LENFEST OCEAN PROGRAM

A scientific summary
January 2024

SUPPORTING SCIENCE AND COMMUNICATING RESULTS.

New Framework to Assess Marine Biodiversity in U.S. Waters

In a new paper in the journal *One Earth*, an international task force of experts developed a framework to assess the abundance and distribution of marine biodiversity, and applied it to U.S. waters from the near coast to the borders of Exclusive Economic Zone (EEZ).

Why Assess Biodiversity at the National Level?

The astounding array of biodiversity and habitats in our oceans are at the heart of ecosystem health, sustaining a range of essential services to people, from shoreline protection to commercial and recreational fishing, carbon sequestration, and more. However, climate change, extractive industries and other stressors are threatening marine biodiversity. Stemming its loss is essential across management priorities, including the president's commitment to protect 30% of coastal and marine waters by 2030, the White House Ocean Climate Action Plan, and the National Ocean Biodiversity Strategy. But just putting in place more marine protected areas (MPAs) will not make them more effective. The U.S. needs a network of MPAs that are more than the sum of their parts. They should be ecologically representative, foster connectivity between habitats, and consider the dynamic nature of coastal and marine systems.

The biodiversity assessment framework is the basis by which managers and communities can ground regional and local actions in a nationwide knowledge of marine biodiversity distribution. It could be used to continually assess biodiversity over time and at multiple spatial scales to strategically expand protections, evaluate management effectiveness, and foster climate adaptation. The framework is able to inform any mandate or policy that involves area-based management and has the potential to link climate resilience and biodiversity by incorporating improved future species distributions.

Key takeaways from the framework's first application to U.S. waters

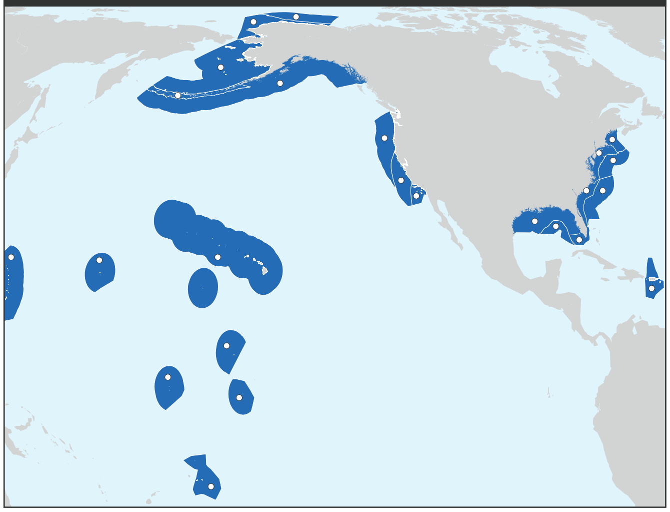
- **U.S. protected areas fail to meet network criteria**, despite 26% of U.S. marine waters being in some form of protection.
- **MPAs vary widely in success across ecoregions.** There are no fully protected areas (FPAs) that are both large and well-connected, and less than two-thirds are in some form of protection.
- **Balancing multiple network criteria is key.** Some regions have lower area coverage but more effective MPAs because they better balance representativity, replication, and connectivity.
- **We likely overestimate protection because of data gaps**, including sparse information from outside of MPAs, oceanic waters (vs. coastal systems), and invertebrate species (vs. vertebrates).

> "Use the framework to effectively protect biodiversity by taking a network approach to MPAs."

Applying the Biodiversity Assessment Framework to U.S. Waters

The framework quantifies indicators of biodiversity (i.e., habitat-forming species, species of conservation concern, harmful organisms, and supporting organisms) across 24 distinct U.S. marine ecoregions, then compares them to the Convention on Biological Diversity's (CBD) five criteria of an effective MPA network.

