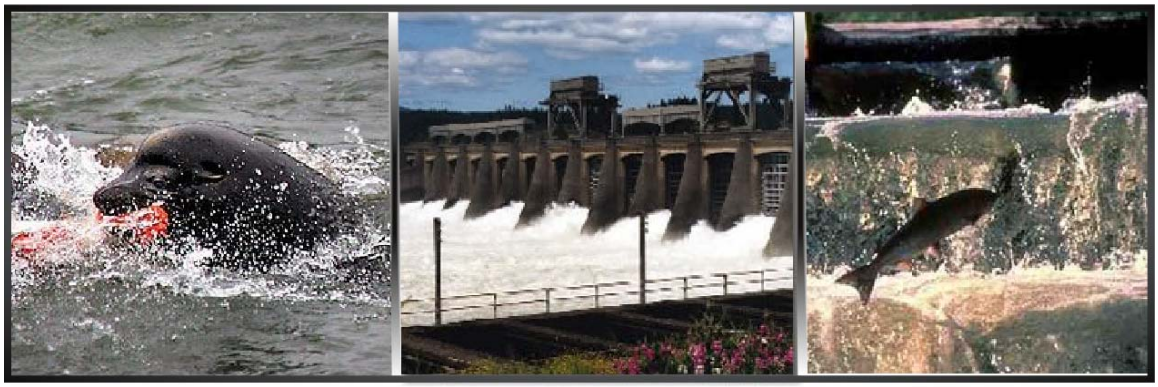
DRAFT ENVIRONMENTAL ASSESSMENT

Reducing the Impact on At-risk Salmon and Steelhead by California Sea Lions in the Area Downstream of Bonneville Dam on the Columbia River, Oregon and Washington



National Marine Fisheries Service
Northwest Region

January 11, 2008

COVER SHEET

Title of Environmental Review:

Environmental Assessment for the Take of California Sea Lions at Bonneville Dam Pursuant to Section 120 of the Marine Mammal Protection Act

Listed Species and Evolutionarily Significant Units:

Steller sea lion, Eastern U.S. Stock (threatened)
Upper Columbia River Spring Chinook (endangered)
Snake River Spring/Summer Chinook (threatened)
Snake River Basin steelhead (threatened)
Middle Columbia River steelhead (threatened)
Lower Columbia River steelhead (threatened)

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Legal Mandates:

Endangered Species Act of 1973 (ESA, 16 U.S.C. 1531 et seq.)
Marine Mammal Protection Act (MMPA, 16 U.S.C. 1361 et seq.)
National Environmental Policy Act (NEPA, 42 U.S.C. 4321 et seq.)

Location of Proposed Activities:

Lower Columbia River, Oregon and Washington

Activity Considered:

NMFS' approval or disapproval of the States of Washington, Oregon, and Idaho application for lethal take of California sea lions by intentional means at Bonneville Dam in accordance with the Marine Mammal Protection Act Section 120.

LIST OF ACRONYMNS

ACC	Animal Care Committee
ADD	Acoustic Deterrent Device
AWA	Animal Welfare Act
CBLEC	Columbia Basin Law Enforcement Council
Corps	U.S. Army Corps of Engineers
CRITFC	Columbia River Inter-Tribal Fish Commission
Ecology	Washington State Department of Ecology
ESA	Endangered Species Act
FCRPS	Federal Columbia River Power System
ICC	Incident Command Center
IDFG	Idaho Department of Fish and Game
MMPA	Marine Mammal Protection Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
OSP	Optimum Sustainable Population
PBR	Potential Biological Removal
TMDL	Total Maximum Daily Load
TRT	Technical Recovery Team
WDFW	Washington Department of Fish and Wildlife

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1.0 PURPOSE AND NEED FOR ACTION

1.1 Introduction

The National Marine Fisheries Service (NMFS) has prepared this environmental assessment in accordance with the National Environmental Policy Act (NEPA). The document considers the environmental consequences of alternative actions to reduce seal and sea lion (pinniped) predation on salmon and steelhead (salmonids) listed as threatened and endangered under the Endangered Species Act (ESA) below Bonneville Dam (Figure 1-1). The analysis will inform decisions concerning actions NMFS may take to reduce pinniped predation below Bonneville Dam, specifically approval or disapproval of a request by Washington, Oregon, and Idaho (States) for lethal take of California sea lions by intentional means according to section 120 of the Marine Mammal Protection Act (MMPA).

1.1.1 Pinniped Predation at Bonneville Dam

California sea lions hunt for and eat migrating adult salmonids as the fish move through the tailrace (the river channel downstream of a dam) below Bonneville Dam and pass into one of eight fishway entrances that lead to fish ladders located on the Oregon and Washington sides of the Columbia River. Five population groups of ESA listed salmon and steelhead are affected by pinniped predation at Bonneville Dam as shown in Table 1.1-1. Pinniped predation at Bonneville Dam is a recent source of increased mortality for adult salmonids and efforts to control it have proven ineffective.

Table 1.1-1 Endangered Species Act status of Columbia and Snake River Basin salmon and steelhead impacted by pinniped predation at Bonneville Dam

Species[1]	ESU/DPS	Current Endangered Species Act Listing Status
Chinook salmon (*O. tshawytscha*)	Upper Columbia River Spring-run[2]	Endangered 6/28/05 (70 FR 37160)
	Snake River Spring/Summer-run[2]	Threatened 6/28/05 (70 FR 37160)
Steelhead (*O. mykiss*)	Snake River Basin	Threatened 1/5/06 (71 FR 834)
	Middle Columbia River[2]	Threatened 1/5/06 (71 FR 834)
	Lower Columbia River[2]	Threatened 1/5/06 (71 FR 834)

[1]The ESA defines a "species" to include any distinct population segment (DPS) of any species of vertebrate fish or wildlife. For Pacific salmon, NMFS considers an evolutionarily significant unit, or ESU, a "species" under the ESA. For Pacific steelhead, NMFS has delineated DPSs for consideration as "species" under the ESA.
[2]These ESUs/DPSs have populations particularly vulnerable to predation because their run timing coincides with peak abundance of sea lions in the tailrace at Bonneville Dam.

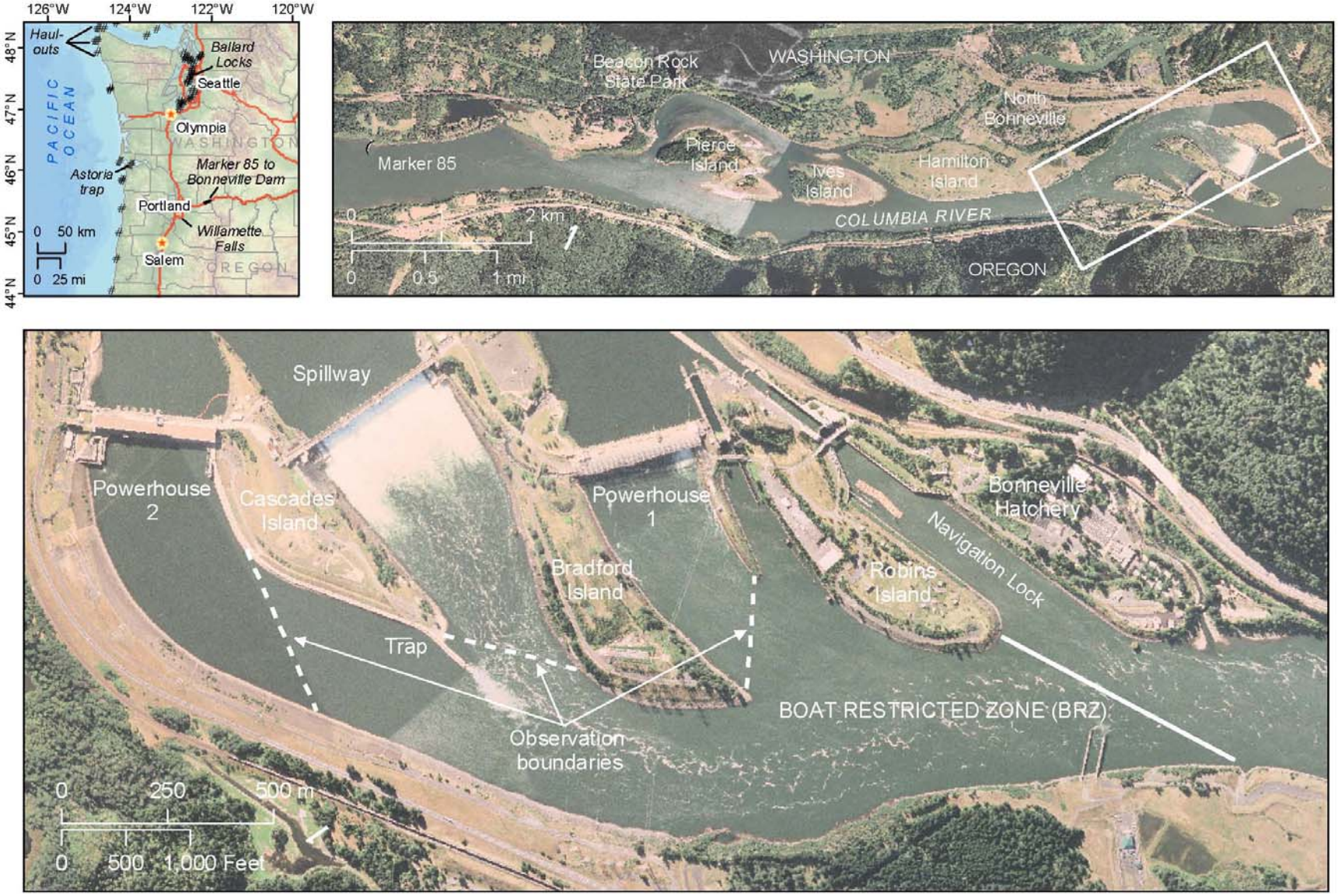


Figure 1-1 Action Area: Bonneville Lock and Dam Complex

Until 2001, few seals and sea lions were observed feeding in the area immediately downstream of Bonneville Dam. In April 2001, the U.S. Army Corps of Engineers (Corps) began to monitor marine mammal predation on ESA listed salmonids in the tailrace of the Bonneville Dam, and has documented pinniped predation on fish, principally adult salmon and steelhead, for the past 6 years. The monitoring was called for in NMFS' 2000 Biological Opinion for Operation of the Federal Columbia River Power System (FCRPS) (NMFS 2000). As a result of the Corps' monitoring efforts, it is now possible to quantify a minimum level of California sea lion predation on listed salmonids at Bonneville Dam.

The Corps expanded its monitoring program at Bonneville Dam in 2002 and has since conducted systematic observations of pinniped predation on salmonids from January through May during 2002-2007. Tables 1.1-2, 1.1-3, and 1.1-4 summarize the Corps' monitoring data for this 6 year period.

Pinnipeds hunt for and eat a variety of fish in the Columbia River below Bonneville Dam. Combined data in Table 1.1-2 show that nearly 80 percent of the fish that pinnipeds preyed upon were salmonids (listed and non-listed) and nearly 15 percent were other types of fish. Additional summary data from the Corps for 2002-2007 identifies prey preference by species, attributing 99.2 percent of observed salmonid take to California sea lions, 99.2 percent of observed lamprey take to California sea lions, and 97.8 percent of observed sturgeon take to Steller sea lions (R. Stansell, pers. comm., Corps, September 4, 2007).

Table 1.1-2 Summary of visually observed prey consumed by pinnipeds, 2002-2007

Percent Chinook (%)	Percent Steelhead (%)	Percent Salmonid Sp. (%)	Percent Lamprey (%)	Percent Sturgeon (%)	Percent Shad (%)	Percent Other (%)	Percent Unknown (%)
44.7	4.4	29.5	9.3	4.0	1.2	0.2	6.6
Total Listed & Non-listed Salmonids 78.6%			**Total Other Fish 14.7%**				**Total Unknown 6.6%**

Source: R. Stansell, pers.comm., Corps, September 4, 2007.

The number of identifiable California sea lions present at Bonneville Dam has increased overall during the years 2002 to 2007, with annual fluctuations as shown in Table 1.1-3. The count jumped from 30 in 2002 to 108 in 2003. Counts remained above 100 in 2004, but dropped by 20 in 2005, by 8 in 2006, and by 4 in 2007. The decreases in observed abundance of California sea lions may be a result of actual decreases in their abundance, or a result of decreased identification of individual sea lions because sea lions are elusive and less visible during non-lethal deterrence activities (e.g., boat pursuit, pyrotechnics and/or non-lethal ammunition) (R. Stansell, pers. comm., Corps, October 31, 2007). In spite of these drops, the number of observed individuals in 2007 is more than double the 2002 observations. Table 1.1-3 provides additional information regarding the degree to which counted individuals were identifiable as branded and naturally marked (H) or naturally marked (P), and what percentage increase of new individuals were observed in these two identification categories annually. Over the 6 year period, 271 separate identifiable individuals were counted. Additional California sea lions were observed but not counted because they did not have natural or applied markings to aid in identification.

Table 1.1-3 Summary of yearly minimum California sea lion counts at Bonneville Dam, 2002-2007

	2002		2003		2004		2005		2006		2007		Total
ID Category	*All*	*New*	*All*	*New*	*All*	*New*	*All*	*New*	*All*	*New*	*All*	*New*	
H	17	17	73	59	82	40	68	18	66	26	63	24	184
Percent New (%)				81		49		26		39		38	
P	13	13	35	31	19	19	13	11	7	7	6	6	87
Percent New (%)				89		100		85		100		100	
H + P	**30**	30	**108**	90	**101**	59	**81**	29	**73**	33	**69**	30	**271**
Percent New(%)				83		58		36		45		43	

Source: Wright 2007; Data attributed to Stansell

H = marked animals (branded and naturally marked) that are identified unambiguously (151 total) or with high confidence (53 total) between years.

P = naturally marked animals that can be identified unambiguously (15 total) or with high confidence (72 total) within years, but only potentially between years.

Notes: 1) The Corps database is still undergoing error-checking; exact numbers may change but no change is anticipated in overall patterns or conclusions.

2) Additional animals are observed each year that bear no natural markings to aid within or between year tracking.

The number of listed and non-listed adult salmonids taken by California sea lions in the Bonneville Dam tailrace increased consistently from 2002 to 2007, but the percentage of run taken in any given year varied due to run size (Table 1.1-4). California sea lions took approximately 1,000 returning adults salmonids in 2002 (0.4 percent of that year's run) and 3,900 in 2007 (4.2 percent of that year's run).

Table 1.1-4 Summary of yearly minimum pinniped take observation data at Bonneville Dam, January 1-May 31 during 2002-2007

	2002	2003	2004	2005	2006	2007
Observed Minimum Salmonid Predation (fish taken) by Pinnipeds[1, 2]	1,010	2,329	3,533	2,920+	3,023	3,859
Total Salmonid Passage	284,733	217,185	186,804	82,006	105,063	88,474
Pinniped Predation of Salmonids as a Percentage of Salmonid Run Size (%)[1, 2]	0.4	1.1	1.9	3.4+	2.8	4.2

Source: R. Stansell pers. comm.., Corps, September 4, 2007

Notes: 1) Summarized data from the Corps attributes 99.2 percent of observed salmonid take to California sea lions.

2) Pinnipeds caught additional salmonids which escaped with unknown levels of injury.

Some portion of the adult salmonids California sea lions eat are listed salmon and steelhead, as evidenced through genetic analysis of sea lion scat samples. There are no data from which to conclude that California sea lions distinguish listed fish from non-listed fish. Current data support an

assumption that California sea lions prey randomly on available salmonids, and that listed salmonid stocks will therefore be taken in proportion to their abundance below the dam.

As the population has expanded, California sea lions have adapted their foraging behaviors to previously unused or under-exploited river and estuarine habitat. The number of California sea lions at Bonneville Dam has increased during the years 2002 to 2007. With more sea lions below Bonneville Dam, the number of adult salmonids caught has also increased over the same time period. The loss of returning adult fish to sea lion predation results in fewer fish surviving to spawn, thus reducing spawning potential and recruitment.

Section 109(h)(1)(C) of the MMPA authorizes non-lethal removal of nuisance marine mammals by state and federal officials. In April 2004, Oregon Department of Fish and Wildlife (ODFW), Washington Department of Fish and Wildlife (WDFW), Columbia River Inter-Tribal Fish Commission, and NMFS convened to discuss non-lethal deterrent actions to stop California sea lions from taking salmonids at Bonneville Dam. The collective agencies identified California sea lions in the area of the tailrace and fishways at Bonneville Dam as a "nuisance." The agencies made this determination based on the Corps' data, which documented increased levels of fish mortality caused by the presence of pinnipeds. In addition, several salmon and steelhead populations (Table 1.1-1) that pass through Bonneville Dam are particularly vulnerable to predation because their run timing coincides with peak abundance of sea lions in the tailrace.

During 2002-2003, all sea lion and salmonid interaction occurred in the tailrace immediately downstream of Bonneville Dam. In 2004 Corps staff observed a branded California sea lion (marked as individual C404) in the lower fishway. In 2005, Corps staff began to observe additional California sea lions in the fish ladders. Individual C404 entered the upper fish ladders and public observation area to hunt for fish in 2005.

The Corps and States took several actions in response to increasing predation in the tailrace and fish ladders at Bonneville Dam. These actions included installing sea lion exclusion gates as a physical barrier on some ladder entrances; installing acoustic deterrent devices in fishways to block access by sea lions using high intensity sound; and actively deterring sea lions from the fish ladders using harassment techniques such as boat pursuit, pyrotechnics (cracker shells), and/or non-lethal ammunition (rubber buckshot, sabot rounds). The Corps and States implemented these non-lethal deterrence activities during 2005 through 2007, expanding its efforts annually. The Corps, ODFW, WDFW, and NMFS conducted research to test whether such non-lethal deterrence activities could reduce California sea lion predation on salmon and steelhead in the tailrace (Norberg et al. 2005; Wright et al. 2007; Stansell et al. 2006). Results showed that sea lions could be displaced from some areas by non-lethal means but only for brief periods. When deterrence activity ceased, the sea lions quickly returned.

Despite the non-lethal deterrence activities, sea lions could not be totally displaced from the tailrace and predation continued in areas where harassment was ineffective or could not be performed. Neither dam-based nor boat-based deterrents reduced the overall California sea lion abundance or salmonid predation in the near dam environment. Despite non-lethal deterrence activity, observations through the Corps' Bonneville monitoring program estimated that pinnipeds consumed over 2,920 salmonids in 2005 (3.4 percent of that year's run), 3,023 salmonids in 2006 (2.8 percent of that year's run), and 3,859 salmonids in 2007 (4.2 percent of that year's run) as shown in Table 1.1-4.

1.1.2 Marine Mammal Protection Act Section 120

In 1994, Congress amended the MMPA, adding section 120, which established a process for authorizing intentional lethal take of individually identifiable pinnipeds that have a significant negative impact on salmonids that are either listed or approaching listing under the Endangered Species Act. On December 5, 2006, the States applied to the Secretary of Commerce (Secretary) for authority to lethally take, by intentional means, individually identifiable California sea lions in accordance with the section 120 process. In their section 120 application, the States contend that loss of ESA-listed Columbia River salmonids to California sea lions has a significant negative effect on recovery because:

> 1) it is a new, growing, and unmanaged source of mortality, while other sources of in-river mortality are actively managed and are stable or decreasing (e.g., through harvest reductions, fish passage and habitat improvements, and hatchery reform); and 2) the hydromodification of the river has altered the natural predator-prey relationship to artificially favor predatory California sea lions.

The States' section 120 application specifies that they do not contend "that California sea lion predation is more significant than other sources of mortality to Columbia River ESA-listed salmonids, but simply that it is significant, and that it must be dealt with as are other sources of mortality."

The Secretary, acting through the Assistant Administrator for NMFS, determined that the States' section 120 application provided sufficient evidence to warrant establishing a pinniped-fishery interaction task force (task force). In a Federal Register notice on January 30, 2007, NMFS announced receipt of the States' application and solicited public comments on the application and any additional information that should be considered. In an August 9, 2007 Federal Register notice, NMFS announced establishment of the task force and provided information about its first public meeting. Convened in September 2007, the task force reviewed the States' application, public comments on the application, and other information related to sea lion predation on salmon and steelhead at Bonneville Dam.

The task force considered criteria contained in section 120(d) and additional questions posed by NMFS in determining whether to recommend approval or disapproval of the States' application. The task force met three times and provided its final report and recommendations to NMFS on November 5, 2007. Task force meetings were open to the public.

1.2 Description of the Proposed Action

The task force convened by NMFS to consider the States' application recommended (with one of 18 members dissenting) that NMFS approve the States' application for lethal take authority, while continuing non-lethal deterrence measures. NMFS proposes to approve the States' section 120 application for lethal removal of California sea lions at Bonneville Dam, under certain conditions, in accordance with the MMPA. These conditions are described in more detail in Section 2 under Alternative 3: Proposed Action:

- *Continue Non-lethal Activities*
- *Authorize Lethal Removal*

- *Monitor and Evaluate*

1.3 Purpose and Need for Action

An increasing level of California sea lion predation on listed salmon and steelhead species is well documented at Bonneville Dam in the Columbia River Basin (subsection 1.1.1, Pinniped Predation at Bonneville Dam). To reduce this predation, the States applied for lethal take authority under section 120 of the MMPA. The purpose of the proposed action is to support the States' efforts to improve adult salmonid survival by reducing pinniped predation at Bonneville Dam, consistent with the MMPA and in consideration of the task force recommendations. The need for the proposed action is that NMFS must respond to the States' section 120 application, as prescribed in the MMPA, to address the seasonally recurring problem of pinniped predation, which contributes to the decline or impedes recovery of listed salmon and steelhead passing through Bonneville Dam.

Other types of actions aimed at salmonid recovery, such as habitat improvements or modifications to the hydropower facilities at Bonneville Dam, are beyond the scope of the direct effects analyses but are addressed as cumulative effects**.**

1.4 Relationship to Other Plans and Policies

The proposed action and alternatives analyzed in this environmental assessment relate to other federal, state, tribal, and local plans and policies addressing salmon and steelhead survival in the Columbia River basin.

ESA section 4(f) recovery planning has generally recognized addressing pinniped predation as important to increasing the survival of adult salmonids returning to spawn in the Columbia River basin. The proposed action at Bonneville Dam supports the following locally developed salmon recovery plans to conserve and recover listed salmonids to self sustaining levels so that they can be removed from the List of Endangered and Threatened Wildlife (50 CFR 17.11):

- *Draft Columbia River Estuary Recovery Plan Module for Salmon and Steelhead* (NMFS 2006)
- *Final Upper Columbia Recovery Plan* (Upper Columbia Salmon Recovery Board, adopted October 2007), and
- *Interim Lower Columbia Salmon Recovery and Fish & Wildlife Plan* (Lower Columbia Fish Recovery Board, approved February 2006).

Other sources of adult and juvenile salmonid mortality are addressed through ESA section 7 consultation for federal actions likely to adversely affect listed fish. Through the consultation process federal agencies or applicants may change their proposed actions to avoid harming listed fish, or NMFS may require them to conduct their proposed action in a way that reduces or mitigates harm to listed fish. NMFS consults on a host of actions in the Columbia River including operation and maintenance of the Federal Columbia River Power System (FCRPS); commercial, recreational, and tribal fisheries; forest management; irrigation withdrawals; road construction; grazing; and numerous other actions that affect fish habitat and fish migration. Measures required by the 2000 FCRPS Biological Opinion and subsequent FCRPS ESA section 7 consultation efforts (such as increased spill, improved passage facilities, and habitat protection and restoration), as well as their costs, are

substantial and are reported in the Endangered Species Act 2003 Check-In Report (U.S. Bureau of Reclamation et al. 2003).

The proposed action is considered in the context of comprehensive actions addressing all aspects of the salmonid life cycle, and other actions already being taken to recover listed salmonids (see Section 5, Cumulative Effects). Accordingly, the proposed action would be limited to those activities necessary to reduce adult salmonid losses due to pinniped predation (see subsection 1.3, Purpose and Need for Action). Reducing pinniped predation at Bonneville Dam is one of several mechanisms to improve adult salmonid survival.

2.0 ALTERNATIVES

2.1 Introduction

Alternatives were selected for this analysis by developing criteria from key issues surrounding the lethal removal of sea lions. These criteria were then used to assess the range of reasonable alternatives (subsection 2.1.2, Decision Criteria). The four alternatives selected for analysis are those that met all or most of the criteria established; those that did not meet these criteria were considered but not analyzed in detail, as described below (subsection 2.2.5, Alternatives Considered but not Analyzed in Detail).

2.1.1 Action Area

The proposed action would be implemented at Bonneville Dam. As shown in Figure 1-1, Bonneville Dam is located on the Columbia River at river mile 146, approximately 42 highway miles east of Portland, Oregon. The Oregon-Washington state boundary lies along the main Columbia River channel, dividing the project area between the two states. The Bonneville Lock and Dam facility includes two navigation locks, two powerhouses, a spillway, fish passage facilities, a fish hatchery, and two of the largest visitor complexes administered by the Corps.

The proposed action would occur in the section of the Columbia River starting at navigation marker 85 (approximately river mile 140) continuing upstream to the immediate vicinity of the tailrace and dam. Detail in Figure 1-1 shows the area above Navigation Marker 85 up to Bonneville Dam as a "sea lion exclusion zone." Figure 1-1 also shows the "observation area" (comprised of three zones) used by the Corps in their monitoring efforts. These terms are used throughout the description in this and other sections of the Environmental Assessment (EA).

2.1.2 Decision Criteria

In developing a range of reasonable alternatives, NMFS first established 12 decision criteria by identifying key issues raised in the States' application, public comments, internal scoping, task force recommendations, and applicable law. NMFS evaluated the extent to which each potential alternative would meet the decision criteria as a reasonable proposed action. The alternative decision criteria are listed below, and two "minimum threshold" criteria are identified because they represent statutory requirements of the MMPA and NEPA, which all alternatives must meet. NMFS' interpretation of MMPA requirements is further discussed in subsection 2.1.3, MMPA Requirements.

1. Has the potential to meet MMPA requirements (*minimum threshold*)
2. Meets the purpose and need for the action (subsection 1.3, Purpose and Need for Action) (*minimum threshold*)
    - Reduce pinniped predation at Bonneville Dam to protect adult salmonids and improve their chances of survival
    - Respond to the states' MMPA section 120 application
3. Contains lethal action, non-lethal action, or combination of both
4. Non-lethal measures are available and practicable
5. Includes a monitoring component
6. Does not kill more California sea lions than necessary to measurably reduce pinniped predation

7. Does not cause California sea lion population to fall below its optimum sustainable population (OSP) (as defined in MMPA section 3(9)); (subsection 3.4.2, Species Status, Distribution, and Abundance)
8. No removal at rookeries
9. Lethal removal by humane measures as defined by MMPA section 3
10. Lethal removal for animals where non-lethal efforts have failed
11. Carcass disposal consistent with applicable laws
12. Protect public safety

The decision criteria established the parameters for a reasonable range of alternatives. Nine initial alternatives were evaluated using these decision criteria. NMFS determined that four of these should be analyzed in detail because they meet the criteria established for a reasonable range of alternatives. Five alternatives did not meet the threshold criteria or were outside the scope of the purpose and need for the action. NMFS considered these alternatives but has not analyzed them in detail (subsection 2.2.5, Alternatives Considered But Not Analyzed in Detail).

2.1.3 MMPA Requirements

MMPA section 120 (b)(1) allows a State to apply for authorization of "intentional lethal taking of *individually identifiable* pinnipeds which are having a *significant negative impact* on the decline or recovery of salmonid fishery stocks" (emphasis added). The following discussion describes NMFS' proposed application of this MMPA language in the context of the facts at Bonneville Dam. NMFS' proposed implementation has been informed by a number of factors, including: 1) public comments on the notice accepting the States' application; 2) the task force recommendations; 3) the Marine Mammal Commission's (Commission) comments on the task force recommendations[1]; 4) past experience with section 120 implementation at Ballard Locks in Washington State; and 5) Section 120(b)(1)'s legislative history, particularly ambiguous Congressional intent concerning the meaning of "individually identifiable pinnipeds" and "significant negative impact." NMFS believes its proposed application is reasonable in light of the statute's ambiguity and the specific facts and circumstances surrounding the proposal to lethally remove pinnipeds at Bonneville Dam.

Four issues are considered:

1. Must each individual pinniped have a significant negative impact, or is the statutory requirement satisfied if pinnipeds collectively are having a significant negative impact?
2. If the latter, what factors should NMFS consider in determining whether the impact of pinniped predation collectively is significant?
3. To what degree must individual pinnipeds be shown to be contributing to the predation impact?
4. To be considered "individually identifiable," must pinnipeds have features that allow them to be distinguished regardless of their location, or is presence in a geographic area at a particular time sufficient?

[1] Title II of the MMPA created the Marine Mammal Commission. Its duties include recommending to the Secretary those steps it deems necessary or desirable for the protection and conservation of marine mammals. Although section 120 does not specifically provide a role for the Marine Mammal Commission, the Commission provided comments on NMFS' notice accepting the States' application for review, and on the task force's report. NMFS also consulted with the Commission in 1994-95 when it implemented section 120 at Ballard Locks in Washington.

These issues are considered below. Because the third and fourth issues are so closely interrelated, they are discussed together.

1. Must each individual pinniped have a significant negative impact, or is the statutory requirement satisfied if pinnipeds collectively are having a significant negative impact?

In its letter to NMFS of November 23rd, the Commission explored possible interpretations of the phrase "individually identifiable pinnipeds which are having a significant negative impact." The Commission rejected an interpretation "that would require a finding that each pinniped targeted for removal individually has a significant negative impact on the salmonid stocks." The Commission stated that such an interpretation would undermine the intent of section 120 "by establishing a threshold that could be met only in the most extreme predation situations." Instead, the Commission recommended that in applying this statutory language, NMFS employ a two-part standard:

> First, the Service should establish that pinnipeds collectively are having a significant negative impact on the salmonid stocks of concern. If that determination is made, the Service should then determine whether the individuals to be removed are significant contributors to the overall level of predation.

NMFS agrees with the MMC that applying this two-part test is reasonable and achieves the intent of Section 120.

2. What factors should NMFS consider to determine whether the impact of pinniped predation collectively is significant?

The first step of the two-part test is relevant to determine whether pinniped predation collectively is having a significant negative impact on salmonids. In their application the States contend that pinniped predation at Bonneville Dam is significant for two reasons. First, "it is a new, growing, and unmanageable source of mortality, while other sources of in-river mortality are actively managed and are stable or decreasing (e.g., through harvest reductions, fish passage and habitat improvements, and hatchery reform)." Second, "the hydromodification of the river has altered the natural predator-prey relationship to artificially favor predatory California sea lions." The States' section 120 application specifies that they do not contend "that California sea lion predation is more significant than other sources of mortality to Columbia River ESA-listed salmonids, but simply that it is significant, and that it must be dealt with as are other sources of mortality."

The task force also considered whether pinniped predation at Bonneville Dam was having a significant negative impact. The task force was unable to agree on quantitative criteria to assist NMFS in defining "significant negative impact," but did agree to a set of factors NMFS might consider in determining whether pinniped predation at Bonneville Dam is having a significant negative impact (DS Consulting 2007). These factors include:

- Whether pinnipeds are present at the same time that ESA listed salmonids are migrating.
- Whether data indicate that predation has increased beyond historic levels.
- Whether the problem is likely to persist.
- Whether the mortality resulting from pinniped predation is comparable to other forms of in-river mortality that are currently being managed.

The task force outlined additional considerations for taking action:

- There is a comprehensive salmon recovery framework in place that includes multiple actions, monitoring, and evaluation.
- California sea lion predation should be addressed and its impacts evaluated in the context of other limiting factors (i.e., not on their own).
- Non-lethal hazing has been ineffective at reducing predation.
- The proposed level of lethal removal will have no long term negative impact on California sea lion populations.
- California sea lion abundance is within the range of OSP and at carrying capacity.
- The problem is related to/resulting from human caused factors.

Applying these factors and considerations, all but one member of the task force concluded that California sea lions are having a significant negative impact on the recovery of Columbia Basin threatened and endangered salmonids (the dissenting member maintained that the level of pinniped predation at Bonneville Dam is not significant when considered in the context of other sources of mortality such as hydropower operations and harvest).

The Commission found these criteria helpful but was concerned that the task force did not "relate the observed rates of predation by pinnipeds to population-level impacts on salmonids." The Commission recommended that NMFS calculate the extent to which pinniped predation increases extinction risk or delays recovery of the affected salmonids. This impact could then be compared to the impact of other actions on the affected salmonids. The Commission suggested that NMFS' prior ESA consultations on actions affecting these salmonids could provide a guide in determining whether pinniped predation levels are significant. In particular, the Commission suggested that a "no jeopardy" finding in an ESA consultation could serve as a useful benchmark for significance.

NMFS agrees that the analyses recommended by the Commission are useful for putting pinniped impacts into context and informing a determination of significance under the MMPA. These analyses are provided in Section 5, Cumulative Effects, where the effects of the alternatives are considered in context of the effects of other past, present and likely future actions. NMFS disagrees that the ESA section 7 standard for jeopardy provides a useful example from the ESA for making a significance determination under the MMPA. Under NMFS' ESA, the effects of an action may be considered significant if they are likely to have an adversely effect on the listed species, well before they rise to the level of jeopardizing the species' continued existence.

The Commission suggested NMFS consider another standard for significance, which is used elsewhere in MMPA practice. The Commission considers actions that slow recovery of marine mammal populations by less than 10 percent to be insignificant. NMFS declines to adopt this standard here. In its November 23rd letter, the Commission acknowledged there are a host of factors that negatively affect the survival and recovery of Columbia Basin salmonids. If each source of mortality were separately held to this standard, the combined mortality from all sources could prevent recovery.

Finally, the Commission cited as possible guidance NMFS' prior experience under section 120 in authorizing lethal removal of California sea lions at Ballard Locks. In that case, NMFS authorized lethal removal of California sea lions if the pinniped predation rate exceeded 10 percent of the Lake Washington steelhead run. The Commission contrasted this predation rate with the two alternative rates recommended by the task force of 0.5 and 1 percent. NMFS does not consider the Ballard Locks

example applicable in the present situation – if NMFS selected an acceptable mortality rate of 10 percent for all actions affecting listed salmonids, the combined mortality from all sources would be unsupportable. Rather, NMFS agrees with the task force suggestion that several factors must be considered in making a determination of significance. In addition to those factors recommended by the task force, NMFS also agrees with the Commission that mortality levels from other actions should be considered as providing context for considering the significance of sea lion predation.

3. and 4. To what degree must individual pinnipeds be shown to be contributing to the predation impact? To be considered "individually identifiable," must pinnipeds have features that allow them to be distinguished regardless of their location, or is presence in a geographic area at a particular time sufficient?

If NMFS were to conclude that pinnipeds collectively are having a significant negative impact, NMFS would then need to determine which individuals would be eligible for lethal removal to address the impact. The proposal by the States, and the recommendations of the task force, present one interpretation of the statutory language, while the Commission suggests another. The following discussion presents these different interpretations.

In their application, the States propose that two categories of "individually identifiable" pinnipeds can be considered as contributing to the predation impacts. The first category relates to those pinnipeds that have identifying marks and have been observed consuming salmon. Under the States' application, such pinnipeds could be lethally removed wherever found. These individuals are both "individually identifiable" in that they are marked, and have demonstrated that they are contributing to the predation impact by virtue of having been observed consuming salmon. In addition to those individuals, the States propose that any California sea lion found above navigation marker 85 between January 1 and May 31 in the Columbia River can be lethally removed. They reason that "All California sea lions above navigation marker 85 forage for salmonids and as such are 'identifiable' (i.e., in the sense that it is not possible to confuse them with individuals that do not eat salmonids)." It is reasonable to infer from the States' application that because the sea lions in this geographic area are presumed to be consuming salmon, they also may be considered to be contributing significantly to the predation impact.

