UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

Refer to:
2004/00370

May 21, 2004

Mr. Robert Ellis
Portland District, Corps of Engineers
CENWP-OP-GP
P.O. Box 2946
Portland, Oregon 97208-2946

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery and Conservation Management Act Essential Fish Habitat Consultation for the Crims Island Section 536 Juvenile Salmon Habitat Restoration Project, Columbia River Basin, Columbia County, Oregon

Dear Mr. Ellis:

Enclosed is a biological opinion (Opinion) prepared by NOAA's National Marine Fisheries Service (NOAA Fisheries) pursuant to section 7 of the Endangered Species Act (ESA) on the effects of the proposed Crims Island Section 536 Juvenile Salmon Habitat Restoration Project in Columbia County, Oregon. In this Opinion, NOAA Fisheries concludes that the proposed action is not likely to jeopardize the continued existence of 12 species of ESA-listed salmonid fishes, or destroy or adversely modify their designated critical habitat. As required by section 7 of the ESA, NOAA Fisheries includes reasonable and prudent measures with non-discretionary terms and conditions that are necessary to minimize the effects of incidental take associated with this action.

This document also serves as consultation on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and implementing regulations (50 CFR Part 600). NOAA Fisheries concluded that the proposed action may adversely affect designated EFH for Pacific salmon and groundfish species. As required by section 305(b)(4)(A) of the MSA, included are conservation recommendations that NOAA Fisheries believes will avoid, minimize, mitigate, or otherwise offset adverse effects on EFH resulting from the proposed action. As described in the enclosed consultation, 305(b)(4)(B) of the MSA requires that a Federal action agency must provide a detailed response in writing within 30 days after receiving an EFH conservation recommendation.

Please direct any questions regarding this consultation to Robert Anderson of my staff in the Oregon Coast/Lower Columbia Habitat Branch of the Oregon State Habitat Office at 503.231.2226.

Sincerely,

for Michael R Crouse

D. Robert Lohn
Regional Administrator

cc: Maureen Smith, USFWS

Endangered Species Act - Section 7 Consultation
Biological Opinion

&

Magnuson-Stevens Fishery Conservation and Management Act
Essential Fish Habitat Consultation

Crims Island Section 536 Juvenile Salmon Habitat Restoration Project,
Columbia River Basin,
Columbia County, Oregon

Agency: U.S. Army Corps of Engineers

Consultation Conducted By: National Marine Fisheries Service, Northwest Region

Date Issued: May 21, 2004

Issued by:

D. Robert Lohn
Regional Administrator

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1. INTRODUCTION

The Endangered Species Act (ESA) of 1973 (16 USC 1531-1544), as amended, establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat on which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with U.S. Fish and Wildlife Service and NOAA's National Marine Fisheries Service (NOAA Fisheries), as appropriate, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitats. This biological opinion (Opinion) is the product of an interagency consultation pursuant to section 7(a)(2) of the ESA and implementing regulations found at 50 CFR 402.

The analysis also fulfills the essential fish habitat (EFH) requirements under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal fisheries management plan. 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 (§305(b)(2)).

1.1 Background and Consultation History

On April 7, 2004, NOAA Fisheries received a letter from the U.S. Army Corps of Engineers (Corps) requesting informal consultation pursuant to section 7(a)(2) of the ESA, and EFH consultation pursuant to section 305(b)(2) of the MSA for the Crims Island Section 536 Juvenile Salmon Habitat Restoration, Columbia County, Oregon. A biological assessment (BA) describing the proposed action and its potential effects was submitted with the letter. In the BA, the Corps determined the proposed action was not likely to adversely affect the following ESA-listed species: Snake River (SR) steelhead (*Oncorhynchus mykiss*), Upper Columbia River (UCR) steelhead, Middle Columbia River (MCR) steelhead, Upper Willamette River (UWR) steelhead, Lower Columbia River (LCR) steelhead, SR spring/summer-run Chinook salmon (*O. tshawytscha*), SR fall-run Chinook salmon, UCR spring-run Chinook salmon, UWR Chinook salmon, LCR Chinook salmon, Columbia River (CR) chum salmon (*O. keta*), and SR sockeye salmon (*O. nerka*). The Corps also found the proposed project may adversely affect designated EFH. NOAA Fisheries responded to the Corps[1] on April 14, 2004, indicating that we did not concur with the Corps' determination of effects. On April 14, 2004, NOAA Fisheries received an e-mail from the Corps revising their determination of effects and requested formal consultation.

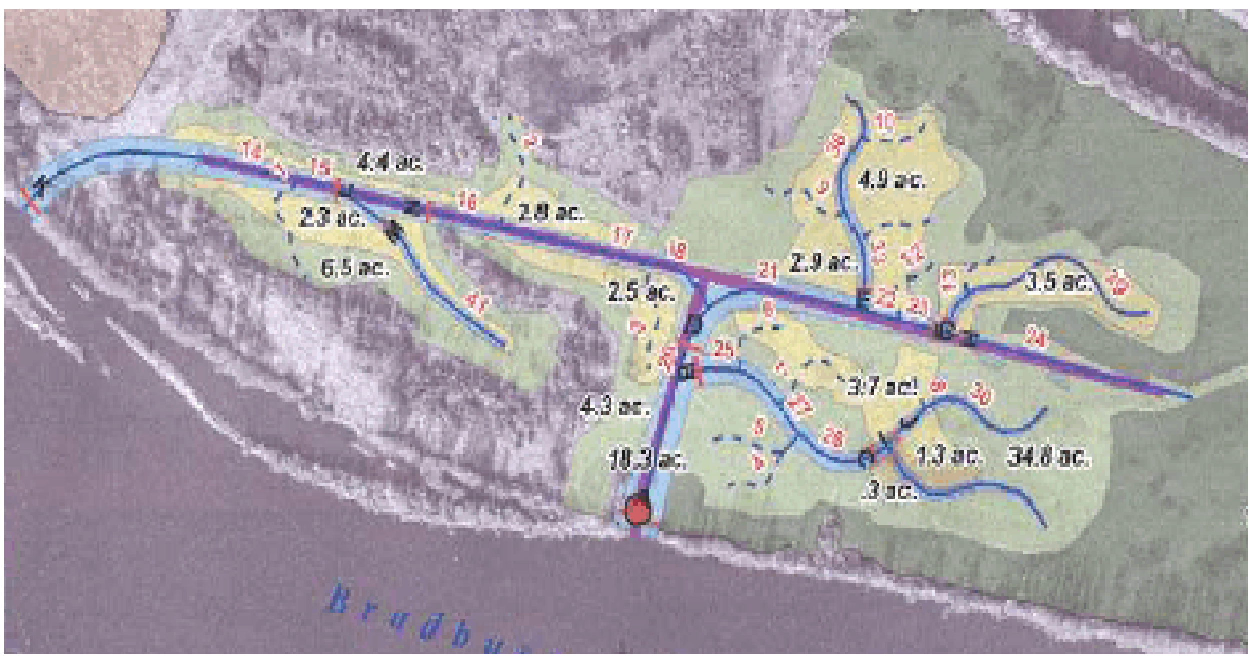
[1] Phone conservation between Robert Anderson, NOAA Fisheries, and Blaine Ebberts and Robert Willis, U.S. Army Corps of Engineers, April 14, 2004.

1.2 Proposed Action

The Corps proposes to authorize the restoration of tidal, emergent and forested wetlands, intertidal mudflats, and riparian forest habitats on Crims Island. Restoration elements include: (1) Excavation of new intertidal channels and reshaping of existing intertidal channels; (2) excavation and enhancement of existing freshwater, emergent wetlands; (3) removal of an earthen dam; (4) riparian plantings and tilling; and (5) operations and maintenance. The proposed restoration includes 75 acres of intertidal wetlands, 17 acres of intertidal channels, 115 acres of riparian forest, and re-establishment of tidal exchange to 88 acres of interior marshes and forested wetlands. The purpose of the proposed action is to enhance off-channel habitat for rearing salmonid fishes (and other wildlife) in the lower Columbia River. Specific elements of the proposed action are described below.

<u>Channel Excavation</u>
Primary intertidal channels (Figure 1) will be constructed with a channel depth of 9 feet and a channel width of 30 feet. Bank angles will be sloped at 1 vertical (V):6 horizontal (H). Secondary intertidal channels will be constructed with a channel depth of 3 feet and a channel width of 3 feet. Approximately 262,000 cubic yards of material will be excavated to create the intertidal channels. Excavated materials will be disposed of in the upland area designated for riparian forest restoration.

Figure 5 Crims Island, Columbia River (river mile 55). Proposed intertidal excavation area. Primary channels are represented with solid lines. Secondary channels are represented with dashed lines.



Riparian Forest Restoration

Soils excavated from the intertidal channels will be disposed of in the upland area east of the proposed intertidal channels for development of riparian forest habitat. Riparian forest development will occur in two phases: Cottonwood and willow cuttings will be planted on 50 acres of the proposed upland riparian forest area using an estimated 22,000 cuttings. The remaining ±65 acres would be tilled in May of 2004, and May of 2005, but no vegetation will be planted.

Work Area Isolation - Temporary Dam

Work area isolation for excavation of the intertidal channels will require the installation of a temporary dam comprised of in-situ soil at the mouth of the T-channel and Bradbury Slough to prevent the inflow of water from entering the construction site. Once the dam is in place, the T-channel will be drained by pumping water out of the T-channel and/or passively through a culvert-tide gate installed in the dam. The temporary dam will be removed upon completion of excavation of the intertidal channels.

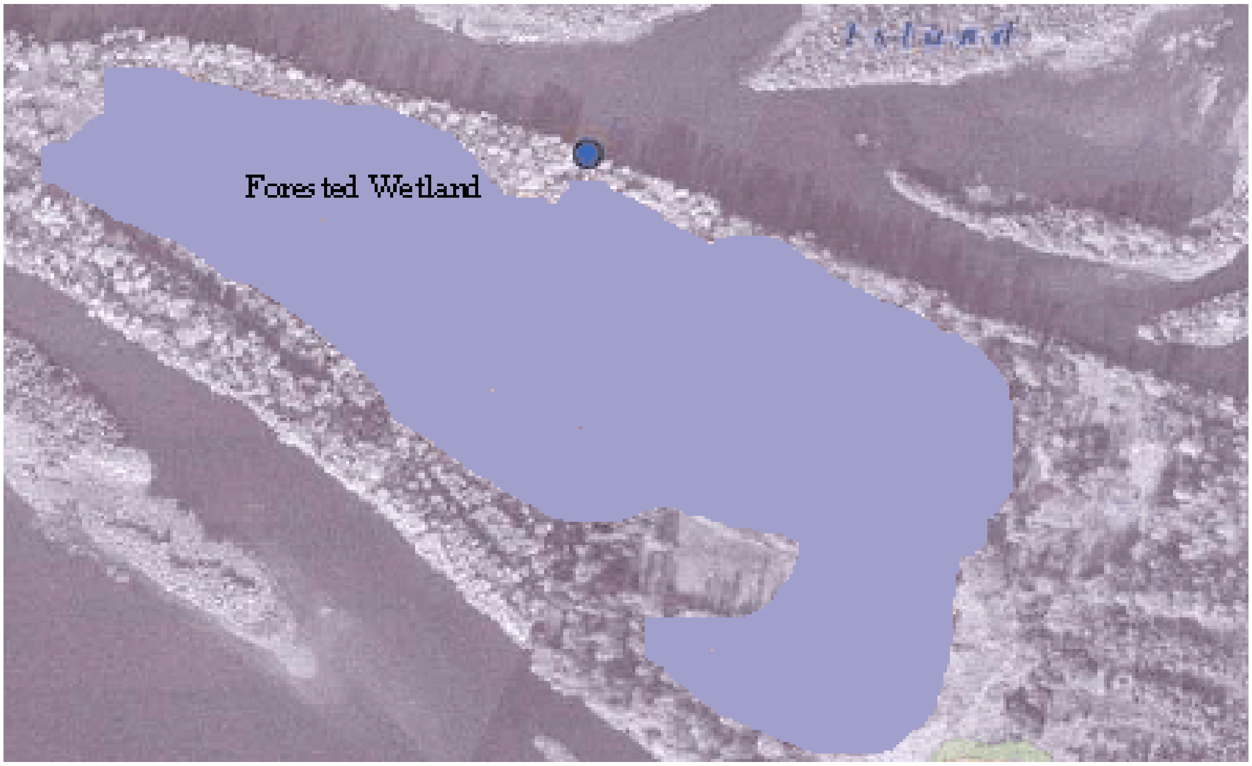
Temporary Water Crossing (Road)

A temporary water crossing measuring 20 feet in width by 100 feet in length, and requiring approximately 200 cubic yards of rock will be placed below mean higher high tide. The temporary road will be removed upon completion of the channel excavation.

