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Climate Change and the Endangered Species Act: Building Bridges to the No-Analog Future

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ARTICLES

CLIMATE CHANGE AND THE ENDANGERED SPECIES ACT: BUILDING BRIDGES TO THE NO-ANALOG FUTURE

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This Article examines the challenges global climate change presents for the Endangered Species Act (ESA) and its primary administrative agency, the U.S. Fish and Wildlife Service (FWS). Climate change will reshuffle ecological systems in ways that will defy prediction using existing knowledge and models, posing threats to species through primary and secondary ecological effects and the effects of human adaptation to climate change. Even assuming global-wide regulation of greenhouse gas emissions eventually yields a more stable climate variation regime, it will differ from the recent historical regime and many species will not survive the transition regardless of human interventions using the ESA. Yet many other species can survive with the assistance offered through a focused application of the ESA.

This Article proposes a policy approach aimed toward that objective. It begins by introducing the climate change challenge facing the FWS and explains why, after the Supreme Court's decision in Massachusetts v. EPA, *the agency must develop a response. Part I examines the likely ecological consequences of climate change, for which we have no analog, and develops a typology of threats species will experience. Part II explores the pressures climate change will place on the FWS's policy decisions as an escalating number of species faces increasingly more serious imperilment as a result of climate change. Part III methodically probes the relevant provisions of the ESA to identify the range of policy discretion the FWS has in making those decisions. Part IV then lays out a plan for the FWS to use the ESA to build bridges for climate-threatened species across the climate change transition and into the no-analog future. Most significantly, I propose that the ESA should not be used to regulate greenhouse gas emissions, but rather that it should be focused on establishing protective measures for species that have a chance of surviving the climate change transition and establishing a viable population in the future climate regime. In particular, the ESA can help ensure that human adaptation to climate change does not prevent other species from adapting as well.*

INTRODUCTION

The pika is toast. More specifically, the American pika (*Ochotona princeps*) is running out of places to live,[1] and global climate change appears to be the primary cause of its decline.[2] This tiny rabbit-like species has the

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[1] The background on the pika in this paragraph is derived from Donald K. Grayson, *A Brief History of Great Basin Pikas*, 32 J. BIOGEOGRAPHY 2103 (2005), and Erik A. Beever et al., *Patterns of Apparent Extirpation Among Isolated Populations of Pikas (Ochotona princeps) in the Great Basin*, 84 J. MAMMALOGY 37 (2003). For numerous images of pikas in their montane habitat, enter "pika" in Google Images.

[2] In this Article, I unapologetically adopt the premise that global climate change is occurring at anomalously rapid rates compared to historical trends, and that anthropogenic (human-induced) sources of greenhouse gases (primarily carbon dioxide) are a significant

unfortunate trait of being remarkably well-adapted to the cold, high-altitude, montane habitat of the Sierra Nevada and Rocky Mountain ranges in the North American Great Basin. Indeed, it is considered one of the iconic species to

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causal factor. I do not endeavor here to convince anyone of this. The Intergovernmental Panel on Climate Change (IPCC), an international scientific project representing hundreds of scientists, has produced a series of reports, including a comprehensive set in 2007, synthesizing scientific information on climate change and its effects on ecological conditions, all of which support the premises adopted herein. *See, e.g.*, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, SUMMARY FOR POLICYMAKERS, CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS, CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 2-5 (2007), *available at* http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf [hereinafter PHYSICAL SCIENCE BASIS SUMMARY]; INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, SUMMARY FOR POLICYMAKERS, CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY, CONTRIBUTION OF WORKING GROUP II TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 8-10 (2007), *available at* http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-spm.pdf [hereinafter CLIMATE CHANGE IMPACTS SUMMARY]; INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, SUMMARY FOR POLICYMAKERS, CLIMATE CHANGE 2007: MITIGATION, CONTRIBUTION OF WORKING GROUP III TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE *passim* (2007), *available at* http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-spm.pdf [hereinafter MITIGATION SUMMARY]; INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE AND BIODIVERSITY, IPCC TECHNICAL PAPER V, at 1 (2002), *available at* http://www.ipcc.ch/pdf/technical-papers/climate-changes-biodiversity-en.pdf [hereinafter CLIMATE CHANGE AND BIODIVERSITY]. The IPCC recently summarized its work to date in INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007 SYNTHESIS REPORT: SUMMARY FOR POLICY MAKERS (2007), *available at* http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf [hereinafter 2007 SYNTHESIS REPORT SUMMARY].

To be sure, the IPCC reports recognize a substantial degree of uncertainty about climate change cause and effect in many respects, which I cover where relevant *infra*. There are also many sources of commentary about climate change taking positions contrary to those adopted in the IPCC reports and in this Article, suggesting that climate change is not occurring, or that if it is occurring, it is a natural and temporary cycle of climate variation. *See, e.g.*, C.D. IDSO & K.E. IDSO, CTR. FOR THE STUDY OF CARBON DIOXIDE & GLOBAL CHANGE, CARBON DIOXIDE AND GLOBAL WARMING: WHERE WE STAND ON THE ISSUE (1998), *available at* http://www.co2science.org/scripts/CO2ScienceB2C/about/position/globalwarming.jsp. On the other hand, there are also many scientists who believe the IPCC has been too cautious in communicating the potential severity of climate change and its effects. *See* Chris Huntingford & Jason Lowe, *"Overshoot" Scenarios and Climate Change*, 316 SCIENCE 829, 830 (2007); Richard A. Kerr, *Pushing the Scary Side of Climate Change*, 316 SCIENCE 1412, 1412 (2007). Being the product of international consensus, moreover, it is widely regarded that the assessments in the IPCC reports were "watered down." *What the Climate Panel Didn't Say*, ENVTL. F., May-June 2007, at 20, 20. Ongoing research that the federal government's Climate Change Science Program (CCSP) conducts, as well as U.S. government involvement in the IPCC project, is covered at http://www.climatescience.gov (last visited Nov. 14, 2007).

people who enjoy climbing in high elevations – it even has its own fan club.[3] The pika's problem is that as global climate change causes surface temperatures to rise, the altitude above which pikas can find suitable conditions for survival also is rising. In Yosemite National Park, for example, researchers have determined that the minimum average altitude for pika populations has risen from 7800 feet to 9500 feet in the past 90 years. Of course, if you think of a mountainous topography, you can quickly appreciate the pika's problem – most remaining pika populations are now stranded on scattered high mountain peaks in ranges separated by low-lying deserts, meaning they are stuck on mountaintop islands and the water is rising, so to speak. Seven of the twenty-five historically described pika populations in the Great Basin have gone extinct, and those remaining are in decline.[4]

The pika's recent decline and gloomy future call to mind the protective capacity of the Endangered Species Act (ESA).[5] Often referred to as the "pit bull" of environmental laws,[6] the ESA erects a powerful framework for the identification and conservation of endangered and threatened species.[7] The United States Fish & Wildlife Service (FWS), which administers the ESA for

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[3] *See* Enthusiasts Mailing List at Pika Works, http://www.pikaworks.com/services/enthusiasts.html (last visited Nov. 14, 2007).

[4] *See* Grayson, *supra* note 1, at 2103.

[5] Endangered Species Act of 1973, Pub. L. No. 93-205, 87 Stat. 884 (codified as amended at 7 U.S.C. § 136 (2000), 16 U.S.C. §§ 1531-1544 (2000), and in other scattered sections of 16 U.S.C.). The pika is not currently protected under the ESA. In October 2007, the Center for Biological Diversity petitioned the federal government to extend ESA protection to the pika on the basis of climate change impacts. *See* Petition to List the American Pika (*Ochotona Princeps*) as Threatened or Endangered Under the Endangered Species Act, at 1 (Oct. 1, 2007), *available at* http://www.biologicaldiversity.org/species/mammals/American_pika/pdfs/American-pika-federal-petition-10-01-2007.pdf.

[6] *See, e.g.*, Steven P. Quarles, *The Pit Bull Goes to School*, ENVTL. F., Sep.-Oct. 1998, at 55, 55 (discussing the origins of this reputation). For additional historical context highlighting the Act's "overbearing statutory certainty," see generally Steven P. Quarles & Thomas R. Lundquist, *The Pronounced Presence and Insistent Issues of the ESA*, NAT. RESOURCES & ENV'T, Fall 2001, at 59.

[7] This Article is not intended to provide a comprehensive overview of the ESA. Rather, it focuses on the manner in which global climate change will influence administration of the ESA. For comprehensive treatments of the ESA, several of which are referred to frequently *infra*, see generally MICHAEL J. BEAN & MELANIE J. ROWLAND, THE EVOLUTION OF NATIONAL WILDLIFE LAW (3d ed. 1997); ENDANGERED SPECIES ACT: LAW, POLICY, AND PERSPECTIVES (Donald C. Baur & Wm. Robert Irvin eds., 2002) [hereinafter LAW, POLICY, AND PERSPECTIVES]; LAWRENCE R. LIEBESMAN & RAFE PETERSEN, ENDANGERED SPECIES DESKBOOK (2003); STANFORD ENVTL. LAW SOC'Y, THE ENDANGERED SPECIES ACT (2001); TONY A. SULLINS, ESA: ENDANGERED SPECIES ACT (2001); THE ENDANGERED SPECIES ACT AT THIRTY: RENEWING THE CONSERVATION PROMISE: VOLUME 1 (Dale D. Goble et al. eds., 2006) [hereinafter THE ENDANGERED SPECIES ACT AT THIRTY].

terrestrial and freshwater species,[8] has identified over 1250 animal and plant species in the United States for protection and has exercised its regulatory authority throughout the nation to fulfill the statute's goal of conserving imperiled species.[9] While few species brought under the ESA's protection have recovered to full health, the ESA is credited with preventing the ultimate extinction of the vast majority of protected species.[10]

Given the threat climate change poses to the pika and potentially many other species – one preeminent ecologist describes climate change as "a major threat to the survival of species and integrity of ecosystems world-wide"[11] – it seems an appropriate target for the ESA. Indeed, although clearly not enthusiastic about the prospect, the FWS appears ready to carry the ESA into the climate change era, having recently proposed to extend ESA protection to the polar bear because of the diminishing ice habitat that the species depends upon for survival.[12] The agency is getting strong nudges from the outside as well, as members of Congress have urged the agency to evaluate the effects of climate change on species generally,[13] environmental advocacy groups have petitioned

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[8] The National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) (also known as NOAA-Fisheries) administers the ESA for most marine species and anadromous fish. My principal focus is on the FWS and terrestrial and freshwater species. What is observed in this Article about the ESA, however, applies equally to administration of the statute by the NMFS.

[9] *See* U.S. Fish & Wildlife Serv., http://www.fws.gov/endangered/ (last visited Feb. 20, 2008) (describing the Endangered Species Program).

[10] *See* J. Michael Scott et al., *By the Numbers*, *in* THE ENDANGERED SPECIES ACT AT THIRTY, *supra* note 7, at 16, 29-32.

[11] Philip E. Hulme, *Adapting to Climate Change: Is There Scope for Ecological Management in the Face of a Global Threat?*, 42 J. APPLIED ECOLOGY 784, 784 (2005). In its 2007 Synthesis Report, the IPCC predicts that "[t]here is *medium confidence* that approximately 20-30% of species assessed so far are *likely* to be at increased risk of extinction if increases in global average warming exceed 1.5-2.5°C," and that if warming "exceeds about 3.5°C, model projections suggest significant extinctions (40-70% species assessed) around the globe." 2007 SYNTHESIS REPORT SUMMARY, *supra* note 2, at 13. For extensive discussion of the basis of this assessment, see *infra* Part I.

[12] *See* Endangered and Threatened Wildlife and Plants; 12-Month Petition Finding and Proposed Rule To List the Polar Bear (*Ursus maritimus*) as Threatened Throughout Its Range, 72 Fed. Reg. 1064 (proposed Jan. 9, 2007) (to be codified at 50 C.F.R. pt. 17). The agency proposed the rule based on a citizen petition for rulemaking. Also acting on a petition, the FWS recently initiated a status review of ten species of penguins based on threats, including climate change impacts. *See* Endangered and Threatened Wildlife and Plants; 90-Day Finding on a Petition To List 12 Penguin Species as Threatened or Endangered Under the Endangered Species Act, 72 Fed. Reg. 37,695 (July 11, 2007). NMFS has identified several coral species for ESA protection based in part on the effects of global climate change. *See* Endangered and Threatened Species: Final Listing Determinations for Elkhorn Coral and Staghorn Coral, 71 Fed. Reg. 26,852 (May 9, 2006).

[13] *See Appropriators Urge Interior to Deepen Review of How Global Warming is Affecting Species*, 38 Env't Rep. (BNA) 1015, 1015 (2007).

the agency to promulgate rules to address climate change,[14] and one court has admonished the agency for failing to take climate change into account in its regulatory programs.[15]

Practically speaking, however, what can the ESA do for the pika or the polar bear? The ESA takes a species-specific approach that has proven effective when employed to address discrete human-induced threats that have straightforward causal connections to a species, such as clearing of occupied habitat for development or damming of a river.[16] That is not the pika's or the polar bear's situation. Rather, *all* anthropogenic sources of greenhouse gases throughout the planet, from a small farm to a sprawling refinery, are contributing to the demise of the pika and polar bear, and the species' decline in both cases is gradual and largely invisible to human perception. The causal chain is less direct than, say, a salmon that finds a dam in its way. Pikas and polar bears will not drop dead because of exposure to greenhouse gas emissions – the species will just fade away as their habitats transform below their feet. The ESA has proven to be unwieldy when applied on large working landscape levels,[17] so is there reason to believe it will be any more effective when applied on global levels to this kind of creeping oblivion?

