UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

November 6, 2012

In response refer to:
2006/07392

P. Michael Payne
Chief, Permits, Conservation and Education Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Room 13705
Silver Spring, Maryland 20910-3226

Dear Michael:

This document transmits NOAA's National Marine Fisheries Service's (NMFS) final biological opinion (Enclosure) based on NMFS' review of the proposed issuance of an Incidental Harassment Authorization to the United States Fish and Wildlife Service (USFWS) for the continuation of bird mitigation research trials on the South Farallon Island and its effect on the federally threatened eastern Distinct Population Segment (DPS) of Steller sea lion (*Eumetopias jubatus*) and designated critical habitat, in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.).* This final biological opinion is based on our review of: (1) the Application for an Incidental Harassment Authorization (IHA) under the Marine Mammal Protection Act (MMPA) submitted by the USWFS and the effects of the proposed action on Steller sea lions in accordance with section 7 of the ESA; and, (2) the USFWS request for formal consultation under Section 7 of the ESA and other supporting documentation. A complete administrative record of this consultation is on file at the NMFS Southwest Regional Office.

Based on the best available scientific and commercial information, NMFS has concluded that the issuance of the IHA permit to the USWFS is not likely to jeopardize the continued existence of the federally threatened eastern DPS of Steller sea lion and will not result in the destruction or adverse modification of Steller sea lion critical habitat.

Thank you for consulting with NMFS on the proposed project. If you have any questions regarding this consultation, please contact Monica DeAngelis, of my staff, at (562) 980-3232, or via e-mail at Monica.DeAngelis@noaa.gov.

Sincerely,

Rodney R. McInnis
Regional Administrator

Enclosure: Biological Opinion

cc: Gerry McChesney, USFWS
Michelle Magliocca, NMFS, OPR

BIOLOGICAL OPINION

AGENCY:	Office of Protected Resources, National Marine Fisheries Service and United States Fish and Wildlife Service (USFWS)
ACTIVITIES CONSIDERED:	Issuance of an Incidental Harassment Authorization under Section 101(a)(5)(D) of the Marine Mammal Protection Act to allow the USFWS to Conduct a Bird Mitigation Research Trial in the Farallon National Wildlife Refuge
CONSULTATION CONDUCTED BY:	Protected Resources Division, Southwest Regional Office, National Marine Fisheries Service
TRACKING NUMBER:	151422SWR2012PR01886
DATE ISSUED:	**November 6, 2012**

Section 7(a)(2) of the Endangered Species Act (ESA; 16 U.S.C. § 1531 *et seq.*) requires that each Federal agency shall ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When the action of a Federal agency may affect a protected species or critical habitat, that agency is required to consult with either NOAA's National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS), depending upon the protected species or critical habitat that may be affected. Federal agencies are exempt from this requirement to consult formally, if they have concluded that an action "may affect, but is not likely to adversely affect" endangered species, threatened species, or designated critical habitat and NMFS or the USFWS concur with that conclusion (50 CFR 402.14(b)). For the actions described in this biological opinion, the action agencies are NMFS' Office of Protected Resources (OPR) for issuance of an Incidental Harassment Authorization (IHA) under the Marine Mammal Protection Act (MMPA) and the USFWS for a proposed bird mitigation research trial on the South Farallon Islands (Farallon National Wildlife Refuge); and the consulting agency is the NMFS Southwest Region (SWR).

This document represents NMFS' Biological Opinion based on our review of the Application for Level B harassment, Incidental Harassment Authorization under the MMPA submitted by the USFWS (see the *Background and Consultation History* section for more information on the purpose of this document), and the effects of the proposed action on Steller sea lions in accordance with section 7 of the ESA.

This biological opinion is based on information from the final and most recent revised Recovery Plan for the Steller sea lion (NMFS 1992; NMFS 2008), the draft status review of the Eastern Distinct Population Segment of the Steller sea lion (NMFS 2012) the most current marine mammal stock assessment reports (Angliss and Allen 2012), past and current research, and population dynamics modeling efforts. This biological opinion represents NMFS-SWR's review of the status of the listed species considered in this consultation, the condition of the critical habitat, the environmental baseline for the action area, the effects of the proposed action and cumulative effects (50 CFR 402.14(g)). For the jeopardy analysis, NMFS-SWR analyzed those combined factors to determine whether the proposed actions are likely to appreciably reduce the likelihood of both the survival and recovery of the affected listed species.

The critical habitat analysis determined whether the proposed action would destroy or adversely modify critical habitat for listed species by examining any change in the conservation value of the essential features of critical habitat. This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 C.F.R. 402.2. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat. Until we have promulgated a new definition of "destruction or adverse modification," our evaluation of effects to proposed or designated critical habitat considers the statutory concepts embodied in Section 3 (the definitions of "critical habitat" and "conservation"), Section 4 (the procedures for delineating and adjusting areas included in a designation), and Section 7 (the substantive standard in paragraph (a)(2) and the procedures in paragraph (b)).

NMFS initially identified several aspects of the proposed intertidal monitoring activities that represent potential hazards to Steller sea lions or their critical habitat, primarily incidental disturbance to the pinnipeds during completion of the work, but which may cause them to move away from the monitors, flush into the water, or inhibit them from hauling out on the shoreline.

The USFWS is seeking an IHA under Section 101(a)(5)(D) of the MMPA, from NMFS-OPR, to allow the incidental take through harassment (disturbance) of the federally threatened eastern Distinct Population Segment (DPS) of Steller sea lion (*Eumetopias jubatus)*, and the non-ESA listed California sea lion (*Zalophus californianus*), Pacific harbor seal (*Phoca vitulina richardii*), northern elephant seal (*Mirounga angustirostris*), and Northern fur seal (*Callorhinus ursinus*), during the process of conducting a trial to test methods to minimize impacts to non-target birds during a future proposed house mouse (*Mus musculus*) eradication project on the South Farallon Islands. Since the activity requested and the issuance of the permit involves two federal agencies, both actions are considered in this biological opinion.

I. BACKGROUND AND CONSULTATION HISTORY

On April 11, 2012, the USFWS sent NMFS-SWR a request for initiation of formal consultation pursuant to Section 7of the ESA regarding the effects of issuing a permit under the MMPA for conducting a trial to test methods to minimize impacts to non-target birds during a future proposed house mouse eradication project on the South Farallon Islands on the threatened eastern DPS Steller sea lion.

On April 17, 2012, NMFS-Office of Protected Resources (O/PR) and NMFS-SWR received a copy of an application for an Incidental Harassment Authorization (Level B).

On August 16, 2012, the NMFS-OPR requested formal consultation with NMFS-SWR pursuant to Section 7 of the ESA regarding the effects of issuing a permit under the MMPA for a trial to test methods to minimize impacts to non-target birds during a future proposed house mouse eradication project on the South Farallon Islands on the threatened eastern DPS Steller sea lion. The IHA, if issued, will be valid for a one year period, and subsequent IHAs would be issued on a yearly basis, once renewal requests are received.

II. DESCRIPTION OF THE PROPOSED ACTION

NMFS proposes to issue an IHA to the USFWS to harass Steller sea lions, California sea lions, Pacific harbor seals, northern elephant seals and Northern fur seals, incidental to the bird mitigation test trial on the Farallon Islands. Typically and IHA is valid for one year and then may be renewed however, this initial IHA will be valid from November 7, 2012 until January 31, 2013. The applicant expects to re-apply annually. Below is a description of the activities to be covered under the NMFS permit.

Project Location

The Farallon Islands consists of a chain of seven islands located approximate 48 km (30 mi) west of San Francisco, near the edge of the continental shelf and in the geographic center of the Gulf of Farallones National Marine Sanctuary (Figure 1). The land of the islands above the mean high tide mark is designated as the Farallon National Wildlife Refuge (managed by the USFWS), while the shore and subtidal are in the Gulf of Farallones National Marine Sanctuary. The nearshore and offshore waters are foraging areas for the five pinniped species listed in the IHA application, one of which is the eastern DPS of Steller sea lions, listed as a threatened species under the ESA.

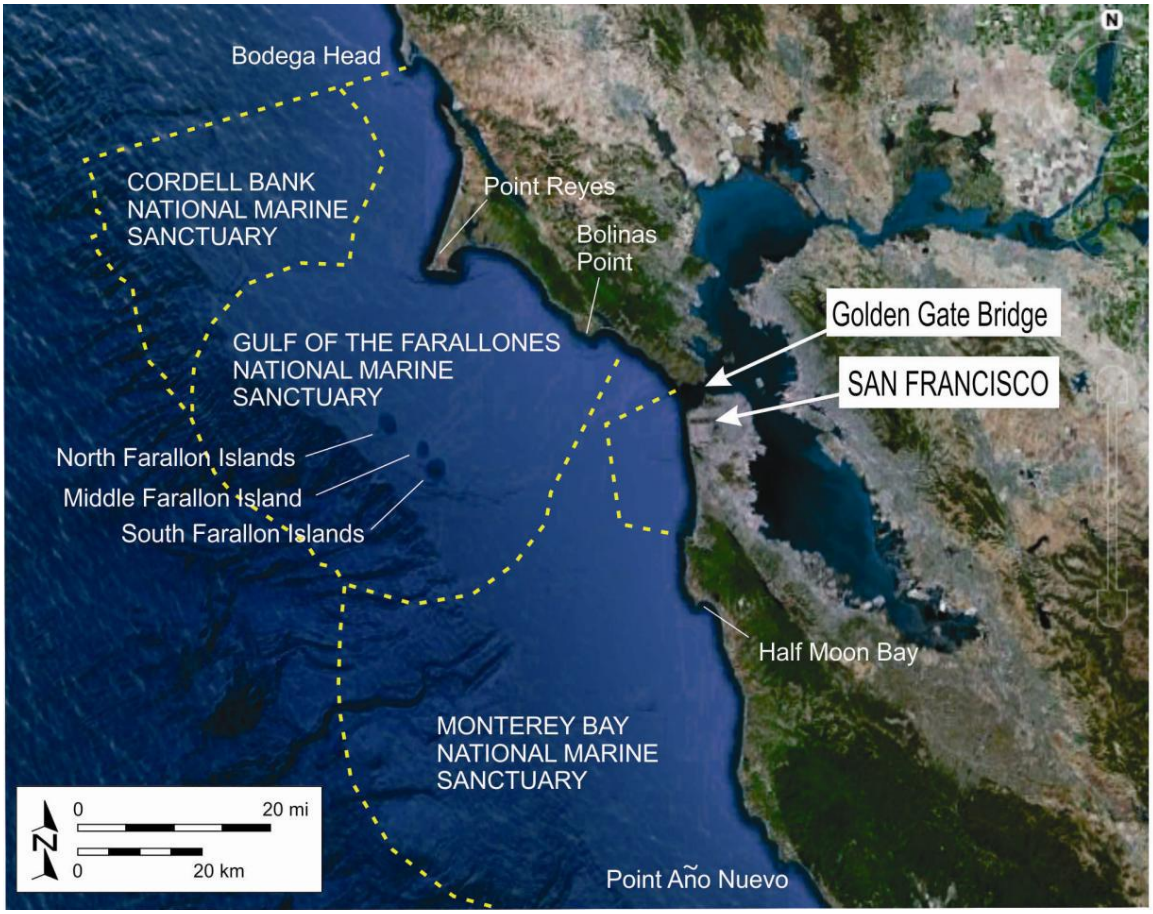

Figure 1. Farallon Islands offshore of San Francisco and site of the Incidental Harassment Authorization request.

The two largest islands of the seven islands are the Southeast Farallon and Maintop (aka West End) Islands. These and several smaller rocks are collectively referred to as the South Farallon Islands, which are the subject of the IHA application. The two largest islands are separated by only a 9 m (30 ft) wide surge channel. Together, these islands are approximately 49 ha (120 ac) in size with an intertidal perimeter around both islands of 7.7 km (4.8 mi). Middle Farallon Island is located 4 km (2.5 mi) to the northwest, and is an emergent rock outcrop approximately 15 m (49 ft) in diameter. The North Farallon Islands consist of four small islands located further northwest from the South Farallon Islands (11.2 km, 7.0 mi). Only two of the North Farallon Islands are named, North Farallon Island and the Isle of Saint James.

Description of the Proposed Action

<u>Introduction, Purpose and Background</u>

Created in 1909 by President Theodore Roosevelt, the Farallon National Wildlife Refuge was established to protect seabirds and marine mammals. The Refuge is comprised of three groups of small islands. Southeast Farallon Island is the largest island at, 70 acres, and was added to the refuge in 1969. The Farallon National Wildlife Refuge is one of seven National Wildlife

Refuges in the San Francisco Bay National Wildlife Refuge Complex, and is just one of 550 refuges in the National Wildlife Refuge System.

The Farallon National Wildlife Refuge is a group of islands located 28 miles west of San Francisco. It sustains the largest sea bird breeding colony south of Alaska and contains 30 percent of California's nesting sea birds. Thirteen species, adding up to one-quarter of a million individuals, breed here, including the largest colonies of Brandt's cormorant and western gull found anywhere.

The refuge contains more than 50 percent of the world's entire ashy-storm petrel population, a declining "species of management concern," whose breeding range is restricted to California. Thousands of endangered California brown pelican disperse from breeding sites further south to roost and feed on the refuge. Six seal and sea lion species breed or haul out to rest on the Farallon Islands.

The refuge and surrounding waters are critical habitat for the threatened Steller sea lion at the southernmost tip of their breeding range. Refuge management focuses on restoring the historical abundance of wildlife that existed prior to a century of human exploitation and disturbance. Species are gradually recovering. Northern fur seals have recently returned to breed after an absence of over 100 years. Most of the refuge is a designated Wilderness Area.

This project describes a bird mitigation trial proposed for a two to four week period from November 7, 2012 to January 31, 2013. The purpose of the trial is to assess potential bird hazing methods that could be used to minimize the risk of rodent bait ingestion by non-target species during a possible future house mouse eradication proposed by the USFWS for the South Farallon Islands of the Farallon National Wildlife Refuge (FNWR) (37° 41'55 / 123° 00'10") (Figure 1). The technique used to remove mice from the Farallon Islands is likely to involve the broadcast of rodent bait, as that is the only method that has ever been successful at eradicating mice from islands of this size.

House mice were introduced to the South Farallon Islands during the 19th century, and the islands have experienced considerable ecosystem degradation as a result of their presence. On the South Farallon Islands, introduced house mice appear to be indirectly impacting the breeding success of burrow nesting seabirds (Ainley and Boekelhide 1990; Sydeman *et al.* 1998; Pyle 2001). Half of the world population of Ashy storm-petrels breeds on the Farallones, and this IUCN endangered species has experienced a 40% population decline in recent years and has not yet recovered. Additionally, several hundred petrels are being killed each year as result of the presence of introduced mice.

The presence of invasive mice on many islands throughout the world has resulted in direct and indirect impacts to nesting seabirds, eggs and chicks. Removing house mice would not only protect the Ashy storm-petrel and other seabirds, but would also assist in the recovery of the native plants, as well as aid in the survival of other island endemics such as the Farallon camel cricket (*Farallonophilus cavernicola*) and the Farallon arboreal salamander (*Aneides lugubris farallonensis*).

Invasive house mice have also recently been identified as vectors of diseases that have caused mass mortalities of marine mammals in island populations of fur seals (de Bruyn *et al.* 2008).

This project would benefit the Farallones' marine mammals by removing the mice that are potential vectors for such diseases and die offs, as well as assist in the restoration of the natural island environment. This hazing research trial could also aid the marine mammals by allowing researchers to develop, test and identify bird hazing methods that would be the least impactful to the marine mammals present during the proposed mouse removal operation.

Although the proposed mouse eradication would likely be carried out during the fall when most gulls and breeding seabirds are absent, some roosting Western gulls (*Larus occidentalis*) will still be present on the island during the fall (primarily at night). Gulls present in the area of rodent bait application could be at risk of ingesting toxic bait. In addition, the presence of these individuals could affect the success of the mouse eradication, as the goal of 100% mouse removal could be jeopardized if gulls were to take bait that is intended for mouse consumption. For these reasons, the USFWS is considering developing mitigation efforts that include a bird hazing program. The proposed bird hazing program for the mouse eradication will be developed based on techniques that have been tested and successfully used to haze gulls from airfields, reservoirs and landfills over recent decades, as well as novel and innovative tools still in development.

As part of the USFWS' ongoing island restoration effort, a field trial using a non-toxic bait pellet with a biomarker was conducted on Southeast Farallon Island during November 2010. During the trial some Western gulls demonstrated an interest in the non-toxic cereal pellets. A limited gull hazing trial was conducted as a follow-up in January 2011 by USDA-APHIS, PRBO, and Island Conservation staff in which several gull hazing techniques were tested in limited areas over a brief period. The methods and results of this pilot study are summarized below. As a condition of the trial, the hazing techniques used (lasers, spotlights, biosonics, effigies, distress calls, and kites) and the areas hazed were conducted to avoid disturbance to marine mammals. As a result, the areas hazed were limited in extent and excluded many tools such as human encroachment, pyrotechnics, and air cannons that are likely to incidentally disturb marine mammals.

While a great deal was learned during the 2011 pilot trial, it was not possible to test the efficacy of gull hazing methods over the entire island or for the length of time that would be required during an actual removal operation. The potential for habituation of gulls to hazing strategies needs to be addressed and site-specific hazing technologies must be tested. A two to four week trial is proposed to test the effects of the hazing techniques on the roosting gulls and the marine mammals on the island. In order to meet the goals of the hazing trial, some marine mammals are likely to be incidentally disturbed as researchers assess the tolerances and habituation behavior of marine mammals on the island. The USFWS is therefore requesting an Incidental Harassment Authorization (Level B) for the South Farallon Islands in order to test their hazing methods during their bird mitigation trial.

Summary of Gull Hazing Trial Study, January 2012

Introduction

One of the eradication alternatives considered involved using cereal-based pellets that Western gulls and other gull species are known to be able to consume. While most gulls and other breeding seabirds were not present on the island at the time, nor do they feed on the island during the proposed time for mouse removal, some western gulls could still be present and roosting.

Hazing of the gulls will be necessary to ensure the delivered pellets are available to all mice on the islands, as well as to reduce the number of gulls that might come into contact with and consume the pellets.

Goal and Objective

The goal of the brief trial was to determine which gull hazing techniques might be most effective in minimizing the number of gulls and other potential non-target birds from roosting on the islands during a proposed mouse eradication operation. Objectives included the following:

- Establish which hazing techniques are most effective for hazing gulls
- Estimate the personnel, equipment, and materials needed to effectively haze gulls
- Determine the effective distances for the various techniques and tools
- Observe gulls and ascertain where they retreat to when hazed off the island

Methods

Hazing was generally restricted to Southeast Farallon Island, but attempts were also made to haze gulls on West End Island and offshore islets from Southeast Farallon. Hazing techniques tested during the trial were conducted in limited study areas on the islands and were implemented so as to avoid disturbances to marine mammals in the area at the time. Diurnal hazing techniques tested included Mylar tape, effigies, *Airsoft* guns, and the broadcasting of predator calls. Dawn and dusk hazing methods included spotlights, lasers, and pyrotechnics. Nocturnal hazing consisted of lasers and predator calls. Attempts were made to assess the numbers of gulls present in treated areas before and after the initiation of hazing efforts and to determine how long the effects of hazing lasted.

Results

Results indicated that intensive use of pyrotechnics at dawn and dusk proved to be highly effective at moving gulls from the island and discouraging them from alighting on the island. Lasers used in the hours before dawn were also very effective at discouraging gulls from landing on the island. The daytime use of effigies, especially in conjunction with predator calls was effective at dissuading gulls from roosting on the island throughout the course of the day. Observations of gulls indicated that the majority of gulls retreated to West End (Maintop and Shell Beach) and Saddle Rock when hazed off of Southeast Farallon Island. It was concluded that Southeast Farallon could be effectively hazed with as few as five personnel at dawn and dusk, but that one person permanently patrolling the island during the day and night for gulls would be useful in further limiting the number of gulls attempting to reestablish and land on the island.

Additional personnel would be needed to haze gulls off of West End and surrounding islets. The gulls appeared to move from one island to another, but did not leave the island group entirely, as the hazing was only done in limited areas. It is unknown how long the hazing techniques would be effective, as habituation could set in over time. Recommendations included that a full scale island-wide hazing study be conducted to test the efficacy of the hazing techniques over a wider area, over a longer period of time, using a wider array of techniques. This trial also assessed the potential for disturbances to marine mammals present as a result of the gull hazing methods, and identified ways to avoid and minimize these impacts, if possible.

While a great deal was learned during the pilot trial, it was not possible to test the efficacy of gull hazing methods over the entire island or for the length of time that would be required during an actual removal operation. The potential for habituation of gulls to hazing strategies needs to be addressed and site-specific hazing technologies must be tested. A two to four week trial is proposed to test the effects of the hazing techniques on the roosting gulls and the marine mammals on the island. In order to meet the goals of the hazing trial, some marine mammals are likely to be incidentally disturbed as researchers assess the tolerances and habituation behavior of marine mammals on the island.

Description of the Action

Any of the following gull hazing techniques are likely to be used during the proposed trial to haze roosting birds (primarily gulls) from the Farallon Islands: lasers, spotlights, pyrotechnics, biosonics, predator calls, air cannons, Mylar tape, a small helicopter, human presence, kites, radio-controlled aircraft, and trained dogs (with proper certification/vaccination records). While all of these techniques may not be available, funded or used in the trial, they are all potentially effective methods being considered to reduce non-target bird (gull) mortality, as well as to maximize the likely success of the proposed mouse eradication operation. Up to five researchers will be present on the islands to implement the hazing trial, as well as to monitor pinniped disturbance. Since the trial is intended to allow researchers to test an array of gull hazing techniques, it is not possible to specify the exact protocol that will be implemented on the ground. For this reason, researchers will carefully monitor take of marine mammals and adjust the research trial to minimize disturbance of marine mammals. Research and monitoring will be conducted by a team of researchers comprised by USFWS, Island Conservation and PRBO Conservation Science biologists who are trained and experienced at conducting such activities and monitoring marine mammal activity on the island.

The use of some or all of these methods could potentially result in the incidental harassment of marine mammals on the Farallon National Wildlife Refuge. The following tools are not listed in any particular order:

1. **Lasers**: Two different handheld lasers could be used during the course of the trial: red or green Avian Dissuader ® (50mW) and handheld green laser pointer (5mW). These lasers will likely be used during pre-dawn hours (~0530-0700 h) to haze gulls already settled on the island. Use of the laser is fairly simple and involves shining the beam briefly in a sweeping motion at the gull roost, which instigates a flight response in most birds, as the intensity of the beam likely triggers a reflexive response that keeps birds from gazing directly at the sun. Once gulls are no longer spending the night on the island, the lasers will be used to haze gulls attempting to land on the island just prior to sunrise. Lasers will also be used in the evenings (~1630 -1800 h) to enhance the use of pyrotechnics and reach areas that are not readily accessible or could not be hazed with pyrotechnics due to the presence of marine mammals. Two short nighttime (2000-2300 h) laser sweeps of 30-60 minutes could be attempted on each island to haze any gulls that might settle back on the island during the course of the evening. The effective range for this method will be estimated by using a Leica® 1200 Rangemaster to determine distances.

The use of lasers is considered one of the more potentially effective hazing methods as it can be done at a distance, is very effective on birds at night, and does not appear to affect pinnipeds. Lasers would not be shined directly at any marine mammals (or humans) for any sustained period of time (*i.e.*, no more than incidentally). The Avian Dissuader web-site (www.avian dissuader.com) has additional statistics on the safety and allowed uses of the tool. The only disturbance to marine mammals likely to occur from lasers would be the direct result of a researcher using the laser near pinnipeds in an effort to haze the gulls. In such cases researchers would approach the area slowly to allow the marine mammals to adjust to their presence or slowly relocate. Because lasers can be used at great distances, this is considered an unlikely scenario and measures will be taken to avoid marine mammal haul-outs and disturbance to marine mammals. Lasers will be used as much as possible; however, they are only effective at night.

