# DESIGNING INSTITUTIONS FOR THE ANTHROPOCENE

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Writing in 1990, Daniel Botkin observed that since the beginning of the modern environmental movement in the 1960s, a core mission of environmental policymakers has been the restoration of the balance of nature. The laws and regulations intended to achieve this objective are designed to halt further human disruptions of nature or reverse the consequences of past disruptions. As Emma Marris has explained recently, this balance of nature paradigm leads virtually every scientific study of environmental change to use or assume a baseline.[1] The baseline, Marris writes, is usually assumed to be the condition of nature before being exposed to detrimental actions of Europeans or, sometimes, of any humans. For environmental scientists, the baseline serves as the "before" from which they can measure subsequent human impacts. This understanding of environmental problems easily translates into policy prescriptions for "healing a wounded or sick nature" and to ethical claims that "[w]e broke it; therefore we must fix it." Thus, says Marris, baselines "typically don't just act as a scientific *before* to compare with an *after*. They become the *good*, the goal, the one correct state."[2]

Both Botkin and Marris reject the balance of nature paradigm and its reliance on historic baselines. In their view, the natural environment is always changing, and humans have been an integral part of nature's story for millennia. Thus, there is no

balance of nature to be restored, just an unknown future. Humans may be able to influence that future, but they and all other living things must adapt to it, or perish.

Botkin labeled his theory the "new ecology," but in fact his insight has deep roots in the work of the fourth century B.C. Greek philosopher Epicurus. In the words of author Matt Ridley, Epicurus thought "(as far as we can tell) that the physical world, the living world, human society and the morality by which we live all emerged as spontaneous phenomena, requiring no divine intervention nor a benign monarch or nanny state to explain them."[3] We only know of Epicurus from the Roman poet Titus Lucretious. His *De Rerum Natura* recounts and expands upon the Epicurean understanding of a spontaneous and constantly changing nature. Upon reading Lucretious for the first time, in his sixth decade of life, Ridley says that he was "left fuming at [his] educators" for their failure to introduce him to Epicurus. While two-plus decades hardly compare to two millennia, it says a great deal that a quarter of a century after Botkin first proposed the new ecology, policymakers seem to have paid little heed.

There can be no doubt that Epicurus and Lucretious were banished to obscurity for the same reasons Galileo was prosecuted: heresy against the teachings of the church. But apparent indifference to Botkin's new ecology probably has a more benign explanation. In *The Structure of Scientific Revolutions,*[4] Thomas Kuhn argued that scientific advances come in fits and starts. Scientists embrace a particular paradigm based on the best knowledge available. They build their own work and theories on that paradigm. When research yields conclusions that appear inconsistent with the accepted paradigm, scientists presume that the research result, not the paradigm, is in error. When such anomalies lead a single researcher to suggest that the accepted paradigm has it wrong, and to propose a new explanation that accommodates the conflicting results, there is resistance from the many scientists whose research and theories rely on the challenged paradigm

Whatever the pace of scientific revolutions, public policies inevitably trail behind. Whereas private decision makers have powerful incentives to get the facts right, policymakers are generally discouraged from adapting to new understandings of the world by those with vested interests in existing policies. As the reach of government has been extended and bureaucracies have grown, the "ship of state" becomes ever more difficult to turn. Elected officials have constituencies built upon particular understandings of how the world works and what government can do to make things better for them. A legislator's change of policy prescription founded on a new, science-based understanding is more likely to be seen as a flip-flop than as newfound wisdom. Bureaucracies face constituencies more interested in stability and the rents

derived from existing rules and regulations than in policy changes in response to new knowledge.

## THE NEW ECOLOGY AND ENVIRONMENTAL POLICY

If Botkin and Marris are correct that nature is constantly changing and that humans are an integral part of nature, what are the implications for environmental policy? If they are correct the goal of restoring nature to its proper balance makes no sense. If nature is always changing, restoring it to some previous state—if that is even possible—would be contrary to nature. What has been described as the balance of nature turns out to be only the state of nature preferred by those claiming it to be in balance. But environmental policies have changed little in response to Botkin's new ecology.