The pika and polar bear thus serve as examples of the tension global climate change will create in the administration of the ESA and other environmental laws. On the one hand, the case for bringing these and other climate-

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[14] Center for Biological Diversity, Petition for Rulemaking To Amend Federal Regulations To Enhance the Recovery of Endangered Species and Address the Growing Impacts of Global Warming on Imperiled Species, at 3 (Feb. 1, 2007), *available at* http://www.biologicaldiversity.org/swcbd/programs/bdes/gw-es/apa-petition.pdf [hereinafter Petition for Rulemaking]; *see also Environmental Groups Seek Federal Action with Rules on Effects of Global Warming*, 38 Env't Rep. (BNA) 308, 308 (2007) (announcing the filing of the Center for Biological Diversity's petition).

[15] *See* Natural Res. Def. Council v. Kempthorne, 506 F. Supp. 2d 322, 370 (E.D. Cal. 2007) ("FWS acted arbitrarily and capriciously by failing to address the issue of climate change . . . ."). For further discussion, see *infra* text accompanying notes 228-29.

[16] *See* Barton H. Thompson Jr., *Managing the Working Landscape*, *in* THE ENDANGERED SPECIES ACT AT THIRTY, *supra* note 7, at 101, 104 ("[ESA enforcement] has had the greatest impact on active changes in species habitat (e.g., the construction of new subdivisions, timber harvesting, and water diversions) . . . ."). The seminal ESA case, and icon of preservationism in American environmental law, involved a dam. Tenn. Valley Auth. v. Hill, 437 U.S. 153, 157 (1978). In that case the Court halted the construction of a nearly completed, federally financed dam project because the federal agencies involved had not complied with the ESA. *Id.* at 172-73. When asked to refuse to enjoin the construction as a matter of equity and common sense, the Court found that the ESA "admits of no exception" and "indicates beyond doubt that Congress intended endangered species to be afforded the highest of priorities." *Id.* at 173-74. The Court refused to "make such fine utilitarian calculations" given that "Congress viewed the value of endangered species as 'incalculable.'" *Id.* at 187.

[17] *See* A. Dan Tarlock, *The Dynamic Urban Landscape*, *in* THE ENDANGERED SPECIES ACT AT THIRTY, *supra* note 7, at 127, 127-32; Thompson, *supra* note 16, at 104-26.

threatened species under the ESA's protective wings seems as unequivocal as they come, regardless of whether greenhouse gas emissions contribute to the climate change effects. On the other hand, given the reasonably anticipated trajectory of global climate change and its effects on ecosystems, there soon may be no practical way to administer the ESA in its present form for those species. As the authors of one environmental law casebook described the dilemma:

> Are the ESA's rationales dwarfed by the current reality of global climate change? If it were possible to show that over the next century as many as half of all endangered species were likely to be rendered extinct by global warming, a condition that appears to be human-augmented but quite impervious to legal liability, would the ESA become an obsolete footnote or continue to be a practicable tool, a worthwhile declaration of principle, and a utilitarian canary in a coal mine? [18]

If what threatens the pika's survival also threatens the ESA's usefulness, these questions are not just for academic discourse. A "worthwhile declaration of principle" that has no practicable means of implementation would present quite a predicament for the FWS. And yet it is not a situation the agency can easily avoid, as the ESA contains a citizen petition procedure requiring the agency to consider species for protection,[19] and a citizen suit provision allowing private attorney general actions to enforce the statute.[20] If past experience is any indication, the stream of petitions to protect species based on global climate change effects will flow stronger, citizen suits will push harder on the agency to use the ESA's regulatory power to attack greenhouse gas emissions, and other suits will be filed to object if the agency attempts to do either.[21]

The ESA is by no means unique in finding itself between a rock and a hard place due to climate change. For example, the Environmental Protection Agency (EPA) recently denied a citizen rulemaking petition asking the agency to regulate greenhouse gas emissions from motor vehicles as an air pollutant under the Clean Air Act.[22] The agency dismissed the petition on the basis that global climate change is so complicated either Congress did not provide for greenhouse gas emissions to be subject matter for the Clean Air Act or, if

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[18] ZYGMUNT J.B. PLATER ET AL., ENVIRONMENTAL LAW AND POLICY: NATURE, LAW, AND SOCIETY 783 (3d ed. 2004).

[19] 16 U.S.C. § 1533(b)(3) (2000).

[20] *Id.* § 1540(g).

[21] For example, citizen petitions, frequently followed by citizen suits, have been a major force behind the identification of species for ESA protection. *See* D. Noah Greenwald et al., *The Listing Record*, *in* THE ENDANGERED SPECIES ACT AT THIRTY, *supra* note 7, at 51, 54-63.

[22] *See* Control of Emissions from New Highway Vehicles and Engines, 68 Fed. Reg. 52,922, 52,922 (Sept. 8, 2003).

Congress did so provide, the agency properly identified conflicting policy concerns as a basis for deciding not to regulate emissions.[23]

Indeed, the EPA's reasoning might have been attractive to the FWS and other regulatory agencies hoping to avoid the myriad of difficult policy issues surrounding climate change: Congress could not have meant for them to incorporate the ubiquitous, complex dynamics of global climate change into each and every discrete regulatory program, and even if Congress did have that in mind, the broad discretion agencies usually enjoy under regulatory statutes provides enough wiggle room to dodge the bullet. The agencies are off the hook. The pika can fend for itself.

But the Supreme Court has nipped this kind of reasoning in the bud. In *Massachusetts v. EPA*,[24] a majority of the Court found that the EPA erred in denying the rulemaking petition, making clear the principle that simply because Congress did not have climate change on its mind when it drafted a law does not mean thirty or however many years later the agency responsible for implementing the law can ignore the effects of climate change.[25] Like any other phenomenon that comes along after a statute is enacted, if global climate change becomes relevant to the statutory text and policy, it is fair game, if not *mandatory* fodder, for incorporation into the regulatory program. Hence, the Court concluded, greenhouse gas emissions, because they are linked to climate

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[23] *See id.* at 52,929-31.

[24] 127 S. Ct. 1438 (2007).

[25] *See id.* at 1462-63. For a concise yet thorough summary of the rulemaking petition, the EPA's decision, lower court proceedings, the Supreme Court's majority and dissenting opinions, and the likely impact of the case, see generally Arnold W. Reitze Jr., *Controlling Greenhouse Gas Emissions From Mobile Sources* – Massachusetts v. EPA, 37 Envtl. L. Rep. (Envtl. Law Inst.) 10,535 (2007). For additional background, see generally Michael Sugar, Case Comment, Massachusetts v. Environmental Protection Agency, 31 HARV. ENVTL. L. REV. 531 (2007).

change and its numerous anticipated ill effects,[26] fit the Clean Air Act's broad definition of an air pollutant.[27] As the Court put it:

> While the Congresses that drafted [the Clean Air Act] might not have appreciated the possibility that burning fossil fuels could lead to global warming, they did understand that without regulatory flexibility, changing circumstances and scientific developments would soon render the Clean Air Act obsolete. The broad language [of the statute] reflects an intentional effort to confer the flexibility necessary to forestall such obsolescence.[28]

Hence, the Clean Air Act charged the EPA with regulating greenhouse gas emissions from motor vehicles if in the EPA's "judgment [the emissions] cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare."[29] Noting that the Clean Air Act defines "welfare" to include "effects on . . . weather . . . and climate," the Court rejected the EPA's proffered bases for its judgment not to regulate greenhouse gas emissions.[30] The EPA had taken the position that, even if it had authority to treat greenhouse gas emissions as a pollutant, it would exercise its discretion not to do so in order to accommodate other priorities, such as facilitating the President's flexibility to negotiate with other nations on climate change.[31] These other priorities, however, were not within the scope of the agency's discretion under the Clean Air Act:

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[26] The majority opinion begins with the observation that "[a] well-documented rise in global temperatures has coincided with a significant increase in the concentration of carbon dioxide in the atmosphere. Respected scientists believe the two trends are related." *Massachusetts*, 127 S. Ct. at 1446. This basic factual assertion is accepted and extended throughout the opinion, leading one observer to suggest that "the broader cultural or symbolic significance of the decision" is that "[t]he Court has accepted – indeed has seemed to internalize – the beliefs, assumptions, and values that animate the environmentalists' views on climate change." Jonathan Z. Cannon, *The Significance of* Massachusetts v. EPA, 93 VA. L. REV. IN BRIEF 51, 59 (2007), http://www.virginialawreview.org/inbrief/2007/05/21/cannon.pdf. Indeed, the case is regarded as "[a] breathtaking result for environmentalists. The first time that environmentalists have both persuaded the Supreme Court to grant review over the federal government's opposition and then won on the merits." Richard Lazarus, *A Breathtaking Result for Greens*, ENVTL. F., May-June 2007, at 12, 12.

[27] *Massachusetts*, 127 S. Ct. at 1459-60. The Clean Air Act defines "air pollutant" in sweeping terms to include "any air pollution agent . . . including any physical, chemical [or] biological . . . substance or matter which is emitted into or otherwise enters the ambient air." 42 U.S.C. § 7602(g) (2000). The Court found that "greenhouse gases fit well within [this] capacious definition." *Massachusetts*, 127 S. Ct. at 1462.

[28] *Massachusetts*, 127 S. Ct. at 1462.

[29] 42 U.S.C. § 7521(a)(1) (2000).

[30] *See Massachusetts*, 127 S. Ct. at 1447 (quoting 42 U.S.C. § 7602(h)).

[31] *Id.* at 1462-63.

> Under the clear terms of the Clean Air Act, EPA can avoid taking further action [to regulate carbon emissions from motor vehicles] only if it determines that greenhouse gases do not contribute to climate change or if it provides some reasonable explanation as to why it cannot or will not exercise its discretion to determine whether they do. To the extent that this constrains agency discretion to pursue other priorities of the Administrator or the President, this is the congressional design.[32]

So too, pika lovers might argue, must the ESA be construed to require the FWS to integrate the changing circumstances and scientific developments surrounding climate change into administration of the statute. Indeed, after *Massachusetts v. EPA*, one can argue it is incumbent on *all* federal regulatory agencies to assess how global climate change is to be integrated into their respective regulatory programs.[33] There is no dodging the bullet – each agency must place the current knowledge of climate change and its reasonably anticipated trajectory next to its regulatory statute and ask how its knowledge and the statute fit together.

Yet in setting this inquiry in motion, the Court raised far more questions than it answered. It is one thing to say an agency must consider whether climate change triggers regulatory authority under a particular statute. It is quite another thing to decide what response the statute requires. Just as agencies are not immune from having to incorporate global climate change as regulatory subject matter, climate change as regulatory subject matter is not immune from agency discretion. Some statutes – perhaps the Clean Air Act is an example – will force an agency down a narrow road toward regulation of greenhouse gas emissions. Other statutes, however, will leave ample room for an agency to argue, depending on its agenda, that greenhouse gas emissions and climate change are not appropriate subjects for regulation. Evaluating the fit between a regulatory program and climate change will, thus, often boil

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[32] *Id.* at 1462 (citation omitted). As its only example of a "reasonable explanation," the Court suggested that the EPA might find "the scientific uncertainty is so profound that it precludes EPA from making a reasoned judgment as to whether greenhouse gases contribute to global warming." *Massachusetts*, 127 S. Ct. at 1463. Yet, having previously observed that "respected scientists" believe greenhouse gases do contribute to climate change, the Court seems to have left EPA little wiggle room. *Massachusetts*, 127 S.Ct at 1446; *see* Cannon, *supra* note 26, at 57; Reitze, *supra* note 25, at 10,538.

[33] For example, the Ninth Circuit recently faulted the National Highway Traffic Safety Administration for failing to take climate change effects into account when promulgating fuel economy standards for light trucks and SUVs. Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin., No. 06-71891, 2007 WL 3378240, at *17-19 (9th Cir. Nov. 15, 2007). Also, several institutional investors recently petitioned the Securities and Exchange Commission to require companies to disclose more information and analysis of the financial risks they face from climate change effects and the regulation of greenhouse gas emissions. California Public Employees Retirement System et al., Petition for Interpretive Guidance on Climate Change Disclosure, at 2-3 (2007), *available at* http://www.sec.gov/rules/petitions/2007/petn4-547.pdf.

down to identifying the scope of an agency's discretion with respect to climate change and determining how the agency can legitimately exercise that discretion. The EPA knows now that it must make a decision about the effects of greenhouse gas emissions from motor vehicles and whether to regulate those emissions, but what is the scope of the agency's discretion in making that decision? That is the question the Court in *Massachusetts v. EPA* left for the EPA to answer under the Clean Air Act.[34]

This Article explores that question from the perspective of the ESA as presently constituted.[35] Part I of the Article describes the effects of climate change and different ways in which it is likely to exacerbate species endangerment, both in terms of number of species at risk and severity of their imperilment. As noted ecologist Jane Lubchenko has put it, "we've entered new territory."[36] Complex direct and indirect mechanisms are likely to be in play, usually in ways less obvious than the stranding of the pika or the melting away of the polar bear's ice. Many ecologists believe we face a no-analog future – one for which we have no experience on which to base projections of ecosystem change,[37] and for which models designed to allow active management decisions as climate change takes effect are presently rudimentary and imprecise.[38] It is not as if ecosystems will move intact as climate conditions shift; rather, they will disassemble as climate change rips apart existing hydrological, temperature, fire, flood, drought, wind, and pest regimes at local levels, with new assemblies forming in their place. And as humans adapt to climate change by moving away from coastal areas and shifting the locations of agricultural land uses, it is likely that we will disturb ecological systems with potentially dramatic effects on resident species. A taxonomy of climate change effects on species thus is useful for understanding the challenges the FWS will face in administering the ESA as the realities of climate change begin to take hold in ecosystems.[39]

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[34] *See Massachusetts*, 127 S. Ct. at 1463 ("We need not and do not reach the question whether on remand EPA must make an endangerment finding, or whether policy concerns can inform EPA's actions in the event that it makes such a finding.").

[35] This Article addresses the scope of agency discretion under existing statutory provisions. Although the Article examines potential rulemaking reforms within the scope of existing statutory authority, I neither suggest nor review proposed statutory reforms of the ESA or any other statute to respond to climate change.

[36] *Interplay of Climate and Currents Disrupts Marine Ecosystems*, SCIENCEDAILY, Feb. 28, 2007, http://www.sciencedaily.com/releases/2007/02/070218140507.htm.

