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

NMFS Tracking No:
2004/00653

September 16, 2004

Rachel Maggi
Natural Resources Conservation Service
11104 NE 149th St Bldg. C, Suite 400
Brush Prairie, Washington 98606

Re: Endangered Species Act Interagency Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the East Fork Lewis River Wetland Restoration and Enhancement, HUC 170800020506, Lewis River, Clark County, Washington.

Dear Rachel Maggi:

The enclosed document contains a biological opinion (Opinion) prepared by NOAA's National Marine Fisheries Service (NOAA Fisheries) pursuant to section 7(a)(2) of the Endangered Species Act (ESA) on the effects of the Natural Resources Conservation Services (NRCS) East Fork Lewis River Wetland Restoration and Enhancement project. In this Opinion, NOAA Fisheries concludes that the proposed action is not likely to jeopardize the continued existence of Lower Columbia (LC) chinook (*Oncorhynchus tshawytscha*), LC River steelhead (*O. mykiss*), LC River chum (*O. keta*), and proposed for listing LC coho (*O. kisutch*) considered in this biological opinion. The Opinion also includes an incidental take statement with terms and conditions necessary to minimize the impact of taking that is reasonably likely to be caused by this action. Take from actions by the action agency and applicant, if any, that meet these terms and conditions will be exempt from the ESA take prohibition.

This document also includes the results of our consultation on the action's likely effects on Essential Fish Habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and includes conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects to EFH. Section 305(b)(4)(B) of the MSA requires Federal agencies to provide a detailed written response to NOAA Fisheries within 30-days after receiving these recommendations. If the response is inconsistent with the recommendations, the NRCS must explain why the recommendations will not be followed, including the justification for any disagreements over the effects of the action and the recommendations.

If you have questions regarding this consultation, please contact Stephanie Ehinger, at 360-534-9341 or via e-mail at stephanie.ehinger@noaa.gov.

Sincerely,

For Michael R Crouse

D. Robert Lohn
Regional Administrator

cc: Ron Klump

Endangered Species Act – Section 7 Consultation
Biological Opinion

And

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

East Fork Lewis River Wetland Restoration and Enhancement,
HUC 170800020506, Lewis River
Clark County, Washington

Lead Action Agency: Natural Resources Conservation Service

Consultation Conducted By: National Marine Fisheries Service
Northwest Region

Date Issued: September 16, 2004

Issued by:

D. Robert Lohn
Regional Administrator

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INTRODUCTION

This document prepared by NOAA's National Marine Fisheries Service (NOAA Fisheries) includes a biological opinion (Opinion) and incidental take statement in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq*.), and implementing regulations at 50 CFR 402. The Essential Fish Habitat (EFH) consultation was prepared in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 *et seq*.) and implementing regulations at 50 CFR 600.

Background and Consultation History

The Natural Resources Conservation Service (NRCS) proposes to fund wetland restoration activities at the Lower East Fork (EF) Lewis River in Cark County, Washington. The NRCS is proposing to use the funds from the Wetland Reserve Program 16 U.S.C. 3837, *et. seq*; 7 CFR, Part 1467. The project will occur within the geographic range of the Lower Columbia River (LCR) chinook (*Oncorhynchus tshawytscha*) Evolutionary Significant Unit (ESU), LCR steelhead (*O. mykiss*) ESU, Columbia River (CR) chum (*O. keta*) ESU, and proposed LCR (*O. kisutch*) ESU[1]. The proposed project will occur within the designated EFH for chinook and coho.

NOAA Fisheries received the biological assessment (BA), the EFH assessment, and a letter from the NRCS West Area office requesting formal consultation on February 22, 2004. This BA describes the complete redesign of the proposed project in response to comments from NOAA Fisheries regarding a previous design. On June 7, NOAA Fisheries sent NRCS a letter with additional questions. Most of these questions were answered on the field visit held on June 8, 2004. NOAA Fisheries and NRCS decided to resolve the remaining questions during consultation. Thus, NOAA Fisheries initiated consultation on June 15, 2004. NOAA Fisheries and NRCS agreed to finalize the Opinion by August 13, 2004 for NRCS to be able to use the 2004 summer construction window. Difficulties with NRCS delivering data led to both parties agreeing to change that date to August 31, 2004.

During the consultation, NOAA Fisheries prepared several memoranda to the file. These memoranda document the analysis of effects of elements of the action which turned out to be not likely to adversely affect listed species. These memoranda are:

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[1] 'ESU' means an anadromous salmon or steelhead population that is either listed or being considered for listing under the ESA, is substantially isolated reproductively from conspecific populations, and represents an important component of the evolutionary legacy of the species (Waples 1991). An ESU may include portions or combinations of populations more commonly defined as stocks within or across regions.

Temperature Effects
Passage of Juvenile Salmonids through the Water-Control Structure

The complete administrative record for this consultation is on file at the Washington State Habitat Office in Lacey, Washington.

Proposed Action

The proposed action is to restore 574 acres of wetland in the channel migration zone of the Lower EF Lewis River. The project consists of the activities listed below. For a detailed description see section 1.6 in the BA.

- Install one pre-cast concrete fish passage structure with stop logs that will allow both upstream and downstream fish passage and water level management (constructed wetland). Most juvenile salmonids are expected to enter the wetland with inflowing flood waters. The top of the water control structure is at design elevation 13. When flooding reaches elevation 13 water will enter the wetland at eight locations including the water control structure. This is expected to occur an average of 50 days between November and June (pers. comm. John Axford).
- Install culvert under access road to replace existing crushed pipe (to provide connectivity within the managed wetland).
- Flatten slope of existing levee down to breach so it can be used by pedestrians. A pedestrian trail runs on top of the levee.
- Enhance floodplain connectivity to the river by creating an additional breach in the levee. A non-functioning screw gate water control structure (three parallel culverts) will be removed and replaced with a bridge.
- Enhance floodplain microtopography by grading 12.5 acres of existing wetland (will include bank shaping on existing outlet ditch and swale creation within managed wetland boundary.
- Place excavation spoils on 4.2 acres of existing wetland.
- Plant 90 acres of trees and shrubs.
- Remove 3,000 feet of dike.
- Breach 1,150 feet of dike, creating habitat islands.
- Erect livestock exclusion fence on Kahn Property.
- Maintain grassland habitat for migratory wildlife species through annual haying on south unit.
- Maintain early successional emergent wetland community through occasional tillage activities in managed wetland area. The main purpose is to exclude reed canary grass.
- Installation of woody debris on the floodplain (if construction budget allows).

The purpose of the action is to restore and enhance floodplain habitat for use by multiple species. A total restoration cannot be achieved due to remaining dike sections along the EF Lewis River and the Columbia River dams. (In pre-dam times flood events in the LCR used to effect the Lower EF Lewis River and result in flooding in the action are. As a result flood frequency and magnitude are expected to be reduced compared to historic conditions.) However, a water control structure was chosen to mimic aspects of the pre-dam hydrology. For details see Baker and Miranda, 2003.

Ducks Unlimited (DU) is conducting a research program with the objective to monitor fish passage across water control structures and fish use of managed versus unmanaged floodplain wetlands. Details of the research program are described in Appendix G of the BA. The applicant will carry out research under and exemption from the take prohibitions under section 9 of the ESA. The DU, in coordination with the Washington Department of Fish and Wildlife, submitted the five-year monitoring program under the ESA research limit No. 7 of the July 2000 4(d) rule.

Proposed Conservation Measures:

1. The entire channel and associated low spots in the floodplain behind the water-control structure are will be regraded so that they are all connected at low flow.
2. The monitoring results are expected to help with adaptive management of the flow out of the wetland. A preliminary operations plan calls for draw down (removal of all stop logs) by July 31 and a minimum flow of one-inch over the stop logs at all times (BA, Appendix H, Exhibit B).

Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For purposes of this consultation, the action area includes the 574 acres of restored wetlands and the EFLewis River between river mile 3.5 and 6.

The action area is used by the species listed in Table 1. All four salmonid species are expected to use the EF Lewis River as a migration corridor. Even though CR chum have not been observed in recent years their current or future presence can not be excluded. Juvenile chinook, steelhead, and coho are expected to use large portions of the 574 acres of floodplain wetlands for rearing. The action area is also designated as EFH for chinook and coho (PFMC 1999).

Table 1 Federal Register Notices for Final Rules that list species, designate critical habitat, or apply protective regulations to ESUs considered in this consultation. (Listing status 'T' means listed as threatened under the ESA, 'E' means listed as endangered, and 'P' means proposed for listing; see, also, proposed listing determinations for 27 ESUs of West Coast salmonids, at 69 FR 33102, 6/14/04.)

Species ESU	Listing Status	Critical Habitat	Protective Regulations
Lower Columbia River Chinook salmon (*Oncorhynchus Tshawytscha*)	T 3/24/99; 64 FR 14308	Not applicable	7/10/00; 65 FR 42422
Columbia River Chum salmon (*O. keta*)	T 3/25/99; 64 FR 14508	Not applicable	7/10/00; 65 FR 42422
Lower Columbia River Coho salmon (*O. kisutch*)	P 6/14/04; 69 FR 33102	Not applicable	Not applicable
Lower Columbia River Steelhead (*O. mykiss*)	T 3/19/98; 63 FR 13347	Not applicable	7/10/00; 65 FR 42422

ENDANGERED SPECIES ACT

The ESA 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 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 critical habitats. Section 7(b)(4) requires the provision of an incidental take statement specifying the impact of any incidental taking and specifying reasonable and prudent measures to minimize such impacts.

Biological Opinion

This Opinion presents NOAA Fisheries' review of the status of each ESU considered in this consultation, the environmental baseline for the action area, all the effects of the action as proposed, and cumulative effects. NOAA Fisheries analyzes those combined factors to conclude whether the proposed action is likely to appreciably reduce the likelihood of both the survival and recovery of the affected ESUs. See, 50 CFR 402.14(g). If the action under consultation is likely to jeopardize an ESU, NOAA Fisheries must identify any reasonable and prudent alternatives for the action that avoid jeopardy and meet other regulatory requirements (50 CFR 402.02).

Status of the ESUs

This section defines range-wide biological requirements of each ESU, and reviews the status of the ESUs relative to those requirements. The present risk faced by each ESU informs NOAA Fisheries' determination of whether additional risk will 'appreciably reduce' the likelihood that an ESU will survive and recover in the wild. The greater the present risk, the more likely any additional risk resulting from the proposed action's effects on the population size, productivity (growth rate), distribution, or genetic diversity of the ESU will be an appreciable reduction (see, McElhaney *et al.* 2000).

NOAA Fisheries convened a biological review team (BRT) to update the status of listed chinook, chum, coho salmon, and steelhead trout ESUs in Washington, Oregon, California, and Idaho. The updated status reviews they produced, BRT 2003, can be obtained at **http://www.nwr.noaa.gov/AlseaResponse/20040528/brtusr.html.** The status of the species below is largely excerpted from BRT 2003.

Chinook Salmon

Chinook salmon, also commonly referred to as king, spring, quinnat, Sacramento, California, or tyee salmon, is the largest of the Pacific salmon (Netboy 1958 as cited in Myers *et al.* 1998). The species historically ranged from the Ventura River in California to Point Hope, Alaska, in North America, and in northeastern Asia from Hokkaido, Japan to the Anadyr River in Russia (Healey 1991). Additionally, chinook salmon have been reported in the Mackenzie River area of Northern Canada (McPhail and Lindsey 1970). Chinook salmon exhibit very diverse and complex life-history strategies. Healey (1986) described 16 age categories for chinook salmon, seven total ages with three possible freshwater ages. This level of complexity is roughly comparable to sockeye salmon, although sockeye salmon have a more extended freshwater residence period and use different freshwater habitats (Miller and Brannon 1982, Burgner 1991).

