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The Ecological Society of America (ESA), founded in 1915, is the world's largest community of professional ecologists and a trusted source of ecological knowledge, committed to advancing the understanding of life on Earth. The 8,000-member society publishes [six journals and a membership bulletin](#) and broadly shares ecological information through policy, media outreach and education initiatives.

ESA commends the United States Global Change Research Program (USGCRP) and the White House Office of Science and Technology Policy (OSTP) for developing the National Nature Assessment (NNA) and engaging with the ecological community. ESA views these comments as the continuation of a multi-year process of engagement between the ecological community, USGCRP, OSTP and potential users of the NNA.

Of special note in effective engagement with the ecological community are Deputy Director for Climate and Environment, White House Office of Science and Technology Policy, Jane Lubchenco; Director for the National Nature Assessment, U.S. Global Change Research Program, Phillip Levin; and Chief of Staff for the National Nature Assessment, U.S. Global Change Research Program, Tessa Francis.

We appreciate the opportunity to submit these comments on the proposed themes and topics of the first NNA on behalf of our members from the ecological and biological communities. Defining nature and its value to the nation is critical as it strikes at the core of human well-being, national security, economic prosperity and health. ESA wholeheartedly supports the development and use of the National Nature Assessment.

ESA recognizes the NNA's vital role in evaluating the state of U.S. lands, waters and wildlife and the essential benefits they provide. Engaging the scientific community, particularly ecologists, is crucial to ensuring the assessment is scientifically sound and contributes to informed, sustainable and equitable decision-making. Given ecology's goal of advancing our understanding of natural systems, and its interdisciplinary and transdisciplinary character, ESA urges the NNA authors to

incorporate ecology and ecological principles throughout the assessment. ESA is heartened to see so many ecologists among the report's authors.

ESA developed the NNA comments based on input from the ecological science community by conducting outreach to over 30,000 people affiliated with ESA and encouraging ESA members, and non-members alike, to review the NNA draft. Common themes from the responses below are summarized for clarity. There is some intentional repetition and overlap in the ESA comments between chapters. Comments are written under the title of each chapter for ease of reading with no special preference for any one chapter or comment.

1. Whole Document - Outline for the First National Nature Assessment

This assessment, overall, is going to be an invaluable contribution to both the national and also the global goal of assessing, and ultimately remediating, the current state of nature writ large.

Nature, biodiversity, global climate change and human wellbeing are intertwined. In combination with other synthesis reports like the National Climate Assessment, the National Nature Assessment will have the potential to contribute to informed, sustainable decision-making, in the U.S. and beyond. Clear examples and outlines of knowledge gaps will help guide future research and assessment reports.

Defining "nature" is a major challenge for this assessment, given the term's varying interpretations across cultural, political and philosophical dimensions. Addressing this multiplicity of definitions early in the report, and revisiting how nature is being defined throughout, could help address overlapping themes among the chapters. Moreover, a sociocultural and historical perspective, integrating Indigenous and other local knowledge systems, would deepen the report's relevance and inclusivity.

To ensure the cohesion of the entire assessment, authors should consider explicitly drawing connections between their chapter and others in the report. Some chapter outlines already make this clear; the assessment will be much stronger if all do.

In multiple chapters, the draft references co-production with local communities. Given that it is viewed very differently across cultures, co-production and its meaning merits discussion, perhaps in a call-out box. To foster a truly inclusive ecology, discussion of co-production should emphasize the role of marginalized communities, including Indigenous groups, in shaping policies and practices that govern nature access.

In that vein, it is essential to balance the need to make data associated with the assessment publicly available while also respecting the data sovereignty and rights of Indigenous communities, ensuring their consent and protection of culturally sensitive information. Upholding these principles promotes trust and collaboration while recognizing the invaluable stewardship and knowledge of Indigenous peoples.

ESA encourages the assessment authors to list the status and trends of endangered and threatened species listed under the Endangered Species Act, along with their critical habitat, throughout the report when applicable.

The subject of education receives several mentions throughout the draft. Education has a tremendous role to play in instilling knowledge and values, making it vitally important for tackling large societal challenges like the ones outlined in this assessment. For that reason, the report authors might consider highlighting

the roles of educators and/or educational institutions — whether for shaping the public’s understanding of nature, for knowledge co-production, for exposing youth to nature, or any other capacity — in one or more call-out boxes within the assessment.

Referring to the U.N. Sustainable Development Goals throughout the assessment would help contextualize the report within global discussions about sustainability and human wellbeing, enhancing the assessment’s utility.

Finally, expanding authorship to include more individuals from the private and nonprofit sectors would enrich the assessment by adding diverse perspectives.

