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GEM PROPOSAL SUMMARY PAGE

(To be filled in by proposer)

Project Title: Monitoring Lingering Oil on Boulder-Armored Beaches in the Gulf of Alaska

Project Period: FY 04-FY 05

Proposer(s): Dr. Gail V. Irvine
U.S. Geological Survey, DOI

Study Location: Kenai Peninsula, Alaska Peninsula

Abstract:

We propose to continue monitoring the persistence and degradation of oil at boulder-armored Gulf of Alaska beaches that have been studied since 1992 and investigate how stability of the boulder armors affects both persistence and weathering. These sites were resampled in 1994 and 1999; 2004 would be the next targeted study date. The continued contamination of these sites, arrayed along the Katmai and Kenai Fjords National Park coasts, compromises the aesthetics and wilderness values of some of the most pristine wilderness-coast parklands in the world. The lack of weathering of much of the oil means that the oil, if released, could pose a risk to biota. Subsurface oil persisted at these sites in 1999 with little change in extent or chemical weathering since 1994. Data also suggests that the boulder armors are largely stable. We propose to assess changes in surface and subsurface oiling, chemical weathering of the oil, and stability of the boulder armors. Results will be published.

Funding:	EVOS Funding Requested:	FY 04	\$ 71.7	TOTAL: \$88.9
		FY 05	\$ 17.2	
		FY 06	\$	
Non-EVOS Funds to be Used:		FY 04	\$ 7.3	TOTAL: \$ 7.3
		FY 05	\$	
		FY 06	\$	

Date: June 16, 2003

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GEM RESEARCH PLAN

Monitoring lingering oil on boulder-armored beaches in the Gulf of Alaska: Continued investigation into persistence and process

I. NEED FOR THE PROJECT

A. Statement of Problem

When the T/V *Exxon Valdez* ran aground in March 1989, there was little thought that lingering oil contamination would span decades, especially given the rocky nature of much of the affected coastline. At that point, there were not very many studies of long-term oil persistence following spills. However, studies from the *Exxon Valdez* oil spill (EVOS), as well as other spills, have indicated that oil can be persistent for at least a decade (e.g., Baker et al. 1992; Irvine et al., 1999; Irvine, 2000; Carls et al., 2001, Short et al. 2002; Irvine et al., 2002, 2003; Reddy et al., 2002) and that effects on biota can also be long-lasting (e.g.; Hawkins and Southward, 1992; Kleklowski et al., 1994; Dauvin, J.-C., 1998; Irvine, 2000; Bodkin et al., 2002; Esler et al., 2002). Some studies have documented the persistence of oil in sheltered locations for 15 to 30 years (e.g., Baker et al., 1992; Reddy et al., 2002). The persistence of oil in cobble- or boulder-armored beaches experiencing relatively high energy, is one of the original findings from EVOS studies (e.g., Michel and Hayes, 1993a, b; 1995; 1999; Hayes and Michel, 1999; Irvine et al., 1999; Irvine et al., 2003). Previously it was thought that oil would be rapidly removed from high-energy rocky beaches by wave action (Vandermuelen, 1977; Irvine et al., 1999; Irvine, 2000). Consequently, high-energy rocky shores were given low Environmental Sensitivity ratings (Hayes et al., 1979), which are often used to determine response activities following spills.

The focus of this proposal is on continued monitoring of the persistence and degradation of oil at boulder-armored Gulf of Alaska beaches that have been studied since 1992. These sites were resampled in 1994 and 1999, and we have previously recommended that such sampling be conducted every five years. 2004 would be the next targeted study date. The continued contamination of these sites, arrayed along the Katmai and Kenai Fjords National Park coasts, compromises the scientific and recreational values, including wilderness characteristics of some of the most pristine wilderness-coast parklands in the world. These values and characteristics are clearly stated in both ANILCA (1980) and the Wilderness Act (1964). Lingering oil continues to degrade the special value of these protected lands, and the lack of weathering of much of the sequestered oil means that the oil, if released, could pose a risk to biota.

One might ask why these sites should be monitored in addition to sites within Prince William Sound. The patterns of oil persistence and degradation at Gulf of Alaska (GOA) sites differed in several important respects from Prince William Sound (Irvine et al., 1999). First, oil stranding in Prince William Sound (PWS) was often in a more fluid form (Payne et al., 1991). Second, the geomorphic character of the Katmai or GOA shoreline is fundamentally different than in PWS, where wave energies are generally lower. We strongly suspect that the results of studies of crude-oil weathering and persistence on shorelines inside Prince William Sound (Michel and Hayes, 1993a, b; 1995; 1999; Hayes and Michel, 1999; Short et al., 2002) may not be directly transferable to GOA shorelines.

In contrast to much of the oil that contaminated shorelines in PWS, oil arrived on GOA shorelines in the form of mousse, which weathers differently than fluid oil. Mousse, a water-in-oil emulsion, weathers principally on its surface, leaving the interior portions of the mousse “patty” relatively unweathered (Payne et al., 1983; Payne et al., 1991). Therefore, the formation of mousse allows transport of packages of less-weathered and still toxic oil over long-distances (Patton et al., 1981; Irvine et al., 1999) and facilitates the long-term persistence of this less-weathered oil in sheltered situations on the shoreline (Baker et al., 1993; Irvine et al., 1999, 2003; Irvine, 2000). The three-dimensional structure of boulder-armored beaches allows oil to penetrate into finer sediments lying beneath stable, boulder lags. These surface armors attenuate wave energy and reduce wave reworking of the underlying substrates and the included oil. Additionally, oil on boulder-armored beaches is often stranded high in the intertidal zone, and is usually sheltered by the boulders from sun exposure.

