Friends of the Sea Otter

Founded in 1968 by Margaret Owings & James Mattison, Jr.
and dedicated to protect and defend a rare and threatened species

April 10, 2000

Mr. Carl T. Benz
Division Chief
U.S. Fish and Wildlife Service
Ventura Field Office
2493 Portola Road, Suite B
Ventura, CA 93003

Re: Draft Revised Recovery Plan for the Southern Sea Otter

Dear Mr. Benz:

Friends of the Sea Otter ("FSO") submits the following comments on the Draft Revised Recovery Plan for the Southern Sea Otter. These comments are endorsed by the Animal Protection Institute, Center for Marine Conservation, Defenders of Wildlife, Humane Society of the United States, National Audubon – California, the Planning and Conservation League, and the Mountain Lion Foundation. We greatly appreciate the effort invested in the preparation of the Draft Plan and encourage the Service to prepare the Final Plan as soon as possible, consistent with the enclosed comments.

Should you have questions regarding our comments, please let us know. Thank you.

Sincerely,

Cindy Lowry
Cindy Lowry
Executive Director

Jim Curland
Jim Curland
Science Director

Enclosure

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Comments on the Draft Revised Recovery Plan for the Southern Sea Otter

Prepared by:

Friends of the Sea Otter

April 10, 2000

INTRODUCTION

On February 8, 2000, the U.S. Fish and Wildlife Service ("FWS") announced the availability for public comment of the Draft Revised Recovery Plan for the Southern Sea Otter ("Draft Plan"). The existing Recovery Plan for this species, issued in 1982, is out-of-date and no longer addresses the current status of the population or its recovery requirements. Thus, an urgent need exists for FWS to issue a revised Recovery Plan as soon as possible.

Friends of the Sea Otter ("FSO") submits the following comments on the Draft Plan. These comments are endorsed by: Animal Protection Institute; Center for Marine Conservation; Defenders of Wildlife; Humane Society of the United States; National Audubon – California; the Planning and Conservation League; and the Mountain Lion Foundation. All of these organizations are committed to the welfare of not only the sea otter but also the marine environment in which it lives. This habitat is a dynamic, constantly changing resource, and sea otters serve as indicators of health of the marine ecosystem. Actions beneficial to recovery of the sea otter also are therefore beneficial to the entire nearshore environment.

We appreciate the hard work invested in the preparation of the Draft Plan by all parties involved. This effort has been underway since the mid-1990s, and we acknowledge the difficulty FWS has experienced in moving the Plan forward to completion. The efforts of the Recovery Team in this regard are particularly appreciated. At this time, we believe it is essential that FWS complete the Plan and issue it in final as soon as possible. The southern sea otter population is experiencing a serious decline, and comprehensive and coordinated recovery efforts must be applied immediately. Time is of the essence. We encourage FWS to devote the resources necessary to support the Recovery Team and complete the Plan in the shortest time frame possible.

By letter of September 9, 1999, FSO and the Center for Marine Conservation urged FWS to establish a recovery implementation team. We continue to believe that such an approach is extremely important. For the Recovery Plan to achieve maximum effect, coordinated, comprehensive, and expedited follow-through is necessary. The best way to accomplish this result is to adopt the recommendations in our September 9 letter and establish an implementation team to carry out the Plan. Although we will develop specific recommendations in this regard upon issuance of a final recovery plan, FWS is encouraged to begin putting this concept into place concurrent with the preparation of the Final Plan.

In general, we are pleased with the substantive changes made in revising the Draft Plan. Some of our concerns with earlier drafts have been addressed. In particular, we are pleased that the Draft Plan calls for a more active approach to achieving recovery, with an emphasis on affirmative measures that need to be carried out to promote recovery.

Under section 4(f)(1)(B)(i) of the Endangered Species Act ("ESA"), a recovery plan is required "to maximum extent practicable" to incorporate "a description of such site-specific management actions as may be necessary to achieve the plan's goals for the conservation and survival of the species." 16 U.S.C. § 1533 (f)(1)(B)(I). The ESA defines "conservation" to mean the "use of all methods and procedures which are necessary to bring any . . . species to the point at which the measures provided pursuant to this chapter are no longer necessary." 16 U.S.C. § 1532(3). As explained in the ESA's legislative history, this requirement is intended to ensure that recovery plans are "as explicit as possible in describing steps to be taken in the recovery of a species." S. Rep. No. 240, 100th Cong., 2nd Sess. 9 (1988), reprinted in 1988 U.S.C.C.A.N. 2709. The courts have acknowledged this principle, stating: "[a] recovery plan that recognizes specific threats to the conservation and survival of a threatened or endangered species but fails to recommend corrective action or explain why it is impracticable or unnecessary to recommend such actions would not meet the ESA's standard." Fund for Animals v. Babbitt, 903 F. Supp. 96, 108 (D.D.C. 1995).

In addition, the ESA requires each recovery plan to include "objective, measurable criteria which, when met, would result in a determination, in accordance with the provisions of this section, that the species be removed from the list . . . ." 16 U.S.C. § 1533(f)(1)(B)(ii). These criteria are to be incorporated into the plan "to the maximum extent practicable." Id.

In applying this requirement, it is necessary for a recovery plan to address each of the five statutory factors used for a listing decision. As ruled in Fund for Animals: "the FWS, in designing objective, measurable criteria, must address all five statutory delisting factors and measure whether threats to [the species] have been ameliorated." Fund for Animals, 903 F. Supp. at 111. These factors are:

1) Present or threatened destruction, modification, or curtailment of its habitat or range;

2) Overutilization for commercial, recreational, scientific, or educational purposes;

3) Disease or predation;

4) Inadequacy of existing regulatory mechanisms; and

5) Other natural or manmade factors affecting its continued existence.

16 U.S.C. § 1533(a)(1). Each of these factors must be addressed in the Plan.

Although more needs to be done in this regard, we appreciate the movement away from relying on a "passive" recovery strategy, as was reflected in the previous Draft Plan. The importance of undertaking affirmative measures is apparent from the serious, sustained decline the sea otter population is now experiencing. This problem was not fully understood when the previous Draft Plan was under public review. As discussed in more detail below, we request that the Final Plan be as precise and action-forcing as possible in setting forth the measures necessary to recover this species.

In preparing the Final Plan, FWS also must be guided by the well-recognized principle that actions taken under the ESA must give the benefit of the doubt to the species and err on the side of species protection. The ESA is the cornerstone of U.S. efforts to conserve biological diversity. It has a decidedly conservative bias towards the protection of endangered and threatened species. For example, the Supreme Court has stated that, "Congress has spoken in the plainest of words, making it abundantly clear that the balance has been struck in favor of affording endangered species the highest of priorities, thereby adopting a policy which it described as 'institutionalized caution.'" Tennessee Valley Authority v. Hill, 437 U.S. 153, 194 (1978). In the same case, the

Supreme Court indicated that "the plain intent of Congress in enacting this statute was to halt and reverse the trend toward species extinction, whatever the cost." Id. at 184. Congress' own language in the ESA, the legislative history of the Act, and subsequent case law demonstrate that these principles apply to the development and implementation of recovery plans and direct FWS to take a protectionist approach towards endangered and threatened species.

These comments are set forth in two sections. First, we set forth our general comments on the Draft Plan, followed by comments on specific provisions of the Draft Plan.[1]

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[1] On December 23, 1999, the Marine Mammal Commission ("MMC") issued a "discussion draft" of an "Action Plan to Promote Recovery of and Identify the Optimal Conservation Strategy for the California Sea Otter Population." The MMC Plan sets forth possible actions for FWS to pursue to achieve several goals related to the southern sea otter. Some of the MMC's proposals relate to *recovery* of the southern sea otter; others focus on issues that address long-term questions about managing sea otter distribution and reconciling perceived or anticipated future conflicts with shellfish fisheries. By letter dated March 1, 2000, FSO submitted detailed comments on the MMC's draft Action Plan. As noted in those comments, which we provided to FWS, the MMC Plan contains numerous excellent proposals that are very important to sea otter recovery and that should be incorporated into the Plan and acted upon by FWS. These include:

1) Measures to determine the cause of the population decline;
2) Expansion of the gillnet observer program;
3) Requirement for the use of modified live-fish and lobster traps;
4) Assessment of oil spill risk (modified to consider increased oil spill risk);
5) Determination of threats posed by diseases and environmental contaminants;
6) Improved mapping; and
7) Assessment of ways to ensure the most accurate methods of sea otter population surveys.

GENERAL COMMENTS

This section sets forth our general comments on the Draft Plan according to the subject matter to which they relate.

Recovery Objective. The Draft Plan states on page viii that the objective of the plan is to "manage the southern sea otter such that the population recovers to a point where it is not considered endangered or threatened." (Emphasis added). This statement mischaracterizes the contents of the Draft Plan and incorrectly suggests that recovery can be attained by "managing" the sea otters themselves. It would be more accurate to say that the recovery objective is: "To manage human activities and take such other actions as are necessary to eliminate or reduce, to the extent possible, threats to the southern sea otter . . . ." We request that this change be made to the discussion of the recovery objective and that this conservation principle be adhered to throughout the Plan.

These action items promote recovery and warrant consideration in the final recovery plan, as modified in accordance with FSO's comments. On the other hand, MMC issues regarding managing sea otter distribution and addressing shellfish conflicts are not recovery issues and should not be included in the Plan.

Recovery Criteria. The Draft Plan contains the same population thresholds for delisting and reclassification as "endangered" that were included in the 1996 draft. As explained in FSO's comments on the 1996 draft, the delisting threshold (2,650 animals) is far too low and cannot serve as the basis for a recovery standard. See Appendix A. In addition, insufficient attention is given to the need for expanded distribution of the species throughout its historic range. A sufficient population size will be of limited value if the animals are located in a habitat area that is not expansive enough to avoid catastrophic results from an oil spill. These are very serious concerns that need to be addressed before the Plan is finalized.

Based upon those concerns, FSO commissioned Daniel Goodman, Ph.D, to review the population modeling approach used in the 1996 plan and the current Draft Plan. See Appendix B. This review demonstrates that by using more realistic and appropriate assumptions and methodology, the delisting threshold should be considerably higher than 2,650. For example, under one scenario presented by Dr. Goodman the delisting threshold should be 4,034 sea otters.[2] The final Recovery Plan should account for the points raised in Dr. Goodman's report and revise the delisting threshold accordingly.

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[2] This would not be the population size at which delisting occurs. It would instead be the threshold level that has to be attained before FWS could consider whether the five delisting criteria set forth in 16 U.S.C. § 1533(a)(1) have been met. See *Fund for Animals v. Babbitt*, 903 F. Supp. at 111.

Dr. Goodman's analysis also makes a number of additional findings and observations that need to be taken into account in the Final Plan. Among his conclusions relevant to the Plan are the following:

- The zonal management system should be eliminated.
- The Plan lacks specificity, clear priorities, and additional protective measures when addressing how to reverse the present decline, or the "substantial likelihood of imminent reclassification to endangered".
- "Explicit high priority" should be given to an expanded fisheries observer program and fisheries closures.
- More studies of tagged animals are needed to refine estimates of reproductive and mortality rates.
- The statistical properties of the census should be reevaluated.

FSO encourages FWS to consider Dr. Goodman's analysis and results in preparing the Final Plan. It is particularly important to do so after revising the oil spill risk assessment in accordance with the comments set forth below.

Oil Spill Risk. FSO's comments on the 1996 draft expressed concern that the oil spill risk analyses relied upon by the Recovery Team were not conservative enough. See Appendix A. The Draft Plan relies upon the same assessments of oil spill risk used in the

1996 draft. Throughout this Draft Plan, and indeed throughout the efforts to recover this species, FWS must follow the admonition of the courts discussed above to err on the side of being conservative to benefit the species. When this approach is applied to the oil spill risk analyses, different conclusions must be drawn and greater protection provided to the species.

To address our concerns over the oil spill approach used in the Draft Plan, FSO retained Deborah French, Ph.D., to review the analyses on this topic incorporated in the 1996 and 2000 Draft Plans. Dr. French's review, which is included as Appendix C, confirms FSO's concerns and demonstrates the need for FWS to take a more conservative approach. Dr. French's key findings are as follows:

- Given the trend toward increased tanker size and tanker traffic within the range of the southern sea otter, the risk of larger spills needs to be evaluated. A catastrophic oil spill could impact the majority (>50%) of the southern sea otter population.

- The proposed delisting threshold (2,650) does not provide enough buffer against catastrophic loss from a spill the size of Exxon Valdez.

- The consequences of a spill at the northern end of the southern sea otter range are the highest.

- A catastrophic oil spill could severely impact the nearshore marine environment and its associated food web, which is likely to have a detrimental impact on the survival and recovery of the southern sea otter.

- With the recent decline in the southern sea otter, this population "may be limited by or unable to recover from an oil spill" due to compromised health (immune systems); competition for food resources with fisheries; incidental take, possible poaching, and other factors. All of these risks should be considered in addition to the risks associated with oil exposure from a large spill.

The Final Plan should incorporate these findings into its analysis and ensure that adequate protection is provided. In particular, Dr. French's analysis should be accepted as additional support for adopting a significantly higher delisting threshold.

In addition to revising the oil spill risk analysis and combining those results with the population assessment approach we recommend by Dr. Goodman to come up with a new delisting threshold, additional emphasis must be placed on measures to reduce the oil spill threat. As the Draft Plan acknowledges, a key element of the sea otter recovery effort is to reduce the threat posed by oil spills. We agree that this is a critical component of the recovery program. It is in this area of reducing oil spill risk that FWS and other

federal agencies should pursue some of their most aggressive affirmative actions. This is most important for reducing the risk posed by: 1) tankers and other vessel accidents; and 2) offshore oil and gas exploration and development. Without question, the emphasis must be placed on avoiding spills. Contingency plans are important, but based on what has been learned about the difficulties of rehabilitating oiled sea otters after the Exxon Valdez spill, we do not place much faith in the role of such contingency plans in helping to achieve recovery. Thus, development of affirmative measures to reduce oil spill risk is a high priority action for recovery.

Our specific concerns in this regard will be discussed in the next section. Generally, with respect to vessel traffic, the plan should call for prompt completion of the International Maritime Organization ("IMO") procedure for routing vessels further offshore from the California coast. Upon the completion of that process, the plan should call upon FWS to enter into a MOU with California Department of Fish and Game ("CDF&G"), the National Oceanic and Atmospheric Administration ("NOAA"), and the U.S. Coast Guard ("USCG") to thoroughly and effectively monitor compliance by vessel operators and determine if the vessel management strategy is effective. If necessary, additional actions should be taken to revise this program or strengthen its enforceability.

With respect to offshore oil and gas activities, the Draft Plan needs to be revised to discuss the fact that the current range expansion of the southern sea otter to the south is likely to put otters in the vicinity of areas subject to offshore oil and gas activities. This could pose an increased risk to sea otters. When the sea otter was listed as threatened, and when the 1982 Recovery Plan was developed, the sea otters' range had not expanded into the area of offshore oil and gas activities. Thus, along with a declining population, there now exists a more direct and immediate threat to up to 20 percent of the otter population. The Draft Plan should be amended to acknowledge this increased threat due to the sea otters' range expansion to the south.

After discussing this risk, the Plan should call for measures to reduce this threat. In addition to calling for actions that will assist in increasing population size and range distribution, the Plan should call for FWS to assess carefully increased risks to sea otters from existing and potential offshore oil and gas activities. One mechanism to do so is through ESA section 7 consultation on these activities. The Draft Plan should call for reinitiation of consultation on previously approved activities based on the changed circumstances associated with the sea otter's southward range expansion and the population decline. In addition, future agency actions will have to be the subject of ESA consultation to address sea otter impacts.

Range Expansion/San Nicolas Island ("SNI") Translocation. We agree with the discussion on pages 24 and 25 of the Draft Plan on the relationship between the SNI translocation, range expansion, and the cessation of the management zone south of Point Conception. As stated in the Draft Plan:

> These facts and events cast doubt on whether the southern sea otter population will increase on its own accord over the next 5 to 10 years. There remains the possibility that the population could be decimated following a major oil spill in the vicinity of the current range of sea otters in California. Therefore, the strategy for recovering this population of sea otters is to allow the number of sea otters in California to increase and to expand the distribution of sea otters in California, such that following a major oil spill in central California, the remaining number of otters will constitute a viable population. The primary action for promoting the recovery of this population at this time is the cessation of the "otter-free-management zone" in the southern California Bight. Without such a change in management, the current population decline could worsen. (Emphasis added.)

This correctly states the current needs of the population. Continued maintenance of the so-called "no otter zone" impedes species recovery. An expanded range is necessary to provide essential habitat for otters. Additionally, the capture of sea otters from the zone and their reintroduction back into the parent range would create significant problems. This reintroduction could add stress on the population in the location to which the animals are moved through exacerbating less than optimal conditions that might exist in the main range (food limitations, habitat degradation, health of the population, social

structure, etc.). There also is the risk to those animals that are moved due to the high level of mortality associated with capture and translocation. Thus, the Recovery Plan must call for the termination of the zonal management approach.

We also note that the current zonal management program violates the requirements of the 1986 translocation law. Section 1(b)(4) of the law requires that the management zone be defined so as to "not include the existing range of the parent population or adjacent range where expansion is necessary for the recovery of the species." (Emphasis added) The Draft Plan confirms that the existing management zone at Point Conception conflicts with this requirement. The Plan explains that additional range is necessary to allow the population to avoid being decimated by a major oil spill. Draft Plan, at p. 24. Dr. French's analysis supports this conclusion. Thus, the Draft Plan confirms that the current zonal management program violates the 1986 law.

Other factors support the conclusion that the zonal management program is illegal. For example, capturing animals and moving them out of the zone will involve unacceptably high morality. Past translocations have involved mortality at a rate of 17%. Clearly, for a small and declining population, adding this level of mortality would be inconsistent with recovery. The final Recovery Plan should include a discussion of how mortality associated with capture and removal from the zone would impede recovery.

As discussed previously, less than optimal conditions in the main part of the range might be creating the southern range expansion observed in the last few years. This range expansion most likely is critical for recovery of this subspecies.

For all of these reasons, we support the Draft Plan's conclusion that '[t]he primary action for promoting the recovery of this population at this time is the cessation of the "otter-free-management zone" in the southern California Bight. Without such change in management, the current population decline could worsen.' Draft Plan, at 25.[3] The Final Plan should recommend immediate cessation of the zonal management concept as reflected in 50 C.F.R. § 17.84.

Research. We are pleased that the Draft Plan includes research on the population decline as one of the priority actions necessary to promote recovery. See Draft Plan, at 4. Many useful research projects are called for, especially under B4 and B6 of the Narrative Outline in the Draft Plan. One of the seven research priorities identified at the April 1999 symposium conducted under the auspices of the Recovery Team and sponsored by FSO, FWS, and the Monterey Bay Aquarium, however, is missing. We request that assessment of "human recreational impacts on sea otters" be incorporated

[3] Undertaking "containment" in the zone also would constitute jeopardy to the species in violation of section 7(a)(2) of the ESA. 16 U.S.C. § 1536(a)(2).

into research goals of the Final Plan. In addition, the Final Plan must emphasize the need for the Executive Branch to request from Congress the funds needed for all of the priority research necessary for the southern sea otter.

Incidental Take. Incidental take continues to be a significant problem for recovery of this species. Problems include: the potential for take of otters in nets beyond 30 fathoms in areas closed to gill and trammel net fishing out to that depth; the lack of State closures in the area between Point Sal and Point Arguello; the probable take of sea otters in live fish traps; and insufficient enforcement resources. The Final Plan should call for actions to address all of these problems. These issues are addressed in more detail in the next section of these comments, but as priority actions the Final Plan should recommend:

- agreement among CDF&G, FWS, and the National Marine Fisheries Service ("NMFS") to increase monitoring of fisheries beyond 30 fathoms to a level of 100% observer coverage, and to take such action as necessary to eliminate identified take, including additional closures;

- federal support for California Assembly Bill 2570 that would close the Point Sal/Point Arguello area to set net fishing;

- increasing enforcement effort;

- federal efforts to bring into effect State regulation of live trap fisheries, including the use of gear modifications, such as exclusion rings in net openings; and

- monitoring of other pot and trap fisheries (lobster, crab, etc.).

SPECIFIC COMMENTS

Our specific comments are set forth by reference to the page, paragraph, and sentence in the Draft Plan on which the relevant discussion appears.

Page vi, paragraph 1: This paragraph should be revise so that it no longer reflects the earlier position that the likelihood of an oil spill and the percentage of sea otters expected to be lost in such an incident are the only two primary factors affecting delisting. As noted elsewhere in the document, in recent years there has been a growing recognition of other substantial threats that are not related to the ongoing oil spill risk (e.g., incidental take, disease, coastal pollution, habitat loss or degradation, impacts caused by human recreation, kelp harvest, malicious takes). In fact, in light of their ongoing, every day presence within the sea otter range, factors other than a catastrophic oil spill may pose continued threats to the southern sea otter.

Page vi, paragraph 2, last sentence: "If" (not "once," as if it were a foregone conclusion) this population is removed from the Threatened/Endangered Species list, it should simultaneously be designated as depleted under the MMPA. There should be no gap in its protection subsequent to delisting but prior to designation. If the population recovers to the point where delisting is contemplated, initiation of the depletion designation process should proceed simultaneously with the ESA delisting process.

Page vii, Current Status, 1st sentence: Because sea otters are not present all year in Gaviota, it would be more accurate to state that "the otter population is concentrated between Half Moon Bay and Point Arguello, with groups of animals periodically seen as far south as Gaviota." SNI numbers should also be updated.

Page vii, Current Status, 3rd sentence: This sentence states: "Although at least 50 births are known to have occurred in this colony from 1989 the population size has remained constant since the early 1990's." The use of the word "constant" could be misconstrued. We recommend the following revision – "the population size has remained below the threshold for calling the translocation a failure and far below the Island's carrying capacity, which was expected to have been reached by now."

Page vii, Current Status, 5th sentence: "Disease" should be included in this sentence as one of the principle threats to the species.

Page vii, Current Status, last sentence: "Decreased reproduction" should be deleted or changed to "decreased reproductive success".

Page vii, Habitat Requirements and Limiting Factors, paragraph 2, 4th sentence: This sentence states: "Since 1995, the population has been in moderate decline, although its range has continued to expand to the south and north." The use of the term "moderate" is misleading. The population decline since 1995 has been continuous and constitutes a 12% decline. For a subspecies listed as threatened, such a population decline should not be considered "moderate".

Page ix, Actions Needed, Item #2: "Managing petroleum exploration, extraction and tankering to minimize the likelihood of a spill" is not sufficient. While managing and reducing may be appropriate for existing tanker traffic, clearly a prohibition on any increase in petroleum activity northward into the sea otter range will be essential for the sea otters' survival. As for fishery interactions, the goal should be to eliminate, not just minimize, sea otter mortality incidental to commercial fishing.

Page x, Actions Needed, Item #3: This item needs to be revised. The current situation no longer involves "limiting the current growth rate." The population is declining, and this item should say: "conduct research to understand the factor or factors, responsible for the current decline and previous limited growth rate. . . ."

Page x, Actions Needed, Add item #5: An additional action item should be added to state: "Designate an implementation team including affected stakeholders, to put the recovery goals for this subspecies into motion"

Page x, Actions Needed, Add item #6: An action item should be added to state: "Identifying and reducing or eliminating sources of contamination, pollution and disease within sea otter habitat and conducting toxicological studies on sea otter tissue and sea otter prey." Toxicology studies have been put on the "back burner" up to now, with the majority of studies concentrating on disease and parasites in sea otters. More studies are needed that document disease-causing bacteria and industrial and residential toxins in the nearshore ecosystem.

Page x, Date of Recovery: Given the current decline of the population, FWS cannot possibly predict a likely time to recovery. Primary emphasis should be placed on identifying and eliminating or mitigating causes for the decline.

Page 1, paragraph 2: References to the potential conflict between the sea otters' recovery and State-managed fisheries as well as the transport and extraction of oil and natural gas should be balanced with references to potential economic benefits from increased kelp harvesting, recreation and tourism, enhancement of kelp forests and their associated ecosystems and finfisheries, reduction of persistent urchin barrens within the Southern California Bight, and the environmental and social benefits associated with the protection afforded to shorelines and beaches by the presence of offshore kelp forests.

Page 2, paragraph 3, sentences 1, 2: The 1911 Fur Seal Treaty only protected sea otters from take on the "high seas." Because sea otters are found primarily close to shore, this protection was of limited value. By 1911, sea otters were close to extinct, and take was low primarily because there were few animals left. These sentences should be revised to read: "Following near extinction because of exploitation in the fur trade during the 18th and 19th centuries, sea otters received legal protection from take on the high seas in 1911.

Because it was no longer profitable to hunt sea otters during the early 1900's due to their scarcity, the population steadily increased."

The discussion on the population decline in Alaska should be used to emphasize the importance of not relying on population growth alone to achieve recovery. The precipitous and dramatic decline in Alaska demonstrates how precarious sea otter populations can be. These facts serve to illustrate the need for significant margins of safety in any delisting criteria. The mere 800 animals used in the Draft Plan as the difference between a recovered population and an endangered population is clearly insufficient. As discussed in these comments, a much larger population size is necessary for delisting, combined with strong and effective affirmative conservation actions.

Page 3, paragraph 3, sentence 6: This sentence creates the impression that sea otters have moved permanently and in large numbers into the management zone. It should read: "By 1995, sea otters were commonly seen as far south as Point Conception. In 1998 and 1999, sea otters moved into the zone on a seasonal basis in the late winter and spring (with a high of 101 animals in 1998 and a high of 152 + 1 pup in 1999). In 2000, it appears that such movement has not occurred to any significant degree."

Page 3, paragraph 4, bottom line: The figure for 1984 should be "1,304", not "1,372".

Pages 6-7, Reproduction: Reproduction of the southern sea otter should be studied further, especially with regard to toxins in the tissues of sea otters and in the tissues of common prey items.

Page 7, paragraph 1: This paragraph states: "In California, most births occur from late February to early April." In the Riedman et al. study (1994), referenced in the Plan, the most recent data supports an "absence of a distinct seasonal birth pattern for sea otters," which contrasts with earlier conclusions that "there is a primary birth peak in late winter and a secondary peak in late summer through early fall in California".

Page 7, Mortality, Item #5: This section should include a reference to the fact that recovery of sea otter carcasses at the southern end of the range is minimal at best, and this could very well bias the data.

With regards to mortality, it also should be noted that over the past several years the State of California has permitted a new fishery to develop throughout the sea otter range which exposes the otters to new dangers – a fishery in which traps are set in nearshore coastal waters to catch live fish for the restaurant trade. The fishery has been allowed to expand without any design requirements on the live traps to prevent the otters

from being entrapped and drowned, yet section 3005(a) of the California Fish & Game Code makes" it unlawful to take birds or mammals with any net, pound, cage, trap, ..." The Plan should call for appropriate action to eliminate any mortality associated with this fishery.

The comments in the Plan about increased mortality from the use of gill and trammel nets and the use of live fish traps are consistent with the address given by Paul Dayton, Ph.D, Scripps Institute of Oceanography, at the Monterey Bay National Marine Sanctuary Symposium on March 18, 2000. Dr. Dayton stated that the decline in catch and the near extinction of several species of fish along the California coast has followed the increased use of gill and trammel nets along our coast. He also emphasized the need for marine reserves with "no take" zones in California to preserve marine resources. This concept should be considered for possible inclusion as a recommendation in the Final Plan.

Page 9, paragraph 1: The Draft Plan should identify the mortality rate for the "periods of apparent decline".

Page 10, paragraph 2: At the end of this paragraph, the Draft Plan should state that, "While potential source of mortality is not presently known, there *are current* efforts to document the incidental take in these fisheries."

Page 10, paragraph 3: This discussion should include a sentence between the 2nd and 3rd sentences, similar to Page, 1, paragraph 2 of the Introduction, regarding the ecological benefits of sea otters.

Page 12, paragraph 1: It appears there may have been disease transmission from sea otters captured for rehabilitation to sea otters in the wild following the spill. Such disease would have been contracted by the otters while they were being held for rehabilitation. This problem should be discussed.

Page 12, Oil and Gas Activities on the Federal Outer Continental Shelf Offshore California: In general, the discussion on offshore oil and gas development should be revised to reflect current developments. While the Draft Plan recognizes the oil companies' recently-granted requests to extend their undeveloped leases off the San Luis Obispo and northern Santa Barbara County coasts, the federal litigation brought by the State of California against the Department of the Interior is not discussed. The litigation

challenges the Department's failure to allow the State of California to review the oil companies' requests to "suspend" (in practical terms, extend) 36 undeveloped leases, as provided for in the Coastal Zone Management Act ("CZMA"). Under the CZMA, federally-approved activities that may affect California's coastal zone must be certified by the State as consistent with the California Coastal Act. However, MMS, with DOI's approval, granted the lease suspensions without providing state review.

In order to clarify the State of California's role in reviewing the expansion of any offshore oil drilling, the FWS should revise the following sentence on page 13: "All of these actions will undergo rigorous environmental review by the Minerals Management Service under the National Environmental Policy Act, the Endangered Species Act, and be subject to review by the California Coastal Commission under the CZMA for a determination of whether the activities are consistent with the California Coastal Act."

In addition, some of the other statements regarding offshore oil activities in this section should be revised. The Draft Plan states on page 13 that: "Under this scenario, the physical presence of the oil industry would diminish offshore over the next decade, although current production levels could be sustained for some time to come." See Draft Plan at p. 13. This statement could be construed incorrectly to mean that the threat to otters will also be diminished. Moreover, the Draft Plan's discussion of the activities that

are expected to occur in the next decade does not support the conclusion that the physical presence of the oil industry would diminish offshore. While the number of platforms would remain the same, drilling activities and extraction may actually increase with the "maximum use of extended-reach drill technology from existing and new platforms . . . ." So far as sea otters are concerned, the threat posed by physical presence of the oil industry actually could increase dramatically over the next decade. This would be the result of the new platforms extending north into the heart of the sea otters' long established range, as far north as Point Buchon. Thus, in the future, oil and gas activity could encompass not only important occupied habitat but also the only section of California's coast where there has been any significant sea otter range expansion in recent years. See Appendix D, "Counts of Sea Otters at the South End of the Range during Spring and Fall Range-Wide Surveys, Spring 1995 - Fall 1999."

It also is important to discuss the Mineral Management Service's continuing obligations under section 7 of the ESA. The Draft Plan recognizes that "[u]pon the end of the directed suspensions, the Minerals Management Service will be reinitiating formal consultation under section 7 of the Endangered Species Act with the National Marine Fisheries Service and the Service on the activities proposed for the nine undeveloped units and one lease." Draft Plan, at p. 13. The Recovery Plan, however, should also discuss that the section 7 consultation requirement mandates that MMS reinitiate formal

consultation of the current offshore oil drilling based upon substantial new information regarding the population and the habitat of the southern sea otter. Section 7 imposes a duty of consultation on all federal agencies. 16 U.S.C. § 1536(a)(2); see also 50 C.F.R. §§ 402.14, 402.16; Sierra Club v. Marsh, 816 F.2d 1376, 1387 (9th Cir. 1987). The FWS's regulations require reinitiation of formal consultation where discretionary Federal involvement or control over the action has been retained or is authorized by law and new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered. 50 C.F.R. § 402.16.

The FWS has recently obtained substantial new information, not previously considered, on the population status, behavior and ecology of the southern sea otter which reveal effects that current offshore oil drilling could have on this species that were not previously considered. The new information includes the expansion of the species range to areas south of Point Arguello. The spring 1998 sea otter survey counted 114 otters south of Point Arguello, and the spring 1999 sea otter survey counted 121 otters south of Point Arguello. In contrast, the spring 1995 survey counted 7 otters, the spring 1996 survey counted 1 otter, and the spring 97 survey did not observe any otters south of Point of Arguello.

Although the last two years have seen the species expand its range south of Point Arguello, the otter population has been experiencing a significant decline of nearly 12

percent. Thus, the sea otter's range expansion south of Point Arguello becomes all that more critical to the species recovery and survival, and the threat posed by offshore oil drilling becomes all that more serious to the protection and recovery of this species. The Draft Plan should identify the need for MMS to reinitiate formal consultation, and the possibility must be mentioned that such offshore development may be fundamentally at odds with recovery of the species.

Page 14-15, Translocation of Sea Otters - History and Status: This paragraph should be updated to reflect the more recent census counts at SNI.

Page 14-15, Incidental Take: The Draft Plan should point out that, within the past five years, significant numbers of sea otters have reoccupied the 20-25 mile long stretch of their historic habitat between Point Sal and Point Arguello off northern Santa Barbara County. This is the only place within their range, and the only place on the entire California coast, where large mesh set gill and trammel nets are still able to be set within waters less than 30 fathoms deep. See Appendix E, "Map of California Gill Net Bans." In recent years, up to as much of 10% of the sea otter population has been found within or adjacent to this area. See Appendix D. The Draft Plan should also report that there is a growing concern (and one documented drowning) over the increased effort in the large-

mesh set gill and trammel net fishery just beyond the 30 fathom depth curve prohibitions in Monterey Bay, as well as southward to the Morro Bay area. This increase in set net fishing also coincides with the decline of the sea otter population and high numbers of dead otters recovered in the recent years and requires increased monitoring effort. FWS should request that 100% monitoring coverage be used.

