

the Big Creek hatchery broodstock when funding of annual trapping becomes certain. Increase the number of winter steelhead smolts being acclimated at Sandy Hatchery (50,000 in 1998) versus the number being directly released into the Sandy River. Continue the program of acclimating 50,000 of these smolts at the facility just below Marmot Dam (conducted since 1993, except for 1997). Establish a team to investigate possibilities of a program for placing hatchery steelhead along with the wild steelhead above Sandy Hatchery, which has been opened to allow access to approximately five miles of winter steelhead habitat on Cedar Creek.

Clackamas and Sandy rivers summer steelhead: Complete the sampling and genetic analysis of smolts from the Clackamas and Sandy rivers to help determine if hatchery summer steelhead are successfully reproducing naturally in each basin. Based on the first two years' of data from the Clackamas River that suggests they are reproducing, and the risk that both the hatchery reared and naturally produced summer steelhead juveniles present to the depressed winter steelhead populations, move all summer steelhead smolt releases to sites below River Mill Dam on the Clackamas and below Marmot Dam on the Sandy starting in 1998 (contingent upon approval by the Oregon Fish and Wildlife Commission). Acclimate as many of the Sandy River smolts as possible at Sandy Hatchery starting in 1998 and trap adults that return to the hatchery. Do the same at Clackamas Hatchery with the smolts produced for the Clackamas River. Contingent upon approval by the Oregon Fish and Wildlife Commission, trap and remove all summer steelhead adults from the existing trap below North Fork Dam on the Clackamas River starting in 1998, and do the same at Marmot Dam on the Sandy with installation of a temporary trap (see winter steelhead discussion above).

Hood River summer steelhead: This population has declined to a level that ODFW and CTWSRO are now proceeding to convert the hatchery program from Skamania broodstock to a wild broodstock (see below under *ODFW IIBIS - Assess Effectiveness of Using Hatchery Production to Reintroduce or Rebuild Depressed Wild Steelhead Populations*).

Phase 2. If funding is secured from PGE, install a permanent trapping facility at Marmot Dam on the Sandy River to control numbers of hatchery steelhead entering the upper basin, and to create potential for initiating a wild broodstock program for Sandy River winter steelhead. Pursue funding for other recapture facilities as needs are identified within the ESU.

Upper Willamette ESU

Phase 1. Pending OFWC approval to modify ODFW basin plans, discontinue the release of 65,000 Skamania stock summer steelhead in the Molalla River by 1999. Review the winter steelhead program at Marion Forks Hatchery for possible reduction or elimination because of suspected low contribution to fisheries, and develop alternative ways to mitigate for winter steelhead production that was lost

due to USACE dams on the North Santiam River. One alternative is to determine the feasibility of using Stayton Pond to rear 1-year smolts and to attract returning adults so they can be kept out of upriver spawning areas consistent with the WFMP.

Eliminate the use of Big Creek hatchery stock for winter steelhead programs above Willamette Falls unless smolts can be released at sites where returning adults can be trapped and removed from the population consistent with WFMP. The program of releasing Big Creek stock smolts in the Molalla River was terminated after 1996. For any elimination of stocking currently done as mitigation for dams, develop alternative ways to mitigate for winter steelhead production lost due to dams. Elimination of Big Creek smolts from the Tualatin River depends on negotiations with Bureau of Reclamation regarding mitigation for Scoggins Dam at Henry Hagg Lake and approval by the OFWC to modify the ODFW basin plan, but ODFW is considering moving these releases to the lower Clackamas River by 1999 where smolt-to-adult survival and contribution to anglers would be greater than in the Tualatin River.

Complete the genetic sampling of smolts underway on the North Santiam River to help determine if hatchery summer steelhead are successfully reproducing naturally in this basin. Starting in 1998, modify the summer steelhead program to release all smolts from the adult recapture facility below Minto Dam and recapture adults for removal or recycling back through part of the fishery (cease any recycling when to isolate from wild spawning population while providing angling opportunity).

Continue the practice of only releasing the summer steelhead smolts in the South Santiam River directly from the hatchery as a volitional release, but modify to take non-migrating smolts out to stock in ponds or lakes. Continue recycling a portion of the returning adults back through fisheries below Foster Dam, targeting the recycling at sites where capture by anglers is most likely and ceasing when fish are too mature to migrate and then eliminating them or releasing them in lakes.

Complete genetic sampling on steelhead in West Slope streams (Yamhill, Rickreall, and Luckiamute basins) to help determine if these are wild populations of winter steelhead or naturalized hatchery runs.

Phase 2. Obtain funds and/or pursue cooperative efforts to expand genetic sampling that will better define population boundaries, then use the information to modify hatchery programs to comply with WFMP and prevent excessive interbreeding of non-local hatchery fish with wild fish. Comparison of early-run with late-run steelhead at Willamette Falls is a high priority.

Specifics/Priorities for the Two Eastern Oregon ESUs. Steelhead hatchery programs in basins within the Snake and mid-Columbia ESUs have been developed as mitigation for lost wild steelhead production resulting from hydroelectric developments on the Snake, Columbia, and Deschutes rivers. These programs have been successful at reestablishing steelhead fisheries in these areas, however, there has been an increasing concern about potential effects on the survival and genetic diversity of wild steelhead populations. Achieving management that meets Oregon's WFMP guidelines is complicated by institutional constraints including mitigation agreements, co-management agreements with tribes, and court decisions under *US v Oregon*.

Middle Columbia ESU.

Phase 1. Continue the local broodstock program for the Umatilla River, incorporating a representative collection of wild adults trapped at Three Mile Dam each year to meet a Type 2 program under WFMP guidelines (up to 30% hatchery fish allowed among total adults on spawning grounds). Continue the local broodstock program for the Deschutes River (originated in the early 1970s from Squaw Creek, upstream from the Pelton/Round Butte dam complex), incorporating a representative collection of wild adults each year (incorporation has been approximately 10% per year since 1993).

Phase 2. Funds are needed to 1) determine how many strays from the Deschutes hatchery program and from hatchery programs elsewhere in the Columbia Basin are spawning naturally in the Deschutes Basin, 2) determine how many wild fish spawning in the Deschutes Basin are strays from wild populations elsewhere in the Columbia Basin, 3) monitor genetic changes in the Deschutes wild steelhead population attributable to strays, and 4) evaluate strategies for controlling strays from spawning in the Deschutes Basin.

Funds are needed for improved monitoring to determine if the 30% guideline for hatchery spawners in the Umatilla River is being violated because hatchery fish have exceeded 30% of the run past Three Mile Dam in most of the recent runs, but the percent hatchery fish on the spawning grounds cannot be accurately estimated.

Snake River Basin ESU.

Phase 1. Continue the local broodstock program for Little Sheep Creek in the Imnaha Basin, incorporating a representative collection of wild adults trapped from the creek each year. Seek agreement with Nez Perce Tribe and USFWS (Lower Snake River Compensation Program) to modify program to use wild adult return numbers to determine the number of smolts produced, up to the program goal,

rather than try to meet the current program goal every year (criteria for departure from this method for setting smolt production will be needed in the event of severe shortages of wild adults returning). This will maintain compliance with a Type 2 program under WFMP (up to 30% hatchery adults allowed among natural spawners) to increase protection of genetic fitness in the wild population.

