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American Conservation and Stewardship Atlas

Thank you for the opportunity to provide comments on the critical task of assembling a national Conservation Atlas to support the Biden administration's America the Beautiful (AtB) initiative. The mission of The Nature Conservancy (TNC) is to conserve the lands and waters on which all life depends. Founded in 1951, we have over one million members globally, and through collaborative efforts have protected more than 1 billion acres of terrestrial, freshwater, and marine ecosystems worldwide. Despite our successes, the urgency of our mission has grown. We now must address the biodiversity and climate crises over the next decade if we are to achieve our goals.

The time to act is now. With only eight years left before 2030, the actions taken over the next year will determine if the United States meets its conservation goals. We firmly believe that state, territorial and tribal governments along with the public should be engaged in this work up front, and that conservation action should be guided by sound science. We appreciate this opportunity to comment on the American Conservation and Stewardship Atlas (Atlas) and share with you the principles, practices, science and data necessary to sustain the beauty, diversity and benefits of our country's habitats and natural resources.

Urgency and Importance: The twin crises of biodiversity loss and climate change present Americans with an extraordinary challenge. Across our lands, freshwaters and ocean, we are witnessing dramatic declines in species that define our nation and our planet. Our forests, grasslands and aridlands are unable to sustain their native flora and wildlife. Bird abundance has dropped by 29 percent (3 billion) since 1970,[1] and similar declines are apparent for mammals,[2] reptiles,[3] amphibians[4] and insects,[5] including critical pollinators.[6] Half of our large carnivores and ungulates show substantial range contractions[7] and some smaller carnivores seem to be vanishing.[8] Bats have been declining for decades and several species are on the verge of extinction.[9] Freshwater environments are even more vulnerable. Continuous river networks are now fragmented by dams into over 54,000 segments[10] resulting in a loss of more than 90 percent of historic connectivity for the majority of the nation's streams and rivers. Accordingly, freshwater fish, crayfish and mussels are our most endangered species groups.[11] Offshore environments are not faring any better, with multiple whale species declining,[12] puzzling drops in seals, sea lions and sea otters,[13] and the collapse of several groundfish fisheries.[14] Oceanic sharks and rays have declined by 71 percent since 1970.[15]

Habitat loss and degradation is the major driver of biodiversity decline in the United States, exacerbated by resource extraction and climate change.[16] However, there is strong evidence that the declines are reversible if we are willing to make the investments needed in area-based conservation. For example, billions of dollars spent on wetland protection and restoration, combined with improved hunting regulation, have reversed this trend for wetland birds that are now increasing in abundance.[1]

We applaud the administration for its visionary AtB initiative. Conservation and restoration efforts, such as those encouraged by AtB, can be effective at sustaining biodiversity and providing natural benefits for people, but only if they are implemented collaboratively, based on sound science and applied equitably. Our comments below focus on core principles and baseline criteria that we think are essential to consider in developing the Atlas, including key datasets for applying those criteria to our lands and waters. TNC's comments are organized into three sections:

Section 1. Core Principles: to ensure the effectiveness, equity and durability of conservation. This section addresses **guiding question 2**: *How can the Atlas reflect the meaningful conservation work already underway in America?*

Section 2. What Counts: Baseline criteria for evaluating which ownerships, easements, restrictions and activities should count as "conserved." This section addresses **guiding questions 3 and 5**: *What stewardship actions should be considered, in addition to permanent protections, to capture a more complete picture of conservation and restoration in America? How can the Atlas best reflect the contributions of state, local, tribal, territorial and private lands?*

Section 3. Which Lands and Waters: Criteria for identifying which lands and waters provide the greatest opportunities for conservation investment and how those lands and waters should be distributed to sustain biodiversity, natural benefits and equitable benefits for communities. This section addresses **guiding questions 1 and 4**: *What data sources, standards and technical approaches should be applied to data included in the Atlas to ensure that it is an authoritative and useful tool for the public? What are the attributes of lands and waters that should be included in the Atlas?* The section also provides recommendations related to **guiding question 6**: *How can the Atlas best reflect land and water contributions to biodiversity, climate change mitigation and resilience and equitable access to nature and its benefits?*

Section 1. Core Principles

TNC stands ready to support the administration in achieving the AtB goals. Our science-based approach, history of on-the-ground conservation projects and extensive relationships with local communities, partners and decision-makers across all U.S. sectors position us as a leader that can work with stakeholders to implement the AtB vision at scale. The following are core elements, embraced by TNC, that we encourage the administration to consider as foundational in supporting, planning and implementing this critical vision across terrestrial, freshwater and marine ecosystems.

a. Representation, Resilience and Connectivity

To sustain America's iconic biological diversity, we must consider more than just a simple percentage of conserved lands, waters and ocean. Instead, we must look at the diversity and quality of ecosystems represented in conserved areas, as well as the connectivity between and within ecosystems that allows plants and animals to migrate in response to climatic changes

and establish new home ranges. Identifying and conserving areas with greater climate resilience will help ensure long-term success in the face of change. Most importantly, conserved areas should be distributed across all realms (land, freshwater, ocean) and across ecoregions within each realm. Rigorous, peer-reviewed datasets exist to ensure these goals are met and are discussed below.

b. Equity and Inclusion

Conserving and restoring 30 percent of the United States relies upon action by Indigenous, public and private working lands and waters across all realms. These areas must be recognized through strong, transparent, collaborative engagement with tribal and private land- and water-rights owners as well as those at all levels of the public sector. Effective conservation can only be achieved through consultation and engagement with the stakeholders in the lands and waters to be conserved. Such consultation can then lead to the development of technical criteria discussed in Section 2 that define conservation for nature and natural processes, for ecosystem benefits, and for climate mitigation and adaptation that apply across habitats, regardless of their ownership, tenure or use.