Forested Wetland

An earthen dam that blocks a former intertidal channel will be removed to re-establish tidal exchange to 88 acres of interior marshes and forested wetlands (Figure 2). Removal of the earthen dam will require excavation of approximately 800 cubic yards of material and will be disposed on site in an upland area. Channel invert would match the river channel elevation. Channel width will be 10 feet. Excavation of the earthen dam will occur at low tide.

Figure 6 Crims Island, Columbia River (river mile 54.7). Proposed forested wetland restoration area. The earthen dam to be removed is represented by the blue dot.



Operations and Maintenance

Vegetation management would include hand cultivation, tilling, and herbicide use. Herbicides would be limited to hand-based applications. The Corps proposed the following conditions and best management practices for use of herbicides:

(a) Herbicide use would be limited to Rodeo® with a formulation of 53.8% glyphosate and 46.2% inert ingredients, and with LI-700 surfactant within the 100-year floodplain, or 50 feet from top-of-bank, whichever is greater.

(b) Rodeo would be diluted to 50% or less concentration of the active ingredient when applied directly to fresh-cut stems, and up to 5% when applied to foliage.

(c) No herbicides would be applied within 25 feet of mean higher high tide elevation.

(d) Only trained individuals would apply herbicides using only low pressure spot spray and direct wicking application methods, and in accordance with label instructions.

(e) Spray activities would only occur during dry, calm weather conditions to prevent drift and runoff.

(f) No spraying would occur during high wind (greater then five miles per hour) or during rain events, or if precipitation has been forecasted within 24 hours of spraying.

Project Timing
The proposed timing for excavation of the intertidal channels will be July 15, 2004, through October 15, 2004. The proposed timing for riparian planting and tilling will be February 15, 2005, through May 15, 2005.

Best Management Practices
NOAA Fisheries regards the best management practices included in the consultation request (EA p. 25) as useful and important to minimize adverse effects to ESA-listed species and their habitats, and considers them to be an integral part of the proposed action. Best management practices in the following categories will apply (see consultation proposal for details):
(1) Erosion and sedimentation control, (2) pollution control, and (3) work area isolation.

Monitoring
Post-project monitoring to evaluate fish use in the intertidal channels and forested wetland would be conducted by the United States Geological Survey's Columbia River Research Laboratory.

1.3 Description of the Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area (project area) involved in the proposed action (50 CFR 402.02). For this consultation, NOAA Fisheries defines the action area as Crims Island, Columbia River, river miles 54.2 to 56.5.

2. ENDANGERED SPECIES ACT

2.1 Biological Opinion

This consultation considers the potential effects of the proposed action by the Corps on SR steelhead, UCR steelhead, MCR steelhead, UWR steelhead, LCR steelhead, SR spring/summer-run Chinook salmon, SR fall-run Chinook salmon, UCR spring-run Chinook salmon, UWR Chinook salmon, LCR Chinook salmon, CR chum salmon, and SR sockeye salmon. Species' listing dates, critical habitat designations, and take prohibitions are listed in Table 1. The objective of this consultation is to determine whether the proposed action is likely to jeopardize the continued existence of the ESA-listed species, or destroy or adversely modify designated critical habitat for SR fall Chinook, SR spring/summer Chinook salmon, or SR sockeye salmon. This consultation is conducted pursuant to section 7(a)(2) of the ESA and its implementing regulations (50 CFR 402).

Table 1. Endangered and Threatened Pacific Salmon and Steelhead Under NOAA Fisheries' Jurisdiction in Oregon

Evolutionarily Significant Unit	**Final Rule** E = Endangered T = Threatened	**Critical habitat (Final Rule)**	**Protective Regulations (Final Rule)**
Snake River fall Chinook salmon	T: April 22, 1992; 57 FR 14653	December 28, 1993; 58 FR 68543	April 22, 1992; 57 FR 14653
Snake River spring/summer Chinook salmon	T: April 22, 1992; 57 FR 146531	October 25, 1999; 64 FR 57399	April 22, 1992; 57 FR 14653
Snake River sockeye salmon	E: November 20, 1991; 56 FR 58619	December 28, 1993; 58 FR 68543	ESA section 9 applies
Snake River steelhead	T: August 18, 1997; 62 FR 43937	N/A	July 10, 2000; 65 FR 42422
Lower Columbia River Chinook salmon	T: March 24, 1999; 64 FR 14308	N/A	July 10, 2000; 65 FR 42422
Upper Columbia River spring Chinook salmon	E: March 24, 1999; 64 FR 14308	N/A	ESA section 9 applies
Upper Willamette River Chinook salmon	T: March 24, 1999; 64 FR 14308	N/A	July 10, 2000; 65 FR 42422
Columbia River chum salmon	T: March 25, 1999; 64 FR 14508	N/A	July 10, 2000; 65 FR 42422
Middle Columbia River steelhead	T: March 25, 1999; 64 FR 14517	N/A	July 10, 2000; 65 FR 42422
Lower Columbia River steelhead	T: March 19, 1998; 63 FR 13347	N/A	July 10, 2000; 65 FR 42422
Upper Willamette River steelhead	T: March 25, 1999; 64 FR 14517	N/A	July 10, 2000; 65 FR 42422
Upper Columbia River steelhead	E: August 18, 1997; 62 FR 43937	N/A	ESA section 9 applies

2.1.1 Biological Information and Critical Habitat

<u>SR Fall Chinook Salmon</u>
The SR fall Chinook salmon evolutionarily significant unit (ESU) once spawned in the mainstem of the Snake River, from its confluence with the Columbia River, upstream to Shoshone Falls (RM 615). The spawning grounds between Huntington (RM 328) and Auger Falls (RM 607) were historically the most important for this species. Only limited spawning activity occurred downstream of RM 273 (Waples *et al.* 1991a), about one mile below Oxbow Dam (Waples *et al.*

1991a). However, irrigation and hydropower projects on the mainstem Snake River have inundated, or blocked access to, most of this area in the past century. The construction of Swan Falls Dam (RM 458) in 1901, eliminated access to much of this habitat and the completion of Brownlee Dam in 1958 (RM 285), Oxbow Dam in 1961 (RM 272), and Hells Canyon Dam in 1967 (RM 247) blocked access to the rest.

Since 1991, spawning has been limited primarily to the mainstem Snake River between a point upstream of Lower Granite Reservoir (RM 149) and Hells Canyon Dam (RM 247, and the lower reaches of the Grande Ronde, Clearwater, and Tucannon Rivers, all tributaries to the Snake River. Redds in the Clearwater River have been observed from its mouth to slightly upstream of its confluence with the north fork (about 40 miles).

No reliable estimates of historical abundance are available (Waples *et al.* 1991b), but because of their dependence on mainstem habitat for spawning, fall Chinook have probably been affected to a greater extent by irrigation and hydroelectric projects than any other species of salmon in the Snake River basin. The mean number of adult SR fall Chinook salmon declined from 72,000 in the 1930s and 1940s, to 29,000 during the 1950s. In spite of this, the Snake River remained the most important natural production area for fall Chinook in the Columbia River basin throughout the 1950s. The number of adults counted at the uppermost Snake River mainstem dams averaged 12,720 total spawners from 1964 to 1968; 3,416 spawners from 1969 to 1974; and 610 spawners from 1975 to 1980 (Waples, *et al.* 1991b). Most adult SR fall Chinook spend 3 years at sea before migrating up the Columbia and Snake Rivers between August and October (Waples *et al.* 1991b). Spawning occurs in the mainstem Snake River and in the lower parts of its major tributaries in between late October and mid-December, typically peaking in November (Myers *et al.* 1998). Fry emerge from the spawning beds from late March through early June. At present, the peak of the smolt outmigration usually occurs in July, however, juvenile fall Chinook may be found migrating in the lower Snake and Columbia Rivers from May through October.[2] SR fall Chinook typically exhibit an "ocean" type juvenile life history pattern, usually rearing in freshwater for only a few months before migrating to the ocean.

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[2] In its comments on the draft USBR 1999 Biological Opinion, the State of Idaho commented that "it is generally accepted that peak juvenile SR fall Chinook migration historically coincided with the declining hydrograph following spring snowmelt" (Kempthorne 1999). However, Krzma and Raleigh (1970) observed that the migration of juvenile fall Chinook into Brownlee Reservoir in 1962 and 1963, began in mid-April, and ended by mid-June (roughly 75% of the migration took place during the second and third weeks of May in those years). Juvenile fall Chinook captured between mid-May and mid-June averaged 71, 81, and 79 mm in 1962, 1963, and 1964, respectively. Similarly, Mains and Smith (1964), who monitored the migration of Chinook salmon in the lower Snake River (RM 82) in 1954 and 1955, collected Chinook salmon fry (most likely those of fall Chinook salmon) migrating in March and April, and documented that the migration of Chinook salmon smolts was nearly complete by the end of June. The average length of fingerlings in June was 90.7 mm. Thus, the historic migration of fall Chinook salmon through the Snake River was more likely to have occurred between late-May and late-June, nearer the peak of historical hydrograph.

SR Spring/Summer Chinook Salmon

It is estimated that at least 1.5 million spring/summer Chinook salmon returned to the Snake River in the late 1800s, approximately 39 to 44% of all spring/summer Chinook in the Columbia River basin. Historically, Shoshone Falls (RM 615) was the uppermost limit to spring/summer Chinook migration, and spawning occurred in virtually all suitable and accessible habitat in the Snake River basin (Fulton 1968 and Matthews and Waples 1991). The development of mainstem irrigation and hydroelectric projects in the mainstem Snake River basin have significantly reduced the amount of habitat available for spring/summer Chinook such that between 1950 and 1960, an average of 125,000 adults returned to the Snake River; only 8% of the historic estimate. An estimated average of 100,000 wild adults would have returned from 1964 to 1968, each year after adjusting for fish harvested in the river fisheries below McNary Dam. However, actual counts of wild adults at Ice Harbor Dam annually averaged only 59,000 each year from 1962 to 1970. The estimated number of wild adult Chinook salmon passing Lower Granite Dam between 1980 and 1990, was 9,674 fish (Matthews and Waples 1991). A recent 5-year geometric mean (1992 to 1996) was only 3,820 naturally-produced spawners (Myers *et al.* 1998). This is less than 0.3% of the estimated historical abundance of wild SR spring/summer Chinook.

