MARINE PROTECTED AREAS OF THE UNITED STATES

NATIONAL
Marine Protected Areas
CENTER

Marine Protected Areas 2020:

Building Effective Conservation Networks

Contributors: Lauren Wenzel, Mimi D'Iorio, Charles Wahle, Gonzalo Cid, Zachary Cannizzo, Katherine Darr

Designer: Dayna McLaughlin

Cover photo: A NOAA archaeologist surveys the wreck of the USS *Schurz* off North Carolina while fish school around divers and the wreck. Photo: Tane Casserley/NOAA

MARINE PROTECTED AREAS 2020:

Building Effective Conservation Networks

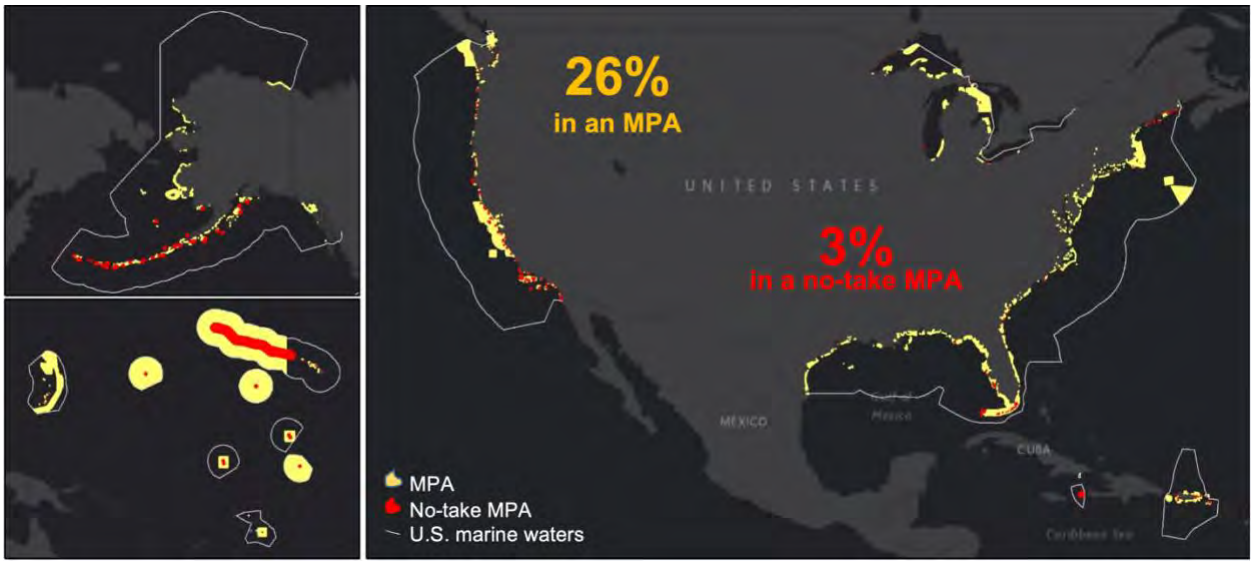
This report summarizes U.S. contributions towards six key aspects of successful marine protected area (MPA) networks. The U.S. has established nearly 1,000 MPAs (as defined by the International Union for the Conservation of Nature (IUCN)) to protect important places in our ocean, estuaries, coastal waters, and Great Lakes. Scientists and managers have identified the following characteristics for networks of MPAs to achieve conservation outcomes[1,2]:

- Area protected
- Ecologically representative
- Ecologically connected
- Other effective conservation measures (that are not MPAs)
- Effectively and equitably managed MPAs
- Integrated into the wider seascape

Most marine protected areas allow multiple uses, such as recreational activities like kayaking. Photo: Sienna Streamfellow

