

**Appendix C. Report of the Independent Review Panel on the National
Marine Fisheries Service’s Implementation of the Permit
Program for Research: Steller Sea Lion and Northern Fur
Seal Case Study**

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Service's Implementation of the Permit Program for Research: Steller Sea
Lion and Northern Fur Seal Case Study**

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LIST OF ACRONYMS

AWA	Animal Welfare Act
DNA	deoxyribonucleic acid
ESA	Endangered Species Act
F/PR1	NMFS Office of Protected Resources, Permits, Conservation and Education Division
HMS	Hawaiian monk seal
HMSRT	Hawaiian Monk Seal Recovery Team
IACUC	Institutional Animal Care and Use Committee
MMPA	Marine Mammal Protection Act
NFS	northern fur seal
NMFS	National Marine Fisheries Service
PEIS	Programmatic Environmental Impact Statement
PIRO	Pacific Islands Regional Office
RPEP	research permit evaluation process
SSL	Steller sea lion
SSLRT	Steller Sea Lion Recovery Team
TDR	time-depth recorder
VHF	very high frequency

EXECUTIVE SUMMARY

The National Marine Fisheries Service (NMFS) Office of Protected Resources, Permits, Conservation and Education Division (F/PR1) convened an expert panel to provide advice on the process it uses to issue permits to do scientific research on marine mammals, particularly as applied to Endangered Species Act (ESA)-listed species such as Steller sea lions (SSL) but also for northern fur seals (NFS) which are protected under the Marine Mammal Protection Act (MMPA). F/PR1 provided the panel with a list of questions and asked for responses to those questions. The panel reviewed a number of documents concerning the permit process and the permits that had been issued, and developed responses to those questions based on their review. They later met for three days to discuss how best to evaluate permit requests and to develop recommendations.

It is the view of the panel that there are three questions that the NMFS F/PR1 must address prior to issuing a permit to work on a marine mammal species listed under the ESA:

1. Is the proposed research sound and has it been vetted through scientific peer review?
2. Will findings from the proposed research likely be useful for promoting recovery, again as determined through scientific peer review with reference to the available recovery plan and any updated information?
3. Are the procedures being proposed humane and do they represent best animal care and husbandry practice as evaluated by an Institutional Animal Care and Use Committee (IACUC)?

Ideally, recovery plans and recovery teams could play a larger role in this process than they do at present. For recovery plans and recovery teams to function effectively in this role, recovery plans would need to be issued more rapidly and updated more frequently; recovery plans would need to give more attention to setting very explicit research priorities linked to resolving uncertainty about threat reduction and recovery actions; and decisions about recovery team composition would need to be sensitive to conflicts of interest with respect both to research agendas and implications for management choices. To the extent that recovery plans and recovery teams cannot fully fill this role, permitting decisions about the potential for research to contribute to recovery will need to rely on the advice of *ad hoc* panels of experts.

The panel recommends the following:

- F/PR1 should not attempt to operate the research permit evaluation process (RPEP) using only their in-house assets.
- F/PR1 should review, and modify if needed, permit reporting requirements and procedures for storing permit report data.
- F/PR1 should use existing mechanisms, or if necessary establish additional mechanisms, to enforce permit provisions and, if necessary, revoke, suspend, or modify permits.
- F/PR1 should require that researchers participate in coordination efforts as a condition of their permit, and should assign staff to facilitate and oversee the required coordination efforts.

- Proposals or study designs of projects involving research on ESA-listed marine mammals should be peer-reviewed to ensure scientific integrity prior to permit requests being submitted to F/PR1.
- To the extent possible, NMFS should rely on recovery plans and recovery teams to provide guidance on the types of research needed to support recovery programs for ESA-listed marine mammals.
- NMFS should review the current format and content of recovery plans, and make modifications to recovery plan guidance, as needed to improve their utility for use in the RPEP.
- In convening recovery teams, NMFS should attempt to maintain independence and diversity of the scientists appointed. Mechanisms should be provided to avoid conflicts of interest in identifying and prioritizing research needs. F/PR1 should participate in the recovery team/recovery plan process.
- NMFS should provide support for meta-analyses of datasets when such analyses can help identify information gaps and research needs. Two examples are monitoring and measuring research impacts and use of telemetry to study habitat use.
- NMFS should develop a system to use expert panels to provide review of science needed for the RPEP when such information is not provided by a recovery plan or recovery team.
- F/PR1 should ensure that any permitted research complies with all relevant legislation and policies (ESA, MMPA, Animal Welfare Act (AWA)).
 - Compliance with humane practices requirements could be accomplished by requiring that research procedures be pre-approved by a competent IACUC.
 - Compliance with the requirement that the research serve a recovery need should be evaluated with reference to the recovery plan, recovery team consultation, and expert panels. The evaluation itself may best be done using a risk-benefit analysis conducted by experts outside of F/PR1.

SECTION I. ANSWERS TO QUESTIONS POSED BY NMFS

1. Types of research activities or projects permitted.

- a. *What specific research activities or projects (e.g., investigations of maternal investment, captive breeding and associated studies, studies of juveniles versus adults) currently or previously permitted are needed to address the conservation, management, and population monitoring needs identified in the Steller Sea Lion Recovery and Northern Fur Seal Conservation Plans?*

Before dealing with the question of what specific types of research are needed to address conservation issues of these two species, it is useful to review the framework within which such research is conducted. There is obvious concern over the conservation status of both species; the eastern Pacific stock of NFS is designated as *depleted* under the MMPA and the western stock of SSL is listed as *endangered* under the ESA while the eastern SSL stock is listed as *threatened*. Attempts to gain understanding of the status of both have been greatly complicated by oceanographic regime shifts and the possible propagation of effects of fisheries through the food web. As a consequence there is still considerable uncertainty over what management actions are really needed, and this uncertainty carries over to the issuance of permits to conduct research intended to reduce management uncertainty. Thus, first and foremost, we should aim to conduct research and monitoring that is needed to identify, and decide on the appropriateness of, management actions that might be taken to promote recovery, or those needed to evaluate the effectiveness of management actions that have been taken in the past. Secondly, only research projects judged to have a low net risk of negative impacts on sea lion recovery, compared to the anticipated benefit to the population, should be carried out, though the evaluation of that risk, and benefit, may itself involve considerable uncertainty. Although these may serve as guidelines, it would be a mistake to be too prescriptive in deciding on what research to permit. This is because we usually do not know which threats, either singly or in combination, are actually limiting population size. Furthermore, some limiting factors, such as predation or environmental variation resulting in changes in food supply, may not be readily “managed”, but understanding the effects of those factors is nonetheless important in evaluating cumulative effects.

Another consideration for permitting research deals with the extent to which study conclusions can be linked to the actual demography of the species in question. Designs that are adequate to establish the plausibility of the role of some factor may not be sufficient to guide an intervention. So, once plausibility has been determined, it would be redundant and inefficient to permit further research on plausibility. Then the permitting process should raise the bar and require that further research on that factor should meet a stronger standard of relevance and utility. For example, a number of behavioral and physiological studies have been conducted on both SSL and NFS with the objective of ‘testing’ the hypothesis that food limitation is important in their observed declines. But the behavioral and physiological responses that were found by such research have not yet been shown to have had negative impacts on the demography of these species at the population level. For another example, studies have shown that the duration of foraging

trips of lactating females differs among sites and such results have been interpreted as evidence for the role of food limitation in explaining population declines. But evidence is still lacking that such behavioral differences are linked to the demography of the population. For another example, some study designs compare some features of animals from a site experiencing positive population growth with those from another exhibiting a decline. But with only a single study site each of ‘treatment’ and ‘control’ it is not generally possible to rule out confounding by coincidental site differences. Given the cost and logistical difficulty in conducting multi-site field research, one effective approach would be to encourage or require cooperation among research groups with similar interests.

This question asks the panel to evaluate “specific research activities or projects” in the context of “the conservation, management, and population monitoring needs identified in the Steller Sea Lion Recovery and Northern Fur Seal Conservation Plans.” While it would seem a reasonable thing to use the existing recovery and conservation plans as the basis for making such an evaluation, the panel sees problems with using the plans in this way.

First of all, the way in which the existing plans identify actions needed for recovery does not always correspond well with a logical organization of the science questions that need to be answered in support of those actions. For example, a single action item may require information from several research activities, and a single research activity may provide data that support several action items. To help deal with this issue, the panel proposes a set of five questions pertinent to organizing research designed to promote or monitor recovery for a species of conservation concern. There are many ways to categorize and organize such research, but the panel agreed that these questions were appropriate for the task at hand. The first questions address the status of the population and life history characteristics that underlie population dynamics. The remaining questions concern factors affecting growth, productivity, mortality, and habitat use, as shown below:

- What is the status of the population?
- What are its life history characteristics?
- What factors are affecting growth of individuals and population productivity?
- What factors are affecting mortality?
- What habitats are used for important ecological functions, and what factors are affecting those habitats?

A second problem with the existing recovery and conservation plans is that, due to the time required for development and approval of the plans, some actions identified in the plan have become outdated by the time that specific research is proposed to address them. How much this problem will impact an evaluation of current research needs depends on the frequency with which plans are updated, the rate of change in population status, and the amount of research being conducted each year. Finally, in many, if not most, cases not all available data relating to specific research questions have been compiled, analyzed, and reported at the time plans were prepared or at the time permit requests were being evaluated. Therefore it often is not possible from the existing recovery plan to

fully evaluate the nature and importance of data gaps and how important the proposed research is to filling those gaps. Some potential options for dealing with these shortcomings of recovery plans are discussed in section II of this report.

Northern fur seal

For reasons discussed above, and others, the panel was uncomfortable with attempting to do a detailed, item by item, evaluation of permitted research activities versus needs identified in conservation/recovery plans. However, to see if our concerns were warranted we attempted such an analysis first for NFS, which we believed would be more tractable than SSL.

The Conservation Plan for the Eastern North Pacific Stock of Northern Fur Seal, published in December 2007, lists a number of conservation actions that require or may be supported by scientific research. We have organized those actions under our list of five research questions as shown in Appendix 1. For each of the questions, we have indicated the priority attached to each research action in the Conservation Plan.

There are currently seven active research permits that allow scientific research on NFS that may cause more than level B harassment. A description of the research objectives, location and timing of research, and specific research activities is given for each permit in Appendix 2. One of the permits addresses basic population monitoring and also involves field studies to determine factors affecting the population. Two other permits primarily cover field studies to determine factors affecting the population. One permit allows the establishment of a captive colony of adult females that will be used for a variety of physiological studies. One permit involves the quantification of marine debris that is entangling seals, and the removal of that debris. Two permits allow collection of tissues from dead animals, removal of debris from entangled seals, and observations of the environment at NFS rookeries.

To evaluate the specific research activities being permitted in the context of the conservation, management, and population monitoring needs identified in the Northern Fur Seal Conservation Plan, we have matched up those needs and activities, organized according to our five research questions. The following sections describe the panel's conclusions regarding the relationship between permitted activities and identified needs.

What is the status of the population?

The conservation plan specifies that population status will be monitored through counts of adult male seals on rookeries, estimates of pup production and survival, estimates of vital rates, and several other studies that can provide insights into status through monitoring other biological parameters (Table 1). It also recommends a reevaluation of carrying capacity, an important, but often elusive, parameter for evaluating status, and ecosystem modeling that can help to understand factors limiting carrying capacity and thus affecting status.

Table 1 lists the research activities that are currently permitted that are related to studies of population status. It is the opinion of the panel that all these activities can provide information useful to addressing information needs identified in the plan. We note that the basic assessment methods used on rookeries (*e.g.*, counts of adult males, estimates of pup production, counts of dead pups, collection and examination of teeth, measurements of animals taken in the harvest) are well proven, and over the years have resulted in a valuable long-term dataset. Marking of fur, flipper tagging, and insertion of coded wire tags all will help with individual identification of seals, a necessary element in the study of survival and other vital rates. The use of ultrasound to examine reproductive tracts of adult females caught at sea is novel, and a properly conducted study could provide needed information on pregnancy rates and other aspects of female reproductive biology that are difficult to obtain by other non-lethal methods.

What are the life history characteristics of northern fur seals?

The conservation plan includes three action items that specifically relate to life history studies (*e.g.*, analysis of teeth, marking animals, and estimating vital rates) and two that involve behavioral and physiological studies that may provide information on life history (Table 2).

The list of research activities related to studies of life history (Table 2) is nearly identical to that for population status, and, in the opinion of the panel, all can provide information useful for addressing needs identified in the plan.

What factors are affecting growth of individuals and population productivity?

Conservation plan action items relating to growth and productivity (Table 3) focus on two general areas: 1) studies to measure effects of human activities (*e.g.*, disturbance, pollutants, fisheries) on NFS; and 2) studies to help understand how natural factors (*e.g.*, disease, environmental conditions, ecosystem factors) affect NFS.

Current permits allow many specific activities that relate to gathering information relevant to questions of growth and productivity of NFS, and how those parameters may be impacted by human-caused and natural factors (Table 3). Samples of blood and blubber can be used to measure contaminant levels. Studies of diet (*e.g.*, collection of prey parts by lavage or enema and from scats) and foraging behavior (*e.g.*, satellite tagging and insertion of stomach temperature transmitters) are needed to evaluate natural and anthropogenic impacts on fur seal feeding. Body and blubber measurements; samples of blood, milk, blubber, muscle, vibrissae, hair, and nails; and measurements of isotope dilution and bioimpedance from seals on rookeries all can provide information on body condition and nutritional status. The project to establish a captive experimental colony of adult females, and its specific research activities, will provide additional insights into a variety of physiology questions, and may be particularly useful for action item 3.1.6 "Evaluate behavioral/physiological studies." The project to capture seals at sea could provide data on growth and productivity, and directly responds to action item 2.7.2 "Evaluate pelagic fur seal sampling."

What factors are affecting mortality?

The conservation plan includes action items relating to determining the impact of mortality factors including those caused by human activities (*e.g.*, marine debris, incidental take in fisheries, subsistence harvests, illegal harvests, pollution) and natural factors (*e.g.*, predation, disease) (Table 4).

The permitted research activities relating to mortality relate primarily involve obtaining samples to study disease and studies of impacts of debris (Table 4). It is the opinion of the panel that all these activities can provide information useful to addressing information needs identified in the plan.

What habitats are used for important ecological functions, and what factors are affecting those habitats?

Conservation plan actions relating to habitat include analysis of existing data on habitat use and the physical environment, collection of additional data particularly in the marine environment, and ecosystem modeling (Table 5).

Two permits include an activity to observe and monitor fur seal habitat use on land, and all other activities relate to research to investigate habitat use at sea (Table 5). We note that the project that would catch, sample, and attach satellite-linked transmitters with stomach transmitters to non-pups and then recapture and resample those animals could provide particularly useful information on specific aspects of how fur seals use marine habitats for feeding. Also, the project that would capture, sample, and attach satellite-linked transmitters with stomach transmitters to seals caught at sea could extend habitat use data to areas and seasons that have not previously been well sampled. It is the opinion of the panel that all these activities can provide information useful to addressing information needs identified in the plan.

Table 1. Conservation plan action items and permitted research activities relating to the question of status of the eastern North Pacific stock of northern fur seal (figures in parentheses correspond to permit numbers).

Conservation plan action items

3.1.2 Continue regular counts of adult males and estimates of pup production on St. Paul, St. George, and Bogoslof Islands

3.1.3 Estimate pup survival

3.1.5 Estimate stock vital rates

3.1.6 Evaluate behavioral/physiological studies

3.1.7 Continue comparative studies on other islands

3.1.9 Promote joint research and collaborative programs

3.4.1 Reevaluate carrying capacity

3.4.6 Ecosystem modeling

Permitted research activities

Capture and restrain pups on land (782-1708-3; 881-1893; 715-1884)

Clip fur from pups (782-1708-3)

Mark fur of pups (782-1708-3; 881-1893)

Attach flipper tags to pups (782-1708-3; 881-1893; 715-1884)

Insert coded wire tag in pups (715-1884)

Capture, restrain, and sedate non-pups on land (782-1708-3; 715-1884)

Extract tooth from non-pups (782-1708-3; 715-1884)

Mark fur of non-pups (782-1708-3)

Attach flipper tags to non-pups (782-1708-3; 715-1884)

Insert coded wire tag in adult females and subadult males (715-1884)

Capture, restrain, and sedate seals at sea (881-1893)

Attach flipper tags to seals caught at sea (881-1893)

Take ultrasonographs of female reproductive tracts of seals caught at sea (881-1893)

Census adult males by counting from a distance (782-1708-3)

Collect and examine dead pups and non-pups (782-1708-3)

Measure animals taken in subsistence harvest (715-1884)

Collect teeth and tissues from dead seals (782-1708-3; 715-1884; 1118-1881; 1119-1882)

Round up subadult male seals and count by age class (1066-1750)

Table 2. Conservation plan action items and permitted research activities relating to the question of life history characteristics of eastern North Pacific northern fur seals (figures in parentheses correspond to permit numbers).

Conservation plan action items

- 3.1.1 Analyze fur seal teeth
- 3.1.4 Evaluate marking programs
- 3.1.5 Estimate stock vital rates
- 3.1.6 Evaluate behavioral/physiological studies
- 3.1.7 Continue comparative studies on other islands

Permitted research activities

- Capture and restrain pups on land (782-1708-3; 881-1893; 715-1884)
- Clip fur from pups (782-1708-3)
- Mark fur of pups (782-1708-3; 881-1893)
- Attach flipper tags to pups (782-1708-3; 881-1893; 715-1884)
- Inject tetracycline into pups (715-1884)
- Insert coded wire tag in pups (715-1884)
- Capture, restrain, and sedate non-pups on land (782-1708-3; 715-1884)
- Extract tooth from non-pups (782-1708-3; 715-1884)
- Mark fur of non-pups (782-1708-3)
- Attach flipper tags to non-pups (782-1708-3; 715-1884)
- Insert coded wire tag in adult females and subadult males (715-1884)
- Capture, restrain, and sedate seals at sea (881-1893)
- Attach flipper tags to seals caught at sea (881-1893)
- Take ultrasonographs of female reproductive tracts of seals caught at sea (881-1893)
- Census adult males by counting from a distance (782-1708-3)
- Measure animals taken in subsistence harvest (715-1884)
- Collect teeth and tissues from dead seals (782-1708-3; 715-1884; 1118-1881; 1119-1882)
- Round up subadult male seals and count by age class (1066-1750)

Table 3. Conservation plan action items and permitted research activities relating to the question of growth and productivity in the eastern North Pacific stock of northern fur seal (figures in parentheses correspond to permit numbers).