2. **Spotlight**: One or 10-million candlepower spotlights could be used during pre-dawn hours (0530 -0700 h) to haze gulls already settled on the island. Once gulls no longer spend the night on the island and their presence is restricted to marine ledges, the spotlight may also be tested to haze gulls intermittently settling on ledges. Two short nighttime (2000 -2300 h) sweeps by gull roosting areas may be attempted in order to haze any gulls that might have settled back on the island during the course of the evening. No disturbance to pinnipeds is expected to occur as the beam would not be directed at pinnipeds. In the case of incidental illumination, the handheld beam would sweep swiftly past them, even if they were adjacent to roosting gulls. The spotlight beam, while bright, is not so focused that it would cause retinal injury.

3. **Biosonics**: Up to three Bird-Guard broadcasting units (bird distress calls) could be used on each island to deter gulls from alighting on the island, as well as encourage them to flee if they are already present. Speakers may be placed in locations which allow access. Additionally, up to 3 Bird Gard® SUPER PRO systems could be used to cover problem gull areas on each island. A number of electronic chips with both gull distress and predator calls could be used. The bird calls themselves are naturally occurring sounds and are not expected to cause harassment of pinnipeds. Given that the bird calls used should be familiar sounds to the islands pinnipeds, no pinniped disturbance is expected. The placements of the speakers are not likely to cause marine mammal disturbances either, as they can be placed in many different areas to avoid haul-out sites. At most, a brief disturbance might be possible if the only place to locate a speaker system is near a haul-out site. If this unlikely case develops, then the area will be approached slowly and cautiously to avoid any stampede or unnecessary disturbances.

4. **Pyrotechnics:** Bird bombs, CAPA charges, screamers, and screamer-bangers could be used to deter gulls during daylight hours. Sounds are rated at 100-130 decibels in-air (depending on specific product). Use of these products immediately adjacent to marine mammal haul-outs could cause some harassment; therefore, so their use will be limited in these areas. It is likely that the pinnipeds might become habituated to their use at a distance over time. Because the sound pressure thresholds for pinnipeds are in the 90-100 decibel level, however, they will not be used directly over a major haul-out site. Placement and use of these units will be so as to avoid exceeding the hearing threshold for marine mammals.

5. **Zon gun:** Zon gun air cannon will be used to deter problem birds. This involves a propane canister which charges a cylinder to produce a loud sound periodically. If pyrotechnics prove to be effective and do not appear to affect marine mammals, this technique may be trialed. Sound levels can be set for between 100-125 decibels in-air. Placement and use of these units will be in an effort to avoid exceeding the hearing threshold for marine mammals.

6. **Helicopter**: A helicopter, a Robinson 22 (R-22), will be used during the trial to haze gulls in remote portions of the islands in addition to other operational purposes including: the simulation of several aerial movements that might be used during the mouse eradication. These activities may include:

> A. Perimeter monitoring flights around the islands to determine the location and numbers of gulls and pinnipeds in remote areas that cannot be viewed from Southeast Farallon Island observation points;
> B. Moving and deploying personnel and equipment to and from areas inaccessible by foot;
> C. Conducting radio-telemetry flights to examine movement patterns of gulls, as well as the efficacy of hazing.

To avoid or minimize pinniped disturbance, helicopter flights in areas where pinnipeds haul out will use a slow sequential approach of decreasing altitude in order to habituate the marine mammals to the sound and noise, as has been done successfully during rodent removal operations on Anacapa Island in 2001-2002 and on Rat Island in 2009.

7. **Human Movements**: Researchers will access areas on West End Island in order to investigate possible gull roosting areas, to haze gulls, and to monitor pinniped responses to hazing activities. Up to five researchers and hazers may be needed to conduct the trial.

8. **Kites and Radio-controlled aircraft**: The use of 5-10 predator kites (such as Eagle or Helikites) or radio-controlled toys may be effective in hazing gulls. Several kites may be used to assess their potential in windy and windless settings. A number of kites are available, including traditional kites (relying upon wind to lift) in the form of predators, 3-D predator shaped kites, and Helium-powered kites (requiring no wind). Most kites can be used to haze gulls at a short distance. This technique will be used sparingly near harbor seals, as they may be more easily spooked by kites than other species. If a kite or aircraft falls into a haul out area, then it will either be: 1) left in place if it cannot be retrieved safely or without causing major pinniped disturbance (*e.g.*, stampede of large numbers of animals); or 2) retrieved using a slow methodical approach to avoid major disturbances or injuries to those marine mammals present. Retrieval could occur at a later time when pinnipeds are either absent or in lower numbers.

9. **Mylar tape:** Bamboo poles measuring approximately six feet with 1-meter lengths of 1" mylar tied to the tops of them could be placed in areas popularly used by gulls. Strips of mylar measuring 1-1.5 meters could be tied to two pieces of monofilament strung between bamboo poles, with the distance between the monofilaments being approximately four meters.

10. **Trained Dogs**: Well-trained herding working dogs (*eg.*, border collies, etc.) have been utilized to haze birds in certain areas and can cover a large amount of terrain over a long period of time without having any impacts on the environment that foot traffic might. Any dogs used for this purpose would have the necessary immunizations and certificates to ensure that no diseases are transmitted between dogs and pinnipeds, or any pinnipeds are harassed.

The projected time for the gull hazing activities would be a 2 to 4 week window sometime between November 7, 2012, and January 31, 2013. The timing will be dependent on seasonal variations in weather, effectiveness, gull abundance and distribution on the island, access to the island, equipment, funding, staff, and permits required. Transport to the island via boats and/or helicopters are also dependent on weather conditions. The duration of the gull-hazing activities would be approximately 2-4 weeks, depending on how quickly it can be established that gulls could be regularly hazed from the island. It is expected that after most gulls have been hazed from the islands repeatedly for a period of days, that daily hazing of much lower intensity would only be needed to keep hazed gulls from returning to roost on the islands. After hazing operations cease, it is expected that most resident as well as many non-resident gulls will quickly return to normal behavioral patterns on the island. The results of this trial will be used to inform hazing operations that may be used during a proposed future mouse eradication project.

The anticipated marine mammal disturbance from project activity could potentially occur on all marine mammal haul-out areas on Southeast Farallon Island and West End Island. Figure 2 shows the late fall gull roosting areas on Southeast Farallon Island and West End.

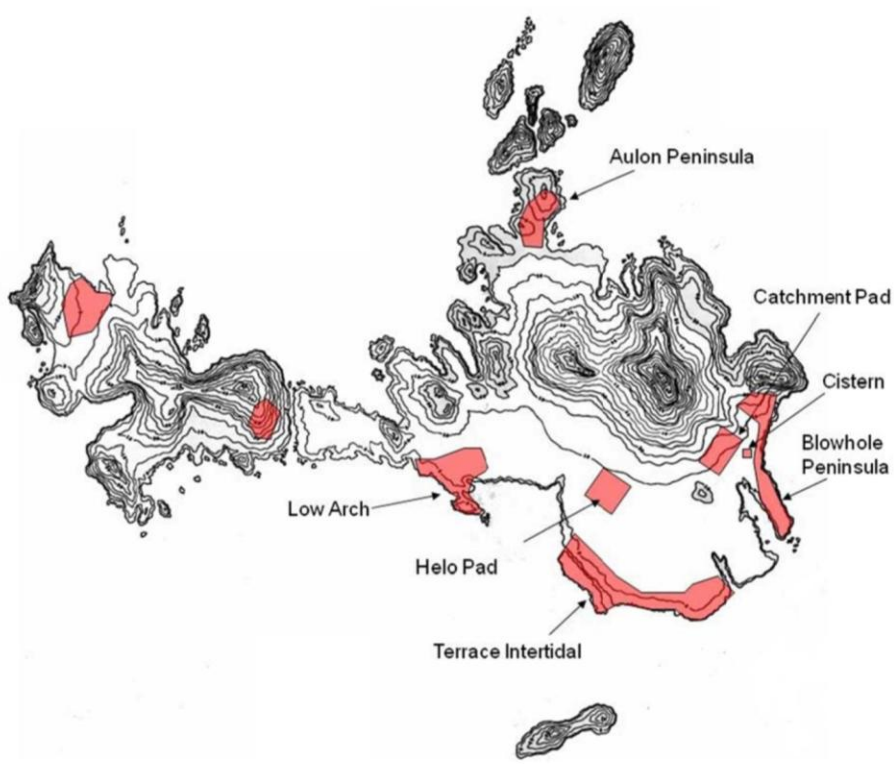

Figure 2. Late fall gull roosting areas on Southeast Farallon Island and West End.

Proposed Mitigation Measures

The mitigation measures presented below were included in the IHA application and the described in the Federal Register for the proposed issuance of an IHA permit (McChesney 2012; 77 FR 51773, August 27, 2012) and corresponding documents. These measures will be included in the IHA permit.

Measures to Minimize Impacts

While the applicant's goal is to conduct a research trial to test hazing methods to mitigate for bird disturbance while trying to eradicate the house mouse from the islands, the USFWS also recognizes the need to minimize incidental take by disturbance of hauled out pinnipeds when completing their work.

Based on NMFS OPR's analysis of the proposed action and comments received during the 30-day public comment period on the *Federal Register* notice, the following mitigation and monitoring measures would be in place to reduce the potential for Steller sea lion disturbance:

1. Temporal Restriction. The applicant will conduct the bird mitigation research trial at a time when there are fewer birds on the island and outside of pinniped pupping season. The proposed schedule for this research would greatly reduce the possibility of injury, serious injury, or mortality to pinnipeds resulting from pups being crushed during a stampede. Pregnant northern elephant seals begin to arrive on the island in late December and early January. Remaining pups from the previous breeding season typically leave the island by November. While hazing operations are not expected to overlap with the presence of northern elephant seal pups, the USFWS will actively avoid pregnant females and pups during the research trial by having a biologist identify and map where these individuals are located.

2. If funding and personnel are available, and based on NMFS recommendation, the USFWS would monitor sound levels of biosonics, pyrotechnics, and zon guns to evaluate the potential exposure levels of pinnipeds to these techniques. If practicable, the USFWS would measure received sound levels at varying distances from the source to determine the distance at which NMFS' in-air thresholds are reached. Results from these measurements would potentially allow the USFWS to determine how far away they need to conduct certain hazing methods.

The methodologies and actions noted here would be utilized and included as mitigation measures in any issued IHA to ensure that impacts to marine mammals are mitigated to the lowest level practicable.

Incidental marine mammal takes will not result in the physical altering of marine mammal habitat. No equipment will be left in habitat areas, and no toxic chemicals will be present or left in place.

Reporting Requirements for IHA

The USFWS would designate at least one NMFS' approved protected species observer to monitor pinnipeds and collect information before, during, and after hazing operations. This observer would be located at the peak of the island's center, which provides visibility of about 70 percent of the island. If hazing operations take place in areas not visible from the island's peak, additional observers would be used to monitor and record information from other locations. Before hazing operations begin, observers would record the number and species of animals in the area. During hazing operations, observers would record the species that react to hazing operations, any change in behavior that occurs, the number of animals that flush (or leave their haul-out), and the number of flushing events. After the hazing operations, observers would record the number and species of animals remaining in the area. Observers would be in communication with the hazing trial implementation staff in order to relay information on pinniped behavioral responses. Observers would be able to halt hazing activities if they result in unexpected pinniped reactions (*e.g.*, stampeding). In the event that the USFWS discovers an injured or dead marine mammal, and the lead observer determines that the injury or death is not associated with or related to the activities authorized in the IHA (*e.g.,* previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), the USFWS would report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, at 301– 427–8401 and/or by email to Michael.Payne@noaa.gov and Michelle.Magliocca@noaa.gov and the Southwest Regional Stranding Coordinator at 562–980–3230 (Sarah.Wilkin@noaa.gov), within 24 hours of the discovery. The USFWS would provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS.

Reporting Prohibited Take

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by the IHA, such as an injury (Level A harassment), serious injury, or mortality, the USFWS would immediately cease the specified activities and report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, at 301–427–8401 and/or by email to Michael.Payne@noaa.gov and Michelle.Magliocca@noaa.gov and the Southwest Regional Stranding Coordinator at 562–980–3230 (Sarah.Wilkin@noaa.gov). The report must include the following information:

- Time, date, and location (latitude/ longitude) of the incident;
- Description of the incident;
- Status of all sound source use in the 24 hours preceding the incident;
- Description of all marine mammal observations in the 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and
- Photographs or video footage of the animal(s) (if equipment is available).

Activities would not resume until NMFS is able to review the circumstances of the prohibited take. NMFS would work with the USFWS to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. The USFWS would not resume their activities until notified by NMFS via letter, email, or telephone. In the event that the USFWS discovers an injured or dead marine mammal, and the lead observer determines that the cause of the injury or death is unknown and the death is relatively recent (i.e., in less than a moderate state of decomposition as described in the next paragraph), the USFWS would immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, at 301–427–8401 and/or by email to Michael.Payne@noaa.gov and Michelle.Magliocca@noaa.gov and the Southwest Regional Stranding Coordinator at 562–980–3230 (Sarah.Wilkin@noaa.gov). The report would include the same information identified in the paragraph above. Activities could continue while NMFS reviews the circumstances of the incident. NMFS would work with the USFWS to determine whether modifications in the activities are appropriate.

Short-Term Monitoring

Currently, many aspects of pinniped research are being conducted by PRBO scientists on the Farallon Islands. Observations and reporting from monitoring research will add to the observational database and marine mammal assessments on the Farallon Islands.

The general goal of improving knowledge of pinnipeds on the South Farallon Islands from the surveys can be accomplished in three specific ways:

1) Observations of unusual behaviors, numbers, or distribution of pinnipeds, such that any potential follow-up research can be conducted by the appropriate personnel;
2) Observations of tag-bearing carcasses of pinnipeds, allowing transmittal of the information to appropriate agencies and personnel; and
3) Observations of rare or unusual species of marine mammals for agency follow-up.

Long-Term Monitoring

The Steller Sea Lion Recovery Team has recommended that the eastern DPS be considered for de-listing due to the positive status of the population and absence of current threats. As part of this process, the team has recommended the development of a post-delisting monitoring plan that would extend for 10 years. This should bolster existing monitoring programs and help ensure that there are no threats to the population's continued existence. Long-term negative impacts from intertidal monitoring would likely show up in any additional large-scale monitoring plans that include evaluation of the status of Steller sea lion haulouts.

III. APPROACH TO THE ASSESSMENT

NMFS approaches its section 7 analyses of agency actions through a series of steps. The first step identifies those aspects of proposed actions that are likely to have direct and indirect physical, chemical, and biotic effects on listed species or on the physical, chemical, and biotic environment of an action area. As part of this step, we identify the spatial extent of these direct and indirect effects, including changes in that spatial extent over time. The result of this step includes defining the *Action Area* for the consultation. The second step of our analyses identifies the listed resources that are likely to co-occur with these effects in space and time and the nature of that co-occurrence (these represent our *Exposure Analyses*). In this step of our analyses, we try to identify the number, age (or life stage), and gender of the individuals that are likely to be exposed to an action's effects and the populations or subpopulations those individuals represent. Once we identify which listed resources are likely to be exposed to an action's effects and the nature of that exposure, we examine the scientific and commercial data available to determine whether and how those listed resources are likely to respond given their exposure (these represent our *Response Analyses*).

The final step of our analyses establishes the risks those responses pose to listed resources (these represent our *Risk Analyses*). Our jeopardy determinations must be based on an action's effects on the continued existence of threatened or endangered species as those "species" have been listed, which can include true biological species, subspecies, or DPSs of species. The continued existence of these "species" depends on the fate of the populations that comprise them.

Similarly, the continued existence of populations are determined by the fate of the individuals that comprise them – populations grow or decline as the individuals that comprise the population live, die, grow, mature, migrate, and reproduce (or fail to do so).

Our risk analyses reflect these relationships between listed species, the populations that comprise that species, and the individuals that comprise those populations. Our risk analyses begin by identifying the probable risks actions pose to listed individuals that are likely to be exposed to an action's effects. Our analyses then integrate those individual risks to identify consequences to the populations those individuals represent. Our analyses conclude by determining the consequences of those population-level risks to the species those populations comprise.

We measure risks to listed individuals using the individuals' "fitness," or the individual's growth, survival, annual reproductive success, and lifetime reproductive success. In particular, we examine the scientific and commercial data available to determine if an individual's probable lethal, sub-lethal, or behavioral responses to an action's effect on the environment (which we identify during our *Response Analyses*) are likely to have consequences for the individual's fitness.

When individual listed plants or animals are expected to experience reductions in fitness in response to an action, those fitness reductions are likely to reduce the abundance, reproduction, or growth rates (or increase the variance in these measures) of the populations those individuals represent (*see* Stearns 1992). Reductions in at least one of these variables (or one of the variables we derive from them) is a necessary condition for reductions in a population's viability, which is itself a necessary condition for reductions in a species' viability. As a result, when listed plants or animals exposed to an action's effects are not expected to experience reductions in fitness, we would not expect the action to have adverse consequences on the viability of the populations those individuals represent or the species those populations comprise (*e.g.*, Brandon, 1978; Mills and Beatty, 1979; Stearns, 1992; Anderson, 2000). As a result, if we conclude that listed plants or animals are not likely to experience reductions in their fitness, we would conclude our assessment.

Although reductions in fitness of individuals is a *necessary* condition for reductions in a population's viability, reducing the fitness of individuals in a population is not always *sufficient* to reduce the viability of the population(s) those individuals represent. Therefore, if we conclude that listed plants or animals are likely to experience reductions in their fitness, we determine whether those fitness reductions are likely to reduce the viability of the populations the individuals represent (measured using changes in the populations' abundance, reproduction, spatial structure and connectivity, growth rates, variance in these measures, or measures of extinction risk). In this step of our analyses, we use the population's base condition (established in the *Environmental Baseline* and *Status of the Species* sections) as our point of reference. If we conclude that reductions in the fitness of individuals are not likely to reduce the viability of the populations those individuals represent, we would conclude our assessment.

Reducing the viability of a population is not always *sufficient* to reduce the viability of the species those populations comprise. Therefore, in the final step of our analyses, we determine if reductions in a population's viability are likely to reduce the viability of the species those populations comprise using changes in a species' reproduction, numbers, distribution, estimates of extinction risk, or probability of being conserved. In this step of our analyses, we use the species' status (established in the *Status of the Species* section) as our point of reference. Our final jeopardy determinations are based on whether threatened or endangered species are likely to experience reductions in their viability and whether such reductions are likely to be appreciable.

Biological opinions, then, distinguish among different kinds of "significance" (as that term is commonly used for NEPA analyses). First, we focus on potential physical, chemical, or biotic stressors that are "significant" in the sense of "salient" in the sense of being distinct from ambient or background. We then ask if: (a) exposing individuals to those potential stressors is likely to represent a "significant" adverse experience in the life of individuals that have been exposed; (b) exposing individuals to those potential stressors is likely to cause the individuals to experience "significant" physical, chemical, or biotic responses; and (c) any "significant" physical, chemical, or biotic response are likely to have "significant" consequence for the fitness of the individual animal. In the latter two cases, (items (b) and (c)), the term "significant" means "clinically or biotically significant," rather than statistically significant.

For populations (or sub-populations, demes, etc.), we are concerned about whether the number of individuals that experience "significant" reductions in fitness and the nature of any fitness reductions are likely to have a "significant" consequence for the viability (= probability of demographic, ecological, or genetic extinction) of the population(s) those individuals represent. Here "significant" also means "clinically or biotically significant" rather than statistically significant.

For "species" (the entity that has been listed as endangered or threatened, not the biological species concept), we are concerned about whether the number of populations that experience "significant" reductions in viability (= increases in their extinction probabilities) and the nature of any reductions in viability are likely to have "significant" consequence for the viability (= probability of demographic, ecological, or genetic extinction) of the "species" those population comprise. Here, again, "significant" also means "clinically or biologically significant" rather than statistically significant.

Destruction or adverse modification[1] determinations must be based on an action's effects on the conservation value of habitat that has been designated as critical to threatened or endangered species. If an area encompassed in a critical habitat designation is likely to be exposed to the direct or indirect consequences of the proposed action on the natural environment, we ask if primary or secondary constituent elements included in the designation (if there are any) or physical, chemical, or biotic phenomena that give the designated area value for the conservation of listed species are likely to respond to that exposure. If primary or secondary constituent elements of designated critical habitat (or physical, chemical, or biotic phenomena that give the designated area value for the conservation of listed species) are likely to respond given exposure to the direct or indirect consequences of the proposed action on the natural environment, we ask if those responses are likely to be sufficient to reduce the quantity, quality, or availability of those constituent elements or physical, chemical, or biotic phenomena.

If the quantity, quality, or availability of the primary or secondary constituent elements of the area of designated critical habitat (or physical, chemical, or biotic phenomena) are reduced, we

[1] We are aware that several courts have ruled that the definition of destruction or adverse modification that appears in the section 7 regulations at 50 CFR 402.02 is invalid and do not rely on that definition for the determinations we make in this Opinion. Instead, as we explain in the text, we use the "conservation value" of critical habitat for our determinations which focuses on the designated area's ability to contribute to the conservation or the species for which the area was designated.

ask if those reductions are likely to be sufficient to reduce the conservation value of the designated critical habitat for listed species in the action area. In this step of our assessment, we combine information about the contribution of constituent elements of critical habitat (or of the physical, chemical, or biotic phenomena that give the designated area value for the conservation of listed species, particularly for older critical habitat designations that have no constituent elements) to the conservation value of those areas of critical habitat that occur in the action area, given the physical, chemical, biotic, and ecological processes that produce and maintain those constituent elements in the action area.

If the conservation value of designated critical habitat in an action area is reduced, the final step of our analyses asks if those reductions are likely to be sufficient to reduce the conservation value of the entire critical habitat designation. In this step of our assessment, we combine information about the constituent elements of critical habitat (or of the physical, chemical, or biotic phenomena that give the designated area value for the conservation of listed species) that are likely to experience changes in quantity, quality, and availability given exposure to an action with information on the physical, chemical, biotic, and ecological processes that produce and maintain those constituent elements in the action area. We use the conservation value of the entire designated critical habitat as our point of reference for this comparison. For example, if the designated critical habitat has limited current value or potential value for the conservation of listed species that limited value is our point of reference for our assessment.

To conduct these analyses, we rely on all of the evidence available to us. This evidence might consist of monitoring reports submitted by past and present permit holders; reports from NMFS Science Centers; reports prepared by natural resource agencies in States and Tribes; reports from non-governmental organizations involved in marine conservation issues; the information provided by the Permits and Conservation Division when it initiates formal consultation; and the general scientific literature. We supplement this evidence with reports and other documents – environmental assessments, environmental impact statements, and monitoring.

During the consultation, we also conducted electronic searches of the general scientific literature using search engines, including *BioOne, Science Direct, Ingenta Connect, JSTOR, Web of Science - Science Citation Index, First Search (Article First, ECO, WorldCat)*, and *Google Scholar*. We supplemented these searches with electronic searches of doctoral dissertations and master's theses. These searches specifically tried to identify data or other information that supports a particular conclusion (for example, a study that suggests whales or turtles will exhibit a particular response to a seismic source) as well as data that does not support that conclusion.

From each document, the following was extracted: when the information for the study or report was collected, the study design, which species the study gathered information on, the sample size, acoustic source(s) associated with the study (noting whether it was part of the study design or was correlated with an observation), other stressors associated with the study, study objectives, and study results, by species. The probability of responses from the following information was estimated: the known or putative stimulus; exposure profile (intensity, frequency, and duration of exposure) where information is available, and the entire distribution of responses exhibited by the individuals that have been exposed. Because the response of individual animals to stressors will often vary with time (for example, no responses may be apparent for minutes or hours followed by sudden responses and vice versa), any differences in time to a particular response were noted.

Given the limited information that is available, this assessment involved a large amount of uncertainty. There is limited information on behavioral reactions of marine mammals to human presence; the mechanisms by which human actions affect the behavior and physiology of marine mammals, and the circumstances that are likely to produce outcomes that harm marine mammals (see NRC 2000, for further discussion of these unknowns).

ACTION AREA

The action area is defined in 50 CFR 402.02 as "all areas to be affected directly or indirectly by the Federal Action and not merely the immediate area involved in the action." The action area for this proposed action encompasses the South Farallon Islands 27 km off the San Francisco, California coast in the Farallon National Wildlife Refuge.