SR spring/summer Chinook migrate through the Columbia River from March through July, and spawn in smaller, higher elevation streams than do fall Chinook. Fry generally emerge from the gravel between February and June. SR spring/summer Chinook exhibit a “stream” type juvenile life history pattern, rearing for one, or sometimes even two years in freshwater before migrating to the ocean from April through June. These smolts are often referred to “yearling” Chinook. Adults typically remain in the ocean for two or three years before returning to spawn (Matthews and Waples 1991).

SR Sockeye Salmon

Before the turn of the century (c. 1880), about 150,000 sockeye salmon ascended the Wallowa, Payette, and Salmon River basins to spawn in natural lakes (Evermann 1896). Sockeye populations in the Payette basin lakes were eliminated after a diversion dam near Horseshoe Bend was constructed in 1914, and Black Canyon Dam was completed in 1924. In 1916, a dam at Wallowa Lake was increased in height, resulting in the extinction of indigenous sockeye in Wallowa Lake. Sockeye salmon in the Salmon River occurred historically in at least four lakes within Idaho’s Stanley basin: Alturas, Redfish, Pettit, and Stanley Lakes. Sunbeam Dam, 20 miles downstream from Redfish Lake, severely limited sockeye and other anadromous salmonid production in the upper Salmon River between 1910 to 1934 (Waples *et al.* 1991a). In the 1950s and 1960s, more than 4,000 adults returned annually to Redfish Lake. Between 1985 and 1987, an average of 13 sockeye were counted at the Redfish Lake weir. Only 10 sockeye have returned to Redfish Lake since 1994: One in 1994, one in 1996, one in 1998 and seven in 1999 (all of those returning in 1999 were 2nd generation progeny of wild sockeye that returned to Idaho in 1993). Since 1991, adult sockeye returning to Redfish Lake have been captured to support a captive broodstock program.

Historically, SR sockeye salmon adults entered the Columbia River in June and July, migrated upstream through the Snake and Salmon Rivers, and arrived at Redfish Lake in August and September. Spawning peaks in October and occurs in lakeshore gravels. Fry emerge in late April and May and move immediately to the open waters of the lake where they feed on plankton for 1 to 3 years before migrating to the ocean. Juvenile sockeye generally leave Redfish Lake from late April through May, and migrate nearly 900 miles to the Pacific Ocean. Although pre-dam reports indicate that sockeye salmon smolts migrated in May and June, tagged sockeye smolts from Redfish Lake passed Lower Granite Dam from mid-May to mid-July. SR sockeye spend 2 to 3 years in the Pacific Ocean before returning to their natal lake to spawn.

SR Steelhead

Historically, SR steelhead spawned in virtually all accessible habitat in the Snake River up to Shoshone Falls (RM 615). The development of irrigation and hydropower projects on the mainstem Snake River have significantly reduced the amount of available habitat for this species. No valid historical estimates of adult steelhead returning to the Snake River basin before the completion of Ice Harbor Dam in 1962, are available. However, SR steelhead sportfishing catches ranged from 20,000 to 55,000 fish during the 1960s (Fulton 1970). The run of steelhead was likely several times as large as the sportfish take. Between 1949 and 1971, adult steelhead counts at Lewiston Dam (on the Clearwater River) averaged about 40,000 per year. The count at Ice Harbor Dam in 1962 was 108,000, and averaged approximately 70,000 per year between 1963 and 1970.

A recent 5-year geometric mean (1990 to 1994) for escapement above Lower Granite Dam was approximately 71,000. However, the wild component of this run was only 9,400 adults (7,000 A-run and 2,400 B-run). In recent years, average densities of wild juvenile steelhead have decreased significantly for both A-run and B-run steelhead. Many basins within the Snake River are significantly under-seeded relative to the carrying capacity of streams (Busby *et al.* 1996).

Steelhead populations exhibit both anadromous (steelhead) and freshwater resident (rainbow or red-band trout) forms. Unlike other Pacific salmon species, steelhead are capable of spawning on more than one occasion, and returning to the ocean to feed between spawning events. SR steelhead rarely return to spawn a second time. Steelhead can be classified into two reproductive types: Stream-maturing steelhead, which enter fresh water in a sexually immature condition and wait several months before spawning; and ocean-maturing steelhead, which return to freshwater with fully developed gonads and spawn shortly thereafter. In the Pacific Northwest, stream-maturing steelhead enter fresh water between May and October, and are referred to as "summer" steelhead. In comparison, ocean-maturing steelhead return between November and April and are considered "winter" steelhead. Inland steelhead populations in the Columbia River basin are almost exclusively of the summer variety (Busby *et al.* 1996).

SR steelhead can be further divided into two groupings: A-run steelhead and B-run steelhead. This dichotomy reflects the bimodal migration of adult steelhead observed at Bonneville Dam. A-run steelhead generally return to fresh water between June and August after spending 1 year in the ocean. These fish are typically less than 77.5 centimeters (cm) in length. B-run steelhead usually return to fresh water from late August to October after spending 2 years in the ocean and are generally greater than 77.5 cm in length.

Both A-run and B-run spawn the following spring from March to May in small to mid-sized streams. The fry emerge in 7 to 10 weeks, depending on temperature, and usually spend 2 or 3 years in fresh water before migrating to the ocean from April to mid-June. These estimates are based on population averages and steelhead are capable of remarkable plasticity with in their life cycles.

<u>LCR Chinook Salmon</u>
The LCR Chinook salmon ESU includes all native populations from the mouth of the Columbia River to the crest of the Cascade Range, excluding populations above Willamette Falls. The former location of Celilo Falls (inundated by The Dalles reservoir in 1960) is the eastern boundary for this ESU. Stream-type, spring-run Chinook salmon found in the Klickitat River, or the introduced Carson spring-run Chinook salmon strain, are not included in this ESU. Spring-run Chinook salmon in the Sandy River have been influenced by spring-run Chinook salmon introduced from the Willamette River ESU. However, analyses suggest that considerable genetic resources still reside in the existing population (Myers *et al.* 1998). Recent escapements above Marmot Dam on the Sandy River average 2,800 and have been increasing (ODFW 1998).

Historical records of Chinook salmon abundance are sparse, but cannery records suggest a peak run of 4.6 million fish in 1883. Although fall-run Chinook salmon are still present throughout much of their historical range, most of the fish spawning today are first-generation hatchery strays. Furthermore, spring-run populations have been severely depleted throughout the ESU and extirpated from several rivers.

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 naturally-spawned populations. All basins are affected (to varying degrees) by habitat degradation. Hatchery programs have had a negative effect on the native ESU. Efforts to enhance Chinook salmon fisheries abundance in the lower Columbia River began in the 1870s. Available evidence indicates a pervasive influence of hatchery fish on natural populations throughout this ESU, including both spring- and fall-run populations. The large number of hatchery fish in this ESU make it difficult to determine the proportion of naturally-produced fish. The loss of fitness and diversity within the ESU is an important concern. The median population growth rate over a base period from 1980 through 1998, ranged from 0.98 to 0.88, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared with that of fish of wild origin (McClure *et al.* 2000).

<u>UCR Spring Chinook Salmon</u>
The UCR ESU includes spring-run Chinook populations found in Columbia River tributaries between Rock Island and Chief Joseph Dams, notably the Wenatchee, Entiat, and Methow River basins. The populations are genetically and ecologically separate from the summer- and fall-run populations in the lower parts of many of the same river systems (Myers *et al.* 1998). Although

fish in this ESU are genetically similar to spring Chinook in adjacent ESUs, they are distinguished by ecological differences in spawning and rearing habitat preferences. For example, spring-run Chinook in upper Columbia River tributaries spawn at lower elevations (500 to 1,000 m) than in the Snake and John Day River systems.

The UCR populations were intermixed during the Grand Coulee Fish Maintenance Project (1939 through 1943), resulting in loss of genetic diversity between populations in the ESU. Homogenization remains an important feature of the ESU. Fish abundance has tended downward both recently and over the long term. At least six former populations from this ESU are now extinct, and nearly all extant populations have fewer than 100 wild spawners.

Given the lack of information on Chinook salmon stocks that are presumed to be extinct, the relationship of these stocks to existing ESUs is uncertain. Recent total abundance within this ESU is quite low, and escapements in 1994 to 1996 were the lowest in at least 60 years. At least 6 populations of spring Chinook salmon in this ESU have become extinct, and almost all remaining naturally-spawning populations have fewer than 100 spawners. Extinction risks for UCR spring Chinook salmon are 50% for the Methow, 98% for the Wenatchee, and 99% for the Entiat spawning populations (Cooney 2002). In 2002, the spring Chinook count at Priest Rapids Dam was 34,083, with 24,000 arriving at Rock Island Dam. The 2002 count was about 67.6% and 242% of the respective 2001, and 10-year average adult spring Chinook count at Priest Rapids Dam.

UWR Chinook Salmon

The UWR Chinook salmon ESU includes native spring-run populations above Willamette Falls and in the Clackamas River. In the past, it included sizable numbers of spawning salmon in the Santiam River, the middle fork of the Willamette River, and the McKenzie River, as well as smaller numbers in the Molalla River, Calapooia River, and Albiqua Creek. Although the total number of fish returning to the Willamette has been relatively high (24,000), about 4,000 fish now spawn naturally in the ESU, two-thirds of which originate in hatcheries. The McKenzie River supports the only remaining naturally-reproducing population in the ESU (ODFW 1998).

There are no direct estimates of the size of the Chinook salmon runs in the Willamette basin before the 1940s. The Native American fishery at the Willamette Falls may have yielded 908,000 kilograms (kg) of salmon (454,000 fish, each weighing 9.08 kg) (McKernan and Mattson 1950). Egg collections at salmon hatcheries indicate that the spring Chinook salmon run in the 1920s may have been five times the run size of 55,000 fish in 1947, or 275,000 fish (Mattson 1948). Much of the early information on salmon runs in the upper Willamette River basin comes from operation reports of state and Federal hatcheries.

Fish in this ESU are distinct from those of adjacent ESUs in life history and marine distribution. The life history of Chinook salmon in the UWR ESU includes traits from both ocean- and stream-type development strategies. Tag recoveries indicate that the fish travel to the marine waters off British Columbia and Alaska. More Willamette fish are recovered in Alaskan waters than fish from the LCR ESU. UWR Chinook salmon mature in their fourth or fifth years.

Historically, 5-year-old fish dominated the spawning migration runs, however, recently most fish have matured at age 4. The timing of the spawning migration is limited by Willamette Falls. High flows in the spring allow access to the upper Willamette basin, whereas low flows in the summer and autumn prevent later-migrating fish from ascending the falls. The low flows may serve as an isolating mechanism, separating this ESU from others nearby.