The task force developed two options for lethal removal of California sea lions. In the first option, they recommended lethal removal under any of seven conditions. The conditions range from removal of animals wherever found if they have recognizable marks and have been observed consuming salmon (similar to the States' first category), to removal on the spot of animals observed consuming salmon in certain areas, or observed to be present in certain areas (e.g., in a fish ladder or above navigation marker 85 if the upriver spring Chinook run is projected to be below 82,000). In the second option, the task force recommends removal of any pinniped above navigation marker 85 (similar to the State's second category).

In contrast, the Commission stated that, under the facts at Bonneville Dam, mere presence in a given area does not support a conclusion that an individual pinniped is a significant contributor to the predation impact, or that it is "identifiable:"

> When one considers the references to "individually identifiable pinnipeds" in section 120(b)(1), "identifying the individual pinniped or pinnipeds" in section 120(b)(2), and "a. description of the specific pinniped individuals or individuals" in section 120(c)(3)(A), it is

clear that Congress established a high evidentiary burden on the States to identify and target individual animals that are contributing to the predation problem.

Accordingly, the Commission objected to options that would allow lethal removal of animals simply because they are present in a geographic area at a time that coincides with salmonid presence. The Commission did support other conditions from the first task force option, though it recommended that some of these conditions be further explained if NMFS intends to adopt them.

At this time, in light of currently available information, the States' request, and the facts at Bonneville Dam, NMFS proposes to consider individual sea lions to be contributing significantly to salmonid predation if they 1) have been observed eating salmonids in the "observation area" below Bonneville Dam[2] between January 1 and May 31 of any year, 2) have been observed in the "observation area" below Bonneville Dam on a total of any 5 days (consecutives days, days within a single season, or days over multiple years) between January 1 and May 31 of any year, and 3) are sighted in the "observation area" below Bonneville Dam after they have been subjected to active non-lethal deterrence.[3] NMFS considers this to be a reasonable application of the statutory language. In addition to analyzing this proposal, the EA also analyzes the proposal put forward by the States' application and the task force recommendation.

2.2 Alternatives

NMFS evaluated nine alternatives for their ability to improve adult salmonid survival by reducing pinniped predation at Bonneville Dam through lethal and non-lethal means. Specifically, NMFS used the criteria listed in subsection 2.1.2, Decision Criteria, and identified four alternatives that met all or most of the criteria. These four are outlined here and further analyzed in this Environmental Assessment. Those alternatives that did not meet all or most of the criteria are discussed briefly as alternatives considered but not analyzed in further detail.

2.2.1 Alternative 1: No Action

Under the No-action Alternative, NMFS would not approve the States' section 120 application. Under this alternative, NMFS would not fund, permit, engage in, or otherwise support active non-lethal or lethal actions to deter California sea lion predation at Bonneville Dam. NMFS assumes that without its support, the States and other federal agencies would also not engage in active non-lethal deterrence actions toward California sea lions. NMFS assumes that some current deterrence measures aimed at California sea lions would continue, specifically maintenance of sea lion exclusion devices and possibly acoustic harassment at fish ladders. Aside from these examples, the No-action Alternative represents a return to practices prior to 2005, before the Corps, NMFS, and the States began active non-lethal deterrence.

[2] Figure 1-1 identifies the "observation area" (comprised of three zones) below Bonneville Dam where California sea lions must be observed eating salmonids or sighted to meet the predatory definition. These observation areas are those used by the Corps in their monitoring program, defined based on required visibility for unambiguous sighting and documentation.

[3] Animals observed in 2006 or 2007 are presumed to have been subjected to active non-lethal deterrence because of the level of activity carried out during those years. Whether this presumption would apply to subsequent years would depend on the extent of non-lethal activities in those years.

It is possible that under the No-action Alternative the States would continue to direct non-lethal activities toward Steller sea lions because these animals more readily respond by leaving the area. For purposes of evaluating environmental effects of various deterrence activities, the No-action Alternative does not include activities aimed at Steller sea lions. This is because 1) only a few Steller sea lions have been observed in the project area over the past few years (Table 3.4-2), so even if the States were to direct some activities toward them, very few events would be expected, and 2) Alternative 2 evaluates the effects of all of the non-lethal deterrence activities that would be aimed at Steller sea lions if the States were to undertake them.

2.2.2 Alternative 2: Non-lethal Deterrence Only

Under this alternative, NMFS would disapprove the States' request for lethal removal authority, but would continue to participate with other federal agencies and the States in the non-lethal deterrence activities that have been conducted since 2005. The States would continue implementation of non-lethal deterrence activities in partnership with the Corps, ODFW, WDFW, and NMFS, as authorized by MMPA section 109(h)(1)(C). This alternative is the same as Task Force Option 3 (recommended by one member) in that it only includes non-lethal deterrence (DS Consulting 2007).

Methods for non-lethal deterrence would be carried out from January 1 through May 31. From about March 15 through May 31 (approximately a 12-week period), boat-based non-lethal deterrence measures would be carried out 5 days a week, 8 hours per day (for a total of about 60 days, or 480 hours). From January 1 through about March 14, such activities would be less frequent (because few sea lions are present), likely not more often than 2 days per week. The estimated cost to conduct this level of boat-based non-lethal deterrence is $150,000 per year (which includes the costs of personnel and equipment for the various methods described below).

All activities would be carried out by up to four State or Federal employees or their authorized contractors. Land and boat-based non-lethal deterrence measures include vessel chasing, cracker shells, aerial pyrotechnics, and rubber projectiles. Boat-based activities would be carried out using two vessels less than 25 feet long and powered by single or dual outboard motors (less than 250 horsepower) or a single inboard engine fitted with a jet pump. Vessels would operate between navigation marker 85 and the Bonneville Dam tailrace, which includes the Corps' designated "boat restricted zone" (Figure 1-1). The area of vessel operation would be visible from boats on the river and shoreline vantage points from approximately Skamania Landing, Washington (roughly river mile 140) upstream to Bonneville Dam; however, no road or facility closures would occur under this alternative.

Activities that occur on land would be conducted by up to four trained employees working between the Corps' controlled structures and lands within the Corps' restriction zone. This work would be conducted on foot and primarily on concrete, asphalt, or rock structures. At times, a non-lethal deterrence activity may be conducted from a vegetated surface, but this would not be typical since the project area grounds mostly consist of hard surfaces. All land-based activities would follow the same training and safety requirements as boat-based activities.

Vessels would be operated by State or Federal employees or their contractors. All project boat operators would be required to have State vessel operation safety and regulations certification. Boat activities within the boat restricted zone would be subject to Corps' approved safety protocols (Corps 1998). Project staff would be required to agree to conduct activities in accordance with the Corp's General Safety Requirements Manual 385-1-1 and have a Job Activity Hazard Analysis on file with

the Corps. Existing vessel safety protocols, designed to ensure safe operation and to avoid disruption of other vessel traffic in the area, include the following:

- Boat operations will be conducted during daylight hours.
- Boat personnel must wear Coast Guard approved personal floatation devices.
- Boats must meet Coast Guard safety standards and be equipped with fire extinguishers, running and anchor lights, an audible warning device (horn), anchor and rope, and a throwable rescue line of sufficient length to reach personnel that have gone overboard.
- Boats must be equipped with marine band radios and monitor channel 14 to coordinate activities with Bonneville Lock and Dam Control Room.
- Boats will not be operated in the spillway area once seasonal spill has begun.
- Boats will not be operated within 100 feet of project structures to maintain a safe distance from powerhouse outflows.
- Boats will not be operated within 150 feet of fishway entrances.
- Boat personnel will receive a Corps approved project orientation and safety briefing.

A typical non-lethal sea lion deterrence event consists of chasing a sea lion downstream using a combination of up to 20 cracker shells, aerial pyrotechnics, rubber projectiles, and/or seal bombs. State and Federal agencies have carried out such activities for the past 2 years without disrupting other uses of the Bonneville Dam area.

2.2.2.1 Above Water Sea Lion Non-lethal Deterrence Techniques

Vessel Chasing

Vessel chasing (or aggressive boat maneuvering) would be used as a first choice of non-lethal deterrence. In this operation, boat operators maneuver the vessel close to the target animal, both herding and harassing it, but avoiding contact between the vessel and the animal. Based on experience in 2007, it is estimated that about 2,500 vessel chasing events would be used each season during non-lethal deterrence activities.

Cracker Shells

Cracker shells are 12 gauge shotgun shells containing a sound and flash explosive charge that is designed to explode in air or on the surface of the water at a distance of 75 to 100 yards from the point of discharge. The impulsive noise from the shotgun firing is comparable to firing a regular round of ammunition, and the noise from the cracker shell explosion is also impulsive and similar to a firecracker. Noise from the cracker shell explosion is intended to startle the target animal and may cause it to flee. Noise from the cracker shell explosion exceeds the current NMFS pinniped disturbance threshold for impulsive sounds in air (100dB re 20 μPa at 1m) and is intended to startle the target animal and cause it to flee. The startle effect is the desired outcome so the devices are not aimed for physical contact. Project staff would receive gun safety training prior to conducting deterrence measures using firearms and would deploy cracker shells according to manufacturer's instructions. Approximately 14,000 cracker shells are anticipated to be used each season during non-lethal deterrence activities. The States' safety plan describes measures to ensure safe operation of the shotgun, including:

- Use of aerial pyrotechnics and cracker shells would be coordinated via radio with Corps contracted USDA Wildlife Damage Agents on shore;
- When working in proximity to the shore or project structures (i.e., within the range of aerial pyrotechnics or cracker shells) boat personnel would monitor for persons and vehicles on shore to avoid an unsafe discharge situation;
- Above water projectiles (cracker shells, aerial pyrotechnics) would be discharged at low elevations above the water surface.

Cracker shells have been previously tested as a deterrent for California sea lions in the action area. Based on advice from state wildlife biologists familiar with terrestrial and avian wildlife in the area, use of aerial explosives were restricted to avoid disturbance of sensitive nesting sites for raptors (eagles, falcons) and other birds (herons). In accordance with established practice, cracker shells would not be discharged in proximity to known sensitive avian nesting sites and rookeries under this alternative.

Aerial Pyrotechnics

Aerial pyrotechnics (screamer rockets, banger rockets) are used on farms to scare birds away from crops. The units are ignited using a hand held launcher, similar to a .22 short caliber starter pistol, and fly through the air, emitting a loud whistling sound (screamers) similar to other whistling type fireworks, or end in an impulsive report similar to a firecracker. Noise from screamer and banger rockets is less intense than cracker shells but still exceeds the current NMFS pinniped disturbance threshold for impulsive sounds in air (100dB re 20 µPa at 1m) and is intended to startle the target animal and cause it to flee.

The units are currently in common use at Bonneville Dam for reducing avian predation, by wading birds, on juvenile salmonids that are moving in shallow water along the shoreline during the spring outmigration. They are typically discharged in the area of the tailrace, several times per hour over the course of the day. For use on pinnipeds, the rockets are directed toward a target animal's location when at the surface. Project staff would deploy aerial pyrotechnics according to the manufacturer's instructions. Approximately 10,000 aerial pyrotechnics are anticipated to be used each season during non-lethal deterrence activities.

Aerial pyrotechnics have been previously tested as a deterrent for California sea lions in the action area. Based on advice from state wildlife biologists familiar with terrestrial and avian wildlife in the area, use of aerial explosives were restricted to avoid disturbance of sensitive nesting sites for raptors (eagles, falcons) and other birds (herons). In accordance with established practice, aerial pyrotechnics would not be discharged in proximity to known sensitive avian nesting sites and rookeries under this alternative.

Rubber Projectiles

Shotgun-fired rubber buckshot and slugs are designed for use as non-lethal deterrents for large game. These devices are designed to deliver an unpleasant but non-lethal blow on impact. The rounds may cause bruising but do not penetrate the skin. Rubber or bag rounds are directed at the exposed part of the target animal's body, avoiding the head and eyes, to achieve the deterrent effect. Project staff would receive gun safety training prior to conducting deterrence measures using firearms and would deploy rubber projectiles according to manufacturer's instructions. Other safety measures would be similar to those adopted for firing cracker shells. Approximately 1,000 rubber projectiles are

anticipated to be used each season during non-lethal deterrence activities. The noise from the shotgun firing is comparable to firing a regular round of ammunition.

2.2.2.2 Underwater Sea Lion Non-lethal Deterrence Techniques

Sea Lion Exclusion Devices

Sea lion exclusion devices are welded aluminum grates, consisting of a series of evenly spaced vertical bars, installed in the eight fishway entrances. The bars provide sufficient spacing for migrating fish to pass through but the spacing is too narrow to allow sea lions to easily enter the fish passage system. All the permanent fish ladder entrances at the dam have sea lion exclusion devices.

Acoustic Deterrent Devices

High-powered Acoustic Deterrent Devices (ADD) have previously been used successfully in pinniped/fishery interaction conflict (NMFS/ODFW 1997), and portable units may be deployed from boats participating in the Columbia River deterrence program. One or more ADD units were installed by the Corps at each of the fishway entrances to protect fish that may momentarily hesitate before entering the fishway. The ADDs in use at the dam emit a short duration (millisecond) pulsed omni-directional sound signal which exceeds the NMFS pinniped disturbance threshold for impulsive sounds in water (160dB re 1µPa at 1m). The sound frequency overlaps the peak hearing sensitivity of pinnipeds and is intended as an irritant (Shusterman et al. 1972) causing them to avoid the area. The units are in continuous operation from January through early June when sea lions are likely to be present, except when shut down for the safety of divers conducting underwater inspections within 150 meters of a device, or for maintenance. They do not affect recreational boating or other vessel use or operation in the area.

Underwater Firecrackers

Underwater firecrackers (or seal bombs) are available domestically and marketed as Class 1.4E explosives, UN number 0471 (formerly Class C) explosive pest control devices. Seal bombs are similar to "M-80" firecrackers and contain approximately 2.3 grams of "flash and sound" charge mixture in a sealed cardboard tube, fitted with an 8 to 9 second waterproof fuse. The units are weighted with sand to sink them up to four meters below the surface of the water before detonation (Myrick et al. 1990). Seal bombs are deployed by lighting the fuse and throwing the unit into the water in proximity to the target animal. When the bomb lands in the water it sinks below the surface before detonation. The intense sound pressure level and flash caused by the seal bomb explosion exceeds the NMFS pinniped disturbance threshold for impulsive sounds in water (160dB re 1µPa at 1m) and is intended to startle the target animal, but may also cause some discomfort.

The Corps has specified safety protocols for use of underwater firecrackers within the boat restricted zone for the protection of personnel and fish including:

- A 100-foot minimum approach distance for boats near all project structures
- A 150-foot minimum approach distance from fishway entrances
- No use of firecrackers within 300 feet from all fishways, floating orifices, Bonneville Powerhouse 2 Corner Collector, smolt monitoring facility outfalls, or within 150 feet of any shoreline or shallow area

- Firecracker use is limited to no more than five per animal per encounter within the boat restricted zone
- No firecracker use within the boat restricted zone once fish counts reach 1,000 fish per day

Seal bombs would be deployed according to manufacturer's instructions. Approximately 2,500 seal bombs are anticipated to be used each season during non-lethal deterrence activities.

Capture, Marking, and Relocation

Positive identification of individual sea lions is most efficient when the animals are permanently marked via branding. Sea lions would be captured using two caged floating platforms that would be placed in locations readily accessible to the animals. After some period of time following deployment, sea lions will adapt to the caged floats and begin hauling out on them and inside the cages. The cage is fitted with a manually operated drop type door which, when tripped, falls into place securing the cage and the sea lions inside.

Adult male sea lions are large and powerful, and once contained in the trap their movements can cause the trap float to tip and rock. The States would file a Job Activity Hazard Analysis with the Corps that would cover protocols to ensure safe operation of the trap. Capture personnel would board the trap from small boats to move animals from the trap into transfer cages for lifting, by crane, to receiving areas on shore for transfer by truck to processing locations for marking. Alternatively, captured sea lions would be transferred from the trap to a barge for marking. Capture crews would typically be fewer than five individuals including the crew leader, however, this does not include personnel needed for crane setup and operation. Assuming two traps would be used and marking operations would be conducted on site the estimated cost of capture and marking operations at Bonneville Dam would be $150,000 (this is additional to the $150,000 estimated for boat-based deterrence activities noted above).

Once captured the unmarked sea lions would be moved from the transfer cages into processing cages to be weighed and then restrained in a squeeze cage for measuring, collection of biological samples (blood, swabs, etc), flipper tagging with single post "Roto" or "Allflex" livestock tags, and permanently marked by hot branding. (Hot branding is an accepted research technique that does not appear to have any lasting physiological effects that might lead to impaired function or mortality (Mellish et al. 2007).) In addition to branding sea lions at Bonneville Dam, a variety of highly visible colored patches and tags, satellite tags, and acoustic tags may be applied. The colored patches would be tested for enhancement of visual and video observation efforts proposed by the Corps and Columbia River Inter-Tribal Fish Commission. The satellite tags would provide information on wide-range movements of individuals (ODFW 2007). The acoustic tags and hydrophone array proposed for the approximately 5-mile area below Bonneville Dam would provide information on movements and foraging habits of known individual sea lions in this area, including information on predation at night.

Capture activities would be conducted during daylight hours for the safety of the personnel involved and the animals. The trap(s) would be located along the shore or adjacent to the dam structures where sea lions are known to congregate. Potential trap locations are visible from viewpoints used by project visitors or from the Washington shore adjoining the tailrace.

Captured and marked sea lions that have no previous history of predation at Bonneville Project (i.e., previously unidentified) may be released in the immediate vicinity or relocated and released elsewhere in the known range of the species. Once adapted to hauling out on a trap, either at the dam

or elsewhere, sea lions may return and be captured multiple times (Gearin et al. 1996; Brown et al. 2007). Sea lions with a previous history of predation at the dam may be held as described below.

Temporary or Permanent Captive Holding

Captured California sea lions that have been previously observed at Bonneville Project (i.e., previously identified) may be held in captivity for an extended period (for example through the end of the spring salmon migration season) or permanently. Conditions during captive holding – enclosures, food, and husbandry practices – would be in compliance with standards established under the Animal Welfare Act (AWA) and subject to review by an established Animal Care Committee (ACC). If sea lions are to be held permanently they may be transferred to permitted captive display facilities and added to the captive inventories of those facilities.

2.2.3 Alternative 3: Modified Task Force Recommendation - Lethal Removal of Individually Identifiable Predatory California Sea Lions After Active Non-lethal Deterrence (Proposed Action)

Alternative 3 is NMFS' proposed action. Under this alternative non-lethal deterrence activities conducted in 2006 and 2007 and described under Alternative 2 would continue, and safety and training requirements for vessel use and deterrence measures (including firearms use) would remain as described under Alternative 2. NMFS would also partially approve the States' request for lethal removal authority under the following conditions:

1) Individually identifiable predatory California sea lions may be lethally removed at Bonneville Dam in the area described under paragraph 3(f) below.

    a) Animals would be considered individually identifiable if they display natural or applied features that allow them to be individually distinguished from other California sea lions.

    b) Animals would be considered predatory if they 1) have been observed eating salmonids in the "observation area" below Bonneville Dam between January 1 and May 31 of any year, 2) have been observed in the "observation area" below Bonneville Dam on a total of any 5 days (consecutives days, days within a single season, or days over multiple years) between January 1 and May 31 of any year, and 3) are sighted in the "observation area" below Bonneville Dam after they have been subjected to active non-lethal deterrence.

2) The number of animals that could be killed (i.e., removed) would be limited to 1 percent of potential biological removal (PBR) or the number necessary to achieve an observed average percent predation rate of 1 percent of the adult salmonids tallied by fish counters over 3 years at Bonneville Dam, whichever is lower. Subsection 3.4.2, Species Status, Distribution, and Abundance, explains how PBR is calculated.

3) The States would be authorized to remove predatory California sea lions under the following conditions:

    a) The States would appoint a standing ACC, to be approved by NMFS, composed of qualified veterinarians and biologists to advise the States on protocols for capturing, holding, and euthanizing predatory sea lions.

b) The capture and transfer processes would be the same as described in Alternative 2 above.

c) Predatory sea lions that are captured (trapped animals) must be held in a temporary holding facility approved by the ACC for at least 48 hours prior to being euthanized.

d) If no pre-approved research, zoo, or aquarium facility is willing to accept an animal within 48 hours of its capture the States may euthanize it.

e) The method of euthanizing captured predatory sea lions must be approved by the ACC. Methods would likely include lethal injection (administered by a qualified veterinarian or other person authorized by state law) (Chapter 18.92 RCW, Chapter 686 ORS), or gunshot.

f) Free-ranging sea lions could be shot by a qualified marksman when hauled out on the concrete apron along the North side of Cascade Island and on the flow deflectors along the base of the dam's spillway (Figure 1-1). In all cases the marksman would shoot from land, the dam, or other shoreline structures. Potential options for lethal removal using firearms are: 1) the marksman would shoot sea lions at close range (less than 25 yards), using a shotgun loaded with a slug or 00 buckshot, when the animal is on shore; 2) the marksman would shoot sea lions from the powerhouse deck or other shoreline area at ranges greater than 25 yards using a hunting rifle with a minimum caliber of .240, when the animal is on shore. Ammunition would not contain lead.

g) The States would make all reasonable efforts to retrieve carcasses of animals that have been shot. Animals killed on land could be retrieved from shore using small boats. Small boats would be used to attempt retrieval of sea lions that may enter the water after being shot on land (but they may sink and not be found immediately or ever). The States would monitor nearby downstream areas for stranded animals that have been shot.

h) Safety and security during lethal removal activities would be provided by the Columbia Basin Law Enforcement Council (CBLEC). The CBLEC would establish an Incident Command Center (ICC) during lethal removal activities. The ICC would direct safety and security and provide a media interface. The ICC would coordinate security and safety activities with the Coast Guard and other agencies as necessary.

i) Road closures or changes to visitation on Corps property/dam facilities would be made by the appropriate Corps personnel in consultation with the ICC. No state or federal road closures beyond the property managed by the Corps are anticipated under this alternative.

j) The States would close fishing areas near the dam as needed to ensure public safety.

k) If predatory sea lions are found hauled out at any other location except a rookery outside of the boat restricted zone the States would coordinate with NMFS and consult with appropriate enforcement or other agencies to determine if they may be removed safely.

4) The States would be required to dispose of carcasses of euthanized animals in accordance with state and local laws and ordinances or transferred for use in scientific research or for educational purposes.

5) The States would be required to report any permanent removals of predatory sea lions (either transferred to permanent captivity or lethally) to NMFS within 30 days following removal, so that NMFS can fulfill its management requirements under the MMPA.

6) The States would be required to develop and implement a monitoring plan to evaluate 1) the impacts of predation, 2) the effectiveness of non-lethal deterrence, and 3) the effectiveness of permanent removal of individually identifiable predatory sea lions as a method to reduce adult salmonid mortality. The States may use data collected by the Corps or other agencies to help fulfill the monitoring requirement and avoid duplication of effort. If resources are available, the States would monitor pinniped impacts on salmonids elsewhere in the lower Columbia River to assess the level of impact from predation relative to observed levels at Bonneville Dam and to other sources of mortality that are being managed under the various salmon recovery plans. Monitoring would assist NMFS and the task force in evaluating the effectiveness of lethal removal, as required by the MMPA.

7) NMFS would issue a 5-year renewable authorization, with annual reviews.

NMFS estimates that lethal removal authority under these conditions would result in the permanent removal of up to 30 California sea lions per year. Based on trapping success at Bonneville Dam in 2007 and by adding an additional trap to the operation, NMFS estimates that up to 50 California sea lions could be captured per year, and that approximately one-third of these would meet the requirements for being considered both "individually identifiable" and "predatory" (subsection 2.1.3, MMPA Requirements). NMFS anticipates that all individually identifiable predatory California sea lions that are successfully trapped would be permanently removed either by permanent placement in a captive facility or by killing. In addition, about the same number of California sea lions are expected to be observed on the haul-outs below the dam. As with animals observed in the traps, it is likely that approximately one-third of these would meet the requirements for being considered both "individually identifiable" and "predatory" (subsection 2.1.3, MMPA Requirements) and would be subject to removal. Thus, NMFS estimates that about 15 sea lions from the traps and about 15 sea lions from the haul-outs below the dams would be permanently removed.

NMFS also anticipates, based on experience from 2007, that there may be 20 days in which trapped animals are processed and 20 days on which animals hauled out below the dams are shot on-site each year. The estimated cost for permanently removing 30 animals is $150,000 per year.

2.2.4 Alternative 4: Unmodified Task Force Lethal Option 2 – Lethal Removal of All California Sea Lions Above Navigation Marker 85 With No Requirement for Prior Active Non-lethal Deterrence

Alternative 4 represents portions of the task force's recommended Option 2 (DS Consulting 2007), with additional conditions established by NMFS. Alternative 4 would authorize the States to lethally remove California sea lions under the following conditions:

1) Individually identifiable predatory California sea lions may be lethally removed between navigation marker 85 and Bonneville Dam.

a) Animals would be considered individually identifiable if they either 1) display natural or applied features that allow them to be individually distinguished from other California sea lions, or 2) are present between January 1 and May 31 in the area between navigation marker 85 and Bonneville Dam.

b) Animals would be considered predatory if they have been observed in the past, or are currently present, in the area between navigation marker 85 and Bonneville Dam between January 1 and May 31.

2) The number of animals that could be killed (i.e., removed) would be limited to 2 percent of PBR (Subsection 3.4.2, Species Status, Distribution, and Abundance, for definition) or the number necessary to achieve an observed average percent predation rate less than 0.5 percent of the salmonid run over the dam (salmon and steelhead combined) between January 1 and May 31 in a given year.

3) The States would be authorized to kill predatory sea lions under the following conditions:

a) Free-ranging sea lions could be shot by a qualified marksman when hauled out or in the water if found upstream of navigation marker 85 to the dam. A marksman could shoot from land, the dam, other shoreline structures, or from a boat. Potential options for lethal removal using firearms are; 1) a marksman, using a shotgun loaded with a slug or 00 buckshot, may shoot sea lions from land, the powerhouse deck, or other shoreline structures at close range (less than 25 yards) when the target animal is on shore or in the water; 2) a marksman, using a shotgun loaded with a slug or 00 buckshot, may shoot sea lions from a boat at close range (less than 25 yards) when the target animal is on shore or in the water; or 3) a marksman, using a hunting rifle with a minimum caliber of .240, may shoot sea lions from land, powerhouse deck, or other shoreline area at ranges greater than 25 yards when the animal is on shore or in the water. Ammunition would not contain lead.

b) The States would make all reasonable efforts to retrieve carcasses of animals that have been shot. Animals killed on land could be retrieved from shore using small boats. Small boats would be used to attempt retrieval of sea lions that are shot in the water or may enter the water after being shot on land (but they may sink and not be found immediately or ever).

c) Safety and security would be the same as described under Alternative 3.

d) State or federal highway closures, if needed, would be coordinated by the ICC (for analysis purposes, it is assumed that highway closures would be limited to 2 hours, and would occur during non-peak travel hours, but within the operational requirements of the Corps' safety requirements).

e) The States could close fishing areas near the dam or down river as needed to ensure public safety.

4) The States would be required to dispose of carcasses of euthanized animals in accordance with state and local laws and ordinances or transferred for use in scientific research or for educational purposes.

5) The States would be required to report any permanent removals of predatory sea lions (either transferred to permanent captivity or lethally) to NMFS within 30 days following removal, so that NMFS can fulfill its management requirements under the MMPA.

6) The States would be required to develop and implement a monitoring plan to evaluate 1) the impacts of predation, 2) the effectiveness of non-lethal deterrents, and 3) the effectiveness of permanent removal of predatory sea lions as a method to reduce adult salmonid mortality. The States may use data collected by the Corps or other agencies to help fulfill the monitoring requirement and avoid duplication of effort. If resources are available, the States would monitor pinniped impacts on salmonids elsewhere in the Columbia River estuary to assess the level of impact from predation relative to observed levels at Bonneville Dam and to other sources of mortality that are being managed under the various salmon recovery plans. Monitoring would assist NMFS and the task force in evaluating the effectiveness of lethal removal, as required by the MMPA.

7) NMFS would issue a 5-year renewable authorization, with annual reviews.

NMFS anticipates that lethal removal authority under these conditions would result in the permanent removal of up to 150 sea lions per year, which is less than the maximum that would be allowed under the 2 percent of PBR cap (subsection 3.4.2.1, California Sea Lion Population Levels). To accomplish this level of removal, NMFS anticipates that from about March 15 through May 31, lethal removal activities would occur 7 days per week, during daylight hours (an average of about 16 hours per day) on the water plus additional hours for shore-based marksmen working during daylight hours. This amounts to approximately 1,120 hours of on-water activity. Under this alternative, there would be no non-lethal deterrence activities (such as pyrotechnics or underwater firecrackers) because the goal would be to kill rather than to frighten the animals.

It is reasonable to expect that use of a rifle and the potential for ricochet would result in the closure of State Route 14 in Washington for up to 2 hours per day, and of Interstate 84 in Oregon for up to 2 hours once a week. Areas of Beacon Rock State Park and elevated areas on the Oregon shore also provide vantage points for shooters, which would necessitate temporary closures of some State Park facilities to public use as well as the Hamilton Island shoreline and boat ramp. It is also likely there would be some disruption of vessel traffic on the Columbia River though it is difficult to predict how many days or hours that would occur. The States have not estimated a cost for conducting a lethal removal program on this scale, but it is reasonable to expect that it could cost up to twice as much as conducting boat-based non-lethal deterrence as described under Alternative 2 because the hours of operation would more than double. Additional costs would be required to ensure public safety (such as closure of state roads or the Interstate, diversion of vessel traffic, etc.). NMFS assumes that under this Alternative the States would not operate the floating traps.

2.2.5 Alternatives Considered But Not Analyzed In Detail

NMFS identified five additional alternatives that are not analyzed in detail in this Environmental Assessment, for the reasons described.

- *States' Application* (WDFW et al., pers. comm.., Directors, November 13, 2006 letter to Bill Hogarth). As stated in their application, the States requested lethal removal of a limited number of California sea lions above navigation marker 85 annually from January 1 to June 30. Any lethal removal would be preceded by a period of non-lethal deterrent activity followed by an evaluation period. In addition to animals above marker 85, all individually marked California sea lions documented feeding on salmonids at Bonneville Dam would be candidates for lethal removal without restriction to time or location in the river. The States expect lethal removal in the first year to be less than 1 percent of PBR for California sea lions. The number to be removed in subsequent years would be lower and likely approach zero within several years. Lethal removal would be by humane methods following recommendation of Safety and Animal Care committees convened by the States. The States did not state a duration for authorization. The environmental effects of this alternative would be similar enough to, and no greater than, those analyzed under Alternative 4. Consequently, it would not be necessary to conduct a separate analysis of this alternative to determine the potential level of effects on resources. Additionally, since this alternative is similar to Alternative 4, which is fully analyzed, no additional information would be developed to inform agency decision-making or the public's consideration under this alternative review.

- *Unmodified Task Force Option* 1 (DS Consulting 2007). As stated in their report and recommendations, the task force identified California sea lions meeting any of seven conditions as eligible for lethal removal over a 6-year period. Lethal removal would occur in the first 3 years and would only continue if the average for predation rate for the previous 3 years exceeds 1 percent. This Environmental Assessment analyzes, as Alternative 3 (NMFS' proposed action), a modified version of task force Option 1. Those elements of task force Option 1 that are not included under Alternative 3 are subsumed under Alternative 4. The environmental effects of this alternative would be nearly the same as those analyzed under Alternative 3 (and no greater than those analyzed under Alternative 4). Consequently, it would not be necessary to conduct a separate analysis of this alternative to determine the potential level of effects on resources. Additionally, since this alternative is similar to Alternative 3, which is fully analyzed, no additional information would be developed to inform agency decision-making or the public's consideration under this alternative review.

- *Modified Task Force Recommendation – Lethal Removal After Active Non-lethal Deterrence for Animals Returning to Bonneville Dam Between Years.* This alternative differs from Alternative 3 in that a California sea lion must be observed eating salmon twice between years in order to be defined as predatory and to be eligible for lethal removal (indicating that the animal returns in more than one season). This alternative would be more protective of California sea lions visiting Bonneville Dam for the first time or for animals that visited in the previous year but did not return. The environmental effects of this alternative would be nearly the same as those analyzed under Alternative 3 (and no greater than those analyzed under Alternative 4). Consequently, it would not be necessary to conduct a separate analysis of this alternative to determine the potential level

of effects on resources. No additional information would be developed to inform agency decision-making or the public's consideration under this alternative review.

- *Other Modifications to Address the Decline or Recovery of Salmonids: Hydropower, Harvest, Hatchery, and/or Habitat.* Public comments raised the concept of addressing other sources of fish mortality, such as changes in the hydropower or fisheries harvest systems, as important to salmonid recovery. Representatives from multiple agencies presented information on components of a regional salmon recovery framework to the task force to provide a comprehensive context in which to consider pinniped predation. This Environmental Assessment does not analyze this alternative in detail because actions to address the decline or recovery of salmonids, beyond the pinniped fishery interaction, have been and continue to be addressed as directed by ESA recovery plans, for example harvest modifications and reductions, modification to hydropower dams and operations, and improvements in hatchery practices.

  Moreover, while NMFS recognizes that other sources contribute to the mortality of listed salmonids on the Columbia River, it is clear from the statutory language that section 120 applies to pinniped predation on listed salmonids and does not require NMFS to take any affirmative step to address other sources of salmonid mortality, (e.g., hydropower or fishery harvest). The States presented NMFS with a specific proposal, which is lethal removal of individually identifiable pinnipeds that are having a significant negative impact on the decline or recovery of listed salmonids on the Columbia River. Section 120 requires NMFS to consider the States' effort to address salmonid mortality resulting from pinnipeds, not mortality from other sources. Consequently, NMFS determined that this alternative was outside the scope of the Section 120 process, the purpose and need for the proposed action, and NMFS' and the States' authority and is not being analyzed in detail.

- *Lethal Removal at Other Locations (e.g., Willamette River).* Public comments support lethal removal to reduce predation or interactions in areas other than Bonneville Dam, including the Willamette River. This Environmental Assessment does not analyze this alternative because actions in locations other than Bonneville Dam are outside the scope of this MMPA section 120 process and the purpose and need for action in this analysis.

2.3 Comparison of Alternatives

Table 2.3-1 summarizes the comparison of effects under the No-action and action alternatives.

Table 2.3-1 Comparison of Alternatives

	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
Non-lethal deterrence	No	Yes	Yes	No
Pinnipeds eligible for removal	None	None	Distinguishing features, observed eating salmon	Observed between navigation marker 85 and Bonneville Dam

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Estimated number of pinnipeds removed annually	None	None	30	150
Number of boats	None	2	2	2
Location of Pinnipeds to be lethally removed	N/A	N/A	Hauled out below dam or from floating trap	Hauled out or in water between nav. marker 85 and dam
Location of marksmen	N/A	N/A	Land	Land or vessels
Road closures	N/A	N/A	Within Bonneville project only	I-84 and State Route 14, ~2 hours/day
Fishing closures	N/A	None	Some possible	Some likely
Disruption of vessel traffic	N/A	None	None	Some possible
Days/hours of activity	N/A		5 days per week, 8 hours per day, ~480 hours total	7 days per week, 16 hours per day ~1,120 hours of on-water activity
Annual Costs		$300,000	$450,000	$300,000
Decrease in number of salmon consumed	Baseline condition	None	1,308-9,425 Chinook 26-693 Steelhead	6,541-47,124 Chinook 129-3,467 Steelhead

3.0 AFFECTED ENVIRONMENT

This section describes those resources that may be affected by the proposed action and its alternatives, to the extent necessary to understand potential impacts.

3.1 Introduction and Environmental Setting

The Bonneville Lock and Dam, located at river mile 146, is in Cascade Locks, Oregon, in the Columbia River Gorge. The facility includes two navigation locks, two powerhouses, spillway, fish passage facilities, fish hatchery, and two of the largest visitor complexes administered by the Bonneville Project (a synonymous title used to refer to the greater Bonneville Lock and Dam complex).

