

Form Rev. 9.14.17

**1. Project Number:**

17120114-M

**2. Project Title:**

Continuing the Legacy: Prince William Sound Marine Bird Population Trends

**3. Principal Investigator(s) Names:**

Dr. Kathy Kuletz, US Fish and Wildlife Service

Robb Kaler, US Fish and Wildlife Service

**4. Time Period Covered by the Report:**

February 1, 2017-January 31, 2018 (Year 6)

**5. Date of Report:**

March 2018

**6. Project Website (if applicable):**[www.gulfwatchalaska.org](http://www.gulfwatchalaska.org)**7. Summary of Work Performed:**

Boat-based marine bird surveys have been conducted on randomized transects in Prince William Sound (PWS; Fig. 1), Alaska, over a 27-year period following the 1989 *Exxon Valdez* oil spill (EVOS). To better understand the dynamics of a marine bird community that has experienced the simultaneous effects of a major oil spill and climate variability, this project monitors the distribution and abundance of marine birds in PWS. The objectives of this project are to:

(1) determine the abundance of marine bird populations in PWS during July 2018 and 2020 in both oiled and unoiled regions; and

(2) determine population abundance of marine bird populations in PWS during July 2018 and 2020 for PWS as a whole.

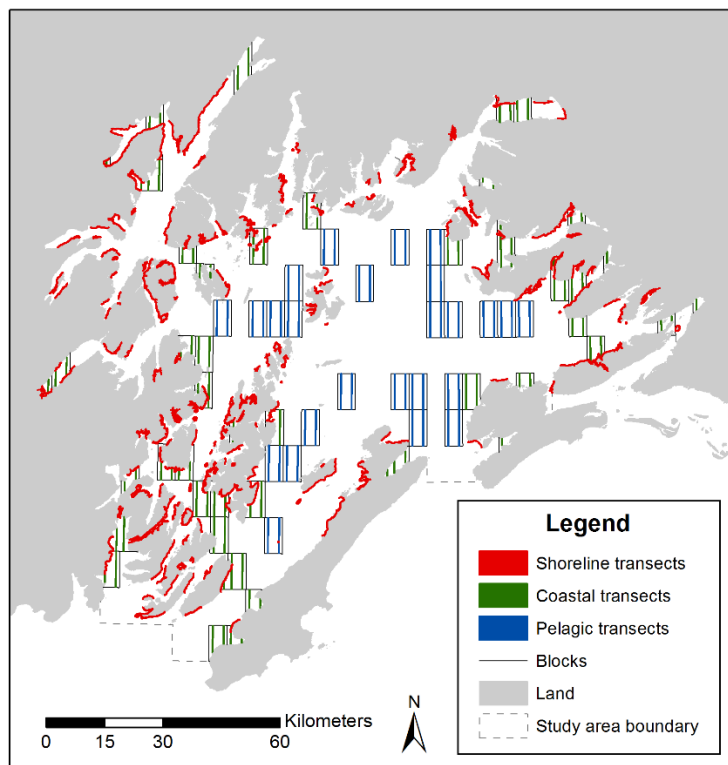


Figure 1. Location of marine bird survey transects within Prince William Sound, Alaska.

This project had no fieldwork scheduled in 2017. The most recent trends of marine birds in oiled areas of PWS and of marine birds throughout PWS are shown in Tables 1 and 2. Progress was made on data processing and data analysis to better streamline data transfer, updating metadata, and summarizing of project results and reporting. During the fall of 2017 much needed repairs were carried out on our research vessels in preparation for summer 2018 surveys.

Table 1. Taxa and trends of oiled areas in Prince William Sound, Alaska, 1989-2016. Bold text indicates  $p < 0.05$ ; "ns" indicates no significant change in trend; "NA" indicates not assessed.

