ENDANGERED SPECIES ACT - SECTION 7

BIOLOGICAL OPINION

and

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT CONSULTATION

Proposed Qualification of the Regional Road Maintenance Program Submitted by 25 Jurisdictions in Washington State for 12 Threatened Salmonid ESUs, Pursuant to Limit No. 10(ii) of the NMFS 4(d) Rule

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Agency: National Marine Fisheries Service

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Northwest Region
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Approved by: [signature] Date: August 15, 2003

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1.0 INTRODUCTION

1.1 Background and Consultation History

NOAA's National Marine Fisheries Service (NOAA Fisheries) published an Endangered Species Act (ESA) section 4(d) rule adopting regulations necessary and advisable to conserve listed species (July 10, 2000, 65 FR 42422). The 4(d) rule creates a mechanism by which application of ESA section 9(a)(1) take prohibitions may be limited for land and water activities that NOAA Fisheries has found will conserve listed salmonids' habitat, yet may incidentally take. The 4(d) rule includes thirteen enumerated limits upon the extent of the general take prohibition for 14 threatened Evolutionarily Significant Units (ESUs). Limit No. 10 covers routine road maintenance activities. For a state, city, county or port program to qualify under Limit No.10(ii), it must adopt a road maintenance program that contributes to the attainment and persistence of properly functioning habitat condition (PFC).

In 1999, in response to several listings of salmonids under the ESA, local governments in the Puget Sound area formed a coalition, known as the "Tri-County ESA Response Effort" (Tri-County Group), to implement programs to conserve listed species. The Tri-County ESA Response Effort identified several government agency program areas with the potential to contribute to conservation. Road maintenance was one of those program areas. At the same time, the Washington State Department of Transportation (WSDOT) began to develop their own road maintenance program. In the fall of 2001, after two years of collaborative effort, WSDOT joined with the Tri-County Group to become the Regional Road Maintenance Technical Working Group. This union expanded the Regional Program to include the entire State of Washington. In January 2002, 25 jurisdictions (24 local jurisdictions and WSDOT) jointly submitted the Regional Road Maintenance ESA Program (RRMP) for qualification under Limit No. 10(ii).

On January 25, 2002, a Federal Register Notice was published (January 25, 2002, 67 FR 3688) announcing the availability of the RRMP for public comment. A 30-day extension of the public comment period was announced on March 13, 2002 (March 13, 2002, 67 FR 11285). The public comment period closed on April 12, 2002. NOAA Fisheries completed its review and response to public comments in late-January 2003. NOAA Fisheries initiated ESA section 7 consultation with itself on March 28, 2003.

The RRMP may affect 12 ESUs of threatened salmonids: Ten of the 14 ESUs addressed in the 4(d) Rule, and two additional ESUs (Snake River (SR) Fall-run and SR spring/summer-run chinook), not addressed in the 4(d) Rule. The 12 ESUs include: Puget Sound (PS), Lower Columbia River (LCR), SR fall-run, SR spring/summer-run, and Upper Willamette River (UWR) chinook salmon (*Oncorhynchus tshawytscha*); Hood Canal (HC) summer-run and Columbia River (CR) chum salmon (*O. keta*); Ozette Lake (OL) sockeye salmon (*O. nerka*), and; Snake River Basin (SRB), LCR, UWR, and Middle Columbia River (MCR) steelhead (*O. mykiss*).

The 4(d) Rule specifically excludes endangered species from its limits on the application of the ESA section 9(a)(1) take prohibitions. NOAA Fisheries, therefore, is not extending 4(d) Limit No. 10 coverage to RRMP activities within the delineated geographic boundaries of the three endangered ESUs Upper Columbia River (UCR) spring-run chinook salmon, UCR steelhead, and SR sockeye salmon. However, these three endangered salmonid ESUs migrate outside the geographic boundaries of their ESUs through a portion of the RRMP's action area. The effects of RRMP activities (primarily conducted in tributary watersheds) on endangered salmonids migrating through the middle and lower mainstem Columbia River would likely be insignificant or discountable and thus not be likely to adversely affect the UCR spring-run chinook salmon, UCR steelhead, or SR sockeye salmon.

1.2 Description of the Proposed Action

NOAA Fisheries proposes to approve 25 Limit No. 10 programs for 25 state and local jurisdictions in Washington State. NOAA Fisheries decided to group these actions in a single consultation pursuant to 50 CFR 402.14(c) because the 25 routine road maintenance programs are similar in nature and duration.

The State of Washington, through WSDOT, together with King, Pierce, Snohomish, Clallam, Kitsap, Mason, and Thurston Counties, and the Cities of Bellevue, Bremerton, Burien, Covington, Edgewood, Everett, Kenmore, Kent, Lake Forest Park, Lakewood, Maple Valley, Newcastle, Renton, Sammamish, Shoreline, Tacoma, and University Place developed the RRMP so that routine road maintenance activities would be protective of salmonids and their habitat.

The RRMP defines what activities are routine road maintenance. As defined on page "*x*" of the RRMP (RRM-TWG 2001), covered maintenance activities are "conducted on currently serviceable structures, facilities, and equipment, involve no expansion of or change in use, and do not result in significant negative hydrological impact."

The RRMP is divided into three parts. In Part 1, the RRMP describes the program framework including the 10 program elements that comprise the program (Regional Forum, Program Review, Best Management Practices (BMPs) and Conservation Outcomes (element 10), Training, Compliance Monitoring, Research, Adaptive Management, Emergency Response, Biological Data Collection, and Reporting). In Part 2, the RRMP elaborates on the BMPs in much greater detail and provides detailed instructions to crews, supervisors, environmental support staff, design personnel, and managers. Part 3 describes a process by which additional counties, cities, and ports in Washington State may develop routine road maintenance programs by adopting RRMP Parts 1 and 2, and then submit their RRMP to NOAA Fisheries for review, public comment, and approval or disapproval.

Finally, the RRMP includes a biological review (BR) of the RRMP prepared by WSDOT and the other entities named above. The BR analyzes the effects of the RRMP on the 12 threatened salmonid ESUs and their habitat statewide. The BR concludes that the identified routine road maintenance activities conducted throughout Washington State under the RRMP will not impair properly functioning habitat, nor appreciably reduce the functioning of already impaired habitat, nor retard the long-term progress of impaired habitat toward PFC.

The Federal action of approving the RRMP under Limit No. 10 required environmental review under the National Environmental Policy Act (NEPA). Two environmental assessments (EA) were prepared to meet NOAA Fisheries' environmental documentation requirements under NEPA: a programmatic EA for Limit No. 10 (NMFS 2003a) and a sequential EA that evaluated the environmental consequences associated with the RRMP submitted by the 25 Washington jurisdictions (NMFS 2003b).

1.3 Action Area

The action area is defined in 50 CFR 402.02 to mean "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." The 25 state and local jurisdictions applying for qualification of the RRMP under Limit No. 10 of the 4(d) Rule carry out routine road maintenance activities out on roads in urban and rural areas throughout the State of Washington. Because of potential direct and indirect effects on listed salmonids from implementation of the RRMP, the action area extends from southeastern Washington and crosses the Columbia Plateau, Cascade Mountains, and the Pacific Border provinces spanning Washington. It consists of the Columbia River basin downstream of Priest Rapids Dam, all coastal watersheds between the Columbia River in the south and the Canadian border in the north, and watersheds that drain to Puget Sound. Part or all of 28 counties fall within the action area, out of a total of 39 counties in Washington.

2.0 ENDANGERED SPECIES ACT

2.1 Biological Opinion

<u>2.1.1 Status of ESUs and Habitat</u>

The 12 threatened salmonid ESUs are in decline. The decline has been attributed to many different factors, including harvest, operation of hatcheries, hydropower development, and destruction of habitat (Federal Caucus 2000). Additionally, municipal and agricultural water withdrawals cause water shortages throughout the West, creating passage barriers, water quality declines, and eliminating habitat. Though less measurable, the effects of introduced aquatic nuisance species, which compete for habitat and prey on salmon, have caused a decline in salmon populations (He and Kitchell 1990). Recent research has shown that ocean conditions play a profound role in survival to spawning age, and contribute substantially to total salmon population numbers (Beamish *et al.* 2000).

The listing status, biological information, and critical habitat designations for the 15 threatened and endangered species are described in Table 1.

Table 1. References to Federal Register Notices and Status Reviews Containing Additional Information Concerning Listing status, Biological Information, and Critical Habitat Designations for Listed Species Considered in this Opinion.

Species	Listing Status Reference	Critical Habitat Reference	Biological Information
Puget Sound chinook Salmon (*Oncorhynchus tshawytscha*)	Threatened Species, (March 24, 1999, 64 FR 14308	No Critical Habitat Designated	Myers *et al* 1998
Lower Columbia River (LCR) chinook salmon (*O. tshawytscha*)	Threatened Species, (February 16, 2000, 65 FR 7764)	No Critical Habitat Designated	Myers *et al.*1998
Snake River fall-run (SRF) chinook salmon (*O. tshawytscha*)	Threatened Species, (April 22, 1992, 57 FR 14653). See correction: (June 3, 1992, 57 FR 23458)	Designated Critical Habitat, (December 28, 1993, 58 FR 68543)	Waples *et al.* 1991b
Snake River spring/summer-run (SRSS) chinook salmon (*O. tshawytscha*)	Threatened Species, (April 22, 1992, 57 FR 14653). See correction:(June 3 1992, 57 FR 23458)	Designated Critical Habitat,(December 28, 1993, 58 FR 68543). See update: (October 25, 1999, 64 FR 57399)	Matthews and Waples 1991
Upper Columbia River (UCR) spring-run chinook salmon (*O. tshawytscha*)	Endangered Species, (March 24, 1999, 64 FR 14308)	No Critical Habitat Designated	Myers *et al.* 1998
Upper Willamette River (UWR) chinook salmon (*O. tshawytscha*)	Threatened Species, (March 24, 1999, 64 FR 14308)	No Critical Habitat Designated	Myers *et al.* 1998
Hood Canal (HC) summer-run chum salmon (*O. keta)*	Threatened Species, (March 25, 1999, 64 FR 14508)	No Critical Habitat Designated	Johnson *et al.* 1997
Columbia River (CR) chum salmon (*O. keta)*	Threatened Species, (March 25, 1999, 64 FR 14508)	No Critical Habitat Designated	Johnson *et al* 1997

Ozette Lake sockeye *(O. nerka)*	Threatened Species, (March 25, 1999, 64 FR 14508)	No Critical Habitat Designated	Gustafson *et al.* 1997
Snake River (SR) sockeye *(O. nerka)*	Endangered Species, (November 20, 1991, 58 FR 58619)	Designated Critical Habitat, (58 FR 68543, December 28, 1993	Waples *et al*. 1991a
Upper Willamette River (UWR) steelhead (*O. mykiss*)	Threatened Species (March 25, 1999, 64 FR 14517)	No Critical Habitat Designated	Busby *et al.* 1995; Busby *et al.* 1996
Snake River Basin (SRB) steelhead (*O. mykiss*)	Threatened Species, (August 18, 1997, 62 FR 43937)	No Designated Critical Habitat	Busby *et al.* 1995; Busby *et al.* 1996
Lower Columbia River (LCR) steelhead *(O. mykiss)*	Threatened Species, (March 19, 1998, 63 FR 13347)	No Critical Habitat Designated	Busby *et al.* 1995; Busby *et al.* 1996
Middle Columbia River (MCR) steelhead (*O. mykiss*)	Threatened Species, (March 25, 1999, 64 FR 14517)	No Critical Habitat Designated	Busby *et al.* 1995; Busby *et al.* 1996
Upper Columbia River (UCR) steelhead (*O. mykiss*)	Endangered Species, (August 18, 1997, 62 FR 43937)	No Critical Habitat Designated	Busby *et al.* 1996; WCSBRT 1997

2.1.1.1 Puget Sound Chinook

The threatened PS chinook salmon ESU encompasses all naturally spawned spring, summer and fall runs of chinook salmon in the Puget Sound region from the North Fork Nooksack River to the Elwha River on the Olympic Peninsula. Critical habitat is not presently designated for this ESU.

Overall abundance of chinook salmon in this ESU has declined substantially from historical levels, and many populations are small enough that genetic and demographic risks are likely to be high. Although some natural spawning escapements in this ESU may be improving, the contribution of hatchery fish to natural escapements may be substantial, masking the trends in natural production. The widespread use of a limited number of hatchery stocks may have resulted in increased risk of loss of fitness and diversity among populations (Myers *et al.* 1998). Despite generally decreasing exploitation rates in Puget Sound since the implementation of the

Pacific Salmon Treaty in 1985, spawning escapement trends have remained relatively constant. A strong decline in recruitment has largely been compensated for by decreases in harvest (WDFW and Puget Sound Indian Tribes 2001).

Freshwater habitat throughout the range of the ESU has been blocked or degraded, with upper tributaries widely affected by poor forestry practices and lower tributaries and mainstem rivers affected by agriculture and urbanization. Other factors of decline include excessive harvest rates of natural stocks in mixed-stock fishing activities and the widespread use of a limited number of hatchery stocks.

Spawning escapement since Myers *et al.* (1998) indicates that 11 out of the 15 PS chinook management units are either stable or have improved relative to the benchmark (1992-96) utilized in that assessment. The upswing in escapement for the majority of the management units is encouraging. However, since much of the additional escapement may have resulted from the near elimination of most harvest, it is too soon to determine if this represents the beginning of sustained improvement in PS chinook production (WDFW and Puget Sound Indian Tribes, 2001).

2.1.1.2 Lower Columbia River Chinook Salmon

The threatened LCR chinook salmon ESU includes all natural-origin populations residing below impassable natural barriers from the mouth of the Columbia River to the crest of the Cascade Range just east of Hood River in Oregon and the White Salmon River in Washington. Critical habitat is not presently designated for this ESU.

Estimated overall abundance of chinook salmon in the ESU is not cause for immediate concern. Long-term trends in fall-run escapement are mixed, with most larger stocks positive, while the spring-run trends are positive or stable. Short-term trends for both runs are more negative, some severely so (Myers *et al.* 1998). However, apart from the relatively large and apparently healthy fall-run population in the Lewis River, production in this ESU appears to be predominantly hatchery-driven with few identifiable native, naturally reproducing populations. About half of the populations constituting this ESU are very small, increasing the likelihood that risks due to genetic and demographic processes in small populations will be important.

Spawning and juvenile rearing areas have been eliminated or greatly reduced by dam construction, and freshwater habitat is in poor condition in many basins, due to forestry practices, urbanization and agriculture. Also of concern is the potential loss of fitness and diversity resulting from the introgression of hatchery fish within the ESU (Myers *et al.* 1998).

2.1.1.3 Snake River Fall-Run Chinook

The threatened SR fall-run chinook salmon ESU includes all natural-origin populations of fall-run chinook in the mainstem Snake River and several tributaries including the Tucannon, Grande Ronde, Salmon, and Clearwater rivers. Fall-run chinook from the Lyons Ferry Hatchery are included in the ESU but are not listed. Critical habitat was designated for SR fall-run chinook salmon on December 28, 1993 (58 FR 68543).