Protecting Coastal and Marine Areas

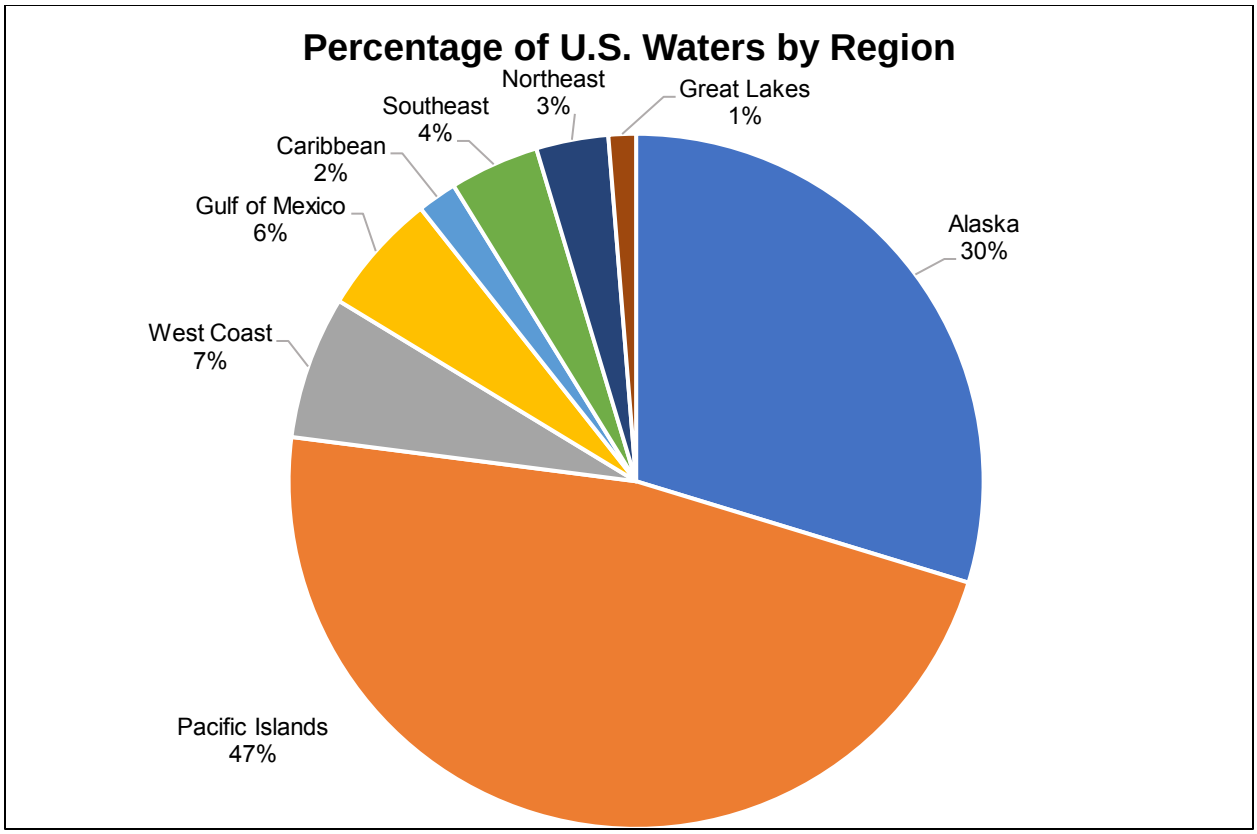
Based on scientific guidance, nearly every country in the world, including the U.S., has agreed to a goal of protecting at least 10% of the globe's coastal and marine areas by 2020. As of June 2020, 26% of U.S. waters (including the Great Lakes) are in some type of MPA, and 3% of U.S. waters are in the most highly protected category of MPAs ("no take" MPAs that prohibit extractive uses). Nearly all the highly protected MPAs in the U.S. are located in two large MPAs in the remote Pacific Ocean – Papahānaumokuākea Marine National Monument and Pacific Remote Islands Marine National Monument. Less than 0.1% of U.S. waters outside of these sites are in highly protected MPAs.



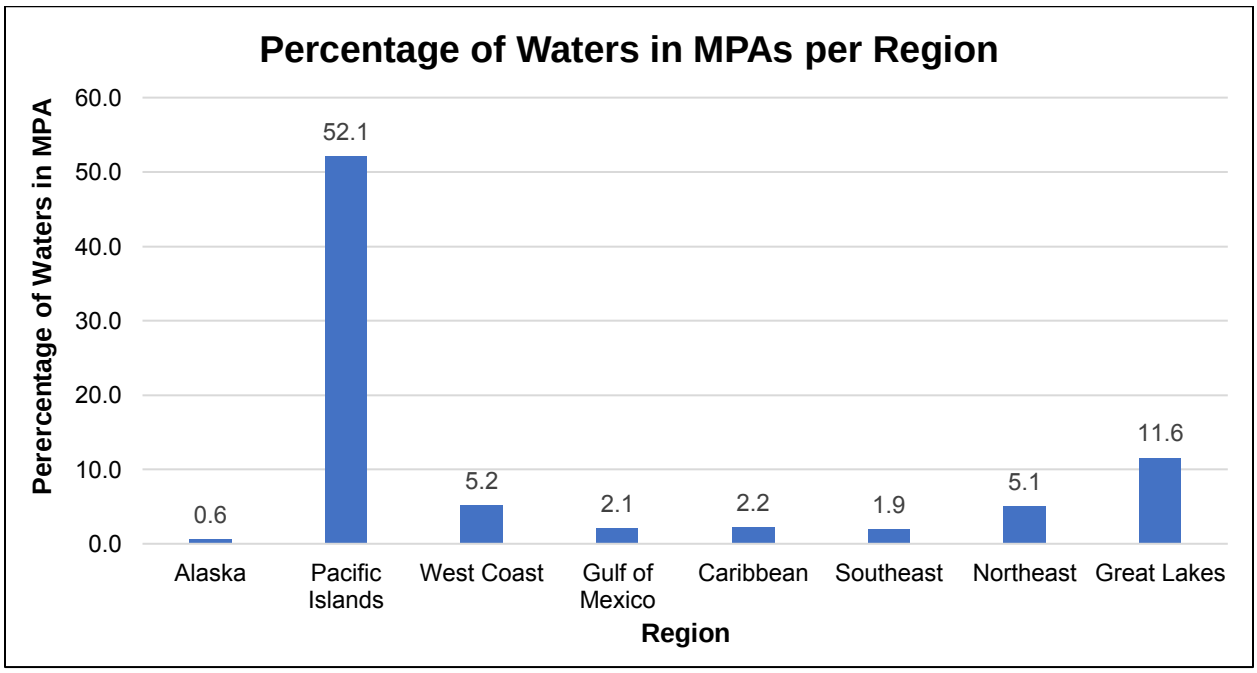
MPA (yellow) and no-take MPA (red) coverage throughout U.S. marine waters. MPAs cover 26% of U.S. marine waters, of which 3% are in no-take marine reserves. Image: NOAA