[37] *See* Douglas Fox, *Back to the No-Analog Future?*, 316 SCIENCE 823, 823 (2007); Douglas Fox, *When Worlds Collide*, CONSERVATION, Jan.-Mar. 2007, at 28.

[38] *See* Peter Cox & David Stephenson, *A Changing Climate for Prediction*, 317 SCIENCE 207, 207 (2007). For more on these modeling difficulties, see *infra* Part I.A.

[39] It also provides an example of what regulatory programs dealing with *human* social and economic institutions can expect in a climate-change future. Like ecosystems, one can foresee human communities and economies responding in "reshuffling" patterns that defy extrapolation from historical trends and for which models are, at present, theoretical at best.

Yet the FWS, like most administrative agencies, has been implementing the ESA's regulatory programs for decades, so what is new about climate change? What is the challenge, other than there being more species at risk and many of them in more dire straits? Is it just a matter of degree, or is climate change a different kind of problem altogether? Part II of the Article engages these questions by exploring the types of challenges climate change will pose for the ESA. As many agencies must, the FWS often exercises its discretion by balancing the statute's primary purpose (protecting species), other mediating statutory criteria (e.g., economic impacts), and background social, legal, and economic contexts not registered directly in the statute but placing pressure on its implementation (e.g., property rights).[40] Global climate change does not fit into one of those boxes; rather, it engulfs all of them and shakes the regulatory system at its roots. The range of possible (but not necessarily permissible) policy responses an agency might devise in such a dynamic and uncertain context is thus quite broad, from doing absolutely nothing to incorporating global climate change into every nook and cranny of the regulatory program. The FWS will face these choices with respect to the emission of greenhouse gases, actions that harm species endangered because of climate change, and conservation efforts that may be impeded by climate change.

Of course, the choices are not all for the FWS to make. Part III of the Article methodically evaluates the permissible discretion Congress has defined for the agency's selection of climate change policies. Like many regulatory statutes, the ESA is a conglomerate of different regulatory tasks and programs, each with its own idiosyncratic discretionary context, and thus each presents a different fit with global climate change. The challenge for the FWS is that each species presents its own set of circumstances with respect to the effects of climate change, meaning the agency has potentially thousands of different scenarios to track through its statutory discretion analysis. Overall, the analysis shows that the agency has considerable flexibility in terms of how it uses (or doesn't use) global climate change as a driver of regulatory policy.

If, for example, climate change shifts agriculturally productive conditions northward from, say, Kansas, how likely is it that agricultural communities in Kansas will simply pick up and relocate northward fully intact? Consider, for example, the diaspora of New Orleanians that followed Hurricane Katrina. Of over 1.3 million applicants for federal assistance, eighty-six percent came from people who had relocated to Louisiana, Mississippi, Texas, and Alabama, but applications came from every state and from more than 35,000 families that had moved over 1000 miles from the Gulf. *See* Katrina's Diaspora, http://www.nytimes.com/imagepages/2005/10/02/national/nationalspecial/20051002diaspora_graphic.html (last visited Jan. 12, 2008) (showing the results of a New York Times investigation of the distribution of Hurricane Katrina victims). Over half of the applications were filed by people that had relocated over 100 miles from New Orleans. *See id.*

[40] The examples given define the history of ESA implementation. *See* J. Michael Scott et al., *Introduction* to THE ENDANGERED SPECIES ACT AT THIRTY, *supra* note 7, at 3, 3 (characterizing the ESA as a legislative attempt to "reconcile the preservation of nature with increasing human population and consumption").

Nevertheless, some choke points limit the agency's discretion and, if *Massachusetts v. EPA* is any indication, will force the FWS to confront difficult policy decisions.

Given that regulatory landscape, Part IV addresses the practical question of what the FWS should do in the absence of congressional action, either with respect to the ESA specifically or in more general ways that relieve pressure from the ESA. I propose a coherent game plan for the agency based on four assumptions: (1) even with swift and effective adoption of global-wide greenhouse gas emission mitigation measures, some residual climate change will continue to occur over the next fifty years;[41] (2) realistically, global-wide mitigation measures will not entirely reverse greenhouse gas emissions to 1990 levels; but (3) mitigation measures will stabilize emissions at a level which will allow global climate regimes to eventually settle into a "natural" pattern of variation; and (4) some species will not survive the transition from the present to that future no matter what actions the FWS takes under the ESA, but others can make it if we help them through the transition. Under these assumptions, I argue that the FWS should *not* attempt to use the ESA to combat greenhouse gas emissions or save all species threatened by climate change, but rather should use it as the bridge to the no-analog future for those species that can benefit from the ESA's helping hand. Part IV closes by elaborating on the policy choices the agency should make to implement this use of the ESA, including how to respond to the effects of human adaptations to climate change.[42]

Like most other existing regulatory statutes, the ESA was not enacted with global climate change in mind, and the ESA alone will not arrest the causes or effects of our planet's no-analog future. But for the foreseeable future, until Congress or the states adopt statutes responding directly and comprehensively to climate change, the ESA is the nation's principal species conservation program. Even if the ESA cannot reverse climate change, pressure will be brought to bear on the FWS, just as it was on the EPA, to use its regulatory powers to "whittle away" at the problem.[43] After *Massachusetts v. EPA* the

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[41] *See* Richard A. Kerr, *How Urgent Is Climate Change?*, 318 SCIENCE 1230, 1230 (2007) ("The system has built in time lags. Ice sheets take centuries to melt after a warming. The atmosphere takes decades to be warmed by today's greenhouse gas emissions.").

[42] Until recently, legal scholarship on climate change has focused primarily on mitigation efforts – i.e., legal measures aimed at reducing greenhouse gas emissions. Given the reality that climate change will continue for some time even if stiff measures are taken globally to reduce greenhouse gas emissions over the next 25-50 years, attention is turning to the law of climate change adaptation – i.e., regulation and facilitation of human responses to climate change. For a sweeping overview of many of the environmental law issues relating to climate change adaptation (though not including the ESA issues in detail), see generally Matthew D. Zinn, *Adapting to Climate Change: Environmental Law in a Warmer World*, 34 ECOLOGY L.Q. 61 (2007).

[43] As the majority in *Massachusetts v. EPA* observed, "[a]gencies, like legislatures, do not generally resolve massive problems in one fell swoop, but instead whittle away over

agency will have little choice but to do so, the only questions being where and how deeply it must cut.

I. CLIMATE CHANGE AS AN AGENT OF ECOLOGICAL RESHUFFLING

The ESA is a change-management law designed to arrest change in one direction – the decline of a species – and bring about a new trajectory of change – recovery of the species. The FWS administers several core programs aimed toward that objective, the details of which are more fully explored later in the Article:

- Section 4 of the ESA authorizes the FWS to identify "endangered" and "threatened" species, known as the listing function,[44] and then to designate "critical habitat"[45] and develop "recovery plans"[46] for the species.

- Section 7 requires all federal agencies to "consult" with the FWS to ensure that actions they carry out, fund, or authorize do not "jeopardize" the continued existence of listed species or "adversely modify" their critical habitat.[47]

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time, refining their approach as circumstances change and they develop a more nuanced understanding of how best to proceed." Massachusetts v. EPA, 127 S. Ct. 1438, 1457 (2007) (citations omitted).

[44] 16 U.S.C. § 1522(a)(1) (2000). For a description of the listing process, see generally LIEBESMAN & PETERSEN, *supra* note 7, at 15-20; STANFORD ENVTL. LAW SOC'Y, *supra* note 7, at 38-58; SULLINS, *supra* note 7, at 11-25; J.B. Ruhl, *Section 4 of the ESA: The Keystone of Species Protection Law*, *in* LAW, POLICY, AND PERSPECTIVES, *supra* note 7, at 19, 19-33; *infra* notes 120-30 and accompanying text.

[45] 16 U.S.C. § 1533(a)(3) (2000). For a description of the critical habitat designation process, see generally LIEBESMAN & PETERSEN, *supra* note 7, at 20-24; STANFORD ENVTL. LAW SOC'Y, *supra* note 7, at 59-69; SULLINS, *supra* note 7, at 26-28; Federico Cheever, *Endangered Species Act: Critical Habitat*, *in* LAW, POLICY, AND PERSPECTIVES, *supra* note 7, at 47; Murray D. Feldman & Michael J. Brennan, *The Growing Importance of Critical Habitat for Species Conservation*, 16 NAT. RESOURCES & ENV'T 88 (2001); *infra* notes 131-39 and accompanying text.

[46] 16 U.S.C. § 1533(f) (2000). For a description of the recovery plan process, see generally LIEBESMAN & PETERSEN, *supra* note 7, at 24-26; STANFORD ENVTL. LAW SOC'Y, *supra* note 7, at 71-77; SULLINS, *supra* note 7, at 34-37; John M. Volkman, *Recovery Planning*, *in* LAW, POLICY, AND PERSPECTIVES, *supra* note 7, at 71; *infra* notes 140-47 and accompanying text.

[47] 16 U.S.C. § 1536(a)(2) (2000). For a description of the consultation process, see generally LIEBESMAN & PETERSEN, *supra* note 7, at 27-39; STANFORD ENVTL. LAW SOC'Y, *supra* note 7, at 83-103; SULLINS, *supra* note 7, at 59-86; Marilyn Averill, *Protecting Species Through Interagency Cooperation*, *in* LAW, POLICY, AND PERSPECTIVES, *supra* note 7, at 87; *infra* notes 169-91 and accompanying text.

- Section 9 requires that all persons, including all private and public entities subject to federal jurisdiction, avoid committing "take" of listed species of fish and wildlife.[48]

- Sections 7 (for federal agency actions)[49] and 10 (for actions not subject to Section 7)[50] establish a procedure and criteria for FWS to approve "incidental take" of listed species.[51]

These programs generate the regulatory firepower needed to effectively intervene in several categories of environmental change that cause species decline: (1) the present or threatened destruction, modification, or curtailment of habitat; (2) over-utilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; and (4) other natural or manmade factors.[52] Of course, this authority is only useful in circumstances where intervention is feasible and effective. For example, habitat loss, the leading cause of species decline,[53] is often the result of easily identifiable human-induced factors susceptible to discrete and effective regulation.[54] By contrast, invasive species, the runner-up in causes of species decline,[55]

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[48] 16 U.S.C. § 1538(a)(1) (2000). For a description of the cases developing the legal standards for what constitutes "take," see generally LIEBESMAN & PETERSEN, *supra* note 7, at 39-46; STANFORD ENVTL. LAW SOC'Y, *supra* note 7, at 104-12; SULLINS, *supra* note 7, at 44-54; Alan M. Glen & Craig M. Douglas, *Taking Species: Difficult Questions of Proximity and Degree*, 16 NAT. RESOURCES & ENV'T 65 (2001); Gina Guy, *Take Prohibitions and Section 9*, *in* LAW, POLICY, AND PERSPECTIVES, *supra* note 7, at 191; Steven P. Quarles & Thomas R. Lundquist, *When Do Land Use Activities "Take" Listed Wildlife Under ESA Section 9 and the "Harm" Regulation?*, *in* LAW, POLICY, AND PERSPECTIVES, *supra* note 7, at 207; *infra* notes 148-68 and accompanying text.

[49] 16 U.S.C. § 1536(b)(4) (2000).

[50] *Id.* § 1539(a)(1).

[51] "Incidental take," although not explicitly defined in a specific statutory provision, is described in section 10 of the statute as take that is "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." *Id.* § 1539(a)(1)(B). The FWS has adopted this meaning in regulations implementing section 7's incidental take authorization. 50 C.F.R. § 402.02 (2003). For a description of the incidental take authorization procedures, see generally LIEBESMAN & PETERSEN, *supra* note 7, at 46-50; STANFORD ENVTL. LAW SOC'Y, *supra* note 7, at 127-73; SULLINS, *supra* note 7, at 87-102; *infra* notes 192-202 and accompanying text.

[52] These are the factors upon which listing decisions are made. *See* 16 U.S.C. § 1533(a)(1)(A)-(E) (2000).

[53] *See* David Wilcove et al., *Quantifying Threats to Imperiled Species in the United States*, 48 BIOSCIENCE 607, 609 (1998).

[54] Indeed, this is the source of the statute's "pit bull" status and largely the reason it is so controversial – discrete actions directly impairing the habitat of protected species make for easy targets of ESA regulation. *See* Glen & Douglas, *supra* note 48, at 68 (discussing the proof and causation requirements necessary to demonstrate harm).

[55] *See* Wilcove et al., *supra* note 53, at 609.

typically present exceedingly complex causes and solutions,[56] meaning there usually is no identifiable regulatory target.[57]

In this respect, climate change presents a complicated scenario. To be sure, there is an easily identifiable regulatory target: greenhouse gas emissions. Leaving until later the question of how much discretion the ESA affords the FWS to regulate greenhouse gas emissions, there are obvious practical obstacles to this approach. First, regulating emissions in the United States alone is highly unlikely to sufficiently reduce global emission levels.[58] Second, even if regulatory measures are implemented worldwide to curtail emissions, the political reality is that the measures will impose phased-in reductions taking several decades to return to benchmark emission levels designed to stabilize or reduce greenhouse gas concentrations in the troposphere.[59] Third, and most significantly, even if benchmark levels are

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[56] *See* Peter M. Vitousek et al., *Biological Invasions as Global Environmental Change*, 84 AM. SCIENTIST 468, 472-77 (1996). For a series of articles covering the invasive species issue comprehensively, see generally *Special Section: Population Biology of Invasive Species*, 17 CONSERVATION BIOLOGY 24-92 (2003).

[57] One exception is ship ballast water discharges, which have been a remarkably effective means of transporting aquatic species around the globe and have thus become a subject of regulatory interest. *See* Sandra B. Zellmer, *The Virtues of "Command and Control" Regulation: Barring Exotic Species from Aquatic Ecosystems*, 2000 U. ILL. L. REV. 1233, 1234. The United States Coast Guard adopted regulations covering ballast water discharges in 2004. *See* 33 C.F.R. §§ 151.1500-.1518, 151.2000-.2065 (2007).

