North and West Alaska
Cooperative Ecosystem Studies Unit
Task Agreement
National Park Service, Alaska Region

Task Agreement No.:	Cooperative Agreement No.:	Effective Dates:
J9910324704	H9910030024	6/1/07 or date of last signature whichever is later until 9/30/09

COOPERATOR: University of Alaska Southeast
Grant and Contract Services
Bill Ray Center
1108 F Street
Juneau, AK 99801

CONTACT: University of Alaska Southeast, Department of Natural Resources

PROJECT TITLE: Contaminants assessment of intertidal resources in Southeast Alaska National Parks

FISCAL YEAR FUNDING: 2007	**Account Number.: 2104-0701-NII**
FY07 NOT-TO-EXCEED: $ 195,975	**NPS Purchase Request Number: R 9815070512**

PROJECT ABSTRACT: An assessment will be made regarding the status of contamination levels of intertidal resources for the coastal parks of the Southeast Alaska Network (SEAN) of the Inventory and Monitoring program.

SCOPE OF WORK: See Attachment
This Task Agreement is subject to all the provisions included in the Cooperative Agreement references above.

For the University of Alaska Southeast

Barbara Hyde
Director, Grant and Contract Services

06/01/07
Date

For the National Park Service
Alaska Regional Office

Joy C. Kucinski
Contracting Officer

6/8/07

Contaminants Assessment of Intertidal Resources in Southeast Alaska National Parks

Project Abstract: An assessment will be made regarding the status of contamination levels of intertidal resources for the coastal parks of the Southeast Alaska Network (SEAN) of the Inventory and Monitoring program. Intertidal mussels will be collected from a number of sites to assess the levels of persistent organic pollutants (POP's), polycyclic aromatic hydrocarbons (PAH's) and metals (e.g., Cd, Hg, etc.). These levels will be considered and interpreted relative to other sites within parks, among parks, and with similar state-wide (e.g., Prince William Sound) and national sampling frameworks (e.g., national Mussel Watch Program). The assessment will also help identify the source of contamination, quantify baseline levels in the event of future catastrophic events, such as an oil spill, and serve as the foundation for recommendations regarding whether the intertidal resources are healthy or approaching impairment and in need of further research or management action.

ARTICLE I – BACKGROUND AND OBJECTIVES

Background and Project Description Seemingly pristine and protected areas can be negatively impacted by contaminants from extremely distant, as well as nearby, sources. Contaminants can take many forms and threaten different components and trophic levels of ecosystems. In Southeast Alaska, recent research has shown that contaminants from a wide range of types and sources are a serious concern, even though the Gulf of Alaska is among the most pristine marine ecosystems yet tested for contaminants (Wright et al. 2000). SEAN faces both local and global contamination threats (Engstrom and Swain 1997). There is evidence that Alaska has accumulated moderate levels of some heavy metals such as mercury (Hg), and other toxics, such as persistent organic pollutants (POPs) and polycyclic aromatic hydrocarbons (PAHs) (Hurwich and Clary 2000, Gabrielsen et al. 2003, NS&T datasets). Some of these contaminants have been detected in sediment and water samples, and have bioaccumulated in marine and freshwater organisms.

In protected places such as national parks, where budgets and access are typically limited, it is important to think critically about which contaminants pose the greatest threat, their mode of transport, how they can best be assessed and monitored, and at what levels they must be detected. It is impossible to know what future threats SEAN will face, in part because global economic trends and regulations on contaminants will greatly affect Alaska. However, existing information does provide useful insights into likely threats to SEAN. Previous studies of SEAN have identified marine vessels and atmospheric (non-point) sources as the most likely contributors of contaminants to these protected areas.

The SEAN strives to make an assessment of the status of contaminant levels in the parks to address the fundamental question of what the current levels of contaminants are in park resources, and whether this level should be of concern. There is also a desire to gain a baseline (inventory) of contaminant levels in the event that a catastrophic event, such as an oil spill, occurs. Given the funding levels, the overriding issue is what and how to assess contaminant levels. Considering that a number of different analytes (POPs, metals, PAHs, etc.) could be sampled from a number of different trophic levels and abiotic media (including air, sediments, and water) in a number of different ecosystems (freshwater, marine, terrestrial), that lab costs for determining a suite of contaminants can easily exceed $2000 per sample, and that inferences should be made at both the park and network spatial scales, it is important to focus on a trophic level, ecosystem or analyte that best accomplishes the goals of SEAN.

