



# **Birds and Offshore Wind Energy Development: Status and Distribution, Potential Effects, Mitigations, and Assessment**

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CALIFORNIA OCEAN RENEWABLE ENERGY CONFERENCE  
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## Species Diversity on the OCS

- Nearshore and shoreline species
  - Sea ducks, loons, grebes, shorebirds, gulls, terns
- Pelagic species primarily in deep offshore waters
  - 50+ species including tubenoses, jaegers, alcids
  - Pelagic shorebirds, terns, gulls

## Special Status Species

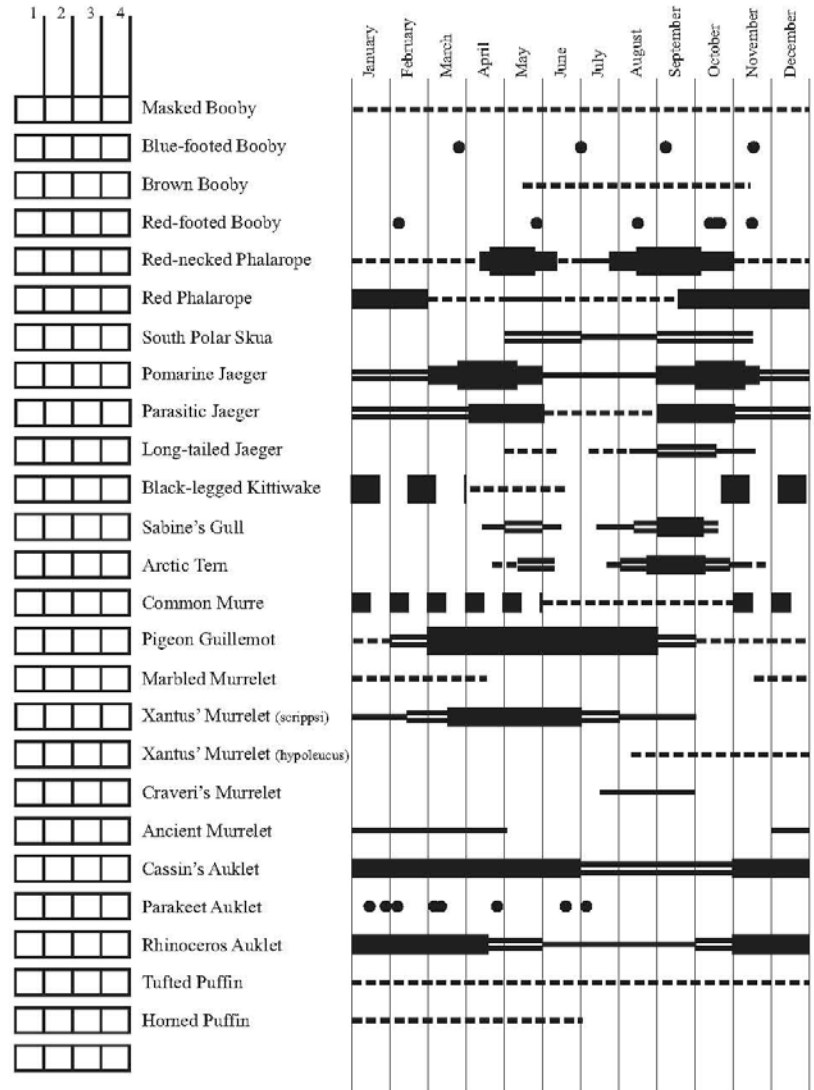
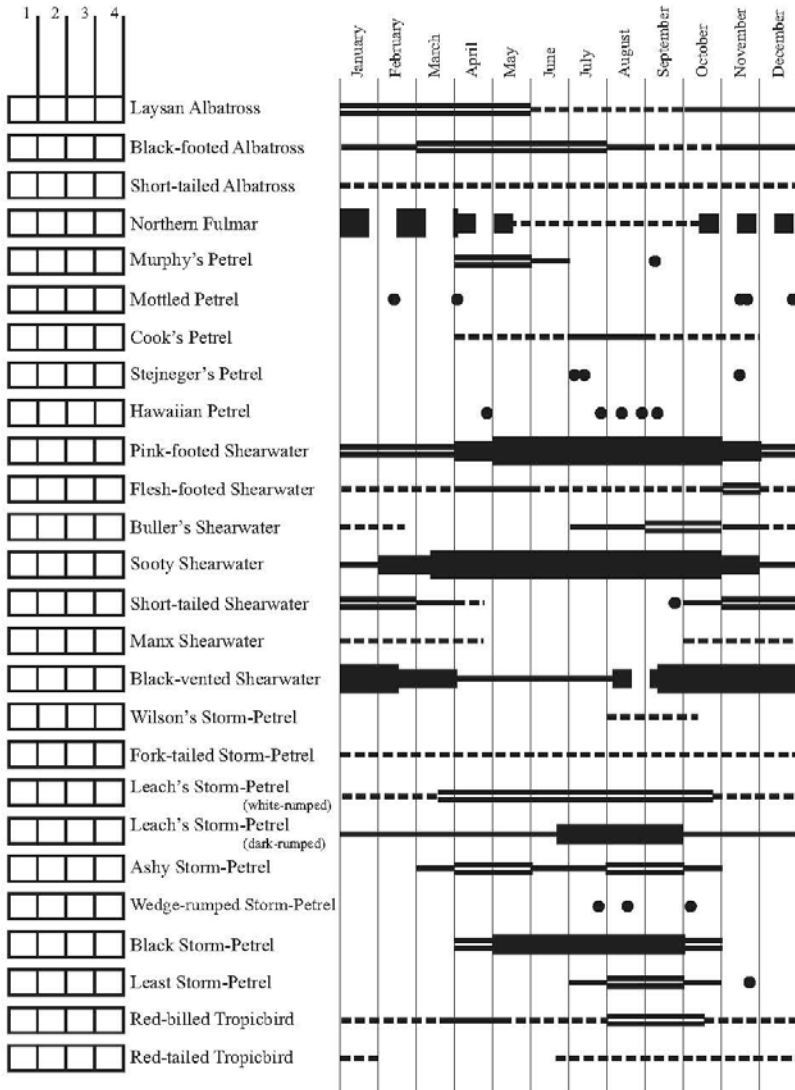
- 5 ESA listed species
- 70 species with some level of special status on the Pacific OCS and coast
  - Several very rare species endemic to the Pacific OCS