[58] The FWS cannot regulate developing nations such as China, which has become the world's leading source of greenhouse gas emissions and has shown only tentative interest in self-imposed or internationally-imposed emission limits. *See* Kathleen E. McLaughlin, *China, Report Says Country Has Already Overtaken U.S. as Leading Source of Carbon Emissions*, 38 Env't Rep. (BNA) 1429, 1429 (June 29, 2007); Daniel Pruzin, *China, Country 'Will Not Accept' Emissions Limits; Government Advisor Cites Insufficient Data*, 38 Env't Rep. (BNA) 1515, 1515 (July 13, 2007); Hou Yanli & Hu Min, *China and Her Coal*, WORLDWATCH, Jan.-Feb. 2007, at 14, 14.

[59] For example, following California's lead, in 2007 Florida Governor Charlie Crist signed executive orders directing the adoption of maximum emission levels of greenhouse gases for electric utilities. *See* State of Florida, Office of the Governor, Exec. Order 07-127 (July 13, 2007), *available at* http://www.myfloridaclimate.com/news/article/34. The standard will require a reduction of emissions to 2000 levels by 2017, to 1990 levels by 2025, and to 80 percent of 1990 levels by 2050. *Id.* Florida will also adopt the California motor vehicle emission standards, pending EPA approval of a waiver from federal standards, imposing a 22-percent reduction in vehicle emissions by 2012 and a 30-percent reduction by 2016. *Id.* For summaries of other proposed and adopted federal and state benchmarks, see generally Stephen C. Jones & Paul R. McIntyre, *Filling the Vacuum: State and Regional Climate Change Initiatives*, 38 Env't Rep. (BNA) 1640 (2007); Pew Ctr. on Global Climate Change, A Look at Emissions Targets, http://www.pewclimate.org/what_s_being_done/targets (last visited Nov. 16, 2007). Many observers believe these benchmarks are unrealistic. *See, e.g.*, Robert N. Stavins, *Free GHG Cuts: Too Good To Be*

attained in the near future, the physical dynamics of greenhouse gas effects on climate are such that climate change will continue on its present trajectory for a significant time period.[60]

Thus, even if the ESA is enlisted as a regulatory weapon against greenhouse gas emissions, the imminent challenge for the statute will be how to address the unavoidable impacts of climate change that have been set in motion by past emissions and which will play out over at least the next 50 years. In this sense, climate change presents scenarios that make anything the FWS has faced in the past look simple. A complex array of climate change effects will lead directly to primary and secondary stresses on ecosystems which we have never before seen or even contemplated, not to mention a tertiary wave of stresses caused when humans themselves adapt to climate change. The picture, to say the least, is not pretty.

A. *Feedback, Nonlinearity, and Reshuffling – Facing a No-Analog Future*

Three metrics drive much of the discussion of climate change as a *global* phenomenon: rising tropospheric carbon dioxide levels as a causal agent, and escalating mean global surface temperatures and rising sea levels as the global effects.[61] The cause and effect relationships at this level are fairly well understood: carbon dioxide and other greenhouse gases trap heat radiating from the earth's surface, which causes surface level temperatures to rise, which in turn causes polar and glacial ice to melt and ocean water volume to expand, which cause sea levels to rise.[62] Nevertheless, models of surface temperature and sea level changes assembled not too long ago are already proving inaccurate based on observed conditions. In general, although commonly accepted projections of carbon dioxide levels in the atmosphere appear to closely track observed conditions, the global mean surface temperature is rising at a rate in the far upper range of model predictions and the sea level is

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True?, ENVTL. F., May-June 2007, at 16, 16 (asserting that the cost estimates California is providing for its benchmark goals are wildly low).

[60] *See* IPCC, CLIMATE CHANGE IMPACTS SUMMARY, *supra* note 2, at 19 ("Past emissions are estimated to involve some unavoidable warming . . . even if atmospheric greenhouse gas concentrations remain at 2000 levels."). Of course, if one believes that climate change is a purely natural phenomenon, then presumably it will continue for some period – perhaps a very long period – regardless of emission reductions.

[61] *See* Stefan Rahmstorf et al., *Recent Climate Observations Compared to Projections*, 316 SCIENCE 709, 709 (2007).

[62] This causal chain as well as other primary and secondary drivers, both natural and anthropogenic, are covered in PHYSICAL SCIENCE BASIS SUMMARY, *supra* note 2, at 10-17. Although much attention has been focused on ice sheet calving and melting, melting of glacial ice appears to be contributing about sixty percent of the "new water" component of sea level rise. *See* Mark F. Meier et al., *Glaciers Dominate Eustatic Sea-Level Rise in the 21st Century*, 317 SCIENCE 1064, 1064 (2007).

rising faster than the upper range of model predictions.[63] More recent models suggest the trends will soon drift considerably above those ranges.[64] In other words, even what we understand best about climate change has proven difficult to model and predict.

Climate change, it turns out, is not a one-variable, one-way phenomenon. Greenhouse gas emissions are not the only phenomena acting as a climate change "forcing."[65] Dust, pollutant haze, and other aerosols in the atmosphere, for example, deflect incoming solar radiation and thus have a cooling effect.[66] As temperatures rise, moreover, other positive and negative feedback effects are triggered that could amplify or impede further warming. Melting tundra, for example, releases more greenhouse gases, and researchers have found this effect is far exceeding expected levels because of its feedback properties.[67] On the other hand, increased duration and intensity of fire regimes may increase warming effects in the short-term because of carbon dioxide emissions but reduce temperatures in the long-term because of increased surface reflectivity

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[63] *See* Rahmstorf et al., *supra* note 61, at 709. Given the complexity of the problem, it is no surprise that climate change effects models are proving difficult to calibrate. Even when climate change has not been a factor, reliable models using weather forecast variables to predict the secondary effects of annual weather patterns on other phenomenon have proven elusive. One recent study showed, for example, that river-level forecasting using annual weather forecast variables is at best moderately accurate only three days into the future. *See* Richard A. Kerr, *River-Level Forecasting Shows No Detectable Progress in 2 Decades*, 316 SCIENCE 1555, 1555 (2007).

[64] *See* Doug M. Smith et al., *Improved Surface Temperature Prediction for the Coming Decade from a Global Climate Model*, 317 SCIENCE 796, 796 (2007) (concluding that natural cooling trends that have been offsetting human-induced warming will die out by 2009, giving way to untempered human-induced warming); *see also* Richard A. Kerr, *Humans and Nature Duel Over the Next Decade's Climate*, 317 SCIENCE 746, 747 (2007) (explaining the difficulty, but necessity, of building climate change models that take into account human-induced *and* natural climate variation causes).

[65] Climatologists refer to phenomena that have a discernable effect on climate as "forcings." *See, e.g.*, 2007 SYNTHESIS REPORT SUMMARY, *supra* note 2, at 5.

[66] *See Another Global Warming Icon Comes Under Attack*, 317 SCIENCE 28, 28 (2007) (explaining that because "[a]erosols cool the planet by reflecting away sunlight and increasing the reflectivity of the clouds," climate change models can vary widely depending on assumptions about aerosol levels).

[67] *See* K.M. Walter et al., *Methane Bubbling from Siberian Thaw Lakes as a Positive Feedback to Climate Warming*, 443 NATURE 71, 71 (2006). The effect leads to a positive feedback loop in the following manner: as the greenhouse gases are released, they contribute to warming that melts the tundra faster, which releases more greenhouse gases more rapidly, and so on. *See* Katey M. Walter et al., *Methane Bubbling from Northern Lakes: Present and Future Contributions to the Global Methane Budget*, 365 PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOC'Y A 1657, 1671 (2007). This effect is believed to have played a significant role in the last deglaciation. *See* K.M. Walter et al., *Thermokarst Lakes as a Source of Atmospheric CH_4 During the Last Deglaciation*, 318 SCIENCE 633, 633 (2007).

(albedo).[68] Even some human-induced phenomena deemed environmentally adverse in other contexts can prove helpful in the climate change context – for example, agricultural soil erosion sequesters organic carbon in stream and lake sediment – meaning feedback effects can cross policy realms with different outcomes in each.[69] As climate change is increasingly studied, nonlinear positive and negative feedback loops like these are being uncovered,[70] making it excruciatingly difficult to construct models of global trends over long time periods.[71]

Indeed, even as we learn more about the highly coupled, tightly interacting processes that comprise the climate, the likelihood is that we will realize with even greater clarity that it is inherently unpredictable. Consider that "[t]he envelope of uncertainty in climate projections has not narrowed appreciably over the past 30 years, despite tremendous increases in computing power, in observations, and in the number of scientists studying the problem."[72] The emerging assessment is that things are unlikely to improve:

> [I]t is evident that the climate system is operating in a regime in which small uncertainties in feedbacks are highly amplified in the resulting climate sensitivity. We are constrained by the inevitable: the more likely a large warming is for a given forcing (i.e., the greater the positive feedbacks), the greater the uncertainty will be in the magnitude of that warming.[73]

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[68] *See* J.T. Randerson et al., *The Impact of Boreal Forest Fire on Climate Warming*, 314 SCIENCE 1130, 1130 (2006) ("Although changes in boreal forest albedo can have a considerable cooling effect on Northern Hemisphere climate, these changes are offset by carbon accumulation, so the net effect . . . on climate change may be close to neutral . . . ." (citations omitted)).

[69] *See* K. Van Oost et al., *The Impact of Agricultural Soil Erosion on the Global Carbon Cycle*, 318 SCIENCE 626, 626 (2007).

[70] These and others are discussed in PHYSICAL SCIENCE BASIS SUMMARY, *supra* note 2, at 10-17.

[71] At the global level, one significant limitation for modeling projection accuracy is the obvious fact that we have no experience with a global climate operating at temperatures like those predicted. In short, "once the world has warmed by 4°C, conditions will be so different from anything we can observe today (and still more different from the last ice age) that it is inherently hard to say when the warming will stop." Myles R. Allen & David J. Frame, *Call Off the Quest*, 318 SCIENCE 582, 582 (2007).

[72] Gerard H. Roe & Marcie B. Baker, *Why Is Climate Sensitivity So Unpredictable?*, 318 SCIENCE 629, 629 (2007).

[73] *Id.* at 632. *But see* M.D. Meyers et al., *USGS Goals for the Coming Decade*, 318 SCIENCE 200, 200 (2007) (expressing optimism that the USGS "will increase its capacity to provide output from predictive and empirical models for managers to test adaptive strategies, to reduce risk, and to increase the potential for hydrological and ecological systems to be self-sustaining, resilient, or adaptable to climate change and related disturbances").

More knowledge about the climate system, in other words, does not necessarily mean greater predictive capacity about global climate patterns.

Of course, what matters for most regulatory agencies is not how well we predict global trends such as surface temperature and sea levels, but what happens at the sub-global regional and local levels at which agencies act. In other words, as surface temperatures and sea levels rise, agencies need to know what happens next, and where. As the EPA puts it, "[e]ffects of global change drivers differ by place and in scale, necessitating place-specific impacts information to enable stakeholders to respond appropriately."[74] Yet even rather fundamental secondary effects questions, such as where it will rain more and less and how fast the ice will melt, remain open to wide variation in available models.[75] For example, in its proposal to list the polar bear as a threatened species under the ESA, the FWS pointed out that "studies indicate that previous projections regarding the rate and extent of climate change underestimated the temperature trend, reductions to annual sea ice during the summer and winter periods, reductions to multi-year pack ice, and reductions in thickness."[76]

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[74] Climate and Land Use Change Effects on Ecological Resources in Three Watersheds: A Synthesis Report, 72 Fed. Reg. 45,045, 45,046 (Aug. 10, 2007) (notice of public comment period).

[75] *See, e.g.*, Frank J. Wentz et al., *How Much More Rain Will Global Warming Bring?*, 317 SCIENCE 233, 233 (2007). The difficulties associated with downscaling global climate change to local secondary effects are relevant, of course, not only to legal responses to threats posed to species, but to threats posed to human populations as well. *See* Robert L. Glicksman, *Global Climate Change and the Risks to Coastal Areas from Hurricanes and Rising Sea Levels: The Costs of Doing Nothing*, 52 LOY. L. REV. 1127, 1128 (2006).