IV. STATUS OF THE SPECIES

NMFS has determined that the actions considered in this biological opinion may affect the following species that are provided protection under the ESA and under NMFS' jurisdiction that may occur in the action area (Table 3):

Table 3. Species that are provided protection under the ESA and under NMFS' jurisdiction that may occur in the action area

Marine Mammals		**Status**
Blue whale *(Balaenoptera musculus)*		Endangered
Fin whale *(Balaenoptera physalus)*		Endangered
Humpback whale (*Megaptera novaeangliae*)		Endangered
Sei whale (*Balaenoptera borealis*)		Endangered
Sperm whale (*Physeter macrocephalus*)		Endangered
Killer whale - southern resident DPS (*Orcinus orca*)		Endangered
North Pacific Right Whale (*Eubalaena japonica*)		Endangered
Steller sea lion - eastern distinct population segment (DPS) (*Eumetopias jubatus*)*		Threatened
Guadalupe fur seal (*Arctocephalus townsendi)*		Threatened
Sea turtles		
Leatherback turtle (*Dermochelys coriacea*)**		Endangered
Loggerhead turtle (*Caretta caretta*) – North Pacific DPS		Endangered
Olive ridley (*Lepidochelys olivacea*)***		Endangered/Threatened
Green turtle (*Chelonia mydas*)***		Endangered/Threatened
Marine fish		
Green Sturgeon, southern DPS (*Acipenser medirostris*)***		Threatened
Pacific Eulachon –southern DPS-(*Thaleichthys pacificus*)		Proposed Threatened
Salmonids		
Chinook (*Oncorhynchus tshawytscha*)	Sacramento River winter, evolutionarily significant unit (ESU)	Endangered
	Central Valley Spring ESU	Threatened
	California Coastal ESU	Threatened
Coho (*Oncorhynchus kisutch*)	Central California Coast ESU	Endangered
	S. Oregon/N. California Coast ESU	Threatened

Steelhead (*Oncorhynchus mykiss*)	Southern California DPS	Endangered
	South-Central California DPS	Threatened
	Central California Coast DPS	Threatened
	California Central Valley DPS	Threatened
	Northern California DPS	Threatened
Invertebrates		
Black Abalone *(Haliotis cracherodii)*******	Range-wide	Endangered

*Critical habitat for the Steller sea lion has been designated at three rookery sites off the California coast, Año Nuevo Island, Southeast Farallon Island, and Sugarloaf Island and Cape Mendocino. Critical habitat extends 3,000 feet above and 3,000 feet around the base of each of the rookeries. See 50 CFR section 226.202 for more information.
**Critical Habitat for the leatherback sea turtle has been designated 41,914 square miles of marine habitat in the Pacific Ocean off the coasts of California, Oregon and Washington (77 FR 4170; 01/26/2012)
***Nesting populations of green and olive ridley sea turtles on the Pacific coast of Mexico are listed as endangered. All others are listed as threatened.
****Critical habitat for green sturgeon: NMFS designated critical habitat for southern DPS of green sturgeon and includes marine waters off of California to a depth of 110 meters beginning at Monterey Bay and extending to the California/Oregon border [See 74 Federal Register 52300, published October 9, 2009, effective November 9, 2009].
*****Critical habitat for black abalone: NMFS designated 360 square km of rocky intertidal and subtidal habitat within five segments of the California coast between the Del Mar Landing Ecological Reserve to the Palos Verdes Peninsula, as well as on the Farallon Islands, An˜ o Nuevo Island, San Miguel Island, Santa Rosa Island, Santa Cruz Island, Anacapa Island, Santa Barbara Island, and Santa Catalina Island [76 FR 66806; October 27, 2011].

Listed Species in the Action Area, but Excluded from the Consultation

The following ESA-listed species may be found in the action area, but are excluded from the consultation, as they would not be affected by human presence in the intertidal areas and shoreline on the South Farallon Islands. In addition, animals that do not haul out on land were also excluded since the harassment would be land-based. Any boat-related takes are covered under PRBO's incidental take (NMFS 2008) since they conduct the boat surveys.

Leatherback sea turtles listed as endangered under the ESA may be observed transiting through the action area. Green turtles, loggerhead, and olive ridley sea turtles, all listed as threatened or endangered under the ESA, would be rare in the action area, but records show that all species have stranded in Northern California and the Pacific Northwest area. Leatherbacks are known to migrate to central and northern California from their natal beaches in Indonesia to feed on jellyfish. The upwelling process that is part of the productive Californian coastal ecosystem provides ideal foraging habitat for leatherbacks and other marine life. During aerial surveys conducted since the early 1990s, leatherbacks were most often spotted off Point Reyes, south of Point Arena, in the Gulf of the Farallons, and in Monterey Bay. Leatherback turtles usually appear in Monterey Bay and California coastal waters during August and September and move offshore in October and November. Other observed areas of summer leatherback concentration include northern California and the waters off Washington through northern Oregon, offshore from the Columbia River plume. In the eastern Pacific, loggerheads have been reported as far north as Alaska, and as far south as Chile. In the U.S., occasional sightings are reported from the coasts of Washington and Oregon, but most records are of juveniles off the coast of southern California. Although sea turtles may be in the action area, it is unlikely that they would be impacted by the project since their presence is rare and project activities would take place on land, in the near shore environment of islands, and during the winter months, where sea turtles would not be impacted and when sea turtles are less likely to be in the area. Although the proposed project area is near designated critical habitat for leatherbacks, activities will not occur in the water and therefore, no impacts to critical habitat for abalone are expected. Therefore, we have determined that this action may affect, but are not likely to adversely affect sea turtles or their designation critical habitat.

The southern population of green sturgeon was listed as a threatened species on April 7, 2006 (71 FR 17757). Critical habitat for green sturgeon has been designated and includes marine waters off of California to a depth of 110 meters beginning at Monterey Bay and extending to the California/Oregon border (74 Federal Register 52300, published October 9, 2009, effective November 9, 2009). This species consists of coastal and Central Valley populations originating from south of the Eel River, with the only known spawning population in the Sacramento River (NMFS 2006b; NMFS 2006c; NMFS 2007a). Based on the physical and chemical characteristics of other bays and estuaries in California, NMFS has confirmed presence of the Southern DPS green sturgeon in: 1) Monterey Bay (Lindley *et al.* 2008), 2) Humboldt Bay (Pinnix 2008), and; 3) coastal waters within the 110 m depth from Monterey Bay, CA to Graves Harbor, AK (including waters off Vancouver Island; Lindley *et al.* 2008). NMFS expects that Southern DPS green sturgeon is also present in California in: 1) the Klamath/Trinity River Estuary, 2) Elkhorn Slough, 3) Tomales Bay, 4) Noyo Harbor, 5) Eel River Estuary (S. Lindley 2008, pers. comm.), and 6) coastal marine waters within 100 m depth from the California/Mexico border to Monterey Bay and northwest of Yakutat Bay, AK to the Bering Sea. The presence of green sturgeon has also been confirmed in Oregon in: Coos Bay and in Winchester Bay (NMFS 2006b) and likely present in Alsea River estuary, Siuslaw River estuary, Yaquina Bay, Tillamook Bay (Emmett *et al.* 1991) and the Rogue River estuary (S. Lindley, 2008, pers. comm.); and in Washington in Willapa Bay, Grays Harbor, Strait of Juan de Fuca (Lindley *et al.* 2008), and Puget Sound (Lindley and Moser, unpublished data 2008). Less is known about the green sturgeon's distribution north of its spawning grounds and geographic range. Given the lack of observations or incidences of bycatch in California fisheries, they are likely rare visitors to the action area. Therefore, because their probability of occurring in the action area during the proposed project is sufficiently small to be discountable and because they do not surface to breathe, they would not be affected by airborne noise, and the magnitude of any effect is considered to be discountable and insignificant. We conclude that the proposed USFWS activities, may affect, but are not likely to adversely affect the southern DPS of green sturgeon. Therefore, the southern population of green sturgeon will not be considered in greater detail in the remainder of this biological opinion. Although the proposed project area does overlap with critical habitat for green sturgeon, activities will not occur in the water and therefore, no impacts to critical habitat for green sturgeon are expected. Therefore, critical habitat for green sturgeon will not be considered in greater detail in the remainder of this biological opinion.

The Pacific eulachon (commonly called smelt, candlefish, or hooligan) are a small anadromous fish from the eastern Pacific Ocean. The proposed rule to list the southern DPS as threatened under the ESA was published on March 13, 2009 (74 FR 10857). The southern DPS of eulachon consists of populations spawning in rivers south of the Nass River in British Columbia, Canada, to, and including, the Mad River in California. Within the range of the southern DPS, major production areas or "core populations" for this species include the Columbia and Fraser Rivers and may have historically included the Klamath River. Eulachon typically spend 3-5 years in saltwater before returning to fresh water to spawn from late winter through early summer. Spawning grounds are typically the lower reaches of larger rivers fed by snowmelt (Hay and McCarter 2000). Little is known regarding the oceanic distribution of steelhead, coho, and chinook salmon originating from Northern California rivers. Because anadromous fish do not surface to breathe and therefore would not be affected by airborne noise, the magnitude of any effect is considered to be insignificant. We conclude that the proposed USFWS activities, may affect, but are not likely to adversely affect listed anadromous fish species (*i.e.*, steelhead, coho, chinook salmon, and Pacific eulachon). Therefore, these species will not be considered in greater detail in the remainder of this biological opinion.

The black abalone is a shallow living marine gastropod with a smooth, circular, and black to slate blue colored univalve shell and a muscular foot that allows the animal to clamp tightly to rocky surfaces without being dislodged by wave action. Black abalone historically occurred from Crescent City, California, USA, to southern Baja California, Mexico (Geiger 2004), but today the species' constricted range occurs from Point Arena, California, USA, to Bahia Tortugas, Mexico, and is rare north of San Francisco, California, USA (Morris *et al.* 1980), and south of Punta Eugenia, Mexico (76 FR 66806). Black abalone generally inhabits coastal and offshore island intertidal habitats on exposed rocky shores where bedrock provides deep, protective crevices for shelter (Leighton 2005). Black abalone range vertically from the high intertidal zone to a depth of -6m (as measured from MLLW) and are typically found in middle intertidal zones. Black abalone is expected to be found in the action area; however, because abalone does not surface to breathe and therefore would not be affected by airborne noise, the magnitude of any effect is considered to be insignificant. Although, the proposed project area does overlap with critical habitat for black abalone, activities will not occur in the water and therefore, no impacts to critical habitat for abalone are expected. We conclude that the proposed USFWS activities, may affect, but are not likely to adversely affect listed black abalone. Therefore, these species will not be considered in greater detail in the remainder of this biological opinion.

There are several endangered cetaceans that may be transiting through the project area: the blue whale, fin whale, humpback whale, sei whale, sperm whale, and North Pacific right whale; however, these animals are typically found offshore of the action area and do not have the biological requirement, nor are they capable, of coming ashore and hauling out. The eastern North Pacific blue whale stock, California/Oregon/Washington fin whale stock, the California/Oregon/Washington humpback whale stock, eastern North Pacific sei whale stock, California/Oregon/Washington sperm whale stock, North Pacific right whale, and Southern Resident killer whale, are the stocks most likely to be found within the action area. There is no designated critical habitat for blue, fin, humpback, sperm, sei, and North Pacific right whales in waters off California, Oregon and Washington. Critical habitat has been designated for the Southern Resident Killer whale (71FR69054) but it is located in waters off the the state of Washington and does not overlap with the action area. Blue whales and humpback whales are most frequently found near the islands in the summer and fall, when strong upwelling may support a rich pelagic food web. Killer whales are also found around the islands.

The population of Guadalupe fur seals is considered a single stock because all are recent descendents from one breeding colony at Isla Guadalupe, Mexico. Critical habitat has not been designated for the Guadalupe fur seal in the U.S. While considered rare in the area, Guadalupe fur seals have been observed as far north as Alaska, and several have been rescued by the local stranding networks. The fur seal was extirpated from the Farallon islands, but it is not known whether the Northern fur seal of Guadalupe fur seal were the islands' native fur seal. However, the northern fur seal is the species that began to recolonize the islands in 1996 and Guadalupe fur seals are considered rare.

Because activities will not be conducted in water and consequently the probability of those species occurring in the action area during the proposed activities is sufficiently small to be discountable, we conclude that the proposed activities may affect, but are not likely to adversely affect blue, fin, humpback, sei, sperm, North Pacific right, and Southern resident killer whales and the Guadalupe fur seal. Therefore, these species will not be considered in greater detail in the remainder of this biological opinion.

Marine Mammals in the Action Area, included in the Consultation

Out of the five marine mammal species observed on the South Farallon Islands, only the Steller sea lion is listed as threatened under the ESA and will be included in this consultation.

Steller Sea Lion

In U.S. waters, there are two separate stocks of Steller sea lions: an eastern U.S. stock, which includes animals east of Cape Suckling, Alaska (144^{o}W), and a western U.S. stock, which includes animals at and west of Cape Suckling (Loughlin 1997). Both the eastern and western stocks were listed as federally threatened in 1990 (55 FR 49204); the western stock was subsequently upgraded to endangered status in 1997 (62 FR 24345). Critical habitat for the eastern DPS of Steller sea lions has been designated (50 CFR 226.202(b)), and is within the action area. However, no effects to critical habitat are expected as a result of the proposed action and effects on critical habitat will not be considered further in this biological opinion.

Distribution

Steller sea lions range along the North Pacific Rim from the Channel Islands off Southern California to northern Hokkaido, Japan (Loughlin *et al*. 1984), with centers of abundance and distribution in the Gulf of Alaska and Aleutian Islands, respectively. The eastern DPS of Steller sea lions, currently listed as threatened, has increased in abundance in California coastal waters, and unlike the observed decline in the western DPS of Steller sea lion, there has not been a concomitant decline in the eastern DPS U.S. stock. The project site occurs in the range of the eastern DPS stock, which includes the population along the coast from central California north to Cape Suckling, in southeast Alaska. The species is also listed as “depleted” under the MMPA and is classified as a “strategic” stock. Within their range, land sites used by Steller sea lions are referred to as rookeries or haul out sites. Rookeries are used by adult sea lions for pupping, nursing, and mating during the reproductive season (generally from May to July). Haul out sites are used by all age classes of both genders, but are generally not where Steller sea lions reproduce. The continued use of particular sites may be due to site fidelity, or the tendency for Steller sea lions to return repeatedly to the same site, often the site of their birth. Presumably, haul out sites and rookeries are chosen and continue to be used, because they protect sea lions from predators, offer some measure of protection from severe climate or sea surface conditions, and are in close proximity to prey resources (Ban 2005; Call and Loughlin 2005).

Año Nuevo and the Farallon Islands were the most important Steller sea lion rookeries in California in the 1920s, with 625 and 400 pups counted at each site in 1922 (Bonnot 1929). Counts for the Farallon Island have been low since at least 1974 and has ranged from 2 to 24 pups from 1990 to 2009 (NMML 2012). Figure 3 shows the present haul out sites used by Steller sea lions on the South Farallon Islands.

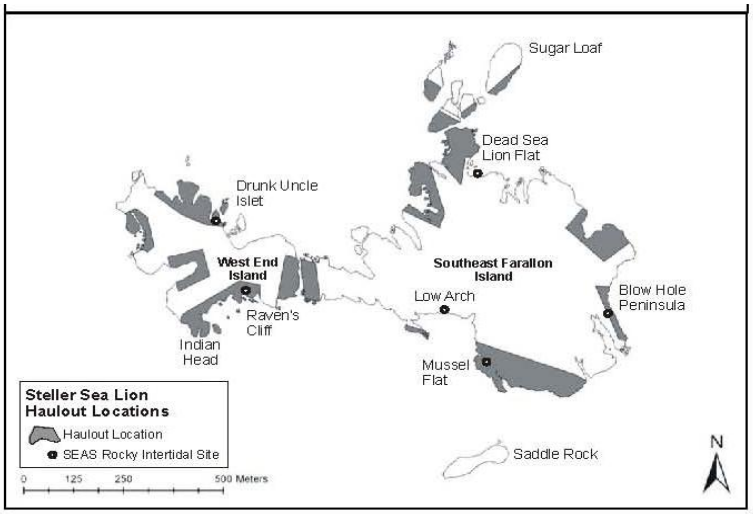

Figure 3. Location of Steller sea lion haul out sites on the South Farallon Islands. [Map courtesy of PRBO Conservation Science, 2012].

The movement patterns of Steller sea lions are not yet well understood, but what is known comes from mark-resight studies of animals branded as pups (Raum-Suryan *et al.* 2002; Scordino 2006; and NMFS 2012) and from animals instrumented with a variety of electronic tags (Merrick and Loughlin 1997; Baba *et al.* 2000; Loughlin *et al.* 2003; Raum-Suryan *et al.* 2004). A northward shift in the overall breeding distribution has occurred, with a contraction of the range in southern California and new rookeries established in southeastern Alaska (Pitcher *et al.* 2007).

Steller sea lions are not known to make regular migrations, but exhibit seasonal movements between rookeries and haul out sites (Sease and York 2003). The best scientific information available indicates that Steller sea lions move on and offshore for feeding excursions. Some individuals are able to move large distances, while others may occupy relatively restriction regions depending on age, sex, and season (Mate 1973; Baba *et al.* 2000; Raum-Suryan *et al.* 2002, 2004; Scordino 2006). During the pupping and breeding season, which varies somewhat with latitude, most adult Steller sea lions occupy rookeries typically on islands or offshore reefs. While some juveniles and non-breeding adults occur at or near the rookeries during the breeding season, most are on haulouts or are at sea foraging. After the breeding season, animals may disperse from the rookery at which they breed. Females may move with their pups to other haul out sites (typically from August through October) and males may travel to distant foraging locations (Spaulding 1964; Mate 1973; Porter 1997). For example, adult males have been seen over 1000km from where they held a territory earlier in the same year (also their natal rookery) (Mate 1973; Scordino 2006). In contrast, Raum-Suryan *et al.* (2004) noted that nearshore areas adjacent to haulouts are critical to the developing juvenile as 90% of round trips were $\leq$ 15 km from haul out sites and 84% were <20 hours in length. Thus, these data indicate that potential threats near haulouts are of particular relevance to developing juveniles.

As mentioned previously females with their pups are also known to disperse. In Oregon and northern California, Scordino (2006) reported a marked pattern in seasonal abundance and distribution of females with a decline in the abundance of females and pups in both Oregon and northern California through the fall. Based on resights of pups branded between 2003-2005, Scordino (2006) found that most pups from Northern California and Southern Oregon remained close their natal rookery, but 9-22% dispersed farther than 500 km. Movement across the eastern DPS/western DPS boundary by animals (particularly juveniles) from both populations occurs (Raum-Suryan 2002, 2004; Gelatt 2007; Scordino 2006; Picher *et al.* 2007). Data imply that eastern DPS males are more likely to be exposed to threats within the breeding range of the western DPS. Thus, it is assumed that only the eastern DPS of Steller sea lions would be impacted by the USFWS' activities on the South Farallon islands.

Population Trend

The best available information indicates that the overall abundance of Steller sea lions in the eastern DPS has increased for a sustained period of at least three decades. Similarly, the best available information indicates that pup production has increased significantly, especially since the mid-1990s. Pitcher *et al.* (2007) estimated that for the 25-year period between 1977 and 2002, overall abundance of the eastern DPS stock of Steller sea lions had increased at an average rate of 3.1% per year.

There are new pup and non-pup count data available since Pitcher *et al.*'s (2007) analyses from most portions of the range. Between 2002 and 2009, NMFS (unpublished) conducted surveys in southeast Alaska, Fisheries and Oceans Canada surveyed British Colombia (Olesiuk 2008), counts of non-pups were made in 2008 by aerial survey in Washington (Jefferies, pers. comm. *in* NMFS 2012), and aerial photographic surveys were flown in Oregon (through 2008), and in California (NMFS unpublished data from 2009 and 2010).

When these new data are added to Pitcher *et al.*'s (2007) time series of surveys, the interval over which we can assess population trend is lengthened, and thus, the confidence that the positive trend is real and sustained is also increased. Based on the new pup count data from southeast Alaska (DeMaster 2009), British Columbia (Olesiuk 2008), Oregon and California (NMFS unpublished data), and multiplying that number (13,889 pups) by either 4.2 or 5.2 (depending on assumptions about the ratios of pups to nonpups in Steller sea lion populations; Trites and Larkin 1996; Pitcher *et al.* 2007), Allen and Angliss (2012) estimated the population abundance of the eastern DPS, using pup multipliers of either 4.2 or 5.2 (Pitcher *et al.* 2007), and the population is estimated to be within the range of 58,334 (13,889 × 4.2) and 72,223 (13,889 × 5.2).

The best available information indicates the eastern DPS has increased from an estimated[2] 18,040 animals in 1979 (90% CI: 14,076-24,761) to an estimated 63,488 animals in 2009 (90% CI: 53,082 - 80,497); thus an estimate of an overall rate of increase for the eastern DPS of 4.3% per year (90% confidence bounds of 1.99% – 7.33%, *in* NMFS 2012-Figure 3.5.6). Moreover, given the observed data, the probability that the overall growth rate was >3.0% was 0.84 (NMML 2012). Most of the overall increase in population abundance was due to increases in the northern portion of the range in southeast Alaska and British Columbia, but the smaller population in the south (Oregon and California) also increased significantly in abundance (e.g., Fritz *et al.* 2008; Olesiuk 2008; DeMaster 2009; NMML 2012).

It is important to note that on a worldwide basis, the eastern DPS has become more important to the long-term viability of the species as a whole as it has recovered, while the western DPS has

[2] Model estimate for 1979 acknowledges that in that particular year only Southeast AK was surveyed.

only recently begun to show limited but significant overall population growth (DeMaster 2011). The rookeries producing the most eastern DPS pups are now in Southeast Alaska and British Columbia. In 2002, approximately 2,500 pups were counted at the Scott Islands rookery in British Columbia (NMFS 2008); a 2010 survey counted 3,936 pups here (P. Olesiuk, pers. comm. to D. Seagars, NMFS Alaska Region, March 6, 2012 *in* NMFS 2012). Based on 2009 data (DeMaster 2009), the Forrester Island complex produced 4,036 pups and Hazy Islands 1,976 pups (both in Southeast Alaska). By contrast, in 2009 the largest rookery for the western DPS was at Ugamak Island complex (with 909 pups) in the eastern Aleutian Islands (DeMaster 2009).

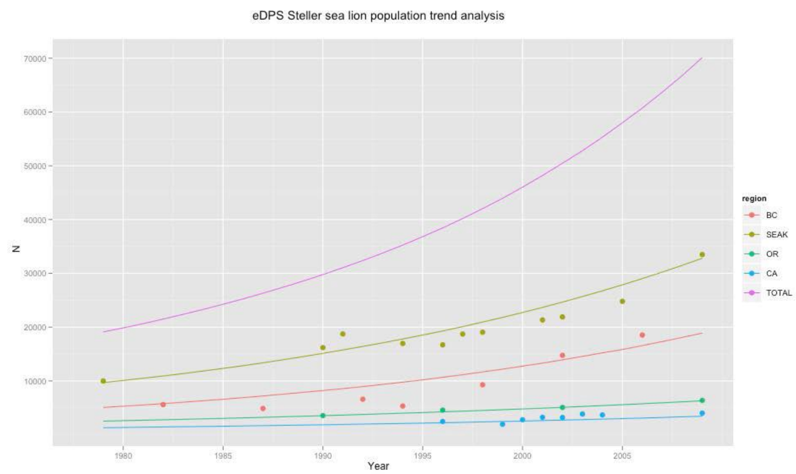

Figure 4. Analysis of population trend for the overall eastern DPS of Steller sea lions, 1979-2009 (NMML 2012).

There is a general consensus that the breeding range of the eastern DPS has shifted north. This shift began at the southern end of the range in the 1930s with the decline of the southern California rookery on San Miguel Island and continued in the 1960s and 1970s when the number of Steller sea lions at central California sites declined (Pitcher et al. 2007). Counts in Oregon have shown a gradual increase since 1976, as the adult and juvenile state-wide count for that year was 1,486 compared to 4,169 in 2002 (NMFS 2008). Steller sea lion numbers in California, especially in southern and central California, have declined from historic numbers. Counts in California between 1927 and 1947 ranged between 4,000 and 6,000 non-pups with no apparent trend, but have subsequently declined by over 50%, and were between 1,500 and 2,000 non-pups during 1980-2004. At Año Nuevo Island off central California, a steady decline in ground counts started around 1970, and there was an 85% reduction in the breeding population by 1987 (LeBoeuf *et al.* 1991). Overall, counts of non-pups at trend sites in California and Oregon have been relatively stable or increasing slowly since the 1980s (Table 4, Fig. 4; from Allen and Angliss 2012).