Conservation plan action items

2.4 Conduct studies to quantify effects of human activities (*e.g.* research, hunting, tourism, vehicles, discharges, facilities) at or near breeding and resting areas

2.6.1 Compile and evaluate existing pollutant data

2.6.2 Monitor and study environmental pollutant exposure

2.7.1 Study the natural and anthropogenic influences on fur seal feeding ecology

2.7.2 Evaluate pelagic fur seal sampling

2.7.4 Determine impact of fisheries

3.1.6 Evaluate behavioral/physiological studies

3.2.1 Compile and evaluate existing disease data

3.2.2 Determine and mitigate disease effects

3.4.5 Quantify environmental effect on behavior and productivity

3.4.6 Ecosystem modeling

Permitted research activities

Capture and restrain pups on land (782-1708-3; 881-1893; 715-1884)

Weigh and measure pups (782-1708-3; 715-1884)

Take ultrasound measurements of blubber of pups (782-1708-3; 881-1893)

Take blood samples from pups (782-1708-3; 881-1893; 715-1884)

Take blubber samples from pups (881-1893; 715-1884)

Take muscle biopsies from pups (881-1893)

Take fecal loops and swabs from pups (782-1708-3; 881-1893; 715-1884)

Take vibrissae from pups (881-1893; 715-1884)

Take hair from pups (881-1893)

Take nails from pups (881-1893)

Gastric lavage pups (782-1708-3)

Attach satellite-linked tags to pups (782-1708-3; 881-1893)

Measure isotope dilution in pups (881-1893)

Measure bioelectric impedance in pups (881-1893)

Place stomach temperature transmitters in pups (881-1893)

Inject tetracycline into pups (715-1884)

Capture, restrain, and sedate non-pups on land (782-1708-3; 715-1884)

Weigh and measure non-pups (782-1708-3; 715-1884)

Extract tooth from non-pups (782-1708-3; 715-1884)

Take ultrasound measurements of blubber of non-pups (782-1708-3)

Take blood samples from non-pups (782-1708-3; 715-1884)

Take vibrissae from adult females and subadult males (715-1884)

Take blubber sample from adult females and subadult males (715-1884)

Take fecal loops from non-pups (782-1708-3; 715-1884)

Take swabs from non-pups (782-1708-3)

Collect milk samples from non-pups (782-1708-3)

Table 3, continued.

Permitted research activities, continued

Attach satellite-linked tags, TDRs, VHF tags to non-pups (782-1708-3; 715-1884)
Insert stomach temperature transmitter in non-pups (782-1708-3)
Recapture non-pups (782-1708-3)
Measure and ultrasound recaptured non-pups (782-1708-3)
Collect milk and blood samples from recaptured non-pups (782-1708-3)
Collect feces by enema from recaptured non-pups (782-1708-3)
Capture, restrain, and sedate seals at sea (881-1893)
Take blood samples from seals caught at sea (881-1893)
Take blubber samples from seals caught at sea (881-1893)
Take muscle biopsies from seals caught at sea (881-1893)
Take fecal loops and swabs from seals caught at sea (881-1893)
Take vibrissae from seals caught at sea (881-1893)
Take hair from seals caught at sea (881-1893)
Take nails from seals caught at sea (881-1893)
Measure isotope dilution in seals caught at sea (881-1893)
Measure bioelectric impedance in seals caught at sea (881-1893)
Take ultrasound measurements of blubber of seals caught at sea (881-1893)
Attach satellite dive recorders to seals caught at sea (881-1893)
Place stomach temperature transmitters in seals caught at sea (881-1893)
Take ultrasonographs of female reproductive tracts of seals caught at sea (881-1893)
Capture female pups and hold in facility on island (715-1883)
Remove female pups from island to captivity (715-1883)
Take blood samples and conduct oral and eye exams on rookery (715-1883)
Take blood samples at captive colony (715-1883)
Manipulate diets of captive seals including fasting (715-1883)
Take morphological measurements of captive seals (715-1883)
Take blubber biopsies of captive seals (715-1883)
Measure blubber of captive seals with ultrasound (715-1883)
Determine body condition of captive seals with isotopes (715-1883)
Measure metabolism of captive seals in metabolic chamber (715-1883)
Collect scats (782-1708-3; 715-1884)
Measure animals taken in subsistence harvest (715-1884)
Collect teeth and tissues from dead seals (782-1708-3; 715-1884; 1118-1881; 1119-1882)

Table 4. Conservation plan action items and permitted research activities relating to the question of mortality in the eastern North Pacific stock of northern fur seal (figures in parentheses correspond to permit numbers).

Conservation plan action items

- 1.1.1 Continue disentanglement program to reduce mortality and harm to fur seals entangled in marine debris
- 1.1.2 Remove marine debris and incorporate surveys of debris in northern fur seal habitat
- 1.1.3 Examine the fate of entangling debris
- 1.2.1 Implement and evaluate fishery and marine mammal observation programs in the North Pacific Ocean and Bering Sea
- 1.2.2 Review observer and incidental take data
- 1.3.1 Monitor and manage subsistence harvests
- 1.3.2 Develop and implement harvest sampling programs
- 1.3.3 Compile and evaluate existing harvest data
- 1.3.4 Identify and evaluate illegal harvests
- 2.4 Conduct studies to quantify effects of human activities (*e.g.* research, hunting, tourism, vehicles, discharges, facilities) at or near breeding and resting areas
- 2.6.1 Compile and evaluate existing pollutant data
- 2.6.2 Monitor and study environmental pollutant exposure
- 2.6.3 Evaluate carcass salvage programs
- 2.7.3 Report fishery interactions
- 3.1.8 Conduct appropriate studies to assess the impact of predation (*e.g.*, killer whales, Steller sea lions, sharks) on fur seal populations
- 3.2.1 Compile and evaluate existing disease data
- 3.2.2 Determine and mitigate disease effects

Permitted research activities

- Collect and examine dead pups and non-pups (782-1708-3)
- Capture and restrain pups on land (782-1708-3; 881-1893; 715-1884)
- Take blood samples from pups (782-1708-3; 881-1893; 715-1884)
- Take fecal loops and swabs from pups (782-1708-3; 881-1893; 715-1884)
- Capture, restrain, and sedate non-pups on land (782-1708-3; 715-1884)
- Weigh and measure non-pups (782-1708-3; 715-1884)
- Take blood samples from non-pups (782-1708-3; 715-1884)
- Take fecal loops and swabs from non-pups (782-1708-3; 715-1884)
- Capture, restrain, and sedate seals at sea (881-1893)
- Take blood samples from seals caught at sea (881-1893)
- Take fecal loops and swabs from seals caught at sea (881-1893)
- Collect teeth and tissues from dead seals (782-1708-3; 715-1884; 1118-1881; 1119-1882)
- Round up subadult male seals and count by age class (1066-1750)
- Characterize the type and weight of debris and the extent of the wound created by the debris on subadult male seals (1066-1750)
- Remove entangling debris from seals (1066-1750; 1118-1881; 1119-1882)

Table 5. Conservation plan action items and permitted research activities relating to the question of habitats of the eastern North Pacific stock of northern fur seal (figures in parentheses correspond to permit numbers).

Conservation plan action items

3.3.1 Compile and evaluate available habitat-use data

3.3.2 Conduct oceanographic and fishery surveys based on pelagic fur seal habitat use

3.4.2 Continue and evaluate Pribilof Islands Sentinel Program

3.4.3 Compile and evaluate existing physical environmental data

3.4.4 Select appropriate environmental indices

3.4.6 Ecosystem modeling

Permitted research activities

Capture and restrain pups on land (782-1708-3; 881-1893; 715-1884)

Attach satellite-linked tags to pups (782-1708-3; 881-1893)

Place stomach temperature transmitters in pups (881-1893)

Capture, restrain, and sedate non-pups on land (782-1708-3; 715-1884)

Weigh and measure non-pups (782-1708-3; 715-1884)

Extract tooth from non-pups (782-1708-3; 715-1884)

Take ultrasound measurements of blubber of non-pups (782-1708-3)

Take blood samples from non-pups (782-1708-3; 715-1884)

Collect milk samples from non-pups (782-1708-3)

Attach satellite-linked tags, TDRs, VHF tags to non-pups (782-1708-3; 715-1884)

Insert stomach temperature transmitter in non-pups (782-1708-3)

Recapture non-pups (782-1708-3)

Measure and ultrasound recaptured non-pups (782-1708-3)

Collect milk and blood samples from recaptured non-pups (782-1708-3)

Collect feces by enema from recaptured non-pups (782-1708-3)

Capture, restrain, and sedate seals at sea (881-1893)

Attach satellite dive recorders to seals caught at sea (881-1893)

Place stomach temperature transmitters in seals caught at sea (881-1893)

Take ultrasonographs of female reproductive tracts of seals caught at sea (881-1893)

Monitor parameters of the fur seal environment on rookeries (1118-1881; 1119-1882)

Steller Sea Lion

The revised Recovery Plan for the Steller Sea Lion, published in March 2008, lists a large number of recovery actions that require or may be supported by scientific research. We have organized those actions under our list of five questions as shown in Appendix 3. For each of the questions, we have shown the priority attached to each research action in the Recovery Plan.

As stated earlier and shown above, the panel conducted a detailed evaluation of research activities versus Conservation Plan needs for NFS in part to determine if there was merit in conducting a similar exercise for SSL. In our opinion the exercise with NFS was tedious and time-consuming, and it did not produce any surprising or significant results. We believe that a similar analysis for SSL would produce similar results—the likely conclusion would be that all, or nearly all, specific research activities currently being permitted can justifiably be viewed as responsive to one or more of the action items called for in the Recovery Plan. For that reason, the panel did not proceed further with attempting to answer this question for SSL.

2. Types of research methods or protocols permitted, including appropriate mitigation measures.

a. *What are the most appropriate methods (e.g., survey protocols, or manner of animal captures) to conduct the research activities or projects identified as necessary to address the conservation, management, and population monitoring needs identified in the Steller Sea Lion Recovery and Northern Fur Seal Conservation Plans?*

i. *When (for what studies) are permanent marks required and when would temporary marks suffice?*

Long-lasting or permanent marks are needed for long-term studies intended to follow the behavior, growth, reproductive success and survival of individuals through time. Sighting histories of permanently marked individuals provide the only non-lethal method to obtain data on these vital parameters. Such information is often critically important to understanding the factors affecting threatened and endangered species and the conservation measures needed for their recovery. Both SSL and NFS lend themselves to long-term study (long-term studies of individuals are not feasible for some marine mammal species), and such research has contributed to our understanding of how these animals cope with a variety of threats. Permanent marking is particularly useful when it is possible to access a large sample of known-age animals without undue disturbance, injury or mortality, as is the case for SSL and NFS. For most pinniped species, including SSL and NFS, such marks are typically applied to cohorts of pups. To be the most useful, long-term marks should be able to be identified from a reasonable distance (*i.e.*, far enough away that the animal is not disturbed

by the presence of the investigator). Many marine mammals (*e.g.*, harbor and grey seals and most cetaceans) can be identified through the use of natural marks, such as individually distinctive patterns of pelage, scars, or other features. The practicality of such methods depends on the distinctiveness and longevity of individual marks, the ease with which individuals may be observed or photographed, and the size of the study population. If a sufficient portion of the population is permanently marked, there may be little or no need to apply temporary marks for short-term studies. Permanent or long-term marking is an essential aspect of studies to measure the cumulative impact of research activities on study animals, because observations of behavioral changes, injuries, or deaths, are not informative for this purpose unless they can be traced to the exposure of individual animals to a specific history of disturbance, handling, and treatment.

ii. *When is it appropriate to conduct multiple studies on the same animal versus using different animals for different studies?*

Generally speaking, use of the same animal for multiple studies is appropriate provided that this does not disadvantage the survival of the animal or introduce bias into the resulting observations. The use of the same animals in multiple studies may, in fact, be recommended when the additional information gained from such an approach provides a deeper or more complete understanding of the research question under study. For example, studies of foraging are often more informative if the consequences of foraging performance are linked with changes in body condition or attendance behavior of females provisioning young. However, the decision to use the same animal in multiple studies needs to be made on a case-by-case basis, with consideration given to the specific nature of the studies (*i.e.*, what actually is being done to the animal and what data are to be collected) and the vulnerability of the animal being studied (*e.g.*, age, sex and reproductive status). Given the diversity of studies and procedures that might be combined, it will be difficult and perhaps counterproductive to attempt to develop specific criteria that can be generally applied. It would be more valuable, as cases arise, to seek the expert opinions of a group of veterinarians and biologists to determine whether it is appropriate to apply multiple procedures to the same animal.

Observations should be made during each procedure, followed by appropriate monitoring, to determine whether the application of multiple procedures has any adverse effects or has compromised use of that animal for a further procedure. Detailed records should be kept, including: methods of capture and handling; drugs administered; animal's response to drugs/handling; results of the physical examination; and environmental data (*e.g.*, temperature and cloud cover) that might be expected to influence the animal's condition during the procedures. These data should be made

available as soon as possible to other researchers studying the same animal or working at the same study site. Such real-time information sharing could be readily facilitated using a secure web site or listserv. Whenever possible, a control group of individuals should be studied to assess the potential negative impacts of multiple procedures. In some cases, testing of the possible impact of combining certain procedures could be done on captive animals.

- iii. *When should studies be conducted using surrogate species (other marine mammal species, other vertebrate species, etc.) rather than ESA-listed, depleted, or otherwise protected species?*

Generally speaking, questions about population growth, demographic parameters, habitat use, and resource relationships will need to be answered by directed research on the population of concern. Alternatively, if there is concern that such research might involve methods that cause significant harm to some individuals or if there is concern that the proposed research methods or study design might not be effective, it would be reasonable to first test the level of harm and the degree of effectiveness on a surrogate species. Such an approach assumes that a credible surrogate is available. A preliminary investigation of the methods and study design on a surrogate species—essentially a proof of concept—would not substitute for the eventual research on the species of concern itself. However, the results of the preliminary research on the surrogate species would increase confidence that the proposed research on the species of interest met the criteria of not posing undue risk while at the same time providing needed information.

Thus, the use of surrogate species should be considered when there is considerable uncertainty about, or high risk associated with, the impact of a study on the species of concern. The decision to use a surrogate species will depend on two factors: (1) the existence of a valid surrogate species of lower conservation concern; and (2) the conservation status of the species in question and the likelihood that injuries or deaths caused by the research might result in an unacceptable impact on recovery. The appropriateness of a surrogate species will depend upon the question being addressed. For example, development of techniques for collecting, storing, and analyzing DNA for genetics studies could be performed on samples taken from almost any mammalian species. Similarly, the development of novel medical techniques including anesthesia, instrument attachment methods, or surgical procedures to implant data-loggers or telemetry devices may be effectively conducted on surrogate species. Studies of basic physiological processes and their responses to various perturbations (*e.g.*, diseases and contaminants) are also likely to be amenable to surrogate studies, as is done commonly in studies of human biology and medicine. However, if the question has to do with species-specific attributes, such as dispersal rates or diet, then surrogate species are not appropriate. Ecological relationships

with other species and behavioral responses to environmental variability are likely to be species-specific. Without careful justification, results from surrogate studies are likely to be of questionable value in answering questions relating to recovery needs of endangered species.

As mentioned above, the concern about using surrogate species should be scaled to the true conservation status of the species in question. While both are substantially reduced, populations of both SSL and NFS are presently relatively large in comparison to other marine mammal taxa within the same protective categories (Lowry *et al.* 2006). Therefore, as a general rule it would not seem necessary to require use of surrogate species for studies of SSL and NFS, although such an approach might be desirable under some special circumstances.

- iv. *When should studies be conducted without living animals (e.g., using tissue culture or computer models) rather than using captive or free-ranging animals?*

The choice of experimentation on live animals versus a model substitute depends entirely on the relative adequacy of the two approaches to answer the question of interest with a high enough level of confidence. Substituting a model exercise or tissue culture for more direct research may involve an ‘extrapolation error’ in transferring the conclusion from the lab to the field, or a ‘model prediction error’ having to do with the many uncertainties involved in the model (*i.e.*, parameter uncertainty, initial conditions uncertainty, and uncertainty about model form). Alternatively, field research may be unable to directly answer a particular question because of the logistical difficulty or expense involved, or the existence of confounding factors. Before denying a permit for live animal research on grounds that a lab experiment or a modeling exercise should be substituted, it should be convincingly demonstrated that the proposed substitute has a high probability of delivering the needed degree of certainty. Absent this criterion, the universal possibility of computer modeling, in particular, could function as a pocket veto in the permitting process. Anything can be modeled. But not every model or statistical analysis has enough predictive power or explanatory resolution to actually settle the question which may be of pressing concern. This is an especially troublesome area in ecosystem modeling, which is still very much an evolving discipline without a strong track record of demonstrated predictive power and without a strong tradition of accepted methods for quantifying predictive or explanatory power.

Where models may play their most useful role for permitting decisions is as a prelude to large scale field research, by evaluating proposed designs before they are deployed (or permitted). Modeling can be used to extend the reach of statistical power analysis. The basic approach is to build a model of the system in question using the available current knowledge (including

the confidence limits which represent the current uncertainty) and then embed in the model a simulation of the proposed research, including the specifics of the design (*i.e.*, sample sizes, sampling locations, measurement error variation) and whatever is known about spatial and temporal heterogeneity and confounding factors in the system, then submit the simulated data to the planned statistical analysis to see whether the result will have narrow enough confidence limits to provide a useful conclusion and give a reliable answer. This kind of statistical planning can be tedious, but it is nowhere nearly as expensive and time consuming as the actual research, and it can more than pay for itself if it prevents a false start. It would be a reasonable stance for F/PR1 to deny permits for research when such a preliminary analysis shows too low a probability that the research will deliver useful results.

b. How much (frequency, sample sizes, etc.) of a specific research activity (e.g., aerial survey, tagging, biopsy sampling, etc.) is minimally required for management and conservation needs, including population monitoring?

