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/GEM Data Policy**, adopted July 9, 2002) and reporting requirements *(Procedures for the Preparation and Distribution of Reports***, adopted July 9, 2002).

PROJECT TITLE: *ShoreZone* mapping for Prince William Sound

Printed Name of PI: Mandy Lindeberg

Signature of PI: _____ Date: 1 August 06

* Available at http://www.evostc.state.ak.us/pdf/admin/datapolicy.pdf
** Available at http://www.evostc.state.ak.us/pdf/admin/reportguidelines.pdf

Trustee Council Use Only
Project No: ____
Date Received: ____

PROPOSAL SUMMARY PAGE

(To be filled in by proposer)

Project Title: *ShoreZone* mapping for Prince William Sound

Project Period: FY07-FY08

Proposer(s): Mandy Lindeberg, NOAA/NMFS Auke Bay Laboratory, Mandy.Lindeberg@noaa.gov

Study Location: Prince William Sound

Abstract: This proposal will continue *ShoreZone* mapping in Prince William Sound (PWS), Alaska. Approximately 8,400 km of shoreline has been mapped in the central Gulf of Alaska, including 1,600 km of shoreline in western PWS in 2004. The majority of the spill area inside PWS, including Knight island area and all of northern and eastern PWS have not been mapped. To support both future oil remediation efforts as well as restoration activities, such as possible herring intervention programs like moving spawn to rearing areas, would be supported by a single mapping protocol that included geomorphology, substrate type, as well as the biological substrate on all beaches. Completing PWS would fill the gap by providing a contiguous data set from across the entire spill area using a standard protocol. Most importantly, this data set will be useful to managers, as it combines photographs of the entire beach area, as well as having a data set that can be sorted by location, substrate type, and other factors. The *ShoreZone* data set is recognized as a significant tool for oil spill response planning, identifying essential fish and wildlife habitat, and for monitoring long-term changes in coastal habitat that may result from development, restoration, or even global climate change. Three 6-day aerial video imagery surveys (about 4,000 km of shoreline) and mapping are proposed. Aerial video imagery would be completed in the first summer with mapping in the following year.

Funding: Additional EVOS Funding Requested:	FY 06	$ 000.0	
(must include 9%GA)	FY 07	$ 237.9	
	FY 08	$ 322.3	
			TOTAL: $ 560.2
Non-EVOS Funds to be Used:	FY 06	$ 150.0	
	FY 07	$ 49.0	
	FY 08	$ 49.0	TOTAL: $ 248.0

Date: 10 October 2006

Background and Introduction

ShoreZone mapping has been implemented on approximately 16,000 km of coastline in the Gulf of Alaska (GOA) over the past four years, including about 25% of Prince William Sound (PWS). *ShoreZone* mapping is valued by many agencies and stake holders because it provides a common and comprehensive database meeting the needs for management and scientific evaluations. Products include not only video documentation of the shoreline, but also an analysis of the geomorphology, substrate type, and biota. Because the database is georeferenced, it can be queried in a variety of ways depending on information needs. The value of *ShoreZone* mapping is recognized by five of the six EVOS Trustee Council agencies; they have sponsored and pooled money for the mapping in Alaska to date. In addition, an EVOS Trustee Council workshop in March 2003 on "Biological and Physical Mapping of the Shoreline in the *Exxon Valdez* Oil Spill Area, Alaska," recommended *ShoreZone* mapping in PWS.

As the Trustee Council contemplates intervention research and activities regarding herring restoration and lingering oil remediation, activities that will likely take place over several years, Sh*oreZone* mapping would aid in the planning and execution of different strategies. Questions such as the location and extent of eelgrass (*Zostera marina*) beds can be answered on a variety of scales, from a regional basis to a specific island or bay. Understanding geomorphology, substrate type, and biota would aid in making decisions ranging from identifying what areas need to be protected from future disturbance to where enhancement facilities should be sited. The *ShoreZone* database will have scientific value also, as it will become a GIS database to attach other data sets, such as fish and sea otter (*Enhydra lutris*) use by habitat type.

An additional 10,000 km of shoreline in Alaska will be mapped in 2006. *ShoreZone* is providing coastal habitat data that has been lacking for most of Alaska. A variety of agencies have subsequently funded the mapping efforts in the GOA (Table 1). The central/northern/eastern shoreline of PWS is one of the only areas that have not been mapped in the GOA. Completion of this area would provide a contiguous data set for PWS, and for much of the northern GOA.

ShoreZone mapping is based on the same protocol used and developed throughout Washington and British Columbia (WaDNR 2000; Harper and Berry 2001; Howes 2001). Several modifications and additional components, however, were added during the pilot program in Alaska, and have been added into the Alaska *ShoreZone* Protocols for the GOA (Harper and Morris 2003). Aerial video imagery is collected during the lowest tides of the year, and this imagery, along with field observations by a geomorphologist and coastal ecologist, provides the primary data for mapping. After the field imagery work is completed, data are interpreted and entered into a georeferenced database. *ShoreZone* also includes a detailed across-shore characterization of morphology, substrate type, and biota. *ShoreZone* mapping provides the benefit of public availability of digital video imagery in conventional formats (VHS tapes or DVD) or web-based images (www.coastalaska.net). Other databases can be layered onto *ShoreZone* mapping–for example, an online atlas of nearshore fishes is currently be constructed for Alaska (Johnson et al. 2005), and will eventually be a layer showing fish distribution and habitat use in areas that have been mapped.

ShoreZone mapping products appeal to many interests, including individuals, resource managers, regional planners, and particularly to habitat scientists. *ShoreZone* products offer a *significant planning tool for oil spill response* as well as for a spatial framework for potential monitoring

programs. *ShoreZone* provides a standard, region-wide data set for the entire oil spill impact region (Harper and Morris 2003).

About 75% of PWS remains to be mapped, including the majority of the spill area, as well as many potential sites for remote releases of Pacific herring (*Clupea pallasii*). Much of the GOA has been mapped over a number of years, with contributions from many agencies and stakeholders (Table 1). Completion of PWS would be a valuable addition, providing a contiguous data set for PWS, and for much of the northern GOA.

Table 1. Summary of *ShoreZone* Projects in the Gulf of Alaska (2001-2006).

Year	Location	Project Activity	Funding
2001	lower Cook Inlet	Aerial imaging; pilot mapping; web-posting of imagery	CIRCAC
2002	outer Kenai, western Cook Inlet	aerial imaging; mapping; web-posting of imagery	CIRCAC/KPB
	outer Kenai	aerial imaging; mapping; web-posting of imagery	EVOS/NPS
	outer Kenai	shore stations – ground-truthing	CIRCAC/KPB
	Kodiak	aerial imaging; web-posting	EVOS/ADNR (CIAP)
2003	Upper Cook Inlet	aerial imaging; mapping; public awareness	USFW/CIRCAC
	Katmai National Park	aerial imaging; mapping; web-posting; ground station survey	NPS/CIRCAC
	Aniakchak Nat. Park	aerial imaging; mapping; web-posting	NPS/CIRCAC
	Kodiak	mapping 2002 imagery; workshop in Kodiak	CIAP/CIRCAC
	Gulf of Alaska	coastal users workshop; development of a *ShoreZone* mapping protocol	EVOS
	Gulf of Alaska	development of shore station database; web-posting	CIRCAC
2004	Gulf of Alaska	development of a 1-stop website for access to *ShoreZone* imagery and data	EVOS/CIRCAC
	PWS	Aerial imaging; web-posting	PWSRCAC
	SE Alaska	*ShoreZone* imaging; mapping; web-posting	NMFS-Habitat
2005	Kodiak	Aerial imaging; mapping; web-posting	EVOS/ADNR
	SE Alaska	*ShoreZone* imaging and mapping; web-posting	NMFS-/ADNR (CIAP)/TNC
2006	SE Alaska Bristol Bay	Aerial imaging; mapping; web-posting	NMFS-/ADNR/TNC

