RISK TO MAINTENANCE-DEPENDENT SPECIES FROM ORTHODOXY IN SPECIES-BASED LAND-USE REGULATION

by

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A THESIS

Presented to the Environmental Studies Program
and the Graduate School of the University of Oregon
in partial fulfillment of the requirements
for the degree of
Master of Science

June 2013

THESIS APPROVAL PAGE

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Title: Risk to Maintenance-Dependent Species from Orthodoxy in Species-Based Land-Use Regulation

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Degree awarded June 2013

THESIS ABSTRACT

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Environmental Studies Program

June 2013

Title: Risk to Maintenance-Dependent Species from Orthodoxy in Species-Based Land-Use Regulation

I theorize and offer some evidence that humans inadvertently risk exacerbating the loss of maintenance-dependent species on private land by using species-based land-use regulation to seek other benefits. Drawing evidence primarily from the US, I argue that such regulation poses a risk to maintenance-dependent species, that humans routinely disregard this risk, and that this disregard widely serves to defend the power of individuals and organizations to use such regulation to seek other benefits. I suggest this implies that with constraints on public funding, humans might improve the survival of some species by clarifying the purpose of such regulation and considering openly refraining from such regulation for some species. I also suggest such change might depend on articulating the issue as whether the survival of a species could ever depend on individuals having a right to conserve or maintain it without selectively incurring harm from regulation intended to save it.

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Partnership and Northwest Lichenologists, 64. http://www.northwestscience.org/Resources/Final%20Annual%20Meeting%20Abstracts%20and%20Programs/2013%20NWSA%20Program%20and%20Abstracts.pdf.

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ACKNOWLEDGMENTS

> Conservation planning is not for the faint of heart.
> (Noss, O'Connell, and Murphy 1997, xiii)

I could not have completed this work without the generous help and encouragement of others. Above all, I thank Ted Toadvine, whose interest, insights, encouragement, faith, and patience brought sunlight to a sometimes dark and stormy path.

I thank Rich Margerum and Patrick Hurley for the opportunity to undertake this work, for their patience in allowing me to pursue it, and for key guidance. I especially thank Patrick for suggesting I take these questions to graduate school and for referring me to work by Zimmerer (2000); and Rich for suggesting one sometimes needs to spiral into a topic. I thank former committee members Rob Ribe and Peter Walker for essential early guidance. I am particularly grateful to Peter for introducing me to political ecology, pointing me to Leach and Mearns (1996a), and suggesting that I would "need to do a lot of reading".

I likewise thank Alan Dickman, the University of Oregon Graduate School, and the Environmental Studies Program for the opportunity to pursue this work and for their extraordinary consideration and support in allowing me additional time to complete it, and Gayla WardWell, for her long faith and encouragement.

I thank the US Fish and Wildlife Service for financial support for research that contributed to this work (under grant 005-4279S-WILDLIFE). The views I present here are solely mine, and I am solely responsible for any errors.

For all whose views I question in this work, I deeply honor their concern for our environment and natural heritage. I share the widespread view that we humans are at

imminent peril of destroying our environment through market failure, and that our own fate will likely depend upon greatly expanding mutual controls to limit destruction of the environment through human action. In questioning any views here, I seek only to prevent our species from inadvertently sacrificing others in the name of saving them, at least not without recognizing what we are doing. I also acknowledge that anyone's views may have changed.

I offer additional acknowledgments in appendix C.

DISCLAIMER

I am not an attorney. This work presents scholarly research and should not be interpreted as legal advice. Anyone seeking to employ or otherwise rely on any interpretations of law herein should first seek legal counsel.

I dedicate this work to early disequilibrium ecologist Henry Allan Gleason (1882–1975).

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CHAPTER I

INTRODUCTION

> [T]here is mounting evidence that some regulatory actions by the Federal government, while well intentioned and required by law, can under certain circumstances have unintended negative consequences for the conservation of species on private lands... The magnitude of this negative outcome is greatly amplified in situations where active management measures (e.g., reintroduction, fire management, control of invasive species) are necessary for species conservation.
>
> (USFWS 2006, 63896–63897, citations omitted)[1]

> There is a war over nature in progress and nature itself is in the middle — caught in a cross-fire of competing interests.
>
> (Lease 1995, 4)

1. Overview of My Argument

In this work, I theorize and offer some evidence that humans inadvertently risk worsening the loss of many species in the name of saving them, by using their presence to seek other benefits through police power. Specifically, drawing evidence primarily from the US, I argue that humans risk exacerbating the loss of maintenance-dependent species on private land by using their presence to seek other benefits through uncompensated species-based land-use regulation.

By species-based land-use regulation, I mean governmental land-use prohibitions or exactions based on the presence of particular species or associated habitat. Examples

[1] I discuss this passage and associated evidence in chapter III.

of such regulation include land-use restrictions or imposition of liability for mitigation fees under the US Endangered Species Act of 1973 (ESA), based on the presence of animal species formally identified ("listed") by the US Fish and Wildlife Service (USFWS) as threatened or endangered.

By maintenance-dependent species, I mean species whose survival depends on humans actively managing land, such as to control invasive exotic vegetation or reintroduce periodic, low-intensity burning formerly practiced by Native Americans (Wilcove and Chen 1998).[2] Scott et al. (2010) recently estimated that of all species listed as threatened or endangered under the ESA, 84% were maintenance-dependent.[3] Explaining maintenance dependence, Wilcove et al. (1996, 6) commented:

> [W]ithout active management, populations of many endangered species will perish as surely as if the land itself had been paved or plowed.

In the US, many imperiled maintenance-dependent species occur substantially on private land. Examples include the Fender's blue butterfly (USFWS 2006, 63880), red-cockaded woodpecker (Costa 1997), and gopher tortoise (Underwood et al. 2012). In 1994, the US Government Accounting Office (GAO 1994, 5–6) estimated that approximately 37% of all species listed as threatened or endangered under the ESA had all of their known habitat in nonfederal ownerships, predominantly comprised of private

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[2] Maintenance-dependence of species was recognized in the US as early as 1931, in a monograph on conserving an imperiled game species, the bobwhite quail (Stoddard 1978 [1931], 405–406, 413; also cf. Leopold 1986 [1933], 4, 7–12, 26, 407; Stone 1965).

[3] Similarly, in 1998, Wilcove and Chen found that of all species listed or proposed for listing as threatened or endangered under the ESA, 60% were maintenance dependent (Wilcove and Chen 1998). Scott et al. (2010) based their estimate on species for which USFWS had developed recovery plans.

land. According to Langpap and Wu (2004, 436, citing a USFWS news release of 1997), more than half of all species listed as endangered under the ESA had at least 80% of their habitat on private land. To the extent that maintenance dependence occurs without regard to type of ownership, this evidence suggests that a majority of maintenance-dependent species have a majority of their habitat on private land.

I offer this work in the hope of identifying opportunities to benefit such species through policy efficiencies and in the hope that such opportunities might coincidentally grant individuals a right to conserve or maintain at least some species without selectively incurring harm from regulation ostensibly intended to save them.[4]

2. The Structure of My Argument

More specifically, drawing evidence primarily from the US, I argue that (1) species-based land-use regulation risks exacerbating the loss of maintenance-dependent species, by inadvertently discouraging otherwise willing individuals from using their own resources to conserve or maintain declining species on private land or participating in incentive programs to do so; (2) that actors routinely disregard this risk in regulatory decisions and related discourse; and (3) that influential actors and a majority of citizens have motives to persist in this disregard, to defend their power to use the presence of species to seek other benefits through species-based land-use regulation.[5] For example, some of these other benefits, I argue, include securing scenery on the property of others;

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[4] By policy efficiency, I mean a change to policy that provides a net gain toward its objective, such as by clarifying its goals or changing its strategy.

[5] By actors, I mean individuals or organizations.

obtaining funds to administer or otherwise support species-based land-use regulation; maintaining stability and expedience in the administration of existing regulatory policies; and enjoying the perception of saving species.

In sum, I theorize and offer some evidence that maintenance-dependent species are at risk from a tyranny of the majority, as humans seek other benefits from each other through species-based land-use regulation without regard for consequent harm to species.[6]

To underscore the pervasiveness and persistence of this disregard for regulatory risk to species, I further theorize and present some evidence that this disregard amounts to hegemonic orthodoxy, characterized by institutions and beliefs that indiscriminately equate conservation with limiting human action, whether through restrictions or exactions. To help make this claim empirically testable, I define orthodoxy as adherence to belief even when it is false or unjustified, such as evidenced by persistent discrepancy with empirical evidence or by other persistent and demonstrable incoherence, and I define hegemonic belief as belief that is widespread and dominant, such as evidenced by enforcement through law, by widespread reproduction through peer-reviewed research,

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[6] I characterize this phenomenon as a tyranny of the majority based not on its potential to cause financial harm to landowners, but on its potential to cause unchecked harm to species. At least in theory, in the US, any financial harm to landowners is checked by limits on governmental "taking" of private property without just compensation, under the 5th Amendment to the US Constitution (Chemerinsky 2006, 639–640). Separately, however, I theorize that by obscuring regulatory risk to landowners, this phenomenon coincidentally has the potential to cause unchecked harm to human happiness, by silently eroding the freedom to use one's own resources to maintain a species without selectively incurring harm from regulation intended to save it.

news reports, or other variously authoritative or popular sources, or by reproduction by actors who are harmed by the belief or who espouse contrary views.

3. Research Questions

To support my theory with evidence, I ask three research questions:

1. Could species-based land-use regulation exacerbate the loss of maintenance-dependent species on private land?
2. Do humans consider risk to species from species-based land-use regulation in associated regulatory decisions and discourse?
3. Do humans seek other benefits from such regulation?[7]

In addition, to explore how actors might productively seek to improve the survival of species by realizing policy efficiencies implied by my argument, I ask a fourth research question, for discussion:

4. In the US, how might actors win consideration of risk to maintenance-dependent species from species-based land-use regulation?

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[7] For readers familiar with land-use regulation, question 3 might seem too obvious to warrant asking. Regulation to prohibit land use in undeveloped land has often been described as providing other benefits, such as preserving "open space" (Duane 2007, 82) and the "scenic character of the landscape" (Noss 2007, 1). I ask this question nevertheless, because I find that evidence to answer it coincidentally helps identify political forces relevant in trying to answer question 4.

4. Methods: Sources and Uses of Evidence

To answer my research questions, I draw on evidence from works by others and to a minor extent from handwritten field notes from my participant-observation in fully public regulatory fora and in one instance as a subject in research by others.[8] The works by others include scholarly articles and textbooks; technical reports; news reports; statutes; governmental rules; and various other sources.

I use the works by others in two ways. First, I cite some works (including peer-reviewed research) as primary evidence, such as to demonstrate disregard for regulatory risk to species. Second, I cite some research as secondary evidence, to directly answer my research questions or to question the accuracy or coherence of works I use as evidence of disregard for regulatory risk.[9]

I selected fora for participation opportunistically, based on relevance and accessibility, including proximity to the University of Oregon. My participation consisted of observation and submission of oral or written public comment, as a citizen.[10]

To err on the side of caution in protecting human subjects, I omit all personal names except as authors of published works or where actors are identified by others in

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[8] For discussion of participant-observation as a research method, see Alasuutari (1995), Hay (2000), Tarlock (2001), Fischer (2003), Paulson, Gezon, and Watts (2003), Marshall and Rossman (2006), Leach (2008), and (Yin 2009).

[9] Neumann (2008) observed that to evaluate claims related to environmental policy, political ecologists often distinguish between their use of research as primary and secondary evidence. Neumann characterized this distinction as requiring researchers to "walk an epistemological tight rope" (733).

[10] Consistent with the theory I present here, I found my comments were often distorted when reported by fora officials in their own words. Thus, unless in my own words, any such artifacts should not be construed as necessarily representing my comments or views accurately.

such works. For disclosure, I note where I have participated in the research or fora I mention in this work.

5. Suppositions and Delimitations

My argument rests on two suppositions. First, I presuppose that at any given time, species widely perceived as imperiled occur only on the property of a minority of citizens. Second, while I draw on evidence primarily from the US, to take advantage of the nation's comparatively long history of species-based land-use regulation,[11] I assume that the phenomenon I theorize could arise wherever similar conditions prevail. (As suggested by the evidence I present in this work, these conditions include the presence of maintenance-dependent species on private land; constraints on public funding for conservation; expandable authority for species-based land-use regulation; cost-sensitive preferences of some individuals or nongovernmental organizations to use their own resources to conserve or maintain some declining species or to participate in incentive programs to do so; and widespread desire for other benefits from species-based land-use regulation.)

In addition to making these two assumptions, I limit my argument in the following respects.

[11] Authority for species-based land-use regulation first arose in US federal law in 1973, with the passage of the ESA (Lueck 2000).

5.1. Species-Based Land-Use Regulation

I limit my argument to uncompensated land-use regulation that is based on the presence of particular species or associated habitat. I exclude other types of regulation, which I presume can help protect species from human action without turning species into a liability. For example, I exclude land-use regulation based on the presence of water or hydric soils, as under the US Clean Water Act; land-use regulation based on distance from water, as in regulation to protect riparian habitat; regulations that limit or prohibit killing particular species as a primary purpose, as under the ESA (§9), state hunting regulations, or the US Migratory Bird Treaty Act; universal development fees required by state or local governments as a condition for permitting new land uses, as long as such requirements are imposed without regard to the presence of species; and compensated regulation (i.e., condemnation), even when such regulation is based on the presence of species.

I recognize that in practice, it could be difficult to distinguish species-based land-use regulation from other types of land-use regulation. For example, under Oregon's land-use law known as Goal 5 (OAR 660-015-0000(5); OAR 660-023), a city government proposed considering property for additional land-use restrictions as upland wildlife habitat in part if "local experts in ... landscape architecture" found it to be "ecologically significant" (City of Eugene Planning Division 2003, attachment B: 1–2).

5.2. Regulation Intended to Improve the Survival of Species

I limit my argument to species-based land-use regulation that is intended to improve the survival of species. Thus, my argument has no bearing on species-based

land-use regulation that is intended to achieve other goals even at the risk of worsening the fate of species. For example, one might expressly seek to use species-based land-use regulation primarily to protect scenery, agricultural soil, or the atmosphere from increased land use, even at the expense of targeted species. Potentially hinting at the possibility of regulation that would intentionally sacrifice species to seek other environmental benefits, in reviewing a recent textbook on conservation science, a conservation biologist commented:

> This book challenges conservation scientists to face discomforting questions. Should we design management plans that are deliberately suboptimal for biodiversity in order to maximize ecosystem services?
>
> (Vellend 2011, back cover, referring to Kereiva and Marvier 2011)[12]

5.3. Maintenance-Dependent Species

I limit my argument to species whose survival depends on active management by humans. In doing so, I do not intend to imply that maintenance-dependent species comprise a category that is fixed or easily distinguished from species that are self-sustaining. A species that appears self-sustaining today could presumably become maintenance dependent tomorrow, with the arrival of a new invasive species. Moreover, the distinction seems difficult to make even at any given time, given the complexity of landscapes with historically native species and the variety of threats to them. I presume only that without active management, some species are more likely to become extinct.

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[12] In contrast to the potential interpretation I suggest here, I do not find Kereiva and Marvier (2011) actually suggest sacrificing species for other ends.

5.4. Terrestrial Species

I exclude aquatic and wetland species from my argument, for two reasons. First, I do so for expedience, to make my argument more tractable, by narrowing its scope. Second, I presume that governments can protect such species from human action through other types of regulation, without turning species into a liability. Examples of such regulation include land-use prohibitions or exactions under the US Clean Water Act, if based solely on the presence of water or hydric soils, and not on the presence of species.

In excluding aquatic and wetland species, I do not intend to imply that any or all such species can survive without active management by humans. Scott et al. (2005, 385) reported that the survival of salmon and some other fish species of large rivers depends on continuous human intervention, to maintain particular environmental characteristics.

5.5. Private Land

I exclude public land from my argument. I do so in part from presuming that on public land, the public tends to share both the benefits and costs of land-use regulation, in contrast to private land, where landowners tend to disproportionately bear the costs (Adler 2008). This difference could presumably reduce any resulting disincentive for maintaining species on public land. However, I exclude public land primarily for expedience and for the relative lack of information about the preferences of governments for preserving their own land-use rights or for conserving species.[13]

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[13] Like Rachlinski (1998), I presume that the preferences of local governments could favor conservation or development, depending on the balance of local political forces. That is, a government might seek to protect its land-use rights for land that it owns, even at the expense of declining species. For example,

5.6. Potential Insufficiency of Voluntary Conservation and Maintenance

I do not presume that voluntary conservation or active management is sufficient to save any species from extinction. I argue only that species-based land-use regulation might worsen the fate of maintenance-dependent species on private land; that is, that in such contexts, governmental failure might be worse than market failure. Some evidence suggests that active management can improve the survival of some species (e.g., cf. Ortega-Álvarez and Lindig-Cisneros 2012, 118–119). However, I do not claim that such efforts always succeed; such successes might even be rare. I claim merely that without active management, some species are more likely to perish. Thus, I argue that even if voluntary conservation and maintenance are insufficient to ensure the survival of a species, such volunteerism might still be necessary, to avoid worsening its fate.

5.7. Uncertainty of Risk to Species from Species-Based Land-Use Regulation

I do not claim to show that species-based land-use regulation exacerbates the loss of maintenance-dependent species. I seek only to show that this risk is significant enough to warrant considering in policy decisions.

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where conservation interests constitute a minority, a city might want to retain its right to build a school or reservoir on city-owned land, or the right to sell that property for maximum financial return, unreduced by land-use restrictions intended to conserve species or associated habitat. I further presume that a government's preferences for conservation could be cost-sensitive. Citing the landmark Lucas decision (Lucas v. South Carolina Coastal Council, 505 U.S. 1003 [1992]), Sagoff (1997) presented an example apparently illustrating such preferences. In that case, a private landowner disputed development restrictions that local government imposed on his property based on its shoreline location. When settlement of the case led the local government to acquire the property, the government lifted the restrictions, then sold it, presumably at a price higher than if the government had kept the restrictions in place.

5.8. Uncertainty of Motives for Disregarding Regulatory Risk to Species

I do not claim to identify all motives for individuals or organizations to disregard risk to species from species-based land-use regulation, nor do I claim to prove that the motives I offer indeed contribute to such disregard. I only suggest motives for which I can offer some evidence of their existence. However, I also suggest that these motives offer a credible and potentially useful explanation for why this disregard persists.

5.9. Characterization of Actors

Primarily for expedience but also for clarity, I generally avoid characterizing the types of actors involved in the phenomenon I describe, except coincidentally, in the course of offering evidence to support my argument. For example, in supporting my claim that actors widely seek other benefits from species-based land-use regulation, I in part offer some evidence that these actors include developers, regulators, and local governments.

In particular, to avoid confusion, I generally avoid characterizing actors as "pro-regulatory" or "anti-regulatory". I take this approach because as some of this evidence shows, some actors who advocate for species-based land-use regulation oppose regulation in general, and some actors who oppose species-based land-use regulation share beliefs that obscure regulatory risk to species.

I leave systematic characterization of relevant actors as a project for future research (e.g., cf. chapter V, section 4.1.6).

5.10. Difference from Libertarianism, Neoliberalism, and Free-Market Environmentalism

Under economic philosophies variously called libertarianism, neoliberalism, or free-market environmentalism, some scholars (e.g., Anderson and Leal 2003, 4) theorize that environmental problems can be addressed more efficiently through private ownership of natural resources, compared to the alternatives of governmental regulation or taxation.[14] In contrast, in arguing that species-based land-use regulation might be counterproductive to the survival of maintenance-dependent species on private land, I do not argue that regulation is always less efficient than private ownership in addressing environmental problems. I allow that regulation or taxation might be more efficient in addressing many and perhaps even most such problems.

6. Implications

As I discuss later in this work, the theory I offer here has two implications. The first concerns policy efficiencies; the second concerns the political prospects of realizing such efficiencies.

First, risk to maintenance-dependent species from species-based land-use regulation implies that with constraints on public funding for conservation, humans might improve the survival of maintenance-dependent species on private land by (1) clarifying whether the purpose of such regulation is primarily to ensure the survival of species or to limit harm to species from human action, and (2) considering an alternate strategy of

[14] It is unclear to me how strictly proponents of these philosophies adhere to them. For example, Anderson (2008, n.p.) commented that global warming does not have easy market solutions.

openly refraining from species-based land-use regulation for maintenance-dependent species on private land, to avoid inadvertently discouraging otherwise willing individuals from using their own resources to conserve or maintain such species or participating in incentive programs to do so. That is, with constraints on public funding for conservation, humans might have an opportunity to improve the survival of many species by granting individuals a right to use their own resources to conserve or maintain a species without selectively incurring harm from regulation intended to save it.[15, 16]

Second, widespread and widely motivated disregard for this regulatory risk to species implies that strong political forces make it extremely difficult for actors to win consideration or implementation of such policy efficiencies. To do so, actors must overcome strongly opposed interests and strongly held and widely supported beliefs. In this work, I nevertheless offer some thoughts for how actors might seek to do so.

7. Contributions to Research by Others

Through the main argument presented here, this work contributes to research by others in the field of political ecology. In addition, through evidence to support that argument, this work coincidentally contributes to research by others in various other domains.

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[15] This implication does not necessarily mean refraining from species-based land-use regulation for all lawful land uses on all private land. I discuss this implication further in chapter V.

[16] As I discuss in chapter V, others (e.g., Zimmerer 2000) have reached variously similar conclusions, though typically in more general terms. In this work, I expressly isolate the issue to maintenance-dependent species on private land.

7.1. Contributions to Political Ecology

This work contributes to the field of political ecology by supporting and extending a theory articulated by Leach and Mearns (1996) to warn of risk to the environment from orthodoxy in governmental conservation programs.[17]

Citing evidence from case studies of international development programs in Africa, Leach and Mearns theorized that powerful coalitions of actors can inadvertently harm the environment by using demonstrably false or questionable beliefs to defend and pursue environmental policies that are ineffective or counterproductive but serve the actors' other interests, such as by exacting fees for or imposing uncompensated

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[17] Political ecologists have yet to settle on a precise definition of their field (Peet and Watts 2004; Walker 2006, 391; Robbins 2012, 14). In this work, I take political ecology to mean the branch of ecology that studies the interaction between human power relations and environmental phenomena (cf. Biersack 2006, 3, citing Wolf 1975; Walker 2006, 391, citing Robbins 2004, 12). By power relations, I mean one's ability to influence the decisions of another, such as through police power, payment, or promulgation of beliefs (cf. Lukes 2005, 12–13).

Political ecologists have shown particular interest in implications of disequilibrium ecology for conservation (e.g., Stott and Sullivan 2000; Zimmerer 2000; Forsyth 2003; Paulson, Gezon, and Watts 2003; Neumann 2009; Grabbatin and Rossi 2012). Neumann (2005, citing others) has suggested that understanding the implications of disequilibrium ecology for conservation is key to the development of political ecology, by demonstrating its usefulness.

For the purpose of this work, I take disequilibrium ecology to mean the theory that species populations do not necessarily persist in the absence of disturbance by humans (Gleason 1917; Gleason 1926; Botkin 1990; Odum 1992; Pickett, Parker, and Fiedler 1992; Meyer 1994; Noss 1995; Soulé 1995; Fiedler, White, and Leidy 1997; Blandin 2011). Disequilibrium ecology contrasts with various earlier theories (e.g., Clements 1905, 1916, 1936; Tansley 1935) that spatially coincident species and environmental factors together constitute inherently discernable wholes that normally develop through predictable, successive stages until they reach a final, stable state. In this work, I collectively refer to these latter theories as equilibrium ecology, characterized by the belief that species tend to persist in the absence of disturbance by humans.

For a more complete discussion of political ecology, disequilibrium ecology, and equilibrium ecology, as well as for definitions of other terms used in this work, see the corresponding entries in appendix B.

restrictions on the use of land by others. Chief among these beliefs were the twin ideas that species populations are stable if undisturbed by humans, and that the environment is threatened only by human action. Coinciding with popular notions of conservation in donor countries, hardened by bureaucracies and other social arrangements, and defended by self-interested actors, these policies and supporting beliefs tended to gain an unassailable, "totalising" force, vulnerable at most at the margins (9, quoting Peet and Watts 2004). Even where beliefs were discredited or policies abandoned, similar beliefs and policies tended to arise, serving similar interests.[18]

Other researchers have variously recognized aspects of the phenomenon described by Leach and Mearns. In part, political ecologists have long documented how landowners or resource users have resisted efforts to establish formal conservation rules to control land and resource use (e.g., Peluso 1992; Neumann 1998; Walker and Hurley 2010; Newfont 2012). In addition, as I note in chapter III, researchers in various disciplines have long observed the use of orthodoxy in environment-related sciences for political ends, especially through the belief that species populations tend to persist if undisturbed by humans.

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[18] Leach, Mearns, and the other authors of the case studies they cite shared the view that the environment faces serious threats. They did not deny the need to address these threats, nor did they claim that most human land uses are benign or beneficial to the environment. Instead, they sought to caution that the confluence of other interests could lead to policies that misdiagnosed environmental problems, obscured more effective solutions, and sometimes worsened the environmental conditions that the policies ostensibly sought to improve.

The work I present here supports and extends the theory of Leach and Mearns in four ways. First, it offers some evidence that the phenomenon they described is also occurring in the US, in the context of species-based land-use regulation.

Second, this work offers some evidence that pro-regulatory actors have found strategies to pursue benefits from species-based land-use regulation even while recognizing that species populations do not necessarily persist in the absence of disturbance by humans. This evidence illustrates how by recognizing that a species is maintenance dependent, pro-regulatory actors can pursue new types of benefits, by rationalizing species-based exactions in place of species-based land-use restrictions, as a means to fund active management.

Third, this evidence coincidentally implies that at least for species-based land-use regulation in the US, the core belief sustaining disregard for regulatory risk to species is not the belief that species tend to persist if undisturbed by humans, but rather a belief that indiscriminately equates conservation with limiting human action.[19]

Fourth, I theorize and offer some evidence that for species-based land-use regulation in the US, disregard for regulatory risk to species reflects a tyranny of the majority, in that such policy is supported by a majority of citizens, rather than only a powerful minority. This distinction suggests that actors could have an even greater challenge in winning consideration of regulatory risk to species. However, this distinction also helps inform how actors might realistically seek such consideration.

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[19] Tarlock (1994, 1124) has characterized this belief as the fundamental tenet of environmentalism ("The core message of environmentalism is that there are limits to human use and abuse of resources").

Like the work of Leach and Mearns, this work illustrates how political ecology can help explain interactions of humans with each other and with other species and help identify opportunities to realize environmental benefits through policy efficiencies. In particular, this work offers an explanation for persistent, widespread distortion in discourse related to species-based land-use regulation and identifies potential opportunities to improve the survival of species by clarifying the purpose and refining the use of such regulation.

7.2. Contributions to Research in Other Domains

This work coincidentally contributes to research in other domains by offering empirical evidence to question the accuracy or coherence of various terms and assumptions used by others. For example, in light of evidence that some species are maintenance dependent, I question the accuracy of indiscriminate claims that species are a public good (in the technical sense); in light of research by others on the preferences of nonindustrial private forest landowners, I question the accuracy of assumptions in economic models that such landowners derive no benefit from wildlife habitat and seek only to develop their property; in light of definitions in the ESA, I theorize that the term "conservation-reliant species" could misleadingly imply that the ESA can only help and never harm species; in light of research by others on the effect of land-use regulation on the market value of selectively regulated property, I question the accuracy of indiscriminate claims that species-based mitigation banking or ecosystem service markets turn species from liabilities into assets for private landowners; and in light of works by early wildlife biologist and conservationist Aldo Leopold, I question the accuracy of

interpretations of his land ethic as indiscriminately equating conservation with limiting human action. I offer these coincidental contributions in chapter III.

8. The Organization of This Work

I pursue my argument in the remaining chapters. In chapters II, III, and IV, I offer evidence to answer my first three research questions, respectively, which in turn concern regulatory risk to species; disregard for regulatory risk to species; and motives for such disregard.

In chapter V, I summarize and discuss these results. I begin by suggesting implications for opportunities to benefit species through policy efficiencies. Next, turning to my fourth research question, I discuss the potential of various approaches for actors to seek such efficiencies, in light of strong political forces opposing their consideration. I conclude by suggesting additional research to further develop and apply the ideas in this work.

CHAPTER II

RISK TO MAINTENANCE-DEPENDENT SPECIES FROM SPECIES-BASED LAND-USE REGULATION

1. Introduction

In this work, I theorize and offer some evidence that humans inadvertently risk worsening the loss of many species in the name of saving them, by using their presence to seek other benefits through species-based land-use regulation. In this chapter, I review what research by others offers as evidence to answer my first research question, "Could species-based land-use regulation exacerbate the loss of maintenance-dependent species on private land?" I draw primarily on research addressing or otherwise helping answer this question in the context of the US.

Specifically, I review evidence and counterevidence for the corresponding hypothesis, "Species-based land-use regulation risks exacerbating the loss of maintenance-dependent species on private land." Consistent with research by others (e.g., Ferraro et al. 2007; Gibbs and Curie 2012; Langpap and Kerkvliet 2012), I seek to determine the effect of species-based land-use regulation apart from the effect of any independent change in public or private funding for conservation by others, such as through governmental incentive programs, and I do not assume such funding exists.

Sources of evidence include statistical outcome-based studies, based on changes to reported status of species listed as threatened or endangered under ESA[20]; outcome-based case studies, based on the delisting of species under the ESA (a designation that they are no longer threatened or endangered); and studies based on stock-flow models, which examine forces benefiting or harming a species. For expedience, where possible, I cite reviews of research by others.

From this review, I argue that:

• Statistical outcome-based studies have not resolved whether species-based land-use regulation on average causes net harm or benefit to species, but these studies include some evidence of net harm and some evidence that the net effect on species (whether harmful or beneficial) worsens as the degree of such regulation increases.[21] Also, insofar as these studies averaged results across species and types of ownership, these studies may have overstated any benefit and understated any harm to maintenance-dependent species on private land.

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[20] As I explained in chapter I, for animal species, such listing triggers land-use restrictions on nonfederal land based on the species' presence.

[21] Borrowing from frameworks presented by Stroup (1997, 58), Hsu (2002), and Mills (2004), I presume that the intensity of species-based land-use regulation for a species can be represented by the resulting risk premium incurred individually or collectively by private landowners whose property has the species or associated habitat. In this model, such regulation ranges from restrictions for any harmful land use on any private land (its maximum) to allowing exactions in lieu of restrictions (in turn ranging from high to low with decreasing requirements for exactions) to openly refraining from such regulation for all lawful land uses on all private land (its minimum). This minimum is partially illustrated by a statewide Habitat Conservation Plan for the Karner blue butterfly, which grants unconditional incidental take authority to all private landowners with 1,000 acres or less or any land not managed for forestry, though this authority is potentially limited in duration, potentially subject to revocation, and granted only in light of exactions yielded by other parties (WDNR 2010).

• Outcome-based case studies suggest the ESA has helped some species; however, any evidence of net benefit or harm from species-based land-use regulation on private land under the ESA is confounded by other presumably beneficial factors, such as public funding, public land ownership, hunting restrictions or other regulation of direct killing, and the banning of DDT.

• Studies based on stock-flow models provide theoretical arguments and qualitative empirical evidence that species-based land-use regulation risks causing net harm to maintenance-dependent species on private land, in part by inadvertently discouraging otherwise willing individuals from participating in incentive programs to conserve or maintain species or from using their own resources to do so.

• Where theoretical arguments claim to show that species-based land-use regulation benefits species, these arguments (at least those reviewed here) are biased by demonstrably false or questionable assumptions, such as that private landowners gain no benefit from conservation, or that the survival of species can be meaningfully measured solely by whether humans destroy associated habitat.

• Even where authors conclude that species-based land-use regulation poses a risk to species on private land, authors often obscure this conclusion or its implications by making demonstrably false or questionable assumptions or by failing to differentiate between potential implications for maintenance-dependent species versus other species.

I look in turn at statistical outcome-based studies, outcome-based case studies, and studies based on stock-flow models. I conclude by summarizing my interpretation of this evidence.

This review largely follows and borrows heavily from others who have cited or presented theoretical models and empirical case studies to argue that species-based land-use regulation is counterproductive to the survival of species on private land (notably Sugg 1993; Mann and Plummer 1995; Lueck 2000; Adler 2008; Adler 2011a). My review differs from theirs in that I limit my argument to maintenance-dependent species and to the risk (versus any certainty) that such regulation is counterproductive; I review some additional evidence; I review counterarguments; and I coincidentally collect evidence of disregard for this risk.

2. Statistical Outcome-Based Studies

Following publication of concern that species-based land-use regulation under the ESA was counterproductive to the survival of species on private land (e.g., Sugg 1993, 75; Mann and Plummer 1995), and continuing through the present, studies have attempted to empirically determine the net effect of such regulation on species, using statistical analysis of data reported by the US Fish and Wildlife Service (USFWS) or NatureServe[22] (cf. reviews by Ferraro et al. 2007; Schwartz 2008; Gibbs and Currie 2012).[23] To date, these studies have yielded mixed results (Ferraro et al. 2007; Schwarz

[22] NatureServe is a nonprofit conservation organization that collects and publishes information about the status of rare and imperiled species (NatureServe 2012a).

[23] These studies have primarily examined data associated with the ESA. This data has included changes to the recovery status of species listed as threatened or endangered (e.g., improving, stable, or declining); the duration of such listing; changes to species designation (e.g., extinct, endangered, threatened, or recovered); designation of critical habitat; adoption and duration of recovery plans (e.g., Schultz and Gerber 2002); progress in completing such plans; and approval of Habitat Conservation Plans. In addition, Rachlinski (1998) sought to correlate recovery status with the differing degrees of species-based land-use regulation

2008; also cf. Rachlinski 1998, 33);[24] the studies have lacked clear experimental controls (Ferraro et al. 2007, 246, 247; Schwartz 2008, 280, 289, 292); and the results might be distorted by biased data (Rachlinksi 1998, 16–17, citing National Research Council 1995; Clark et al. 2002, 1514; Ferraro et al. 2007).[25]

From these studies to date, perhaps the clearest evidence of net benefit to species comes from findings that species survival was positively correlated with the length of time a species was listed as threatened or endangered (e.g., Rachlinski 1998; Male and Bean 2005; Taylor et al. 2005).[26] However, these studies illustrate how the lack of sufficient experimental controls limit any conclusions. As noted in one of the studies (Taylor et al., 361), such findings showed correlation, not causation; at least in theory, some species might have fared better if never listed. Also, Ferraro et al. (246, 247) found

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between plant and animal species under the ESA, and with differing degrees of species-based land-use regulation for plant species under state laws.

Habitat Conservation Plans allow nonfederal landowners to pay mitigation fees or yield other exactions in return for limited exemptions from species-based land-use restrictions under the ESA (cf. §10(a)(1)(B)).

[24] For example, Schwarz (280) concluded that "the scientific question of whether the ESA works effectively to protect species remains open."

[25] Ferraro et al. (247) hypothesized such bias could arise in reporting by USFWS to further agency objectives. Reporting by NatureServe might be similarly vulnerable to bias, from providing planning services to help implement the ESA (NatureServe 2012b).

[26] Except for the existence of Habitat Conservation Plans (which can reduce the degree of species-based land-use regulation, by allowing exactions in lieu of restrictions), other data associated with the ESA do not as clearly reflect the presence or absence of species-based land-use regulation on private land. On private land, critical habitat designation at most requires consulting with USFWS for any projects that involve the US government; recovery plans have no regulatory authority; and in this regard, changes to listing status are redundant with listing as threatened or endangered, except insofar as USFWS issues rules under ESA §4(d) to limit regulation for species listed as threatened. (I discuss such rules in chapter V.)

that for two of the studies (Male and Bean; Taylor et al.), the results were measurably biased by changes to factors influencing listing decisions during the periods studied. Separately, another such study (Gibbs and Currie 2012, 1) found that the correlation between recovery status and duration of listing was so weak, it could be an artifact from poor-quality data.

Likewise from such studies to date, perhaps the clearest evidence of net harm to species comes from Ferraro et al. (246). Seeking to derive a more appropriate experimental control the authors compared changes over time in the status of ESA-listed and unlisted vertebrate species with comparable characteristics and initial status. The authors found that on average, unless accompanied by substantial public funding (characterized as averaging more than $10.9 million per species over 5 years), "species that are listed [as threatened or endangered] ... show a decline that ... is strongly significant" relative to the comparable unlisted species (251). As described by Kareiva (chief scientist for The Nature Conservancy, a nongovernmental conservation organization) and Marvier (2011, 99–100, citing data from Ferraro), "12% of the unlisted at-risk species versus 8% of the [comparable] listed species became less endangered during the same period".[27]

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[27] Ferraro et al. also found that when listing was accompanied by substantial public funding (averaging $10.9 million per species over 5 years), the combination of listing and funding strongly benefited species. Of 68 species in their sample, only 2 of the listed species became more endangered, whereas 8 of the unlisted species became more endangered; and 8 of the listed species became less endangered, whereas only 1 of the unlisted species became less endangered (Kareiva and Marvier 2011, 100, citing data from Ferraro). However, Ferraro et al. commented that due to the lack of relevant experimental controls, they could not test whether this benefit came from funding alone or from the combination of funding and listing (256–257). Ferraro et al. hypothesized that funding might have benefited species by increasing enforcement

This finding by Ferraro et al. might underestimate net harm from species-based land-use regulation to maintenance-dependent species on private land. Like most previous studies, their study tested for the average effect on species without discriminating between types of ownership or dependence on active management. In contrast, in other studies examining the reported status of listed species, species fared six times worse on private land than on federal land (Wilcove et al. 1996[28]), and species fared worse on nonfederal land than on federal land (Hatch et al. 2002).[29, 30] In addition, species-based land-use regulation in theory poses a greater risk to maintenance-dependent species than other species, due to the additional risk from passive destruction.[31]

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of regulation (257). In contrast, noting that Ferraro et al. (256) found that species-recovery funding by federal land management agencies was more effective than species-recovery funding by USFWS (a regulatory agency), Adler (2011a, 13) hypothesized that funding might have benefited species instead by paying for nonregulatory conservation measures, such as land acquisition (18).

[28] Citing data compiled by USFWS and the US General Accounting Office for species listed as threatened or endangered under the ESA, Wilcove et al. (1–2) found 18% of species improving on federal land versus 3% on private land and declining species to outnumber improving species 1.5 to 1 on public land versus 9 to 1 on private land (excluding private land owned by non-profit conservation organizations). (This analysis follows Adler 2011a, 10.)

[29] Neither of these other studies sought to determine the net effect of such regulation on species.

