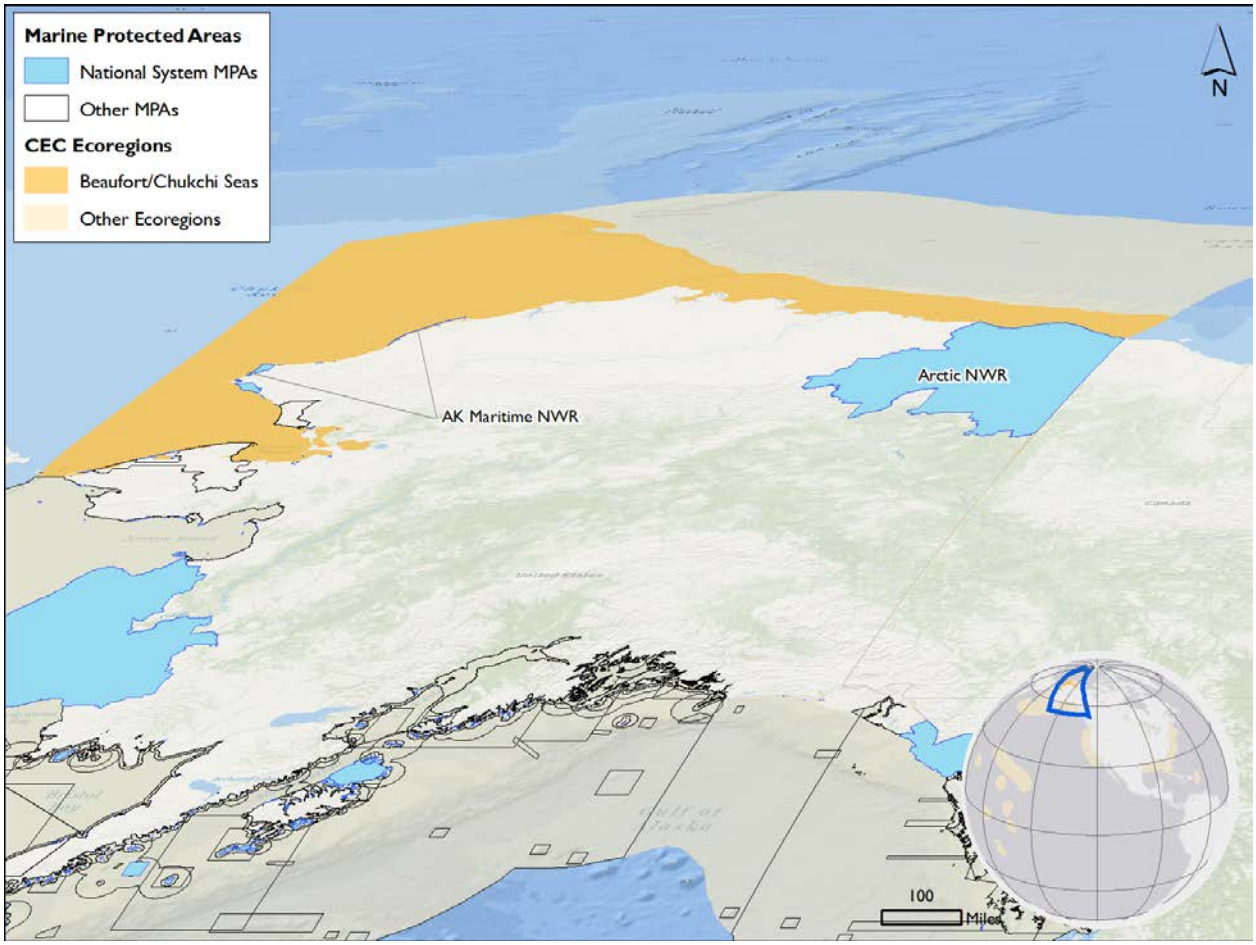
## Beaufort/Chuckchi Seas (Ecoregion 2)

**Background**

The Beaufort and Chukchi Seas are located along the northern coast of the State of Alaska and this area is well known for its coastal oil and gas activities off Barrow and Prudhoe Bay. The seas around the Arctic Ocean are primarily polar, consisting of seasonal sea ice, with highly productive clear waters that support a productive fishery and important populations of marine mammals. In 2012, the Bering Sea, Beaufort/Chukchi Seas, Alaskan/Fjorland Pacific and Aleutian Archipelago Ecoregions provided approximately 58% of the total commercial fisheries harvest (by weight) of the United States. These ecoregions consist of spectacular volcanic islands of the Aleutian chain to the south, the seabird cliffs of the remote Pribilofs, and adjacent lands near the Chukchi Sea provide essential habitat for some 40 million seabirds. It is estimated that the Alaskan ecoregions represent 80% of all seabirds in North America.