Fundamentally, the frequency, design, and sample size needed to address a research question will depend on the variation of the parameters measured, the size of the expected effect, and the precision needed to inform management actions. The principle guiding the evaluation of proposed research should be to use as few individuals as necessary, but as many as needed. Although this may not seem helpful in the evaluation of specific research proposals, both researchers and the reviewers of proposals must be guided by these statistical considerations. For some types of research, such as studies to estimate population size and trends, the methods are well developed and it is feasible to conduct a power analysis to indicate the frequency of measurements, sample sizes, and sampling design that will yield estimates with the necessary precision. Methods to use simulation modeling to evaluate the likely success of other types of research are discussed in the section above.

Studies of the foraging ecology of pinnipeds serve to illustrate the potential complexity of information that must be taken into account, and the importance of keeping sight of the motivating question for the research. Foraging behavior is inherently variable, presumably reflecting individual variation in response to ecological conditions in space and time. Thus, deciding on the appropriate number of animals to sample will depend on the temporal and spatial scale over which inferences are sought and the demographic scope of the question. Foraging tactics differ among age classes and sexes in some species and such differences can have strong seasonal and inter-annual patterns. Variability among individuals of a given age and sex can be large and so, even with preliminary data from pilot studies, the decision about how many animals to study may not be easily resolved. Nevertheless, the choice of number and frequency of samples will always be heavily influenced by inter-individual variability. Therefore, the more we know about the magnitude of this variation, the better we can design studies to effectively and efficiently promote the recovery of protected species. Researchers should be required to demonstrate how they have used existing findings to estimate

sample sizes and frequency of measurement in designing the proposed study. For example, large numbers of SSL and NFS have been fitted with satellite-linked transmitters over the past decade. Thus, we should expect current proposals to build heavily on this past research to determine how many individuals need to be instrumented to answer a particular question. Where little is known about the variability of a parameter for the species of concern, researchers should be guided by knowledge of better-studied similar species.

c. Should there be different standards or more restrictions placed on research conducted on certain age, sex, or life-history stages or on the geographic or temporal distribution of research effort? If so, what should those limitations be?

All else being equal, the relative degree of protection afforded an individual from the effects of potentially deleterious research should reflect the reproductive value (in the sense of life history theory) of that animal. For example, most adult female mammals have a higher reproductive value than other age/sex classes. Thus, those individuals contribute more to potential population growth and recovery than other animals. Reproductive value is also affected greatly by the breeding system of a species – in highly polygynous species, for example, sub-adult males have relatively low reproductive value. Therefore, particular care should be taken when conducting research on individuals of high reproductive value, such as pregnant and lactating individuals. However, there will be cases when scientific questions important to recovery can only be answered by conducting studies on animals of high reproductive value. For example, if food limitation during lactation is suspected of reducing pup growth and associated survival, and this reduced productivity is thought to be an important factor causing the population to decline, then studies of the foraging behavior and diets of lactating females, and growth and survival of their pups, would seem warranted.

d. What criteria should be used for developing and incorporating new (and thus not previously evaluated) research techniques under research permits?

The first criterion should be that the new research technique is expected to provide information needed to guide management actions to promote recovery that cannot be effectively provided by existing techniques. Secondly, the proposed new method should not involve a high risk of injury or death to individuals or of modifying the behavior of individuals such that the resulting data are compromised. Given these two principles, it follows that the more valuable a new technique is judged to be, the more risk managers should be willing to tolerate in order to develop and test the procedure. Thus, when researchers propose to use an untested method on protected species they should be required to provide a compelling case that the new method is needed. And as a general rule, surrogates should be used before applying the technique to the protected species particularly when the new method is an invasive procedure. However, in the cases of SSL and NFS, both populations are large enough that the use of surrogate species would not seem to be required to develop new research methods that are expected to promote recovery.

3. Coordination of permitted research.

- a. *Assuming permits are issued to multiple individuals, what are the most appropriate mechanisms for ensuring research is not unnecessarily duplicative, and is coordinated to optimize data collection across permits and reduce adverse impacts?*

The evaluation of unnecessary duplication should be done at the permitting stage, by F/PR1 in consultation with NMFS Science Centers. However, in evaluating potentially duplicative work, two points need to be considered. The first is that replication may be needed to address research questions where the statistical power of individual studies is low. Any researcher proposing to pursue such an approach should be required to demonstrate how his/her findings will be merged with those of other researchers. The second point is that ecosystems are dynamic in space and time and therefore our understanding of some aspects of the ecology of threatened and endangered species (*e.g.*, diet, foraging behavior, vital rates) are necessarily conditional. Therefore, proposals by different investigators to study the diet of NFS in different places or times are not necessarily duplicative. By contrast, another study of the diving behavior of either species might well be considered unnecessary unless a strong case can be made that further data are need to inform particular management actions.

Effective coordination and communication among researchers may greatly reduce or eliminate the potential for duplicative research. For example, if two researchers propose to test a new anesthesia protocol, it would be desirable to permit one researcher to apply the method and then report results to the second investigator. The second researcher could gain confidence if the results were favorable, or change the protocol if the first application was unsuccessful. The development of effective means of coordination among researchers working on similar research questions and with the same population of study animals is, in large part, the responsibility of the investigators themselves. Nevertheless, NMFS can facilitate and, in some cases require, such coordination as a condition of the permit. If necessary, NMFS should: determine the optimum scheme for coordination (*e.g.*, the frequency and timing of meetings); require that researchers participate in coordination efforts as a condition of their permit; and assign staff to facilitate and oversee the required coordination efforts.

Although effective coordination and communication among researchers may greatly reduce or eliminate the potential for duplicative research, there is another equally important role that NMFS oversight could have. A weakness of much of the research on SSL is the lack of replication in studies trying to determine the causes of population decline. Typically one site is studied in an area of increasing numbers and another from a decreasing population. Thus any differences in the factors underlying demography are confounded with ecological differences between sites. By encouraging coordination among researchers with similar interests such studies could use much stronger experimental designs that would permit more confident inferences to be made.

This would greatly enhance the value of field research aimed at understanding the causes of population change.

i. Alternatively, should NMFS consider limiting the number of permits as a way of ensuring coordination and cooperation among researchers and across projects?

Presumably this would mean that only a small number of permits, each allowing a wide array of activities, would be issued to a few major agencies and research organizations. Other investigators wishing to work on SSL or NFS would have to function as co-investigators on these permits. This might result in more coordination and cooperation among researchers, but it could reduce the role of F/PR1 in evaluating and authorizing specific research activities. The panel believes that such an approach would be undesirable.

b. Should researchers operating under different permits (but studying the same or related questions such as aerial survey for population census or biopsy for population genetics) be required to use the same or similar methods to ensure the information collected is comparable (and to increase the sample sizes overall for a given conservation or management objective) and useful for NMFS conservation of the species?

A standard set of protocols should be established for collecting, storing, sharing, and analyzing data for any research subject that is being investigated by more than one research team. The protocols should require core data to be collected with methods that are either identical or result in compatible data. However, this policy should not prevent new methods from being developed and tested, provided that the core data needed to support conservation objectives are obtained and that any cross-calibration needed to maintain comparability is done.

i. If not, how should NMFS compare or use the data from various permit holders in its management decisions and conservation efforts?

4. Monitoring effects and effectiveness of permitted research.

a. What types of information or data are needed or should be collected to evaluate effects of permitted research?

Monitoring the effects of research, and particularly the cumulative effects of research, is quite different than evaluating the effectiveness of permitted research. In the case of effects, the issue is whether the research procedures applied to individuals in some way might compromise the fitness (*i.e.*, survival, growth, or reproduction) of those individuals or of others disturbed by the research. To judge effectiveness, on the other hand, requires that the results of the research be evaluated with respect to management objectives. In other words, did the research result in information that could be used to promote recovery?

The effects of permitted research on individuals can be studied in comparison to a control group and/or with before-after longitudinal studies of individuals with long-lasting identifying marks. There is a well developed body of research, such as Before-After-Control-Impact-Paired study designs, available to address such questions. Some types of research (*e.g.*, behavioral observation) are expected to have minimal effects and therefore short-term follow up monitoring will suffice. Other studies, such as those fitting animals with transmitters for extended periods of time, might reduce foraging efficiency and ultimately affect survival probability or reproductive success. In such studies, foraging trip duration, haul out patterns, body mass gain or condition could be compared with a control group to assess research effects. In the case of lactating females, the growth rate and weaning mass of pups are good measures of maternal performance and can be used to assess the effects of research, assuming that a control group is available. If a research activity has a particularly high potential for adverse effects but shows great promise to address a critical management action, it may be desirable to require an evaluation of the effects of the activity as a condition of the permit.

In some cases, it may be possible to compare survival and reproductive success of treated and control groups to provide a long-term assessment of research effects. Where such studies are possible (*e.g.*, Hawaiian monk seal; Baker and Johanos 2002) they should be encouraged as they represent the gold standard by which research effects will ultimately be judged. Studies that evaluate research effects will also help researchers and permit reviewers by providing guidance as to which proposals need to monitor research effects and how such monitoring might best be accomplished.

- i. Should NMFS look to studies outside the marine mammal field for some of this information?*

It would be useful to examine the broad field of impact assessment to identify potential approaches to study the effects of permitted research on SSL and NFS populations. In addition, there may be examples from other studies of the effects of research methods on threatened and endangered terrestrial mammals that would help guide NMFS in framing this question.

- b. How should permitted research be evaluated to determine whether or how it contributes to species' recovery?*

Ideally, permitted research should be evaluated for its value in promoting recovery by considering the use of its results in guiding the recovery actions specified in a conservation or recovery plan. However, if such plans are outdated or for other reasons do not reflect current recovery needs and priorities, alternative methods will be needed to make such a determination. Alternatives might include implementation plans developed by the agency and/or a recovery team, and review and analysis of current needs by recovery teams, agency biologists, review panels comprised of independent experts, or contractors.

- i. *What types of information or data are needed or should be collected to evaluate how well permitted research is contributing to conservation and management needs for the species?*

The requirement here is to link research findings with potential recovery actions and their subsequent effect on population status. If it is impossible to make a direct link to recovery (*i.e.*, status), then it may be possible to look for changes in demographic parameters as a surrogate.

The likelihood that one can make a direct linkage between a permitted research activity and recovery will depend on the type of threat affecting the population – whether the threat is acute or chronic – and how many factors are involved. If a population is directly affected by a small number of well defined and acute threats (such as ship strikes and entanglements for right whales), it may be possible to evaluate the benefit of specific research activities to conservation in terms of the reduction or mitigation of the specific threat. In many cases, however, this will be a difficult task. For example, suppose a recovery action is to reduce the effects of fishing on a protected pinniped. Permitted research is conducted on the diet of the pinniped and a commercial fish species is identified as a commonly consumed prey item. Based on this information, restrictions are placed on the fishery and future population surveys show a positive change in status (*i.e.*, a reduced rate of decline or positive population growth). Can we reliably conclude that the permitted research was effective in promoting recovery? This depends on our certainty whether other limiting factors had not changed over time and space. However, one could not dismiss the possibility that the fisheries restrictions helped to change the population's demographics, and that the information provided by the research did help identify a management need.

It seems likely that expert opinion on the appropriateness of the research in reference to a recovery plan (or other appropriate description of research needed in support of recovery) will be most useful to F/PR1 in the short to medium term. Simultaneous testing of multiple hypotheses, with and without the results of a particular category of research results, may provide formal inference with regard to the efficacy of that category of research.

- c. *Who should monitor the various research projects and methods to best assess possible effects?*

NMFS, in consultation with the Marine Mammal Commission, is responsible for monitoring research projects to assess possible effects. This evaluation should be informed by data provided by permitted investigators that document the effects, if any, of the specific research procedures conducted.

On the surface it would seem reasonable for permit managers to simply require that researchers proposing to conduct a certain activity monitor their research subjects for impacts that the activity may have caused. Certainly it is reasonable for researchers who have captured animals and conducted invasive studies (*e.g.*, anesthetization, biopsy, tag attachment, *etc.*) to monitor those individuals until they have recovered and resumed normal behavior. However, the assessment of effects beyond such short-term observations of study animals is more difficult.

In the case of Hawaiian monk seals – a population that is small, has a very restricted distribution on land, and is well studied – it has been possible to rigorously evaluate the possible impacts of certain research activities using an experiment-control design (Baker and Johanos 2002). It would be possible to design and conduct a controlled study to assess the effects of a particular research method or set of methods for NFS and SSL at particular sites. In general, however, these species have large populations that range widely and, with the exception of certain age classes and times of year, individuals are not predictably available to be observed.

There are some sources of information that could be explored for insights into possible effects of research activities on NFS and SSL, including the following:

- The movements and behaviors of many animals have been followed using telemetry devices. These studies provide at least two types of relevant data: (1) an estimate of the minimum survival duration of the individual (*i.e.*, at least as long as the telemetry was functioning and indicated normal behavior patterns); and (2) a description of the behavior of the individual while its tag was operational (*e.g.*, movement rates, diving patterns). These data could be analyzed to see if they vary in relation to the type of research that was conducted on an animal prior to release.
- Individually identified (tagged or branded) individuals are often resighted or recaptured (by researchers, subsistence hunters, stranding networks, and fisheries), and their condition and demographic status can be observed or measured and compared with the history of research activities that have been conducted on them.

Both of the possibilities above require a database that provides a complete record of the specific research conducted on each individual animal. All researchers working on protected species should be required as a condition of their permits to report the identification and specific procedures performed any time an individually identifiable animal is taken. A database containing this information should be maintained by F/PR1 and made available for analysis.

Measuring the possible effects of research on SSL and NFS, both of individual projects and cumulatively, will require a substantial research effort. It may be problematic to require that researchers conduct such studies themselves as conditions of their permits. Such research is challenging and requires considerable dedicated effort. In addition, an approach where individuals monitor their own impacts lacks independence. Another

approach would be for NMFS to issue a request for proposals to measure and monitor impacts of specific research activities on SSL, NFS, or other protected species. Proposals could be solicited both to mine existing data sources as well as to design and conduct dedicated field studies.

- d. *Should permit applications be required to provide monitoring protocols to evaluate the potential effects of the proposed research, or justify why such monitoring is not required, prior to the issuance of the permit?*

Until such time as the effects of particular research procedures are fully evaluated by dedicated study, all research proposals intending to use those procedures should be required to monitor and evaluate their effects. Once the effects of procedures have been evaluated, subsequent proposals could simply refer to those results and not require additional internal evaluation. Dedicated studies designed to evaluate effects of a proposed technique, as described above, would clearly benefit a large number of investigators wishing to use the method. Procedures that have been thoroughly evaluated in similar species should not require further evaluation unless there is reason to believe the effects on the protected species would be quite different or there are questions about their implementation in a particular study.

- e. *In the PEIS, research activities were grouped by predicted risk of mortality as estimated based on previous experience of some permit holders (See Chap 4, Mortality Assessment Tables 4.8-1 through 4.8-5). Research activities after capture were grouped from “no risk” (e.g., collecting milk samples, hair, and swabs) or low risk (e.g., collecting blood, attaching flipper tags, enemas and stomach intubation) to medium risk (e.g., biopsy sampling, pulling teeth) and high risk (i.e., surgical procedures). Hot brands were considered in a class of their own, as were procedures that do not involve capture or tissue sampling. NMFS also considered, but did not include in the Programmatic Environmental Impact Statement (PEIS), grouping these activities based on the likely nature or extent of the injury, including if something went wrong during the procedure. For example, ultrasound and other procedures that do not require cutting or puncturing the skin or inserting instruments into the body are not likely to cause injury even if done incorrectly and would therefore be considered “non-invasive” and not likely to cause long-term adverse effects or mortality. Whereas procedures that penetrate the skin, like flipper tag attachment and blubber biopsies, may only cause minor injury but have the potential for infection and would be considered “minimally invasive” with a risk of indirect mortality or other long-term adverse effects. “Major invasive” procedures would be those like muscle biopsies, sub-cutaneous transmitters, or hot brands that result in deep tissue or more extensive injury or have greater risks of excessive bleeding or infection, and thus have a greater potential for long-term adverse effects. Finally, surgical procedures that exposed the body cavity would be a separate category.*

- i. *Should research activities (surveys, pup-counts, rookery activities prior to capture) and procedures (activities post capture) be grouped for evaluation of effects?*

There is merit in grouping research activities and procedures for the evaluation of effects provided we know that their potential effects really are similar.

- ii. *If so, what is the most appropriate scheme (one of the two above, or something else) for classifying or grouping research procedures for purposes of evaluating impacts or research?*

Although each of the above schemes has advantages, a third option might be considered; one that groups activities and procedures by the kind of effect they are expected to have on the species of concern. For example, surveys and other activities prior to capture and those during and post capture might all cause disturbance resulting in short-term behavioral effects, injury, or mortality. In the end it probably does not matter how activities are grouped. What matters more is the evidence to support the degree of risk classification associated with each activity. A grouping system that includes all research activities and procedures would be preferred to one in which particular procedures are considered separately.

SECTION II. OVERARCHING CONSIDERATIONS FOR PRIORITIZING RESEARCH NEEDS AND ISSUING RESEARCH PERMITS.

The panel was asked to consider research needs for both SSL and NFS. However, the situation with permit issuance is different for these two species because NFS are not ESA listed. For simplicity in the remainder of this report we have restricted our considerations and recommendations to a situation where a species is listed under the ESA, but many of the same principles should apply to non-ESA-listed marine mammals.

1. Current mechanisms for identifying research essential for conservation and recovery.

Section 10(d) of the ESA says “The Secretary may grant exceptions...” to taking prohibitions “...only if he finds and publishes his findings in the Federal Register that (1) such exceptions were applied for in good faith, (2) if granted and exercised will not operate to the disadvantage of such endangered species, and (3) will be consistent with the purposes and policy set forth in section 2 of this Act.” The purpose and policy portions of the ESA (Section 2) say that the Act is intended to provide a means to conserve species, and Section 3 defines "conserve," "conserving," and "conservation" as meaning “to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary.” With regard to issuance of permits for scientific research, read together these sections say that NMFS may issue permits for scientific research on ESA-listed species if it finds that such permits will further the recovery of the species. It is therefore obvious that there needs to be a transparent, effective, and timely mechanism for identifying research essential for conservation and recovery, which should form the backbone of an RPEP.

