

**NATIONAL MARINE FISHERIES SERVICE
ENDANGERED SPECIES ACT SECTION 7
BIOLOGICAL AND CONFERENCE OPINION**

Title: Biological and Conference Opinion on the Issuance of Scientific Research Permit Nos. 22289, 22293, and 22298 to the National Marine Fisheries Service's Marine Mammal Laboratory, Alaska SeaLife Center, and Alaska Department of Fish and Game for Research on Steller Sea Lions

Consultation Conducted By: Endangered Species Act Interagency Cooperation Division, Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce

Action Agency: Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce

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1 INTRODUCTION

The Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 et seq.) establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat they depend on. Section 7(a)(2) of the ESA requires Federal agencies to insure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitat. Federal agencies must do so in consultation with National Marine Fisheries Service (NMFS) for threatened or endangered species (ESA-listed), or designated critical habitat that may be affected by the action that are under NMFS jurisdiction (50 C.F.R. §402.14(a)). If a Federal action agency determines that an action “may affect, but is not likely to adversely affect” endangered species, threatened species, or designated critical habitat and NMFS concur with that determination for species under NMFS jurisdiction, consultation concludes informally (50 C.F.R. §402.14(b)).

The Federal action agency shall confer with the NMFS for species under NMFS jurisdiction on any action which is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat (50 C.F.R. §402.10). If requested by the Federal agency and deemed appropriate, the conference may be conducted in accordance with the procedures for formal consultation in §402.14.

Section 7(b)(3) of the ESA requires that at the conclusion of consultation, or conference if combined with a formal consultation, NMFS provides an Opinion stating whether the Federal agency’s action is likely to jeopardize ESA-listed species or destroy or adversely modify designated critical habitat. If NMFS determines that the action is likely to jeopardize listed species or destroy or adversely modify critical habitat, NMFS provides reasonable and prudent alternatives that can be taken by the Federal agency or the applicant and allow the action to proceed in compliance with section 7(a)(2) of the ESA. If an incidental take is expected, section 7(b)(4) requires NMFS to provide an incidental take statement that specifies the impact of any incidental taking on the species and includes reasonable and prudent measures NMFS considers necessary or appropriate to minimize such impacts and terms and conditions to implement the reasonable and prudent measures.

The action agency for this consultation is the NMFS, Office of Protected Resources, Permits and Conservation Division (hereafter the Permits and Conservation Division). The Permits and Conservation Division proposes to issue three scientific research permits (Section 3) pursuant to section 10(a)(1)(A) of the ESA, section 104 of the Marine Mammal Protection Act (MMPA) of the 1972, as amended (16 U.S.C. 1361 et seq.), and the Fur Seal Act of 1966, as amended (16 U.S.C. 1151 et seq.). Permit No. 22289 will be issued to NMFS’ Marine Mammal Laboratory (MML), 7600 Sand Point Way N.E., Seattle, Washington 98115. Permit No. 22293 will be issued to the Alaska SeaLife Center (ASLC), 301 Railway Avenue, Seward, Alaska 99664. Permit No. 22298 will be issued to the Alaska Department of Fish and Game (ADF&G), 1255 W 8th St, Juneau, Alaska 99802. The purpose of the proposed permits are to allow an exception to

the moratorium and prohibition on takes established under the ESA and MMPA in order to allow the MML, ASLC, and ADF&G to conduct scientific research on Steller sea lions in the surrounding waters of California, Oregon, Washington, and Alaska on the U.S. West Coast.

Under the ESA 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 as “an act which actually kills or injures fish or wildlife and may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering.” While the U.S. Fish and Wildlife Service further defines harass by regulation (50 C.F.R. §17.3), until NMFS promulgates a regulatory definition, we rely on NMFS’ interim guidance, which defines harass as an act that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering” (NMFSPD 02-110-19).

Under the MMPA take is defined as “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal (16 U.S.C. 1361 et seq.) and further defined by regulation (50 C.F.R. §216.3) as “to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal.” This includes, without limitation, any of the following:

- The collection of dead animals, or parts thereof;
- The restraint or detention of a marine mammal, no matter how temporary;
- Tagging a marine mammal;
- The negligent or intentional operation of an aircraft or vessel;
- The doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal;
- Feeding or attempting to feed a marine mammal in the wild.

For purposes of this action, the two levels of MMPA harassment are further defined under the MMPA as any act or pursuit, torment, or annoyance which:

- Has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); 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 (Level B harassment). Under NMFS regulation, MMPA Level B harassment does not include an act that has the potential to injure a marine mammal or marine mammal stock in the wild.

NMFS’ interim ESA harass definition does not specifically equate to MMPA Level A or Level B harassment, but shares some similarities with both in the use of the terms “injury/injure” and a focus on a disruption of behavior patterns. Since the proposed permits will authorize take under both the ESA and MMPA, our ESA analysis, which relies on NMFS’ interim guidance on the

ESA term harass, may result in different conclusions than those reached by the Permits and Conservation Division in their MMPA analysis. Given the differences between the MMPA and ESA standards for harassment, there may be circumstances in which an act is considered harassment, and thus take, under the MMPA but not the ESA.

This consultation, biological and conference opinion (Opinion) was completed in accordance with section 7(a)(2) of the statute (16 U.S.C. 1536 (a)(2)), associated implementing regulations (50 C.F.R. §§402.01-402.16), and agency policy and guidance conducted by NMFS Office of Protected Resources Endangered Species Act Interagency Cooperation Division (hereafter referred to as “we”). This Opinion was prepared by NMFS’ Office of Protected Resources Endangered Species Act Interagency Cooperation Division (ESA Interagency Cooperation Division) in accordance with section 7(b) of the ESA and implementing regulations at 50 C.F.R. Part 402.

This document represents the NMFS’ Office of Protected Resources ESA Interagency Cooperation Division’s opinion on the effects of the proposed actions under Permit Nos. 22289, 22293, and 22298 on Cook Inlet Distinct Populations Segment (DPS) beluga whales, blue whales, bowhead whales, fin whales, Western North Pacific population of gray whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, Southern Resident DPS of killer whales, North Pacific right whales, sei whales, sperm whales, Beringia DPS of bearded seals, Guadalupe fur seals, Arctic subspecies of ringed seals, Western DPS of Steller sea lions, East Pacific DPS of green sea turtles, non-Mexico Pacific breeding colony areas of olive ridley sea turtles, leatherback sea turtles, North Pacific Ocean DPS of loggerhead sea turtles, Puget Sound/Georgia Basin DPS of bocaccio, Lower Columbia River, Puget Sound, Snake River Fall-Run, and Upper Columbia River Spring-Run evolutionarily significant units (ESU) of chinook salmon, Columbia River and Hood Canal Summer-Run ESU of chum salmon, Lower Columbia River ESU of coho salmon, Southern DPS of eulachon, Southern DPS of north American green sturgeon, Ozette Lake and Snake River ESU of sockeye salmon, Lower Columbia River, Middle Columbia, Puget Sound, Snake River, and Upper Columbia River DPS of steelhead trout, and Puget Sound/Georgia Basin DPS of yelloweye rockfish as well as designated critical habitat for Western DPS of Steller sea lions, North Pacific right whale, and proposed critical habitat for Arctic subspecies of ringed seals. A complete record of this consultation is on file at the NMFS Office of Protected Resources in Silver Spring, Maryland.

1.1 Background

The research permit applicants and scientists at the MML, ASLC, and ADF&G have a wide range of experience conducting Steller sea lion research and are long-term marine mammal researchers. As such, we have previously conducted ESA section 7 consultations on Steller sea lion research permits for these applicants. It is important to note that a Section 7 consultation for years 2014 through 2019 did not occur due to the Permits the Conservations Division’s use of the preexisting 2009 re-initiated Biological Opinion on the 2007 Programmatic Environmental

Impact Statement for Research on Steller Sea Lion and Northern Fur Seals (NMFS 2007b; NMFS 2009).

The MML's proposed research activities under Permit No. 22298 is a continuation of work conducted under Permit Nos. 18528 (2014 through 2019); 14326 and 14327 (2009 through 2014); 782-1889 (2007 through 2009); 782-1702 and 782-1768 (2006 through 2007); 782-1768-00 (2005 through 2006), and as such have a similar action area and scope of work as the current permit application. The previous opinions for each of these research permits determined that the authorized research activities were not likely to jeopardize the continued existence of ESA-listed species nor result in destruction or adverse modification of designated critical habitat (NMFS 2005; NMFS 2006; NMFS 2007a; NMFS 2009).

The ASLC's proposed research activities under Permit No. 22293 is a continuation of work conducted under Permit No. 18438 (2014 through 2019); 14334, 14328, and 14335 (2009 through 2014); 881-1890, 881-1893, and 881-1745 (2007 through 2009); 881-1668 (2006 through 2007); and 881-1668-04 (2005 through 2006), and as such have similar action areas and scope of work as the current permit application. The previous opinions for each of these research permits determined that the authorized research activities were not likely to jeopardize the continued existence of ESA-listed species nor result in destruction or adverse modification of designated critical habitat (NMFS 2005; NMFS 2006; NMFS 2007a; NMFS 2009).

The ADF&G's proposed research activities under Permit No. 22289 is a continuation of work conducted under Permit No. 18438 (2014 through 2019), 14325 (2009 through 2014), 358-1888 (2007 through 2009); 358-1769 (2006 through 2007); 358-1769-00 (2005 through 2006), and as such have similar action areas and scope of work as the current permit application. The previous opinions for Permit Nos. determined that the authorized research activities were not likely to jeopardize the continued existence of ESA-listed species and no destruction or adverse modification of designated critical habitat was anticipated (NMFS 2005; NMFS 2006; NMFS 2007a; NMFS 2009).

In this consultation, we build upon our long-term evaluation of the MML, ASLC, and ADF&G's research activities from previous consultations, considering these previous research permits as part of the *Environmental Baseline* (Section 10) and evaluating the effects of authorizing the MML, ASLC, and ADF&G to continue to conduct research activities under Permit Nos. 22289, 22293, and 22298, over the next five years.

1.2 Consultation History

This Opinion is based on information provided in the applicants' permit application, correspondence and discussions with the Permits and Conservation Division and the applicants, previous biological opinions for research permits on activities conducted by the MML, ASLC, and ADF&G, annual reports from previous research activities conducted by researchers at the MML, ASLC, and ADF&G, other similar research activities for which we have conducted ESA section 7 consultations, and the best scientific and commercial data available from the literature.

Our communication with the Permits and Conservation Division regarding the permit is summarized as follows:

- On August 22, 2018, the Permits and Conservation Division requested early technical assistance and review of the permit applications by the ESA Interagency Cooperation Division.
- On September 5, 2018, the we notified the Permits and Conservation Division that they had reviewed the permit applications and provided comments.
- On September 15, 2018, the Permits and Conservation Division provided the combined comments to the applicants and requested additional information.
- On October 22, 2018, the Permits and Conservation Division received responses to comments and an updated application from the ASLC.
- On November 2, 2018, the Permits and Conservation Division received responses to comments and an updated application from the MML.
- On December 18, 2018, the Permits and Conservation Division sent the ESA Interagency Cooperation Division a memorandum and initiation package requesting formal consultation on the proposed issuance of Permit Nos. 22289, 22293, and 22298. The memorandum and initiation package was received on January 31, 2019, with a request for review and additional information requests by January 17, 2019 (this date was extended to February 28, 2019 due to government shutdown [see below]); and a request for formal consultation to be concluded and the signed Opinion received one week prior to the proposed target issuance date of June 1, 2019, for a due date of May 24, 2019.
- On December 22, 2018, consultation was held in abeyance for 38 days due to a lapse in appropriations and resulting partial government shutdown. Consultation resumed on January 28, 2019.
- On February 12, 2019, we provided the Permits and Conservations Division with questions and comments on its initiation package.
- On February 19, 2019, we received responses to our questions and comments on the initiation package and we determined there was sufficient information to initiate formal consultation on February 20, 2019. We provided the Permits and Conservation Division with an initiation letter on February 21, 2019.
- On April 1, 2019, we received requested maps of the action area from the Permits and Conservation Division.
- On April 16, 2019, applications for Permit No. 22298, 22293, and 22289 were published in the *Federal Register* (FR).
- On April 17, 2019, we received a revised permit application for Permit No. 22293 from the Permits and Conservation Division.
- On May 3, 2019 we received revised draft permits for Permit Nos. 22289, 22298, and 22293 from the Permits and Conservation Division.

2 THE ASSESSMENT FRAMEWORK

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species; or adversely modify or destroy their designated critical habitat.

“Jeopardize the continued existence of” means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of an ESA-listed species in the wild by reducing the reproduction, numbers, or distribution of that species” (50 C.F.R. §402.02).

“Destruction or adverse modification” means a direct or indirect alteration that appreciably diminishes the value of designated critical habitat for the conservation of an ESA-listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features (50 C.F.R. §402.02).

An ESA section 7 assessment involves the following steps:

Description of the Proposed Action (Section 3): We describe the proposed action and those aspects and associated stressors of the proposed action that may have direct or indirect effects on the physical, chemical, and biotic environment that is inhabited by or supports ESA-listed species and critical habitat.

Action Area (Section 4): We describe the action area and its entire spatial extent associated with the potential stressors.

Interrelated and Interdependent Actions (Section 5): We identify interrelated and interdependent actions. *Interrelated* actions are those that are part of a larger action and depend on that action for their justification. *Interdependent* actions are those that do not have independent use, apart from the action under consideration.

Potential Stressors (Section 6): We identify the stressors that could occur as a result of the proposed action and may affect ESA-listed species, designated critical habitat, and proposed critical habitat.

Species and Critical Habitat Not Likely to be Adversely Affected (Section 7): We identify the ESA-listed species and designated critical habitat that are not likely to be adversely affected by the stressors.

Species Likely to be Adversely Affected (Section 8): We identify the ESA-listed species and that are likely to co-occur with the stressors produced by the proposed action in space and time and evaluate the status of those species and habitat.

Status of Species Likely to be Adversely Affected (Section 9): We examine the status of each species and critical habitat range-wide. We also evaluate the status of the species and condition of critical habitat within the action area that are likely to be affected by the proposed action.

Environmental Baseline (Section 10): We describe the environmental baseline in the action area including: past and present impacts of Federal, state, or private actions and other human activities on the species and critical habitat within the action area; anticipated impacts of proposed Federal projects that have already undergone formal or early section 7 consultation, and impacts of state or private actions that are contemporaneous with the consultation in process.

Effects of the Action (Section 11): We identify the number, age (or life stage), and gender of ESA-listed individuals that are likely to be exposed to the stressors and the populations or sub-populations to which those individuals belong. We also consider whether the action “may affect” designated critical habitat. This is our exposure analysis. We evaluate the available evidence to determine how individuals of those ESA-listed species and critical habitat are likely to respond given their probable exposure. This is our response analyses. We then assess the consequences of these responses of individuals that are likely to be exposed to the populations those individuals represent, and the species those populations comprise. We also assess the consequences of these responses and impacts of the proposed action on the essential habitat features and conservation value of designated critical habitat. This is our risk analysis.

Cumulative Effects (Section 12): Cumulative effects are the effects to ESA-listed species and designated critical habitat of future state or private activities that are reasonably certain to occur within the action area (50 C.F.R. §402.02). Effects from future Federal actions that are unrelated to the proposed action are not considered because they require compliance through separate ESA section 7 consultations.

Integration and Synthesis (Section 13): In this section, we integrate the analyses in the Opinion to summarize the consequences to ESA-listed species and designated critical habitat under NMFS’ jurisdiction as a result of the proposed action.

Conclusion (Section 14): With full consideration of the status of the species and the designated critical habitat, we consider the effects of the action within the action area on populations or subpopulations and on essential habitat features when added to the environmental baseline and the cumulative effects to determine whether the action could reasonably be expected to:

- Reduce appreciably the likelihood of survival and recovery of ESA-listed species in the wild by reducing its numbers, reproduction, or distribution, and state our conclusion as to whether the action is likely to jeopardize the continued existence of such species; or
- Appreciably diminish the value of designated critical habitat for the conservation of an ESA-listed species, and state our conclusion as to whether the action is likely to destroy or adversely modify designated critical habitat.

If, in completing the last step in the analysis, we determine that the action under consultation is likely to jeopardize the continued existence of ESA-listed species or destroy or adversely modify designated critical habitat, then we must identify reasonable and prudent alternative(s) to the action, if any, or indicate that to the best of our knowledge there are no reasonable and prudent alternatives (See 50 C.F.R. §402.14).

In addition, we include an incidental take statement (Section 15) that specifies the impact of the take, reasonable and prudent measures to minimize the impact of the take, and terms and conditions to implement the reasonable and prudent measures (ESA section 7 (b)(4); 50 C.F.R. §402.14(i)). We also provide discretionary conservation recommendations that may be implemented by the action agency (Section 16) (50 C.F.R. §402.14(j)). Finally, we identify the circumstances in which reinitiation of consultation is required (Section 17) (50 C.F.R. §402.16).

To comply with our obligation to use the best scientific and commercial data available, we collected information identified through searches of Google Scholar and literature cited sections of peer-reviewed articles, species listing documentation, and reports published by government and private entities. This Opinion is based on our review and analysis of various information sources, including:

- Information submitted by the Permits and Conservation Division and the applicant;
- Government reports (including NMFS' biological opinions and stock assessment reports);
- National Oceanic and Atmospheric Administration (NOAA) technical memorandums; and
- Peer-reviewed scientific literature.

These resources were used to identify information relevant to the potential stressors and responses of ESA-listed species and designated critical habitat under NMFS' jurisdiction that may be affected by the proposed action to draw conclusions on risks the action may pose to the continued existence of these species and the value of designated critical habitat for the conservation of ESA-listed species.

3 DESCRIPTION OF THE PROPOSED ACTION

“Action” means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies. The proposed action for this consultation is the Permits and Conservation Division's issuance of scientific research permits pursuant to the requirements of the MMPA to the MML, ASLC, and ADF&G.

The Permits and Conservation Division proposes to issue scientific research Permit Nos. 22289, 22293, and 22298 to harass, capture, sample and survey the Eastern and Western DPS's of Steller sea lions throughout most their range. The purpose of the research activities is to measure population status, vital rates, foraging ecology, habitat requirements, and effects of natural and anthropogenic factors on Steller sea lions. Proposed activities include aerial surveys (manned and unmanned aircraft systems [UAS]), vessel surveys, ground surveys, photographic identification, brand resighting, photography and videography, passive acoustic monitoring, behavioral observations, biological sampling (scat, spew, molt, salvage, biopsies, blood swabs, stomach lavage, tooth extraction), capture activities (capture by hand, hoop net, other net, underwater noose, noose with pole, chemical immobilization, and darting), sedation and

anesthesia, branding, bioelectrical impedance, external instrumentation, tagging, marking, ultrasound, and euthanasia (in emergency situations). A summary of research activities and proposed take estimates for Permit Nos. 22289, 22293, and 22289 are also presented in Table 2 through Table 4.

The National Marine Fisheries Service Marine Mammal Laboratory

Under Permit No. 22289, the purpose of the research activities is to promote conservation by studying the population status, vital rates, foraging ecology, habitat requirements, and effects of natural and anthropogenic factors for Steller sea lions in the North Pacific Ocean pursuant to fulfilling NMFS management objectives and legal requirements under the MMPA and ESA. Research activities include aerial surveys, vessel surveys, ground surveys, capture and handling, marking, sampling (including but not limited to blood, blubber, swabs of all mucus membranes and lesions, skin, vibrissae, feces, urine, hair, nail, etc.), branding, and tagging. Research activities (e.g., vessel surveys and non-pup captures) will occur throughout the year. Aerial surveys will occur throughout the year, but during June through July for abundance estimation purposes. Research activities for vital rates and health assessments of pups will occur during June through July. Studies for the Western DPS of Steller sea lions are conducted to support recovery efforts as required under the ESA and outlined in the 2008 Steller Sea Lion Recovery Plan (NMFS 2008). Additional studies are conducted in accordance with monitoring guidelines in the 2013 Post-Delisting Monitoring Plan (PDMP) for the Eastern DPS of Steller sea lions (NMFS 2013). The studies will entail the collection of data to test hypotheses of factors affecting populations of Steller sea lions, particularly in areas of continued decline.

The MML's research program involves a broad range of studies and methods to address multiple objectives, which are structured to (1) support recovery of the Western DPS of Steller sea lions by addressing specific recovery actions as outlined in the NMFS (2008) Steller Sea Lion Recovery Plan; or (2) maintain the recovered status of the Eastern DPS of Steller sea lions by addressing research and monitoring needs identified in the 2013 PDMP, which calls for a ten-year monitoring period. The MML and collaborators (ADF&G, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, and authorized recipients will work to meet objectives one through four below.

Objective one is to estimate abundance and population trends of Steller sea lions in Alaska and the Pacific Northwest:

- Monitor population abundance and trends (counts of pups and non-pups);
- Determine if trends differ among regions;
- Determine if trends meet criteria for recovery (for the Western DPS of Steller sea lions);
- Assess the local and seasonal distribution of sea lions at haulouts; and
- Assess the impact that sea lion movement across the Eastern DPS/Western DPS boundary (i.e., 144 degrees West longitude at Cape Suckling, Alaska) may have on trend estimates for each DPS (count, sighting, and genetic data).

Objective two is to estimate reproductive and survival rates:

- Update estimates of reproductive and survival rates (branded animal resightings);
- Determine immigration/emigration rates concomitant to assessment of vital rates;
- Determine how reproductive and survival rates relate to continued population declines in the western-central Aleutian Islands; and
- Determine if reproductive and survival rates are adequate to support population recovery (Western DPS of Steller sea lions), or are consistent with an increasing or stable population (Eastern DPS of Steller sea lions).

Objective three is to determine areas, habitats, and prey species important to Steller sea lions:

- Determine if designated critical habitat, as currently defined, is adequate to support recovery of the Western DPS of Steller sea lions;
- Determine which environmental features reflect important foraging habitat; and
- Monitor diet (spatially and temporally).

Objective four is to assess natural and anthropogenic threats to recovery (Western DPS of Steller sea lions), residual or emerging threats to maintain recovery (Eastern DPS of Steller sea lions), and increase understanding of basic Steller sea lion ecology:

- Examine relationships between environmental variability and population trends;
- Examine relationships between commercial fisheries activity (including incidental takes) and sea lion recovery;
- Monitor entanglement in debris, such as packing bands, flashers, etc.;
- Monitor direct takes (subsistence harvest);
- Monitor condition, diseases, contaminants, parasites, and biotoxins;
- Monitor declines in abundance of important prey;
- Monitor degradation of terrestrial or marine habitats; and
- Monitor range use patterns.

The Alaska SeaLife Center

Under Permit No. 22293, the purpose of the research activities is to monitor population vital rates of Steller sea lions and determine what factors most affect vital rates and the potential for population recovery. Projects will focus on population dynamics (survival, natality, and population trends), health (body condition, epidemiology, endocrinology, and physiology), diet (scat and blubber analyses), and behavior (maternal care, play, and adult male breeding). Research activities include vessel surveys, ground surveys, photography and videography (digital imaging), capture and handling (body condition measurement), branding, marking, sampling (including but not limited to blood, blubber, skin, vibrissae, feces, hair, milk, carcass, etc.), ultrasound, and tagging. Remote video/audio monitoring will occur year-round for the entire duration of the project. Carcass/scat collections will take place opportunistically throughout the year for the entire duration of the project. Pup branding and associated sampling will occur

between June 25 and July 6 during only three years of the five-year study. Remote biopsies will be collected between July 15 and May 31 during all years of the project. Studies for Steller sea lions will be conducted in the Gulf of Alaska and Aleutian Islands.

The main objectives of ASLC's research activities are continued monitoring of the behavior, food habitats, natality, mortality, health, and physiology of Steller sea lions, with a specific emphasis on aspects related to vital rates (reproductive [natality] and survival rates) and maternal care. Although much of the research activities will focus on vital rates and maternal care, the ASLC will also assess other aspects of Steller sea lion biology, taking a broad approach to understanding the factors that might be limiting the recovery of Steller sea lion populations. ASCL will specifically address threats outlined in the NMFS (2008) Recovery Plan for the Steller sea lion. The threats to recovery of the Western DPS of Steller sea lions that are potentially high include (1) competition with fisheries; (2) environmental variability; and (3) predation by killer whales. Additional threats that are considered relatively minor that will be addressed during the research activities include entanglement in marine debris, disease, and disturbance from vessel traffic and scientific research.

The ASLC's research activities will work on the following hypotheses:

- Population recovery is being limited by low female reproductive rates (natality) due to poor nutrition, contaminants, disease, or parasites.
- Neonatal mortality is limiting population recovery and is caused by poor maternal care (e.g., low nursing frequency and rookery attendance), abandonment, poor body condition, and/or increasing storm frequency during the peak pupping season.
- Low juvenile survival is limiting population recovery and may be caused by killer whale predation or by poor nutrition.
- Hormones found in scat or blubber tissue can be used to identify levels of stress and reproductive status.
- Public and research disturbances at haulouts and rookeries adversely affected the behavior and hauling-out patterns of all age classes.
- Non-invasive tools such as thermal imaging and three-dimensional imaging can be developed and used to assess the health, condition, and growth of Steller sea lions.
- Genetic diversity within and between rookeries is low and limiting adaptability to environmental variation.

The Alaska Department of Fish and Game

Under Permit No. 22298, the purpose of the research activities is to continue monitoring the status of the Alaskan Steller sea lion population and, by monitoring the health, nutritional status and foraging behavior of these animals, investigate the potential causes of population decline (or lack of recovery) in order to provide for the recovery of the population. Research activities include aerial surveys, vessel surveys, ground surveys, capture and handling, marking, sampling (including but not limited to blood, blubber, fecal loops, skin, vibrissae, feces, urine, hair, nail,

etc.), branding, and tagging. Most observational mark-resight and count field work will take place from May through August. Capture and sampling as well as survey effort will be conducted at various locations year-round. Pup capture for sampling and/or branding will be conducted during the June through July breeding season. These research activities are also intended to accommodate rapid response to new and emerging conservation needs.

Continuation of the long-term research program authorized by Permit No. 22298 will continue to provide key information to management, and identification of change over time, to inform conservation decisions.

Specific objectives of Permit No. 22298 include the following:

Objective one is to assess distribution, dispersal, genetic diversity, maternal and/or paternal origins, entanglement prevalence and vital rates such as age-specific survival rate, reproductive rate, and probability of weaning in Steller sea lions. This objective is accomplished through aerial count surveys, branding of pups on rookeries and older juveniles outside the breeding season, collection of tissue samples for genetics work and ground, vessel or aerial observational mark-resight effort in the Eastern DPS and Western DPS of Steller sea lions. It is important to note that the requested aerial survey takes by the ADF&G are not planned to duplicate or replace annual/biannual summer aerial population surveys conducted by the MML. The ADF&G conducts all marking and resighting for vital rates in the Alaska segment of the Eastern DPS of Steller sea lions. The ADF&G also provides at least 1/3 of summer mark-resighting data for the Western DPS of Steller sea lions. Mark-resighting work under this permit will also substantially increase vital rates coverage of the Bering Sea and the border regions between the Eastern DPS and Western DPS of Steller sea lions, which currently see relatively low monitoring effort. Data collected during resight efforts include: a count of non-pups, a count of pups (except at larger rookeries, where accurate pup counts are especially difficult and time consuming to obtain), and a description and photograph of sea lions with injuries, neck or other entanglements, or ingested fishing gear (as indicated by fishing line, hooks and flashers with line protruding from their mouths). A photo library containing images of all the ADF&G-marked animals will be used to confirm these resight observations. Photos and resighting data are shared periodically among groups marking and resighting Steller sea lions (MML, Oregon Department of Fish and Game, the ASLC, Russian and Canadian counterparts), using a standard or comparable format for all groups to maintain libraries of their marked animals. By providing mark-resighting data from standardized annual surveys to estimate age-specific survival, reproduction, entanglement and movement patterns, this objective contributes the baseline population monitoring required to determine whether the demographic criteria and recovery factor criteria for downlisting and delisting (Western DPS of Steller sea lions) are met, and provides for the continued genetic structure and population research suggested for the Eastern DPS of Steller sea lions PDMP. This objective responds to tasks 1.1.1, 1.2.1 and 1.2.4 of the Steller Sea Lion Recovery Plan (NMFS 2008).

Objective two is to assess the physical health of free-ranging Steller sea lions through standard biochemical assays on blood serum by monitoring tissue samples (blubber, blood, milk, hair, urine and feces, etc.) for toxicology to determine if these individuals are contaminated by toxins from their environment; for endocrinology to assess the physical effects of present and past stressors on individual sea lions; for body condition using measures of lipid stores; and by monitoring the presence of or previous exposure to specific bacteria or viruses in captured Steller sea lions through serology, fecal loops and culture swaps. This objective addresses the Western DPS of Steller sea lions downlisting recovery factor criterion requiring that information is adequate to conclude that disease is not limiting recovery; in particular, its contribution to the low fecundity that is suspected to be impeding recovery, and addresses the suggested PDMP for the Eastern DPS of Steller sea lions. This objective responds to the tasks 1.3.2, 1.4.2, 4.1.1, 4.1.2, 4.1.4, 4.2.2, and 4.2.3 in the 2008 Steller Sea Lion Recovery Plan and Method D of the Eastern DPS of Steller sea lions PDMP (NMFS 2008; NMFS 2013).

Objective three is to monitor the movement and diving behavior of Steller sea lions. This part of the study is conducted through the use of satellite linked location and/or dive recorders. These external instruments will be affixed to individuals and provide information regarding the geographic location and diving behavior of the animal. A particular focus will be placed on determination of adult and subadult home range estimation to evaluate seasonal habitat use and its potential contribution to contaminant exposure and diet. This objective addresses the Western DPS of Steller sea lion downlisting recovery factor criteria requiring knowledge of Steller sea lion foraging ecology sufficient to determine whether fisheries are likely to limit recovery, modification of fishery conservation measures and designation of sea lion critical habitat adequate to allow for recovery. This objective responds to tasks 2.3.3, 2.3.4, and 2.4.1 of the Steller Sea Lion Recovery Plan and Methods C, D and F of the Eastern DPS of Steller sea lions PDMP (NMFS 2008; NMFS 2013).

Objective four is to determine seasonal changes in the diet of juvenile, subadult and adult Steller sea lions. This objective will be met through the use of stable isotopes (levels measured in the whiskers and in blood) and by examining the fatty acid composition of the individuals' blubber layer, and blood and milk from pups and adult females. The ADF&G will also collect and analyze scat for prey remains and DNA analysis to determine diet. Understanding the relative differences in diet among demographic and geographic groups, and the suite of prey that comprise these diets, addresses the Western DPS of Steller sea lion recovery factor criterion requiring knowledge of Steller sea lion foraging ecology sufficient to determine whether fisheries are likely to limit recovery. Understanding changes in diet also helps to inform sudden changes in population parameters. Diet assessment is also a key parameter in the investigation of high contaminant levels found in Western DPS of Steller sea lions. This objective responds to tasks 2.3.1 and 2.3.2. of the Steller Sea Lion Recovery Plan and Method E of the Eastern DPS PDMP (NMFS 2008; NMFS 2013).

Objective five is to determine the age of individual animals through the use of DNA methylation, examination of tooth dentin and cementum layers. In order to assess the age of Steller sea lions captured it is necessary at times to take a tooth from the animal. Presently, non-invasive age determination (to year) is possible only for Steller sea lions younger than 24 months of age (King et al. 2007), or for Steller sea lions previously branded on their natal rookeries. Accurately determining age of captured individuals is a basic measure required for investigation of age at weaning and age specific growth rates, which supports the work described in objectives three and five to eight. The DNA methylation technique is also a stepping stone toward development of a new technique, close-kin mark-recapture, which may supplement or replace brand resighting to determine population vital rates.

Through the successful completion of these objectives in both the Eastern and Western DPS of Steller sea lions and through analysis of retrospective samples and data, the ADF&G will improve understanding of the biology of Steller sea lions, contribute to identification of factors limiting the recovery of the Western DPS of Steller sea lions and provide research supporting monitoring of the delisted Eastern DPS of Steller sea lions. Research within the Eastern DPS of Steller sea lions also serves as a control population against which Western DPS studies will be compared. The ADF&G, working under this permit, will provide the majority of new information on the biology of Steller sea lions within the Alaska segment of the Eastern DPS. The ADF&G is also expected to contribute approximately 25 percent of the new information on the vital rates, health status and foraging ecology of Steller sea lions in the Alaska segment of the Western DPS. This information will contribute to the success of the management agencies in implementing actions to facilitate the recovery of this species in the Western DPS of the United States.

Table 1. Summary of research methods for Permit Nos. 22289, 22293, and 22298.

Proposed Research Method	Permit No. 22289	Permit No. 22293	Permit No. 22298
Aerial Surveys – Manned Aircraft	Yes	No	Yes
Aerial Surveys – Unmanned Aircraft Systems	Yes	No	Yes
Vessel Surveys	Yes	Yes	Yes
Ground Surveys	Yes	Yes	Yes
Photographic Identification	Yes	Yes	Yes
Brand Resighting	Yes	Yes	Yes

Photography and Videography	Yes	Yes	Yes
Behavioral Observations	Yes	Yes	Yes
Passive Acoustic Monitoring	No	Yes	Yes
Biological Sampling	Yes	Yes	Yes
Branding	Yes	Yes	Yes
Capture Activities	Yes	Yes	Yes
Ultrasound	Yes	Yes	Yes
Bioelectrical Impedence	Yes	No	Yes
Internal and External Instrumentation	Yes	Yes	Yes
Import/Export/Receive Parts	Yes	Yes	No

The proposed duration of the scientific research permits is five years. In accordance with Federal regulations (50 C.F.R. §216.39), the duration of a permit may be extended for up to one year via a minor amendment to allow uninterrupted continuation of research if a new five-year permit application has been received and is in-process. In such cases, no additional MMPA takes will be authorized during the extension; any takes that were allocated for the fifth year of the permit that were not used may be used during the extension. Thus, the annual takes proposed in the draft permit may be extended for use over a six-year period.

Table 2. Proposed permitted annual MMPA take for Endangered Species Act-listed species under Permit No. 22289.

Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, and Bering Sea.											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
1	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	170	1	Harass	Survey, aerial	Count/survey; Photograph/Video; Remote vehicle, aerial (fixed wing); Remote vehicle, aerial (VTOL)	Breeding season aerial survey by manned aircraft or UAS. Some animals may be overflowed more than once per year.
2	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	Non-Pup	Male and Female	2740	1	Harass	Survey, aerial	Count/survey; Photograph/Video; Remote vehicle, aerial (fixed wing); Remote vehicle, aerial (VTOL)	Breeding season aerial survey by manned aircraft or UAS. Some animals may be overflowed more than once per year. Includes animals in water per F/PR directions.

Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, and Bering Sea.											
Line	Species	Stock/Listing Unit	Producti on/ Origin	Life stage	Sex	Authori zed Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
3	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	Non-Pup	Male and Female	1500	1	Harass	Survey, aerial	Count/survey; Photograph/Video; Remote vehicle, aerial (fixed wing); Remote vehicle, aerial (VTOL)	Non-breeding season regional aerial surveys by manned aircraft or UAS. Some animals may be overflown more than once per year. Includes animals in water per F/PR directions.
6	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	10	1	Harass	Survey, aerial	Count/survey; Observation, mark resight; Photo-id; Photogrammetry; Remote vehicle, aerial (fixed wing); Remote vehicle, aerial (VTOL)	Resights by UAS, breeding season. Some animals may be overflown more than once per year.
7	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	Non-Pup	Male and Female	90	1	Harass	Survey, aerial	Count/survey; Observation, mark resight; Photo-id; Photogrammetry; Remote vehicle, aerial (fixed wing); Remote vehicle, aerial (VTOL)	Resights by UAS, any season. Some animals may be overflown more than once per year.
8	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	Non-Pup	Male and Female	14000	1	Harass	Survey, vessel	Collect, scat; Collect, spew; Count/survey; Observation, mark resight; Observations, behavioral; Photo-id	Non-breeding season (August-May). Some animals may be exposed more than once per year.

Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, and Bering Sea.											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
9	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	400	1	Harass	Survey, vessel	Collect, scat; Collect, spew; Count/survey; Observation, mark resight; Observations, behavioral; Photo-id	Breeding season (June-July). Some animals may be exposed more than once per year.
10	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	Non-Pup	Male and Female	850	1	Harass	Survey, ground	Collect, scat; Collect, spew; Count/survey; Observation, mark resight; Observations, behavioral; Photo-id	Some animals may be exposed more than once per year.
11	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	100	1	Harass	Survey, ground	Collect, scat; Collect, spew; Count/survey; Observation, mark resight; Observations, behavioral; Photo-id	Breeding season (June-July). Some animals may be exposed more than once per year.
12	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	250	1	Capture/Handle/Release	Hand and/or Dip Net	Anesthesia, gas w/cone or mask; Collect, scat; Collect, urine; Instrument, external (e.g., VHF, SLTDR); Mark, hot brand; ; instrument, external (e.g., VHF); mark, flipper tag (e.g. conventional cattle tag if not branded or for transmitter/instrument attachment); Measure (standard morphometrics); Photo-id; Restrain, hand; Restrain, net; Sample, fecal loop; Sample, fecal swab; Sample, skin biopsy; Sample, swab all mucus membranes; Weigh	Marked with hot brand and limited sample collection.

Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, and Bering Sea.											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
13	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	100	1	Capture/Handle/Release	Hand and/or Dip Net	Anesthesia, gas w/cone or mask; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Instrument, external (e.g., VHF, SLTDR); Mark, hot brand; mark, flipper tag (e.g. conventional cattle tag if not branded or for transmitter/instrument attachment); Measure (standard morphometrics); Photo-id; Restrain, board; Restrain, hand; Restrain, net; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, clip nail; Sample, fecal loop; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	Marked with hot brand and with additional samples collected.

Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, and Bering Sea.											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
14	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	200	1	Capture/Handle/Release	Hand and/or Dip Net	Collect, scat; Collect, urine; Instrument, external (e.g., VHF, SLTDR); Mark, other (e.g., neoprene patch); instrument, external (e.g., VHF); mark, flipper tag (e.g. conventional cattle tag if not branded or for transmitter/instrument attachment); Measure (standard morphometrics); Restrain, board; Restrain, hand; Restrain, net; Sample, blood ; Sample, clip hair; Sample, clip nail; Sample, fecal loop; Sample, fecal swab; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	Not marked with hot brand and with samples collected.
15	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	1100	1	Harass	Survey, ground	Collect, scat; Collect, spew; Count/survey; Incidental disturbance; Observation, mark resight; Observations, behavioral; Photo-id	Disturbance incidental to pup handling activities during breeding season.
16	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	Non-Pup	Male and Female	1600	1	Harass	Survey, ground	Collect, scat; Collect, spew; Count/survey; Observation, mark resight; Observations, behavioral; Photo-id	Disturbance incidental to pup handling activities during breeding season.

Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, and Bering Sea.											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
17	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	Juvenile / Subadult	Male and Female	20	2	Capture/Handle/Release	Other	Administer drug, IM ; Administer drug, IV; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Incidental disturbance; Instrument, external (e.g., VHF, UHFSLTDR, archival, camera/video); mark, flipper tag (e.g. conventional cattle tag if not branded or for transmitter/instrument attachment for instrument attachment, or if not branded); mark, hot brand; measure (standard morphometrics); Photo-id; Restrain, hand; Restrain, net; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, clip nail; Sample, fecal enema; Sample, fecal loop; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, vibrissae (pull); Stable isotopes and serial blood samples; Ultrasound; Weigh	Animals >= 2 months old. capture techniques include: dart, injectable immobilizing agent; hoop, net; hand. Only one hot brand administered per animal. 2nd take is incidental disturbance for instrument retrieval. If remote release fails a recapture may be attempted.

Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, and Bering Sea.

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
18	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	Juvenile / Subadult	Male and Female	10	1	Harass	Dart, injectable immobilizing agent	Anesthesia, injectable sedative	Darted but not captured. May be darted a second time with reversal agents.

Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, and Bering Sea.											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
19	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	Adult	Female	20	2	Capture/Handle/Release	Dart, injectable immobilizing agent	Administer drug, IM ; Administer drug, IV; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Incidental disturbance; Instrument, external (e.g., VHF, UHF, archival, camera/videoSLTDR); mark, flipper tag (e.g. conventional cattle tag if not branded or for transmitter/instrument attachment); Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Photo-id; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, clip nail; Sample, fecal enema; Sample, fecal loop; Sample, fecal swab; Sample, milk (lactating females); Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, swab all mucus membranes; Sample, vibrissae (pull); Stable isotopes and serial blood samples; Ultrasound; Weigh	2nd take is incidental disturbance for instrument retrieval. If remote release fails a recapture may be attempted.

Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, and Bering Sea.											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
20	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	Adult	Female	10	1	Harass	Dart, injectable immobilizing agent	Anesthesia, injectable sedative	Adult females darted but not captured. May be darted a second time with reversal agents.
21	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	Subadult	Male	5	2	Capture/Handle/Release	Dart, injectable immobilizing agent	Administer drug, IM ; Administer drug, IV; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Incidental disturbance; Instrument, external (e.g., VHF, UHF, archival, camera/video); Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Photo-id; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, clip nail; Sample, fecal enema; Sample, fecal loop; Sample, fecal swab; Sample, milk (lactating females); Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, swab all mucus membranes; Sample, vibrissae (pull); Stable isotopes and serial blood samples; Ultrasound; Weigh	Subadult and Adult Males. 2nd take is incidental disturbance. If remote release fails a recapture may be attempted.

Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, and Bering Sea.											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
22	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	Subadult	Male	2	1	Harass	Dart, injectable immobilizing agent	Anesthesia, injectable sedative	Subadult and Adult males darted but not captured.
23	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	Non-Pup	Male and Female	5500	2	Harass	Survey, ground	Collect, scat; Collect, spew; Count/survey; Incidental disturbance; Observation, mark resight; Observations, behavioral; Photo-id	Disturbance incidental to capture/handling activities during non-breeding season.
24	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	2	1	Unintentional mortality	Other	Unintentional mortality; Import/export/receive, parts; Other.	Unintentional mortality, including humane euthanasia. Necropsy and salvage of tissues would follow. Unintentional mortalities are rare; but multiple mortalities within a year are possible.. Other = necropsy.
25	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	9999	1	Harass / Sample	Other	Import/export/receive, parts; Other.	Other = Necropsy and tissue salvage of any dead animal encountered unrelated to our research activities.

*Takes=the maximum number of animals, not necessarily individuals, that may be targeted for research annually for the suite of procedures in each row of the table.

Table 3. Proposed permitted annual MMPA take for Endangered Species Act-listed species under Permit No. 22293.

Take Information for Permit No. 22293; Most of the work will be concentrated at Chiswell Island (59.602 N, 149.568 W) and rookeries/haulouts between Prince William Sound and Outer Island. Additional work farther west is dependent on funding and research needs.											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
1	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	6000	12	Harass	Other	Count/survey; Incidental disturbance; Remote video monitoring	Other = Harassment is associated with maintenance & repair of remote monitoring equipment (cameras, microphone, control tower); vessel and ground approach to access rookery and haulouts
2	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	125	1	Capture/Handle/Release	Hand and/or Dip Net	Anesthesia, gas w/cone or mask; Calipers (skin fold); Mark, bleach ; Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Photo-id; Photogrammetry; Photograph/Video; Restrain, board; Restrain, hand; Restrain, net; Sample, blood ; Sample, clip hair; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	Pup capture/sampling/markings; Individual pups will not be marked by more than one method; branding/sampling will occur in only 3 of the 5 years of permit; only 100 pups will have milk samples taken annually

Take Information for Permit No. 22293; Most of the work will be concentrated at Chiswell Island (59.602 N, 149.568 W) and rookeries/haulouts between Prince William Sound and Outer Island. Additional work farther west is dependent on funding and research needs.

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
3	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	1000	1	Harass	Survey, ground	Incidental disturbance	Incidental disturbance associated with capture, handling, and sampling of pups
4	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	Adult	Male and Female	100	3	Harass	Other	Sample, blubber biopsy; Sample, muscle biopsy; Sample, skin biopsy; photography; videography; count/survey	Collect method is remote biopsy darting
5	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	Juvenile/Subadult	Male and Female	50	3	Harass	Other	Sample, blubber biopsy; Sample, muscle biopsy; Sample, skin biopsy	Collect method is remote biopsy darting
6	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	200	3	Harass	Other	Incidental disturbance	Incidental disturbance associated with biopsy darting
7	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	1170	1	Sampling	Survey, ground	Collect, molt; Collect, scat; Collect, spew; Collect, urine; Salvage (carcass, tissue, parts)	Collect fecal samples, placentas, aborted fetuses, and carcasses

Take Information for Permit No. 22293; Most of the work will be concentrated at Chiswell Island (59.602 N, 149.568 W) and rookeries/haulouts between Prince William Sound and Outer Island. Additional work farther west is dependent on funding and research needs.											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
8	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	4000	6	Harass	Survey, ground	Incidental disturbance	Incidental disturbance by researchers on ground and associated with material collections and salvage that may include scat, aborted fetuses, placentae, carcasses, spew, other tissues and parts
9	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	4000	6	Harass	Survey, vessel	Count/survey; Incidental disturbance; Observation, mark resight; Photo-id; vessel obs.	Incidental disturbance associated with vessel based observations, photo ID and counts
10	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	4	1	Unintentional mortality	Other	Unintentional mortality; Salvage (carcass, tissue, parts)	Mortality incidental to any research activity or including euthanasia for humane purposes. Full necropsies performed when possible. Not to exceed 12 across permit.
11	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	1000	9999	Import/export/receive only	Other	Import/export/receive, parts	export of scat hard and soft parts, blubber samples, skin, hair for laboratory analysis

*Takes=the maximum number of animals, not necessarily individuals, that may be targeted for research annually for the suite of procedures in each row of the table.

Table 4. Proposed permitted annual MMPA take for Endangered Species Act-listed species under Permit No. 22298.

Take Information for Permit No. 22298; Research activities will occur throughout the coast and along offshore areas eastern and western Alaska.											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Take Per Animal	Take Action	Observe/Collect Method	Procedures	Details
1	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	1390	1	Harass	Survey, ground	Count/survey; Incidental disturbance; Observation, mark resight	Incidental disturbance during ground surveys and remote biopsy sampling at haulouts and rookeries.
2	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	4000	1	Harass	Survey, vessel	Count/survey; Incidental disturbance; Observation, mark resight	Incidental disturbance during vessel surveys and remote biopsy sampling at haulouts and rookeries.
3	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	7500	1	Harass	Survey, aerial	Count/survey; Incidental disturbance; Observation, mark resight; remote vehicle (fixed wing); remote vehicle, (VTOL)	Incidental disturbance during SSL aerial surveys. . Includes a 0.05%*non-pup count buffer to account for animals in the water.
4	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	4000	1	Harass	Other	Collect, scat; Incidental disturbance; Observation, monitoring; Other; Remote video monitoring	Incidental disturbance associated with ground activities including disturbances of non-target SSL during capture and observation, scat collection, carcass collection, remote biopsy sampling, equipment maintenance, etc.

Take Information for Permit No. 22298; Research activities will occur throughout the coast and along offshore areas eastern and western Alaska.											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Take s Per Animal	Take Action	Observe/Collect Method	Procedures	Details
5	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	2500	1	Harass	Other	Incidental disturbance	Incidental disturbance of non-target SSLs associated with pup branding.
6	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	Juvenile	Male and Female	50	1	Harass	Other	Other; Sample, skin biopsy; Photography, Videography	Remote skin biopsy of juvenile SSLs.
7	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	Adult	Male and Female	150	1	Harass	Other	Other; Sample, skin biopsy; Photography, Videography	Remote skin biopsy of adult SSLs.

Take Information for Permit No. 22298; Research activities will occur throughout the coast and along offshore areas eastern and western Alaska.											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
9	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	300	1	Capture/Handle/Release	Hand and/or Dip net	Administer drug, IM; Administer drug, subcutaneous; Administer drug, topically; Collect, scat; Collect, urine; Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Photo-id; Restrain, board; Restrain, cage; Restrain, hand; Restrain, net; Restrain, other; Sample, blood ; Sample, clip hair; Sample, fecal swab; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	June - July. This is Method 1. Manual capture and sampling of pups on their rookery. No branding.
10	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	400	1	Capture/Handle/Release	Hand and/or Dip net	Administer drug, IM; Administer drug, subcutaneous; Administer drug, topically; Anesthesia, gas w/cone or mask; Collect, scat; Collect, urine; Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Photo-id; Restrain, board; Restrain, cage; Restrain, hand; Restrain, net; Restrain, other; Sample, clip hair; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	June - July. This is Method 2. Manual capture and minimal sampling of pups on their rookery. Branding optional on pups at least 20 kg or without umbilicus.

Take Information for Permit No. 22298; Research activities will occur throughout the coast and along offshore areas eastern and western Alaska.											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
11	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	200	1	Capture/Handle/Release	Hand and/or Dip net	Administer drug, IM; Administer drug, subcutaneous; Administer drug, topically; Anesthesia, gas w/cone or mask; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Photo-id; Restrain, board; Restrain, cage; Restrain, hand; Restrain, net; Restrain, other; Sample, blood ; Sample, clip hair; Sample, clip nail; Sample, fecal loop; Sample, fecal swab; Sample, other; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	June - July. This is Method 3. Manual capture and sampling of pups on their rookery. Branding optional on pups at least 20 kg or without umbilicus. Optional sampling added: bioelectrical impedance, blood, clip nail, fecal loop/swab, stomach lavage, swab mucous membranes, ultrasound, other (milk).

Take Information for Permit No. 22298; Research activities will occur throughout the coast and along offshore areas eastern and western Alaska.											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
12	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	40	1	Capture/Handle/Release	Hand and/or Dip net	Administer drug, IM; Administer drug, subcutaneous; Administer drug, topically; Anesthesia, gas w/cone or mask; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Photo-id; Restrain, board; Restrain, cage; Restrain, hand; Restrain, net; Restrain, other; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, clip nail; Sample, fecal loop; Sample, fecal swab; Sample, other; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	June - July. This is Method 4. Manual capture and sampling of pups on their rookery. Branding optional on pups at least 20 kg or without umbilicus. Sample, other=milk. Optional sampling added: blubber biopsy.

Take Information for Permit No. 22298; Research activities will occur throughout the coast and along offshore areas eastern and western Alaska.											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
13	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	Pup/Juvenile	Male and Female	45	1	Capture/Handle/Release	Other	Administer drug, IM; Administer drug, subcutaneous; Administer drug, topically; Administer drug, intraperitoneal; Administer drug, IV; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Evan's blue dye and serial blood samples; Instrument, external (e.g., VHF, SLTDR); Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Photo-id; Restrain, cage; Restrain, net; Restrain, other; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, clip nail; Sample, fecal loop; Sample, fecal swab; Sample, muscle biopsy; Sample, other; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, tooth extraction; Sample, urine catheter; Sample, vibrissae (pull); Stable isotopes and serial blood samples; Ultrasound; Weigh	All year. Capture and handling of immature SSLs > 2 mo. Capture by underwater lasso, net, hand, noose pole, remote chemical immobilization (nonpups only). Sample, other=milk. Intended research take is 30 captures; 15 takes are included to account for sea lions struck by a dart but not immobilized and captured. One brand per lifetime.

Take Information for Permit No. 22298; Research activities will occur throughout the coast and along offshore areas eastern and western Alaska.											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
14	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	Adult	Male and Female	45	1	Capture/Handle/Release	Other	Administer drug, IM; Administer drug, subcutaneous; Administer drug, topically; Administer drug, intraperitoneal; Administer drug, IV; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Evan's blue dye and serial blood samples; Instrument, external (e.g., VHF, SLTDR); Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Photo-id; Restrain, cage; Restrain, net; Restrain, other; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, clip nail; Sample, fecal loop; Sample, fecal swab; Sample, milk (lactating females); Sample, muscle biopsy; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, tooth extraction; Sample, urine catheter; Sample, vibrissae (pull); Stable isotopes and serial blood samples; Ultrasound; Weigh	All year. Capture and handling of adult SSLs. Capture by underwater lasso, net, hand, noose pole, remote chemical immobilization. Intended research take is 30 captures; 15 takes are included to account for sea lions struck by a dart but not immobilized and captured. One brand per lifetime.

Take Information for Permit No. 22298; Research activities will occur throughout the coast and along offshore areas eastern and western Alaska.											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
15	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	3	1	Unintentional mortality	Other	Unintentional mortality; Salvage (carcass, tissue, parts)	Unintentional mortality, including humane euthanasia. Full necropsies performed when possible.
16	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	100	1	Sample	Other	Salvage (carcass, tissue, parts)	Collect or sample carcasses from (dead) stranded SSLs.
17	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	100	1	Import/export/receive only	Other	Salvage (carcass, tissue, parts)	Receive/import/export carcasses or samples from subsistence harvested SSLs.
18	Seal, ringed	Arctic (NMFS Threatened)	Wild	All	Male and Female	50	1	Harass	Survey, ground	Incidental disturbance	Incidental disturbance during SSL research activity on land.
19	Seal, ringed	Arctic (NMFS Threatened)	Wild	All	Male and Female	200	1	Harass	Survey, aerial	Incidental disturbance	Incidental disturbance during SSL aerial surveys <= 1000 feet altitude.
20	Seal, bearded	Beringia	Wild	All	Male and Female	200	1	Harass	Survey, aerial	Incidental disturbance	Incidental disturbance during SSL aerial surveys. No ground surveys.

*Takes=the maximum number of animals, not necessarily individuals, that may be targeted for research annually for the suite of procedures in each row of the table

3.1 Proposed Activities

3.1.1 Aerial Surveys

Under Permit No. 22289, the MML conducts aerial surveys in Alaska to determine abundance and trends of Steller sea lion populations by counting animals from images obtained at terrestrial rookery and haulout sites (Johnson and Fritz 2013). Aerial surveys for pup and non-pups will be conducted biennially at trend sites (those consistently surveyed over decades), and at least every four years at all haulouts and rookeries in the Western DPS of Steller sea lions. Aerial surveys for pups and non-pups are conducted during late-June through early-July, when the greatest proportion of adults are onshore to give birth and breed after the mean pupping date (approximately June 10th) and before pups are large and independent enough to routinely enter the water (approximately mid-July). Aerial surveys will also be concentrated in the Gulf of Alaska from Dixon Entrance to False Pass (133 to 163 degrees West), during 2019.

Aerial surveys in the Gulf of Alaska and Aleutian Islands will likely occur during 2020 and 2022, whereas aerial surveys in Southeast Alaska will likely occur during 2019, 2021, and 2023. However, flexibility is important should aerial surveys ever need to be conducted during consecutive years. In the Eastern Gulf of Alaska and Southeast Alaska, two aerial surveys will be conducted within the breeding season in one year.

Sites within Southeast Alaska will likely be aerial surveyed during every odd year (2019, 2021, and 2023) because trends in this region heavily influence the overall trend for the Eastern DPS of Steller sea lions. These aerial surveys will also include a replicate survey of Southeast Alaska (Eastern DPS of Steller sea lions) and the Eastern Gulf of Alaska (at least through the western tip of the Kenai Peninsula, for the Western DPS of Steller sea lions) during at least one of these years to help resolve trans-boundary movements.

Seasonal and regional aerial surveys conducted during the non-breeding season (August through April) using manned and unmanned aircraft are used to assess local responses to environmental conditions such as prey availability, to evaluate potential response or exposure to human activities, and to take advantage of aerial surveys conducted by collaborators primarily for other species (e.g., harbors seals [*Phoca vitulina*] and ice-affiliated seals such as bearded seals [*Erignathus barbatus*] and ringed seals [*Phoca hispida*]). More information on the MML's aerial surveys are provided in Table 5, Figure 1, and Figure 2.

Table 5. Sound intensity measurements (in decibels) of a Twin Otter manned aircraft, an APH-22 hexacopter unmanned aircraft system, and an Aeryon Scout quadcopter unmanned aircraft system.

Altitude (Feet)	Ambient Temperature	Twin Otter Manned Aircraft	APH-22 Hexacopter Unmanned Aircraft System - Video	APH-22 Hexacopter Unmanned Aircraft System – Still Photographs	Aeryon Scout Quadcopter Unmanned Aircraft System
10	55	NA	NA	NA	NA
16	55	NA	NA	NA	66
20	55	NA	NA	NA	65
36	55	NA	NA	NA	61
50	55	NA	58	60	NA
52	55	NA	NA	NA	53
100	55	68	54	56	NA
150	55	NA	50	54	NA
200	55	NA	48	50	NA
500	55	58	NA	NA	NA
1,500	55	45	NA	NA	NA

NA=Not available or not assessed.

Note: Ambient sound was 3 meters (10 feet) away from the shoreline with 0.3 meters (1 foot) wave height and a light wind (9.3 to 14.8 kilometers per hour [5 to 8 knots]).

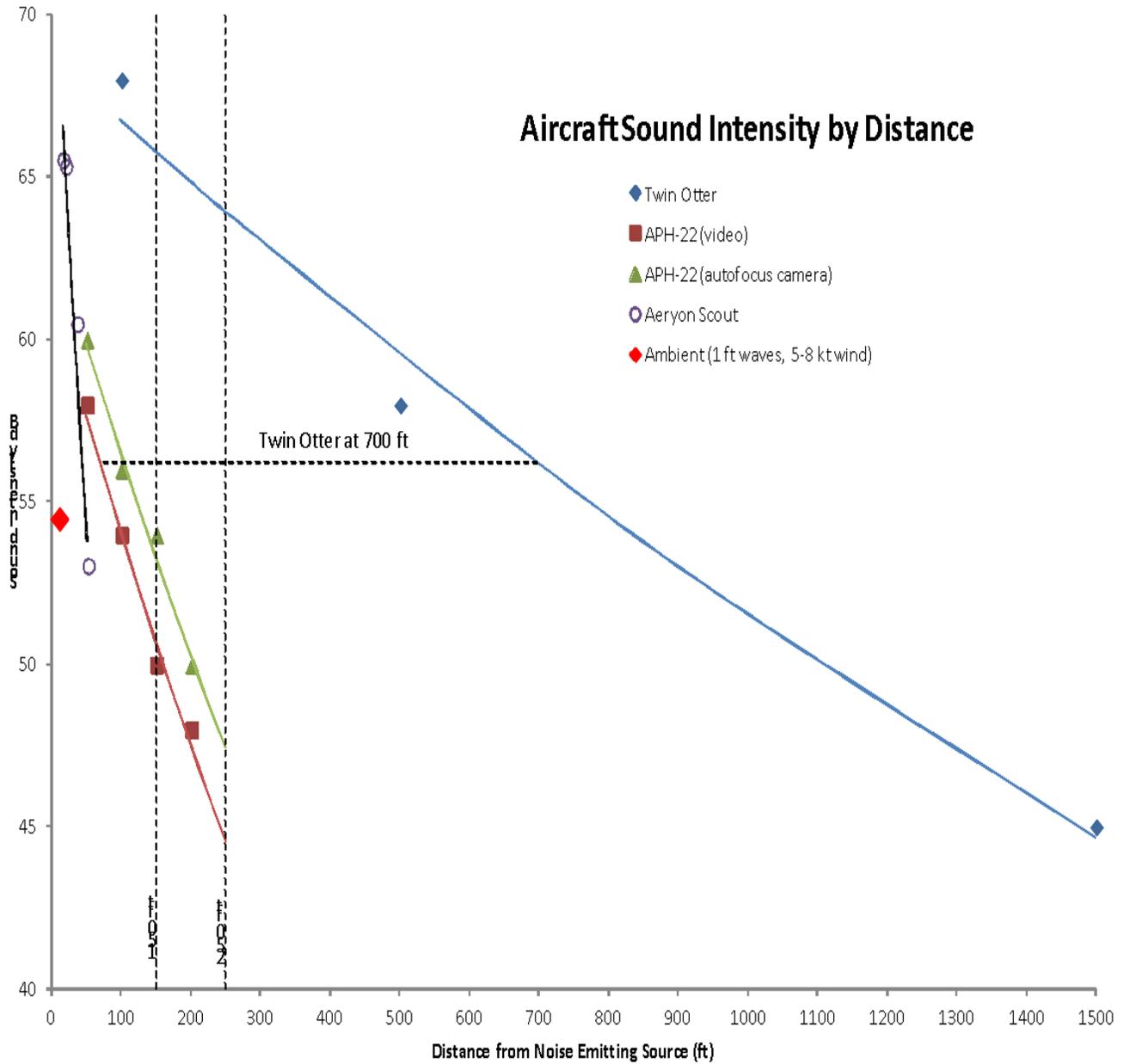


Figure 1. Sound intensity (in decibels) of the deHavilland Twin Otter DHC-6 manned aircraft, APH-22 hexacopter unmanned aircraft system, and Aeryon Scout quadcopter unmanned aircraft system.

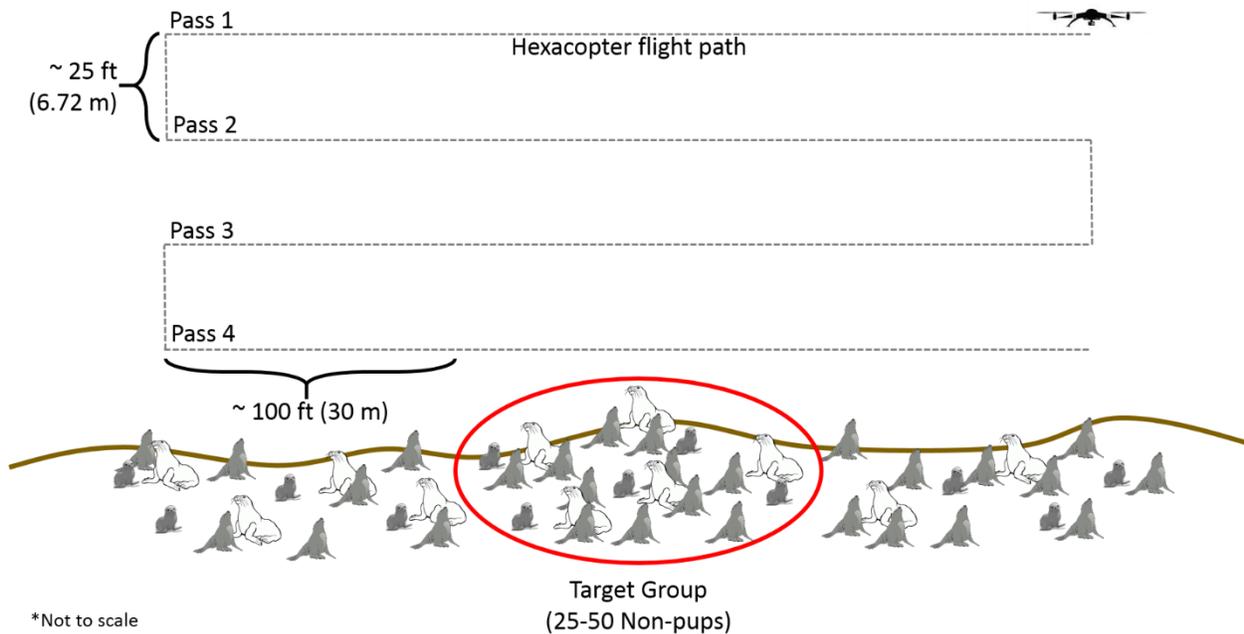


Figure 2. General hexacopter unmanned aircraft system flight path over target group of animals, during which each straight line pass was lower than the previous. Number of passes and speed varied depending on the species and flight mode (automated waypoints versus flying manual points).

Under Permit No. 22298, aerial survey methods using manned aircraft are proposed and are currently employed and permitted under the ADF&G's existing permit utilizing both fixed-wing and helicopters. In addition, the ADF&G proposes to use UAS. Aerial surveys are a relatively low-cost method for the ADF&G, relative to vessel- or ground-based methods, to accomplish mark-resight and entanglement surveys. In addition, aerial surveys have special utility at locations on the fringe of the ADF&G's core vessel-based mark-resight survey area (e.g., most of southeastern Alaska south of Frederick Sound and haulouts north of Icy Strait) which often go unsurveyed due to time and distance limitations.

The ADF&G will conduct aerial surveys to collect brand, entanglement, and count data of Steller sea lions. For the ADF&G, this work contributes to the successful completion of assessing distribution, dispersal, genetic diversity, maternal and/or paternal origins, entanglement prevalence and vital rates such as age-specific survival rate, reproductive rate, and probability of weaning in Steller sea lions (ADF&G 2019). The ADF&G proposes to conduct aerial surveys throughout coastal Alaska in areas where Eastern DPS and Western DPS of Steller sea lions will occur, year-round at haulouts and outside the breeding season at rookeries (August through April).

The ADF&G is proposing to conduct aerial surveys at haulouts, and during the non-breeding season at rookeries, because these are effective tools for assessing seasonal changes in the distribution and relative abundance of sea lions (e.g., Womble et al. 2005). In past years, large numbers of Steller sea lions have been seen congregating at various places during ephemeral

concentrations of prey species, such as brief spring mixed-sex aggregations of over 5,000 at Dry Bay, near the Eastern DPS/Western DPS of Steller sea lions interface, and early winter subadult/adult male gatherings at Saint Lawrence Island on the northern fringe of sea lion distribution.

3.1.1.1 *Manned Aerial Surveys*

Under Permit No. 22289, the MML will conduct manned aerial surveys using at least three personnel, typically combining researchers from the MML, NMFS' Southwest Fisheries Science Center (SWFSC), and contract scientists. Generally a Twin Otter aircraft (operated by NOAA Aircraft Operations Center) equipped with vertically-oriented, high-resolution digital cameras (with forward motion compensation) mounted in the aircraft's belly port is used to obtain images of animals on rookeries and haulouts. If a Twin Otter aircraft is unavailable, manned aerial surveys will be conducted with a high-wing, low speed aircraft such as an Aero Commander. Aerial surveys will be conducted during mid-day (10:00 am to 7:00 pm) when animals are most likely on land and photographs are taken vertically at altitudes of at least approximately 213 meters (700 feet) while passing over the rookery or haulout site. To minimize disturbance to animals, aerial surveys of individual sites will be conducted quickly (typically from seconds to ten minutes), depending on the size of the site, and sites are approached without banking. Manned aerial survey dates are coordinated with other research groups conducting research activities within the study areas.

Under the proposed permit, the MML will also conduct aerial surveys in the Pacific Northwest. In Washington, Oregon, and California, aerial surveys will be flown at a minimum altitude of approximately 152 meters (500 feet), but typically at approximately 183 to 244 meters (600 to 800 feet). Manned aerial surveys will be flown in a single or twin-engine, high-wing aircraft (e.g., Cessna 185 or Parnavia Observer). Aircraft are flown at a speed of approximately 148.2 to 185.2 kilometers per hour (80 to 100 knots). Aerial surveys are generally conducted during the breeding season (July), but may occur during any month. Data that will be collected during aerial surveys include data, time, location, general weather conditions, an estimate of the number of animals at each site, and the number of photographs taken. An UAS may be substituted for the manned aircraft following the same procedures. Mitigation measures in these areas are the same as those used in Alaska.

Under Permit No. 22298, the ADF&G will conduct manned aircraft surveys that will be conducted by known and experienced contractors or the ADF&G employees. During these surveys, the ADF&G will use manned aircraft equipped with digital cameras to photograph groups of hauled-out sea lions. Manned fixed winged aircrafts will fly at an altitude of 150 to 180 meters (492.1 to 590.6 feet) and helicopters will fly at altitudes greater than 250 meters (820.2 feet). After each flight, images taken during aerial surveys will be downloaded and sea lions are counted for each date at each site using established protocols for counting animals by photograph. The ADF&G will only conduct survey flights during daylight. To estimate relative abundance, all sea lions observed during a survey flight are counted. Surveys will be performed

during flights chartered by the ADF&G for the purpose of conducting sea lion surveys, during flights already being conducted for the purposes of collecting other data (e.g., marine debris, herring and salmon survey flights), and during point-to-point flights transporting the ADF&G staff and collaborators to and from study sites. As stated earlier, the requested survey takes for aerial surveys are not intended to duplicate or replace annual/biannual summer aerial population surveys conducted by the MML.

3.1.1.2 *Unmanned Aircraft Systems*

Under Permit No. 22289, the MML will conduct unmanned aerial surveys using UAS to supplement and replicate (at certain locations) the use of manned aerial surveys and photograph Steller sea lions. The UAS may be used in lieu of any manned aircraft at any time. The UAS will also be used for photographic identification, mark-resighting, photography and videography, and behavioral observations. In the case of the Western DPS of Steller sea lions, the MML was unable to conduct manned aerial surveys at rookeries and haulout sites in an approximately 483 kilometer (300 miles) stretch of the Aleutian Islands during the breeding seasons from 2009 through 2012 because of inclement weather and lack of landing sites due to runway repair activities. The availability of alternate means to photograph Steller sea lions at such locations greatly improves researcher's ability to get complete counts and meet management responsibilities during their previous permit.

The principal UAS will be the APH-22 hexacopter, although other types of rotary-wing or fixed-wing UAS may be used depending on availability, funding, and other logistics). The APH-22 hexacopter weighs approximately 1.8 kilograms (less than 4 pounds) and has an approximately 55 centimeter (1.8 feet) diameter between motor centers for carrying a camera system (e.g., Olympus EP-2 camera with a fixed lens). The MML will also use an APH-28 hexacopter, which has an approximate 70-centimeter (2.3 foot) length between motor centers. The APH-28 hexacopter is nearly identical to the APH-22 hexacopter, but has greater lifting capabilities for heavier payloads such as higher resolution cameras or thermal sensors. Currently, the MML has a camera (e.g., Olympus EP-2) and thermal sensor (e.g., FLIR DUO Pro R) installed on the APH-28 hexacopter that can replace the visual camera. The APH-28 hexacopter is slightly larger and has more power than the APH-22 hexacopter; however, given the larger carbon-fiber propellers, the sound propagation is nearly identical to the APH-22 hexacopter. These UAS can be launched from a research vessel, but more likely, a suitable ground-based launch site downwind and away from the animals will be used to minimize disturbance. From either ground- or research vessel-based launch sites, if the UAS and radio controller lose connection, the UAS will automatically return to "home" (either the take-off location for ground based flights or the home beacon for research vessel-based flights) and land. The APH-22 hexacopter has a 30-minute flight duration, although flights will likely be no longer than 20 minutes to allow for battery reserve. Photographs will be taken every two to five seconds during the flight, which will provide considerable overlap. The pilot will attempt to fly straight line transects slowly (three to five meters per second [5 to 10 miles per hour]) and will avoid hovering to reduce potential

animal disturbance. Flights will be conducted at altitudes between approximately 46 to 76 meters (150 to 250 feet), with a maximum altitude of 122 meters (400 feet), which will provide the necessary resolution on the photographs to discern pups. See Figure 3, Figure 4, and Figure 5 for examples of UAS equipment used by the MML.



Figure 3. Example of APH-22 hexacopter unmanned aircraft system.



Figure 4. Example of AeroVironment Puma AE unmanned aircraft system.



Figure 5. Example of Aeryon Scout unmanned aircraft system.

In the laboratory, two researchers working independently will count all Steller sea lions in photographs taken at each terrestrial site during the aerial survey. Steller sea lions are counted off digital photographs using high-resolution monitors and Adobe Photoshop software. A script within the software tallies the number of pups, juveniles, adult females, subadult males, and adult males that are counted. Initial total counts of non-pups (juveniles, adult females, subadult males, and adult males) at each site by each researcher are compared. If the difference in total non-pup counts at a site is greater than five percent or has an absolute magnitude of greater than 20 (for large sites), then the photographs (with counted animals) are compared to reconcile discrepancies. If Steller sea lions are disturbed into motion or into the water and far removed from land, every effort is made to count them, but animals that were otherwise in water and far removed from land at undisturbed sites are not. Because altitude and orientation are known, length of individual animals can be measured and animals can be assigned to age and sex classes.

After obtaining raw pup and non-pup count data from aerial surveys, abundance index trends, predicted counts, and realized counts are estimated using the R package *agTrend* (Johnson and Fritz 2014) for each region and DPS in Alaska. This method uses a three-level hierarchical model to augment missing abundance measurements, while accounting for survey methodology changes and variability due to survey replication. Predicted counts are used to estimate trends, and account for both observation and process errors. Realized counts use the standardized variance at each site throughout a given time series to estimate survey counts the MML can expect to collect if they had completely surveyed all sites. Therefore, the more complete the aerial survey, the more similar raw counts are to realized counts.

Under Permit No. 22298, the ADF&G will conduct UAS surveys to supplement manned aerial counts and vital rate studies of Steller sea lions. The UAS survey methods will follow those used in field tests by the MML population survey team under the guidance of the Geophysical Institute at the University of Alaska Fairbanks. The UAS will be flown 50 to 83 meters (164 to 272 feet), an altitude at which the two UAS devices in use by the MML present a smaller profile than that presented by the NOAA Twin Otter flying at 233 meters (764.4 feet), its regular altitude during summer Steller sea lion population surveys.

The UAS equipment specifications (fixed wing or vertical take-off and landing, payload components, battery life, auto-return feature, size and mass, and details for the ground control station, spotter roles, and line of sight of device) are not yet determined. If permitted to use an UAS, before acquiring and operating an UAS device, the ADF&G will submit a study plan to NMFS' Permits and Conservation Division with details. In addition, the ADF&G will obtain any appropriate Federal Aviation Administration permits and authorizations and personnel licenses upon approval of this method.

3.1.2 Vessel Surveys

Under Permit No. 22289, the MML will conduct vessel and ground surveys for marked animals. Estimating survival using mark-recapture methods requires substantial amounts of observational (“resight”) effort to minimize estimate error. Branded or other previously-marked animals will

be observed in a manner that may incur disturbance during (1) vessel-based surveys; (2) observation from land if topographically advantageous, (3) UAS deployments, and (4) while conducting research on northern fur seals (*Callorhinus ursinus*) on the Pribilof Islands and Bogoslof Island. Observations will also be obtained from research activities such as (1) land-based observations by NMFS scientists studying Steller sea lions at field camps on Marmot and Ugamak Islands, (2) land-based opportunistic observations by residents of the Pribilof Islands, (3) land-based observations by U.S. Fish and Wildlife Service scientists studying Pacific walrus (*Odobenus rosmarus divergens*) based at a field camp on Round Island, (4) photographs or video taken by cameras mounted above terrestrial haulout and rookery sites on four islands and operated by the ASLC, and (5) photographs and information submitted by the public. These data will be collected in support of all of the tasks associated with objective two by producing estimates of survival and reproductive rate, and subsequently will be used to address objective four (see the beginning of Section 3 for the MML research objectives).