Funding Sources Acronyms from Table 1 Above:

CIRCAC	Cook Inlet Regional Citizens Advisory Council
EVOS	Exxon Valdez Oil Spill Trustee Council
KPB	Kenai Peninsula Borough
USFW	US Fish and Wildlife Service
NPS	National Park Service
ADNR (CIAP)	Alaska Dept. Natural Resources (Alaska Coastal Impact Assistance Program)
ADFG	Alaska Dept. of Fish and Game
NMFS	National Marine Fisheries Service – Habitat Division
TNC	The Nature Conservancy

NEED FOR THE PROJECT

A. Statement of Problem

Prince William Sound consists of a mosaic of nearshore habitat types including reefs, rocky headlands, fiords, mud flats, eelgrass beds, wetlands, kelp forests, and cobble beaches. Layered on to this varied landscape have been changes ranging from earthquakes to oil spills. Hundreds of studies have been completed in PWS following the *Exxon Valdez* oil spill, yet no quantitative information exists on where and how much of the above habitats occur in most of PWS, even after 16 years of research and monitoring following the spill. Even the heavily mapped SCAT surveys from the early days of the spill or the post 2001 SCAT surveys are not in a common database that can be queried, by region, island, or bay. PWS Pacific Herring populations remain depressed, and show a general lack of recovery for the past 15 years and researchers have not been able to pin point the cause. Developing habitat capability models for herring will be a key element in understanding not only PWS populations (Fig.1) but other populations found in Sitka, British Columbia, and Puget Sound. ShoreZone mapping is the solution to the lack of biophysical information in PWS that is available to managers and researchers.

This proposal will complete a systematic, high resolution, low-tide mapping database for the entire oil spill area by providing geo-referenced data on geomorphology, substrate type, and biota for central and eastern PWS. Resource managers and scientists will have a database to monitor long-term changes in shoreline habitat and fish use that may result from human disturbance or global climate change.

An exception is western PWS that was mapped with ShoreZone in 2004 (Fig. 1). ShoreZone mapping and ground-truthing have been initiated in western PWS, but continuation of this program to the rest of PWS never materialized. Western PWS was mapped via *ShoreZone* protocols in 2004, followed in 2006 by ground truthing by scientists from Auke Bay Laboratory. Using NPRB funds, mapped habitat was ground-truthed and sampled for fish use at eight randomly selected locations in western PWS (Fig. 2). Habitats sampled included eelgrass, understory kelps, and bedrock outcrops. Objectives of this study are to identify nearshore habitat types that are important to forage fishes and document differences in habitat use by season, day vs. night, life stage, and habitat type. This study was funded by the North Pacific Research Board (NPRB) and the Oil Spill Recovery Institute (OSRI); data will be incorporated into an Alaskan region *ShoreZone*/Fish Atlas website, and will be available to resource managers to track long-term changes in fish distribution and habitat. The next logical step would be to extend the mapping to the remaining 75% of PWS to provide a region wide database on habitat and fish distribution.

Shoreline mapping was identified as a top priority in recent nearshore workshops sponsored by the *Exxon Valdez* Oil Spill Trustee Council (Schoch et al, 2002; EVOSTC 2002; Norcross, 2003), because it provides a foundation for monitoring and research of the nearshore habitat, and also provides a valuable assessment tool for oil spill responders and planners. The PWS Sensitive Areas Work Group has noted that eelgrass, a resource known to be sensitive to oil spills, is a critical habitat for herring spawn, and one of the resources mapped with *ShoreZone* (Mutter et al 2003). As the EVOSTC and agencies contemplate intervention activities with lingering oil and with herring enhancement strategies, *ShoreZone* would be an excellent tool to aid in those activities.

Existing Environmental Sensitivity Index (ESI; NOAA 2000; see also Ruby *et al* 1979, and Issacs Associates 1985) maps occur within the region but do not include web-posted imagery, are of much lower resolution than *ShoreZone*, are not web accessible, and are not of sufficient resolution for ecosystem monitoring. The ESI maps are only partially available in digital format throughout the GOA. In addition, ESI maps do not include explicit exposure, substrate, morphology or biotic data, as does the *ShoreZone* mapping data.

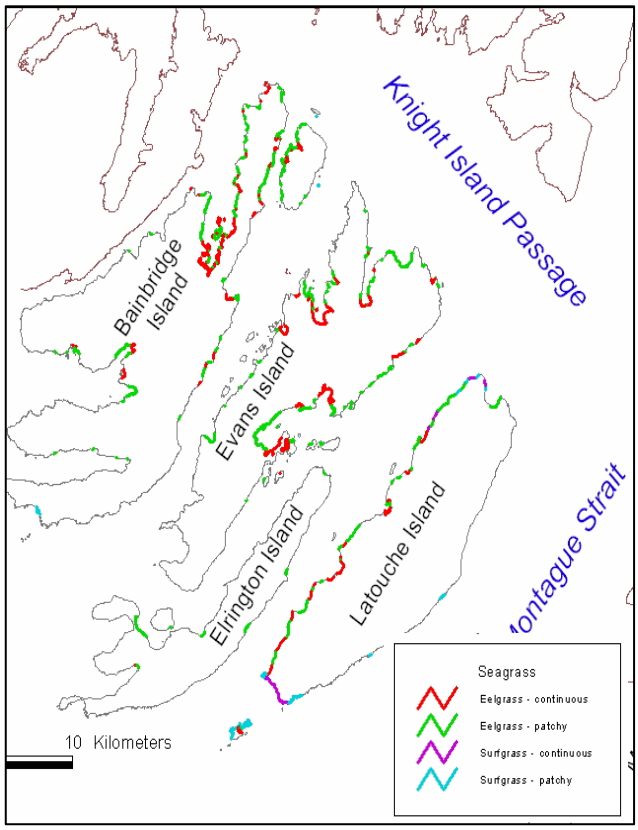

Figure 1. *ShoreZone* map of western PWS detailing the shoreline extent of seagrasses, a known spawning habitat for Pacific herring (*Clupea pallasii*)

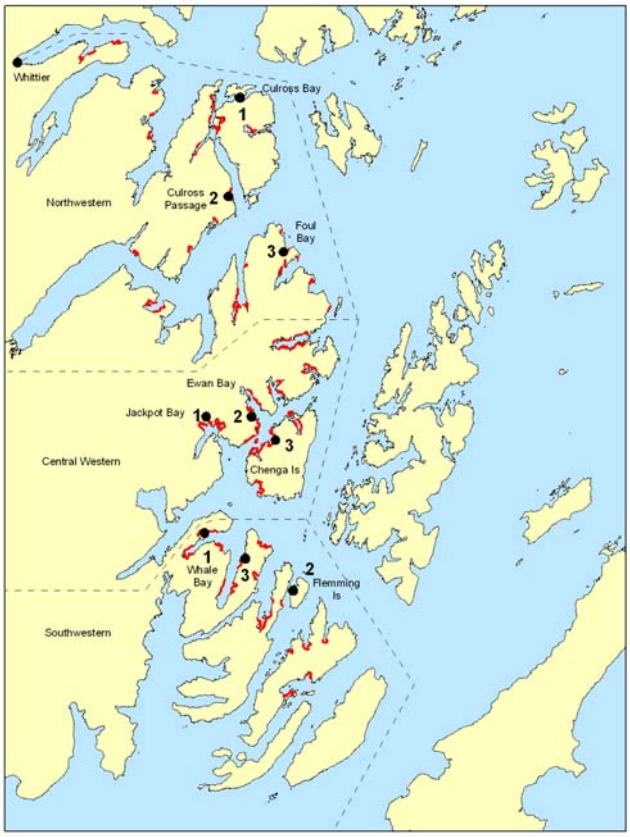

Figure 2. Nine sampling areas representing 27 shore stations in western PWS for ground-truthing *ShoreZone* imagery and nearshore fish sampling in 2006. Red lines indicate extent of continuous eelgrass (*Zostera marina*).