This ESU includes the mainstem river and all tributaries, from their confluence with the Columbia River to the Hells Canyon complex. Because genetic analyses indicate that fall-run chinook salmon in the Snake River are distinct from the spring/summer-run in the Snake River basin (Waples *et al.* 1991b), SR fall-run chinook salmon are considered separately from the other two forms.

Some SR fall-run chinook historically migrated over 900 miles from the ocean. Although the SR population is now restricted to habitat in the lower river, genes associated with the lengthier migration may still reside in the population. Because longer freshwater migrations in chinook salmon tend to be associated with more-extensive oceanic migrations (Healey 1983), maintaining populations occupying habitat that is well inland may be important in continuing diversity in the marine ecosystem as well.

Because of hydrosystem development, the most productive areas of the Snake River basin are now inaccessible or inundated. The upper reaches of the mainstem Snake River were the primary areas used by fall-run chinook salmon, with only limited spawning activity reported downstream from river mile 272.

The Snake River has contained hatchery-reared fall-run chinook salmon since 1981 (Busack 1991). The hatchery contribution to Snake River escapement has been estimated at greater than 47% (Myers *et al.* 1998). Artificial propagation is recent, so cumulative genetic changes associated with it may be limited. Wild fish are incorporated into the brood stock each year, which should reduce divergence from the wild population. Release of subyearling fish may also help minimize the differences in mortality patterns between hatchery and wild populations that can lead to genetic change (Waples 1999).

For the SR fall-run chinook salmon ESU as a whole, NOAA Fisheries estimates that the median population growth rate (lambda) over the base period ranges from 0.94 to 0.86, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (McClure *et al.* 2000). NOAA Fisheries has also estimated the risk of absolute extinction for the aggregate SR fall-run chinook salmon population, using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (*i.e.*, hatchery effectiveness equals zero), the risk of absolute extinction within 100 years is 0.40 (McClure *et al.* 2000). At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness equals 100%), the risk of absolute extinction within 100 years is 1.00 (McClure *et al.* 2000).

2.1.1.4 Snake River Spring/Summer-Run Chinook Salmon

The threatened SR spring/summer chinook salmon includes all natural-origin populations in the Tucannon, Grande Ronde, Imnaha, and Salmon rivers. Some or all of the fish returning to several of the hatchery programs are also listed including those returning to the Tucannon River, Imnaha, and Grande Ronde hatcheries, and to the Sawtooth, Pahsimeroi, and McCall hatcheries on the Salmon River. Critical habitat was designated for SR spring/summer chinook salmon on December 28, 1993 (58 FR 68543), and was revised on October 25, 1999 (64 FR 57399).

Even before mainstem dams were built, habitat was lost or severely damaged in small tributaries by construction and operation of irrigation dams and diversions, inundation of spawning areas by impoundments, and siltation and pollution from sewage, farming, logging, and mining (Fulton 1968). Recently, the construction of hydroelectric and water storage dams without adequate provision for adult and juvenile passage in the upper Snake River has kept fish from all spawning areas upstream of Hells Canyon Dam.

There is a long history of human efforts to enhance production of chinook salmon in the Snake River basin through supplementation and stock transfers. The evidence is mixed as to whether these efforts have altered the genetic makeup of indigenous populations. Straying rates appear to be very low.

For the SR spring/summer chinook salmon ESU as a whole, NOAA Fisheries estimates that the median population growth rate (lambda) over the base period ranges from 0.96 to 0.80, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to the effectiveness of fish of wild origin (McClure *et al.* 2000). NOAA Fisheries has also estimated median population growth rates and the risk of absolute extinction for the seven spring/summer chinook salmon index stocks, using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (*i.e.*, hatchery effectiveness equals zero), the risk of absolute extinction within 100 years for the wild component ranges from zero for Johnson Creek to 0.78 for the Imnaha River (McClure *et al.* 2000). At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness equals 100%), the risk of absolute extinction within 100 years ranges from zero for Johnson Creek to 1.00 for the wild component in the Imnaha River (McClure *et al.* 2000).

2.1.1.5 Upper Willamette River Chinook Salmon

The threatened UWR chinook salmon ESU includes native spring populations in the Willamette River and tributaries upstream of Willamette Falls, including naturally produced spring-run fish in the Clackamas River. Critical habitat is not presently designated for this ESU.

The abundance of naturally-produced spring-run chinook in the ESU has declined substantially from historic levels. Historic escapement levels may have been as high as 200,000 fish per year (Myers *et al.* 1998). Current natural escapement is less than 5,000 fish, and about two-thirds of the natural spawners are estimated to be first-generation hatchery fish (Myers *et al.* 1998). Although natural escapements are substantially depressed, the number of naturally spawning fish have gradually increased in recent years (NMFS 2001). Although natural escapements are depressed, the number of naturally spawning fish has gradually increased in recent years.

The primary cause of decline of chinook in this ESU is the blockage of access to large areas of spawning and rearing habitat by dam construction. The remaining habitat has been degraded by thermal effects of dams, forestry practices, agriculture, and urbanization. Another concern for this ESU is that commercial and recreational harvest were high, relative to the apparent productivity of natural populations. New fishing regulations are expected to reduce harvest mortality by 70% from historic levels. Efforts have been taken to remedy some of the past hatchery practices including limiting the proportion of hatchery spawners in some natural production areas, and reincorporating local-origin wild fish into the hatchery broodstock.

2.1.1.6 Ozette Lake Sockeye

The threatened OL sockeye salmon ESU includes all sockeye salmon that return to Lake Ozette through the Ozette River and currently spawn primarily in lakeshore upwelling areas on Ozette Lake. A small proportion of this ESU may also spawn below the lake in the Ozette River and its tributary, Coal Creek. Critical habitat is not presently designated for this ESU.

The historical abundance of OL sockeye is poorly documented, but is believed to have declined significantly from historic levels. Historical estimates indicate run sizes of a few thousand sockeye salmon, with a peak recorded harvest of nearly 18,000 in 1949. Between 1977 and 1999, the average annual abundance level for the total (lake and tributary-origin) was 1,075 (ranging from 263 to 2,191 per year). This most recent four year annual mean run size from 1996 to 1999 for this predominantly four-year-old age at return escapement average compares to a mean escapement of 811 for the previous four years of the cycle (1992 to 1995, ranging from less than 267 to 2,548 per year). Sockeye salmon originating from Ozette Lake tributaries comprised an average of 9.8% of the total Ozette Lake escapement in recent years. Recent run size estimates and analysis of previous estimation methods indicate that sockeye abundance within the ESU may be relatively stable or increasing. Some of this increase is attributable to the hatchery supplementation and recovery program initiated in response to the decline in population abundance.

Factors likely contributing to the decline of this ESU include introduced species, predation, loss of tributary populations, decline in quality of beach-spawning habitat, unfavorable ocean conditions, excessive historical harvests, introduced diseases, and the potential genetic effects of past and on-going hatchery practices (Dlugokenski *et al.* 1981; Beauchamp *et al. 1995*; Jacobs *et al.* 1996). Habitat degradation in the form of sedimentation, stream-bed scouring, increased flows, and degraded water quality have been primarily attributed to logging and associated road building.

2.1.1.7 Hood Canal Summer-Run Chum Salmon

The threatened HC summer-run chum ESU includes populations in Hood Canal and in Discovery and Sequim Bays on the Strait of Juan de Fuca. The ESU also includes summer-run chum salmon in the Dungeness River, but their status is uncertain (WDFW and PNPTT 2000). Critical habitat is not presently designated for this ESU.

Although abundance was high in the late 1970s, abundance for most HC summer-run chum populations declined rapidly beginning in 1979, and has remained at depressed levels. The terminal run size for this ESU averaged 28,971 during the 1974 to 1978 period, declining to an average of 4,132 during 1979 to 1993. Abundance during the 1995 to 2000 period improved, averaging 8,724 adults. However, much of the increase in abundance can be attributed to a supplementation program begun in 1992 (WDFW and PNPTT 2000).

The causes of decline for this ESU include a combination of the cumulative effects of habitat degradation, high fishery exploitation rates, and shifts in climatic conditions that have changed patterns and intensity of precipitation. Channel, riparian forest, and sub-estuarine conditions were moderately to severely degraded in all watersheds due to a history of logging, road building, rural development, agriculture, water withdrawal, and channel manipulations throughout the ESU (WDFW and PNPTT 2000). Total exploitation rates have dropped dramatically since 1995 as a result of fishery actions taken to protect summer-run chum and other salmonid species.

Supplementation programs were instituted beginning in 1992 due to assessments of moderate or high risk of extinction for several stocks (WDFW and PNPTT 2000). These programs are scheduled to end in 12 years, unless re-evaluation at that time indicates extending them would be beneficial to recovery of the ESU.

2.1.1.8 Columbia River Chum Salmon

This threatened ESU includes all naturally produced chum salmon populations that enter the Columbia River. Historically, chum salmon were abundant in the lower reaches of the Columbia River and may have spawned as far upstream as the Walla Walla River (Johnson *et al.* 1997). However, reductions in available habitat currently limit chum salmon in the Columbia River to tributaries below Bonneville Dam. Presently, only two chum salmon populations are recognized and monitored in the Columbia River (Grays River and Hardy and Hamilton Creeks/Ives Island group), although chum have been reported in other areas, including the East Fork Lewis River (Salo 1991; Kostow 1995). Critical habitat is not presently designated for this ESU.

Current abundance is less than one percent of historic levels, and the ESU has lost some of its original genetic diversity. The estimated minimum run size for this ESU has been relatively stable, since the run collapsed during the mid-1950s (Johnson *et al.* 1997). Information from stream surveys of the remaining populations suggests that there may be a few thousand chum spawning in the Columbia River basin (Johnson *et al.* 1997).

Decline of this ESU is attributed to dams and habitat degradation primarily from diking and wetland loss (Johnson *et al.* 1997). Hatchery fish have had little influence on the wild component of the Columbia River chum salmon ESU (Johnson *et al.* 1997).

2.1.1.9 Upper Willamette Steelhead

The UWR steelhead ESU includes all naturally produced steelhead in the Willamette River and its tributaries upstream of Willamette Falls. No estimates of abundance prior to the 1960s are available. Abundance has been declining steeply since the late 1980s going from an average of over 15,000 in the 1970s and 1980s to several thousand today (Busby *et al.* 1996). Critical habitat is not presently designated for this ESU.

The potential negative influence of hatchery fish through genetic effects and competition between native and non-native stocks was noted as the primary factor of concern for this ESU (Busby *et al.* 1996). Habitat blockage from dams and habitat degradation from logging and urbanization have contributed to stream flow and temperature problems and loss of riparian habitat (Bottom *et al.* 1985, Busby *et al.* 1996).

2.1.1.10 Lower Columbia River Steelhead

The threatened LCR steelhead ESU includes all naturally produced steelhead in tributaries to the Columbia River between the Cowlitz and Wind Rivers in Washington and the Willamette and Hood Rivers in Oregon, excluding steelhead in the upper Willamette River above Willamette Falls and steelhead in the little and Big White Salmon Rivers in Washington (Middle Columbia ESU) (Busby *et al.* 1996). Critical habitat is not presently designated for this ESU.

No estimates of historical abundance (pre-1960s) specific to this ESU are available. A conservative estimate of current abundance puts the average run size at greater than 16,000. Abundance trends are mixed and possibly affected by short-term climate conditions. At the time of NOAA Fisheries' status review (Busby *et al.* 1996), the majority of stocks for which data are available within this ESU were declining, although some had increased strongly. Since 1996, listed LCR steelhead populations have generally increased, with some populations rebounding more quickly than others.

The magnitude of hatchery production, habitat blockages from dams, and habitat degradation from logging and urbanization are areas of concern. The widespread production of hatchery steelhead within this ESU creates specific concerns for summer steelhead and Oregon winter-run steelhead stocks, where there appears to be substantial overlap in spawning between hatchery and natural fish (Busby *et al.* 1996). Most of the hatchery stocks originate from stocks within the ESU, but many are not native to local river basins.

2.1.1.11 Middle Columbia River Steelhead

The threatened MCR steelhead ESU includes all natural-origin populations in the Columbia River basin above the Wind River in Washington, and the Hood River in Oregon (exclusive), including the Yakima River in Washington, except for steelhead in the Snake River basin (Busby *et al.* 1996). This ESU includes the only populations of winter-run inland steelhead in the United States (in the Klickitat River, Washington, and Fifteenmile Creek, Oregon). Both the Deschutes River and Umatilla River hatchery stocks are included in the ESU, but are not listed. Critical habitat is not presently designated for MCR steelhead.

Substantial habitat blockages are present in this ESU. Water withdrawals, and loss of riparian vegetation caused by overgrazing have seriously reduced summer flows in the principal summer-run steelhead spawning and rearing tributaries of the Deschutes River. High summer and low winter temperatures are limiting factors for salmonids in many streams in this region (Bottom *et al.* 1985; Busby *et al.* 1996).

Continued increases in the proportion of stray steelhead in the Deschutes River basin is a major concern. The ODFW and the Confederated Tribes of the Warm Springs Reservation of Oregon estimate that 60% to 80% of the naturally spawning population consists of strays, which greatly outnumber naturally produced fish. Although the reproductive success of stray fish has not been evaluated, the genetic contribution of non-indigenous, hatchery stocks may have reduced the fitness of the locally adapted, native fish. A decrease in fitness could have occurred through hybridization and associated reductions in genetic variation or introduction of deleterious (non-adapted) genes. Hatchery fish can also directly displace natural spawning populations, compete for food resources, or engage in agonistic interactions (Campton and Johnston 1985; Waples 1991b; Hilborn 1992; Busby *et al.* 1996).

The negative effects of any interbreeding between stray and native steelhead will be exacerbated if the stray steelhead originated in geographically distant river basins, especially if the river basins are in different ESUs. A key unresolved question about the large number of strays in the Deschutes basin is how many stray fish remain in the basin and spawn naturally.

Historical abundance in the ESU may have been in excess of 300,000 (Busby *et al.* 1996). Total abundance was estimated at about 200,000 by the early 1980s, and by the early 1990s average abundance was 142,000 with 39,000 naturally produced. Total steelhead abundance in the ESU appears to have been increasing recently, and the naturally produced component has been relatively stable. However, the majority of natural stocks for which there are data within this ESU have been declining.

There is particular concern about Yakima River and winter-run steelhead stocks. Winter-run steelhead are reported within this ESU only in the Klickitat River and Fifteenmile Creek. No abundance information exists for winter-run steelhead in the Klickitat River, but winter-run steelhead are reported to have been declining in abundance in Fifteenmile Creek. Escapement trends for natural summer and winter steelhead have been increasing over the last few years but are still below historic levels.

For the MCR steelhead ESU as a whole, NOAA Fisheries estimates that the median population growth rate (lambda) over the base period ranges from 0.88 to 0.75, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared with that of fish of wild origin (McClure *et al.* 2000). NOAA Fisheries has also estimated the risk of absolute extinction for four of the subbasin populations, using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (*i.e.*, hatchery effectiveness equals zero), the risk of absolute extinction within 100 years ranges from zero for the Yakima River summer run to 1.00 for the Umatilla River and Deschutes River summer runs (McClure *et al.* 2000). Assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness equals 100%), the risk of absolute extinction within 100 years ranges from zero for the Yakima River summer-run to 1.00 for the Deschutes River summer-run (McClure *et al.* 2000).