SPECIAL COMMENT: The Government Accountability Office (GAO) keeps extensive information on multiple federal agencies that manage the nation’s land and water resources. Cross-referencing specific portions of the NNA under federal management by agency would be beneficial in creating management plans to protect and manage these resources.

According to the GAO website, “The federal government owns and manages approximately 650 million acres of land in the United States—about 30% of the nation’s total surface area. Four major federal land management agencies, the Department of Agriculture’s Forest Service and the Department of the Interior’s Bureau of Land Management (BLM), Fish and Wildlife Service (FWS), and National Park Service (NPS)—are responsible for managing about 95% of these lands. Other prominent federal agencies involved in natural resources management include the Bureau of Indian Affairs (BIA), the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Army Corps of Engineers (the Corps).”

2. Nature and Equity in the U.S.

The document effectively outlines the spatial patterns of nature inequity across the U.S., emphasizing the disparity in access to ecosystem services based on race, income and sociodemographic factors. From an inclusive ecology perspective, it is crucial to consider how these inequities not only impact marginalized communities but also exacerbate biodiversity loss and conservation challenges. The emphasis on “nature deprivation” across urban and rural areas and its ripple effects for both human and nonhuman life align well with the principles of inclusive ecology, which advocate for equitable access to nature for all species and communities.

Key Topic 2 (“The historical and contemporary roots of nature inequities”) provides essential context for understanding the current landscape of environmental injustices. In particular, highlighting how the exclusion of non-Western worldviews and management practices has contributed to the mismanagement of natural resources would shed light on the origins of today’s environmental inequalities. The history and geography of natural resources and natural resource extraction could also be relevant to this discussion. Certain flat regions with fertile soils (e.g. the eastern corn plains, great plains, Mississippi delta) were conducive to large-scale agriculture, while others had raw materials like ore and fossil fuels that made them attractive for extraction and development (e.g. northern Michigan, Texas oil and gas fields), setting the stage for current-day inequities.

As the draft notes, data access and transparency serve as crucial tools for knowledge and accountability, enabling communities to make informed decisions and supporting equitable planning and development. However, for transparency to genuinely advance equity, it must be paired with resources like legal and

financial support, as well as capacity-building, to ensure that all local communities can actively and effectively participate in the decision-making process.

Another solution discussed in the chapter outline is the restoration of Indigenous land and stewardship practices, an important and challenging endeavor. Balancing the rights and desires of different groups and setting agreed-upon priorities will require considerable care. Perhaps inspiration for this portion of the chapter can be drawn from the example of First Nations' involvement in development projects in Vancouver, British Columbia (e.g. <https://www.squamish.net/partnerships-entities/partnerships/senakw/>).

ESA hopes the chapter authors will reconsider the use of phrases like “healthy environment” and “healthy nature,” vague terms that can be rephrased to articulate more clearly what is recognized as “healthy.” An ecological approach can be helpful in identifying which environmental components (e.g. composition, function, etc.) are the focus of a given discussion.

Lastly, the authors may want to consider incorporating the ideas of intersectionality, ecopedagogy, imaginal ecology, “two-eyed seeing,” and Indigenous science into the chapter, to highlight how adopting different perspectives or worldviews can promote equity and inclusion.

3. Bright Spots in Nature in the U.S.

Highlighting successes in nature conservation, restoration, agriculture/fisheries/forestry and environmental justice is essential, as it highlights effective strategies, inspires continued efforts and demonstrates that positive change is achievable. This chapter would benefit from acknowledgement that some of the challenges nature now faces in the U.S. are borne out of flawed Western ideologies surrounding conservation and natural resource management. Observing, learning and changing practices have resulted in many of the bright spots referenced.

ESA suggests the following additional examples of bright spots for inclusion in this chapter:

- Indigenous and Indigenous-inspired agricultural practices like Menominee forestry and the Aroostook Band of Micmacs' aquaculture project
- Consumer-oriented labeling initiatives like the Sustainable Forestry Initiative labels
- Restoration of fire regimes and ongoing adaptive silviculture work, such as with America's Longleaf Restoration Initiative
- Increasing co-production of science with land managers, local communities, etc.
- State-level legislative successes like New York's Birds and Bees Protection Act

4. Status, Trends, and Future Projections of Nature in the U.S.

This chapter tackles an immense and complex subject that is nonetheless essential for developing informed, adaptive strategies to protect biodiversity, sustain ecosystem services and address future conservation challenges. The chapter's subject matter presents an opportunity to discuss shifting baseline syndrome, the phenomenon where accepted norms for the condition of the environment decline over time.