In a political system where people commonly urge deference to science to resolve policy disagreements, having the science on one's side functions like a trump in a card game. Policy preferences prevail not because they better reflect the aggregated preferences of voters, but because science has declared them to be correct. Once this deference-to-science approach to resolving policy disagreements is accepted, the rationale for a particular policy preference collapses if the science behind it is proven wrong. So among the parties who support and benefit from existing policies, there is a natural reluctance to accept new scientific explanations that could support competing policy preferences.

Even if the science is correct in every instance, the case for deferring policy choices to science is unpersuasive. In any political system, policies reflect the value preferences of the officials empowered to make decisions. Science is essential to informing those policymakers of the likely consequences of the choices they make. But beyond their personal preferences, scientists have nothing useful to say about which policy alternatives are best.

Marris suggests that there is a second basis in environmental politics for claiming a trump on the policy preferences of others. If pursuit of the balance of nature, or some other more specific objective, can be said to be an ethical duty, that duty constitutes a moral high ground that demands special consideration. According to her, matters of convenience and economic cost, even if they have science on their side, pale in significance relative to moral claims. And when science and morality call for the same outcome, as environmentalists have long claimed is the case with restoring the balance of nature, there is little reason to even consider economic and social costs. Look at the ongoing debates over the appropriate policy responses to climate change. Considerations of cost in relation to expected benefits—even from those who, like

Danish economist Bjorn Lomborg, accept that climate change is happening and that human activities are a contributing cause—are generally given short shrift.[5]

Absent a baseline of nature in balance, are we left to environmental policies based on nothing more than competing preferences? In an important sense, that is what all political decisions come down to. The allocation of any scarce resource reflects the preferences of those who hold the power to decide. But how these decisions are made within the institutions we rely upon to allocate scarce resources affects many things we might care about: How well and efficiently are we utilizing the earth's resources? Are the benefits and costs being distributed fairly? Are we achieving the desired balance between liberty and community? Are nonhuman creatures being treated humanely? What are the unintended consequences of our chosen policies?

Some policy preferences relating to the allocation of scarce resources are better informed than others on matters of science. Whether science contributes what it can to informing the policy preferences of those empowered to decide depends largely upon the institutional arrangements for deciding. Decision makers, whether voters in a democratic republic or dictators in an authoritarian state, have ample incentive to understand how best to accomplish what they value. But the institutional arrangements within which they function will have a lot to do with how well they succeed.

In the context of environmental policymaking, is there a relationship between our understanding of nature and the institutional arrangements we employ? Absolutely. The balance of nature understanding encourages centralization of policymaking. If we accept that science will reveal a single correct policy goal, allowing individual states to set their own goals risks some of them getting it wrong. In deference to local autonomy and federalism, we might allow states to choose the means, as we have under some federal environmental laws, but the ends will be best established by a central authority. When there is a single correct policy goal, it would be a waste of time and an invitation to controversy and error for the 50 states to proceed separately.

But if the context for environmental policymaking across an entire continent is an evolving nature influenced by a multitude of factors, including human action, centralized institutions will struggle. Lacking a policy goal fixed by a scientific baseline, policymakers might be encouraged to look to a universal moral baseline. But opinions vary widely about what is morally right. Policymakers who justify their decisions as simply "the right thing to do" will learn quickly that people are less inclined to defer on questions of morality than on questions of science. Most people claim little expertise in science, but they usually have firm convictions about morality.

With acceptance of the human role in nature's evolution, there is no denying that human actions contribute to the problems that environmental policymakers seek

to solve. Once we accept that human actions driven by human preferences are an integral part of nature, it would be illogical to deny that human preferences are—and should be—integral to environmental policymaking. Without science or morality as trumps, policy decisions are revealed for what they are: choices among competing preferences, some well informed, others less so

What sort of institutions will best accommodate this recognition of the integral role of human preferences in both creating and solving environmental problems, while also facilitating informed choice in actions that contribute to environmental problems and to environmental policy? Absent a single correct policy objective, centralization is unlikely to be the best approach in most cases. Given shifting human preferences, a steadily changing and highly variable natural environment, and a wide array of human actions contributing to the changes and variability, decentralized institutions allow for locally appropriate and timely decisions. What we should seek are institutions that allow environmental policy to evolve along with the changing environment and in response to shifting human preferences.

