Biosphere Reserves: Learning Places for Sustainable Human Relationships with the Planet

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> *There is a real situation, that can't be denied, but it is too big for any individual to know in full, and so we must create our understanding by way of an act of the imagination.*
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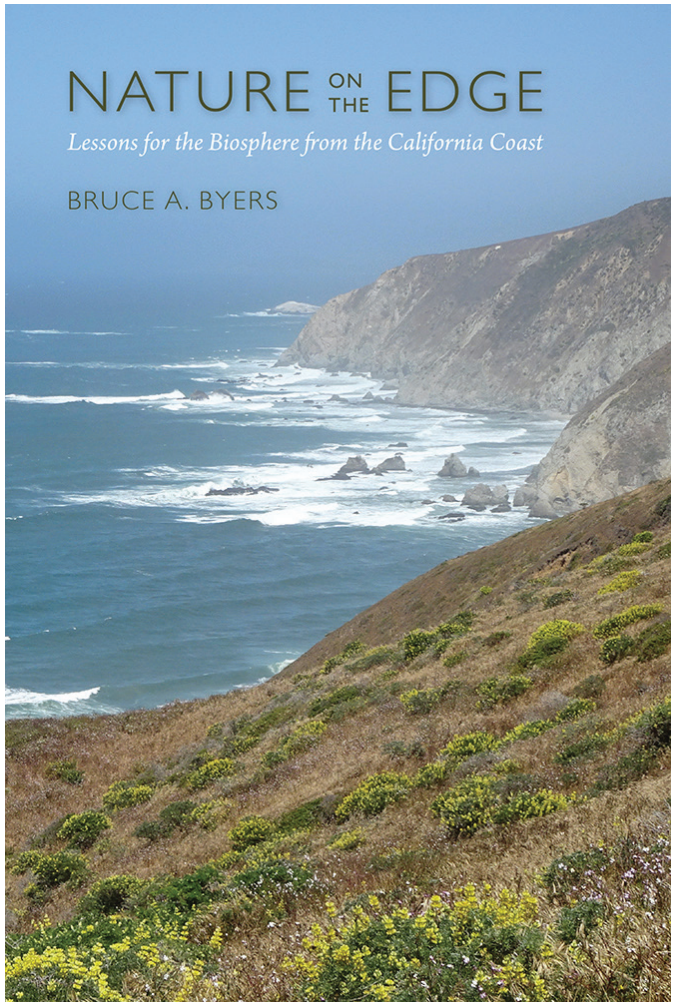
> —Kim Stanley Robinson, *The Ministry for the Future*[1]

We are in the midst of an inevitable transformation of the human-nature relationship. We must bring back some kind of resilience and sustainability to the ecology of our species before our actions destroy the ecology of the planet that sustains us. The transformation has been going on for at least half a century, very slowly—almost unrecognizably slowly to most people, busy living their own lives, caught in a kind of temporal nearsightedness that discounts the future, and more or less trapped in an unsustainable global political and economic system that is based on a fundamentally human-centered worldview.

The late 1960s and 1970s saw an exponential increase in attention to the emerging ecological crisis in the United States and worldwide. These essays explore the history and dimensions of the problem and response through the lens of one of the major programs of global cooperation invented to deal with it at that time, the Man and the Biosphere Programme (MAB) of the United Nations Educational, Scientific, and Cultural Organization (UNESCO), which set up an international network of biosphere reserves. The United States played a key role in the establishment of the program and network. But domestic politics forced the US MAB program underground in the 1990s and almost killed it completely in the 2000s. In about 2015, UNESCO issued an ultimatum: provide updated "periodic reviews" on the status of US biosphere reserves, or they would be dropped from the program. Twenty-eight of the forty-seven US biosphere reserves in existence at the time completed periodic reviews in 2016 and remain in the program; nineteen did not and withdrew.

Cutting-edge ideas from California were woven into the fabric of the program from the beginning, as I'll describe here. In part because of that, and in part because of the uniqueness, complexity, and scale of California's two coastal biosphere reserves (Golden Gate and Channel Islands), I wanted to compare them with Oregon's Cascade Head Biosphere Reserve, which I wrote about in a 2020 book of essays, *The View from Cascade Head: Lessons for the Biosphere from the Oregon Coast*.[2] I was curious to see how the conceptual framework of themes and lessons that I developed there might apply in California. It worked well, validating and extending some lessons from Cascade Head, and also led to new insights and inspiring stories that apply globally.



