# A Synthesis of Important Areas in the U.S. Beaufort Sea

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## Introduction

Image Credit: Milo Burcham

A thorough understanding of Arctic marine ecology and habitat usage patterns is necessary for making well-informed management decisions in the Arctic Ocean. The objective of our study was to identify and map important areas critical to the functioning of the marine ecosystem in the U.S. Chukchi and Beaufort Sea federal offshore planning areas and state waters through a synthesis of best available scientific data.

## Methods

Image Credit: Tim Sullivan/USCG

We used spatial analysis and mapping to examine patterns of use and overlap of high-value habitats, including information on wildlife migration routes and foraging areas, subsistence use areas, seafloor habitats, ice habitat areas, and places with high primary productivity.

Our maps drew from an extensive literature and data review of the current body of knowledge of the Arctic scientific community. Spatial data sources included telemetry, aerial and boat surveys, maps and area descriptions in published studies, publically available and scientifically documented local and traditional knowledge, and personal communication with experts.

In the Beaufort Sea, we used 50% isopleth contours to identify core areas based on 1) kernel density analysis of 2000–2013 data from the Aerial Survey of Arctic Marine Mammals (ASAMM) database (Krenz et al. 2015), and 2) kernel density grids originally used to generate Important Bird Areas (IBAs; Smith et al. 2014b). We collected a library of over 800 papers and reports, synthesized spatial data from more than 50 sources, and created 30 new maps of the Beaufort Sea.

## Results & Discussion

Image Credit: Suzanne Miller/USFWS

We identified and described four areas critical to ecosystem functioning and resilience: the Barrow Canyon Complex, Harrison Bay, and core areas in both the Central and the Eastern U.S. Beaufort.

The U.S. Beaufort Sea shelf and slope are also important migration corridors for marine species that encompass waters in the Beaufort Sea within 75 miles of shore, as well as being identified as important for future ecosystem resilience. Furthermore, omission from our maps did not necessarily indicate that an area was considered unimportant. This synthesis brought together information on the current understanding of different aspects of the U.S. Beaufort Sea ecosystem to provide spatial information for management, conservation, and further research.

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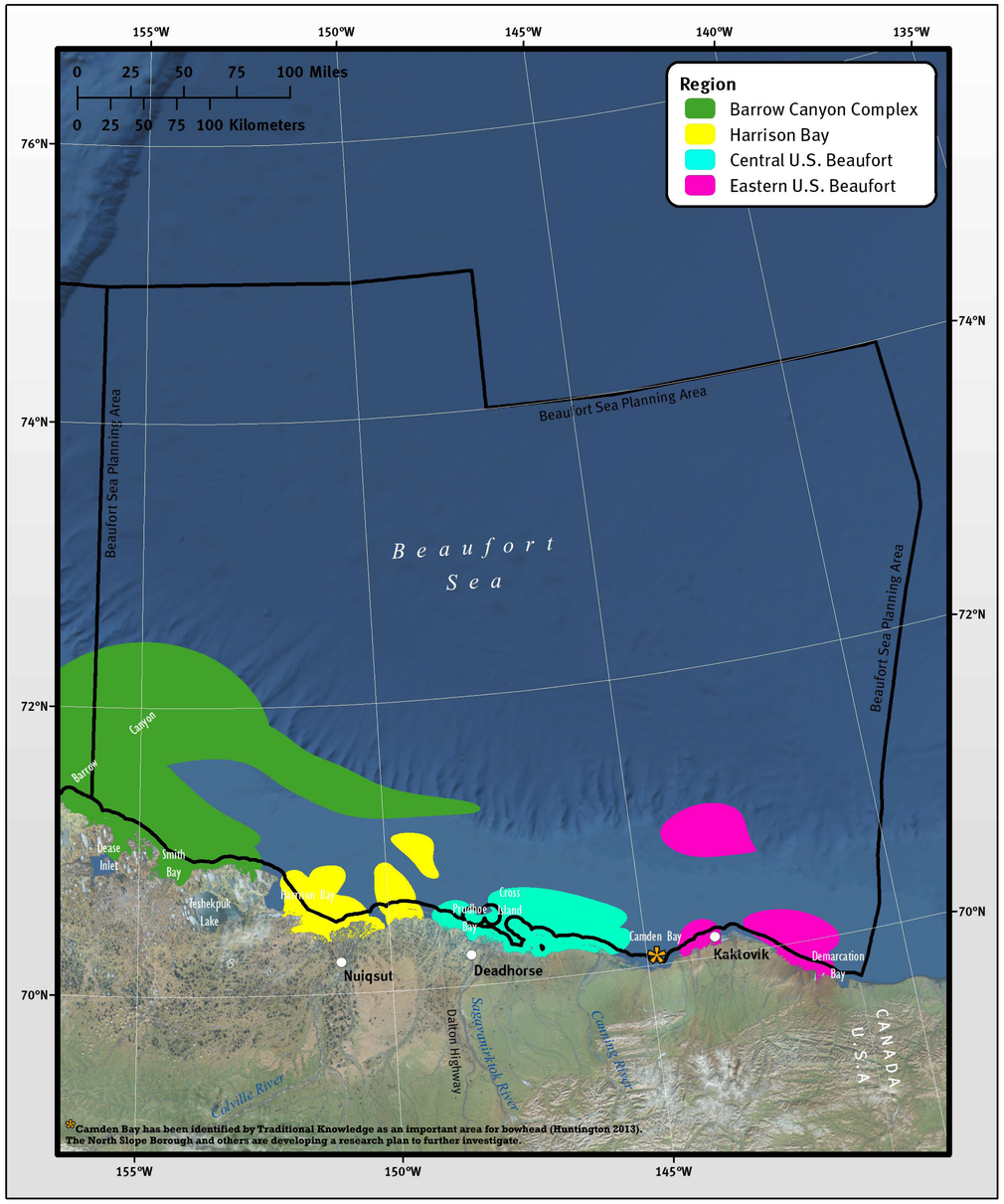