In addition, this section needs additional revision to reflect current actions. The last half of the paragraph beginning with "The Director of the California Department of Fish & Game," should be deleted. The Director no longer has the authority to allow use of gill or trammel nets between Point San Luis and Point Sal because the sea otters are now resident there year round, and thus this provision has been removed from California Fish & Game Code Section 8664.5. This statement should be revised to read: "The Director of the California Department Fish & Game has the temporary emergency authority under Section 8664.5 of the California Department of Fish & Game Code to alter or close the net fishery to prevent any sea otter mortality in the area between Point Sal and Point Arguello. To date, this authority has not been exercised in this area. Instead, urgency legislation (AB 2750) has been introduced in the California State Legislature to ban permanently the use of large-mesh gill and trammel nets set in waters less than 30 fathoms deep between Point Sal and Point Arguello. Until the legislation passes or the Director exercises this emergency authority, sea otters have no protections

from the nets along this section of the coast." The Plan should then recommend that the required actions be taken to implement such closures.

Page 15, Paragraph 1, sentence 2: The translocation was undertaken to pursue "conservation and recovery" of the sea otter not "management," and this paragraph should be revised accordingly.

Page 17, Vessel Traffic Section: The discussion on vessel traffic management should be revised to reflect the current status of this effort. The IMO has approved the shifts in traffic separation schemes, or lanes, that guide large vessels into San Francisco and through the Santa Barbara channel. The IMO also approved the recommendation that container ships and bulk product carriers travel further offshore in the north-south tracks between 13 and 20 nautical miles offshore of Big Sur and the San Mateo coastline. The IMO expanded that recommendation by requiring that ships carrying hazardous materials in bulk travel between 25 and 30 nautical miles offshore. All tankers carrying oil will travel 50 nautical miles offshore. The Final Plan should discuss these measures and recommend that they be implemented as soon as possible and monitored to ensure their continued effectiveness.

The Draft Plan should mention that on June 17, 1999, the United States Coast Guard noticed its proposed rulemaking regarding "Traffic Separation Schemes: Off San Francisco, in the Santa Barbara Channel, in the Approaches to Los Angeles-Long Beach, California." 64 Fed.Reg. 32451. The Coast Guard is expected to adopt a final regulation within the next month. Thus, if the regulation is adopted prior to the Final Plan, specific reference should be made to the rule. The Plan should recommend adoption of this proposal.

Page 20, Research Section: The Draft Plan needs to provide a more detailed discussion of priority research activities. The discussion under this section creates the appearance that quite a bit of research has been funded and is underway. In fact, very little sea otter research is now underway, even though there is a critical need for numerous projects. This is due to a lack of federal funding. The Recovery Plan should serve as a catalyst for this research. FSO recommends including the following introductory paragraph in this section:

> Although little research is currently being conducted on southern sea otters due to the lack of funding, some research projects on sea otters have been undertaken since the Southern Sea Otter Recovery Plan was first published in 1983. As discussed elsewhere in this plan, numerous important research projects need to be funded and undertaken at this time.

Page 22, paragraph 1, sentence 3: This sentence provides an estimate of the "minimum" historical abundance of sea otters "in California" (14,000). FSO believes it is necessary to provide the range of possible historical abundance estimates from DeMaster et al. 1996, not just the minimum. In addition, there is no valid legal or biological basis for defining the population range by the California border. Historically, there was no such limit, and the Recovery Plan needs to reflect this fact.

Page 24, paragraph 1: This paragraph explains the degree to which the SNI translocation has been unsuccessful. To give the complete picture in this regard, it should be pointed out that by this time it was expected that the population would have reached carrying capacity of approximately 500 animals. The current population is less than 5% of the level that had been projected by this time.

Page 32, paragraph 1, sentence 2: This paragraph describes how it would be more preferable to allow the existing population to "passively recover" than it would be to pursue a translocation program. Clearly, the recovery program described in the Draft Plan calls for more than a strategy of "passive" population growth. This sentence should be revised to read: "The Service believes range expansion of sea otters in California will occur more rapidly if the existing population is allowed to recover through the

conservation measures described in this Plan than it would under a recovery program that includes translocating sea otters."

Page 33, paragraph 1, sentence 1: The Draft Plan should state the recovery goal in a more positive way than "to delist" the species. Instead, the goal should be explained as "to achieve sufficient growth in population size and distribution through conservation measures and affirmative actions to ensure that the protections provided under the ESA are no longer necessary."

Page 33, paragraph 1: The second sentence should be revised to read: "To achieve this goal, coastal vessel traffic should be regulated (or managed) in a way that will minimize the risk of accidents in and near the southern sea otter range, offshore oil exploration, development and production must not be allowed to further intrude into the sea otter range, and the southern sea otter population must increase in number and range."

Page 33, paragraph 2: The second sentence should be revised to read: "Such actions include, but are not limited to, evaluating, reducing and eliminating anthropogenic causes of mortality; developing and implementing a plan to reduce the probability of an oil spill occurring in the sea otters' range from either tanker traffic or offshore oil activities;

developing and implementing plans to reduce or eliminate the incidental take of sea otters; protecting sea otters, their habitat and prey from coastal pollution; and evaluating the assumptions used to estimate the population level at which southern sea otters could be considered recovered".

Page 35, paragraph 3, Evaluate the causes of mortality of otters that strand on California beaches: The forth sentence should be revised to read: "Finally, information on the cause of death (fishery-related, contaminant levels in tissues, disease, natural causes, etc.). . . ."

Page 35, paragraph 4, Page 36, paragraph 1: It is critically important that the necropsy program being conducted by the California Marine Wildlife Veterinary Care and Research Center receive a permanent, secure funding source for its work. A critical flaw in the necropsy program, however, is that the agency does not have enough personnel to recover dead otters, particularly in the southern part of the range. These problems should be discussed in the Final Plan.

Page 36, paragraph 2: It is unclear whether the occurrence or the detection of poaching incidents is likely to be low and unpredictable. Given the inadequate number of wardens

responsible for patrolling the sea otter range, and the inaccessibility and remote likelihood of detection of dead otters along much of the area, the degree of poaching is an unknown, and the assumption that it is low is unwarranted. The lack of available federal and state personnel for sea otter salvage work further aggravate this problem.

The Draft Plan should further discuss "the existing marine mammal salvage program of the National Marine Fisheries Service." Providing additional funding for salvage of as many beach cast otters as possible should be a major FWS priority and a recommendation in the Final Plan. The Plan also should emphasize that NMFS must give high priority to sea otter salvage as part of this program, even though this is a species under FWS jurisdiction.

Page 36, paragraph 3: Attempts to correlate locations of sea otter carcasses with gill net fisheries and evidence of disease and contaminants will be severely hampered by the lack of a salvage program in the southern portion of the range. The Final Plan should recommend that this program be fully funded and undertaken. Correlation with locations of live fish trap fisheries could also be helpful.

Page 37, Implement vessel management plans that minimize the risk of tanker accidents and other possible sources of oil spills: The Draft Plan states that the U.S.

Coast Guard should monitor compliance by vessel operators to determine if the vessel management strategy is effective. The Draft Plan should provide that such monitoring reports should be provided to the Service on a scheduled basis (i.e., every six months). The Draft Plan should also provide that the Coast Guard's monitoring reports indicate the type of vessels (hazmat, tanker, etc.) and location of vessels that do comply with the recommended distances. Based upon this information, the Service and Coast Guard will be able to fully assess the risk to the otters and to more accurately determine if the management strategy is effective.

Page 38, carryover paragraph, sentence 3: This sentence asserts that the goal of achieving a one percent chance of an oil spill hitting the sea otter range could not be achieved for the vessel management plan. The Final Plan should describe what the percentage risk of a spill was that had been attained through this procedure. In addition, the Plan should identify what other measures could be undertaken to reduce the risk to this level. For example, what "logistical constraints" prevented attainment of this goal and what could be done to eliminate them.

Page 38, paragraph 3, 22. Implement an oil spill contingency plan that includes a sea otter response plan: The third sentence should be revised to read: "Although

contingency planning efforts are not expected to protect large numbers of sea otters, rescue efforts to protect as many sea otters as possible would be implemented, and could be particularly helpful in the event of smaller spills".

Page 41, paragraph 2, sentence 3: This sentence should be revised by changing "is thought" to "was thought" to have virtually eliminated entanglement mortality.

Page 41, paragraph 2, sentences 11, 12: This discussion should be revised to add the following: "From 1995 through 1998 there was no observer program. Additionally, beginning in 1993, sea otters began to reoccupy the 20-mile long stretch of their former range between Point Sal and Point Arguello – the only area along the entire California coast where large mesh set gill and trammel nets are still not banned in waters less than 30 fathoms deep. In recent years, up to 10% of the California sea otter population has been found within or immediately adjacent to this area. In 1998, National Marine Fisheries Service surveys for harbor porpoise in the Monterey Bay area identified an increase of gill net fishing in water deeper than 30 fathoms in southern Monterey Bay. Sea otters were also observed in waters deeper than 30 fathoms. This change in fishing location to an area occupied by sea otters suggested that sea otters were again being

exposed to and dying in gill nets, and subsequently a sea otter was confirmed drowned in a net set just beyond the 30 fathom depth curve in Monterey Bay.

In April 1999, the National Marine Fisheries Service resumed an observer program to monitor for take of harbor porpoise in Monterey Bay. This program also reports on take of sea birds and sea otters. The Service should continue to work with the National Marine Fisheries Service to expand both the area and the percentage of net pulls observed in monitoring sea otter mortality due to fishery interactions."

Page 42, 311. Determine the levels of incidental take and develop plan to reduce or eliminate this source of mortality. 311. Monitor the incidental take of sea otters in commercial fisheries: The last sentence in this section should be changed to read: "The Service should expand monitoring efforts with National Marine Fisheries Service to ensure that otters throughout their range (including the recently reoccupied area between Point Sal and Point Arguello) are not compromised by fishing activity. This will require expanding the extent of monitoring southward from Monterey Bay throughout the rest of the otter range, and significantly increasing the percentage of net pulls observed in the areas where sea otters are present." The Final Plan should emphasize that NMFS has an affirmative duty under the ESA to conduct such monitoring, even though the sea otter is not a species under its jurisdiction.

Page 42-43, paragraph 3, 313. Evaluate the potential for incidental take of otters in trap and pot fisheries: The following revisions should be made to this section: "The Service has received reports that sea otters occasionally drown in lobster traps , and sea otters have been found dead in crab pots in Alaska and California. While the Service has no direct evidence that trap or pot fisheries are significantly affecting the otter population in California, the recent decline in sea otter population has coincided with the development of the nearshore live trap fishery within the otter range, and the condition of some dead otters recovered in areas where live fish traps are utilized have been consistent with the condition of otters who have drowned in traps elsewhere. An evaluation of the potential to take otters is warranted. . . . Local fisherman reported that the application of a steel ring in the trap opening prevents pinnepeds from forcing their way into crab and fish traps. It appears that these devices might be effective at excluding sea otters and possibly other non-target species. It also appears that they can be installed with little expense or inconvenience and that federal funding may be available, if necessary, for this purpose."

CDF&G is proposing regulations for adoption by the California Fish & Game Commission that would require that use of ridged wire rings between 4" and 6" in diameter in all live fish traps set north of Point Arguello. The Service should support this

proposal, which was initially recommended by trap fisherman, and support research to further refine the ring design.

Page 43, section 32: Money should be appropriated to increase law enforcement personnel, especially in the southern end of the range. This will require additional law enforcement personnel and vessels. Construction of a boat launch at Vandenberg Air Force Base would greatly increase the effectiveness and safety of marine patrols. The Final Plan should recommend that these actions be taken.

Page 45, paragraph 3, 42. Determine concentrations and possible effects of disease, stress, toxic trace elements and organocholorines on sea otters: Dr. David Jessup has documented the presence of diseases previously found only in terrestrial species. Also, although DDT is banned in U.S., it persists and there are recent press reports of its being re-exposed as soils erode. The Final Plan should recommend that these potential causes of sea otter mortality be fully studied

Page 47, paragraph 1, 422. Determine the sources of environmental contaminants: The list of sources of contaminants in last sentence should include urban and agricultural run-off.

Page 48, paragraph 1: These analyses should be done within the mainland range where almost all of the sea otters are found, not exclusively at SNI. While it would be nice to know contamination at SNI and the other Channel Islands, if funding is limited, the emphasis should be along the coast within the range of the mainland population.

Page 49, paragraph 1, 425. Implement all reasonable and prudent measures to minimize factors causing stress or disease in the southern sea otter population: The recommendations in this section are excellent, but they should be started right away. It is inappropriate to wait five years until adequate sample size is obtained, as outlined in preceding section.

Page 49, last sentence, page 50, first sentence, 43. Evaluate the potential for habitat related differences in growth rates between populations of sea otters: It is not sufficient to merely say that "otter predation reduces many prey populations, including herbivorous invertebrates and/or species exploited in commercial and recreational fisheries." In fact, in some instances there may be more individuals in a prey species, although they may be smaller in size than individuals were prior to sea otter predation, and there may be more members of more species. There is evidence of excellent recruitment within certain shellfish populations in the sea otter range. And of course, there are many obvious benefits correlated with the presence of sea otters – enhanced

kelp forests and associated finfisheries and kelp harvesting, reduction of coastal erosion due to the presence of nearshore kelp forests, tourism and recreational opportunities, etc. There is even the possibility that gill net closures to protect sea otters have enhanced the California halibut population. Thus, to say: "[s]ocial and economic consequences of this interaction are the primary societal barrier to the natural expansion and recovery of the California population" reflects an incomplete picture. There are also many social and economic benefits correlated with the presence of sea otters. Suffice it to say, it is important to evaluate the potential for habitat-related differences in growth rates between populations of sea otters as part of refining a recovery strategy for sea otters. References to economic and/or social costs and benefits are inappropriate, however, as considerations in a recovery plan.

Page 51, paragraph 3, 6. Use a captive population to address research needs, to mitigate a potential catastrophic population decline, and to facilitate public education and outreach efforts: These are all important components in securing the sea otters' survival. We recommend, however, that specific funding levels not be set until it is known how much money will be available for sea otter recovery so an appropriate allocation can be made among priority tasks.

Page 61: The inclusion of the California Regional Water Quality Board in this list is critical, as it will be an essential agency involved in contaminant issues.

CONCLUSION

Subject to the revisions discussed here in this letter, the Draft Plan is ready for finalization. We commend the Recovery Team for its hard work and request that the Plan be finalized and put into effect as soon as possible, in accordance with these comments. At this time, FWS should develop a team to carry out the Final Plan through an implementation program.

A

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7 January 1997

Mr. Carl Benz
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Dear Mr. Benz,

Shortly after the 24 September 1996 close of the comment period on the Draft Revised Southern Sea Otter Recovery Plan (Plan), the Monterey Bay Aquarium conducted a two-day workshop to address a variety of issues related to southern sea otter recovery. This workshop offered an opportunity for authors of an upcoming special issue of the Endangered Species Update to present their sea otter research and recovery results and recommendations. Considerable information and discussion pertinent to the southern sea otter recovery effort emerged at that workshop, and in the research and policy planning efforts that Friends of the Sea Otter have been engaged in since. Accordingly, it is appropriate for the U.S. Fish and Wildlife Service (USFWS) to consider additional information that has relevance to the Plan. The purpose of this letter is to set forth the position of Friends of the Sea Otter (FSO) as to how the Plan and related programs must be developed and carried out.

Priority of Southern Sea Otter Recovery

As an initial matter, FSO notes that there was considerable support at the workshop for making southern sea otter recovery effort a high priority. It was clear from the discussion at the workshop that a well-reasoned, consensus-based Plan can be developed for this species. Such a Plan would not only set the species on a track for recovery on a reasonable schedule, but could serve as an example for other recovery plans on how to achieve agreement among interested parties. The USFWS should take advantage of this opportunity to demonstrate just how effectively a recovery planning process under the ESA can work when a cooperative, consultative process is used and proper consideration is given to the needs of the affected species. Sweeping amendments to the ESA, as demanded by many opponents of the law, are not needed. Instead, as the southern sea otter recovery plan can illustrate, what is required is a well-managed, adequately funded recovery planning process that calls upon the expertise of the members of the Recovery Team and other affected parties.

By this letter, FSO requests that the Plan be given high priority within the USFWS recovery program. Currrently, this species has a ranking of only 9C. This is an extremely low ranking for a species that has strong potential for recovery *if adequate action is taken by the USFWS*. The USFWS will truly be foregoing an excellent opportunity to achieve a success story under the ESA if it does not invest the relatively modest resources appropriate to complete this planning process and take the necessary management and research actions to achieve recovery.

Failure of the Plan to Adopt the Required Conservative Approach Under the ESA

As discussed in FSO's initial comments, the ESA requires the USFWS to give the benefit of the doubt to species and to include appropriately conservative judgements. When there is doubt or speculation, the USFWS is to err on the side of the species.

The draft revised Plan fails to follow this course in several important areas. Rather than presenting a blueprint for safe and assured recovery, the Plan reads more like a justification for prompt delisting. Numbers and assumptions are used in a variety of ways to produce a population size that would allow delisting in the near future. This is not the proper approach for a recovery plan. Instead, at each juncture when such an assumption is to be applied, the proper question to ask is "Are we providing a sufficient margin of error to protect the species?" Although it does not follow that every area of uncertainty must be resolved in the most conservative manner to the benefit of the species, the overall approach adopted must clearly weigh in favor of the species and be based on the best available science. In the final Plan, either the species must be given the benefit of the doubt by adopting the conservative approach, or the USFWS must explain why the analysis it is adopting is acceptable based on the best available science. Clearly, when an appropriately conservative approach is adopted, the population size required for delisting will increase substantially above the level proposed in the draft revised Plan and a variety of management and research actions will be identified as necessary.

Failure of current draft Plan to satisfy Section 4(f)

The Plan, as currently proposed, provides insufficient biological and legal grounds for ESA delisting of the southern sea otter.

The standards for a legally sufficient recovery plan are set forth in section 4(f) of the ESA. 16 U.S.C. § 1533(f). In several respects, the draft revised Southern Sea Otter Recovery Plan fails to satisfy these requirements. The areas of deficiency are discussed below.

Site-Specific Management Actions. Under section 4(f)(1)(B)(i) a recovery plan is required "to the maximum extent practicable" to incorporate "a description of such site-specific management actions as may be necessary to achieve the plan's goals for the conservation and survival of the species." Id. § 1533 (f)(1)(B)(i). The Act defines "conservation" to mean "the use of all methods and procedures which are necessary to bring any ... species to the point at which the measures provided pursuant to this chapter are no longer necessary." Id. § 1532(3). As explained in the Act's legislative history, this requirement is intended to ensure that recovery plans are "as explicit as possible in describing steps to be taken in the recovery of a species." S. Rep. No. 240, 100th Cong., 2d Sess. 9(1988), reprinted in 1988 U.S.C.C.A.N. 2709.

The draft plan fails to satisfy this test. Indeed, the Plan does not identify any site-specific management actions, nor does it provide any explanation why it is not feasible to do so. As a result, the Plan violates the "site-specific management action" requirement of section 4(f). As the courts have interpreted this requirement:

> A recovery plan that recognizes specific threats to the conservation and survival of a threatened or endangered species but fails to recommend corrective action or explain why it is impracticable or unnecessary to recommend such actions would not meet the ESA's standard.
> Fund for Animals v. Babbitt, 903 F. Supp. 96, 108 (D.D.C. 1995)

For the southern sea otter, a variety of site-specific management actions are necessary. First and foremost among these are actions necessary to reduce the oil spill risk. The most effective management action in this regard would be the promulgation of mandatory vessel traffic routes that would require tankers and other ships to transit the California coast far enough offshore to reduce the oil spill risk. Even if mandatory measures are not deemed feasible, actions such as the designation of an advisory "Area to Be Avoided" or discretionary vessel traffic routes are required to be considered. There may be ways to approach this from both the state (Mr. Pete Bontadelli, California Department of Fish and Game, Office of Oil Spill Prevention and Response can remand vessel contingency plans back to the vessel owners, asking for an increased level of habitat protection from an oil spill) and federal levels (the Secretary of the Interior can ask the Departments of Commerce and Transportation to consider habitat protection measures in addition to navigational safety). These and other options need to be addressed through a recovery plan site-specific management action that deals with the oil spill threat.

Oil spill risk is not the only threat to sea otters that must be addressed through site-specific management actions. As stated in detail within our original comments, the Plan needs to:

1) Address concerns over available food resources and quality;

2) Address new concerns over sea otter population health;

3) Address apparent population declines; and

4) Implement and continue critical research and policy work.

FSO requests that the draft Plan be revised to include site-specific management actions to address these issues. As discussed in FSO's previous comments, the draft revised Plan is deficient because it relies upon a single quantitative standard for delisting, with no statement of required qualitative actions. This is where the required section 4(f) site-specific management considerations come in. Until such actions are included as criteria for recovery, the draft Plan will not satisfy section 4(f) and will fail to serve as a reasonable guide for recovery of the southern sea otter.

Objective, Measurable Criteria. Section 4(f) of the ESA also requires each recovery plan to include "objective, measurable criteria which, when met, would result in a determination, in accordance with the provisions of this section, that the species be removed from the list ..." 16 U.S.C. § 1533 (f)(1)(B)(ii). These criteria are to be incorporated into the plan "to the maximum extent practicable."

In applying this requirement, it is necessary for a recovery plan to address each of the five statutory factors used for a listing decision. As ruled in Fund for Animals: "the FWS, in designing objective, measurable criteria, must address all of the five statutory delisting factors and measure whether threats to [the species] have been ameliorated." Fund for Animals, 903 F. Supp. at 111. These factors are:

1) The present or threatened destruction, modification, or curtailment of its habitat or range;

2) Overutilization for commercial, recreational, scientific, or educational purposes;

3) Disease or predation;

4) The inadequacy of existing regulatory mechanisms; and

5) Other natural or manmade factors affecting its continued existence.

16 U.S.C. § 1533 (a)(1). These factors are not adequately addressed in the draft revised Plan.

In the case of the first factor, habitat impacts, the Plan includes no discussion of objective, measurable criteria that could be applied to address the major threat -- oil spill risk. Instead, the Plan relies merely upon population growth to reach a point where the oil spill risk is perceived as reduced. Relying upon population growth alone to address this criterion has been disfavored by the courts. Fund for Animals, 903 F. Supp. at 112.

To meet this delisting factor, the USFWS must revise the Plan to discuss the ways in which oil spill threats and other habitat impacts could be reduced or eliminated. For example, oil spill risk could be addressed through consultative actions with the CDFG/OSPR Director to demand greater levels of protection in the state-mandated vessel contingency plans, and through DOI consultation with and influence on the U.S. Coast Guard to establish suitable boundaries and requirements for an Area To Be Avoided and Traffic Separation Schemes.

The third delisting criterion -- disease or predation -- is also a major factor of concern. As expressed in our original comments, data from the National Wildlife Health Center indicate that nearly 40% of the sea otter carcasses examined have an infectious disease. Coupled with low survey counts and high monthly mortalities (1996 compared to the previous 10-year average), there is genuine concern regarding the overall health and stability of the southern sea otter population. Chronic influences of environmental contamination or parasite loads, combined with acute population loss as a result of a major oil spill, could place this population in an extremely precarious recovery position. The Plan needs to take this fully into account.

So too does the fourth factor — inadequacy of existing regulatory mechanisms — come into play. Currently, regulatory mechanisms to address oil spill risk are not adequate. Unless something is done to establish meaningful regulatory tools to minimize this threat, recovery cannot be achieved. The revised Plan should spell out what "regulatory mechanisms" are needed in this regard. Finally, the Plan must also set forth objective, measurable criteria to deal with "other natural or manmade factors." These factors include, but are not limited to:

1) Point and non-point water pollution leading to levels of environmental contaminants that may be causing some degree of immune suppression in southern sea otters;

2) Distribution and abundance of California nearshore kelp, and effectiveness of current regulations in protecting that resource to meet sea otter habitat protection requirements;

3) Impact of human nearshore water uses on distribution and behavior of sea otters; and

4) Captive and rehabilitation-to-release programs as they contribute to population recovery goals.

To facilitate the smooth operation of interagency and multi-institution research programs, and the eventual transition of ESA Recovery Planning to MMPA Conservation Planning, the USFWS should also within this Plan commit resouces to provide:

5) A sea otter Research Coordinator/Research and Policy Liaison, to include streamlining of the research permit process; and

6) An evaluation of California shellfish biomass availability and sustainability (e.g., current harvest levels, effects of shellfish contaminants on otter and human health, stock level effects of abalone withering syndrome).

Depletion under the MMPA

The draft revised Plan needs to discuss the process that will be used to determine OSP for the southern sea otter. It is quite clear that even when ESA recovery is achieved, this species will remain depleted under the MMPA, as it will be below its maximum net productivity level (MNPL). FSO does not consider it necessary to discuss in the final Plan what the actual MNPL level is or what conservation measures will be necessary to achieve OSP. However, it is important to explain how these determinations will be undertaken. In this regard, FSO believes the the OSP issues should be addressed on a separate track, but that a commitment should be made by the USFWS that no delisting decision will be made until a determination is made on depleted status under the MMPA. There should be no gap in time between delisting under the ESA and the formal designation of depleted under the MMPA.

Action requested of the USFWS

FSO proposes that that following program goals be embraced by the USFWS in order to determine the degree to which many of the above-identified factors affect population recovery. Within the following list, tasks already identified within the draft revised Plan are in plain text, while new tasks are noted in *italic*. Relation of each task to one or more of the five ESA delisting criteria are also noted.

	Task description	SSORP task number	Recovery & delisting criterion (reference page 3)
1.	Monitor distribution and abundance of sea otter populations.	11	1
2.	Evaluate causes of sea otter mortality.	12	3 & 5
3.	Determine concentrations and possible effects of disease, stress, toxic trace elements and organochlorines on sea otters.	42	3 & 5
	a. Analyze sea otter tissues for evidence of stress or disease.	424	3 & 5
	b. Determine contaminant levels in sea otters, sea otter prey, and in other components of the sea otter coastal food web and ecosystem.	423	3 & 5
	c. Determine the sources of environmental contaminants.	422	3 & 5
	d. Archive tissues from sea otters for future analyses of environmental contaminants.	421	3 & 5
	e. Implement all reasonable and prudent measures to minimize factors causing stress or disease in the sea otter population.	425	3, 4 & 5

	Task description, continued	SSORP task number	Recovery & delisting criterion (reference page 3)
4.	*Conduct focused health assessments of the wild sea otter population.*		3 & 5
5.	*Review unmet California oil spill prevention and response tasks.*	211 212 221	1 & 4
6.	*Implement additional California oil spill prevention measures.*	222 223	
7.	Monitor incidental take of sea otters in commercial fisheries (e.g., gillnet, crab, lobster, finfish live trap).	311 313	2 & 4
8.	*Monitor habitat-level impacts of California commercial fisheries (e.g., abalone, urchin crab, lobster, squid) on sea otters.*		2 & 4
9.	Evaluate the effectiveness of current fishing regulations for preventing sea otter take.	312	4
10.	Evaluate the potential for habitat related differences in growth rates between populations of sea otters.	43	1
11.	*Evaluate distribution and abundance of California nearshore kelp.*		1
12.	*Evaluate the effectiveness of current California kelp harvest regulations.*		4
13.	*Evaluate California shellfish biomass availability and sustainability (e.g., current effects of shellfish contaminants and parasites on sea otter and human health, stock-level effects of abalone withering syndrome).*		3 & 4
14.	*Evaluate impact of human nearshore water users on distribution and behavior of sea otters.*		4 & 5
15.	*Evaluate captive and rehabilitation-to-release programs in terms of population recovery potential.*		4
16.	Evaluate differences in life history parameters for sea otter populations throughout the North Pacific.	41	1, 3, & 5

	Task description, continued	SSORP task number	Recovery & delisting criterion (reference page 3)
17.	*Provide Southern Sea Otter Research Coordinator/ Research and Policy Liaison*		Facilitates ongoing interagency and multi-institution communications & planning.
18.	Using above information, evaluate assumptions used to estimate the population level at which southern sea otters could be considered removed under the ESA.	4	1 - 5

FSO is seeking a state legislative bill to support program steps 3b, 3c, 3d, 5, 8, 9, 11, 12, 13, 14, and 17. Our understanding is that the CDFG/OSPR will in mid-1997 submit to the USFWS an ESA Section 6 proposal to supplement, at a minimum, program steps 2, 3a, 3b, 3d, and 4. We expect the USFWS to offer full financial consideration to the Section 6 proposal, and to provide USFWS fulfillment of program step 18.

Existing programs within the USFWS, the Division of Biological Resources, the National Marine Fisheries Service, and the California Department of Fish and Game, with linkings among those programs, should be able to provide completion of all other listed research and management tasks. FSO will support in any way possible the procurement of funds for any of the currently unmet research or management objectives.

FSO believes that the draft Plan can be revised to address these additional concerns if action is taken promptly. Failure to take advantage of the current momentum, research opportunities and political interest in the Plan will cause significant further delay. As a first step, FSO requests that the USFWS convene in the near future a meeting of the Recovery Team and other sea otter experts and interested parties. The following topics need to be heard and addressed at that meeting:

1) Discussion of revisions needed to the Plan for it to satisfy the requirements discussed in this letter.

2) An update from managers of the Oiled Wildlife Veterinary Care and Research Center (OWVCRC) at Santa Cruz on planned research programs to be based there. These managers have worked to identify research and funding needs. The OWVCRC could accomodate a full southern sea otter morbidity and mortality program, research on diseases, contaminants and parasites in sea otters and their prey, focused health assessments of the wild population, and tagging, tracking and observations of sea otters. These research and policy objectives match those that are or should be stated within the Draft Revised Southern Sea Otter Recovery Plan.

3) A preliminary reevaluation of the sole quantitative value suggested in the Plan as sufficient for successful southern sea otter delisting. The Plan as it currently stands provides insufficient sea otter population protection. An updated evaluation should be planned for the year 2004 or 2005, following completion of the research tasks noted in the table above.

4) The Team and the USFWS must develop guidelines for sea otter rehabilitation and/or reintroduction that can be consistently adhered to by all aquaria or facilities housing or rehabilitating southern sea otters.

This meeting should provide the necessary information for the Team to revise the draft Plan. That revised document should be provided to participants in the meeting for final review. Assuming adequate consensus can be achieved, the Plan could then be released in final form and held out as an example of how the recovery planning process can successfully address the concerns of affected parties and produce a reliable plan for delisting.

In addition to the meeting, and finalization of the Plan, FSO requests that the USFWS take the following actions:

1) Support the Section 6 application for sea otter health and research to be submitted by CDFG/OSPR in mid-1997. FSO can assist this process through discussions with key political supporters.

2) Consult on oil spill prevention policies with the following:

   a) Mr. Pete Bontadelli, California Department of Fish and Game, Office of Oil Spill Prevention and Response. A recent court decision in Washington state upheld the state right to remand vessel contingency plans to vessel operators and demand a greater level of protection of state resources. Mr. Bontadelli may now be able to do the same for the three central California National Marine Sanctuaries, demanding vessel operators remain 50 miles offshore except when entering and exiting harbors.

   b) The U.S. Coast Guard recently announced (Proposed Rule, Federal Register Vol. 61 No. 208, pg 55248) that there was "no navigational need for additional offshore routing measures" other than some shifting in traffic separation routes. However, the USFWS and Secretary of Interior Bruce Babbitt must argue that establishment of an oil tanker traffic buffer zone (or a navigational Area To Be Avoided) around the three central California National Marine Sanctuaries would establish the minimal level of habitat protection prerequisite to any attempt to delist the southern sea otter.

Thank you for considering these issues. If you have any questions, please let me know.

Sincerely,

Ellen Faurot-Daniels

Ellen Faurot-Daniels
Science Director

cc: John Twiss (MMC), Robert Hofman (MMC), Michael Gosliner (MMC), Gregory Silber (MMC), Secretary Bruce Babbitt (DOI), John Rogers (USFWS), Jamie Clark (USFWS), Michael Spear (USFWS), Wayne White (USFWS), Ann Badgeley (USFWS), Cindy Berry (USFWS), Doug DeMaster (NMFS), Ann Kinsinger (DBR), John Lien (SLC), James Estes (DBR), Mike Martin (CDFG), Terry Jackson (MBNMS), Ed Ueber (GFNMS), Ed Cassano (CINMS), Congressman Sam Farr, Senator Dianne Feinstein, Senator Barbara Boxer, Assemblyman Fred Keeley, David Bunn, Don Baltz, Stephanie Thornton (SRD/NOAA), Peter Douglas (CCC), Susan Hansch (CCC), Warner Chabot (CMC), Tim Eichenberg (CMC), Robert Irvin (CMC), Nina Young (CMC), Rachel Saunders (CMC), Andy Palmer (CMC), Laverne Smith (ESC), Pete Bontadelli (CDFG/OSPR), Mel Odemar (CDFG/OSPR), Don Lollock (CDFG/OSPR), Dave Jessup (CDFG/OSPR), Jonna Mazet (CDFG/OSPR), Jack Ames (CDFG/OSPR), Dan Costa (UCSC), Gary Griggs (UCSC), Terrie Williams (UCSC), Dave Caspar (UCSC), Stuart Somach

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20 September 1996

Mr. Carl Benz
Assistant Field Supervisor
U.S. Fish and Wildlife Service
Ecological Services
Ventura Field Office
2493 Portola Road, Suite B
Ventura, California 93003

Dear Mr. Benz,

Following are the comments of Friends of the Sea Otter (FSO) on the Draft Revised Southern Sea Otter Recovery Plan . FSO is a not-for profit organization founded in 1968 dedicated to the protection of a rare and threatened species, the southern sea otter, as well as sea otters throughout their north Pacific range, and all sea otter habitat. There are over 4,000 FSO members, representing all 50 states and 20 foreign nations.