Nutrients from deep cold waters mix with shallower waters of the Aleutian Islands to provide for constant production of phytoplankton. Melting of sea ice triggers a seasonal spring phytoplankton bloom, leading to this productive ecosystem as well. The ecoregion receives considerable input of freshwater from the Mackenzie River. This freshwater input along with

seasonality of sea ice and upwelling makes the ecoregion among the most productive of high-latitude seas, supporting a large biomass of fishes, birds and marine mammals.

**MPAs in the Bering Sea**

The five MPAs in the Beaufort/Chukchi Seas Ecoregion include two members (40%) of the National System and three (60%) that are eligible but are not currently National System (Figure 1). The 2 National System MPAs are both National Wildlife Refuges. These 2 National System MPAs do not extend seaward, with a small exception around Afognak Island, thus reducing protection of marine resources beyond the intertidal area. The 2 National System MPAs within Ecoregion 2 established for broader ecosystem protection and biodiversity conservation purposes are the Alaska Maritime and Arctic National Wildlife Refuges. The Beaufort Sea is located adjacent to the north coast of the Arctic National Wildlife Refuge. The Arctic NWR, the largest National Wildlife Refuge in the country, is in a moderately highly productive area due to the mixing of freshwater from the Mackenzie River Delta with the salt waters of the Beaufort Sea. These waters remain ice-covered for eight or more months each year. The refuge's don't extend very far seaward but their estuarine and nearshore marine waters are important for marine mammals (fissipeds, pinnipeds, cetaceans) as well as anadromous and coastal marine fish. Managed by the U.S. Fish and Wildlife Refuge (FWS), the Alaska Maritime NWR is the most remote unit of the National Wildlife Refuge System. The Alaska Maritime NWR is comprised of more than 2,500 islands, islets, spires, rocks and headlands. Generally islands are scattered thousands of miles along Alaska's coastline and are a biological hotspot for seabirds, fish and marine mammals. The refuges in this ecoregion (and within other ecoregions) host seabird populations of both national and international significance.

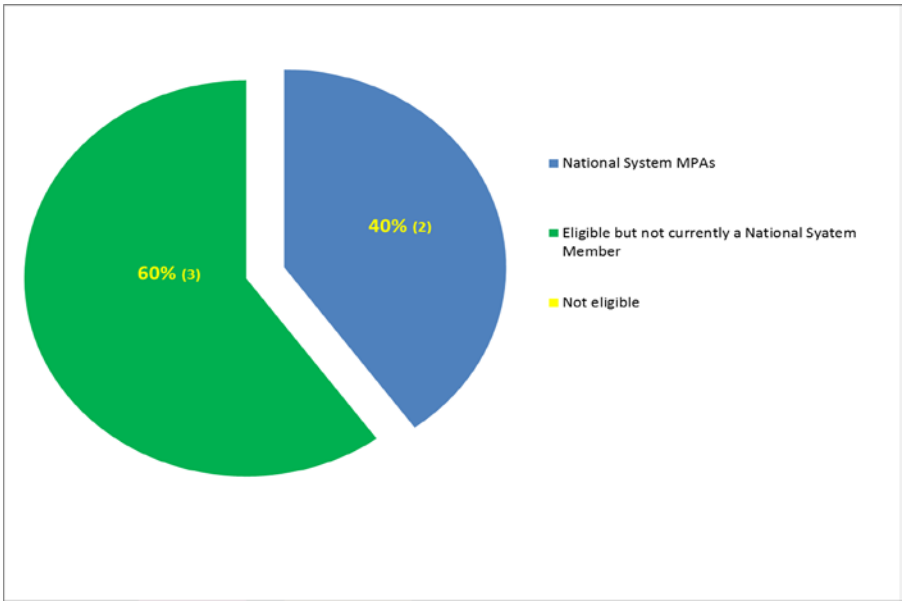



Figure 1. Percent of Marine Protected Areas (MPAs) within Beaufort/Chukchi Seas (Ecoregion 2) that are Members of the National System of MPAs (n=5).