In our studies of lingering at GOA boulder-armored beaches, we have examined the persistence of both surface and subsurface oil, the chemical composition of the oil through time, and movement of the boulder armor. In 1999, these beaches showed continued contamination by subsurface oil, despite their exposure to high wave-energies. Significant declines in surface oil cover occurred at all study sites. In contrast, mousse has persisted under boulders in amounts similar to what was present in 1994 and probably in 1989, as indicated by examination of dip stones. Oil persists in these settings due to armoring of underlying sediments and their included oil beneath boulders. Especially striking is the general lack of weathering of this stranded oil over the last decade. Oil at five of the six armored-beach sites ten years after the spill is compositionally similar to eleven-day old *Exxon Valdez* oil. In fact, some of this oil is less weathered (Irvine et al., 2003) than oil recently sampled from PWS (Short et al., 2002).

Analysis of movements in the boulder armor that covers the study beaches reveals that only minor shifts have occurred since 1994, suggesting that over the last five, and probably over the last ten years, boulder armors have remained largely unmoved at the study sites. Our findings emphasize the importance of particular geomorphic parameters in determining stranded oil persistence. Surface armoring, combined with stranding by oil mousse, has resulted in the unexpectedly lengthy persistence of only slightly to moderately weathered oil within otherwise high-energy wave environments.

Questions remain about how long mousse will persist and in what chemical state on these boulder-armored shores. Continued monitoring of these sites will allow us to understand further the factors that interact to promote both persistence of the oil and its lack of degradation. We predict that if unusually strong storms are able to disrupt the boulder armors, subsurface oil will decrease and weathering of the oil will increase. The release of this oil through storm events has the potential to cause effects on biota, especially given the only slight to moderate weathering of the oil in 1999.

B. Relevance to GEM Program Goals and Scientific Priorities

This project directly addresses one of the topics and concerns listed in the FY04 Invitation for proposals: Lingering Oil. In some respects it spans both the older focus of damage assessment/restoration and the newer monitoring focus of GEM. This project has a very basic link to oil spill effects: we are studying the persistence and degradation of stranded oil. The persistence of oil on national park coastlines constitutes injury to the scientific, recreational and wilderness values of Kenai Fjords and Katmai National Parks. Also, the project is primarily a

monitoring project, with additional investigations into the processes allowing for the persistence of this oil.

Certainly one of the legacies of the EVOS should be increased knowledge of spills in arctic waters. This project not only defines better the long-term injuries due to the spill, but also will help predict the effects of future oil spills in this region and guide future oil spill response efforts. In particular, our results suggest that a revision to the Ecological Sensitivity Indices (ESIs) for boulder-armored exposed rocky shores may be necessary, and that instead of being rapidly cleansed by wave action, these sites are locations where oil may persist for decades with minimal weathering. This revision could lead to changes in response and cleanup strategies for these habitats.

II. PROJECT DESIGN

A. Objectives

2004

1. Monitor (a) surface and (b) subsurface oil at 6 previously established sites along the Gulf of Alaska coast.
2. Assess boulder movement at the sites.
3. Determine the physical extent and chemical weathering of the oil.

2005

1. Preparation of final report and submission of a manuscript to peer-reviewed journal.
2. Presentation of findings at a professional conference

Hypothesis being tested:

H: Subsurface oil will persist with minimal chemical degradation at beaches with well-developed boulder armors until there are large shifts in the boulder armor. Such shifts in the armor are likely to come from unusually large storm events.

The research proposed addresses both long-term persistence and degradation of oil through time on special value lands, and also investigates one mechanism postulated to be responsible for its persistence.

B. Procedural and Scientific Methods

Sampling methods at the boulder-armored beaches will include: relocation and resampling of permanently marked quadrats, assessment of boulder movements through surveying of marked bolts in boulders, gas chromatography/mass spectroscopy (GC/MS) analysis of oiled sediment samples from each site, and analysis of sub-surface oiling via sampling of “dip stones”. Greater specifics on the methods associated with each objective are given below.

1.a. *Monitor surface oil at the 6 previously sampled boulder-armored beach sites.*

Methods established in 1994 will be used to reassess the surficial oiling at the 6 sites previously established along the coasts of Kenai Fjords and Katmai National Parks. Oil percent cover will be estimated visually in the field within 12-26 quadrats per site. These quadrats, set up in 1994, originally were positioned over areas of the most extensive and persistent surface oiling. Each quadrat was marked permanently by placing two rock bolts in diagonal corners. Each 40 x 50 cm quadrat is subdivided by thin nylon lines, which enables more precise visual assessments. Independent estimates by observers will be compared and estimates modified until all observers agree on oil coverage within 5% (Dethier et al., 1993).

1.b. *Monitor subsurface oil at the 6 previously sampled boulder-armored beach sites.*

We hypothesize that oil trapped in the subsurface of boulder-armored beaches will remain there for lengthy intervals and will weather slowly since it is shielded from both physical abrasion and evaporation. We will monitor the extent of subsurface oiling through examination of “dip stones,” which are elongate rocks protruding out of the surface but extending down into the subsurface oil layer. The ideal dip stone extends vertically below the lowest subsurface oil, illustrating the maximum depth of oiling at that spot. The depth of oil is recorded, along with descriptors of its type (e.g., asphalt, mousse, etc.). Layers of different oiling type can occur along the dip stone.

2. *Assess the extent of boulder movements at the sites.*

The extent of boulder movement at a beach site is determined through the resurveying of marked bolts permanently affixed to individual boulders. These marked boulders are also used to mark quadrat locations. Bolt locations were mapped to within ± 2 cm horizontal distance and ± 1 cm elevation using an automatic level, tape measure, and stadia rod from a temporary bench mark (tbm) consisting of labeled rock bolts on bedrock adjacent to the quadrat cluster. Detailed leveling and horizontal mapping of the marker bolts allows quantification of boulder movements on the study beach during subsequent surveys. Repeated measurements of selected bolts are made to determine surveying error.