Table 4. Counts of adult and juvenile Steller sea lions observed at rookery and haulout trend sites by year and geographical area for the eastern U. S. stock from 1982 through 2009.

Area	1982	1990	1991	1992	1994	1996	1998	2000	2002	2006	2009
Central CA	511[1]	655	537	276	508	382	564[3]	349	380		308
Northern CA/OR	3,094	3,088	3,180	4,274	3,831	4,192	4,464	3,793	4,885		
British Columbia	4,713	6,109[2]	--	7,376	8,091	--	9,818	--	12,121	15,700	
Southeast Alaska	6,898	7,629	8,621	7,555	9,001	8,231	8,693	9,892	9,951		11,965
Total	15,216	17,481	--	19,48	21,43	--	23,53	--	27,337		

[1] This count includes a 1983 count from Año Nuevo.
[2] This count was conducted in 1987.
[3] This count was conducted in 1999.

Reference: NMFS 1995; Strick *et al*. 1997; Sease *et al*. 1999; Sease and Loughlin 1999; Sease et al. 2001; Olesiuk 2003; 2008; Brown *et al*. 2002; NMFS 2008; ODF&W unpubl. data, 7118 NE Vandenberg Ave., Corvallis, OR 97330; Point Reyes Bird Observatory, unpubl. data, 4990 Shoreline Hwy., Stinson Beach, CA 94970; NMFS unpublished data (M. Lowry, SWFSC); DeMaster 2009). Central California data include only Año Nuevo and Farallon Islands. Trend site counts in northern California/Oregon include St. George, Rogue, and Orford Reefs. British Columbia data include counts from all sites. Adapted from Allen and Angliss 2012.

In Southeast Alaska, counts of nonpups at trend sites increased by 56% from 1979 to 2002 from 6,376 to 9,951 (Merrick *et al*. 1992; Sease *et al.* 2001; NMFS 2008). NMFS conducted an aerial survey of Southeast Alaska in early June 2008 and counted only 8,748 non-pups on trend sites (Fritz *et al.* 2008). It is thought that the lower than expected count in Southeast Alaska may have been due to movement of animals early in the survey period (early June to early July) north to the Prince William Sound region (since counts of non-pups there were over 1,300 greater in 2008 than 2007) or south to British Columbia. This hypothesis was supported by counts from a late June 2009 non-pup survey in SE Alaska, in which 11,965 non-pups were observed on trend sites, over 3,200 more than were counted in early June 2008. Between 1979 and 2009, counts of pups on the three largest rookeries in Southeast Alaska (Forrester Island complex, Hazy Island and White Sisters) more than tripled (from 2,219 to 6,859). In British Columbia, counts of non-pups throughout the province increased at a rate of 3.9% annually from 1971 through 2006 (Olesiuk and Trites 2003, Olesiuk 2008). Counts of non-pups at trend sites throughout the range of the eastern Steller sea lion stock are shown in Figure 5 (Allen and Angliss 2012). Between the 1970s and 2002, the average annual population growth rate of eastern Steller sea lions was 3.1% (Pitcher *et al.* 2007).

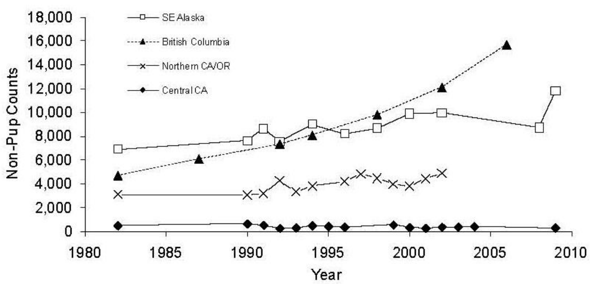

Figure 5. Counts of adult and juvenile Steller sea lions at rookery and haulout trend sites throughout the range of the eastern U.S. stock, 1982- 2009. Data from British Columbia include all sites. Adapted from Allen and Angliss (2012).

Reproduction

Steller sea lions have a polygynous mating strategy, in which a single male may mate with multiple females. As mating occurs on land (or in the surf or intertidal zones), males are able to defend territories and thereby exert at least partial control over access to adult females and mating privileges. The pupping and mating season is relatively short and synchronous, probably due to the strong seasonality in the Steller sea lions' environment and the need to balance aggregation for reproductive purposes with dispersion to exploit distant food resources (Bartholomew 1970).

Male Steller sea lions become sexually mature between three and seven years of age. Males may become territorial at 10 and 11 years of age (Calkins and Pitcher 1982). Breeding males set up territories in May (Pitcher and Calkins 1981) and females, most of whom return to breed at their natal rookery, begin to arrive shortly thereafter (Gentry 1970; Higgins 1984; Merrick 1987). Most males do not defend a territory for more than 3 years, although they may return for up to 7 years (Gisiner 1985). The breeding sex ratio of females to males is often summarized to be about 10-15:1 (Gisiner 1985; Merrick 1987). Female Steller sea lion become sexually mature between three and six years of age; they may still reproduce into their early 20s (Mathisen *et al.* 1962; Pitcher and Calkins 1981). Pitcher and Calkins (1981) concluded that adult females normally ovulate once each year and that most breed annually. However, Steller sea lion females may experience reproductive failures so such breeding may not always result in a surviving pup, especially during periods of nutritional stress (Pitcher *et al*. 1981).

In May, adult males arrive at the rookeries and compete for territories. In late May, females arrive at the rookeries, where pregnant females give birth to a single pup a few days after arriving on the rookery. About 90% of pups within a given rookery are born within a 25-day period (Pitcher *et al.* 2001). Because pupping is so highly synchronous there are temporal periods of high vulnerability to stressors, such as disturbance or fluctuations in prey availability. Pupping occurs from late May to early July and peaks in June (Pike and Maxwell 1958, Mathisen *et al*. 1962, Gentry 1970, Pitcher and Calkins 1981, Bigg 1985; Pitcher *et al.* 2002). The mean date of pupping varies throughout the range of the eastern DPS, but not in a linear fashion with latitude. Pitcher *et al.* (2001) reported that the earliest mean pupping date occurred at Forrester Island in southeast Alaska and that the mean date becomes progressively later both south and north of this location, and with the latest mean date at Año Nuevo in California. They hypothesized that female nutritional status likely explains the differences in pupping times at individual rookeries but that the mean timing of births at rookeries was determined by the availability of prey near rookeries and weather conditions favorable for pup survival.

Mating typically occurs about one to two weeks after they pup (Gentry 1970). The gestation period is probably about 50-51 weeks, but implantation of the blastocyst is delayed about 3.5 months after breeding, late September or early October (Pitcher and Calkins 1981). For females with a pup, nursing continues for months to several years (Pitcher and Calkins 1981; Porter 1997; Loughlin 1998; Trites and Porter 2002; Trites *et al.* 2006; summarized in NMFS 2008). The nature and timing of weaning is important because it determines the resources available to the pup during the winter season. The maintenance of the mother-offspring bond may also limit their distribution or the area used for foraging. Trites *et al.* (2006) reported that the proportion of time that Steller sea lion pups nursed declined through the spring to early summer suggesting that sea lion pups began supplementing their milk diet with solid food in the spring. They concluded that weaning appears to typically occur at the start of the breeding season when pups are one or two years old. No sea lions were observed to be weaned during the winter.
Pups first enter the water at about 2–4 weeks of age (Sandegren 1970) and can swim in the open ocean at about 4 weeks of age. Pups begin to disperse (with their mothers) from rookeries to haulouts between 2-3 months of age (Raum-Suryan *et al.* 2002; Scordino 2006).

Pitcher *et al.* (2007) summarized that Steller sea lions historically used six rookeries in California: San Miguel Island, Año Nuevo Island, the Farallon Islands, Seal Rocks off of San Francisco, Sugarloaf Island-Cape Mendocino, and Saint George Reef. Recently, the National Marine Mammal Laboratory (2012) summarized trends for the three rookeries in California where breeding still occurs (Año Nuevo, Sugarloaf-Cape Mendocino, and St. George Reef). Non-pup counts at the three trend sites in California have been stable between 1990-2009, while pup production increased at 5.3% per year between 1996 (N=546) and 2009 (N=893).

On the Farallon Islands, Steller sea lion breeding colonies are strictly protected to reduce or eliminate risk of human disturbance; access to these areas is rarely permitted. On the Farallon Islands, Steller sea lion breeding colonies are located in closed areas where researchers never visit, eliminating any risk of disturbing breeding animals.

Hearing

In-air territorial male Steller sea lion sounds are usually low-frequency roars, while females vocalize less and at a higher frequency (Schusterman *et al.* 1970; Loughlin *et al.* 1987). Campbell *et al.* (2002) determined that females have distinctive acoustic signatures. These calls range in frequency from 30 to 30,000 Hz with peak frequencies from 150 to 1,000 Hz; typical duration is 1,000 to 1,500 milliseconds (Campbell *et al.* 2002). Pups produce bleating sounds. The underwater hearing sensitivity of two Steller sea lions was recently tested; with hearing thresholds of the male significantly higher than those of the female (Kastelein *et al.* 2005). The range of best hearing for the male was from 1 to 16 kHz, with maximum sensitivity (77 dB re 1 μPa-m) at 1 kHz. The range of best hearing for the female was from 16 to above 25 kHz, with maximum sensitivity (73 dB re 1 μPa-m) occurring at 25 kHz. It is not known whether the differences in hearing sensitivities are due to individual differences in sensitivity or due to sexual dimorphism in hearing (Kastelein *et al.* 2005). NMFS currently uses the in-air 90 dBA re 20 μPa_{RMS} threshold for injury.

IV. ENVIORNMENTAL BASELINE

By regulation, environmental baselines for biological opinions include the past and present impacts of all state, Federal or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process (50 CFR 402.02). The environmental baseline for this biological opinion includes the effects of several activities that affect the survival and recovery of the Steller sea lion in the action area.

A number of human activities have contributed to the current status of the Steller sea lion population in the action area. Some of those activities, most notably commercial sealing, occurred extensively in the past, ended, and no longer appear to affect this Steller sea lion population, although the effects of these reductions likely persist today. Other human activities are ongoing and appear to continue to affect Steller sea lions (See *Status of the Species* Section for specific information).

Of all activities that are normally considered in an environmental baseline, the activities that appear to have the greatest effect on the survival and recovery of the Steller sea lion considered in this biological opinion generally fall into four categories: unnatural changes to vital demographic rates, fisheries, intentional taking (including subsistence hunts), and research activities associated with reducing those impacts. Other activities, like possible pollution and contaminants, entanglement in marine debris, and disruptions (including anthropogenic) of the marine ecosystem, also appear to have effects on the survival and recovery of threatened pinnipeds, but those effects are much more difficult to evaluate. Steller sea lions exhibit natal site fidelity but are also known to travel great distances (*i.e.*, recorded 1500 km); therefore, Steller sea lions born in California, may be subjected to threats throughout their range, which includes Oregon, Washington, and Alaska.

The Eastern DPS of Steller sea lion abundance is well documented in the action area and the following narratives summarise the information that is available. That is followed by a discussion of natural and anthropogenic phenomena that are known to or are suspected to influence their distribution, abundance, status, and trends in the action area.

Distribution of the Eastern DPS of Steller Sea Lions in the Action Area

The Eastern DPS of Steller Sea lions live year round along the Central California coast. The current population of Steller sea lions in the proposed action area is estimated to number between 50 and 750 animals. Overall, counts of non-pups at trend sites in California and Oregon have been relatively stable or increasing slowly since the 1980s (Allen and Angliss 2012). PRBO estimates that between 50 and 150 Steller sea lions live on the Farallon Islands. On the Southeast Farallon Islands, numbers of Steller sea lions have continued to decline (1974-1996) with a rate of decline of 5.9% per year for adult females; a 4.5% per year decline for immature animals; and a significant decline in maximum number of pups (Hastings and Sydeman 2002). Although the reduced numbers of Steller sea lions on the Farallon Islands has been driven by reduced numbers of adult females during the breeding season, it is unknown whether reduced numbers of adult females and immature animals during this period is due to reduced survival, or changes in geographic distribution (Hastings and Sydeman 2002). Pup counts on the Farallon Islands have generally varied from 5 to 15 (Hastings and Sydeman 2002; PRBO unpublished data).

Natural and Anthropogenic Stressors in the Action Area

Natural Mortality

Killer whales and sharks prey on Steller sea lions. Based on mortality rates used in Loughlin and York (2000), about 5,500-6,200 sea lions will die each year in a stable or increasing population of approximately 40,000 animals (NMFS 2008). An unknown portion of the mortality will result from predation by transient killer whales residing in the range of the eastern DPS of Steller sea lion. Long *et al.* (1996) reported white shark bites on 548 live and dead pinnipeds in central California, 53 of which were Steller sea lions. For the period from 1970 to 1992 the number of shark-bitten pinnipeds shows an overall increase attributable to increases in both the predators (sharks) and their primary prey (California and Steller sea lions) (NMFS 2008). Long and Hanni (1993) speculated that white shark predation could impede recovery of Steller sea lions in California, if the number of sea lion declines further and the shark population continues to increase.

Parasitism and Disease
During the past three decades, the scientific community and regulatory agencies have become increasingly aware of the long-term impact of environmental stressors on the sustainability of ecosystems. As demonstrated in the case study by Bickham *et al.* (2000) on Steller sea lions, if genetic variability is lost as a result of some historical factor, the likelihood that Steller sea lions would become extinct, if the populations were challenged by some new disease or parasite, is quite high. Disease can increase the mortality and cause reproductive failure through abortions, stillbirths, neonatal mortality, reduced fecundity, and reduced conception rates, all of which can have major impacts on the dynamics of wild populations (Scott 1988; Gulland 1995). Disease and parasitism are common in all pinniped populations and have been responsible for major die-offs worldwide, but such events are usually relatively short-lived. Disease and parasitism are also potential causes for population decline, and evidence is available indicating that animals have been exposed to diseases and that animals also carry parasites.

Conditions may be arising which could enhance Steller sea lion exposure to novel diseases. The marine environment of the eastern North Pacific, the environment in which the Steller sea lion lives, may change in the future due to global warming and related changing ocean conditions. Shifts in the ranges of some species associated pathogens may co-occur or follow such changing environmental conditions over the foreseeable future. Based on the best available information (*e.g.,* Lafferty and Gerber 2002; Goldstein *et al.* 2009 a), these changes are likely to increase the potential for the introduction of new pathogens. However, none of the evidence available, at this time, provides any indication that disease or parasitism are causing the decline throughout the southern portion of the Steller sea lion's range or are impeding recovery.

Antibodies to *Chlamydophila psittaci*, caliciviruses, herpesviruses, adenoviruses, and *Toxoplasma gondii* were detected at moderate to high frequencies in Steller sea lions in areas of decline and also in areas of the thriving populations (Burek *et al.* 2003). Nutritional stress is widely considered to be the most likely underlying cause of the decline of Steller sea lions in the Gulf of Alaska and Aleutian Islands (Alaska Sea Grant 1993; DeMaster and Atkinson 2002; Trites and Donnelly 2003). Although the effects of disease and parasitism remain a concern and to date, adequate research has not been conducted to assess the relative nature and magnitude of parasitism in sea lion populations, they do not appear to be significant enough to impede recovery, based on the information currently available.

Parasites that have been reported in Steller sea lions include intestinal cestodes, trematodes, nematodes, acanthocephalans, acarian mites, and anopluran skin louse (Dailey and Brownell 1972; Dailey and Hill 1970). Parasites have been found in Steller sea lions that may cause mortality to malnourished animals. Hookworms are of particular interest because of their ability to cause morbidity and mortality in other pinnipeds. Some research has been conducted on hookworm loads in eastern DPS pups. In pups less than 3 months old examined in 2003 and 2004, total intestinal worm burdens ranged from 18 to 3,477 (Burek *et al.* 2003, 2005). These levels have been shown to cause mortality due to anemia in northern fur seals (Olsen 1958). Preliminary data (Rea *et al.* 2010) indicates there are higher stress protein (haptoglobin) levels in eastern DPS animals (than in western DPS animals), where a high prevalence of hookworm parasites has been found, and where animals are crowded. Adequate research has not been conducted to assess the relative magnitude, importance and synergistic effects of parasitism, disease, and crowding in Steller sea lion populations. The potential for these factors to cause population-level effects as density on rookeries and haulouts increases remains uncertain.

Subsistence/Native Harvest Information
The subsistence harvest of Steller sea lions during 2004-2008 is summarized in Wolfe *et al.* (2009b). During each year, data were collected through systematic interviews with hunters and users of marine mammals in approximately 2,100 households in about 60 coastal communities within the geographic range of the Steller sea lion in Alaska. Approximately 16 of the interviewed communities lie within the range of the eastern U.S. stock. The average number of animals harvested and struck but lost is 12 animals/year. An unknown number of Steller sea lions from this stock are harvested by subsistence hunters in Canada. The magnitude of the Canadian subsistence harvest is believed to be small. Alaska Native subsistence hunters have initiated discussions with Canadian hunters to quantify their respective subsistence harvests, and to identify any effect these harvests may have on management of the stock (Allen and Angliss 2012).

Fishery Interactions
Amendments to the MMPA in 1988 and 1994 required observer programs to monitor marine mammal incidental take in some domestic fisheries. Until 2003, there were six different federally regulated commercial fisheries in Alaska that could have interacted with Steller sea lions and were monitored for incidental mortality by fishery observers. As of 2003, changes in fishery definitions in the List of Fisheries have resulted in separating these 6 fisheries into 22 fisheries (69 FR 70094, 2 December 2004). This change does not represent a change in fishing effort, but provides managers with better information on the component of each fishery that is responsible for the incidental serious injury or mortality of marine mammal stocks in Alaska.

Fishery observers monitored four commercial fisheries during the period from 1990 to 2005 in which Steller sea lions from this stock were taken incidentally: the California (CA thresher shark and swordfish drift gillnet, Washington (WA)/Oregon (OR)/CA groundfish trawl, northern WA marine set gillnet, and Gulf of Alaska sablefish longline fisheries. There have been no observed serious injuries or mortalities incidental to the CA thresher shark and swordfish drift gillnet fishery since 1994 (NMFS 2000, Carretta 2002, Carretta and Chivers 2003, Carretta and Chivers 2004). In the WA/OR/CA groundfish trawl (Pacific whiting component only) one Steller sea lion was observed killed in each year in 2001-03; these observed takes in combination with a mortality that occurred in an unmonitored haul resulted in a mean estimated annual mortality level of 0.8. No data are available after 1998 for the northern Washington marine set gillnet fishery. There have been no observer reported mortalities in the Gulf of Alaska sablefish longline since 2000 (Perez unpubl. ms. *in* Allen and Angliss 2012). During the 3-year period from 2007-2009, a total of 20 Steller sea lions mortalities occurred in fisheries operating south of latitude 49°N (2007 = 14 mortalities, 2008 = 6 mortalities, 2009 = 0 mortalities), with an average annual take of 6.67 animals. These takes were reported as animals killed by gear; however, they could not be assigned to a particular fishery. These mortalities result in a mean annual mortality rate of 7.47 Steller sea lions. No mortalities were reported by fishery observers monitoring drift gillnet and set gillnet fisheries in Washington and Oregon this decade; though, mortalities have been reported in the past.

Strandings of Steller sea lions provide additional information on fishery-related mortality. Estimates of fishery-related mortality from stranding data are considered minimum estimates because not all entangled animals strand, and not all stranded animals are found or reported. In Alaska, during the 5-year period from 2005-2009, there were eleven serious injuries and mortality of Steller sea lions (6 in 2007, 2 in 2008, and 3 in 2009) due to ingestion of J-hooks attached to a "flasher" (an attractor used in salmon trolling) in which the hook was lodged in the esophagus and penetrating adjacent tissue (NMFS Alaska Region stranding database, unpublished data). A total of 121 observations of Steller sea lions with flashers hanging from their mouth were reported in Southeast Alaska and northern British Columbia between 2003 and 2007 (Raum-Suryan *et al.* 2009; Lauri Jemison pers. comm. *in* Allen and Angliss 2012) indicating an average rate of hook ingestion of 24.2 per year. It is not clear whether entanglements with hooks and flashers involved the recreational or commercial component of the salmon troll fishery. Based on Angliss and DeMaster (1998), it is appropriate to consider these fishery interactions "serious injuries." Mortality records from the Alaska stranding database indicate a rate of incidental mortality of at least 0.6/year from the troll fishery.

Entanglements were also reported in the stranding database, with a total of 9 cases (1 in 2007, 7 in 2008, and 1 in 2009) of serious injury and mortality attributed to entanglement, averaging 1.8 annually between 2005-2009. There were no fishery-related strandings of Steller sea lions in Washington, Oregon, or California between 2005 and 2009. Due to limited observer program coverage, no data exist on the mortality of marine mammals incidental to Canadian commercial fisheries (i.e., those similar to U.S. fisheries known to take Steller sea lions). As a result, the number of Steller sea lions taken in Canadian waters is not known. The minimum estimated mortality rate incidental to commercial and recreational fisheries (both U.S. and Canadian) is 33.5 sea lions per year, based on fisheries observer data (7.47), opportunistic observations (24.2), and stranding data (1.8).

Research-Related Mortality

Marine mammals have been the subject of field studies for decades. The primary objective of many of these studies has generally been monitoring populations to gather data for behavioral and ecological studies. Over time, NMFS has authorized permits for various non-lethal forms of "take" of marine mammals in the proposed action area. Research in the action area has included biopsy sampling, close vessel and aircraft approaches, photo-identification, tagging, and collection of sloughed skin. Intentional lethal sampling of Steller sea lions was a primary means of collecting reproductive, morphometric, dietary, and histological samples for scientific research in the 1960s and 1970s. After the passage of the MMPA, this sampling method was strictly regulated and was discontinued once the species was listed as threatened under the ESA. Research activities under the MMPA and ESA are highly regulated and closely monitored, and may include the incidental taking or harassment of Steller sea lions in the course of research activities. Research activities, including counting, capturing, and handling animals, may result in inadvertent or indirect Steller sea lion mortality. Mortality may occasionally occur incidental to marine mammal research activities authorized under MMPA permits issued to a variety of government, academic, and other research organizations. Between 2003 and 2007, there were a total of 9 incidental mortalities resulting from research on the eastern stock of Steller sea lions, which results in an annual average of 1.8 mortalities per year from this stock (Tammy Adams, pers. comm. *in* Allen and Angliss 2012). Two Steller sea lions died in 2008 in traps at Bonneville Dam, part of the lethal take program targeting California sea lions, averaging 0.4 deaths per year.

Other Human Activities

Prior to 1972, approximately 45,000 Steller sea lions were intentionally killed in Alaska during state-sanctioned commercial harvest and predator control programs (Merrick *et al.* 1987). These sources of direct intentional killing of Steller sea lions were banned following passage of the MMPA in 1972. A provision under section 118 of the MMPA, however, allowed fishermen to lethally deter Steller sea lions from interfering with commercial fishing operations. A large but unknown number of Steller sea lions are believed to have been shot by fishermen between 1972 and 1990 (Trites and Larkin 1992). Such shooting has been illegal since the species was listed as threatened. (Note: the 1994 amendments to the MMPA made intentional lethal take of any marine mammal illegal except for subsistence hunting by Alaska Natives or where imminently necessary to protect human life). There are no records of illegal shooting of Steller sea lions from the eastern stock listed in the NMFS enforcement records for 1999-2003 (NMFS, unpublished data). Steller sea lions were taken in British Columbia during commercial salmon farming operations. Preliminary figures from the British Columbia Aquaculture Predator Control Program indicated a mean annual mortality of 45.8 Steller sea lions from this stock over the period from 1999 to 2003 (Olesiuk 2004). Starting in 2004, aquaculture facilities were no longer permitted to shoot Steller sea lions (P. Olesiuk, Pacific Biological Station, Canada, pers. comm. *in* Allen and Angliss 2012). Strandings of Steller sea lions with gunshot wounds do occur, along with strandings of animals entangled in material that is not fishery-related. During the period from 2005 to 2009, strandings of animals from this stock with gunshot wounds occurred in Oregon and Washington (three in 2005) resulting in an estimated annual mortality of 0.6 Steller sea lions. This estimate is considered a minimum because not all stranded animals are found, reported, or cause of death determined (via necropsy by trained personnel). Two mortalities from gunshots were reported (1 in 2007 and 1 in 2009); however, Steller sea lions reported in the Alaska stranding database as shot are not included in this estimate, as they may result from animals struck and lost in the Alaska Native subsistence harvest. In addition, human-related stranding data are not available for British Columbia.