## SHIFTING THE DOMINANT POLICY PARADIGM

Over the past half century, as focus has shifted toward concern for human effects on the environment, there have been two dominant approaches: command and control regulation and public ownership/management. Both have tended to be highly centralized for a combination of theoretical and practical reasons. The dominant balance of nature paradigm calls for uniform national regulations designed to reestablish nature's balance by, for example, reducing pollution, restoring wildlife populations and habitat, and reclaiming degraded sites. The regulatory method of choice has been to establish mandatory targets for each regulated entity based on the perceived balance to be restored, followed by regulatory enforcement—so-called command and control regulation. At the same time, the historical circumstance of vast federal land ownership in the American West made it logical and easy to shift from centralized management for resource development to centralized management for ecological restoration. Land managers once responsible for producing timber, minerals, and forage in economically meaningful quantities gradually became responsible for the restoration of nature's balance.

In retrospect, an alternative to command and control regulation and public management that seems to have anticipated the Botkin thesis began to emerge in the 1980s. A greater reliance on private property rights, contracts, and markets, it was argued, would create ground-level incentives for the very actors being subjected to top-down, command and control regulations to instead make environmentally

sensitive decisions. Proponents of this view claimed that the advantages of such a free market environmentalist approach would be many. Even if the single objective of restoring the balance of nature made sense, it was a mistake to assume that all resources of a common type are the same across a vast continent. On-the-ground resource owners and users have local knowledge that command and control regulators and centralized public managers could never have. Unlike the bureaucrats of agencies like the Environmental Protection Agency, the Fish and Wildlife Service, the Bureau of Land Management, and the Forest Service, private resource owners can make—in fact must make, if they are to survive—timely and informed adjustments when conditions change or unexpected problems arise.

From its beginning, a routine objection to the free market environmentalist approach was that the wealthy and those interested in resource consumption rather than conservation or preservation have an advantage. But if environmental markets are truly free, and if property rights systems accommodate unconventional properties like instream flows, conservation easements, nonuse of permits to pollute the air and graze the public lands, or variably-priced temporal permits to drive on roads and bridges, preservation and conservation suffer no disadvantage. Wealth is no more a constraint on environmental markets than it is on any others.

Other contributors to this volume address how the free market environmentalist approach resonates with the Botkin and Marris explanation of ecological realities. In the remainder of this essay, I examine how legal institutions will best facilitate resource use and environmental protection in light of an evolving nature and frequently shifting human values.

## SUBSIDIARITY

Europeans have looked to the principle of subsidiarity as a guide in the design of institutions governing large regions. The idea is that problems should be addressed at the most decentralized level appropriate to their solution. Why the most decentralized level? Because problems tend to be less complex on the local level, where knowledge about those problems also tends to be deeper. So when is local problem solving inappropriate? When what may appear to be a local problem has nonlocal effects or causes. Those nonlocal effects and causes can be regional, national or global, thus requiring governance at some more centralized level. Subsidiarity allows for diversity and adaptability in both policy priorities and means for achieving those priorities.

At least in theory, the American federal system is an illustration of subsidiarity. At the time of the framing of the U.S. Constitution, the United States was a loose confederation of sovereign states under the Articles of Confederation. The confederation

government had very limited powers. Most significant actions, like taxation and regulation of commerce, required unanimous approval by the states. Indeed, the Philadelphia Convention of 1787 was the culmination of a series of efforts to strengthen the central government. The resulting constitution enumerated specific powers of the federal congress, confirmed the existence of rights-based limits on those powers, and provided that "powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people."[6]

Most commentary on American federalism focuses on the relative powers of the national and state governments. But from a subsidiarity perspective, the American federal system of government is far more complex. We can be sure that those who drafted the Constitution and the delegates in every state who voted for ratification of the Constitution presumed an ongoing and important role for local governments. Few nations have a broader array of local governments than the United States. Counties, cities, towns, school districts, zoning districts, irrigation districts, drainage districts, rural fire districts, weed control districts, and so on all perform functions of government. It is also clear from the Constitution itself that the framers recognized the legitimacy and importance of the most decentralized of decision makers—voluntary private associations and individuals. From the perspective of subsidiarity, all of these governing entities and decision makers should be viewed as parts of the whole structure of American government.