Continue the hatchery steelhead program in the Oregon portion of the Grande Ronde Basin using Wallowa stock, but develop strategies for switching to local broodstock(s). This switching will reduce the risk of impacts from hatchery strays on wild steelhead populations and possibly create the option of hatchery broodstocks that can be used to reintroduce or rebuild severely depressed wild populations. The Wallowa broodstock originated from a mixture of Snake River steelhead trapped at lower Snake River dams. This change in broodstock will require coordination with tribal co-managers (NPT and CTUIR), the US v Oregon Production Advisory Committee (PAC), USFWS (Lower Snake River Compensation Program), and NMFS.

Continue the research on factors affecting residualism and the impacts of residualism on wild fish that began in 1992 with hatchery steelhead in the Grande Ronde and Imnaha basins. Until study results are more conclusive, continue to acclimate smolts at the Little Sheep Creek facility in the Imnaha Basin and at Wallowa Hatchery and the Big Canyon facility in the Wallowa Basin, and continue to directly release smolts in Catherine Creek and two main river sites in the Grande Ronde Basin (the upper site has been moved 12 miles down river to reduce risks of straying to wild fish spawning areas). Seek agreement from tribal co-managers (NPT and CTUIR), the US v Oregon Production Advisory Committee (PAC), USFWS (Lower Snake River Compensation Program), and NMFS to increase size of smolts at release while reducing numbers released to reduce residualism.

Phase 2. If agreement is reached on a plan for switching to local broodstock(s) in the Grande Ronde Basin, new funds will likely be needed to implement, monitor, and evaluate.

ODFW ID1 - Use of Volunteers

Phase 1. Expand emphasis and scope of volunteers to help implement salmon and steelhead restoration actions such as restoring habitat, collecting wild broodstock, outplanting juveniles from wild broodstock, placing hatchery salmon carcasses in streams, conducting surveys of habitat and fish abundance, and monitoring compliance with existing rules. Restoration activities will benefit significantly from assistance by existing volunteer programs (e.g. STEP) and new voluntary efforts from landowners, sporting and conservation clubs, watershed councils, and other cooperating groups.

Phase 2. No additional funds are needed to implement this measure, so no Phase 2 elements are listed.

This measure is similar to what WDFW is proposing in their draft *Lower Columbia Steelhead Conservation Initiative* for the portions of the SW Washington and Lower Columbia ESUs that are in Washington.

ODFW IIA2S - Reduce Hatchery Steelhead Smolt Releases

See description below under **Factor for Decline: Competition with Hatchery Reared Fish, Biological Objective A**, in regard to reducing the potential for competition between juvenile hatchery and wild steelhead.

Federal Agency Measures:

NOAA-NMFS9 - Supplementation

Work with ODFW to review hatchery operations to ensure they are compatible with wild fish production; fund staff person to address use of hatcheries to support self-sustaining populations of wild salmonids.

Measures from Section 5: Large Storage Dams and Hydroelectric Projects:

PGE 15 - Sort Out Hatchery Fish from Fish Trap and Haul Downstream

Phase 1: PGE will continue the cooperative program started in 1995 to sort all winter steelhead at the North Fork fish trap. Hatchery steelhead from non-native stock are sorted and hauled back downstream. Only wild adults and adults from the native broodstock program (not to exceed 50% of the total over North Fork Dam) are passed upstream.

PGE 16 - Support with Funding Wild Winter Steelhead Broodstock Program

Phase 1: PGE will continue trapping and hauling (to hatchery for genetic stock) for the wild winter steelhead broodstock program. The wild winter steelhead broodstock program, started in 1991, collects enough wild adults at the North Fork trap to produce 40,000 smolts. Returns from this program over the past two years have added substantially to escapement over North Fork Dam.

Biological Objective:

- B. Clearly describe the purpose and conduct of all steelhead hatchery programs*
In order to accurately assess the effects of hatchery programs and to ensure that hatchery programs are managed to minimize potential impacts to wild populations, clear documentation of each program is needed. While some documentation of steelhead hatchery programs exists, it is incomplete or lacking entirely for some programs.

Measures:

ODFW IIA3S - Develop Management Objectives for Steelhead Hatchery Programs, Including Genetic Guidelines

Phase 1. Develop specific management objectives, including genetic guidelines, for each steelhead hatchery program to minimize risks to wild fish while maintaining harvest

opportunities. Work with appropriate tribal co-managers in each basin to review each hatchery program to: 1) document the specific purpose for each program, 2) ensure consistency with sound genetic principles, and 3) evaluate effectiveness and economic efficiency.

Phase 2. No additional funds are needed to implement this measure, so no Phase 2 elements are listed.

This measure is very similar to what WDFW is proposing in their draft *Lower Columbia Steelhead Conservation Initiative* for the portions of the SW Washington and Lower Columbia ESUs that are in Washington.

Federal Agency Measures:

NOAA-NMFS9 - Supplementation

Work with ODFW to review hatchery operations to ensure they are compatible with wild fish production; fund staff person to address use of hatcheries to support self-sustaining populations of wild salmonids.

Biological Objective:

- C. *Facilitate differentiation of hatchery fish from wild fish on spawning grounds.*
The most critical factor related to potential genetic effects of hatchery fish on wild fish is the degree to which they may be interbreeding. If hatchery fish are intercepted at a high rate in fisheries, return with fidelity to hatcheries or are removed at fish traps the potential for genetic impacts is small. If hatchery fish stray to spawning grounds at high rates, however, the impacts can be more significant. Determining the precise rate of straying has been difficult, since hatchery and wild fish were difficult to differentiate in the field (even with 100% finclipping of hatchery fish, differentiation is difficult without capturing adults). Easy field identification and more monitoring of adult escapement is needed before accurate and widespread assessment of straying can be conducted to monitor attainment of WFMP guidelines for stray rates.

Measures:

ODFW IIA4S - Continue to Mark All Hatchery Steelhead

See description above under **Factor for Decline: Harvest Impacts to Spawning Escapement, Biological Objective C**, regarding fisheries that do not interfere with the restoration of wild steelhead populations.

Federal Agency Measures:

NOAA-NMFS8 - Fisheries Harvest

Promote harvest plans that protect listed species; fund marking of hatchery steelhead to enable selective fisheries with minimal impacts to wild steelhead.

NOAA-NMFS24 - Steelhead Genetics

Continue to use biochemical and molecular genetic techniques to investigate population structure of Pacific salmonids, including steelhead. Comprehensive data bases and analytical tools have been developed for this ongoing NMFS program that allow estimation of stock composition in mixed stock fisheries.

Monitoring:

ODFW will monitor the estimated percentage of hatchery spawners among total spawners on spawning grounds as part of annual spawning escapement monitoring (ODFW IB1S).

Compliance of hatchery programs and practices with management objectives, genetic guidelines, production goals, and stocking plans will occur primarily through ODFW's ongoing hatchery database system, annual hatchery production planning meetings, periodic Wild Fish Management Policy compliance reports, and through the Integrated Hatchery Operations Program (IHOP) monitoring procedures for Columbia Basin hatchery programs.

Results from this monitoring will allow more widespread assessment of the rate of straying of hatchery fish and more precise estimation of the potential genetic risk to wild runs. For a set of populations where annual smolt and adult escapement monitoring will be carried out (ODFW IB1S), the productivity of the wild populations in relation to percentage of hatchery spawners amongst the total spawners in the wild may become quantifiable if the sampling is conducted for enough years.