3. *Determine the physical extent and chemical weathering of the oil.*

The chemical state of oil at these beaches is determined through GC/MS analysis of two subsurface oil samples collected from each site. Such sampling has been conducted since 1992, and a few samples exist from earlier years after the spill. Chemically clean sampling utensils and containers are used, and samples are frozen within two hours of collection. Chain of custody procedures are used to track collection data and transfer of the samples. At the end of the fieldwork, frozen samples are flown to the Auke Bay Laboratory for GC/MS analyses conducted according to established protocols (Short et al., 1996). After the chemical analyses are complete, the results are fed into a model of oil weathering created by Short and Heinz (1999), that allows the weathering state of these samples to be compared to samples taken at other times and locations. The results of the GC/MS analysis become part of the hydrocarbon database maintained by the Auke Bay Laboratory.

C. Data Analysis and Statistical Methods

Data obtained will be analyzed according to appropriate techniques.

Surface oiling is reassessed in marked quadrats by estimates of oil percent cover. Percent cover data for individual quadrats will be compared through time (1994, 1999, 2004) via pair-wise tests. As for all tests discussed, the data will be tested for normality and the appropriate parametric or non-parametric test chosen. Data from 1994 and 1999 were compared in our latest report and manuscript via the Wilcoxon signed-rank test.

Subsurface oiling is assessed through the sampling of dip stones at each site. Means and ranges of the depth of oiling for each site will be compared through time.

Oil weathering: The presence and relative abundance of polynuclear aromatic hydrocarbons (PAH) within samples will be compared, and a weathering index based on a first-order kinetic loss rate model of Short and Heinz (1997) will be used to compare the degree of weathering of different samples at the same and different sites.

Boulder movement: Measurement of boulder movement will be compared between year, by site. Various measures of movement, e.g., horizontal and vertical displacements, changes in angular orientation of the marker bolts, will be considered separately. Measurement error is determined through repeated measurements of selected marked bolts. The significance of displacements for the boulder armoring will be discussed in relation to the size classes of the boulders on the beach. Variations between beaches will be contrasted, especially in relation to the extent of chemical weathering of oil samples.

D. Description of Study Area

Six study sites have been previously established, five along the Katmai National Park and Preserve coast, and one along the Kenai Fjords coast. These sites were selected for study of oil persistence in 1992 based on shoreline-assessment data gathered between 1989 and 1991 by EXXON and the Alaska Department of Environmental Conservation. Oil mousse was consistently observed at all of the sites by oil assessment teams. The sites represent boulder-armored gravel beaches, most with an underlying bedrock abrasion platform at shallow depth.

Maps with the location of the study sites, and more details of site morphology and location of quadrats have been included in previous reports submitted to the EVOS Trustee Council. The Kenai Fjords site is location on the north shore of McArthur Pass. The Katmai sites are located at Cape Douglas, Kiukpalik Island, Ninagiak Island, Cape Gull, and Kashvik Bay.

E. Coordination and Collaboration with Other Efforts

NOAA is a cooperating agency, as one of the Principal Investigators, Dr. Jeff Short, is allied with NOAA's Auke Bay Fisheries Laboratory. Our project will be complementary to any lingering oil monitoring projects undertaken in PWS. In addition to providing a geographical balance to the oil monitoring, we also provide clearer insight into the effects on oil persistence of such factors as stranding by mousse, particularly on higher exposure boulder-armored beaches.

III. SCHEDULE

A. Project Milestones

2004

- Objective 1. Monitor surface and subsurface oil at 6 previously established sites along the Gulf of Alaska coast.
To be met by September 2004

- Objective 2. Assess boulder movement at the sites.
To be met by December 2004

- Objective 3. Determine the physical extent and chemical weathering of the oil.
To be met by January 2005

2005

- Objective 4. Preparation of final report and submission of a manuscript to peer-reviewed journal.

- Objective 5. Presentation of findings at a professional conference

B. Measurable Project Tasks

FY 04, 1st quarter (October 1, 2003-December 31, 2003)

October: Project funding approved by Trustee Council

FY 04, 2nd quarter (January 1, 2004-March 31, 2004)

January 12-16 (tentative): Annual GEM Workshop

FY 04, 3rd quarter (April 1, 2004-June 30, 2004)

June: Sample Katmai sites

FY 04, 4th quarter (July 1, 2004-September 30, 2004)

July: Sample Kenai Fjords site
Ship oil samples to Auke Bay lab

FY 05, 1st quarter (October 1, 2004-December 31, 2004)

December 15: Finish analysis of boulder movement and surface and subsurface oil measures

FY 05, 2nd quarter (January 1, 2005-March 31, 2005)

(dates not yet known) Annual GEM Workshop

January 15: Receive GC/MS analyses of oil samples from Auke Bay

FY 05, 3rd quarter (April 1, 2005-June 30, 2005)

April 15 Submit final report (which will consist of draft manuscript for publication) to Trustee Council Office

June: Present findings to scientific conference

IV. RESPONSIVENESS TO KEY TRUSTEE COUNCIL STRATEGIES

A. Community Involvement and Traditional Ecological Knowledge (TEK)

This study, occurring as it does, on national park coasts distant from local communities, does not anticipate involvement of communities or of traditional ecological knowledge.

