



Exxon Valdez Oil Spill Trustee Council

Long-Term Research and Monitoring, Mariculture, Education and Outreach

Annual Project Reporting Form

Project Number: 23120114-M

Project Title: Prince William Sound Marine Bird Surveys and Associated Shelf Waters

Principal Investigator(s): Robert Kaler, U.S. Fish and Wildlife Service, Migratory Bird Management

Reporting Period: February 1, 2023 – January 31, 2024

Submission Date: March 1, 2024

Project Website: <https://gulfwatchalaska.org/>, <https://nga.lternet.edu/>

Please check all the boxes that apply to the current reporting period.

- Project progress is on schedule.**
 - Project progress is delayed.**
 - Budget reallocation request.**
 - Personnel changes.**
-

1. Summary of Work Performed:

This report summarizes marine bird survey work conducted in Prince William Sound (PWS) and on the Seward Line and in the Northern Gulf of Alaska-Long Term Ecological Research (NGA-LTER) study area.

July Prince William Sound Marine Bird Survey:

In July 2023, we conducted boat-based surveys to monitor abundance and distribution of marine birds in PWS (Fig. 1) and completed the 17th year of summer surveys since the 1989 *T/V Exxon Valdez* oil spill. The randomly selected shoreline (212), coastal (91) and pelagic (50) 200-meter wide transects were completed from three (3) survey boats (7.6-meter length). Analyses of July 2023 PWS data are pending and will be completed in March 2024.



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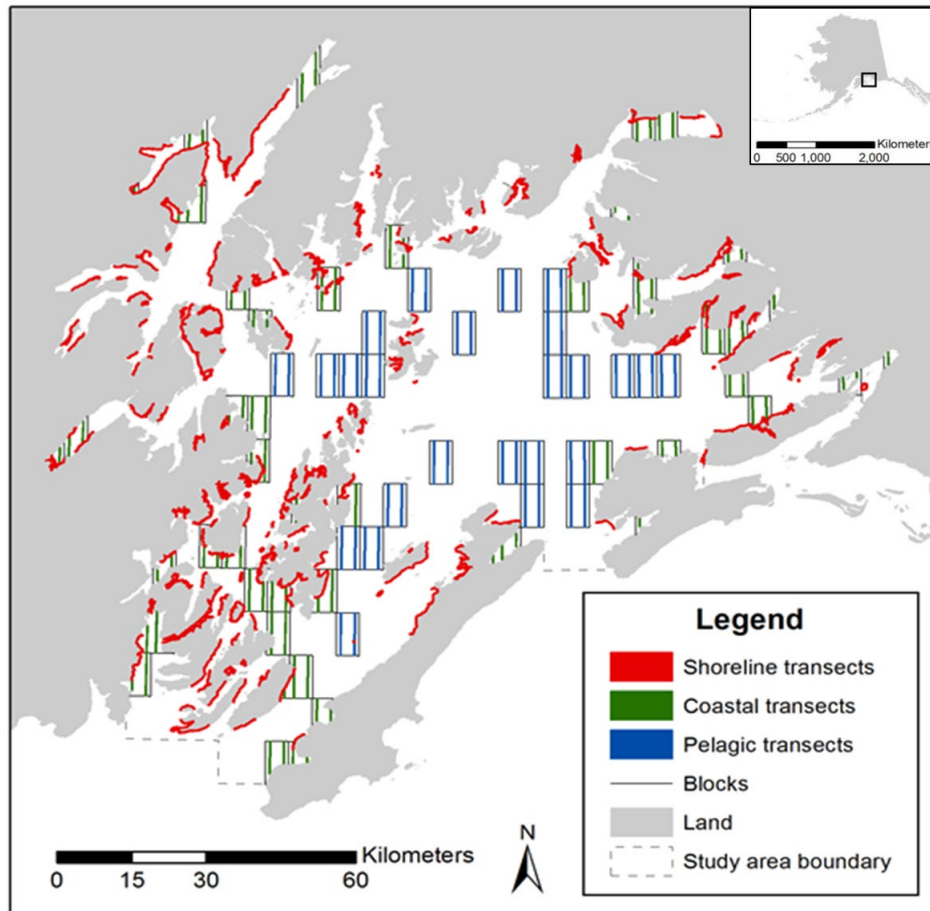


Figure 1. Map of the Prince William Sound, Alaska, July marine bird survey study area and transects indicating shoreline (red), coastal (green), and pelagic (blue) transects.