[30] Seeking to explain this difference, Adler (2011a, 10–11, 17) hypothesized that regulation under the ESA is more effective at conserving species on federal land than on private land because federal agencies have greater control over federal land and are less sensitive than private landowners to regulatory disincentives for maintaining habitat. Alternatively, this difference could in theory have resulted from worse threats to species on private land. Regardless, citing Hatch et al., Schwartz (2008, 293) suggested that "Clearly distinguishing the performance of the ESA on private versus public lands is much needed".

[31] By passive destruction, I mean eliminating a species by refraining from management essential to its survival, such as by allowing its habitat to succumb to invasive exotic vegetation or loss of fire or similar disturbance. Illustrating opportunities for passive destruction for two maintenance-dependent prairie species in the Pacific Northwest, USFWS (2012f) recently commented:

In contrast, Gibbs and Currie (2012, 5) hypothesized that the net harm found by Ferraro et al. was likewise attributable to poor-quality data. In addition, Schwartz (personal communication, 2012) suggested the method used by Ferraro et al. could have introduced bias, due to the duty of federal agencies to search for new populations of a species once it is designated as a candidate for listing as threatened or endangered. In this view, the discovery of any new populations could avert the decision to list a species and thereby bias listing decisions to disproportionately include species that are more imperiled than others, even between comparable species that had the same conservation status prior to the search for new populations. This hypothesis apparently has yet to be expressly debated in peer-reviewed literature.[32, 33]

> [I]nvasion by nonnative grasses and woody vegetation [has been] rendering habitat unusable for Taylor's checkerspot butterflies and streaked horned larks. (61950)
>
> In 2008, a large population of streaked horned larks colonized ... a privately-owned parcel in Linn County; as the vegetation at the site matured in the following 2 years, the site became less suitable for larks, and the population declined... This is likely a common pattern... (61947)
>
> Sites that currently have Taylor's checkerspot butterflies present will quickly become unsuitable if trees and shrubs are not removed and if the site is not managed specifically for the long-term conservation of the [species]... (61951)

[32] From such statistical outcome-based studies to date, other evidence of net harm to species comes from Rachlinski (1998, 26, 33). He in part found that of ESA-listed plant species reported as stable or better, a lower percentage (12.4% versus 51.2%) were reported as improving in jurisdictions with species-based land-use restrictions for plants, versus jurisdictions that lacked such restrictions. (The author hypothesized that the difference in outcomes reflected voluntary conservation by landowners in the latter jurisdictions [33].) From such comparisons, the author also found that species-based land-use regulation on average provided a net benefit to species; yet he concluded this result was ambiguous, because overall, listed plant species (often unprotected under state law and not directly protected under the ESA on private land) fared no worse than listed animal species (33). The author hypothesized that this ambiguity derived from inherent differences in factors associated with plants and animals (33).

Separately, another statistical outcome-based study found that on average, listed species with Habitat Conservation Plans tended to fare better than listed species without such plans (Langpap and Kerkvliet 2012).[34] This result might appear to imply that species-based land-use regulation under the ESA improves the survival of species. However, the authors did not test for the net effect of listing; species with Habitat Conservation Plans might have fared worse than comparable species that were unlisted (and which therefore did not have such plans). Instead, while still potentially distorted by bias in status reports, this finding offers additional evidence that species survival decreases with increased intensity of species-based land-use regulation on nonfederal land, when comparing (1) regulation that provides only restrictions with (2) regulation that allows exactions in lieu of restrictions.[35] This finding also raises the question of

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[33] Authors have varied in how they have reported these and other statistical outcome-based studies. For example, in his review, Schwartz (2008, 292) concluded that the preponderance of evidence showed that "application of the fundamental species protection tools" under the ESA is correlated with improving status of species. However, it is unclear whether Schwartz intended "fundamental species protection tools" to include annual funding by USFWS, such as for land acquisition, as others have (e.g., Gibbs and Currie 2012, 1). In addition, while citing Ferraro et al. regarding listing criteria, Schwartz omitted mentioning their finding that without substantial funding, listing worsened the fate of species. In contrast, in commenting on the performance of the ESA, Kareiva and Marvier (2011, 99) reported only the study by Ferraro et al., and they characterized the finding of net harm as showing "little evidence that ESA listing was beneficial". In another example, Mir and Dick (2012, 191) reported only the finding by Taylor et al. (2005), without mentioning criticism of their method, and solely on that basis, Mir and Dick concluded that "Protecting habitat ... is the most effective measure to preserve populations of threatened and endangered species."

[34] As noted above, Habitat Conservation Plans allow nonfederal landowners to pay mitigation fees or yield other exactions in return for limited exemptions from species-based land-use restrictions under the ESA.

[35] In theory, the opportunity to yield exactions can only reduce the cost that species-based land-use regulation imposes on landowners, relative to the cost of regulatory land-use restrictions. If the cost of exactions were higher than the cost of restrictions, landowners could simply decline to yield the exactions and instead incur the cost of the restrictions.

whether species survival improves or worsens with increasing mitigation fees or other exactions required of landowners to participate in a Habitat Conservation Plan.[36, 37]

As for the finding by Ferraro et al., the finding by Langpap and Kerkvliet might underestimate harm to maintenance-dependent species on private land. Langpap and Kerkvliet did not discriminate between private and public land nor between species that do and do not depend on active management.

3. Outcome-Based Case Studies

Critics and advocates of species-based land-use regulation under the ESA have both tried to assess its net effect on species by citing cases in which USFWS has upgraded its designation of species as threatened or endangered, to represent the species' partial or complete recovery from risk of extinction (e.g., Mann and Plummer 1995, 243–247; Schwartz 2008, 290; Adler 2011a, 10). Actors from both camps have acknowledged that the ESA has saved several species from extinction or at least slowed their decline (e.g., Mann and Plummer 1995, 240, 247; Goble 2009, 18–20). However, any evidence that the benefit came from species-based land-use regulation on private land is confounded by factors such as public funding, public land ownership, and other forms

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[36] USFWS has significant discretion in determining the nature and scope of exactions required from participating landowners (USFWS and NMFS 1996, 3:6, 3:19). In part, the agency's demands for exactions need not provide a net benefit to the species in question, under the agency's present interpretation of the ESA (3: 20–3:21).

[37] In a study of a different ESA exception program (Safe Harbor Agreements), Wilcove and Lee (2004) found that the program was successful in that the number of participating private landowners increased substantially over time. However, the authors noted that they had no information on the program's effect on the species in question.

of regulation, such as banning DDT or restricting hunting (i.e., regulating direct killing, versus incidental killing, through land use) (Mann and Plummer 1995, 240–245; Goble 2009, 18–22; Adler 2011a, 10).

Any conclusions about the effect of the ESA are further constrained by the low number of species that have been delisted (designated as recovered). As of September 2012, 2,021 species of plants or animals (including distinct population segments) were listed as threatened or endangered under the ESA, but only 28 had been designated as recovered (USFWS 2012b; USFWS 2012c).[38]

At least one such case study (Goble 2009, 25–27; also cf. Mann and Plummer 1995, 245) has described the delisting of a maintenance-dependent species that was substantially on private land. This case involved the 2003 delisting of the population of Columbian white-tailed deer in Douglas County, Oregon. Yet here, too, any benefit from species-based land-use regulation is potentially masked by substantial in-kind public funding. In part, the US Forest Service gave up public land to fund public acquisition of 6,581 acres of private property (formerly the Dunning Ranch) as a reserve to provide habitat for the deer, through a land exchange (US Senate 1998). In part, the US Bureau of Land Management (BLM) agreed to actively maintain and improve habitat on the reserve (USFWS 2003a, 43654). Potentially clouding evidence of lasting benefit to the deer, a retired state wildlife biologist subsequently claimed that BLM had reduced its efforts to

[38] I model this comparison after Adler (2011b, 7).

sustain the population on the reserve, in favor of sustaining rare plants there, and that the population of deer on the reserve was continuing to decline (Allbritten 2011). [39]

4. Theoretical and Empirical Studies Based on Stock-Flow Models

Several studies have sought to use what are in effect stock-flow models to evaluate the biological effectiveness of species-based land-use regulation on private land.[40] These models implicitly or explicitly take the survival of a species to be determined by the net effect of forces helping or harming the species, such as by increasing or decreasing the extent or quality of associated habitat. In formulating and presenting these models, researchers have varied in their assumptions, the nature and use of their evidence, the range of forces and policy alternatives they considered, and the formality of their analysis. While some of these studies present quantitative measures of relevant forces, all of the studies are implicitly qualitative, for they do not quantify all relevant forces.

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[39] Case studies by Layzer (2008) potentially provide additional evidence of net benefit to species from species-based land-use regulation. In part from comparing outcomes from three Habitat Conservation Plans, Layzer argued that environmental planning projects tend to have better outcomes for the environment when the projects limit the ability of potentially regulated actors to influence regulatory decisions (268–269). However, any conclusions about the effectiveness of species-based land-use regulation are clouded by other factors in these cases. For example, a plan that Layzer found to have a better outcome (the Sonoran Desert Conservation Plan, as of April 2013 still pending approval by USFWS as a Habitat Conservation Plan) provided mitigation through acquisition of habitat with $135 million in public funds and required no mitigation fees or other exactions from participating private landowners for individually owned properties (Pima County 2012, 2, 5). In contrast, a plan that Layzer found to have a worse outcome (the Balcones Canyonlands Conservation Plan) requires participating private landowners to pay mitigation fees of up to $5,500 per acre or to concede other exactions (Travis County 2012).

[40] Stock-flow models analyze a quantity of something as the product of forces adding or subtracting to it (cf. Harrison 2008, 506–509). Here, the "something" of interest is the survival of particular species.

Here, I review stock-flow studies supporting the claim that species-based land-use regulation risks exacerbating the loss of maintenance-dependent species on private land. I then review additional supporting evidence regarding the preferences of landowners with respect to species and regulation; I describe how authors have blunted these conclusions with respect to maintenance-dependent species; and I review some stock-flow studies offering counterarguments and counterevidence.

4.1. Stock-Flow Studies Finding Regulatory Risk to Species

A number of stock-flow studies have presented theoretical arguments and empirical evidence that species-based land-use regulation risks causing net harm to species on private land, by encouraging landowners to manage land to eliminate or avoid the presence of targeted species. While these studies have typically considered active destruction of habitat, several have also considered passive destruction of maintenance-dependent species, from inadvertently discouraging otherwise willing landowners from participating in incentive programs to conserve or maintain species or from using their own resources to do so. Claims regarding such passive destruction hinge on evidence that some private landowners value wildlife habitat and are willing to use their own resources to maintain it or to participate in incentive programs to do so, but averse to selectively incurring land-use regulation.

I review these arguments in historical perspective, to underscore the breadth of concern they represent.

The roots of these claims precede the advent of species-based land-use regulation in the US. In the first textbook on wildlife management,[41] Aldo Leopold (1986 [1933]) described the need for active management by humans to maintain various species (16) and cautioned that discretion is essential when using regulation to encourage private landowners to manage land for benefit of wildlife (407).

This concern emerged again by 1990, when a former city planner (Rossi 1990, 96) reported "mounting evidence" that in California, local land-use ordinances intended to protect oak trees instead risked accelerating their loss. In part citing an increase in the rate of tree-cutting applications submitted to local government by private landowners, the author reported that such ordinances typically turned landowners against oak trees, and that landowners responded to the ordinances by cutting oak trees before they grew large enough to trigger regulatory restrictions, or by cutting oaks unlawfully thereafter. Relevant to the risk of passive destruction of maintenance-dependent species, the author reported that the ordinances discouraged landowners from planting new oaks. He argued that this posed a serious long-term threat to oaks, due to their loss of natural regeneration. The author suggested that with constraints on public funding, local governments could do more to conserve and maintain oaks by abandoning oak protection ordinances and instead adopting a strategy of supporting voluntary conservation, such as by providing free technical advice and recognition.[42]

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[41] Per Freyfogle and Goble (2009, 210).

[42] Perhaps due to unavailability of relevant policy mechanisms in the study area, the author apparently did not consider the alternative of funding conservation and maintenance of oaks through exactions.

Supporting concern for passive destruction of such oaks, Huntsinger and Fortman (1990) reported associated preferences from a random survey of private forest landowners in oak-associated ranchlands in California, taken in 1985. The authors found that a majority of the landowners disfavored regulations that would restrict cutting oaks, but also that a majority of the landowners reported valuing oaks for providing environmental amenities, such as shade or wildlife habitat.[43]

By 1998, various authors had accumulated theoretical arguments and evidence that species-based land-use regulation under the ESA inadvertently encourages private landowners to destroy habitat for listed species and discourages otherwise willing landowners from conserving or maintaining such habitat. Citing this argumentation and evidence, Rachlinski (1998, 2, 5–7) theorized that such regulation is counterproductive to the survival of maintenance-dependent species (7). However, the author dismissed this concern by assuming that maintenance-dependence is rare, and that passive and active destruction depend on landowner knowledge of regulatory risk (7).[44]

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[43] The landowners further reported that they valued oaks for increasing the market value of their property. This would seem to conflict with the landowners' dislike for regulation. However, this could be explained by an apparent lack of ordinances protecting oaks on the lands owned by the respondents. Such ranch lands were zoned as forestland (Doak et al. 1988), and in 1985, government officials had formally promised to respect the property rights of ranchers, under an Integrated Hardwood Management Program (Alagona 2008, 337–338). California apparently did not adopt legal provisions expressly protecting oaks until 2005, when the state adopted mitigation requirements for oak woodlands, under CEQA (Bean, Kihlsinger, and Wilkinson 2008, 64).

[44] Thus restricting his attention to the risk to species from active destruction, the author concluded that species-based land-use regulation is "probably beneficial" to animal species, because more landowners are likely to harm listed species than protect them (35–36). The author nevertheless concluded that such regulation would be counterproductive to the survival of plant species, by assuming that landowners would

Similar arguments and evidence continued to accumulate through the next decade. In an updated review, Adler (2008, 319–330, 364) concluded more generally that species-based land-use regulation is likely counterproductive to the survival of species, because landowners can and do respond by preemptively destroying habitat.[45] The author's considerations included harm to species from discouraging otherwise willing landowners from voluntarily maintaining habitat for maintenance-dependent species.

4.2. Assumptions Obscuring Regulatory Risk to Maintenance-Dependent Species

Regardless of intent, in finding that species-based land-use regulation risks exacerbating the loss of species on private land, like Rachlinski (1998), several authors of stock-flow studies have made assumptions or generalizations that blunt this conclusion with respect to maintenance-dependent species.

For example, some (e.g., Zhang and Flick 2001; Adler 2008) did not discriminate between policy implications for maintenance-dependent species and implications for other species. Accordingly, critics might dismiss the authors' conclusion by claiming that all preemptive harm to species is an unavoidable cost of trying to save them. Or for

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have more time to actively destroy plant species than destroy animal species, due to the need for legislative change for regulation under the ESA to prohibit harm to plant species on private land (36).

[45] Illustrating such evidence, Lueck and Michael (2003, 53) found that species-based land-use regulation harmed red-cockaded woodpecker (a species listed as endangered under the ESA) by encouraging private landowners to harvest their timber before it grew old enough to support the species. Testing harvest as a function of proximity to known woodpecker colonies, the authors estimated that from 1984 to 1990, this effect resulted in the loss of 5,090 to 15,145 acres of mature trees that could have benefited the species. The authors also noted that their estimate was likely low, for it did not include any additional loss of habitat for the species from discouraging otherwise willing landowners from controlling invasive understory vegetation, which poses a threat to the species (54).

example, some (e.g., Lueck 2000; Adler 2008) but not all (e.g., Innes 2000, 206) framed the alternative to species-based land-use regulation as a requirement for governments to compensate landowners for such regulation. Accordingly, by overlooking the alternative of refraining from such regulation, critics might dismiss the authors' conclusion by arguing that limits on public funding make compensation impractical.

Two additional examples illustrate other ways in which authors have similarly blunted or avoided a conclusion finding net harm. First, Hsu (2002, 28) concluded that unenforceability "can undermine the ESA altogether", but he dismissed this concern by assuming that landowners seek only to develop their land (56, 65); by ignoring the potential for landowners to evade regulation through passive destruction; and by assuming that preemptive destruction is largely avoidable through stricter enforcement (93). Second, from qualitative interviews with family forestland owners in oak-associated, maintenance-dependent habitat in Oregon, Fischer (2006, 172 fig. 11) found that species-based land-use regulation could both help and harm associated species, but Fischer avoided the question of whether it causes net benefit or harm, and instead suggested that the harm might be dispelled if landowners are compensated for regulation through mitigation banking (175).[46, 47]

In addition, many of these authors further blunted their conclusion with respect to maintenance-dependent species by failing to consider the alternative of exactions in lieu of land-use restrictions, such as through Habitat Conservation Plans. This omission

[46] As I discuss in chapter III, landowners cannot control whether they receive mitigation fees or are liable for paying them.

[47] I participated as a subject in this study, as one of 68 subjects.

invites critics to argue that the benefit to species from exactions (e.g., securing conservation easements and using mitigation fees to fund maintenance) could outweigh any harm caused to species by discouraging landowners from using their own resources to maintain species or participating in incentive programs to do so. At least in theory, patient landowners can defeat such demands for exactions through passive destruction, but landowners with shorter time horizons may prefer to yield the exactions. Regardless, the arguments described here suggest the fate of maintenance-dependent species might depend on considering whether such tradeoffs cause net benefit or harm to the species in question.

4.3. Further Evidence of Landowner Preferences Regarding Species and Regulation

Literature primarily from forestry and agriculture offers additional evidence that some private landowners value wildlife habitat and are willing to use their own resources to maintain it or to participate in incentive programs to do so, but are averse to selectively incurring land-use regulation.

This evidence includes self-reported preferences from surveys and interviews involving nonindustrial forest landowners in the US; family ownerships in upland prairie and oak savanna; and farmers (e.g., Creighton, Baumgartner, and Blatner 2002; Ryan et al. 2003; Wilcove and Lee 2004; Fischer 2006;[48] Fischer and Bliss 2006a; Fischer and Bliss 2006b; Butler 2008; Fischer and Bliss 2008; Majumdar, Teeter, and Butler 2008; Raymond and Olive 2008; Kaye, Schwindt, and Menke 2011).

[48] I participated in this study, as one of 68 subjects.

This evidence also includes more objective data, such as evidence of participation in USFWS Safe Harbor Agreements (e.g., Bean 1999a, 37; Zhang and Mehmood 2002), and family forest landowners in the US southeast allowing harvestable trees to grow longer than is economically efficient (e.g., Hyberg and Holthausen 1989; Pattanayak, Murray, and Abt 2002).

Though less direct, some additional evidence of humans maintaining habitat at their own expense comes from unpaid volunteers restoring habitat in projects for public and private environmental organizations. For example, Ryan, Kaplan, and Grese (2001, 629) reported that "[I]n 1996 the Nature Conservancy's Volunteer Stewardship Network in Illinois alone estimated that over 5600 volunteers dedicated almost 57 000 hours to cleaning or maintaining more than 67 000 acres (27 000 ha) of natural areas".

4.4. Counterarguments and Counter-Evidence from Stock-Flow Studies

In contrast to the above arguments and evidence, some theoretical or empirical stock-flow studies have claimed to show that species-based land-use regulation provides a net benefit to species, or that private landowners are insensitive to selectively incurring land-use regulation.

Langpap and Wu (2004) presented a game-theoretic model showing that for species-based land-use regulation under the ESA, land-use prohibitions provide a greater level of conservation than exactions. However, the authors arrived at this result in part by assuming that "The landowner incurs costs from conservation, but derives no benefits" (439). This assumption is clearly contradicted by the studies cited above. In addition, the authors' conclusion was subsequently contradicted by the empirical evidence found by

Langpap and Kerkvliet (2012), described above, and a finding by Langpap (2006) that by itself, relief from species-based land-use regulation would result in private landowners managing for endangered species, even more so than compensation or cost sharing (567–568).[49]

Doremus (2002, 352–353) argued that conservation-minded landowners do not mind selectively incurring regulatory land-use restrictions: "[L]ove of nature can make regulation ... less adversarial... People who see the nature around them as a special gift that adds value to their daily lives will make some sacrifices and accept some limitations to keep it around". However, the author provided no evidence for this claim, and it is contradicted by studies cited above.

Similarly, from a questionnaire to a focus group of nonindustrial private forest landowners, Langpap (2004) found that such landowners do not feel greatly threatened by the risk of incurring increased land-use regulation under the ESA, whether through restrictions or liability for exactions. However, this result could be explained by the subjects' failure to understand the author's terminology. For example, the author referred to exactions as "assurances" and described them as one of three types of "incentives" offered by a public agency (386). The result could also be explained by the subjects'

[49] As I describe in chapter III, Langpap and Wu (2004) nevertheless provided the basis for the Society for Conservation Biology (a professional organization of conservation biologists) to subsequently advocate for maintaining authority for species-based land-use regulation.

belief that they could evade any new species-based land-use regulation, by harvesting their timber before any new regulation could be enforced on their property.[50]

In a random survey of households in Tennessee Valley, Bliss et al. (1994) found that over two-thirds of nonindustrial forest landowners (households owning an acre or more of forestland) agreed that private property rights should be limited if necessary to protect the environment (8), and almost two-thirds agreed that regulations are appropriate to protect threatened and endangered species (9). This result contradicts several studies cited above, including subsequent studies by Bliss.[51] This difference might be explained if respondents believed they had no imperiled species or could otherwise evade regulation.

5. Conclusion

Efforts to find or derive controlled experiments have not resolved whether species-based land-use regulation causes net benefit or harm to targeted species. However, these efforts have produced some evidence of net harm.

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[50] Both explanations are consistent with my understanding from participating as a subject in the author's focus group.

[51] For example, from qualitative interviews with private landowners, Fischer and Bliss (2008, 282) concluded that species-based land-use regulation ("species regulations") might be less effective than education and outreach in encouraging landowners to maintain Oregon white oak (a maintenance-dependent species):

> Owner's values for autonomy and self-determination suggest that it may be more suitable for policy makers to engage owners in learning forums about oak conservation rather than to impose new rules... [These values] indicate that policies may be able to engage owners in conservation, either on their own or through programs, if they can assure owners that the oak habitat they enhance will not become a liability or an encumbrance.

Meanwhile, stock-flow studies have produced substantial evidence of harm to targeted species and qualitative reasons to believe the result could be net harm. However, the results from stock-flow studies are limited by the failure to consider all relevant forces and policy alternatives. For example, Bean, Kihslinger, and Wilkinson (2008, 57–58) reported that species-based mitigation fees exacted under the ESA totaled an average of $370.3 million/yr from 2001 through 2006; yet it is unclear how much of this came from private landowners, how it was distributed, and whether for any species the benefit from exactions outweighed the harm from discouraging otherwise willing landowners from conserving or maintaining associated habitat.[52]

As I argue in the next chapter, humans risk exacerbating the loss of species by avoiding or distorting such judgments through policies and beliefs that obscure harm to species from species-based land-use regulation.

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[52] An example from Benton County (OR) illustrates how the mix of benefits from exactions and harm from disincentives might affect maintenance-dependent species on private land. In return for limited immunity under the ESA for incidental harm to two maintenance-dependent butterfly species (through maintenance of roadsides and approval of development permits for existing lots in associated habitat), the county agreed to a Habitat Conservation Plan under which the county would acquire 50 to 60 acres of associated habitat; pay mitigation fees on behalf of private landowners for occupied habitat lost to new, county-approved development on private land; and maintain habitat for the species on the acquired land, but only for 6 years (Benton County 2010). Meanwhile, the agreement left landowners in Benton County at risk of liability under the ESA if additional animal species were listed, or if the county couldn't find sufficient funding to pay mitigation fees for the species already listed. In addition, the agreement implicitly reaffirmed that private landowners outside of Benton County remained at risk of liability under the ESA if local governments were unable or unwilling to pay mitigation fees on their behalf, or if new animal species were listed, even if the species were maintenance-dependent. I discuss this plan further in chapter III.

CHAPTER III

DISREGARD FOR RISK TO MAINTENANCE-DEPENDENT SPECIES FROM SPECIES-BASED LAND-USE REGULATION

1. Introduction

In this work, I am theorizing and offering some evidence that humans risk exacerbating the loss of maintenance-dependent species on private land by using their presence to seek other benefits through species-based land-use regulation. In the previous chapter, I argued that research by others offers some evidence that species-based land-use regulation risks exacerbating the loss of maintenance-dependent species on private land. In this chapter, I argue that actors widely and routinely disregard this risk in related regulatory decisions and discourse.[53]

To support this claim, I offer examples of such disregard in the US. To emphasize the breadth of this disregard, I include some evidence from outside the US.

My use of these examples coincides with research by others on risk to the environment from environmental orthodoxies and in particular with research on persistent belief in equilibrium ecology; that is, the belief that species populations tend to persist if

[53] By discourse, I mean human communication generally, such as found in governmental publications, textbooks, scholarly research, and technical reports.

undisturbed by humans (Stone 1965; Botkin 1990, vii, 8, 192, 195; Leach and Mearns 1996; Wiener 1996, 8n26, 13; Stott 1997; Zimmerer 2000, 365; Forsyth 2003, 63–68; Zimmerer and Bassett 2003, 12, 282, 286; Neumann 2005; Leach 2008).[54, 55]

My treatment here differs from theirs in three ways. First, I focus on examples that pertain directly or indirectly to species-based land-use regulation. Second, I have selected examples to illustrate a variety of new or continuing means of disregard for regulatory risk to species, both to offer further evidence that this disregard is widespread, persistent, and can take many forms, and to try to bring these new forms to light. Third, some of these examples illustrate how actors have continued to indiscriminately equate the survival of species with limiting human action even while recognizing maintenance

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[54] As I discussed in chapter I, by orthodoxy, I mean adherence to belief even when false or unjustified, such as evidenced by persistent claims that are demonstrably false or misleading.

[55] Also cf. Odum (1969, 268), Huffman (1992), Sagoff (1997, 830, 907, 913, 924, 980), McCarthy (1998, 141–142), Scoones (1999), Rodgers (2000, 297), Doremus (2010, 206–207), and Maier (2012, 3): In an early work ironically promoting the belief that ecosystems are self-maintaining, Odum hinted at associated orthodoxy ("It is strange that man does not readily recognize the importance of recurrent changes [in the landscape]"); in part suggesting that humans have always influenced the environment, Huffman argued in general terms that because environmentalists widely share orthodox belief that free markets only harm the environment, environmentalists risk overlooking the possibility that free markets might sometimes benefit the environment; Sagoff found persistent belief in equilibrium ecology, but he argued that exotic species increase biodiversity, and he apparently did not consider that species-based land-use regulation might pose a risk to species; McCarthy noted conservationists' persistent belief in equilibrium ecology, but h suggested only that this belief had a political cost; Scoones noted equilibrium orthodoxy and suggested it has impeded consideration of conservation policy and management from more accurately reflecting ecological and social dynamics; Rodgers offered theory and evidence that persistent, self-serving misbeliefs can distort environmental decision making, but his focus was belief that conservation can be achieved without tradeoffs; Doremus suggested that belief in equilibrium ecology persisted to rationalize land-use regulation, but she did not suggest such regulation could harm species; philosophy professor and self-described conservationist Maier found such extensive incoherence in use of the concept of biodiversity to justify and guide conservation, he commented, "It is as if there is a tacit agreement among colleagues not to rock the boat of bad reasoning".

dependence, by using maintenance-dependence to rationalize using species-based land-use regulation to seek exactions in place of land-use restrictions.

As these examples illustrate, these forms of disregard include provisions in law, administrative practice, and demonstrably false, incoherent, or misleading beliefs in other variously authoritative settings. Expressly or implicitly, all of these examples reflect a belief that indiscriminately equates the survival of species with limiting human action.[56]

As my evidence is limited to examples, I offer these examples to contradict the contrary claim, "Humans routinely consider this risk in related regulatory decisions and discourse". To that end, I include examples from governmental policies, textbooks, peer-reviewed research, and other variously authoritative or otherwise widely recognizable sources. In addition, to illustrate how extensively some of these claims dominate the US population, I include examples where actors reproduce such claims even though they appear to work against their own stated interests or beliefs. By doing so, I seek to offer some evidence that disregard for regulatory risk to species is not only orthodox but also hegemonic.[57] At the same time, I do not claim this disregard is absolute; some of my examples show it is not.

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[56] As I noted in chapter I, this belief coincides with the fundamental belief of environmentalism, as characterized by Tarlock (1994, 1124).

[57] As I discussed in chapter I, by hegemonic, I mean dominating the thought or practices of a human population, especially when reflected in social rules or reproduced by those whose interests it harms (cf. Gaventa 1982; Mezirow 1991, 131; Hajer 1995, 60–61; Adger et al. 2001, 685; Pritchard and Sanderson 2002).

Specifically, the examples I present here illustrate the following means of disregard for risk to species from species-based land-use regulation (keyed by number to the corresponding section):

2. Disregard through law and its administration
    2.1. Disregard through perceived lack of discretion under the ESA
    2.2. Disregard through limitations and goal confusion in ESA exception programs
        2.2.1. Habitat Conservation Plans
        2.2.2. Safe Harbor and Candidate Conservation Agreements
3. Disregard by obscuring regulatory risk in owning habitat
    3.1. "Regulation increases the market value of property"
    3.2. "Conservation banking turns species from liabilities into assets"
    3.3. "Ecosystem service markets pay for providing habitat"
    3.4. "The ESA doesn't protect plants on private land"
4. Disregard through other economic claims and assumptions
    4.1. "Landowners seek only to develop their property"
    4.2. "Species are a public good" (in the technical sense)
5. Disregard through policy rhetoric
    5.1. "Conservation-reliant species"
    5.2. "Carrot and stick"
6. Disregard through theories in ecology
    6.1. "Resilience"
    6.2. "Patch dynamics"

6.3. Unpredictability as implying a greater need to limit human action

6.4. "Land use changes land faster than natural processes"

6.5. Other continuing belief in the stability of ecosystems

7. Disregard through intentionally misleading theories and rhetoric

8. Disregard through other demonization and idolization

8.1. Disregard through personal attack in scholarship

8.2. Disregard through interpretation of Leopold's land ethic

9. Disregard through containment of dissent

9.1. "Best available science" (omitting social science)

9.2. "Political ecology has waning influence"

9.3. Containment by omitting innovation from reporting

10. Disregard by otherwise assuming prescriptive goals[58]

2. Disregard through Law and Its Administration

The US Endangered Species Act (ESA) seeks "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved [and] to provide a program for the conservation of such endangered species and threatened species" (§2(b)). However, as I describe here, actors have interpreted and administered the ESA in ways that disregard risk to maintenance-dependent species on private land from species-based land-use regulation under the ESA.

[58] For field notes on additional means of disregard, see the more extensive list in appendix A and usage notes in appendix B.

As I described in chapter I, the ESA imposes species-based land-use regulation on private land by prohibiting harm to animal species that are listed by USFWS as threatened or endangered.[59, 60] This prohibition extends to harm through coincidental destruction of associated habitat, such as from farming, residential development, or any other land use (Bean and Rowland 1997). The ESA refers to such coincidental harm as "incidental take" (§10).

Actors have disregarded regulatory risk to species in part by claiming that a lack of discretion under the ESA limits or prohibits regulators from considering such risk. In addition, limitations and goal confusion in ESA exception programs have contributed to such disregard.

2.1. Disregard through Perceived Lack of Discretion under the ESA

Actors have dismissed concern for regulatory risk to species by interpreting the ESA (accurately or not) as mandating species-based land-use regulation for species listed as threatened or endangered, regardless of its effect on species. For example, USFWS recognized that various upland prairie species in the Willamette Valley depend on active management, to control invasive exotic vegetation and reintroduce or simulate historic burning (USFWS 2000, 3884–3885), yet USFWS listed the species as threatened or

[59] USFWS extended these prohibitions to threatened species through rulemaking (Bean and Rowland 1997, 226).

[60] The National Marine Fisheries Service has similar authority for marine and anadromous species (NOAA Fisheries 2013).

endangered (id.) and subsequently disavowed any legal obligation to consider harm to the species from consequent land-use restrictions:

> Many non-Federal landowners derive satisfaction in contributing to ... endangered species recovery... Many private landowners, however, are wary of the possible consequences of encouraging endangered species to their property, and there is mounting evidence that some regulatory actions by the Federal government, while well intentioned and *required by law*, can under certain circumstances have unintended negative consequences for the conservation of species on private lands. Many landowners fear a decline in their property value due to real or perceived restrictions on land-use options where threatened or endangered species are found. Consequently, harboring endangered species is viewed by many landowners as a liability, resulting in anti-conservation incentives... According to some researchers, the designation of critical habitat on private lands significantly reduces the likelihood that landowners will support and carry out conservation actions. The magnitude of this negative outcome is greatly amplified in situations where active management measures (e.g., reintroduction, fire management, control of invasive species) are necessary for species conservation.
>
> (USFWS 2006, 63896–63897, emph. added, citations omitted)[61]

Other actors have contributed to such disregard for regulatory risk to species by expressly referring to regulation under the ESA as "mandated" (e.g., Babbitt 2005, 93; O'Connell 1992, 141; Yaffee 2006, 210; Beardsley 2012, 619). Illustrating the

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[61] The works cited in this passage (Wilcove et al. 1996; Main et al. 1999; Bean 2002; Conner and Mathews 2002; James 2002; Koch 2002; Brook, Zint, and De Young 2003) all pertain to real or perceived species-based land-use restrictions under the ESA. USFWS made this comment in a rule designating critical habitat for the species in question, but such designation imposes no regulatory restrictions on private land, except at most to limit actions funded, authorized, or carried out by federal agencies (Bean and Rowland 1997; Kostyack 1997, 370; Turner and Rylander 1998, 111). The rule excluded some properties from critical habitat designation, as an essentially symbolic reward for voluntary conservation (USFWS 2006, 63898–63903). However, the rule did not otherwise temper land-use regulation on those properties or anywhere else for these species.

USFWS has used virtually identical language in proposing or issuing rules for several other species, but apparently always likewise only to exclude some areas from critical habitat designation (e.g., USFWS 2005 [bull trout]; USFWS 2007a [peninsular bighorn sheep]; USFWS 2008a [picture-wing flies]; USFWS 2009 [arroyo toad]; USFWS 2010b [Preble's meadow jumping mouse]; USFWS 2012g [northern spotted owl]).

persistence of this characterization, Benson and Garmestani (2011, 395) likewise repeated it even while cautioning that this "mandate" is impeding the ESA from addressing maintenance dependence of species.

As I describe in the following sections, USFWS has nevertheless used ESA exception programs, and in some cases prosecutorial discretion, to grant nonfederal landowners limited immunity from species-based land-use regulation under the ESA. However, USFWS has substantially limited this immunity and has typically granted it only in conjunction with substantial exactions.

2.2. Disregard through Limitations and Goal Confusion in ESA Exception Programs

Since passage of the ESA in 1973, the US Congress and USFWS have instituted three exception programs that temper the ESA's prohibition against incidental take on nonfederal land: Habitat Conservation Plans, Safe Harbor Agreements, and Candidate Conservation Agreements with Assurances. However, even while variously recognizing maintenance dependence or regulatory risk to species, these programs have helped maintain disregard for such risk, in various ways.[62]

2.2.1. Habitat Conservation Plans

Through a 1982 amendment to the ESA, the US Congress authorized USFWS to enter into Habitat Conservation Plans with nonfederal landowners, as a compromise with

[62] The ESA (§4(d)) also allows USFWS to issue rules to refrain from regulation for species listed as threatened. As I describe in chapter V, to date, USFWS has apparently used this provision only to a limited degree.

deep-pocketed developers over the financial costs they incur from absolute land-use prohibitions (Noss, O'Connell, and Murphy 1997; Sax 1997; Plater 1998; Bean 1999b, 18; Tarlock 2001). Subject to approval by USFWS, a Habitat Conservation Plan allows participating nonfederal landowners to concede land, easements, money, and/or services in exchange for limited authority for incidental take of species covered by the plan (Bean, Fitzgerald, and O'Connell 1991, ix, 16). The 1982 amendment recognized that some species are maintenance dependent, but the amendment established Habitat Conservation Plans as a means to seek exactions to conserve and maintain species (US House of Representatives 1982), without regard for any risk such demands might pose to them.

The 1982 amendment was modeled after an agreement that became the first Habitat Conservation Plan (Bean, Fitzgerald, and O'Connell 1991, 54, 56–57). The plan primarily concerned a maintenance-dependent species (mission blue butterfly), on San Bruno Mountain, CA (7, 11).[63] The circumstances of the plan were "extremely rare", in that virtually all known remaining populations of the species existed on a single, commercially valuable property owned by a major corporate landowner (11, 52, 53). The plan was rationalized in part as exacting land and fees from the landowner to provide for actively maintaining the species' habitat in perpetuity (56–57; US House of Representatives 1982, 32). In authorizing the amendment, the US Congress expressly

[63] The plan was prepared in 1982 and approved by USFWS in 1983 (USFWS 1983). When approved, the plan also included the San Bruno elfin butterfly and San Francisco garter snake (id.). At the time, neither of these species had been found on the property in question (TRA Environmental Sciences 1982, III-6; Bean, Fitzgerald, and O'Connell 1991, 53).

intended the San Bruno plan to serve as a model for future Habitat Conservation Plans and as a measure of their adequacy (31–32).[64]

Habitat Conservation Plans disregard regulatory risk to species in part through limitations on any immunity they provide to landowners. Any such immunity is limited in part by a plan's duration.[65] USFWS can extend the duration of a plan by renewing it, at the agency's discretion (id.). In addition, a plan does not protect participating landowners from liability from new listings of species not included in ("covered by") the plan (Bean, Fitzgerald, and O'Connell 1991, 21). A Habitat Conservation Plan can include unlisted species but must treat them the same as listed species, potentially requiring additional exactions (USFWS and NMFS 1996, 4: 1).

More significantly, Habitat Conservation Plans contribute to disregard for regulatory risk to species in that by statute (at least superficially), the plans do not seek to ensure the survival of species nor to confer a net benefit to species, but instead seek for participants ("permittees") to "minimize and mitigate the impacts of such taking" "to the maximum extent practicable" (ESA §10(a)(B)(ii)). Under this interpretation, USFWS has no duty to consider regulatory risk to species in seeking exactions from landowners in

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[64] Other developers showed little interest in Habitat Conservation Plans until 1995, when USFWS adopted a No Surprises policy (Doremus 2010, 211). It promised participants immunity from any additional liability for incidental take of species included in a Habitat Conservation Plan (Sax 1997).

