

Environmental Studies Program: Ongoing Study

Title	Analysis of Long-term Seabird Colony Legacy Data in the Pacific Northwest as a Regional Baseline (PC-16-06)
Administered by	Pacific OCS Region
BOEM Contact(s)	David Pereksta (david.pereksta@boem.gov)
Procurement Type(s)	Inter-agency Agreement
Conducting Organizations(s)	U.S. Fish and Wildlife Service, Oregon Coast National Wildlife Refuge Complex
Total BOEM Cost	\$419,195
Performance Period	FY 2016–2020
Final Report Due	January 22, 2021 (report expected May 2022)
Date Revised	March 24, 2022
PICOC Summary	
<i><u>Problem</u></i>	Several offshore wind and wave energy development projects are being planned off the coast of Oregon. Such energy projects offshore of existing seabird colonies could potentially have effects on seabirds breeding along the coast of Oregon and Washington. While aerial photos have been taken of these colonies for decades, the images have not been scanned, preserved, or analyzed.
<i><u>Intervention</u></i>	Process, analyze, and summarize long-term seabird colony abundance and distribution data collected by the U.S. Fish and Wildlife Service.
<i><u>Comparison</u></i>	Provide colony counts for Oregon seabird colonies from 1988 to the present and for Washington from the early 2000s and from 2010 to the present. The analysis and interpretation of the resulting dataset will assess the status and trends of breeding seabirds over the 26-year period.
<i><u>Outcome</u></i>	BOEM can use the products from this study, including an extensive environmental baseline, to analyze and assess the potential effects of proposed offshore energy projects under the National Environmental Policy Act and other pertinent statutes.
<i><u>Context</u></i>	Washington-Oregon

BOEM Information Need(s): Several offshore wind and wave energy development projects are being planned off the coast of Oregon. Such energy projects offshore of existing seabird colonies could potentially have effects on seabirds breeding within the Oregon Coast National Wildlife Refuge Complex and Washington Maritime National Wildlife Refuge Complex. The goal of this study is to process, analyze, and summarize long-term seabird colony abundance and distribution data collected by the U.S. Fish and Wildlife Service (USFWS) and to produce products available for use in impacts assessments under the National Environmental Policy Act. It will provide an environmental baseline against which to evaluate potential effects of region-wide offshore energy development projects on West Coast seabird breeding colonies and populations. This study will enable comparisons of bird attendance between colonies and project sites before and after project installation. The study will conform with the Outer Continental Shelf Lands Act of 1953, (43 U.S.C. 1331 *et seq.*), which specifies that studies conducted by

federal agencies of coastal areas which may be affected by energy sales and leases may be utilized in lieu of BOEM directly conducting such activities.

Background: Aerial photographic seabird colony surveys have been conducted annually off coastal Oregon since 1988 and in coastal Washington since 2010. The current state of knowledge of Oregon seabird colonies is based on counts of a sub-sample of aerial images because budget constraints have prevented the processing of more than a small portion of the Oregon images. Although the entire coast of Oregon is surveyed, only about 12% of the total 393 colonies are counted each year. The processing, counting, and analysis of all images through this study would improve our understanding of the population trends and changes to distributions of breeding seabirds along the entire Oregon coast in response to changing resources and other influences. Additional interest in this study stems from concerns that earlier slide images, taken using color film, are beginning to degrade and without digitization, processing, and archiving, will be lost. This study would allow USFWS to archive, process, manage, analyze, and report 26 years of previously unprocessed photographic data in Oregon, which is the only long-term baseline data set of its kind for seabird colonies in the Pacific Northwest. The study would also conduct similar work on a less-extensive data set from Washington. This study will provide colony counts for Oregon seabird colonies from 1988 to the present and for Washington from the early 2000s and from 2010 to the present. It will also produce an analysis and interpretation of the resulting dataset into a final report assessing status and trends of breeding seabirds over the 26-year period. All colony count data will be made available to BOEM as georeferenced database files and through online portals, including MarineCadastre.gov, the North Pacific Seabird Colony Register, and the Avian Knowledge Network. Opportunities to integrate these seabird data with other established monitoring programs (e.g., Multi-Agency Rocky Intertidal Network, Pacific Rocky Intertidal Survey and Monitoring) and new monitoring networks (e.g., Marine Biodiversity Observation Network) will also be assessed.

BOEM has recently funded several studies to document at-sea movements, flight behaviors, and distributions of seabirds along Oregon, Northern California, and Washington in order to inform planning and assess effects of offshore energy development on seabirds and their habitats (see Adams et al. 2014; Adams et al. 2017; BOEM 2014a; BOEM 2014b). This study will complement those ongoing studies by providing baseline data on seabirds at colony sites along the Oregon and Washington coasts. Although energy projects might most directly affect seabirds through mortality from collision with energy devices, indirect effects to seabird colonies are possible by obstruction of flight corridors to foraging areas, interruption of foraging and other behaviors, and attraction to energy project sites. Comparisons between the studies listed above and this study will help assess whether seabird breeding or feeding distributions change as a result of offshore energy projects.

Objectives: The objectives of this study are to: 1) process, archive, and analyze USFWS's long-term seabird colony dataset for Oregon and Washington to establish population trends and distributions of nesting seabirds; 2) populate and maintain a database that will be readily accessible to BOEM for use in impacts assessments; and 3) produce reports or scientific publications that will be readily available to BOEM, the scientific community, the general public, and other government agencies.