Northern Gulf of Alaska-Long Term Ecological Research:

During 2023, we conducted a total of 3077 linear km of marine bird surveys during three NGA-LTER cruises: April 22 – May 8 (Fig. 2), June 29 – July 15 (Fig. 3), and September 13 – 19 (Fig. 4). Averaged across all 3-km transects during each cruise, we observed highest mean density of marine birds during spring (12.5 birds/km²), and the lowest mean density during summer (5.4 birds/km²), while the mean density during fall was slightly less than during spring (10.6 birds/km²).



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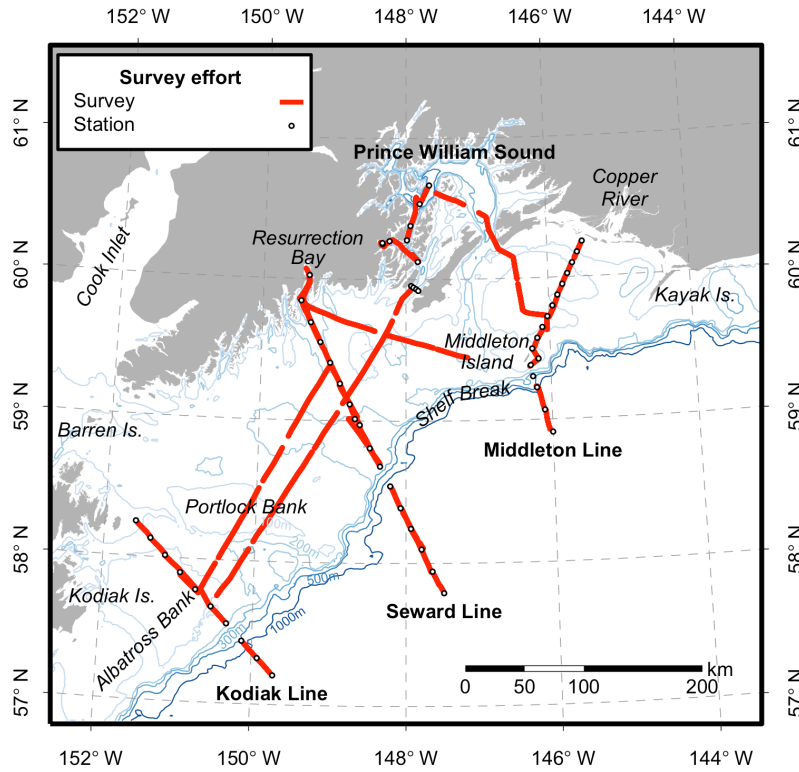


Figure 2. Seabird surveys during April-May 2023 Northern Gulf of Alaska-Long Term Ecological Research cruise (R/V Sikuliaq).