ESA implores the chapter authors to include microbial biodiversity in their assessment, given microbes' profound connections to animal and plant health and ecosystem function.

The “other drivers” mentioned in Key Topic 1 (“Status, Trends, and Future Projections of Nature across U.S. landscapes, seascapes, and terrestrial and aquatic ecosystems”) include natural disturbances, phenomena worth considering separately. These disturbances, themselves a part of nature, can be major events altering the trajectories of socio-ecological systems. The chapter authors may want to consider addressing historical disturbance patterns, current responses and projected increases/intensification of disturbances in this section.

Under Key Topic 2 (“Status, Trends, and Future Projections of Biodiversity”), ESA suggests that the chapter consider how efforts to diversify landscapes at varying scales — from residential yards to farms to national forests — could reap biodiversity benefits.

5. Status, Trends, and Future Projections of Drivers of Change in Nature in the U.S.

Another ambitious topic, this chapter on the drivers of change in nature — both direct pressures and underlying causes — will offer a crucial overview of the complex, evolving interactions between human and non-human forces that shape biodiversity, ecosystem processes and human-nature relationships.

For Key Topic 1 (“Historical context for drivers of change”), rather than beginning the discussion of U.S. nature at a point in the distant pre-human past, the chapter authors may want to consider working backwards in time from the present day. This approach would facilitate the framing of modern drivers as operating on a legacy of land use and societal transformations.

Regardless of its approach to chronology, Key Topic 1 should strive to focus on the continental scale of North America, with coverage of global events only where necessary.

The forced removal of Indigenous people had profound consequences for land use and natural resource management. In parts of the U.S., especially prior to major westward colonial expansion, the dispossession and extirpation of Indigenous people was accompanied by a period of land abandonment (spawning American conceptions of wilderness). In addition, Indigenous stewardship was replaced by colonial attitudes toward natural resource use, a major shift in the human-nature relationship. Indigenous knowledge and practices hold great potential for reversing some of the troubling trends in U.S. nature. In this chapter's coverage of this topic, ESA encourages the authors to highlight not only Indigenous stewardship of terrestrial ecosystems, but marine ones, as well.

Under Key Topic 3 (“Trends in drivers of change in nature”), the chapter authors may want to frame trends in terms of space, time and intensity. Many drivers, such as wildfire or economic activity, will vary across these three dimensions. There is growing awareness of the impact of fire suppression on U.S. ecosystems; if the chapter authors produce this topic's proposed Figure 2, they may find fire deficit data available in LANDFIRE useful (<https://landfire.gov/>). Additionally, the authors of this section should carefully consider their use of the terms “nature,” “ecosystem” and “biodiversity,” to avoid confusion and clarify precisely what the scientific evidence supports.

Finally, this chapter outline rightfully includes the topic of invasive species as drivers of change. It will be important to acknowledge the underlying drivers of biological invasion, particularly human movement and global supply chains.

6. Nature and Cultural Heritage in the U.S.

The draft's recognition of intangible cultural heritage is a positive step toward an inclusive ecological framework. The authors should consider further exploring the emotional and spiritual connections that communities, particularly Indigenous peoples and communities of color, have with nature. These intangible connections are foundational to their identity and way of life, yet they are often overlooked in mainstream environmental planning. Integrating these non-material elements into nature conservation could foster more profound ecological stewardship and cultural preservation.

Key Topic 2, "Multiplicity of worldviews concerning nature," is a welcome acknowledgement of the diversity of perspectives on human-nature relationships. It is worth emphasizing that these worldviews intersect and sometimes clash. The chapter authors may also want to consider referring to a "plurality" of world views, rather than a "multiplicity," the former term being preferred by some scholars.

Key Topic 3, "Co-production of nature as a primary manifestation of cultural heritage," is a vital inclusion. The co-production of nature should be framed as an ongoing, dynamic process that involves multiple stakeholders, including those from historically marginalized groups. Highlighting the active role that diverse communities play in shaping and managing ecosystems can help shift the narrative from passive beneficiaries to active co-creators of ecological and cultural heritage. The concept of "biocultural diversity" offers an excellent framework, emphasizing the interconnectedness of cultural and biological systems.

7. Nature and the Economy in the U.S.

Understanding and acknowledging the many linkages between nature and the economy is essential for achieving long-term economic and environmental health. ESA would like to highlight a few considerations with respect to this chapter's coverage of the agricultural sector.