In 1937, Congress authorized the Corps to complete, maintain, and operate the facility for navigation and hydropower. In 1938, the Bonneville first powerhouse went into operation. Congress later authorized recreational opportunities to provide additional benefits from the facility. The Corps completed the Bonneville second powerhouse in 1982, which more than doubled generating capacity. Powerhouse 1 is currently under construction for rehabilitation (estimated completion in 2010). Powerhouse 2 runs on a "first on and last off" basis, and is currently the primary power-producing unit. Approximately 100,000 cubic feet of water per second pass over the spillway from April to August.

The Bonneville Dam is a run-of-river project, and is not operated for flood control. Run-of-river projects have limited storage capacity and pass water at nearly the same rate as the water enters the reservoir. The reservoir level behind Bonneville Dam varies only a few feet during normal operations. This limited storage is used for hourly regulation of powerhouse discharges to follow daily and weekly energy demand.

NMFS identified 16 resources that could be affected by the proposed action or alternatives. A description for each resource follows and provides the context for understanding potential effects of each alternative.

3.2 Air

The Clean Air Act (42 USC § 7401 et seq.) establishes the structure for regulating air quality. Under the Clean Air Act, the U.S. Environmental Protection Agency (EPA) sets limits on certain pollutants to ensure basic health and environmental protection from air pollution. States play a lead role in implementing the Clean Air Act.

The affected environment of the project area is located within the Columbia River Gorge National Scenic Area. In May 2000, the Columbia River Gorge Commission approved an air quality amendment to the Columbia Gorge National Scenic Area Management Plan to protect the air resource consistent with the purpose of the National Scenic Area Act (subsection 3.10, Social and Economic Resources). The provision called for the States of Oregon and Washington to 1) continue monitoring air pollution and visibility levels in the Gorge and 2) to analyze emissions data to identify sources that significantly contribute to air pollution. Based on this analysis, the States of Oregon and Washington were charged with developing and implementing a regional air quality strategy to carry out the

purposes of the Scenic Area Act with the U.S. Forest Service and in consultation with affected stakeholders.

The Columbia Gorge Air Quality Project (Project) was developed in response to this charge and is co-managed by the Oregon Department of Environmental Quality (ODEQ) and the Southwest Clean Air Agency (SWCAA). The Agencies released a Science Summary Report detailing the results of a technical study that included significant source categories influencing Gorge visibility. This work will inform the subsequent policy work on a Gorge air quality strategy. Klickitat County in Washington and Air Sciences, partners to the Project, sponsored a study of long-term air quality trends in and around the Columbia Gorge. The study concluded that despite steady increases in state population, air quality in and around the Columbia Gorge is generally improving (Norville 2006) as shown in Table 3-1.

Table 3.2-1 Summary of air quality trends around the Columbia River Gorge

Pollutant	Trend	Data Source
Maximum hourly nitrogen dioxide (NO_2)	Downward (improving) over 15 years	Oregon DEQ
Annual NO_2	Downward (improving) over 15 years	USEPA Aerometric Information Retrieval System (AIRS)
Maximum and 2nd highest daily particulate matter with diameter less than 10 microns (PM_{10})	Downward (improving) since 1989	Oregon DEQ
Annual PM_{10}	Downward (improving) since 1990	Oregon DEQ
4th highest 8-hour and 3-year average of 4th highest 8-hour ozone	Modest downward trend from 1988, flat since 1998	Oregon DEQ, AIRS
98th percentile particulate matter with diameter less than 2.5 microns ($PM_{2.5}$)	Flat (constant), limited data since 1999	Oregon DEQ, AIRS
Annual $PM_{2.5}$	Flat (constant) or slight downward, limited data since 1999	Oregon DEQ, AIRS
Light Scattering	Downward (improving) since 1990	Oregon DEQ, AIRS
Interagency Monitoring of Protected Visual Environments (IMPROVE) extinction	Long term downward in long term stations since 1989	IMPROVE Database
Wishram and Mt. Zion nitrate and extinction	Inconclusive due to record gaps and instrument issues	IMPROVE Database

Source: Table adapted from Table 3, Norville 2006.

3.3 Water Quality

The Clean Water Act (33 USC 1251 et seq.) establishes the basic structure for regulating pollutants in waterways. States have primary responsibility for the health and protection of water quality. While each state depends on the EPA to develop and provide proposed water quality criteria, water quality standards differ, both qualitatively (e.g., narrative standards) and quantitatively (e.g., numeric standards) from state to state.

As part of administering elements of the Clean Water Act, ODEQ and Washington State Department of Ecology (Ecology) are required to assess state water quality and publish assessments, referred to as the 305(d) report and the 303(d) list (the numbers referring to the relevant sections of the original Clean Water Act text). The 305(d) report reviews the quality of all waters of the state, while the 303(d) list identifies specific waterbodies that are considered impaired (based on a specific number of exceedances of state water quality criteria in a specific segment of a water body). Both ODEQ and Ecology have adopted some type of regulation to address 1) nutrients/temperature/dissolved oxygen (subsection 3.10, Fish Habitat), 2) turbidity, 3) metals, and 4) pesticides/antibiotics.

The affected environment of the project area includes water quality of the surface water and groundwater resources below Bonneville Dam. In general, water quality in streams throughout the Columbia River basin has been degraded by human activities such as dams and diversion structures, water withdrawals, farming and grazing, road construction, timber harvest activities, mining activities, and urbanization (NMFS 1995a.). ODEQ and Ecology have listed the lower Columbia River, from river mile 146 (Bonneville Dam) to the mouth, as 303(d) impaired, impacting the beneficial use of the system. Listing requires development of a total maximum daily load (TMDL) as an implementing plan for achieving the water quality standard for each parameter. TMDLs are complete for dioxin and total dissolved gas.

3.4 Marine Mammals

Three stocks of marine mammals (pinnipeds) travel up the Columbia River as far as Bonneville Dam: California sea lions (*Zalophus californianus californianus*) (United States stock), Steller sea lions (*Eumetopias jubatus*) (eastern United States stock), and harbor seal (*Phoca vitulina richardsi*) (Oregon/Washington coastal stock). These stocks are known to occur and forage in the tailrace at the dam during the January through May adult run timing of ESA listed salmon and steelhead and could be affected by the action alternatives. Information on life history, status, distribution, and abundance for these three species follows.

3.4.1 Life History

California Sea Lion (United States Stock)

California sea lions are members of the family otariidae and are found from southern Mexico to southeast Alaska. The United States stock is defined geographically for management purposes and is described as being comprised of animals that breed in the waters of the United States north of the international boundary with Mexico. The California sea lion is sexually dimorphic, meaning that males and females are distinct in size and color. Males may reach 1,000 pounds and 8 feet in length and females grow to 300 pounds and 6 feet in length. Their color ranges from chocolate brown in males to a lighter, golden brown in females. At around 5 years of age males develop a bony bump on top of their skull called a sagittal crest. The crest is visible in the “dog-like” profile of male sea lion heads, and hair around the crest gets lighter with age.

The breeding range of California sea lions in the United States is centered on the California Channel Islands but pupping has been reported farther north on the Farallon Islands and at Año Nuevo, California (Keith et al. 1984). Sexual maturity occurs at 4 to 5 years although breeding success for male animals depends on a number of factors most notably size (Heath 2002). Mature males (8+ years) defend breeding territories on the rookeries (a place where seals and sea lions give birth and mate) between May and August. Females return to the rookeries to give birth and most pups are born in June. Males breed with females that give birth and then come into estrus in their territory. Most males are unsuccessful at establishing breeding territory on the rookeries due to heavy competition between dominant animals and retreat to sea or to nearby "bachelor" beaches to await breeding opportunities (Heath 2002).

Following the breeding season males migrate northward and are commonly reported in Oregon and Washington beginning in mid- to late August, and in British Columbia and Alaska as the season progresses. Females are rarely observed north of the California-Oregon border. California sea lions have a bimodal peak in abundance at Oregon haul-outs with peak numbers encountered during the migration periods in May and September (Scordino 2006). Some California sea lions remain in northern waters year round and do not return to their breeding rookeries.

California sea lions feed on a variety of fish and cephalopods (squid, octopus) based upon season, location, and prey availability. In the breeding range, food habit studies report that primary prey is whiting, anchovy, squid, and rockfish (Antonelis et al. 1984; Fiscus 1979; Fiscus and Baines 1966; Scheffer and Neff 1948). North of the breeding range, diet shifts to what is locally and seasonally abundant. In Puget Sound, California sea lions feed principally on Pacific whiting, spiny dogfish, Pacific herring, and Pacific cod (Schmitt et al. 1995). In Oregon coastal rivers, California sea lions are known to eat salmonids and lamprey along with other non-salmonid fish (Roffe and Mate 1984). Based on analysis of intestinal samples the California sea lion diet in the Columbia River estuary includes smelt, salmonids, rockfish, lamprey, and herring (Brown et al. 1995).

The current population estimate for the United States stock of California sea lions is 238,000 (Carretta et al. 2007) and has now reached carrying capacity. See subsection 3.4.2 Species Status, Distribution, and Abundance below for more information on California sea lion population status and trend.

Steller Sea Lion (Eastern United States Stock)

Steller sea lions, the largest members of the family otariidae, are found around the Pacific rim from California to Japan. The eastern United States stock ranges eastward from Cape Suckling, Alaska. Stellers show marked sexual dimorphism with males averaging approximately 1,500 pounds and 10 feet in length and females averaging about 700 pounds and 8 feet in length. Adult females have a tawny to silver colored pelt. Males are characterized by dark, dense fur around the neck that appears like a mane and light tawny coloring to the rest of their body.

The breeding range of the eastern United States stock of Steller sea lions extends from southeast Alaska through British Columbia and Oregon to northern California. There are no rookeries in Washington. Females sexually mature between 3 to 6 years of age. Males sexually mature between 3 to 7 years of age but cannot hold a breeding territory until between 8 and 12 years of age (Pitcher and Calkins 1981). Steller sea lions congregate at breeding rookeries from late April through August, and mature males defend breeding territories on the rookeries from mid-May to mid-July. Females show strong site fidelity to their natal rookery and return there to pup (i.e., give birth) between late May and

early July. Males mate with females that give birth and come into estrus on their territory. Non-breeding individuals do not return to the rookeries during the breeding season but remain at coastal haul-outs (areas where seals and sea lions move from the water to shore to rest, dry off, and heal).

Steller sea lions are year-round residents of coastal Oregon and Washington. Large seasonal shifts in distribution have been documented for Steller sea lions in the southern portion of their range (Scordino 2006) but they are not recognized as a migratory species (Sease and York 2003). After the breeding season male Steller sea lions are rarely seen on the Oregon coast (Scordino 2006; Mate 1975). Most males disperse into northern feeding grounds in Washington, Canada, and Alaska. Females with dependent pups appear to be limited in their dispersal distances (Raum-Suryan et al. 2002; Scordino 2006) as most individuals are seen within 300 miles of their natal rookery. Juvenile Steller sea lions disperse widely and have been observed as far as 1,600 miles from their natal rookery (Scordino 2006).

Steller sea lion use of particular haul-outs changes on a seasonal basis (Scordino 2006). The seasonal changes in haul-out attendance are likely due to changes in weather patterns and availability of prey. Steller sea lions' preference of fish and squid species depends on their locality and the season (Sinclair and Zeppelin 2002). In Oregon and Washington, Steller sea lions eat offshore, schooling fish such as gadids (the cod family) and forage fish (small oily fish like herring and sardines).

The current population estimate for the eastern United States stock of Steller sea lions is 47,885 (Angliss and Outlaw 2007). The population is listed as threatened under the ESA and, therefore, is considered depleted (below OSP) under the MMPA.

Harbor Seals (Oregon/Washington Coast Stock)

Harbor seals, members of the family phocidae, inhabit coastal and estuarine waters and shoreline areas from Baja California to western Alaska. The Oregon/Washington Coastal stock of harbor seal is one of three management stocks for this species along the Pacific coast of the continental United States The range of the stock, defined geographically for management purposes, extends from the California/Oregon border north to the Strait of Juan de Fuca at Cape Flattery, Washington. The average weight for adult seals is about 180 pounds and males are somewhat larger than females. The basic color of the coat is gray and mottled but highly variable from dark with light color rings or spots to light with dark markings.

Harbor seals generally are non-migratory but local movements are associated with factors such as tides, weather, season, prey availability, and reproduction (Scheffer and Slipp 1944; Bigg 1969, 1981). Numerous harbor seal haul-out sites are found on the intertidal mudflats and sandbars in the lower Columbia River estuary including nursery areas in Cathlamet Bay near Astoria (Jeffries et al. 2000). On the Oregon and Washington coast females give birth to pups at haul-out sites on land beginning in April through mid-July (Huber et al. 2001). Females breed within weeks of giving birth and breeding activity takes place in the water.

The diet of harbor seals in the lower Columbia River is seasonally variable and diverse. In the winter, smelt are predominant but at other times of year the diet includes anchovy, Pacific herring, salmonids, staghorn sculpin, starry flounder, and lamprey (Riemer and Brown 1997).

The current population estimate for the Oregon/Washington Coast stock of harbor seal is 24,732 (Carretta et al. 2007). In that report, Carretta et al. (2007) conclude that statistical analyses of seal

population growth in Oregon and Washington indicate that the stock is within OSP and has reached carrying capacity.

3.4.2 Species Status, Distribution, and Abundance

Aided by the MMPA, most stocks of pinnipeds along the west coast have recovered or are recovering from early exploitation (Caretta et al. 2006). The United States stock of California sea lion has recovered from an estimated population of 1,000 in the 1930s to an estimated 238,000 in 2007 (Bartholomew and Boolootion 1960; Carretta et al. 2007). Based on analyses of pup counts in California through 2005, this species is currently at its carrying capacity. Populations of harbor seals are also stable (Caretta et al. 2006). There has been steady improvement in the eastern stock of Steller sea lions (Angliss and Outlaw 2007), which are federally listed as threatened under the ESA. The United States stock of California sea lions is not listed as threatened or endangered under the ESA or considered depleted or a strategic stock as defined under section 3 of the MMPA (Carretta et al. 2006). Table 3.4-1 summarizes the status, distribution, and abundance for these species.

Table 3.4-1 Status, Distribution, and Abundance for Marine Mammals of Concern

Species	Federal (F) and State (S)[1] Status	Distribution within the Project Area	Abundance
California sea lion	F: none S: none	Occurs in Columbia River and estuary up to Bonneville Dam, primarily during the non-breeding season (September to June (NMFS & ODFW1997). Large haul-out at the South Jetty on the Columbia River (Jeffries et al. 2000). Haul-outs at the project include the spillway lip prior to spill, the boat dock below the navigation lock and on the concrete apron at the corner collector flume on Cascade Island (Stansell 2005).	The population off the west coast of the United States has shown an overall increasing trend since the mid-1970s, with an average annual rate of increase of over five percent (NMFS 1997). Periodic declines within this period have occurred due to El Nino events (Carretta et al. 2004). The population is stable and has reached carrying capacity.
Steller sea lion	F: Threatened S: Threatened for WA and sensitive in OR	Occur in Columbia River and estuary up to Bonneville Dam (NMFS 2007a). A haul-out site is present at the South Jetty on the Columbia River (Jeffries et al. 2000). Haul-outs at the project are the same as those used by California sea lions.	The Steller sea lion eastern United States stock is listed as threatened under the ESA and therefore depleted under the MMPA (Angliss and Outlaw 2007). The population is stable or increasing through much of its range but its status regarding OSP is unknown.
Harbor seal	F: none S: monitor in WA; none in OR	Occur year-round in the Columbia River estuary and the lower Columbia River to Bonneville Dam (NMFS 2007a). Numerous haul-out sites have been documented in the lower river as far up stream as Longview, WA (approx. river mile 57) (Jeffries et al. 2000).	The Oregon/Washington Coast harbor seal population is stable and very close to carrying capacity (Jeffries et al. 2003).

[1] For state status, if a state is not listed, the species either doesn't occur in the area or the species has no state listing status. For Idaho, listing status is included for those species listed as S1 = critically imperiled, S2 = imperiled, or S3 = vulnerable.

As early as the turn of the 19th century harbor seals were known to be present in the Columbia River as far east as The Dalles, Oregon, (at the prior site of Celilo Falls (Thwaites 1969). Stansell (2004) cited reports of increasing numbers of both seals and sea lions (unknown species) being seen in the river prior to 1959. The earliest known report of animals identified as California sea lions hauled out at Bonneville Dam were from the early 1970s, also noted by Stansell (2004). Observations of increasing impacts from sea lion predation on salmonids at Willamette Falls (at river mile 128 in a tributary of the Columbia River) began in the mid-1990s (NMFS 1999) indicating a growing presence in the river far from the ocean.

Observations of California sea lions at Bonneville Dam began to increase in 2000 (Stansell 2004). The States' application summarized information from the Corps on pinniped abundance at Bonneville Dam as replicated here in Table 3.4-2. As the table reflects, in all years between 2002 and 2006, California sea lions were the dominant pinniped present and feeding on adult salmonids. As a result, this section focuses primarily on California sea lions.

Table 3.4-2 Annual summaries of pinniped abundance and duration at the Bonneville Dam tailrace from 2002-2006 as presented in the States' application

	2002	2003	2004	2005	2006
Total number of individual pinnipeds	31	111	105	85	85
California sea lion	30	106	101	80	72
Steller sea lion	0	3	2	4	10
Harbor seal	1	2	2	1	3
Maximum daily number of pinnipeds	14	32	37	43	46
Maximum number of days individual was present	14	25	31	39	72
Date of first pinniped sighting	3/20	3/14	2/24	2/10	2/9
Date of last pinniped sighting	5/17	5/24	5/26	6/10	6/5
Total number of days pinnipeds present	59	72	93	121	117

Note: Not all years had the same start and end dates. Corps criteria to denote first and last sighting date: for California sea lions only, must be observed by Corps staff and not to include sightings with more than five days of no sea lions observed from the last observation.

Note: This information duplicates Table 1 provided in the States' application. Updated reports will present slight variations of the numbers, however the general trends are unchanged.

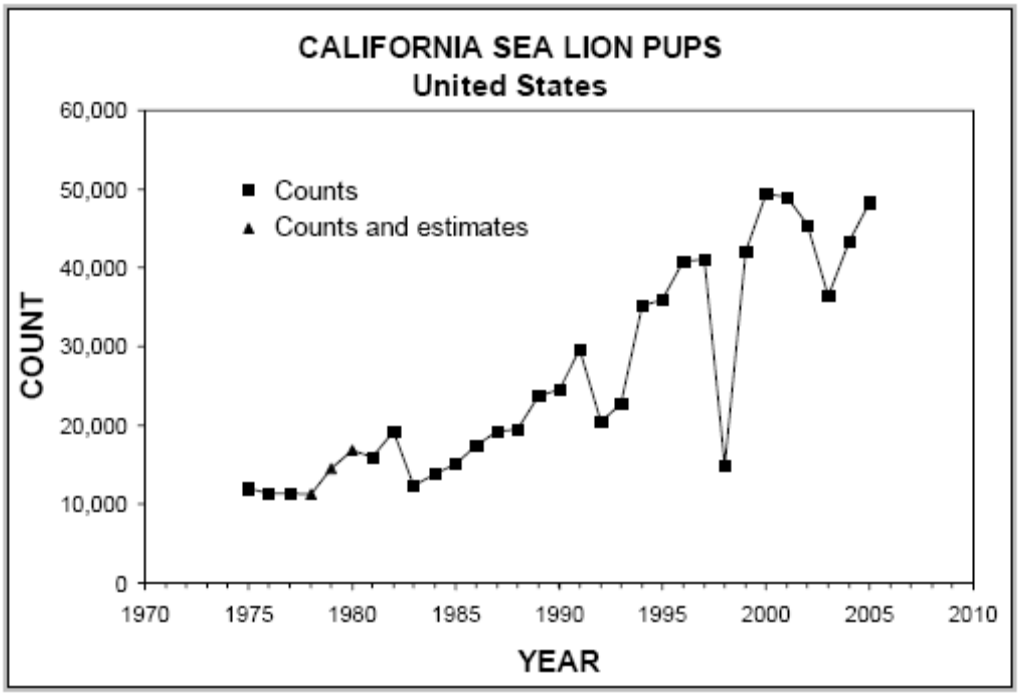
It is likely that more pinnipeds are present than are observed, since observations are recorded only from observation stations at the dam, observations do not occur at all hours, and only sea lions that can be identified are counted. The observation areas are large and poor weather conditions (e.g., wind, rain), murky and turbulent water, and heavy debris can make spotting an animal that might only surface for seconds, very difficult. Because of these limitations, the exact number of California sea lions arriving in the action area each season is uncertain. For purposes of this analysis, NMFS assumes there may have been as many as 40 percent more than the actual number observed during the large salmonid return and California sea lion presence year of 2003, or 150 animals.

3.4.2.1 California Sea Lion Population Levels

The California sea lion population has grown exponentially since the 1930s when the estimated United States population was 1,000 individuals (Bartholomew and Boolootion 1960). Breeding season pup counts provide the best means of estimating population size, because this is the only age class that can be counted ashore in its entirety. Figure 3-1 plots pup count data during the 1975 and 2005 time series (Carretta et al. 2007), including dips in pup survival during four El Niño events (1983-1984, 1992-1993, 1998, and 2003). Applying a general linear model to the pup count data,

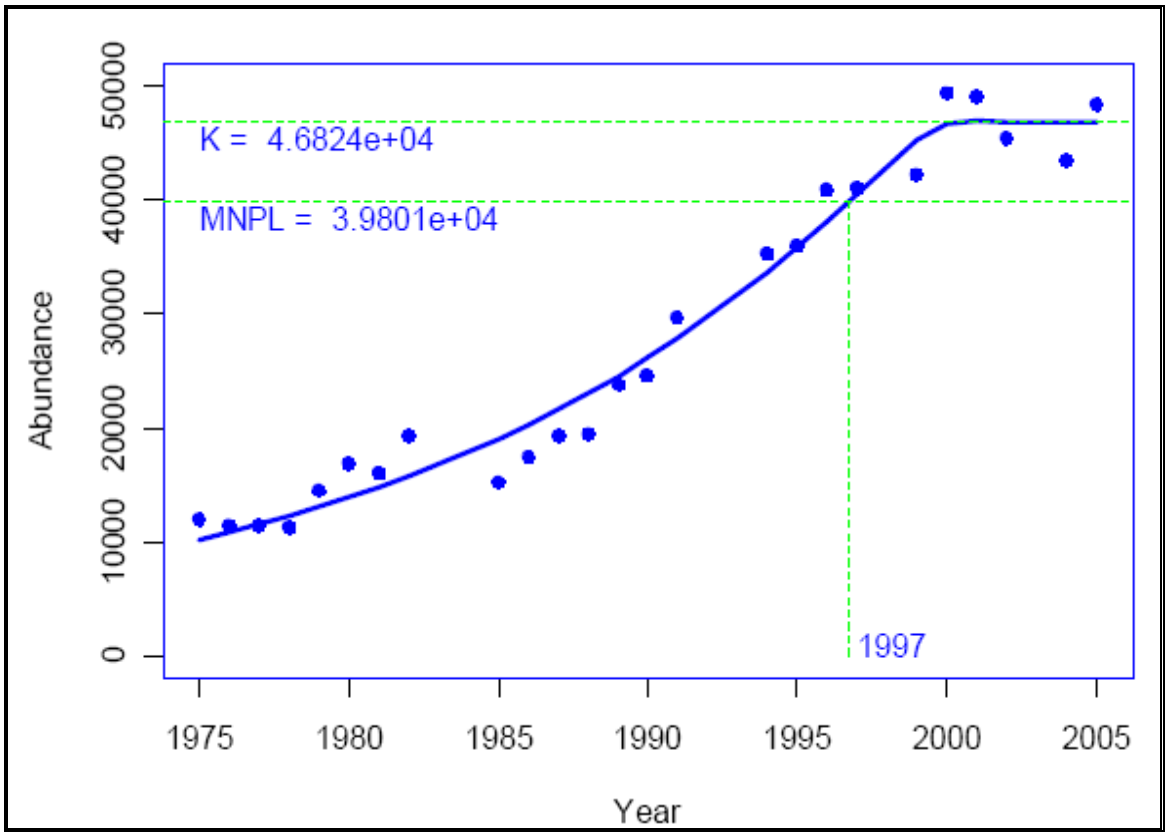
excluding El Niño years from the time series, yields a generalized growth curve for the California sea lion population. The logistic growth curve in Figure 3-2 shows an annual growth rate of 5.6 percent for this same time period.

Figure 3-1 Yearly California Sea Lion Pup Counts between 1975 and 2005



Source: Carretta et al. 2007
NOTE: Major dips in pup counts from general upward trajectory are signatures of El Niño events.

Figure 3-2 **Generalized logistic growth of California sea lion pup counts obtained during 1975-2005 (excluding El Nino years). Indicates when Maximum Net Productivity Level (MNPL) was reached and that the population has reached carrying capacity (K)**



Source: Carretta et al. 2007
Note: Calculations where z = 19.09, R_{max} = 0.0652, n0 = 10,100, and SE = 1,055.

Pre-exploitation population levels are unknown; however, data supports the hypothesis that the 1991 population was greater than pre-exploitation numbers (Low 1991). Today, the west coast California sea lion population is approximately double what it was in 1991. As the population has increased, counts of California sea lions in British Columbia increased 10 fold between 1972 and 1984. This rate of growth was faster than the annual rate of increase of the overall California sea lion population, suggesting that a shift in distribution had occurred (Bigg 1985). Counts around the Columbia River have likewise increased disproportionately to population growth, also indicating a shift in distribution. On the south jetty at the mouth of the Columbia River, counts of California sea lions range from 0 to over 700 seasonally (Hodder 2005) with several hundred more in Astoria at river mile 12 (Matteson et al. 1993). In the 1980s counts greater than 50 sea lions in Astoria were rare (Beach et al. 1985).

The United States stock of California sea lions has recovered to optimum sustainable population (OSP) size, with an estimated abundance of 238,000, and has reached carrying capacity for present ocean and breeding site conditions (Carretta et al. 2007). Optimum sustainable population (OSP) is a population size that falls within a range from the population level of a given species or stock which is the largest supportable within the ecosystem (carrying capacity or (K)) to the population level that

results in maximum net productivity level (MNPL) (50 CFR 216.3). Maximum net productivity is the greatest net annual increment (increase) in population numbers or biomass resulting from additions to the population due to reproduction and/or growth less losses due to natural mortality. As displayed in the Figure 3-2, the California sea lion population reached its MNPL in1997 (39,800 pups) and carrying capacity in 2000 (calculated at approximately 200,000 based on 46,800 pups) (Carretta et al. 2007).

Relevant to the States' application, the potential biological removal (PBR) level represents the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain OSP (50 CFR 229.2). For the United States stock of California sea lions the PBR is 8,511 sea lions per year (Carretta et al. 2007). Because the PBR is calculated using a population minimum it represents a conservative allowance for human caused mortality. As represented in the States' application and for purposes of comparison, current estimates of human caused mortality, primarily due to incidental take in commercial fishery operations, averaged 1,476 animals per year from 1997 to 2001 (Carretta et al. 2006) or 17.3 percent of PBR.

3.4.2.2 California Sea Lion Tracking at Bonneville Dam

Beginning in 1997, ODFW began capturing and branding California sea lions in the Columbia River at Astoria. This research effort will continue pending future funding. By fall 2006, ODFW had permanently marked and released over 630 sea lions. These marked individuals allow biologists to study individual movement and foraging behavior. Steller sea lions have not been marked at the sea lion trap in Astoria as California sea lions have.

At the Bonneville Dam, the Corps has tracked the presence of individual pinnipeds since 2002 through ODFW brands and/or natural markings. California sea lions generally arrive starting in mid-February and are present through beginning of June (R. Stansell, pers. comm., Corps, Letter Report, 2005). The minimum number of identifiable California sea lions present at Bonneville Dam has increased overall from 2002 to 2007, with annual fluctuations as shown in Table 1.1-3 (subsection 1.1.1, Pinniped Predation at Bonneville Dam). The count increased from 30 in 2002 to 108 in 2003. Counts remained above 100 in 2004, but dropped by 20 in 2005, by 8 in 2006, and by 4 in 2007. The decreases in observed abundance of California sea lions may be a result of actual decreases in their abundance, in response to sharply declining numbers of returning adult salmonids, or a result of decreased identification because sea lions are elusive and less visible during non-lethal deterrence activities (e.g., boat pursuit, pyrotechnics, and/or non-lethal ammunition) (R. Stansell, pers. comm., Corps, October 31, 2007). In spite of these drops, the number of observed individuals in 2007 is more than double 2002 observations.

As indicated in Table 1.1-3, a number of sea lions observed at the dam return from year to year but new animals are also identified each year. In 2007, for example, 24 of the 63 individual branded sea lions sighted by observers at the dam were identified for the first time. Although some of these animals may have been present previously but not observed, it is nevertheless likely that new animals continue to arrive at the dam given the total number of sea lions observed each year and the percentage of newly identified individuals encountered each season. In other words, if the number of sea lions involved in the pinniped-fishery interaction were constant from year to year, and no new individuals were being recruited, over time the number of unknown sea lions would decline until all individuals at the dam would be recognized. This does not appear to be happening. Each year some individuals from previous season do not return and are replaced by new arrivals.

3.4.3 Factors Affecting Distribution at Bonneville Dam

Pinnipeds are opportunistic feeders whose feeding habits vary by location, season, and year (NMFS 1997). They are known to congregate in areas of locally and seasonally abundant and energy-rich prey (Womble and Sigler 2006). The presence of pinnipeds at Bonneville Dam responds to the prey abundance in the project area, including a seasonal influx of salmonids.

Agencies implemented and tested non-lethal deterrence activities during 2005-2007 to minimize pinniped predation at the dam. Initial data supported the inference that non-lethal deterrence alters pinniped foraging behavior and might even reduce sea lion impacts on salmonids below Bonneville Dam (Norberg et al. 2005). However, more rigorous studies in 2006 and 2007 concluded that while California sea lions can be shifted from foraging their location as well as the time of day they foraged, the animals become conditioned to avoid harassment and non-lethal deterrence does not reduce the impact of California sea lions on salmonids (Brown et al. 2007). Individual California sea lions have been documented at Bonneville Dam for as few as one year or as many as 6 years (R. Stansell, pers. comm., Corps, September 4, 2007).

3.4.3.1 Feeding Habits and Salmonid Predation

Pinnipeds are opportunistic hunters and will take a variety of fish depending on location, season, abundance and prior foraging success. Foraging success for pinnipeds on migrating fish stocks is likely enhanced whenever numbers of fish are concentrated or wherever natural or manmade features slow the rate of migration or cause fish to temporarily congregate (Stansell 2004). During spring smelt, lamprey, salmon, and steelhead migrations, pinnipeds commonly follow prey up the Columbia River as far as Bonneville Dam (NMFS 2007a). Up to 300 seals and sea lions are known to feed in these upriver areas during this time, with some of the animals feeding heavily on salmon and steelhead (NMFS 2007a).

Migrating salmonids approaching Bonneville Dam move through the near shore area and congregate in the attraction flows from the fishway entrances. The majority of salmonids killed by sea lions in the tailrace are taken within 200 meters of the face of the powerhouse and fishway entrances (Stansell 2004). Determining the exact location of a catch is difficult, however, because the pinnipeds hunt a large area and do not always surface with a captured fish until farther downstream.

Visual observations of predation below Bonneville Dam for the period 2002 to 2007, shown in Table 1.1-2 (subsection 1.1.1, Pinniped Predation at Bonneville Dam) indicate that close to 80 percent of the fish that pinnipeds preyed upon were salmonids (listed and non-listed) and nearly 15 percent were other types of fish. The combined observed prey distribution of sea lions from 2002 to 2007 for fish other than salmonids was composed of lamprey (9.3 percent), sturgeon (4.0 percent), and shad (1.2 percent) (R. Stansell, pers. comm., Corps, September 4, 2007). Additional summary data from the Corps for 2002 to 2007 identifies prey preference by species, attributing 99.2 percent of observed salmonid take to California sea lions, 99.2 percent of observed lamprey take to California sea lions, and 97.8 percent of observed sturgeon take to Steller sea lions (R. Stansell, pers. comm., Corps, September 4, 2007). However, surface observations of prey taken by sea lions from 2002 to 2007 have revealed seasonal trends, annual variability, and sea lion species preferences for these fish species.

The proportion of observed surface predations on lamprey in the immediate vicinity below Bonneville Dam has fluctuated from 2002 to present. Lamprey composed 5.4 percent of prey items observed

taken by sea lions in 2002 and increased to 25.1 percent of observed takes by 2005 (R. Stansell, pers. comm., Corps, Letter Report, 2005). In 2006 and 2007, the percent of observed lamprey taken was much lower, at 9.9 percent and 2.5 percent, respectively (Stansell et al. 2006; Stansell et al. 2007a). California sea lions were the primary consumers of lamprey (99.2 percent of observed takes, 2002 to 2007) (R. Stansell, pers. comm., Corps, September 4, 2007). In all years observed (2002 to 2007), the frequency of lamprey taken increased in May (R. Stansell, pers. comm., Corps, September 4, 2007). California sea lions may target easily caught prey species leading up to their late May departure for breeding grounds in southern California, and lamprey is relatively easy to catch in comparison to salmon (R. Stansell, pers. comm., Corps, Letter Report, 2005).

The first sturgeon observed taken by a sea lion at Bonneville Dam occurred in 2005 (R.Stansell pers. comm.., Corps, Letter Report 2005). However, the frequency of sturgeon taken in the lower Columbia River was reportedly increasing from 2002 to 2005 (R. Stansell, pers. comm., Corps, Letter Report, 2005). In 2006 and 2007, the frequency of white sturgeon taken by sea lions at Bonneville Dam increased to 264 and 361 sturgeon, respectively (Stansell et al. 2006; Stansell et al. 2007a). Steller sea lions consumed the majority of sturgeon at Bonneville Dam (97.8 percent). In 2007, the majority of sturgeon takes occurred in January and February (R. Stansell, pers. comm., Corps, September 4, 2007).

Shad were observed taken by sea lions in relatively consistent and low proportion from 0 percent to 3.5 percent of observed surface predations (2002 to 2005) (R. Stansell, pers. comm., Corps, Letter Report, 2005). Food habits analysis of sea lion scat samples collected near Bonneville Dam revealed that shad was detected with greater frequency of occurrence in Steller sea lion scat samples (25 percent) than in California sea lion scat samples (2.4 percent; Table 3.4-3).

Data from fecal analysis provides an additional source of information on prey preference to supplement visual observation. In 2007, 70 fecal samples were collected from various haul-out sites used by both species of sea lions at Bonneville Dam. Genetic analyses to determine which sea lion species contributed to each sample was not attempted, so the analyses of prey in the scats is an indication of prey preference for both species combined. The analyses revealed that salmonids and sturgeon were the two most common prey species (Brown et al. 2007).

Table 3.4-3 Percent frequency of occurrence of prey items identified in Steller sea lion, California sea lion, and mixed sea lion scat collected at or near Bonneville Dam, 2007

Prey Item	Percent Frequency of Occurrence (%)		
	California sea lion[1]	Steller sea lion[2]	Mixed[1,3]
Adult salmonid	92.9	25.0	93.1
Juvenile salmonid	4.8	n/a	3.4
Pacific lamprey	4.8	8.3	10.0
American shad	2.4	25.0	n/a
Salmonid, age unknown	2.4	n/a	3.4
Sucker	2.4	n/a	n/a
Unidentified fish	2.4	66.7	3.4
Sturgeon	n/a	50.0	n/a

	Percent Frequency of Occurrence (%)		
n scat[4]	42	12	29

Source: Brown et al. 2007
[1]Scat samples collected at Bonneville Dam (RM 145), March to May, 2007.
[2]Scat samples collected at Dodson, OR (RM 140) and Bonneville Dam (RM 145), February to April, 2007.
[3]Mixed scat refers to samples that were likely deposited by California sea lions, but may come from Steller sea lions sharing the same haul out area.
[4]Food habit studies are generally conducted on feces to avoid reporting biases of surface observations and to avoid killing animals for stomach content analysis. Fecal samples collected at the corner collector apron of Power House 2, the floating trap, and from docks at The Fishery (Brown et al. 2007).