Ecologically important biogenic habitats known to be found in high-latitude seas are found in several of the ecoregion's five MPAs, such as seagrass (60%), coldwater corals (60%) wetlands and mudflats (60%) and kelp/algae (60%) (Figure 2). Non-biogenic habitat such as rocky reefs (40%) and rocky intertidal (20%) also occur in several of the ecoregion's MPAs (Figure 2). Flowing freshwater from the ecoregion's rivers and streams provides habitat for recreationally

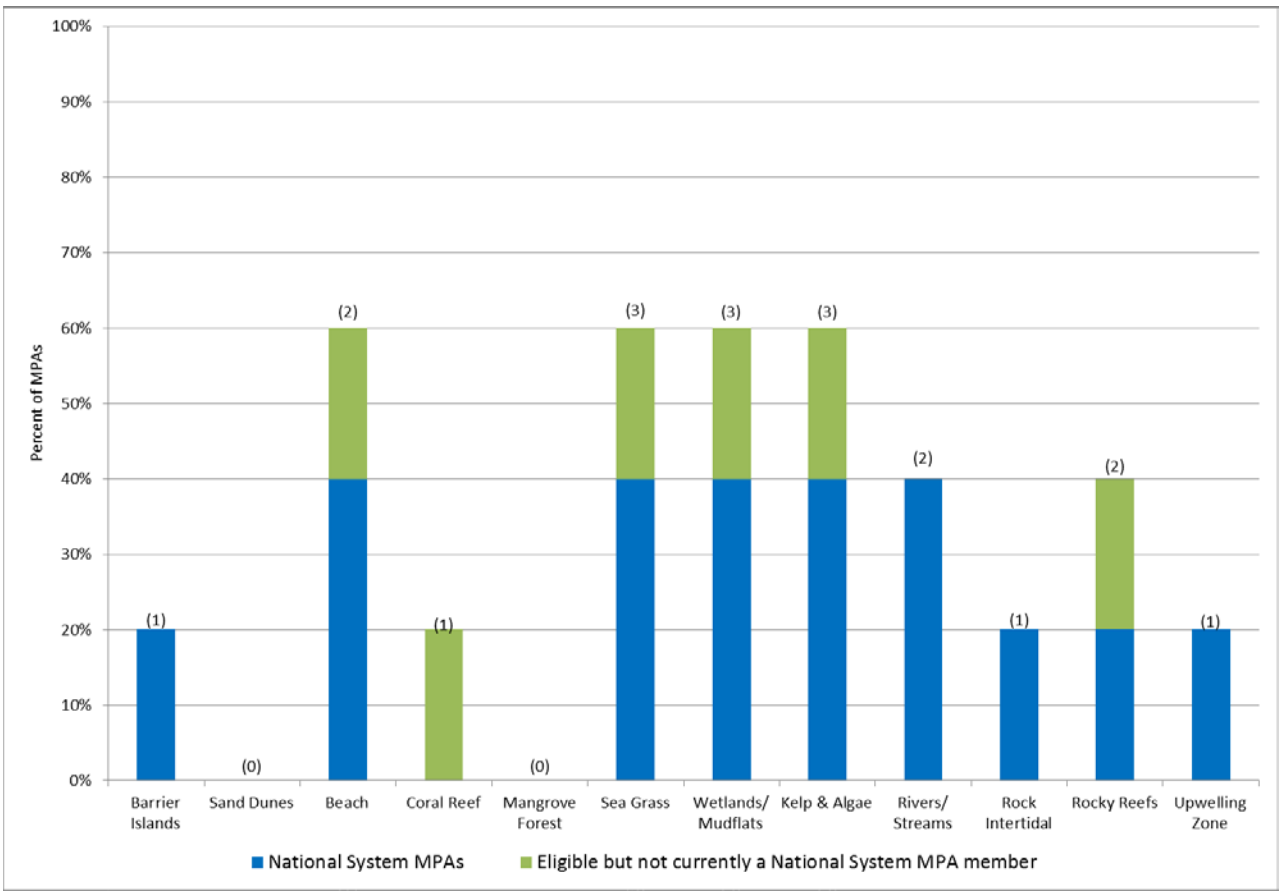


Figure 2. Percent of MPAs that contain certain habitat groups in the Beaufort/Chukchi Seas (Ecoregion 2)

and commercially important species of groundfish (e.g., Alaskan cod, flounder), found in all of the ecoregion's MPAs. The ecoregion also supports internationally significant salmon fisheries, and other anadromous fish such as Pacific herring and whitefish are reported in many (80%) of the ecoregion's MPAs (Figure 3). Various types of marine fishes are found throughout many of the ecoregion's MPAs, including estuarine and coastal fishes in 80%, coastal pelagic fishes in 60% and highly migratory species in 40%. Marine mammals feed in these productive waters, with cetaceans, pinnipeds and fissipeds occurring in 80%, 100%, and 80%, respectively, of the ecoregion's MPAs (Figure 3).