These comments also reflect the concerns of the groups listed below:

Animal Protection Institute
The Animal Protection Institute is a national nonprofit organization formed in 1968 to inform, educate, and encourage the humane treatment of all animals. API protects against animal abuse through enforcement/legislative actions, investigation, advocacy campaigns, crisis intervention, public awareness, and education. Specific areas of concern are companion animals, wildlife, farm animals, marine mammals, animals used in research, and humane education.
Total membership: 75,000 nationwide

Center for Marine Conservation
The CMC is a national, non-profit organization founded in 1972 to conserve the diversity and abundance of life in the oceans. The Center's programs focus on protecting critical marine habitats, preventing marine pollution, protecting endangered and threatened marine species and managing fisheries for conservation.
Total membership: 110,000 nationwide

Environmental Defense Fund
The Environmental Defense Fund is a leading environmental organization whose work spans global issues as wide-ranging as ocean pollution, rainforest destruction, and global warming. Since its founding in 1967 in the effort to save the osprey and other wildlife from DDT, EDF's trademark has been the use of multi-disciplinary teams of scientists, economists and attorneys to develop economically viable solutions to environmental problems.
Total membership: 250,000 nationwide

Save Our Shores
Save Our Shores is a non-profit organization working to protect the ecological integrity of the Monterey Bay National Marine Sanctuary through policy research, education, and citizen action.
Total membership: 1000

We appreciate the opportunity to comment on this version of the Recovery Plan, and hope the concerns expressed here will be useful in framing the next few years of recovery effort on behalf of the southern sea otter. We look to the leadership of the USFWS in assuring the full and successful recovery of the southern sea otter.

Sincerely,

Ellen Faurot-Daniels
Science Director, Friends of the Sea Otter

Alan H. Berger
Alan H. Berger, Executive Director
Animal Protection Institute

Nina Young
Nina Young, Marine Mammalogist
Center for Marine Conservation

Michael J. Bean
Michael J. Bean, Chairman, Wildlife Programs
Environmental Defense Fund

Vicki Nichols
Vicki Nichols, Executive Director
Save Our Shores

cc: Mr. John Twiss, Dr. Robert Hofman, Mr. Mike Gosliner, Esq., Marine Mammal Commission
Mr. Bruce Babbitt, Secretary of the Interior
Ms. Jamie Clark, USFWS
Mr. Wayne White, Mr. Michael Spear, USFWS
Dr. Douglas DeMaster, NMFS
Ms. Ann Kinsinger, NBS
Members of the Southern Sea Otter Recovery Team
Ms. Stephanie Thornton, Chief, Sanctuaries and Reserves Division
Mr. Terry Jackson, MBNMS
Ms. Karin Strasser-Kauffman, SAC-MBNMS
Mr. Ed Ueber, GFNMS/CFNMS
Mr. Sam Farr, U.S. House of Representatives
Ms. Dianne Feinstein, Ms. Barbara Boxer, U.S. Senate
Mr. Fred Keeley
Mr. Don Baur, Esq., Perkins Coie
Mr. John Lien, State Lands Commission
Mr. Peter Douglas, Ms. Susan Hansch, California Coastal Commission
Ms. Rachel Saunders, Mr. Warner Chabot, Mr. Robert Irvin, Center for Marine Conservation
Mr. Mel Odemar, Mr. Don Lollock, Dr. David Jessup, Dr. Jonna Mazet, and Mr. Jack Ames, California State Office of Oil Spill Prevention and Response
Dr. Daniel Costa, Dr. Terrie Williams, Mr. Gary Griggs, Mr. Steve Davenport, Dr. Dave Caspar, U.C. Santa Cruz
Ms. Toni Frohoff, Humane Society of the United States

— COMMENTS — **DRAFT REVISED SOUTHERN SEA OTTER RECOVERY PLAN**

Ellen Faurot-Daniels
Science Director, Friends of the Sea Otter

September 20, 1996

GENERAL COMMENTS

NARROW FOCUS

Our principal concerns have to do with the too-narrow focus of this Recovery Plan. The emphasis on calculating the number of sea otters needed to provide a margin of safety following a major oil spill downplays or ignores several other important considerations that need to be comprehensively addressed before sea otter recovery will be complete and ESA delisting discussions can begin.

EMPHASIS ON GENERATING POPULATION NUMBER FOR DELISTING IS FLAWED

We understand that the Southern Sea Otter Recovery Team (SSORT) has attempted to find a definite number to offer as a delisting standard, and as a team of scientists, they have addressed their scientific challenge and offered the work here for comment. However, sea otter delisting is not a challenge to be met solely by scientific or mathematical means. Generation of a population number for delisting will not suffice if the essential threats remain.

NUMBERS MEAN LITTLE IF RANGE LIMITED AND THREATS TO RANGE THE SAME

There is essentially nothing that has changed in terms of the degree of oil spill threat to sea otters since this revision of the Recovery Plan was requested. Although the U.S. Coast Guard and the Department of Fish and Game have been involved in oil spill contingency response planning, the degree of protection to our coastal resources -- including sea otters -- is still terribly limited. Use of offshore tanker traffic routes currently is based only on voluntary, limited, and unenforceable efforts by a handful of oil companies.

Otters still occupy only the same narrow band of coastline they occupied in 1989, and are still just as vulnerable to an oil spill. With no significant increase in population distribution, a simple increase in population numbers will in no way provide adequate protection. Adding a few more otters to what will still be a limited distribution just means that more otters -- not fewer -- can be killed by the type of oil spill modeled within this Recovery Plan.

OIL SPILL PREVENTION POLICIES NEEDED TO PROTECT ESSENTIAL HABITAT

Mitigating the oil spill threat then becomes more a policy than a scientific issue, and goes beyond the actual scope of requirements or recommendations the Recovery Team can make. Even the best possible planning and recommendations of Recovery Team scientists may leave a shortfall in successful recovery planning. What is now needed for full and successful sea otter recovery, in addition to Recovery Team advice, are critical changes in the way the Service becomes involved in substantive action on behalf of oil spill prevention.

Finding at least one tangible and significant oil spill prevention technique to formalize and implement will be the only way to effectively protect the coast and its resources. The USFWS will have to link efforts to those of other agencies, and have established for the Monterey Bay National Marine Sanctuary -- which encompasses almost all of the southern sea otter range -- an "Area To Be Avoided" by the various large vessels transiting the central California coast.

NEED TO ADDRESS CONCERNS OVER AVAILABLE FOOD RESOURCES AND QUALITY

While this Plan recognizes the need to research impacts of sea otters on shellfish resources, there is no identification of a similar, perhaps more important need to study the abundance, distribution and quality of the food resources available to the sea otters. If sea otters within their current range become food-limited as a result of human overharvest of shellfish, or as a result of contamination of the food supply, then recovery levels sufficient for ESA delisting, and ongoing population stability, cannot be assured.

NEED TO ADDRESS NEW CONCERNS OVER SEA OTTER POPULATION HEALTH

Another critical need involves a dedication of additional research devoted to answering questions, not just about sea otter numbers and distribution, but about sea otter health. These questions of health have been raised as a result of extensive and detailed data collection on dead sea otters over the past 5 years. These data indicate that nearly 40% of the dead sea otters examined have an infection at the time of death.

We know what the diseases are, but know little about how otters encounter these diseases, whether they are encountering them at greater rates than in the past, or whether their resistance to natural or new types of infections has changed.

We certainly do not know how any of these problems impact the stability of the current population or how they will affect long-term recovery.

We believe it is imperative to discover these answers before any moves toward delisting are made by the Service. In the years before delisting discussions begin there must be research devoted to answering questions of sea otter infection rates, whether and to what degree infections are communicable, and incidence and impact of environmental contaminants, toxins, and parasites on sea otters and their critical habitat.

NEED TO ADDRESS APPARENT POPULATION DECLINES

Southern sea otter population survey totals vary by season and by sighting conditions during a given survey. However, the 1995 and 1996 Spring surveys are uncharacteristically low. In addition, average monthly mortalities (averaged over the past 14 years) have been higher than normal for the past two years. There is evidence of drowning for several of the 1996 deaths. There is also concern that emerging fisheries in the central portion of the sea otter range have the potential for taking sea otters.

This Recovery Plan must reflect and adequately address these new concerns, and determine whether and how potential or probable population impacts must be factored into the overall mortality (and recovery) considerations.

RESEARCH MUST CONTINUE

While the Recovery Plan lists many of the ongoing and future research projects that are central to sea otter recovery and eventual delisting, it does not list them all. In addition, it as yet provides no mechanism for implementing any research.

- Because the USFWS has for the past six years progressively abandoned its sea otter recovery programs, about all that is left in terms of what it definitively contributes is a Recovery Plan report. If sea otter delisting under the ESA is the Service goal, then it needs in the next ten years to do more than simply maintain the *status quo* of the past six.

It remains for the U.S. Fish and Wildlife Service to couple the scientific advice others can provide (such as that found within an approved Recovery Plan) with the future policy actions that only the USFWS can effectively advocate and implement. A Recovery Plan is not a free-standing template for a species' recovery, although there is a very real danger in having it perceived as such. Without appropriate commitment from the USFWS in both the science and policy arenas, the scientific recommendations of a Recovery Team will only meet a portion of the total recovery need.

SPECIFIC COMMENTS

Suggested text additions noted in *italic*.

DISCLAIMER PAGE

page v

"Objectives will be attained and any necessary funds made available subject to budgetary and other constraints affecting the parties involved, as well as the need to address other priorities. *The Service will make every effort to garner the necessary funds to fulfill sea otter recovery objectives as outlined within the approved final SSORP and its Implementation Plan*".

Remark: As the disclaimer currently stands, it will leave a sizeable Service "out" in terms of implementing the recommendations in the SSORP. Work on southern sea otter recovery has come to a virtual standstill since 1990. There are no longer any Service personnel dedicated to sea otter recovery, no identifiable sea otter recovery programs aside from development and completion of this SSORP, and no dedicated funds for actual sea otter recovery projects. Sea otters are no longer a "priority" species for the USFWS, so monies or Service personnel to accomplish the tasks outlined in this SSORP stand as hollow promises. Other priorities notwithinstanding, the Service needs to become a more active advocate in garnering the necessary dedicated monies to see sea otter recovery efforts through to their true and credible completion.

PREFACE

page vii, para. 1

"...the Service reconstituted..."

Remark: How about "reconvened" or reestablished"?

page vii, para. 1

Near the end of this paragraph, the Southern Sea Otter Recovery Team (SSORT) states that the oil spill contract data "are equivocal", and that the resultant course of action will use as its standard a "preponderance of evidence." This form of predictive (and equivocal) science seems to take on increasing authority as the Recovery Plan proceeds -- perhaps even more than oil spill modelers Ford and Bonnell are comfortable with. Because the models are equivocal, recovery planning should take, in the absence of any measurable reduction in the oil spill threat, the most conservative approach and reflect a 100% kill from an oil spill.

pg. vii, para 2

Because the "likelihood of otters persisting in California is currently determined primarily by whether a major oil spill occurs" does not mean that other factors are not equally as important. Sea otter listing as threatened (1977) and the first Recovery Plan (1982) reflect the dominant concerns of the time (oil spills). However, oil spill concerns have since 1990 been subject to active contingency planning and evaluation by the U.S. Coast Guard, the state of California, industry, and private organizations. Although the threat has not substantially diminished, it is being addressed by others outside the Recovery Team and the USFWS. It is appropriate that the Recovery Team look at numbers of sea otters in light of the oil spill threat. However, sea otter head counts alone will not lead to an adequate population base for delisting discussions and decisions. Issues of sea otter health surfaced in 1992, is the current substantive and problemmatic issue, and will confound delisting discussions unless a forward-thinking research effort is directed at it in the very near future. It is in delineating the source of these health problems that the USFWS and the Recovery Team can play a role suitable to contemporary issues not yet fully addressed by other agencies or entities. Therefore, at each place in this document where "primary" concern with major oil spills is noted, it needs to be mentioned that this is not the exclusive concern.

page vii, para.3
"The Service recognizes that once the range and number of otters has increased sufficiently or the risk of an oil spill event to the otter population has been decreased sufficiently, delisting under the ESA will occur."
Remark 1: This misrepresents the ESA recovery and delisting process. Regardless of the threat(s) that resulted in the listing of a species (Sec. 4(a)(1), ESA of 1973), all categories of threat are reviewed during delisting. If factors affecting successful recovery remain in any category, delisting will not proceed.
Remark 2: The special conjuring the SSORT has done in this Plan (with Service approval if not upon direct Service request) has been to determine how many sea otters would be needed for delisting to proceed *EVEN IF* the population had not increased sufficiently nor the oil spill risk decreased sufficiently. This is the first rock upon which the delisting attempt will legally founder.
Remark 3: Delisting discussions cannot proceed until the USFWS has first fully assessed the health (and other non-oil-related threats) to otters in the southern sea otter population. Evaluation of threats needs to be inclusive of all known threats, not restricted to just those the Service or SSORT can conveniently isolate. Inadequate addressing of remaining threats is the second rock upon which the delisting attempt will legally founder.

EXECUTIVE SUMMARY

page ix, para. 1
Population growth rate is reported here as 5-7% per year, while elsewhere a rate of 5% is used. Although the 5% is more nearly correct, some mention needs to be made of why it, rather than another number, was adopted for use.

The last two (1995, 1996) Spring census totals need to be incorporated into a new average, and the low count ramifications and/or anomalies discussed. Elevated monthly mortality rates (calculated on a 14-year average) also need to be addressed; they indicate that lower numbers of sea otters seen during the regular censuses may not be simply a function of weather and sightability variables.

Last line: "Oil spills, which could occur at any time, could decimate this population."
Remark: Then why do recovery numbers not support an allowance for "decimation" with calculations and expectations for a 100% kill?

page ix, para. 3
"The depressed population growth rate of the southern sea otter is largely due to elevated mortality as opposed to reproductive depression or emigration. The cause or causes of this mortality are unclear."
Remark: Although this revised Recovery Plan outlines concerns over mortality, all the references to ESA delisting only reflect the SSORT's impression that they only need to address the oil spill threat. Delisting discussions need to be based upon, and preceded by, the acquisition of sufficient and defensible data on both the oil spill threat and sea otter health.

page ix, para. 4
"If the currently observed rate of population growth continues, the southern sea otter could be delisted under the ESA by 1999."
Remark: This will be the case only if suitable oil spill prevention measures have been taken, and sea otter health concerns and other threats have been fully addressed. Friends of the Sea Otter will legally challenge the Service if the delisting process is engaged before all pertinent research and recovery actions have been implemented or achieved.

page x, para. 1
"The southern sea otter population should be considered endangered under the ESA if the population declines to a level less than or equal to 1850 animals."
Remark: Again, this deals with a head count only, and does not include health

assessments. Perha[illegible] in the years it will take for scientific d[illegible] on health issues to be collected, health/mortality concerns should be addressed by having the SSORT modify the minimum viable population size by adjusting the calculations of N_e (effective population size). This offers the sea otter population some additional protection while the health issues are being investigated and resolved.

- The Service must include in the Implementation Plan to the Recovery Plan the results of multi-agency and multi-group strategic planning for cooperative research endeavors over the next 5-10 years.

page x, para. 1
"...the southern sea otter population should be considered endangered if the average population size over a three year period ..."
Remark: Using spring or fall survey counts? We recommend the use of fall counts, as they more clearly represent the number of otters recruited into the population each year. Spring counts are inflated due to high pup counts (approximately 50% of the pups born each spring will die by the following fall). Also, are otters within the translocation zone (the experimental population) to be included? Otters at the Channel Islands are currently not included in the spring and fall survey totals.

page x, para. 2-3
Again, specify (and justify) choice of spring or fall survey counts to be used as part of the three-year running average.

page x, para. 3
Add that results of population health and mortality assessments will be prerequisites to delisting discussions.

page x, para. 4
Actions Needed (#1). *Continue to* monitor, as this is an ongoing activity.

page x, para. 4
Actions Needed (general). We feel #3 should become the #1 priority. Oil should remain as #2, ongoing monitoring should be #3.

page xi, last para.
"...delisting *discussions* under the ESA could *begin* by 1999."

I. INTRODUCTION

A. SYSTEMATICS

page 1, para. 1
"...the Service reconstituted..."
Remark: How about "reconvened" or "reestablished"?

B. ECOLOGY

page 2, para. 1
The discussion of historic and present range of the species and each subspecies would be greatly facilited by a map. Perhaps it should precede what is now Figure 1. Alternatively, Figure 1 could be reduced and used as an insert to the total range map.

"Total population size is unknown but probably exceeds 100,000 individuals"
Remark: Clarify "total" to make sure it is understood that this is inclusive of all three subspecies, if that is what is meant.

"Following near extinction *due to hunting* during the ..."

"In several areas p ·ulations are thought to be at or near eq. ·brium density"
Remark: It would ·e very helpful to have a map that indicates these areas.

Sec. 3. Food Habits.
page 4, para. 4
"Optimal Foraging Theory" needs a reference.

"Due to the reduction in invertebrates ... individual otters from several long-established populations in Alaska and Russia consume large quantities of fish.
Remark 1: This needs a reference.
Remark 2: How well described and defended is this cause and effect relationship? Our understanding was that otters in Alaska and Russia opportunistically caught and consumed some (not necessarily large) quantities of slow-moving fish, perhaps due in part to prey-switching when invertebrate food resources became limited. The taking of fish was not coincidental to the taking of preferred invertebrate prey (as implied here in the Recovery Plan), but a sequential consequence of food limitation and the need to exploit other food types. It has been hypothesized that fish-eating by southern sea otters is not yet seen to any great extent because a) southern sea otters are not food-limited, b) slow-moving species of fish are not as prevalent in the southern sea otter range, and/or c) sea otters are not yet pressed, through food limitation, into learning how to take fish.

Sec. 4. Reproduction.
page 5, last para, page 6, first para.
"The birth peak is seasonally asynchonous in some parts of central California."
Remark: This needs to be clarified. As written now, it appears that several or overlapping areas of "seasonal" asynchronicity would lead to difficulty in discerning any seasonal peaks, particularly given the relatively short California sea otter range.

Sec. 5. Mortality.
page 6, para. 2
"Despite this, causes of mortality and their effect on population characteristics ..."
Remark: So why is the Recovery Plan not substantively addressing this in calculations of population numbers required for delisting?

Sec. 6. Community Ecology
page 6, para. 4
Re: Work on food web relationships in British Columbia, Alaska, and Russia --
Remark: The USFWS should (at least conceptually within the Recovery Plan) acknowledge that similar soft-bottom community ecology studies in the area of the California sea otter southern-peripheral male group (near Pismo Beach, CA) could serve two very useful purposes: 1) provide current community ecology data from California, to be added to the comparative database, and 2) concurrent sampling of soft-bottom invertebrate prey could be used in studies of parasite vectors and contaminant loadings in common sea otter prey items.

C. REASONS FOR LISTING

page 7, para. 2
It needs to be recognized that the reasons for sea otter listing in 1977 acknowledged the primary threat of that time -- oil spills. This Recovery Plan, to be complete, should not look exclusively at what the Federal Register said in 1977, or what the Recovery Plan had as its charge in 1982. The current (1989) version of the Recovery Plan was requested in response to new information stemming from the *Exxon Valdez* spill. It must also be responsive to needs identified since 1989 (e.g., infectious disease, immune suppression), to avoid the need for another Recovery Plan before the beginning of delisting discussions.

Petroleum Development Problems

page 7, para. 5, point 2

"The expected number of otters that will die as a result of contact with oil following an oil spill is likely to be no less than 50 percent." "...this estimate is likely to be lower than actual losses (i.e., negatively biased)."

Remark 1: Needs to specify size of spill (>= 1000 bbl?).

Remark 2: Despite acknowledging this low estimate of kill, the Recovery Plan does not calculate recovery (delisting) numbers reflective of the admitted negative bias.

D. PAST AND ONGOING RECOVERY EFFORTS

Public Law 99-625

pg. 8, para. 3

"The size of the management zone cannot infringe upon habitat necessary for the recovery of the southern sea otter population."

Remark: It should be noted here for future reference by zonal management advocates that this same consideration may hold for Conservation Plans generated under the Marine Mammal Protection Act after sea otters are delisted under the ESA.

pg. 9, para. 2

" ... the continued translocation of juveniles was unlikely to result in the establishment of a colony."

Remark: Just because emigration rates of juveniles may have equalled emigration rates of adults does not mean that translocation of juveniles, given adequate time, cannot result in establishment of a colony. This statement needs to distinguish between issues of site fidelity (juveniles vs. adult) and time-scales for successful establishment of a resident and growing colony (using juvenile vs. adult pioneer stock).

pg. 9, para. 3

"... although some are suspected to 1) ..., or 2) have died."

Remark: It is not clear why these supposed dead (under #2) have not been included with the 11 known or suspected to be dead.

pg. 10, para. 1

"These animals were either captured, moved undetected ..."

Remark: Clarify that the otters moved, on their own, undetected -- as it reads now, it appears the USFWS containment efforts went undetected.

"Between 1990 and 1993, 14 sea otters ... were captured *from San Miguel Island* and relocated to the northern portion of the California mainland population."

E. SUMMARY OF THE PROBLEM AND BASIS FOR RECOVERY

pg. 11, para. 3

"Research associated with the translocation was designed i) to understand sea otter population dynamics, in particular growth-limiting factors ..."

Remark: This has been the greatest single shortfall of the translocation program. Each year since 1990, the USFWS has dropped further and further behind in its ability to lead the "management" of southern sea otters through dedicated coordination of research activities. When research efforts became part of the National Biological Service responsibility in 1992, the USFWS failed to coordinate any substantive strategic research and policy planning between the NBS and the USFWS. The impetus and beginnings of such a program came with the translocation, but were not sufficiently carried forward. Both this Recovery Plan and the movement toward ESA delisting discussions reflect the continuation and increase in problems inherent with not having a rigorous research and management program upon which to base management decisions.

pg. 12, para. 2
"The establishment of one or more sea otter colonies by translocation was proposed in the original plan because, at that time, the population was not growing and reasons for the lack of growth were unknown."
Remark: The Final Environmental Impact Statement clearly indicates that the reason for lack of population growth in the early-mid 1980s was known to be due to incidental catch in gill and trammel nets (pg. 4, FEIS Vol.1).

pg. 12, para. 4
"The translocation to San Nicolas Island to date has been less successful than originally hoped for ..."
Remark: At pg. 9, para. 1 of this document, it is noted in reference to other translocated populations that each of these translocated populations declined from 60-90% of their initial size in the year or two following release. The San Nicolas translocation results are consistent with this. What is inconsistent with previous experience is that the FEIS for the San Nicolas translocation expected the population to have had all of the San Nicolas habitat occupied within 5 years of translocation (pg. 4, FEIS Vol. 1). The more reasonable expectations now are that many years will be required before the population is large enough to be considered viable (pg. 12, para. 4); however, this does not negate the value of the translocation program in terms of providing additional range for additional numbers of otters. In fact, were the USFWS to adequately address the mortality and emigration issues still unresolved with San Nicolas, this population could be hoped to grow and contribute more substantially to the overall population numbers that the SSORT is advising be met.

pg. 13, para. 1
"Therefore, the strategy for recovering this population of sea otters is to increase the number of sea otters in California, such that following a major oil spill in Central California, the remaining number of otters will constitute a viable population."
Remark: Too much of this strategy is based on equivocal modeling, a drive to come up with a delisting "number", a disregard for the protection that can be afforded from expanded range in addition to expanded numbers (part of previous recovery plans but removed from consideration in this), and a disregard in recovery planning for threats other than oil spills, all in an overriding drive to derive an oil spill recovery/delisting "number". There is an unwarranted presumption that only 50% of sea otters will be killed by a major spill, and that there will therefore be some "refuge" left after a spill within the current geographic range of the southern sea otter. This Recovery Plan strategy supposes that all we need are enough animals to populate refuge portions of range, to act as "seed" for population regrowth after the spill.

However, the relatively straight California central coast does not offer substantial pocket refugia. Oil spill models can and do just as easily predict a 100% kill as a 50% kill. The non-negligible possibility of a 100% kill of otters along the central coast is not being addressed in this Recovery Plan.

pg. 14, para. 2
"In this case, the principal threat is from mortality caused by an oil spill."
Remark: This is true only when limiting the view of sea otter recovery to the problems envisioned in 1977.

pg. 15, para. 6
"The Service anticipates the southern sea otter population will reach a three-year running average of 2650 animals by the turn of the century."
Remark: Cite whether 1) using spring or fall survey counts, and 2) whether including San Nicolas Island, San Miguel Island, Purisima Point, or any other "extralimital" animals in total numbers counted as part of running average.

pg. 16, para. 7
DELISTED, UNDER ESA: "The southern sea otter population should be delisted under the ESA when the average population level over a three-year period exceeds 2650 animals, *and all population risks due to compromised health have been identified and redressed, and all other sources of human-caused mortality have been identified and redressed.*"

F. STRATEGY OF RECOVERY

pg. 17, para. 2
"The primary, but not only threat to the persistence of this population ...""... and significantly degrade the short-term quality of the otter's habitat ..."
Remark: Define "degrade" and "short-term". It would be important to reference the current work of Dr. David Jessup (California Office of Oil Spill Prevention and Response) and Dr. Jonna Mazet (U.C. Davis and the California Office of Oil Spill Prevention and Response), who are conducting multivariable and multigenerational studies of mink as models for sea otters impacted by oil spills. Their feeding of petroleum to mink (which mimics long-term residency of petroleum in sea otter prey items following a spill) and the resulting affects on mink reproductive behavior and success address concerns for sea otters that are broader than those chosen for consideration by the SSORT.

pg. 17, para. 3
"The Service believes range expansion of sea otters in California will occur *at least as* rapidly if the existing population is allowed to passively recover than it would under a recovery program that includes any new translocation of sea otters *to portions of their historic range that are currently unoccupied.*"

II. RECOVERY

pg. 18, para 1
"This delisting criterion is preliminary and may be revised on the basis of new information ..."
Remark: This needs to be emphasized much sooner and much more frequently within this document than it currently is, or the USFWS will be rightly accused of having misled the public (particularly industry) when delisting discussions begin. Some of the "new" information (particularly the infectious disease and immune suppression concerns) are known now, and the USFWS will not be able to claim in 1999 that they had no knowledge of these problems. The USFWS needs to make certain that in the time leading up to delisting discussions, the critical information on sea otter health assessments, contaminants, mortality, and status and trends of both the mainland and colony populations, have all been made and the results scientifically peer reviewed. This will require the USFWS to assume a proactive management position, and work actively to catalyze the necessary research through the NBS, universities, and other respected scientific channels.

- If the USFWS wants to make southern sea otter recovery under the ESA a *bona fide* success story, it will have to move from its current passive operational mode in which critical scientific research and related management decisions are delayed or avoided, and "lack of funds" offered as the explanation. We understand "lack of funds". The solution is not to stop work, but to engage in more collaborative (and hopefully transparent) joint research and management endeavors, prioritize research objectives, fund research projects according to their priority, and stick to each project until it can be documented

and defended as completed. The credibility of the USFWS will be subject to challenge early on in delisting discussions if research and management strategic planning leading to the delisting endpoint does not begin now. This Recovery Plan is the first and most appropriate place for the USFWS to restate their renewed commitment to research and management leadership.

B. NARRATIVE OUTLINE

Evaluate the causes of mortality of otters that strand on California beaches.

Pg. 20, para. 1, section B.12

"Because mortality has been identified as the general agent of depressed growth in the California sea otter population, the Service should continue this program through at least 1997."

Remark: We feel this program (or its equivalent) should continue until the anticipatedbeginning of delisting discussions, regardless of the year in which that occurs.

pg. 20, para. 2, section B.12

"The Service has received reports concerning poaching or vandalism of otters, however, the occurrence of such incidences is likely to be very low and unpredictable. Therefore, direct monitoring for this behavior is not warranted."

Remark: The Marine Mammal Protection Act requires the Department of Commerce (through the National Marine Fisheries Service) and the Department of the Interior (through the USFWS) to monitor commercial fisheries that are involved in incidental take from strategic stocks of marine mammals -- which include those that are listed as endangered or threatened under the Endangered Species Act. The takes of sea otters in crab pots or lobster traps may be unpredictable, but there is no certainty that they are low. Because of this, direct monitoring for this behavior is warranted. It is not the case, as has been asserted by some members of the SSORT, that the entire trap/pot fishery has to be monitored, or that the fishery needs to be closed in order to discern fisheries impacts on sea otter population growth. A subset of the fishery (perhaps 20-25%) needs to be under a direct reporting and observation program, similar to the program used in the 1980's and 1990's for coastal gill and trammel net observations. A voluntary written survey program cannot be used in lieu of a direct observation program, as past experience during the MMPA Interim Exemption shows that many fishermen will not provide reliable information. The direct observation program will also determine if fishermen are weighting and sinking sea otters drowned in traps and pots. To date, it is suspected that carcasses of otters drowned in traps and pots never make it to the mainland shore for recovery and determination of drowning. Another substantial hole in the data set is perpetuated by the lack of a beachwalk program along any of the Channel Islands, where carcasses of drowned otters not deliberately sunk are more likely to beach.

pg. 20, para. 2

"Where poaching is suspected, carcasses will be recovered and X-rayed to determine if an animal had been shot."

Remark 1: Suspected poaching will have to include mortality determinations beyond shootings. Drowned otters are difficult to recover and catagorize as drowned, so require special carcass analysis. Cut or dismembered otter carcasses need to be analyzed for natural vs. anthropogenic trauma source.

Remark 2: Most vandalized otters will not be recovered unless 1) the mainland sea otter carcass recovery and necropsy program is 2) coupled with Channel Island shoreline searches for carcasses and 3) direct observation of trap and pot fisheries near the islands. Of tremendous concern is that programs 2 and 3 have never been developed by the USFWS, and program 1 (a 20-year-old sea otter carcass recovery and necropsy program led by the California Department of Fish and Game) was eliminated on 1 July 1995. The SSORT and the USFWS need to address this very substantial problem within the Recovery Plan, and not dismiss it as "not warranted".

Prepare a report that summarizes the available information on tanker routes and operations (including relevant statutes, regulations, and enforcement programs), current level of risk of an oil spill, and means available to minimize risks.

pg. 20, para. 5, section B.211

Remark: This is already being done outside the USFWS. Based on the relatively little involvement the USFWS has had in the past on this issue, we see it as very unlikely that the USFWS will have the resources or actual intention of doing much more than they have already. It would be a much better expenditure of USFWS effort and limited financial resources to focus on issues that no other entity is giving adequate attention to -- namely, sea otter health assessments, mortality investigations, and related programs (fisheries observation, etc). Minimizing oil spill risk is most effectively accomplished by joining the Monterey Bay National Marine Sanctuary (Sanctuary and Reserves Division, NOAA) and the U.S. Coast Guard in securing for the Sanctuary a formal and enforceable "Area To Be Avoided".

Take actions identified in task 211 to minimize the risk of tanker accidents and other possible sources of oil spills.

pg. 21, para. 2, section B.212

Remark: It would be appropriate for the USFWS to review and comment on work underway by others. The USFWS must also commit to cooperating with other agencies in trying to establish for the Monterey Bay National Marine Sanctuary an "Area To Be Avoided" (or its enforceable equivalent) by the various large vessels transiting the central California coast. While traffic separation lanes can be one component of protecting coastal resources from a spill, it can be harder to manage and enforce than an ATBA. Traffic separation modifications should be considered for ingress/egress from San Francisco Bay.

Prepare a report on the location of oil spill containment, dispersant, and clean-up equipment, deployment strategies, and expected effectiveness in California.

pg. 22, para. 3, section B.222

Remark: Although the USFWS does not have a contingency plan in place, others do (the California office of Oil Spill Prevention and Response). The USFWS needs to become familiar with these plans through review, comment, and participation in drills.

"This information should be collated into one report with maps and directories. Deficiencies should be identified in an appendix."

Remark: All of these reports are being generated by the U.S. Coast Guard, the California OSPR office, and industry. The USCG is preparing summary reports through the Area Planning process. The USCG and the California OSPR office have done shortfall analyses. There is no need for the USFWS to duplicate this monumental task.

Prepare a field protocol for responding to an oil spill within the sea otter's range in California.

pg. 23, para. 2, section B.223

"The Service should develop a Sea Otter Oil Spill Contingency Plan that addresses the responsibilities and authorities of the U.S. Fish and Wildlife Service and the California Department of Fish and Game..."

Remark: This has been done from the perspective of the Department of Fish and Game (OSPR office). The USFWS needs to become more involved in the ongoing planning and determine what their role will be in *operation* of these existing contingency plans at the time of the spill.

Monitor the i. dental take of sea otters in commercial fisheries.
pg. 24, para. 2, section B.311
"The Service should continue to coordinate monitoring efforts with NMFS to ensure that otters in newly occupied range (such as near Pt. Purisima) are not compromised by fishing activity."
Remark: There is no longer a NMFS observer program in the southern part of the sea otter range with which the USFWS can cooperate. However, there is a pressing need to establish a jointly funded and operated (USFWS/NMFS/CDFG) fisheries observation program that could gather appropriate data from a subset of trap, pot, and gill and trammel net fisheries.

Prepare a report that evaluates the effectiveness of regulations on the use of gill and trammel nets in California waters over the last 10 years.
pg. 24, para. 3, section B.312
Remark: This would be a worthwhile project, particularly if coupled with a new effort to collect current incidental take data for the fisheries and fishing areas of concern.