B. Rationale/Link to Restoration

The Trustee Council specifically solicited ShoreZone mapping under Herring projects to gain knowledge of herring spawn habitats, possible herring release locations and future oil remediation and tracking areas. The *ShoreZone* data set will contribute substantially to these needs and be a critical tool by providing a spatial framework on multiple levels.

Research Tool

ShoreZone mapping will provide much needed information on the quantity and quality of nearshore habitats in PWS. With the addition of ground-truthing and fish sampling at selected sites (see Fig. 2 for 2006 example), valuable information can be obtained on the distribution, habitat use, and relative abundance of forage fish species in the nearshore ecosystem of eastern PWS. This information is lacking because standard research surveys by the Alaska Fisheries

Science Center (AFSC) do not sample the nearshore environment. Nearshore habitat is important for several forage species. Pacific herring, Pacific sand lance (*Ammodytes hexapterus*), and capelin (*Mallotus villosus*), as well as other ecologically important species are commonly found in nearshore waters for feeding or spawning. In addition, nearshore habitat is of particular importance to juvenile stages of many fish species, such as Pacific cod (*Gadus macrocephalus*), walleye pollock (*Theragra chalcogramma*), and many rockfish species (*Sebastes* spp.). Lack of information on habitat use, quantity and quality of nearshore habitat, and the impacts of habitat features on the growth and energy density of forage fish, hinders our ability to understand critical features of forage fish rearing habitat in the PWS ecosystem. Because nearshore habitats are vulnerable to human disturbance, a better understanding of how the nearshore environment supports ecologically important forage fish species is needed to help managers conserve forage fish species populations and protect essential habitats.

ShoreZone data will interact directly with the PWS Ocean Observing System real time numerical circulation and wave models. By providing a near synoptic, high-resolution picture of coastal resource distribution throughout the Gulf, spatial variation in biological resources will be related to important physical constraints (e.g., substrate, exposure, water quality) as well as man-made impacts (e.g., harvesting, seawall construction).

Mangement Tool
The ShoreZone database contains a rigorous biophysical classification system which could augment probability modeling efforts by the Trustees in their comprehensive restoration plan. Elements listed in this plan include determining whether geomorphological features can be found associated with lingering oil. ShoreZone can provide detailed information on shoreline lengths, exposure, across shore components, an oil residency index, biological resources, and imagery for modeling verification. ShoreZone will also provide managers in the future with a response tool that was lacking in 1989.

Previous experiences in Washington and British Columbia, and earlier Gulf of Alaska *ShoreZone* projects indicate that the data is utilized by a wide range of resource agencies for shore-spawning fish habitat assessment (Washington Department of Fish and Wildlife), for bird habitat capability (Washington Department of Fish and Wildlife), for oil spill sensitivity assessments (Burrard Clean Operations Inc., BC Ministry of Environment and Washington Department of Ecology, NOAA), for marine park siting (Orcas Pass Marine Protected Area Initiative), and planning (Olympic Marine Sanctuary, Pacific Rim National Park, Gwaii Hanaas National Marine Park). Non-governmental organizations have been significant users of the information and the data set is routinely used by universities in research projects (Dr. T. Klinger, U of W, pers. communication 2002).

PROJECT DESIGN

A. Objectives

Specific objectives and time line of the proposed PWS *ShoreZone* project are:

1. Collect high resolution, low-tide imagery of the remainder of the PWS coastline (4,100 kms in 2007) in three helicopter surveys.

2. Map shoreline features using the Alaska *ShoreZone* Protocol, using the collected imagery, completing a geo-referenced database by May 2008).

3. Make data available to the public through a web based internet site hosted by NMFS (imagery available Dec 2007 and geo-referenced database by July 2008.

B. Procedural Methods

B.1 Low-Tide, High Resolution Aerial Video Imagery Collection

Aerial video imagery (AVI) of the surveyed shorelines is collected during the aerial surveys. This oblique, color imagery is collected during the lowest daylight tides of the year, while tides are below "zero feet". The imagery includes a continuous geomorphological description of the shore line on one sound track and a continuous biological description of the shore line on the other sound track. A three-chip video camera is used for imaging, GPS location is burned onto each frame, GPS trackline data is electronically recorded, and all imagery is recorded on digital tapes. Helicopters are used as the primary flying platform on most surveys but fixed-wing aircraft can be used on "straight" coastlines (e.g., western Cook Inlet).

Standard data products from the AVI surveys are: (a) a flightline manual documenting the flightline tracks and the electronic data files, (b) videotape copies and (c) web-posted 1 second image captures that allow web-users to fly the coastline through an ArcIMS site.

The coastline length by region is summarized in Table 2 and indicates there is about 16,000 km of shoreline within the central GOA region. Approximately 8,400 km or 53% has already been imaged to the Alaska *ShoreZone* standard. An additional 3,300 km has been imaged during the summer of 2005. There are roughly 4,100 km remaining to be imaged in PWS (excluding the Copper River Delta). With about 1,600 km of imagery acquired during a typical 5 to 6-day low-tide window, three separate AVI surveys would be required to complete the proposed PWS work. A suggested AVI survey schedule for Prince William Sound is included in Table 3. There are only 4 to 5 tides per year where it is appropriate to collect *ShoreZone* data and spring and early summer are the preferred tide windows for aerial imaging.

B.2 Shore-Zone Mapping

The primary data product of the proposed *ShoreZone* mapping project is a georeferenced database of biophysical *ShoreZone* data. The shoreline is segmented into *along-shore units* or segments and into *across-shore components*. A database contains attributes on each unit and component including an oil residency index (Tables 4 & 5); units may be either polygons, lines or points, and are referenced through GIS. The shoreline features will be classified by geomorphologists and by biologists according to the Alaska *ShoreZone* Mapping Protocol (Harper and Morris 2003). The *ShoreZone* mapping products are tied to individual AVI surveys for costing purposes. That is, each 6-day AVI survey is assumed to result in approximately 1,600 km of imagery for mapping.

Table 2 Shoreline Length per Region

Region	Shoreline Length (km)	Completed AVI Surveys (km)	% Completed
Cook Inlet, Upper	625	625	100%
Cook Inlet, Lower	1,614	1,614	100%
Kenai Peninsula	1,969	1,969	100%
Kodiak Is	5,006	1,700	34%
PWS, East	1,357	0	0%
PWS, West	4,266	1,600	38%
Katmai National Parks	870	870	100%
Totals:	***15,707***	***8,378***	***53%***

Table 3 Suggested Prince William SoundAVI Survey Schedule and Costs

Calendar Period	AVI Surveys	Coastline Imaged (km)	Cost per Survey
Summer 2006 - Tide 1	PWS, West/North	1,166	$ 60K
Summer 2006 - Tide 2	PWS, Central	1,500	$ 78K
Summer 2006 - Tide 3	PWS, East	1,357	$ 70K
	Total:	***4,023***	***$ 208k***