24 distinct ecoregions



5 criteria of an effective MPA network

- **Important areas** for specific animals or plants
- **Representativity** of a region's biodiversity and habitat types
- **Connectivity** among MPAs
- **Replication** of sites with particular biodiversity components
- **Viability** and **Adequacy** of the size and condition of an MPA to maintain ecosystem integrity

Figure 1

The Marine Biodiversity Assessment Framework

Walk through the main steps of the framework to assess the distribution and abundance of marine biodiversity

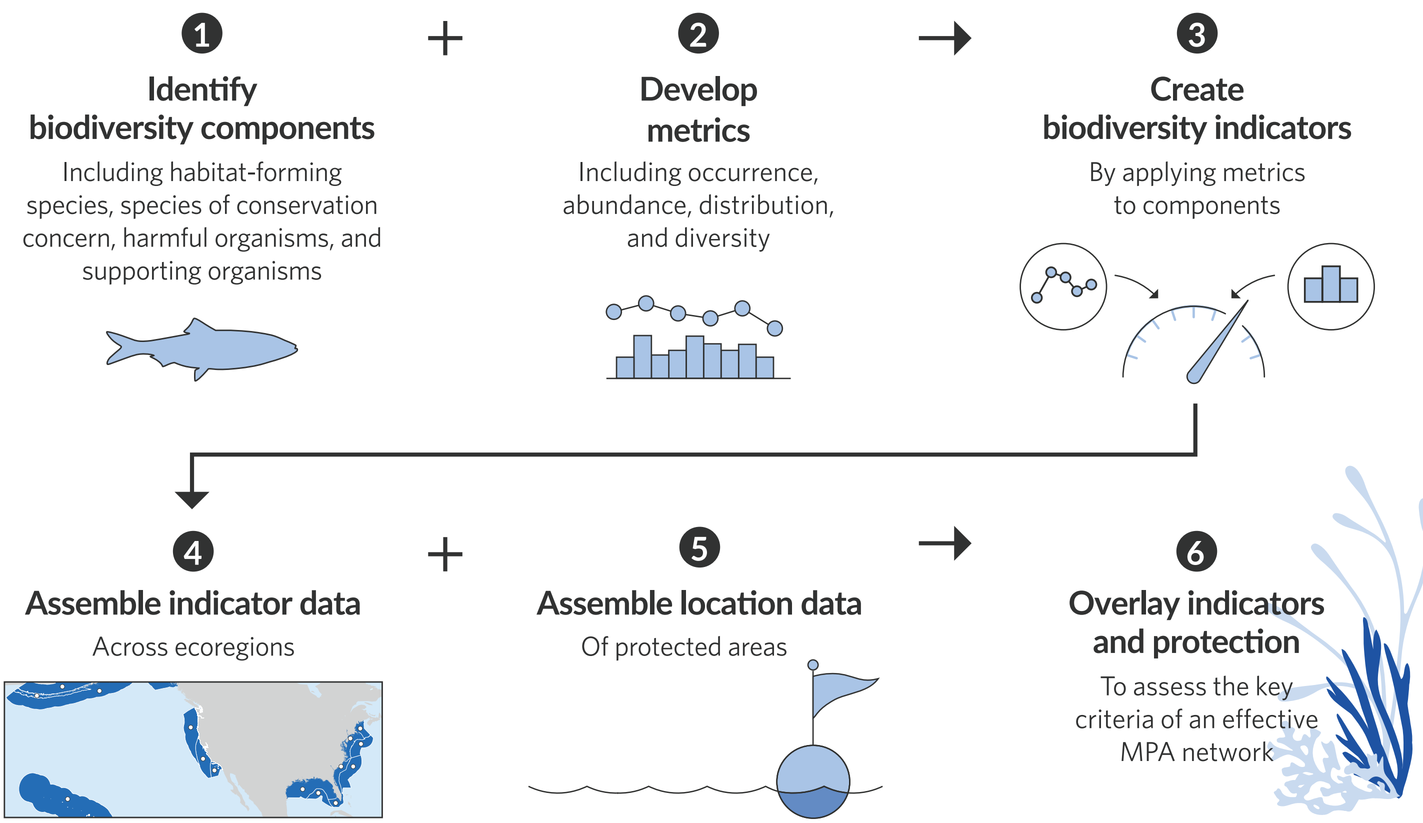
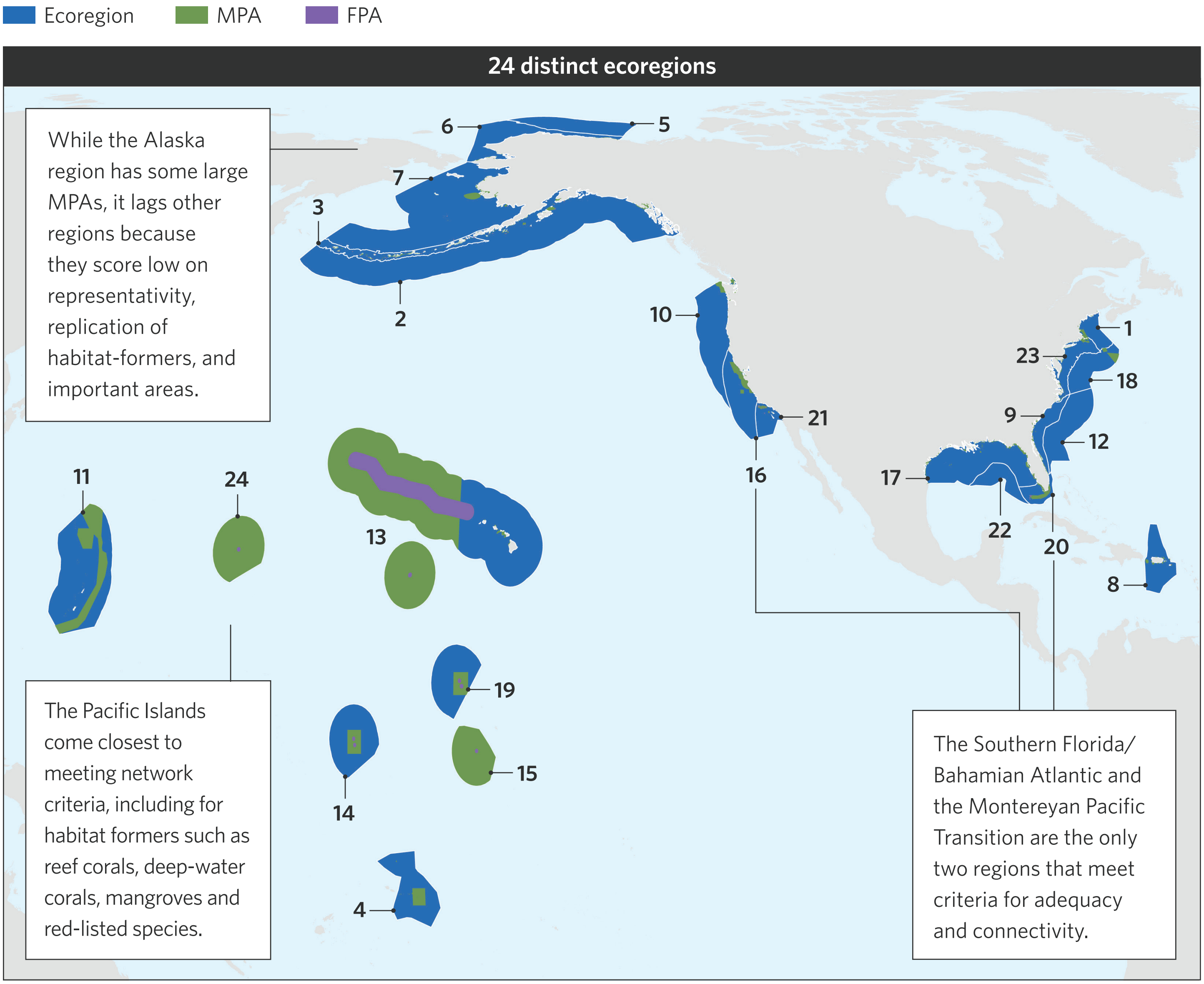


