The Environmental State: Nature, Environmental Politics and Bureaucratic Change in the United States, 1973-2019[*]

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Abstract

The environmental state, understood as the nationally-caged "set of institutions and practices dedicated to the management of the environment and societal–environmental interactions" (Duit, Feindt, and Meadowcroft 2016:5), is the dominant means of organizing human relationships with nature across the globe, but remains undertheorized and sparsely studied in sociology and cognate disciplines. We (1) theorize the environmental state as a networked system of agencies and offices focused on providing the biophysical and social conditions required to support life and livelihoods, i.e. "environmental welfare"; (2) posit that long-term patterns of bureaucratic change across the environmental state are shaped by the ways that different bundles of political and organizational resources recursively structure environmental politics and reshape elements of the environmental state itself; (3) use long-term and fine-grained administrative data from the U.S. federal bureaucracy to operationalize the environmental state in the U.S. case; (4) introduce a novel means of empirically mapping changes to the environmental state over time; and (5) use fuzzy set analysis to illustrate the theoretical propositions we set forth. Our analysis advances a political and environmental sociology of the environmental state and points to the ways that bureaucratic structure and culturally distinctive understandings of nature continue to shape efforts to "transform" environmental governance in light of critical environmental problems like climate change and mass extinction.

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Many major ecological problems, including climate change (Dunlap and Brulle 2015; Hoegh-Guldberg et al. 2018), mass extinction (Ceballos, Ehrlich, and Dirzo 2017), and persistent and unjust toxic exposures (Pellow 2017) demand, as the United Nations recently put it, "transformative" political responses (Brondizio et al. 2019). Activists and leaders have long called for global efforts to address these challenges, but the world remains largely governed by fractious and provincial nation-states. International efforts to address climate change have proved stubbornly difficult to realize (Giddens 2009). Oft-cited success cases, like the global Montreal Protocol on Substances that Deplete the Ozone Layer, seem less transformative than tolerable once carefully inspected (Gareau 2013). Global environmental governance institutions themselves are increasingly threatened by nationalist and authoritarian political currents (McCarthy 2019). Even leading scholars of transnational private regulation, which aims to push past the limits of national sovereignty, suggest that international rules and standards schemes may work best by re-centering states in questions of regulation and control (Bartley 2018). For better or for worse, the nation-state seems destined to play a central role in addressing—or failing to address—many of the biggest and most pressing ecological challenges of the day.

Yet sociological accounts of the state's role in environmental protection and regulation remain fragmented and incomplete. With few exceptions (Buttel 2000, 2002; Downey 2015; Frickel and Davidson 2004; Goldman 1998; Hironaka 2014; Hooks and Smith 2004; Rudel 2019), environmental sociology treats the state as a secondary concern, for example, as a legitimating component of the capitalist "treadmill of production" (Schnaiberg 1980) or, conversely, as an instrument of "ecological modernization" (Mol and Spaargaren 2000). Other "state" research—on the welfare state (Esping-Andersen 1990; Prasad 2012; Skocpol 1992), the

developmental state (Block 2008; Evans 1995), the carceral state (Gottschalk 2008; Wacquant 2009)—tends not to focus on environmental governance. Even recent scholarship on the environmental state *per se*—almost exclusively outside of sociology—tends to focus heavily on questions of the normative potential of a "green" or "eco-state," and less on the concrete, political-historical development of the state's actual attempts at environmental governance (Bäckstrand and Kronsell 2015; Duit et al. 2016; Eckersley 2004; Hausknost and Hammond 2020).

A full account of national environmental protection and regulation – and beyond policy, the federal bureaucracy's material and technological impacts on and interactions with nature – demands a thoroughly sociological and historical account of the environmental state. We cannot explain the shortcomings nor the successes of environmental governance if we do not more comprehensively understand this "set of institutions and practices dedicated to the management of the environment and societal–environmental interactions" (Duit et al. 2016:5). We certainly cannot hope to "transform" environmental governance in light of climate change, mass extinction, and environmental injustice if we do not understand the political and organizational dynamics shaping and sustaining the state infrastructures that govern human relationships with nature.

We approach this larger project of theorizing the environmental state by focusing more narrowly on the environmental bureaucracy in the United States over the past half-century. Our aim is to identify the political processes and organizational resources that have shaped long-term patterns of bureaucratic change in order to theorize how and why some environmental agencies have grown and expanded their administrative power while others have withered and struggled to maintain relevance and influence. By explaining how and why the U.S. environmental state

has developed since the 1970s, we can begin to identify the mechanisms that help explain variation in the robustness or weakness of state-led environmental protection, and to theorize the processes that may animate transformations in environmental governance yet to come.

Our approach depends upon understanding the state as a whole – and the environmental state within it – as a politically contested, networked "system of strategic action fields" (Fligstein and McAdam 2012:67) that "need have no final unity or even internal consistency" (Mann 1993:56), but that *is* constituted by multiple overlapping domains or fields of governance with identifiable environmental foci and corresponding administrative units – for example, forests and timber harvest overseen for forestry departments, coastal waters managed by marine and oceanic ministries, and canine and ungulate populations managed by wildlife agencies. Conceived this way, changes in the environmental state will be inherently contested and political but also relational, with strategic action and political conflict within and between fields organized around overlapping and mutually constructed concerns, conflicts, and bureaucratic mandates specifically related to nature and natural resources and shaped by society's embeddedness in natural ecosystems (Brechin and Fenner 2017; Kaup 2015). Over time, we posit, long-term patterns of change in the environmental bureaucracy will reflect the accumulation of iteratively contested politics in these overlapping domains, contingent upon the specific ways that the state embeds natural ecosystems in social relations and the politics that flow from those relationships. Our primary aim is to map these patterns of long-term bureaucratic change and to identify their organizational and social-ecological origins, with direct implications for the state's capacity to address a wide variety of critical environmental problems. We leave to future research the essential work of linking these patterns of bureaucratic change to measurable ecological processes and outcomes.

Our more specific analysis unfolds in five steps. First, informed by extant research of economic, environmental, and political sociologists, social movement scholars, and organization theorists, we define the environmental state and outline a theory of environmental politics flowing from it. We remain sensitive to the relational position of environmental governance vis-à-vis other areas, like social welfare or law enforcement and incarceration, and focus on the intervening influences of social movements, regulatory responsibilities, and networks of scientific experts that shape environmental politics and bureaucratic change. A central feature of our theorization is its focus on how these "outside" forces work differently on different agencies *within* the environmental state, depending upon the specific roles and mandates of particular departments and offices in the larger field of environmental governance. Some agency mandates – managing vast territories used for recreation and resource extraction, for instance – prompt substantial attention and critical support from social movement organizations and industry groups. Others, like predicting the weather and supporting sustainable agriculture, do not. Different governance mandates thus afford different agencies different levels of access to various political and organizational resources, like the attention of movement organizations concerned about endangered species, or the external legitimacy afforded by strong linkages to networks of scientific experts. Different "bundles" of organizational resources like these, we argue, shape long-term patterns of bureaucratic change and help explain how and why different elements of the environmental state develop in different ways (Fligstein and McAdam 2012; Hannan and Freeman 1989; Pfeffer and Salancik 1978).

A diverse group of cultural and environmental sociologists have recently begun to theorize the ways that distinctive understandings of nature structure environmental politics and governance, including the challenges of assigning value to ecological damage caused by oil spills

(Fourcade 2011), valuing and conserving birds (Bargheer 2018), managing and conserving the "wild west" (Farrell 2015, 2020), and navigating tensions between water use and species protection (Scoville 2019). Extending these insights, next we argue that a distinctive feature of the U.S. environmental state is its role in governing culturally distinctive "kinds" of biophysical nature: some agencies and offices in the environmental state focus on "ordinary" nature, such as clean air and water, while others focus more on "special" nature, such as sublime wilderness and charismatic fauna. While clearly entwined and interdependent ecologically, we argue that ordinary and special natures carry different levels of *political and symbolic* salience and thus constitute a special set of political-ecological resources not readily accessible to other parts of the federal bureaucracy. As such, agencies' roles in governing the two different natures attracts (or variously repels) different political constituencies and related organizational resources that, in turn, shape bureaucratic change. Thus, along with the effects of things like social movement pressure and connectedness to scientific experts, the long-term development of the environmental state is related to how different agencies are associated with the provision of special and ordinary nature.

Turning to our empirical analysis, in the third section we marshal fine-grained administrative data on federal spending and employment to inductively identify the elements of the U.S. environmental bureaucracy that constitute the environmental state. Then, we advance an empirically concise means of measuring annual changes to those units over forty-seven years, from 1973 to 2019. Focusing on changes in agency employment and spending allows us to develop an easily reproducible, quantifiable, four-fold typology of intra-state bureaucratic change. Some agencies grow in employment and spending terms while others decay in both dimensions, while still others have increasingly large budgets but shrinking staff sizes or vice

versa. The diversity of change we discover inside the environmental state suggests emergent and contingent patterns of political conflict in line with our theorization, with different patterns of bureaucratic change plausibly related to the distinctive bundles of resources available to different agencies. This initial finding adds important nuance to many accounts of the state in and beyond environmental sociology, which tend to see states – implicitly or explicitly – as structurally subordinate to and constrained by the interests of growth (Benton 1996; Moore 2015; O'Connor 1988).

Fourth, we use fuzzy-set qualitative comparative analysis to identify the bundles of ecological, political, and organizational resources associated with the specific patterns of bureaucratic change we document. We find that, in combination with other political and organizational resources, agencies that provide special nature are generally able expand their administrative and bureaucratic power over the long run. Those that provide ordinary nature, or neither kind, rely exclusively upon other (non-ecological) resources to maintain or expand their bureaucratic mandates, and these agencies very often erode over time. In combination with distinctive regulatory roles (Demortain 2019), levels of external political support from movement groups (Carpenter 2001; Pedriana and Stryker 2004; Reynolds 2021), and connectedness to networks of scientific experts (Carpenter 2001, 2010; Jasanoff 1990, 2006), the provision of qualitatively different kinds of nature plays a central role in explaining long-term patterns of environmental politics and bureaucratic change.

Finally, we sketch an agenda for future research on the environmental state and environmental politics emerging from the foregoing analysis. With others who have studied the state in other contexts, we concur that bureaucratic and administrative change is inherently political and specifically shaped by the gamesmanship of agency creation (Moe 1989), the

autonomy of entrepreneurial and activist bureaucrats (Carpenter 2001, 2010; Cook 1988; Demortain 2019), the endogenous processes of constructing law and legal compliance (Dobbin and Sutton 1998; Edelman 2016), and the advocacy of external groups and movements that leverage statutes and regulations to advance their interests (Pedriana and Stryker 2004; Reynolds 2021). To this suite of processes, we suggest that future research build on this study's novel insight: that bureaucratic structure and governance capacity also develops iteratively over time as a function of the cultural and political salience of the social *and ecological* goods that agencies provide and govern within their distinct organizational mandates. For the U.S. environmental state, those processes privilege agencies that provide special nature but handicap those that do not, with important long-term consequences for conservation, resource management, climate policy, toxics regulation, and environmental justice.

Two caveats before we proceed: First, although the environmental state's management and regulatory functions take center stage in this study, we also acknowledge that the environmental state has close linkages to the state's broader developmental and military prerogatives (Block 2008; Evans 1995; Mann 1993; Zysman 2018). In the United States, governmental support for economic development is centered in the Department of Defense and the Department of Energy, which have profound and extensive impacts on the natural world and on environment-society relations (Downey 2015; Hooks and Smith 2004). The present study nods to the environmental state's support for extractive activities in the empirical analysis that follows, but for reasons of both administrative complexity and conceptual clarity, a full account of the environmental state's entanglements with the state's broader developmental and military roles is beyond the scope of the present study. Second, while the study focuses on the United States, our theoretical framework and methodological approach has broader implications for

managing and governing human relationships with nature in other national and historical contexts, provided that adjustments are made for historically and culturally specific administrative structures and conceptions of nature in particular times and places. Indeed, we see the present study as laying the theoretical and empirical foundations for extensive cross-national comparative research. Both caveats point to potent lines of future inquiry.