[76] Endangered and Threatened Wildlife and Plants; 12-Month Petition Finding and Proposed Rule To List the Polar Bear as Threatened Throughout Its Range, 72 Fed. Reg. 1064, 1071 (proposed Jan 9, 2007) (to be codified at 50 C.F.R. pt. 17). Indeed, the degree to which projections were off appears to be considerable – we are approximately thirty years ahead of what models forecasted losses would have been by 2006. *See* Julienne Stroeve et al., *Arctic Sea Ice Decline: Faster than Forecast*, 34 GEOPHYSICAL RESEARCH LETTERS L09501, at 4-5 (2007). Part of the problem is the lack of understanding about how human-induced and natural processes interact, with "models probably lack[ing] some realistic feedbacks, natural processes that can amplify a climactic nudge – whether natural or humanmade – into a shove." Richard A. Kerr, *Is Battered Arctic Sea Ice Down for the Count?*, 318 SCIENCE 33, 33 (2007). In an effort to bring the models up to date with observations in order to assist the FWS in its polar bear assessment, in 2007 the U.S. Geological Survey screened all models that failed to predict within twenty percent of the 2006 September sea ice extent of the Arctic and projected future trends based on the remaining models. *See* ERIC DEWEAVER, U.S. GEOLOGICAL SURVEY, UNCERTAINTY IN CLIMATE MODEL PROJECTIONS OF ARCTIC SEA ICE DECLINE: AN EVALUATION RELEVANT TO POLAR BEARS 1 (2007). Using only the models that satisfied this accuracy test – there were only ten – the agency found that "all lose at least 30% of their September ice extent, and 4 lose over 80% of their September ice by the middle of the 21st Century." *Id.* Seven of the ten models proven to be most accurate thus far are ice free by September 2099. *Id.*

Indeed, for the FWS it often will be the case that what matters for a particular species is primarily a function of local ecological conditions and their effects on the species. The FWS, in other words, has to find models that predict the effects of global climate warming on a wide range of physical and biological cycles, "downscale" those effects to local ecological conditions, and then evaluate the effects of those local changes on the species of concern. Such specific downscaling efforts encounter the same nonlinear feedback properties that make climate change effects difficult to model and predict at mean global levels, but they operate with even more volatility at regional and local levels.[77] As the U.S. Climate Change Science Program has summarized:

> In spite of the great interest and importance in understanding and forecasting ecosystem responses to climate change and variability, it is often difficult to relate specific, observable changes in ecosystems to climate change in a rigorous, causal manner. This is partly because climate variables are linked to specific ecosystem responses through complex, nonlinear chains of interacting processes. Part of the difficulty is also related to the need to 'downscale' attributes of change in the climate system to understand ecosystem changes at regional or ecoregional scales. Moreover, effects of climate change on ecosystems and their constituent species and processes are typically confounded with effects of numerous other human actions, including land-use changes that fragment and degrade ecosystems at various spatial scales, pollutants, invasions of non-native species, and resource management and utilization practices. It is difficult to tease apart effects of climate change from these other effects. These challenges are made more difficult by the current paucity of long-term data and information for most ecosystem types and ecoregions, especially from experiments designed to ascertain cause-and-effect relationships.[78]

Applying these projections to the known ecoregions of polar bear habitat, the agency concluded that two-thirds of the world's polar bear population will be lost by mid-century. *See* U.S. GEOLOGICAL SURVEY, USGS SCIENCE TO INFORM U.S. FISH & WILDLIFE SERVICE DECISION MAKING ON POLAR BEARS, EXECUTIVE SUMMARY 2 (2007). The full set of USGS reports is available at U.S. Geological Survey, New Polar Bear Finding, http://www.usgs.gov/newsroom/special/polar%5Fbears/ (last visited Feb. 20, 2008).

[77] *See* U.S. CLIMATE CHANGE SCIENCE PROGRAM, CCSP SYNTHESIS AND ASSESSMENT REPORT 3.1, CLIMATE MODELS: AN ASSESSMENT OF STRENGTHS AND LIMITATIONS FOR USER APPLICATIONS, PUBLIC REVIEW DRAFT 70-71 (2007) (describing problems with existing capacities for downscaling).

[78] U.S. CLIMATE CHANGE SCIENCE PROGRAM, CCSP SYNTHESIS AND ASSESSMENT PRODUCT 4.2, PROSPECTUS FOR THRESHOLDS OF CHANGE IN ECOSYSTEMS 1-2 (2007) (describing the scope of research to be conducted on ecological downscaling models). It is, of course, equally as important to study and understand macroecological effects. *See* Jeremy T. Kerr et al., *The Macroecological Contribution to Global Change Solutions*, 316 SCIENCE 1581, 1581 (2007).

Fundamentally, therefore, the FWS has no models of this sort at its disposal because nobody has the experience or knowledge upon which to base them. Ultimately, they may simply be beyond our capacity. Although all ecosystems undergo disturbance regimes such as flood, fire, and drought, all of which we have some experience observing and predicting, ecologists understand that these forms of disturbance are part of the stable disequilibrium of resilient, dynamic ecosystems.[79] But climate change does not present just another disturbance regime, the operations of which we can extrapolate from current ecological knowledge; rather, it will be the undoing of ecosystems as we know them.[80] As leading ecologists have observed, this makes it inherently difficult to predict long-term outcomes for defined ecosystems:

> New climates are expected to cause ecosystem reshuffling as individual species, constrained by different environmental factors, respond differently. One tree may be limited by summer rains that hold back seedling recruitment, for instance, whereas another species may be limited by winter freezes that control insect pests. Some species may migrate up-latitude or up-elevation, while others stay put. An ecosystem might see many species vanish – but also new arrivals.[81]

These scenarios are no longer hypothetical. For example, a group of oceanographers, climatologists, and ecologists recently reported that unusual ocean conditions and marine die-offs reshaped their understanding of the ocean ecosystem off the Pacific coast of the United States.[82] Synthesizing decades of atmospheric and oceanographic data, the researchers found that drastic fluctuations in winds and currents seem to explain observed ocean anomalies, such as low oxygen zones and a massive die-off of seabirds.[83] The underlying weather patterns were consistent with climate change predictions, but their effects were unexpected. As one of the researchers observed, "[c]limate change is upon us, there is no doubt about that . . . . What's catching us by surprise is the rate at which warming is hitting us. And, of course, how fast the ocean has changed – that is what amazes me."[84]

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[79] For a comprehensive treatment of disequilibrium and resilience theories of ecosystem dynamics, see generally PANARCHY: UNDERSTANDING TRANSFORMATION IN HUMAN AND NATURAL SYSTEMS (Lance H. Gunderson & C.S. Holling eds., 2002).

[80] *See* CLIMATE CHANGE IMPACTS SUMMARY, *supra* note 2, at 8 ("The resilience of many ecosystems is likely to be exceeded this century by an unprecedented combination of climate change, associated disturbances (e.g., flooding, drought, wildfire, insects, ocean acidification), and other global change drivers (e.g., land-use change, pollution, over-exploitation of resources).").

[81] Fox, *supra* note 37, at 823.

[82] *Interplay of Climate and Currents Disrupts Marine Ecosystems*, *supra* note 36.

[83] *Id.*

[84] *Id.* (quoting Bill Peterson of NOAA). The U.S. Climate Change Science Program is, as of this writing, working to complete a comprehensive overview of ecological responses and adaptations to climate change, known as Synthesis and Assessment Product 4.4:

This is the no-analog future of the ESA. Some effects will be more predictable than others, such as that warmer waters will exceed the temperature limits of some fish species.[85] But many effects will be difficult to predict, such as the cascade effects the loss of a top-level predator fish causes in its ecosystem.[86] Where and when these effects will occur, their magnitude and duration, and the other effects they will set in motion are questions the FWS has only begun to confront.

B. *A Typology of Climate Change Threats to Species*

Accurate prediction of climate change effects on local ecological conditions is, for now (and perhaps always will be), beyond the capacity of ecological models. A taxonomy of effects can, nevertheless, be constructed and may be useful for evaluating where the ESA can be most effectively employed when climate change threatens the continued existence of a species. I divide the taxonomy at its highest level between primary ecological effects, secondary ecological effects, and human adaptation impacts.[87]

1. Primary Ecological Effects

The pika presents a relatively straightforward scenario of climate-induced species decline – the ecological conditions it needs for survival do not exist below a particular temperature regime. Of course, it is possible that as climate change takes hold, suitable conditions for the pika will materialize somewhere else in the world, but that will do the pikas of the Great Basin little good. They do not have the option of relocating once the temperature regime lifts above the peaks which they now call home.[88] Rather, the pika and other species with specific ecological needs and limited migration capacity are likely to face significant threats from this kind of first order change in ecological conditions. Threats in this category will come in several forms:

Stranding. Some species will not be able to withstand the degradation or complete loss of essential habitat conditions beyond tolerable thresholds

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Preliminary Review of Adaptation Options for Climate-Sensitive Ecosystems and Resources. *See* 72 Fed. Reg. 46,610, 46,610 (Aug. 21, 2007) (notice of availability of draft report and request for public comments).

[85] *See* Hans O. Portner & Rainer Knust, *Climate Change Affects Marine Fishes Through the Oxygen Limitation of Thermal Tolerance*, 315 SCIENCE 95, 95 (2007).

[86] *See* Ransom A. Myers et al., *Cascading Effects of the Loss of Apex Predatory Sharks from a Coastal Ocean*, 315 SCIENCE 1846, 1846 (2007).

[87] All of the impact categories covered in my typology have been discussed to one extent or another in scientific literature. *See, e.g.*, CLIMATE CHANGE AND BIODIVERSITY, *supra* note 2, at 16-23. My arrangement of them is designed to coincide with the legal analysis of the ESA covered *infra* Parts II-IV.

[88] Of course, humans have the option of moving pikas to new locations. I take up the issue of "assisted migration" below. *See infra* Part III.D.2.

and will have no adaptive capacity to migrate and seek suitable conditions elsewhere.[89]

Life-Stage Habitat Loss. Some species will find ecological conditions for essential life-stage junctures, such as migratory pathways or refuge habitat during juvenile stages, disrupted beyond tolerable thresholds, making the continued availability of suitable ecological conditions for other life-stages irrelevant.[90]

Altered Biological Events. Some species will respond to climate change, particularly warming of surface and water temperatures, through phenologic changes such as shifts in the timing of budding, spawning, or migration. If, as is likely, all ecologically linked species do not shift in synch, some species may face significant threats.[91]

2. Secondary Ecological Effects

Not all species will find it necessary and possible to depart their current ecosystems in order to withstand the direct effects of climate change, but many will. Others will stay to fight it out. While humans might cheer these species on, the aggregate effects of ecological disruption and species reshuffling are likely to lead to several secondary threats.

Increased Stress. Some species will not experience primary ecological changes beyond tolerable thresholds, but will experience increased stress as those thresholds are approached and will become more susceptible to disease, parasitism, predation, and other forms of mortality.[92]

Successful Adaptive Migration. As some species adapt to climate change by successfully migrating to and establishing in areas that present suitable conditions, their introduction may disrupt predator-prey or other ecological conditions to the detriment of other species.[93] One species' successful adaptive migration, in other words, can be another's demise.[94]

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[89] *See, e.g.*, CLIMATE CHANGE AND BIODIVERSITY, *supra* note 2, at 22.

[90] *See, e.g., id.* at 17-18.

[91] *See, e.g., id.* at 12.

[92] *See, e.g., id.* at 13-14.

[93] *See, e.g., id.* at 17.

[94] The reintroduction of wolves into Yellowstone illustrates the effects that can be expected from successful migrations. Researchers believe that the wolves, by preying on elk, have set in motion a series of ecological adjustments leading to rejuvenation of aspen stands. In the absence of their natural predator, the grazing elk were suppressing aspen regeneration; whereas, the introduced wolves have not only reduced elk numbers but also have deterred them from entering aspen stands where they are easy targets. *See* Virginia Morell, *Aspens Return to Yellowstone, with Help from Some Wolves*, 317 SCIENCE 438, 438 (2007).

Opportunistic Invasion. Rather than increased stress effects, some species will find an erosion of barriers, such as temperature limits or water availability, which formerly prevented them from successfully establishing in a particular area, notwithstanding a history of natural or human-induced introduction opportunities. Climate change will close down on some species, but open doors for others.[95]

3. Human Adaptation Impacts

Just as the primary threats to species before climate change centered around human-induced ecological change, it is likely that human adaptation to climate change will play a leading role in threatening species. For example, climate change will likely lead human populations to increase rainwater harvesting and water storage, to adjust the timing and location of crop plantings, to relocate seawalls and other storm barriers, to relocate urban infrastructure, and to shift recreational facilities such as ski slopes to higher altitudes.[96] Several forms of human adaptation impacts will present the most pernicious of such threats:

Direct Habitat Conversion. Many human communities are likely to find it necessary and possible to migrate to avoid rising sea levels along coastal areas, to relocate agricultural land uses, and to obtain secure water supplies.[97] These migrations will necessarily involve some conversion of land uses in areas that presently provide suitable ecological conditions for particular species, in some cases at scales sufficient to pose a threat to the species.[98]

Degraded Ecological Conditions. Relocated human communities will likely introduce ecological degradations from new or amplified pollution, noise, water diversions, and other stresses.[99] Many human communities, relocated or not, also will implement climate change mitigation and adaptation measures designed primarily to protect human health and welfare, such as coastal flood barriers, which in some cases could

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[95] *See, e.g.*, CLIMATE CHANGE AND BIODIVERSITY, *supra* note 2, at 16-17. An example already observed is the expansion of the giant Humboldt squid into the coastal waters of central California. Previously known in that area only during periodic El Nino events, which allowed them to ride warm water currents northward from Mexico for temporary foraging on hake, the squid have permanently taken residence as warmer water temperatures present the necessary ecological conditions. *See* Louis D. Zeidberg & Bruce H. Robinson, *Invasive Range Expansion by the Humboldt Squid,* Dosisicus gigas, *in the Eastern North Pacific*, 104 PROC. OF THE NAT'L ACAD. OF SCI. 12,948, 12,949-50 (2007).

[96] *See* 2007 SYNTHESIS REPORT SUMMARY, *supra* note 2, at 15.

[97] *See* Norman Meyers, *Environmental Refuges in a Globally Warmed World*, 43 BIOSCIENCE 752 *passim* (1993).

[98] *See* CLIMATE CHANGE AND BIODIVERSITY, *supra* note 2, at 3-4.

[99] *See id.* at 42-43.

threaten ecological conditions for other species.[100] Even planting of forests to sequester carbon could degrade conditions for some species.[101]

Induced Invasions. Human adaptation to climate change is likely to involve spatial relocations, as well as increased flow of goods to new settlement areas, which, as in the past, are likely to introduce non-native species to local ecosystems, some of which will establish successfully.[102]

To be sure, it can be expected that some species will fare well, perhaps even spectacularly, with climate change. On balance, however, "[a]pproximately 20-30% of plant and animal species assessed so far are likely to be at increased risk of extinction if increases in global average temperatures exceed 1.5-2.5°C."[103] Whichever of the foregoing effects takes hold, therefore, and whenever and wherever they threaten a particular species, it seems beyond question that the ESA has a busy future in store. The next section grounds that assessment in practical policy terms for the FWS.

II. THE IMPACT OF CLIMATE CHANGE ON THE ESA

Recently, the director of the National Aeronautics and Space Administration opined that while he has "no doubt that . . . a trend of global warming exists," he is "not sure that it is fair to say that it is a problem we must wrestle with."[104] His reasons for advocating inaction included that it is not "within the power of human beings to assure that the climate does not change" and that, in any event, it is "arrogant" for us today to decide "that this particular climate we have right here today, right now, is the best climate for all other human beings."[105] That, of course, is one view, and it suggests a limited role for the ESA in the development of climate change policy.

