PROPOSAL SIGNATURE FORM

THIS FORM MUST BE SIGNED BY THE PROPOSED PRINCIPAL INVESTIGATOR AND SUBMITTED ALONG WITH THE PROPOSAL. If the proposal has more than one investigator, this form must be signed by at least one of the investigators, and that investigator will ensure that Trustee Council requirements are followed. Proposals will not be reviewed until this signed form is received by the Trustee Council Office.

By submission of this proposal, I agree to abide by the Trustee Council's data policy (*Trustee Council Data Policy**, adopted July 9, 2002) and reporting requirements (*Procedures for the Preparation and Distribution of Reports***, adopted July 9, 2002).

PROJECT TITLE: **Nearshore Synthesis: Sea otters & Sea Ducks**

Printed Name of PI: ____Brenda E. Ballachey_____

Signature of PI: _____ Date _____

Printed Name of co-PI: ____James L. Bodkin _____

Signature of co-PI: _____ Date _____

Printed Name of co-PI: ____A. Keith Miles _____

Signature of co-PI: _____ Date _____

Printed Name of co-PI: ____Daniel Esler _____

Signature of co-PI: _____ Date _____

* **www.evostc.state.ak.us/Policies/data.htm**
** **www.evostc.state.ak.us/Policies/Downloadables/reportguidelines.pdf**

Trustee Council Use Only Project No._____ Date Received: _____

FY08 INVITATION
PROPOSAL SUMMARY PAGE

Project Title: Nearshore Synthesis: Sea otters and sea ducks

Project Period: 1 October 2007 - 31 September 2009

Proposer(s): Brenda E. Ballachey and James L. Bodkin, USGS Alaska Science Center, A. Keith Miles, USGS Western Ecological Research Center, Daniel Esler, Pacific Wildlife Foundation

bballachey@usgs.gov, james_bodkin@usgs.gov, keith_miles@usgs.gov, desler@sfu.ca

Study Location: Prince William Sound, Alaska

Abstract: Sea otters, and other nearshore birds and mammals were severely impacted by the 1989 *Exxon Valdez* oil spill. In areas where acute effects were greatest and lingering oil persists, recovery for some of those nearshore birds and mammals remains incomplete through 2007. We present four objectives in this proposal: (1) Evaluate progress toward nearshore ecosystem recovery through surveys of expression of the Cytochrome P450 1A biomarker; (2) Estimate the frequency of use of oiled intertidal habitats by foraging sea otters; (3) Conduct histopathological examinations of sea otter liver biopsies, and (4) Evaluate PCB concentrations in sea otters and sea ducks. Anticipated outcomes will identify the current level of exposure to lingering oil in a suite of nearshore vertebrates, potential pathways of exposure to lingering oil through intertidal foraging by sea otters, the potential contribution of non-EVO contaminants (PCBs) to expression of the P450 biomarker, and the potential for injury at the cellular level in sea otters.

Funding:
EVOS Funding Requested: FY08 $ 485.3K (must include 9%GA)
EVOS Funding Requested: FY09 $ 279.0K (must include 9%GA)
EVOS Funding Requested: FY10 $ 000K (must include 9%GA)
Non-EVOS Funds to be used: FY08 $105K

TOTAL FY08: $590.3K

TOTAL both FY08 & FY09: $869.3K

Note: Work in FY09 will proceed only if warranted based on FY08 findings.

Date: 24 March 2008

(NOT TO EXCEED ONE PAGE)

PROJECT PLAN
Sea Otter Status and Nearshore Synthesis

Brenda Ballachey and James Bodkin, U.S. Geological Survey, Alaska Science Center
A. Keith Miles, U.S. Geological Survey, Western Ecological Research Center
Daniel Esler, Pacific Wildlife Foundation

I. NEED FOR THE PROJECT

A. Statement of Problem

Nearly 20 years ago the T/V *Exxon Valdez* spilled some 11 million gallons of crude oil into Prince William Sound (PWS) and the Gulf of Alaska, resulting in widespread mortality among marine plants and animals, with injury most severe among species occupying nearshore habitats (Spies et al. 1996). Perhaps contrary to some expectations, oil persists in intertidal habitats in western PWS (WPWS) and is particularly evident in those bays and passages where oiling was heaviest in 1989 (Short 2004). Further, evidence throughout the nearshore trophic web indicates an invertebrate pathway of exposure to upper trophic levels, including sea otters and sea ducks, with chronic effects resulting in delayed ecosystem recovery (Dean et al. 2000, Trust et al. 2000, Esler et al. 2000, Fukuyama et al. 2001, Ballachey et al. 2001a, Ballachey et al. 2001b, Bodkin et al. 2002, Esler et al. 2002). Studies conducted in 2001-2005 (EVOS projects //585 and //0620) have documented the abundance (but not the distribution) of residual oiling throughout the western Sound and the bioavailability of the oil to both predators and their prey populations, with significant elevations of cytochrome P4501A (CYP1A), a biomarker of exposure to aromatic hydrocarbons, observed in some nearshore species sampled in oiled areas as recently as 2007. For sea otters, aerial surveys of abundance through 2007 demonstrate no recovery of the population in those areas that were heavily oiled in 1989, despite significant increases in population size at Montague Island and in the entirety of WPWS (USGS unpublished data).

Sea otters, harlequin ducks and Barrow's goldeneyes are among the species considered to be at highest risk of continuing injury from oil because of their close association with nearshore areas. Both harlequins and goldeneyes feed exclusively in intertidal areas. For sea otters, recent EVOS supported research demonstrated that, on average, an individual animal allocates about 15% of its foraging to the intertidal zone (USGS unpublished data). However, significant variation was evident among seasons, with an average of more than 35% intertidal foraging in late spring. Thus, intertidal foraging provides a potential pathway of exposure to oil for both sea otters and sea ducks. A recent study by Boehm et al. (2007), however, suggests that sea otters may avoid foraging in areas of lingering oil. Avoidance of habitats where lingering oil persists could help explain why sea otter populations in heavily oiled areas have not recovered, but this reduction of habitat available for foraging does not explain elevated CYP1A biomarker levels in sea otters and other nearshore species in WPWS over the last decade.

In consideration of the delayed recovery of several species of birds and mammals that occupy nearshore habitats in WPWS, and the finding of unanticipated volumes and persistence of spilled *Exxon Valdez* oil, we identify four research needs to assess the current status of nearshore

habitats and species relative to potential exposure to lingering oil: (1) estimate the current exposure of a suite of nearshore species to lingering *Exxon Valdez* oil in WPWS; (2) evaluate sea otter use or avoidance of intertidal habitats relative to the presence of lingering oil; (3) conduct histopathological examination of sea otter liver biopsies, and (4) conduct an analysis of existing data on polychlorinated biphenyls (PCBs) levels in sea ducks and sea otters.

The first research need can be met through measurement of the CYP1A biomarker in five species: two fishes (crescent gunnels and masked greenlings), two birds (harlequin ducks and Barrow's goldeneyes), and 1 mammal (sea otters) that reside in nearshore habitats. The second research need will be met through a combination of approaches, including (a) determination of the frequency of use of known contaminated shorelines by foraging sea otters, (b) determination of the frequency of intertidal foraging and estimate the relative magnitude of oil on previously oiled shorelines that have not been sampled for lingering oil, and (c) experimental estimation of the persistence of excavations that simulate sea otter forage pits in intertidal sediments. If it is determined that sea otters are avoiding foraging in intertidal habitats, additional research in 2009 may be required to quantify the extent of that avoidance and to evaluate alternative pathways and sources of exposure to nearshore vertebrates. The third research need, histopathology of sea otter livers, will be done on archived samples collected from 2001-2006. The fourth research need, analysis of PCB data collected in the late 1990's on sea otter and sea duck tissue samples, will help determine if contaminants other than PAHs from lingering oil might be contributing to elevated CYP1A levels in WPWS.

The outcomes of the proposed research include current estimates of the expression of CYP1A in species that reside in habitats known to harbor residual oil from the spill, identification of the use or avoidance of intertidal habitats where lingering oil persists, and evaluation of injury at cellular level in sea otters. These findings will be relevant to evaluating the current status of species and habitats injured by the 1989 spill, and useful in formulating potential restoration strategies. Further, these analyses will aid researchers in identifying locations and common pathways of exposure, potential constraints to recovery through habitat avoidance, and identify potential locations for restoration activities by managers.