Evaluate the potential for incidental take of otters in trap and pot fisheries.
pg. 25, para. 1, section B.313
"The Service has received reports that sea otters are occasionally drowned in lobster traps."
Remark: Frequent drownings may still only result in occasional observations of drownings. The two are not equivalent.

Page 25, para. 1
"To this end, the Service should contract for a survey of pot and trap fishermen ..."
Remark: Voluntary reporting by fishermen during the 5-year MMPA Interim Exemption was marked by a poor rate of survey return and incomplete or inaccurate data on those that were returned. Because of this, the 1994 MMPA insisted on direct observations of those fisheries that take or are suspected of taking marine mammals from strategic stocks. The USFWS should not duplicate the failures of voluntary reporting, but instead determine how to sample appropriate subsets of strategic fisheries.

"Additionally, the Service should analyze sea otter carcasses in areas where trap and pot fisheries occur for evidence of drowning."
Remark: The trap and pot fisheries of greatest concern occur around the Channel Islands, where there is not a dedicated sea otter carcass recovery program. The USFWS could serve a very useful purpose in seeing that a Channel Island salvage program gets established, for general information and in anticipation of analyzing carcasses for evidence of drowning in traps and pots.

"To devise mitigation measures, studies should be undertaken with captive sea otters to determine if and how otters get caught in traps and pots."
Remark: This is an intriguing idea, but we have concerns about how permits to institutions conducting such studies would be structured, the risks to the captive otters of entrapment and drowning during the experiments, and public and facility perception of use of captive otters for these sorts of studies. This type of work requires the USFWS (perhaps with the guidance of the SSORT) to develop a policy on captive sea otter holding, training, experimentation, and the corresponding permitting processes.

Prepare a series of recommendations on how sea otter mortality caused by fishery interactions could be reduced or eliminated.
pg. 25, para. 2, section B.314
This information will not be useful (the number of otters taken incidental or directly as a result of fisheries actions will be underestimated) unless the USFWS can spearhead a renewed fisheries observer program for key fisheries and areas.

Minimize intentional take of southern sea otters.
pg. 25, para. 3, section B.32
"Develop an approach to minimize intentional take of southern sea otters."
Remark: The California Department of Fish and Game contracted for development of a Marine Patrol Plan. The report was completed in June 1994 and approved by the CDFG. One of the very good recommendations included a mandatory requirement for commercial fishing vessels to carry transponders. Enforcement actions could then be targeted to fishing vessels and activities of concern. We do not know if the CDFG has moved to implement any of the approved recommendations. This may be of value to the USFWS when evaluating fisheries observation and enforcement needs, and may open another door to USFWS/CDFG cooperation.

The USFWS should also begin to work closely with the CDFG and the Monterey Bay National Marine Sanctuary (MBNMS) on enforcement. The MBNMS Foundation has received financial contributions that will allow for purchase of boats and CDFG enforcement personnel time. If the USFWS cooperates with these agencies in planning for the increased enforcement activities within the boundaries of the MBNMS, monitoring of incidental take of marine mammals (including sea otters) by fisheries could legitimately and easily be incorporated, at very little additional expense to the USFWS.

Evaluate assumptions used to estimate the population level at which southern sea otters could be considered recovered under the ESA.
pg. 25, para. 4, section B.4
"Criteria for delisting under the ESA are concerned with the probability of an oil spill reducing the sea otter population to a level where the probability of extinction is non-negligible."
Remark: You mean "negligible" or "not significant" or "to a level approaching zero", and not "non-negligible", right? "Non-negligible" indicates "of significance".

Evaluate differences in life history parameters for sea otter populations throughout the north Pacific.
pg. 26, para. 3, section B.41
"The following parameters should be *measured or* estimated for several populations of sea otters:..."

Determine concentrations and possible effects of disease, stress, toxic trace elements and organochlorines on sea otters.
pg. 27, para. 4, section B.42
"PCB's in liver tissues of California sea otters were in higher concentrations than those associated with reproductive failure in mink."
Remark: Risebrough (1989) noted in this same paper his impression that the higher body burdens of contaminants carried by sea otters did not seem to result in reproductive failure. His question at the time, and the one that still needs to be investigated, is why do sea otters apparently differ from their cousins (mink and river otters) in susceptibility to contaminant burdens? Preceding the answering of that question should be more research that reinvestigates whether reproductive *suppression* in sea otters is related to contaminant burdens; perhaps Risebrough just did not pick this up with the types of samples, sample sizes, or study animals he investigated. In addition, studies should determine whether particular types or load levels of contaminants impair sea otter immune suppression systems. If so, then this may help account for increased mortality rates (and population growth suppression) documented for the southern sea otter.

Archive tissues om California sea otters for future analysis of environmental contaminants.
pg. 28, para. 2, section B.421
"Although the use of some of these compounds is currently banned in the U.S., they are being used in increasing amounts elsewhere in the world."
Remark 1: Even though these compounds have been banned in the U.S., residuals of historic deposits are being re-exposed as farmlands erode. This has been the case and the concern with the Elkhorn Slough area of the sea otter range, and may be true for other river mouths draining agricultural areas as well. So, current sources are not restricted to those from foreign countries.
Remark 2: Concerning foreign sources, it should be noted that dispersal mechanisms include airborne drift from Baja California, and from ocean-current borne compounds depositing along the central coast.
Remark 3: It should be emphasized that archiving tissues for future analyses is not intended to take the place of analyses to be done at the time of the *original* tissue collection. The samples are divided, and a portion reserved for future studies.

"The literature is replete with examples of erroneous differences in various parameters due to handling and analytical techniques. Therefore, a standard protocol should be followed by all investigators ..."
Remark: Will the USFWS and NBS take the lead in seeing this standard protocol developed?

Determine contaminant levels in sea otter prey, and in other components of the coastal food web and ecosystem.
pg. 29, para. 2, section B.423
"...it is important to know whether the contaminants are being obtained from some particular prey type, or whether prey types exist that could expose sea otters to high levels of contaminants if a switch in diet were to occur. These analyses should be done at San Nicolas Island."
Remark: It is important to do some of this work at San Nicolas Island, but to include other areas as well. It would be particularly useful to conduct similar studies within the mainland sea otter range, particularly with soft-bottom prey species that dominate the habitat at the ends of the sea otter range. Contaminants, diseases and parasites borne by soft-bottom invertebrates may hold the answer to lack of sea otter range expansion and low population growth.

- **Task 423 is not listed (or funding estimated) within the Implementation Plan (pages 34-36). This is an important (and expensive) task, and cannot be overlooked within the final SSORP.**

Analyze tissues for evidence of stress or disease.
pg. 30, para. 1
"At least 5 years of study will be needed to obtain adequate sample sizes."
Remark: We feel the necropsy program should be extended to whenever delisting discussions begin, regardless of the year in which that occurs. We feel delisting will hinge on the availability and reliability of pertinent necropsy results. The program certainly needs to be expanded not only in years, but in scope. This additional scope would address the etiology of infectious disease and immune suppression, look at more than just the freshest carcasses, and look at carcasses retrieved from a new Channel Islands carcass recovery effort.

- While the participants in the necropsy program may change as the National Wildlife Health Service shifts its focus elsewhere, the research database that they have developed should have its critical elements evaluated and maintained by researchers and veterinary pathologists working with the State's OSPR program, U.C. Davis, and other relevant

research participan . Significant financial and advisory ass. ance should be committed to this program by the USFWS.

Evaluate the potential for habitat related differences in growth rates between populations of sea otters.
pg. 30, para. 3, section B, 43
"The assumption that otters in central California are at maximal levels relative to what the environment will support and that these densities are representative of maximal levels throughout central and northern California is critical in predicting rates of recovery."
Remark: The way this is stated, it assumes that otters already are at their maximal levels. This assumption needs greater field testing through direct observation of activity patterns of otters if it is going to be taken as true. Activity patterns of otters are highly variable by age, sex, reproductive condition, and time of day. This statement needs to be clarified to indicate that the activity pattern information will be gathered and verified, and then the carrying capacity figures verified.

- If sea otters within their current range become food-limited as a result of human overharvest of shellfish, or as a result of contamination of the food supply, then recovery levels sufficient for ESA delisting, and ongoing population stability, cannot be assured.

SUMMARY COMMENTS

1. While actions to mitigate oil spill threats obviously need to continue, there now needs to be additional research devoted to answering questions about sea otter:

   a) infectious disease, contaminants and parasite burdens,
   b) vectors for disease, parasites and toxins
   c) impact of a) and b) on sea otter life history parameters.

   - A multiplier (perhaps included as a more conservative recalculation of the effective population size) needs to be developed by the USFWS that gives additional protection to the population while the above health and mortality issues are researched and resolved.

2. Within the Recovery Plan, there needs to be clear, early, and repeated assertions that ESA delisting discussions require as a prerequisite not only a certain sea otter population level, but assurances that health and mortality concerns have been fully addressed by research and redressed by management.

3. The USFWS needs to accept the lead in conducting strategic planning for research and management that will lead us into the next century with understandable management policy development and defensible research data as pre-delisting goals. This Recovery Plan sets out a number of tasks for USFWS accomplishment. However, given past history and projected agency budget shortfalls, it will not be possible for the USFWS to meet these research and management challenges unless greater high-level USFWS support for this work can be attained.

4. The USFWS needs to approach the San Nicolas translocation program with a rededicated effort directed at answering remaining questions regarding mortality and emigration. This would include, among other tasks:

   a) Development of a fisheries observation program for the trap and pot fisheries in the Channel Islands, and

   b) Beach walks at the Channel Islands to search for sea otter carcasses.

5. The USFWS (perhaps with ongoing assistance from the SSORT) needs to develop a policy on captive breeding and rehabilitation of sea otters. In the event a major spill eliminates the wild population, "broodstock" for repopulation using the California subspecies will only be found in aquaria. However, California sea otters do not yet breed well in captivity, and techniques and issues surrounding introduction of captive-bread and raised pups back to the wild are still highly problemmatic. This issue requires appropriate research and policy discussion.

WITHIN THE IMPLEMENTATION PLAN TO THE FINAL VERSION OF THIS RECOVERY PLAN, THERE NEEDS TO BE:

1. Not just an acknowledgement of pending and future research needs, but an <u>actual plan and mechanism</u> for seeing research programs implemented over the next 5-10 years.

2. Commitment of the USFWS to supporting development of at least <u>one</u> tangible and significant oil spill prevention strategy (such as development of an Area To Be Avoided around the Monterey Bay National Marine Sanctuary).

3. Provision for research, management, and planning funds that are earmarked by the Service and used exclusively for addressing research and policy needs identified as part of strategic planning and the Implementation Plan.

4. Probably most important, an acknowledgement that although a Recovery Plan can be approved by the USWS while still insufficient or inadequate, it is not prudent management practice to do so. Whether the goal of the Plan is simply sea otter recovery, or whether it is more specifically recovery for the purpose of delisting under the ESA, the same questions of sea otter health, protection from decimation by an oil spill, protection from incidental take in fisheries, and all other categories of threeat listed within the ESA remain. Delisting under the ESA will not occur successfully, and will be successfully challenged legally, if these concerns have not been addressed.

As the Recovery Plan and it Implementation Plan moves from draft to final, these steps can and should be incorporated if the USFWS is to meet its practical and legal management obligations.

A progressive program by the USFWS can address these concerns at the same time it stengthens the importance of protecting, managing and recovering an ESA-listed species that is also a keystone predator, an indicator of ecosystem health, an indicator of how we will assure the protection of marine biodiversity, and a charismatic player in human multiple-use conflicts.

— End of comments —

FRIENDS OF THE
SEA OTTER

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14 April 1995

Mr. Michael Spear
Director, Region 1
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Portland, OR 97232-4181

Dear Mr. Spear,

Following are the comments of Friends of the Sea Otter (FSO) on the Southern Sea Otter (Revised) Recovery Plan submitted to the U.S. Fish and Wildlife Service (USFWS) by the Southern Sea Otter Recovery Team (SSORT). We appreciate the opportunity to make early comments on this version of the Recovery Plan, and hope our concerns expressed here will be useful in framing the next few years of recovery effort on behalf of the southern sea otter.

You will see that our principal concerns have to do with the too-narrow focus of this Recovery Plan. The emphasis on calculating the number of sea otters needed to provide a margin of safety following a major oil spill downplays or ignores several other important considerations that need to be comprehensively addressed before ESA delisting discussions can begin. FSO feels that :

1) A 100% kill from an oil spill needs to be anticipated and used in calculating the minimum sea otter population size needed for delisting.

2) A multiplier needs to be developed by the SSORT that gives additional protection to the population while health and mortality issues are researched and resolved.

3) The priority of future research needs to be shifted from modeling the impact of oil spills, and devoted instead to answering questions about sea otter:
   a) infectious disease, contaminants and parasite burdens,
   b) vectors for disease, parasites and toxins
   c) impact of a) and b) on sea otter life history parameters.

4) Within the Recovery Plan, there needs to be clear, early, and repeated assertions that ESA delisting discussions require as a prerequisite not only a certain sea otter population level, but assurances that health and mortality concerns have been fully addressed by research and redressed by management.

5) The USFWS needs to accept the lead in conducting strategic planning for research and management that will lead us into the next century with understandable management policy development and defensible research data as pre-delisting goals. This Recovery Plan sets out a number of tasks for USFWS accomplishment. However, given past history and projected agency budget shortfalls, it will not be possible for the USFWS to meet these research and management challenges unless high-level USFWS support for this work can be attained.

6) The USFWS needs to approach the San Nicolas translocation program with a rededicated effort directed at answering remaining questions regarding mortality and emigration. This would include, among other tasks:
   a) Development of a fisheries observation program for the trap and pot fisheries in the Channel Islands, and
   b) Beach walks at the Channel Islands to search for sea otter carcasses.

7) The USFWS (perhaps with ongoing assistance from the SSORT) needs to develop a policy on captive breeding and rehabilitation of sea otters.

A progressive program by the USFWS can address these concerns at the same time it strengthens the importance of protecting, managing and recovering an ESA-listed species that is also a keystone predator, an indicator of ecosystem health, an indicator of how we will assure the protection of marine biodiversity, and a charismatic player in human multiple-use conflicts.

Detailed comments are listed using page-by-page reference to the Recovery Plan:

Disclaimer page

(pg. vi)
The sentence, "Objectives will be attained and any necessary funds made available subject to budgetary and other constraints affecting the parties involved, as well as the need to address other priorities" leaves a sizeable loophole in recovery planning. Work on southern sea otter recovery has come to a virtual standstill over the past few years; currently there are no plans by the USFWS to dedicate any personnel in FY 95-96 to sea otter issues. There are additional concerns that the discretionary monies dedicated in the past to recovery actions may be redirected to maintaining personnel positions in the face of fiscal cutbacks. Recognizing that the USFWS needs to prioritize limited funds, but that recovery dollars and efforts need to be both defended and defensible, we suggest that the USFWS prioritize the list of research and recovery tasks outlined in this document, and include a statement in the disclaimer section that indicates that recovery objectives will be addressed on this priority basis.

Preface

(pg. viii, para. 1)
The Southern Sea Otter Recovery Team (SSORT) states that the oil spill contract data "are equivocal", and that the resultant course of action will use as its standard a "preponderance of evidence". This form of predictive (and equivocal) science seems to take on increasing authority as the Recovery Plan proceeds -- perhaps even more than oil spill modelers Ford and Bonnell are comfortable with. We understand that the SSORT has been directed to find a definite number to offer as a delisting standand, but feel that the number eventually derived by them does not adequately reflect its equivocal roots. Because the models are equivocal, recovery planning should take the most conservative approach and reflect a 100% kill from an oil spill.

(pg. viii. para 2)
Because the "likelihood of otters persisting in California is currently determined primarily by whether a major oil spill occurs" does not mean that other factors are not equally as important. Sea otter listing as threatened (1977) and the first Recovery Plan (1982) reflect the dominant concerns of the time (oil spills). However, oil spill concerns have since 1990 been subject to active contingency planning and evaluation by the U.S. Coast Guard, the state of California, industry, and private organizations. Although the threat has not substantially diminished, it is being addressed by others outside the Recovery Team and the USFWS. It is appropriate that the Recovery Team look at the numbers of sea otter needed for delisting in light of the oil spill threat. However, sea otter head counts alone will not lead to an adequate population base for delisting discussions and decisions. Issues of sea otter health surfaced in 1993, is the current substantive and problemmatic issue, and will confound delisting discussions unless a forward-thinking research effort is directed at it in the very near future. It is in delineating the source of these health problems that the USFWS and the Recovery Team can play a role suitable to contemporary issues not yet fully addressed by other agencies or entities.

Therefore, at each place in this document where "primary" concern with major oil spills is noted, it needs to be mentioned that this is not the exclusive concern.

(pg. viii, para.3)
re: "... delisting under the ESA will occur." Delisting discussions may begin at this point, but will not be productive unless the USFWS has first fully assessed the health of otters in the southern sea otter population.

Executive Summary

(pg. x, para. 1)
Population growth rate is reported here as 5-7% per year, while elsewhere a rate of 5% is used. Although the 5% is correct, some mention needs to be made of why it, rather than some other number, was adopted for use.

Mention also needs to be made that group of 17 individuals at San Nicolas Island includes pups.

Last line: "Oil spills, which could occur at any time, could decimate this population."
Remark: Then why do recovery numbers not support an allowance for "decimation" with calculations for a 100% kill?

(pg. x, para. 2)
Do you mean "more than 100m" ?

(pg. x, para 3)
"Since the early 1970s, this population has ranged in size ..."
Remark: "ranged" implies pronounced and frequent swings. We recommend you use the phrasing on pg. 2 para. 2 -- "... the California population increased from several hundered animals in the late 1930s ...., declined to a minimum of ...., and then increased ..."

(pg. x, para. 3)
"The depressed population growth rate of the southern sea otter is largely due to elevated mortality as opposed to reproductive depression or emigration. The cause or causes of this mortality are unclear."
Remark: Although this revised Recovery Plan outlines concerns over mortality, all the references to ESA delisting only reflect the SSORT's charge to address the oil spill threat. Delisting discussions need to be based upon, and preceded by, the acquisition of sufficient and defensible data on both the oil spill threat and sea otter health.

(pg. x, para. 4)
"If the currently observed rate of population growth continues, the southern sea otter could be delisted under the ESA by 1999."
Remark: This will be the case only if sea otter population health concerns and causes of mortality are not addressed.

(pg. xi, para. 1)
"The southern sea otter population should be considered endangered under the ESA if the population declines to a level less than or equal to 1850 animals."
Remark: Again, this deals with a head count only, and does not include health assessments. Health/mortality concerns should be addressed by having the SSORT derive another multiplier, and that multiplier used to bump up the sea otter population numbers needed for delisting discussions to begin. This offers the sea otter population some additional protection while the health issues are being investigated and resolved.

"...the southern sea otter population should be considered endangered if the average population size over a three year period ..."
Remark: Using spring or fall survey counts? We recommend the use of fall counts, as they more clearly represent the number of otters recruited into the population each year. Spring counts are inflated due to high pup counts (approximately 50% of the pups born each spring will die by the following fall). Also, are otters within the translocation zone to be included? Otters at the Channel Islands are currently not included in the spring and fall survey totals.

(pg. xi, para. 2-3)
Again, specify (and justify) choice of spring or fall survey counts to be used as part of the three-year running average.

(pg. xi, para. 3)
Add that results of population health and mortality assessments will be prerequisites to delisting discussions.

(pg. xi, para. 4)
Actions Needed (#1).
Continue to monitor, as this is an ongoing activity.

(pg. xi, para. 4)
Actions Needed (general).
We feel #3 should become the #1 priority. Oil should remain as #2, ongoing monitoring should be #3.

(pg. xii, last para.)
"...delisting discussions under the ESA could begin by 1999."

Table of contents

(page xiii, section II.B.11)
"Continue to monitor abundance and distribution"

(pg. xiii, section II.B.12.)
"Continue to evaluate causes of mortality..."

(pg. xiii, section II.B.211.)
"Prepare a report on tanker routes..."
Remark: This has already been done outside the USFWS. There is no purpose to preparing another report. We suggest the USFWS change "prepare" to "review".

(pg. xiii, section II.B.212.)
"Take actions to minimize oil spill threats..."
Remark: The USFWS has not been very active to date on this issue. What will or can the USFWS expect to do directly in terms of "take action"? Is "Review actions" a more appropriate way to portray expected USFWS activity on this issue?

(pg. xiii, section II.B.222.)
"Prepare a report on the location of oil spill response equipment..."
Remark 1: Add "in California" after "location"
Remark 2: These data are being compiled and summarized as part of the U.S. Coast Guard Area Contingency Planning process, and as part of state efforts. It is therefore more appropriate to phrase the expected USFWS activity as "Review and comment on existing reports..."

(pg. xiii, section II.B.223.)
A field protocol has been prepared by the state. What is needed is a directed effort by the USFWS to review and comment.

(pg. xiii, section II.B.311)
"Monitor incidental take" is misleading because there are no current monitoring programs. Would it be more appropriate and accurate to phrase this as "Evaluate need for programs to monitor incidental take"?

(pg. xiii, section II.B.313)
"Evaluate potential for incidental take in trap/pot fisheries"...
Remark: And then what? Based on the results of this evaluation and the need for renewal of an fisheries observer program, it would be appropriate for the USFWS to take the lead in coordinating a jointly (USFWS/NMFW/CDFG) operated and funded observation program. We would like this to be addressed in the Recovery Plan, with the topic isolated under its own subheading in the Table of Contents.

(pg. xv, section II.B.425)
Emphasis on contaminants must expand to include other potential or probable links to mortality. These should include, at a minimum, 1) etiology of infectious disease transmissions and their relative contributions, if any, to immune suppression, 2)

historic, present, and future roles of sea otter invertebrate prey as intermediate parasite hosts, and 3) contribution, if any, of various petroleum and petroleum diluent products to sea otter nervous or reproductive systems, and their corresponding contributions to sea otter immune suppression.

Introduction

(pg. 1, para. 1)
"...the Service reconstituted..."
Remark: How about "reconvened" or "reestablished"?

(pg. 2, para. 1)
The discussion of historic and present range of the species and each subspecies would be greatly facilited by a map.

"Total population size is unknown but probably exceeds 100,000 individuals"
Remark: Clarify "total" to make sure it is understood that this is inclusive of all three subspecies, if that is what is meant.

"Following near extinction due to hunting during the ..."

"In several areas populations are thought to be at or near equilibrium density"
Remark: It would be very helpful to have a map that indicates these areas.

(pg. 3, para. 1)
"Optimal Foraging Theory" needs a reference

"Due to the reduction in invertebrates ... individual otters from several long-established populations in Alaska and Russia consume large quantities of fish."
Remark 1: This needs a reference.
Remark 2: How well described and defended is this cause and effect relationship? Our understanding was that otters in Alaska and Russia opportunistically caught and consumed some (not necessarily large) quantities of slow-moving fish, perhaps due in part to prey-switching when invertebrate food resources became limited. The taking of fish was not coincidental to the taking of preferred invertebrate prey (as implied here in the Recovery Plan), but a sequential consequence of food limitation and the need to exploit other food types. It has been hypothesized that fish-eating by southern sea otters is not yet seen to any great extent because a) southern sea otters are not food-limited, b) slow-moving species of fish are not as prevalent in the southern sea otter range, and/or c) sea otter are not yet pressed, through food limitation, into learning how to take fish.

(pg. 4)
What will this figure be? If it was intended to be a range map, it needs to sit closer to pg. 2.

(pg. 5, last para.)
"The birth peak is seasonally asynchonous in some parts of central California."
Remark: This needs to be clarified. As written now, it appears that several or overlapping areas of "seasonal" asynchronicity would lead to difficulty in discerning any seasonal peaks, particularly given the relatively short California sea otter range.

(pg. 6, para. 1)
"Despite this, causes of mortality and their effect on population characteristics ... "
Remark: So why is the Recovery Plan not substantively addressing this in calculations of population numbers required for delisting?

(pg. 6, para. 2)
Re: Work on food web relationships in British Columbia, Alaska, and Russia --
Remark: The USFWS should (at least conceptually within the Recovery Plan) acknowledge that similar soft-bottom community ecology studies in the area of the California sea otter southern-peripheral male group (near Pismo Beach, CA) could serve two very useful purposes: 1) provide current community ecology data from California, to be added to the comparative database, and 2) concurrent sampling of soft-bottom invertebrate prey could be used in studies of parasite vectors and contaminant loadings in common sea otter prey items.

(pg. 6, para 3)
It needs to be recognized that the reasons for sea otter listing in 1977 acknowledged the primary threat of that time -- oil spills. This Recovery Plan, to be complete, should not look exclusively at what the Federal Register said in 1977, or what the Recovery Plan had as its charge in 1982. The current (1989) version of the Recovery Plan was requested in response to new information stemming from the *Exxon Valdez* spill. It must **also** be responsive to needs identified since 1989 (e.g., infectious disease, immune suppression), to avoid the need for another Recovery Plan before the beginning of delisting discussions.

(pg. 7, para. 3, point 2)
"The expected number of otters that will die as a result of contact with oil following an oil spill ..." Needs to specify size of spill (>= 1000 bbl?).

(pg. 8, para. 2)
"The size of the management zone cannot infringe upon habitat necessary for the recovery of the southern sea otter population."
Remark: It should be noted here for future reference by zonal management advocates that this same consideration will hold for Conservation Plans generated under the Marine Mammal Protection Act after sea otters are delisted under the ESA.

(pg. 9, para. 1)
" ... the continued translocation of juveniles was unlikely to result in the establishment of a colony."
Remark: Just because emigration rates of juveniles may have equalled emigration rates of adults does not mean that translocation of juveniles, given adequate time, cannot establish a colony. This statement needs to distinguish between issues of site fidelity (juveniles vs. adult) and time-scales for successful establishment of a resident and growing colony (using juvenile vs. adult "pioneer" stock).

(pg. 9, para. 2)
"... although some are suspected to 1) ..., or 2) have died."
Remark: It is not clear why these supposed dead (under #2) have not been included with the 11 known or suspected to be dead.

(pg. 9, para. 3)
"These animals were either captured, moved undetected ..."
Remark: Clarify that the otters moved, on their own, undetected -- as it reads now, it appears the USFWS containment efforts went undetected.

"Between 1990 and 1993, 14 sea otters ... were captured from San Miguel Island and relocated to the northern portion of the California mainland population.

(pg. 11, para. 2)
"Research associated with the translocation was designed i) to understand sea otter population dynamics, in particular growth-limiting factors ..."
Remark: This has been the greatest single shortfall of the translocation program. Each year since 1990, the USFWS has dropped further and further behind in its ability to lead the "management" of southern sea otters through dedicated coordination of research activities. When research efforts became part of the National Biological Service responsibility in 1992, the USFWS failed to coordinate any substantive strategic research and policy planning between the NBS and the USFWS. The impetus and beginnings of such a program came with the translocation, but were not sufficiently carried forward. This Recovery Plan and the movement toward ESA delisting discussions both reflect the amplification of problems inherent with not having a rigorous research and management program upon which to base management decisions.

(pg. 11, para. 4)
"The establishment of one or more sea otter colonies by translocation was proposed in the original plan because, at that time, the population was not growing and reasons for the lack of growth were unknown."
Remark: The Final Environmental Impact Statement clearly indicates that the reason for lack of population growth in the early-mid 1980's was known to be due to incidental catch in gill and trammel nets (pg. 4, FEIS Vol.1).

(pg. 12, para. 3)
"The translocation to San Nicolas Island to date has been less successful than originally hoped for ..."
Remark: At pg. 8, para. 3 of this document, it is noted in reference to other translocated populations that "each of these translocated populations declined from 60-90% of their initial size in the year or two following release." The San Nicolas translocation results are consistent with this. What is inconsistent with previous experience is that the FEIS for the San Nicolas translocation expected the population to have had all of the San Nicolas habitat occupied within 5 years of translocation (pg. 4, FEIS Vol. 1). It is now recognized as true that "many years will be required before the population is large enough to be considered viable" (pg. 12, para. 3), but that does not diminish the value of the translocation program in terms of providing additional range for additional numbers of otters. In fact, were the USFWS to adequately address the mortality and emigration issues still unresolved with San Nicolas, this population could be hoped to grow and contribute more substantially to the overall population numbers that the SSORT is advising be met.

(pg. 12, para. 4)
"Therefore, the strategy for recovering this population of sea otters is to increase the number of sea otters in California, such that following a major oil spill in Central California, the remaining number of otters will constitute a viable population."

Remark 1: Too much of this strategy is based on equivocal modeling, a drive to come up with a delisting "number", a disregard for the protection that can be afforded from expanded range in addition to expanded numbers (part of previous recovery plans but ignored in this), and a disregard in recovery planning for threats other than oil spills, all in an overriding drive to derive an oil spill recovery/delisting "number".

There is an unwarranted presumption that only 50% of sea otters will be killed by a major spill, and that there will therefore be some "refuge" left after a spill within the current geographic range of the southern sea otter. This Recovery Plan strategy supposes that all we need are enough animals to populate refuge portions of range, to act as "seed" for population regrowth after the spill. However, the relatively straight California central coast does not offer substantial pocket refugia. Oil spill models can and do just as easily predict a 100% kill as a 50% kill. The non-negligible possibility of a 100% kill of otters along the central coast is not being addressed in this Recovery Plan.

(pg. 13, para. 3)
"In this case, the principal threat is from mortality caused by an oil spill."
Remark: This is true only when limiting the view of sea otter recovery to the problems envisioned in 1977.

(pg. 15, para. 5)
"The Service anticipates the southern sea otter population will reach a three-year running average of 2650 animals by the turn of the century."
Remark: Cite whether 1) using spring or fall survey counts, and 2) whether including San Nicolas Island, San Miguel Island, Purisima Point, or any other "extralimital" animals in total numbers counted as part of running average.

(pg. 16, para. 4)
Delisted, Under ESA: The southern sea otter population should be delisted under the ESA when the average population level over a three-year period exceeds 2650.0 animals, all population risks due to compromised health have been identified and remedied, and all other sources of human-caused mortality have been identified and remedied.

(pg. 17, para. 1)
"The primary, but not only, threat to the persistence of this population ..."

"... and significantly degrade the short-term quality of the otter's habitat ..."
Remark: Define "degrade" and "short-term". It would be important to reference the current work of Dr. David Jessup (California office of Oil Spill Prevention and Response) and Dr. Jonna Mazet (U.C. Davis and the California office of Oil Spill Prevention and Response), who are conducting multivariable and multigenerational studies of mink as models for sea otters impacted by oil spills. Their feeding of petroleum to mink (which mimics long-term residency of petroleum in sea otter prey items following a spill) and the resulting affects on mink reproductive behavior and success address concerns for sea otters that are broader than those chosen for consideration by the SSORT.

(pg. 17, para. 2)
"The Service believes range expansion of sea otters in California will occur at least as rapidly if the existing population is allowed to passively recover than it would under a recovery program that includes any new translocation of sea otters to portions of their historic range that are currently unoccupied."

Recovery

(pg. 17, para 3)
"This delisting criterion is preliminary and may be revised on the basis of new information ..."
Remark: This needs to be emphasized much sooner and much more frequently within this document than it currently is, or the USFWS will be rightly accused of having misled the public (particularly industry) when delisting discussions begin. Some of the "new" information (particularly the infectious disease and immune suppression concerns) are known now, and the USFWS will not be able to claim in 1999 that they had no knowledge of these problems. The USFWS needs to make certain that in the time leading up to delisting discussions, the critical information on sea otter health assessments, contaminants, mortality, and status and trends of both the mainland and colony populations, have all been made and the results scientifically peer reviewed. This will require the USFWS to assume a proactive management position, and work actively to catalyze the necessary research through the NBS, universities, and other respected scientific channels. If the USFWS wants to make southern sea otter recovery under the ESA a *bona fide* success story, it will have to move from its current passive operational mode in which critical scientific research and related management decisions are delayed or avoided, and "lack of funds" offered as the explanation. We understand "lack of funds". The solution is not to stop work, but to engage in more collaborative (and hopefully transparent) joint research and management endeavors, prioritize research objectives, fund research projects according to their priority, and stick to each project until it can be documented and defended as completed. The credibility of the USFWS will be subject to challenge early on in delisting discussions if research and management strategic planning leading to the delisting endpoint does not begin now. This Recovery Plan is the first and most appropriate place for the USFWS to restate their renewed commitment to research and management leadership.

(Pg. 20, para. 2, section B.12)
"Because mortality has been identified as the general agent of depressed growth in the California sea otter population, the Service should continue this program through at least 1997."
Remark: We feel this program should continue at least until 1999 and the anticipated beginning of delisting discussions.

(pg. 20, para. 3, section B.12)
"The Service has received reports concerning poaching or vandalism of otters, however, the occurrence of such incidences is likely to be very low and unpredictable. Therefore, direct monitoring for this behavior is not warranted."
Remark: The Marine Mammal Protection Act requires the Department of Commerce (through the National Marine Fisheries Service) and the Department of the Interior (through the USFWS) to monitor commercial fisheries that are involved in incidental take from strategic stocks of marine mammals -- which include those that are listed as endangered or threatened under the Endangered Species Act. The takes of sea otters in

crab pots or lobster traps may be unpredictable, but there is no certainty that they are low. Because of this, direct monitoring for this behavior is warranted. It is not the case, as has been asserted by some members of the SSORT, that the entire trap/pot fishery has to be monitored, or that the fishery needs to be closed in order to discern fisheries impacts on sea otter population growth. A subset of the fishery (perhaps 20-25%) needs to be under a direct reporting and observation program, similar to the program used in the 1980's and 1990's for coastal gill and trammel net observations. A voluntary written survey program cannot be used in lieu of a direct observation program, as past experience during the MMPA Interim Exemption shows that fishermen will not provide reliable information. The direct observation program will also determine if fishermen are weighting and sinking sea otters drowned in traps and pots. To date, it is suspected that carcasses of otters drowned in traps and pots never make it to the mainland shore for recovery and determination of drowning. Another substantial hole in the data set is perpetuated by the lack of a beachwalk program along any of the Channel Islands, where carcasses of drowned otters not deliberately sunk are more likely to beach.