Two generalized freshwater life-history types were initially described by Gilbert (1912): 'stream-type' chinook salmon reside in freshwater for a year or more following emergence, whereas 'ocean-type' chinook salmon migrate to the ocean predominately within their first year. Healey (1983, 1991) has promoted the use of broader definitions for 'ocean-type' and 'stream-type' to describe two distinct races of chinook salmon. This racial approach incorporates life-history traits, geographic distribution, and genetic differentiation and provides a valuable frame of reference for comparisons of chinook salmon populations. For this reason, the BRT has adopted the broader 'racial' definitions of ocean- and stream-type for this review.

Of the two life-history types, ocean-type chinook salmon exhibit the most varied and plastic life-history trajectories. Ocean-type chinook salmon juveniles emigrate to the ocean as fry, subyearling juveniles (during their first spring or fall), or as yearling juveniles (during their second spring), depending on environmental conditions. Ocean-type chinook salmon also undertake distinct, coastally oriented, ocean migrations. The timing of the return to freshwater and spawning is closely related to the ecological characteristics of a population's spawning habitat.

Five different run times are expressed by different ocean-type chinook salmon populations: spring, summer, fall, late-fall, and winter. In general, early run times (spring and summer) are exhibited by populations that use high spring flows to access headwater or interior regions. Ocean-type populations within a basin that express different runs times appear to have evolved from a common source population. Stream-type populations appear to be nearly obligate yearling outmigrants (some 2-year-old smolts have been identified), they undertake extensive off-shore ocean migrations, and generally return to freshwater as spring-run- or summer-run fish. Stream-type populations are found in northern British Columbia and Alaska, and in the headwater regions of the Fraser River and Columbia River interior tributaries.

Before development of the ESU policy (Waples 1991), NOAA Fisheries recognized Sacramento River winter-run chinook salmon as a 'distinct population segment' under the ESA (NMFS 1987). Subsequently, in reviewing the biological and ecological information concerning West Coast chinook salmon, BRTs have identified additional ESUs for chinook salmon from Washington, Oregon, and California: Snake River fall-run (Waples *et al.* 1991), Snake River spring- and summer-run (Matthews and Waples 1991), and Upper Columbia River summer-run and fall-run chinook salmon (originally designated as the Mid-Columbia River summer-run- and fall-run chinook salmon, Waknitz *et al.* 1995), Puget Sound chinook salmon, Washington Coast chinook salmon, LCR chinook salmon, Upper Willamette River chinook salmon, Middle Columbia River spring-run chinook salmon, Upper Columbia River spring-run chinook salmon, Oregon Coast chinook salmon, Upper Klamath and Trinity rivers chinook salmon, Central Valley fall-run and late-fall-run chinook salmon, and Central Valley spring-run chinook salmon (Myers *et al.* 1998), the Southern Oregon and Northern California chinook salmon, California Coastal chinook salmon, and Deschutes River (NMFS 1999).

Lower Columbia River Chinook Salmon

The status of LCR chinook was initially reviewed by NOAA Fisheries in 1998 (Myers *et al.* 1998) and updated in that same year (NMFS 1998e). In the 1998 update, the Biological Review Team (BRT) noted several concerns for this ESU. The 1998 BRT was concerned that there were very few naturally self-sustaining populations of native chinook salmon remaining in the LCR ESU. Naturally reproducing (but not necessarily self-sustaining) populations identified by the 1998 BRT were the Lewis and Sandy Rivers 'bright' fall runs and the 'tule' fall runs in the Clackamas, EF Lewis and Coweeman Rivers. These populations were identified as the only bright spots in the ESU. The few remaining populations of spring chinook salmon in the ESU were not considered by the previous BRT to be naturally self-sustaining because of either small size, extensive hatchery influence, or both. The previous BRT felt that the dramatic declines and losses of spring-run chinook salmon populations in the LCR ESU represented a serious reduction in life-history diversity in the region. The previous BRT felt that the presence of hatchery chinook salmon in this ESU posed an important threat to the persistence of the ESU and also obscured trends in abundance of native fish. The previous BRT noted that habitat degradation and loss due to extensive hydropower development projects, urbanization, logging and agriculture threatened the chinook salmon spawning and rearing habitat in the lower Columbia River. A majority of the previous (1998) BRT concluded that the LCR ESU was likely to become endangered in the foreseeable future. A minority felt that chinook salmon in this ESU were not presently in danger of extinction, nor were they likely to become so in the foreseeable future.

New data acquired for the BRT (2003) report includes spawner abundance estimates through 2001, new estimates of the fraction of hatchery spawners and harvest estimates. In addition, estimates of historical abundance have been provided by The Washington Department of Fish and Wildlife. Information on recent hatchery releases was also obtained. New analyses include the designation of relatively demographically independent populations, recalculation of previous BRT metrics with additional years data, estimates of median annual growth rate under different assumptions about the reproductive success of hatchery fish, and estimates of current and historically available kilometers of stream.

The ESU exhibits three major life history types: fall run (‘tules’), late fall run (‘brights’), and spring run. The ESU spans three ecological zones: Coastal (rain driven hydrograph), Western Cascade (snow or glacial driven hydrograph), and Gorge (transitioning to drier interior Columbia ecological zones). The fall chinook populations are currently dominated by large scale hatchery production, relatively high harvest and extensive habitat degradation (discussed in previous status reviews). The Lewis River late fall chinook population is the healthiest in the ESU and has a reasonable probability of being self-sustaining. The spring-run populations are largely extirpated as the result of dams which block access to their high elevation habitat. Abundances have largely declined since the last status review update (1998) and trend indicators for most populations are negative, especially if hatchery fish are assumed to have a reproductive success equivalent to that of natural-origin fish. However, 2001 abundance estimates increased for most LCR chinook populations over the previous few years and preliminary indications are that 2002 abundance also increased (Rawding, personal communication, cited in BRT 2003). Many salmon populations in the Northwest have shown increases in abundance over the last few years and the relationship of these increases to potential changes in marine survival are discussed in the introduction to the BRT (2003) report.

A majority (71 percent) of the BRT votes for this ESU fell in the ‘likely to become endangered’ category, with minorities falling in the ‘danger of extinction’ and ‘not likely to become endangered’ categories. Moderately high concerns for all Viable Salmonid Population (VSP) elements are indicated by estimates of moderate to moderately high risk for abundance and diversity. All of the risk factors identified in previous reviews were still considered important by the BRT. The Willamette/Lower Columbia River Technical Review Team has estimated that 8-10 historic populations in this ESU have been extirpated, most of them spring-run populations. Near loss of that important life history type remains in important BRT concern. Although some natural production currently occurs in 20 or so populations, only one exceeds 1000 spawners.

High hatchery production continues to pose genetic and ecological risks to natural populations and to mask their performance. Most populations in this ESU have not seen as pronounced increases in recent years as occurred in many other geographic areas.

Chinook salmon in the East Fork are fall-runs. There are two stocks: an early one which enters the system in late September and spawns in mid- to late October, and a later stock which enters in October and spawns from November to mid- December. Fry begin emergence during February. Smolts from the early stock leave the system in May; smolts from the later stock are out by July (Dammers 2000).

East Fork Lewis River fall chinook spawn from river mile 6.2 to river mile 18. The East Fork Lewis River fall chinook spawners are a native stock of wild production. The stock has been supplemented from time to time by Kalama stock since 1940, but no fall chinook have been planted in the basin since 1986 (WDF/WDW 1993 in Wade 2000). Even though the LCR ESU fall chinook are listed by NOAA Fisheries as "Threatened," wild fall chinook in the Lewis River system have maintained a significant population with negligible hatchery influences, unlike other lower Columbia River stocks. There is now a self-sustaining escape of approximately 5,700 adults (Wade 2000). This represents about 80 percent to 85 percent of the wild fall chinook returning to the LCR (WDF 1990 in Wade 2000).

The Lower Columbia Technical Recovery Team rated the EF Lewis River fall chinook as a legacy population.

Ocean-type juvenile chinook usually move to the sea after a brief freshwater rearing period (Taylor 1991). During their short freshwater residence they utilize mainstem and off-channel freshwater habitats. Documented off-channel habitat use includes side channels/backwater (Hayman *et al.* 1996) and floodplain wetlands (Baker and Miranda 2003). Compared to coho, who seek out off-channel rearing habitat, chinook juveniles are thought to utilize the mainstem as well as off-channel areas (Murphy et al 1989, pers. com Scott Anderson).

Chum Salmon

Chum salmon are semelparous, spawn primarily in freshwater, and apparently exhibit obligatory anadromy, as there are no recorded landlocked or naturalized freshwater populations (Randall *et al.* 1987). The species is known for the enormous canine-like fangs and striking body color (a calico pattern, with the anterior two thirds of the flank marked by a bold, jagged, reddish line and the posterior third by a jagged black line) of spawning males. Females are less flamboyantly colored and lack the extreme dentition of the males.

The species has the widest natural geographic and spawning distribution of any Pacific salmonid, primarily because its range extends further along the shores of the Arctic Ocean than other salmonids. Chum salmon have been documented to spawn from Korea and the Japanese island of Honshu, east, around the rim of the North Pacific Ocean, to Monterey Bay in California.

Presently, major spawning populations are found only as far south as Tillamook Bay on the Northern Oregon coast. The species' range in the Arctic Ocean extends from the Laptev Sea in Russia to the Mackenzie River in Canada. Chum salmon may historically have been the most abundant of all salmonids: Neave (1961) estimated that before the 1940s, chum salmon contributed almost 50 percent of the total biomass of all salmonids in the Pacific Ocean. Chum salmon also grow to be among the largest of Pacific salmon, second only to chinook salmon in adult size, with individual chum salmon reported up to 108.9 cm in length and 20.8 kg in weight (Pacific Fisherman 1928). Average size for the species is around 3.6 to 6.8 kg (Salo 1991).

Chum salmon spend more of their life history in marine waters than other Pacific salmonids. Chum salmon, like pink salmon, usually spawn in coastal areas, and juveniles out migrate to seawater almost immediately after emerging from the gravel that covers their redds (Salo 1991). This ocean-type migratory behavior contrasts with the stream-type behavior of some other species in the genus *Oncorhynchus* (e.g., coastal cutthroat trout, steelhead, coho salmon, and most types of chinook and sockeye salmon), which usually migrate to sea at a larger size, after months or years of freshwater rearing. This means survival and growth in juvenile chum salmon depends less on freshwater conditions than on favorable estuarine conditions. Another behavioral difference between chum salmon and species that rear extensively in freshwater is that chum salmon form schools, presumably to reduce predation (Pitcher 1986), especially if their movements are synchronized to swamp predators (Miller and Brannon 1982).

In December 1997, the first ESA status review of west coast chum salmon (Johnson *et al.* 1997) was published which identified four ESU: (1) Puget Sound/Strait of Georgia ESU, which includes all chum salmon populations from Puget Sound, the Strait of Georgia, and the Strait of Juan de Fuca up to and including the Elwha River, with the exception of summer-run chum salmon from Hood Canal; (2) Hood Canal summer-run ESU, which includes summer-run populations from Hood Canal and Discovery and Sequim Bays on the Strait of Juan de Fuca; (3) Pacific coast ESU, which includes all natural populations from the Pacific coasts of California, Oregon, and Washington, west of the Elwha River on the Strait of Juan de Fuca; and (4) Columbia River ESU.

In March 1998, NOAA Fisheries published a federal register notice describing the four ESUs and proposed a rule to list two--Hood Canal summer-run and Columbia River ESUs--as threatened under the ESA (NMFS 1998b). In March 1999, the two ESUs were listed as proposed, with the exception that the Hood Canal summer-run ESU was extended westward to include summer-run fish recently documented in the Dungeness River (NMFS 1999a).