Alaska's coasts are world renowned for their seabird populations, thriving during the short growing season and seasonal pulse of prey items. The marine and estuarine areas of Alaska's ecoregions support the largest populations of birds in all of North America. Birds are classified as waterfowl, estuarine or seabirds, signifying where their principal feeding areas occur (e.g., freshwater, estuarine, marine), and are found in 60%, 80%, and 60%, respectively, of the ecoregion's MPAs (Figure 4). Birds not classified in any of these feeding guilds are found in all of the ecoregion's MPAs.

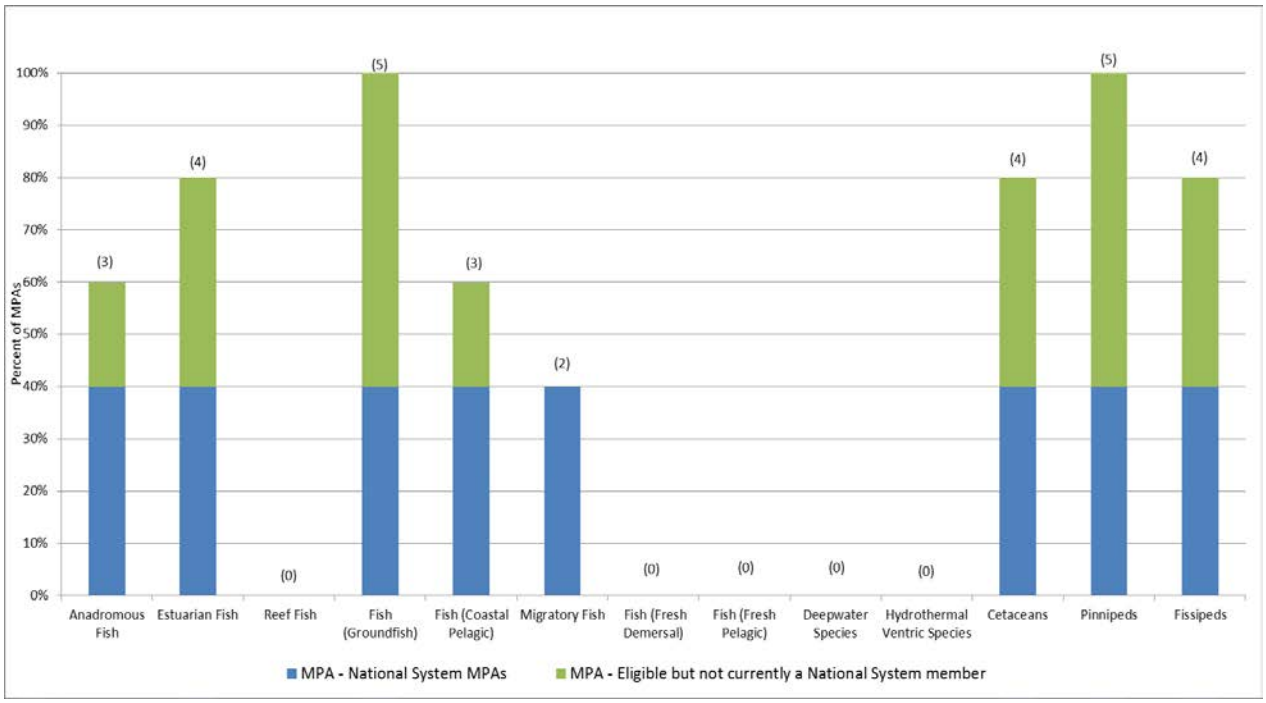



Figure 3. Percent of MPAs that contain certain Fish and Marine Mammal Groups in the Beaufort/Chukchi Seas (Ecoregion 2)