Vessel surveys will typically be conducted during May through August and October through November, but can occur at any time of year. In general, sites are visited between the hours of 8:30 am to 10:30 pm during summer months. Timing varies seasonally depending on the level of light. A group of researchers consisting of at least two observers and a research vessel (e.g., skiff) operator will depart from the larger research vessel, approach the site from downwind to reduce potential disturbance (or from the right side to increase the chance of seeing animals branded on the left side if they enter the water). Small research vessels are typically an inflatable skiff equipped with a four-stroke, 30 horse-power outboard motor, SAFE boat, or other type of vessel.

Vessel and ground surveys occurring in Washington, Oregon, and California will follow similar protocols as those used in Alaska for collecting and processing brand resight data. Branded or other previously-marked Steller sea lions will be documented using (1) vessel-based and small boat surveys, (2) observations from land if topographically advantageous, (3) UAS deployments, (4) remotely-installed cameras, and (5) photographs and information submitted by the public.

Vessel surveys will be conducted several times per month, from spring to fall, throughout the range of Steller sea lions in northern California (primarily Saint George Reef), Oregon (primarily Rogue and Orford Reefs), and Washington (northern outer coast). Researchers will approach slowly from a distance of greater than 100 meters (328.1 feet), in which the Steller sea lions generally do not become startled by the vessel and appear to become used to it. Animals will be observed using binoculars and images are taken with digital cameras with telephoto lenses; average approach distances to Steller sea lions are 50 meters (164 feet). Observations are made using image-stabilizing binoculars (e.g., Fujinon or Nikon 14 by 40 or 10 by 40), and photographs taken with a digital camera (e.g., Nikon D1X) with an image-stabilizing lens (e.g., Nikon 80 to 400 millimeters [3.1 to 15.7 inches]). Vessel surveys will be conducted by two to four staff operating small boats (e.g., Boston Whaler [6.7 meters or 22 feet]).

Under Permit No. 22293, the ASLC will conduct vessel surveys from a custom built, seven meter (23 feet), landing craft called the *Jubatus* owned by the ASLC. Additional vessels of similar size may be used depending on the availability of the *Jubatus*.

Under Permit No. 22298, the ADF&G will also conduct vessel surveys for brand resighting and associated observations of Steller sea lions. Observations of branded or otherwise previously marked sea lions during vessel surveys are accomplished using a skiff or ship. During vessel surveys, extreme care will be used on first approach to haulouts and rookeries by skiffs such that at greater than 200 to 400 meters (656.2 to 1,312.3 feet), animals will be given at least several minutes to notice the ADF&G's presence before further approach resumes. The skiff will remain at this distance stationary or moving at less than 8 kilometers per hour (5 miles per hour). This is expected to prevent most agitation of animals as Steller sea lions react most strongly when approached unexpectedly and at high speeds by skiffs. Only if the ADF&G researchers observe animals behaving naturally and appear to be comfortable with their presence (not looking at the skiff and altering their movements on land or moving towards the water) will the skiff approach closer at less than 8 kilometers per hour (5 miles per hour). As long as animals continue to appear comfortable with the presence of the skiff, most skiff-based resighting work will be conducted at a distance of 10 to 50 meters (32.8 to 164 feet) from the shoreline. If animals remain uncomfortable with the ADF&G's presence at this distance, resighting will be conducted at a distance where few or no animals appear agitated. Observations from vessel-based platforms will be conducted infrequently (usually only when sea conditions prevent launching skiffs) at minimum distances of 100 meters (328.1 feet).

Visual observations of brands and marks during the ADF&G vessel surveys will be made using binoculars (often image-stabilized) or spotting scopes, and digital images will be obtained for most (greater than 97 percent) of the marked animals observed during dedicated resighting efforts. Observers' interpretation of marks will be recorded in notebooks, compared to digital images, and entered into a database. A photo library containing images of all the ADF&G-marked animals will be used to confirm these resight observations. The ADF&G will share photos and resighting data periodically among groups marking and resighting Steller sea lions (i.e., MML, Oregon Department of Fish and Game, ASLC, Russian and Canadian counterparts), using a standard or comparable format for all groups to maintain libraries of their marked animals.

The ADF&G will also conduct vessel-based resight surveys to assess sea lion presence and movement, to describe ephemeral seasonal concentrations at areas of ecological significance to sea lions (e.g., Alsek/Akwe rivers), to better understand sea lion usage of locations off the regular survey route (e.g., Bristol Bay), and to characterize sea lion usage at the northern fringe of their range (e.g., Saint Lawrence Island). Most boat-based resighting work for survival and reproductive rates will occur when pups are greater than two weeks to two months of age, when pups are past the perinatal period.

3.1.3 Ground Surveys

Under Permit No. 22289, the MML will conduct ground surveys in Washington, Oregon, and California. These ground surveys will include remote camera monitoring activities (e.g., installation, maintenance, and removal of cameras), resighting of marked Steller sea lions, and scat collection. The MML may conduct up to 24 ground surveys at any one site per year depending on funding, staffing, and weather conditions.

Camera monitoring of branded animals for survival estimation will be accomplished via automated cameras installed at Pyramid Rock, Rogue Reef, and Oregon. Cameras will be installed in April or May prior to arrival of pregnant females and territorial males. One to two maintenance trips are generally required throughout the viewing season (conducted outside peak pupping times), with a final removal trip in September or October (weather dependent).

Ground surveys for brand resighting for survival estimation will primarily occur at on-shore and nearshore haulouts, which can be approached by foot or research vessel. These will be conducted several times per month, year round, throughout the range of Steller sea lions in northern California (primarily Trinidad Head), Oregon (primarily Cape Arago, Sea Lion Caves, and Cascade Head), and Washington (primarily Bodeliteh Island and Sea Lion Rock). Ground surveys for brand resighting may occur on offshore sites, concurrent with other research activities (remote camera maintenance, scat collection). Animals will be observed using binoculars and images are taken with digital cameras with telephoto lenses and average approach distances from the animals will be 50 meters (164 feet).

Under Permit No. 22293, the ASLC will conduct ground surveys. Ground survey approaches will occur 0 to 100 meters away from Steller sea lions. Ground surveys will be conducted at rookeries and haulouts where Western DPS of Steller sea lions occur in coordination with other agencies conducting similar efforts. Photos will be taken with high resolution digital cameras to document observations. Observations will focus on branded, tagged, injured, or entangled sea lions. All sea lions in the water and on land will be counted during these rookery and haulout visits.

Under Permit No. 22298, the ADF&G will also conduct ground-based count and resight surveys to assess sea lion presence and movement, to describe ephemeral seasonal concentrations at areas of ecological significance to sea lions (e.g., Alsek/Akwe rivers), to better understand sea lion usage of locations off the regular survey route (e.g., Bristol Bay), and to characterize sea lion usage at the northern fringe of their range (e.g., Saint Lawrence Island). In addition, the ADF&G resight surveys will also be used to record and analyze behavioral observations. These behavioral observations are discussed further below in Section 3.1.7.

Land-based observations will be conducted at various distances depending on topography of sites. When resighting at haulouts the ADF&G may approach more closely to a group of animals to better view a brand. As with vessel surveys, visual observations of brands and marks conducted during ground surveys will be made using binoculars (often image-stabilized) or

spotting scopes, and digital images will be obtained for most (greater than 97 percent) of the marked animals observed during dedicated resighting efforts. At 20 to 40 percent of sites visited by skiff, the ADF&G observers will also resight animals from shore in hidden locations 50 to 200 meters (164 to 656.2 feet) away from Steller sea lions. Observers' interpretation of marks will be recorded in notebooks, compared to digital images, and entered into a database. Additional data collected during resight efforts include: a count of non-pups, a count of pups (except at larger rookeries, where accurate pup counts are especially difficult and time consuming to obtain), and a description and photograph of sea lions with injuries, neck or other entanglements, or ingested fishing gear (as indicated by fishing line, hooks and flashers with line protruding from their mouths).

3.1.4 Photographic Identification

Under Permit No. 22289, the MML will conduct photographic identification during aerial surveys, vessel surveys, ground surveys, and capture events. During aerial surveys, photographs will be taken with a high resolution camera from both manned aircraft and UAS. During vessel and land surveys, photographs taken with a digital camera (e.g. Nikon D1X) with an image-stabilizing lens (e.g. Nikon 80 to 400 millimeters [3.1 to 15.7 inches]). After aerial survey photographs are taken, these pictures are sent to a laboratory where two researchers working independently will count all Steller sea lions in photographs taken at each terrestrial site during the survey. Sea lions are counted off digital photographs using high resolution monitors and Adobe Photoshop software (mention of specific products does not serve as an endorsement). A script within the software tallies the number of pups, juveniles, adult females, sub-adult males, and adult males that are counted. Initial total counts of non-pups (juveniles, adult females, sub-adult males, and adult males) at each site by each researcher are compared; if the difference in total non-pup counts at a site is greater than five percent or has an absolute magnitude of greater than 20 (for large sites), then the photographs (with counted animals) are compared to reconcile discrepancies. If sea lions are disturbed into motion or into the water by the survey aircraft, then every effort is made to count them, but animals that were otherwise in the water and far removed from land at undisturbed sites are not. Because altitude and orientation are known, length of individual animals can be measured and animals can be assigned to age and sex classes.

Under Permit No. 22293, the ASLC will conduct photographic identification. Researchers will conduct brand or mark resighting from research vessels and from land at haulouts and rookeries throughout the range of Western DPS of Steller sea lions in coordination with other agencies conducting similar photographic identification efforts. Photographic identification will be conducted on animals with unique natural scars, fungal patches, flippers, or applied brands or tags. Researchers will focus on animals with brands, tags, injuries or entanglements.

Photographs will be taken with high-resolution digital cameras to document observations. Cameras will use zoom lenses (at least 300 millimeters [11.8 inches]) to forego the need for close approaches in most cases. Approaches from land and sea will generally remain outside or 100 meters (328 feet), but researchers may approach to within 20 meters (65.6 feet) during vessel

and ground surveys to properly identify uniquely marked animals. Photographs will be regularly taken, logged in a relational database, and analyzed using custom software on desktop computers at the ASLC. The database will contain resightings, behavior, movements, and reproductive history of individuals. Audio and video files will be recorded to digital video disks, digital video recorders, and computer hard drives.

Under Permit No. 22298, the ADF&G will also conduct photo identification of captured Steller sea lions. Photo identification of captured animals will be used to assess distribution, dispersal, genetic diversity, maternal and/or paternal origins, entanglement prevalence and vital rates such as age-specific survival rate, reproductive rate, and probability of weaning in Steller sea lions (ADF&G 2019). Photo-identification is currently employed and permitted under the ADF&G's existing permit (expiring in 2019). A full-frame brand photo, full frame left-side photograph (including brand), and additional photographs will be taken. Photographs are also taken of unbranded animals (right, left, and dorsal photographs).

3.1.5 Brand Resighting

Under Permit Nos. 22289, 22293, and 22298 the MML, ASLC and ADF&G will conduct brand resighting. In order to be included as a sighting in the MML's recapture database, an individual branded animal must be positively and unambiguously identified. In order to achieve this, field observers record each brand character and a code indicating the quality of the identification and of the character/digit itself on the animal. In the long-term, year-round efforts to resight marked animals occur at many locations in the study area. Digital images of brands are taken at the time of marking and as often as possible during re-sight efforts. Conditions of brands are recorded and escribed during each re-sight even in subsequent years. Short- to mid-term monitoring is accomplished through visual observations of animals as available, and by examination of movement and dive records obtained using telemetry. Long-term monitoring will be achieved through visual resights of marked animals for comparison of survival with similar aged animals.

The ADF&G will conduct brand resighting during vessel and ground surveys. The ADF&G's objectives of resighting branded sea lions include estimating important life history parameters including age-specific survival, weaning, and reproductive rates; describing distribution and movement patterns based on sex, age, and natal rookery; and determining the prevalence and type of anthropogenic entanglements. Additionally, observing previously-handled sea lions provides a means to evaluate possible impacts of the ADF&G studies requiring capture and handling, as well as yielding information on the weaning status of previously studied animals (ADF&G 2019).

During the ADF&G's proposed research activities, brand resighting will be conducted at rookeries and haulouts in Southeast Alaska with possible additional resighting effort in British Columbia. Sea lions marked in the Forrester Island complex are frequently observed in British Columbia. Additional brand resighting will be conducted, as funding allows and partly decided in response to the available resight effort by the ADF&G cooperators in the region (MML and ASLC), in the Gulf of Alaska and to locations west in the Western DPS of Steller sea lions. This

work is coordinated with the MML and ASLC. Resighting work at Forrester Island complex will occur throughout the pupping season from late May through July and include the perinatal period so that actual birth rates (not confounded with pup mortality) and pup mortality rates can be explicitly estimated during the pupping season.

3.1.6 Photography and Videography

Under Permit Nos 22289, 22293, and 22298, the MML, ASLC, and ADF&G will conduct photography and videography. The MML will conduct photogrammetry and remote video monitoring using high depth cameras including remote camera installations (at rookeries in the western-central Aleutian Islands). Cameras will be installed in April or May prior to arrival of pregnant females and territorial males. One to two maintenance trips are generally required throughout the viewing season (conducted outside peak pupping times), with a final removal trip in September or October (weather dependent).

The ASLC will conduct remote video monitoring year-round at Chiswell Island rookery and neighboring haulouts for the entire duration of the research activities. Remote video monitoring will study maternal care, population, natality rates, mortality, body condition, growth rates, and the effects of disturbance (tourism) with minimal or no invasive impacts. Killer whale presence and predation will be assessed through this research method as well. In 1998, the ASLC began a remote video project on Chiswell Island near the entrance to Resurrection Bay to count Steller sea lions and conduct behavioral studies. Video cameras and supporting equipment included a microwave transmitter, solar and wind generators, and a weather station were installed adjacent to the rookery. Up to six cameras equipped with pan, tilt, zoom, windshield washer/wiper functions as well as controllable via UHF or microwave signals are located at intervals above the rookery for complete viewing of the animals using this area. Two or more cameras will be specially programmed for three-dimensional photogrammetric measurements of animals. One or more cameras will be equipped with infrared thermographic imaging. Digital images will be taken remotely from the ASLC under varying weather and sea lion pelage conditions (e.g. wet/dry, molting or not) to determine primary areas of heat loss and potential for infection or disease in many of the animals on shore. Audio and video signals from those cameras are received and controlled in real-time from the ASLC.

In addition, remote video sites have since been installed at haulouts near the Chiswell Island rookery at Seal Rocks (Kenai), Nataoa Island, and Cape Resurrection Islets to assess behavioral patterns such as foraging cycles, timing of weaning, and spontaneous abortions at those sites. Currently, three to eight annual visits are needed to service and maintain the remote video system. Visits will occur during the times of year when animal presence is low or non-existent. Locations for remote video monitoring may expand to larger rookeries west of Outer Island, Alaska, but within the range of the Western DPS of Steller sea lions if funding becomes available. Additional time-lapse cameras may be installed at haulouts or rookeries where real-time remote video links are not possible or practical. The time-lapse cameras will record still

images or short video clips on a regular basis up to once per minute at locations and during periods of expected animal presence.

Researchers will also use three-dimensional digital imaging to estimate the size of animals and infrared thermal imaging to estimate heat loss and detect potential disease and infection for animals on shore. Estimates of size and mass of animals using three-dimensional photogrammetry cameras has already been developed at the ASLC (Waite et al. 2007) and additional single-camera photogrammetry methods are also available (Meise et al. 2014). These types of technology can easily be integrated into remote control video cameras. Infrared thermography has been used on a variety of marine mammals and has been validated for use on Steller sea lions by the ASLC (Willis et al. 2005).

Under Permit No. 22298, the ADF&G will conduct photography and videography during its proposed Steller sea lion research activities. The ADF&G will conduct remote time-lapse camera surveys year-round (remote video monitoring). Remote time-lapse cameras are fixed, un-manned stations mounted near Steller sea lion haulouts that record presence/absence, counts and make brand resight or entanglement observations. Incidental disturbance during installation, servicing and removal of cameras is requested by the ADF&G for these activities in the ground-survey category on the ADF&G take tables. In addition, during Steller sea lion capture events, the ADF&G will photograph captured Steller sea lions for future photo-identification (See Section 3.1.4)

3.1.7 Behavioral Observations

Under Permit Nos. 22289, 22293, and 22298, the MML, ASLC, and ADF&G will conduct behavioral observations. During reproductive rate surveys, the ADF&G will observe and record animal behavior (mother-pup interactions, nursing, etc.). In general, the behaviors that the ADF&G are able to detect that may suggest animals are aware of their presence include "alert" - an animal looking in the direction of researchers/research activities and animals orienting to and entering the water. Excluding instances when a sea lion looks directly at a researcher, the ADF&G researchers cannot be certain these behaviors are due to researcher presence, since they are normal behaviors of sea lions. In order to accurately record mother-pup interactions researchers remain at a distance where researchers can see no outwardly visible reaction to the ADF&G presence (ADF&G does not wish to disturb the behavior that researchers are trying to document).

As stated in Section 3.1.3, the ADF&G resight surveys will also be used to record and analyze behavioral observations. Annual summer survival and reproductive rate survey(s) will be conducted during four to 16 weeks in summer (May through August) at haulouts and rookeries throughout Southeast Alaska (Eastern DPS and Western DPS of Steller sea lions) and other portions of the Western DPS, including multiple visits to selected haulouts and rookeries (two to 20 visits per summer at one to 15 sites, two to 20 visits per summer at one to six sites) to improve resighting rates of juveniles and at rookeries (one to ten days per rookery per trip) to estimate reproductive rate and weaning probabilities via a robust design. The ADF&G will

attempt to minimize disturbances when collecting behavioral data for the reproductive rate and weaning studies. Based on the ADF&G's observations over the past ten years, detectable disturbances have been minimal during these surveys.

3.1.8 Passive Acoustic Monitoring

Under Permit No. 22293, the ASLC will conduct remote continuous audio (passive acoustic) monitoring using non-invasive equipment (microphones and cameras) year-round for the entire duration of the research activities. Passive acoustic monitoring will be conducted at Chiswell Island and other rookeries and haulouts.

Under Permit No. 22298, the ADF&G will conduct passive acoustic monitoring. For the ADF&G, passive acoustic monitoring contributes to successfully assessing distribution, dispersal, genetic diversity, maternal and/or paternal origins, entanglement prevalence and vital rates such as age-specific survival rate, reproductive rate, and probability of weaning in Steller sea lions. In addition, passive acoustic monitoring assists in monitoring the movement and diving behavior of Steller sea lions. These objectives can be fulfilled through the use of devices such as attached acoustic recorders. The ADF&G has collaborated on projects that successfully use this method to detect the foraging location of marine mammals and to help determine whether noise displaces animals from feeding areas (e.g. Cook Inlet DPS of beluga whale research). The ADF&G has not previously requested this passive sampling method in its existing Steller sea lion permit, however it is requesting to retain this as a potential data collection method. Instrument technology is developing rapidly as advances in miniaturization, battery technology and software engineering allow for new combinations of instruments. As a result, attached acoustic recorders may be potentially deployed on Steller sea lions to perform passive acoustic monitoring. Any MMPA takes from passive acoustic monitoring will fall under the ADF&G's requested unintentional disturbance takes: either vessel- or ground-survey or deployment/retrieval of scientific instruments takes.

3.1.9 Capture Activities

Under Permit Nos 22289, 22293, and 22298, the MML, ASLC, and ADF&G will conduct capture activities on Western DPS of Steller sea lions. The following is a general overview of the capture activities that each applicant will conduct. This is followed by sections detailing each specific capture technique.

Under Permit No. 22289, the MML will conduct capture activities to accomplish objectives two to four and include research methodologies that differ for targeted age classes and locations (see the beginning of Section 3 for the MML research objectives). Pups (greater than five days to two months old) are captured by hand and hoop net; juveniles (greater than two months to three years old) are captured by hand or larger hoop net depending on size and location; and juveniles, subadults, or adults are captured using larger hoop net, or remotely-delivered (darting) chemical anesthetics. Restraint techniques also vary by age classes and locations. Pups (less than or equal to two months old) on rookeries are restrained by hand, net, and/or gas anesthesia (if being

marked with a hot brand). Juveniles, subadults, or adults will be restrained using a combination of restraint wraps, gas anesthesia, or injectable sedatives. Subadults or adults may also be restrained in a squeeze cage if captured in the Pacific Northwest.

Pups are handled to assess health, condition, exposure to contaminants or disease, stock structure, and dispersal. Capture activities will occur at the rookeries selected for permanent marking of pups, but also at other rookeries selected from sites to balance sample size needs among regions, and to maximize retrospective comparisons. The subgroup of pups handled for sampling are to understand health-related mechanisms underlying Steller sea lion population trends in Alaska. Researchers will collect measurements (standard morphometrics), weights, blood samples, and swabs of mucus membranes (nasal, ocular, oral, vaginal, and anal) and lesions for health and condition assessment and disease surveillance. Fecal and urine samples (excreted while handling) will be opportunistically collected for biotoxin (harmful algal bloom) monitoring. Skin samples will be collected for continued genetic studies. During permanent marking, a subset of pups being handled will be biologically sampled. Biological sampling includes blubber biopsy which will be collected for fatty acid and toxicology analysis; fecal loop for determination of parasites, disease, hormone concentrations; milk collection from stomach lavage; vibrissae pull; and external ultrasound.

In Alaska, multiple techniques will be used to capture non-pups (i.e., juveniles, subadults and adults). It is not possible to predict in advance of the research activities (with the exception of the adult captures using injectable sedatives) how many might be captured using a specific technique. Captures will be conducted in partnership with the ADF&G, with either group taking the lead on specific trips. The MML and ADF&G will share research methods and personnel, and results from the combined research activities. Similar to pups, biological samples will be collected from non-pups to assess health, condition, exposure to biotoxins, contaminants, and disease, and stock identification. Non-pups will also be tagged with instruments (transmitter and/or archival) to assess their habitat use and foraging ecology. The number of animals outfitted with instruments each year is constrained by budget limitations and sampling logistics. Thus, multiple deployments over several years are necessary to obtain optimum sample sizes to describe habitat use. The MML and ADF&G's research activities will use a target sample size of 20 to identify differences between two strata (e.g., location, season, etc.). Captures of non-pups can occur in any season and two takes per individual are allocated to each individual in the event they are disturbed for instrument recovery. The MML will capture and instrument subadult and adult male animals in areas where they are conducting captures of adult females.

The northern Washington coast has two adjacent islands (Carroll Island and Sea Lion Rock) that were previously defined as haulout sites, but are now considered rookeries as pup births have increased since 2008. The MML has no current plans to begin branding pups at these sites, but proposed to conduct flipper tagging on up to 50 pups per year at these sites to possibly document movements between rookeries and haulouts in the Pacific Northwest, where an additional 200 pups per year may be flipper tagged at haulouts. Pups will be flipper tagged using large, white

plastic Allflex plastic tags as a means of ancillary identification. Tags will be applied to flippers using tag application pliers. The MML will capture and instrument up to ten subadults or adults per year with satellite tags at Carroll Island and Sea Lion Rock by darting them. These tags may be applied through the use of biopsy punches, epoxy glue, and flipper tags. The application of satellite tags on Steller sea lions are further discussed in Section 3.1.14.2.

Under Permit No. 22293, the ASLC will capture up to 125 female and male pups (less than two months of age) per year determine the factors that may be affecting the health and condition of pups and to permanently or temporarily mark animals for movement and vital rate studies of age-specific survivorship and reproduction. Animals will be captured and will have their weight measured, morphometrics recorded, and other biological sampling will be done (blood, hair, milk, skin, vibrissae). Methods used to collect that data will be conducted through board restraint, gas anesthesia, branding or marking, ultrasound, and photogrammetry.

Steller sea lion pups will be captured on the rookery by corralling them in a central location. Up to six personnel will approach the rookery by water and land from different directions to flush adults into the water and corral pups together in a crèche. If pups enter the water and stray from the rookery, they will be collected by using an aluminum skiff and a hoop net with a long handle and turned to the temporary crèche on the rookery or corralled back to the rookery if capture is not possible. Pups in the crèche will be taken individually to biological sampling and branding stations using hoop nets. All hoop nets will be made of polyester or nylon webbing with a mesh size of about 2.5 centimeters (1 inch) and a 1.3 centimeters (0.5 inch) centimeter diameter aluminum frame. One to five personnel (one for every 25 pups) will continually monitor the crèche with a 2.4 meter (8 feet) blunt, wooden pole to keep pups from straying and stacking up on each other to prevent suffocation or injury. All pups noses and mouths will be kept visible to ensure they are breathing properly.

To minimize the effects of handling and branding, veterinarians and experienced biologists will watch for signs of distress such as unusually rapid or slow respiration and/or potential for injury. Any animal that shows signs of distress while being handled will be released immediately and closely monitored. An emergency kit consisting of an endotracheal tube and ambu bag, laryngoscope, respiratory stimulant (doxapram), a cardiac stimulant (epinephrine), a parasympatholytic agent (atropine) and a corticosteroid (dexamethasone) will be readily available. Anesthesia using isoflurane gas (Heath et al. 1997) will be used to relieve pain and prevent struggling during branding, blood draws, skin biopsy, and pulling vibrissae. There is a small risk of infection associated with bleeding, skin biopsies, and other types of samples taken from the pups. The risk of infection will be reduced through the disinfection of sampling sites isopropyl alcohol or betadyne and the use of sterile and/or aseptic equipment and sampling techniques. If an animal is seriously injured during captures or any other procedure and in need of emergency euthanasia as determined by the attending veterinarian, protocols for non-routine euthanasia will be followed. In addition, all serious injuries or mortalities will be reported to NMFS.

Under Permit No. 22298, the ADF&G will conduct captures using standardized methods. Captures are accomplished by several techniques that differ for targeted age classes and are completed to accomplish all ADF&G objectives for its proposed research activities listed above in the beginning of Section 3. Pups (newborn to two months old; since presence of umbilicus and estimation of age cannot be assessed until the pups are closely examined after capture) are captured by hand, hoop net or other net. Pups two months old or greater are captured by hand, or by using hoop nets, other nets, underwater noose, or noose by pole. Juveniles, subadults and adults are captured using hoop nets, other nets, underwater noose, noose by pole, or remote chemical immobilization. Restraint techniques similarly vary by age class. Pups (less than two months old) on rookeries are restrained by hand or net or by using gas anesthesia (if hot-branded), whereas older pups, juveniles and subadults are restrained physically (hand or restraint device) or chemically (valium or gas anesthesia). Adults are restrained physically (squeeze-cage), chemically (valium), with gas anesthesia, or a combination of the above based on judgment of the attending veterinarian.

Land-captured sea lions that are older pups (greater than or equal to two months of age) and/or juvenile (ADF&G defines this group as one year to three years of age) may be transferred to a research vessel or processed on-site, and restrained with isoflurane, as are sea lions captured with underwater noosing. Sea lions are inducted using masks, and endotracheal tubes are inserted (Heath et al. 1997) to continue administration during sampling procedures. This age group is also successfully captured in the water using the lasso technique (Raum-Suryan et al. 2004).

3.1.9.1 *Capture by Hand*

Under Permit Nos. 22289, 22293, and 22298, the MML, ASLC, and ADF&G will conduct capture by hand. Under Permit No. 22289, the MML will capture pups by hand in order to physically restrain them. Inhalable isoflurane gas may also be used if they are branded. Smaller pups can be safely restrained by one person, while another person collects measurements and samples. Restraint is accomplished by gently, but firmly restricting movement of the head and foreflippers. Hoop-net captured juveniles are physically restrained by hand by slowly transferring them from the hoop net into fabric restraining wraps.

The MML will capture pups (greater than five days through two months old) using a hoop net or by hand and placed in a hoop net (large gauge nylon netting with mesh sizes of approximately 3 centimeters [1.2 inches]) for multiple procedures. During branding operations, pups are corralled against cliffs or boulders and then are captured with a hoop net. One person can safely capture smaller pups, but in most cases, two people are required to carry the pup to a given workstation. Pups are processed in small groups, monitored after rounded up to prevent piling and overheating, and separated from the group if necessary. Furthermore, any pups displaying signs of distress are released, monitored, and treated if necessary.

Under Permit No. 22298, the ADF&G will conduct capture by hand methods. Capture by hand may be supplemented through the use of other capture techniques and equipment (i.e., hoop net, other net, cage, or board restraint). In addition, restraint techniques vary by age class. Pups (less

than two months old) on rookeries are restrained by hand or net or by using gas anesthesia (if hot-branded), whereas older pups, juveniles and subadults are restrained physically (hand or restraint device) or chemically (valium or gas anesthesia). Adults are restrained physically (squeeze-cage), chemically (valium), with gas anesthesia, or a combination of the above based on judgment of the attending veterinarian.

3.1.9.2 Hoop Net

Under Permit Nos. 22289, 22293, and 22298, the MML, ASLC, and ADF&G will conduct hoop net captures. Under Permit No. 22289, the MML will capture pups by hoop net. Weights of pups in hoop nets or juveniles and adult females in restraining wraps are collected (± 0.1 kilograms [0.2 pounds]) by suspending the hoop net or wrap from a digital scale mounted on a tripod. For morphometric comparisons, 50 pups per rookery (approximately 25 males and 25 females) will provide a minimum sample size useful for statistical analyses of mass by sex class (sufficient to detect a 15 percent change in mass of males and a ten percent change in the mass of females [$\alpha=0.05$ and statistical power $(1-\beta)=0.80$]).

Under Permit No. 22298, pups and juvenile Steller sea lions on land may be captured with a large hand held hoop net by ADF&G researchers. This method involves up to three biologists stalking as close as possible to the target animals before entrapping them in nets. This technique has proven safe for both researchers and animals and has only had one recorded mortality during a capture trip. Hoop-net captured sea lions may be physically restrained by slowly transferring them into fabric restraining wraps used for weighing. Steller sea lions are restrained in this wrap during measurements and sample collection. Injectable valium or isoflurane gas may be administered under veterinary supervision to reduce struggling. Steller sea lions may also be transferred directly from the hoop net to a capture noose similar to the type used during dive captures, released to the water, and recovered by the ADF&G's capture skiff in similar fashion to dive-captured sea lions. Both methods have been successfully employed by the ADF&G during previous work.

3.1.9.3 Other Net

Under Permit Nos. 22289 and 22298, the MML and ADF&G may use other nets to capture Steller sea lions.

3.1.9.4 Underwater Noose

Under Permit Nos. 22289 and 22298, the MML and ADF&G may conduct underwater noose captures of Steller sea lions. This method consists of two or three divers, supported by skiffs and a larger vessel, approaching a haulout under water. The natural curiosity of young sea lions draws them to the divers, and after a brief period, sea lions will approach close enough that the divers can place a rope lasso over their heads. The noose is slipped around the animal's head and the lasso is tightened on the lower neck/shoulder region while the crew of the second capture skiff retrieves the rope. Animals will be wrapped in a restraining net, pulled into the skiff using the net and placed directly into padded, ventilated capture boxes. As soon as the lid to the

capture box is secure the lasso is removed from the neck/shoulders of the animal. This technique has proven to be effective and safe for divers and captured animals, and has not resulted in an injury or mortality by either the MML or ADF&G in over 700 captures (ADF&G 2019).

3.1.9.5 *Noose with Pole*

Under Permit No. 22298, ADF&G will conduct noose with pole captures. The modified noose-pole technique permits land captures without requiring personnel to step onto and disturb the haulout. The lasso is affixed to animals either from a concealed position on land or from a skiff, using a long pole rigged to hold the lasso. The sea lions will be lassoed and then released into the water with a buoy attached and brought into ADF&G's capture skiff following the same protocols as its dive captures. This method would follow all protocols established with the underwater captures; it is essentially the same concept except it does not require divers.

3.1.9.6 *Restraint Wrap*

Under Permit No. 22289, the MML may use restraint wraps to capture animals.

3.1.9.7 *Squeeze Cage*

Under Permit Nos. 22289 and 22298, the MML and ADF&G may use a squeeze cages to temporarily hold captured Steller sea lions. The MML will only use squeeze cages during its Steller sea lion capture activities in the Pacific Northwest.

3.1.9.8 *Chemical Immobilization/Darting*

Under Permit No. 22289, the MML will specifically target larger animals for capture by use of sedatives delivered via propelled darts. For this procedure, an observer and darter dressed in camouflaged clothing will select an unsuspecting group of animals on land that appear to be in good position relative to the water (i.e., away from the ocean shoreline or pools of standing water on the rookery). The darter and observer will move carefully to a position that is 5 to 20 meters (16.4 to 65.6 feet) from the targeted subject without disturbing it or other Steller sea lions, allowing a shot to be taken from as short a distance as possible. This permits lower impact velocities, reducing potential "startle" effects of a dart. Close proximity to the target animal also facilitates more precise estimates of mass (for dosage) and quicker access to the animal once induction occurs. Quick access to the animal will also reduce complications associated with compromised breathing when a Steller sea lion becomes immobilized and adopts a posture that inhibits normal breathing patterns.

During the previous research permit, the MML successfully administered medetomidine-butorphanol-midazolam (dosage range approximately 0.038 to 0.044, 0.13 to 0.15, and 0.19 to 0.22 milligrams per kilogram, respectively) (Haulena 2014) to adult females via remotely delivered darts (e.g., 3 milliliters Daninject dart syringes or similar) from a carbon dioxide-powered projector rifle (e.g., Daninject Model JM Special, or similar). Darts will be aimed to deliver sedatives intra-muscularly into the hips and tibia lumbar muscle or into muscle over the shoulders (Haulena and Heath 2001). Sedated animals are approached approximately 12 minutes

post-darting and checked for responsiveness. After obtaining an open airway, animals are then intubated with an endotracheal tube and supplemented with isoflurane (0.5 to 1.5 percent) in 100 percent oxygen using a portable vaporizer to maintain anesthesia (if an animal is too responsive, isoflurane may be delivered via a cone-mask prior to intubation). While anesthetized, heart rate, respiratory rate, body temperature, oxygen saturation, and blood gases will be monitored throughout the procedure while biological samples are collected. Prior to release, one or more external instruments to record behavior and provide tracking data (see Section 3.1.14) will be attached to pelage using five-minute epoxy (Devcon Products) or similar adhesives. Animals will be reversed from sedation with an intermuscular dose of naltrexone (30 milligrams) and atipamezole (45 milligrams) and extubated from afar by gently pulling on a cord (approximately 5 meters [16.4 feet] in length) that is tied to the endotracheal tube. Darted animals that escape across land or into the water prior to handling will be followed by a research vessel or from land to verify survival. When feasible, animals in the water are also darted with the reversing agent using the same delivery system described above.

Although the MML will likely continue to use the mixture specified above (those dosages in Haulena and Schmitt 2018), veterinarians have requested the MML retain as much flexibility as possible in sedation drug options. Thus, the MML will include additional options such as the use of Telazol (an injectable one to one mixture of Tiletamine and Zolazepam) mixed with atropine sulfate (to reduce potential cardio-respiratory complications of Telazol) delivered at dosages of 1.8 to 2.5 milligrams per kilogram (Loughlin and Spraker 1989) and the immobilizing agents described in Table 6 below.

Table 6. Injectable immobilizing agents used for darting under Permit No. 22289.

Anesthetic	Dose and Method of Administration	Duration	Intervention
Medetomidine, Butorphanol and Midazolam; Reversal with Atipamezole, Naltrexone, and Flumazenil	Medetomidine: 0.03 to 0.10 mg/kg; Butorphanol: 0.2 to 0.4 mg/kg; Midazolam by dart: 0.1 to 0.2 mg/kg; Reversal with Atipamezole: 0.15 to 0.5 mg/kg; Naltrexone: 0.5 mg/kg; Flumazenil: 0.0002 to 0.002 mg/kg	Up to 40 minutes duration	Doxapram (up to 5 milliliters per kilogram) sublingual and/or epinephrine and/or intubation and oxygen
Butorphanol and Midazolam; Reversal with Naltrexone and Flumazenil	Butorphanol: 0.2 to 0.4 mg/kg; Midazolam: 0.1 to 0.2 mg/kg; Reversal with Naltrexone: 0.5 mg/kg; Flumazenil: 0.0002 to 0.002 mg/kg	Up to 40 minutes duration	Doxapram (up to 5 milliliters per kilogram) sublingual and/or epinephrine and/or intubation and oxygen

Medetomidine and Midazolam; Reversal with Atipamezole	Medetomidine: 0.03 to 0.1 mg/kg; Midazolam by dart: 0.1 to 0.2 mg/kg; Reversal with Atipamezole: 0.15 to 0.5 mg/kg; Flumazenil: 0.0002 to 0.002 mg/kg	Up to 40 minutes duration	Doxapram (up to 5 milliliters per kilogram) sublingual and/or epinephrine and/or intubation and oxygen
Medetomidine and Telazol; Reversal with Atipamezole and/or Flumazenil	Medetomidine: 0.03 to 0.01 mg/kg; Telazol: 0.77 to 1.1 mg/kg by dart; Reversal with Atipamezole: 0.14 to 0.2 mg/kg; or Flumazenil: 0.002 to 0.005 mg/kg	Time to Effect: 3 to 22 minutes; Procedure time 59 to 73 minutes	Doxapram (up to 5 milliliters per kilogram) sublingual and/or epinephrine and/or intubation and oxygen

The mean induction time for Telazol anesthesia in adult female Steller sea lions is approximately ten minutes. Therefore, one of the risks of this agent is that an animal can be spooked into the water before induction is complete. In order to minimize this risk, the MML will exclude Steller sea lions that are close the ocean shoreline or pools of standing water from chemical immobilization procedures, only qualified veterinarians and personnel will be involved in all aspects of the process (mass estimation, darting, and agent dosage).

Under Permit No. 22298, ADF&G will conduct remote chemical immobilization through the use of propelled darts. At the discretion of the attending veterinarian, drugs may be administered intramuscularly, intraperitoneal, intravenously, subcutaneously, and/or topically. ADF&G will use the similar methods, drugs, and drug doses as the MML when conducting remote chemical immobilization. In addition, antibiotics (e.g. Oxytetracycline) may be administered if evidence of wounds or infections warrants in the opinion of the attending veterinarian. Personnel that would administer drugs include veterinarian or veterinary technician with state license requirements or anesthetist.

In the event of respiratory distress or arrest, doxapram is administered (diluted in saline into the trach tube if intubated), intravenously or sublingually in the dosage of approximately one miligram/kilogram. This dosage would be repeated as needed to resuscitate and after ten to 15 minutes as needed until full recovery. The anesthetist may administer atropine, epinephrine, and any other emergency resuscitation drugs as prescribed by the attending veterinarian or veterinary technician supervising the procedures. After the administration of any drug, animals will be monitored and kept contained until they appear alert and able to move around without impairment.

3.1.9.9 *Sedation and Anesthesia*

Under Permit No. 22289, the MML will use gas anesthesia (isoflurane and sevoflurane) which is the safest known method for anesthetizing otariids due to the ability to titrate the level of drug to effect (Haulena and Schmitt 2018; Lian et al. 2018). This will reduce stress on pups, improve the quality of brands by preventing wiggling during branding. The MML will use equipment and techniques developed and described by Heath et al. (1996) and Heath et al. (1997), whereby inhalation anesthesia is delivered to hand-restrained pups using a portable gas anesthesia machine via a cone or mask placed over the snout. Subadult and adult animals will be inducted using masks, then intubated with an endotracheal tube (approximately 9 to 16 millimeters [0.4 to 0.6 inches] for animals less than 100 kilograms [220 pounds] and 14 to 24 millimeters [0.6 to 0.9 inches] for animals greater than 100 kilograms [220 pounds]) to continue administration of gas anesthesia during sampling procedures (Heath et al. 1997; Lian et al. 2018). Gas anesthesia will be administered and monitored by personnel thoroughly trained in its application for the time requirements of branding. This research method has been used extensively with Steller and California sea lions, both adults and pups, and was developed primarily for and during research activities in the field on these species in collaboration with the MML and ADF&G. This research method has also been used successfully with other pinnipeds (Gales and Mattlin 1998) .

Isoflurane will be delivered using a four to five percent vaporizer setting with a 5 to 10 Liter per minute oxygen flow rate until induction, after which the concentration of isoflurane will be reduced to one to two percent with a two to three Liters per minute oxygen flow to maintain anesthesia (Lian et al. 2018). A dose of 0.3 milligrams per kilogram Valium (diazepam) may be administered intramuscularly for sedation (Lian et al. 2018) prior to administering gas anesthesia or in lieu of gas anesthesia (e.g., for short restraint times when branding is not used) at the discretion of veterinarian. Adults captured by darting will be additionally restrained by supplementing them with isoflurane (range 0.5 to 1.5 percent) in 100 percent oxygen.

All pups are observed closely after gas anesthesia to ensure full recovery prior to release. Pups are held in a protected location on the rookery during recovery under the protection of researchers until they regain mobility and move away under their own power. They are released back onto the center of the rookery, away from the water, where they rejoin the other pups and remain until research activities have ended at the end of the day.

Similarly, non-pups are continuously monitored post-anesthesia and handling and they are not released until fully alert, oriented, and able to undertake complete motor function. Short- to mid-term monitoring is accomplished through visual observations of animals as available, and by examination of movement and dive records obtained using telemetry. Long-term monitoring will be achieved through visual resights of marked animals for comparison of survival with similar aged animals.

To mitigate potential adverse effects associated with gas anesthesia, only trained personnel or a qualified veterinarian will administer anesthesia and monitor vital signs during the procedure. Animals anesthetized for longer periods of time will be warmed or cooled, if necessary. A crash

kit comprised of drugs for anesthetic reversal and resuscitation will be available at all times. The MML's machines will be cleaned and calibrated on a regular basis to reduce malfunction.

Under Permit No. 22293, the ASLC will anesthetize animals for certain research activities. When pups are transferred to the biological sampling or branding station, they will be physically restrained in sternal recumbency on a sampling board while a veterinarian or other qualified person anesthetizes the animals using a five percent isoflurane gas anesthesia in medical oxygen delivered by a properly calibrated anesthetic vaporizer (e.g., Fluotec Mark 2) and with a modified cone mask held tightly over the face to create an air seal. Isoflurane will be adjusted to between one and two percent after the anesthetic plane has been reached. Pups will be physically restrained by net or hand for not more than 20 minutes and by anesthesia for not more than 20 minutes.

All researchers involved in the restraint, anesthetic, and research activities will discuss personnel placement, assignments, and duties prior to each event. The veterinarian or veterinary technician in charge of anesthesia will remain stationed at the head of the animal during the entire procedure to monitor respiration, depth of anesthesia, and vital signs until the pup has recovered a swallow reflex. If the animal is carried, it will be done with head down and with no abdominal pressure. Should complications from anesthesia arise, an emergency kit consisting of an endotracheal tube and ambu bag, laryngoscope, respiratory stimulant (doxapram), a cardiac stimulant (epinephrine), a parasympatholytic agent (atropine), and a corticosteroid (dexamethasone) will be readily available.

Under Permit No. 22298, ADF&G will utilize sedation and anesthesia on captured Steller sea lions. Anesthesia with intubation and injectable sedative may be used on ADF&G's pup/juvenile and adult/subadult captures. ADF&G will use similar methods, equipment, and drugs to conduct sedation and anesthesia. Isoflurane will be adjusted to between one and two percent after the anesthetic plane has been reached. ADF&G will deliver anesthesia to hand-restrained pups through a mask, sufficient for the time requirements of branding (typical anesthesia administration time is eight to 12 minutes at a surgical plane, although under situations of slow induction and/or extensive sampling this can reach a maximum of 25 minutes). Gas anesthesia will be administered and monitored only by personnel thoroughly trained in its application.

3.1.9.10 *Euthanasia*

Under Permit Nos. 22289, 22293, and 22298, the MML, ASLC, and ADF&G will conduct euthanasia in emergency situations at the discretion of researchers or contract veterinarian, and in accordance with the American Veterinary Association Guidelines for Euthanasia (AVMA 2013). For the MML, Euthanasia will be achieved with pentobarbital-based solution (Beuthanasia) administered at one milliliter per 20 kilogram body mass. In some situations, euthanasia by overdose of isoflurane or intracardiac administration of potassium chloride while under anesthesia may be alternatively chosen, particularly in cases where carcasses cannot be fully removed from the field site.

Under Permit No. 22298, the ADF&G will conduct euthanasia in emergency situations. As per ADF&G standards, any wildlife euthanized must be conducted in a manner approved as humane by the Guidelines for the Euthanasia of Nondomestic Animals, 2006, published by the American Association of Zoo Veterinarians, or the AVMA Guidelines on Euthanasia 2013, published by the American Veterinary Medical Association (American Association of Zoo Veterinarians 2006; AVMA 2013). The decision to euthanize a sea lion will include a consultation between the project leader, the attending veterinarian on site, and the staff veterinarian (if available) and mutual agreement of the parties that euthanasia is necessary to relieve an animal suffering. Euthanasia will be considered in situations where the animal is in one of the following states: (1) Moribund (semi-conscious to unconscious) with a disease process or injuries that in the opinion of the veterinarian(s) has a negligible chance of recovery; (2) the animal has injuries or a disease process that is so severe that the animal is in great distress or pain and is unlikely to be able to recover and subsequently survive in the wild with available on site treatment capabilities; and (3) the animal has an infectious disease that if released back into the wild, could be a serious threat to the human or animal health.

If euthanasia is agreed as the most humane option based on the criteria above, then the following procedures within the humane euthanasia guidelines will be used:

If the animal is conscious, it will be sedated as necessary or anesthesia will be induced via isoflurane or an injectable anesthetic. The selection of the most appropriate drug from those available will be made by the veterinarian on site. After sedation or in the unconscious animal, an intravenous or intraperitoneal injection of a barbiturate euthanasia solution can be administered by the veterinarian. However, depending on the barbiturate method used, the carcass must be buried beyond the reach of scavengers or incinerated.

For animals where carcass burial or incineration is not available or practical, the animal will be anesthetized with isoflurane or by injection with a balanced anesthetic drug combination (sedation may proceed the induction of anesthesia). When the animal is in a surgical plane of anesthesia, a saturated solution of potassium chloride will be administered by intracardiac injection. Under the most extraordinary circumstances, if the animal cannot be safely physically restrained or darted for the administration of the anesthesia, then the animal will be euthanized by gunshot to the head with a rifle or shotgun with sufficient range, caliber and projectile accuracy to provide instantaneous death with a single shot as per the euthanasia guidelines.

In the event a female dies or is seriously injured because of ADF&G's research activities, the orphaned pup shall, when it can be identified, be humanely provided for: either salvaged by placement in a stranding facility for rehabilitation, or if salvage is not practical, euthanized.

3.1.10 Biological Sampling

Under Permit No. 22289, the MML will perform blood sampling, blubber/skin biopsy sampling, fecal sampling, hair clip sampling, nail clip sampling, enema sampling, milk sampling, morphometric sampling, stomach lavage, swab sampling, urine sampling, and vibrissae sampling on captured Steller sea lions. Biological sampling (blubber, fecal, etc.) of pups will be used to assess concentrations of heavy metals as part of collaborative research activities with the ADF&G and the University of Alaska Fairbanks. Blubber, pelage, and whisker samples will be provided to the ADF&G, and tissue samples will be provided to NMFS and academic investigators for genetic analyses. In addition, the MML will conduct opportunistic molt/spew/scat/carcass sampling. All biological samples will be labeled with the date, location, type, and a unique identification number (brand or tag, if appropriate), stored in appropriate container, and transported to the MML, ADF&G, or Oregon Department of Fish and Wildlife research laboratories for analysis.

Under Permit No 22293, the ASLC will also perform blood sampling, blubber biopsy sampling, fecal sampling, hair clip sampling, scat sampling, milk sampling, morphometric sampling, swab sampling, urine sampling, and vibrissae sampling on captured Steller sea lions. In addition, the ASLC will conduct opportunistic molt/spew/scat/carcass sampling. Researchers will not conduct biological sampling during the breeding or pupping season (May 15 through July 15) at any rookery, but sampling may occur at non-breeding haulouts.

Under Permit No. 22298, the ADF&G will also perform blood sampling, blubber/muscle/skin biopsy sampling, fecal sampling, hair clip sampling, nail clip sampling, tooth extraction, milk sampling, morphometric sampling, stomach lavage, swab sampling, urine sampling, and vibrissae sampling on captured Steller sea lions. In addition, ADF&G will collect opportunistic scat and carcass samples. Methods for transporting and storing samples are discussed in the sections below.

3.1.10.1 *Biopsy Sampling*

Under Permit 22289, the MML will conduct biopsy sampling for blubber, lesions, and skin. A blubber sample will be taken from Steller sea lions greater than two months old for fatty acid and toxicology analyses by taking up to three biopsies to the depth of the underlying muscle layer (up to 0.5 grams [0.001 pounds] each, up to five centimeters [two inches] depth depending on age of animal) from anesthetized animals. On animals inducted with gas anesthesia, a single sampling site in the pelvic region will be shaved and scrubbed with Betadine and alcohol. A small incision (large enough to accommodate the biopsy punch, approximately 10 millimeters [0.4 inches]) will be made with a sterile scalpel blade and using sterile techniques, a sterile biopsy punch of six to eight millimeters [0.2 to 0.3 inches] in diameter will be inserted into the incision and blubber samples will be collected at three different angles from the incision (leaving only a single 10 millimeter [0.4 inches] straight incision). If not under general anesthesia, lidocaine (one cubic centimeter [0.1 cubic inch] of two percent solution) will be injected in a rosette around the biopsy site as a local anesthetic and to reduce bleeding. Blubber samples are stored on dry ice or

at negative ten degrees Celsius while at sea, shipped on dry ice, and stored at negative 80 degrees Celsius upon return to the laboratory until analysis. Blubber samples are sent to the ADF&G and analyzed by collaborating laboratories at the University of Alaska Fairbanks, or others such as the University of Alaska Anchorage's Applied Science, Engineering and Technology laboratory or NOAA's Northwest Fisheries Science Center.

A lesion sample will be taken if deemed appropriate by the attending veterinarian. Most of these biopsies will be of skin lesions and possibly oral lesions. The animal will be under anesthesia during biopsy sampling. The biopsy site will be prepped by a light wipe with isopropyl alcohol. A six millimeter (0.2 inches) sterile biopsy punch will be used for the biopsy and the sample will be picked up with sterile forceps. Multiple biopsies (three to four) of a lesion will be taken for diagnostic purposes. Biopsies will be split with half placed in formalin and half placed in a cryovial and frozen immediately for culture. Depending on the lesion, this will be submitted for viral, bacterial, and/or fungal culture, or polymerase chain reaction.

A skin sample approximately five millimeters (0.2 inches) in diameter will be clipped from the webbing of the hind flipper for genetic analysis from all captured unique individuals. Skin samples will be preserved in ethyl alcohol solution for analysis of mitochondrial and nucleic deoxyribonucleic acid (DNA) for refinement of stock delineation.

Under Permit No. 22293, the ASLC will conduct biopsy (blubber and skin) sampling. Biopsy sampling will occur on juveniles (one to three years of age), subadults (four to eight years of age for males only), and adults (females at least four years of age, males at least nine years of age). The purpose of biopsy sampling juveniles and adults is to determine dietary preferences and diversity from fatty acid analysis of blubber tissue, to relate blubber thickness to animal health, assess contaminant loads, and genetic diversity and relationships among animals through DNA analysis in the skin. Biopsy sampling will be conducted from July 15 through May 31. Researchers will conduct remote biopsy sampling to collect muscle and blubber to determine the persistence of heavy metals and organochlorines over time and in different regions (Myers et al. 2008). Skin sampling will be used to analyze and expand genetic databases to determine the amount of genetic diversity between and within stocks. This will be analyzed in conjunction with the MML.

After disinfection with isopropyl alcohol or betadine, skin samples will be collected for genetic analysis from each pup (greater than or equal to 20 kilograms [44.1 pounds]) using a six millimeter (0.2 inch) punch tool prior to flipper tag insertion or using a piglet ear-notching pliers from the interdigital margin of the hind flipper. Genetic analysis from mitochondrial DNA from skin tissue will provide additional information on diversity within rookeries and dispersion between rookeries and DPSs.

Blubber and skin samples will be collected from up to 50 juvenile males and females, and 100 adults per year using a retrievable dart fired from a crossbow. Researchers will not dart a female if it is known to be nursing a pup, but it may not always be possible to know if a lone adult female targeted had a dependent pup. Biopsy dart tips will be approximately 0.9 centimeters (0.4

inches) in diameter and not exceed 3.5 centimeters (1.4 inches) in depth to limit penetration into muscular tissue (Hoberecht et al. 2006b). Prior to use in the field, biopsy dart tips will be sterilized in an autoclave. A sufficient number (greater than or equal to six) of sterile biopsy dart tips will be taken into the field during each day to avoid having to sterilize additional dart tips while in the field. If some muscle tissue is extracted in the biopsy sample, then the full depth of blubber will have been collected. Blubber depth comparisons will be made incrementally up to 3.5 centimeters (1.4 inches) between individuals and time periods. Muscle will not specifically be targeted in this study. If obtained, muscle samples will be archived at the ASLC for later analysis of contaminant loads. Contaminants in muscle tissue are of interest to native subsistence hunters because that is the portion of the animal typically eaten. A small hole in the biopsy dart will allow attachment of a tether line for dart retrieval. Adults will only be biopsy sampled outside the breeding and/or pupping season (from July 16 through May 31); whereas juveniles will be biopsy sampled only at haulouts during any time of the year but not at rookeries during the breeding and/or pupping season. Individuals that can be positively identified by brands, tags, or natural markings may be targeted up to three times per year to study interseasonal differences in blubber composition and thickness.

Animals may be biopsy darted from land or water, but no attempt will be made to biopsy sample an animal unless there are no other animals or obstructions between the target animal and the researcher firing the biopsy dart. Researchers will take only one attempt if a target animal is struck with the biopsy dart and no more than second attempt will be made if the first shot entirely missed the target animal. Animals will be approached to within 20 meters (65.6 feet) from downwind, if possible. Researchers will not attempt to biopsy sample an animal if the wind is greater than 24.1 kilometers per hour (13 knots) (Hoberecht et al. 2006b) or if sea state conditions are greater than 0.3 meters (one foot) if biopsy sampling from a research vessel. Success rates for the collection of blubber and skin samples from animals are greater than 90 percent with virtually no adverse effects (Hoberecht et al. 2006b). Researchers will take care not to aim toward the head of any animal, but toward the flank or center of body mass. Researchers will target animals that are not in large groups when possible.

Under Permit No. 22298, the ADF&G will conduct blubber biopsy sampling. For the ADF&G, blubber biopsy contributes to successful completion assessing the physical health of free-ranging Steller sea lions and determining the age of individual animals through the use of DNA methylation. ADF&G will sample blubber from Eastern DPS and Western DPS of Steller sea lion rookery pups, older pups, juveniles, subadults and adults for fatty acid and toxicology analyses by taking up to 3 biopsies to the depth of the underlying muscle layer (up to 0.5 grams each, up to 5 centimeters [2 inches] depth depending on age of animal) from anesthetized animals. On sea lions inducted with gas anesthesia a single sampling site in the pelvic region will be shaved and scrubbed with Betadine and alcohol. A small incision (large enough to accommodate the biopsy punch, approximately 10 millimeters) will be made with a sterile scalpel blade and using sterile techniques, a sterile biopsy punch of 6 to 8 millimeters (0.24 to 0.3 inches) in diameter will be inserted into the incision and blubber samples will be collected at

three different angles from the incision (leaving only a single ten millimeters [0.4 inches] straight incision). If not under general anesthesia, Lidocaine (one cubic centimeter of two percent solution) will be injected in a rosette around the biopsy site as a local anesthetic and to reduce bleeding. Samples are stored at -negative ten degrees Celsius or on dry ice while at sea, shipped on dry ice and stored at negative 80 degrees Celsius upon return to the laboratory until analysis. Samples are analyzed by the University of Alaska Anchorage's Applied Science Engineering and Technology (ASET) laboratory or at various collaborating laboratories such as NOAA's Northwest Fisheries Science Center for contaminants.

In addition to blubber biopsy sampling, under Permit No. 22298 the ADF&G will also conduct muscle biopsies of Steller sea lions. For the ADF&G, muscle biopsy contributes to successful completion of assessing the physical health of free-ranging Steller sea lions and monitoring the movement and diving behavior of Steller sea lions. Muscle oxygen stores are determined by measuring muscle myoglobin content and estimating muscle mass (from deuterated water (DTO) estimate of lean body mass and allometric equations). Myoglobin content will be determined following methods widely applied to pinnipeds (including Steller sea lions) without long-term adverse effects or complications (Ponganis et al. 1993; Reed et al. 1994; Kanatous et al. 1999). Additional muscle structure, hormone and enzyme activity analyses will be performed on the samples to examine factors that influence muscle structure and function (Castellini and Somero 1981; Reed et al. 1994; Kanatous et al. 1999). ADF&G will take a small muscle biopsy from the major swimming muscle (pectoralis) and the longissimus dorsi (used for terrestrial support and locomotion). On Eastern DPS and Western DPS of Steller sea lion older pups, juveniles, subadults and adults, after sea lions are inducted with gas anesthesia, sampling sites will be scrubbed with Betadine and alcohol, and a small incision (large enough to accommodate the biopsy punch, approximately 10 millimeters [0.4 inches]) made with a sterile scalpel blade. Using sterile techniques, a sterile biopsy punch of six to eight millimeters [0.2 to 0.3 inches] in diameter will be inserted into the incision and pushed through to the muscle layer fascia. The punch is then rotated and extracted with the muscle sample and pressure applied to the site. Up to two 25 to 35 milligram samples are taken from each site at different angles. Two samples are necessary because myoglobin assays require flash frozen tissues, while the fiber type assays require fixed tissue. The consensus of marine mammal veterinarians is that under these conditions, it is preferable to not close the biopsy sites with surgical clamps or sutures. Closing the site increases the risk of infection and abscess formation. The longissimus dorsi biopsy will be taken from the blubber biopsy site to reduce the number of incisions made. Samples are stored on dry ice while at sea, shipped on dry ice and stored at negative 80 degrees Celsius upon return to the laboratory until analysis. Muscle samples are analyzed in ADF&G/University of Alaska Fairbanks laboratory for histochemistry and morphology.

The next form of biopsy sampling the ADF&G will conduct under Permit No. 22298 is a manual skin biopsy. Skin biopsies contribute to the successful completion of assessing distribution, dispersal, genetic diversity, maternal and/or paternal origins, entanglement prevalence and vital rates such as age-specific survival rate, reproductive rate, and probability of weaning in Steller

sea lions. In addition, skin biopsies help assess the physical health of free-ranging Steller sea lions and in determining the age of individual animals through the use of DNA methylation. A sample of skin, approximately five millimeters [0.197 inches] in diameter, punched from the hind flipper for genetic analyses will be taken once per lifetime from all animals handled. Skin samples will be taken from Eastern DPS and Western DPS rookery pups, older pups, juveniles, subadults and adults. Samples will be preserved in an ethanol solution, or as directed to meet genetics laboratory requirements, for future analysis of mitochondrial and nucleic DNA.

The ADF&G will also perform biopsies of lesions if the veterinary pathologist present determines that it is of scientific importance. Most of these biopsies will be of skin lesions, possibly oral lesions. The animal will be under anesthesia or chemically immobilized. The biopsy site will be prepped by a light wipe with isopropyl alcohol. A six millimeter [0.2 inch] sterile biopsy punch will be used for the biopsy and the sample picked up with sterile forceps. Multiple biopsies (three to four) of a lesion will be taken for diagnostic purposes. Biopsies will be split, half placed in formalin, and half in a cryovial and frozen immediately for culture. Depending on the lesion, this will be submitted for viral, bacterial and/or fungal culture or polymerase chain reaction.

A skin scraping would be taken in any case where mites are suspected (hair loss in a patchy or extensive pattern, signs of self-trauma from itching, reddened, thickened skin). The scraping will be done in the standard veterinary diagnostic technique as described. Several areas of lesions are selected, in each area, the skin is pinched up firmly between the fingertips, a dulled number ten scalpel blade with a drop of mineral oil on it is held in the opposite hand and the raised folded skin surface is scraped firmly with the dulled blade at a very oblique angle. The pinched skin is squeezed during the process to extrude mites from the sebaceous glands so they can be picked up with the skin cells on to the oily blade. The skin is scraped until the superficial epidermis is excoriated. The material scraped up onto the blade is placed on a glass microscope slide, another drop of oil added, cover-slipped, and then viewed under a microscope immediately. The slide is scanned for the presence of mites. A skin scraping is an important adjunct to biopsy and can be more sensitive diagnostically for demodectic mange mites than a biopsy which can often miss the mites and eggs.

The last form of biopsy that the ADF&G will conduct under Permit No. 22298 is a remote skin biopsy. Remote skin biopsies contribute to the successful completion of assessing distribution, dispersal, genetic diversity, maternal and/or paternal origins, entanglement prevalence and vital rates such as age-specific survival rate, reproductive rate, and probability of weaning in Steller sea lions. In addition, remote skin biopsies help assess the physical health of free-ranging Steller sea lions and in determining the age of individual animals through the use of DNA methylation. This sampling method is currently employed and permitted under the ADF&G's existing permit.

The purpose of biopsy darting juvenile, subadult and adult Steller sea lions is to provide skin samples for genetic analysis (e.g., maternal and paternal origins), develop an assay to measure ages of animals via levels of DNA methylation, and, ultimately, to develop close-kin mark-

recapture methods. Future work may expand to blubber biopsies. The intent of this method is to reduce the need for capture and handling of Steller sea lions, along with the unintentional capture-related disturbance, to collect these data.

Skin samples will be collected from juvenile, subadult and adult males and females using a retrievable dart fired from a crossbow. All penetrative parts of the biopsy head will be sterilized via autoclave or stovetop pressure sterilizer prior to use. Stoppers and biopsy tips will be reused multiple times; tips will be sharpened prior to each use. The inside diameter of dart tips will not be larger than eight millimeters in diameter and length not exceeding 15 millimeters (0.6 inches), in order to limit penetration depth. This is substantially smaller than darts used in previous Steller sea lion remote biopsy work (e.g., Hoberecht et al. 2006b) which targeted blubber tissue, requiring wider (nine millimeter) and deeper (35 to 50 millimeter [1.37 to 2 inches]) penetration. Because the ADF&G is targeting collection of a skin sample only, a shallower sample would further limit potential impact to animals. A small hole in the dart will allow attachment of a tether line for dart retrieval.

Subadults, adults and juveniles will be darted during any time of the year. Where possible, biopsy-darted Steller sea lions will be positively identified by their brand (or, if and where feasible, flipper tags) and these individuals will be sampled only once per year. At rookeries during the breeding season, darting will be attempted only for animals at the water's edge and in the least dense portions of the group. Animals will be approached to within 20 meters (65.6 feet) from downwind if possible. The skin sample will be taken from the center of mass - preferably the shoulder or flank - and care will be taken to avoid striking near the head. Records will be kept for each biopsy attempt whether successful or not, including information on distance to target animal, reaction of target animal, disturbance to nearby animals, and environmental conditions (e.g., wind speed/direction, precipitation, sea conditions). No attempt will be made to dart an animal if wind is estimated to be greater than 24.1 kilometers per hour (13 knots) (Hoberecht et al. 2006b) or, if darting from a vessel, if sea conditions are greater than 0.3 meters (one foot). Darts with samples retained will be slowly retrieved using the attached retrieval line. Collected samples will be subsampled and stored in a method appropriate to the analyses planned.

Unintentional disturbance may occur during darting, varying broadly from zero to 200 animals per event. In order to reduce the potential of incidental disturbance, the ADF&G will choose to dart animals that are not in large groups when possible. Previous work noted dart retrieval (by pulling in the retrieval line) caused unintentional alerts and movements; this will be minimized by retrieving darts slowly, avoiding brightly colored darts and line (Hoberecht et al. 2006b) and ensuring disturbed Steller sea lions have safe egress routes available. Darting at rookeries will occur to provide adequate sample for this study.

The ADF&G will continue to modify and refine its remote biopsy techniques to reduce impacts on target animals and those around them. For example, the ADF&G will use dead stranded sea lions to test out different dart configurations to determine the shallowest depths of dart tips that

can reliably collect skin tissue from juvenile, subadult, and adult males and females, while limiting penetration into blubber and muscle tissue. Also, the ADF&G will explore different variable velocity dart projectors (e.g. Dan-Inject JM-Special 25) as a means to obtain samples in the future.

The alternative to remote biopsy darting of individual sea lions would be to capture, sedate, and biopsy sea lions by hand. However, information in tables 4.8-9, 4.8-10, and 4.8-11 of the Final Programmatic Environmental Impact Statement (NMFS 2007b) indicates a four-fold increased chance of mortality per animal using that latter method over biopsy darting individuals, when the effects of capture handling and disturbance are included.

3.1.10.2 *Blood Sampling, Evans Blue Dye, and Deuterated water*

Under Permit 22289, the MML will conduct blood sampling, and stable isotope and serial blood sampling. Blood samples (whole, serum, or plasma) will be analyzed by the MML, ADF&G, and other laboratories; whereas, subsamples may be provided to other researchers or laboratories for analyses as appropriate.

Researchers will conduct blood draws using sterile techniques by or under the direct supervision of qualified and experienced personnel. Prior to blood sample collection, the collection site is cleaned by repeated swabbing with a disinfecting solution (e.g., alcohol, povidone iodine, chlorhexidine). Blood is collected by venipuncture of the caudal gluteal vein, brachial vein, or plantar vein of the hind flippers. Sterile, disposable needles are used ranging in sizes 18 to 23 gauge varying in length from 1.9 to 7.6 centimeters (0.75 to 3 inches) depending upon the size of the captured animal. Butterfly needles will generally be used for flipper venipuncture. Blood will be collected directly into evacuated blood collection tubes, or into a syringe with thumb plunger. Blood collection will be limited to three attempts (i.e., needle insertions) at a given sampling location. In anesthetized animals, indwelling catheters may be used. Following needle or catheter withdrawal, firm pressure is applied to prevent hemorrhage from the venipuncture site. Blood sample volume will be kept to the minimum necessary to achieve study objectives, with the maximum sampling volume for a single draw (or total sampling volume among multiple blood draws in a single session) from a single animal less than one percent of the animal's body mass, provided no additional blood is drawn from that animal for at least three weeks.

For non-pups receiving DTO injections, blood will be drawn at three times; once prior to DTO administration, and at two subsequent times (approximately 20 minutes apart) once the DTO is equilibrated with the animal's blood pool (approximately two hours following DTO injection). Blood samples will be stored at negative ten degrees Celsius or lower (on dry ice or liquid nitrogen) after processing while at sea, shipped on dry ice and stored at negative 80 degrees Celsius upon return to the laboratory until blood samples are sent to authorized recipients for various analyses.

Steller sea lions under gas anesthesia will be given an intermuscular injection of known volumes of DTO (1 grams [0.002 pounds]/kilogram of body mass) (99 percent enriched) using a sterile,

disposable 20 gram (0.04 pounds), 3.8 centimeter (1.5 inch) hypodermic needle after the injection site is cleaned with alcohol. A pre-sample of blood will be collected prior to injection of DTO, and equilibration of the isotope will occur for approximately 2.5 hours while other procedures are being performed. A preliminary post-sample of serum will be drawn 20 minutes prior to the final post-sample, at approximately two hours. Separate post samples are advantageous for determining that full equilibration of DTO has been accomplished. Methods and volumes of blood collected will be the same as blood sampling. Mass spectrophotometric analysis of DTO in water distilled from blood samples will be conducted by a commercial laboratory (Metabolic Solutions, Inc.) or enrichment of samples will be measured using Fourier-transform infrared spectrophotometry in the ADF&G and University of Alaska Fairbanks laboratory. Calculation of percent body fat will be made using equations from Bowen and Iverson (1998), and assuming a hydration of 0.73 (total body water to fat-free body mass) (Wang et al. 1999).

Under Permit No. 22293, the ASLC will collect blood serum to examine known reproductive pathogens such as Coxiella, Brucella, Chlamydomydia, Leptospira, Toxoplasma, and herpesviruses that may have a role in abortions and unfit offspring. Researchers will conduct blood sampling on all captured pups greater than or equal to 20 kilograms (44.1 pounds). Blood will be collected from the caudal gluteal, jugular, or flipper vein using new, sterile needles. Each new, sterile needle will be inserted into the skin only once. A maximum of three needle redirections will be made at any one site per sessions to reduce muscle injury and bruising, and to reduce risk of introducing infection. The blood volume of Steller sea lions varies from approximately 90 to 120 milliliters per kilogram⁻¹ (Richmond et al. 2006). The acceptable safe veterinary standard for blood withdrawal is ten percent of total blood volume (Murray 2000). Therefore, for all Steller sea lions the acceptable safe limit for blood withdrawal will be 9 milliliters per kilogram⁻¹, but the ASLC will limit themselves to only 1 milliliter per kilogram⁻¹ and will not exceed one cubic centimeter (0.1 cubic inch) per kilogram of body mass. Drawing this limited amount of blood from each captured sea lion will avoid any adverse effects occurring from this amount of blood collection. Minimum blood volumes need for analysis for CBC, contaminants, serum chemistries, hormones, and lymphocyte proliferation are 1, 6, 2, 9, and 10 milliliters, respectively (total equal to 28 milliliters). When pup masses are less than 28 kilograms (61.7 pounds), blood analyses will be prioritized by the principal investigator based on research priorities outlined in the NMFS (2008) Steller sea lion Recovery Plan. For example, if the ASLC takes a blood sample from a pup weighing 22 kilograms (48.5 pounds), the ASLC will not extract more than 22 milliliters of blood and forego lymphocyte proliferation or hormone analysis.

Under Permit No. 22298, ADF&G will inject Steller sea lions with Evans blue dye and conduct serial blood samples. Evans blue dye and blood samples contribute to the successful completion of assessing the physical health of free-ranging Steller sea lions and determining seasonal changes in the diet of juvenile, subadult and adult Steller sea lions. These sampling methods are currently employed and permitted under ADF&G's existing permit.

The level of available oxygen stored in blood can be determined by measuring hematocrit and hemoglobin (routinely performed as part of the approved health condition blood sampling protocol), and total blood volume. Total blood volume will be estimated by injection and dilution of Evan's blue dye (Foldager and Blomqvist 1991). After collection of a pre-sample, Evan's blue dye will be injected intravenously at a dose of three to five cubic centimeters (0.5 milligrams per kilogram body weight), serial five millimeter blood samples will be collected at ten, 20 and 30 minutes post injection from Eastern DPS and Western DPS older pups, juveniles, subadults and adults. Evans blue dye concentration is determined spectrophotometrically in the ADF&G's University of Alaska Fairbank's laboratory. Calculation of total blood oxygen storage capacity is made incorporating measures of blood volume, hematocrit, and hemoglobin concentration (Ponganis et al. 1993).

For situations in which vasoconstriction makes Evans blue injection and serial blood sampling at peripheral sites impossible (e.g., when peripheral vasoconstriction occurs due to the remote chemical immobilization capture method), a jugular catheterization will be used.

Blood samples will be taken from Eastern DPS and Western DPS of Steller sea lion older pups, juveniles, subadults and adults. Clinical blood chemistries are useful for examining the gross physiological status of individual animals. In other otariid species, electrolytes, oxygen carrying capacity (red blood cell indices), and immune system function (white blood cell indices) are highly useful for making inferences about the health of young animals. Blood sampling further provides samples useful to feeding ecology, toxicology and endocrinology research relevant to conservation.

Blood draws will be made by personnel trained/experienced in blood draw techniques. Blood will be collected from the caudal gluteal vein (using 18 gram spinal needles varying in length from 2.5 to 6.4 centimeters [1 inch to 2.5 inches] depending upon the size of the captured animal), hind flipper vein (21 gram by 1 inch butterfly), or median artery (23 or 21 gauge needle varying in length from 2.5 to 5.1 centimeters [1 inch to 2 inches] depending on the animal's size) accessed from the dorsal or ventral plane. A venous or venous/arterial mixed sample will be collected from the caudal gluteal venous sinus through an 18 to 20 gauge needle directly into vacutainers as soon as possible and then again right before terminating gas anesthesia and antagonizing the injectable anesthesia. One of the venous samples will be collected in an Ethylenediaminetetraacetic acid tube, cooled and centrifuged for plasma later after return to the ship. The plasma will be aliquoted into a cryovial and frozen to negative 20 degrees Celsius or colder for later analyses on commercial oxidative stress assays.

To reduce the risk of infection, only clean, sterile disposable needles will be used to obtain blood samples and a new needle will be used for each blood collection. The area to be sampled will be thoroughly disinfected with ethyl alcohol or betadine prior to insertion of the needle. Each needle may be reinserted into the skin once if the first site does not work but only if not dull and not contaminated by handling. A maximum of three needle insertions will be made at any one site at any one session to reduce muscle injury and bruising and to reduce risk of introducing infection.

Sufficient pressure and/or dry gauze will be applied to the venipuncture site after removal of the needle to minimize the potential for hematoma formation in the surrounding tissues. This procedure will only be performed by/under the direct supervision of qualified and experienced personnel.

For situations in which vasoconstriction makes blood collection at peripheral sites impossible (e.g., when peripheral vasoconstriction occurs due to the remote chemical immobilization capture method), a jugular blood draw will be used. This procedure is performed upon anesthetized sea lions. The venipuncture site will have its fur clipped, cleaned with Betadine and alcohol and allowed to dry. If necessary, the skin will be nicked at the needle site with a number ten or smaller scalpel blade. A 16 to 18 gauge over-the-needle indwelling catheter (appropriate to the size of the animal) will be placed by a veterinarian (or by a person supervised by a veterinarian) familiar with jugular catheterization. Since movement of the animal is required for other permitted measurements and sampling, the catheter will be secured with temporary sutures until the catheter and sutures are removed at the end of handling. A total of not more than four millimeters of blood per kilogram of body mass is taken from any animal per capture event (see Appendix 4 of ADF&G (2019)).