B. Resource Management Applications

Who will benefit from the research results we will provide? Those agencies that will have responsibilities in future spills - for knowing the long-term nature of oil contamination from spills, for understanding what factors are responsible for such persistent contamination, for incorporating such understanding into response and protection activities. These agencies include Alaska Departments of Natural Resources and Environmental Conservation, and the National Oceanic and Atmospheric Association (Dr. John Whitney). Our findings are likely to affect the redefinition and application of Environmental Sensitivity Indices, which are commonly used to guide response activities following spills. The documentation of lingering oil, especially oil that is not weathering, on high-energy beaches contradicts earlier ratings applied to similar habitats. Additionally, the National Park Service is concerned about continuing contamination of the Katmai and Kenai Fjords National Park shorelines, and the injury that that constitutes.

V. PUBLICATIONS AND REPORTS

We are requesting funding for publication of project results in a peer-reviewed journal. The tentative title of the manuscript is: "Fifteen years after the *Exxon Valdez* oil spill: long-term persistence of oil on boulder-armored beaches distant from the spill origin". We plan to target the journal, *Environmental Science and Technology*, with a submission date planned for May 2005.

VI. PROFESSIONAL CONFERENCES

We plan to present project results at American Society of Limnology and Oceanography meetings to be held in Spain during June 2005.

VII. LITERATURE CITED

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Gail V. Irvine
Condensed Resume
June, 2003

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Education: B.A., University of California, Santa Barbara, Zoology, 1969 (Honors)
M.S., University of Washington, Seattle, Zoology, 1973
Ph.D., University of California, Santa Barbara, Aquatic and Population
Biology, 1983

Professional Societies:

Ecological Society of America
American Society of Limnology and Oceanography
Western Society of Naturalists

Professional Commitments:

Editorial Board, Marine Domain, TheScientificWorld (electronic journal)

Relevant Experience:

- 1984-1990: Marine Biologist with the Minerals Management Service. Analyzed effects of potential oil spills in Alaskan marine waters. Technical advisor for post-spill studies conducted by the Smithsonian Institution (with Minerals Management Service funding) in Panama, following the Galeta oil spill. (I had previously done research on coral reefs in Panama, including the Galeta reef).
- 1990- 1994: Coastal Resources Specialist with the National Park Service, Anchorage, Alaska. Coordinated and conducted coastal projects along marine coastlines of Alaskan national parks, including Kenai Fjords, Katmai and Lake Clark National Parks. Involved in emergency response to potential oil spill in Glacier Bay National Park.
- 1992-1995: Principal Investigator on Oiled Mussel Project, Gulf of Alaska.
- 1992-1995: Project Manager, then a Principal Investigator on the study, "Fate and Persistence of Stranded Oil on National Park Coastlines".
- 1994- present: Research Ecologist with the National Biological Survey, then the U.S. Geological Survey, Biological Resources Division.

- 1995- 1997: Opportunistic cooperater with Principal Investigators of the Nearshore Vertebrate Predator Project. Studying recruitment dynamics of invertebrate species.
- 1995- present: Principal Investigator on a project to: “Develop coastal monitoring protocols and process-based studies to address landscape-scale variation in coastal communities of Glacier Bay National Park and Preserve, Katmai National Park and Preserve, and Wrangell-St. Elias National Park and Preserve.”
- 1999-2000: Principal Investigator on EVOS project: “Residual oiling of armored beaches and mussel beds in the Gulf of Alaska”.

Most Relevant Publications:

- Irvine, G.V., Mann, D.H., and J.W. Short (2003). Persistence of ten-year old *Exxon Valdez* oil on Gulf of Alaska beaches : the importance of boulder armoring. *Marine Pollution Bulletin*, ms. accepted, probable 2003 publication date.
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Current Collaborators :

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Dr. Scott Carpenter, Scott, University of Iowa
Dr. Dan Mann, Dan, University of Alaska
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Dr. Jeff Short, Auke Bay Fisheries Lab
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Condensed Resume
June 2003

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Education : B.S., University of California, Riverside, 1972, Biochemistry and
Philosophy
M.S., University of California, Santa Cruz, 1982, Physical Chemistry
Ph.D. candidate, University of Alaska, defending summer 2003

Relevant Experience :

1989- Present: Established and managed the hydrocarbon analysis facility at ABL to analyze hydrocarbon samples generated by the *Exxon Valdez* NRDA effort. Responsible for quality control and data interpretation of all data hydrocarbon data produced by ABL labs. Principal investigator of several EVOS projects through the damage assessment and restoration years, particularly those studies involved in tracking oil (subtidal sediments), tracking the Hydrocarbon Data Base, several specific projects (Pristane; Coal as a background source), and most importantly, principal investigator of the large shoreline assessment project (SCAT) in FY 2001. Many publications.

Relevant Publications :

- Short, J. W., Lindeberg, M. R., Harris, P. M., Maselko, J. M., Pella, J. J., and Rice, S. D. 2003. A quantitative estimate of oil persisting on beaches of Prince William Sound, Alaska, USA, 12 years after the Exxon Valdez oil spill. In prep.
- Short, J. W. 2002. Oil identification based on a goodness-of-fit metric applied to hydrocarbon analysis results. *Environmental Forensics* 3:349-356.
- Van Kooten, G. W., Short, J. W., and Kolak, J. J. 2002. Low maturity Kulthieth Formation coal: A possible source of polycyclic aromatic hydrocarbons in benthic sediment of the northern Gulf of Alaska. *Environmental Forensics* 3:227-242.
- Short, J. W., Lindeberg, M. R., Harris, P. M., Maselko, J. M., and Rice, S. D., 2002. Vertical oil distribution within the intertidal zone 12 years after the Exxon Valdez oil spill in Prince William Sound Alaska. *Proceedings of the Twentyfifth Arctic and Marine Oilspill Program (AMOP) Technical Seminar*, Environment Canada, Ottawa, Ont. pp. 57-72.