Recovery plans

Section 4(f)(1) of the ESA says “The Secretary shall develop and implement plans (hereinafter in this subsection referred to as “recovery plans”) for the conservation and survival of endangered species and threatened species listed pursuant to this section, unless he finds that such a plan will not promote the conservation of the species.” In general, NMFS has prepared recovery plans for listed marine mammals, and in the specific case of SSL an initial recovery plan was approved in 1992 and a revised plan was approved in 2008.

The ESA goes on to say that recovery plans should include “a description of such site-specific management actions as may be necessary to achieve the plan’s goal for the conservation and survival of the species”, but it does not speak to what research might be needed to identify those site-specific management actions. Nonetheless, it would seem reasonable to expect that recovery plans could provide an important source of information for identifying research essential for conservation and recovery.

Earlier in this report, the panel identified the following reasons why the current generation of recovery plans is not as useful as might be expected in this regard.

- The way in which the existing plans identify actions needed for recovery does not always correspond well with a logical organization of the science questions that need to be answered in support of those actions.
- The time it has taken for development and approval of recovery plans has meant that some actions identified in the plan have become outdated by the time that specific research is proposed to address them.
- Not all of the available data relating to specific research questions have been compiled, analyzed, and reported at the time plans are prepared or at the time permit requests are being evaluated.

The utility of recovery plans for the RPEP could be enhanced. It is quite possible, perhaps likely, that people involved with preparing the plans did not anticipate that the plans would be used in such a way (but see the terms of reference for the most recent SSL Recovery Team in the section below). If providing support and rationale for the RPEP process were a clear intent of the plan it is likely that organization and emphasis could be structured in ways to make it more useful. The alternative is to do a *post hoc* analysis of how research activities correspond with plan actions, as we have done in section I.1 of this report.

Development of the initial SSL recovery plan began in 1990 and the draft plan was approved in December 1992. That plan was ‘in force’ for more than 15 years. Development of the revised plan began in 2001 and the draft was approved in March 2008. In practice, the development and approval of recovery plans has often been a long process, especially for species facing complex, controversial, and/or poorly understood threats like SSL. And the reality is that long intervals between plan revisions have been common. It is reasonable to expect a recovery plan to provide a thorough general outline of research needed to support recovery efforts, and when they are first approved they may be current about specific needs. However, given the current institutional processes, the analysis of scientific needs in those plans often will not be sufficiently up to date to support decision-making about the appropriateness and necessity of specific research activities as later permit requests arise.

The final point listed above (*i.e.*, incomplete analysis of recent research) is a common problem in evaluating research needs. Undoubtedly those charged with preparing recovery plans make efforts to ensure that the best available data are incorporated into them. But, particularly where there are large, multi-faceted, multi-year projects operating simultaneously, as is the case with SSL, having all the information compiled, analyzed, and available at any point in time is usually not achievable. In some situations unpublished analyses and documents, or personal communications, may be a mechanism for accessing and incorporating more recent information. However, for recovery plans, which are peer-reviewed, published documents intended to guide agency recovery actions for several years, such attributions may not be appropriate because others cannot access and scrutinize the basis used for creating elements of the plan.

Recovery teams

Section 4(f)(2) of the ESA states, “The Secretary, in developing and implementing recovery plans, may procure the services of appropriate public and private agencies and institutions and other qualified persons. Recovery teams appointed pursuant to this subsection shall not be

subject to the Federal Advisory Committee Act.” This general statement about recovery teams is often clarified in a terms of reference, as in the following for the most recent SSL team: “The current recovery team has been established as a body of experts to revise the recovery plan for Steller sea lions and to advise NMFS on issues related to their status and conservation. The revised recovery plan will serve as a basis for future recovery efforts, prioritization of research to ensure that new information will contribute toward the greatest research needs, and effective monitoring to allow NMFS to track the status of Steller sea lions and the factors that may affect them.” The terms of reference for the current Hawaiian Monk Seal (HMS) Recovery Team state: “The role of the HMSRT is to advise the Pacific Island Region Office (PIRO) Regional Administrator on issues concerning the implementation of the recovery plan. HMSRT responsibilities include reviewing and commenting on recovery and research activities, offering advice related to implementation of scientific and management activities in the plan, and providing advice on prioritizing recovery activities. HMSRT input may include actions such as evaluating research and management programs, assessing the efficacy of specific recovery efforts, evaluating species status and listing classification when appropriate, and recommending new or emergency actions needed to enhance the recovery of the species.”

It is evident that NMFS intends for recovery teams to provide ongoing input on recovery needs in addition to what role they may play in recovery plan development. Evaluation and prioritization of research needs are two of the continuing roles expected of the teams, and it is therefore reasonable to expect that teams could play a role in the RPEP.

Members of this panel have considerable experience with NMFS-appointed recovery teams for marine mammals, and we agree that input from such teams can be helpful for evaluating research. However, whether or not teams will be appropriate and useful for the RPEP depends on a number of factors, including the following:

- Team makeup—The ESA does not speak to the makeup of teams other than to say that members must be “qualified persons.” Terms of reference may specify that team members are experts in science and resource management. In fact, some teams have been comprised almost entirely of such experts, while other teams in addition contain a number of “stakeholder representatives.” In either event, the experts in science are commonly people who are actively doing research on the species in question, which is understandable since they embody much of the relevant scientific knowledge. Even though these are people of high integrity, it is hardly fair to ask them for unbiased evaluations of what research is essential for recovery. Stakeholders, by definition, have their own sets of interests.
- Team priorities—NMFS has relied heavily on recovery teams for the preparation of recovery plans, and initial drafts of both SSL plans were prepared by teams. Teams may also be asked for advice on important and complex recovery issues such as critical habitat designation, reclassification of threat level, etc. Providing the specific scientific advice needed in support of the RPEP is unlikely to occur unless it is identified as a high priority for team action.
- Team time constraints—Associated with the issue of priorities for a recovery team is the issue of time constraints. NMFS does not compensate members for their time working on recovery teams. Those working for agencies and organizations with an

official role in recovery may do so as part of their normal work duties, but others must participate *pro bono*. Based on the panel's experience with this project, providing the scientific evaluation and advice needed for the RPEP is a substantial endeavor, particularly for a situation like that SSL, and it is unrealistic to expect that level of effort from a recovery team comprised of volunteers.

In spite of the issues described above, in the panelists' experience there have been times when recovery teams have provided NMFS with the type of advice needed for the RPEP. During the 1990s the HMS Recovery Team commonly did detailed critiques of ongoing research and research needs at their annual meeting. Those efforts were fruitful largely for the following reasons: 1) the team was comprised mostly of experienced scientists who were not themselves actively engaged in monk seal research; 2) the factors affecting the population's status at that time were fairly well identified; 3) the components of the research that were intrusive addressed clearly understood needs; 4) the bulk of the research being done and proposed was highly focused in scope, and largely managed directly by a NMFS lab in a program with acknowledged credibility; and 5) the research program presented comprehensive and timely summaries of results to the recovery team at annual meetings. The original SSL Recovery Team performed a somewhat similar role in the years following approval of their initial plan. The recent SSL Team has been unable to effectively fill this role, partly because of the team's composition and also because the factors affecting the population are more complex and their relative impacts are largely unknown. Furthermore, the Team that prepared the revised SSL plan was subsequently disbanded.

2. Decision system for issuance of permits.

The questions put to the panel are framed in terms of research permits for SSL and NFS, but these same questions could arise in connection with research permits affecting almost any protected species. Looking to the future, given the prospects for climate change and the reality of growing human populations and growing demands for resources, it is easy to imagine that the number of species with protective listings will increase. With a little more imagination we could consider the possibility that increasingly the conservation of some of those species might involve diffuse ecosystem effects whose mechanisms are poorly understood, so that the consequences of some interventions might be increasingly difficult to predict. This future, then, will increase the quantitative burden on the permitting process just through sheer numbers of research programs needing permits. It may also increase the burden in a qualitative way, if a need is perceived for more experimental management, and more intrusive research, in order to cope with the crucial uncertainties for species that are failing to recover after the more straightforward protections and interventions have been tried and proven insufficient.

In a future with increasing numbers of permit applications to consider, and conceivably with applications for permits for research that arguably might be considered more 'risky,' reliance on an *ad hoc* process, such as we are participating in now, could encounter a log jam. Clear and effective standards consistent with the needs for effective management will be needed for a smoothly running permit evaluation process.

What will be needed is a permitting process that taps into the expertise that is already on board in the institutional compliance with ESA—ideally the recovery teams. After all, the scientists on those teams should be the people who have the opportunity to become immersed in the knowledge about the species and its management. Ideally, this knowledge should have been synthesized, in a quality-controlled way, in the recovery plan for the species in question.

The decision process would also benefit from quantitative standards that can be used by F/PR1, so that, to the extent possible, the decisions could be data-driven and fact-driven, thus reducing the dependence on judgment calls that are difficult to document and defend.

Therefore, it is the view of the panel that there are three questions that F/PR1 must address prior to issuing a permit to work on an ESA-listed species:

1. Is the proposed research sound and has it been vetted through scientific peer review?
2. Will findings from the proposed research likely be useful for promoting recovery, again as determined through scientific peer review with reference to the available recovery plan and any updated information?
3. Are the procedures being proposed humane and do they represent best animal care and husbandry practice as evaluated by an IACUC?

Under such a system, F/PR1 would **not** be responsible for the determining what research is needed or what represents best practice. Nevertheless, F/PR1 needs to know what current research needs and priorities are and what the best practices are. Review of proposals or study plans by IACUCs could serve to ensure that best practices are to be used. Understanding current research needs and priorities will require that F/PR1 coordinate effectively with NMFS Science Centers. What we are proposing here represents a departure from the current system in which F/PR1 is unreasonably burdened with both evaluating research priorities and best practice research procedures and ensuring that proposed research is consistent with the requirements of the ESA and MMPA.

NMFS asked the panel the following basic questions.

- What research and monitoring are needed to meet management needs?
- What methods and protocols, including sample size, are appropriate?
- How should the research be coordinated?
- How should effects and effectiveness be monitored?

The idealized answers to these questions could be fairly simple, though admittedly the implementation may not be simple at all, and there may be serious legal and policy hurdles. In the following sections of this report the panel presents the idealized simple answers first, and then comes back to the implementation challenges and policy requisites.

What research and monitoring are needed to meet management needs?

The research and monitoring needed to meet the management needs should be the research and monitoring that has been identified in the recovery plan as essential. The recovery plan should

explain why that research is essential, and it should explain how the outcome of that research and monitoring will guide decisions about specific recovery actions. The premise is that until the research is done, launching those recovery actions would be imprudent because of the uncertainty, but the research is expected to resolve enough of the uncertainty that reasonable choices could be made among the potential actions.

What methods and protocols, including sample size, are appropriate?

The appropriate methods, protocols, and sample sizes are whatever it takes to obtain sufficient resolution of the uncertainties to justify subsequent choices of action, provided (1) comparative analysis shows that the methods and protocols selected have the lowest possible risk to the population among the potential methods and protocols that could get job done, and (2) risk benefit analysis shows that the risk to the population from the research and monitoring activities is more than compensated for by the conservation benefits of implementing the recovery actions that the research results will select and guide. While computational frameworks for doing such analyses are available they have not been applied to the current situation with issuance of permits for research on ESA-listed marine mammals.

How should the research be coordinated?

The research should be coordinated by NMFS, the responsible agency, to ensure that permitted research does match up with the research needs identified in the recovery plan, and to ensure that the methods and protocols proposed will get the job done, minimize impact within that constraint, and pose a risk that is more than compensated by the expected conservation utility of the expected results.

How should effects and effectiveness be monitored?

Effects, in the sense of impacts, of the research must be monitored as part of the research program itself to verify that the actual impacts are consistent with the impacts predicted in the RPEP. The effectiveness of the research is judged by its delivering the resolution needed to support the management decision at which it is directed. If events show that the impacts or resolution are not as expected, or if changing circumstances make the management question moot, the risk-benefit analysis should be revisited, and the permit itself should be re-evaluated on that basis.

Implementation challenges in an imperfect world

The reader will doubtless have recognized by now the large distance between the idealized world of the above short answers and the actual world of the current recovery plans and the current technical analysis capacity of F/PR1.

Recovery plans, as they actually exist, tend to be inclusive rather than deeply discriminating in the cataloging of research needs. They seldom present a documented logical “if-then” structure linking anticipated research results to choices among potential recovery actions in the recovery plan. At best, therefore, we would face a need for much more demanding technical guidance

provided to recovery teams regarding those sections of a recovery plan. However difficult and time consuming this may be, the bottom line is ‘who better than the recovery team to identify research needs’ and ‘where better than the recovery plan to document and explain those needs.’

The prospective evaluation of sample size is a common academic requirement for graduate students planning their thesis research. The basic statistical tool is called ‘power analysis.’ Oddly, the larger the research program, the less common it is for this kind of analysis to be done. It definitely should be done for ESA-permitted research, since the stakes are so high. If too small a sample is taken, the research will not obtain the needed statistical resolution while a larger sample than needed may cause larger impact than was necessary. The statistical expertise needed to do this kind of analysis is available at the NMFS Science Centers and within many other research groups.

The risk-benefit analysis will place the greatest strain on personnel allocation within NMFS. There are few people within the agency with this capability, and most of those few are the same people who are in demand for running complicated stock assessments. NMFS will need to cultivate a new cadre with these talents in the years ahead.

The SSL and NFS research programs well exemplify the problem of not having current information at hand for permit decision-making—a number of research programs have been conducting a wide range of studies, over many years. The challenge of using that information to evaluate what research should be permitted requires knowing both what has been done and what has been learned. Investigators working on marine mammals are required to submit annual reports of their research to F/PR1. It would seem relatively straightforward to obtain specific information on what has been done from those reports, but it is not clear that the information is being reported and stored in the most useful ways. Review and modification of these procedures may be warranted.

Developing an understanding of what has been learned through already permitted research—and therefore what more needs done—is an even greater challenge. During 1991-2005 researchers from the National Marine Mammal Laboratory (NMML) and their cooperators attached satellite-linked telemetry instruments to 179 SSL in Alaskan and Russian waters. While sample sizes for individual regions, age classes, and years were generally not large, 97 SSL less than a year old were tagged. In the case of NFS, such instruments were attached by NMML to 665 animals in the Bering Sea, including 320 put on adult females. These figures do not include attachments that were done by other research programs operating in Alaska and Russia. While there have been a number of publications that analyze and report subsets of these research efforts, to the knowledge of the panel there has been no formal attempt to synthesize all of the results and use that synthesis to decide when, where, and on what type of animals future deployments are needed.

Policy obstacles

The applicable ESA provisions create a tension between a prohibition on research that would “operate to the disadvantage” of a listed species, and the mandate to “use...all methods and procedures which are necessary” for recovery. The notion of a short-term impact of research

(which could be interpreted to “disadvantage” the population) being balanced by the long-term use of the resulting information, which is “necessary” for recovery, is a complication that the legal system has not yet confronted directly. There will almost certainly be reluctance to issue permits on this basis until the policy issues have received very thorough airing, and appropriate standards of evidence and procedures have been adopted for how the applicable risk benefit analysis should be done, and what the results of that risk benefit analysis must show in order to justify the permit. Considering the subtleties and the complexities, it is to be expected that this policy discussion will take a long time. It would not be too soon to start the discussions now.

Until such policy is clarified, any research permit that entails more than a ‘negligible’ impact on the population may be difficult to defend, and open to controversy, if challenged. And, at the moment, even the definition of negligible is not entirely clear in an ESA context. ‘Potential biological removal,’ which is a provision of the MMPA, not the ESA, could offer some relevant ideas, but transfer of those ideas to ESA would not be automatic.

Ultimately, acceptance of a risk-benefit framework (*e.g.*, a management strategy evaluation), which issues permits for research that is genuinely necessary even though it poses a non-trivial short term risk, will require an atmosphere of trust in the institutions and the decision system. Consider a non-threatening example, a marking program. The marking process itself may be somewhat intrusive and pose some level of risk to the individual animals. The justification of a marking program could be that it provides needed information not readily available at lower cost to the species, about movements, survival rates, and reproductive rates. But note that this justification assumes that an adequate resighting program will be implemented and maintained for as long as necessary after the animals are marked, and that the results of the research (*i.e.*, the new information about movements, or survival, or reproductive rates) really will be used to make a significant management decision. In the absence of binding commitments to implement the follow up and to use the results, this becomes a matter of trust.

When the risk posed is small, as it may be in many marking programs, the trust that is asked for may not be much of a strain. But as the risk of the research goes up, the certainty that might be demanded about the commitment for management to follow up might go up as well. The policy developments that might nurture this trust include guidelines that are more explicit about the planning function of a recovery plan document, and ways of making some components of the plan more binding.

3. Options for the near term.

In-house review by NMFS

Much of the expertise on research needed to support recovery of ESA-listed marine mammals resides within NMFS. NMFS could choose to conduct the RPEP by consulting entirely with their own staff. This could have advantages with regard to administrative efficiency and perhaps cost. However, there are obvious disadvantages: NMFS researchers would be taken away from their normal work to assist in the RPEP; NMFS researchers would be in a conflict of interest situation reviewing their own planned work; and the RPEP would not take advantage of the spectrum of knowledge and experience available from non-NMFS scientists. An alternative to

avoid some of these disadvantages would be for NMFS to contract with an appropriate person(s) or organization(s) to provide them a scientific analysis of ongoing and needed scientific research which they could then use in the RPEP.

Expert review panels and workshops

The original SSL Recovery Team began considering the need to revise the original recovery plan in 1996, four years after the plan was approved. The team recognized that much research had been done on SSL in the intervening period and that it would be necessary to evaluate that information in depth prior to making a new set of recommendations about necessary management and research actions. As a result the team designed and conducted four review workshops, funded by NMFS, to bring together representatives of past and ongoing SSL research programs to present their results to a panel of experts including both SSL researchers and other qualified biologists. The reports from those review panels (SSLRT 1997a,b; SSLRT 1999a,b) provided as up-to-date as possible summaries of work that had been done as well as recommendations for what more should be done to support recovery needs. It is the opinion of the panel that this represents the level of effort and detail required to support a scientifically defensible RPEP.