While the abundance of UWR spring Chinook salmon has been relatively stable over the long term and there is evidence of some natural production, at present natural production and harvest levels the natural population is not replacing itself. With natural production accounting for only one-third of the natural spawning escapement, natural spawners may not be capable of replacing themselves even in the absence of fisheries. The introduction of fall-run Chinook into the basin and the laddering of Willamette Falls have increased the potential for genetic introgression between wild spring- and hatchery fall-run Chinook. Habitat blockage and degradation are significant problems in this ESU.

The median population growth rate over a base period from 1980 through 1998, ranges from 1.01 to 0.63, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared with that of fish of wild origin (McClure *et al.* 2000).

<u>CR Chum Salmon</u>
Chum salmon of the CR ESU spawn in tributaries and in mainstem areas below Bonneville Dam. Most fish spawn on the Washington side of the Columbia River (Johnson *et al.* 1997). Previously, chum salmon were reported in almost every river in the lower Columbia River basin, but most runs disappeared by the 1950s (Rich 1942, Marr 1943, Fulton 1970). The Washington Department of Fish and Wildlife (WDFW) regularly monitors only a few natural populations in the basin, one in Grays River, two in small streams near Bonneville Dam, and the mainstem area next to one of the latter two streams. Recently, spawning has occurred in the mainstem Columbia River at two spots near Vancouver, Washington, and in Duncan Creek below the Bonneville Dam.

Historically, the CR chum salmon ESU supported a large commercial fishery in the first half of this century, landing more than 500,000 fish per year as recently as 1942. Commercial catches declined beginning in the mid-1950s, and in later years rarely exceeded 2,000 per year. There are now no recreational or directed commercial fisheries for chum salmon in the Columbia River, although chum salmon are taken incidentally in the gill-net fisheries for coho and Chinook salmon, and some tributaries have a minor recreational harvest (WDF *et al.* 1993). Observations of chum salmon still occur in most of the 13 basins/areas that were identified in 1951 as hosting chum salmon, however, fewer than 10 fish are usually observed in these areas. In 1999, the WDFW located another Columbia River mainstem spawning area for chum salmon near the I-205 bridge (WDFW 2000).

Chum salmon enter the Columbia River from mid-October through early December and spawn from early November to late December. Recent genetic analysis of fish from Hardy and Hamilton Creeks and from the Grays River indicate that these fish are genetically distinct from other chum salmon populations in Washington. Genetic variability within and between populations in several geographic areas is similar, and populations in Washington show levels of genetic subdivision typical of those seen between summer- and fall-run populations in other areas, and are typical of populations within run types (Salo 1991, WDF *et al.* 1993, Phelps *et al.* 1994, Johnson *et al.* 1997).

The median population growth rate is 1.04 over a base period from 1980 through 1998, for the ESU as a whole (McClure *et al.* 2000). Because census data are peak counts (and because the precision of those counts decreases markedly during the spawning season as water levels and turbidity rise), NOAA Fisheries is unable to estimate the risk of absolute extinction for this ESU.

<u>MCR Steelhead</u>
The MCR ESU occupies the Columbia River basin from above the Wind River in Washington, and the Hood River in Oregon, and continues upstream to include the Yakima River in Washington. The region includes some of the driest areas of the Pacific Northwest, generally receiving less than 40 cm of precipitation annually (Jackson 1993). Summer steelhead are widespread throughout the ESU, and winter steelhead occur in Mosier, Chenowith, Mill, and Fifteenmile Creeks, Oregon, and in the Klickitat and White Salmon Rivers, Washington. The John Day River probably represents the largest native, naturally-spawning stock of steelhead in the region.

Estimates of historical (pre-1960s) abundance specific to this ESU are available for the Yakima River, which has an estimated run size of 100,000 (WDF *et al.* 1993). Assuming comparable run sizes for other drainage areas in this ESU, the total historical run size may have exceeded 300,000 steelhead (NOAA 2000a).

Most fish in this ESU smolt at 2 years and spend 1 to 2 years in salt water before re-entering freshwater, where they may remain up to a year before spawning (Howell *et al.* 1985). All steelhead upstream of The Dalles Dam are summer-run (Schreck *et al.* 1986, Reisenbichler *et al.* 1992, Chapman *et al.* 1994, Busby *et al.* 1996). The Klickitat River, however, produces both summer and winter steelhead, and age-2-ocean steelhead dominate the summer steelhead, whereas most other rivers in the region produce about equal numbers of both age 1- and 2-ocean fish. A non-anadromous form co-occurs with the anadromous form in this ESU; information suggests that the two forms may not be isolated reproductively, except where barriers are involved.

Current population sizes are substantially lower than historic levels, especially in the rivers with the largest steelhead runs in the ESU, the John Day, Deschutes, and Yakima Rivers. At least two extinctions of native steelhead runs in the ESU have occurred (the Crooked and Metolius Rivers, both in the Deschutes River basin). For the MCR steelhead ESU as a whole, (NOAA 2000a) estimates that the median population growth rate over the base period (1990 to 1998) 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). In 2002, the count of Bonneville Dam steelhead totaled 481,036, and exceeded all counts recorded at Bonneville Dam since 1938, except the 2001 total, which was 633,464. Of the total return in 2002, 143,032 were considered wild steelhead (Fish Passage Center 2003).

LCR Steelhead

The LCR ESU encompasses all steelhead runs in tributaries between the Cowlitz and Wind Rivers on the Washington side of the Columbia, and the Willamette and Hood Rivers on the Oregon side. The populations of steelhead that make up the LCR steelhead ESU are distinguished from adjacent populations by genetic and habitat characteristics. The ESU consists of summer and winter coastal steelhead runs in the tributaries of the Columbia River as it cuts through the Cascades. These populations are genetically distinct from inland populations (east of the Cascades), as well as from steelhead populations in the upper Willamette River basin and coastal runs north and south of the Columbia River mouth. Not included in the ESU are runs in the Willamette River above Willamette Falls (UWR ESU), runs in the Little and Big White Salmon Rivers (MCR ESU), and runs based on four imported hatchery stocks: (1) Early-spawning winter Chambers Creek/lower Columbia River mix, (2) summer Skamania Hatchery stock, (3) winter Eagle Creek NFH stock, and (4) winter Clackamas River ODFW stock (63 FR 13351 and 13352). This area has at least 36 distinct runs (Busby *et al.* 1996), 20 of which were identified in the initial listing petition. In addition, numerous small tributaries have historical reports of fish, but no current abundance data. The major runs in the ESU, for which there are estimates of run size, are the Cowlitz River winter runs, Toutle River winter runs, Kalama River winter and summer runs, Lewis River winter and summer runs, Washougal River winter and summer runs, Wind River summer runs, Clackamas River winter and summer runs, Sandy River winter and summer runs, and Hood River winter and summer runs (NOAA 2000a).

All runs in the LCR steelhead ESU have declined from 1980 to 2000, with sharp declines beginning in 1995 (NOAA 2000a). Historic counts in some of the larger tributaries (Cowlitz, Kalama, and Sandy Rivers) probably exceeded 20,000 fish; more recent counts have been in the range of 1,000 to 2,000 fish (NOAA 2000a). Habitat loss, hatchery steelhead introgression, and harvest are the major contributors to the decline of steelhead in this ESU. For the LCR steelhead ESU, NOAA (2000a) estimates that the median population growth rate over the base period (1990 to 1998) ranges from 0.98 to 0.78, decreasing as the effectiveness of hatchery fish spawning in the wild increases compared with that of fish of wild origin (McClure *et al.* 2000).

UWR Steelhead

The UWR steelhead ESU occupies the Willamette River and tributaries upstream of Willamette Falls, extending to and including the Calapooia River. These major river basins containing spawning and rearing habitat comprise more than 12,000 square kilometers (km^2) in Oregon. Rivers that contain naturally-spawning, winter-run steelhead include the Tualatin, Molalla, Santiam, Calapooia, Yamhill, Rickreall, Luckiamute, and Mary’s, although the origin and distribution of steelhead in a number of these basins is being debated. Early migrating winter and summer steelhead have been introduced into the upper Willamette basin, but those components are not part of the ESU. Native winter steelhead within this ESU have been declining since 1971, and have exhibited large fluctuations in abundance.

Over the past several decades, total abundance of natural late-migrating winter steelhead ascending the Willamette Falls fish ladder has fluctuated several times over a range of approximately 5,000 to 20,000 spawners. However, the last peak occurred in 1988, and this peak has been followed by a steep and continuing decline. Abundance in each of year from 1993 to 1998, was below 4,300 fish, and the run in 1995, was the lowest in 30 years.

In general, native steelhead of the Upper Willamette River are late-migrating winter steelhead, entering freshwater primarily in March and April. This atypical run timing appears to be an adaptation for ascending Willamette Falls, which functions as an isolating mechanism for UWR steelhead. Reproductive isolation resulting from the falls may explain the genetic distinction between steelhead from the upper Willamette River basin and those in the lower river. UWR late-migrating steelhead are ocean-maturing fish. Most return at age 4, with a small proportion returning as 5-year-olds (Busby *et al.* 1996). Willamette Falls (Rkm 77) is a known migration barrier (NOAA 2000a). Winter steelhead and spring Chinook salmon historically occurred above the falls, whereas summer steelhead, fall Chinook, and coho salmon did not. Detroit and Big Cliff Dams cut off access to 540 km of spawning and rearing habitat in the North Santiam River. In general, habitat in this ESU has become substantially simplified since the 1800s by removal of large woody debris to increase the river's navigability.

Habitat loss, hatchery steelhead introgression, and harvest are the major contributors to the decline of steelhead in this ESU. For the UWR steelhead ESU, the estimated median population growth rate for 1990-1998 ranged from 0.94 to 0.87, decreasing as the effectiveness of hatchery fish spawning in the wild increased compared with that of fish of wild origin (McClure *et al.* 2000).

UCR Steelhead

This inland steelhead ESU occupies the Columbia River basin upstream from the Yakima River to the U.S./Canada border. Rivers in the area primarily drain the east slope of the northern Cascade Mountains and include the Wenatchee, Entiat, Methow, and Okanogan River basins.

Estimates of historical (pre-1960s) abundance specific to this ESU are available from fish counts at dams (NOAA 2000a). Counts at Rock Island Dam from 1933 to 1959, averaged 2,600 to 3,700, suggesting a pre-fishery run size exceeding 5,000 adults for tributaries above Rock Island Dam (Chapman *et al.* 1994, Busby *et al.* 1996). Lower Columbia River harvests had already depressed fish stocks during the period in which these counts were taken, thus, the pre-fishery estimate should be viewed with caution.

Habitat degradation, juvenile and adult mortality in the hydropower system, and unfavorable environmental conditions in both marine and freshwater habitats have contributed to the declines and represent risk factors for the future. Harvest in lower river fisheries and genetic homogenization from composite broodstock collection are other factors that may contribute significant risk to the UCR steelhead ESU.

The median population growth rate over a base period from 1990 through 1998, ranged from 0.94 to 0.66, decreasing as the effectiveness of hatchery fish spawning in the wild increased compared with that of fish of wild origin (McClure *et al.* 2000). In 2002, 15,286 steelhead were counted at Rock Island Dam, compared with the 2001 count of 28,602, and the 10-year average return of 9,165. Of the total steelhead counted at Rock Island Dam in 2002, 10,353 were wild steelhead (Fish Passage Center 2003).