## HIERARCHY AND SELF-ORGANIZATION IN NATURE

If we embrace the principle of subsidiarity, two concepts in ecology theory—hierarchy and self-organization—suggest how we might think about the allocation of authority among this wide array of decision makers. Indeed, the history of the development of human social institutions has similarities to the organic self-organization of nature's hierarchy.

In most biological sciences, as also in the law, taxonomy facilitates description and understanding of a multitude of distinct elements—organisms in the case of biology, and rules in the case of law. But taxonomy can obscure the relationships among a system's various parts. In their quest to understand and describe dependencies among organisms within a larger whole, ecologists face a daunting challenge. Ecological systems tend to be highly complex with processes that function on different timescales and across varying spatial extents. Hierarchy theory serves to isolate layers or segments of the whole for study without losing sight of the overarching objective: understanding where the isolated parts fit into the whole.

To understand the place and role of a particular organism in the larger ecological system, hierarchy theory holds that there are two necessary reasons for things being as they are. First, the underlying parts of the system must allow what observation reveals to exist—what is observed must be possible. Second, upper-level constraints must also allow what observation reveals to exist—what is observed must not be constrained by other organisms or processes. Take the lowly mouse as an illustration. Absent particular food sources, water, and temperatures within a certain range, the mouse is not possible. Thus, though it may seem otherwise, mice are not observed everywhere on earth. But the presence or prevalence of mice where they are possible is constrained by predators, disease, and even traps set by humans. This hierarchy of limits from below (possibilities) and above (constraints) helps explain the mouse and its place in a larger ecosystem.

Although we often speak of nature's design, or of the purposes of particular organisms, the existing combination of possibilities and constraints that allow the mouse to exist is not by design. It is the result of what ecologists call self-organization. According to the theory, what appears to be conscious coordination among organisms within an ecosystem is actually the result of fortuitous interactions and adaptations among individual organisms. Self-organization is a spontaneous and ongoing process triggered by random fluctuations in possibilities and constraints. The resulting organization is entirely decentralized, relatively stable and able to self-repair when disturbed. Thus, the mouse has a shot at, but is not assured, a particular role, or even a place, in any particular ecosystem at any given point in time.

## HIERARCHY AND SELF-ORGANIZATION IN HUMAN INSTITUTIONS

What distinguishes humans from all other organisms in the ecosystem are the capacities to understand at least some of the interactions among organisms and to consciously regulate human and other effects on the ecosystem. This combination of human capacities can be employed through many different institutional arrangements. Individuals can and do act autonomously. Individuals of like mind also collaborate through private associations of various types. And the wide array of governments mentioned previously allow for public action in the name of everyone within a particular area, whether of like mind or not. The ecology principles of hierarchy and self-organization are instructive in applying the concept of subsidiarity to the allocation of decision-making authority among the various levels of government.

The principle of subsidiarity holds that government decisions and actions should occur at the most decentralized level where the desired results can be achieved. This

suggests that the default institution should be the private market, where individuals self-organize in pursuit of purely personal ends. Like the organisms in an ecosystem, individuals self-organize by producing and selling what their capacities, inclinations, and circumstances allow, and by acquiring from others goods and services those others are better situated to produce. Customs that develop over time to facilitate transactions and enforce promises are integral to these private markets. In Anglo-American countries, custom was gradually formalized into what came to be called the common law, administered by judges whose authority derived from the state. Only at this point could it be said that there was some element of design in the system. But even then, the rules of the common law were derived largely from custom and evolved in response to the changing demands of the private actors who looked to the law to facilitate their chosen interactions.

The common law, however, as with any other system rooted in the customs of self-organizing individuals, cannot provide solutions to all of the challenges arising from social existence. In the terms of hierarchy theory, some problems simply cannot be resolved at this most decentralized level of social action. What economists would call public goods, like defense against invading outsiders, or the construction and maintenance of highways, prove difficult to accomplish through spontaneous self-organization. Some degree of centralization is needed, but not necessarily the same degree in all cases. Defense seems best accomplished through centralized national institutions, while regional or local institutions might better provide highways and other public services. Thinking again in the terms of hierarchy theory, the optimal point on the continuum from decentralized to centralized institutions depends on the possibilities and constraints at any point in time.