Other human related activities may infrequently result in mortality to Steller sea lions. For example, in 2008, two Steller sea lions died when the doors of research traps closed unintentionally at Bonneville Dam (K. Wilkinson, unpublished NMFS NWR Stranding data).

Commercial and Private Marine Mammal Viewing

In addition to vessel operations, private and commercial vessels engaged in marine mammal watching also have the potential to impact Steller sea lions in the proposed action area. NMFS has promulgated regulations at 50 CFR 224.103, which provide specific prohibitions regarding wildlife viewing activities. In addition, NMFS launched an education and outreach campaign to provide commercial operators and the general public with responsible marine mammal viewing guidelines. In January 2002, NMFS also published an official policy on human interactions with wild marine mammals which stated that: "NOAA Fisheries cannot support, condone, approve or authorize activities that involve closely approaching, interacting or attempting to interact with whales, dolphins, porpoises, seals, or sea lions in the wild. This includes attempting to swim, pet, touch, or elicit a reaction from the animals."

Although considered by many to be a non-consumptive use of marine mammals with economic, recreational, educational, and scientific benefits, marine mammal watching is not without potential negative impacts. One concern is that animals become more vulnerable to vessel strikes once they habituate to vessel traffic (Swingle *et al.* 1993; Wiley *et al.* 1995). Another concern is that preferred habitats may become abandoned if disturbance levels are too high. There is also direct evidence of pinniped haul out site (Pacific harbor seals) abandonment because of human disturbance at Strawberry Spit in San Francisco Bay **(**Allen 1991). NMFS has little information on the effects of human disturbance on Steller sea lions in California, particularly during sensitive times of the year when the need to haul out or congregate is greatest (*e.g.*, pupping or breeding seasons), however, close approach by human on foot, aircraft, or in watercraft is likely to disturb Steller sea lions and may disrupt important biological functions. For more information on noise associated with commercial and private marine mammal viewing see *Anthropogenic Noise* Section.

Pollution, Contaminants, and Entanglement in Marine Debris

Chronic exposure to the neurotoxins associated with paralytic shellfish poisoning (PSP) via zooplankton prey has been shown to have detrimental effects on marine mammals. Estimated ingestion rates are sufficiently high to suggest that the PSP toxins are affecting marine mammals, possibly resulting in lower respiratory function, changes in feeding behavior, and a lower reproductive fitness (Durbin *et al.* 2002). The impacts of these activities are difficult to measure. However, some researchers have correlated contaminant exposure to possible adverse health effects in marine mammals. Contaminants such as organochlorines do not tend to accumulate in significant amounts in invertebrates, but do accumulate in fish and fish-eating animals.

Steller sea lions are exposed to local and system-wide contaminants and pollutants as they traverse the North Pacific basin. Most studies to date on Steller sea lions have involved animals from the western DPS; thus, much remains to be learned about the levels of a suite of contaminants and the physiological mechanisms and reproductive consequences of such substances in the eastern DPS Steller sea lions. Elevated levels of copper, mercury, and selenium were detected in Steller sea lions that foraged along the coast of central California (Reeves *et al.* 2002). Castellini (1999) found that levels of zinc, copper, and metallothionein were comparable between Steller sea lion pups sampled from the eastern and western DPS, and were lower in captive sea lions. The similarity of levels in both DPSs suggests that heavy metal contamination may be having similar effects on both DPSs. Existing studies on Steller sea lions have shown relatively low levels of toxic substances (with few exceptions), as well as heavy metals, and these levels are not believed to have caused high mortality or reproductive failure (Lee *et al.* 1996), and are not considered significant contributors to observed Steller sea lion declines (NMFS 2008).

Steller sea lions become entangled in a variety of debris and been observed with packing bands, discarded fishing gear, rope, and other debris around their necks. Such debris can be lethal, if it is not biodegradable. Entanglements around the neck can be especially deadly if animals are entangled that are still growing (or gaining more massive necks with maturity, as do male sea lions). While noting that entanglement in a variety of debris occurs, including packing bands, loops of line, and fishing gear, and may cause mortality, NMFS (2008) noted that "the extent is unknown and may range from a fraction of a percentage to several percent a year."

Reduction of Prey due to Fisheries

Steller sea lions prey upon some fish species that are also harvested by commercial, subsistence, and recreational fisheries (*e.g.*, Pacific cod, walleye pollock, Pacific hake, salmon, herring, etc.). Fishery removals have the potential to reduce the availability of these species to sea lions at a variety of spatial and temporal scales. Reduced prey availability can represent an acute or chronic threat to sea lion populations. Acute prey shortages may lead to starvation while chronic prey shortages have been shown in other mammals to reduce reproductive fitness, increase offspring mortality, and increase the susceptibility to disease and predation.

Fisheries present within the range of the eastern DPS of Steller sea lion could cause such effects, which include: Acting as a competitor for prey; Causing changes in the local or regional absolute and relative (with respect to other species) abundance of some fish species with the potential for impacts on ecosystem structure, function, and the resiliency of populations within some, food webs, changes to the age and size structure of fish populations, and reductions in Steller sea lion foraging success; Causing changes to fish distributions with resultant effects on Steller sea lion sea foraging efficiency; Causing changes in the average size and age of fish in a population, thereby potentially affecting Steller sea lion foraging efficiency and affecting the dynamics of the fish populations; Causing damage to habitat (e.g., due to bottom trawling) of Steller sea lion prey; and, Disturbance of rookeries or haulouts resulting in abandonment of the site on a short-term and/or long-term basis.

Given the sustained significant increases in non-pup abundance and increases in pup production of Steller sea lions in Southeast Alaska, British Columbia, Oregon, increasing abundance in Washington, current and anticipated continued fisheries management procedures and regulatory mechanisms, there is no indication that fisheries are directly or indirectly competing with eastern DPS Steller sea lions to the point where the level of fisheries related competition constitutes a threat to the survival or recovery of the eastern DPS of Steller sea lions.

Habitat Degradation

Human activities, including discharges from wastewater systems, dredging, ocean dumping and disposal, aquaculture and additional impacts from coastal development, are also known to impact marine mammals and their prey in their habitat. In the North Pacific, undersea exploitation and development of mineral deposits, as well as dredging of major shipping channels, pose a continued threat to the coastal habitat for marine mammals. Dredging, sewage effluent, potential oil spills, as well as substantial commercial vessel traffic, and the impact of trawling and other fishing gear on the ocean floor are continued threats to Steller sea lions in the proposed action area.

In taxa such as pinnipeds, which require specific habitat for breeding on land but are constrained by adaptations for feeding at sea (Stirling 1983), understanding the factors important to selection of breeding habitat is particularly important for assessing the prospect for recovery of small populations. Disturbances of Steller sea lion haulouts and rookeries can potentially cause disruption of reproduction, stampeding, or increased exposure to predation by marine predators.

Critical habitat for Steller sea lions includes an air zone that extends 3,000 feet (0.9 km) above areas historically occupied by sea lions at each major rookery in California and Oregon, measured vertically from sea level. Critical habitat also includes an aquatic zone that extends 3,000 feet (0.9 km) seaward in State and Federally managed waters from the baseline or basepoint of each major rookery in California or Oregon. Critical habitat in California for the Steller sea lion, as designated in 50 CFR Pt. 226.203, Table 1, is at Año Nuevo Island (Figure 5), Southeast Farallon Island (Figure 6), Sugarloaf Island and Cape Mendocino (Figure 7). NMFS comments on actions that may take place in sensitive Steller sea lion critical habitat and regularly reviews and provides recommendations to avoid the most sensitive times and areas in order to minimize the likelihood of having adverse impacts.

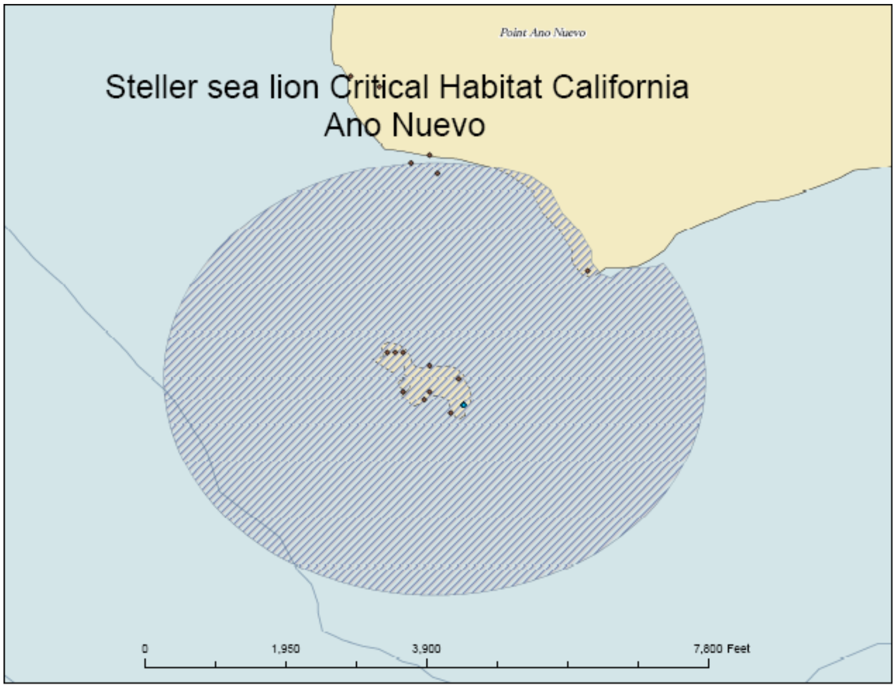

Figure 5. Steller sea lion critical habitat designated on Año Nuevo Island, includes a 3,000 foot buffer (50 CFR 226.03).

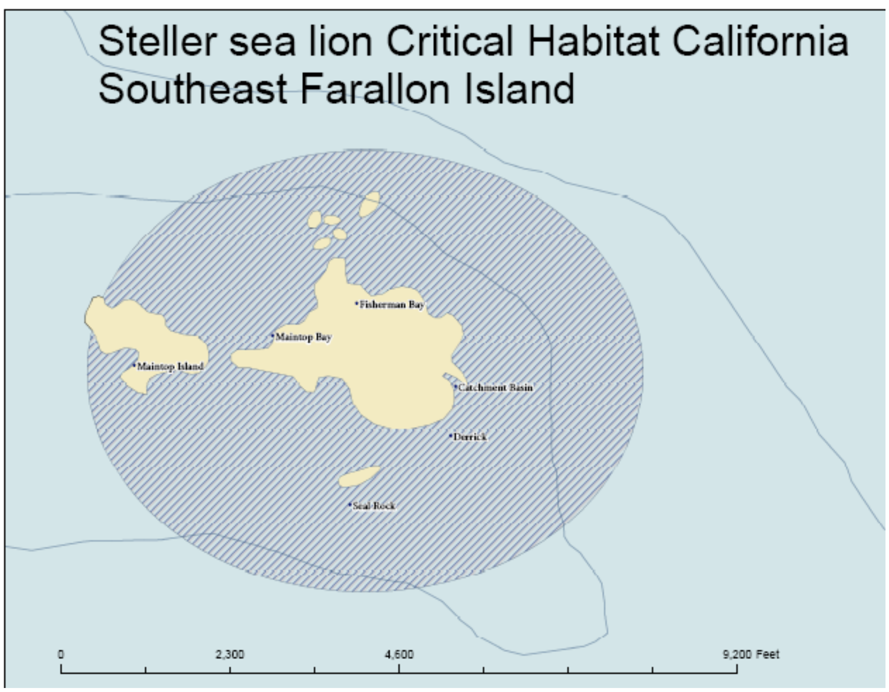

Figure 6. Steller sea lion critical habitat designated on the Southeast Farallon Islands, California; includes a 3,000 foot buffer (50 CFR 226.03).

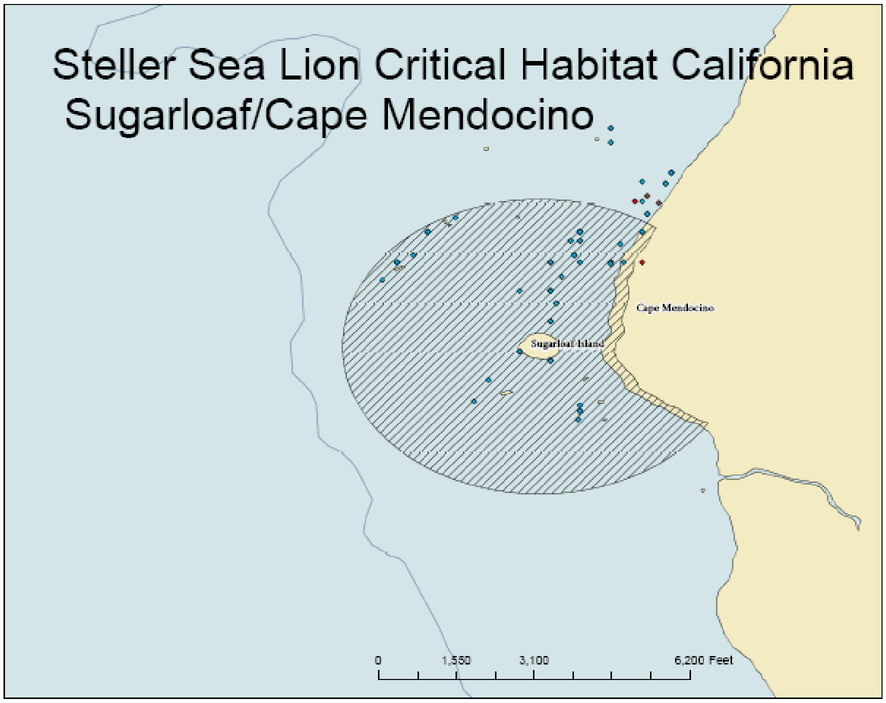

Figure 7. Steller sea lion critical habitat designated on Sugarloaf Island/Cape Mendocino, California; includes a 3,000 foot buffer (50 CFR 226.03).

Anthropogenic Noise

As one of the potential stressors to marine mammal populations, noise and acoustic influences may seriously disrupt marine mammal communication, navigational ability, and social patterns. Many marine mammals use sound to communicate, navigate, locate prey, and sense their environment. Both anthropogenic and natural sounds may cause interference with these functions. Steller sea lions are regularly exposed to several sources of natural and anthropogenic sounds. Anthropogenic noise that could increase ambient noise levels, arise from the following general types of activities in and near the sea, any combination of which, can contribute to the total noise at any one place and time. These noise sources include: transportation; dredging; construction; oil, gas, and mineral exploration in offshore areas; geophysical (seismic) surveys; military activities; sonar; explosions; and ocean research activities (Richardson *et al.* 1995). Several researchers have argued that anthropogenic sources of noise have increased ambient noise levels in the ocean over the last 50 years (Jasny *et al.* 2005; National Resource Council 1994, 1996, 2000, 2003, 2005; Richardson *et al.* 1995). Much of this increase is due to increased shipping due to more numerous ships of larger tonnage (National Research Council 2003). Commercial fishing vessels, cruise ships, transport boats, recreational boats, and aircraft, all contribute sound into the ocean (National Research Council 2003). The military uses sound to test the construction of new vessels ("ship shock trials") as well as for naval operations and exercises. Most observations of behavioral responses of marine mammals to the sounds produced have been limited to short-term behavioral responses, which included the cessation of feeding, resting, or social interactions. Acoustic devices have also been used in fisheries nets to prevent marine mammal entanglement (Goodson 1997; NMFS 1997; Marine Mammal Commission 1999) and to deter seals from salmon cages (Johnston and Woodley 1998), but little is known about their effects on non-target species.

Vessel noise, like aircraft noise, is a combination of narrowband "tonal" sounds at specific frequencies and "broadband" sounds with energy spread continuously over a range of frequencies (Richardson *et al.* 1995). Surface shipping is the most widespread source of anthropogenic, low frequency (0 to 1,000 Hz) noise in the oceans (Simmonds and Hutchinson 1996). The Navy estimated that the 60,000 vessels of the world's merchant fleet, annually emit low frequency sound into the world's oceans for the equivalent of 21.9 million days, assuming that 80 percent of the merchant ships are at sea at any one time (U.S. Navy 2001). Ross (1976) has estimated that between 1950 and 1975, shipping had caused a rise in ambient noise levels of 10 dB. He predicted that this would increase by another 5 dB by the beginning of the 21^{st} century. The National Resource Council (2003) estimated that the background ocean noise level at 100 Hz has been increasing by about 1.5 dB per decade, since the advent of propeller-driven ships.

Calkins and Pitcher (1982) found that disturbance from aircraft and vessel traffic has extremely variable effects on hauled-out sea lions. Michel *et al.* (2001) suggested an association between long-term exposure to low frequency sounds from shipping and an increased incidence of marine mammal mortalities caused by collisions with ships. Pinnipeds, including Steller sea lions, are not as likely to be threatened by vessel noise and ship traffic as cetaceans, since they are smaller and are highly maneuverable in the water. However, sea lion reaction to occasional disturbances ranges from no reaction at all to complete and immediate departure from the haul out area. The type of reaction appears to depend on a variety of factors. When sea lions are frightened off rookeries during the breeding season and pupping season, pups may be trampled or even abandoned. After repeated disturbances, sea lions have temporarily abandoned areas (Thorsteinson and Lensink 1962), but in other situations have continued using areas after repeated and severe harassment. The consequences of such disturbances are difficult to measure. The proximity of their haul out sites to shipping channels and the increase in ship traffic may increase the likelihood of vessel impacts on pinnipeds, but the effects, such as ship strikes or impacts to pinniped communication, are unknown. Stranding data indicates that pinnipeds have been struck by ships and it is likely that the actual number of pinnipeds struck by ships is higher than what is reported in stranding databases, particularly since dead animals are more apt to sink at sea then drift into shore. However, the overall impact of ship strikes to pinnipeds, including Steller sea lions, is unknown. At present, concern about the effects of anthropogenic disturbance focuses on disturbance as an impediment to research on Steller sea lions and whether it might contribute to the decline of the population in the southern portion of their range. Carretta *et al.* (2001) and Jasny *et al.* (2005) identified increasing levels of anthropogenic noise as a habitat concern for whales and other marine mammals because of its potential effect in their ability to communicate.

Oil and Gas Development

Human development activities that result in aquatic habitat destruction from the release of contaminants and pathogens (*e.g.,* during construction/demolition) could directly diminish the health and reproductive success of Steller sea lions or cause them to abandon feeding, breeding, or resting sites. Development and discharge proposals associated with oil and gas development typically undergo an ESA section 7 consultation during the Federal permitting process. At this time, there are no proposed development or discharge proposals within the proposed project area. The types of impacts from geophysical surveys and construction (*i.e.,* introduction of noise into the environment) are covered under *anthropogenic noise*.

Oil spills are expected to adversely affect Steller sea lions if they contact individual animals, haulouts, or rookeries when occupied, or large proportions of major prey populations (Minerals Management Services 1996). Potential effects include: oil exposure, including surface contact and pelage fouling, inhalation of contaminant vapor, or ingestion of oil or oil-contaminated prey. Since the insulation of non-pup sea lions is provided by a thick layer of fat, rather than pelage whose insulative value could be destroyed by fouling, oil contact is not expected to cause death from hypothermia. However, sensitive tissues (*e.g.*, eyes, nasal passages, mouth, or lungs) are likely to be irritated or ulcerated by exposure to oil of hydrocarbon fumes. Steller sea lions were undoubtedly exposed to oil after the Exxon Valdez oil spill in 1989 in Prince William Sound, Alaska, but no significant adverse effects of the oil were confirmed (Calkins *et al.* 1994).

Oil and gas leasing, exploration and development has occurred directly in the historic or current range of the eastern DPS in waters off California. New leasing is not currently occurring or planned offshore of California, but there are multiple active leases and platforms on which drilling is occurring and oil is produced in that state. Maps of these leases are available at: http://www.boemre.gov/omm/pacific/lease/lease.htm. They include multiple platforms at the southernmost extent of the range, shoreward of the Channel Islands, off Point Arguello, and off Huntington and Seal Beaches. In July of 2010, BOEMRE Pacific region indicated that there are currently 241,023 acres in active leases and 43 of the 49 active leases are producing in California.

Climate Change and Ocean Acidification

Connecting global warming and ocean acidification to increased levels of carbon dioxide in the atmosphere, recent scientific literature has expressed a growing concern over the potential impacts of these phenomena (McCarty 2001; Fabry et al. 2008; NRC 2010; IPCC 2007b; ACIA 2004; NMFS 2010). Findings particularly relevant to Steller sea lions included shifts in the range and abundance of algae, plankton, and fish in high-latitude oceans and changes in the migrations of fish in rivers (IPCC 2007b: 8-9).

The general northward shift in distribution within the breeding range and the decline of eastern DPS Steller sea lions in the southernmost part of the range may reflect just such a response to climate change. Changes in the ocean environment, particularly warmer temperatures, may be possible factors that have favored California sea lions over Steller sea lions in the southern portion of the Steller's range (NMFS 2008). The most evident change is that all of the new rookeries in the eastern DPS have been established in Alaska at the northern end of the range, suggesting a population shift north.

In general, Steller sea lions are likely to be less sensitive to this threat than other marine organisms, as they are opportunistic and mobile predators. However, the flexibility of the eastern DPS in responding to climate change is limited by the terrestrial nature of some of their important habitat, such as rookery sites. Historically, rookery sites have been located near areas of high productivity and seasonally available food resources. The foraging efficiency of nursing females may be affected by factors that change the timing, distribution, and abundance of key prey in the proximity of rookeries. While new rookery sites have been established in the northern part of the range of the eastern DPS, the number of sites with suitable characteristics that are also protected from human disturbance may be limited within the range of this DPS. Past patterns of resilience to environmental variability may not, therefore, clearly predict the future ability of the eastern DPS to respond to environmental change.

Global climate warming and ocean acidification pose a threat to the Steller sea lion population from potential food web alteration, direct physiological impacts on prey species, or more generally, to changes in the composition, temporal and spatial distribution and abundance of Steller sea lion prey assemblages. If the underlying food webs are affected by ocean acidification and climate change, this population segment of Steller sea lions would also likely be affected. It has become increasingly clear that global climate warming and related acidification of the oceans poses a serious threat to marine ecosystems in general. However, consideration of this issue is complicated by the rapidly evolving understanding of this complex threat, the uncertainty about how Steller sea lions might respond, and the inability to apply this knowledge under the "foreseeable future" standard to predict a response by the eastern DPS with any reliability.

Clearly, the issue is not specific to Steller sea lions or their habitat. Steller sea lions may be no more sensitive to such modification than many other marine mammal species. Based on the available information, it is likely that global warming and ocean acidification may affect eastern North Pacific subarctic ecosystems before the end of this century; however the magnitude, timing, and mechanism of the changes, and how they may affect the eastern DPS of Steller sea lion is, at this point, impossible to predict. Given the increasing population trends of the eastern DPS of Steller sea lion, the robust reproduction over a large range, and the relatively large population size, the available information suggests that global warming and ocean acidification are not impeding this population's overall viability and are not likely to cause it to become in danger of extinction within the foreseeable future throughout all or a significant portion of its range (NMFS 2012).

The Impact of the Environmental Baseline on Listed Resources

Although Steller sea lions are exposed to a wide variety of past and present State, Federal or private actions; other human activities that have already occurred or continue to occur in the action area; Federal Actions that have already undergone formal or early section 7 consultation under the ESA; and State or private actions that are contemporaneous with this consultation, the impact of those activities on the status, trend, or the demographic processes of threatened and endangered species remains largely unknown.

The action area for the proposed action encompasses the entire South Farallon islands and nearshore intertidal waters. We refer the reader to the *Status of the Species* section for general information on the species' biology, ecology, status, and population trends at the species scale. This section identifies many of the major existing stressors that Steller sea lions are exposed to at the same time they will be exposed to the stressors of the proposed operations.