Under Permit No. 22298, the ADF&G will inject Steller sea lions with DTO and sodium bromide (NaBr). For the ADF&G, using DTO dilutions to determine body condition contributes to successful completion of assessing the physical health of free-ranging Steller sea lions. These sampling methods are currently employed and permitted under ADF&G's existing permit.

DTO and NaBr will be injected into Eastern DPS and Western DPS of Steller sea lion older pups, juveniles, subadults and adults to determine total body water content and intracellular water space. Sea lions under gas anesthesia will be given an intramuscular injection of known volumes (one-gram DTO/kilogram body mass) of DTO (99 percent enriched) using a 20-gauge 1.5-inch hypodermic needle after the injection site is cleaned with alcohol. These animals will also receive an intravenous injection of a known volume of NaBr (30 to 50 milligram/kilogram body weight). A pre-sample of blood will be collected prior to injection of DTO and NaBr, and equilibration of the isotope will occur for approximately 2.5 hours while other procedures are performed. A preliminary post-sample of serum will be drawn 20 minutes prior to the final post-sample, at approximately two hours. Separate post samples are advantageous for determining that full equilibration of DTO and NaBr have been accomplished.

Because larger juveniles and adults require large volumes of this solution injected for measurement of total body fat measurement, this would require multiple intermuscular injections using the technique described above. Instead, for larger animals ADF&G will utilize an intraperitoneal injection of the DTO solution. This technique is commonly used in otariids, phocids and cetaceans. The injection site on the lateral body wall below the epaxial muscles will be cleaned with betadine and alcohol prior to insertion of a two to four inch 18 gauge over the needle sterile catheter. The catheter will be inserted until it punctures the peritoneal wall, the soft catheter will be advanced and the stylet removed. An extension set will be used to inject

sterilized deuterium oxide, made isotonic to a 0.7 percent solution of sodium chloride. After injection, the catheter will be withdrawn and direct pressure applied to the injection site to prevent bleeding. Now that research needs are shifting to larger immature and adult sea lions, ADF&G must use this technique to administer deuterium oxide to avoid the need for multiple injection sites and the potential tissue damage and increased sea lion handling time that would result.

Mass spectrophotometric analysis of DTO in water distilled from blood samples will be conducted by a commercial laboratory (Metabolic Solutions, Inc.) or enrichment of samples will be measured using Fourier-transform infrared spectroscopy spectrophotometry in ADF&G's University of Alaska Fairbanks laboratory. Calculation of percent body fat will be made using equations from Bowen and Iverson (1998), and assuming a hydration of 0.73 (Wang et al. 1999). NaBr concentration is determined using high pressure liquid chromatography.

For sea lions that will be serially sampled after DTO injection, blood is drawn at three times, once prior to DTO administration, and at two subsequent times (approximately 20 minutes apart) once the DTO is equilibrated with the animal's blood pool (approximately two hours following DTO injection). When Evans Blue is being used for blood volume analysis, post DTO blood samples are drawn from a catheter placed in the hind flipper vein. Evans blue dye is injected through this catheter and three subsequent blood samples are drawn at 10-minute intervals from the catheter.

Blood samples are stored at negative ten degrees Celsius or on dry ice after processing while at sea, shipped on dry ice and stored at negative 80 degrees Celsius upon return to the laboratory until analysis. The ADF&G states that a minimum of 37 milliliters of serum (roughly equivalent to 75 milliliters of whole blood depending on hematocrit) is needed to perform the following analyses in duplicate with archival samples to repeat analysis when necessary: hematology (hematocrit, hemoglobin, specific gravity, plasma and whole blood water content), clinical blood chemistry, fatty acid composition, deuterium analyses, metabolic chemistry, serology, virology assays, stable carbon and nitrogen isotope content, haptoglobin, Evans' blue concentration, NaBr concentration, serum iron content, growth hormone and dietary bioindicators (e.g. Trimethylamine N-oxide). Any additional serum or plasma is archived for future retrospective analyses and sample requests made by other researchers. If less than 75 milliliters of whole blood is drawn, then a subset of these analyses are prioritized. Blood chemistry is analyzed by commercial veterinary clinical lab or in ADF&G's University of Alaska Fairbanks laboratory.

3.1.10.3 *Enema Sampling*

Under Permit No. 22289, the MML will conduct enemas with Steller sea lions greater than two months old to recover remains of prey items from the lower digestive tract. A clean, lubricated enema tube is inserted into the rectum and one to two liters of warm water are gently applied to flush feces from the lower digestive tract. Fecal material is collected in a plastic bag for sieving and removal of prey remains in the laboratory. Stomach tubes are cleaned with water and Nolvasan (or similar) disinfectant and subsequently rinsed well with water before use on

subsequent animals to avoid cross-contamination of samples and potential spread of disease between individuals. All samples will be frozen at a minimum negative 20 degree Celsius for short-term storage and negative 80 degrees Celsius thereafter.

3.1.10.4 *Hair Clip Sampling*

Under Permit 22289, the MML will collect a small sample of hair (three by three centimeters [1.2 by 1.2 inches]) for contaminants and trace metals analysis. Hair is trimmed with scissors and collected into polyethylene sample bags. Hair samples will be sent to the ADF&G for analysis.

Under Permit No. 22293, the ASLC will collect hair samples (generally a small amount) to measure the exposure of animals to mercury (or other contaminant analysis) in their environment. Clipped hair will be collected during temporary marking procedures from all individuals.

Under Permit No. 22298, the ADF&G will collect tissue samples including a small sample of hair for stable isotope or contaminants analysis. Hair samples are clipped from an area approximately three centimeters by three centimeters (1.2 inches by 1.2 inches) (typically associated with preparation of a biopsy site). Sampled hair will be stored, transported dry, and analyzed by cooperating laboratories such as NOAA's Northwest Fisheries Science Center or Todd O'Hara of the University of Alaska Fairbanks.

3.1.10.5 *Milk Sampling*

Under Permit No. 22289, the MML will attempt to collect milk from adult females directly from the teat by manual manipulation or gentle suction. Oxytocin (20 international units) will be administered either intramuscularly or intravenously at the discretion of the attending veterinarian to elicit milk letdown for milk collection directly from the teat. Milk samples will be frozen at a minimum negative ten degree Celsius or on dry ice while at sea, shipped on dry ice, and stored at negative 80 degrees Celsius upon return to the laboratory until analysis. Analysis will be completed at the ADF&G/University of Alaska Fairbanks laboratory or at cooperating laboratories.

Under Permit No. 22293, the ASLC will collect milk samples for quantitative fatty acid signature analysis. Milk samples will be collected by gastric intubation from up to 100 female and male pups that are being branded or marked. New, sterile tubes will be used for each use. Quantitative fatty acid signature analysis of milk will determine variation in maternal diet and how associated with parameters of maternal care and pup survival. Gastric intubation requires restraining the pup and holding the mouth open for the insertion of a gastric tube. If under anesthesia for marking, gastric intubation will be conducted either prior to administration of anesthesia or after recovery from anesthesia to ensure adequate swallow reflex. Pups will be allowed to regain a swallowing reflex prior to tube insertion. Once the tube is properly inserted in the stomach, suction is applied, milk is extracted, and then the tube is removed. A maximum of 60 milliliters of milk will be removed from pups by this method. Milk sampling generally takes less than five minutes and will only be performed by trained staff.

Under Permit No. 22298, ADF&G will collect milk samples from Eastern DPS and Western DPS pups and lactating females. For the ADF&G, collecting milk from rookery pups (greater than or equal to 20 kilograms [44.1 pounds]), older pups, juveniles and lactating adult females contributes to successful completion of assessing the physical health of free-ranging Steller sea lions and determining seasonal changes in the diet of juvenile, subadult and adult Steller sea lions. This method is currently employed and permitted under ADF&G's existing permit.

Ingested milk removed from the stomach of nursing pups or juveniles does not provide a good estimate of proximate composition of the milk produced by the mother, however the stable isotope and fatty acid signatures are not compromised by partial digestion and can still provide valuable information about the diet of the mother at different times of the year. Therefore, the ADF&G will collect a sub-sample of stomach contents using stomach intubation from Eastern DPS and Western DPS of Steller sea lion rookery pups (greater than or equal to 20 kilograms [44.1 pounds]), older pups, and juveniles. A clean stomach tube (e.g. foal feeding tube) will be inserted into the mouth and throat of anesthetized animals and gently guided down through the esophagus. A gentle suction will wick stomach fluids up the tube, which is then pinched, extracted, and drained into sample containers. Stomach tubes are cleaned with water and Nolvasan disinfectant and subsequently rinsed well with water before use on subsequent animals to avoid cross-contamination of samples and potential spread of disease between individuals.

Milk collection from Eastern DPS and Western DPS of Steller sea lion adult females will be conducted directly from the teat by manual manipulation or suction following injection of 20 international units dose of oxytocin to facilitate milk let-down (either administered intravenously or intramuscularly at the discretion of the attending veterinarian). Samples are stored at negative ten degrees Celsius or on dry ice while at sea, shipped on dry ice and stored at negative 80 degrees Celsius upon return to the laboratory until analysis. Analysis is completed in the ADF&G's University of Alaska Fairbanks laboratory or cooperating laboratories. Any other drug administered by the veterinarian in response to an animal emergency, illness or injury (i.e. injection of dexamethasone to a sea lion in respiratory distress) are not directed for research and are at the discretion of the veterinarian and thus are not included in ADF&G's research permit request.

3.1.10.6 ***Molt***

Under Permit Nos. 22289 and 22293, the MML and ASLC will opportunistically collect molt sample from all representative sex and age classes from various locations. Molt collection itself does not involve any physical handling of animals.

3.1.10.7 ***Morphometric Measurements/Metabolic Rates***

Under Permit No. 22289, the MML will perform standard morphometric measurements. Researchers will measure standard lengths (straight length from tip of nose to tip of tail) of pups on a board with embossed measuring units, whereas lengths of all other age classes of sea lions are measured using a measuring tape. Axillary girth (immediately behind fore flippers) is also

measured using a measurement tape. Additional lengths and girths will be obtained with all measurements recorded to the nearest centimeter.

Under Permit No. 22293, the ASLC will also perform standard morphometric measurements. Standard morphometrics including mass, length, and girth, will be taken from all captured pups.

Under Permit No. 22298, the ADF&G will also perform standard morphometric measurements including, but not limited to, dorsal standard, curvilinear length, and girth (neck, chest, axillary, upper mid trunk and mid trunk, and hips). Standard length is measured in centimeters with the pup oriented straight on a board, ventral (belly) side down, straight line from nose to tip of tail +/- 0.5 centimeters (0.2 inches). Curvilinear length is measured in centimeters following the curve of the dorsal midline from tip of nose to tip of tail. Girth is measured in centimeters using a floss tape. For axillary girth the animal is oriented straight, measurement is taken around the body under the 'flipper pits' using a floss tape to ensure accurate measurement. +/- 0.5 centimeters (0.2 inches). Other measurements may include teeth (e.g., canine length), flipper margins and lesions, wounds, or brands found on the animal. Also, the ADF&G will weigh captured animals. Weights will be measured in kilograms.

In addition to conducting body measurements, the ADF&G, under Permit No. 22298 will determine metabolic rates through use of a portable metabolic chamber. For the ADF&G, this contributes to successful completion of assessing the physical health of free-ranging.

Metabolic rate data is used to determine how much oxygen an animal consumes over time under various environmental and physiological conditions (Hoopes et al. 2014). The results of captive research have prompted authors to propose that a depressed metabolic state (lower relative oxygen utilization) would be evident in animals subject to nutritional stress. Therefore, the researchers propose to take whole animal metabolic rate from a selected subsample of older pup, juvenile, subadult and adult sea lions captured during the ADF&G's other field capture work using indirect calorimetry using open circuit respirometry (a portable metabolic chamber). Metabolic rate is measured in animals while resting quietly in capture boxes. This technique has been used successfully by the ADF&G and collaborators in the past. During 2003 through 2005 ADF&G conducted this experiment on over 80 wild-caught animals with no noticeable adverse effects. There is no evidence of stress caused by this restraint in the capture box (or metabolic chamber) either through visible observation or through changes in oxygen consumption. In case the ADF&G observes evidence of distress during restraint within the capture box, it will be at the discretion of the principle investigator, Co-investigator or attending veterinarian to determine to immediately release the animal from the restraint or to administer an anesthetic to relieve stress.

The chamber is designed to completely enclose the occupied capture box, with multiple intake vents for fresh air entry at one end of the chamber and an exhaust port system through which the mixed ambient air and respired gases will be drawn by the vacuum pump provided in the Sable Systems metabolic rate analysis equipment. The flow rate of ambient air through this system is adjusted to ensure constant fresh air delivery, good mixing and negligible accumulation of expired gases. The chamber is constructed of transparent lexan, a polycarbonate material, to

allow constant observation of the subject during the measurement. This ensures that the ADF&G can analyze data during rest, and not sleeping periods, which is important to determine the metabolic rates of an animal.

3.1.10.8 *Nail Clip Sampling*

Under Permit No. 22289, the MML will collect the tip of a nail from a foreflipper for stable isotope or contaminants analysis from a subset of animals whose vibrissae were also collected. Nail clippers will be disinfected before use on animals. Nail samples will be sent to the ADF&G for analysis.

Under Permit No. 22298, ADF&G may also collect tissue samples including the tip of a nail from each fore flipper for stable isotope or contaminants analysis. Once sampled, nails are then stored and transported dry.

3.1.10.9 *Salvage*

Under Permit Nos. 22289, 22293, and 22298, the MML, ASLC, and ADF&G will conduct salvaging of Steller sea lion carcasses. Fresh, beach-cast sea lion carcasses carry high scientific value because they are rare in Alaska, provide insight into population threats, and allow invasive sampling of the type impossible to accomplish using live subjects (e.g., radioactive isotope surveillance). This activity contributes to successful completion of multiple objectives including but not limited to assessing the physical health of free-ranging Steller sea lions, determining seasonal changes in the diet of juvenile, subadult and adult Steller sea lions, and determining the age of individual animals through the use of DNA methylation. Under Permit No. 22289, the MML will conduct necropsies on and collect samples from carcasses resulting from accidental mortalities. Opportunistic port-mortem results will provide insight into mechanisms of death, and an opportunity to take other measurements of health and condition that will not otherwise be available.

Under Permit No. 22293, the ASLC will conduct carcass sampling and necropsies. The purpose of carcass and placenta collections to determine cause of mortality, abortions, stillbirths, prevalence of disease causing agents, and contaminants. Researchers will opportunistically collect aborted fetuses to document and examine diseases, contaminants, and parasites that are affecting the reproduction of Western DPS of Steller sea lions. Aborted fetuses and deceased newborns (zero to 30 days old) will be examined for enzyme activities, contaminant load, and endocrinology. Placentas will also be opportunistically collected and examined for basic physiological structure and function, enzyme activities, contaminant load, immunoglobins, and endocrinology. Necropsies can determine age at mortality and potential causes of mortality. Carcasses that may can provide a source of tissues required for laboratory research. Major organs, tissues (e.g., lungs, kidneys, heart, liver, brain, eyes) of freshly dead animals of all ages will be opportunistically collected and analyzed for microbes, protozoans, parasites, contaminant load, histopathology, and immunohistochemistry. Carcasses also periodically become available through research teams (MML, ADF&G, The North Pacific Universities Marine Mammal

Research Consortium, and Alaska Sea Otter and Steller Sea Lion Commission) in the field. These tissue samples may be sent to various laboratories for diagnostic analyses. In the event of an unusual mortality event, a large number of carcasses may be collected. All carcasses will be reported to the Alaska Regional Stranding Network.

Under Permit No. 22298, the ADF&G will also conduct salvaging of Steller sea lion carcasses.

The ADF&G requests that the MMPA takes in this activity apply to incidental disturbance caused by examination, retrieval and/or sampling of found-dead sea lions. Carcasses will be sampled in-place or moved to other locations at the discretion of the biologists on scene. This activity refers to direct taking of found-dead individuals or subsistence-harvested individuals.

The Recovery Plan for Steller sea lions (NMFS 2008) identified the need to investigate carcasses and collect samples from natural death as well as subsistence harvest (task 5.7.3), and the Eastern DPS PDMP anticipated the need to monitor threats and, disease and health of the population. In addition, grantees from other funded grants have requested various tissue samples from carcasses of all age classes for investigations of disease, histology, parasitology and other indices of condition.

When available, carcasses will be collected in whole for transport to a laboratory. When in the field, tissue samples will be collected and preserved according to set necropsy protocols. In previous years a Memorandum of Agreement has been set up between the ADF&G and the Aleut Community of Saint Paul Island to allow subsistence-harvested tissues to be collected and sent to the ADF&G's laboratory. The ADF&G may develop agreements with Western DPS co-management groups to increase access to tissues from animals taken for subsistence in these areas. Additionally, the ADF&G may conduct surveys in Southeast Alaska in the Eastern DPS, dedicated to counting and recovering aborted fetuses during the months of December through May, when most aborted fetuses have been observed. The ADF&G will also continue collecting freshly-dead rookery pups at Forrester Island rookery to evaluate density-dependent disease prevalence at this old, large rookery. Other carcass sampling opportunities will also be exploited, often in conjunction with the Marine Mammal Health and Stranding Response Program. Live animals will only be disturbed during these surveys when generally fresh carcasses or fetuses are observed and need to be retrieved. The ADF&G has successfully retrieved fresh fetuses from both the land and the water near haulouts without modifying the behavior of animals hauled out. Disturbance to animals will be minimized, with the haulout approached slowly to avoid a panic or stampede. However, the high value of fresh carcasses makes some incidental take necessary and minimal disturbance to other sea lions may occur during retrieval. Depending on the age of the carcass, it will be shipped either chilled or frozen to a veterinarian or veterinary pathologist for subsequent analysis.

3.1.10.10 *Scat and Fecal Sampling*

Under Permit No. 22289, the MML will opportunistically collect scat or fecal samples from all age classes of Steller sea lions if they defecate during handling procedures. The MML will collect fecal samples using a sterilized fecal loop for determination of parasites, disease, and hormone concentrations. Fecal samples will be taken and cultured according to standard veterinary procedures. Scat samples obtained from haulouts or rookeries are labeled with date and location and transported to the MML for analysis. Scat subsamples may be provided to other investigators as requested. Remaining scat samples will be archived at the MML.

Scat collections for food habits analysis will typically occur concurrent with other research activities (e.g., remote camera maintenance, resight surveys). Fecal samples are collected using hand-trowels, spoons, tweezers, and spray bottles, and placed in plastic bags (e.g., zip-lock or whirl-pak). Bags are labeled with pinniped species, date, location, and number, and then frozen and stored for later processing and analysis.

Scat collections follow resight disturbance at sites logistically feasible for landing and collecting. No haulout or rookery is cleared solely for the purpose of scat collection. Rather, collections are made after disturbances from other activities and animals have flushed from the area. A minimum of 30 scats is optimal to adequately characterize diet at a site; thus, sites that have historically yielded high volumes of scat are prioritized. Scats are individually collected, bagged, tagged, and shipped to the laboratory for processing and analysis. Scats are individually collected, bagged, tagged, and shipped to the laboratory for processing and analysis. Scats are washed and sieved, and hard parts retained. These hard parts (typically bones, otoliths, and cephalopod beaks) are identified to taxa. Scat analyses provide a description of diet diversity and the frequency of occurrence of various prey items by area and season. These data will be compared with historical data on prey characteristics, preference, and availability to evaluate the hypothesis that changes have occurred in prey consumption.

Under Permit No. 22293, the ASLC will opportunistically collect scat samples throughout the year for the entire duration of the research activities at various sites in the Gulf of Alaska and the Aleutian Islands. The purpose of scat sampling is to assess diet and dietary variation among individuals and over time, levels of various contaminants or disease factors, and to assess stress levels and pregnancy rates. Scat samples will provide a means to assess levels of hormones (such as stress and pregnancy status) among wild pinnipeds. Scat samples will also be examined for prey remains, contaminants, and evidence of parasitic infection. Scat sampling will generally be less than one hour on site. A site will not be visited for collection of scat samples more than four times annually, with no less than three days separating dates. To ensure the most comprehensive representation of stress hormone concentrations, all scat visualized on each rookery will be collected, assigned an identification number, and relevant data regarding conditions at the collection sites noted. Following the return to the laboratory, scat samples will be processed, sexed, and assayed according to methods reported by Mashburn and Atkinson (2004). Scat

sampling will be collected from haulouts and rookeries at times when animals are being disturbed for other research activities such as captures.

Under Permit No. 22298, ADF&G will conduct scat collection for diet analysis during its regular research activities, in particular during its annual summer brand resight cruises. The ADF&G proposed to choose scat sampling locations with low densities of Steller sea lions and low probability of young pups present. However, where collection is required by a specific study plan responding to a specific conservation need (e.g., to gather prey and diet information from sea lions at specific rookeries in response to a specific conservation-guided research question), the ADF&G may elect to use additional incidental disturbance takes on portions of rookeries and haulouts to gather scats. Where necessary, sea lions will be cleared as slowly as possible to avoid causing stampedes or panic.

The ADF&G also intends to conduct directed scat sampling at haulouts during winter months to collect new samples for comparison to previously-collected scats from these sites during winter. The geographic and temporal scope of scat collections has increased as the number of sites ADF&G visit for resights has increased. The objective of this work, continuing a long-term and geographically-broad research program, is to track changes in sea lion diet, due to change in prey fields or other factors, which may have occurred since inception of scat collection in the late 1990s.

This is accomplished by researchers landing on shore in an area hidden from animals if possible, then slowly and cautiously approaching sea lions, stopping movement and hiding when animals appear too agitated (i.e., moving quickly or stampeding into the water). Occasionally, the ADF&G will use skiffs near shore to encourage animals to move into the water at a controlled pace (by altering the distance from shore and speed of the boat to either encourage or slow movement). Similar methods will be employed in support of carcass collection, scientific instrument servicing and capture operations.

Scats will be opportunistically collected when rookeries and haulouts are disturbed for animal captures during resight activities in the event animals are inadvertently disturbed into the water, or during specific scat-or carcass-retrieval surveys for which animals are gently moved into the water. Scats are individually bagged, tagged, and stored in negative 40 degrees Celsius freezers. Prey remains are identified by contractors using hard parts, DNA or other appropriate analysis methods.

In addition, under Permit No. 22298, the ADF&G will also conduct fecal loops. Fecal loops contribute to successful completion of assessing the physical health of free-ranging Steller sea lions. The ADF&G will collect fecal samples using a sterilized fecal loop for determination of parasites, disease, and hormone concentrations. Fecal loops will be taken from anesthetized Eastern DPS and Western DPS of Steller sea lion rookery pups, older pups, juveniles, subadults and adults. Samples are stored on dry ice while at sea, shipped on dry ice and stored at negative 80 degrees Celsius upon return to the laboratory until analyzed by various collaborating laboratories.

3.1.10.11 *Spew Sampling*

Under Permit Nos. 22289 and 22293, the MML and ASLC will perform spew sampling. Spew collections follow resight disturbance at sites logistically feasible for landing and collecting. No rookery or haulout is cleared solely for the purpose of spew collection. Rather, collections are made after disturbances from other activities.

3.1.10.12 *Stomach Lavage*

Under Permit No. 22289, the MML will collect a sub-sample of stomach contents from pups and juveniles using stomach intubation. A clean stomach tube (e.g., foal feeding tube) is inserted into the mouth and throat of anesthetized animals and gently guided down through the esophagus. A gentle suction causes contents to be wicked up the tube, which is then pinched, extracted, and the stomach contents are drained into sample containers. Stomach tubes are cleaned with water and Nolvasan (or similar) disinfectant and subsequently rinsed with water before use on subsequent animals to avoid cross-contamination of samples and potential spread of disease between individuals. Samples (less than 50 milliliters) drawn into the tube by mechanical vacuum are transferred to sample vials and sent to the ADF&G for analysis.

Under Permit No. 22298, the ADF&G will also conduct stomach lavage. For the ADF&G, stomach lavage contributes to successful completion of assessing distribution, dispersal, genetic diversity, maternal and/or paternal origins, entanglement prevalence and vital rates such as age-specific survival rate, reproductive rate, and probability of weaning in Steller sea lions. In addition, stomach lavage assists in assessing the physical health of free-ranging Steller sea lions. Intubation is used to conduct lavage (washing out) for stomach contents on sedated Steller sea lions. An intubation tube is inserted in the animal's stomach using fluids to flush out the contents, which are collected for later analysis. The length of the stomach tube needed is estimated by measuring the distance to the stomach along the outside of the animal's body. The tube is then inserted into the mouth, down the throat and into the stomach. To determine the proper location of the tube, a small amount of air is blown into the tube while listening for gurgling either through the tube or by using a stethoscope placed on the left abdominal wall (Dierauf 1990). After the stomach tube is properly placed, it is connected to a manually operated suction pump and sea water is pumped into the animal's stomach (Antonelis Jr. et al. 1987). The suction fitting of the pump is then connected to one of two hose fittings on an airtight collecting bottle while the other fitting is attached to the lavage tube. A vacuum is created in the collecting bottle and the slurry of water and undigested food parts is suctioned from the stomach.

3.1.10.13 *Swab Sampling*

Under Permit No. 22289, the MML will conduct sterile culture swab sampling of dermal lesions. Additionally, as appropriate, the MML will conduct swab sampling of mucus membranes, rectal, nasal, ocular, and vaginal areas for surveillance of disease. Swabs will be taken and cultured according to standard veterinary procedures.

Under Permit No. 22293, the ASLC will conduct swab sampling. Swabs of all mucosal and dermal tissue will be performed to provide material for multiple assays, including epidemiology and endocrine activity. Potentially infected tissue from skin with lesions or abscesses, if found on any pup, will be targeted for swabs. Additional dermal and/or mucosal swabs may be taken from pups without lesions or abscesses as a control group or for general analyses. Specific analyses will include examination for bacterial, viral, and other pathogens (e.g., mites and fungus) in addition to hormone analyses.

Under Permit No. 22298, the ADF&G will conduct culture swabs. Culture swabs contribute to successful completion of assessing the physical health of free-ranging Steller sea lions. The ADF&G will use sterile culture swabs to swipe dermal lesions, or ocular, nasal, rectal, and/or genital areas and other mucus membranes, as appropriate, from any handled sea lions for surveillance of disease. Swabs will be taken from anesthetized Eastern DPS and Western DPS of Steller sea lion rookery pups, older pups, juveniles, subadults and adults. Swabs will be taken and cultured according to standard veterinary procedures. Samples will be stored on dry ice while at sea, shipped on dry ice and stored at negative 80 degrees Celsius upon return to the laboratory until analysis and analyzed by various collaborating laboratories.

3.1.10.14 *Tooth Extraction*

Under Permit No. 22298, the ADF&G will conduct tooth extraction. For the ADF&G, tooth extraction contributes to successful completion of assessing distribution, dispersal, genetic diversity, maternal and/or paternal origins, entanglement prevalence and vital rates such as age-specific survival rate, reproductive rate, and probability of weaning in Steller sea lions. In addition, tooth extraction will help determine the age of individual animals through the use of DNA methylation and examination of tooth dentin and cementum layers. For Eastern DPS and Western DPS of Steller sea lion juveniles, subadults and adults, extraction of one second pre-molar tooth from the right side would be accomplished by use of a scalpel to loosen attachments, and then extracted with a dental elevator on sea lions under general gas anesthesia. Significant progress has been made over the past ten years to develop a technique of determining age of juvenile sea lions (up to 24 months of age) using measurement of the length of the canine tooth and the diastema (King et al. 2007). This statistical relationship will negate the need to pull additional teeth for aging unknown juvenile sea lions under the age of 24 months in the future. Currently this relationship can only be applied to animals up to the age of 24 months. Additional data will be collected from known aged animals (previously branded as pups) who are 24 months and older at the time of next capture to extend the application of this relationship. Until this is available, the age of unmarked sea lions estimated to be older than 24 months based on body size and tooth development will need to be determined by counting incremental growth layers on a longitudinal section of the pre-molar tooth using standard procedures at the MML laboratory or a private contractor. Only one tooth will be extracted over the life of the animal. Collected teeth will be catalogued, stored and transported dry.

3.1.10.15 *Urine Sampling*

Under Permit No. 22289, the MML will conduct urine sampling of Steller sea lions. Urine samples will be collected opportunistically from all age classes of sea lions if they urinate during handling procedures. Urine samples may also be manually expressed from non-pups by locating the bladder and gently squeezing the area with a thumb and fore finger. Animals may be catheterized with sterile, disposable catheters as a last resort, but only when they are under anesthesia, and at the discretion of an attending veterinarian. All samples will be collected into cryovials and frozen at a minimum of negative 20 degrees Celsius for short-term storage and thereafter.

Under Permit No. 22293, the ASLC will also conduct urine sampling of Steller sea lions utilizing the same or similar methods described here.

Under Permit No. 22298, the ADF&G will also conduct urine sampling of Steller sea lions. For the ADF&G, collection of urine contributes to successfully assessing the physical health of free-ranging Steller sea lions. This sampling method is currently employed and permitted under ADF&G's existing permit.

The ADF&G will collect a sterile sample of urine using a urinary catheter to measure DNA adducts that are produced physiologically in response to polycyclic aromatic hydrocarbons (PAH) contaminant exposure in mammals. This will provide a monitoring tool to assess the potential for relative contaminant exposure in Steller sea lions in pristine regions compared to those involved in offshore oil and gas development.

Urine collection will be conducted as follows: For females, in sternal recumbency, the flippers will be moved laterally, the vaginal vestibule will be cleaned with chlorhexidine scrub, gently wiped with wetted gauze and rinsed with water. A disinfected speculum will be introduced with sterile water-soluble lubricant to allow visualization of the urethral opening. A sterile, canine bitch catheter or polypropylene urinary catheter will be lubricated with sterile lubricant and introduced into the urethral opening and advanced into the bladder until urine flows or any resistance is felt indicating the bladder wall is reached. A syringe will be attached to collect the urine or it will be allowed to free-flow into a vial. When the desired volume has been collected, the catheter will be withdrawn. If a metal bitch catheter is used, it will then be scrubbed and disinfected for at least 20 minutes in a cold sterilant solution.

For males, the animal will be in lateral recumbency, the prepuce opening will be cleaned as in the female above, the sheath will be manually retracted to expose the tip of the penis which will then also be cleaned and rinsed. A sterile polypropylene catheter appropriate to the animal's size will be introduced into the urethral opening and gently advanced into the bladder until urine flows or resistance indicates the bladder wall was reached. Urine will be allowed to flow into a vial or collected into a syringe. Once the appropriate volume is obtained, the catheter will be gently withdrawn.

3.1.10.16 *Vibrissae (Whisker) Sampling*

Under Permit No. 22289, the MML will pull one vibrissae from an animal for stable isotope analysis to help identify the general trophic level of which an animal is feeding over prolonged periods. Pulling, rather than clipping a vibrissae is preferable because clipping results in an unknown length remaining attached to the Steller sea lion. Stable isotope ratios show regular, oscillating patterns in Steller sea lion vibrissae of one to three centimeters (0.4 to 1.2 inches), and changes in ratios can occur in less than one centimeter (0.4 inches). Thus, obtaining the root of the vibrissae, representing the most recent growth, for analysis is crucial. Vibrissae are pulled by gripping with forceps and pulling forcefully and rapidly in one smooth motion. Vibrissae will be sent to the ADF&G for analysis.

Under Permit No. 22293, the ASLC will also collect vibrissae sampling. A vibrissae may be pulled from up to 100 anesthetized male and female pups greater than or equal to 20 kilograms (44.1 pounds) for growth and stable isotope analysis. The ASLC will conduct vibrissae sampling using the same or similar method as the MML

Under Permit No. 22298, the ADF&G will collect biological samples of pulled vibrissae from captured Steller sea lions. Collecting samples vibrissae contributes to successful completion of assessing the physical health of free-ranging Steller sea lions and determining seasonal changes in the diet of juvenile, subadult and adult Steller sea lions. One vibrissa may be pulled from Eastern DPS and Western DPS rookery pups, older pups, juveniles, subadults, and adults for purposes including stable isotope analysis to help identify the general trophic level at which an animal is feeding over prolonged periods, or longitudinal analysis of hormonal changes to determine parameters such as stress or reproductive state. The ASLC will conduct vibrissae sampling using the same or similar method as the MML Once sampled, vibrissae are then stored, transported dry, and sectioned in the ADF&G's University of Alaska Fairbanks laboratory and analyzed either by the United States Geological Survey or the University of Alaska Fairbanks under cooperative agreement.

3.1.11 **Bioelectrical Impedance**

Under Permit Nos. 22289 and 22298, the MML and ADF&G will conduct bioelectrical impedance (subcutaneous) analysis. The purpose of bioelectrical impedance analysis for ADF&G is to contribute to the successful completion of assessing the physical health of free-ranging Steller sea lions. Bioelectrical impedance analysis is a rapid measure of body composition conducted on anesthetized animals. This will be conducted upon Eastern DPS and Western DPS of Steller sea lion older pups, juveniles, subadults and adults. BIA measures the conductivity of a whole body as an index to the distribution of water and electrolytes and uses measurements of reactance and resistance to calculate estimates of body fat (Lukaski 1987). This requires developing a mathematical relationship between values determined from BIA, and another measure of body composition, such as DTO dilution. This technique has been widely applied in marine mammals, with varying degrees of precision (Gales et al. 1994; Arnould 1995; Bowen et al. 1999). This technique is hoped to replace the more precise DTO method for

assessing body fat (condition) in Steller sea lions. Analysis by (Castellini 2001) found an excellent relationship between DTO measures of total body water and BIA impedance measurements. The procedure is simple and quick and will also provide an estimate of body condition in cases where the veterinarian determines that prolonged or repeated anesthesia necessary for the equilibration of deuterium is not recommended for some animals (i.e. animals with previous injuries, infection or poor health). On a sedated sea lion, four 3.8 centimeter (1.5 inch) 20 G needles are inserted subcutaneously (two anterior just behind the skull, two posterior near the tail) as electrodes. Leads from these electrodes attach to a portable BIA unit (RJL Enterprises Quantum II, or Model 101A) and instantaneous readings of resistance and reactance are obtained. The electrodes are then removed. For best precision, the measures are repeated two to five times, taking a maximum of three minutes while animals are anesthetized.

3.1.12 Ultrasound

Under Permit No. 22289, the MML will conduct ultrasonography to measure blubber depth and to image internal organs of anesthetized Steller sea lions. This technique has become commonplace in wildlife and marine mammal medicine because it is noninvasive and provides precise measurements of organs and blubber thickness (Brook et al. 2001; Mellish et al. 2004; Dennison and Saviano 2018). On restrained non-pup animals, measurements of blubber depth will be obtained by directly imaging the blubber layer with a Sonosite 180 Plus with a general purpose curved transducer array used externally. Ultrasonography of anesthetized adult females will be used to image the reproductive tracts to determine pregnancy and ovulation rates. External exams of this type are a common tool used on captive cetaceans and pinnipeds with little or no risk to the animal (Brook et al. 2001; Mellish et al. 2004; Dennison and Saviano 2018). In cases where detailed ovarian fine structure on non-pups is not possible by external examination, transrectal and/or transvaginal ultrasonography is used. Internal ultrasonography is a safe and effective method used in both humans and wildlife (Adams and Dierschke 1992; Stephenson et al. 1995; Adams 2001), with or without anesthetization (Adams et al. 2007). Transrectal or transvaginal ultrasonography will be performed by a qualified veterinary ultrasonographer/theriogenologist or technical staff specifically trained in this procedure by a qualified ultrasonographer/theriogenologist.

Under Permit No. 22293, the ASLC will use skin calipers and a portable ultrasound device such as the Sonosite Vet 180 Plus to non-invasively determine blubber thickness in captured pups following Castellini and Calkins (1993). Ultrasound will require the temporary restraint of an animal and may be partially completed when under anesthesia for other research activities.

Under Permit No. 22298, the ADF&G will perform ultrasounds on capture Steller sea lions. Ultrasonic imaging contributes to successful completion of assessing the physical health of free-ranging Steller sea lions. This sampling method is currently employed and permitted under ADF&G's existing permit.

The ADF&G will use ultrasonography to measure blubber depth and to image internal organs of anesthetized rookery pups (less than two months old on rookeries), older pups, juveniles,

subadults and adult sea lions. Ultrasonography has become commonplace in wildlife and marine mammal medicine (Brook et al. 2001). On restrained sea lions, measurements of blubber depth will be obtained by directly imaging the blubber layer with a Sonosite 180 Plus with a general purpose curved transducer array used externally. If appropriately trained personnel are available, examination of internal organs (again with an external transducer) will be conducted.

3.1.13 Branding

Under Permit No. 22289, the MML will conduct branding on pups collected from a corralled group one-by-one. Branding will be conducted after they are weighed, measured, and anesthetized with isoflurane gas. Branding irons are made of stainless steel, and vary in size appropriate to the side of the Steller sea lion being marked. For pup use, dimensions of the largest digits are 5.1 to 5.7 centimeters by 7.6 to 10.2 centimeters (2 to 2.25 inches by 3 to 4 inches) using 7.9 to 9.5 millimeter (5/16 or 3/8 inch) stock. Larger sizes 7.6 to 12.7 centimeters (three by five inches largest digit dimension, 0.5 inch stock) can be used for adults and larger juveniles or subadults. Each iron is heated red-hot in a portable, propane-fired forge and applied perpendicularly to the animal's shoulder with light, even pressure (five pounds per square inch) for two to four seconds. Digits are 4 to 5 centimeters (1.6 to 2 inches) apart to insure clarity of numbers. A four-digit brand is applied in about one to two minutes. Pups are observed for deleterious effects during recovery (aberrant respiration rate, sluggishness, lack of response, signs of injury), then released if fully recovered. Pups that are very young (e.g., under 20 kilograms [44.1 pounds] or umbilicus present) are not branded. Pups are marked by hot-branding a letter corresponding to the natal rookery followed by a unique one to three digit number starting on the left shoulder and extending down the left side of the animal. Over the course of the MML's branding program, the amount of time that individual pups were herded into a group prior to being measured and branded ranged from approximately one to 90 minutes. The total duration that the rookery was disturbed by human presence on land total approximately six hours.

Steller sea lions greater than two months of age are branded under anesthesia following the same protocols above (if not previously branded), except Steller sea lions tagged with telemetry devices receive an "=" symbol (in lieu of a letter) followed by a unique one to three digit number starting on the left shoulder and extending down the left side of the animal. In the Pacific Northwest, adult male sea lions are permanently hot-branded with a letter and number on its rump due to limitations of the physical restraint. Only one brand is applied over the life of the animal, regardless of how well brands heal and readability of digits. Poorly healed (containing at least one unreadable digit) brands were few (less than 0.07 of animals resighted again at greater than or equal to one year of age) for animals branded as pups at rookeries from 2001 through 2005 (ADF&G unpublished data as cited in MML 2019). A poorly healed brand also serves as a unique identifier as photograph documentation prevents biasing of resight or survival probabilities by unreadability of digits. Based on captive studies, individuals typically appear to

respond well to the procedure and show no clinical signs of infection or inflammation within weeks (Mellish et al. 2007).

In Alaska, pups (less than or equal to two months old) will be permanently marked at up to three rookeries each year. Branding will be conducted a maximum of three times at any individual rookery. Rookeries currently identified for marking pups are located at Marmot Island, Sugarloaf Island, Seal Rocks, Ugamak Island, and Agattu Island. Pups not branded will be temporarily marked (e.g., with a livestock marker) if needed to avoid recapture.

Under Permit No. 22293, the ASLC will also conduct branding. Branding will be conducted from June 25 through July 6 during three years of the five-year study. Hot branding will be conducted on pups greater than or equal to 20 kilograms (44.1 pounds) as described in Merrick et al. (1996). Hot branding will place permanent, unique letter/number code on the animal's left flank to allow identification of individual animals by birth year and rookery location. Brands will typically consist of one rookery-identifying letter followed by one to three digits. Only qualified veterinarians or other personnel with sufficient experience in the technique will be allowed to perform this research method. Hot irons will only be applied long enough to permanently mark the superficial dermis and not damage the underlying tissue (approximately three to four seconds). Branding irons are made from 0.8 centimeter (0.3 inch) cold-rolled, stainless steel round-stock and are approximately 5.1 centimeters (2 inches) wide by 7.6 centimeters (3 inches) tall. Brands will only be applied while the animal is under anesthesia in order to minimize discomfort and improve brand quality. There is the potential for infection at the wound site, and the activity of the animal may prolong or prevent healing by producing repetitive stress on the wound.

Pups less than 20 kilograms (44.1 pounds) and other that are not deemed healthy enough for branding (i.e., starving, diseased, or naturally badly injured) will be marked with either plastic cattle ear tags, dye, bleach, or shaved hair for temporary identification. The marking of these animals will aid in determining their fate over the short term and will assist in identifying the age of pups by subsequent association with identifiable females whose date and/or time of parturition was previously observed. This will allow the ASLC to more accurately determine size at age and maternal characteristics that are correlated with unhealthy pups.

Under Permit No. 22298, the ADF&G will also conduct hot branding. For the ADF&G, hot-branding contributes to successful completion of assessing distribution, dispersal, genetic diversity, maternal and/or paternal origins, entanglement prevalence and vital rates such as age-specific survival rate, reproductive rate, and probability of weaning in Steller sea lions. Hot branding will be performed on Eastern DPS and Western DPS of Steller sea lion rookery pups, older pups, juveniles, subadults and adults. Branding will not occur on pups younger than two months of age, which will be marked with dye, paint, or bleach. A discussion on the ADF&G marking methods is discussed in the *External Instrumentation* section below.

During rookery pup capture, small groups of pups (ten to 20 animals) are captured individually and held in nets and taken one-by-one to be weighed, measured, photographed, anesthetized with

isoflurane gas, sampled and branded. Typical anesthesia administration time is eight to 12 minutes at a surgical plane; however, during situations of slow induction and/or extensive sampling this can reach a maximum of 25 minutes.

For both rookery pup captures and older pup, juvenile, subadult and adult captures, the following procedures are used. The branding irons used are made of cold-rolled steel (approximately 10 millimeter [0.4 inches] stock); the dimensions of the largest digits are approximately 5 centimeters (2 inches) wide and 8 centimeters (3.1 inches) high (Merrick et al. 1996). Each iron is heated red-hot in a portable, propane-fired forge and applied perpendicularly to the animal's shoulder with light, even pressure for two to four seconds. Digits are four to five centimeters apart to insure clarity of numbers. A brand up to three digits requires about one to two minutes to complete. Pups are observed during recovery from anesthesia, then released.

During branding, total handling time from hand capture of rookery pups to full recovery from anesthesia is typically one hour, however may extend to a maximum of 1.5 hours under conditions of unusually difficult terrain or slow recovery from the anesthetic that requires handlers to monitor the respiratory pattern and alertness of pups longer. Very young pups (e.g., under 20 kg or umbilicus present) are not branded in order to obtain a sample of post-natal, viable pups for survival analyses (see Appendix 1a, b of ADF&G (2019)).

Total handling time of older pups, juveniles, subadults and adults will vary depending on:

- the duration of other processing occurring during the capture event,
- whether the animal was restrained using remote chemical immobilization alone, or a combination of remote chemical immobilization and inhalable anesthesia, and
- whether the animal is temporarily held and transported after capture (i.e., during dive capture of pups and juveniles).

During branding events, ADF&G has also established new protocols to ensure the capture events cause less risk for mortality to pups. During the early attempts at branding in Southeast Alaska several mortalities occurred due to pups being crushed among the huddle of pups that were corralled for branding, or were caught in the pools present on the rookeries, often due to a large number of pups crowding and holding them below the surface. Several modifications to the original protocols have been made over the ADF&G's five years of branding in Southeast Alaska to mitigate these problems and minimize the overall disturbance that ADF&G presence on a rookery imparts. The following summarizes the ADF&G's branding protocol:

At each rookery site a small group of four or five biologists survey a haulout or rookery from a skiff to plan the best way to approach a site and move pups for branding. Once a location is chosen, the adults are slowly moved off the rocks. It is possible to put a large number adult sea lion into the water by approaching a skiff and causing an initial disturbance by making noise and attracting attention. This will allow researchers to control the rate that animals enter the water (i.e. how fast and how many animals move into the water), thereby permitting a slower movement of the sea lions. Moving the adults slowly allows time for pups to move away from

the water, reducing the number of pups that go into the water when people move onto the rock. Once pups move away from the water and a large stampede is noticed to be unlikely, the first group of biologists will move onto the rock and an initial area will be cleared of animals. These biologists would then set up equipment and make a general plan. The branding operation should be set up in relative seclusion and the pup hold/release site should be situated so as not to scare unbranded pups. If done correctly unbranded pups should remain relatively close but undisturbed until pup roundups are conducted. Once most of the equipment and general working area has been set up, captures of pups can begin. This is done by stalking groups of pups that are in safe areas and netting them with small hoop nets. In a single round up, 15 to 20 pups could be captured and then taken to the branding area. Corralling of pups should be avoided at all times and fencing should only be used to prevent pups from being pushed into cracks or pools. Pups in nets are secured and watched by two to six people at all times to insure the safety of the animals until branding.

The methods described above have proven successful in locations such as those found in Southeast Alaska with rugged terrain and a large population of pups. In ADF&G's 2016 report of pup mortalities, they further indicated these steps reaffirming the important points of the revised protocols developed in 2005, ensuring pup monitors are solely dedicated to pup safety, of sufficient numbers, and experienced in the task, and ensuring sufficient overall coordination of the branding operation such that duties and lines of responsibility are well understood among the participants.

For a more detailed analysis of ADF&G branding activities, see Appendix 1a of ADF&G (2019). Only one brand is applied over the life of the animal, regardless of how well brands heal and readability of digits.

3.1.14 External Instrumentation/Tagging/Marking

3.1.14.1 *Flipper Tagging/Marking*

Under Permit No. 22289, the MML will conduct external flipper tagging. At sites where branding is logistically unfeasible to place a permanent mark, and a short-term mark is desirable to monitor animals for less than two years, flipper tags will be used at the discretion of the researchers. Colored or white plastic tags (e.g., Allflex) are affixed to fore flippers using tag application pliers. Insertion sites will be swabbed with alcohol prior to application and care will be taken to avoid incorrect tag placement. Flipper tags will also be used as an external instrument attachment technique.

In addition, the MML will conduct temporary marking on individuals that are not hot branded or flipper tagged to avoid repeat handling during the capture event (in the case of pups), or for subsequent monitoring (non-pups) using non-toxic livestock markers (for example non-toxic, lead-free all-weather "paintsticks" livestock markers by La-Co Industries) or hair dyes (e.g., Lady Clairol hair dye).

Under Permit No. 22293, the ASLC will also conduct external flipper tagging. Researchers will affix plastic tags that are approximately 4 by 5 centimeters (1.6 to 2 inches) through the foreflipper in loose skin on the trailing edge (posteriorly) and near where the flipper meets the body. The hole is made with a punch. Each animal will receive two paired tags, one pair per flipper, to minimize the chance of losing the ability to identify the animal if one tag is lost. Care will be taken to avoid placing the tag so low as to have the animal walking on it or so high as to have it irritating the animal's flank area. Pups will be anesthetized for flipper tagging and branding, but not necessarily for marking via dye, bleach, or hair clipping.

In addition, the ASLC will also conduct temporary marking on individuals using bleach, dye, or hair clipping. Dye will be applied to the forehead in a simple color mark using non-drip grease markers that will not seep into eyes, nose, or mouth. Bleach marking and hair clipping will only be applied on the left and/or right flank in the shape of simple numbers that are approximately 12.7 to 15.2 centimeters (5 to 6 inches) in height. Hair bleach will be of professional quality that is approved for human use. Marking of restrained animals with hair bleach is considered a safe method that has been used on many pups (Adams 2000) for temporary marking. Hair will be clipped using a battery-powered professional hair clipper. Pups will not be marked more than once per research method.

Under Permit No. 22298, the ADF&G will also conduct flipper tagging and marking of Steller sea lion. For the ADF&G, Flipper tagging and marking contributes to successful completion of assessing distribution, dispersal, genetic diversity, maternal and/or paternal origins, entanglement prevalence and vital rates such as age-specific survival rate, reproductive rate, and probability of weaning in Steller sea lions. In addition, it minimizes repeated disturbance of individuals. In cases where branding is not used to place a permanent mark on a captured sea lion (for example at rookeries where pups are not branded because resight effort is not possible, or where land captures of juveniles or adults occur) and a short-term mark is desirable to reduce handling confusion or monitor sea lions for less than two years, alternatives to branding will be considered at the discretion of the investigator.

The ADF&G will mark Eastern DPS and Western DPS of Steller sea lion rookery pups, older pups, juveniles, subadults and adults. Marking/tagging may include double color-coded plastic flipper tags (e.g., cattle tags made by All-Flex, Inc.), non-toxic livestock markers (for example non-toxic, lead-free all-weather "paintstick" livestock markers by La-Co Industries), commercial hair dye, or shaving a small amount of hair on the top of the head. For example, pups that are captured in locations where they are likely to be resighted regularly may be flipper-tagged, whereas pups in remote locations lacking resight effort are often not flipper-tagged. Additionally, pups that are handled (weighed, measured, sampled, etc.) during capture operations, but not branded, are marked with paintsticks to identify individuals and prevent repetitive capture and sampling.

3.1.14.2 *External Instrumentation*

Under Permit No. 22289, the MML will conduct external instrumentation. The number of animals outfitted with instruments each year is constrained by budget limitations and sampling logistics, thus multiple deployments over several years are necessary to obtain optimum sample sizes. External telemetry and/or archival instruments containing various sensors will be attached to all age classes of Steller sea lions in order to monitor their foraging ecology and even the in situ properties of their immediate surroundings. The MML will deploy instruments such as very high frequency (VHF) transmitters (23 to 92 grams [0.05 to 0.20 pounds], dimensions vary; Advanced Telemetry Systems), and ultra-high frequency transmitters, including, but not limited to satellite-linked dive recorders, satellite-linked time-depth recorders, satellite relay data loggers, Fast-Loc GPS satellite transmitters, standard platform transmitter terminals (e.g., Kiwisat 101 satellite transmitters, 100 grams [0.22 pounds], approximately 7.6 by 12.7 by 2.5 centimeters [3 by 5 by 1 inch]), or other similar instruments (e.g., acoustic tag, GPS phone tag, Fluoro-tag, conductivity-temperature-depth [CTD] tags, Crittercam), including prototypes that may be developed during the permit period (Lander et al. 2018). Depending on the instrument or combination of instruments used, the MML will infer the foraging behavior of Steller sea lions by tracking their movement, behaviors (e.g., dive parameters, pitch and roll, striking patters, jaw motion, etc.), physiology (heart rate), and activity or haulout patterns. Additionally, cameras will be used to determine what prey species are being targeted by Steller sea lions.

External instruments are typically attached to the pelage on the animal's back, shoulders, or head (if instrument and animal size are appropriate) with fast-setting epoxy glue or other cyanoacrylates and do not last for more than one year due to the molt. Satellite transmitters generally do not need to be retrieved (though they contain a complete archival record if they are), whereas, archival tags (e.g., time-depth recorder, accelerometers, gyroscopes, cameras, etc.) will be retrieved with a remote release device (Wildlife Computers, Inc.). These external instruments archive data onboard at a much finer resolution than is available through data-transmitting instruments, and thus provide an opportunity to study diving and foraging behavior at a much finer resolution and spatial scale. To track longer-term regional movements and obtain data during the molt period, animals captured prior to or during the breeding season may also be outfitted with external instruments using a flipper tag attachment. As technology has improved and there have been advances in miniaturization, radio transmitters have been incorporated into conventional flipper tags (cattle ear tags). Additionally, flipper-mounted satellite transmitters have become a viable tool for collecting data through the molting season and have been used successfully with harbor seals and ice seals. These transmitters are custom made, with two components (i.e., main tag casing with an external antenna and two threaded hollow posts and a bottom plate with two screws) encased in polyurethane (Wildlife Computers, Inc.). Two biopsy punches separated by a distance equivalent to the tag posts are made in the connective tissue in the middle of the foreflipper webbing using sterile, disposable biopsy punches. The tag posts are then inserted through the holes in the flipper in which the screws are inserted from the bottom

plate. These tags have provided as much as three years of data for long-term telemetry monitoring.

A single or combination of multiple instruments attached to an animal will total less than five percent of an individual’s body mass. No specific marine mammal guidelines have been published (Gales et al. 2009), but in general a target of less than five to ten percent of body mass is suggested for carnivores (Sikes et al. 2011). For example, males greater than two years old weigh 27 to 62 kilograms (59.5 to 136.7 pounds) (mean 43.2 ± 9.6 , $n=13$) and females weigh 30.5 to 47 kilograms (67.2 to 103.6 pounds) (mean 36.5 ± 5.2 kilograms, $n=12$), allowing for a maximum instrument mass of 1,350 grams (3 pounds) for the smallest potential animal at five percent of body mass. At one year of age, males and females weigh over 60 kilograms (132.3 pounds) (mean of 102 kilograms [224.9 pounds] for males, 88 kilograms [194 pounds] for females). Adult females can weigh over 300 kilograms (661.4 pounds) and adult males over 600 kilograms (1,322.8 pounds). Dimensions and exact types of instruments deployed upon Steller sea lions will vary due to improvements in technology. Dimensions of current technology the MML is most likely to use are described in the Table 7 below, and represent a sample of the types and sizes of instruments to be used (actual dimensions and mass may vary somewhat from those listed), whereas a comprehensive list of instruments the MML may use are presented in Lander et al. (2018).

Table 7. External instruments, size, percent body mass, and attachment method used by the Marine Mammal Laboratory during research activities on Steller sea lions.

Mark or Instrument	Size (Dimensions and Mass)	Attachment Method
Time-Depth Recorder	6 x 1.75 x 1.76 centimeters 40 grams	External Adhesive
SPLASH (Large)	10.8 to 11.9 x 6.5 x 3.5 to 6.9 centimeters 145 to 458 grams	External Adhesive
SPLASH (Small)	7 x 3 x 3 centimeters 65 to 145 grams	External Adhesive
SRDL	10.5 x 7 x 4 centimeters 370 grams	External Adhesive
SPOT	7.1 x 3.4 x 2.3 centimeters 30 to 145 grams	External Adhesive or Flipper Tag
VHF	3 x 1 x 1 centimeters 30 grams	External Adhesive or Flipper Tag

Heart Rate Recorder	7 x 5 x 1 centimeters 60 grams	External Adhesive
Camera – Archival	5.5 x 8.5 x 10.5 centimeters 700 grams	External Adhesive

SPLASH=Satellite data recorders, satellite-linked time-depth recorders, GPS relay or archival instruments, Fluoro-transmitter.

SRDL=Satellite-relayed data logger.

SPOT=Satellite position only tag.

VHF=very high frequency transmitter.

A small subset of pups (approximately 20 animals) may be tagged with telemetry instruments. As flipper radio (VHF/UHF) tag attachments become smaller, they may be used to supplement abundance surveys with additional correction factors and dispersal studies.

Under Permit No. 22298, the ADF&G will also place external instruments on captured Steller sea lions. Attachment of scientific instruments contributes to successful completion of monitoring the movement and diving behavior of Steller sea lions. Scientific instruments may be attached to Eastern DPS and Western DPS older pups, juveniles, subadults and adults after capture, or without capture using a modified pole or other non-capture instrument deployment technique. Instruments are attached to the hair on the animal's back just over the shoulders, or onto the top of the head (if instrument and animal size are appropriate), with a small volume of fast-setting epoxy glue. Such instruments will fall off during the annual summer-fall molt or are removed by investigators using shavers to clip the fur under the instrument at the time of subsequent capture, whichever occurs first. Instruments may also be attached as miniaturized transmitters fitted to flipper tags. Such attachment provides the ability to avoid transmitter loss during molt. This provides important understanding of movements after the breeding season toward winter feeding areas, particularly relevant to understanding the regional contaminant sources encountered by pregnant females in the Western DPS. Prior experience with flipper tags indicates complete tag loss by year two (Hastings et al. 2017).

Attached instruments will allow tracking of sea lions at sea and measurement of behavior during dives (task 2.3.3 in NMFS 2008). Instrument technology is developing rapidly as advances in miniaturization, battery technology and software engineering allow for new combinations of instruments. The ADF&G will deploy instruments such as, but not limited to, time-depth recorders, TDR; VHF radio transmitters, VHF; satellite data recorders, SPLASH (formerly named SDR and SLTDR); smart position-only tags, SPOT; global positioning system relay or archival instruments, GPS; and satellite-relay data loggers, SRDL. ADF&G will also potentially deploy heart-rate and stomach temperature recorders, HTR; heart-rate transmitters, HRX; archival cameras, UTPR; and acoustic recorders. Some of these instruments require recovery in order to physically connect and download data, some instruments relay data via radio and thus do not require recovery, and some instruments provide a limited dataset via radio when recovery is not possible but also provide more extensive data if recovered. The maximum number of

instruments attached to an individual sea lion will not exceed two to five percent of the animal's body weight (Kenward 1987; RIC 1998) . The number of animals outfitted with instruments each year will be determined by budget limitations and priority conservation-driven areas of research focus rather than more rigorous calculations of optimum or minimum sample sizes. Sufficient samples sizes for effective testing of hypotheses will be met through multi-year study designs with collaborators.

Deployment of more than one instrument upon an individual sea lion may be required, typically by combining transmitters with archival dive- or physiological parameter recorders (TDR, HTR, HRX, UTPR) or by combining a head-mounted location/dive reporting instrument (SPLASH) for shorter-term detailed data with a flipper-tag location instrument for longer-term seasonal movement data. Transmitters and archival tags may also be potted into single units. Multiple tags may be deployed as head and dorsal, head and flipper, dorsal and dorsal, or dorsal and flipper combinations. Where head-mount is preferred for both instruments, combined dimensions will not exceed ADF&G's head-mount protocol. The maximum number of instruments attached to an individual sea lion will not exceed two to five percent of the animal's body weight (Kenward 1987; RIC 1998). This work may occur range-wide in response to opportunities for collaboration with colleagues in other areas.

3.1.15 Import/Export/Receive Parts

Under Permit No. 22289, the MML will import/export/receive Western DPS of Steller sea lions parts.

Under Permit No. 22293, the ASLC will not import biological samples; however, hard parts from scat samples and fatty acid extracts will be exported to Canada for identification.

For the ADF&G, any importation or export of Steller sea lion parts or samples will be accomplished under the authority and conditions of existing Permit No. 21315 (which expires on January 31, 2023 and will be requested for renewal at that time for another five-year period.)

3.2 Conservation Measures

The Permits and Conservation Division's proposed action requires mitigation measures to minimize potential adverse effects of the proposed research activities. Mitigation measures to minimize effects are also included in the researchers permit applications. They are described previously in the *Description of the Proposed Action* (see Section 3) and were considered throughout the *Exposure and Response Analysis*. Mitigation measures to minimize or avoid exposure of ESA-listed pinniped species to research activities proposed by the MML, ASLC, and ADF&G are described further below:

Overall, each of the permit applicants used or derived mitigation measures from NMFS (2007b). These measures consist of protocols specific to conducting count surveys (aerial, ground, and vessel), orchestrating capture/handle/release of Steller sea lions, branding, performing anesthesia, sampling, and coordinating research plans with other researchers active in the same

action area to reduce potential for repeated disturbance at the same time. In addition, terms and conditions in each of the proposed permits will include mitigation measures to minimize harassment to all non-target ESA-listed species. Although each applicant will conduct similar activities and mitigation protocols derived from NMFS (2007), there are subtle differences based on each applicant's research goals and objectives. As a result, each of the applicants' proposed mitigation measures to minimize or avoid exposure is presented below:

3.2.1 Marine Mammal Laboratory

3.2.1.1 *General Mitigation*

As with other applicants, the MML proposes to combine multiple research activities for any given site to minimize the number of disturbances, and affect as little species habitat as possible to accomplish an activity. The MML will exercise caution when conducting all activities and efforts will be immediately terminated if there is any evidence that any given activity may be life threatening. Captured animals will be carefully monitored for signs of stress. If a captured animal shows signs of acute or protracted alarm reaction (e.g., overexertion, constant muscle tensions, abnormal respiration or heart rate) that may lead to serious injury, capture myopathy, other disease conditions, or death, research-related procedures are immediately ceased to focus on the animal, and treat the symptoms as determined appropriate by the principal investigator, co-investigator, or attending veterinarian. An experienced marine mammal veterinarian is present to carry out or provide direct on-site supervision of all activities involving the use of anesthesia. Furthermore, only highly experienced and well-trained personnel perform invasive procedures. Additional MML protocols for the proposed activities are presented below:

3.2.1.2 *Aerial Surveys*

For all manned aerial surveys, aircrafts will approach sites without banking. Banking is a maneuver used to change the aircraft heading. The turn is initiated by using the ailerons or spoilers to roll (also known as bank) the aircraft to one side. The sound change associated with banking increases the likelihood of disturbing animals. By not performing banking, aircrafts are typically only within hearing range for no more than one to two minutes. This protocol has been observed to reduce the effects of the approach and usually less than 1 percent of hauled out animals enter the water (MML 2019). The MML coordinates with the NOAA Aircraft Operations Center to work with the Federal Aviation Administration to comply with Federal Aviation Administration flight regulations and NOAA Aircraft Operations Center regulations and permissions prior to all missions. The MML currently only has permission to fly UAS within line of site of the ground control station and pilot in command. There will always be a visual observer present looking for aircraft and at least one other person to view the animals to observe for any reaction to the UAS.

For UAS operation, measures to minimize negative effects will include: (1) operation at altitudes between 45.7 to 76.2 meters (150 and 250 feet) above Steller sea lions; (2) the pilot will attempt to fly slow (3 to 5 meters per second; 5 to 10 miles/hour) straight line transects and avoid hovering to reduce disturbance; and (3) an observer will be dedicated to monitoring Steller sea

lion reactions and advising pilots of appropriate changes to flight operations if necessary to mitigate.

3.2.1.3 *Vessel Surveys*

During vessel surveys observers are occasionally placed onshore away from animals if improved viewing can be obtained inconspicuously. It is possible that some Steller sea lions can be flushed from haulout sites during vessel surveys; however, care is exercised to minimize this response by approaching slowly and in gradual steps. By first approaching slowly from a distance of greater than 100 meters (328.1 feet), the Steller sea lions generally do not become startled by the vessel and appear to become used to it. Subsequent closer approaches at a slow speed generally do not result in Steller sea lions flushing into the water. If some animals begin moving to the water, the research vessel backs off slowly and allows the Steller sea lions to settle and acclimate to the presence of the research vessel. The proposed vessel surveys will also be conducted by experienced observers and research vessel operators who have conducted vessel surveys in this area from 2001 through 2018. These personnel know how to conduct the vessel surveys in a safe and non-intrusive manner to reduce disturbance.

3.2.1.4 *Unintentional Disturbance*

Unintentional disturbance during scat collection, capture/sampling, or observational/monitoring activities are proposed to be conducted efficiently, such that the total time researchers are occupying a rookery/haulout and total number of times a site is disturbed are minimized. Multiple activities are combined for a site to minimize number of disturbances. Only a minimal portion of a site is disturbed to accomplish an activity. Biologists experienced in capture and sampling techniques will be used to complete the activities as quickly as possible and only highly experienced and well-trained personnel perform invasive procedures. All animals are monitored post-handling for signs of acute stress or injury for as long as possible without causing further disturbance of the rookery/haulout.

3.2.1.5 *Capture/Handle/Release*

During non-pup captures (includes hand, hoop net, underwater noose, floating trap, dart injection and associated activities), the MML proposes to carefully monitor animals for signs of stress. If a captured animal shows signs of acute or protracted alarm reaction (e.g., overexertion, constant muscle tensions, abnormal respiration, or increased heart rate) that may lead to serious injury, capture myopathy, other disease conditions, or death, research-related procedures are immediately ceased to focus on the animal and treat the symptoms as determined appropriate by the principal investigator, co-investigator, or attending veterinarian.

The MML will use caution when approaching all pinnipeds, particularly mother/pup pairs, and efforts to approach and handle a particular animal or mother/pup pair are immediately terminated if there is any evidence that the activity(ies) may be life threatening. Reasonable steps will be taken to identify pups of lactating females before attempting to immobilize a lactating female. In the event a female dies or is seriously injured as a result of the activities, the orphaned pup shall,

when it can be identified, be humanely provided for (i.e. salvaged [placed in a stranding facility for rehabilitation and eventual release], or if salvage is not possible, euthanized).

During pup captures, the MML proposes to process animals in groups small enough that all animals can be adequately monitored (e.g. two physically restrained but not chemically immobilized animals per observer), and handling/restraint time are kept to the minimum possible. When pups are handled, they are sufficiently monitored, and separated if necessary, to ensure that they are not suffocated, being crushed, or aspirating milk. Pups restrained are restrained by hand, without using a restraint board or drugs (except where the use of gas anesthesia is indicated for branding and other intrusive procedures), and handling time is kept to a minimum.

3.2.1.6 *Anesthesia*

The MML proposes to utilize an experienced marine mammal veterinarian to carry out or provide direct on-site supervision of all activities involving the use of anesthesia. Mitigation for these risks will be accomplished by careful selection of target animals (relatively calm animals that have the least risk of escaping into the water or to other inaccessible or hazardous areas), immediate availability of revival agents (such as doxapram and epinephrine), reversal agents (atipamezole (medetomidine), flumazenil (midazolam) or naltrexone (butorphanol)) and CPR measures, and by not utilizing injectable agents for prolonged anesthesia. Atropine and prednisolone will also be available and used at the discretion of the veterinarian. The MML proposes to also ensure that animals that have been captured or are recovering from immobilizing drugs have an opportunity to recover without undue risk of injury from other animals. All animals will be monitored for apnea or respiratory depression, bradycardia, tachycardia, hypothermia, and hyperthermia, and treated as necessary. After using sterile needles, all injection sites will be thoroughly cleaned to prevent any infections.

3.2.1.7 *Mark, Hot Brand*

To minimize disturbance related to branding activities, the MML proposes to follow clearing procedures as described in Section 3.1.13. Unless a ground count was conducted in association with the branding operation, the portion of the rookery cleared is kept to the minimum necessary to round up the desired number of pups. Hot-brands are applied only when an animal is under general anesthesia to prevent brief acute stress. Care is taken to prevent over-branding animals in an effort to prevent infection or tissue trauma. The MML personnel then remain with pups until they fully recover from anesthesia.

3.2.1.8 *External Instrumentation*

For use of external instruments, the MML proposes to limit the total weight of instruments attached, positioning the instrument to minimize interference with motion, and using epoxy/glue with care so as not to burn the animal.

3.2.1.9 *Biological Sampling*

For blood collection and other invasive procedures, the MML proposes to only use highly experienced and well-trained personnel to perform invasive procedures. Sterile, disposable needles or instruments will be used for skin/blubber biopsies, stomach intubation, enemas, blood sampling, and injections of drugs or other approved substances. When disposables are not available, instruments (darts, stomach tubes, biopsy needles, etc.) are thoroughly disinfected with a bactericidal/virucidal agent in accordance with the product directions between animals and, as needed, immediately prior to each use. Field-sterile techniques are always utilized when collecting samples. When blood sampling, needle insertions will not exceed three attempts (needle insertions) per animal, and not more than 1.0 milliliters of blood per kilogram of body mass is drawn per capture event. All injection sites are cleaned with alcohol to prevent infections. If an animal cannot be adequately immobilized for blood sampling, efforts to collect blood are discontinued. Care is taken to ensure endotracheal tubes do not extend past the pre-thoracic bifurcation of the trachea resulting in unilateral lung intubation.

3.2.1.10 *Mark, Temporary (Dye, Paint, etc.)*

Only non-toxic products will be used to prevent toxicity to the animal through ingestion during grooming.

3.2.1.11 *Monitoring Research Effects*

To evaluate the effects of all activities and ensure animals have recovered, the MML will monitor the short-term effects of activities while on site conducting research to the maximum extent practical without causing further disturbance of the animals. For example, the MML personnel can simultaneously assess the number of animals disturbed during each activity. In the past, disturbances from scat collection and brand resighting have averaged less than 28 percent of the sea lions exposed to the activity (MML 2019), and the rate may be much less for protocols designed to assess behavioral relationships between mothers and pups. Disturbance caused during aerial surveys in the past was minimal, as witnessed by personnel of the MML that were on the ground viewing the rookery beaches at Fish, Marmot, and Ugamak Islands during 2002 and at Marmot and Ugamak Islands during 2004. Most sea lions appeared unaware of the aircraft and probably less than ten percent of the animals surveyed reacted at all. Observers on Ugamak Island noted a “mild spook of rookery,” but all animals remained on the beach. In remote regions that experience little aircraft or vessel traffic, few animals were occasionally spooked off a site by the aircraft. No major disturbances, injuries, or mortalities were a consequence of aerial survey activities.

Monitoring the long-term effects of activities has been an on-going process and the MML will continue monitoring programs that have already been implemented at field camps on Ugamak and Marmot Islands. For example, during the period 2000 through 2008, the MML monitored the effects of its activities during pup counts and handling at all rookeries visited, and independent

observations were made by observers at two rookeries, including Ugamak and Marmot Islands. These effects are discussed in detail in the *Exposure and Response Analysis* (Section 11.2).

For more information on mitigation measures related to the MML's proposed activities, see Section 19 in Appendix A for the terms and conditions the Permits and Conservation Division propose to include in Permit No. 22289.

3.2.2 Alaska SeaLife Center

The ASLC proposes to implement several measures to mitigate unintentional disturbance to the target and non-target species during all operations in the field. The ASLC proposes to not conduct repair and maintenance to remote monitoring equipment at rookery sites during peak pupping (June 1 through June 25) if disturbance is likely; although peripheral equipment may be serviced during that time period if researchers remain out of sight and sound from sea lions. Site visits for repair and maintenance at other times will be scheduled as temporally far from the pupping season as practical (based on weather conditions for accessing sites and staff availability) and combined with other planned disturbance (e.g. material collection, branding, etc.) when possible. All site visits will be supervised by an experienced researcher and all visitors will dress in clothing that blends well with surrounding terrain, move with stealth when near sea lions or seabirds, and if animals are disturbed, will complete the service as quickly as possible so as to minimize the time that sea lions are displaced. Pinnipeds and other species that are "non-target species" will be avoided by keeping at least 100 meters from them and/or the ASLC will alter the course of its survey/research activities as needed.

The Principal Investigator and some of the Co-Investigators typically participate in an annual research coordination meeting in Anchorage during late-January. This meeting among parties holding Steller sea lion field research permits is undertaken to ensure the ASLC's activities are not unnecessarily duplicative in time, study locations, and study objectives. The coordination will also to determine where, when, and what gaps may exist in critical knowledge about Steller sea lions to determine how and who can fill those research needs. These activities have led to good cooperative efforts to obtain samples without unnecessary duplication of efforts. For example, researchers and staff from the Alaska Department of Fish & Game (ADFG) assisted with Alaska SeaLife Center efforts to capture, mark, and sample pups on Chiswell Island in 2016. Many biological samples were shared with ADF&G to fulfill some of their research objectives regarding endangered Steller sea lions.

To minimize the effects of handling and branding, veterinarians and experienced biologists will watch for signs of distress such as unusually rapid or slow respiration and/or potential for injury. If a Steller sea lion shows signs of distress while being handled, the ASCL will release the animal immediately and closely monitor it. An emergency kit consisting of an endotracheal tube and ambu bag, laryngoscope, respiratory stimulant (doxepam), a cardiac stimulant (epinephrine), a parasympatholytic agent (atropine) and a corticosteroid (dexamethasone) will be readily available. Anesthesia using isoflurane gas will be used to relieve pain and prevent struggling during branding, blood draws, skin biopsy, and pulling vibrissae (Heath et al. 1997).

Due to lessons learned with a pup mortality in 2011, the ASLC will expand the holding area (corral) to allow the pups to spread out and not pile upon each other to any great extent. Upon arrival at the rookery, any standing water in the corral will be pumped out using a large hand-power bilge pump. Researchers guarding the crèche will also be continually warned to be watchful against pups stacking up on each other and to be sure all noses are in view with unrestricted access to open air.

The ASLC claims that while there is a small risk of infection associated with bleeding, skin biopsies, and other types of samples taken from the pups, the risk of infection will be reduced through the disinfection of sampling sites isopropyl alcohol or betadyne and the use of sterile/aseptic equipment and sampling techniques. To further reduce the risk of infection, only clean, sterile disposable needles will be used to obtain blood samples and a new needle will be used for each blood collection. The ASLC will not to biopsy dart pups anywhere or time nor any non-pup on a rookery during the pupping season. All dart tips will be sterilized prior to each use. No attempt will be made to dart an animal unless there are no other animals or obstructions between the subject and the person firing the dart. Animals will be approached to within 20 meters (65.6 feet) from downwind if possible. No attempt will be made to dart an animal if wind is greater than 24.1 kilometers per hour (13 knots) (Hoberecht et al. 2006a) or if sea conditions are greater than one foot if darting from a vessel. Success rates for collection of skin and blubber from Steller sea lions are greater than 90 percent with virtually no adverse effects (Hoberecht et al. 2006a). Care will be taken not to aim toward the head of any animal but toward the flank or center of body mass. The ASLC states that additional unintentional disturbance may occur during darting but will be kept to a minimum by choosing to dart animals that are not in large groups when possible. These procedures will only be performed by/under the direct supervision of qualified and experienced personnel.

Animals will be preferentially sampled at locations where remote video equipment is installed. Therefore, the ASLC will be able to continually monitor Steller sea lions after all procedures for as long as they remain at those sites. When sea lions are sampled at sites without remote monitoring equipment, researchers will remain on site for at least one hour after sampling to monitor effects.

For more information on mitigation measures related to the ASLC's proposed activities, see Section 19 in Appendix B for the terms and conditions the Permits and Conservation Division propose to include in Permit No. 22293.