First, while regenerative agriculture practices, such as using winter cover crops, are widely promoted for supporting soil health and other co-benefits, there may be uncertainties surrounding their application. For example, winter cover crops can sometimes be reduced but at other times increase direct emissions of nitrous oxide, a potent greenhouse gas. Additionally, the costs of implementing these practices may be significant. These uncertainties point to a need for more research to better understand the adoption of these practices.

Historic discrimination and continuing inequities in the agricultural sector are worth highlighting in this chapter. The U.S. Department of Agriculture's history of discriminatory practices against growers from marginalized communities has repercussions that are still being felt today. Moreover, some federal grants are only available to land-owners, not renters, a restriction that can create substantial obstacles for tenant farmers wishing to access funding for conservation practices.

8. Nature and Human Health and Well-Being in the U.S.

Human health and wellbeing are connected to nature in complex ways. ESA's only comments for this chapter are to request that the authors consider addressing dietary exposures to pollutants and toxins, and the emerging research on human gut microbiomes.

9. Nature and Risk, Resilience, and Security in the U.S.

Connections between nature, risk, resilience and security underscore how human actions that impact natural systems can have critical societal feedbacks.

Climate change's impacts on risk and resilience will be pervasive, as the draft outline makes clear. Key Topic 1 ("Human effects on nature, risk, and resilience") should address how cold temperatures promote resilience and security and reduce risk in the U.S., for example via frosts that kill pests or via snowpacks that store water. The absence or reduction of these cold conditions is somewhat distinct from the effects of climate change that are driven by heat per se.

The chapter authors may want to consider explicitly highlighting hazard combinations involving infrastructure. For example, the challenges posed by contaminated water following Hurricane Katrina's flooding of New Orleans illustrate the joint hazards of pollution and the built environment during a natural disaster. Similarly, as climate change raises sea levels, inundated and derelict coastal infrastructure will pose a hazard to human safety and navigation, showcasing the interaction of climate change and the built environment.

Under Key Topic 3 ("The relationship between nature and security in the U.S."), ESA encourages the authors to address how pollution, land/water use changes and species extirpations tie into security issues. All three factors can erode vital ecosystem services and food security, leading to conflict, which in turn can further exacerbate pollution, land and water management challenges, and biodiversity loss.

Environmental justice and equity concerns are inseparable from a discussion of nature and societal resilience. The chapter authors should consider the role of formal and informal education in empowering local communities to develop their own resilience efforts.

Lastly, this chapter may present an opportunity to discuss and critique assisted migration, the intentional transplanting of organisms to novel locations in anticipation of/in response to climate change.

10. Nature and Climate Change in the U.S.

This chapter outline on the wide-ranging subject of nature and climate change is comprehensive and well-constructed. It could benefit from deeper exploration and refinement in a few areas.

In Key Topic 1 ("Effects of climate change on nature"), discussion of the abiotic environment should not neglect freshwater ecosystems.

Under Key Topic 2 ("Effects of nature on climate change"), the treatment of forest carbon sequestration would benefit from explicit consideration of below-ground carbon, an often-overlooked carbon pool in forested ecosystems. Compared to above-ground carbon stores in forests, data on below-ground carbon in forests tend to be scarcer and much less robust, presenting an analytical challenge. However, underestimating soil contributions to greenhouse gas exchange risks drawing inaccurate conclusions about the role of forests in global carbon cycling.

Also under Key Topic 2, the draft's coverage of climate impacts on sensible heat fluxes could be balanced by also addressing latent heat flux.

Finally, additional guidance on building partnerships with Indigenous and marginalized communities would strengthen the chapter and is supported by existing literature.

11. Opportunities for Nature and People in the U.S.

This clearly drafted chapter outline offers a vision for the future by discussing how integrating diverse values of nature, adopting a socioecological systems approach and fostering nature-based innovations present powerful opportunities to enhance outcomes for both people and nature. ESA has the following minor suggestions for this chapter:

- The authors might consider the role of co-creation and re-framing human-nature relationships around relationship, reciprocity and respect (sometimes referred to as the three R's of Indigenous research).
- Education (e.g. ecopedagogies) can transform how people value nature and perceive human-nature relationships. The chapter could elaborate on this role.
- The concept of biophilia may be worth discussing in the context of Key Topics 1 and/or 2.

12. Frameworks and Approaches for Assessing Nature in the U.S.

Some of the content of this critical chapter — particularly material covered under Key Topics 1 and 2 — is needed early in the assessment, to set the stage and provide context to the other chapters. This material would be welcome in Chapter 1 (“Overview”).

ESA appreciates the opportunity to comment on the NNA Zero-Order Draft. You may contact Alison Mize, Director of Public Affairs, with any questions (alison@esa.org).