Adequacy:

Full implementation of ODFW's Wild Fish Management Policy for steelhead hatchery programs will make a substantial improvement in controlling the risk of losing genetic adaptation in wild populations compared with the risks from typical steelhead hatchery programs of 5-10 years ago. Since 1992, all hatchery steelhead smolts have been externally marked. This has facilitated differentiation of hatchery spawners from wild fish (ODFW IIA4S) and allows quicker, more quantitative responses in adjusting hatchery and fishery management to control percentages of hatchery fish on wild spawning grounds. However, estimation will be more difficult than for salmon because steelhead live for extended periods after spawning which makes it difficult to recover carcasses and determine if a fish is of hatchery origin. In some situations, water

conditions allow counting and classification of hatchery fish on spawning grounds by visual observation of live fish in the stream. For many populations, estimates will have to be extrapolated from data collected prior to spawning at counting stations or in fisheries downstream, and adjustments will need to be made for harvest or other factors that differentially remove hatchery fish before spawning occurs. Detection and quantification of impacts on productivity of wild fish populations from hatchery strays spawning in the wild may be possible with the planned adult and juvenile monitoring, but will likely take decades except for a few situations where lengthy data sets already exist. If the proposed monitoring of adult abundance and hatchery/wild composition is not funded, we will not be able to adequately determine if the plan fully addressed this factor for decline in the next decade.

VI. Factor for Decline: Competition with Hatchery Reared Fish

In addition to the potential for genetic risks to wild fish from hatchery fish discussed above, hatchery fish can also compete with wild fish, particularly if they are stocked at a larger size than wild fish at the same time or stocked before they have smolted and thus remain in freshwater until ready to migrate to the ocean. This could be detrimental to wild fish if resources, particularly food and cover, are limited. However, most hatchery salmon and steelhead are stocked as smolts that tend to migrate immediately to the ocean (partly because they are larger than wild juveniles), minimizing the amount of time hatchery and wild fish will be in direct competition for limited freshwater resources. Hatchery salmon and steelhead stocked as unfed fry may compete with wild juveniles over an extended period, but they appear to survive particularly poorly and may be less fit than wild fry. All releases of unfed fry by ODFW have been eliminated or reduced to very low numbers. In addition to hatchery-reared fish, juveniles produced by hatchery adults spawning in wild fish habitats can create competition for wild populations, as in the case of wild winter steelhead facing potential competition from summer steelhead juveniles produced by hatchery adults spawning naturally in the Willamette Basin where summer steelhead were not indigenous. Also, hatchery salmon and hatchery trout can impact wild steelhead through competition and other ecological interactions in some situations, so this concern is also addressed in this supplement to *The Oregon Plan*.

Biological Objective:

A. *Reduce the potential for competition between juvenile hatchery and wild steelhead by decreasing the number of hatchery steelhead released.*

In situations where hatchery fish are not being released in wild fish rearing areas to rebuild depressed populations (see ODFW IIB1S below that addresses using hatchery fish for rebuilding wild populations), competition with the wild juveniles needs to be controlled. Decreasing steelhead smolt releases is only one of the ways to decrease competition with wild steelhead, but is the surest way. Acclimation and direct-release sites located below or away from wild steelhead rearing areas, volitional releases, and other methods can be effective and are included under ODFW IIA1S (Implement Wild Fish Management Strategies for Steelhead). The decreases in steelhead smolt releases that are described below for the various ESUs were done primarily to reduce risk of hatchery fish interbreeding with wild fish, but the decreases will also reduce risk of hatchery juveniles competing with wild juveniles.

Measures:

ODFW IIA2S - Reduce Hatchery Steelhead Smolt Releases

Continue the restrictions on steelhead smolt releases that are in place now (major reductions have occurred in recent years), phase out part or all of some summer and winter steelhead stocking programs in the Lower Columbia and Upper Willamette ESUs, and continue to monitor the need for reductions statewide. Work with appropriate tribal co-managers in each basin, funding entities, and the public to achieve agreement on any reductions. No additional funds are needed to implement this measure, so all elements are Phase 1 and there are no Phase 2 elements listed.

Specifics/Priorities for the Two Coastal Steelhead ESUs

Klamath Mountains Province ESU.

Phase 1. Continue the current reduced level of stocking which is being done to decrease the potential effects of possible spawning with wild fish.

Review the Applegate River winter steelhead program for possible reductions, partly because restrictions on angler access are increasing as streamside land is developed. Restricted access may be reducing contribution rate of hatchery fish to anglers below level that justifies current risks to wild fish from a hatchery program designed to mitigate for USACE's Applegate Dam. Alternative mitigation to benefit anglers in the basin would need to be negotiated with the USACE if smolt numbers and adult returns are decreased.

Oregon Coast ESU.

Phase 1. Continue the restrictions on steelhead smolt releases that are in place now (major reductions have occurred, such as the progressive reduction in the Nehalem River Basin from 100,000 in various parts of the basin in 1988 down to 50,000 total with distribution limited to the North Fork Nehalem River alone in 1994, the last year of release). Monitor winter steelhead in the Tillamook Bay and Nestucca River systems for signs of impact from the introduced runs of summer steelhead founded from Siletz stock hatchery fish and reduce smolt releases, if needed. Annual releases of 10,000 Siletz stock smolts into the Kilchis River were discontinued after 1993. Starting in 1987, a portion of the 50,000 Siletz stock smolts released annually in the Wilson River was shifted downstream, and 20,000 of the annual smolts have been released at lower river sites since 1994. During the same period, a portion of the 70,000 Siletz stock smolts released annually in the Nestucca River was shifted downstream, and 25,000 have been released annually at lower river sites since 1994, including 15,000 moved to Three Rivers to bolster shrinking returns of broodstock to Cedar Creek Hatchery.

Specifics/Priorities for the Three Lower Columbia ESUs

SW Washington ESU.

Phase 1. Continue the restrictions on steelhead smolt releases that are in place

now. The following reductions in hatchery steelhead smolt releases have been implemented: Lewis and Clark River program of 30,000 smolts and South Fork Klaskanine River program of 20,000 smolts discontinued after 1992; Clatskanie River program of 20,000 smolts reduced to 10,000 after 1992 and discontinued after 1996.

The hatchery steelhead programs on Gnat Creek, Big Creek and Klaskanine rivers potentially impacts wild steelhead in about 4, 6, and 2 miles, respectively, of wild steelhead spawning and rearing habitat below the hatcheries on these rivers. However, wild steelhead populations within these reaches may have already been extirpated.

Lower Columbia ESU.

Phase 1. Terminate stocking of winter steelhead in N. Fk. Scappoose Creek (1996 was final release). Review program of stocking Eagle Creek (Clackamas Basin) winter steelhead in the Sandy River and reduce or eliminate if necessary to protect the Sandy River wild population.

Upper Willamette ESU.

Phase 1. Discontinue the release of Big Creek stock hatchery winter steelhead according to the following schedule:

Molalla River - 1997 (last release was 1996)

Tualatin River - 1999 (depends on negotiations with Bureau of Reclamation regarding mitigation fish; ODFW is considering moving these releases to the lower Clackamas River where contribution to anglers would be greater)

Review the benefits and problems (such as residualism) of current smolt rearing programs for winter and summer steelhead and investigate feasibility and costs of modifying the programs to reduce interactions of hatchery smolts with wild juvenile steelhead. Continue the volitional release practices for summer steelhead smolts at South Santiam hatchery, but modify if needed (e.g., haul residuals from facilities to trout fisheries in ponds or lakes), to reduce residualism of hatchery smolts. Pending OFWC approval to modify ODFW basin plans, discontinue the release of 65,000 Skamania stock summer steelhead in the Molalla River by 1999.