[65] For example, in USFWS Region 1, the permit duration of approved Habitat Conservation Plans has ranged from 2 to 50 years (http://ecos.fws.gov/conserv_plans/PlanReportSelect?region=1&type=HCP, accessed 2 January 2013).

return for incidental take authority; USFWS need consider risk to species only from the proposed incidental take (ESA §10(a)(2)(B)(iv)).[66]

Reinforcing such disregard, actors have continued to widely perceive Habitat Conservation Plans as a means to conserve listed species — including maintenance-dependent species — by seeking exactions from private landowners (e.g., Bean, Fitzgerald, and O'Connell 1991, xii; Grodsky 1993; Kostyack 1997, 761; Leshy 2001, 214).[67] Illustrating this view, some actors (Bean, Fitzgerald, and O'Connoll 1991) have argued that USFWS should aggressively enforce the ESA's land-use restrictions to help USFWS seek such exactions (xiii–xiv, 43, 45).

Potentially further obscuring regulatory risk to species, fear and the cost of negotiation and implementation have tended to discourage smaller or less wealthy landowners from participating in the development of Habitat Conservation Plans (Bean, Fitzgerald, and O'Connoll 1991, 13, 69), thereby potentially obscuring how such landowners might respond to incurring liability for exactions (cf. Peterson and Horton 1995, 140, 163).

Two additional examples illustrate limitations of Habitat Conservation Plans in considering regulatory risk to species. First, in authorizing a Habitat Conservation Plan for the Willamette Valley prairie species mentioned above, USFWS required the

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[66] According to USFWS, "biological goals ... are the rationale behind the minimization and mitigation strategies" (USFWS and NMFS 2000, 1), but "The purpose of [an] HCP [Habitat Conservation Plan] is to ensure that the effects of the permitted action on listed species are adequately minimized and mitigated" (USFWS 2008b, 1), and "No explicit provision of the ESA or its implementing regulations requires that an HCP must result in a net benefit to affected species" (USFWS and NMFS 1996, 3:20–3:21).

[67] One critic likened this approach to a "protection scheme" (Simmons 1999, 317, citing Ike Sugg).

applicant (Benton County, OR) in part to accept liability for mitigation fees for all known populations on presently developable nonfederal land within the county, even though USFWS commented that under the plan, the county offered to pay these fees on behalf of private landowners due to concern that making private landowners liable for the fees would be counterproductive to the survival of these species (Benton County 2010, i, 43; USFWS 2010a, 13).[68, 69] USFWS apparently did not consider waiving these fees.

Second, under Wisconsin's statewide Habitat Conservation Plan for the Karner blue butterfly (a maintenance-dependent species distributed across numerous private ownerships), USFWS granted blanket immunity from species-based land-use regulation for all private landowners with 1,000 acres or less or any private land not managed for forestry, but only on condition that the state and other actors yield substantial exactions; only for a relatively short duration (initially 10 years); and subject to unilateral revocation

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[68] To avoid discouraging restoration and maintenance of existing populations of one of the covered species (Fender's blue butterfly), USFWS also promised to refrain from prosecuting incidental take of the species from specific agricultural and restoration activities and any incidental take of new populations of the species introduced outside of a specific area identified as having existing populations (the "Blue Zone") (Benton County 2010, 11, F: 1–3). However, this discretion likewise extended only for the duration of the Habitat Conservation Plan; excluded future listings of other geographically associated species; and depended on Benton County yielding various exactions (id.). These exactions included obtaining 50 to 60 acres of habitat for Fender's blue butterfly and maintaining populations of the species there for 6 years (id.). The plan also called for identifying and modifying regulatory disincentives that hinder conservation, but the plan did not identify or assign resources to do so (id., E61).

[69] I participated in development of the Benton County Habitat Conservation Plan by attending public meetings and submitting oral and written public comment, as a citizen, from 2006 through 2010. These meetings included separate meetings for the general public, a stakeholder advisory group, and a technical advisory group. All my comments generally suggested a need to consider regulatory risk to the species in question and to consider the scope of discretion available to USFWS for species-based land-use regulation under the ESA.

by USFWS at any time (WDNR 2010; Lentz and Christenson 2011).[70, 71] Moreover, USFWS and the Wisconsin Department of Natural Resources initially rationalized this immunity at least in part as recognizing that they lacked the resources to support a large number of Habitat Conservation Plans (Lentz and Christenson 2011, 151).

Informal comparison with other approved Habitat Conservation Plans suggests that the Benton County and Wisconsin plans were unusually permissive to landowners in addressing regulatory risk to maintenance-dependent species on private land.[72] Yet even in these two cases, such permissiveness was limited and contingent in part on funding by state or local government. For example, in both cases, participating landowners remained at risk of incurring species-based land-use regulation if the respective governments failed to obtain the funding to fulfill their obligations under the plans; if USFWS chose to let

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[70] The exactions yielded by the state and other actors included committing more than 250,000 acres to conserving the species, and funding public education and outreach to encourage its conservation on small private lands (Lentz and Christenson 2011, 151, 155). In 2010, USFWS renewed the plan for another 10 years (USFWS 2013a).

[71] According to the Wisconsin Department of Natural resources, despite these limitations, this immunity measurably increased voluntary landowner participation in conserving the species (WDNR 2003; Lentz and Christenson 2011, 155–156). However, this finding was not controlled for other factors, such as state-funded outreach (WDNR 2003).

[72] For example, the state of Florida's Scrub-Jay Umbrella Habitat Conservation Plan requires participating landowners to pay a mitigation fee averaging $29,324 per acre for impacting scrub-jay habitat or to purchase equivalent credits from a conservation bank (USFWS 2007b [updated 2012], 28, 46), and the Williamson County (TX) Regional Habitat Conservation Plan requires participating landowners to pay a mitigation fee of $7,000 per acre for impacting golden-cheeked warbler habitat, with the fee increasing annually by $500 per acre for 10 years beginning in 2010 (Williamson County Conservation Foundation 2008, xi). But also cf. Pima County's (AZ) proposed Habitat Conservation Plan, discussed in chapter II.

the plans expire; or if the participants' property became populated by listed species not covered by the plans.[73]

2.2.2. Safe Harbor and Candidate Conservation Agreements

Through rulemaking in 1999, USFWS established two other exception programs expressly to address risk to species from species-based land-use regulation under the ESA (USFWS 1999, 32707). In part, these programs — Safe Harbor Agreements and Candidate Conservation Agreements with Assurances — expressly seek to dispel risk to maintenance-dependent species from discouraging otherwise willing landowners from voluntarily maintaining habitat for maintenance-dependent species (id.). However, both of these programs still substantially disregard and fail to dispel this risk, due to various limitations and apparent goal confusion.

Safe Harbor Agreements are intended to allow nonfederal landowners to create or enhance habitat for listed species without incurring additional land-use restrictions from new populations of the species (USFWS and NMFS 1999a). However, the agreements do not waive land-use restrictions for existing populations of listed species, even if the species are maintenance-dependent. Instead, the agreements establish existing

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[73] USFWS subsequently proposed listing three additional prairie species geographically associated with the species covered by the Benton County Habitat Conservation Plan — Taylor's checkerspot butterfly, streaked horned lark, and (though only in Washington state) Mazama pocket gopher (Banse 2012; USFWS 2012f). The Benton County plan does not cover these species on private land (Benton County 2010, 11–12). Yet possibly signaling increasing consideration for regulatory risk to maintenance-dependent species, USFWS also proposed a special rule under ESA §4(d) to unconditionally exempt some incidental take of the streaked horned lark from prosecution, in part to reduce regulatory disincentives for maintaining its habitat (USFWS 2012f, 61939; cf. 61973, citing Bean and Wilcove 1997). I discuss this case further in chapter V.

populations of listed species as an agreement's "baseline", fully subject to the land-use restrictions of the ESA.

Safe Harbor Agreements are further limited by whether USFWS is available and willing to prepare and execute such agreements,[74] and by a requirement that participating landowners provide a "net benefit" to the species, through measures approved at the discretion of USFWS. Still further, the agreements grant a participant incidental take authority for any new populations only after the participant carries out these measures for the duration of the agreement (USFWS and NMFS 1999a, 32721).[75, 76]

Thus, where USFWS is able and willing to enter into a Safe Harbor Agreement, would-be participants potentially expose themselves to land-use restrictions from existing populations of listed species; participants must agree to whatever measures USFWS requires for the agreement; and if USFWS does not renew the agreement, participants face the choice of incurring new land-use restrictions or destroying the habitat that they have created or maintained. As for Habitat Conservation Plans, participants also risk incurring land-use restrictions if a species that is not included subsequently becomes listed. Safe Harbor Agreements may include unlisted species, but the agreements must

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[74] USFWS (1999, 32710) estimated that at its funding level for fiscal year 1999, it could develop only 67 Safe Harbor Agreements and 67 Candidate Conservation Agreements with Assurances per year.

[75] Participants may terminate a Safe Harbor Agreement before the end of its duration due to "circumstances out of the landowner's control" (USFWS and NMFS 1999a, 32725).

[76] In some cases, USFWS has eased participation by establishing programmatic Safe Harbor Agreements. Such agreements provide a template for agreements with individual landowners. However, as illustrated by a recent programmatic agreement (USFWS 2008d), participants must still agree to whatever terms USFWS demands, and the individual agreements still have the other limitations I describe here.

similarly establish a baseline for any existing populations and provide a net conservation benefit for the additional species.

Safe Harbor Agreements also contribute to disregard for regulatory risk to species insofar as USFWS policy allows confusion as to whether the agreements are intended to improve the survival of species by reducing regulatory disincentives or by seeking exactions from landowners. Hinting at the latter interpretation, some actors (Bocetti, Goble, and Scott 2012, 875) have advocated using Habitat Conservation Plans and Candidate Conservation Agreements with Assurances to seek legally binding agreements to ensure management of maintenance-dependent species in perpetuity.

Candidate Conservation Agreements with Assurances are similar to Safe Harbor Agreements, except that they are intended to cover species that are candidates for listing under the ESA, and not yet listed (USFWS and NMFS 1999b). Like Safe Harbor Agreements, Candidate Conservation Agreements contribute to disregard for regulatory risk to species through various limitations. However, in two respects, Candidate Conservation Agreements are more limited than Safe Harbor Agreements. First, participants must agree to undertake conservation measures that USFWS finds sufficient to avoid any need ever to list the species included in the agreement, in perpetuity, assuming all other landowners undertook the same measures. Second, the agreements provide incidental take authority only for populations in addition to the populations needed to avoid listing.[77]

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[77] These additional limitations might help explain why USFWS had completed only 17 Candidate Conservation Agreements with Assurances by 2008 (Womack 2008, iii). In contrast, 189 landowners were participating in Safe Harbor Agreements by 2002 (Wilcove and Lee 2004, 642).

2.3. Disregard through Prescription in Oregon Land-Use Law (Goal 5)

A portion of Oregon land-use law known as Goal 5 illustrates other ways that law has dictated disregard for risk to species from species-based land-use regulation. Goal 5 seeks to "protect natural resources and conserve scenic and historic areas and open spaces", including "wildlife habitat" (OAR 660-015-0000(5)). However, rather than seeking to ensure the survival of species, Goal 5 narrowly seeks to "protect" "wildlife habitat", where "protect" means to "limit or prohibit" "conflicting [land] uses" through "regulations" (OAR 660-015-0000(5); OAR 660-023). In addition, Goal 5 restricts consideration of regulatory risk to species or wildlife habitat when considering such restrictions for any particular property, in that Goal 5 allows such decisions to consider effects only within a limited "impact area", defined as the area affected by conflicting uses on the property in question (OAR 660-023-0040(3)).[78]

3. Disregard by Obscuring Regulatory Risk in Owning Habitat

Actors have helped disregard regulatory risk to species by making demonstrably false or misleading claims that obscure regulatory risk to individuals who own land with imperiled species, and by extension, the risk to landowners for restoring or maintaining habitat for imperiled species. By denying or minimizing the risk to owning habitat for

[78] The regulatory authority of Goal 5 was significantly reduced in 2007, by the passage of Measure 49 (Walker and Hurley 2011, 112). With some exceptions, Measure 49 presently requires the state or local governments to compensate private landowners for any new restrictions on residential development on farm or forest land, when such restrictions are based solely on state law.

imperiled species, actors deny or minimize the consequent risk to maintenance-dependent species. Here, I offer some examples.

3.1. "Regulation Increases the Market Value of Property"

Actors have long obscured regulatory risk to owning habitat for imperiled species by indiscriminately claiming, suggesting, or implying that increased land-use regulation increases the market value of property or has little or no effect on the value. For example:

> ESA restrictions on private property use might produce offsetting benefits for other uses of the land, as by enhancing its tourist value for rare bird watching.
> (Meltz 1994, 411)[79]

> Property values generally increase as more of a landscape is protected as natural area and as the quality of life for all residents improves
> (Noss, O'Connell, and Murphy 1997, 222)

> Property markets typically capitalize, or account for, the impacts of land-use regulations ... Actions that protect a site's environmental amenities may also protect the site's property value...
> (ECONorthwest 2004, 3)[80]

> [T]he amenity value created by MSHCP [multiple-species Habitat Conservation Plan] reserves compensates land developers by increasing value in market price and demand for housing.
> (Scott, Fernandez, and Allen 2006, 216)[81]

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[79] This work has been cited as recently as 2011 (by Goldberg et al.) to describe the conflict between the ESA and private ownership of land.

[80] Illustrating the potential influence of such claims, this work was commissioned by Portland Metro (a local government with authority to regulate land use in and around Portland, OR), for an economic cost-benefit analysis of regulation to restrict land use in "natural areas".

[81] As I described earlier in this chapter, Habitat Conservation Plans are a form of species-based land-use regulation that allows landowners to pay fees or yield other exactions in lieu of land-use restrictions (Bean, Fitzgerald, and O'Connell 1991).

Or more subtly:

> There is concern that critical habitat is excessively burdensome on the private landowner. Economic models have suggested that critical habitat designation increases property values ... (Zabel & Paterson 2006). Analyses have also suggested that these increased land values driven by critical habitat designation benefit private landowners (Quigley & Swoboda 2007). ... Assessments of private landowner impacts that result from critical habitat designation would benefit from a distinction of the kinds of stakeholders that gain and lose from these decisions. (Schwartz 2008, 284)[82]

Such claims are misleading. Research by others has shown that proximity to protected "open space" or "natural areas" can increase the market value of private property (e.g., Letzenhiser and Netusil 2001; Anderson and West 2006); however, research (including Quigley and Swoboda 2007) has also long shown that species-based land-use regulation under the ESA (or any other selectively applied land-use regulation) typically reduces the market value of land with unexercised property rights (e.g., Riddiough 1997; Smith and Shogren 2002, 170; cf. Adler 2008, 302, citing Turnbull 2005).[83] Theoretically, insofar as the market value of land depends on allowable uses (Interagency Land Acquisition Conference 2000, 10), any land-use regulation can only reduce that value, at least in the short term (Shogren 1998, 55). Empirically, scholarly literature and technical reports have long provided examples where regulation under the

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[82] The author (283–284) noted that critical habitat designation itself imposes little or no land-use regulation, but he argues that it facilitates such regulation.

[83] Quigley and Swoboda apparently conflated ESA listing with critical habitat designation. As I note above, the latter rarely imposes restrictions on private land. USFWS interprets the ESA as requiring studies of economic impacts that include the impacts of both critical habitat designation and listing (USFWS 2006, 63870; also cf. NEA 2008, 5–6, citing a duty to do so under a ruling by the US Tenth Circuit Court of Appeals).

ESA has dramatically reduced the market value of private property (e.g., Simmons 1999, 319–321; Innes 2000, 195, citing Sugg 1993; Sunding 2006, 202; NEA 2008, ES-8).

3.2. "Conservation Banking Turns Species from Liabilities into Assets"

Actors have also widely obscured regulatory risk in owning habitat for imperiled species by indiscriminately claiming that conservation banking can make species-based land-use regulation profitable for private landowners.

As practiced under the ESA[84], conservation banking refers to USFWS-authorized programs that allow a designated actor (the conservation bank) to receive species-based mitigation fees from nonfederal landowners for land uses that incidentally harm listed species or other particular at-risk species, such as under a Habitat Conservation Plan (Bean, Kihslinger, and Wilkinson 2008, 16–18, citing USFWS 2003b). In return for authority to receive mitigation fees, the bank must undertake conservation measures approved by USFWS in authorizing the bank (id.). These measures typically include agreeing to provide a perpetual conservation easement for bank-owned land and agreeing to undertake specific measures to manage the land in perpetuity to provide suitable habitat for the species in question. Required management typically includes actively managing habitat, such as to control invasive exotic species or undertake periodic prescribed burning. To win authorization, a bank must satisfy USFWS that it has sufficient funds to fulfill its obligations in perpetuity or can obtain them within 5 years. USFWS determines landowners' liability for mitigation fees in terms of credits and

[84] Conservation banking has also been practiced under California state law and to a small extent under Washington law (Bean, Kihslinger, and Wilkinson 2008, 18–20).

mitigation ratios. Typically, a credit represents one acre of bank property or a breeding pair of a listed species. USFWS awards credits to the bank's owners according to the owners' conservation accomplishments. The mitigation ratio determines how many credits a landowner must buy from the bank to adversely impact one equivalent measure of land (e.g., one acre of habitat, or the habitat for a breeding pair of a listed species). The ratio usually depends on the quality of the landowner's habitat, with higher quality habitat resulting in a higher ratio.[85] Conservation banking allows a bank and prospective buyers to negotiate the price of credits. Payments for credits have ranged from $4,000 to $125,000 per acre (Ruhl, Glen, and Hartman 2005, 31) and as high as $100,000 for a breeding pair of red-cockaded woodpeckers (Braüer et al. 2006, 24).[86] A bank's income depends on the willingness of landowners to buy credits.

Proponents of conservation banking argue that conservation banking expedites the design and payment of mitigation fees and improves their benefit to species by establishing larger reserves and funding active maintenance (Bean, Kihslinger, and Wilkinson 2008, 16–17, citing USFWS 2003b). Others question the benefit to species (e.g., Pawliczek and Sullivan 2011), which as of 2008 were little studied (Bean, Kihslinger, and Wilkinson, 38).

More to the point here, actors widely and indiscriminately claim or suggest such programs turn listed species from liabilities into assets for private landowners (e.g.,

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[85] USFWS also assigns a mitigation ratio to the bank, depending on the quality or other desirability of the bank's habitat. This ratio determines how many credits the bank is awarded per acre or other measure of habitat (Fox and Nino-Murcia 2005, 1005).

[86] Ellison and Dwyer (2000) reported payment for credits as high as $250,000 per acre.

Mills 2004, 539; Wilcove and Lee 2004, 640; Fox and Nino-Murcia 2005, 997; Braüer et al. 2006, 56; Fox et al. 2006, 242–243; Bayon, Carroll, and Fox 2008, 5; also cf. ODFW 2006, 25). For example:

> Conservation banking is attractive to landowners and land managers because it allows conservation to be implemented within a market framework, where habitat for listed species is treated as a benefit rather than a liability... From the landowner's perspective, it provides ... an opportunity to generate income from what may have previously been considered a liability.
>
> (USFWS 2003b, 1)

> Conservation banking can restack the "economic cards" in favor of conservation on private land by turning listed species into economic assets (rather than regulatory liabilities).
>
> (Bauer, Fox, and Bean 2004, 10719)

> Landowners can profit from selling habitat or species credits to parties who need to compensate for adverse impacts to these speices [sic]. Landowners can generate income, keep large parcels of land intact, and possibly reduce their taxes.
>
> (USFWS 2011e, 1)

Such claims disregard regulatory risk in owning habitat in two ways. First, they overlook that the species-based regulation underlying a conservation bank imposes a cost on all landowners with unprotected habitat that is occupied by the species in question, by imposing liability for mitigation fees. Conservation banks depend on enforcing species-based land-use regulation:

> It is critical to recognize this link between the enforcement of regulatory controls and the potential of conservation banking... [V]igorous and committed enforcement of biodiversity mitigation requirements will be critical to the success of banking.
>
> (Fox and Nino-Murcia 2005, 1003–1006)

Even where landowners seek to use their property only to provide wildlife habitat, any liability for mitigation reduces the market value of their property (cf. Anderson 2004, 460).

Second, landowners cannot control whether they end up receiving mitigation fees or incurring liability for them. In effect, conservation banking taxes Peter to pay Paul, and landowners cannot ensure they end up as Paul and not as Peter. To establish a conservation bank, a landowner needs deep resources, time, risk tolerance, and agency approval (Fox and Nino-Murcia 2005; Casey et al. 2006, 45; Mead 2008, 16). Adding to the challenge, USFWS tends to disfavor small ownerships (USFWS 2003b, 1) and has used its discretion in setting mitigation ratios to favor some properties over others when establishing banks (Fox and Nino-Murcia 2005, 1005). Even with agency approval, "conservation banking is not a hobby. It is a serious and potentially risky real estate venture" (Ruhl, Glen, and Hartman 2005, 31). In part, landowners seeking to create a conservation bank risk that "investigating opportunities will reveal previously unrecognized endangered species and, in the event that a bank is not established, result in increased enforcement of the ESA" (Fox and Nino-Murcia 2005, 1006). Characterization of conservation banking as "incentive-based" (e.g., USFWS 2011e, 1) or a "free-market enterprise" (e.g., USFWS 2011a, 2) further obscures landowners' lack of choice in incurring liability for mitigation.

Thus, by indiscriminately claiming that conservation banking turns species from liabilities into assets, actors overstate the potential benefit and understate the risk both to landowners and species from the underlying regulation. More fully recognizing these effects, two economists commented:

> When incentive-based instruments, such as ... habitat banking or offsets are applied at the same time as liability rules, then the same activity is subject to two different price signals... This will be redundant at best or counterproductive at worst.
>
> (Schröter-Schlaack and Ring 2011, 198)[87]

Two examples illustrate the dominance of indiscriminate claims that conservation banking turns species from liabilities into assets. First, a long-time critic of the ESA (Adler 2011a, 18–19) likened conservation banking to fee simple purchase and conservation easements, as "voluntary" mechanisms, providing "financial incentives" to help "eliminat[e] the economic burdens of species listings" under the ESA. Second, such claims have been repeated by a non-profit organization that seeks to promote free-market solutions to environmental problems and which has likewise long criticized the ESA. In an article titled "Squeezing profits from endangered species", the organization's magazine stated:

> This magazine has documented what the good political intentions of environmental protection laws can create perverse economic incentives to do just the opposite. ... You know that, rather than risk loss of economic value under the imposition of heavy-handed regulations [under the ESA], rational landowners are motivated by self-interest and fear to quietly destroy — AKA "shoot, shovel, and shut up" — both the rare critters and the critical habitats they need... [I]t turns out that if you look closely ... there is flexibility built into the ESA. ... Conservation Banking Agreements ... offer legal protections and incentives in the form of mitigation credits, much like the credits for conserving or creating wetlands...
>
> (Workman 2012, 6–7, 7–8)[88, 89]

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[87] Despite this recognition, the authors disregard risk to maintenance-dependent species from species-based land-use regulation by assuming such regulation is enforceable, in indiscriminately claiming that "'Direct regulation' will have to play a crucial role in safeguarding a minimum level of biodiversity to avoid crossing critical thresholds of ecosystem function" (196). Citing de Groot et al. (2010), the authors do caution against institutional failure, but de Groot et al. do not mention risk to species from regulatory disincentives.

Another example illustrates the persistence of such claims. After questioning the accuracy of claiming that conservation banking compensates landowners for conservation, one researcher subsequently repeated the claim without such reservations:

> [T]he value of credits may not compensate owners for their opportunity costs. ... If landowners cannot earn enough in credits for conserving habitat, they may not respond to a habitat mitigation banking policy, or worse, they may respond perversely by eliminating the habitat that they perceive has become a liability.
>
> (Fischer 2006, 177–186)

> Habitat mitigation banking satisfies owners' need for ... compensation...
>
> (Fischer and Bliss 2009, 899)[90]

---

[88] This statement is also misleading in that under the US Clean Water Act, mitigation banking generally does not provide credits for protecting existing wetlands from development (Bean, Kihslinger, and Wilkinson 2008, 11, citing "Federal Guidance for the Establishment, Use and Operation of Mitigation Banks," 60 *Federal Register* 58605 [1995], §I.B.).

[89] The organization published these representations even though its executive director previously cautioned that any benefits from conservation banking must be measured against the costs from the underlying regulation:

> This type of property right [habitat mitigation credits] can reduce transaction costs and increase the incentive for landowners to produce habitat, but it first requires a redistribution of rights from the landowner to the polity. ... Again it should be emphasised that the rent-seeking costs inherent in such redistribution must be netted from the benefits of lower transaction costs.
>
> (Anderson 2004, 460)

[90] The authors arrived at this conclusion based only on qualitative interviews with 36 private landowners in which the authors apparently represented or interpreted habitat mitigation banking only as providing income to landowners. For example, the authors reported that the landowners "[a]bhorr[ed] regulation" (895); that many favored "creating markets ... to allow them to generate income..." (889); and that "On the whole, owners viewed oak as a private good... They argued that society should help them conserve oak by paying for it. ... Twelve owners recommended rent and payment programs and five owners suggested ecosystem services markets..." (892). In concluding that such responses favored habitat mitigation banking, the authors indiscriminately equated "ecosystem services market" with habitat mitigation banking (899), without distinguishing between free markets and regulatory markets. (Cf. the next section here.)

Illustrating the potential influence of such claims, the state of Oregon's statewide conservation strategy presently calls for increasing the use of conservation banking, while indiscriminately describing it as a way to "benefit landowners" and an approach in which "habitat values are converted to credits" (ODFW 2006, 25).

3.3. "Ecosystem Service Markets Pay for Providing Habitat"

The terms "ecosystem service markets" and "payments for ecosystem services" have been variously used to mean (1) regulatory markets based on the presence of species or other environmental benefits and/or (2) free markets for such benefits[91] (e.g., Ruhl, Kraft, and Lant 2007; Mercer, Cooley, and Hamilton 2011; EPRI 2012[92]).

As with conservation banking (a regulatory ecosystem service market driven by species-based land-use regulation, as described above), actors have helped obscure regulatory risk to species by indiscriminately claiming that ecosystem service markets or

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[91] In environmental contexts, a regulatory market consists of a legal regime allowing actors to pay others to provide an environmental benefit (such as habitat for imperiled species) in return for the right to harm or destroy a similar or equivalent benefit elsewhere (Thompson 2000, 262), whereas a free market consists of a legal regime implicitly or explicitly allowing actors to buy and sell an environmental benefit (such as habitat for imperiled species) without incurring legal penalties for harming or destroying that benefit (Anderson and Leal 2003, 4).

[92] Illustrating this diversity of meanings, Mercer, Cooley, and Hamilton defined "payments for ecosystem services" as "[f]ormal and informal contracts in which landowners are remunerated for managing their land to produce one or more ecosystem service..." (1), where payment types include "Public Payments... Voluntary Transactions... [and] Compliance-Driven Transactions" (3). In contrast, EPRI (2012, 4) defined "Payments for Ecosystem Services" as "purely voluntary actions that are not driven by regulatory compliance obligations", whereas Ruhl, Kraft, and Lant (2007) claimed that "Law ... has to enter the picture for ecosystem services to be put into operation as a meaningful policy driver" (ix), and they described "market-based systems" as based on "compensatory mitigation requirements" (278–279).

"payments for ecosystem services" turn imperiled species into opportunities for private landowners to profit or generate income.

For example, a university lecture course on ecosystem service markets has claimed that regulatory ecosystem service markets are so successful in giving market value to imperiled species, actors are purchasing habitat in anticipation of new species-based land-use regulation, which the lecture characterized as "pre-regulatory markets":

> [A pre-regulatory market] is a market that is created in anticipation of regulation, and there's a lot more examples of this than you might realize. One of the best is the market for sage grouse habitat out in the range lands of Eastern Oregon. The sage grouse is the spotted owl of sage brush country, and it is anticipated that it will be listed as an endangered species ... and there's a lot of folks that are stockpiling habitat and selling habitat in anticipation of regulation. And there's a lot of other examples of this.
>
> (Anonymous 2010, 15:21–16:25)

(I have found no evidence of profit-driven actors seeking to develop a pre-regulatory market for sage grouse or any other unlisted species under the ESA.[93])

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[93] For comparison, a task force for the State of Idaho recently recommended that the State "consider funding projects to create a mitigation bank of sage-grouse habitation restoration projects that future development projects would repay through compensatory mitigation requirements" (O'Laughlin 2012, 15).

Also for comparison, two consultants (Gartner and Donlan 2011, 1) reported working to develop a pilot "pre-compliance" conservation bank under the ESA, for the gopher tortoise (a candidate for listing as threatened or endangered in some areas of the US and already listed as threatened elsewhere in the US). However, the consultants described the program as being driven primarily not by speculators seeking to profit but by landowners seeking to minimize their present or future liability under the ESA, as for conventional conservation banks. In particular, the pilot project was being driven by the US Army, which sought to avoid land-use restrictions arising from the presence of the tortoise on Army property (4). Moreover, the consultants reported that "The marketplace must be designed so that landowners perceive having candidate species on their property as an asset as opposed to a liability" (6), yet the consultants did not identify how the program might do this, except to note that "Discussion is ongoing" (5). From a subsequent presentation (Gartner and Donlan 2012), the consultants described landowners as needing in part to provide a non-wasting endowment (15) and to otherwise meet the terms required to participate in a Habitat Conservation Plan or Candidate Conservation Agreement with Assurances (23) to receive any

As for conservation banking, such claims disregard that when payments are funded by exactions from species-based land-use regulation (as in regulatory markets), the underlying regulation typically turns existing populations of listed species into a liability for landowners with unexercised land-use rights in associated habitat. Insofar as ecosystem service markets consist of conservation banking, such claims also disregard the barriers preventing typical landowners from establishing a conservation bank (described in the previous section), which they must do to receive any payments. Reflecting the popularity and misleading nature of such claims, a critic of ecosystem service markets cautioned:

> As is often the case, win-win scenarios are broadly appealing but often involve self-deception
>
> (Goble 2007, 440)

Actors have made such claims in part by taking advantage of confusion between regulatory and nonregulatory ecosystem service markets. For example, further illustrating the dominance of such claims, Oregon Senate Bill 513 (2009) advocated the development of ecosystem service markets, defined ecosystem service markets as including regulatory markets, appeared to distinguish regulatory markets from "payment for ecosystem services", yet characterized ecosystem service markets as a source of income for private landowners:

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payment from the program. The gopher tortoise is coincidentally maintenance-dependent, due to fire dependence and invasive exotic species and (DeBerry and Pashley 2004, 6).

These accounts are consistent with an appeal by USFWS (2012e, 15352) for suggestions for potential rule changes to facilitate development of "pre-listing mitigation" banks for candidate species or other unlisted species.

> "Ecosystem services markets" means the full spectrum of regulatory, quasi-regulatory and voluntary mitigation markets. (§1(5))
>
> "Payment for ecosystem services" means arrangements through which the beneficiaries of ecosystem services pay back the providers of ecosystem services. (§1(6))
>
> It is necessary to assist landowners in gaining access to additional sources of revenue such as emerging ecosystem services markets... (§3(1))[94]

Some actors have additionally obscured risk to species from regulatory ecosystem service markets by indiscriminately implying or claiming that ecosystems are stable or self-maintaining.[95] For example, in promoting the development of ecosystem service markets, the US Environmental Protection Agency (2009, 4) characterized ecosystems as self-sustaining and humans only as potential disrupters:

> Natural functioning ecosystems are self sustaining through the interactions among biological and physical components. Humans are an integral part of ecosystems, so our actions combined with natural events can alter ecosystem structure and function... How are ecosystems disrupted? Ecosystems and their services can be disrupted or destroyed by human actions...[96]

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[94] Still further illustrating the dominance of such claims, Senate Bill 513 was supported in part by Defenders of Wildlife, the Oregon Homebuilders Association, and the Oregon Business Council (Garrett 2009).

[95] Except where noted, I use the term "ecosystem" to refer to the living organisms and environmental factors within a given area, without assuming or implying that the populations of these organisms are stable. This interpretation contrasts with use of the term by many others (e.g., Tansley 1935), including its use in many of the works I cite here. I discuss differing uses of the term under the corresponding entry in appendix B.

[96] Similarly, while calling for greater attention to context and cautioning that regulatory ecosystem service markets likely create losers, Jack, Kousky, and Sims (2008, 9468) characterized biodiversity as an ecosystem service that is "nonexcludable", thereby allowing "compulsory mechanisms for demand generation". (As I discuss later in this chapter, "nonexcludable" here implies that a landowner cannot

Illustrating the potential influence of misleading claims about ecosystem service markets, such markets have been described as a "dominant model for environmental policy and management" that has spawned "a thriving industry of professionals providing advice on ecosystem services" (Norgaard 2010, 1219). Or for example, a coalition of governmental and nongovernmental actors has been working to develop an ecosystem service market for upland prairie species in the Willamette Valley, derived in part from species-based land-use regulation under the ESA, with no apparent regard for consequent regulatory risk to associated species:

> In August 2009, a group of 25 agencies, conservation organizations, and other stakeholders agreed to pilot a new system for quantifying the ecosystem services provided by wetlands, streams, and upland prairie in the Willamette Basin; and for using those measures to improve the effectiveness of compensatory mitigation and provide new conservation incentives for landowners. This paper documents the Counting on the Environment process used to construct the upland prairie calculator and how it fits into potential voluntary and regulated markets for prairie credits. ... US Fish and Wildlife Service, Oregon Department of Fish and Wildlife, and other agencies have approved testing of the calculator and associated credit issuance process for use in Habitat Conservation Plans, consultations that require mitigation, and other programs.
>
> (Cochran and Adamus 2010, 40)

> [H]igher quality upland prairies represent some of the "products" land managers will soon be able to produce and sell through ecosystem service markets. These markets also provide anyone with unavoidable environmental impacts from legally permitted activity with viable alternatives for making-up for it — alternatives that meet regulatory standards... There are several pieces in place to minimize and reduce these impacts (e.g. ... species conservation banking)...
>
> (Willamette Partnership 2009, 2)

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prevent others from benefiting from species on his or her property. This in turn implies that the species are self-maintaining.)

As reflected in the first of these quotes, the coalition was indiscriminately representing species-based regulatory markets as providing "incentives" for landowners to conserve the Willamette Valley's upland prairie, without recognizing that the underlying regulation can also create disincentives for doing so. As noted above, the associated species targeted to date by such regulation are maintenance-dependent (USFWS 2000; USFWS 2006, 63880).

3.4. "The ESA Doesn't Protect Plants on Private Land"

Actors have also obscured regulatory risk in owning habitat for imperiled species by misleadingly claiming that the ESA does not prohibit the destruction of plant species on private land. For example, in a survey of landowner attitudes about imperiled species and regulatory risk, by consultants developing Benton County's (OR) Habitat Conservation Plan for the Fender's blue butterfly and various other maintenance-dependent species, the consultants asked:

> Did you know that under federal and state law, threatened and endangered animals are protected on private lands but plants usually are not?
>
> (Kaye, Schwindt, and Menke 2011, 11)

In fact, the ESA prohibits harm to plant species on private property when they are essential to the survival of an animal species that occupies the property and is listed as threatened or endangered (Bean and Rowland 1997, 217–218). For example, in this case, the Fender's blue butterfly depends on Kincaid's lupine (a maintenance-dependent plant species), the sole host for the butterfly's larvae (Wilson et al. 2003, 80; USFWS 2006,

63863, 63880).[97] The consultants subsequently corrected their representation in the Habitat Conservation Plan itself (Benton County 2010, E62), but not in publishing the results of their survey (Kaye, Schwindt, and Menke 2011). Instead, they repeated their claim:

> During public meetings, we identified widespread misunderstanding of federal and state endangered species law as an obstacle to public support for conservation on private lands. Only about half of rural landowners (53%) knew that federally listed plants are usually not protected on private lands... This may have been part of the reason that fewer rural landowners ... would plant seeds of endangered plants... These results prompted us to provide a clearly worded explanation of endangered species regulations within the [Habitat Conservation Plan].
>
> (Kaye, Schwindt, and Menke 2011, 121)

4. Disregard through Other Economic Claims and Assumptions

Actors have obscured regulatory risk to species by making various other economics-related claims and assumptions that are demonstrably false or misleading. The following examples illustrate assumptions that private landowners seek only to develop their property and gain no benefit from wildlife habitat, and indiscriminate claims that species are a public good (in the technical sense used in economics).

4.1. "Landowners Seek Only to Develop Their Property"

Some scholarly works in economics have disregarded regulatory risk to species by assuming that private landowners do not benefit from wildlife and/or that they seek

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[97] As described above, due to concern that regulatory disincentives "could severely limit the potential for recovery" of species covered by Benton County's Habitat Conservation Plan, USFWS in part promised to use prosecutorial discretion to refrain from imposing liability on landowners for incidental harm to new populations of Fender's blue butterfly, subject to various conditions (Benton County 2010, 11, F1–F3).

only to develop their property. For example, in constructing a game-theoretic model of decisions by regulators and private landowners considering a Habitat Conservation Plan under the ESA, Langpap and Wu (2004) assumed:

> If the landowner is not regulated, he develops his entire property and no conservation takes place. (438)
>
> The landowner incurs costs from conservation, but derives no benefits. Thus, his objective is to minimize the costs of conservation. (439)

Or for example, in constructing a similar model, Hsu (2002, 65) assumed:

> The landowner wishes to develop as much of the property as possible. ... The landowner receives no benefit from and does not care about biodiversity.

As discussed in the previous chapter (in section 4.3), these assumptions conflict with evidence that many private landowners value environmental amenities and that some are willing to conserve or maintain wildlife habitat with little or no help. The above assumptions disregard regulatory risk to species by obscuring harm to species from discouraging otherwise willing individuals from using their own resources to maintain habitat for imperiled species or from participating in incentive programs to do so.

Illustrating the use of such assumptions to disregard regulatory risk to species, Hsu used his assumptions to conclude that any noncompliance with the ESA consists solely of unlawful active destruction of habitat; that it should be addressed through stricter enforcement; and that any remaining active destruction is an unavoidable cost of conservation (93).[98] Further illustrating such use, Fitzgerald and Hartl (2012) cited the

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[98] The ESA cannot require private landowners to actively maintain habitat (USFWS and NMFS 1999a, 32717) ("proactive management actions cannot be mandated or required by the [Endangered Species] Act"). Even assuming authority to require active maintenance, such enforcement might be impractical,

model by Langpap and Wu to argue for maintaining the threat of regulation under the ESA, in comment to USFWS on behalf of the Society for Conservation Biology, in response to a request by USFWS for suggestions to change rules to improve conservation incentives under the ESA.[99]

4.2. "Species Are a Public Good" (in the Technical Sense)

Actors have widely obscured regulatory risk to species by indiscriminately referring to species, wildlife habitat, or biodiversity as a public good, in the sense used in economics. Economists define a public good as a good that is characterized by nonrivalry and nonexcludability, meaning that the benefit from a good to one person does not decrease its potential to benefit others, and that no one can prevent others from benefiting from it (ten Brink et al. 2011, 25; Tietenberg and Lewis 2012, 31). Examples include national defense and (less perfectly) the Earth's atmosphere. Since in principle no individual has to pay for a public good to benefit from it, societies sometimes seek to supply a public good through regulation or other governmental power, such as by

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given the complexity and experimental nature of actively maintaining species; Aldo Leopold — recognized as the "Father of Wildlife Management" in the US (Trager and Kennedy 2012, 32, citing Errington 1948, McAtee et al. 1962, and Swanson 1987) — commented that "Acts of conservation without the requisite desires and skills are futile", and that "This limitation of conservation law and policy is inherent and unavoidable" (Leopold 1991a [1944], 319, 318).