Columbia River Chum Salmon

NOAA Fisheries last provided an updated status report on Columbia River chum in 1999 (NMFS 1999b). As documented in the 1999 report, the previous BRT was concerned about the dramatic declines in abundance and contraction in distribution from historical levels. The previous BRT was also concerned about the low productivity of the extant populations, as evidenced by flat trend lines at low population sizes. A majority of the previous BRT concluded that the Columbia River chum salmon ESU was likely to become endangered in the foreseeable future and a minority concluded that the ESU was currently in danger of extinction.

New data include spawner abundance through 2000, with preliminary estimate of 2002, new information on the hatchery program, and new genetic data describing the current relationship of spawning groups. New analyses include designation of relatively demographically independent populations, recalculation of previous BRT metrics with additional years data, estimates of median annual growth rate, and estimates of current and historically available kilometers of stream.

Updated information provided in the BRT (2003), the information contained in previous LCR status reviews, and preliminary analyses by the Willamette Lower Columbia Technical Review Team suggest that 14 of the 16 historical populations (88 percent) are extinct or nearly so. The two extant populations have been at low abundance for the last 50 years in the range where stochastic processes could lead to extinction. Encouragingly, there has been a substantial increase in the abundance of these two populations. In addition there are the new (or newly discovered) Washougal River mainstem spawning groups. However, it is not known if the increase will continue and the abundance is still substantially below the historical levels.

Nearly all of the likelihood votes for this ESU fell in the ‘likely to become endangered’ (63 percent) or ‘danger of extinction’ (34 percent) categories. The BRT had substantial concerns about every VSP element, as indicated risk estimates scores that ranged from moderately high for growth rate/productivity to high to very high for spatial structure. Most or all of the risk factors identified previously by the BRT remain important concerns. The Willamette Lower Columbia Technical Review Team has estimated that close to 90 percent of the historical populations in the ESU are extinct or nearly so, resulting in loss of much diversity and connectivity between populations. The populations that remain are small, and overall abundance for the ESU is low. This ESU has showed low productivity for many decades, even though the remaining populations are at low abundance and density dependent compensation might be expected. The BRT was encouraged that unofficial reports for 2002 suggest a large increase in abundance in some (perhaps many) locations. Whether this large increase is due to any recent management actions or simply reflects unusually good conditions in the marine environment is not known at this time, but the result is encouraging, particularly if it were to be sustained for a number of years.

The status of the EF Lewis stock is described in NRCS 2004.

The Lower Columbia Fish Recovery Board rated the EF Lewis River chum as a core population.

Coho Salmon

Coho salmon is a widespread species of Pacific salmon, occurring in most major river basins around the Pacific Rim from Monterey Bay in California north to Point Hope, Alaska, through the Aleutians, and from Anadyr River south to Korea and northern Hokkaido, Japan (Laufle *et al.* 1986). From central British Columbia south, the vast majority of coho salmon adults are 3-year-olds, having spent approximately 18 months in freshwater and 18 months in saltwater (Gilbert 1912, Sandercock 1991). The primary exceptions to this pattern are 'jacks,' sexually mature males that return to freshwater to spawn after only 5-7 months in the ocean. However, in southeast and central Alaska, the majority of coho salmon adults are 4-year-olds, having spent an additional year in freshwater before going to sea (Godfrey *et al.* 1975, Crone and Bond 1976). The transition zone between predominantly 3-year-old and 4-year-old adults occurs somewhere between central British Columbia and southeast Alaska.

With the exception of spawning habitat, which consists of small streams with stable gravels, summer and winter freshwater habitats most preferred by coho salmon consist of quiet areas with low flow, such as backwater pools, beaver ponds, dam pools, and side channels (Reeves *et al.* 1989). Habitats used during winter generally have greater water depth than those used in summer, and also have greater amounts of large woody debris. West Coast coho smolts typically leave freshwater in the spring (April to June) and re-enter freshwater when sexually mature from September to November and spawn from November to December and occasionally into January (Sandercock 1991). Stocks from British Columbia, Washington, and the Columbia River often have very early (entering rivers in July or August) or late (spawning into March) runs in addition to 'normally' timed runs.

The status of coho salmon for purposes of ESA listings has been reviewed many times, beginning in 1990. The first two reviews occurred in response to petitions to list coho salmon in the LCR and Scott and Waddell creeks (central California) under the ESA. The conclusions of these reviews were that NOAA Fisheries could not identify any populations that warranted protection under the ESA in the LCR (Johnson *et al.* 1991), and that Scott and Waddell creeks' populations were part of a larger, undescribed ESU (Bryant 1994).

A review of West Coast (Washington, Oregon, and California) coho salmon populations began in 1993 in response to several petitions to list numerous coho salmon populations and NOAA Fisheries' own initiative to conduct a coastwide status review of the species. This coastwide review identified six coho salmon ESUs, of which the three southern most were proposed for listing, two were candidates for listing, and one was deemed 'not warranted' for listing (Weitkamp *et al.* 1995). In October 1996, the BRT updated the status review for the Central California (CC) ESU, and concluded that it was at risk of extinction (NMFS 1996a). In October 1996, NOAA Fisheries listed this ESU as threatened (Table 1).

In December 1996, the BRT updated the status review update for both proposed and candidate coho salmon ESUs (NMFS 1996b). However, because of the scale of the review, comanagers' requests for additional time to comment on the preliminary conclusions, and NOAA Fisheries' legal obligations, the status review was finalized for proposed coho salmon ESUs in 1997 (NMFS 1997), but not for candidate ESUs. In May 1997, NOAA Fisheries listed the Southern Oregon/Northern California coasts (SONC) ESU as threatened, while it announced that listing of the Oregon Coast (OC) ESU was not warranted due to measures in the 'Oregon Coastal Salmon Restoration Initiative' (Oregon Plan 1997, now referred to as the 'Oregon Plan for Salmon and Watersheds'). This finding for OC coho salmon was overturned in August 1998, and the ESU listed as threatened (Table 1).

The process of updating the coho salmon status review was begun again in October 1998 for coho salmon in Washington and the lower Columbia River. However, this effort was terminated before the BRT could meet, due to competing activities with higher priorities.

In response to a petition by (Oregon Trout *et al.* 2000), the status of LCR coho salmon was revisited in 2000, with BRT meetings held in March and May 2001 (NMFS 2001a). The BRT concluded that splitting the LCR/Southwest Washington coast ESU to form separate LCR and Southwest Washington coast coho salmon ESUs was most consistent with available information and the LCR ESU was at risk of extinction. Like the 1996 status review update, these results were never finalized.

Lower Columbia River Coho Salmon.

The status of LCR coho salmon was initially reviewed by the NOAA Fisheries in 1996 (NMFS 1996b) and the most recent review occur in 2001 (NMFS 2001a). In the 2001 review, the BRT was very concerned that the vast majority (over 90 percent) of the historical populations in the LCR coho salmon ESU appear to be either extirpated or nearly so. The two populations with any significant production (Sandy and Clackamas) were at appreciable risk because of low abundance, declining trends and failure to respond after a dramatic reduction in harvest. The large number of hatchery coho salmon in the ESU was also considered an important risk factor. The majority of the 2001 BRT votes were for 'at risk of extinction' with a substantial minority in 'likely to become endangered.'

New data include spawner abundance estimates through 2002 for Clackamas and Sandy populations (the previous status review had data just through 1999). In addition, the Oregon Department of Fish and Wildlife conducted surveys of Oregon LCR coho salmon using a stratified random sampling design in 2002, which provided the first abundance estimates for lower tributary populations (previously only limited index surveys were available. Estimates of the fraction of hatchery-origin spawners accompany the new abundance estimates. In Washington, no surveys of natural-origin adult coho salmon abundance are conducted. Updated information through 2002 on natural-origin smolt production from Cedar, Mill, Germany, and

Abernathy creeks and the upper Cowlitz River were provided by the Washington Department of Fish and Wildlife.

New analyses include the tentative designation of demographically independent populations, the recalculation of metrics reviewed by previous BRTs with additional years of data, estimates of median annual growth rate under different assumptions about the reproductive success of hatchery fish, a new stock assessment of Clackamas River coho by The Oregon Department of Fish and Wildlife (Zhou and Chilcote 2003), and estimates of current and historically available kilometers of stream.

As part of its effort to develop viability criteria for LCR salmon and steelhead, the Willamette/Lower Columbia Technical Recovery Team has identified historically demographically independent populations of Endangered Species Act-listed salmon and steelhead in the LCR (Myers *et al.* 2002). Population boundaries are based on an application of VSP definition (McElhany *et al.* 2000). Based on the Willamette Lower Columbia Technical Review Team's framework for chinook and steelhead, the BRT tentatively designated populations of LCR coho salmon. A working group at the Northwest Fisheries Science Center hypothesized that the LCR coho salmon ESU historically consisted of 23 populations. These population designations have not yet been reviewed by the Willamette Lower Columbia Technical Review Team.

Previous BRT and Oregon Department of Fish and Wildlife analyses have treated the coho in the Clackamas River as a single population (see previous status review updates for more complete discussion and references). However, recent analysis by The Oregon Department of Fish and Wildlife (Zhou and Chilcote 2003) supports the hypothesis that coho salmon in the Clackamas River consist of two populations, an early run and a late run. The late run population is believed to be descendant of the native Clackamas River population, and the early run is believed to descend from hatchery fish introduced from Columbia River populations outside the Clackamas River basin. The population structure of Clackamas River coho is uncertain; therefore, in the BRT (2003) report, analyses on Clackamas River coho are conducted under both the single population and two population hypotheses for comparison.

For other salmonid species, the Willamette Lower Columbia Technical Review Team partitioned LCR populations into a number of 'strata' based on major life-history characteristics and ecological zones. These analyses suggest that a viable ESU would require a number of viable populations in each of these strata. Coho salmon do not have the major life-history variation seen in LCR steelhead or chinook, and would thus be divided into strata based only on ecological zones.

On the positive side, adult returns in 2000 and 2001 were up noticeably in some areas, and evidence for limited natural production has been found in some areas outside the Sandy and Clackamas. The paucity of naturally produced spawners in this ESU can be contrasted with the very large number of hatchery-produced adults. Although the scale of the hatchery programs, and the great disparity in relative numbers of hatchery and wild fish, produce many genetic and ecological threats to the natural populations, collectively these hatchery populations contain a great deal of genetic resources that might be tapped to help promote restoration of more widespread naturally spawning populations.

The status of this ESU was reviewed by the BRT in 2000, so relatively little new information was available. A majority (68 percent) of the likelihood votes for LCR coho salmon fell in the 'danger of extinction' category, with the remainder falling in the 'likely to become endangered' category. As indicated by the risk matrix totals, the BRT had major concerns for this ESU in all VSP risk categories (risk estimates ranged from high risk for spatial structure/connectivity and growth rate/productivity to very high for diversity). The most serious overall concern was the scarcity of naturally produced spawners throughout the ESU, with attendant risks associated with small population, loss of diversity, and fragmentation and isolation of the remaining naturally produced fish. In the only two populations with significant natural production (Sandy and Clackamas), short and long-term trends are negative and productivity (as gauged by preharvest recruits) is down sharply from recent (1980s) levels.

The status of the EF Lewis stock is described in NRCS 2004.

The Lower Columbia Fish Recovery Board rated the EF Lewis River coho as a core population.