Given these constraints and the diversity of sampling regimes, a number of explicit objectives were crafted that appear to reflect the goals of SEAN for this assessment. These include:

- Make spatially balanced and rigorous inferences at the park and network level spatial scale.
- Select analytes that most likely reflect existing or future contaminant threats to SEAN parks.
- Select samples and ecosystems that are most susceptible to these contaminant threats.
- Select a target analyte, organism, or parameter that likely integrates contaminant levels over time, recognizing that sampling is more or less a one time effort.
- Select a parameter or analyte that can be compared with existing benchmarks or criteria, or contaminant loads from other areas in order to put the existing levels in perspective of 'healthy ecosystems'.

Select species or trophic levels that will allow for sufficient sampling (amount collected) and replication but will minimally conflict with the NPS mandates of invasive sampling or wilderness conditions.

- Identify a trophic level or organism that integrates contaminants over time yet reflects the contaminant loads within the parks, i.e., is not a function of migration from outside areas.

Given the available funding and the specific goals, an approach of sampling marine contaminants will best meet the stated objectives and provide insight into existing contaminant levels at SEAN. Mussels are an ideal organism for examining contaminants in SEAN for a number of reasons, including: the ability to make external and internal inferences from data, relatively inexpensive sampling costs, and insight into chronic, as well as catastrophic, contamination threats.

Contaminant values from mussels can be compared to an existing database collected as part of the national Mussel Watch Program (MWP), which is responsible for monitoring over 100 contaminants in mussel tissue collected at over 280 sites throughout the coastal US since 1986 (O'Connor 2001). There are five MWP sites in the Gulf of Alaska and Southeast, including one site near KLGO. This is important because a vital component of any park inventory program is the ability to make inferences about conditions at park sample sites relative to one another, and to areas outside the park. These inferences make it possible to determine whether contaminant sources are most likely local, regional, or global. In turn, this information greatly facilitates identification of specific sources, mechanisms of contamination, and the means to minimize or mitigate contaminant threats. Because of the MWP, mussels collected and analyzed following MWP protocols will meet a universal goal in contaminant assessment studies of providing data that can be compared to similar data collected outside the sampling universe to obtain valid internal and external inferences.

Second, there has been a tremendous amount of work by NOAA researchers at the Auke Bay Lab (Juneau, AK) on sampling design and assessment of intertidal organisms as a result of the Exxon Valdez Oil Spill in Prince William Sound. Currently, NOAA scientists Dr. Jeep Rice and Larry Holland have agreed to consult in optimizing sampling design, PAH analyses, and interpretation of results relative to their previous research throughout Alaska.

In addition, because the existing funding is limited and this contaminants assessment is likely a singular opportunity, it is necessary to obtain data from something relatively inexpensive to sample. The costs of contaminant lab analyses run a minimum of several hundred dollars per sample per class of analytes. Due to this high "front-end" cost that cannot be avoided, it is important to minimize other costs associated with obtaining samples. Tissue samples from large, mobile, high trophic-level organisms, such as marine mammals, can be time-intensive, expensive, controversial, and consequently, severely limit sample size. In contrast, mussels can be obtained relatively quickly and cheaply, making it possible to sample multiple sites fairly quickly.

Furthermore, mussels are sessile filter feeders and live up to 20 years, so they provide insight into contamination that has occurred over the previous several years, as well as indicating any recent catastrophic events in nearby areas. Mussels bioaccumulate and bioconcentrate many contaminants. However, because they are not migratory, they will not reflect contaminants reaching other parts of the region or provide misinformation about park contamination status.

Another important point is that sampling marine contaminants meets the peripheral but related objective of assessing status, in the event that a catastrophic oil spill occurs. The most likely (anthropogenic) catastrophic threat to SEAN parks is an oil spill. Recent NPS mapping efforts (CoastWalker, ShoreZone) provide a comprehensive assessment of the extent and types of intertidal resources for all of SEAN parks, and this intertidal contaminant assessment would compliment these efforts to obtain baseline data should catastrophe strike.