Conservation approaches must include attention to diversity, equity, inclusion and justice. Conservation and management efforts led by Indigenous peoples should receive non-negotiable safeguards to ensure the continuation of traditional ways of life and rights, including customary hunting, fishing and gathering practices. Policies that support the creation of tribal conservation areas within tribal nation jurisdictions should be considered. Conservation and management approaches must provide access and avoid unintended impacts to low-income communities, communities of color and overburdened communities.

c. Durability

Durability comes first from the support of local stakeholders in the community. It is critical conservation actions are inclusive and representative of the perspectives and needs of local land and rights owners as well as the larger community. By building partnerships and coalitions to ensure that the needs of local communities are met with durable policies, agreements, sustainable financing, and other forms of institutional support – both public- and private-sector commitments – we can assure sufficient community support will exist or will be generated to achieve conservation commitments. Success in any ecoregion will be highly dependent on local buy-in, addressing policy barriers and opportunities, and available public and private incentives. As areas are prioritized for investment of resources and expertise, these enabling factors must be taken into consideration to position conservation efforts for long-term success.

d. Effective Management

Long-term conservation will not be successful without transparent management goals, measures of success and implementation capacity, including sustainable policies, incentives and support. Conservation purposes and objectives must be made explicit at the outset of undertaking effective management. Consistent outcomes and approaches to measure the success of these efforts will support improvement over time. Conservation areas must have the

appropriate management in place to remain ecologically viable and ensure long-term resilience to climate change.

Not all conservation areas protected from development are fully conserved or managed effectively. Thus, addressing deficiencies in stewardship, increasing active restoration, and mitigating stressors or conservation pressures that originate inside and outside conservation areas will be critical (e.g., land-based sources of pollution in estuarine and riverine habitats). In many cases, this will require coordinating and layering management efforts using multiple authorities and working comprehensively across government levels and agency authorities. The ability to implement public management programs will require sufficient government funding and incentives to leverage private investment.

e. Assuring Adequate Funding

Successful implementation of AtB's conservation, management and restoration efforts will need mechanisms in place to assure adequate funding at a scale that can meet the need. The AtB initiative implementation process should include an examination of 1) an assessment of the financial resources needed to achieve the AtB objectives, 2) how to best use current public and private funding resources to achieve the need, and 3) how to address any shortfalls or gaps by securing new or additional funding resources. Most needed funding for conservation efforts must come from public sources. Domestically, the United States should increase investment at the federal, state, local and tribal levels by 2030 for land, water and biodiversity conservation by considering new and additional investments in resilience and nature-based solutions to infrastructure development.

Private funding can also play a critical role in meeting biodiversity needs. While direct government appropriation funding is essential to support AtB initiatives, creating incentives for private sector conservation action is a critical and complementary financing tool. Numerous current financial and tax policy mechanisms could be used to support such initiatives. Finally, many community and economic development programs exist at the federal, state, and local levels of government which, if structured properly, could also be used to enhance and provide complimentary financial support for AtB objectives.

Section 2. What Counts?

TNC supports a paired approach to conservation that includes mechanisms to protect land, freshwater and marine areas from conversion as well as programs that support stewardship, management and restoration. Both elements are needed to ensure that ecosystem and species thrive across all U.S. territorial lands, ocean and freshwaters. We recognize and support the need for enhanced efforts in at least 30 percent of each realm *where restoring and maintaining functional ecosystems and sustaining species populations is the primary objective*. These efforts should supplement, not supplant, the need for effective conservation and management in other areas given the interconnected nature of natural systems.

Relatedly, AtB acknowledges that restoring ecological conditions is a critical conservation activity. Restoration activities can help replace habitats already lost or degraded to boost biodiversity and address climate adaptation needs and mitigation potential. These activities may occur outside of spatial protection and efforts should be made to incorporate this information into the Atlas. Many of the attributes discussed below can be used in evaluating restoration activities, including legal or policy mechanisms in place to ensure that the restored condition is sustained.

In sum, we strongly support the administration's efforts to characterize conservation along a continuum. We see the Atlas serving as a comprehensive tool with the potential to communicate related but distinct types of information, including progress toward the AtB goal. In addition, the Atlas can place value for broader progress along the continuum conservation, including stewardship and restoration efforts that could go beyond 30 percent.

a. Create a Consultative Process to Define Criteria

The criteria for "what counts" as conserved in this section applies specifically to the 30 percent of each realm where restoring and maintaining functional ecosystems and sustaining species populations is the primary objective. Establishing an initial baseline for evaluating which ownerships, easements, restrictions and activities should "count" in the AtB initiative requires extensive consultation with states, territorial, tribal and local governments and key stakeholders. These stakeholders include land and water rights owners, ranchers, farmers, foresters, hunters, anglers, conservation organizations and Black, Indigenous and People of Color (BIPOC) communities, among others. Such consultations must also be informed by core standards and principles of ecology and cultural considerations. Setting an initial baseline without the benefit of such consultation and expertise would have negative implications for work to advance conservation in the United States.

Establishing a baseline also requires the advice of experts in the full range of those relevant ecological, biological and social sciences. While TNC has science and conservation expertise that will be useful in informing a dialogue about what areas should count toward the AtB goal, the organization believes it is premature to draw lines until representative voices have been heard. It is critical stakeholders have agreed upon the basic criteria and attributes that define conservation lands and waters. This includes how to set a bar for counting newly conserved areas in assessing progress toward the goal and what levels of permanence and commitment to management for ecologically beneficial outcomes are needed to meet the definition of conserved areas.

b. Broad Principles and Recommendations for Representation

TNC urges the administration to focus on principles that could apply broadly to all realms – lands, freshwaters and ocean – and engage the appropriate suite of stakeholders and experts in dialogue about those principles. We support the participation of all concerned parties and the development of many pathways that lead to positive and measurable conservation outcomes over time. Our recommendations focus on the leadership or authority responsible for a specific area of land or water, and our criteria are designed to assess the clarity of its biodiversity

objectives, the strength of its commitments and the presence of the enabling conditions needed to deliver on its commitments.