The number of listed and non-listed adult salmonids observed taken by California sea lions in the Bonneville Dam tailrace increased consistently from 2002 to 2007, but the percentage of run taken in any given year varied due to run size (R. Stansell, pers. comm., Corps, September 4, 2007). California sea lions took approximately 1,000 returning adults salmonids in 2002 (0.4 percent of that year's run) and 3,900 in 2007 (4.2 percent of that year's run) (R. Stansell, pers. comm., Corps, September 4, 2007). Information on yearly minimum pinniped take observed at Bonneville Dam during 2002 to 2007 is shown in Table 1.1-4 (subsection 1.1.1, Pinniped Predation at Bonneville Dam).

The actual consumption of salmonids by California sea lions may be much greater than the observed level of take discussed above. Wright (2007) reports a range in per capita predation rates for California sea lions from 1.48 salmon per day (based on a bioenergetics analysis) to a maximum of 10 salmon per day (based on an observation of 1 individual sea lion during 1 day at Bonneville Dam). Assuming an average residency time for a California sea lion in the observation area of 32 days in 2007 (Wright 2007), the average salmonid consumption of a California sea lion at Bonneville Dam may range from 47 to 320 salmonids per year. The total number of California sea lions present in the observation area during 2007 was between 69 and 111 individuals (Wright 2007). The total number of California sea lions in the action area likely exceeds the number estimated in the observation area and could be as high as 150 sea lions per year (subsection 2.2.4, Alternative 4: Unmodified Task Force Lethal Option 2 – Lethal Removal of all California Sea Lions above Navigation Marker 85 with No Requirement for Prior Active Non-lethal Deterrence). Assuming a per-capita yearly consumption rate of 47 to 320 salmonids per year and 150 California sea lions present, the total consumption may range from 7,050 to 48,000 salmonids.

3.4.3.2 Non-lethal Deterrence Activities

The Corps employed and monitored non-lethal deterrence techniques in cooperation with the ODFW, WDFW, and NMFS in the area of the Bonneville Dam tailrace from 2005 through 2007. Efforts included passive techniques like exclusion gates and acoustic deterrence devices issuing high intensity sound. Active techniques included tactile harassment by boat pursuit, pyrotechnics (cracker shells), and/or non-lethal ammunition (rubber buckshot, sabot rounds) in the near dam environment (from the dam and by boat) (subsection 1.1.1, Pinniped Predation at Bonneville Dam).

In 2005, agencies tested whether non-lethal deterrence activities affected pinniped predation. The initial phase of the test involved chasing sea lions out of the fishways. The Corps used acoustic deterrence devices and deployed pyrotechnics and/or non-lethal ammunition to keep sea lions out of fishways. The Corps also installed four sea lion exclusion devices to block passage of sea lions into fishways, however they were not installed until the week of May 30 and most sea lions were gone by then. Although exclusion gates were found to be generally effective at fishway entrances, individual

California sea lions were able to move through the fishways, entering the fish ladders up to the public viewing area (in the most severe instance) to hunt for and eat migrating adult salmonids. During tests in 2005 the Corps found they could drive sea lions from the fishways using active non-lethal deterrence techniques, however sea lions would gradually return when the harassment ended (R. Stansell, pers. comm., Corps, Letter Report 2005).

In conjunction with measures to keep sea lions out of the fishways, NMFS, ODFW, WDFW, and the Corps also conducted activities in the tailraces of Bonneville Dam (May 5, 6, 17, and 18, 2005). These measures involved personnel using boats to access sea lions and to actively harass them with boat pursuit, underwater firecrackers, aerial pyrotechnics, and non-lethal ammunition. As with the fishways, initial efforts showed that sea lions could be moved away from some areas (powerhouses), but sea lions quickly reentered the tailrace area after hazing efforts subsided (Norberg et al. 2005). Predation in the tailrace of the dam was reduced in the immediate vicinity of the active non-lethal deterrence, but it was not possible to quantify the magnitude of the reduction because variables (such as water flow from dam) could not be held constant. Active non-lethal deterrence was ineffective in the spillway area where water conditions precluded the use of boats.

These preliminary tests also showed that the impulsive detonation of underwater firecrackers had the potential to disturb or injure fish. Startle responses (leaping or rolling at the surface) involving adult and juvenile salmonids and shad were observed on several occasions during the test. No injured or dead fish were observed or collected during the startle events (Norberg et al. 2005).

In 2006, agencies increased passive and active non-lethal deterrence activity. The Corps installed sea lion exclusion devices early in the season and used acoustic deterrent devices by the eight fishway entrances to keep sea lions from entering. Agencies used pyrotechnics and non-lethal ammunition from dam-based locations. Beginning April 2, 2006, ODFW and WDFW participated in an estimated 1,000 active deterrence events using vessel chasing, cracker shells, aerial pyrotechnics, underwater fire crackers and rubber projectiles in the tailrace. Approximately 6,000 seal bombs, 8,000 cracker shells, 1,500 rubber bullet rounds, and 1,000 screamer and banger rockets were discharged during the engagements (Wright et al. 2007). No pinnipeds or fish were observed injured by these activities. Despite these increased efforts, the Corps and States found the 2006 non-lethal deterrence activities to be ineffective at reducing predation on salmonids (Stansell et al. 2006). The Corps did conclude that more intensive and directed efforts may have reduced pinniped presence near fishway entrances (Stansell et al. 2006).

Agencies again increased non-lethal deterrence activity in 2007. From February 28 to May 26, 2007 agencies used active deterrence methods 7 days a week for 10 hours per day. During nearly 1,500 active deterrence events, boat crews discharged 2,700 seal bombs, 13,500 cracker shells, and 1,000 rubber bullet rounds. No pinniped injuries were noted during these activities (Brown et al. 2007). Staff observed decreases in the abundance of Steller sea lions below the dam, but not California sea lions (Brown et al. 2007). Deterrence personnel observed California sea lions changing their behavior and movement patterns to either stay submerged under water longer, use the cover associated with bank vegetation or structure, and employ other techniques to make themselves less noticeable (R. Stansell, pers. comm., Corps, October 31, 2007). Additionally, personnel observed animals changing their times of feeding (earlier in the morning or later in the afternoon) when deterrence methods were not being used.

Experiences with non-lethal deterrence activities at the dam have proven similar to results of harassment efforts elsewhere. At the Ballard Locks, non-lethal deterrence activities using the same techniques proved ineffective at controlling sea lion predation. Although some techniques showed

signs of success early on, sea lions adapted quickly and either learned to avoid the measures or became tolerant while continuing to forage (NMFS 1995a). Similarly, non-lethal deterrence has not proven universally effective at controlling pinniped predation in other areas or at commercial fish farms (Fraker et al. 1998; Norberg 2000; Olesiuk et al. 1995).

Tests conducted by the Corps, ODFW, WDFW, and NMFS indicate that neither dam- nor boat-based harassment alone produce an appreciable effect on the salmonid predation rate by California sea lions at Bonneville Dam. In 2005, pinnipeds took approximately 2,900 salmonids, compared with 3,000 in 2006 and 3,900 in 2007 (Brown et al. 2007).

In 2005 and 2006, Steller sea lions generally reacted to activities focused on California sea lions (Brown et al. 2007). Beginning in 2007, non-lethal deterrence measures were aimed at Steller sea lions. Soon after focused non-lethal deterrence activities began on February 28, 2007, the observed numbers of Steller sea lions dropped dramatically. As Steller sea lion numbers declined, so did sturgeon catches. Observers recorded 78 sturgeon catches in the week prior to non-lethal deterrence and only 10 during the first week of harassment (Stansell et al.2007b).

3.4.3.3 Lethal Deterrence Activities

Since enactment of the MMPA, lethal removal of sea lions has been curtailed. Commercial fishers in the United States continued to legally shoot seals and sea lions for the protection of gear and catch under a statutory exemption until 1994, when the MMPA was amended to prohibit the practice. Under section 109 of the MMPA, Federal, state, and local officials may take marine mammals by lethal means only under very specific conditions. As previously described in Section 1 (subsection 1.1.2, Marine Mammal Protection Act Section 120), state resource managers may apply for authorization to take pinnipeds by lethal methods under section 120 of the Act. The only other instance where section 120 authority has been granted was in response to sea lion predation on steelhead at the Ballard Locks in Washington. In that instance, three individually identifiable California sea lions were captured and targeted for lethal removal. A permitted captive holding facility offered to accept the animals for inclusion in their collection. One of the animals subsequently died of a pre-existing cancer condition and the remaining two lived out their lives in captivity. While the permanent removal of these individual sea lions prevented them from further preying on salmonids, the experience at Ballard Locks did not provide a statistically valid test of the efficacy of lethal removal as a technique for managing an ongoing pinniped-fishery conflict because the winter steelhead run at the locks was in collapse. The run is now functionally extinct, and the numbers of fish remain so low that sea lions entering the area below the locks are unlikely to encounter a steelhead.

At the Puntledge River in British Columbia, a group of approximately 30 harbor seals were preying on outmigrating juvenile salmonids. Non-lethal deterrence failed to solve the conflict and ultimately all of the seals involved in the interaction were lethally removed by authorized professional marksmen (Olesiuk 1995). No significant predation was noted for some years afterward. A decade following the lethal action, seal predation on juvenile salmonids has become re-established and is again the subject of concern for fisheries managers (M. Joyce, Department of Fisheries and Oceans, pers. comm., November 8, 2007).

3.5 Listed Salmonids

Section 3 of the ESA defines “species” as including “any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when

mature." In 1991 NMFS issued a policy for delineating distinct population segments of Pacific salmon (56 FR 58612; November 20, 1991). Under this policy, a group of Pacific salmon populations is considered an "evolutionarily significant unit" (ESU) if it is substantially reproductively isolated from other populations, and it represents an important component in the evolutionary legacy of the biological species. NMFS considers an ESU of Pacific salmon to be a "distinct population segment" (DPS) and thus a "species" under the ESA.

In 1996, NMFS and FWS adopted a joint policy for recognizing DPSs under the ESA (DPS Policy; 61 FR 4722; February 7, 1996). The DPS Policy adopts criteria similar to, but somewhat different from, those in the ESU Policy for determining when a group of vertebrates constitutes a DPS: the group must be discrete from other populations, and it must be significant to its taxon. NMFS applies the DPS policy in determining what populations or population groups of West Coast steelhead qualify for consideration as a "species" under the ESA.

In the Columbia River basin there are currently 13 ESUs/DPSs of salmon and steelhead listed as threatened or endangered under the ESA (Table 3.5-1). Of these 13 listed species, 11 have a geographic range that overlaps with the action area, and of these, five species also exhibit adult run timing that coincides with the period when pinnipeds are present. This section reviews the life history, distribution, and status for only those listed salmon and steelhead species whose geographic range and run timing (Table 3.5-2) coincide with the presence of pinnipeds in the action area.

Table 3.5-1 ESUs and DPSs of Pacific salmonids (*Oncorhynchus spp.)* listed as threatened and endangered species under the ESA in the Columbia and Snake River Basins[1]

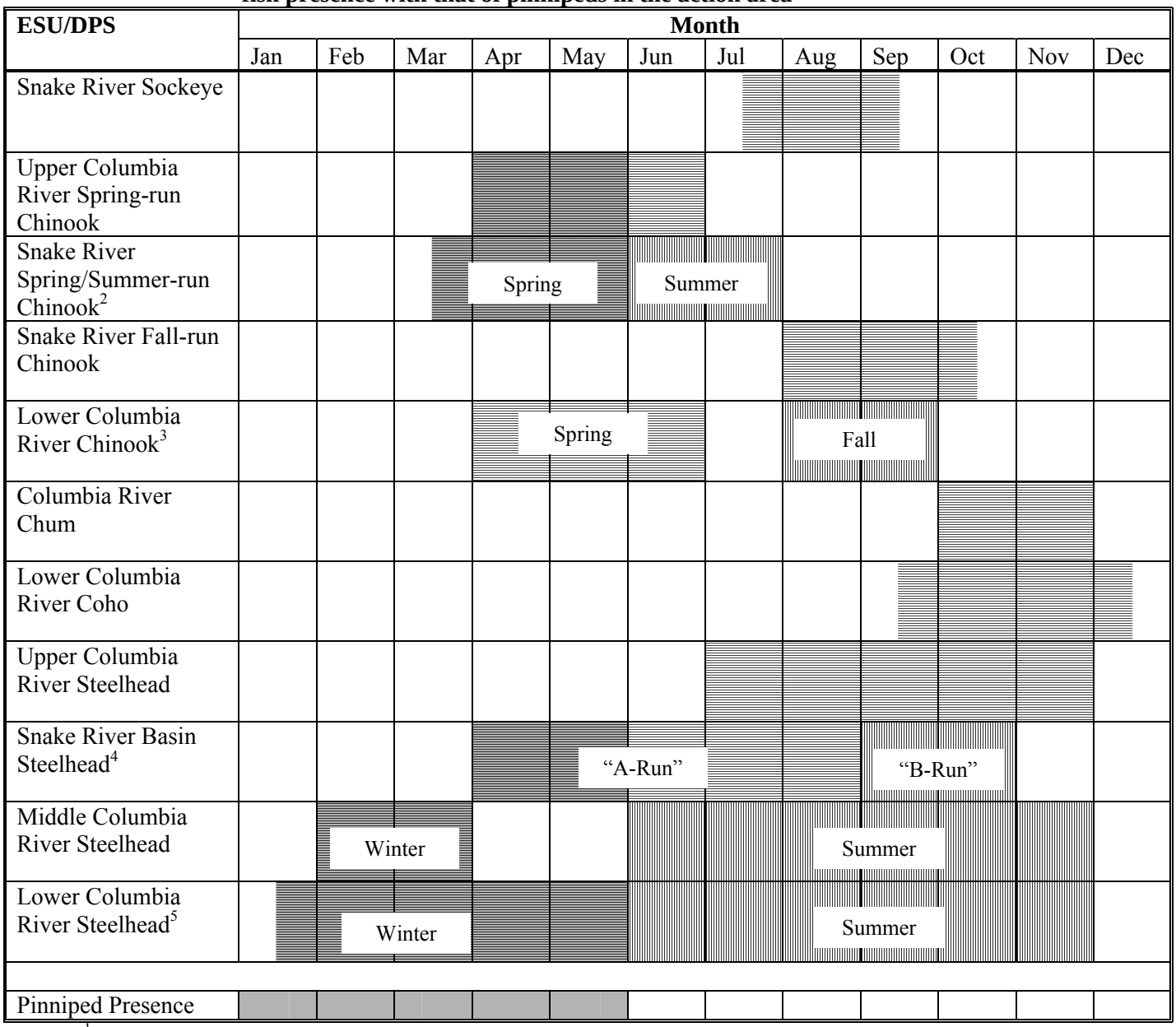
ESU/DPS	ESA Status	Geographic Range	Range Includes Action Area	Run Timing Coincides with Pinniped Presence[2]
Sockeye (*O. nerka*)				
Snake River	Endangered	All anadromous and residual sockeye salmon from the Snake River Basin, Idaho, as well as artificially propagated sockeye salmon from the Redfish Lake captive propagation program.	Yes	No
Chinook (*O. tshawytscha*)				
Upper Columbia River Spring-run	Endangered	All naturally spawned populations of Chinook salmon in all river reaches accessible to Chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington (excluding the Okanogan River), the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the	Yes	Yes

ESU/DPS	ESA Status	Geographic Range	Range Includes Action Area	Run Timing Coincides with Pinniped Presence[2]
		Peacock jetty (north jetty, Washington side) upstream to Chief Joseph Dam in Washington.		
Snake River Spring/Summer-run	Threatened	All naturally spawned populations of spring/summer-run Chinook salmon in the mainstem Snake River and the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins.	Yes	Yes
Snake River Fall-run	Threatened	All naturally spawned populations of fall-run Chinook salmon in the mainstem Snake River below Hells Canyon Dam, and in the Tucannon River, Grande Ronde River, Imnaha River, Salmon River, and Clearwater River.	Yes	No
Lower Columbia River	Threatened	All naturally spawned populations of Chinook salmon from the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River, and includes the Willamette River to Willamette Falls, Oregon, exclusive of spring-run Chinook salmon in the Clackamas River.	Yes	No
Upper Willamette River	Threatened	All naturally spawned populations of spring-run Chinook salmon in the Clackamas River and in the Willamette River, and its tributaries, above Willamette Falls, Oregon.	No	No
Chum (*O. keta*)				
Columbia River	Threatened	All naturally spawned populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon.	Yes	No
Coho (*O. kisutch*)				
Lower Columbia River	Threatened	All naturally spawned populations of coho salmon in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia up to and including the Big	Yes	No

ESU/DPS	ESA Status	Geographic Range	Range Includes Action Area	Run Timing Coincides with Pinniped Presence[2]
		White Salmon and Hood Rivers, and includes the Willamette River to Willamette Falls, Oregon.		
Steelhead (*O. mykiss*)				
Upper Columbia River	Endangered	All naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the United States-Canada border.	Yes	No
Snake River Basin	Threatened	All naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho.	Yes	Yes
Middle Columbia River	Threatened	All naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington, excluding *O. mykiss* from the Snake River Basin.	Yes	Yes
Lower Columbia River	Threatened	All naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in streams and tributaries to the Columbia River between the Cowlitz and Wind Rivers, Washington (inclusive), and the Willamette and Hood Rivers, Oregon (inclusive).	Yes	Yes
Upper Willamette River	Threatened	All naturally spawned anadromous *O. mykiss* (steelhead) populations below natural and manmade impassable barriers in the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to the Calapooia River (inclusive).	No	No

[1]For a species' ESA status, description, and range see 70 FR 37160 (June 28, 2005), 71 FR 834 (January 5, 2006), Myers et al. (1998), and Busby et al. (1996).
[2]See Table 3.5-2 for a description of adult run timing at Bonneville Dam.

Table 3.5-2 Temporal distribution of migrating adults in ESUs and DPSs of west coast salmonids (*Oncorhynchus spp.)* listed as threatened and endangered species under the ESA in the Columbia and Snake River Basins[1]. Only those ESUs/DPSs with geographic distributions that overlap the action area are included (see Table 3.5-1). Horizontal and vertical hatching denotes the approximate run timing for a given ESU/DPS. Gray shading denotes overlap in fish presence with that of pinnipeds in the action area



[1]Run timing information obtained from Busby et al. (1996), Gustafson et al. (1997), Myers et al. (1998), and Good et al. (2005).

[2]For management purposes the end of the spring Chinook run, and the beginning of the summer run is May 31 (TAC 2003a). However, early returning fish from the summer-run Chinook populations in the Snake River spring/summer-run Chinook ESU may be present in the action area in May when pinnipeds are present (Myers et al., 1998).
[3]Although the geographic boundaries of the Lower Columbia River Chinook ESU do overlap with the action area, there are no extant spring-run populations included in the ESU that are above Bonneville Dam. The Willamette/Lower Columbia Technical Recovery Team notes that the historical spring-run population in Hood River is now "extinct" (McElhany et al. 2007).
[4]Although the technical definition of "A-run" steelhead for fish counts at Bonneville Dam is steelhead returning between July 1 and October 31 that are larger than 78 cm fork length, there is a small proportion of returning steelhead passing Bonneville Dam between April 1 and June 30 that are likely early returning natural-origin A-run steelhead (TAC 2003b).
[5]The winter-run steelhead included in the Lower Columbia River steelhead ESU include natural winter-run steelhead population in the Hood River and the Hood River (ODFW stock # 50) hatchery winter-run steelhead stock Myers et al. 1998, 2006). Freshwater entry and migration for these stocks occurs between February and March.

3.5.1 Life History

3.5.1.1 Pacific Salmon and Steelhead

Pacific salmon and steelhead (salmonids) are anadromous fish, meaning adults migrate from the ocean to spawn in freshwater lakes and streams where their offspring hatch and rear prior to migrating to the ocean to forage until maturity. The migration and spawning times vary considerably among and within species and populations (Groot and Margolis 1991). At spawning, adults pair to lay and fertilize thousands of eggs. Eggs incubate for several weeks to months before hatching and emerging as young juveniles, which begin actively feeding (Groot and Margolis 1991). Juveniles may spend from a few hours to several years in freshwater areas before migrating to the ocean as "smolts" (Groot and Margolis 1991).

The fish typically spend from 1 to 5 years foraging over thousands of miles in the North Pacific Ocean before returning to freshwater to spawn. Spawning migrations known as "runs" occur throughout the year, varying in time by species and location. Most adult fish return or "home" with great fidelity to spawn in their natal stream, although some do stray to non-natal streams. Salmon species die after spawning, while steelhead may return to the ocean and make repeat spawning migrations.

3.5.1.2 Chinook Salmon

Listed Columbia River Chinook include populations from the lower and upper river tributaries. Upriver spring-run populations passing Bonneville Dam typically enter freshwater in late March and migrate to their spawning grounds through June (Myers et al. 1998). Upriver summer-run populations may enter freshwater as early as May, with freshwater migration lasting through July. The period of freshwater entry and migration for upriver fall-run populations is August-September. Adult spring-run Chinook passage at Bonneville Dam typically peaks in late April. For management purposes, the end of the spring Chinook run and the beginning of the summer run, is May 31 (TAC 2003a). However, early returning fish from the summer-run Chinook populations in the Snake River spring/summer-run Chinook ESU may be present in the action area in May when pinnipeds are present (Myers et al. 1998).

3.5.1.3 Steelhead Trout

Steelhead is the name commonly applied to the anadromous form of the biological species *O. mykiss*. Juveniles can spend up to 7 years in fresh water prior to smoltification, and then spend up to 3 years in salt water prior to first spawning. Unlike salmon, which die after spawning, steelhead may spawn more than once. Spawning migrations of West Coast steelhead occur throughout the year, with seasonal peaks. These "runs" are usually named for the season in which the peak occurs.

The Columbia River summer steelhead run is comprised of populations from lower and upper river tributaries. Summer steelhead enter freshwater year-round with the majority of the run entering from June through October. The lower river component of the run tends to be earlier-timed than the upriver stocks, with abundance peaking during May and June. Upper river steelhead include hatchery and wild stocks that pass Bonneville Dam from April 1 through October 31 each year. Historically, peak counts at Bonneville Dam were bimodal, with the first peak in early August (the "A-run" stock) and the second peak in mid-September (the "B-run" stock). A-run steelhead are characteristically smaller fish (under 10 pounds) that spend 1 or 2 years at sea and return to tributaries throughout the middle and upper Columbia River and the Snake River basins. The later arriving B-run steelhead are larger (over 10 pounds), typically having spent two or three years at sea, and returning primarily to Idaho's upper Clearwater and Salmon River subbasins in the Snake River Basin. There is some overlap with some large and small steelhead returning to many different tributaries throughout the basin.

Prior to 1999, the A-run of steelhead at Bonneville Dam was defined as all steelhead counted from April 1 through August 25, and the B-run was defined as all steelhead counted from August 26 through October 31. In recent years, distinct bimodal peaks at Bonneville Dam have become less evident. Since 1999 a new method of assessing the relative returns of A- and B-run steelhead has been implemented. In this method, all fish counted during April 1 through June 30 are classified as "Skamania Index" steelhead. Fish passing Bonneville Dam from July 1 through October 31 that are less than 78 cm fork length (FL) are now classified as A-run steelhead, while all steelhead during this period that are greater than or equal to 78 cm FL are classified as B-run. Despite this management classification, it is likely the steelhead passing between April 1 through June 30 includes early returning natural-origin A-run steelhead (for example, in 2003, 13 percent of the upriver "Skamania Index" summer steelhead were wild fish; TAC 2003b).

3.5.2 Species Description, Status, and Potentially Affected Populations

The five ESUs/DPSs whose spatial and temporal distributions coincide with the presence of pinnipeds in the action area are the: 1) Upper Columbia River spring-run Chinook ESU; 2) Snake River spring/summer-run Chinook ESU; 3) Snake River Basin steelhead DPS; 4) Middle Columbia River steelhead DPS; and 5) Lower Columbia River steelhead DPS (see Tables 3.5-1 and 3.5-2). The extinction risk and ESA status for these ESUs/DPSs is summarized below; those specific populations or run types that may be affected by the presence of pinnipeds in the action area are highlighted.

3.5.2.1 Upper Columbia River Spring-run Chinook

The Upper Columbia River spring-run Chinook ESU was first listed as an endangered species in 1999 (64 FR 14307; March 24, 1999). The ESU includes all naturally spawned populations of Chinook salmon in all river reaches accessible to Chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River (70 FR 37217; June 28, 2005). Six artificial propagation programs are considered to be part of the ESU. Approximately 50 percent of the returning fish in the Upper Columbia River spring-run Chinook ESU are of hatchery origin (NMFS 2007b).

All populations in the Upper Columbia River spring-run Chinook ESU exhibited pronounced increases in abundance in 2001. These increases are particularly encouraging following the last decade of steep declines to record, critically low escapements. Despite strong returns in 2001, both recent 5-year and long term productivity trends remain below replacement. In a recent review of the status of this ESU, NMFS expressed concern about its abundance and productivity, and comparatively less concern for its spatial structure and diversity (70 FR 37217; June 28, 2005). There are three extant populations of Upper Columbia River spring-run Chinook (ICTRT 2003; Table 3.5-3). The presence of returning adults from these three spring-run populations coincides with the presence of pinnipeds in the action area (Tables 3.5-1 and 3.5-2).

3.5.2.2 Snake River Spring/Summer-run Chinook

The Snake River spring/summer-run Chinook ESU was first listed as a threatened species in 1992 (57 FR 14653; April 22, 1992). The ESU includes all naturally spawned populations of spring/summer-run Chinook salmon in the mainstem Snake River and the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins (70 FR 37217; June 28, 2005). Fifteen artificial propagation programs are considered to be part of the ESU. Approximately 80 percent of the returning fish in the Snake River spring/summer-run Chinook ESU are of hatchery origin (NMFS 2007b).

The aggregate return (including hatchery and natural-origin fish) of Snake River spring/summer-run Chinook in 2001 exhibited a large increase over recent abundances. Short-term productivity trends were at or above replacement for the majority of natural production areas in the ESU, although long-term productivity trends remain below replacement for all natural production areas, reflecting the severe declines since the 1960s.

In a recent review of the status of this ESU, NMFS found moderately high risk for the abundance and productivity of this ESU, and comparatively lower risk for spatial structure and diversity (70 FR 37217; June 28, 2005). There are 31 extant populations in the Snake River spring/summer-run Chinook ESU, including 28 spring-run populations (ICTRT 2003; Table 3.5-3). The presence of returning adults from these 28 spring-run populations coincides with the presence of pinnipeds in the action area (Tables 3.5-1 and 3.5-2).

3.5.2.3 Snake River Basin Steelhead

The Snake River Basin steelhead DPS was first listed as a threatened species in 1997 (62 FR 43937; August 18, 1997). The DPS includes all naturally spawned populations of steelhead in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho (71 FR 834; January 5, 2006). Six artificial propagation programs are considered part of the DPS. Approximately 85 percent of the returning fish in the Snake River Basin steelhead DPS are of hatchery origin (NMFS 2007b).

The 2001 Snake River steelhead return over Lower Granite Dam was substantially higher relative to the low levels seen in the 1990s; however, the recent 5-year mean abundance (14,768 natural returns) is only 28 percent of the interim recovery target level. In a recent status review, NMFS found moderate risks to the DPS's abundance, productivity, and diversity, and comparatively lower risk to the DPS's spatial structure (71 FR 834; January 5, 2006). There are 16 extant "A-run" populations (ICTRT 2003; Table 3.5-3) whose adult run timing may coincide with the presence of pinnipeds in the action area.

3.5.2.4 Middle Columbia River Steelhead

The Middle Columbia River steelhead DPS was first listed as a threatened species in 1999 (64 FR 14517; March 25, 1999). The DPS includes all naturally spawned populations of steelhead in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington, excluding steelhead from the Snake River Basin (71 FR 834; January 5, 2006). Seven artificial propagation programs are considered part of the DPS. Approximately 30 percent of the returning fish in the Middle Columbia River steelhead ESU are of hatchery origin (NMFS 2007b).

The abundance for some of the natural populations in the Middle Columbia River steelhead DPS has increased substantially in recent years. Long-term trends for 11 of the 12 production areas within the range of the DPS were negative, although it was observed that these downward trends are driven, at least in part, by a peak in returns in the middle to late 1980s, followed by relatively low escapement levels in the early 1990s. Short-term trends in the 12 production areas were mostly positive from 1990 to 2001. In a recent status review, NMFS found moderate risks to the DPS's productivity, spatial structure, and diversity, with the greatest relative risk to the ESU's abundance (71 FR 834; January 5, 2006). There are two extant winter-run populations in Fifteenmile Creek and the Klickitat River (ICTRT 2003; Table 3.5-3) whose adult run timing coincides with the presence of pinnipeds in the action area (Tables 3.5-1 and 3.5-2).

3.5.2.5 Lower Columbia River Steelhead

The Lower Columbia River steelhead DPS was first listed as a threatened species in 1998 (63 FR 13347; March 19, 1998). The DPS includes all naturally spawned populations of steelhead in streams and tributaries to the Columbia River between the Cowlitz and Wind Rivers, Washington (inclusive), and the Willamette and Hood Rivers, Oregon (inclusive). Excluded are steelhead in the upper Willamette River Basin above Willamette Falls and steelhead from the Little and Big White Salmon Rivers in Washington (71 FR 834; January 5, 2006). Ten artificial propagation programs are considered to be part of the DPS. Approximately 30 percent of the returning fish in the Lower Columbia River steelhead DPS are of hatchery origin (NMFS 2007b).

Some steelhead populations in the Lower Columbia River DPS, particularly summer-run populations, have shown encouraging increases in abundance in recent years. However, population abundance levels remain small (no population has a recent 5-year mean abundance greater than 750 spawners). In a recent status review, NMFS found moderate risks to the ESU's abundance, productivity, spatial structure, and diversity (71 FR 834; January 5, 2006).

There are three extant populations of the winter-run steelhead that pass through the action area en route to spawning areas in the Columbia River Gorge and the Hood River. Their presence coincides with the presence of pinnipeds in the action area (Tables 3.5-1 and 3.5-2).

Table 3.5-3 Identification and viability of populations in ESUs and DPSs of West Coast salmonids (*Oncorhynchus spp.)* listed as threatened and endangered species under the ESA in the Columbia and Snake River Basins. Only those populations are included with geographic and temporal distributions that overlap the action area and the presence of pinnipeds, respectively (see Table 3.5-2)

ESU/DPS	River Basin	Population[1,2] Name	Life History	Population Viability[3,4,5]
Upper Columbia River Spring-run Chinook	Methow	Methow River	Spring-run	High Risk
	Wenatchee	Wenatchee River	Spring-run	High Risk
	Entiat	Entiat River	Spring-run	High Risk
Snake River Spring/Summer-run Chinook	Grand Ronde	Catherine Creek	Spring-run	High Risk
		Wallowa/Lostine River	Spring-run	High Risk
		Minam River	Spring-run	High Risk
		Upper mainstem Grande Ronde River	Spring-run	High Risk
		Wenaha River	Spring-run	High Risk
	Imnaha	Big Sheep Creek	Spring-run	High Risk
		Imnaha River mainstem	Spring-run	High Risk
	Lower Snake tributaries	Tucannon River	Spring-run	High Risk
		Asotin Creek	Spring-run	High Risk
	Salmon River tributaries	Chamberlain Creek	Spring-run	High Risk
		Little Salmon River	Spring-run	High Risk
	Middle Fork Salmon River	Bear Valley Creek/Elk Creek	Spring-run	High Risk
		Big Creek	Spring-run	High Risk
		Camas Creek	Spring-run	High Risk
		Middle Fork	Spring-run	High Risk
		Salmon River (below Indian Creek)	Spring-run	High Risk
		Pistol Creek	Spring-run	High Risk
		Marsh Creek	Spring-run	High Risk
		Sulphur Creek	Spring-run	High Risk
		Loon Creek	Spring-run	High Risk
		Middle Fork Salmon River (above Indian Creek)	Spring-run	High Risk
	Upper Salmon River	Valley Creek	Spring-run	High Risk
		Lemhi River	Spring-run	High Risk
		North Fork Salmon River	Spring-run	High Risk
		Pahsimeroi River	Spring-run	High Risk

ESU/DPS	River Basin	Population[1,2] Name	Life History	Population Viability[3,4,5]
		East Fork Salmon River	Spring-run	High Risk
		Upper mainstem Salmon River (above Redfish Lake)	Spring-run	High Risk
		Upper mainstem Salmon River (below Redfish Lake)	Spring-run	High Risk
		Yankee Fork	Spring-run	High Risk
Snake River Basin Steelhead	Lower Snake	Tucannon River	A-run	High Risk
		Asotin Creek	A-run	High Risk
	Clearwater	Lower Clearwater	A-run	Moderate Risk
	Grande Ronde	Lower Grande Ronde	A-run	Moderate Risk
		Joseph Creek	A-run	Low Risk
		Wallowa River	A-run	Moderate Risk
		Upper Grand Ronde	A-run	Moderate Risk
	Salmon River	Little Salmon	A-run	Moderate Risk
		Chamberlain Creek	A-run	High Risk
		Panther Creek	A-run	Moderate Risk
		North Fork	A-run	Moderate Risk
		Lemhi River	A-run	Moderate Risk
		Pahsimeroi River	A-run	Moderate Risk
		East Fork	A-run	Moderate Risk
		Upper mainstem	A-run	Moderate Risk
	Imnaha	Imnaha River	A-run	Moderate Risk
	Hells Canyon	Hells Canyon	A-run	Largely Extirpated
Middle Columbia River Steelhead	Fifteenmile	Fifteenmile Creek	Winter-run	Moderate Risk
	Klickitat	Klickitat River	Winter-run	Moderate Risk
Lower Columbia River Steelhead	Columbia	Columbia River lower Gorge tributaries	Winter-run	Moderate Risk
		Columbia River upper Gorge tributaries	Winter-run	Moderate Risk
		Hood River	Winter-run	Moderate Risk

[1]For identification of historical populations in the Interior Columbia see ICTRT (2003).
[2]For identification of historical populations in the Lower Columbia see Myers et al. (2006).
[3]Risk ratings are reported for Abundance and Productivity VSP criteria.
[4]For population viability in the Interior Columbia see ICTRT (2007a, 2007b)
[5]For population viability in the Lower Columbia see McElhany et al. (2007).

Recent Spring-run Chinook and Steelhead Returns at Bonneville Dam Coinciding with Pinniped Presence

Table 3.5-4 presents adult passage data for spring-run Chinook and steelhead passing Bonneville Dam during the period of pinniped presence (January through May). The mean run size of spring-run Chinook from 2001 to 2007 is 180,657, ranging from 66,646 to 391,842 fish (Corps 2007). Hatch (2007) estimated that from 2003-2005 approximately 25 to 35 percent of the total spring Chinook run passing Bonneville Dam was composed of ESA-listed fish (including those of hatchery origin). This estimated range is consistent with DNA analyses of pinniped scat and spew samples in 2006 indicating approximately 25 percent of the samples were from listed populations (Hatch 2007). The mean total run size of steelhead passing Bonneville Dam from 2001 to 2007 is 6,434, including natural and hatchery-origin winter-run steelhead, Skamania Index steelhead, and early returning A-run steelhead (Corps 2007). Table 3.5-4 presents estimates showing that from 2001 to 2007 approximately 28 to 60 percent of the total steelhead run passing Bonneville Dam was composed of ESA-listed fish (including those of hatchery origin).