Highly protected areas have been shown to produce stronger conservation outcomes than areas where more extractive uses are allowed.[3,4] New highly protected areas can be established, working with stakeholders, to:

- Enhance the level of protection within *existing MPAs* by effectively addressing current and emerging threats, and by creating special use zones where needed to protect key habitats and resources.
- Develop and adaptively manage *new sites and networks* with high levels of protection reflecting local uses, threats, and conservation values.



The U.S. encompasses more than 4.8 million square miles (12.4 million square kilometers) of marine waters. This pie chart depicts the percent of U.S. marine waters in each geographic region. Nearly half of U.S. waters lie in the Pacific Islands region. Source: NOAA



Graph shows the percent of regional waters that are in marine protected areas (MPAs). Relative to the area of marine waters, the Pacific Islands have the highest proportion of MPAs (52%) while Alaska has the lowest (<1%). Source: NOAA

Ecologically Representative Networks

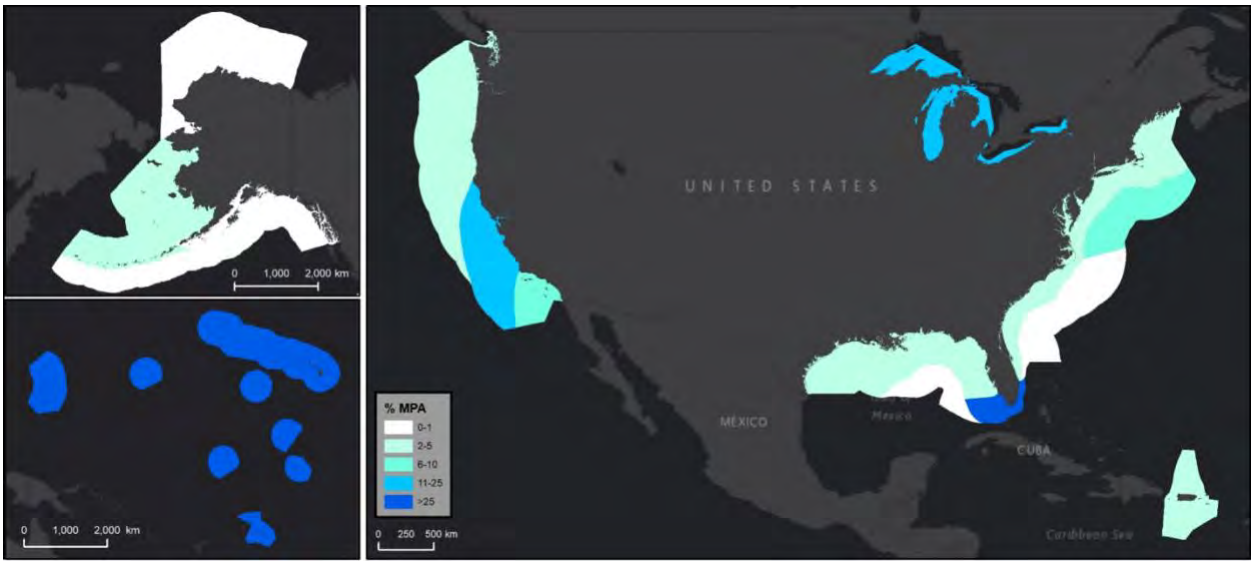
Aldo Leopold, the father of wildlife ecology, said, "To keep every cog and wheel is the first precaution of intelligent tinkering." In this spirit, ecologically representative systems of MPAs conserve characteristic areas in their local eco-regions, and protect marine and coastal areas that support ecologically important habitats, communities, species, processes, and features. This integration of ecological representativeness into the design and management of MPA networks can enhance conservation outcomes, particularly for species and habitats with small ranges.[5]

The goal of "representativeness" is embraced by many federal and state MPA programs in the U.S. Examples include:

- National Estuarine Research Reserve System, a robust conservation partnership between NOAA and 29 coastal states.
- California's statewide MPA network.
- Executive Order 13158 calling for a "scientifically based, comprehensive national system of MPAs representing diverse U.S. marine ecosystems, and the nation's natural and cultural resources."