Steelhead

Steelhead is the name commonly applied to the anadromous form of the biological species *Oncorhynchus mykiss*. The present distribution of steelhead extends from Kamchatka in Asia, east to Alaska, and down to southern California (NMFS 1999), although the historical range of steelhead extended at least to the Mexico border (Busby *et al.* 1996). Steelhead exhibit perhaps the most complex suite of life-history traits of any species of Pacific salmonid. They can be anadromous or freshwater resident (and under some circumstances, apparently yield offspring of the opposite form). Those that are anadromous can spend up to 7 years in fresh water before smoltification, and then spend up to 3 years in salt water before first spawning. The half-pounder life-history type in Southern Oregon and Northern California spends only 2 to 4 months in salt water after smoltification, then returns to fresh water and outmigrates to sea again the following spring without spawning. This species can also spawn more than once (iteroparous), whereas all other species of *Oncorhynchus* except *O. clarki* spawn once and then die (semelparous). The anadromous form is under the jurisdiction of the NOAA Fisheries, while the resident freshwater forms, usually called 'rainbow' or 'redband' trout, are under the jurisdiction of U.S. Fish and Wildlife Service.

Although no subspecies are currently recognized within any of the species of Pacific salmon, Behnke (1992) has proposed that two subspecies of steelhead with anadromous life history occur in North America: *O. mykiss irideus* (the 'coastal' subspecies), which includes coastal populations from Alaska to California (including the Sacramento River), and *O. mykiss gairdneri* (the 'inland' subspecies), which includes populations from the interior Columbia, Snake and Fraser Rivers. In the Columbia River, the boundary between the two subspecies occurs at approximately the Cascade Crest. A third subspecies of anadromous steelhead (*O. mykiss mykiss*) occurs in Kamchatka, and several other subspecies of Steelhead are also recognized which only have resident forms (Behnke 1992).

Within the range of West Coast steelhead, spawning migrations occur throughout the year, with seasonal peaks of activity. In a given river basin there may be one or more peaks in migration activity; since these runs are usually named for the season in which the peak occurs, some rivers may have runs known as winter, spring, summer, or fall steelhead. For example, large rivers, such as the Columbia, Rogue, and Klamath rivers, have migrating adult steelhead at all times of the year. Names used to identify the seasonal runs of steelhead vary locally; in Northern California, some biologists have retained the use of the terms spring and fall steelhead to describe what others would call summer steelhead.

Steelhead can be divided into two basic reproductive ecotypes, based on the state of sexual maturity at the time of river entry, and duration of spawning migration (Burgner *et al.* 1992). The stream-maturing type (summer steelhead in the Pacific Northwest and Northern California) enters fresh water in a sexually immature condition between May and October and requires several months to mature and spawn. The ocean-maturing type (winter steelhead in the Pacific Northwest and Northern California) enters fresh water between November and April with well-developed gonads and spawns shortly thereafter.

In basins with both summer and winter steelhead runs, it appears that the summer run occurs where habitat is not fully used by the winter run or a seasonal hydrologic barrier, such as a waterfall, separates them. Summer steelhead usually spawn farther upstream than winter steelhead (Roelofs 1983, Behnke 1992). Coastal streams are dominated by winter steelhead, whereas inland steelhead of the Columbia River Basin are almost exclusively summer steelhead. Winter steelhead may have been excluded from inland areas of the Columbia River Basin by Celilo Falls or by the considerable migration distance from the ocean. The Sacramento-San Joaquin River Basin may have historically had multiple runs of steelhead that probably included both ocean-maturing and stream-maturing stocks (CDFG 1995, McEwan and Jackson 1996). These steelhead are referred to as winter steelhead by the California Department of Fish and Game (CDFG); however, some biologists call them fall steelhead (Cramer et. al 1995). It is thought that hatchery practices and modifications in the hydrology of the basin caused by large-scale water diversions may have altered the migration timing of steelhead in this basin (D. McEwan, personal communication, cited in BRT 2003).

Inland steelhead of the Columbia River Basin, especially the Snake River Subbasin, are commonly referred to as either A-run or B-run. These designations are based on a bimodal migration of adult steelhead at Bonneville Dam (235 km from the mouth of the Columbia River) and differences in age (1- versus 2-ocean) and adult size observed among Snake River steelhead. It is unclear, however, if the life-history and body size differences observed upstream are correlated back to the groups forming the bimodal migration observed at Bonneville Dam. Furthermore, the relationship between patterns observed at the dams and the distribution of adults in spawning areas throughout the Snake River Basin is not well understood. A-run steelhead are believed to occur throughout the steelhead-bearing streams of the Snake River Basin and the inland Columbia River; B-run steelhead are thought to be produced only in the Clearwater, Middle Fork Salmon, and South Fork Salmon Rivers (IDFG 1994).

The half-pounder is an immature steelhead that returns to fresh water after only 2 to 4 months in the ocean, generally overwinters in fresh water, and then outmigrates again the following spring. Half-pounders are generally less than 400mm and are reported only from the Rogue, Klamath, Mad, and Eel Rivers of Southern Oregon and Northern California (Snyder 1925, Kesner and Barnhart 1972, Everest 1973, Barnhart 1986); however, it has been suggested that as mature steelhead, these fish may only spawn in the Rogue and Klamath River Basins (Cramer *et al.* 1995). Various explanations for this unusual life history have been proposed, but there is still no consensus as to what, if any, advantage it affords to the steelhead of these rivers.

In May 1992, NOAA Fisheries was petitioned by the Oregon Natural Resources Council (ONRC) and 10 co-petitioners to list Oregon's Illinois River winter steelhead (ONRC *et al.* 1992). NOAA Fisheries concluded that Illinois River winter steelhead by themselves did not constitute an ESA ‘species’ (Busby *et al.* 1993, NMFS 1993). In February 1994, NOAA Fisheries received a petition seeking protection under the Endangered Species Act (ESA) for 178 populations of steelhead (anadromous steelhead) in Washington, Idaho, Oregon, and California. At the time, NOAA Fisheries was conducting a status review of coastal steelhead populations (*O. m. irideus*) in Washington, Oregon, and California. In response to the broader petition, NOAA Fisheries expanded the ongoing status review to include inland steelhead (*O. m. gairdneri*) occurring east of the Cascade Mountains in Washington, Idaho, and Oregon.

In 1995, the steelhead BRT met to review the biology and ecology of West Coast steelhead. After considering available information on steelhead genetics, phylogeny, and life history, freshwater ichthyogeography, and environmental features that may affect steelhead, the BRT identified 15 ESUs—12 coastal forms and three inland forms. After considering available information on population abundance and other risk factors, the BRT concluded that five steelhead ESUs (Central California Coast, South-Central California Coast, Southern California, Central Valley, and Upper Columbia River) were presently in danger of extinction, five steelhead ESUs (LCR, Oregon Coast, Klamath Mountains Province, Northern California, and Snake River Basin) were likely to become endangered in the foreseeable future, four steelhead ESUs (Puget Sound, Olympic Peninsula, Southwest Washington, and Upper Willamette River) were not presently in significant danger of becoming extinct or endangered, although individual stocks within these ESUs may be at risk, and one steelhead ESU (Middle Columbia River) was not presently in danger of extinction but the BRT was unable to reach a conclusion as to its risk of becoming endangered in the foreseeable future.

LCR Steelhead.

The status of LCR steelhead was initially reviewed by NOAA Fisheries in 1996 (Busby *et al.* 1996), and the most recent review occurred in 1998 (NMFS 1998a). In the 1998 review, the BRT noted several concerns for this ESU, including the low abundance relative to historical levels, the universal and often drastic declines observed since the mid-1980s, and the widespread occurrence of hatchery fish in naturally spawning steelhead populations. Analysis also suggested that introduced summer steelhead may negatively affect winter native winter steelhead in some populations. A majority of the 1998 BRT concluded that steelhead in the lower Columbia ESU were at risk of becoming endangered in the foreseeable future.

New data available for this update included: recent spawner data, additional data on the fraction of hatchery-origin spawners, recent harvest rates, updated hatchery release information, and a compilation of data on resident steelhead. For many of the Washington chinook salmon populations, the Washington Department of Fish and Wildlife has conducted analyses using the Ecosystem Diagnosis and Treatment (EDT) model. The EDT model attempts to predict fish population performance based on input information about reach-specific habitat attributes (http://www.olympus.net/community/dungenesswc/EDTprimer. pdf). New analyses for this update include the designation of demographically independent populations, recalculation of previous BRT metrics with additional years' data, estimates of median annual growth rate (ë) under different assumptions about the reproductive success of hatchery fish, and estimates of current and historically available kilometers of stream.

Based on the provisional framework discussed in the general Introduction to the BRT (2003) report, the BRT assumed as a working hypothesis that resident fish below historical barriers are part of this ESU, while those above long-standing natural barriers (e.g., in upper Clackamas, Sandy, and some of the small tributaries of the Columbia River Gorge) are not. Case 3 resident fish above dams on the Cowlitz, Lewis, and Sandy Rivers are of uncertain ESU status.

A large majority (over 79 percent) of the BRT votes for this ESU fell in the 'likely to become endangered' category, with small minorities falling in the 'danger of extinction' and 'not likely to become endangered' categories. The BRT found moderate risks in all the VSP categories, with mean risk matrix scores ranging from moderately low for spatial structure to moderately high for both abundance and growth rate/productivity. All of the major risk factors identified by previous BRTs still remain. Most populations are at relatively low abundance, and those with adequate data for modeling are estimated to have a relatively high extinction probability. Some populations, particularly summer run, have shown higher returns in the last 2-3 years. The Willamette LCR Technical Review Team has estimated that at least four historical populations are now extinct. The hatchery contribution to natural spawning remains high in many populations.

The status of the EF Lewis stock is described in NRCS 2004.

The Lower Columbia Fish Recovery Board rated the EF Lewis River summer steelhead as a legacy population.

Environmental Baseline

The ‘environmental baseline’ includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02). For projects that are ongoing actions, the effects of future actions over which the Federal agency has discretionary involvement or control will be analyzed as ‘effects of the action.’

NOAA Fisheries describes the environmental baseline in terms of the biological requirements for habitat features and processes necessary to support life stages of the subject ESUs within the action area. When the environmental baseline departs from those biological requirements, the adverse effects of a proposed action on the ESU or its habitat are more likely to jeopardize the listed species or result in destruction or adverse modification of critical habitat (NMFS 1999).

The biological requirements of salmon and steelhead in the action area vary depending on the life history stage present and the natural range of variation present within that system (Groot and Margolis 1991, NRC 1996, Spence *et al.* 1996). Generally, during spawning migrations, adult salmon require clean water with cool temperatures and access to thermal refugia, dissolved oxygen near 100 percent saturation, low turbidity, adequate flows and depths to allow passage over barriers to reach spawning sites, and sufficient holding and resting sites. Anadromous fish select spawning areas based on species-specific requirements of flow, water quality, substrate size, and groundwater upwelling. Embryo survival and fry emergence depend on substrate conditions (e.g., gravel size, porosity, permeability, and oxygen concentrations), substrate stability during high flows, and, for most species, water temperatures of 13°C or less. Habitat requirements for juvenile rearing include seasonally suitable microhabitats for holding, feeding, and resting. Migration of juveniles to rearing areas, whether the ocean, lakes, or other stream reaches, requires unobstructed access to these habitats. Physical, chemical, and thermal conditions may all impede migrations of adult or juvenile fish.

The project includes approximately 574 acres of land (see BA, Appendix B) within the floodplain of the EF of the Lewis River. The river divides the project into two distinct units, the north unit and the south unit. Below, baseline conditions for the north and south unit are described.

In July juvenile and adult summer- and winter-run steelhead and juvenile Coho are likely to utilize the EF River for rearing and migration. Fall run juvenile chinook are expected to have left by July. Chum leave the EF Lewis by May. (BA, NRCS 2004).

Adequate summer temperatures for steelhead and coho rearing and migration are of concern in the lower EF Lewis River. The lower EF Lewis River has been on the 303(d) list for exceeding State temperature standards. Average daily temperature in July of 2001 through 2003 are above 20 Celsius. Maximum temperature in July 2003 reached 27 Celsius, in July 2002, 24.8 Celsius, and in 2001, 22.2 Celsius (DOE 2004).