B. Relevance to the 1994 Restoration Plan Goals and Scientific Priorities

Recovery of the PWS ecosystem from the *Exxon Valdez* oil spill may not be considered complete until individual animals are no longer exposed to lingering oil from the spill, and when populations reach pre-spill levels of abundance. Neither harlequin ducks nor sea otters have fully attained recovery goals, and lingering oil remains implicated in the lack of recovery at the species and ecosystem levels. The proposed work will allow continued evaluation of the state of the nearshore ecosystem through measures of biomarkers of hydrocarbon exposure in species occupying nearshore habitats. Results of these biomarker assessments will identify if exposure persists and, therefore, where restoration efforts may be of greatest potential benefit to nearshore species as a group and the nearshore ecosystem as a whole. Additional work proposed herein will help to elucidate mechanisms of continuing oil-related injury that may be constraining recovery of the nearshore in WPWS.

II. PROJECT DESIGN

A. Objectives

Objective 1. Measure the CYP1A biomarker in 5 nearshore species that previously exhibited elevated levels of CYP1A.

$H_{o:}$ Measured levels of CYP1A do not differ between known oiled sites and unoiled sites for each species.

For over a decade (since 1996), we have monitored CYP1A levels as a measure of exposure to aromatic hydrocarbons (PAH) in a suite of species (2 fishes, 4 birds, 2 mammals) associated with intertidal areas in WPWS (Ballachey et al. 2001b). All 8 species have shown elevated CYP1A over this period, but in several species, including river otters and pigeon guillemots, data suggest that exposure has diminished to background levels (USGS unpublished data). However, for other species, including sea otters and sea ducks, there are still concerns of persisting exposure to oil. Differences in continuing risk for intertidal species may relate to dietary preferences, as consumption of invertebrates may lead to greater exposure to lingering oil in sediments compared to consumption of fishes.

In 2008, we propose to resample 5 nearshore species (sea otters, harlequin ducks, Barrows goldeneyes, masked greenlings and crescent gunnels) for evidence of continuing exposure to lingering oil, using the CYP1A biomarker. As in past seasons, captures would be done in oiled areas of WPWS and in nearby unoiled areas to provide a reference sample.

Objective 2. Estimate frequency and locations of use of soft sediment intertidal habitats by foraging sea otters.

In 2004 and 2005, we recovered 16 archival time depth recorders (TDR's) from sea otters residing in areas of western Prince William Sound, Alaska that were heavily oiled in 1989. Our study area included shorelines where lingering oil persisted in intertidal habitats, and where a suite of nearshore fishes, birds, and mammals exhibited evidence of chronic oil exposure through 2001. The 16 TDR's contained 14.7 years of continuous recordings representing 1,075,202 forage dives. On average sea otters made 197 forage dives per day (se=15, range 115-303), with females making significantly more dives per day than males (219 vs. 130; t=3.47, p=0.004). Overall individuals allocated 0.13 (se=0.02) of their foraging to the intertidal zone and 0.87 (se=0.09) to the subtidal. Females allocated significantly more foraging to the intertidal (0.16, se=0.02) than males (0.05 se=0.006; t=2.71, p=0.017) (Figure 1). Based on a diet consisting of 0.72 clams and the assumption that clams require excavations, we estimate that female sea otters, on average, are excavating intertidal sediments during 25 dives per day and males during 5 dives per day. We also detected a strong seasonal signal in the frequency of intertidal foraging in our study animals when the proportion of intertidal foraging averaged 0.23 during the months of March-May, compared to 0.13 in all other months.

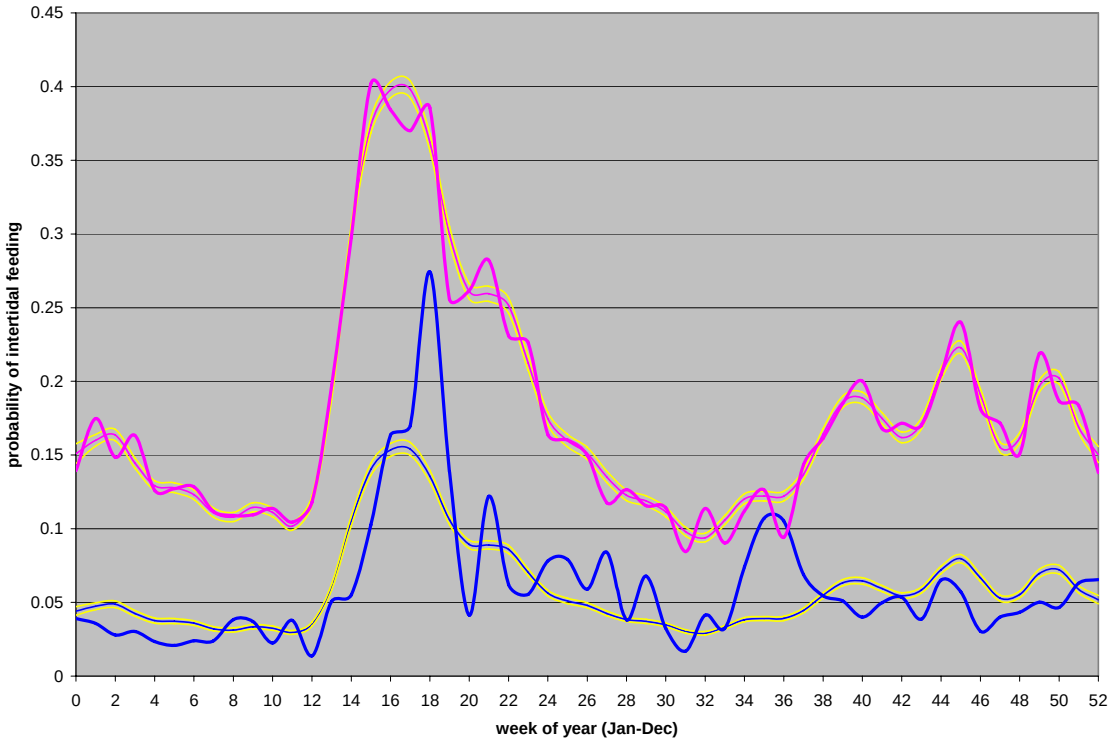

Figure 1. Probability of intertidal foraging by sea otters at Knight Island, Prince William Sound, 2003-2004. Fine pink line is modeled value for all females (n=11) and fine blue line is modeled values for all males (n=5). Thick lines are average values by sex and yellow lines are 95% confidence intervals for each sex.

Analysis of TDR data also provided estimates of the distribution of foraging within the intertidal zone (Figure 2). In this analysis, each forage dive depth was corrected for tidal elevation at the time the dive occurred. For example, a dive to -2m when the tidal elevation was + 1.5 m equated to a tidally corrected depth of -0.5m. Averaging over all individuals, we found that intertidal foraging was most common near the zero tidal level and estimate that 37% of all intertidal foraging occurs in the tidal range above the MLLW level of 0.0m (Figure 2).