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# Bird Baseline - Pelagic Species



## Hazards

- Birds at risk from anthropogenic sources

## Annual Bird Deaths in the U.S.

- Cats: 1.4-3.7 billion
  - 33 island bird extinctions worldwide!
- Windows: 100 million-1 billion
- Power lines: 130-175 million
- Autos: 50-100 million
- Lighted towers: 4-50 million
- Pesticides and toxics: 16 million
- Persecution: >4 million
- Oil and waste water: 1.4-2 million
- Land-based wind turbines: 100,000-440,000 (3.1 birds/MW/year)



## Collision Hazard

- Rotor and support towers

## Avoidance

- Displacement from feeding grounds
- Movement barriers
  - Migration and feeding

## Attraction

- Prey base and habitat alteration/creation
- Light attraction/disorientation
- Perching - including falcons



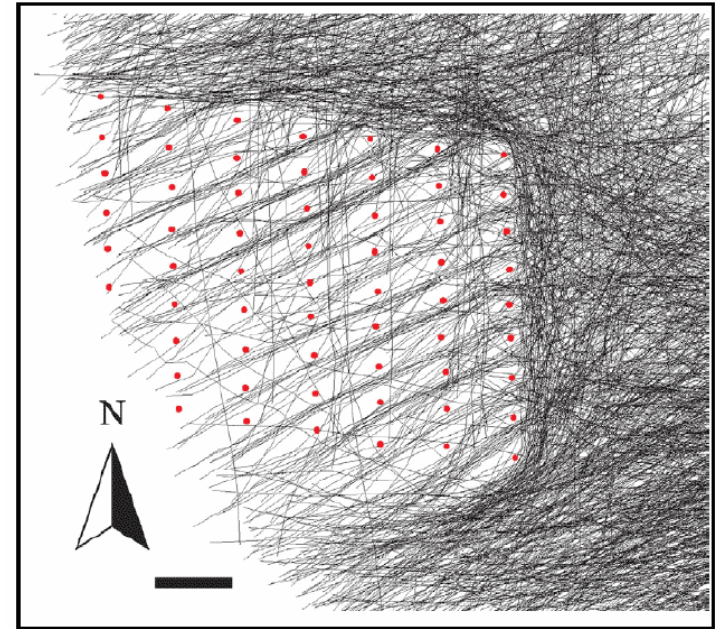
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**Effects from one project could be minimal, but cumulative impacts from multiple projects could be substantial**