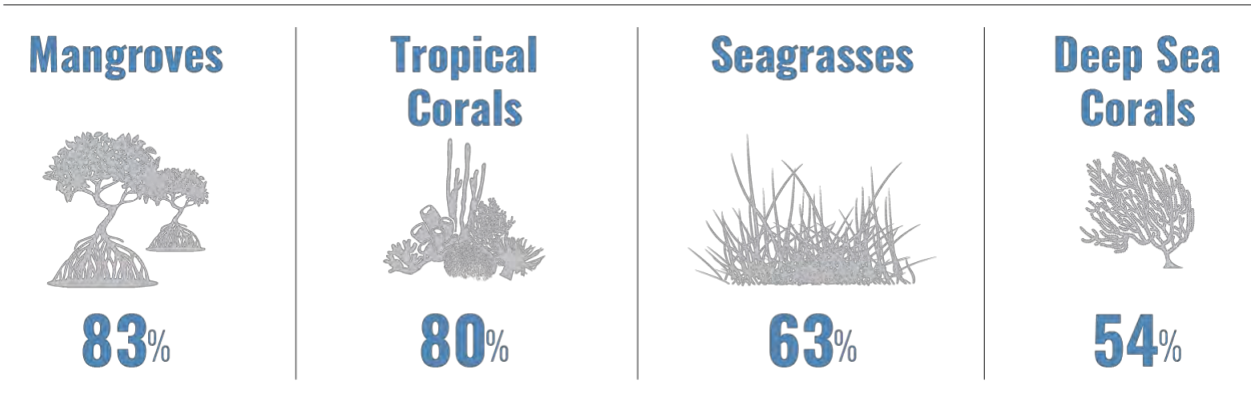
Chesapeake Bay National Estuarine Research Reserve is one of the 29 coastal sites that make up the National Estuarine Research Reserve System. Photo: Chesapeake Bay NERR

By several measures, the current collection of federal and state MPAs in the U.S. is moderately representative of the nation's key eco-regions, ecosystems, and taxa. In 2015 and 2020, NOAA's National MPA Center conducted preliminary assessments of the degree of representativeness in the nation's portfolio of MPAs. These analyses found that all of the 19 marine ecoregions in the U.S. contained at least one and often many MPAs. The relative number and sizes of these MPAs vary widely within and among ecoregions, as do their levels of protection, management approaches, and likely conservation impacts on those ecosystem features.



Percent of marine ecoregions protected in an MPA. Marine ecoregions are mapped to represent areas with similar habitats and ecosystems. Ecoregions with the highest percent of waters in MPA protection are the coral reef ecosystems in the Pacific Islands and South Florida. Image: Commission for Environmental Cooperation and NOAA MPA Inventory

Additionally, many ecologically significant ecosystem types, habitats, processes, and taxa are protected by federal and state MPAs. For example, 80% of shallow tropical corals, 83% of mangroves, 63% of seagrasses, and 54% of deep corals (based on their current extent mapped) are contained within an MPA in U.S. waters.



Percentages of mapped habitat area that is protected in U.S MPAs. Image: NOAA

Achieving a more representative network of MPAs in the U.S. will require:

- *Filling Critical Data Gaps* – Creating better access to reliable and comparable data on the distribution of ecologically important features throughout the exclusive economic zone, including the deep sea and polar regions. Additionally, MPA programs and their research and exploration partners must develop high-resolution maps of the distribution and abundance of diverse taxa, habitats, and ecologically important processes to identify areas of conservation concern, including outside MPAs.
- *Strengthening Legal Authorities* – MPA statutes, policies, and designations should more explicitly incorporate and operationalize the concept of representativeness in the structure, composition, and management of new and existing networks.
- *Incorporating Climate Change* – Design for new MPA networks, and adjustments to existing ones, must plan for expected changes in species composition, habitat types, and ecological processes over time as the climate changes.