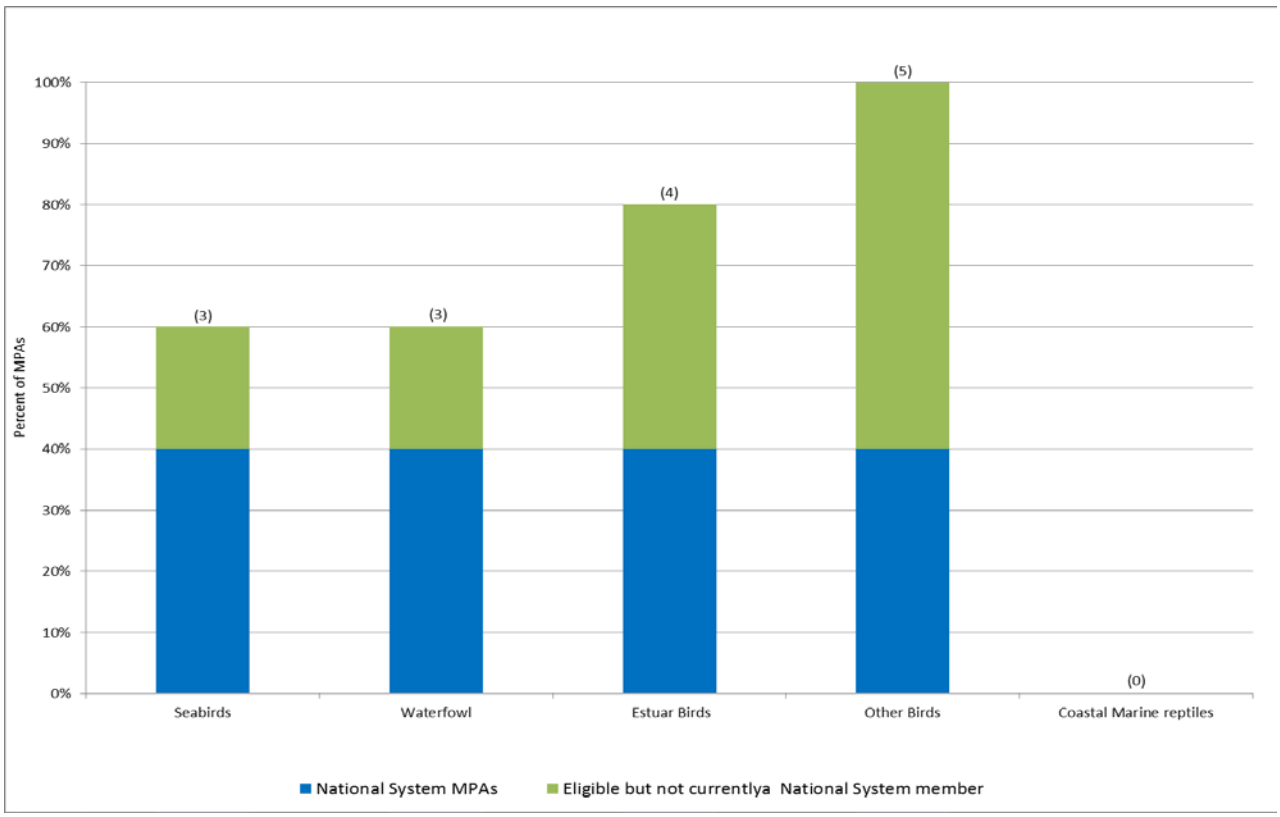



Figure 4. Percent of MPAs that contain Marine Birds and reptiles in the Beaufort/Chukchi Seas (Ecoregion 2)

The Chukchi Sea is strongly influenced by nutrient-rich Pacific water and has a very high benthic biomass, among the highest soft-sediment macrofaunal communities in the world. By contrast, the benthic biomass in the Beaufort Sea is considerably lower. The areas close to shore (as is the case within the ecoregion's MPAs) are generally considered depleted in benthic faunal biomass and species richness due to seasonal ice-scouring and low salinity conditions from riverine input. This freshwater input and suspended matter from rivers such as the Mackenzie and Colville results in nearshore estuarine conditions and keeps the benthic and algal communities relatively low. However, many of the subtidal invertebrates found in the Beaufort and Chukchi Seas are of great ecological importance as food sources for fish, marine mammals and birds, and are found within the most (80%) of the ecoregion's MPAs (Figure 5). Bivalve mollusks, for instance, are eaten by walrus and benthic amphipods are consumed by gray whales and bearded seals. Nearshore boulders and gravel in the wildlife refuges and national parks and monuments (e.g., Bering Land Bridge National Park and Preserve) provide the necessary substrate and refugia for species such as sponges, soft corals, and tube worms.