2.1.1.12 Snake River Basin Steelhead

The threatened SRB steelhead includes all naturally produced steelhead in the Snake River basin of southeast Washington, northeast Oregon and Idaho (Busby *et al.* 1996). None of the hatchery stocks in the Snake River basin is listed, but several are included in the ESU. Critical habitat is not presently designated for SRB steelhead.

Hydrosystem projects create substantial habitat blockages in this ESU; the major ones are the Hells Canyon Dam complex (mainstem Snake River) and Dworshak Dam (North Fork Clearwater River). Minor blockages are common throughout the region. Steelhead spawning areas have been degraded by overgrazing, as well as by historical gold dredging and sedimentation due to poor land management. The habitat degradation has resulted in significant temperature and flow fluctuations, sedimentation, and loss of riparian vegetation. Habitat in the Snake River basin is warmer and drier and often more eroded than elsewhere in the Columbia River basin or in coastal areas (Busby *et al.* 1996).

Hatchery fish are widespread and stray to spawn naturally throughout the region. In the 1990s, an average of 86% of adult steelhead passing Lower Granite Dam were of hatchery origin. Hatchery contribution to naturally spawning populations varies, however, across the region. Hatchery fish dominate some stocks, but do not contribute to others (Busby *et al.* 1996).

For the SRB steelhead ESU as a whole, NOAA Fisheries estimates that the median population growth rate (lambda) over the base period ranges from 0.91 to 0.70, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared to that of fish of wild origin (McClure *et al.* 2000). NOAA Fisheries has also estimated the risk of absolute extinction for the A- and B-runs, using the same range of assumptions about the relative effectiveness of hatchery fish. At the low end, assuming that hatchery fish spawning in the wild have not reproduced (*i.e.*, hatchery effectiveness equals zero), the risk of absolute extinction within

100 years is 0.01 for A-run steelhead and 0.93 for B-run fish (McClure *et al.* 2000). At the high end, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness equals 100%), the risk of absolute extinction within 100 years is 1.00 for both runs (McClure *et al.* 2000).

2.1.1.13 Summary of the Evolutionarily Significant Units' Current Status

Average population abundances in the 12 threatened ESUs are clearly substantially less than historical levels. The current low average abundances of the species and the range of different activities currently affecting the species underscore the critical need for continued rigorous monitoring and evaluation of population parameters and the effects of various activities on those populations. The biological requirements of the 12 threatened ESUs are currently not being met under the environmental baselines. Their status is such that there must be significant improvements in the environmental conditions of the ESUs' respective baselines. Previous NOAA Fisheries listing decisions and consultations, and the biological review prepared for the RRMP, provide additional, detailed discussions of the environmental baselines. Current scientific information suggests that a multitude of factors, past and present, human and natural, have contributed to the decline of these ESUs. For example, there is evidence to suggest that previous and current destruction and modification of freshwater habitats contribute to the decline of these species.

2.1.2 Evaluating the Proposed Action

The standards for determining jeopardy and destruction or adverse modification of critical habitat are set forth in section 7(a)(2) of the ESA. In conducting analyses of habitat-altering actions under section 7 of the ESA, NOAA Fisheries uses the following steps of the consultation regulations and when appropriate combines them with *The Habitat Approach, Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Anadromous Salmonids* (NMFS 1999): (1) Consider the biological requirements and status of the listed species; (2) evaluate the relevance of the environmental baseline in the action area to the species' current status; (3) determine the effects of the proposed or continuing action on the species, and whether the action is consistent with any available recovery strategy; and (4) determine whether the species can be expected to survive with an adequate potential for recovery under the effects of the proposed or continuing action, the effects of the environmental baseline, and any cumulative effects, and considering measures for survival and recovery specific to other life stages. In completing this step of the analysis, NOAA Fisheries determines whether the action under consultation, together with all cumulative effects when added to the environmental baseline, is likely to jeopardize the ESA-listed species or result in the destruction or adverse modification of critical habitat. If jeopardy or adverse modification are found, NOAA Fisheries may identify reasonable and prudent alternatives for the action that avoid jeopardy and/or destruction or adverse modification of critical habitat.

The fourth step above (jeopardy/adverse modification analysis) requires a two-part analysis. The first part focuses on the action area and defines the proposed action's effects in terms of the species' biological requirements in that area (*i.e.*, effects on essential features). The second part focuses on the species itself. It describes the action's effects on individual fish, populations, or both - and places that impact in the context of the ESU as a whole. Ultimately, the analysis seeks to determine whether the proposed action is likely to jeopardize a listed species' continued existence or destroy or adversely modify its critical habitat.

2.1.2.1 Biological Requirements

The first step in the methods NOAA Fisheries uses for applying ESA section 7(a)(2) to listed salmon is to define the species' biological requirements that are most relevant to each consultation. NOAA Fisheries also considers the current status of the listed species; taking into account population size, trends, distribution, and genetic diversity. To assess the current status of the listed species, NOAA Fisheries starts with the determinations made in its original decision to list the species for protection under the ESA. Additionally, the assessment will consider any new information or data that are relevant to the determination.

The relevant biological requirements are those necessary for the listed species to survive and recover to naturally reproducing population levels at which time protection under the ESA would be unnecessary. Species or ESUs not requiring ESA protection have the following attributes: population sizes large enough to maintain genetic diversity and heterogeneity, the ability to adapt to and survive environmental variation, and are self-sustaining in the natural environment.

The 12 threatened species covered by this consultation have similar basic biological requirements. These requirements include food, flowing water (quantity), high quality water (cool, free of pollutants, high dissolved oxygen concentrations, low sediment content), functioning riparian conditions, stable streambank conditions, flood plain connectivity, adequate in-stream abundance and sources of woody material recruitment, clean spawning substrate, and unimpeded migratory access to and from spawning and rearing areas (adapted from Spence *et al.* 1996).

NOAA Fisheries has related the biological requirements for listed salmonids to a number of habitat attributes, or pathways, in the Matrix of Pathways and Indicators (MPI). These pathways (Water Quality, Habitat Access, Habitat Elements, Channel Condition and Dynamics, Flow/Hydrology, Watershed Conditions, Disturbance History, and Riparian Reserves) indirectly measure the baseline biological health of listed salmon populations through the health of their habitat. Specifically, each pathway is made up of a series of individual indicators (*e.g.*, indicators for water quality include temperature, sediment, and chemical contamination) that are measured or described directly. Based on measurement or description, each indicator is classified within a category of the properly functioning condition (PFC) framework: (1) properly functioning, (2) at risk, or (3) not properly functioning. Properly functioning condition is defined as "the sustained presence of natural habitat forming processes in a watershed that are necessary for the long-term survival of the species through the full range of environmental variation."

The specific biological requirements affected by the proposed RRMP include food availability and habitat attributes including water quality, flow/hydrology, habitat access, riparian elements and channel condition and dynamics.

2.1.2.2 Environmental Baseline

The environmental baseline represents the current set of basal conditions to which the effects of the proposed action are then added. Environmental baseline is defined as "the past and present impacts of all Federal, state, and private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or informal section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation process" (50 CFR 402.02). The term "action area" is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action."

For the purpose of this consultation, the action area includes all waters throughout the State of Washington within the range of the 12 threatened salmon and steelhead ESUs. The action area may extend upstream or downstream of permitted projects, based on their potential to affect fish passage, riparian succession, the hydrologic cycle, the erosion, transportation, and deposition of sediments, and other ecological processes related to the formation and maintenance of salmon habitats. Indirect effects may occur throughout the watershed where other activities depend on RRMP activities for their justification or usefulness. The major factors influencing the environmental baseline within the action area include: (1) habitat modifications; (2) hatchery practices; and (3) harvest management.

2.1.2.2.1 Habitat. *Introduction.* The scale of the analysis appears large as the action area includes much of Washington State. However, the effects of underlying routine road maintenance activities are highly repetitive and predictable. To enable an appropriate analysis for intra-agency consultation, programmatic consultation must fact the condition of habitat elements, statewide. NOAA Fisheries summarized status information reported in several documents, including Washington State Department of Natural Resources' (WDNR) *Changing Our Water Ways: Trends in Washington's Water Systems* (WDNR 2000), the Washington State Conservation Commission's (WSCC) *Habitat Limiting Factors Reports* (WSCC 1999 - 2001) and the Regional Road Maintenance Technical Working Group's *Biological Review of the Regional Road Maintenance ESA Program Guidelines* (RRM-TWG 2001). These documents review the trends affecting aquatic resources statewide.

Declines in the status of salmon and steelhead in Washington State are attributed to myriad factors, including habitat functional quality and amount. Both natural and human-induced activity have contributed to this decline; under formal consultation NOAA Fisheries focuses primarily on human activities.

While human disturbances may have minimal impacts individually, the number, magnitude, duration, and cumulative impacts since Euro-American settlement combine to form the primary cause of the decline of numerous salmon stocks in fresh water. Historical and current human-caused disturbances include: clearing and channelizing rivers, sending logs down streams via splash dams, extensive land clearing, diverting water, livestock grazing in waterways, mining run-off, constructing logging roads and accelerating erosion, removing old growth forests, filling and diking of wetlands and estuaries, armoring shorelines and streambanks, developing hydroelectric dams, creating barriers to fish migration, increasing surface run-off, contaminating water and sediments, introducing non-native plants and animals, changing levels of oxygen and nutrients in waterways and over fishing.

Human activity and development have significant and damaging impacts on the environment, and the growing population indicates increasing pressure on the state's aquatic resources. Washington's population (5.8 million in 2000) is expected to increase by nearly 2 million by the year 2020. Although each watershed is unique, the impacts of development can be grouped into broad categories:

• Interrupting the flow of water
• Alterations to aquatic ecosystems
• Shoreline modifications
• Effects of shipping and transportation
• Pollution

Interrupted flow regime. Today, approximately 1,025 dams obstruct the flow of water in Washington; this number includes any structure than can store 10 or more acre-feet of water. Because dams obstruct the flow of rivers, they change the physical flow of water, resulting in areas that are either drier than normal or flooded. Changing the depth and flow of rivers also affects the water's temperature.

Dams also change the flow of materials carried in river water. They stop the flow of debris, nutrients, sediments, and reduce the size and quality of floodplains. As a result, reservoirs eventually fill with sediments and inadequate amounts of sediments reach the deltas and estuaries. Dams also change the movement of fish migrating between the streams and oceans. In addition to the many dams blocking fish movement, the Washington Department of Fish and Wildlife (WDFW) indicates there is a minimum of 2,400 to 4,000 human-made barriers blocking 3,000 to 4,500 miles of freshwater spawning and rearing habitat for salmon. A recent critique of the Washington State Hydraulic Code estimated that there are approximately 8,800 culvert related barriers blocking over 6,000 miles of habitat. The authors estimated an annual lost opportunity of 10 million adult salmon (Hollowed and Wasserman 2000).

Irrigation projects significantly changed the timing, quantity, and quality of flow in many rivers and tributaries. Flood control dikes and highway construction cut off rivers from their historic flood plains and wetlands, resulting in habitat destruction, changes in stream temperature and nutrient composition alterations. In the Yakima River basin, these changes contributed to the reduction of historically abundant runs of salmon and steelhead. Today, summer-run chinook, native coho and anadromous sockeye are extinct and spring chinook declined from 9,300 in 1986 to 645 in 1997.

Human impacts and natural events can combine to change the flow of a river. The natural course of a river includes its floodplain. When the East Fork Lewis River was captured by floodplain gravel pits in 1995, it abandoned 1,700 feet of gravel spawning beds, and when captured again in 1996, it abandoned another 3,200 feet.

The availability of water has long been a major issue for all Washington residents, including its aquatic species. Of Washington's 62 Water Resource Inventory Areas (WRIAs), 16 have both an ESA-listed salmon stock and a water supply problem. In addition, about 450 lakes and streams in Washington are partially or completely closed to further withdrawals.

Another issue associated with growth in Washington is increased coverage by impervious surfaces. Impervious surfaces affect the amount of water that seeps into the ground and washes into streams; they also affect how quickly the water gets there. When land is covered with pavement or buildings, the area available for rainwater and snowmelt to seep into the ground and replenish the groundwater is drastically reduced; in many urban areas it is virtually eliminated. The natural movement of water through the ground to usual discharge points such as springs and streams is altered. Instead, the natural flow is replaced by storm sewers or by more concentrated entrance points of water into the ground.

Changing the timing and amount of water run-off can lead to too much water going directly into streams in the rainy months of winter instead of soaking into the ground. Consequently, there is not enough water in the ground to slowly release into streams in the dry months of summer. Too much water in the winter can cause fish habitat to be scoured by unnaturally swift currents; not enough water in streams in the summer leads to water temperatures too high to support fish. Studies show that when impervious surfaces such as pavement and buildings cover between five percent to eight percent of a watershed, the health of streams and the fish in them declines, despite stormwater controls. In the south Puget Sound area, most urban watersheds are 20% to 40% covered with hard surfaces, altering stream flows, water temperatures, and in-stream habitat for everything from insects to fish.

Altered Aquatic Ecosystems. Wetlands improve water quality by filtering out sediments, nutrients, and toxic chemicals. However, research shows that a watershed can withstand having only five percent to eight percent of its land base covered with buildings, roads, and other impervious surfaces before significant changes in wetland functions and stream hydrology begin to occur. Washington has almost two centuries of wetland conversion. Since statehood, Washington has lost 33% of its wetland areas, from 1.4 million acres to 938,000 acres.

Estuary losses have occurred primarily through conversions to farms and cities. In the Skagit Valley, for example, a large majority of the estuary mud flats and flood plain was converted to farmland before the first land surveys of 1889. Nearly 75% of the wetland area was lost before statehood. Currently less than 3 square miles of tidal estuary wetland remain, a 93% loss.

When tidal flood plains and estuaries are destroyed or significantly disturbed, critical functions are at risk. The vast food source is diminished and silt that is carried along by currents to replenish beaches and nearshore habitat is lost. Replacing estuaries with farms, industry, and cities destroys habitat critically needed by salmon.

Eelgrass, a marine flowering plant, grows low in the intertidal zone and in mud and sand in the shallow subtidal zone. It is critical to salmon recovery efforts because it provides fish a place to hide and evade predators. It also provides food and habitat for salmon prey. Because of where it grows, eelgrass is largely inaccessible and hard to survey. As a result, it is unclear how much eelgrass has disappeared from Puget Sound waters over the past 100 years. However, the historical data that scientists do have suggest that eelgrass beds in Bellingham Bay have declined by about 50% over the past 100 years; a figure fairly consistent throughout its range in Washington.