(pg. 21, para. 1)
"Where poaching is suspected, carcasses will be recovered and X-rayed to determine if an animal had been shot."
Remark 1: Suspected poaching will have to include mortality determinations beyond shootings. Drowned otters are difficult to recover and catagorize as drowned, so require special carcass analysis. Cut or dismembered otter carcasses need to be analyzed for natural vs. anthropogenic trauma source.
Remark 2: Most vandalized otters will not be recovered unless 1) the mainland sea otter carcass recovery and necropsy program is 2) coupled with Channel Island shoreline searches for carcasses and 3) direct observation of trap and pot fisheries near the islands. Of tremendous concern is that programs 2 and 3 have never been developed by the USFWS, and program 1 (a 20-year-old sea otter carcass recovery and necropsy program lead by the California Department of Fish and Game) is slated for abandonment on 1 July 1995. The SSORT and the USFWS need to address this very substantial problem within the Recovery Plan, and not dismiss it as "not warranted".

(pg. 21, para. 4, section 211)
"Prepare a report that summarizes the available information on tanker routes and operations ..."
Remark: This is already being done outside the USFWS. Based on the relatively little involvement the USFWS has had in the recent past on this issue, we see it as very unlikely that the USFWS will have the resources or actual intention of doing much more than they have already. It would be a much better extension of USFWS effort and limited financial resources to focus on issues that no other entity is giving adequate attention to -- namely, sea otter health assessments, mortality investigations, and related programs (fisheries observation, etc).

(pg. 22, para. 2, section 212)
"Take actions identified in task 211 ..."
Remark: It would probably be sufficient for the USFWS to review and comment on work underway by others. Review and comment would represent an increase in USFWS involvement to date. A level of participation beyond this requires more resources than the USFWS probably has to available to offer.

(pg. 22, para. 3, section 222)
"Implement an oil spill contingency plan that includes a sea otter response plan."
Remark: Although the USFWS does not have a contingency plan in place, others do (the California office of Oil Spill Prevention and Response). The USFWS needs to become familiar with these plans through review, comment, and drills.

(pg. 23, para. 2, section 222)
"Prepare a report on the location of oil spill containment, dispersant, and clean-up equipment..." "This information should be collated into one report with maps and directories. Deficiencies should be identified in an appendix."
Remark: All of these reports are being generated by the U.S. Coast Guard, the California OSPR office, and industry. The USCG is preparing summary reports through the Area Planning process. The USCG and the California OSPR office are doing shortfall analyses. There is no need for the USFWS to duplicate this monumental task.

(pg. 23, para. 3, section 223)
"The Service sould develop a Sea Otter Oil Spill contingency Plan that addresses the responsibilities and authorities of the U.S. Fish and Wildlife Service and the California Department of Fish and Game..."
Remark: This has been done from the perspective of the Department of Fish and Game (OSPR office). The USFWS needs to become more involved in the ongoing planning.

(pg. 25, para. 1, section 311)
"The Service should continue to coordinate monitoring efforts with NMFS to ensure that otters in newly occupied range (such as near Pt. Purisima) are not compromised by fishing activity."
Remark: There is no longer a NMFS observer program in the southern part of the sea otter range with which the USFWS can cooperate. However, there is a pressing need to establish a jointly funded and operated (USFWS/NMFS/CDFG) fisheries observation program that could gather appropriate data from a subset of trap, pot, and gill and trammel net fisheries.

(pg. 25, para. 2, section 312)
"Prepare a report that evaluates the effectiveness of regulations on the use of gill and trammel nets ..."
Remark: This would be a worthwhile project, particularly if coupled with a new effort to collect current incidental take data for the fisheries and fishing areas of concern.

(pg. 25, para. 3, section 313)
"The Service has received reports that sea otters are occasionally drowned in lobster traps."
Remark: Frequent drownings may still only result in occasional observations of drownings. The two are not equivalent.

"To this end, the Service should contract for a survey of pot and trap fishermen ..."
Remark: Voluntary reporting by fishermen during the 5-year MMPA Interim Exemption was marked by a poor rate of survey return and incomplete or inaccurate data on those that were returned. Because of this, the 1994 MMPA insisted on direct observations of those fisheries that take or are suspected of taking marine mammals

from strategic stocks. The USFWS should not duplicate the failures of voluntary reporting, but instead determine how to sample appropriate subsets of strategic fisheries.

(pg. 25-26, section 313)
"Additionally, the Service should analyze sea otter carcasses in areas where trap and pot fisheries occur for evidence of drowning."
Remark: The trap and pot fisheries of greatest concern occur around the Channel Islands, where there is not a dedicated sea otter carcass recovery program. The USFWS could serve a very useful purpose in seeing that a Channel Island salvage program gets established, for general information and in anticipation of analyzing carcasses for evidence of drowning in traps and pots.

"To devise mitigation measures, studies should be undertaken with captive sea otters to determine if and how otters get caught in traps and pots."
Remark: This is an intriguing idea, but we have concerns about permitting to institutions to allow such studies, the risks to the captive otters of entrapment and drowning during the experiments, and public and facility perception of use of captive otters for these sorts of studies. This type of work requires the USFWS (perhaps with the guidance of the SSORT) to develop a policy on captive sea otter holding, training, experimentation, and the corresponding permitting processes.

(pg. 26, para. 2, section 314)
This information will not be useful (the number of otters taken incidental or directly as a result of fisheries actions will be underestimated) unless the USFWS can spearhead a renewed fisheries observer program for key fisheries and areas.

(pg. 26, para. 3, section 32)
"Develop an approach to minimize intentional take of southern sea otters."
Remark: The California Department of Fish and Game contracted for development of a Marine Patrol Plan. The report was completed in June 1994 and approved by the CDFG. One of the very good recommendations included a mandatory requirement for commercial fishing vessels to carry transponders. Enforcement actions could then be targeted to fishing vessels and activities of concern. We do not know if the CDFG has moved to implement any of the approved recommendations. This may be of value to the USFWS when evaluating fisheries observation and enforcement needs, and may open another door to USFWS/CDFG cooperation.

(pg. 26, para. 4)
"Criteria for delisting under the ESA are concerned with the probability of an oil spill reducing the sea otter population to a level where the probability of extinction is non-negligible."
Remark: You mean "negligible" or "not significant" or "to a level approaching zero", and not "non-negligible", right? "Non-negligible" indicates "of significance".

(pg. 27, section 411)
"The following parameters should be <u>measured or</u> estimated for several populations of sea otters:..."

(pg. 28, section 42)
"PCB's in liver tissues of California sea otters were in higher concentrations than those associated with reproductive failure in mink."
Remark: Risebrough (1989) noted in this same paper his impression that the higher body burdens of contaminants carried by sea otters did not seem to result in reproductive failure. His question at the time, and the one that still needs to be investigated, is why do sea otters apparently differ from their cousins (mink and river otters) in susceptibility to contaminant burdens? Preceding the answering of that question should be more research that documents that reproductive failure in sea otters is not related to contaminant burdens; perhaps Risebrough just did not pick this up with the types of samples, sample sizes, or study animals he investigated.

(pg. 29, section 421)
"Although the use of some of these compounds is currently banned in the U.S., they are being used in increasing anounts elsewhere in the world."
Remark: Even though these compounds have been banned in the U.S., residuals of historic deposits are being re-exposed as farmlands erode. This has been the case and the concern with the Elkhorn Slough area of the sea otter range, and may be true for other river mouths draining agricultural areas as well. There are also concerns over airborne drift from Baja California, and from ocean-current borne compounds depositing along the central coast.

"The literature is replete with examples of erroneous differences in various parameters due to handling and analytical techniques. Therefore, a standard protocol should be followed by all investigators ..."
Remark: Will the USFWS and NBS take the lead in seeing this standard protocol developed?

(pg. 30, section 423)
"...it is important to know whether the contaminants are being obtained from some particular prey type, or whether prey types exist that could expose sea otters to high levels of contaminants if a switch in diet were to occur. These analyses should be done at San Nicolas Island."
Remark: It is important to do some of this work at San Nicolas Island, but to include other areas as well. It would be particularly useful to conduct similar studies within the mainland sea otter range, particularly with soft-bottom prey species that dominate the habitat at the ends of the sea otter range. Contaminants, diseases and parasites borne by soft-bottom invertebrates may hold the answer to lack of sea otter range expansion and low population growth.

(pg. 31, para. 1)
"At least 5 years of study will be needed to obtain adequate sample sizes."
Remark: We feel the necropsy program should be extended to at least 1999, or whenever delisting discussions begin. We feel delisting will hinge on the availability and reliability of pertinent necropsy results. The program certainly needs to be expanded not only in years, but in scope. This additional scope would address the etiology of infectious disease and immune suppression, look at more than just the freshest carcasses, and look at carcasses retreived from a new Channel Islands carcass recovery effort.

(pg. 31, para. 3)
"The assumption that otters in central California are at maximal levels relative to what the environment will support and that these densities are representative of maximal levels throughout central and northern California is critical in predicting rates of recovery."
Remark: The way this is stated, it assumes that otters already <u>are</u> at their maximal levels. This assumption needs greater field testing through direct observation of activity patterns of otters if it is going to be taken as true. Activity patters of otters are highly variable by age, sex, reproductive condition, and time of day. This statement needs to be clarified to indicate that the activity pattern information will be gathered and verified, and <u>then</u> the carrying capacity figures verified.

This concludes our page-by-page comments. We thank you again for providing us with an opportunity for comment, and look to the leadership of the USFWS in assuring the full and successful recovery of the southern sea otter.

Sincerely,

Ellen Faurot-Daniels

Ellen Faurot-Daniels
Science Director

cc: Dr. Robert Hofman (Marine Mammal Commission)
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B

COMMENTS ON THE JANUARY 2000 DRAFT REVISED RECOVERY PLAN FOR THE SOUTHERN SEA OTTER *

D. Goodman

April 5, 2000

1. SALIENT FEATURES OF THE NEW DRAFT RECOVERY PLAN

The new (Jan 2000) draft revised recovery plan:

1. states that the population has been declining since 1995
2. suggests that the population decline probably is not owing to a decline in reproduction
3. suggests that the population decline is probably owing to an increase in mortality
4. acknowledges that there could be incidental mortality owing to set net activity in water of greater than 30 fathom depth
5. recommends rescinding the zonal management system
6. does not propose immediate implementation of additional protective measures other than lifting of zonal management
7. proposes an Endangered status criterion of 1,850 total population

* Prepared under contract to Friends of the Sea Otter

8. does not specify changes in management that should attend possible reclassification to Endangered

9. proposes a recovery criterion of 2,650 total population

10. proposes a list of recommended research and monitoring activities, but without specifically proposing further tagging or radio-tagging

2. GENERAL APPRAISAL OF THE NEW DRAFT RECOVERY PLAN

Briefly, my recommendation is to agree about the population decline and its probable causes (#1, #2, #3, #4), and to support the recommendation that the zonal management system should be lifted (#5), and to support the recommendation that a population level of 1,850 should be adopted as a criterion for reclassifying to Endangered (#7).

I have reservations about some of the other points in the new draft recovery plan. I do not agree with the proposed recovery criterion of 2,650 total population (#9)–it is too low, for reasons that are readily demonstrated. I am not satisfied with the lack of specificity and clear priorities in the new draft recovery plan with respect to management measures to address the present decline (#6), or to address the substantial likelihood of imminent reclassification to Endangered (#8).

Though I concur in the worth of the items in the list of research and monitoring efforts recommended in the new draft recovery plan (#10), I think specific recommendations on the need for tagging, radio-tagging, and use of resightings of tagged animals, would strengthen the proposals for continued monitoring of the population size and for investigations into the causes of mortality.

My own attempts to synthesize the available quantitative information for this population lead me to conclude that the present estimates of the vital rates and the estimates of incidental mortality do not adequately explain the observed population decline. This leaves open the possibility that incidental mortality is considerably higher than suspected. This also underscores the need for more tagging and radio-tagging studies to get more precise estimates of the vital rates.

3. COMMENTS ON THE INTERPRETATION OF SOUTHERN SEA OTTER DEMOGRAPHY

The interpretation of the mortality and reproduction information on California sea otters, in relation to the time series of censuses of the total population, could be enhanced through use of a simple life table model. One such model can be constructed as follows:

Assume an annual time step.

Assume the time step begins just before reproduction.

Assume that the survival rate for adults is an average value, S, that is constant with age. The base case will assume that the survival rate for adult females is in the neighborhood of 0.90, following Siniff and Ralls (1991), but we will adjust this parameter to achieve the historic 5% rate of population increase, observed during the periods 1938-1976 and 1983-1995, assuming further that this historic growth rate occured during periods of neglibible incidental fishing mortality.

In scenarios that depart from the base case, we will consider non-zero values of incidental fishing mortality that are imposed on the survivors of the natural mortality rate associated with the base case.

Assume that the birth rate to adult females is 0.90, following Riedman, et al. (1994) and consistent with Siniff and Ralls (1991) and Jameson and Johnson (1993). Assume that this birth rate is constant with age, once effective reproductive age is reached. This corresponds to a natality of 0.45 females per female of effective reproductive age, assuming a 50/50 sex ratio at birth.

Assume that the survival of pups to weaning is 0.60, splitting the difference among the results reported by Siniff and Ralls (1991), Jameson and Johnson (1993), and Riedman, Estes, Staedler, Giles, and D.R. Carlson (1994). There is some ambiguity in the reporting of weaning success, owing in part to ambiguity about the time period in question, which ranges from 3-6 months, depending on the authors definitions. Jameson and Johnson (1993) observed a period of pup "dependency" of about 6 months, but this probably includes a post-nursing period when the mother provides food items for the young. In the various tagging studies that are the basis for the estimates of vital rates, it is only the adults that are tagged, and individually identifiable. Pup mortality during the period of "dependency" has been estimated from records of the frequency with which a tagged female ceases to be associated with a pup before the pup reaches the "normal" age of independence. The actual death of the pup is not actually determined. Therefore, the pre-independence pup mortality estimates are strongly influenced

by the definition of the "normal" length of the period of "dependency."

Assume that the survival rate of juvenile females is 0.9 times the adult survival rate, in the base case, but assume that incidental fishing mortality operates on juveniles at the same rate as on the rest of the population. The multiplier of 0.9 is consistent with the results reported by Siniff and Ralls (1991).

Assume that the survival of pups to their first birthday is a product of the weaning success and the juvenile survival rate. This compounding assumes that the juvenile survival rate for post weaning pups exacts the same mortality in those 6-9 months that would be exacted in 12 months for juveniles older than 1 year. Accordingly, the effective fecundity, in females per female, is the product of the natality (0.45) times the weaning success (0.60) times the juvenile survival multiplier (0.9) times the adult survival rate (around 0.90) in the base case. With incidental mortality, this would further be multiplied by the escapement rate.

Assume that the first age class with effective reproduction is 4 (animals entering this age class are 4 years old at that time), consistent with the observations of Jameson and Johnson (1993), and the observation by Riedman, et al., (1994) that the age of female sexual maturity is 3, but that weaning success in the first pregnancy is low. This will yield a survivorship to first effective reproduction equal to the cube of the juvenile survival rate.

This model, which uses the geometric series approximation, allows a direct polynomial solution for the multiplicative factor of increase. Properties of this model are discussed in Goodman (1984).

Solving for the adult survival rate (and adult survival component of the juvenile and pup survival rates) that yields a 5% population growth rate with zero incidental fishing mortality, a natality rate of 0.45, a weaning success of 0.60, and a juvenile survival rate multiplier of 0.9, we find that value of the adult survival rate to be 0.934. This value is acceptably close to the Siniff and Ralls (1991) estimates of 0.89-0.91 for adult female survival rates. The agreement is surprisingly good, given the small sample sizes of tagged animals that provide the evidence for the key vital rates, and the sometimes short time intervals over which tag retention was good enough for estimation of survival of the tagged animals in some of the early studies.

Not withstanding the uncertainties in the numbers, this model will be used as the base case for the subsequent discussion. It is not clear how stable the underlying vital rates really are over time. Pre-weaning mortality in California sea otters, in fact, is thought to be elevated (Siniff and Ralls, 1991; Riedman, et al., 1994) compared to the norm for the Alaska sea otter population during its

period of population growth.

4. COMMENTS ON THE MAIN POINTS IN THE NEW DRAFT RECOVERY PLAN

4.1. The Recent Population Decline

The population spring census has declined at an annual rate of 3% since 1995. This contrasts with a 5% annual rate of increase from 1938-1876, and from 1983-1995. The previous major decline, from 1976 to 1983, was at an annual rate of 5%.

There is no alternative but to take these rates at face value, since, at the moment, we have no better window on the population status. The consistency of the annual rates of decline over several years lends credence to the reality of the apparent population changes. A 3% rate of decline, if it persists, has grave implications.

Nevertheless, there are questions about the statistical properties of the census that, in the longer term, should be pursued. The documentation that I have seen does not provide an explanation of why the spring counts are consistently higher than the fall counts. It is believed, I gather, that sightability is less favorable in the fall. But if sightability can cause fall counts to be noticeably lower than spring, we have to wonder what effect sightability is having on the spring counts also.

The new draft recovery plan uses only the spring counts in its analysis, and reports only the spring counts in the data table Appendix A. The new draft recovery plan proposes to continue the present census design, with both spring and fall counts. Some previous studies have used the pup numbers in the fall counts, in conjunction with the next spring census, to develop estimates of the annual pup production. If the investment in the fall counts continues, there really should be a commitment to a more comprehensive analysis that reports, and analyzes all the data.

The new draft recovery plan does not discuss the statistical properties of the census, though it mentions, without explanation or quantification, a "coefficient of variation" (p 29, last paragraph, in connection with use of a 3-year running average). Since so much of the inference about the population status hinges on interpretation of the census time series, a careful analysis of the statistical properties of this census would be warranted. If the proposed recovery criterion and listing

criterion continues to be phrased in terms of the "standard" census counts, rather than in terms of confidence limits from those counts, an understanding of the statistical properties of the counts is crucial to modeling the expected performance of these decision rules.

It is not clear whether the count obtained by the census is truly exhaustive, or whether it is more properly understood as an "index" which delivers counts that are smaller than the actual population size, owing to less than absolute detection. There are two modes of "effort" in this survey, shore based and aerial, which may have different detection rates. As the spatial distribution of the population changes, the respective effort modes may be contributing different fractions of the count. This might confound interpretation of the time series of index counts for determining a trend in population size. A recent publication by Eberhardt, Garrott and Becker (1999) illustrates some potential pitfalls from use of a time series of index counts to infer a population trend.

Two publications, Estes and Jameson (1988), and Estes (1990b) bear on these questions in the California sea otter census. Discussion of their findings, in light of the Eberhardt et al. (1999) paper, would be an aid to interpretation of the census time series in the new draft recovery plan.

4.2. Lack of Association of the Decline with Changes in Reproduction

The new draft recovery plan notes that the population decline is not associated with a decrease in the fraction of the counts made up by "dependent pups." Figure 5 of Appendix D of the document graphs that fraction in the spring counts, from 1983-1998. The fraction has fluctuated from under 0.1 to over 0.2, with most values in the range between 0.125 and 0.175 during this period. Indeed there does not seem to be a systematic relation between this fraction and the population trend.

But interpretation of the lack of apparent association needs to consider two issues: (a) Does the fraction dependent in the spring census necessarily reflect the reproductive rate? (b) How much change in reproductive rate is required to accomplish the shift from a growth rate of 5% to a rate of decline of 3%?

The meaning of the fraction dependent in the spring census is not entirely clear. Reproduction occurs year round in sea otters, though it is more concentrated in February and March (Wendell et al, 1984; Siniff and Ralls, 1988). It is thought that sea otter pups normally stay with their mother for about 6 or 7 months (Estes, 1990a; Jameson and Johnson, 1993), while "small" pups are thought to

be no more than 3 months old (Payne and Jameson, 1984). Estes (1990a) added "small" pups from the fall (October- November) census of the previous year to the total pups in the spring (April-May) to obtain a ratio of about 0.25 for the pups in the censused population, which he thought accorded better with the presumed reproductive rates. "Small" pups were reported separately from "large" pups in the 1982-1990 account of the shore-based survey in Table 7 (p 76) of Riedman and Estes (1990). This classification of pups by size is not mentioned in the more recent documents that I have examined, including the new draft recovery plan and the Marine Mammal Commission Annual Report for 1999. If such data are still being collected in the census, it would be helpful to make those data available also, and to include them in the analysis.

In the 1982-1990 period, there are 5 years (1983, 1985, 1986, 1987, and 1989) which report classification of pups by size in both spring and fall censuses in Riedman and Estes (1990). For these five years, overall: the fraction of pups classified as "small" was 0.50 in both the spring and the fall censuses; the fraction of the year's pups contributed by the spring census was 0.63. On this evidence, the seasonality seems weak. If effective natality expressed in both male and female pups is 0.9 on an annual basis, and the "small" pups counted in one census represent the reproduction from a 3-month interval (with no pup mortality during those 3 months), which is 1/4 of the year, and females make up half the adult population, the census should observe 0.9/4/2=0.11 "small" pups per adult (of both sexes) in the census, or 0.22 total pups ("small" and not "small") per adult in the census. There is evidence that males suffer higher mortality rates, so females could make up more than half the adult population, in which case the ratio of pups to adults might be expected to be larger than 0.22. During these 5 years, the ratio of total pups per independent otter was 0.14, which is a little low compared to the expectation. Allowing for some pup mortality, and allowing for the fraction subadult in the census of "independent" otters, might account for the discrepancy. It would be interesting to develop a more complete model to compare against the observed fraction of pups in the census.

We are left to conclude that the fraction of the spring census reported as pups probably is only a rough index to reproductive rate, and its relationship to the actual reproductive rate will be sensitive to variations in reproductive seasonality, in particular, and also to variation in pup survival rates.

Using the base case model life table, we may ask how much the natality would have to be reduced in order to reduce the population growth rate from a 5% increase (which is what the base case model confers) to a 3% decrease (which

is what has been observed since 1995), with no change in any of the survival rates. This switch from population growth to decline, with the base case model, would occur if the natality rate decreased from 0.45 to 0.110 while holding the survival rates constant. It is unlikely that such a large decrease of the natality rate–dropping to a quarter of its former value–would go undetected in the data on fraction of the census comprised by pups.

We conclude that the new draft recovery plan's assertion that the recent population decline probably is not caused by a decline in "reproduction" is reasonable, if by reproduction we mean births per adult female. The more likely scenario, of course, might be a decline in weaning success or first year survival, possibly with the birth rate undiminished; and the connection of this change to the observed fraction pups in the census is much more complicated, and depends on the age at which the increased mortality exerts its effect.

For example, if natality and weaning success were unchanged from the base case, but juvenile survival (and the juvenile survival component of the survival rate to the first birthday) were allowed to vary, while the adult survival rate were held constant at the rate of the base case, a switch to the observed rate of decline could be achieved by reducing the juvenile survival rate multiplier from 0.9 to 0.632. This change would probably not be detectable in the coarse data on the fraction of the census comprised by pups. We conclude, therefore, that the available data cannot rule out an increase in juvenile mortality rates as a major cause of the decline, even with adult mortality unchanged.

4.3. Attributing the Decline to Increased Mortality

The new draft recovery plan speculates that the recent population decline is owing to increased mortality.

The average annual carcass count 1983-1995 was about 100 animals, or about 5% of the population. This was at a time when the total adult and adult component mortality rate had to be on the order of 6.6% (from the base case model with 5% population increase), so it appears, remarkably, that the preponderance of the adult component mortality is accounted for in the carcass survey. Since 1995, the average carcass count has been more like 150 animals, or about 7.5% of the population. If the 5:6.6 ratio of observed to total adult component mortality still holds, the new adult mortality rate would be about 9.9%, corresponding to an adult survival rate of 0.901. If we assume that all the other elements of the base case model (including the multiplier relating juvenile survival to adult sur-

vival rates) are unchanged, this change in the adult survival rate would drop the population growth rate to positive 1.3% growth–not low enough to account for a nominal 3% rate of population decline.

In order to achieve a population rate of decline of 3%, with the base case model life table except for the adult survival rate (and the adult survival component of juvenile survival and pup survival to the first birthday), the adult survival rate would have to drop to 0.863–more than a doubling of the adult mortality compared to the base case. Such a value for the adult mortality rate is not implausible, of course, but the question then becomes what the observed carcass count should be in order to be consistent with this more than doubling of mortality.

One possible interpretation is that the fraction of the total mortality that appears in the carcass survey has declined as the total mortality increased after 1995. If this is the case, it raises doubt whether the relative frequency of the various causes of death tallied in the carcass survey (1/4 are necropsied) provides a reliable index to the relative frequency of causes of death for all mortality.

It would be nice to know more about the relationship between observed and unobserved mortality, and to have some quantification of observation effort. There needs to be more documentation of the methods and design for the carcass survey to support the implication that results of this survey provide a quantitative index to the total actual mortality.

4.4. Incidental Take as a Significant Mortality Factor

There is strong circumstantial evidence that incidental fisheries mortality, particularly in set nets, is of a magnitude that can appreciably affect the sea otter dynamics. During the 1976 to 1983 period, when the population was declining 5% annually, set net fisheries operated within the range of the sea otters. It is estimated that the average annual mortality from set nets, at that time, was 80 otters per year (Wendell et al., 1985). If we take the average population size at this time to be 1,450 the estimated incidental mortality was then 5.5%.

In the base case model, an additional 5.5% mortality is not sufficient to change a 5% annual rate of population increase to a 5% annual rate of decline: the model shows a less than 1% rate of decline (0.8%) with this scenario. Perhaps the estimate of 80 otters killed per year during this period was too low.

In 1982, emergency regulatory closures were imposed on the set net fishery (Appendix D of the new draft recovery plan). In 1985, California State law restricted use of set nets to waters deeper than 15 fathoms in areas frequented

by sea otters, and in 1991 the closure was extended to 30 fathoms. Since the otter population resumed a 5% per year increase in 1983, it is believed that these fishery closures were effective in reducing the incidental mortality, supporting the speculation that incidental mortality was largely responsible for the 1976 to 1983 decline.

The new draft recovery plan mentions (p 41) a NMFS observer program that operated from 1990-1995, which was relevant to incidental take of southern sea otters, but it seems as if the data from this program have not been analyzed for this purpose. Such an analysis needs to be done. Even if no otter mortalities were observed, the design and coverage of the observer program ought to be documented, so that the implications of the observed "zero" can be properly interpretted.

In 1998, NMFS aerial surveys for harbor purpose detected otter activity in waters deeper than 30 fathoms in an area of an active set net fishery (Forney, memo to Carl Benz). Extrapolation to the known areas of such set net activity within the otter range led to an estimate of 50 otter deaths per year possible (but apparently none have actually been observed). The implication is that the 30 fathom closure may not provide sufficient protection.

Note that 50 otter deaths per year is not enough additional mortality to change a nominal 5% rate of increase to the nominal 3% rate of decrease observed since 1995. Under the base case model, to achieve a 3% rate of decline, the annual incidental mortality from a population of 2090 animals would have to be 160 animals per year (rather than 50), over and above the base mortality. So, if incidental fishery mortality really is the cause for the 3% decline, the estimate of 50 from the set net fishery must be an underestimate of the total incidental fishing mortality.

I have not encountered estimates of the incidental mortality attributable to trap and pot gear.

4.5. Rescinding the Zonal Management System

In 1986, federal legislation created a "management zone" south of Point Conception, and a "translocation zone" around San Nicolas Island, authorizing establishment of a new sea otter colony in the "translocation zone" with animals moved from the main population, and providing for removal back to the main population north of the "management zone" if animals from the new colony spread into the "management zone." In the actual event, the new colony has failed to grow

(though consistent reproduction has been observed), and twice in the last two years substantial numbers of otters have temporarily migrated into the "management zone" from the main population in the north.

The objective of establishing a new colony in the "translocation zone" was to provide a viable second population source at a geographic remove from the main population, as a buffer against a catastrophic mortality event, such as an oil spill. Since the new population on San Nicolas has failed to meet this objective, it seems that the only alternative for protecting the California sea otter against catastrophic spatially correlated events is to allow continued natural geographic spread. The evidence of the last few decades is that the dominant direction of such natural range extension is southward. Accordingly, the new draft recovery plan recommends lifting of the zonal management system, to allow that extension. The logic is sound.

Further, it must be noted that the current range expansion is occuring during a period of population decline, suggesting some density dependent pressure–perhaps resource limitation–on the main population. Containing the population, by preventing range expansion, would exacerbate such pressure, to the detriment of the population at a time when it is in decline. This adds support to the argument for lifting the zonal management system.

4.6. Additional Protective Measures

The new draft recovery plan does not propose immediate implementation of any specific additional protection measures for the southern sea otter population, beyond lifting the zonal management system.

Zonal management, thus far, has not been invoked to contain animals migrating southward from the main population, but if zonal management remains on the books, it might be implemented in the future. The lifting of zonal management would remove the future threat of a negative density dependent factor. But the new draft recovery plan does not present an argument that lifting the zonal management system is likely, in itself, to be sufficient to reverse the present decline.

The draft recovery plan provides a good account of what is known about the fates of the otters that were translocated to San Nicolas. The material that I read was not as clear about the numbers and disposition of otters, presumably originating from the new colony at San Nicolas, that were moved from the management zone and released into the main population. The number moved in honoring the

management zone agreement represents a loss to the population, both in terms of contributing to crowding in the main population, and in terms of underutilization of potential carrying capacity within the management zone.

But still we should inquire whether lifting the zonal management is likely to reverse the current decline of the population overall. Imagine that, with the zonal management lifted, some combination of migrants from the mainland population, and migrants from San Nicolas and San Miguel Islands comprise a subpopulation of 200 that, considering a plausible best case, then grow at 5% per year, while the main population, counted as the present total spring census of 2090 less the 200 animals constituting the new subpopulation, continues to decline at 3% per year. The total population, then, will still decline, only at a slower rate (initially, at about 2.2% per year), crossing the proposed Endangered threshold within 6 years, and continuing to decline till the total population bottoms out in 22 years and then begins a rebound.

So, even though lifting of the zonal management system is a good idea, implementation of some additional protective measures will also be needed if the goal is to reverse the current population decline in the near term. Some spatially explicit modeling, making full use of all the existing data, might shed more light on possible patterns in the present decline, and provide information on the possible local growth rates that would be achievable if the population were allowed to expand into the management zone.

On the evidence of the population decline since 1995, the population seems to be experiencing some kind of trouble. It might be prudent to assume that some positive actions are warranted to alleviate that trouble. It would be good for the new draft recovery plan to describe the sorts of additional protective measures that would constitute such positive actions, and to consider the circumstances under which institution of such intervention should be implemented.

Suspicions are now directed at incidental take as a contributing cause in the present population decline. Under the ammended MMPA, any incidental take of sea otters is already prohibitted. So, further protective measures probably should focus on increasing the effectiveness of this prohibition. Expansion of an observer program, and increasing the size of fishery exclusion zones seem logical directions.

4.7. A Threshold Population of 1,850 for Endangered Status

The present listing status of the California sea otter is Threatened. The new draft recovery plan proposes a population level of 1,850 as a criterion for reclassification

of the population as Endangered under ESA . The logic is that at a population size of 1,850 the population is on the threshold of danger from genetic factors, as calculated from theory that is now fairly well accepted within the science of conservation biology. This criterion seems appropriate.

4.8. Management Changes if the Population is Reclassified to Endangered

The new draft recovery plan does not indicate what changes in management should accompany a reclassification to Endangered, if this in fact were to occur. This is worth considering, since the population could well cross this threshold in the near future. From the estimated present population size of 2090, if the population continues to decline at the present rate of 3% per year, it will reach the proposed Endangered threshold in 4 years. If, starting in 1999, the population declines at 5% per year, which was the rate of decline during the 1976-1983 period, the population will reach the proposed Endangered threshold in a little over 2 years.

If the population level associated with the proposed Endangered criterion does pose a significant risk to the population, as suggested by the science, it would be well to be prepared for the eventuality that may be only 2 to 4 years away. The new draft recovery plan does recommend future research that seems worthwhile and relevant, but a sense of urgency, and possible need for implementation priorities, consistent with this timetable, is not apparent.

Indeed, the proposed decision theoretic language for the Endangered reclassification in the new draft recovery plan, "the probability of the population declining below 1,850 animals in a specified period of time (e.g., 5 years) is greater than 0.05," suggests to me that reclassification proceedings might plausibly be initiated right now. So there is a need to begin considering management responses now, as well.

4.9. A Population Level of 2,650 as a Recovery Criterion

The new draft recovery plan proposes a population level of 2,650 (as indicated by an average of 3 consecutive "standard" annual surveys) as a threshold at which delisting should be considered. The reasoning behind this number is that the modeling documented in the new draft recovery plan in appendices B and C suggests that this would provide 90% probability of the population not being reduced below the proposed Endangered threshold (1,850) under a worst case volume oil spill (Ralls et al., 1996). This seems a logical enough approach with

respect to that one risk factor–oil spill– but I don't think it takes sufficient account of the evident demographic volatility of sea otters from other causes.