Recent Collaborators:

Dr. Mace Barron, P.E.A.K. Research, Boulder, Colorado

Dr. Peter Hodson, Queen's University, Ontario, Canada

Dr. Gail Irvine, US Geological Survey, Anchorage, Alaska

Dr. Jon Kolak, US Geological Survey, Reston, Virginia

Drs. Lena Latkovskaya, Sakhalin Research Institute of Fisheries and Oceanography, 196
Komsomolskaya Street, Yuzhno-Sakhalinsk, Russia

Dr. Kenneth Lee, Department of Fisheries and Oceans, Halifax, Canada

Dr. James R. Payne, Payne Environmental Consultants, Inc., Encinitas, California

Dr. Arnfinn Skadsheim, Rogaland Research Institute, Stavanger, Norway

Dr. Gerald VanKooten, Calvin College, Grand Rapids, Michigan

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04- FY 06**

		PROPOSED TRUSTEE AGENCY TOTALS (FY 04 - 06)					
		ADEC	ADF&G	ADNR	USFS	DOI	NOAA
Budget Category:	Proposed FY 04	Proposed FY 05	Proposed FY 06	TOTAL PROPOSED			
Personnel	\$34.8	\$11.6	\$0.0	\$46.4			
Travel	\$4.7	\$2.9	\$0.0	\$7.6			
Contractual	\$19.8	\$0.0	\$0.0	\$19.8			
Commodities	\$6.5	\$1.3	\$0.0	\$7.8			
Equipment	\$0.0	\$0.0	\$0.0	\$0.0			
Subtotal	\$65.8	\$15.8	\$0.0	\$81.6			
General Administration (9% of subtotal)	\$5.9	\$1.4	\$0.0	\$7.3			
Project Total	\$71.7	\$17.2	\$0.0	\$88.9			

Cost-share Funds:

In this box, identify non-EVOS funds or in-kind contributions used as cost-share for the work in this proposal. List the amount of funds, the source of funds, and the purpose for which the funds will be used. Do not include funds that are not directly and specifically related to the work being proposed in this proposal.

USGS Contribution: Gail Irvine 1mo. salary

FY 04-06

Date Prepared:

Project Number:
Project Title: Lingering Oil on GOA Armored Beaches
Lead Agency: DOI--USGS

FORM 2A
MULTI-TRUSTEE
AGENCY
SUMMARY

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04- FY 06**

Contractual Costs:		Contractual
Description		Sum
Boat lease 11 days @ \$1800.00/day		19.8
If a component of the project will be performed under contract, the 4A and 4B forms are required.		Contractual Total
		\$19.8
Commodities Costs:		Commodities
Description		Sum
Film processing, sample shipment, misc. supplies		0.5
		Commodities Total
		\$0.5

FY 04

Project Number:
Project Title: Lingering Oil on GOA Armored Beaches
Agency A: DOI--USGS

FORM 3B
Contractual &
Commodities
DETAIL

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04- FY 06**

New Equipment Purchases:		Number of Units	Unit Price	Equipment Sum
Description				
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
New Equipment Total				\$0.0
Existing Equipment Usage:		Number of Units	Inventory Agency	
Description				
Surveying equipment, cameras, radios,binoculars, computers				

FY 04

Project Number:
Project Title: Lingering Oil on GOA Armored Beaches
Agency A: DOI--USGS

FORM 3B
Equipment
DETAIL

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04- FY 06**

Personnel Costs:		GS/Range/ Step	Months Budgeted	Monthly Costs	Overtime	Personnel Sum
Name	Description					
Gail Irvine	Research Ecologist	GS/12/10	1.2	7.5		9.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
Subtotal			1.2	7.5	0.0	
Personnel Total						\$9.0
Travel Costs:		Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
Description						
Present findings at American Society of Limnology and Oceanography, Spain		1.3	1	8	0.2	2.9 0.0 0.0 0.0 0.0 0.0 0.0 0.0
Travel Total						\$2.9

FY 05

Project Number:
Project Title: Lingering Oil on GOA Armored Beaches
Agency A: DOI--USGS

FORM 3B
Personnel
& Travel
DETAIL

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
 DETAILED BUDGET FORM FY 04- FY 06**

Contractual Costs:		Contractual
Description		Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required.		Contractual Total
		\$0.0
Commodities Costs:		Commodities
Description		Sum
		Commodities Total
		\$0.0

FY 06

Project Number:
 Project Title: Lingering Oil on GOA Armored Beaches
 Agency A: DOI--USGS

FORM 3B
 Contractual &
 Commodity
 DETAIL

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04- FY 06**

Budget Category:	Proposed FY 04	Proposed FY 05	Proposed FY 06		TOTAL PROPOSED
Personnel	\$4.2	\$2.6	\$0.0		\$6.8
Travel	\$0.0	\$0.0	\$0.0		\$0.0
Contractual	\$0.0	\$0.0	\$0.0		\$0.0
Commodities	\$6.0	\$0.0	\$0.0		\$6.0
Equipment	\$0.0	\$0.0	\$0.0		\$0.0
Subtotal	\$10.2	\$2.6	\$0.0		\$12.8
General Administration (9% of subtotal)	\$0.9	\$0.2	\$0.0		\$1.2
Project Total	\$11.1	\$2.8	\$0.0		\$14.0
Other Funds					
<p>Cost-share Funds: In this box, identify non-EVOS funds or in-kind contributions used as cost-share for the work in this proposal. List the amount of funds, the source of funds, and the purpose for which the funds will be used. Do not include funds that are not directly and specifically related to the work being proposed in this proposal.</p>					

**FY 04-
06**

Project Number:
Project Title:
Agency B: NOAA

FORM 3A
TRUSTEE
AGENCY
SUMMARY

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
 DETAILED BUDGET FORM FY 04- FY 06**

Contractual Costs:		Contractual
Description		Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required.		Contractual Total
		\$0.0
Commodities Costs:		Commodities
Description		Sum
Hydrocarbon analyses, 12 samples @ \$500.00 each		6.0
		Commodities Total
		\$6.0

FY 04

Project Number:
 Project Title:
 Agency B: NOAA

FORM 3B
 Contractual &
 Commodities
 DETAIL

Budget Justification

Monitoring lingering oil on boulder-armored beaches in the Gulf of Alaska: Continued investigation into persistence and process

Funding is requested for two years, FY2004 and FY2005, with a total request of \$88.9k. The fieldwork components of the project will occur in the first year, with some of the data analysis, report writing, manuscript preparation and presentation of the work occurring in the second. The budget is discussed below, by year and budget category.