There are three main lessons. First, the history of human interaction with an ecological landscape can be seen centuries later, and it is important and often inspiring to understand the history of nature conservation in a place. That history is always full of individual "heroes" who model for us the effectiveness of individual action, and sometimes these catalytic individuals join to form groups that catalyze collective conservation action. The second lesson is that ecological mysteries still abound, despite all the scientific knowledge we've gained. That means that the need for research to inform sustainable ecological management is never-ending. Ecological research is needed to guide ecological restoration, and restoration often reveals unknown ecological relationships. Finally, how we think about our place in nature—our worldview—shapes our individual and collective behavior and thereby our effects on the biosphere that sustains us. A root cause of the multifaceted ecological crisis is the human-supremacist worldview that now dominates, and is used to justify, the current global economic and geopolitical system. A successful transformation to an ecologically sustainable human relationship with the planet will require a new, ecocentric worldview. Two sources could inform the development of such a worldview. One source is old worldviews of ecologically adapted cultures from around the world that have managed to survive the onslaught of Western colonization, or at least some surviving elements of them that could be revitalized. The other potential source of an ecocentric worldview is ecology and other systems sciences.

The biosphere is where the nonliving parts of our round planet, the lithosphere, hydrosphere, and atmosphere—rock, water, and air, in simple terms—meet and mingle and create the conditions in which life evolved. Each of these "spheres" is a highly dynamic system by itself. But add life to the mix, and the biosphere is more dynamic still, with its food webs, nutrient cycles, symbioses, ecosystems, and evolution. For us, or any species, the biosphere is it, our one and only home here on this far-flung lonely island Earth, circling an undistinguished star in an outer band of the Milky Way galaxy.

The biosphere is *thin*, very thin. From the depths of the deepest oceans, maybe six miles deep, to the tops of the tallest mountains, maybe six miles high, it's only about twelve miles thick. Compared to the diameter of the Earth, this living skin is not much more than one-thousandth as thick as the planet is wide, about as thick relative to the whole Earth as the skin of an apple is to the apple. If you look at the famous Apollo 17 photo of Earth, sometimes called the "blue marble" photo,[3] you can barely see the thin layer of atmosphere around the edges. That thinness screams fragility.

It took scientists quite a while to begin to imagine the Earth-ecosystem as a whole. The term "biosphere" was first used in something like its modern sense in 1885, and the term and concept were promoted by Ukrainian geochemist Vladimir Vernadsky in a 1926 book, *The Biosphere*. Ecological historian Frank Golley describes Vernadsky's book as "a scientific expression of a global system of man and nature."[4] The biosphere *concept* is a cutting-edge idea about why everything we do is interconnected and interdependent. It posits that the fate of humans and the nonhuman species of the planet cannot be disentangled, that human well-being requires the well-being of all species.

In 1968, with concern about human damage to the environment rising rapidly, UNESCO organized an international meeting called the "Biosphere Conference" in Paris.[5] It was the first time the word "biosphere" was used in international deliberations. The conference concluded that human development and nature protection had to be linked, and it was thus the first intergovernmental forum to discuss and promote what came to be called "sustainable development."

After this conference, in 1971, UNESCO launched the Man and the Biosphere Programme (using "man" to refer to all humans, both men and women). The program established sites called "biosphere reserves" within ecologically and culturally diverse regions of the biosphere where the human-nature relationship could be studied, monitored, and improved, working toward a goal of long-term sustainability and resilience for both humans and nature.

What are biosphere reserves? The UNESCO website provides this summary:

> Biosphere reserves are learning places for sustainable development. They are sites for testing interdisciplinary approaches to understanding and managing changes and interactions between social and ecological systems, including conflict prevention and management of biodiversity. They are places that provide local solutions to global challenges. Biosphere reserves include terrestrial, marine and coastal ecosystems. Each site promotes solutions reconciling the conservation of biodiversity with its sustainable use.[6]

I have always described biosphere reserves as laboratories and models for understanding and improving the human-nature relationship. A few people have challenged my use of the term "laboratory," saying that it's too

scientific sounding, and we don't want to suggest that we are experimenting with people. But we *do* need to experiment, both socially and ecologically, because what we are doing now is having serious negative consequences in many places, and we don't really know what to do or what will work.