In light of the observed propensity for sea otter populations to enter into episodes of persistent and significant population decline, I think the proposed Recovery criterion is uncomfortably close to the proposed Endangered threshold.

The western Alaska sea otter population has recently exhibitted an alarming 25% per year decline, apparently owing to ecosystem changes. At this rate of decline, a delisted southern sea otter population (2,650 individuals under the proposed criterion) could deteriorate to Endangered (1,850 individuals) in just over 1 year. Even, the 5% rate of decline observed in the California sea otter population from 1976 to 1983, thought to be caused primarily by incidental mortality in fisheries, could accomplish the transition from a population of 2,650 to 1,850 in 7 years. I don't think these short transition times constitute enough of a buffer for effective management to make proper use of the Threatened classification under ESA.

The point of a Threatened category is to allow for graduated management actions, of a less drastic nature than would be called for under Endangered classification, but which offered reasonable prospects for preventing the transition to the Endangered status taking place. In order for a graduated system of this sort to operate effectively, there must be enough time for the management under the Threatened status to be implemented, and take effect, before the population status deteriorates to Endangered. Given the realities of how slow the ESA decision processes can be (consider the record of delays just in issuing and revising recovery plans), and given the imperfections in our monitoring systems and the uncertainties in our knowledge of what management actions to implement, and given the response times of ecological systems, a buffer period of 1 to 7 years just doesn't seem enough.

If, for example, it were decided that a 10 year buffer period were appropriate, and the plausible worst case sustained rate of decline of a duration of 10 years was 7.5% per year (somewhat faster than the rate of decline observed in the southern sea otter population from 1976 to 1983, but much slower than the rate of decline now underway in Alaska), the associated threshold population level would be 4,034. Note that the estimate of the historic population size for the southern sea otter is 14,000 (DeMaster, Marzin, and Jameson, 1996). Accordingly, under the MMPA, at any population size much under 60% of this figure (or 8,400), the population would almost certainly be determined to be depleted, and so it would be afforded the broad legal protection of the MMPA even if it were not listed

under ESA.

In my opinion, the proposed delisting criterion should be reconsidered, using a PVA analysis that takes account of all the existing evidence about major sources of risk and population change for this population, and also taking account of the probability of detecting trends and changes of population size in light of the statistical properties of the censusing procedure. The delisting threshold should be set high enough that the probability would be low for the population to decline from delisted to Endangered status in a time too short for management responses to be decided, implemented, and take effect. The analysis should evaluate the expected performance of the proposed decision system, in a probabilistic analysis. There is considerable precedent for this type of analysis, most notably in the IWC literature, and for other marine mammal management contexts as well.

Given that the population at present is declining, there doesn't seem to be a pressing need to determine the delisting threshold immediately.

4.10. Priorities

The new draft recovery plan presents a list of recommended research and monitoring activities that are all well-reasoned items. It is striking that the table giving the Recovery Plan Implementation schedule accords most of tasks (14 out of 21) priority 1. I don't know whether implementation of all the priority 1 tasks is consistent with anticipated budgets. In case it is not, I would want to be emphatic about the need for an element that is implicit, but not explicit, in the list.

The list of recommended research and monitoring activities describes tasks for obtaining better estimates of mortality rates and reproductive rates, but so far as I could tell in my reading of the document, there is no explicit statement of the need for tagging and radio-tagging, and there is no description of the importance of resightings of marked animals for the estimation of vital rates. I believe that further tagging, radio-tagging, and follow up studies of the tagged animals should be a very high priority.

More studies of individually identifiable marked animals are needed in order to refine and update the estimates of age specific reproductive rates and mortality rates. Resighting statistics of individually marked animals can also provide critical information for calibrating the "standard" survey procedure. The tagging program should include a large enough sample of radio-tagged animals with depth instrumentation to establish movement patterns, foraging range and foraging depth for the main segments of the population. This information will be

central to understanding the spatial component of the population dynamics and for quantifying the potential for interaction with the various fisheries.

My simple back-of-the-envelope calculations for purposes of the comments I have presented here, have, I believe, identified some important loose ends in our understanding of the demography of the southern sea otter. Data that could be provided from tagging, radio-tagging, and resighting programs will be absolutely crucial for a comprehensive modeling analysis to resolve these loose ends.

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Final Report:
Review of Draft Southern Sea Otter Recovery Plan (Revised) Sections on Oil Spill Risks and Impacts

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Summary

A review was performed of the oil spill impact assessment included the Draft Southern Sea Otter Recovery Plan of 1996 and the Draft Revised Recovery Plan of 2000 (Southern Sea Otter Recovery Team, 1996, 2000). The same oil spill impact assessment is included in both drafts of the Plan (i.e., based on Appendices B and C, identical in the two documents). In addition to reviewing the analysis provided in the (2000) Plan on its own merits, results were checked for reasonableness using Applied Science Associates' (ASA's) pre-existing oil spill model and the assumption that a worst case spill volume would be that of the *Exxon Valdez* oil spill (EVOS).

Despite a number of major simplifications made in the oil spill impact modeling presented in Appendices B and C, the results those authors obtained were similar to my findings using the ASA spill model that accounts for area swept by a volume of oil and the dose otters would be expected to receive. Assuming a reasonable threshold dose, the modeling indicates there is a 10% probability that >37% of the southern sea otter population would be killed by an EVOS-size spill. A larger percentage of the population would be impacted by larger size spills. Given the trend toward increasing tanker size using the port of San Francisco, the risk of larger spills needs to be evaluated.

While it is likely that a catastrophic oil spill could impact a significant fraction of the southern sea otter population, the risk of such an event has not adequately been quantified. The stated approach in the Plan is to consider the impact of a catastrophic oil spill and set the delisting level at a size greater than the endangered level plus the number of otters that could be lost in a catastrophic spill. However, given that three analyses (Appendix B, Appendix C, and my analysis herein) estimate that more than 50% otters could be impacted by such a spill, and that the population has varied in recent years between 5-7% annual increase and 5% annual decline, it appears that 800 otters (which is 30% of the delisting size of 2650) would not provide enough buffer to compensate for oil spill and other causes of population decrease. In addition, a catastrophic oil spill could also alter the marine food web in the area, which is likely to have significant implications on sea otter survival and recovery.

Furthermore, the modeling results indicate that there is a 50% chance that greater than 23% of the sea otter population would be oiled if an EVOS-size spill were to occur. If the population size were at the proposed delisting level of 2650 at the time of the spill, it would be reduced to 2040 individuals, only 200 more than the endangered population size. Again, this proposed delisting level not provide enough buffer against catastrophic loss.

These results underscore just how vulnerable the southern sea otter population is to a catastrophic oil spill. Thus, reduction of the risk of such a spill is of paramount importance. The consequences of a spill at the north end of the sea otter range are the highest. Thus, the sea otter recovery plan needs to be integrated with existing California OSPR and US Coast Guard contingency planning and prevention regulations, to reduce

the risk of large spills occurring. Expansion of the existing range would also be an important preventative measure against catastrophic loss.

It should be noted that the oil spill risk is just one of a number of issues of importance to sea otter population recovery. The population may be limited by or unable to recover from an oil spill because of poor health (e.g., high incidence of infection), low reproductive rate (e.g., as affected by contaminants), competition for food with fisheries, incidental take and poaching, and other factors. These risks need to be considered in addition to the direct oiling of otters by a large spill. The other risks would be multipliers of the risks due to oil spills, as well as affect the recovery potential and rate after a spill occurs. If the population is unable to or slow to recover from a spill, and additional spills occur, there is a real possibility that the population could be brought to below the endangered threshold size.

The existing Plan correctly identifies the high risk of serious consequences if there is a catastrophic spill, and that prevention of spills and extension of the range would be the best mitigation measures. However, the Plan does not adequately address the additional and interacting stresses of biological factors and human-interaction on the risks to the population. The proposed delisting population size does not address or compensate for these risks. My conclusions herein are in agreement with those of Goodman (2000). The Plan's proposed buffer of 800 otters is not large enough, given the observed variability in the southern sea otters' survival rates, the uncertainty in the future growth or decline of the population, the vulnerability of the entire population to a catastrophic oil spill, and the needed time for recovery of the population. Further analysis is needed to evaluate an appropriate buffer to protect the population from reaching the endangered level.

Introduction

A review was performed of the oil spill impact assessment included the Draft Southern Sea Otter Recovery Plan of 1996 and the Draft Revised Recovery Plan of 2000 (Southern Sea Otter Recovery Team, 1996, 2000), termed the Plan herein. The same oil spill impact assessment is included in both drafts of the Plan (i.e., based on Appendices B and C, identical in the two documents). Specific attention was paid to Appendix B by R.G. Ford and M.L. Bonnell (1995) and to Appendix C by A. J. Brody (1992). Since the Brody (1992) report was prepared before Ford and Bonnell (1995), and Ford and Bonnell (1995) use some of the information developed by Brody in their analysis, Appendix C by Brody (1992) will be reviewed first. This is followed by a review of Appendix B by Ford and Bonnell (1995). Third is a review of the use of these oil-modeling results in the Plan.

In addition to reviewing the analysis provided in the Plan on its own merits, results were checked for reasonableness using Applied Science Associates' (ASA's) pre-existing oil spill models (French et al, 1996; 1999). This includes comparison to brief trajectory analysis on an *Exxon Valdez* sized (11 million-gallon) spill on the California coast. The ASA spill model provides a map of expected oil exposure and timing along the coast, as well as expected percentage of the southern sea otter population oiled. These results may

be compared to the results of Ford and Bonnell (1995) and Brody (1992), as well as the interpretation of those results in the Plan.

Finally, comment is made on the overall recovery plan for the southern sea otter population. Consideration is given to oil spill risk and other issues relating to sea otter recovery.

Analysis by Brody (1992, Appendix C)

Brody's analysis depends on the following assumptions, only some of which are explicitly discussed by the author:

1. The worst case spill size is 11 million gallons (250,000 bbl) of crude oil, the volume of the *Exxon Valdez* oil spill (EVOS).

   If one uses historical data on oil spills from tankers in U.S. waters, the EVOS is the worst case volume. Thus, this could be considered a reasonable estimate of worst case. However, the data on tanker traffic and volumes transported off California, both now and in the future, should be reviewed to determine if this maximum possible spill volume is appropriate. Ford and Bonnell (1995) performed an analysis of potential spill volumes for the coast of California. Thus, the worst case volume assumption is discussed in the next section.

2. The length of coastline impacted by oil may be described by Ford's (1985) regression based on 39 oil spill model simulations for southern California. The regression is given by: $\log(\text{COAST}) = -0.8357 + 0.4525 \log(\text{VOL}) + 0.0128(\text{LAT})$, where COAST is shore length in km, VOL is spill volume in bbl, and LAT is the latitude of the spill origin in degrees.

   The length of coastline oiled is certainly a function of the volume spilled. However, there is no mechanistic reason why the length of coastline oiled would be related to latitude. The latitude relationship is an artifact of the particular region (southern California) where Ford (1985) performed his trajectory analysis. The length of coast oiled is related to the geography of the region, wind patterns, and currents. Figure 1 shows the predicted coastline length oiled as a function of volume for three latitudes: 33°N (southern California), 37°N (central California at Monterey Bay), 60°N (Prince William Sound). The coast length oiled is predicted to be slightly longer for Monterey than for southern California, and much longer for Prince William Sound. Coincidentally, Prince William Sound has much more coastline per unit area, so this relationship perhaps has the correct trend for Alaska versus California (an argument made by Brody). However, there is no evidence or physical justification that the southern California correlation can be carried outside the area for which the data were derived. Thus, Brody's use of this equation for central California, and particularly for Alaska, is very approximate (as Brody himself admits in his report).

3. Exposure of sea otters to oil is assumed 100% along the coastline length impacted.

   Sea otters occupy near shore habitats along the coast, and so their exposure to oil would be related to the length of coastline impacted. However, as alluded to by Brody, the complexity of the shoreline will determine the frequency at which otters actually contact oil. The Alaskan coast has many more bays and islands than the relatively linear central Californian coast. Thus, the actual exposure, defined as contact with oil if the oil passes by the coast, would be more likely along California than in Alaska. However, the argument could also be made that otters trapped in embayments (as in Alaska) would be more likely to be oiled (per length of coastline) than the more open California coast otters. The Plan analysis recognizes this problem with application of the Alaskan data, and describes the 50% mortality estimate from Brody as uncertain and as a minimum.

   The assumption of 100% exposure if a coastline is impacted by oil is actually a gross simplification of reality. The oil is actually quite patchy and moves along a coastline, impacting the water surface and shoreline to varying degrees. The details of the forcing winds and currents, as well as sea otter behavior, determine the actual exposure to sea otters.

4. Otter mortality assumptions:
   a. All otters captured after the EVOS may be considered exposed.
   b. Mortality of captured sea otters after EVOS reflects the oil-induced mortality of exposed otters in the field.
   c. Oil-exposed otters did not migrate significantly before capture.
   d. Exposed otters are assumed to obtain the same dosage of oil along any impacted shoreline.
   e. Mortality rate is a function of distance from the spill origin, which is a function of the age of the oil. Fresh oil would kill nearly 100% of otters exposed, whereas weathered oil at >300km from the spill origin would kill less than 20%.

   The assumption that all of the otters captured after the EVOS were exposed to oil and their mortality is representative of mortality in the field is a large one, and likely not accurate. However, given the available data, this is probably the best assumption that could be made.

   Accepting that the captured sea otters are a representative sample of exposed otters, the mortality calculated as a function of distance from the spill origin actually is a composite of the portion actually contacting oil times the portion dying from that oil exposure. Thus, this is a leap of faith to extrapolate experience from the EVOS to a similarly sized spill off California. However, given the limitations of the available data, the interpretation and extrapolation of those data are reasonable.

   Mortality rate is assumed a function of distance from the spill origin. This is assumed to result from the increasing age of the oil with time and distance from the spill site.

The weathered oil is assumed less toxic and to have less impact on otters. The author assumes the oil dosage is the same along any impacted shoreline. However, the distance correlation may actually be due to the lower frequency of contact with oil and/or the lower dosage per contact, rather than to simple weathering. Brody examines the time to death data, arguing that otters exposed later in the spill survived longer. However, this could be due to varying dose as well as to weathering of the oil.

The author recognizes the limitations in the assumptions made, and discusses the otter mortality assumptions in particular. Whereas, Brody estimates the percent mortality in the central California impact zone at 55-66%, the 100% mortality limit could be reached if his assumptions are off by a factor of two. The uncertainty of Brody's model could be greater than a factor of two (although data are not available to estimate the uncertainty of his analysis).

Analysis by Ford and Bonnell (1995, Appendix B)

Ford and Bonnell's (1995) analysis went much further than that by Brody (1992). Ford and Bonnell (1995) make following assumptions:

1. The worst case spill size is 350,000 bbl of crude oil, 1.4 times the volume of the *Exxon Valdez* oil spill (EVOS).

   This assumption is critical, as the approach in the Plan is to protect the southern sea otter population only if the population size is below the genetically viable stock level plus the worse case kill from an oil spill. Thus, the critical data from all the oil spill assessment work is how large a kill that worst case would be. The worst case volume for an oil spill off California is difficult to determine. The worst case might be considered the largest tanker capacity under the worst case environmental conditions. However, the risk of such an occurrence may be so small as to be meaningless. Thus, the probabilities of such catastrophic spills need to be estimated.

   Based on historical data on oil spills from tankers in U.S. waters, the EVOS is the worst case volume. However, the EVOS was only a partial loss of the ship's total volume. Ford and Bonnell (1995) appear to recognize this (although this is not explicitly stated), as they model spills up to 1 million bbl. However, in their analysis, they only apply the data up to a maximum spill size of 350,000 bbl, arguing that would likely be the largest possible volume. It is clear from the ambiguity in the Plan and both Appendix B and C that the maximum possible spill volume was not completely resolved (by the Plan). Also, Ford's analysis was completed by January 1995. Newer information may indicate a higher maximum possible spill volume.

   To estimate the future worst case volume, the data on tanker volumes that may be transported *in future years* should be reviewed to determine if this maximum possible spill volume is appropriate. For example, the National Research Council,

Transportation Research Board, Committee on Evaluating Alternative Tanker Designs has identified at least some consideration of tankers entering San Francisco Bay with capacities of over 5 million bbl. Presently, the maximum tanker size is about 300,000 DWT (dead weight tons), which holds about 2.2 million bbl. Thus, the worst case could be larger than 350,000 bbl. An update to the worst case volume analysis is recommended.

2. The size of tankers and volumes transported per time will remain as they were in 1992.

   DNA Associates (1993) compiled oil transport data for California for 1992. Ford and Bonnell (1995) reviewed these data to determine expected volumes and frequency of transport, and assumed these transportation patterns apply over the next 30 years. Ford and Bonnell do not provide the frequency data and volumes, so it is not possible to confirm their accuracy. However, it is assumed that the data they used are in fact accurate.

   What is more critical is the issue of how oil transportation patterns will change in the future. While the assumptions made by Ford and Bonnell (1995) were reasonable at the time (i.e., in late 1994 when they did their analysis), if tanker sizes increase and traffic patterns change, the risks computed over the up-coming 30 years by Ford and Bonnell (1995) will not be accurate.

3. The frequency of spills per volume transported in 1974-1986 will apply over the next 30 years.

   The Minerals Management Service (1986) has compiled (U.S.) spill frequency data per volume transported for 1975-1986. More recent data were not available when Ford and Bonnell (1995) performed their analysis. However, recent data compiled by Cutter Information Corp. (D. S. Etkin) indicate that oil spill frequency has actually decreased through the 1990s, i.e., since the Oil Pollution Act of 1990 (OPA 90) regulations went into effect. Thus, the assumption by Ford and Bonnell (1995) is conservative and appropriate, assuming tanker sizes don't change (but see discussion above).

4. The spill sites simulated, by randomizing location or by moving the spill site along transects, represent the range of possible results which depends on spill location.

   The number of spill sites and their locations are adequate to characterize the range of spill consequences based on spill location. The result that the worst case spill site is at the north end of the otter range and near shore is reasonable and realistic, given the prevailing winds and currents from the northwest and north, and the fact that the otters are close to shore.

5. Oil spills are simulated using Lagrangain Elements (LEs), which are transported by winds (using historical data) and currents (based on the Dynalysis of Princeton

model). Evaporation and entrainment into the water column were assumed negligible. Spreading was based on a regression (curve fit) from observational data.

The use of LEs and vector summation of wind and current transport is the accepted approach to modeling oil spills. The wind and current data used are appropriate for this analysis.

Significant fractions of oil may evaporate or entrain (mix) into the water column after spills. However, Ford and Bonnell's (1995) method of calculating otter contact with the oil is simply to assume that any otter within 5 km of the center of the LE is contacted. This assumption is not dependent on calculation of either evaporation or entrainment. The spreading calculation is based on field observations, which is a reasonable approach. However, data and the model algorithm are not presented to evaluate their accuracy.

6. Otters were assumed to contact oil if the oil came within 5 km of the path of a Lagrangian element (LE).

   Clearly the oil represented by each LE would not cover a circle 5 km in radius. Thus, this assumption is conservative (in the direction of over-estimating otter impact). For the purpose of the Plan, such a conservative assumption is reasonable.

   One problem is there is no apparent threshold of mass for a LE to have an impact. Thus, the longer the model is run, the larger the area impacted, even if the LE would in reality be depleted to trivial volume. Again, the assumption is conservative.

7. Otter mortality assumptions, once there is oil contact, are based on Brody (1992):
   a. All otters captured after the EVOS may be considered exposed.
   b. Mortality of captured sea otters after EVOS reflects the oil-induced mortality of exposed otters in the field.
   c. Oil-exposed otters did not migrate significantly before capture.
   d. Exposed otters are assumed to obtain the same dosage of oil along any impacted shoreline.
   e. Mortality rate is a function of distance from the spill origin, which is a function of the age of the oil. Fresh oil would kill nearly 100% of otters exposed, whereas weathered oil at >300km from the spill origin would kill less than 20%.

   These assumptions were discussed in the previous section. Assuming the mortality estimates reflect the EVOS experience and can be applied to California, the problem with actually applying this mortality rate is that the rate is a function of shoreline oiled, not of oil passing over water within 5 km of otters. Thus, strictly speaking, the estimated contacts from Ford and Bonnell (1995) should not be multiplied by the mortality rate per length of shoreline oiled from Brody (1992). However, since otters are in fact spread along the shoreline, the probability is good that oil passing within 5 km of an otter will also hit shore. Thus, the error is possibly ameliorated.

In their risk assessment in the last section, Ford and Bonnell (1995) correctly state that they cannot estimate otter mortality from their expected contacts data. All the results are stated to be sea otter "contacts". However, Ford and Bonnell (1995) use the mortality rates for their "detailed scenarios" on page12-13 to estimate 37% mortality from a worst case 250,000-bbl spill. Because of the concerns stated above, this estimate is highly uncertain.

8. The risk of oil spills to the southern sea otter population may be estimated by calculating the number of otters impacted over 30 years, from the sum of the otters contacted per spill times frequency of a spill, over all spill size categories.

   The implicit assumption here is that the otter population recovers to baseline after each spill before the next spill. Assuming a 5% rate of increase per year, it would take the population 10 years to recover from a 37% loss. If the spills occur every few years, for example, and a significant fraction of the population is killed each time (using Ford and Bonnell's results and assuming a significant fraction of contacts cause mortality), there would not be enough time for the population to recover between spills. The authors point out this limitation in their results.

   It is not clear how the data in Table 5 of Appendix B may be interpreted. A contact is simply defined as oil passing within 5 km of the otter. It is unclear how this may be translated to an impact on the population.

Because of the limitations in the risk data and treatment of cumulative impacts, the spill modeling results of most utility are probably the estimated percentages of the otter population potentially exposed (contacted) by an individual oil spill. For the EVOS size spill (250,000 bbl), Ford and Bonnell (1995) estimate 87% of the population contacted (within 5 km of oil) and 37% of the population killed (with a 90th percentile of 52% contacted and 27% killed). These results will be discussed further below.

Assumed Worst Case Oil Spill Impact in the Southern Sea Otter Recovery Plan

In the main text of the Plan, the results of Brody (1992) from Appendix C are cited as support for the estimate that at least 50% of otters contacted by oil (implicitly assumed as in the sense of Ford and Bonnell, 1995) are likely to die after a catastrophic oil spill. The Plan states it is assumed that 100% of otters contacted die. The number of otters contacted under the worst case conditions was based on Ford and Bonnell (1995)'s 10th percentile estimate of 800 otters contacted, which represents 30% of the population. Note that implicit in this assumption is that 10% of the time, more otters would be contacted than 30%. The worst case is cited as 1600 otters contacted, which represents 60% of the population. Thus, the 800 figure could be characterized as the worst case number contacted times a 50% mortality rate. However, what is unclear is exactly where these numbers may be found in Appendix B. As noted above, it appears the worst case result was 87% contacted. The choice of the 10th percentile result was not explained or fully justified. Further clarification should be included in the Plan.

In any case, these worst case mortality estimates must be considered highly uncertain. It would seem prudent, given these significant mortality estimates and the uncertainty, to provide more of a buffer than 800 animals, as it is possible that more of the population could be impacted, according to the data available to the authors of the Plan.

Analysis of Potential Oil Exposure Using SIMAP Model

In order to examine whether the sea otter oil exposure estimates included in the Plan are reasonable, ASA's SIMAP oil model was run for a 250,000 bbl (11 million gallon) spill of Alaskan crude just off shore of Point Sur. Ford and Bonnell (1995) and Brody (1992) identified this location as being the worst case spill location, because it is at the up-wind end of the sea otter distribution, and abundance is higher than the average there.

The SIMAP model was derived from a model ASA prepared for the U.S. Department of the Interior for Natural Resource Damage Assessment (French et al., 1996; called the Type A model under CERCLA NRDA regulations). This model has been validated and the results used by Trustees in NRDA cases (French and Rines, 1997; French, 1998). French et al. (1999) describe the algorithms in SIMAP, and provides an example application for contingency planning and risk assessment.

The probability of consequences of a spill may be estimated using SIMAP applied in stochastic mode. In stochastic mode, a large number of model simulations are run for a given spill site, randomly varying the spill date and time, and thus the actual wind and current conditions, for each run.

The time histories of a large number of spill simulation runs are used to generate probabilities that water surface, water column, and shoreline areas will be affected by a release from the given site. A location is considered affected if oil greater than a selected threshold of concern passes through a 1.6 km x 1.5-km grid cell (the resolution of the model grid used in this analysis).

Appendix A provides a brief overview of the model and a description of how it may be used in environmental risk assessments for oil spills. For this review, I have performed a preliminary model run using a simplified version of the approach described in Appendix A. This provides an indication of the potential degree of exposure to the sea otter population, which might be expected from a selected spill volume. Thus, the simple risk analysis that was performed provides a check on the analysis in Ford and Bonnell (1995), Brody (1992) and the Plan.

The modeling analysis reported here is similar to Ford and Bonnell's (1995) model of otter contacts with oil. The differences are that SIMAP (1) accounts for weathering (evaporation) and entrainment of oil and (2) defines contact as an oil slick thicker than 1 micron coming within 1.6 km of an otter. Note that this definition of contact is conservative.

The southern sea otter occupies nearshore waters of central California, between Ano Nuevo and Purisma Point (370 km of coastline). For the modeling, it was assumed they are evenly distributed along this coastline, extending to about 10 miles from the coast. This total area of habitat is 5800 km^2. The total population estimated at 2097 otters (spring 1999 survey) is assumed to occupy this habitat year-round. This indicates an average of 0.414 otters per km^2 of coastal water habitat. In reality, otters are concentrated inside the 40 m depth contour (Appendix D of the Plan), which is for most of the range about 2-3 miles from the coast. However, the model results below are not sensitive to this assumption, as a large spill tends to oil a wide path along the coast.

The SIMAP trajectory and fates model was run in stochastic mode to generate maps of expected surface oiling, shoreline oiling, and subsurface contamination (which might affect the habitat or food web upon which the sea otters depend). Appendix B contains a list of inputs used in the modeling. The long-term wind record used was for 1984-1991, from the offshore NOAA buoy #46028, San Martin (35° 44'08"N, 121° 53'11"W). Appendix C contains mapped output.

Figure C-1 maps the probability (%) of water surface oil exceeding a thickness of 1 micron (which is heavy sheen) at any time after the spill anywhere within the 2.5 km^2 grid cell. From the analysis in French et al. (1996a), oil 1 micron thick would be an approximate threshold potential impacts to birds and furred mammals (such as otters). Figure C-2 shows the minimum travel time after the spill for that oiling to occur. The most obvious thing to note is that the oil is extremely likely to move along the coast. Oil can move quite quickly with northwest winds, as fast as through the entire present sea otter range in a week.

Figure C-3 shows the worst case spill volume passing through each grid cell. Note that 500 MT per grid cell is equivalent to 0.2-mm thick oil over that cell area. This is a considerable amount of oil (black oil), and it is extremely likely that otters in that grid cell area would be oiled by that spill. In the areas labeled 0-500 MT (which is actually > 2.5 MT or 1 micron thick oil), probably some otters would survive, but it seems likely that most would be impacted. Thus, the area affected in Figure C-3 times the number of otters per unit area gives an estimate of worst case expected sea otter mortality. The estimate is 49% of the otter population, or 1025 otters, assuming a population of 2097. The likelihood of this worst-case consequence, given a spill of this size occurs, is 0.5%.

Figure 2 shows the frequency distribution of otters oiled in the model results. The percentile is the probability that the impact will be greater than or equal to the indicated percentage of the otter population exposed, assuming a 250,000-bbl spill occurs. Table 1 summarizes the statistics. The 50^{th} percentile is 24% oiled, the mean is 23% oiled, and 95% of cases fall between 3-45% of the otter population exposed to oil. The results also indicate that there is an equal likelihood for the impact to fall anywhere in the range 3-45%.

Figure C-4 shows the probability of shoreline oiling of > 1 micron thick oil. Note that the oiling probabilities are higher just offshore than on the coastline (comparing Figures C-1 and C-4). This is because, if oil hits shore, a significant fraction is likely to be retained there.

Oil not hitting shore continues along the coast, oiling more habitat. Also, oil that beaches may be re-lifted by the tides, move along the shore, and re-strand. Shoreline oiling may not be a good indicator of oil impacts to otters just off the shoreline.

Figures C-5 to C-7 provide an indication of oil exposure to the food web, which may have an impact on otters. The threshold for polynuclear aromatic hydrocarbons (PAHs) is 1 ppb, based on the analysis of oil toxicity by French (1998), showing that PAHs are the most toxic portion of the oil, and that 1 ppb is a threshold for sublethal effects (1-10% of the acutely toxic levels). The results show that the area of highest sea otter concentration would be likely be exposed to potentially toxic concentrations after an EVOS-sized spill at Point Sur. However, the expected concentrations (Figure C-6) are just above the chronic threshold, and would not exceed lethal levels for most species.

For subsurface (whole) oil, 10 ppb was used as the threshold (Figure C-7). This would be conservatively low as a threshold for any impacts (French et al., 1996a; French, in review). The maximum possible subsurface oil concentrations are below 100 ppb. Thus, the main concern would be for the aromatics in that oil (and dissolved aromatics, Figure C-6), rather than the other hydrocarbons. The threshold for impacts of dissolved aromatics is about 1-10 ppb (French, in review).

The SIMAP stochastic model identifies which spill date, and thus, which environmental conditions, would lead to the largest impact on the sea otter population. The worst case spill time in the wind record was for May 6, 1988 at 1600 hrs. The 250,000-bbl spill was run for that date through both the three-dimensional oil trajectory and fate model and the biological effects model.

The SIMAP biological effects model estimates bird and marine mammal exposure and kills from the area swept by slicks and estimated pre-spill abundance. The model calculates the area swept by slicks and the dose an animal would get if it stayed on the water surface the entire time the slick goes by. If the dose exceeds a minimum threshold, then the kill is calculated as area swept times number of animals per unit area times a kill probability. The kill probability represents the probability an animal is actually on the water surface times the probability it would die if oiled. For birds and furred mammals (such as sea otters), the probability of dying once oiled is assumed 100%.

The worst case spill on May 6, 1988 yielded a sea otter impact of 42% of the otter population (888 otters) oiled. Presumably most of these otters would die, unless rehabilitation is successfully performed. This more exact calculation of otters oiled is very close to the gridded estimate of "contacts" from the stochastic model of 49% of the otters from above, indicating that the stochastic results in Figure 2 and Table 1 may be interpreted as the percentage of otters expected to be significantly oiled by a 250,000 bbl spill.

Thus, in summary, these model results support the conclusions of Brody (1992) and Ford and Bonnell (1995) that otter mortality could reach about 50% of the population under

worst case conditions and for a 250,000 bbl spill. The impacts would be higher for a higher volume spill.

Discussion and Recommendations

From the spill modeling results, it appears that a catastrophic oil spill could impact nearly the entire present range of the sea otter. Even the SIMAP modeling results, which account for quantity of oil impacting each area, indicate that a substantial fraction of the otter population could be impacted by such a spill.

The plan calls the modeling results of Appendices B and C equivocal. My analysis supports the previous modeling analyses. Even so, if the modeling is equivocal, more buffer than use of the 10^{th} percentile result should be used.

The Plan clearly states in the Preface that two approaches were identified to reduce oil spill risks to the sea otter population (allowing delisting):

- Increase the range of the population to reduce the risk of a single spill reducing the population below a level that is viable.
- Decrease the risk of occurrence of major spill events in the sea otters' range.

If the range is held constant, the same percentage of the population would be impacted regardless of how large the population is at the time of the spill. If a spill occurs, especially if it is significantly larger than 250,000 bbl, most of the population could be impacted. Thus, extension of the range, such that no single spill could impact the entire population, would be crucial to allow for natural repopulation.

The future risk of oil spills occurring, and the size of those spills, is key to assessing the risk to otters. Thus, the plan should evaluate more fully just what the risk is and develop specific steps to reduce that risk.

It seems clear that the worst case location and environmental conditions for a catastrophic oil spill have been identified. The worst case would be at the north end of the sea otter range with northwesterly winds to carry the oil along the coast. What is unclear is:

- The spill volume that represents the worst case spill over the next 30 years.
- The expected frequency of spills of catastrophic spills in future years.
- The expected mortality for each spill volume.
- The cumulative impact of multiple spills over the next 30 years.

The Plan does focus on the reduction of spill risk as a major issue. However, determination of the worst case volume is lacking and in need of better definition. If, for example, tanker routes moved further offshore of the otter habitat, the benefit of specific routings would need to be quantified as a reduction in risk of oil impact. The plan states that the tanker routes should be moved such that if a spill occurs in the routing lanes,

there would be an insignificant chance that oil will contact shore. However, specific plans are not evaluated and resulting reductions of risk are not quantified.

The SIMAP model case run here provides one estimate of mortality for the EVOS spill volume. In a more thorough analysis, other spill volumes (and locations) could also be examined. Thus, expected mortality given a spill event can be quantitatively addressed, given assumptions about the exposure dosage of oil that causes an impact to otters.