The Politics of Environmental Protection

Serious investigations of the environmental state are emerging from many quarters of the academy. These projects include environmental historians' careful, yet largely atheoretical, accounts of the environmental state's early rise in Western capitalist democracies (and elsewhere) through the twentieth century (Gottlieb 2005; McNeill 2001; Shabecoff 2003; Taylor 2016; Uekotter 2009, 2017). A large theoretical literature on "green states" has also developed in political science. However, as Hausknost and Hammond (2020:2) point out, "normative conceptions of an idealized green state, eco-state or sustainability state" are distinct from empirical accounts of environmental states as socio-historical formations that have struggled to address the largest-scale ecological crises (cf. Eckersley 2004; Gough 2016; Heinrichs and Laws 2014; Meadowcroft 2005). In line with this concern, a handful of affiliated scholars, mostly in political science, policy, and business, have taken up the study of such "actually existing" environmental states (e.g. Dryzek et al. 2003; Mol 2016). This research shows great promise, having produced cross-sectional comparisons of nationally distinctive policy repertoires (Jordan, Wurzel, and Zito 2013; Meckling and Jenner 2016; Sommerer and Lim 2016); developed typologies of environmental states across national contexts (Death 2016; Duit 2016); and debated

the prospects of environmental states achieving and managing long-term sustainability goals (Hausknost 2020; Hausknost and Hammond 2020; Pellizzoni 2020).

Environmental sociologists have charted the rapid diffusion during the late 20th century of western environmental values into state administrative units around the world (Frank, Hironaka, and Schofer 2000; Hironaka 2014) and studied the impacts of those politics on international environmental governance (Ciplet, Roberts, and Khan 2015; Fisher 2004; Goldman 1998). Others, addressing long-simmering debates over society's prospects for long-term sustainability under capitalism, have cast states as instruments of economic expansion that either push society relentlessly toward ecological ruin (Bunker and Ciccantell 2005; Schnaiberg 1980) or that haltingly gropes toward an ecologically enlightened form of modernization (Buttel 2002; Mol and Spaargaren 2000).[1] In the US context, still others have documented alarming patterns environmental (in)justice and inequity, often linked to racist and otherwise discriminatory economic and military policies supported by the state (Brechin and Fenner 2017; Downey 2015; Harrison 2019; Hooks and Smith 2004). Yet, for the most part, environmental sociologists have devoted scant attention to the organizational character and development of the environmental state *per se*, particularly at national and sub-national scales. A fully social-historical and political-sociological account of the environmental state is absent.

What is the environmental state?

A sociological theory of the environmental state must include four elements. First, as environmental sociologists have thoroughly elaborated, such a theory requires remaining attuned to the state's role in managing complex interdependences between humans and the natural environment, often by way of deeply destructive economic and military activity (Buttel 2000;

Foster and Clark 2020; Moore 2015; Schnaiberg 1980; York, Rosa, and Dietz 2003). Second, it equally requires incorporating the ongoing influence of environmental movements and other countervailing forces that have substantially expanded the state's role in environmental protection and regulation over more than a century, and especially since 1970 (Dryzek et al. 2003; Gough 2016; Pellow and Brulle 2005; Shabecoff 2003; Taylor 2014, 2016). Third, it requires taking account of culturally and historically specific conceptions of nature itself, and human relationships to it, which both make and are made by the economic processes and contentious politics that shape environmental governance (Bargheer 2018; Cronon 1996; Farrell 2015; Fourcade 2011; Kaup 2015; Scoville 2019). Fourth, it requires situating the above three processes in extant state structures, notably institutions for adjudicating disputes (e.g. courts) and institutions for actually managing and implementing policy (e.g. the bureaucracy).

With these four elements in mind, we call upon the immense literature in sociology and political science on the (social) welfare state to draw a loose analogy with the environmental state. To begin with, if the social welfare state is the nationally-caged constellation of institutions, organizations, and policies that "permit people to make their living standards independent of pure market forces" (Esping-Andersen 1990), then the environmental state is the constellation institutions, organizations, and policies that provide and protect the biophysical foundations of human and non-human life and livelihoods, independent of market forces alone. Environmental "welfare", then, encompasses the biophysical and social conditions required to support life and livelihoods; the environmental state aims to provide and support environmental welfare, although, like the social welfare state, often in tension with other state prerogatives, like promoting economic growth, sustaining employment, or making war (Buttel 2002).

But like the social welfare state, the environmental state is also a dynamic and emergent historical formation, built from layers of institutions and reforms cobbled together out of political conflicts and their resolutions over time. As a result, different administrative units and arms of the environmental state take on different responsibilities related to their organizational legacies and the political compromises arrived at during formative moments of environmental reform and bureaucratic change. For example, the Army Corps of Engineers, founded in 1802 and long a chief architect of ecological destruction by draining wetlands and damming rivers, becomes a central steward of the Clean Water Act of 1972, the legislation protecting rivers and wetlands from pollution and dumping (Hays 1989; Lifset 2014). Further, just as different concepts of social welfare and the deservedness of different social groups have shaped social welfare policy through time (Skocpol 1992; Somers and Block 2005; Wacquant 2009), conflicts and compromises within the environmental state are influenced by evolving understandings of nature and human relationships to it (see Steffen et al. 2011).

In the aggregate, then, long-term patterns of bureaucratic growth and decay in the environmental state will depend on agencies' differential access to political and organizational resources, which are themselves shaped by agencies' distinctive roles and mandates – i.e. their embeddedness (Brechin and Fenner 2017; Dale 2020; Kaup 2015) in the larger field of environmental governance (Fligstein and McAdam 2012; Hannan and Freeman 1989; Pfeffer and Salancik 1978). Such resources can include agency budgets and workforces, of course, but can also involve different configurations of technical expertise or links to public interest groups or user communities, exemplified by hunting and fishing enthusiasts' close historical connections to the U.S. Fish and Wildlife Service (Duda et al. 2021). The shifting cultural salience of nature, such as historically celebrated fauna, like eagles and bison, or iconic landscapes, like Yosemite

or Yellowstone, also provide important symbolic resources to the environmental state, as we discuss in the next section.

For now, the larger point is that any agency's particular bundle of resources will not only shape its own administrative capacity, but that those resources develop endogenously from the specific features and characteristics of the agency's originating governance mandate and in relation to a shifting menu of exogenous political, legal, and cultural forces that political sociologists and movement scholars have long understood as key determinants of state structure and change (Amenta 1998; Dryzek et al. 2003; Esping-Andersen 1990; Kitschelt 1986; Skocpol 1992). This framework rejects the state-as-unitary-actor model implicit in many environmental sociological accounts of environmental politics in favor of a relational model that anticipates bureaucratic change along three organizational-temporal dimensions:1) between the environmental state and other substantive domains within the bureaucracy; 2) between agencies of the environmental state itself; and 3) within individual environmental agencies. The next challenge is to specify the general processes and mechanisms patterning long-term changes and to explain how and why different agencies grow or shrink over the long-term.

Regulatory Role

In large part, politics inside the environmental state is shaped by an agency's regulatory role, which determines its structural embeddedness in political-economic – and political-*ecological* – conflict. For example, among other statutes, the U.S. Environmental Protection Agency (EPA) is charged with enforcing the Clean Air Act of 1970, the Clean Water Act of 1972, and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, a.k.a. Superfund). These regulatory responsibilities put EPA at the center of all major

environmental conflicts involving air pollution, water pollution, and toxic waste, and thus structurally embed EPA in disputes between major polluters (and major industries), on the one hand, and environmental interests, on the other (Demortain 2019). The U.S. Fish and Wildlife Service (USFWS), the chief enforcer of the Endangered Species Act of 1973, is similarly embedded in conflicts between land developers and conservationists aiming to protect open space and species. And so on for all agencies in the environmental state with prominent regulatory roles.

On the other hand, many environmental state agencies have little-to-no regulatory role. The U.S. Forest Service and Bureau of Land Management (BLM), which collectively oversee over 1.7 million square kilometers of territory – the area of France, Spain, Germany, and Italy combined – have few direct regulatory responsibilities and are instead principally land *managers*. Responsibility for enforcing the Clean Air, Clean Water, and Endangered Species Acts on Forest Service and BLM lands falls to EPA and USFWS, who are charged with overseeing those statutes. The U.S. Geological Survey (USGS) has even less regulatory responsibility; it is principally an environmental research organization. Historically contingent administrative arrangements like these have allowed such agencies to largely escape the structurally induced political-economic conflicts and courtroom battles endemic to agencies with regulation-focused governance mandates.

Regulatory-induced conflict does not imply bureaucratic weakness nor long-term administrative decay, just as eliding regulatory conflict does not imply growth or ensure administrative stability. To the extent that regulations are shaped by regulated industries themselves (i.e. in cases of "capture"), or when regulations serve as barriers to entry for would-be competition in established industries, agencies with prominent regulatory roles may actually

enjoy some level of *support* from regulated entities (Carpenter and Moss 2014; Posner 1974). Regulations, and thus agencies with regulatory roles, also provide an important source of external legitimacy for the state and its representatives even when enforcement is weak and compliance is largely symbolic (Edelman 2016; Schneiberg and Bartley 2001). Thus, agencies with regulatory responsibilities are likely to enjoy some level of support from elected officials, who often have an interest in at least *appearing* to enforce popular rules and standards, like regulations to ensure that their constituents have access to clean air and water and lead-free paint and automobile fuel. Regulations also provide a critical legal foothold for advocacy organizations who seek to, for example, expand the reach of environmental laws, which many environmental groups have done very successfully over the past several decades (Lifset 2014; Plater 2013; Turner and Isenberg 2018). On balance, while provoking conflict, regulatory responsibility offers an important political and administrative resource to support bureaucratic growth and expansion in the U.S. environmental state, granting that, in cases when anti-regulatory forces are especially strong, a regulatory role could become a counter-balancing political liability as well. More formally, we expect a prominent regulatory role to support administrative growth or at least stability over the long-run in the U.S. environmental state.

Critical Support from Movements

A second resource for bureaucratic strength and agency influence stems from critical support by social movement organizations and "counterpublics" that push agencies and officials towards new areas of research, policy, and governance (Hess 2016). In the U.S. context, where the courts are relatively open to legal challenges and where citizen suit provisions in many environmental laws create stable opportunity structures, such support very often takes the form of litigation; the

support is "critical" because movement organizations most often sue agencies to demand strengthened or expanded enforcement of environmental laws rather than the opposite (Lifset 2014; Turner and Isenberg 2018). Industry interests and business groups seem to be more disposed to influencing electoral politics, agenda-setting, and the legislative policy process (Oreskes and Conway 2010; Stokes 2020) and, patterns of litigation indicate, are far less likely to use the courts to shift environmental law and agency governance mandates.[2]

In part, such litigation links back to agency regulatory roles: EPA and USFWS, for example, are routinely sued by environmental advocacy organizations for failing to enforce environmental statutes in the ways that movement groups allege are mandated by law. But litigation can also transcend regulatory mandates. The U.S. Forest Service and BLM may not have prominent regulatory roles, but they can be – and regularly are – sued for failing to manage land or resource extraction in ways that comply with environmental statutes enforced by other agencies. In principle, even agencies with no direct role in enforcing laws or managing land, like the Natural Resources Conservation Service, can be sued, for example, for encouraging agricultural practices that pollute waterways, contribute to atmospheric pollution, or impinge upon endangered species habitat. The prominence – and the success – of environmental groups at using such lawsuits to expand environmental protection is so widespread that it may lie at the heart of contemporary anti-environmental resentments in U.S. politics (Layzer 2012; Turner and Isenberg 2018). Further, court judgements provide direct warrants for agency managers to request resources from congress and agency leaders, so as to comply with legal decisions that mandate expanded regulatory, management, or research roles. Critical support from movement groups, largely by way of litigation, is thus a key resource for administrative strength and bureaucratic expansion (Barkan 1980; Sellers 1995). We generally expect high levels of

litigation, dominated, as it is, by environmental movement groups, to support administrative growth and robustness in the U.S. environmental state.

Scientific Networks and Expertise

Professional communities of scientific experts and institutions also play key roles in relation to the environmental state (Jasanoff 1990; see also Mukerji 1989; Schnaiberg 1977). Protecting nature's inherent diversity and ecological complexity requires a large, professionally diverse network of civil servants as well as researchers located outside the bureaucracy, all with deep expertise in a wide range of natural sciences like biology, toxicology, ecology, atmospheric chemistry and physics, hydrology, and so on—areas of scientific research that have flourished and professionalized in parallel with the environmental state's own development (Bocking 2004; Frickel 2004; Hays 1989; Nash 2007). Like regulatory mandates and support from social movements, scientific networks and expertise also function as political and organizational resources for the environmental state: environmental movement organizations rely on expertise to gain disproportionate access to congressional hearings (Ganz and Soule 2019) and advocate for environmental justice (Ottinger and Cohen 2011); bureaucrats and agency leaders marshal expertise to assess environmental impact, moderate conflict, build reputation, and establish legitimacy (Carpenter 2010; Demortain 2019; Oppenheimer et al. 2019); and industry builds counter-expertise to slow regulatory momentum on everything from greenhouse gas emissions (Lahsen 2008) to endangered species (Scoville 2019) to chemicals (Creager 2021).

