

The Science Supporting 30x30

Nature is in a state of collapse. A million species worldwide face extinction. But we have the tools to create a better, healthier future for our planet – and ourselves – if we act now. In 2016, American two-time Pulitzer-prize-winning biologist and naturalist, E.O. Wilson, published, *Half-Earth: Our Planet's Fight for Life*. In it, he makes the scientific case for a solution to the biodiversity crisis: dedicating fully half the surface of the Earth to nature. A critical step in achieving that goal is protecting 30 percent of global land and waters and 30 percent of ocean areas by 2030 (30x30).

The scientific publications below demonstrate the necessity and value of protecting land, water, and oceans in order to: 1) prevent mass extinctions and promote global biodiversity; 2) defend against climate change impacts by keeping areas like forests, mangroves, wetlands and grasslands that sequester large quantities of carbon intact; 3) facilitate climate adaptation by providing safe havens where wildlife can thrive without other pressures; and 4) ensure that the natural systems on which we depend for food, oxygen and other essential services are sustained.

There are two foundational pieces of scientific literature supporting 30x30:

[The Global Assessment Report on Biodiversity and Ecosystem Services: Summary for policymakers](#), S. Diaz, et al. (2019) *Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services* (IPBES). A critical assessment of the status and trends of the natural world that finds that a million species are threatened with extinction, many within decades, and outlines the social implications of these trends given how dependent we are on thriving and abundant biodiversity and ecosystems. The Report identifies the largest drivers of extinction: changes in land and sea use, direct exploitation of organisms, climate change, pollution, and invasion of alien species, and the actions that can be taken to temper nature's collapse. The Report concludes that expanding and effectively managing protected areas, including terrestrial, freshwater and marine areas, is critical for safeguarding biodiversity and the natural systems we depend on for abundant food, clean water, and other services. Protected areas must be ecologically representative networks of interconnected areas covering key biodiversity hotspots that are safeguarded into the future by enhanced monitoring, enforcement, and stakeholder collaboration.

[A Global Deal for Nature: Guiding principles, milestones, and targets](#), E. Dinerstein, et al. (2019) *Science Advances* 5: 4. The Global Deal for Nature (GDN) calls for 30% of the Earth to be formally protected—and an additional 20% designated as climate stabilization areas—by 2030 in order to save the Earth's biodiversity and conserve the native ecosystems required to remain below a 1.5°C rise in average global temperature. The paper highlights 67% of terrestrial ecoregions that can help meet the land-specific 30% protection goal, identifies protecting and restoring 30% of the world's freshwater ecoregions as a “vital milestone,” and calls for protection of at least 30% of the ocean. The paper makes the case for the GDN as a companion pact to the Paris Climate Agreement, solving “the two major challenges facing the biosphere and all the species within it and result[ing] in a return to safe operating space for humanity.”

Additional literature supporting protecting 30% of our planet's lands and waters, and 30% of our oceans:

General

[A review of evidence for area-based conservation targets for the post-2020 global biodiversity framework](#), S. Woodley, et al. (2019) *PARKS* 25.2: 31-46. The paper reviews scientific evidence on large-scale percentage-area conservation targets and concludes that current targets are not adequate to conserve biodiversity; protected areas need to be high-quality, well governed, and effectively managed; and that global protection of a minimum of 30% and up to 70% or higher of the land, inland waters and sea on Earth is well supported in scientific literature.

Land

[30% land conservation and climate action reduced tropical extinction risk by more than 50%](#), L. Hannah, et al. (2020) *Ecography* 43: 1-11. The authors assess the combined impact on extinction risk of species from limiting climate change and increasing the extent of protected areas in the tropics. They conclude that by limiting climate change to 2°C and protecting 30% of terrestrial areas, we can reduce the aggregate extinction risk for nearly 300,000 species by more than 50% compared with uncontrolled climate change and no increases in protected areas.

[Conservation attention necessary across at least 44% of Earth's terrestrial area to safeguard biodiversity](#), J. Allan, et al. (2019) *bioRxiv* 339977. The authors estimate the minimum amount of land needed to secure important sites for biodiversity, remaining wild areas, and representative areas of species distribution and ecosystems. They conclude that at least 43.6% of terrestrial areas require conservation attention via protected area designations or responsive land-use policies. The authors note that nearly 2% of these critical areas are slated to be lost to intensive land-use by 2030 and thus require immediate protection.