Generalized Fish Use in the Lower Columbia River

Based on migratory timing, listed salmon and steelhead species likely will be present in the action area during the proposed construction period. The action area serves as rearing and saltwater acclimation habitat for juvenile salmon and steelhead, and migration habitat from adult salmon and steelhead. Juvenile and adult steelhead migrate year-round, with peak smolt out-migration occurring May through June, and peak adult emigration occurring January through June. Juvenile and adult sockeye salmon migrate April through August, with peak smolt out-migration occurring May through June, and peak adult emigration occurring June through July. Juvenile and adult Chinook salmon migrate year-round, with peak smolt out-migration occurring March through July, and peak adult emigration occurring March through October. Juvenile and adult chum salmon migrate October through May, with peak smolt out-migration occurring March through May, and peak adult emigration occurring October through November.

Site-Specific Fish Use in the Action Area

A fisheries evaluation was conducted at Crims Island in March 2003 through September 2003, and in March 2004 (no data was made available for the 2004 evaluation). Salmonid fishes were present from March through July. Sub-yearling Chinook salmon were the most abundant age class (484 total). Yearling Chinook and coho salmon were present, but represented less than 1% of salmonid fishes collected. Salmonid fishes represented ± 4% of the total fish species collected.

Critical Habitat

NOAA Fisheries designates critical habitat based on physical and biological features that are essential to the listed species. For this Opinion, NOAA Fisheries has designated critical habitat for SR sockeye salmon, SR spring/summer Chinook salmon, and SR steelhead. The essential features of designated critical habitat within the action area that support successful spawning, incubation, fry emergence, migration, holding, rearing, and smoltification for ESA-listed salmonid fishes include: (1) Substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food (primarily juvenile), (8) riparian vegetation, (9) space, and (10) safe passage conditions.

2.1.2 Evaluating Proposed Actions

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 CFR 402 (the consultation regulations). 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 its Habitat Approach (NOAA Fisheries

1999): (1) Consider the biological requirements 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 (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 cumulative effects when added to the environmental baseline, is likely to jeopardize the ESA-listed species. If so, step 5 occurs. In step 5, NOAA Fisheries may identify reasonable and prudent alternatives for the action that avoid jeopardy, if any exist.

The fourth step (above) 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 habitat features). The second part focuses on the species itself. It describes the action's effects on individual fish, or populations, or both, and places these effects in the context of the evolutionarily significant unit (ESU) as a whole. Ultimately, the analysis seeks to answer the question of whether the proposed action is likely to jeopardize a listed species' continued existence.

2.1.3 Biological Requirements

The first step in the methods NOAA Fisheries uses for applying the 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 to the current status of the listed species, NOAA Fisheries starts with the determinations made in its decision to list the species for ESA protection and also considers new data available that is relevant to the determination.

The biological requirements of a listed species are population characteristics necessary for salmon and steelhead to survive and recover to naturally-reproducing population levels, at which time protection under the ESA would become unnecessary. These requirements are best defined as the attributes associated with viable salmonid populations. Viable salmonid populations are populations that have a negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and genetic diversity changes (random or directional) over a 100-year time frame. The attributes associated with viable salmonid populations include adequate abundance, productivity (population growth rate), population spatial scale, and genetic diversity (McElhany *et al.* 2000). These attributes are influenced by survival, behavior and experiences throughout the life cycle and by all action affecting the species, and are therefore distinguished from the more specific biological requirements associated with the action area. However, it is important that the action area effects be considered in the context of these species-level biological requirements when evaluating the potential for the species to survive and recover (*i.e.*, in the context of the full set of human activities and environmental conditions affecting the species). Biological requirements may also be described as characteristics of the habitat for actions that primarily affect survival through habitat pathways.

The current status of each species (Table 1) indicates that the species-level biological requirements are not being met for any of the ESUs considered in this consultation. This indicates that improvements in survival rates (assessed over the entire life cycle) will be needed to meet species-level biological requirements in the future. NOAA Fisheries will assess survival improvements necessary in the life stages influenced by the proposed action after considering the environmental baseline, which is specific to the area affected by the proposed action. For this consultation, the biological requirements are habitat characteristics that would function to support successful adult migration, juvenile rearing and migration, and smoltification (see Table 1 for references).

2.1.4 Environmental Baseline

Over the past century, human activities have altered the range of physical forces in the action area. To a significant degree, the risk of extinction for salmon stocks in the Columbia River basin has increased because complex freshwater and estuarine habitats needed to maintain diverse wild populations and life histories have been lost and fragmented. Estuarine habitat has been lost or altered directly through diking, filling, and dredging, and has also been degraded through changes to flow regulation that affect sediment transport and salinity ranges of specific habitats within the estuary. Not only have salmonid rearing habitats been eliminated, but the connections among habitats needed to support tidal and seasonal movements of juvenile salmon have been severed.

The lower Columbia River estuary lost approximately 43% of its tidal marsh (from 16,180 acres historically to 9,200 acres today), and 77% of its historic tidal swamp habitats (from 32,020 acres historically to 6,950 acres today) between 1870 and 1970 (Thomas 1983). One example is the diking and filling of floodplains that were formerly connected to the tidal river. This practice eliminated large expanses of low-energy, off-channel habitat for salmon rearing and migrating during high flows. Similarly, diking of estuarine marshes and forested wetlands within the estuary removed most of these important off-channel habitats.

Within the lower Columbia River, diking, river training devices (*e.g.*, pile dikes, riprap), railroads, and highways have narrowed and confined the river to its present location. Between the Willamette River and the mouth of the Columbia River, diking, flow regulation, and other human activities have resulted in a confinement of 84,000 acres of floodplain that likely contained large amounts of tidal marsh and swamp. The lower Columbia River's remaining tidal marsh and swamp habitats are in a narrow band along the Columbia River and its tributaries' banks, and around undeveloped islands.

The Columbia River in the action area is on the Oregon Department of Environmental Quality (ODEQ) 303(d) list as water quality limited for temperature (summer months), DDT, PCBs, and arsenic. Water quality data for the Columbia River from the Washington State Department of

Ecology 303 (d) list include: Dissolved oxygen, temperature, total dissolved gas, and fecal coliform.

Historically, Crims Island was a complex of low marsh/swamp/forested wetlands and mudflats interspersed with upland riparian forest habitat. The area has been developed for agricultural uses over the past century. Conversion of the area has contributed to a substantial loss of freshwater, intertidal and forested wetland habitat in the lower Columbia River that provided off-channel rearing habitat for juvenile salmonid fishes.

2.1.5 Analysis of Effects

2.1.5.1 Effects of Proposed Action

Construction Activities

Constructions activities likely to affect listed salmon and steelhead and designated critical habitat include: (1) Temporary dam installation, (2) fish removal and de-watering, (3) intertidal channel excavation, (4) earthen dam removal (T-channel and forested wetland), and (5) upland tilling.

Before de-watering and fish removal, a temporary earthen dam would be installed at the confluence of the T-channel and Bradbury Slough. Fish may be killed, or more likely, temporarily displaced, by in-water work activities. Aspects of the proposed action most likely to injure or kill listed salmon and steelhead are the isolation of the in-water work area, and fish removal and handling. Although in-water work area isolation is a conservation measure intended to minimize adverse effects from instream construction activities to fish present in the work isolation area, some fish may be captured, handled, and released. Capturing and handling fish causes physiological stress, though overall effects of the procedure are generally short-lived if appropriate precautions are exercised. The primary factors controlling the likelihood of stress and death from handling are differences in water temperatures (between the river and transfer containers), dissolved oxygen concentrations, the amount of time that fish are held out of the water, and the extent of physical trauma. Stress on salmonid fishes increases rapidly from handling if the water temperature exceeds 18°C or if dissolved oxygen concentration is below saturation.

Fish removal would occur at a time of year when abundance of juvenile salmonid fishes is likely to be low. The area to be de-watered includes more than 4,700 lineal feet of intertidal habitat. Given the likelihood for the presence of some juvenile salmon in the intertidal channels, the total area involved in de-watering, the probability of stranding and killing some juvenile salmon is likely.

Short-Term and Long-Term Effects from Intertidal Channel Excavation

Excavation of the intertidal channels would be completed with in a de-watered environment, but hyporheic groundwater and groundwater head-pressure likely would maintain some level of water in the excavated channels during excavation. While this would degrade water quality in the intertidal channels, the area would be isolated from the active channel of the Columbia River and Bradbury Slough. Therefore, adverse water quality effects during intertidal channel excavation is unlikely to adversely affect listed salmon and steelhead, or designated critical habitat.

Once the excavation of the intertidal channels is completed, the earthen dam would be removed. The initial influx of water from Bradbury Slough will flow into the newly-constructed network of intertidal channels is likely to cause extensive surface erosion due to hydraulic scour. It is likely to take several months to achieve equilibrium and stability of loose soils throughout the 17 acres of intertidal habitat; although adverse water quality effects are likely to attenuate in the intertidal channels after an initial series of tidal cycles (first month). Establishment of vegetation sufficient to minimize erosion in the intertidal marsh habitat is likely to take up to a year or more since excavation of the intertidal channels will end in mid-October, well beyond the seeding and growing season for aquatic and upland vegetation. Erosion and sediment yield from exposed earth is likely to be episodic during the first year, especially during heavy and sustained rainfall events in the winter and spring. Effects to listed salmon and steelhead and designated critical habitat from degraded water quality are described below.

Turbidity and Total Suspended Solids

In-water construction activities (*e.g.*, stream channel excavation, earthen dam installation and removal) are likely to increase turbidity, temporarily and episodically, over a period of months, and increase total suspended solids (TSS) in the excavated intertidal channels. Increases in turbidity in the forested wetland in the vicinity where the earthen dam would be removed, likely would be short-term. Tilling the upland area beside the intertidal marsh area would potentially expose 115 acres to erosion and will likely serve as a source of acute and chronic sediment into the intertidal channels until effective ground cover is established. Potential effects from project-related increases in turbidity on salmonid fishes includes, but is not limited to: (1) Reduction in feeding rates and growth, (2) increased mortality, (3) physiological stress, (4) behavioral avoidance, (5) reduction in macroinvertebrate populations, and (6) temporary beneficial effects. Potential beneficial effects include a reduction in piscivorous fish/bird predation rates, enhanced cover conditions, and improved survival conditions.

Increases in turbidity can adversely affect filter-feeding macroinvertebrates and fish feeding. At concentrations of 53 to 92 ppm (24 hours) macroinvertebrate populations were reduced (Gammon 1970). Concentrations of 250 ppm (1 hour) caused a 95% reduction in feeding rates in juvenile coho salmon (Noggle 1978). Concentrations of 1200 ppm (96 hours) killed juvenile coho salmon (Noggle 1978). Concentrations of 53.5 ppm (12 hours) caused physiological stress and changes in behavior in coho salmon (Berg 1983).

Indirectly, suspended solids can affect other water quality variables such as temperature and dissolved oxygen (DO). Because of the greater heat absorbency of the particulate matter, the surface water becomes warmer and this tends to stabilize the stratification (layering) in waterbodies. This, in turn, interferes with mixing, decreasing the dispersion of oxygen and nutrients to deeper layers and altering the vertical stratification of heat in the water column

(Wilber and Clarke 2001). High concentrations of TSS can block light from reaching submerged vegetation. As the amount of light passing through the water is reduced, photosynthesis slows down. Reduced rates of photosynthesis causes less DO to be released into the water by plants. If light is completely blocked from bottom-dwelling plants, the plants will stop producing oxygen and will die. As the plants are decomposed, bacteria will use up even more oxygen from the water. Low DO can lead to fish kills. High TSS can also cause an increase in surface water temperature, because the suspended particles absorb heat from sunlight. This can cause DO levels to fall even further (because warmer waters can hold less DO), causing additive harm to aquatic life.