At the other extreme, scientists from the World Wildlife Fund argue that "[t]he most direct way to protect the ecosystems in which [endangered] species live – the mandate of the ESA – will be to address the cause of climate change:

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[100] *See id.* at 43.

[101] *See id.* at 36.

[102] The EPA has suggested that "important progress has been made in identifying climate change effects on invasive species, but . . . our understanding of effects on specific species and interactions of other stressors needs to be improved." Effects of Climate Change on Aquatic Invasive Species and Implications for Management and Research, 72 Fed. Reg. 45,046, 45,047 (Aug 10, 2007) (notice of availability of research report and public comment period). Most invasive species introductions are human-induced. *See* Vitousek et al., *supra* note 56, at 468.

[103] CLIMATE CHANGE IMPACTS SUMMARY, *supra* note 2, at 11.

[104] Donald Kennedy, *Mixed Messages About Climate*, 317 SCIENCE 169, 169 (2007) (quoting Michael Griffin from radio interview with National Public Radio, the transcript of which is available at NPR, NASA Administrator Michael Griffin Not Sure that Global Warming is a Problem, http://www.npr.org/about/press/2007/053107.griffinaudio.html (last visited Jan. 12, 2008)).

[105] *Id.*

greenhouse gas emissions," and that "it is important that we also consider how implementation of the ESA can be used to reduce the vulnerability of imperiled species and aid in their recovery despite changing conditions."[106] This view suggests a much larger role for the ESA.

A. *Reshuffling the Regulatory Landscape*

The ESA instructs the FWS to use the regulatory powers it confers on the agency to "provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved."[107] Achieving this primary statutory goal presents difficult questions of policy discretion. While preserving ecosystems is clearly the statute's primary goal, how precisely to use the agency's regulatory discretion to "provide a means" of achieving the goal is not self-evident from the text of the statute. Add to that the presence of secondary goals sprinkled throughout the statute, such as the command that the FWS "shall cooperate with State and local agencies to resolve water resource issues in concert with conservation of endangered species"[108] and that designation of critical habitat must take "into consideration the economic impact, the impact on national security, and any other relevant impact,"[109] and the agency is confronted with yet another layer of policy balancing. Indeed, the FWS has endured nearly constant scrutiny in Congress and the courts over how it has executed the ESA's primary and secondary goals.[110]

Alas, the balancing act does not end there for the agency. An important driver of policy discretion under the ESA has for decades been the background social, economic, and legal context within which the statute is situated. The ESA's "pit-bull" reputation has come at some cost, as the statute is often portrayed as unduly interfering with property rights, susceptible to unscientific agency biases, and riddled with irrational fiscal outcomes. It is, to put it mildly, not well liked in some quarters, and at some junctures in its history those who deride the statute have been in a position to act on this sentiment. For example, by the mid-1990s the ESA had reached a low-point in the Republican-controlled Congress, where the statute had become a whipping boy for property rights and "sound science" advocates.[111] Adeptly, however, then-

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[106] Lara Hanson & Christopher R. Pyke, *Climate Change and Federal Environmental Law*, SUSTAINABLE DEV. L. & POL'Y, Winter 2007, at 26, 27.

[107] 16 U.S.C. § 1531(b) (2000).

[108] *Id.* § 1531(c)(2).

[109] *Id.* § 1533(b)(2) (2000 & Supp. 2005).

[110] For an overview of the pressures the FWS has faced in this respect, including demands on the one hand that it be more "precautionary" and on the other hand that it be more "scientific," see generally J.B. Ruhl, *The Battle Over Endangered Species Act Methodology*, 34 ENVTL. L. 555 (2004) [hereinafter Ruhl, *Methodology*].

[111] For comprehensive and thoughtful "insider" accounts of the fate of the ESA in this period, see generally John D. Leshy, *The Babbitt Legacy at the Department of Interior: A Preliminary View*, 31 ENVTL. L. 199 (2001), and Joseph L. Sax, *Environmental Law at the*

Secretary of the Interior Bruce Babbitt spearheaded a series of policy reforms designed to forge a two-part agenda of promoting species conservation while nonetheless responding to the concerns voiced in opposition to the statute. One side of the agenda focused on enhancing species conservation through greater emphasis on ecosystem-level management of habitat and other resources vital to the sustainability of imperiled species.[112] The other side focused on confirming the science-based mission of the statute and providing greater voice and fairness to landowners on whose property imperiled species are found.[113] Over time, this double-barreled agenda took many forms and led to numerous regulatory innovations.[114] Implementing this strategy, however, depended on innovative interpretations of ESA authorities and the extent of agency discretion,[115] the very task that climate change may force on the agency once again.

The FWS thus has been in the policy balancing game for some time, working where it can to keep the primary and secondary statutory goals in line and the overall statutory profile in harmony with the relevant background policy context. So what is new about climate change for an agency already seasoned in the exercise of policy balancing? Everything. Climate change does not fit into one of the familiar policy realms, affecting the policy balance by operating from within the existing set of trade-offs. Rather, climate change operates on all levels of the policy triad – i.e., the primary mission, secondary goals, and background policy context – at once, disrupting not only the contents of each, but also how the trade-off dynamics between each level play out. The ESA's primary goal of species conservation will be challenged by the primary, secondary, and human adaptation effects of climate change. The ESA's secondary goals, such as economic practicability and water resources management, will face their own set of climate change challenges. And the background policy context of property rights, scientific norms, agency

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Turn of the Century; A Reportorial Fragment of Contemporary History, 88 CAL. L. REV. 2375 (2000).

[112] *See, e.g.*, Endangered and Threatened Wildlife and Plants: Notice of Interagency Cooperative Policy Regarding the Role of State Agencies in Endangered Species Act Activities, 59 Fed. Reg. 34,274, 34,275 (July 1, 1994) (emphasizing the role states play in species conservation); George Frampton, *Ecosystem Management in the Clinton Administration*, 7 DUKE ENVTL. L. & POL'Y F. 39 *passim* (1996) (presenting various policies that, in the view of one DOI official, changed the regulatory system "into a strategy that sparks regional multi-species ecosystem planning").

[113] *See* J.B. Ruhl, *Who Needs Congress? An Agenda for Administrative Reform of the Endangered Species Act*, 6 NYU ENVTL. L.J. 367, 388-400 (1998) (providing a cotemporaneous survey of policies serving this purpose).

[114] For a retrospective summary of the full effect of the Babbitt-era reforms, see J.B. Ruhl, *Endangered Species Act Innovations in the Post-Babbittonian Era – Are There Any?*, 14 DUKE ENVTL. L. & POL'Y F. 419, 430-34 (2004).

[115] Once again, an insider's account provides a thoughtful perspective on the strategic approach the Babbitt administration took. *See* Leshy, *supra* note 111, at 212-14.

performance, fiscal constraints, and other concerns will also evolve as climate change places broad pressure on the economy and society. How the FWS balances between these three disassembling realms of policy attention will also inevitably change, as the agency will have had no prior experience with the emerging set of relationships.

In short, just as climate change will reshuffle ecosystems, it will reshuffle the policy context of regulatory programs such as the ESA. Babbitt tested the policy limits of the ESA against fairly well-defined constraints and complaints that boiled down, for the most part, to politics. In the climate change era, by contrast, what will qualify as scientifically credible, fiscally sound, attentive to property rights, and a means of conserving species is uncharted territory for Congress, the courts, and the agency alike. Politics will matter, but the physical world will matter more.

B. *Focal Points for Policy Choices*

Where are the pervasive, transformative policy implications of climate change most likely to place pressure on administration of the ESA? Like the EPA after *Massachusetts v. EPA*, the FWS surely will find itself effectively barred from taking the position that climate change is not occurring or, if it is occurring, that it has no anthropogenic causal component. Unlike where the Clean Air Act takes the EPA, however, accepting that human-induced climate change is occurring does not lead inevitably to particular administrative duties or findings under the ESA. No provision of the ESA addresses pollutants, emissions, or climate in any specific regulatory sense. Rather, the statute operates on fairly holistic levels, requiring the FWS to consider what constitutes endangerment, take, jeopardy, and recovery of species. Far from insulating the FWS from the need to test the range of its discretion, the general nature of the ESA will thrust the FWS into several key policy quagmires:

Identifying Climate-Threatened Species. As no regulatory authorities of the ESA operate until a species is listed as endangered or threatened under Section 4 of the ESA, the initial pressure point is how the FWS uses available science to determine the effects of climate change on particular species. Identifying climate change as a basis for listing a species is likely to invite charges from industry that the agency is using weak models and sparse data, whereas declining to list a species for which a plausible case of climate threat can be made is likely to invite claims from environmental groups that the agency is ignoring the science.

Regulating Greenhouse Gas Emissions. If the FWS identifies climate change as a basis for designating a species for protection under the ESA, it inevitably will face the question whether federal actions that cause, fund, or authorize greenhouse gas emissions jeopardize the species under Section 7, and whether any person emitting greenhouse gases is taking

the species in violation of Section 9.[116] Weak regulation of emissions would ignore the evidence that they are the primary human activity directly contributing to climate change, whereas strong regulation would run into complicated cause-and-effect issues, not to mention potentially caustic political battles.

Regulating Non-Climate Effects To Protect Climate-Threatened Species. Regardless of how aggressively the FWS attempts to regulate greenhouse gas emissions to protect a climate-threatened species, it inevitably will face the problem of how aggressively to regulate other actions that injure the species but which do not contribute to climate change, such as habitat conversion, water diversion, and pollution. Indeed, the agency will face this question even if it adopts the position that climate change is purely natural in cause. For species imperiled primarily because of climate change, however, regulating human activities having no climate change impacts could be controversial and, in the final analysis, futile.

Designing Conservation and Recovery Initiatives. As the FWS regulates more activities associated with climate-threatened species, it inevitably will face the need to design conservation measures as conditions for approval of incidental take under Sections 7 and 10, as well as the need to formulate recovery measures for the species under Section 4. The long-term effectiveness of such measures, however, will be thrown into question as rising sea levels, rising temperatures, and the general reshuffling of ecosystems alter the underlying premises used to design them.

Species Trade-Offs. As noted above, the ESA depends on an overriding purpose of "provid[ing] a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved."[117] Yet, the reshuffling of species under climate change conditions will make it difficult to identify "the ecosystems" to be conserved and is likely to pit species against species in a manner unprecedented in nature.[118] Can the

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[116] Some environmental advocacy groups have made no bones about their intention to pursue litigation forcing the FWS and NMFS to regulate greenhouse gases in order to protect climate-threatened species and their designated critical habitat areas. For example, the Center for Biological Diversity believes that the designation of critical habitat for several species of climate-threatened corals "actually moves the entire Endangered Species Act [ESA] onto a firm legal foundation for challenging global-warming pollution." *See* Mark Clayton, *New Tool To Fight Global Warming: Endangered Species Act?*, CHRISTIAN SCIENCE MONITOR, Sept. 7, 2007, at USA 3 (quoting Kieran Suckling, Policy Dir., Ctr. for Biological Diversity), *available at* http://www.csmonitor.com/2007/0907/p03s03-usgn.html.

[117] 16 U.S.C. § 1531(b) (2000).

[118] Obviously, species naturally compete with one another, such as for habitat and food, or in conflict as predator and prey. There are also a number of examples in which conservation measures taken to benefit a species protected under the ESA pose adverse

FWS reasonably hope to defy climate change and keep existing ecological regimes intact, or should it follow where the reshuffling leads and work toward conserving the new order?

Dealing with the Doomed. Perhaps the most confounding question for the FWS will be how to respond with respect to species that appear doomed because of lack of migratory and adaptive capacity to withstand climate change effects in their natural habitat range. Should the FWS assist such species if it means relocating them to areas climate change has altered in such a way as to provide suitable habitat? If so, how must the agency take into account the impact of assisted migration on other species? Or, if the doomed are left where they are, must the agency expend resources protecting them, or can they be ignored?

These six policy choices define the core of the ESA: which species to protect; which threats to regulate; how to help. Left to its own choosing, the FWS might decide to downplay climate change as a factor in all these respects, to integrate it aggressively, or to mix and match according to a menu of objectives and depending on a variety of criteria. The agency might determine, for example, that identifying all species plausibly threatened by climate change is a salutary use of the ESA, but that expending regulatory authority on those species threatened primarily by climate change – the doomed – is unwise. Or it may decide that the "pit-bull" version of the ESA is the nation's most promising mechanism for going after large emitters of greenhouse gases. The point, however, is that the choice is not all for the FWS to make. Before turning to what the FWS ought to do, we must consider what it can do.

III. FITTING AGENCY DISCRETION WITH CLIMATE CHANGE

Climate change inevitably will rear its head in several ESA programs. The question will be whether the FWS will use its discretion to the fullest in an attempt to incorporate climate change as a regulatory mechanism or, instead, will use its discretion to minimize the role of climate change in decision making. But what is the extent of the agency's discretion – how passive or aggressive can it choose to be? The petitioners who have sought rulemaking changes to address climate change under the ESA "believe that existing law and regulations already *require* the . . . consideration of global warming in all relevant decisions," but do not explain the basis for that assertion in their petition.[119] Keeping the six policy choices outlined above in mind, this Section examines the extent of discretion granted to the agency via five distinct ESA

effects for other species protected under the ESA or for other species generally. *See* NAT'L RESEARCH COUNCIL, SCIENCE AND THE ENDANGERED SPECIES ACT 111-23 (1995). For a detailed case study of such a conflict in its legal context, see generally William W. Kinsey, Zalaphus *(Sea Lion) and* Oncorhynchus *(Salmon/Steelhead): Protected Predator Versus Protected Prey*, NAT. RESOURCES & ENV'T, Fall 2007, at 36.

[119] *See* Petition for Rulemaking, *supra* note 14, at 3 (emphasis added).

components: the listing programs found in Section 4 of the statute; the take regulations of Section 9; the jeopardy consultation program of Section 7; the HCP permit program of Section 10; and, the statute's pervasive "best scientific data available" standard for decision making.