The amount of dissolved oxygen in water is an important measurement of overall water quality. Areas of Puget Sound are experiencing lower levels of dissolved oxygen. In March 2000, the Puget Sound Water Quality Action Team identified 87 areas in Puget Sound that had problem with low dissolved oxygen. Human actions are the main contributor to depleted oxygen. Excessive fertilizers and nitrogen applied to yards and fields, and fecal matter from septic fields and failing septic systems, contribute pathogens and nutrients that can deplete oxygen. Because there is little historical data on dissolved oxygen concentrations in marine waters, it is difficult to compare the health of Washington's marine waters of today to those of the past. However, based on measurements of dissolved oxygen in the southern part of Hood Canal made in the 1950s and 1960s, today's dissolved oxygen concentrations are lower, more frequently.

The introduction of non-native species has been known to profoundly affect ecosystems by disrupting food webs and displacing native species. Because of a lack of natural predators or competitors, these introduced species can spread rapidly. In 1998, an expedition discovered more than 52 invasive species in Puget Sound. Non-native species are introduced primarily through shipping, aquaculture, research, and aquaria industries. Other tenacious and insidious non-native species that have invaded Washington's waters and aquatic ecosystems include:

• Eurasian Water Milfoil, an aquatic plant found in lakes and slow-moving streams. It can lower dissolved oxygen and increase pH; displace native aquatic plants and increase water temperature.

• Parrotfeather is limited to coastal lakes and streams, the Columbia River, the Chehalis River and private ponds and lakes. The emergent stems shade the water column, eliminating algal growth, which is the basis of the aquatic food web.

• Purple Loosestrife generally grows in marshes, ponds, streambanks, ditches and lake shores. Because it grows so aggressively, large stands take over an area and eventually replace the native plant species, eliminating the natural food and cover essential to native shoreline and wetland inhabitants.

• Hydrilla roots in lake sediments and grows rapidly under very low light conditions. Hydrilla can fill the water column with vegetation, displacing native fish and wildlife.

• Spartina is an non-native species of intertidal cordgrass. If left uncontrolled, Spartina transforms mud flats into dense, raised meadows, cut by narrow, deep channels. The loss of mud flats, eelgrass, and algae directly affect native fish species that depend on these areas for feeding, spawning and rearing.

Shoreline Modification. Washington has more than 3,000 miles of marine shoreline. When these shorelines are changed or eradicated, intertidal and nearshore habitat is affected or lost, causing significant stress on the salmon that rely on these habitats. Modifications of shorelines include bulkheads, docks, piers, or areas that have been filled or dredged.

Few statistics exist on the extent of freshwater shoreline modification. One lake that has received some attention is Lake Washington, in Seattle. More than 80% of its shoreline has been armored against erosion and over 3,000 residential piers cover approximately 2.5% of the lake's surface. Adverse effects of these shoreline modifications include loss of riparian vegetation, shading of the nearshore aquatic zone, and an increase in attractive refugia for piscivorous birds and fish.

Development of Washington's marine and estuarine shoreline over the past 100 years has created a landscape that is dramatically different from what the first settlers found. About 800 miles of the Puget Sound shoreline have been modified, with 25% of the modifications in the intertidal areas. Up to 52% of the central Puget Sound shoreline and about 35% of the shorelines of Whidbey Island, Hood Canal, and south Puget Sound have been changed or eradicated. To help protect their shoreline property from erosion, many waterfront homeowners construct bulkheads between their land and the beach. Ironically, one consequence of bulkheads is the loss of sand from the beach and beach erosion. The natural process of bluff erosion provides a supply of sand and rocks to the beach. Construction of bulkheads cuts off this supply of beach-building material and prevents the wave's energy from dissipating. A 1998 survey in Puget Sound found that nearly 15% of armored beaches had mostly large rocks and minimal sediment compared to only one percent of unarmored beaches. The loss of sand and pebbles affects small fish that use this habitat for spawning. These small fish form the base of the food chain for larger fish.

The Shoreline Management Act was passed in 1971 to protect the state's shorelines from development impacts. However, since passage of the Act, about 26,000 permits have been issued statewide for substantial shoreline development projects. This number does not include single family homes, which are exempt from the permit process.

Shipping and Transportation. Since the days of early settlement, marine shipping has played a key role in the state's economy, and ports are the critical hub of this waterborne trade. Early dredging, filling, and other alterations of shallow estuarine areas were devastating to the fish that depended on the habitat as a transition from freshwater to saltwater. Over time, the increased demand for shipping facilities led to more dredging and filling until today an average of 50% of the original wetland habitat in Puget Sound's major bays has been destroyed. Bays near urban centers such as Tacoma and Seattle have less than five percent of their natural intertidal habitat left.

There are 48 ports in Washington's waters. The total tonnage shipped from those ports has increased 60% over the past five decades, and shipping container traffic is expected to double in the next 20 years. Not only are there more ships, but the ships are being built bigger. To accommodate larger ships, ports expand and shipping channels are dredged deeper. Dredging the bottom of bays and rivers displaces plants and animals living there and can stir up contaminated sediments. Dumping dredged materials elsewhere in the water smothers habitat.

In the late 1990s, the Army Corps of Engineers proposed deepening the Columbia River's existing navigation channel to accommodate larger ships. Over the 50-year life of the project, the deeper channel will result in 267 million cubic yards of material which would need to be disposed in the river, in the ocean, or on land. The disposal of dredged material will result in the loss of at least 67 acres of habitat in the river, 200 acres of agricultural land, and 20 acres of wetlands. The dredging project will alter the designated critical habitat of listed salmon, damage prey species stocks, and alter the food web.

Ports expand to accommodate not only more ships, but larger ships as well. The shipping industry continually builds larger ships to carry larger cargo loads. In response, ports enlarge their facilities and deepen their navigation channels so that larger vessels can dock and unload their goods. The larger vessels carry more ballast water, which when dumped into Washington's waters has the potential of introducing non-native species. Increased shipping activity affects more than just the waterfront–it also results in an increased need for overland transportation. More trucks and rail cars are needed to transfer goods to and from ships and inland destinations. Aquatic ecosystems are at risk of becoming polluted by more petroleum-carrying run-off from increased traffic on roads.

Pollutants. Washington is rich in water resources, but there are unseen risks in many of the state's water bodies. Of the 1,099 lakes, streams, and estuaries for which there is data, 643 (59%) are so impaired they do not adequately provide for swimming, fishing or habitat. The main causes of water quality problems are related to human activities, such as farming, failing septic systems, increased erosion along streams, and pollutants added to land and water.

The mud and sand in many places beneath Washington's waters are so contaminated they do not meet state and federal standards. More than 3,000 acres of Puget Sound sediments are so contaminated that federal laws require they be cleaned up. Of the state's 112 contaminated sites identified by the Washington State Department of Ecology, 93 are in saltwater and 19 are in freshwater. Contaminated sediments are detrimental to the health and diversity of aquatic populations.

Declines in Fish. Salmon provide critical links in an entire food web. They transport energy and nutrients between the ocean, estuaries, and freshwater environments, even in death. Recent calculations indicate that only three percent of the marine nutrients once delivered by anadromous salmon to the rivers of Puget Sound, the Washington Coast, and the Columbia River are currently reaching those streams. Researchers surmise this is due to the substantial decline in salmon populations over the past several decades.

The decline in salmon over the past several decades is the result of both natural and human factors. Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented habitat. Water diversions for agriculture, flood control, domestic, and hydro power purposes have greatly reduce or eliminated historically accessible habitat. Studies indicate that in most western states, about 80% to 90% of the historic riparian habitat has been eliminated.

Road Maintenance Activities. Current RRMP activities affect peak and base flows in streams as a result of the permanent removal of vegetation, earth clearing work and hydraulic modification work. Runoff of pollutants from roadways and accidental spills in work areas affects water quality indicators, including chemical contamination. Lack of sufficient erosion control measures leave exposed soil susceptible to the erosive forces of flowing water. Excess sediment loading into receiving waterbodies and streams, together with increased turbidity levels impairs gills of fish, smothers eggs, embeds spawning gravels, disrupts feeding and growth patterns of juveniles, delays upstream migration of adults, and scours nutrients from the stream substrate. Maintenance activities near streams disturb fish and causes them to temporarily abandon suitable habitat. The long-term or permanent removal of riparian vegetation has resulted in degraded water quality (*e.g.*, increased water temperature).

Habitat Summary. Although specific habitat concerns differ among watersheds, there are some common findings:

- Adjacent land management practices and direct actions within stream corridors have significantly altered natural stream ecological processes;

- Fine sediment (less than 0.85mm) levels in stream gravels regularly exceed the less-than-12% level identified as representing suitable spawning habitat (USFWS 1999);

- Adequate Large Woody Debris (LWD) is lacking in streams, particularly larger key pieces needed to develop pools, log jams, and other habitat components important to salmonids;

- Adequate pools are lacking for rearing juvenile salmonids and supporting adult salmonids during their upstream migration;

- High rates of channel constrictions and the alteration of natural hydrology further worsens the rate of streambank erosion and substrate instability due to loss of streambank and riparian integrity;

- Riparian function is lost due to removal, or alteration, of natural riparian vegetation. This habitat loss affects water quality, lateral erosion, streambank stability, and instream habitat conditions;

- A significant number of barriers, including culverts, screens, water diversions, and dams, prevent unrestricted upstream and downstream access to juvenile and adult salmonids;

- Dams have altered temperature profiles, inundated spawning habitat, created passage barriers, diminished sediment transport, altered seasonal flow patterns, imparted broad diel flow fluctuations, eliminated lotic channel characteristics, and created habitat for species that prey on or compete with salmonids (Spence *et al.* 1996; Wydoski and Whitney 1979; Tabor *et al.* 1993);

- Heavily development in uplands has altered natural stream hydrology. The threat of similar impacts to streams experiencing current and future development growth;

- Fertilizers, pesticides, petroleum products and other industrial and agricultural contaminants have degraded water quality;

- Altered natural estuaries have significantly affected estuarine and marine functions.

2.1.2.2.2 Hatcheries. For more than 100 years, hatcheries in the Pacific Northwest have been used to replace natural production lost as a result of hydropower and other development, not to protect and rebuild natural populations. As a result, most salmon populations in this region are primarily hatchery fish. In 1987, for example, 95% of the coho, 70% of the spring-run chinook, 80% of the summer-run chinook, 50% of the fall-run chinook, and 70% of the steelhead returning to the Columbia River basin originated in hatcheries. (CBFWA 1990).

While hatcheries certainly have contributed greatly to the overall numbers of salmon, only recently has the effect of hatcheries on native wild populations been demonstrated. In many cases, these effects have been substantial. For example, production of hatchery fish, among other factors, has contributed to the 90% reduction in wild coho salmon runs in the lower Columbia River over the past 30 years (NMFS 2000a).

NOAA Fisheries has identified four primary categories of risk that hatcheries can pose on wild-run salmon and steelhead: 1) ecological effects; 2) genetic effects; 3) overharvest effects; and 4) masking effects (NMFS 2000a). Ecologically, hatchery fish can increase predation on, displace, and/or compete with wild fish. These effects are likely to occur when fish are released in poor condition and do not migrate to marine waters, but rather remain in the streams for extended rearing periods during which they may prey on or compete with wild fish. Hatchery fish may also transmit hatchery-borne diseases, and hatcheries themselves may release diseases into stream via water effluents.

Genetically, hatchery fish can affect the genetic variability of native fish via interbreeding, either intentionally or accidentally. Interbreeding can also result from the introduction of native stocks from other areas. Theoretically, interbred fish are less adapted to, or productive, within the unique local habitats where the original native stock evolved.

In many areas, hatchery fish provide increased fishery opportunities. When wild fish mix with hatchery stock, fishing pressure can lead to overharvest of smaller or weaker wild stocks. Further, when migrating adult hatchery and wild fish mix on the spawning grounds, the health of the wild runs and the condition of the habitat's ability to support runs can be overestimated, because the hatchery fish mask surveyors' ability to discern actual wild run conditions.

Recent hatchery reforms include supplementation and reintroduction programs conducted to minimize adverse genetic, ecological, and demographic effects on naturally-produced salmonids. Monitoring and evaluation programs have been designed to identify the ecological and genetic effects of hatchery programs listed fish. The role of hatcheries in the future of Washington's salmonids is presently unclear; it will depend on the values people place on fish production and biological diversity. Clearly, conservation of biological diversity is gaining support, and the future role of hatcheries may shift toward judicial use of hatcheries to meet these goals rather than opposing them.

2.1.2.2.3 Harvest. Non-Indian fisheries began in about 1830 with the arrival of European settlers; by 1861, commercial fishing was an important economic activity that developed with the advent of canning technologies. The early commercial fishery used gill nets, seines hauled from shore, traps, and fish wheels. Later, purse seines and trolling (using hook and line) fisheries developed. Recreational (sport fishing) began in the late 1800s, occurring primarily in tributary locations (NMFS 2000a).

Whereas freshwater fisheries in Washington were declining during the first half of the twentieth century, primarily due to high harvest rates, ocean fisheries were growing, particularly after World War II. This trend occurred up and down the West Coast as fisheries with new gear types leapfrogged over the others to gain first access to the migrating salmon runs. Large, mixed-stock fisheries in the ocean gradually supplanted the freshwater fisheries, which were increasingly restricted or eliminated to protect spawning escapements. By 1949, the only freshwater commercial gear types remaining were gill nets, dip nets, and hoop nets (NMFS 2000a). This leapfrogging by various fisheries and gear types resulted in conflicts about harvest allocation and the displacement of one fishery by another. Ocean trolling peaked in the 1950s; recreational fishing peaked in the 1970s. The ocean harvest has declined since the early 1980s as a result of declining fish populations and increased harvest restrictions.

The capacity of salmonids to produce more adults than are needed for spawning offers the potential for sustainable harvest of naturally produced (versus hatchery-produced) fish. This potential can be realized only if two basic management requirements are met: 1) enough adults return to spawn and perpetuate the run, and 2) the productive capacity of the habitat is maintained. Catches may fluctuate in response to such variables as ocean productivity cycles, periods of drought, and natural disturbance events. However, as long as the two management requirements are met, fishing can be sustained indefinitely. Unfortunately, both prerequisites for sustainable harvest have been violated routinely in the past. The lack of coordinated management across jurisdictions, combined with competitive economic pressures to increase catches or to sustain them in periods of lower production, resulted in harvests that were too high and escapements that were too low. At the same time, habitat has been increasingly degraded, reducing the capacity of the salmon stocks to produce numbers in excess of their spawning escapement requirements.

For years, the response to declining catches was hatchery construction to produce more fish. Because hatcheries require fewer adults to sustain their production, harvest rates in the fisheries were allowed to remain high, or even increase, further exacerbating the effects of overfishing on the naturally produced (non-hatchery) runs mixed in the same fisheries. More recently, harvest managers have instituted reforms including weak stock, abundance based, harvest rate, and escapement-goal management.

2.1.2.2.4 Natural Conditions. Changes in the abundance of salmonid populations are substantially affected by changes in the freshwater and marine environments. For example, large-scale climatic regimes, such as El Niño, affect changes in ocean productivity. Much of the Pacific Coast was subject to a series of very dry years during the first part of the 1990s. In more recent years, severe flooding has adversely affected some stocks.