Table 4 Summary of Data Attributes Recorded for Each Shore Unit

Category	Attribute	Description
General	Unit ID	unique identifier used to link database to maps
	Type	polygon, line or point features
	Length	alongshore length of unit
	Area	area of polygon
	Source	sources of imagery
	Mapper	name of mapper
	Map Date	date of mapping
	Editor	name of editor
	Edit Date	date of editing
Exposure	Exposure Calculated	exposure class calculated by GIS model (6 classes)
	Exposure Observed	exposure class observed by mapper (6 classes)
	Exposure Biological	exposure class determined by observed biota within unit
	Effective Fetch	fetch window
	maximum fetch length	maximum measured fetch
	max fetch direction	direction of maximum fetch
	orientation	shore normal direction to shoreline orientation
Shore Character	Shore Type	substrate/morphology summary (34 classes)
	Habitat Type	biological summary based on exposure and substrate (10 classes)
Sediment	Abundance	index of sediment (3 classes)
	Source	source of sediment in unit (3 classes)
	Transport Direction	direction of alongshore transport
Shore Modification	Mod1 type	type of primary shore modification
	Mod1 %	% of shore modification in unit
	Mod1 length	length of shore modification
	Mod2 type	type of secondary shore modification
	Mod2 %	% of shore modification in unit
	Mod2 length	length of shore modification
	Mod3 type	type of tertiary shore modification
	Mod3 %	% of shore modification in unit
	Mod3 length	length of shore modification
Other	Riparian %	% of riparian vegetation in unit
	Riparian Length	length of riparian
	Oil Residence Index	derived estimate of potential oil residence based sediment type and exposure

Table 5. Data Attributes Recorded for Each Across-Shore Component within a Shore Unit

Category	Attribute	Description
General	Component ID	unique identifier linked component to a unit
	Zone	the elevation of the component in the shore zone (3 classes)
	Sequence	the sequence of the component in the zone
Geologic	Component Morphology	a descriptor of the morphology (22 classes)
	Component Sediment	a descriptor of the sediment (22 classes)
	Component Width	width of component
	Component Slope	slope of component
	Process	dominant process (5 classes)
Biologic (Biobands)	VER	'Verrucaria'
	PUC	salt-tolerant grasses
	GRA	Grasses
	BAR	upper barnacle
	FUC	'Fucus'
	BLGR	Blue-green
	ULV	'Ulva'
	HAL6	'Halosaccion'
	BMU	blue mussel
	RED6	mixed filamentous & blade reds
	ALA1	Intertidal *Alaria* spp. with *Semibalanus cariosus*
	SBR6	Soft browns
	CHB6	Chocolate browns
	RED7	Bright red zone
	ZOS	'Zostera'
	ALA2	Dragon kelp
	NER	Nereocystis

C. Statistical Methods

No specialized statistical analysis is required for the proposed *ShoreZone* Mapping Program.

D. Description of Study Area

The PWS survey would encompass unmapped portions of PWS minus the Copper River Delta area and will complement other mapping programs in the Gulf of Alaska. The project includes the primary impact area of the *Exxon Valdez* spill. This PWS proposal, if funded in its entirety, would image and map an additional 4,023 km of GOA shoreline habitats.

It is assumed that all communities in PWS would benefit from the proposed project in that the imagery and *ShoreZone* data are available directly through web-access. The direct web-access of imagery should benefit lay-users, including tourists and recreational users. The direct, web-access of the *ShoreZone* data should benefit regional spill responders, resource managers, and interest groups.

E. Coordination and Collaboration with Other Efforts

The proposed *ShoreZone* Mapping Project complements a number of ongoing projects in the GOA, including existing mapping initiatives funded by the organizations and agencies listed in Table 1. For example, a similar study (ground-truthing and fish sampling) was initiated in western PWS in 2006, and was partially funded by NPRB and OSRI. These data sets will be combined into "one" PWS data set, and will be combined with GOA data sets. The proposed mapping is a precursor for more detailed mapping/monitoring initiatives by providing region-wide data that can be queried for specific information related to each PI's project. Presentations have been provided to oil industry operators and response organizations in Cook Inlet and PWS, the state Alaska Regional Response Team, as well as the workgroup representing ADEC, industry, citizens, and other agencies who are leading the development of Geographic Response Strategies within the EVOS area.

In-kind services were provided for the 2004 aerial surveys in PWS by the Cook Inlet RCAC, NMFS's Habitat Division in Auke Bay, and by OSRI. These organizations provided personnel time to conduct portions of the surveys. It is anticipated that they will continue to provide these in-kind services. Finally, the data collected during this proposed project will be coordinated with any effort to coordinate all of the regional *ShoreZone* data into a single-source database.

SCHEDULE

A. Project Milestones

Objective 1	Collect Aerial Video Imagery		
		PWS, West/North	May 2007
		PWS, Central	June 2007
		PWS, East	July 2007
		Web-post all aerial imagery	September 2007
Objective 2	Complete *ShoreZone* Mapping		May 2008
Objective 3	Complete posting of ShoreZone information into the web based site hosted by NMFS by Aug 2008, and for the fish data by Nov 2008.		

B. Measurable Project Tasks

The proposed project tasks are organized in terms of our "suggested" schedule and assuming that the proposed PWS *ShoreZone* project is fully EVOS funded. There is flexibility with these tasks).

FY07, 1st quarter (October 1, 2006 - December 31, 2006)

October 2006	Project funding approved by EVOSTC

FY 07, 3rd quarter (April 1, 2007 - June 30, 2007)

April 2007	Contracts in place for helicopters; field plan produced
May 2007	First AVI survey during one 5 to 6-day low-tide series
June 2007	Second AVI survey during one 5 to 6-day low-tide series

FY07, 4th quarter (July 1, 2007 - September 30, 2007)

July 2007	Third AVI survey during one 5 to 6-day low-tide series
Sept 2007	All aerial video imagery web-posted
Sept 2007	AVI flight manuals complete, tape copies
September 2007	Begin mapping of imagery from AVI surveys

FY 08, 1st quarter (October 1, 2007 - December 31, 2007)

	Continue mapping of imagery from AVI surveys

FY08, 2nd quarter (January 1, 2008 - March 31, 2008)

January 23-27	Annual Marine Science Symposium
	Continue mapping of imagery from AVI survey

FY 08, 3rd quarter (April 1. 2008 - June 30, 2008)

15 April 2008	2005 *ShoreZone* Mapping Complete;
	Outreach trip to PWS communities.
July 2008	Post all ShoreZone mapping products; Geo-reference data base

FY08, 4th quarter (July 1, 2008 – September 30, 2008)

September 2008	Submit to Trustees a final summary report.

RESPONSIVENESS TO KEY TRUSTEE COUNCIL STRATEGIES

A. Community Involvement and Traditional Ecological Knowledge (TEK)

No specific program is included for inclusion of TEK as part of this project.

Our AVI surveys are based as close as possible to the flight areas. For the western PWS surveys funded by the PWS RCAC, we based the surveys from the village of Chenega with attendant boarding and logistical support. For eastern PWS we anticipate basing surveys from Tatitlek and Cordova. The Center for Alaska Coastal Studies in Homer, Alaska, is currently incorporating *ShoreZone* data and website imagery into their 2005 curriculum and we envision that similar organizations can use PWS as part of public outreach.

ShoreZone information includes web-accessible imagery and environmental data, unlike existing ESI data. In several regional workshops (Homer, Kodiak, Anchorage), we have received enthusiastic endorsement from coastal communities, including scientists, teachers, planners and city managers. The *ShoreZone* data is considered a community asset that will provide a valuable planning tool for decades to come. Our survey programs have been based in the communities, including Kodiak, Kenai, Homer, Whittier, Seward and Chenega. Communities are actively aware of the program – the smaller the community, the greater the awareness.

B. Resource Management Applications

The *ShoreZone* mapping data has a range of potential resource management applications; actual uses of the *ShoreZone* data in Washington and BC are as follows: 1. mapping of critical habitat, 2. oil spill sensitivity mapping, 3. oil spill response, 4. research site planning, 5. sandlance spawning capabilitiy, 6. bird habitat management, 7. recreational planning, 8. riparian vegetation disturbance, 9. shoreline modification impacts.