## Ocean Fisheries

In ecology theory, at least as it predates or rejects Botkin's recognition of the integral role of humans, possibilities and constraints are all attributed to non-human or "natural" factors. But when the concepts are applied to the design of human institutions, whether pursuant to subsidiarity or some other guiding principle, possibilities and constraints are at once both "natural" and "manmade." For example, it is often not possible for local or even national governments to manage ocean fisheries that are both widespread and transient. Governments can only manage successfully those resources over which they have jurisdiction or authority. National regulation of ocean fisheries beyond their territorial jurisdiction will be limited by those jurisdictional boundaries, while also being constrained by various international agreements preempting national choices. This combination of restraints from below and above

argues for some sort of international institution, yet the actual fishing is done by individual private entities who will be difficult to police given physical realities of the oceans. So the best solution in terms of both productivity and conservation may be one that is highly centralized in setting harvesting limits and highly localized in the creation of incentives to comply with those limits.

## Land

The environmental successes and failures of resource management regimes in the United States tend to confirm the validity of the subsidiarity prescription for the most decentralized level of governance that is effective. From the very beginnings of the American nation, it was assumed that most land would be privately owned. With the significant exception of the federal public lands of the American West (considered below), this decentralized management regime has prevailed and has been highly effective from an economic perspective. Since the beginning of the modern environmental movement, however, the predominant view among environmentalists has been that private ownership of land is a contributing cause of many environmental problems. This is so, some environmentalists argue, because private owners focus on land uses with marketable values and thus ignore environmental values that generally cannot be bought and sold—they take account of the benefits to themselves but not the costs to others. The usual explanation for this perceived failing of the private property regime is market failure—some combination of transactions costs, public goods, external costs, and poorly defined property rights (really a legal system failure).

From the perspective of hierarchy theory, this absence of markets for environmental goods is the result of people presuming it impossible to establish property rights in such goods. This limits the effectiveness of markets in the allocation of scarce environmental resources. The argument concludes, therefore, that it is necessary to move to a more centralized level of governance that will be effective. Rather than accept the outcomes generated through countless property transactions presumed by market theory to optimize social benefits in relation to costs, government at some level of centralization will be called upon to assess how best to allocate environmental resources. This will be accomplished through democratic representation, a wide array of public processes, scientific and management expertise, and ultimately a political balancing of competing interests. In the case of land, a stationary resource whose use has largely local external effects, it is accepted that the relatively decentralized level of local government will often be the most effective.

Zoning by local governments is intended to protect wetlands, wildlife habitat, open space, scenic vistas, and other so-called ecosystem services, among other things.

Although some of these values either can be or already are supplied privately, an absence of markets can limit the possibilities to solve environmental problems through the decentralized institution of private property. Zoning regulations function much like nuisance law in that they limit the rights of property owners. But zoning is very different from nuisance law in that new limits can be imposed retroactively and are enforced not by private lawsuits but by government authorities. People often suggest that zoning should be implemented on a state or national level to assure that all properties are regulated and everyone shares in the expected environmental gains, but the wide variation in ecological conditions across a large area of diverse communities constrains the effectiveness of such an approach. Oregon, where a set of statewide goals and guidelines govern land use planning and regulation in every corner of the state, is illustrative. Because it is not possible for a statewide system to account for the preferences of every individual, and the state consists of a wide variety of communities with different shared values, the result has been an imposition of urban values on rural communities along with processes appropriate in some settings yet unduly burdensome in others. On the other hand, if the objective is to preserve or protect particular environmental resources without regard to the preferences of the actual humans directly affected, local governance will probably not be effective—it will often fail to embrace the objective and, in any event, lacks authority beyond its physical boundaries. In hierarchy theory terms, local governments lack the possibility of managing for broader statewide purposes.

## Climate Change and Other Nuisances

Although environmentalists have generally favored centralized regimes over decentralized ones—and, therefore, have rejected the common law as an effective restraint on environmental degradation—they have recently taken an interest in the common law doctrine of nuisance, considering it an effective tool in the avoidance and remedying of environmental harms ranging from wetlands destruction to climate change. When all properties include something in the nature of an easement that protects against harm emanating from all neighboring properties, a purely private regime of land management is responsive to some environmental harms. Given that this has always been the case, what explains environmentalists' recent fascination with the common law? After all, the alleged limits (impossibilities) of common law remedies are what led earlier environmentalists to conclude that the common law is inadequate to their task.