Specifics/Priorities for the Two Eastern Oregon ESUs

Middle Columbia ESU.

Phase 1. Continue to document the incidence of out-of-basin hatchery strays in the John Day and Deschutes basins and use assessment of barging effects on steelhead straying to seek improvements or alternative ways to protect wild populations in these two basins. Alternatives could include restricting steelhead smolt releases in other hatchery programs in the Columbia Basin, although this would require a multi-state, multi-tribal, and federal coordination effort to alter many existing agreements.

ODFW IIA5S - Manage Salmon Hatchery Programs to Avoid Impacts on Wild Steelhead

Although many Oregon basins had naturally co-existing populations of salmon, steelhead, and cutthroat trout before European settlement, some studies demonstrate dominance of coho juveniles over steelhead and cutthroat juveniles in streams, and where wild steelhead populations are depressed, ODFW will be cautious about increasing potential for coho to compete for limited natural resources through hatchery programs. ODFW has made substantial reductions in stocking of hatchery coho salmon in coastal streams in recent years, and though not done specifically to benefit wild steelhead, such benefits may result.

This measure is similar to what WDFW is proposing in their draft *Lower Columbia Steelhead Conservation Initiative* for the portions of the SW Washington and Lower Columbia ESUs that are in Washington.

Phase 1. Work with appropriate tribal co-managers in each basin to reach agreement on any significant changes to salmon hatchery programs and any new programs.

Specifics/Priorities for the Two Coastal Steelhead ESUs. Continue activity initiated in 1995 to remove coho at the Siletz Falls trap as part of restoration program for Siletz River summer steelhead, and limit coho smolt stocking programs to areas well below falls (coho only invaded summer steelhead habitat after the falls were laddered).

Specifics/Priorities for the Three Lower Columbia ESUs. Continue to limit all releases of coho to areas below North Fork Dam on the Clackamas River and Marmot Dam on the Sandy River unless part of a wild coho rehabilitation program as defined in the Wild Fish Management Policy. Relocate coho stocking site for Henry Hagg Lake mitigation from Tualatin River (where it is unlikely that coho were indigenous) to a Willamette tributary below Willamette Falls (depends on negotiations with Bureau of Reclamation regarding mitigation fish). While the above changes are not based on steelhead needs, some reduction in risks to steelhead can be expected.

Phase 2. If funds can be obtained, ODFW will further study risks and impacts of coho salmon hatchery programs on wild steelhead.

ODFW IIA3S - Develop Management Objectives for Steelhead Hatchery Programs, Including Genetic Guidelines

See description above under **Factor for Decline: Loss of Genetic Adaptation of Wild Populations, Biological Objective B**, in regard to describing the purpose and conduct of hatchery programs.

ODFW IIIA3 - Manage Trout Fisheries to Reduce Ecological Interactions and Mortality on Juvenile Salmonids

See description above under **Factor for Decline: Harvest Impacts to Spawning Escapement, Biological Objective A**, regarding management for attainment of spawning escapement or other population health goals.

Federal Agency Measures:

NOAA-NMFS9 - Supplementation

Work with ODFW to review hatchery operations to ensure they are compatible with wild fish production; fund staff person to address use of hatcheries to support self-sustaining populations of wild salmonids.

Monitoring:

Annual production records for each hatchery raising salmon, steelhead, and trout detail the numbers of juveniles raised and the numbers stocked at each specific location, along with the other specific information contained in the hatchery monitoring records. For a set of populations where annual juvenile steelhead monitoring will be carried out (ODFW IB1S), the survival of wild juveniles as affected by competition from hatchery reared juveniles may be quantifiable if appropriate treatment and reference streams are included.

Adequacy:

The importance of competition between hatchery fish and wild steelhead in Oregon streams is relatively unknown. However, the recently implemented reductions and proposed changes in steelhead, trout, and salmon stocking will serve to lower this risk below what it has been historically. If the proposed monitoring of adult and juvenile steelhead abundance is not funded, the plan will not adequately address this factor for decline.

VII. Factor for Decline: Low Density Reproductive Failure of Wild Populations

At extremely depressed densities, spawning populations of salmonids may fail to sustain themselves due to inability to find a mate, inbreeding depression, and other unknown depensatory factors. Once a population has fallen to such low levels extinction is likely unless the number of spawners can be increased through other means.

Biological Objectives:

A. *Evaluate the potential and effectiveness of using hatchery production to rebuild or restore critically depressed wild populations of steelhead.*

To date, hatcheries have been used to produce fish primarily to support fisheries. The use of hatcheries to reintroduce wild fish or supplement particularly weak natural runs has been a relatively unused approach. Given the low numbers of some specific populations, hatchery rearing of wild origin fish may provide a means of either reintroducing wild salmonids into areas where they have largely been extirpated, or to temporarily boost populations in order to raise depressed spawning populations above minimum genetic

thresholds.

Measures:

ODFW IIBIS - Assess Effectiveness of Using Hatchery Production to Reintroduce or Rebuild Depressed Wild Steelhead Populations

Work with appropriate tribal co-managers in each basin to develop plans to utilize hatchery production based on wild parents to aid restoration of extirpated or extremely depressed wild populations. Plans will identify the underlying causes for the loss or near loss of the targeted wild populations, how and when we anticipate the underlying problems can be corrected, how many years of hatchery intervention are proposed, and what the evaluation program will be. Plans may include some form of captive broodstock program, with a priority placed on starting such programs from collections of wild juveniles in an attempt to obtain more genetic diversity compared with collection of a few adults for initial broodstock.

This measure is very similar to what WDFW is proposing in their draft *Lower Columbia Steelhead Conservation Initiative* for the portions of the SW Washington and Lower Columbia ESUs that are in Washington.

Phase 1. For projects not already underway in 1997, plans describing proposed approaches to re-establish populations extirpated above dams in the Deschutes, Willamette or other basins, or approaches to rebuild extremely depressed wild populations using hatchery reared fish will be developed with tribal co-managers (as appropriate for each basin) and submitted for ODFW Fish Division review. If a plan is favorably reviewed by Fish Division and the appropriate tribal co-manager(s), approved by the Oregon Fish and Wildlife Commission, and appropriately funded, we will proceed with it as an experimental program intended to determine the effectiveness of the approach.

Specifics/Priorities for the Two Coastal Steelhead ESUs.

Siletz summer steelhead: Continue to allow Siletz stock hatchery adults to spawn with wild adults through 1999 to avoid low density reproductive failure of wild population, then sharply reduce or eliminate hatchery adults from spawning areas through trapping at Siletz Falls. Haul hatchery adults back down to recycle through fishery, or release in ponds or lakes to isolate from wild spawning population. Incorporate wild adults to constitute 5%-10% of broodstock if wild adult abundance is 300 and stable or increasing. Release up to 80,000 smolts annually in areas below Siletz Falls (possibly with acclimation to improve survival and/or reduce straying). Continue to monitor wild fish escapement and if numbers are not increasing in the 1998/99 run, design an artificial propagation program based on wild broodstock for possible initiation as early as the 1999/2000 run. Use few, if any, adults from the current broodstock that has been substantially domesticated since initiation from wild Siletz summer steelhead in 1958.