There are a number of variations on how review panels and workshops could be designed and used to provide the background analysis needed for the RPEP. The optimum design will depend on a number of factors including: 1) the frequency with which NMFS feels that such analyses need to be done (*e.g.*, annually, every five years, etc.); and 2) whether in-depth reviews are needed only for specific problem situations like SSL or if they are needed for all marine mammal research permits. If in-depth review will be needed only occasionally for particular species an *ad hoc* approach such as that coordinated by the first SSL Recovery Team might be adequate. However, if such reviews will be needed more frequently and for all species NMFS might consider organizing, and providing funding for, a standing expert panel committed to spending the necessary effort on this issue in a continuing and timely manner.

SECTION III. RECOMMENDATIONS OF THE PANEL

- F/PR1 should not attempt to operate the RPEP using only their in-house assets.
- F/PR1 should review, and modify if needed, permit reporting requirements and procedures for storing permit report data.
- F/PR1 should use existing mechanisms, or if necessary establish additional mechanisms, to enforce permit provisions and, if necessary, revoke, suspend, or modify permits.
- F/PR1 should require that researchers participate in coordination efforts as a condition of their permit, and should assign staff to facilitate and oversee the required coordination efforts.
- Proposals or study designs of projects involving research on ESA-listed marine mammals should be peer-reviewed to ensure scientific integrity prior to permit requests being submitted to F/PR1.
- To the extent possible, NMFS should rely on recovery plans and recovery teams to provide guidance on the types of research needed to support recovery programs for ESA-listed marine mammals.

- NMFS should review the current format and content of recovery plans, and make modifications to recovery plan guidance, as needed to improve their utility for use in the RPEP.
- In convening recovery teams, NMFS should attempt to maintain independence and diversity of the scientists appointed. Mechanisms should be provided to avoid conflicts of interest in identifying and prioritizing research needs. F/PR1 should participate in the recovery team/recovery plan process.
- NMFS should provide support for meta-analyses of datasets when such analyses can help identify information gaps and research needs. Two examples are monitoring and measuring research impacts and use of telemetry to study habitat use.
- NMFS should develop a system to use expert panels to provide review of science needed for the RPEP when such information is not provided by a recovery plan or recovery team.
- F/PR1 should ensure that any permitted research complies with all relevant legislation and policies (*e.g.*, ESA, MMPA, AWA).
 - Compliance with humane practices requirements could be accomplished by requiring that research procedures be pre-approved by a competent IACUC.
 - Compliance with the requirement that the research serve a recovery need should be evaluated with reference to the recovery plan, recovery team consultation, and expert panels. The evaluation itself may best be done using a risk-benefit analysis conducted by experts outside of F/PR1.

SECTION IV. LITERATURE CITED

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APPENDIX A NFS Research Questions and Conservation Actions

Research questions for conserving and recovering the eastern Pacific stock of northern fur seals and conservation plan actions relating to each question. Numbers are those assigned to actions in the conservation plan. SMALL CAPS=highest priority; *italics*=moderate priority, times new roman=lowest priority.

What is the status of the population?

- 3.1.2 CONTINUE REGULAR COUNTS OF ADULT MALES AND ESTIMATES OF PUP PRODUCTION ON ST. PAUL, ST. GEORGE, AND BOGOSLOF ISLANDS
- 3.1.3 ESTIMATE PUP SURVIVAL
- 3.1.5 ESTIMATE STOCK VITAL RATES
- 3.1.6 *Evaluate behavioral/physiological studies*
- 3.1.7 *Continue comparative studies on other islands*
- 3.1.9 PROMOTE JOINT RESEARCH AND COLLABORATIVE PROGRAMS
- 3.4.1 REEVALUATE CARRYING CAPACITY
- 3.4.6 *Ecosystem modeling*

What are the life history characteristics of the population?

- 3.1.1 *Analyze fur seal teeth*
- 3.1.4 EVALUATE MARKING PROGRAMS
- 3.1.5 ESTIMATE STOCK VITAL RATES
- 3.1.6 *Evaluate behavioral/physiological studies*
- 3.1.7 *Continue comparative studies on other islands*

What factors are affecting growth of individuals and population productivity?

- 2.4 *Conduct studies to quantify effects of human activities (e.g. research, hunting, tourism, vehicles, discharges, facilities) at or near breeding and resting areas*
- 2.6.1 COMPILER AND EVALUATE EXISTING POLLUTANT DATA
- 2.6.2 *Monitor and study environmental pollutant exposure*
- 2.7.1 STUDY THE NATURAL AND ANTHROPOGENIC INFLUENCES ON FUR SEAL FEEDING ECOLOGY
- 2.7.2 Evaluate pelagic fur seal sampling
- 2.7.4 DETERMINE IMPACT OF FISHERIES
- 3.1.6 *Evaluate behavioral/physiological studies*
- 3.2.1 *Compile and evaluate existing disease data*
- 3.2.2 *Determine and mitigate disease effects*
- 3.4.5 *Quantify environmental effect on behavior and productivity*
- 3.4.6 *Ecosystem modeling*

What factors are affecting mortality?

- 1.1.1 *Continue disentanglement program to reduce mortality and harm to fur seals entangled in marine debris*

- 1.1.2 *Remove marine debris and incorporate surveys of debris in northern fur seal habitat*
- 1.1.3 Examine the fate of entangling debris
- 1.2.1 Implement and evaluate fishery and marine mammal observation programs in the North Pacific Ocean and Bering Sea
- 1.2.2 Review observer and incidental take data
- 1.3.1 MONITOR AND MANAGE SUBSISTENCE HARVESTS
- 1.3.2 *Develop and implement harvest sampling programs*
- 1.3.3 *Compile and evaluate existing harvest data*
- 1.3.4 IDENTIFY AND EVALUATE ILLEGAL HARVESTS
- 2.4 *Conduct studies to quantify effects of human activities (e.g. research, hunting, tourism, vehicles, discharges, facilities) at or near breeding and resting areas*
- 2.6.1 COMPILE AND EVALUATE EXISTING POLLUTANT DATA
- 2.6.2 *Monitor and study environmental pollutant exposure*
- 2.7.3 *Report fishery interactions*
- 2.6.3 Evaluate carcass salvage programs
- 3.1.8 Conduct appropriate studies to assess the impact of predation (e.g., killer whales, Steller sea lions, sharks) on fur seal populations
- 3.2.1 *Compile and evaluate existing disease data*
- 3.2.2 *Determine and mitigate disease effects*

What habitats are used for important ecological functions, and what factors are affecting those habitats?

- 3.3.1 COMPILE AND EVALUATE AVAILABLE HABITAT-USE DATA
- 3.3.2 CONDUCT OCEANOGRAPHIC AND FISHERY SURVEYS BASED ON PELAGIC FUR SEAL HABITAT USE
- 3.4.2 *Continue and evaluate Pribilof Islands Sentinel Program*
- 3.4.3 COMPILE AND EVALUATE EXISTING PHYSICAL ENVIRONMENTAL DATA
- 3.4.4 Select appropriate environmental indices
- 3.4.6 *Ecosystem modeling*

APPENDIX B NFS Permitted Research

Permit No. 782-1708-3 National Marine Mammal Laboratory

Specific Research Objectives: [note some research specific to San Miguel Island is not considered because San Miguel fur seals were not included in the NFS Conservation Plan]

1. Count the number of territorial and idle bulls on each rookery of the Pribilof Islands and on Bogoslof Island.
2. Estimate the number of pups born on the Pribilof Islands and Bogoslof Island.
3. Assess the frequency and causes of pup and non-pup mortality at selected rookery sites.
4. Monitor condition indices (weight and length), nutritional status and physiological health, and bacterial and viral pathogens of northern fur seal pups and non-pups as a method of evaluating early and late cohort "health".
5. Monitor the diet of northern fur seal females and sub-adult males on all major rookery islands.
6. Use satellite (time/depth and location) transmitters and radio telemetry for obtaining information on the location and behavior of various age and sex classes of fur seals at sea. Information from these instruments will be compared to real-time information obtained on the oceanographic data (*e.g.*, temperature, and salinity) and fisheries survey data to provide more complete understanding of the fur seals' habitat requirements.

Location and Timing:

Research will be conducted May-December, 2003-2007 on the breeding rookeries of the U.S. population of northern fur seals. These include St. Paul, St. George, and Otter Islands of the Pribilof Islands group; and Bogoslof Island in the Bering Sea.

Specific Research Activities:

Census adult males by counting from a distance
Capture and restrain pups on land
Clip fur from pups
Collect and examine dead pups and non-pups
Weigh and measure pups
Take ultrasound measurements of blubber of pups
Take blood samples from pups
Take fecal loops and swabs from pups
Mark fur of pups
Attach flipper tags to pups
Gastric lavage pups
Attach satellite-linked tags to pups
Capture, restrain, and sedate non-pups on land
Weigh and measure non-pups
Extract tooth from non-pups
Take ultrasound measurements of blubber of non-pups
Take blood samples from non-pups
Take fecal loops from non-pups
Take swabs from non-pups
Mark fur of non-pups

Attach flipper tags to non-pups
Collect milk samples from non-pups
Attach satellite-linked tags, TDRs, VHF tags to non-pups
Insert stomach temperature transmitter in non-pups
Recapture non-pups
Measure and ultrasound recaptured non-pups
Collect milk and blood samples from recaptured non-pups
Collect feces by enema from recaptured non-pups
Collect teeth and tissues from dead seals
Collect scats

Permit No. 881-1893 Alaska Sealife Center

Specific Research Objectives:

1. To monitor fur seal pup movements, diving behavior and prey ingestion from their rookery departure in November (post-weaning) to June using satellite telemetry.
2. To characterize fur seal pup habitat-associations by combining tracking and dive data with bathymetry and satellite remote sensing of hydrographic features.
3. To collect data on juvenile and adult northern fur seal diet, body condition, and movements and habitat associations utilizing pelagic captures.

Location and Timing:

Field seasons for initial captures of pups on the rookery will occur during the months of October and November in each year of the project. recaptures would most likely occur between the months of May and November. Research will be conducted on the Pribilof Islands, St. Paul and St. George Islands, and Bogoslof Island, in the Bering Sea.

Specific Research Activities:

Capture, restrain, and sedate pups on land
Take blood samples from pups
Take skin samples from pups
Take blubber samples from pups
Take muscle biopsies from pups
Take fecal loops and swabs from pups
Take vibrissae from pups
Take hair from pups
Take nails from pups
Measure isotope dilution in pups
Measure bioelectric impedance in pups
Take ultrasound measurements of blubber of pups
Attach flipper tags to pups
Mark fur of pups
Attach satellite-linked tags to pups
Place stomach temperature transmitters in pups
Capture, restrain, and sedate seals at sea
Sample and process as described above for pups
Take ultrasonographs of female reproductive tracts of seals caught at sea

Permit No. 715-1884 Andrew Trites, NPUMMRC

Research Objectives (specific objectives are not listed in the permit application):

Activity 1. Behavioral foraging ecology of northern fur seals. The primary goal is to determine what pelagic habitat is used by lactating northern fur seals in the eastern Bering Sea and how they use it. *Activity 2.* Demographic and behavioral studies of northern fur seals. This study will establish a marked population of known aged northern fur seals that will be resighted in future years to estimate vital rates and provide information about the feeding and behavioral ecology of northern fur seals. We will establish whether the population decline is caused by a high mortality of young animals or mature individuals, or whether it is related to reproductive failure. *Activity 3.* Assessing changes in body size and annual growth increments of teeth of northern fur seals. Body size of male northern fur seals taken in subsistence harvests on St. Paul and St. George will be compared with historical measurements taken since 1911 to assess the current condition of fur seals relative to carrying capacity.

Location and Timing:

Research will occur in all months and seasons, but will be concentrated in the months of July – September while fur seals are on land. Northern fur seal research will be conducted on the Pribilof Islands (St. Paul and St. George islands) and Bogoslof Island. Activity 3 will be conducted on both Pribilof Islands. Activity 2 will be initiated on St. Paul Island, and will be expanded to St. George Island and Bogoslof Island in years 3-5 subject to available funding and review of protocols established in years 1-2. Activity 1 will be conducted on St. Paul Island and will be expanded to St. George Island and Bogoslof Islands in years 3-5 subject to available funding.

Specific Research Activities:

Activity 1

Capture and restrain adult females on land
Take measurements of adult females
Attach electronic tags to adult females
Collect scats

Activity 2

Capture and restrain pups on land
Take measurements of pups
Take swabs from pups
Take blood from pups
Take vibrissae from pups
Take skin samples from pups
Take blubber sample from pups
Inject tetracycline into pups
Attach flipper tags to pups
Insert coded wire tag in pups
Capture, restrain, and sedate adult females and subadult males on land
Take measurements of adult females and subadult males
Take swabs from adult females and subadult males
Take blood from adult females and subadult males
Take vibrissae from adult females and subadult males

Take skin samples from adult females and subadult males
Take blubber sample from adult females and subadult males

Attach flipper tags to adult females and subadult males
Insert coded wire tag in adult females and subadult males
Remove postcanine tooth from adult females and subadult males
Collect scats

Activity 3

Measure animals taken in subsistence harvest
Collect teeth; determine age and measure growth rings

Permit No. 715-1883 Andrew Trites, NPUMMRC

Specific Research Objectives:

- a. Obtain baseline measures of growth and resting and daily metabolism in young northern fur seals to enhance predictive bioenergetic models.
- b. Determine the fasting capabilities of young fur seals, and the interaction between fasting and thermal demands.
- c. Establish blood biochemistry and hematology parameters that can be used as bioindicators of nutritional stress in northern fur seals.
- d. Determine the pattern of tissue catabolism during periods of under-nutrition.
- e. Determine the effect of dietary changes on reproductive hormones.
- f. Estimate the maximum food intake levels of young northern fur seals and their ability to alter intake to compensate for changes in food quality and availability.
- g. Determine the species-specific calibration coefficients (enrichment values) needed to determine diet from fatty acid signature analysis.
- h. Quantify digestion and recovery correction factors required to accurately describe diet from hard fecal remains (scat analysis).
- i. Determine the effectiveness of using stable isotope and fatty acid signature analyses to determine diet in wild fur seals

Location and Timing:

Initial takes and holding/evaluation are anticipated to be for 5-7 days in October 2007 on St. Paul Island (57° N, 170°W) in the Bering Sea, Alaska. This time of year corresponds to when fur seals are weaning. With the assistance of experienced NMFS researchers, 8 female pups that are approaching weaning will be captured from the fringes of one rookery on St. Paul Island (possibly Zapadni Reef, Kitovi, Vostochni, English Bay or Reef rookery).

Specific Research Activities:

Capture female pups and hold in facility on island
Remove female pups from island to captivity
Take blood samples and conduct oral and eye exams on rookery
Take blood samples at captive colony
Manipulate diets of captive seals including fasting
Take morphological measurements of captive seals
Take blubber biopsies of captive seals

Measure blubber of captive seals with ultrasound
Determine body condition of captive seals with isotopes
Measure metabolism of captive seals in metabolic chamber

Permit No. 1066-1750 LGL Alaska Research Associates

Specific Research Objectives:

Evaluate the importance of marine debris as a source of mortality to fur seals on the Pribilof Islands.

Location and Timing:

Field work will be done during July and August 2004 and intermittently until June 2005 in the Pribilof Islands, AK in the Bering Sea.

Specific Research Activities:

Round up subadult male seals and count by age class
Remove entangling debris from subadult males
Characterize the type and weight of debris and the extent of the wound created by the debris
Capture solo pups and adult females and remove entangling debris

Permit no. 1118-1881 Aleut Community of St. Paul Island

Overall Objectives:

Biosample Program--The objective of the Biosample Program is to collect, salvage, and/or accept (from subsistence users) and to distribute biosamples from dead stranded, subsistence hunted and beach cast marine mammals for both research and educational purposes. An example of the sort of research projects that will be undertaken by ECO with the biosamples is marine mammal tooth collection and aging. In addition, external requests for tissue samples from accredited researchers occur regularly (*e.g.* for genetic or toxicology investigations). *Marine Mammal Tooth Collection* --The objective of this project is to provide an accurate age determination for all seals taken during the St. Paul subsistence harvest. *Entanglement Program*--The primary goal of this project is to address the persistent problem of northern fur seal entanglement in derelict fishing gear and other marine debris. The activities proposed under this permit are designed to: a) mitigate effects of entanglement in marine debris on the Pribilof Islands through the capture and release of entangled northern fur seals; b) track the rate of entanglement as a long-term measure of the success of any efforts intended to reduce fur seal mortality due to entanglement, and c) identify the source of entangling debris to better target management efforts to prevent future fur seal entanglement. *Tanam Amgignaa (Island Sentinel) Program*--The objectives of the Tanam Amgignaa (TA) or Island Sentinel Program are to advance stewardship and active responsibility of and for the Pribilof Islands ecosystem. The program provides a centralized community forum to promote environmental education, outreach and cultural awareness through community-based monitoring.

Location and Timing:

Research will take place on St. Paul, Otter, and Walrus Islands and Sea Lion Rock of the Pribilof Islands group in the Bering Sea, Alaska, throughout the year.

Specific Research Activities:

Collect hard tissues, soft tissues, and/or whole carcasses from subsistence kills and natural deaths—provide samples to other investigators for analysis (tooth ageing, diets)
Estimate entanglement rates
Disentangle seals
Monitor parameters of the fur seal environment on St. Paul Island

Permit no. 1119-1882 Aleut Community of St. George Island

Overall Objective:

Biological Sample Collection--The Aleut Community of St. George Island Traditional Council has regularly assisted NMML staff and other independent researchers in the collection and distribution of biological samples from numerous marine mammal species, including but not limited to northern fur seals, harbor seals, and Steller sea lions. It is our desire to continue to collect and distribute biosamples from marine mammal species for research. *Marine Mammal Tooth Collection*--The Aleut Community of St. George Island has participated in the collection of teeth for research purposes during the local fur seal subsistence harvest since the cessation of the commercial fur seal harvest. As a part of our current fur seal subsistence harvest monitoring program, the Aleut Community of St. George Island Traditional Council via their Kayumixtax ECO department collects a sample of teeth from harvested male fur seals to be aged at the NMML. *Entanglement Program*--The primary goal of this project is to address the persistent problem of northern fur seal entanglement in derelict fishing gear and other marine debris. The activities proposed under this permit are designed to: a) mitigate effects of entanglement in marine debris on the Pribilof Islands through the capture and release of entangled northern fur seals; b) track the rate of entanglement as a long-term measure of the success of any efforts intended to reduce fur seal mortality due to entanglement, and c) identify the source of entangling debris to better target management efforts to prevent future fur seal entanglement. *Island Sentinel Program*--The objectives of the Tanam Amgignaa (TA) or Island Sentinel Program are to advance stewardship and active responsibility of and for the Pribilof Islands ecosystem. The program provides a centralized community forum to promote environmental education, outreach and cultural awareness through community-based monitoring.