3.2.3 The Alaska Department of Fish and Game

To minimize disturbance and avoid duplication, all of the ADF&G's proposed activities will be coordinated with research activities of the MML, ASLC, University of Alaska, and other active researchers conducting field research on Steller sea lions in Alaska. The ADF&G proposes to send required notifications of upcoming research simultaneously to NMFS, as requested, and also to the set of researchers working in Alaska. There are instances when researchers from different agencies will plan studies at the same haulout or rookery location. Communication and

coordination between agencies has assured not only that disturbance of animals at a particular location is distributed amongst different times of the year, but also that cooperative research opportunities are optimized to decrease the activity at each haulout and increase the amount of information that can be gained from each known (marked) animal. One example of this cooperation is cooperative research cruises such as the ones conducted in 2010, 2011, 2012, 2013 and 2015 by ADF&G and the MML in the Aleutian Islands and southeastern Alaska. Another example is annual planning for the brand resight effort shared among the ADF&G, MML and ASLC, during which the following agencies ensure they will not cause repeated disturbance at particular sites and also attempt to “fill in gaps” where agencies working in adjoining areas are not able to cover the full range of surveys they require. Prior to each capture trip, researchers at other agencies are consulted to agree upon whether previously studied and marked animals should be targeted for continued study on a case by case basis. For instance, extremely valuable information can be gained from measuring body condition and identifying current diet of marked animals to assess growth rates and time of weaning in different segments of the population. However, in some cases, previously studied animals will be rejected for capture.

The ADF&G’s proposed coordination between research teams from other agencies is accomplished through annual coordination meetings or online exchanges coordinated by the MML, through annual notification of research intentions to the NMFS PR Alaska Region Steller Sea Lion Coordinator, through frequent informal communications and through participation on scientific review panels. In addition to coordination of research, a very high level of collaborative research (sample sharing, joint captive projects etc.) has been undertaken with the ASLC, MML and other researchers which have also resulted in joint publication of results.

A review of anticipated effects of these activities was presented the Programmatic Environmental Impact Statement (EIS) for Steller Sea Lion and Northern Fur Seal Research (NMFS 2007b) and are discussed in Section 11.2 of this Opinion. The ADF&G Institutional Animal Use and Care Committee (IACUC) has also reviewed and approved all proposed animal handling activities (See Appendix 8 of ADF&G 2019) for both this permit and our separate disentanglement response authorization under the Marine Mammal Health and Stranding Response Program.

3.2.3.1 Capture (includes Hand, Hoop Net, Underwater Noose, Noosing with Pole, Remote Chemical Immobilization)

The capture and handling involved in this activity are likely to elicit the greatest amount of stress during the actual capture operation. Methods and equipment are continually refined to limit the amount of stress and reduce any potential pain or suffering associated with capture. To date, there are no other methods of capture known that would increase the safety or reduce the stress more than what is currently used. Underwater captures have facilitated faster handling times. Remote chemical immobilization has further enabled safe capture of sea lions larger than feasible for the underwater dive-capture method, and the current drug combination provides a

considerable margin of safety in the event sea lions are struck and lost before handling (See Appendix 2 of ADF&G 2019). The majority of handling is conducted while the sea lion is immobilized under general anesthesia (isoflurane) after initial capture (either dive capture, remote chemical immobilization or manual restraint). The stress, pain, and suffering are reduced as much as they are for human subjects undergoing invasive procedures. Gas anesthesia importantly provides a longer handling and sampling time (up to one hour and longer) than is possible under remote chemical immobilization alone. Some handling, marking, instrument attachment and sampling is also conducted while sea lions are under the remote immobilization drug combination or restrained manually. In these situations, the set of procedures is more limited in order to take less time (e.g., instrument attachment, pulling vibrissae or a brand may be applied under remote chemical immobilization, while DTO serial sampling and blubber biopsies would not).

While capture myopathies have not been documented to occur in pinnipeds; the ADF&G assumes captures are a stressful event for sea lions. Captured animals are carefully monitored for signs of stress. If a captured animal shows signs of acute or protracted alarm reaction (e.g., overexertion, constant muscle tensions, abnormal respiration or heart rate) that may lead to serious injury, capture myopathy, or other disease conditions, or death, research-related procedures are immediately ceased to focus on the animal, and treat the symptoms as determined appropriate by the primary investigator, co-investigator, or attending veterinarian.

Animals are processed in groups small enough that all animals can be adequately monitored (e.g. two physically restrained but not chemically immobilized animals per observer), and handling/restraint times are kept to the minimum possible. When rookery pups are handled, they are sufficiently monitored, and separated if necessary, to ensure that they are not suffocated, crushed, or aspirating milk.

An experienced marine mammal veterinarian is present to carry out or provide direct on-site supervision of activities involving the use of gas anesthesia.

The ADF&G will use caution when approaching all Western DPS of Steller sea lions, particularly mother/pup pairs, and efforts to approach and handle a particular animal or mother/pup pair are immediately terminated if there is any evidence that the activity may be life-threatening.

Reasonable steps will be taken to identify pups of lactating females before attempting to immobilize a lactating female. In the event a female dies or is seriously injured as a result of the activities, the orphaned pup shall, when it can be identified, be humanely provided for: salvaged by placement in a stranding facility for rehabilitation, or if salvage is not possible, euthanized.

The ADF&G plans to ensure that animals that have been captured or are recovering from immobilizing drugs have an opportunity to recover without undue risk of injury from other animals. This is accomplished by releasing them in an area void of other animals, yet in close proximity to the sampling stations from which they can be visually monitored until fully alert

and able to safely move away on their own. Juvenile and younger sea lions can also be released from their processing site, typically remote from other animals (e.g., a research vessel). Older, chemically-immobilized Steller sea lions are typically processed where they lie on the haulout; as such, the area in the vicinity of their subsequent recovery is usually already empty of other animals.

To the maximum extent practical without causing further disturbance of the rookery/haulout, animals are monitored post-handling for signs of acute stress or injury.

3.2.3.2 *Blood Collection*

For blood collection and other invasive procedures, only highly-experienced and well-trained personnel from the ADF&G will perform invasive procedures. Not more than four milliliters of blood per kilogram of body mass is drawn per capture event. When conducting labeled water (DTO) and Evans blue studies, additional needle insertions may be performed, but catheters are preferentially used to minimize impacts on the animal. If an animal cannot be adequately immobilized for blood sampling, efforts to collect blood are discontinued.

For invasive procedures (e.g. blood collection, muscle biopsy, skin biopsy, blubber biopsy, bioelectrical impedance analysis, DTO and NaBr injection, and Evan's blue dye injection) disposable needles, biopsy punches and other instruments are used to the maximum extent possible. Disposable needles are always used for blood sampling and injections of drugs or other approved substances. When disposables are not available, instruments (e.g., stomach tubes, biopsy needles) are autoclaved or thoroughly disinfected between uses with a bactericidal/virucidal agent in accordance with the product directions and, as needed, immediately prior to each use. Flipper punches (for flipper skin sample collection) are disinfected between uses.

3.2.3.3 *Tooth Extraction*

The ADF&G will only perform tooth extraction while the sea lion is under general anesthesia, and only by trained personnel. Dental extraction instruments will be thoroughly disinfected with a bactericidal/virucidal agent in accordance with the product directions between animals and, as needed, immediately prior to each use.

3.2.3.4 *Measures to mitigate unintentional disturbance*

All activities are coordinated with research activities of the MML, ASLC and other researchers to minimize disturbance. The NMFS Alaska Region is notified in advance of the ADF&G's research activity schedule.

3.2.3.5 *Aerial Surveys*

The ADF&G proposes to approach survey sites, when possible, from a kilometer or more offshore without banking (the sound change associated with banking increases the likelihood of disturbing animals), and maintain a distance that is within hearing range for no more than one to two minutes.

3.2.3.6 *Vessel Surveys*

Disturbance to animals is minimized by slowly approaching the haulout from up wind, allowing animals to become accustomed to the ADF&G's presence. If animals begin to move due to the ADF&G's presence, vessels will back away from the site.

3.2.3.7 *Scat and Carcass Collection*

Impacts of these activities are potentially greater than aerial surveys or brand resighting, because most adult animals must be moved to the edge of the collection area on the rookery or haulout in order to land personnel for collection. To minimize impact, the ADF&G's protocol includes the following:

Unless required by a specific study plan (e.g., to gather prey and diet information from sea lions at specific rookeries in response to a specific conservation-guided research question), scat is not collected from rookeries during the pupping season unless the rookery is already disturbed for pup branding, pup sampling or another activity, and then only in the area already disturbed. Scats are also collected from isolated sections of rookeries ordinarily occupied by bachelor males and subadults, and the areas the ADF&G selects for sampling typically contain few or no sea lions at the time researchers step onto land. Scats will be collected from winter haulouts, especially as guided by specific research questions addressing conservation questions (e.g., determining differences in sea lion diet against historical samples to determine potential causes of population changes.). Carcasses are relatively high-value samples, because identification and recovery of freshly dead Steller sea lions to determine cause of death, contaminant loads and other important information is rare. In the case of potential carcass collection, in response to current conservation needs, a decision may be made by the principal investigator or co-investigator on site whether the disturbance of nearby sea lions is worth the potential information to be collected from fresh-dead carcasses. In all cases, the investigator on site will make the judgement how much unintentional disturbance is reasonable, and will minimize the number of unintentional disturbances required to collect a carcass. For scat and carcass collection, where necessary, specific areas of haulouts are cleared of animals slowly by approaching from up wind and slowly moving the animals off the rock or further down the rock. This allows animals to slowly move to the water without stampeding. In all cases, the minimum rookery or haulout disturbance is made to accomplish the collections required. The ADF&G minimizes the time spent occupying the beach, with work led by biologists experienced in herding to slowly move the adults out of the way, and experienced collectors to complete the research work as quickly as possible.

The criteria used to identify whether a disturbance has occurred are based on observations of animals reacting to the scientists. If animals are observed to be unable to move away from research activity (i.e., are ‘trapped’) or are endangering themselves in response to scientists’ activities, the activity is terminated. In the past the ADF&G has terminated the approach to a haulout if it was observed that pups could be injured or fall into cracks, if it was determined that an otherwise good remote chemical immobilization candidate is surrounded by “jumpy” sea lions, and various other situations that did not present themselves as ideal. The ADF&G states that there are no quantifiable criteria to be used because each site has different topography and conditions, which are modified by the density of animals and distribution of sex/age classes. The ADF&G will rely on caution and conservative decision-making, enabled by previous experience with the reaction of sea lions to its work.

In order to minimize disturbance to individual haulout sites, the ADF&G has designed capture methods (underwater dive capture), stalking methods (careful stalk and selection of candidates for remote chemical immobilization), observation methods (remote cameras, aerial brand resight and observing from cover) and sampling methods (remote biopsy) to minimize and when possible eliminate disturbance. In addition, when handling or moving animals, biologists experienced in capture and sampling techniques are used to complete the activities as quickly as possible.

3.2.3.8 *Hot-Brand*

To minimize disturbance related to branding activities, the ADF&G follows clearing procedures as described in Appendix 1 of their application (ADF&G 2019). The portion of the rookery cleared is kept to the minimum necessary to round up the desired number of pups. In some cases, this may mean the entire rookery (i.e., Biali Rocks), or entire sub-units of a rookery (i.e., one side of an island on the Graves Rocks rookery), may be cleared. The area used for the actual procedure is located out of sight of the majority of the rookery whenever possible in order to reduce the visibility to other sea lions, thus reducing their reactions to our presence. Likewise, pups are released out of sight after the procedures and are monitored during recovery to ambulatory state. A minimum of one and usually two or three marine mammal veterinarians are on site to examine pups and administer care as they determine necessary. Emergency drugs and resuscitation materials are kept available and stocked and all personnel are trained to look for signs of distress in both pups handled or about to be handled and those possibly disturbed by ADF&G’s actions. These are also kept available for captures and handling of juveniles and sea lions greater than three years of age.

3.2.3.9 *Post-processing Recovery Monitoring*

All animals are observed closely after gas anesthesia or remote chemical immobilization to ensure full recovery from restraint prior to release. Recovering animals are placed and monitored in a protected location on the rookery (typical for rookery pups), are monitored during extubation, reversal and full recovery (typical for remotely immobilized sea lions), or monitored in a protected location on a research vessel during recovery (typical for dive captures). Sea lions

are under the observation and protection of researchers (i.e., researchers have an ability to monitor and intervene) until they regain mobility and move away under their own power. During capture events, significant effort is expended conducting multiple resight bouts at haulouts to document behavior of recently handled animals at the location. As for long-term followup of individuals, over 50 animals have now been recaptured following previous branding and sampling events, which let us more closely review effects of our previous handling. All invasive procedures have been noted to be healed or healing in the expected manner (depending upon the length of time between captures) by veterinary staff. ADF&G states that due to its extensive vital rates brand resight program, it has been able to track the fates of captured sea lions over several years, and in the rare occurrence of capture-related injuries. In addition, ADF&G annually reports re-sightings of the injured individuals in its permit report along with any pertinent behavior (e.g., a juvenile female injured during capture in 2009 was observed with her first pup several years later).

All activities and protocols proposed have been previously reviewed and approved by the ADF&G's Division of Wildlife Conservation IACUC and a copy of ADF&G's current signed protocol is attached as Appendix 8 of its permit application (ADF&G 2019). The ADF&G renews this protocol annually and requests IACUC review of new techniques, in concert with modifications to its permit, as needed. Through consultation with leading marine mammal veterinarians and biologists, the least intrusive methods available for each activity have been selected to gain the information needed. All invasive activities are conducted under chemical restraint.

For more information on mitigation measures related to the ADF&G's proposed activities, see Section 19 in Appendix C for the terms and conditions the Permits and Conservation Division propose to include in Permit No. 22298.

4 ACTION AREA

Action area means all areas affected directly, or indirectly, by the Federal action, and not just the immediate area involved in the action (50 C.F.R. §402.02). The action area for Permit Nos. 22289, 22293, and 22298 include haulouts, rookeries, and surrounding waters in California, Oregon, Washington, and Alaska on the U.S. West Coast.

The action area for Permit No. 22289 specifically includes California (including offshore waters), Oregon (including Columbia River and offshore waters), Washington (including Columbia River and offshore waters), and other U.S. locations (including offshore waters). Research activities (e.g., vessel surveys and non-pup captures) will occur throughout the year. Aerial surveys will occur throughout the year, but during June through July for abundance estimation purposes. Research activities for vital rates and health assessments of pups will occur during June through July. Maps of the action area for Permit No. 22289 are shown in Figure 6 though Figure 8.

The action area for Permit No. 22293 will include the coast and along offshore areas of the Gulf of Alaska and Aleutian Islands. Most of the work will be concentrated at Chiswell Island (59.602 North, 149.568 West) and rookeries/haulouts between Prince William Sound and Outer Island. Additional work farther west is dependent on funding and research needs. Remote video/audio monitoring will occur year-round for the entire duration of the project. Carcass/scat collections will take place opportunistically throughout the year for the entire duration of the project. Pup branding and associated sampling will occur between June 25 and July 6 during only three years of the five-year study. Remote biopsies will be collected between July 15 and May 31 during all years of the project. A Map of the action area for Permit No. 22293 is shown in Figure 6.

The action area for Permit No. 22298 will occur throughout the coast and along offshore areas of eastern and western Alaska. Most observational mark-resight and count field work will take place from May through August. Capture and sampling as well as survey effort will be conducted at various locations year-round. Pup capture for sampling and/or branding will be conducting during the June through July breeding season. Maps of the action for Permit No. 22298 are shown in Figure 6 and Figure 7.

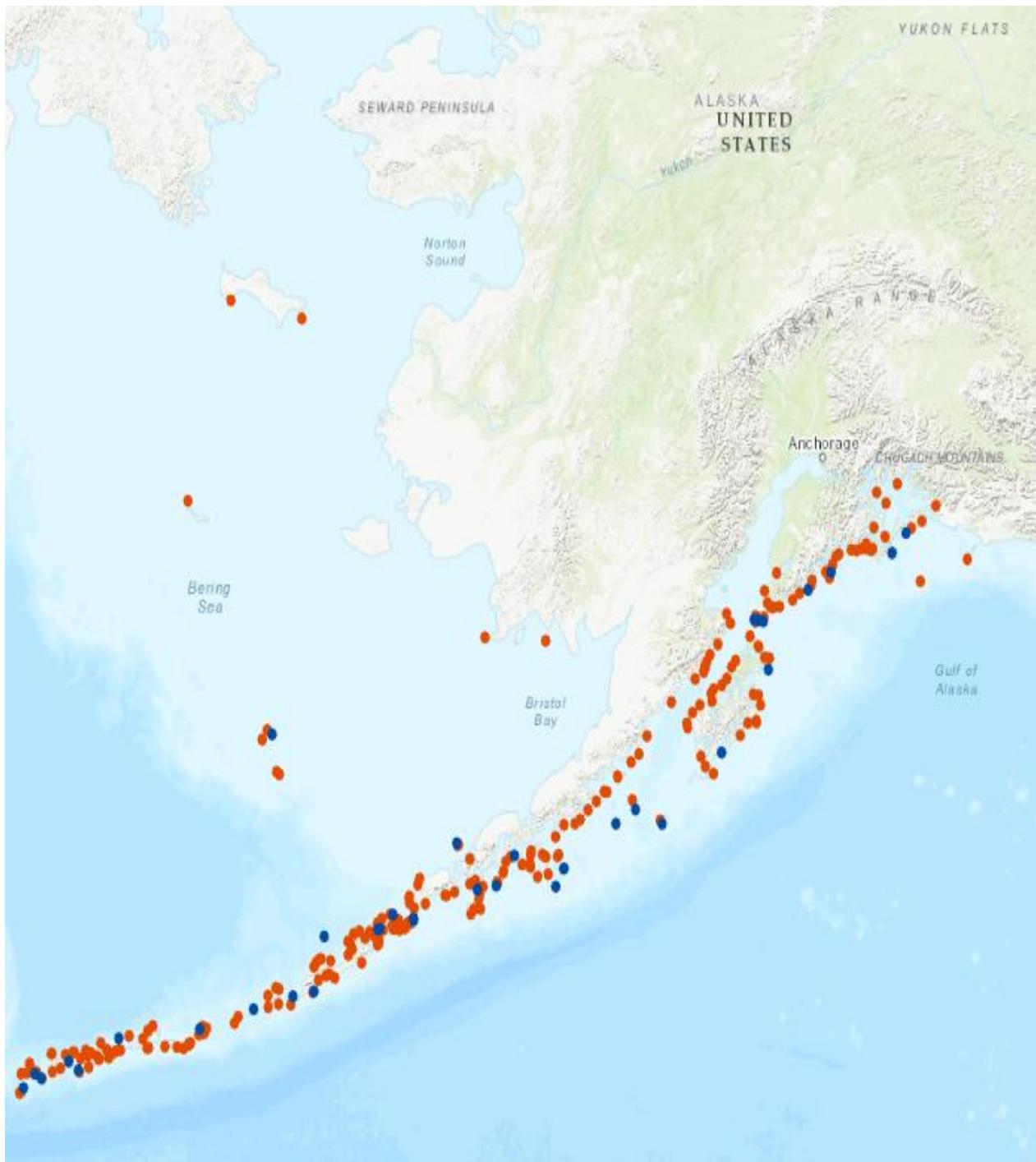


Figure 6. Western and Central Alaska Action Area for Permit Nos. 22298, 22289, and 22293. Permit No. 22293 will primarily be located in the Kenai Fjords area. Blue dots depict rookeries and orange dots depict haulouts sites that will be visited by Marine Mammal Laboratory, Alaska Sea Life Center, and Alaska Department of Fish and Game researchers.

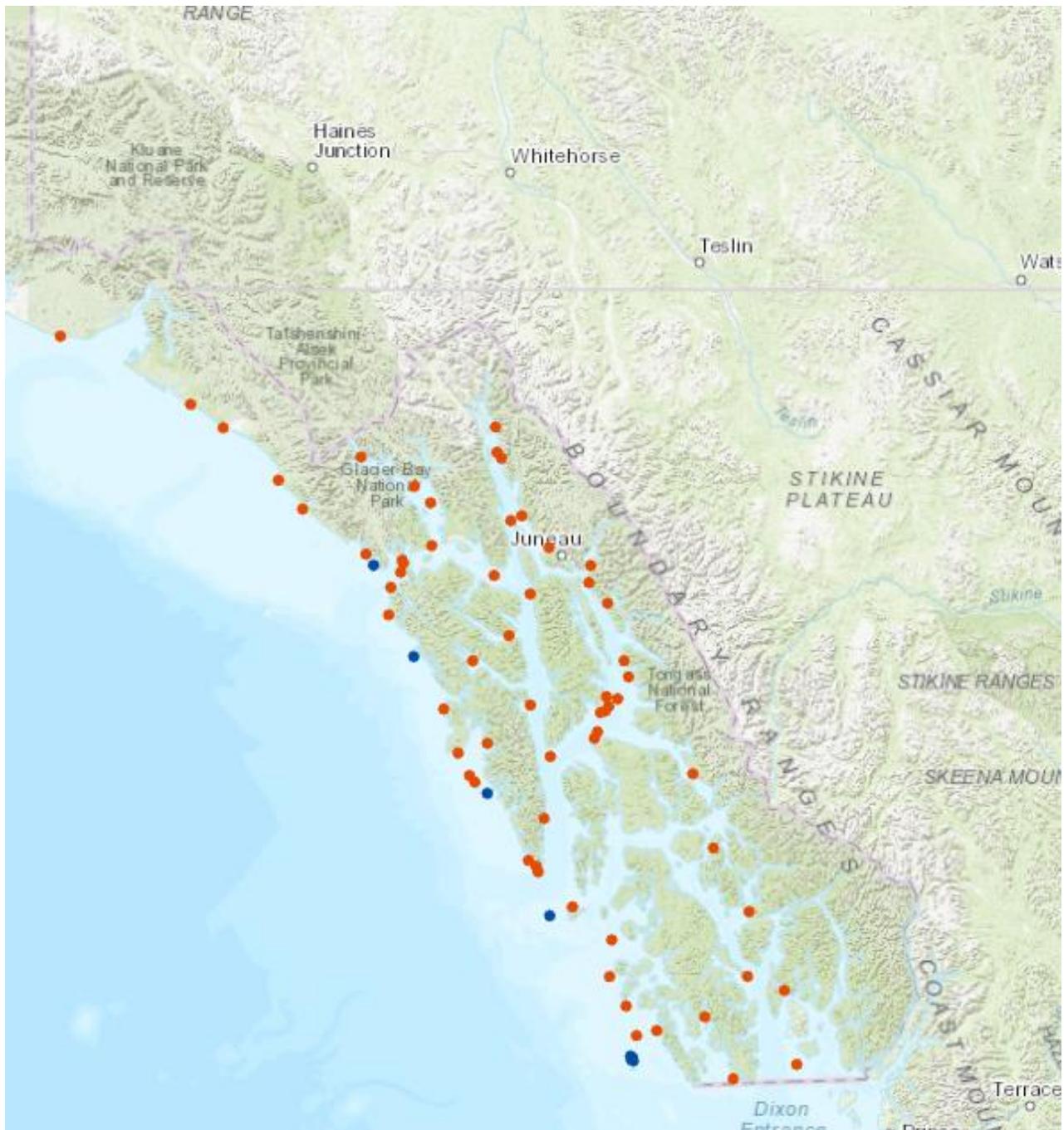


Figure 7. Southeast Alaska Action Area for Permit Nos. 22298 and 22289. Blue dots depict rookeries and orange dots depict haulouts sites that will be visited by Marine Mammal Laboratory and Alaska Department of Fish and Game researchers.

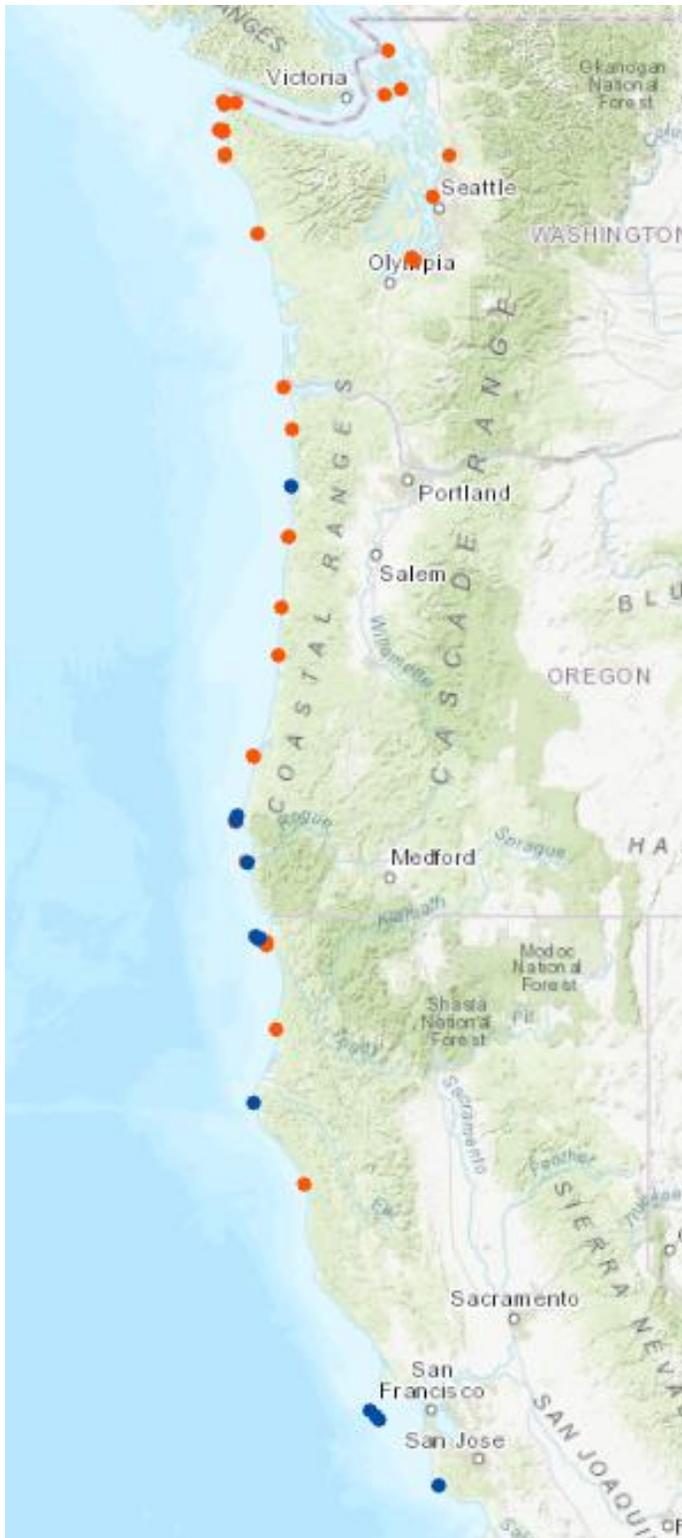


Figure 8. Washington, Oregon, and California Action Area for Permit No. 22289. Blue dots depict rookeries and orange dots depict haulouts sites that will be visited by Marine Mammal Laboratory researchers.

5 INTERRELATED AND INTERDEPENDENT ACTIONS

Interrelated actions are those that are part of a larger action and depend on that action for their justification. *Interdependent* actions are those that do not have independent utility apart from the action under consideration. For this consultation, we consider all vessel transit associated with research activities as interdependent. Thus, we evaluate the effects of vessel transit on ESA-listed species and so include all water traversed during such transits as part of the action area.

6 POTENTIAL STRESSORS

There are several potential stressors that we expect to occur during the proposed actions. These stressors are classified into two categories which include stressors that are not likely to adversely affect ESA-listed species and designated critical habitat and stressors that are likely to adversely affect ESA-listed species and designated critical habitat. These stressors are discussed below.

We have determined that the MML, ASLC, and ADF&G's import and export of materials from the Western DPS of Steller sea lions will have no effect on populations in the wild. Therefore, we will not discuss these research activities further in this opinion.

6.1 Stressors Not Likely to Adversely Affect ESA-Listed Species and Critical Habitat

If the effects of an action are determined to be wholly beneficial, insignificant, or discountable we conclude that the action is not likely to adversely affect ESA-listed species or designated critical habitat. This same decision model applies to individual stressors associated with the proposed action, such that some stressors may be determined to be not likely to adversely affect ESA-listed species or critical habitat because any effects associated with the stressors would not rise to the level of take under the ESA. As further detailed below, we find that the stressors of pollution and vessel strike are not likely to adversely affect ESA-listed species because their effects are both discountable.

6.1.1 Pollution

The potential for pollution from vessel fuel or oil leakages is extremely unlikely. An oil or fuel leak from a vessel will likely pose a significant risk to the vessel and its crew and actions to correct a leak should occur immediately to the extent possible. In the event that a leak should occur, the amount of fuel and oil onboard the research vessels is unlikely to cause widespread, high dose contamination (excluding the remote possibility of severe damage to the vessel) that will impact ESA-listed species directly or pose hazards to their food sources. Because the potential for oil or fuel leakage is extremely unlikely to occur, we find that the risk from this potential stressor is discountable. Therefore, we conclude that pollution by oil or fuel leakage is not likely to adversely affect ESA-listed marine mammals, sea turtles, or fishes during the proposed Steller sea lion research activities.

6.1.2 Vessel Strike

The potential for vessel strikes during the proposed research activities is extremely unlikely. The MML, ASLC, and ADF&G have conducted similar research activities over a number of years with previous authorization from the Permits and Conservation Division with no reports of vessel strikes. These authorizations have also received previous Section 7 consultations from the ESA Interagency and Cooperation Division (NMFS 2005; NMFS 2006; NMFS 2007a; NMFS 2009). In most instances, vessel surveys will approach sea lion haulouts slowly from up wind, allowing animals to become accustomed to their presence. Vessel surveys and research activities may occur year-round and will be conducted from vessels ranging in size from skiffs, small boats (i.e., a Boston Whaler [6.7 meters or 22 feet]) and larger research vessels. During vessel surveys, the researchers will operate vessels at slow speeds (under 18.5 kilometers per hour [10 knots]). In addition, there will be 100 percent observer coverage to look for sea lions and other marine animals during surveys. Vessel transit to survey areas and areas targeted for capturing Steller sea lions may take place at greater speeds. Vessels used for capture activities do not include larger research vessels that may be employed during vessel surveys, which reduces the potential for impacts to ESA-listed marine species associated with vessel collisions. In addition, the presence of researchers during all activities will ensure marine animals sighted along the vessel's path are avoided to minimize the potential for collision. As a result, the likelihood for vessel strike is extremely unlikely to occur and we find the risk from this potential stressor is discountable. Therefore, we conclude that vessel strike is not likely to adversely affect ESA-listed marine mammals, sea turtles, or fishes during the proposed Steller sea lion research activities.

6.2 Stressors Likely to Adversely Affect ESA-Listed Species and Critical Habitat

The potential stressors associated with the proposed activities that are likely to adversely affect ESA-listed species and critical habitat include aerial surveys, vessel surveys, vessel noise, non-invasive terrestrial research activities (i.e., remote video monitoring, photo-id, passive acoustic monitoring, close approach ground surveys, brand resight, behavioral observations, and video/acoustic recording equipment installation/maintenance), non-invasive biological sampling (i.e. scat, spew, molt, and salvage collection), non-chemical captures (hand, hoop net, other net, underwater noose, noose with pole, restraint wrap, board restraint, and squeeze cage), chemical immobilization captures (darting/injectable immobilization), sedation/anesthesia, handling and biological sampling, external instrument attachment/tagging/marking, hot branding, and lethal take. These potential stressors are described and evaluated in detail in the sections below.

7 SPECIES AND CRITICAL HABITAT NOT LIKELY TO BE ADVERSELY AFFECTED

This section identifies the ESA-listed species under NMFS jurisdiction that may occur within the action areas (as described in Table 8) that are not likely to be adversely affected by the proposed action. NMFS uses two criteria to identify the ESA-listed species or critical habitat that are not likely to be adversely affected by the proposed action, as well as the effects of activities that are interrelated or interdependent with the Federal agency's proposed action. The first criterion is

exposure, or some reasonable expectation of a co-occurrence, between one or more potential stressors associated with the proposed activities and ESA-listed species or designated critical habitat. If we conclude that an ESA-listed species or designated critical habitat is not likely to be exposed to the proposed activities, we must also conclude that the species or critical habitat is not likely to be adversely affected by those activities.

The second criterion is the probability of a response given exposure. ESA-listed species or designated critical habitat that is exposed to a potential stressor but is likely to be unaffected by the exposure is also not likely to be adversely affected by the proposed action. We applied these criteria to the ESA-listed species in Table 8 and we summarize our results below.

An action warrants a "may affect, not likely to be adversely affected" finding when its effects are wholly beneficial, insignificant or discountable. Beneficial effects have an immediate positive effect without any adverse effects to the species or habitat. Beneficial effects are usually discussed when the project has a clear link to the ESA-listed species or its specific habitat needs and consultation is required because the species may be affected.

Insignificant effects relate to the size or severity of the impact and include those effects that are undetectable, not measurable, or so minor that they cannot be meaningfully evaluated.

Insignificant is the appropriate effect conclusion when plausible effects are going to happen, but will not rise to the level of constituting an adverse effect.

Discountable effects are those that are extremely unlikely to occur. For an effect to be discountable, there must be a plausible adverse effect (i.e., a credible effect that could result from the action and that would be an adverse effect if it did impact a listed species), but it is very unlikely to occur.

In this section, we evaluate the effects of the proposed action on several ESA-listed species and designated or proposed critical habitat that may be affected, but are not likely to be adversely affected. For these ESA-listed species and critical habitat, we focus specifically on stressors that are associated with the Permits and Conservation Division's proposed issuance of Permit Nos. 22289, 22293, and 22298. These stressors are specifically those that are likely to adversely affect ESA-listed species and designated or proposed critical habitat (See Section 6 above). The effects of other stressors associated with the proposed action, which are not likely to adversely affect ESA-listed species were evaluated in Section 6 and will not be discussed here. The species potentially occurring within the action areas that may be affected, but are not likely to be adversely affected, are listed in Table 8, along with their regulatory status, designated critical habitat, and recovery plan.

Table 8. Threatened and endangered species, designated critical habitat, and proposed critical habitat potentially occurring in the action area for Permit No. 22289, 22293, and 22298 that may be affected, but not likely to be adversely affected.

Species	ESA Status	Critical Habitat	Recovery Plan
Marine Mammals – Cetaceans			
Beluga Whale (<i>Delphinapterus leucas</i>) – Cook Inlet DPS	E – 73 FR 62919	76 FR 20179	82 FR 1325
Blue Whale (<i>Balaenoptera musculus</i>)	E – 35 FR 18319	-- --	07/1998
Bowhead Whale (<i>Balaena mysticetus</i>)	E – 35 FR 18319	-- --	-- --
Fin Whale (<i>Balaenoptera physalus</i>)	E – 35 FR 18319	-- --	75 FR 47538 07/2010
Gray Whale (<i>Eschrichtius robustus</i>) – Western North Pacific Population	E – 35 FR 18319	-- --	-- --
Humpback Whale (<i>Megaptera novaeangliae</i>) – Central America DPS	E – 81 FR 62259	-- --	11/1991
Humpback Whale (<i>Megaptera novaeangliae</i>) – Western North Pacific DPS	E – 81 FR 62259	-- --	11/1991
Humpback Whale (<i>Megaptera novaeangliae</i>) – Mexico DPS	T – 81 FR 62259	-- --	11/1991
Killer Whale (<i>Orcinus orca</i>) – Southern Resident DPS	E – 70 FR 69903	71 FR 69054	73 FR 4176 01/2008
North Pacific Right Whale (<i>Eubalaena japonica</i>)	E – 73 FR 12024	73 FR 19000	78 FR 34347 06/2013
Sei Whale (<i>Balaenoptera borealis</i>)	E – 35 FR 18319	-- --	12/2011
Sperm Whale (<i>Physeter macrocephalus</i>)	E – 35 FR 18319	-- --	75 FR 81584
Marine Mammals – Pinnipeds			
Bearded Seal (<i>Erignathus barbatus</i>) – Beringia DPS	T – 77 FR 76739	-- --	-- --
Guadalupe Fur Seal (<i>Arctocephalus townsendi</i>)	T – 50 FR 51252	-- --	-- --
Ringed Seal (<i>Phoca hispida hispida</i>) – Arctic subspecies	T – 77 FR 76706 Currently vacated, but listing will be reinstated	79 FR 73010 (Proposed)	-- --
Steller Sea Lion (<i>Eumetopias jubatus</i>) – Western DPS	E – 55 FR 49204	58 FR 45269	73 FR 11872 2008

Species	ESA Status	Critical Habitat	Recovery Plan
Marine Reptiles			
Green Turtle (<i>Chelonia mydas</i>) – East Pacific DPS	T – 81 FR 20057	-- --	63 FR 28359 01/1998
Olive Ridley Turtle (<i>Lepidochelys olivacea</i>) – Non Mexico Pacific Coast Breeding Colony Areas	T – 43 FR 32800	-- --	-- --
Leatherback Turtle (<i>Dermochelys coriacea</i>)	E – 35 FR 8491	44 FR 17710 and 77 FR 4170	10/1991 – U.S. Caribbean, Atlantic, and Gulf of Mexico 63 FR 28359 05/1998 – U.S. Pacific
Loggerhead Turtle (<i>Caretta caretta</i>) – North Pacific Ocean DPS	E – 76 FR 58868	-- --	-- --
Fishes			
Steelhead Trout (<i>Oncorhynchus mykiss</i>) – California Central Valley DPS	T – 71 FR 834	70 FR 52487	79 FR 42504
Steelhead Trout (<i>Oncorhynchus mykiss</i>) – Central California Coast DPS	T – 71 FR 834	70 FR 52487	81 FR 70666
Steelhead Trout (<i>Oncorhynchus mykiss</i>) – Lower Columbia River DPS	T – 71 FR 834	70 FR 52629	78 FR 41911
Steelhead Trout (<i>Oncorhynchus mykiss</i>) – Middle Columbia River DPS	T – 71 FR 834	70 FR 52629	74 FR 50165
Steelhead Trout (<i>Oncorhynchus mykiss</i>) – Northern California DPS	T – 71 FR 834	70 FR 52487	81 FR 70666
Steelhead Trout (<i>Oncorhynchus mykiss</i>) – Puget Sound DPS	T – 72 FR 26722	81 FR 9251	-- --
Steelhead Trout (<i>Oncorhynchus mykiss</i>) – Snake River Basin DPS	T – 71 FR 834	70 FR 52629	81 FR 74770 (Draft)
Steelhead Trout (<i>Oncorhynchus mykiss</i>) – South-Central California Coast DPS	T – 71 FR 834	70 FR 52487	78 FR 77430
Steelhead Trout (<i>Oncorhynchus mykiss</i>) – Southern California DPS	E – 71 FR 834	70 FR 52487	77 FR 1669
Steelhead Trout (<i>Oncorhynchus mykiss</i>) – Upper Columbia River DPS	T – 71 FR 834	70 FR 52629	72 FR 57303
Steelhead Trout (<i>Oncorhynchus mykiss</i>) – Upper Willamette River DPS	T – 71 FR 834	70 FR 52629	76 FR 52317

Species	ESA Status	Critical Habitat	Recovery Plan
Chinook Salmon (<i>Oncorhynchus tshawytscha</i>) – California Coastal ESU	T – 70 FR 37160	70 FR 52488	81 FR 70666
Chinook Salmon (<i>Oncorhynchus tshawytscha</i>) – Central Valley Spring-Run ESU	T – 70 FR 37160	70 FR 52488	79 FR 42504
Chinook Salmon (<i>Oncorhynchus tshawytscha</i>) – Lower Columbia River ESU	T – 70 FR 37160	70 FR 52629	78 FR 41911
Chinook Salmon (<i>Oncorhynchus tshawytscha</i>) – Puget Sound ESU	T – 70 FR 37160	70 FR 52629	72 FR 2493
Chinook Salmon (<i>Oncorhynchus tshawytscha</i>) – Sacramento River Winter-Run ESU	E – 70 FR 37160	58 FR 33212	79 FR 42504
Chinook Salmon (<i>Oncorhynchus tshawytscha</i>) – Snake River Fall-Run ESU	T – 70 FR 37160	58 FR 68543	80 FR 67386 (Draft)
Chinook Salmon (<i>Oncorhynchus tshawytscha</i>) – Snake River Spring/Summer Run ESU	T – 70 FR 37160	64 FR 57399	81 FR 74770 (Draft)
Chinook Salmon (<i>Oncorhynchus tshawytscha</i>) – Upper Columbia River Spring-Run ESU	E – 70 FR 37160	70 FR 52629	72 FR 57303
Chinook Salmon (<i>Oncorhynchus tshawytscha</i>) – Upper Willamette River ESU	T – 70 FR 37160	70 FR 52629	76 FR 52317
Coho Salmon (<i>Oncorhynchus kisutch</i>) – Central California Coast ESU	E – 70 FR 37160	64 FR 24049	77 FR 54565
Coho Salmon (<i>Oncorhynchus kisutch</i>) – Lower Columbia River ESU	T – 70 FR 37160	81 FR 9251	78 FR 41911
Coho Salmon (<i>Oncorhynchus kisutch</i>) – Oregon Coast ESU	T – 73 FR 7816	73 FR 7816	81 FR 90780
Coho Salmon (<i>Oncorhynchus kisutch</i>) – Southern Oregon and Northern California Coasts ESU	T – 70 FR 37160	64 FR 24049	79 FR 58750
Chum Salmon (<i>Oncorhynchus keta</i>) – Columbia River ESU	T – 70 FR 37160	70 FR 52629	78 FR 41911
Chum Salmon (<i>Oncorhynchus keta</i>) – Hood Canal Summer-Run ESU	T – 70 FR 37160	70 FR 52629	72 FR 29121

Species	ESA Status	Critical Habitat	Recovery Plan
Sockeye Salmon (<i>Oncorhynchus nerka</i>) – Ozette Lake ESU	T – 70 FR 37160	70 FR 52630	74 FR 25706
Sockeye Salmon (<i>Oncorhynchus nerka</i>) – Snake River ESU	E – 70 FR 37160	58 FR 68543	80 FR 32365
Green Sturgeon (<i>Acipenser medirostris</i>) – Southern DPS	T – 71 FR 17757	74 FR 52300	2010 (Outline)
Eulachon (<i>Thaleichthys pacificus</i>) – Southern DPS	T – 75 FR 13012	76 FR 65323	9/2017
Bocaccio (<i>Sebastes paucispinis</i>) – Puget Sound/Georgia Basin DPS	E – 75 FR 22276 and 82 FR 7711	79 FR 68041	81 FR 54556 (Draft) 10/2017
Yelloweye Rockfish (<i>Sebastes rubberimus</i>) – Puget Sound/Georgia Basin DPS	T – 75 FR 22276 and 82 FR 7711	79 FR 68041	81 FR 54556 (Draft) 10/2017

DPS=Distinct Population Segment

E=Endangered

T=Threatened

7.1 Endangered Species Act- Listed Cetaceans

Aerial surveys, vessel noise, and vessel surveys are the only stressors of the proposed action that have the potential to affect cetaceans whose ranges spatially overlap with the action area including Cook Inlet DPS of beluga whales, blue whales, bowhead whales, fin whales, Western North Pacific population of gray whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, Southern Resident DPS of killer whales, North Pacific right whales, sei whales, and sperm whales.

Aerial Surveys: Aerial surveys using helicopters, fixed-wing aircrafts and UAS are proposed to monitor Steller sea lion distribution and population trends. Aerial surveys will take place year-round. Thus, aerial surveys will take place during periods when whales may be concentrated in their feeding grounds within the action area. Manned aircraft will fly at a minimum altitude of 149.4 meters (490 feet) or greater and UAS will fly at a minimum altitude of 45.7 meters (150 feet) or greater and will avoid flying over non-target species, such as the ESA-listed cetaceans provided in Table 8 above. Any noise or visual disturbance associated with the surveys is expected to be a short duration (the time needed to spot the whale and alter course or increase the altitude of the airplane) and at a sufficient altitude that would be mostly undetectable by any cetaceans in the area. Therefore, the effects from research area surveys on ESA-listed cetaceans is expected to be so minimal as be insignificant.

Vessel Operations: Vessel surveys and transits may occur year-round and will be conducted from vessels ranging in size from skiffs, small boats (i.e., a Boston Whaler [6.7 meters or 22 feet]) and larger research vessels. During vessel surveys, the researchers will operate vessels at

slow speeds (under 18.5 kilometers per hour [10 knots]) to minimize wake with 100 percent observer coverage. Vessel transit to survey areas and areas targeted for capturing Steller sea lions may take place at greater speeds. However, vessels used for capture activities do not include larger research vessels that may be employed during vessel surveys, which reduces the potential greater noise levels. Any noise or visual disturbance from vessel surveys and transits to cetaceans overlapping with the surveys is expected to be brief, and so small in scale as to be insignificant. Therefore, the effects on ESA-listed cetaceans associated with vessel surveys and vessel noise during the proposed in-water research activities is anticipated to be insignificant.

In summary, we conclude that the Permits and Conservation Division's issuance of Permit Nos. 22289, 22293, and 22298 may affect, but is not likely to adversely affect ESA-listed Cook Inlet DPS of beluga whales, blue whales, bowhead whales, fin whales, Western North Pacific population of gray whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, Southern Resident DPS of killer whales, North Pacific right whales, sei whales, and sperm whales during aerial surveys and vessel operations. As a result, we will not carry these species forward in this Opinion.

7.2 Endangered Species Act-Listed Pinnipeds

The proposed action spatially overlaps with ESA-listed pinniped species and DPSs including Guadalupe fur seals, Beringia DPS bearded seals, and Arctic subspecies ringed seals. The Permits and Conservation Division has not proposed the authorization of directed take for any of these ESA-listed pinnipeds or unintentional disturbance of Guadalupe fur seals under the MMPA for Permit Nos. 22289, 22293, and 22298. However, under Permit No. 22298, the ADF&G requested the authorization of incidental take (by disturbance) of ESA-listed Arctic subspecies ringed seals and Beringia DPS bearded seals during the proposed research activities. The only stressors of the proposed activities that have the potential to affect ESA-listed pinnipeds are aerial surveys, vessel surveys, vessel noise, and ground surveys. The following discusses why impacts from these stressors are not likely to adversely affect ESA-listed pinniped species.

Aerial Surveys: Aerial surveys using helicopters, fixed-wing aircrafts, and UAS are proposed to monitor Steller sea lion distribution and population trends. Aerial surveys may occur year-round and planes will fly at a minimum altitude of 149.4 meters (490 feet) or greater and UAS will fly at a minimum altitude of 45.7 meters (150 feet) or greater. Aerial surveys will only be directed at Steller sea lion haulouts and rookeries, greatly reducing the chances for it to impact species other than the target species. In addition, during the ADF&G's 2014 through 2019 Steller sea lion research activities occurring in the same action area, the ADF&G requested MMPA Level B take of ringed and bearded seals from aerial surveys, however during each of those years, no recorded MMPA Level B takes of ringed or bearded seals were made. In addition, during the proposed research activities, researchers will avoid flying over Guadalupe fur seals since no take is authorized for these species. As a result, the probability of any noise or visual disturbance associated with aerial surveys impacting non-target ESA-listed pinnipeds during the proposed Steller sea lion research activities is negligible. Therefore, the effects on Guadalupe fur seals,

Beringia DPS bearded seals, and Arctic subspecies ringed seals associated with aerial surveys conducted as part of the proposed research activities on Steller sea lions is considered discountable and will not result in take.

Vessel Operations: Vessel surveys and transits may occur year-round and will be conducted from vessels ranging in size from skiffs, small boats (i.e., a Boston Whaler [6.7 meters or 22 feet]) and larger research vessels. During vessel surveys, the researchers will operate vessels at slow speeds (under 18.5 kilometers per hour [10 knots]) to minimize wake with 100 percent observer coverage. Vessel transit to survey areas and areas targeted for capturing Steller sea lions may take place at greater speeds. However, vessels used for capture activities do not include larger research vessels that may be employed during vessel surveys, which reduces the potential greater noise levels. Any noise or visual disturbance from vessel operations to Guadalupe fur seals, Beringia DPS of bearded seals, and Arctic subspecies of ringed seals from vessel surveys is expected to be momentary and so small in scale as to be immeasurable. Therefore, the effects associated with vessel surveys and vessel noise on Guadalupe fur seals, Beringia DPS of bearded seals, and Arctic subspecies of ringed seals will be insignificant.

Unintentional disturbance from ground surveys for Steller sea lions could cause temporary behavioral disturbance to Guadalupe fur seals, Beringia DPS of bearded seals, and Arctic subspecies of ringed seals due to animals being alerted by researcher presence. However, ground surveys will not be directed at these species as they are meant to only approach and observe Steller sea lions. In addition, ground surveys are not expected to encounter Beringia DPS of bearded seals and Arctic subspecies of ringed seals since most activities will occur south of their range, but may occasionally encounter Guadalupe fur seals as they become more common on the U.S. West Coast. If an ESA-listed pinnipeds (excluding Western DPS of Steller sea lions) were encountered during ground surveys, the temporary behavioral responses would be so minor that it would not lead to behavioral harassment that could impact an individual's fitness. In addition, no requested takes for Guadalupe fur seals have been made by the MML, ASLC, and ADF&G. Therefore, we find that effects from ground surveys on Guadalupe fur seals, Beringia DPS of bearded seals, and Arctic subspecies of ringed seals will be insignificant.

In summary, we conclude that the Permits and Conservation Division's issuance of Permit Nos. 22289, 22293, and 22298 may affect, but is not likely to adversely affect Guadalupe fur seals, Beringia DPS of bearded seals, and Arctic subspecies of ringed seals through aerial surveys and vessel operations. As a result, we will not carry these species forward in this Opinion.

7.3 Endangered Species Act-Listed Sea Turtles

The proposed action spatially overlaps with several ESA-listed sea turtle species and DPSs including East Pacific DPS of green turtles, non-Mexico Pacific Coast breeding colony areas of olive ridley turtles, leatherback turtles, and North Pacific Ocean DPS of loggerhead turtles. Aerial surveys, vessel noise, and vessel surveys are the only stressors of the proposed action that have the potential to affect the ESA-listed sea turtles whose ranges spatially overlap with the action area.

Aerial Surveys: Aerial surveys using helicopters, fixed-wing aircrafts, and UAS are proposed to monitor Steller sea lion distribution and population trends. Aerial surveys will take place year-round. Planes will fly at a minimum altitude of 149.4 meters (490 feet) or greater and UAS will fly at a minimum altitude of 45.7 meters (150 feet) or greater and will avoid flying over non-target species, such as whales since no take is authorized for these species. Therefore, any noise or visual disturbance associated with the surveys would be of short duration (the time needed to spot the whale and alter course or increase the altitude of the airplane) and so small as to be immeasurable. Therefore, the effects associated with aerial surveys conducted as part of the proposed research activities on cetaceans will be insignificant and will not result in take.

Vessel Operations: Vessel surveys may occur year-round and will be conducted from vessels ranging in size from skiffs, small boats (i.e., a Boston Whaler [6.7 meters or 22 feet]) and larger research vessels. During vessel surveys, the researchers will operate vessels at slow speeds (under 18.5 kilometers per hour [10 knots]) to minimize wake with 100 percent observer coverage. Vessel transit to survey areas and areas targeted for capturing Steller sea lions may take place at greater speeds. However, vessels used for capture activities do not include larger research vessels that may be employed during vessel surveys, which reduces the potential greater noise levels. Any noise or visual disturbance from vessel operations to sea turtles associated with surveys is expected to be momentary and so small in scale as to be inconsequential and will not result in take. Therefore, the effects associated with vessel surveys and vessel noise on ESA-listed sea turtles will be insignificant.

In summary, we conclude that the Permits and Conservation Division's issuance of Permit Nos. 22289, 22293, and 22298 are not likely to adversely affect the East Pacific DPS of green turtles, leatherback turtles, North Pacific Ocean DPS of loggerhead turtles, and Non-Mexico's Pacific Coast breeding colonies areas of olive ridley turtles from aerial surveys and vessel operations. As a result, we will not carry these species forward in this Opinion.

7.4 Endangered Species Act-Listed Fishes

The proposed action spatially overlaps with several ESA-listed fishes including Pacific salmon (which includes steelhead) from all ESA-listed ESUs and DPSs, Southern DPS of eulachon, Puget Sound/Georgia Basin DPS of bocaccio, Puget Sound/Georgia Basin DPS of yelloweye rockfish, and Southern DPS of green sturgeon. The only stressors associated with the proposed research activities that have the potential to disturb ESA-listed fishes include vessel surveys and vessel noise. Even though ESA-listed fishes are likely to co-occur with proposed vessel operation activities where a few individuals could be exposed to sensory disturbances emanating from the noise of vessels and/or shadows cast by the vessel, we expect that there is only a small probability of such exposure. Nevertheless, if individual fishes were exposed to these disturbances, we would not expect their exposure to result in anything more than a minor avoidance response with no meaningful behavioral effects.

In summary, we conclude that the Permits and Conservation Division's issuance of Permit Nos. 22289, 22293, and 22298 are not likely to adversely affect ESA-listed Pacific salmon (which

includes steelhead) from all ESUs and DPSs, Southern DPS of eulachon, Puget Sound/Georgia Basin DPS of bocaccio, Puget Sound/Georgia Basin DPS of yelloweye rockfish, and Southern DPS of green sturgeon from vessel operations. As a result, we will not carry these species further in this Opinion.

7.5 Designated Critical Habitat

7.5.1 Killer Whale – Southern Resident Distinct Population Segment

In 2006, NMFS designated critical habitat for the Southern Resident DPS of killer whale (71 FR 69054). The three specific areas in Washington: (1) the Summer Core Area in Haro Strait and waters around the San Juan Islands; (2) Puget Sound; and (3) the Strait of Juan de Fuca (Figure 9), which comprise approximately 6,630 square kilometers (1,933 square nautical miles) of marine habitat. The physical and biological features essential to the conservation of Southern Resident DPS of killer whales includes: (1) water quality to support growth and development; (2) prey species of sufficient quantity, quality, and availability to support individual growth, reproduction and development, as well as overall population growth; and (3) inter-area passage conditions to allow for migration, resting, and foraging.



Figure 9. Map identifying designated critical habitat for the endangered Southern Resident distinct population segment of killer whale.

7.5.2 North Pacific Right Whale

In 2008, NMFS designated critical habitat for the North Pacific right whale, which includes an area in the Southeast Bering Sea and an area south of Kodiak Island in the Gulf of Alaska. Designated critical habitat for the North Pacific right whale is influenced by large eddies, submarine canyons, or frontal zones which enhance nutrient exchange and act to concentrate prey. North Pacific right whale designated critical habitat is adjacent to major ocean currents and characterized by relatively low circulation and water movement. The designated critical habitat supports feeding by North Pacific right whales because they contain specific physical and biological features that include: nutrients, physical oceanography processes, certain species of zooplankton (copepods), and a long photoperiod due to the high latitude (73 FR 19000).

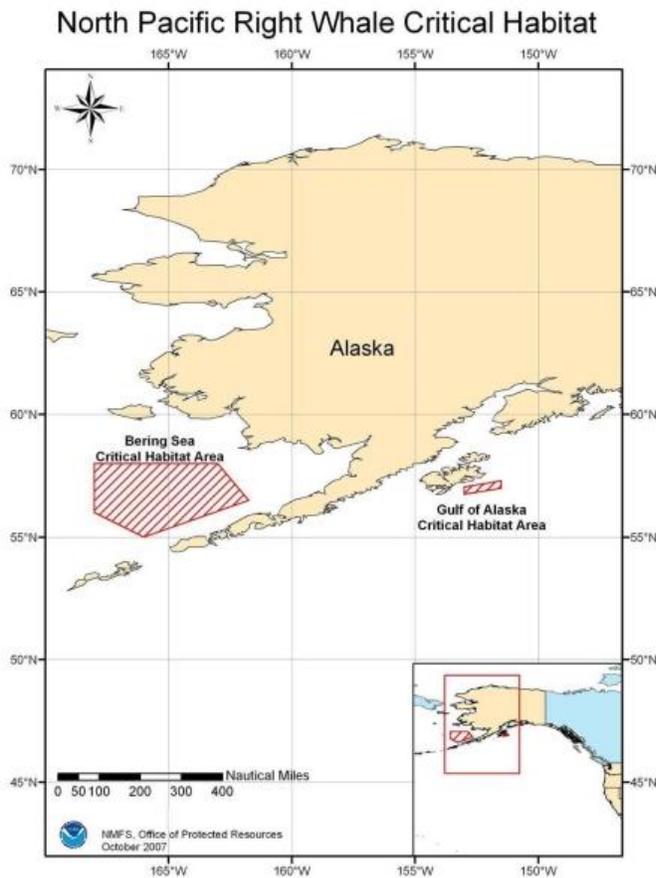


Figure 10. Map identifying designated critical habitat for the endangered North Pacific right whale in the Southeast Bering Sea and south of Kodiak Island in the Gulf of Alaska.

7.5.3 Proposed Ringed Seal – Arctic Subspecies Critical Habitat

In 2014, NMFS proposed to designate critical habitat for the Arctic subspecies of ringed seal in the northern Bering, Chukchi, and Beaufort Seas in Alaska (79 FR 73010). The physical or biological features essential to the conservation of the species are: (1) sea ice habitat suitable for the formation and maintenance of subnivean birth lairs used for sheltering pups during whelping

and nursing, which is defined as seasonal landfast (shorefast) ice, except for any bottom-fast ice extending seaward from the coastline in waters less than 2 meters (6.6 feet) deep, or dense, stable pack ice, that has undergone deformation and contains snowdrifts at least 54 centimeters (21.3 inches) deep; (2) sea ice habitat suitable as a platform for basking and molting, which is defined as sea ice of 15 percent or more concentration, except for any bottom-fast ice extending seaward from the coastline in waters less than 2 meters (6.6 feet) deep; (3) primary prey resources to support Arctic ringed seals, which are defined to be Arctic cod, saffron cod, shrimps, and amphipods.

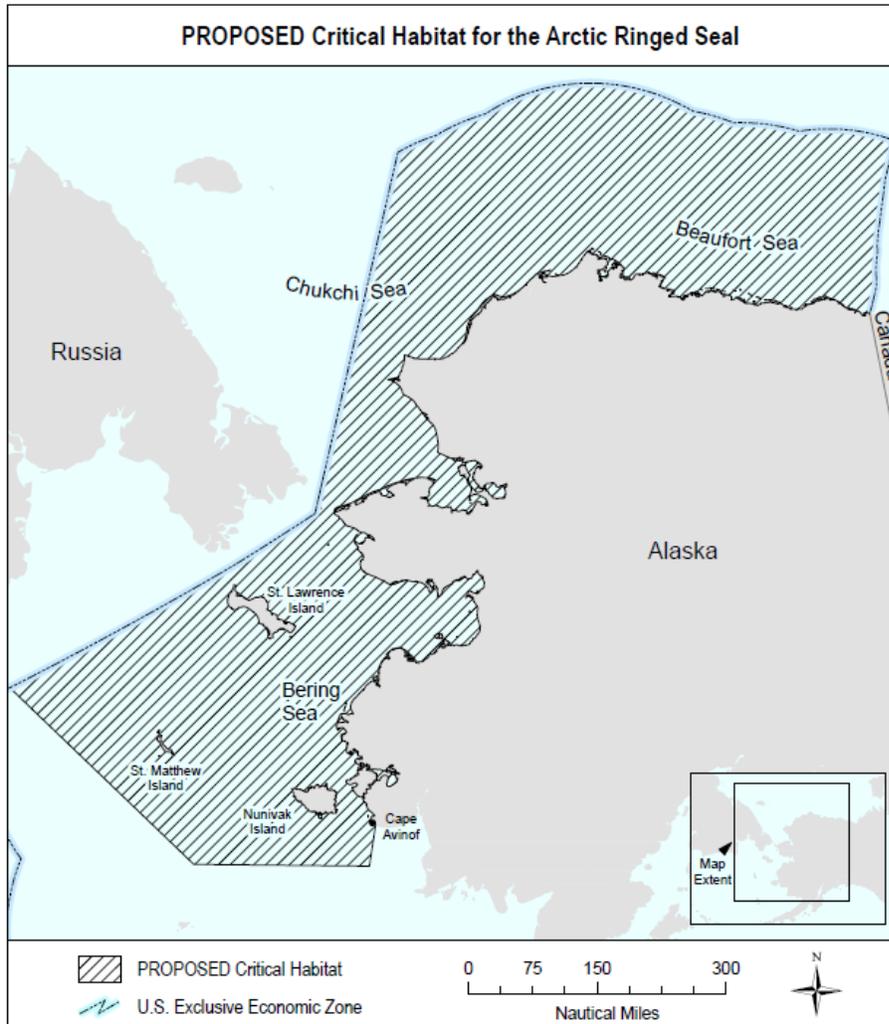


Figure 11. Map identifying proposed designated critical habitat for the threatened Arctic subspecies of ringed seal in the Bering, Chukchi, and Beaufort Seas in Alaska.

7.5.4 Steller Sea Lion – Western Distinct Population Segment Critical Habitat

In 1997, NMFS designated critical habitat for the Steller sea lion (58 FR 45269), which remains in effect for the Western DPS despite the Eastern DPS being delisted in 2013 (78 FR 66139). The designated critical habitat includes specific rookeries, haulouts, and associated areas, as well

as three marine foraging areas that are considered to be essential for health, continued survival, and recovery of the species. In Alaska, areas include major Steller sea lion rookeries, haulouts and associated terrestrial, air, and aquatic zones. The aquatic zones extend 0.9 kilometers (0.5 nautical miles) seaward from the major rookeries and haulouts east of 144° West. In addition, NMFS designated special aquatic foraging areas as critical habitat for the Steller sea lion. These areas include the Shelikoff Strait (in the Gulf of Alaska), Bogoslof Island, and Seagum Pass (the latter two are in the Aleutian Islands). These sites are located near Steller sea lion abundance centers and include important foraging areas, large concentrations of prey, and host large commercial fisheries that often interact with the species. The physical and biological features identified for the aquatic areas of Steller sea lion designated critical habitat that occur within the action area are those that support foraging, such as adequate prey resources and available foraging habitat (58 FR 45269). While Steller sea lions do rest in aquatic habitat, there was insufficient information available at the time critical habitat was designated to include aquatic resting sites as part of the critical habitat designation (58 FR 45269).

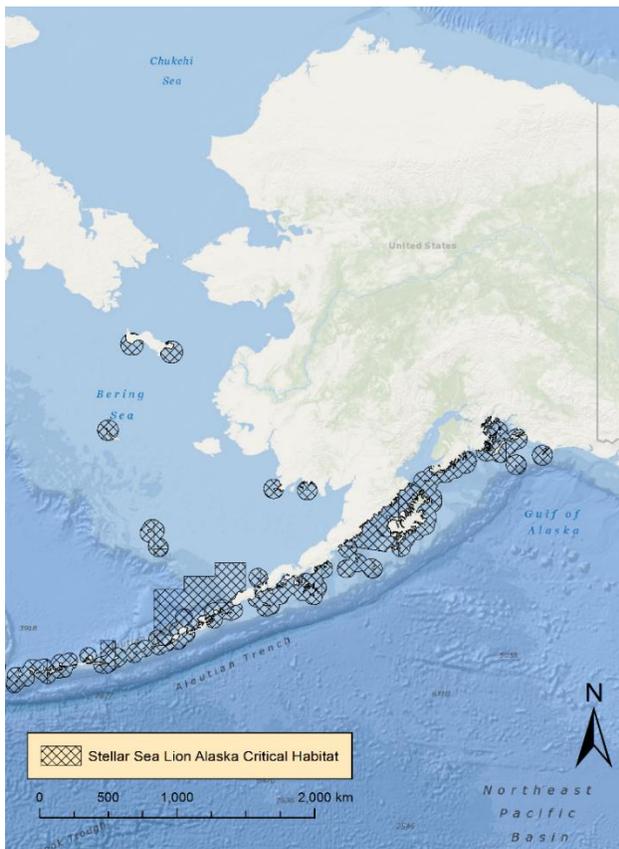


Figure 12. Map identifying designated critical habitat for the endangered Western distinct population segment of Steller sea lion in Alaska.

7.5.5 Leatherback Turtle

In 2012, NMFS revised designated critical habitat for the leatherback turtle by designating additional areas within the Pacific Ocean. This designation includes approximately 43,798

square kilometers (16,910 square miles) stretching along the California coast from Point Arena to Point Arguello east of the 3,000 meter (9,842.4 feet) depth contour; and 64,760 square kilometers (25,004 square miles) stretching from Cape Flattery, Washington to Cape Blanco, Oregon east of the 2,000 meter (6,561.7 feet) depth contour. The designated areas comprise approximately 108,558 square kilometers (41,914 square miles) of marine habitat and include waters from the ocean surface down to a maximum depth of 80 meters (262 feet). NMFS has identified one physical and biological feature for the conservation of leatherback turtles in marine waters off the U.S. West Coast that includes the occurrence of prey species, primarily scyphomedusae (i.e., jellyfish) of the order Semaestomeae (e.g., *Chrysaora*, *Aurelia*, *Phacellophora*, and *Cyanea*), of sufficient condition, distribution, diversity, abundance, and density necessary to support individuals as well as population growth, reproduction, and development of leatherback turtles (77 FR 4170).

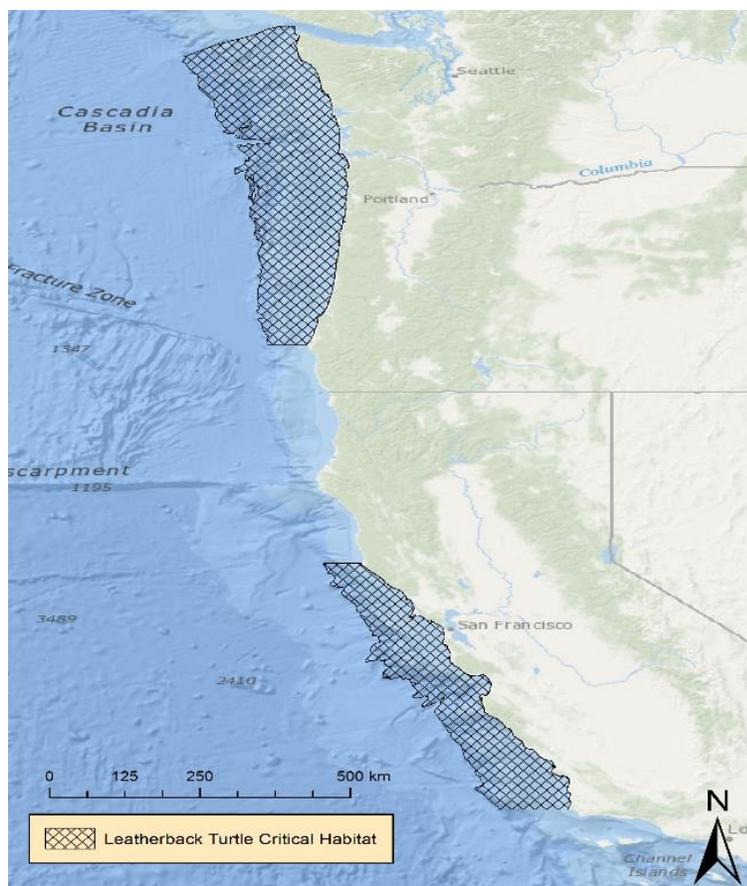


Figure 13. Map identifying designated critical habitat for the endangered leatherback turtle along the United States Pacific Coast.

7.5.6 ESA-Listed Rockfish

Critical habitat for the Puget Sound/Georgia Basin DPS for bocaccio, canary rockfish, and yelloweye rockfish was finalized in 2014 (79 FR 68041). The critical habitat designation was updated in 2017 when canary rockfish were delisted (82 FR 7711). The specific areas in the final

designation include 590.4 square miles (1529 square kilometers) of nearshore habitat for bocaccio and 414.1 square miles (1072.5 square kilometers) of deepwater habitat for yelloweye rockfish and bocaccio in Washington. Physical and biological features essential for adult bocaccio and yellow rockfish include benthic habitats and sites greater than 30 meters (98.4 feet) deep that includes sufficient prey resources, water quality, and rocks or highly rugose habitat. For juvenile bocaccio located in nearshore critical habitat, features essential for their conservation include sufficient prey resources and water quality.

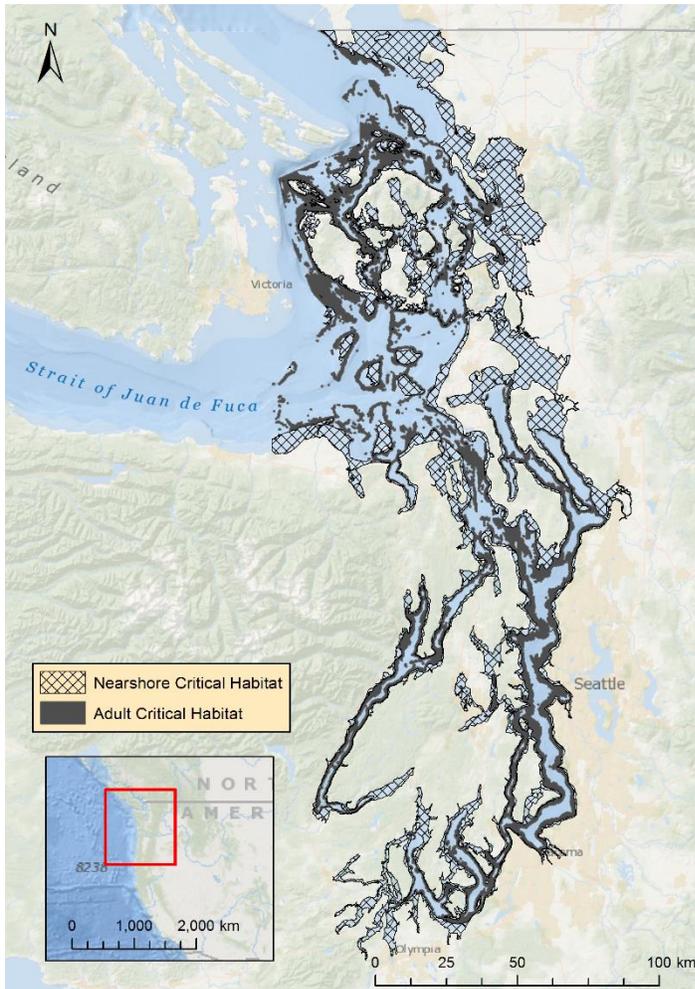


Figure 14. Map of designated critical habitat for the Puget Sound/Georgia Basin distinct population segment of bocaccio.

7.5.7 Green Sturgeon – Southern Distinct Population Segment

In 2009, NMFS designated critical habitat for the Southern DPS of green sturgeon. Specific areas include coastal U.S. marine waters within 109.7 meters (359.9 feet) depth from Monterey Bay, California (including Monterey Bay), north to Cape Flattery, Washington, including the Strait of Juan de Fuca, Washington, to its U.S. boundary; the Sacramento River, lower Feather River, and lower Yuba River in California; the Sacramento-San Joaquin Delta and Suisun, San Pablo, and San Francisco bays in California; the lower Columbia River estuary; and certain coastal bays and

estuaries in California (Humboldt Bay), Oregon (Coos Bay, Winchester Bay, Yaquina Bay, and Nehalem Bay), and Washington (Willapa Bay and Grays Harbor). NMFS designated approximately 515 kilometers (320 miles) of freshwater river habitat, 2,323 square kilometers (11,421 square miles) of marine habitat, 784 kilometers (487 miles) of habitat within the Yolo and Sutter bypasses (Sacramento River, California) as critical habitat for Southern DPS of green sturgeon. Physical and biological features essential for Southern DPS of green sturgeon include freshwater riverine systems, estuarine habitats, and nearshore coastal marine areas that provide sufficient food resources, substrate type suitable for egg deposition and development, water flow, water quality, migratory corridors, depth (greater than or equal to 5 meters [16.4 feet]), and sediment quality.

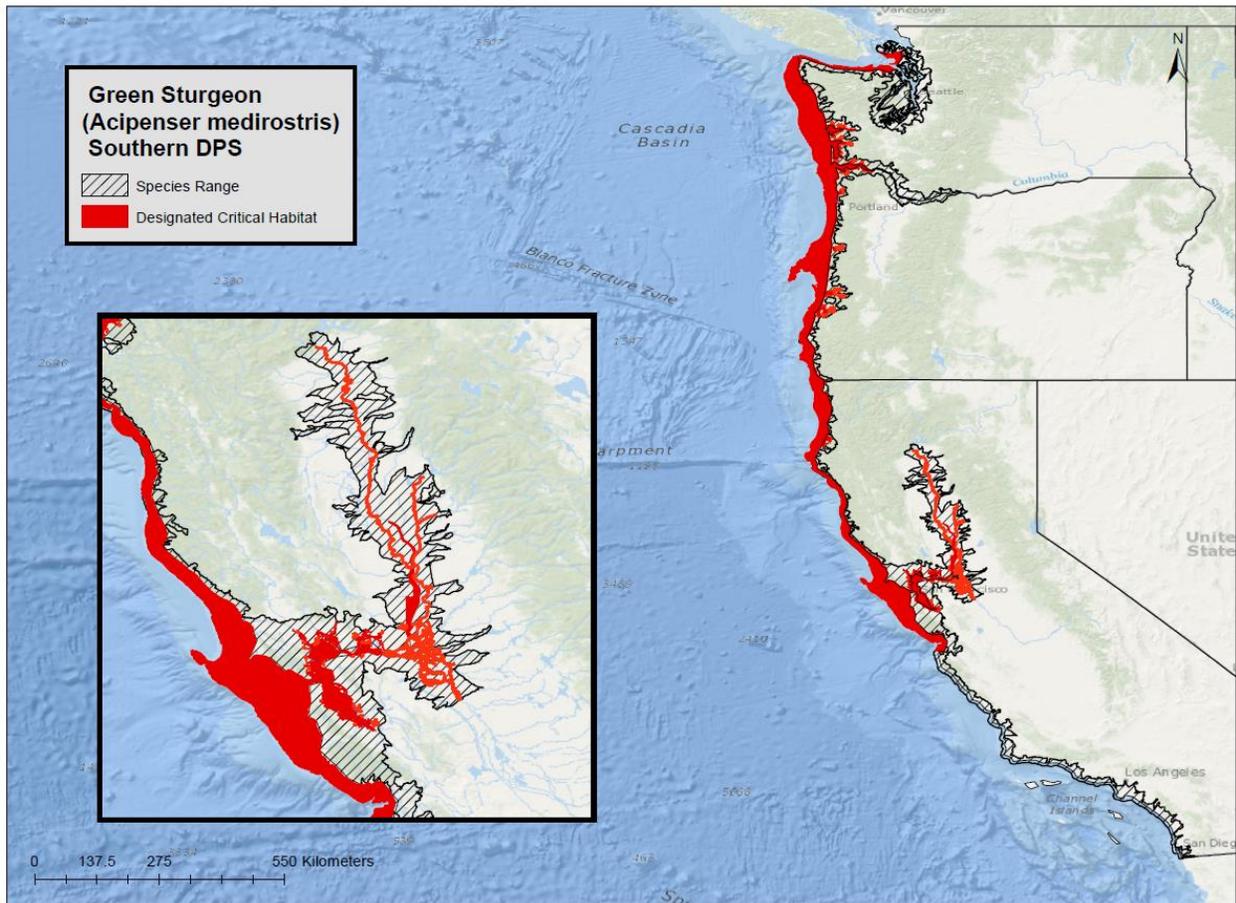


Figure 15. Map of geographic range (within the contiguous United States) and designated critical habitat for Southern distinct population segment of green sturgeon.