Taxon	f	prob	intercept	slope	trend
Bald Eagle	6.11	<b>0.03</b>	6.03	0.03	<b>increase</b>
Black-legged Kittiwake	0.55	0.47	9.81	0.01	ns
Black Oystercatcher	0.15	0.70	5.12	0.00	ns
Bufflehead	1.13	0.33	-1.07	0.05	ns
"Cormorants"	14.62	<b>0.00</b>	5.88	0.06	<b>increase</b>
"Goldeneyes"	0.04	0.84	3.53	-0.01	ns
"Grebes"	3.75	0.08	6.51	-0.03	ns
Glaucous-winged Gull	0.71	0.42	-0.79	0.02	ns
Harlequin Duck	13.90	<b>0.00</b>	8.73	0.03	<b>increase</b>
Kittlitz's Murrelet	1.94	0.24	6.88	0.02	ns

Taxon	f	prob	intercept	slope	trend
"Loons"	1.00	0.34	4.91	-0.06	ns
Marbled Murrelet	0.48	0.50	4.41	-0.02	ns
Mew Gull	0.02	0.89	9.64	0.00	ns
"Mergansers"	5.13	<b>0.04</b>	6.70	-0.03	<b>decrease</b>
"Murrelets"	10.90	<b>0.01</b>	10.59	-0.04	<b>decrease</b>
"Murres"	0.00	0.98	7.01	0.00	ns
Northwestern Crow	NA	NA	6.40	-0.59	NA
Pigeon Guillemot	29.23	<b>0.00</b>	7.23	-0.03	<b>decrease</b>
"Scoters"	1.15	0.31	7.43	-0.09	ns
"Terns"	22.78	<b>0.02</b>	6.50	-0.35	<b>decrease</b>

Table 2. Taxa and trends of marine birds in Prince William Sound, Alaska, 1989-2016. Bold text indicates  $p < 0.05$ ; "ns" indicates no significant change in trend; "NA" indicates not assessed.

Taxon	f	prob	intercept	slope	trend
Bald Eagle	1.04	0.33	7.33	0.01	ns
Black-legged Kittiwake	1.41	0.26	10.26	0.01	ns
Black Oystercatcher	4.10	0.07	6.25	0.01	ns
Bufflehead	3.11	0.13	3.18	-0.08	ns
"Cormorants"	2.01	0.18	5.71	0.03	ns
"Goldeneyes"	0.02	0.90	5.69	0.00	ns
"Grebes"	3.93	0.07	4.47	-0.05	ns
Glaucous-winged Gull	6.32	<b>0.03</b>	9.80	<b>0.02</b>	<b>increase</b>
Harlequin Duck	0.41	0.56	8.62	0.01	ns
Kittlitz's Murrelet	0.48	0.50	7.58	-0.02	ns
"Loons"	0.13	0.72	6.45	-0.01	ns
Marbled Murrelet	1.04	0.33	10.03	0.01	ns
Mew Gull	0.18	0.68	7.99	0.00	ns
"Mergansers"	0.03	0.86	8.51	0.00	ns
"Murrelets"	7.94	<b>0.02</b>	11.02	<b>-0.03</b>	<b>decrease</b>
"Murres"	0.05	0.84	7.98	-0.01	ns
Northwestern Crow	.	.	7.36	-0.30	ns
Pigeon Guillemot	5.84	<b>0.03</b>	7.88	<b>-0.03</b>	<b>decrease</b>
"Scoters"	0.82	0.38	7.79	0.02	ns
"Terns"	0.74	0.45	6.18	-0.11	ns

## 8. Coordination/Collaboration:

### A. Projects Within a Trustee Council-funded program

#### 1. Within the Program

- Kathy Kuletz and Robb Kaler have been participating in discussions and meetings on opportunities to integrate marine bird data across the other projects composing the

pelagic and nearshore components of the long-term monitoring effort (projects 17120114-C, E, and H).

- Kathy Kuletz and Mary Ann Bishop (PWS Science Center) continue to collaborate on marine bird (project 17120114-E) and herring survey (project 17120111-B) work in PWS.
- Collaboration within the pelagic projects (forage fish [17120114-C], humpback whale [17120114-O], killer whale [17120114-N], and marine bird [17120114-E and M]) and between the pelagic projects and the Herring Research and Monitoring program will continue to discuss local areas where whales and seabirds have been determined to overlap in time and space.
- PIs from this project coordinate with the Seward Line environmental drivers project (17120114-L) to provide marine bird and mammal observers during oceanographic cruises.
- In an effort led by the Gulf Watch Alaska Science Coordinator (project 17120114-A), PIs from GWA nearshore (project 17120114-H) and pelagic (projects 17120114-C and E) components are compiling data sets from marine bird surveys conducted in the Gulf of Alaska with the objective of a region-wide analysis to determine population status and trends of key species (species are yet to be identified).
- Additionally, work is underway to standardize data management of raw marine bird and mammal data collected during nearshore and pelagic surveys. The final product will be programming scripts written in Program R used for data processing (e.g., QA/QC), population trend analyses, and reporting.