Effects of the proposed action are likely to lead to effects similar to those described above. The EA included an erosion and sedimentation control plan, however, the Corps provided no details of the proposed plan, therefore its potential effectiveness cannot be evaluated.

Temperature

The Columbia River in the action area is on the ODEQ 303(d) list as water quality limited for temperature during the summer months. The water temperature criterion for the Columbia River is 20.0°C, plus a narrative provision that requires sufficiently distributed cold water refugia to protect waters designated for salmon and steelhead migration. Excavation of the intertidal channels will alter channel morphology creating a network of wider and deeper intertidal channels, potentially causing an increase in water temperature, thereby increasing the potential for temperature-related diseases and physiological stress.

Water temperature is a function of external factors, such as solar radiation, air temperature, precipitation and base flows, and internal factors, such as width-to-depth ratios, groundwater inputs, and hyporheic exchange (Poole and Berman 2001). The proposed action could affect both sets of factors. The development of intertidal channels in an open landscape exposed to solar radiation is likely to lead to increased water temperatures, while other factors, such as functional width-to-depth ratios, may offset other factors that contribute to increased water temperatures.

Elevated water temperatures can increase the rate at which energy is consumed for standard metabolism (Fry 1971), and can cause depletion of energy reserves owing to increased respiratory demands, protein coagulation, and enzyme inhibition in adult salmon (Idler and Clemens 1959, Gilhousen 1980). Juvenile salmon exposed to constant water temperatures greater than 18°C are highly susceptible to disease, such as *Chondrococcus columnaris.* Susceptibility to disease is a function of concentration of columnaris organisms, length of exposure, and temperature (EPA 2001) as well as age of individual (increased age, increased resistance). Coho salmon exposed to *C. columnaris* had a rapidly increasing rate of infection with increase in water temperatures above 12.2°C (Fryer and Pilcher 1974). For coho salmon, infection frequency was low at 12.2°C (3%), but was 49% at 15°C, and rapidly jumped to 100% at water temperatures greater than 20.6°C. Elevated water temperatures can increase the rate at which energy is consumed for standard metabolism (Fry 1971), and can cause depletion of energy reserves owing to increased respiratory demands, protein coagulation, and enzyme inhibition in adult salmon (Idler and Clemens 1959, Gilhousen 1980).

Juvenile salmon are likely to avoid waters with elevated temperatures. Increases in water temperature likely would lead to a potential pathway for disease. This may reduce fitness and survival. Given that water temperatures in the action area exceeds 20°C, the effects described above are likely to occur. The network of intertidal channels would be constructed in a manner that would permit waters from Bradbury Slough to flow in and out of the intertidal channels in a manner consistent with reference intertidal channel conditions, potentially repressing some of the factors that contribute to increased water temperature. In addition, as shade-producing vegetation is established, solar input would be reduced improving water temperatures in the intertidal channels. Improvement of internal factors, such as width-to-depth ratios and groundwater inputs, are likely to contribute to improvements in water quality and improve off-channel habitat for rearing salmonid fishes.

Dissolved Oxygen

A number of factors affect DO in receiving waters. The DO content of fresh water is about 14.6 mg/L for saturation at 0° C and decreases gradually with increasing temperature to 9.1 mg/L at 20° C and 7.5 mg/L at 30° C (Rand and Petrocelli 1985). Other factors that tend to decrease DO in receiving waters include aquatic microbial, plant, and animal respiration. Factors that tend to increase DO include the equilibrium between atmospheric oxygen concentrations and the concentration of DO in water, wind mixing, and photosynthesis by aquatic algae and higher aquatic plants.

Spatial variability in DO includes longitudinal, vertical, and temporal components (COE 1999). Typical depletion of DO downstream of a source of oxygen demand is approximated by a specific, first-order decay curve to a sag point, and then recovery based on re-aeration. The shape
of the curve is dictated by the magnitude of the demand, the nature of the substances exerting the demand, the water temperature, hydraulic factors, stream geometry, the background DO concentration, and the re-aeration potential of the reach downstream of the source (COE 1999). Longitudinal variability in DO concentrations can also be related to the locations of sediment oxygen demand, stands of macrophytes, differences in re-aeration rates related to channel morphometry, the presence of blooms of phytoplankton or the presence of large numbers of respiring organisms in localized areas. Vertical variability in DO levels typically occurs when water is isolated at depth through thermal or density stratification. This isolation removes the potential for re-aeration of these waters while allowing for DO depletion through the settling into and decomposition of organic matter in the deep layers, which is additive to latent sediment oxygen demand. The DO concentrations vary over temporal time scales ranging from seasonal to hourly.

Low levels of DO in water can cause direct and indirect effects to fish as well as create additional stress by causing an increase in toxicity of metals. Sublethal effects of reducing DO below saturation can include metabolic, feeding, growth, behavioral, and productivity effects.

Behavioral responses include avoidance of low DO sites or patches and curtailment of migration if DO levels drop too low across the entire river corridor. Physiological changes to low DO, include elevation in both rate and amplitude of breathing, decreased heart rate, increased stroke volume of the heart, and altered metabolic rate (Ruggerone 2000). In situations where demand of DO exceeds input, fish kills may occur.

Productive streams exhibit diurnal cycles in water-column DO concentrations due to photosynthesis and respiration. Although fish can detect and will attempt to avoid reduced concentrations of DO, average measurements of DO do not reflect the damage that can occur during diurnal minima. Other important factors include the length and frequency of fish exposure to the low DO level. In several species studied, fish growth appeared to be determined by the daily minimum of DO, not the average or maximum. Studies reviewed (NOAA 1999b) indicate possible 5 to 20% reductions in growth of juvenile coho salmon between 6.5 to 8 mg/L DO. Reductions in DO can decrease swimming performance in both adult and juvenile fish, affecting the ability to migrate, forage and avoid predators (NOAA 1999b, Spence *et al.* 1996). Any reduction in DO below saturation at high water temperatures increases the risk of adverse affects to salmonids. Sub-yearling and smolt life stages are very sensitive to low DO. Dahlberg *et al.* (1968, as cited in ODEQ 1995) found that a reduction in DO to 7.5 mg/L resulted in a 5% reduction in swimming speed. Dahlberg noted that swimming speed declined markedly below 7 to 8 mg/L DO. The ecological significance of increased stress and reduced swimming ability has only recently been increasingly verified and associated with latent declines in production and survival (Wilkie *et al.* 1997, Wedemeyer *et al.* 1990, Budy *et al.* 2002).

Sublethal effects that occur below 8 mg/L may control survival and success of juvenile salmonids in nature through reduced growth and size observed in juvenile salmonids at DO concentrations below saturation. Swimming speed in juvenile salmon declines markedly below DO concentrations of 7 to 8 mg/L (NOAA 1999b). Results of several growth experiments summarized for coho salmon (Warren *et al.* 1973, as cited in ODEQ 1995) show that growth rate appears closely related to DO concentrations below 6.0 to 6.5 mg/L. The ODEQ's issue paper further reports that concentrations from near 8 to 6.5 mg/L resulted in measurable reductions in swim speed and maximum attainable growth and laboratory studies which have shown that blood is not fully saturated with oxygen at levels near 6.5 mg/L and changes in oxygen transfer efficiency occur. At elevated water levels, water temperatures work in synergy with DO concentrations to cause a range of adverse affects to salmonids. This range includes acute lethal toxicity, inability to complete essential foraging and predator avoidance behaviors, area avoidance, migration delays, increased stress, reductions in growth, and slower swimming speed.

Based on the information above, a water-column DO concentration equal to or greater than 8.0 mg/L is required to meet the biological requirements of rearing, smolting, and migrating sub-yearling and yearling juveniles and migrating adult salmon and steelhead. An increase in water temperature in the intertidal channels likely would result in seasonal lowering of DO until internal and external factors affecting water temperature in the action area improve.

Sediment Quality Evaluation

Mean grain size for all the samples was 0.05 mm, with 0.05% gravel, 40.67% sand (57.78%-32.38% range), 59.27% silt/clay (75.33%-42.22% range) and 4.60% volatile solids (2.74%-8.78% range). The total organic carbon ranged from 5,470 to 36,600 mg/kg, with a mean value of 14,044 mg/kg.

Pesticides, Polychlorinated Biphenyls, Phenols, Phthalates, Benzyl Alcohol, and Benzoic Acid: Pesticide concentrations ranged from <1.4 ug/kg to 7.37ug/kg. PCB aroclors were detected at concentrations <130 ug/kg. Phenols ranged in concentration from <19 ug/kg to 408 ug/kg. Phthalates ranged from <8.73 ug/kg to 57.5 ug/kg. Benzyl alcohol concentrations ranged from <11.2 ug/kg to 68.9 ug/kg. Benzoic acid concentrations ranged from <43.6 ug/kg to 485 ug/kg.

Polynuclear Aromatic Hydrocarbons (PAHs) and Metals: Total low molecular weight PAH analyte concentrations ranged from < 1.3 ug/kg to 113.2 ug/kg. Total high molecular weight PAH analyte concentrations ranged from < 1.3 ug/kg to 521.0 ug/kg. Metal concentrations ranged from 61.0 ug/kg for mercury to 172,000 ug/kg for zinc.

A review of the chemical analyses indicated low levels of pesticides, PCBs, phenol and phthalate compounds, and low levels of PAHs and metals. The concentrations of these compounds are below levels likely to cause harm to listed salmon and steelhead. The only chemical that was detected at concentrations that may cause harm to listed salmon and steelhead was benzyl alcohol, which was detected at 68.9 ug/kg. Toxicity data for benzoic acid indicate a 96-hour LC_{50} of 180,000 ug/kg for mosquito fish (*Gambusia affinis*), and a 96-hour LC_{50} of 47,000 ug/kg for rainbow trout (*Oncorhynchus mykiss*) (Johnson *et al.* 1980). While these toxicity data indicate that mortality of fish are three orders of magnitude higher than the concentrations detected in the sediment quality evaluation, these data are an LC_{50}, which is where 50% of the test subjects die. Therefore, harm would likely occur at concentrations much lower than those reported in these toxicity tests, but the probability of sublethal effects to juvenile salmon and steelhead from exposure to soils contaminated with benzoic acid at concentrations measured is unlikely.

Riparian Forest Restoration

The riparian forest restoration element would occur in an upland area at the eastern extent of the island. Elevations range from 10 to 19 feet (NAVD88). Erosion from rainfall is likely to generate sediment yields to the intertidal channels above background levels until effective ground cover is established (1 to 5 years). Probability flood profiles provided by the Corps (hydraulics report p. 1), indicate surface water elevations ranging from 13.6 feet for the 2-year flood and 20.1 feet for the 500-year flood (NAVD88). Depending on rainfall and flood intensity, potential sediment yields from the upland riparian forest area to the intertidal channels is likely until effective ground cover is well-established.

Water Quality - Potential Spills

Operation of excavation equipment requires the use of fuel, lubricants, coolants, *etc.*, which if spilled into a waterbody, could injure or kill aquatic organisms. The EA included a spill containment and control plan, however, the Corps provided no details of the plan, therefore its potential effectiveness cannot be evaluated.