Mc Cullough (1999) showed that the distributional limit of Chinook and steelhead corresponds approximately to a mean daily water temperature of 20 Celsius. Sullivan *et al.* 2000 suggests a threshold of 26 C for annual maximum temperature from his analysis of lethal temperature. Juveniles are generally reported to have preferences for lower rearing temperatures than adults. (Ann Richter and Steven Kolmes, TRT 2004 and references herein). Thus, temperature can be assumed to be a critical and at times limiting factor for salmonids in the EF Lewis River.

Further baseline conditions for each of the two distinct wetland areas of the action area are described below. The area along the north side (right bank, looking downstream), the North Unit, of the river was cleared of almost all woody vegetation in the 1920's and improved for farming in the 1930's with the addition of drainage ditches, most notably the "Catfish Lake" outlet ditch. A flood-control dike and a water control structure was added along the river. Three parallel non-functioning, rusted screw gates currently limit fish access to the seasonally flooded portions of the wetland. This land has since been managed as pasture and hayland. Reed canary grass was cut and baled for hay in 1999 and for many years prior to this. There are no perennial streams on this property, although approximately two acres hold water through the summer months during most years. Native wetland plants dominate about 40 acres of this 132 acre unit (30 percent). Native species include sedges, rushes, wapato, smartweed and mannagrass. The remaining acreage is primarily reed canary grass and other pasture species.

The South Unit of the project covers 450 acres. Agricultural modifications on the south side include the installation of drainage ditches and a cross dike built to direct water off the site. In addition, a "L-shaped" levee is present and was most likely built to hold water for duck hunting. A 1939 aerial photo (No. 1733) shows a mixture of shrub/scrub and emergent marsh wetland conditions as well some areas of riparian forest cover. Roughly two-thirds of the original woody vegetation has been removed. A small, spring-fed channel drains north, along the toe of the hill, for most of the length of this property. Much of the receding floodwater returns to the river via this channel. Native plants dominate only about one-third of the acreage; the remaining acreage is introduced pasture grasses, primarily reed canary grass.

The following description of the baseline hydrology applies to both wetland units. From mid-October to mid-November, the hydrology is driven by precipitation, which collects in closed depressions in the floodplain. Repeated flooding occurs beginning in late-November and continues into June, with the water receding between flood events. Flooding results from high flows on the EF of the Lewis River and high river levels on the Columbia River causing water to back up into the project area. From late-June to late-July the water on the site is from flood flows and precipitation trapped by the topography.

Water retention has been reduced by drainage ditches. This creates ideal conditions for non-native reed canary grass. Areas dominated by native wetland species exist in floodplain depressions and a relic river channel ("Catfish Lake"). These areas all exhibit a greater degree of ponding into the mid-summer as well as remaining inundated between flood events.

The dikes along the river and the cross-dike have been partially breached by past floods and have not been repaired. Although they have been breached, they still generally limit the flow of water through the floodplain.

Each ESU considered in this Opinion resides in or migrates through the action areas. Thus, for this action area, the biological requirements for salmon and steelhead are the habitat characteristics that would support successful migration for all four adult ESUs and successful rearing for chinook, steelhead, and coho. In particular they are adequate summer temperatures in the Lower EF Lewis River, and accessible and good floodplain rearing habitat for juveniles.

Effects of the Action

'Effects of the action' means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02).

'Indirect effects' are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). Indirect effects may occur outside the area directly affected by the action, and may include other Federal actions that have not undergone section 7 consultation but will result from the action under consideration. To be considered indirect effects, such actions must be reasonably certain to occur, as evidenced by appropriations, work plans, permits issued, or budgeting; follow a pattern of activity undertaken by the agency in the action area; or be a logical extension of the proposed action.

'Interrelated actions' are those that are part of a larger action and depend on the larger action for their justification; 'interdependent actions' are those that have no independent utility apart from the action under consideration (50 CFR 402.02). Future Federal actions that are not a direct effect of the action under consideration, and not included in the environmental baseline or treated as indirect effects, are not considered in this Opinion.

Effects on Listed Species and their Habitat

The applicant proposes to perform no instream work in the EF Lewis River. All work below the ordinary high water mark is proposed to be performed in the dry. (NRCS, 2004) Thus, NOAA

Fisheries agrees with the assessment of the applicant that there are no short term construction related adverse impacts.

Overall the long-term effects of the proposed actions are expected to be beneficial. Removing and breaching the dike, planting woody vegetation, and excluding livestock are expected to partially restore floodplain functions including hydrology. Regrading some of the floodplain on the north unit and installing one water-control structure is intended to enhance and enlarge winter floodplain rearing opportunities for juvenile salmonids. Sommer *et al.* (2001) showed that floodplain rearing can lead to better growth rates in chinook compared to river rearing. He attributed these better growth rates to greater availability of drift insects. NOAA Fisheries expects an increase in juvenile survival related to the enhanced rearing opportunities in the entire 574 acres of to be enhanced floodplain.

Regrading some of the floodplain on the north unit and installing one water-control structure may result in some adverse effects. NOAA Fisheries consulted on a similar wetland enhancement project with water-control structures on Sauvie Island, OR in 1999 (OSB 1999-0282). That consultation analyzed a potential delay of migration of juvenile salmonids and a potential increase in stranding beyond that which currently exists. Currently there is some ponding in the summer time mainly in the Catfish Lake area. NOAA Fisheries assumes that some stranding of juveniles is associated with these small and during the summer isolated pockets of water.

The proposed action could lead to conditions including migratory delay where juveniles reside in the wetland longer than they would under preexisting conditions. Additionally, juveniles delaying migration could be stranded leading to injury and death for chinook, steelhead, and coho salmon. Baker and Miranda (2003) and Baker (2003) found juveniles of these three species rearing in wetlands with water control structures. In contrast, chum are thought to emigrate shortly after hatching and have not been found in any of the wetlands monitored over the last three years (Baker and Miranda, 2003).

The proposed project intends to restore floodplain habitat and enhance hydraulics by mimicking natural conditions. A total restoration cannot be achieved due to the remaining dike sections along the EF Lewis River and the Columbia River Dams. In pre-dam times, flood events in the LCR used to effect the Lower EF Lewis River and result in flooding in the action area. As a result, flood frequency and magnitude are expected to be reduced compared to historic conditions (Baker and Miranda, 2003). The enhanced hydrology will cause occasionally slower outflow velocity associated with migratory delay and stranding. The effect of the migratory delay could be beneficial or detrimental, depending on rearing conditions in the wetland and conditions during outmigration in the EF Lewis River. To answer this open question NOAA Fisheries has required monitoring of migration delay (T&C 1d.).

The DU has been studying migratory delay and other water-control structure related issues since 2001. Baker and Miranda (2003) have summarized preliminary results that indicate that water-control structures provide fish passage, but lack of data does not allow them to analyze the question of migratory delay. The current data indicate that a much greater sampling effort would be needed to ever answer the question of migratory delay conclusively (Baker and Miranda, 2003).

From the current data the question of stranding can not be addressed very well either (p 96/97 in Baker and Miranda, 2003, and Appendix A). Preliminary studies by Baker and Miranda, 2003 (p. 88) show that salmon move into the wetlands in winter and out of wetlands in the spring: "68 percent of the salmonids that entered the wetlands did so before April 1; and 83 percent of the salmonids in the outbound trap were caught after April 1." Most of the fish (85 percent) at the Multenomah North wetland left the wetland during April and May. Overall around 70 percent to 80 percent of salmon leaving the wetlands were caught in April and May. Emigration correlated with high flow events. (p. 32 in Baker 2003). These data give an indication that just as under natural floodplain conditions most salmon know when to leave. The currently available data do not allow us to calculate which percentage of the salmonids utilizing the wetland do leave and which percentage get stranded. NOAA Fisheries conducted a literature search which did not result in any more conclusive information (Appendix A).

Due to all the uncertainties left by the available monitoring data, NOAA Fisheries cannot calculate an estimate of quantities of juveniles that are likely to die as a result of the proposed action. The proposed floodplain habitat is designed to increase rearing habitat and be as close to natural conditions as possible. However, unavoidable differences in flood frequency and magnitude compared to historic conditions are expected to result in, at times, slow outflow velocities that are likely to result in some stranding and migratory delay. To minimize these adverse effects the entire channel and associated low spots in the floodplain behind the water-control structure are proposed to be regraded so that they are all connected at low flow. This will facilitate that juveniles do not get stranded in isolated pockets of deep water. A second minimization/conservation measure is that the applicant will operate the water-control structure to minimize take. The current operating proposal prescribes a minimum of one inch flow over the water control structure. The monitoring results and hydraulic analysis will give some indication on how to best adjust flow for juvenile salmonids (adaptive management). The preliminary monitoring data do not answer the question of migratory delay, but indicate that many salmon utilizing the wetland leave by June, prior to the water temperature reaching critical levels (Baker and Miranda, 2003). Considering the minimization measures and the indication that juveniles leave the wetland by June NOAA Fisheries estimates that less than 10 percent (over the present level or occurrence of stranding) of the juveniles utilizing the wetland will be subject to stranding or migratory delay.

To further estimate the magnitude of the adverse effect NOAA Fisheries estimated the percentage of juveniles from the EF Lewis River that are likely to be exposed to the estimated maximum mortality of 30 percent. The north unit is 132 acres. NOAA Fisheries estimates that this is approximately 6 percent (Appendix B) of the seasonally available floodplain habitat of the

Lower EF Lewis River below Lucia Falls[2]. NOAA Fisheries assumes that chinook and steelhead who have been shown to rear in mainstem and off-channel areas are distributed evenly over the available floodplain when averaged over the flooding season (October to June). NOAA Fisheries assumes that juvenile coho that seek out off-channel rearing habitat will occur at 1.5 the average density (total juveniles per total floodplain and river area) in the subject wetland. Using these assumptions leads to the conclusion that less than 1.1 percent of the juvenile coho and .7 percent of the juvenile chinook and steelhead from the EF Lewis River will be subject to stranding or delayed migration (Appendix B). The entire project would enhance 574 acres of floodplain, approximately 30 percent of the available floodplain habitat of the Lower EF Lewis River. Thus, approximately 29 percent of the juvenile chinook and steelhead and 44 percent of the juvenile coho from the EF Lewis River are expected to experience enhanced survival due to improved rearing conditions.

Cumulative Effects

'Cumulative effects' are 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 (50 CFR 402.02). Cumulative effects that reduce the capacity of listed ESUs to meet their biological requirements in the action area increase the risk to the ESU that the effects of the proposed action on the ESU or its habitat will result in jeopardy (NMFS 1999).

All of the action area except for 2.5 miles of the EF Lewis River is contained in an conservation easement. No major state or private activities are likely to take place in the floodplain wetlands. The following analysis relates only to the 2.5 miles of the EF Lewis River.

Between 1990 and 2000, the population of Clark County increased by 45 percent.[2] Thus, NOAA Fisheries assumes that future private and state actions will continue within the action area, increasing as population density rises. As the human population in the action area continues to grow, demand for agricultural, commercial, or residential development is also likely to grow. The effects that new developments have that are caused by that demand are likely to further reduce the conservation value of habitat within the action area.

Although quantifying an incremental change in survival for the ESUs considered in this consultation due to the cumulative effects is not possible, it is reasonably likely that those effects within the action area will have a long-term negative effect on the likelihood of their survival and recovery.

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[2] Lucia Falls is a migration barrier for Chinook and chum. Steelhead and coho may pass the falls depending of flow conditions. Lucia Falls is a migration barrier for Chinook and chum. Steelhead and coho may pass the falls depending of flow conditions. Lucia Falls is a migration barrier for Chinook and chum. Steelhead and coho may pass the falls depending of flow conditions.