Salmon and steelhead are exposed to high rates of natural predation, particularly during freshwater rearing and migration stages. Ocean predation may also contribute to significant natural mortality, although the levels of predation are largely unknown. In general, salmonids are prey for pelagic fishes, birds, and marine mammals, including harbor seals, and killer whales. There have been recent concerns that the rebound of seal and sea lion populations, following their protection under the Marine Mammal Protection Act of 1972, has resulted in substantial mortality for salmonids.

A key factor substantially affecting many West Coast stocks has been the general pattern of a 30-year decline in ocean productivity. The mechanism whereby stocks are affected is not well understood. The pattern of response to these changing ocean conditions has differed among stocks, presumably due to differences in their ocean timing and distribution. It is presumed that survival is driven largely by events occurring between ocean entry and recruitment to a subadult life stage. Time-series of survival rate information for UWR spring chinook, Lewis River fall-run chinook, and Skagit fall-run chinook salmon show highly variable or declining trends in early ocean survival, with very low survival rates in recent years (NMFS 2000a).

Recent evidence suggests that marine survival of salmonids fluctuates in response to 20- to 30-year cycles of climatic conditions and ocean productivity (Cramer *et al.* 1999). This phenomenon has been referred to as the Pacific Decadal Oscillation. Ocean conditions that affect the productivity of Washington salmonid populations appear to have been in a low phase of the cycle for some time and to have been an important contributor to the decline of many stocks. The survival and recovery of these species will depend on their ability to persist through periods of low natural survival.

Additional detailed information regarding the status of the species and factors affecting the species environment within the action area can be found in various recent NMFS and NOAA Fisheries Opinions on artificial propagation, harvest, and habitat activities. Additional sources of baseline information include NMFS and NOAA Fisheries status reports, Washington Conservation Commission's *Limiting Factors Reports*, and WDFW/tribal harvest management plans.

2.1.2.2.5 Environmental Baseline Summary. Notwithstanding improvements in hatchery, harvest and habitat management practices, environmental conditions in the action area are still generally poor with respect to salmonid survival in a number of their life stages. In fact, for many stocks, survival must improve by an order of magnitude in order for the ESUs to survive and recover. Smolt-to-adult return rates in 1998 for SR spring/summer-run chinook, for example, were less than one-half of one percent – about one-tenth the rate needed for sustainability (NMFS 2000a). The continuous and cumulative reduction in habitat productive capacity has influenced the ability of the 12 threatened species to recover by reducing population resiliency and lowering survival rates. Improvement in habitat, hatchery and harvest conditions over those currently available under the environmental baseline is needed to meet the biological requirements for survival and recovery of these species. Permanent degradation of these conditions would have a significant impact due to the amount of risk they presently face under the environmental baseline. As analyzed below, the intent of the RRMP is to address some of the identified habitat limiting factors.

2.1.3 Analysis of Effects

NOAA Fisheries' ESA implementing regulations define "effects of the action" as "the direct and indirect effects of an action on the species, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline." Direct effects are immediate effects of the project on the species or its habitat, and indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur (50 CFR 402.02).

The RRMP is a conservative program consisting of specific approaches to conducting routine road maintenance activities, complemented by a suite of Program Elements to ensure that road maintenance activities protect salmonids. The State of Washington and local road maintenance agencies that will use the RRMP will be effectively changing their road maintenance activities to meet the ecological needs of listed salmonids, to the extent that routine road maintenance activities affect those needs. Nevertheless, road maintenance activities might affect elements of the environment in ways that have implications for listed salmonids. These effects are described below.

2.1.3.1 Road Maintenance Activities

A complete application package for qualification under 4(d) Limit No. (10)(ii) includes a number of required items, including a description of the manner in which the activities may affect listed species or critical habitat, and an analysis of the effects of the program on those species and habitats, including short-term and long-term effects, indirect and cumulative effects. To determine the effects of the RRMP on listed salmonids, the Biological Subcommittee of the 25 jurisdictions prepared a Biological Review (BR) (RRM-TWG 2001), using a modified version of NOAA Fisheries' Matrix of Pathways and Indicators (MPI). The MPI identifies six conceptual pathways (*e.g.*, water quality, channel condition) of 18 habitat condition indicators (water temperature, width/depth ratio) for determining the effect of an action. The Biological Subcommittee consulted with NOAA Fisheries during the preparation of the BR. NOAA Fisheries agrees with the conclusions drawn in the BR.

In addition to a traditional effects analysis, the BR contains several tables (BR Tables 23 and 24) (RRM-TWG 2001) to serve as visual aids in comparing the effects of road maintenance activities in compliance with the RRMP to road maintenance work without implementation of the RRMP. The Tables use MPI indicator criteria to determine whether an RRMP-compliant activity restores, degrades, or is not likely to adversely affect (NLAA) baseline indicators.

The RRMP intends to address many of the typical ways road maintenance activities could adversely affect listed species. These include effects on (a) water quality; (b) changes in channel conditions and dynamics; (c) alteration of stream flows; (d) shifts in watershed condition; and (e) direct harm to salmon and steelhead by altering development, bioenergetics, growth, and behavior. Without the RRMP, these impacts would occur during earthwork, hydraulic modifications, vegetation modifications, asphalt and concrete paving, and fish exclusion activities. Even with the RRMP, effects from these activities remains a possibility (although they would be specifically addressed by the RRMP program), and thus they are described below.

Clearing, Drilling, Excavating, Filling, Grading, Grubbing, Cleaning, Grinding, and Cutting. These activities include all work necessary to maintain roadways, streambanks, roadside ditches, culverts, catch basins, inlets, and detention/retention basins. This type of work is likely to have beneficial effects; cleaning out sediment and debris from drainage systems provides benefits to salmon habitat by preventing pollutants and sediments entrapped in stormwater facilities from entering surface or groundwater. There remains a possiblity that these activities can also have adverse water quality impacts, directly effecting aquatic species. These impacts occur through the generation of sediments and side casting of windborne dust and paint particles. Clearing ditches, culverts, and drainage systems and grading shoulders can dislodge sediments and expose soils, allowing an increase of sediment transport during storm events. Because stormwater conveyance systems often discharge into salmon habitat, the resultant temporary increase of sediment loads can adversely affect water quality in fish-bearing waters. Excess sediment loading and turbidity levels can clog gills of fish, smother eggs, embed spawning gravels, disrupt feeding and growth patterns of juveniles, delay up-stream migration of adults, and scour nutrients from the stream substrate (Burton *et. al* 1990 and WSCC 1999).

Earth surface and cleaning activities near streams can disturb fish and cause them to abandon suitable habitat. These activities can have noise levels above ambient conditions or increase light at night. Detour routes may result in concentrated traffic volumes and increased access to aquatic habitat that may affect salmon. The use of gas and diesel powered equipment creates a potential for accidental spills of substances toxic to fish. Removal of riparian vegetation occurring from grading at storm outfalls and during the removal of debris can affect prey resources, reduce cover habitat, reduce LWD recruitment, increase sedimentation, and increase water temperature.

On balance, the RRMP addresses these issues both through activity specific BMPs, and through the general Program Elements (see section 2.1.3.2 below).

Shore Defense Works. Most shore defense road maintenance work involves repair or replacement of existing bank stabilizing structures. New structures designed to armor streambanks are part of Capital Improvement Projects (CIP) and outside the scope of the RRMP. Most CIP bank stabilization projects require a U.S. Army Corps of Engineers permit, thus triggering ESA section 7 consultation with NOAA Fisheries. In general terms, however, hardened embankments simplify stream channels, alter hydraulic processes, and prevent natural channel adjustments (reduced sinuosity) (Spence *et al.* 1996). Bank hardening can cause an increase in stream velocities that contribute to channel incision and streambank failure. It can also potentially hinder localized water exchange processes (*i.e.*, hyporheic-surface water exchange) and floodplain connectivity within the small area adjacent to the project site. As amplified erosive forces attack different locations and landowners respond with more bank hardening, the river eventually attains a continuous fixed alignment lacking complexity and function in riparian and near shore habitats (COE 1977). Maintenance requirements in these streamside settings may be intermittent, but typically the presence of hardened banks transfers stream energy and shifts erosion points – leading to perpetual maintenance requirements upstream and downstream of the armored bank.

The effects of increased sediment disturbance, riparian vegetation modification, spills of toxic substances from gas- and diesel-powered equipment, and increased noise from shore defense road maintenance work are expected to be similar to those described in the earthworks section, above.

Channelization or Ditching. Regular channelization or ditching maintenance in or adjacent to watercourses and streams is required to remove built-up sediments, debris or blockages, and to maintain capacity. Channelization and ditching can result in the alteration or loss of salmon habitat through the removal of snags and trees that could function as future LWD recruitment. These activities may also degrade hydrogeomorphology, wetlands, riparian vegetation, erosion/deposition balance, soils and water quality, and may affect the creation of critical off-channel habitat. Instream gravel bars can move due to changes in hydrodynamics, resulting in fewer meanders and reduced quantities of gravel for spawning habitat. Juvenile fish that may be rearing in the vicinity would most likely be displaced during maintenance work. The effects to salmonids of increased sediment disturbance, riparian vegetation modification, spills of toxic substances from gas- and diesel-powered equipment, and increased noise are expected to be similar to those described in the earthworks section, above.

Removal of Large Woody Debris. The LWD will be removed only when and where there is a safety hazard, such as debris build-up against bridge abutments. Removal activities can cause an increase of turbidity, sediment, gravel, rocks, nutrients, bacteria, oxygen demanding materials, heavy metals, petroleum hydrocarbons, synthetic organics and other solids. Excess sediment loading and high turbidity levels can impact redds by smothering eggs with fine sediments and reduced water circulation. Removal of LWD can affect all life history stages of salmonids as a result of excess sediment loading and high turbidity levels. Fish could be impacted by sub-lethal conditions, including the disruption of feeding, attenuated growth patterns of juveniles, or delaying the upstream migration of adults. The LWD removal may also change a stream's hydrology, with effects similar to those identified in the preceding sections.

Work Area Isolation, Temporary Water Diversions and Fish Exclusion. Road maintenance activities frequently require work within streams that contain salmonids. Some of these activities require a site to be temporarily dewatered. Although work area isolation techniques can temporarily prevent usage of the work area by listed salmonids, these techniques also decrease or avoid the exposure of listed fish to the effects of construction activities in the work area. In fact, in such cases, work area isolation and fish removal will be necessary. Road maintenance activities that may require fish exclusion actions include work on open drainage systems, watercourses and streams (e.g., sediment removal), culvert repairs, bridges, and emergency slide/washout repairs.

Work area isolation is a conservation measure intended to reduce the exposure of listed fish adverse effects of erosion and runoff on aquatic life. However, diversions, isolation, and exclusion can significantly impact listed fish in the area. Water diversion and temporary structure work creates a physical barrier to migrating salmon. Maintenance work on diversion structures could result in increases in sediment disturbance, riparian vegetation modification, spills of toxic substances from gas- and diesel-powered equipment, and increased noise are similar to those described in the earthworks section, above, resulting in similar effects to salmonids as identified in the preceding sections. Additionally, improper placement of equipment in or around riparian habitat may erode streambanks.

Electrofishing is one means of fish capture. It is employed when other methods prove ineffective and may not be recommended in all situations. Its use will be determined through permit requirements and/or site conditions, as prescribed in the RRMP's Fish Exclusion Protocol (Appendix E of the RRMP). This protocol is based on NOAA Fisheries' Guidelines for Electrofishing Waters Containing Salmonids Under the Endangered Species Act (NMFS 2000b). Although the practice is potentially hard on fish, electrofishing is intended to locate residual fish in the isolated work area to reduce incidental take.

Electrofishing is a process by which an electrical current is passed through water containing fish in order to stun them—thus making them easy to capture. It can cause a suite of effects ranging from simple harassment to actually killing the fish. The amount of unintentional mortality attributable to electrofishing may vary widely depending on the equipment used, the settings on the equipment, and the expertise of the technician. Electrofishing can have severe effects on adult salmonids and will be limited to the direct and indirect effects of exposure to an electric field, capture by netting, holding captured fish in aerated tanks, and the effects of handling associated with transferring the fish back to the river. Physical injuries from electrofishing include internal hemorrhaging, spinal misalignment, or fractured vertebrae.

The primary contributing factors to stress and death from fish exclusion activities are excessive doses of anesthetic, improper electrofishing techniques, differences in water temperatures (between the river and wherever the fish are held), dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma. It is also common that re-introduction of the stream to a newly constructed project will temporarily increase turbidity downstream.

Vegetation Modification: The primary purpose of vegetation maintenance is to promote, maintain, sustain, manage, or encourage vegetation growth within the Right of Way (ROW) to comply with a variety of regulations and standards. Activities include suppressing non-desirable vegetation and enhancing desirable vegetation. Short- and long-term vegetation modifications may occur during routine maintenance of open and closed drainage systems, watercourses and streams, stream crossings, bridges, and emergency washout repairs. The removal of vegetation adjacent to watercourses or streams may impact water quality and various habitat elements. Vegetation removal may contribute to a decrease in stream sinuosity and complexity, resulting in the degradation of hydrogeomorphology. It can also decrease refuge and rearing habitat for macroinvertebrates, and increase the water temperature of the immediate area.

Pesticide Applications: The RRMP's Vegetation Management Maintenance category allows for the application of chemicals (herbicides and pesticides), and describes the manner and location in which applications may occur. BMPs are included in the RRMP to ensure that agencies electing to use herbicides and pesticides as part of their vegetation management program do so appropriately. NOAA Fisheries does not believe that there is currently sufficient information available to ensure that such chemical applications are not creating sublethal affects to listed species. NOAA Fisheries is currently working with Federal Agencies on an appropriate monitoring regimen to investigate the fate and transport of chemicals applied during a variety of activities. The monitoring intensity is beyond the scope of the RRMP; therefore NOAA Fisheries is not providing consultation, nor take authorization, on any road maintenance activities that propose the application of chemicals, herbicides or pesticides.

Addition of Impervious Surfaces: Generally, significant increases in impervious surface area within the ROW do not fall under the definition of maintenance. Projects that increase impervious surface area are usually part of roadway CIPs, and typically are federally funded or permitted. Roadway CIPs are not addressed by the RRMP and are not covered by this consultation. The Federal nexus requires a separate ESA section 7 consultation. Under some circumstances, however, maintenance activities add impervious surface for safety reasons, rather than to add capacity. New impervious surface associated with maintenance work can result in increased levels of heavy metals, hydrocarbons, and other pollutants. Impervious surfaces can also increase water temperature by reducing shaded conditions, and by increasing solar exposure to surface water that would otherwise infiltrate or remain shaded beneath vegetation. New impervious surface area near streams can cause impacts to riparian vegetation, resulting in reduced cover for fish, a reduction in prey species, increased water temperature, and water quality degradation. RRMP actions that increase flows, such as increases in impervious surfaces, can disturb gravel in salmon or steelhead redds and can also agitate or dislodge developing young and cause their damage or loss. Similarly, actions that reduce subsurface or surface flows, reduce shade, deposit silt in streams, or otherwise reduce the velocity, temperature, or oxygen concentration of surface water as it cycles through a redd can adversely affect the survival, timing, and size of emerging fry.