Like in healthcare and medicine (Carpenter 2010; Starr 2017), then, environmental welfare is irrevocably linked to the politics of scientific knowledge, expertise, and professional authority (Jamison 2001; Yearley 1991). At the same time, as the epicenter of U.S.

environmental governance has steadily shifted from legislative halls to administrative rule-making and then to courtrooms, the authority and legitimacy of environmental agencies has increasingly hinged on complex, technical rationale and scientific justifications for agency actions, which also become central points of political and legal dispute (Strauss 1996; Turner and Isenberg 2018). The ability of agencies to call upon expert knowledge for understanding nature is thus doubly important for theorizing the politics of the environmental state: science is a central source of policymaking itself (Jasanoff 1990), as well as agency reputation, authority, and autonomy (Carpenter 2010); and it is also a focal point of political contention and dispute that offers, for example, entrepreneurial bureaucrats and movement organizations a scientific foothold for expanding or challenging an agency's authority (Jasanoff 2006; Moore et al. 2011). More generally, strong links to networked communities of non-state experts offer agencies key resources for securing external legitimacy and political support and ensuring long-term administrative stability or even growth. Formally, we expect strong linkages to broader networks of scientific expertise to support administrative growth in the environmental state, or, at the very least, to protect against decay in highly contentious and technical governance contexts when the legitimacy of agency actions is called into question.

The Distinctive Politics of Nature

Nature also plays a unique role in the environmental state as both the source of material sustenance necessary to sustain life *and* as a central source of cultural and political salience, helping to sustain intimate and enduring human relationships with land, water, sky, flora, and fauna (Cronon 1996; Farrell 2015, 2020; Holleman 2018; Taylor 2016; Vogel 2018). Appreciating nature's dual role as the biophysical basis for all life and as an enduring cultural

resource is critical for explaining the politics of bureaucratic change in the environmental state. This is because the duality is reflected in the organizational structure of environmental governance.

Most agencies and bureaus in the U.S. environmental state have strong affinities with one dimension of nature or the other. The EPA almost exclusively manages and regulates the sort of nature necessary for directly sustaining human life and livelihoods in the form of clean air, clean water, and safe places to live. We label this sort of directly life-sustaining nature "ordinary nature," for the ways that it supports ordinary, everyday human (and non-human) existence in an industrialized society. By way of the authority of the Clean Air Act and Clean Water Act, the EPA is a specialist in the provision of ordinary nature – even as conflict, controversy, and persistent problems of toxic pollution and environmental injustice swirl around it (Demortain 2019; Frickel and Elliott 2018; Harrison 2019).

Other agencies focus almost entirely on the provision of "wild" and "sublime" spaces, charismatic fauna, and vast tracts of land and water that, while of course enmeshed within broader ecosystems and economies essential for sustaining biophysical life, are also directly linked to culturally distinctive notions about the sanctity, beauty, and enjoyment of the great outdoors as apart from direct material sustenance (Cronon 1996; Farrell 2015). Agencies like the National Park Service and USFWS do little to provide ordinary nature by way of direct regulation of pollution and so on, but they are specialists in the provision of "special nature": they have long legacies as purveyors of American wilderness and wildness, which everyone from staunchly anti-regulation conservatives (Cramer 2016; Hochschild 2016) to radical "ecocentritists" (Woodhouse 2018) seek to preserve for nature's own sake and for the human recreation, rejuvenation, and replenishment such nature allows.

Special and ordinary nature have overlapping but distinct political constituencies. Disputes over special nature, for the most part, pit land developers and extractive industries against the conservation movement, with its storied history dating back to environmental legends like Gifford Pinchot, John Muir, and Aldo Leopold, and stretching forward to the present by way of prominent advocacy organizations with annual revenues in the hundreds of millions of dollars, like the Sierra Club and the Natural Resources Defense Council – organizations that continue to have prominent roles in shaping U.S. environmental policy (Ganz and Soule 2019; Olzak et al. 2016). Agencies like USFWS, National Park Service, Forest Service, and BLM sit astride these conflicts, arbitrating tensions, implementing laws, and managing the wide, open spaces of special nature that have a central role in American politics and nationalism, that supply large quantities of natural resources to myriad industries, and that are sought out by the ultra-rich and working class alike for recreational and scenic enjoyment (Bargheer 2018; Farrell 2015, 2020; Taylor 2016).

Disputes over ordinary nature, by contrast, often set industry – manufacturing and chemical plants, power utilities, ports and other epicenters of commerce – in contention with the anti-toxics and environmental justice movements, partly supported by large environmental social movement organizations, but "composed largely of people from communities of color, indigenous communities, and working-class communities" (Pellow 2017:2; Szasz 1994). Agencies like the EPA sit in the middle here, enforcing the rules (or failing to) that limit toxic releases that are more likely to impact poorer and minority neighborhoods than middle class and white ones, and urban residents more than rural communities (Pellow and Brulle 2005; Taylor 2014).

Agencies that provide ordinary nature thus occupy a very different social position in the field of U.S. environmental governance than agencies that provide special nature. Not only do ordinary nature agencies lack access to the special forms of nature that have historically generated broad coalitions of political support (see e.g. Farrell 2020; Gottlieb 2005; Hays 1989; Taylor 2016), but the sources of political support that ordinary nature agencies *do* have access to – especially the environmental justice and anti-toxics movements – are far less well-resourced than the organizations and industries that threaten ordinary nature in the first place, like the manufacturing, chemical, and fossil fuel sectors that EPA is tasked with regulating (Brulle 2018). Thus, if the politics of special and ordinary nature are distinct, this is in part because the distributions of resources across the organizations that engage in political contention around each "kind" of nature are distinct as well. More formally, we generally expect the provision of special nature to support administrative growth and strength but expect the provision of ordinary nature to operate as a political and organizational liability, especially absent the support of movements or experts.

To evaluate these four theoretical propositions concretely, we turn next to documenting patterns of change in the environmental state before using fuzzy-set qualitative comparative analysis to identify the bundles of organizational resources associated with those changes.

Identifying the Environmental State: Data, Measures, Operationalization

To capture patterns of bureaucratic change in the environmental state, we merge annual spending data from the Office of Management and Budget (OMB) with more than 94.7 million person-years of individual-level employment data from Office of Personnel Management (OPM) for the period 1973-2019 (Appendix A). These data allow us to directly measure discretionary and total

outlays and employment levels in all major and most minor agencies, bureaus, offices, and other administrative units in the U.S. federal government (hereafter, "agencies"), including civilian employment in the Department of Defense. We take account of agency mergers and reorganizations through time to ensure long-term continuity between OPM personnel data and OMB spending data. We exclude agencies that house fewer than 50 employees in any observed year (this excludes 89 agencies, 51 of which are special commissions); agencies that exist for less than 10 years (this excludes an additional 22 agencies); and a handful of intelligence agencies and quasi-public, quasi-private agencies and enterprises not tracked by OPM (e.g. the Central Intelligence Agency, Post Office, Freddie Mac). This leaves 230 agencies plus the Department of Defense that comprise the vast majority of the federal bureaucracy in the United States (Appendix B). Using individual-level OPM data, we also measure a range of agency characteristics, including aggregate levels of education (e.g. fractions of employees with Ph.D. degrees), the fraction of employees categorized as outside experts and consultants, and the fraction of employees who are political appointees. All measures are repeated annually. In order to situate the environmental state within the larger federal bureaucracy, and to assess general trends, we also create aggregate measures for cabinet-level departments (e.g. Department of Agriculture, Department of Interior), all agencies of a given substantive type (e.g. all health-focused agencies; all natural resources and environment agencies, a.k.a. the environmental state), and bureaucracy-wide measures.

Taken as a whole, these data offer the most comprehensive and detailed portrait of the U.S. federal bureaucracy – and the environmental state nested within it – that we know of. They account for between 1.74 and 2.18 million federal civil servants and between $2.16 and $5.6 trillion in federal spending annually.[3] Spanning eight presidential administrations and twenty-

three Congresses, the data allows us develop a long – but detailed – view of the environmental state as a historical and political formation.

We operationalize the environmental state inductively, including all agencies whose annual spending is principally focused on "natural resources and environment," as categorized by OMB.[4] This approach identifies 22 candidate agencies as constituting core elements of the environmental state. From this list, we cull the Advisory Council on Historic Preservation, a tiny federal agency that focuses on historic preservation but not "environment"; the Rural Utilities Service, which focuses primarily on rural development; the Water Resources Council, a small organization eventually absorbed into the Natural Resources Conservation Service last observed in the data in 1982; the Presidio Trust, a very small, firm-like agency formed in the 1990s solely to manage the Presidio (a single park) in San Francisco; and both the Dept. of Interior Office of Inspector General and the Office of the Solicitor, which play largely administrative roles, the former as a government watchdog and the latter as the chief lawyer for the Department of Interior. This leaves 16 key agencies that constitute the environmental state in our analysis. Basic descriptive statistics and key organizational features for each are provided in Table 1. Defined this way, the environmental state represents over 9 million person-years within the broader data (10% of all observations and 13% of observations excluding the Department of Defense), signaling the substantial human capital invested in environmental protection and resource management and the importance of these functions for understanding the modern U.S. state as a whole. Notably, however, the environmental state only accounts for a small fraction of total government outlays: about 5% of discretionary and less than 1% of net spending by the U.S. federal government in 2019.[5]

[Table 1 about here]

Measuring Change in Public Agencies

To capture long-term bureaucratic change, we measure changes in net annual discretionary outlays (financial capital) and changes in net annual employment (human capital) for all the constituent agencies in our data, in the environmental state and beyond.[6] As indicators of bureaucratic and administrative change, agency-level outlays and employment have two important virtues.

First, these two quantities are easily measurable; (relatively) easily accessible in our specific context and in many others (i.e. comparable data exist in other nation-states or sub-national units); and are highly commensurable, offering readily comparable metrics within and across agencies and ministries that have different governance mandates or provide different forms of (environmental) welfare.

Second, tracking concomitant changes in agency spending and employment provides a simple and theoretically meaningful means of capturing qualitative changes in governance. In the United States, congress and the president control overall agency budgets, while agency managers retain high levels of discretion over intra-agency spending and staffing (Padgett 1981). Given this, agencies that experience long-term spending and employment growth signal areas of governance that are a) generally prioritized by external political actors (i.e. congress and the president) and b) largely managed by agency staff, as indicated by investments in human along with financial capital by in-house agency leaders and managers.[7] Paired growth in agency spending and in-house employment, in other words, signals the expansion of governance by *government* – opposite the austerity, "hollowing out,'' and outsourcing typically associated with

neoliberalism (Centeno and Cohen 2012). By contrast, agencies that have experienced spending growth coupled with *declines* in employment signal areas of governance that are a) still prioritized by external political actors, but b) where internal agency managers have shifted towards an outsourcing or "delegation" model of governance, relying on private firms, NGOs, or state-level agencies to do the work that might otherwise be done by agency staff directly (Light 2018; Morgan and Campbell 2011; Pacewicz 2018).[8] Where both agency spending and employment decline over the long-run, we capture wholesale disinvestment from a particular area of governance by both external political principals and agency managers – not just hollowing out, but full-blown erosion of a particular element of the bureaucracy.

Tracking changes in agency employment and spending thus allows us to compare widely disparate agencies across substantive domains and to make inferences about changing approaches to governance. We name and elaborate these patterns of change below (Figure 4), but not before documenting the specific patterns that emerge from the data.

Mapping Agency Change

Patterns of bureaucratic change over the 47-year period we obverse can be visualized by mapping each agency's trajectory through an *outlays-employment phase space* where annual changes in spending and employment are represented as a series of vectors arranged tip-to-tail in a phase diagram. This approach succinctly captures changes in spending (on the x-axis), changes in employment (on the y-axis); how spending and employment change in relation to each other (the direction or phase angle of each individual vector); and long-terms shifts in agency approaches to environmental governance, towards governance-by-government, delegation, erosion, and so on (the overall progression of vectors from one to the next). Spending and

employment levels are indexed to 1980 in order to facilitate direct comparison of proportional changes across agencies of different sizes. Axis scales in phase diagrams are logarithmic so that changes of similar proportion (halving or doubling) have similar visual magnitudes.