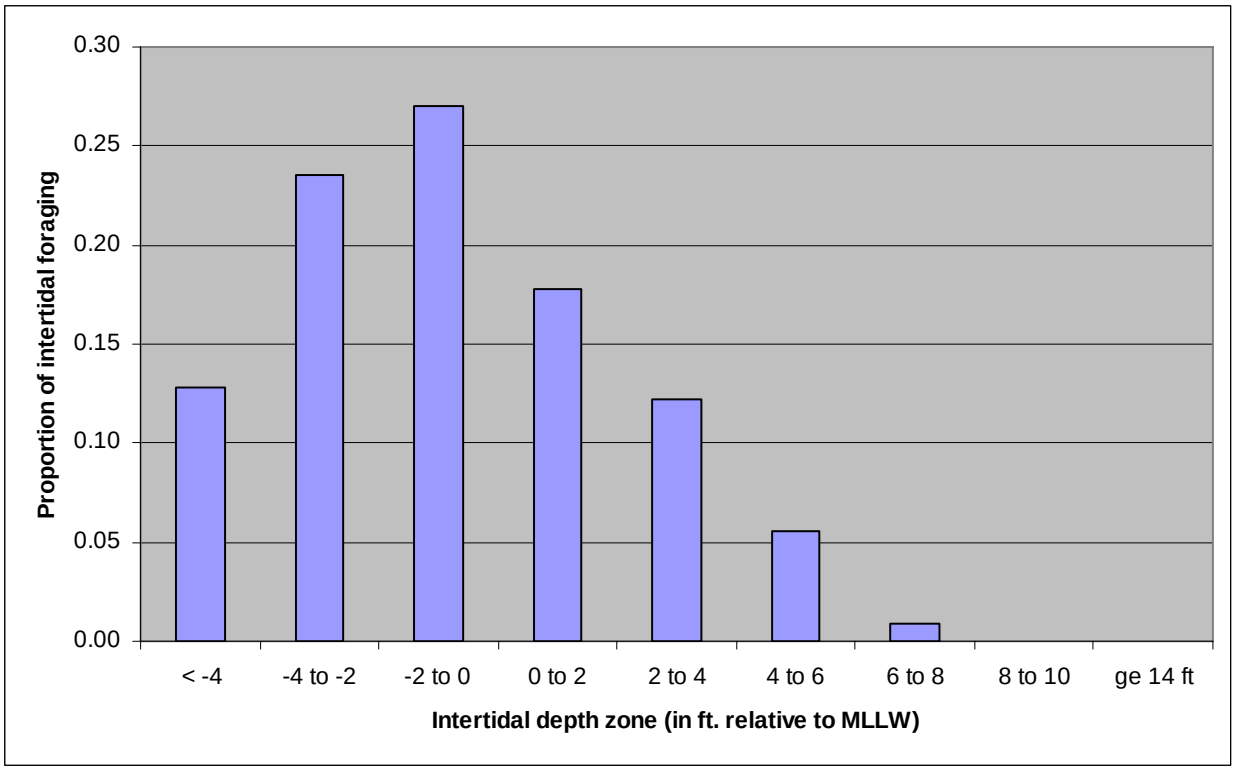

Figure 2. Vertical distribution of intertidal foraging depths by sea otters at Knight Island, Prince William Sound, 2003-2004. All foraging depths were corrected for tidal elevation at the time the dive occurred.

Although we provide accurate estimates of the distribution of intertidal foraging by sea otters at Knight Island, we have not collected data on foraging locations relative to lingering oil locations. While we assume that our study animals use the intertidal zone in proportion to availability, it is possible that sea otters are able to detect oil-contaminated habitats and avoid foraging at those locations. Boehm et al. (2007) searched shoreline segments in WPWS known to retain lingering oil and found little evidence of sea otter foraging within those segments based on the general absence of foraging pits, particularly in tidal elevations above 0.0m. From this they concluded that sea otter foraging in the intertidal does not intersect with habitats where lingering oil persists and thus represents little opportunity for exposure to lingering oil. Potential explanations for the apparent inconsistency between documented exposure and use of the intertidal by sea otters include 1) persistence of otter excavated pits less than one year, in contrast to the assumption of Boehm et al. (2007), and 2) avoidance of contaminated intertidal areas resulting in delayed recovery of sea otters as a consequence of reduced habitat availability. To evaluate these two alternatives we propose a two phase approach. In phase 1, we will (1) experimentally determine the persistence of pits in habitats where lingering oil occurs and, (2) determine the frequency of use of contaminated shorelines by foraging sea otters based on estimates of pit persistence and observations of foraging sea otters. If data obtained through addressing 1 and 2 above indicate sea otters are avoiding contaminated habitats, additional work (phase 2) will be required to quantify the magnitude of this effect and the identification of those areas being avoided. Results of the proposed work will improve our understanding of how sea otters, and by extension other

species, are continuing to be exposed to lingering oil, and identify habitats and locations that would be candidates for direct restoration activities.

Phase 2: If it is determined in 2008 that sea otters are actively avoiding foraging in intertidal habitats contaminated with residual EVO, additional work may be justified to identify and quantify the extent of this avoidance. Advanced technology remote sensing (e.g. GPS tags, radio transmitters) may be required to provide these estimates. In anticipation of this need, we are requesting $20K in R&D support to develop appropriate technologies and their explicit application to sea otters. It should be determined by late summer of 2008 if phase 2 will be needed and a detailed proposal will be developed at that time. For planning purposes we anticipate a phase 2 project cost of approximately $250K.

Objective 3. Conduct histopathological examination of sea otter liver biopsies.

Sea otters in oiled areas of WPWS do not appear to have recovered from the 1989 *Exxon Valdez* oil spill, and chronic exposure to hydrocarbons, presumably from the spill, is suspected to be a factor limiting recovery although mechanisms of toxicity are not well understood. Capture of sea otters for collection of biological samples has been ongoing since shortly post-spill. Since 2001, we have been sampling livers (by endoscopy) and biopsies have been preserved in formalin for histopathology, comparing sea otter samples in oiled and unoiled areas. Histological examination of these samples is important as the liver is thought to be an organ that may be adversely affected by long-term exposure to oil, and observations at the cellular level may be informative in understanding mechanisms of injury. Furthermore, samples should be independently scored by two pathologists. Liver samples have been read already by one pathologist and thus we propose a second, fully independent reading.

Objective 4. Conduct an analysis of existing data on PCB levels in sea ducks and sea otters.

Elevations of the CYP1A biomarker of exposure to hydrocarbons have been observed in numerous species that inhabit areas affected by the 1989 *Exxon Valdez* oil spill in WPWS. Induction of CYP1A is a measurable and well-known cellular detoxification response to hydrocarbon exposure in vertebrates, and assessment of CYP1A in sea ducks and sea otters continues to indicate possible exposure to EVOS oil more than a decade after the spill. However, certain PCB constituents, particularly highly toxic coplanar congeners, also may activate the CYP1A response and thus confound results that identify EVOS hydrocarbons as the causative agent. Concentrations of PCB congeners were measured in plasma of harlequin ducks captured in the late 1990's in WPWS, and Trust et al. (2000) established that PCB congener concentrations did not account for the variation in CYP1A between oiled and unoiled areas of WPWS. PCBs have also been measured in serum samples of 28 sea otters captured in the mid-1990s in WPWS, in known oiled and unoiled areas, but for sea otters, there has not been a full evaluation of PCBs relative to CYP1A. We will provide a complete analysis of CYP1A and PCBs in sea otters, and subsequently compare PCB congener concentrations in sea otters and harlequin ducks.

B. Procedural and Scientific Methods

Objective 1. Measure the CYP1A biomarker in 5 nearshore species that previously exhibited elevated levels of CYP1A.

Sea otters, harlequin ducks and Barrow's goldeneyes are all species that occupy nearshore marine habitats and forage completely (ducks) or partially (otters) in intertidal habitats where lingering oil deposits are known to occur. Further, in oiled areas of WPWS, all three species have demonstrated elevated levels of the CYP1A enzyme, a biomarker of hydrocarbon exposure, over the last few years. Elevations of CYP1A have also been noted in past years for two species of fish, masked greenlings and crescent gunnels, which inhabit nearshore waters.

We will capture and sample individuals of all 5 species using methods previously described (Bodkin et al. 2002, Esler et al. 2002, Jewett et al. 2001). As in previous years, samples from oiled areas will be obtained in the vicinity of northern Knight Island, where shorelines were heavily oiled in 1989, and at Montague Island as a reference site. In 2008, we also plan to extend the area of capture to Green Island and Prince of Wales Passage, areas which are thought to have less residual oil on shorelines relative to northern Knight Island. Captures in these areas should help to clarify the geographic area of concern regarding potential continuing exposure to oil on shorelines. We plan to capture a total of 45 sea otters, masked greenlings and crescent gunnels, 15 each from the three areas (heavily oiled, moderately oiled and unoiled reference), in May 2008. Sea duck captures (40 each species, 20 from oiled and 20 from unoiled areas) will be done in March 2009, targeting birds in oiled areas at northern Knight, Green and Crafton islands, and at Montague Island as a reference site.

For sea otters and sea ducks, methods used for CYP1A assays will be similar to those used in past years. For sea otters, mRNA will be isolated from blood samples and analyzed for CYP1A by real-time PCR at two laboratories, UC Davis and Purdue University. Sea duck liver biopsies will be analyzed for CYP1A using the EROD assay, at UC Davis. For greenlings and gunnels, past CYP1A assays have been by immunohistochemistry (IHC) on formalin-fixed liver samples. However, in 2008, we will freeze liver biopsies in liquid nitrogen and quantify CYP1A by the EROD assay, as this should be a more sensitive measure of the biomarker levels than the IHC assay.

Objective 2. Estimate frequency and locations of use of soft sediment intertidal habitats by foraging sea otters.