[2] U.S. Census Bureau, State and County Quickfacts, Clark County, WA. any county Available at http://quickfacts.census.gov/qfd/

Conclusion

After reviewing the best available scientific and commercial information regarding the biological requirements and the status of the LCR chinook ESU, LCR steelhead ESU, Columbia River chum ESU, and proposed LCR coho ESU considered in this Opinion, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, NOAA Fisheries' concludes that the action, as proposed, is not likely to jeopardize the continued existence of these species.

These conclusions are based on the following considerations: Overall the project will enhance winter rearing opportunities for listed juvenile salmonids by enhancing the survival rate. However, some mortality is likely to occur as a result of stranding and delayed migration. This mortality is thought to be a little higher than under existing conditions. Calculations based on the best available science and assumptions puts the extent of the adverse effect at less than one percent of the juvenile Chinook and steelhead, and 1.1 percent of coho of the EF Lewis River run. This compares to around 28 percent which are expected to benefit from the enhanced winter rearing.

Reinitiation of Consultation

Reinitiation of formal consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) If the amount or extent of taking specified in the incidental take statement is exceeded. If the monitoring data indicate that more than one percent of the juvenile chinook, coho, and steelhead from the EF Lewis River die from stranding; (b) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (c) If the identified action is subsequently modified in a manner that has an effect to the listed species or critical habitat that was not considered in the biological opinion; or (d) If a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR 402.16).

To reinitiate consultation, contact the appropriate State Office Habitat Office of NOAA Fisheries and refer to the NOAA Fisheries Number assigned to this consultation.

Incidental Take Statement

Section 9(a)(1) of the ESA prohibits the taking of listed species without a specific permit or exemption. Protective regulations adopted pursuant to section 4(d) extends the prohibition to threatened species. Among other things, an action that harasses, wounds, or kills an individual of a listed species or harms a species by altering habitat in a way that significantly impairs its essential behavioral patterns is a taking (50 CFR 222.102). Incidental take refers to 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). Section 7(o)(2) exempts any taking that meets the terms and conditions of a written incidental take statement from the taking prohibition.

Amount or Extent of Take

Juvenile chinook, steelhead, and coho are likely to be present in the North Unit of the action area during part of the year when at least some effects of the proposed action will occur. Because these effects will injure or kill, or increase the likelihood that individuals will be injured or killed, NOAA Fisheries expects that take is reasonably certain to occur.

NOAA Fisheries expects that juvenile chinook, steelhead, and coho will die from delayed migration and stranding. To estimate the magnitude of the effect NOAA conducted a comparitative habitat analysis based on the best available data. Based on that analysis mortality of EF Lewis River chinook and steelhead juveniles is less than one percent and less than 1.1 percent for coho.

Based on available data, NOAA Fisheries cannot quantify the amount of anticipated take in numbers of individual fish the will be injured or killed from delayed migration and stranding. In such cases NOAA characterizes the amount of take as unquantifiable.

Reasonable and Prudent Measures

Reasonable and prudent measures are non-discretionary measures to avoid or minimize take that must be carried out by cooperators for the exemption in section 7(o)(2) to apply. The NRCS has the continuing duty to regulate the activities covered in this incidental take statement where discretionary Federal involvement or control over the action has been retained or is authorized by law. The protective coverage of section 7(o)(2) may lapse if the NRCS fails to exercise its discretion to require adherence to terms and conditions of the incidental take statement, or to exercise that discretion as necessary to retain the oversight to ensure compliance with these terms and conditions. Similarly, if any applicant fails to act in accordance with the terms and conditions of the incidental take statement, protective coverage may lapse.

The following reasonable and prudent measures are necessary and appropriate to minimize take of listed species resulting from completion of the proposed action. These reasonable and prudent measures would also minimize adverse effects to critical habitat, if any.

The NRCS shall:

1. Minimize incidental take by operating the water-control structure to maximize benefits to rearing salmonids.

2. Ensure completion of a comprehensive monitoring and reporting program to confirm this Opinion is meeting its objective of minimizing take from permitted activities.

Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, the NRCS and its cooperators must comply with the following terms and conditions, that implement the reasonable and prudent measures described above. Partial compliance with these terms and conditions may invalidate this take exemption or lead NOAA Fisheries to a different conclusion regarding whether the proposed action will result in jeopardy.

1. To implement Reasonable and Prudent Measure No. 1, the NRCS shall ensure that: The DU continues its monitoring program at the restoration site. Monitoring efforts shall be designed to answer the open questions of how many juvenile salmonids utilize the wetland at the end of spring (May-July), when outmigration is expected. These abundance data shall be compared to the reference site. If relative abundance (catch per unit effort data) suggests that juveniles reside significantly longer in the controlled wetland and thus are subject to potential stranding and migration delay, flow rates shall be increased in coordination with NOAA Fisheries. It may take several years to get sufficient data to understand the magnitude of juvenile stranding and migratory delay. Thus, emphasize also shall be placed on the hydraulic analysis and comparison of pre-restoration, post-restoration, and historic conditions. Flow rates at the water-control structure shall be managed to resemble historic conditions as closely as possible.

2. To implement Reasonable and Prudent Measure No. 2, the NRCS shall ensure that: DU submits an annual monitoring report to NOAA Fisheries to the address listed below:

Steven W Landino
NOAA Fisheries
Habitat Conservation Division
510 Desmond Drive SE Suite 103
Lacy, Washington 98503
Attn: SW Washington Branch Chief

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

Background

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

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

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

An EFH consultation with NOAA Fisheries is required for 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 to EFH.

Identification of Essential Fish Habitat

Pursuant to the MSA the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of federally-managed Pacific salmon: chinook (*Oncorhynchus 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 water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC 1999), and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of potential adverse effects to these species' EFH from the proposed action is based, in part, on this information.

Proposed Actions

The proposed action and action area are detailed above in the "Proposed Action" section of this document. The project encompasses habitats that have been designated as EFH for chinook and coho.

Effects of Proposed Action

As described in detail in the "Effects of the Action" section of this document, the proposed action may result in the following long-term adverse effect to juvenile chinook and coho:

- Slow outflow rates out of the North Unit floodplain wetland that may result in stranding and migratory delay.

Conclusion

NOAA Fisheries concludes that the proposed action would adversely affect the EFH for chinook and coho.

Essential Fish Habitat Conservation Recommendations

Pursuant to Section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations to Federal agencies regarding actions which may adversely affect EFH. Although NOAA Fisheries understands that the conservation measures described in the BA will be implemented by the NRCS, it does not believe that these measures are sufficient to address the adverse impacts to EFH described above. Therefore, NOAA Fisheries recommends that: NRCS operate the water-control structure to maximize benefits to salmonids. To be able to decide what operation would benefit salmonids NOAA Fisheries recommends that:

- The DU continue its monitoring program at the restoration site.

- Monitoring efforts be designed to answer the open questions of how many juvenile salmonids utilize the wetland at the end of spring (May-July), when outmigration is expected.
- Compare these abundance data to the reference site.

If relative abundance (catch per unit effort data) suggests that juveniles reside significantly longer in the controlled wetland and thus are subject to potential stranding and migration delay, NOAA Fisheries recommends that flow rates be increased in coordination with NOAA Fisheries.

Statutory Response Requirement

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

Supplemental Consultation

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

DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

Section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-554) ("Data Quality Act") specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the Biological Opinion addresses these DQA components, documents compliance with the Data Quality Act, and certifies that this Biological Opinion has undergone pre-dissemination review.

Utility: This document records the results of two interagency consultations, completed under two separate legal authorities. The information presented in this document is useful to two agencies of the Federal government (NOAA Fisheries and Natural Resources Conservation Service), the residents of Clark County, Washington, the Ducks Unlimited conservation organization, and the general public. These consultations help fulfill multiple legal obligations of the named agencies. The information is also useful and of interest to the other identified people and organizations because it describes the manner in which public trust resources are being managed and conserved. The information presented in these documents and used in the underlying consultations represents the best available scientific and commercial information and has been improved through interaction with the consulting agency.

Integrity: This consultation was completed on a computer system managed by NOAA Fisheries in accordance with relevant information technology security policies and standards set out in Appendix III, "Security of Automated Information Resources," Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

Objectivity: Information Product Category: Natural Resource Plan.

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NOAA Fisheries ESA Consultation Handbook, ESA Regulations, 50 CFR 402.01 et seq., and the Magnuson-Stevens Fishery Conservation and Management Act (MSA) implementing regulations regarding Essential Fish Habitat, 50 CFR 600.920(j).

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the literature cited section. The analyses in this biological opinion/EFH consultation contain more background on information sources and quality. Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NOAA Fisheries staff with training in ESA and MSA implementation, and reviewed in accordance with Northwest Region ESA quality control and assurance processes.

LITERATURE CITED

Baker Cyndi. August 2003. Floodplain Wetland Restoration and Pacific Salmon 2002 Annual Report to NOAA Fisheries. The Sauvie Report

Baker Cyndi and Rose Miranda. November 2003. Fish Monitoring at Floodplain Wetland Monitoring Sites in the Pacific Northwest. Draft

Barnhart, R. A. 1986. Species profiles: Life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest)--steelhead. U.S. Fish Wildlife Service Biological Report 82(11.60), 21 p.

Behnke, R. J. 1992. Native trout of western North America. American Fisheries Society Monograph 6, 275 p. American Fisheries Society, Bethesda, Maryland.

BRT (West Coast Salmon Biological Review Team). 2003. Updated status of Federally listed ESUs of West Coast salmon and steelhead. U. S. Department of Commerce, National Marine Fisheries Service, Northwest Fisheries Science Center and Southwest Fisheries Science Center (July 2003). http://www.nwr.noaa.gov/AlseaResponse/20040528/brtusr.html

Bryant, G. J. 1994. Status review of coho salmon in Scott Creek and Waddell Creek, Santa Cruz County, California. National Marine Fisheries Service, Southwest Region, Protected Species Management Division, 102 p. Available from National Marine Fisheries Service, Southwest Region, 501 W. Ocean Blvd., Suite 4200, Long Beach, California 90802.

Burgner, R. L., J. T. Light, L. Margolis, T. Okazaki, A. Tautz, and S. Ito. 1992. Distribution and origins of steelhead trout (*Oncorhynchus mykiss*) in offshore waters of the North Pacific Ocean. International North Pacific Fisheries Commission Bulletin. 51, 92 p.

Busby, P. J., O. W. Johnson, T. C. Wainwright, F. W. Waknitz, and R. S. Waples. 1993. Status review for Oregon's Illinois River winter steelhead. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-10, 85 p.

Busby, P. J., T. C. Wainwright, G. J. Bryant, L. J. Lierheimer, R. S. Waples, F.W. Waknitz, and I. V. Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-NWFSC-27, 261 p.

CDFG (California Department of Fish and Game). 1995. Letter to M. Schiewe for the ESA Administrative Record for west coast steelhead (30 March 1995), 10 p. plus attachments.

Available from Environmental and Technical Services Division, National Marine Fisheries Service, 525 NE Oregon Street, Suite 500, Portland, Oregon 97232.

Cramer, S. P., and 12 co-authors. 1995. The status of steelhead populations in California in regards to the Endangered Species Act. Document prepared for Association of California Water Agencies, 167 p. Available from Environmental and Technical Services Division, National Marine Fisheries Service, 525 NE Oregon Street, Suite 500, Portland, Oregon 97232.

Crone, R. A., and C. E. Bond. 1976. Life history of coho salmon, *Oncorhynchus kisutch*, in Sashin Creek, southeastern Alaska. Fisheries Bulletin, U.S., 74(4):897-923.