Operations and Maintenance

Operation and maintenance activities on Crims Island would be limited to the 115 acre upland riparian forest. No maintenance of the intertidal channels was proposed. The Corps anticipates a 3-year operations and maintenance (plantings and weed management) period to support establishment of riparian plantings. The Corps is proposing hand cultivation, tilling, and herbicide treatments to control weeds. Effects from hand cultivation and tilling to listed salmon and steelhead and designated critical habitat likely would be discountable.

The Corps proposes to include the use chemicals to control invasive species (e.g., reed canarygrass). Herbicide use would be limited to Rodeo, with a formulation of 53.8% glyphosate and 46.2% inert ingredients. Herbicides would be limited to hand-based applications. The Corps proposed the following conservation methods and best management practices for use of herbicides:

(a) Herbicide use would be limited to Rodeo with a formulation of 53.8% glyphosate and 46.2% inert ingredients, and with LI-700 surfactant within the 100-year floodplain, or 50 feet from top-of-bank, whichever is greater.
(b) Rodeo would be diluted to 50% or less concentration of the active ingredient when applied directly to fresh-cut stems, and up to 5% when applied to foliage.
(c) No herbicides would be applied within 25 feet of mean higher high tide elevation.
(d) Only trained individuals would apply herbicides using only low pressure spot spray and direct wicking application methods, and in accordance with label instructions.
(e) Spray activities would only occur during dry, calm weather conditions to prevent drift and runoff.
(f) No spraying would occur during high wind (greater then five miles per hour) or during rain events, or if precipitation has been forecasted within 24 hours of spraying.

Glyphosate is strongly adsorbed by soil and does not retain herbicidal properties following contact with soil. Some information indicates the presence of phosphate ions may impair or reverse glyphosate adsorption (Norris *et al*. 1991). The half-life of glyphosate in soil can range from three to 249 days [U.S. Forest Service (FS) 2000]. In general, glyphosate degradation is dependent on soil texture and organic content (FS 2000). Degradation is rapid in soils of low organic content, and slower in soils with high organic content (Tu *et al*. 2001). The main break-down products of glyphosate are aminomethylphosphonic acid (AMPA) or glycine, which are further broken down by soil microorganisms (Norris *et al*. 1991). One hundred nineteen days after treatment with Rodeo at 4.7 L ha^{-1}, glyphosate concentrations in the estuarine mudflats of Willapa Bay, Washington, declined 51% to 72%, while AMPA did not degrade during that period (Simenstad *et al*. 1996).

Glyphosate dissolves easily in water (Norris *et al*. 1991). However, because glyphosate is strongly adsorbed by soil particles, it is not easily released back into water moving through soil.

In the project area, glyphosate has the greatest potential to enter flowing water due to direct deposition from drift or accidental spill during application. Indirect contamination may result from over-ground runoff that transports contaminated soil particles to waterways during spring and fall rains, or from inundation of treatment sites in floodplains. Glyphosate entering the water may quickly be bound to sediment and suspended particulates (Solomon and Thompson 2003), although some studies indicate it may remain suspended in freshwater for weeks (Anton *et al*. 1994). Tests show that the half-life for glyphosate in water ranges from 35 to 63 days.

Glyphosate toxicity is affected by environmental factors (*e.g*., water hardness, temperature, or pH) [Mitchell *et al*. 1987, Norris *et al*. 1991, Anton *et al*. 1994, Henry *et al*. 1994, Mensink and Janssen 1994, Syracuse Environmental Research Associates, Inc. and Syracuse Research Corporation (SERA) 1997]. Toxicity increases at lower pH levels and higher temperatures (Henry *et al*. 1994; Mensink and Janssen 1994, section 9.1.2.3; SERA 1997). With regard to pH, surfactants may have the opposite relationship and exhibit increased toxicity in alkaline waters (SERA 1997, FS 2000).

The Corps proposes to use the surfactant LI-700. Aquatic toxicity of the proposed surfactant LI-700 is relatively low (Table 2). The additive effect of the surfactant on the toxicity of the applied solution is poorly understood. SERA (1997) reported, “data appear to be inadequate for a quantitative assessment of ecological effects of the surfactant,” LI-700. Glyphosate has been found to have an antagonistic effect on the toxic action of a surfactant (Mensink and Janssen 1994).

Table 2. The Aquatic Toxicity of Glyphosate, Rodeo, or an Equivalent Formulation, and the Proposed Surfactant (LI-700).

LC_{50}= concentration lethal to 50% the sample population.
EC_{50}= concentration at which 50% of the sample population exhibits an effect.
NOEC = concentration at which no observable effects are noted among the sample population.

	Glyphosate	Rodeo® or equiv.	LI-700®
Salmonid 96-hr NOEC	823 ppm (1)	1,500 ppm (1)	<100 ppm (5)
Salmonid 24-hr LC_{50}		60 ppm (4)	140 ppm (5)
Salmonid 48-hr LC_{50}			130 ppm (5)
Salmonid 96-hr LC_{50}	580 ppm (2)	1,100 ppm (2)	130 ppm (5)
Invertebrate 48-hr NOEC			100 ppm (5)
Invertebrate 48-hr EC_{50}	55 ppm (3)	5,600 ppm (3)	
Invertebrate 24-hr LC_{50}			450 ppm (5)
Invertebrate 48-hr LC_{50}	117 - 930 ppm (3)	218 -1,216 ppm (3)	170 ppm (5)
Invertebrate 96-hr LC_{50}		720- 1,177 ppm (3)	190 ppm (6)

(1) Anton *et al.* (2) Mitchell *et al*. 1987. (3) Henry *et al*. 1994.
(4) Dow 2000. (5) Loveland Industries, Inc. 2000. (6) FS 2000.

Herbicide applications are proposed in riparian and floodplain areas, posing some level of risk of exposing fish to toxic substances. However, the proposed conservative application methods to be used and the relatively low toxicity of the herbicide selected, are likely to minimize adverse effects to salmon and steelhead, designated critical habitat, or salmon and steelhead prey.

Long-Term Effects - Restoration
In the long term, the proposed restoration would enhance and restore approximately 163 acres of intertidal and forested wetland habitats for juvenile salmon and steelhead. An additional 115 acres of upland riparian forest would be established at the eastern extent of the island. Habitat features and biological considerations likely to be improved include: (1) Water quality and quantity; (2) intertidal connectivity; (3) increased off-channel habitat complexity (intertidal channels and the forested wetland); (4) nutrient exchange; (5) large woody debris recruitment (greater than 50 years); (6) flood plain connectivity (upland riparian forest); and (7) improved rearing conditions for juvenile salmon and steelhead.

Monitoring
The Corps provided no details of the proposed post-project fish monitoring and evaluation plan. Likely effects of capture and handling are some what uncertain, but likely would include physiological stress, injury, or death.

2.1.5.2 Effects on Critical Habitat

NOAA Fisheries designates critical habitat based on physical and biological features that are essential to the listed species. Essential features of designated critical habitat include substrate, water quality, water quantity, water temperature, food, riparian vegetation, access, water velocity, space and safe passage. Effects to critical habitat from these categories would be similar to the effects described above in section 2.1.5.1.

2.1.5.3 Cumulative Effects

Cumulative effects are defined in 50 CFR 402.02 as “those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation.” NOAA Fisheries is not aware of any state or private activities, not involving Federal activities that are reasonably certain to occur within the action area.

2.1.6 Conclusion

The fourth step in NOAA Fisheries’ approach to determine jeopardy is to determine whether the proposed action, in light of the above factors, is likely to appreciably reduce the likelihood of the species’ survival and recovery in the wild. For the jeopardy determination, NOAA Fisheries uses the consultation regulations, and its Habitat Approach (NOAA Fisheries 1999) to determine whether actions would further degrade the environmental baseline or hinder attainment of PFC at a spatial scale relevant to the listed ESU. That is, because the subject ESUs consists of groups of populations that inhabit geographic areas ranging in size from less than ten to several thousand square miles, the analysis must be applied at a spatial resolution wherein the actual effects of the action on the species can be determined.

After reviewing the best available scientific and commercial information available regarding the current status of SR steelhead, UCR steelhead, MCR steelhead, UWR steelhead, LCR steelhead, SR spring/summer-run Chinook salmon, SR fall-run Chinook salmon, UCR spring-run Chinook salmon, UWR Chinook salmon, LCR Chinook salmon, CR chum salmon, and SR sockeye salmon, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, NOAA Fisheries concludes that the action, as proposed, is not likely to jeopardize the continued existence of the species listed above in this paragraph, and is not likely to destroy or adversely modify designated critical habitat for SR fall-run Chinook salmon, SR spring/summer-run Chinook salmon, and SR sockeye salmon.

Our conclusion is based on the following considerations: (1) Excavation of the intertidal channels, earthen dam removal (forested wetland), de-watering and fish removal, tilling, post-project monitoring and their potential effects (*e.g.*, increases in turbidity, harm) will occur at a time of year when abundance of juvenile salmon and steelhead is likely to be low, minimizing, but not eliminating, adverse effects to listed salmon and steelhead; (2) potential long-term water quality effects (*e.g.*, increases in turbidity, water temperature) will attenuate over time as water circulation, intertidal channel stability, and riparian vegetation are established at levels where ecological functions are attained; (3) the effects of this action are not likely to impair currently properly functioning habitats, appreciably reduce the functioning of already impaired habitats, or retard the long-term progress of impaired habitats toward proper functioning condition essential to the long-term survival and recovery at the population or ESU scale; and (4) in the long term, the proposed restoration is likely to improve the function of impaired habitat indicators in the action area contributing to the survival and recovery of listed salmon and steelhead in the Columbia River basin.

2.1.7 Reinitiation of Consultation

This concludes formal consultation on these actions in accordance with 50 CFR 402.14(b)(1). Reinitiation of consultation is required: (1) If the amount or extent of incidental take is exceeded; (2) the action is modified in a way that causes an effect on the listed species that was not previously considered in the biological assessment and this Opinion; (3) new information or project monitoring reveals effects of the action that may affect the listed species in a way not previously considered; or (4) a new species is listed or critical habitat is designated that may be affected by the action (50 CFR 402.16).

2.2 Incidental Take Statement

The ESA at section 9 [16 USC 1538] prohibits take of endangered species. The prohibition of take is extended to threatened anadromous salmonid fishes by section 4(d) rule [50 CFR 223.203]. Take is defined by the statute as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." [16 USC 1532(19)] Harm is defined by regulation as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavior patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering." [50 CFR 222.102] Harass is defined as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering." [50 CFR 17.3] Incidental take is defined as "takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant." [50 CFR 402.02] The ESA at section 7(o)(2) removes the prohibition from any incidental taking that is in compliance with the terms and conditions specified in a section 7(b)(4) incidental take statement [16 USC 1536].

2.2.1 Amount or Extent of Take

The proposed action covered by this Opinion is reasonably certain to result in incidental take of listed species due to effects from excavation of the intertidal channels, increases in turbidity, increases in total suspended solids, and fish removal and handling. Effects of actions such as these are largely unquantifiable in the short term, but are likely to be largely limited to harm in the form of injury and behavior modification.