A key recommendation of Section 3 is that the 30 percent be distributed across all realms and all ecoregions and ecosystems within each realm, so that, collectively, the AtB goal ensures adequate conservation for all terrestrial, freshwater and marine ecosystems. We recognize that the process and authorities determining for how each realm is managed vary widely but we see several common principles that could be shared across realms.

c. Realm-Specific Considerations

We anticipate that while the principles are shared across ecological realms, specific criteria and attributes vary among realms to account for the inherent differences in how we use, manage and regulate our land and waters. Below are specific considerations for each realm.

i. <u>Terrestrial</u>

Rather than propose a specific technical standard such as GAP1, GAP2 or GAP3, TNC instead invites a broader conversation about the criteria for assessing what should be included in the AtB baseline and conservation goals. As such, TNC urges consideration for conservation of public or private lands that have all or most of the following attributes:

a. A clearly defined geographic boundary.
b. A stated and enforced commitment to not convert to other uses for an agreed-upon and ecologically relevant timeframe.
c. Stated conservation objectives to retain or restore native species and communities, manage ecosystems sustainably and keep resource extraction objectives consistent with and secondary to the primary conservation objectives.
d. A written management plan detailing how conservation objectives will be met and monitored.
e. A clearly identified lead (owner/manager/agency/tribal nation) to implement the management plan and fulfill the conservation objectives.
f. Authorities and policies in place, or will be developed, to support and ensure that conservation objectives goals can be achieved and sustained.
g. Adequate (or assurance thereof) funding needed to implement and sustain the conservation management activities described above.
h. A mechanism in place to evaluate effectiveness.

We note several nuances to these base criteria relative to ownership types:

Indigenous lands typically satisfy criteria ***a & f,*** and often meet criteria ***b-e,*** but attributes should be adapted to fit unique cultural and political approaches to conservation and land management while supporting the long-term biocultural health of these lands. TNC expects that portions of some tribal lands will be delineated specifically to qualify as conserved land. A long history of sustainable land management has shown that cultural norms, natural law and

tribal laws can be effective in achieving long-term ecosystem health and should be considered as alternatives to detailed written management plans. Assessing this will take time and will require partnerships with tribes to jointly develop these criteria and determine where land meets the criteria.

Private working lands will be critical to how the administration works toward AtB as efforts to conserve a representative 30 percent require a specific focus on geographies dominated by private lands. Private working lands included in the baseline should meet the criteria listed above, with particular emphasis on how to commit to, and manage for, stated conservation outcomes while maintaining private production benefits. This may be achieved through participation in a sustainability program/certification or a legal agreement such as a conservation easement. Such a plan needs long-term goals and monitoring of conservation outcomes. However, TNC advises transparent and considerable outreach to these communities to determine this framework and develop incentives to encourage landowners to participate and enroll in programs with these clear, ecologically driven aims.

Multiple-use public lands will also play a critical function in achieving the AtB goal. Primarily administered by the Bureau of Land Management and the U.S. Forest Service (USFS), these lands are governed by organic acts that require management consistent with land-health goals. However, the multiple-use mandate of these lands can and often does allow for use activities that are incompatible with conservation objectives. Lands with federal designations that promote the conservation of multiple-use public lands, such as areas of critical environmental concern, national conservation areas, national scenic areas, wilderness study areas, backcountry conservation areas and habitat management areas, may provide the clearest connection to the attributes necessary for inclusion in a baseline. However, in weighing inclusion in a baseline, the administration should carefully consider both the condition of multiple-use federal lands beyond these management designations as well as plausible threats to that condition. After decades of management, multiple-use federal lands currently in good condition and meeting many of the criteria listed above should be identified for inclusion. Others may be good candidates for future investments in restoration or improved stewardship activities that could lead to their inclusion.

TNC recognizes these criteria set forth minimum conditions and encourages the administration to set further ambitious baseline assessment criteria that go beyond ***a-f,*** such as criteria associated with management effectiveness.

Actions to restore ecological conditions are critical conservation activities. However, the existence of such efforts alone would not suffice to count areas with ongoing restoration actions as conserved. To do so, there must be legal or policy mechanisms in place to ensure that the restored conditions are achieved and sustained within a defined geographic area and time period as described in ***a-f*** above.

Recommended Terrestrial Datasets

The administration can facilitate the process of tracking conservation progress by ensuring that the information they collect on the country's conservation areas includes a clear geographic boundary and attributes relating to ownership, intent, conservation objective, type of legal protection, tenure, permanence and management goal. The U.S. Geological Survey's (USGS) Protected Areas Database (PAD-US) is a great starting place, and we support continued efforts to expand the inclusion of state and private conservation lands.

While TNC already contributes information on our fee and easement lands to PAD-US, particularly useful would be the full incorporation of other state and regional conservation datasets, including but not limited to:

- Conservation And Recreation Lands (CARL) in the Great Lakes Atlantic Region;
- California Protected Areas Database (CPAD);
- California Conservation Easement Database (CCED);
- Illinois Protected Natural Lands (I-view);
- Indiana Managed Lands;
- Public Lands for Conservation and Recreation in IOWA; and
- Minnesota Dept. of Natural Resources: State Managed Public Lands.

The Land Trust Alliance and TNC have extensive relationships with land trusts whose properties are not well represented in PAD-US. As it is often hard to understand the conservation intent of a piece of property from the owner or designation, we encourage the managers of this information to develop information about each land parcel that relates to criteria ***a-f***.

ii. Freshwater

TNC applauds the administration for its timely national and global leadership in representing the conservation needs and values of freshwaters as an explicit part of the AtB goal set. Because only a small portion of our rivers and lakes have any formal designation and policies affecting their use and management vary geographically, we recommend that the administration and Interagency Working Group consider an active dialogue or ad-hoc freshwater advisory group with stakeholders to fully develop the methodology and compile the information needed to reflect the conservation status of our freshwater systems in the Atlas.