Methods: USFWS will process and analyze aerial images of seabird colonies taken annually in coastal Oregon since 1988 and coastal Washington since 2010. Approximately 50,000 film slides taken from 1988 to 2008 must be professionally scanned, managed, and archived before they can be digitally counted. These oldest and most vulnerable color film slides will be processed first. All images taken after 2008 are digital and have been archived in three locations. Digital images will be graded and digitized, and the highest-quality images of each colony will be digitally counted using GIS for several species,

including common murre, Brandt's cormorant, and double-crested cormorant. The resulting counts will be entered into a georeferenced database. Count data will then be analyzed to compare spatial and temporal variability of colony counts between seasons as well as long-term seabird colony trends. Data will be summarized into a final report, published papers, and scientific presentations at conferences and meetings, as appropriate. Data will be made readily accessible to BOEM, the science community, and the general public as a georeferenced database, as well as through online portals.

Specific Research Question(s):

1. What is the spatial and temporal variability of seabird colony counts along the Oregon and Washington coasts.
2. What are the long-term seabird colony trends in this region?

Current Status: The BOEM-USFWS interagency agreement was awarded June 8, 2016. A summary of work performed to date includes:

- Biological Science Technician recruited and hired to process slides and implement data management
- Initiated paperwork to contract with Oregon State University under a cooperative agreement
- Bar coding software and 35 mm slide labels purchased
- Bar coding system checked and completed
- National Archives and Records Administration (NARA) contacted to arrange 35 mm slide storage
- 35 mm slide storage boxes purchased (NARA requirements)
- 35 mm slide inventory completed and checked for quality control
- 47,271 slides labelled with bar codes placed in NARA storage boxes
- Installed GIS software and secured license to enable counting of birds on 35 mm slides.
- Scanning company contacted to determine cost and timing
- Test scans performed on 300 slides at different dpi to determine quality
- 32,351 slides delivered to scanning contractor and scanning process completed
- 4,700 slides checked for database and barcoding errors

In addition, the following has been accomplished since September 2017:

- Remaining slides from Oregon and Washington entered into database (total = 59,771)
- All slides checked for database and barcoding errors
- Bar coding system amended and remaining labels printed
- All slides labeled and put into NARA storage boxes; boxes were indexed in database
- Updated and completed slide inventory for scanning contractor
- All remaining slides (12,466) were delivered to scanning contractor
- Scanning company contacted to determine cost and timing
- Decided to proceed with methods suggested by the National Protocol Framework for Monitoring Common Murre and Brandt's Cormorant Breeding Colonies in the California Current System to select colonies for counting
- Initiated discussion with experts to further define colony selection methodology
- Installed GIS software and secured license to enable counting of birds on digitized slides
- Digitized files received from scanning contractor
- Identified and located missing slides from digital package received from scanning contractor
- Produced Phase I Deliverable and submitted digital package and report to BOEM

- Conducted QAQC on database
- Merged functional slide catalogs and removed extraneous tables and queries
- Decided to proceed with full census counts of colonies in 1997 and 2014
- Amended database with additional fields and tables to accommodate colony counts, grading and selection information
- Classified colonies by Common Murres and Brandt's Cormorant populations for future size stratification and random sampling
- Determined file structure and data entry protocol
- Developed image selection criteria and grading system
- Initiated image selection and grading for 1997 files
- Continued exploration of image processing and analysis software and potential for automation
- Additional slides were discovered, entered into database, labeled, scanned and boxed for archival
- Updated slide catalog to accommodate counts
- Packaged first 10434 slides in archive boxes
- Categorized all sites by size for 1997 and 2014
- Designated and prioritized counting groups/rounds using random selection for 2014
- Completed image selection for Rounds 1 and 2 (2014)
- Merged photos for Round 1 (2014) images as necessary
- Completed counts for 12 of the 19 sites in Round 1
- Recorded time spent selecting, merging and counting images to provide estimated completion of census counts
- Created new geodatabase for Legacy project GIS files
- Identified colonies that may be good candidates for auto counting, made recommendations for upcoming aerial survey
- Identified colonies with one or more near vertical images in 2014 to test auto counting methods
- Continued data entry, labeling, scanning and archival boxing for recently discovered slides
- Updated slide catalog to accommodate counts
- Completed counts of all large and medium colonies in 2014, 29 sites
- Rescanned stitched images of large colonies in 1997 (n=5); determined 1994 to be better data set
- Recorded time spent selecting, merging and counting images to provide estimated completion of census counts
- Graded image quality, added to database
- Migrated completed data (selected and stitched images, counts) to shared network drive
- Created new geodatabase for Legacy project GIS files
- Updated collaborators on progress, determined best use of remaining time on contract

The draft final report was submitted to BOEM in December 2020 and is currently under review with an expected publication date of May 2022.

Publications Completed: None

Affiliated WWW Sites: <https://marinecadastre.gov/espis/#/search/study/100117>

References:

- Adams J, Felis J, Mason JW, Takekawa JY. 2014. *Pacific Continental Shelf Environmental Assessment (PaCSEA): Aerial Seabird and Marine Mammal Surveys Off Northern California, Oregon, and Washington, 2011-2012.*, U.S. Department of the Interior, Bureau of Ocean Energy Management, Pacific OCS Region, Camarillo, CA. OCS Study BOEM 2014-003. 266 p.
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