Figure 1 shows the phase diagram of the USFWS, a key element of the environmental state responsible for managing the U.S. National Wildlife Refuge System and implementing the Endangered Species Act. The net trajectory of the diagram indicates an overall pattern of growth in both employment and spending at USFWS since the early 1970s, even with notable regressions during the end of the Carter and the start of the Reagan presidencies, and again under the Obama and Trump administrations. The diagram also reveals that budget and employment are relatively tightly coupled at USFWS: when USFWS budget grows, agency management mostly responds with matching investments in human capital. When Congress imposes cuts, managers shrink the workforce. While this coupling does not preclude the outsourcing of at least some agency work, it does suggest that USFWS management, on the whole, remains committed to governance by government—that is, in-house staff doing much of the agency's work. Finally, the bulk of USFWS's location in the phase space—the phase diagram's center of mass, particularly after 1980—is in the upper right quadrant of the phase space, again indicating an average pattern of coupled employment and spending growth.

[Figure 1 about here]

EPA's phase diagram is very different (Figure 2). Employment and spending are not consistently coupled at EPA and the center of mass of EPA's phase diagram since 1980 is in the upper-left quadrant of the phase space, indicating an overall decline in spending but considerable

growth in employment. This pattern is, in part, the product of stiff spending cuts imposed by congress in the late 1970s and early 80s, especially for EPA grant programs that often funded the construction of waste water treatment plants (Congressional Research Service 2019). Throughout this period of overall budgetary austerity, however, EPA management still *grew* investments in human capital, even as net agency resources shrank. Whatever the precise mechanisms behind these patterns, the political-organizational dynamics driving change at EPA are clearly different than at USFWS.

[Figure 2 about here]

Each constituent agency in the environmental state can be plotted in a similar way to reveal its unique pattern of change over the past 47 years (Appendix C). To assess how all the agencies of the environmental state have changed in relation to one another, we plot the average position of each agency in the outlays-employment phase space from 1980 to 2019 (Figure 3B). We benchmark to 1980 rather than 1973, when our data begin, to guard against the misleading effects of setting reference points during the volatile and formative years of the environmental state in the early 1970s, and because 1980 – the last full year of the Carter Administration – marks the final year before a qualitative shift in governance associated with the landmark election of Ronal Reagan. We also plot the average position of aggregated category totals for each domain of governance in our data (e.g. all environmental state agencies, all health agencies, etc.), which helps situate patterns of change in the environmental state in relation to other substantive domains of governance (Figure 3A).

This aggregation exercise reveals two important patterns. First, the environmental state as a whole (the green square in Figures 3A and 3B) has eroded in employment and spending terms since 1980: on average, it spends less money and employs fewer people than it did forty years ago.[9] This is in contrast to most other domains of governance, nearly all of which exhibit average growth in spending, average growth in employment, or both (Figure 3A). This parallel decline in human and financial capital is all the more noteworthy given (1) the steadily growing governance mandates assumed by the modern environmental state since its inception in the early 1970s and (2) the challenge of automating much its governance work, which depends heavily upon higher-order tasks like scientific research, data analysis and interpretation, on-the-ground land management, and site-specific regulatory enforcement.

[Figure 3 about here]

Second, the environmental state's overall erosion masks substantial heterogeneity within it (Figure 3B). USFWS has *grown*, on average, in spending and employment terms. USGS and NRCS, meanwhile, have eroded in both dimensions. EPA has seen an average decline in spending coupled with average growth in employment. The National Oceanic and Atmospheric Administration (NOAA) has experienced the opposite trend, with considerable growth in spending even as its staffing levels have, on average, declined. This diversity of change patterns offers the first clear evidence that the politics of bureaucratic change vary between agencies within fields of governance, in our case, inside the environmental state.

We note finally that the outlays-employment phase space offers a useful means of qualitatively categorizing agencies based on the distinctive patterns of change they experience

(Figure 4). We name agencies that end up in the lower-left quadrant, which are characterized by declines in spending and declines in employment, *erosion* agencies, for the way their human and financial capital has eroded relative to a benchmark year (e.g. NRCS). Agencies occupying the upper-right quadrant are *accretion* agencies—the opposite of erosion—for the way that their human and financial capital has grown (e.g. USFWS). Agencies characterized by growth in spending and declines in employment occupy the lower-right quadrant. These are *delegation* agencies, named for the literature on the "delegated welfare state" and the general practice of outsourcing that this pattern suggests (e.g. NOAA; see Light 2018; Morgan and Campbell 2011). Agencies that are characterized by declines in spending coupled with growth in employment are *centralization* agencies, for the ways this pattern signals an increasing centralization of agency resources in human capital; these agencies occupy the upper-left quadrant (e.g. EPA).

[Figure 4 about here]

Analytic Approach

We use fuzzy set Qualitative Comparative Analysis (faQCA; Ragin 2000, 2008) to identify the bundles of organizational resources that cohere to produce agency erosion, accretion, delegation, and centralization. fsQCA is a case-oriented method (Ragin and Becker 1992) grounded in the logic of configurational (i.e. set-theoretic) causation: the idea that causality emerges from distinct configurations of specific conditions or "ingredients" that, taken as a whole, constitute unique "recipes" for particular outcomes (Ragin 2008). fsQCA thus formalizes ways of thinking common in comparative and historical and case-based research in order to systematically identify the sets of causal conditions that, for example, support the development of social welfare

programs (Amenta, Carruthers, and Zylan 1992; Hicks, Misra, and Ng 1995), facilitate labor resistance to shortcomings in workplaces (Roscigno and Hodson 2004), are associated with high-polluting manufacturing facilities (Grant et al. 2010; Grant, Jorgenson, and Longhofer 2020), or that support community mobilization in response to environmental risks (Wright and Boudet 2012).

Calibrating category membership

fsQCA requires a process of calibration: setting thresholds that indicate full membership, non-membership, and a crossover point between these poles for each outcome category (accretion, erosion, delegation, centralization). This calibration process is typically one-dimensional, for example, from low to high polluting industrial facilities (Grant et al. 2010, 2020) or from non-mobilization to high-level community mobilization in response to environmental risk (Wright and Boudet 2012). Because our outcome categories are two-dimensional, we quantify category membership as a function of the magnitude, m, and the phase angle, ϕ, of the vector from the origin of the outlays-employment phase space (1,1) to an agency's average position in the phase space from 1980 to 2019 (i.e. its position in Figure 4; for an example, see Figure 5). Category membership, C, is thus given by:

$$C = \frac{M}{2} sin(\phi + \theta) + 1 \begin{cases} \theta = \frac{3\pi}{4} for\ delegation \\ \theta = \frac{5\pi}{4} for\ erosion \\ \theta = \frac{7\pi}{4} for\ centralization \\ \theta = \frac{9\pi}{4} for\ accretion \end{cases} \quad (1)$$

where *M* is the standardized magnitude, given by:

$$m = (\Delta o^2 + \Delta e^2)^{\frac{1}{2}} \quad (2)$$

$$Z = \frac{m - \bar{m}}{\sigma} \quad (3)$$

$$M = \frac{e^{2Z}}{1 + e^{2Z}} \quad (4)$$

[Figure 5 about here]

We use equation (1) to compute membership scores for 222 federal agencies[10] for each of the four patterns of agency change. We set the full set membership (non-membership) threshold as the average of all membership scores within a π/4 radian (45°) window centered on ϕ that maximizes (minimizes) category membership.[11] We set crossover thresholds similarly, except that we center our calculation around ϕ midway between values that would maximize and minimize category membership.[12] This approach ensures that degrees of category membership for environmental state agencies are set in empirical and theoretical relation to patterns of change across the entire bureaucracy (Figure 6). Finally, we calibrate set membership scores (logistically rescale from 0 to 1) based on the calculated thresholds and using the "calibrate" function in the R package QCA (v 3.11; see Thiem and Dusa 2013).

[Figure 6 about here]

Resources for Bureaucratic Change in the Environmental State

For our formal analysis, we home in the four political and organizational resources central to explaining bureaucratic change that we discussed above. Like our outcome measures of agency change, all measures of political-organizational resources described herein are calibrated for use in fsQCA (Appendix D).

To capture the degree to which an agency is structurally embedded in regulatory politics and political-economic conflict, we use a simple binary variable to indicate whether an agency has a substantial regulatory role enforcing any major environmental statutes (see Table 1).

To capture the degree to which an agency experiences critical support from outside movement groups in ways that might help it expand its administrative reach and bureaucratic power, we measure the percent of all cases in the *Nexis Uni* database that name the agency as a litigant, most often the defendant.[13] While movements can target states in a variety of ways (Walker, Martin, and McCarthy 2008), professionalized movement organizations often participate in highly routinized and formalized channels of contentious politics, and as we discuss above, litigation is a principle means of effecting change in U.S. environmental politics (Dryzek et al. 2003; Lifset 2014; Strauss 1996; Tarrow 2011; Turner and Isenberg 2018). The court rulings that arise from litigation, in particular, are a central mechanism of bureaucratic change: legal mandates to change administrative practice can "ratify" newly innovated forms of legal compliance (Dobbin and Sutton 1998; Edelman 2016), but they can also force organizations to take up new practices, like more robust non-discrimination enforcement, new forms of protection against non-discrimination law, and more expansive interpretations of (environmental) statutes (Pedriana and Stryker 2004; Reynolds 2021).

To capture an agency's reliance on expert networks, we measure the percent of agency employees that OPM categorizes as outside experts or consultants. The vast majority (98%) of these "employees" in fact work on an intermittent basis; most (71%) have PhDs and are university faculty or other highly educated specialists. These are, in short, organizational knowledge and reputation brokers, linking agencies to broader expert communities and networks of power (Carpenter 2010:65–70; Jasanoff 1990, 2006); their employment as consultants signals the degree to which agencies rely upon highly specialized technocratic expertise in their approach to governance.

Finally, to capture the degree to which an environmental state agency can call upon the culturally resonant, symbolic power of special nature, as contrasted with ordinary nature, we measure the fraction of total agency spending allocated to "conservation" and "recreation" (key elements of special nature), less agency spending on "water resources" and "pollution control and abatement" (key elements of ordinary nature). This results in a range of values from -1 to 1, with agencies that spend most or all of their funds on ordinary nature ranking lowest (EPA, Bureau of Reclamation, Army Corps of Engineers); agencies that spend on neither recreation or conservation nor pollution control or water resources in the middle (NOAA, NRC, USGS, etc.); and land-management agencies—those that provide special nature—ranking highest (National Park Service, USFWS, Forest Service, etc.).

Explaining Bureaucratic Change in the Environmental State

Our formal analysis begins by searching for evidence of causal necessity: the presence or absence of specific organizational resources in *all* instances of a specific pattern of bureaucratic change, which would suggest that the resource (or its absence) may be necessary for the pattern

of change to occur (Ragin 2000:210–18). Among the four organizational resources (and their negations) we focus on, we find no robust evidence of causal necessity (Table 2).[14]

[Table 2 about here]

But there is some weaker evidence of causal necessity (shaded rows in Table 2). High provision of special nature is almost always present in cases of bureaucratic accretion, providing initial evidence that governing special nature may itself offer agencies a political-organizational resource that supports bureaucratic growth in the environmental state. A lack of regulatory role, meanwhile, is very often associated with agency erosion, providing initial evidence that absent a clear administrative mandate and the attendant political resources such a role provides, agencies may wither over time. We also find weak evidence that *low* levels of connectedness to outside experts is a feature widely shared by all patterns of bureaucratic change *except* centralization (growth in employment paired with declines in spending). In part, this finding reflects the fact that most agencies in the environmental state do not rely heavily on outside expertise. Those that do – specifically the EPA and Nuclear Regulatory Commission – tend to be characterized by growing employee corps but shrinking budgets (i.e. centralization), but our analysis suggests that links to outside experts are not causally necessary for this change pattern to occur.