Neither the USGS or NOAA have agency mandates to carry out the particular research that is being proposed.

2004:

Personnel:

Principle investigators for the project are Gail Irvine of the USGS, Alaska Science Center and Jeff Short, of NOAA's Auke Bay Laboratory. Gail will be in charge of hiring, organization and accomplishment of fieldwork, general project coordination and management. Jeff will provide oversight for hydrocarbon analyses and their interpretation. Additional personnel, a biologist and geologist/surveyor, will be hired by the USGS to support the field activities, plus data analysis.

Travel:

The travel requested is to support field work. Two different trips are needed: one (to and from Seward) to support fieldwork in Kenai Fjords National Park, the second (to and from Homer) to support fieldwork in Katmai National Park. Although we don't know the home base of the boats that will be leased, in the past these are the two ports from which we have generally staged our work.

Contractual Costs:

Contract costs are for boat leases for field work.

Commodities Costs:

Costs include monies for film processing, sample shipment and miscellaneous supplies. USGS will supply specially cleaned sample jars.

Equipment:

No funds are being requested for equipment. Existing equipment will be used.

2005:

Personnel:

Funds are being requested for manuscript preparation and submittal.

Travel:

Funds are being requested to support presentation of our findings at a professional conference

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: Monitoring Lingering Oil on Boulder-Armored Beaches in the Gulf of Alaska

Printed Name of PI: Gail V. Irvine

Signature of PI: _____ Date _____

Printed Name of co-PI: _____

Signature of co-PI: _____ Date _____

Printed Name of co-PI: _____

Signature of co-PI: _____ Date _____

* 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:	<u>040708</u>
Date Received:	_____
PROPOSAL SUMMARY PAGE (To be filled in by proposer)	
Project Title:	Monitoring Lingering Oil on Boulder-Armored Beaches in the Gulf of Alaska
Project Period:	FY 05-FY 06
Proposer(s):	Dr. Gail V. Irvine U.S. Geological Survey, DOI
Study Location:	Kenai Peninsula, Alaska Peninsula
Abstract:	
<p>We propose to continue monitoring the persistence and degradation of oil at boulder-armored Gulf of Alaska beaches that have been studied since 1992 and investigate how stability of the boulder armors affects both persistence and weathering. These sites were resampled in 1994 and 1999; 2005 would be the next targeted study date. The continued contamination of these sites, arrayed along the Katmai and Kenai Fjords National Park coasts, compromises the aesthetics and wilderness values of some of the most pristine wilderness-coast parklands in the world. The lack of weathering of much of the oil means that the oil, if released, could pose a risk to biota. Subsurface oil persisted at these sites in 1999 with little change in extent or chemical weathering since 1994. Data also suggests that the boulder armors are largely stable. We propose to assess changes in surface and subsurface oiling, chemical weathering of the oil, and stability of the boulder armors. Results will be published.</p>	
<p>Note: This project was approved by the EVOS Trustees for FY04-FY05, but could not be accomplished, due to extended illness of the PI, who was being treated for cancer. The project was resubmitted and approved for FY05-FY06, with the same content, but a 1-year delay in all scheduling and no cost increases. The current supplemental requests changes in the budget due to cost increases since the original FY04 proposal.</p>	
Funding:	EVOS Additional Funding Requested:
(Includes 9%GA)	FY 05 \$ 15,750.50 FY 06 \$ 6,104.00
Original funding approved:	FY04 \$ 71,700.00 FY 05 \$ 17,200.00 FY06 \$ 0
	TOTAL Additional funding Requested: \$21,854.50
	Non-EVOS Funds to be Used: FY 05-06 \$ 11.3
TOTAL:	\$110,754.50 (supplemental request for FY04-05 \$88.9 previously approved)

Date: April 14, 2005 (supplemental funding)

(NOT TO EXCEED ONE PAGE)

Daniel H. Mann

Institute of Arctic Biology
Irving II Building
University of Alaska
Fairbanks, AK 99708
(907) 474-2419
dmann@mosquionet.com

EDUCATION:

1976: **B.A.** Anthropology (University of Washington)
1978: **M.S.** Forest Entomology (College of Forest Resources, University of Washington)
1983: **Ph.D.** Soil Science and Quaternary Studies (College of Forest Resources,
University of Washington)

THESIS AND DISSERTATION:

M.S.: Ecology of Snowfield-foraging Arthropods on Mount Rainier (advisors:
R.I. Gara and J.S. Edwards)

Ph.D.: The Quaternary History of the Lituya Glacial Refugium, Alaska (advisor: F.C.
Ugolini)

Mann, D.H. and Hamilton, T.D. (1995). Late Pleistocene and Holocene Paleoenvironments of the North Pacific Coast. *Quaternary Science Reviews* 14, 449-471.

Mann, D.H. and Crowell, A.L. (1996). A large earthquake occurring 700 to 800 years ago in Aialik Bay, southern coastal Alaska. *Canadian Journal of Earth Sciences* 33, 117-126.

Irvine, G.V., Mann, D.H., and Short, J.W. (1999). Multi-year persistence of oil mousse on high energy beaches distant from the Exxon Valdez spill. *Marine Pollution Bulletin* 38, 572-584.