Hierarchy theory suggests an answer. While environmentalists have scored many legislative and administrative victories over the past several decades, they have

sometimes encountered resistance. Frustrations, particularly in the context of climate change, have led some environmental advocates to explore means for circumventing these centralized law making entities. Because lawsuits have always been important to environmentalists in the enforcement of legislative and administrative standards and procedures, it is natural for them to appeal to the courts to do what the other branches of government have either failed or refused to do. Such common law claims were seldom argued previously because the kinds of rulings desired by environmentalists were not possible unless a judge was willing to make fundamental changes to existing common law doctrines. That has not changed, so to be successful, recent claims based on nuisance and the public trust doctrine require judges to make possible what has heretofore been impossible—by amending and rewriting existing law. While doing so might serve some environmental goals, it will necessarily impose significant costs on those who have relied on the constraints of existing law.

## Federal Public Lands

Another example illustrates how principles of ecology theory might inform institutional choices. As mentioned above, about 50 percent of the American West is the property of the national government. This arrangement was the result of historical circumstance, but we have since made conscious choices about the retention and management of these lands. Originally, the default assumption was that the vast majority of the western public lands would be transferred to private ownership, and various laws were put in place to make that happen. Over time, retention by the government of particular parcels was thought to best serve the national interest, although there were always interests in the background who sought private advantage from public ownership. Yellowstone was thought to be a unique national treasure, while the railroads foresaw private gains from transporting tourists to protected parkland. Forest lands were reserved from private acquisition to protect water and timber resources, often over the objection of local governments who foresaw—correctly, it turns out—the loss of both economic development possibilities and tax base. More recently, Congress required the federal government to manage the public lands for multiple uses pursuant to extensive public planning, leading to the effective withdrawal of many resources from economically productive uses.

The history of federal public land policies is more the product of shifting political influence at the national level than of a reasoned approach to scarce resource allocation. To the extent that national policy aimed to exploit public lands for their timber and range resources, it made no sense to rely on federally employed foresters controlled from Washington, D.C. For some years, the futility of this approach was

acknowledged by delegating significant authority to on-the-ground forest supervisors. But even then, it would have made more sense to give private timber operators long-term leases on particular lands. Timber management is most effective when decentralized and, consequently, relieved of the limits of ignorance and conflicting objectives that inevitably come from on high. Once multiple use became national policy, something resembling zoning for different and compatible uses under local control would have made far more sense than a central mandate that all lands be managed for all purposes. To the extent timber production is a desired use of particular lands, the principle of subsidiarity holds that private ownership in some form will be most effective. To the extent preservation of a unique resource like Yellowstone is a desired use, public ownership at some level will likely be more effective. (Although aspects of national park management can be and have been more effectively performed by private entities.) As in ecosystems, the possibilities and constraints at various levels will determine success and failure.

## Water

Finally, consider the example of water. Ownership of the physical resource, as with land, is not possible given the transitory nature of most water bodies. In England the institution of riparian rights emerged, likely as a result of self-organization among neighboring property owners. This riparian doctrine, under which owners of lands adjacent to a particular stream had correlative rights of use in the water, was received by the eastern states and adopted by new states heading West. But the naturally arid conditions of the American West imposed significant constraints on the effectiveness of the riparian doctrine.

As with the customs that provided the foundations of the common law, customary practices among self-organizing miners supplied the underpinning of the western appropriation doctrine. "First in time, first in right," allowed miners to dig for gold with confidence that their discoveries would be secure. The same principle allowed them to acquire a reliable supply of the water needed for mining. With the arrival of courts and the opportunity to resolve disputes in an efficient and civil manner, refinements designed to facilitate exploitation of valuable minerals and later of fertile land became part of the law. With a growing population and more water rights claimants, record keeping and permit systems were put in place in an effort to avoid conflict and inform potential users of existing rights. As water sources became more heavily exploited, concerns about future water needs and stresses on natural systems led state governments to impose conditions and limits on new permits. More recently, states have imposed restrictions on previously established rights, usually in an effort to protect fish and wildlife.