Bundles of Resources for Bureaucratic Change

Table 3 summarizes our primary fsQCA results. Formally, this is an analysis of the combinations of organizational resources that seem to be causally *sufficient* for distinct patterns of bureaucratic change to occur. All of our results are (1) characterized by high sufficiency inclusion

(consistency) scores, indicating that the associated organizational resources are consistent with (subsets of) a given pattern of agency change; (2) characterized by high proportional reduction in inconsistency (PRI) scores, indicating that given combinations of resources principally explain the outcome of interest and not its negation;[15] and (3) have high coverage scores, indicating that given recipes explain a considerable fraction of cases associated with a particular pattern of bureaucratic change. Thus, our findings are substantively meaningful and not empirically true but trivial.[16] Our findings are also robust to a number of alternative specifications (e.g. accounting for the effects of political appointees in agencies or the salience of specific agencies in the print news)[17] and align closely with theoretical expectations. In that sense, the results below provide a high-level confirmation of the dynamics of bureaucratic change theorized above.

The qualitative and comparative approach of fsQCA does not permit the identification or separation of individual effects or "causes," however, limiting our claims to the "conjunctural" effects of multiple organizational resources taken in unity (Ragin 2000, 2008). Our approach also does not specifically identify the exact mechanisms that translate resources into organizational and political outcomes, work we leave for the future. For now, we reiterate that our results are best interpreted as supporting evidence of the general theoretical processes we outline above and that suggest important points of investigative departure for subsequent research. In particular, the results of our fsQCA analysis should not be mistaken decontextualized "proof" of generic relationships between variables, especially insomuch as they might relate to other national and historical contexts.

[Table 3 about here]

As expected, in the U.S. environmental state, agencies that lack organizational resources generally erode. The most striking instances of this pattern include the Bureau of Ocean Energy Management, the USGS, the Bureau of Mines, the Bureau of Reclamation, and the Natural Resources Conservation Service, all of which (1) lack a regulatory role, (2) do not provide special nature, (3) are, partly as a result, not enveloped in high levels of legal contention and (4) cannot call on strong networks of outside experts to buttress their legitimacy and expertise (Table 3-E1). In short, these agencies lack all the political-organizational resources we focus on. The predictable results is what we label bureaucratic "erosion of the forgotten."

One other instance of bureaucratic erosion, the U.S. Army Corps of Engineers, has a prominent regulatory role – it co-administers the Clean Water Act with EPA – and therefore attracts high levels of legal contention (Table 3-E2). But the Army Corps provides ordinary, not special, nature and lacks linkages to outside experts. Robbed of the symbolic power of special nature, in particular, and tarnished by a legacy of environmental degradation (Gottlieb 2005; Hays 1999; Holleman 2018), we suspect the Army Crops stands in an especially weak position to garner political support beyond its organizational boundaries, again resulting in a pattern of bureaucratic erosion.

Centralization is the odd cousin to erosion: a pattern of change where organizational resources combine in a way that erodes external (i.e. congressional) budgetary support, but where internal agency managers are, nonetheless, able to grow employment, for example, by finding ways to invest in in-house staff even as larger programs, like agency-controlled grants to cities and states, are cut. For EPA and the Nuclear Regulatory Commission (NRC), this pattern of change seems to have emerged from an "expert regulation" configuration of resources (Table

3-C1). Both agencies are structurally embedded in conflict due to their prominent regulatory roles, which in turn prompts high levels of legal contention and critical support from movement groups, and both have unusually robust linkages to networks of outside experts to shore up agency legitimacy and reputation in these contentious political contexts. These are all key resources for winning modest budgetary gains that can be used to fund an expanding employee corps. But neither EPA nor NRC provides special nature, robbing them of a key political-organizational resource that might otherwise help them grow a broader base of political support and stave off cuts in funding for programs that reach beyond organizational boundaries. Indeed, partly because of its regulatory role and provision of ordinary nature, EPA has become a favorite punching bag for critics of environmental regulation – even as it continues to garner high levels of critical support (i.e. litigation) from environmental movement groups (Demortain 2019; Layzer 2012; Turner and Isenberg 2018). The results is a decline in overall agency resources and a narrowing (centralization) of governance mandate, even as managers are, on average, able to win support for in-house programs and employment.

The National Park Service indicates an alternative path to bureaucratic centralization (Table 3-C2). NPS has neither (1) a prominent regulatory role nor (2) strong linkages to outside experts. Partly as a result—and opposite of EPA—it (3) garners comparatively little critical support (litigation) from social movement organizations. This trifecta mirrors conditions of erosion and, we suspect, helps explain slowly eroding NPS budgets over time. But NPS provides special nature in its most splendid and sublime forms, which a) inescapably requires on-the-ground personnel to manage, particularly given the large size and high use of the National Parks; and b) which agency managers seem to have been able to leverage as a justification for regular investments in the NPS employee corps even as budgets were slashed and maintenance deferred.

At a minimum, absent other political-organizational resources, providing special nature seems to have protected NPS from full-blown erosion.[18]

Bundles of resources associated with agency delegation and accretion—both characterized by spending growth—reinforce the critical role that special nature plays in garnering broad political support and budgetary investment in the environmental state. The sets of organizational resources characteristic of these change patterns also heavily overlap:[19] Both accretion and delegation agencies (1) have prominent regulatory roles and (2) tend to have weak networks with outside experts, perhaps signaling that, blessed with growing financial resources, agency leaders are not concerned about external agency legitimacy or replacing lost in-house expertise. Most importantly, (3) delegation and accretion agencies are key providers of special nature. These agencies have ready access to the political support to be garnered by providing Congress and the public with, for example, marine sanctuaries and marine mammal protection more broadly, as in the case of NOAA, or the sprawling 95 million acres of land – and over 800 million acres of submerged lands and waters – contained in the National Wildlife Refuge System. That network of special nature is governed by USFWS—a clear example of agency accretion—and may be among the most well-positioned of all instances of special nature for generating broad-based political support. That is because National Wildlife Refuges overlap with nearly 30% (123 of 435) of U.S. congressional districts and are enjoyed by a broad, politically cross-cutting constituency that includes hunters, fishers, and birders and associated organizations (U.S. Fish and Wildlife Service 2016).

Special Nature and Resource Extraction

Finer grained differences in the provision of special nature help differentiate agency delegation (declining employment) from accretion and centralization agencies (growing employment). (No erosion agencies in our analysis provide special nature.) Some agencies, like the National Park Service and USFWS, set aside special nature and forbid nearly all extractive activities in those areas.[20] Other agencies are deeply enmeshed in ecologically destructive logging, mining, and drilling activities. The Forest Service, for example, was founded to manage lands in service of the timber and forest products industry. The BLM is legally mandated to manage public lands for "multiple uses," including conservation as well as oil and gas extraction. The Bureau of Safety and Environmental Enforcement (BSEE) safeguards against oil spills and thus protects coastlines and marine ecosystems, but also supports offshore oil and gas drilling.

The OMB's coding of agency spending indirectly captures this distinction. Spending on "recreation" loosely corresponds to providing special nature absent extractive activities (e.g. NPS), while spending on "conservation" corresponds loosely to the provision of special nature in ways that are coupled to extractive industries (e.g. BLM, BSEE). One agency straddles this division: reflective of its unique role as neither direct supporter of extraction nor wholesale preservation agency, the USFWS spends roughly half its budget on "conservation" and half on "recreation."

We thus split our variable for special nature in two, and revisit our fsQCA analysis for only those agencies that provide special nature, but this time separately measuring the provision of *extractive nature* (spending coded by OMB as "conservation") and *recreation nature* (spending coded by OMB as "recreation") (Table 4).[21] As expected, the bundles of resources associated with patterns of agency change that we discover are nearly identical to our primary

analysis, but with a crucial distinction: by in large, those agencies that provide recreation nature—special nature with minimal-to-no extraction (NPS, USFWS)—see growth in employment over time. We suspect this finding in part is explained by the demands of managing large protected lands areas, and partly by the political support afforded by providing recreation nature for diverse constituencies. By contrast, agencies providing extractive nature trend towards delegation – the pattern characteristic of outsourcing. We interpret this finding as reflecting the different role these agencies play in managing biophysical nature: NOAA, BSEE, and the Office of Surface Mining, Reclamation, and Enforcement face lower demands to physically manage vast territories. But the provision of extractive nature, specifically, also binds these agencies more closely to industry in a way that facilitates outsourcing of governance work and ensuring they play an economically developmental role (Evans 1995, Block 2008) by investing public funds in the industries they support and which, in turn, support them. In short, if the provision of "wild" and untrammeled special nature is one key ingredient for administrative resilience in the environmental state so too, it seems, are close ties to resource extraction and economic development.

[Table 4 about here]

Conclusion: A New Research Agenda

The environmental state remains the most prominent and important means of organizing human relationships with nature around the world, but has received scant attention from sociologists and little more from scholars in cognate disciplines. We advance a political and environmental sociology of the environmental state that emphasizes the ways this networked set of agencies and

offices develops and changes according to the composition of the political and organizational resources that each agency gains access to. In the U.S. context, we show how agency regulatory responsibilities, legal pressure of movement groups, connectedness to communities of scientific experts, and, most notably, the provision of culturally distinctive "kinds" of nature all interact to produce distinctive patterns of change in the environmental state. Importantly, none of these resources for change is independent; all are interactive and endogenous. Unique combinations of each help explain the ways that any given element of the environmental state has developed over the long-term and how the environmental state as a whole has developed in relation to the national state. The theoretical framework, accompanying methodological approach, and empirical illustration advances the larger collective project of building an environmental and political sociology of the environmental state in at least four ways.

First, our approach to mapping bureaucratic change offers a novel and general means of capturing the internal diversity of states across substantive areas of governance, from agencies and offices focused on environment to healthcare to national defense. Similarly, our emphasis on the political-organizational resources provided by culturally particular public goods can be modified to explain differential patterns of bureaucratic accretion and erosion in a variety of substantive areas, like law enforcement and incarceration and social welfare, where historically and culturally distinctive ideas about, e.g., race (Fox 2010; Wacquant 2009), gender (Orloff 1996; Skocpol 1992), and markets (Somers and Block 2005) also seem to shape long-term patterns of change inside the state. And our meso-level focus on agencies as units of analysis helps reinvigorate the study of states as networked formations constituted by smaller bureaucratic units (Fligstein and McAdam 2012; Mann 1993) and will be crucial for theorizing

and facilitating the "transformations" in governance necessary to address large-scale problems like climate change and toxic pollution.

Our account also raises a number of important questions and suggests a range of promising areas of future research the pursuit of which we believe can further integrate environmental sociology into the larger discipline (see also Foster and Holleman 2012). For example, agency linkages to networks of outside experts seem crucial for shoring up legitimacy and growing in-house staff even under conditions of austerity (e.g. EPA, NRC), but can also expose agencies to heightened risk of capture (Carpenter and Moss 2014). Studying how these two competing dynamics interact raises foundational questions of bureaucratic autonomy and power and bears directly on, for example, the environmental state's capacity to lead a just and equitable clean energy transition as apart from the interests of the fossil fuel industry (Grant et al. 2020; Stokes 2020). The role of "experts" as defined in our analysis also hints at agency linkages to other organizational domains, like the burgeoning field of environmental consulting, the environmental services industry, and the highly professionalized environmental non-profit sector, and gestures towards a number of critical questions in the vein of classic research on political influence, interlocking directorates, revolving doors, and the (environmental) power elite (e.g. Downey 2015; Mizruchi 2013). And the high-level analysis we present here also demands much finer grained research on the intra-organizational expertise that structure the provision of environmental welfare directly, like the shifting roles and influence of economists, ecologists, toxicologists, risk science and the social sciences at EPA (Demortain 2019; Harrison 2019) and analogous trends in other agencies.

Third, our analysis also presents opportunities to refine understanding of environmental social movements and their linkages to historically specific human relationships with nature. The

distinction between special and ordinary nature, in particular, is ripe for political-historical analysis of how the two natures and their respective constituencies have shifted in their composition and relations through history (e.g. Taylor 2014, 2016) and cross-nationally, where distinct understandings of nature ought to produce different patterns of change (Fourcade 2011) and where different political and administrative structures produce different opportunities for movement influence (Dryzek et al. 2003). New studies of culturally distinct "kinds" of nature may also add nuance to research on the social bases for environmental concern, which at present makes homogenizing assumptions about the meaning and salience of nature and ecological harm in nation-states around the world (Dunlap and York 2008; Summers and VanHeuvelen 2017). More generally, systematically attending to distinctive human relationships to different kinds of nature—including the ways those understandings are woven into the governance mandates of distinct agencies and laws—promises to reveal important features of the politics that animate nationally-particular policy responses to environmental problems.