## **2. Across Programs**

### **a. Herring Research and Monitoring**

Depending on data to be collected by the Herring Research and Monitoring Program in 2017-2021, reported information on abundance and distribution of herring in PWS will be used as a potential explanatory variable in interpreting observed changes in distribution and population trends of marine birds in PWS.

### **b. Data Management**

We are coordinating with the Data Management team to upload data to the Research Workspace and make it available on the Gulf of Alaska data portal and review metadata and update for accuracy.

### **c. Lingering Oil**

None

## **B. Projects not Within a Trustee Council-funded program**

- Marine bird data from this study collected at the Naked Island group (Naked, Storey, & Peak islands) will be used to help evaluate the recovery of pigeon guillemots and other seabird species (e.g., Arctic tern, parakeet auklet, tufted puffin) that were extirpated by mink introduced to the island group (project 17100853).

## **C. With Trustee or Management Agencies**

- Kathy Kuletz, with funding from the North Pacific Research Board (NPRB) and US Fish and Wildlife Service (USFWS) Migratory Bird Management, conducted marine bird and

mammal surveys as part of the long-term monitoring program for the northern Gulf of Alaska (a.k.a. the 'Seward Line' [project 17120114-L]), which is part of the multi-agency (University of Alaska Fairbanks, NPRB, USFWS) program.

- USFWS is a Department of Interior agency and data collected under this project are used in the management of migratory birds.

## 9. Information and Data Transfer:

### A. Publications Produced During the Reporting Period

Cushing, D., D. Roby, D. Irons. 2017. Pattern of distribution, abundance, and change over time in a subarctic marine bird community. *Deep Sea Research II*. DOI: <http://dx.doi.org/10.1016/j.dsr2.2017.07.012>

Esler, D., B. Ballachey, C. Matkin, D. Cushing, R. Kaler, J. Bodkin, D. Monson, G. Esslinger, K. Kloecker. 2018. Timelines and mechanisms of wildlife population recovery following the *Exxon Valdez* oil spill. *Deep Sea Research II*. DOI: <http://dx.doi.org/10.1016/j.dsr2.2017.04.007>.

Kaler, R., E. Labunski, and K. J. Kuletz. 2018. Prince William Sound Marine Bird Surveys. *Exxon Valdez Oil Spill Restoration Project Final Report* (Restoration Project 16120114-K). *Exxon Valdez Oil Spill Trustee Council*, Anchorage, Alaska.

### B. Dates and Locations of any Conference or Workshop Presentations where EVOSTC-funded Work was Presented

Arimitsu, M., M. Bishop, D. Cushing, S. Hatch, B. Heflin, R. Kaler, K. Kuletz, C. Matkin, J. Moran, D. Olsen, J. Piatt, A. Schaefer, J. Straley. Changes in marine predator and prey populations in the aftermath of the North Pacific Heat Wave: Gulf Watch Alaska Pelagic update 2017. **Poster Presentation**. Alaska Marine Science Symposium, Anchorage, AK. 22-26 January 2018.

Cushing, D., K. Kuletz, R. Hopcroft, S. Danielson, and E. Labunski. 2017. Shifts in cross-shelf distribution of seabirds in the northern Gulf of Alaska under different temperature regimes, 2007-2015. **Poster Presentation**. The 44<sup>th</sup> Meeting of the Pacific Seabird Group, Tacoma, WA. 21-25 February 2017.

Kaler, R., K. Kuletz, D. Dragoo, and H. Renner. 2017. Unusual observations of seabirds in the Gulf of Alaska following the 2015-2016 mass die-off. **Article**. *Delta Sound Connections*. <http://pwssc.org/wp-content/uploads/2017/06/DSC-2017-web2.pdf>.

Piatt, J., T. Jones, K. Kuletz, H. Renner, J. Parrish, R. Corcoran, S. Schoen, B. Bodenstein, R. Kaler, M. Garcia-Reyes, H. Coletti, M. Arimitsu, R. Duerr, K. Lindquist, J. Lindsey, and W. Sydeman. 2018. Unprecedented scale of seabird mortality in the NE Pacific during the 2015-2016 marine heat wave. **Oral Presentation**. Alaska Marine Science Symposium, Anchorage, AK. 22-26 January 2018.