Location and Timing:

Research will take place throughout the year on St. George Island of the Pribilof Islands group in the Bering Sea, Alaska

Specific Research Activities:

Collect hard tissues, soft tissues, and/or whole carcasses from subsistence kills and natural deaths; provide samples to other investigators for analysis (tooth ageing, diets)
Estimate entanglement rates
Disentangle seals
Monitor parameters of the fur seal environment on St. George Island

APPENDIX C SSL Research Questions and Recovery Actions

Research questions for conserving and recovering Steller sea lions and recovery plan actions relating to each question. Numbers are those assigned to actions in the recovery plan. SMALL CAPS=highest priority; *italics*=moderate priority, ***bold italics***=medium priority, times new roman=lowest priority.

What is the status of the population?

- 1.1.1 ESTIMATE TRENDS FOR PUPS AND NON-PUPS VIA AERIAL SURVEYS
- 1.1.2 CONTINUE TO MONITOR POPULATION TRENDS ON PRIBILOF ISLANDS (PARTICULARLY THE WALRUS ISLAND ROOKERY) VIA AERIAL SURVEYS OR LANDBASED PUP COUNTS
- 1.2.1 *Continue to estimate survival, natality, and immigration/emigration rates through a branding/resight program*
- 1.2.3 ***Develop an age-structured population model using medium format photos from aerial surveys***
- 1.2.4 *Develop methods and determine reproductive rates including pregnancy and parturition rates*
- 1.3.1 ***Examine the effects of season, age, and sex on body condition***
- 1.3.2 *Develop improved indices of health, body condition, and reproductive status using chemical methods (e.g., hematology serum chemistries, and endocrine monitoring)*

What are its life history characteristics?

- 1.2.1 *Continue to estimate survival, natality, and immigration/emigration rates through a branding/resight program*
- 1.2.3 ***Develop an age-structured population model using medium format photos from aerial surveys***
- 1.2.4 *Develop methods and determine reproductive rates including pregnancy and parturition rates*
- 1.4.1 *Develop improved live capture techniques for general research needs*
- 5.7.4 *Document local knowledge and cultural science (Traditional Ecological Knowledge, TEK) pertaining to sea lions to better understand changes in sea lion movement (local and seasonal), feeding patterns and prey, seasonal haulouts, predation and ecosystem dynamics*

What factors are affecting growth of individuals and population productivity

- 1.4.1 *Develop improved live capture techniques for general research needs*
- 1.4.2 ***Develop improved non-lethal sampling techniques to assess health***
- 2.3.1 *Collect and analyze scat samples and stomach contents to determine prey consumption*
- 2.3.2 *Develop stable isotope and fatty acid methodologies to assess prey consumption*
- 2.3.4 *Evaluate all information on sea lion foraging areas and develop a description of foraging needs*
- 2.4.3 ***Distinguish how natural and anthropogenic factors influence marine ecosystem dynamics and subsequently sea lion population dynamics***

- 2.5.1 Determine the physiological diving capabilities and evaluate how this limits the ability to forage successfully
- 2.5.2 *Determine the energetic costs to foraging sea lions*
- 2.5.3 *Assess the nutritional value of prey by species, season, and area including digestibility and overall value to sea lions*
- 2.5.4 ***Develop an energetics model to investigate the interrelationships between prey availability and sea lion growth, condition, and vital rates***
- 2.6.5 *Assess the response of sea lions to changes in prey distribution and availability*
- 2.6.7 ***Explore the use of ecosystem based (multi-species) stock assessment models to set fishery catch limits to ensure adequate prey resources for a recovered sea lion population***
- 3.5.2 Monitor and minimize unintentional takes associated with research activities
- 4.1.1 ***Conduct epidemiological surveys***
- 4.1.2 ***Develop and implement methods for parasite evaluations***
- 4.1.3 ***Develop and implement methods to test immune system functioning***
- 4.1.7 ***Develop models to simulate disease impacts based on energetics, physiology, abundance and demographics.***
- 4.2.1 *Design a contaminant research and management plan*
- 4.2.2 *Collect contaminant samples from free-ranging sea lions and in environmental ‘hotspots’*
- 4.2.3 *Examine blood and tissue samples for evidence of contaminant linked endocrine effects including free-ranging and captive work*
- 4.2.4 *Develop models to simulate contaminant impacts and effects based on energetics, physiology, abundance and demographics*
- 5.7.3 *Analyze carcasses from subsistence harvest to assess age, body condition, and other relevant information to ensure safety of carcasses for human consumption*

What factors are affecting mortality?

- 3.1.1 Monitor and evaluate incidental take in commercial and recreational fisheries through observer and self-reporting programs
- 3.1.2 Monitor and evaluate incidental take in non-commercial fisheries
- 3.2.1 Monitor intentional take via shoreline surveys for carcasses near suspected conflict “hotspots” and by encouraging reporting of illegal shooting through NMFS’s enforcement hotline
- 3.3.1 Develop and promote non-lethal means of deterring sea lions from hauling out on docks
- 3.5.1 Coordinate research efforts to reduce potential for unnecessary or duplicative research-related takes
- 3.5.2 Monitor and minimize unintentional takes associated with research activities
- 4.1.1 ***Conduct epidemiological surveys***
- 4.1.2 ***Develop and implement methods for parasite evaluations***
- 4.1.3 ***Develop and implement methods to test immune system functioning***
- 4.1.4 *Evaluate causes of mortality by examining dead and live animals of all age and sex classes for disease from various sources across the geographic range and in all seasons*
- 4.1.7 ***Develop models to simulate disease impacts based on energetics, physiology, abundance and demographics.***
- 4.3.1 ***Understand predator life histories, biology and ecology through studies of free-ranging and captive animals***

- 4.3.2 *Determine killer whale diets*
- 4.3.3 *Develop methods to obtain samples from live killer whales*
- 4.3.4 *Expand the stranding network to increase samples of killer whales available for research*
- 4.3.5 *Determine killer whale distribution and behavior across the North Pacific*
- 4.3.6 *Estimate numbers of killer whale ecotypes in time and space*
- 4.3.7 *Develop models to simulate predation rates based on killer whale energetics and abundance of Steller sea lion demographics (NOTE--this is really what it says)*
- 5.3.1 *Continue and expand the Alaska stranding network to increase coastal coverage and community involvement in monitoring sea lion mortality*
- 5.3.2 *Survey selected areas for stranded animals*
- 5.3.3 *Expand tissue sampling efforts to improve the information obtained from dead sea lions*
- 5.3.4 *Monitor the incidence and impact of entanglement in marine debris*
- 5.7.1 *Co-manage subsistence harvests and evaluate the efficacy and accuracy of using retrospective subsistence harvest surveys*
- 5.7.4 *Document local knowledge and cultural science (Traditional Ecological Knowledge, TEK) pertaining to sea lions to better understand changes in sea lion movement (local and seasonal), feeding patterns and prey, seasonal haulouts, predation and ecosystem dynamics*

What habitats are used for important ecological functions and what factors are affecting those habitats?

- 2.2 *Redefine and catalog rookery and haulout sites and ensure their protection*
- 2.3.3 *Deploy instruments to obtain fine scale data on sea lion foraging habitat*
- 2.4 *Determine the environmental factors influencing sea lion foraging and survival*
- 2.4.1 *Assess the relationships between oceanographic profiles or features and sea lion foraging ecology*
- 2.4.3 *Distinguish how natural and anthropogenic factors influence marine ecosystem dynamics and subsequently sea lion population dynamics*
- 2.6.1 *Improve groundfish stock assessment surveys to determine seasonal and inter-annual patterns of prey abundance, distribution, and movement at scales relevant to sea lions*
- 2.6.2 *Assess competition for prey with sympatric consumers (e.g., gadids and flatfish, fur seals, harbor seals, other marine mammals, and seabirds)*
- 2.6.3 *Utilize groundfish fishery observer data to assess the spatialtemporal distribution of the fishery*
- 2.6.4 *Assess effectiveness of sea lion closure zones around rookeries and haulouts using small-scale experiments*
- 2.6.6 *Evaluate and implement current or equivalent fishery regulations to protect foraging habitat and prey resources for sea lions*
- 2.6.7 *Explore the use of ecosystem based (multi-species) stock assessment models to set fishery catch limits to ensure adequate prey resources for a recovered sea lion population*

Appendix D. Guidance for Internal Initial Review of Applications

Guidance for Internal Review of Applications

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Guidance for Internal Review of Applications

(December 2008)

1.0 Introduction

This guidance accompanies the “application score sheet” (Attachment 1) and is only for applications for a permit to “take”¹ marine mammals for research or enhancement. Such permits are issued under Section 104 of the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C 1361 *et seq.*) and the regulations governing the taking and importing of marine mammals (50 CFR Part 216). For “takes”² of marine mammals listed as threatened or endangered under the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq.*), permits are also³ issued under section 10(a)(1)(A) of the ESA and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR Parts 222-226).

The purpose of the initial review of an application by the permit analysts is to evaluate how well the applicant has addressed the applicable permit issuance criteria set forth in the MMPA, ESA, and National Marine Fisheries Service (NMFS) regulations. The following guidance shall be used, in conjunction with the “application score sheet,” in evaluating which permit issuance criteria are applicable and whether the application is consistent with all applicable criteria.

The “application score sheet” indicates the applicable section of the MMPA, ESA, or NMFS regulations for each criterion. The sheet also provides a reference to the sections of the application where the applicant’s corresponding response should be located. Note that just as a checklist is not sufficient record of a deliberative process, the “application score sheet” does not take the place of a decision document. Permit analysts should use this guidance in conjunction with the “application score sheet” to develop a summary of application review memorandum or other appropriate written record of application review and findings relative to the issuance criteria.

2.0 Rating Applicant Responses

For the purpose of application review and use of the “application score sheet” the permit issuance criteria are separated into four categories: (1) general, (2) MMPA requirements, (3) ESA requirements, and (4) other applicable laws. Within each category rank specific statutory and regulatory criteria from 0 to 4 according to how well the applicant’s responses address a criterion. The ranks are as follows: (0) Not Applicable; (1) Not Addressed (either no response given or response does not relate to the question); (2) Poorly Addressed; (3) Adequately Addressed; or 4) Well Covered.

¹ Under the MMPA, “take” is defined as to "harass, hunt, capture, kill or collect, or attempt to harass, hunt, capture, kill or collect."

² 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."

³ As a matter of unwritten policy, NMFS typically issues a joint MMPA/ESA permit to applicants requesting take of ESA-listed marine mammals, rather than separate permits under each statute. This is done as a courtesy to the applicant, to streamline both the application process and the permit reporting requirements.

Note that when an applicant provides no response to a question or section of the application, the appropriate rank is “(1) Not Addressed,” regardless of whether the question or section is applicable to their activity. A criterion may only be ranked as “(0) Not Applicable” both when PR1 has appropriately determined the question or section not applicable and the applicant has briefly explained why the question or section is not applicable to their activity.

For criteria that PR1 determines “not applicable” to a particular application, and for which the applicant has adequately explained why it is not applicable, the appropriate rank is “0.” If the applicant provided text in response to a question or section of the application but the information provided is irrelevant to a criterion or is otherwise non-responsive, the appropriate rank is “(1) Not Addressed.” If a criterion is applicable, but not addressed, the application should be considered incomplete and the summary of review memo should identify all such responses and recommend the application be returned to the applicant for additional information.

2.1 General Criteria

The issuance criteria identified as “general” relate to whether: (1) the application is for species within NMFS jurisdiction, (2) the activities are consistent with the specified sections of the Acts, and (3) the applicant has followed the appropriate application procedures. Evaluating these criteria should be the first step in review of an application before proceeding to review of the details of the application for consistency with the specific permit issuance criteria under the MMPA, ESA, and other applicable laws.

Note that the general criteria do not correspond to how well the applicant responded to specific questions: that determination is made when evaluating each specific statutory or regulatory criterion. The general criteria only relate to whether the applicant provided a response. Thus, the only applicable ranks are “1” or “4.”

NMFS regulations for permit application submission (50 CFR 216.33) require persons seeking a special exception permit to submit an application that is “signed by the applicant” and provides “in a properly formatted manner all information necessary to process the application.” NMFS has developed written application instructions specifying the form and manner in which applications must be submitted (OMB No. 0648-0084, Expires 09/30/2009⁴).

In reviewing the application for compliance with these general criteria, consider the following:

- G.1. Was the application submitted using the current version of the application instructions?
- If not, rank the response as “1” and end your review here with a recommendation for the application to be returned because the request was not submitted in a properly formatted manner.
 - If yes, then rank the response as “4” and proceed to next criterion.

⁴ These OMB-approved instructions are reviewed and renewed periodically by NMFS. Analysts should refer to the most current OMB-approved instructions at the time an application is under review.

- G.2. Was the application signed by the applicant (i.e., by the PI if applicant is an individual or by the Responsible Party and PI if applicant is an institution/organization)?
- If not, rank the response as “1” and end your review here with a recommendation for the application to be returned for appropriate certification by applicant.
 - If yes, then rank the response as “4” and proceed to next criterion.
- G.3. Are the activities for “purposes of scientific research” on marine mammals?
- If not, rank the response as “0” and end your review here with a recommendation for the application to be returned because activity is not consistent with provisions of section 104 of MMPA.
 - If yes, rank the response as “4” and proceed to next criterion.
- G.4. If takes of threatened or endangered species are requested, are the activities for “scientific purposes” under ESA?
- If not, rank the response as “0” and end your review here with a recommendation for the application to be returned because activity is not consistent with provisions of section 10(a)(1)(A) of ESA.
 - If yes, rank the response as “4” and proceed to next criterion.
- G.5. Are the marine mammal species for which take is requested under NMFS jurisdiction? (Note that the U.S. Fish and Wildlife Service has jurisdiction for MMPA section 104 and ESA Section 10(a)(1)(A) permits for walrus, manatee, polar bear, and sea otter.)
- If not, indicate whether the applicant is seeking or requires a joint permit with FWS or end your review here and recommend application be returned because species are not within NMFS jurisdiction.
 - Also note whether non-mammal species are proposed for taking, and whether the applicant may require additional permits from other agencies.
 - If yes, rank the response as “4” and proceed to next criterion.

2.2 MMPA Requirements Criteria

The issuance criteria identified as “MMPA requirements” relate to the specific statutory and regulatory requirements for permits issued pursuant to Section 104 of the MMPA. In ranking how well the applicant’s responses address these criteria, consider whether the applicant provided an appropriate level of evidence in support of their assertions, including references to other material (e.g., peer-reviewed publications) that supports the validity of their assertions. In evaluating “whether” a criteria is met, consider the how’s and why’s of the applicant’s responses.

In reviewing the application for compliance with the MMPA requirements criteria, consider the following:

- M.1. Did the applicant justify that taking of a marine mammal or marine mammal stock is necessary?

- Did they adequately explain why their hypothesis cannot be tested or question answered without taking a marine mammal, such as
 - through examination of existing data or information (on same or other species)
 - through use of non-protected species (species that are not protected under the MMPA or listed under the ESA)
 - without live animals (e.g. via computer modeling or tissue culture)
- For activities that involve capture or sampling of wild animals, did the applicant also adequately explain why they could not use animals already in captivity or rehabilitated animals?

Criteria related to statutory definition of *bona fide scientific research*

- M.2. Has the applicant provided a clearly stated hypothesis to be tested, or question to be answered?
- This is important because an assessment of whether methods are appropriate, sample sizes are justified, outcomes are likely to benefit conservation, etc. is difficult in the absence of a well defined hypothesis or question.
- M.3. Has the applicant demonstrated that (how or why) the proposed methods are appropriate for the stated hypothesis/question?
- Consider that a well-planned study uses methods consistent with the type of data needed to address the question.
 - Consider not only the manner of collecting the samples (e.g. aerial vs. land-based surveys, permanent vs. temporary marks, tissue sampling vs. observations) but the temporal and spatial nature of the sampling.
 - For example, is the study proposed for the appropriate time of year or geographic location relative to the hypothesis?
- M.4. Has the applicant demonstrated that (how or why) the sample size⁵ is appropriate (e.g., neither too small nor too large, and not directed at an inappropriate segment of the population or species) for the stated hypothesis/question?
- If the size is too small for the hypothesis/question, consider how an inadequate or insufficient sample size would affect the outcome of the study.
 - Keep in mind that some experimental studies will necessarily begin with small sample sizes in early phases.
 - Consider the magnitude of the risks to the individual, stock, or species.
 - Are the risks to the individual, stock, or species justified given an inadequate data set?
 - Is it still worthwhile to collect the information and if so, why?
 - If the size is too large, what is the rationale?

⁵ Note that for applications to conduct presence or abundance surveys, a sample size justification should focus not on the number of animals that would be counted, but on the number of surveys that would be conducted and necessary to make a robust population estimate or informed decision about presence.

- Consider how the applicant justified the need to sample within a specific sex, age classes, life history stage, sub-population, etc. relative to their specific hypothesis or question.

- M.5. Has the applicant demonstrated that (how and why) the sample size is achievable given their resources and the expertise of the personnel listed?
- Consider past permit performance: has the applicant previously been successful? If not, what impact has this had on achieving the study goals? What changes have they made that make it more likely they will succeed this time?

NOTE: the following three criteria, while interrelated and inextricably linked, are interpreted within the statutory definition of “bona fide” as being either/or requirements, such that an applicant technically need only satisfy one, but not all, of the three. However, by the nature of the criteria, projects that do not satisfy one, will also likely not satisfy the others.