A. Intertidal forage pit persistence: Pit persistence will be estimated by experimentally creating sea otter foraging pits in the intertidal zone at northern Knight Island, PWS. Dimensions of pits will be approximately 0.3m by 0.3m by 0.2m deep, the approximate dimensions of sea otter forage pits typically observed in PWS and elsewhere in Alaska. Sediments resulting from the excavations will be distributed around the perimeter of the pit, simulating the excavation of a sea otter. Experimental pits will be excavated at three tidal elevations (0.0m, +1 m and +2m) along five transects on seven beaches representing exposure to wind and wave directions across the compass range (approximately 50 degrees). Transects will be systematically placed, with random start, and spaced up to 50 m apart depending on the width of the shoreline containing

suitable sediments. Shorelines with unconsolidated sediments (from silt/sand to cobble) and identified as suitable clam habitat by the presence of clam shell litter will be selected for sampling. Each pit will be located along a transect marked at each end by rebar stakes 1 m below the 0.0 and above the +2.0m tidal elevations. Pits will be excavated at the designated tidal heights along the transect with distances between pits and the endpoints used to identify and locate each pit (Fig 3). Transect endpoints and each pit will be identified by GPS coordinates and the slope of the beach along the transect will be measured. Sediment profiles for each pit will be determined visually during excavation. Each pit will be photographed upon excavation, identified by site and number and will be visited periodically until it is no longer discernable. Intervals of pit inspection will begin at one day with an increasing interval up to two weeks (to coincide with spring tide series). At each visit the pit will be identified as present or absent, and photographed. At least two biologists will alternate in inspections of pits, to minimize familiarity with the pit locations as a factor in assessing their persistence. The distance measurements from endpoints will be used to reconcile potential discrepancies that might be caused by the presence of new pits or questions related to persistence. Foot traffic and other sources of potential disturbance to pits will be minimized to the extent possible.

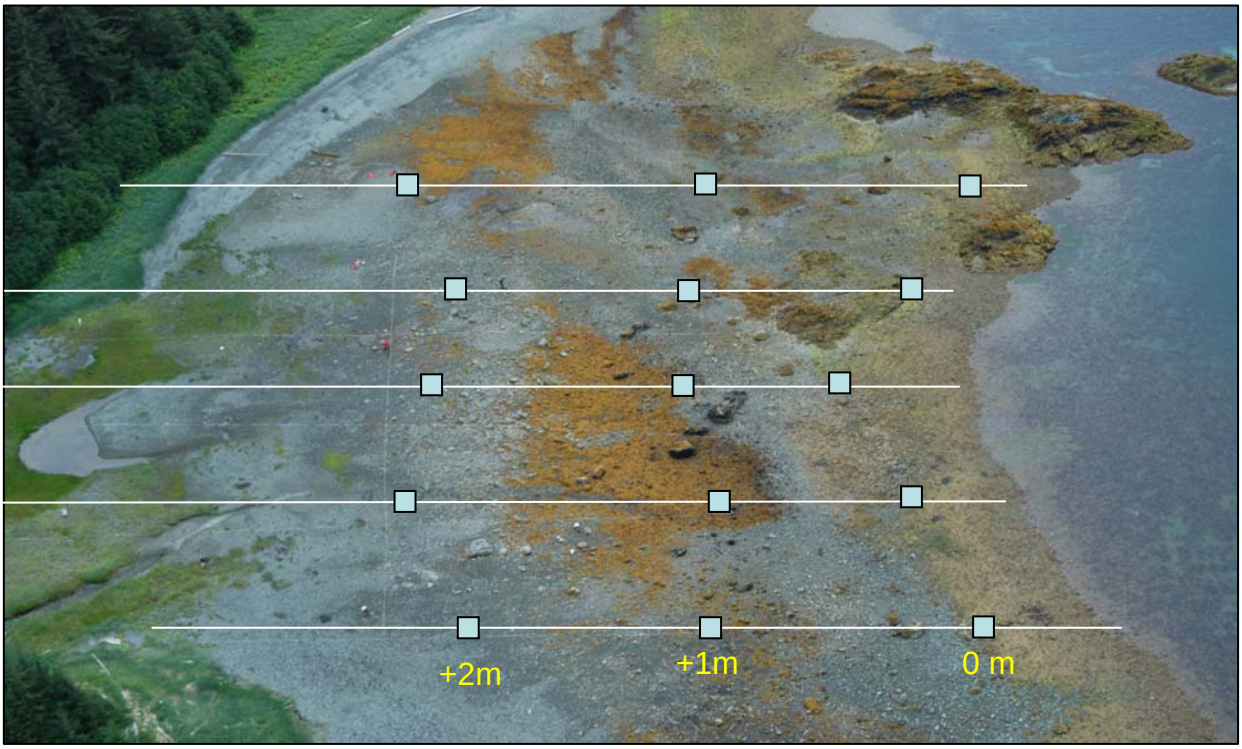

Figure 3. Example of sampling design of experimental pits on a beach in Prince William Sound.

B. Intertidal foraging and PAH's: Potential explanations for the lack of sea otter forage pits in shorelines known to harbor residual oil is simply that forage pits persist for less than a year (perhaps much less), requiring more frequent sampling to evaluate the use of those beaches as foraging areas than the single sampling reported by Boehm et al. (2007). Alternatively, sea

otters may be avoiding foraging where lingering oil persists. To address these possibilities, we will sample foraging beaches at northern Knight Island visually for foraging sea otters and for evidence of past foraging indicated by foraging pits. Observations will be made on a weekly basis during spring and summer 2008. Because only a small fraction (~10%) of beaches heavily oiled in 1989 needed to be sampled to estimate the volume of lingering oil in 2001 and 2004, it is likely that sea otter foraging may be occurring on beaches where lingering oil persists, but which were not used to estimate lingering oil volume (Short et al 2004) or sea otter foraging (Boehm et al. 2007). (i.e., most beaches where lingering oil persists remain undocumented as to location).

During the months of April- June, 2008 (when intertidal foraging is elevated) we will sample visually for sea otters foraging in the intertidal zone during high tide periods, and will visually search for evidence of intertidal foraging pits during periods of low tide. When either or both procedures identify intertidal foraging we will map and record those locations with GPS. Those locations will be overlaid with maps depicting shoreline oiling immediately following the spill. When the observed forage locations intersect with known oiled shorelines we will deploy passive sampling devices (SPMD's, semi-permeable membrane devices) on the surface over the identified shore line and simulate foraging sea otter behavior by creating excavations with 2 m pry bars. This will be done during periods of a rising tide when the sediments are covered with water. The excavations will disturb sediments and residual oil, if present will rise to the surface and be accumulated with SPMD's. We will deploy up to 40 SPMD's in foraging areas that were previously oiled and 10 SPMD's, using identical methods over unoiled soft-sediment habitats. SPMD's will be tethered to the substrate central to the identified forage areas and allowed to float during the rising tide. The SPMD's will be retrieved during the following daylight low tide period. Deployment, retrieval, and analysis of SPMD's will be under the supervision of NOAA, Auke Bay Laboratory scientists.

Objective 3. Conduct histopathological examinations of sea otter liver biopsies obtained from 2001-2006.

Samples have been examined at Purdue University by Dr. Paul Snyder and by a second pathologist working with Dr. Snyder. However, an additional examination of the biopsies, fully independent of the Purdue readings, is advisable. Thus we propose to send liver samples for histopathology readings by Dr. F.C. Mohr, a board certified pathologist in the School of Veterinary Medicine at UC Davis, California. Staining and scoring procedures used on the biopsies will follow standard histological methods.

Objective 4. Conduct an analysis of existing data on PCB levels in sea ducks and sea otters.

For this component, no new samples or data are required. Rather, we will use an existing data set on PCB congeners that was collected in the late 1990's on sea otter serum samples, supplemented with a data set on harlequin duck plasma samples. Data will be provided to Dr. K. Miles at UC Davis, who will work with personnel there (a biologist with extensive PCB experience and a statistician) on a full analysis of the data, including PCB concentrations in tissues by area (oiled vs. unoiled) and relations among congeners and expression of CYP1A in individual animals.

C. Data Analysis and Statistical Methods

Objective 1. Measure the CYP1A biomarker in 5 nearshore species that previously exhibited elevated levels of CYP1A.