## Effects Monitoring Ongoing

- Collision Risk
  - Poorly quantified; monitoring difficult
  - Behavioral changes minimize collision risk
  - Risk greatest to species flying more frequently at turbine blade height
- Barrier effects – migration
  - Most species avoid wind farms
  - Most show gradual avoidance; others dramatic
  - Greater problem for commuting birds
- Displacement
  - Avoidance of project areas after buildout
  - Significance depends on availability of alternate feeding grounds



## Effects Monitoring Ongoing

- Attraction
  - Cormorants strongly attracted
  - Gulls and Red-breasted Mergansers weakly attracted
  - Perching and prey increases
- Avoidance
  - Great Crested Grebe, Northern Gannet, and loons strongly avoided
  - Sea ducks, fulmars, alcids weakly avoided
  - Data for some species still lacking
- Weak attraction or avoidance – no recognizable effect
  - Common Eider, Black-legged Kittiwake, Common and Arctic Terns



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## Siting is Critical!

- Tough to undo once done, so spend time before project understanding bird status, distribution, and movements in area

## Other Mitigations

- Construction timing
- Turbine design and repowering
  - Fewer larger ones with minimal perching opportunities
- Turbine layout
  - Wider spacing
- Turbine operation and curtailment
  - Slower speeds; temporary shutdown during migratory peaks or low visibility
- Acoustic deterrents
- Visual approaches
- Offsite/onsite compensation





## Avian Species

- Abundance and diversity of species in the California Current and Southern California Bight
- Listed species and species of concern
- Determine avian baseline and data gaps – sooner than later

## Diverse Stakeholders

- A number of bird organizations likely involved
- Interested public and variety of stakeholder groups



- Site-specific seasonal distribution and abundance – scale
- Seasonal density maps
  - Feeding, breeding, high-use areas, migration routes, colony flight pathways
- Attraction and avoidance behavior
- Migration routes and patterns
  - Distance from shore, timing, passage height, each with weather/climate
- Energetic consequences
- Potential effects on prey
- Nocturnal activity and movement
- Effects of noise, lights and structures; collision risk

**Difficult information to collect due to weather, remoteness, vessel availability, etc.**



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## Broad-scale Assessments

- Facilitate planning at landscape level
- Government supported

## Site-specific Assessments

- Project-level planning and assessment
- Project proponent supported
- BOEM guidelines based on statistical analysis



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## Goals

- Identify baseline conditions
- Detect changes associated with anthropogenic effects
- Evaluate the effects of past policies and management activities
- Design and implement projects that will minimize adverse effects to avian species to the maximum extent practicable



## Planning for Renewable Energy Assessment

- At-sea surveys and historical comparisons
- Telemetry studies
- Colony cataloging
- Technology testing
- Marine biogeographic assessments
- Data synthesis and predictive modeling
- Evaluation of monitoring programs
- Lighting studies
- Vulnerability assessment
  - Flight height analysis



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## Partners

- USGS, NOAA, USFWS, OSU and a variety of other collaborators



**Ongoing (to be completed February 2017)** — Synopsis of Research Programs that can Provide Baseline and Monitoring Information for Offshore Energy Activities in the Pacific Region

Study Profile: <http://www.boem.gov/PR-14-dmi/>

**Ongoing (to be completed December 2016)** — Seabird and Marine Mammal Surveys off the Northern California, Oregon and Washington Coasts

Study Profile: <http://www.boem.gov/pc-10-05/>

First Report (BOEM 2014-003): <http://www.data.boem.gov/PI/PDFImages/ESPIS/5/5427.pdf>

Webinar: <http://www.boem.gov/Science-Exchange-1/>

**Ongoing (to be completed December 2016)** — Developing and Applying a Vulnerability Index for Scaling the Possible Adverse Effects of Offshore Renewable Energy Projects on Seabirds on the Pacific OCS