A. *Section 4: Listing, Critical Habitat, and Recovery Plans*

Section 4 establishes a package of programs aimed at identifying imperiled species: (1) the listing function, through which such species are identified as endangered or threatened; (2) the designation of critical habitat essential for the survival of such species; and (3) a planning function designed to identify the steps needed for their recovery. Each program presents the FWS with junctures of narrow and broad discretion with respect to climate change.

1. Identifying Species

Section 4(a)(1) of the ESA requires the FWS to:

> [D]etermine whether any species is an endangered species or a threatened species because of any of the following factors:
>
> (A) the present or threatened destruction, modification, or curtailment of its habitat or range;
>
> (B) overutilization for commercial, recreational, scientific, or educational purposes;
>
> (C) disease or predation;
>
> (D) the inadequacy of existing regulatory mechanisms;
>
> (E) other natural or manmade factors affecting its continued existence.[120]

There could hardly be a more definitive mandate to consider the effects of greenhouse gas emissions and climate change on species. Greenhouse gas emissions are unquestionably a "manmade factor," and if as abundant evidence suggests they are contributing to climate change, they are potentially "affecting . . . [the] continued existence" of climate-threatened species. Regardless of their causal agents, atmospheric warming, sea level rise, and other primary ecological effects of climate change involve "the destruction, modification, or curtailment of . . . [species'] habitat or range." Furthermore, the ecological reshuffling effects of climate change contribute to secondary ecological effects such as "disease or predation." The effects of climate change, therefore, are unambiguously within the ambit of the listing criteria, leaving no room for the FWS to argue that it may leave climate change out of the listing calculus.

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[120] 16 U.S.C. § 1533(a)(1) (2000). The statute also requires the director of the FWS to "make determinations required by subsection (a)(1) of this section solely on the basis of the best scientific and commercial data available to him after conducting a review of the status of the species." *Id.* § 1533(b)(1)(a). For a discussion of the "best scientific data available" standard, see *infra* Part III.E.

Hence, like the EPA under the Clean Air Act, the FWS seems stuck with the challenge of identifying which species are endangered or threatened partly or primarily because of climate change. The pika, which is not yet listed as endangered or threatened, should be at the front of this line.

Although Section 4 leaves no room for debate over whether the agency must integrate climate change effects in the listing decision, the statute provides considerable flexibility for how the agency does so. For example, a species is endangered if it is "in danger of extinction throughout all or a significant portion of its range"[121] and is threatened if it "is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."[122] These are not precise concepts. For example, what does "all or a significant portion of its range" mean? One court described the passage as "odd phraseology" and an "enigmatic phrase,"[123] and recently it took the lawyers at the Department of the Interior nineteen single-spaced pages of dense legal analysis, accompanied by seventeen single-spaced pages of probing discussion of the ESA's legislative history, to explain to the FWS what the lawyers believe this phrase means.[124] Between this interpretational difficulty and phrases such as "in danger of," "is likely to," and "foreseeable future," the FWS may not be so hemmed in after all. Given the extent of agency expertise that must necessarily go into making such judgments, and given the uncertainty associated with downscaling global climate change effects to local species-specific ecological contexts, the FWS likely has considerable play in terms of matching different climate change threat scenarios with the ESA's endangered, threatened, not-threatened matrix. Indeed, the agency thus far has weaved between these terms and used its agency expertise and administrative discretion to find climate change a factor in some cases and not in others.[125] Some species may present such compelling

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[121] 16 U.S.C. § 1532(6) (2000).

[122] *Id.* § 1532(20).

[123] Defenders of Wildlife v. Norton, 258 F.3d 1136, 1141 (9th Cir. 2001).

[124] Memorandum from Solicitor, U.S. Dep't of the Interior, to Director, U.S. Fish and Wildlife Serv., The Meaning of "In Danger of Extinction Throughout All or a Significant Portion of its Range" (Mar. 16, 2007).

[125] For example, unlike its conclusions thus far for the polar bear and penguins, the agency was unconvinced that the American eel is endangered as a result of the effects climate change has had on ocean conditions, notwithstanding ample evidence that the effects are real and posing imminent threats to the species. *Compare* Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition To List the American Eel as Threatened or Endangered, 72 Fed. Reg. 4967, 4995 (Feb. 2, 2007) (rejecting a listing petition "because oceanic conditions are within normal variations [and] the American eel is evolutionarily adapted to oceanic variations"), *with* Thierry Wirth & Louis Bernatchez, *Decline of North Atlantic Eels: A Fatal Synergy?*, 270 PROC. OF THE ROYAL SOC'Y OF LONDON 681, 681 (2003) (compiling evidence of threats from changing oceanic conditions associated with climate change).

cases of climate change threat that even aggressive use of discretion could not support a decision not to list, but many will present more ambiguous scenarios.

Another source of discretion in the listing function rests in Section 4(d), which, as codified, provides:

> Whenever any species is listed as a threatened species pursuant to subsection (c) of this section, the Secretary shall issue such regulations as he deems necessary and advisable to provide for the conservation of such species. The Secretary may by regulation prohibit with respect to any threatened species any act prohibited under section 1538(a)(1) of this title, in the case of fish or wildlife, or section 1538(a)(2) of this title, in the case of plants, with respect to endangered species . . . .[126]

In an article illustrating the interplay between this authority and the regulatory provisions of the ESA, Madeline June Kass explained how Section 4(d) of the statute provides considerable regulatory flexibility.[127] When animal species are listed as endangered, the "take" prohibition of Section 9 applies automatically and fully, leaving less discretion to the FWS as to how to regulate activities that might cause take of the species. By contrast, under Section 4(d) the FWS has the discretion to prescribe the level of take protection afforded species listed as threatened. Kass describes how the FWS (like its sister agency, the NMFS) has increasingly turned to this option to relieve the angst associated with Section 9, crafting complex rules under Section 4(d) detailing activities that are and are not prohibited under Section 9.[128]

This option may prove especially useful for the FWS with respect to a climate-threatened species. It may allow the FWS to identify and regulate the specific effects of human adaptation to climate change that pose significant obstacles to the survival and recovery of a species, whereas broad, dispersed actions such as greenhouse gas emissions could be entirely excluded from regulation. Indeed, the FWS has proposed to list the polar bear as threatened, and has suggested it might employ this approach.[129] Of course, the success of

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[126] 16 U.S.C. § 1533(d) (2000).

[127] *See* Madeline June Kass, *Threatened Extinction of Plain Vanilla 4(d) Rules*, 16 NAT. RESOURCES & ENV'T 78, 78-79 (2001).

[128] *See id.* at 79-81.

[129] *See* Endangered and Threatened Wildlife and Plants; 12-Month Petition Finding and Proposed Rule To List the Polar Bear (*Ursus maritimus*) as Threatened Throughout Its Range, 72 Fed. Reg. 1064, 1097 (proposed Jan. 9, 2007) (to be codified at 50 C.F.R. pt. 17). NMFS took this approach when it listed two coral species as threatened, in part due to climate change effects, and noted that it would evaluate "the necessity and advisability of proposing protective regulations pursuant to section 4(d) of the ESA for these two coral species." Endangered and Threatened Species: Final Listing Determinations for Elkhorn Coral and Staghorn Coral, 71 Fed. Reg. 26,852, 26,859 (May 9, 2006) (to be codified at 50 C.F.R. pt. 223); *see also* Robin Kundis Craig, Acropoa spp.: *Water Flow, Water Quality, and Threatened Corals*, NAT. RESOURCES & ENV'T, Fall 2007, at 8, 9.

this strategy depends on a scientifically credible basis for designating the species as threatened. Moreover, the condition that protective regulations be "necessary and advisable to provide for the conservation of such species" has not been tested in a context like that suggested – i.e., to exclude one set of causal factors, ostensibly because the cause, effect, and response associated with them is so complex, so as to focus conservation resources on a more manageable set of factors. Not surprisingly, therefore, this new approach, while "creative and fresh,"[130] is controversial, and would no doubt prove doubly so if used as suggested for dealing with climate-threatened species.

2. Designating Critical Habitat

Section 4(a) of the ESA also requires that, "to the maximum extent prudent and determinable [the FWS] shall, concurrently with making a determination under paragraph (1) that a species is an endangered species or a threatened species, designate any habitat of such species which is then considered to be critical habitat."[131] The statute defines critical habitat as:

> (i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 1533 of this title, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and
>
> (ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 1533 of this title, upon a determination by the [FWS] that such areas are essential for the conservation of the species.[132]

The critical habitat program has proven quite controversial. In addition to a wave of suits involving missed statutory deadlines for critical habitat designations, "both the protection provided by and the analysis required for critical habitat designation are coming under increasing judicial scrutiny."[133] Nevertheless, in the context of climate change, the critical habitat program could lend considerable flexibility to the FWS in several respects.

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[130] Kass, *supra* note 127, at 133.

[131] 16 U.S.C. § 1533(a)(3)(A).

[132] *Id.* § 1532(5)(A).

[133] *See* Feldman & Brennan, *supra* note 45, at 88. The wave of litigation has become so intense and costly that the FWS has described it as having nothing short of debilitating effects on the agency's ability to carry out its conservation mission. The agency has long believed that, "in most circumstances, the designation of 'official' critical habitat is of little additional value for most listed species, yet it consumes large amounts of conservation resources," and "that the present system for determining and designating critical habitat is not working." Endangered and Threatened Wildlife and Plants; Notice of Intent To Clarify the Role of Habitat in Endangered Species Conservation, 64 Fed. Reg. 31,871, 31,872 (June 14, 1999).

On the one hand, the provision allowing designation of specific areas outside the geographical area occupied by the species if "essential for the conservation of the species" may be an ideal way for FWS to respond aggressively to ecological reshuffling. To the extent downscale models can predict with reasonable certainty where a species might successfully migrate to adapt to changes brought about by climate change, a credible interpretation of the critical habitat provisions would allow the agency to "reserve" those areas through critical habitat designations.[134] This would provide an effective tool to force human adaptation measures to minimize effects in such areas, thus securing a greater chance for the species to withstand climate change transitions and establish a viable population in its new ecological home.

On the other hand, several provisions also open the door to a more passive approach. For example, the agency could justifiably conclude that designation of critical habitat for species doomed by climate change fails to meet the "prudent" standard, as the designation will provide no benefit.[135] Indeed, for a doomed species, arguably there is no habitat "essential to the conservation of the species," as conservation of the species is not possible. Even for species that might be assisted through critical habitat designation, the complexities of climate change could render the extent of such habitat "indeterminable,"[136] which would delay designation for up to one year after the species is listed.[137]

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[134] The FWS took an approach like this with respect to the Preble's Meadow Jumping Mouse, deciding to include small streams in the species' critical habitat, even though larger streams are more important to the species, on the ground that "Preble's populations along mountain streams may be less subject to certain threats including . . . long-term climate change." Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Preble's Meadow Jumping Mouse (*Zapus hudsonius preblei*), 68 Fed. Reg. 37,276, 37,285 (June 23, 2003) (codified at 50 C.F.R. pt. 17). On the other hand, it declined to do so for the Spreading navarretia plant. A commenter suggested that the critical habitat should "include areas of unoccupied suitable habitat that would provide for recovery opportunities, including . . . migration in response to climate change," but the agency merely observed that "critical habitat designations do not signal that habitat outside the designation is unimportant or may not be required for recovery." Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for *Navarretia fossalis* (Spreading Navarretia), 70 Fed. Reg. 60,658, 60,662 (Oct 18, 2005) (codified at 50 C.F.R. pt 17).

[135] The statute does not define "prudent." According to FWS regulations, designation of critical habitat is not prudent if it "would not be beneficial to the species." 50 C.F.R. § 424.12(a)(1)(ii) (2006). Courts have examined "not prudent" determinations by the FWS with a "hard look" review demanding more than conclusory statements and expecting that such determinations will be rare. *See* LIEBESMAN & PETERSEN, *supra* note 7, at 20-21; STANFORD ENVTL. LAW SOC'Y, *supra* note 7, at 64-66. No phenomenon operating on the scale of climate change has been involved in those cases.

[136] The statute does not define "indeterminable." According to FWS regulations, critical habitat is indeterminable if "(i) Information sufficient to perform required analyses of the impacts of the designation is lacking, or (ii) The biological needs of the species are not sufficiently well known to permit identification of an area as critical habitat." 50 C.F.R. § 424.12(a)(2). This is the position the FWS has taken thus far with respect to the polar bear.

In addition, the statute specifies that the FWS "shall designate critical habitat, and make revisions thereto, under subsection (a)(3) . . . on the basis of the best scientific data available and after taking into consideration the economic impact, the impact on national security, and any other relevant impact, of specifying any particular area as critical habitat."[138] Based on this analysis, the agency "may exclude any area from critical habitat if [the agency] determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless [the agency] determines, based on the best scientific and commercial data available, that the failure to designate such area as critical habitat will result in the extinction of the species concerned."[139] The FWS could put together a credible case that a designation of critical habitat for some climate-threatened species might so extensively impede human adaptation to climate change as to warrant exercise of its discretion not to act, assuming the case also can be made that extinction is not therefore inevitable.

3. Formulating Recovery Plans

Section 4(f) of the ESA requires the FWS to "develop and implement plans (. . . 'recovery plans') for the conservation and survival of endangered species and threatened species listed pursuant to this section, unless [the FWS] finds that such a plan will not promote the conservation of the species."[140] The agency must also "give priority to those endangered species or threatened species, without regard to taxonomic classification, that are most likely to benefit from such plans, particularly those species that are, or may be, in conflict with construction or other development projects or other forms of economic activity."[141] Arguably, this prioritization mandate speaks directly to climate-threatened species which, perhaps only with the help of the ESA, could survive the transition to stabilized climate regimes. On the other hand, one striking aspect of the recovery plan program is that it specifically relieves the FWS of any duty to prepare a plan if the agency finds that "a plan will not promote the conservation of the species."[142] For a species essentially doomed by climate change through stranding or other extreme effects, the FWS could

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See Endangered and Threatened Wildlife and Plants; 12-Month Petition Finding and Proposed Rule To List the Polar Bear (*Ursus maritimus*) as Threatened Throughout Its Range, 72 Fed. Reg. 1064, 1096 (proposed Jan. 9, 2007) (to be codified at 50 C.F.R. pt. 17) (citing 50 C.F.R. § 424.12(a)(2)).