Migratory species like this sea turtle can travel extraordinary distances and often use MPAs that may be thousands of miles apart as breeding or feeding areas. MPA networks help managers care for these far flung species during different life stages. Photo: Matt McIntosh/NOAA

Ecologically Connected Systems of MPAs

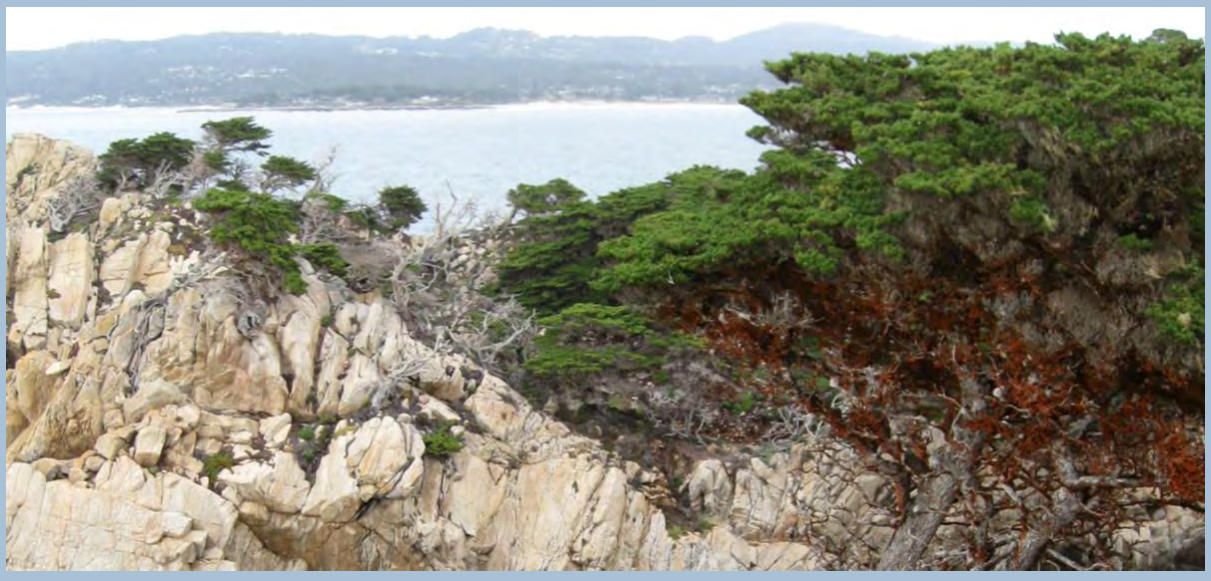
Ecological connectivity refers to the functional linkages between spatially distinct populations, communities, habitats, or ecosystems, including the exchange of organisms, nutrients, or materials. Connectivity enhances the effectiveness, biodiversity, productivity, stability, and resilience of MPAs and networks.[6]

Ecological connectivity is only beginning to be a factor in the design and adaptive management of MPAs and MPA networks in U.S. waters. To date, the states of California and Hawai'i have created the nation's first MPA networks that take connectivity into account in the location of sites. In contrast, most other U.S. MPAs were established over several decades by many different programs, each with distinct conservation goals and management approaches. MPA establishment processes have historically focused on individual sites of local significance, rather than on connected networks of ecologically linked sites.

U.S. MPA managers are addressing the connectivity of their sites through such approaches as working with adjacent watershed managers to curb land-based pollution; partnering with ocean managers to protect known connections among nearby habitats needed by species at different life stages; and establishing international sister site partnerships with other MPAs that may share migratory species or are linked by ocean currents.

Case Study: California's Statewide Network of MPAs

The state of California's portfolio of MPAs is the nation's only example of an intentionally designed, ecologically connected, cohesive, regional network of MPAs. This network design involved significant stakeholder input and relied on models and studies of ocean circulation, larval dispersal, optimal size and spacing distances, and projected impacts on commercial and recreational fisheries. This planning approach allowed California to leverage ecological connectivity to maximize conservation and economic outcomes throughout the state's waters. It can serve as a model for other U.S. and international MPA programs in the establishment of ecologically connected networks.



Point Lobos State Marine Reserve is a California marine protected area. Photo: NOAA