[99] "Recently, Langpap and Wu argued that the likelihood that a private entity will undertake voluntary conservation efforts under the Endangered Species Act depends upon the 'availability of assurances regarding future regulation, as well as on the background threat of regulation and the cost advantage of voluntary agreements.' Without both the 'threat' of mandatory conservation requirements through regulation, and regulatory assurances that there are advantages to taking voluntary conservation actions early, voluntary conservation efforts will likely be inefficient." (Fitzgerald and Hartl 2012, 4, citing Langpap and Wu 2004).

imposing taxes to support an army. Maintenance-dependent species thus do not qualify as a public good, insofar as passive destruction allows private landowners to lawfully exclude anyone from benefiting from them.

By indiscriminately claiming that species are a public good, actors misleadingly imply that any species will persist if regulation prohibits landowners from destroying it. In contrast, Innes (2000, 196) more accurately characterized species and wildlife habitat as having "public use value", to recognize that in some cases, private landowners can lawfully destroy wildlife habitat and have done so to avoid species-based land-use regulation.

Two economics textbooks illustrate the dominance and persistence of indiscriminate claims that species are a public good. One of these textbooks (Tietenberg and Lewis 2012) indiscriminately characterized biodiversity as a public good (31–33), even after removing an indiscriminate claim in previous editions that "if ... land is preserved [from destructive land uses], the ecosystem benefits will be retained" (e.g., Tietenberg and Lewis 2009, 30).[100] The other textbook (ten Brink 2011), written primarily for policy makers (xxvii), described invasive exotic species as a pervasive and growing threat to biodiversity (24), yet indiscriminately characterized biodiversity as a public good (209), commented that "protecting the supply of public goods usually falls to government" (24), stated that "compensatory mitigation" for environmental impacts "is

[100] Tietenberg and Lewis (2012) further cautioned that because biodiversity is a public good, society cannot rely on the private sector to supply biodiversity in a socially desirable amount (31). However, they also suggested that the privately supplied amount might still be considerable (33).

essential to stop ongoing cumulative losses of biodiversity... " (310), and noted that such mitigation depends on "[l]egislation requiring compensation for ... impacts" (311).

Further illustrating the dominance of indiscriminate claims that species are a public good, such claims have been repeated in Oregon law (in part to advocate regulation to conserve species),[101] they have been repeated by critics of the ESA (Sugg 1993, 78; Stroup 1997, 55), and they have been repeated by a nongovernmental organization that seeks to promote free-market solutions to environmental problems (Salzman 2010).[102]

By implying that all species are nonexcludable, such claims obscure the possibility that species-based land-use regulation might exacerbate the loss of maintenance-dependent species on private land, such as by discouraging otherwise willing landowners from using their own resources to maintain species or from participating in incentive programs to do so.

5. Disregard through Policy Rhetoric

Actors have disregarded regulatory risk to species by using policy-related rhetoric to obscure assumptions or findings from research. I offer two examples here:

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[101] Passed in 2009, Oregon Senate Bill 513 in part states that "[W]ildlife habitat and other [ecological] values ... are generally considered public goods" (§1(2)), and that "New or improved regulatory schemes ... will make additional natural resources available to protect and enhance ecosystem services" (§3(4)), including "native flora and fauna" (§3(5)).

[102] The organization's magazine comments that "biodiversity is a classic public good" (Salzman 2010, 17), and suggests that one way to provide biodiversity is through mitigation fees (as "one-off payments") (13).

"conservation-reliant species" and "carrot and stick". Each represents a telescopic argument conveying implied assumptions that are demonstrably false or misleading.

5.1. "Conservation-Reliant Species"

Some natural scientists and legal scholars have proposed improving the survival of maintenance-dependent species on private land by recognizing them as "conservation-reliant" and using the threat of regulation under the ESA to seek legally enforceable agreements that ensure sufficient management in perpetuity (or as long as required), including sufficient funding to carry it out, such as through an endowment (Scott et al. 2005; Scott et al. 2010; Bocetti, Goble, and Scott 2012, 875; Goble et al. 2012). Proponents argue that "the ESA provides or motivates the management tools needed to maintain the species" (Bocetti, Goble, and Scott 2012, 875). Proponents offer their proposal in part because the ESA does not allow a species to be delisted without assurance that all threats have been dispelled, and in part because listing may impede conservation efforts:

> Paradoxically, continued listing under the ESA for many currently listed species may not be the best way to achieve long-term persistence. ... For example, landowners are often reluctant to manage their land in ways that might attract an endangered species because of the regulatory constraints imposed by the ESA... Similarly, the paperwork and its concomitant costs in time and money are disincentives to the use of available conservation tools such as habitat conservation plans, candidate conservation plans, and safe harbor agreements...
>
> (Goble et al. 2012, 871)

This proposal and its supporting arguments obscure regulatory risk to species four ways. First, used in the context of the ESA, the term "conservation-reliant" implies that the survival of such species depends on the ESA. This is because the ESA defines

"conservation" as "To use all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary" (§3(3)). By implying that measures provided by the ESA are necessary, the term "conservation-reliant" obscures the possibility that regulation under the ESA might worsen the fate of a species, as I discussed in the previous chapter.

Second, some proponents have claimed that "When measured against more realistic metrics, the ESA has actually been extremely successful" (Bocetti, Goble, and Scott 2012, 874).[103] As evidence, they cite Taylor et al. (2005) and Schwartz (2008). However, as I note in chapter II, Taylor et al. found "a correlation rather than causation" (Scott and Goble 2005, 299), and Schwartz (2008, 280) concluded that "the scientific question of whether the ESA works effectively to protect species remains open".

Third, the proponents implicitly assume that USFWS or other actors will have more success finding sufficient legally binding agreements under threat of regulation, whether from current or future listings (Goble et al. 2012, 872). This assumption seems questionable. It is unclear how asking for a legally enforceable commitment would increase voluntary funding, especially if the commitment must assure management in perpetuity.[104] USFWS has routinely obtained substantial funding from nonfederal landowners through species-based mitigation fees (Bean, Kihslinger, and Wilkinson

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[103] Scott et al. (2010, 96) similarly claimed, "The U.S. Endangered Species Act and similar instruments in other nations have worked well", without offering supporting evidence. Illustrating the dominance of such claims, even ESA critic Stroup (1997, 59) assumed the ESA benefits species at "low levels" of regulation.

[104] Scott et al. (2005, 384) cautioned that "'In perpetuity' is a lightning rod".

2008, 57–58); however, Bonnie and Wilcove (2008, 63, 66) cautioned that if species-based mitigation fees are too high, private landowners "are more likely to just wait out the species and allow natural succession to get rid of their ESA liability" (66), and that "USFWS will be under greater political pressure to help developers skirt the rules or to simply not enforce the ESA" (63).[105]

To illustrate an endowment obtained from mitigation fees, some proponents cite the San Bruno Mountain Habitat Conservation Plan (Bocetti, Goble, and Scott 2012, 875). However, as noted above, that case could be considered "extremely rare", in that essentially all known populations of the primary species in question existed only on a single, commercially valuable property, owned by a major corporate landowner.

Some proponents also cite examples of species successfully delisted through agreements to provide perpetual management (Goble et al. 2012, 871; Bocetti, Goble, and Scott 2012, 876). However, these examples all involve public land and/or public funding, such as an agreement by BLM to perpetually maintain the Douglas County (OR) population of Columbian white-tailed deer on land acquired through an exchange with public land.

Fourth, proponents ironically help obscure maintenance dependence by using the terms "natural fire regimes" and "wildfire" to describe historic burning that maintained habitat for the Karner blue butterfly and Kirtland's warbler (Goble et al. 2012, 871; Bocetti, Goble, and Scott 2012, 876), and by implying some hope that at least the latter

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[105] On the latter concern, Bonnie and Wilcove commented, "In our experience, this is an important consideration" (63).

species might become self-sustaining, once "ecological processes" are restored (Bocetti, Goble, and Scott 2012, 878). In contrast, evidence suggests burning in the habitat for both species (jackpine forest in Michigan) was substantially undertaken by Native Americans (Loope and Anderton 1998, 206; Abrams and Nowacki 2008, 1123[106]).

5.2. "Carrot and Stick"

Actors have obscured regulatory risk to species by using the terms "carrot and stick" to indiscriminately imply that like a stick behind a beast of burden, regulation can only serve its purpose, and never work against it.[107] In contrast, insofar as species-based land-use regulation discourages active management necessary to the survival of species, such regulation in effect places the stick in front of the beast, potentially driving it backward.

For example, while describing incentives as needed to control invasive exotic species on private land (8), and calling it "critically important" to consider perverse incentives from policies (14), a report by Defenders of Wildlife (a nongovernmental conservation organization) argued for keeping the "stick" of regulation to conserve biodiversity:

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[106] Nowacki, MacCleery, and Lake (2012, 81) also suggested that Native American burning in this portion of North America (the "Warm Continental Division: conifer northern hardwood systems") probably did not exceed about 3.2% of the total land base (the fraction reported for southern Ontario). However, this fraction is apparently consistent with the findings by Loope and Anderton and by Abrams and Nowacki; as represented in Michigan, the fraction of the total land base occupied by jackpine forest (which is more flammable than surrounding types of land cover) was also small (cf. Cleland et al. 2004).

[107] Other rhetoric likewise implying that regulation always serves its purpose includes "legal sideboards" (e.g., Yaffee 2006, 218), "regulatory floor" (id., 219), "critical safety net" (USFWS 2011b, n.p.), "last resort" (e.g., Scott, Goble, and Davis 2006, 15), and "the need to list" (e.g., Goble et al. 2012, 870).

> [I]n addition to positive, voluntary incentives, there is clearly a need for conservation regulations that set a minimum performance level to guide landowner decision-making. In other words, there is a need for both the "carrot" and the "stick" ... We should not pay landowners to obey the law. Regulations define the baseline for protection of ecological values.
>
> (Casey et al. 2006, 85)

Illustrating the dominance of this rhetoric, some researchers have used it even where they found that the "stick" of regulation might be counterproductive. Specifically, Zhang and Flick (2001) found theoretical and empirical evidence that listing under the ESA likely had a net adverse effect on the survival of red-cockaded woodpecker, by inadvertently discouraging landowners from replanting pine trees essential to it.[108] The authors concluded that "Of the vast majority of endangered species that have some or their entire habitat on private lands, the likelihood of their thriving there is not bright if the current policy is not changed" (454). Yet, suggesting that financial incentives could address the regulatory disincentives, the authors obscured their finding by referring to incentives and regulation as "carrots" and "sticks" (443).

Similarly, Langpap (2006, 567–568), referred to regulation under the ESA as a "stick" and suggested increasing its use, even while presenting evidence that regulatory assurances alone could motivate conservation by private landowners.[109] The author apparently did not distinguish between assurances used to seek exactions and assurances

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[108] The authors additionally suggested that listing might also discourage landowners from actively suppressing understory vegetation, which threatens the species by exacerbating predation.

[109] "[A]lthough all three types of incentives can have an effect on landowners' decisions, cost sharing provides the weakest incentive, compensation has a somewhat stronger effect, and assurances is the most effective incentive" (568).

used to provide unconditional regulatory relief (e.g., as approximated by Safe Harbor Agreements with zero baseline and minimal requirements for participation).

6. Disregard through Theories in Ecology

Actors have helped disregard regulatory risk to species by interpreting disequilibrium ecology in various ways that resurrect the assumption of equilibrium ecology that species tend to persist if undisturbed by humans, or that otherwise indiscriminately imply a need to limit land use.[110] I offer four examples here: the theory of resilience; the theory of patch dynamics; a claim that the unpredictability of ecosystems above all implies a greater need to limit human action; and claims that land use changes land faster than other forces. I follow these examples with evidence that actors have helped obscure regulatory risk to species by more directly maintaining belief in equilibrium ecology.

6.1. Resilience

With some variations, resilience is the theory that ecosystems tend to persist in any of a fixed number of historically stable states (called "stability domains") as long as disturbance from external forces remains within some "natural range of variability" (Holling 1973, 14, 17; Walker et al. 1981; Holling and Meffe 1996, 332, 334; Pritchard and Sanderson 2002, 148–151; Gunderson and Walters 2002, 167; Fleishman et al. 2011,

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[110] As I discussed in chapter I, a fundamental insight of disequilibrium ecology is that species populations do not necessarily persist in the absence of disturbance by humans (Pickett, Parker, and Fiedler 1992, 74; Goble 2007, 418n26).

citing Groffman et al. 2006). The theory of resilience presumes ecosystems have "self-organizing processes" that tend to maintain ecosystems in stable states (Holling and Meffe 1996, 330, 334).[111]

By definition, the concept of resilience is incoherent for maintenance-dependent species, such as for species that are threatened by invasive exotic vegetation. As Pimm (1984, 2) commented, by its definition, "Resilience is not, therefore, defined for unstable systems".[112]

Despite its questionable relevance in ecology, resilience theory has "firmly entered debates in planning theory and practice" and has "not only spread like wildfire through a number of social science disciplines, but has also been deployed by a wide range of decision-makers, policy communities and non-state actors" (Shaw 2012, 308, citing Shaw and Theobald 2011).[113]

Some actors have incorporated resilience theory in ways that obscure regulatory risk to species, by implying that ecosystems tend to persist if undisturbed by humans. For example, in a scientific article presenting "Top 40" research questions to guide the conservation of biodiversity, the authors defined "ecosystem resilience" as "the

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[111] To avoid such misleading implications, Romme, Wiens, and Safford (2012, 5) recently suggested replacing "natural range of variability" with "historical range of variation".

[112] Gunderson, Holling, et al. (2002, 5–6) noted that Pimm's (1984) definition of ecosystem resilience presumed an ecosystem had only one stable state. However, this difference is moot for maintenance-dependent species, which by definition cannot survive without active management by humans.

[113] Some actors (e.g., Benson and Garmestani 2011) have discussed resilience in the context of social-ecological systems. Such interpretations might be coherent for maintenance-dependent species, insofar as these interpretations presume humans provide any necessary management. (This does not necessarily imply that it is coherent to describe societies themselves as resilient; cf. Davoudi 2012.)

maximum perturbation that an ecosystem can withstand without shifting to an alternative state", and in a question that might otherwise suggest considering the effects of species-based land-use regulation on species, the authors asked (as question 17), "How do different systems of natural resource governance affect capacity for adaptive management and maintenance of ecosystem resilience?" (Fleishman et al. 2011, 292, 294).[114] Or for example, resilience theorists have typically referred to historically recurring change as resulting from "natural disturbance" (e.g., Holling and Meffe 1996, 331), and loss of fire as fire "suppression" (e.g., Holling and Meffe 1996, 330; Peterson 2002, 232), thereby obscuring any historic active management by Native Americans and any dependence on continuing or simulating such management.

Ironically, some resilience theorists (Holling and Meffe, 1996, 333) have cautioned against orthodoxy in natural resource management based on belief that ecosystems are generally stable.

6.2. Patch Dynamics

The theory of patch dynamics holds that an ecosystem can persist despite periodic disturbance if the ecosystem is large enough, so that the disturbance is spatially limited and allows species in undisturbed areas to recolonize disturbed areas (Pickett and

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[114] I participated in the creation of this article by submitting two questions for consideration by the authors. One of my questions asked, "Could increasing species-based land-use regulation (whether as prohibitions or as liability for mitigation fees or other exactions) be counterproductive to the survival of species whose fate depends on active management by humans (such as to control invasive exotic species)?"

Thompson 1978; Meyer 1994, 881).[115] As for the theory of resilience, proponents of patch dynamics have emphasized the term "natural disturbance" (e.g., White and Pickett 1985, 3).

Actors have used the theory of patch dynamics to argue for conserving biodiversity by protecting land from human disturbance (e.g., Pickett and Thompson 1978). To the extent that actors use patch dynamics to argue for species-based land-use regulation without considering maintenance dependence, actors might help obscure regulatory risk to species. However, any such use is not monolithic; e.g., a long-time scholar of patch dynamics (Wu 1992, 14) cautioned that context is important, and that "We can no longer take for granted that nature knows best and that nature recovers if left alone..." In addition, some early proponents defined "natural disturbance" to include disturbance by humans (White and Pickett 1985, 10–11), and if only indirectly, recognized that the persistence of plant species can require active management (Pickett and Thompson 1978, 30, citing Stone 1965).

6.3. Unpredictability as Implying a Greater Need to Limit Human Action

Some actors have obscured regulatory risk to species by narrowly arguing that the unpredictability of ecosystems implies a greater need to limit human action or to preserve legal authority to do so. For example, asked by a "leading exponent of the incorporation of the new ecology into environmental law" (Wiener 1996, 2, describing A. Dan Tarlock)

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[115] Sprugel (1991, 4) and Blandin (2011, 209) noted that patch dynamics (like resilience) rescued equilibrium ecology from the discovery of disequilibrium ecology, by theorizing that stability occurs at larger scales. Similarly, Sagoff (1997, 924, referring to Meyer 1994, 881) characterized this reasoning as returning to "the orthodox conclusion" of equilibrium ecology.

to assess the implications of disequilibrium ecology for the ESA, a law professor indiscriminately concluded that the unpredictability of ecosystems implies a need to restrict harmful human action across a greater area:

> ["A more dynamic conservation model"] must be addressed with a new focus on restricting harmful actions across the landscape, rather than designating a small proportion of inviolate reserves.
>
> (Doremus 2010, 233)

Illustrating a call to preserve regulatory authority under the ESA, the professor (234) also recommended reducing the limited regulatory immunity to landowners participating in Habitat Conservation Plans, under the "No Surprises" rule:

> An easy step in that direction would be to tie the extent of "no surprises" protection explicitly to our level of knowledge about the system. The more we know, the more confident we are of our predictions for the future, the more willing we should be to offer strong regulatory certainty to a permittee. The less we know at the outset, the more we should require a permit applicant to accept the possibility of increased future obligations.

Such arguments presume that increasing species-based land-use regulation can only improve the fate of species.[116]

6.4. "Land Use Changes Land Faster than Natural Processes"

Some actors (e.g., Botkin 1990, 156–157, 190–191; Callicott 1996, 372; cf. Freyfogle 2000, 10063–10064) have contributed to disregard for regulatory risk to species by claiming that land uses change land faster than natural processes. Such claims

[116] In arguing to limit immunity under the No Surprises rule, Doremus (2010, 182) also obscured regulatory risk to owning habitat for imperiled species by overstating the immunity that the rule already provides, by indiscriminately claiming that it assures that "conservation commitments, once made, will not later be increased". Under the present rule, any immunity is limited to the duration of a Habitat Conservation Plan and to the species covered by the plan (USFWS and NMFS 1998, 8867; USFWS 2008b, 4).

have apparently sought to reconcile recognition of disequilibrium ecology with the desire to save species or habitat from destruction by humans, by assuming that human-caused changes to land can be distinguished from other changes to land by different rates of change (e.g., cf. Botkin 1990, 156–157; Callicott 1996, 369).[117] However, such claims rationalize disregard for risk to species from species-based land-use regulation, by implying that such regulation provides a net benefit to the species it is intended to help.

Such claims are not necessarily accurate. For example, referring to an assessment of biodiversity in the Willamette Valley (OR), Puget Trough (WA), and Georgia Basin (BC) (Floberg et al. 2004), an ecologist with The Nature Conservancy cautioned that:

> Even if protection from development can be accomplished by designating reserves, the biodiversity assessment identified the expansion of invasive species, and the absence of fire from ecosystems that were historically maintained by fire, as the most important and widespread threats to prairies and savannas.
>
> (Alverson 2005, n.p.)

Even presuming that land uses are destroying native species faster than invasive species or loss of fire, such claims do not specify when (if ever) conservation priorities should switch from primarily limiting harmful land uses to primarily encouraging active management. Without such an endpoint, such claims could rationalize disregarding regulatory risk to species indefinitely.

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[117] These claims appear to originate from Leopold's (1949 [1948], 218) "basic idea" (one of three) that "man-made changes are of a different order than evolutionary changes".

6.5. Other Continuing Belief in the Stability of Ecosystems

Some actors have contributed to disregard for regulatory risk to species by more directly maintaining indiscriminate belief in the stability of ecosystems. For example, in a fact sheet explaining its program to fund research to support environmental decision making based on valuation of ecosystem services (including ecosystem service markets), the US Environmental Protection Agency mentioned only "naturally functioning" ecosystems, described them as "self sustaining", and mentioned humans only as sources of harm:

> Natural functioning ecosystems are self sustaining through the interactions among biological and physical components. Humans are an integral part of ecosystems, so our actions combined with natural events can alter ecosystem structure and function... How are ecosystems disrupted? Ecosystems and their services can be disrupted or destroyed by human actions...
>
> (US Environmental Protection Agency 2009, 4)

Other evidence also suggests belief in the stability of ecosystems remains significant among natural resource professionals. For example, Hull et al. (2002) reported that in interviews with 44 people involved in the science, policy, and management of forests in southwestern Virginia, a majority expressed belief in a "balance of nature":

> More than half of the respondents (23 of 44) employed, at some point during their interview, a "balance of nature" argument. They suggested that nature was "balanced" or in "harmony" or that there exists an "equilibrium" in nature due to "forces" that "heal," "improve," or otherwise guide nature towards some balanced or healthy state... An ecosystem, it was suggested, functioned like an organism with "self-perpetuating," "self-maintaining" processes that allow it to "heal itself."
>
> (Hull et al. 2002, 12)

More recently, Mori (2011, 2, citing Moore et al. 2009) commented that the "non-equilibrium concept in ecology" "still lacks scientific consensus", despite its "gradual

scientific acceptance". Illustrating such skepticism, Freyfogle and Newton (2002, 871) argued that evidence for the instability of ecosystems is inconclusive.

The popular 2009 science-fiction film *Avatar* offers some evidence that popular media help maintain public belief in the stability of ecosystems. In the film, a tree-like species on another planet organizes other forest species to fight against invading humans, who are destroying the planet's forest through mining.

7. Disregard through Intentionally Misleading Theories and Rhetoric

Some natural scientists have contributed to disregard for regulatory risk to species by condoning, defending, or perpetuating theories or terminology of equilibrium ecology for political purposes, even while acknowledging that they are misleading.

Natural scientists have long been aware of the political value of such beliefs and rhetoric. For example, arguing against a theory that ecosystems derive stability from complexity, a biologist suggested that belief in the theory still benefited conservation:

> The diversity-stability hypothesis has been trotted out time and time again as an argument for various preservationist and environmentalist policies. ... [A]lthough the hypothesis may be false, the policies it promotes are prudent. ...
>
> It is the sort of thing that people like, and want, to believe. Thus ... we may be certain that the "hypothesis" will persist for a while as an element of folk-science. Eventually ... the essential imagery of this once-scientific hypothesis will recede to a revered position in the popular environmental ethic, where it doubtless will do much good.
>
> (Goodman 1975, 261)

Or similarly:

> [Careful communication] helps us to think more clearly and avoid creating unfortunate opportunities for people looking to twist our results. In this respect, isn't it better to leave the "balance of nature" as something that has validity and meaning to the public at large rather than debate it as a scientific concept?
>
> (Lovejoy 1997, 366)

> I share the view of some participants here that the public's street sense of balance is a savvy one, and we ought not to kick the legs out from beneath it with current ecological dogma.
>
> (Harte 1997, 382)[118]

Illustrating efforts that could help maintain such beliefs, the founding editor of *Conservation Biology* cautioned that the concept of ecological "health" is problematic as a scientific term, but he noted the political value of its connotations, noted its value in communicating with nonscientists, and subsequently used the term himself to imply that species conservation depends on governmental intervention (which, if public funding is insufficient, implies a need to increase regulation):

> Any attempt to imbue ecological health with the rigor and specificity that will allow us to use it as a scientific tool may well strip it of the intuitive, general meaning that is its chief value. ...
>
> Nevertheless, to avoid giving the appearance of sanctioning ecosystem destruction by being unwilling to come to grips with the concept of health, ecologists should not be afraid to use the term at least occasionally, even though it may have no place in their daily research...
>
> (Ehrenfeld 1992, 141–142)

> Words are funny things — often their connotations are as important as their meanings, as any good political speechwriter knows.
>
> (Ehrenfeld 2005, 34)

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[118] In contrast, for example, ecologists Pickett and Cadenasso (2002, 6) cautioned that the term "ecosystem" could erroneously connote equilibrium or other meanings that are "clearly unsupported or highly problematical".

> Trusting to market forces and the laws of supply and demand to correct inequities and restore healthy equilibria does not work in economics and certainly does not work in conservation.
>
> (Ehrenfeld 2008, 1092)[119]

8. Disregard through Other Demonization and Idolization

Actors have helped obscure regulatory risk to species by demonizing or idolizing other actors or their beliefs.[120] Here, I offer examples of demonization of dissenters through personal attack and idolization of land-use regulation through demonstrably questionable interpretations of Aldo Leopold's land ethic.

8.1. Disregard through Personal Attack

Actors have helped disregard regulatory risk to species by demonizing others as - pro-development or against the interests of the public for calling attention to disequilibrium ecology or its potential implications for ensuring the survival of species. For example, in response to argument that natively vegetated landscapes cannot be

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[119] The author's comment on the political value of connotations suggests scientists might have political motives in introducing new terminology implying that ecosystems are self-maintaining, or in trying to preserve discredited terminology of equilibrium ecology by redefining this terminology in terms of disequilibrium ecology. For example, some scientists have referred to dormant seeds in soil as contributing to a "remember" process (Gunderson, Holling, et al. 2002, 16; also cf. Gunderson, Pritchard, et al. 2002, 264). Or for example, Golley (1993, 197) redefined "ecosystem development" (formerly reflecting belief in ecosystems as organisms) to mean any gradual change:

> Since ecosystems have no genetic structure or even an analogous genetic structure, there can be no ecosystem evolution in the same way that there is evolution of a biological species. Still, ecosystems do change over time, and we can speak of ecosystem development.

[120] By portraying others as villains or heroes, actors can reinforce power relations (Adger, Benjaminsen, Brown, and Svarstad 2001, 703).

indiscriminately equated with wilderness, actors accused environmental historian Cronon of being "imperialist" (Kuhlman 1996, 156, citing Cronon 1996) and cautioned him not to publish his work, for fear of its misuse, even while acknowledging its validity (per McCarthy 1998, 142).

Such personal attacks have some history in efforts to show that ecosystems do not develop or maintain themselves like organisms. Early ecologist Henry Gleason was demonized and essentially driven from ecology for introducing disequilibrium ecology in the US, in 1917, when he questioned the view that ecosystems are organisms (Gleason 1953; Nicolson 1990; Pickett, Parker, and Fiedler 1992).[121]

8.2. Disregard through Interpretation of Leopold's Land Ethic

Actors have helped disregard regulatory risk to species by indiscriminately claiming that in calling for a land ethic, early wildlife biologist and conservationist Aldo Leopold was advocating for pursuing conservation by increasing land-use regulation (e.g., Sagoff 1997, 883, 884, 886; Doremus 2003, 21, citing Freyfogle 1990; 1995; 1996; 1998; Newton 2006, 349–350).[122] Such claims serve to defend indiscriminate use of land-

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[121] Nicolson (120, 143–144) suggested that Gleason left ecology in part to seek better employment (as a taxonomic botanist). However, Gleason was clearly ostracized and subjected to personal attack (Nicolson 143–144; Gleason 1953).

[122] Sagoff described a "Leopoldian land ethic" as offering "a basis for defining a takings proof land-use regulatory system" (884), and described "the Leopoldian approach" as an "exercise in [police] power to prevent harm to public rights by limiting the use of private property to its natural resources" (883, quoting Sax 1993, in turn quoting Just v. Marinette County, 201 NW 2d, 1439; alteration by Sax). Doremus commented that "Changes in moral understanding can also affect society's view of the need for regulation", and she described Freyfogle as seeking to articulate "how a Leopoldian ethic would alter societal understanding of the terms of landownership" (21). Underscoring that interpretation, Freyfogle

use regulation, by associating its use with a widely revered historic figure.[123] However, a review of Leopold's writing reveals that Leopold recognized maintenance dependence and called for active management (1986 [1933], 5); expressly distinguished "ethics" from "police power" (id., 208–209, 214); and expressly cautioned that where species depend on humans actively maintaining habitat, regulation should be used with discretion (406–407).[124]

Moreover, four years before his death, responding to criticism that his publications "left unclear the proper roles of private initiative and government action on land-use issues" (Newton 2006, 169), Leopold wrote that he was unsure how to reconcile public and private interests in private land use:

> The subject you bring up is one that interests me greatly, but I'm not sure that we can discuss it satisfactorily by letter. I'd like very much to talk it out with you. As far as I know the thing that is lacking in my papers arises from my realization that nothing can be done about [environmental problems] without creating a new kind of people. ... I am thoroughly convinced that social planning in the degree

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(2006, 4) has argued against the purchase of conservation easements, to avoid weakening political will to increase land-use regulation, and he has argued for disregarding landowners' state of mind in policy decisions ("[Landowners'] morality and mental state raise intermediate issues that are best set aside...") (Newton and Freyfogle 2005, 42).

[123] Freyfogle described a "battle" over Leopold's legacy as "an argument about whose policy brief gets to cite Aldo Leopold as support" (2004, 2, 3) in a "war" over private property (2003b, 354). Leopold's work containing his essay on the land ethic has been described as one of the three most important and influential books in the history of American conservation (Cronon 1998, 147, citing Leopold 1949 [1948]). Illustrating the potential influence of interpretations of Leopold's land ethic, in the 1990s, Leopold's work was repeatedly cited in testimony to defend the ESA from legislation that would have weakened its regulatory authority (Rosmarino 2002).

[124] In the same work — his only textbook — Leopold described the need to actively maintain habitat to ensure the persistence of wildlife (5), and he traced the history of such management from the 1200s (6–7, 12, 21, 26, 305, 311). His unpublished papers (Leopold 1943) indicate that he used this work in his university instruction at least as late as 1943, five years before his death.

> apparently favored by me is thoroughly no good. Things that are done wholly by government are really not done, because any decent land-use is worthwhile, not only for its effect on the land, but for its effect on the owner. ... Please don't consider this as a real reply to your very important letter. Will you bring the matter up the next time we can have a beer together, or better still, two or three beers?
>
> (Newton 2006, 170, quoting a letter of 23 October 1944 to Douglas Wade)[125]

Still closer to the end of his life, Leopold wrote that his conservation philosophy was a work in progress:

> In a letter written barely a month before his death, in 1948, Leopold confessed he lacked "a completely logical [conservation] philosophy all thought out, in fact on the contrary, I [Leopold] am deeply disturbed and do not myself know the answer to the conflicting needs with which we are faced."
>
> (Newton 2006, 263–264, quoting a letter from Leopold to Morris Cooke, declining support for proposed dams)

Leopold's essay "The Land Ethic" itself hints that he did not intend to indiscriminately equate his land ethic with increasing land-use regulation. Commentators (e.g., Doremus 2000, 34) typically select the following passage as expressing his land ethic:

> A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise.
>
> (Leopold 1949 [1948], 224–225)

Yet in the next sentence, Leopold wrote, "It of course goes without saying that economic feasibility limits the tether of what can or cannot be done with land" (225), and on the same page, he cautioned that "Conservation is paved with good intentions which prove to

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[125] In part, Leopold might not have considered potential differences in types of land-use regulation. As noted in chapter I, species-based land-use regulation did not arise in US federal law until 1973.

be futile, or even dangerous, because they are devoid of critical understanding either of the land, or of economic land-use."

9. Disregard through Containment of Dissent

Actors have obscured regulatory risk to species by obscuring concern for such risk or efforts to address it. Others have noted such "containment" of dissent from dominant views in land-use planning (Few 2001, 112), in ecology (Nicolson 1990, 144, quoting Gleason 1961, 3), in natural resource management (Pritchard and Sanderson 2002, 155; cf. Rodgers 2000: 298), and by tyrannies of the majority:

> The tyranny of the majority need not always express itself through legal-juridical means; it can also set the accepted assumptions about what is or is not appropriate for discussion. If certain matters are simply not discussed, then the official openness of the forum in which discussions occur is irrelevant. Tyranny of this sort is not subject to appeal.
>
> (Reed 2001, 443–444, reviewing various works by others)

Here, I offer examples of actors obscuring concern for regulatory risk to species by excluding relevant social science, dismissing political ecology, and omitting mention of actual and potential innovation in addressing this risk.

9.1. "Best Available Science" (Omitting Social Science)

Some actors have obscured regulatory risk to species by restricting "best available science" to exclude social science from consideration in decisions on species-based land-use regulation. For example, in preparing regulation in part to restrict land use on private property based on the presence of species associated with upland prairie and Oregon white oak (Thurston County 2012a), under Washington State's Growth Management Act,

Thurston County (WA) acknowledged that the species depend on active management by humans,[126] and as required by state law, the county collected and presented what it considered the "best available science" to guide its decision (Thurston County 2012a, appendix A), yet the section on oak and prairie habitat apparently included no social science, except for one reference to a document that summarized a study on motivating volunteer management on public land (id., citing GOERT 2010). Thus, for example, the county did not consider research such as by Fischer (2006), supporting concern for harm to these oak-associated species from regulatory disincentives for maintaining them on private land.

9.2. "Political Ecology Has Waning Influence"

Some actors have helped obscure regulatory risk to species by claiming that political ecology has decreasing relevance. In a work that in part describes ecosystems as resilient (19–20) and advocates increasing regulation to provide ecosystem services (295), Ruhl, Kraft, and Lant (2007, 39) claimed that "the political-ecology school reached its greatest influence in the 1990s". Such claims dismissed subsequent work by political ecologists describing policy implications of disequilibrium ecology as a central concern

[126] "Invasive species have overrun many prairie areas." (Thurston County 2012b, 2). "Prairies and Oregon white oak habitat support a wide variety of plants and animals that are not found in other environments. Without active management, the amount of acreage will continue to decline to the detriment of a myriad of species." (Thurston County 2012c, 2)

of the field, key to its development (e.g., Forsyth 2003; Neumann 2005) and a continuing concern in natural resource management (e.g., Leach 2008).[127]

9.3. Containment by Omitting Mention of Innovation in Regulation

Actors have helped obscure regulatory risk to species by omitting mention of actual or potential innovation in addressing such risk. For example, in reporting on the Benton County Habitat Conservation Plan for various maintenance-dependent species on private land, consultants who prepared the plan mentioned that it contained various innovations (Kaye, Schwindt, and Menke 2011), but did not mention that the innovations included an agreement by the county to pay all mitigation expenses on behalf of private landowners (for existing lots and existing populations of listed species, for the life of the permit), out of concern that liability for species-based mitigation expenses might harm the species (USFWS 2010a, 13). This might be the plan's most significant innovation; aside from a somewhat similar approach in Wisconsin's Habitat Conservation Plan for the Karner blue butterfly (described above), I am unaware of any other Habitat Conservation Plan in which actors paid for all mitigation on behalf of private landowners.

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[127] Ruhl, Kraft, and Lant (2007) cautioned that "where ... the costs of effective exclusion [is] low ... private property regimes may be the more efficient approach", compared to regulation (131), and that "it would be potentially a huge mistake" "to move directly to regulatory instruments without first considering how property rights can be reconfigured" to further conservation (266). However, the authors' endorsement of the theory of ecosystem resilience obscures the need for such caution with species-based land-use regulation.

10. Disregard by Otherwise Assuming Prescriptive Goals

As described above, actors have used various beliefs — such as the theory of resilience — to assume that the goal of biodiversity conservation should be to limit human action, thereby disregarding any need to consider risk to species from species-based land-use regulation. Actors have used other reasoning to arrive at the same prescriptive goal, and thereby to disregard regulatory risk to species. I offer three examples.

First, while calling for measures to address the unfairness to private landowners from land-use regulation, a legal scholar who helped establish the Safe Harbor Agreement program and the No Surprises policy under the ESA (Plater 1998, 428, referring to Joseph Sax) implicitly assumed that ecosystems are stable, by describing biodiversity conservation as presently in "late stage governance", and he indiscriminately described increasing land-use regulation as "necessary" to conservation:

> [M[odern times have brought a wide range of regulatory laws that dramatically changed the rules of the game from the owner's perspective. These laws include ... endangered species protection...
>
> (Sax 2010, 456)

> America's reluctance to engage in long-range land use planning ... has produced a situation of late-stage public governance. That situation has, in some instances, thrust an undue portion of the burden of programs like ... biodiversity protection on the relatively few landowners who still have undeveloped or pristine land available. ... [We need to m]aintain the legitimate and necessary authority of the state to regulate land use in accordance with contemporary problems and present-day community values.
>
> (Sax 2010, 469)

Second, while arguing that disequilibrium ecology in part implies a need for greater discretion in environmental regulation, another legal scholar nevertheless concluded that regulation must be pursued to protect ecosystems from humans:

> Even in light of [ecosystem change and uncertainty], regulation must be pursued. ... Without government oversight, there is [sic] insufficient economic incentives to protect public resources.
>
> (Profeta 1996, 75)

> [Ecosystems are] absolutely necess[ary] in sustaining life. Thus, we cannot desert our attempts to protect ecosystems from disturbances that will undermine these functions and values.
>
> (Profeta 1996, 102)

Third, by indiscriminately equating laws and regulations with safeguarding the environment, a *Collaborative Guide for Environmental Advocates* advises advocates to seek to maintain or strengthen existing laws and regulations, and never relax them:

> What can be offered [as advice to environmental advocates] are some fundamental safeguards that need to be in place to avoid damaging the environment. ... Enforcement of current laws and regulations must be continued or strengthened. ... *[U]nder no circumstances should [collaborative groups] be used to authorize avoidance of or exceptions to environmental ... laws.* ... Even if, in your situation, it appears that a greater overall environmental benefit could be achieved by circumventing legal compliance, this could hurt efforts in other areas where rigorous application of that aspect of the law is needed.
>
> (Dukes and Firehock 2001, 16, orig. emph.)

11. Conclusion

In this chapter, I have argued that actors in the US widely and routinely disregard risk to maintenance-dependent species from species-based land-use regulation. As evidence, I have offered examples of such disregard through governmental policies and demonstrably false or misleading claims in related research and other domains of public

discourse. These examples have included instances of actors advocating intentionally misleading beliefs, and instances of actors reproducing demonstrably misleading beliefs that work against their own stated interests.