In the Plan, the spill risk assessment should include consideration of population recovery time, and assess effects of cumulative spills. Even assuming a 5-7% annual rate of increase of the southern sea otter population, recovery between spills would be expected to be very slow. Figure 3 shows the recovery time of the otter population, assuming a constant 5% per year rate of increase after a catastrophic spill. The recovery time after a 23% loss (which has a 50% probability, given a spill of 250,000 bbl) is 6 years. For a 49% loss, recovery would take 14 years (assuming the 5% annual increase is maintained). If recovery is slower than 5% per year (or if the population is in decline, as it appears to be at present, see Goodman, 2000), recovery would take much longer (or possibly not occur if other causes of population decline are not addressed). Figure 4 shows the recovery time of the otter population, assuming a constant 2% per year rate of increase after a catastrophic spill. The recovery time after a 23% loss (which has a 50% probability, given a spill of 250,000 bbl) is 13 years. For a 49% loss, recovery would take 34 years (assuming the 2% annual increase is maintained throughout that period). The likelihood of another catastrophic spill occurring during that recovery period needs to be evaluated. Also, even a 2% annual increase may be optimistic if the current rate of decline is not reversed.

Given the importance of recovery potential to the population, more detailed population analysis should be performed. For example, marine mammal (fur seal) population recovery after catastrophic oil spills was simulated with an age-structured population model in a previous study for MMS (French and Reed, 1990; French et al., 1989; Reed et al., 1989). The issue was similar: that a catastrophic oil spill might cause an irreversible decline in a population already severely reduced from its historical carrying capacity.

Variations in age-specific survival and reproductive rates infer different population rates of change, and these variations need to be considered in evaluating recovery potential. At a minimum, the analysis of population recovery potential should consider the implications of historically observed variation in age-specific survival and reproduction, such as the considerations described by Goodman (2000) in his review of the Plan. Population rate of change has varied considerably over the past several decades from 5-7% annual rate of increase to a similar rate of decline.

The full range of possible rates of population change should be considered (in a matrix) along with the range of potential impacts of oil spills and their probabilities of occurrence, both individually and cumulatively. The probability of occurrence is the product of the spill likelihood and the probability of the consequences. This type of analysis could be incorporated into a risk assessment to estimate cumulative risk of spills.

Conclusions

In conclusion, it appears that a catastrophic oil spill could impact a majority (>50%) of the southern sea otter population. However, the risk of such an event occurring has not adequately been quantified. The stated approach in the Plan is to consider the impact of a catastrophic oil spill and set the delisting level at a size greater than the endangered level plus the number of otters that could be lost in a catastrophic spill. However, given that three analyses (Appendix B, Appendix C, and my analysis herein) estimate that more than 50% otters could be impacted by such a spill, and that the population has varied in recent years between 5-7% annual increase and 5% annual decline, it appears that 800 otters (which is 30% of the delisting size of 2650) would not provide enough buffer to compensate for oil spill and other causes of population decrease. In addition, a catastrophic oil spill could also alter the marine food web in the area, which is likely to have significant implications on sea otter survival and recovery.

Furthermore, the modeling results indicate that there is a 50% chance that greater then 23% of the sea otter population would be oiled if an EVOS-size spill were to occur. If the population size were at the proposed delisting level of 2650 at the time of the spill, it would be reduced to 2040 individuals, only 200 more than the endangered population size. Again, this does not provide enough buffer against catastrophic loss.

These results underscore just how vulnerable the southern sea otter population is to a catastrophic oil spill. Thus, reduction of the risk of such a spill is of paramount importance. The consequences of a spill at the north end of the sea otter range are the highest. Thus, the sea otter recovery plan needs to be integrated with existing California OSPR and US Coast Guard contingency planning and prevention regulations. This vulnerability and need is recognized and addressed in the Plan.

Finally, it should be noted that the oil spill risk is just one of a number of issues of importance to sea otter population recovery. The population may be limited by or unable to recover from an oil spill because of poor health (e.g., high incidence of infection), low reproductive rate (e.g., as affected by contaminants), competition for food with fisheries, incidental take and poaching, and other factors. These risks need to be considered in addition to the direct oiling of otters by a large spill. The other risks would be multipliers of the risks due to oil spills. Goodman (2000) in his review of the Plan describes in more detail the implications of these biological factors on the recovery potential of the sea otter population.

The existing Plan correctly identifies the high risk of serious consequences if there is a catastrophic spill, and that prevention of spills and extension of the range would be the best mitigation measures. However, the Plan does not adequately address the additional and interacting stresses of biological factors and human-interaction on the risks to the population. The proposed delisting population size does not address or compensate for these risks. My conclusions herein are in agreement with those of Goodman (2000). The plans proposed buffer of 800 otters is not large enough, given the observed variability in the southern sea otters' survival rates, the uncertainty in the future growth or decline of

the population, the vulnerability of the entire population to a catastrophic oil spill, and the needed time for recovery of the population. Further analysis is needed to evaluate an appropriate buffer to protect the population from reaching the endangered level.

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Figure 1. Coastline Length Impacted as a Function of Spill Volume and Latitude (after Brody, 1992, Appendix C of the Southern Sea Otter Recovery Plan)

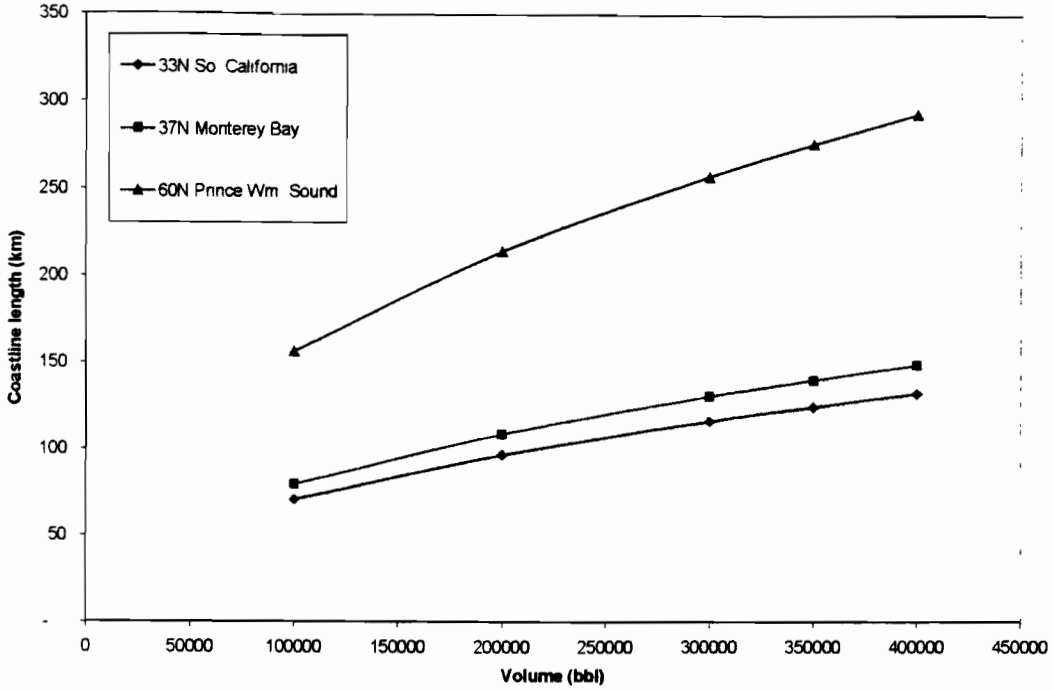


Figure 2. Probability that greater than the indicated percentage of the sea otter population would be exposed to oil, if an 11 million gallon spill were to occur off Point Sur.

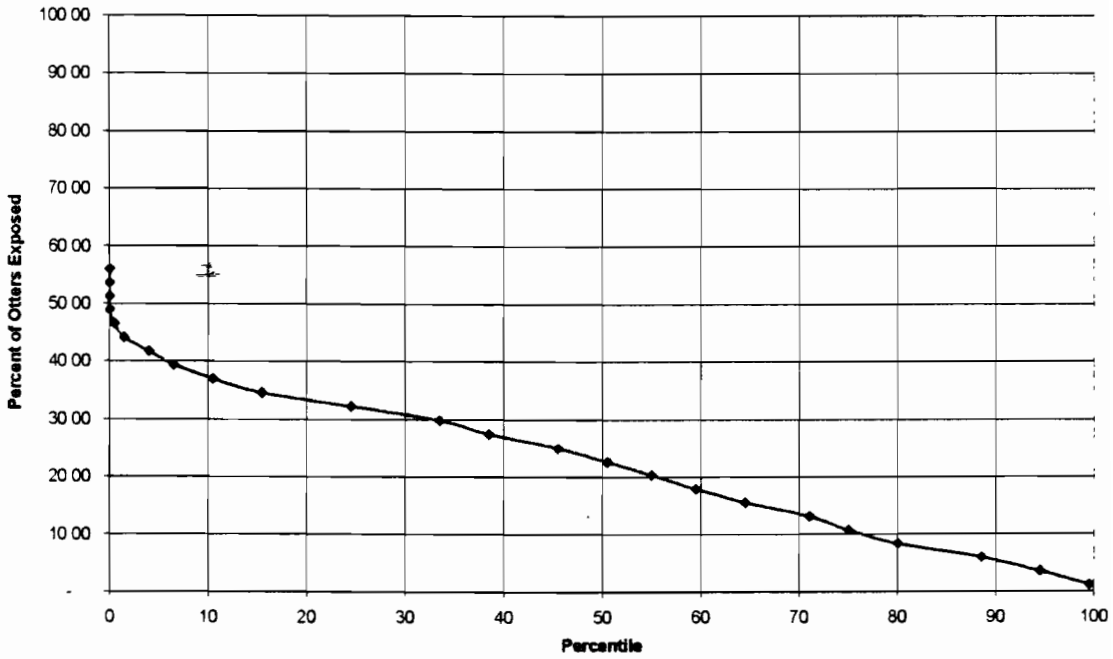


Table 1. Expected exposure of the southern sea otter population to oil (>1micron thick within 1.6 km) from a 250,000-bbl (11 million gallon) spill at Point Sur, using ASA's oil spill impact model SIMAP. The 95% confidence limits are the mean + or - 2(standard deviation).

Population:

- # otters = 2,097
- habitat area = 5799 km^2
- otter density = 0.362 /km^2

Summary Statistics	Fraction of habitat	Area (km2) of habitat	# otters exposed
maximum	0.489	2,833	1,025
median	0.239	1,387	502
mean	0.230	1,336	483
standard deviation	0.121	700	253
minimum	0.012	71	26
mean+2(std.dev)	0.472	2,737	990
mean-2(std.dev)	-0.011	-	-

Worst case spill date (i.e., maximum):

- probability of consequence = 0.5%
- fraction of otters oiled = 42.34%
- # otters oiled = 888

Figure 3. Recovery of the sea otter population following a 250,00-bbl oil spill assuming 5% rate of increase per year. The risk factors are for the consequences to the otter population, assuming the spill occurs.

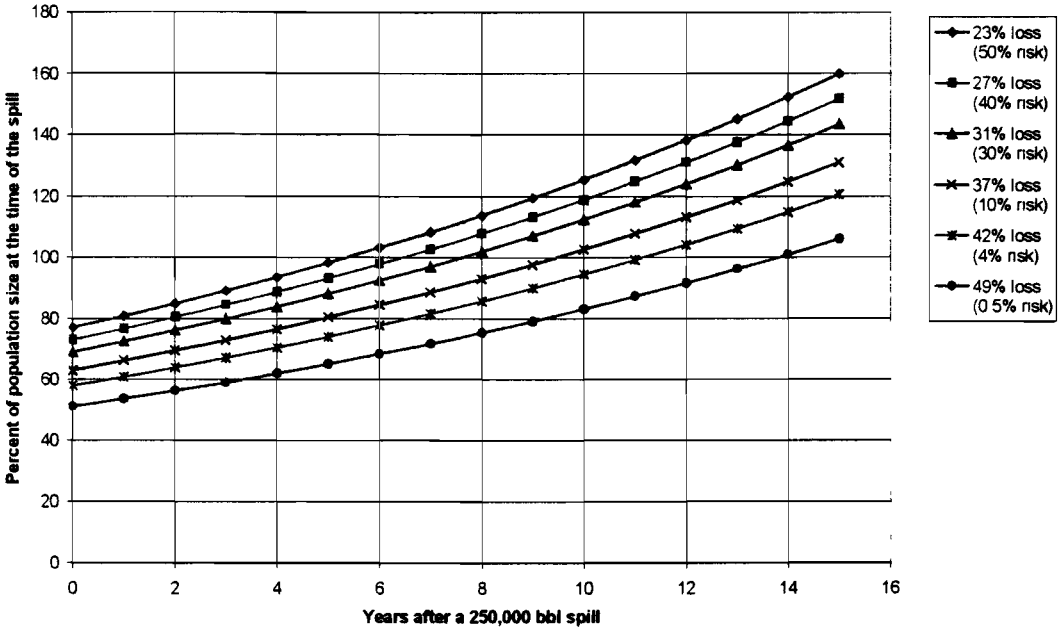
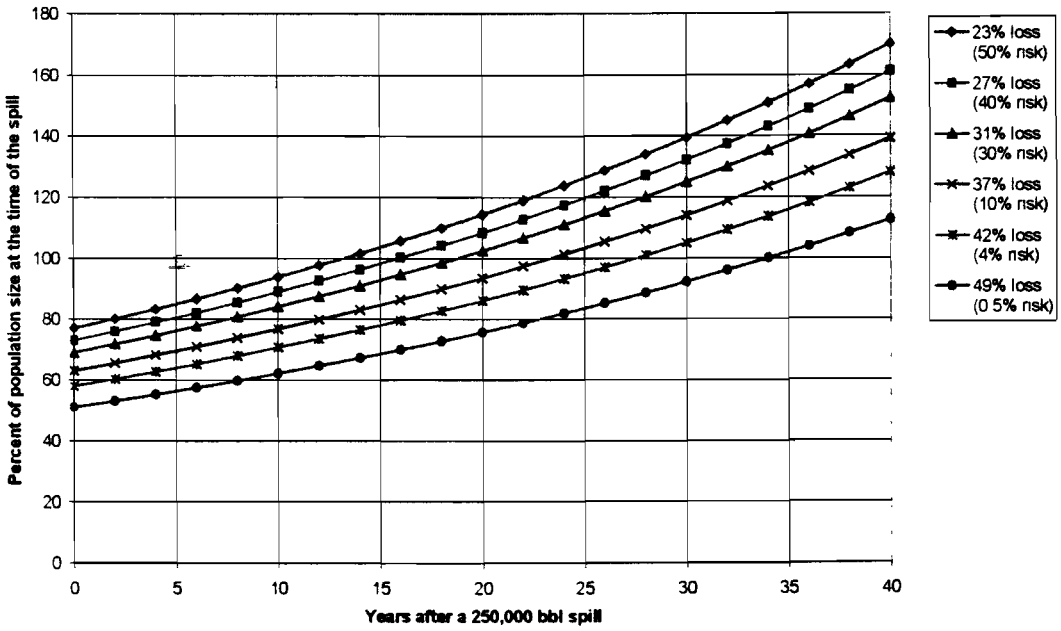


Figure 4. Recovery of the sea otter population following a 250,00-bbl oil spill assuming 2% rate of increase per year. The risk factors are for the consequences to the otter population, assuming the spill occurs.



Appendix A

Technical Approach:
Environmental Risk Assessment for Oil Spills
Using Applied Science Associates' Model SIMAP

Introduction

The technical approach below is an outline for a complete oil spill environmental impact assessment using modeling. For the sea otter analysis in this review, only preliminary stochastic modeling of trajectory, fates, and exposure to the otters' habitat has been performed. This provides an indication of the potential degree of exposure to the population, which might be expected from a worst case spill. Thus, the simple risk analysis that was performed provides a check on the analysis in Brody (1992) and the Plan.

Models use knowledge of physical, chemical, toxicological and biological relationships along with environmental data to simulate spills. A number of oil trajectory and fates models are available around the world. However, model developers have rarely carried out the analysis to quantitatively address exposure and impacts of oil spills. Applied Science Associates' (ASA) oil spill model SIMAP is the international leader in addressing these issues. SIMAP is a three-dimensional model, meaning that it not only evaluates impacts at the water surface and the shoreline, but also evaluates the probable distribution of whole oil and low molecular weight aromatics in the water column that might result from potential spills. The aromatics of concern are those in oil which cause the most toxicity, the monoaromatics (BTEX) and 2 to 4-ring polynuclear aromatic hydrocarbons (PAHs).

SIMAP is useful for risk assessment, contingency planning, cost-benefit analysis and natural resource damage assessment. SIMAP may be applied to investigate a single spill event, to evaluate the probable consequences of an event, or to determine a worst-case spill scenario. Examples of these applications include risk assessment in support of permit application, comparison of response strategies for contingency planning, and analysis of maximum liabilities for accidental spills. Practical uses for model outputs include the determination of which kinds of response equipment should be used in a particular area and where the equipment should be placed to be most effective, and what areas are most at risk from possible spills at a specific location.

For oil spills, environmental risk is quantified as the probability of a spill times the probability of the consequences. Probability of a spill may be quantified by historical statistics combined with analysis of expected shipping. The probability of consequences of a spill may be estimated using SIMAP applied in stochastic mode. In stochastic mode, a large number of model simulations are run for a given spill site, randomly varying the spill date and time, and thus the wind and current conditions, for each run. The time histories of a large number of spill simulation runs are used to generate probabilities that

water surface, water column, and shoreline areas will be affected by a release from the given site. Further analysis of worst case impacts may be accessed using individual spill simulations for worst case environmental conditions. Sensitivity analysis may be performed, whereby critical input data are varied over the possible range to determine their influence on the results.

Spill Environmental Risk Assessment --Modeling Approach

For oil spill environmental risk assessment, SIMAP may be used in a stepwise approach, summarized as follows.

1. Spill Probabilities: The risk of spills of various size categories (eg., small, medium and large) may be quantified from spill statistics and expected volume movements of oil in and out of the facility or along the transportation route of interest. This analysis will help determine that spill sizes and fuel types to include in the modeling analysis.

2. Stochastic Modeling of Trajectory and Fates: For each spill volume and fuel type of interest, spill trajectory and fates modeling is performed in stochastic mode to estimate probabilities of water surfaces, shorelines and water volumes exposed above thresholds of concern. These probabilities and worst case exposure thickness and concentration for each location are overlaid on maps of resources of concern. The color maps of model output may be viewed on the computer or printed in report format.

3. Stochastic Percent Exposure Assessment: The stochastic exposure model will estimate percent of a resource (species or habitat) exposed for each of the individual trajectory and fates model runs in a stochastic case. The results of all model runs for a stochastic case are combined to provide statistics on exposure, i.e., mean, minimum, maximum, standard deviation, etc. A frequency distribution of expected percent exposures may be developed for each resource of concern (i.e., a histogram showing percent of runs in each percent exposure range).

4. Worst Case or Representative Scenario Exposure Analysis: For each specific location near the spill site with resources of concern, the 3-dimensional fates and biological exposure models may be run for the worst case environmental conditions. Representative spills may also be identified and run. Model outputs include trajectory, concentrations over time, and percent of biota exposed. Sensitivity analysis may be performed varying the toxicity values used in the exposure model.

5. Stochastic Impact Assessment: For those resources where biomass or numbers per unit area can be quantified, the stochastic impact model estimates biomass (kg) or numbers exposed for each of the individual trajectory and fates model runs in the stochastic analysis. A frequency distribution of expected impacts is developed from these results (i.e., a histogram showing percent of runs in each impact range).

6. Worst Case or Representative Scenario Impact Assessment: For those resources where biomass or numbers per unit area can be quantified, the biological impact model may be run for the worst case or representative scenarios. The results are a quantification of biomass (kg) or numbers impacted, and resulting catch loss. Sensitivity analysis may be performed varying the toxicity values used.

Spill Probabilities

Probability of a spill may be quantified by historical statistics combined with analysis of expected shipping. Probability of a spill from a vessel or facility may be quantified by historical statistics. History has shown that probability of a spill is inversely related to volume released, such that large spills are much less frequent than small spills. Spill rates also vary by the origin, i.e., between tankers, barges, facilities, etc.

The risk of a spill is expressed as number of spills per unit volume of oil transported or processed through an area or facility. Thus, data on movements of oil are needed in addition to spill frequency data.

In the United States, the United States Coast Guard (USCG) and the Minerals Management Service (MMS) collect data on spill incidents, including volume, oil type, location and origin. Similar statistics are available for international incidents from, for example, Cutter Information Corp. (D. S. Etkin) and other sources.

The US Army Corps of Engineers compile data on volumes and movements of oil in US waters. Typically, each facility or shipper will compile and evaluate their data on oil and fuel movements.

Stochastic Modeling of Trajectory and Fates

In order to determine risks to resources, multiple scenarios and conditions need to be evaluated to develop an expectation of risk of oil reaching each site of concern. There may be specific sites of concern, or the goal may be to identify what sites are at risk.

The stochastic model may be used as a component of the risk assessment process. It is used to determine the range of distances and directions oil spills are likely to travel from a particular site, given the historical wind speed and direction data for the area. The stochastic model performs a large number of simulations for a given spill site, varying the spill date and time, and thus the wind and current conditions, for each run. Output of the model is the time history of a large number of spill trajectories. These distributions are used to generate probabilities that water surface, water column, and shoreline areas will be affected by a release from the given site.

The stochastic model in SIMAP is a three-dimensional model, meaning that it not only evaluates impacts at the water surface and the shoreline, but also evaluates the probable

distribution of whole oil and low molecular weight aromatics in the water column that might result from potential spills. The aromatics of concern are those in oil which cause the most toxicity, the monoaromatics (BTEX) and 2 to 4-ring polynuclear aromatic hydrocarbons (PAHs). The outputs are probabilities of oil reaching each location mapped, expressed as exceedance of a threshold, and as maximum expected thickness or concentration over time.

The 3D stochastic model in SIMAP quantifies, in space and over time, for each individual model run, the following components:

- Oil or fuel thickness (volume per unit area) on water surface
- Oil or fuel thickness (volume per unit area) on shorelines
- Subsurface oil or fuel droplet concentration, as total hydrocarbons
- Dissolved aromatic (BTEX and PAH) concentration
- Surfactant concentration (for emulsions)

The range of possible scenarios includes various wind and current conditions, volume spilled, and other parameters. To sample this universe of possibilities, long-term wind and current records are developed. For each model run used to develop the statistics, the spill date is randomized. This provides a probability distribution of wind and current conditions during the spill. The list of input assumptions that may be randomized is below.

- Release date (an so wind and current patterns)
  - All months of the year (quantifies risks for spills at any time of year)
  - Selected month(s) or season (quantifies risks for spills at that time of year)
- Spill volume
  - randomized up to a maximum possible (quantifies typical, mean risk)
  - constant at maximum possible (quantifies risks for worst case volume)
- Location
  - single release point (e.g., at facility)
  - area over which release location is randomized (e.g., along a transportation route)

A stochastic model case is a quantification of probabilities (statistics), based on multiple model runs, for selected:

- Oil or fuel type (with associated physical and chemical characteristics)
- Spill volume
- Location
- Thresholds of concern for
  - Surface oil (water or shoreline)
  - Subsurface droplets
  - Dissolved aromatics
  - Surfactant

For each of the components of the spill, an effects endpoint is selected, which provides a threshold above which probabilities are to be reported. These thresholds may be for mortality, sublethal or chronic effects, for tainting, or for impacts on recreational or other human uses.

The results of multiple model runs for a stochastic case are evaluated to develop the following statistics for each of the components listed above.

- Probability of exposure greater than a threshold (thickness or concentration)
- Time to first exceedance of the threshold
- Maximum thickness, volume or concentration at any time after the spill, at a given location (peak exposure at each location)
    - Worst case maximum amount for all possible releases (i.e., maximum peak exposure for all the model runs). This is calculated in two steps: (1) For each individual run (for each spill date run), the maximum amount over all time after the spill is saved for each location in the model grid. (2) The runs are evaluated to determine the highest amount possible at each location. Note that these *worst case maximum* amounts are not additive over all locations. These represent maximum possible amounts of oil that could ever reach each site, considered individually. The spill date and time for the worst case run is also saved.
        - Mean expected maximum amount for all possible releases (i.e., mean peak exposure of all model runs). This is calculated in two steps: (1) For each individual run (for each spill date run), the maximum amount over all time after the spill is saved for each location in the model grid. (2) The runs are evaluated to determine the mean expected peak exposure (mean amount for all runs) at each location. Note that these *mean expected maximum* amounts are not additive over all locations. These represent the mean of many different runs, affecting different sites to maximum extent at different times after the spill.

The SIMAP graphical user interface produces maps of these statistics. For each stochastic model case, maps are produced of probability of exceeding the chosen threshold, time of first exceedance, and of peak exposure. The exposure maps are average expected and worst possible oiling by location. These exposure maps contain color (or gray scale) contours of thickness or concentration. Mapped geographical data of sensitive resources may be compared and/or overlaid with model results. This will show where resources would be most at risk, and giving indications of where protection would be most beneficial. French et al. (1999) is an example study using this approach.

Stochastic Percent Exposure Assessment

The stochastic exposure model estimates percent of a resource (species or habitat) exposed for each of the individual trajectory and fates model runs in a stochastic case. The results of all model runs for a stochastic case are combined to provide statistics, such

as mean, maximum, minimum, standard deviation, etc.. A frequency distribution of expected percent exposures is developed for each resource of concern. This is both a table and a histogram showing percent of runs in each range of percent exposure (such as for the ranges 0-5%, 5-10%, 10-20%, etc., as appropriate).

Species presence and absence data are compiled from existing sources for fish, shellfish, and aquatic wildlife. Aquatic wildlife include waterfowl, seabirds, waders, shorebirds, raptors that use aquatic habitats, cetaceans, seals, other marine mammals, and sea turtles. Presence/absence data may be seasonal or monthly averages in representative habitats, which are applied to similar habitats, or may be site-specific maps.

Worst Case or Representative Scenario Exposure Analysis

The worst case potential spill may be identified using the probability analysis (stochastic 3-dimensional trajectory and fates model). The worst case will be for the spill date and time where wind and current conditions are such that maximal exposure to sensitive resources occurs at a specific location near the spill site. An individual worst case scenario may be simulated using the 3-dimensional fates and biological exposure models in SIMAP. This quantifies the worst possible concentrations and percent of resources exposed. Sensitivity analysis provides measures of uncertainty for these predictions. In a sensitivity analysis, critical input data are varied within possible ranges to determine how sensitive the results are to the input assumptions.

For each location near the spill site with resources of concern, the 3-dimensional fates and biological exposure models are run for the worst case environmental conditions for that resource location. Representative spills may also be identified and run. Model outputs include trajectory, concentrations over time, and percent of biota exposed. Sensitivity analysis will be performed varying the toxicity values used in the exposure model.

Stochastic Impact Assessment

For those resources where biomass or numbers per unit area can be quantified, the stochastic impact model estimates biomass (kg) or numbers exposed for each of the individual trajectory and fates model runs in the stochastic case analysis. A frequency distribution of expected impacts is developed from these results

Biological abundance data are compiled from existing sources. Abundance data is compiled for fish, shellfish, and aquatic wildlife. Aquatic wildlife include waterfowl, seabirds, waders, shorebirds, raptors that use aquatic habitats, cetaceans, seals, other marine mammals, and sea turtles. Abundance may be seasonal or monthly averages in representative habitats, which are applied to similar habitats, or may be site-specific maps. Life history information, including natural and fishing mortality rates, for local species is also compiled.

Using this information, the stochastic impact model in SIMAP quantifies the most likely (mean expected) and range of impacts using a frequency distribution. This is both a table and a histogram showing percent of runs in each range of impact (such as for the ranges 0-100 kg, 100-200 kg, etc., as appropriate). The frequency distribution is specific to the oil type, spill location, spill volume, and thresholds chosen for the stochastic case. Multiple cases may be examined for varying thresholds, to examine different endpoints or sensitivity.

Worst Case or Representative Scenario Impact Assessment

For those resources where biomass or numbers per unit area can be quantified, the biological impact model may be run for the worst case or representative scenarios.

Biological abundance data are compiled from existing sources. Abundance data is compiled for fish, shellfish, and aquatic wildlife. Aquatic wildlife include waterfowl, seabirds, waders, shorebirds, raptors that use aquatic habitats, cetaceans, seals, other marine mammals, and sea turtles. Abundance may be seasonal or monthly averages in representative habitats, which are applied to similar habitats, or may be site-specific maps. Life history information, including natural and fishing mortality rates, for local species is also compiled.

Using this information, the single-scenario biological impact model in SIMAP quantifies the expected impacts of a scenario. The results are a quantification of biomass (kg) or numbers impacted, and resulting catch loss. Sensitivity analysis will be performed varying the toxicity values used.

SIMAP Model Description

The modeling analysis is performed using a model system developed by Applied Science Associates (ASA) called SIMAP (Spill Impact Model Analysis Package). SIMAP includes (1) an oil trajectory and fates model, (2) a biological exposure model, (3) a biological effects model, (4) input tools for oil physical, chemical and toxicological data, (5) input tools for environmental data, (6) tools to grid and enter geographical data, (7) input tools for biological data, (8) a response module to analyze effects of response strategies, (9) graphical visualization tools for outputs, and (10) exporting tools to produce text format output. SIMAP may be run in either deterministic (single scenario) or stochastic mode.

SIMAP was developed from the oil fates and biological effects submodels in the Natural Resource Damage Assessment Model for Coastal and Marine Environments (NRDAM/CME). The NRDAM/CME (Version 2.4, April 1996) was published as part of the United States Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) type A Natural Resource Damage Assessment (NRDA) Final Rule (U.S. Federal Register, May 7, 1996, Vol. 61, No. 89, p. 20559-20614). The model is also

incorporated in the U.S. Oil Pollution Act of 1990 NRDA regulations. The technical documentation for this model is in French et al. (1996, 1999). The model algorithms will only be briefly summarized here.

The trajectory and fates model estimates the distribution of oil (as mass and concentrations) on the water surface, on shorelines, in the water column and in the sediments. The model is three-dimensional, using a latitude-longitude grid for environmental data. Algorithms based on state-of-the-art published research include spreading, evaporation, transport, dispersion, emulsification, entrainment, dissolution, volatilization, partitioning, sedimentation, and degradation. Oil mass is tracked separately for low molecular weight aromatics (1 to 3-ring PAHs) that cause toxicity, other volatiles, and non-volatiles.

The biological model estimates acute toxic response of marine biota to the oil. Wildlife oiled and killed are a function of area swept by surface oil, dosage, and vulnerability. Percent mortality of fish, shellfish, and their eggs and larvae are computed as a function of temperature, concentration, and time of exposure. Lost productivity of lower trophic levels is assessed as resulting from acute exposure. Lost catch and wildlife missing from the affected populations are estimated for present and future years, using estimated pre-spill abundance and natural and harvest mortality rates which would occur in the absence of the spill.

SIMAP includes the physical fates and biological effects models in the NRDAM/CME, with several changes and additions, as described in French et al. (1999). Most of the additions were made to increase model resolution, allow modification and site-specificity of input data, allow incorporation of temporally-varying three-dimensional current data, and facilitate analysis of results. The stochastic modeling approach was also added to SIMAP.

Summary of the Risk Assessment Approach

For oil spills, environmental risk is quantified as the probability of a spill times the probability of the consequences. Probability of a spill may be quantified by historical statistics combined with analysis of expected shipping. The probability of consequences of a spill may be estimated using SIMAP applied in stochastic mode.

In stochastic mode, a large number of trajectory and fates model simulations are run for a given spill site, randomly varying the spill date and time, and thus the wind and current conditions, for each run. The time histories of a large number of spill simulation runs are used to generate probabilities that water surface, water column, and shoreline areas will be affected by a release from the given site. The maximum exposure to each location is also quantified. Exposure data may be used to quantify the percent of resources affected above thresholds of concern. If desired, these percentages exposed may be multiplied by abundance to quantify expected impacts.

Further analysis of worst case scenarios may be accessed using individual spill simulations for worst case environmental conditions. Sensitivity analysis may be performed, whereby critical input data are varied over the possible range to determine their influence on the results. The output of this analysis may be to quantify and/or map areas affected above thresholds of concern, or to extend the analysis to quantify percentages or quantities of resources impacted.

References

French, D., M. Reed, K. Jayko, S. Feng, H. Rines, S. Pavignano, T. Isaji, S. Puckett, A. Keller, F. W. French III, D. Gifford, J. McCue, G. Brown, E. MacDonald, J. Quirk, S. Natzke, R. Bishop, M. Welsh, M. Phillips and B.S. Ingram, 1996a. The CERCLA type A natural resource damage assessment model for coastal and marine environments (NRDAM/CME), Technical Documentation, Vol. I–V. Final Report, submitted to the Office of Environmental Policy and Compliance, U.S. Department. of the Interior, Washington, DC, April, 1996, Contract No. 14-0001-91-C-11.

French, D., H. Schuttenberg, and Tatsusaburo Isaji, 1999. Probabilities of Oil Exceeding Thresholds of Concern: Examples from an Evaluation for Florida Power and Light, Proceedings of 22nd Arctic and Marine Oil Spill Program (AMOP) Technical Seminar, Calgary, Alberta, June 1999.

Appendix B

Input Data Used in the SIMAP Trajectory and Fates Model

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 Scenario Specification: Stochastic 3D FATES
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 Scenario Name : STOTTER1
 Description   : EVOS volume at Monterey

 Oil Spilled   : Alaskan No. Slope Crude (CME8)
 Amount Spilled  : 11000000.00 gallons      =    35934.91 Metric Tons
 Spill volume (mass) was held constant at this amount.