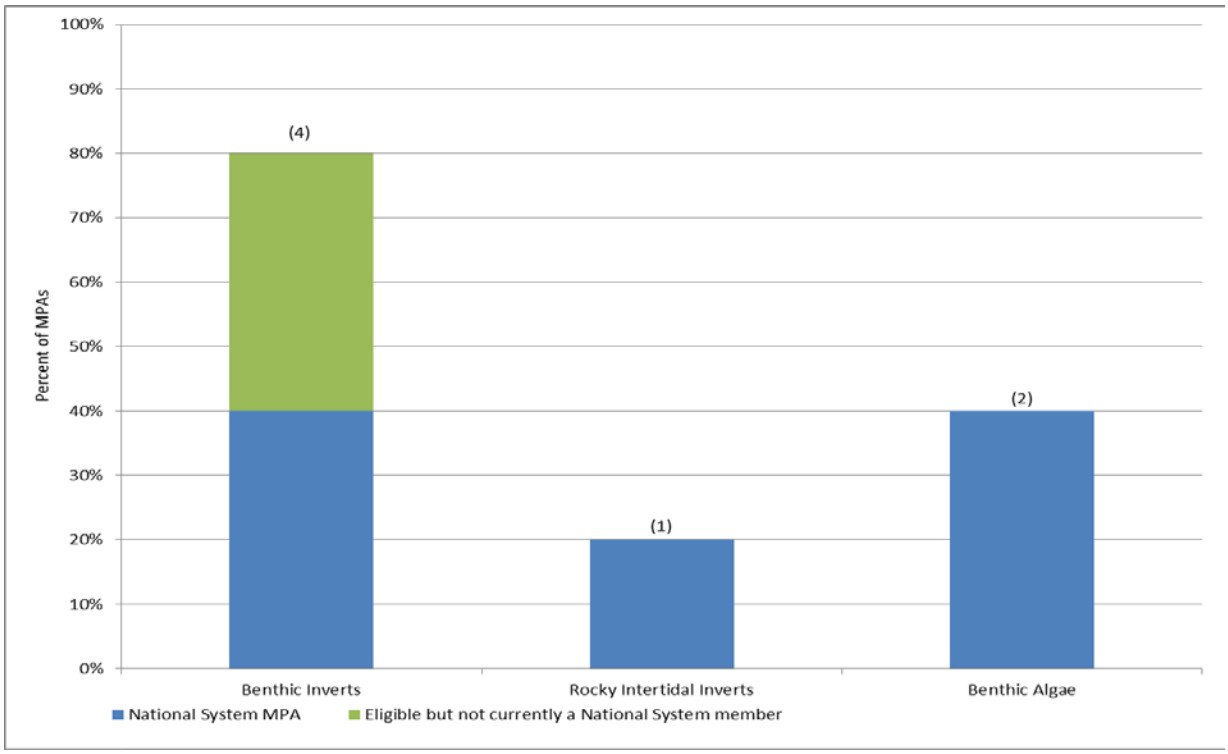


Figure 5. Percent of Benthic Invertebrates and Benthic Algae in the Beaufort/Chukchi Seas (Ecoregion 2)

Ecologically important areas that support where species breed, nest, spawn and rest can be found throughout several of the ecoregion's MPAs. For example, Figure 6 illustrates that most of the ecoregion's MPAs include bird nesting habitat (100%), bird migratory areas (100%) and marine mammal haulouts (60%).

**Conclusions**

The five MPAs in this ecoregion contain the major habitat and species groups and ecologically important areas found in the ecoregion as a whole. These resources are also found in more