7.5.8 Effects to Designated Critical Habitat

7.5.8.1 Killer Whale – Southern Resident Distinct Population Segment Critical Habitat

As shown in Figure 9, the action area for Permit No. 22289 intersects with areas designated as critical habitat for Southern Resident DPS of killer whales. Although we expect that some

research activities may occur within areas designated as critical habitat for Southern Resident DPS of killer whales, the proposed activities are only focused on Steller sea lions and would not result in changes in the conservation value of any physical and biological features for killer whales. Although vessel surveys could have an impact on inter-area passage conditions for Southern Resident DPS of killer whales, vessel operations will only be temporary in nature and will solely be directed to travel to locations where Steller sea lions are located. Therefore, the effects of the proposed permits on designated Southern Resident DPS of killer whale critical habitat are considered discountable and are not likely to adversely affect the critical habitat. As a result, we will not carry this critical habitat further in this Opinion.

7.5.8.2 North Pacific Right Whale Critical Habitat

Research will not be conducted within the area designated as North Pacific right whale critical habitat, which lies outside Alaska State waters. Vessels associated with the proposed action could transit through the area as there are no predefined vessel transit routes associated with the proposed action, although this is unlikely because research activities, including vessel surveys and capture/handling/release activities, will take place only near or around Steller sea lion haulouts. The designated critical habitat is delineated by coordinates forming a polygon in the Bering Sea in an area characterized by high densities of zooplankton such as copepods and euphausiids that serve as prey species for North Pacific right whales and comprise the primary constituent elements of its designated critical habitat. The proposed research activities will not affect the abundance or distribution of the prey species in the designated critical habitat and any effects are considered insignificant. Therefore, the effects of the proposed permits on designated North Pacific right whale critical habitat are considered insignificant and are not likely to adversely affect the critical habitat. As a result, we will not carry critical habitat for this species further in this Opinion.

7.5.8.3 Proposed Ringed Seal – Arctic Subspecies Critical Habitat

As shown in Figure 11, the proposed research activities occurring in Alaska will occur within the proposed designated critical habitat for Arctic subspecies ringed seals, however the research will only be temporary and minimal. In addition, the activities only spatially overlap with a small portion of the proposed critical habitat located in the northern extent of the action area. The proposed research would not affect physical or biological features that support foraging, such as adequate prey resources and available sea ice habitat. At best, incremental and transient disturbances are anticipated from increased human presence. For the most part, we do not expect that changes in prey distribution would be measurable even for the short period of time researchers may be in the proposed critical habitat. In addition, the proposed research activities would have no impact on reducing sea ice habitat for Arctic subspecies ringed seals. Therefore, the effects of the proposed permits on the proposed critical habitat for Arctic subspecies ringed seals are considered insignificant and are not likely to adversely affect the critical habitat. As a result, we will not carry this critical habitat further for this subspecies in this Opinion.

7.5.8.4 *Steller Sea Lion Critical Habitat*

As shown in Figure 12, the proposed research activities occurring in Alaska, Oregon, and California will occur within critical habitat for Steller sea lions. As a result, research activities will overlap with Steller sea lion rookeries and haulouts. These areas will be disturbed several times and during sensitive periods. Although critical habitat areas such as rookeries and haulouts will be disturbed repeatedly, the temporary nature and duration of each activity is not expected to affect the long-term ability of these sensitive areas to support the reproduction, foraging, and survival of the species. At best, incremental and transient disturbances are anticipated from increased human presence. For the most part, we do not expect that changes in prey distribution would be measurable even for the short period of time researchers may be in the designated critical habitat. Therefore, the effects of the proposed permits on designated Steller sea lion critical habitat are considered insignificant and are not likely to adversely affect the critical habitat. As a result, we will not carry this critical habitat for this species further in this Opinion.

7.5.8.5 *Leatherback Turtle Critical Habitat*

As shown in Figure 13, the action area for Permit No. 22289 intersects with areas designated as critical habitat for leatherback sea turtle in Washington, Oregon, and California. Although we expect that some research activities may occur within areas designated as critical habitat for leatherback turtles, the proposed activities are only focused on Steller sea lions and would not result in changes in the conservation value or reduction to prey species such as jellyfish (the only physical and biological feature for leatherback sea turtle critical habitat). Therefore, the effects of the proposed permits on designated leatherback turtle critical habitat are considered insignificant and are not likely to adversely affect the critical. As a result, we will not carry this critical habitat for this species further in this Opinion.

7.5.8.6 *ESA-Listed Rockfish Critical Habitat*

As shown in Figure 14, the action area for Permit No. 22289 intersects with areas designated as critical habitat for Puget Sound/Georgia Basin DPS of bocaccio and yelloweye rockfish. Although we expect that some research activities may occur within areas designated as critical habitat for Puget Sound/Georgia Basin DPS of bocaccio and yelloweye rockfish, the proposed activities are only focused on Steller sea lions and would not result in changes in the conservation value or physical and biological features for Puget Sound/Georgia Basin DPS of bocaccio and yelloweye rockfish designated critical habitat. Therefore, the effects of the proposed permits on designated ESA-listed rockfish critical habitat are considered insignificant and are not likely to adversely affect the critical habitat. As a result, we will not carry this critical habitat further in this Opinion.

7.5.8.7 *Green Sturgeon – Southern Distinct Population Segment Critical Habitat*

As shown in Figure 15, the action area for Permit No. 22289 intersects with areas designated as critical habitat for green sturgeon. Although we expect that some research activities may occur within areas designated as critical habitat for Southern DPS of green sturgeon, the proposed

activities are only focused on Steller sea lions and would not result in changes in the conservation value or physical and biological features for Southern DPS of green sturgeon. Therefore, the effects of the proposed permits on designated Southern DPS of green sturgeon critical habitat are considered insignificant and are not likely to adversely affect the critical habitat. As a result, we will not carry this critical habitat further in this Opinion.

8 SPECIES LIKELY TO BE ADVERSELY AFFECTED

This section identifies and examines the status of the Western DPS of Steller sea lions that would be adversely affected by the proposed action. The status includes the existing level of risk that the ESA-listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. The species status section helps to inform the description of the species’ current “reproduction, numbers, or distribution,” which is part of the jeopardy determination as described in 50 C.F.R. §402.02. More detailed information on the status and trends of the Western DPS of Steller sea lion, and its biology and ecology can be found in the listing regulations and critical habitat designations published in the *Federal Register*, status reviews, recovery plans, and on this NMFS website:

<https://www.fisheries.noaa.gov/topic/endangered-species-conservation>

Table 9. Endangered Species Act-listed threatened and endangered species that are likely to be adversely affected by the National Marine Fisheries Service’s Permits and Conservation Division’s proposed action of issuance of Permit Nos. 22289, 22293, and 22298.

Species	ESA Status	Critical Habitat	Recovery Plan
Marine Mammals – Pinnipeds			
Steller Sea Lion (<i>Eumetopias jubatus</i>) – Western DPS	E – 55 FR 49204	58 FR 45269	73 FR 11872 2008

DPS=Distinct Population Segment
 E=Endangered
 T=Threatened

9 STATUS OF SPECIES LIKELY TO BE ADVERSELY AFFECTED

This section identifies and examines the status of each species that would be adversely affected by the proposed action. The status includes the existing level of risk that the ESA-listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. The species status section helps to inform the description of the species’ current “reproduction, numbers, or distribution,” which is part of the jeopardy determination as described in 50 C.F.R. §402.02. More detailed information on the status and trends of these ESA-listed species, and their biology and ecology can be found in the listing regulations and critical habitat designations published in the *Federal Register*, status reviews, recovery plans,

and on this NMFS websites: [https://www.fisheries.noaa.gov/topic/endangered-species-conservation, among others.](https://www.fisheries.noaa.gov/topic/endangered-species-conservation_among_others)

9.1 Steller Sea Lion – Western Distinct Population Segment

The Steller sea lion ranges from Japan, through the Okhotsk and Bering Seas, to central California. It consists of two morphologically, ecologically, and behaviorally separate DPSs: the Eastern, which includes sea lions in Southeast Alaska, British Columbia, Washington, Oregon, and California; and the Western, which includes sea lions in all other regions of Alaska, as well as Russia and Japan (Figure 16).

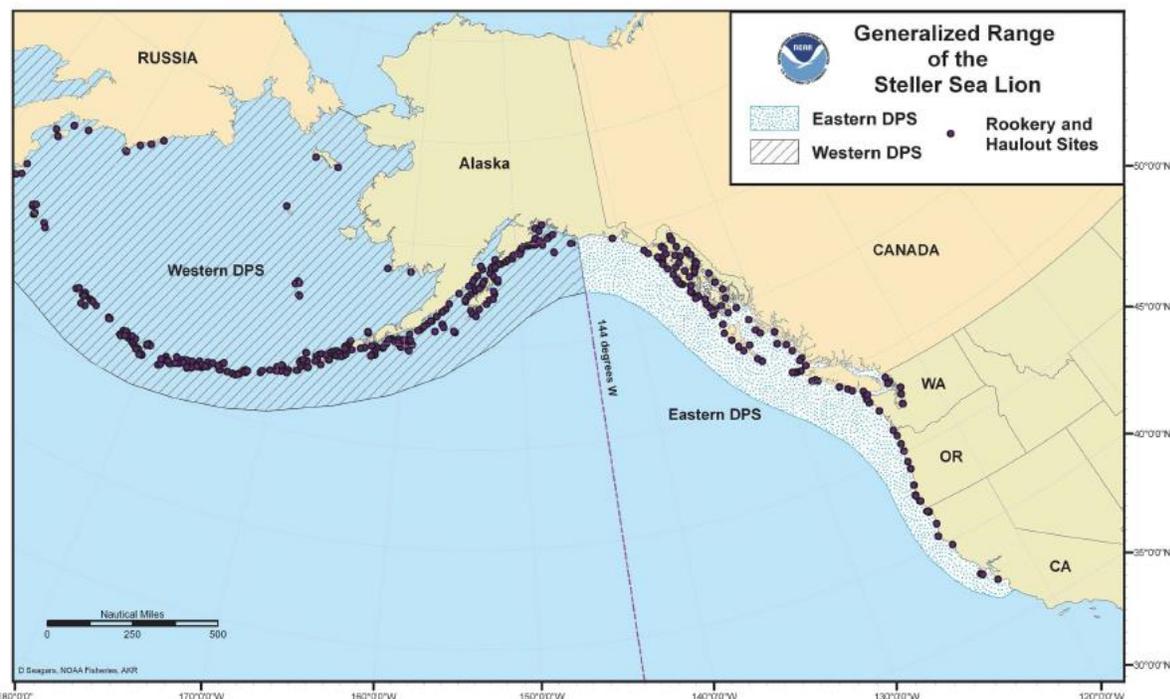


Figure 16. Map identifying the range of the endangered Western distinct population segment of Steller sea lion.

At the time of their initial ESA-listing, Steller sea lions were considered a single population listed as threatened. On May 5, 1997, following a status review, NMFS established two DPSs of Steller sea lions, and issued a final determination to list the Western DPS as endangered under the ESA. The Eastern DPS was delisted on November 4, 2013, and the Western DPS retained its endangered status (78 FR 66139).

We used information available in the final ESA-listing, the revised Recovery Plan (NMFS 2008), and the most recent stock assessment report (Muto et al. 2018) to summarize the status of the Western DPS of Steller sea lions, as follows.

Life History

Within the Western DPS of Steller sea lions, pupping and breeding occurs at numerous major rookeries from late May to early July. Male Steller sea lions become sexually mature at three to seven years of age. They are polygynous, competing for territories and females by age ten or eleven. Female Steller sea lions become sexually mature at three to six years of age and reproduce into their early 20's. Most females breed annually, giving birth to a single pup. Pups are usually weaned in one to two years. Females and their pups disperse from rookeries by August to October. Juveniles and adults disperse widely, especially males. Their large aquatic ranges are used for foraging, resting, and traveling. Steller sea lions forage on a wide variety of demersal, semi-demersal, and pelagic prey, including fishes and cephalopods. Some prey species form large seasonal aggregations, including endangered salmon and eulachon species. Others are available year round.

Population Dynamics

The following is a discussion of the species' population and its variance over time. This section includes abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the Western DPS of the Steller sea lion.

As of 2017, the best estimate of abundance of the Western DPS of Steller sea lion in Alaska was 11,952 pups and 42,315 for non-pups (total $N_{\min} = 54,267$) (Muto et al. 2018). This represents a large decline since counts in the 1950s ($N=140,000$) and 1970s ($N=110,000$).

Using data collected from 1978 through 2017, there is strong evidence that pup and non-pup counts of western stock Steller sea lions in Alaska were at their lowest levels in 2002 and 2003, respectively, and have increased at 1.78 percent and 2.14 percent, respectively, between 2002 and 2017 (Sweeney et al. 2017). Western DPS of Steller sea lion site counts decreased 40 percent from 1991 through 2000, an average annual decline of 5.4 percent; however, counts increased three percent between 2004 through 2008, the first recorded population increase since the 1970s (NMFS 2008). Overall, there are strong regional differences across the range in Alaska, with positive trends in the Gulf of Alaska and eastern Bering Sea east of Samalga Pass (approximately 170 degrees West) and generally negative trends to the west in the Aleutian Islands. Non-pup trends in 2002 through 2017 in Alaska have a longitudinal gradient with highest rates of increase generally in the east (eastern Gulf of Alaska) and steadily decreasing rates to the west.

Based on the results of genetic studies, the Steller sea lion population was reclassified into two DPSs: Western and Eastern. The data which came out of these studies indicated that the two populations had been separate since the last ice age (Bickham et al. 1998). Further examination of the Steller sea lions from the Gulf of Alaska (i.e., the Western DPS) revealed a high level of haplotype diversity, indicating that genetic diversity had been retained despite the decline in abundance (Bickham et al. 1998). There is an exchange of sea lions across the stock boundary, especially due to the wide-ranging seasonal movements of juveniles and adult males (Jemison et al. 2013). During the breeding season, sea lions, especially adult females, typically return to their

natal rookery, or a nearby breeding rookery to breed and pup (Hastings et al. 2017). However, mixing of mostly breeding females from Prince William Sound to Southeast Alaska began in the 1990s and two new, mixed-stock rookeries were established (O'corry-Crowe et al. 2011; Jemison et al. 2013).

Steller sea lions are distributed mainly around the coasts to the outer continental shelf along the North Pacific Ocean rim from northern Hokkaido, Japan through the Kuril Islands and Okhotsk Sea, Aleutian Islands and central Bering Sea, southern coast of Alaska and south to California (Figure 16). The Western DPS includes Steller sea lions that reside in the central and western Gulf of Alaska, Aleutian Islands, as well as those that inhabit the coastal waters and breed in Asia (e.g., Japan and Russia).

Vocalization and Hearing

In underwater environments, Steller sea lions hear within the range of 0.5 to 32 kiloHertz for males and from 4 to 32 kiloHertz for females (Kastelein et al. 2005). Males and females apparently have different underwater hearing sensitivities, with males hearing best at 1 to 16 kiloHertz (best sensitivity at the low end of the range) and females having a maximum sensitivity at 25 kiloHertz (best hearing at the upper end of the range) (Kastelein et al. 2005).

Status

The species was ESA-listed as threatened in 1990 because of significant declines in population sizes for unknown reasons that are not explained by the documented level of direct human-caused mortality and serious injury. At the time, the major threat to the species was thought to be reduction in prey availability. To protect and recover the species, NMFS established the following measures: prohibition of shooting at or near Steller sea lions; prohibition of vessel approach to within 5.6 kilometers (3 nautical miles) of specific rookeries, within 0.8 kilometers (0.4 nautical miles) of land, and within sight of other listed rookeries; and restriction of incidental fisheries take to 675 Steller sea lions annually in Alaskan waters.

The minimum mean annual U.S. commercial fishery-related mortality and serious injury rate (40 sea lions) is more than ten percent of the potential biological removal (ten percent of potential biological removal equals 33) and, therefore, not be considered insignificant and approaching a zero mortality and serious injury rate. Based on available data, the total estimated annual level of human-caused mortality and serious injury (252 Steller sea lions) is below the potential biological removal level (326) for this stock (Muto et al. 2018).

There are key uncertainties in the assessment of the Western U.S. stock of Steller sea lions. Some genetic studies support the separation of Steller sea lions in western Alaska from those in Russia; population numbers in this assessment are only from the U.S. to be consistent with the geographic range of information on mortality and serious injury. There is some overlap in range between animals in the western and eastern stocks in northern Southeast Alaska. The population abundance is based on counts of visible animals; the calculated NMIC and potential biological removal levels are conservative because there are no data available to correct for animals not

visible during the visual surveys. There are multiple nearshore commercial fisheries which are not observed; thus, there is likely to be unreported fishery-related mortality and serious injury of Steller sea lions. Estimates of human-caused mortality and serious injury from stranding data are underestimates because not all animals strand nor are all stranded animals found, reported, or have the cause of death determined. Several factors may have been important drivers of the decline of the stock. However, there is uncertainty about threats currently impeding their recovery, particularly in the Aleutian Islands (Muto et al. 2018).

Recovery Goals

See the 2008 Revised Recovery Plan for the Steller sea lion for complete downlisting/delisting criteria for each of the following recovery goals.

1. Baseline population monitoring.
2. Insure adequate habitat and range for recovery.
3. Protect from over-utilization for commercial, recreational, scientific, or educational purposes.
4. Protect from diseases, contaminants, and predation.
5. Protect from other natural or anthropogenic actions and administer the recovery program.

10 ENVIRONMENTAL BASELINE

The “environmental baseline” includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 C.F.R. §402.02).

A number of human activities have contributed to the status of populations of ESA-listed pinnipeds in the action area. Some human activities are ongoing and appear to continue to affect pinniped populations in the action areas for this consultation. Some of these activities, most notably hunting, occurred extensively in the past and continue at low levels that no longer appear to significantly affect pinniped populations, although the effects of past reductions in numbers persist today. The following discussion summarizes these impacts, which include climate change, oceanic temperature regimes, subsistence harvest/native harvest, illegal shooting, vessel strikes, fisheries (fisheries interactions and aquaculture), pollution (marine debris, pesticides and contaminants, and hydrocarbons), aquatic nuisance species, predation, sound (vessel sound and commercial shipping, aircraft, seismic surveys, and marine construction), military activities, and scientific research activities.

10.1 Climate Change

There is a large and growing body of literature on past, present, and future impacts of global climate change, exacerbated and accelerated by human activities. Effects of climate change include sea level rise, increased frequency and magnitude of severe weather events, changes in

air and water temperatures, and changes in precipitation patterns, all of which are likely to impact ESA resources. NOAA's climate information portal provides basic background information on these and other measured or anticipated climate change effects (see <https://www.climate.gov>).

In order to evaluate the implications of different climate outcomes and associated impacts throughout the 21st century, many factors have to be considered. The amount of future greenhouse gas emissions is a key variable. Developments in technology, changes in energy generation and land use, global and regional economic circumstances, and population growth must also be considered.

A set of four scenarios was developed by the Intergovernmental Panel on Climate Change (IPCC) to ensure that starting conditions, historical data, and projections are employed consistently across the various branches of climate science. The scenarios are referred to as representative concentration pathways (RCPs), which capture a range of potential greenhouse gas emissions pathways and associated atmospheric concentration levels through 2100 (IPCC 2014). The RCP scenarios drive climate model projections for temperature, precipitation, sea level, and other variables: RCP2.6 is a stringent mitigation scenario; RCP2.5 and RCP6.0 are intermediate scenarios; and RCP8.5 is a scenario with no mitigation or reduction in the use of fossil fuels. The IPCC future global climate predictions (2014 and 2018) and national and regional climate predictions included in the Fourth National Climate Assessment for U.S. states and territories (2018) use the RCP scenarios.

The increase of global mean surface temperature change by 2100 is projected to be 0.3 to 1.7 degrees Celsius under RCP2.6, 1.1 to 2.6 degrees Celsius under RCP 4.5, 1.4 to 3.1 degrees Celsius under RCP6.0, and 2.6 to 4.8 degrees Celsius under RCP8.5 with the Arctic region warming more rapidly than the global mean under all scenarios (IPCC 2014). The Paris Agreement aims to limit the future rise in global average temperature to 2 degrees Celsius, but the observed acceleration in carbon emissions over the last 15 to 20 years, even with a lower trend in 2016, has been consistent with higher future scenarios such as RCP8.5 (Hayhoe, Doherty et al. 2018).

The globally-averaged combined land and ocean surface temperature data, as calculated by a linear trend, show a warming of approximately 1.0 degrees Celsius from 1901 through 2016 (Hayhoe, Doherty et al. 2018). The IPCC Special Report on the Impacts of Global Warming (2018) (IPCC 2018) noted that human-induced warming reached temperatures between 0.8 and 1.2 degrees Celsius above pre-industrial levels in 2017, likely increasing between 0.1 and 0.3 degrees Celsius per decade. Warming greater than the global average has already been experienced in many regions and seasons, with most land regions experiencing greater warming than over the ocean (Allen, de Coninck et al. 2018). Annual average temperatures have increased by 1.8 degrees Celsius across the contiguous U.S. since the beginning of the 20th century with Alaska warming faster than any other state and twice as fast as the global average since the mid-20th century (Jay, Reidmiller et al. 2018). Global warming has led to more frequent heatwaves in

most land regions and an increase in the frequency and duration of marine heatwaves (Allen, de Coninck et al. 2018). Average global warming up to 1.5 degrees Celsius as compared to pre-industrial levels is expected to lead to regional changes in extreme temperatures, and increases in the frequency and intensity of precipitation and drought (Allen, de Coninck et al. 2018).

Climate change has the potential to impact species abundance, geographic distribution, migration patterns, and susceptibility to disease and contaminants, as well as the timing of seasonal activities and community composition and structure [(MacLeod et al. 2005); (Robinson et al. 2005); (Kintisch 2006); (Learmonth et al. 2006); (McMahon and Hays 2006); (Evans and Bjørge 2013); (IPCC 2014)]. For example, changes in the marine ecosystem caused by global climate change (e.g., ocean acidification, salinity, oceanic currents, dissolved oxygen levels, nutrient distribution) could influence the distribution and abundance of lower trophic levels (e.g., phytoplankton, zooplankton, submerged aquatic vegetation, crustaceans, mollusks, forage fish), ultimately affecting primary foraging areas of ESA-listed species including marine mammals, sea turtles, and fishes. In addition, marine species ranges are expected to shift as they align their distributions to match their physiological tolerances under changing environmental conditions (Doney et al. 2012). Hazen et al. (2012) examined top predator distribution and diversity in the Pacific Ocean in light of rising sea surface temperatures using a database of electronic tags and output from a global climate model. They predicted up to a 35 percent change in core habitat area for some key marine predators in the Pacific Ocean, with some species predicted to experience gains in available core habitat and some predicted to experience losses. The effects of these changes to the marine ecosystems of the Bering Sea, Aleutian Islands, and the Gulf of Alaska, and how they may affect Steller sea lions are uncertain. Warmer waters could favor productivity of some species of forage fishes, but the impact on recruitment of important prey fish of Steller sea lions is unpredictable. Recruitment of large year-classes of gadids (e.g., pollock) and herring has occurred more often in warm than cool years, but the distribution and recruitment of other fish (e.g., osmerids) could be negatively affected (NMFS 2008).

As temperatures in the Arctic and subarctic waters are warming and sea ice is diminishing, there is an increased potential for harmful algal blooms that produce toxins to affect marine life (see Figure 17). Biotoxins like domoic acid and saxitoxin may pose a risk to marine mammals in Alaska. In addition, increased temperatures can increase *Brucella* infections. 905 marine mammals from 13 species were sampled including; humpback whales, bowhead whales, beluga whales, harbor porpoises, northern fur seals, Steller sea lions, harbor seals, ringed seals, bearded seals, spotted seals, ribbon seals, Pacific walruses, and northern sea otters. Domoic acid was detected in all 13 species examined and had 38 percent prevalence in humpback whales, and 27 percent in Steller sea lions. Additionally, fetuses from a beluga whale, a harbor porpoise and a Steller sea lion contained detectable concentrations of domoic acid documenting maternal toxin transfer in these species. Saxitoxin was detected in ten of the 13 species, with the highest prevalence in humpback whales (50 percent) and ten percent prevalence in Steller sea lions (Lefebvre et al. 2016).



Figure 17. Algal toxins detected in 13 species of marine mammals from southeast Alaska to the Arctic from 2004 through 2013 (Lefebvre et al. 2016).

This review provides some examples of impacts to ESA-listed species and their habitats that may occur as the result of climate change. While it is difficult to accurately predict the consequences of climate change to a particular species or habitat, a range of consequences are expected that are likely to change the status of the species and the condition of their habitats. The indirect effects of climate change on Western DPS of Steller sea lions would likely include changes in the distribution of temperatures suitable for many stages of their life history, the distribution and abundance of prey, and the distribution and abundance of competitors or predators.

10.2 Oceanic Temperature Regimes

Oceanographic conditions in the Pacific Ocean can be altered due to periodic shifts in atmospheric patterns caused by the Southern oscillation in the Pacific Ocean, which leads to El Niño and La Niña events and the Pacific decadal oscillation. These climatic events can alter habitat conditions and prey distribution for ESA-listed species in the action area (Beamish 1993; Mantua et al. 1997; Hare and Mantua 2001) (Benson and Trites 2002; Stabeno et al. 2004; Mundy 2005; Mundy and Cooney 2005).

The Pacific decadal oscillation is the leading mode of variability in the North Pacific and operates over longer periods than either El Niño or La Niña/Southern Oscillation events and is capable of altering sea surface temperature, surface winds, and sea level pressure (Mantua and Hare 2002; Stabeno et al. 2004). During positive Pacific decadal oscillations, the northeastern

Pacific experiences above average sea surface temperatures while the central and western Pacific Ocean undergoes below-normal sea surface temperatures (Royer 2005). Warm Pacific decadal oscillation regimes, as occurs in El Niño events, tends to decrease productivity along the U.S. west coast, as upwelling typically diminishes (Hare et al. 1999; Childers et al. 2005). Recent sampling of oceanographic conditions just south of Seward, Alaska has revealed anomalously cold conditions in the Gulf of Alaska from 2006 through 2009, suggesting a shift to a colder Pacific decadal oscillation phase. More research needs to be done to determine if the region is indeed shifting to a colder Pacific decadal oscillation phase in addition to what effects these phase shifts have on the dynamics of prey populations important to ESA-listed pinnipeds throughout the Pacific action area. A shift to a colder decadal oscillation phase would be expected to impact prey populations, although the magnitude of this effect is uncertain.

Oceanic temperature changes is claimed to be a significant cause of major declines of Steller sea lion (*Eumetopias jubatus*) populations in the Aleutian Islands and Gulf of Alaska due to the 1976 through 1977 climate regime shift (Trites et al. 2007). Trites et al. (2007) states that changes in ocean climate are theorized to have affected the amount, quality, and availability of prey, which in turn may have impacted the rates of birth and death of sea lions. Trites et al. (2007) claims that recent studies of the spatial and temporal variations in the ocean climate system of the North Pacific support this hypothesis. Ocean climate changes appear to have created adaptive opportunities for various species that are preyed upon by Steller sea lions at mid-trophic levels. The east–west asymmetry of the oceanic response to climate forcing after 1976 through 1977 is consistent with both the temporal aspect (populations decreased after the late 1970s) and the spatial aspect of the decline (western, but not eastern, sea lion populations decreased). These broad-scale climate deviations appear to be controlled by regionally multifaceted biogeographic arrangements along the Aleutian Islands and Gulf of Alaska, which include a transition point from coastal to open-ocean conditions at Samalga Pass westward along the Aleutian Islands. These conversion points identify unique collections of diverse combinations of prey species, which are in turn correlated with differential population sizes and trajectories of Steller sea lions. In addition, Trites et al. (2007) claims that archaeological records spanning 4,000 years indicate that sea lion populations have experienced major shifts in abundance in the past. Shifts in ocean climate are the most closely fundamental explanation for the broad suite of ecosystem changes that have been observed in the North Pacific Ocean in recent decades (Trites et al. 2007).

10.3 Subsistence Harvest/Native Harvest

Sea lions have been hunted by humans for centuries for their fur, meat, and oil. While hunting was previously the primary cause of population decline among ESA-listed pinnipeds, it no longer represents a major threat. Limited subsistence hunting of Steller sea lions is permitted. Steller sea lions are included in the action area in Alaska subsistence harvests. Since subsistence harvest surveys began in 1992, the number of households hunting and harvesting Steller sea lions has remained relatively constant at low levels (Wolfe et al. 2013).

The Steller Sea Lion Recovery Plan (NMFS 2008) ranked subsistence harvest as a low threat to the recovery of the Western DPS. The most recent subsistence harvest data were collected by the ADF&G through 2008 and by the Ecosystem Conservation Office of the Aleut Community of St. Paul through 2009. The mean annual subsistence take from this stock for all areas except Saint Paul in 2004 through 2008 (172) combined with the mean annual take for Saint Paul in 2010 through 2014 (30) is 202 Western DPS of Steller sea lions (Muto et al. 2018).

10.4 Illegal Shooting

The Steller Sea Lion Recovery Plan (NMFS 2008) ranked illegal shooting as a low threat to the recovery of the Western DPS. Illegal shooting of sea lions was thought to be a potentially significant source of mortality prior to the listing of sea lions as threatened under the ESA in 1990. There have been no cases of illegal shooting successfully prosecuted since 1998 (NMFS, Alaska Enforcement Division), although the NMFS Alaska Stranding Program documents 60 Steller sea lions with suspected or confirmed firearm injuries from 2000 through 2016 in Southeast Alaska. On June 1, 2015, the NMFS AKR Stranding Response Program received reports of at least five dead Steller sea lions on the Copper River Delta. Two NMFS biologists recorded at least 18 pinniped carcasses, most of which were Steller sea lions, on June 2, 2015. A majority of the carcasses had evidence that they had been intentionally killed by humans. Subsequent surveys resulted in locating two additional Steller sea lions, some showing evidence suggestive that they had been intentionally killed. Therefore, NMFS Alaska Region designed a 2016 survey plan for the Copper River Delta focused on the time period of greatest overlap between the salmon driftnet fishery and marine mammals. The purpose of the surveys was to determine if the intentional killing observed in 2015 continued, and to collect cause of death evidence and samples for health assessments. Within the Western Alaska portion of the action area intentional killing by humans appears to be continuing and was the leading cause of death of the pinnipeds NMFS assessed on the Copper River Delta from May 10 through August 9, 2016. Without continuous monitoring in past years, it is impossible to know if the lack of reported carcasses in the decade prior to 2015 accurately reflects past intentional killings by humans. Numbers of marine mammals found dead with evidence of human interaction dropped between 2015 and 2017, but intentional illegal killing is still occurring (Wright 2018).

10.5 Vessel Disturbance/Strikes

Vessel traffic, in the form of sea lion research, tourism, and other marine vessel traffic, may disrupt sea lion feeding, breeding, or aspects of sea lion behavior. The Steller Sea Lion Recovery Plan (NMFS 2008) ranked disturbance from these sources as a low threat to the recovery of the Western DPS of Steller sea lions. Disturbance from these sources is not likely affecting population dynamics in the Western DPS of Steller sea lions within the action area.

In regards to vessel strike there are records of this, NMFS' Alaska Region Stranding Program has records of three occurrences of Steller sea lions being struck by vessels in Southeast Alaska; all were near Sitka, which is located in the Southeast Alaska portion of the action area. Vessel strike is not considered a major threat to Steller sea lions (NMFS 2018b).

10.6 Fisheries

Fisheries constitute an important widespread use of the ocean resources throughout the action area. Fisheries can adversely affect fish populations, other species, and habitats. Direct effects of fisheries interactions on marine mammals include entanglement and entrapment, which can lead to fitness consequences or mortality as a result of injury or drowning. Indirect effects include reduced prey availability, including overfishing of targeted species, and destruction of habitat. Use of mobile fishing gear, such as bottom trawls, disturbs the seafloor and reduces structural complexity. Indirect impacts of trawls include increased turbidity, alteration of surface sediment, removal of prey (leading to declines in predator abundance), removal of predators, ghost fishing (i.e., lost fishing gear continuing to ensnare fish and other marine animals), and generation of marine debris. Lost gill nets, purse seines, and long-lines may found and disrupt bottom habitats and have the potential to entangle or be ingested by marine mammals.

Fisheries can have a profound influence on fish populations. In a study of retrospective data, Jackson et al. (2001) concluded that ecological extinction caused by overfishing precedes all other pervasive human disturbance of coastal ecosystems, including pollution and anthropogenic climatic change. Marine mammals are known to feed on several species of fish that are harvested by humans (Waring et al. 2008). Thus, competition with humans for prey is a potential concern. Reductions in fish populations, whether natural or human-caused, may affect the survival and recovery of several populations.

Globally, 6.4 million tons of fishing gear is lost in the oceans every year (Wilcox et al. 2015). Entrapment and entanglement in fishing gear is a frequently documented source of human-caused mortality in cetaceans (see Dietrich et al. 2007). Materials entangled tightly around a body part may cut into tissues, enable infection, and severely compromise an individual's health (Derraik 2002). Entanglements also make animals more vulnerable to additional threats (e.g., predation and vessel strikes) by restricting agility and swimming speed.

Fisheries interactions are a major threat to pinnipeds through several mechanisms: prey reduction, intentional shootings, incidental bycatch, and entanglement in fishing gear. Reduced quantity or quality of prey appears to be a major threat to several pinniped species, as evidenced by population declines, reduced body size/condition, low birth rates, and high juveniles mortality rates (Trites and Donnelly 2003; Baker 2008). Pinnipeds are also intentionally shot by fishermen as a result of actual or perceived competition for fish. An estimated 50 to 1,180 Steller sea lions are shot annually (Atkinson et al. 2008). Pinnipeds are also injured and killed accidentally as a result of being hooked by longline fisheries, entangled in fishing line, and entangled in gillnet, trawl, and other net-based fisheries. Commercial fishing is estimated to incidentally kill approximately 30 Steller sea lions annually (Atkinson et al. 2008).

Although the Steller Sea Lion Recovery Plan (NMFS 2008) ranked interactions with fishing gear and marine debris as a low threat to the recovery of the Western DPS of Steller sea lions, it is likely that many entangled sea lions may be unable to swim to shore once entangled, may die at sea, and may not be available to count (Raum-Suryan et al. 2009). Based on data collected within

the action area by ADF&G and NMFS, Helker et al. (2017) reported Steller sea lions to be the most common species of human-caused mortality and serious injury between 2011 and 2015. During this timeframe, there were 146 cases of serious injuries to Eastern DPS Steller sea lions from interactions with fishing gear from marine debris. Raum-Suryan et al. (2009) observed a minimum of 386 animals either entangled in marine debris or having ingested fishing gear over the period between 2000-2007 in Southeast Alaska and northern British Columbia. Over the same period, the Western DPS of Steller sea lions mostly interacted with observed trawl (66) and some longline (3) groundfish fisheries, typically resulting in death. The total current estimated annual mortality rate of Western DPS of Steller sea lions incidental to all U.S. commercial fisheries is 31 animals per year (Muto et al. 2018).

The Steller Sea Lion Recovery Plan (NMFS 2008) ranked competition with fisheries for prey as a potentially high threat to the recovery of Western DPS of Steller sea lion. Substantial scientific debate surrounds the question about the impact of potential competition between fisheries and Steller sea lions. It is generally well accepted that commercial fisheries target several important Steller sea lion prey species (NRC 2003) including salmon species, Pacific cod, Atka mackerel, pollock, and others. These fisheries could be reducing sea lion prey biomass and quality at regional and/or local spatial and temporal scales such that sea lion survival and reproduction are reduced.

10.7 Pollution

Within the action area, pollution poses a threat to ESA-listed marine mammals. Pollution can come in the form of marine debris, pesticides, contaminants, and hydrocarbons.

10.7.1 Marine Debris

Marine debris is an ecological threat that is introduced into the marine environment through ocean dumping, littering, or hydrologic transport of these materials from land-based sources (Gallo et al. 2018). Even natural phenomena, such as tsunamis and continental flooding, can cause large amounts of debris to enter the ocean environment (Watters et al. 2010). Marine debris has been discovered to be accumulating in gyres throughout the oceans. Marine mammals often become entangled in marine debris, including fishing gear (Baird et al. 2015). Despite debris removal and outreach to heighten public awareness, marine debris in the environment has not been reduced (NRC 2008) and continues to accumulate in the ocean and along shorelines within the action area.

Marine debris affects marine habitats and marine life worldwide, primarily by entangling or choking individuals that encounter it (Gall and Thompson 2015). Entanglement in marine debris can lead to injury, infection, reduced mobility, increased susceptibility to predation, decreased feeding ability, fitness consequences, and mortality for ESA-listed species in the action area. Entanglement can also result in drowning for air breathing marine species including pinnipeds. The ingestion of marine debris has been documented to result in blockage or obstruction of the digestive tract, mouth, and stomach lining of various species and can lead to serious internal

injury or mortality. Data on marine debris in some locations of the action area is largely lacking; therefore, it is difficult to draw conclusions as to the extent of the problem and its impacts on populations of ESA-listed species.

Plastic debris is a major concern because it degrades slowly and many plastics float. The floating debris is transported by currents throughout the oceans and has been discovered accumulating in oceanic gyres (Law et al. 2010). Additionally, plastic waste in the ocean chemically attracts hydrocarbon pollutants such as polychlorinated biphenyl and dichlorodiphenyltrichloroethane. Marine mammals can mistakenly consume these wastes containing elevated levels of toxins instead of their prey.

Although the Steller Sea Lion Recovery Plan (NMFS 2008) ranked interactions with fishing gear and marine debris as a low threat to the recovery of the Western DPS, it is likely that many entangled sea lions may be unable to swim to shore once entangled, may die at sea, and may not be available to count (Loughlin 1986; Raum-Suryan et al. 2009). Based on data collected by ADF&G Game and NMFS, Helker et al. (2017) reported Steller sea lions to be the most common species of human-caused mortality and serious injury between 2011 and 2015. During that time period, Helker et al. (2017) reported ten Western DPS of Steller sea lions experienced mortality or serious injury as a result marine debris interactions. Raum-Suryan et al. (2009) observed a minimum of 386 animals either entangled in marine debris or having ingested fishing gear over the period 2000 through 2007 in Southeast Alaska and northern British Columbia. Over the same period, the Western DPS mostly interacted with observed trawl (66) and some longline (3) groundfish fisheries, typically resulting in death. The total current estimated annual mortality rate of Western DPS of Steller sea lions incidental to marine debris is two sea lions per year (Muto et al. 2018)

10.7.2 Pesticides and Contaminants

Exposure to pollution and contaminants have the potential to cause adverse health effects in marine species. Marine ecosystems receive pollutants from a variety of local, regional, and international sources, and their levels and sources are therefore difficult to identify and monitor (Grant and Ross 2002). Marine pollutants come from multiple municipal, industrial, and household sources as well as from atmospheric transport (Iwata 1993; Grant and Ross 2002; Garrett 2004; Hartwell 2004). Contaminants may be introduced by rivers, coastal runoff, wind, ocean dumping, dumping of raw sewage by boats and various industrial activities, including offshore oil and gas or mineral exploitation (Grant and Ross 2002; Garrett 2004; Hartwell 2004).

The accumulation of persistent organic pollutants, including polychlorinated-biphenyls (PCBs), dibenzo-p-dioxins, dibenzofurans and related compounds, through trophic transfer may cause mortality and sub-lethal effects in long-lived higher trophic level animals (Waring et al. 2016), including immune system abnormalities, endocrine disruption, and reproductive effects (Krahn et al. 2007). Persistent organic pollutants may also facilitate disease emergence and lead to the creation of susceptible “reservoirs” for new pathogens in contaminated marine mammal populations (Ross 2002). Recent efforts have led to improvements in regional water quality and

monitored pesticide levels have declined, although the more persistent chemicals are still detected and are expected to endure for years (Mearns 2001; Grant and Ross 2002).

Numerous factors can affect concentrations of persistent pollutants in marine mammals, such as age, sex and birth order, diet, and habitat use (Mongillo et al. 2012). In marine mammals, pollutant contaminant load for males increases with age, whereas females pass on contaminants to offspring during pregnancy and lactation (Addison and Brodie 1987; Borrell et al. 1995). Pollutants can be transferred from mothers to juveniles at a time when their bodies are undergoing rapid development, putting juveniles at risk of immune and endocrine system dysfunction later in life (Krahn et al. 2009).

Beckmen et al. (2008) assessed blood, blubber, milk, and feces samples that were collected from 53 free-ranging and three captive Steller sea lions (*Eumetopias jubatus*) in Alaska from 1998 through 2003 to measure exposure to selected organochlorine contaminants (e.g., dioxin-like PCBs, and dichlorodiphenyltrichloroethanes [DDTs]). Regional organochlorine contaminant exposure was compared in blubber samples of pups through subadults of the Eastern DPS in Southeast Alaska (n=48) as compared to the Western DPS Gulf of Alaska (n=55) and Aleutian Islands (n=43). Pesticides and polybrominated diphenyl ethers were identified in 25 and 15 animals respectively, including four individuals that were sampled at five month intervals. Transfer of organochlorine contaminants through the placenta was extremely low.

Concentrations of organochlorine contaminants peaked in pups sampled between two to six weeks of age, declined by midway through the suckling period, and increased again through the first year of the presumed dependent suckling period though the weaning period. At the time of the study, Beckmen et al. (2008) suggested these data show that exposure to organochlorine contaminants is at a level of concern especially in young pups in portions of the range of the endangered western stock of Steller sea lions. However, in a more recent study, Zaleski et al. (2014) assessed effects of organochlorine contaminants on the survival and movement probabilities of Steller sea lions estimated in program MARK using resighting data collected from 2003 through 2009. During the study, survival and movement were determined to be most affected by age and location rather than organochlorine contaminants.

10.7.3 Hydrocarbons

Numerous small-scale vessel spills likely occur in the action area. A nationwide study examining vessel oil spills from 2002 through 2006 found that over 1.8 million gallons of oil were spilled from vessels in all U.S. waters (Dalton and Jin 2010). In this study, “vessel” included numerous types of vessels, including barges, tankers, tugboats, and recreational and commercial vessels, demonstrating that the threat of an oil spill can come from a variety of boat types. Below we review the effects of oil spills on marine mammals more generally. Much of what is known comes from studies of large oil spills such as the *Deepwater Horizon* and *Exxon Valdes* oil spill.

Exposure to hydrocarbons released into the environment via oil spills and other discharges pose risks to marine species. Marine mammals are generally able to metabolize and excrete limited amounts of hydrocarbons, but exposure to large amounts of hydrocarbons and chronic exposure

over time pose greater risks (Grant and Ross 2002). Acute exposure of marine mammals to petroleum products causes changes in behavior and may directly injure animals (Geraci 1990). The *Deepwater Horizon* oil spill in the Gulf of Mexico in 2010 led to the exposure of tens of thousands of marine mammals to oil, causing reproductive failure, adrenal disease, lung disease, and poor body condition.

The Steller Sea Lion Recovery Plan ranked the threat of toxic substances as medium (NMFS 2008). Toxic substances can affect animals in two major ways. First, the acute toxicity caused by a major point source of a pollutant (such as an oil spill or hazardous waste) can lead to acute mortality or moribund animals with a variety of neurological, digestive and reproductive problems. Second, toxic substances can impair animal populations through complex biochemical pathways that suppress immune functions and disrupt the endocrine balance of the body, causing poor growth, development, reproduction and reduced fitness. Sea lions exposed to oil spills may become contaminated with PAHs through inhalation (Calkins D. G. et al. 1994), dermal contact and absorption, direct ingestion, or by ingestion of contaminated prey (Albers and Loughlin 2003).

Some Steller sea lions are likely directly exposed to oil, particularly during tanker breaches like the spill from the *Exxon Valdez* in 1989. Exposure or fouling fur (pelage) is not as detrimental to a sea lion as an otter or bird because the blubber is the primary insulation. While, no significant adverse effects of the oil were confirmed following the Exxon spill (Calkins *et al.* 1994) ingestion and exposure of mucosal membranes may have chronic effects on an individual's health (Albers and Loughlin 2003).

10.8 Aquatic Nuisance Species

Aquatic nuisance species are aquatic and terrestrial organisms, introduced into new habitats throughout the U.S. and other areas of the world that produce harmful impacts on aquatic ecosystems and native species (<http://www.anstaskforce.gov>). They are also referred to as invasive, alien, or non-indigenous species. Invasive species have been referred to as one of the top four threats to the world's oceans (Raaymakers and Hilliard 2002; Raaymakers 2003; Terdalkar et al. 2005; Pugniuc 2010). Introduction of these species is cited as a major threat to biodiversity, second only to habitat loss (Wilcove et al. 1998). A variety of vectors are thought to have introduced non-native species including, but not limited to aquarium and pet trades, recreation, and ballast water discharges from ocean-going vessels. Common impacts of invasive species are alteration of habitat and nutrient availability, as well as altering species composition and diversity within an ecosystem (Strayer 2010). Shifts in the base of food webs, a common result of the introduction of invasive species, can fundamentally alter predator-prey dynamics up and across food chains (Moncheva and Kamburska 2002), potentially affecting prey availability and habitat suitability for ESA-listed species. They have been implicated in the endangerment of 48 percent of ESA-listed species (Czech and Krausman 1997). Currently, there is little information on the level of aquatic nuisance species and the impacts these invasive species may

have on Steller sea lions in the action area through the duration of the project. Therefore, the level of risk and degree of impact to Steller sea lions unknown.

10.9 Predation

The Steller Sea Lion Recovery Plan (NMFS 2008) ranked predation by killer whales as a potentially high threat to the recovery of the Western DPS. Steller sea lions in both the eastern and western stocks are eaten by killer whales (Maniscalco et al. 2007; Dahlheim and White 2010; Horning and Mellish 2012).

Relative to other Western DPS of Steller sea lion sub-regions, transient killer whale abundance and predation on Steller sea lions has been well studied in the Prince William Sound and Kenai Fjords portion of the Eastern Gulf of Alaska. Steller sea lions represented 33 percent (Heise 2003) and five percent (NMFS 2014) of the remains found in deceased killer whale stomachs in the GOA, depending on the specific study results. Matkin (2012) estimated the abundance of transient killer whales in the eastern Gulf of Alaska to be 18. Maniscalco et al. (2007) identified 19 transient killer whales in Kenai Fjords from 2000 through 2005 and observed killer whale predation on six pup and three juvenile Steller sea lions. Maniscalco et al. (2007) estimated that 11 percent of the Steller sea lion pups born at the Chiswell Island rookery (in the Kenai Fjords area) were preyed upon by killer whales from 2000 through 2005 and concluded that Gulf of Alaska transient killer whales were having a minor impact on the recovery of the sea lions in the area (Maniscalco et al. 2007). Maniscalco et al. (2008) further studied Steller sea lion pup mortality using remote video at Chiswell Island. Pup mortality up to 2.5 months postpartum averaged 15.4 percent, with causes varying greatly across years (2001 through 2007). They noted that high surf conditions and killer whale predation accounted for over half the mortalities. Even at this level of pup mortality, the Chiswell Island Steller sea lion population has increased.

Other studies in the Kenai Fjords/Prince William Sound region have also found evidence for high levels of juvenile Steller sea lion mortality, presumably from killer whales. Based on data collected post-mortem from juvenile Steller sea lions implanted with life history tags, 12 of 36 juvenile Steller sea lions were confirmed dead, at least 11 of which were killed by predators (Horning and Mellish 2012). Horning and Mellish (2012) estimated that over half of juvenile Steller sea lions in this region are consumed by predators before four years of age. They suggested that low juvenile survival due to predation, rather than low natality, may be the primary impediment to recovery of the Western DPS of Steller sea lions in the Kenai Fjords/Prince William Sound region.

Steller sea lions may also be attacked by sharks, though little evidence exists to indicate that sharks prey on Steller sea lions. The Steller Sea Lion Recovery Plan did not rank shark predation as a threat to the recovery of the Western DPS (NMFS 2008). Sleeper shark and Steller sea lion home ranges overlap (Hulbert et al. 2006) and one study suggested that predation on Steller sea lions by sleeper sharks may be occurring (Horning and Mellish 2012). A significant increase in the relative abundance of sleeper sharks occurred during 1989 through 2000 in the central Gulf of Alaska; however, samples of 198 sleeper shark stomachs found no evidence of Steller sea lion

predation (Sigler et al. 2006). Sigler et al. (2006) sampled sleeper shark stomachs collected in the Gulf of Alaska near sea lion rookeries when pups may be most vulnerable to predation (i.e., first water entrance and weaning) and found that fish and cephalopods were the dominant prey. Tissues of marine mammals were found in 15 percent of the shark stomachs, but no Steller sea lion tissues were detected. Overall, Steller sea lions are unlikely prey for sleeper sharks (Sigler et al. 2006).

10.10 Disease and Parasitism

Disease and parasitism are common in all pinniped populations and have been responsible for major die-offs in other species, but such events are usually relatively short-lived and provide more evidence of morbidity or mortality. Acute toxicity events may result in mass mortalities; repeated exposure to lower level contaminants may result in immune suppression and/or endocrine disruption (Atkinson et al. 2008). Pinnipeds may become exposed to infectious diseases (e.g., Chlamydia and leptospirosis) through polluted waterways (Aguirre et al. 2007). Burek et al. (2005) evaluated samples from the period of steepest decline in Steller sea lion populations (1970s to 1990s) and found no evidence of significant exposure of sea lions to several morbilliviruses, but did find exposure to several other viruses, such as phocid herpesviruses, caliciviruses and others. While some of these viruses may contribute to low birth rates and reduce an individual's immunity, the extent to which they have affected Steller sea lion populations is unclear. The Steller Sea Lion Recovery Plan (NMFS 2008) ranked diseases and parasites as a low threat to the recovery of the Western DPS of Steller sea lions.

10.11 Sound

Western DPS of Steller sea lions that occur in the action area may be regularly exposed to several sources of anthropogenic sounds. These include, but are not limited to maritime activities, aircraft, seismic surveys (exploration and research), pile driving, and marine construction (dredging). Western DPS of Steller sea lions have the potential to be impacted by either increased levels of anthropogenic-induced background sound or high intensity, short-term anthropogenic sounds.

Anthropogenic sound in the action areas may be generated by commercial and recreational vessels, sonar, aircraft, seismic surveys, in-water construction activities, wind farms, military activities, and other human activities. These activities occur to varying degrees throughout the year. The scientific community recognizes the addition of anthropogenic sound to the marine environment as a stressor that can possibly harm marine animals or significantly interfere with their normal activities (NRC 2005). The species considered in this Opinion may be impacted by anthropogenic sound in various ways. Once detected, some sounds may produce a behavioral response, including but not limited to, changes in habitat to avoid areas of higher sound levels, changes in diving behavior, or (for cetaceans) changes in vocalization (MMC 2007).

Many researchers have described behavioral responses of Steller sea lions to sounds produced by boats and vessels, as well as other sound sources such as helicopters and fixed-wing aircraft

(Kucey and Trites 2006; Wilson et al. 2012). Most observations have been limited to short-term behavioral responses, which included avoidance behavior and temporary cessation of feeding, resting, or social interactions. Masking may also occur, in which an animal may not be able to detect, interpret, and/or respond to biologically relevant sounds. This can have a variety of implications for an animal's fitness including, but not limited to, predator avoidance and the ability to reproduce successfully (MMC 2007)

Despite the potential for these impacts to affect individual Western DPS of Steller sea lions, information is not currently available to determine the potential population level effects of anthropogenic sound levels in the marine environment (MMC 2007). For example, we currently lack empirical data on how sound impacts growth, survival, reproduction, and vital rates for this species, nor do we understand the relative influence of such effects on the population being considered in the action area. As a result, the consequences of anthropogenic sound on this species in the action area remain uncertain, although recent efforts have made progress establishing frameworks to consider such effects (NAS 2017).

10.11.1 Vessel Sound and Commercial Shipping

Vessel sounds from commercial shipping is expected to occur in the action area. Much of the increase in sound in the ocean environment is due to increased shipping, as vessels become more numerous and of larger tonnage (NRC 2003; Hildebrand 2009b; McKenna et al. 2012).

Commercial shipping continues to be a major source of low-frequency sound in the ocean, particularly in the Northern Hemisphere where the majority of vessel traffic occurs. Although large vessels emit predominantly low frequency sound, studies report broadband sound from large cargo vessels above 2 kiloHertz. The low frequency sounds from large vessels overlap with the predicted hearing ranges for otariids (60 Hertz to 39 kiloHertz) (NMFS 2018a) and may mask their vocalizations and cause stress (Rolland et al. 2012). At frequencies below 300 Hertz, ambient sound levels are elevated by 15 to 20 dB when exposed to sounds from vessels at a distance (McKenna et al. 2013). Analysis of sound from vessels revealed that their propulsion systems are a dominant source of radiated underwater sound at frequencies less than 200 Hertz (Ross 1976). Additional sources of vessel sound include rotational and reciprocating machinery that produces tones and pulses at a constant rate. Other commercial and recreational vessels also operate within the action area and may produce similar sounds, although to a lesser extent given their much smaller size.

Individual vessels produce unique acoustic signatures, although these signatures may change with vessel speed, vessel load, and activities that may be taking place on the vessel. Peak spectral levels for individual commercial vessels are in the frequency band of 10 to 50 Hertz and range from 195 dB re: $\mu\text{Pa}^2\text{-s}$ at 1 meter for fast-moving (greater than 37 kilometers per hour [20 knots]) supertankers to 140 dB re: $\mu\text{Pa}^2\text{-s}$ at 1 meter for small fishing vessels (NRC 2003). Small boats with outboard or inboard engines produce sound that is generally highest in the mid-frequency (1 to 5 kilohertz) range and at moderate (150 to 180 dB re: $1 \mu\text{Pa}$ at 1 meter) source levels (Erbe 2002; Gabriele et al. 2003; Kipple and Gabriele 2004). On average, sound levels are

higher for the larger vessels, and increased vessel speeds result in higher sound levels. Measurements made over the period 1950 through 1970 indicated low frequency (50 Hertz) vessel traffic sound in the eastern North Pacific Ocean and western North Atlantic Ocean was increasing by 0.55 dB per year (Ross 1976; Ross 1993; Ross 2005). Whether or not such trends continue today is unclear. Most data indicate vessel sound is likely still increasing (Hildebrand 2009a), and we assume is also occurring within the action area. However, the rate of increase appears to have slowed in some areas (Chapman and Price 2011), and in some places, ambient sound including that produced by vessels appears to be decreasing (Miksis-Olds and Nichols 2016).

Sonar systems are used on commercial, recreational, and military vessels and may also affect cetaceans (NRC 2003). Although little information is available on potential effects of multiple commercial and recreational sonars to pinnipeds, the distribution of these sounds would be small because of their short durations and the fact that the high frequencies of the signals attenuate quickly in seawater (Nowacek et al. 2007). For further discussion of military sound on the ESA-listed species considered in this Opinion, see Section 10.12.

10.11.2 Aircraft

Aircraft within the action area may consist of small commercial or recreational airplanes or helicopters, to large commercial airliners. These aircraft produce a variety of sounds that could potentially enter the water and impact marine mammals. While it is difficult to assess these impacts, several studies have documented what appear to be minor behavioral disturbances of Steller sea lions in response to aircraft presence (Kucey 2005).

10.11.3 Seismic Surveys

There are seismic survey activities involving towed airgun arrays that may occur within the action area. They are the primary exploration technique to locate oil and gas deposits, fault structure, and other geological hazards. These activities may produce noise that could impact ESA-listed cetaceans within the action area. These airgun arrays generate intense low-frequency sound pressure waves capable of penetrating the seafloor and are fired repetitively at intervals of ten to 20 seconds for extended periods (NRC 2003). Most of the energy from the airguns is directed vertically downward, but significant sound emission also extends horizontally. Peak sound pressure levels from airguns usually reach 235 to 240 dB at dominant frequencies of five to 300 Hertz (NRC 2003). Most of the sound energy is at frequencies below 500 Hertz, which is within the hearing range of otariids (NMFS 2018a). In the U.S., all seismic surveys involving the use of airguns with the potential to take Western DPS of Steller sea lions are covered by incidental take authorizations under the MMPA which undergo formal ESA section 7 consultation. In addition, the Bureau of Ocean Energy Management authorizes oil and gas activities in domestic and foreign waters, including the action area, and thus has consulted with NMFS to ensure their actions have not resulted in jeopardy for Western DPS of Steller sea lions, nor adversely modify or destroyed designated critical habitat.

Within the action area, there are two known National Science Foundation-funded seismic survey for research purposes with a MMPA incidental take authorization from NMFS scheduled to occur in the Eastern North Pacific Ocean off Washington and Oregon and Western Gulf of Alaska in 2019. These actions are the subject of separate ESA section 7 consultations.

10.11.4 Marine Construction

Marine construction in the action area that produces sound includes drilling, dredging, pile-driving, cable-laying, and explosions. These activities are known to cause behavioral disturbance and physical damage (NRC 2003) to marine mammals, including Steller sea lions located within the action area. While most of these activities are coastal, offshore construction does occur.

10.12 Military Activities

The U.S. Navy conducts training, testing, and other military readiness activities on range complexes throughout coastal and offshore areas in the U.S. and on the high seas. The U.S. Navy's Hawaii-Southern California Training and Testing, Northwest Training and Testing, and Gulf of Alaska Training and Testing range complexes overlap with the action area for Permit No. 22289 while the Gulf of Alaska Training and Testing overlaps with the action area for Permit Nos. 22293 and 22298. During training, existing and established weapon systems and tactics are used in realistic situations to simulate and prepare for combat. Activities include: routine gunnery, missile, surface fire support, amphibious assault and landing, bombing, sinking, torpedo, tracking, and mine exercises. Testing activities are conducted for different purposes and include at-sea research, development, evaluation, and experimentation. The U.S. Navy performs testing activities to ensure that its military forces have the latest technologies and techniques available to them. The majority of the training and testing activities the U.S. Navy conducts in the action area are similar, if not identical to activities that have been occurring in the same locations for decades.

The U.S. Navy's activities produce sound and visual disturbance to marine mammals, including Steller sea lions throughout the action area. Anticipated impacts from harassment due to the U.S. Navy's activities include changes from foraging, resting, milling, and other behavioral states that require low energy expenditures to traveling, avoidance, and some behavioral states that require higher energy expenditures. Based on the currently available scientific information, behavioral responses that result from stressors associated with these training and testing activities are generally temporary and have not been expected to affect the reproduction, survival, or recovery of ESA-listed species within the action area. Sound produced during U.S. Navy activities is also expected to result in instances of hearing impairment and permanent damage (e.g. TTS and PTS) to marine mammals, including Steller sea lions. The U.S. Navy's activities constitute a federal action and take of ESA-listed marine mammals considered for these activities have previously undergone separate ESA section 7 consultation. Through these consultations with NMFS, the U.S. Navy has implemented monitoring and conservation measures to reduce the potential effects of underwater sound from activities on ESA-listed resources in the Pacific Ocean.

Conservation measures include employing visual observers and implementing mitigation zones during activities using active sonar and explosives.

10.13 Scientific Research Activities

Scientific research similar to that which will be conducted under Permits Nos. 22289, 22293, and 22298 has and will continue to impact ESA-listed Steller sea lions within the action area. Currently, there are at least eight active research permits that may affect Western DPS Steller sea lions in the Pacific Ocean considered during this consultation (Permit Nos. 16239, 18438, 18534, 18537, 18824, 19436, 19592, 21238, and 21678) in the proposed study area. The primary objective of these studies is generally to monitor populations or gather data for behavioral and ecological studies. These research activities may directly and indirectly result in harassment, stress, injury, and a low amount of mortality.

A total of at least eight research permits in the North Pacific Ocean represents substantial research, but this research occurs over an expansive area given the size of the action area for Permit Nos. 22289, 22293, and 22298. Nonetheless, in the action area research activities are typically concentrated around easily accessible areas. As such, repeated disturbances of individuals Steller sea lions may occur within a year. However, all permits contain conditions requiring the permit holders to coordinate their research activities with the NMFS' regional offices and other permit holders and, to the extent possible, share data to avoid unnecessary duplication of effort and associated disturbance of Western DPS of Steller sea lions. Nevertheless, the "take" numbers in the scientific research permits represent a worst-case scenario in the action area.

Western DPS of Steller sea lions may have and are expected to continue to respond to these research activities conducted in the action area in a variety of ways including no obvious response, minor behavioral disturbances, avoidance and stress-related response, temporarily abandoning important behaviors such as feeding and breeding, and in rare cases sea lions may become injured, infected, and possibly even die from research activities (i.e. accidental crushing/drowning of pups during capture which has occurred during past Steller sea lion research activities). The fact that multiple permitted "takes" of Western DPS of Steller sea lions are already permitted in the action area and are expected to continue to be permitted in the future means that research has the ability to contribute to or even exacerbate the stress response of Western DPS Steller sea lions generated from other threats occurring in the action area.

10.14 Impact of the Baseline on Endangered Species Act-Listed Species

Collectively, the stressors described above have had, and likely continue to have, lasting impacts on the ESA-listed Steller sea lions considered in this consultation. Some of these stressors result in mortality or serious injury to individual animals e.g., vessel strikes), whereas others result in more indirect (e.g., fishing that impacts prey availability) or non-lethal (e.g., vessel noise) impacts. Assessing the aggregate impacts of these stressors on Steller sea lions is difficult and, to our knowledge, no such analysis exists. This becomes even more difficult considering that many

of the species in this Opinion are wide-ranging and subject to stressors in locations throughout and outside the action area.

We consider the best indicator of the aggregate impact of the *Environmental Baseline* on ESA-listed Western DPS Steller sea lions to be the status and trend of this species. As noted in Section 9, Western DPS of Steller sea lions are experiencing increases in population abundance in some areas (east of Samalga Pass, whereas Western DPS of Steller sea lions in other areas (west of Samalga Pass) are declining. Taken together, this indicates that the *Environmental Baseline* is impacting this species in different ways. The portion of the Western DPS population (located east of Samalga Pass) experiencing increasing population abundances are doing so despite the potential negative impacts of the activities described in the *Environmental Baseline*. Therefore, while the *Environmental Baseline* may slow their recovery, recovery is not being prevented. For the portion of the Western DPS population (located west of Samalga Pass) that may be declining in abundance, it is possible that the suite of conditions described in the *Environmental Baseline* is preventing their recovery. However, it is also possible that their populations are at such low levels (e.g., due to changes in oceanic temperature regimes and impacts from fisheries) that even when the species' primary threats are removed, the species may not be able to achieve recovery. At small population sizes, species may experience phenomena such as demographic stochasticity, inbreeding depression, and Allee effects, among others, that cause their limited population size to become a threat in and of itself. A thorough review of the status and trends of Steller sea lions is discussed in the *Status of Species Likely to be Adversely Affected* section of this Opinion.

11 EFFECTS OF THE ACTION

Section 7 regulations define “effects of the action” as the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 C.F.R. §402.02). Indirect effects are those that are caused by the proposed action and are later in time, but are reasonably certain to occur. This effects analysis section is organized following the stressor, exposure, response, and risk assessment framework.

As discussed in Section 6, we identified the potential stressors created by the issuance of Permit Nos. 22289, 22293, and 22298. In this section, we describe each of these potential stressors associated with the proposed actions, the probability of individuals of ESA-listed species being exposed to these stressors based on the best scientific and commercial evidence available, and the probable responses to those individuals (given probability of exposures) based on the available evidence. As described in Section 11.2, for any responses that would be expected to reduce an individual's fitness (i.e., growth, survival, annual reproductive success, or lifetime reproductive success), the assessment would consider the risk posed to the viability of the population(s) those individuals comprise of and to the ESA-listed species those populations represent. For this consultation, we are particularly concerned about behavioral and stress-based physiological disruptions and potential unintentional mortality that may result in sea lions that

fail to feed, reproduce, or survive because these responses are likely to have population-level consequences. The purpose of this assessment and, ultimately, of this consultation is to determine if it is reasonable to expect the proposed action to have effects on ESA-listed species that could appreciably reduce their likelihood of surviving and recovering in the wild.

11.1 Stressors Associated with the Action

11.1.1 Stressors Likely to Adversely Affect Protected Species

As discussed in Section 6.2, the stressors associated with the proposed action identified as being likely to adversely affect ESA-listed species and critical habitat include aerial surveys, vessel surveys, vessel noise, non-invasive terrestrial research activities (i.e., remote video monitoring, photo-id, passive acoustic monitoring, close approach ground surveys, brand resight, behavioral observations, and video/acoustic recording equipment installation/maintenance), non-invasive biological sampling (i.e. scat, spew, molt, and salvage collection), non-chemical captures (hand, hoop net, other net, underwater noose, noose with pole, restraint wrap, board restraint, and squeeze cage), chemical immobilization captures (darting/injectable immobilization), sedation/anesthesia, handling and biological sampling, external instrument attachment/tagging/markings, hot branding, and lethal take. Each of these stressors and their impacts on Western DPS Steller sea lions during the proposed activities are thoroughly discussed in the exposure and response analysis below (Section 11.2).

11.2 Exposure and Response Analysis

The *Exposure Analysis* identifies, as possible, the number, age (or life stage), and gender of the ESA-listed individuals that are likely to be exposed to the stressors and the population(s) of the sub-population(s) those individuals belong. The *Response Analysis* evaluates the available evidence to determine how individuals of those ESA-listed species are likely to respond given their probable exposure.

11.2.1 Exposure Analysis

In this section, we quantify the likely exposure of ESA-listed species to the activities and associated stressors that may result from the proposed action (Section 3), and when possible quantify the number of exposures to an individual animal. The stressors we expect individuals of the Western DPS of Steller sea lions to be exposed to are listed above (Section 11.1.1). Table 2, Table 3, and Table 4 specify the applicants' and the Permits and Conservation Division's proposed exposure to these stressors on Western DPS Steller sea lions.

The ADF&G, MLL, and ASLC have explained the MMPA take number estimates in their permit applications for Permit Nos. 22289, 22293, and 22298 respectively. Based on this explanation, our own evaluation of these numbers in comparison to the MML, ASLC, and ADF&G and other researchers' annual reports for similar species and research activities, and the conservative assumption that all MMPA take that the Permits and Conservation Division authorize *could* occur, we adopt the exposure numbers of ESA-listed species that are reasonably certain to occur

as the number of animals specified in Table 2, Table 3, and Table 4 as likely to be affected by the specific research activities. These numbers and resulting effects are discussed below.

Under Permit No. 22289, the MML plans to study Steller sea lions throughout offshore and coastal waters of Alaska, Washington, Oregon, and California. During their research, the MML researchers may incur the following MMPA take numbers of individuals from the Western DPS of Steller sea lion during research activities:

- 4,510 individuals during aerial surveys. This includes 4,330 male and female non-pups and 180 male and female pups;
- 14,400 individuals during vessel surveys. This includes 14,000 male and female non-pups and 400 male and female pups;
- 9,150 individuals during ground surveys, non-invasive terrestrial research activities (i.e., behavioral observation and photographic identification), and non-invasive biological sampling (opportunistic collection of scat, spew, molts, and carcasses). This includes 7,100 male and female non-pups and 1,200 male and female pups;
- 550 individuals from non-chemical capture (i.e. hand or net) and handling/sampling (i.e. anesthesia, biological sampling, branding, instrument attachment, and release). This includes 250 male and female non-pups and 300 male and female pups;
- 43 individuals (67 takes are authorized since some sea lions may be taken more than once during these activities due to unintentional disturbance for instrument retrieval) from chemical capture (i.e. dart and injectable immobilizing agents) and handling/sampling (i.e. anesthesia, biological sampling, branding, instrument attachment, and release). This includes 10 male and female juveniles that may be darted, immobilized with an injectable agent or hand captured and then handled/sampled; 10 male and female juveniles that will be darted but not captured; 10 adult females that will be darted or injected with an immobilizing agent and handled/sampled; 10 adult females that will be darted but not captured; and 3 subadult males that will be darted or injected with an immobilizing agent and handled/sampled; and
- Two individuals for unintentional mortality. This includes male and female Steller sea lions of all life stages.

Under Permit No. 22293, the ASLC plans to study Steller sea lions throughout offshore and coastal waters of the Gulf of Alaska and Aleutian Islands. As stated earlier in Section 4, most of the work will be concentrated at Chiswell Island (59.602 degrees North, 149.568 degrees West) and rookeries/haulouts between Prince William Sound and Outer Island. Additional work farther west is dependent on funding and research needs. During their research, the ASLC researchers may annually expose the following numbers of Western DPS of Steller sea lions to research activities:

- 667 individuals (4,000 MMPA takes are authorized since some sea lions may be taken more than once during these activities) during vessel surveys. This includes male and female Steller sea lions of all life stages;

- 1,667 individuals (5,000 takes are authorized since some sea lions may be taken more than once during these activities) during ground surveys (only includes incidental disturbance associated with capture of pups and opportunistic collection of scat, spew, and carcasses). This includes male and female Steller sea lions of all life stages;
- 500 individuals (6,000 takes are authorized since sea lions may be taken more than once during these activities) during remote video monitoring activities. This includes male and female Steller sea lions of all life stages;
- 1,170 individuals during ground survey activities associated with the collection of fecal samples, placentas, aborted fetuses, and carcasses. This includes male and female Steller sea lions of all life stages;
- 125 individuals from non-chemical capture (i.e. hand or net) and handling/sampling (i.e., anesthesia, biological sampling, branding, and release). This includes only male and female pups;
- 50 individuals during biopsy darting activities (150 takes are authorized since sea lions may be taken more than once during remote biopsy darting activities). This includes 17 male and female juveniles and 33 male and female adults;
- 67 individuals unintentionally harassed during biopsy darting activities (200 takes are authorized since sea lions may be unintentionally taken more than once during remote biopsy darting activities). This includes male and female Steller sea lions of all life stages; and
- Four unintentional lethal takes. This includes male and female Steller sea lions of all life stages.

Under Permit No. 22298, the ADF&G plans to study Steller sea lions throughout offshore and coastal waters of eastern and western Alaska. During their research, the ADF&G researchers may annually expose the following numbers of Western DPS of Steller sea lions to research activities:

- 7,500 individuals to aerial surveys. This includes male and female Steller sea lions of all life stages;
- 4,000 individuals during vessel surveys. This includes male and female Steller sea lions of all life stages;
- 1,390 individuals during ground surveys. This includes male and female Steller sea lions of all life stages;
- 4,000 individuals during ground activities (unintentional take during scat/carcass collection, capture and observation, remote biopsy, and equipment maintenance). This includes male and female Steller sea lions of all life stages;
- 2,500 individuals during branding activities (unintentional take during branding activities). This includes male and female Steller sea lions of all life stages;
- 200 individuals during remote biopsy activities. This includes 50 male and female juveniles and 150 male and female adults;

- 940 individuals from non-chemical capture (i.e. hand or net) and handling/sampling (i.e. anesthesia, biological sampling, branding, instrument attachment, and release). This includes 300 male and female pups that will not be branded, and 640 male and female pups with optional branding for individuals over 20 kilograms.;
- 90 individuals from non-chemical (i.e. hand or net) or chemical capture (i.e. darting) and handling/sampling. This includes 45 male and female juveniles and 45 male and female adults; and
- Three unintentional lethal takes. This includes male and female Steller sea lions of all life stages.

Given the Permits and Conservation Division’s issuance and counting of takes as well as the researchers’ ability to identify each individual animal in the field in real time, the *Annual Number of Authorized Takes* presented in Table 2, Table 3, and Table 4 represent the maximum number of individuals that may be exposed to the proposed research activities annually, although it is possible that individuals can be exposed more frequently than specified in *Takes Per Individual* (Table 2, Table 3, and Table 4) in a given year for research activities under Permit Nos. 22289, 22293, and 22298.

11.2.2 Response Analysis

In all we expect few mortalities or long-term adverse effects as a result of the proposed activities for ESA-listed Steller sea lions. NMFS’ Permits and Conservation Division states that short-term behavioral responses from disturbance, would be from sampling, branding, and tagging. In addition, they state that energetic costs (from tag attachments) that may result from research activities would not likely lead to disruption of essential behaviors such as feeding, mating, or nursing, to a degree that the individual’s likelihood of successful reproduction or survival would be substantially reduced. NMFS’ Permits and Conservation Division claim that occasionally, capture of pinnipeds and associated activities can result in serious injury and mortality of a small number of individuals. These are most commonly results of anesthesia and sedation complications as well as occasional pup mortalities from stampede of adult pinnipeds off the rookery. The sections below presents an in-depth review of each research activity the MML, ASLC, and ADF&G propose to conduct and their corresponding effects on Western DPS of Steller sea lions.

11.2.2.1 Aerial Surveys

As stated in Section 3.1, aerial surveys through the use of fixed-wing aircraft, helicopters, and unmanned aerial systems would be authorized under the proposed Permit No. 22298 (ADF&G) and 22289 (MML) in order to assess the abundance and distribution of Steller sea lions. An aircraft flying over Steller sea lions hauled out on land can cause disturbance and result in ESA behavioral harassment. Overall, the use of fixed-wing aircrafts, helicopters, and unmanned aerial surveys may cause brief auditory and visual disturbance of Steller sea lions. The effects from this

disturbance may range from no response to initiating a flight response in an aggregation (i.e., a stampede).