In offering these examples, my point is not to defend or further the argument that species-based land-use regulation might exacerbate the loss of maintenance-dependent species on private land; I leave that argument to the previous chapter. My point here is that actors widely and routinely disregard this risk, through strict adherence to belief.

In the next chapter, again drawing evidence primarily from the US, I argue that actors widely have motives to persist in this disregard, even at the risk of worsening the fate of species such regulation is ostensibly intended to help.

CHAPTER IV

OTHER REAL OR PERCEIVED BENEFITS FROM SPECIES-BASED LAND-USE REGULATION

1. Introduction

In this work, I am theorizing and offering some evidence that humans risk exacerbating the loss of maintenance-dependent species on private land by using their presence to seek other benefits through species-based land-use regulation. In previous chapters, drawing on evidence primarily from the US, I argued that species-based land-use regulation risks exacerbating the loss of maintenance-dependent species on private land, and that actors widely and routinely disregard this risk in related regulatory decisions and discourse. In this chapter, again drawing on evidence primarily from the US, I argue that humans widely value real or perceived benefits from species-based land-use regulation other than the survival of the species such regulation is ostensibly intended to help.

Specifically, I offer evidence that individuals and organizations variously value the following real or perceived benefits from species-based land-use regulation, or from seeking such regulation:

- The existence value and quality of life from protected land
- Increased market value of properties near protected land
- Funding associated with species-based land-use regulation

• Expedience, cost savings, and risk reduction from exactions

• Other organizational interests

I include some research from the UK for additional evidence regarding the nature of conservation-related preferences among the general public.

2. Existence Value and Quality of Life from Protected Land

A variety of evidence suggests that humans in the US widely value scenery and other quality-of-life benefits from open space that is protected from destructive land use, especially where individuals can enjoy these benefits directly.[128]

The desire to protect scenery has deep historic roots in the modern conservation movement, which inherited a goal of preserving sacred and spectacular nature (Doremus 2000, 24–32; Nash 2001; Doremus 2002, 327–328; Tarlock 2010, 10).[129] Illustrating this heritage, environmental law grew out of a desire "to stop ... development of *scenic* 'natural' areas" (Tarlock 2001, 50, citing Hays 1987; emph. added).

National and various statewide surveys in the US have found that a majority of citizens favor protecting species, wildlife habitat, or "natural areas" from destruction by humans (Sagoff 1997, 987, citing others; Czech and Krausman 1999; Doremus 2000, 53, citing others; CFM Research 2005, 9; Oregon Task Force on Land Use Planning 2009, 13; Responsive Management 2010).

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[128] Economists use the term "existence value" to describe benefits enjoyed only by knowing (or thinking) they exist, rather than benefits experienced directly.

[129] Doremus (2000, 32) commented that the conservation movement's preference for esthetics is often "subordinated", and that "Outside the wilderness context the esthetic discourse continues to be presented without a great deal of content, and with some embarrassment."

Some evidence suggests these survey responses reflect a preference for protecting land from human use over ensuring the survival of species. First, the public has persistently opposed active management essential to maintain Kirtland's warbler (Bocetti, Goble, and Scott 2012, 877) and maintain native species in wilderness preserves in Chicago (Callicott 2003, 53; also cf. 50–51).[130] Second, surveys from the UK found that the general public had a very poor understanding of biodiversity (Spash and Hanley 1995); that "the public and conservation movement ... is still almost totally immersed in concepts of the 'balance' and stability of 'nature'" (Ladle and Gillson 2009, 238); and that "respondents who were already interested in the environment and [a] nature reserve placed priority on generalized notions of peace and nature above concepts such as biodiversity" (Trudgill 2001, 691). Some economists have suggested it is reasonable to expect similar preferences among the US public (Brown and Shogren 1998, 13, citing Hanley and Spash 1993).

Illustrating preferences for protecting land from human use over saving species, an attorney (Plater 2004) in the landmark Tellico Dam case (Tennessee Valley Authority v. Hill, 437 US 153) commented that his clients sought regulation under the ESA not to save a species (the snail darter) but to stop construction of a dam.

Further illustrating such preferences, a variety of evidence suggests they are shared by scientists and others involved in conservation discourse:

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[130] Wilderness preservationists opposed active management to maintain native vegetation as early as 1965 (Stone 1965, pp. 1264, 1266).

• From interviewing conservation biologists about their views, a philosophy professor concluded:

> Desire for habitat and ecosystem protection may be a proxy for wilderness preservation, the desire for untrammeled vast reaches; these can be smuggled in under the biodiversity concept.
>
> (Takacs 1996, 43)

Describing similar preferences in others, one of the interviewees commented:

> [Amateur conservationists use] the term biodiversity in very, very loose ways. And what they're really interested in is wildness, wild areas, natural areas.
>
> (Noss, quoted in Takacs 1996, 42)[131]

• Seeking to motivate readers of the journal *Conservation Biology* to take political action to further conservation, a biologist appealed to their desire for scenery:

> We can no longer assume these working landscapes will always remain intact and will always serve as the pleasing interfaces we drive through when going from town to city or city to wilderness
>
> (Knight 1999, 224)

• After wrestling for years to understand the implications of disequilibrium ecology for conservation (Worster 1977, 479; 1988, 296; 1993; 1994), an environmental historian ultimately cited his appreciation for the view outside his window to explain his conclusion that conservation should narrowly seek to set aside land as wilderness:

> This is precisely what the modern idea of conservation aims to do: provide the space, either set aside in large, discrete blocks or protected within the interstices of the landscape, so that all the many histories [of people and nature] can coexist.
> ...
> These are conclusions about the real world, I believe that the study of nature and history leads us to make today. They are conclusions that stand up well

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[131] Elsewhere, the same interviewee also hinted that biologists prefer to live in low-density settings, to encourage biophilia in their children through contact with wild nature (Noss 2007, 6).

> because they are based not merely on private fantasies but on knowledge. They make sense of the scene outside my window.
>
> (Worster 1995, 82)[132]

• In discussing the role of conservation science in land-use planning, a professor of planning (Berke 2007, 59) commented that a "core value" of sustainability includes "visually pleasing landscapes".

Other evidence illustrates the manifestation of such preferences in support for species-based land-use regulation. First, in urging others to support a Thurston County (WA) ordinance that would restrict development based in part on the presence of upland prairie and Oregon white oak — both associated with maintenance-dependent species (Thurston County 2012b, 2) — an advocacy organization appealed to landowners to write to the county commissioners to state, "This [ordinance] is important because it will protect my property from dangerous overdevelopment of neighboring land..." (Futurewise 2011).[133, 134] Second, in assessing the environmental impacts of Benton County's Habitat Conservation Plan for associated species, USFWS (2010a, 1) commented that upland prairie and Oregon white oak habitat "contribute to the scenic landscape enjoyed by Benton County's residents".

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[132] Further illustrating disregard for regulatory risk to maintenance-dependent species, Worster (1998, xii) later additionally justified this conclusion by indiscriminately equating wilderness with biodiversity ("We humans need, for ... the sake of biodiversity, to leave some part of the world's evolutionary fabric free to do its own weaving, independent of our inventions or control").

[133] The county subsequently adopted the ordinance and incorporated associated restrictions into a "Critical Areas Ordinance Update" under the state's Growth Management Act (Thurston County 2012a).

[134] Expressing such views more generally, Peterson and Liu (2008) theorized that "[d]emocratic processes combined with NIMBY (not in my backyard) sentiments should address environmental degradation" (126, citing Norton and Hannon 1997).

3. Increased Market Value of Properties Near Protected Land

Substantial evidence suggests another benefit of species-based land-use regulation is to increase the market value of property near open space that is protected from destructive land use. Statistical studies have found that the market value of property is higher when it is close to protected open space (Scott, Fernandez, and Allen 2006, 215, citing others) or has views of open space (Lutzenhiser and Netusil 2001; Anderson and West 2006; Sander and Polasky 2009).[135]

4. Funding Associated with Species-Based Land-Use Regulation

Species-based land-use regulation has offered a variety of employment and other funding to experts and others involved in advocating, supporting, designing, or implementing such regulation.

Illustrating funding for initiating species-based land-use regulation under the ESA, the Xerces Society — a nongovernmental conservation organization that has petitioned to list species under the ESA, including the Fender's blue butterfly and Taylor's checkerspot butterfly (Xerces Society 2012a) — paid $914,503 in salaries and benefits in 2011 (Xerces Society 2012b), and the Center for Biological Diversity — a nongovernmental conservation organization that has petitioned to list species under the ESA as a core part of its mission (Center for Biological Diversity 2012) — paid

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[135] A former US Secretary of the Interior similarly claimed that development restrictions on one property increased the market value of others, due both to viewshed and to the increased scarcity of developable land (Babbitt 2005, 66).

$3,773,848 in salaries and benefits in 2010 (the most recent year available) (Center for Biological Diversity 2011).

Illustrating funding to help administer the ESA, USFWS awarded an average of $7,681,719 per year from 2003 through 2006 in grants to help develop Habitat Conservation Plans under the ESA (USFWS 2012d) (unadjusted dollars).

Illustrating funding from species-based exactions under the ESA, US nonfederal landowners provided an average of $370 million per year between 2001 and 2006 in species-based mitigation fees (Bean, Kihslinger, and Wilkinson 2008, 57).

Illustrating funding from private sources to try to benefit from such exactions, Ellison and Dwyer (2003, n.p.) reported that a long-time advocate of ecosystem service markets was now "earning money for EPRI [a private firm] by selling ecological audits to large landowners, to identify potential [conservation] banks; 13 sold."

Illustrating opportunities for funding for research to support species-based land-use regulation, the National Science Foundation (the primary source of US federal funds for non-medical life-science research) adopted proposal review guidelines encouraging the use of research for "informing environmental *protection* and conservation efforts" (Stein 2007, 52; emph. added).

5. Expedience, Cost Savings, and Risk Reduction through Exactions

The opportunity to yield or accept species-based exactions through Habitat Conservation Plans has provided benefits to large developers, state and local governments, and USFWS, relative to the alternative of incurring or imposing species-based land-use restrictions under the ESA. Well funded developers tend to favor such

exactions over land-use restrictions (Scott, Fernandez, and Allen 2006; Duane 2007, 82, 85; White 2008, 34; Jonas, Pincetl, and Sullivan 2013, 9), in part to reduce future liability (Sax 1997, 46), in part to reduce their financial loss from the presence of listed species (cf. USFWS 2011e, 1).[136] State and local governments have also supported such exactions, to benefit from efficiencies, greater certainty, and greater control in addressing their own liability, both for harming listed species directly (such as through maintaining roadsides) and for issuing permits for private land-uses that would harm listed species (Loew 2000; Tarlock 2006, 129, 134). USFWS has favored such exactions as way to avoid or reduce political opposition to strict prohibitions on nonfederal land (Plater 1998, 427–428; Tarlock 2001, 46; cf. Wilcove 2010, 229–230).[137]

These relative benefits can motivate actors to defend species-based land-use regulation through exactions, even though the actors might be better off without the underlying regulation in the first place. For example, in public meetings held by Benton County in developing its Habitat Conservation Plan for various prairie species, one of the few self-identified private landowners to speak publicly in favor of the plan was a self-described large developer (field observations, 27 January 2009 through 12 October 2010).[138] The landowner explained that he was not presently at risk from regulation for

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[136] If land-use restrictions were more expensive than exactions demanded by regulators, developers could choose to accept the restrictions. Adams (1997, 287) commented that recognition of maintenance dependence has served the interests of developers, by rationalizing exactions in lieu of land-use restrictions.

[137] Cf. White (2008, 33): "The battle between business and biodiversity is one long fought... The mutually agreed upon solution has taken the form of compensatory mitigation."

[138] From public comment by other self-identified private landowners and county representatives, most of the self-identified private landowners at these meetings had received a letter from the county informing

the species in question, for he had already yielded substantial exactions through his own arrangement with USFWS, but that he suggested other landowners accept the Habitat Conservation Plan, to avoid the expense and risk of trying to arrange their own plan with USFWS.

6. Other Organizational Interests

Some evidence suggests that regulatory agencies and other organizations sometimes seek to further internal interests or conform to external political forces, potentially at the expense of formal or statutory goals (Primm and Clark 1996, 1040; Babbitt 2005, 62–63; Adler 2008, 337–338; Bonnie and Wilcove 2008, 63).[139] Such behavior can be exacerbated by individuals seeking to benefit from conforming to organizational norms (Rodgers 2000, 299–300, citing Trivers 1985; also cf. Leman and Nelson 1981, 99, 109) or by individuals seeking to avoid punishment for questioning such norms (Holling and Meffe 1996, 333). Internal interests can include defense of expertise (Profeta 1996, 89, citing others) and institutional survival (Holling and Meffe 1996).

Illustrating such behavior, in the 1920s and 1930s, the US Bureau of Biological Survey — the predecessor to USFWS — resisted efforts by conservationists to end the agency's multimillion-dollar predator control program and did so in part by suppressing

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them that their property might have a listed animal species (Fender's blue butterfly) that would be included in the Habitat Conservation Plan (field observations, 27 January 2009 through 12 October 2010).

[139] The potential for such behavior has been recognized by others for agencies (Innes, Polasky, and Tschirhart 1998, 45; Prichard and Sanderson 2002, 159–160; Yaffee 2006, 219) and for public interest research groups (Breyer 1982, 353).

internal criticism and continuing the program secretly in national parks, after the program was terminated there (Worster 1994, 277–279, 283). More recently, USFWS reportedly sought to make the ESA look successful, to defend the ESA from attack by US legislators, in 1994 (Sax 2000, 2381).

7. Conclusion

In this chapter, I have offered evidence that in the US, humans widely value real or perceived benefits from species-based land-use regulation other than the survival of the species that such regulation is ostensibly intended to help.

In the next chapter, I review my argument that humans inadvertently risk exacerbating the loss of maintenance-dependent species on private land by using their presence to seek other benefits through species-based land-use regulation; I discuss potential implications for improving the survival of species through policy efficiencies; and I discuss how actors might most effectively pursue such efficiencies, in light of the political forces reflected by the preferences I have described here.

CHAPTER V

DISCUSSION AND CONCLUSION: POTENTIAL OPPORTUNITIES TO BENEFIT SPECIES THROUGH POLICY EFFICIENCIES

> [W]e should not worry too much about anything except the direction in which we travel.
>
> (Aldo Leopold 1991b [1947], 345–346)

1. Introduction

In this work, I am theorizing and offering some evidence that humans risk exacerbating the loss of maintenance-dependent species on private land by using their presence to seek other benefits through species-based land-use regulation. In previous chapters, drawing on evidence primarily from the US, I argued that species-based land-use regulation could worsen the fate of maintenance-dependent species on private land, by discouraging otherwise willing landowners from conserving or maintaining habitat for imperiled species; that actors widely and persistently disregard this risk in regulatory decisions and associated discourse, often through demonstrably false or misleading claims; and that influential actors and a majority of the public widely value other benefits from such regulation. In sum, I find this evidence supports concern that maintenance-dependent species are at risk from a tyranny of the majority, as humans seek to benefit at the expense of others through species-based land-use regulation, without regard for

consequent harm to species, and that this disregard amounts to hegemonic orthodoxy, characterized by institutions and beliefs that indiscriminately equate conservation with limiting human action, whether through restrictions or exactions. [140]

In this chapter, I argue that this evidence implies that with constraints on public funding, humans might have opportunities to improve the fate of maintenance-dependent species through policy efficiencies, but also that widespread preferences for other benefits could make such efficiencies politically difficult to implement in practice. Again drawing primarily on evidence from the US, I describe what such efficiencies might look like, how they have already been partially implemented, and how actors might seek to further their implementation, despite strong opposition to doing so. I conclude by offering some suggestions for additional research to further develop the theory and evidence I have presented here.

2. Potential Opportunities to Benefit Species through Policy Efficiencies

Actors might have a variety of direct and indirect opportunities to improve the survival of maintenance-dependent species on private land through efficiencies in species-based land-use regulation. I describe some potential opportunities in general terms then offer some ideas for how they might be implemented under the ESA.

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[140] As I discussed in chapter I, I characterize this phenomenon as a tyranny of the majority not for its potential to cause financial harm to landowners, but for its potential to cause unchecked harm to species, and coincidentally for its potential to cause unchecked harm to humans by denying happiness from conserving or maintaining a species without penalty.

2.1. Considering Openly Refraining from Species-Based Land-Use Regulation

If species-based land-use regulation might be counterproductive to the survival of a species on private land, it follows that with all other factors unchanged (including constraints on public funding for conservation), humans might improve the survival of the species by considering the alternative of openly refraining from such regulation for the species, to avoid or reduce regulatory disincentives for otherwise willing individuals to use their own resource to conserve or maintain the species or to participate in incentive programs to do so. By definition, such an alternative could be seen as establishing a limited free market for the conservation of a species.[141, 142]

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[141] Other scholars have articulated this implication in varying ways. Expressing the argument in general terms, Ruhl, Kraft, and Lant (2007, 131) theorized that where the cost of exclusion is low, a private property regime might be more efficient than regulation in supplying ecosystem services. (At least in theory, landowners can exclude all benefit from maintenance-dependent species at little or no cost, through passive destruction.) However, their characterization of such regulation as inefficient potentially obscures to less technical readers that such regulation might be counterproductive.

More specifically, citing preemptive destruction of habitat for the red-cockaded woodpecker (a maintenance-dependent species), Innes (2000, 197, 198, 206) concluded that when landowners can destroy habitat to avoid regulation under the ESA, governments should consider whether such regulation might be counterproductive and in such cases refrain from such regulation without compensation, and he warned that to proceed otherwise could lead to "government misbehavior" warranting judicial intervention; however, Innes did not limit this conclusion to maintenance-dependent species. Similarly, in part documenting a private landowner's intent to evade regulation under the ESA through passive destruction of habitat for the Oregon silverspot butterfly (a maintenance-dependent species), Mann and Plummer (1995, 225–230) suggested improving the survival of species by allowing a "voluntary" market for their conservation (characterized by allowing conservation "without penalty"), by allowing incidental take of species, while still prohibiting their direct killing; however, the authors also suggested increasing public funding for conservation, and they did not limit their argument to maintenance-dependent species. Also similarly, Sugg (1995, 15–16) suggested considering private property ownership and markets as a means to save wildlife from perverse incentives of the ESA, but he did not limit his argument to maintenance-dependent species.

More abstractly, White (2006, 59) theorized that disequilibrium ecology implies a need to consider "the hazards of polemically foreclosing debate about the relationship between capitalist political economy

To be most effective, this alternative approach would need to dispel all species-based regulatory risk to landowners for conserving or maintaining a maintenance-dependent species on private land. In particular, this approach would need to address species-based land-use regulation by all levels of government (federal, state, and local) and for any other species that depend on actively maintaining the same habitat. In addition, such policy would need to avoid species-based constraints on upzoning (i.e., species-based relaxation of land-use restrictions or exactions); otherwise, landowners who conserve or maintain a species could incur a loss in market value by selectively losing the opportunity for upzoning to increase the market value of their property, a benefit that would otherwise be enjoyed by neighbors who let the species disappear.[143]

Two examples partially illustrate what a free market might look like for conserving a species. First, as I described in chapter III, Wisconsin's statewide Habitat Conservation Plan grants blanket authority for incidental take for the Karner blue butterfly (a maintenance-dependent species) on private land of 1,000 acres or less or any

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and ecology", and Zimmerer (2000, 364–365, 367n19) theorized that disequilibrium ecology could rationalize "a primarily property-rights or purely market-promoting brand of conservation", as providing environmental efficiencies. (Zimmerer [id.] also theorized that instead, conservation institutions might more fully consider relevant social and ecological factors in conservation decisions. However, if a government concluded that it could best serve a species by refraining from species-based land-use regulation, the outcome would be the same as creating a free market for associated habitat.)

[142] As I discussed in chapter III, free markets differ from regulatory markets in that the former do not selectively penalize buyers or sellers from participating or refraining from participating in sales of the goods or services in question.

[143] Illustrating species-based constraints on upzoning, the city of Helvetia (OR) proposed an ordinance that would designate properties with Oregon white oak and other ecologically desirable features as "rural reserves", to preclude such properties from future upzoning, under Oregon Senate Bill 1011 (Save Helvetia! 2010; Metro 2013).

private land not managed for forestry, to avoid discouraging private landowners from voluntarily maintaining its habitat (WDNR 2010, 3). Second, in proposing to list the streaked horned lark (another maintenance-dependent species) under the ESA as threatened, USFWS also proposed a special rule under ESA §4(d) to grant blanket authority for incidental take of the species from normal farming and ranching activities and existing airport maintenance activities (USFWS 2012f, 61939, 61972–61973, 62007). Both of these examples have conditions or limitations that leave landowners at substantial risk from species-based land-use regulation for conserving or maintaining habitat for these or other imperiled species.[144] Yet however imperfectly, each of these examples illustrates how refraining from species-based land-use regulation for a species might grant individuals a right to own, use, and sell land with the species or associated habitat as they can for otherwise equivalent land, so that willing individuals could buy, conserve, or maintain habitat for the species without selectively incurring harm for doing so.[145]

As I noted in chapter I, risk to species from species-based land-use regulation does not necessarily imply a need to refrain from such regulation for all lawful land uses on all private land. For example, regulators or other decision makers might find they

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[144] For example, in both cases, landowners remain at risk from listing of additional species, and for the streaked horned lark, landowners remain at risk to the extent they have refrained from exercising existing development rights.

[145] Armsworth et al. (2006) theorized that the purchase of land for conservation can harm species, by increasing the market value of land and thereby stimulating the conversion of land to other uses. However, such a mechanism is unclear. If free of regulatory risk, landowners can rationally refrain from development, for they need not develop their land to benefit from its market value (Riddiough 1997).

could maximize the survival of a species by refraining from such regulation for only some types of land uses and/or some types of landowners (such as for properties less than a particular size). Yet risk to species from species-based land-use regulation implies that the survival of a species might depend on considering the full range of such choices, based on the corresponding net harm or benefit to the species, in light of all relevant factors (e.g., the potential for passive destruction; landowner preferences concerning conservation, land-use restrictions, and exactions; etc.).[146]

As I also noted in chapter I, this implication has no bearing on species-based land-use regulation for other types of species; nor on regulatory prohibitions against direct killing of species, such as from hunting (Stroup 1997, 60) or such as prohibited by the ESA (§9); nor on other forms of land-use regulation, at least where such other regulation avoids creating disincentives for active management essential to the survival of species. For example, such a free market would not preclude land-use regulation based solely on the presence of wetlands (as under the US Clean Water Act); nor universal development fees imposed on all properties; nor (insofar as landowners find it unobjectionable) compensated species-based land-use regulation.

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[146] Present US law apparently allows regulators to discriminate between types of landowners when applying species-based land-use regulation, due to judicial deference to the reasoning of governmental agencies in applying economic regulation:

> [Like virtually all substantive due process challenges to economic regulation since 1937,] equal protection challenges to economic regulations are subjected to a rational basis test and are [therefore] unlikely to succeed.
>
> (Chemerinsky 2006, 629n124)

Further, this implication has no bearing on regulation that is clearly intended to achieve other goals. For example, one might expressly seek to use species-based land-use regulation to secure scenery or other environmental benefits, even at the risk of worsening the fate of targeted species.

2.2. Clarifying the Primary Goal of Species-Based Land-Use Regulation

For actors to consider potential benefits to species from refraining from species-based land-use regulation, actors might first need to clarify whether the primary purpose of such regulation is to improve the survival of a species or to achieve some other goal, such as only limiting harm from disturbance by humans.[147]

As I described in chapter III, policies have sometimes dictated or appeared to dictate that the primary goal of species-based land-use regulation should be to limit harm from human action or to maximize exactions from private landowners, and not primarily to ensure the survival of species.[148] With belief in equilibrium ecology, any species-based land-use regulation could be seen as benefiting species, whether through restrictions or exactions. Yet if species-based land-use regulation might worsen the fate of maintenance-dependent species on private land (cf. chapter II), the fate of many species might depend

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[147] This implication illustrates an instance of more general claims that disequilibrium ecology implies a need to clarify the goals of environmental management (whether active or passive), to ensure it furthers and does not work against its purpose (e.g., Pickett, Parker, and Fiedler 1992, 79, 84; Profeta 1996, 78, 80, 95; Moore et al. 2009, 17).

[148] For example, Oregon state rules dictate that land-use law intended to "protect" "wildlife habitat" should narrowly seek to "limit or prohibit" "conflicting [land] uses" through "regulations" (OAR 660-015-0000(5); OAR 660-023). Or for example, the ESA dictates that Habitat Conservation Plans should narrowly seek to "minimize and mitigate" harm from human action (ESA §10(a)(1)(B)).

on reconsidering and clarifying or affirming (whether through rulemaking or legislation) that the primary goal of species-based regulation is to ensure the survival of species.

2.3. Specific Potential Opportunities for Efficiencies under the Existing ESA

Existing statutes for the ESA might give USFWS some opportunities to benefit maintenance-dependent species by clarifying the purpose of species-based land-use regulation and by refining its use, to include openly refraining from such regulation for a species on private land.

USFWS has already taken some steps in this direction. For example, as I described in chapter III, USFWS created authority for Safe Harbor Agreements and Candidate Conservation Agreements with Assurances, which grant some limited (and conditional) immunity for prosecution from incidental take on private land; granted blanket authority for some incidental take of maintenance-dependent species through Habitat Conservation Plans in Wisconsin (WDNR 2010) and Benton County (Benton County 2010, 11, F: 1–3), the latter through prosecutorial discretion (id.); and as I described earlier in this chapter, USFWS proposed a special rule under ESA §4(d) to grant blanket, unconditional authority for incidental take of the streaked horned lark (another maintenance-dependent species) from certain land uses on private land (USFWS 2012f). Except for the Habitat Conservation Plan in Wisconsin (which rationalized blanket authority for incidental take on private properties of 1,000 acres or less based on a lack of resources to administer numerous individual permits), USFWS took all of these steps expressly to benefit the respective species by improving incentives or decreasing disincentives for maintaining associated habitat on private land.

Yet all of these examples still leave private landowners at substantial risk from species-based land-use regulation for conserving or maintaining habitat for imperiled species. In part, the take authority under these two Habitat Conservation Plans depends on other actors carrying out substantial obligations;[149] is potentially time limited; and does not cover all land uses nor all species that occur in the same habitat. Moreover, as is apparently typical for Habitat Conservation Plans, these Habitat Conservation Plans took substantial time and money to develop;[150] their development depended on sustained participation by USFWS (USFWS 2010a, 93–94; Lentz and Christenson 2011); and the plans might not have included blanket, unconditional authority for incidental take without sustained pressure by other actors (Hall 2009; Lentz and Christenson 2011, 151, 162).

Here, I describe some direct and indirect opportunities that USFWS might have to go further in considering and implementing such an alternative, for benefit of species. I do not suggest this list is complete; additional opportunities might exist.

2.3.1 Consider Dispelling Disincentives through Special Rules under ESA §4(d)

Existing authority to issue special rules under ESA §4(d) might present the most substantial and efficient opportunity for USFWS to go further in dispelling regulatory disincentives for conserving or maintaining species on private land. For species that are

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[149] The Wisconsin plan in part obligated 26 apparently large landowners to commit and manage 250,000 acres for conservation (Lentz and Christensen 2011, 151, 154). The Benton County plan obligated the county to measures I describe in chapter II, section 5.

[150] Development and approval of Wisconsin's statewide Habitat Conservation Plan took about 4 years and cost more than $1.5 million (Lentz and Christenson 2011, 152–153). Development and approval of Benton County's Habitat Conservation Plan took 4 to 5 years (USFWS 2010a, 93–94) and was expected to cost $804,509 (Benton County 2006, 10).

listed as threatened, §4(d) in part allows USFWS to issue "special rules" that "take the place of" and "decrease the ESA's normal protections" for species when such rules are "necessary and advisable to provide for the conservation of such species" (USFWS 2011c, n.p.). Or as USFWS (id.) explained more fully:

> One use of 4(d) rules is to relax the normal ESA restrictions to reduce conflicts between people and the protections provided to the threatened species by the ESA. A 4(d) rule can be used in such a situation if those conflicts would adversely affect recovery and if the reduced protection would not slow the species' recovery. This type of 4(d) rule is already in effect for gray wolves. Under authority of a 4(d) rule, Minnesota wolves that have preyed on domestic animals can be trapped and killed by designated government agents. This 4(d) rule was developed to avoid even larger numbers of wolves being killed by private citizens who might otherwise take wolf control into their own hands.

Accordingly, where USFWS concludes that species-based land-use regulation would be counterproductive to the survival of a species, USFWS could potentially list (or downlist) the species as threatened and issue a special rule granting unconditional authority for incidental take for the species on private land, whether for all land uses and all private land or only some land uses and/or some types of private land.[151] To dispel disincentives from harboring other species that depend on the same maintenance-dependent habitat, perhaps such a rule might additionally include some indication that USFWS expected to treat these other species similarly, thereby giving landowners some basis for investment-backed expectations (which I discuss below).

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[151] Scott et al. (2005, 387) similarly suggested that USFWS could gain regulatory flexibility by downlisting species from endangered to threatened, and for the same reason, the state of Wisconsin suggested doing so for the Karner blue butterfly, in 1992 (Lentz and Christenson 2011, 148).

It is presently unclear how fully USFWS has considered the possibility of issuing such a rule for the streaked horned lark or any other species, and in particular, whether USFWS has considered unconditionally allowing incidental take of a species from all lawful land uses on all private land.[152, 153]

2.3.2. Consider Coordinating Policy Efficiencies with Other Governments

The above suggestions all potentially leave private landowners at risk of species-based land-use regulation by state or local governments for maintaining habitat for imperiled species. Nevertheless, the existing ESA could presumably allow USFWS to encourage these other governments to adapt their policies to conform to federal policy.

Potentially illustrating one mechanism to do so, USFWS used eligibility for federal grants under ESA §6 to encourage states to develop statewide wildlife

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[152] For example, USFWS (2013b, p. 20076) asked for public comment in particular on the potential benefit to the streaked horned lark from excluding private land from designation as critical habitat (an essentially symbolic gesture, as explained in chapter II), whereas USFWS did not similarly ask for public comment on the potential benefit to the species from granting unconditional authority for incidental take beyond the limited scope already proposed (2012f, 61972–61973).

[153] USFWS has issued special rules under ESA §4(d) for at least 64 species (Buck, Corn, and Alexander 2009, 13), with varying purposes. For example, one rule sought to prevent listing of the polar bear from disrupting green-house-gas-producing commerce (id., 10). However, as illustrated by the proposed rule for the streaked horned lark, such rules seem typically intended to exempt only land uses that are considered beneficial to or generally compatible with the species in question, without fully considering risk to species from regulatory disincentives arising from restricting other land uses (e.g., also cf. USFWS 1992, exempting some forestry management for the Louisiana black bear; USFWS 2004, exempting certain land uses for the Preble's meadow jumping mouse), or to allow some direct or incidental take of a listed species outside of designated conservation areas (e.g., USFWS 2012a, for the Utah prairie dog).

conservation strategies.[154] Ambiguously, Oregon's plan (ODFW 2006) on the one hand calls for encouraging "voluntary conservation" (3–4), calls for "improving regulatory certainty" (24), and claims it "will not add new regulation" (4), yet on the other hand recognizes "federal laws govern[ing] ... species protection" as a "[s]olid [f]oundation" for conservation and anticipates that "future species listings ... could result in additional regulations" (3–4). If USFWS found that species-based land-use regulation would be counterproductive to the survival of a species, USFWS could perhaps similarly use eligibility for grants to encourage states and local governments to coordinate their efforts with USFWS to clarify the purpose of their respective policies and allow regulators to consider refraining from such regulation (whether as restrictions or exactions), where such restraint might benefit species.

2.3.3. Consider Clarifying the Purpose and Expectations of §10(a)(1)(A) Agreements

As I described in chapter III, existing rules for ESA Safe Harbor Agreements and Candidate Conservation Agreements with Assurances appear to allow some confusion as to whether such agreements are intended to improve the survival of maintenance-dependent species by removing disincentives for active management or by maximizing exactions from private landowners. Partially illustrating the latter interpretation, as I noted in chapter III, some actors have called for using such agreements to seek exactions to ensure the perpetual maintenance of species (Bocetti, Goble, and Scott 2012, 875,

[154] "To be eligible for additional Federal grants and satisfy the requirements for participating in the SWG [State Wildlife Grant] program, each state and U.S. territory needed to develop a statewide 'Comprehensive Wildlife Conservation Strategy' and submit it to the National Advisory Acceptance Team by October 1, 2005" (USFWS 2011d, 1:28).

878). Further illustrating the latter interpretation, a legal scholar who helped create the Safe Harbor Agreements program (Goble, Scott, and Davis 2006, 349, referring to Michael Bean) has twice cautioned that there is a "temptation to go overboard" when defining requirements for landowners to participate in such agreements (Bean 1998: n.p.; 2005: n.p.).

Accordingly, if USFWS found that species-based land-use regulation could be counterproductive to the survival of a maintenance-dependent species on private land, USFWS might improve the survival of some species by changing the rules for these agreements to clarify that their primary purpose is to ensure the survival of species, and by recognizing that the best choice for a species might sometimes be for such agreements to seek nothing from private landowners, even for existing populations (which private landowners can in theory lawfully destroy anyway, through passive destruction[155]).

2.3.4. Consider Reallocating Funding under ESA §6 to Encourage Innovation

USFWS allocation of "cooperative conservation grants" under ESA §6 has encouraged actors to support species-based land-use regulation under the ESA, by appearing to favor development of Habitat Conservation Plans over other forms of policy innovation under the ESA. For example, in fiscal year 2013, USFWS allocated a total of $43.3 million under four such grant programs, but two of the programs are dedicated to supporting Habitat Conservation Plans (through planning assistance and land acquisition), and a third program is dedicated to acquiring land for species with recovery

[155] I discuss passive destruction in chapter II, section 2.

plans (USFWS 2013d). Only the fourth program ("Conservation Grants") might conceivably support policy innovation such as I suggest here (presuming such work could be considered under "development of management plans"), but this is unclear (id., 1). Accordingly, USFWS might have an opportunity to encourage such innovation by reallocating §6 funding to allow equal consideration for any innovation under the ESA for benefit of species, rather than favoring support for Habitat Conservation Plans.[156]

2.3.5. Consider Minimizing Conflicts of Interest in Developing ESA Exception Plans

USFWS might also further such innovation by expressly seeking to avoid conflicts of interest when actors develop Habitat Conservation Plans or other ESA exception agreements on behalf of others. For example, third-party consultants who help develop such plans might benefit from exactions they design, such as where consultants with natural resource expertise would receive funding from mitigation fees to execute mitigation required by a plan. In such cases, or where a consultant routinely receives funding from USFWS to develop such plans, a consultant might be reluctant to consider alternatives that refrain from seeking exactions or that might otherwise challenge policy

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[156] Similarly suggesting a need for USFWS to encourage a broader range of innovation within the agency itself, two state officials who helped develop Wisconsin's statewide Habitat Conservation Plan for the Karner blue butterfly (Lentz and Christenson 2011, 161) subsequently commented:

> [T]he ESA should be increasingly administered in a manner that encourages willing land stewards to engage in species conservation by removing regulatory barriers. USFWS employees must be encouraged to exercise sound judgment to authorize the use of innovative initiatives and strategies, based on sound ecology, that hold promise for species conservation.

norms within USFWS. While neutral consultants might be hard to find, USFWS might seek them out or encourage their selection in preparing such plans.[157]

2.3.6. Promulgate Guidelines to Encourage Consideration of Relevant Human Factors

USFWS might help realize policy efficiencies to benefit maintenance-dependent species on private land by promulgating guidelines to encourage greater consideration of relevant human factors in any decision concerning species-based land-use regulation on private land. Without understanding potential interactions between policy, landowners, and species, environmental managers risk misjudging the effects of their decisions on unstable ecosystems (Zimmerer 2000, 364). For example, consideration of research on the response of landowners to regulatory risk might lead USFWS to consider listing a maintenance-dependent species as threatened rather than endangered, to give USFWS greater discretion in regulating incidental take of the species.

USFWS has at times considered human-factors research in its rulemaking, but it has apparently done so inconsistently. For example, USFWS considered such research when designating critical habitat for the Fender's blue butterfly in the Willamette Valley (e.g., USFWS 2006, 63896–63897) (though as I noted in chapter III, critical habitat designation typically has no effect on land-use regulation on private land, so that any restraint in such designation typically has at most symbolic value). In contrast, USFWS (2000) apparently did not consider such research in its decision to list the Fender's blue

[157] Though perhaps for different reasons, Bean, Fitzgerald, O'Connell (1991, 15) similarly cautioned that brokers for Habitat Conservation Plans should be neutral.

butterfly as endangered. By setting appropriate guidelines, USFWS might encourage consideration of relevant human factors in all such decisions.

2.3.7. Consider Systematically Reviewing Need for and Scope of Discretion under the ESA

USFWS has at times and to varying degrees recognized that species-based land-use regulation might be counterproductive to the survival of maintenance-dependent species on private land (e.g., USFWS 1999, 32707; USFWS 2006, 63896–63897), and that such species might sometimes be helped by refraining from such regulation (e.g., USFWS 2012f, 61939, 61972–61973). Yet as illustrated by the examples described above, the agency's actions to refrain from such regulation have been significantly limited or conditional. In addition (as I note above), it is unclear how fully USFWS has considered the possibility that a species might have the best chance of survival if regulators unconditionally refrained from species-based land-use regulation for the species on private land, and in particular if regulators did so universally (e.g., by unconditionally authorizing incidental take of the species for all lawful land uses on all private land). Accordingly, USFWS might have an opportunity to benefit such species by undertaking a comprehensive review of the potential effects of such regulation on a species and the means and scope of authority available to USFWS to refrain from such regulation for the species, if the agency concluded such regulation would more likely cause it net harm.

USFWS has already acknowledged calls for reviews to dispel regulatory disincentives or other institutional barriers to voluntary conservation, in acknowledging Oregon's statewide conservation strategy (ODFW 2006, 10) and in approving Benton

County's Habitat Conservation Plan for various prairie species (Benton County 2010, 61). For example, Benton County's plan called for working "to reduce regulatory disincentives to conservation" by "[i]dentify[ing] regulations that hinder conservation in Benton County and work[ing] with state and federal regulator to address these issues", including working to address concern that Safe Harbor Agreements and Candidate Conservation Agreements with Assurances "may not provide sufficient assurances" to dispel disincentives "to conserve or enhance habitat for listed species due to the possibility of future land use restrictions" (id.). However, in both Oregon's strategy and Benton County's plan, these calls were apparently symbolic, for neither assigned funding or responsibility for anyone to undertake such a review. Evidence of widespread and persistent distortion in related decisions and discourse (cf. chapter III) suggests that to be effective, such a review must be undertaken comprehensively and in good faith.