3.5.3 Recovery Planning for ESA-Listed Salmonids

Section 4(f) of the ESA requires NMFS to develop and implement recovery plans for the conservation and survival of listed species. Recovery plans must describe specific management actions, establish objective measurable criteria for delisting, and estimate the time and cost to carry out measures needed to achieve recovery. Recovery plans for listed salmonids are in various stages of completion to address all listed salmon ESUs or steelhead DPSs in the Columbia and Snake River basins (Table 3.5-5). To develop recovery plans, NMFS established technical recovery teams (TRT) to provide scientific input, and invited local stakeholders to develop strategies and actions. NMFS reviews locally developed recovery plans, ensures that they satisfy the ESA requirements, and makes them available for public review and comment before formally adopting them as ESA recovery plans.

Recovery plans create a context in which to place the range of actions that will be necessary to recover threatened and endangered Columbia River salmonids. In addition, Federal agencies must consult with NMFS under ESA section 7 on any action that is likely to adversely affect the listed species. Through the consultation process Federal agencies or applicants may change their proposed actions to avoid harming listed fish, or NMFS may require them to conduct their proposed action in a way that reduces or mitigates harm to listed fish. NMFS consults on a host of actions in the Columbia River including operation and maintenance of the Federal Columbia River Power System; commercial, recreational, and tribal fisheries; forest management; irrigation withdrawals; road construction; grazing; and numerous other actions that affect fish habitat and fish migration.

Table 3.5-4 Columbia Basin spring-run Chinook and steelhead returns[1] at Bonneville Dam coinciding with the period of pinniped presence (January through May)

Yearly Returns Between January 1 and May 31	Spring-run Chinook Passage			Steelhead			
	Total Adult Return	Estimated[2] Percentage (%) of Run That Is Listed	Estimated ESA-Listed Return	Total Returns	Natural Origin Returns	Estimated[3] Total ESA-Listed Return	Estimated Percentage (%) of Run That Is Listed
2007	66,646	25-35	16,662 – 23,326	5,188	1,342	2,502	48
2006	96,458		24,115 – 33,760	5,688	1,078	2,977	52
2005	74,053		18,513 – 25,919	2,895	676	1,314	45
2004	170,308		42,577 – 59,068	7,345	1,681	2,681	37
2003	195,770		48,943 – 68,520	7,904	1,469	4,716	60
2002	269,520		67,380 – 94,332	8,734	1,935	3,151	36
2001	391,842		97,961 – 137,145	7,281	1,623	2,061	28

[1]Return data obtained from the Corps' Adult Fish Count Reports and Online Database at: https://www.nwp.usace.army.mil/op/fishdata/home.asp

[2]Hatch (2007) estimated that from 2003-2005 approximately 25-35 percent of the total spring-run Chinook passing Bonneville Dam were composed of ESA-listed fish (including those of hatchery origin). This estimated range is consistent with DNA analyses of pinniped scat and spew samples in 2006 that indicated that approximately 25 percent of the samples were from listed populations (Hatch 2007).

[3]There are no direct estimates of the proportion of the steelhead run passing Bonneville Dam that is listed. All upriver winter-run steelhead stocks are listed. The estimates are based on an assumption that all steelhead passing above Bonneville Dam prior to April 1 are listed, and all steelhead passing Bonneville Dam from April 1 – May 31 are non-listed Skamania Index steelhead. As noted above in the text, an unknown proportion of early-returning ESA-listed Snake River A-run steelhead may be included in the Skamania Index.

Through ESA section 4(f) recovery planning and ESA section 7 consultations, NMFS requires or recommends actions to improve salmonid survival, with the expectation that this will contribute to recovery of ESA-listed salmonids. Examples include dam passage improvements, habitat protection and restoration, fisheries reductions, and predator control. Reducing pinniped predation in the Columbia River basin represents just one of several possible mechanisms to improve adult salmonid survival.

The TRTs are charged with describing the historical population structure, developing biological recovery criteria with which to evaluate the status of an ESU relative to recovery, and identifying those factors limiting or impeding recovery. There is a separate TRT for the Lower Columbia and Interior Columbia regions. These TRTs identified the historical population structure for the ESUs/DPSs in their respective areas (Myers et al. 2006; ICTRT 2003), and have developed draft viability criteria against which the status of individual populations has been assessed (McElhany et al. 2007; ICTRT 2007a, 2007b). Table 3.5-2, as discussed above, lists those populations within the potentially affected ESUs whose presence in the action area coincides with the presence of pinnipeds. Table 3.5-3 summarizes the level of risk faced by each potentially affected population relative to the viability standards for abundance and productivity established by the TRTs. A population with an acceptable or "low" risk level is defined as one with a 5 percent probability of extinction in a 100-year period (ICTRT 2007a; McElhany et al. 2000). A population with a probability of extinction between 5 and 25 percent in 100 years is defined as at "moderate risk." A population with a probability of extinction exceeding 25 percent over 100 years is defined as at "high risk." Only one of 54 potentially affected populations is presently believed to be at "low risk" of extirpation (the Joseph Creek A-run steelhead population within the Snake River Basin steelhead DPS). Thirty-five populations are believed to be at "high risk" of extirpation, and the remaining 17 populations are believed to be at "moderate risk."

Table 3.5-5 Status of Endangered Species Act recovery planning for listed salmonid species (*Oncorhynchus spp.*) potentially affected by pinniped presence at Bonneville Dam[1]. Links to each individual plan are provided at: http://www.nwr.noaa.gov/Salmon-Recovery-Planning/ESARecovery-Plans/Draft-Plans.cfm/

Recovery Sub-Domain	Species Addressed	Final Recovery Plan Complete	Interim Regional Recovery Plan Complete	Target for Completion of Draft Recovery Plan	Responsible Entity(ies)
Interior Columbia Recovery Domain					
Upper Columbia	Upper Columbia River spring-run Chinook	**X**			Upper Columbia Salmon Recovery Board
Snake Idaho	Snake River spring/summer-run Chinook			January 2008	NMFS & State of Idaho
Oregon					OR Snake Sounding Board
SE Washington	Snake River Basin Steelhead		**X**		SE Washington Salmon Recovery Board
Mid Columbia	Middle Columbia River Steelhead			January 2008	NMFS & all Management Units
Oregon				October 2007	OR Snake Sounding Board
Yakima				Revision October 2007	Yakima Salmon Recovery Board
SE Washington			**X**		SE Washington Salmon Recovery Board
Gorge					
	Lower Columbia River Steelhead			October 2007	NMFS & Yakama Nation

[1]Table modified from NMFS 2007c.

The key factors limiting the recovery of the ESA-listed salmonid populations whose presence in the action area coincides with that of pinnipeds are listed in Table 3.5-6. Federal agencies, states, tribes and local governments have taken steps to correct the limiting factors and improve survival of listed salmonids. Table 3.5-7 identifies many of these conservation measures and the expected survival benefits from them.

Table 3 .5-6 Key limiting factors identified for Endangered Species Act listed salmonid species (*Oncorhynchus spp.*) potentially affected by pinniped presence at Bonneville Dam

ESU/DPS	Key Limiting Factors[1]
Upper Columbia River Spring-run Chinook	▪ Hydropower projects ▪ Predation ▪ Harvest ▪ Hatchery effects ▪ Habitat (estuary and tributary)
Snake River Spring/Summer-run Chinook	▪ Hydropower projects ▪ Predation ▪ Harvest ▪ Habitat (estuary and tributary)
Snake River Basin Steelhead	▪ Hydropower projects ▪ Predation ▪ Harvest ▪ Hatchery effects ▪ Habitat (tributary)
Middle Columbia River Steelhead	▪ Hydropower projects ▪ Habitat (tributary) ▪ Predation ▪ Hatchery effects ▪ Habitat (estuary)
Lower Columbia River Steelhead *(upriver populations)*	▪ Hydropower projects ▪ Predation ▪ Harvest ▪ Hatchery Effects ▪ Habitat (estuary and tributary)

[1]Key limiting factors as described in NMFS (2007b).

Table 3.5-7 Base mortality rates for key limiting factors and survival improvements relative to base mortality attributable to implemented and ongoing conservation measures addressing these key limiting factors for Endangered Species Act listed salmonid species (*Oncorhynchus spp*.) potentially affected by pinniped presence at Bonneville Dam

Key Limiting Factor		Base Mortality[1] (%)					Percentage (%) Survival Improvement Relative to Base Mortality Attributable to Implemented and Ongoing Conservation Measures[2]				
		UCR Spring Chinook	SR Spring/Summer Chinook	SR Basin Steelhead	MCR Steelhead	LCR Steelhead	UCR Spring Chinook	SR Spring/Summer Chinook	SR Basin Steelhead	MCR Steelhead	LCR Steelhead
Hydrosystem	Smolt Mortality Rate (FCRPS[3])	35.4	51.5[4]	59.9[5]	7.1	7.1	21-38	23.0	-2.0	6.0	6.0
	Adult Mortality Rate (FCRPS)	9.9	15.4	16.8	2.3	2.3					
Predation	Smolt Predation by Terns	13.0[6]					40.5[7]				
	Smolt Predation by Pikeminnow	8.0					25.0				
	Adult Predation by Pinnipeds	0.4-5.0[8]					--				
Harvest	Allowed Incidental Take Limits	5.5-17	5.5-17	4.0	6.0	6.0	4.0	4.0	4.0	4.0	4.0
	Average Actual Take	10.7	10.7	1.0-1.8	1.0-1.8	1.0-1.8					
Habitat	Estuary	-- [9]					0.3	0.3	0.3	0.3	0.3
	Tributary						2.0	0.5-4.	0.5-8.	0.1	0.1

[1]"Base" mortality reflects the life-cycle mortality for a given key limiting factor for the 20 year period prior to 2000 (NMFS 2007c).
[2]Estimated survival improvements, relative to base mortality, attributable to multiple conservation measures implemented in 2000-2006 to improve fish survival. Survival improvement estimates represent the benefits from a suite of conservation actions (NMFS 2007c).

[3]Federal Columbia River Power System (FCRPS).
[4]Average in-river smolt mortality for the Snake River spring/summer-run Chinook ESU is 51.5 percent. Average smolt mortality for the ESU with transport is 9.8 percent (NMFS 2007c).
[5]Average in-river smolt mortality for the Snake River spring/summer-run Chinook ESU is 59.9 percent. Average smolt mortality for the ESU with transport is 7.7 percent (NMFS 2007c).
[6]Estimated mortality rate by Caspian terns in the Columbia River estuary in 1998 (NMFS 2007b).
[7]Caspian tern predation in the estuary was reduced from 13,790,000 smolts to 8,201,000 smolts after relocation of the tern population from Rice Island to East Sand Island in 1999 (NMFS 2007c).
[8]Range of estimated pinniped mortality rates at Bonneville Dam from 2002-2006. Source: Robert Stansell, Corps.
[9]Quantitative estimates of the base mortality due to human-caused estuary and tributary habitat degradation are not available.

3.6 Other Fish Species

3.6.1 Non-listed Spring-run Chinook Stocks

The Middle Columbia River Chinook ESU includes spring-run populations spawning in the Klickitat, Deschutes, John Day, and Yakima Rivers (Myers et al. 1998). The peak passage of these spring-run Chinook populations at Bonneville Dam is typically in late April (ITAC 2003a). There is a substantial level of hatchery production of upriver spring-run Chinook that are not included in the listed ESUs. Spring-run hatchery Chinook produced at the Leavenworth National Fish Hatchery (Wenatchee River, Washington), Entiat National Fish Hatchery (Entiat River, Washington), Powell Hatchery (Clearwater River, Idaho), and Rapid River Hatchery (Little Salmon River, Idaho) are not considered part of the Upper Columbia River spring-run or Snake River spring/summer run Chinook ESUs (NMFS 2003; 72 FR 37160, June 28, 2005). Hatch (2007) estimated that from 2003 to 2005 approximately 65 to 75 percent of the total spring-run Chinook passing Bonneville Dam were composed of non-listed natural (i.e., Middle Columbia River ESU) and hatchery-origin fish.

3.6.2 White Sturgeon

White sturgeon (*Acipenser transmontanus*) are present in the mainstem Columbia River as far upstream as the Kootenai River. They are long-lived species (up to 100 years), and do not mature and begin reproducing until they are 15 to 20 years old (or approximately 5 feet in length). Groups of white sturgeon are segregated by limited passage at several mainstem dams. Passage of white sturgeon at fish ladders is typically low and occurs in a net downstream direction. However, the available genetic evidence does not suggest genetically distinct populations of white sturgeon (Anders et al. 2000). ODFW recognizes two white sturgeon populations in the vicinity of the action area: a lower Columbia River/Coastal population; and a Bonneville Reservoir population above Bonneville Dam and below the Dalles Dam.

The commercial and recreational fisheries on this population are the largest sturgeon fisheries in the world. Length restrictions in fisheries ensure that nearly all fish of reproducing age are released. The white sturgeon population residing in the lower Columbia River within and downstream of the action area is the most productive in the species' range (DeVore et al. 1995). Harvest of white sturgeon in lower Columbia River sport and commercial fisheries has averaged over 42,000 fish annually (DeVore et al. 1999). The sturgeon fishery ranks as the largest sport fishery in the Columbia Basin in terms of effort with a ten-year annual average of over 175,000 angler trips. Factors most responsible for the favorable production potential of the population are access to marine areas, abundant food resources, and consistently favorable hydrologic conditions during the spawning timeframe, which enhances recruitment (Parsley and Beckman 1994; DeVore et al. 1995).

White sturgeon are present in the action area year-round. White sturgeon in the lower Columbia River generally spawn from April through July, with spawning triggered consistently when water temperatures reach 50 degrees F (LCFRB 2004). Annual spawning of white sturgeon in the Columbia basin occurs first below Bonneville Dam, with spawning activity occurring immediately below the dam in high velocity areas in the tailrace (Parsley et al. 1993, 2002).

The current white sturgeon population in the lower Columbia River is estimated at over 1 million fish exceeding 24 inches in length (LCFRB 2004). Direct population surveys for the lower Columbia River white sturgeon population are available for the period 1987 to 1997 (DeVore et al. 2000). Although surveys to estimate recruitment and the abundance of large "broodstock" individuals have not been conducted regularly, the available data suggest that the lower Columbia River white sturgeon population exhibits regular recruitment and stable abundances of older broodstock individuals. The average

estimated abundance (1987 to 1997) of white sturgeon 36 to 60 inches in size (fork length) is 297,450 fish, and approximately 7,743 "large broodstock" fish that are 60 to 72 inches in size. The abundance trend indicates a significant increase in the 36 to 72 inch population since 1989, and ODFW considers this population at low risk (ODFW 2005).

3.6.3 Lamprey

Three lamprey species are found within the Columbia and Snake River basins and occur within the action area: Pacific lamprey (*Lampetra tridentate*); western brook lamprey *(L. ayresi*); and river lamprey (*L. richardsoni*). Although there is some limited status information regarding Pacific lamprey (see below), little is known about the status of the western brook and river lamprey species. In 2003, 11 environmental organizations submitted a petition to list four lamprey species under the ESA, including the three lamprey species present in the action area (Klamath-Siskiyou Wildlands Center et al. 2003)[4]. The petitioners asserted that the viability of these lamprey species is at significant risk due to several threats including predation by marine mammals (harbor seals and California sea lions.

Pacific Lamprey – Pacific lamprey live in the ocean as adults where they are external parasites on marine fish. Adults are anadromous, returning to freshwater streams to spawn. In the Columbia River, there appear to be two Pacific lamprey runs, one occurring in late May to early June, and another in late July to early August (Starke and Dalen 1995). Peak passage occurs in early June (Kostow 2002). Spawning takes place primarily between February and May. Pacific lamprey populations can be highly variable, with the abundance of returning adults varying by orders of magnitude from one year to the next (Kostow 2002; Beamish and Levings 1991). This variability creates uncertainty in interpreting apparent trends and assessing viability. In the early 1990s tribal fish managers and ODFW noted that Pacific lamprey were "apparently declining to perilously low numbers" (Kostow 2002). Adult lamprey counts have decreased at all Columbia River dams, with the greatest declines observed at the Snake River dams where counts indicate a 99 percent decline between the 1960s and 2001 (Close et al. 2002). Average lamprey passage at Bonneville Dam was 109,000 from 1938 to 1969, but declined to an average of 39,000 from 1997 to 2002. Recently, however, counts of adult Pacific lamprey have increased at Bonneville Dam (ODFW 2005). ODFW has identified the lower Columbia/Willamette population of Pacific lamprey as at risk due to several threats, including predation by pinnipeds. Evidence suggests that Steller sea lions may specifically target Pacific lamprey (Jameson and Kenyon 1977; Roffe and Mate 1984).

Western Brook Lamprey – The western brook lamprey is probably the second most common and widely distributed lamprey in the Columbia and Snake River basins after the Pacific lamprey (Kostow 2002). The western brook lamprey lives only in freshwater, is non-parasitic, and does not feed as an adult. Little is known about the life-history characteristics of western brook lamprey, and there are many critical uncertainties regarding their status, biology, and habitat requirements. It is likely that western brook lamprey movement is minimal, and that most individuals remain within their stream of origin (Pletcher 1963). This lack of movement has likely resulted in significant population structure, but no supporting information exists (Kostow 2002).

There is no historic or current abundance, productivity, or distribution information available for the western brook lamprey. As with Pacific lamprey, ODFW concluded that the lower Columbia/Willamette

[4] The U.S. Fish and Wildlife Service (FWS) concluded that the petition failed to present sufficient information to warrant a status review. With respect to Pacific lamprey, FWS acknowledge there were documented declines, but found that the petitioners failed to present substantial information to indicate that the declining populations may represent a DPS or DPSs of the species. With respect to western brook and river lamprey, FWS found that there was insufficient information to assess their status. (See 69 FR 77158; December 27, 2004).

population of western brook lamprey is at risk noting that predation by pinnipeds may pose a threat to the species (ODFW 2005).

River Lamprey – River lamprey adults, like the Pacific lamprey, are anadromous and parasitic on marine fish. River lamprey migrate to the ocean for only 10 weeks, scavenging or feeding on smelt and herring. Little is known about the biology or status of river lamprey. In the Columbia River adult river lampreys are currently known only from museum collections (Kostow 2002). This lack of observation may be because the species is very rare, or that the species is difficult to find or identify in freshwater. The last collection records are from the Columbia River in 1980. ODFW has not assessed the status of river lamprey.

3.6.4 Shad

American shad (*Alosa sapidissima*) is a highly migratory anadromous species that enters freshwater in the spring and early summer months to spawn (TAC 2006). Shad are present in the action area between May and early August, with peak abundance occurring in June (LCFRB 2004). Unlike salmonids, shad do not necessarily die after spawning and many continue to spawn annually. Shad is not a native species to the Pacific coast, but was intentionally introduced from the east coast. Shad was first introduced to the west coast in 1871 in the Sacramento River, and is now present from San Diego Bay (California) to Kodiak Island (Alaska) (Welander 1940; Faria et al. 2006). The shad transplanted in the Sacramento River soon thrived and strayed north into the Columbia River. Shad were being harvested in the Columbia River by 1880, and in 1995 shad fry were deliberately planted in the Columbia River. By 1990 the population of shad entering the Columbia River totaled over 4 million fish. The average shad return over Bonneville Dam over the last 10 years has been over 3.1 million fish (LCFRB 2004).

3.7 Fish Habitat

3.7.1 Essential Fish Habitat

Under the Magnuson-Stevens Fishery Conservation and Management Act, Essential Fish Habitat (EFH) refers to the waters and substrate necessary for fish to carry out spawning, breeding, feeding, or growth to maturity, including freshwater areas that support the various life stages of Pacific salmonids (NOAA 2007). Freshwater EFH defined for salmon species includes all lakes, streams, ponds, rivers, wetlands, and other bodies of water historically accessible to salmon (PFMC 2000). Fishery Management Plans specify how the Pacific Fishery Management Council develops recommendations for management of EFH. Two Pacific salmon species from the identified Fishery Management Plans species list occur at Bonneville dam in the freshwater habitat of the Columbia River: Chinook and coho. Salmonid species are sensitive to loss of suitable spawning and rearing habitat, barriers to fish migration, and reduced water and sediment quality in freshwater habitats (PFMC 2000).

3.7.1.1 Freshwater Habitat

Freshwater habitat at Bonneville Dam has been altered from historic conditions. There are two fish passage facilities now operating at Bonneville, including two major adult fish ladder complexes (the Bradford Island Complex and the Washington Shore Complex) together with fish collection systems at both powerhouses.

Fish habitat includes the water column, substrate, and riparian areas. The water column is discussed in subsection 3.3, Water Quality. Christy and Putera (1993) describe the lower Columbia River as a highly altered and degraded ecosystem. The substrate is cobbles and gravel mixed with silt. Natural processes that formed the riparian area have largely disappeared, and riparian vegetation "has been irrevocably altered by grazing, logging, flood control, and the advent of exotic species between Bonneville Dam and river mile 140" (Christy and Putera 1993).

3.7.1.2 Critical Habitat

NMFS has designated critical habitat in the lower Columbia River, including the project area, for 10 salmonid ESUs/DPSs (Table 3.7-1). In designating critical habitat, NMFS identified essential features including spawning sites, juvenile rearing areas and migration corridors, adult migration corridors, food resources, water quality and quantity, and riparian vegetation.

Table 3.7-1 Critical habitat designations and descriptions

Species	Date of Critical Habitat Designation	Description of Critical Habitat
Chinook Snake River spring/summer	October 25, 1999	Columbia River to confluence with Snake River, Snake River and tributaries
Chinook Snake River fall	December 28, 1993	Columbia River to Confluence w/ Snake River, Snake River and tributaries
Chinook Lower Columbia River	January 2, 2006	Columbia River to confluence with Hood River and tributaries
Chinook Upper Columbia River	January 2, 2006	Columbia River to Island Dam and tributaries
Chum Columbia River	January 2, 2006	Columbia River to confluence with Hood River and tributaries
Sockeye Snake River	December 28, 1993	Columbia River to confluence with Snake River, Snake River and tributaries
Steelhead Snake River Basin	January 2, 2006	Columbia River to confluence with Snake River, Snake River and tributaries
Steelhead Lower Columbia River	January 2, 2006	Columbia River to confluence with Hood River and tributaries
Steelhead Middle Columbia River	January 2, 2006	Columbia River to confluence with Yakima River and tributaries
Steelhead Upper Columbia River	January 2, 2006	Columbia River to Chief Joseph Dam and tributaries

3.8 Terrestrial Wildlife and Birds

The Bonneville Lock and Dam is located within disturbed wildlife habitats. The area immediately below the Bonneville Project has been disturbed from construction of the new lock on the Oregon side and the Bonneville Second Powerhouse on the Washington side. Construction of the second powerhouse involved removal of the downstream tip of Bradford Island (Oregon) and a portion of the Washington shore; and relocation of 2 miles of State Highway 14 and 1-3/4 miles of Washington Burlington Northern Santa Fe

Railroad; and the entire town of North Bonneville. A portion of the original shore remains as Cascades Island, though this remnant has been reshaped via excavation and fill. Powerhouse 2 spans a new channel between Cascades Island and the new Washington shore. The new shorelines were shaped and rip-rapped, and shoreline and embankments seeded and landscaped.

River otter, muskrat, mink, beaver may be found along the shorelines, and fox, deer, coyote, black bear, and elk in the adjacent hills. The area supports Canada geese and white fronted geese. Osprey and bald eagles use the islands and shorelines for perching or resting sites between fishing trips. Great blue herons forage along the shorelines for food. Red-tailed hawks, kestrels, and northern harriers hunt the pasture and open grassland areas.

To minimize predation on fish at Bonneville Dam, wildlife officials employ techniques to deter and control predators. For avian predators these techniques include non-lethal, passive, exclusionary-type devices, such as bird netting and electric wires. In some cases, harassment of the birds using pyrotechnics or a trained falconer, is also employed. To date, only two avian (both were osprey) injuries or fatalities from the predator control devices and techniques have been documented.

Various federal, state, and local regulations address wildlife protection, including protection of threatened, endangered, and sensitive fish and wildlife in the project area (Table 3.8-1). Operations at Bonneville Dam are designed to comply with these laws and regulations.

Table 3.8-1 Federal, State, and local regulations for natural resources

Regulation	Overseeing Agency	Species, Habitats, and/or Resource Addressed
Federal		
Federal Endangered Species Act (ESA)	NMFS and U.S. Fish and Wildlife Service (FWS)	All federally-listed threatened and endangered species and critical habitats
Marine Mammal Protection Act	NMFS and FWS	Marine mammals
Migratory Bird Treaty Act and Executive Order 13186	FWS	Nearly all species of birds
The Bald and Golden Eagle Protection Act	FWS	Bald and golden eagles
Fish and Wildlife Coordination Act	FWS; WDFW	All wildlife
Animal Damage Control Act	FWS	Certain predatory or wild animals and nuisance mammal and bird species
State[1]		
Washington State list of endangered, threatened, and sensitive species	WDFW	All state-listed endangered, threatened, and sensitive species
Oregon State Endangered Species Act	ODFW	All state-listed threatened and endangered species
Local		

Regulation	Overseeing Agency	Species, Habitats, and/or Resource Addressed
County Sensitive Areas Ordinances and Comprehensive Plans	Various counties	Varies by county, but generally includes critical or outstanding habitat for herons, raptors or state or federal designated endangered or threatened species; designated wildlife habitat corridors; riparian and wetland habitats

[1] Idaho does not have a state endangered species act.

3.9 General Vegetation

The general setting below Bonneville Dam is a river bottomland that includes cobble shorelines extending into riparian forests, floodplains, open water habitats, and upland forest habitats. The setting is degraded and includes developed and filled lands due to construction of the dam, lock and powerhouses as well as freeway and railroad construction. Some areas include small pastures and scattered rural residential development, as well as major transportation facilities. The cobble substrate shoreline is subject to periodic inundation due to fluctuating water levels downstream of the dam. The shoreline is disturbed and rip rapped, with little vegetation due to maintenance activities. The original shoreline around Bonneville Dam exists only as part of the Fort Cascades National Historic Site and Trail.

Where unaltered, the river bottomlands setting consists primarily of a largely deciduous forest, with black cottonwood, red alder, bigleaf maple, and willows dominating. Unforested marshes also occur in this setting. Public use areas and parks contain landscaped vegetation patterns uncharacteristic of riparian communities, such as mowed lawn areas and ornamental plantings.

3.10 Social and Economic Resources

Thousands of people are residents in the Columbia Gorge or visit for recreation. Population growth in the Portland-Vancouver area created opposing pressures for protection and development of the Gorge in the 1960s and 1970s. Citizens concerned about urban sprawl worked with congressional leaders to create a scenic management area. Congress designated the Columbia River Gorge National Scenic Area Act in 1986 (Scenic Area Act; Public Law 99-663).

The Columbia River Gorge National Scenic Area (Scenic Area) has two primary purposes. First, the Scenic Area Act mandates protection and enhancement of cultural, natural, and recreation resources, along with the Gorge's world-class scenery. The second purpose is to protect and support the economy by encouraging growth to occur in existing urban areas and allowing future economic development in a manner that is consistent with resource protection.

The Scenic Area Act sustains the Gorge's economic health by providing a framework where the protection and enhancement of resources drives economic development, protecting the resources that make the Columbia Gorge special. Since the Scenic Area was created, developments and new land uses are reviewed according to the framework. People visit the Scenic Area to view the unspoiled scenery and take advantage of the Gorge's unparalleled recreational opportunities, which helps fuel the Gorge's visitor

and recreation industries. In recent years, new businesses have located in the Columbia Gorge in part due to the quality of life associated with these outstanding scenic and recreation resources. The Scenic Area Act also sustains the Gorge's economic health by preserving important agricultural and forest lands.

The Scenic Area stretches 85 miles long and includes portions of three Oregon and three Washington counties. The area designated for special protection spans 292,500 acres on both sides of the Columbia. For management purposes, lands in the Scenic Area are categorized as Special Management Areas, General Management Areas, and Urban Areas. The Bonneville Lock and Dam is an Urban Area exempt from Scenic Area regulations.

Today, the Corps maintains a reliable system of navigation locks, including the Bonneville Lock and Dam, along the Columbia-Snake Inland Waterway to Lewiston, Idaho. The system supports international trade valued at an estimated $1.5 to $2 billion annually and carries about 10 million tons of cargo, making it the second largest export gateway on the West Coast (PNWA 2004).

Commerce on the Columbia and Snake Rivers supports more than 40,000 jobs in the region with an average annual wage of $46,000. About $1.8 billion annually in personal income and $208 million in state and local taxes are generated by maritime activities on the Columbia-Snake system. From January to December 2005, 9,386,000 tons of cargo passed through Bonneville Dam.

The General Accounting Office reviewed the cost of salmon recovery measures in a 2002 report. According to that review, from 1982 through 2001, Federal agencies spent $3.3 billion on Columbia River salmon recovery (General Accounting Office 2002).

3.11 Tourism and Recreation

The Scenic Area is known worldwide for the variety and quality of its recreational opportunities: windsurfing, hiking, fishing, mountain biking, kayaking, and kiteboarding. The area around the Bonneville Lock and Dam and Lake Bonneville includes several developed recreation areas, some managed by the Corps, such as the visitor centers, and some managed by other entities, such as state parks and boat basins.

The Bonneville Project, including pool, fee lands, and lesser interests, is over 25,000 acres. Facilities open to the public include the Bradford Visitor Center and Washington Shore Visitor Complex. At these facilities, visitors can experience first-hand the operation of the two hydroelectric powerhouses and watch migrating fish traveling upstream at the underwater viewing rooms next to the fish ladders. Both visitor centers are open 362 days a year from 9:00 a.m. to 5:00 p.m. The two visitor centers and immediate fishing areas, as described below, draw approximately 1 million visits annually. The Bonneville Dam facilities over the greater 40 mile long reservoir drew nearly 2.74 million recreational visits in fiscal year 2005.

Fishing is the primary public use in the area of the Bonneville Lock and Dam. The Corps maintains four designated fishing areas. These are Tanner Creek, Robins Island, Bradford Island, and the Washington Shore. The first three are inside secure gated areas and open during established fishing season from 7:00 a.m. to 5:00 p.m. The Washington Shore fishing area is in an open non-gated area open during the established fishing season according to the hours designated by regulation. The Corps closed the Cascade Island fishing area following September 11, 2001, for security purposes.

Fishing occurs at these locations throughout the year, depending on the fishery. Sturgeon fishing is heaviest in spring, summer and fall. Shad fishing occurs in spring and early summer, and is one of the

heaviest fishing seasons because of the large run size. The northern pikeminnow bounty program, run by the Bonneville Power Administration, has caused high use in all fishing areas during the summer. Species such as salmon and steelhead, are fished for on a limited basis spring through fall. State agencies, ODFW, and WDFW establish regulations for these fisheries.

A wide variety of other recreation uses occur on all sites. The Fort Cascades National Historic Site and Trail and the Washington Shore are the only areas designated for hiking. Nature observation occurs throughout the greater area of the Bonneville Lock and Dam.

3.12 Cultural Resources

3.12.1 Historic Designations

The Bonneville Project, which is within the action area, includes two primary historic designations. First, the Bonneville Lock and Dam was placed on the National Register of Historic Places as an historic district in 1986. The historic district covers a 97-acre area consisting of seven parts: the administration building, auditorium, spillway dam, first powerhouse, first navigation lock, fish hatchery, and landscaping. The district was further designated a National Historic Landmark by the National Park Service in 1987. The historic significance of the Bonneville Project is based on the colonial revival style architecture of the administrative facilities, the unique engineering design, the contribution to the region's industrial development, the lock's role in transportation, the entrance landscaping and the role of Bonneville as a major government undertaking in the 1930s to provide jobs during the Great Depression.

Fort Cascades was also designated the Fort Cascades National Historic Site and placed on the Register of Historic Places. The site was designated based on the occurrence of events at this location that shaped the settlement of the Pacific Northwest. These include prehistoric Indian petroglyphs, the 1894 flood, as well as military and railroad portages associated with the townsite. The Historic Site features a 1.5 mile interpretive trail which leads to the Cascades Townsite and Fort Cascades Compound. Fort Cascades is located on Hamilton Island downstream of the Bonneville Dam, off of Washington State Highway 14, and within the project area. The southern and eastern shorelines of Hamilton Island adjoin the action area as the Washington shore of the tailrace and extending downstream to the Channel shared with Ives Island near Beacon Rock.

3.12.2 Tribal Interests

Native Americans have a vested cultural, religious, and economic interest in lands around the Bonneville Project. Northwest coast Native American peoples have always depended upon salmon for food and trade. Native peoples used a variety of fishing methods including haul seines, weirs, spears, and dipnets. At Celilo Falls, upstream from Bonneville Dam, native peoples fished from platforms with dipnets. In 1957 construction of The Dalles Lock and Dam inundated the falls.

Negotiations between the United States Government and Native Americans began with the treaties of 1854 and 1855 granting Native Americans the right to use their native fishing grounds. Under the 1945 Rivers and Harbors Act, treaty fishing rights were promised but they were not authorized until Public Law 100-581 was signed in 1988. This law provides construction authority for the United States to satisfy its commitment to the Tribes whose usual and accustomed fishing access sites were inundated by dam construction on the Columbia River. Public Law 100-581 directs the Secretary of the Army to identify, develop and improve Treaty fishing access sites known as "in-lieu" sites for transfer to the Department of Interior. The Corps has continued to build sites along the Columbia River for use by treaty tribes, including designation of an in-lieu site approximately one mile upstream of Bonneville Dam on the

Washington shore. Managed by the Bureau of Indian Affairs, these sites are used year round for important cultural, religious, and economic purposes by the Confederated Tribes of the Warm Springs, the Yakama Indian Nation, the Nez Perce Tribe and the Confederated Tribes of the Umatilla Indian Reservation.

3.13 Noise

Noise levels at the Bonneville Project fluctuate with transportation-related noise as the primary input to ambient levels. With major roadways and railways on both the Oregon and Washington sides of the project, highway traffic and railcars are constant inputs. In addition, there is transportation-related noise from the Columbia River due to traffic moving through the navigation lock. This includes towboat and vessel horns and alarms as they navigate waters also used by recreational boaters. During fishing seasons there is an increase in recreational boats on the waterway.

During the spring and summer months when juvenile salmon and steelhead are migrating downstream through the dam, wildlife control agents occasionally use sirens, whistles, firecrackers, and other noise generating devices to scare away birds feeding on the disoriented juvenile fish. Additional ambient noise inputs include sound from the operation of the locks and dam themselves. This includes water over the spillway. Wildlife input includes the barking of California sea lions during the months when they are present on site.

There are 11 houses at the Bonneville fish hatchery with year-round residents. Other residential areas within the action area include Warrendale, Dodson and Coverts Landing (Oregon, downstream) and North Bonneville and Skamania (Washington, downstream).

3.14 Aesthetics

The Columbia Gorge is renowned foremost for its spectacular beauty. The Gorge's scenic resources span a diverse array of landscapes including rain forests, rolling farmlands, and semi-arid grasslands. The western Gorge, with an average annual rainfall of 75 inches, includes misty mountains, rich forestlands and more waterfalls than any area in the country. The eastern Gorge, with an annual rainfall of less than 15 inches, includes scenic rim-rock bluffs, rolling hills, farm and ranchlands.

The Bonneville Project is located in this setting between Cascade Locks, Oregon, and North Bonneville, Washington. It is a series of impressive industrial structures of grey concrete and metal. Large transmission lines connect from the project to red and white towers on the adjacent hillsides. There are surface area parking lots at the administrative and visitor facilities. The grounds are well maintained and landscaped with vegetation on three islands across which the project spans.

The Bonneville Project is considered an Urban Area under the National Scenic Area Act.
It specifically consists of administrative buildings (multiple), visitor centers (2), powerhouses (2), a spillway section (18 bays), navigation locks (2), and adult and juvenile fish passage facilities and non-overflow sections. Moving from the Oregon shoreline north are the navigation locks, one on either side of Robins Island. Then Powerhouse 1 crosses the Columbia River from Robins Island to Bradford Island, and the spillway follows connecting Bradford Island to what is now Cascades Island (previously the Washington shore). Powerhouse 2 crosses from Cascades Island to the present Washington shoreline.