Figure 2

Snapshots from the Framework

Examples from its first application assessing MPA effectiveness against network criteria

Currently, 26% of U.S. waters are in an MPA or FPA, seemingly close to the 30% target. However, this 26% obscures large spatial variations and substantial gaps in which species and habitat types are protected. This underscores the importance of evaluating protections using data on biodiversity and a more comprehensive network criteria.

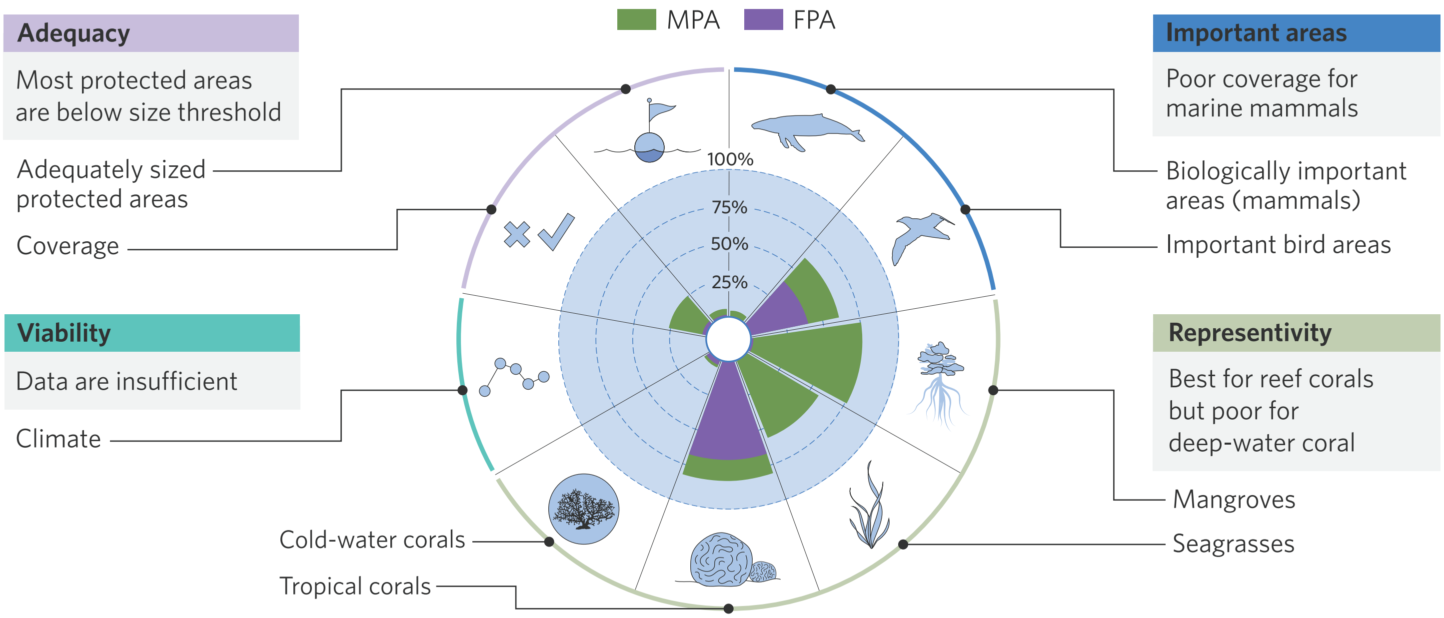


1 Acadian Atlantic	**9** Carolinian Atlantic	**17** Northern Gulf of Mexico
2 Alaskan/Fjordland Pacific	**10** Columbian Pacific	**18** Northern Gulf Stream Transition
3 Aleutian Archipelago	**11** Guam and Marianas	**19** Palmyra Atoll
4 American Samoa	**12** Gulf Stream	**20** South Florida/Bahamian Atlantic
5 Arctic Basin	**13** Hawaiian Archipelago	**21** Southern Californian Pacific
6 Beaufort/Chukchi Seas	**14** Howland and Baker Islands	**22** Southern Gulf of Mexico
7 Bering Sea	**15** Jarvis Island	**23** Virginian Atlantic
8 Caribbean Sea	**16** Montereyan Pacific Transition	**24** Wake Island

Figure 3

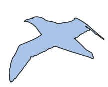
The U.S. MPA Network Falls Short of Effective Protection

Indicators of U.S. marine biodiversity protection assessed across all regions

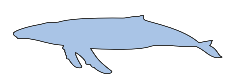


Protection of important areas for birds and mammals is inconsistent

Across the 24 ecoregions, percentage that are in protected waters:



About 60% of important bird areas (IBAs)



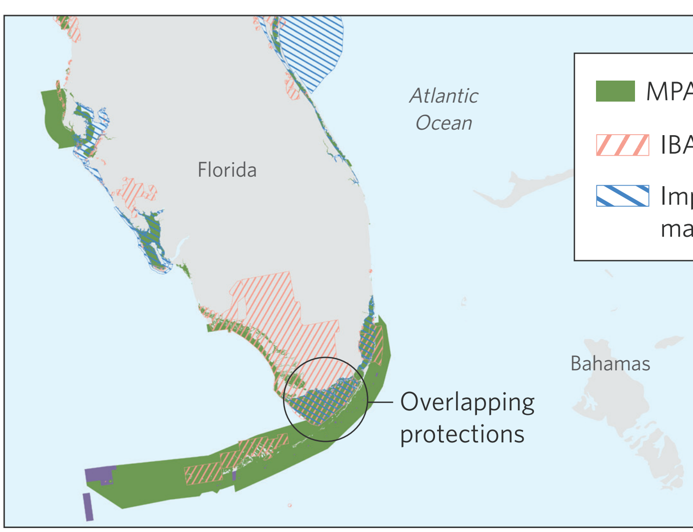
<10% of biologically important areas (BIAs) for marine mammals

South Florida/Bahamian Atlantic

Important areas for both seabirds and marine mammals are best covered by MPAs in the South Florida/Bahamian Atlantic ecoregion, but still have low coverage by FPAs.