ESA §2(c) might already provide authority for such a review by USFWS (a federal agency), by declaring that it is the policy of Congress that:

> [A]ll Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act.

2.3.8. Other Potential Opportunities to Benefit Species through Policy Efficiencies

Though possibly requiring new legislation, USFWS or the US Congress might have two additional opportunities to dispel regulatory disincentives for maintaining species on private land. First, USFWS or the Congress might clarify or establish that the primary purpose of Habitat Conservation Plans is not to "minimize and mitigate" harm to species from impacts by humans (ESA §10(a)(1)(B)), but rather to ensure their survival.

Second, USFWS or the US Congress might clarify or affirm that the primary purpose of the ESA itself is to ensure the survival of species and not merely to limit harm to species from human action. In contrast, for example, findings under the ESA describe harm to species only from "economic growth and development untempered by adequate concern and conservation" (§1(a)), and the ESA describes the purpose of the Act as seeking in relevant part:

> to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, [and] to provide a program for the conservation of such endangered species and threatened species
>
> (ESA §2(b))

Without clarification, USFWS or courts might interpret the ESA as narrowly seeking to limit harm from human action (whether through restrictions or exactions), insofar as USFWS or courts presume "ecosystems" are stable,[158] or that the US Congress intended the ESA's "program" of land-use regulation to supercede the survival of species.[159]

3. A Critical Survey of Potential Paths for Realizing Policy Efficiencies

How might actors seek to benefit species by bringing about such policy efficiencies? In the face of persistent, widespread disregard for regulatory risk to species (cf. chapter III) and widespread preferences for other benefits from species-based land-use regulation (cf. chapter IV), actors seem likely to find such innovation difficult at best

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[158] For example, Tansley (1935, 306) defined ecosystems as "relatively stable", and USFWS (2010a, 95) has defined ecosystems as "stable system[s]".

[159] Offering some evidence that the purpose of the ESA is greater than merely limiting harm from human action, ESA §3(3) recognizes that the conservation of a species might require "regulated taking" "in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved".

to realize. In part, actors must potentially overcome (1) opposition by a majority seeking to use police power to secure environmental amenities from a minority at little or no cost to themselves; (2) opposition by influential actors (potentially including natural resource professionals, developers, regulatory agencies, and local governments) who seek various other benefits from species-based land-use regulation; and (3) reluctance of influential actors (such as those just cited) to reconsider existing authority for land-use regulation, for fear of incurring net harm from any change (such as by losing the opportunity to seek or pay exactions in lieu of imposing or incurring land-use restrictions).

Further underscoring the barriers to such innovation, evidence of widespread disregard through demonstrably false or misleading beliefs (cf. chapter III) suggests that these political forces can dominate rationality in associated research and discourse (cf. Bromley 1991, 5, 100; Mezirow 1991, 131, citing Gramsci 1971; Leach and Mearns 1996; Pritchard and Sanderson 2002, 155; Fischer 2003; Bromley 2006). As a result, actors might not succeed in correcting such distorted beliefs without changing power relations that create and sustain these beliefs (cf. Mezirow 1991, 57, citing Foucault 1972).

Consistent with this bleak outlook, Leach and Mearns (1996) suggested that there are no proven methods of success for correcting environmental policies that are supported by distortions in science and favor politically powerful interests. Further, Leach (2008, 1785) commented that dissent often has no impact on such distortion.

Here, drawing on works by others and in part on my participant observation in development of Benton County's Habitat Conservation Plan for various prairie species (Benton County 2010), I nevertheless review and assess the prospects for actors to seek

such efficiencies through various potential paths. I begin with what I find to be the least promising paths and proceed through paths I find increasingly promising, if only by comparison. I do not suggest that this survey is complete; other paths might exist, including more promising ones.

3.1. Political Backlash as a Limit to Increasing Land-Use Regulation

Various scholars have long theorized that political opposition to distributional consequences of regulation will limit land-use regulation in general (Marsh 2003 [1864], 201–202) and species-based land-use regulation in particular (e.g., Sagoff 1997, 991–992; Turner and Rylander 1998, 132–133; Doremus 2010, 209). Some evidence suggests that this political limit arises where land-use regulation would adversely impact a large number of landowners. For example, Oregon voters blocked almost all further increases in uncompensated land-use regulation under state law by passing Measure 37, in 2004 (Walker and Hurley 2011). However, other evidence suggests that the political limits to increasing land-use regulation do not arise as readily where it affects relatively few landowners at any given time, as may occur with species-based land-use regulation. For example, legislative attempts to limit the regulatory authority of the ESA have repeatedly failed (Innes 2000, 197n34; Baur, Bean, and Irvin 2009, 10006).[160]

In the case of species-based land-use regulation, political opposition is further weakened insofar as adversely affected landowners tend to be affected only once, and insofar as smaller landowners lack the resources to organize or otherwise defend

[160] Adler (2013) recently suggested that political conservatives in the US have largely abandoned seeking changes to the ESA.

themselves (Sugg 1995, 13; Adler 2008, 350–351). Potentially weakening such opposition still further, some larger or wealthier landowners have supported the present administration of species-based land-use regulation under the ESA, as an efficient means to dispense with their liability under that law (cf. chapter IV).

Theorizing that society seeks to secure environmental benefits by imposing increasing land-use regulation on a minority of landowners, a legal scholar and former USFWS official (Plater 1998, 437–428, referring to Joseph Sax) commented:

> I do not see any way in which to undo the basic momentum and consequences of the land management system we have created, which is essentially a competitive appropriation system.
>
> (Sax 2010, 467)

Similarly, expressing concern for risk to species from regulatory disincentives created by the ESA, a former director of the California Department of Fish and Game commented:

> God help the environmentalist who openly questions the fairness of the powerful law that has become so useful in stopping projects in the neighborhood.
>
> (Gibbons 2001, 24)

Accordingly, political backlash against the distributional consequences of species-based land-use regulation seems to offer little promise for actors who seek to temper such regulation for benefit of species or any other purpose, except where such regulation is coincidentally limited by opposition to the distributional consequences of more general types of land-use regulation.[161]

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[161] Potentially still further limiting any help from political opposition to land-use regulation in general, such opponents might not wish to recognize biological concerns about species-based land-use regulation, insofar as such concerns distract from and undermine belief that any land-use regulation is unfair.

3.2. Courts as a Remedy for Tyrannies of the Majority

Scholars (e.g., Tocqueville 2003 [1835]; Plater and Norine 1989, 677n40; Sagoff 1997, 846, 848; cf. Doremus 2003, 6) have long identified courts as the most hopeful cure for tyrannies of the majority. In the US, in theory, some potential avenues for actors to challenge species-based land-use regulation in court include claims based on (1) substantive due process, (2) investment-backed expectations, and (3) procedural due process. However, various factors limit the potential for such action to save species from disregard for harm from species-based regulation. I briefly assess the potential for each of these types of claims, then consider some additional hurdles to such claims in general.

3.2.1. Challenges Based on Substantive Due Process

Under a principle referred to as substantive due process, the 5th and 14th Amendments to the US Constitution in theory guarantee individuals a right to be free from governmental action that takes liberty or property without adequate reason (Chemerinsky 2006, 545–546). In part, regulation must substantially advance a legitimate government interest (Linda Lingle, Governor of Hawaii, et al. v. Chevron USA. Inc.,[162] Justice Kennedy concurring, citing Agins v. Tiburon[163]). However, since 1937, the US Supreme Court has exercised virtually complete deference to agencies in disputes over the rationality of regulation of economic activity, including land-use regulation

[162] 544 U.S. 528 (2005).

[163] 447 US 255 (1980).

(Chemerinsky 2006, 625, 628). Accordingly, such challenges likely have little prospect of success.[164]

3.2.2. Challenges Based on Reasonable Investment-Backed Expectations

The 5th Amendment to the US Constitution in theory protects individuals from governmental "taking" of property without just compensation (Chemerinsky 2006, 664–665). In practice, however, courts have routinely allowed uncompensated land-use regulation (including regulation under the ESA), even where it has caused substantial financial harm to landowners (Bean and Rowland 1997, 35–37). Accordingly, such "takings" claims stand little chance.

One legal scholar (Breemer 2005, citing Penn Central Transportation Co. v. New York City, 438 US 104 [1978]) has nevertheless suggested that landowners might still defend themselves from land-use regulation through "takings" claims based on the theory of reasonable investment-backed expectations. Under this theory, for example, a risk-tolerant, conservation-minded landowner might submit a letter to USFWS and state and local governments declaring reasonable investment-backed expectations to be free from future species-based land-use regulation for maintenance-dependent species, because such regulation would be counterproductive to the survival of the species, and because imminent biophysical threats to such species require the landowner to come to these

[164] To find irrationality, a court must find pervasive bad faith, lunacy, a shock to the conscience, or utter failure of means to advance the stated end (Ratner 1967; Michelman 1979; Plater and Norine 1989). In contrast, to find rationality, the court need only find relevant evidence adequate to support a decision by a rational mind (Plater and Norine 1989, 716), with any legitimate and conceivable basis, even if that purpose is unrelated to the express purpose of the law or regulation (Chemerinsky 2006, 540). Moreover, legislation may legitimately seek to address only a limited aspect of a problem (Pettinga 1987, 783).

conclusions now, in deciding to maintain associated habitat. Yet due to judicial deference to agencies in the rationality of economic regulation, such a strategy might still offer little more than civil disobedience and carry similar risk.

3.2.3. Challenges Based on Procedural Due Process

The 5th and 14th Amendments to the US Constitution and the US Administrative Procedure Act (as well as equivalent state laws) in part give individuals a right to be free from governmental action that takes liberty or property without sufficiently fair proceedings (Chemerinsky 2006, 545). In addition, the National Environmental Policy Act (NEPA) gives citizens a right to ensure that federal agencies appropriately consider potential environmental impacts when deciding on some federal actions (Bean and Rowland 1997, 209).[165]

In theory, for example, these rights might allow citizens or other actors to file legal claims challenging various decisions under the ESA as arbitrary or capricious for failing to consider regulatory risk to species and/or for failing to consider the need for or scope of authority for USFWS to refrain from such regulation for a species on private land. In contrast to the deference that courts have granted agencies in substantive due process in land-use regulation (see above), courts have reversed some listing decisions and other regulatory decisions by USFWS based on procedural due process (Innes,

[165] Courts have disagreed over the applicability of NEPA to listing decisions under the ESA (Bean and Rowland 1997, 209–210).

Polasky, and Tschirhart 1998, 47).[166] In practice, however, such recourse might be limited to technical procedural grounds that an agency could easily overcome.

Alternatively, as I discuss below, actors might merely raise these concerns through public comment in regulatory proceedings, to encourage and empower USFWS to undertake such consideration.

3.2.4. Other Hurdles to Legal Action

Potentially further dimming hope for at least some of the above legal challenges to species-based land-use regulation, US law has long disfavored private ownership of undeveloped land, especially when it provides a public benefit. Frontier law manifested this notion by prohibiting private ownership of undeveloped land. Under the Homestead Act, a citizen had to put land to "productive use" to own it; "[t]here was no right to hold it for investment as an appreciating asset" (Sax 1993, 1453). Some courts have manifested this notion as well:

> [W]hen one devotes his property to a use in which the public has an interest, he, in effect, grants to the public an interest in that use, and must submit to be controlled by the public for the common good.
>
> (Munn v. Illinois,[167] 126, quoted in Chemerinsky 2006, 616)

> As one ... court explained in rejecting the development expectations of a landowner who acquired land prior to restrictive regulation, "a developer with designs on improving its property consistent with an existing zoning framework

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[166] For a recent example, see Alaska Oil and Gas Association et al. v. Salazar et al. (US District Court for State of Alaska, case 3:11-cv-0025-RRB), Order Granting Plaintiffs' Motions for Summary Judgment, 11 January 2013).

[167] 94 US 113 (1877).

> had best get its shovel into the ground" to obtain reasonable development expectations.
>
> (Breemer 2005, 20, quoting W.R. Grace & Co.–Conn. v. Cambridge City Council[168])

Still further dimming hope for legal action, the types of claims I discuss above variously face significant hurdles of ripeness,[169] cost, and time (Breemer 2005; Burling 2005; Meltz 2013). In addition, courts cannot stray too far from the views of the majority (Ratner 1967). Further, judges presumably like scenery as much as anyone.[170]

Accordingly, except possibly to the extent that agencies seek to increase consideration to avoid due process claims, legal action seems to offer little hope for saving species from regulatory risk.

3.3. Increasing Agency Discretion

Some scholars (e.g., Profeta 1996, 95; Zimmerer 2000) have suggested increasing agency discretion as a means to adapt conservation policy more rationally to disequilibrium ecology. As I have argued in this work, such discretion might be essential to the survival of maintenance-dependent species on private land, whether through prosecutorial discretion per se or through other policy mechanisms. Moreover, as I have described above, USFWS has indeed exercised some discretion to temper species-based land-use regulation to benefit maintenance-dependent species.

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[168] 779 N.E. 2d 141, 155 (MA App. Ct., 2002).

[169] For example, an actor might not be able to take such action until a species is listed.

[170] Nevertheless perhaps adding a glimmer of hope, present due process law has been characterized as unstable (Chemerinsky 2006; Winkler 2006, 808).

Yet that evidence does not clearly reveal that agencies seek such discretion. For example, the development of Wisconsin's statewide Habitat Conservation Plan for the Karner blue butterfly and Benton County's Habitat Conservation Plan for various prairie species both suggest that USFWS exercised such discretion only after other actors expressed sustained concern for the agency's need to do so (Hall 2009; Lentz and Christenson 2011). This reluctance coincides with comments that inertia within agencies favors existing regulatory policies (Breyer 1982, 365), and that agencies lack political will to experiment aggressively with imperiled species (Profeta 1996, 88). Still, both of these examples suggest some willingness to do so.

Thus, while agencies might be critical to tempering species-based land-use regulation for benefit of species, any such innovation likely depends on initiative by other actors. Supporting this view, a study of state conservation agreements commented that regulators need private-sector champions to realize policy innovation (Brogden 2001).[171]

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[171] In contrast, as I noted in chapter II, Layzer (2008, 268–269) argued against allowing potentially regulated actors to influence regulatory decisions, because (per Layzer) it can lead to worse environmental outcomes. However, it is unclear whether in reaching this conclusion Layzer considered maintenance dependence. For example, Layzer expressly placed greater value on plans that sought to minimize active management (37), and she expressed her conclusion in terms of "ecological health" and "the ability of natural processes to sustain themselves":

> When restoring ecological health is the paramount goal, planners are more likely to approve, and managers to implement, approaches that rely less on energy-intensive manipulation and more on enhancing the ability of natural processes to sustain themselves — even if doing so imposes costs on some stakeholders. (269)

Coming despite Layzer's recognition that species populations tend to change chaotically (11) and may require active intervention (297n19), Layzer's framing here appears to offer further evidence of disregard for regulatory risk to species through persistent belief in the stability of ecosystems (cf. chapter III, section 6.5). Such belief tends to imply that discretion can only weaken the benefit to species from land-use regulation, and that such regulation can never harm them (e.g., cf. Layzer, 281–282). In contrast,

3.4. Communicative Planning through Policy Fora

Despite bleak assessments of the prospects for actors to correct politically expedient distortions in environmental policy and associated discourse, such distortions might nevertheless offer actors some leverage to seek change (Mezirow 1991, 132, citing Gramsci 1971; Leach 2008). In particular, distorted beliefs in ecology might create opportunities for citizens to seek change by engaging in policy fora where these beliefs are perpetuated (Leach, 1793).

I interpret such advice as coinciding with the theory of communicative planning. By this I mean the theory that actors with conflicting interests can sometimes further their interests by perceiving problems or solutions in new ways through mutual discussion (Innes 1998; Fischer 2003, 181–237; cf. Roe 1994; Mintrom and Norman 2009, 657).

Communicative planning is far from assured to change anything (Huxley 2000). Breyer (1982, 366) and Walker (2006, 392) suggested that to have any effect on policy, actors must offer framing that captures the attention of relevant actors. Yet as Brockington and Homewood (1996, 103, citing Kuhn 1996 [1962]) theorized, "orthodoxies are as enduring as the energy and mental agility of those holding them". Normative beliefs are especially resistant to change when they involve deeply held values (Margerum 2011, 242–243). Leach (2008, 1793) theorized that to realize change, actors must successfully negotiate underlying power relations, the trajectories of existing institutions, and their influence over possibilities for action.

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as I argue in chapter II, with constraints on public funding, lack of discretion poses a risk to maintenance-dependent species on private land, by inadvertently discouraging private efforts to help them.

In light of these constraints, I suggest that actors might seek to win consideration of regulatory risk to species by using public or professional comment in relevant policy fora to reframe debate over species-based land-use regulation in terms of its effect on species, rather than on landowners; in terms of the scope of discretion available to regulators and considered by them; in terms of correcting demonstrably false, misleading, or incoherent claims or misleading omissions; and perhaps most importantly, in terms of raising the question of whether individuals should ever have a right to conserve or maintain a species without selectively incurring harm from regulation based on its presence. Such framing might variously appeal to others insofar as it appeals to their interest in saving species; their sense of professionalism; and/or their desire to have the freedom to maintain a species without risking penalties for doing so. By appealing to these values, such framing might variously lead actors to perceive species-based land-use regulation as a threat to species; a threat to their own professionalism; and/or a threat to their personal pursuit of happiness.[172] In addition, by asking whether individuals should ever have a right to conserve or maintain a species without selectively incurring harm from regulation intended to save it, such framing challenges beliefs that obscure regulatory risk to species by obscuring risk to landowners from species-based land-use regulation.[173, 174]

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[172] Brehm found that where actors know they have lost rights, the loss can motivate them to seek to restore their rights (Miron and Brehm 2006).

[173] For management issues that involve disequilibrium ecology, Pritchard and Sanderson (2002, 150) additionally theorized that actors might increase their influence by showing that they are intimately familiar with the local and historical context and (if relevant) that they are an authentic part of the landscape.

The development and outcome of Wisconsin's statewide Habitat Conservation Plan for Karner the blue butterfly (Lentz and Christenson 2011, 151, 152, 162) and Benton County's Habitat Conservation Plan for various prairie species (USFWS 2010a, 13, 93–94) both suggest such communicative involvement in political fora might have some effect in tempering species-based land-use regulation for benefit of species. Alternatively, both cases might simply reflect a response to actual or anticipated political opposition by numerous landowners to the distributional consequences of such regulation. Yet insofar as this opposition was expressed as concern for regulatory risk to species (as for the Benton County HCP), such concern still seems to have had some effect.

Nevertheless, evidence suggests that even where communicative planning has promise, change requires heavy and sustained efforts by individuals. Two state officials who helped develop the Wisconsin plan subsequently commented that innovation in the face of an agency's preferences for "rigid application of its rules and regulations" took

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[174] One might also suggest that actors seek to participate in fora in politically conservative communities, presuming that the local governments in such communities would support any rationale for opposing species-based land-use regulation. However, a survey of one politically conservative community found widespread concern for endangered species as well as for property rights (Raymond and Olive 2008, 490), similar to preferences reported for the US as a whole (Czech and Krausman 1999, 470), implying that conservative communities might be as likely as liberal communities to support species-based land-use regulation, especially if it would affect relatively few landowners. In contrast, from interviews in the Teton Valley (ID and WY), Peterson and Liu (2008) found that individuals favoring private property rights disliked unplanned development as much as others but were more opposed to land-use planning in general.

Perhaps more promisingly, actors might seek to participate in fora where a local government is led by actors who share an interest in exploring the efficiencies suggested here, for benefit of species, or where proposed regulation would affect a large proportion of landowners.

"extraordinary individual efforts", and that present institutional structures under the ESA tend to make such efforts unsustainable (Lentz and Christenson 2011, 161–162).[175]

3.5. Using the Internet to Organize Scattered Innovators

Who might be willing and able to make the sustained effort apparently required to win even limited consideration of risk to maintenance-dependent species from species-based land-use regulation? The evidence I have presented so far suggests such actors are few in number. For example, small landowners apparently have the most to lose from such regulation, as a proportion of their wealth (Sax 2010, 465), but they tend to be "one-time players" (Adler 2008, 350–351), have difficulty organizing (id.), and might find that the cost of political action outweighs any benefit. In contrast, if landowners are willing to sacrifice any hope for freedom to maintain a species without penalty for doing so, they can at least in theory avoid associated regulatory risk, by allowing such species to succumb to invasive vegetation or other threat. Moreover, due to beliefs obscuring regulatory risk to landowners for maintaining imperiled species (cf. chapter III), many landowners might be unaware of this risk unless and until it confronts them. Yet the size of an advocacy coalition might be crucial to demonstrating support for policy change (Mintrom and Norman 2009, 653).

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[175] In another context, historian Grossman (2006) reported that in the US, early abolitionists took 30 years to find effective framing for their movement, and that this framing found wide acceptance only after economic relations changed. (According to Grossman, the successful framing warned that if slavery is lawful, slavers can enslave anyone.)

Presuming that such innovators are indeed few in number, the rise of the Internet might give them affordable and effective tools to find each other and form a coalition to further their shared mission.

3.6. Communicative Planning through Scholarly Research

Compared to the variously bleak choices I have described so far, perhaps the most promising path to realize these efficiencies is to undertake communicative planning through scholarship. By this I mean engaging in peer-reviewed research that seeks to benefit species by identifying false or misleading claims or other mechanisms that obscure regulatory risk to species, and by identifying social dynamics that create and sustain such behavior. At least in principle, scholarship rewards explanations of observed phenomena and correction of false beliefs. Political ecologists have embraced such research as a core mission (e.g., Leach and Mearns 1996, 28–33; Forsyth 2003, 202; Zimmerer and Bassett 2003; Neumann 2005, 72–74, 78–79).

Though perhaps likewise for lack of better choices, a study of institutional orthodoxy within NASA came to a similar conclusion. Finding that this orthodoxy contributed to the Challenger disaster, as institutional culture encouraged agency scientists to favor their own interests over scientific findings, Rodgers (2000, 299–300) concluded that aside from courts, scientific institutions offer the best hope to save scientific findings from institutional and cultural self-deception.

Research can nevertheless be impeded by orthodoxy in scholarship, as illustrated by examples in chapter III. Presenting another hurdle, research on conservation in the context of disequilibrium ecology requires a strong interdisciplinary perspective (Vale

and Parker 1980, 153; Meffe, Ehrenfeld, and Noss 2006, 596; Walker 2005; Verwij, Thompson, and Engel 2006, 246–247; Grabbatin and Rossi 2012, 283).

Yet again, for lack of better options, such research might still offer a relatively productive and potentially more sustainable path to win consideration of such efficiencies in practice, especially if combined with public comment in regulatory fora. This work reflects a humble attempt at such research.

4. Potential Areas for Further Research

I offer the following suggestions for additional research to further develop and apply the theory I have presented here, for potential benefit both to understanding these phenomena and to the survival of species.

4.1. Further Development of Theory and Evidence Presented Here

The following research projects would further develop particular aspects of the theory and evidence presented in this work.

4.1.1. The Colorful and Unresolved History of Disequilibrium Ecology

Expanding on evidence from chapters III and IV, this work would argue (1) that natural scientists widely came to recognize disequilibrium ecology only after a 1982 amendment to the ESA recognized maintenance dependence as a rationale for seeking exactions in lieu of species-based land-use restrictions, and (2) that this practice has been supported by a new generation of demonstrably false, misleading, or questionable claims in related disciplines, beyond claims that have helped perpetuate belief in equilibrium ecology.

4.1.2. A War of Musical Chairs: What Have We Done to Leopold's Land Ethic? (And What Else Can We Do?)

Expanding on evidence from chapter III, this work would argue that actors have widely misinterpreted Aldo Leopold's land ethic as indiscriminately equating conservation with limiting human action through police power.

4.1.3. Some Truths and Half-Truths about Ecosystem Service Markets and Conservation Banking

Expanding on evidence from chapter III, this work would seek to further pure and applied research on ecosystem service markets by (1) questioning indiscriminate claims that species-based mitigation banking turns species from liabilities into assets for private landowners, and by extension, (2) suggesting that actors might more effectively pursue efficiencies through ecosystem service markets by more clearly distinguishing between free markets and regulatory markets.

4.1.4. Risk to Biodiversity from Orthodoxy in Economics

Expanding on evidence from chapter III, this work would argue that a variety of widespread but demonstrably false or misleading claims and assumptions in economics scholarship have obscured risk to maintenance-dependent species from species-based land-use regulation on private land.

4.1.5. A Political Ecology Glossary of Species Conservation

Adding more cites as evidence for usage notes and benefiting from peer review, this work would enhance and validate the glossary I present as field notes in appendix B.

4.1.6. An Alternate Game Theory of the Private Land Problem

This work would present a game-theoretic model of the theory offered here, by building on a model presented to the Oregon chapter of The Wildlife Society (Novick 2011, 14–15). In contrast to previous game-theoretic models of benefit or harm to species on private land from species-based land-use regulation (e.g., Hsu 2002; Lueck and Michael 2003; Mills 2004; Buckley and Haddad 2006), this model would narrowly address maintenance-dependent species and not only model policy outcomes and potential opportunities to benefit species through policy efficiencies, but also model political forces that could hinder recognition and realization of these opportunities. To do so, the model would reflect amenity preferences of private landowners; the alternative of openly refraining from species-based land-use regulation for a species on private land (whether wholly or partially); preferences of regulatory advocates for benefits other than species; and the potential for advocates to disregard regulatory risk to a species.[176]

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[176] More specifically, the model would present a two-player, two-stage game. One of the actors would represent (1) private landowners whose property has a maintenance-dependent species or its habitat and (2) other individuals and nongovernmental organizations potentially willing to purchase and/or maintain property for benefit of the species. This actor's actions would include Maintain the species, Destroy the species (whether through passive destruction or active, preemptive destruction), and Yield exactions (where policies allow).

The second actor would represent all individuals and organizations who support species-based land-use regulation (e.g., potentially including local governments, regulatory agencies, conservationists,

4.1.7. Implications of Maintenance-Dependent Species for Sustainability Policy

Noting evidence for and implications of risk to maintenance-dependent species from species-based land-use regulation, this work would argue that sustainability policy might be furthered by abandoning presumptions that sustainability is always served by increasing regulation or always served by decreasing regulation, and instead considering the potential net benefit to sustainability from using or refraining from specific types of regulation in specific contexts, in light of the preferences and power of relevant actors.

4.2. Case Studies of Politics and Rationality in Related Policy Decisions

Through interviews or participant observation, additional case studies of regulatory decisions might shed more light on the social forces and reasoning affecting

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and even developers, as described in chapter IV). In the first stage, this actor could choose between "Disregard regulatory risk to the species" and "Consider regulatory risk to the species". In the second stage, the actor would then choose between "Openly refrain from species-based land-use regulation for the species" (i.e., seek neither strict prohibitions nor exactions); "Seek species-based exactions for the species" (ranging from demanding a little to demanding a lot); and "Strictly prohibit land uses harmful to the species". Each of these choices would provide two types of payoff: (1) harm and benefit to the species (resulting in some net harm or benefit to the species), in light of the first actor's response, and (2) other real or perceived benefits (e.g., securing scenery or mitigation fees). The payoff for the species would be represented as a supply curve, showing the net harm or benefit to the species (e.g., in terms of its reproduction rate) as a function of the corresponding regulatory risk to the first actor (e.g., in dollars per parcel, acre, or landowner), potentially represented individually, collectively, or by type).

The model would illustrate how the second actor can maximize their payoff in other real or perceived benefits by disregarding (1) harm to the species from the choices favoring species-based land-use regulation and/or (2) benefit to the species from refraining from such regulation (whether fully or partially, such as by seeking less in exactions), thereby increasing the perceived net benefit to the species from species-based land-use regulation, whether through exactions or restrictions, but potentially increasing net harm to the species.

decisions to increase or decrease discretion species-based land-use regulation under the ESA or other authority.

4.3. Case Studies of Biological Effects of Species-Based Land-Use Regulation

Retrospective case studies of particular regulatory decisions might better reveal the biological effects of species-based land-use regulation on maintenance-dependent species on private land. One example is the effect of related decisions on the Douglas County (OR) population of Columbian white-tailed deer.

4.4. International Case Studies

Case studies might also help reveal opportunities to benefit species through policy efficiencies in other nations, by comparing the US experience with species-based land-use regulation to the experience with such regulation elsewhere. For example, studies might compare the authority for such regulation (or lack thereof); associated preferences among relevant actors; relevant power relations; how such dynamics have influenced (or might influence) the manifestation of such regulation; and how actors might best seek to influence that expression for benefit of species in other nations, whether retrospectively or proactively.

5. Conclusion: Signs of Change?

In this work, I have theorized and presented some evidence that humans risk exacerbating the loss of maintenance-dependent species on private land by using species-based land-use regulation to seek other benefits. I have also presented some evidence of regulators and governments taking some limited steps to refrain from such regulation, for

benefit of species. From reviewing potential actions for actors to further such policy efficiencies in spite of strongly opposing political forces, I conclude that the most productive paths might be (1) to undertake further research on this phenomenon, especially to reveal distortions or omissions obscuring regulatory risk to species, and especially by undertaking participant-observation in related policy fora; and (2) to try to reframe political conflict over species-based land-use regulation in terms of its effect on species, in terms of discretion considered by regulators, and as asking whether individuals should ever have a right to conserve or maintain a species without selectively incurring harm from land-use regulation based on its presence. Last, consistent with theory by others (Mintrom and Norman 2009, 657), the evidence I have presented here suggests that actors pursuing such policy efficiencies must be willing to find some satisfaction from incremental progress.

APPENDIX A

FIELD NOTES, PART 1:

A QUALITATIVE SURVEY OF DISREGARD FOR REGULATORY RISK TO SPECIES

1. Introduction

This appendix summarizes my field notes of observed means of disregard for risk to maintenance-dependent species on private land from species-based land-use regulation. I collected these observations in the course of undertaking this work, from 2004 through 2012, from reading related scholarly and nonacademic works by others and from participant-observation in related public fora. As such, this collection constitutes a qualitative survey of the means of disregard, collected through snowball sampling (Marshall and Rossman 2006), periodically refreshed by searches for related keywords in academic databases and other searchable sources.

In chapter III, I described several of these means of disregard and offered evidence of their use. I include this more extensive list here to offer additional perspective on those instances, relative to the scope and types of disregard I have observed, and to offer potential topics for future research. For additional field notes on terms included here, see the usage notes in appendix B.

I do not claim that this survey is complete; i.e., that my sampling reached saturation. Over time, I seemed to discover additional means of disregard with decreasing

frequency. However, I continued to discover additional means even in the last months of this work. Moreover, theory and my observations both suggest that actors will continue to generate new means. Scholars (including some ecologists) have long theorized and observed that reason serves to secure self-serving belief (e.g., Stoddard 1978 [1931], 497; Leopold 1986 [1933], 212; Mezirow 1991, 57, citing Foucault 1972; Mezirow 1991, 131, citing Gramsci 1971; Rodgers 2000; Pritchard and Sanderson 2002, 152, citing Leach and Mearns 1996; Bromley 2006). Further (as I note in chapter V), documenting orthodoxy in another environmental context, Brockington and Homewood (1996, 103, citing Kuhn 1996 [1962]) theorized that "orthodoxies are as enduring as the energy and mental agility of those holding them". As reflected by the dates of evidence in chapter III, the periodic emergence of new means of disregard suggests to me that humans have an infinite capacity to generate new reasoning and rhetoric to defend their perceived interests.[177]

2. Observed Means of Disregard for Regulatory Risk to Species

Note: Numbering here does not correspond to paragraph numbering in chapter III.

[177] In light of ongoing climate change, I expect new arguments might include indiscriminate claims that it is hopeless to maintain habitat for imperiled species. (This might be true, but I would question whether such claims justify exacerbating the loss of species through species-based land-use regulation if such regulation is intended to improve their survival.)

1. Disregard through law and its administration

    1.1. Disregard through perceived lack of discretion under the ESA

    1.2. Disregard through limitations and goal confusion in ESA exception programs

    1.3. Disregard by prescription under Oregon land-use law (Goal 5)

    1.4. Disregard through presumptions of public rights to undeveloped private land

2. Disregard through policy arguments and rhetoric

    2.1. Disregard by obscuring regulatory risk in owning habitat

        2.1.1. “Conservation banking turns species from liabilities into assets”

        2.1.2. “Ecosystem service markets pay for providing habitat”

        2.1.3. “Regulation increases the market value of property”

        2.1.4. “ESA exceptions offer voluntary, negotiated agreements”

        2.1.5. “The No Surprises policy eliminates all future risk to landowners”

        2.1.6. “The ESA doesn’t protect plants”

        2.1.7. “Political backlash protects private landowners”

        2.1.8. “Conservation-minded landowners don’t mind regulation”

        2.1.9. “Tax reduction compensates landowners for regulation”

    2.2. Disregard through other claims and assumptions in economics

        2.2.1. “Species are a public good” (in the technical sense)

        2.2.2. “Landowners seek only to develop their property”

    2.3. Disregard through policy rhetoric

        2.3.1. “Conservation-reliant species”

        2.3.2. “Carrot and stick”

        2.3.3. “Protect”, “Sideboards”, “Safety net”

2.3.4. “Responsibility”, “Obligation”

2.3.5. “Bounded conflict”

2.3.6. “Regulatory baseline” (in the ecological sense)

2.3.7. “Regulatory baseline” (in the regulatory sense)

2.3.8. “Regulatory incentive”

2.3.9. “Landowner cooperation”

2.3.10. “Fairness”

2.3.11. “Precautionary principle”

2.4. Disregard through other policy arguments

2.4.1. “The ESA works”

2.4.2. “Assume funding”

2.4.3. “Assume enforceability”

2.4.4. “Regulation is insufficient” (but assumed necessary)

2.4.5. “Volunteerism is insufficient” (but assumed expendable)

2.4.6. “Free markets are part of the problem and thus not a solution”

2.4.7. “It’s the law”

2.4.8. “Target relatively stable species”

2.4.9. “Scientific management” (justifies regulatory risk to species)

3. Disregard through ecological arguments and rhetoric

3.1. Continuing belief in ecosystem stability

3.2. Disregard through neo-equilibrium theories

3.2.1. Resilience

3.2.2. Patch dynamics

3.5.12. “Natural succession”

3.5.13. “Community”

3.5.14. “Conservation biology” (as the study of anthropogenic harm)

3.5.15. “Evolution” (as a goal furthered by limiting human action)

3.5.16. Evidence of ecosystem instability is inconclusive

4. Disregard through other demonization, idolization, and idealization

4.1. Disregard through personal attack

4.2. Disregard through misinterpretation of Leopold’s land ethic

4.3. Disregard through idealization of regulatory agencies

4.4. Disregard through demonization and idealization of private landownership

4.4.1. “Speculation is wrong”, and other demonization of private landownership

4.4.2. Demonization of private landowners

4.4.3. Idealization of conservation-minded landowners

5. Disregard through containment of dissent

5.1. “Political ecology has waning influence”

5.2. Containment through omission and exclusion

5.2.1. “Best available science” (omitting social science)

5.2.2. Containment by omitting mention of innovation in regulation

APPENDIX B

FIELD NOTES, PART 2: GLOSSARY

1. Introduction

I developed this glossary in the course of writing this work, to identify and distinguish often conflicting meanings of related terms. I include this glossary here as field notes, hoping it might help readers understand this work; help identify potential areas for future research on related discourse; and help clarify discussion regarding public policy to conserve species, especially those whose survival depends on actively managing private land. To better serve these ends, I include some related terms that I examined in the course of this research but do not mention in the body of this work.

I see a need for such clarification for three reasons. First, recognition of disequilibrium ecology has made many previous ecological and conservation terms ambiguous or incoherent. Second, as I argue in this work, actors — whether intentionally or not — often exploit such ambiguity in ways that obscure political claims and by extension the risk they pose to species. Third, facilitating such use, many of these terms involve concepts that span disciplines.

In this glossary, I use the terms "obsolete" and "archaic" to indicate terms or definitions that disequilibrium ecology has rendered incoherent ("obsolete") or that have been widely by abandoned for other reasons ("archaic").

This glossary may contain errors and should be considered a work in progress.

2. Definitions

active destruction: Actively eliminating a species or associated habitat to minimize a real or perceived risk of incurring land-use regulation based on its presence, whether before or after such regulation is adopted for the species (Brook, Zint, and De Young 2003).

actor: (As used here) An individual or organization; (game theory) a player.

adaptive capacity: 1. The theorized ability of an ecosystem to remain within a given state (or limited set of recurring states) despite changing conditions (Gunderson, Pritchard, et al. 2002, 264; Gunderson and Walters 2002, 167). **2.** The theorized ability of an ecosystem to change in response to an unprecedented change in environmental conditions (Craig 2010). ***Usage notes:*** **1.** Actors can use this term to obscure regulatory risk to species, by implying (under definition 1) that ecosystems tend to persist if undisturbed by humans, or (under definition 2) that ecosystems can persist by adapting to any environmental change, in the same way that species adapt through evolution or organisms adapt through learning. **2.** Definition 2 is tautological; no matter how an ecosystem changes, the outcome can always be called an "adaptation", even if the ecosystem comes to be populated solely by invasive exotic species. ***Historical note:*** At least one actor (Craig 2013, 89–90(?), quoting Mitchell [2011], 13) has used this term to impute organismic qualities to ecosystems, by claiming that as "complex adaptive systems", ecosystems "adapt ... to improve their chances of survival or success ... through learning or evolutionary processes". It is unclear what the actor concluded this implies for governance to conserve species; elsewhere (Craig

and Benson (forthcoming), the actor cited Benson (2012), who recognized that "many species are ... 'conservation-reliant' ... and will require continuing intervention...", but who argued that "without more rigorous ESA enforcement, incentives to engage in habitat conservation by private individuals will remain weak".

agency: (As used here) A governmental organization, especially one with authority and duty to interpret and enforce statutes by adopting and enforcing administrative rules.

alienability: The power to dispossess oneself of property, such as to sell it, or to abandon it to prevent it from becoming a burden. See usage note at *property rights*.

amenity: (As used here) A desired, nonextractable quality of land, such as scenery or species that are legally protected from harvest.

assurance: (As used here) Regulatory assurance.

balance: 1. *Balance of nature* definition 1. **2. a.** To avoid, minimize, or mitigate destruction of native species or habitat through human action, such as under a Habitat Conservation Plan. **b.** To compromise between using land for conservation and using land in ways that conflict with conservation (e.g., Harte 1997, 383, citing Babbitt 1997; Benton County 2010, 1). ***Usage note,*** Actors can use this term to obscure regulatory risk to species, by allowing use under definition 2 to mean definition 1.

balance of nature: 1. (Obsolete) A theory that species populations tend to persist if undisturbed by humans; *equilibrium ecology* definition 1. **2.** The tendency of some species populations to persist where real or assumed conditions provide such stability, such as in the absence of invasive exotic species. ***Usage note:*** Actors can use this term to disregard regulatory risk to species by allowing use under definition 2 to mean definition 1.

biodiversity: The variety of life, including diversity between and within species.

biome: The plants and animals within an area (Tansley 1935, 306). See usage note at *biotic community*.

biotic community: 1. The populations of some or all species in a given area (Diamond and Case 1986, ix). **2.** (Obsolete) Such populations, conceived of as an organism or as having the properties of an organism, including the tendency to maintain themselves in a stable state (Phillips 1935, cited in Tansley 1935, 295; cf. Allee, Emerson, Park, Park, and Schmidt 1949, 728, cited in Egerton 1973, 344). ***Usage note:*** Actors can use this term to obscure regulatory risk to species, by allowing use under definition 1 to mean definition 2. ***Historical note:*** Believing plants and animals are too dissimilar to form a single community, Tansley (1935, 304, 306) proposed replacing this term with *biome*.