Dammers, Wolf. 2000. Washington Department of Fish and Wildlife, Fish and Wildlife Biologist. Personal communication, January 4, 2004.

DOE 2004. Water quality data from Department of Ecology web page: saved with admin record as tmp27D090EFLewisDOE.xls

Everest, F. H. 1973. Ecology and management of summer steelhead in the Rogue River. Oregon State Game Commission, Fishery Research Report 7, Corvallis, Oregon. 48 p.

Gilbert, C. H. 1912. Age at maturity of Pacific coast salmon of the genus *Oncorhynchus*. Bulletin of the U.S. Fisheries Commission 32:57-70.

Godfrey, H., K. A. Henry, and S. Machidori. 1975. Distribution and abundance of coho salmon in offshore waters of the North Pacific Ocean. International North Pacific Fisheries Commission Bulletin 31, 80 p.

Groot, C. and L. Margolis. 1991. Pacific Salmon Life Histories. UBC Press, Vancouver, Canada. 564 p.

Healey, M. C. 1983. Coastwide distribution and ocean migration patterns of stream- and ocean type chinook salmon, *Oncorhynchus tshawytscha*. Canadian Field-Naturalist 97:427-433.

Healey, M. C. 1986. Optimum size and age at maturity in Pacific salmon and effects of size selective fisheries. Canadian Special Publication of Fisheries and Aquatic Sciences 89:39-52.

Healey, M.C. 1991. The life history of chinook salmon (*Oncorhynchus tshawytscha*). *In*: C. Groot and L. Margolis (eds), Life history of Pacific salmon, p. 311-393. Univ. BC Press, Vancouver, BC.

Hayman R.A., E.M. Beamer, and R.E. Mc Clure. 1996 Skagit System Cooperative Chinook Restoration Research Progress Report No.1. Skagit System Cooperative, LaConner, WA 98257

IDFG (Idaho Department of Fish and Game). 1994. Documents submitted to the ESA Administrative Record for west coast steelhead by E. Leitzinger, October 18, 1994. Available from Environmental and Technical Services Division, National Marine Fisheries Service, 525 NE Oregon Street, Suite 500, Portland, Oregon 97232

Johnson, O.W., T.A. Flagg, D.J. Maynard, G.B. Milner, and F.W. Waknitz. 1991. Status review for Lower Columbia River Coho Salmon. U.S. Dep. Commer. NOAA Tech. Memo. NMFS F/NWC-202 94 p.

Kesner, W. D., and R. A. Barnhart. 1972. Characteristics of the fall-run steelhead trout *(Salmo gairdneri gairdneri*) of the Klamath River system with emphasis on the half-pounder. California Fish and Game 58(3):204-220.

Laufle, J. C., G. B. Pauley, and M. F. Shepard. 1986. Species profiles: Life histories and environmental requirements of coastal fishes and invertebrates (Pacific Northwest): coho salmon. U.S. Fish and Wildlife Service Biological Report 82 (11.48), 18 p.

Matthews G.M. and R.S. Waples. 1991. Status review for Snake River spring and summer chinook salmon. NOAA Tech. Memo. NMFS F/NWC-200 75 p. (Available from Natl. Marine Fish. Serv., Northwest Fisheries Science Center, Coastal Zone and Estuarine Studies Division, 2725 Montlake Blvd. E., Seattle, WA, 98112--2097)

McCullough, D.A. 1999. A review and synthesis of effects of alterations to the water temperature regime on freshwater life stages of salmonids, with special reference to Chinook salmon. Water Resource Assessment, U.S. EPA 910-R-99-010, Columbia River Inter-Tribal Fish Commission, Portland, Ore. 291 p.

McElhany, P., M. Ruckleshaus, M. J. Ford, T. Wainwright, and E. Bjorkstedt. 2000. Viable Salmon Populations and the Recovery of Evolutionarily Significant Units. U. S. Department of Commerce, National Marine Fisheries Service, Northwest Fisheries Science Center, NOAA Technical Memorandum NMFS-NWFSC-42. 156 p. http://www.nwfsc.noaa.gov/publications/techmemos/tm42/tm42.pdf

McEwan, D., and T. A. Jackson. 1996. Steelhead restoration and management plan for California. California Dep. Fish Game, 234 p. Available from California Department of Fish and Game, Inland Fisheries Division, 1416 Ninth Street, Sacramento, California 95814.

McPhail, J.D., and C. C. Lindsey. 1970. Freshwater fishes of Northwestern Canada and Alaska. Bulletin of the Fisheries Research Board of Canada 173:381.

Miller, R. J., and E. L. Brannon. 1982. The origin and development of life-history patterns in Pacific salmon. In, E. L. Brannon and E. O. Salo (editors), Proceedings of the Salmon and Trout Migratory Behavior Symposium, pages 296-309. University of Washington Press, Seattle, Washington.

Murphy, M.L., J. Heifetz, J.F. Thedinga, S.W. Johnson, and K.V. Koski. 1989. Habitat utilization by juvenile Pacific salmon in the glacial Taku River, Southeast Alaska. Can J of Fish and Aquat. Science 46:1677-1685

Myers, J.M., R.G. Kope, G.J. Bryant, D. Teel, L.J. Lierheimer, T.C. Wainwright, W.S. Grant, F.W. Waknitz, K. Neely, S.T. Lindley, and R.S. Waples. 1998. Status review of chinook salmon from Washington, Idaho, Oregon, and California. U.S. Department of Commerce, NOAA Technical Memo. NMFS-NWFSC-35, 443 p.

Myers, J. M., C. Busack, D. Rawding, and A. Marshall. 2002. Identifying historical populations of chinook and chum salmon and steelhead within the lower Columbia River and upper Willamette River evolutionarily significant units. Draft report to the co-managers from the Willamette/Lower Colombia River Technical Recovery team, National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, Washington (May 10, 2002).

Neave, F. 1961. Pacific salmon: Ocean stocks and fishery developments. Proceedings of the 9th Pacific Science Congress 1957(10):59-62.

NMFS (National Marine Fisheries Service). 1987. Endangered and threatened species; winter run chinook salmon. Federal Register [Docket No. 27 February 1986] 52(39):6041-6048.

NMFS (National Marine Fisheries Service). 1993. Endangered and threatened species; Illinois River winter steelhead in Oregon. Federal Register [Docket 930517-3117, 20 May 1993] 58(96): 29390-29392.

NMFS (National Marine Fisheries Service). 1996a. Supplemental report of the Biological Review Team on central California coast coho salmon. Memorandum from M. Schiewe to W. Stelle, dated 17 October, 1996, 4 p. Available from Environmental and Technical Services Division, National Marine Fisheries Service, 525 NE Oregon Street, Portland, Oregon 97232.

NMFS (National Marine Fisheries Service). 1996b. Status review update for coho salmon from Washington, Oregon, and California. Draft document prepared by the West Coast Coho salmon Biological Review Team, 20 December 1996, 47 p. plus tables, figures and appendices.

NMFS (National Marine Fisheries Service). 1997. Status review update for coho salmon from the Oregon and Northern California coasts. West Coast coho salmon Biological Review Team, 28 Mar. 1997. 70 p. + appendices.

NMFS (National Marine Fisheries Service). 1998a. Conclusions regarding the updated status of Puget Sound, Lower Columbia River, Upper Willamette River, and Upper Columbia River spring-run ESUs of West Coast Chinook Salmon. Memorandum to U. Varanasi (Northwest Fisheries Science Center), W. Stelle (National Marine Fisheries Service), and W. Hogarth (Southwest Fisheries Science Center) from M. Schiewe (Northwest Fisheries Science Center) (February 12, 1999) 62 p.

NMFS (National Marine Fisheries Service). 1998b. Endangered and threatened species: Proposed threatened status and designated critical habitat for Hood Canal summer-run chum salmon and Columbia River chum salmon. Federal Register [Docket 980219043-8043-01, No. 011498B. 10 March 1998] 63(46):11774-11795.NMFS 1998

NMFS (National Marine Fisheries Service). 1998e. Factors contributing to the decline of chinook salmon: an addendum to the 1996 West Coast steelhead factors for decline report. Protected Resource Division, National Marine Fisheries Service, Portland, Oregon. 70 p.

NMFS (National Marine Fisheries Service). 1999a. Status review update for deferred ESUs of West Coast chinook salmon (*Oncorhynchus tshawytscha*) from Washington, Oregon, California, and Idaho. Memorandum to U. Varanasi (Northwest Fisheries Science Center) and M. Tillman (Southwest Fisheries Science Center) from M. Schiewe (Northwest Fisheries Science Center) 16 July 1999. 116 p.

NMFS (National Marine Fisheries Service). 1999b. Endangered and threatened species: Threatened status for two ESUs of chum salmon in Washington and Oregon. [Docket 980219042-9069-02, No. 011498B. 25 March 1999] 64(57):14508-14517.NMFS 1999

NMFS (National Marine Fisheries Service). 1999. The Habitat Approach. Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Anadromous Salmonids. Northwest Region, Habitat Conservation and Protected Resources Divisions, Portland, Oregon (August 26, 1999). http://www.nwr.noaa.gov/1habcon/habweb/habguide/habitatapproach_081999.pdf

NMFS (National Marine Fisheries Service). 2001a. Status review update for Lower Columbia River Coho Salmon. West Coast coho salmon Biological Review Team, May 2001. 67 p.

NOAA Fisheries. October 20, 1999. Biological Opinion. Sauvie Island North Unit Wetlands Project, Columbia County, OR. OSB 1999-0282.

NRC (National Research Council). 1996. Upstream—Salmon and Society in the Pacific Northwest. National Academy Press, Washington, D.C. 452 p.

NRCS (Natural Resources Conservation Service) 2004. Biological Assessment. East Fork Lewis River Wetland Restoration and Enhancement.

ONRC (Oregon Natural Resources Council), Siskiyou Regional Education Project, Federation of Fly Fishers, Kalmiopsis Audubon Society, Siskiyou Audubon Society, Klamath/Siskiyou Coalition, Headwaters, The Wilderness Society, North Coast Environmental Center, Oregon Chapter of The Sierra Club, and The National Wildlife Federation. 1992. Petition for a rule to list the Illinois River winter steelhead as threatened or endangered under the Endangered Species Act and to designate critical habitat. Unpublished manuscript, 16 p. (Document submitted to U.S. Department of Commerce, NOAA Fisheries, National Marine Fisheries Service, Northwest Region, Seattle, Washington, May 1992).

Oregon Plan. 1997. Oregon Plan for Salmon and Watersheds (consisting of the Oregon Coastal Salmon Restoration Initiative, March 10, 1997 and as amended with the steelhead Supplement, December 1997). Governor's Natural Resources Office, State of Oregon, Salem.

Oregon Trout, Native Fish Society, Oregon Council of Trout Unlimited. 2000. Petition to list lower Columbia River coho salmon (*Oncorhynchus kisutch*) as endangered pursuant to the Endangered Species Act of 1973 as amended. Petition to Secretary of Commerce, Washington D.C. (July 2000) 22 p.

Pacific Fisherman. 1928. Record chum caught off Quadra. Pacific Fisherman 1928(Oct.):13.

PFMC (Pacific Fishery Management Council). 1999. Amendment 14 to the Pacific Coast Salmon Plan. Appendix A: Description and Identification of Essential Fish Habitat, Adverse Impacts and Recommended Conservation Measures for Salmon. Pacific Fishery Management Council, Portland, Oregon (March 1999). http://www.pcouncil.org/salmon/salfmp/a14.html

Pitcher, T. J. 1986. Functions of shoaling in teleosts. In, T. J. Fisher (editor). The Behavior of Teleost Fishes, pages 294-337. Johns Hopkins University Press, Baltimore, Maryland.