This gradual shift from a spontaneous, decentralized system of private rights acquired by putting water to use, toward a system with growing regulation of private use and the reservation of waters for public purposes, may make sense where water is scarce and growing populations have increased demand. But how do we know whether we are relying on the right water allocation institutions from an environmental, or any other, perspective? In response to increased urban demand, the requirements of the Endangered Species Act and other wildlife protection polices, and, particularly in recent years, extended drought, there has been a strong push for more centralized planning and policy directives. Indeed, contrary to the principle of subsidiarity, the default has been in the direction of greater centralization with little regard for or understanding of effectiveness. Most notably, the efficiency advantages of market allocation have been abandoned to regional and statewide planning based on expert counsel and endless public hearings. Notwithstanding that big water development projects designed and funded largely by the federal government are the source of many environmental problems (while also providing significant economic benefits), environmentalists are unified in their calls for more central planning and less deference to private rights.

While some level of centralization in water allocation is needed to achieve certain policy goals, there is little reason to think we have the institutional arrangements correct overall. The fact that the prior appropriation system was, in its beginnings, self-organized, is persuasive evidence that it served the needs of private users. At the same time, there is no doubt that public needs, particularly those of the modern environmental era, were neglected due to the constraints of the private rights system. But centralized authority has its own possibilities and constraints that will not be evaluated and understood if the default is ever more centralization.

## CONCLUSION

While there are examples of what might be called self-organization in human institutions, like the custom foundations of the common law, and of the prior appropriation doctrine of western American water law, the reality is that the human capacity for choice usually leads to institutions most likely to serve the interests of those in power. Seldom are the institutions of governance chosen pursuant to abstract principles independent from the particular interests of those doing the choosing.

Although environmentalists often prefer to view their cause as the pursuit of a higher good that rises above the more mundane concerns of day-to-day life, environmental protection and preservation are really just an aspect of the larger challenge of allocating scarce resources. The fact of scarcity is what leads to concern about

polluted air, endangered species, threatened wetlands, open space, and every other resource we might value. If we understand the objective of environmental policy to be the allocation of more resources to the satisfaction of environmental values, and we accept that this objective will influence the selection of institutions for resource allocation, the new ecology provides some guidelines for getting the institutions right.

In the context of an existing system of institutional options that range from the extreme centralization of international agreements to the extreme decentralization of private property rights and markets, the principle of subsidiarity holds that we should prefer the most decentralized approach that achieves our purposes. Defaulting to the most decentralized approach that will be effective derives from the empirical reality that people closer to a problem usually have better knowledge of both the causes of the problem and the remedies likely to solve it. It's not a coincidence that decentralized approaches, beginning with private markets, also give greater regard to differing priorities and allow for experimentation in the discovery of solutions. Given that humans ultimately affect the environment at the individual level, attention to the positive and negative consequences of individual freedom of action is essential to effective environmental policies.

Self-organization as an explanation for ecological systems informs institutional design—not just as a model, but also as a recognition that, like other integral parts of the ecosystem, humans have a natural capacity for self-organization. That is what happens in markets, where the force is no less powerful than in the self-organization of less sentient participants in natural ecosystems. It is also what happens through the most disruptive obstacle to effective governance, rent seeking—a force that grows more disruptive with greater centralization. If the driving force of self-organization in an ecosystem is the self interest of the constituent organisms, is there little wonder that humans become ever more aggressive rent seekers as their opportunities for rents increase?

While hierarchy theory in ecology seeks to explain why things are as they are, the concepts of possibilities and constraints can be helpful to institutional design. What is impossible should not be attempted, and constraints from above—both natural and human-imposed—will limit alternatives that would otherwise be possible. It all seems rather obvious, but the tunnel vision of special interest politics too often leads to policy choices that are doomed to fail in the face of unrecognized or unacknowledged limits from below and above.

## ENDNOTES

1 Emma Marris, *Rambunctious Garden: Saving Nature in a Post-Wild World* (2011).
2 *Id.* at 3.
3 Matt Ridley. *The Evolution of Everything: How New Ideas Emerge.* 8 (2015).
4 Thomas Kuhn, *The Structure of Scientific Revolutions* (1962).
5 Bjorn Lomborg. "This Child Doesn't Need a Solar Panel." *Wall Street Journal*. October 21, 2015.
6 10th amendment to U.S. Constitution.