Data generated in CYP1A assays will be tested for normality and if non-normal, will be analyzed using nonparametric tests, or transformed to achieve normality where feasible. Because a different CYP1A metric is obtained for sea otters vs. sea birds vs. fishes, species groups will be analyzed separately. The main effect of interest for all species is the comparison of areas (heavily oiled vs. moderately oiled vs. unoiled for sea otters and fishes; oiled vs. unoiled for sea ducks). Depending on our ability to capture close to known oiled beaches, we may be able to group individuals within oiled and unoiled areas (i.e., by proximity to a specific segment of shoreline) and compare subgroups within each area. ANOVA will be performed to test for area effects. We will also examine trends in CYP1A over time for species with multiple years of CYP1A measurement, using regression analysis. Finally, we will examine relations between individual measures of CYP1A and proximity of individuals to known oiled shorelines at the time of capture.

Objective 2. Estimate frequency and locations of use of soft sediment intertidal habitats by foraging sea otters

Intertidal forage pit persistence: Pit persistence will be estimated as the mean (se) number of days between excavation and first date when the pit was no longer detectable and will be calculated based on all pits from all sites. The midpoint in time between the last day the pit was detected and the first day it was not detected will be used to estimate persistence time. We will also estimate pit persistence by site and tidal elevation, and compare those estimates with 2-way analysis of variance. Assuming some pits are evident after four months we will model persistence of remaining pits based on the rate of disappearance observed through four months. If all pits are evident after four months we will visit each site once per month, or as frequently as possible for up to one year, or until more than 50% of the pits disappear.

B. Intertidal foraging and PAH's: PAH concentrations obtained from SPMD's placed over previously oiled intertidal forage areas (n=40) will be compared with PAH concentrations from SPMD's placed over unoiled intertidal forage areas (n=10). A spatial analysis searching for intersections between documented intertidal foraging areas and known intertidal habitats where lingering oil persists should identify if sea otters are foraging in, or avoiding contaminated sediments.

Objective 3. Conduct histopathological examinations of sea otter liver biopsies obtained from 2001-2006.

Liver sections will be provided to Dr. F.C. Mohr in the College of Veterinary Medicine at UC Davis. Samples will be stained using standard histology techniques, and read blind. A report summarizing the incidence and severity of abnormalities by area will be provided.

Objective 4. Conduct an analysis of existing data on PCB levels in sea ducks and sea otters.

Using statistical techniques for correlation evaluation (e.g., regression analyses), we propose to evaluate the relationship of PCB congener concentrations to P450 induction. We will use principal components analysis (PCA) to determine relationships of PCB congener homologues among species and locations. Our results will be compared to current knowledge, and provided in a final, scientifically peer-reviewed report.

D. Description of Study Area

All components of this study will be done in WPWS. To achieve Objective 1, we will collect new samples. Objective 2 will require observational work, to be done in WPWS. For Objective 3, we will utilize existing samples, and Objective 4 will rely entirely on syntheses of existing data sets.

E. Coordination and Collaboration with Other Efforts

The proposed work builds on the long history of EVOS and Department of Interior study of sea otters in PWS (Nearshore Vertebrate Predator project, Doroff et al. 1994, Ballachey et al. 1994, Bodkin and Udevitz 1999, Bodkin et al. 2002, Ballachey et al 2003, Monson et al. 2000). Prior project numbers include 99025, 02423, 02585, 03620 and 04620, and 05775. The scope of prior work includes annual sea otter population size estimates since 1993, estimates of reproduction, survival and mortality, prey size and abundance, health and condition, and movements and home ranges. Assays of the CYP1A biomarker in a suite of nearshore species have been conducted since 1996. Dr. Keith Miles will be responsible for laboratory assays of CYP1A (Objective 1); however, for continuity and comparisons with previous years, we will also send a duplicate set of sea otter tissue samples to Dr. P. Snyder at Purdue University, who has done assays of CYP1A in sea otters in the past. Dr. Miles also will oversee the PCB data analysis (Objective 4), working in collaboration with personnel at UC Davis (M. Ricca, biologist, and M. Yee, statistician). Dr. S. Rice and M. Lindeberg of NOAA Auk Bay Laboratory will assist in the project, specifically in the SPMD component (Objective 2) and also in the fish capture and sampling (Objective 1).

Approximately 15% of the total cost of the work proposed for FY08 will be funded by the Alaska Science Center, USGS, in the form of salary costs ($46K), and facilities and equipment ($56K) and by NOAA/Auke Bay Lab, in the form of salary costs ($3K).

III. SCHEDULE

A. Project Milestones

Objective 1. CYP1A

Sea otters and fishes: sample acquisition to be completed by June 30, 2008
Sample and data analyses & reporting to be completed by December 31, 2008

Sea ducks: sample acquisition to be completed by April 15, 2009
Sample and data analyses & reporting to be completed by August 31, 2009

Objective 2. Use of soft sediment intertidal habitats by foraging sea otters
Initiate personnel and contractual actions by 15 March, 2008
Initiate field data acquisition by April 15, 2008
Phase 2 determination by 1 October 2008
Data compilation, analysis, and reporting to be completed December 2008

Objective 3. Histopathological examination of sea otter liver biopsies
Data acquisition and compilation to be completed by July 31, 2008

Objective 4. Analysis of PCB data from sea ducks and sea otters
Data analysis and report writing to be completed by June 30, 2009

Final Report on all components completed by September 30, 2009

B. Measurable Project Tasks

FY 08, 2nd quarter (January 1, 2008 - April 1, 2008)
Initiate logistic requirements for field research (vessel charters, personnel action, cooperative agreements, and procurements)

FY 08, 3rd quarter (April 1, 2008 - July 1, 2008)
Establish floating field camp at Knight Island
Complete sea otter and fish CYP1A sampling
Initiate pit persistence and sea otter intertidal location field work
Initiate analysis and reporting of sea otter histopathology

FY 08, 4th quarter (July 1, 2008 – October 1, 2008)
Complete pit persistence and sea otter intertidal location field work
Phase 2 need determination
Initiate analysis of sea otter and fish CYP1A
Complete analysis and reporting of sea otter histopathology

FY 09, 1st quarter (October 1, 2008 - Dec 31 2008)
Complete analysis and reporting of pit persistence and sea otter intertidal foraging
Complete analysis and reporting of fish and sea otter CYP1A

FY 09, 2nd quarter (January 1, 2009 - March 31, 2009)
Capture of harlequin ducks and Barrow's goldeneyes
Initiate analysis of sea duck CYP1A

FY 09, 4th quarter (July 1, 2009 - September 30, 2009)
Complete analysis and reporting of sea duck CYP1A
Final report preparation

IV. RESPONSIVENESS TO KEY TRUSTEE COUNCIL STRATEGIES

A. Community Involvement and Traditional Ecological Knowledge (TEK)

We will be available to interact with communities in meetings to explain and discuss ongoing restoration projects. Contractual arrangements will be made with Cordova Air Service (907-424-3289) in Cordova to provide aerial support for sea otter capture and other field efforts as needed.

B. Resource Management Applications

Results of the proposed survey work, in conjunction with the synthesis of prior work completed under projects //025, //423, //620, and //775, should provide managers with additional information to make decisions regarding progress toward recovery of sea otter and sea duck populations, and intertidal communities at northern Knight Island. Results will also facilitate understanding risk factors, including exposure to lingering oil, which may be contributing to delayed rates of recovery, and will identify locations of specific shoreline habitats where populations of marine mammals, birds and fishes have incurred exposure to lingering oil and which may be suitable for direct restoration actions. The combined results of the proposed work will allow managers to better evaluate the current state of progress toward recovery in the nearshore ecosystem in PWS and to identify specific locations that may be most suitable for and result in the most direct benefit in achieving restoration objectives. Results of proposed work will also provide a current measure of the extent to which lingering oil can be implicated in continuing exposure to fishes, birds, and mammals that reside in nearshore habitats. These data will be useful to residents and visitors of WPWS that have curtailed their recreational and subsistence use of species such as mussels, clams, and chitons, due to concerns over contamination from lingering oil.

V. PUBLICATIONS AND REPORTS

An annual progress report will be submitted to the Trustee Council on 1 September, 2008 & 2009. A final report on all project components will be submitted by 30 September 2009. The synthesis of data collected on sea otter recovery from the 1989 EVOS will provide new information on the consequences of and recovery from oil spilled in coastal ecosystems that has not previously been published and will make a new contribution to the primary scientific literature. The results of CYP1A studies across a suite of taxonomically and trophically diverse species will provide continuing perspective into whether or not exposure continues, and if so, where, and potentially how, consumers are gaining exposure to lingering oil. The histopathology and PCB components of the study will provide insight into mechanisms of injury, and both will make contributions to the primary scientific literature.