We also see important opportunities to extend our analysis into new lines of environmental sociological inquiry. In ways that cannot be reduced to logics of accumulation heavily emphasized by U.S. environmental sociologists (e.g. Foster and Clark 2020; Moore 2015; Schnaiberg 1980; York et al. 2003), states also pursue military and geopolitical ends with both ecologically destructive and socially unjust consequences (Downey 2015; Mann 1993). Formally, however, military actions are often still accountable to rules and standards set by environmental statutes, setting the state's military and environmental fields in tension. In the United States, the Department of Defense is the chief steward of vast bombing ranges, military bases, chemical weapons depots, and training areas that are also home to endangered species and protected waterways and often proximate to American Indian populations (Hooks and Smith

2004). These intra-state tensions, wherein military-driven "treadmills of production," war-related "treadmills of destruction," *and* environmental state prerogatives to provide environmental welfare all intersect, raise complex questions about the internal complexity (and disunity) of the state and the impacts of military policy on the biophysical world. Studying how different state prerogatives intersect, conflict, and entwine, is critical for assessing the prospects of "transformation" and long-term sustainability in a world governed by militarily dominant nation-states.

Finally and most broadly, we see as-yet untapped advantages in tilting the lens of environmental sociology and adjacent areas of political sociology, social movements research and organizational theory from a primary focus on the ways that politics shapes states and organizations, to the ways that states and organizations recursively construct their own administrative trajectories and capacities for governance, based on the politics that flows from their structure. The analytical inversion should include the ways that states embed nature, as social construct and biophysical stuff, into these politics. Such a historically attuned political sociology of the environmental state would be sensitive to but also transcend highly abstract theoretical suppositions about generic relationships between "states," "capital," and environmental protection. It would be well suited to reveal the sources of political-administrative strength and weakness that enable and constrain agencies in their capacity to govern, including their ability to respond and adapt to growing ecological crises. Charting a course towards "transformative" change in environmental governance, after all, requires attending to the endogenous political dynamics that have shaped environmental governance in the United States and other nation-states for the past half century. Although there is much left to learn, the stakes could not be clearer. In the United States, as elsewhere, the increasing frequency and intensity of

storms, drought, and biological reorganization of terrestrial and marine ecosystems under climate change is already overburdening existing infrastructure from flood control to agriculture to pollution abatement (Elliott 2018). The rapid warming of the planet is placing additional and growing strains on agencies of the environmental state, many of which have followed trajectories of full or partial erosion for decades. Society stands little chance of successfully remaking environmental protection under conditions of unprecedented ecological uncertainty if sociologists and others do not first understand the intra-state political and organizational dynamics that drive regulatory and administrative change in the environmental state.

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Notes

[1] Current threads of Marxist environmental sociology, which dominates the core of the field with broad-scale ecological critiques of capitalism, largely ignores states, state-led politics, and state theory (see, for example, Foster and Clark 2020; Moore 2015).

[2] For example, in a separate analysis of 3,267 federal district court cases from 1969 to 2019 involving the Clean Water Act and Endangered Species Act that name federal agencies as defendants, 57% of cases were brought by non-profit organizations. The next highest categories of plaintiffs were individuals (13%), industry (10%), and trade associations (5%). Of the 1,212 cases where federal agencies were plaintiffs, 77% of the time the federal government sued individuals (33%) and industry (44%). The next highest category was state government (11%).

[3]Unless otherwise noted, all figures throughout are given in real 2018 dollars. Total spending for all agencies may seem larger than spending figures more familiar to some readers (e.g. a $4 trillion annual budget in recent years) because more commonly reported figures also include a variety of "undistributed offsetting receipts" and similar, like interest earned by government trust funds.

[4] OMB classifies all federal spending into 21 major spending "functions" - e.g., "natural resources and environment" - and 118 sub-functions e.g., "conservation" or "pollution control and abatement" - each of which is intended to capture "the most important purpose" of a given federal activity or action, "without regard to agency or organizational distinctions" (Government Accountability Office 2005:124). A specific agency may thus spend on activities in many functional areas; in order to be included as part of the environmental state in our analysis, the natural resources and environment function had to constitute a plurality of agency spending averaged across all years the agency is observed.

[5] In the United States, federal spending is categorized by OMB as either "discretionary" or "mandatory". Discretionary spending is spending that congress has control over in the annual budgeting and appropriations process. Mandatory spending is spending that is mandated by a previously enacted statute (e.g. Social Security or Medicare programs) and thus that congress cannot change outside reforming the relevant statute itself, separate from the annual budgeting and appropriations process.

[6] We retain spending on grants in our outlays measures since funds granted to other entities (e.g. state-level, private, or municipal organizations) are still used in service of the overall governance mandate of any given agency.

[7] Of course, agencies flush with cash and with growing employee corps can also outsource a large share of their work to third parties even as they grow their own in-house governance capacity.

[8] Other dynamics are also possible, e.g. growing capital or operations costs. Available evidence suggests delegation is the driving mechanism. For example, over the study period, the National Oceanic and Atmospheric Administration sees a marked increase in spending, a notable decline in employment, and also a large increase in procurement spending (i.e. contracting). See Light (2018) for an extended discussion of this trend.

[9] This assessment of change is conservative: it is based on the *average* change in spending and employment from 1980 to 2019, not the net change over that period. See Figure X in Appendix C for net changes rather than averages.

[10] 12 agencies of the full 234 cannot be plotted since they experience negative changes in spending (i.e. they produce rather than spend revenue). See Appendix B.

[11] E.g., for the accretion category, we compute the average of C for agencies that fall in the window $\phi = \pi/4 \pm \pi/8$ radians for full category membership and the average of C for agencies that fall in the window $\phi = 5\pi/4 \pm \pi/8$ radians for full category non-membership.

[12] E.g., for the accretion category, the average of C for agencies that fall in the window $\phi = 3\pi/4 \pm \pi/8$ and $\phi = 7\pi/4 \pm \pi/8$.

[13] Since Nexis Uni does not provide case totals for each year or allow empty searches (to return all cases), we estimate total cases as the number of cases that contain any of the seven most common words in the English language. Specifically, we count the annual number of cases returned when we search for ["the" OR "be" OR "to" OR "of" OR "and" OR "a" OR "in"].

[14] Formally, we find no instances where causal ingredient necessity inclusion (consistency) scores cross a 0.9 threshold and where relevance of necessity (RoN) is above 0.5 (Schneider and Wagemann 2012:236).

[15] A causal recipe that equally explains an outcome and its negation presents obvious problems for explanation and would score 0 for PRI. A causal recipe that perfectly explains an outcome (is a full subset of the outcome condition) and does not explain its negation at all (i.e. is fully excluded from the negation of the outcome) would score 1 for PRI (Ragin 2008; Schneider and Wagemann 2012).

[16] The coverage scores we present are conservative because of our two-dimensional measure of agency membership. Specifically, equation (1) leads to overlapping categorizations of many agencies. For example, the Bureau of Safety and Environmental Enforcement is categorically a delegation agency but actually scores higher than any other

agency in the accretion category (see again Figure 6). Thus, many categorically adjacent agencies are included in the calculation of recipe coverage for any given outcome, which suppresses coverage scores and suggests that reported recipes may be more substantively meaningful than their (already robust) coverage scores imply.

[17] In developing our analysis, we worked with a number of additional conditions, both internal and external to agencies; none proved more explanatory than the four we present here. For details, see Appendix D.

[18] We note additionally that in 2020, a thoroughly bipartisan conservation bill signed by none other than Donald Trump allocated nearly $10 billion in funding to NPS—a clear indication of political clout afforded by special nature (Karni 2020).

[19] This overlap is partly an artifact of our approach to fsQCA calibration: we calibrate agencies' category membership scores relative to the bureaucracy as a whole, and in that broader administrative context, agencies in the environmental state score low on accretion but higher on delegation. As a result, even agencies located in the accretion quadrant of the phase space (e.g. USFWS) have only moderate accretion membership scores, with several delegation agencies scoring similarly or even higher on the accretion scale (see Figure 6).

[20] Extraction is forbidden in National Parks. For the most part, resource extraction is also prohibited in National Wildlife Refuges, but there are exceptions where, for example, UWFWS owns surface rights but not sub-surface mineral rights (Crafton, Comay, and Humphries 2018).

[21] Leaving agencies that do not provide special nature in the analysis has no substantive effect; it only confirms that a) erosion agencies and b) "expert regulation" agencies (EPA, NRC) provide no special nature whatsoever, of the recreation or extractive variety. We drop these agencies only to simply the presentation of results in Table 4.

Table 1. Agencies of the U.S. Environmental State

Sorted by employee corps size, smallest to largest

Agency	Founding Year	Ancestral Agency (Founding Year)	Years observed	Employees (2019)	Discretionary Outlays (2019; $ B)	% outlays on natural resources (avg)	Regulatory role	% of federal litigation (avg)	% employees who are outside experts (avg)	% spending on special nature (avg.)[22]	Primary Focus/Mission	Critical Statutes[23]
Office of Surface Mining, Reclamation, and Enforcement	1977	-	40	373	0.17	82.85	Yes		Yes	82.84	Regulation of mining; reclamation of abandoned mine lands	Surface Mining Control and Reclamation Act of 1977
Bureau of Ocean Energy Management	2011	Minerals Management Service (1982)	37	565	0.15	100.00	No		No	0.00	"manage development of U.S. Outer Continental Shelf energy and mineral resources"	Federal Oil & Gas Royalty Management Act of 1982
Bureau of Safety and Environmental Enforcement	2011	Minerals Management Service (1982)	37	775	0.12	100.00	Yes		Yes	100.00	Regulation of offshore drilling	
Bureau of Mines	1910	-	22	2,128 (1994)	0.29 (1994)	100.00	No		No	0.00	Research on mining and related, including conservation of mineral resources	
Nuclear Regulatory Commission	1975	Atomic Energy Commission (1946)	47	2,908	0.11	100.11	Yes		Yes	0.00	Regulation of nuclear reactors, materials, and waste	Atomic Energy Act of 1954
Office of the Secretary of the Interior	1849	-	47	3,477	1.20	99.17	No		No	79.48	Residual category of all DOI personnel/spending not assigned specific agency	
Bureau of Reclamation	1923	U.S. Reclamation Service (1902)	47	5,408	1.30	99.99	No		No	-99.88	Dam construction and power generation in the West; water management	Reclamation Act of 1902
U.S. Geological Survey	1879	-	47	7,9845	1.10	100.00	No		No	0.00	Mapping and study of mineral resources (historical); primary science and research agency for DOI (present)	
U.S. Fish and Wildlife Service	1940	U.S. Fish Commission (1871)	47	8,293	1.50	98.33	Yes		Yes	97.91	Management of fish and wildlife habitat, including National Wildlife Refuge System (95 million acres of land; 855 million acres of land and water)	Migratory Bird Treaty Act of 1918; Migratory Bird Hunting and Conservation Stamp Act of 1932; Fish and Wildlife Coordination Act of 1934; Fish and Wildlife Act of 1956; Endangered Species Act of 1973
Natural Resources Conservation Service	1935	Soil Erosion Service (1933)	47	8,914	0.89	99.97	No		No	52.20	Agricultural erosion control (historical); sustainable agriculture and related technical assistance to farmers (present)	

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Bureau of Land Management	1946	General Land Office (1812)	47	10,413	1.23	88.61	No		No	93.42	"Multiple use" and "sustained yield" management of mostly Western lands (155 million acres)	The Wilderness Act of 1964; Federal Land Policy and Management Act of 1976
National Oceanic and Atmospheric Administration	1970	U.S. Geodetic Survey (1807)	47	11,262	5.09	98.08	Yes		Yes	98.08	Weather forecasting and research; environmental research; stewardship of coastal and marine environments	The Coastal Zone Management Act of 1972; The Marine Protection, Research, and Sanctuaries Act of 1972; Endangered Species Act of 1973; Magnuson-Stevens Act of 1976; Marine Mammal Protection act of 1977
Environmental Protection Agency	1970	Several	47	14,291	8.20	99.47	Yes		Yes	-98.84	Establishing and enforcing national environmental standards	Clean Air Act of 1970; Clean Water Act of 1972; The Marine Protection, Research, and Sanctuaries Act of 1972; Safe Drinking Water Act of 1974; Toxic Substances Control Act of 1976; CERCLA of 1980 (a.k.a. "Superfund")
National Park Service	1916	-	47	20,949	2.78	99.76	No		No	99.70	Management of national parks and monuments (84 million acres)	National Park Service Organic Act of 1916; The Wilderness Act of 1964
Forest Service	1905	-	47	35,521	5.75	91.01	No		No	91.21	Management of national forest and grasslands (194 million acres)	The Multiple Use Sustained Yield Act of 1960; The Wilderness Act of 1964; National Forest Management Act of 1976
U.S. Army Corps of Engineers	1802	-	47	35,998	6.79	99.69	Yes		Yes	-100.29	Civil engineering, disaster preparedness, regulation of national waterways	Rivers and Harbors Act of 1899; Clean Water Act of 1972
Department of Interior (DOI)	**1849**	**-**	**47**	**66,001**	**12.94**	**63.11**	**-**		**-**	**24.05**	**Management of most federal lands; administration of programs related to American Indians, Alaskan Natives, and Native Hawaiians**	**-**
Environmental State NET	**-**	**-**	**47**	**168,416**	**36.69**	**95**	**-**		**-**	**-**	**-**	**-**

Table 1. Agencies of the U.S. Environmental State
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[22] Spending on special nature is defined as spending on (conservation + recreation – pollution control – water resources) as defined by OMB spending sub-functions. Negative values thus indicate spending on pollution control and water resources, a.k.a. ordinary nature.
[23] All federal agencies are also bound by the National Environmental Policy Act of 1969.