 Spill Location:
 Longitude (deg., min.): 121  54.1901 (W) =121.90320 (W)
 Latitude  (deg., min.):  36  15.9451 (N) = 36.26575 (N)

 Simulation Period: Years: 1991 to 1991
 from month  1 to 12
 # of randomly chosen start times = # runs:  200

 Release Duration (hrs)          :    .0
                  (instantaneous release)

 Simulation Time Step Fixed (hrs) :   1.00000
 Length of the Simulation (days)  :  14.0

Thresholds for oiling probabilities:
  Surface slicks on water:     .001000 mm
  Shoreline oiling:      .001000 mm
  Subsurface aromatics:    1.000000 mg/m3 (ppb)
  Subsurface oil droplets:   10.000000 mg/m3 (ppb)

 Number of Sublots (Lagrangian particles) Simulated:
   Number of Spillets              :   200
   Number of Aromatic Particles    :   500
   Number of Oil Droplet Particles:   250

  1 Windfile(s) Used:
       46028-91.WNE
 Surface Oil wind drift factor:   3.5 %
 Surface Oil wind drift angle :    .0 deg.

 No current data used.

 Habitat Grid File: OTTER200.GRD
 Fetch calculated from grid.

 Horizontal Turbulent Dispersion Coefficient:  3.00 m2/sec
 Constant Vertical Turbulent Dispersion Coefficient: .001000 (m**2/sec)
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Air Temperature (deg.C)    :   15.
Water Temperature (deg.C) :   15.
Salinity (ppt)             :  32.0
  This salinity is assumed constant in space.
  Density is calculated from salinity and temperature.

Suspended Sediment Concentration (mg/l): 10.00
Susp. Sedmnt Settling Velocity (m/day) :  3.00

Oil Droplet Coalescence Occurs Within Range :
  Minimum Dilution:          1.0
  Maximum Dilution:          1.0
Coalescence Rate (d Diameter/dt, microns/hr):     .000000

Droplet Density Rate of Change at 10 microns:     .000000 g/cm3/hr

Droplets Contacting Bottom Sediments and Shorelines Do Not Stick.

Surface release assumed

Diffusion coefficients in water at 25 C (cm2/sec):
  Aromatics, mol. wt. < 100:  .000010290
  Aromatics, mol. wt. > 100:  .000007988
Solubility enhancement factors for dissolution:
  Aromatics, mol. wt. < 100: 2.20
  Aromatics, mol. wt. > 100: 2.20


Response Assumptions During Time Simulated:
No dispersant applied.
No removal (mechanical or burning) performed.
No collection boom polygons retained oil.
No deflection boom polylines deflected oil.
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Properties Assumed for: Alaskan No. Slope Crude (CME8)

Density @ 25 deg. C (g/cm3)	:	.863000
Viscosity @ 25 deg. C (cp)	:	16.900000
Surface Tension (dyne/cm)	:	27.000000
Pour Point (deg. C)	:	-8.0
Initial Boiling Pt. (deg. C)	:	90.0
Aromatic Particulate/Dissolved	:	3650.000000
Adsorption Rate to Susp. Sedmnt	:	.010080
Adsorption Salinity Coef.(/ppt)	:	.023000
Fraction Low Mol.Wt. Aromatics	:	.0150
Fraction High Mol.Wt. Aromatics	:	.0500
Fraction Non-Aromatic Volatiles	:	.1600
A1-- Intercept Henry's Law v. T	:	4.500000
B1-- Slope Henry's Law v. T	:	10.100000
To-- Init. Boiling Pt.(deg. K)	:	363.000000
Tg--Gradient Distillation Curve	:	540.000000
Minimum Oil Thickness (m)	:	.000050
Maximum Mousse Water Content (%)	:	70.00
Degradation Rate (/day), Surface & Shore	:	.010000
Degradation Rate (/day), Oil in Water	:	.010000
Degradation Rate (/day), Oil in Sediment	:	.001000
Degradation Rate (/day), Aromatics in Water	:	.010000
Degradation Rate (/day), Aromatics in Sediment	:	.001000

Appendix C

Mapped Results from the SIMAP Trajectory and Fates Model

Below are the results of stochastic simulations for an 11 million-gallon spill at Point Sur. The start date of 200 runs was randomized within a decade-long wind record from a nearby weather buoy. Appendix A is a description of the model. Appendix B contains the assumptions used. See the main report for discussion of these results.

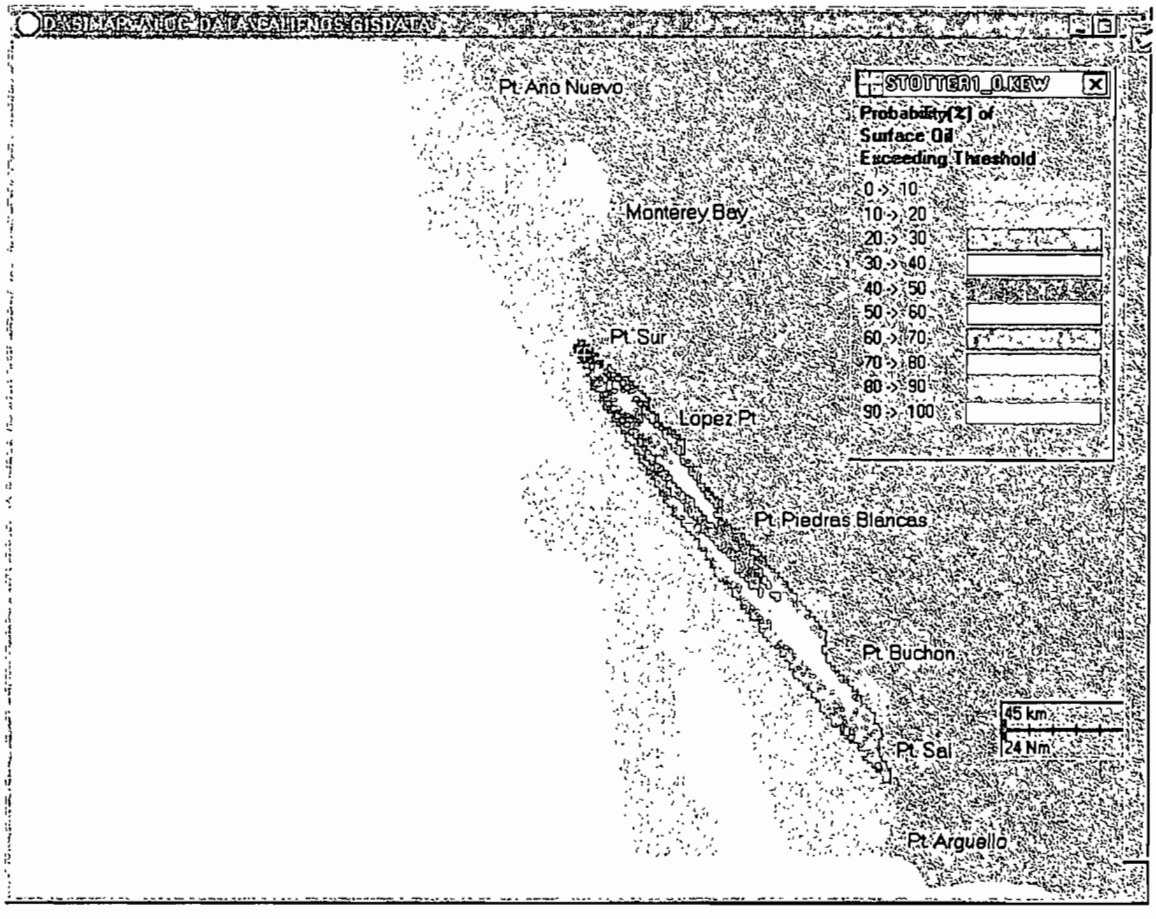


Figure C-1. Probability of water surface oil exceeding a thickness of 1 micron, in percent (%), for an 11 million-gallon spill at Point Sur.

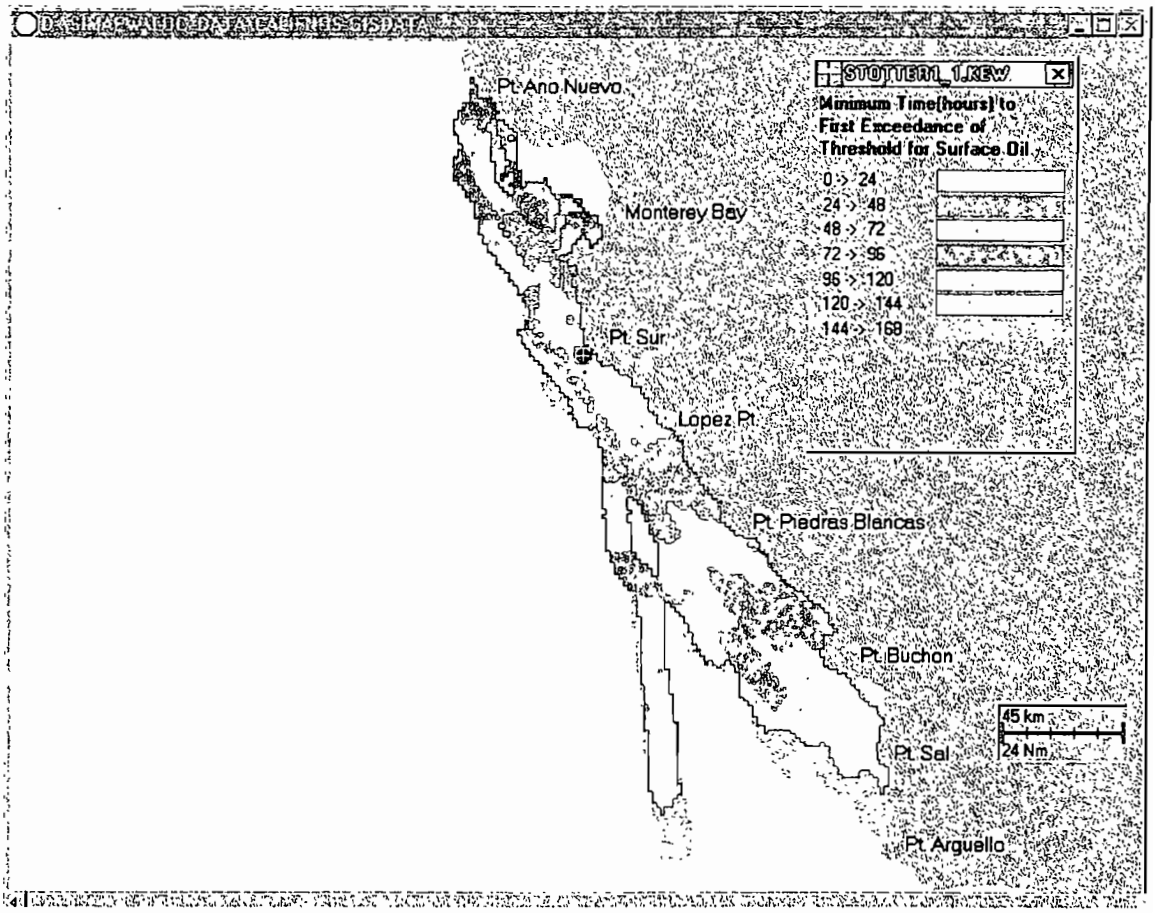


Figure C-2. Surface oil minimum travel time after the spill, in hours, for an 11 million gallon spill at Point Sur.

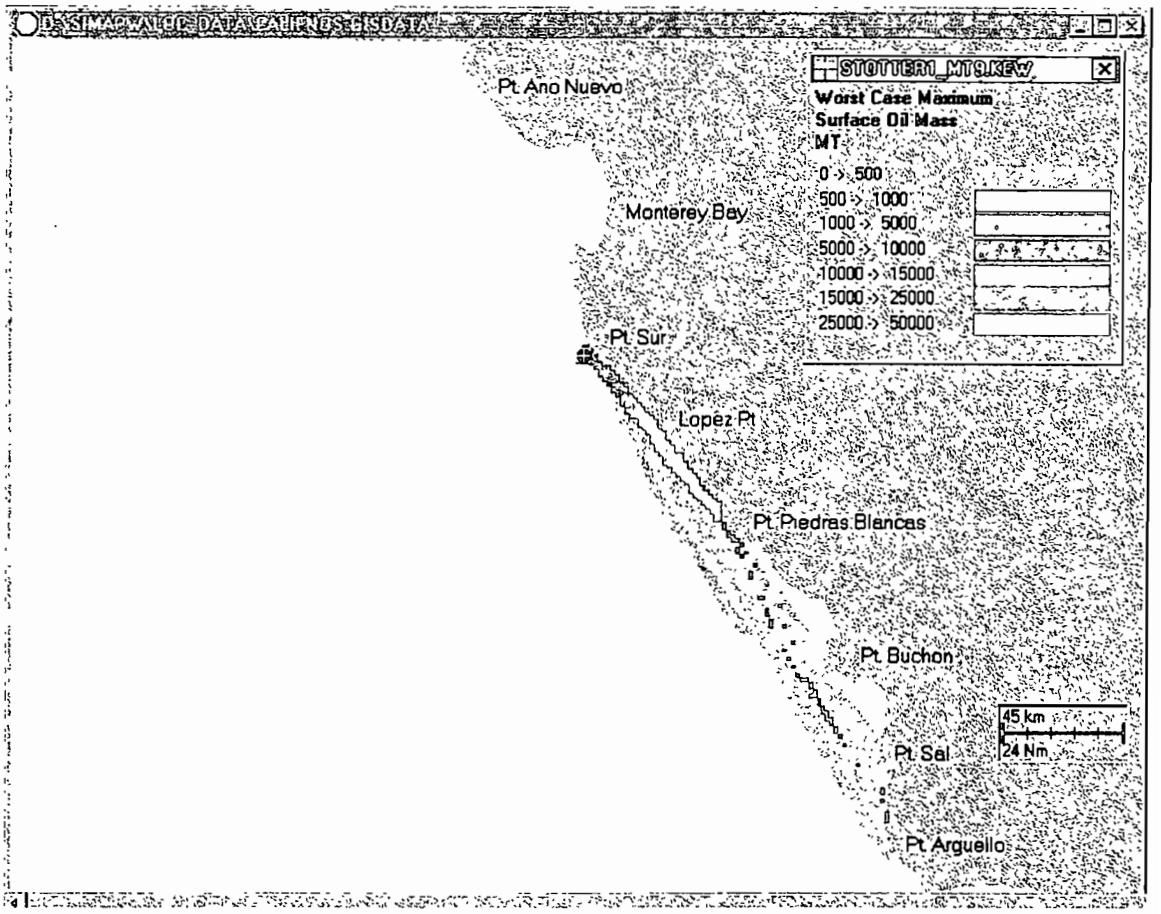


Figure C-3. Maximum surface oiling for the worst case run, in metric tons per grid cell (with area = 2.5 km^2), for an 11 million gallon spill at Point Sur.

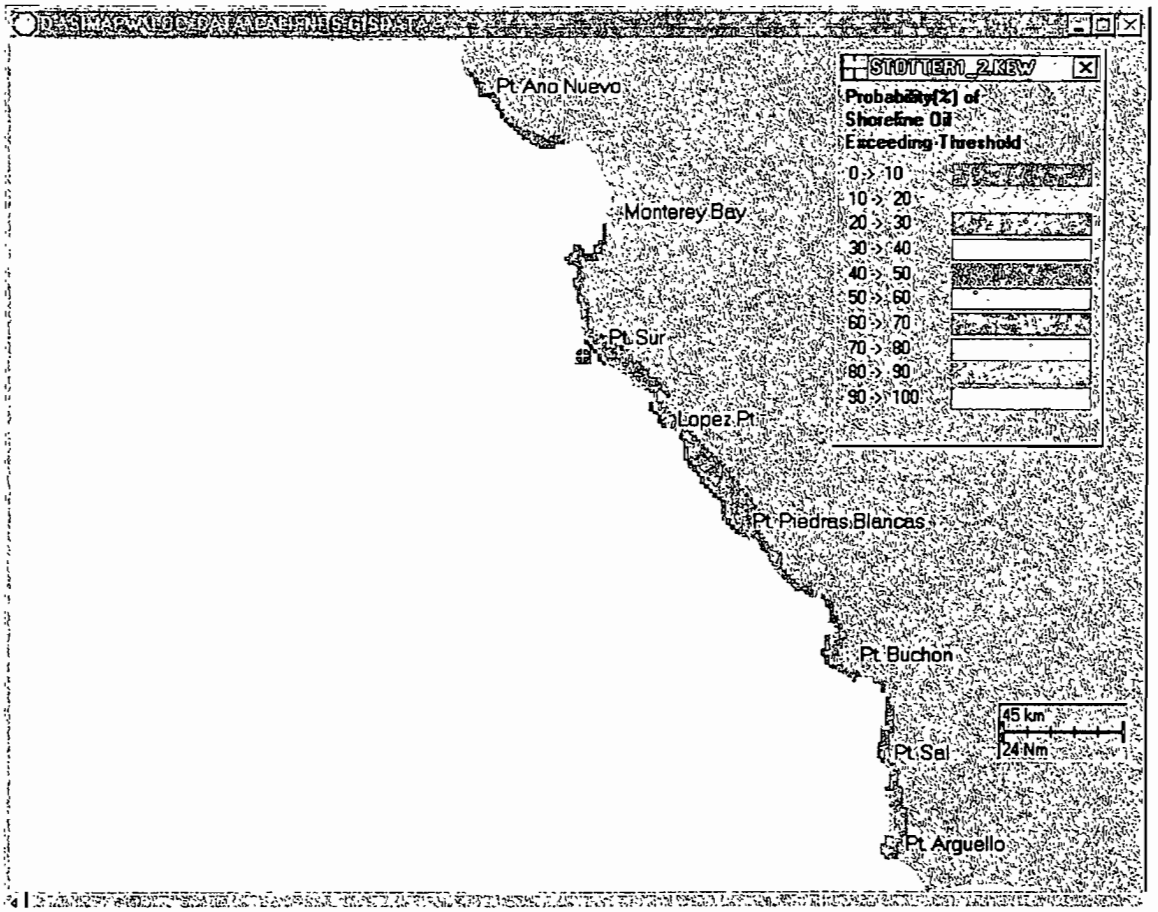


Figure C-4. Probability of shoreline oiling exceeding 1 micron, in percent (%), for an 11 million gallon spill at Point Sur.

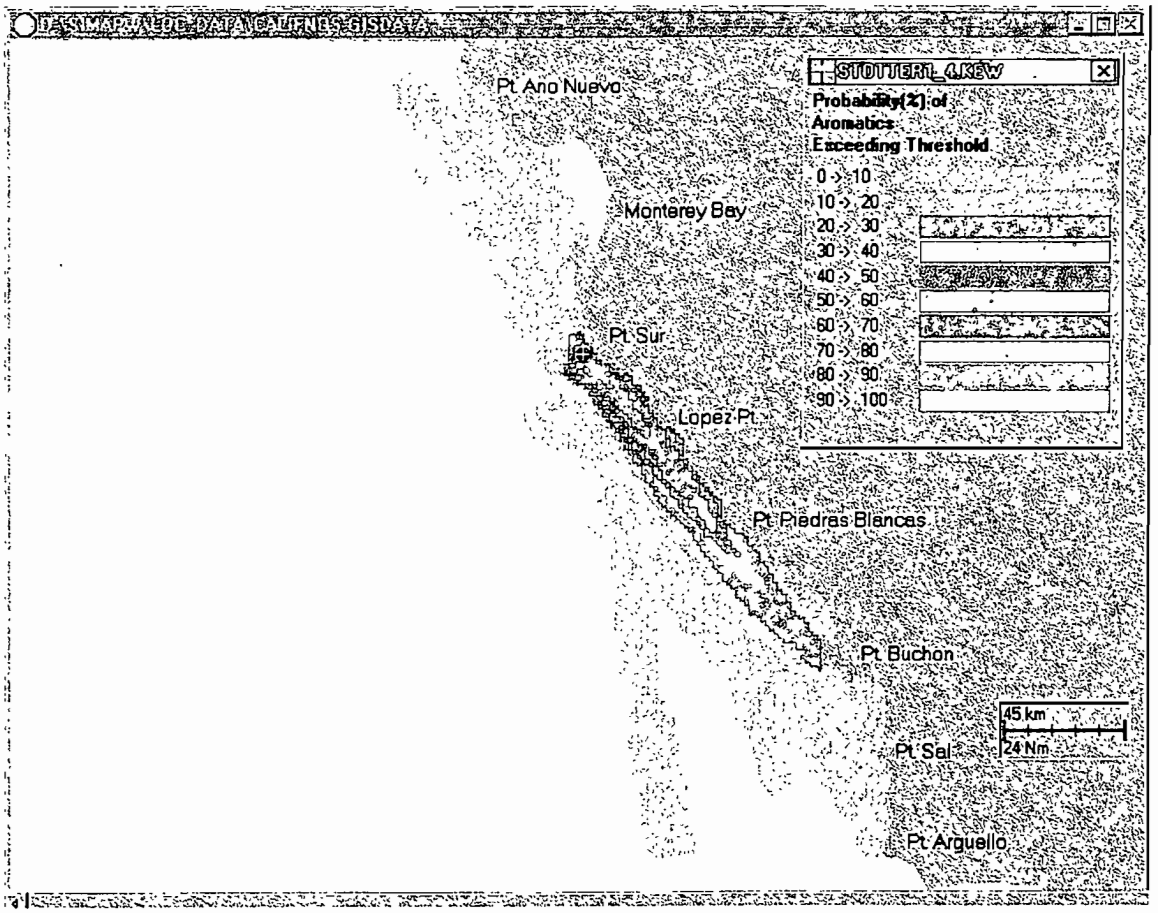


Figure C-5. Probability of PAH concentrations exceeding 1 ppb, in percent (%), for an 11 million gallon spill at Point Sur.

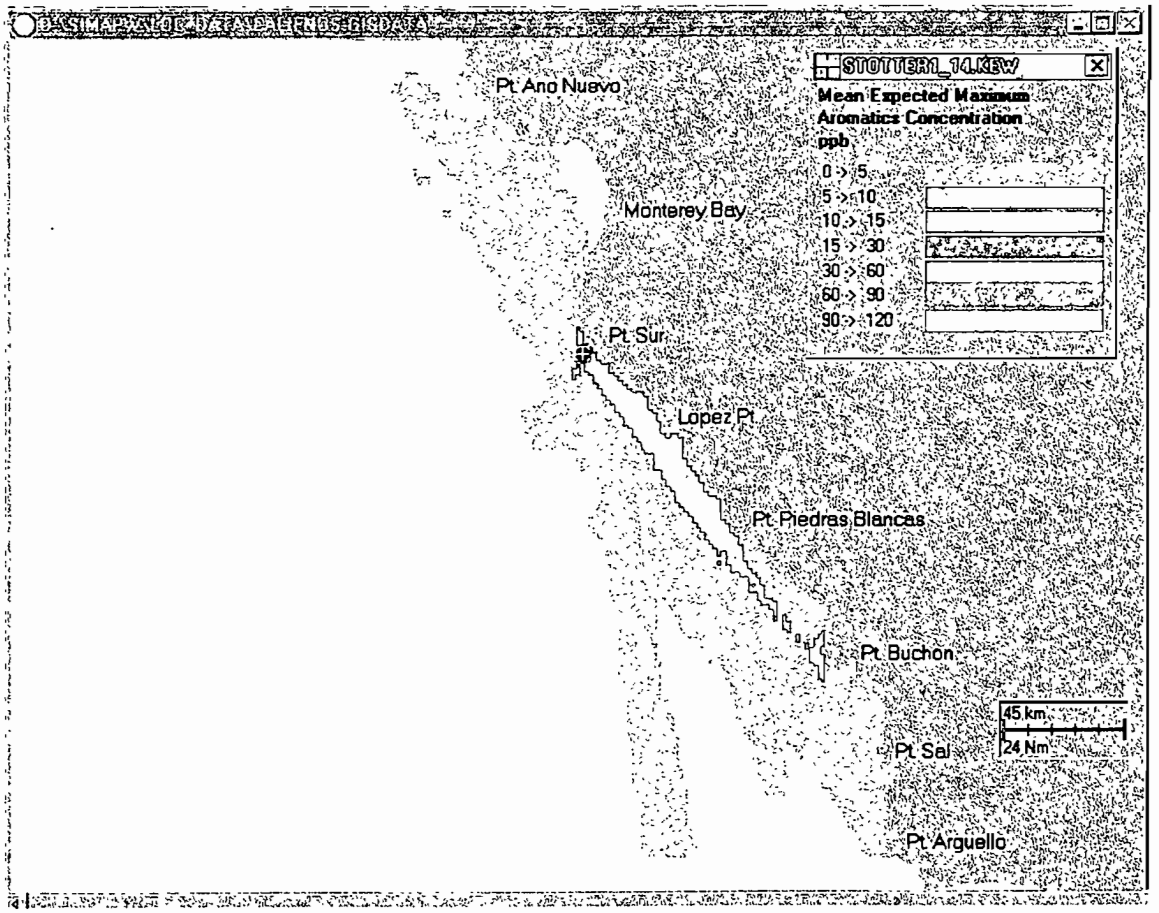


Figure C-6. Mean expected maximum PAH concentration, in ppb, for an 11 million-gallon spill at Point Sur.

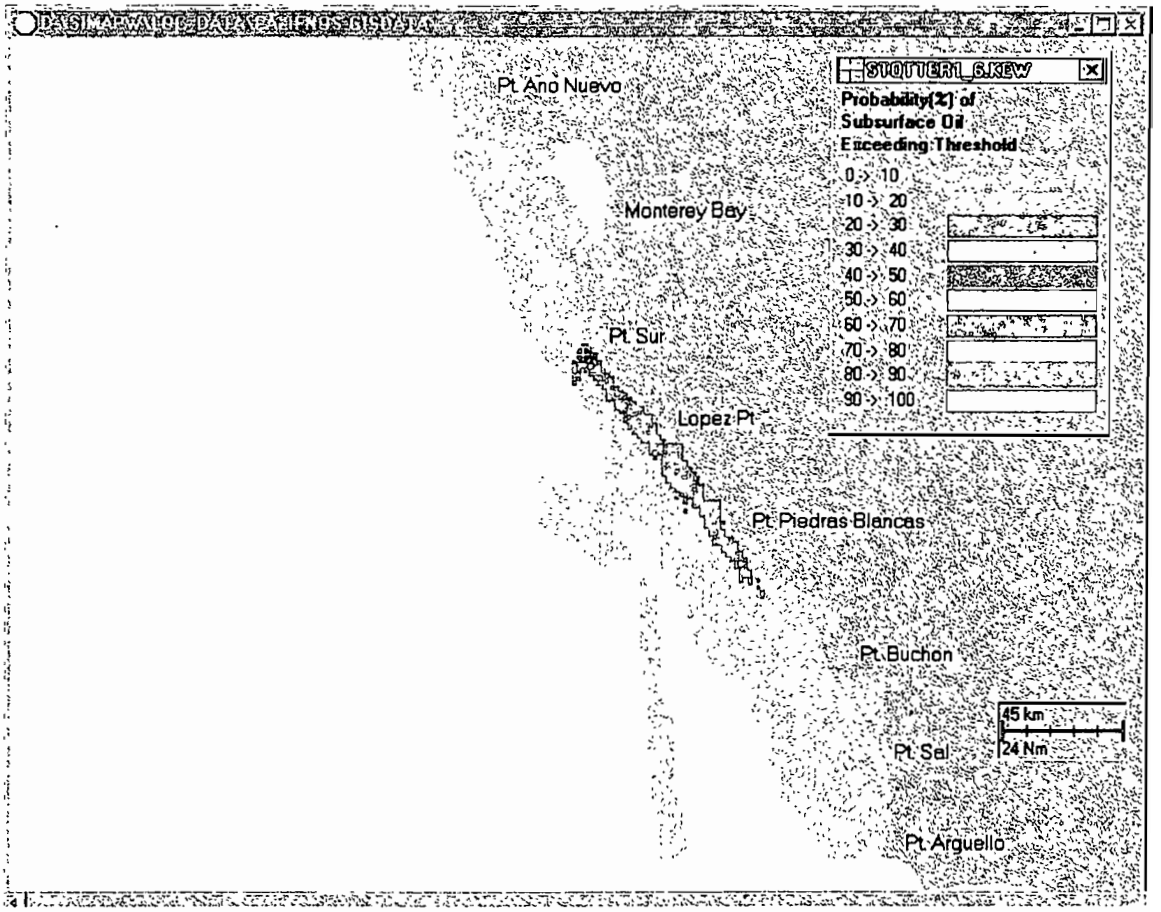


Figure C-7. Probability of subsurface oil concentrations exceeding 10 ppb, in percent (%), for an 11 million-gallon spill at Point Sur.

D

COUNTS OF SEA OTTERS AT THE SOUTH END OF THE RANGE DURING SPRING AND FALL RANGE-WIDE SURVEYS, SPRING 1995 - FALL 1999

Survey	Pt. Buchon to Pismo Pier	Pismo Pier to Pt. Sal	**Pt. Sal to Pt. Arguello**	Pt. Arguello to Pt. Conception	Southeast of Pt. Conception	Total South End of Range	Total Range-Wide Census
S-95	221	33	**17**	5	2	278	2,377
F-95	120	87	**14**			221	2,190
S-96	146	15	**12**	0	1	174	2,278
F-96	117	86	**14**	1		218	2,019
S-97	227	31	**24**			282	2,229
F-97	143	51	**19**	1	1	215	2,205
S-98	162	78	**60**	21	93	414	2,114
F-98	109	12	**187**	7	3	318	1,937
S-99	137	112	**34**	61	60	404	2,090
F-99	107	115	**34**	2	3	261	1,970

Numbers are for total animals counted, including dependent pups.

Chart prepared from data compiled by Brian Hatfield, U.S. Geological Survey

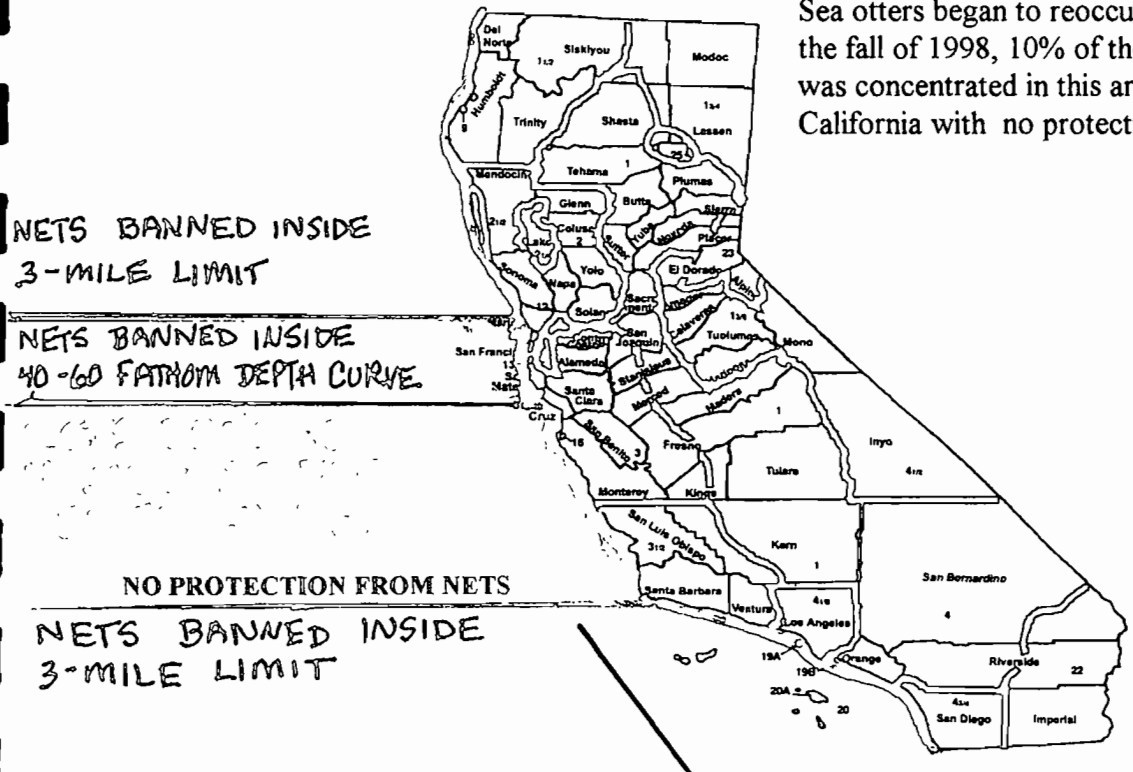
E

CALIFORNIA GILL & TRAMMEL NET BANS

No gill and trammel nets may be set within ocean waters less than 30 fathoms deep anywhere on the entire California coast, from the Oregon to the Mexican borders...

Except within the 20 mile stretch of coast between Point Sal and Point Arguello in Northern Santa Barbara County, just north of Point Conception.

Sea otters began to reoccupy this area in 1993, and by the fall of 1998, 10% of the entire sea otter population was concentrated in this area – the only place in California with no protections from drowning in nets.



Specific Area Closures – No Nets Allowed:

within 3-mile limit from Point Reyes north to Oregon border due to salmon fishery conflicts.

within 40 to 60 fathom depth curves from Santa Cruz County to Point Reyes due to threats to sea birds and harbor porpoise.

within 30 fathom depth curve from Santa Cruz to Point Sal due to threats to sea otters, marine birds, harbor porpoise and pinnipeds.

within 3-mile limit from Pt. Arguello to Mexican border due to sport fishery conflicts and theats to pinnipeds.