VI. PROFESSIONAL CONFERENCES

We anticipate the results of the proposed work will be suitable for presentation at a national or international scientific meeting during FY08/FY09. Because of the global nature of oil spills, the unanticipated magnitude and duration of EVOS effects, and the apparent susceptibility of marine mammals and birds to such events, this work will provide valuable contributions at professional meetings.

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Areas of Expertise

Sea otters: biochemical, physiological, population and ecological effects of oil exposure
Marine mammals: population status and indices of condition
Environmental toxicology; Biomarkers of contaminant exposure
Mammalian genetics and physiology; Quantitative genetics

Education

Oregon State University, Corvallis, Oregon - Ph.D., 1985
Major: Animal Breeding and Genetics; Minors: Genetics, Statistics
Colorado State University, Fort Collins, Colorado - M.S., 1980
Major: Animal Sciences/Animal Breeding and Genetics
Colorado State University, Fort Collins, Colorado - B.S. with distinction, 1974
Major: Animal Sciences

Professional Experience (1987 to present)

Research Physiologist, 1990 - present
Alaska Science Center, U.S. Geological Survey, Anchorage, AK
(Formerly National Biological Service; Fish & Wildlife Service)
General Biologist, November 1989 to July 1990
Alaska Fish and Wildlife Research Center, U.S. Fish and Wildlife Service, Anchorage, AK
Staff Officer, March 1987 to November 1989
Board on Agriculture, National Research Council (NRC), Washington, DC, USA

Collaborations

Monterey Bay Aquarium, NOAA/ABL, Purdue University, South Dakota State University, USFWS**,** Woods Hole Oceanographic Institute

Affiliations

American Association for the Advancement of Science
Society for Marine Mammalogy
Society for Environmental Toxicology and Chemistry

Selected Publications

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Education:
1985 -MS, California Polytechnic State University, San Luis Obispo, CA. (Wildlife Biology)
1976- BS, Long Beach State University (Biology), Long Beach, CA
1972 - AS, Cypress College (Biology), Cypress, CA

Memberships:
Society for Marine Mammalogy
American Society of Mammalogists
Society for Conservation Biology
Wildlife Society
National Geographic Society

Responsibilities: I lead Alaska sea otter research and the marine science program for the Alaska Science Center. The mission of the Center is to provide biological information and research findings to resource managers, policymakers, and the public to support sound management of biological resources and ecosystems in Alaska and throughout the North Pacific Ocean. The Alaska sea otter project is one of two USGS sea otter research programs, the other led by James Estes, located in Santa Cruz, CA.

I am responsible for designing, developing and directing multi-disciplinary research programs for studying North Pacific coastal marine ecosystems, focusing on sea otter populations and their role in structuring coastal marine communities in Alaska. Current research programs encompass three broad objectives, including (1) designing, developing and testing methods to assess the status of sea otter populations, (2) describing processes responsible for structuring coastal marine communities, and (3) determining the status of recovery of sea otter populations affected by the 1989 Exxon Valdez oil spill in Prince William Sound, Alaska.

Scope of each of the three research programs:

Designing, developing and testing methods to assess the status of sea otter populations. Appropriate conservation and management of sea otter populations requires accurate knowledge on the status of populations relative to available resources, primarily food and space. Current projects to evaluate population status include measures of abundance (density), age and sex specific fecundity and survival, individual condition and bio-markers, and activity-time budgets. Remote sensing devices (time-depth recorders) are currently being tested as a new method to estimate time budgets.

Describing processes responsible for structuring coastal marine communities. Processes responsible for driving the structure and function of north Pacific coastal communities are complex and not well understood, yet managers of coastal resources need to understand causes

of variation and change in coastal communities. Current projects include a) defining coastal marine community structure in terms of physical character, biological productivity, and species composition and abundance of algae, macro-invertebrates, fishes, birds and mammals, and b) employing comparative and experimental methods to allow inference regarding cause of change in the coastal system.

Determining the status of recovery of sea otter populations affected by the 1989 *Exxon Valdez* oil spill in Prince William Sound, Alaska. Natural resources are subjected to increasing levels of anthropogenic disturbance, as exemplified by this nation's largest oil spill, the Exxon Valdez spill of 1989. Previous methods to understand the acute and chronic effects of disturbances at both species and ecosystem levels are poorly developed, often leading to uncertainty. Project objectives include developing new tools and approaches to improve our understanding of catastrophic perturbations and methods to describe the processes of how systems recover and to identify factors that can constrain system recovery.

Selected Publications:

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Bodkin, J.L. and R. Jameson. 1991. Patterns of seabird and marine mammal carcass deposition along the central California coast, 1980-1986. Can J. Zool. 69:1149-1155.

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Collaborators:

Dr. S.D. Rice, NOAA, Dr. P. Snyder, Purdue University, Dr. M. Murray, Monterey Bay Aquarium, Dr. Chuck Mohr, UC Davis, Dr. L. Bowen, UC Davis.

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Education:

2000 Ph.D. Wildlife Science. Oregon State University, Corvallis, Oregon, USA.

1988 M.Sc. Wildlife Ecology. Texas A&M University, College Station, Texas, USA.

1985 B.Sc. Biology/Outdoor Education. Northland College, Ashland, Wisconsin, USA.

Research Interests:

Avian ecology and conservation, sea duck biology, nearshore marine systems, population biology and demography, population structure, wildlife habitat associations, energetics.

Professional Experience:

February 2001 - present	University Research Associate and Adjunct Professor, Centre for Wildlife Ecology, Department of Biological Sciences, Simon Fraser University, British Columbia
March 1990 - February 2001	Research Wildlife Biologist, Alaska Biological Science Center, Biological Resources Division, U.S. Geological Survey, Anchorage, Alaska

Selected Peer-reviewed Publications:

Kirk, M., **D. Esler**, S. A. Iverson, and W. S. Boyd. 2008. Movements of wintering surf scoters: predator responses to different prey landscapes. Oecologia: in press.

Gorman, K. B., **D. Esler**, P. L. Flint, and T. D. Williams. 2008. Nutrient reserve dynamics during egg production by female Greater Scaup (*Aythya marila*): relationships with timing of reproduction. Auk 125: in press.

Lewis, T. L., **D. Esler**, and W. S. Boyd. 2008. Foraging behaviors of Surf and White-winged Scoters in relation to clam density: inferring food availability and habitat quality. Auk 125: in press.

Kirk, M., **D. Esler**, and W. S. Boyd. 2007. Foraging effort of surf scoters (*Melanitta perspicillata*) wintering in a spatially and temporally variable prey landscape. Canadian Journal of Zoology: in press.

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Bond, J. C., **D. Esler**, and K. A. Hobson. 2007. Isotopic evidence for sources of nutrients allocated to clutch formation by harlequin ducks. Condor 109:698-704.

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Žydelis, R., **D. Esler**, W. S. Boyd, D. Lacroix, and M. Kirk. 2006. Habitat use by wintering surf and white-winged scoters: effects of environmental attributes and shellfish aquaculture. Journal of Wildlife Management 70:1754-1762.

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Current Assignment: Supervisory Research Wildlife Biologist - USGS; Faculty, Graduate Group in Ecology; Associate in the AES, Wildlife, Fisheries, and Conservation Biology, University of California, Davis (UCD).

Education: Ph.D., Oregon State University, June 1987, Wildlife Ecology; M.S., Oregon State University, August 1976, Wildlife Biology; B.S., Howard University, June 1972, Zoology.

Current Research: Team lead of 5 biologists, 4 graduate researchers, and 14 technicians that specialize in field-oriented investigative approaches to contaminants problems and general problems of conservation of wildlife species. The goals of my research are to determine consequences of accumulation of contaminants in prey, and discriminate the effects caused by contaminants from naturally occurring changes in prey populations. I conduct studies on the effects of contaminants on the structure of invertebrate and vegetative assemblages and the potential for accumulation of these contaminants among specific prey guilds of migratory aquatic birds and marine mammals. **Collaborative UCD Studies:** Dr. Jeff Stott, Dr. Liz Bowen: Environmental signatures and gene expression patterns in sea otters; Dr. Barry Wilson: Cytochrome P-4501A induction and hydrocarbon exposure.

Current Awarded Studies:
Aquatic Bird Use of Recreated Wetlands, Salton Sea, California: Benefits and Risks. State of California 2007
Effects of mercury (Hg) on waterbirds and habitat at San Francisco Bay. State of California, CALFED 2005.
Science Support for Wetland Restoration of Salt Ponds, San Francisco Bay Estuary. USGS Place Based Program, 2007
Understanding the dynamics of mercury in eared grebes, Great Salt Lake, Utah. U.S. Fish & Wildlife Service, 2006
Snowy Plovers at Point Reyes National Seashore: Unraveling the Mystery of Mercury, U.S. Park Service. 2006.