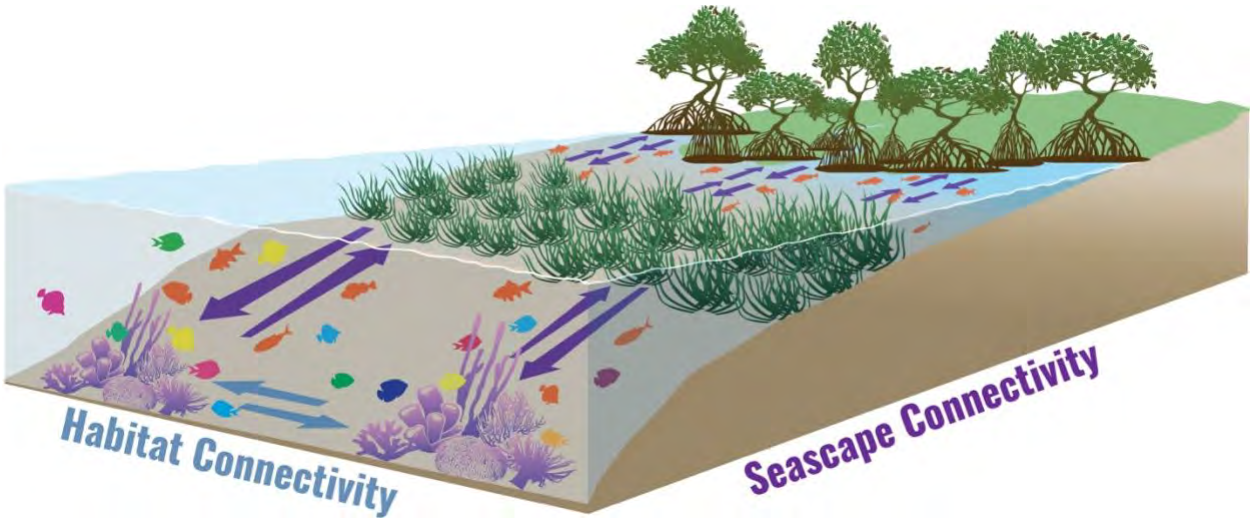
Improving Connectivity of MPA Networks in the U.S.

More effective and locally focused outreach and communication tools would help planners, stakeholders, and decision-makers understand the importance, value, and mechanics of ecological connectivity in their geographical context. The following additional actions would improve near-term capacity to improve MPA connectivity:

- Developing new authorities, policies, governance frameworks, and planning tools that explicitly incorporate ecological connectivity into the design and management of MPA networks.
- Developing new insights into how connectivity works across a variety of ecosystems, taxa, life stages, and regions, and how those linkages may change with a changing climate.

Species that move slowly, or not at all, like this sea cucumber on a coral reef in American Samoa, depend on connectivity through larval dispersal to maintain healthy populations. Photo: Greg McFall/NOAA

- Integrating areas that are not MPAs but contribute to conservation outcomes (defined as "other effective conservation measures" by the IUCN), into MPA networks to provide additional opportunities to incorporate ecological connectivity.



There are two primary types of ecological connectivity in MPAs. *Habitat connectivity* links geographically separated habitats of the same type (e.g., larval dispersal among coral reefs) while *seascape connectivity* links habitats of different types within the same ecosystem (e.g., juvenile fish migrating from mangrove nurseries to nearby seagrasses and coral reefs). Both are important to the long-term effectiveness of MPA networks. Image: NOAA

Other Effective Conservation Measures for U.S. Waters

Effective management of ocean areas that are not MPAs also contributes to MPA goals of ecosystem and biodiversity conservation. An "other effective conservation measure" (OECM) occurs outside of a protected area, but may nevertheless achieve long-term biodiversity conservation outcomes. Because of these potential benefits, OECMs (such as military exclusion zones or some fishery closures) can make important contributions to MPA networks.

Role of OECMs for Ocean Conservation in the U.S.

In 2008, anticipating the important role of the OECM concept in spatial planning, the National MPA Center published a report on *de facto* MPAs in U.S. waters – areas that were not designated as MPAs, but potentially provide conservation benefits. The report found that approximately 3% of U.S. waters were in such areas, which vary widely in their purpose, size, and level of protection. While OECMs are more narrowly defined than *de facto* MPAs, this review provides a useful starting point for U.S. efforts to identify and report on OECMs and to consider their potential role in improving MPA effectiveness and protecting ecosystem connectivity. The U.S. has not yet developed a comprehensive inventory of OECMs that contribute to MPA networks.

Other Effective Area-Based Conservation Measure

IUCN defines an other effective area-based conservation measure (OECM) as "a geographically defined area other than a protected area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the *in-situ* conservation of biodiversity with associated ecosystem functions and services and where applicable, cultural, spiritual, socio-economic, and other locally relevant values."

Case Study: No Motor Zone for Manatee Protection

Photo: Keith Ramos/USFWS

The Indian River lagoon (including the Banana River) near NASA's Kennedy Space Center is home to one of the largest concentrations of manatees in Florida. These endangered marine mammals have been monitored since the 1970s, and in 1990, NASA closed the area to motor boats to minimize disturbance. The Florida Fish and Wildlife Commission manages the area and delineates the boundary of the No Motor Zone with signs. This 10,600 acre open water area is one of the few places in Florida free from motor boats and has become a desirable destination for paddlers and fishermen. Much of the shoreline of this part of the lagoon is within the Security Area of the Kennedy Space Center and Cape Canaveral Air Force Station, and access to the No Motor Zone is limited. The overall trend in the number of manatees in these waters has increased over time, and ranges from 200-300 in the summer to over 1,000 in the spring. Manatees and other marine life in the Indian River Lagoon system have been negatively impacted by poor water quality, which kills the seagrasses they feed on and causes harmful algal blooms, and efforts are underway to address this problem.