## Barrow Canyon Complex

Barrow Canyon and the associated complex of ecological values straddle the boundary between the Beaufort and Chukchi seas. Complex water mass mixing, upwelling, and sea ice dynamics make the waters around Point Barrow and Barrow Canyon very productive compared to other nearby areas and the nutrient-poor Canada Basin (Mathis et al. 2007). See associated key features presented on the Smith et al. (2015) Chukchi Sea poster.

## Harrison Bay

Image Credit: Dave Shaw

Shallow depth and nutrient supply from the Colville results in relatively high productivity compared to other nearshore areas of the Beaufort Sea (Alexander et al. 1975). Likely because of higher productivity and shallow, sheltered waters, Harrison Bay supports substantial numbers of birds of concern, including scoters, eiders, and loons (Fischer et al. 2004, Lysne et al. 2004, Smith et al. 2014a, Smith et al. 2014b).

Key Features:

- *Major hotspot for marine birds*
- *Globally significant Important Bird Areas (IBAs)*
- *Summer core area for Audubon WatchList bird species of concern*
- *Hotspot for benthic-feeding seabirds in summer*
- *Feeding and high-density denning areas for polar bears*
- *Major migration staging area for red-throated and yellow-billed loons in summer and fall and spectacled and king eiders in spring and fall*

## Central U.S. Beaufort

Image Credit: Kelvin Aitker

This area is part of the fall migratory corridor for bowhead whales from the Beaufort to Bering Sea (Moore 2000, Moore et al. 2000), along continental slope habitat closer to the coast. Within the migration corridor across the Beaufort shelf, there are several areas that likely provide feeding habitat where more bowhead whales are consistently observed. This area is also characterized by nearshore barrier islands with productive lagoon areas with significantly high abundances of marine birds, including long-tailed ducks, king and common eiders, yellow-billed and red-throated loons, glaucous gulls, and brant (Smith et al. 2014a, Smith et al. 2014b).

Key Features:

- *Concentration area for bowhead whales during fall migration*
- *Core area for Beaufort Sea stock female beluga whales in September*
- *Subsistence hunting area for the community of Nuiqsut*
- *Ringed seal subnivean denning habitat*
- *Feeding and high-density denning areas for polar bears*
- *Major hotspot for marine birds*
- *Summer core area for Audubon WatchList bird species of concern*
- *Globally significant IBAs*
- *Major concentration area for king eiders in spring and spectacled eiders spring-fall*
- *Hotspot for benthic-feeding seabirds in fall*
- *Ecosystem-level hotspots, i.e. Important Ecological Areas (IEAs)*

## Eastern U.S. Beaufort

Image Credit: NOAA Fisheries

This area is part of an important migratory corridor for bowhead whales during the fall migration from the Beaufort to the Bering Sea (Moore 2000, Moore et al. 2000) with several important feeding and resting hotspots. This area lies to the west of the Mackenzie Delta within an area of relatively high productivity.

Key Features:

- *Concentration area for bowhead whales feeding and resting in the fall*
- *Beluga whale concentration area*
- *Subsistence hunting area for the community of Kaktovik*
- *Summer core area for Audubon WatchList bird species of concern*
- *A globally significant IBA*
- *Major concentration area for king eiders in spring*
- *Hotspot for benthic-feeding seabirds in fall*
- *Ice seal concentration area and ringed seal subnivean denning habitat*
- *Feeding and high-density denning areas for polar bears*
- *Primary productivity hotspot*
- *Ecosystem-level hotspot*

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