Recent Journal Articles:
Miles, A.K., Flint, P.L., Trust, K.A., Ricca, M.A., Spring, S.E., Arrieta, D.E., Hollmen, T., Wilson, B.A. 2007. Polycyclic Aromatic Hydrocarbon Exposure in Steller's Eiders and Harlequin Ducks, Eastern Aleutian Islands, Alaska. Environmental Toxicology and Chemistry. 26(12):2694-2703.
Meckstroth, A. ,Miles, A.K., Chandra, S. 2007. Diets of Introduced Predators Using Stable Isotopes and Stomach Contents. Journal of Wildlife Management. 71(7):2387-2392.

Anthony, R.G., Miles, A.K., Ricca, M.A., Estes, J.A. 2007. Sources of environmental contaminants in nesting bald eagles, Aleutian Archipelago, Alaska. J. Environmental Toxicology and Chemistry. 26(9):1843-1855.

Ricca, M.A., A.K. Miles, R.G. Anthony, X. Deng, and S.S.O Hung. 2007. Effect of lipid extraction on analyses of stable carbon and stable nitrogen isotopes in coastal organisms of the Aleutian archipelago. Canadian Journal of Zoology. 85:40-48.

Bowen, L., Riva, F., Mohr, C., Aldridge, B., Schwartz, J., Miles, A.K., Stott, J.L. 2007. Differential gene expression induced by exposure of captive mink to fuel oil; a model for the sea otter. Ecohealth. 4:298-309.

Takekawa, J.Y., Miles, A.K., Tsao-Melcer Schoellhamer, D.H., Fregien, S., Athearn, N.D. in press. Dietary flexibility in three representative waterbirds across salinity and depth gradients in salt ponds of San Francisco Bay. Hydrobiologia.

BUDGET JUSTIFICATION
NEARSHORE SYNTHESIS: SEA OTTERS AND SEA DUCKS
Ballachey, Bodkin, Esler & Miles

Total FY08 project cost $590.3K, including $105K provided by USGS/ASC and NOAA, Auke Bay Lab. $485.3K requested from EVOSTC for FY08; projected FY09 cost of $279.0K.

The costs not covered by the EVOS funds include salary for J. Bodkin, sea otter project staff for capture-related activities, and partial salary of Keith Miles, and NOAA/ABL staff (J. Rice) involved in project supervision and interpretation of results. The project is not legislatively mandated, but will provide information valuable to both sea otter management (USFWS and the Alaska Sea Otter Commission) and the EVOS Trustee Council in terms of understanding sea otter population dynamics, behavioral ecology and recovery from the *Exxon Valdez* oil spill. Indirect costs have been previously arranged between the EVOS office and Trustee Agencies. In-kind support provided by the USGS includes use of a 25' Boston Whaler, skiffs, telescopes, binoculars, and field camp facilities (including a floating weather port).

FY 2008: Amount requested $485.3K (total project cost estimated at $590.3K).

Personnel: $120.0K total. Funds will provide the additional salary support necessary for all 5 objectives. USGS and NOAA-ABL will be providing $49K in additional salary and miscellaneous support.

Travel: $5.2K total, for EVOS for travel to PWS for field work (Objectives 1, 2) to conduct sea otter captures, fish sampling, and sea otter pit persistence and intertidal foraging studies.

Contractual: $289.6K total. $70K is requested for vessel support for Objectives 1 & 2, and $4K for aerial support to increase efficiency of sea otter captures. $46.5K is requested for assays on tissues collected under Objective 1, including CYP1A analyses, blood chemistry and hematology on sea otters, and histopathology on sea otters. An additional $10.8K is requested for histopathology on archived sea otter samples. $20K is requested for development of GPS/satellite tags for sea otters, pending implementation of Objective 2, Phase 2. Also requested under contractual costs is $97.7 K, to cover expenses associated with capture of sea ducks for tissues for CYP1A assays. Funds for this work are to be provided through the Pacific Wildlife Foundation, with which Dr. Esler is affiliated. Funds include salary support (Esler, 3 technicians, veterinarian), charter vessel for captures, travel costs to PWS for captures, supplies (veterinary & miscellaneous), and shipping costs.

Equipment & commodities: USGS will provide facilities and equipment valued at $56K. New equipment purchases of $7.2 are included, for binoculars & scope for field work associated with Objective 2, and safety equipment for field personnel.

FY 2009: Estimated budget of $279K if Phase 2 of Objective 2 (see above) is warranted, based on findings from Phase 1 in 2008. Also included in total projected for FY09 is $22K for an aerial survey of sea otters in WPWS.

Budget Category:	Proposed FY 2008	Proposed FY 2009	PROPOSED FY 2008 TRUSTEE AGENCIES TOTALS					
			ADEC	ADF&G	ADNR	USFS	DOI	NOAA
							$447.1	$38.2
Personnel	$120.0	$66.0						
Travel	$5.2	$6.0						
Contractual	$289.6	$154.0						
Commodities	$23.2	$30.0						
Equipment	$7.2	$0.0	LONG RANGE FUNDING REQUIREMENTS					
Subtotal	$445.2	$256.0				Estimated		
General Administration	$40.1	$23.0				FY 2009		
Project Total	$485.3	$279.0				$279.0		
Full-time Equivalents (FTE)								
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:

FY08: USGS--$447.1K
NOAA - $38.2K
Estimated In kind support (USGS & NOAA) - $105K

Total FY08 project cost $590.3K

FY09: Estimated $279K -- USGS

FY08-09

Revised: March 24, 2008

Project Number:
Project Title: Nearshore Synthesis: Sea otters and sea ducks
Agency: Lead agency: USGS

FORM 2A
MULTI-TRUSTEE AGENCY SUMMARY

2008-09 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2007 - September 30, 2009

Budget Category:	Authorized FY 2007	Proposed FY 2008	Proposed FY 2009
Personnel		$110.0	$66.0
Travel		$5.2	$6.0
Contractual		$264.6	$154.0
Commodities		$23.2	$30.0
Equipment		$7.2	$0.0
Subtotal	$0.0	$410.2	$256.0
General Administration		$36.9	$23.0
Project Total	$0.0	$447.1	$279.0
Full-time Equivalents (FTE)		1.5	1.8
	Dollar amounts are shown in thousands of dollars.		
Other Resources			

Estimated FY 2009
$279.0

Comments:

FY08 Total project cost $552.1K, including $105K provided by USGS/ASC and NOAA, Auke Bay Lab.
$447.1K is requested from EVOSTC for FY08.
The costs not covered by the EVOS funds include salary for J. Bodkin (estimated 18K), S. Rice (estimated 3K), sea otter project capture staff (estimated 17K) and Keith Miles (estimated 11K), and equipment and supplies provided by USGS (56K).

Phase 2 work in 2009 dependent on results of 2008 field work on frequency and locations of use of soft sediment intertidal habitats by foraging sea otters. Phase 2 also includes an aerial survey of sea otters in western PWS.

FY08-FY09

Prepared: March 24, 2008

Project Number:
Project Title: Nearshore Synthesis: Sea otters and sea ducks
Agency: USGS

2008-09 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2007 - September 30, 2009

Personnel Costs:		GS/Range/	Months	Monthly		Proposed
Name	Position Description	Step	Budgeted	Costs	Overtime	FY 2008
Ballachey, B.	Research Physiologist		4.0	9.0		36.0
Kloecker, K.	Biologist		2.0	7.0		14.0
Field Biologist	Biologist		12.0	5.0		60.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		18.0	21.0	0.0	
					Personnel Total	$110.0

Travel Costs:	Ticket	Round	Total	Daily	Proposed
Description	Price	Trips	Days	Per Diem	FY 2008
M. Murray (veterinarian, sea otter capture)	0.6	1	2	0.2	1.0
Anchorage to Whittier (2 people, 8 trips)		8	16	0.2	3.2
Field crew, sea otter capture (field per diem at $5.00/day, plus travel to & from Whittier)					1.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$5.2

FY08

Prepared:

Project Number:
Project Title: Nearshore Synthesis: Sea otters and sea ducks
Agency: USGS

2008-09 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2007 - September 30, 2009