Mann, D.H., Crowell, A.L., Hamilton, T.D., and Finney, B.P. (1999). Holocene Geologic and climatic history around the Gulf of Alaska. *Arctic Anthropology* 35, 112-131.

Mann, D.H., Heiser, P.A., and Finney, B.P. (2002). Holocene history of the Great Kobuk Sand Dunes, Northwestern Alaska. *Quaternary Science Reviews* 21, 709-731

Mann, D.H., Peteet, D.M., Reanier, R.E., and Kunz, M.L. (2002). Responses of an arctic landscape to Lateglacial and early Holocene climatic changes: the importance of moisture. *Quaternary Science Reviews* 21, 997-1021

Recent Professional Collaborators

Finney, B.P., University of Alaska, Fairbanks
Heiser, P.A., University of Alaska, Anchorage
Irvine, G.V., U.S. Geological Survey, Anchorage
Kunz, M.L., Bureau of Land Management
Peteet, D.M., Columbia University

Reanier, R.E., Reanier and Associates
Rupp, S., University of Alaska, Fairbanks

Budget Justification

Monitoring lingering oil on boulder-armored beaches in the Gulf of Alaska: Continued investigation into persistence and process

Note: Changes to previous budget justification below are in bolded text

Supplemental funding of \$21.9k is requested for FY05-06. The original, approved funding in FY04-05 was \$88.9k. The project was granted a delay of one year, when G. Irvine was on extended medical leave in FY04 due to cancer treatment (most of FY04). The fieldwork components of the project will occur in the first year, with some of the data analysis, report writing, manuscript preparation and presentation of the work occurring in the second. The budget is discussed below, by year and budget category. Neither the USGS, UAF or NOAA have agency mandates to carry out the particular research that is being proposed.

2005:

Personnel:

Principle investigators for the project are Gail Irvine of the USGS, Alaska Science Center, **Dan Mann (UAF)**, and Jeff Short, of NOAA's Auke Bay Laboratory. Gail will be in charge of hiring, organization and accomplishment of fieldwork, general project coordination and management. Jeff will provide oversight for hydrocarbon analyses and their interpretation. Additional personnel, a biologist and geologist/surveyor, will be hired by the USGS to support the field activities, plus data analysis. **Dr. Dan Mann, who has been involved in this research since 1995, will be participating again. We gain the valuable experience and expertise which he provides. Slight changes in the structure of the budget reflect the shift from involving a USGS geologist to doing a contract to cover Dr. Mann's involvement. Note: increases in salary costs since the FY04-05 proposal are reflected in the supplemental request.**

Travel:

The travel requested is to support field work. Two different trips are needed: one (to and from Seward) to support fieldwork in Kenai Fjords National Park, the second (to and from Homer) to support fieldwork in Katmai National Park. Although we don't know the home base of the boats that will be leased, in the past these are the two ports from which we have generally staged our work.

Contractual Costs:

Contract costs are for boat leases for field work. **Note: contract costs for boats outside PWS have gone up considerably since our work was first proposed, and the supplemental request reflects information received from several sources.**

Commodities Costs:

Costs include monies for film processing, sample shipment and miscellaneous supplies. USGS will supply specially cleaned sample jars.

Equipment:

No funds are being requested for equipment. Existing equipment will be used.

2006:

Personnel:

Funds are being requested for manuscript preparation and submittal.

Travel:

Funds are being requested to support presentation of our findings at a professional conference

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04- FY 06**

		PROPOSED TRUSTEE AGENCY TOTALS (FY 04 - 06)					
		ADEC	ADF&G	ADNR	USFS	DOI	NOAA
FY05						\$14,388.0	\$1,362.5
FY06						\$5,559.0	\$545.0
Budget Category:	Proposed FY 05	Proposed FY 06	Proposed FY 07	TOTAL PROPOSED			
Personnel	\$6,850.00	\$2,600.00	\$0.00	\$9,450.00			
Travel	\$0.00	\$0.00	\$0.00	\$0.00			
Contractual	\$7,600.00	\$3,000.00	\$0.00	\$10,600.00			
Commodities	\$0.00	\$0.00	\$0.00	\$0.00			
Equipment	\$0.00	\$0.00	\$0.00	\$0.00			
Subtotal	\$14,450.00	\$5,600.00	\$0.00	\$20,050.00			
General Administration (9% of subtotal)	\$1,300.50	\$504.00	\$0.00	\$1,804.50			
Project Total	\$15,750.50	\$6,104.00	\$0.00	\$21,854.50			

Cost-share Funds:

In this box, identify non-EVOS funds or in-kind contributions used as cost-share for the work in this proposal. List the amount of funds, the source of funds, and the purpose for which the funds will be used. Do not include funds that are not directly and specifically related to the work being proposed in this proposal.

USGS Contribution: Gail Irvine 1.2 mo. salary (\$11.3k)

NOTE: This budget reflects only changes to the previously submitted and approved FY05-06 budget, which originally had been proposed as FY04-05 work. The approved FY04-05 project was later approved for delayed implementation due to extended cancer treatments in FY04 of G. Irvine. At the time of request for delay, no changes were made to the budget. This supplemental budget requests changes due to increases in costs (especially in salaries, boat charter fees), but the scope of the work hasn't changed. The structure of the budget is slightly changed to reflect the participation of Dr. Dan Mann (who was not included in the FY04-05 budget but who will now be the participating geologist/geomorphologist).