It is worth noting that marine contaminants have been identified as important threats to park integrity in recent water quality reports (Eckert et al. 2006a, 2006b, Hood et al 2006). More specifically, likely contaminants from marine vessels are PAHs associated with petroleum combustion and oil spills. The proposed study will show evidence of any petroleum contamination, making it a useful indicator and tools for obtaining baseline information.

The objectives of this effort are to provide a comprehensive assessment report that includes maps of sampling sites and results from contaminant analyses of samples from each park. This report will include a synthesis of existing literature and contextualization of the SEAN results with respect to local, regional, national, and global

contamination threats and trends. In addition, all results will be archived into an access database that includes GPS coordinates, site descriptions, and contaminant levels from park analysis. This will serve as a valuable baseline to make inferences about future trends in contaminants and as a reference should any catastrophic events occur. Finally, a formal sampling protocol for long-term monitoring of park contaminants will be developed that integrates into the park vital signs monitoring plan.

Sampling Design
To ensure geographic coverage of SEAN, the three parks will be stratified and a stratified random sampling approach will be used to obtain samples that provide broad geographic coverage. SITK and KLGO will each be a stratum. In addition, GLBA will be broken down into the following six strata: Icy Strait/Outer Coast, Lower Bay, Middle Bay, East Arm, West Arm, Bartlett Cove. We will randomly sample mussels in each stratum at two sites. These two samples from each stratum will be analyzed for a full suite of potential contaminants, including POPs, PAHs, MeHg, TBT (tributyltin), Cd, and As. We will also obtain mussel samples from the boat harbors adjacent to SITK and KLGO, and analyze these samples for the same full suite of contaminants listed above. These harbors will provide "hot" controls for comparison to nearby park sites. By using this stratification to obtain samples and by analyzing a large suite of contaminants in these samples, we will obtain a broad picture of contamination in SEAN.

Due to the large size of GLBA, we will obtain further samples throughout this park to assess the severity and extent of the most likely contaminants in this region, MeHg and PAHs. Specifically, we will obtain 10 randomly located mussels samples from each of five of the aforementioned GLBA strata: Icy Strait/Outer Coast, Lower Bay, Middle Bay, East Arm, and West Arm. These strata include nearly all the intertidal zone in GLBA.

Following stratification, sample sites will be randomly located within each stratum. The Shore zone and Coastwalker databases will be used to obtain the distribution of mussels in each stratum. The extent of mussels will be broken down into 100 m segments. Then, the 100 m segments within each stratum will be randomly selected as sample sites using the allocation of effort described above. Sample locations will center in each 100 m segment. Using this approach we will obtain geographically diverse and representative samples of mussels and contaminants from GLBA, and will be able to make park-wide inferences on the contaminant levels for all regions containing mussels.

ARTICLE II – STATEMENT OF WORK

A. The UAS will:

1. Undertake a project titled: "Contaminants Assessment of Intertidal Resources in Southeast Alaska National Parks as described above. The project will assess the status of contaminantion levels, including persistent organic pollutants (POP's), polycyclic aromatic hydrocarbons (PAH's) and metals (e.g., Cd, Hg, etc.) of intertidal resources for the coastal parks of the Southeast Alaska Network (SEAN), and interpreted relative to other sites within parks, among parks, and with similar state-wide (e.g., Prince William Sound) and national sampling frameworks (e.g., national Mussel Watch Program). Appoint Dave Tallmon as Principal Investigator (PI).
2. Hire a field assistant to assist in field work, database creation, and interpretation.
3. Consult with NOAA Fisheries experts on intertidal contaminant sampling and interpretation.
4. Write a final report summarizing and interpreting results relative to local, regional, national, and global data on intertidal contamination. Create a database of raw and interpreted data and provide copies of the database to the SEAN I&M.
5. Throughout the project adhere to the Information Deliverables Specifications for Research Projects by the SEAN I&M Network
6. Serve as the principle author on any publication stemming from this effort.
7. Clearly identify and acknowledge the NPS in all published material produced under this funding.
8. Participate and collaborate with the NPS ATR in a 60-day wrap-up period beginning July 30, 2008.