Alaska

In contrast, less than 10% of important areas are in MPAs across the five Alaska ecoregions—a major gap given the region's importance to migrating whales and birds, and its vulnerability to climate change.



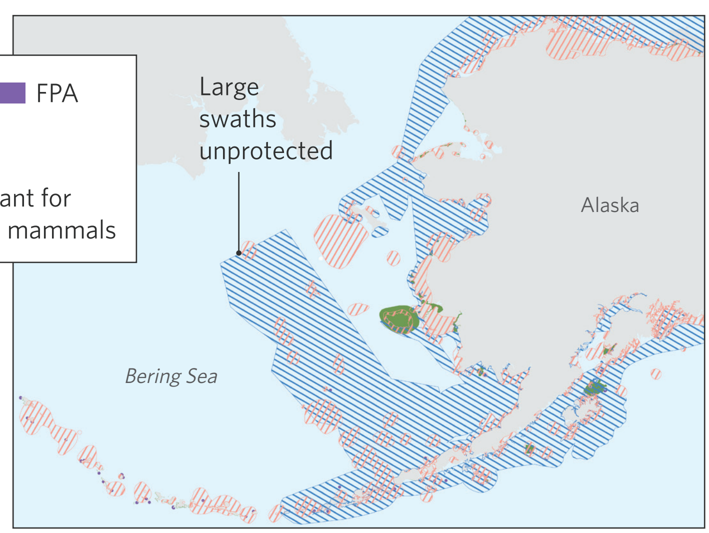
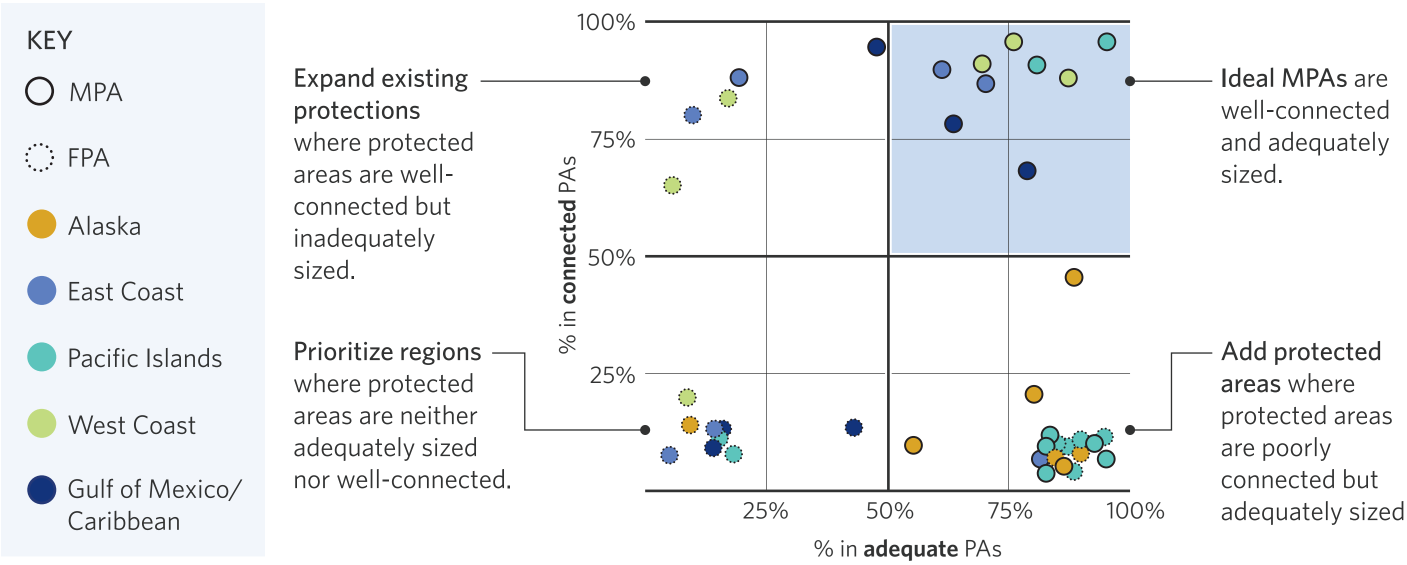