Specifics/Priorities for the Three Lower Columbia ESUs

SW Washington ESU. Initial restocking consideration would be in the reaches of Big Creek (already initiated), Gnat Creek, and North Fork Klaskanine River above ODFW hatcheries where approximately the 26 miles of good winter steelhead spawning and rearing habitat is blocked off by hatchery weirs. ODFW is currently implementing actions to re-establish a naturally producing run in the 16 miles above Big Creek Hatchery using a hatchery stock. Wild fish may have been extirpated from the three hatchery streams so that wild broodstock may have to be developed from adjacent streams such as the Lewis and Clark River.

Lower Columbia ESU.

As called for in the Hood River Production Project Master Plan, initiate the changes in the propagation program and its evaluation on summer steelhead in Hood River starting with the 1997/1998 run. This will involve replacing the Skamania broodstock with a Hood River wild broodstock. Replacement will be done over a period of years and the take of wild adults for broodstock will be limited to 25% of the wild run consistent with the HRPP Master Plan and adjusted, if needed, in very low run years (guidelines for numbers of adults taken will be developed in cooperation with CTWSRO). Follow plans to acclimate juveniles and provide for volitional release at all stocking sites in the basin by 1998 when facilities are scheduled for completion (haul residuals from volitional release facilities to areas below Powerdale Dam where they may eventually smolt and there is a low probability of them competing with wild juvenile steelhead). The upstream trap at Powerdale Dam will be used in concert with changes in the propagation program to bring summer steelhead into compliance with the WFMP by the 1998/99 run year.

Until the local Hood River wild broodstock is built up and can provide for a Hood River fishery, continue to use Skamania broodstock for hatchery production to augment the fishery below Powerdale Dam. Release the smolts below the dam and remove all Skamania stock hatchery adults trapped at the dam. Restrict angling for summer steelhead to the river below Powerdale Dam and recycle at least a portion of the hatchery steelhead from the trap back through the fishery (cease when fish are too mature to migrate and then release in lakes to isolate from wild spawning population while providing angling opportunity) or distribute to CTWSRO for subsistence purposes.

Continue the practice and evaluation of incorporating wild broodstock into the hatchery program for the depressed winter steelhead population of the Hood River (began in 1992 and 70%-90% of the broodstock has been wild). Follow plans to acclimate juveniles and provide for volitional release at all stocking sites in the basin by 1998 when facilities are scheduled for completion (haul residuals from volitional release facilities to areas below Powerdale Dam where they may eventually smolt and there is a low probability of them competing with wild juvenile steelhead). The practice was initiated on the East Fork Hood River in 1996 in an attempt to decrease the number of hatchery juveniles that residualize

and interact with wild.

Upper Willamette ESU. ODFW views the Molalla River and Upper South Santiam River as the areas in this ESU where wild steelhead production appears depressed enough to consider initiating hatchery programs with the strict purpose (or at least initial purpose) being to rebuild depressed populations, and will produce an analysis of the feasibility, expected benefits, and risks of initiating such hatchery intervention by June 30, 1998.

Specifics/Priorities for the Two Eastern Oregon ESUs

Middle Columbia ESU. Continue to work with CTWSRO and PGE through the FERC relicensing process to investigate the feasibility and desirability of reintroducing steelhead into the Deschutes Basin above the Pelton/Round Butte dam complex and work with them to plan a hatchery program to assist in the reintroduction, if needed.

Snake River Basin ESU. ODFW concludes there is no compelling evidence of need for a hatchery program with the strict purpose of rebuilding a depressed population in this ESU at present, but will work with the NPT and CTUIR to periodically review the need.

Phase 2. If a reintroduction or rebuilding plan is approved by the Oregon Fish and Wildlife Commission, but requires additional funding to implement, we will seek funding to proceed with it as an experimental program intended to determine the effectiveness of the approach.

ODFW ID1 - Use of Volunteers

See description above under **Factor for Decline: Loss of Genetic Adaptation of Wild Populations, Biological Objective A**, regarding reducing the percentage of hatchery fish spawning in the wild.

Federal Agency Measures:

NOAA-NMFS9 - Supplementation

Work with ODFW to review hatchery operations to ensure they are compatible with wild fish production; fund staff person to address use of hatcheries to support self-sustaining populations of wild salmonids.

NOAA-NMFS10 - Hatchery Research

Evaluate whether more natural rearing conditions in hatcheries result in higher instream survival.

NOAA-NMFS24 - Steelhead Genetics

Continue to use biochemical and molecular genetic techniques to investigate population structure of Pacific salmonids, including steelhead. Comprehensive data bases and

analytical tools have been developed for this ongoing NMFS program that allow estimation of stock composition in mixed stock fisheries.

Monitoring:

This action is essentially experimental, and verification of the effectiveness of using hatchery fish of wild origin to rebuild wild populations is its primary objective. Therefore, monitoring and evaluation will be a major component of this action wherever such stocking is done. Detailed monitoring and evaluation of this approach is underway in the Imnaha, Umatilla, and Hood rivers assisted by federal funding.

Adequacy:

The adequacy of this action in restoring critically depressed wild populations is largely unknown and will only become clear through comprehensive monitoring and evaluation. Use of new techniques, possibly including genetic marking, to carefully evaluate the success of this approach will also be different from previous evaluations. Plans will be widely reviewed before the actions are implemented.

VIII. Factor for Decline: Reduced Nutrients (Carcass Nutrient Cycle) from Depressed Runs

Reduced numbers of salmon spawning in streams has resulted in fewer carcasses contributing to the growth and survival of juvenile salmonids rearing within and downstream from spawning areas. Carcasses alone are not as helpful to juveniles as live adults spawning in streams because redd construction dislodges insects and salmon eggs from the gravel, providing food for juveniles. However, carcasses provide nutrients to boost growth and survival when juveniles feed on carcass tissue, when they feed on organisms that consume carcass tissue, and when they feed on organisms that incorporate nutrients derived from decomposition of carcasses followed by reincorporated through plant and animal food webs within and adjacent to streams. Juvenile salmonids may be specifically adapted to benefit from unique minerals or other components of adult salmon tissues obtained in the ocean. Increased growth and survival of juveniles in the stream should result in more abundant and larger (and/or more “fit”) smolts that have higher survival rates in the ocean, thereby increasing abundance of adults.

Research in Washington suggests artificial carcass placement contributes to the above processes with resultant benefits to growth and survival, so addition of carcasses in areas of low spawner abundance may provide benefits to salmon, steelhead, and searun cutthroat trout. However, the increase in growth, survival and adult production that can be expected from a given density of carcass placement cannot be predicted accurately. Although the amount of nutrients provided to stream systems by adult salmon was found to be substantial relative to other sources where salmon runs are large, habitat conditions and water temperature likely have larger impacts on juvenile salmonid growth and survival.

Biological Objective:

- A. *Increase the growth and survival of juvenile salmonids in a set of streams where anadromous salmonid spawner abundance is depressed by increasing the*

abundance of adult salmon and steelhead carcasses in spawning areas during and shortly after the spawning season.

Measures:

ODFW IVB4 - Use Hatchery Carcasses to Increase Wild Salmonid Production

With the landowner cooperation, DEQ permits and volunteer labor that has been obtained, begin to restore benefits to juvenile salmonid production through placement of hatchery salmon carcasses in priority stream reaches. Salmonid production has been shown to benefit directly from food and nutrients derived from adult salmonid carcasses. Carcass placement will be considered only in streams that are not water quality limited by excessive nutrients.