B. The NPS will:

1. Provide financial assistance to the UAS as provided in Table 1.
2. Assign Dr. Scott Gende, or similarly qualified individual, as the ATR.

3. Interact directly with the PI and be involved in sampling design, field work, analysis and interpretation of data, and review final reports.
4. Participate and collaborate with the UAS PI in a 60-day wrap-up period beginning July 1, 2008.

Substantial Cooperation and Involvement by NPS

The NPS, specifically Scott Gende, Coastal Ecologist for the Southeast Alaska Coastal Cluster program (which includes all SEAN parks plus Wrangell-St.Elias) will play a significant role in development of the project including review of sampling design, consultation with NOAA scientists on sampling strategy and lab work, logistics planning and coordination (including coordinating boat support from GLBA to access remote sites and housing while in the park), field sampling, and reviews of draft and final reports. The NPS has so far worked closely with Dave Tallmon, UAF, in developing this study framework and will continue this partnership throughout the project.

Budget

Table 1: Budget for Contaminants Assessment of SEAN

	Cost per Unit	# Units	Total
Sampling:			
Air Travel (KLGO, SITK, GLBA)	$1,000/person	2	$2,000
Boat Travel (KLGO, SITK, GLBA)	$300/day	18	$5,400
Float Plane (GLBA Icy/Outer Coast)	$500/hr	10	$5,000
Field Materials	$3,000/total	1	$3,000
Lodging (KLGO)	$175/night	2	$350
Laboratory Costs:			
Comprehensive Samples	$2,060/sample	36	$74,160
PAH and MeHg Samples	$740/sample	50	$37,000
Shipping	$50/sample	88	$4,400
Salary:			
PI (salary + benefits)	$9,565/month	3.5	$33,478
Field Assistant	$2,000/month	1	$2,000
Grand Total (Direct)			$166,788
Indirect (17.5%)			$29,187
Grant Total (Direct and Indirect)			$195,975

All sampling will occur in August 2007. Sampling costs include air travel to KLGO and GLBA from Juneau for the PI and field assistant ($1,000/person). Geof Smith is willing to obtain samples from SITK, so no travel costs to SITK are included. Boat expenses to sample GLBA and KLGO will include 18 days boat rental, with 16 days required for GLBA alone. It costs $250/day for 20' skiff rental from Alaska Boat and Kayak. Boat fuel will costs ~$50/day. Therefore, we expect to pay $300/day for boat rental for a total of $5,400 for the entire project. In addition, we anticipate needing a float plane for nearly two days of sampling the Icy Strait/Outer Coast of GLBA ($8000). It costs $500/hr to rent a float plane and we anticipate that 10 hours will be required to obtain samples from Icy Strait/Outer Coast (10 hr * $500/hr= $6000). We have also budgeted $3,000 for field sampling equipment, including ultraclean ichem bottles for each sample, ice/dry ice, and coolers to store samples. Our lodging costs for SITK include a one night stay for the PI and field assistant.

Lab analysis costs will vary with individual samples. PAHs cost $500/sample at the NOAA Auke Bay Lab and PCB analyses are $1000/sample at the NOAA Montlake Lab. Mercury and TBT will cost $240 each, and three other metals will cost $80/sample (at various private labs). Thus, the 36 comprehensive samples will cost $2,060/sample for a total of $37,080. Two comprehensive samples will be collected from each of our eight identified strata in addition to harbors adjacent to SITK and KLGO. The majority of samples, 10 samples from each of the five major strata of GLBA (excluding Bartlett Cove), will be analyzed only for PAHs and Hg, which will cost ~$740/sample.

Shipping will also be expensive ($4,400) due to the need to send subsamples of the 88 field samples to multiple labs, including labs in the coterminous US.

Three months salary for the PI and one month for a field assistant are requested. Two months of the PI's time will be dedicated to sampling design (consultation with labs, CoastWalker/ShoreZone familiarization, site selection), field prep, sampling, and distribution of samples to appropriate labs. A month of the field assistant's time will be dedicated to field prep and sampling. An additional month of the PI's salary is requested for synthesis and writing of the results obtained from the field and lab, and generation of the final products described below in Article V.