Tracking the conservation status and its durability for freshwater systems is complex as freshwater systems integrate habitat, connectivity, water quality, biotic composition and flow, each of which is governed, managed and measured differently.[17] The question on "what counts" toward freshwater conservation is also the current subject of global policy dialogue. Several organizations, including IUCN World Commission on Protected Areas and TNC are collaborating with stakeholders to develop a method for tracking progress for freshwater systems consistent with the 30 percent by 2030 goal under the post-2020 Global Biodiversity Framework. This includes a series of workshops in 2022. While the goals of AtB and the post-

2020 framework are not identical, we would welcome the opportunity to learn from the Interagency Working Group's experience and likewise work in close coordination on developing a methodology for tracking freshwater conservation.

As context, an estimated 10-13 percent of inland waters in the United States fall within protected areas. Most often, protection mechanisms and management plans focus on the terrestrial ecosystem and confer limited benefits to freshwater ecosystems and the biodiversity and ecosystem services they support. For example, the location of a river in a national park does not necessarily confer protection for hydrology, species composition, water quality or connectivity. More explicit measures for freshwater protection within existing "terrestrial" conservation areas can dramatically affect our nation's freshwater health. Recent studies show the cost-effectiveness of integrated planning and protection that considers the unique attributes of freshwater ecosystems, including the necessity of watershed-scale approaches.[18]

Considering this complexity, we provide the initial recommendation that freshwaters with most or all of the following attributes should be considered for inclusion in the AtB baseline and conservation goals:

a. A clearly defined geographic scope that accounts for riverine length and/or lake, wetland, floodplain and delta area.
b. A legal commitment or congressional designation to manage and conserve for an agreed-upon and ecologically relevant timeframe, a river, stream, natural lake, floodplain or related wetland to improve or preserve the natural freshwater environment to a reasonable degree.
c. A legally recognized or otherwise approved management plan detailing how conservation objectives regarding freshwater resources will be met and monitored for an agreed-upon timeframe. This includes ensuring that resource conversion or extraction activities are consistent with conservation objectives
d. A clearly identified lead (federal, state, territorial, tribal) to implement the plan and fulfill conservation objectives.
e. Adequate authorities (legal, policy, cultural) to meet and sustain conservation objectives.
f. Sufficient funding (or assurances thereof) needed to accomplish and sustain the conservation objectives described in the management plan.
g. A mechanism in place to evaluate effectiveness.

Management Plans: Effective management mechanisms for freshwater ecosystems should consider five key ecological attributes – hydrology, water quality, connectivity, biotic composition and habitat – and be customized to achieve stated freshwater conservation objectives. These key attributes preserve ecological function, and their conservation can be achieved by a combination of designations, legal protection, habitat conservation and other mechanisms described above that vary in permanence and effectiveness. Importantly, freshwater protection needs to include mechanisms beyond the classic area-based approach and include policies and practices that benefit freshwater ecosystems inside and outside designated protected areas. Additionally, most freshwater systems will require restoration.

Protocols for restoring ecological function and monitoring outcomes should be explicit in the management plan and described within the parameters of the designation.

The configuration and diversity of resilient and conserved freshwater ecosystems matters. Section 3 describes TNC's work to map resilience for riverine freshwater ecosystems, and we can share this research and work with others as part of the overall consultation process.

Recommended Freshwater Datasets:
Again, tracking the conservation status of freshwater systems is challenging as rivers integrate habitat, connectivity, water quality, biotic composition and flow, each of which is measured differently. PAD-US, or other land securement datasets listed for terrestrial, are useful for measuring direct habitat or watershed protections (see for example, Abell et al. 2017)[19]. Other spatial designations important to track are:

- Federal Wild and Scenic Rivers;
- Nationwide Rivers Inventory;
- Outstanding National Resource; Waters designation (Tier 3 Antidegradation under the Clean Water Act); and
- Candidate rivers for any of the above.

The first two can identify rivers where fragmentation by dam construction is unlikely to occur. The third prohibits any lasting degradation of the chemical, physical or biological integrity. Additionally, many state and local water policies have a spatial footprint that could be used to map the geographic extent of their influence.

Described further in Section 3., TNC is halfway through a three-year project to identify and map resilient freshwater systems across the continental United States. Within this assessment, two foundational datasets may be useful for the Atlas. One, we used TNC Secured Lands data and the methodology of integrated protection of stream reaches (Abell et al. 2017) to develop a related dataset for the United States. Two, we collated the spatial designations listed above into the database (please see Sect 3.)

iii. Marine

The National Oceanic and Atmospheric Administration's (NOAA) Marine Protected Area (MPA) inventory estimates the cumulative spatial area of marine protection in U.S. waters is close to 26 percent. However, many large offshore marine areas are concentrated in remote areas, leaving the less-remote marine waters under-conserved. Further, not all areas identified in the inventory are defined to protect biodiversity and/or are not effectively managed, representative or resilient. There are also gaps in the inventory of measures implemented under management authorities not primarily focused on biodiversity but having a comparable effect (e.g., Habitat Areas of Protected Concerns, Deep Sea Coral Protected Areas). Area-based fisheries management areas with a conservation focus should be considered for their potential to contribute to the Atlas. Sustainable commercial and recreational fishing activities should be

incorporated into conservation criteria. TNC recommends conservation for estuarine and marine waters that have most or all of the following attributes:

a. A clearly defined geographic scope.
b. A stated and enforced commitment to sustainable management of lands and waters in the catchment for an agreed-upon and ecologically relevant timeframe.
c. Stated conservation objectives to retain or restore native species and communities, manage ecosystems sustainably and keep resource extraction objectives consistent with conservation objectives.
d. A management plan describing how the conservation objectives will be met.
e. A mechanism in place to evaluate effectiveness.
f. A clearly identified lead to implement the plan and fulfill the conservation objectives.
g. Adequate authorities to meet conservation objectives.
h. Mechanisms in place to account for threats and management activities beyond site boundaries that have an adverse impact on the status of the ecological system (i.e., coastal run-off, sewage, or sedimentation stemming from coastal lands).
i. Adequate (or assurance thereof) funding needed to implement conservation management described above.