Historically, seal hunts had caused Steller sea lions to decline to the point where they faced risks of extinction. Since the end of commercial hunting, this primary threat to the eastern DPS has been eliminated. However, these species have not yet recovered from those historic declines and scientists cannot determine if those initial declines continue to influence current populations of Steller sea lions. In addition, it is not clear what influence climate change or other factors may have on the current distribution of the eastern DPS of Steller sea lions across their range, particularly with the decrease in their range in California and the establishment of new haul out areas and rookeries in Alaska. The relationships between specific sound sources, or anthropogenic sound in general, and the responses of marine mammals to those sources are still subject to scientific investigation, but no clear patterns have emerged. As a result, the potential consequences of anthropogenic sound on Steller sea lions also remain uncertain. The levels of mortality from research directed activity, entanglement, and "other human related sources" are very small relative to population size and productivity.

A portion of the proposed project activities were tested in 2012 where it was determined that harassment of pinnipeds would be unavoidable once the full trial was tested. Therefore, the number and timing of stranding events in California were also examined to detect potential relationships within the conduct of the proposed project activities. Based on the information, we are unable to find a correlation between the stranded animals and the project activities.

V. EFFECTS OF THE PROPOSED ACTION

In this section of the biological opinion, the potential effects of proposed action activities on the eastern DPS of Steller sea lions, is described. As explained in the *Approach to the Assessment* section, we identified several aspects of the proposed project that may affect Steller sea lions. In the following section, we discuss how individual animals may be affected by the proposed action and assess whether any changes in the survival or reproduction of any affected pinniped might be expected. We relate any reductions in fitness to population level consequences and finally the species level.

The ESA does not define harassment nor has NMFS defined this term, pursuant to the ESA, through regulation. However, the MMPA of 1972, as amended, defines harassment as "any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild or has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering" [16 U.S.C. 1362 (18)(A)].

For this biological opinion, we define "harass" for ESA purposes, similarly to the MMPA's definition of harassment: an intentional or unintentional human act or omission, that creates the probability of injury to an individual animal by disrupting one or more behavioral patterns that are essential to the animal's life history or its contribution to the population the animal represents. We are particularly concerned about behavioral disruptions that may result in animals that fail to feed or breed successfully or fail to complete their life history because these responses are likely to have population-level consequences.

APPLICATION OF APPROACH TO THE ASSESSMENT

NMFS initially identified five elements of the proposed bird mitigation trial activities that may represent potential hazards to threatened or endangered species or critical habitat that has been designated for them: (1) elevated sound levels; (2) presence of a helicopter; (3) presence of humans; (4) presence of dogs; and (5) visual stimuli (*e.g.,* lasers, spotlights, kites, remote controlled aircraft, and mylar tape).

Thus, this assessment focuses on the elements of elevated sound levels; presence of a helicopter, humans and dogs; and visual stimuli. The potential risks associated with these elements was analyzed by assessing the frequency and the potential for disturbance by elevated sound levels; presence of a helicopter, humans and dogs; and visual stimuli. The first step in the analysis evaluates the available evidence to determine the likelihood of listed species or critical habitat being exposed to USFWS activities. The analysis assumed that USFWS activities pose no risk to listed species or critical habitat if they are not exposed to the activities (NMFS recognizes that some activities could have indirect, adverse effects on listed species or critical habitat by disrupting marine food chains, a species' predators, or a species' competitors; however, situations where these effects might apply to species under NMFS' jurisdiction were not identified in this case). The analysis also assumed that the potential consequences of exposure to USFWS activities on individual animals would be a function of the intensity of elevated sound levels or the presence of a helicopter, humans, dogs, and visual stimuli (*e.g.*, lasers, spotlights, kites, remote controlled aircraft, and mylar tape); and the duration, and frequency of the animal's exposure to USFWS activities. Once we identified that Steller sea lions (eastern DPS) were likely to be exposed disturbance by elevated sound levels or the presence of a helicopter, humans, dogs, and visual stimuli (*e.g.*, lasers, spotlights, kites, remote controlled aircraft, and mylar tape) and the nature of that exposure, we examined the scientific and commercial data available to determine whether and how Steller sea lions are likely to respond given their exposure. The remainder of our analyses proceeded using the approach we described in the previous section. Although the overall trend for the eastern DPS stock is showing an increase, the stock is declining in the southern portion of its range, which includes California and the action area. Exposure to elevated sound levels or the presence of a helicopter, humans, dogs, and visual stimuli (*e.g.*, lasers, spotlights, kites, remote controlled aircraft, and mylar tape) is likely to disrupt one or more behavioral patterns that are essential to an individual animal's life history or to the animal's contribution to the population. However, these behavioral responses are expected to be temporary and are not likely to hinder the reproductive success or recovery of the Steller sea lion and would also not result in the serious injury or mortality of a single individual. Thus, no impact on the population size of breeding stock of Steller sea lions is expected to occur.

POTENTIAL RESPONSES TO STRESSORS

Based on our review of the available data, the proposed activities are likely to cause five primary stressors: disturbance by elevated sound levels or elevated sound levels; presence of a helicopter, humans and dogs; and visual stimuli. The narratives that follow describe these identified stressor in greater detail, describe the probability of Steller sea lions being exposed to these stressors based on the best scientific and commercial evidence available, then describe the probable responses of this listed species, given probable exposures, based on the evidence available.

Based on our review of the data available, Steller sea lions are likely to be exposed to the five stressors mentioned above. We assume that all five of the pinniped species (Steller sea lions, California sea lions, Pacific harbor seals, Northern elephant seals, and Northern fur seals) could be present during the activities because of limited sighting data or facts about their habitats and presence in similar locations in coastal zones. Any measures to minimize impacts to Steller sea lions would also be beneficial to the other pinniped species known to use the area. NMFS considers an animal to have been harassed if it moved greater than 1 m (3.3 ft) in response to the researcher's presence or if the animal was already moving and changed direction and/or speed, or if the animal flushed into the water. Animals that became alert without such movements were not considered harassed. There is no potential for serious injury or mortality to pinnipeds from any USFWS bird mitigation trial activities.

A Brief Background on Sound

The following subsection relies heavily on Richardson *et al.* (1995) for information on sound characteristics and the effects of noise on marine mammals.

Noise is generally thought of as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, diminishes the quality of the environment, or is otherwise annoying. Noise sources include: transportation; dredging; construction; oil, gas, and mineral exploration in offshore areas; geophysical (seismic) surveys; sonar; explosions; and ocean research activities. Response to noise varies by the type and characteristics of the noise source, distance between the source and the receptor, receptor sensitivity, and time of the day. Noise may be intermittent or continuous, steady or impulsive, and may be generated by stationary or transient sources. Specific concerns of this analysis are the potential continuous or impulse noise effects on marine mammals.

Due to the complex characteristics of sound, a variety of metrics (or units) are necessary to describe the noise environment in specific conditions. Sound is comprised of waves of energy that travel through air or water as vibrations of fluid particles. The rate at which the vibrations occur is referred to as sound frequency, and it is measured in cycles per second, or hertz (Hz).

The range of sound levels that humans are capable of hearing is very large. If the threshold of hearing (faintest sound level one can recognize) is assigned a value of one, then the threshold of pain (highest level that one is capable of hearing), measured on the same scale, would have a value of ten million. In order to make this large range of values more meaningful, a logarithmic mathematical scale is used, the decibel scale. On this scale, the human threshold level is 0 decibels (dB) and the threshold of pain is approximately 140 dB. Thus, the reference level for the decibel scale used to describe airborne sound is the threshold of human hearing. In physical terms, this corresponds to a sound pressure of 20 micro Pascals (μPa). For underwater sound, a reference level of 1 μPa is used.

Sound level meters have been developed to measure sound fields and to show the sound level as a number proportional to the overall sound pressure as measured on the logarithmic scale. This is often referred to as the sound pressure level (SPL). Sound level meters are useful in that they provide a number that is directly related to the human sensation of loudness. Thus, some meters are calibrated to emphasize frequencies in the 1 to 4 kHz range and to de-emphasize higher and especially lower frequencies to which humans are less sensitive. Sound level measurements obtained with these instruments are termed “A-weighted” (expressed in dBA). Airborne sounds are often expressed as broadband A-weighted (dBA) or C-weighted (dBC) sound levels. A-weighting refers to frequency dependent weighting factors applied to sound in accordance with the sensitivity of the human ear to different frequencies. With A-weighting, sound energy at frequencies below 1 kilohertz (kHz) and above 6 kHz are de-emphasized and approximate the human ear’s response to sounds below 55 dB. C-weighting corresponds to the relative response to the human ear to sounds levels above 85 dB. While it is unknown whether the pinniped ear responds similarly to the human ear, the pinniped’s highest hearing frequency is at higher frequencies that that of humans, therefore, A-weighting is typically used to express in-air hearing for pinnipeds.

Sound in water propagates more efficiently than sound in air but is subject to similar types of transmission loss (TL) (*e.g.*, spherical spreading and attenuation). When sound spreads spherically (in air or water), sound intensity from the source diminishes as the square of the distance from the source ($1/r^2$, or diminishing of sound levels by 6 dB per range with doubling of distance, r, and 20 dB per range when distance increases ten-fold). This is based on the accepted approximation for transmission loss: TL = 20 Log r. In the underwater environment, sound typically spreads spherically from the sound source until it is reflected by a surface, such as the ocean bottom or a submerged object, and multiple propagation paths are established. Sound can also reflect off various surfaces in the underwater environment, resulting in cylindrical spreading (1/r, or sound diminishes by 3 dB per range with a doubling of distance, and a 10 dB difference when distance increases ten-fold).

Ambient noise is background noise, and in the ocean, such noise arises from wind, waves, organisms, fishing boats, etc. Man-made noise can interfere with detection of acoustic signals, such as communication calls, echolocation sounds, and environmental sounds important to marine mammals. If the noise is strong enough relative to the received signal, the signal will be "masked" and undetectable. The size of this "zone of masking" of a marine mammal is highly variable, and depends on many factors that affect the received levels of the background noise and the sound signal.

Sounds may be transient (pulsed), of relatively short duration having an obvious start and end (explosions, sonars, etc.), or they may be continuous, seeming to go on and on *(e.g.*, an operating drillship). The distinction between transient and continuous sounds is not absolute, however, as many sounds are not purely one or the other. In describing a transient sound, it is useful to present the peak level as well as the waveform, a description of how the sound varies with time. When transient sounds are so short so as to be considered impulsive, they are best described in terms of their energy levels. An animal's response to a pulsed sound with a particular peak level can be quite different than its response to a continuous sound at the same level. Since the mammalian ear operates as a detector of energy, temporal integration should be included when assessing effects, including sensation and damaging levels, of transient noise (Madsen 2005). The noise analyzed in this biological opinion is associated with helicopter operations and noise created by maintenance and renovation activities, therefore transient sound versus longer-term sound exposure will be analyzed when describing the effects of sound on marine mammals.

Elevated Sound Levels (not associated with Helicopters)

Most bird deterrent techniques have been developed to prevent damage to a crop or structure. General approaches have included the use of visual or auditory sound-making devices, visual scaring devices, exclusion, habitat modification, chemical repellents, removal (trapping), or killing. Since the purpose of this trial is to preserve bird presence on the island, the use of visual or auditory sound-making devices and visual scaring devices were considered. Visual devices will be considered further under the *Visual Stimuli* section below.

The use of pyrotechnics, biosonics, predator calls, and/or air cannons that might be expected to have greater risk of disturbing marine mammals will be used primarily outside of marine mammals haul outs, and will only be used as a last resort in haul-out areas to haze the most persistent of the roosting gulls on the islands. Pyrotechnics include a variety of devices that frighten birds by producing loud bangs or whistling noises, and in some cases, bright flashes of light. Pyrotechnics are considered standard hazing techniques and are widely used. Most of the commonly used pyrotechnics are projectiles launched from a pistol or shotgun.

Biosonics

Biosonics is the use of an animal's natural vocalizations to influence the behavior of that species (Gorenzel and Salmon 2008). Many species of animals have a vocabulary that conveys meaning to other individuals of their own species. An animal's language, which may range from body postures and movements to vocalizations, is used to communicate information about social rank, courtship, territory, food sources, predators, and other subjects. The animal's survival could very well depend on its ability to understand what is being communicated and to respond appropriately. This biological relevance of an alarm or distress call, habituation, to calls takes longer than to synthesized or novel sounds.

Biosonics depends on animals reacting to particular calls in a predictable and favorable manner. Often, alarm or distress calls are used to make an animal leave an area. Alarm or warning calls are given in response to a potential predator; distress calls are given when a bird is attacked or restrained. Biosonics have been most successful with flocking birds. Distress calls have been used to disperse crows and starlings from night roosts and gulls from airports, marinas, and outdoor restaurants.

Predator calls

A variety of signals are available within the audible hearing range of birds. Depending on the device, broadcasts may consist of electronically synthesized sounds, novel sounds (*e.g.*, dog barking, sirens, gunfire, music, human voices), alarm or distress calls, or predator calls (*e.g.*, raptor calls). The broadcasts are intended to alarm or stress the target birds and either cause or predispose them to leave the area. Broadcast equipment ranges from simple, portable players to sophisticated programmable units.

Bird bombs, screamers, and screamer-bangers

Bird bombs, screamers, and screamer banger rockets are pyrotechnic cartridges fired from a modified starter pistol using a .22 caliber blank (Gorenzel and Salmon 2008). Bird bombs, sometimes called bangers, travel approximately 50 to 75 feet before exploding. Screamers, sometimes called whistlers, do not explode, but make screaming and whistling noises as they travel and leave a visible trail of smoke. The range of screamers is about 150 to 200 feet. The screamer banger rocket combines the bird bomb and a screamer all into one unit. The rocket travels about 300 to 350 feet, making a screaming noise followed by the report from the banger. Although a screamer generally goes where aimed, the flight path can sometimes be erratic.

CAPA launcher and rocket

The CAPA launcher is a 4-caliber Very-type, hand-held flare gun fitted with a removable liner in the barrel (Gorenzel and Salmon 2008). The liner permits the use of 18 mm "bird scaring cartridges," essentially small rockets that travel up to 1,000 feet before detonating with a loud report of 150 dBA. According to the manufacturer, when fired at a 45 degree angle, the rocket reaches a height of approximately 600 feet, then arches back towards the ground and explodes at 300 feet above the ground. The distance downrange will be about 700 feet. If fired at a 30 degree angle, the downrange distance would be 1,000 feet and the rocket would explode at 100 feet above the ground.

Zon Gun

A Zon Gun or propane cannon, produce a loud directional blast by slowly filling a bellows with propane gas from a propane tank, then rapidly transferring the gas to a chamber for ignition by a spark (Gorenzel and Salmon 2008). The interval between detonations can be varied from 30 seconds to 30 minutes. After deployment these devices operate automatically. Certain models also have the capability to rotate which would give the appearance that each blast is coming from a different direction. The effective range of the cannon depends on weather conditions and ambient noise levels. At times, operators have used the prevailing winds to carry the sound. Cannons have been effective over distances of more than 2,000 feet. The manufacturer recommends that because of the loud report and the danger to a person in front of the barrel, at least two warning signs should be posted near the cannon and that ear protection is advised.

Helicopter

A helicopter, if used, would be a Robinson 22 (R-22), and will first conduct a reconnaissance monitoring flight around Southeast Farallon and West End prior to conducting any bird hazing operations. These flights will take off and land using the approved helicopter flight path for Southeast Farallon Island and will begin flying high and move slowly in a wide circumferential flight. The presence and distribution of marine mammals will be mapped and their response recorded by a USFWS or PRBO monitors. If the helicopter needs to fly below 100 feet or touch-down in any area for hazing or for transfer of equipment or personnel, the helicopter will avoid if possible flying directly over active haul out areas. If pilots need to fly over such an area, they will adopt a slow graduated descent and approach to avoid any stampeding or injury, as has been done successfully on many other such projects in the United States (Anacapa Rat Eradication Final EIS 2001 http://www.nps.gov/chis/naturescience/upload/AIRP%202.%20Final%20EIS%20Chap%201-5.pdf and Salmon 2010). The marine mammal response to the aircraft will be noted, including any habituating reactions.

Although information exists regarding aircraft disturbance and marine mammals, there is very little specific information regarding helicopter disturbance and its effect on pinnipeds. Therefore, we used surrogate species to assess probable impacts of helicopter disturbance on pinnipeds, specifically Steller sea lions.

Airborne sounds from aircraft may directly affect marine mammals that haul out on land or ice, and perhaps any marine mammal at the surface. The complex process of air-to-water transmission affects the characteristics of aircraft sound received by marine mammals below the surface. When determining the propagation characteristics of aircraft sound, an altitude of 300 m is the usual reference distance for in-air measurements and predictions (Richardson *et al.* 1995). Aircraft are powered by either reciprocating or turbine engines. The primary sources of sound from aircraft, aside from their turbojet or turbofan, are their propellers or rotors. Turbine engine sounds are characterized by the whine of the blades within different stages of the engine; tones occur at frequencies from several hundred Hertz to well above 1kHz. For example, a two-bladed helicopter rotor turning at 330 rpm results in a tone at 11 Hz (Richardson *et al.* 1995). The larger the number of blades, the higher the fundamental frequency for a given rotation rate. Dominant tones in noise spectra from helicopters and fixed-wing aircraft generally are below 500 Hz (Richardson *et al.* 1995). According to Richardson *et al.* (1995), helicopters tend to be noisier than similar-sized fixed wing aircraft, large aircraft tend to be noisier than smaller ones, and aircraft on takeoff or climb tend to be noisier than those during cruise or approach. The escape responses (*i.e.*, leaving the ice) of hauled out ringed seals (*Phoca hispida*) to a low-flying (150 m) fixed-wing twin-engine aircraft (Partenavia PN68 Observer) during strip censuses in eastern Greenland (June 1984) and to a low-flying (150 m) helicopter (Bell 206 III) during reconnaissance in northwestern Greenland (May 1992) were recorded by Born *et al.* (1999). Seals escaped less than about 600 m in front of the fixed-winged aircraft. The overall probability of escaping was 0.21 within a 200-m-wide center zone, 0.06 on the side of the aircraft (100-300 m from the flight track), and 0.02 between 300 and 500 m from the track. Overall, about 49% of all seals escaped as a response to the helicopter. Seals entered the water a maximum of about 1250 m in front of the helicopter. The study by Born *et al.* (1999) indicated that the risk of scaring ringed seals into the water could be substantially reduced if helicopters do not approach them closer than about 1500 m, and small fixed-winged aircraft not closer than about 500 m.

Helicopter disturbance of wild animals may cause physiological and/or behavioral responses that compromise the animal's survival, growth, reproductive fitness, ability to raise young, energy budgets, and habitat use. One relationship is clear between aircraft and wildlife responses: the closer the aircraft, the greater the probability that the animal will react and the greater the response (Yeomans 2002). Panic reactions and escape responses to overflights can be energetically "expensive" to animals. Disturbed animals usually run or otherwise move away from aircraft, thus increasing their energy expenditure (National Park Service 1994). Many studies have examined the responses of wildlife to mechanized recreational activities and human disturbances. Perching or nesting birds may flush when disturbed, for example. A study of bald eagles demonstrated that over 40% of eagles elicited responses when helicopters approached at distances of under 3,050 m (10,000 ft) (Watson 1993). In contrast, eagles defending their nests did not flush until encounters were under 30 m (99 ft) (Watson 1993). Cote (1996) recorded, during 32% of observations of helicopter disturbance events, mountain goats walked or ran >100 m or were vigilant for >10 min post-overflight. Of the remaining observations, 42% of goats were lightly disturbed (moved <10 m or vigilant for <2 min) and 26% were moderately disturbed (moved 10-100m or vigilant >2 min and <10 min). Distance between animals and helicopters was the most important factor affecting goat responses; the behaviors noted above were observed 85% of the time when helicopters approached <500 m (1,640 ft). Research indicates that flight altitude, noise output, speed, approach pattern, and reproductive status, are the most important factors in determining an animal's reaction to an overflight (McKechnie and Gladwin 1995), and researchers have concluded that helicopter traffic is more disruptive than fixed winged aircraft traffic (Belanger and Bedard 1989; Harrington and Veitch 1992; Watson 1993; Richardson *et al.* 1995; Albright and Kunstel 2001; National Research Council 2005).

Stemp (1983) found that both behavioral and cardiac responses of sheep to helicopters with overflights at 400 m above ground, resulted in elevated heart rates lasting for up to one hour post-disturbance in Rocky Mountain Bighorn sheep. However, both MacArthur *et al.* (1982) and Stemp (1983) noted the poor correlation between cardiac and observable behavioral responses. Scotton and Pletscher (1998) studied bighorn sheep ewe-lamb disruptions and found larger, turbine-powered helicopters (Hughes 500) caused ewes to move farther from lambs than did smaller, piston-powered helicopters (Robinson R-22).

Helicopter regulations as they pertain to marine mammals do not exist in California. However, guidance has been developed for other species and information is available regarding other wildlife and aircraft. On the Federal Aviation Association (FAA) website (http://www.faa.gov) "Bird Hazards and Flight Over National Refuges, Parks, and Forests," Section 7-4-6 addresses

"Flights Over Charted U.S. Wildlife Refuges, Parks, and Forest Service Areas." Subsection b states "pilots are requested to maintain a minimum altitude of 2,000 feet [600 m] above the surface of the following: National Parks, Monuments, Seashores, Lakeshores, Recreational Areas, and Scenic Riverways administered by the National Park Service, National Wildlife Refuges, Big Game Refuges, Game Ranges and Wildlife Ranges administered by the U.S. Fish and Wildlife Service, and Wilderness and Primitive areas administered by the U.S. Forest Service (http://www.faa.gov/atpubs/aim/Chap7/aim0704.html). While California State law is not specific to helicopters and wildlife disturbance, the State (in both Fish and Game Code and the State law) does not allow harassment of wildlife. An approach to within 60 m (200 ft) would constitute harassment (S. Torres, pers. comm. *in* Wilson and Shackleton 2001) regarding regulations governing the use of aircraft near wildlife, but this pertains to hunting (Wilson and Shackelton 2001).

Individual animal behavior is difficult to predict and is likely influenced by many factors. Therefore, broad management guidelines need to be based on the range of behaviors that can be expected under different disturbance scenarios. Guidelines should be based on the most sensitive animals in a population (Wilson and Shackleton 2001).

Noise testing performed on the R22 Raven Helicopter, the helicopter to be used during bird mitigation trial activities, were taken at 1,500 feet for Take-off/Departure and Approach/Landing (Dotti 2004) and resulted in a Sound Exposure Level (SEL) of 70 dBA re 20 μPa. The R22 is comparable to the R44, except it is smaller. The R-22 has two seats and the R44 has 4. Since the R22 met FAA requirements there was no need to collect more specific information regarding noise levels closer to the ground. Thus, the specifications for the R44 were conservatively used here since the R22 is much quieter than the R44. For the R44, the noise levels measured on the ground at this distance and speed, were 81.9 dBA for the model R44 Raven I, or 81.0 dBA for the model R44 Raven II (S. Turnour, Raven Helicopters, pers. comm., 2006). It is assumed that noise levels increase as the distance between the helicopter and the receiver of the noise decreases. The most significant impact is from the proximity of helicopters flying over the site. The most common response to overflights is temporary displacement into the water from the haulout by a portion, or all, of the animals present. No deaths or injuries to adult animals have been documented due to past aerial activities conducted by the USFWS or USCG.

Exposure to sound energy may result in a range of physiological effects in marine mammals. The auditory system is thought to be the most sensitive to sound exposure, but sound exposure may cause non-auditory physiological effects such as stress and tissue injury. Exposure of marine mammals to high intensity sound may cause a temporary threshold shift (TTS), or a temporary loss in hearing (Finneran *et al.* 2005). Permanent threshold shifts (PTS) or permanent loss of hearing sensitivity can result when animals are exposed even briefly to very intense sounds, over a long duration and/or to moderately intense sounds, or intermittently, but repeatedly, to sounds sufficient to cause TTS (Clark 1991). Indirect ecological effects may occur if ecologically related species are affected by anthropogenic sound, thereby changing the nature of their relationship with marine mammals or the structure of the affected ecosystem. If and when such effects occur, they may reduce the foraging efficiency of marine mammals, potentially compromising their growth, condition, reproduction, and survival.