Figure 4

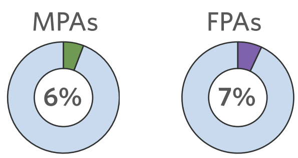
Opportunities for Strategic Expansion of Protected Areas

Indicators of marine biodiversity in MPAs and FPAs reveal how size, adequacy, and connectivity work together, creating opportunities for improvement



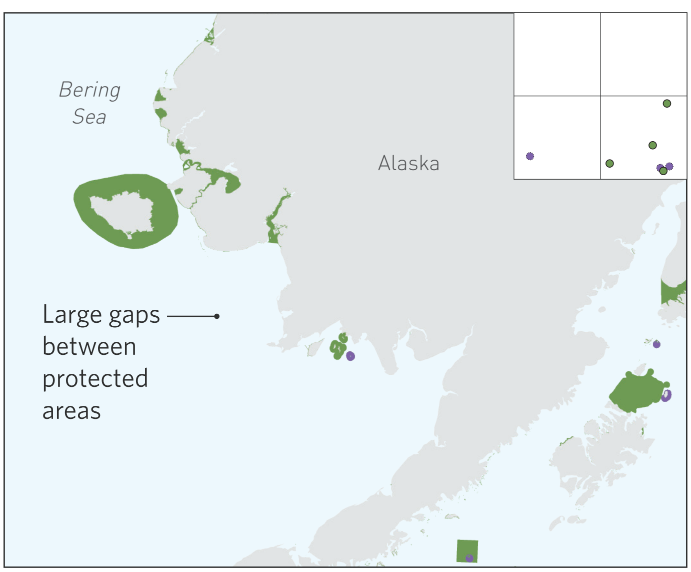
Improving effectiveness by increasing network size and connectivity

In U.S. waters, % of adequately sized protected areas:

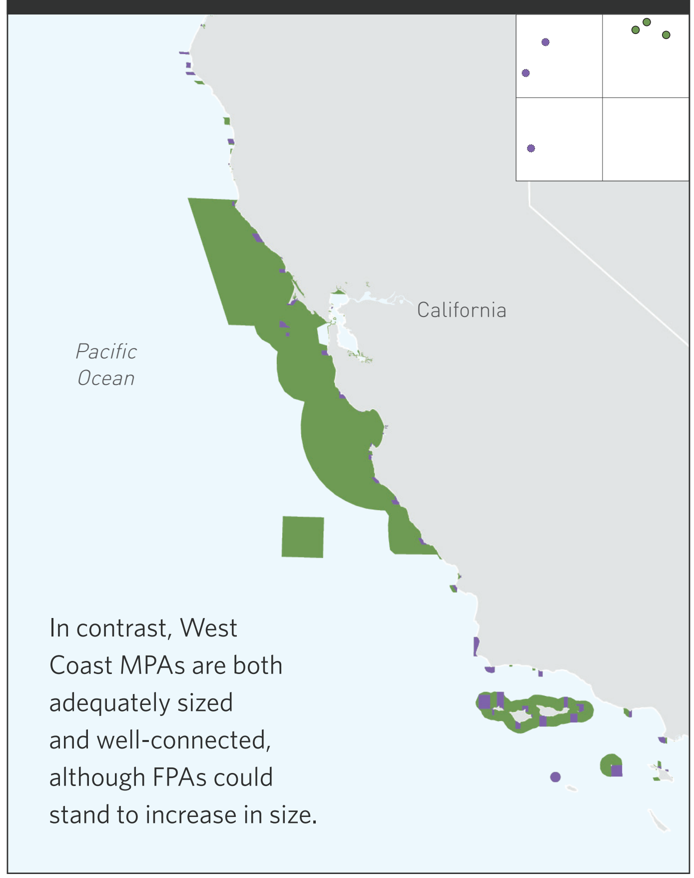


Alaska

Alaskan MPAs are the least well connected, reinforcing the vulnerability of MPAs in this region. In Alaska, connectivity could be increased by designating new intermediate MPAs that decrease the distance between protected areas.



West Coast



In contrast, West Coast MPAs are both adequately sized and well-connected, although FPAs could stand to increase in size.

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CITATIONS

Gignoux-Wolfsohn et al., New framework reveals gaps in US ocean biodiversity protection, OneEarth (2023), https:// doi.org/10.1016/j.oneear.2023.12.014

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