FY 05-06

Project Number: 040708
Project Title: Lingering Oil on GOA Armored Beaches
PI: Irvine
Lead Agency: DOI--USGS

FORM 2A
MULTI-TRUSTEE
AGENCY
SUMMARY

Date Prepared: 14-Apr-05

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04- FY 06**

Contractual Costs:		Contractual
Description		Sum
Boat lease 11 days @ \$2400.00/day (increase of \$600/day)		6,600.0
Contract with University of Alaska (Fairbanks), for services of Dr. Dan Mann Dan Mann, 1 mo; volunteer assistant; benefits 32.4%; travel; overhead, UAF, 25%): Total is \$12.2 Increase over previously listed USGS geologist, and associated travel costs		1,000.0
If a component of the project will be performed under contract, the 4A and 4B forms are required.		
Contractual Total		\$7,600.0
Commodities Costs:		Commodities
Description		Sum
Film processing, sample shipment, misc. supplies, test equipment		
Commodities Total		\$0.0

FY 05

Project Number: 040708
 Project Title: Lingering Oil on GOA Armored Beaches
 PI: Irvine
 Lead Agency: DOI--USGS

FORM 3B
 Contractual &
 Commodities
 DETAIL

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04- FY 06**

Personnel Costs:		GS/Range/ Step	Months Budgeted	Monthly Costs	Overtime	Personnel Sum
Name	Description					
Gail Irvine (reduced time, increased cost/mo)	Research Ecologist	GS/12/10	1.0	2100.0		2,100.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
Subtotal			1.0	2100.0	0.0	
Personnel Total						\$2,100.0
Travel Costs:		Ticket Price	Round Trips	Total Days	Daily Per Diem	Travel Sum
Description						
Present findings at national conference TBD						0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
Travel Total						\$0.0

FY 06

Project Number: 040708
 Project Title: Lingering Oil on GOA Armored Beaches
 PI: Irvine
 Lead Agency: DOI--USGS

FORM 3B
 Personnel
 & Travel
 DETAIL

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
 DETAILED BUDGET FORM FY 04- FY 06**

Contractual Costs:		Contractual
Description		Sum
Contract with University of Alaska, Fairbanks (for services of Dr. Dan Mann) (0.3 months, benefits, 25% OH)		3,000.0
If a component of the project will be performed under contract, the 4A and 4B forms are required.		Contractual Total
		\$3,000.0
Commodities Costs:		Commodities
Description		Sum
Registration for scientific meeting Page charges		
		Commodities Total
		\$0.0

FY 06

Project Number: 040708
 Project Title: Lingering Oil on GOA Armored Beaches
 PI: Irvine
 Lead Agency: DOI--USGS

FORM 3B
 Contractual &
 Commodities
 DETAIL

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
 DETAILED BUDGET FORM FY 04- FY 06**

Contractual Costs:		Contractual
Description		Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required.		Contractual Total
		\$0.0
Commodities Costs:		Commodities
Description		Sum
		Commodities Total
		\$0.0

FY 07

Project Number: 040708
 Project Title: Lingering Oil on GOA Armored Beaches
 PI: Irvine
 Lead Agency: DOI--USGS

FORM 3B
 Contractual &
 Commodity
 DETAIL

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
 DETAILED BUDGET FORM FY 04- FY 06**

Budget Category:	Proposed FY 05	Proposed FY 06	Proposed FY 07	TOTAL PROPOSED
Personnel	\$1,250.00	\$500.00	\$0.0	\$1,750.0
Travel	\$0.00	\$0.00	\$0.0	\$0.0
Contractual	\$0.00	\$0.00	\$0.0	\$0.0
Commodities	\$0.00	\$0.00	\$0.0	\$0.0
Equipment	\$0.00	\$0.00	\$0.0	\$0.0
Subtotal	\$1,250.00	\$500.00	\$0.0	\$1,750.0
General Administration (9% of subtotal)	\$112.50	\$45.00	\$0.0	\$157.5
Project Total	\$1,362.50	\$545.00	\$0.0	\$1,907.5
Other Funds				
<p>Cost-share Funds: In this box, identify non-EVOS funds or in-kind contributions used as cost-share for the work in this proposal. List the amount of funds, the source of funds, and the purpose for which the funds will be used. Do not include funds that are not directly and specifically related to the work being proposed in this proposal.</p>				

**FY 06-
07**

Project Number: 040708
 Project Title: Lingering Oil on GOA Armored Beaches
 PI: Irvine
 Agency B: NOAA

FORM 3A
 TRUSTEE
 AGENCY
 SUMMARY

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
 DETAILED BUDGET FORM FY 04- FY 06**

Contractual Costs:		Contractual
Description		Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required.		Contractual Total
		\$0.0
Commodities Costs:		Commodities
Description		Sum
Hydrocarbon analyses, 12 samples @ \$500.00 each		
		Commodities Total
		\$0.0

FY 05

Project Number: 040708
 Project Title: Lingering Oil on GOA Armored Beaches
 PI: Irvine
 Agency B: NOAA

FORM 3B
 Contractual &
 Commodities
 DETAIL

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
 DETAILED BUDGET FORM FY 04- FY 06**

Contractual Costs:		Contractual
Description		Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required.		\$0.0
Contractual Total		\$0.0
Commodities Costs:		Commodities
Description		Sum
Commodities Total		\$0.0

FY 06

Project Number: 040708
 Project Title: Lingering Oil on GOA Armored Beaches
 PI: Irvine
 Agency B: NOAA

FORM 3B
 Contractual &
 Commodities
 DETAIL

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
 DETAILED BUDGET FORM FY 04- FY 06**

Contractual Costs:		Contractual
Description		Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required.		\$0.0
Contractual Total		\$0.0
Commodities Costs:		Commodities
Description		Sum
Commodities Total		\$0.0

FY 07

Project Number: 040708
 Project Title: Lingering Oil on GOA Armored Beaches
 PI: Irvine
 Agency B: NOAA

FORM 3B
 Contractual &
 Commodities
 DETAIL