This measure is similar to what WDFW is proposing in their draft *Lower Columbia Steelhead Conservation Initiative* for the portions of the SW Washington and Lower Columbia ESUs that are in Washington.

Phase 1. Permits have been obtained from DEQ to allow use of hatchery carcasses to boost natural salmonid production in streams until restored runs can contribute this function naturally. About a dozen streams in the two coastal ESUs and the Lower Columbia ESU received carcasses in the winter of 1996/97. Volunteer contributed to the placement of carcasses in the winter of 1996/97 and efforts are being organized to place carcasses in selected test streams again starting in the winter of 1997/98.

Specifics/Priorities for the Two Coastal Steelhead ESUs. Implement the design of a placement and evaluation program for about 40 coastal streams.

Specifics/Priorities for the Three Lower Columbia ESUs. Continue the cooperative carcass placement and evaluation program with the USFS on Still Creek in the Sandy Basin.

Specifics/Priorities for the Two Eastern Oregon ESUs. Complete the design of a placement and evaluation program for several streams within the Snake River Basin ESU in time for permit approval and placement starting in the fall of 1998.

Phase 2. Efforts will increase as new field staff become available (ODFW IVB2) and if results from test streams are encouraging.

ODFW ID1 - Use of Volunteers

See description above under **Factor for Decline: Loss of Genetic Adaptation of Wild Populations, Biological Objective A**, regarding reducing the percentage of hatchery fish spawning in the wild.

Monitoring:

ODFW pathologists will use existing monitoring programs to screen out batches of hatchery carcasses that pose significant disease risks if placed in streams. ODFW's existing hatchery management database system will track how many carcasses of each species are sent out by date for placement in each stream basin. District biologist staffs will maintain records of how many carcasses of each species are placed in each stream section by date. District biologists will make sure that periodic surveys are conducted (by their staffs or by trained volunteers from watershed councils or other interest groups) to monitor retention and/or movement of carcasses in a selection of streams. A more intensive research project is being implemented on the coast using a selection of treatment and reference streams to estimate benefits of carcass placement as a practical management tool, with conclusive results on benefits to anadromous salmonids, particularly coho salmon not anticipated for several years. The design is being coordinated with DEQ so that agency can match its sampling program to ODFW's carcass placement program for the purpose of monitoring changes in water quality.

Adequacy:

Addition of carcasses in areas of low spawner abundance should provide benefits to salmon, steelhead and searun cutthroat trout, but the amount of benefit that can be expected from a given level of carcass placement in a stream cannot yet be predicted accurately, and the number of hatchery carcasses of coho, chinook, and steelhead expected to be available for placement will allow treatment of a relatively small proportion of streams. There is some uncertainty about quantitatively applying existing research results to broad scale application to Oregon streams because there are so many variables affecting juvenile salmonid growth and survival. Providing an adequate experimental design to test effectiveness of a broad scale application of the carcass placement appears to be challenging and potentially very expensive.

Chapter 14A

Section 4: Fish Management and Predation

Predation: Key Parameter for Restoring Salmonid Populations

ISSUE BACKGROUND

Salmon, steelhead, and searun cutthroat trout live in a complex ecosystem that contains many threats to their existence. One factor often suggested by concerned individuals and groups as a cause for the present declines is predation. Juvenile salmonids are prey for a variety of animals, including other fish, freshwater and marine mammals and birds, insects, and herptiles. Adult salmonids are prey for marine mammals. Such predation is a natural occurrence and comprises a portion of the natural mortality that affects anadromous salmonid populations between hatching and spawning. Human control of much of this natural predation is inappropriate and will not be considered. Predacious insects and some bird species will almost certainly never be considered for management to benefit salmonids. Management or control of certain species in specific situations, however, has been suggested and may be appropriate and necessary.

Indigenous predators have always been part of the salmonid ecosystem and may not have been a significant factor in the decline of anadromous salmonids. However, the concentration and delay of juveniles and adults caused by dams has increased susceptibility of anadromous salmonids to predation by indigenous and exotic predators. The loss of protective cover in stream and estuary habitats and attraction of predators to large releases of hatchery smolts are also factors that may have led to increased predation on wild salmonids in some basins. Even if predation has not been a major cause of the decline, depressed runs may be more significantly impacted by predation than if populations were at healthy levels, and heavy localized predation could potentially limit salmon, steelhead, or searun cutthroat trout restoration.

Growing concern over predation has resulted from changes in its likely magnitude. There is no certain information on what constitute "natural" population levels of predators, but there is valid scientific data that suggests populations of several prominently visible predator species have been increasing over the past few decades. This has been true for California sea lions, harbor seals and double crested cormorants. Obvious growth of populations and visible feeding activity by these predators suggests predation could be heavy in site specific situations.

In addition, new predator species have been added to the ecosystem. Legal and illegal introductions of predacious fish have been made in a number of coastal drainages. Striped bass, largemouth bass, smallmouth bass, bluegill, crappie, bullheads and yellow perch have become established in a number of locations, raising concern over potential predation on salmonids. Results of these introductions have been inconsistent, with obvious impacts to salmonid populations in some cases and negligible impacts in others.

Responding to the issue of predation is made difficult by the fact that there is little objectively obtained data that defines the magnitude of predatory losses to salmon, steelhead, or cutthroat from the various predatory species. Furthermore, it is not certain that effective remedies could be identified or implemented to address excessive predation. Thus, measures developed in this

section of *The Oregon Plan* are focused on gaining reliable information on the actual impacts to anadromous salmonids from predation to allow reasoned consideration of the need for management and possible management approaches. Responses to localized predation are based on current information and will utilize currently available techniques. Improvements in water quality, flow, instream habitat, and fish passage at barriers accomplished through measures in other sections of *The Oregon Plan* may do more to reduce predation on salmonids than any of the following measures.

I. Factor for Decline: Predation by Pinnipeds and Sea Birds

While most reviews of the scientific literature suggest natural predation by pinnipeds and sea birds has not been a direct or significant factor in the decline of most anadromous salmonid populations, there is wide-spread public concern about effects of these predators on these fish populations in Oregon. It is also important to note that most examinations of this interaction are dated and few studies have focused on the effects of predation on specific salmonid populations. Confounding this situation is observation of significant increases in abundance of certain predator populations (e.g. pinnipeds and cormorants) in areas where some anadromous salmonid populations are at low abundance. In these cases, predation by locally abundant predators could have a negative effect on recovery of depressed fish populations.

Biological Objective:

- A. *Determine and evaluate the impacts of predation by pinnipeds and sea birds on anadromous salmonids.*

ODFW needs to determine and evaluate the potential for negative affects to the recovery of depressed salmon, steelhead, and searun cutthroat populations through predation by locally abundant pinniped and avian predators, including estimates of the increased recovery time resulting from losses to localized predation in specific systems. ODFW also needs to relate the significance of predation to other factors for decline.

Measures:

ODFW IC2a & b - Determine Predator Impacts from Pinnipeds and Sea Birds

This measure is very similar to what WDFW is proposing in their draft Lower Columbia Steelhead Conservation Initiative for the portions of the SW Washington and Lower Columbia ESUs that are in Washington.

Phase 1. Provide existing data needed by other entities conducting predation research, such as data on smolt releases for the study of avian predation on anadromous salmonid smolts being conducted by Oregon State University in the Columbia River and information on adult fish returns for the study of pinniped predation being conducted by NMFS.