**C. Data and/or Information Products Developed During the Reporting Period, if Applicable**

Kaler, R., and K. Kuletz. 2017. Prince William Sound Marine Bird Data, Alaska, 2012-2016, Gulf Watch Alaska Pelagic Component. Dataset. *Exxon Valdez* Oil Spill Trustee Council Long-Term Monitoring program, Gulf Watch Alaska. Research Workspace. <https://doi.org/10.24431/rw1k113>.

**D. Data Sets and Associated Metadata that have been Uploaded to the Program's Data Portal**

This project had no field work scheduled in 2017 and so no new data sets or associated metadata were uploaded during the reporting period.

**10. Response to EVOSTC Review, Recommendations and Comments:**

**Science Panel Comments and Responses on Revised FY17-21 Proposal, September 2016**

*In September 2016, the Science Panel had no specific comments.*

**Science Panel Comments and Responses on FY18 Work Plans, September 2017**

*In September 2017, the Science Panel commented:* The Panel is pleased with the work the PIs are conducting and impressed with the survey coverage. Would it be worth surveying a subset of sites to monitor annually?

*PI Response:* We agree with the Science Panel that, ideally, we would improve trends analysis by adding surveys to include even numbered years to our current 'odd year' July surveys. However, budgetary constraints make such an effort impractical. The additional time and costs would include boat preparation and post-survey maintenance, hiring extra personnel or covering salary of in-house personnel, lodging, per diem, fuel, and additional data control and analyses. Even selecting a much reduced number of transects to survey during even years (by 'subset of sites' we presume the panel is referring to transects), the cost of gearing up and operating a survey in Prince William Sound (PWS) is not substantially reduced by reducing the number of transects. A rough estimate of surveys during even years would be \$150-180K per year, in addition to the current \$222K per odd year under the current work plan. If additional funds were added to this project to cover a reduced survey during even years, we would first want to conduct an analysis to determine what level of effort would be statistically robust, and how those transects or regions (sites) should be selected. Such an analysis could be useful for future planning, but would require additional funds for a contract or to cover time for the U.S. Fish and Wildlife Service (USFWS) biometrician. We have some indication of what a reduced level of effort can provide, based on an analysis conducted for USFWS by WEST, Inc. in 2003 (Nielson et al. 2003). In brief, although the effect varied among species, the conclusion was that, on average, the coefficient of variation (CV) would not decrease substantially at 80% of our current effort, but increased substantially after that, which would greatly reduce our ability to detect population trends of < 50%. The report states: "However, for many species with low CVs at 100% of the 4 | Page original sample size (i.e., CV around 0.2 or less), the CV almost doubles when the sampling effort is reduced to 30%." We add that for species of conservation concern, typically with low or variable numbers, an unusually low or high

abundance estimate in any given year will result in much reduced probability of detecting change in the population over time. The report also notes, however, that "... a systematic sample of blocks across habitats will likely provide more precise estimates of species abundance than the stratified random sample." With additional years of data since 2003, analysis of sampling effort by habitats may help with design of a reduced effort during even years. Alternative to reduced surveying during even years, additional funds for the PWS marine bird surveys could be directed towards 'winter' (March) surveys. The March survey had fewer transects than July surveys, but has not been funded since 2010. The species composition of PWS changes substantially between July and March, with nine species or species groups primarily represented only in March (see Table 1 of the WEST, Inc. report); these were waterfowl, seaducks, and grebes. March surveys would provide population estimates and trends for all species during this critical season. Literature Cited: Nielson, R., S. Howlin, L. McDonald. 2003. "Bootstrapping to investigate effects of sample size on variance and bias of estimated species totals for Prince William Sound Marine Bird Surveys". Report by WEST, Inc. to U.S. Fish and Wildlife Service, Anchorage, Alaska, April 28, 2003.

<b>11. Budget:</b>
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Please see provided program workbook.

Based on permission received from the *Exxon Valdez* Oil Spill Trustee Council, unspent funds (approximately \$24,000) from FY12-16 were used to repair survey boats.