2.1.3.2 Integrated Minimization Measures

The RRMP is a program that focuses on achieving desired environmental outcomes while providing jurisdictions maximum flexibility in responding to changing conditions at the worksite. Conservation outcomes of the RRMP fall into the following general categories: sediment collection, worksite pollutant containment, blockage removal, restoration of flow velocities and volumes, removal of fish passage barriers, revegetation, infiltration, prevention of utility leaks, and addressing chronic maintenance problems.

- *Sediment Collection*: Containment of sediment/pollutants maintains or restores the sediment collection process by removing sediments from many collection points in the drainage system (e.g., catch basins, maintenance holes, retention/detention facilities, pipes, inlets, and vaults). Proper maintenance of the ROW structure also protects against collapse or failure of the structure, which could result in significant sediment releases to aquatic habitat.

- *Worksite Pollutant Containment*: Many RRMP BMPs involve containment of sediment and other pollutants at the worksite. Similar to collection and removal of sediments and other pollutants from the ROW structure, containing loose soils, sediment, and other pollutants on the worksite reduces the amount of pollutants that can reach aquatic habitat. A critical component of worksite pollutant containment in the RRMP is an effectiveness monitoring BMP.

- *Blockage Removal*: The timely removal of drainage system blockages reduces the potential for sediment, turbidity, offsite erosion and debris to adversely affect fish habitat. Blockage removal also reduces the likelihood of system failure, which can have significant adverse habitat effects. BMPs used during this type of work achieve the same objectives as those identified in Sediment Collection and Worksite Pollutant Containment above.

- *Restoration of Flow Velocities and Volumes*: Maintaining or restoring flow velocities and volumes required for health aquatic habitat is an important conservation outcome that is spelled out in a number of maintenance categories involving drainage system maintenance. The RRMP requires appropriate system design for system repair or replacement, appropriate maintenance of existing systems, and removal of sediment or blockages.

- *Removal of Fish Passage Barriers*: When performing stream crossing maintenance activities, the RRMP prescribes the removal of fish passage barriers. All fish passage work requires adherence to all Federal, state and local permit and regulatory requirements.

- *Revegetation*: The RRMP specifies the need for revegetation of disturbed areas to reduce erosion and sediment transport. Revegetation provides biofiltration, shading, and bank stabilization in riparian areas. It also promotes macroinvertebrate population growth, lowers herbicide use, and suppresses non-desirable vegetation.

- *Infiltration*: The RRMP specified the maximization of opportunities for increased infiltration and biofiltration. Cleaning and maintaining roadway shoulders and grass-line ditches improves infiltration.

- *Prevention of Utility Leaks*: Maintenance of water and sewer systems prevents increased flow volumes and velocities, severe erosion, and the introduction of pollutants caused by breaks, leaks and malfunctions.

- *Addressing Chronic Maintenance Problems*: To reduce the number of chronic maintenance problems that contribute to habitat degradation, the RRMP commits implementing agencies to refer chronic maintenance and habitat problems to agency-specific capital improvement programs.

The potential adverse effects of the RRMP are avoided and minimized by these conservation measures designed to achieve the RRMPs conservation outcomes. With implementation of the conservation measures, most RRMP activities fall into the “restore” and “NLAA” categories.

Among the various Federal, state, and local regulations or ordinances with which road maintenance agencies must already comply, the RRMP relies on the value of Washington State’s Hydraulics Code (Revised Code of Washington (RCW) Chapter 77.55) as contributing to protecting ecological resources important to listed salmonids. Specifically, certain in-water activities carried out under the RRMP require review by the WDFW and compliance with any Hydraulics Project Approval (HPA) permits issued by the WDFW upon such review.

NOAA Fisheries has not formally evaluated the Hydraulics Code for the purpose of issuing general ESA assurances for projects conducted under the State of Washington’s HPA Program. However, NOAA Fisheries has reviewed and assessed HPAs program for the limited purpose of determining the adequacy of the HPAs issued for routine road maintenance activities in contributing to the protection of listed salmonids (attached to this Biological Opinion (Opinion) as Appendix A). To make this determination, NOAA Fisheries reviewed the Hydraulic Code, the existing rules for administration of the HPA (Washington Administrative Code (WAC) Chapter 222-110), the WDFW HPA manual (1998), the WDFW document *"Hydraulic Project Approvals—Basics and How to Process"* (2002), the WDFW *Mitigation Policy* (1999), WDFW technical resources, and WDFW's February 22, 2002 comments to NOAA Fisheries regarding the proposed 4(d) limit for the RRMP. In addition, NOAA Fisheries reviewed two statewide general maintenance HPAs, and 52 individual HPAs provided by WDFW for typical road maintenance activities.

In the review of the above-listed material, NOAA Fisheries considered the adequacy in protecting listed salmonids affected by routine maintenance activities in the context of the specifc actions for which the HPAs were issued. Based on that review, and for the limited purpose of conducting this consultation, NOAA Fisheries concluded that the HPA permitting program established in Washington State law and regulation would adequately protect resources meeting the ecological needs of threatened salmonids in the context of routine road maintenance activities undertaken by RRMP participants.

Similar to other BMPs in the RRMP, the HPA process will be monitored under the RRMP's adaptive management program (see below). Additionally, the collection of listed salmonids requires a special permit from the WDFW, which in turn requires possession of an ESA section 10(a)(1)(a) permit. Although most jurisdictions have their own section 10(a)(1)(a) permit, some jurisdictions do not, in which case a WDFW Biologist does the collection work. The WDFW staff are covered by a NOAA Fisheries section 10(a)(1)(a) permit issued to WDFW. In-water work restrictions, including seasonal construction restrictions, are often included in HPAs.

In addition to the required compliance with numerous Federal, state and local regulations, 54 other BMPs are proposed in the RRMP to minimize worksite pollutants, restore and maintain surface water drainage, reduce turbidity and reduce sediments from entering watercourses and streams. Examples of BMPs include worksite containment of sediments and contaminants, restoration of flow velocities and volumes, stormwater infiltration, fish barrier removal, prevention of utility leaks, identification and referral of chronic maintenance problems, bioengineering, native revegetation, and LWD replacement. Furthermore, the RRMP requires adherence to the conservation measures described in Appendix E of the RRMP. The measures in Appendix E include specially developed fish exclusion and electrofishing guidance, based on NOAA Fisheries' electrofishing guidelines (NMFS 2000b).

Despite the outcome-based approach, the BMPs may not be fully effective at achieving the conservation outcomes and some RRMP activities could continue to adversely affect salmonids. In a general sense, BMPs are only as effective as their selection, installation, maintenance, monitoring and staff training. Without effective BMP implementation, road maintenance activities such as vegetation management, hydraulic modification, and excavation could adversely affect water temperature, increase sediment mobilization, decrease pool frequency and quality, and reduce floodplain connectivity. However, these impacts are expected to be short-term and minor in scale.

To overcome the possibility of the ineffective use of BMPs, the RRMP includes nine mandatory Program Elements (in addition to Program Element 10 - BMPs and Conservation Outcomes) to minimize the risk of adverse impacts from routine road maintenance activities. The nine Program Elements form an integrated process of training, monitoring, and adaptive management that tracks the effectiveness of the BMPs in achieving the RRMP's conservation outcomes. The Program Elements include the Regional Forum, training, monitoring, scientific research, adaptive management, and reporting.

- *Regional Forum.* Each jurisdiction receiving a limit to the 4(d) take prohibition by means of the RRMP will be required to participate in the Regional Forum. The Regional Forum will meet quarterly to share information and experiences that could lead to improvement of the RRMP. Information shared will include crew experiences implementing BMPs, discovery of new products and BMPs, results of scientific research, and feedback on training.

- *Training.* The specially designed RRMP training program will provide crew members and supervisors appropriate training in when to use BMPs and recognizing problems with BMPs. Engineering and environmental support staff will be trained to ensure that potential technical problems are addressed in the planning stages of projects that require design or environmental support. NOAA Fisheries will approve the training.

- *Monitoring.* Each local jurisdiction will establish a formal monitoring program for monitoring compliance and effectiveness of BMP outcomes during the course of maintenance activities and after work is completed, if necessary. If problems occur, BMPs will be modified or added to achieve the RRMPs conservation outcomes.

- *Scientific Research.* A program of field studies and literature searches will evaluate and improve the effectiveness and selection of various BMPs.

- *Adaptive Management.* The RRMP jurisdictions have committed to developing an adaptive management process to be implemented at the local and regional levels. The adaptive management process provides for learning from experience and for reducing uncertainty through scientific research. Local ESA teams and the Regional Forum will gather and evaluate information during the course of maintenance activities, BMP implementation, monitoring, and scientific research. Both the RRMP itself, and its implementation by local jurisdictions, will be modified as necessary to achieve its conservation objectives.

- *Reports.* NOAA Fisheries will receive a biennial report from the Regional Forum. The reports will include a review of the ten program elements, updates on research, recommended BMP changes, and recommended updates on each program element.

As an additional level of assurance, Limit No. 10 of the 4(d) rule (July 10, 2000, 65 FR 42422) authorizes NOAA Fisheries to periodically evaluate a qualified road maintenance program for its effectiveness in maintaining and achieving habitat function that provides for conservation of the listed salmonids. Whenever warranted, NOAA Fisheries will identify to the local jurisdictions ways in which the program needs to be altered or strengthened. Changes may be identified if the program is not protecting desired habitat functions, or where even with the habitat characteristics and functions originally targeted, habitat is not supporting population productivity levels needed to conserve the listed species. If any jurisdiction covered by Limit No. 10 does not make changes to respond adequately to the new information in the shortest amount of time feasible, but not longer than one year, NOAA Fisheries will publish notification in the Federal Register announcing its intention to withdraw the limit so that take prohibitions would then apply to the program as to all other activity not within a limit.

2.1.4 Effects on Critical Habitat

NOAA Fisheries designates critical habitat based on physical and biological features that are essential to the listed species. Essential features for designated critical habitat include substrate, water quality, water quantity, water temperature, food, riparian vegetation, access, water velocity, space and safe passage.

Critical habitat has been designated for three of the 15 species addressed in this Opinion: SR fall-run chinook (December 28, 1993, 58 FR 68543), SR spring/summer-run chinook (December 28, 1993, 58 FR 68543, updated October 25, 1999, 64 FR 57399), and SR sockeye (November 20, 1999, 58 FR 58619). Using NOAA Fisheries' Habitat Approach (NMFS 1999) as a surrogate for estimating fish mortality, this Opinion identified and analyzed the extent of project effects on habitat salmon need to express certain essential behavior patterns. The effects of the RRMP to designated critical habitat are expected to be the same as those described in section 2.3, above.

2.1.5 Cumulative Effects

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this Opinion. Future Federal actions unrelated to this action, including the ongoing operation of hydropower systems, hatcheries, fisheries, and land management activities are being (or have been) reviewed through separate ESA section 7 consultation processes and are not considered in this section.

A number of reasonably foreseeable non-Federal resource management strategies will affect listed ESUs and their habitat within the action area. Tribal, state, and local government actions are likely to be in the form of legislation, administrative rules, or policy initiatives. These actions may include changes to land use patterns and water use allocations, which can affect the intensity and location of these across the action area. There are uncertainties related to the implementation of these government actions due to budget and policy constraints, which when taken into account over a wide geographic area, makes this cumulative effects analysis difficult. A general description of the primary Tribal, state, and local programs is summarized in Table 17 of the Environmental Assessment for the RRMP (NOAA Fisheries 2003, in publication).

These activities affecting listed salmonids activities within the action area are expected to increase with a projected increase in population of nearly 2 million people by the year 2020 (WDNR 2000). Thus, NOAA Fisheries assumes that future private and state actions will continue within the action area, but at increasingly higher levels as population density climbs.

The RRMP could have minor impacts and short-term negative effects associated with listed salmonids and aquatic habitat. These reach-scale effects may be minor on an individual basis, however, their cumulative effect could potentially be negative for a short period of time. Alternatively, the cumulative impact of the RRMP at the watershed scale may have minor beneficial effects because of reasonably foreseeable Tribal, state, local and private plans, policies, and programs aimed at benefitting water quantity and quality, fish passage, shoreline and fish habitat conditions. Tribal, state, and local plans, programs, and activities include water quality and pollution control, streamflow enhancement, watershed planning, environmental land use planning and zoning, shoreline protection, and habitat conservation plans (NOAA Fisheries 2003, in publication).

2.1.6 Conclusion

NOAA Fisheries has reviewed the direct, indirect, and cumulative effects of the proposed action on the 12 threatened species. NOAA Fisheries evaluated these effects in light of existing conditions in the action area, the measures included in the action to minimize the risk of effects, and the significant oversight authority of NOAA Fisheries provided in the 4(d) Rule. The proposed action may cause short-term adverse effects on listed species by temporarily increasing sedimentation rates, water temperatures, and flows; decreasing dissolved oxygen and fish passage; and by collecting, removing and transporting fish during fish exclusion activities. Long-term ecosystem effects of the RRMP include changes in the complexity of their habitat, periodic changes to primary and secondary production (food web effects), and changes in hydrodynamics and sedimentology.

These effects are reasonably certain to result in incidental take, but the extent of harm is likely to be minimized by specific measures included in the action. Additionally, the RRMP's 10 Program Elements and NOAA Fisheries' oversight role shall provide for constant improvements to routine road maintenance practices in Washington State. Thus, the proposed actions would not reduce pre-spawning survival, egg-to-smolt survival, or survival during upstream or downstream migration to a level that would appreciably diminish the likelihood of survival and recovery of proposed or listed fishes. Consequently, it is NOAA Fisheries' Opinion that the proposed action is not likely to jeopardize the continued existence of these species. Nor is the project likely to destroy or adversely modify designated critical habitat for the SR fall-run chinook salmon, SR spring/summer-run chinook salmon or SR sockeye salmon. At this time, no critical habitat is designated for the other 12 listed salmonid species in the action area.

2.1.7 Reinitiation of Consultation

This concludes formal consultation on NOAA Fisheries' proposed qualification of the RRMP. As provided in 50 CFR section 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an affect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Additional reinitiation requirements, including re-evaluation and modification requirements, are set forth in the RRMP and in Limit No. 10 of the 4(d) Rule (July 2000), which are incorporated herein.

2.2 Incidental Take Statement

Where NOAA Fisheries approves a 4(d) Limit, there is no take liability for threatened species, and so there is no need of a take exemption through ESA section 7(o). The 4(d) Rule specifically excludes endangered species from its limits on the application of the ESA section 9(a)(1) take prohibitions. NOAA Fisheries, therefore is not extending 4(d) Limit No. 10 coverage to RRMP activities within the delineated geographic boundaries of the three endangered ESUs. The three endangered salmonids (UCR spring-run chinook salmon, UCR steelhead, and SR sockeye salmon) migrate outside the geographic boundaries of their ESUs, through a portion of the RRMP's action area. NOAA Fisheries conducted a separate assessment on these species and concluded that the effects of RRMP activities (primarily conducted in tributary watersheds) on endangered salmonids migrating through the middle and lower mainstem Columbia River would likely be insignificant or discountable and thus not be likely to adversely affect the UCR spring-run chinook salmon, UCR steelhead, or SR sockeye salmon. Thus, there is no need of a take exemption through ESA section 7(o) for the endangered species, either.