While the above criteria provide a starting point, coastal and marine systems can present some unique challenges to spatially based conservation. The following considerations should be discussed during the development of the Atlas and identification of sites:

a. The multi-dimensional nature of marine ecosystems places limitations on area-based conservation. Seafloor habitat is a driver for spatial management that does not fully account for water column habitats and temporal variations. For these reasons, management beyond boundaries is important to marine conservation. Finding ways to account for conservation beyond static area designations with set geographic boundaries should be considered.
b. Spatially based marine conservation occurs under multiple authorities with varying requirements in regard to management-plan development and updates. There is value in the way programs such as National Marine Sanctuaries and National Estuarine Research Reserves require formal management plans that are updated regularly. At the same time, there should be ways to account for official actions having clear conservation value under different authorities (e.g., Habitat Areas of Particular Concern) with less formal management plan structure. Either approach requires adequate investment to complete timely reviews.
c. While measuring the effectiveness of conservation is important, the remoteness and size of some marine protection areas can make consistent monitoring challenging and expensive. How to address these challenges should be accounted for in evaluating potential areas.
d. U.S. ocean management is entirely within the public realm through overlapping state, territorial and federal agencies and authorities. How these authorities are or could be applied in an area will be critical for assessing how to address threats to biodiversity in a

manner that addresses climate adaptation needs and mitigation potential. In developing the Atlas, mechanisms to account for and evaluate the impact of these overlapping authorities should be considered.

Recommended Marine Datasets:

- NOAA's Marine Protected Area Inventory (https://marineprotectedareas.noaa.gov/dataanalysis/mpainventory)
- The MPA Guide (https://mpa-guide.protectedplanet.net)
- Protected Seas Navigator (https://protectedseas.net)

Section 3. Which Lands and Waters?

TNC recognizes that sustaining the United States' biological diversity requires more than just the conservation of a specific amount of area. Arguably, how conserved lands and waters are distributed across the country is even more fundamental to achieving the objective. Specifically, as the administration makes additional conservation investments, it must consider the types and distribution of ecosystems represented within the conserved areas, the functions and services provided by those areas, and the connectivity between areas needed to facilitate migration between plants and animals' current and future ranges under climate change.

This section addresses **guiding questions 1 and 4,** and touches on **question 6**:

- *What are the attributes of lands and waters that should be included in the Atlas?*
- *What data sources, standards, and technical approaches should be applied to data included in the Atlas to ensure that it is an authoritative and useful tool for the public? How can the Atlas best reflect land and water contributions to biodiversity, climate change mitigation and resilience, and equitable access to nature and its benefits?*

Core Principles: We strongly advocate that the AtB targets and actions adhere to six core scientific principles of conservation biology, supported by the Atlas:

a. **Represent all realms**: terrestrial, freshwater and marine.
b. **Represent all ecological regions and native ecosystem** types (within realms).
c. **Anticipate climatic change**. Focus on resilient sites and maintain or create connectivity between sites and to allow for adaptation.
d. **Maximize carbon sequestration**: and
e. **Maintain, restore, or enhance ecological function**, ecosystem services and population viability.

We discuss each principle separately below and suggest datasets that we have found useful for mapping and tracking this theme in the United States.

a. Represent all Realms

We urge the Atlas to give equal attention to all three realms: terrestrial, freshwater, and marine. Each realm has a distinct biota and a distinct set of cycles and processes that underpin its ecological coherence, but they are all interconnected. When conservation strategies consider and address those interconnections, ecological viability and durability are more likely to be secured, and there will be cost efficiencies through applying such a whole-systems approach.[17] Further, we must develop cohesive conservation strategies that work across geopolitical boundaries, agency authorities and socioeconomic realities where the realms are often intertwined. By coordinating planning, protection, restoration and management efforts, and applying the principles of representation and resilience to the network of conserved areas, we can ensure the United States' full range of plant and animal species have suitable habitat now and in the future.

b. Represent all Ecological Regions and Native Ecosystem Types (within Realms)

To ensure that conservation encompasses all of the United States' environments, habitats, wildlife and plants, a good starting point would be to distribute the conserved areas among ecoregions (roughly 30 percent per ecoregion). Ecoregions are relatively large areas of land or water that contain characteristic and geographically distinct assemblages of natural communities and species. For example, the TNC terrestrial ecoregions divide the United States into 68 physiographic regions such as the Central Appalachians, Northern Tallgrass Prairie and California Central Coast. Ecoregions maps and schemas are internally consistent and form a sound base for measuring representation.

The U.S. terrestrial ecoregions defined and used by TNC are based on the geographic subsections developed by USFS (continental United States) and USGS (Alaska). The U.S. Environmental Protection Agency and USGS have also developed an ecoregion map of North America in conjunction with nine Canadian and Mexican agencies. TNC has developed a portfolio of conservation sites representing intact habitats, rare species populations or exemplary natural communities for all the TNC terrestrial ecoregions.

Freshwater ecoregions developed by the World Wildlife Fund (WWF) Conservation Science Program was done in partnership with TNC and 200 freshwater scientists from institutions around the world. This framework is widely used for freshwater planning.

Marine ecoregions of the world were defined in Spalding et al. (2007) and marine ecoregions for North America have been developed by an international team of scientists led by McGill University for the Commission for Environmental Cooperation. These are incorporated into many marine planning efforts and were considered in NOAA's report *Representativeness of Marine Protected Areas of the United States*. In coordination with multiple partner organizations, TNC has developed marine assessments for a majority of U.S. estuarine and marine waters with conservation portfolios related to seafloor habitats, coastal habitats and offshore migratory species that could help inform the development of the Atlas.