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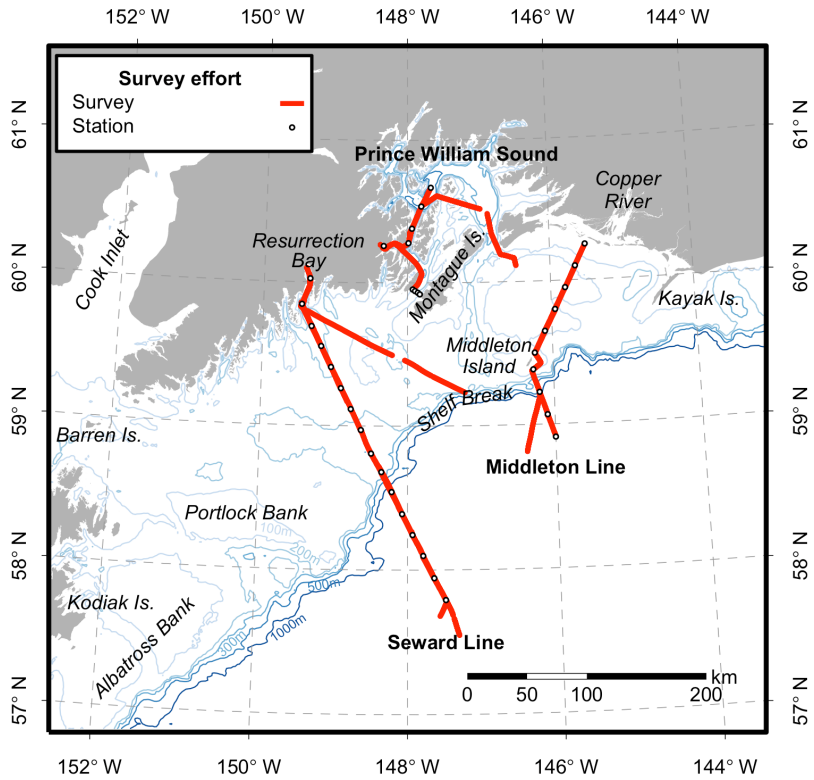


Figure 3. Seabird surveys during June-July 2023 Northern Gulf of Alaska-Long Term Ecological Research cruise (R/V Kilo Moana).



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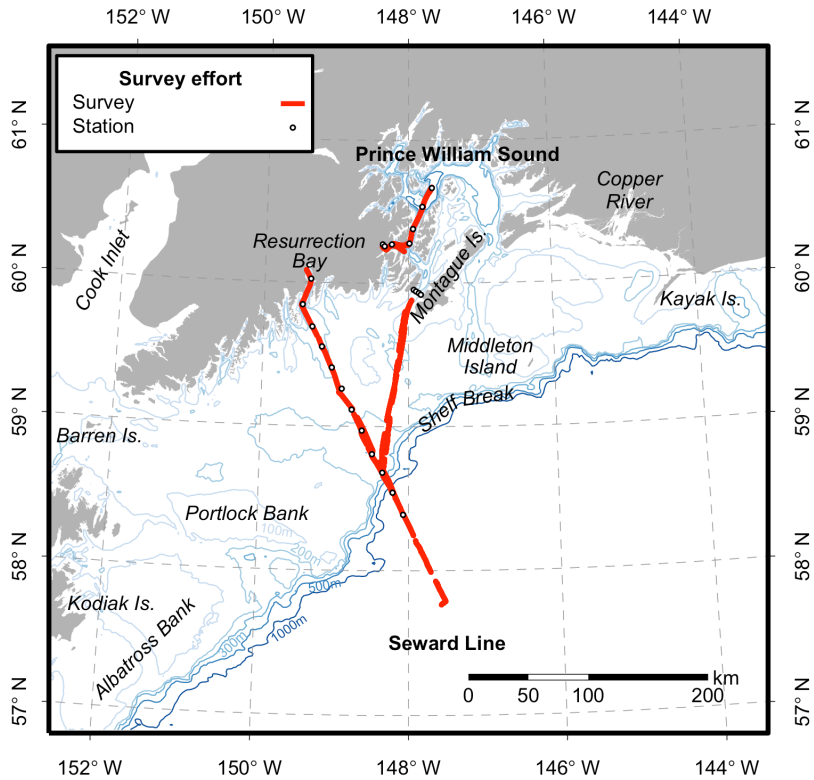


Figure 4. Seabird surveys during September 2023 Northern Gulf of Alaska-Long Term Ecological Research cruise (R/V Tiglax).