- M.6. Has the applicant demonstrated how their activity would contribute to the basic knowledge of marine mammal biology or ecology, including the relative importance of the contribution and how likely they are to be successful in achieving their stated objective?
- Consider how well the applicant has demonstrated their knowledge of the relevant literature and placed their study in the proper context.
 - It is not sufficient to simply claim a link. The applicant should
 - provide a logical argument for how their sample collection (and subsequent analysis) would result in robust data and
 - describe how that data would fill specific information gaps or significantly enhance existing knowledge.
- M.7. Has the applicant demonstrated how their activity would identify, evaluate, or resolve a specific conservation problem for marine mammals?
- It is not sufficient to simply claim a link. The applicant should provide a logical argument for how their sample collection (and subsequent analysis) would result in robust data that could be used to inform (in a meaningful way) a specific conservation or management decision.
- M.8. Has the applicant demonstrated that (why) their activity is not unnecessarily duplicative?
- Have they explained
 - how their study is unique,
 - how their study builds upon previous studies in a meaningful way
 - if it duplicates a previous study, why the duplication is essential to understanding the issue or validating the theory
- M.9. Has the applicant demonstrated that (why) they are reasonably likely to publish or otherwise make their results available to the public in a reasonable period of time?

- Evaluation of this criterion should include review of the applicant’s publication history and consideration of how likely their study is to be publishable.
- Consider that peer-reviewed publications typically have standards, similar to these issuance criteria, regarding a clearly stated hypothesis, appropriate sample sizes and methods, and significance or relevance of the information.

Criteria related to statutory definition of humane

- M.10. Are the methods described in sufficient detail to evaluate potential effects?
- M.11. Has the applicant appropriately identified potential effects, both short and long-term, of each procedure, as well as cumulative or synergistic effects?
- M.12. How does the applicant’s alternatives search substantiate that their methods are those with the least possible potential for pain and stress?
- M.13. How has the applicant demonstrated that their proposed mitigation measures would avoid or minimize adverse effects of each activity to the maximum extent practical?
- M.14. Has the applicant explained how their monitoring or research is appropriate to evaluate effects?

Criteria related to “manner of taking”

- M.15. Has the applicant described all of the relevant details of each proposed method?
- Refer to Appendix 1 for level of detail that would constitute a “well-covered” response for commonly requested activities.
- M.16. Does the application specify the number and kind of marine mammals proposed for taking by each activity and, within each activity, by species, stock, sex, age, and life-history stage?
- Note that level of detail appropriate for this response may depend on the nature of the hypothesis or question. At a minimum, the applicant must specify both the total number of animals that would be affected and the total number of times an animal would be exposed to a given activity.
- M.17. Does the application specify the locations of the taking with sufficient detail to confirm presence of species, and marine mammal stock identity?
- Note that information on location is also needed for evaluation of environmental impacts overall.
- M.18. Does the application specify the period during which the activity would be conducted, including overall project start and end dates, as well as sufficient detail regarding seasons, frequency, etc. to confirm presence of species, stock identity, sex, age, and life-history stages likely to be affected?

- Note that information on time and frequency is essential to evaluation of cumulative effects.

Criteria related to “Lethal Taking”

- M.19. If lethal taking, either intentional or unintentional, is requested, or is otherwise possible due to nature of the activity, how has the applicant justified that non-lethal methods are not feasible?
- Note that feasibility is not based on “ability,” as in cost or ease of doing something, but to possibility, as in an alternative exists, regardless of cost or ease of carrying it out.
- M.20. If lethal taking from a depleted stock is requested or otherwise possible due to nature of activity, how has the applicant justified that the results of their research will directly benefit that stock or species, or otherwise fulfill a specific critically important research need identified by NMFS?
- Note that an adequate justification for “directly benefit” should directly link the information to be gained from the study to a specific management or conservation action that would likely result in an improvement in the status of the stock or species.
- M.21. Has the applicant appropriately identified and adequately explained the processes for research-related mortality and associated probabilities of such mortality?
- Note that there can be more than one process that can lead to mortality, such as immediate effects of a drug interaction versus longer term effects of an infection or internal bleeding, or an injury that hinders feeding.
 - In evaluating this application, also consider past records for the same or similar activities, by the same applicant and others.

2.3 ESA Requirements Criteria

The issuance criteria identified as “ESA requirements” relate to the specific statutory and regulatory requirements for permits issued pursuant to Section 10(a)(1)A) of the ESA. In ranking how well the applicant’s responses address these criteria, consider whether the applicant has provided an appropriate level of evidence in support of their assertions, including references to other material (e.g., peer-reviewed publications) that supports the validity of their assertions. Consider the how’s and why’s of the applicant’s responses in evaluating “whether” a criteria is met.

In reviewing the application for compliance with the ESA requirements criteria, consider the following:

Criteria related to “in good faith”

- E.1. Has the applicant demonstrated their understanding of and intent to act consistent with the requirements of the ESA, NMFS implementing regulations, and permit terms and

conditions, and is their capability to successfully carry out their research consistent with what they purport to accomplish?

- Note that for applicants with previous NMFS permits, you must review the administrative records for those permits in evaluating whether the applicant has a history of permit compliance and successful completion of permitted studies.
- For capability, also consider the experience and expertise of personnel, and adequacy of facilities and other resources necessary to carrying out the research.

Criteria related to “Will not operate to the disadvantage”

E.2. Has the applicant demonstrated that their activity would not hinder the recovery, result in harm that would put the species at increased risk, or otherwise result in loss or damage that would delay recovery?

- Consider whether the applicant has searched for and considered adverse effects on individuals (e.g., physical injury, death, reduced or failed reproduction, reduced growth, impaired foraging ability, depressed immune response) known to be associated with the proposed research in general, and specific procedures in particular?
- What are the consequences of these adverse effects on the survival, longevity, or reproductive capacity of individuals?
- What are the consequences (in context of numbers of animals affected and overall population size) of these adverse outcomes for the threatened or endangered populations the individuals represent?

Criteria related to furthering bona fide and necessary or desirable purpose, or enhancing propagation or survival

E.3. Has the applicant explained how the results of their research would directly benefit the species; contribute significantly to fulfilling a critically important research need identified by NMFS for the subject species; identify, evaluate or resolve a specific conservation problem for the subject species; or contribute significantly to the general understanding of the subject species’ biology or ecology?

- Does the hypothesis or question address a well-defined conservation problem?

E.4. Has the applicant demonstrated appropriate knowledge of the listing status and current population trends and threats for the subject species?

- Appropriate knowledge is essential in designing a well-planned study and putting the study results in the proper context for determining how they would contribute to conservation.
- A well-covered response
 - defines the significance or extent of the problem (using statistics or supporting facts)
 - identifies likely causes of the problem and its effects
 - defines the specific part of the problem that would be addressed by the study and how

- E.5. Has the applicant appropriately identified possible adverse impacts of their research on the listed species and how the impacts would be minimized?
- It is not sufficient for the applicant to indicate impacts are “negligible,” “minimal,” “short-term,” etc. without defining what is meant by these terms.
 - For example, “short-term” could mean the animals recover within minutes or before the next breeding season. The possible implications for these two examples could be very different.
- E.6. Has the applicant demonstrated that the personnel to be involved in the taking have appropriate prior experience with the same or similar species and have demonstrated success with the proposed or analogous methods?
- Consider that the experience of personnel who will be engaged in activities with higher potential for serious injury or mortality should be commensurately greater than that of personnel who will be engaged in “lower risk” activities such as behavioral observations.
- E.7. Has the applicant demonstrated why their research cannot be conducted using a species or stock that is not listed under the ESA?
- E.8. Has the applicant provided appropriate documentation for captive born animals or stated their intent to remove animals from the wild?
- E.9. If animals are to be removed from the wild, or captive propagation is proposed, has the applicant made appropriate provisions for the ultimate disposition of the animals at the conclusion of the project or program?
- For release of animals to the wild, this should include discussion of
 - how the applicant would ensure animals are free of disease and other pathogens that could pose a risk to animals in the wild
 - how (and for how long) animals would be monitored post-release
 - how the applicant would ensure animals are not imprinted on humans or have developed other behavioral abnormalities that would hinder their survival in the wild
 - For propagation, does the applicant have adequate (by APHIS standards) space for the maximum number of progeny that could result?

2.4 Other Applicable Laws Criteria

The issuance criteria identified as “other applicable laws” relate to the requirements of other federal, state, and local permits, licenses, approvals, and consultation requirements necessary to issue the permit or conduct the proposed research. When it is the applicant’s responsibility to secure the necessary approvals, NMFS is obligated under National Environmental Policy Act (NEPA) to ascertain whether the applicant has secured or is seeking other federal, state, or local approvals for their action. In ranking how well the applicant’s responses address these criteria, consider how convincing or well supported by references the argument is.

In reviewing the application for compliance with the other applicable laws criteria, permit analysts shall consider the following:

- O.1. Has the applicant demonstrated compliance with the requirements of their institution’s Animal Care and Use Committee (ACUC), pursuant to the Animal Welfare Act or justification for why such compliance is not required?
- Note, the applicant may submit, as proof of compliance, a copy of the protocols submitted to their ACUC and the corresponding written approval of the Committee. In this case, permit analysts should confirm that the descriptions of protocols submitted to the ACUC are identical to those in the permit application.
- O.2 Has the applicant demonstrated that they have applied for, secured, or will apply for other federal, state, and local permissions required for their conduct of the research?

Criteria related to National Environmental Policy Act determination

In general, consider whether the applicant gave responses with sufficient detail for PR1 to determine whether NMFS issuance of the permit is suitable for a categorical exclusion, is covered by an existing programmatic environmental assessment (EA) or an environmental impact statement (EIS), or for PR1 to prepare an EA or EIS.

- O.3. Has the applicant described the location of their research with sufficient detail for PR1 to evaluate potential environmental impacts?
- Consider, for example, whether there is sufficient information to determine whether:
- the action would occur in or near geographic areas that may be considered “ecologically critical” such as national or state parks, wildlife refuges, wild and scenic rivers, essential fish habitat, designated critical habitat for any listed species, etc.;
 - there could be cumulative impacts when this action is added to existing impacts and those that are reasonably foreseeable;
 - the physical features of the area could exacerbate or alleviate potential adverse impacts of proposed research methods;
 - other species of wildlife or protected plants could be present or otherwise affected, and how.
- O.4. Has the applicant described their methods in sufficient detail to fully evaluate the potential effects on target species, non-target species, and other features of the environment?
- For work on land, the applicant should describe methods of ingress and egress to field sites.
- O.5. Has the applicant appropriately identified the potential effects, both short- and long-term, of each procedure, as well as cumulative or synergistic effects?
- O.6. Has the applicant identified how their proposed post-activity monitoring is appropriate to evaluate the effects of their activity and to ensure recovery of animals post-handling or sampling?

3.0 Scoring the Application

After reviewing the application and ranking the applicant's responses, compute the scores for each criterion and the application overall. Scores for individual criteria are calculated by multiplying the rating by the weight. The overall score for an application is the sum of these scores.

Note: Applications with a total score below 1.8 out of 4 for MMPA criteria and below 1.72 out of 4 for ESA criteria should be returned to the applicant with an explanation of the deficiencies and not considered further. This is based on ranks of "2" (poorly addressed) or less for all responses, and where some criteria (such as lethal taking) may not be applicable.

Note that incomplete applications do not receive a final score. A lack of response to any specific criterion, regardless of its weight, is sufficient reason to consider an application incomplete and return it to the applicant without further processing.

Note also that if the research involves taking both marine mammals and ESA-listed species, including threatened or endangered marine mammals, the applicant must satisfy both the MMPA and the ESA requirements because permits are required under both statutes.

Weights were assigned to each criterion on the score sheet based on their importance in the final decision regarding whether issuance of the permit is consistent with all legal requirements. While all applicable permit issuance criteria must be met, they are not necessarily equally important. For criteria with lower weights in the final decision, a rating of "poorly addressed" would have less influence on the decision whether to issue a permit than such a rating for a criterion of higher weight. For some criteria, a rating of "poorly addressed" may be cause for returning the application for additional information or explanation by the applicant.

3.1 General Requirements

The responses to the General Criteria are not weighted or considered in scoring the application overall. The general criteria reflect whether the applicant has provided responses as required, but not how responsive the information is relative to the criteria. Failure to receive a rank of "4" for any of these general criteria means the application should not be considered further under this guidance. Therefore, the following applications should be returned and not considered further

- incomplete (responses ranked as "not addressed")
- improperly formatted
- inappropriately signed
- not for species under NMFS jurisdiction
- not for scientific research⁶ on marine mammals

⁶ Recall that this document is only for review of applications for permits to conduct scientific research. If the application was submitted as a scientific research permit request, but the activity proposed is related to another type of activity under Section 104 of the MMPA (e.g., public display, commercial or educational photography), the applicant should be advised to resubmit using the appropriate format and the application should be reviewed under the applicable criteria.

3.2 MMPA Requirements

Assuming the applicant has provided responses to all of the MMPA Requirements Criteria, the application should be scored as follows:

- If NMFS determines a criterion not applicable, it is not factored into the final score.
- If NMFS ranks that the applicant's responses to details of the manner of taking (criteria M15 – M18) as “poorly addressed, the application should be returned for additional details so that the permit will accurately reflect the needs of the research with respect to species, location, duration, etc. Otherwise, multiply the rank by the weight and enter the score in the appropriate column.
- If NMFS ranks the applicant's responses to the following criteria “poorly addressed,” the application may be returned to the applicant for additional information or NMFS may make the application available for public review and comment to get additional information. If the applicant's responses to these criteria are ranked as “3” or “4” then multiply the rank by the weight and enter the score in the appropriate column.
 - Justification that taking of marine mammals is necessary (M1)
 - Justification that project is consistent with bona fide definition (M2 – M9)
 - Justification that manner of taking is consistent with the MMPA's definition of humane (M10 – M14)
 - Justification that non-lethal methods are not feasible (M19)

3.3 ESA Requirements

Assuming the applicant has provided responses to all of the ESA Requirements Criteria, the application should be scored as follows:

- If NMFS determines a criterion not applicable, it is not factored into the final score.
- If NMFS ranks the applicant's response to the following criteria “poorly addressed,” the application should be returned to the applicant for additional information or explanation. These criteria reflect positive findings that must be made by NMFS or positive showings that must be made by the applicant, pursuant to the statute or regulations. If the applicant's responses to these criteria are ranked as “3” or “4” then multiply the rank by the weight and enter the score in the appropriate column.
 - The permit has been “applied for in good faith” (E1)
 - The permit “will not operate to the disadvantage of listed species” (E2)
 - The permit would further a bona fide and necessary or desirable scientific purpose; or enhance propagation or survival (E3)

3.4 Other applicable laws

These criteria are not directly related to permit issuance requirements the applicant must satisfy under the MMPA and ESA, and they are weighted correspondingly lower. However, these criteria reflect information necessary to processing the application, including determinations NMFS must make under NEPA.

- If the applicant fails to demonstrate compliance with Animal Welfare Act (AWA) or applicable requirements for other federal, state or local permits necessary to conduct the research, it is not necessary to return the application.

- If NMFS ranks the applicant’s responses to the NEPA determination criteria as “poorly addressed,” the application should be returned to the applicant for additional information or explanation.

As with the MMPA and ESA criteria, multiply the rank for each of these “other applicable laws” criteria by the weight and enter the score in the appropriate column.

4.0 Documenting Analyst Recommendations

After ranking and scoring an application using the “score sheet,” complete a “summary of review memorandum” to document your review and recommendations.

If	You should
responses to G1 – G5 are ranked as “0”	recommend the application be returned and not considered further
Responses to M1 – M14 or M19 are ranked below “3”	recommend the application be returned for additional information, and withdrawn if no response within 60 days or recommend the application be published in <i>Federal Register</i> for public review with note that application may contain insufficient information
responses to M15 – M18 are ranked below “3”	contact the applicant for additional information; allow 60 days for response
response to E1 – E3 are ranked below “3”	contact the applicant for additional information; allow 60 days for response
application is scored >1.8 (MMPA) and >1.72 (ESA)	recommend the application be published in <i>Federal Register</i> for public review and comment
application is scored <1.8 (MMPA) and <1.72 (ESA)	recommend the application be returned for additional information, and withdrawn if no response within 60 days

When returning an application for additional information, indicate which parts of the application require additional information or responses. If an applicant does not respond to requests for additional information within 60 days, consider the application withdrawn. Withdrawn applications are not considered further. Applicants who wish to pursue the activities in a withdrawn application must submit a new application for review.

When returning an application that will not be considered further, prepare a letter for signature by the Division Chief which specifies the reasons for return (e.g., species not within NMFS jurisdiction).

APPENDIX 1: “Well-Covered” Sampling Methods Details

Descriptions of sampling methods for these commonly proposed research activities should contain the following details to be ranked as “well covered” responses.