Phase 2. If funds and permits can be obtained, ODFW will evaluate the potential for negative impacts on salmon, steelhead and searun cutthroat populations from localized predation by sea birds and pinnipeds in estuaries and rivers. This work will involve field research activities at selected sites to examine predator food habits, estimate salmonid consumption rates, and evaluate the affects of such predation on anadromous salmonid recovery. Given this information, the importance of predation can be assessed along with other factors which may be affecting recovery to guide appropriate and necessary management measures.

Federal Agency Measures:

USFWS22 - Avian Predator Management

Work with ODFW to develop policy on management of avian salmonid predators. Also create or serve on steering committees to oversee research and consider subsequent recommendations for avian predator management.

NOAA-NMFS34 - Hire the Fisher Data Collection Program

Continue to support a program that received \$4.9 million during the fiscal year 1997 to hire fishers to gather data off the coast of Oregon, California and Washington. The projects funded often include data important to salmon management and conservation.

Projects range from

testing the effects of a selective fishery in Young Bays on incidental take levels of wild stocks of spring chinook and steelhead, to tagging sea lions, a salmonid predator, in the Columbia River at Astoria.

Biological Objective:

- B. *Propose management actions as needed to respond to local predation problems relative to the significance of the observed predation.*

Measures:

ODFW IC1 - Policy on Management of Salmonid Predators

ODFW will develop a set of state policies and guidelines on the issues of salmonid predation within the framework of federal responsibility for certain predatory species. ODFW will work with the NMFS and USFWS and the other west coast states to develop an Oregon policy on predation issues and management that includes state concerns about predation in federal management plans and action for these species.

ODFW IC3 - Predator Management

This measure is very similar to what WDFW is proposing in their draft *Lower Columbia Steelhead Conservation Initiative* for the portions of the SW Washington and Lower Columbia ESUs that are in Washington.

Phase 1 & 2. ODFW will manage obvious predation problems at specific sites with

current levels of understanding using currently authorized methods (additional funding as Phase 2 efforts may be needed in some situations). Such efforts will focus on known problem areas in rivers and estuaries (e.g. natural restrictions or barriers) and at structures that concentrate salmon and attract predators (e.g. fish passage facilities, ladders, etc.).

At the present time, the only active predator management activity in coastal rivers and bays is the legislatively mandated program to haze cormorants from three estuaries during the spring when coho smolts are abundant. Previous observations in the Tillamook, Nestucca and Nehalem estuaries indicated heavy feeding activity by large numbers of cormorants concurrent with large numbers of smolts present. The Oregon legislature authorized non-lethal hazing on the three estuaries in 1996 and 1997 to move cormorants to other areas to feed, hopefully off shore.

In the Lower Columbia ESU, NMFS granted ODFW permission in 1996 and 1997 to haze and tag sea lions consuming adult chinook salmon and winter steelhead at the entrances to ladders on the Willamette River at Willamette Falls in the spring.

Federal Agency Measures:

USFWS22 - Avian Predator Management

Work with ODFW to develop policy on management of avian salmonid predators. Also create or serve on steering committees to oversee research and consider subsequent recommendations for avian predator management.

Monitoring:

Pinniped populations statewide are monitored by ODFW on an annual basis during peak breeding or migratory periods. Numbers of pinnipeds during these times at individual bays and rivers are recorded. Additional monitoring at other times of the year will be needed to relate local pinniped abundance to timing of adult salmon, steelhead, and searun cutthroat trout returns and smolt migration periods. No coast wide monitoring of cormorants is done by ODFW, but counts of cormorants are being made in the Tillamook, Nehalem and Nestucca estuaries as part of the legislatively approved cormorant hazing program. Counts in 1996 suggested that cormorant numbers were reduced. Smolt to adult survival estimates for hatchery fish liberated through those drainages in 1996 and 1997 will be compared to survival rates prior to hazing and to survival rates in other non-hazed estuaries to determine if any differences can be related to the hazing efforts. Ongoing activities to reduce predation at specific problem sites will be monitored and reviewed internally (ODFW) and externally (with NMFS and USFWS) through established annual reporting and review processes.

Adequacy:

Development of Oregon policies and guidelines on predation issues and concerns will help guide state actions and will result in better coordination with federal agencies with management authority for certain salmonid predators. Conducting new research specifically aimed at determining predation levels on specific anadromous salmonid populations and evaluating the effects of such predation on fish population recovery will allow any management actions that may

be considered necessary to be based on valid science rather than on circumstantial observations. Ongoing actions to reduce obvious predation at areas where fish passage problems occur, such as ODFW's efforts to reduce marine mammal predation near ladder entrances at Willamette Falls, will benefit those individual populations if the actions are successful, and the actions will alleviate some level of public concern for predation impacts. Experimental hazing of cormorants may improve relative survival of smolts in those estuaries and may provide information useful for consideration in other areas where cormorants congregate to feed.

II. Factor for Decline: Interactions with Exotic Fishes

Introduced fishes may prey on or compete with anadromous salmonids where juveniles rear in or migrate through habitats occupied by the introduced species. This occurs in lakes and reservoirs that have tributaries used by anadromous salmonids for spawning and that also contain warm water fish populations, including reservoirs on the Columbia and Snake rivers. Coastal lakes used by steelhead populations include Floras Lake, Tahkenitch Lake, Siltcoos Lake, Sutton Lake, and Devils Lake. Coastal lake systems are much more critical to coho salmon than steelhead, and historically supported strong runs of wild coho salmon. In addition to warm water fishes in the coastal lakes, both the Coos and Umpqua estuaries contain striped bass and American shad. The Umpqua River also supports smallmouth bass in the main stem and a few tributaries. Umpqua squawfish, endemic to the Umpqua Basin, have in the last decade become established in the Rogue River through illegal pond stocking followed by accidental release into Grave Creek. A number of exotic fishes in anadromous waters of the Columbia Basin, such as walleye, smallmouth bass, and American shad, present risks to anadromous salmonids. Because degraded habitat can increase susceptibility of salmonids to predation and lead to proliferation of exotic fishes, improvements in water quality, flow, instream habitat, and fish passage at barriers accomplished through measures in other sections of *The Oregon Plan* may do more to reduce predation on salmonids than any of the following measures.

Biological objective:

- A. *Determine and evaluate the potential for negative effects to restoration of depressed anadromous salmonid populations from predation and competition by locally abundant exotic fishes.*

ODFW needs to understand the actual impact of exotic fishes on anadromous salmonids to determine the significance of this factor to recovery and in relation to other factors for decline. ODFW also needs to estimate the increased recovery time resulting from losses to localized predation and competition in specific systems. The most detailed information is for the Columbia River, and the resultant action has been to target control not on exotic fishes, but rather on an indigenous species that was documented to be a bigger problem. The squawfish bounty program seeks to reduce predation by squawfish on anadromous salmonid smolts, a problem that developed with construction of mainstem Columbia River dams.

Measures:

ODFW IC4 - ODFW and NMFS Joint Workshop on Exotic Predacious Fish

ODFW and NMFS will cosponsor a scientific workshop to review all pertinent scientific information on the abundance and distribution of exotic fishes and interactions of indigenous anadromous salmonids and exotic warm water fish species. The workshop will also explore the efficacy of potential habitat and fisheries management actions to reduce adverse interactions and needed research.

ODFW IC2c – Determine Predator Impacts from Exotic Fish

This measure is similar to what WDFW is proposing in their draft *Lower Columbia Steelhead Conservation Initiative* for the portions of the SW Washington and Lower Columbia ESUs that are in Washington.