The adult and juvenile fish passage facilities now in operation include two major adult fish ladder complexes: the Bradford Island Complex and the Washington Shore Complex together with fish collection systems at both powerhouses. Various aspects of the fish ladders are visible to the public both

outside and inside the visitor centers. Non-lethal take activities implemented in the past at Bonneville Dam are also visible to the public from the fishing areas at these locations

Fishing activities on the Columbia River in the action area can be viewed from shore, local roads and major highways, nearby trails, and the two visitor centers. These include boaters and anglers from the shore. Other river traffic is also an important component of the aesthetic environment including barges that frequently enter and exit the locks and recreational boating.

3.15 Transportation

The Columbia River system is the Northwest's river highway. As the only sea-level route from the Great Basin to the Pacific Ocean, the 465 mile Columbia-Snake inland waterway represents a key link to the Columbia-Snake River Basin interior region. This transportation system consists of navigation channels and locks, port facilities, and shipping operations. Bonneville Lock and Dam is the first navigable channel in the system. It facilitates barge transport from the Pacific Ocean to Lewiston, Idaho, the most inland port. The system is used for commodity shipments from inland areas of the Pacific Northwest and as far away as North Dakota.

The Bonneville Project lies east of Portland, Oregon, approximately 42 miles. The Oregon-Washington state boundary lies along the main Columbia River channel, dividing the project between the two states. Running parallel to the Columbia River on the Oregon side is a major roadway, Interstate 84, and railway, Oregon Union Pacific Railroad. The Washington side of the river also has a major roadway, State Highway 14, and railway, Washington Burlington Northern Santa Fe Railroad Company. Tables 3.15-1 and 3.15-2 show traffic volumes for these two major roadways. Both roadways provide entry to the Bonneville Project, including use by the public for visiting the Bradford Visitor Center (Oregon), Washington Shore Visitor Complex (Washington), and the four designated fishing areas. There are designated public parking areas.

Table 3.15-1 Average hourly traffic volume (number of vehicles/hour) during daylight hours on I-84 through the Columbia River Gorge, January to May, 2006

AUTOMATED TRAFFIC STATION	TRAFFIC DIRECTION	MONTH				
		JANUARY	FEBRUARY	MARCH	APRIL	MAY
Rowena	West-bound	546	552	602	584	564
	East-bound	545	557	621	595	569
Troutdale	West-bound	539	550	419	850	846
	East-bound	506	519	392	801	802

Source: ODOT unpublished data.

Table 3.15-2 Average hourly traffic volume (number of vehicles/hour) during daylight hours on SR-14 through the Columbia River Gorge, January to May, 2006

AUTOMATED TRAFFIC STATION	TRAFFIC DIRECTION	MONTH				
		JANUARY	FEBRUARY	MARCH	APRIL	MAY
Maryhill	West-bound	0*	0*	56	61	63
	East-bound	0*	0*	58	59	61
Washougal	West-bound	0*	186*	199*	207	198
	East-bound	144*	162*	165*	160	165

Source: WSDOT unpublished data.
* No data, due to equipment malfunction
January- only 20 days of data (missing 11 days)
February- missing 5 days
March-missing 9 days

3.16 Public Services

3.16.1 Law Enforcement

The Corps has access to multiple law enforcement services in both Oregon and Washington. In Oregon, the Oregon State Police enforce game and fish regulations, and the Corps contracts with them for law enforcement of the fishing areas (primarily) and other public areas. Because the Bonneville Project is in the east end of Oregon's Multnomah County bordering on Oregon's Hood River County upstream, the Corps also contracts with Sheriffs Offices from both counties. The Rooster Rock State Park, downstream from the Bonneville Project in Oregon, contracts with the Oregon State Police and can provide assistance to the Corps as needed.

In Washington, the Corps primary law enforcement contract is with the Skamania County Sheriffs Office located in Stevenson, Washington. The WDFW enforces fish and game regulations and officers are regularly in the Washington Shore area.

3.16.2 Fire

The Bonneville Project, which is in the action area, is served by three fire departments in neighboring towns. North Bonneville (Washington, downstream) is the closest and has a small volunteer fire crew. Cascade Locks (Oregon, upstream) also has a volunteer fire crew with some professional fire fighting capacity. Stevenson (Washington, upstream) has the largest fire crew with professional fire fighting capacity. The Corps maintain a fire truck onsite for immediate response at the Bonneville Project.

3.17 Safety and Human Health

The Bonneville Project is a secure and gated facility, open to the public 362 days a year. Gates are open 7:00 a.m. to 5:00 p.m., and the Bradford Visitor Center and Washington Shore Visitor Complex are open from 9:00 a.m. to 5:00 p.m.

The Corps has an established Bonneville Project Safety Program, revised in June 2006. The document outlines the general structure of the safety and occupation health program that supports the provision of safe and healthful workplaces, procedures and equipment. The program is applicable to project staff, official visitors, contractors and member of the public engaged in recreational activities at the Bonneville Project. The Corps maintains the right for employees to stop work if deemed unsafe for themselves or others.

As stated in the Bonneville Project Safety Program, the Corps Safety and Health Requirements Manual (EM 385-1-1) outlines the following information for "Contractor Safety" and quality control:

- Contracts will include the Federal Acquisition Regulation (FAR) clause 52.236-13 on Accident Prevention, which causes the contractor to maintain Safety and Occupational Health quality control over all contractor activities.
- Contractors are required to comply with requirements in EM 385-1-1 and with all other applicable local, state and federal Safety and Occupational Health standards.
- Contractors are required to provide and maintain work environments that safeguard contractor and subcontractor employees, the public, government personnel, property, materials, and supplies in order to avoid interruptions, delays, and unanticipated additional costs to government operations.
- Contractors must submit a Safety and Occupational Health program to the Corps for acceptance, including the means of inspection, and identification and resolution of potential issues will be addressed.

The Bonneville Project Safety Program further includes a "Public Recreation Safety Program." Under this program, the Corps publishes policies to implement effective public recreation safety programs and risk management procedures to assure the public use areas are developed and maintained in a safe and healthful condition.

The Corps maintains a boat restriction zone that is delineated by a line extending from the southern most tip of Robins Island to the Washington shore to a line extending from the northern most tip of Bradford Island. Access in this area requires a permit. The public is only allowed in the two visitor facilities and four designated fishing areas.

4.0 Environmental Consequences

4.1 Introduction

The following analyses address the 16 resources identified as having a potential to be impacted by the alternatives. The analyses describe expected conditions under the various alternatives when compared to the affected environment or existing conditions described in Section 3.0, Affected Environment. Cumulative effects are analyzed in Section 5.

The terms "effect" and "impact" are used synonymously under NEPA, consequently both terms may be used in the following analyses. Impacts include effects on the environment that are direct, indirect, or cumulative. Direct effects are caused by the action itself and occur at the same time and place. Indirect effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Cumulative impacts are those impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

4.2 Air Quality

4.2.1 Alternative 1: No-action Alternative

Under the No-action Alternative, there would be no lethal removal or non-lethal deterrence activities implemented or funded by NMFS. Under this alternative the Corps may conduct routine maintenance of sea lion exclusion devices at the fish ladders and/or operate acoustic deterrence devices at the dam. Any maintenance activities that may occur would introduce insignificant emissions into the air for the following reasons. Exclusion gate maintenance involving welding is a source of ozone and particulate matter that would have minor if not immeasurably small effects on air quality beyond the immediate proximity to the welder. Similarly, the effects of vehicle and equipment exhaust on the amounts of nitrous dioxide and particulates would be minimal. Acoustic deterrent devices emit sound signals only, and would not emit any form of substances into the air. Consequently, there would be no impact to air quality as a result of these two non-lethal activities under the No-action Alternative, and no effect on the Class II category for the Columbia Gorge airshed.

The Columbia Gorge Air Quality Project concluded that air quality in the Gorge is improving (Norville 2006). The limited non-lethal activities under the No-action Alternative would neither negatively or positively affect the improving trend of air quality in the Gorge because no air emissions would occur. The discontinuation of other non-lethal methods under this alternative, such as use of pyrotechnics, would result in less air-borne smoke in the immediate vicinity of the dam. However, the amount of airborne smoke emitted from past use of pyrotechnics occurred during the period of improvement, which indicates little effect on airshed quality; therefore, this alternative would not measurably contribute to the improving air quality trend in the Gorge.

4.2.2 Alternative 2: Non-lethal Deterrence Only

Under this alternative, non-lethal deterrence activities that involve boat use and pyrotechnics would occur, but similar to the No-action Alternative, would have only a minor, non-measurable effect on air quality limited to within the vicinity of the dam. No effect to air quality would occur beyond the dam vicinity under Alternative 2 or the No-action Alternative. No other non-lethal deterrence activity would

result in airborne emissions, such as smoke, into the action area (subsection 2.2.2, Alternative 2: Non-lethal Deterrence Only).

Unlike the No-action Alternative, use of vessels and pyrotechnics to chase sea lions would generate engine exhaust and small amounts of smoke from the pyrotechnics. These effects, however, would be short term, localized, and immeasurable in the large open areas where the activities would occur.

As under the No-action Alternative, there would be no negative effect on the improving trend of air quality in the Columbia River Gorge because of the limited duration and minor amount of smoke emissions from non-lethal deterrence activities.

4.2.3 Alternative 3: Lethal Removal of Individually Identifiable Predatory California Sea Lions After Active Non-lethal Deterrence (Proposed Action)

Impacts to air quality anticipated under Alternative 3 would be the same as those described under Alternative 2. Alternative 3 would involve the same non-lethal deterrence methods analyzed under Alternative 2. In addition, Alternative 3 would involve the lethal removal of sea lions if non-lethal deterrence measures failed. The lethal removal under this alternative includes the potential use of firearms that would result in airborne emissions; however, the effects on air quality would be comparable to those produced by non-lethal aerial pyrotechnics and cracker shells. The additional firearm discharges under this alternative would be minimal and would not result in any measurable effect to air quality relative to the No-action Alternative beyond those described for non-lethal deterrence in Alternative 2. Therefore, no positive or negative impact would occur to the airshed in the vicinity of the dam or in the Columbia River Gorge.

4.2.4 Alternative 4: Lethal Removal of All California Sea Lions Above Navigation Marker 85 With No Requirement for Prior Active Non-Lethal Deterrence

Impacts to air quality under Alternative 4 would likely be greater than those described under Alternative 2 (and as compared to the No-action Alternative) because Alternative 4 would involve nearly twice the amount of time of boat-based activities on the water (subsection 2.2.4, Alternative 4: Unmodified Task Force Lethal Option 2 – Lethal Removal of all California Sea Lions above Navigation Marker 85 with No Requirement for Prior Active Non-lethal Deterrence). This would increase the potential for smoke and exhaust emissions from boat engines when compared to the No-action Alternative where no boat activity would occur and to Alternatives 2 or 3 where much less boat activity is anticipated. However, as under Alternatives 2 and 3, boat-based activities would occur in a small area compared to the total area of the Columbia Gorge airshed, and it is anticipated that boat exhaust from one or two boats would quickly dissipate.

It is not likely that the amount of exhaust from boat use under this alternative would impair the improving condition of the airshed in the vicinity of the dam or in the Columbia River Gorge because of the limited duration of use (weeks compared to months or years of ongoing boat activity) from a limited number of boats.

4.3 Water Quality

4.3.1 Alternative 1: No-action Alternative

Under the No-action Alternative, there would be no lethal removal or non-lethal deterrence activities so there would be no effect on water quality from these activities, and no effect on 303(d) impairment status

of the Columbia River. Routine maintenance of sea lion exclusion and acoustic deterrence devices at the dam may occur, but there would be no effect on water quality from possible routine maintenance because such activities are conducted from and on shore. This alternative would not contribute to or hinder improving water quality in the Columbia River.

4.3.2 Alternative 2: Non-lethal Deterrence Only

Under this alternative, non-lethal deterrence activities that involve boat use and pyrotechnics would occur, but similar to the No-action Alternative, would have only a minor, non-measurable effect on water quality, limited to the vicinity of the dam.

Unlike the No-action Alternative, the use of vessels and pyrotechnics to chase sea lions would generate engine exhaust and small amounts of combustion byproducts. Residues from pyrotechnics (paper, carbon, sulfur, cardboard) would be carried away by the wind, quickly diluted in the flowing water, or gradually degrade with exposure to moisture and therefore would have no measurable effects. Plastic shell casings from cracker shells often fall in proximity to the shooter (in the boat or on shore) where they can be collected for disposal. Plastic shell casings that land in the water would persist in the environment for an extended period of time. Any effects on water quality, however, would be short-lived and localized, and would represent a miniscule proportion of the total contaminant load in the Columbia River system.

As under the No-action Alternative, there would be no negative effect on the 303(d) impairment status of the Columbia River because of the limited duration and minor amount of contaminants released from non-lethal deterrence activities.

4.3.3 Alternative 3: Lethal Removal of Individually Identifiable Predatory California Sea Lions After Active Non-lethal Deterrence (Proposed Action)

Impacts to water quality anticipated under Alternative 3 would be the same as those described under Alternative 2. Alternative 3 would involve the same non-lethal deterrence methods analyzed under Alternative 2. In addition, Alternative 3 would involve the lethal removal of sea lions if non-lethal deterrence measures failed. However, lethal removal methods would not result in any additional release of contaminants into the Columbia River or other waterbodies. For this reason, no positive or negative impact to water quality would occur in the vicinity of the Bonneville Lock and Dam.

4.3.4 Alternative 4: Lethal Removal of All California Sea Lions Above Navigation Marker 85 With No Requirement for Prior Active Non-Lethal Deterrence

Impacts to water quality under Alternative 4 would likely be greater than those described under Alternative 2 (and as compared to the No-action Alternative) because Alternative 4 would involve approximately twice the amount of time of boat-based activities on the water (subsection 2.2.4, Alternative 4: Unmodified Task Force Lethal Option 2 – Lethal Removal of all California Sea Lions above Navigation Marker 85 with No Requirement for Prior Active Non-lethal Deterrence). This would increase the potential for combustion byproducts from boat engines to enter the water, compared to the No-action Alternative and to Alternatives 2 and 3. However, as under Alternatives 2 and 3, boat-based activities would occur in a small area compared to the total area of the Columbia River, and it is anticipated that combustion byproducts from one or two boats would quickly dissipate.

It is not likely that the amount of combustion byproducts from boat use under this alternative would affect the 303(d) impairment status of the Columbia River because of the limited duration of use (weeks compared to months or years of ongoing boat activity) from a limited number of boats.

4.4 Marine Mammals

4.4.1 Alternative 1: No-action Alternative

If NMFS denies the States' request for lethal removal authority and discontinues its support of non-lethal activities to deter pinniped predation at Bonneville Dam, it is likely that the States and other Federal agencies would also not pursue such activities. The exception is that the Corps would be expected to continue the use of sea lion exclusion devices at the fish ladders.

With respect to California sea lions at Bonneville Dam, animals would likely congregate in the action area between mid-February until early June each year to feed on returning adult spring Chinook and steelhead. It is possible that the number of animals at the dam would increase over the numbers seen in 2006 (Table 3.4-2), when there was an active non-lethal deterrence effort. It is more likely, however, that the number of animals would fluctuate depending on available prey, for the following reasons.

California sea lions at the dam increased from 31 animals observed in 2002 to over 100 animals observed in 2003 and 2004 (Table 3.4-2). Some non-lethal deterrence activities were carried out in 2005, but it was not until 2006 that a thorough deterrence effort was mounted. In 2005 and 2006 the numbers of California sea lions at the dam dropped to 85 animals. Because non-lethal activities were limited in 2005, it is unlikely the observed decrease in numbers of sea lions that year was caused by the non-lethal activities. It is more likely that the number of California sea lions observed at the dam decreased in response to a sharp decrease in spring Chinook returns between 2004 (170,000) and 2005 (74,000) (Table 3.5-4). Moreover, there is no evidence that the non-lethal deterrence efforts in 2006 and 2007 succeeded in reducing the numbers of pinnipeds at Bonneville Dam or their rate of predation. The maximum daily number of sea lions present at the dam increased, and the total number of days that pinnipeds were present remained stable, from 2006 to 2007 (Table 3.4-2) in spite of non-lethal deterrence activities. In addition, the total number of salmonids taken by sea lions increased consistently from 1,000 in 2002 to 3,900 in 2007 (Table 1.1-4 and subsection 3.4.3, Factors Affecting Distribution at Bonneville Dam). Thus, future abundance of California sea lions at the dam would likely fluctuate in response to the fluctuations in prey, regardless of non-lethal deterrence activities. If California sea lions were able to consume a high proportion of the Chinook and steelhead runs, it is possible that over time the predation would deplete the runs to the point of functional extinction, as happened at Ballard Locks in Washington (subsection 3.4.3, Factors Affecting Distribution at Bonneville Dam). In that case, the number of sea lions would decrease foraging at the dam, as happened at Ballard Locks, or increase feeding on other species such as lamprey and shad.

The No-action Alternative would have no effect on overall abundance and productivity of the California sea lion population range-wide, and the population would likely remain at OSP. Male California sea lions migrate south from the Columbia River as the breeding season approaches in May and June (subsection 3.4.1, Life History). Neither the migration timing nor the abundance of migratory male sea lions would be affected by the No-Action Alternative.

The numbers of Steller sea lions at Bonneville Dam would likely increase as they have done since 2002. In the absence of non-lethal deterrence activities, there would be no activities that would cause Steller sea lions to leave the area, as they were observed doing in 2006 and 2007 in response to activities directed at California sea lions. Steller sea lions are year round residents of coastal Oregon and Washington; however, breeding individuals migrate to rookeries, beginning as early as April, as the breeding season approaches (subsection 3.4.1, Life History). Neither the migration timing nor the abundance of migratory Steller sea lions would be affected by the No-Action Alternative.

The presence of harbor seals under the No-action Alternative would likely remain stable or increase slightly because this was and has been the trend in recent years, regardless of non-lethal deterrence activities (subsection 3.4.2, Species Status, Distribution and Abundance, and Table 3.4-2) Harbor seals typically consume small prey, and it is unlikely their abundance would fluctuate in response to fluctuating numbers of returning adult salmonids. Harbor seals are generally non-migratory but local movements are associated with factors such as prey availability and reproduction (subsection 3.4.1, Life History). Pupping occurs along the coast beginning in April through June and nursery areas are found in the lower Columbia River in Cathlamet Bay near Astoria, Oregon. The No-Action Alternative would have no effect on the use of the river by harbor seals.

4.4.2 Alternative 2: Non-lethal Deterrence Only

NMFS' denial of the States' request for lethal removal authority and participation in non-lethal activities would likely result in the States and other Federal agencies implementing non-lethal activities similar to those carried out in 2007. The non-lethal deterrence activities are unlikely to have an effect on the abundance of California sea lions at Bonneville Dam, or on California sea lions range-wide, for the reasons described under Alternative 1. Thus compared to the No-action Alternative, no change in California sea lion abundance would be expected. Under Alternative 2 there would be some impacts to individual sea lions, but these would be localized and temporary and would not result in serious injury or mortality.

California sea lions exposed to noise and vessel-chasing would be temporarily displaced, but as observed in prior years, are likely to either learn to avoid these activities or to tolerate the experience (subsection 3.4.3, Factors Affecting Distribution at Bonneville Dam). Capturing sea lions on the haul-out traps is non-injurious and many animals tolerate the process and continue to haul out on the traps (Gearin et al. 1996). Marking (tagging, branding) of California sea lions would be conducted in a humane manner under guidance of a standing ACC, and the effects of this activity would be short-term and unlikely to result in serious injury (subsection 2.2.2, Alternative 2: Non-lethal: Deterrence Only). California sea lions are tolerant of capture and marking activities and serious injury or mortality resulting from the process is unlikely. Thus, compared to the No-action Alternative, Alternative 2 would result in increased temporary and localized disturbance of individual California sea lions, but no change in the number of mortalities or the range-wide status of the population.

By definition non-lethal deterrence measures result in harassment of the targeted pinnipeds. Several of the non-lethal deterrence techniques generate elevated sound pressure levels (SPL), above current NMFS pinniped disturbance thresholds for impulsive sounds in air (100dB re 20 µPa) or in water (160dB re 1 µPa), with the potential to cause temporary or permanent hearing impairment. Acoustic deterrent devices installed at the fishway entrances operate at a primary frequency of 10 kHz, well within the range of best hearing sensitivity of sea lions, and SPL of approximately 195$dB_{(RMS)}$ re 1 µPa at 1 meter from the source. The duration of a signal pulse is short, on the order of a millisecond. The source levels are likely to be reduced somewhat in close proximity to the source by entrained air in the water and turbulence from the flows out of the fishway entrances. It is possible that sea lions could voluntarily approach the acoustic devices to within 1 meter of the source and be exposed to SPL sufficient to cause a temporary threshold shift (TTS) in their hearing sensitivity. The risk of permanent threshold shift (PTS) from such exposure is low. Foraging sea lions near the fishway entrances are in constant motion and the tailrace area is large enough for the animals to avoid close exposure. Sound pressure levels produced by seal bombs are higher (200 -220dB re 1 µPa at 1 meter from the source (Richardson et al. 1995) and have the potential to cause hearing loss for an animal exposed at close range. Sea lions are unlikely to be exposed to seal bomb explosions at close range because 1) seal bombs are dropped over the side of the boat and not aimed at the animal; 2) sea lions avoid the boats; and 3) there is ample room for sea lions to move. There is also the

potential for physical (non-auditory) injury from the shock wave produced by a seal bomb detonation at close range (< 1 meter), however, as has been shown over the past three seasons, the likelihood is extremely remote (no observed injuries with over 8,700 seal bombs deployed). The remaining techniques that generate high SPL (aerial pyrotechnics, cracker shells) have less explosive force than seal bombs and therefore the effects of these techniques would fall within the range of those described. There is no evidence that the non-lethal deterrence efforts in 2006 and 2007 affected the numbers of pinnipeds at Bonneville Dam or their rate of predation, and future abundance of California sea lions at the dam would likely fluctuate in response to the fluctuations in prey, regardless of non-lethal deterrence activities, as described under the No-action Alternative.

With respect to the overall range-wide abundance, distribution, and productivity of the California sea lion population, Alternative 2 would have no effect, and the population would likely continue at OSP. Male California sea lions migrate south from the Columbia River as the breeding season approaches in May and June (subsection 3.4.1, Life History). Neither the migration timing nor the abundance of migratory male sea lions would be affected by this Alternative.

Steller sea lions would be tagged but not branded under Alternative 2, so the effects of marking would be less than those described for California sea lions. Temporary captive holding would be conducted in a humane manner under guidance of a standing ACC.

In contrast to California sea lions, Steller sea lions are less tolerant of non-lethal hazing activities and, as observed in prior years, would likely respond by leaving the action area for some unspecified period of time. Displacement from the foraging area at Bonneville Dam is unlikely to affect the Steller sea lion individuals or population range-wide because there is ample room in the remainder of its range, including the lower Columbia River, for animals to relocate and thrive. Thus compared to the No-action Alternative, Alternative 2 would result in increased displacement of foraging Steller sea lions, but no change in the range-wide abundance, distribution, or productivity of the population.

The impact to harbor seals would be as described under Alternative 1 with the exception that a minimal number of animals may be temporarily disturbed by hazing activities directed at California sea lions. Harbor seal occurrence in the action area is rare or infrequent (fewer than five animals observed annually) (subsection 3.4.2, Species Status, Distribution, and Abundance, and Table 3.4-2). Capture and marking activities would have no effect on harbor seals because harbor seals do not haul out in the traps and so would not be captured. The effects of Alternative 2 on the range-wide abundance, distribution, and productivity of the harbor seal population would be the same as under Alternative 1.

4.4.3 Alternative 3: Lethal Removal of Individually Identifiable Predatory California Sea Lions After Active Non-lethal Deterrence (Proposed Action)

Under Alternative 3, NMFS would grant the States' request for lethal removal authority, with conditions, including a requirement that non-lethal deterrence activities would also be pursued. The non-lethal activities under this Alternative would be similar to those described under Alternative 2, with similar effects, and therefore compare similarly to the No-action Alternative.

Subsection 2.2.3, Alternative 3: Modified Task Force Recommendation - Lethal Removal of Individually Identifiable Predatory California Sea Lions after Active Non-lethal Deterrence (Proposed Action), describes those sea lions that would be considered "predatory" and therefore eligible for permanent removal (either by killing or permanent captivity). Lethal removal would be conducted in a humane manner under the guidance of a standing ACC. The methods of killing predatory sea lions would include shooting or lethal injection. Animals could be shot only while hauled-out on shore, by a marksman who

also must be on shore. Because of these requirements, it is unlikely that a marksman would shoot any sea lion other than one on the list of predatory sea lions. These requirements would also minimize the potential that an animal would be wounded but not killed: sea lions hauled-out on land make a stable target, and a marksman firing from shore would be firing from a stable platform, which promotes accurate shot placement. Predatory sea lions may also be killed by lethal injection, gunshot, or other methods approved by the ACC following capture using haul-out traps.

This alternative would allow up to 1 percent of the California sea lion PBR (or about 85 animals) to be removed each year. Because of limitations on which animals could be killed and where they could be killed (that is, predatory animals in the trap at Bonneville or hauled out on the dam structure), a more likely estimate is that 30 California sea lions could be killed annually under Alternative 3. This represents an increase of 30 mortalities compared to the No-action Alternative and Alternative 2. The removal of 30 animals (or possibly as many as 85) from the California sea lion population would have no effect on the overall range-wide abundance, distribution, and productivity of the California sea lion population because the number of sea lions involved is extremely small compared to the current number of animals (8,511) that can be safely removed from the population (PBR) without affecting its status with respect to OSP (subsection 3.4.2, Species Status, Distribution, and Abundance). There is a surplus of male California sea lions in the population, meaning that not all males that participate in the breeding migration are successful at establishing and maintaining breeding territories on the rookeries and therefore spend the breeding season at nearby haul-outs or at sea (subsection 3.4.1, Life History). Individual sea lions that would be permanently removed under Alternative 3, and that may have occupied a breeding territory, would be rapidly replaced by otherwise idle males from the population. The migration timing would not be affected by this alternative. Thus compared to the No-action Alternative, Alternative 3 would result in no change in status of the population range-wide.

Permanent captive holding of some California sea lions would also be possible under Alternative 3. Captive holding would be allowed by permitted holding facilities, in compliance with the standards established under the Animal Welfare Act. The estimate of 30 animals (with a limit of about 85 animals) removed under Alternative 3 includes animals that are captured and transferred to permanent captivity, thus the effects of this activity are considered in the discussion above.

The local abundance of California sea lions at the dam would be reduced by as many as 30 sea lions annually. If approximately 150 California sea lions are present in the action area each year (subsection 3.4.2, Species Status, Distribution, and Abundance), the 30 animals potentially removed under this alternative would represent a reduction of 20 percent of the abundance at Bonneville Dam, compared to the No-action Alternative. It is possible that new animals would take the place of removed animals during the year in which the removal occurs. Over time, if experienced predatory sea lions were removed, it is possible that the remaining animals would be less experienced and less effective as predators. It is also possible that the removal of experienced animals and the non-lethal deterrence of inexperienced animals would result in fewer sea lions being attracted to the action area. If this occurred, the total number of predatory sea lions in the action area would gradually decline.

Under Alternative 3, Steller sea lions and harbor seals would be subject to the same non-lethal activities considered under Alternative 2, but not to lethal removal. The effects for Steller sea lions and harbor seals would thus be similar to those described under Alternative 2, and the comparison to the No-action Alternative would be similar to that described for Alternative 2.

4.4.4 Alternative 4: Lethal Removal of All California Sea Lions Above Navigation Marker 85 With No Requirement for Prior Active Non-Lethal Deterrence

Under Alternative 4, NMFS would grant the States' request for lethal removal authority, with conditions, but would not require that non-lethal deterrence activities be pursued. Subsection 2.2.4, Alternative 4: Unmodified Task Force Lethal Option 2 – Lethal Removal of All California Sea Lions Above Navigation Marker 85 With No Requirement for Prior Active Non-lethal Deterrence, describes those sea lions that would be considered "predatory" and therefore eligible for lethal removal. These include any California sea lion found above navigation marker 85 between January 1 and May 31. Lethal removal would be conducted as humanly as possible under the guidance of a standing ACC. The methods of killing predatory sea lions would include shooting or lethal injection. Animals could be shot while in the water or hauled-out on shore. Marksmen may be in vessels or on shore.

As many as 150 California sea lions would likely be killed under Alternative 4, which represents an increase of 150 mortalities compared to the No-action Alternative. The removal of 150 animals from the California sea lion population would have no effect on the overall range-wide abundance, distribution, and productivity of the California sea lion population because the number of sea lions involved is extremely small compared to the current number of animals (8,511) that can be safely removed from the population (PBR) without affecting its status with respect to OSP (subsection 3.4.2, Species Status, Distribution, and Abundance). There is a surplus of male California sea lions in the population, meaning that not all males that participate in the breeding migration are successful at establishing and maintaining breeding territories on the rookeries and therefore spend the breeding season at nearby haul-outs or at sea (subsection 3.4.1, Life History). Individual sea lions that would be permanently removed under Alternative 3, and that may have occupied a breeding territory, would be rapidly replaced by otherwise idle males from the population. The migration timing would not be affected by this alternative. Thus similar to the No-action Alternative and Alternatives 2 and 3, Alternative 4 would result in no change in status of the population range-wide.

In the action area, Alternative 4 would result in the near elimination of California sea lions, compared to the No-action Alternative and Alternative 2, under which as many as 150 California sea lions would be expected annually at Bonneville Dam, and compared to Alternative 3, under which the number of sea lions at Bonneville Dam may be reduced by 30. Non-lethal deterrence measures, as described in Alternative 2, would not be implemented and therefore the overall effects of non-lethal deterrence activities would be reduced. As predatory sea lions are removed, fewer recurrent animals with foraging experience at the dam would remain to feed and predation rates would decline. Likewise, as predatory sea lions are removed, fewer experienced animals would remain to move up river thus reducing the attraction of new animals to the action area. As a result the total number of predatory sea lions in the action area would decline more rapidly than under Alternative 3.

Under this alternative, some individual animals are likely to be wounded but not killed because animals moving in three dimensions in the water are difficult to target, and because marksmen shooting from vessels may not be accurate with every shot. An unknown portion of the 150 animals targeted may be wounded but not immediately killed, compared to the No-action Alternative and Alternative 2, under which no animals are likely to be wounded or killed. Compared to Alternative 3, Alternative 4 would result in some unknown additional number of animals being wounded but not killed.

Under Alternative 4, Steller sea lions and harbor seals would not be exposed to non-lethal activities because there would be none. To the extent that vessel activity and noise associated with the lethal removal of California sea lions would occur near Steller sea lions, they would likely avoid the area because they are intolerant of human activity. In this respect, the effects to Steller sea lions would thus be similar to those described under Alternative 2, and the comparison to the No-action Alternative would be similar to that described for Alternative 2.

Because it may be difficult for marksmen in vessels to distinguish between California and Steller sea lions in the water, it is possible that under this Alternative some Steller sea lions would be mistakenly shot. Very few harbor seals occur in the action area. As they would not be targeted for lethal removal and are tolerant of human activity and noise, it is likely that Alternative 4 would result in no change in the abundance of harbor seals at Bonneville Dam compared to the No-action Alternative.

4.5 Listed Salmonids

The sections below describe the potential direct and indirect effects of the four alternatives on listed salmonids in the action area. Direct effects are the immediate or latent impacts on fish distribution or survival that may result from the use of vessels, cracker shells, aerial pyrotechnics, rubber projectiles, underwater firecrackers, firearms, acoustic deterrent devices, or sea lion exclusion devices. Indirect effects include those resulting from a change in pinniped predation, which could lead to a change in survival of fish passing Bonneville Dam. Effects are analyzed only for those listed salmon and steelhead with geographic ranges that overlap the action area, and for which run-timing coincides with the period of pinniped presence (see Table 3.5-2 in subsection 3.5, Listed Salmonids).

4.5.1 Alternative 1: No Action

Under Alternative 1 there would be no activities to deter pinniped predation at Bonneville Dam beyond the acoustic deterrent devices and sea lion exclusion devices at fish ladders. Thus there would be no direct effects on listed salmonids from the use of vessels, cracker shells, aerial pyrotechnics, rubber projectiles, or underwater firecrackers. The acoustic deterrent devices and sea lion exclusion devices would not be expected to have any impact on listed salmonids because the sound frequencies produced by the acoustic devices are above the hearing sensitivity threshold of most fish including salmon, and research indicates that sea lion exclusion devices do not affect salmonid passage or survival (Jepson et al. 2006).

There would be no change under Alternative 1 compared to present conditions with respect to indirect effects. As described in subsection 3.4, Marine Mammals, observations during 2006 and 2007 suggest that the non-lethal deterrence measures that have been pursued in recent years have not had a measurable effect on pinniped predation rates. Pinniped consumption of salmonids would therefore likely continue at the current rates, that is, an observed 3,900 salmonids consumed per year, with estimated consumption as high as 7,050 to 48,000 salmonids (subsection 3.4.3.1, Feeding Habits and Salmonid Predation). The lack of non-lethal deterrence measures under this alternative is not expected to result in a change in pinniped predation rates or a change in the numbers, life history, distribution, run timing, or level of extinction risk of listed salmonids passing Bonneville Dam. There is no information available to determine whether pinniped predation disproportionately affects hatchery- or natural-origin fish passing through the action area.

4.5.2 Alternative 2: Non-Lethal Deterrence Only

Under Alternative 2 there would be no direct effects to listed salmonids from non-lethal deterrence activities (including the use of vessels, cracker shells, aerial pyrotechnics, rubber projectiles and underwater firecrackers) relative to the No-action Alternative for the following reasons. Vessels are unlikely to strike fish, and at most may startle fish near the surface, causing a short-term change in movement. This short-term startle response would have no appreciable effect on fish distribution or survival. The sound energy from cracker shells and aerial pyrotechnics exploding in the air would dissipate quickly and little energy would be transmitted to the water column. Residues from pyrotechnics (paper, carbon, sulfur) would be carried away by the wind or quickly diluted in the flowing water and therefore would have no measurable effects. The velocity of rubber projectiles would attenuate quickly

upon striking the water surface. Additionally it is highly unlikely that an errant rubber projectile would, by chance, directly strike a fish near the surface. Rubber projectiles are made of an inert material (rubber, plastic) and once spent the projectile would sink or float away. Underwater firecracker detonations in close proximity to salmonids may cause injury that may be difficult to detect by surface observation. However, safety protocols would be developed to reduce the likelihood of close exposure (subsection 2.2.2, Alternative 2: Non-lethal Deterrence Only). In the last 2 years of hazing operations below Bonneville Dam, only one adult salmonid was observed reacting (jumping and swimming away) to underwater firecrackers, and no salmonid mortality was observed (NMFS 2007a). Studies indicate that large fish (including adult salmon) weighing more 2.2 pounds would not experience serious injury from the impulse pressures generated by an underwater firecracker if they are more than 4.9 feet away from the point of detonation (Myrick et al. 1990; Yelverton et al. 1975). In addition, the sound from the detonation of an underwater firecracker would drop off quickly with distance and so would not be expected to affect fish. As under the No-action Alternative, acoustic deterrent devices and sea lion exclusion devices would not affect listed salmonids for the reasons noted above. Thus with respect to direct effects, there would be no change under Alternative 2 compared to the No-action Alternative.

There would also be no change under Alternative 2 compared to the No-action Alternative with respect to indirect effects. As described in subsection 3.4, Marine Mammals, observations during 2006 and 2007 suggest that the non-lethal deterrence measures that would be pursued under Alternative 2 do not have a measurable effect on pinniped predation rates. Pinniped consumption of salmonids would therefore likely continue at the current rates, that is, an observed 3,900 salmonids consumed per year, with estimated consumption as high as 7,050 to 48,000 salmonids (subsection 3.4.3.1, Feeding Habits and Salmonid Predation). The non-lethal deterrence measures under this alternative are not expected to result in a change in pinniped predation rates or a change in the numbers, life history, distribution, run timing, or level of extinction risk of listed salmonids passing Bonneville Dam. There is no information available to determine whether pinniped predation disproportionately affects hatchery- or natural-origin fish passing through the action area.