Randall, R. G., M. C. Healey, and J. B. Dempson. 1987. Variability in length of freshwater residence of salmon, trout, and char. In, M.J. Dodswell *et al.* (editors), Common Strategies of Anadromous and Catadromous Fishes. American Fisheries Society Symposia, Bethesda, Maryland. 1:27-41.

Reeves, GH; Everest, FH; Nickelson, TE. 1989. Identification of physical habitats limiting the production of coho salmo in western Oregon and Washington. GEN. TECH. REP. USDA FOR. SERV. PAC. NW. RANGE EXP. STN., 1989, 25 pp

Richter Ann and Steven Kolmes. Maximum Temperature: Upper Optimal Temperature Limits for Salmonids in the Willamette and Lower Coumbia Rivers. Appenix L of Salmonid Viability Criteria. 2003. Technical Review Team Report. http://research.nwfsc.noaa.gov/trt/viability_criteria.htm

Roelofs, T. D. 1983. Current status of California summer steelhead (*Salmo gairdneri*) stocks and habitat, and recommendations for their management. Submitted to U.S. Department of Agriculture, Forest Service, Region 5, 77 p. Available from Environmental and Technical Services Division, National Marine Fisheries Service, 525 NE Oregon Street, Suite 500, Portland, Oregon 97232

Salo E.O. 1991. Life History of Chum Salmon (*Oncorhynchus keta*). In: Groot, C. and L. Margolis (editors). 1991. Pacific salmon life histories. University of British Columbia Press, Vancouver, British Columbia.

Sandercock, F.K. 1991. Life history of coho salmon (*Oncorhynchus kisutch*). Pages 395-446 In: Groot, C. and L. Margolis (editors). 1991. Pacific salmon life histories. University of British Columbia Press, Vancouver, British Columbia.

Snyder, J. O. 1925. The half-pounder of Eel River, a steelhead trout. California Fish and Game 11(2): 49-55.

Sommer, T. R., M. L. Nobriga, W. C. Harrell, W. Batham, and W. J. Kimmerer. 2001. Floodplain rearing of juvenile Chinook salmon: evidence of enhanced growth and survival. Can. J. Aquat. Sci. 58: 325-333

Spence, B.C, G.A. Lomnicky, R.M. Hughes, R.P. Novitzki. 1996. An Ecosystem Approach to Salmonid Conservation. TR-4501-96-6057. ManTech Environmental Research Services Corp., Corvallis, Oregon. (December 1996). http://www.nwr.noaa.gov/1habcon/habweb/habguide/ManTech/front.htm

Sullivan, K., D.J. Martin, R.D. Carwell, J.E. toll, and S. Duke. 2000. An analysis of the effects of temperature on salmonids of the Pacific Northwest with implications for selecting temperature criteria. Sustainable Ecosystems Institute Portland, Ore.

Taylor, E.B. 1991 Behavioural interactions and habitat use in juvenile Chinook and coho salmon. Animal Behaviour 42:729-744

Wade, Gary. 2000. WRIA 27 Habitat Limiting Factors Analysis. Washington Conservation Commission. Olympia, Washington.

Waples, R.S. 1991. Definition of "Species" Under the Endangered Species Act: Application to Pacific Salmon. U.S. Department of Commerce, National Marine Fisheries Service, Northwest Fisheries Science Center, NOAA Technical Memorandum NMFS- F/NWC-194. http://www.nwfsc.noaa.gov/publications/techmemos/tm194/waples.htm

Waknitz, F. W., G. M. Matthews, T. Wainwright, and G. A. Winans. 1995. Status review for Mid-Columbia River summer chinook salmon. NOAA Technical Memorandum, NMFS-NWFSC-22, 80 p.

Weitkamp, Laurie A., Thomas C. Wainwright, Gregory J. Bryant, George B. Milner, David J. Teel, Robert G. Kope, and Robin S. Waples. 1995. Status Review of Coho Salmon from Washington, Oregon, and California.

Zhou, S. and M. Chilcote. 2003. Stock assessment and population viability of Clackamas River coho salmon. Oregon Department of Fish and Wildlife Fish Division Information Report; Portland, Oregon. 35 p.

APPENDIX A: Stranding of Juvenile Salmonids in the Wetland

From the current data the question of stranding can not be addressed very well. (p 96/97 in Baker and Miranda, Nov. 2003) However, to get an idea of the relevance and magnitude of this problem Cyndi Baker interprets Bleckmann, 1993 in her draft annual report, 2003, to mean that fish with lateral lines have an extraordinary ability for detecting velocities as low as .03 mm/sec. It would be helpful for estimating the magnitude of potential juvenile salmonid stranding to know the minimum velocity detection for salmonids and which velocities trigger a behavioral response. NOAA Fisheries could then estimated the minimal average outflow velocities for the proposed wetland and compare it to the minimum response velocity, see example calculations below.

<u>Example Calculations:</u>
To calculate outflow velocities for the proposed wetland I made the following assumptions, drawn from the BA (NRCS 2004):
an outflow of 1 inch over the riser and
a flow of 1.18 cfs(see calculations for average outflow volume below.) and
an average wetland depth of 1.3 ft = 70 acre foot/ 54 acre and
a width of 850 ft to a maximum of 1250 ft perpendicular to the flow (taken from sheet 3 of 9 Appendix F, BA, NRCS 2004)

<u>Results:</u>
<u>The calculated velocities are .55 and .38 mm/sec respectively.</u>

.001068 ft/sec = 1.18 cfs /(1.3 ft*850 ft)
0.001067873 foot/second = 0.3254877 millimeter/second

.000726 mm/sec = 1.18 cfs /(1.3 ft*1250 ft)
0.0007262 foot/second = 0.2213458 millimeter/second

However, NOAA Fisheries interprets Bleckmann, 1993, to mean that the absolute sensitivity for freestanding neuromasts in less than .03 mm/sec. Blackmann (1993) conditions the absolute sensitivity number by explaining that "the hydrodynamic stimulus which drives the cupula is different from the stimulus the animal detects. The reason for this is that the velocity of the water at the surface of the animal is proportional to a fractional derivative of the velocity of the water volume outside the boundary layer." NOAA fisheries ran a literature search to find minimal flow detection velocities in salmonids. The following data bases and key words were used:

Database	Years	Key words	Returned references
CSA Aquatic Science and Fisheries Abstracts, Oceanic Abstracts,	All	Flow detection AND salmonids	0

Water Resources Abstracts			
		Flow detection	7 (FlowDetectionRef)
ISI Current Content Connect	All	Flow Detection and Salmon Flow Detection and Salmonid Flow Detection and Fish Velocity Detection Velocity Thresholds Fish and (Cupula or Neuromasts) Salmon and (Cupula or Neuromasts)	0 0 1 13 16 47 3

None of the articles contain relevant information.

Thus, until further research returns results NOAA Fisheries has to assume that some stranding occurs.

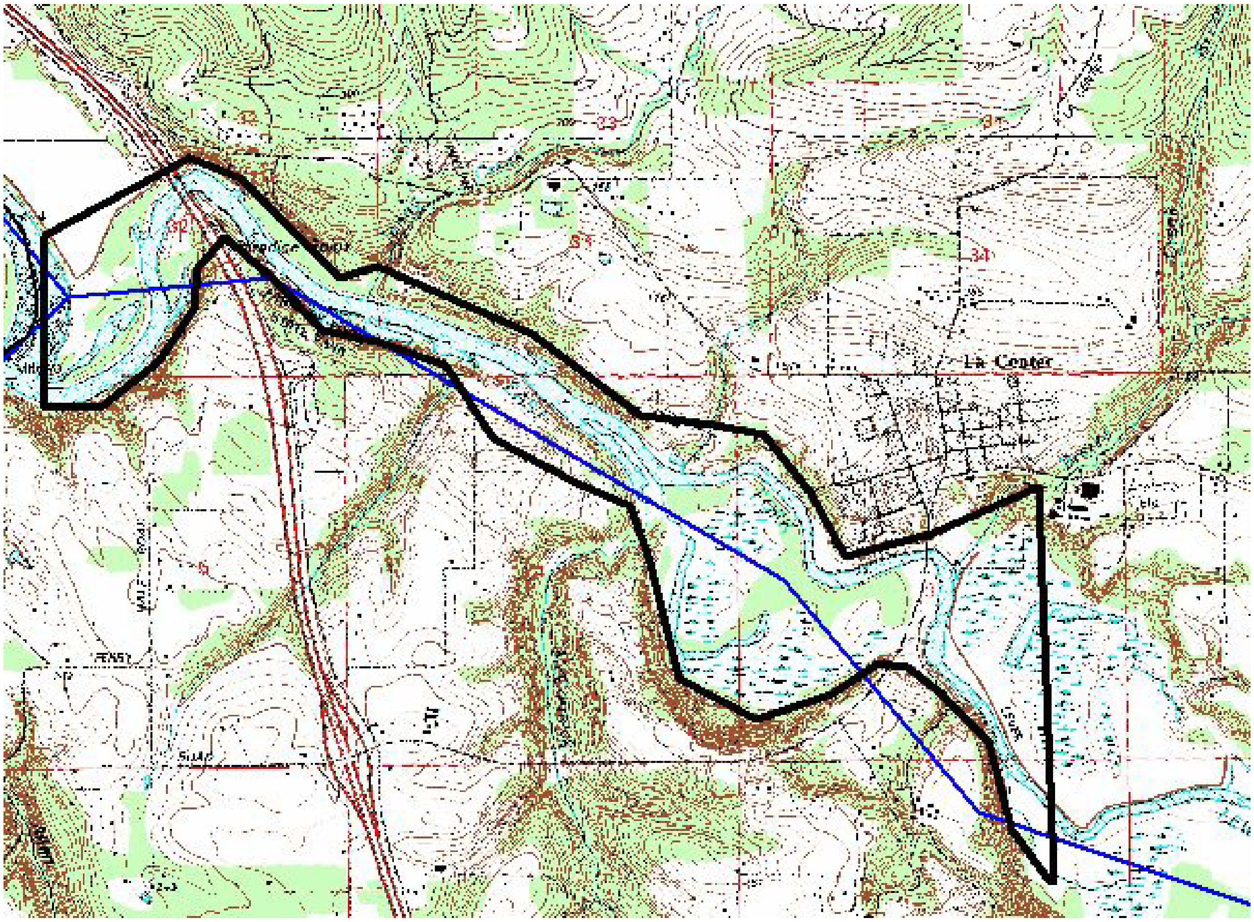
APPENDIX B: Estimate of EF Lewis River Floodplain And Mortality Calculations

NOAA Fisheries used the procedure detailed below to estimate the floodplain area of the EF Lewis River between Lucia Falls and the confluence of the EF Lewis River and the North Fork Lewis River. NOAA Fisheries received a FEMA floodplain map for the upper extent of the subject reach, Lucia Falls to above La Center. The floodplain area on the FEMA map is 1227 acres. (Map available in administrative record) No FEMA floodplain map was available for the lower extent. NOAA Fisheries used a GIS topographic map in which it drew a polygon around the estimated floodplain area and had GIS calculate the area, 646 acres (see map below). NOAA Fisheries added both areas to estimate the total floodpain seasonally available to salmonids, 1873 acres. This acerage should be viewed as a rough estimate, only.

1873 acres (floodplain+river)	= 100%
123 acres (N Unit)	= 6.6 %
574 acres (N+S unit)	= 30.6%

<u>Effect Calculations:</u>

6.6 % * .1 (mortality) = .7 % of entire EF Lewis juvenile chinook and steelhead
.7% mortaliy * 1.5 (higher density factor for coho) = 1.05
30.6 % - .7 = 29.9 % of entire EF Lewis juvenile chinook and steelhead
29.9 % * 1.5% (higher density factor for coho) = 44 %
EF Lewis River Lower Floodplain Delineation:


La Center