Table 2. Analysis of Necessity

Primary causal conditions for agency change

	Accretion			*Erosion*			*Delegation*			*Centralization*		
Causal Condition	**Inclusion**	**RoN**	**Coverage**	**Inclusion**	**RoN**	**Coverage**	**Inclusion**	**RoN**	**Coverage**	**Inclusion**	**RoN**	**Coverage**
No Regulatory Role	0.411	0.482	0.252	0.780	0.787	0.812	0.548	0.560	0.455	0.701	0.606	0.547
Regulatory Role	0.726	0.800	0.641	0.302	0.724	0.452	0.548	0.806	0.655	0.407	0.726	0.458
Low Legal Contention	0.731	0.588	0.466	0.671	0.735	0.726	0.689	0.653	0.595	0.696	0.636	0.565
High Legal Contention	0.611	0.729	0.512	0.529	0.841	0.751	0.575	0.791	0.652	0.619	0.794	0.660
Weak Expert Networks	0.846	0.361	0.409	0.774	0.478	0.635	0.904	0.450	0.591	0.731	0.378	0.450
Strong Expert Networks	0.302	0.842	0.437	0.313	0.928	0.768	0.232	0.846	0.453	0.455	0.948	0.837
Low Provision of Special Nature	0.307	0.556	0.220	0.712	0.878	0.864	0.402	0.616	0.389	0.697	0.728	0.635
High Provision of Special Nature	0.820	0.719	0.601	0.362	0.650	0.449	0.709	0.775	0.703	0.440	0.634	0.410

Note: we present the analysis of necessity for the four primary ingredients for agency change (and their negations) that we focus on, but we examined all 80 conjunctural (Boolean AND) configurations of these four ingredients (i.e. the eight singular ingredients, the 34 combinations of 2 ingredients, the 32 combinations of 3 ingredients, and the 16 combinations of all four ingredients). None of these combinations passed a 0.9 threshold for necessity of inclusion. 26 disjunctural (Boolean OR) configurations passed that threshold, some with moderately high relevance of necessity scores.

Table 3. Recipes for change in the environmental state

Four ingredients: regulation, contention, expert networks, special nature

Recipe No.	Bundles of Resources	Inclusion	PRI	Coverage	Agencies	Pattern name	Recipe Overlap
Erosion							
E1	No Regulatory Role + Low Legal Contention + Weak Expert Networks + Low Provision of Special Nature	.963	.956	.376	Bureau of Ocean Energy Management U. S. Geological Survey Bureau of Mines Natural Resources Conservation Service Bureau of Reclamation	"erosion of the forgotten"	n/a
E2	Regulatory Role + High Legal Contention + Weak Expert Networks + Low Provision of Special Nature	1.000	1.000	.126	U.S. Army Corps of Engineers	"regulation without resources"	n/a
E3	Regulatory Role + Low Legal Contention + Strong Expert Networks + Low Provision of Special Nature	1.000	1.000	.130	Nuclear Regulatory Commission (*Centralization*)	-	n/a
	Net	**.974**	**.969**	**.540**	Listed above	-	-
Accretion							
A1	Regulatory Role + Weak Expert Networks + High Provision of Special Nature	1.000	1.000	.218	U.S. Fish and Wildlife Service	-	Supraset of D1
A2	No Regulatory Role + High Legal Contention + Strong Expert Networks + High Provision of Special Nature	1.000	1.000	.209	Office of the Secretary of the Interior	-	D2
	Net	**1.000**	**1.000**	**.325**	Listed above	-	-
Centralization							
C1	Regulatory Role + Strong Expert Networks + Low Provision of Special Nature	.983	.974	.309	Environmental Protection Agency Nuclear Regulatory Commission	"expert regulation"	n/a
C2	No Regulatory Role + Low Legal Contention + Weak Expert Networks + High Provision of Special Nature	.925	.781	.336	National Park Service	-	n/a
	Net	**.946**	**.901**	**.576**	Listed above	-	-
Delegation							
D1	Regulatory Role + Low Legal Contention + Weak Expert Networks + High Provision of Special Nature	.920	.893	.508	National Oceanic and Atmospheric Administration Office of Surface Mining, Reclamation, and Enforcement Bureau of Safety and Environmental Enforcement U.S. Fish and Wildlife Service *(Accretion)*	-	Subset of A1
D2	No Regulatory Role + High Legal Contention + Strong Expert Networks + Low Provision of Special Nature	.995	.988	.151	Office of the Secretary of the Interior	-	A2
	Net	**.998**	**.998**	**.502**	Listed above	-	-

Table 4. Recipes for change in special nature agencies: extractive v. recreation nature

Five ingredients: regulation, contention, expert networks, recreation nature, extraction nature)

Recipe No.	Recipes for Agency Change	Inclusion	PRI	Coverage	Agencies	Recipe name	Recipe Overlap
Erosion							
N/A *– No agencies that provide special nature are erosion agencies.*[24]							
Accretion							
A1	Regulatory Role + High Legal Contention + Weak Expert Networks + High Recreation Nature + High Extractive Nature	1.000	1.000	.109	U.S. Fish and Wildlife Service	-	D1
A2	No Regulatory Role + High Legal Contention + Strong Expert Networks + Low Recreation Nature + High Extractive Nature	1.000	1.000	.176	Office of the Secretary of the Interior	-	D3
	Net	**1.000**	**1.000**	**.271**	Listed above	-	-
Centralization							
C1	No Regulatory Role + Low Legal Contention + Weak Expert Networks + High Recreation Nature + Low Extractive Nature	1.000	1.000	.268	National Park Service	-	n/a
	Net	**1.000**	**1.000**	**.268**	Listed above	-	-
Delegation							
D1	Regulatory Role + High Legal Contention + Weak Expert Networks + High Recreation Nature + High Extractive Nature	1.000	1.000	.092	U.S. Fish and Wildlife Service (*Accretion*)	-	A1
D2	Regulatory Role + Low Legal Contention + Weak Expert Networks + Low Recreation Nature + High Extractive Nature	1.000	1.000	.578	{National Oceanic and Atmospheric Administration; Office of Surface Mining, Reclamation, and Enforcement; Bureau of Safety and Environmental Enforcement}	-	n/a
D3	No Regulatory Role + High Legal Contention + Strong Expert Networks + Low Recreation Nature + High Extractive Nature	1.000	1.000	.148	Office of the Secretary of the Interior (*Accretion*)	-	A3
	Net	**1.000**	**1.000**	**.703**	Listed above	-	-

[24] Formally, no agencies that provide special nature also pass a 0.9 sufficiency (consistency) inclusion score threshold for membership to the erosion category. As we would expect, given comparatively higher provision of special nature, the Natural Resources Conservation Service comes closest, and a sufficiency inclusion score of 0.8224 for membership to the high erosion set.

Table 4. Recipes for change in special nature agencies: extractive v. recreation nature
Five ingredients: regulation, contention, expert networks, recreation nature, extraction nature)

Figures

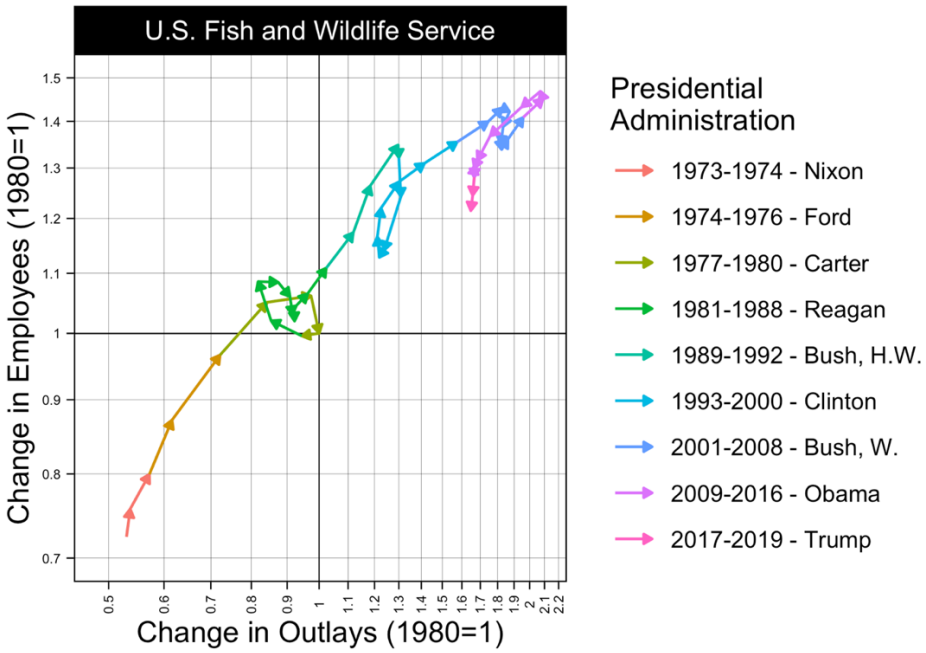

Figure 1: U.S. Fish and Wildlife's path through the outlays-employment phase space from 1973 to 2019.

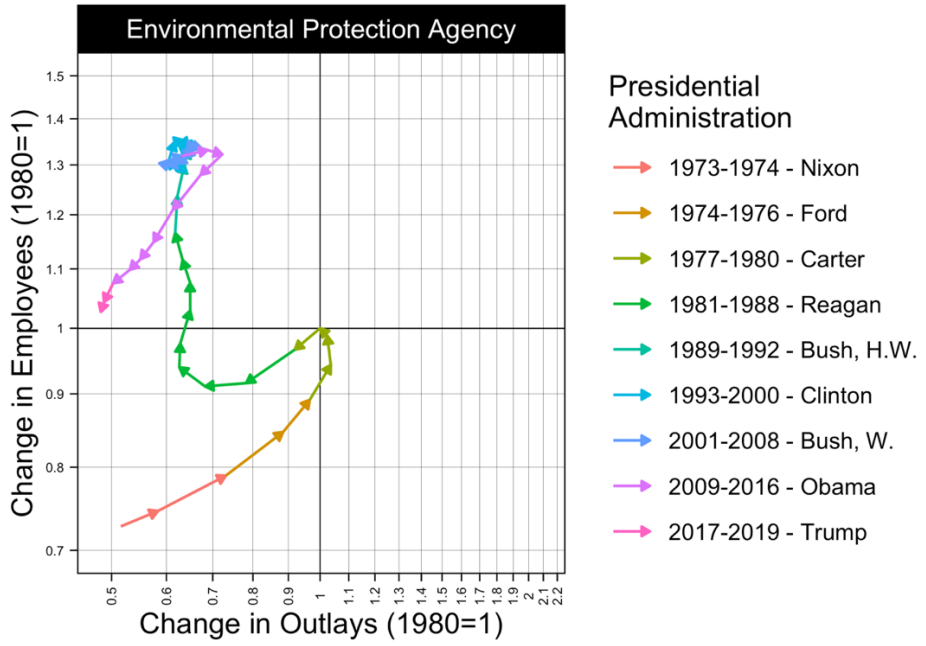

Figure 2: U.S. EPA's path through the outlays-employment phase space from 1973 to 2019.