4.5.3 Alternative 3 – Lethal Take of Individually Identifiable Predatory California Sea Lions After Active Non-lethal Deterrence

Alternative 3 would include the same type and level of non-lethal deterrence activities as Alternative 2. For the reasons described under Alternative 2, these non-lethal deterrence activities would not be expected to have any direct effects on listed fish relative to the No-action Alternative. Lethal activities would be carried out from shore in such a way as to avoid bullets entering the water. In the event a bullet did enter the water, it would be highly unlikely to strike a listed fish. Bullets are made of metal and once spent the projectile would sink. For these reasons, under Alternative 3 there would be no change from the No-action Alternative with respect to direct effects.

With respect to indirect effects, there would likely be an increase in survival (and hence an increase in the abundance and a decrease in the level of extinction risk) of listed adult salmonids under Alternative 3 compared to the No-action Alternative because of the lethal removal of some California sea lions. Under this alternative an estimated 30 California sea lions may be removed. The estimated total number of adult salmonids that could be consumed by 30 sea lions ranges from 1,410 to 9,600 fish (Table 4.5-1). Of these, the majority would be spring Chinook (1,308 to 9,425), and of these, 25 to 35 percent would be listed (327 to 3,299). A smaller portion of the total would be steelhead (26 to 693), and of these, 28 to 60 percent would be listed (7 to 414). These numbers represent approximately 0.5 to 7.2 percent of the average total return of ESA-listed spring-run Chinook and steelhead from 2001 to 2007 at Bonneville Dam (Table 4.5-1).

In addition, the lethal removal of some California sea lions might deter other sea lions from the action area, either because exposure to the lethal activities would cause them to avoid the area or because the removal of experienced sea lions would make it less likely that they would learn to forage successfully. These possibilities are too uncertain, however, to support a reliable estimate of any decrease in pinniped predation (and corresponding increase in salmonid survival). Conversely, it is likely that other sea lions would eventually replace the sea lions that were lethally removed, so the increase in the number of salmonids passing Bonneville Dam would likely be less than the numbers shown in Table 4.5-1. Compared to the No-action Alternative, under Alternative 3 there would be a maximum increase of 327 to 3,299 listed adult spring Chinook and 7 to 414 listed adult steelhead passing Bonneville Dam.

4.5.4 Alternative 4 – Lethal Take of All California Sea Lions Above Navigation Marker 85 With No Requirement for Prior Active Non-Lethal Deterrence.

Under Alternative 4 there would be marksmen on the water during most daylight hours as well as marksmen on the shore during some daylight hours. There would be no non-lethal deterrence (that is, no vessel chasing, aerial pyrotechnics, underwater firecrackers, or rubber bullets). For the reasons described under Alternative 2, no direct effects on salmonids are likely as a result of vessel activities relative to the No-action Alternative. In addition, no direct effects on salmonids are likely as a result of stray bullets entering the water: bullets would be aimed at sea lions; any salmonids in the area would be actively avoiding sea lions; salmon are actively migrating through the area; and the area is large. Alternative 4 would not be expected to have any direct effects on listed fish and thus there would be no change from the No-action Alternative with respect to direct effects.

With respect to indirect effects, the intent of Alternative 4 is to eliminate all or nearly all pinnipeds from the area immediately below Bonneville Dam. Under this alternative an estimated 150 California sea lions may be removed. The estimated total number of adult salmonids that could be consumed by 150 sea lions ranges from 7,050 to 48,000 fish (Table 4.5-1). Of these, the majority would be spring Chinook (6,541 to 47,124), and of these, 25 to 35 percent would be listed (1,635 to 16,494). A smaller portion of the total would be steelhead (129 to 3,467), and of these, 28 to 60 percent would be listed (36 to 2,068). This total consumption represents approximately 2.7 to 36.0 percent of the average total return of ESA-listed spring-run Chinook and ESA-listed steelhead from 2001 to 2007, at Bonneville Dam (Table 4.5-1).

It is likely that fewer than 7,050 to 48,000 adult salmonids would be saved because over time new pinnipeds would be expected to replace the ones that were removed. This replacement would take time, however, and the new recruits would be confined to the area below river mile 85 (because lethal removal would be taking place above that point), where foraging is less efficient than the area immediately around the fish ladder entrances at Bonneville Dam. Thus compared to the No-action Alternative, under Alternative 4 there would be a maximum increase of 1,635 to 16,494 listed adult spring Chinook and 36 to 2,068 listed adult steelhead passing Bonneville Dam.

Table 4.5-1 Estimates of the potential increase in the numbers of spring-run Chinook and steelhead passing Bonneville Dam[1] resulting from the estimated removal of pinnipeds under Alternatives 3 and 4

Alt.	Estimated Number of Pinnipeds Removed annually	Potential Increase in Number of Salmonids Passing Bonneville Dam (salmonids/ year)[2]	Potential Increase in Total Number of Spring Chinook[3]	Potential Increase in Number of Listed Spring Chinook[4]	Potential Increase in Number of Unlisted Spring Chinook[4]	Potential Increase in Total Number of Steelhead[5]	Potential Increase in Number of Listed Steelhead[6]	Potential Increase in Number of Unlisted Steelhead[6]	Maximum Potential Percent Improvement in the Return of Listed Spring Chinook and Steelhead[7]	Maximum Potential Percent Improvement in the Return of Unlisted Spring Chinook and Steelhead[8]
3	30	1,410–9,600	1,308–9,425	327–3,299	850–6,126	26–693	7–414	10–497	0.5–7.2	0.7–5.2
4	150	7,050–48,000	6,541–47,124	1,635–16,494	4,906–35,343	129–3,467	36–2,068	52–2,485	2.7–36.0	3.7–25.9

[1]Estimates derived using run data are from 2001-2007, Table 3.5-4, during which spring-run Chinook comprised 92.78 to 98.18 percent of the total salmonid run during the period of pinniped presence (Jan. 1 through May 31).

[2]Represents the product of the estimated number of pinnipeds removed, the range in per capita predation rates of California sea lions (salmon/individual seal/day), and an assumed average residency time of individual California sea lions in the action area of 32 days per year. Wright (2007) reports a range in per capita predation rates of California sea lions from 1.48 salmon per day (from bioenergetics analysis) to a maximum of 10 salmon per day (observation of 1 individual in 1 day at Bonneville Dam). Utilizing this range in consumption rates of 1.48 to 10 salmon per day, and assuming an average residency time of 32 days (Wright 2007), the average salmonid consumption of a California sea lion at Bonneville Dam may range from 47 to 320 salmon per year. It is possible that the maximum salmonid consumption may be higher. The maximum residence time observed for an individual sea lion in 2007 was 70 days (Wright 2007). If one considers the range in residency times among California sea lions at Bonneville Dam, the maximum salmonid consumption may be as much as 700 salmon per year.

[3]The minimum estimates in this column represent the product of the minimum increase in the number of salmonids per year under a given alternative, and the minimum proportion of the total run that was spring-run Chinook (92.78 percent). The maximum estimates in this column represent the product of the maximum increase in the number of salmonids per year under a given alternative, and the maximum proportion of the total run that was spring-run Chinook (98.18 percent).

[4]The minimum estimates in this column represent the product of the minimum potential increase in the total number of spring-run Chinook, and the minimum proportion of the spring Chinook run that was listed/unlisted (25 and 65 percent, respectively). The maximum estimates in this column represent the product of

the maximum potential increase in the total number of spring-run Chinook, and the maximum proportion of the spring Chinook run that was listed/unlisted (35 and 75 percent, respectively). Estimates of the proportion of the spring-run Chinook returns that are listed from Hatch (2007).

[5]The minimum estimates in this column represent the product of the minimum increase in the number of salmonids per year under a given alternative, and the minimum proportion of the total run that was steelhead (1.82 percent). The maximum estimates in this column represent the product of the maximum increase in the number of salmonids per year under a given alternative, and the maximum proportion of the total run that was steelhead (7.22 percent).

[6]The minimum estimates in this column represent the product of the minimum potential increase in the total number of steelhead, and the minimum proportion of the steelhead run that was listed/unlisted (28.31 and 40.33 percent, respectively). The maximum estimates in this column represent the product of the maximum potential increase in the total number of steelhead, and the maximum proportion of the steelhead run that was listed/unlisted (59.67 and 71.69 percent, respectively).

[7]Minimum value represents the low estimate of the Total Potential Salmonid Consumption, multiplied by the low estimate of the proportion of the total run (spring-run Chinook and steelhead) that is listed (0.25), divided by the high estimate of the 2001-2007 average total ESA-Listed (spring-run Chinook and steelhead) return (65,925). The maximum value represents the high estimate of the Total Potential Salmonid Consumption, multiplied by the high estimate of the proportion of the total run (spring-run Chinook and steelhead) that is listed (0.36), divided by the low estimate of the 2001-2007 average total ESA-Listed (spring-run Chinook and steelhead) return (47,936).

[8]Minimum value represents the low estimate of the Total Potential Salmonid Consumption, multiplied by the low estimate of the proportion of the total run (spring-run Chinook and steelhead) that is unlisted (0.64), divided by the high estimate of the 2001-2007 average total unlisted (spring-run Chinook and steelhead) return (121,166). The maximum value represents the high estimate of the Total Potential Salmonid Consumption, multiplied by the high estimate of the proportion of the total run (spring-run Chinook and steelhead) that is unlisted (0.75), divided by the low estimate of the 2001-2007 average total unlisted (spring-run Chinook and steelhead) return (139,154).

4.6 Other Fish Species

The sections below describe the potential direct and indirect effects of the four alternative actions on fish species other than listed salmonids, including unlisted salmonids, in the action area. Direct effects are the immediate or latent impacts on fish distribution or survival that may result from the use of vessels, cracker shells, aerial pyrotechnics, rubber projectiles, underwater firecrackers, firearms, acoustic deterrent devices, or sea lion exclusion devices. Indirect effects include those resulting from a change in pinniped predation, which could lead to a change in survival of fish residing in or passing through the action area. Effects are analyzed only for those unlisted salmonids and other fish species with geographic ranges that overlap the action area, and for which run-timing or presence coincides with the period of pinniped presence (see subsection 3.6.1, Non-listed Spring-run Chinook Stocks).

4.6.1 Alternative 1: No-Action Alternative

Under Alternative 1 there would be no activities to deter pinniped predation at Bonneville Dam beyond the acoustic deterrent devices and sea lion exclusion devices at fish ladders. Thus there would be no direct effects on other fish species (white sturgeon, lamprey, and shad) from vessel activity, or the use of cracker shells, aerial pyrotechnics, rubber projectiles, or underwater firecrackers. The acoustic deterrent devices and sea lion exclusion devices would not be expected to have any impact on unlisted salmonids or other fish species because the sound frequencies produced by the acoustic devices are above the hearing sensitivity threshold of most fish, and research indicates that sea lion exclusion devices do not affect salmonid passage or survival, or the survival or passage of other fish using fish ladders.

There would be no change under Alternative 1 compared to present conditions with respect to indirect effects on unlisted salmonids at Bonneville Dam. Pinniped predation levels on unlisted salmonids would likely be similar to levels seen in the past. Although there was an active non-lethal deterrence program in 2006 and 2007, available evidence (NMFS 2007a) suggests the program did not substantially affect California sea lion predation on salmonids in the action area. There is no information available to determine whether pinniped predation disproportionately affects hatchery- or natural-origin fish passing through the action area. The lack of non-lethal deterrence measures under this Alternative is not expected to result in a change in the numbers, life history, distribution, run timing, or level of extinction risk of unlisted hatchery- or natural-origin salmonids passing Bonneville Dam.

California sea lions have been observed predating on lamprey in the action area, representing 99 percent of the observed lamprey take (subsection 3.4.3, Factors Affecting Distribution at Bonneville Dam). Given that non-lethal deterrence measures in 2006 and 2007 were not observed to reduce predation by California sea lions (subsection 3.4.3, Factors Affecting Distribution at Bonneville Dam; NMFS 2007a), predation by California sea lions on lamprey would be expected to continue under Alternative 1. Steller sea lions have been observed predating on white sturgeon in the action area, representing 98 percent of the observed sturgeon take (subsection 3.4.3, Factors Affecting Distribution at Bonneville Dam). Observations in the action area suggest that Steller sea lions are minor predators on lamprey, however, Steller sea lions have been documented to target lamprey as prey at other locations (subsection 3.6.2, White Sturgeon).

The non-lethal deterrence program in 2006 and 2007 was effective at dislocating Steller sea lions from the action area, and presumably reduced their predation rate to an unknown extent on white sturgeon (subsection 3.4.3, Factors Affecting Distribution at Bonneville Dam, Non-lethal

Deterrence Activities) and lamprey (subsection 3.6.3, Lamprey) relative to the prior period when there was little or no non-lethal deterrence at Bonneville Dam. Under the no-action Alternative, the lack of non-lethal deterrence measures would likely increase predation by Steller sea lions on white sturgeon, decrease white sturgeon abundance, reduce future recruitment, and possibly limit the availability of white sturgeon for harvest relative to current conditions. Similarly, the No-action Alternative would likely increase predation by Steller and California sea lions on lamprey, decrease their abundance, and increase the level of risk faced by lamprey stocks in the Columbia River.

Pinnipeds in the action area also consume shad (Table 3.4-3, and subsection 3.4.3, Factors Affecting Distribution at Bonneville Dam), however, it is not known whether non-lethal deterrence activities affect predation rates on shad. The effect of the No-action Alternative relative to current conditions on shad is uncertain.

4.6.2 Alternative 2: Non-Lethal Deterrence Only

Under Alternative 2 there would be no direct effects on unlisted salmonids or other fish species for the reasons described in subsection 4.5.2, Listed Salmonids, Alternative 2: Non-Lethal Deterrence Only. The exposure of unlisted salmonids to detonations of underwater firecrackers may result in a momentary startle response by juvenile or adult salmonids (subsection 3.4.3, Factors Affecting Distribution at Bonneville Dam); however, no injury or mortality of unlisted salmonids is anticipated because of the safety measures that would be implemented. Thus, with respect to direct effects, there would be no change for unlisted salmonids under Alternative 2 compared to the No-action Alternative. Alternative 2 would also be expected to have no indirect effects on unlisted salmonids, compared to the No-action Alternative, because California sea lions would be expected to continue predating on salmonids (subsection 3.4.3, Factors Affecting Distribution at Bonneville Dam, and subsection 4.5.2, Listed Salmonids, Alternative 2).

Compared to the No-Action Alternative, there would be no direct effects of Alternative 2 on other fish species (white sturgeon, lamprey, and shad). These species would also be exposed to detonations from underwater firecrackers, and momentary startle responses in these species have been noted (subsection 3.4.3, Factors Affecting Distribution at Bonneville Dam). However, the effects of exposure would be minor and transitory, and no injuries or mortalities are anticipated from the use of underwater firecrackers.

Non-lethal deterrence under Alternative 2 would be expected to have indirect effects on white sturgeon and lamprey, compared to the No-action Alternative, because non-lethal deterrence activities have been effective at displacing Steller sea lions from the action area, and Steller sea lions have been observed consuming white sturgeon (subsection 3.4.3, Factors Affecting Distribution at Bonneville Dam, Non-lethal Deterrence Activities) and lamprey (subsection 3.6.3, Lamprey) as prey. Thus Alternative 2 would result in an increase in survival of white sturgeon, an increase in future recruitment, and possibly an increase in the availability of white sturgeon for harvest relative to the No-action Alternative.

Alternative 2, through the displacement of Steller sea lions, would also result in an increase in the survival and abundance of lamprey in the action area, compared to the No-action Alternative, and may reduce the level of risk facing lamprey stocks in the Columbia River. These benefits to lamprey due to the displacement of Steller sea lions may be minor, as observations suggest they may represent less than 1 percent of the lamprey take in the action area (subsection 3.4.3, Factors Affecting Distribution at Bonneville Dam). Non-lethal deterrence measures under Alternative 2

would have no effect on California sea lion predation on lamprey relative to the No-action Alternative for the reason described above under Alternative 1. The indirect effects of this alternative compared to the No-action Alternative for shad is unknown (see above discussion under the No-action Alternative).

4.6.3 Alternative 3: Lethal Removal of Individually Identifiable Predatory California Sea Lions after Active Non-lethal Deterrence (Proposed Action)

Under Alternative 3 there would be no direct effects on unlisted salmonids and other fish species (white sturgeon, lamprey, and shad) relative to the No-action Alternative, due to non-lethal deterrence measures for the reasons discussed above under Alternative 2. Lethal activities would be carried out from shore in such a way as to avoid bullets entering the water. In the event a bullet did enter the water, it would be highly unlikely to strike a listed fish. Bullets are made of metal and once spent the projectile would sink. For these reasons, under Alternative 3 there would be no change from the No-action Alternative with respect to direct effects.

With respect to indirect effects, Alternative 3 would result in an increase in survival of unlisted salmonids for the same reasons as described in subsection 4.5.3, Listed Salmonids, Alternative 3. As described in subsection 4.5.3, Listed Salmonids, Alternative 3, the estimated total number of salmonids that could be consumed by 30 sea lions potentially removed under this alternative ranges from 1,410 to 9,600 fish (Table 4.5-1). Of these, the majority would be spring Chinook (1,308 – 9,425), and of these, 65 to 75 percent would be unlisted (850 to 6,126). A smaller portion of the total would be steelhead (26 to 693), and of these, 40 to 72 percent would be unlisted (10 to 497). This total consumption represents approximately 0.7 to 5.2 percent of the average total return of non-ESA listed spring-run Chinook and steelhead from 2001 to 2007 at Bonneville Dam (Table 4.5-1). For the reasons described in subsection 4.5.3, Listed Salmonids, Alternative 3, it is expected that actual improvement in the return of non-ESA listed fish under this alternative would be less than the maximum of 5.2 percent.

A decrease in indirect effects on white sturgeon and lamprey is expected under this alternative compared to the No-action Alternative. The reduction in predation mortality for white sturgeon would be attributable to the displacement of Steller sea lions by the non-lethal deterrence activities under this alternative. The displacement of Steller sea lions is also expected to result in an unquantifiable but minor beneficial effect on lamprey relative to the No-action Alternative (see explanation under Alternative 2, above). The lethal removal of California sea lions is also expected to result in a survival increase for lamprey because observations indicate that they represent 99 percent of the lamprey predation (subsection 3.4.3, Factors Affecting Distribution at Bonneville Dam). The indirect effect of Alternative 3 compared to the No-action Alternative for shad is unknown (see above discussion under the No-action Alternative).

4.6.4 Alternative 4: Lethal Removal of All California Sea Lions Above Navigation Marker 85 With No Requirement for Prior Active Non-Lethal Deterrence

Under Alternative 4 there would be no direct effects to other fish species relative to the No-action Alternative for the reasons discussed above under Alternative 3.

With respect to indirect effects, Alternative 4 would result in an increase in survival of unlisted salmonids. As shown in Table 4.5-1, the estimated total number of salmonids that could be consumed by 150 sea lions potentially removed under this alternative ranges from 7,050 to 48,000 fish. Of these, the majority would be spring Chinook (6,541 to 47,124), and of these, 65 to

75 percent would be unlisted (4,906 to 35,343). A smaller portion of the total would be steelhead (129 to 3,467), and of these, 40 to 72 percent would be unlisted (52 to 2,485). This total consumption represents approximately 3.7 to 25.9 percent of the average total return of non-ESA listed spring-run Chinook and steelhead from 2001-2007 at Bonneville Dam (Table 4.5-1). For the reasons described in subsection 4.5.3, Listed Salmonids, Alternative 3, it is expected that actual improvement in the return of non-ESA listed salmonids under this alternative would be less than the maximum of 25.9 percent.

Although non-lethal deterrence activities would not occur under Alternative 4, it is reasonable to expect that the level of boat activity and the shooting of California sea lions would cause Steller sea lions to avoid the area. As a result, white sturgeon and lamprey survival would likely increase compared to the No-action Alternative. The increased survival of white surgeon may result in increased future recruitment and an increased availability of sturgeon for harvest relative to the No-action Alternative. The lethal removal of California sea lions would further reduce predation on lamprey relative to the No-action Alternative, resulting in likely increases in their abundance and a reduction in the risk to lower Columbia River lamprey stocks. The indirect effect of this alternative compared to the No-action Alternative to shad is unknown (see above discussion under the No-action Alternative).

4.7 Fish Habitat

Potential impacts to fish habitat under any alternative would include effects from non-lethal deterrence activities and/or lethal removal activities on the water column, substrate, and riparian zones within the action area. Impacts to the riparian zones within the action area would be immeasurable or very minor because the riparian area in the lower Columbia River is highly altered and degraded (Christy and Putera 1993) (subsection 4.9, General Vegetation). Water quality impacts, including effects to the water column and on substrate are generally addressed in subsection 4.3, Water Quality. There would be no substantial effect to any water quality parameter under any action alternative because all boat-based deterrence or removal activities would be of short duration and localized within the action area. Further, substrate would not be affected because none of the activities would disturb substrate.

There would be no effect on EFH for coho or Chinook because there would be no impact on water quality or substrate necessary for coho or Chinook to carry out spawning, breeding, feeding, or growth to maturity. Additionally, because there would be no negative effect on riparian areas, substrate, or water quality, no negative impacts to critical habitat are anticipated (e.g., spawning sites, juvenile rearing areas and migration corridors, adult migration corridors, food resources, water quality and quantity, and riparian vegetation) (subsection 3.7, Fish Habitat).

4.8. Terrestrial and Avian Wildlife

4.8.1 Alternative 1: No-Action Alternative

Denial of the States' request for lethal removal authority and no action to reduce or control pinniped predation at Bonneville Dam would have no effect on terrestrial or avian wildlife in the action area because activities aimed at reducing California sea lion presence and predation would not occur. Actions to deter avian predators in the tailrace of the dam would likely continue at past levels.

4.8.2 Alternative 2: Non Lethal Deterrence Only

Denial of the States' request for lethal removal authority and implementing a program of non-lethal deterrence would likely result in a minor increase in disturbance of terrestrial and avian wildlife in the action area compared to the No-action Alternative because of the introduction of additional human activity and noise into the environment.

Capturing sea lions using the haul-out trap is unlikely to have any effect on terrestrial wildlife because terrestrial wildlife is unlikely to be near the trap. Birds resting on or in proximity to the trap may be temporarily displaced while the trap is in use but this effect would be localized and temporary.

Terrestrial and avian wildlife on shore in proximity to aerial pyrotechnics and cracker shells would be momentarily startled by the unexpected sound. The effect would be local and temporary, and disturbed wildlife would likely return to these areas after the non-lethal activities have stopped. Aerial pyrotechnics and cracker shells would not be used near sensitive avian nesting sites under this alternative so disturbance of nesting eagles, peregrine falcons, and herons in the action area from use of these devices is unlikely.

4.8.3 Alternative 3: Lethal Removal of Individually Identifiable Predatory California Sea Lions after Active Non-lethal Deterrence (Proposed Action)

Granting the States' request for lethal removal authority with conditions and implementing a non-lethal deterrence program would likely result in a minor increase in disturbance of terrestrial and avian wildlife in the action area compared to the No-action Alternative because of the introduction of additional human activity and noise into the environment.

This alternative would have effects similar those described under Alternative 2 on terrestrial and avian wildlife in the action area. There would be no added effect from permanent lethal removal of a small number of California sea lions on other wildlife in the area because removals would be conducted using capture techniques as previously described under Alternative 2 or by use of firearms that produce noise that is less than the noise anticipated for non-lethal aerial pyrotechnics or cracker shells.

4.8.4 Alternative 4: Lethal Removal of All California Sea Lions Above Navigation Marker 85 With No Requirement for Prior Active Non-Lethal Deterrence

Granting the States' request for lethal removal authority with conditions would likely result in a minor increase in disturbance of terrestrial and avian wildlife in the action area compared to the No-action Alternative because of the introduction of additional human activity and noise into the environment. Compared to Alternatives 2 and 3, Alternative 4 would likely result in less disturbance to terrestrial and avian wildlife in the action area. Alternative 4 would involve about twice as many hours of vessel activity as Alternatives 2 and 3, but less noise because of the elimination of non-lethal activities, which are deliberately noisy. The use of firearms to kill sea lions under this alternative would produce less noise than the noise anticipated for non-lethal aerial pyrotechnics or cracker shells.

4.9 General Vegetation

4.9.1 Alternative 1: No-action Alternative

There would be no impact to general vegetation in the action area under the No-action Alternative because no land-based activities would occur. Additionally, no activities would occur near the Fort Cascades Historic Site and Trail, so there would be no impact to this area of original shoreline in the Bonneville Dam vicinity.

4.9.2 Alternative 2: Non-lethal Deterrence Only

Unlike the No-action Alternative, non-lethal deterrence measures under Alternative 2 would include land-based activities that could disturb existing vegetation. However, any land-based activities would be conducted by four or fewer people at any one time, and would primarily occur on the previously disturbed shoreline near the dam (subsection 2.2.2, Alternative 2: Non-lethal Deterrence Only). Land-based deterrence activities including vessel chasing, and the deployment of cracker shells, aerial pyrotechnics, and rubber projectiles, would be primarily conducted from hard surfaces such as rock or concrete, but some activities may occur on vegetated surfaces. The potential for vegetation to be disturbed is very unlikely, however, since the shoreline in the project area is mainly degraded by developed and filled lands resulting from dam and facility construction, river fluctuations that inundate the shoreline, and ongoing maintenance activities.

As under the No-action Alternative, there would be no impact to the Fort Cascades Historic Site and Trail because no non-lethal deterrence activities would occur in this area.

4.9.3 Alternative 3: Lethal Removal of Individually Identifiable Predatory California Sea Lions After Active Non-lethal Deterrence (Proposed Action)

Impacts to general vegetation anticipated under Alternative 3 would be the same as those described under Alternative 2. Alternative 3 would involve the same non-lethal methods analyzed under Alternative 2. In addition, Alternative 3 would involve the lethal removal of sea lions if non-lethal deterrence measures failed. This removal would occur by one marksman from a land-based location or from an existing structure. A dead sea lion would be retrieved by boat, which would be launched from an existing boat ramp. Consequently, little or no impact would occur to general vegetation as a result of lethal removal.

Although no lethal removal activities would occur under the No-action Alternative, the minor amount and duration of activity involved under Alternative 3, the high likelihood that shooting would occur from a structure, and the current degraded condition of the shoreline in most of the project area, would result in nearly the same level of impact, which would be minor or immeasurable.

4.9.4 Alternative 4: Lethal Removal of All California Sea Lions Above Navigation Marker 85 With No Requirement for Prior Active Non-Lethal Deterrence

Impacts to general vegetation under Alternative 4 would be the same as those described under Alternative 3 related to lethal removal activities. There would be no non-lethal activities under Alternative 4, so as under the No-action Alternative, there would be no effect on shoreline vegetation from non-lethal deterrence activities.

4.10 Social and Economic Resources

4.10.1 Alternative 1: No-action Alternative

Under this alternative, there would be limited non-lethal deterrence activities, which could result in fewer employment opportunities from the States compared to management of a number of non-lethal deterrence methods. However, only four, temporary/seasonal personnel or contractors would be employed to manage a full suite of non-lethal deterrence measures and activities, so the impact of losing these temporary employment positions would be negligible on the local or state economy. This impact would be substantially offset by the cost savings to the States of not conducting deterrence activities, which is estimated at $150,000 under Alternative 2 (subsection 2.2.2, Alternative 2: Non-lethal Deterrence Only) (maintenance of sea lion exclusion devices at the fish ladders and acoustic harassment at the dam would be an ongoing cost to the Corps, although minor compared to the cost of managing a full suite of non-lethal deterrence measures).

There would be no effect on the residential population of the Gorge as a result of this alternative because the lack of sea lion deterrence activities would not cause residents to move out of the region or provide an incentive to move into the Gorge region.

Similarly, there would be no measurable effect on the goals of the Columbia River Gorge National Scenic Area designation aimed at protection and enhancement of cultural, natural, visual, and recreational resources and protection of area economies consistent with resource protection (subsection 3.10, Social and Economic Resources). While salmon are considered a cultural and natural resource, the use of non-lethal deterrence measures in 2005 and 2006 did not substantially affect sea lion predation on salmonids in the action area (subsection 4.5.1, Alternative 1: No Action Alternative). In addition, salmon survival is linked to many factors that occur in the Columbia Gorge area. Consequently, it is unlikely that reducing the use of non-lethal deterrence measures alone would demonstrate any measurable effect on salmon or its value as a cultural or natural resource. Further, the lack of non-lethal deterrence measures would have no bearing on the goal of protecting area economies consistent with resource protections since it would not result in any effect to the local economy (e.g., taxes, funding sources, employment) and would not alter the physical environment.

There would be no effect on visitor center or dam employees or to the lock system in the Gorge as a result of the No-action Alternative because maintenance of sea lion exclusion devices at the fish ladders and acoustic harassment at the dam would have no connection to lock operations and would not result in facility closures. Consequently, there would be no effect on international trade related to lock operations, which is valued at an estimated $1.5 to $2 billion annually, or on the annual 10 million tons of cargo barged through the Columbia River system, or on state and local taxes generated from maritime activities on the Columbia River (subsection 3.10, Social and Economic Resources).

4.10.2 Alternative 2: Non-lethal Deterrence Only

Impacts on the social and economic environment are anticipated to be largely the same under Alternative 2 as described under the No-action Alternative. The employment of a few seasonal, temporary personnel or contractors for non-lethal deterrence activities would have no measurable effect on the local economy, and no effect on residential populations. However, the cost of managing the full suite of non-lethal deterrence measures would be approximately $150,000 annually, which would be a considerable increase over the minor cost anticipated under the No-

action Alternative for maintenance of sea lion exclusion devices at the fish ladders and acoustic harassment at the dam.

As described under the No-action Alternative, the deterrence of sea lions would not likely improve salmon survival, which would then have no effect on the goals of the Columbia River Gorge National Scenic Area Designation. Similarly, the effect of non-lethal deterrence measures under Alternative 2 would likely be immeasurable or nonexistent compared to other, ongoing factors that contribute to salmon population declines in the project area. Similar to the No-action Alternative, the cost of managing the full suite of non-lethal deterrence measures would not substantially or directly protect area economies consistent with resource protections. Since the funding for these activities are provided by the States, not the local economy, no changes in local employment are anticipated, and because there would be no alterations to the physical environment.

Effects on employees or on the lock system and subsequent economic benefits to the Columbia Gorge region would be the same under Alternative 2 as described under the No-action Alternative since non-lethal deterrence measures would not impact lock operations or lead to facility closures.

4.10.3 Alternative 3: Lethal Removal of Individually Identifiable Predatory California Sea Lions After Active Non-lethal Deterrence (Proposed Action)

Impacts to the social and economic environment under Alternative 3 would be approximately the same as those described under Alternative 2. The addition of lethal removal activities under Alternative 3 would impact the social or economic environment in the same manner as impacts described under Alternative 2 because no additional employment or cost to the States would be anticipated beyond the Alternative 2 estimations. However, depending on the success of the lethal removal measures, it is possible that pinniped predation would decrease, and that there would be a modest improvement in salmonid survival under this alternative as compared to the No-action Alternative or Alternative 2 (Table 4.5-1). This would be compatible with the goals of protecting cultural and natural resources under the Columbia River Gorge National Scenic Area Designation since salmon are considered to be cultural and natural resources.

4.10.4 Alternative 4: Lethal Removal of All California Sea Lions Above Navigation Marker 85 With No Requirement for Prior Active Non-Lethal Deterrence

Impacts to the social and economic environment under Alternative 4 would be approximately the same as those described for Alternatives 2 and 3 because although no non-lethal measures would occur, the effect of lethal removal only would not impact the local economy or residential population. Impacts associated with the goals of the Columbia River Gorge National Scenic Area Designation would be the same as those described under Alternative 3 because successful lethal removal under Alternative 4 could lead to an even greater increase in salmonid survival than estimated under Alternative 3 (Table 4.5-1).

While the States have not estimated the cost for a lethal removal only alternative, it is estimated to be at least twice the cost for non-lethal activities described under Alternative 2 (or greater than $300,000) (subsection 2.2.4, Alternative 4: Unmodified Task Force Lethal Option 2 – Lethal Removal of All California Sea Lions Above Navigation Marker 85 With No Requirement for Prior Active Non-lethal Deterrence). This would be a substantial increase over the cost to the States for non-lethal only or non-lethal and lethal combined management ($150,000 under

Alternatives 2 and 3), and as compared to the No-action Alternative where only limited non-lethal deterrence activities would be managed.

It is likely there would be some disruption of vessel traffic on the Columbia River under Alternative 4, although it is difficult to predict how many days or hours that would occur. This impact could be substantial on any given day between mid-March and May (the Corps averages 250 vessel lockages per month at Bonneville Dam between March and May), but it is not expected to have a substantial, long-term effect on international trade related to lock operations, which is valued at an estimated $1.5 to $2 billion annually, or on the annual 10 million tons of cargo barged through the Columbia River system, or on state and local taxes generated from maritime activities on the Columbia River (subsection 3.10, Social and Economic Resources).

Vessel traffic disruptions would also affect employees who operate vessels, as well as employees at the dam and visitor centers if there are temporary closures under Alternative 4. There would be some economic effect greater than that experienced under any of the other alternatives as a result of shut-downs or closures. However, it is difficult to determine the cost of such shut-downs or closures on employers because the duration and timing of shut-downs or closures are unknown, the number of affected employees is unknown, and employer responses are unknown (e.g., will they continue to pay employees during mandatory shut-downs or closures?). There would be no economic effect to either of the dam visitor centers as a result of temporary safety closures because these facilities do not generate income.

4.11 Tourism and Recreation

4.11.1 Alternative 1: No-action Alternative

There would be no effect on tourism or recreation in the project area or in the vicinity of the Columbia River Gorge as a result of the No-action Alternative because only limited non-lethal deterrence activities would occur, neither of which would cause area closures or limitations on recreational activities.

There would be no closures of the Bradford Visitor Center and Washington Shore Visitor Complex, the four fishing areas maintained by the Corps in the project area, the Fort Cascades Historic Site and Trail, or any other public area under this alternative.

4.11.2 Alternative 2: Non-lethal Deterrence Only

Under Alternative 2, boat-based activities would be carried out using two vessels less than 25 feet long and powered by single or dual outboard motors (less than 250 horsepower) or a single inboard engine fitted with a jet pump. Vessels would operate between navigation marker 85 and the Bonneville Dam tailrace, which includes the Corps' designated "boat restricted zone" (Figure 1-1). Methods for non-lethal deterrence would be carried out from January 1 through May 31. From about March 15 through May 31 (approximately a 12-week period), boat-based non-lethal deterrence activities would be carried out 5 days a week, 8 hours per day (for a total of about 60 days, or 480 hours). From January 1 through about March 14, such activities would be less frequent, likely not more often than 2 days per week.

As described under subsection 3.11, Tourism and Recreation, fishing is the primary public use in the area of the Bonneville Lock and Dam. The Corps maintains four designated fishing areas. These are Tanner Creek, Robins Island, Bradford Island, and the Washington Shore. The first

three are inside secure gated areas and open during established fishing season from 7:00 a.m. to 5:00 p.m. The Washington Shore fishing area is in a non-gated area open during the established fishing season according to the hours designated by regulation. The Corps closed the Cascade Island fishing area following September 11, 2001, for security purposes.

Fishing occurs at these locations throughout the year, depending on the fishery. Sturgeon fishing is heaviest in spring, summer, and fall. Shad fishing occurs in spring and early summer, and is one of the heaviest fishing seasons because of the large run size. The northern pikeminnow bounty program, run by the Bonneville Power Administration, has caused high use in all fishing areas during the summer. Species such as salmon and steelhead, are fished for on a limited basis spring through fall.