Ecoregions: Recommended Datasets

- The Nature Conservancy. 1999. Terrestrial Ecoregions of the United States
- Bailey et al. 1994. Ecoregions and subregions of the United States (map). Washington, DC: USDA Forest Service
- Cleland et al. 2007. Ecological Subregions: Sections and Subsections for the conterminous United States. U.S. Department of Agriculture, U.S. Forest Service
- Environmental Protection Agency. 013. Level III Ecoregions of the Continental United States
- Abell et al. 2008. Freshwater Ecoregions of the World
- Spalding et al. 2007. Marine Ecoregions of the World
- Wilkinson et al. 2009. Marine Ecoregions of North America
- NOAA. 2015. Representativeness of Marine Protected Areas of the United States

Terrestrial Ecosystems: Recommended Datasets

- Anderson et al. 2021. Geophysical Settings of the U.S. TNC
- Horton et al. 2017. US Geological Survey State Geologic Mapping Compilation
- Natural Resources Conservation Service 2014a. SSURGO
- Natural Resources Conservation Service 2014b STASGO
- Chaney et al. 2019. POLARIS
- LANDFIRE Remap 2016 Biophysical Settings of CONUS. Earth Resources Observation and Science Center, U.S. Geological Survey. (And counterparts for Alaska and Hawaii)
- U.S. Geological Survey Gap Analysis Program, 20160513, GAP/LANDFIRE National Terrestrial Ecosystems 2011: U.S. Geological Survey, https://doi.org/10.5066/F7ZS2TM0.
- U.S. Geological Survey. 2019. National Land Cover Database for the conterminous U.S. State and Regional Datasets
- Ferree C. and Anderson, M.G. 2015. A Terrestrial Habitat Map for the Northeastern United States and Atlantic Canada. Report and dataset. TNC
- California Department of Forestry and Fire Protection. 2004. Wildlife Habitats: Multi-Source Land Cover Data. Statewide and county maps

Freshwater Ecosystems: Recommended Datasets

- McManamay and DeRolph. 2018. A stream classification system for the conterminous United States.
- Olivero, A.P and M.G. Anderson. 2008. Northeast Aquatic Habitat Classification System. Report and datasets TNC
- Olivero Sheldon, A., et al.2015 A Stream Classification for the Appalachian Region. Report and dataset. TNC
- McManamay et al. 2018. A stream classification system to explore the physical habitat diversity and anthropogenic impacts in riverscapes of the eastern United States

Marine Ecosystems: Recommended Datasets

- Greene et al. 2010. The Northwest Atlantic Marine Assessment Phase I: Species, Habitats and Ecosystems. Report and datasets. TNC

- Anderson et al. 2011. The Northwest Atlantic Marine Assessment Phase II. Identifying Conservation Areas in the Northwest Atlantic Marine Region. Report and datasets. TNC
- Conley et al. 2017. The South Atlantic Bight Marine Assessment. Report and datasets
- Beck et al 2000. Identifying Priority Sites for Conservation in the Northern Gulf of Mexico: an Ecoregional Plan. Report and datasets. TNC
- Gleason et al. 2003. Southern California's Marine Ecoregional Assessment. Report and datasets. TNC
- Gleason et al. 2006. Northern California Marine Ecoregional Assessment. Version 1.1, Report and datasets. TNC
- Popper and Vander Schaff. 2013. The Pacific Northwest Marine Ecoregional Assessment. Report and datasets. TNC
- Schill et al. 2021. Regional High-Resolution Benthic Habitat Data from Planet Dove Imagery for Conservation Decision-Making and Marine Planning
- Chollett et al. 2022 (in review) Incorporating Uncertainty and trade-offs when prioritizing the protection of coral climate refugia

Within an ecoregion, conserved areas should be further distributed across ecosystem types derived from a classification of major habitats or from geophysical properties that underpin the distribution of vegetation types such as soil, geology and elevation. TNC has helped establish an approach to representation known as Conserving Nature's Stage. The idea is to ensure the representations of all ecosystems under both current and future climates by representing the geophysical gradients that underlie current patterns of diversity. We encourage the Atlas to assess ecosystem representation based first on enduring geophysical properties using consistent national datasets, and then by current habitats, ecological systems or vegetation types using a variety of sources for which the highest resolution and most trusted sources are often at the state or regional level.

c. Anticipate Climate Change: Focus on Climate-Resilient Sites and Maintain Connectivity between Sites and to Allow for Adaptation

As climate change drives shifts in species, ecosystems, and biomes, conservation plans based on current biodiversity patterns will become less effective at sustaining species and natural processes over the long term. In particular, the current configuration of protected areas may fail to adequately provide access to diverse climatic conditions needed for species and populations to persist amid changing regional climates. Accordingly, conservation planners have begun to focus on conserving sites with a diversity of local climates and connectivity to allow species to adapt in situ or move to newly favorable areas. The most climate-resilient areas have a high diversity of species/taxa, habitat types, topographic features and microclimates, as well as minimal barriers that restrict adaptive movement of species or ecosystems.

TNC has pioneered the identification of climate-resilient land and waters. In 2021, we completed a decade-long project to identify and map a representative resilient and connected network (RCN) of sites to sustain the diversity of the United States. The RCN covers 34 percent

of the conterminous United States, 42 percent of Alaska and 35 percent of Hawai'i, making it an ideal foundational dataset for AtB. TNC engaged 289 professional scientists and conservationists to develop and review the results through 15 geographically specific steering committees. The steering committees included staff from six federal agencies, 17 state agencies, 22 non-governmental organizations, 17 universities, 8 natural heritage programs and 50 TNC offices. The methods, results and underlying approach have been described in five peer-reviewed journal articles and 15 geographically specific reports reviewed by the steering committees. The reports, articles and authoritative datasets are all publicly available through TNC's Center for Resilient Conservation Science (https://crcs.tnc.org)and Conservation Gateway websites (https://nature.org/climateresilience)

The RCN and its component datasets have been incorporated into a public web tool, the Resilient Land Mapping Tool (https://maps.tnc.org/resilientland), that allows users to generate statistics on resilience, connectivity, biodiversity and carbon for any land in the United States.