BLM: Abbreviation for US Bureau of Land Management.

Candidate Conservation Agreement: (US law) **1.** (Plural) A program like the CCAA program but for federal landowners only. **2.** Such an agreement.

Candidate Conservation Agreement with Assurances: (US law) **1.** (Plural) An exception program under the ESA through which USFWS can grant nonfederal landowners authority for incidental take of one or more species in return for agreeing to proportionately take sufficient action to ensure the species never become listed. **2.** Such an agreement.

carrot and stick: (Informal) The use of rewards and punishments to motivate actors to behave in a desired way. ***Usage note:*** Actors can use this phrase (or just the term *stick*) to disregard regulatory risk to species, by implying that like a stick behind a beast of

burden, regulation can drive individuals only to act as intended, obscuring that some types of regulation might in effect place the stick in front of the beast and serve to drive it backward.

case study: A collection of observations from a specific and usually local context, often over a period of time, normally to answer or inform one or more research questions, such as to suggest new research questions or theories of causation for observed phenomena (Yin 2009).

CCA: Abbreviation for Candidate Conservation Agreement.

CCAA: Abbreviation for Candidate Conservation Agreement with Assurances.

CEQA: Abbreviation for the California Environmental Quality Act of 1970.

chaotic: (As used here) Unpredictable at any scale. See usage note at *stochastic*.

Clementsian ecology: Equilibrium ecology as theorized by Clements (1905; 1916; 1936). See historical note at *ecosystem.*

climax ecology: (Obsolete) Equilibrium ecology as theorized by Clements (1905).

climax formation: (Obsolete) The final, stable state of an ecosystem as theorized by Clements (1905, 1916, 1936). See historical note at *ecosystem*.

coalition: (As used here) A population of humans sharing a common interest, as in seeking benefits from species-based land-use regulation, not necessarily coordinating actions with each other; advocacy coalition (Hajer 1995); faction (Madison 2008 [1787]).

common-pool resource: A resource managed under a common-property regime (Tietenberg and Lewis 2012, 28). ***Usage note:*** Bromley (1991, 22) advocated abandoning this term in favor of *common-property regime*, to avoid confusion

between common-pool resources that are managed under a common-property regime and (as used by some) those that are not.

common-property regime: Community ownership of a resource (such as land for grazing) with formal or informal rules set and enforced by a community (such as a government) to govern its use (Bromley 1991, 2; Tietenberg and Lewis 2012, 28). ***Usage note:*** Actors have confusingly used this term to refer to open-access property regimes, which by some definitions (as in this work) lack any such controls (Bromley 1991, 22). See usage note at *common-pool resource*.

communicative planning: 1. A theory that actors especially with conflicting interests can sometimes further their interests by perceiving problems or solutions in new ways through discussion with each other (Innes 1998). **2.** The conduct of such discussion, as through public hearings on regulatory decisions, through scientific discourse, or between research subjects.

condemnation: Compensated governmental action reducing private ownership of property, such as by seizing fee simple ownership of land or by prohibiting particular land uses through regulation while paying the landowner for consequent loss.

confiscatory regulation: (Informal) Regulation that imposes restrictions or liability for exactions without compensation. ***Usage note:*** This term might be seen as inflammatory, by emphasizing the adverse effect of regulation on regulated individuals and not any benefit it might provide to the public. In contrast, at least some contexts (such as hunting imperiled species), one might argue that private property rights do not exist where they conflict with the public interest and so cannot be confiscated.

conflicting use: (Goal 5) Human uses harmful to the value of land as wildlife habitat or other publicly desired natural resource.

Congress: (US law) The legislative body of national government.

conservation: 1. To conserve. **2.** The intended result of actions to conserve.

conservation banking: Mitigation banking based on the presence of species or associated habitat, as under the ESA (e.g., Bean, Kihslinger, and Wilkinson 2008).

Usage note: Actors can use this term to obscure regulatory risk to species, by indiscriminately implying that such programs reward landowners for conservation, such as by ignoring the loss landowners incur from liability for mitigation (for example, due to existing populations of targeted species).

conservation biology: Scientific study of the loss and preservation of biodiversity.

Usage note: Actors can use this term to obscure regulatory risk to species, by indiscriminately equating the preservation of biodiversity with limiting human action. E.g., cf. Odenbaugh (2003, 55) describing conservation biology as seeking "to better understand the nature and rate of anthropogenically caused mass extinctions", and Pickett, Parker, and Fiedler (1992) describing conservation biology as studying limits.

conservation easement: A legal agreement intended to conserve species or other desired qualities of land by restricting conflicting land uses.

conservationist: (As used here) A person that seeks to preserve, maintain, or increase nonextractive benefits from the environment, such as scenery, native species, or ground water, such as by limiting human action or actively controlling invasive exotic species.

conservation market: 1. A regulatory market for designated species or associated habitat. **2. a.** A free market for such species; a qualified free market. **b.** A free market for any species.

conservation-reliant: 1. (Scott et al. 2005; Scott et al. 2010; Bocetti, Goble, and Scott 2012; Goble et al. 2012) Maintenance-dependent, such as requiring active management of habitat or active assistance with migration. **2.** (Schwartz 2008, 294) Designation of a species as perpetually protected from conflicting land-uses throughout its remaining habitat, when low populations or lack of habitat preclude the species from "recovering" as defined under the ESA. ***Historical note:*** Scott et al. (2005) introduced this term in part to propose legally binding agreements ensuring perpetual, active maintenance of a species as a strategy to meet the ESA's goal of "recovering" species, which by definition supposes that once threats are removed, species can survive without the measures provided by the ESA. ***Usage note:*** Actors can use the term *conservation-reliant* in two ways to obscure regulatory risk to species. First, actors can tacitly construe *conservation* according to the definition of *conserve* under the ESA, thereby implying that regulatory authority and duty under the ESA always helps or at least never harms species; see *conserve* definition 3a. Second, regulators could use *conservation-reliant* definition 2 to declare species-based land-use regulation successful in conserving a maintenance-dependent species without providing for any measures to maintain its habitat.

conserve: 1. (As used here except where noted) To retain, maintain, or enhance passive benefits from land, notably including biodiversity and scenery. **2.** (Hypothesized) Doing so solely by limiting human action; preservation. **3.** (US law) **a.** "To use all

methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act [the ESA] are no longer necessary" (ESA §3(3)). **b.** (Habitat Conservation Plans) To minimize and mitigate harm to a species or its habitat from land use (ESA §10(a)(1)(B)). ***Usage notes:*** **1.** Definition 1 allows for conservation to potentially include limiting human action, providing active management, and/or increasing the population of a species or other desired quality of land to some presumed sustainable level. **2.** Actors can use this term to obscure regulatory risk to species, by allowing use under definitions 2, 3a, or 3b to mean definition 1, thereby indiscriminately implying that limiting or prohibiting human action improves the fate of species. Definitions 3a and 3b facilitate such use insofar as funding and perceived regulatory authority and duty constrain measures provided by the ESA to limiting human action.

cooperation: See usage note at *landowner cooperation*.

counternarrative: A description of a problem and its solution in a way that conflicts with another proposed explanation and solution (Roe 1994).

critical habitat: (US law) Areas determined or determinable by USFWS to be essential to the survival of a species listed under the ESA as threatened or endangered.

density bonus: Relaxation of regulatory land-use restrictions in return for conservation easements or other concessions from a landowner, such as to reduce disturbance on the property by clustering any new buildings.

despotism: Tyranny.

developer: A typically private individual or organization that seeks to profit from purchasing land and converting it for more intensive human use, such as constructing

residential housing or golf course in what is presently habitat for native wildlife species.

development: (As used here) Conversion of land for human use, such as for agriculture or residential dwellings. ***Usage note:*** Some authors define development to exclude conversion for agricultural use. For simplicity in this work, I omit this distinction.

discourse: 1. (As used here) Verbal or written expression, especially when explicitly or implicitly expressing preferences regarding a particular issue. **2.** A "specific ensemble of ideas, concepts, and categorizations that is produced, reproduced, and transformed into a particular set of practices and through which meaning is given to physical and social realities" (Hajer 1995, 60); labeling.

discourse analysis: (As used here) Interpretive discourse analysis; frame analysis; interpretive policy analysis (Roe 1994); argumentative discourse analysis (Fischer 2003). ***Usage note:*** For simplicity and brevity, in this work, I use *discourse analysis* to mean interpretive discourse analysis (Hajer 1995), versus any other types of discourse analysis, such as purely statistical analysis of word use.

disefficiency: (Economics) The quality or measure of something being counterproductive to its purpose; negative efficiency.

disequilibrium ecology: 1. A theory that ecosystems are thermodynamically open and far from equilibrium, so that their present state often depends on their history, and their future state tends to be unpredictable over space and time (Gleason 1917; 1926; Botkin 1990; Odum 1992; Pickett, Parker, and Fiedler 1992; Zimmerer 1994; Adams 1997, 286; Jelinski 2005, 285 ["Nature is dynamic and highly variable with open-ended trajectories contingent upon preceding events"]; Wallington et al. 2005; Blandin

2011; Tarlock 2010, 11). **2.** The practice of ecology with recognition of such a theory.

Historical notes: **1.** As defined here, disequilibrium ecology has also been called patch dynamics (Pickett, Parker, and Fiedler 1992, 72), the new ecology (sensu Zimmerer 1994; Scoones 1999; Pritchard and Sanderson 2002, 149–150), the nonequilibrium paradigm (sensu Zimmerer 2000), and the flux of nature paradigm (sensu Ladle and Gillson 2009). **2.** This definition differs from theories that assume that ecosystems or species populations are typically stable (whether within a single state or a limited set of historically recurring states) when undisturbed by humans or other extreme forces and when considered at a large enough scale of space or time. Such other theories include resilience (Gunderson, Pritchard, et al. 2002b, 259) and some interpretations of patch dynamics (sensu Pickett and Thomson 1978; White and Pickett 1985), the flux of nature paradigm (sensu Meyer 1994), the new ecology (sensu Pritchard and Sanderson 2002, 150–151), and the nonequilibrium paradigm (sensu Mori 2011). **3.** Disequilibrium ecology has increased recognition that species populations do not necessarily persist in the absence of disturbance by humans. In contrast, for example, while Tansley (1935) theorized that ecosystems are "extremely vulnerable" to destabilization from internal forces or from invasion by external components (301), he hypothesized that ecosystems generally tend to arrive at a state that is stable (300, 306), at least relative to human observation (302). **4.** Disequilibrium ecology has coincidentally also increased recognition of the historic influence of human action in maintaining ecosystems or species populations, such as through periodic burning by Native Americans (e.g., Botkin 1990). For example, Clements (1936, 262–264) theorized that recurring fire had maintained populations of some species in the US (as

a "fire subclimax"), but he dismissed burning by Native Americans, as relatively insignificant (253). In contrast, disequilibrium ecology has been summarized as viewing nature as "dynamic, chaotic, and humanized" (Fischer 2006, 221, citing Botkin 1990 and Turner 1994). Also see historical note at *ecosystem.*

disincentive: An incentive that discourages an action, such as by reducing its payoff.

DLCD: Abbreviation for Oregon Department of Land Conservation and Development.

due process: (US law) **1.** A right under the 5th and 14th Amendments to the US Constitution, or the US Administrative Procedure Act or equivalent state law for individuals to be free from governmental action that takes life, liberty, or property without adequate reason or fair proceedings (Chemerinsky 2006, 545). **2.** A right under the National Environmental Policy Act for citizens to ensure that federal agencies appropriately consider potential environmental impacts when deciding on an action. Also see *procedural due process* and *substantive due process*.

dynamic ecology: 1. (Archaic?) Clementsian ecology (Adams 1997, 282, citing McIntosh 1985, 77). **2.** The study of ecosystems whose state can change, especially when such change is recurring or gradual (cf. Tansley 1935, 304). **3.** Disequilibrium ecology (Zimmerer 1994, 109). See usage note at *dynamic ecosystem.*

dynamic ecosystem: 1. An ecosystem whose state can change. **2. a.** An ecosystem subject to some recurring disturbance, such as wildfire, such that its state can be predicted at some scale of space or time; *patch dynamics* definition 2. **b.** (Clementsian ecology; archaic) An ecosystem that changes through a series of inherent, predictable states. ***Usage note:*** In light of disequilibrium ecology, which views ecosystems as potentially open and unpredictable, definition 1 is redundant with the definition of

ecosystem. **2.** Actors can in theory use this term to obscure regulatory risk to species, by allowing use under definition 1 to mean definition 2a or 2b. Also see historical notes at *ecosystem*.

dynamic equilibrium: 1. (Thermodynamics) A condition of a system such that its state remains constant only because reversible changes are continuously canceled by others, as when evaporative loss of water is balanced by precipitation. **2.** (Ecology) A condition of an ecosystem such that its state remains constant only because any changes are continuously canceled by others; steady state. See usage note at *equilibrium*.

ecological dynamics: An ecological process sufficient to change the state of an ecosystem. See usage note at *dynamic ecosystem*.

ecological process: 1. A nonhuman biological, chemical, or physical interaction that has contributed or contributes to a typically desirable state of an ecosystem. **2.** Such interactions additionally including actions by humans, such as periodic burning by Native Americans. ***Usage note:*** Actors can use this term to obscure regulatory risk to species, by allowing use under definition 2 to mean definition 1, thereby implying that ecosystem states do not depend on human action.

ecology: The study of the relation of organisms to each other and their environment, typically in terms of the distribution and abundance of species (cf. Borden 2008, 95).

ecosystem: 1. (As used here except where noted) An area typically delineated by the presence of one or more particular species or geophysical features, together with the living organisms within that area and the environmental qualities with which they interact (cf. Tansley 1935, 299–300; Levin 1992, p. 1960, citing Whittaker 1975;

Likens 1992, 9; Noss, O'Connell, and Murphy 1997, xvi; Likens 1998, 248). **2.** (Archaic?) Such organisms and environmental qualities when "relatively stable" (Tansley 1935, 306). ***Historical notes:*** **1.** Tansley (1935) introduced the term *ecosystem* to represent the species and their environment in a geographic area without implying that together, these elements together constituted an organism, as Clements had theorized and represented with the term "plant formation" (Clements 1905; 1916; 1936; cf. Tansley 1935, 290, citing Clements 1916). **2.** As reflected in definition 2, Tansley (1935) expressly assumed that ecosystems (and all other systems, including solar systems and atoms) develop from "incipient" stages to arrive at a stable state, due to a presumed "universal tendency to the evolution of dynamic equilibria" (300, 306). Like Clements (1916, 1935), Tansley also assumed that ecosystems are often inherently discernable (291, 300) and tend to approach their stable state through discernable phases (286, 306). Tansley nevertheless allowed that relative to other types of systems (such as solar systems and atoms), ecosystems are "extremely vulnerable" to destabilization from external or internal forces (301) and might always be changing (302), though slowly, relative to the timescale of human civilizations (id.). **3.** In contrast to Clements and Tansley, but consistent with definition 1, Gleason (1917; 1926) concluded that ecosystems (as "plant associations") lack inherent boundaries and predictable trajectories and are instead delineated arbitrarily and tend to change chaotically. **4.** Illustrating the persistence of definition 2, a USFWS document recently defined the term *ecosystem* as "A discrete unit that consists of living and nonliving parts, interacting to form a stable system" (USFWS 2010a, 95). **5.** Tansley (1935) expressly allowed for ecosystems to include humans (303–304). In recognizing the

potential role of human agency, Tansley did not imply that humans have special rights or privileges over other species; instead, he cautioned that humans are increasingly destroying ecosystems that he conceived of as preceding human influence (303).

Usage notes: 1. Within definitions 1 and 2, scholars variously define *ecosystem* to include only the organisms within an area (e.g., Fleishman et al. 2011, 292) or also some or all aspects of their environment (e.g., Tansley 1935, 304; Likens 1998, 248). **2.** Actors can use the term *ecosystem* to obscure regulatory risk to species, by allowing use under definition 1 to mean definition 2, thereby implying that species populations tend to persist in the absence of disturbance by humans. Also see usage notes at *resilience* and *patch dynamics*.

ecosystem autonomy: A theory that some ecosystems are relatively capable of maintaining themselves if freed from harmful outside influences (including fire suppression), especially when protected in areas sufficiently large (Pulliam and Johnson 2002, 73–74). ***Historical note:*** As reflected in Pulliam and Johnson (2002), this term interprets disequilibrium ecology as implying that conservation efforts should focus on ecosystems that are relatively stable. ***Usage note:*** Actors could in theory use this term to disregard regulatory risk to species by implying that all ecosystems tend to be self-maintaining. In contrast, Pulliam and Johnson (2002, 79) cautioned that planners should consider the needs of particular species and the potential effects of particular actions in particular contexts.

ecosystem dynamics: Ecological dynamics. See usage note at *dynamic ecosystem.*

ecosystem memory: 1. A theorized capacity of an ecosystem allowing it to return to a previous state (Gunderson, Pritchard, et al. 2002, 264). **2.** The influence of history

(such as past land uses or the presence of dormant seeds) as reflected in the present state of an ecosystem or other geographic area, sometimes with the potential to influence its future (such as through the presence of dormant seeds) (Pulliam and Johnson 2002, 71–72). ***Usage note:*** Actors can use definition 1 to disregard regulatory risk to species by allowing use under definition 2 to mean definition 1, thereby implying that ecosystems are self-maintaining or otherwise have the qualities of an organism. See usage note at *ecosystem autonomy*.

ecosystem process: Ecological process.

ecosystem service: 1. A quality of the environment that benefits humans, such as fresh water, oxygen, or biodiversity. **2.** Such a quality derived from an environment that is conceived of as threatened only by human action and that presumably persists without it. ***Usage note:*** Actors can use this term to obscure regulatory risk to species, by allowing use under definition 1 to mean definition 2, such as by defining ecosystem services as benefits supplied by nature, thereby implying that species tend to persist if undisturbed by humans. (See usage note at *nature*.)

ecosystem service market: 1. Any social arrangement that allows willing actors (buyers) to pay willing landowners (sellers) for providing an ecosystem service. **2.** Such an arrangement where landowners have perfect rights to the ecosystem service, including the right of excludability; a free market. **3.** Such an arrangement where government instead seeks to constrain landowners' right of excludability through regulation, by imposing liability for mitigation for reducing the supply of the ecosystem service, as for wetland mitigation banking under the US Clean Water Act or species-based mitigation banking under the ESA. ***Usage note:*** Actors can use this term to obscure

regulatory risk to species, by allowing use under definitions 1 or 2 to mean definition 3, thereby indiscriminately implying that a regulatory market turns an ecosystem service into an asset for private landowners, without revealing that the underlying regulatory scheme can turn the ecosystem service into a liability for them, as when listing a species under the ESA imposes liability for mitigation based on the presence of existing populations of the species. This ambiguity often hinges on confusion over whether buyers in an ecosystem service market pay for an existing ecosystem service (as for an existing wetland or an existing population of a species) or only for an increase in that service (as for creating new wetlands or increasing the population of a species), sometimes referred to as *uplift*. Also see usage note at *payment for ecosystem services*.

efficiency: (Economics) **1.** The quality or measure of achieving a goal without waste. **2. a.** A change (as in public policy) that reduces waste in achieving a goal. **b.** (Game theory) An action that benefits some or all actors without harming others, relative to other available actions; Pareto efficiency. ***Usage note:*** Economists and game theorists distinguish between a true Pareto efficiency, which directly benefits some or all actors with losses to none, and a potential Pareto efficiency, which benefits one or more actors enough for them to compensate all others for any losses and to still come out ahead.

empirical: Based on observable phenomena, rather than purely theoretical reasoning. ***Usage note:*** This work presumes empirical evidence can be quantitative or qualitative. It is unclear how widely researchers share this view. For example, in characterizing evidence that species-based land-use regulation can harm species, Ferraro et al. (2007,

246, citations omitted) distinguished empirical evidence from anecdotal evidence ("[T]there is anecdotal, theoretical, and empirical evidence that the Act encourages landowners to preemptively harm species and their habitat"). From the examples cited by Ferraro et al., it is unclear whether this distinction hinges on the use of quantitative (versus qualitative) evidence or on peer-reviewed recognition of qualitative evidence (e.g., from case studies).

Endangered Species Act: 1. US Endangered Species Act of 1973. **2.** A similarly named act under state law, such as the Oregon Endangered Species Act. ***Usage note:*** Except where noted, I use this term to mean the US Endangered Species Act of 1973 as presently amended.

enhance: 1. Maintain. **2.** Restore. ***Usage Note:*** Actors can use this term to obscure regulatory risk to species, by allowing use under definition 1 to mean definition 2, thereby implying that species persist in the absence of disturbance by humans.

environment: The physical world. ***Usage note:*** For simplicity in this work, I define *environment* to exclude living organisms.

equilibrium: 1. (Ecology) Stable landscape conditions, such as populations of species. **2.** (Thermodynamics) A condition of a closed system such that its characteristics remain unchanged (Nash 1971). ***Historical note:*** Perhaps inadvertently, by introducing the term *ecosystem* as a "relatively stable dynamic equilibrium", Tansley (1935, 306) implied that ecosystems are closed systems. In thermodynamics, a system at equilibrium is by definition a closed system, whereas a real-world ecosystem is an open system, since matter and energy flow through any real landscape (Odum 1992).

equilibrium ecology: 1. (Obsolete) **a.** A theory widely attributed to Frederic Clements which held that ecosystems are "organisms" (Clements 1916, 1) or "complex organism[s]" (Tansley 1935, 297, citing Philips 1934, 1935a, 1935b; Clements 1936, 16) and normally develop through predictable and successive stages to reach a final, pre-determined, self-maintaining state, called the climax; climax ecology (Clements 1905; 1916; 1936); Clementsian ecology. **b.** A theory that over time, ecosystems generally tend to arrive at a relatively unchanging state unless sufficiently disturbed by external forces (cf. Tansley 1935; Odum 1969), typically through a repeatable sequence of discernable stages unique to local conditions (e.g., Tansley 1935). **c.** (As used here) A theory that species populations tend to persist in the absence of disturbance by humans. **2.** The practice of ecology assuming such theories. ***Usage notes:*** **1.** Definitions 1a and 1b are potentially confusing in that some definitions of *ecosystem* assume that ecosystems are stable (e.g., Tansley 1935). **2.** Definitions 1a and 1b differ in that the first attributes the stability of ecosystems to their properties as actual organisms, whereas the latter attributes such stability to the laws of thermodynamics and/or sometimes theories of "emergent properties" (Pritchard and Sanderson 2002, 148, citing others; Salt 1979, citing others). **3.** Definition 1c seeks to represent the characteristics common to definitions 1a and 1b while avoiding confusion from the term *ecosystem*. Also see historical notes at *ecosystem*.

ESA: Abbreviation for Endangered Species Act. See usage note at *Endangered Species Act.*

exaction: Payment of fees or other goods or services, potentially including dedication of land or land use rights, in return for governmental permission to undertake an action otherwise prohibited by law.

excludability: (Economics). The power to prevent others from benefiting from a resource; exclusivity. See usage note at *property rights*.

exclude: (Economics) To prevent others from benefiting from a good or service.

exclusivity: (Economics) Excludability.

externality: See *regulatory externality*.

fairness: The perception that benefits or harms are distributed justly, as from governmental action. ***Usage note:*** Actors can use this term to obscure regulatory risk to species by narrowly framing concern about species-based land-use regulation as a question of the fair distribution of its costs and benefits between humans, without considering its potential to harm species (e.g., Sagoff 1997; Babbitt 2005; Sax 2005; Tarlock 2006; Wyman 2008; Sax 2010; Anderson and Watson 2012).

fire exclusion: Prohibiting or refraining from burning, such as by Native Americans prior to European settlement.

fire suppression: 1. Policy or action by humans to prevent or extinguish spontaneously occurring fire, such as from lightning. **2.** Such policy or action additionally including fire exclusion. ***Usage note:*** Actors can use this term to obscure regulatory risk to species, by allowing use under definition 2 to mean definition 1, thereby implying that burning essential to species will continue without human action.

frame: A system of belief, typically defining a problem and rationalizing a solution for it, often serving the believer's interests (Hajer 1995; Shmueli 2008); framing. ***Usage note:*** A frame is not necessarily distorted; cf. *labeling*.

frame analysis: Characterization of an actor's beliefs especially as they embody preferences, typically to categorize conflicting views and to identify opportunities for efficiencies, such as by clarifying preferences or identifying new actions (Hajer 1995; Kauffman and Smith 1999; Shmueli 2008); interpretive policy analysis; discourse analysis.

framing: 1. A frame. **2.** Creating, expressing, or believing in a frame.

free market: (Environmental economics) A system of law implicitly or explicitly allowing actors to buy or sell particular environmental benefits (such as habitat for an imperiled species) without selectively incurring legal penalties for refraining from doing so (Anderson and Leal 2003, 4).

free-market environmentalism: A theory that when property rights are clearly defined, enforced, and transferable, private ownership can address some environmental problems more efficiently than can regulation or behavior-based taxation (Anderson and Leal 2003, 4–8). **Usage note:** As defined by Anderson and Leal (id.), free-market environmentalism differs from libertarianism in the scope of contexts in which free markets are believed to provide greater socially efficiency than regulation or taxation.

game management: 1. (Archaic) The study or practice of conserving species through applied ecology (Leopold 1986 [1933]); conservation biology; wildlife biology. **2.** Such study or practice limited to species subject to harvest for human use.

game theory: Mathematical modeling of decision making based on the existence of one or more players (actors) each with a choice of possible actions and with preferences for choosing between these actions, as ranked by their payoff, where each actor seeks to maximize his or her payoff, especially where the payoff to one actor depends on choices made by other actors.

Goal 5: (Oregon law) A statute and associated rules giving local governments a duty and authority in part to periodically consider "protect[ing] natural resources and conserv[ing] scenic and historic areas and open spaces" (OAR 660-015-0000(5)), where "natural resources" include "wildlife habitat" (OAR 660-015-0000(5)), and "protect" means to "limit or prohibit" "conflicting uses" of land (OAR 660-023-0010) through "regulations" (OAR 660-023-0050).

Growth Management Act of 1990: (Washington law) A statute granting local governments a duty and authority to limit land-use through regulation to protect the environment and other qualities of life from uncoordinated and unplanned growth, with goals that include the conservation of open space and "critical areas" of wildlife habitat (RCW 36.70A). ***Usage note:*** In this work, I refer to this statute and any associated rules as presently amended.

habitat: 1. A collection of plant species and/or biophysical conditions on which an animal species depends to some degree for its survival. **2.** Land with historically native species. ***Usage note:*** In conservation discourse, historical emphasis on animal species makes the term *habitat* confusing when referring to land-use regulation based on the presence of plant species. To avoid this confusion when referring to species that might

be plant or animal, in this work, I generally use the term "species or associated habitat".

habitat conservation banking: Conservation banking.

Habitat Conservation Plan: (US law) **1.** (Plural) A USFWS program granting nonfederal landowners limited authority to incidentally take (harm or destroy) species otherwise protected by the ESA, in return for an agreement by the landowners to minimize or mitigate such take to the maximum extent practicable, such as by paying mitigation fees or yielding conservation easements, under terms set by USFWS (ESA §10(a)(1)(B)). **2.** Such an agreement. ***Usage note:*** Following Tarlock (2001), I capitalize this term, to distinguish such agreements from other types of conservation plans.

Habitat Mitigation Policy: (Oregon law) An administrative rule (OAR 635-415) empowering the state to impose liability for mitigation fees or other exactions for harm to a species when such power is authorized by another statute (as under the US ESA).

harm: (US law) Actions destructive to wildlife, including "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering" (16 USC §1540b).

HCP: Abbreviation for Habitat Conservation Plan.

hegemonic: (As used here) Dominating the thought and/or practices of a human population, especially when reflected in social rules or reproduced by those whose interests it harms (cf. Gaventa 1982, 11–13; Mezirow 1991, 131; Hajer 1995, 60–61; Adger et al. 2001, 685; Pritchard and Sanderson 2002).

impact analysis: (Economics; planning) Qualitative assessment of the costs and benefits from an action, through unquantified identification of relevant effects.

incentive: 1. A payoff or potential payoff that rewards or penalizes some behavior. **2.** Positive incentive. **3.** Regulatory incentive. See usage note at *regulatory incentive*.

incidental harm to species: Incidental take.

incidental take: (US law) Harm to a listed species in violation of ESA section 9 resulting from and not the purpose of otherwise lawful activity, such as clearing of land for dwellings or agriculture.

individual: (As used here) **1.** Any nongovernmental entity, such as a person or corporation. **2.** A specimen of a nonhuman species.

inefficiency: (Economics) The quality or measure of waste in achieving a goal.

interpretive discourse analysis: Identifying logical interpretations of language in policy or related communication, especially to identify hidden assumptions or implied prescriptions, often by referring to empirical evidence, usually to inform policy decisions, such as by clarifying actors' preferences or identifying new possibilities for action (Hajer 1995; Fischer 2003; cf. Yanow 2000). ***Usage note:*** With some minor variations in meaning or context, scholars have referred to interpretive discourse analysis as interpretive policy analysis (Yanow), frame analysis (Gasper and Apthorpe 1996), narrative policy analysis (Roe 1994), argumentative discourse analysis (Fischer), and mythic criticism (Peterson and Horton 1995).

interpretive policy analysis: Interpretive discourse analysis of language related to policy.

labeling: (Sociology) The expression of preferences, especially by a dominant force or authority, through language or social arrangements, typically implying but obscuring beliefs in right and wrong or good and bad, often through a single word or short phrase (Becker 1966); framing that rests on demonstrably false or questionable beliefs. ***Historical note:*** Leach and Mearns (1996, 7) referred to labeling in explaining the expression of environmental orthodoxy. ***Usage notes:*** **1.** For simplicity in the context addressed by this work, one might relax Becker's definition to include labeling by any actor, not just by a dominant force. **2.** In introducing the term *labeling*, Becker did not distinguish between a dominant force controlled by a minority and one controlled by a plurality.

landowner: (As used here) An actor (such as a citizen or municipal government) that possesses a fee-simple interest in land.

landowner cooperation: 1. Action undertaken by a nonfederal landowner without risk of incurring harm for doing otherwise; voluntary action. **2.** Such action undertaken to avoid incurring species-based land-use restrictions or liability for mitigation fees, as under ESA Habitat Conservation Plans, Safe Harbor Agreements, or Candidate Conservation Agreements with Assurances. ***Usage note:*** Actors can use this term to obscure regulatory risk to species, by allowing use under definition 1 to mean definition 2, thereby obscuring regulatory risk to landowners.

land use: (As used here) Active or passive benefit from land, such as through agriculture, human residence, or conservation of scenery or biodiversity.

land-use planning: 1. Land-use regulation (Theobold 2007). **2.** The use of land-use regulation or other usually governmental means to allow or encourage desirable land

uses and prohibit or otherwise discourage undesirable land uses. ***Usage note:*** Actors can use this term to disregard regulatory risk to species by allowing use under definition 2 to mean definition 1.

land-use regulation: Governmentally imposed land-use restrictions or liability for exactions for exemption from such restrictions.

law: (US) Governmental rules determined by constitution, statute, or administrative decisions, and/or their interpretation by a court.

LCDC: Abbreviation for Oregon Land Conservation and Development Commission.

lexicographic preference: (Economics; game theory) A preference so strong that an actor will not trade an action for another even with compensation (Spash and Hanley 1995). ***Historical note:*** Spash and Hanley (203) used this term to characterize the preference of individuals who were unwilling to trade away the preservation of biodiversity (however individuals understood it) for any price.

libertarianism: (Economics) **1.** A political philosophy holding that except for relatively few services such as national defense or systems of justice, when property rights are clearly defined, enforced, and transferable, private ownership of goods and services provides greater social benefit than when such goods and services are publicly owned or controlled through regulation or taxes. **2.** Belief in such a philosophy.

list: (US law) To formally designate a species or distinct population under a specific category of imperilment under the ESA, with the categories of threatened and endangered automatically triggering land-use restrictions based on the presence of the species.

maintain: To actively manage land through human action to further the survival of particular species or the persistence of associated habitat, such as by physically removing invasive exotic vegetation.

maintenance dependent: Requiring active management by humans, such as to control invasive exotic species or reintroduce or simulate historic burning. ***Usage note:*** Maintenance dependence is not a fixed quality. For example, the increasing impact of invasive exotic species suggests that more species will become maintenance dependent over time (Scott et al. 2005; ten Brink 2011, 24–25).

market: (Economics) An often decentralized collection of buyers and sellers whose interactions determine the allocation of goods or services through voluntary exchange (Keohane and Olmstead 2007, 56). ***Usage note:*** A market may be a free market or a regulatory market.

Measure 37: (Oregon law) A successful state ballot initiative of 2004 that required state or local governments upon request to compensate private landowners for any regulatory land-use restrictions imposed after the owners purchased their land, or to waive such restrictions, with exceptions only for health and welfare (Walker and Hurley 2011). ***Historical note:*** This measure was subsequently modified by Measure 49, which substantially limited claims for compensation for past land-use regulation, but left intact the restrictions on new regulation (Walker and Hurley 2011, 112).

Measure 49: (Oregon law) A successful state ballot initiative of 2007 that limited the effects of Measure 37, by offering private landowners limited exemption from regulatory land-use restrictions imposed after the owners purchased their land, while requiring that landowners provide extensive evidence of harm to request such waivers,

but still requiring waivers or compensation for any new, subsequent land-use restrictions, with certain exceptions, including regulation required to comply with federal law (as under the ESA) or to protect public health or welfare (cf. Walker and Hurley 2011).

metanarrative: (Policy analysis) A characterization of a problem and its solution integrating two or more usually conflicting interpretations of the problem and its solution as proposed by others (Roe 1994).

mitigation banking: 1. A regulatory program authorizing individuals or organizations to collect and pool mitigation fees from landowners, such as through land-use regulation based on the presence of species or wetlands, and to use these fees for mitigation, such by constructing wetlands, actively maintaining wildlife habitat, or paying others to do so. **2.** Such a program also authorizing such fees to be used to acquire land through purchase, whether fee simple or for conservation easements (Bean and Dwyer 2000, 10537, 10546–10547, citing California law); preservation banking. See usage note at *conservation banking*.

mitigation fee: Payment required of a landowner by a government for permission for a land use that would otherwise be prohibited as harmful to the environment, typically calculated as the cost to compensate for that damage, such as by creating habitat equivalent to that which would be destroyed.

mitigation: (As used here) Payment, deed restriction, or other provision exacted from a landowner by a government for permission for otherwise prohibited harm to species or habitat.

moral economy: 1. A traditional system of mutual obligations influencing the exchange of goods or services outside of conventional market forces, as between poor peasants with traditional culture (Robbins 2012, 61–62, citing E.P. Thompson and James Scott; Hann 2010, citing Thompson and Scott). **2.** (As proposed by Hann 2010) Economic preferences not reflected by conventional markets, such as an individual's pride and enjoyment in maintaining native species. **Usage notes: 1.** Researchers have typically used the term to help explain conflict between capitalist policies and peasants or other poor classes (Robbins; Hann). In part citing evidence of economically irrational beliefs among some advocates of capitalism (Hann, 194–195), Hann proposed definition 2 to represent any preferences that contradict the notion of *homo economicus* (humans seeking to maximize their individual wealth), without restricting use of the term to preferences that are shared, traditional, or limited to particular political values. **2.** For economists, the distinction between conventional and moral economy is moot, insofar as economists can model the latter preferences like any other preferences.

narrative: Language describing a problem and prescribing its solution, usually by implying the existence of actors and motives, typically conveyed telescopically, as through a word or brief phrase (Roe 1994; Fischer 2003, 179); labeling; mythemes (Peterson and Horton 1995, citing Doty 1986).

narrative policy analysis: A method of interpretive discourse analysis that theorizes instances of language as describing a problem and its solution in terms of actors, conflict, and resolution, and which typically seeks to identify efficiencies by clarifying actors' preferences and offering alternative descriptions (or "metanarratives") of

problems and their solution, especially for problems characterized by complexity, uncertainty, and political polarization (Roe 1994).

native: (As used here) Historically occurring in a particular geographical area, such as in the a portion of the US prior to European settlement. ***Usage note:*** Whether a species is native is inherently arbitrary, insofar as the answer depends on one's choice of time scale. This distinction is also becoming blurred insofar as species come to depend on recently introduced species. For example, a Habitat Conservation Plan for the Taylor's checkerspot butterfly (a historically native species) recognizes an exotic plant species as an indicator of the butterfly's habitat, for the butterfly is known to lay its eggs solely on that plant species; the butterfly's historically native host plant is unknown and presumed extinct (Benton County 2010).

natural: (As used here) **1.** Created without human influence. **2.** Historically native to an area. See usage note at *nature*.

natural disturbance: A physical or biological disruption of the landscape by nonhuman forces, such as by flooding, disease, or lightning-caused fire. ***Usage note:*** Actors can use this term to obscure regulatory risk to species, by using the term to represent all historical disturbance of the landscape, thereby tacitly dismissing any historic management by humans, such as through periodic burning. Actors can generally make similar use of other terms referring to natural, such as *natural process*. Also see usage note at *nature*.

natural process: Ecological process. See usage notes at *natural disturbance* and *nature*.

natural range of variation: (Ecology) A theory that an ecosystem tends to persist in any of several stable states until change exceeding some threshold pushes the ecosystem to

another stable state or (if too great) to some new state, the latter with increased risk of species extinction (Holling and Meffe 1996, 328, 330, 332). See usage note at *resilience*.

natural succession: Succession. See usage note at *succession*.

nature: 1. (Game theory; physics) Chance; randomness. **2.** The biophysical world uninfluenced by humans (Passmore 1974, 5); wilderness. **3.** Biodiversity. ***Usage notes:*** **1.** Disequilibrium ecology has clarified that meanings 2 and 3 can conflict, such as where the survival of a species depends on active management by humans. Commenting that "Everyone with any brain knows ... that ecological management is essential in most wilderness areas and other reserves if we want to maintain biodiversity...", conservation biologist Reed Noss (1995, 60, 61) articulated the consequent ambiguity for the concept of nature by adding, "What is nature? Hell if I know." Because of this ambiguity, I strive in this work to avoid using the terms *nature* and *natural* except to note their use in discourse by others. **2.** Actors can use this term to obscure regulatory risk to species, by allowing use under definition 1 or 2 to mean definition 3, thereby implying that species persist when undisturbed by humans.

negotiation: To work through discussion with another toward mutual agreement, such as through compromise. ***Usage note:*** Actors can use this term to obscure regulatory risk to species by implying that regulators bargain with regulated parties in seeking species-based exactions (e.g., Sax 1997, 885; Yaffee 2006), whereas a regulator might perceive no reason to limit its demands (Breyer 1982, 179, 379) other than to avoid exacerbating political opposition to the underlying regulatory authority (Sagoff 1997).

neoliberal: Favoring use of markets and/or private ownership over use of governmental regulation and/or taxation, such as by allowing the trade of species-based mitigation fees instead of solely imposing species-based land-use restrictions (McCarthy and Prudham 2004; Castree 2008; Bakker 2009).

new ecology: (Archaic?) **1.** Disequilibrium ecology (Botkin 1990; Zimmerer 1994; Pritchard and Sanderson 2002, 149–151; Callicott 2008). **2.** Biophysical ecology with emphasis on quantifying flows of energy, such as between "producers" and "consumers" (Worster 1994, 473), without necessarily assuming that ecosystems have some central organizing force. **3.** Ecology presuming the theory of resilience (Pritchard and Sanderson 2002, 149–151; Cote and Nightingale 2012). ***Usage note:*** Actors can use this term to obscure regulatory risk to species, by allowing use under definition 1 or 2 to mean definition 3, thereby implying that when undisturbed by humans, ecosystems tend to persist within one or more historically recurring states. Also see usage note at *resilience*.