Biosphere reserves are not just another kind of "protected area," a term commonly used to refer to places like national parks, national forests, or nature preserves. All biosphere reserves are "multiple use" areas—where the anthropocentric term "use" refers to human activities and the kinds of ecological benefits that flow to people from them. Most biosphere reserves have one or more zones where human uses are strictly limited and nature is more or less allowed to take its own wild course without much human influence or impact. These could be wilderness areas, strict nature preserves, watersheds that are closed to public access, marine protected areas, or research natural areas, for example. The UNESCO MAB Programme calls these "core areas." It's not that these zones have *no* human uses—scientific research, outdoor education, and certain low-impact kinds of recreation can occur in them—but simply that they are protected from activities that would damage their biodiversity or ecological integrity.

All biosphere reserves also include zones with greater or lesser degrees of human influence, where the ecological effects of those activities can be observed and regulated. Areas with intermediate levels of human activity and influence are labeled "buffer zones" by UNESCO MAB, and usually called "managed use areas" in US biosphere reserves. Areas with the most human impact, in many cases urban areas or farmland where natural ecosystems have been mostly or completely replaced, are labeled "transition areas" by UNESCO MAB, and called "areas of partnership and cooperation" in US biosphere reserves.

Most biosphere reserves encompass a mosaic of these three kinds of areas, sometimes without sharp boundaries between them, reflecting the existing land and water ownership patterns and the legal management authorities and responsibilities of those land and water owners. A simplistic "bull's-eye" pattern of zones, as depicted on the UNESCO MAB website,[7] almost never exists in reality.

Biosphere reserves are sometimes very large—the Golden Gate Biosphere Reserve is about twenty-eight thousand square miles of land and sea, for example—and are a mosaic of land and water uses and jurisdictional authorities. Because of their size and complexity, and because the term "reserve" is thought by some to suggest a strict limitation on human uses and activities, the collaborative network representing US biosphere reserves recently recommended that they be called "biosphere regions." However, in order to reflect the history of the MAB Programme and to emphasize its international structure, I will use the official term "biosphere reserve"[8] throughout these essays.

The challenge, which biosphere reserves are an attempt to solve, is that ecosystems function at relatively large scales and have porous boundaries, whereas human social and political boundaries now often, even usually, ignore natural ecological units. That wasn't always or usually the case, as I'll explore in later essays. The modern mismatch between ecological and social reality is a major reason for the environmental crisis we now face. Public lands and waters, managed for different goals (sometimes incompatible ones) by different public agencies at different scales—local, regional, state, national—are scattered among private lands, which are also subject to legal and management restrictions, but far fewer than public lands. Bottom line: it's a mess. Biosphere reserves may help us sort the mess and explore potential solutions. At least that's the idea.

ENDNOTES

1. Kim Stanley Robinson, *The Ministry for the Future: A Novel* (New York: Orbit, 2020), 41.
2. Bruce A. Byers, *The View from Cascade Head: Lessons for the Biosphere from the Oregon Coast* (Corvallis: Oregon State University Press, 2020).
3. NASA, "Blue Marble – Image of the Earth from Apollo 17," November 30, 2007, https://www.nasa.gov/content/blue-marble-image-of-the-earth-from-apollo-17.
4. Frank B. Golley, *A History of the Ecosystem Concept in Ecology: More Than the Sum of the Parts* (New Haven, CT: Yale University Press, 1993), 57.
5. UNESCO, "Intergovernmental Conference of Experts on the Scientific Basis for Rational Use and Conservation of the Resources of the Biosphere (Paris, France, September 4–13, 1968), Recommendations," https://eric.ed.gov/?id=ED047952; UNESCO, *Use and Conservation of the Biosphere*, Proceedings of the 1968 Biosphere Conference, Paris, France, 1970, https://unesdoc.unesco.org/ark:/48223/pf0000067785.
6. UNESCO, "What Are Biosphere Reserves?," 2021, https://en.unesco.org/biosphere/about.
7. UNESCO, "What Are Biosphere Reserves?"
8. National Park Service, Connected Conservation, "US Biosphere Network," 2021, https://www.nps.gov/subjects/connectedconservation/us-biosphere-network.htm.