- ◆ For **aerial surveys**, including with **photo-id**: Description (including latitude and longitude) of the survey area(s); time(s) of year for the surveys; type of survey craft (e.g. fixed wing, helicopter, etc.); survey altitude; air speed; photo-id altitude and number of passes per animal; measures to minimize disturbance.
- ◆ For **vessel surveys**, including with **photo-id**: Description (including latitude and longitude) of the survey area(s); time(s) of year for the surveys; type/size of survey vessel; vessel speed; protocols for going “off track” to photo-id animals, including type/size of photo-id vessel, vessel speed, number of close approaches per animal; measures to minimize disturbance.
- ◆ For **remote sampling (biopsy) in water**: type of vessel; vessel speed; minimum approach distance; number of close-approaches per animal; size and kind of biopsy dart; dart deployment method (e.g., cross bow, rifle, pole, etc.) including force of impact; maximum depth of dart penetration; location of sample on animal (i.e., shoulder, back, hindquarter, etc.); size of sample (diameter X depth); measures to minimize serious injury or mortality.
- ◆ For **remote sampling (biopsy) on land**: minimum approach distance, number of close-approaches per animal, size and kind of biopsy dart; dart deployment method (e.g., cross bow, rifle, pole, etc.) including force of impact; maximum depth of dart penetration; location of sample on animal (i.e., shoulder, back, hindquarter, etc.); size of sample (diameter X depth); measures to minimize serious injury or mortality.
- ◆ For **capture of small cetaceans**: describe capture method (i.e., type of net, deployment method) and measures to minimize potential injury or mortality.
- ◆ For **capture of pinnipeds**: describe capture method (i.e., underwater lasso, hoop net, floating trap, tranquilizer dart, beach seine, etc.); measures to minimize potential injury or mortality.
- ◆ For **chemical restraint of pinnipeds**: name of drug, dosage, route of administration (i.e., IV, IM, intubation, etc.); maximum duration of restraint; measures to minimize potential for injury or mortality; any reversal agents (include dosage, route).
- ◆ For **physical restraint of pinnipeds**: type of restraint (i.e., by hand, net, cage, etc.); maximum duration of restraint; measures to minimize potential injury or mortality.
- ◆ For **blood sampling of pinnipeds**: location of sample (which blood vessel); total volume needed for assay; total volume to be collected. For serial blood samples (e.g., for total body water or metabolic rate measurements) total number of samples per animal; sampling interval; total volume per sample.
- ◆ For **blood sampling of small cetaceans**: location of sample (which blood vessel); total volume needed for assay; total volume to be collected. For serial blood samples (e.g., total body water or metabolic rate measurements) total number of samples per animal; sampling interval; total volume per sample.
- ◆ For **biopsy sampling of restrained pinnipeds**: type of tissue (i.e., skin only; skin with blubber; full blubber depth; muscle; etc.); location of sample on animal (i.e., shoulder, back, hindquarter, etc.); size of sample = diameter of sample X depth of sample; whether

- or not biopsy site would be left open or closed; if closed, manner of closure; biopsy tool (needle, punch, etc.); anesthetics or analgesics (include route and dosage).
- ◆ For **remote attachment of scientific instruments**: minimum approach distance; approach method (i.e., type of vessel, vessel speed, etc.); maximum number of close approaches per animal; deployment method (i.e., pole, cross bow, etc.); attachment method (i.e., suction cup, implantable); if implantable; depth of penetration and composition of attachment device; maximum duration of attachment; method of removal/retrieval, if applicable; location of attachment on animal; type of instrument; mass and total external dimensions of instrument; if instrument emits signal, indicate frequency (λ) of signal in Hz, pulse rate and duration of signal.
 - ◆ For **non-remote external attachment of scientific instruments** (i.e. to restrained animals): attachment method (e.g., epoxy, harness, flipper or fin tag, etc.); location of attachment on animal; type of instrument; mass and total external dimensions of instrument; if instrument emits signal, indicate frequency (Hz) and intensity (dB) of signal, pulse rate, and duration of signal; maximum duration of attachment; method of removal/retrieval, if applicable.
 - ◆ For **internal instruments** (including PIT tags, heart rate monitors, stomach temperature pills, etc.): type of instrument; mass and dimensions of instrument; location of instrument; method of implant (e.g., injection, surgical, administered intra-esophageal into stomach). If surgical implant, describe surgical procedure including location and size of incision; method of incision closure; anticipated time for healing; duration of surgical procedure; use of anesthesia or sedatives.
 - ◆ For **captive maintenance of mammals**: Explanation of how facilities and care meet AWA requirements.
 - ◆ For **administering drugs or chemicals** in general: Dosage, route, reversal agents (where applicable); measures to minimize adverse effects, including mortality.
 - ◆ For **auditory brainstem response or auditory evoked potential** (on captive or stranded marine mammals): handling protocol, type of measurement equipment, methods of data collection and data analysis. See also “Standard NMFS Questions for Permits Involving AEP.”
 - ◆ For **active acoustics** (playbacks or broadcasts): type of signal, depth in water column, power output, source level, frequency, maximum intended received level, signal duration and duty cycle. Inclusion of a propagation model is also desirable.

Attachment 1: Application Score Sheet

Protected Resources Permits Division
Initial Review of Marine Mammal Research or Enhancement Permit Application

File No. _____ Applicant: _____

Rate how well the applicant's responses address each criterion, from 0 to 4 where:
(0) Not Applicable; (1) Not Addressed; (2) Poorly Addressed; (3) Adequately Addressed;
or 4) Well Covered.

Use a "Summary of Application Review" memo to explain the rationale for ratings, as necessary.

	Statutory/ Regulatory Reference	Criterion	Application Reference	Rank	Weight	Score
<i>General</i>						
G1	50 CFR 216.33(a)	Used current version of application instructions	OMB No. 0648-0084		0	
G2	50 CFR 216.33(a)	Application signed by appropriate person (P.I. if individual applicant, or Responsible Party if institutional applicant)	VIII.		0	
G3	MMPA: 104(c)(1)	Activities proposed are for "purposes of scientific research" on marine mammals (MMPA)	IV.A & overall		0	
G4	ESA: 10(a)(1)(A)	Activities proposed are for "scientific purposes" (ESA)	IV.A & overall		0	
G5	MMPA; Sec.3 (12)(A)(i)	Species for which take is requested are under NMFS jurisdiction	IV.B.		0	
<i>MMPA requirements</i>						
M1	104(c)(3)(A)	Justification that taking of a marine mammal or marine mammal stock is necessary (i.e., applicant has demonstrated why hypothesis cannot be tested or question cannot be answered without taking a marine mammal)	Overall; and if depleted: IV.B.3.b(2)		0.20 (20%)	
	104(c)(3)(A)	Project is consistent with bona fide definition			(40%)	

	Statutory/ Regulatory Reference	Criterion	Application Reference	Rank	Weight	Score
M2		Clearly stated hypothesis to be tested, or question to be answered	IV.B.3.a		0.04 (4%)	
M3		Applicant has demonstrated that proposed methods are appropriate for hypothesis or objective	IV.C.2.		0.04 (4%)	
M4		Applicant has demonstrated that sample size is appropriate (neither too large nor too small) for hypothesis/question	IV.B.3.a.		0.04 (4%)	
M5		Sample size is achievable given applicant's resources and expertise of personnel	IV.E. & III.B.		0.03 (3%)	
M6		Applicant has demonstrated how the study would contribute to the basic knowledge of marine mammal biology or ecology, including relative importance of the contribution	IV.B.3.b		0.08 (8%)	
M7		Applicant has demonstrated how the study would identify, evaluate, or resolve conservation problems for marine mammals	IV.B.3.b		0.08 (8%)	
M8		Applicant has demonstrated that study is not unnecessarily duplicative	IV.B.2.a		0.03 (3%)	
M9		Applicant is reasonably likely to publish or otherwise make results available	IV.F. & attached CV per III.B.		0.06 (6%)	
	104(b)(2)(B)	Manner of taking is consistent with MMPA definition of humane			(20%)	
M10		Methods are described in sufficient detail to evaluate potential effects	IV.D.		0.04 (4%)	
M11		Applicant has appropriately identified potential effects, both short and long-term, of each	IV.D.a.		0.04 (4%)	

	Statutory/ Regulatory Reference	Criterion	Application Reference	Rank	Weight	Score
		procedure, as well as cumulative or synergistic effects				
M12		Alternatives search or description supports that proposed methods are those with least possible potential for pain, stress, etc.	IV.D.4		0.03 (3%)	
M13		Applicant has demonstrated why and how mitigation measures proposed would avoid or minimize adverse effects of each activity to the maximum extent practical	IV.D.2.		0.06 (6%)	
M14		Applicant has identified how proposed monitoring is appropriate to evaluate effects of research and recovery of animals post-handling or sampling	IV.D.3.		0.03 (3%)	
		Details of manner of taking			(10 %)	
M15	104(b)(2)(B)	Application describes the manner in which marine mammals will be taken	IV.C.2.b		0.04 (4%)	
M16	104(b)(2)(A)	Application specifies number and kind of animals proposed for taking, by species, stock, sex, age or life-history stage	IV.B.1.a		0.02 (2%)	
M17	104(b)(2)(B)	Application specifies the location for activity (with sufficient detail relative to evaluation of effects)	IV.C.1.b		0.02 (2%)	
M18	104(c)(3)(C)	Application specifies period during which activity would be conducted, including start and end date, with sufficient detail re: seasons, frequency, etc. to evaluate effects	IV.C.1.a		0.02 (2%)	
		Lethal Taking			(10%)	
M19	104(c)(3)(B)	If lethal taking (intentional	IV.C.4		0.04	

	Statutory/ Regulatory Reference	Criterion	Application Reference	Rank	Weight	Score
		or unintentional) is requested, applicant has justified that nonlethal methods are not feasible.			(4%)	
M20	104(c)(3)(B)	If lethal taking of depleted stock is requested, applicant has demonstrated how results of the research will directly benefit that species/stock or fulfill critically important research need	IV.C.4		0.04 (4%)	
M21		Applicant has appropriately identified and adequately explained mechanisms for research-related mortality and probability of such mortality	IV.D.1		0.02 (2%)	
Total MMPA Score						
<i>ESA requirements</i>						
E1	10(d)	The permit has been “applied for in good faith:” i.e., the applicant has demonstrated their intent to act consistent with the requirements of the ESA, regulations, and permit conditions; and their capability is consistent with what they purport to accomplish	Past permit records (VI.A.) & III.B.		0.30 (30%)	
E2	10(d)	Applicant demonstrates that proposed activity “will not operate to disadvantage of listed species:” i.e., will not hinder recovery, result in harm that would put species at increased risk, or otherwise result in loss or damage that would delay recovery	IV.D		0.30 (30%)	
	10(d)	Would further a bona fide and necessary or desirable scientific purpose; or enhance propagation or survival			(40%)	
E3		Explains how research	IV.B.3.b(2)		0.10	

	Statutory/ Regulatory Reference	Criterion	Application Reference	Rank	Weight	Score
		results would directly benefit the species; contribute significantly to fulfilling critically important research need for the subject species; identify, evaluate, or resolve conservations problems for the subject species; or contribute significantly to understanding basic biology or ecology of subject species			(10%)	
E4		Applicant demonstrates knowledge of listing status and current population trends and threats	IV.B.1 and IV.B.2		0.05 (5%)	
E5		Applicant discusses possible adverse impacts of the proposed research and how they would be minimized or mitigated	IV.D.1 and IV.D.2		0.06 (6%)	
E6		Applicant and other personnel have appropriate prior experience with same or similar species and have demonstrated success with proposed or analogous methods	III.B		0.05 (5%)	
E7		Applicant has demonstrated why proposed research cannot be conducted using an alternative species or stock, not listed under ESA	IV.B.3.b(1)		0.06 (6%)	
E8		Applicant has provided appropriate documentation for captive born animals or has stated their intent to remove from the wild.	IV.C.3		0.04 (4%)	
E9		Applicant has described provisions for disposition of species at conclusion or project or program	IV.C.3(i)		0.04 (4%)	
Total ESA Score						
<i>Other applicable laws</i>						

	Statutory/ Regulatory Reference	Criterion	Application Reference	Rank	Weight	Score
O1		Applicant has demonstrated compliance with IACUC requirements of their institution	IV.D.4.		0.01 (1%)	
O2		Applicant has demonstrated that they have applied for, secured, or will apply for other federal, state, and local permits required for conduct of the research	VI.B.		0.01 (1%)	
		NEPA determination			(8%)	
O3		Applicant has described location with sufficient detail for PR1 to evaluate potential environmental impacts	IV.C.1(b)		0.02 (2%)	
O4		Applicant has described methods with sufficient detail for PR1 to evaluate potential cumulative effects on target and non-target species and the physical environment	IV.C.2 and IV.C.3		0.02 (2%)	
O5		Applicant has identified all likely types of effects (short and long-term, direct and indirect, cumulative and synergistic) of the research	IV. D.1		0.02 (2%)	
O6		Applicant has described how their monitoring methods are appropriate for evaluating effects of their research	IV.D.3		0.02 (2%)	
Total Other Laws Score						
Total Application Score						

Analyst: _____

Date reviewed: _____

Appendix E Example Internal Initial Scoping Document for Issuance of a Research Permit

The following is an example of a template that NMFS Permits Division will use to document the internal scoping process for determining the appropriate level of NEPA analysis for a proposed permit for research on Steller sea lions or northern fur seals.

- A. Description of Proposed Action: NMFS proposes to issue a scientific research or enhancement permit pursuant to Section 104 of the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1361 *et seq.*) and Section 10(a)(1)(A) of the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq.*).
- B. Action Area: [name or short description of geographic location of research].
1. List of threatened and endangered species and designated critical habitat that may be present within the area
 2. List of non-target species that may be present within the area
 3. List of areas considered “ecologically critical” or unique in any other way: [e.g., historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers, essential fish habitat]
- C. Duration of Action: [when would permitted activities commence and when would they end, e.g., permit expiration date].
1. Project timing [i.e., describe time and frequency (e.g., monthly from January through March) of field season or project]
- D. Purpose of and Need for Action: [e.g., provide an exemption from the MMPA take prohibitions so that applicant can collect information on species’ abundance and distribution, in accordance with requirements of Section 117 of MMPA for marine mammal stock assessments.]
1. Project description: [brief description of activities, e.g., conduct aerial and vessel surveys and whether their effects are adequately evaluated in PEIS].
 2. Project Objectives: [short summary of study objectives, as provided by applicant].

{option 1} PR1 NEPA determination: issuance of the proposed permit is consistent with the activities identified in the Preferred Alternative of the Final Programmatic Environmental Impact Statement for Steller Sea Lion and Northern Fur Seal Research (NMFS 2007) and no further NEPA analysis is required for issuance of the permit, which will contain terms and conditions consistent with the PEIS and NMFS Record of Decision.

[NOTE: stop here if determination is that permit is within scope of PEIS]

{option 2} PR1 NEPA determination: the proposed research activities are outside the scope of the preferred alternative \ or\ the effects are not evaluated in the Final Programmatic Environmental Impact Statement for Steller Sea Lion and Northern Fur Seal Research (NMFS 2007). A tiered environmental assessment will be prepared to evaluate the potential environmental impacts of permit issuance. PR1 will follow the guidance in the NOAA NEPA

Handbook, NAO 216-6, Policy Directive 30-131, and the HQ Quality Assurance Plan regarding content and format for the EA. The following outlines the scope, purpose and need, and a range of alternatives to be included in the analysis, and other relevant factors identified in Section 4.2 of the HQ Quality Assurance Plan.

E. Alternatives, including Proposed Action:

1. Proposed Action: Issue permit with standard permit conditions
2. No Action: Deny permit
3. [others; e.g., issue permit with special mitigation and monitoring requirements]

F. Issues within scope of the EA: This EA will evaluate impacts according to the factors identified in section 6.01b of NAO 216-6 for determining the significance of a major federal action. PR1 has preliminarily identified the level of potential impacts under the Proposed Action as follows:

1. impacts on biological environment
 - a. target species
 - b. non-target species
 - c. biodiversity, ecosystem function, etc.
2. impacts on physical environment [e.g., loss or destruction of significant cultural or historical resources; changes in land use patterns; alteration of wetlands, EFH, refuges]
3. impacts on social and economic environment
 - a. public health and safety [consider impacts on water use and quality; air quality; traffic and transportation; noise; risk of exposure to hazardous materials, wastes, and other contaminants; risk of contracting disease; risk of damages from natural disasters]
 - b. Environmental Justice [e.g., result in inequitable distributions of environmental burdens or access to environmental goods]
4. resources identified, but that will not be analyzed and why
5. degree of uncertainty [e.g., new techniques]
6. level of controversy [e.g., has there been or is there likely to be litigation; has the public objected to similar or related projects]
7. precedent setting or decision in principle [e.g., involve any irreversible or irretrievable commitments of resources; predispose agency to permitting or funding a future project]
8. cumulative impacts [related to other past, present or reasonably foreseeable future actions with individually insignificant but cumulatively significant impacts]

H. Other Affected Agencies and Parties: PR1 has determined that no other offices or parties would be affected by or need to be involved in the NEPA process for this action. \or\ PR1 has determined that the following parties and agencies should be involved in the NEPA analysis and review process:

1. [e.g., name of cooperating agency; relevant jurisdiction; type of involvement]
2. [e.g., name of agency or party; type of involvement]

I. Preliminary Schedule:

1. [e.g., Circulate draft EA for internal review by [date]]
2. [e.g., Final EA and FONSI by [date]]

J. [optional] Proposed List of Agencies, Organizations, and Persons to Whom Copies of the EA will be Sent:

1. [e.g., stakeholders, plaintiffs, Tribal governments, State Agencies]

Appendix F. Format for Annual and Final Permit Reports

Reports may be submitted

- through the online system at <https://apps.nmfs.noaa.gov>
- by email attachment to the permit analyst for this permit
- by hard copy mailed or faxed to the Chief, Permits Division, Office of Protected Resources, NMFS, 1315 East-West Highway, Suite 13705, Silver Spring, MD 20910; phone (301) 713-2289; fax (301) 427-2521

Date: _____ **Reporting Period:** _____

Permit Number: _____ **Permit Holder's Name:**

Contact Name: _____ **Contact Email:** _____

Contact Phone #: _____

(Contact = person submitting report)

Part I: Take Table. Enter the actual number of animals taken during this reporting period.

Insert take table from permit. Add column for "Actual number of animals taken".

NOTE: If you conducted activities or took protected species for which you were not authorized, you must enter them on separate lines of the table and explain exactly what happened (see Part II below).

Part II: Narrative. Briefly provide the following information:

1. Describe any problems or unforeseen effects encountered during the permitted activities and any steps taken or proposed to resolve such problems.

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2. Describe what measures were taken to minimize effects of permitted activities on animals and the effectiveness of these measures.

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3. If animals were unintentionally injured or killed, describe the circumstances. Describe how dead animals were disposed of if not in the way described in the permit.

4. Describe the physical condition of animals taken and used in the permitted activities.

5. Describe the effects permitted activities had on animals, including any unforeseen responses or effects.

6. Describe steps taken to coordinate the permitted activities with other permit holders.

7. Summarize any preliminary findings. Did you accomplish the goals of your permitted activities?

8. List titles of reports, publications, etc. resulting from this reporting period. Attach copies of any final documents as available. If these documents are not yet available, indicate when you anticipate that they will be completed and submitted. When reports and publications are available, send to the Permits Division, and include the permit number in the correspondence.

9. Note the number and type of non-permitted species caught, harassed, or otherwise taken, and the observed effects of such taking.

10. Note any incidental (non-research related) use of photographs, film, or other images (e.g., on websites, in commercial publications or documentaries).

11. Indicate any additional findings, results, or information on which you would like to report or comment.