PUBLICATIONS AND REPORTS

The ShoreZone imagery and the Nearshore Fish Atlas of Alaska for the PWS region will be added to the online ARC IMS site hosted by NMFS. The Trustee Counsil will receive a summary report for PWS and a complete geospatial ShoreZone database with imagery.

PROFESSIONAL CONFERENCES

Results from this project will be presented at the Alaska Marine Science Symposium.

PERSONNEL

A. Principal Investigator (PI)

Mandy Lindeberg (Project Manager and Possible Biological Field Crew)
NOAA/NMFS Auke Bay Laboratory
11305 Glacier Hwy
Juneau, AK 99801
phone: 907 789-6616
fax: 907 789-6094
email: Mandy.Lindeberg@noaa.gov

B. Other Key Personnel

ShoreZone mapping components:

Dr. John Harper (Chief Scientist)
Coastal & Ocean Resources Inc.
214 - 9865 W. Saanich Rd.
Sidney, BC V8L 5Y8 Canada
phone: 250 655 4035
fax: 250 655 1290
email: john@coastalandoceans.com

Mary Morris (Biological Mapper)
Archipelago Marine Research Ltd.
525 Head St.
Victoria, BC V9A 5F1
250 383 4535
250 383 0103
marym@archipelago.ca

Fish sampling/ Ground Truthing

Scott Johnson
Auke Bay Laboratory
11305 Glacier Hwy
Juneau, AK 99801
phone: 907 789-6063
fax: 907 789-6094
email: Scott.Johnson@noaa.gov

John Thedinga
Auke Bay Laboratory
11305 Glacier Hwy
Juneau, AK 99801
907 789-6025
907 789-6094
John.Thedinga@noaa.gov

C. Contracts

The primary subcontractor will be Coastal & Ocean Resources Inc. with additional subcontracting for biological mapping components to Archipelago Marine Research Ltd.

LITERATURE CITED

Exxon Valdez Oil Spill Trustee Council, 2002. Detecting and Understanding Change in Nearshore Environments: Planning for Habitat Mapping in the Gulf of Alaska. April 15, 2002 workshop sponsored by the *Exxon Valdez* Oil Spill Trustee Council held at Lands End Resort, Homer, AK.

Harper, J.R., G.A. Robilliard, J. Issacs and E.H. Owens, 1984. Coastal sensitivity analysis of the northern Chukchi Sea coast of Alaska. Proceedings of the 7th Arctic Marine Oil Spill Program (AMOP) Technical Seminar (Edmonton, Alberta), May 1984, Environment Canada, Ottawa, p. 278-294.

Harper, J.R. and H. Berry 2001. Application Examples of the of the Washington *ShoreZone* Data (abstract). Proceedings of the Puget Sound Research 2001 Conference, Seattle, Washington.

Harper, J.R. and M. Morris 2003. *ShoreZone* Mapping Protocol for the Gulf of Alaska. Contract Report by Coastal and Ocean Resources Inc. of Sidney, BC to the Exxon Valdez Oil Spill Trustee Council (EVOS), Anchorage Alaska, 63p.

Howes, D.E., J.R. Harper and E.H. Owens 1994. Physical shore-zone mapping system for British Columbia. BC Ministry of Environment, Lands and Parks, Victoria, BC, 71p.

Howes, D.E. 2001. BC Biophysical Shore-Zone Mapping System – A Systematic Approach to Characterize Coastal Habitats in the Pacific Northwest. Proceedings of the Puget Sound Research 20011 Conference, Seattle, Washington.

Johnson, S. W., A. D. Neff, and J. F. Thedinga. 2005. An atlas on the distribution and habitat of common fishes in shallow nearshore waters of southeastern Alaska. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-157. 89 p.

Jon Issacs and Associates 1985. Kodiak Island Borough Coastal Sensitivity Study Technical and Citizens Manuals. Kodiak Island Borough, Community development Department, Kodiak, Alaska

Morris, M., J.R. Harper , P.D. Reimer, H.R. Frith and D.E. Howes 1995. Coastal biotic mapping system using aerial video imagery. *In* Proceedings of the Third Thematic Conference on Remote Sensing for Marine and Coastal Environments, Seattle WA, p. 200-210.

Mutter et al 2003. Prince William Sound Sensitive Areas Working Group Annual Workshop. Anchorage, Alaska, February 2003.

NOAA 2000. Environmental Sensitivity Maps for Prince William Sound, Alaska. National Oceanic and Atmospheric Administration, Hazardous Materials and Response Branch, Sand Point, Washington.

Norcross, B., 2003. Biological and Physical Mapping of the Shoreline In the Exxon Valdez Oil Spill Area, Alaska Workshop Summary and Recommendations March 20-21, 2003 Exxon Valdez Oil Spill Restoration Office Conference Room 441 W. 5th Ave. Suite 500 Anchorage, AK.

Ruby, C.H., M.O. Hayes, P.J. Reinhat and K. Finkelstein 1979. Oil spill vulnerability, coastal morphology and sedimentation of the Kodiak archipelago. Contract Report by the University of South Carolina, Columbia, S.C. 149p.

Schoch, G.C., G.L. Eckert and T.A. Dean, Long-Term Monitoring in the Nearshore: Designing Studies to Detect Change and Assess Cause, Project Number: 02395, Workshop Summaries and Recommendations, November 9, 2001, Santa Barbara, California, January 24, 2002, Anchorage, Alaska.

Schoch, G.C., J.R. Harper and M. Dethier 1998. The physical classification and biological modeling of nearshore habitats in Carr Inlet. Technical Report for the Washington State Department of Natural Resources, Olympia, WA, 70p.

WaDNR 2001. Washington State *ShoreZone* Inventory. Technical Data Report Distributed on CD-ROM by the Washington State Department of Natural Resources, Olympia, Washington (http://www2.wadnr.gov/nearshore/data/).

Zacharias, M.A., D.E. Howes, J.R. Harper and P. Wainwright 1998. The British Columbia Marine Ecosystem Classification: Rationale, development and verification. Coastal Management 26:105-124.

BUDGET JUSTIFICATION

FY07

Auke Bay Laboratory

Personnel: Requested **$5.0 K**
In kind **$49.0 K**

Mandy Lindeberg, Auke Bay Laboratory Research Biologist, will be the Project Manager for this proposal to oversee the field survey scheduling, data collection, quality assurance, and final products. She will also participate in the aerial surveys as a coastal ecologist. During this field work overtime costs will be $5 K. It is anticipated that 6 months of her services will be in kind for this project.

Travel: Requested **$9.3 K**

Travel would be for M. Lindeberg to participate in the three aerial imaging trips to PWS, attend the Annual Workshop in Anchorage, and join John Harper for an outreach trip to PWS communities. For QAQC issues with CORI M. Lindeberg will travel to Victoria.

Contractual**:**

Coastal and Ocean Resources, Inc. (CORI) Requested **$194.0 K**

CORI would be selected for this contract as they are currently the only group conducting coastal mapping using the Alaska *ShoreZone* Mapping Protocols as developed under an earlier EVOS TC contract to CORI. To fly and image 4,000 km of shoreline in PWS it is estimated that it will cost **$46.00 per kilometer**. The contract would include personnel costs, travel, equipment rental, phone/courier, and services such as digitizing of appropriate coastlines for the GIS database. CORI would also be responsible for contracting a Helicopter and paying for fuel. An additional $10K in travel will be needed for J. Harper to attend the Anchorage Annual Workshop and an outreach trip to PWS communities (includes a float plane charter).