Our surveys of seabirds along the Seward Line build off earlier efforts that began in 1998, and we collaborated with prior investigators to integrate the spring Seward Line seabird time-series from 1998–2019 (Cushing et al. 2023). This time-period includes a series of predominantly colder years (2007–2013), followed by the 2014–2016 Pacific marine heatwave, allowing examination of the responses of diverse seabird taxa to changing conditions. Seabird responses to shifts between cold and warm conditions have varied among taxa. Tubenoses (e.g., albatrosses [*Diomedeidae* spp.], storm-petrels [*Hydrobates* spp.], fulmars [*Fulmarus* spp.], shearwaters) were associated with warm conditions, with higher abundance and increased use of the middle shelf during 2015–2018. In contrast, alcids (e.g., murre, puffins, guillemots, murrelets) and gulls (e.g., kittiwakes [*Rissa tridactyla*], glaucous-winged gulls [*Larus glaucescens*]) concentrated inshore during and after the heatwave. Movement of piscivorous seabirds such as gulls and



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murres into coastal waters during the heatwave was probably caused by a reduction in their prey on the continental shelf. The heatwave has been associated with shifts in forage fish populations and changes in the diets of alcids and gulls in the Northern Gulf of Alaska, and alcids and gulls exhibited multiple years of reproductive failures, and murres experienced mass starvation. Since the heatwave, abundance of alcids and gulls has remained low on the shelf during spring, suggesting that they have not fully recovered from these food-web disruptions. Another important finding was significant decreases in densities of tufted puffins along the Seward Line during spring over the two-decade study period.

Based on these results, we developed an annual contribution to the Seabird Synthesis within the Gulf of Alaska Ecosystem Status Report, North Pacific Fisheries Management Council (Arimitsu et al. 2023). We selected three seabird species that are representative of their foraging guild: common murre (diving, primarily feed on forage fish but also feed on small nektonic invertebrates such as euphausiids and squid), black-legged kittiwake (surface-feeding, primarily feed forage fish and small nektonic invertebrates) and fork-tailed storm-petrel (*Oceanodroma furcata*; surface feeding, primarily feed on zooplankton and ichthyoplankton) (Fig. 5).