[Targeted expansion of Protected Areas to maximize the persistence of terrestrial mammals](#), S. Mogg, et al. (2019) *bioRxiv* 608992. The authors find that the global community's existing targets for protection (17% of land and 10% of ocean) have limited ecological impact because they are too small and poorly enforced. To assess what is necessary in the future, they focus on terrestrial mammals and reverse-engineer the IUCN Red List criteria to generate area-based conservation targets and spatial conservation priorities for minimizing extinction risk. They conclude that approximately 60% of the Earth's non-Antarctic land surface requires some form of protection and that targets short of this will be inadequate to secure the persistence of the current populations of terrestrial mammals.

Water

[Theory and practice to conserve freshwater biodiversity in the Anthropocene](#), R. Flitcroft, et al. (2019) *Aquatic Conservation: Marine and Freshwater Ecosystems* 29: 1013– 1021. Fresh waters are hotspots of both biodiversity and endangerment. Freshwater ecosystems occupy less than 1% of the Earth's surface but contain as much as 12% of all known species, including a third of all vertebrate species. Populations

of monitored freshwater species have declined 83% between 1970 and 2014. Freshwater species are particularly vulnerable to stressors including diversions, dams, pollution, and changes in temperature and habitat expected from climate change. Simply relying on protection of land areas has been ineffective, and immediate action directed specifically at fresh waters is necessary to prevent extinction and further degradation.

[Protected areas and freshwater biodiversity: A novel systematic review distills eight lessons for effective conservation](#), M. Acreman, et al. (2020) *Conservation Letters*. 13: e12684. A systematic review of 75 case studies regarding the effectiveness of terrestrial protected areas in conserving or restoring freshwater biodiversity found that the absence of measures to specifically address freshwater biodiversity stressors, such as dams, abstractions, habitat degradation, and invasive species was associated with lack of effectiveness. Among the tools for enhancing the effectiveness of protected areas include expanding protected areas to ensure connectivity, including measures specifically targeted at freshwater biodiversity protection in areas designed to protect terrestrial ecosystems, and protecting hydrological regimes, water quality, and riparian vegetation.

[Ecosystem services of wetlands](#), W. Mitsch, et al. (2015) *International Journal of Biodiversity Science, Ecosystem Services & Management* 11: 1-4. Wetlands are recognized as among the most valuable ecosystems on the planet. They stabilize water supplies, mitigating floods and droughts. Wetlands support an extensive foodchain and rich biodiversity, and play a major role in the landscape by providing unique habitats for a wide variety of flora and fauna. Likewise, they are some of the most important carbon sinks and climate stabilizers on a global scale.

Ocean

[IPCC Special Report on the Ocean and Cryosphere in a Changing Climate](#), H. O. Pörtner, et al. (2019) *International Panel on Climate Change (IPCC)*. Since 1970, the ocean has absorbed more than 90% of excess heat in the climate system, and the rate of ocean warming has more than doubled since the 1990s. Dramatic ocean changes are causing widespread shifts in species composition, geographic range, and abundance. Climatic threats compound existing human threats to marine life, such as fishing. The report calls for “timely, ambitious and coordinated action” to address unprecedented changes in the ocean, including networks of marine protected areas that uptake and store carbon and facilitate the adaptation of stressed marine species to their changing environment.

[Effective Coverage Targets for Ocean Protection: Effective Targets for Ocean Protection](#), B. C. O’Leary, et al. (2016) *Conservation Letters* 9: 398-404. The authors find that science strongly supports placing at least 30% of the ocean in highly protected MPAs. Highly protected MPAs provide more benefits per area covered than partially protected MPAs, including greater benefits for habitats and species of conservation concern. MPAs must also be designated in areas with high biodiversity value and have effective management and enforcement.

[No-Take Marine Reserves Are the Most Effective Protected Areas in the Ocean](#), E. Sala and S. Giakoumi (2018) *ICES Journal of Marine Science* 75: 1166-1168. The authors find that no-take marine reserves are by far the most effective type of MPA. Fish biomass in no-take MPAs is 670% higher than in unprotected areas and 343% higher than in partially-protected MPAs. No-take MPAs help restore the entire ecosystem through a chain of positive effects resulting from animal recovery. Effective MPAs also create benefits outside of their boundaries and provide ecotourism, job, and fisheries benefits.

[Evidence that spillover from Marine Protected Areas benefits the spiny lobster \(*Panulirus interruptus*\) fishery in southern California](#), H. S. Lenihan, et al. (2021) *Scientific Reports* 11, 2663. The authors find greater build-up of lobsters within MPAs relative to unprotected areas, and greater increase in total lobster catch in fishing zones containing MPAs vs. those without MPAs. The results show that a 35% reduction in fishing area resulting from MPA designation was compensated for by a 225% increase in total catch after 6-years, thus indicating at a local scale that the trade-off of fishing ground for no-fishing zones benefitted the fishery.