ABL contractor Requested **$10 K**

A contractor will aid in QA/QC of the database and posting of the imagery on the web.

Commodities**:**

none

SubTotal	$218.3 K
GA (9%)	$ 19.6 K
Project Total	**$237.9 K**

FY08

Auke Bay Laboratory

Personnel: Requested **$0.0 K**
In kind **$59.0 K**

Mandy Lindeberg will provide 6 months of her salary towards this project. During field work in PWS overtime costs will be $5 K. Additional ABL staff will be providing 3 mos each of in kind services towards the forage fish efforts, Scott Johnson and John Thedinga.

Travel: Requested **$1.2 K**

Six ABL staff/contractors will be traveling to PWS for two 10 day charters. This will require 12 RT tickets at $600 from Juneau to PWS. These costs have a low per diem rate since workers will be staying on a vessel. Additional travel will be for M. Lindeberg to attend the Anchorage Annual Workshop.

Contractual**:**

Coastal and Ocean Resources, Inc. (CORI) Requested **$284.5 K**

A contract to Coastal and Ocean Resources, Inc. (CORI) will for the biophysical mapping of all of the shorelines surveyed during the three AVI surveys. "Biophysical mapping" includes converting the digital image and audio data into georeferenced data and producing a database that links the geomorphology and biological habitat data for the *ShoreZone* areas. This work will be completed by geomorphology mappers at CORI and coastal ecologists at Archipelago Marine Research, Ltd. Costs are estimated at **$70.00 per kilometer** of survey. Additional contractual costs to CORI will include their phone/courier, miscellaneous printing and binding of reports. An additional $4.5 K is being requested for J. Harper and M. Morris to attend the Anchorage Annual Workshop.

ABL contractors Requested **$10 K**

Contractors will aid in database QA/QC.

Commodities**:**

none

SubTotal	$295.7 K
GA (9%)	$ 26.6 K
Project Total	**$322.3 K**

FY09

No funds are being requested for this fiscal year but final products will be submitted April 15, 2009.

DATA MANAGEMENT QA/QC STATEMENT

Being part of NOAA/NMFS we are fully FGDC compliant. *ShoreZone* metadata and QA/QC protocols can be downloaded from the following website: http://www.coastalaska.net/maps.htm. Data management and quality control will be the responsibility of Mandy Lindeberg and she will work with the EVOSTC to set up a data management plan so ShoreZone and Fish Atlas products can be properly archived and shared.

We will use MetaLite, freeware created by USGS for collecting and validating Federal Geographic Data Committee (FGDC)-compliant metadata, as requested.

1. Study design has been given elsewhere in this proposal.
2. Standard scientific protocols will be used for field studies and hypothesis testing if required.
3. Data characteristics
    a. Metadata will be provided if the proposal is funded.
    b. Quantitiative datasets will be obtained for forage fish and Federally Mandated Species in Prince William Sound.
4. Our cited literature describes the methods to be used for mapping.
5. Handling and custody of samples will follow standard ABL protocols.
6. Calibration and evaluation of analytical instruments are routinely performed at ABL but are not expected to be used for this project.
7. Standard software will be used (Microsoft Office, ESRI).

MANDY R LINDEBERG
Fisheries Research Biologist

Auke Bay Laboratory, Alaska Fisheries Science Center
National Marine Fisheries Service, NOAA
11305 Glacier Highway, Juneau, Alaska 99801-8626
Phone: (907) 789-6616
FAX: (907) 789-6094
e-mail: mandy.lindeberg@noaa.gov

1990- present: Mandy has been involved in *Exxon Valdez* oil spill research for the last 16 years. Her research includes studies on intertidal invertebrates and seaweeds, mussel populations, and a co-principal investigator of spot shrimp populations in Prince William Sound. Recently, she has been a co-PI of the lingering oil studies in PWS (2001-05) and has participated in *ShoreZone* habitat mapping (aerial and ground truething) throughout Central and SE Alaska (2002-present). The EVOS Coastal Habitat project dealt with the damage assessment, restoration, and long term monitoring of intertidal algae. Her expertise lies with coastal ecology and specializes in the taxonomy and ecology of seaweeds. All of these studies have enabled her to develop a unique knowledge of Alaskan coastal habitats.

Education: BS 1989, Marine Biology, Western Washington University, Bellingham, Washington.

Publications:

Short, J.W., J.M. Maselko, M.R. Lindeberg, P.M Harris, and S.D. Rice. In Press 2006. Vertical distribution and probability of encourntering intertidal *Exxon Valdez* oil on shorelines of three embayments within Prince William Sound, Alaska. Environmental Science and Technology.

Short, J.W., S.D. Rice, M.R. Lindeberg, and M.G. Carls. 2005. Use of polyethylene membrane devices for monitoring diesel oil contamination on and within beaches. Proceedings of the 31st Annual Aquatic Toxicity Workshop, Charlestown, Prince Edward Island, Canada, Canadian Department of Fisheries and Oceans.

Short, Jeffrey W., Mandy R. Lindeberg, Patricia M. Harris, J. Maselko, Jerome J. Pella, and S.D. Rice. 2004. An estimate of oil persisting on beaches of Prince William Sound, 12 years after the *Exxon Valdez* oil spill. Environ. Sci. and Technol. Vol 38: 19-25.

Short, Jeffrey W., Mandy R. Lindeberg, Patricia M. Harris, Jacek Maselko, and Stanley D. Rice. 2002. Vertical oil distribution within the intertidal zone 12 years after the *Exxon Valdez* oil spill in Prince William Sound, Alaska. Pp. 57-72 In: Proceedings of the Twenty-fifth Arctic and Marine Oilspill Program (AMOP) Technical Seminar. Environment Canada, Ottawa, Ontario.

Payne, J.R., W.B. Driskell, M.R. Lindeberg, W. Fournier, M.L. Larsen, J.W. Short, S.D. Rice, and D. Janka. In press. Dissolved- and particulate-phase hydrocarbons in interstitial water from Prince William Sound intertidal beaches containing buried oil thirteen years after the Exxon Valdez Oil Spill. 2005 International Oil Spill Conference, American Petroleum Institute.

List of Collaborators in last 4 years:

(all were inkind services; no collaborations with shared funding in the last 3 years)

Susan Saupe
Cook Inlet RCAC
910 Highland Ave
Kenai, AK 99611
phone: 907 283 7222
fax: 907 283- 6102
email: saupe@circac.org

Dr. John Harper
Coastal & Ocean Resources Inc.
214 - 9865 W. Saanich Rd.
Sidney, BC V8L 5Y8 Canada
phone: 250 655 4035
fax: 250 655 1290
email: john@coastalandoceans.com

Ms. Mary Morris (Biological *ShoreZone* Mapper)
Archipelago Marine Research Ltd.
525 Head St.
Victoria, BC V9A 5F1
phone: 250 383 4535
fax: 250 383 0103
email: marym@archipleago.ca

COASTAL AND OCEAN
RESOURCES INC.
214-9865 W. Saanich Rd
Sidney, BC V8L 5Y8
CANADA

Phone: (250) 655-4035

Fax: (250) 655-1290

e-mail: john@coastalandoceans.com
webpage: www.coastalandoceans.com

JOHN R. HARPER
P. Geo.