Phase 1. All actions will require additional funding, so are listed under Phase 2.

Phase 2. If funds can be obtained, ODFW will add more evaluations to its existing information base on the potential for impacts from predation by introduced fish to anadromous salmonid restoration. Despite evidence that exotic fish have impacted populations in some specific locations, there is presently little information on the actual magnitude of predatory losses to anadromous salmonids throughout Oregon except in the Columbia River. Research studies will be conducted to evaluate the impact of predation by exotic fish (and native fish in some cases) to anadromous salmonid restoration and to determine the number of waters where restoration is being impacted by fish predation. This information will allow appropriate prioritization of efforts to deal with predation by exotic fishes.

Federal Agency Measures:

NOAA NMFS7 - Exotic Fishes

Same as *ODFW IC4* above. NMFS will work with ODFW to co host a workshop on exotic predacious fish

Biological Objective:

- B. Take management actions based on evaluation of costs, benefits, and expectation of success.*

Measures:

ODFW IC3 - Predator Management (Exotic Fishes)

This measure is very similar to what WDFW is proposing in their draft *Lower Columbia Steelhead Conservation Initiative* for the portions of the SW Washington and Lower Columbia ESUs that are in Washington.

Phase 1 & 2. ODFW will manage exotic fish predators in specific problem areas, with current levels of understanding about predatory interactions, as necessary (additional funding as Phase 2 efforts may be needed in some situations).

Predation by exotic fishes can impact anadromous salmonid production, but understanding the actual impact attributable to predation is confounded by the environmental changes that have taken place in many anadromous salmonid waters. There also are no easy management actions which can be applied to reduce or eliminate this factor. Removal of exotic fishes is often controversial and is not always effective in large systems. Furthermore, history has suggested that the public will simply reestablish popular exotic sport fish, negating the benefits of the removal. Relaxation of harvest regulations is unlikely to affect the total biomass of warm water predators like largemouth and smallmouth bass, as a large proportion of bass anglers practice catch and release, and the other warm water species already have liberal limits. Despite these difficulties, we will act on specific problem areas where feasible.

ODFW IC4 - ODFW and NMFS Joint Workshop on Exotic Predacious Fish

ODFW and NMFS will cosponsor a scientific workshop to review all pertinent scientific information on the abundance and distribution of exotic fishes and interactions of indigenous anadromous salmonids and exotic warm water fish species. The workshop will also explore the efficacy of potential habitat and fisheries management actions to reduce adverse interactions and needed research.

Federal Agency Measures:

NOAA NMFS7 - Exotic Fishes

Same as *ODFW IC4* above. NMFS will work with ODFW to co host a workshop on exotic predacious fish

Monitoring:

To the extent that adult and juvenile steelhead monitoring is carried out (ODFW IB1S) in systems where exotic fishes are present, further information may be generated for assessment of changes in steelhead production which might occur from changes in management of exotic fishes in these areas. Some monitoring of largemouth bass populations routinely occurs in the coastal lakes having important bass fisheries; that work could become more focused if it was needed to support specific evaluation activities related to the predation issue. Likewise, the smallmouth bass population in the Umpqua system is intermittently sampled for population structure and exploitation information. Striped bass production in Coos River is estimated annually from samples obtained by seining.

Adequacy:

Mortality from predation and competition by exotic fishes is a steelhead recovery issue to the extent that steelhead population sustainability is limited by that mortality source. At production levels beyond a sustainability threshold, the issue becomes one of balancing the public values of increased salmon, steelhead, and searun cutthroat production against the costs of management changes to favor anadromous salmonids and the foregone values of the affected resident fisheries. If sustainability is an issue, the measures proposed can lead to a systematic assessment of the potential for relief from predation losses.

Information from studies on largemouth bass (Tenmile Lakes), striped bass (Umpqua and Coos Rivers), smallmouth bass (Umpqua River and John Day River), and walleye (Columbia River) can be used in characterizing expected interactions with salmon, steelhead, and searun cutthroat trout. The loss of warm water fishing opportunities which will occur if exotic fishes are eradicated or substantially reduced in abundance will create a very serious public policy issue. In addition, methods which might be used to affect reduction of exotic fishes and vegetation (control through piscicides and herbicides; grass carp; watershed management prescriptions) will raise serious environmental and policy issues.

Federal Agency Measures with General Application to Section 4: Fish Management and Predation

BLM/USFS2 - Research

Work with local watershed councils, ODFW personnel, universities, and the Pacific Northwest Region Experimental Station staffs to improve coordination, integration, and information sharing on key research topics.

BLM/USFS3 - Monitoring and Evaluation

Explore expanded coordination with the State and watershed councils on Northwest Forest Plan implementation and effectiveness monitoring.

BLM/USFS4 - Inventories

Continue to collect data that are compatible with state efforts. This combined data has been used to describe aquatic and hydrologic conditions across whole watersheds, regardless of land ownership. The BLM and USFS will continue to work with the State in filling critical information gaps to ascertain health of aquatic systems. They will also continue to collaborate with the state in improving consistency and accomplishing inventory on priority watersheds and critical lands.

BLM/USFS8 - Education/Interpretation/Outreach

Work with the State and watershed councils in expanding ongoing cooperative outreach and environmental education programs.

BLM/USFS10 - Interagency and Tribal Coordination

Continue to work with other Federal, State, and County agencies and tribal governments to ensure coordination and sharing of information between involved entities.

NOAA-OAR22 - Oregon Sea Grant

Promote education and outreach on complexities of fish management. Provide annual funds (\$1.9M in 1997) for research, and education and outreach; support extension agents who assist watershed councils; support publication of newsletter, books.

NOAA-COP23 - Pacific Northwest Coastal Ecosystem Regional Study

Fund \$5M for 5 years to study linkages between coastal and offshore waters near Coos Bay and

The Oregon Plan

Supplement I¾ Steelhead

Revised February 6, 1998

Measures Analysis

Fish Management and Predation

two sites in Washington.

NOAA-NMFS25 - Population Status

Complete series of coastwide population status reviews of five species of Pacific salmonids, with information on biology and ecology of each species.

NOAA-NMFS30 - Snake River Recovery Plan

Proposed plan contains measures to reduce impacts of hatchery fish on wild fish and to reduce bycatch in mixed stock fisheries, and an improved decision-making forum and other measures that benefit all migratory fish.

NOAA-NMFS34 - Hire the Fisher Data Collection Program

Continue to support a program that received \$4.9 million during the fiscal year 1997 to hire fishers to gather data off the coast of Oregon, California and Washington. The projects funded often include data important to salmon management and conservation. Projects range from testing the effects of a selective fishery in Young Bays on incidental take levels of wild stocks of spring chinook and steelhead, to tagging sea lions, a salmonid predator, in the Columbia River at Astoria.

BIA1 - Co-Manager Consultation

Respond to requests for consultation on plans and policies that may affect tribal resources. This would include habitat protection and restoration projects, as well as development of terminal and selective fishing sites. The BIA can act as liaison between Oregon, local watershed councils, private landowners, and individual tribes regarding issues that affect tribal resources.

BPA9- Access to Computer and GIS Data Bases

Provide state and private parties with access to the Bonneville-funded Computer Information System (CIS) and Geographic Information System (GIS) resources. Access to the CIS and the GIS resources will be through the Pacific States Marine Fisheries Commission