Effectively and Equitably Managed MPAs

Well-managed MPAs are those that achieve the conservation outcomes, goals, and objectives in their management plans. Most MPAs in the U.S. have management plans with goals and objectives. However, the diverse range of federal, state, territorial, tribal, and local MPAs and programs each measure effectiveness differently, making it difficult to derive a regional or national picture of MPA effectiveness.

For example, even within the federal government, MPA programs use different mechanisms to measure management effectiveness and adapt their management to environmental, policy, and socioeconomic changes. NOAA's National Marine Sanctuary System produces condition reports to assess the condition and trends of the resources found in each national marine sanctuary. Condition reports also identify drivers and pressures on target resources, trends for resources and ecosystem services, and existing management responses to pressures.

Other federal agency-level examples implemented nationally or at the site or ecosystem levels include the inventory and monitoring programs of the U.S. Fish and Wildlife Service and the National Park Service, which select indicators to represent the overall health or condition of protected area resources, including some socioeconomic indicators such as human values.

There are many opportunities for public involvement to help ensure equitable management of MPAs in the U.S. For example, federal and state legislation (the National Environmental Policy Act and state counterparts to this law) requires agencies to assess the social and economic impacts of a proposed action, including different alternatives, during MPA designations and the development of management plans, and to provide for public comment. This process ensures that social and economic impacts are considered explicitly before management decisions are made. Some MPAs have taken the additional step of establishing citizen advisory councils that meet regularly and advise agencies on aspects of MPA management. Other programs have worked with local communities to create "friends" groups for specific MPAs that conduct education, stewardship, and fundraising activities. As the U.S. population becomes more diverse, there is an increased need to reflect this diversity in the audiences who experience and benefit from our public lands and waters.

Channel Islands National Marine Sanctuary, Channel Islands National Park, and the state of California cooperate to monitor marine resources. Photo: Donna Hendricks

Improving Management Effectiveness in U.S. MPAs

Among the key opportunities for U.S. MPAs in addressing management effectiveness are:

- Standardizing and routinely applying management effectiveness assessment tools among national and state level MPA agencies.
- Synthesizing management effectiveness data to provide more regional and national scale pictures of key accomplishments, gaps, and challenges, and acting on those findings.
- Increasing the integration of social science to address issues such as human uses and values of MPAs, and overcoming barriers to gathering this information.
- Integrating climate change adaptation into management planning and providing additional tools that can be quickly implemented to address climate impacts (e.g., such as through dynamic management measures or through inter-agency or international partnerships).
- Ensuring more effective public communication about how MPA management is conducted and its goals are being achieved.

A researcher at San Francisco Bay National Estuarine Research Reserve gathers weather and water quality monitoring data to better understand estuarine systems nationwide. Photo: Matt Ferner/San Francisco Bay NERR

National Park Service diver studies coral health in Virgin Islands National Park. Photo: NPS

Integrated MPAs in the Wider Seascape

MPAs are not "islands" operating in isolation from their surroundings. Instead, many are integral components of a complex and dynamic seascape of physical and ecological processes and management jurisdictions supporting an expanding suite of ocean uses. For example, many MPAs contribute to nearby connected ecosystems and to the services they provide (e.g., fishing) through the dispersal from the site of larvae and spillover of adults of ecologically and/or economically important species. Conversely, many MPAs, and the valued resources they protect, are impacted by human activities originating far beyond their boundaries (e.g., energy development or pollution from adjacent watersheds) or by those that intermittently transit through the sites (e.g., shipping). As a result, MPAs in the U.S. and worldwide are integrated into the fabric of ocean management on geographic scales that reach beyond their individual local physical footprints, management priorities, or authorities.

Case Study: Slower Ships and Safer Whales

The U.S. West Coast hosts 293 federal and state MPAs located in some of the nation's most productive and heavily used waters. The confluence of whale feeding habitats and heavy shipping traffic led NOAA's Office of National Marine Sanctuaries to collaborate with the shipping industry and the U.S. Coast Guard to develop voluntary vessel speed reductions to limit ship strikes on blue, humpback, and fin whales in seasons of peak abundance. Additionally, slower speeds reduce ocean noise and decrease greenhouse gas emissions. Managers of Greater Farallones, Cordell Bank, Monterey Bay, and Channel Islands national marine sanctuaries used outreach to the shipping industry, annual report cards, and public recognition of successes to generate and celebrate cooperation among participating shipping companies. A related program, Blue Skies/Blue Whales, provided modest monetary incentives to companies to reduce vessel speeds, leading to higher levels of cooperation. This innovative initiative highlights how MPAs can leverage public-private partnerships with key user groups to enhance the conservation of important natural resources both within and beyond their boundaries.