SPECIALTIES:

- **oilspill research and planning**
- **multidisciplinary marine studies**
- **coastal zone management**
- **coastal and nearshore habitat**

EDUCATION:

B.Sc.	Geology (cum laude), University of Massachusetts (1973); L.R. Wilson Award for Excellence in Geology
M.Sc.	Marine Science, Louisiana State University (1976)
Ph.D.	Marine Science, Louisiana State University (1978)

WORK EXPERIENCE:

1987-present	**Principal**, Coastal and Ocean Resources (previously Harper Environmental Services), British Columbia and Nova Scotia
1989-present	**Adjunct Professor**, Centre of Earth and Ocean Resources, University of Victoria, Victoria, British Columbia
2004-present	**President** of the Board of Directors, Marine Ecology Centre
1987-1989	**Marine Geologist/Coastal Coordinator**, Committee for Co-ordination of Joint Prospecting for Mineral Resources in South Pacific Offshore Areas (CCOP/SOPAC), Suva, Fiji
1986-1987	**Manager**, Maritime Region, Dobrocky Seatech Ltd., Halifax, Nova Scotia
1985-1986	**Manager**, West Coast Region, Dobrocky Seatech Ltd., Sidney, BC
1983-1985	**Manager**, Geosciences and Hydrographic Services, Dobrocky Seatech Ltd.
1980-1983	**Senior Project Scientist**, Woodward-Clyde Consultants, Victoria, British Columbia and San Francisco, California
1978-1980	**Post-Doctoral Fellow**, Geological Survey of Canada, Pacific Geoscience Centre., Sidney, British Columbia
1973-1978	**Research Assistant**, Coastal Studies Institute, Louisiana State University, Baton Rouge, Louisiana

---

GEOGRAPHIC EXPERIENCE:

East, west and arctic coasts of Canada; east, west and arctic coasts of the United States; Brazil; Costa Rica; Fiji; Kenya; Kiribati; Papua New Guinea; Tonga; Western Samoa

PROJECT MANAGEMENT

Over the past 15 years, Dr. Harper has personally managed over 250 separate projects related to coastal and marine resources including the following disciplines:

Coastal Zone Management - Dr. Harper has been closely involved with coastal management planning in British Columbia and is currently conducting a resource inventory and user needs assessment for the province of British Columbia. He is also involved with the development of marine region classification of Canada for use in environmental ecosystem monitoring. Dr. Harper has been closely involved with the development of coastal habitat classification and mapping systems over the past three years, using state-of-the-art remote sensing and GIS systems.

Oil Spill Research, Planning and Response - oil spill research studies since 1980, including several years of field studies associated with the Baffin Island Oil Spill experiment, sensitivity evaluations for the coasts of northern California, British Columbia, Kodiak Island, the Chukchi and Beaufort Sea coasts of Alaska, the Beaufort Sea coast of Canada, Labrador and Newfoundland. Other research areas have included the long-term fate of oil on shorelines, decision-making for shoreline cleanup operations and long-term monitoring programs. In 1984, he designed and implemented a physical monitoring program of the MV Puerto Rican oil spill off San Francisco. In 1991, Harper Environmental Services compiled the first Directory of Canadian Marine Oilspill Specialists. In 1992, he directed an Oil Spill Sensitivity Mapping Workshop in Costa Rica for ARPEL.

Dr. Harper has been extensively involved in the EXXON Valdez oil spill cleanup operation in Prince William Sound (1989-1992) with participation in quality assurance for preparation of oiling maps, coordination of the Prince William Sound Fate and Persistence Studies, bioremediation monitoring surveys.

Coastal Research/Marine Geology - coastal and nearshore studies since 1971 and with research projects on all major coastlines of North America and throughout the South Pacific. Research topics have included: beach monitoring, coastal mapping, sediment transport predictions and measurements, coastal erosion and scour monitoring, and coastal storm surge surveys.

Environmental Impact - since 1973, Dr. Harper has been closely involved with large, multidisciplinary impact assessments including: the first superport to be developed in the US (Harper, 1974), major construction projects at Prudhoe Bay (causeway construction and oil field waterflood construction), siting and impact evaluation of a major marine oil terminal in Santa Barbara, and the Beaufort Sea Environmental Monitoring Project (BEMP). Also he has been extensively involved with oil spill contingency planning in the marine environment with input to plans for offshore drilling in western Canada (Chevron, PetroCanada), the Beaufort Sea (Dome Petroleum) and Prudhoe Bay, Alaska (ARCO).

Marine Parks - numerous marine park studies including field studies of coastal landforms to delineation of new marine park sites in the Canadian arctic. In 1983, Dr. Harper conducted a strategic planning study for Parks Canada to delineate the marine regions of Canada; major segments of this study, including the delineated regions, have recently been incorporated into Parks Canada policy. Two field seasons of field work have been conducted within Pacific Rim National Park. He is currently directing a major biophysical mapping project of the newest marine park in Canada, South Moresby/Gwaii Haanas National Park Reserve.

Selected publications

Harper, J.R., B.D. Bornhold, B. Burd, B. Emmett, C. Picard and P. Thuringer 2003. Use of Seabed Imaging and Mapping System for Use in Change Detection Monitoring (Abstract). Proceedings of the 2003 Georgia Basin/Puget Sound Conference, Vancouver, BC.

Harper, J.R., B.D. Bornhold and B. Burd. 2003b. Evaluation of the Towed Video Imagery for Eelgrass Mapping and Monitoring (Abstract). Proceedings of the 2003 Estuarine Research Federation Conference, Seattle, Washington.

Emmett, E., P. Thuringer and **J.R. Harper** 2001**.** Using towed underwater video to map the physical and biological features of Victoria and Esquimalt Harbours, British Columbia (Abstract). Proceedings fo the Submerged Lands 2001 Conference, Seattle, Washington.

Harper, J.R., B.D. Bornhold, P. Thuringer and D. McCullough 1999. Application of Underwater Video Imaging for Seabed Engineering and Habitat Assessment. *In* Proceedings of the 1999 Canadian Coastal Conference, Victoria, BC, 12p.

Harper, J.R., B. Emmett, D.E. Howes and D. McCullough 1998. Seabed imaging and mapping system – seabed classification of substrate, epiflora and epifauna. *In* Proceedings of the 1998 Canadian Hydrographic Conference, Victoria, BC, 13p.

Zacharias, M.A., D.E. Howes, **J.R. Harper** and P. Wainwright 1998. The British Columbia Marine Ecosystem Classification: Rationale, development and verification. Coastal Management 26:105-124.

Zacharias, M.A., D.E. Howes and **J.R. Harper** 1998. The development of an ecosytem classification using an ecosystem-based approach. Approaches to Marine Ecosystem Delineation in the Strait of Georgia: Proceedings of a DFO Workshop, Sidney, B.C., 4-5 November 1997 Canadian Technical Report of Fisheries and Aquatic Sciences 2247 p96-104

Harper, J.R., G. Sergy and M. Kory. 1997. Orimulsion-sediment interaction scoping experiments. Proceedings of the 20th Annual Arctic Marine Oilspill Project (AMOP) Technical Seminar, Vancouver, BC, in press.

Harper, J.R. and D.E. Howes. 1997. Development of a shoreline protection strategy for the West Coast of Vancouver Island. Proceedings of the 20th Annual Arctic Marine Oilspill Project (AMOP) Technical Seminar, Vancouver, BC, in press.

Odhiambo, B.K., R.W. Macdonald, M.C. O'Brien, **J.R. Harper** and M.B. Yunker 1996. Transport and fate of mine tailings in a coastal fjord of British Columbia as inferred from the sediment record. Science and the Total Environment: 191:77-94.

Hodgins, D.O., **J.R. Harper** and Andree Chevier 1995. Technical guidance for physical monitoring at ocean disposal sites. Proceedings of the 1995 Canadian Coastal Conference, National Research Council of Canada, (in press).

Morris, M., **J.R. Harper** , P.D. Reimer, H.R. Frith and D.E. Howes 1995. Coastal biotic mapping system using aerial video imagery. *In* Proceedings of the Third Thematic Conference on Remote Sensing for Marine and Coastal Environments, Seattle WA, p. 200-210.