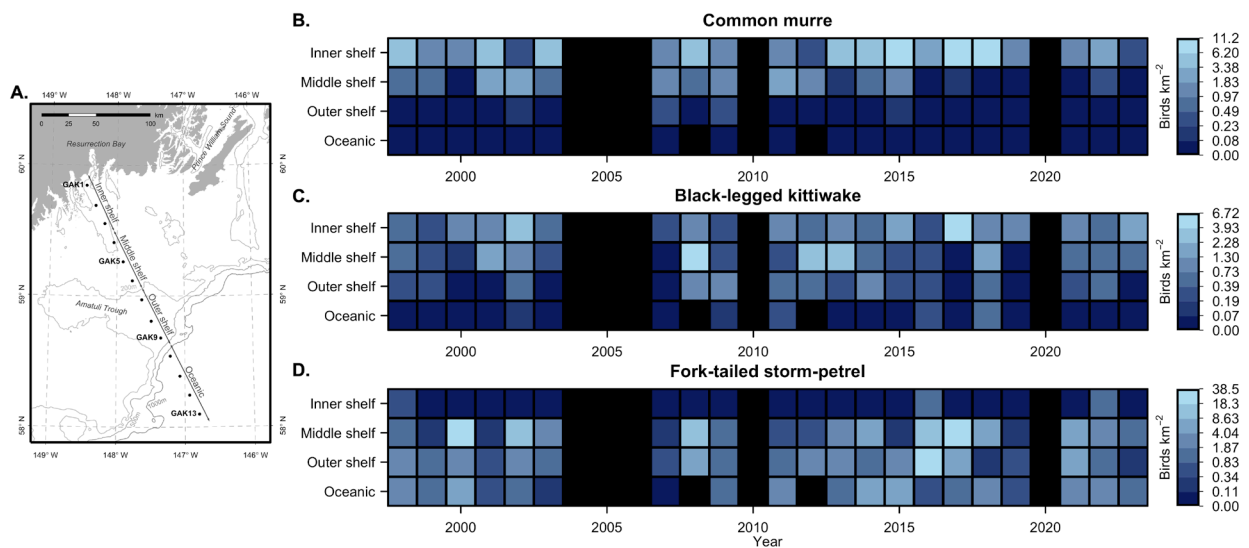


Figure 5. The Seward Line in the Northern Gulf of Alaska, and four domains used for analysis (A). Mean densities (birds/km²) of common murres, black-legged kittiwakes, and fork-tailed storm-petrels within domains during spring Seward Line cruises, 2007–2023 (B-D). Black indicates no seabird surveys were conducted.



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In general, low abundance of murres, kittiwakes, and storm-petrels on the middle and outer continental shelf along the Seward Line during early-May 2023 were consistent with observations in other recent post-heatwave years, although densities of murres were exceptionally low. This contrasted with high densities of murres over banks east of Kodiak. Densities of kittiwakes were also elevated over these banks. These observations suggest that distributional shifts of piscivorous species occurred, potentially in response to increased prey resources elsewhere in the region. In contrast, distributional patterns of planktivorous fork-tailed storm-petrels during the April-May 2023 cruise appeared primarily related to phenology.

Literature Cited:

Arimitsu, M., D. Cushing, B. Drummond, S. Hatch, T. Jones, R. Kaler, E. Labunski, J. Lindsey, J. F. Piatt, H. Renner, and S. Whelan. 2023. Seabird Synthesis. Pages 161-173 in B. E. Ferris, editor. Ecosystem Status Report 2023: Gulf of Alaska, Stock Assessment and Fishery Evaluation Report. North Pacific Fishery Management Council. Anchorage, Alaska. <https://apps-afsc.fisheries.noaa.gov/REFM/docs/2023/GOAecosys.pdf>.

Cushing, D. A., K. J. Kuletz, L. Sousa, R. H. Day, S. L. Danielson, E. A. Labunski, and R. R. Hopcroft. 2023. Differential response of seabird species to warm- and cold-water events in a heterogeneous cross-shelf environment in the Gulf of Alaska. Marine Ecology Progress Series :HEATav2. <https://doi.org/10.3354/meps14239>.

2. Products:

Peer-reviewed publications:

Cushing, D. A., K. J. Kuletz, L. Sousa, R. H. Day, S. L. Danielson, E. A. Labunski, and R. R. Hopcroft. 2023. Differential response of seabird species to warm- and cold-water events in a heterogeneous cross-shelf environment in the Gulf of Alaska. Marine Ecology Progress Series :HEATav2. <https://doi.org/10.3354/meps14239>.

Strom S., and the Northern Gulf of Alaska Long-Term Ecosystem Team. 2023. Recent marine heatwaves affect marine ecosystems from plankton to seabirds in the Northern Gulf of Alaska. In E. S. Kappel, V. Cullen, M. J. Costello, L. Galgani, C. Gordó-Vilaseca, A. Govindarajan, S. Kouhi, C. Lavin, L. McCartin, J. D. Müller, B. Pirenne, T. Tanhua, Q.



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Zhao, and S. Zhao, editors. *Frontiers in Ocean Observing: Emerging Technologies for Understanding and Managing a Changing Ocean*. *Oceanography* 36:31-33.
<https://doi.org/10.5670/oceanog.2023.s1.9>.