Several national marine sanctuaries are working with the shipping industry to voluntarily slow ships in areas with high whale concentrations to reduce ship strikes. Photo: Elliot Hazen/NOAA, NOAA Fisheries Permit #14245

Further Integrating U.S. MPAs into Seascape Management

Outside of energy development and other industrial activities, existing U.S. ocean management regimes provide for limited coordination mechanisms for regions and states to share data and consider ocean uses. As place-based management tools that routinely engage local communities, user groups, and stakeholders, MPAs can serve as a trusted, local partner for diverse ocean interests to find practical and equitable solutions to these complex space use issues. Steps that would accelerate this trend include:

- Broadening MPAs' management focus to consider their interaction with and dependence on resources, habitats, and threats outside their boundaries.
- Proactive and sustained effort to build and sustain meaningful, collaborative partnerships with the full range of stakeholder interests in the region.
- Using knowledge of ecological connectivity and marine corridors within regions to help inform broader spatial management plans.

Drakes Bay is part of California's Tomales-Drake Watershed and Greater Farallones National Marine Sanctuary. Photo: Brian Cluer/NOAA

Photo: Matt McIntosh/NOAA

Conclusion

The U.S. has made significant progress in designating and managing MPAs to conserve marine resources, which in turn help to sustain a healthy ocean and the coastal communities. With 26% of the country's marine waters in MPAs, the U.S. exceeds the current United Nations Sustainable Development Goal target and the Convention on Biological Diversity's Aichi Target 11 to protect 10%, and is well on its way to meeting the more ambitious target of 30% ocean protection recommended by scientists and under consideration by the Convention for Biological Diversity. The following strategies would continue to strengthen U.S. marine conservation efforts.

Addressing Climate Change – The design of new MPAs and MPA networks, and the adaptive management of existing ones, requires consideration of the widespread and lasting impacts of climate change on marine ecosystems and species. This relates directly to the design and adaptive management of current and new MPAs. Additionally, the U.S. has an opportunity to mitigate climate change impacts by protecting areas that serve as carbon sinks (e.g., mangroves, salt marshes, and seagrasses), and by managing the carbon stored in marine and coastal habitats, living marine resources, and marine sediment by protecting it from disturbance.

Ensuring Effective MPAs – Sustained, science-based, adaptive management of MPAs is increasingly vital to their success. U.S. MPA programs can increase their effectiveness by sustaining efforts to monitor, evaluate, and adaptively manage our MPAs in a rapidly changing ocean.

Engaging the Public - Many MPA programs are actively involved in community engagement through visitor centers, public education, advisory councils, citizen science, social media, and other efforts. Continuing and expanding on these efforts would continue to build public understanding of the value of MPA networks and their role in sustaining a healthy ocean.

Addressing Spatial Gaps in MPA Coverage - Most of the MPA coverage in the U.S. is in the remote Pacific Islands, providing a high level of protection to coral reef ecosystems and some of the world's most important areas for seabirds, turtles, and marine mammals. However, other regions of the U.S. would benefit from expanded MPA coverage to ensure the continuity of benefits that marine resources provide to coastal communities and economies.

A 2020 Vision

By addressing these outstanding needs, the U.S. can build upon the successful MPA programs in place, and realize the full potential of MPA networks to sustain a healthy ocean and the essential benefits it provides.

[1] Convention for Biological Diversity. 2009. Azores Scientific Criteria and Guidance for Identifying Ecologically or Biologically Significant Areas and Designing Representative Networks of Marine Protected Areas in Open Ocean Waters and Deep Sea Habitats. https://www.cbd.int/marine/doc/azores-brochure-en.pdf.
[2] Convention for Biological Diversity Target 11 Technical Rationale. 2012. https://www.cbd.int/sp/targets/rationale/target-11/.
[3] Partnership for Interdisciplinary Studies of Coastal Oceans. 2007. The Science of Marine Reserves (2nd Edition, United States Version).
[4] Edgar, G., R. Stuart-Smith, T. Willis, et al. 2014. Global conservation outcomes depend on marine protected areas with five key features. Nature 506, 216–220. https://doi.org/10.1038/nature13022.
[5] Magris, R.A., M. Andrello, R.L. Pressey, et al. 2018. Biologically representative and well-connected marine reserves enhance biodiversity persistence in conservation planning. Conservation Letters 11, e12439.
[6] Olds, A.D., R.M. Connolly, K.A. Pitt, et al. 2016. Quantifying the conservation value of seascape connectivity: a global synthesis. Global Ecology and Biogeography 25, 3-15.

www.marineprotectedareas.noaa.gov

The National Marine Protected Areas Center is located within NOAA's Office of National Marine Sanctuaries and works with the Department of the Interior to serve as a resource to all federal, state, territorial and tribal programs responsible for the health of the oceans.