As mentioned above, noise testing performed on the R44 Raven Helicopter, at 492 ft above ground level, measured noise levels at 81.9 dB(A) for the model R44 Raven I, or 81.0 dB(A) for the model R44 Raven II (S. Turnour, Raven Helicopters, pers. comm., 2006). In past consultations, NMFS has used a conservative estimate of the SEL at which TTS (Level B harassment) may be elicited in-air in harbor seals and California sea lions and northern elephant seals (*Mirounga angustirostris*), to be 145 dB re 20μPa^2-sec and 165 dB re 20μPa^2-sec, respectively (Lawson *et al.* 1998). However, studies have shown that when exposed to sound levels between 98.9 and 101 dB re 20μPa^2-sec from a rocket launcher, harbor seals responded by fleeing into the water, but many returned to land within several hours. Like harbor seals, Steller sea lions are skittish by nature, and it is not unreasonable to assume that if Steller sea lions are exposed to sound pressure levels between 98.9 and 101 dB re 20μPa^2-s, they would respond in the same manner as harbor seals. It is likely that the initial approach of the helicopter, the visual cue and approaching engine/rotor sound, will cause the majority of animals hauled out on the island to alert and flush into the water. As the helicopter approaches, it is expected that the sound levels would increase above the measured noise levels (R44=81-81.9 dBA at 150 m (492 ft) above ground level)). Since the actual sound levels of the helicopter below 150 m (492 ft) are not known, we assume that animals remaining at the site could be exposed to TTS-inducing SELs if the helicopter needs to fly below 150 m (492 ft). On Rat Island in Alaska where a similar rodent invasion occurred, bait was applied via helicopter using a bait hopper. The helicopter flew at a speed ranging from 25 – 50 knots (46 – 93 km/hr or 29 – 58 mph) at an average altitude of approximately 50 m (164 ft.) above the ground.

The noise emanating from the helicopter is not expected to penetrate the water column because the airborne sounds will likely reflect or refract from the water surface. In addition, while in transit, the helicopter will follow standard protocol and avoid flying at low altitudes near haul out sites to minimize impacts to other pinnipeds, including Steller sea lions, hauled out at other islands within the Refuge. This evidence, in combination with the estimated sound pressure levels produced by the helicopter and bird mitigation trial activities, suggests that no pinnipeds, including Steller sea lions, will be exposed to PTS- inducing SELs during project activities. For those very few animals that may remain hauled out as the helicopter approaches, it is expected that they will eventually flush into the water before the helicopter reaches the lower altitudes potentially needed for bait application. It is not expected that any Steller sea lions would remain hauled out once the helicopter begins its descent to these lower altitudes. However, since it is not known what sound levels are associated with the helicopter below 46 m (150 ft), we assume that should the helicopter require descent below 46 m (150 ft) that those few animals that remain hauled out could be exposed to TTS-inducing SELs, but only for a very short period of time.

Human Presence

Animals respond to disturbance from humans in the same way as they respond to the risk of predation, by avoiding areas of high risk, either completely or by using them for limited periods (Gill *et al.* 1996). There is increasing recognition that the effect of human disturbance on wildlife is highly dependent on the nature of the disturbance (Burger *et al*. 1995; Klein *et al.* 1995; Kucey 2005). Generally, human disturbance to hauled out pinnipeds may be categorized by purpose: scientific investigation, ecotourism, and recreation. Of the three types of human disturbances, ecotourists and recreationists are not likely to be aware of the negative impacts that their presence may have on wildlife. Foot traffic at distances of 25-50 m resulted in short-term (several minutes) heart rate increases among Rocky Mountain bighorn sheep in Alberta, Canada (MacArthur *et al.* 1982). Hicks and Elder (1979) studied interactions between humans and California bighorn sheep in the Sierra Nevada Mountains. The authors found that the reactions of sheep to humans were related to distance to humans and to group size and composition.

Scientists often need to closely monitor demographic parameters and their work often present the most intense kinds of disturbance: entering rookeries or haulouts and capturing and handling animals. However, most scientists are aware of the potential harmful effects of their work, and any scientific research permit issued takes into account any potential impacts the research could have on individual animals and the population. Disturbance of elephant seal harems caused by visits by researchers resulted in direct but transient changes in some types of behavior; no long-term changes in behavior (period of weeks) was implied from the comparison made between the areas of high and low human presence (Engelhard *et al.* 2002)

Disturbances resulting from human activity and other causes can impact pinniped haul out behavior (Renouf *et al.* 1981; Schneider and Payne 1983; Terhune and Almon 1983; Allen *et al.* 1984; Stewart 1984; Suryan and Harvey 1999; Mortenson *et al.* 2000; Kucey and Trites 2006), both in the short- and long-term. The apparent skittishness of both harbor seals and Steller sea lions raises concerns regarding behavioral and physiological impacts to individuals and populations experiencing high levels of human disturbance. It is well known that human activity can flush harbor seals off haul out sites (Allen *et al.* 1984; Calambokidis *et al.* 1991; Suryan and Harvey 1999; Mortenson *et al.* 2000). Researchers have also observed that human disturbances in the form of boat traffic and people walking on the beach, can flush seals into the water from haul out sites and impact seal haulout numbers (Renouf *et al.* 1981; Schneider and Payne 1983; Terhune and Almon 1983). Lelli and Harris (2001) found that the level of boat traffic (including motor and paddle boats) in Gun Point Cove, Maine, was, by far, the single strongest predictor of harbor seal haulout numbers. Of the 85 incidents in which harbor seals were flushed, 93% were caused by boats.

The Hawaiian monk seal has been shown to avoid beaches that have been disturbed often by man (Kenyon 1972). Stevens and Boness (2003) concluded that after the 1997-98 El Niño when populations of the fur seal, *Arctocephalus australis*, in Peru declined dramatically, seals abandoned some of their former primary breeding sites, but continued to breed at adjacent beaches that were more rugged (*i.e.*, less likely to be used by humans). Abandoned and unused sites were more likely to have human disturbance than currently used sites. Human disturbance appeared to cause Steller sea lions to desert a breeding area at Northeast Point on St. Paul Island, Alaska (Kenyon 1962).

Dogs

If dogs are used in the trial, the dog(s) on the island will go through a thorough quarantine, vaccination, and de-worming period prior to arrival to avoid any chance of introducing any infectious agent to the island. Since the primary mission of Island Conservation is specifically to avoid any unintentional alien introductions and their possible consequences, the USFWS has a very well developed set of biosecurity measures we have used when bringing dogs onto islands for eradication purposes, both in the U.S. (Channel Islands) and internationally. Any dogs used for gull hazing will be specially trained for the task, will be under voice control and would not roam freely, and will not be used to intentionally disturb marine mammals. Dogs will be confined when not used for hazing, and their feces will be kept out of intertidal haul out areas. Dogs will go through rigorous training not to respond to marine mammals, and if a dog were to be unresponsive to commands on the island and interact with marine mammals in a negative manner, the dog will not be allowed to continue participating in the trial while unleashed.

Visual Stimuli
Visual deterrents for birds have been used for centuries in an attempt to control bird damage in agriculture. The main issue with visual deterrents is habituation. However, a visual deterrent, even if effective for only 3 to 5 days, may provide a less invasive mechanism to deter birds. Visual deterrents provide temporary control at specific locations by attempting to frighten birds by presenting a stimulus that the birds associate with danger (e.g., a predator) or that is novel and startles them. In some cases, unfamiliarity will cause birds to avoid an object. Avoidance of new objects, called novel object response, varies among bird species. Resident birds would have more of an opportunity to be exposed to the visual deterrent, thus can habituate and data show that visual deterrents are most effective with migratory birds. The effect of visual deterrents can be reinforced with other stimuli, such as pyrotechnics and human presence.

Mylar tape, an example of a visual deterrent, moves in the wind and flashes brightly. Depending on the wind speed, the tape may also produce a low-volume humming or cracking noise when it moves. Kites, similar to the mylar tape, may represent a novel stimulus and the noise created from the kite reacting to the wind may also elicit an avoidance response in birds. Lasers are a bird control device that can be used at night or other low-light conditions. Lasers project a highly concentrated beam of red light that startles birds. No ocular or other injury has been reported in birds from lasers (Glahn *et al.* 2000). For humans, ocular injury appears to result only from intentional staring at the laser light close to the diffuser. Thus, as a general rule, the manufacturer recommends that the laser not be pointed within a nominal ocular hazard distance of 43 feet. In fact, as a general practice, a laser should be treated as a firearm and the operator should maintain proper muzzle control (barrel down). Spotlights may represent a novel stimulus for birds, which may elicit an avoidance response. Radio controlled aircraft may disperse birds from a large area as birds are thought to respond to the approach and noise of the aircraft. Model airplanes are highly maneuverable and can be flown to direct the dispersal of birds and appearance of the aircraft itself may also resemble a predator about to attack (painted to resemble a falcon). Radio-controlled model aircraft have been used to harass birds at airports, landfills, and aquaculture facilities.

EXPOSURE ANALYSIS

Exposure analyses are designed to identify the listed resources that are likely to co-occur with these effects in space and time and the nature of that co-occurrence. In this step of our analysis, we try to identify the number, age (or life stage), and gender of individuals that are likely to be exposed to an Action’s effects and the populations or subpopulations those individuals represent.

Steller sea lions are regularly observed hauled out at South Farallon islands. These animals could be present during the proposed project. The probability of their presence in the area of the proposed project is likely to depend on the season, including variable oceanographic conditions, wave height, and availability of prey. Steller sea lions use the island as a haul out site year-round; however, the number of animals varies at each of the haul out locations depending on season. Animals may be disturbed or temporarily displaced from the area. Any behavioral disruptions resulting from the bird mitigation trial activities are expected to be temporary (*e.g.,* animals are expected to return to use the haul out by the end the day) since disturbance of pinnipeds would only last for a short periods of time and would not occur continuously over the 4-week period proposed for the bird mitigation trial. The gulls roost in areas where pinnipeds can be found hauled out on the shore. Accessing the roosts and/or gull hazing techniques may cause incidental Level B (behavioral) harassment of pinnipeds through some unavoidable approaches if pinnipeds are hauled out directly in the area where researchers need to access or if the stimuli are detectable within the haul out sites.

The proposed project would be conducted on the South Farallon Island (see Figures 2 and 3). Most of the gull hazing is expected to occur within Southeast Farallon; however, hazing may be implemented around other areas of the island if gulls attempt to roost. Up to five biologists would be present on the islands to implement the research trail and monitor pinniped disturbance. Since the trial is intended to allow researchers to test an array of gull hazing techniques, the USFWS cannot specify the exact protocol that will be implemented. The trials will be conducted between November 2012 and January 2013, with most likely dates between early November and mid-December and will last about four weeks.

Estimated Exposure

If we assume that 100% of the animals hauled out each of the trial locations for that day might be exposed to trial activities (*i.e.,* elevated sound, helicopter presence, human presence, dogs, or visual stimuli), then this estimate represents the number of times a sea lion might be "taken" in the form of harassment. We do not anticipate any of these sea lions to die or exhibit responses that might constitute harm or injury.

Figures 2 and 3 depict the overlap between Steller sea lion haul out sites and proposed areas to test the gull hazing techniques. The current population of eastern Steller sea lions in the proposed research trial area is estimated to number between 50 and 150 animals. On Southeast Farallon Island, the abundance of females declined an average of 3.6 percent per year from 1974 to 1997 (Sydeman and Allen, 1999). Pup counts on the Farallon Islands have generally varied from five to 15 (Hastings and Sydeman, 2002; PRBO unpub. data). However, the proposed site visits in November and February fall outside of the pupping and breeding seasons for Steller sea lions.

The USFWS estimated take by using the maximum pinniped counts from weekly censuses in November 2006-2011. These numbers represent the highest count ever recorded for Steller sea lions during the month of November since 2006. November typically has the highest pinniped counts compared to December and January (the period when the proposed activity would take place). These numbers represent the best available information on haul outs in the proposed action area. The USFWS' take estimates for the length of the trial result in 56 Steller sea lions.

These estimates are likely conservative because the USFWS used maximum counts and these numbers do not take mitigation measures into consideration. Researchers would attempt to minimize the take of Steller sea lions (*e.g.,* by using hazing methods the farthest possible distance from haul out sites) and Steller sea lions are not known to haul out near typical gull roosts. Frequency of harassment would depend upon the location of the gulls and the success of the hazing operations. Pinnipeds may be disturbed as much as twice per day for the duration of the 4-week trial. Since the USFWS take estimates are based on weekly census counts, they do not account for the maximum 4-week duration of the proposed trial. Thus, it is likely that a maximum of 224 Steller sea lions will be taken by harassment caused by the proposed bird hazing activities which represents approximately 0.42% of eastern DPS Steller sea lions (conservatively using the N_{MIN}). Proposed mitigation measures and minimizing the number of disturbances necessary to successfully complete the trial would greatly reduce the potential harassment caused by the proposed activities.

Response Analysis

Elevated Sound Level Response
Elevated sound levels caused by bird hazing activities may cause harassment of Steller sea lions, both hauled out and in the water (at or directly below the surface). The physical presence of the equipment may also lead to non-acoustic effects on marine mammals involving visual or other cues. Steller sea lions demonstrate a flight response to sudden movements, noises, smells, and approaches (in particular with aircraft and vessels).

Stress Response
Acute responses to sounds may be difficult to quantify, but they are much more tractable to investigation than are responses to repeated or chronic sounds. Classic stress responses begin when an animal's central nervous system perceives a potential threat to its homeostasis. That perception triggers stress responses regardless of whether a stimulus actually threatens the animal; the mere perception of a threat is sufficient to trigger a stress response (Moberg 2000; Sapolsky 2005; Seyle 1950). Once an animal's central nervous system perceives a threat, it mounts a biological response or defense that consists of a combination of the four general biological defense responses: behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune response.

Although stress-induced pathologies have been hard to identify in free-ranging marine mammals, based on work with terrestrial mammals, it is likely that marine mammals would experience similar responses. The stress caused by pursuit and capture activates similar physiological responses in terrestrial mammals (Harlow *et al.* 1992) and cetaceans (St. Aubin and Geraci 1992). In the case of many stressors, the first and most economical (in terms of biotic costs) response is behavioral avoidance of the potential stressor or avoidance of continued exposure to a stressor. An animal's second line of defense to stressors involves the autonomic nervous system and the classical "fight or flight" response, which includes the cardiovascular system, the gastrointestinal system, the exocrine glands, and the adrenal medulla to produce changes in heart rate, blood pressure, and gastrointestinal activity that humans commonly associate with stress. These responses have a relatively short duration and may or may not have significant long-term effect on an animal's welfare.

An animal's third line of defense to a stressor involves its neuroendocrine systems, usually hormones associated with the hypothalmus-pituitary-adrenal system (most commonly known as the HPA axis in mammals or the hypothalamus-pituitary-interrenal axis in fish and some reptiles). Unlike stress responses associated with the autonomic nervous system, virtually all neuroendocrine functions that are affected by stress – including immune competence, reproduction, metabolism, and behavior – are regulated by pituitary hormones. In the majority of stress studies, the HPA axis has been the primary neuroendocrine axis monitored. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction (Moberg 1987; Rivier 1995) and altered metabolism (Elasser *et al*. 2000), immune competence (Blecha 2000) and behavior. Increases in the circulation of glucocorticosteroids (cortisol, corticosterone, and aldosterone in marine mammals) have been equated with stress for many years.

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and distress, is the biotic cost of the response. When stressed, an animal uses glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response does not pose a risk to the animal's welfare.

However, when an animal has insufficient biotic reserves to satisfy the biotic cost of a stress response, then resources must be shifted away from other biotic functions. When sufficient reserves are diverted from these functions, the functions are impaired. For example, when stress shifts metabolism away from growth, young animals no longer thrive, and growth is stunted. When energy is shifted from supporting reproduction, reproductive success is diminished. In these cases, animals have entered a pre-pathological state (pathological state and are experiencing "distress;" *sensu* Seyle 1950) or "allostatic loading" (*sensu* McEwen and Wingfield 2003). This period of distress will last until the animal replenishes its biotic reserves sufficient to restore normal function.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses have also been documented fairly well through controlled experiments; because this physiology exists in every vertebrate that has been studied, it is not surprising that stress responses and their costs have been documented in both laboratory and free-living animals (Holberton *et al*. 1996; Hood *et al*. 1998; Jessop *et al*. 2003; Krausman *et al*. 2004; Lankford *et al*. 2005; Reneerkens *et al*. 2002; Thompson and Hamer 2000). Although no information has been collected on the physiological responses of marine mammals upon exposure to anthropogenic sounds, studies of other marine animals and terrestrial animals would lead us to expect some marine mammals to experience physiological stress responses and, perhaps, physiological responses that would be classified as "distress" upon exposure to certain frequency sounds.

For example, Jansen (1998) reported on the relationship between acoustic exposures and physiological responses that are indicative of stress responses in humans (for example, elevated respiration and increased heart rates). Jones (1998) reported on reductions in human performance when faced with acute, repetitive exposures to acoustic disturbance. Trimper *et al*. (1998) reported on the physiological stress responses of osprey to low-level aircraft noise while Krausman *et al*. (2004) reported on the auditory and physiology stress responses of endangered Sonoran pronghorn to military overflights. Smith *et al*. (2004a, 2004b) identified noise-induced physiological stress responses in hearing-specialist fish that accompanied TTS and PTS hearing losses. Welch and Welch (1970) reported physiological and behavioral stress responses that accompanied damage to the inner ears of fish and several mammals.

Hearing is one of the primary senses marine mammals use to gather information about their environment and to communicate with conspecifics. Although empirical information on the relationship between sensory impairment (TTS, PTS, and acoustic masking) on marine mammals remains limited, it seems reasonable to assume that reducing an animal's ability to gather information about its environment and to communicate with other members of its species would be stressful for animals that use hearing as their primary sensory mechanism. Therefore, we assume that acoustic exposures sufficient to trigger onset PTS or TTS would be accompanied by physiological stress responses because terrestrial animals exhibit those responses under similar conditions (NRC 2003). More importantly, marine mammals might experience stress responses at received levels lower than those necessary to trigger onset TTS. Based on empirical studies of the time required to recover from stress responses (Moberg 2000), we also assume that stress responses are likely to persist beyond the time interval required for animals to recover from TTS and might result in pathological and pre-pathological states that would be as significant as behavioral responses to TTS. It is not expected that Steller sea lions would exhibit the accompanied physiological stress response from exposure to PTS levels, since they are not expected to be exposed to PTS levels. However, for the few animals that may remain hauled out at the water's edge of the Island as the helicopter (see below section on Potential Response to the Helicopter) approaches and could be exposed to TTS levels, they may exhibit the accompanied physiological stress response from exposure to TTS levels. In addition, depending on the proximity of an animal to the Pyrotechnics, Zon Gun or CAPA launcher, it could also be exposed to TTS levels and may exhibit the accompanied physiological stress response from exposure to TTS levels. Any harassment caused by the Biosonics or from noise generated by the radio-controlled aircraft or other visual stimuli (*i.e.*, mylar tape or kite) may cause an animal to leave the haul out temporarily or to exhibit a stress response that would be relatively short in duration and will likely not have significant long-term effect on an animal's welfare.

Potential Responses to the Helicopter

In general, Steller sea lions, like other pinnipeds, select haul out sites and rookeries in areas where there is little disturbance. The aircraft route will use the pre-approved approach and landing protocol already established for the United States Coast Guard which has been used to drop off supplies to the South Farallon Islands. Therefore, it is likely that the haul out sites and rookeries in the South Farallon Islands are at a distance far enough away where the animals are not disturbed or the majority of animals have habituated to these activities along the pre-approved route. Steller sea lions demonstrate a flight response to sudden movements, noises, smells, and approaches (in particular with aircraft and vessels).

Noise generated from helicopter activities may cause harassment of Steller sea lions, both hauled out and in the water (at or directly below the surface). The physical presence of aircraft could also lead to non-acoustic effects on marine mammals involving visual or other cues. Airborne sound from a low-flying helicopter or airplane may be heard by marine mammals while at the surface or underwater. In general, helicopters tend to be noisier than fixed-wing aircraft of similar size, and larger aircraft tend to be louder than those that are smaller. Underwater sounds from aircraft are strongest just below the surface and directly under the aircraft. Noise from aircraft would not be expected to cause direct physical effects but have the potential to affect behavior. The primary factor that may influence abrupt movements of animals is engine noise, specifically changes in engine noise. Responses by mammals could include hasty dives or turns, change in course, or flushing and stampeding from a haul out site. There are few well-documented studies of the impacts of aircraft overflight over pinniped haul out sites or rookeries, and many of those that exist, are specific to military activities (Efroymson *et al.* 2001). Several factors complicate the analysis of long- and short-term effects for aircraft overflights. Information on behavioral effects of overflights by military aircraft (or component stressors) on most wildlife species is sparse. Moreover, models that relate behavioral changes to abundance or reproduction, and those that relate behavioral or hearing effects thresholds from one population to another are generally not available. In addition, the aggregation of sound frequencies, durations, and the view of the aircraft into a single exposure metric is not always the best predictor of effects and may also be difficult to calculate. Overall, there has been no indication that single or occasional aircraft flying above pinnipeds in-water cause long-term displacement of these animals (Richardson *et al*. 1995). The Lowest Observed Adverse Effects Levels

(LOAELs) are rather variable for pinnipeds on land, ranging from just over 150 m (492 ft) to about 2000 m (6,562 ft) (Efroymson *et al.* 2001). A conservative (90th percentile) LOAEL according to Efroymson et al. (2001) is 1150 m. Most thresholds represent movement away from the overflight. Bowles and Stewart (1980) estimated an LOAEL of 305 m (1,000 ft) for helicopters (low and landing) in California sea lions and harbor seals observed on San Miguel Island, CA; animals responded to some degree by moving within the haulout and entering into the water, stampeding into the water, or clearing the haulout completely. Both species always responded with the raising of their heads. California sea lions appeared to react more to the visual cue of the helicopter than the noise. Thus, if we assume the most "severe" reaction described by Bowles and Stewart (1980) would occur at the Island, then it is likely that a helicopter conducting hazing techniques would cause 100% of the animals to flush into the water. However, animals are expected to resume their migration, feeding, or other behaviors without consequences to their survival or reproduction from aerial disturbance (Kucey 2005) at the end of the work day. See *Stress Response* under the *Elevated Sound Potential Response* section above for more specific information on the potential stress response from noise generated by the helicopter.

Potential Responses to Human Presence
Potential impacts on sea lions from human disturbance could range from a physiological stress response, to sea lions leaving the haul out either temporarily or permanently (Orsini 2004). Short-term effects of human presence include disruptions of sea lion daily activities and potential redistribution of animals within and among sites. However, the effects of repeated short-term disturbance at the population level are unknown, particularly in research-related disturbances (NMFS 2002). Displacements may increase population numbers and density at alternate sites or force individuals to inhabit sub-optimal habitat (Creel *et al.* 2002).

Long-term effects of human disturbance that significantly reduces the time that sea lions haul out, or substantially interferes with the activity pattern of hauled out sea lions, could potentially have consequences on life cycles and activities (Orsini 2004). Steller sea lion research in Alaska and British Columbia has focused on both the western DPS (declining) and eastern DPS (increasing) populations. Comparable research on both these populations has not revealed any discernable negative effects on either population. Constantine *et al.* (2004) argued that the long-term effects of reduced resting behavior on long-lived species, such as sea lions, might affect their fitness, individual reproductive success and population size; however, the lack of any obvious long-term effect and the apparent resilience of sea lions to human encroachment and hunting pressures, argues in favor of the resiliency of sea lions to intermittent disturbances (Kucey 2005). Sea lions at certain haul out sites may become habituated to repeated disturbance stimuli, or conversely, may exhibit increased levels of response (Frid and Dill 2002). However, sea lions can still experience continued physiological stress with frequent human approach despite an apparent habituated response to high levels of intrusion (Fowler 1999). Regardless of the level of habituation, Kucey (2005) determined that it was clear that Steller sea lions demonstrate a flight response to sudden movements, noises, smells, and approaches (in particular with aircraft and vessels).