Therefore, even though NOAA Fisheries expects some low level of incidental take to occur due to the action covered by this Opinion, the best scientific and commercial data available are not sufficient to enable it to estimate a specific amount of incidental take. In instances such as this, NOAA Fisheries designates the expected level of take in terms of the extent of take allowed. Therefore, the extent of take for this Opinion is limited to take resulting from activities undertaken as described in this Opinion that occurs in the action area to SR steelhead, UCR steelhead, MCR steelhead, UWR steelhead, LCR steelhead, SR spring/summer-run Chinook salmon, SR fall-run Chinook salmon, UCR spring-run Chinook salmon, UWR Chinook salmon, LCR Chinook salmon, CR chum salmon, and SR sockeye salmon. Incidental take associated with post-project monitoring is limited to capture and harm from seining, handling for measurement and species identification, and release. Incidental killing of ESA-listed fish (identified in section 2.1.1 of this Opinion) in association with post-project monitoring is limited to no more than 1% of all ESA-listed fish captured per monitoring event. Incidental take occurring due to modifications to the proposed action or beyond the area described is this Opinion are not authorized by this consultation.

2.2.2 Reasonable and Prudent Measures

The following reasonable and prudent measures are necessary and appropriate to minimize take of the above species from implementation of the proposed action. The Corps shall ensure that:

1. The extent of incidental take is minimized by ensuring that measures are taken to limit the duration, extent, and type of in-water work.

2. The extent of incidental take from ground disturbance is minimized.

3. A post-project fish-use monitoring and reporting program is completed.

4. A comprehensive monitoring and reporting program is completed to confirm this Opinion is meeting its objective of minimizing take from permitted activities.

2.2.3 Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures described above for each category of activity. These terms and conditions are non-discretionary.

1. To implement reasonable and prudent measure #1 (in-water work), the Corps shall ensure that:

    a. All water intakes used for the project, to include pumps used to isolate and de-water an in-water work area, will have a fish screen installed, operated, and maintained according to NOAA Fisheries' juvenile fish screen criteria for fish available at: <http://www.nwr.noaa.gov/1hydrop/hydroweb/ferc.htm>

    b. Before and intermittently during de-watering to isolate an in-water work area, an attempt must be made to capture and release fish from the isolated area to minimize risk of harm or killing.

        i. Complete transfers using a sanctuary net that holds water during transfer to prevent the added stress of an out-of-water transfer.

        ii. Describe any capture and release effort in a post-project report, including the name and address of the supervisory fish biologist, methods used to isolate the work area and minimize disturbances to ESA-listed species, stream conditions before and following placement and removal of barriers, the means of fish removal, the number of fish removed by species, the condition of all fish released, and any incidence of observed injury or mortality.

        iii. Electroshocking is not authorized under this Opinion.

    d. If a sick, injured or dead specimen of a threatened or endangered species is found, the finder must notify the Vancouver Field Office of NOAA Fisheries Law Enforcement at 360.418.4246. The finder must take care in handling of sick or injured specimens to ensure effective treatment, and in handling dead specimens to preserve biological material in the best possible condition for later analysis of cause of death. The finder also has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not disturbed unnecessarily.

2. To implement reasonable and prudent measure #2 (ground disturbance), the Corps shall ensure that:

   a. All ground disturbing activities (*e.g.*, intertidal channel excavation, tilling) are carried out in a manner that does not cause long-term erosion and sediment yields.
   b. For vegetation management, the following conditions shall apply for chemical treatments:
      i. All herbicides shall be limited to hand-based applications. Aerial application of herbicides is prohibited.
      ii. Herbicide use would be limited to Rodeo with a formulation of 53.8% glyphosate and 46.2% inert ingredients, and with LI-700 surfactant within the 100-year floodplain, or 50 feet from top-of-bank, whichever is greater.
      iii. Rodeo would be diluted to 50% or less concentration of the active ingredient when applied directly to fresh-cut stems, and up to 5% when applied to foliage.
      iv. No herbicides would be applied within 25 feet of mean higher high tide elevation.
      v. Only trained individuals would apply herbicides using only low pressure spot spray and direct wicking application methods, and in accordance with label instructions.
      vi. Spray activities would only occur during dry, calm weather conditions to prevent drift and runoff.
      vii. No spraying would occur during high wind (greater then five miles per hour) or during rain events, or if precipitation has been forecasted within 24 hours of spraying.

3. To implement reasonable and prudent measure #3 (monitoring - fish use), the Corps shall ensure that:

   a. A fish use monitoring plan is submitted to NOAA Fisheries a minimum of 60 days before post-project fish use monitoring.
   b. The monitoring plan for fish use is carried out in the following manner:
      i. Juvenile salmonid fishes are handled with extreme care and kept in cold water to the maximum extent possible during sampling and processing procedures. When fish are transferred or held, a healthy environment must be provided; *e.g.*, the holding units must contain adequate amounts of well-circulated water. When using gear that captures a mix of species, the permit holder must process juvenile salmonid fishes first to minimize handling stress.
      ii. If incidental capture of any listed adult fish while sampling for juveniles occurs, the adult fish shall be released without further handling and such take must be reported.

iii. The Corps shall obtain approval from NOAA Fisheries before changing sampling locations or research protocols.

iv. The Corps shall notify NOAA Fisheries as soon as possible, but no later than two days, after any authorized level of take is exceeded. The permit holder must submit a written report detailing why the authorized take level was exceeded.

v. Incidental take authorized under this Opinion ceases to be in effect if transferred or assigned to any other person without NOAA Fisheries' authorization.

vi. The Corps shall submit to NOAA Fisheries an annual post-season report describing the research activities, the number of listed fish taken and the location, the type of take, the number of fish intentionally killed and unintentionally killed, the take dates, and a brief summary of the research results. Falsifying annual reports or permit records is a violation of this permit.

c. The monitoring report addressing the data required above shall be submitted by December 31 of a given year, to:

National Marine Fisheries Service
Oregon State Habitat Office
Habitat Conservation Division
Attn: 2004/00370
525 NE Oregon Street, Suite 500
Portland, OR 97232

4. To implement reasonable and prudent measure #4 (monitoring - comprehensive), the Corps shall ensure that:

a. The action is carried out as proposed by monitoring and recording project implementation.

b. The implementation of proposed conservation measures, the success or failure of the measures, and actions taken to correct failures of the measures are monitored and recorded.

c. The extent, duration, and frequency of any turbidity plumes related to project activities, and efforts made to control turbidity, are monitored and recorded.

d. Accidental spills of hazardous materials, and efforts made to control any such spills, are monitored and recorded.

e. The survival of vegetation plantings is monitored and recorded.

f. Any observed injury and/or mortality of fish resulting from project implementation is monitored and recorded.

g. The condition of the project sites, before and following construction of each project-specific element are monitored using photo-documentation.

i. Photo stations shall be established so the entire construction site can be recorded.

ii. Photos shall be taken of the construction site before any construction activities.
iii. Photo-documentation of the construction site shall be taken at high and low tides throughout the construction period.

h. To assess water quality effects, a water temperature monitoring plan is submitted to NOAA Fisheries a minimum of 30 days prior to project completion.
  i. The monitoring plan shall include, at a minimum, the following:
    (1) Water temperature monitoring shall be conducted using continuous temperature recorders.
    (2) Temperature recorders are installed in the intertidal channels in a manner that represents the system.
    (3) The temperature recorders shall be installed in a manner that it is secure and is not exposed during low tides.
    (4) Water temperature shall be measured continually starting no later than April1st and ending no earlier than September 30th. Monitoring shall cover a minimum of 2 years.

i. Water quality in the intertidal channels is monitored and recorded.
  i. Water temperature shall be reported as daily minimum, daily maximum, and running 7-day average of the daily maximum for each week (*i.e.* per the protocol of the ODEQ).

j. A monitoring report addressing the data required above shall be submitted annually, by December 31 of a given year, to:

National Marine Fisheries Service
Oregon State Habitat Office
Habitat Conservation Division
Attn: 2004/00370
525 NE Oregon Street, Suite 500
Portland, OR 97232

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

3.1 Background

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires the inclusion of EFH descriptions in Federal fishery management plans. In addition, the MSA requires Federal agencies to consult with NOAA Fisheries on activities that would adversely affect EFH.

Section 305(b) of the MSA (16 U.S.C. 1855(b)) requires that:

- 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;

- NOAA Fisheries shall provide conservation recommendations for any Federal or state activity that may adversely affect EFH;

- Federal agencies shall, within 30 days after receiving conservation recommendations from NOAA Fisheries, provide a detailed response in writing to NOAA Fisheries regarding the conservation recommendations. The response shall 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 the conservation recommendations of NOAA Fisheries, the Federal agency shall explain its reason for not following the recommendations.

EFH means those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting the 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 600.110). 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).

EFH 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.

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 on EFH.

3.2 Identification of EFH

Pursuant to the MSA, the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of federally-managed Pacific salmon: Chinook (*O. tshawytscha*); coho (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*) (PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other waterbodies 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). EEH also has been designated for groundfish species and coastal pelagic species. The estuarine EFH composite includes those waters, substrates and associated biological communities within bays and estuaries of the EEZ, from mean higher high water level (MHHW) or extent of upriver saltwater intrusion to the respective outer boundaries for each bay or estuary as defined in 33 CFR 80.1 (Coast Guard lines of demarcation). Detailed descriptions and identifications of EFH are contained in the fishery management plans for groundfish (PFMC 1999), coastal pelagic species (PFMC 1999a), and Pacific salmon (PFMC 1999b). Casillas *et al.* (1998) provides additional detail on the groundfish EFH habitat complexes.

3.3 Proposed Action

The proposed action is described above in section 1.2 of this document. For this consultation, NOAA Fisheries defines the action area as Crims Island, Columbia River , river mile 54.2 to 56.5). This area has been designated as EFH for various life stages of Chinook and coho salmon, and groundfish species (starry flounder and pacific sanddab).

3.4 Effects of Proposed Action

The proposed action will adversely affect water quality for groundfish species (starry flounder and pacific sanddab), and Chinook and coho salmon due to in-water excavation-related activities.
Specific effects of the proposed action are described above in sections 2.1.5.1 and 2.1.5.2

3.5 Conclusion

The proposed action will adversely affect the EFH for groundfish species (starry flounder and pacific sanddab), and Chinook and coho salmon.

3.6 EFH Conservation Recommendations

Pursuant to section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations for any Federal or state agency action that may adversely affect EFH. In addition to conservation measures proposed for the project by the Corps, reasonable and prudent measure #2 in section 2.2.2 and the terms and conditions contained in section 2.2.3 (respectively) of the ESA portion of this Opinion are applicable to salmon EFH. Therefore, NOAA Fisheries incorporates each of those measures here as EFH conservation recommendations.

3.7 Statutory Response Requirement

Please note that the MSA (section 305(b)) and 50 CFR 600.920G) requires the Federal agency to provide a written response to NOAA Fisheries after receiving EFH conservation recommendations within 30 days of its receipt of this letter. This response must include a description of measures proposed by the agency to avoid, minimize, mitigate or offset the adverse effects of the activity on EFH. If the response is inconsistent with a conservation recommendation from NOAA Fisheries, the agency must explain its reasons for not following the recommendation.

3.8 Supplemental Consultation

The Corps must reinitiate EFH consultation with NOAA Fisheries if the action is substantially revised or new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR 600.920).

4. LITERATURE CITED

Section 7(a)(2) of the ESA requires biological opinions to be based on the best scientific and commercial data available. This section identifies the data used in developing this Opinion.

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