Frid and Dill (2001) argue that an animal's response to human-caused disturbance is analogous to their response to a predator, such that they will make optimal fleeing decisions that balance the benefit of avoiding capture against the cost of abandoning the resource patch. To a sea lion hauled out on land, the silhouettes of a UAS (Puma A/E, and APH-22), manned aircraft (Twin Otter), and eagles (a natural predator of Steller sea lions) can appear the same (See Figure 18). This, combined with noise from the aircraft has the potential to alert and flush Steller sea lions from a haulout. In review of studies across taxa, Frid and Dill (2001) found that, in general, the probability of fleeing increases when the disturbance approaches more directly and when the cost of fleeing is lower than the perceived cost of staying. Although results varied among studies as to whether speed and the size of the disturbance (i.e., size of the perceived predator) influenced flight responses (Frid and Dill 2001). In some instances, sea lions have temporarily abandoned haulouts after repeated disturbance (Thorsteinson and Lensink 1962; Kucey 2005), but in other situations they have continued using areas after repeated and severe harassment. Kenyon (1962) noted permanent abandonment of areas in the Pribilof Islands that were subjected to repeated disturbance. A major sea lion rookery at Cape Sarichef was abandoned after the construction of a light house at that site, but the sea lions used the site as a haulout after the light house was no longer inhabited by humans. However, it is important to note that aerial surveys conducted by the MML and ADF&G will not cause continued or repeated disturbance of Steller sea lions particularly given the coordinated efforts by each of the two agencies to minimize disturbance and avoid duplication of research activities (See Section 3.2).

The effects of aerial surveys that have been conducted in the past by the MML and ADF&G have been provided in annual reports for Permit No. 782-1532 for the years 2000 through 2004 (ADF&G 2019). Data from aerial surveys has documented effects from a manned aircraft, resulting in: 2,797 sea lions observed to be disturbed (similar to 'alerted') out of a total of 216,821 counted during monthly aerial surveys in both western and eastern stocks, which calculates to only 1.3 percent of Steller sea lions being disturbed across the entire numbers counted. The report states that a main goal of the aerial surveys is to not disturb sea lions as it has the potential to negatively skew the sample if animals left the field of view. Overall, observations from the report period indicated it was very rare for sea lions to actually spook or go into the water. The MML report also claimed that less than ten percent of sea lions counted during breeding season aerial surveys reacted, and that few animals spooked off of a site. Observers at field camps in 2002 and 2004 also observed little response to survey aircraft, but reported "mild spooks" at Ugamak Island though all animals remained on the beach. "Mild spooks" refers to a proportion of the animals (approximately ten percent) becoming alert and moving toward the water, but remaining on the beach.

In addition to the MML report, Kucey (2005) states that during aerial surveys of the eastern population conducted in 2004, researchers reported counting 17,000 Steller sea lions from the

plane of which only 147. In addition, Kucey (2005) observed more than 1,000 Steller sea lion disturbance events of which only five percent of the animals leaving the haulout sites was in response to aircraft disturbance (n=20).

Reactions of animals to aerial survey aircraft differ depending on the acoustics of the site. A reaction similar to that observed at Ugamak Island is more likely at rookeries or haulouts located at the base of a cliff or in an embayment. Little or no reaction of animals has been observed at sites on flat offshore islands (ADF&G 2019). In addition, the responses of Steller sea lions to the use of a helicopter during the ADF&G's (the only applicant proposed to use a helicopter during aerial surveys) proposed aerial surveys are not expected to differ from the use of a manned fixed wing aircraft. In general, helicopters tend to be noisier than fixed wing aircraft of similar size. However, as previously stated, the minimum altitude at which the ADF&G will fly a helicopter during its proposed activities is 250 meters (820.2 feet) in the air, 100 meters (328.1 feet) higher than the minimum altitude for a fixed wing aircraft. Also, noise testing on a Robinson R66 Helicopter measured the sound levels on the ground for a typical helicopter takeoff and approach as 87.8 dB re: 20 μ Pa (Robinson 2017) at 150 meters (492.1 feet). These sound levels are below NMFS' behavioral threshold for airborne pinniped disturbance (100 dB re: 20 μ Pa for Steller sea lions) (NMFS 2018a). Due to the information stated above and given current aerial survey protocols (discussed in Section 3.2), we expect the level of response of Steller sea lions from manned aerial surveys to be low and not result in significant behavioral responses.

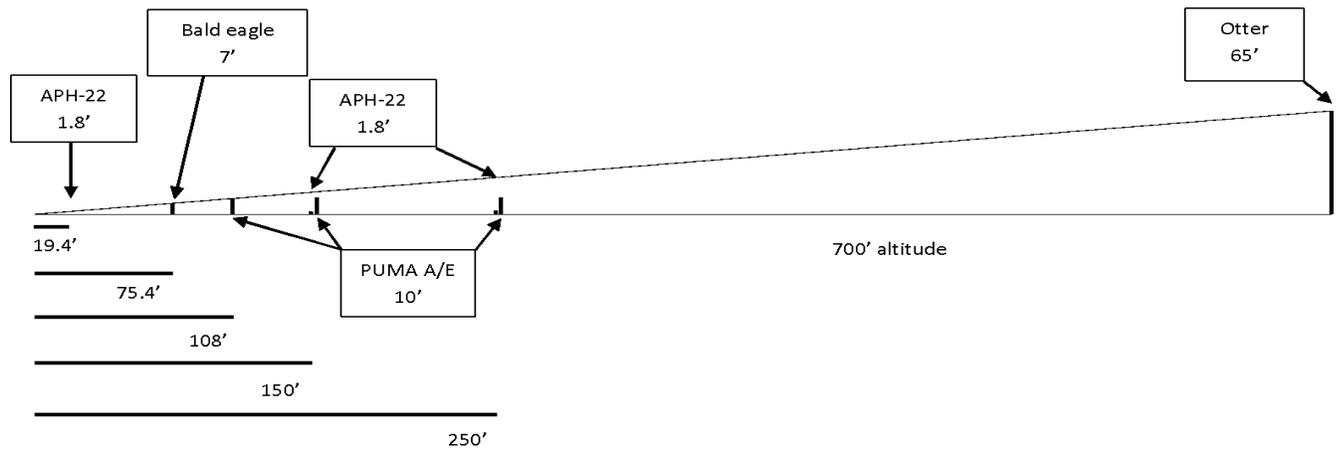


Figure 18. Comparison of silhouettes of Twin Otter manned aircraft (65 feet wingspan), an APH-22 unmanned aircraft system (1.8 feet diameter), a Puma A/E unmanned aircraft system (10 feet wingspan), and a bald eagle (7 feet wingspan) (ADF&G 2019).

In addition to use of manned aircrafts, we expect effects on Steller sea lions from UAS to be minimal. The ADF&G states that UAS devices have been tested by the MML to collect Steller sea lion population data with minimal disturbances to animals. While studying Steller sea lions from Attu Island to the Delarof Islands off of the Aleutian Island chain in Alaska from June to

July, Sweeney et al. (2016) noted that over the course of the 17 flights totaling in almost four hours of flight time, there was only one instance when the observers noted a disturbance causing the sea lions to move from their position. A majority of the sea lions did not react to the presence of the UAS. If they did, their typical reaction was to adjust to an upright posture to look up at the sky with little or no movement from their position (Sweeney et al. 2016). At Ayugadak Island observers flew the UAS above the non-pups and 42 pups. Observers at the cliff edge noted 24 animals moving from their position towards the water edge. Only five of those entered the water, but stayed in the shallows. However, it is believed this disturbance was caused when the pilot adjusted the UAS altitude while over the animals. This is due to the fact that a UAS generates greater sound levels when changing altitude than it does in level flight and the loudness could have been further amplified by echoing off the adjacent 12 meter (39.4 feet) cliff (Sweeney et al. 2016).

11.2.2.2 *Vessel Surveys*

The Permits and Conservation Division proposes the authorization of vessel surveys by the ADF&G, MML, and ASLC to assess the abundance and distribution of Steller sea lions. According to information from the permit applicants, vessels used in the surveys will range from skiffs to larger research vessels. Similar to aerial surveys, vessel surveys may cause brief auditory and visual disturbance of Steller sea lions. The effects from this disturbance may range from no response to initiating a flight response in an aggregation (i.e., a stampede). Since permit applicants (specifically ADF&G) may use multiple vessel surveys at any site per year (depending on funding, staffing, vessel availability, weather), some animals may be harassed more than once during this activity.

Kucey (2005) recorded disturbance events from vessels across eight sites used by Steller sea lions in the summer and sites used in the winter/spring season. During observation, it was noted that vessel disturbance evoked greater responses than aerial disturbances with more than 15 percent of the animals leaving the haulout in response to watercraft (n=36) as opposed to only five percent from aerial surveys (n=20). Kucey (2005) observed that the nature of the vessel approach (i.e., speed, noise, fumes, combined with other variables like weather) influenced the magnitude of the response. However, similar to unintentional disturbance from aerial surveys, effects from unintentional disturbance resulting from vessel surveys are predicted to be ephemeral during the proposed research activities. This is particularly true given that the MML, ADF&G, and ASLC will not cause continued or repeated disturbance of Steller sea lions due to the coordinated efforts by each of the three agencies to minimize disturbance and avoid duplication of research activities (See Section 3.2). In addition, ADF&G (2019) states that during vessel surveys, animals disturbed into the water haulout again within 30 minutes of the disturbance. Due to this information we expect the level of response of Steller sea lions from vessel surveys to be low and not result in significant behavioral responses.

11.2.2.3 *Non-Invasive Terrestrial Research Activities*

Non-invasive terrestrial research activities include remote video monitoring, photo-identification, passive acoustic monitoring, close approach ground surveys, brand resight, behavioral observations, and video/acoustic recording equipment installation/maintenance. These activities were combined together in this response section due to their similar impacts on Steller sea lions. For detailed descriptions on each of these activities, please refer to Section 3.1. The effects from this disturbance may range from no response to initiating a flight response in an aggregation (i.e., a stampede).

Disturbances resulting from non-invasive terrestrial research activity can impact short- and long-term Steller sea lion haulout behavior (Kucey and Trites 2006; Wilson et al. 2012). Steller sea lions, like many other pinnipeds, are sensitive to human presence when they are hauled out on land and may be influenced by chronic disturbance to rookery beaches. Additionally, this disturbance may impact survival due to the trampling of pups by fleeing adults, mother-pup separations, and the interruption of suckling bouts (Engelhard et al. 2002). Disturbance includes a variety of effects, including subtle to conspicuous changes in behavior, movement, and displacement. Reactions to sound, if any, depend on the state of maturity, experience, current activity, reproductive state, time of day, and many other factors (Southall et al. 2007). These behavioral reactions from marine mammals are often shown as: changing durations of surfacing and dives, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior; avoidance of areas; and/or flight responses (e.g., pinnipeds flushing into the water from haulouts or rookeries). If a marine mammal does react briefly to human presence by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, and unlikely to result in long-term effects to the stock or population. For example, while studying the effects of terrestrial research activities on Steller sea lions, Wilson et al. (2012) found that optimally timed, low-frequency research disturbance did not appear to have long-term effects on Steller sea lion behavior or abundance and was largely associated with changes that were similar to natural variation. However, if visual stimuli from human presence displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (Weilgart 2007; Lusseau et al. 2008). However, this level of displacement is not anticipated to occur from the proposed activities considered here, as research activities are not expected to occur for a prolonged period of time and permit applicants will coordinate to prevent repeated disturbance of rookeries and/or haulouts. Due to this information we expect the level of response of Steller sea lions from non-invasive terrestrial research activities to be low and not result in significant behavioral responses.

11.2.2.4 *Non-Invasive Biological Sampling(Scat/Spew/Molt/Salvage Collection)*

As described in Section 3, scat, spew, molt, and salvage collections will be similar to ground surveys that are conducted during research activities and as such, their effects will be similar to the non-invasive terrestrial research activities described above (i.e. unintentional disturbance).

The following examples are taken from an analysis written by the MML biologists that represents the combined experience of both the MML and ADF&G to terrestrial research activities that cause unintentional disturbance. Unintentional effects account for the effects on the proportion of animals unintentionally exposed to a research activity. Researcher presence among animals is expected to have different impacts depending on timing of the activity relative to the sea lion breeding cycle. Expected reactions of exposed sea lions include: (1) becoming alerted (includes physiological reactions that may not be externally expressed); (2) entering water; or (3) sustaining an injury because of the activity (for example, being trampled, or having an elevated physiological stress reaction).

During observation studies, Kucey (2005) notes that scat collection disturbances caused all animals to enter the water when researchers went ashore. In regards to salvaging carcasses, carcasses of non-pups are often found alone, away from other hauled-out sea lions such that no animals would be disturbed. A carcass of a fetus, however, is often found among hauled-out animals which may result in unintentional disturbance. Adult and juvenile sea lions displaced from the rookery typically remain in the water immediately off shore and often return to the beach before the scientific party departs. At some sites, animals have hauled-out again along the periphery of the beach before the scientific party has finished its work and departed the haulout (MML 2019). Due to the information presented above we expect the level of response of Steller sea lions from non-invasive biological sampling to be low and not result in significant behavioral responses.

11.2.2.5 *Non-Chemical Capture (Hand, Hoop Net, Other Net, Underwater Noose, Noose with Pole, Restraint Wrap, Restraint Board, and Squeeze Cage)*

As discussed in Section 3.1.9, several possible capture methods may be used since the applicability and success of each technique varies between age, location, weather conditions and the behavior of the animals on any particular day. The effects from the use of captures by hand, hoop net, other nets, underwater noose, noose with pole, restraint wrap, restraint board, and squeeze cages are discussed below.

Overall, capture and handling of Steller sea lions by each of the methods stated above is expected to elicit an escape-avoidance response and a temporary physiological response as observed in blood cortisol concentrations (Keogh et al. 2013). Although pups may struggle initially after capture, they typically calm down very quickly after being hand-restrained. Once pups are fully restrained, the ADF&G has noted that they have not observed instances of distress reactions (i.e. open mouth breathing, catatonia, etc.) to these activities.

NMFS (2007b) identified the following ways in which animals may potentially be injured during capture. These include:

- Efforts to avoid or escape capture can lead to contusions, lacerations, hematomas, nerve injuries, concussions, and fractures, as well as hyperthermia and myopathy from increased muscle activity.
- Pups herded into large groups for processing or that pile up in response to disturbance on rookeries may be injured or suffocated under the weight of other pups.
- Pups attempting to reunite with their mothers after researchers leave may encounter lactating females who may aggressively displace and injure them.

Nevertheless, NMFS (2007b) notes that while these risks may exist, data at the time of the 2007 PEIS and current data (ADF&G 2019; ASLC 2019; MML 2019) indicate these outcomes are rare. Although rare, mortalities have occurred during captures as a result of pup deaths caused by asphyxia due to pup crowding and drowning (ADF&G 2019; ASLC 2019; MML 2019). However, each of NMFS' Permits and Conservation Division's permits require researchers to corral pups into groups small enough that animals can be adequately monitored to prevent drowning, overheating, suffocation, and injury (See Section 19). Furthermore, as of 2018, the ADF&G program has captured over 700 sea lions using the dive-capture (using underwater nooses and hoop nets) or remote chemical immobilization methods with no mortalities directly associated with the capture technique.

In addition to the effects listed above, capture myopathy was another potential effect resulting from capture noted in NMFS (2007b). Capture myopathy is associated with prolonged or repeated stress reactions in many mammals and characterized by degeneration and necrosis of striated and cardiac muscles. Capture myopathy may be fatal and may not develop until 7 to 14 days after capture and handling. Since NMFS (2007b) was published, capture myopathy has not been documented to occur in pinnipeds although it should be noted that captures are a stressful event for sea lions (ADF&G 2019). Due to the information presented above we expect non-chemical captures of Steller sea lions to be low to moderately stressful events that will be ephemeral in scope and will almost never lead to serious injury or death. Nevertheless, due to the data presented above, there is a possibility that rare occurrences of low level harm, serious injury or mortality may occur.

11.2.2.6 *Chemical Capture (Darting/Injectable Immobilization)*

Chemical immobilization of pinnipeds can be challenging due to their cardio-respiratory adaptations for breath-hold diving. Similar to phocids, otariids are less sensitive to chemical immobilization drugs. Although anesthetic regimens are similar to those of terrestrial carnivores (Haulena 2007), larger otariids can be more difficult to capture and remotely fired darts are sometimes the only option available in field conditions (Gales 1989). Nevertheless, there are reports of decreases in the reliability of anesthesia when darts are employed in comparison to hand injection (Haulena et al. 2000), primarily because drugs administered by darts cannot be titrated to desired effect (Haulena 2007). Immobilization of sea lions with remotely injected

agents has multiple risks, including dart function, variable delivery volumes depending upon site of injection, delay in onset of effects, accidental induction dosages based on improper mass estimates, potential inaccessibility of a darted animal, and drug-related complications (Gales 1989; Haulena 2007). Additionally, accidental intravascular injection is always a possibility, and there may be problems associated with drugs being injected into fat and resulting in variable and prolonged effects (Parry et al. 1981; Baker and Gatesman 1985; Gales 1989). To gain a clearer understanding of potential effects, NMFS (2007b) summarizes these and other effects of chemical immobilization by listing the following:

- Chemical immobilization for sedation or anesthesia requires an accurate assessment of an animal's weight and condition to determine the appropriate dosage. Miscalculation can lead to an overdose that may result in death.
- A dart-injected animal may be injured if it enters the water after being darted and later aspirates water or drowns as the drug begins to take effect.
- Dart injection of anesthetic into blubber rather than muscle tissue can lead to aseptic necrosis and large abscesses.
- Dart injections into the abdominal or chest regions can result in puncture of the stomach or lungs, which may be fatal. The safest injection site for darts are in the deep muscle areas of the hind limbs (NMFS 2007a). However, the blubber layer on pinnipeds can make delivery of an injectable drug into the muscle, where needed for proper absorption and distribution, difficult.
- Darts may hit an animal smaller than intended, leading to an inadvertent overdose.
- Animals under sedation can develop hyperthermia (over-heating) or hypothermia (reduced body temperature) due to stress reactions and the effects of some drugs on thermoregulation. Both conditions can influence the physiological response of the animal to drugs or exacerbate existing health problems.
- Immobilizing drugs can result in respiratory depression or apnea (stopped breathing); muscle spasms; increased salivation, which can lead to choking; and complications for animals that already have kidney or liver diseases.

The following accounts are summaries of both the MML and ADF&G's remote chemical immobilization activities presented in annual reports on past research permits. The MML reports that during October and November of 2010 through 2015, 17 adult female Steller sea lions were successfully captured, handled, released, and tracked in Southeast Alaska (n=3) and the western-central Aleutian Islands (n=13) using combination of medetomidine-butorphanol-midazolam (Haulena 2014). Post-release monitoring ranged from 19 to 267 days, with most tag deployments exceeding durations achieved during the 1990s. The shortest duration deployment of 19 days was confirmed to be due to instrument failure, as the adult female was subsequently observed with a pup during the next breeding season at Alaid Island in the Western Aleutian Islands. Animals that were unsuccessfully sedated were visually followed to confirm survival, during which time the MML observed three types of responses from all the animals, including (1) animals entered

water, but returned to shore and recovered from light sedation with no intervention; (2) animals entered the water and were able to maneuver and surface to breathe; observations of these animals for up to 145 minutes confirmed recovery from sedative effects, and (3) animals entered the water and were remotely-injected by dart with reversal agents for immediate recovery. All of these animals that entered the water were too responsive to capture from the water into a skiff.

In addition to reports from the MML, in June 2013, an ADF&G team successfully darted a 12-year old adult male Steller sea lion (H80, born in 2001 at Hazy Island) at Benjamin Island in Southeast Alaska to disentangle it from packing bands that were constricting around its neck. Dr. Kimberlee Beckmen darted H80 from the bow of a skiff just offshore the haulout. H80 entered the water in less than a minute, and then continued to breathe at the surface while sedatives took effect over about a 20-minute period. The team then worked to disentangle H80 while it remained in the water alongside the skiff. After about 50 minutes, the reversal agents were administered and H80 recovered and swam away (and has subsequently been observed multiple times on Benjamin Island).

In all, the results from both the MML and ADF&G show that Steller sea lions entering the water after injection with sedatives are able to maintain buoyancy and respiration until sedative effects wear off. The combination of medetomidine, butorphanol, and midazolam is sufficiently well-tolerated to buffer against larger dosages if weight estimates are imprecise. This sedative combination also allows the use of reversal agents that initiate a rapid recovery. There have been no observed mortalities related to the MML or ADF&G darting efforts.

The MML and ADF&G's results are a vast improvement over previous studies using dart-delivered sedatives on Steller sea lions in Alaska. Previously, sedation was accomplished using Telazol and mortalities due to Telazol-related complications were a small proportion of the handling risk. Of 16 juveniles and 72 subadult or adult Steller sea lions darted using Telazol during 1990 through 1996, two juveniles (13 percent) and one adult (one percent) died presumably from drug interactions, though an additional 11 juveniles and 41 adults (59 percent of 88 darted) were not handled because they were never sedated, or moved to inaccessible locations. During 1992-1994, Heath et al. (1996) darted 73 adult female Steller sea lions, two of which (three percent) died due to Telazol-related complications, and 22 (29 percent) were not sedated due to dart failure. Mortalities have been associated with giving additional doses of Telazol to animals not successfully inducted, or when attempting to extend the immobilization period (Haulena and Heath 2001). Heath et al. (1996) reported on 51 adult female Steller sea lions that were immobilized with Telazol between 1992 and 1994. Of these 51, there were five mortalities (9.8 percent). Only two of the mortalities were due to Telazol complications. Two Steller sea lions drowned in pools of water on the rookery, and one Steller sea lion died because of a malfunction of the gas anesthesia machine.

With improved methods it was possible to reduce the risk of mortality associated with chemical immobilization. Between 1995 and 2008, an additional 71 immobilization attempts of free-ranging Steller sea lions using Telazol resulted in four mortalities (MML 2019). In two of these

cases the sea lions were spooked when the dart hit them and they moved quickly into the water. One sea lion was ambushed by a large bull as she recovered from anesthesia and despite efforts to move the bull away, the bull pinned the female in a pool of water and she drowned. Only one sea lion died while under anesthesia. Three of these four mortalities occurred on the recapture event, which is much more dangerous than initial captures. By not recapturing with darting methods the risk of mortality is significantly decreased. A significant improvement in method was the addition of atropine sulfate to Telazol in the dart. Atropine is a muscarinic-receptor antagonist, which blocks the parasympathetic stimulus to reduce heart rate. This bradycardia is a key element of the cardiovascular dive response that is sometimes mimicked during Telazol anesthesia. Atropine, therefore, reduces the cardio-respiratory complications of Telazol. Improvements were also made to the gas anesthesia machine to prevent the type of malfunction that occurred in the earlier design.

The mean induction time for Telazol anesthesia in adult female Steller sea lions is approximately ten minutes. Therefore, one of the risks of chemical immobilization is that a sea lion can be spooked into the water before induction is complete. In order to minimize this risk, the MML proposes to exclude sea lions that are close to the ocean shoreline or pools of standing water on the rookery. The darter and observer will be dressed in camouflaging clothes and move slowly and carefully to a position as close to the subject as possible without disturbing it or other sea lions, allowing the shot to be taken from as short a distance as possible. Darting from a short distance will permit lower impact velocities, thus reducing the startle effect of darting. Close proximity to the target sea lion will also facilitate more accurate estimates of mass and quicker access to the sea lion once induction has occurred. Quick access will reduce complications associated with compromised breathing when a sea lion becomes immobilized and adopts a posture that inhibits normal breathing patterns.

Another concern when chemically immobilizing adult female sea lions is the effect of Telazol on the fetus or pup. Telazol has been shown to cross the placental barrier and therefore use of Telazol for Cesarean section in dogs and cats is contraindicated (Telazol drug information sheet; CI 5129-1; Fort Dodge Animal Health, Fort Dodge, IA). Telazol, however, causes less respiratory depression in the fetus than other commonly used injectable anesthetics, and therefore it is commonly used for Cesarean sections in monkeys and cats (MML 2019). There have been no studies on the teratogenicity of Telazol. During the months of June–August, adult female Steller sea lions might be pregnant, but the embryo will be at the arrested blastocyst stage, so any effects of Telazol will be negligible. All darting of adult females would occur during August–May when mothers may be nursing a dependent. The two components of Telazol, tiletamine and zolazepam are both lipophilic compounds with moderate half-lives (two to four hours), so it might be possible for these compounds to be excreted in breast milk. There have been no studies of excretion of Telazol into milk, but other cyclohexamines and benzodiazepines have been examined. In human infants that nursed on mothers shortly after the mothers received high doses of diazepam, a benzodiazepine similar to zolazepam, the plasma concentration in the infant was typically less than ten percent of the mother’s concentration, which is well below the

level that could produce anesthetic symptoms or other complications (Lee and Rubin 1993; Hale 1999). Semple et al. (2000) reported that the tissue residues of Telazol in polar bears were down to trace levels within 24 hours post-immobilization, and even at 12 hours the highest concentrations were still well below the level that could produce an anesthetic effect. It seems unlikely that Steller sea lions could excrete enough Telazol in their milk to have an adverse effect on their pups. Based on the pharmacokinetics of isoflurane, the amount of isoflurane that would be expected to be excreted in milk would be negligible (Lee and Rubin 1993). Furthermore, NMFS is unaware of any reports of anesthetic symptoms or other complications in the pups of immobilized Steller sea lions despite close visual observations of many of the immobilized females and their pups at Lowrie Island in Southeast Alaska by the applicants. Due to the information presented above we expect chemical captures of Steller sea lions to be low to moderately stressful events that will be ephemeral in scope, cause a small wound (low level harm) that is likely to heal properly, and will almost never lead to serious injury or death. Nevertheless, due to the data presented above, there is a possibility that rare occurrences of injury or mortality may occur, although the risk for this is smaller than that of non-chemical capture.

11.2.2.7 *Sedation/Anesthesia*

Effects from anesthesia on Steller sea lions overlap those of chemical immobilization. These effects can include asphyxiation, aspiration of gastric contents, and apnea. These effects are largely due to the fact that pinnipeds have a strong dive response that can be triggered by anesthesia which can lead to breath-holding, apnea, and bradycardia (Haulena and Heath 2001; Haulena 2014). In addition to impacts from strong dive responses, effects from anesthesia can also cause hypothermia. While performing field anesthesia of juvenile Steller sea lions, Lian et al. (2018) observed severe hypothermia with temperatures less than 35 degrees Celsius (95 degrees Fahrenheit) measured in 22 percent of all animals that underwent anesthesia procedures. There was a strong association with the month in which the procedures took place and the occurrence of hypothermia. The majority of hypothermia events occurred in February and March. Hypothermia also had a significant but weak association with length of anesthesia (slope = -0.02, $r^2 = 0.02$, $F_{1,439} = 8.4$, $P < 0.01$) and sex ($F_{2,462} = 8.6$, $P < 0.01$), but no association with year, region, body weight, and time spent resting from capture to start of anesthesia. However, applicants will closely monitor all anesthetized sea lions during research activities to monitor for signs of apnea, respiratory depression, bradycardia, tachycardia, hypothermia, and hyperthermia, and will treat as necessary (See Section 3.2). Since 2001, only one non-rookery pup mortality occurred during ADF&G research activities when a female sea lion aspirated under anesthesia during capture (ADF&G 2019). Effects on Steller sea lions to specific drugs used during sedation/anesthesia events are discussed below:

Isoflurane gas: Inhalation anesthetics such as isoflurane gas are used to induce anesthesia in animals that can be manually restrained, and are commonly used to augment analgesia or increase the depth of anesthesia in animals previously immobilized by injectable agents.

Prolonging immobilization by administering repeated doses of injectable agents is associated with a high risk of mortality, and an additional dose of Telazol should never be given (Gage 1993). Isoflurane, a halogenated ether with potent anesthetic action (NMFS 2007a), is an inhaled general anesthetic that induces reversible depression of the central nervous system, resulting in unconsciousness, analgesia, voluntary muscular relaxation, and suppression of reflex activity (Fowler 1986). Isoflurane is especially useful for short procedures in which rapid recovery and few aftereffects are desirable. The effects of inhalation anesthetics increase predictably with increased dose, unlike injectable agents, which tend to be unpredictable and idiosyncratic among animals (Fowler 1986). In general, captive animals have been observed to fully recover from anesthesia with isoflurane after 8 hours (Gage 1993). Isoflurane gas appears to have the best recovery characteristics, and be safe and reliable, in otariids (Haulena and Heath 2001).

Lidocaine: A surface anesthetic effect, e.g. loss of feeling or sensation, can be achieved by subcutaneous injection. Lidocaine hurts for several seconds to a minute following injection into the skin. Lidocaine can produce serious side-effects if injected intravascularly, and if accidentally swallowed, can cause convulsions. The use of lidocaine with epinephrine is contraindicated as it may cause tachycardia (rapid heart rate). As a surface anesthetic, lidocaine is relatively safe, as evidenced by its availability in a variety of over-the-counter topical preparations for relieving pain and itching in humans (NMFS 2007a).

Valium: The effects are dose-related, and cumulative. It is metabolized by the liver and excreted by the kidneys. Possible side effects include bradycardia (slowed heart rate), respiratory depression, tremor, confusion, photo-phobia, blurred vision, nausea, vomiting, depressed gag reflex, lethargy, and ataxia (inability to coordinate muscle activity during voluntary movement). It should be used with caution in animals experiencing shock. Injectable valium is irritating to the vein and tissue, and may cause pain during administration. It has a rapid onset when given intravenously (NMFS 2007a).

As shown, the use of sedation/anesthesia may cause potential adverse side-effects to Steller sea lions. Nevertheless, as shown through the data, the risk from these side-effects to cause serious harm or mortality is extremely low. Due to the rare occurrences of injury and mortality as a result of sedation/anesthesia activities, coupled with the conservation measures presented in Section 3.2, we anticipate most adverse responses from sedation/anesthesia on Steller sea lions to be temporary and negligible. However, due to the data presented above on past research activities, there is a possibility that rare occurrences of injury or mortality may occur, although the risk for this is smaller than that of non-chemical capture.

11.2.2.8 ***Biopsy (Darting and Punches)***

Biopsy darting is expected to elicit an escape-avoidance response in most juveniles and adult females but less often in subadult and adult males (Hoberecht et al. 2006a). The small wound site may drip blood for about ten minutes (Hoberecht et al. 2006a). The physiological response from darting is similar to a reaction created by other small wounds obtained by natural causes. Hazards of remote biopsy sampling include inadvertently striking vulnerable areas such as the

head or abdomen, darts that penetrate too deeply and cause excessive bleeding or tissue damage, stuck darts or broken tips remaining attached to the animals, causing irritation and possibly abscess and infection, and inadvertent repeated sampling of the same individual, thereby compounding the effects on that animal (NMFS 2007b). Depending on the depth of penetration and force of impact biopsy darts can damage internal organs if they strike the abdominal area, resulting in a fatal wound that may not be detected by researchers at the time of sampling. Animals can also be severely injured if darts strike them in the head (Gemmell and Majluf 1997).

NMFS (2007b) states that biopsy punches for skin and blubber samples produce a small wound that has the potential for infection, especially when considering the unsanitary conditions of the environment. An otherwise healthy animal should be able to heal and recover from a properly performed procedure, but animals with compromised immune systems may develop major complications. In addition, this procedure may cause more than momentary pain. Muscle biopsy produces a small-diameter deep wound that can bleed excessively and tends to heal at the surface prior to deep tissue healing, thereby increasing the chances of abscess formation, particularly if the biopsy needle or dart was not properly sterilized. Biopsy wounds, as with any wounds including those acquired during intra-species aggressive interactions, may become contaminated despite use of sterile equipment. Therefore, leaving the wound open to drain should an abscess form, rather than suturing closed, is preferable (NMFS 2007a). As with skin and blubber biopsies, unhealthy animals or those with compromised immune systems may develop major complications from such an infection.

Success rates for collection of skin was 96 percent ($n = 296$ strikes) with virtually no adverse effects (Hoberecht et al. 2006a). Responses of Steller sea lions biopsied with the larger darts used by Hoberecht et al. (2006a) varied by age/sex class: 95 percent of juveniles, 65 percent of adult females, and 30 percent of adult males left the haulout after they were darted, often returning within five minutes. Unintentional disturbance may occur during darting, varying broadly from zero to 200 animals per event. The MML will reduce potential unintentional disturbance by choosing to dart animals that are not in large groups when possible. Previous work noted dart retrieval (by pulling in the retrieval line) caused unintentional alerts and movements; however this can be minimized by retrieving darts slowly, avoiding brightly colored darts and line (Hoberecht et al. 2006a) and ensuring disturbed Steller sea lions have safe egress routes available. Given the data presented above, we anticipate adverse responses from biopsy on Steller sea lions to be negligible. Biopsy may cause a small wound site but this is expected to heal. Although there is a small chance that the wound may lead to infection, due to the conservation measures presented in Section 3.2, this is unlikely to occur. In addition, we anticipate any unintentional disturbance of non-targeted Steller sea lions during biopsy darting to be low and not result in significant behavioral responses.

11.2.2.9 *Handling and Biological Sampling/Testing of Restrained/Sedated/Anesthetized Sea Lions*

As discussed in Section 3.1.10, collection of skin, blubber, muscle, blood, hair, nails, vibrissae, milk, morphological measurements, stomach content fecal matter, urine, swabs, and teeth will be conducted by experienced personnel from either anesthetized or properly restrained animals. In addition, during these activities, researchers will also evaluate an individual Steller sea lion's health and condition by conducting bioelectrical impedance, ultrasounds, and injecting Steller sea lions with DTO, NaBr, and Evans blue dye. A summary of the impacts expected from these activities presented are presented below:

Skin/Blubber/Muscle Biopsy: As mentioned in the section above, biopsy samples can produce wounds that, as with any wound, have the potential for infection, particularly given the unsanitary environment of the rookeries. An otherwise healthy animal should be able to heal and recover from a properly performed procedure, but animals with compromised immune systems may develop major complications. More discussion on the effects of blubber/muscle biopsy is presented above in Section 11.2.2.8.

Blood collection, Bioelectrical Impedance, and Ultrasound: The potential long-term effects of conducting bioelectrical impedance, ultrasound, and collecting serial blood samples have not been well studied (NMFS 2007b). Each of these procedures necessitate the extended restraint of animals, which may increase the risk of stress-related effects and behavioral changes when the animals are released (this is the only known risk related to ultrasound activities). All procedures that require insertion of needles (i.e., blood collection and bioelectrical impedance) carry the risk of infection and abscesses that may affect an animal's general health. To reduce this risk, Steller sea lions may be scrubbed with betadine or ethyl to prevent infection. Use of these substances may cause a temporary burning sensation and itching can occur (NMFS 2007a). In addition, blood collection can cause pain, stress, damage to the vein, abscesses, and clotting, particularly when multiple attempts are made on the same animal, but if animals are anesthetized, there would be no pain associated with the insertion of the needles.

The ADF&G (2019) states that there are currently no known hazards to the individual sea lion as a result of these activities discussed here. However, the 2000 annual report for Permit No. 881-1443 (ASLC) reported development of a subcutaneous abscess on a captive adult female Steller sea lion, apparently resulting from tissue necrosis induced by the focal electrical current at the site of a bioelectrical impedance electrode implant (NMFS 2007a). The abscess was opened for drainage and began to heal slowly over the next five to six months. However, a scab and area of granulation tissue then formed at the site and was treated with topical antibiotics for several months, resulting in a small area of scar tissue, which will likely remain hairless. In addition to this, removing a volume of blood too large relative to the animal's mass and ability to replace what was taken can result in fatigue, anemia, weakened immunity, and problems with clotting. However, when performed by a qualified, experienced person using commonly accepted

standards of good practice (measures mentioned in Sections 3.1.10.2 and 3.2), we anticipate these risks will likely be negligible.

Injection of DTO, NaBr, and Evans blue dye: The potential long-term effects of injecting Steller sea lions with substances for research purposes, such as DTO, NaBr, and Evans blue dye have not been well studied (NMFS 2007b). These procedures necessitate the extended restraint of animals, which may increase the risk of stress-related effects and behavioral changes when the animals are released. Also, similar to blood collection and bioelectrical impedance, all procedures that require insertion of needles carry the risk of infection and abscesses that may affect an animal's general health. However, due to proper veterinary standards proposed by each of the applicants we anticipate these risks negligible.

Evans blue dye is a diazo dye used for determination of blood volume on the basis of dilution of a standard solution of the dye in plasma following intravenous injection. The dye binds to albumin in the blood stream and remains bound long enough to circulate and distribute in the entire plasma volume of the blood stream. Evans blue was carcinogenic in one study in rats when administered intraperitoneally. It produced sarcomas of the reticuloendothelial system in the liver. This dye is considered a teratogen at high doses, which can cause abnormal prenatal development. However, ADF&G (2019) states that there are currently no known hazards to the individual sea lion as a result of these activities. Also, this dye is currently used safely for numerous human medicine applications (NMFS 2007a).

DTO is a stable, relatively non-toxic and naturally occurring isotope. Up to 20 to 25 percent of body water can be replaced by deuterium oxide in mice before toxic effects are observed. The use of deuterium oxide increases the amount of time an individual animal must be handled due to the need for multiple blood samples prior to and after administration. During past research activities, Steller sea lions at the ASLC would undergo deuterium oxide procedures while under anesthesia, thus reducing stress from repeated blood sampling. Sea lions at the ASLC have previously been administered DTO up to every four months while under anesthesia with no adverse reactions (NMFS 2007a).

NaBr is used in conjunction with DTO. ADF&G (2019) states that there are currently no known hazards to the individual sea lion as a result of these activities. Also, past test experiments on volunteer humans test subjects using smaller doses of NaBr than what is currently proposed by the ADF&G showed no adverse effects from NaBr intake (van Gelderen et al. 1993). As a result, we anticipate risks from the injection of DTO, NaBr, and Evan's blue dye to be negligible.

Collection of Hair, Nails, Vibrissa, Milk and Morphometric measurements: Clipping whiskers, clipping hair, clipping nails, collecting milk from lactating females, and conducting morphometric measurements (i.e. measuring length, weight, and metabolic rate through the use of a metabolic chamber) is not likely to result in any pain for Steller sea lions. However, the pulling of a whisker may cause more than momentary pain due to the highly sensitive nature of this sensory organ. The area of the snout where the vibrissae follicles are located is highly vascularized with numerous nerve endings to enable a sea lion to use its vibrissae to search for

food even at very cold temperatures (Gee 1998). The effects on the animal of clipping a whisker, toenail or patch of hair, conducting morphological measurements, and collecting milk from lactating females are negligible compared to the effects of capture and restraint. In addition, even though effects from pulling whiskers are great than that of clipping, adverse effects on the animal of pulling a whisker are probably largely negligible compared to the effects of capture and restraint. The effects of milk collection through stomach intubation on pups is discussed below.

Stomach intubation, Enemas, Fecal Loop, Urine, and Swabs: Stomach intubation carries the risk of introducing fluids into the trachea and lungs, which may lead to initiating aspiration pneumonia or death. There is also a risk of cross-contamination if equipment is not properly disinfected between animals. However, when performed by a qualified, experienced person using commonly accepted standards of good practice, these risks are likely negligible. Enemas and fecal loops carry the risk of perforating the rectum, which may lead to peritonitis. Any time a foreign object is inserted into the rectum there is the possibility of perforation, which can lead to peritonitis that may result in death. In addition, there is the slight potential to introduce or spread infection if fecal loops, catheters (for urine collection), and swabs are not used properly. When performed by a qualified, experienced person using commonly accepted standards of good practice, these risks are likely negligible. The risks associated with capture and restraint are also associated with this procedure.

Tooth Extraction: The potential adverse effects of canine tooth extractions relate to the risks of capture, anesthesia, and the possibility of infection following extraction. The procedure may result in more than momentary pain, which could temporarily interfere with the animal's ability to forage. Goebel et al. (2003) measured differences in survival to the next year and natality for adult female Antarctic fur seals (*A. gazella*) in which a post-canine tooth was removed under isoflurane gas anesthesia. These females were anaesthetized for greater than ten minutes for various procedures, one of which was removal of the first post-canine tooth in a subsample of those processed. No significant differences were found in survival and natality of these adult females when those with and without tooth removal were compared.

Although complications may be present with the activities mentioned above, it is important to mention that applicants have observed no noticeable effects when handling, collecting biological samples, and testing sea lions (ADF&G 2019; ASLC 2019; MML 2019). In addition, recaptures of animals have indicated that no adverse effects have occurred to animals that have undergone invasive procedures requested by applicants (MML 2019). Blubber/muscle biopsy and tooth removal sites have healed, as have genetic tissue collection sites. The volume of blood collected (less than 4 milliliters blood per kilogram body mass) is based on the body weight due to the extreme value of archiving any additional serum or plasma that is not consumed by the current research analyses, and this relative volume has been recommended by marine mammal veterinarians as a negligible amount (ADF&G 2019).

In assessing behavior, previously dive-captured animals have chosen to interact with divers within hours to days of their first capture (MML 2019). However, during more recent capture and handling work, based on manual restraint (pup rookery branding/sampling) or remote chemical immobilization, it has not been possible to judge whether, or not, previously captured individuals are more or less likely to interact with researchers. However, satellite tagged sea lions have been tracked actively moving and diving subsequent to remote chemical immobilization and – where branded or otherwise identified by natural markings – have been resighted during regular brand resight surveys. Baker and Johanos (2002) conducted a study on the effects of research handling on the endangered Hawaiian monk seal (*Monachus schauinslandi*) by analyzing differences in subsequent year survival, migration and condition between handled seals and controls between 1983 through 1998 (n=549 handled seals). Handling included attaching telemetry devices, blood collecting and tagging. No significant differences in one-year resighting rates, migration rates or condition were noted. They concluded that conservative selection procedures and careful handling techniques have no deleterious effects on monk seals. Due to this data and given the information presented above for Steller sea lions, we expect the effects for handling and biological sampling of Steller sea lions to cause harassment leading to low to moderate stress events. However, these effects are only expected to be temporary in nature.

11.2.2.10 *External Instrument Attachment/Marking*

External instrument attachment and marking can result in potential impacts to Steller sea lions. In a review of both tagging and marking effects on marine mammals as a whole, Walker et al. (2011) claims that marking and tagging can cause pain and changes in swimming/haulout behavior, maternal attendance and the duration of foraging trips. However, Walker et al. (2011) states that impacts from marking and tagging has typically not been found to affect survival.

Studies of marked/tagged pinnipeds have tended to focus on effects such as maternal foraging and attendance behavior (Walker and Boveng 1995) and survival and migration (Baker and Johanos 2002). For example, Antarctic fur seals (*Arctocephalus gazella*) fitted with both time-depth recorders and radio-transmitters had increased foraging-trip and nursing-visit durations compared with animals carrying only radio-transmitters (Walker and Boveng 1995). Another study using devices attached with epoxy glue examined the effects of research handling, including blood sampling, flipper tagging and the placement of time-depth recorders, data loggers and video recorders, on the migratory behavior, survival and body condition of Hawaiian monk seals, and found no difference between control and handled animals (Baker and Johanos 2002). There was, however, no direct assessment of how the attachment of devices affected the behavior or foraging success of the animals.

NMFS (2007b) summarizes impacts from these activities by stating the following possible complications involved with internal and external instrument attachment of Steller sea lions:

- External attachment of instruments to the fur or skin with epoxy can cause irritation and lead to increases in grooming behavior with reductions in foraging behavior and other

normal behavior. The hydrodynamic drag created by the instrument can hinder swimming performance and result in increased energetic costs of swimming, potentially affecting foraging efficiency.

- Use of dyes, bleach, paint, or other chemicals to temporarily mark the pelage of Steller sea lions or Northern fur seals can potentially cause irritation, and some of the chemicals can be toxic if ingested, and, if they get into an animal's eye can result in blindness. Additional physiological or behavioral effects of temporary pelage marking are unknown, but potentially could alter thermoregulation or grooming behavior.
- Flipper tags create puncture wounds that produce more than momentary pain, include chances of infection, and may also pull out over time, creating a rip in the flipper.

Other examples of effects from flipper tags can include changes in haulout behavior, however impacts on migration patterns has not been observed within pinnipeds. For example, tagged Hawaiian monk seals hauled out further from the marking site than did untagged animals (Henderson and Johanos 1988). Another study showed that migration rates of Hawaiian monk seals were not influenced by flipper tagging (Baker and Johanos 2002). Similarly, there was no segregation or rejection between unmarked northern fur seals and animals marked with fluorescent pelage paste (Griben et al. 1984).

No study has found that visual tags affect survival (Henderson and Johanos 1988; Baker and Johanos 2002; Hastings et al. 2009). However, visual tags can cause destruction of tissue at the site of tag attachment (Irvine et al. 1982) and have been known to cause subsequent tissue damage when torn out (Henderson and Johanos 1988). Paterson et al. (2010) used infrared thermography to monitor the healing process after the attachment of flipper tags in grey seals and found small increases in surface temperature during the healing process, with some animals presenting with exudate, swelling and partially open wounds; 24 days after tagging, these signs were no longer present. Paint was not reported to cause histological abnormalities in a single study comparing tissue biopsies of painted and unpainted regions from northern fur seals marked with fluorescent paste (Griben et al. 1984).

Trites (1991) re-evaluated data collected from 1957 to 1966 to determine whether flipper tagging and marking affected growth rates in northern fur seal pups. A previous assessment of the data by (Abegglen et al. 1957) concluded that marking reduced growth rates, but Trites (1991) found that tagged and untagged pups grew at the same rate and suggested that differences in weight may have been due to inadvertently selecting smaller pups that were more easily captured. Due to the data presented above, we expect the effects of external instrument attachment and marking to result in low level harassment or harm that will only be temporary in nature (i.e, when the device is being attached or mark is applied).

11.2.2.11 *Hot Branding*

Hot branding can result in potential negative impacts to Steller sea lions. NMFS (2007b) states that hot-brands are the permanent marking method currently used for Steller sea lions and can

lead to stress, pain that is more than momentary, wounds that remain open for prolonged periods, and infection. MML (2019) states that the behavior of branded pups is not observably different from that of other handled and restrained pups. In a study published after NMFS (2007b), (Mellish et al. 2007) observed statistically significant increases in white blood cell counts, platelet levels, and globulin and haptoglobin concentrations up to two weeks after branding juvenile Steller sea lions, typical of a response to minor tissue trauma, and all returned to normal levels within 7-8 weeks. They conclude that though there is a short-term immune response to branding, recovery is rapid and no lasting effects occur that would impair function or result in mortality. The short-term survival rate of marked pups one to three months old at two rookeries in the Western DPS was high (asymptotic apparent daily survival rate of 0.9995 per day), strongly suggesting no mortality was associated with handling and branding of pups, or with the rookery disturbance caused by the process (Fritz et al. 2018). This result is also corroborated by the MML's assessment that juvenile survival through the first five years of life measured by observations of sea lions branded, as survival of pups has greatly improved over the survival estimated from the period of large population decline (Fritz et al. 2014), thus hot branding does not appear to exert negative effects on pup survival rates. In addition, observed behavioral responses of Steller sea lions have demonstrated that previously dive-captured and branded animals have chosen to interact with the ADF&G divers within hours to days of their first capture (ADF&G 2019), indicating this method of branding does not have persistent or long-term deleterious effects on the animals. Due to the data presented above, we expect the effects of hot-branding to result in low level harm that will only be temporary in nature (i.e, when the hot-brand applied).

11.2.2.12 *Lethal Take*

As shown in Section 11.2.1, lethal takes of Steller sea lions may occur under Permit Nos. 22289, 22293, and 22298. Although lethal takes of Steller sea lions during each of the applicants' proposed activities will not be planned, there is a potential for a small number of unintentional lethal take that could occur as a result of the proposed activities. For example, as stated in Section 11.2.2.5, sea lion pups may die due to unexpected crushing or drowning events during capture activities. The ADF&G has conducted research under its current five-year Permit No. 18537 with two mortalities recorded during capture and handling of sea lions (branding and sampling of rookery pups) during a single rookery branding event (July 2016 at Graves Rocks). These animals drowned in an on-rookery puddle after net capture and movement to a holding area prior to branding and sampling. Old, sick, or weak adults Steller sea lion may be exposed to mortality events during chemical capture, handling and sampling. Since 2001, one non-rookery pup mortality occurred during the ADF&G research activities when a female sea lion aspirated under anesthesia during capture. Also, unintentional lethal take can occur even if a Steller sea lion was not observed to be deceased. For example, the ASLC states that if a lactating female were to die during the course of research, attempts will be made to capture the orphaned pups and transfer them to an appropriate stranding facility. However, if the attempt fails, both the mother and the dependent pup will be counted as two separate mortalities. The reason for this is

because the ASCL would be unable to capture, raise, and re-release a dependent pup, and the fate of the pup in the wild will likely be unknown. As a result, we would assume this to be a lethal take due to a high-likelihood that the pup would not be able to be properly nourished since it has not fully weaned. Plans to conduct euthanasia of Steller sea lions in emergency situations (i.e. serious injury) have also been established for each of the permit applicants (see Section 3.1.9.10).

The criteria that NMFS and the applicants used to estimate lethal takes of Western DPS of Steller was based on the number of prior mortality events from current and previous authorizations for the MML, ASCL, and ADF&G Steller sea lion research activities. Death of an individual Steller sea lion would have a direct fitness consequence to the individual leading to lost reproductive potential that the individual might contribute to the population or sub-population. This lost reproductive potential will vary depending on the sex (male or female) and maturity of the individual. The death of a male would have less of an effect on the population than the loss of a female. Loss of a sexually mature female will have immediate effects on recruitment while lost reproductive potential from mortality of a juvenile female might not be realized for several years. However, due to the low number of proposed annual mortality by each of the permit applicants (nine proposed annual lethal takes), population-level effects from the proposed lethal takes under Permit No. 22289, 22293, and 22298 are anticipated to be negligible. This is discussed in detail in the *Risk Analysis* (Section 11.3) below.

11.2.2.13 *Long Term Effects from Research Activities*

Monitoring the long-term effects of activities has been an on-going process and the MML will continue monitoring programs that have already been implemented at field camps on Ugamak and Marmot Islands. For example, during the period 2000 through 2008, the MML monitored the effects of its activities during pup counts and handling at all rookeries visited, and independent observations were made by observers at two rookeries, including Ugamak and Marmot Islands. No stampeding occurred at any rookery visited, and non-pups displaced typically remained in the water immediately offshore and often began returning to the beach before the scientific party departed. No mortalities were observed to occur during the conduct of, or as a consequence of, any pup survey activities. Observers at Marmot Island likewise detected no apparent effect of disturbance on pup or non-pup counts subsequent to rookery activities during 2004. During the period 2000 through 2008, observers at Ugamak Island detected no mortalities as a result of branding activities conducted at the Ugamak Bay and Ugamak North rookery locations. Observers at Marmot Island detected no apparent difference in mortality for branded and unbranded pups during weeks subsequent to branding. Observers at Marmot Island also detected no apparent difference in pup counts subsequent to branding operations during 2004.

An analysis of Marmot Island data collected during 2000 through 2005 compared sea lion counts and behavior between years with and without researcher presence during the breeding season (Fritz et al. 2008; Wilson et al. 2012). During 2000 through 2005, there were three years with research disturbance and pup branding, and three years with no research disturbance. Count and

behavioral data were modeled with and without disturbance as a factor in generalized linear models. Research disturbance was a significant factor in changes to the proportion of female sea lions resting and exhibiting aggression, and increase in males that were active for one to five days post-disturbance. However, these were the only adult female and male behaviors affected by research disturbance, whereas changes in pup or juvenile behaviors were unrelated to research disturbance. Any potential impact of research disturbance on attendance patterns was within the range of internal variability for all age/sex classes, with the exception of territorial males with females during the first two branding years. In 2007, researchers weighed and measured 50 pups on Marmot Island, but did not conduct branding operations. The Fritz et al. (2008) model was then extended to test this additional year of research disturbance without branding. Similar to findings for the 2000 through 2005 data, model analyses indicated that in 2007 counts of all age/sex classes were higher following the research disturbance than were predicted had no research disturbance occurred. There was less change in sea lion behavior than in previous years. However, in branding years behavioral and attendance changes were small and temporary, and research disturbances of any kind were well within the ranges observed in non-research disturbance years.

11.3 Risk Analysis

In this section, we assess the consequences of the responses of individuals that have been exposed to the stressors we have identified as adversely affecting Western DPS of Steller sea lions, the populations those individuals represent, and the species those populations comprise. Whereas the *Response Analysis* (Section 11.2.2) identified the potential responses of ESA-listed species to the proposed action, this section summarized our analysis of the expected risk to individuals, populations, and species given the expected exposure to the stressors (as described in Section 11.2.1) and the expected responses to those stressors (as described in Section 11.2.2).

We measure risk to individuals of endangered or threatened species based upon effects on the individual's "fitness," which may be indicated by changes to the individual's growth, survival, annual reproductive fitness, and lifetime reproductive success. When we do not expect ESA-listed animals exposed to an action's effects to experience reductions in fitness, we will not expect the action to have adverse consequences on the viability of the populations those individuals represent or the species those populations comprise. As a result, if we conclude that ESA-listed animals are not likely to experience reductions in their fitness, we will conclude our assessment. If, however, we conclude that individual animals are likely to experience reductions in fitness, we will assess the consequences of those fitness reductions on the population(s) those individuals belong to.

As noted in the *Response Analysis* (Section 11.2.2), most of the research activities and associated mitigation measures to minimize exposure and associated responses as proposed (other than a negligible amount of lethal take), are not expected to reduce the long-term fitness of any individual Western DPS of Steller sea lions. In the Environmental Assessment prepared for issuing Steller sea lion research permits in 2002, NMFS (2002) established an average annual

mortality upper limit that was applied to Western DPS of Steller sea lions at a level that even if reached would not cause a significant impact. NMFS (2002) stated that if accidental mortalities in the Western DPS reached ten sea lions in one year (about five percent of the stock's potential biological removal at the time), researchers would then be required to consult with one another to identify research practices and prevent accidental mortalities in the western stock from exceeding 20 sea lions in that year (ten percent of the stock's potential biological removal at the time). In NMFS (2002), a potential biological removal of less than ten percent was considered to be negligible and not thought to have a significant effect on Steller sea lion population dynamics. With this mitigation measure in place, NMFS (2002) concluded that accidental mortality from research activities would not have a significant adverse impact on the Steller sea lion population. Since 2002, the Western DPS of Steller sea lion population has risen (Muto et al. 2018). In addition, the number of lethal takes for Permit Nos. 22289, 22293, and 22298 would not reach a threshold of ten takes per year as the total maximum number of mortalities for all permits would be nine. An analysis of long-term population data and anthropogenic threats to Western DPS of Steller sea lions (Atkinson et al. 2008; NMFS 2008) suggest that the low number of expected mortalities related to research activities is not a significant threat to population recovery. In addition to lethal take, most effects to Steller sea lions during the proposed research activities are expected to be short term and any injuries from tagging or biopsies are expected to heal within weeks. This, combined with the low potential for the proposed research activities to have long-term effects on Steller sea lion populations (see Section 11.2.2.13), illustrates that the proposed research activities present a low threat level to Western DPS of Steller sea lions. As such, the issuance of Permit Nos. 22289, 22293, and 22298 are not expected to present any long-term risk to the Western DPS of Steller sea lions.

12 CUMULATIVE EFFECTS

“Cumulative effects” are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 C.F.R. §402.02). 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, we searched for information on future state, tribal, local or private (non-Federal) actions reasonably certain to occur in the action areas. We conducted electronic searches of Google and other electronic search engines for other potential future state or private activities that are likely to occur in the action area. We are not aware of any non-Federal actions that are likely to occur in the action areas during the foreseeable future that were not considered in the *Environmental Baseline* (Section 10) of this Opinion.

13 INTEGRATION AND SYNTHESIS

The *Integration and Synthesis* section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the *Effects of the Action* (Section 11) to the *Environmental Baseline* (Section 10) and the *Cumulative Effects* (Section 12) to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) appreciably reduce the likelihood of both the survival and recovery of a ESA-listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species. These assessments are made in full consideration of the *Status of the Species Likely to be Adversely Affected* (Section 9). For this consultation, the effects were determined to not likely to adversely affect designated critical habitat; therefore only the risk to ESA-listed Western DPS of Steller sea lions are discussed in this section.

The previous discussions separately summarized the probable risks the proposed action poses to threatened and endangered species and critical habitat that are likely to be exposed to the stressors associated with the research activities under Permit Nos. 22289, 22293, and 22298. These summaries integrate the exposure profiles presented previously with the results of our response analyses for each of the proposed actions considered in this Opinion.

13.1 Steller Sea Lion – Western Distinct Population Segment

No reduction in numbers (excluding a negligible amount of estimated mortalities as a result of the research activities) is anticipated to occur during the proposed actions. Based on our analysis of the research activities, we expect a maximum of nine Western DPS Steller sea lions to succumb to annual lethal take by the MML, ASLC, and ADF&G during its proposed activities. As stated in our Risk analysis (Section 11.3), death of an individual Steller sea lion would have a direct fitness consequence to the individual leading to lost reproductive potential that the individual might contribute to the population or sub-population. This lost reproductive potential will vary depending on the sex (male or female) and maturity of the individual. The death of a male would have less of an effect on the population than the loss of a female. Loss of a sexually mature female will have immediate effects on recruitment while lost reproductive potential from mortality of a juvenile female might not be realized for several years. However, the amount of lethal take resulting from the proposed activities would not surpass the threshold implemented by NMFS (2002) which established an average annual mortality upper limit that was applied to Western DPS of Steller sea lions at a level that even if reached would not cause a significant impact. NMFS (2002) stated that if accidental mortalities in the Western DPS reached ten Steller sea lions in one year (about 5 percent of the stock's potential biological removal in 2002), researchers would then be required to consult with one another to identify research practices and prevent accidental mortalities in the western stock from exceeding 20 sea lions in that year (ten percent of the stock's potential biological removal). In NMFS (2002), a potential biological removal of less than ten percent was considered to be negligible and not thought to have a significant effect on Steller sea lion population dynamics. Since 2002, the Western DPS

population has risen (Muto et al. 2018), making the NMFS (2002) annual take limit even more conservative now. As stated in Section 9.1, as of 2017, the best estimate of abundance of the Western DPS of Steller sea lion in Alaska was 11,952 pups and 42,315 for non-pups (total $N_{\min}=54,267$) (Muto et al. 2018). Maximum annual lethal take will account for only less than 0.02 of the population. In addition, current estimates indicate a population growth rate of 2.14 percent and 1.78 percent for non-pup and pup counts of Western DPS of Steller sea lions. Because populations appear to be increasing in size, the species appears to be somewhat resilient to current threats; however, populations west of Samalga Pass (170 degrees West to 172 degrees East) appear to be in decline and the species has not recovered to pre-exploitation levels.

Also, it should be noted that the thresholds used to estimate mortality and serious injury in this consultation are highly conservative as the actual amount of Steller sea lion deaths that have occurred during past authorizations have not reached this level. For example, the ASLC, which proposes the highest amount of annual mortality ($n=4$), has only had one mortality of a Steller sea lion pup during its past ten years of research conducting similar activities in a similar action area (ASLC 2019). Furthermore, an analysis of long-term population data and anthropogenic threats to Western DPS of Steller sea lions (Atkinson et al. 2008; NMFS 2008) suggest that mortality related to research is not a significant threat to population recovery. As a result of this information, no significant reduction in reproduction is expected to occur as a result of the proposed lethal take of Western DPS of Steller sea lions under Permit Nos. 22289, 22293, and 22298.

In addition to lethal take, considering the totality of the research activities, individual Steller sea lions may experience stress, minor injury from tagging or the taking of a biopsy, or have altered behaviors. Under Permit Nos. 22289, 22293, and 22298, 53,528 live Steller sea lions may be exposed to research activities each year. The majority of effects to Steller sea lions are expected to be short term, low level behavioral effects from aerial surveys, vessel surveys, ground surveys, non-invasive research activities, and unintentional disturbance from capture and branding activities which consist of 51,521 of the 53,528 individuals being impacted. Invasive procedures which will directly take Steller sea lions by capture, branding, tagging, biopsy, handling and sampling will only include 2,007 individual Western DPS of Steller sea lions a year which only makes up 3.7 percent of the Western DPS of Steller sea lions. Any injuries from tagging or biopsies are expected to heal within weeks. External instruments and tags are not expected to cause a hindrance to swimming or haulout behavior because of the small size and mass of the tags compared to the size of Steller sea lions. Behavioral and physiological responses that may be exhibited by Steller sea lions upon tagging are expected to return to normal soon after tag attachment. Other than a small amount of proposed lethal take, none of the research activities are expected to result in any intermediate or long-term fitness consequences for individual Steller sea lions. As such, we do not anticipate the proposed research activities will impede the recovery objectives for Steller sea lions. The Final Recovery Plan for Western DPS of Steller sea lions claims that the ultimate goal of the plan is to promote the recovery of the Western DPS of Steller sea lion, and its ecosystem, to a level sufficient to warrant its removal from the federal List of

Endangered and Threatened Wildlife and Plants (List) under the ESA. The intermediate goal is to reclassify the Western DPS from endangered to threatened. The following recovery objectives are relevant to the overall purpose of the proposed actions:

- Continue population monitoring and research on the key threats potentially impeding sea lion recovery.

Due to no effects on the distribution of Western DPS of Steller sea lion populations as a result of the proposed action, we do not anticipate the proposed research activities will impede the recovery objectives for Steller sea lions. In conclusion, we believe the effects associated with the proposed action are not expected to cause a reduction in the likelihood of survival and recovery of Western DPS of Steller sea lions in the wild.

14 CONCLUSION

After reviewing the current status of the ESA-listed species, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent actions, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of Western DPS of Steller sea lions.

15 INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a 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 (16 U.S.C. §1532(19)). NMFS defines "Harm" as "an act which actually kills or injures fish or wildlife and may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering (50 CFR 222.102). NMFS' interim guidance defines "Harass" as an act that "creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering" (NMFSPD 02-110-19). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this incidental take statement.

All research activities associated with the issuance of Permit Nos. 22289, 22293, and 22298 involve directed take for the purposes of scientific research. Therefore, the NMFS does not expect the proposed action will incidentally take threatened or endangered species. However, we request that the Permits and Conservation Division report to us whether the MMPA-authorized take specified in Table 2, Table 3, and Table 4 actually occurs and the actual numbers of take in comparison to the permitted MMPA take numbers at the expiration of the permit, as well as any

available information on the response animals exhibited to those takes. Such information will be used to inform the *Environmental Baseline* and *Effects of the Action* for future consultations for the authorization of permits to the ADF&G, MML, and the ASLC, and other similar research activities permitted by the Permits and Conservation Division.

16 CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on ESA-listed species or critical habitat, to help implement recovery plans or develop information (50 C.F.R. §402.02).

We make the following conservation recommendations, which will provide information for future consultations involving the issuance of permits that may affect ESA-listed marine mammals:

Documentation of Responses in Annual Reports

Researchers should thoroughly document the time spent in all attempted capture and release activities and the responses of target animals to these activities in order to assess stress responses on the part of these animals and develop measures to further minimize the stress responses of captured animals as a result of capture and release activities. In addition, researchers should thoroughly document the behavioral reactions to all sampling and tagging activities in order to determine whether additional measures to further minimize stress are needed. Researchers should submit this information to the Permits and Conservation Division as part of their required annual reporting. The Permits Division should post this information on their Authorizations and Permits for Protected Species online database (<https://apps.nmfs.noaa.gov/>) including all attachments detailing the results.

Documentation of Responses in Future Permit Applications

The Permits and Conservation Division should require that all researchers conducting invasive tagging of pinnipeds provide detailed information on the responses they have observed from their past research. Researchers should provide a high-level of detail in their application and supporting materials to inform recommendations related to minimizing impacts of invasive tagging on ESA-listed pinnipeds. These reports should be provided to the ESA Interagency and Cooperation Division during future Section 7 consultations involving pinniped research.

Results of Tagging

The Permits and Conservation Division should gather data from researchers conducting invasive tagging of pinnipeds to provide detailed information on how many tags were successfully deployed, how many tags were unsuccessfully deployed, how many tags failed to transmit

entirely, and how many tags were delayed and for how long in transmitting after deployment. This should be provided as part of the annual reporting.

Data Sharing

The Permits and Conservation Division should work to establish protocols for data sharing among all permit holders. While many researchers in the community collaborate, having a national standard for data sharing among all researchers permitted by the NMFS will reduce impacts to trusted resources by minimizing duplicative research efforts. We recommend basic reporting information be required from each researcher including the species, location, number of individuals, and age, sex, and identity (if known) at the expiration of each permit. This information would further inform the tracking of impacts of multiple research activities on ESA-listed cetaceans.

Aggregate Take Tracking

The Permits and Conservation Division should develop a system for tracking and evaluating the extent of take issued and that which is realized for any given population of ESA-listed species. The Permits and Conservation Division's current permit tracking allows tracking of individual permit takes. For the purpose of understanding the extent of research at broad scales (e.g., number of research permits in a particular region), it remains difficult to quantify the extent of take each individual population of ESA-listed species may be subject to across permits for any given period of time. Such aggregate take tracking would be better enable us to evaluate the impacts of multiple, simultaneous research efforts on ESA-listed species.

Standard Mitigation Measures for Corralling Pups

The NMFS Permits and Conservation Division should consider standard mitigation measures that limit or restrict the practice of corralling pups. Standardized mitigation measures similar to the protocols implemented by the ADF&G should be considered a good example in preventing unnecessary stampede events and/or pup deaths caused by overcrowding and drowning during research activities.

In order for NMFS' ESA Interagency Cooperation Division to be kept informed of actions minimizing or avoiding adverse effects on, or benefiting, ESA-listed species or their designated critical habitat, the Permits and Conservation Division should notify the ESA Interagency Cooperation Division of any conservation recommendations they implement in their final action.

Action Agency

We recommend the MML consult with the ESA Interagency Cooperation Division on the funding and/or carrying out their research activities, in addition to the Permits and Conservation Division for the proposed issuance of scientific research permits, as they are also part of the same Federal agency that should ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat.

In order for ESA Interagency Cooperation Division to be kept informed of actions minimizing or avoiding adverse effects on, or benefiting, ESA-listed species or their proposed or designated critical habitat, the Permits and Conservation Division should notify the ESA Interagency Cooperation Division of any conservation recommendations they implement in their final action.

17 REINITIATION NOTICE

This concludes formal consultation for the Permits and Conservation Division's proposed action to issue Permit Nos. 22289, 22293, and 22298. As 50 C.F.R. §402.16 states, 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 taking specified in the incidental take statement is exceeded.
- (2) New information reveals effects of the agency action that may affect ESA-listed species or critical habitat in a manner or to an extent not previously considered.
- (3) The identified action is subsequently modified in a manner that causes an effect to ESA-listed species or designated critical habitat that was not considered in this Opinion.
- (4) A new species is listed or critical habitat designated under the ESA that may be affected by the action.

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19 APPENDICES

19.1 Appendix A – Draft Permit No. 22289

The text below was taken directly from the proposed permit provided to us in the consultation initiation package from the Permits and Conservation Division. The final permit may have minor changes that will not affect this Opinion.

Permit No. 22289

Expiration Date: May 31, 2024
Reports Due: September 1, annually

PERMIT TO TAKE PROTECTED SPECIES¹ FOR SCIENTIFIC PURPOSES

I. Authorization

This permit is issued to the Marine Mammal Laboratory (hereinafter “Permit Holder”), National Marine Fisheries Service, 7600 Sand Point Way, NE., Seattle, WA 98115–0070 [Responsible Party: John L. Bengtson, Ph.D.] pursuant to the provisions of the Marine Mammal Protection Act of 1972 as amended (MMPA; 16 U.S.C. 1361 *et seq.*); the regulations governing the taking and importing of marine mammals (50 CFR Part 216); the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq.*); the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR Parts 222-226); and the Fur Seal Act of 1966 (16 U.S.C. 1151 *et seq.*).

II. Abstract

The objectives of the permitted activity, as described in the application, are to measure population status, vital rates, foraging ecology, habitat requirements, and effects of natural and anthropogenic factors for Steller sea lions in North Pacific Ocean areas to promote conservation

¹ “Protected species” include species listed as threatened or endangered under the ESA, and marine mammals.

and recovery efforts through the collection and analysis of data necessary to meet management objectives mandated by the MMPA, to support analyses of human impacts required under the ESA and the National Environmental Policy Act, and as directed by the Post-delisting Monitoring Plan for the Eastern Distinct Population Segment (DPS) of Steller sea lions.

III. Terms and Conditions

The activities authorized herein must occur by the means, in the areas, and for the purposes set forth in the permit application, and as limited by the Terms and Conditions specified in this permit, including appendices and attachments. Permit noncompliance constitutes a violation and is grounds for permit modification, suspension, or revocation, and for enforcement action.

A. Duration of Permit

1. Personnel listed in Condition C.1 of this permit (hereinafter “Researchers”) may conduct activities authorized by this permit through May 31, 2024. This permit may be extended by the Director, National Marine Fisheries Service (NMFS) Office of Protected Resources or the Chief, Permits and Conservation Division (hereinafter Permits Division), pursuant to applicable regulations and the requirements of the MMPA and ESA.
2. Researchers must immediately stop permitted activities and the Permit Holder or Principal Investigator must contact the Chief, NMFS Permits and Conservation Division (hereinafter “Permits Division”) for written permission to resume:
 - a. If three or more Steller sea lions are darted and suffer unanticipated adverse effects, including entering the water and either drowning or disappearing so that their fate cannot be determined.
 - b. If serious injury or mortality² of protected species reaches that specified in Tables 1-5 of Appendix 1.

² This permit allows for unintentional serious injury and mortality caused by the presence or actions of researchers up to the limit in Tables 1-5 of Appendix 1. This includes, but is not limited to: deaths of dependent young by starvation following research-related death of a lactating female; deaths resulting from infections related to sampling procedures or invasive tagging; and deaths or injuries sustained by animals during capture and handling, or while attempting to avoid researchers or escape capture. Note that for marine mammals, a serious injury is defined by NMFS Permit No. 22289

- c. If authorized take³ is exceeded in any of the following ways:
 - i. More animals are taken than allowed in Tables 1-5 of Appendix 1.
 - ii. Animals are taken in a manner not authorized by this permit.
 - iii. Protected species other than those authorized by this permit are taken.
 - d. Following incident reporting requirements at Condition E.2.
3. The Permit Holder may continue to possess biological samples⁴ acquired⁵ under this permit after permit expiration without additional written authorization provided a copy of this permit is kept with the samples and they are maintained as specified in this permit.

B. Number and Kinds of Protected Species, Locations and Manner of Taking

- 1. The tables in Appendix 1 outline the authorized species and stock or DPS authorized; number of animals to be taken; number of animals from which parts may be received, imported and exported; and the manner of take, locations, and time period.
- 2. Researchers working under this permit may collect images (e.g., photographs, video) and audio recordings in addition to the photo-identification or behavioral photo-documentation authorized in Appendix 1 as needed to document the permitted activities, provided the collection of such images or recordings does not result in takes.
- 3. The Permit Holder may use visual images and audio recordings collected under this permit, including those authorized in Tables 1-5 of Appendix 1, in printed materials (including commercial or scientific publications) and presentations

regulation as any injury that will likely result in mortality.

³ By regulation, a take under the MMPA means to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal. This includes, without limitation, any of the following: The collection of dead animals, or parts thereof; the restraint or detention of a marine mammal, no matter how temporary; tagging a marine mammal; the negligent or intentional operation of an aircraft or vessel, or the doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal; and feeding or attempting to feed a marine mammal in the wild. Under the ESA, a take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to do any of the preceding.

⁴ Biological samples include, but are not limited to: carcasses (whole or parts); and any tissues, fluids, or other specimens from live or dead protected species; except feces, urine, and spew collected from the water or ground.

⁵ Authorized methods of sample acquisition are specified in Appendix 1.

provided the images and recordings are accompanied by a statement indicating that the activity was conducted pursuant to NMFS ESA/MMPA Permit No. 22289. This statement must accompany the images and recordings in all subsequent uses or sales.

4. The Chief, Permits Division may grant written approval for personnel performing activities not essential to achieving the research objectives (e.g., a documentary film crew) to be present, provided:
 - a. The Permit Holder submits a request to the Permits Division specifying the purpose and nature of the activity, location, approximate dates, and number and roles of individuals for which permission is sought.
 - b. Non-essential personnel/activities will not influence the conduct of permitted activities or result in takes of protected species.
 - c. Persons authorized to accompany the Researchers for the purpose of such non-essential activities will not be allowed to participate in the permitted activities.
 - d. The Permit Holder and Researchers do not require compensation from the individuals in return for allowing them to accompany Researchers.

5. Researchers must comply with the following conditions related to the manner of taking:

Counting Takes

For Ground surveys and captures

- a. For pinnipeds, you will count 1 take per animal per day for those animals that react to the research activities in these ways:
 - i. Movements of twice the animal's body length or more,
 - ii. Changes of direction greater than 90 degrees, or
 - iii. Retreats (flushes) to the water.

- b. If you are working on land, count takes of all pinniped species encountered on land based on behavioral responses in B.5.a.
 - i. If you are working on land and pinnipeds are in the water, do not count them unless you see an adverse behavioral response from your activities.
- c. Count every animal netted or captured in water even if immediately released. Count and report any non-target species that are netted.
- d. Count and report 1 take per day for each pinniped captured for all procedures including approach, capture, handle, sample, and release.

For Vessel Surveys

- e. If you are surveying pinnipeds hauled out on land from a vessel, count animals that exhibit behavioral response detailed above in B.5.a while on land.
 - i. Do not count pinnipeds that approach the vessel in the water, but
 - ii. Do count pinniped takes in water if there is a noticeable adverse behavioral response.
- f. Do not count takes of pinnipeds as you are transiting between research locations and not actively conducting research.