Terrestrial Climate Resilience and Connectivity: Recommended Datasets

- A Resilient and Connected Network for Sustaining Biodiversity under Climate Change in the U.S. Description: A connected network of climate-resilient sites and linkages representing all ecoregions and ecosystems of the U.S. and designed to sustain biodiversity under climate change. TNC
- Resilient Sites for Terrestrial Conservation in the U.S. Description: Representative climate-resilient sites with high topoclimatic diversity and low levels of human modification that provide species with connected, diverse climatic conditions. TNC
- Connectivity and Climate Flow for the U.S. Description: Connecting linkages and climate flow zones sustain regional connectivity to support dispersal, gene flow, and range shifts. TNC
- Sites with Recognized Biodiversity Value in the U.S. Description: Sites with recognized biodiversity value (rare species, intact habitat, exemplary communities) based on TNC ecoregion-based assessments and/or state wildlife action plans. TNC
- Resilient Coastal Sites of the US. Description: Coastal sites with available migration space and intact processes to allow tidal habitats to persist through landward migration and establishment. TNC (available as individual datasets for Northeast, South Atlantic, Gulf of Mexico, Alaska and Hawaii)

Freshwater Resilience: Recommended Datasets

TNC is halfway through a three-year project to identify and map resilient freshwater systems across the continental United States. The project uses data from multiple sources to assess the longitudinal connectivity, physical diversity, water provisioning and condition of every stream reach and functionally connected river network in the continental United States. Additionally, the project is assembling a dataset of streams, rivers, lakes and ponds that have been recognized for their biodiversity value through a TNC freshwater ecoregional plan, a state wildlife action plan, or by NatureServe and the Natural Heritage Network.

Results will be released as authoritative datasets by the end of 2022 and are also being incorporated into a web tool that is currently being designed and tested. We anticipate that the results will become the foundation of TNC's conservation of freshwater systems in the United States, and we hope they will be of value to the Atlas as foundational datasets for freshwater systems.

Anticipated November 2022

- A Resilient and Connected Network for Sustaining Freshwater Biodiversity under Climate Change in the U.S. Description**:** A connected network of resilient river systems representing all ecoregions and ecosystems of the U.S. and designed to sustain biodiversity under climate change. TNC
- Resilient Networks for Freshwater Conservation in the U.S. Description: Representative climate-resilient river networks with high linear connectivity and above average conditions that provide species with connected, diverse climatic conditions. TNC
- Freshwater Systems with Recognized Biodiversity Value in the U.S. Description: River and stream networks with recognized biodiversity value (rare species, intact habitat, exemplary communities) based on TNC ecoregion-based assessments and/or state wildlife action plans. TNC

Foundational Datasets for Freshwater Resilience Assessment

- National Anthropogenic Barrier Databases 2012 (ScienceBase) (Cooper et al. 2017) enhanced by the Southeast Aquatic Resources Partnership (SARP), and TNC.
- USGS National Hydrography Dataset (NHD+ high resolution) 2020
- USGS. NHD, Watershed Boundary Dataset (WBD).

Marine Resilience and Biodiversity

Climate change is altering the temperature, chemistry, currents and cycles of the ocean and coastal systems. In response, species are moving – colonizing new areas, abandoning unsuitable habitats and altering their migratory pathways. The ocean's physical structure underlies many existing biodiversity patterns and is likely to continue influencing species distributions under future climate scenarios. Development of the Atlas should include efforts to understand climate impacts on ocean, coastal and Great Lakes systems. It should then use the information to identify connected network of conservation areas that will accommodate climate-related shifts and conserve and restore future potential habitat (i.e., inundated coastal areas). NOAA's Climate and Fisheries Initiative is an example of ongoing work that leverages the expertise of multiple NOAA line offices to enhance ocean modeling and build the decision support system needed to better incorporate climate considerations into management decisions.

Based on TNC's experience in ocean conservation, the following information should be considered when identifying resilient coastal and marine areas:

- Coastal habitat ability to migrate with sea-level rise.
- Species shifts resulting from temperature increases and other climate conditions.

- Geomorphological components that bring habitat resilience with a changing climate.
- Connectivity, including larval connectivity and key migratory pathways.
- Metrics that describe a dynamic system, including species aggregations and features, both at the seafloor and throughout the water column, that support those aggregations.
- Persistent patterns, seasonal and interannual variability and trends over time. Projections, with model and scenario uncertainties, to determine how likely is an area to change.

While efforts to build the Atlas should move forward with readily available information, the ability to identify resilient coastal and marine areas would benefit filling key data gaps:

- **Seafloor mapping and habitat characterization.** The most recent progress report of the Interagency Working Group on Ocean and Coastal Mapping found that 54 percent of U.S. ocean, coastal, and Great Lakes waters are unmapped. Ensuring representative ecosystems are conserved requires characterization of habitats. The NOAA-led Southeast Seafloor Mapping effort provides an example of how this collaboration could move forward.
- **Biological data.** Current shifts in species distribution are driven by shifts in food sources. Increased zooplankton and forage fish data would help evaluate trophic connections and climate shifts.
- **Oceanographic data.** There are many oceanographic datasets available, but few interpret the information to determine what features drive species aggregations, relative importance of areas, or shifts related to climate change.

a. Maximize Carbon Sequestration

There have been significant improvements to map and estimate carbon. Several high-resolution datasets now exist for the continental United States that provide rigorous, data-based estimates of current carbon stock, estimated sequestration and potential gains from restoration for land-based carbon. The above datasets can be viewed at https://maps.tnc.org/resilientland.

Natural climate solutions refer to conservation, restoration and improved land management actions that increase carbon storage or avoid greenhouse gas emissions. Combined with innovations in clean energy and other efforts to decarbonize the world's economies, natural climate solutions offer some of our best options in the response to climate change. TNC-led research done with 15 other institutions demonstrates that nature-based solutions can provide up to 37 percent of the emission reductions needed by 2030 to keep global temperature increases under 2°C.