3.0 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

3.1 Background

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance Essential Fish Habitat (EFH) for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (section 305(b)(2));
- NOAA Fisheries must provide conservation recommendations for any Federal or state action that would adversely affect EFH (section305(b)(4)(A));
- Federal agencies must provide a detailed response in writing to NOAA Fisheries within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NOAA Fisheries EFH conservation recommendations, the Federal agency must explain its reasons for not following the recommendations (section 305(b)(4)(B)).

Essential Fish Habitat means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA section 3). For the purpose of interpreting this definition of EFH: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.10). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (*e.g.*, contamination or physical disruption), indirect (*e.g.*, loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

Essental Fish Habitat consultation with NOAA Fisheries is required regarding any Federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as certain upstream and upslope activities.

Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities, that may have an adverse effect on EFH. Therefore, EFH consultation with NOAA Fisheries is required by Federal agencies regarding any activity that may adversely affect EFH, regardless of its location.

The objectives of this EFH consultation are to determine whether the proposed action would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH resulting from the proposed action.

3.2 Identification of EFH

Pursuant to the MSA the Pacific Fisheries Management Council (PFMC) has designated EFH for federally-managed fisheries within the waters of Washington, Oregon, and California. Designated EFH for groundfish and coastal pelagic species encompasses all waters from the mean high water line, and the upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon and California, seaward to the boundary of the U.S. exclusive economic zone (370.4 km) (PFMC 1998a, 1998b). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC 1999), and longstanding, naturally-impassable barriers (*i.e.*, natural waterfalls in existence for several hundred years) (PFMC 1999). In estuarine and marine areas, designated salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (370.4 km) offshore of Washington, Oregon, and California north of Point Conception to the Canadian border (PFMC 1999).

Detailed descriptions and identifications of EFH are contained in the fishery management plans for groundfish (PFMC 1998a), coastal pelagic species (PFMC 1998b), and Pacific salmon (PFMC 1999). Casillas *et al.* (1998) provides additional detail on the groundfish EFH habitat complexes. Assessment of the potential adverse effects to these species' EFH from the proposed action is based, in part, on these descriptions.

3.3 Proposed Actions

The proposed action and action area are detailed above in Section 1.2 of this document. Routine road maintenance activities conducted in accordance with the RRMP and occurring outside the geographic boundaries of ESA ESUs, but within designated EFH (e.g., the Chehalis River basin), are covered by this MSA consultation. The exceptions (*i.e.*, not covered by this MSA consultation) are activities occurring within the geographic boundaries of the UCR spring-run chinook salmon, UCR steelhead, and SR sockeye salmon. The action area includes habitats that have been designated as EFH for various life-history stages of 47 species of groundfish, 5 coastal pelagic species, and 3 species of Pacific salmon (Table 2).

3.4 Effects of Proposed Action

As described in detail in Section 2.1.3.1 of this Opinion, the proposed action may result in short-term adverse effects to a variety of habitat parameters. The RRMP and its Biological Review clearly identify anticipated impacts to affected species likely to result from the proposed activities and the measures that are necessary and appropriate to minimize those impacts. These effects include delivery of sediments to streams through routine road maintenance activities, vegetation removal, loss of LWD, and hydraulic modifications.

Table 2. Fish species with designated EFH in Washington State.

Groundfish Species	redstripe rockfish *S. proriger*	English sole *Parophrys vetulus*
soupfin shark *Galeorhinus galeus*	rosethorn rockfish *S. helvomaculatus*	flathead sole *Hippoglossoides elassodon*
spiny dogfish *Squalus acanthias*	rosy rockfish *S. rosaceus*	petrale sole *Eopsetta jordani*
big skate *Raja binoculata*	rougheye rockfish *S. aleutianus*	rex sole *Glyptocephalus zachirus*
California skate *Raja inornata*	sharpchin rockfish *S. zacentrus*	rock sole *Lepidopsetta bilineata*
longnose skate *Raja rhina*	splitnose rockfish *S. diploproa*	sand sole *Psettichthys melanostictus*
ratfish *Hydrolagus colliei*	striptail rockfish *S. saxicola*	starry flounder *Platichthys stellatus*
Pacific cod *Gadus macrocephalus*	tiger rockfish *S. nigrocinctus*	arrowtooth flounder *Atheresthes stomias*
Pacific whiting (hake) *Merluccius productus*	vermilion rockfish *S. miniatus*	
black rockfish *Sebastes melanops*	yelloweye rockfish *S. ruberrimus*	**Coastal Pelagic Species**
bocaccio *S. paucispinis*	yellowtail rockfish *S. flavidus*	jack mackeral *Trachurus symmetricus*
brown rockfish *S. auriculatus*	shortspine thornyhead *Sebastolobus alascanus*	anchovy *Engraulis mordax*
canary rockfish *S. pinniger*	cabezon *Scorpaenichthys marmoratus*	Pacific sardine *Sardinops sagax*
China rockfish *S. nebulosus*	lingcod *Ophiodon elongatus*	Pacific mackerel *Scomber japonicus*
copper rockfish *S. caurinus*	kelp greenling *Hexagrammos decagrammus*	market squid *Loligo opalescens*
darkblotch rockfish *S. crameri*	sablefish *Anoplopoma fimbria*	
greenstriped rockfish *S. elongatus*	Pacific sanddab *Citharichthys sordidus*	**Pacific Salmon Species**
Pacific ocean perch *S. alutus*	butter sole *Isopsetta isolepis*	chinook salmon *Oncorhychus tshawytscha*
quillback rockfish *S. maliger*	curlfin sole *Pleuronichthys decurrens*	coho salmon *O. kisutch*
redbanded rockfish *S. babcocki*	Dover sole *Microstomus pacificus*	Puget Sound pink salmon *O. gorbuscha*

3.5 Conclusion

NOAA Fisheries concludes that the proposed action would adversely affect the EFH for the groundfish, coastal pelagic, and Pacific salmon species listed in Table 1.

3.6 Essential Fish Habitat Conservation Recommendations

Pursuant to Section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations to Federal agencies regarding actions which may adversely affect EFH. NOAA Fisheries understands that the conservation measures described in the RRMP will be implemented by the jurisdictions approved under Limit No. 10(ii). Furthermore, it believes that these measures are sufficient to address the adverse impacts to EFH described above.

3.7 Statutory Response Requirement

Pursuant to the MSA (section 305(b)(4)(B)) and 50 CFR 600.920(j), Federal agencies are required to provide a detailed written response to NOAA Fisheries' EFH conservation recommendations within 30 days of receipt of these recommendations. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. In the case of a response that is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

3.8 Supplemental Consultation

NOAA Fisheries must reinitiate EFH consultation with itself if the proposed action is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR. 600.920(l)).

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Appendix A

NOAA FISHERIES

WASHINGTON HABITAT BRANCH

May 27, 2003

TO: Steve Landino

FROM: Steve Keller

SUBJECT: **4(d) rule (Limit 10) application—State of Washington Regional Routine Road Maintenance Plan—adequacy of the Washington Department of Fish and Wildlife Hydraulic Project Approval for conditioning instream work to protect listed species**

This is a follow-up to a memorandum to you dated October 7, 2002 in which Dan Guy, Laura Hamilton and I assessed the adequacy of the Washington Department of Fish and Wildlife (WDFW) Hydraulic Project Approval (HPA) process for protecting salmonids listed by the National Marine Fisheries Service (NOAA Fisheries) under the Endangered Species Act (ESA) during inwater road maintenance activities described in the 4(d) rule Limit 10 application for the State of Washington Regional Routine Road Maintenance Program (RMP). In that memorandum we compared the Hydraulic Code—Chapter 77.55 Revised Code of Washington (RCW) and the existing rules for administration of the HPA—Chapter 222-110 Washington Administrative Code (WAC) against NOAA Fisheries Opinions for their adequacy to protect NOAA Fisheries listed fish affected by routine "maintenance" activities. Based upon that review, we concluded that the majority of project types regulated by the Hydraulic Code could adequately protect listed fish but that regulation of some HPA project activities were not clearly or fully addressed in the RCWs or the WACs.

NOAA Fisheries subsequently met with WDFW to discuss these shortcomings and to do further review of how to proceed, given the lack of specificity in the RCWs and WACs. In response WDFW suggested that NOAA Fisheries further review WDFW policies and procedures, including the WDFW HPA manual (1998), the WDFW document *"Hydraulic Project Approvals—Basics and How to Process"* (2002), the WDFW *Mitigation Policy* (1999), and WDFW technical resources and guidelines for insights as to the administration and effectiveness of the HPA program. WDFW also provided NOAA Fisheries with two statewide general maintenance HPAs, and 50 individual HPAs provided by WDFW and issued for typical road maintenance kinds of activities. In addition we reviewed WDFW's February 22, 2002 comments to NOAA Fisheries regarding the proposed 4(d) limit for the RMP.

This review demonstrates that the HPA permitting system of RCWs, WACs, policies, procedures and additional WDFW Technical Guidance is likely to be adequate to protect NOAA Fisheries' ESA-listed salmonids for instream maintenance activities undertaken by RMP participants. However this review does not represent a full "audit" of the adequacy of the HPA program, including issues such as WDFW staffing, permit compliance and enforcement, diminished protection for political expediency, or the possibility that the Hydraulic Code could be significantly altered or eliminated. It also does not constitute a formal consultation under section 7 of the ESA. This review should be treated more as a collective assessment of law, rule, intent and process utilized by WDFW to protect fish life, coupled with a review of 50 individual and two general HPAs that WDFW considers to demonstrate its intent and direction for protecting fish life during routine road maintenance projects. It should also be noted that the HPA is not a stand-alone protection strategy for the RMP. ESA-listed fish can be further protected by ensuring full implementation of the RMP. Collaboration between NOAA Fisheries, RMP participants and WDFW is essential for developing maintenance projects or programs, assessing project effects on listed species and avoiding, minimizing or mitigating those effects, monitoring outcomes of projects or programs at attaining or progressing towards properly functioning condition (PFC).

Instream maintenance activities considered in this review included:

- Bank Protection
- Sediment Removal
- Bridge Pier/Footing/Abutment Scour Repair
- Bridge Cleaning/Painting
- Trash/Debris Removal, including large woody debris
- Culvert Installation
- Culvert Cleaning
- Culvert Maintenance
- Fish Passage
- Habitat Enhancement
- Beaver Dam Removal

The Hydraulic Code—Chapter 77.55—Revised Code of Washington (RCW)

The Hydraulic Code was originally enacted into Washington State law in 1949, has been amended many times since, and is being considered for significant updates in the 2003 session of the Washington State Legislature. The law requires that anyone constructing any form of hydraulic project that would use, divert, obstruct, or change the natural flow or bed of any river or stream or utilize any waters of the state must obtain a Hydraulic Project Approval (HPA) from WDFW before commencing work. The intent of the law is to allow work to proceed under permits that provide for the proper protection of fish life. Notable amendments occurred in 1967 (criminal violation provision), 1977 (bed defined, emergency HPA provision added), 1983 (entire Fisheries Code was recodified, salt waters explicitly included, 45-day processing deadline), 1986 (agricultural HPAs defined, Hydraulic Appeals Board added, civil penalties added), 1991 (marine bulkheads), 1995 (aquatic plants pamplet), 1996 (marina maintenance, streamlining for watershed restoration projects), 2000 (Fisheries and Wildlife Codes merged), and 2002 (stormwater authority defined).

The Hydraulic Code Rules—Chapter 220-110—Washington Administrative Code (WAC)

The Hydraulic Code Rules were first adopted in 1983 and the last major update occurred in 1994.

The rules are intended to administer, interpret and clarify the Hydraulic Code. The rules include common provisions for the protection of fish life for typical projects proposed to WDFW, either in freshwater or saltwater. These projects include such things as bank protection, water crossing structures, channel changes and realignments, gravel removal, bulkheads, docks, piers, marinas and dredging. Implementation of these provisions is stated to be necessary to minimize project specific and cumulative impacts to fish life. The technical provisions apply to a hydraulic project when included as provisions on an HPA. Each application is reviewed on an individual basis and programmatic HPAs may be issued. Common technical provisions may be modified or deleted as appropriate to individual projects and additional special provisions may be added to address project or site-specific considerations not adequately addressed by the common technical provisions.

HPAs for inwater maintenance activities such as those contemplated by the RMP usually require and include specific HPA provisions, including those that reference:

- Plans
- Design specifications
- Construction timing (inwater and upland)
- Notification of Area Habitat Biologist and WDFW Enforcement
- Requirements for on-site construction/inspection specialists
- Site access (permanent or temporary)
- Equipment staging
- Equipment cleaning and maintenance
- Site preparation, vegetation disturbance/revegetation
- Water diversion/screeening
- Fish exclusion/salvage
- Wastewater discharge and treatment
- Spill prevention and clean-up
- Use of deleterious substances (concrete, treated wood, etc)
- Cleanup and Erosion Control
- Monitoring
- Reporting

WDFW HPA Manual (1998) and WDFW "Hydraulic Project Approvals—Basics and How to Process"

These two documents provide guidance to Area Habitat Biologists (AHB) who have been delegated signature authority for individual HPAs. The HPA manual contains directions on how to process HPAs using a menu-driven computer program provided to each AHB. The manual contains a section titled "*Technical Provisions and Guidelines for Use.*" The introduction to each category of project (e.g. Bank Protection) contains guidance on how to minimize and mitigate project impacts.

The WDFW document "*Hydraulic Project Approvals—Basics and How to Process - 2002*" is more procedural (e.g. what constitutes a complete application, processing timelines, compliance with other laws, etc.). It also includes the WDFW Mitigation Policy which provides guidance on WDFW's mitigation sequencing (*i.e.*, avoiding, minimizing, restoring, preserving, compensating, monitoring and taking corrective actions), on allowable types of mitigation (*i.e.,* in order of preference: on-site, in-kind; off-site, in-kind; on-site, out-of-kind; and off-site, out-of-kind). In addition, the HPA WACs require that all HPAs incorporate mitigation measures as necessary to achieve no net loss of fish habitat. For projects with potentially significant impacts, a mitigation agreement may be required prior to project construction. The HPA may be sequenced and/or phased including timing to provide for up front mitigation. This manual also references how WDFW coordinates its HPAs with the WDFW Enforcement Program. In addition, AHBs are currently using a WDFW Habitat resource risk and impact decision matrix to facilitate making HPA priority designations for site visits by enforcement officers. HPAs are prioritized as Priority 1 (high), Priority 2 (medium) and Priority 3 (low).

WDFW Technical Resources and Guidelines

Guidance documents such as WDFW's *Integrated Streambank Protection Guidelines (2002),* its *Fish Passage Design at Road Culverts (1999, but being updated),* and a combined-agency effort, *Aquatic Habitat Guidelines: An Integrated Approach to Marine, Freshwater, and Riparian Habitat Protection and Restoration (2002)* are examples of written technical materials that are available to applicants and AHBs for use in designing, constructing and monitoring "fish-friendly" construction projects. In addition, AHBs can work directly with WDFW engineers to solve permit design and permitting issues in a manner that minimizes fish habitat impacts.