For Aerial Surveys

- g. If you are counting pinnipeds hauled out on land from a manned or unmanned aircraft, count pinnipeds that exhibit the behavioral responses detailed above in B.5.a for land-based work.
- h. Additionally, to account for animals in the water below the aircraft that may be disturbed from the flyover:
 - i. You are not required to report on takes that occur in water during overflights if there is no obvious adverse behavioral response.
 - ii. If you happen to see a noticeable adverse reaction from a pinniped in water, please include it in your annual reports.

- i. Manned aerial surveys must be flown at an altitude of 500 feet or higher.
- j. Researchers are authorized to use a fixed wing and vertical take-off and landing UAS.
- k. UAS must be flown at an altitude of 150 feet or higher.

Ground Research and Capture

- l. Researchers must carry out activities efficiently and use biologists experienced in capture and sampling techniques to complete the activities as quickly as possible to reduce disturbance and minimize handling time.
- m. Researchers must exercise caution when approaching all pinnipeds, and must take reasonable steps to identify and avoid/minimize capture, sampling, and disturbance of pregnant females and lactating females with pups.
- n. Efforts to approach and capture a particular pinniped or lactating female and pup must be immediately terminated if there is any evidence that the activities may be life-threatening to the animals.
- o. Researchers must take reasonable steps to identify pups of lactating females before attempting to immobilize a lactating female.
- p. Researchers must minimize the time lactating females are removed or otherwise separated from their dependent offspring as a result of research activities.
- q. Researchers must capture and handle pinnipeds in groups small enough so that all animals can be adequately monitored to prevent drowning, overheating, suffocation, and injury.
- r. Researchers must use sterile disposable needles, biopsy punches, and other sampling tools to the maximum extent practicable.
- s. Researchers must thoroughly clean and disinfect all non-disposable equipment between animals and, as needed, immediately prior to each use.
- t. Researchers must consult an experienced marine mammal veterinarian for proper dosages and protocols for use of anesthesia and sedatives, including administration via remote darting.
- u. Researchers must immediately cease research-related procedures if a pinniped is showing signs (e.g., overexertion, constant muscle tensions, abnormal respiration or heart rate) that may lead to serious injury, capture

myopathy, other disease conditions, or death; and monitor and treat the animal as determined appropriate by the PI, CI, or attending veterinarian.

- v. Researchers must ensure that pinnipeds that have been captured and anesthetized or administered immobilizing drugs have an opportunity to recover after release without undue risk of drowning or injury from other animals.

Mortalities

- w. To the maximum extent practical without causing further disturbance, researchers must monitor study sites following any disturbance (e.g., surveys or sampling activities) to determine if any animals have been seriously injured or killed, or if any pups have been abandoned. Any observed serious injury to or death of a marine mammal or observed abandonment of a dependent pup is to be reported as indicated below and in Condition E.2.
- x. If a lactating female dies as a result of the permitted activities and her dependent pup can be identified, or if a dependent pup is abandoned, the PI, CI or veterinarian present will evaluate the pup's age, health, and ability to survive on its own. If the pup is not likely to survive and the pup is not a candidate for rehabilitation, or rehabilitation is not logistically feasible, the PI/CI and/or veterinarian will determine the proper course of action (e.g., euthanasia) in accordance with the approved Institutional Animal Care and Use Committees (IACUC) protocols and the pup must be counted as a research-related mortality.
- y. In the event an animal dies, is euthanized, or if a dependent pup is abandoned as a result of research activities, the Permit Holder must, within two weeks, submit an incident report as described in Condition E.2. For research-related mortalities, a necropsy should be performed, except where not feasible such as in remote areas with limited personnel. Gross necropsy findings should be included as part of an incident report. Final necropsy findings (e.g., histology and other analyses) must be submitted when complete.
- z. Researchers must take appropriate actions (e.g., disinfection procedures) for minimizing the introduction of new disease agents, vectors capable of efficiently transmitting indigenous dormant diseases or those not currently being effectively transmitted, and species that can serve as amplification hosts for transmitting indigenous diseases to other species.

Salvage

- aa. The Permit Holder must coordinate with the NMFS Alaska Region Stranding Coordinator (phone 907-586-7248) prior to collecting samples

or carcasses of any dead stranded ESA-listed marine mammals. The Stranding Coordinator may require the Permit Holder to collect specific data and samples and provide these to the NMFS Alaska Regional Office.

Non-target Species

- bb. This permit does not authorize takes of any protected species not identified in Appendix 1, including those species under the jurisdiction of the United States Fish and Wildlife Service (USFWS). Should other protected species be encountered during the research activities authorized under this permit, researchers must exercise caution and remain a safe distance from the animal(s) to avoid take, including harassment.

Sea Otters

- cc. For activities in areas where sea otters may be encountered, the Permit Holder or PI must follow these conditions to prevent interactions with sea otters:
 - i. Obey all speed zones and drive slowly in all areas with sea otters. Boat strikes are a cause of death for sea otters.
 - ii. If sea otters are observed prior to an encounter, avoid approaching them directly and maintain a minimum distance of 20 meters (66 feet) at all times.
 - iii. If sea otters approach, place boat engines in neutral and allow the animals to pass.
 - iv. If the sea otters are located during aerial surveys, altitudes should be increased to 500 feet and surveys should cease if the sea otters appear to be affected by the over flight.
- dd. During capture events in waters where sea otters may be present, the Permit Holder or PI must follow these conditions to prevent interactions with sea otters:
 - i. Netting activities must cease if a sea otter is sighted within 100 meters.
 - ii. If a sea otter is accidentally captured:

- A. Devote all staff efforts to freeing the animal. Remember that a sea otter must surface approximately every few minutes. The Permit Holder or PI shall brief all participants to ensure that they understand that freeing a sea otter can be dangerous. This briefing will caution people to keep fingers out of the nets, that no jewelry should be worn, that sea otters can reach all parts of their body with their mouth (due to their lack of blubber and need to constantly groom) and deliver a bite that could result in serious injury, and that they give the animal adequate time and room to breathe as they are freeing it.
 - B. As appropriate, turn off the vessel motors or put the engine in neutral. Propellers can seriously injure or kill sea otters.
 - C. Release tension on the net to allow the animal the opportunity to free itself. Exercise caution when attempting to assist the animal. Sea otters can thrash violently if captured or entangled in a net. Quick action is essential to protect the sea otter. Ensure that the animal does not escape with net still attached to it.
 - D. Contact the USFWS offices to report any gear or vessel interactions with sea otters.
- ee. If a sea otter is injured or killed during research activities, in addition to the requirements in Condition B.5.dd.ii above:
- i. Research must be suspended and the USFWS immediately contacted (see contact information below); and
 - ii. Within 30 days of the injury or mortality, a report detailing the circumstances that led to the injury or mortality and suggesting measures to prevent or minimize the chances of future injuries or mortalities must also be sent to: USFWS Division of Management Authority (DMA) (phone: 1-800-358-2104; fax: 703-358-2281, e-mail: Permits@fws.gov); and the USFWS Ventura Fish and Wildlife Office (VFWO), 2493 Portola Road, Suite B, Ventura, CA 93003,(805-644-1766), Lilian_Carswell@fws.gov.
 - iii. In the event of a death of a sea otter, a necropsy should be performed by a qualified veterinarian and details of the cause of death included in the written report in B.5.ee.iii above.

- iv. The USFWS may subsequently recommend continuation of the suspended activities with any necessary modifications/conditions.
- 6. The Permit Holder must comply with the following conditions and the regulations at 50 CFR 216.37, for biological samples acquired or possessed under authority of this permit.
 - a. The Permit Holder is ultimately responsible for compliance with this permit and applicable regulations related to the samples unless the samples are permanently transferred according to NMFS regulations governing the taking and importing of marine mammals (50 CFR 216.37) and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR 222.308).
 - b. Samples must be maintained according to accepted curatorial standards and must be labeled with a unique identifier (e.g., alphanumeric code) that is connected to on-site records with information identifying the following:
 - i. Species and, where known, age and sex;
 - ii. Date of collection, acquisition, or import;
 - iii. Type of sample (e.g., blood, skin, bone);
 - iv. Origin (i.e., where collected or imported from); and
 - v. Legal authorization for original sample collection or import.
 - c. Biological samples belong to the Permit Holder and may be temporarily transferred to Authorized Recipients identified in Appendix 2 without additional written authorization, for analysis or curation related to the objectives of this permit. The Permit Holder remains responsible for the samples, including any reporting requirements.
 - d. The Permit Holder may grant written approval to additional Authorized Recipients for analysis and curation of samples related to the permit objectives. The Permit Holder must maintain a record of the transfer including the following:
 - i. Name and affiliation of the recipient;
 - ii. Address of the recipient;
 - iii. Types of samples sent (species, tissue type); and
 - iv. Type of analysis or whether samples will be curated.

- e. Sample recipients must have authorization pursuant to 50 CFR 216.37 prior to permanent transfer of samples and transfers for purposes not related to the objectives of this permit.
- f. Samples cannot be bought or sold, including parts transferred pursuant to 50 CFR 216.37.
- g. After meeting the permitted objectives, the Permit Holder may continue to possess and use samples acquired under this permit, without additional written authorization, provided the samples are maintained as specified in the permit and findings are discussed in the annual reports (See Condition E.3).

C. Qualifications, Responsibilities, and Designation of Personnel

- 1. At the discretion of the Permit Holder, the following Researchers may participate in the conduct of the permitted activities in accordance with their qualifications and the limitations specified herein:
 - a. Principal Investigator – Thomas Gelatt, Ph.D.
 - b. Co-Investigators – See Appendix 2 for list of names and corresponding activities.
 - c. Research Assistants – personnel identified by the Permit Holder or Principal Investigator and qualified to act pursuant to Conditions C.2, C.3, and C.4 of this permit.
- 2. Individuals conducting permitted activities must possess qualifications commensurate with their roles and responsibilities. The roles and responsibilities of personnel operating under this permit are as follows:
 - a. The Permit Holder is ultimately responsible for activities of individuals operating under the authority of this permit. Where the Permit Holder is an institution/facility, the Responsible Party is the person at the

institution/facility who is responsible for the supervision of the Principal Investigator.

- b. The Principal Investigator (PI) is the individual primarily responsible for the taking, import, export and related activities conducted under the permit. This includes coordination of field activities of all personnel working under the permit. The PI must be on site during activities conducted under this permit unless a Co-Investigator named in Condition C.1 is present to act in place of the PI.
 - c. Co-Investigators (CIs) are individuals who are qualified to conduct activities authorized by the permit, for the objectives described in the application, without the on-site supervision of the PI. CIs assume the role and responsibility of the PI in the PI's absence.
 - d. Research Assistants (RAs) are individuals who work under the direct and on-site supervision of the PI or a CI. RAs cannot conduct permitted activities in the absence of the PI or a CI.
 3. Personnel involved in permitted activities must be reasonable in number and essential to conduct of the permitted activities. Essential personnel are limited to:
 - a. Individuals who perform a function directly supportive of and necessary to the permitted activity (including operation of vessels or aircraft essential to conduct of the activity),
 - b. Individuals included as backup for those personnel essential to the conduct of the permitted activity, and
 - c. Individuals included for training purposes.
 4. Persons who require state or Federal licenses or authorizations (e.g., veterinarians, pilots – including UAS operators) to conduct activities under the permit must be

duly licensed/authorized and follow all applicable requirements when undertaking such activities.

5. Permitted activities may be conducted aboard vessels or aircraft, or in cooperation with individuals or organizations, engaged in commercial activities, provided the commercial activities are not conducted simultaneously with the permitted activities.
6. The Permit Holder cannot require or receive direct or indirect compensation from a person approved to act as PI, CI, or RA under this permit in return for requesting such approval from the Permits Division.
7. The Permit Holder or PI may designate additional CIs without prior approval from the Chief, Permits Division provided:
 - a. A copy of the letter designating the individual and specifying their duties under the permit is forwarded to the Permits Division by facsimile or email on the day of designation.
 - b. The copy of the letter is accompanied by a summary of the individual's qualifications to conduct and supervise the permitted activities.
 - c. The Permit Holder acknowledges that the designation is subject to review and revocation by the Chief, Permits Division.
7. Where the Permit Holder is an institution/facility, the Responsible Party may request a change of PI by submitting a request to the Chief, Permits Division that includes a description of the individual's qualifications to conduct and oversee the activities authorized under this permit.
8. Submit requests to add CIs or change the PI by one of the following:
 - a. The online system at <https://apps.nmfs.noaa.gov>;
 - b. An email attachment to the permit analyst for this permit; or

- c. A hard copy mailed or faxed to the Chief, Permits Division, Office of Protected Resources, NMFS, 1315 East-West Highway, Room 13705, Silver Spring, MD 20910; phone (301)427-8401; fax (301)713-0376.

D. Possession of Permit

- 1. This permit cannot be transferred or assigned to any other person.
- 2. The Permit Holder and persons operating under the authority of this permit must possess a copy of this permit when:
 - a. Engaged in a permitted activity.
 - b. A protected species is in transit incidental to a permitted activity.
 - c. A protected species taken or imported under the permit is in the possession of such persons.
- 3. A duplicate copy of this permit must accompany or be attached to the container, package, enclosure, or other means of containment in which a protected species or protected species part is placed for purposes of storage, transit, supervision or care.

E. Reporting

- 1. The Permit Holder must submit incident and annual reports containing the information and in the format specified by the Permits Division.
 - a. Reports must be submitted to the Permits Division by one of the following:
 - i. The online system at <https://apps.nmfs.noaa.gov>;
 - ii. An email attachment to the permit analyst for this permit; or
 - iii. A hard copy mailed or faxed to the Chief, Permits Division.
 - b. You must contact your permit analyst for a reporting form if you do not submit reports through the online system.
- 2. Incident Reporting

- a. If the total number of mortalities is reached, or authorized takes have been exceeded as specified in Conditions A.2 and B.5, the Permit Holder must:
 - i. Contact the Permits Division by phone (301-427-8401) as soon as possible, but no later than 2 business days of the incident;
 - ii. Submit a written report within 2 weeks of the incident as specified below; and
 - iii. Receive approval from the Permits Division before resuming work. The Permits Division may grant authorization to resume permitted activities based on review of the incident report and in consideration of the Terms and Conditions of this permit.
 - b. Any time a serious injury or mortality of a protected species occurs, a written report must be submitted within two weeks.
 - c. The incident report must include 1) a complete description of the events, and 2) identification of steps that will be taken to reduce the potential for additional serious injury and research-related mortality or exceeding authorized take.
3. Annual reports describing activities conducted during the previous permit year (from June 1 to May 31) must:
- a. Be submitted by September 1 each year for which the permit is valid, and
 - b. Include a tabular accounting of takes and a narrative description of activities and their effects.
 - c. Include data on disturbance rates of marine mammals specific to UAS operations. Details should include, but not be limited to: species, altitude and angle of approach, context of exposure (e.g., behavioral states), and observed behavioral responses to the UAS.
4. A joint annual/final report including a discussion of whether the objectives were achieved must be submitted by (September 1, 2024), or, if the research concludes prior to permit expiration, within 90 days of completion of the research.
5. Research results must be published or otherwise made available to the scientific community in a reasonable period of time. Copies of technical reports,

conference abstracts, papers, or publications resulting from permitted research must be submitted the Permits Division upon request.

F. Notification and Coordination

1. NMFS Regional Offices are responsible for ensuring coordination of the timing and location of all research activities in their areas to minimize unnecessary duplication, harassment, or other adverse impacts from multiple researchers.
2. The Permit Holder must ensure written notification of planned field work for each project is provided to the NMFS Regional Office listed below at least two weeks prior to initiation of each field trip/season.
 - a. Notification must include the following:
 - i. Locations of the intended field study and/or survey routes;
 - ii. Estimated dates of activities; and
 - iii. Number and roles of participants (for example: PI, CI, veterinarian, boat driver, safety diver, animal restrainer, Research Assistant “in training”).
 - b. Notification must be sent to the following Assistant Regional Administrators for Protected Resources as applicable to the location of your activities:

For activities in AK; Arctic Ocean; and Bering, Beaufort, and Chukchi Seas: Alaska Region, NMFS, P.O. Box 21668, Juneau, AK 99802-1668; phone (907)586-7235; fax (907)586-7012;

For activities in WA, OR, CA: West Coast Region, NMFS, 501 West Ocean Blvd., Suite 4200, Long Beach, CA 90802-4213; phone (562)980-4005; fax (562)980-4027; Email (*preferred*): WCR.research.notification@noaa.gov.

3. Researchers must coordinate their activities with other permitted researchers to avoid unnecessary disturbance of animals or duplication of efforts. Contact the Regional Offices listed above for information about coordinating with other Permit Holders.

G. Observers and Inspections

1. NMFS may review activities conducted under this permit. At the request of NMFS, the Permit Holder must cooperate with any such review by:
 - a. Allowing an employee of NOAA or other person designated by the Director, NMFS Office of Protected Resources to observe and document permitted activities; and
 - b. Providing all documents or other information relating to the permitted activities.

H. Modification, Suspension, and Revocation

1. Permits are subject to suspension, revocation, modification, and denial in accordance with the provisions of subpart D [Permit Sanctions and Denials] of 15 CFR Part 904.
2. The Director, NMFS Office of Protected Resources may modify, suspend, or revoke this permit in whole or in part:
 - a. In order to make the permit consistent with a change made after the date of permit issuance with respect to applicable regulations prescribed under Section 103 of the MMPA and Section 4 of the ESA;
 - b. In a case in which a violation of the terms and conditions of the permit is found;

- c. In response to a written request⁶ from the Permit Holder;
 - d. If NMFS determines that the application or other information pertaining to the permitted activities (including, but not limited to, reports pursuant to Section E of this permit and information provided to NOAA personnel pursuant to Section G of this permit) includes false information; and
 - e. If NMFS determines that the authorized activities will operate to the disadvantage of threatened or endangered species or are otherwise no longer consistent with the purposes and policy in Section 2 of the ESA.
3. Issuance of this permit does not guarantee or imply that NMFS will issue or approve subsequent permits or amendments for the same or similar activities requested by the Permit Holder, including those of a continuing nature.

I. Penalties and Permit Sanctions

- 1. A person who violates a provision of this permit, the MMPA, ESA, or the regulations at 50 CFR 216 and 50 CFR 222-226 is subject to civil and criminal penalties, permit sanctions, and forfeiture as authorized under the MMPA, ESA, and 15 CFR Part 904.
- 2. The NMFS Office of Protected Resources shall be the sole arbiter of whether a given activity is within the scope and bounds of the authorization granted in this permit.
 - a. The Permit Holder must contact the Permits Division for verification before conducting the activity if they are unsure whether an activity is within the scope of the permit.
 - b. Failure to verify, where the NMFS Office of Protected Resources subsequently determines that an activity was outside the scope of the permit, may be used as evidence of a violation of the permit, the MMPA, the ESA, and applicable regulations in any enforcement actions.

J. Acceptance of Permit

⁶ The Permit Holder may request changes to the permit related to: the objectives or purposes of the permitted activities; the species or number of animals taken; and the location, time, or manner of taking or importing protected species. Such requests must be submitted in writing to the Permits Division in the format specified in the application instructions.

1. In signing this permit, the Permit Holder:
 - a. Agrees to abide by all terms and conditions set forth in the permit, all restrictions and relevant regulations under 50 CFR Parts 216, and 222-226, and all restrictions and requirements under the MMPA, and the ESA;
 - b. Acknowledges that the authority to conduct certain activities specified in the permit is conditional and subject to authorization by the Office Director; and
 - c. Acknowledges that this permit does not relieve the Permit Holder of the responsibility to obtain any other permits, or comply with any other Federal, State, local, or international laws or regulations.

Donna S. Wieting
Director, Office of Protected Resources
National Marine Fisheries Service

Date Issued

John L. Bengtson, Ph.D.
Director, Marine Mammal Laboratory
Responsible Party

Date Effective

Appendix 1: Tables Specifying the Kind(s) of Protected Species, Location(s), and Manner of Taking

Table 1. Take Information for Pacific Ocean; State/Territory: OR (Marine and fresh waters of State of Oregon.). Pacific Ocean; State/Territory: OR (Marine and fresh waters of State of Oregon.)											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
1	Sea lion, Steller	East of 144°; Long (Eastern US)	Wild	All	Male and Female	200	1	Harass	Survey, aerial, UAS	Count/survey; Photo-id; Photogrammetry, Remote vehicle, aerial (fixed wing); Remote vehicle, aerial (VTOL)	Aerial surveys by manned and UAS aircraft
2	Sea lion, Steller	East of 144°; Long (Eastern US)	Wild	All	Male and Female	500	1	Harass	Survey, vessel	Count/survey; Observation, mark resight; Photo-id; Photogrammetry	

Table 1. Take Information for Pacific Ocean; State/Territory: OR (Marine and fresh waters of State of Oregon.). Pacific Ocean; State/Territory: OR (Marine and fresh waters of State of Oregon.)

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Take Per Animal	Take Action	Observe/Collect Method	Procedures	Details
3	Sea lion, Steller	East of 144°; Long (Eastern US)	Wild	All	Male and Female	2000	1	Harass	Survey, ground	Collect, scat; Count/survey; Observation, mark resight; Photo-id; Photogrammetry; Remote video monitoring	Remote camera on Pyramid Rock, Rogue Reef
4	Sea lion, California	US Stock	Wild	Non-Pup	Male	200	1	Harass	Survey, aerial	Incidental disturbance, manned or unmanned aircraft, UAS	
5	Sea lion, California	US Stock	Wild	Non-Pup	Male	100	1	Harass	Survey, vessel	Incidental disturbance	

Table 1. Take Information for Pacific Ocean; State/Territory: OR (Marine and fresh waters of State of Oregon.). Pacific Ocean; State/Territory: OR (Marine and fresh waters of State of Oregon.)

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Take Per Animal	Take Action	Observe/Collect Method	Procedures	Details
6	Sea lion, California	US Stock	Wild	Non-Pup	Male	1000	1	Harass	Survey, ground	Incidental disturbance	
7	Seal, harbor	Oregon & Washington Coastal Waters Stocks	Wild	All	Male and Female	200	1	Harass	Survey, aerial	Incidental disturbance, manned or unmanned aircraft, UAS	
8	Seal, harbor	Oregon & Washington Coastal Waters Stocks	Wild	All	Male and Female	100	1	Harass	Survey, vessel	Incidental disturbance	

Table 1. Take Information for Pacific Ocean; State/Territory: OR (Marine and fresh waters of State of Oregon.). Pacific Ocean; State/Territory: OR (Marine and fresh waters of State of Oregon.)

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Take Per Animal	Take Action	Observe/Collect Method	Procedures	Details
9	Seal, northern elephant	California Breeding Stock	Wild	All	Male and Female	20	1	Harass	Survey, aerial	Incidental disturbance	
10	Seal, northern elephant	California breeding stock	Wild	All	Male and female	20	1	Harass	Survey, ground	Incidental disturbance	Incidental disturbance during ground counts for Steller sea lions

Table 1. Take Information for Pacific Ocean; State/Territory: OR (Marine and fresh waters of State of Oregon.). Pacific Ocean; State/Territory: OR (Marine and fresh waters of State of Oregon.)

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
11	Sea lion, Steller	East of 144°; Long (Eastern US)	Wild	All	Male and female	9999	1	Harass/Sample	Other	Import/export/receive, parts; Other.	Other = Necropsy and tissue salvage of any dead animal encountered unrelated to our research activities.

Table 2. SSL eDPS. Take Information for Pacific Ocean; State/Territory: AK; Gulf of Alaska. Pacific Ocean; State/Territory: AK; Gulf of Alaska, Southeast Alaska (Alaska - eDPS)

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
1	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	pup	Male and Female	280	1	Harass	Survey, aerial	Count/survey; Photo-id; Photogrammetry; Remote vehicle, aerial (fixed wing); Remote vehicle, aerial (VTOL)	Breeding season, manned or UAS surveys. Some animals may be overflown more than once per year.
2	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	Non-Pup	Male and Female	780	1	Harass	Survey, aerial	Count/survey; Photo-id; Photogrammetry; Remote vehicle, aerial (fixed wing); Remote vehicle, aerial (VTOL)	Breeding season, manned or UAS surveys. Some animals may be overflown more than once per year. Includes animals in the water per F/PR directions.

Table 2. SSL eDPS. Take Information for Pacific Ocean; State/Territory: AK; Gulf of Alaska. Pacific Ocean; State/Territory: AK; Gulf of Alaska, Southeast Alaska (Alaska - eDPS)

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
3	Seal, harbor	Southeast Alaska Stock	Wild	All	Male and Female	40	1	Harass	Survey, aerial	Incidental disturbance	Some animals may be overflown more than once per year. Includes animals in the water per F/PR directions.
4	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	Non-Pup	Male and Female	90	1	Harass	Survey, aerial	Count/survey; Observation, mark resight; Photo-id; Photogrammetry; Remote vehicle, aerial (fixed wing); Remote vehicle, aerial (VTOL)	Resights by UAS.
5	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	All	Male and Female	9999	1	Harass/Sample	Other	Import/export/receive, parts; Other	Other = Necropsy and tissue salvage of any dead animal encountered unrelated to our research activities.

Table 3. Take Information for Pacific Ocean; State/Territory: WA; Marine and freshwater areas State of Washington (Washington). Pacific Ocean; State/Territory: WA; Marine and freshwater areas State of Washington (Washington)

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
1	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	All	Male and Female	200	1	Harass	Survey, aerial	Count/survey; Photo-id; Photogrammetry; UAS	Aerial surveys by manned aircraft and UAS
2	Sea lion, California	US Stock	Wild	Non-Pup	Male	100	1	Harass	Survey, aerial	Incidental disturbance	Some animals may be harassed more than once but individuals cannot be determined
3	Seal, harbor	Oregon & Washington Coastal Waters Stocks	Wild	All	Male and Female	100	1	Harass	Survey, aerial	Incidental disturbance	Some animals may be harassed more than once but individuals cannot be determined

Table 3. Take Information for Pacific Ocean; State/Territory: WA; Marine and freshwater areas State of Washington (Washington). Pacific Ocean; State/Territory: WA; Marine and freshwater areas State of Washington (Washington)

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
4	Seal, northern elephant	California Breeding Stock	Wild	All	Male and Female	20	1	Harass	Survey, aerial	Incidental disturbance	Some animals may be harassed more than once but individuals cannot be determined
5	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	All	Male and Female	200	1	Harass	Survey, vessel	Count/survey; Observation, mark resight; Photo-id; Photogrammetry	
6	Sea lion, California	US Stock	Wild	Non-Pup	Male	200	1	Harass	Survey, vessel	Incidental disturbance	

Table 3. Take Information for Pacific Ocean; State/Territory: WA; Marine and freshwater areas State of Washington (Washington). Pacific Ocean; State/Territory: WA; Marine and freshwater areas State of Washington (Washington)

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
7	Seal, harbor	Oregon & Washington Coastal Waters Stocks	Wild	All	Male and Female	100	1	Harass	Survey, vessel	Incidental disturbance	
8	Seal, northern elephant	California Breeding Stock	Wild	All	Male and Female	25	1	Harass	Survey, vessel	Incidental disturbance	
9	Sea lion, Steller	East of 144°; Long (Eastern US)	Wild	All	Male and Female	2000	1	Harass	Survey, ground	Collect, scat; Count/survey; Observation, mark resight; Photo-id; Photogrammetry; Remote video monitoring	Landings on Bodelteh Island for camera install/maintenance

Table 3. Take Information for Pacific Ocean; State/Territory: WA; Marine and freshwater areas State of Washington (Washington). Pacific Ocean; State/Territory: WA; Marine and freshwater areas State of Washington (Washington)

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
10	Sea lion, California	US Stock	Wild	Non-Pup	Male	3000	1	Harass	Survey, ground	Incidental disturbance	Landings on Bodelteh Island, and incidental to pup/non-pup capture activities at all locations
11	Seal, harbor	Oregon & Washington Coastal Waters Stocks	Wild	All	Male and Female	300	1	Harass	Survey, ground	Incidental disturbance	Landings, Bodelteh Island
12	Seal, northern elephant	California Breeding Stock	Wild	All	Male and Female	6	1	Harass	Survey, ground	Incidental disturbance	Landings on Bodelteh Island

Table 3. Take Information for Pacific Ocean; State/Territory: WA; Marine and freshwater areas State of Washington (Washington). Pacific Ocean; State/Territory: WA; Marine and freshwater areas State of Washington (Washington)

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
13	Sea lion, Steller	East of 144°; Long (Eastern US)	Wild	pup	Male and Female	250	2	Capture/Handle/Release	Hand and/or Dip Net	Mark, Flipper tag; Measure (standard morphometrics); Restrain, board; Restrain, hand; Restrain, net; Sample, blood ; Sample, clip hair; Sample, clip nail; Sample, fecal loop; Sample, fecal swab; Sample, skin biopsy; Sample, swab all mucus membranes; Weigh	Carroll Island, Sea Lion Rock, and other Pacific Northwest areas -some pups may be recaptured for weights

14	Sea lion, Steller	East of 144°; Long (Eastern US)	Wild	Non- Pup	Male and Female	10	2	Capture/ Handle/ Release	Dart, injectable immobilizing agent	Administer drug, IM ; Administer drug, IV; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Instrument, external (e.g., VHF, SLTDR); Mark, flipper tag; Measure (standard morphometrics); Photo-id; Sample, blood ; Sample, clip hair; Sample, clip nail; Sample, fecal loop; Sample, fecal swab; Sample, skin biopsy; Sample, swab all mucus membranes; Stable isotopes and serial blood samples; Weigh	Some may be recaptured to recover instruments
15	Sea lion, Steller	East of 144°; Long (Eastern US)	Wild	All	Male and Female	2	1	Unintentional mortality	Dart captures	Unintentional mortality; Import/export/receive, parts; Other.	Unintentional mortality including humane euthanasia;

Table 3. Take Information for Pacific Ocean; State/Territory: WA; Marine and freshwater areas State of Washington (Washington). Pacific Ocean; State/Territory: WA; Marine and freshwater areas State of Washington (Washington)

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
											necropsy. Other = Necropsy.
16	Sea lion, Steller	East of 144°; Long (Eastern US)	Wild	All	Male and Female	9999	1	Harass / Sample	Other	Import/export/receive, parts; Other.	Other = Necropsy and tissue salvage of any dead animal encountered unrelated to our research activities.
17	Sea lion, Steller	East of 144°; Long (Eastern US)	Wild	All	Male and Female	260	99999	Import/export/receive only	Import/export/receive only	Import/export/receive, parts.	Parts collected during handling and sampling of study animals.

Table 3. Take Information for Pacific Ocean; State/Territory: WA; Marine and freshwater areas State of Washington (Washington). Pacific Ocean; State/Territory: WA; Marine and freshwater areas State of Washington (Washington)

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
18	Sea lion, Steller	East of 144°; Long (Eastern US)	Wild	Pup	Male and Female	100	1	Harass	Survey, ground	Collect, scat; Collect, spew; Count/survey; Incidental disturbance; Observation, mark resight; Observations, behavioral; Photo-id	Disturbance incidental to capture/handling activities during breeding season.
19	Sea lion, Steller	East of 144°; Long (Eastern US)	Wild	Non-pup	Male and Female	1000	1	Harass	Survey, ground	Collect, scat; Collect, spew; Count/survey; Incidental disturbance; Observation, mark resight; Observations, behavioral; Photo-id	Disturbance incidental to capture/handling activities during breeding season.
20	Sea lion, Steller	East of 144°; Long (Eastern US)	Wild	Non-pup	Male and Female	1000	1	Harass	Survey, ground	Collect, scat; Collect, spew; Count/survey; Incidental disturbance; Observation, mark resight; Observations, behavioral; Photo-id	Disturbance incidental to capture/handling activities during non-breeding season.

Table 4. Take Information for Pacific Ocean; State/Territory: CA; Marine and freshwater areas. Pacific Ocean; State/Territory: CA; Marine and freshwater areas, State of California (California)

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
1	Sea lion, Steller	East of 144°; Long (Eastern US)	Wild	All	Male and Female	100	1	Harass	Survey, aerial	Count/survey; Photo-id; Photogrammetry; UAS	Aerial surveys by manned aircraft and UAS
2	Sea lion, California	US Stock	Wild	Non-Pup	Male	200	1	Harass	Survey, aerial	Incidental disturbance	
3	Seal, harbor	California Stock	Wild	All	Male and Female	200	1	Harass	Survey, aerial	Incidental disturbance	
4	Seal, northern elephant	California Breeding Stock	Wild	All	Male and Female	200	1	Harass	Survey, aerial	Incidental disturbance	

Table 4. Take Information for Pacific Ocean; State/Territory: CA; Marine and freshwater areas. Pacific Ocean; State/Territory: CA; Marine and freshwater areas, State of California (California)

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
5	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	All	Male and Female	500	1	Harass	Survey, vessel	Count/survey; Observation, mark resight; Photo-id; Photogrammetry	
6	Sea lion, California	US Stock	Wild	Non-Pup	Male	500	1	Harass	Survey, vessel	Incidental disturbance	
7	Seal, harbor	California Stock	Wild	All	Male and Female	200	1	Harass	Survey, vessel	Incidental disturbance	
8	Seal, northern elephant	California Breeding Stock	Wild	All	Male and Female	50	1	Harass	Survey, vessel	Incidental disturbance	

Table 4. Take Information for Pacific Ocean; State/Territory: CA; Marine and freshwater areas. Pacific Ocean; State/Territory: CA; Marine and freshwater areas, State of California (California)

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
9	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	All	Male and Female	1000	1	Harass	Survey, ground	Collect, scat; Count/survey; Observation, mark resight; Photo-id; Photogrammetry; Remote video monitoring	Landings at St. George Reef sites
10	Sea lion, California	US Stock	Wild	Non-Pup	Male	500	1	Harass	Survey, ground	Incidental disturbance	Landings at St. George Reef sites
11	Seal, harbor	California Stock	Wild	All	Male and Female	200	1	Harass	Survey, ground	Incidental disturbance	Landings at St. George Reef sites
12	Seal, northern elephant	California Breeding Stock	Wild	All	Male and Female	50	1	Harass	Survey, ground	Incidental disturbance	Landings at St. George Reef sites

Table 4. Take Information for Pacific Ocean; State/Territory: CA; Marine and freshwater areas. Pacific Ocean; State/Territory: CA; Marine and freshwater areas, State of California (California)

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
13	Sea lion, Steller	East of 144°; Long (Eastern US)	Wild	All	Male and Female	9999	1	Harass/Sample	Other	Import/export/recieve, parts; Other.	Other = Necropsy and tissue salvage of any dead animal encountered unrelated to our research activities.

Table 5. Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, Bering Sea, a (Alaska - wDPS)

Line	Species	Stock/Listing Unit	Product ion/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe / Collect Method	Procedures	Details
1	Sea lion, Stellar	West of 144°; Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	170	1	Harass	Survey, aerial	Count/survey; Photograph/Video; Remote vehicle, aerial (fixed wing); Remote vehicle, aerial (VTOL)	Breeding season aerial survey by manned aircraft or UAS. Some animals may be overflown more than once per year.
2	Sea lion, Stellar	West of 144°; Long (Western US) (NMFS Endangered)	Wild	Non-Pup	Male and Female	2740	1	Harass	Survey, aerial	Count/survey; Photograph/Video; Remote vehicle, aerial (fixed wing); Remote vehicle, aerial (VTOL)	Breeding season aerial survey by manned aircraft or UAS. Some animals may be overflown more than once per year. Includes animals in water per F/PR directions.

Table 5. Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, Bering Sea, a (Alaska - wDPS)

Line	Species	Stock/Listing Unit	Product ion/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe / Collect Method	Procedures	Details
3	Sea lion, Stellar	West of 144° Long (Western US) (NMFS Endangered)	Wild	Non-Pup	Male and Female	1500	1	Harass	Survey, aerial	Count/survey; Photograph/Video; Remote vehicle, aerial (fixed wing); Remote vehicle, aerial (VTOL)	Non-breeding season regional aerial surveys by manned aircraft or UAS. Some animals may be overflown more than once per year. Includes animals in water per F/PR directions.
4	Seal, Northern fur	Eastern Pacific Stock	Wild	All	Male and Female	800	1	Harass	Survey, aerial	Incidental disturbance	Includes animals in water per F/PR directions.

Table 5. Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, Bering Sea, a (Alaska - wDPS)

Line	Species	Stock/Listing Unit	Product ion/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe / Collect Method	Procedures	Details
5	Seal, harbor	Bering Sea/Gulf of Alaska Stocks	Wild	All	Male and Female	35	1	Harass	Survey, aerial	Incidental disturbance	Includes animals in water per F/PR directions. Some animals may be overflown more than once per year.
6	Sea lion, Stellar	West of 144° Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	10	1	Harass	Survey, aerial	Count/survey; Observation, mark resight; Photo-id; Photogrammetry; Remote vehicle, aerial (fixed wing); Remote vehicle, aerial (VTOL)	Resights by UAS, breeding season. Some animals may be overflown more than once per year.
7	Sea lion, Stellar	West of 144° Long (Western US) (NMFS Endangered)	Wild	Non-Pup	Male and Female	90	1	Harass	Survey, aerial	Count/survey; Observation, mark resight; Photo-id; Photogrammetry; Remote vehicle, aerial (fixed wing); Remote vehicle, aerial (VTOL)	Resights by UAS, any season. Some animals may be overflown more than once per year.

Table 5. Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, Bering Sea, a (Alaska - wDPS)

Line	Species	Stock/Listing Unit	Product ion/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe / Collect Method	Procedures	Details
8	Sea lion, Stellar	West of 144°; Long (Western US) (NMFS Endangered)	Wild	Non-Pup	Male and Female	14000	1	Harass	Survey, vessel	Collect, scat; Collect, spew; Count/survey; Observation, mark resight; Observations, behavioral; Photo-id	Non-breeding season (August-May). Some animals may be exposed more than once per year.
9	Sea lion, Stellar	West of 144°; Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	400	1	Harass	Survey, vessel	Collect, scat; Collect, spew; Count/survey; Observation, mark resight; Observations, behavioral; Photo-id	Breeding season (June-July). Some animals may be exposed more than once per year.
10	Sea lion, Stellar	West of 144°; Long (Western US) (NMFS Endangered)	Wild	Non-Pup	Male and Female	850	1	Harass	Survey, ground	Collect, scat; Collect, spew; Count/survey; Observation, mark resight; Observations, behavioral; Photo-id	Some animals may be exposed more than once per year.

Table 5. Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, Bering Sea, a (Alaska - wDPS)

Line	Species	Stock/Listing Unit	Product ion/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe / Collect Method	Procedures	Details
11	Sea lion, Stellar	West of 144° Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	100	1	Harass	Survey, ground	Collect, scat; Collect, spew; Count/survey; Observation, mark resight; Observations, behavioral; Photo-id	Breeding season (June-July). Some animals may be exposed more than once per year.

Table 5. Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, Bering Sea, a (Alaska - wDPS)

Line	Species	Stock/Listing Unit	Product ion/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe / Collect Method	Procedures	Details
12	Sea lion, Stellar	West of 144° Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	250	1	Capture/Handle/Release	Hand and/or Dip Net	Anesthesia, gas w/cone or mask; Collect, scat; Collect, urine; Instrument, external (e.g., VHF, SLTDR); Mark, hot brand; ; instrument, external (e.g., VHF); mark, flipper tag (e.g. conventional cattle tag if not branded or for transmitter/instrument attachment); Measure (standard morphometrics); Photo-id; Restrain, hand; Restrain, net; Sample, fecal loop; Sample, fecal swab; Sample, skin biopsy; Sample, swab all mucus membranes; Weigh	Marked with hot brand and limited sample collection.

13	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	100	1	Capture/Handle/Release	Hand and/or Dip Net	Anesthesia, gas w/cone or mask; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Instrument, external (e.g., VHF, SLTDR); Mark, hot brand; mark, flipper tag (e.g. conventional cattle tag if not branded or for transmitter/instrument attachment); Measure (standard morphometrics); Photo-id; Restrain, board; Restrain, hand; Restrain, net; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, clip nail; Sample, fecal loop; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	Marked with hot brand and with additional samples collected.
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14	Sea lion, Stellar	West of 144°; Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	200	1	Capture/Handle/Release	Hand and/or Dip Net	Collect, scat; Collect, urine; Instrument, external (e.g., VHF, SLTDR); Mark, other (e.g., neoprene patch); instrument, external (e.g., VHF); mark, flipper tag (e.g. conventional cattle tag if not branded or for transmitter/instrument attachment); Measure (standard morphometrics); Restrain, board; Restrain, hand; Restrain, net; Sample, blood ; Sample, clip hair; Sample, clip nail; Sample, fecal loop; Sample, fecal swab; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	Not marked with hot brand and with samples collected.
15	Sea lion, Stellar	West of 144°; Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	1100	1	Harass	Survey, ground	Collect, scat; Collect, spew; Count/survey; Incidental disturbance; Observation, mark resight; Observations, behavioral; Photo-id	Disturbance incidental to pup handling activities during breeding season.

Table 5. Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, Bering Sea, a (Alaska - wDPS)

Line	Species	Stock/Listing Unit	Product ion/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe / Collect Method	Procedures	Details
16	Sea lion, Stellar	West of 144° Long (Western US) (NMFS Endangered)	Wild	Non-Pup	Male and Female	1600	1	Harass	Survey, ground	Collect, scat; Collect, spew; Count/survey; Observation, mark resight; Observations, behavioral; Photo-id	Disturbance incidental to pup handling activities during breeding season.

17	Sea lion, Stellar	West of 144°; Long (Western US) (NMFS Endangered)	Wild	Juvenile/ Subadult	Male and Female	20	2	Capture/Handle/Release	Other	Administer drug, IM ; Administer drug, IV; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Incidental disturbance; Instrument, external (e.g., VHF, UHFSLTDR, archival, camera/video); mark, flipper tag (e.g. conventional cattle tag if not branded or for transmitter/instrument attachment for instrument attachment, or if not branded); mark, hot brand; measure (standard morphometrics); Photo-id; Restrain, hand; Restrain, net; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, clip nail; Sample, fecal enema; Sample, fecal loop; Sample, fecal swab;	Animals >= 2 months old. capture techniques include: dart, injectable immobilizing agent; hoop, net; hand. Only one hot brand administered per animal. 2nd take is incidental disturbance for instrument retrieval. If remote release fails a recapture may be attempted.
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Table 5. Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, Bering Sea, a (Alaska - wDPS)

Line	Species	Stock/Listing Unit	Product ion/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe / Collect Method	Procedures	Details
										Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, vibrissae (pull); Stable isotopes and serial blood samples; Ultrasound; Weigh	
18	Sea lion, Stellar	West of 144° Long (Western US) (NMFS Endangered)	Wild	Juvenile/ Subadult	Male and Female	10	1	Harass	Dart, injectable immobilizing agent	Anesthesia, injectable sedative	Darted but not captured. May be darted a second time with reversal agents.

19	Sea lion, Stellar	West of 144°; Long (Western US) (NMFS Endangered)	Wild	Adult	Female	20	2	Capture/Handle/Release	Dart, injectable immobilizing agent	Administer drug, IM ; Administer drug, IV; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Incidental disturbance; Instrument, external (e.g., VHF, UHF, archival, camera/videoSLTDR); mark, flipper tag (e.g. conventional cattle tag if not branded or for transmitter/instrument attachment); Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Photo-id; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, clip nail; Sample, fecal enema; Sample, fecal loop; Sample, fecal swab; Sample, milk (lactating females); Sample, nasal swab;	2nd take is incidental disturbance for instrument retrieval. If remote release fails a recapture may be attempted.
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Table 5. Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, Bering Sea, a (Alaska - wDPS)

Line	Species	Stock/Listing Unit	Product ion/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe / Collect Method	Procedures	Details
										Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, swab all mucus membranes; Sample, vibrissae (pull); Stable isotopes and serial blood samples; Ultrasound; Weigh	
20	Sea lion, Stellar	West of 144° Long (Western US) (NMFS Endangered)	Wild	Adult	Female	10	1	Harass	Dart, injectable immobilizing agent	Anesthesia, injectable sedative	Adult females darted but not captured. May be darted a second time with reversal agents.

21	Sea lion, Stellar	West of 144°; Long (Western US) (NMFS Endangered)	Wild	Subadult	Male	5	2	Capture/Handle/Release	Dart, injectable immobilizing agent	Administer drug, IM ; Administer drug, IV; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Incidental disturbance; Instrument, external (e.g., VHF, UHF, archival, camera/video); Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Photo-id; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, clip nail; Sample, fecal enema; Sample, fecal loop; Sample, fecal swab; Sample, milk (lactating females); Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, swab all mucus membranes; Sample, vibrissae (pull); Stable	Subadult and Adult Males. 2nd take is incidental disturbance. If remote release fails a recapture may be attempted.
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Table 5. Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, Bering Sea, a (Alaska - wDPS)

Line	Species	Stock/Listing Unit	Product ion/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe / Collect Method	Procedures	Details
										isotopes and serial blood samples; Ultrasound; Weigh	
22	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	Subadult	Male	2	1	Harass	Dart, injectable immobilizing agent	Anesthesia, injectable sedative	Subadult and Adult males darted but not captured.

Table 5. Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, Bering Sea, a (Alaska - wDPS)

Line	Species	Stock/Listing Unit	Product ion/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe / Collect Method	Procedures	Details
23	Sea lion, Stellar	West of 144° Long (Western US) (NMFS Endangered)	Wild	Non-Pup	Male and Female	5500	2	Harass	Survey, ground	Collect, scat; Collect, spew; Count/survey; Incidental disturbance; Observation, mark resight; Observations, behavioral; Photo-id	Disturbance incidental to capture/handling activities during non-breeding season.

Table 5. Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, Bering Sea, a (Alaska - wDPS)

Line	Species	Stock/Listing Unit	Product ion/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe / Collect Method	Procedures	Details
24	Sea lion, Stellar	West of 144° Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	2	1	Unintentional mortality	Other	Unintentional mortality; Import/export/receive, parts; Other.	Unintentional mortality, including humane euthanasia. Necropsy and salvage of tissues would follow. Unintentional mortalities are rare; but multiple mortalities within a year are possible.. Other = necropsy.

Table 5. Take Information for Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean. Study Number: 22289; Pacific Ocean; State/Territory: AK; North Pacific Ocean, Gulf of Alaska, Bering Sea, a (Alaska - wDPS)

Line	Species	Stock/Listing Unit	Product ion/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe / Collect Method	Procedures	Details
25	Sea lion, Stellar	West of 144° Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	9999	1	Harass/Sample	Other	Import/export/receive, parts; Other.	Other = Necropsy and tissue salvage of any dead animal encountered unrelated to our research activities.
26	Sea lion, Stellar	East of 144° Long (Eastern US)	Wild	All	Male and Female	595	99999	Import/export/receive only	Import/export/receive only	Import/export/receive, parts.	Parts collected during handling and sampling of study animals.

Appendix 2: NMFS-Approved Personnel and Authorized Recipients for Permit No. 22289.

The following individuals are approved to act as Co-Investigators pursuant to the terms and conditions under Section C (Qualifications, Responsibilities, and Designation of Personnel) of this permit.

Name of Co-Investigator	Activities
Gavin Brady	Aerial surveys in Alaska.
Dr. Peter Boveng	Aerial surveys in Alaska.
Dr. Michael Cameron	Aerial surveys in Alaska.
Cynthia Christman	Aerial surveys in Alaska.
Shawn Dahle	Aerial surveys in Alaska.
Dr. Robert DeLong	All studies of sea lions in Washington, Oregon, and California
Dr. Brian Fadely	Vessel- and land-based studies and sea lion capture, handling, and sampling in Alaska
Patrick Gearin	All studies of sea lions in Washington, Oregon, and California.
Dr. Thomas Gelatt (PI)	Vessel- and land-based studies and sea lion capture, handling, and sampling in Alaska
Dr. Dawn Goley	Land and vessel-based observations and scat collections in California and Oregon
Jeff Harris	All studies of sea lions in Washington, Oregon, and California
John Jansen	Aerial surveys in Alaska.
Steven J. Jeffries	All studies of sea lions in Washington, Oregon, and California
Dyanna Lambourn	All studies of sea lions in Washington, Oregon, and California
Dr. Michelle Lander	Vessel- and land-based studies and sea lion capture, handling, and sampling in Alaska
Dr. Josh London	Aerial surveys in Alaska.

Name of Co-Investigator	Activities
Kathryn E. Luxa	Aerial surveys in U.S. range; land, and vessel-based observational studies in Alaska.
Morgan Lynn	Aerial surveys in U.S. range.
Dr. Sharon Melin	All studies of sea lions in Washington, Oregon, and California
Erin Moreland	Aerial surveys in Alaska.
Dr. Anthony Orr	All studies of sea lions in Washington, Oregon, and California
Dr. Lorrie Rea	Vessel- and land-based studies and sea lion capture, handling, and sampling in Alaska; receipt and analysis of any collected tissue.
Dr. Rolf Ream	Vessel- and land-based studies and sea lion capture, handling, and sampling in Alaska
Michael J. Rehberg	Vessel- and land-based studies and sea lion capture, handling, and sampling in Alaska
Dr. Sheanna Steingass	All studies of sea lions in Washington, Oregon, and California
Dr. Jeremy Sterling	Vessel- and land-based studies and sea lion capture, handling, and sampling in Alaska
Katherine L. Sweeney	Aerial surveys in U.S. range; land, and vessel-based observational studies in Alaska
Rod Towell	Aerial (UAS) surveys in U.S. range; vessel- and land-based studies and sea lion capture, handling, and sampling in Alaska
Bryan Wright	All studies of sea lions in Washington, Oregon, and California.
Heather Ziel	Aerial surveys in Alaska.

Biological samples authorized for collection or acquisition in Tables 1-5 of Appendix 1 may be transferred to the following Authorized Recipients for the specified disposition, consistent with Condition B.6 of the permit:

Authorized Recipient	Sample Type	Disposition
Alaska Department of Fish and Game, Anchorage, Fairbanks, Juneau, AK	Any collected	Analysis and curation of samples
Dr. Shannon Atkinson, UAF, Juneau, AK	Any collected	Analysis
Dr. Kathy Burek, AVPS, Eagle River, AK	Any collected	Analysis, curation
Dr. Tracey Goldstein, UC Davis, Davis, CA	Any collected	Analysis, curation
Dr. Mandy Keogh, Alaska Department of Fish and Game, Division of Wildlife Conservation	Any collected	Analysis, curation
Dr. Todd O’Hara, UAF Veterinary Medicine Program	Any collected	Analysis
Dr. Kathi Lefebvre, NOAA Fisheries NWFSC Environmental and Fisheries Sciences Division, Seattle, WA	Any collected	Analysis
Phoenix Veterinary Laboratories, Mukilteo, WA	Blood	Analysis
Dr. Greg O’Corry-Crowe, Florida Atlantic University, Boca Raton, FL	Blood, tissue	Analysis, curation

19.2 Appendix B – Draft Permit No. 22293

The text below was taken directly from the proposed permit provided to us in the consultation initiation package from the Permits and Conservation Division. The final permit may have minor changes that will not affect this Opinion.

Permit No. 22293

Expiration Date: May 31, 2024
Reports Due: September 1, annually

PERMIT TO TAKE PROTECTED SPECIES⁷ FOR SCIENTIFIC PURPOSES

I. Authorization

This permit is issued to the Alaska SeaLife Center (hereinafter “Permit Holder”), 301 Railway Avenue, P.O. Box 1329, Seward, AK 99664 (Responsible Party: Tara L. Riemer, Ph.D.), pursuant to the provisions of the Marine Mammal Protection Act of 1972 as amended (MMPA; 16 U.S.C. 1361 *et seq.*); the regulations governing the taking and importing of marine mammals (50 CFR Part 216); the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq.*); the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR Parts 222-226); and the Fur Seal Act of 1966 (16 U.S.C. 1151 *et seq.*).

II. Abstract

The objectives of the permitted activity, as described in the application, are to conduct population monitoring and health, nutrition, and foraging studies to provide data on pup and juvenile survival, reproductive rates, diet, epidemiology, endocrinology, immunology, physiology, ontogenetic and annual body condition cycles, and behavior of Steller sea lions of the Western distinct population segment (DPS).

⁷ “Protected species” include species listed as threatened or endangered under the ESA, and marine mammals.
NMFS Permit No. 22293

III. Terms and Conditions

The activities authorized herein must occur by the means, in the areas, and for the purposes set forth in the permit application, and as limited by the Terms and Conditions specified in this permit, including appendices and attachments. Permit noncompliance constitutes a violation and is grounds for permit modification, suspension, or revocation, and for enforcement action.

A. Duration of Permit

1. Personnel listed in Condition C.1 of this permit (hereinafter “Researchers”) may conduct activities authorized by this permit through May 31, 2024. This permit may be extended by the Director, National Marine Fisheries Service (NMFS) Office of Protected Resources or the Chief, Permits and Conservation Division (hereinafter Permits Division), pursuant to applicable regulations and the requirements of the MMPA and ESA.
2. Researchers must immediately stop permitted activities and the Permit Holder or Principal Investigator must contact the Chief, NMFS Permits and Conservation Division (hereinafter “Permits Division”) for written permission to resume:
 - c. If three Steller sea lions are darted and suffer unanticipated adverse effects, including entering the water and either drowning or disappearing so that their fate cannot be determined.
 - d. If serious injury or mortality⁸ of protected species reaches that specified in Table 1 of Appendix 1.
 - e. If authorized take⁹ is exceeded in any of the following ways:

⁸ This permit allows for unintentional serious injury and mortality caused by the presence or actions of researchers up to the limit in Table 1 of Appendix 1. This includes, but is not limited to: deaths of dependent young by starvation following research-related death of a lactating female; deaths resulting from infections related to sampling procedures or invasive tagging; and deaths or injuries sustained by animals during capture and handling, or while attempting to avoid researchers or escape capture. Note that for marine mammals, a serious injury is defined by regulation as any injury that will likely result in mortality.

⁹ By regulation, a take under the MMPA means to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal. This includes, without limitation, any of the following: The collection
NMFS Permit No. 22293

- v. More animals are taken than allowed in Table 1 of Appendix 1.
- vi. Animals are taken in a manner not authorized by this permit.
- vii. Protected species other than those authorized by this permit are taken.

f. Following incident reporting requirements at Condition E.2.

- 3. The Permit Holder may continue to possess biological samples¹⁰ acquired¹¹ under this permit after permit expiration without additional written authorization provided a copy of this permit is kept with the samples and they are maintained as specified in this permit.

B. Number and Kinds of Protected Species, Locations and Manner of Taking

- 1. The table in Appendix 1 outlines the authorized species and stock or distinct population segment (DPS) authorized; number of animals to be taken; number of animals from which parts may be received, imported and exported; and the manner of take, locations, and time period.
- 2. Researchers working under this permit may collect images (e.g., photographs, video) and audio recordings in addition to the photo-identification or behavioral photo-documentation authorized in Appendix 1 as needed to document the permitted activities, provided the collection of such images or recordings does not result in takes.
- 3. The Permit Holder may use visual images and audio recordings collected under this permit, including those authorized in Table 1 of Appendix 1, in printed materials (including commercial or scientific publications) and presentations provided the images and recordings are accompanied by a statement indicating that the activity was conducted pursuant to NMFS ESA/MMPA Permit No. 22293. This statement must accompany the images and recordings in all subsequent uses or sales.

of dead animals, or parts thereof; the restraint or detention of a marine mammal, no matter how temporary; tagging a marine mammal; the negligent or intentional operation of an aircraft or vessel, or the doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal; and feeding or attempting to feed a marine mammal in the wild. Under the ESA, a take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to do any of the preceding.

¹⁰ Biological samples include, but are not limited to: carcasses (whole or parts); and any tissues, fluids, or other specimens from live or dead protected species; except feces, urine, and spew collected from the water or ground.

¹¹ Authorized methods of sample acquisition are specified in Appendix 1.

4. The Chief, Permits Division may grant written approval for personnel performing activities not essential to achieving the research objectives (e.g., a documentary film crew) to be present, provided:
 - d. The Permit Holder submits a request to the Permits Division specifying the purpose and nature of the activity, location, approximate dates, and number and roles of individuals for which permission is sought.
 - e. Non-essential personnel/activities will not influence the conduct of permitted activities or result in takes of protected species.
 - f. Persons authorized to accompany the Researchers for the purpose of such non-essential activities will not be allowed to participate in the permitted activities.
 - d. The Permit Holder and Researchers do not require compensation from the individuals in return for allowing them to accompany Researchers.
5. Researchers must comply with the following conditions related to the manner of taking:

Counting Takes

For Ground surveys and captures

- a. For pinnipeds, you will count 1 take per animal per day for those animals that react to the research activities in these ways:
 - i. Movements of twice the animal's body length or more,
 - ii. Changes of direction greater than 90 degrees, or
 - iii. Retreats (flushes) to the water.
- b. If you are working on land, count takes of all pinniped species encountered on land based on behavioral responses in B.5.a.

- i. If you are working on land and pinnipeds are in the water, do not count them unless you see an adverse behavioral response from your activities.
- c. Count every animal netted or captured in water even if immediately released. Count and report any non-target species that are netted.
- d. Count and report 1 take per day for each pinniped captured for all procedures including approach, capture, handle, sample, and release.

For Vessel Surveys

- e. If you are surveying pinnipeds hauled out on land from a vessel, count animals that exhibit behavioral response detailed above in B.5.a while on land.
 - i. Do not count pinnipeds that approach the vessel in the water, but
 - ii. Do count pinniped takes in water if there is a noticeable adverse behavioral response.
- f. Do not count takes of pinnipeds as you are transiting between research locations and not actively conducting research.

Ground Research and Capture

- g. Researchers must carry out activities efficiently and use biologists experienced in capture and sampling techniques to complete the activities as quickly as possible to reduce disturbance and minimize handling time.
- h. Researchers must exercise caution when approaching all pinnipeds, and must take reasonable steps to identify and avoid/minimize capture, sampling, and disturbance of pregnant females and lactating females with pups.
- i. Efforts to approach and capture a particular pinniped or lactating female and pup must be immediately terminated if there is any evidence that the activities may be life-threatening to the animals.
- j. Researchers must take reasonable steps to identify pups of lactating females before attempting to immobilize a lactating female.
- k. Researchers must minimize the time lactating females are removed or otherwise separated from their dependent offspring as a result of research activities.

- l. Researchers must capture and handle pinnipeds in groups small enough so that all animals can be adequately monitored to prevent drowning, overheating, suffocation, and injury.
- m. Researchers must use sterile disposable needles, biopsy punches, and other sampling tools to the maximum extent practicable.
- n. Researchers must thoroughly clean and disinfect all non-disposable equipment between animals and, as needed, immediately prior to each use.
- o. Researchers must consult an experienced marine mammal veterinarian for proper dosages and protocols for use of anesthesia and sedatives, including administration via remote darting.
- p. Researchers must immediately cease research-related procedures if a pinniped is showing signs (e.g., overexertion, constant muscle tensions, abnormal respiration or heart rate) that may lead to serious injury, capture myopathy, other disease conditions, or death; and monitor and treat the animal as determined appropriate by the PI, CI, or attending veterinarian.
- q. Researchers must ensure that pinnipeds that have been captured and anesthetized or administered immobilizing drugs have an opportunity to recover after release without undue risk of drowning or injury from other animals.

Mortalities

- r. To the maximum extent practical without causing further disturbance, researchers must monitor study sites following any disturbance (e.g., surveys or sampling activities) to determine if any animals have been seriously injured or killed, or if any pups have been abandoned. Any observed serious injury to or death of a marine mammal or observed abandonment of a dependent pup is to be reported as indicated below and in Condition E.2.
- s. If a lactating female dies as a result of the permitted activities and her dependent pup can be identified, or if a dependent pup is abandoned, the PI, CI or veterinarian present will evaluate the pup's age, health, and ability to survive on its own. If the pup is not likely to survive and the pup is not a candidate for rehabilitation, or rehabilitation is not logistically feasible, the PI/CI and/or veterinarian will determine the proper course of action (e.g., euthanasia) in accordance with the approved Institutional Animal Care and Use Committees (IACUC) protocols and the pup must be counted as a research-related mortality.

- t. In the event an animal dies, is euthanized, or if a dependent pup is abandoned as a result of research activities, the Permit Holder must, within two weeks, submit an incident report as described in Condition E.2. For research-related mortalities, a necropsy should be performed, except where not feasible such as in remote areas with limited personnel. Gross necropsy findings should be included as part of an incident report. Final necropsy findings (e.g., histology and other analyses) must be submitted when complete.
- u. Researchers must take appropriate actions (e.g., disinfection procedures) for minimizing the introduction of new disease agents, vectors capable of efficiently transmitting indigenous dormant diseases or those not currently being effectively transmitted, and species that can serve as amplification hosts for transmitting indigenous diseases to other species.

Salvage

- v. The Permit Holder must coordinate with the NMFS Alaska Region Stranding Coordinator (phone 907-586-7248) prior to collecting samples or carcasses of any dead stranded ESA-listed marine mammals. The Stranding Coordinator may require the Permit Holder to collect specific data and samples and provide these to the NMFS Alaska Regional Office.

Non-target Species

- w. This permit does not authorize takes of any protected species not identified in Appendix 1, including those species under the jurisdiction of the United States Fish and Wildlife Service (USFWS). Should other protected species be encountered during the research activities authorized under this permit, researchers must exercise caution and remain a safe distance from the animal(s) to avoid take, including harassment.

Sea Otters

- x. For activities in areas where sea otters may be encountered, the Permit Holder or PI must follow these conditions to prevent interactions with sea otters:
 - i. Obey all speed zones and drive slowly in all areas with sea otters. Boat strikes are a cause of death for sea otters.
 - ii. If sea otters are observed prior to an encounter, avoid approaching them directly and maintain a minimum distance of 20 meters (66 feet) at all times.

- iii. If sea otters approach, place boat engines in neutral and allow the animals to pass.

- y. During capture events in waters where sea otters may be present, the Permit Holder or PI must follow these conditions to prevent interactions with sea otters:
 - i. Netting activities must cease if a sea otter is sighted within 100 meters.
 - ii. If a sea otter is accidentally captured:
 - A. Devote all staff efforts to freeing the animal. Remember that a sea otter must surface approximately every few minutes. The Permit Holder or PI shall brief all participants to ensure that they understand that freeing a sea otter can be dangerous. This briefing will caution people to keep fingers out of the nets, that no jewelry should be worn, that sea otters can reach all parts of their body with their mouth (due to their lack of blubber and need to constantly groom) and deliver a bite that could result in serious injury, and that they give the animal adequate time and room to breathe as they are freeing it.
 - B. As appropriate, turn off the vessel motors or put the engine in neutral. Propellers can seriously injure or kill sea otters.
 - C. Release tension on the net to allow the animal the opportunity to free itself. Exercise caution when attempting to assist the animal. Sea otters can thrash violently if captured or entangled in a net. Quick action is essential to protect the sea otter. Ensure that the animal does not escape with net still attached to it.
 - D. Contact the USFWS offices to report any gear or vessel interactions with sea otters.

- z. If a sea otter is injured or killed during research activities, in addition to the requirements in Condition A.2.b above:
 - i. Research must be suspended and the U.S. Fish and Wildlife Service (USFWS) immediately contacted (see contact information below); and
 - ii. Within 30 days of the injury or mortality, a report detailing the circumstances that led to the injury or mortality and suggesting measures to prevent or minimize the chances of future injuries or mortalities must also be sent to: USFWS Division of Management Authority (DMA)

(phone: 1-800-358-2104; fax: 703-358-2281, e-mail: Permits@fws.gov); and the USFWS Ventura Fish and Wildlife Office (VFWO), 2493 Portola Road, Suite B, Ventura, CA 93003,(805-644-1766), [Lilian Carswell@fws.gov](mailto:Lilian_Carswell@fws.gov).

- iii. In the event of a death of a sea otter, a necropsy should be performed by a qualified veterinarian and details of the cause of death included in the written report in 6.b. above.
 - iv. The USFWS may subsequently recommend continuation of the suspended activities with any necessary modifications/conditions.
6. The Permit Holder must comply with the following conditions and the regulations at 50 CFR 216.37, for biological samples acquired or possessed under authority of this permit.
- a. The Permit Holder is ultimately responsible for compliance with this permit and applicable regulations related to the samples unless the samples are permanently transferred according to NMFS regulations governing the taking and importing of marine mammals (50 CFR 216.37) and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR 222.308).
 - b. Samples must be maintained according to accepted curatorial standards and must be labeled with a unique identifier (e.g., alphanumeric code) that is connected to on-site records with information identifying the following:
 - i. Species and, where known, age and sex;
 - ii. Date of collection, acquisition, or import;
 - iii. Type of sample (e.g., blood, skin, bone);
 - iv. Origin (i.e., where collected or imported from); and
 - v. Legal authorization for original sample collection or import.
 - c. Biological samples belong to the Permit Holder and may be temporarily transferred to Authorized Recipients identified in Appendix 2 without additional written authorization, for analysis or curation related to the objectives of this permit. The Permit Holder remains responsible for the samples, including any reporting requirements.

- d. The Permit Holder may request approval of additional Authorized Recipients for analysis and curation of samples related to the permit objectives by submitting a written request to the Permits Division specifying the following:
 - v. Name and affiliation of the recipient;
 - vi. Address of the recipient;
 - vii. Types of samples to be sent (species, tissue type); and
 - viii. Type of analysis or whether samples will be curated.
- e. Sample recipients must have authorization pursuant to 50 CFR 216.37 prior to permanent transfer of samples and transfers for purposes not related to the objectives of this permit.
- f. Samples cannot be bought or sold, including parts transferred pursuant to 50 CFR 216.37.
- g. After meeting the permitted objectives, the Permit Holder may continue to possess and use samples acquired under this permit, without additional written authorization, provided the samples are maintained as specified in the permit and findings are discussed in the annual reports (See Condition E.3).

C. Qualifications, Responsibilities, and Designation of Personnel

- 1. At the discretion of the Permit Holder, the following Researchers may participate in the conduct of the permitted activities in accordance with their qualifications and the limitations specified herein:
 - a. Principal Investigator – John M. Maniscalco, Ph.D.
 - b. Co-Investigators – See Appendix 2 for list of names and corresponding activities.
 - c. Research Assistants – personnel identified by the Permit Holder or Principal Investigator and qualified to act pursuant to Conditions C.2, C.3, and C.4 of this permit.

2. Individuals conducting permitted activities must possess qualifications commensurate with their roles and responsibilities. The roles and responsibilities of personnel operating under this permit are as follows:
 - a. The Permit Holder is ultimately responsible for activities of individuals operating under the authority of this permit. Where the Permit Holder is an institution/facility, the Responsible Party is the person at the institution/facility who is responsible for the supervision of the Principal Investigator.
 - b. The Principal Investigator (PI) is the individual primarily responsible for the taking, import, export and related activities conducted under the permit. This includes coordination of field activities of all personnel working under the permit. The PI must be on site during activities conducted under this permit unless a Co-Investigator named in Condition C.1 is present to act in place of the PI.
 - c. Co-Investigators (CIs) are individuals who are qualified to conduct activities authorized by the permit, for the objectives described in the application, without the on-site supervision of the PI. CIs assume the role and responsibility of the PI in the PI's absence.
 - d. Research Assistants (RAs) are individuals who work under the direct and on-site supervision of the PI or a CI. RAs cannot conduct permitted activities in the absence of the PI or a CI.
3. Personnel involved in permitted activities must be reasonable in number and essential to conduct of the permitted activities. Essential personnel are limited to:
 - a. Individuals who perform a function directly supportive of and necessary to the permitted activity (including operation of vessels essential to conduct of the activity),
 - b. Individuals included as backup for those personnel essential to the conduct of the permitted activity, and

- c. Individuals included for training purposes.
-
- 4. Persons who require state or Federal licenses or authorizations (e.g., veterinarians) to conduct activities under the permit must be duly licensed/authorized and follow all applicable requirements when undertaking such activities.
 - 5. Permitted activities may be conducted aboard vessels or aircraft, or in cooperation with individuals or organizations, engaged in commercial activities, provided the commercial activities are not conducted simultaneously with the permitted activities.
 - 6. The Permit Holder cannot require or receive direct or indirect compensation from a person approved to act as PI, CI, or RA under this permit in return for requesting such approval from the Permits Division.
 - 7. The Permit Holder may add CIs by submitting a request to the Chief, Permits Division that includes a description of the individual's qualifications to conduct and oversee the activities authorized under this permit. If a CI will only be responsible for a subset of permitted activities, the request must also specify the activities for which they would provide oversight.
 - 8. Where the Permit Holder is an institution/facility, the Responsible Party may request a change of PI by submitting a request to the Chief, Permits Division that includes a description of the individual's qualifications to conduct and oversee the activities authorized under this permit.
 - 9. Submit requests to add CIs or change the PI by one of the following:
 - d. The online system at <https://apps.nmfs.noaa.gov>;
 - e. An email attachment to the permit analyst for this permit; or
 - f. A hard copy mailed or faxed to the Chief, Permits Division, Office of Protected Resources, NMFS, 1315 East-West Highway, Room 13705, Silver Spring, MD 20910; phone (301)427-8401; fax (301)713-0376.

D. Possession of Permit

1. This permit cannot be transferred or assigned to any other person.
2. The Permit Holder and persons operating under the authority of this permit must possess a copy of this permit when:
 - a. Engaged in a permitted activity.
 - b. A protected species is in transit incidental to a permitted activity.
 - c. A protected species taken or imported under the permit is in the possession of such persons.
3. A duplicate copy of this permit must accompany or be attached to the container, package, enclosure, or other means of containment in which a protected species or protected species part is placed for purposes of storage, transit, supervision or care.

E. Reporting

1. The Permit Holder must submit incident and annual reports containing the information and in the format specified by the Permits Division.
 - a. Reports must be submitted to the Permits Division by one of the following:
 - iv. The online system at <https://apps.nmfs.noaa.gov>;
 - v. An email attachment to the permit analyst for this permit; or
 - vi. A hard copy mailed or faxed to the Chief, Permits Division.
 - b. You must contact your permit analyst for a reporting form if you do not submit reports through the online system.
2. Incident Reporting
 - a. If the total number of mortalities is reached, or authorized takes have been exceeded as specified in Conditions A.2 and B.5, the Permit Holder must:

- iv. Contact the Permits Division by phone (301-427-8401) as soon as possible, but no later than 2 business days of the incident;
 - v. Submit a written report within 2 weeks of the incident as specified below; and
 - vi. Receive approval from the Permits Division before resuming work. The Permits Division may grant authorization to resume permitted activities based on review of the incident report and in consideration of the Terms and Conditions of this permit.
- b. Any time a serious injury or mortality of a protected species occurs, a written report must be submitted within two weeks.
 - c. The incident report must include 1) a complete description of the events, and 2) identification of steps that will be taken to reduce the potential for additional serious injury and research-related mortality or exceeding authorized take.
3. Annual reports describing activities conducted during the previous permit year (from June 1 to May 31) must:
 - a. Be submitted by September 1 each year for which the permit is valid, and
 - b. Include a tabular accounting of takes and a narrative description of activities and their effects.
 4. A joint annual/final report including a discussion of whether the objectives were achieved must be submitted by (September 1, 2024), or, if the research concludes prior to permit expiration, within 90 days of completion of the research.
 5. Research results must be published or otherwise made available to the scientific community in a reasonable period of time. Copies of technical reports, conference abstracts, papers, or publications resulting from permitted research must be submitted the Permits Division upon request.

F. Notification and Coordination

1. NMFS Regional Offices are responsible for ensuring coordination of the timing and location of all research activities in their areas to minimize unnecessary duplication, harassment, or other adverse impacts from multiple researchers.

2. The Permit Holder must ensure written notification of planned field work for each project is provided to the NMFS Regional Office listed below at least two weeks prior to initiation of each field trip/season.

- a. Notification must include the following:

- i. Locations of the intended field study and/or survey routes;
- ii. Estimated dates of activities; and
- iii. Number and roles of participants (for example: PI, CI, veterinarian, boat driver, safety diver, animal restrainer, Research Assistant “in training”).

- b. Notification must be sent to the Assistant Regional Administrator for Protected Resources:

Alaska Region, NMFS, P.O. Box 21668, Juneau, AK 99802-1668; phone (907)586-7235; fax (907)586-7012.

3. Researchers must coordinate their activities with other permitted researchers to avoid unnecessary disturbance of animals or duplication of efforts. Contact the Regional Office listed above for information about coordinating with other Permit Holders.

G. Observers and Inspections

1. NMFS may review activities conducted under this permit. At the request of NMFS, the Permit Holder must cooperate with any such review by:
 - a. Allowing an employee of NOAA or other person designated by the Director, NMFS Office of Protected Resources to observe and document permitted activities; and
 - b. Providing all documents or other information relating to the permitted activities.

H. Modification, Suspension, and Revocation

1. Permits are subject to suspension, revocation, modification, and denial in accordance with the provisions of subpart D [Permit Sanctions and Denials] of 15 CFR Part 904.
2. The Director, NMFS Office of Protected Resources may modify, suspend, or revoke this permit in whole or in part:
 - a. In order to make the permit consistent with a change made after the date of permit issuance with respect to applicable regulations prescribed under Section 103 of the MMPA and Section 4 of the ESA;
 - b. In a case in which a violation of the terms and conditions of the permit is found;
 - c. In response to a written request¹² from the Permit Holder;
 - d. If NMFS determines that the application or other information pertaining to the permitted activities (including, but not limited to, reports pursuant to Section E of this permit and information provided to NOAA personnel pursuant to Section G of this permit) includes false information; and
 - e. If NMFS determines that the authorized activities will operate to the disadvantage of threatened or endangered species or are otherwise no longer consistent with the purposes and policy in Section 2 of the ESA.
3. Issuance of this permit does not guarantee or imply that NMFS will issue or approve subsequent permits or amendments for the same or similar activities requested by the Permit Holder, including those of a continuing nature.

¹² The Permit Holder may request changes to the permit related to: the objectives or purposes of the permitted activities; the species or number of animals taken; and the location, time, or manner of taking or importing protected species. Such requests must be submitted in writing to the Permits Division in the format specified in the application instructions.