No Surprises rule: (US law) A federal rule allowing USFWS to guarantee it will not seek further exactions from landowners participating in a Habitat Conservation Plan for the duration of plan and for the species it covers (USFWS and NMFS 1998; USFWS 2008b, 4). ***Usage note:*** Actors can use this term to obscure regulatory risk to species by claiming or implying that the rule shelters participating landowners from future exactions for any species and/or for all time (e.g., Doremus 2010), thereby under-representing regulatory risk to landowners for having imperiled species.

nonequilibrium ecology: Disequilibrium ecology (Zimmerer 2000). ***Usage note:*** Unlike the term *nonequilibrium ecology*, the term *disequilibrium ecology* recognizes that an

ecosystem could in theory remain in stable state, depending on conditions (Meyer 1994; cf. Pickett, Parker, and Fiedler 1992, 71; Partridge 2005). Also see usage notes at *disequilibrium ecology*.

nonequilibrium ecosystem dynamics: Biological, geophysical, or anthropogenic forces, such as invasive exotic species or climate change, that can make the state of an ecosystem unpredictable at any scale of time or space.

nonexcludability: (Economics) A quality of a good or service such that no one can prevent others from consuming it (Tietenberg and Lewis 2012, 31).

nonexclusivity: (Economics) Nonexcludability.

nonfederal land: Land owned by parties other than a nation's highest governmental entity, such as land owned by an individual or municipal government.

nonrivalry: (Economics) A quality of a good or service such that its consumption by one does not decrease the potential for others to consume it; indivisibility (Tietenberg and Lewis 2012, 31).

n.p.: Abbreviation for *no page* (as when citing unpaginated electronic works).

OAR: Abbreviation for Oregon Administrative Rules.

ODF: Abbreviation for Oregon Department of Forestry.

ODFW: Abbreviation for Oregon Department of Fish and Wildlife.

offset: (Australian law) Mitigation fee or other exaction.

open-access regime: Ownership giving everyone unrestricted access to a resource.

open-access resource: A good (such as approximated by atmospheric oxygen) available to anyone without interference by others; a good characterized by nonexcludability;

res nullius. ***Usage note:*** When use of an open-access resource by one does not diminish the remainder available to others, it is typically called a public good.

open space: (Informal) Typically vegetated land without human-made physical structures other than plants growing or grown in situ.

Oregon white oak habitat: (As used here) Any vegetated landscape containing or adjacent to Oregon white oak, especially where containing other native plant species. ***Usage note:*** Ecologists (e.g., Burns and Honkala 1990) typically characterize Oregon white oak habitat as ranging from prairie to savanna to woodland, according to the percentage of canopy cover or other qualities. For simplicity, I use the term to include all such variations.

Oregon white oak savanna: 1. (Informal) Oregon white oak habitat. **2.** A grassy landscape with widely spaced Oregon white oaks, typically not exceeding a specified spatial density or percentage of canopy cover.

orthodoxy: (As used here) Adherence to belief even when it is false or unjustified, such as evidenced by persistent discrepancy with empirical evidence or by other persistent and demonstrable incoherence. ***Usage notes:*** **1.** Unlike lying, orthodoxy does not necessarily imply distorting information knowingly. In part, self-deception can help deceive others (Trivers 2000). **2.** Insofar as individuals can disagree over evidence or logic, orthodoxy, like any belief, is ultimately in the eye of the believer and thus politically defined (cf. Bromley 2006).

ownership: Having a legal or practical (i.e., economic) right to benefit from something, such as land; a property right.

participant-observation: Research in which a researcher participates in the phenomenon he or she is studying.

passive destruction: (As used here) Eliminating a species or its habitat by refraining from active management essential to the survival of the species, especially when used to avoid incurring land-use regulation based on its presence, whether before or after such regulation is adopted for the species.

patch dynamics: 1. Disequilibrium ecology (Pickett, Parker, and Fiedler 1992). **2.** A theory that the occurrence of a species can vary unpredictably over time within small areas but remain relatively stable when measured at a large enough scale of time or space (Pickett and Thomson 1978; White and Pickett 1985). ***Usage note:*** Actors can use this term to obscure regulatory risk to species, by allowing use under definition 1 to mean definition 2, thereby implying that species persist in the absence of disturbance by humans. In contrast, Wu (1992, 14) theorized that stability is not a universal phenomenon but rather a characteristic of some landscapes, and that as a consequence, "We can no longer take for granted that nature knows best and that nature recovers if left alone."

payment for ecosystem services: (Often plural) **1.** Any program or other action to financially reward landowners for providing an ecosystem service, such as wildlife habitat. **2.** Mitigation banking; habitat conservation banking; species banking. ***Usage note:*** Actors can use this term to obscure regulatory risk to species, by allowing use under definition 1 to mean definition 2. Such use implies that species-based land-use regulation only pays landowners for conserving species, without revealing that mitigation banking funds such payments through mitigation fees exacted from

landowners, and that when authority to seek such exactions depends on the presence of species, liability for mitigation fees tends to impose a cost on all landowners whose land already has the species. Also see usage note at *ecosystem service market*.

payoff: (Game theory) A reward or punishment received by an actor for choosing an action. ***Usage note:*** A payoff is not necessarily monetary. For example, it might consist of recognition, personal satisfaction, or expedience in administering regulation.

perfect property right: Property ownership characterized by excludability, transferability, and enforceability; efficient property right (Tietenberg and Lewis 2012, 23).

person: (US law) A human individual or corporation.

perverse incentive: A reward or penalty that works against an intended outcome.

planning: (As used here) Land-use planning.

plant association: (Archaic) *Ecosystem* definition 1 (Gleason 1917; 1926). ***Historical note:*** Gleason introduced this term to represent landscape vegetation without implying that such vegetation has inherent types or boundaries nor the characteristics of an organism. See historical note at *ecosystem*.

plant formation: (Obsolete) An "organism" (Clements 1916, 3) comprised of an assemblage of species that develops through inherently characteristic phases to achieve a characteristic, stable ("climax") state, through interaction with the environment; plant formation (Clements 1905; 1916; 1936; cf. Tansley 1935, 290, citing Clements 1916; Pickett and Cadenasso 2002). See historical note at *ecosystem*.

police power: The legal authority of a government to impose restrictions on individuals under threat of fines or imprisonment, or to exact fees or other concessions from

individuals in return for exemption from such penalties. ***Usage note:*** In US legal scholarship, this term typically appears as "the police power", reflecting that a government has a monopoly on police power within its political boundaries. In this work, I omit the article "the", to emphasize that the use of police power may differ between governments. Cf. similar use by Leopold (1986 [1933]).

policy efficiency: A change to policy that provides a net gain toward its objective, such as by clarifying its goals or changing its strategy.

policy entrepreneur: Individuals or small groups who seek to change policy, typically by drawing attention to policy problems, presenting innovative policy solutions, building coalitions of supporters, and securing action by authoritative bodies to change relevant laws or rules (cf. Mintrom and Norman 2009).

political: Involving power relations.

political ecology: 1. The branch of ecology that studies the interaction between human power relations and environmental phenomena, typically researched through local study and with attention to factors such as historical context, scale, tenure relations, moral (non-market) preferences, and alternative framing of problems and solutions, often including minority views, drawing theory and methods from other disciplines as needed, and typically seeking to advance express political goals, such as sustainability (Greenberg and Park 1994, 1; Zimmerer 2000; Forsyth 2003; Peet and Watts 2004; Neumann 2005; Walker 2005; Forsyth 2008; Neumann 2009). **2.** A theory of such influence in a particular context. ***Usage notes:*** **1.** Political ecology allows for considering humans as part of an ecosystem, without necessarily assigning humans any special rights or privileges over other species. Ecology has shared this

understanding since at least 1935, when in introducing the term *ecosystem*, Tansley (1935, 303–304) called for viewing humans as a potential component of an ecosystem: "We cannot confine ourselves to the so-called 'natural' entities and ignore the processes and expressions of vegetation now so abundantly provided us by the activities of man. ... The 'natural' entities and the anthropogenic derivates alike must be analysed in terms of the most appropriate concepts we can". **2.** Political ecology overlaps cultural ecology. The latter addresses social relations that may or may not include power relations (Biersack 2006, 3) and has been criticized in part for overly assuming that actors are rational and that knowledge is apolitical (Neumann 2005, 22). **3.** As a branch of ecology, political ecology is thus a branch of biology and an empirical science.

positive incentive: An actual or potential payoff (such as payment or a stewardship award) that provides a net benefit to an actor to encourage or discourage particular behavior.

power relation: (As used here) The ability of an actor to influence a decision by another, such as through funding, use of police power, or (Pritchard and Sanderson 2002) control of discourse; a political relationship between humans.

prairie: Land predominantly covered by grass species and with few or no trees, often characterized by a specific limit on the spatial density of trees. See usage note at *Oregon white oak habitat*.

precautionary principle: A theory that in deciding between actions with uncertain outcomes, it is best to assume that any potential harmful effects would occur. ***Usage note:*** Actors can use this principle to obscure regulatory risk to species by additionally

assuming a need to take action, thereby dismissing any need to consider harmful effects from regulatory actions, thereby implying a need to consider only the harmful effects of refraining from action. In contrast, disequilibrium ecology implies that for native species, inaction can be as harmful as action (Wiener 1996), or more so.

preemptive destruction: Active or passive destruction of a species or associated habitat to reduce a real or perceived risk of incurring land-use regulation based on the presence of the species or habitat, whether before or after such regulation is adopted for the species (Brook, Zint, and De Young 2003). ***Usage note:*** Actors can use this term to obscure regulatory risk to species, by interpreting it to include only active destruction, thereby obscuring the power of landowners to destroy such species passively.

prescription distortion: Conflating a goal with a strategy to achieve that goal, such as to overlook other strategies that might be more efficient or less counterproductive.

procedural due process: (US law) A right under the 5th and 14th Amendments to the US Constitution or under the US Administrative Procedure Act or equivalent state law for individuals to be free from governmental action that takes life, liberty, or property without sufficiently fair proceedings (Chemerinsky 2006, 545).

property right: 1. (Legal property right) The ability to call upon government to defend one's access to a stream of benefits from land or other property (Bromley 1991). **2.** (Economic property right) The practical ability to receive a benefit stream from land or other property, such as a squatter receives through unlawful habitation (Barzel 1997). ***Usage notes:*** **1.** Both definitions allow for conceiving of property as a bundle of separable and negotiable rights (Carroll et al. 2007). Thus, for a given parcel of land,

one might own rights to some land uses but not others. **2.** Definition 1 implies that one can view land-use regulation as collective public (i.e., state) ownership of interests in private property, through which individuals can benefit from the property of others. **3.** Definition 1 also implies that the boundaries of legal ownership tend to follow the boundaries of public opinion (Bromley 1991; Freyfogle 2003a). As one economist put it:

> [I]f the collective fails to admit the social usefulness of a particular property claim, then it is delegitimized...
>
> (Bromley 1991, 5)

4. Both definitions further allow for recognizing that an owner's benefits from land can be financial or nonfinancial. For example, an owner might benefit from a property's market value (a benefit realized upon its sale) or the property's sense of place, even if the market value does not reflect the owner's valuation of its aesthetic or spiritual value. ***Historical notes:*** **1.** Locke (1988 [1689]) offered a theory to rationalize private ownership of property based on its benefit to society, insofar as an owner's power to receive benefits from property creates incentives that coincidentally benefit society. In this theory, for example, private ownership of an orchard encourages individuals to produce fruit, by ensuring they can keep it or sell it. However, Locke's theory implies an understanding of what constitutes private and social benefits, and how tenure security can affect those benefits. **2.** The US Supreme Court cited a re-articulation of Locke's theory in a landmark ruling that established the present constitutional boundary between private ownership of land and regulation of its use (Penn Central Transportation Co. v. New York City, 438 US 104 [1978], citing Michelman 1967). **3.** Illustrating the relation of belief to land ownership, Bromley

(1991) and Rose (1990) noted that Locke's theory serves to rationalize unequal distribution of wealth through land ownership. Apparently implying that this may have been Locke's intent, Bromley notes that Locke's work was subsidized by a sinecure from a wealthy noble. Also see *perfect property right*.

property rights analysis: A branch of economics that in part seeks to understand regulatory actions as economic transactions between individuals and government (or more specifically, voters or other actors who influence regulatory decisions), typically with costs and benefits to each (Barzel 1997, 131–138).

protect: 1. (Informal) To conserve. **2. a.** To limit or prohibit conflicting land uses in wildlife habitat, especially through regulation (e.g., Goal 5; Grumbine 1995). **b.** To prohibit harm to animals or plants identified as threatened or endangered under the ESA, under penalty of law (USFWS 2011a, 1). ***Usage note:*** Actors can use this term to obscure regulatory risk to species, by allowing use under definition 1 to mean definition 2a or 2b, thereby implying that species can be saved from extinction solely by eliminating external threats. For example, Goal 5 — an Oregon land-use planning law enacted in 1973 — in part authorizes local governments to "protect" "wildlife habitat" (OAR 660-015-0000(5)); gives them a duty to periodically consider doing so; and in part suggests they consider doing so through land acquisition or tax incentives (OAR 660-023-0010); but narrowly defines "protect" to mean "limit or prohibit" "conflicting uses" of land (OAR 660-023-0010) through "regulations" (OAR 660-023-0050). ***Historical note:*** Regulatory authority under Goal 5 was subsequently tempered by the passage of Ballot Measure 49, in 2007 (Walker and Hurley 2011).

protected class: (US law) A specific category of humans, such as females or a religious group, identified by common law as having a right to be free from discrimination under the 14th Amendment to the US Constitution.

public funding: Financial or in-kind payment by government, such as rents, cost sharing, or density bonuses.

public good: (Economics) A good (such as approximated by scenery) characterized by nonrivalry and nonexcludability, such that its benefit to one does not decrease its potential to benefit others, and no one can prevent others from benefiting from it (ten Brink 2011, 25; Tietenberg and Lewis 2012). ***Usage notes:*** **1.** A public good differs from a public benefit. All public goods offer a public benefit, but not all public benefits are public goods. A public benefit is a public good only when someone providing the benefit cannot prevent the public from enjoying it. A species fails to qualify as a public good insofar as maintenance-dependence allows private landowners to lawfully exclude others from benefiting from it, through passive destruction. **2.** Actors can use this term to obscure regulatory risk to species by indiscriminately referring to species as a public good, thereby implying that species will persist if protected from disturbance by humans.

public policy: (As used here) **1.** Statutes or administrative rules having the force of law. **2.** An explicit governmental preference for particular goals or types of actions.

punitive regulation: (Informal) Regulation that imposes a private cost on selected individuals. ***Usage note:*** I presume this term can be inflammatory to some, by implying that regulation is intended to impose harm, instead of solely to further the public interest.

rationality review: (US law) Judicial determination whether a governmental action has violated an individual's constitutional right to be free from harm through arbitrary or capricious action by government.

RCW: 1. (Ecology) Abbreviation for red-cockaded woodpecker. **2.** (Washington law) Abbreviation for Revised Code of Washington.

reasonable investment-backed expectations: (US law) A largely undeveloped doctrine arising from the landmark Penn Central case (Penn Central Transportation Co. v. New York City, 438 US 104 [1978], citing Michelman 1967), which held that when determining whether governmental regulation violates an individual's rights under the 5th or 14th Amendments to the US Constitution, a court should in part consider the individual's historic intent and/or expectations of reward from financial investments in property (Breemer 2005).

received wisdom: (Sociology) A belief or system of beliefs sustained through labeling, such as to define an environmental problem and its solution, typically represented in the form of a narrative (cf. Leach and Mearns 1996); orthodoxy.

recover: To "bring any endangered species or threatened species to the point at which the measures provided pursuant to the [ESA] are no longer necessary" (ESA §3(3), §4(f)(1)). ***Usage note:*** Actors can use this term to obscure regulatory risk to species, by implying that a species or ecosystem will persist after it is returned to some previous state.

regulation: 1. (Law) Governmental rules to enforce a statute, such as by imposing land-use prohibitions or liability for exactions, usually without compensation, and normally to achieve a stated purpose. **2.** (Ecology) Control, such as the influence of a predator

species on the population of its prey. **Usage note:** To avoid implying that government has a constitutional duty to compensate private landowners for land-use regulation, Ruhl, Kraft, and Lant (2007, 130) cautioned against characterizing regulation as public ownership of private land, though they note this perspective is disputed.

regulatory assurance: Regulatory incentive.

regulatory coalition: (As used here) All persons and organization helping authorize, implement, facilitate, or otherwise support species-based land-use regulation, whether or not such efforts are coordinated between them.

regulatory disincentive: A disincentive arising from regulation.

regulatory externality: An unintended desirable or undesirable effect of regulation, such as imposing a financial cost to private landowners from land-use restrictions intended to conserve a species on their property.

regulatory flexibility: 1. Governmental authority to exercise discretion in imposing or enforcing regulation. **2.** Governmental authority to seek exactions in lieu of regulatory restrictions. ***Usage note:*** Actors can use this term to obscure regulatory risk to species, by allowing use under definition 1 to mean definition 2.

regulatory incentive: 1. Regulation intended to discourage undesired action. **2.** A governmental program to allow landowners to pay mitigation fees or yield other exactions in lieu of land-use restrictions, such as to discourage undesired action, encourage or fund desired action, or reduce the cost such restrictions impose on landowners. ***Usage note:*** Actors can use this term to obscure regulatory risk to species, by indiscriminately implying that regulatory exactions offer a net benefit to regulated landowners. A program to allow exactions in lieu of regulatory prohibitions can

increase a landowner's payoff, but only relative to the landowner's loss from the imposition of those restrictions, such as through their effect on the market value of his or her property; when regulation is applied selectively, the landowner would typically be better off if subject neither to the regulation nor liability for associated exactions.

regulatory market: (Environmental economics) A system of law allowing actors to pay others to provide an environmental benefit (such as habitat for imperiled species) in return for the right to harm or destroy a similar or equivalent benefit elsewhere (Thompson 2000, 262); mitigation banking; conservation banking. See usage note at *mitigation banking*.

regulatory risk: (As used here) **1.** A landowner's likelihood of incurring increased land-use regulation, such as based on the presence of particular species. **2.** Threat to the survival of a species from such regulation, as from inadvertently discouraging otherwise willing landowners from controlling invasive exotic species.

residence: (Canadian law) Habitat, as for a species designated under SARA as endangered.

resilience: (Ecology) **1.** A theory that ecosystems tend to persist in any of a fixed number of historically stable states ("stability domains") as long as disturbance from external forces remains within some threshold or natural range of variability (Holling 1973, 14, 17; Walker et al. 1981; Holling and Meffe 1996; Pritchard and Sanderson 2002, 148–151; Gunderson and Walters 2002, 167; Fleishman et al. 2011, citing Groffman et al. 2006). **2.** The capacity of an ecosystem to withstand disturbance without entering a state different from its historic stability domains. **3.** The speed at which an ecosystem returns to one of its stability domains after some perturbation (Pimm 1984);

engineering resilience (Holling and Gunderson 2002, 27). ***Usage note:*** Actors can use the term *resilience* to obscure regulatory risk to species, by implying that ecosystems tend to persist if undisturbed by humans. The theory of resilience presumes ecosystems have "self-organizing processes" that maintain ecosystems in historically stable states (Holling and Meffe 1996, 330, 334). In contrast, Pimm (1984, 2) commented, "Resilience is not, therefore, defined for unstable systems". ***Historical notes:*** **1.** Some founders of the theory of resilience coincidentally commented that the fundamental challenge to sustainability is the carrying capacity of the Earth, without recognizing any need for humans to actively maintain species, except at most to restore a system to a stable state (e.g., Holling and Meffe 1996, 335; Gunderson and Holling 2002, xxi–xxii; Gunderson, Pritchard, et al. 2002, 259). **2.** Some actors (e.g., Benson and Garmestani 2011) have discussed resilience in the context of social-ecological systems. Such interpretations might be coherent for maintenance-dependent species, insofar as these interpretations presume humans provide any necessary management. (This does not necessarily imply that it is coherent or objective to describe societies themselves as resilient; cf. Davoudi 2012.)

responsibility: 1. (Legal responsibility) A governmental claim to ownership of private property by imposing an enforceable duty upon a landowner through law, such as through land-use regulation (cf. Bromley 1991). **2.** (Moral responsibility) An actor's preference for voluntarily undertaking an action that benefits others, without risk of penalty for choosing otherwise, such as a landowner's desire to conserve or maintain wildlife habitat without risk of penalty for doing otherwise (cf. Leopold 1986 [1933]).

Usage note: Actors can in theory use this term to obscure regulatory risk to species, by allowing use under definition 2 to mean definition 1.

restore: (Ecology) **1.** To return an area to a previous condition, such as measured by populations of plant or animal species. **2.** (Obsolete) To return an ecosystem to a presumed self-sustaining condition (e.g., Buckley and Haddad 2006, 49). ***Usage note:*** Actors can use this term to obscure regulatory risk to species, by allowing use under definition 1 to mean definition 2, thereby implying that once restored, an ecosystem will persist if undisturbed by humans.

reverse condemnation: (US law) Legal action by an individual to seek compensation from government for regulation that effects a taking (definition 2) of private property.

RIBE: (US law) Abbreviation for reasonable investment-backed expectation.

risk premium: (Economics) A measure of the cost that an actor incurs from exposure to an event that might or might not occur; (as used here) a reduction in the market value of land from the likelihood of incurring increased land-use regulation.

safe harbor: (Oregon law) A provision under Goal 5 allowing local governments to rely on land-use restrictions under the ESA to meet state requirements for protecting wildlife habitat from conflicting uses, instead of developing new regulations or other means to do so. See usage note at *Safe Harbor Agreement.*

Safe Harbor Agreement: (US law) A contract with USFWS granting a landowner limited immunity from land-use prohibitions under the ESA for new individuals of a listed species and other included species, beyond the "baseline" of any individuals of these species already present, in return for the landowner carrying out specified duties, such as to actively manage the species' habitat. ***Historical note:*** USFWS established

authority for Safe Harbor Agreements under a provision of the ESA that allows limited exceptions to its land-use prohibitions (USFWS 1999). Under a Safe Harbor Agreement, immunity may not take effect immediately, has limited duration, and applies only to species included in the agreement. ***Usage note:*** Safe Harbor Agreements are completely unrelated to the safe harbor provision under Goal 5, except insofar as a local government's use of the latter might theoretically recognize a landowner's exemption under the ESA through the former.

safety net: (Conservation) A theory that species-based land-use regulation can benefit a species if other measures fail to do so (e.g., USFWS 2011b, n.p. ["The ESA provides a critical safety net for America's native fish, wildlife and plants. This landmark conservation law has prevented the extinction of hundreds of imperiled species across the nation and promoted the recovery of many others."]). ***Usage note:*** Actors can use this term to obscure regulatory risk to species, by implying that species-based land-use regulation can only help and never harm species.

SARA: (Canadian law) Abbreviation for Species At Risk Act of 2002.

savanna: Land predominantly covered by grass species and with widely separated trees, often categorized by a specified limit on the spatial density of trees. See usage note at *Oregon white oak habitat*.

scientific: Testable with empirical evidence, through controlled experiment. ***Usage note:*** Actors can use this term to disregard regulatory risk to species, by implying that scientific management (especially when centralized) provides greater benefit to species than amateur management (especially when broadly distributed), without

considering the cost to species from discouraging innovation or private spending by landowners or other actors.

seed bank: An area's dormant seeds.

SHA: Abbreviation for Safe Harbor Agreement.

sideboards: (As used here) A belief that any discretion in land-use regulation should not allow humans to harm the environment beyond some threshold of harm. ***Usage note:*** Actors can use this term to obscure regulatory risk to species by implying that species-based land-use regulation can never harm them.

society: (As used here) A population of humans, acting individually or collectively, typically within a political boundary.

Species At Risk Act of 2002: (Canadian law) A federal statute and associated rules to ensure the survival of native species, in part through regulatory prohibitions.

species-based land-use regulation: Governmental land-use prohibitions or imposition of liability for exactions based on the presence of one or more particular species or associated habitat, as through prohibition of incidental take under the ESA.

spillover: Regulatory externality.

stability domain: (Ecology) A theoretically stable state of an ecosystem (Gunderson and Walters 2002, 167). ***Usage note:*** Actors can use this term to obscure regulatory risk to species, by implying that ecosystems can be stable if free from human action. See usage note at *resilience*.

stakeholder: (Informal) An actor whose has an interest in, and often power to influence, the outcome of a decision (Friedman and Miles 2006); (game theory) player.

steady state: (Thermodynamics; ecology) A condition in which the characteristics of an open system remain constant, such as due to equal inward and outward flows of energy.

stick: (Informal) Regulation. See usage note at *carrot and stick*.

stochastic: (As used here) Varying randomly, such as about an average. ***Usage note:*** As used in this work, stochastic does not necessarily imply chaotic.

stock-flow analysis: Theorizing or testing the supply of something (such as a firm's financial capital or the population of a species) as the combined result of factors adding to or subtracting from it.

substantive due process: (US law) A right of individuals under the 5th or 14th Amendments to the US Constitution for individuals to be free from governmental action that takes life, liberty, or property without adequate reason (Chemerinsky 2006, 545–546).

succession: (Ecology) **1.** (Obsolete) The progression of an ecosystem through characteristic, pre-determined stages, culminating in a self-maintaining state called the climax (cf. Phillips 1934, cited in Tansley 1935, 287). **2.** (Archaic?) The transformation of an ecosystem through a repeatedly occurring sequence of discernable states, especially when gradual, typically resulting in a relatively stable state (Tansley 1935, 286–289, 303–304; Likens 1992, 10). **3.** Any change in an area's vegetation when undisturbed by human action, such as due to invasion by exotic plant species (e.g., USFWS 2001 [Oregon silverspot butterfly revised recovery plan], iii). ***Usage notes:*** **1.** Actors can use this term to obscure regulatory risk to species, by allowing use under definition 3 to mean definition 1 or 2, thereby implying that if

protected from disturbance by humans, ecosystems tend to remain within a limited number of historically stable states. **2.** The continuing, authoritative use of definition 1 (e.g., American Heritage Dictionary, 5th ed., 2011) and the paucity of terms to distinguish such use from definition 3 reflect the continuing legacy equilibrium ecology.

system: 1. (Thermodyamics) A space, usually containing matter and energy, separated from all interaction with anything external to it (Nash 1971). **2.** (Ecology) Ecosystem.

take: (US law) **1.** (ESA) **a.** To cause death, injury, or harassment to an organism in violation of the ESA. **b.** The result of such action; a taking. **2.** (Constitutional law) To regulate the use of private property so extensively as to violate the 5th Amendment to the US Constitution, thereby requiring government to compensate the property owner; taking. ***Usage notes:*** **1.** Under current law, take (definition 1a or 1b) must involve actual killing or injury of a listed species (16 USC §1540b; Bean and Rowland 1997, 217). **2.** Under current law, regulation causes take (definition 2) if it "goes too far" in reducing an owner's benefit from property (Pennsylvania Coal Company v. Mahon, 260 US 393 [1922]).

takings jurisprudence: (US law) The branch of law that determines the extent to which a government may impose costs on an actor without violating the actor's constitutional rights. See *take* definition 2.

TDR: (Often plural) Abbreviation for transferable development rights.

territorial campaign: (Geography) A persistent, systematic, and typically organized effort by one or more actors to claim ownership of land-use rights held by others, as through war or increasing land-use regulation.

territorial claim: (Geography) Assertion of property rights to land held by others, as through war or increasing land-use regulation.

tragedy of the commons: (Informal) Destruction of an open-access resource through its overexploitation by humans. ***Usage note:*** Introduced by Garret Hardin (1968), this term erroneously conflates open-access resources with common property regimes (Bromley 1991, 22). Exploitation of the latter can in theory be and often is in practice limited by community norms or policies (Ostrom 1990).

transferable development rights: A governmental program authorizing landowners to sell some or all of their land-use rights in a designated area (the "sending" area) to landowners in another designated area (the "receiving" area), such as to preserve open space or other environmental benefits in the former.

tyranny: Unchecked use of power against others, such as without considering its harm to others (or as used here, to other species); despotism.

tyranny of the majority: (As used here) The widely popular use of police power or other means, whether through acts or omissions, to seek a benefit at the expense of a minority without checks on the costs imposed by such action, even when all citizens have negligible costs of political organizing and perfect information about the consequences of all actions. ***Historical note:*** Tocqueville (2003 [1835]) theorized that democracy has two vulnerabilities. One is capture of government by a minority faction; the other is tyranny of the majority. A key difference is that capture by a minority can in theory be cured politically, if the majority has sufficient information. In contrast, a majority can sustain its tyranny even with perfect information, so that a tyranny of the majority can in theory be cured only by the court or by a change in

conditions, such as insofar as the invention of the cotton mill led to abolishing slavery in the US, by reducing the economic benefit of slave labor. This definition implies that a tyranny of the majority will tend to foster orthodoxy, to avoid or minimize awareness the costs to the minority and thereby defend the majority's power over the minority. Madison (2008 [1787]) described the possibility of tyrannies of the majority, in advocating ratification of the US Constitution.

universality: (Economics) The theoretical condition that all property is owned by someone, whether by a private entity or government, so as to avoid or minimize its wasteful consumption or destruction.

upzoning: The relaxation of land-use prohibitions, such as to accommodate a city's population growth.

US BBS: Abbreviation for US Bureau of Biological Survey.

US Bureau of Biological Survey: A former US federal agency that became USFWS (Worster 1994, 262, 283).

USC: Abbreviation for US Code.

US Code: An official compilation of US federal statutory law. ***Usage note:*** US Code excludes regulations, which are set by agencies authorized by statute to do so.

US Endangered Species Act of 1973: (US law) A federal statute that seeks in part to "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species" (ESA §2(b)). ***Usage note:*** Except where indicated otherwise, I use this term and its abbreviation (ESA) to refer to the statute as presently amended.

USFWS: Abbreviation for US Fish and Wildlife Service.

valuation of ecosystem services: (Economics) To assign a financial cost of replacing some beneficial quality of land (such as wetlands or wildlife habitat), typically to impose liability for mitigation fees. ***Usage note:*** Actors can use this term to obscure regulatory risk to species by implying that valuation of an ecosystem service means that landowners will be paid for providing it, without recognizing that landowners may incur a loss from liability for destroying it, such as landowners typically incur upon the listing of a species as threatened or endangered under the ESA. Such listing typically imposes land-use prohibitions and/or liability for mitigation fees based on the presence of the species or associated habitat.

voluntary: (Land-use planning) **1.** Arising from an individual's free choice, without risk of incurring a penalty for choosing differently, such as from incurring liability for land-use prohibitions or exactions; purely or truly voluntary (Mann and Plummer 1995, 228). **2.** Chosen under threat of such harm, as when choosing to pay a mitigation fee to avoid liability for incidental take under the ESA; exacted. ***Usage note:*** Actors can use this term to obscure regulatory risk to species, by allowing use under definition 1 to mean definition 2.

WDNR: Abbreviation for Wisconsin Department of Natural Resources.

woodland: Land predominantly covered by grass species or other semi shade-intolerant species and moderately separated trees, typically deciduous and often categorized by a specified limit on their spatial density, such as to provide a closed or nearly closed canopy. See usage note at *Oregon white oak habitat*.

zoning: Spatially explicit, differentiated land-use regulation.

APPENDIX C

ADDITIONAL ACKNOWLEDGMENTS

I thank the following additional individuals and organizations for helping me arrive at these ideas and their expression through this work, whether by offering suggestions (many of which I have incorporated here), encouragement, or simply the opportunity to share thoughts. In thanking these individuals and organizations, I do not imply that any of them necessarily agrees with any aspect of my argument. I claim sole responsibility for errors, and I apologize to all who I have missed here.

Gail Achterman, William M. Adams, Peter S. Alagona, Ed Alverson, Marnie Allbritton, Adel Amos, Hannah Anderson, Terry Anderson, the Association of American Geographers, Jennifer Bardeen, Rick Barney, Mike Barsotti, Richard Bastasch, Michael Bean, Erik Beever, Paul Bell, Daniel Benjamin, Steven Bissell, Neil Björklund, Scott Hoffman Black, John Bliss, Greg Bothun, Peg Boulay, Allan Branscom, Scott Bridgham, Rebecca Briggs, Daniel Bromley, Isis Brook, Russ Brooks, Cat Brown, David Budeau, Karen Buell, Bram Büscher, Alan Butler, J. Baird Callicott, Trudy Cameron, Mario Cardozo, the Cascadia-Prairie Oak Partnership, Frank Casey, Susan Castillo, William Castillo, Jim Cathcart, Craig Chisolm, Mikki Collins, Jimmy S. Christenson, Sally Collins, Miel Corbett, Robin Kundis Craig, Adam Davis, Jerry Davis, Robert Deal, Dana Dedrick, Matthew Dennis, Bob DenOuden, Sally Duncan, Ron Eber, *Ecotone*, William Edelglass, Daniel Edge, Cristina Eisenberg, the Emerald Chapter of the Society of American Foresters, Robert Emmons, *Environment*, *Environmental Ethics*, Rich Fairbanks, Ken Faulk, Paul Ferraro, Robert Felsing, Paige Fischer, John Fitzgerald, Karen Fleck-Harding, Jessica Fox, William Funk, Lisa Gaines, the Garry Oak Ecosystem Recovery Team, Mike Gaudern, Dale Goble, Neil Gunningham, Brian Grabbatin, Patti Haggerty, David Hammer, Pam Hardy, John Harte, Doug Heiken, Laura Hill, PJ Hill, Ariel Hiller, Steve Hodges, Reed Hopper, Carl Hosticka, Laura Huggins, Miriam Hulst, the Institute for Natural Resources, the International Association for Society and Natural Resources, Jim James, Annabelle Jaramillo, Bart Johnson, James Johnston, Eric T. Jones, William Karasov, Vera Kawene, Tom Kaye, Jane Kertis, the office of Governor John Kitzhaber, Ralph Klein, Ann Kreager, Michael Kreger, Lane County Land Watch, Egbert Leigh Jr., David R. Lentz,

the Liberty Fund, Mary Linders, John List, David Littlewood, the Long Tom Watershed Council, Ted Lorenson, Nena Lovenger, Christine Maguire, Art Martin, Galen Martin, Michael Meagher, Curt Meine, Roger Meiners, Carolyn Menke, James Merzenich, Holly Michael, Michael Mintrom, Curt Mitchell, Marie Morin, David Morman, Bill Moshofsky, Bob Nardi, the National Ecosystem Services Partnership, Mark Nechodom, Mia Nelson, Michael Nelson, Roderick Neumann, Bruce Newhouse, Malcolm Nicolson, Bryan Norton, Reed Noss, Gregory J. Nowacki, Sara O'Brien, Chad Okrusch, Lydia Olander, James Olmstead, the Oregon and Washington Chapters of The Wildlife Society, the Oregon and Washington Departments of Fish and Wildlife, the Oregon Department of Forestry, the Oregon Oak Communities Working Group, the Oregon Planning Institute, the Oregon Small Woodlands Association, the Pacific Legal Foundation, the Pacific Northwest Political Science Association, Brad Parshalle, Paul Phifer, Zygmunt Plater, Michael Pope, Jeff Powers, Jim Proctor, the Property and Environment Research Center, the Public Interest Environmental Law Conference, Claire Puchy, Amanda Punton, Sue Reams, Patrick Reed; Eric Rickerson, Jim Rinehart, Ignacio A Krell Rivera, Dan Rohlf, Val Rogers, Murray Rudd, JB Ruhl, Mike Russo, Hal Salwasser, Kathryn Saterson, Bernard Schermetzler, Marc Schlossberg, Jason Schreiner, Michael Schwartz, Rachel Schwindt, J. Michael Scott, the Second Midwest Environmental Philosophy Conference, Lauri Segel, Steve Smith, the Society for Conservation Biology, Jonathan Soll, Glen Spain, Hanne Svarstad, Rich Szlemp, Milton Takei, Stanley A. Temple, Ted Thomas, Walter Thurman, Tom Tietenberg, Mike Totey, Teresa Trump, John Tschirhart, Craig Tuss, the US Fish and Wildlife Service (including the Pacific region office, the Oregon field office, and the National Conservation Training Center), Kersti Vaino, Anne van den Nouweland, John VanLandingham, Sara Vickerman, Rich Wallace, Mike Wallace, Reed Watson, Jeff Weber, Rollie White, Jonathan Wiener, David S. Wilcove, Mark Wilson, Patrick I. Wilson, Representative Kelly Wirth, Eric Wold, Mary Wood, Jianguo Wu, Junjie Wu, Charles Yenter, Karl S. Zimmerer, Bob Zybach, and Stephen Zylstra.

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Notes: **1.** For historical context, here and in the body of this work, I follow some dates of publication with the date of authorship, in square brackets. **2.** Internet uniform resource locators (URLs) include all punctuation shown except for the terminal period appearing at the end of entries. **3.** All book publishers are in the US unless specified otherwise.

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