Carbon: Recommended Datasets

Forest Carbon

- Williams, C. A., N. Hasler, H. Gu, and Y. Zhou. 2021b. Forest Carbon Stocks and Fluxes from the NFCMS, Conterminous USA, 1990-2010. ORNL Distributed Active Archive Center.

Soil Carbon (upper 20 cm)

- Gu, H., Williams, C. A., Hasler, N., & Zhou, Y. (2019). The carbon balance of the southeastern U.S. Forest sector as driven by recent disturbance trends. Journal of Geophysical Research: Bio geosciences, 124, 2786– 2803. https://doi.org/10.1029/2018JG004841

Reforestation

- The Reforestation Hub, (www.ReforestationHub.org) shows 133 million acres of opportunity in the United States to restore forest cover for climate mitigation.

Blue Carbon

- EPA's annual Inventory of U.S. Greenhouse Gas Emissions and Sinks, coastal wetland information. https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks
- The Smithsonian Environmental Research Center's Coastal Carbon Research Coordination Network maintains the Coastal Carbon Atlas. https://ccrcn.shinyapps.io/CoastalCarbonAtlas

b. Maintain, Restore or Enhance Ecological Function

The success of AtB in sustaining nature in the United States depends strongly on the resilience, distribution, and connectivity between conservation areas. However, the biotic system occurring on the included sites may need restoration or management to ensure they are functioning as natural ecosystems and providing the services needed by people and the rest of nature.

Monitoring and measuring outcomes is a large topic. For terrestrial systems, and to a lesser extent freshwater and marine ecosystems, we refer the Atlas team to the work of the Tracking the Benefits of Natural & Working Lands (NWL) in the United States project led by Lydia Olander, Katie Warnell, and Sara Mason of the Nicholas Institute for Environmental Policy Solutions at Duke University and National Ecosystem Services Partnership.

Monitoring and Measuring Outcomes: Recommended Datasets:

The Tracking the Benefits of Natural and Working Lands team has compiled, reviewed and prioritized over 71 datasets for 12 types of NWL benefits along with additional information about each dataset (extent, resolution, update frequency). The list is available a benefits database organized by benefit; many benefits have multiple potential data sources. The datasets in the database were identified through the experience of the project team in mapping benefits of NWL, scientific literature, online searches and 30 conversations with experts. For freshwater systems, two datasets that could be useful include the National Aquatic Resource Surveys from the EPA (https://www.epa.gov/national-aquatic-resource-surveys) and the National Fish Habitat Action Plan data and associated Multi-species Assessments.

Citations

[1]K.V. Rosenberg et al. 2019. Decline of the North American Avifauna. Science 365(6461).
[2]Y.M. Bar-On, R. Phillips, R. Miloa. 2018. The biomass distribution on Earth. PNAS 115(25): 6506–6511
[3]J.E. Hill, T.L. DeVault, J.L. Belant. 2019. Impact of the human footprint on anthropogenic mortality of North American reptiles. Science Direct.
[4]E. Muths, et al. 2011. The State of Amphibians in the United States, Contribution number 412 of the U.S. Geological Survey Amphibian Research and Monitoring Initiative (ARMI). 4 pp.
[5]M.S. Crossley et al. 2020 No net insect abundance and diversity declines across US Long Term Ecological Research sites. Nature Ecology and Evolution.
[6]F. Sánchez-Bayo, C.A.G. Wyckhuys. 2019 Worldwide decline of the entomofauna: A review of its drivers. Biological Conservation 232: 8-27.
[7]A.S. Laliberte, W.J. Ripple. 2004. Range Contractions of North American Carnivores and Ungulates. BioScience Vol. 54 No. 2.
[8]D. Jachowski, R. Kays, A. Butler, A.M. Hoylman, and M.E. Gompper. 2021. Tracking the decline of weasels in North America. PLoS One. https://doi.org/10.1371/journal.pone.0254387
[9]S.C. Loeb et al. 2015. A plan for the North American Bat Monitoring Program (NABat). Gen. Tech.Rep. SRS-208. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 100 p.
[10]L.L. Master, S.R. Flack, B.A. Stein. 1998. Rivers of Life: Critical Watersheds for Protecting Freshwater Biodiversity. The Nature Conservancy, 71 pp.
[11]Walsh et al., 2011. The Decline of North American Freshwater Fishes, American Currents.
[12]A.M. Magera, J.E. Mills Flemming, K. Kaschner, L.B. Christensen, H.K. Lotze HK (2013) Recovery Trends in Marine Mammal Populations. PLoS ONE 8(10): e77908.
[13]J.A. Estes, D.F. Doak, A.M. Springer, T.M. Williams. 2022. Causes and consequences of marine mammal population declines in southwest Alaska: a food-web perspective. Philos Trans R Soc Lond B Biol Sci. 2009 Jun 27; 364(1524): 1647–1658.
[14]R. Hilborn et al. 2021. Global status of groundfish stocks. Fish and Fisheries. DOI: 10.1111/faf.12560
[15]N. Pacoureau et al. 2021. Half a century of global decline in oceanic sharks and rays. Nature volume 589, pages567–571.
[16]IPBES (2019): Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany. 1148 pages. https://doi.org/10.5281/zenodo.3831673
[17] J. Higgins et al. 2021. Durable Freshwater Protection: A framework for establishing and maintaining long-term protection for freshwater ecosystems and the values they sustain. Sustainability, 13(4); https://doi.org/10.3390/su13041950
[18]C.G. Leal et al. 2020. Integrated terrestrial-freshwater planning doubles conservation of tropical aquatic species. Science, 370 (6512). pp. 117-121. ISSN 0036-8075
[19]Abell et al. 2017. Unlocking the potential of protected areas for freshwaters. Biological Conservation, 134(1):48-63.