The WDFW Approach to the RMP

WFDW provided substantial comments about the RMP in a February 22, 2002 letter to NOAA Fisheries. These comments are instructive, as they provide a picture of how WDFW has and will continue to approach fish habitat protection as it relates to maintenance activities anticipated in the RMP, in particular activities which will require HPAs. Fundamentally, WDFW expressed concern that implementation of some of the Best Management Practices and other elements of the RMP may contribute to long-term habitat loss and preclude attainment of properly functioning habitat conditions for fish. WDFW felt that the RMP had little discussion of how chronic maintenance impacts will be mitigated. WDFW felt that chronic maintenance should be defined and a process provided to resolve issues of chronic maintenance—a method is needed to break the "circle of perpetual maintenance." For example, in certain instances over the long-term, it may be prudent, cost-effective and more fish friendly to relocate a road out of a channel migration zone instead of perpetually armoring an eroding streambank. In another case chronic channel excavation at a culvert inlet may indicate the need for a much larger culvert or a bridge.

Individual HPAs

I examined 52 separate maintenance-related HPAs provided by WDFW for consistency with WDFW WACs, policy and guidance and instruction. HPAs reviewed included:

Bank Protection (rock) - 6
Bank Protection (Large Woody Debris - LWD) - 8
Bank Protection (rock and LWD) - 12
Slope Stabilization - 1
Sediment Removal - 9
Culvert Installation - 5
Bridge Footing/Pier Scour Repair - 2
Bridge/Culvert Debris Removal (statewide programmatic) - 1
Fish Habitat Enhancement - 6
Utility Corridor Maintenance - 1
Beaver Dam Removal (statewide programmatic) - 1

The following tables summarize (by project type or conditioned activity) the content of the WACs, HPA technical provisions, additional WDFW Technical Guidance and actual HPA provisions for maintenance-related HPAs**.**

Bank Protection (Freshwater)

HPA WACs	**HPA Manual(s) - Technical Provisions**	**Additional WDFW Technical Guidance**	**HPAs**
- WACs require mitigation/ no net loss of habitat - WACs identify bio-engineering as preferred method for bank protection, general requirements for type and extent of project, project-specific HPA provisions variable - WACs that generally address equipment staging, maintenance, erosion control, reveg	Bioengineering is the preferred method of bank protection wherever practicable, define limits of encroachment beyond OHWL, lineal extent and or reference to permanent landscape features, require 100 yr flood integrity, may need to tailor revegetation on a site specific basis	WDFW staff are instructed to encourage applicants/designers to consider the WDFW Integrated Streambank Protection Guidelines (ISPG) - an analytical approach to diagnose and treat bank erosion problems with the least impact on fish and fish habitat	24 of 26 HPAs referenced plans (2 w/o plans specified LWD placement by landmarks), 20 of 26 riprap projects included LWD, 8 were LWD only, LWD size/species/upland source often req'd, 2 HPAs included bio-engineering designs, 21 of 26 had 100 yr flood design req'd, Engineered Log Jams have been permitted, boulder clusters used, several large demonstration projects req'd on-site expertise during construction, many HPAs had winter timing due to imminent flood threats

Bank Protection (Marine)

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- WACs require mitigation/ no net loss) - WACs require least impacting alternative minimizing encroachment below OHW - WACs prohibit bank protection in eelgrass, no permanent loss of forage fish spawning habitat - WACs address construction methodology, equipment use, habitat features and vegetation,	- Separate provisions for concrete, rock, timber, bulkheads - bulkheads prohibited in eelgrass, Pacific herring spawning beds and ling cod and rockfish settlement and nursery areas - bulkheads limited in baitfish spawning areas - staked alignments req'd - limits on waterward encroachment -footing depth -beach gravelling -wood preservatives discouraged or must meet BMPs -pre-project fish surveys req'd for critical habitat -saltwater construction timing windows	Engineering expertise, nearshore fish use mapping and fish use/life history expertise	No specific HPAs sampled

Sediment Removal

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- WACs for sediment removal (dredging in freshwater areas) more applicable to lakes, limit dredging in fish spawning areas.	Technical provisions for sediment removal (dredging in freshwater areas) more applicable to lakes -limit dredging in fish spawning areas -avoid pits, potholes, depressions that may strand fish - dredging equipment specified - minimize turbidity	WDFW staff are instructed to encourage applicants/designers to consider the WDFW Integrated Streambank Protection Guidelines (ISPG) - an analytical approach to diagnose and treat bank erosion problems with the least impact on fish and fish habitat ISPG addresses fluvial geomorphology and riverine sediment transport processes relative to bank erosion and may lead to direct bank protection in lieu of dredging	-the 9 HPAs reviewed limited the project area and volume limits, one was for low flow municipal water supply and one was for a hatchery water supply emergency, one req'd LWD be retained for off-site fish enhancement - Programmatic permit to WSDOT for limited sediment removal (>50 yds) at culverts and.bridges, HPA requires AHB coordination/site approval for HPA deviations

Large Woody Debris Removal/Relocation

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- WACs require no net loss of habitat, discourage LWD removal except for safety, allow LWD repositioning to provide stable, functioning habitat - WACs that address equipment staging, maintenance, erosion control, reveg	-Technical Provisions closely mirror the WACs, -guidance provided to clearly specify which LWD may be removed, how and to where	- ISPG - Appendix I:Anchoring and placement of large woody debris	- One HPA reviewed allowed LWD removal in conjunction w/culvert inlet clean-out but req'd that the LWD be stock-piled for later use in fish enhancement projects - Three HPAs specified individual LWD pieces to be moved and where to relocate for bank protection, req'd anchoring to withstand 100 yr flows - Programmatic permit to WSDOT for limited LWD removal at culverts and.bridges, HPA defines LWD, requires AHB coordination/site approval for HPA deviations

Culvert Cleaning

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- No specific WACs	- No specific provisions	-None	-3 HPAs for sediment removal were upstream or downstream of culverts, no work within the culvert proper, but limitations on volume and project area - Programmatic permit to WSDOT for limited sediment removal (>50 yds) at culverts and.bridges when associated w/LWD removal, HPA requires AHB coordination/site approval for HPA deviations

Culvert Maintenance (e.g. fill slopes, wingwalls)

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- No specific WACs	- No specific Technical Provisions	- None	- None reviewed

Culvert Replacement

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- WAC language for water crossing structures (culvert replacement). WACs require no net loss, lists hierarchy of replacement structures by "preference." Bridges are preferred.	-Bridges preferred (avoid footings waterward of OHWL) - approvable culverts in descending order of preference include temporary culverts, bottomless arch culverts, arch culverts, and round culverts (corrugated culverts preferrred over smooth surfaced culverts) - two culvert options: 1- inside width >stream channel 2- design elements in WAC 222-110-070 -two year limit for temporary culverts - design standards - discourage culvert baffles except at some retro-fits -perpetual maintenance falls to landowner -program oversight of all culvert HPAs -flow bypass generally req'd	- Crossing structures guided by "fish passage design at road culverts." (Currently in revision)	-Five individual new culvert installations reviewed (two bottomless arches, one arch and two temporaries) - 1 HPA required bonding, monitoring plan - 2 had perpetual passage requirements - temporaries had 1 year removal req'd

Fish Passage (other than stream crossings)

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- No specific HPA WACs	- Under no circumstance shall a blockage to stream flow or fish passage be created	-WDFW engineering assistance - WDFW standard design drawings for log weirs, rock grade controls	- Several HPAs for LWD, rock, or boulder placement referenced approved plans and/or had a perpetual "no blockage" provision or specific fish passage criteria w/in provisions

Bridge Cleaning/Painting

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- WAC reference in Water Crossing Structures (may require HPA) - 5 yr permit/permit exemption may be granted w/plan that meets or exceeds WDFW requirements)	- reference in Water Crossing Structures (may require HPA) - 5 yr permits provided - permit exemption may be granted w/plan that meets or exceeds WDFW requirements)	- MOA w/WSDOT regarding bridge maintenance - under review	- None reviewed

Sewer/Waterline Maintenance

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- No specific WAC language for maintenance - specific WACs for new construction (conduit x'ings)	- None	- None	- None Reviewed

Utility Corridor Maintenance

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
-No specific WAC language for maintenance - specific WACs for new construction	- None	- None	- 1 low impact HPA to accomodate limb removal during minor tree pruning -conflicting provisions, but no resource risk

Fish Habitat Enhancement

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- Some WAC guidance within WACs for bank protection, LWD repositioning	- bank protection, LWD repositioning	- Aquatic Habitat Guidelines	- 5 HPAs included placement of habitat structures such as grade controls, gravel replacement, engineered log jams, etc -23 HPAs required fish habitat enhancement features (LWD, rock clusters)

Beaver Dam Removal

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs

- No specific WACs	- No guidance	- Aquatic Habitat Guidelines	- blanket HPA to WSDOT (7/15/02 to 7/15/03) -specifies applicable dams -hand-held tools -requires AHB review of chronic beeaver dam problems -specific HPA timing by stream - annual report req'd - no individual HPAs reviewed

Plans and Specifications

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- general plans for project, complete plans and specifications for activity waterward of OHWL - complete plans and specifications for the proper protection of fish life	- provision that references specific plans and modifications that have been approved (ranging from simple sketches for minor projects to very detailed plans for more significant projects) - design specifications for structures is 100 yr peak flow	- ISPG - Fish Passage Passage Design at Road Culverts - WDFW standard design drawings for log weirs, rock grade controls	- 47/50 HPAs referenced specific plans provided by applicant, as modified by HPA provisions - the remaining three HPAs used verbal descriptions of minor projects w/in provisions (including size, location, reference points, etc)

Construction Timing

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- No specific WACs in freshwater (except for mineral prospecting) - specific marine WACs for salmon and nearshore marine fish	- generalized multi-species guidelines available for most streams are designed to protect incubating eggs, most juvenile outmigration individual HPAs may be tailored to protect specific species life history timing	- None	- 48/50 individual HPAs had timing windows (2 exceptions were year-round minor projects) -reflected general concurrence with WDFW timing windows - exceptions for imminent threats/emergencies - less restrictive timing where impacts were insignificant or where provisions were more restricitive -many HPAs required timing specifically to protect listed fish -fish/redd surveys req's in two HPAs because of work outside windows -many HPAs had more liberal timing in non-listed fish use areas (non-use tribs or outside of ESUs). - general timing windows for WSDOT programattics w/AHB notification required to deviate

Notification

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- No specific WAC language for maintenance - specific WACs for new construction	- Six versions of notification requirements, depending upon signficance/timing/duration of HPA and compliance inspection needs	- None	- 50/50 notified Enforcment of HPA prioriity (1 P-1, 35 p-2, 14 p-3) - 30/50 req'd AHB pre-post compliance notification - 11/50 req'd specialists on site (wetlands, fish biology, stream ecology, landscape, engineer)

Site Access

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- No specific WACs	- None	- None	- specific site access routes addressed in six individual HPAs, both general HPAs

Equipment Staging

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- WAC language in Bank Protection, Gravel Removal, LWD removal/repositioning	- Addressed in Technical Provisions in Bank Protection, Gravel Removal, LWD removal/repositioning,	- None	- 34 HPAs had provisions for staging (usually on uplands, dry bars, bank, bridge, roadway, w/in cofferdams) - 4 HPAs had requirements for specific equipment type - 3 HPA s specifically prohibited stream crossings

Equipment Cleaning/ Maintenance

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
WAC language in Bank Protection, Gravel Removal; specific HPA pgm provision for equipment cleaning/maintenance	Technical provision for clean, no leaks, repair	- None	- 36/51 applicable HPAs required clean equipment provision

Fish Exclusion/ Salvage

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- WAC language in Water Crossing Structures, Temporary Bypass, Flume or Channel (Safe removal of stranded fish, screening required)	- w/in temporary bypass (below) -fish salvage should be carefully considered (could be more harmful, WDFW fish capture to be offered when staff available	- none	- 10 applicable HPAs req’d fish salvage (7 offered WDFW assistance) - 12 applicable HPAs did not require salvage - salvage usually req’d for culvert installations, site specific for bank protection

Temporary Water Diversion

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- WACs for Temporary By-pass Culvert, Flume or Channel - Bypass required for culvert installations (w/exceptions)	- HPA pgm provisions specify the bypass mechanism for individual projects (e.g. pump, flume, culvert)	- WDFW guidelines for use of electrofishers	- 21/22 applicable HPAs required some form of bypass - One in-lake HPA required a silt curtain - 12 individual and 2 pgmtc HPAs limited work to periods of low flows or no flow

Wastewater Discharge/ Treatment

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- WAC language in Water Crossing Structures and Conduit Crossings	- 15 water quality provisions to apply to specific situations	- None	- 24 of 28 applicable HPAs required wastewater mgnt - one bypassed into irrigation ditch - two had instream check dams - applied primarily to rock bank protection, permanent culverts, sediment removal

Spill Prevention/Cleanup

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- No WAC reference to spill plans	- equipment cleaning/leak prevention	- none	- 39/50 applicable HPAs had at least general spill prevention provisions - seven HPAs req'd spill prevention/clean-up plans/materials on site - 23 HPAs had fish distress/Ecology notification/stop work provision

Use of Deleterious Substances (concrete, treated wood)

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- WAC requirements in Water Crossing Structures, Bulkheading, treated wood (creosote, penta) not allowed in lakes, treated wood discouraged in marine waters	- HPA pgm provisions for treated wood, concrete containment/exclusion	- Western Wood Preservers (WWP) Best Management Practices (BMPs) for Treated Wood in Aquatic Environments	- 19 applicable HPAs had a standard provsion that prohibited fresh cement or concrete leachate from contacting state waters - three HPAs required use of WWP BMPs for treated wood - four HPAs specifically prohibited the use of concrete

Erosion Control

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- General WAC requirements in Bank Protection, Water Crossing Structures, Conduit Crossing, Temporary Bypass, Gravel removal, Outfall Structures	- Provisions for applicable situations	None	50/52 HPAs required erosion control, many req'd site specific erosion control plans

Vegetation Disturbance/Revegetation

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- Specific WAC requirements in Bank Protection, Water Crossing Structures, Conduit Crossing, Temporary Bypass, Gravel Removal, LWD, Outfall Structures (generic language)	- 8 provisions to be used as needed	ISPG, Aquatic Habitat Guidelines	51/52 HPAs had provisions that limited vegetation disturbance and required revegetation with native species - 17 HPAs had specific spacing and 80%/3 yrs survival required - 11 HPAs referenced specific landscape plans and/or speciesrequirements

Monitoring and Reporting

HPA WACs	HPA Manual(s) - Technical Provisions	Additional WDFW Technical Guidance	HPAs
- No specific WAC requirements - revegetation survival (8)%/3yrs) implies that monitoring shall occur	- WDFW Mitigation Policy requires monitoring and contingency plans when a specific mitigation plan is required	- ISPG, Aquatic Habitat Guidelines	- except for revegetation monitoring and perpetual fish passage requirement, only 2/50 individual HPAs specifically required monitoring and/or reporting - WSDOT Beaver Dam Removal HPA requires detailed annual report