Reports:

Arimitsu, M., D. Cushing, B. Drummond, S. Hatch, T. Jones, R. Kaler, E. Labunski, J. Lindsey, J. F. Piatt, H. Renner, and S. Whelan. 2023. Seabird Synthesis. Pages 161-173 in B. E. Ferris, editor. *Ecosystem Status Report 2023: Gulf of Alaska, Stock Assessment and Fishery Evaluation Report*. North Pacific Fishery Management Council. Anchorage, Alaska. <https://apps-afsc.fisheries.noaa.gov/REFM/docs/2023/GOAecosys.pdf>.

Popular articles:

No new contributions for this reporting period.

Conferences and workshops:

Arimitsu, M., D. Cushing, J. Durban, S. Hatch, R. Kaler, C. Matkin, J. Moran, D. Olsen, S. Pegau, J. Piatt, J. Straley, S. Whelan, and L. Wild. 2024. Changes in marine predator and prey populations in the Northern Gulf of Alaska: Gulf Watch Alaska Pelagic Update 2023. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Cushing, D. A., K. J. Kuletz, L. Sousa, R. H. Day, S. L. Danielson, E. A. Labunski, and R. R. Hopcroft. 2023. Differential response of seabird species to warm- and cold-water events along the Seward Line in the Northern Gulf of Alaska. Oral presentation, Pacific Seabird Group Annual Meeting, La Jolla, California, February.

Kaler, R. 2023. Population trends of marine birds in Prince William Sound, Alaska, 1989-2022. Oral presentation, Alaska Bird Conference, Anchorage, Alaska, December.

Public presentations:

Kaler, R. 2023. Status and trends of marine birds in Alaska. Invited presentation, “Lunch and Learn” at the UAF Bristol Bay Campus, Virtual, November.

Kaler, R. 2023. Updates on Alaskan seabirds, including avian influenza. Alaska Migratory Bird Co-management Council annual meeting, November. (Presentation slides contributed to information packet).



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Data and/or information products developed during the reporting period:

Kaler, R. 2024. Population trends of marine birds in Prince William Sound, Alaska, 1989-2022. Poster and handouts.

Data sets and associated metadata:

Kuletz, K., D. Cushing, and E. Labunski. 2023. Marine bird survey observation and density data from Northern Gulf of Alaska LTER cruises, 2018–2022. Research Workspace. Dataset. doi:10.24431/rw1k45w

Kaler, R. 2023. Pelagic: Prince William Sound marine birds. Gulf of Alaska Data Portal: <https://gulf-of-alaska.portal.aos.org/#metadata/6aac5903-f3af-4eb4-b4d7-11006e6ea497/project>.

Additional Products not listed above:

No new contributions for this reporting period.

3. Coordination and Collaboration:

The Alaska SeaLife Center or Prince William Sound Science Center

Information collected during the July PWS marine bird survey are available to Prince William Sound Science Center staff (M. A. Bishop and A. Schaefer) to compliment the winter PWS marine bird surveys. Currently, there are no collaborations with the Alaska SeaLife Center.

EVOSTC Long-Term Research and Monitoring Projects

This project is part of the Pelagic component of the Gulf Watch Alaska Long-Term Research and Monitoring (GWA-LTRM) program and coordinates with other GWA-LTRM projects in the following ways:

- We are involved in an on-going discussion to explore opportunities to integrate the July PWS marine bird data with the other projects, including those within the GWA-LTRM Pelagic component and GWA Environmental Drivers component. Additionally, the principal investigators (PIs) have been coordinating with the GWA-LTRM Nearshore component (Heather Coletti) and Science Coordinator (Rob Suryan) to merge marine bird data sets into a broader geographic analysis of population trends. Additional discussions include comparing



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boat-based PWS marine bird survey data, which include sea otters with fixed-wing aircraft surveys conducted by sister agencies, with marine bird and mammal data collected during Nearshore project work.