The non-lethal deterrence methods proposed under Alternative 2 would coincide with fishing activities during the spring and summer (e.g., sturgeon, shad, pikeminnow, salmon, steelhead), but would not interface with fall fisheries (e.g., salmon, steelhead). Additionally, the allowable times for non-lethal activities to be employed during daylight hours would coincide with fishing hours established by the Corps. However, past non-lethal deterrence activities have not interfered with recreational boating or the recreational fishery in the vicinity of the dam (subsection 2.2.2, Alternative 2: Non-lethal Deterrence Only), and it is anticipated that there would be no interference with these activities from future employment of the same measures. Additionally, boat-based activities would be restricted to a zone established by the Corps, and small vessels would be used, further limiting possible impacts to recreational boating or fishing.

There would be no effect on recreational fishing or tourism as a result of any land-based, non-lethal deterrence measures under Alternative 2 because there would be no facility or public area closures as described under the No-action Alternative.

4.11.3 Alternative 3: Lethal Removal of Individually Identifiable Predatory California Sea Lions after Active Non-lethal Deterrence (Proposed Action)

Impacts resulting from non-lethal deterrence measures under Alternative 3 would be the same as those described under Alternative 2.

Unlike the No-action Alternative, Alternative 3 would involve close-range shootings, and the Corps would close fishing areas close to the dam for public safety (subsection 2.2.3, Alternative 3: Modified Task Force Recommendation - Lethal Removal of Individually Identifiable Predatory California Sea Lions After Active Non-lethal Deterrence). Such closures are not anticipated to negatively impact recreational fishing because all other allowable fishing areas in the Columbia River would remain open. Further, such closures would be limited in duration, allowing boaters to re-enter the Corps' managed fishing areas once lethal removal measures were completed.

Temporary closures of Corps roads and either the Bradford Visitor Center or Washington Shore Visitor Complex could occur under Alternative 3 compared to the No-action Alternative where no closures would occur. This may inconvenience visitors on a particular day and time, but overall, closures would be rare, localized, and temporary (hours, not days).

As under the No-action Alternative and Alternative 2, there would be no effect to tourists on the Fort Cascades Historic Site and Trail or designated hiking trails along the Washington shore because no lethal removal or non-lethal deterrence activities would occur in the vicinity of these sites.

4.11.4 Alternative 4: Lethal Removal of All California Sea Lions Above Navigation Marker 85 With No Requirement for Prior Active Non-Lethal Deterrence

Impacts anticipated under Alternative 4 would be greater to tourism and the recreational fishery under this alternative as compared to the No-action Alternative, and Alternatives 2 and 3. Because of the potential for ricochet related to lethal removal activities, Alternative 4 would result in the closure of State Route 14 in Washington for up to 2 hours per day, and of Interstate 84 in Oregon for up to 2 hours once a week from mid-March through May. Areas of Beacon Rock State Park and elevated areas on the Oregon shore also provide vantage points for shooters, which would necessitate temporary closures of some State Park facilities to public use as well as the Hamilton Island shoreline and boat ramp. Road and public park closures would be an inconvenience to tourists in the Gorge region as well as to boaters who use ramps in these closed areas.

Because of the potential for vessel traffic interruptions during lethal removal activities, it is assumed that recreational boating would also be restricted between mid-March through May for up to 16 hours per day on average (subsection 2.2.4, Alternative 4: Unmodified Task Force Lethal Option 2 – Lethal Removal of all California Sea Lions above Navigation Marker 85 with No Requirement for Prior Active Non-lethal Deterrence). This would be a substantial increase in closure potential to recreational fishing in the dam vicinity as compared to any of the other alternatives.

As under Alternative 3, temporary closures of Corp roads and either the Bradford Visitor Center or Washington Shore Visitor Complex could occur under Alternative 4 compared to the No-action Alternative where no closures would occur. This may inconvenience visitors on a particular day and time, but overall, closures would be rare, localized, and temporary (hours, not days).

In contrast to the No-action Alternative and Alternatives 2 and 3, tourists on the Fort Cascades Historic Site and Trail or designated hiking trails along the Washington shore could be affected by closures because lethal removal would occur in the vicinity of these sites.

4.12 Cultural Resources

4.12.1 Alternative 1: No-action Alternative

There would be no impact to cultural resources in the action area under the No-action Alternative because no land-based activities would occur. Additionally, no sea lion control activities would occur near the Fort Cascades Historic Site and Trail, so there would be no impact to this historic site. Maintenance of sea lion exclusion devices at the fish ladders and acoustic deterrence devices at the Bonneville Lock and Dam would take place under water. In addition, there would be no effect on the lock system because maintenance of sea lion exclusion devices at the fish ladders and acoustic harassment at the dam would have no connection to lock operations. The No-action Alternative, therefore, would have no impact to the historic significance of the Bonneville Project, which is based on above-water features and the lock's role in transportation. The nearest "in-lieu" site for Treaty fishing access is approximately 1 mile upstream from Bonneville Dam and would not be affected by maintenance activities.

As discussed in subsection 4.5.1, Alternative 1: No Action Alternative, the use of non-lethal deterrence measures in 2005 and 2006 did not substantially affect sea lion predation on salmonids in the action area. Under the No-action Alternative, sea lions would likely continue to prey on salmon, possibly reducing the availability of this cultural resource for Treaty tribes in the action area.

4.12.2 Alternative 2: Non-lethal Deterrence Only

Although non-lethal deterrence measures under Alternative 2 would include land-based activities, none of these would have the potential to affect cultural resources in the action area. No ground-disturbing activities would take place, so there would be no need for pre-project surveys to determine the presence or absence of prehistoric or historic materials. As under the No-action Alternative, there would be no impact to the Fort Cascades Historic Site and Trail because no non-lethal deterrence activities would occur in this area. The use of vessels and pyrotechnics to chase sea lions would not result in any lock closures or affect any of the above-water features of the Bonneville Lock and Dam, so there would be no impact to the historic significance of the Bonneville Project. Also, similar to the No-action Alternative, no deterrence activities would occur near any "in-lieu" Treaty fishing access sites. Alternative 2, like the No-action Alternative, would permit the use of non-lethal deterrence measures only, which have not been found to substantially affect sea lion predation on salmonids in the action area. Under this alternative, therefore, sea lions would likely continue to prey on salmon, possibly reducing the availability of this cultural resource for Treaty tribes in the action area.

4.12.3 Alternative 3: Lethal Removal of Individually Identifiable Predatory California Sea Lions After Active Non-lethal Deterrence (Proposed Action)

Impacts to cultural resources anticipated under Alternative 3 would be the same as those described under Alternative 2. No ground-disturbing activities would take place, so there would be no need for pre-project surveys to determine the presence or absence of prehistoric or historic materials. Alternative 3 would involve the same non-lethal methods analyzed under Alternative 2. In addition, Alternative 3 would involve the lethal removal of sea lions if non-lethal deterrence measures failed. When lethal removal activities are underway, some Bonneville Project roads and facilities may be closed to protect public safety. Portions of the eastern shoreline of Hamilton Island, within the Fort Cascades National Historic Site, may also be closed. Such temporary closures would not affect the historic significance of these sites, however. No sites upstream of the dam, including the "in-lieu" Treaty fishing access site, would be closed during lethal removal activities.

Depending on the success of the lethal removal measures, it is possible that pinniped predation at the Bonneville Lock and Dam would decrease, and that there would be a modest improvement in salmon survival under this alternative as compared to the No-action Alternative or Alternative 2 (Table 4.5-1). This could result in increased availability of this cultural resource for Treaty tribes in the action area.

4.12.4 Alternative 4: Lethal Removal of All California Sea Lions Above Navigation Marker 85 With No Requirement for Prior Active Non-Lethal Deterrence

Impacts to cultural resources under Alternative 4 would be similar to those described under Alternative 3. No ground-disturbing activities would take place, so there would be no need for pre-project surveys to determine the presence or absence of prehistoric or historic materials.

Closures of roads and facilities could occur over a greater area (extending downstream to navigation marker 85), but such temporary closures would have no impact on the historic significance of the Bonneville Project. Closures would not extend far enough upstream to affect the "in-lieu" Treaty fishing access site 1 mile above the dam. Unlike Alternative 3, there is the potential under Alternative 4 that the navigation locks may be closed for up to 2 hours. Such closures, however, would have no lasting effect on the lock's role in transportation, and would not result in any impacts on their historic significance.

As described for the No-action Alternative and Alternative 2, non-lethal deterrence activities would have no effect on cultural resources in the action area. The absence of non-lethal deterrence activities under Alternative 4, therefore, would not result in any differences in the effects anticipated under Alternative 3.

Impacts associated with the availability of salmon as a cultural resource for Treaty tribes would be similar to those described under Alternative 3. Because a greater number of predatory sea lions would be subject to lethal removal under Alternative 4 than under Alternative 3, there could be a greater increase in salmon survival (Table 4.5-1).

4.13 Noise

4.13.1 Alternative 1: No-action Alternative

Under the No-action Alternative, deterrence activities would be limited to routine maintenance of sea lion exclusion devices at the fish ladders and use of underwater acoustic deterrence devices at the dam. Noise from boats used for maintenance would not exceed ambient noise levels associated with vessel and highway traffic in the action area. Noise from underwater acoustic deterrence devices is essentially inaudible above the water's surface in areas accessible to the public. Consequently, there would be no effect on the acoustic environment as a result of these two non-lethal activities under this alternative. Noise associated with ongoing avian non-lethal deterrence would continue, and would include loud reports from explosive devices.

4.13.2 Alternative 2: Non-lethal Deterrence Only

Non-lethal deterrence activities under Alternative 2 would generate noise levels in the area between navigation marker 85 and the Bonneville Dam tailrace that would exceed the levels anticipated under the No-action Alternative. The primary sources of elevated noise levels would be pyrotechnics (cracker shells, screamer rockets, banger rockets, shotguns for rubber projectiles) and boats used for vessel chasing, acoustic harassment, and the capture and release program. Boat-based activities would be carried out using two vessels less than 25 feet long and powered by single or dual outboard motors (less than 250 horsepower) or a single inboard engine fitted with a jet pump. Non-lethal deterrence measures would be carried out from January 1 through May 31. From about March 15 through May 31 (a period of approximately 12 weeks), boat-based non-lethal deterrence would be carried out 5 days a week, 8 hours per day (for a total of about 60 days). From January 1 through about March 14, such activities would be less frequent, likely not more often than 2 days per week. Based on these estimates, non-lethal deterrence measures would result in elevated noise levels on approximately 82 days (22 days from January through mid-March, and 60 days from mid-March through the end of May).

Noise from operation of the Bonneville Lock and Dam, combined with traffic on adjacent highways, railways, and the Columbia River waterway contribute to ambient noise levels in the

action area (subsection 3.13, Noise). Additional noise from vessels used in boat-based deterrence activities would not be expected to result in substantial changes in the acoustic environment compared to the No-action Alternative.

Aerial pyrotechnics would be audible to visitors to the dam, anglers on shore, or boaters in the action area. Noise from aerial pyrotechnics may also reach residential areas within 1 mile of the action area, including the communities of North Bonneville and Skamania. Hamilton Island, situated between the Columbia River and North Bonneville (Figure 1-1), would likely reduce the amount of noise that reaches residential areas in that area. The sounds associated with deterrence measures would be similar to those produced by avian non-lethal deterrence, which has been ongoing for many years. Noise-generating activities would take place only during daylight hours, and would be limited to short bursts of concussive noises. The number of sudden, loud noises under Alternative 2 would increase compared to the number associated with avian non-lethal deterrence, and would occur in a greater area downstream of the dam (as far downstream as navigation marker 85). Based on information collected while non-lethal deterrence activities were conducted in 2005 through 2007, residents and visitors may file more noise-related complaints than under the No-action Alternative, particularly in areas downstream of Hamilton Island. No substantial adverse effects on the acoustic environment were reported during this period, however, and none would be expected under Alternative 2.

Sounds from underwater firecrackers may be detectable through the hulls of vessels fishing in the open waters below the tailrace. These sounds would dissipate quickly in the open expanse of the Columbia River and would not be expected to result in adverse disturbance of persons in these vessels.

4.13.3 Alternative 3: Lethal Removal of Individually Identifiable Predatory California Sea Lions After Active Non-lethal Deterrence (Proposed Action)

Noise levels resulting from non-lethal deterrence activities under Alternative 3 would be the same as those described under Alternative 2, and the anticipated impacts would be the same. Lethal removal measures would include the use of firearms by marksmen on shore or on structures in the immediate vicinity of the observation area below Bonneville Dam. Noise levels associated with firearms would not be expected to exceed those associated with aerial pyrotechnics. The total number of sudden, loud noises may increase with the addition of firearm use, or it could decrease if lethal removal effectively reduces the number of predatory sea lions subject to deterrence and removal in the action area. As with Alternative 2, no substantial adverse effects on the acoustic environment would be expected.

4.13.4 Alternative 4: Lethal Removal of All California Sea Lions Above Navigation Marker 85 With No Requirement for Prior Active Non-Lethal Deterrence

No non-lethal deterrence measures would be employed under Alternative 4, which means all noise related to pinniped control would be generated by firearms and boats. In contrast to Alternative 3, lethal removal would not be limited to the specified observation area at Bonneville Dam, but could take place in any portion of the area between navigation marker 85 and the dam. This matches the area in which non-lethal control measures would be conducted under Alternatives 2 and 3, so the area with the potential to be affected by noise would not differ from those two alternatives.

In contrast to Alternative 3, lethal removal activities could be conducted not only from on shore or structures, but also from a boat. NMFS anticipates that from about March 15 through May 31, lethal removal activities would occur 7 days per week, during all daylight hours (an average of about 16 hours per day for approximately 78 days) on the water, plus additional hours for shore-based marksmen working during daylight hours. From January 1 through about March 14 (when sea lions are less numerous in the action area), such activities would be less frequent. Based on these estimates, non-lethal deterrence measures would result in elevated noise levels on approximately 100 days (22 days from January through mid-March, and 78 days from mid-March through the end of May).

Based on these estimates, Alternative 4 would result in more vessel-related noise than Alternative 2 or Alternative 3. In the context of the existing noise generated by vehicles and vessels in the action area, however, additional noise from vessels used in boat-based lethal activities under this alternative would not be expected to result in substantial changes in the acoustic environment, compared to the No-action Alternative or Alternatives 2 and 3.

Although lethal control activities would be conducted on a greater number of days than under Alternative 2 or Alternative 3, the total number of sudden, loud noises may be smaller under Alternative 4 than under the other two action alternatives. The number of gunshots required to kill an animal would likely be smaller than the number of cracker shells, screamer rockets, banger rockets, or rubber projectiles needed to cause an animal to leave the area. In addition, the total number of gunshots may decrease as the number of sea lions subject to lethal removal decreases. For these reasons, noise levels associated with lethal removal under Alternative 4 would not be expected to exceed those associated with non-lethal deterrence under Alternative 2 or with the combination of lethal removal and non-lethal deterrence under Alternative 3. As with Alternatives 2 and 3, no substantial adverse effects on the acoustic environment would be expected.

4.14 Aesthetics

4.14.1 Alternative 1: No-action Alternative

There would be no impact on aesthetic resources under the No-action Alternative because there would be no alteration of the landscape. There would be no change in fishing activities, river traffic, or lock operations under this alternative; therefore, these components of the river's aesthetic environment would not be altered by routine maintenance of sea lion exclusion devices at the fish ladders and acoustic harassment at the dam.

4.14.2 Alternative 2: Non-lethal Deterrence Only

Impacts under this alternative would be the same as those described under the No-action Alternative because, although land-based and boat-based activities would occur, they would not alter the aesthetic environment of the project area. Boats are a part of the current aesthetic character of the river. The placement of a few, small boats to conduct non-lethal deterrence activities would not markedly alter the current scenic composition of this environment. Few land-based activities would occur, and they would involve only up to four personnel temporarily standing on shore or on structures. Again, this would not affect the aesthetic character of the project area. Underwater devices for non-lethal deterrence would not be visible to area visitors.

4.14.3 Alternative 3: Lethal Removal of Individually Identifiable Predatory California Sea Lions After Active Non-lethal Deterrence (Proposed Action)

Impacts under Alternative 3 would be the same as those described under Alternative 2. Although this alternative would involve lethal removal methods by marksmen on shore this would not alter the physical environment in the project area.

4.14.4 Alternative 4: Lethal Removal of All California Sea Lions Above Navigation Marker 85 With No Requirement for Prior Active Non-lethal Deterrence

Impacts under Alternative 4 would be the same as those described under Alternative 3 for lethal removal activities.

4.15 Transportation

4.15.1 Alternative 1: No-action Alternative

There would be no effect on transportation in the project area as a result of the No-action Alternative because only limited non-lethal deterrence activities would occur, neither of which would cause any road closures. Acoustic deterrence devices do not affect vessel operation in the project area. There would be no effect on the lock system as a result of the No-action Alternative because maintenance of sea lion exclusion devices at the fish ladders and acoustic harassment at the dam would have no connection to lock operations.

4.15.2 Alternative 2: Non-lethal Deterrence Only

Similar to the No-action Alternative, no road or facility closures would occur under this alternative, and non-lethal deterrence activities would not impact lock operations. Past non-lethal deterrence measures have not interfered with recreational boating in the vicinity of the dam (subsection 2.2.2, Alternative 2: Non-lethal Deterrence Only), and it is anticipated that there would be no interference with these activities from future employment of the same measures. For these reasons, there would be no effect on transportation in the project area.

4.15.3 Alternative 3: Lethal Removal of Individually Identifiable Predatory California Sea Lions After Active Non-lethal Deterrence (Proposed Action)

Impacts resulting from non-lethal deterrence measures under Alternative 3 would be the same as those described under Alternative 2.

Unlike the No-action Alternative, Alternative 3 would involve the shooting of free-ranging sea lions by qualified marksmen at close range. While lethal removal activities are underway, the Corps (in consultation with the Incident Command Center (ICC)) would close roads and facilities close to the dam for public safety (subsection 2.2.3, Alternative 3: Modified Task Force Recommendation - Lethal Removal of Individually Identifiable Predatory California Sea Lions After Active Non-lethal Deterrence). Such closures may impede the movement of visitors on Corps property on a particular day and time. Overall, however, such closures would be rare, localized, and temporary (typically less than 2 hours). Travelers passing through the action area by land (on State Highway 14 in Washington, Interstate 84 in Oregon, or by railway) or by water (through the navigation locks) would not be affected because no closures of the locks or roads beyond the property managed by the Corps are anticipated under Alternative 3. NMFS

anticipates, based on experience from 2007, that there may be 20 days on which animals hauled out below the dams are shot on-site each year. No long-term changes to highways, roads, bridges or navigation routes, including navigation locks, would occur.

4.15.4 Alternative 4: Lethal Removal of All California Sea Lions Above Navigation Marker 85 With No Requirement for Prior Active Non-lethal Deterrence

Impacts to transportation under Alternative 4 would likely be greater under this alternative as compared to the No-action Alternative and Alternatives 2 and 3. Because of the potential for ricochet related to lethal removal activities, Alternative 4 would result in the closure of State Route 14 in Washington and of Interstate 84 in Oregon for up to 2 hours per day, once a week from mid-March through May. Based on the average hourly traffic volumes presented in subsection 3.15 (Transportation), approximately 240 vehicles (129 westbound and 109 eastbound) be may delayed by each hour of closure on State Route 14, and approximately 1,200 vehicles may be delayed by each hour of closure on Interstate 84. These values likely represent an overestimate of the number of vehicles that may be affected, because highway closures, if needed, would occur during non-peak travel hours, when traffic volumes are typically below average rates. Closures could have a substantial impact on individual travelers on individual days, but no substantial, long-term effects on highway travel through the action area are anticipated.

Some disruption of vessel traffic on the Columbia River would also be likely under Alternative 4, although it is difficult to predict the number of days or hours on which this would occur. This impact could be substantial on any given day between mid-March and May (the Corps averages 250 vessel lockages per month at Bonneville Dam between March and May), but no substantial, long-term effects on the use of the locks as a navigational feature are anticipated.

4.16 Public Services

4.16.1 Alternative 1: No-action Alternative

No protests would be expected under the No-action Alternative. There would be no effect on public services in the project area as a result of the No-action Alternative because neither maintenance of sea lion exclusion devices nor use of acoustic deterrence devices entails the need for law enforcement or fire fighting.

4.16.2 Alternative 2: Non-lethal Deterrence Only

Under this alternative, non-lethal deterrence activities that involve boat use and pyrotechnics would occur. Similar to the No-action Alternative, no additional need for law enforcement would be anticipated. When non-lethal deterrence activities were conducted in 2005 through 2007, no incidents occurred that necessitated the intervention of law enforcement officials and none would be expected under Alternative 2. In contrast to the No-action Alternative, there is a remote likelihood that accidental discharge of pyrotechnics in vegetated areas on shore may require response by local fire crews. No such events occurred in 2005 through 2007.

4.16.3 Alternative 3: Lethal Removal of Individually Identifiable Predatory California Sea Lions After Active Non-lethal Deterrence (Proposed Action)

Impacts resulting from non-lethal deterrence measures under Alternative 3 would be the same as those described under Alternative 2.

Unlike the No-action Alternative and Alternative 2, Alternative 3 would involve the shooting of free-ranging sea lions by qualified marksmen at close range. While lethal removal activities are underway, the Corps (in consultation with the ICC) would close roads and facilities close to the dam for public safety (subsection 2.2.3, Alternative 3: Modified Task Force Recommendation - Lethal Removal of Individually Identifiable Predatory California Sea Lions After Active Non-lethal Deterrence). Enforcement of such closures may require the participation of Corps-contracted law enforcement staff from Sheriff's Offices in Skamania County in Washington and Multnomah and Hood River Counties in Oregon. Road and facility closures at the Bonneville Lock and Dam would be rare, localized, and temporary (typically less than 2 hours) and would not be expected to divert a substantial number of law enforcement personnel from other duties. Based on experience from 2007, NMFS anticipates that there may be 20 days on which animals hauled out below the dams are shot on-site each year. No long-term changes to law enforcement needs in the action area would occur.

Protestors opposed to the shooting of sea lions may necessitate responses by local law enforcement personnel. No protests would be expected under the No-action Alternative. Similar to the need for enforcement of facility closures, protest activities under Alternative 3 would not be expected to divert a substantial number of law enforcement personnel from other duties.

4.16.4 Alternative 4: Lethal Removal of All California Sea Lions Above Navigation Marker 85 With No Requirement for Prior Active Non-lethal Deterrence

No non-lethal deterrence measures would be employed under Alternative 4, meaning the possibility of an accidental discharge of pyrotechnics in vegetated areas would be even more remote than under Alternatives 2 and 3. The potential need for a response by local fire crews would be less likely than under those alternatives.

Law enforcement needs related to the closure of roads and facilities near the dam would be the same as those described for Alternative 3. Temporary closures on State Route 14 in Washington and Interstate 84 in Oregon would require additional participation of local law enforcement personnel. Such closures may last up to 2 hours per day, once a week from mid-March through May. Enforcing closures and directing traffic on those occasions may result in extra costs associated with overtime pay and materials, but would not be expected to divert a substantial number of law enforcement personnel from other duties.

As with Alternative 3, protestors opposed to the shooting of sea lions may necessitate responses by local law enforcement personnel. Because a greater number of sea lions may be targeted for removal and activities would be occurring over a greater number of days, the number of protestors and protest events would likely be greater than under Alternative 3. Similar to the need for enforcement of road and facility closures, protest activities under Alternative 4 would not be expected to divert a substantial number of law enforcement personnel from other duties.

4.17 Safety and Human Health

4.17.1 Alternative 1: No-action Alternative

The No-action Alternative would have minor effects on safety and human health because only limited non-lethal deterrence activities would occur (acoustic deterrence devices and maintenance of sea lion exclusion devices), neither of which would involve more than a minor chance of injury associated with operation and maintenance. The Corps maintains a safety program, which

establishes strict safety requirements (subsection 3.17, Safety and Human Health), and which would be implemented for the limited activities under this alternative.

4.17.2 Alternative 2: Non-lethal Deterrence Only

Under Alternative 2, boat-based activities would be carried out using two vessels less than 25 feet long and powered by single or dual outboard motors (less than 250 horsepower) or a single inboard engine fitted with a jet pump. Up to four employees would operate vessels between navigation marker 85 and the Bonneville Dam tailrace, which includes the Corps' designated "boat restricted zone" (Figure 1-1). Methods for non-lethal deterrence would be carried out from January 1 through May 31. From about March 15 through May 31 (approximately a 12-week period), boat-based non-lethal deterrence activities would be carried out 5 days a week, 8 hours per day (for a total of about 60 days, or 480 hours). From January 1 through about March 14, such activities would be less frequent, likely not more often than 2 days per week.

Non-lethal deterrence activities under this alternative would pose some risk to safety, compared to the No-action Alternative. Vessels could capsize, and firearms or explosive devices (cracker shells, aerial pyrotechnics) could misfire or detonate prematurely, exposing the four employees to injury. Employees handling the traps or animals in the traps could be injured by falling while mounting the trap from a boat, while working on the trap, or by trapped animals. No injuries were reported during non-lethal activities in 2005-2007, and employees would be expected to follow safety procedures established by the Corps and States (subsection 2.2, Non-lethal Deterrence Only; subsection 3.17, Safety and Human Health). It is unlikely that vessels or projectiles would strike bystanders as the employees involved in non-lethal deterrence activities would follow safety procedures established by the Corps and described in subsection 2.2, Non-lethal Deterrence Only. No injuries of bystanders were reported during non-lethal activities in 2006 and 2007 (subsection 3.17, Safety and Human Health).

4.17.3 Alternative 3: Lethal Removal of Individually Identifiable Predatory California Sea Lions After Active Non-lethal Deterrence (Proposed Action)

Impacts resulting from non-lethal deterrence measures under Alternative 3 would be the same as those described under Alternative 2, and the comparison to the No-action Alternative would therefore also be the same.

Unlike the No-action Alternative and Alternative 2, Alternative 3 would involve shooting of sea lions hauled out below Bonneville Dam with live ammunition. There is some risk of bullets ricocheting off the hard haul-out surface, but there is little likelihood that ricocheting bullets would strike anyone because the haul-outs are located in a part of the project area that is not open to the public and is within the Corps' boat restriction zone (Figure 1-1). There is little risk of a stray bullet striking anyone because the States' safety plan would specify the type of weapons and ammunition that could be used, the training required of marksmen, and the conditions under which animals could be shot, including public area closures as needed.

4.17.4 Alternative 4: Lethal Removal of All California Sea Lions Above Navigation Marker 85 With No Requirement for Prior Active Non-lethal Deterrence

Although Alternative 4 does not include non-lethal deterrence activities, potential impacts to safety would be greater under this alternative as compared to the No-action Alternative, and Alternatives 2 and 3 for several reasons. More sea lions would potentially be shot (150 compared

with none under the No-action Alternative and Alternative 2, and compared with 30 under Alternative 3). The increased use of live ammunition to shoot sea lions increases the risk of injury from a bullet strike. The location of the targets (in the water as well as on land) and the marksmen (in vessels as well as on land) also increases the risk of injury to the marksmen and bystanders compared to Alternative 3. Bullets fired at an oblique angle may ricochet off the surface of the water. Because marksmen shooting from vessels are likely to be lower in relation to the target animal than marksmen shooting from land, there is thus greater risk of ricochet. Marksmen shooting from vessels are likely to be less accurate than marksmen shooting from land because of the instability of the shooting platform, creating a risk of stray bullets in addition to the risk of ricocheting bullets. The safety program of the Corps and States, and the closure of visitor areas, fishing areas, and roads, would minimize the chances of someone being struck by a stray or ricocheting bullet.

5.0 CUMULATIVE EFFECTS

NEPA defines cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). This analysis examines the two resources that have the potential for cumulative effects when the proposed action (Alternative 3) is added to other past, present, and reasonably foreseeable future actions: marine mammals and salmonids.

5.1 Marine Mammals

Subsection 3.4, Marine Mammals, describes the growth of the California sea lion population following adoption of the MMPA, and Figure 3-2 illustrates that the United States stock of California sea lions is currently at OSP, having reached the carrying capacity of its habitat. Subsection 3.4, Marine Mammals, also describes the PBR method for determining a level of removals from a marine mammal population that will be low enough to avoid causing the population to fall below its OSP level. For the United States stock of California sea lions the PBR is 8,511 sea lions per year (Carretta et al. 2007). The estimated annual human-caused mortality for California sea lions during 1997 through 2001 was 1,476 animals (Carretta et al. 2006). If an additional 30 California sea lions were killed each year under the proposed action, the total human-caused mortalities would still represent less than 20 percent of the estimated PBR. Thus the proposed action would not have cumulative impacts on the United States stock of California sea lions.

Under the proposed alternative, it is likely that many California sea lions would continue to be present in the lower Columbia River generally and at Bonneville Dam in particular. In the lower Columbia area generally, there are approximately 700 sea lions observed each year on the south Jetty and several hundred more at river mile 12 in Astoria (subsection 3.4, Marine Mammals). At Bonneville Dam between 2003 and 2006 there were 85 to 111 sea lions observed (Table 3.4-2). There are likely many more sea lions than those observed, and may be as many as 150 in any one year in the area below the dam (subsection 3.4, Marine Mammals). There are no other known activities that are likely to cause the number of sea lions at Bonneville Dam or the lower Columbia River to decrease (although a substantial decrease in the number of salmonids available as prey would likely reduce California sea lion presence in the area below the dam). Removing 30 sea lions each year would reduce the numbers of sea lions present at the dam, but there would still be many sea lions in the area each year. The 30 sea lions likely removed under the proposed alternative (with a limit of no more than 85 sea lions removed) would represent a small fraction of the hundreds present throughout the lower Columbia.

5.2 Listed Salmonids

As reflected in Table 3.5-3, all upper Columbia and Snake River spring Chinook populations are at high risk, and the majority of Snake River, middle Columbia River and lower Columbia River steelhead are at moderate risk. Implementing the proposed action could result in a maximum increase of 327 to 3,299 listed spring Chinook (from 0.5 to 7.2 percent of the run) and 7 to 414 listed steelhead (from 2.7 to 36.0 percent of the run) passing Bonneville Dam (Table 4.5-1). Actual numbers may be lower because eventually new sea lions would likely take the place of sea lions that had been removed.

These salmon and steelhead species potentially affected by the proposed action have been listed for several years. Many factors have led to their decline and are preventing their recovery (subsection

3.6). As a result, recovery plans for these species encourage the management of all sources of mortality, including marine mammal predation. Examples include:

Basinwide Salmon Recovery Strategy (Federal Caucus 2000). Marine mammal predation has a measurable effect on returning adult Columbia River salmonids. Predation is part of a properly functioning ecosystem, however, given the perilous state of decline being faced by many salmon and steelhead species, predation control could contribute to recovery efforts, along with other management actions. Recommend active management of predators, including sea lions, in the Columbia River as important to improve salmonid survival rates.

Draft Columbia River Estuary Recovery Plan Module for Salmon and Steelhead (*Estuary Module*) (NOAA Fisheries, September 2006). The cumulative effect of altered flows, changes in sediment transport processes and food sources, introduced species, hatcheries, upstream habitat impacts, hydroelectric impacts, and contaminants have recast estuary and plume environments such that predator/prey relationships have changed significantly. Predation by pinnipeds on adult spring Chinook and winter steelhead is a significant threat to salmon and steelhead recovery. Altered predator/prey relationships between native pinnipeds and salmonids ranks as a "high" threat priority (4 on a scale of 1 to 5 where 5 is the highest priority ranking), and actions to reduce salmon and steelhead predation by pinnipeds is among a suite of actions most important for the recovery of spring Chinook and winter steelhead (Action CRE-14).

Final Upper Columbia Recovery Plan (Upper Columbia Salmon Recovery Board, adopted October 2007). Mammals are natural salmonid predators but the role of predation has been reshaped by changes in predator and prey populations along with major changes in the environments. Supports immediate adoption of more effective predator control programs, including lethal removal when necessary, of the marine and avian predators that have the most significant negative impacts on returns of Upper Columbia Basin ESA-listed salmonid fish stocks.

Interim Lower Columbia Salmon Recovery and Fish & Wildlife Plan (Lower Columbia Fish Recovery Board, approved February 2006). Predation management is needed in prescribed situations where pinnipeds are creating unnatural levels of predation.

In addition to recovery planning, Federal agencies must consult with NMFS under section 7 of the ESA on any action that is likely to adversely affect the listed fish. Through the consultation process Federal agencies or applicants may change their proposed actions to avoid harming listed fish, or NMFS may require them to conduct their proposed action in a way that reduces or mitigates harm to listed fish. From 1982 through 2001, federal agencies spent $3.3 billion on Columbia River salmon recovery (GAO 2002) (Section 3.10, Social and Economic Resources). Table 3.5-7 illustrates the various types of actions subject to consultation and the results in terms of salmonid survival improvements. Specifically with respect to predator control, Table 3.5-7 shows marked reductions in predation by terns and the northern pikeminnow. While it is not possible to translate funds expended to numbers of fish saved, it is evident from this information that billions of dollars are committed to actions aimed at improving survival of listed Columbia Basin salmon.

Implementation of the proposed action would make a measurable contribution to improving survival of returning adult salmonids. While as a single action it is not sufficient to recover these listed species, there is no single action available that would accomplish that goal. As identified in recovery planning documents, the recovery of the species requires incremental improvements in the array of factors that cause mortality. The proposed action would make an incremental contribution, in addition to other efforts, to decreasing all sources of mortality.

6.0 AGENCIES AND ORGANIZATIONS CONSULTED

NMFS coordinated with various programs and offices within the agencies and entities listed below in preparation of this EA. In particular, development of the environmental assessment was greatly influenced by the work done by the Pinniped-Fishery Interaction Task Force for the Columbia River. Task force members from the agencies and organizations listed below represented the broad spectrum of opinion and expertise concerning the pinniped fishery interaction.

Pinniped-Fishery Interaction Task Force

Employees of Dept. of Commerce

- Patricia Dornbusch NMFS, NWR Salmon Recovery Division
- Robert Delong NMFS, National Marine Mammal Laboratory

Scientists Knowledgeable about Pinniped-Fishery Interaction

- Tom Loughlin Retired, Marine Mammal Scientist
- Daryl Boness Retired, Marine Mammal Scientist
- Barry McPherson Oregon Chapter, American Fisheries Society

Conservation Organizations

- Sharon Young Humane Society of the United States
- David Shepherdson Oregon Zoo
- Debrah Marriott Lower Columbia River Estuary Partnership

Fishing Organizations

- Bruce Buckmaster Salmon for All
- Dennis Richey Oregon Anglers

Indian Treaty Tribes

- Joe Oatman Nez Perce Tribes
- Carl Scheeler Confederated Tribes of the Umatilla Indian Reservation
- Jody Calica Confederated Tribes of the Warm Springs Reservation
- Paul Ward Confederated Bands of the Yakama Nation
- Doug Hatch Columbia River Inter-Tribal Fish Commission

States

- Steve Williams Oregon Department of Fish & Wildlife
- Guy Norman Washington Department of Fish & Wildlife

Other

- Bob Willis U.S. Army Corps of Engineers

NMFS solicited comments from the public and provided those comments to the Task Force for their consideration. Topical briefings, from State, Tribal, and Federal agency experts, were provided to the Task Force to familiarize them with data and observations collected at Bonneville Dam, endangered salmon recovery planning, preparation and contents of the States' application, non-lethal deterrence measures, and the pinnipeds involved. The Task Force met three times to

discuss the available data and develop recommendations to guide NMFS in its decision to approve or deny the States' application. The Task Force meetings were open to the public and during each meeting new information provided by the public was distributed to Task Force members for their consideration.

During the establishment of the Task Force, NMFS coordinated with the Marine Mammal Commission to identify a Commission representative to participate in the Task Force proceedings. Observers from the Commission also attended the Task Force meetings to observe the deliberations. Upon receipt of the "Final Report and Recommendations of the Marine Mammal Protection Act Section 120 Pinniped-Fishery Interaction Task Force: Columbia River" NMFS consulted with the Marine Mammal Commission to obtain their views and comments on the report, and considered their input during the preparation of this EA.

Lastly, NMFS sought and received assistance in the preparation of the draft EA from the U.S. Army Corps of Engineers, Fisheries Field Unit at Bonneville Dam.

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