Sergy, G., S. Blenkinsopp, **J.R. Harper**, B. Humphrey and E.H. Owens 1995. Recent and emerging Canadian studies addressing oil-on-shoreline issues. Proceedings of of Special Conference on Oil Poluution, International Maritime Organization, London, 13p.

Harper., J.R. and P.D. Reimer 1995. Review of aerial video imagery (AVI) applications and development of AVI standards for the Province of British Columbia. *In* Proceedings of the Third Thematic Conference on Remote Sensing for Marine and Coastal Environments, Seattle WA, p. 700-709.

Harper, J.R., G. Sergy and T. Sagayama 1995. Subsurface oil in coarse sediments experiments (SOCSEX II). Proceedings of the 18th Annual Arctic Marine Oilspill Project (AMOP) Technical Seminar, Edmonton, AB,. p.867-886.

Sergy, G., S. Blenkinsop, **J.R. Harper**, B. Humphrey and E.H. Owens 1995. Recent and emerging Canadian studies addressing oil-in-shorelines issues. Proceedings of the Second International Research and Development Forum, International Maritime Organization, London.

Humphrey, B. and **J.R. Harper**, 1993. Coarse sediment oil persistence laboratory studies and model. Proceedings of the 1993 Arctic Marine Oil Spill Conference, Calgary, AB

Gillie, R.D., **J.R. Harper** and R. Howorth, 1992. Beach profile changes at Tarawa, Kiribati, 1991-92. 7th International Coral Reef Symposium.

Harper, J.R., D.F. Dickins, D. Howes and G. Sergy, 1992. Recent shoreline mapping projects in British Columbia and significance to oil spill countermeasure planning. Proceedings of the 15th Arctic and Marine Oil Spill Technical Seminar (AMOP), Environment Canada, p. 293-300.

Harper, J.R., 1991. Non-carbonate sediment budgets. Keynote Paper, Proceedings of the 1987 CCOP/SOPAC Workshop on Coastal Processes in the South Pacific Island Nations, SOPAC Technical Bulletin 7:55-58.

Harper, J.R. and E.H. Owens, 1991. Post-cyclone coastal hazard assessment and mapping using a simple aerial videorecording system. Proceedings of the 1987 CCOP/SOPAC Workshop on Coastal Processes in the South Pacific Island Nations, SOPAC Technical Bulletin 7:163-164.

Harper, J.R., J. Dempsey, W. Duval, J. Haggarty,
B. Humphrey, L. Solsberg and G. Tidmarsh, 1991. Development of a directory of Canadian marine oilspill response specialists. Proceedings of the 14th Arctic and Marine Oilspill Program (AMOP) Technical Program, Environment Canada, p. 207-213.

FY07 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2006 - September 30, 2007

Budget Category:	Authorized FY 2006	Proposed FY 2007	Proposed FY 2008	Total Project
Personnel		$5.0	$0.0	$5.0
Travel		$9.3	$1.2	$10.5
Contractual		$204.0	$294.5	$498.5
Commodities		$0.0	$0.0	$0.0
Equipment		$0.0	$0.0	$0.0
Subtotal	$0.0	$218.3	$295.7	$514.0
General Administration		$19.6	$26.6	$46.2
Project Total	$0.0	$237.9	$322.3	$560.2
Full-time Equivalents (FTE)		0.5	0.5	
	Dollar amounts are shown in thousands of dollars.			
Other Resources				

Comments:

Cost of flying and travel have increased due to the increase of fuel costs since the 2004 flying.

ABL inkind = M. Lindeberg 6 mos = $49 K (FY 07 Non-EVOS)

M. Lindeberg 6 mos = $ 49 K (FY 08 Non-EVOS)

Revisions (Oct. 2006): Upon the Trustees requests we have removed line items associated with forage fish and ground truthing to occur in FY08 (M. Lindeberg overtime = $5.0K, ABL staff travel = $7.6K, Vessel contract = $50K, ABL temp field labor = $20K, and ABL temp database labor $10K). **Total budget reduction - $100.9 K**

FY07

Prepared:

Project Number: 070805
Project Title: ShoreZone Mapping for PWS
Agency: NOAA/NMFS Auke Bay Laboratory

FY07 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2006 - September 30, 2007

Personnel Costs:		GS/Range/ Step	Months Budgeted	Monthly Costs	Overtime	
Name	Position Description					
M Lindeberg PI	Fisheries Research Biologist	ZP-III	6.0	0.0	5.0	
	Subtotal		6.0	0.0	5.0	
					Personnel Total	

Travel Costs:		Ticket Price	Round Trips	Total Days	Daily Per Diem	
Description						
M Lindeberg	travel for AVI surveys	0.6	3	18	0.2	
	travel for Annual Workshop	0.6	1	3	0.2	
	travel to communities for outreach	0.6	1	3	0.2	
	travel to CORI for QA/QC	0.6	1	3	0.3	
					Travel Total	

FY07

Project Number: 070805
Project Title: ShoreZone Mapping for PWS
Agency: NOAA/NMFS Auke Bay Laboratory

Contractual Costs:		
Description		
Coastal and Ocan Resources, Inc. (Dr. John Harper)		
Flying/Imaging	($46 per km of shoreline; 4,000 km to image)	
Personnel	J. Harper and M. Morris	
Travel	2 RT Victoria -PWS x three trips = $6K; two people for 18 days in PWS = $9 K	
	food and lodging for helicopter pilot (18 days in PWS)	
	J. Harper to ANC annual meeting	
	J. Harper to PWS plus air charter	
Contracts	Helicopter and fuel ($5 K per day; 18 days)	
Commodities	shipping, electronics, digital imagery supplies, and computer supplies	
ABL contractor	data QA/QC and web posting	
When a non-trustee organization is used, the form 4A is required.	**Contractual Total**	
Commodities Costs:		
Description		
	Commodities Total	

FY07

Project Number: 070805
Project Title: ShoreZone Mapping for PWS
Agency: Auke Bay Laboratory

Prepared:

FY07 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2006 - September 30, 2007

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		

FY07

Project Number: 070805
Project Title: ShoreZone Mapping for PWS
Agency: NOAA/NMFS Auke Bay Laboratory

FY07 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2006 - September 30, 2007

Personnel Costs:		GS/Range/ Step	Months Budgeted	Monthly Costs	Overtime	
Name	Position Description					
M. Lindeberg	Fisheries Research Biologist	ZP-III	6.0	0.0	0.0	
	Subtotal		6.0	0.0	0.0	
					Personnel Total	

Travel Costs:		Ticket Price	Round Trips	Total Days	Daily Per Diem	
Description						
M Lindeberg	travel for Annual Workshop	0.6	1	3	0.2	
					Travel Total	

FY08

Project Number: 070805
Project Title: ShoreZone Mapping for PWS
Agency: NOAA/NMFS Auke Bay Laboratory

FY07 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2006 - September 30, 2007

Contractual Costs:			
Description			
Temp Labor (ABL)	database QA/QC audit		
Coastal and Ocan Resources, Inc. (Dr. John Harper)			
Mapping	($70 per km of shoreline; 4,000 km)		
Personnel	J. Harper, M. Morris, Tech 4, Tech 3		
Travel	EVOS Annual Workshop	2 RT Victoria to ANC	
Contracts			
Commodities			
When a non-trustee organization is used, the form 4A is required.		**Contractual Total**	
Commodities Costs:			
Description			
		Commodities Total	

FY08

Project Number: 070805
Project Title: ShoreZone Mapping for PWS
Agency: Auke Bay Laboratory

FY07 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2006 - September 30, 2007

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

Project Number: 070805
Project Title: ShoreZone Mapping for PWS
Agency: NOAA/NMFS Auke Bay Laboratory