Study Profile: <http://www.boem.gov/pc-12-01/>

Webinar: <http://www.boem.gov/Science-Exchange-6/>

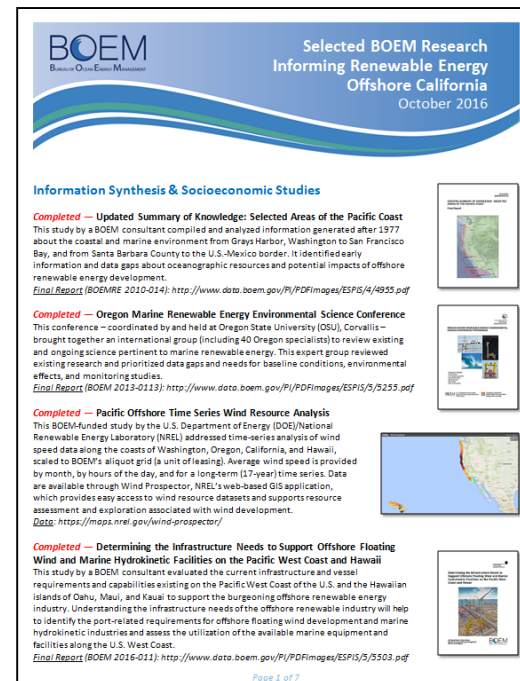
Final Report (BOEM 2016-043): *In press*

**Ongoing (to be completed 2019)** — Data Synthesis and High-resolution Predictive Modeling of Marine Bird Spatial Distributions on the Pacific OCS

Study Profile: <http://www.boem.gov/pc-15-01/>

**Planned (to start fall 2017)** — Seabird and Marine Mammal Surveys Near Potential Renewable Energy Sites Offshore Central and Southern California

Study Profile: <http://www.boem.gov/pc-17-01/>



**BOEM**  
BUREAU OF OCEAN ENERGY MANAGEMENT

**Selected BOEM Research Informing Renewable Energy Offshore California**  
October 2016

**Information Synthesis & Socioeconomic Studies**

**Completed** — Updated Summary of Knowledge: Selected Areas of the Pacific Coast  
This study by a BOEM consultant compiled and analyzed information generated after 1977 about the coastal and marine environment from Grays Harbor, Washington to San Francisco Bay, and from Santa Barbara County to the U.S.-Mexico border. It identified clearly information and data gaps about oceanographic resources and potential impacts of offshore renewable energy development.  
Final Report (BOEMRE 2010-014): <http://www.data.boem.gov/PI/PDFImages/ESPIS/4/4935.pdf>

**Completed** — Oregon Marine Renewable Energy Environmental Science Conference  
This conference — coordinated by and held at Oregon State University (OSU), Corvallis — brought together an international group (including 40 Oregon specialists) to review existing and ongoing science pertinent to marine renewable energy. This expert group reviewed existing research and prioritized data gaps and needs for baseline conditions, environmental effects, and monitoring studies.  
Final Report (BOEM 2013-0113): <http://www.data.boem.gov/PI/PDFImages/ESPIS/5/5255.pdf>

**Completed** — Pacific Offshore Time Series Wind Resource Analysis  
This BOEM-funded study by the U.S. Department of Energy (DOE) National Renewable Energy Laboratory (NREL) addressed time-series analysis of wind speed data along the coasts of Washington, Oregon, California, and Hawaii, scaled to BOEM's aliquot grid (a unit of leasing). Average wind speed is provided by month, by hours of the day, and for a long-term (27-year) time series. Data are available through Wind Prospector, NREL's web-based GIS application, which provides easy access to wind resource datasets and supports resource assessment and exploration associated with wind development.  
Page: <https://maps.nrel.gov/wind-prospector/>

**Completed** — Determining the Infrastructure Needs to Support Offshore Floating Wind and Marine Hydrokinetic Facilities on the Pacific West Coast and Hawaii  
This study by a BOEM consultant evaluated the current infrastructure and vessel requirements and capabilities existing on the Pacific West Coast of the U.S. and the Hawaiian Islands of Oahu, Maui, and Kauai to support the burgeoning offshore renewable energy industry. Understanding the infrastructure needs of the offshore renewable industry will help to identify the port-related requirements for offshore floating wind development and marine hydrokinetic industries and assess the utilization of the available marine equipment and facilities along the U.S. West Coast.  
Final Report (BOEM 2016-011): <http://www.data.boem.gov/PI/PDFImages/ESPIS/5/5303.pdf>

Page 1 of 7





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## Opportunities for Partnerships

- Numerous collaborations already established through existing studies
  - Government and academia
- Variety of partnerships nationwide
- Outreach to science community for study ideas
- Future studies in development





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