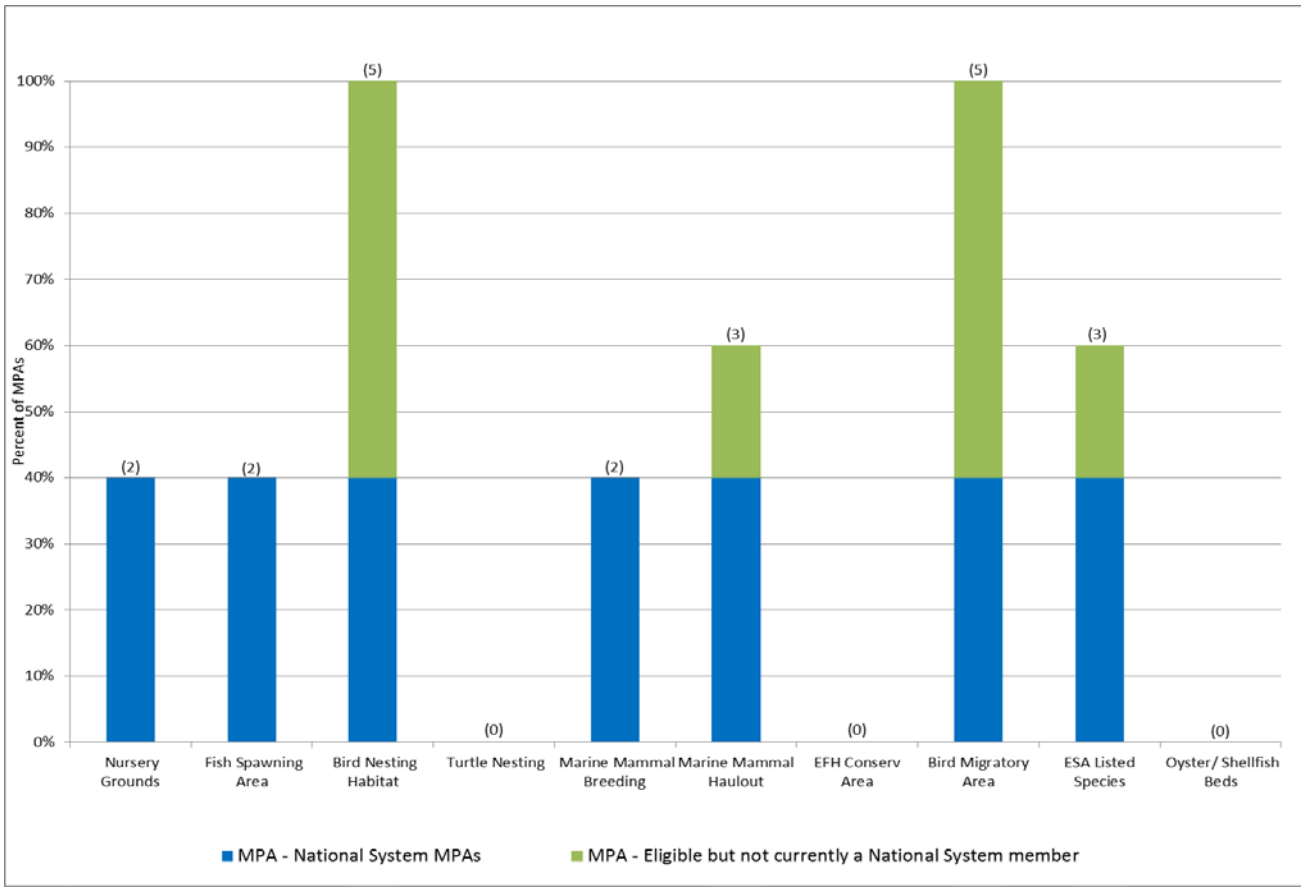


Figure 6. Percent of MPAs with ecologically important areas in the Beaufort/Chukchi Seas (Ecoregion 2)

than one MPA, resulting in some replication of ecological features (species, habitats and ecological processes) -- one of the criteria identified by the Convention on Biological Diversity (CBD) in designing effective MPA networks.

Four of the five MPAs (40%) in the ecoregion are were established primarily to protect biodiversity and ecosystem function, 2 of the non-National System member MPAs are managed by the National Park Service, a national park and a national preserve, and are likely managed with similar objectives in mind. The 3rd non-National System MPA in the ecoregion, the Northern Bering Sea Research Area, is managed primarily to gain information on the area prior to committing to permitting extraction activities in the future.

**Suggested Reading**

Hopcroft, Russ, Bodil Bluhm and Rolf Gradinger (Eds). 2008. Arctic Ocean Synthesis: Analysis of Climate Change Impacts in the Chukchi and Beaufort Seas with Strategies for Future Research. Institute of Marine Sciences, University of Alaska-Fairbanks and North Pacific Research Board. (http://www.arcodiv.org/news/NPRB_report2_final.pdf)