Stress Responses
Acute responses to sounds may be difficult to quantify, but they are much more tractable to investigation than are responses to repeated or chronic sounds. Classic stress responses begin when an animal's central nervous system perceives a potential threat to its homeostasis. That

perception triggers stress responses regardless of whether a stimulus actually threatens the animal; the mere perception of a threat is sufficient to trigger a stress response (Moberg 2000; Sapolsky 2005; Seyle 1950). Once an animal's central nervous system perceives a threat, it mounts a biological response or defense that consists of a combination of the four general biological defense responses: behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune response.

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An animal's third line of defense to a stressor involves its neuroendocrine systems, usually hormones associated with the hypothalmus-pituitary-adrenal system (most commonly known as the HPA axis in mammals or the hypothalamus-pituitary-interrenal axis in fish and some reptiles). Unlike stress responses associated with the autonomic nervous system, virtually all neuroendocrine functions that are affected by stress – including immune competence, reproduction, metabolism, and behavior – are regulated by pituitary hormones. In the majority of stress studies, the HPA axis has been the primary neuroendocrine axis monitored. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction (Moberg 1987; Rivier 1995) and altered metabolism (Elasser *et al*. 2000), immune competence (Blecha 2000) and behavior. Increases in the circulation of glucocorticosteroids (cortisol, corticosterone, and aldosterone in marine mammals) have been equated with stress for many years.

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However, when an animal has insufficient biotic reserves to satisfy the biotic cost of a stress response, then resources must be shifted away from other biotic functions. When sufficient reserves are diverted from these functions, the functions are impaired. For example, when stress shifts metabolism away from growth, young animals no longer thrive, and growth is stunted. When energy is shifted from supporting reproduction, reproductive success is diminished. In these cases, animals have entered a pre-pathological state (pathological state and are experiencing "distress;" *sensu* Seyle 1950) or "allostatic loading" (*sensu* McEwen and Wingfield 2003). This period of distress will last until the animal replenishes its biotic reserves sufficient to restore normal function.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses have also been documented fairly well through controlled experiments; because this physiology exists in every vertebrate that has been studied, it is not surprising that stress responses and their costs have been documented in both laboratory and free-living animals (Holberton *et al*. 1996; Hood *et al*. 1998; Jessop *et al*. 2003; Krausman *et al*. 2004; Lankford *et al*. 2005; Reneerkens *et al*. 2002; Thompson and Hamer 2000). Although no information has been collected on the physiological responses of marine mammals upon exposure to anthropogenic sounds, studies of other marine animals and terrestrial animals would lead us to expect some marine mammals to experience physiological stress responses and, perhaps, physiological responses that would be classified as "distress" upon exposure to certain frequency sounds.

Behavioral/Disturbance Responses

There is mounting evidence that wild animals respond to human disturbance in the same way that they respond to predators (Beale and Monaghan 2004; Frid 2003; Frid and Dill 2002; Gill *et al*. 2000; Gill *et al.* 2001; Harrington and Veitch 1992; Lima 1998; Romero 2004). Based on the evidence available, marine mammals are likely to exhibit several behavioral responses upon being exposed to loud sound transmissions. They will: try to avoid exposure, respond to the exposure as they would respond to other human activities (behavioral disturbance), experience social disruptions, exhibit behaviors associated with distress (see the Stress Response Section), habituate to the stressors, or they will not respond. These responses manifest themselves as stress responses (in which an animal perceives human activity as a potential threat and undergoes physiological changes to prepare for a flight or fight response or more serious physiological changes with chronic exposure to stressors), interruptions of essential behavioral or physiological events, alteration of an animal's time budget, or some combinations of these responses (Frid and Dill 2002; Romero 2004; Sapolsky *et al*. 2000; Walker *et al*. 2005). These responses have been associated with abandonment of sites (Sutherland and Crockford 1993), reduced reproductive success (Giese 1996; Mullner *et al*. 2004), and the death of individual animals (Daan *et al*. 1996; Feare 1976). The narratives that follow summarize the information available on these behavioral responses and since there isn't a wealth of information on a marine mammal's response to human disturbance, we assume that marine animals would likely follow similar responses to other wild animals, even though the studies presented were not all conducted on marine mammals.

When encountering disturbance stimuli, ranging from the low-flying helicopter to the wildlife photographer, an animal's response appears to follow the same economic principles used by prey when they encounter predators (Berger *et al*. 1983; Madsen 1994; Gill *et al*. 1996, 2001; Gill and Sutherland 2000). This verbal model is called the risk-disturbance hypothesis. It predicts that responses by disturbed animals track short-term changes in factors characterizing disturbance stimuli, with responses being stronger when perceived risk is greater. The level of perceived risk may result from a combination of factors that characterize disturbance stimuli, along with factors related to natural predation risk (Frid 2001; Papouchis *et al*. 2001).

Existing studies of behavioral effects of man-made sounds in marine environments remain inconclusive, partly because of their limited ability to detect behavioral changes that are significant to the biology of the individual animals being observed. These studies are further complicated by the variety of responses that can occur within a single species of marine mammals, which can exhibit a wide range of responses to man-made noise that can vary by individuals and their circumstances. Under certain circumstances, some individuals will continue the normal activities in the presence of high levels of man-made noise; in other circumstances, the same individual or other individuals may avoid an acoustic source at much lower received levels (Richardson *et al*. 1995).

Determining the significance of noise disturbance to marine mammals remains a challenge for scientists. A workshop held by the National Research Council in 2004, examined the threshold for "biologically significant" effects of noise on marine mammals; that is, noise from an action that affects the ability of an animal to grow, survive, and reproduce. These can also have population-level consequences and affect the viability of the species. The National Research Council recommended that a predictive model be developed to determine the biological significance of behavioral change in response to noise. The consensus of participants in the workshop was that at least a decade would be required to have the data and understanding to turn such a conceptual model into a functional tool (NRC 2005).

Potential Responses to Dog Presence

Potential impacts on sea lions from disturbance caused by the presence of dogs could range from a physiological stress response, to sea lions leaving the haulout either temporarily or permanently. Short-term effects of dog presence include disruptions of sea lion daily activities and potential redistribution of animals within and among sites. However, the effects of repeated short-term disturbance at the population level are unknown. Dogs have been used to deter California sea lions from bait receivers with mixed success. See section above on *Potential Responses to Human Presence* and the subsection on *Stress Response* as it is expected that the presence of dogs would have similar effects, particularly an animal's reaction to the presence of a potential predator.

Potential Responses to Visual Stimuli

Potential impacts on sea lions from disturbance caused by visual stimuli could range from a physiological stress response to sea lions leaving the haulout temporarily. Short-term effects of visual stimuli include disruptions of sea lion daily activities and potential redistribution of animals within and among sites. However, the effects of repeated short-term disturbance at the population level are unknown. See section above on *Potential Responses to Elevated Sound Levels and Human Presence* and the subsection on *Stress Response* as it is expected that the potential response to visual stimuli would have similar, if not milder, effects on Steller sea lions.

Probable Responses of Steller sea lions to the proposed action

Since Steller sea lions are skittish by nature, it is likely that loud, frequent, unfamiliar noises are likely to disrupt resting sea lions or those foraging in the water near the sound source. Steller sea lions would likely abandon haulouts, or dive if foraging in the water, if disturbed by project activities. Generally, animals return to their previous behavior within an hour (Porter 1997) or a few days (Kucey 2005), depending on the level and length of disturbance.

Elevated Sound Levels

Responses by Steller sea lions to elevated sound levels near their haul out site could flushing and stampeding from a haul out site. It is expected that Steller sea lions would respond to some degree by moving within the haulout and entering into the water, stampeding into the water, or clearing the haulout completely. It is expected that 100% of the animals hauled out would flush into the water as a result of project activities, particularly if the Pyrotechnics, Zon Gun, CAPA launcher, and helicopter noise were in close proximity to the haul out sites.

Helicopter

Responses by Steller sea lions to the approach of a helicopter near their haul out site could include hasty dives or turns, change in course, or flushing and stampeding from a haul out site. There are few well-documented studies of the impacts of aircraft overflight over pinniped haul out sites or rookeries, and those that exist are specific to military activities (Efroymson *et al.* 2001). Overall, there has been no indication that single or occasional aircraft flying above pinnipeds in-water cause long-term displacement of these animals (Richardson *et al*. 1995). It is expected that, as observed by Bowles and Stewart (1980), Steller sea lions would react similarly to aircraft (including visual cues) as California sea lions and harbor seals that were observed on San Miguel Island, CA; animals responded to some degree by moving within the haulout and entering into the water, stampeding into the water, or clearing the haulout completely. Both species always responded with the raising of their heads. It is expected that 100% of the animals hauled out would flush into the water as a result of project activities, particularly the presence of the helicopter.

Human Presence

Determining the effects of human disturbance on individual Steller sea lion behavior depends on what is considered normal or baseline behavior. Kucey (2005) determined that significant seasonal differences in the behaviors between Steller sea lions that remained on land and those that returned to the water did exist. Animals that returned to the water showed a decrease in rates of total numbers of behaviors and interactions in the winter/spring, when compared to summer, and an increase following a research disturbance. Seasonal considerations that may have affected haulout behavior may include: reproductive status, prey availability correspondence to foraging efforts, distances traveled between haul out sites and rookeries, and possible climate conditions on the haulout or in the water. Individual sea lions took longer to "settle down" in winter/spring than in summer. This may be related to the fact that sea lions typically spend longer at sea during winter/spring months (Merrick and Loughlin 1997; Sease and York 2003), and may behave differently onshore after their winter trips. Kucey (2005) who observed that it took sea lions longer to "settle down" in winter/spring than in summer, determined that this may be explained by weather conditions or fatigue due to greater physical exertion during the trips (*i.e.,* sea lions may need more rest after winter trips and are less likely to flush completely, but may shift around the haul out site or show signs of "agitation" before resting).

In addition, Kucey (2005) observed similar rates of behavior for animals remaining on land, but substantially different rates among age and sex classes for animals that returned to the water. Such age and sex class behavioral differences may be related to the social, physical, or reproductive status of individual animals and their varying energetic expenditures (Harkonen *et al.* 1999). From spring to summer breeding seasons, sea lions distribute themselves within and among sites according to their reproductive status. Disturbance that displaces adult male sea lions from their territories, for example, especially during the breeding season, increases the likelihood of aggressive interactions occurring among males (NMFS 2002). In contrast, adult males may also provide a stabilizing influence in the summer months that shortens the time it takes the other sea lions to "settle down" after hauling out. Lewis (1987; *in* Richardson *et al.* 1995) reported 22 out of 23 stampedes of Steller sea lions were caused by human disturbance during censuses. Although a few pups were killed, there were changes in some animals' behavior, which included reduced mother-pup contact.

Overall, Steller sea lions showed a short-term effect of disturbance at a local population level, whereby mean numbers of sea lions using haul out sites dropped following a major disturbance, and according to Kucey (2005), did not recover for 2-4 days.

Dog Presence

Similar to human presence (see above in this Section on *Human Presence*) determining the effects of human disturbance on individual Steller sea lion behavior depends on what is considered normal or baseline behavior. Overall, as described in detail above, the studies by Kucy (2005), Steller sea lions would show a short-term effect of disturbance at a local population level, whereby mean numbers of sea lions using haul out sites dropped following a major disturbance. It is expected that 100% of the animals hauled out would flush into the water as a result of project activities.

Visual Stimuli

Similar to human presence (see above in this Section on *Human Presence*) determining the effects of human disturbance on individual Steller sea lion behavior depends on what is considered normal or baseline behavior. Overall, as described in detail above, the studies by Kucy (2005), Steller sea lions would show a short-term effect of disturbance at a local population level, whereby mean numbers of sea lions using haul out sites dropped following a major disturbance. It is expected that 100% of the animals hauled out would flush into the water as a result of project activities.

VI. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

During this consultation, NMFS searched for information on future Federal, State, tribal, local, or private actions that were reasonably certain to occur in the action area. The action area is part of the National Marine Sanctuaries; thus, any future projects would likely need a federal permit from NOAA and the USFWS.

VII. INTEGRATION AND SYNTHESIS OF EFFECTS

NMFS' Office of Protected Resources Permits and Conservation Division proposes to issue an IHA for incidental takes that would occur during the surveys, pursuant to MMPA section 101(a)(5)(D).

In this assessment, we measure risks to listed individuals using changes in the individual's "fitness" or the individual's growth, survival, annual reproductive success, and lifetime reproductive success. When we do not expect listed plants or animals exposed to an action's effects to experience reductions in fitness, we would not expect the action to have adverse consequences on the viability of the populations those individuals represent or the species those populations comprise (Anderson 2000; Mills and Beatty 1979; Brandon 1978; Stearns 1977, 1992). As a result, if we conclude that listed plants or animals are *not* likely to experience reductions in their fitness, we would conclude our assessment.

The following narratives summarize the probable risks the proposed project poses to Steller sea lions, over a one year period. These summaries integrate the results of the *Exposure* and *Response* analyses presented in previous sections of this biological opinion. It is reasonable to assume that the proposed project will create sounds within the Steller sea lion's hearing range. However, as mentioned previously in the *Effects* section, we do expect the project to result in the incidental harassment of animals, but no pinnipeds, including Steller sea lions, will be exposed to loud enough sounds to impact their hearing.

Steller sea lions likely to be exposed to the proposed project include those animals from the eastern DPS. The minimum size of the population can be estimated as the actual count of hauled out sea lions of 52,847 (as corrected); this does not account for animals at sea (Angliss and Allen *et al.* 2012). We assume any age or gender may be exposed, however since the work window is outside of the pupping season, few, we do not expect any exposure to newborn pups. In addition, although the overall trend for the eastern DPS stock of Steller sea lions is showing an increase, the stock is declining in the southern portion of its range, which includes California and the action area.

For the purposes of this biological opinion, if Steller sea lions are present, we assumed that 100% of the animals hauled out might be exposed bird hazing trial activities and this represents the number of individuals that might be "taken" in the form of harassment. If on land, the animals will likely depart from the haulout into the water, swim with their head above water, vocalize, or dive. If the disturbance persists, animals may vacate and depart from the area near the source of disturbance. A maximum of about 224 animals are expected to be taken by harassment as a result of proposed bird hazing trial activities. As mentioned previously, the minimum population estimate for the eastern DPS of Steller sea lions is 52,847; therefore, this project may incidentally harass 0.42% of the total population annually.

The only type of harassment expected is displacement. We expect no mortality or injury to Steller sea lions, in particular to younger animals, since the research activities will be conducted outside of the pupping season and the risk of stampedes is reduced by the proposed approach measures to each bird hazing site. Critical habitat has been defined for Steller sea lions as a 3,000 foot buffer around all major haul-outs and rookeries, as well as associated terrestrial, air, and aquatic zones, which includes Southeast Farallon Island. The USFWS' proposed activity is not expected to result in the physical alteration of marine mammal habitat.

The disturbance responses associated with direct effects of project activities are expected to have short duration; they are likely to result in acute stress responses (*e.g.*, physiological and hormonal changes in animals that are normally associated with "fight or flight" responses), but not likely to impair the overall health of sea lions by depleting their energy reserves since the response intensity and duration is not likely to exceed the received threshold above 90dBA re 20 μPa_{RMS} ,where we would expect permanent impacts.

It is not expected that this project will impact the prey base; therefore depletion of energy reserves via a lack of a food source, is also not expected. Some of the same Steller sea lions may be exposed multiple times over the course of the project, but these actions are not likely to impair the overall health of those sea lions by depleting their energy reserves since the response intensity and duration is not likely to exceed the threshold where we would expect permanent impacts (above the received level of 90dBA re 20 μPa_{RMS}). Although we acknowledge that some individuals may suffer reduced fitness (from stress caused by the harassment) due to effects of the proposed action, we do not expect that a large proportion of Steller sea lions using the project site would suffer reduced fitness (that is, their response to the proposed action is not expected to reduce a sea lion's probability of surviving to age "x" and its probability of reproducing at age "x"), and therefore, we do not expect a subpopulation effect. In addition, any effects of the action on individual fitness would likely not exceed the natural variability in the subpopulation. Because we do not expect the action to have adverse consequences on the viability of the subpopulations that sea lions in the action area represent, we would not expect the eastern DPS population of Steller sea lions to experience reductions in reproduction, numbers, or distribution that might appreciably reduce their likelihood of surviving and recovering in the wild. Given this and the likely response by Steller sea lions to the proposed project (*i.e.*, harassment as defined in this document), individual Steller sea lions are likely to be adversely affected by human presence during proposed project activities, but as mentioned previously, the proposed project is not expected to appreciably reduce the eastern DPS of Steller sea lion's likelihood of surviving or recovering in the wild.

Although the biological significance of the animal's behavioral responses to bird hazing trial activities remains unknown, exposure to human presence are likely to disrupt one or more behavioral patterns that are essential to an individual animal's life history or to the animal's contribution to a population. For the proposed action, behavioral responses that result from human presence and any associated disruptions, are expected to be temporary and are not likely to affect the reproduction, survival, or recovery of the Steller sea lion.

As mentioned previously, no impact on the population size or breeding stock of Steller sea lions is expected to occur. The movement to the water is expected to be gradual, as opposed to a stampede, due to the disturbance minimization approach technique (see *Terms and Condition 1*). During bouts of bird hazing activities some animals may be temporarily displaced and either raft in the water or relocate to other haul out sites. Most animals are expected to return soon after activities cease for that day. The long term effect on the island as a rookery and haulout is expected to be negligible.

We do expect that the action will result in the incidental harassment of Steller sea lions, as defined in the MMPA, even though mitigation measures will be in place. These measures will reduce the severity of the harassment, but will not resolve the likelihood of incidental harassment.

VII. CONCLUSION

After reviewing the best available scientific information and commercial information on the current status of the threatened Steller sea lion, the environmental baseline for the action area, the effects of the action proposed for November through January, and the cumulative effects, it is NMFS' biological opinion that the United States Fish and Wildlife Service's bird mitigation hazing trial activities on South Farallon Island may adversely affect, but are not likely to jeopardize, the continued existence of Steller sea lions under NMFS' jurisdiction.

VIII. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibits the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not the purpose of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary and must be implemented by the Unites States Fish and Wildlife Service and NMFS-OPR in order for the exemption in section 7(o)(2) to apply. If either of these entities fails to implement and adhere to the terms and conditions of this Incidental Take Statement, the protective coverage of section 7(o)(2) may lapse.

A marine mammal species or population stock which is listed as threatened or endangered under the ESA is, by definition, also considered depleted under the MMPA. The ESA allows takings of threatened and endangered marine mammals only if authorized by section 101(a)(5) of the MMPA. Until the proposed action receives authorization for the incidental taking of marine mammals under section 101(a)(5)(D) of the MMPA, the incidental takes of marine mammals described below are not exempt from the taking prohibition of section 9(a), pursuant to section 7(o) of the ESA. The Unites States Fish and Wildlife Service submitted an application for an Incidental Harassment Authorization on April 17, 2012. Issuance of an Incidental Harassment Authorization is anticipated by November 2012.

Amount or Extent of the Take Anticipated

The effects analyses contained in this biological opinion concluded that individual Steller sea lions may be exposed to and are likely to respond to human presence associated with the proposed bird hazing trial activities.

This biological opinion concluded that Steller sea lions are likely to be exposed to and likely to respond to elevated sound levels, presence of helicopter, humans, and dogs, and visual stimuli in ways that constitute "harassment" for the purposes of the ESA. The closer these seals are to the activities and the greater the number of times they are exposed to these activities, the greater their likelihood of being exposed to and responding to, that exposure. Based on our analysis, NMFS does not expect any Steller sea lions to be injured or killed as a result of exposure to the proposed action (refer to the *Effects of the Action* section of this biological opinion for further discussion).

For the purposes of this biological opinion and Incidental Take Statement, we assumed that 100% of the animals hauled out at South Farallon Island might be exposed to bird hazing trial activities, and this represents the number of times a sea lion might be "taken" in the form of harassment.

The estimated 224 individual animals expected to be taken by harassment does not take into account that multiple individuals may be exposed more than once during each day and it is expected that some of the same individuals will be impacted throughout the day's abalone research activity. The minimum population estimate for the eastern DPS of Steller sea lions is 52,847, therefore this project may incidentally harass 0.42% of the total minimum population, annually.

It is estimated that approximately 224 individual Steller sea lions could be potentially affected by Level B behavioral harassment over the course of the proposed IHA. Estimates of the numbers of marine mammals that might be affected are based on consideration of the number of marine mammals that could be disturbed appreciably by approximately four weeks of bird hazing trial activities between November and January during the course of the proposed activity. All of the potential takes are expected to be Level B behavioral harassment only. Because of the mitigation measures that will be required and the likelihood that some pinnipeds will avoid the area during restoration and maintenance activities, no injury or mortality to pinnipeds is expected or requested.

Effect of Take

In the accompanying Biological Opinion, NMFS has determined that this level of anticipated take is not likely to result in jeopardy to the species.

Reasonable and Prudent Measures

NMFS believes the following reasonable and prudent measures are necessary and appropriate for the USFWS and NMFS-OPR to minimize the impacts of incidental take on threatened and endangered species:

1. In order to minimize take of eastern Steller sea lions, all activities must comply with the IHA issued under section 101(a)(5)(D) and 50 CFR 216.107.

2. In order to minimize take of eastern Steller sea lions, researchers must not approach beaches if predators are visible in the area.

3. Require that the United States Fish and Wildlife shall immediately cease bird hazing trial activities should an injured or dead Steller sea lion be found on South Farallon Island; and that injury or death is attributed, by NMFS, to bird hazing trial activities.

4. Require that the United States Fish and Wildlife shall monitor and report the implementation of measures described in the terms and conditions and evaluate mitigation measures and results of the monitoring program.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Endangered Species Act of 1973, as amended, the agencies must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline reporting and monitoring requirements, as required by the section 7 regulations (50 CFR 402.14(i)).

In addition to implementing the proposed mitigation measures NMFS-OPR as detailed in the Description of the Action section of this Biological Opinion, include the following Terms and Conditions to implement the Reasonable and Prudent Measures:

1. A copy of the Incidental Take Statement and IHA must be in the possession of each researcher operating under the authority of the IHA.

2. USFWS shall implement measures to reduce the risk of disturbance by selecting judicious routes of approach to gull roosts, avoiding close contact with Steller sea lions hauled out on shore, and the use of extreme caution upon approach. In no case will marine mammals be deliberately approached by bird trial personnel, and in all cases every possible measure will be taken to select a pathway of approach to study sites that minimizes the number of Steller sea lions potentially harassed. In general, researchers will stay inshore of Steller sea lions whenever possible to allow maximum escape to the ocean.

3. Provide instructions to bird trial research personnel on appropriate conduct when in the vicinity of hauled out marine mammals. Bird trial research personnel should attempt to avoid unnecessary noise while on South Farallon Island.

4. Bird trial research personnel must monitor for predators and not approach hauled out areas if killer whales or great white sharks are seen. Steller sea lions must not be disturbed until the area is free of predators. At least one NMFS approved protected species observer should be designated as the biological monitor during bird trial research activities.

5. Interim monitoring reports shall be submitted to NMFS-SWR on a monthly basis during the research work window. In addition, a comprehensive Draft Interim Monitoring Report shall be submitted to NMFS-SWR at the conclusion of and within 90 days of, the work window for that year. A Final Interim Monitoring Report must be submitted to the SWR Regional Administrator within 30 days after receiving comments from the SWR Regional Administrator on the Draft Interim Report. If no comments are received from NMFS, the Draft Interim Monitoring Report will be considered to be the final report. Information to be included in the reports is detailed in the Incidental Harassment Authorization Permit requirement for this action.

6. If an animal has died or become injured in the vicinity the South Farallon Island, all operations must cease and officials must immediately notify the SWR Stranding Coordinator at 562-980-3230 and the Marine Mammal Center at 707-465-6265. Officials must also contact the SWR Protected Resources Division at 562-980-3232 before resuming operations to determine if the death was attributed to project activities.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Endangered Species Act (Act) directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. NMFS has identified no conservation recommendations at this time.

REINITIATION NOTICE

This concludes formal consultation on the NMFS' proposal to permit the United States Fish and Wildlife Service to conduct abalone research activities during November and February. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of authorized take is exceeded, NMFS must immediately request reinitiation of section 7 consultation.

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