- Collaboration within the GWA-LTRM Pelagic component (forage fish [23120114-C], humpback whale [23120114-O], killer whale [23120114-M], and marine bird [this project]), and between the Pelagic and Herring Research and Monitoring components, will continue to focus on physical and biological features of locations where whales and seabirds have been found to overlap in time and space.
- Marine bird surveys during Seward Line and NGA-LTER cruises are operationally and scientifically integrated with project 22120114-L, Seward Line monitoring. Two manuscripts that incorporated both seabird and other physical and/or biological time-series from this project were published during this reporting period (Cushing et al. 2023, Strom 2023).

EVOSTC Mariculture Projects

Information from the PWS marine bird survey is available to the mariculture project PIs; however, current mariculture planning areas have minimal overlap with PWS transects and sites selected for mariculture activities.

EVOSTC Education and Outreach Projects

No new contributions for this reporting period.

Individual EVOSTC Projects

The PWS marine bird surveys provide population estimates and trends that will improve our ability to interpret results of Exxon Valdez Oil Spill Trustee Council (EVOSTC) project 23110853 – Pigeon Guillemot Restoration Program. After removing invasive mink from the Naked Island Group in PWS, the project monitored recovery of pigeon guillemot numbers. Additionally, the project monitored productivity of black-legged kittiwake success across PWS as an index of food availability.

In addition, this project coordinates with the Data Management program to provide survey data within the required timeframes.

Trustee or Management Agencies

Marine bird data from this study collected at the Naked Island group (Naked, Storey, and Peak islands in PWS) will be used to help evaluate the recovery of pigeon guillemots and other marine



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bird species (e.g., Arctic tern, parakeet auklet [*Aethia psittacula*], tufted puffin) that were extirpated by introduced mink. The PWS marine bird survey supports the management directives of the U. S. Fish and Wildlife Service to conserve and maintain populations of migratory birds. Additionally, the pigeon guillemot remains listed by the EVOSTC as “not recovered” following the oil spill. These survey data will compliment important information regarding the recovery guillemots.

Additionally, since 2021 we have contributed an annually updated time-series of spring cross-shelf distribution of seabirds along the Seward Line to the seabird synthesis within the National Oceanographic and Atmospheric Administration’s annual Gulf of Alaska Ecosystem Status Report.

Native and Local Communities

No new contributions for this reporting period.

4. Response to EVOSTC Review, Recommendations and Comments:

No comments for FY23.

5. Budget:

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
 PROJECT BUDGET PROPOSAL AND REPORTING FORM**

Budget Category:		Proposed FY 22	Proposed FY 23	Proposed FY 24	Proposed FY 25	Proposed FY 26	5- YR TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel		\$28,907	\$122,278	\$31,869	\$136,816	\$37,377	\$357,247	\$151,185
Travel		\$2,168	\$20,913	\$2,193	\$21,384	\$2,219	\$48,877	\$23,081
Contractual		\$43,500	\$110,058	\$45,702	\$113,952	\$48,016	\$361,228	\$153,558
Commodities		\$0	\$21,020	\$6,000	\$27,613	\$6,000	\$60,633	\$21,020
Equipment		\$13,500	\$102,250	\$0	\$4,400	\$0	\$120,150	\$115,750
Indirect Costs	Rate = 0%	\$0	\$0	\$0	\$0	\$0	\$0	\$0
SUBTOTAL		\$88,075	\$376,519	\$85,764	\$304,165	\$93,612	\$948,135	\$464,594
General Administration (9% of subtotal)		\$7,927	\$33,887	\$7,719	\$27,375	\$8,425	\$85,332	N/A
PROJECT TOTAL		\$96,001	\$410,406	\$93,483	\$331,540	\$102,037	\$1,033,467	
Other Resources (In-Kind Funds)		\$29,053	\$30,429	\$32,841	\$33,841	\$35,879	\$162,043	



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Spending of FY23 funds followed the proposed budget. The contract for vessel charter was greater than expected, within 10% of proposed costs. NGA-LTER contract (support by external funding) for seabird surveys was completed, but some funds were held back to support agency staff to complete the fall Seward Line survey.