Contractual Costs:	Proposed
Description	FY 2008
Vessel charter10 days to establish pit persistence/intertidal forage work	20.0
Vessel charter for sea otter capture 25d @ 2K/d	50.0
Aerial support, sea otter capture (20 hours at 200/hr)	4.0
Hematology and serum chemistry, sea otter bloood samples (45 @ $60)	2.7
Histology - sea otter liver samples (180 old plus 45 new 2008 read in duplicate; $60 each)	16.2
CYP1A assays USGS/UCD (215 samples @$140)	30.1
CYP1A assays Purdue (45 samples @$140 + 32% Purdue OH)	8.3
PCB data analysis (M. Ricca, 6 months @ 2.1K/m, M. Yee, 1 month @ 1K)	13.6
Satellite phone service--emergency communication	2.0
Pacific Wildlife Foundation, Dr. Esler See tab for USGS contract	97.7
R&D - advanced technology/remote sensing, sea otters	20.0

When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$264.6
Commodities Costs:	Proposed
Description	FY 2008
field camp food 30/d x 300 person d	9.0
fuel boat 2000 g @ 4.00/g	8.0
Whittier - parking and vessel slip	2.0
Weatherport supplies (fuel, line, supplies)	2.0
Liquid nitrogen, sample storage & shipping	1.0
Shipping costs	1.2
Commodities Total	$23.2

FY08

Prepared:

Project Number:
Project Title: Nearshore Synthesis: Sea otters and sea ducks
Agency: USGS

2008-09 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2007 - September 30, 2009

New Equipment Purchases:	Number	Unit	Proposed
Description	of Units	Price	FY 2008
Binoculars (2)			3.0
Questar telescope and tripod			3.0
Personnel safety equipment			1.2
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$7.2

Existing Equipment Usage:	Number	Inventory
Description	of Units	Agency

FY08

Prepared:

Project Number:
Project Title: Nearshore Synthesis: Sea otters and sea ducks
Agency: USGS

2008-09 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2007 - September 30, 2009

Personnel Costs:		GS/Range/	Months	Monthly		Proposed
Name	Position Description	Step	Budgeted	Costs	Overtime	FY 2008
	Research Physiologist		3.0	10.0		30.0
	Biologist		3.0	6.0		18.0
Field Biologist	Biologist		3.0	6.0		18.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		9.0	22.0	0.0	
					Personnel Total	$66.0

Travel Costs:	Ticket	Round	Total	Daily	Proposed
Description	Price	Trips	Days	Per Diem	FY 2008
M. Murray (veterinarian, sea otter capture)	0.6	1	2	0.2	1.0
Anchorage to Whittier (2 people, 8 trips)		8	16	0.2	3.2
Field crew, sea otter capture (field per diem at $5.00/day, plus travel to & from Whittier)					1.8
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$6.0

FY09

Prepared:

Project Number:
Project Title: Nearshore Synthesis: Sea otters and sea ducks
Agency: USGS

2008-09 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2007 - September 30, 2009

Contractual Costs:	Proposed
Description	FY 2008
Vessel charter for sea otter capture/recapture 30d @ 2K/d	60.0
instruments for sea otter tracking/data collection 20@$3k	60.0
sample analyses 20@ $200 each	6.0
veterinarian, 1 month	6.0
aerial survey 80 hours @ $275/hour	22.0

When a non-trustee organization is used, the form 4A is required. **Contractual Total**	$154.0
Commodities Costs:	Proposed
Description	FY 2008
food, fuel, field supplies	30.0
Commodities Total	$30.0

FY09

Prepared:

Project Number:
Project Title: Nearshore Synthesis: Sea otters and sea ducks
Agency: USGS

2008-09 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2007 - September 30, 2009

New Equipment Purchases:	Number of Units	Unit Price	Proposed FY 2008
Description			
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$0.0

Existing Equipment Usage:	Number of Units	Inventory Agency
Description		

FY09

Prepared:

Project Number:
Project Title: Nearshore Synthesis: Sea otters and sea ducks
Agency: USGS

2008 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2007 - September 30, 2008

Budget Category:	Authorized FY 2007	Proposed FY 2008
Personnel		$10.0
Travel		$0.0
Contractual		$25.0
Commodities		$0.0
Equipment		$0.0
Subtotal	$0.0	$35.0
General Administration		$3.2
Project Total	$0.0	$38.2
Full-time Equivalents (FTE)		0.2
Other Resources		

LONG RANGE FUNDING REQUIREMENTS

			Estimated FY 2009		

Dollar amounts are shown in thousands of dollars.

Comments:

FY08

Prepared:

Project Number:
Project Title: Nearshore Synthesis: Sea otters and sea ducks
Agency: NOAA-ABL

2008 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2007 - September 30, 2008

Personnel Costs:		GS/Range/ Step	Months Budgeted	Monthly Costs	Overtime	
Name	Position Description					
M. Lindeberg	Biologist		2.0	5.0	0.0	
	Subtotal		2.0	5.0	0.0	
					Personnel Total	

Travel Costs:	Ticket Price	Round Trips	Total Days	Daily Per Diem	
Description					
				Travel Total	

FY08

Prepared:

Project Number:
Project Title: Nearshore Synthesis: Sea otters and sea ducks
Agency: NOAA-ABL

2008 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2007 - September 30, 2008

Contractual Costs:	
Description	
NOAA SPMD purchase and analysis	
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	
Commodities Costs:	
Description	
Commodities Total	

FY08

Prepared:

Project Number:
Project Title: Nearshore Synthesis: Sea otters and sea ducks
Agency: NOAA-ABL

2008 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2007 - September 30, 2008

New Equipment Purchases:		Number of Units	Unit Price	
Description				
Those purchases associated with replacement equipment should be indicated by placement of an R.			**New Equipment Total**	

Existing Equipment Usage:	Number of Units	
Description		

FY08

Prepared:

Project Number:
Project Title: Nearshore Synthesis: Sea otters and sea ducks
Agency: NOAA-ABL

2008 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2007 - September 30, 2008

Budget Category:	Authorized FY 2007	Proposed FY 2008						
Personnel		$47.0						
Travel		$6.5						
Contractual		$36.2						
Commodities		$8.0						
Equipment		$0.0	LONG RANGE FUNDING REQUIREMENTS					
Subtotal	$0.0	$97.7				Estimated FY 2009		
Indirect								
Project Total	$0.0	$97.7						
Full-time Equivalents (FTE)		0.7						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:

Expenses on this form are for the sea duck capture, for CYP1A biomarker work. Funds to be overseen by Dr. Dan Esler; to be provided from the USGS to the Pacific Wildlife Foundation. 5% overhead for the Pacific Wildlife Foundation is included under contracts, below.

FY08

Prepared:

Project Number:
Project Title: Nearshore Synthesis: Sea otters and sea ducks
Agency: USGS contract to Pacific Wildlife Foundation (Dr. Esler)

2008 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2007 - September 30, 2008

Personnel Costs:			Months	Monthly		
	Name	Position Description	Budgeted	Costs	Overtime	
	D. Esler	PI Biologist	3.0	8.0		
	Lead Technician	Biotechnician	2.0	3.5		
	Technician	Biotechnician	2.0	2.0		
	Veterinarian	Vet	1.0	12.0		
		Subtotal	8.0	25.5	0.0	
					Personnel Total	

Travel Costs:		Ticket	Round	Total	Daily	
	Description	Price	Trips	Days	Per Diem	
	Vancouver to Anchorage	1.0	5			
	Miscellaneous travel			15	0.1	
					Travel Total	

FY08

Prepared:

Project Number:
Project Title: Nearshore Synthesis: Sea otters and sea ducks
Agency: USGS contract to Pacific Wildlife Foundation (Dr. Esler)

2008 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2007 - September 30, 2008

Contractual Costs:	
Description	
Vessel charter ((21 days @ 1.5/d) Overhead to Pacific Wildlife Foundation (5% of contract)	
Contractual Total	
Commodities Costs:	
Description	
Shipping Vet supplies ($50/bird * 80) Miscellaneous	
Commodities Total	

FY08

Prepared:

Project Number:
Project Title: Nearshore Synthesis: Sea otters and sea ducks
Agency: USGS contract to Pacific Wildlife Foundation (Dr. Esler)

2008 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2007 - September 30, 2008

New Equipment Purchases:	Number of Units	Unit Price	
Description			
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	

Existing Equipment Usage:	Number of Units	
Description		

FY08

Prepared:

Project Number:
Project Title: Nearshore Synthesis: Sea otters and sea ducks
Agency: USGS contract to Pacific Wildlife Foundation (Dr. Esler)