References

Eckert, G., E. Hood, S. Nagorski, C. Talus. 2006a. Assessment of coastal water resources and watershed conditions at Glacier Bay National Park, Alaska. NPS/NRWRD/NRTR-2006/347. National Park Service, USDI. 129 p.

Eckert, G., E. Hood, C. Talus, S. Nagorski. 2006b. Assessment of coastal water resources and watershed conditions at Sitka National Historical Park, Alaska. NPS/NRWRD/NRTR-2006/347. National Park Service, USDI. 81 p.

Engstrom, D. and E. B. Swain. 1999. Recent declines in atmospheric mercury deposition in the upper Midwest. Envir. Sci & Tech. 31:960-967.

Gabrielsen, G. W., E.H. Jorgensen, A. Evenset, R. Kallenborn. 2003. Report from the AMAP conference and workshop: Impacts of POPs and mercury on Arctic environments and humans. Tomso, Norway. Norsk Polarinstitutt.

Hurwich, E. M., and L. C. Chary. 2000. Persistent organic pollutants (POPs) in Alaska: what does science tell us? Circumpolar Conservation Union 29 p.

Eckert, G., E. Hood, C. Talus, S. Nagorski. 2006. Assessment of coastal water resources and watershed conditions at Klondike Gold Rush National park, Alaska. NPS/NRWRD/NRTR-2006-349. National Park Service, USDI. 89 p.

O'Connor, T. P. 2000. Persistent organic pollutants (POPs) in mussels and oysters in the USA. Proceedings of the international workshop on marine pollution by persistent organic pollutants (POPs). February 26-27, 2001.

Wright, B. A., J.W. Short, T.J. Weingartner, and P.J. Anderson. 2000. The Gulf of Alaska. in C. Sheppard, ed. Seas at the millennium: an environmental evaluation. Oxford Press.

ARTICLE III – TERM OF AGREEMENT

See Cover Sheet for list of project deliverables and timeframe.
This agreement shall remain in effect from June 1, 2007 until September 30, 2009. NPS may reassess needs and funding availability and create modifications, including the addition of work elements and funding. Addition of work elements shall be subject to agency needs and the availability of funds in future fiscal years.

ARTICLE IV – KEY OFFICIALS

NPS Unit: SEAN (I&M)

National Park Service Key Official
Scott Gende, National Park Service
Scott Gende
Glacier Bay Field Station
3100 National Park Road
Juneau, AK 99801
907-364-2622
Scott_Gende@nps.gov

CESU – University Partner: University of Alaska Southeast

Principal Investigator
David Tallmon
11120 Glacier Hwy
Juneau, Alaska
david.tallmon@uas.alaska.edu
(907) 796-6330

Investigator/Researcher

ARTICLE V – WORK ELEMENTS
We anticipate the delivery of several products as a result of this project. First, UAF will provide a comprehensive assessment report that includes maps of sampling sites and results from contaminant analyses of samples from each park. This report will include a synthesis of existing literature and contextualization of the SEAN results with respect to local, regional, national, and global contamination threats and trends. In addition, all results will be archived into an MS Access database that includes GPS coordinates, site descriptions, and contaminant levels from park analysis. This will serve as a valuable baseline to make inferences about future trends in contaminants and as a reference should any catastrophic events occur. Finally, the Final Report will include the development of a formal sampling protocol for long-term monitoring of park contaminants that will integrate into the park vital signs monitoring plan.

ARTICLE VI - Financial Award

NPS funding in FY 2007 is limited to and shall not exceed $195,975. Partial payment shall be based upon approved billings at intervals of one month or greater. Partial payment approvals shall be based upon meeting all provisions of the Task Agreement.

Billings and fund transfers will occur by means of invoices which shall be submitted to the following address:

Sheri Barry
Chief of Administration
Glacier Bay National Park and Preserve
P.O. Box 140
Gustavus, AK 99826

Invoices must refer to the following Task Agreement number:

CESU Cooperative Agreement Number H9910030024
Task Agreement Number: 9910324704
Tallmon – Contaminants Assessment of Intertidal Resources

and include date, and an itemized description of the costs incurred.