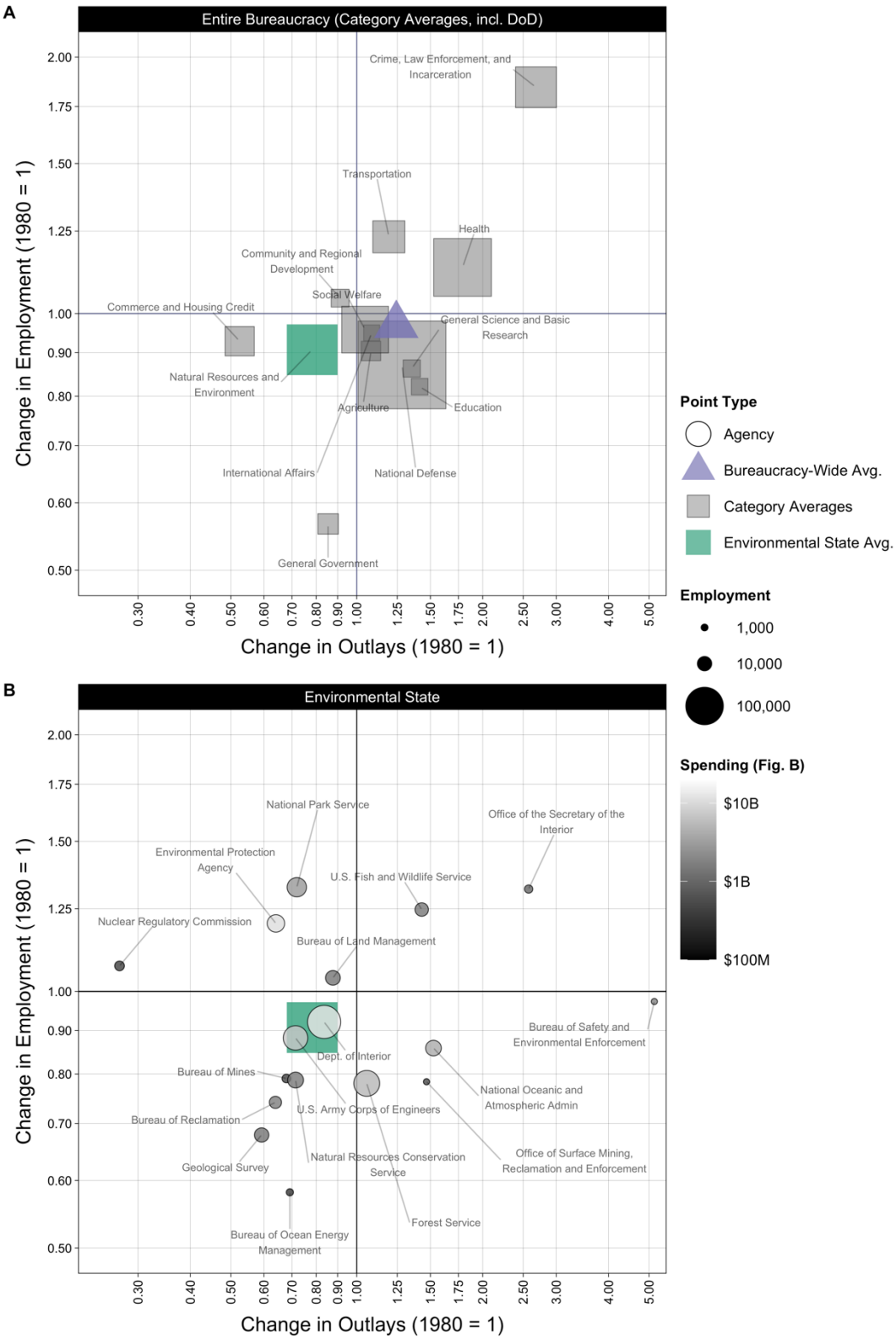

Figure 3: (A) Average patterns of change for (A) all major fields of governance across the U.S. federal bureaucracy, 1980-2019, and (B) individual elements of the environmental state.

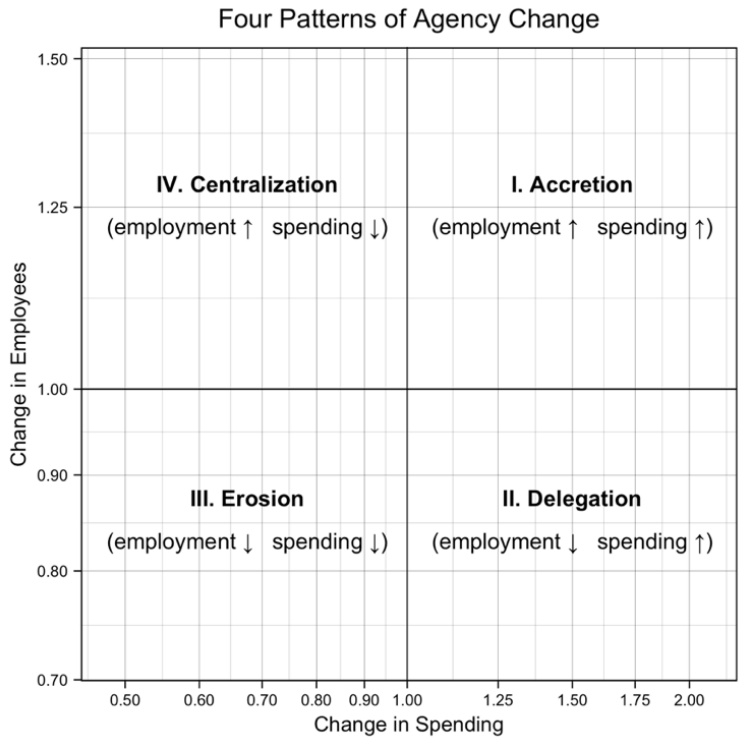

Figure 4: Four patterns of bureaucratic change

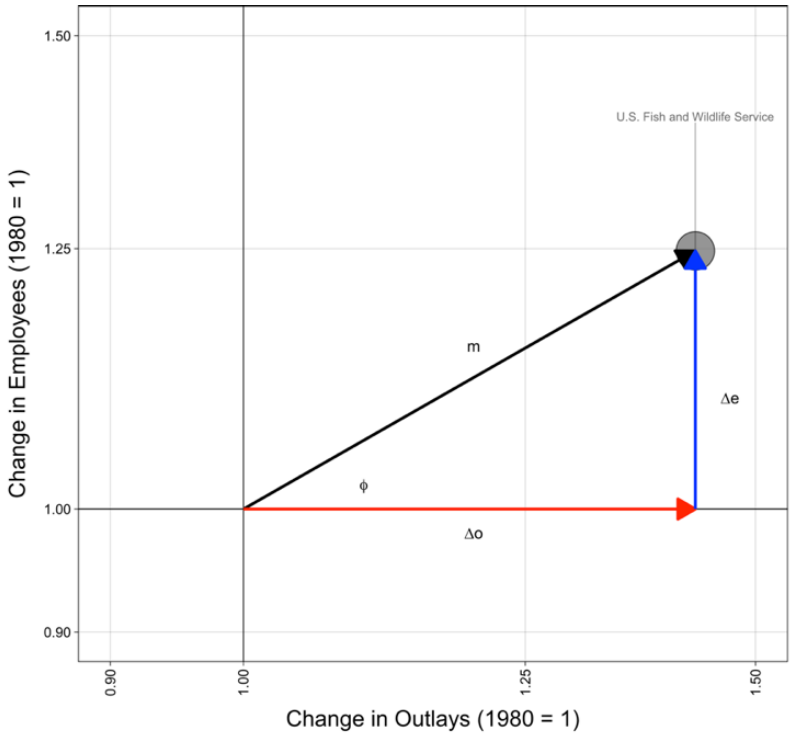

Figure 5: Quantifying agency category membership using average agency position in the outlays-employment phase space from 1980 to 2019. Note that USFWS's position is the same as Figure 3B.

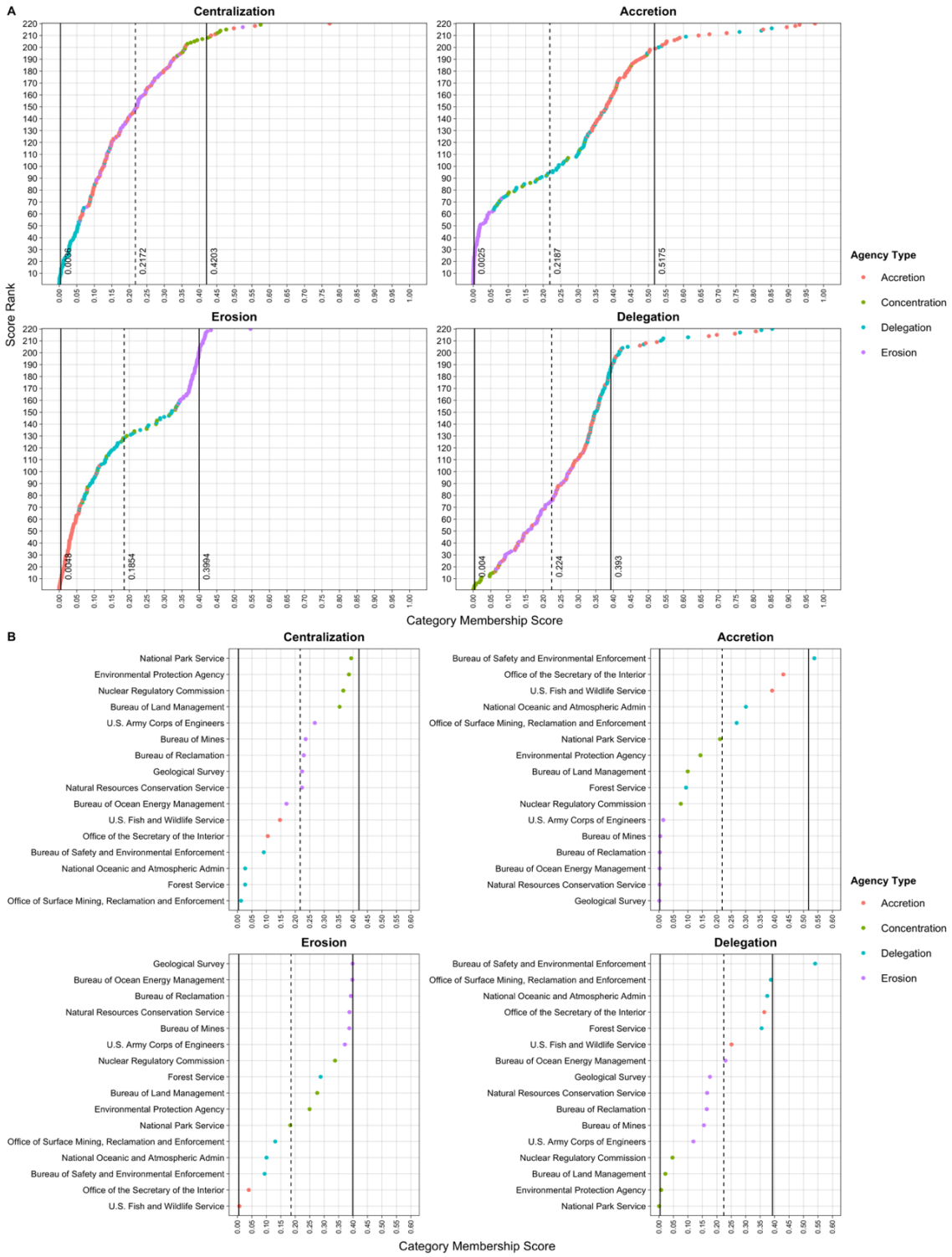

Figure 6: (A) Setting category membership calibration thresholds with 222 agencies in the U.S. Federal bureaucracy. Each agency is represented as a single point; point color indicates which quadrant of the phase space the agency resides within, on average, from 1980-2019 (see again figure 4). Agencies are ordered by their category membership-level ("score-rank") on the y-axis. Category membership score is given on the x-axis (see Equation 1). Solid vertical lines represent thresholds for full membership (right-most lines) and full non-membership (left-most lines). Dotted lines represent crossover points. See main text for description of threshold calculation. (B) Category membership scores of environmental state agencies only. Threshold lines are the same as those in shown in (A).