I. Penalties and Permit Sanctions

1. A person who violates a provision of this permit, the MMPA, ESA, or the regulations at 50 CFR 216 and 50 CFR 222-226 is subject to civil and criminal penalties, permit sanctions, and forfeiture as authorized under the MMPA, ESA, and 15 CFR Part 904.
2. The NMFS Office of Protected Resources shall be the sole arbiter of whether a given activity is within the scope and bounds of the authorization granted in this permit.
 - a. The Permit Holder must contact the Permits Division for verification before conducting the activity if they are unsure whether an activity is within the scope of the permit.
 - b. Failure to verify, where the NMFS Office of Protected Resources subsequently determines that an activity was outside the scope of the permit, may be used as evidence of a violation of the permit, the MMPA, the ESA, and applicable regulations in any enforcement actions.

J. Acceptance of Permit

1. In signing this permit, the Permit Holder:
 - a. Agrees to abide by all terms and conditions set forth in the permit, all restrictions and relevant regulations under 50 CFR Parts 216, and 222-226, and all restrictions and requirements under the MMPA, and the ESA;
 - b. Acknowledges that the authority to conduct certain activities specified in the permit is conditional and subject to authorization by the Office Director; and
 - c. Acknowledges that this permit does not relieve the Permit Holder of the responsibility to obtain any other permits, or comply with any other Federal, State, local, or international laws or regulations.

Donna S. Wieting

NMFS Permit No. 22293

Expiration Date: May 31, 2024

Date Issued

Director, Office of Protected Resources
National Marine Fisheries Service

Tara L. Riemer, Ph.D.
President and CEO
Alaska SeaLife Center
Responsible Party

Date Effective

Appendix 1: Table Specifying the Kind(s) of Protected Species, Location(s), and Manner of Taking

Table 1. Take Information for Study Number: 22293; Most of the work will be concentrated at Chiswell Island (59.602 N, 149.568 W) and rookeries/haulouts between Prince William Sound and Outer Island. Additional work farther west is dependent on funding and research needs.											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
1	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	6000	12	Harass	Other	Count/survey; Incidental disturbance; Remote video monitoring	Other = Harassment is associated with maintenance & repair of remote monitoring equipment (cameras, microphone, control tower); vessel and ground approach to access rookery and haulouts
2	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	125	1	Capture/Handle/Release	Hand and/or Dip Net	Anesthesia, gas w/cone or mask; Calipers (skin fold); Mark, bleach ; Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Photo-id; Photogrammetry; Photograph/Video; Restrain, board; Restrain, hand; Restrain, net; Sample, blood ; Sample, clip hair; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	Pup capture/sampling/markings; Individual pups will not be marked by more than one method; branding/sampling will occur in only 3 of the 5 years of permit; only 100 pups will have milk samples taken annually

Table 1. Take Information for Study Number: 22293; Most of the work will be concentrated at Chiswell Island (59.602 N, 149.568 W) and rookeries/haulouts between Prince William Sound and Outer Island. Additional work farther west is dependent on funding and research needs.

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
3	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	1000	1	Harass	Survey, ground	Incidental disturbance	Incidental disturbance associated with capture, handling, and sampling of pups
4	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	Adult	Male and Female	100	3	Harass	Other	Sample, blubber biopsy; Sample, muscle biopsy; Sample, skin biopsy; photography; videography; count/survey	Collect method is remote biopsy darting
5	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	Juvenile/Subadult	Male and Female	50	3	Harass	Other	Sample, blubber biopsy; Sample, muscle biopsy; Sample, skin biopsy	Collect method is remote biopsy darting
6	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	200	3	Harass	Other	Incidental disturbance	Incidental disturbance associated with biopsy darting

Table 1. Take Information for Study Number: 22293; Most of the work will be concentrated at Chiswell Island (59.602 N, 149.568 W) and rookeries/haulouts between Prince William Sound and Outer Island. Additional work farther west is dependent on funding and research needs.

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
7	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	1170	1	Sampling	Survey, ground	Collect, molt; Collect, scat; Collect, spew; Collect, urine; Salvage (carcass, tissue, parts)	Collect fecal samples, placentas, aborted fetuses, and carcasses
8	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	4000	6	Harass	Survey, ground	Incidental disturbance	Incidental disturbance by researchers on ground and associated with material collections and salvage that may include scat, aborted fetuses, placentae, carcasses, spew, other tissues and parts
9	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	4000	6	Harass	Survey, vessel	Count/survey; Incidental disturbance; Observation, mark resight; Photo-id; vessel obs.	Incidental disturbance associated with vessel based observations, photo ID and counts
10	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	4	1	Unintentional mortality	Other	Unintentional mortality; Salvage (carcass, tissue, parts)	Mortality incidental to any research activity or including euthanasia for humane purposes. Full necropsies performed when possible. Not to exceed 12 across permit.

Table 1. Take Information for Study Number: 22293; Most of the work will be concentrated at Chiswell Island (59.602 N, 149.568 W) and rookeries/haulouts between Prince William Sound and Outer Island. Additional work farther west is dependent on funding and research needs.

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
11	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	1000	9999	Import/export/receive only	Other	Import/export/receive, parts	export of scat hard and soft parts, blubber samples, skin, hair for laboratory analysis
12	California sea lion		Wild	All	Male and Female	20	12	Harass	Other	Incidental disturbance;	Other = Harassment is associated with maintenance & repair of remote monitoring equipment (cameras, microphone, control tower); vessel and ground approach to access rookery and haulouts
13	Harbor seal		Wild	All	Male and Female	100	12	Harass	Other	Incidental disturbance;	Other = Harassment is associated with maintenance & repair of remote monitoring equipment (cameras, microphone, control tower); vessel and ground approach to access rookery and haulouts

Appendix 2: NMFS-Approved Personnel and Authorized Recipients for Permit No. 22293.

The following individuals are approved to act as Co-Investigators pursuant to the terms and conditions under Section C (Qualifications, Responsibilities, and Designation of Personnel) of this permit.

Name/Affiliation	Role	Activities
John Maniscalco, Ph.D. Alaska SeaLife Center Seward, AK	Principal Investigator	Supervise and perform all activities under the permit excluding anesthesia during capture
Markus Horning, Ph.D. Alaska SeaLife Center Seward, AK	Co-investigator	Supervise and perform all activities under the permit excluding anesthesia during capture and biopsy darting
Pamela Parker, M.S. Alaska SeaLife Center Seward, AK	Co-investigator	Remote and field-based monitoring, capture, handling, morphometrics of pups, collection of scats, spews, tissues, and carcasses
Jared Guthridge, M.S. Alaska SeaLife Center Seward, AK	Co-investigator	Field-based monitoring, capture/handling/morphometrics of pups, collection of scats, spews, tissues, and carcasses
Carrie Goertz, D.V.M., Ph.D. Alaska SeaLife Center Seward, AK	Veterinarian	Supervise and perform anesthesia, animal health assessments, capture and handling

Biological samples authorized for collection or acquisition in Table 1 of Appendix 1 may be transferred to the following Authorized Recipients for the specified disposition, consistent with Condition B.6 of the permit:

Name and Affiliation	Sample	Disposition
Lorrie Rea, Ph.D. University of Alaska	Receive hair, vibrissae, whole blood, pup carcasses	Analysis

Fairbanks, AK		
Mandy Keogh, Ph.D. Alaska Department of Fish & Game, Juneau, AK	Receive whole blood, serum, hair, vibrissae, feces	Analysis
Kathy Burek Huntington, Ph.D. Alaska Veterinary Pathology Services, Eagle River, AK	Fixed tissue samples, blood, whole carcasses, tissue and mucous swabs	Analysis
Sara Iverson, Ph.D. Dalhousie University Halifax, Nova Scotia, Canada	Milk and blubber fatty acid extractions for identification	Analysis
Susan Crockford Pacific ID, Victoria, B.C., Canada	Hard part remains from scat and spew for identification.	Analysis
Greg O’Corry Crowe Harbor Branch Oceanographic Institute, Fort Pierce, FL	Skin biopsy or punches for genetic analysis	Analysis

19.3 Appendix C – Draft Permit No. 22298

The text below was taken directly from the proposed permit provided to us in the consultation initiation package from the Permits and Conservation Division. The final permit may have minor changes that will not affect this Opinion.

Permit No. 22298

Expiration Date: May 31, 2024
Reports Due: September 1, annually

PERMIT TO TAKE PROTECTED SPECIES¹³ FOR SCIENTIFIC PURPOSES

I. Authorization

This permit is issued to the Alaska Department of Fish and Game (hereinafter “Permit Holder”), Division of Wildlife Conservation, Juneau, Alaska [Responsible Party: Michael J. Rehberg], pursuant to the provisions of the Marine Mammal Protection Act of 1972 as amended (MMPA; 16 U.S.C. 1361 *et seq.*); the regulations governing the taking and importing of marine mammals (50 CFR Part 216); the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq.*); the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR Parts 222-226); and the Fur Seal Act of 1966 (16 U.S.C. 1151 *et seq.*).

II. Abstract

The objective of the permitted activity, as described in the application, is to continue monitoring the status of the Alaskan Steller sea lion population and, by monitoring the health, nutritional status and foraging behavior of these animals, investigate the potential causes of the population decline, or lack of recovery, as to provide for the recovery of the population.

¹³ “Protected species” include species listed as threatened or endangered under the ESA, and marine mammals.
NMFS Permit No. 22298

III. Terms and Conditions

The activities authorized herein must occur by the means, in the areas, and for the purposes set forth in the permit application, and as limited by the Terms and Conditions specified in this permit, including appendices and attachments. Permit noncompliance constitutes a violation and is grounds for permit modification, suspension, or revocation, and for enforcement action.

A. Duration of Permit

1. Personnel listed in Condition C.1 of this permit (hereinafter “Researchers”) may conduct activities authorized by this permit through May 31, 2024. This permit may be extended by the Director, National Marine Fisheries Service (NMFS) Office of Protected Resources or the Chief, Permits and Conservation Division (hereinafter Permits Division), pursuant to applicable regulations and the requirements of the MMPA and ESA.
2. Researchers must immediately stop permitted activities and the Permit Holder or Principal Investigator must contact the Chief, NMFS Permits and Conservation Division (hereinafter “Permits Division”) for written permission to resume:
 - a. If three Steller sea lions are darted and suffer unanticipated adverse effects, including entering the water and either drowning or disappearing so that their fate cannot be determined.
 - b. If serious injury or mortality¹⁴ of protected species reaches that specified in Tables 1-3 of Appendix 1.
- b. If authorized take¹⁵ is exceeded in any of the following ways:

¹⁴ This permit allows for unintentional serious injury and mortality caused by the presence or actions of researchers up to the limit in Tables 1-3 of Appendix 1. This includes, but is not limited to: deaths of dependent young by starvation following research-related death of a lactating female; deaths resulting from infections related to sampling procedures or invasive tagging; and deaths or injuries sustained by animals during capture and handling, or while attempting to avoid researchers or escape capture. Note that for marine mammals, a serious injury is defined by regulation as any injury that will likely result in mortality.

¹⁵ By regulation, a take under the MMPA means to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal. This includes, without limitation, any of the following: The collection of dead animals, or parts thereof; the restraint or detention of a marine mammal, no matter how temporary; tagging a

- i. More animals are taken than allowed in Tables 1-3 of Appendix 1.
- ii. Animals are taken in a manner not authorized by this permit.
- iii. Protected species other than those authorized by this permit are taken.

c. Following incident reporting requirements at Condition E.2.

3. The Permit Holder may continue to possess biological samples¹⁶ acquired¹⁷ under this permit after permit expiration without additional written authorization provided a copy of this permit is kept with the samples and they are maintained as specified in this permit.

B. Number and Kinds of Protected Species, Locations and Manner of Taking

1. The tables in Appendix 1 outline the authorized species and stock or distinct population segment (DPS) authorized; number of animals to be taken; number of animals from which parts may be received, imported and exported; and the manner of take, locations, and time period.
2. Researchers working under this permit may collect images (e.g., photographs, video) and audio recordings in addition to the photo-identification or behavioral photo-documentation authorized in Appendix 1 as needed to document the permitted activities, provided the collection of such images or recordings does not result in takes.
3. The Permit Holder may use visual images and audio recordings collected under this permit, including those authorized in Tables 1-3 of Appendix 1, in printed materials (including commercial or scientific publications) and presentations provided the images and recordings are accompanied by a statement indicating that the activity was conducted pursuant to NMFS ESA/MMPA Permit No. 22298. This statement must accompany the images and recordings in all subsequent uses or sales.

marine mammal; the negligent or intentional operation of an aircraft or vessel, or the doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal; and feeding or attempting to feed a marine mammal in the wild. Under the ESA, a take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to do any of the preceding.

¹⁶ Biological samples include, but are not limited to: carcasses (whole or parts); and any tissues, fluids, or other specimens from live or dead protected species; except feces, urine, and spew collected from the water or ground.

¹⁷ Authorized methods of sample acquisition are specified in Appendix 1.

NMFS Permit No. 22298

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Expiration Date: May 31, 2024

4. The Chief, Permits Division may grant written approval for personnel performing activities not essential to achieving the research objectives (e.g., a documentary film crew) to be present, provided:
 - a. The Permit Holder submits a request to the Permits Division specifying the purpose and nature of the activity, location, approximate dates, and number and roles of individuals for which permission is sought.
 - b. Non-essential personnel/activities will not influence the conduct of permitted activities or result in takes of protected species.
 - c. Persons authorized to accompany the Researchers for the purpose of such non-essential activities will not be allowed to participate in the permitted activities.
 - d. The Permit Holder and Researchers do not require compensation from the individuals in return for allowing them to accompany Researchers.

5. Researchers must comply with the following conditions related to the manner of taking:

Counting Takes

For Ground surveys and captures

- a. For pinnipeds, you will count 1 take per animal per day for those animals that react to the research activities in these ways:
 - i. Movements of twice the animal's body length or more,
 - ii. Changes of direction greater than 90 degrees, or
 - iii. Retreats (flushes) to the water.

- b. If you are working on land, count takes of all pinniped species encountered on land based on behavioral responses in B.5.a.

- i. If you are working on land and pinnipeds are in the water, do not count them unless you see an adverse behavioral response from your activities.
- c. Count every animal netted or captured in water even if immediately released. Count and report any non-target species that are netted.
- d. Count and report 1 take per day for each pinniped captured for all procedures including approach, capture, handle, sample, and release.

For Vessel Surveys

- e. If you are surveying pinnipeds hauled out on land from a vessel, count animals that exhibit behavioral response detailed above in B.5.a while on land.
 - i. Do not count pinnipeds that approach the vessel in the water, but
 - ii. Do count pinniped takes in water if there is a noticeable adverse behavioral response.
- f. Do not count takes of pinnipeds as you are transiting between research locations and not actively conducting research.

For Aerial Surveys

- g. If you are counting pinnipeds hauled out on land from a manned or unmanned aircraft, count pinnipeds that exhibit the behavioral responses detailed above in B.5.a for land-based work.
- h. Additionally, to account for animals in the water below the aircraft that may be disturbed from the flyover:
 - i. You are not required to report on takes that occur in water during overflights if there is no obvious adverse behavioral response.
 - ii. If you happen to see a noticeable adverse reaction from a pinniped in water, please include it in your annual reports.

Aerial Surveys

- i. Manned aerial surveys must be flown at an altitude of 490 feet or higher.
- j. Researchers are authorized to use a fixed wing and vertical take-off and landing UAS.
- k. UAS must be flown at an altitude of 150 feet or higher.

Ground Research and Capture

- l. Researchers must carry out activities efficiently and use biologists experienced in capture and sampling techniques to complete the activities as quickly as possible to reduce disturbance and minimize handling time.
- m. Researchers must exercise caution when approaching all pinnipeds, and must take reasonable steps to identify and avoid/minimize [capture and sampling and] disturbance of pregnant females and lactating females with pups.
- n. Efforts to approach and capture a particular pinniped or lactating female and pup must be immediately terminated if there is any evidence that the activities may be life-threatening to the animals.
- o. Researchers must take reasonable steps to identify pups of lactating females before attempting to immobilize a lactating female.
- p. Researchers must minimize the time lactating females are removed or otherwise separated from their dependent offspring as a result of research activities.
- q. Researchers must capture and handle pinnipeds in groups small enough so that all animals can be adequately monitored to prevent drowning, overheating, suffocation, and injury.
- r. Researchers must use sterile disposable needles, biopsy punches, and other sampling tools to the maximum extent practicable.
- s. Researchers must thoroughly clean and disinfect all non-disposable equipment between animals and, as needed, immediately prior to each use.
- t. Researchers must consult an experienced marine mammal veterinarian for proper dosages and protocols for use of anesthesia and sedatives, including administration via remote darting.
- u. Researchers must immediately cease research-related procedures if a pinniped is showing signs (e.g., overexertion, constant muscle tensions, abnormal respiration or heart rate) that may lead to serious injury, capture myopathy, other disease conditions, or death; and monitor and treat the animal as determined appropriate by the PI, CI, or attending veterinarian.
- v. Researchers must ensure that pinnipeds that have been captured and anesthetized or administered immobilizing drugs have an opportunity to

recover after release without undue risk of drowning or injury from other animals.

Mortalities

- w. To the maximum extent practical without causing further disturbance, researchers must monitor study sites following any disturbance (e.g., surveys or sampling activities) to determine if any animals have been seriously injured or killed, or if any pups have been abandoned. Any observed serious injury to or death of a marine mammal or observed abandonment of a dependent pup is to be reported as indicated below and in Condition E.2.
- x. If a lactating female dies as a result of the permitted activities and her dependent pup can be identified, or if a dependent pup is abandoned, the PI, CI or veterinarian present will evaluate the pup's age, health, and ability to survive on its own. If the pup is not likely to survive and the pup is not a candidate for rehabilitation, or rehabilitation is not logistically feasible, the PI/CI and/or veterinarian will determine the proper course of action (e.g., euthanasia) in accordance with the approved Institutional Animal Care and Use Committees (IACUC) protocols and the pup must be counted as a research-related mortality.
- y. In the event an animal dies, is euthanized, or if a dependent pup is abandoned as a result of research activities, the Permit Holder must, within two weeks, submit an incident report as described in Condition E.2. For research-related mortalities, a necropsy should be performed, except where not feasible such as in remote areas with limited personnel. Gross necropsy findings should be included as part of an incident report. Final necropsy findings (e.g., histology and other analyses) must be submitted when complete.
- z. Researchers must take appropriate actions (e.g., disinfection procedures) for minimizing the introduction of new disease agents, vectors capable of efficiently transmitting indigenous dormant diseases or those not currently being effectively transmitted, and species that can serve as amplification hosts for transmitting indigenous diseases to other species.

Salvage

- aa. The Permit Holder must coordinate with the NMFS Alaska Region Stranding Coordinator (phone 907-586-7248) prior to collecting samples or carcasses of any dead stranded ESA-listed marine mammals. The Stranding Coordinator may require the Permit Holder to collect specific data and samples and provide these to the NMFS Alaska Regional Office.

Non-target Species

- bb. This permit does not authorize takes of any protected species not identified in Appendix 1, including those species under the jurisdiction of the United States Fish and Wildlife Service (USFWS). Should other protected species be encountered during the research activities authorized under this permit, researchers must exercise caution and remain a safe distance from the animal(s) to avoid take, including harassment.

Sea Otters

- cc. For activities in areas where sea otters may be encountered, the Permit Holder or PI must follow these conditions to prevent interactions with sea otters:
 - i. Obey all speed zones and drive slowly in all areas with sea otters. Boat strikes are a cause of death for sea otters.
 - ii. If sea otters are observed prior to an encounter, avoid approaching them directly and maintain a minimum distance of 20 meters (66 feet) at all times.
 - iii. If sea otters approach, place boat engines in neutral and allow the animals to pass.
 - iv. If the sea otters are located during aerial surveys, altitudes should be increased to 500 feet and surveys should cease if the sea otters appear to be affected by the over flight.
- dd. During capture events in waters where sea otters may be present, the Permit Holder or PI must follow these conditions to prevent interactions with sea otters:
 - i. Netting activities must cease if a sea otter is sighted within 100 meters.
 - ii. If a sea otter is accidentally captured:
 - A. Devote all staff efforts to freeing the animal. Remember that a sea otter must surface approximately every few minutes. The Permit Holder or PI shall brief all participants to ensure that they understand that freeing a sea otter can be dangerous. This briefing will caution people to keep fingers out of the nets, that no jewelry should be worn, that sea otters can reach

all parts of their body with their mouth (due to their lack of blubber and need to constantly groom) and deliver a bite that could result in serious injury, and that they give the animal adequate time and room to breathe as they are freeing it.

- B. As appropriate, turn off the vessel motors or put the engine in neutral. Propellers can seriously injure or kill sea otters.
 - C. Release tension on the net to allow the animal the opportunity to free itself. Exercise caution when attempting to assist the animal. Sea otters can thrash violently if captured or entangled in a net. Quick action is essential to protect the sea otter. Ensure that the animal does not escape with net still attached to it.
 - D. Contact the USFWS offices to report any gear or vessel interactions with sea otters.
- ee. If a sea otter is injured or killed during research activities, in addition to the requirements in Condition B.5.dd.ii above:
- i. Research must be suspended and the USFWS immediately contacted (see contact information below); and
 - ii. Within 30 days of the injury or mortality, a report detailing the circumstances that led to the injury or mortality and suggesting measures to prevent or minimize the chances of future injuries or mortalities must also be sent to: USFWS Division of Management Authority (DMA) (phone: 1-800-358-2104; fax: 703-358-2281, e-mail: Permits@fws.gov); and the USFWS Ventura Fish and Wildlife Office (VFWO), 2493 Portola Road, Suite B, Ventura, CA 93003,(805-644-1766), Lilian_Carswell@fws.gov.
 - iii. In the event of a death of a sea otter, a necropsy should be performed by a qualified veterinarian and details of the cause of death included in the written report in B.5.ee.iii above.
 - iv. The USFWS may subsequently recommend continuation of the suspended activities with any necessary modifications/conditions.
6. The Permit Holder must comply with the following conditions and the regulations at 50 CFR 216.37, for biological samples acquired or possessed under authority of this permit.

- a. The Permit Holder is ultimately responsible for compliance with this permit and applicable regulations related to the samples unless the samples are permanently transferred according to NMFS regulations governing the taking and importing of marine mammals (50 CFR 216.37) and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR 222.308).
- b. Samples must be maintained according to accepted curatorial standards and must be labeled with a unique identifier (e.g., alphanumeric code) that is connected to on-site records with information identifying the following:
 - vi. Species and, where known, age and sex;
 - vii. Date of collection, acquisition, or import;
 - viii. Type of sample (e.g., blood, skin, bone);
 - ix. Origin (i.e., where collected or imported from); and
 - x. Legal authorization for original sample collection or import.
- c. Biological samples belong to the Permit Holder and may be temporarily transferred to Authorized Recipients identified in Appendix 2 without additional written authorization, for analysis or curation related to the objectives of this permit. The Permit Holder remains responsible for the samples, including any reporting requirements.
- d. The Permit Holder may request approval of additional Authorized Recipients for analysis and curation of samples related to the permit objectives by submitting a written request to the Permits Division specifying:
 - ix. The name and affiliation of the recipient;
 - x. The address of the recipient;
 - xi. The types of samples to be sent (species, tissue type); and
 - xii. The type of analysis or whether samples will be curated
- e. Sample recipients must have authorization pursuant to 50 CFR 216.37 prior to permanent transfer of samples and transfers for purposes not related to the objectives of this permit.
- f. Samples cannot be bought or sold, including parts transferred pursuant to 50 CFR 216.37.
- g. After meeting the permitted objectives, the Permit Holder may continue to possess and use samples acquired under this permit, without additional written

authorization, provided the samples are maintained as specified in the permit and findings are discussed in the annual reports (See Condition E.3).

C. Qualifications, Responsibilities, and Designation of Personnel

1. At the discretion of the Permit Holder, the following Researchers may participate in the conduct of the permitted activities in accordance with their qualifications and the limitations specified herein:
 - a. Principal Investigator – Michael J. Rehberg.
 - b. Co-Investigators – See Appendix 2 for list of names and corresponding activities.
 - c. Research Assistants – personnel identified by the Permit Holder or Principal Investigator and qualified to act pursuant to Conditions C.2, C.3, and C.4 of this permit.
2. Individuals conducting permitted activities must possess qualifications commensurate with their roles and responsibilities. The roles and responsibilities of personnel operating under this permit are as follows:
 - a. The Permit Holder is ultimately responsible for activities of individuals operating under the authority of this permit. Where the Permit Holder is an institution/facility, the Responsible Party is the person at the institution/facility who is responsible for the supervision of the Principal Investigator.
 - b. The Principal Investigator (PI) is the individual primarily responsible for the taking, import, export and related activities conducted under the permit. This includes coordination of field activities of all personnel working under the permit. The PI must be on site during activities conducted under this permit unless a Co-Investigator named in Condition C.1 is present to act in place of the PI.

- c. Co-Investigators (CIs) are individuals who are qualified to conduct activities authorized by the permit, for the objectives described in the application, without the on-site supervision of the PI. CIs assume the role and responsibility of the PI in the PI's absence.
 - d. Research Assistants (RAs) are individuals who work under the direct and on-site supervision of the PI or a CI. RAs cannot conduct permitted activities in the absence of the PI or a CI.
- 3. Personnel involved in permitted activities must be reasonable in number and essential to conduct of the permitted activities. Essential personnel are limited to:
 - a. Individuals who perform a function directly supportive of and necessary to the permitted activity (including operation of vessels or aircraft essential to conduct of the activity),
 - b. Individuals included as backup for those personnel essential to the conduct of the permitted activity, and
 - c. Individuals included for training purposes.
- 4. Persons who require state or Federal licenses or authorizations (e.g., veterinarians, pilots – including UAS operators) to conduct activities under the permit must be duly licensed/authorized and follow all applicable requirements when undertaking such activities.
- 5. Permitted activities may be conducted aboard vessels or aircraft, or in cooperation with individuals or organizations, engaged in commercial activities, provided the commercial activities are not conducted simultaneously with the permitted activities.

6. The Permit Holder cannot require or receive direct or indirect compensation from a person approved to act as PI, CI, or RA under this permit in return for requesting such approval from the Permits Division.
7. The Permit Holder or PI may add CIs by submitting a request to the Chief, Permits Division that includes a description of the individual's qualifications to conduct and oversee the activities authorized under this permit. If a CI will only be responsible for a subset of permitted activities, the request must also specify the activities for which they would provide oversight.
8. Where the Permit Holder is an institution/facility, the Responsible Party may request a change of PI by submitting a request to the Chief, Permits Division that includes a description of the individual's qualifications to conduct and oversee the activities authorized under this permit.
9. Submit requests to add CIs or change the PI by one of the following:
 - a. The online system at <https://apps.nmfs.noaa.gov>;
 - b. An email attachment to the permit analyst for this permit; or
 - c. A hard copy mailed or faxed to the Chief, Permits Division, Office of Protected Resources, NMFS, 1315 East-West Highway, Room 13705, Silver Spring, MD 20910; phone (301)427-8401; fax (301)713-0376.

D. Possession of Permit

1. This permit cannot be transferred or assigned to any other person.
2. The Permit Holder and persons operating under the authority of this permit must possess a copy of this permit when:
 - a. Engaged in a permitted activity.
 - b. A protected species is in transit incidental to a permitted activity.
 - c. A protected species taken or imported under the permit is in the possession of such persons.
3. A duplicate copy of this permit must accompany or be attached to the container, package, enclosure, or other means of containment in which a protected species or

protected species part is placed for purposes of storage, transit, supervision or care.

E. Reporting

1. The Permit Holder must submit incident and annual reports containing the information and in the format specified by the Permits Division.
 - a. Reports must be submitted to the Permits Division by one of the following:
 - i. The online system at <https://apps.nmfs.noaa.gov>;
 - ii. An email attachment to the permit analyst for this permit; or
 - iii. A hard copy mailed or faxed to the Chief, Permits Division.
 - b. You must contact your permit analyst for a reporting form if you do not submit reports through the online system.
2. Incident Reporting
 - a. If the total number of mortalities is reached, or authorized takes have been exceeded as specified in Conditions A.2 and B.5, the Permit Holder must:
 - i. Contact the Permits Division by phone (301-427-8401) as soon as possible, but no later than 2 business days of the incident;
 - ii. Submit a written report within 2 weeks of the incident as specified below; and
 - iii. Receive approval from the Permits Division before resuming work. The Permits Division may grant authorization to resume permitted activities based on review of the incident report and in consideration of the Terms and Conditions of this permit.
 - b. Any time a serious injury or mortality of a protected species occurs, a written report must be submitted within two weeks.
 - c. The incident report must include 1) a complete description of the events, and 2) identification of steps that will be taken to reduce the potential for additional serious injury and research-related mortality or exceeding authorized take.

3. Annual reports describing activities conducted during the previous permit year (from June 1 to May 31) must:
 - a. Be submitted by September 1 each year for which the permit is valid, and
 - b. Include a tabular accounting of takes and a narrative description of activities and their effects.
 - c. Include data on disturbance rates of marine mammals specific to UAS operations. Details should include, but not be limited to: species, altitude and angle of approach, context of exposure (e.g., behavioral states), and observed behavioral responses to the UAS.
4. A joint annual/final report including a discussion of whether the objectives were achieved must be submitted by (September 1, 2024), or, if the research concludes prior to permit expiration, within 90 days of completion of the research.
5. Research results must be published or otherwise made available to the scientific community in a reasonable period of time. Copies of technical reports, conference abstracts, papers, or publications resulting from permitted research must be submitted the Permits Division upon request.

F. Notification and Coordination

1. NMFS Regional Offices are responsible for ensuring coordination of the timing and location of all research activities in their areas to minimize unnecessary duplication, harassment, or other adverse impacts from multiple researchers.
2. The Permit Holder must ensure written notification of planned field work for each project is provided to the NMFS Regional Office listed below at least two weeks prior to initiation of each field trip/season.
 - a. Notification must include the following:
 - i. Locations of the intended field study and/or survey routes;
 - ii. Estimated dates of activities; and

iii. Number and roles of participants (for example: PI, CI, veterinarian, boat driver, safety diver, animal restrainer, Research Assistant “in training”).

b. Notification must be sent to the Assistant Regional Administrator for Protected Resources:

Alaska Region, NMFS, P.O. Box 21668, Juneau, AK 99802-1668; phone (907)586-7235; fax (907)586-7012.

3. Researchers must coordinate their activities with other permitted researchers to avoid unnecessary disturbance of animals or duplication of efforts. Contact the Regional Office listed above for information about coordinating with other Permit Holders.

G. Observers and Inspections

1. NMFS may review activities conducted under this permit. At the request of NMFS, the Permit Holder must cooperate with any such review by:

a. Allowing an employee of NOAA or other person designated by the Director, NMFS Office of Protected Resources to observe and document permitted activities; and

b. Providing all documents or other information relating to the permitted activities.

H. Modification, Suspension, and Revocation

1. Permits are subject to suspension, revocation, modification, and denial in accordance with the provisions of subpart D [Permit Sanctions and Denials] of 15 CFR Part 904.

2. The Director, NMFS Office of Protected Resources may modify, suspend, or revoke this permit in whole or in part:
 - a. In order to make the permit consistent with a change made after the date of permit issuance with respect to applicable regulations prescribed under Section 103 of the MMPA and Section 4 of the ESA;
 - b. In a case in which a violation of the terms and conditions of the permit is found;
 - c. In response to a written request¹⁸ from the Permit Holder;
 - d. If NMFS determines that the application or other information pertaining to the permitted activities (including, but not limited to, reports pursuant to Section E of this permit and information provided to NOAA personnel pursuant to Section G of this permit) includes false information; and
 - e. If NMFS determines that the authorized activities will operate to the disadvantage of threatened or endangered species or are otherwise no longer consistent with the purposes and policy in Section 2 of the ESA.
3. Issuance of this permit does not guarantee or imply that NMFS will issue or approve subsequent permits or amendments for the same or similar activities requested by the Permit Holder, including those of a continuing nature.

I. Penalties and Permit Sanctions

1. A person who violates a provision of this permit, the MMPA, ESA, or the regulations at 50 CFR 216 and 50 CFR 222-226 is subject to civil and criminal penalties, permit sanctions, and forfeiture as authorized under the MMPA, ESA, and 15 CFR Part 904.

¹⁸ The Permit Holder may request changes to the permit related to: the objectives or purposes of the permitted activities; the species or number of animals taken; and the location, time, or manner of taking or importing protected species. Such requests must be submitted in writing to the Permits Division in the format specified in the application instructions.

2. The NMFS Office of Protected Resources shall be the sole arbiter of whether a given activity is within the scope and bounds of the authorization granted in this permit.
 - a. The Permit Holder must contact the Permits Division for verification before conducting the activity if they are unsure whether an activity is within the scope of the permit.
 - b. Failure to verify, where the NMFS Office of Protected Resources subsequently determines that an activity was outside the scope of the permit, may be used as evidence of a violation of the permit, the MMPA, the ESA, and applicable regulations in any enforcement actions.

J. Acceptance of Permit

1. In signing this permit, the Permit Holder:
 - a. Agrees to abide by all terms and conditions set forth in the permit, all restrictions and relevant regulations under 50 CFR Parts 216, and 222-226, and all restrictions and requirements under the MMPA, and the ESA;
 - b. Acknowledges that the authority to conduct certain activities specified in the permit is conditional and subject to authorization by the Office Director; and
 - c. Acknowledges that this permit does not relieve the Permit Holder of the responsibility to obtain any other permits, or comply with any other Federal, State, local, or international laws or regulations.

Donna S. Wieting
Director, Office of Protected Resources
National Marine Fisheries Service

Date Issued

Michael J. Rehberg

Wildlife Biologist, Alaska Department of Fish & Game

Responsible Party

Date Effective

Appendix 1: Tables Specifying the Kind(s) of Protected Species, Location(s), and Manner of Taking

Table 1. SSL Eastern DPS											
Line	Species	Stock/ Listing Unit	Produ ction/ Origi n	Life stage	Sex	Authoriz ed Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
1	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	All	Male and Female	1390	1	Harass	Survey, ground	Count/survey; Incidental disturbance; Observation, mark resight	Incidental disturbance during ground surveys and remote biopsy sampling at haulouts and rookeries.
2	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	All	Male and Female	5000	1	Harass	Survey, vessel	Count/survey; Incidental disturbance; Observation, mark resight	Incidental disturbance during vessel surveys and remote biopsy sampling at haulouts and rookeries.
3	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	All	Male and Female	5000	1	Harass	Survey, aerial	Count/survey; Incidental disturbance; Observation, mark resight; remote vehicle (fixed wing); remote vehicle, (VTOL)	Incidental disturbance during SSL aerial surveys. Assumes 1.3% of animals present are disturbed. Includes a 0.05%*non-pup count buffer to account for animals in the water.

Table 1. SSL Eastern DPS											
Line	Species	Stock/ Listing Unit	Produ ction/ Origi n	Life stage	Sex	Authorize d Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
4	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	All	Male and Female	9000	1	Harass	Other	Collect, scat; Incidental disturbance; Observation, monitoring; Other; Remote video monitoring	Incidental disturbance associated with ground activities including disturbances of non-target SSL during capture and observation, scat collection, carcass collection, remote biopsy sampling, equipment maintenance, etc.
5	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	All	Male and Female	250	1	Harass	Other	Incidental disturbance	Incidental disturbance of non- target SSLs associated with pup branding.
6	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	Juven ile	Male and Female	50	1	Harass	Other	Other; Sample, skin biopsy	Remote skin biopsy of juvenile SSLs.
7	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	Adult	Male and Female	150	1	Harass	Other	Other; Sample, skin biopsy	Remote skin biopsy of adult SSLs.

Table 1. SSL Eastern DPS											
Line	Species	Stock/ Listing Unit	Produ ction/ Origi n	Life stage	Sex	Authoriz ed Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
9	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	pup	Male and Female	200	1	Capture/H andle/Rel ease	Other	Administer drug, IM; Administer drug, subcutaneous; Administer drug, topically; Collect, scat; Collect, urine; Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Photo-id; Restrain, board; Restrain, cage; Restrain, hand; Restrain, net; Restrain, other; Sample, blood ; Sample, clip hair; Sample, fecal swab; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	June - July. This is Method 1. Manual capture and sampling of pups on their rookery. No branding.

Table 1. SSL Eastern DPS											
Line	Species	Stock/ Listing Unit	Produ ction/ Origi n	Life stage	Sex	Authorize d Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
10	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	pup	Male and Female	200	1	Capture/H andle/Rel ease	Other	Administer drug, IM; Administer drug, subcutaneous; Administer drug, topically; Anesthesia, gas w/cone or mask; Collect, scat; Collect, urine; Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Photo- id; Restrain, board; Restrain, cage; Restrain, hand; Restrain, net; Restrain, other; Sample, clip hair; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	June - July. This is Method 2. Manual capture and minimal sampling of pups on their rookery. Branding optional on pups at least 20 kg or without umbilicus.

Table 1. SSL Eastern DPS											
Line	Species	Stock/ Listing Unit	Produ ction/ Origi n	Life stage	Sex	Authoriz ed Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
11	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	pup	Male and Female	150	1	Capture/H andle/Rel ease	Other	Administer drug, IM; Administer drug, subcutaneous; Administer drug, topically; Anesthesia, gas w/cone or mask; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Photo-id; Restrain, board; Restrain, cage; Restrain, hand; Restrain, net; Restrain, other; Sample, blood ; Sample, clip hair; Sample, clip nail; Sample, fecal loop; Sample, fecal swab;; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	June - July. This is Method 3. Manual capture and sampling of pups on their rookery. Branding optional on pups at least 20 kg or without umbilicus. Optional sampling added: bioelectrical impedance, blood, clip nail, fecal loop/swab, stomach lavage, swab mucous membranes, ultrasound,

Table 1. SSL Eastern DPS											
Line	Species	Stock/ Listing Unit	Produ ction/ Origi n	Life stage	Sex	Authoriz ed Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
12	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	pup	Male and Female	20	1	Capture/ Handle/ Release	Other	Administer drug, IM; Administer drug, subcutaneous; Administer drug, topically ; Anesthesia, gas w/cone or mask; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Photo-id; Restrain, board; Restrain, cage; Restrain, hand; Restrain, net; Restrain, other; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, clip nail; Sample, fecal loop; Sample, fecal swab; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	June - July. This is Method 4. Manual capture and sampling of pups on their rookery. Branding optional on pups at least 20 kg or without umbilicus. . Optional sampling added: blubber biopsy.

13	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	Pup/Juvenile	Male and Female	45	1	Capture/Handle/Release	Other	Administer drug, IM; Administer drug, subcutaneous; Administer drug, topically; Administer drug, intraperitoneal; Administer drug, IV; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Evan's blue dye and serial blood samples; Instrument, external (e.g., VHF, SLTDR); Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Photo-id; Restrain, cage; Restrain, net; Restrain, other; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, clip nail; Sample, fecal loop; Sample, fecal swab; Sample, muscle biopsy; Sample, other; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, tooth extraction; Sample, urine catheter; Sample, vibrissae (pull); Stable isotopes and serial blood samples; Ultrasound; Weigh	All year. Capture and handling of immature SSLs > 2 mo. Capture by underwater lasso, net, hand, noose pole, remote chemical immobilization (nonpups only). Sample, other=milk. One brand per lifetime. Intended research take is 30 captures; 15 takes are included to account for sea lions struck by a dart but not immobilized and captured.
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14	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	Adult	Male and Female	45	1	Capture/ Handle/ Release	Other	Administer drug, IM; Administer drug, subcutaneous; Administer drug, topically; Administer drug, intraperitoneal; Administer drug, IV; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Evan's blue dye and serial blood samples; Instrument, external (e.g., VHF, SLTDR); Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Photo-id; Restrain, cage; Restrain, net; Restrain, other; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, clip nail; Sample, fecal loop; Sample, fecal swab; Sample, milk (lactating females); Sample, muscle biopsy; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, tooth extraction; Sample, urine catheter; Sample, vibrissae (pull); Stable isotopes and serial blood samples; Ultrasound; Weigh	All year. Capture and handling of adult SSLs. Capture by underwater lasso, net, hand, noose pole, remote chemical immobilization. Intended research take is 30 captures; 15 takes are included to account for sea lions struck by a dart but not immobilized and captured. One brand per lifetime.
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Table 1. SSL Eastern DPS											
Line	Species	Stock/ Listing Unit	Produ ction/ Origi n	Life stage	Sex	Authoriz ed Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
15	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	All	Male and Female	3	1	Unintenti onal mortality	Other	Unintentional mortality; Salvage (carcass, tissue, parts)	Unintentional mortality, including humane euthanasia. Full necropsies performed when possible.
16	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	All	Male and Female	100	1	Sample	Other	Salvage (carcass, tissue, parts)	Collect or sample carcasses from (dead) stranded SSLs.
17	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	All	Male and Female	100	1	Import/ex port/recei ve only	Other	Salvage (carcass, tissue, parts)	Receive/import/export of carcasses or samples from subsistence harvested SSLs.
18	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	All	Male and Female	3960	1	Harass	Survey, ground	Count/survey; Incidental disturbance; Observation, mark resight	May - August. Incidental disturbance during ground surveys at haulouts and rookeries (Forrester Island Complex).
19	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	All	Male and Female	3500	1	Harass	Survey, vessel	Count/survey; Incidental disturbance; Observation, mark resight	May - August. Incidental disturbance during vessel surveys at haulouts and rookeries (Forrester Island Complex).

Table 2. Western SSL

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Take Per Animal	Take Action	Observe/Collect Method	Procedures	Details
1	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	1390	1	Harass	Survey, ground	Count/survey; Incidental disturbance; Observation, mark resight	Incidental disturbance during ground surveys and remote biopsy sampling at haulouts and rookeries.
2	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	4000	1	Harass	Survey, vessel	Count/survey; Incidental disturbance; Observation, mark resight	Incidental disturbance during vessel surveys and remote biopsy sampling at haulouts and rookeries.
3	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	7500	1	Harass	Survey, aerial	Count/survey; Incidental disturbance; Observation, mark resight; remote vehicle (fixed wing); remote vehicle, (VTOL)	Incidental disturbance during SSL aerial surveys. . Includes a 0.05%*non-pup count buffer to account for animals in the water.

Table 2. Western SSL											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Take Per Animal	Take Action	Observe/Collect Method	Procedures	Details
4	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	4000	1	Harass	Other	Collect, scat; Incidental disturbance; Observation, monitoring; Other; Remote video monitoring	Incidental disturbance associated with ground activities including disturbances of non-target SSL during capture and observation, scat collection, carcass collection, remote biopsy sampling, equipment maintenance, etc.
5	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	2500	1	Harass	Other	Incidental disturbance	Incidental disturbance of non-target SSLs associated with pup branding.
6	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	Juvenile	Male and Female	50	1	Harass	Other	Other; Sample, skin biopsy; Photography, Videography	Remote skin biopsy of juvenile SSLs.

Table 2. Western SSL											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
7	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	Adult	Male and Female	150	1	Harass	Other	Other; Sample, skin biopsy; Photography, Videography	Remote skin biopsy of adult SSLs.
9	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	300	1	Capture/Handle/Release	Hand and/or Dip net	Administer drug, IM; Administer drug, subcutaneous; Administer drug, topically; Collect, scat; Collect, urine; Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Photo-id; Restrain, board; Restrain, cage; Restrain, hand; Restrain, net; Restrain, other; Sample, blood ; Sample, clip hair; Sample, fecal swab; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	June - July. This is Method 1. Manual capture and sampling of pups on their rookery. No branding.

Table 2. Western SSL

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
10	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	400	1	Capture/Handle/Release	Hand and/or Dip net	Administer drug, IM; Administer drug, subcutaneous; Administer drug, topically; Anesthesia, gas w/cone or mask; Collect, scat; Collect, urine; Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Photo-id; Restrain, board; Restrain, cage; Restrain, hand; Restrain, net; Restrain, other; Sample, clip hair; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	June - July. This is Method 2. Manual capture and minimal sampling of pups on their rookery. Branding optional on pups at least 20 kg or without umbilicus.
11	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	200	1	Capture/Handle/Release	Hand and/or Dip net	Administer drug, IM; Administer drug, subcutaneous; Administer drug, topically; Anesthesia, gas w/cone or mask; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Photo-id; Restrain, board; Restrain, cage; Restrain, hand; Restrain, net; Restrain, other; Sample, blood ; Sample, clip hair; Sample, clip nail; Sample, fecal loop; Sample, fecal swab; Sample, other; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	June - July. This is Method 3. Manual capture and sampling of pups on their rookery. Branding optional on pups at least 20 kg or without umbilicus. Optional sampling added: bioelectrical impedance, blood, clip nail, fecal loop/swab, stomach lavage, swab mucous membranes, ultrasound, other (milk).

Table 2. Western SSL

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
12	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	pup	Male and Female	40	1	Capture/Handle/Release	Hand and/or Dip net	Administer drug, IM; Administer drug, subcutaneous; Administer drug, topically; Anesthesia, gas w/cone or mask; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Photo-id; Restrain, board; Restrain, cage; Restrain, hand; Restrain, net; Restrain, other; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, clip nail; Sample, fecal loop; Sample, fecal swab; Sample, other; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, vibrissae (pull); Ultrasound; Weigh	June - July. This is Method 4. Manual capture and sampling of pups on their rookery. Branding optional on pups at least 20 kg or without umbilicus. Sample, other=milk. Optional sampling added: blubber biopsy.

Table 2. Western SSL

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
13	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	Pup/Juvenile	Male and Female	45	1	Capture/Handle/Release	Other	Administer drug, IM; Administer drug, subcutaneous; Administer drug, topically; Administer drug, intraperitoneal; Administer drug, IV; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Evan's blue dye and serial blood samples; Instrument, external (e.g., VHF, SLTDR); Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Photo-id; Restrain, cage; Restrain, net; Restrain, other; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, clip nail; Sample, fecal loop; Sample, fecal swab; Sample, muscle biopsy; Sample, other; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, tooth extraction; Sample, urine catheter; Sample, vibrissae (pull); Stable isotopes and serial blood samples; Ultrasound; Weigh	All year. Capture and handling of immature SSLs > 2 mo. Capture by underwater lasso, net, hand, noose pole, remote chemical immobilization (nonpups only). Sample, other=milk. Intended research take is 30 captures; 15 takes are included to account for sea lions struck by a dart but not immobilized and captured. One brand per lifetime.

Table 2. Western SSL

Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
14	Sea lion, Steller	West of 144°; Long (Western US) (NMFS Endangered)	Wild	Adult	Male and Female	45	1	Capture/Handle/Release	Other	Administer drug, IM; Administer drug, subcutaneous; Administer drug, topically; Administer drug, intraperitoneal; Administer drug, IV; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Bioelectrical impedance (subcutaneous); Collect, scat; Collect, urine; Evan's blue dye and serial blood samples; Instrument, external (e.g., VHF, SLTDR); Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Photo-id; Restrain, cage; Restrain, net; Restrain, other; Sample, blood ; Sample, blubber biopsy; Sample, clip hair; Sample, clip nail; Sample, fecal loop; Sample, fecal swab; Sample, milk (lactating females); Sample, muscle biopsy; Sample, skin biopsy; Sample, stomach lavage; Sample, swab all mucus membranes; Sample, tooth extraction; Sample, urine catheter; Sample, vibrissae (pull); Stable isotopes and serial blood samples; Ultrasound; Weigh	All year. Capture and handling of adult SSLs. Capture by underwater lasso, net, hand, noose pole, remote chemical immobilization. Intended research take is 30 captures; 15 takes are included to account for sea lions struck by a dart but not immobilized and captured. One brand per lifetime.

Table 2. Western SSL											
Line	Species	Stock/Listing Unit	Production/Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
15	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	3	1	Unintentional mortality	Other	Unintentional mortality; Salvage (carcass, tissue, parts)	Unintentional mortality, including humane euthanasia. Full necropsies performed when possible.
16	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	100	1	Sample	Other	Salvage (carcass, tissue, parts)	Collect or sample carcasses from (dead) stranded SSLs.
17	Sea lion, Steller	West of 144° Long (Western US) (NMFS Endangered)	Wild	All	Male and Female	100	1	Import/export/receive only	Other	Salvage (carcass, tissue, parts)	Receive/import/export carcasses or samples from subsistence harvested SSLs.

Table 3. Incidental take											
Line	Species	Stock/ Listing Unit	Production/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
1	Sea lion, California	US Stock	Wild	All	Male and Female	200	1	Harass	Survey, ground	Incidental disturbance	Incidental disturbance during SSL research activity on land.
2	Sea lion, California	US Stock	Wild	All	Male and Female	445	1	Harass	Survey, vessel	Incidental disturbance	Incidental disturbance during SSL research activity aboard skiffs or vessels.
3	Sea lion, California	US Stock	Wild	All	Male and Female	2300	1	Harass	Survey, aerial	Incidental disturbance	Incidental disturbance during SSL aerial surveys <= 1000 feet altitude. Assumes 20% of animals present are disturbed.
4	Seal, harbor	Range-wide	Wild	All	Male and Female	550	1	Harass	Survey, ground	Incidental disturbance	Incidental disturbance during SSL research activity on land.
5	Seal, harbor	Range-wide	Wild	All	Male and Female	1880	1	Harass	Survey, vessel	Incidental disturbance	Incidental disturbance during SSL research activity aboard skiffs or vessels.

Table 3. Incidental take											
Line	Species	Stock/ Listing Unit	Production/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
6	Seal, harbor	Range-wide	Wild	All	Male and Female	2700	1	Harass	Survey, aerial	Incidental disturbance	Incidental disturbance during SSL aerial surveys. Assumes 20% of animals present are disturbed.
7	Seal, spotted	Alaska Stock	Wild	All	Male and Female	1000	1	Harass	Survey, aerial	Incidental disturbance	Incidental disturbance during SSL aerial surveys. Assumes 20% of animals present are disturbed. No ground surveys.
8	Seal, ringed	Arctic (NMFS Threatened)	Wild	All	Male and Female	50	1	Harass	Survey, ground	Incidental disturbance	Incidental disturbance during SSL research activity on land.
9	Seal, ringed	Arctic (NMFSThreatened)	Wild	All	Male and Female	200	1	Harass	Survey, aerial	Incidental disturbance	Incidental disturbance during SSL aerial surveys <= 1000 feet altitude.
10	Seal, bearded	Beringia	Wild	All	Male and Female	200	1	Harass	Survey, aerial	Incidental disturbance	Incidental disturbance during SSL aerial surveys. No ground surveys.
11	Seal, ribbon	Alaska Stock	Wild	All	Male and Female	200	1	Harass	Survey, aerial	Incidental disturbance	Incidental disturbance during SSL aerial surveys. No ground surveys.
12	Seal, Northern fur	Eastern Pacific Stock	Wild	All	Male and Female	70	1	Harass	Survey, ground	Incidental disturbance	Incidental disturbance during SSL research activity on land.
13	Seal, Northern fur	Eastern Pacific Stock	Wild	All	Male and Female	220	1	Harass	Survey, vessel	Incidental disturbance	Incidental disturbance during SSL research activity aboard skiffs or vessels.

Table 3. Incidental take											
Line	Species	Stock/ Listing Unit	Production/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
14	Seal, Northern fur	Eastern Pacific Stock	Wild	All	Male and Female	120	1	Harass	Survey, aerial	Incidental disturbance	Incidental disturbance during SSL aerial surveys.

Appendix 2: NMFS-Approved Personnel and Authorized Recipients for Permit No. 22298.

The following individuals are approved to act as Co-Investigators pursuant to the terms and conditions under Section C (Qualifications, Responsibilities, and Designation of Personnel) of this permit.

Name of Personnel	Activities
Michael Rehberg (PI)	Bioelectrical impedance (subcutaneous) of pinnipeds Capture pinnipeds: (hand, hoop net, other net), (underwater noose – <i>above water tasks</i>) Collect pinniped scat Count/survey pinnipeds: (vessel; land) External instrument on pinnipeds (e.g., VHF, SLTDR) Mark pinnipeds: (bleach, clip fur, dye/paint, neoprene patch), (flipper tag) Measure and weigh pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Remote video monitoring of pinnipeds Restrain pinnipeds (board, cage, hand, or net) Sample biopsy of pinnipeds (hands-on) (skin) Sample pinnipeds (nail, hair, or vibrissae)
Margaret Archibold (CI)	Collect pinniped scat Count/survey pinnipeds: (vessel; land) Observation of pinnipeds (mark resight, monitoring, or behavioral) Photo-Identification of pinnipeds Remote video monitoring of pinnipeds Salvage of dead pinnipeds (carcass, tissue, parts)
Julie Avery (CI)	Administer drugs to pinnipeds (IM) Administer drugs to pinnipeds (IV) Administer drugs to pinnipeds (subcutaneous) Administer drugs to pinnipeds (topically) Gas anesthesia for pinnipeds w/cone or mask Bioelectrical impedance (subcutaneous) of pinnipeds Capture pinnipeds: (hand, hoop net, other net), (underwater noose – <i>surface capture, no diving</i>) Collect pinniped scat Count/survey pinnipeds: (vessel; land) Mark pinnipeds: (bleach, clip fur, dye/paint, neoprene patch), (flipper tag) Measure and weigh pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Photo-Identification of pinnipeds Restrain pinnipeds (board, cage, hand, or net) Salvage of dead pinnipeds (carcass, tissue, parts) Sample, pinnipeds (blood) Sample pinnipeds: (serial blood samples, e.g., Evans blue, hormones, D2O) Sample biopsy of pinnipeds (hands-on) (blubber, skin, or muscle) Sample pinnipeds (nail, hair, or vibrissae) Sample pinnipeds, swab (anal, nasal, ocular, oral, fecal, or all mucus membranes) Sample pinnipeds (milk), (fecal enema or loop), (urine or stomach lavage). Ultrasound of pinnipeds

Name of Personnel	Activities
Kimberlee Beckmen, DVM (CI)	Administer drugs to pinnipeds (IM) Administer drugs to pinnipeds (IV) Administer drugs to pinnipeds (intraperitoneal) Administer drugs to pinnipeds (subcutaneous) Administer drugs to pinnipeds (topically) Injectable sedative/anesthesia to pinnipeds Gas anesthesia for pinnipeds w/cone or mask Gas anesthesia for pinnipeds w/intubation Bioelectrical impedance (subcutaneous) of pinnipeds Capture pinnipeds: (hand, hoop net, other net), (underwater noose – <i>above water tasks</i>), (remote chemical immobilization/darting) (noose with pole). Collect pinniped scat External instrument on pinnipeds (e.g., VHF, SLTDR) Mark pinnipeds: (bleach, clip fur, dye/paint, neoprene patch), (flipper tag) Measure and weigh pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Restrain pinnipeds (board, cage, hand, or net) Salvage of dead pinnipeds (carcass, tissue, parts) Sample, pinnipeds (blood) Sample pinnipeds: (serial blood samples, e.g., Evans blue, hormones, D2O) Sample biopsy of pinnipeds (hands-on) (blubber, skin, or muscle) Sample pinnipeds (nail, hair, or vibrissae) Sample pinnipeds (swab anal, nasal, ocular, oral, fecal, or all mucus membranes) Sample pinnipeds (milk), (fecal enema or loop), (urine or stomach lavage). Sample, tooth extraction Ultrasound of pinnipeds
Brian Fadely (CI)	Administer drugs to pinnipeds (IM) Administer drugs to pinnipeds (IV) Administer drugs to pinnipeds (subcutaneous) Administer drugs to pinnipeds (topically) Injectable sedative/anesthesia to pinnipeds Bioelectrical impedance (subcutaneous) of pinnipeds Capture pinnipeds: (hand, hoop net, other net), (underwater noose), Collect pinniped scat Count/survey pinnipeds: (vessel; land) External instrument on pinnipeds (e.g., VHF, SLTDR) Mark pinnipeds: (bleach, clip fur, dye/paint, neoprene patch), (flipper tag) Measure and weigh pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Photo-Identification of pinnipeds Remote video monitoring of pinnipeds Restrain pinnipeds (board, cage, hand, or net) Salvage of dead pinnipeds (carcass, tissue, parts) Sample, pinnipeds (blood) Sample pinnipeds: (serial blood samples, e.g., Evans blue, hormones, D2O) Sample biopsy of pinnipeds (hands-on) (blubber, skin, or muscle) Sample pinnipeds (nail, hair, or vibrissae) Sample pinnipeds (swab anal, nasal, ocular, oral, fecal, or all mucus membranes) Sample pinnipeds (milk), (fecal enema or loop), (urine or stomach lavage). Ultrasound of pinnipeds

Name of Personnel	Activities
Tom Gage (CI)	Capture pinnipeds: (hand, hoop net, other net), (underwater noose – above water tasks). Collect pinniped scat Count/survey pinnipeds: (vessel; land) External instrument on pinnipeds (e.g., VHF, SLTDR) Mark pinnipeds: (bleach, clip fur, dye/paint, neoprene patch), (flipper tag), (hot brand) Measure and weigh pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Photo-Identification of pinnipeds Remote video monitoring of pinnipeds Restrain pinnipeds (board, cage, hand, or net) Salvage of dead pinnipeds (carcass, tissue, parts) Sample biopsy of pinnipeds (hands-on) (skin) Sample pinnipeds (nail, hair, or vibrissae) Sample pinnipeds (swab anal, nasal, ocular, oral, fecal, or all mucus membranes) Sample pinnipeds (milk), (fecal enema or loop), (urine or stomach lavage).
Sue Goodglick (CI)	Capture pinnipeds: (hand, hoop net, other net), (underwater noose – <i>above water tasks</i>) Collect pinniped scat Count/survey pinnipeds: (vessel; land) Mark pinnipeds: (bleach, clip fur, dye/paint, neoprene patch) Measure and weigh pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Photo-Identification of pinnipeds Restrain pinnipeds (board, cage, hand, or net) Salvage of dead pinnipeds (carcass, tissue, parts)
Thomas Gelatt (CI)	Administer drugs to pinnipeds (subcutaneous) Bioelectrical impedance (subcutaneous) of pinnipeds Capture pinnipeds: (hand, hoop net, other net), (underwater noose), (noose with pole). Collect pinniped scat Count/survey pinnipeds: (vessel; land) External instrument on pinnipeds (e.g., VHF, SLTDR) Mark pinnipeds: (bleach, clip fur, dye/paint, neoprene patch), (flipper tag), (hot brand) Measure and weigh pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Remote video monitoring of pinnipeds Restrain pinnipeds (board, cage, hand, or net) Salvage of dead pinnipeds (carcass, tissue, parts) Sample, pinnipeds (blood) Sample biopsy of pinnipeds (hands-on) (blubber, skin) Sample pinnipeds (nail, hair, or vibrissae) Sample pinnipeds (swab anal, nasal, ocular, oral, fecal, or all mucus membranes) Sample pinnipeds (milk), (fecal enema or loop), (urine or stomach lavage). Sample, tooth extraction

Name of Personnel	Activities
Kelly Hastings (CI)	Capture pinnipeds: (hand, hoop net, other net). Collect pinniped scat Count/survey pinnipeds: (vessel; land) Mark pinnipeds: (bleach, clip fur, dye/paint, neoprene patch), (flipper tag) Measure and weigh pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Photo-Identification of pinnipeds Restrain pinnipeds (board, cage, hand, or net) Salvage of dead pinnipeds (carcass, tissue, parts)
Lauri Jemison (CI)	Acoustic, passive recording Bioelectrical impedance (subcutaneous) of pinnipeds Capture pinnipeds: (hand, hoop net, other net), (noose with pole). Collect pinniped scat Count/survey pinnipeds: (vessel; land; air) External instrument on pinnipeds (e.g., VHF, SLTDR) Mark pinnipeds: (bleach, clip fur, dye/paint, neoprene patch), (flipper tag) Measure and weigh pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Photo-Identification of pinnipeds Remote video monitoring of pinnipeds Restrain pinnipeds (board, cage, hand, or net) Salvage of dead pinnipeds (carcass, tissue, parts) Sample, pinnipeds (blood) Sample biopsy of pinnipeds (hands-on) (skin) Sample pinnipeds (nail, hair, or vibrissae) Sample pinnipeds (swab anal, nasal, ocular, oral, fecal, or all mucus membranes)
Justin Jenniges (CI)	Acoustic, passive recording Bioelectrical impedance (subcutaneous) of pinnipeds Capture pinnipeds: (hand, hoop net, other net), (underwater noose), (remote chemical immobilization/darting) Collect pinniped scat Count/survey pinnipeds: (vessel; land; air) External instrument on pinnipeds (e.g., VHF, SLTDR) Mark pinnipeds: (bleach, clip fur, dye/paint, neoprene patch), (flipper tag), (hot brand) Measure and weigh pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Photo-Identification of pinnipeds Remote vehicle, aerial (VTOL or fixed wing) (pending training if procedure is approved on new permit) Remote video monitoring of pinnipeds Restrain pinnipeds (board, cage, hand, or net) Sample biopsy of pinnipeds (hands-on) (skin) Sample biopsy of pinnipeds (remote darting) (blubber, skin) Sample pinnipeds: (nail, hair, or vibrissae), (fecal enema or loop) Sample pinnipeds, swab (anal, nasal, ocular, oral, fecal, or all mucus membranes) Salvage of dead pinnipeds (carcass, tissue, parts)

Name of Personnel	Activities
Shawna Karpovich (CI)	Administer drugs to pinnipeds (IM) Administer drugs to pinnipeds (IV) Administer drugs to pinnipeds (subcutaneous) Administer drugs to pinnipeds (topically) Injectable sedative/anesthesia to pinnipeds Bioelectrical impedance (subcutaneous) of pinnipeds Capture pinnipeds: (hand, hoop net, other net) Collect pinniped scat Count/survey pinnipeds: (vessel) External instrument on pinnipeds (e.g., VHF, SLTDR) Mark pinnipeds: (bleach, clip fur, dye/paint, neoprene patch), (flipper tag) Measure and weigh pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Photo-Identification of pinnipeds Remote video monitoring of pinnipeds Restrain pinnipeds (board, cage, hand, or net) Salvage of dead pinnipeds (carcass, tissue, parts) Sample, pinnipeds (blood) Sample pinnipeds: (serial blood samples, e.g., Evans blue, hormones, D2O) Sample biopsy of pinnipeds (hands-on) (blubber, skin, or muscle) Sample pinnipeds (nail, hair, or vibrissae) Sample pinnipeds (swab anal, nasal, ocular, oral, fecal, or all mucus membranes) Sample pinnipeds (milk), (fecal enema or loop), (urine or stomach lavage). Sample, tooth extraction Ultrasound of pinnipeds
Mandy Keogh (CI)	Administer drugs to pinnipeds (IM) Administer drugs to pinnipeds (topically) Injectable sedative/anesthesia to pinnipeds Bioelectrical impedance (subcutaneous) of pinnipeds Capture pinnipeds: (hand, hoop net, other net) Collect pinniped scat External instrument on pinnipeds (e.g., VHF, SLTDR) Mark pinnipeds: (bleach, clip fur, dye/paint, neoprene patch), (flipper tag) Measure and weigh pinnipeds Metabolic chamber/hood on pinnipeds Restrain pinnipeds (board, cage, hand, or net) Salvage of dead pinnipeds (carcass, tissue, parts) Sample, pinnipeds (blood) Sample pinnipeds: (serial blood samples, e.g., Evans blue, hormones, D2O) Sample biopsy of pinnipeds (hands-on) (blubber, skin, or muscle) Sample pinnipeds (nail, hair, or vibrissae) Sample pinnipeds (swab anal, nasal, ocular, oral, fecal, or all mucus membranes) Sample pinnipeds (milk), (fecal enema or loop), (urine or stomach lavage). Ultrasound of pinnipeds
Molly Kemp (CI)	Collect pinniped scat Count/survey pinnipeds: (vessel; land) Observation of pinnipeds (mark resight, monitoring, or behavioral) Photo-Identification of pinnipeds Salvage of dead pinnipeds (carcass, tissue, parts)
Stephen Woods Lewis (CI)	Acoustic, passive recording Collect pinniped scat Count/survey pinnipeds: (vessel; land) Mark pinnipeds: (flipper tag) Measure and weigh pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Photo-Identification of pinnipeds Salvage of dead pinnipeds (carcass, tissue, parts) Sample biopsy of pinnipeds (remote darting) (blubber, skin)

Name of Personnel	Activities
Sara Michelle Longson (CI)	Gas anesthesia for pinnipeds w/cone or mask Gas anesthesia for pinnipeds w/intubation Collect pinniped scat Measure and weigh pinnipeds Salvage of dead pinnipeds (carcass, tissue, parts) Sample, pinnipeds (blood) Sample pinnipeds (nail, hair, or vibrissae) Sample pinnipeds (swab anal, nasal, ocular, oral, fecal, or all mucus membranes)
John Moran (CI)	Acoustic, passive recording Collect pinniped scat Count/survey pinnipeds: (vessel; land; air) Observation of pinnipeds (mark resight, monitoring, or behavioral) Photo-Identification of pinnipeds Salvage of dead pinnipeds (carcass, tissue, parts)
Ryan P. Morrill (CI)	Capture pinnipeds: (hand, hoop net, other net) Collect pinniped scat Count/survey pinnipeds: (vessel; land) Measure and weigh pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Photo-Identification of pinnipeds Restrain pinnipeds (board, cage, hand, or net) Sample pinnipeds (nail, hair, or vibrissae)
Susan Oehlers (CI)	Count/survey pinnipeds: (air)
Nick Olmsted (CI)	Count/survey pinnipeds: (vessel; land) Observation of pinnipeds (mark resight, monitoring, or behavioral) Photo-Identification of pinnipeds Salvage of dead pinnipeds (carcass, tissue, parts)
Christie R. Osburn (CI)	Count/survey pinnipeds: (vessel; land) Observation of pinnipeds (mark resight, monitoring, or behavioral) Salvage of dead pinnipeds (carcass, tissue, parts)
Grey Pendleton (CI)	Collect pinniped scat Count/survey pinnipeds: (vessel; land; air) Observation of pinnipeds (mark resight, monitoring, or behavioral) Photo-Identification of pinnipeds Restrain pinnipeds (board, cage, hand, or net) Salvage of dead pinnipeds (carcass, tissue, parts)

Name of Personnel	Activities
Lori Polasek (CI)	Administer drugs to pinnipeds (IM) Administer drugs to pinnipeds (IV) Administer drugs to pinnipeds (subcutaneous) Administer drugs to pinnipeds (topically) Injectable sedative/anesthesia to pinnipeds Bioelectrical impedance (subcutaneous) of pinnipeds Capture pinnipeds: (hand, hoop net, other net) Collect pinniped scat Count/survey pinnipeds: (vessel; land; air) External instrument on pinnipeds (e.g., VHF, SLTDR) Mark pinnipeds: (bleach, clip fur, dye/paint, neoprene patch), (flipper tag) Measure and weigh pinnipeds Metabolic chamber/hood on pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Photo-Identification of pinnipeds Remote video monitoring of pinnipeds Restrain pinnipeds (board, cage, hand, or net) Salvage of dead pinnipeds (carcass, tissue, parts) Sample, pinnipeds (blood) Sample pinnipeds: (serial blood samples, e.g., Evans blue, hormones, D2O) Sample biopsy of pinnipeds (hands-on) (blubber, skin, muscle) Sample pinnipeds (nail, hair, or vibrissae) Sample pinnipeds (swab anal, nasal, ocular, oral, fecal, or all mucus membranes) Sample pinnipeds (milk), (fecal enema or loop), (urine or stomach lavage). Ultrasound of pinnipeds
Kim Raum-Suryan (CI)	Bioelectrical impedance (subcutaneous) of pinnipeds Capture pinnipeds: (hand, hoop net, other net), (underwater noose – above water tasks), (noose with pole). Collect pinniped scat Count/survey pinnipeds: (vessel; land; air) External instrument on pinnipeds (e.g., VHF, SLTDR) Mark pinnipeds: (bleach, clip fur, dye/paint, neoprene patch), (flipper tag) Measure and weigh pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Photo-Identification of pinnipeds Remote video monitoring of pinnipeds Restrain pinnipeds (board, cage, hand, or net) Salvage of dead pinnipeds (carcass, tissue, parts) Sample, pinnipeds (blood) Sample biopsy of pinnipeds (hands-on) (skin) Sample pinnipeds (nail, hair, or vibrissae)

Name of Personnel	Activities
Lorrie Rea (CI)	Administer drugs to pinnipeds (IM) Administer drugs to pinnipeds (IV) Bioelectrical impedance (subcutaneous) of pinnipeds Capture pinnipeds: (hand, hoop net, other net), (underwater noose) Collect pinniped scat Count/survey pinnipeds: (vessel; land) External instrument on pinnipeds (e.g., VHF, SLTDR) Mark pinnipeds: (bleach, clip fur, dye/paint, neoprene patch), (flipper tag), (hot brand) Measure and weigh pinnipeds Metabolic chamber/hood on pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Restrain pinnipeds (board, cage, hand, or net) Salvage of dead pinnipeds (carcass, tissue, parts) Sample, pinnipeds (blood) Sample pinnipeds: (serial blood samples, e.g., Evans blue, hormones, D2O) Sample biopsy of pinnipeds (hands-on) (blubber, skin, or muscle) Sample pinnipeds (nail, hair, or vibrissae) Sample pinnipeds (swab anal, nasal, ocular, oral, fecal, or all mucus membranes) Sample pinnipeds (milk), (fecal enema or loop), (urine or stomach lavage). Sample, tooth extraction Ultrasound of pinnipeds
Katharine N. Savage (CI)	Administer drugs to pinnipeds (IM) Administer drugs to pinnipeds (IV) Administer drugs to pinnipeds (subcutaneous) Administer drugs to pinnipeds (topically) Injectable sedative/anesthesia to pinnipeds Gas anesthesia for pinnipeds w/cone or mask Gas anesthesia for pinnipeds w/ intubation Capture pinnipeds: (hand, hoop net, other net), (remote chemical immobilization/darting) (noose with pole). Collect pinniped scat Count/survey pinnipeds: (vessel; land; air) External instrument on pinnipeds (e.g., VHF, SLTDR) Mark pinnipeds: (bleach, clip fur, dye/paint, neoprene patch), (flipper tag) Measure and weigh pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Restrain pinnipeds (board, cage, hand, or net) Salvage of dead pinnipeds (carcass, tissue, parts) Sample, pinnipeds (blood) Sample pinnipeds: (serial blood samples, e.g., Evans blue, hormones, D2O) Sample biopsy of pinnipeds (hands-on) (blubber, skin, or muscle) Sample pinnipeds (nail, hair, or vibrissae) Sample pinnipeds (swab anal, nasal, ocular, oral, fecal, or all mucus membranes) Sample pinnipeds (milk), (fecal enema or loop), (urine or stomach lavage). Sample, tooth extraction Ultrasound of pinnipeds
Gay Sheffield (CI)	Collect pinniped scat Count/survey pinnipeds: (vessel; land; air) Measure and weigh pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Salvage of dead pinnipeds (carcass, tissue, parts)

Name of Personnel	Activities
Greg Snedgen (CI)	Capture pinnipeds: (hand, hoop net, other net), (underwater noose), (remote chemical immobilization/darting). Collect pinniped scat Count/survey pinnipeds from: (vessel; land) External instrument on pinnipeds (e.g., VHF, SLTDR) Mark pinnipeds: (bleach, clip fur, dye/paint, neoprene patch), (flipper tag), (hot brand) Measure and weigh pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Restrain pinnipeds (board, cage, hand, or net) Sample biopsy of pinnipeds (hands-on) (blubber, skin) Sample pinnipeds (nail, hair, or vibrissae) Sample pinnipeds (swab anal, nasal, ocular, oral, fecal, or all mucus membranes) Salvage of dead pinnipeds (carcass, tissue, parts)
Brian Taras (CI)	Capture pinnipeds: (hand, hoop net, other net) Collect pinniped scat Count/survey pinnipeds: (vessel) Observation of pinnipeds (mark resight, monitoring, or behavioral) Restrain pinnipeds (board, cage, hand, or net) Salvage of dead pinnipeds (carcass, tissue, parts)
Elizabeth Van Burgh (CI)	Acoustic, passive recording Capture pinnipeds: (hand, hoop net, other net) Collect pinniped scat Count/survey pinnipeds: (vessel; land) Measure and weigh pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Photo-Identification of pinnipeds Restrain pinnipeds (board, cage, hand, or net) Salvage of dead pinnipeds (carcass, tissue, parts) Sample pinnipeds (nail, hair, or vibrissae)
Jamie Womble (CI)	Capture pinnipeds: (hand, hoop net, other net) Collect pinniped scat Count/survey pinnipeds: (vessel; land; air) External instrument on pinnipeds (e.g., VHF, SLTDR) Mark pinnipeds: (flipper tag) Measure and weigh pinnipeds Observation of pinnipeds (mark resight, monitoring, or behavioral) Photo-Identification of pinnipeds Remote vehicle, aerial (VTOL or fixed wing) Restrain pinnipeds (board, cage, hand, or net) Salvage of dead pinnipeds (carcass, tissue, parts) Sample biopsy of pinnipeds (hands-on) (skin) Sample pinnipeds (nail, hair, or vibrissae) Sample pinnipeds (swab anal, nasal, ocular, oral, fecal, or all mucus membranes)

Biological samples authorized for collection or acquisition in Tables 1-4 of Appendix 1 may be transferred to the following Authorized Recipients for the specified disposition, consistent with Condition B.6 of the permit:

Authorized Recipient	Sample Type	Disposition
Kathy Burek, DVM, Alaska Pathology Services	All samples	Analysis, storage
Jennifer Burns, Associate Professor, University of Alaska Anchorage	All samples	Analysis
Alexander Kitaysky, Associate Professor, University of Alaska Fairbanks	All samples	Analysis
Milton Levin, Assistant Research Professor, University of Connecticut	Serum, plasma, buffy coats, whole blood	Analysis
Luke Montrose, PhD Fellow, University of Michigan, School of Public Health	RNA Paxgene, blood tubes	Analysis
Greg O'Correy-Crowe, Geneticist, Harbor Branch Oceanographic Institute	All samples	Analysis
Wendy Puryear, Lab Manager, Infectious Disease and Global Health, Cummings School of Veterinary Medicine, Tufts University	Serum, plasma, buffy coats, whole blood, and swabs	Analysis
Jonathan Runstadler DVM, Infectious Disease and Global Health, Cummings School of Veterinary Medicine, Tufts University	Serum, plasma, buffy coats, whole blood, and swabs	Analysis
Bradley Swanson, Professor, Central Michigan University	Skin samples	Analysis
Andrew Trites, Program Director, University of British Columbia	All samples	Analysis