ARTICLE VII – LIABILITY
Each party accepts responsibility for any property damage, injury, or death caused by the acts or omissions of their respective faculty, students, employees, or other representatives, acting within the scope of their employment arising under this Task Agreement, to the fullest extent permitted by law.

ARTICLE VIII – ATACHMENTS

Project Cover Sheet

North and West Alaska Cooperative Ecosystem Studies Unit (NWA-CESU)
NWA-CESU Cooperative Agreement Number: CA 9910030024

PROJECT COVER SHEET

Instructions: This is a form. Enter information is shaded areas, they will expand.

Title of Project: **Contaminants assessment of intertidal resources in Southeast Alaska National Parks**

Name of NPS park/NPS unit: SEAN (I&M)

Name of University/University partner: University of Alaska Fairbanks

NPS key official: (include name, address, phone number and email)
Scott Gende,
Glacier Bay Field Station,
3100 National Park Road,
Juneau, AK, 99801,
907-364-2622,
Scott_Gende@nps.gov

Principal Investigator: (include name, address, phone number and email)
David Tallmon,
11120 Glacier Hwy,
Juneau, AK 99801
(907) 796-6330,
david.tallmon@uas.alaska.edu

Investigator/researcher: (if different from PI above, include name, address phone number and email)
Same as above.

Cost of Project in FY07 & 08:

Direct cost:	$166,788
Indirect cost (CESU overhead 17.5%):	$ 29,187
Total cost:	$195,975

NPS account number: (project's park, regional or WASO account number) 2104-0701-NII
PR number from IDEAS: R9815070512

Name of funding source: Inventory and Monitoring

Project schedule -

Scheduled start of Project: July 1, 2007

List of completed work elements or "milestones" in chronological order:
(Note: Project period can run for up to five fiscal years, including the year in which the funds were obligated)

Project work elements	Expected date
Starting Date for planning	June 1, 2007
Final consultation with NOAA on sampling design	July 1, 2007
Samples collected at all parks, samples sent to respective labs	August 31, 2007
CD provided to SEAN I&M Database Manager with an up-to-date Project Organizer as described in the Information Deliverables Specifications for Research Projects for the SEAN I&M Network.	September 30, 2007
Lab results back from respective labs	February 28, 2008
CD provided to SEAN I&M Database Manager with an up-to-date Project Organizer as described in the Information Deliverables Specifications for Research Projects for the SEAN I&M Network.	April 30, 2008
Draft report and interpretation	June 1, 2008
Final wrap up period begins	July 1, 2008
Draft final report sent to SEAN for review	August 31, 2008
Final Draft Report completed and final of Project Organizer	Sept 30, 2008

Invoices are payable upon receipt only if the reports or results have been received and approved by the NPS key official.

What would be your expected End of Project date? September 30, 2008

(Note: Project period can run for up to five fiscal years, including the year in which the funds were obligated. If you expect this project to be active over several years, or you expect to add funding to this project in subsequent years, indicate that in the project description in the Task Order)

Substantial involvement by the National Park Service:

Please select from the following to indicate the appropriate types of substantial involvement by both the NPS and the cooperator.
In addition, the substantial involvement must be detailed within the attached Scope of Work.

Select <u>all</u> which are appropriate:

☒ The National Park Service and the cooperator will jointly participate in developing, reviewing and modifying project proposals, data, and/or reports

☒ The National Park Service and cooperator will jointly participate in project research and/or fieldwork.

☒ The National Park Service will have substantial direct involvement prior to project activity to insure compliance with the National Environmental Policy Act (NEPA) and/or the National Historic Preservation Act (NHPA), as well as in obtaining any necessary permits.

☒ Project findings will be incorporated into National Park Service management decisions, operations and/or planning efforts.

Contribution of Project to Objectives of NWA-CESU

The NPS NWA-CESU Research Coordinator finds that this project contributes to the purpose of the CESU and is consistent with the approved Mission Statement, Strategic, and /or Annual work Plan

3/23/07

Lois Dalle-Molle, NWA-CESU Research Coordinator Date