[137] *See* 16 U.S.C. § 1533(b)(6)(C)(ii) (2000). At the end of that year, critical habitat must be designated "to the maximum extent prudent." *Id.*

[138] *Id.* § 1533(b)(2) (2000 & Supp. 2005). For a discussion of the "best scientific data available" standard, see *infra* Part III.E.

[139] 16 U.S.C. § 1533(b)(2) (2000 & Supp. 2005).

[140] *Id.* § 1533(f)(1) (2000).

[141] *Id.* § 1533(f)(1)(A).

[142] *Id.* § 1533(f)(1).

justifiably reach such a finding and avoid expending agency resources developing a plan for the species.

Even if the FWS does prepare a recovery plan for a climate-threatened species, presumably on the premise that the ESA can help the species, it will be of limited application as the courts have interpreted recovery plans to have no mandatory effect on federal agencies, much less anyone else.[143] They are plans, and that's it.

Nevertheless, recovery plans are not necessarily meaningless. They do provide a wealth of information about a species and its road to recovery.[144] Although Professor Federico Cheever has meticulously chronicled the failure of recovery planning to amount to anything in terms of enforceability,[145] he also has outlined the case for using recovery plans to guide implementation of the other ESA programs, including those that do have regulatory force. Professor Cheever's argument points to the influence recovery plans have had on judicial determinations of such matters as whether an activity causes take, whether an activity jeopardizes a species, and whether a species should be reclassified from endangered to threatened.[146] Moreover, recovery plans can help motivate and guide state, local, and private collaborative efforts to respond to the effects of climate change on the species.[147] Through recovery plans, therefore, the FWS may be able to influence how climate change effects are viewed for species in the regulatory programs of the ESA – the take prohibition, the jeopardy consultation program, and the HCP permit program – which are taken up in the next three sections of the Article.

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[143] *See* LIEBESMAN & PETERSEN, *supra* note 7, at 25-26; STANFORD ENVTL. LAW SOC'Y, *supra* note 7, at 76-77.

[144] For example, the FWS must incorporate in each plan:

> (i) a description of such site-specific management actions as may be necessary to achieve the plan's goal for the conservation and survival of the species;
>
> (ii) objective, measurable criteria which, when met, would result in a determination, in accordance with the provisions of this section, that the species be removed from the list; and
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> (iii) estimates of the time required and the cost to carry out those measures needed to achieve the plan's goal and to achieve intermediate steps toward that goal.

16 U.S.C. § 1533(f)(1)(B).

[145] *See* Federico Cheever, *Recovery Planning, the Courts and the Endangered Species Act*, 16 NAT. RESOURCES & ENV'T 106, 108-10 (2001).

[146] *See id.* at 110-11, 135.

[147] *See, e.g.*, Proposed Recovery Plan for the Evolutionarily Significant Unit (ESU) of the Puget Sound Chinook Salmon, 70 Fed. Reg. 76,445, 76,447 (proposed Dec. 27, 2005) (stating that integration of climate change effects in the recovery plan can "support recovery actions to protect and restore local habitat conditions as a buffer against larger-scale changes").

B. *Section 9: The Take Prohibition*

Section 9(a)(1) of the ESA instructs that, except as provided elsewhere in the ESA,[148] "with respect to any endangered species of fish or wildlife . . . it is unlawful for any person subject to the jurisdiction of the United States to . . . take any such species within the United States or the territorial sea of the United States."[149] Recognizing that this so-called "take prohibition" has defined limits – it does not apply to plant species[150] and does not apply automatically to threatened species of fish and wildlife[151] – where applicable, it takes effect sweepingly and with tremendous force. Persons subject to the prohibition include all federal, state, and local governments and all private organizations and individuals.[152] The prohibition applies "within the United States," on public and private lands alike. And it applies to acts that "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" the protected species.[153] Within that list of prohibited activities, the FWS and the NMFS have defined "harm" to include any modification of the species' habitat – in this case not limited to designated critical habitat – that "actually kills or injures" the species members "by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering."[154] Although the United States Supreme Court upheld this interpretation of the statute in *Babbitt v. Sweet Home Chapter of Communities for a Great Oregon*,[155] the devil is in the details in this instance.

The *Sweet Home* opinion took with one hand while it gave with the other, limiting the breadth of the harm definition as much as it upheld the idea that take extends to habitat losses. The harm definition projects the take prohibition from cases in which the action causes direct death or injury (e.g., hunting, shooting, and trapping), to cases in which causality is indirect – i.e., loss of habitat leads in some way to actual death or injury. However, theories of indirect take can become quite attenuated and speculative, in which case it would be unreasonable to enforce the take prohibition's rebuttable presumption against the activity as rigorously as in more obvious cases of direct take. For example, assume that a developer's plan to build a subdivision would locate new homes in an area within several hundred yards of habitat known to be occupied by members of a protected bird species, but not actually in the habitat. Opponents of the project may argue that some of the residents of the new homes will have cats as pets, some of those cat owners will allow their

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[148] The incidental take permitting program is one such exception. *See infra* Part III.D.1.

[149] 16 U.S.C. § 1538(a)(1), (a)(1)(B) (2000).

[150] Plants receive more limited protection. *See id.* § 1538(a)(2).

[151] As noted *supra* Part III.A.1, the listing agency may by rule extend some or all of the take prohibition protections to threatened species. *Id.* § 1533(d).

[152] All these entities fit the ESA's definition of "person." *See id.* § 1532(13).

[153] *Id.* § 1532(19).

[154] 50 C.F.R. § 17.3 (2006) (FWS definition); *id.* § 222.102 (NMFS definition).

[155] 515 U.S. 687, 704 (1995).

cats to wander outdoors, some of those cats may venture into the bird's habitat, and some of those cats may eat birds, and some of those birds may be individuals of the protected bird species. Anyone could speculate such possibilities, and it would be unreasonable to impose the burden on the developer of proving the postulated scenario is not possible.[156]

Rather, as the Court pronounced when it upheld the harm definition, in many cases it is appropriate to impose the burden of proof on the proponent of the indirect harm theory. Thus, the majority emphasized that the harm rule incorporates "but for" causation, with "every term in the regulation's definition of 'harm' . . . subservient to the phrase 'an act which actually kills or injures wildlife.'"[157] Furthermore, the term should "be read to incorporate ordinary requirements of proximate causation and foreseeability."[158] The majority thus implicitly endorsed Sweet Home's "strong arguments that activities that cause minimal or unforeseeable harm will not violate the [ESA] as construed."[159] In her concurrence, Justice O'Connor was more direct, limiting the scope of the harm rule to "significant habitat modification that causes actual, as opposed to hypothetical or speculative, death or injury to identifiable protected animals."[160] Since the Court established these tort-like evidentiary burdens, the lower courts have steadfastly refused to enforce the take prohibition based on attenuated indirect take theories, but have enjoined case-specific instances of take when death or injury was proven to be likely.[161]

The stiff evidentiary and proof burdens *Sweet Home* imposed largely explain why the government and citizen groups (through citizen suits) so infrequently attempt to prosecute take violation claims.[162] Prosecuting a

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[156] *See* Morrill v. Lujan, 802 F. Supp. 424, 430-31 (S.D. Ala. 1992) (rejecting an ESA claim for injunctive relief based on this set of allegations). In settlement of another round of litigation initiated following denial of the injunction request, the developer in *Morrill* nonetheless agreed to prohibit house cats in the development. *See* William H. Satterfield et al., *Who's Afraid of the Big Bad Beach Mouse?*, 8 NAT. RESOURCES & ENV'T 13, 15 (1993) (citing *Developer Agrees To Protect Beach Mice*, BIRMINGHAM NEWS, Jan. 19, 1993).

[157] *Sweet Home*, 515 U.S. at 700 n.13.

[158] *Id.* at 696-97 n.9.

[159] *Id.* at 699.

[160] *Id.* at 708-09 (O'Connor, J., concurring).

[161] For a thorough survey of the post-*Sweet Home* cases, see Glen & Douglas, *supra* note 48, at 68-69.

[162] The handful of reported cases involving land uses are covered in Glen & Douglas, *supra* note 48, *passim*. As they show, most Section 9 enforcement cases are brought by citizen groups under the citizen suit provision of the ESA. A rare example of federal government prosecution is *United States v. Town of Plymouth*, 6 F. Supp. 2d 81 (D. Mass. 1998), in which the government sued a city for failing to prevent its citizens from running over a small endangered bird while riding ORVs along a public beach. *Id.* at 91-92. The FWS and citizen groups have also prosecuted a number of Section 9 cases against water diverters in western states. *See* James R. Rasband, *Priority, Probability, and Proximate*

climate change case would be no mean feat either, given the generic effects of greenhouse gas emissions and the imprecision of downscaling models. Consider, for example, a scenario in which the pika is listed as endangered due to climate change. Who is taking the pika? Are greenhouse gas emissions from, say, a coal-fired power plant in Florida taking the pika? The plaintiff in such a case would have to show that the power plant emissions are the actual as well as proximate, foreseeable cause of the primary and secondary ecological effects which are in turn the actual as well as proximate, foreseeable cause of the pika's demise.[163] Proving that would prove too much, however, as it would necessarily follow that *all* sources of greenhouse gases are taking the pika. This is an inherent feature of the take prohibition that makes it inapposite when take of a species occurs through large-scale, dispersed causal agents, such as water consumption and pollution – if *anyone* is taking the species, *everyone* is taking the species. Although nothing in the ESA prevents the FWS from attempting to prosecute such a case, it would be a daunting prosecutorial undertaking[164] as well as likely political suicide.[165] Thus far, the FWS has

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Cause: Lessons from Tort Law About Imposing ESA Responsibility for Wildlife Harm on Water Users and Other Joint Habitat Modifiers, 33 ENVTL. L. 595, 618-23, 628-30 (2003).

[163] Even the Center for Biological Diversity, which has "push[ed] to use the ESA to fight global warming," concedes that "any bid to fight the construction of a power plant by arguing that emissions might harm a species would probably be thrown out of court, because such climate-change effects remain speculative." Clayton, *supra* note 116 (reporting on an interview with Kieran Suckling, Policy Dir., Ctr. for Biological Diversity); *see also* Brendan R. Cummings & Kassie R. Siegel, Ursus martimus*: Polar Bears on Thin Ice*, NAT. RESOURCES & ENV'T, Fall 2007, at 3, 7 (staff members of the Center for Biological Diversity concede that "[w]hile it is clear that global warming affects listed species, attributing an individual action's contribution to global warming is more difficult"). Difficulties in establishing actual and proximate causation permeate legal analyses of tort and other liabilities associated with climate change. *See* David A. Grossman, *Warming Up to a Not-So Radical Idea: Tort-Based Climate Change Litigation*, 28 COLUM. J. ENVTL. L. 1, 22-27 (2003).

[164] The difficulty of prosecuting take prohibition claims in such dispersed take scenarios has led some plaintiffs to simplify matters by suing state and local governments that allegedly "authorize" the behavior under state or local law. For example, if a state authorizes boating in state waters inhabited by an endangered species, the claim would be that the state is vicariously liable for injuries boaters cause to the species. This strategy is, not surprisingly, controversial and has had mixed results in the courts. *See* J.B. Ruhl, *State and Local Government Vicarious Liability under the ESA*, 16 NAT. RESOURCES & ENV'T 70, 71-73 (2001). It has never been applied successfully on a scale remotely approaching global greenhouse gas emissions.

Another approach to simplify take prosecutions in dispersed aggregate causation settings could be to single out only major sources of harm for prosecution seeking injunctive relief. For example, in the western water diversion context, which often presents multiple diverters having an aggregate impact on an aquatic species, the FWS or other plaintiff might select major water diverters as the defendants to enjoin their future diversion of water. Professor James Rasband criticizes this approach to the extent it follows anachronistic tort principles

exhibited no stomach for it,[166] and in the long run may determine to use its discretion – in this case prosecutorial discretion[167] – to leave greenhouse gas emissions out of its take enforcement agenda.[168]

The take prohibition would prove more adept at enforcing discrete, identifiable actions that make it less likely a climate-threatened species will survive through the climate change transition. In particular, climate change is likely to present collisions between many species, climate-threatened or not, and human adaptations such as relocated agricultural and urban land uses, technological structures designed to impede sea level rise and floods, and new and intensified water diversions to sustain parched urban centers. Enforcement of the take prohibition in such settings, where proximate cause may be less difficult to establish, could help ensure that human adaptation measures do not disregard the interests of imperiled species. In this sense, Section 9 would be used no differently from the way it is already used – climate change effects would simply be a reason to use it more vigilantly.

C. *Section 7: Jeopardy Consultations*

Section 7(a)(2) of the ESA provides:

> Each Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency (. . . "agency action") is not likely to jeopardize the

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of joint and several liability with no right of contribution. Rasband suggests instead using apportioned injunctive relief based on each defendant's priority of diversion under the western appropriative rights system. *See* Rasband, *supra* note 162, at 637-44. As he points out, however, as the number of diverters increases and the proportionate diversion of any one decreases, more and more diverters must be joined in the suit in order to make a dent in the total diversion of water from the aquatic ecosystem. *See id.* at 641-42. This effect would be particularly acute in the case of greenhouse gas emissions. Neither joint and several liability nor apportioned liability has been employed as a theory of liability in a Section 9 prosecution based on greenhouse gas emissions as the alleged causal agent.

[165] *See* Rasband, *supra* note 162, at 638 (observing that prosecution of take violation cases presents daunting proof complications and is politically unpopular).

[166] For example, the agency does not identify greenhouse gas emissions in the list of activities it believes could potentially result in a violation of Section 9 with regard to the polar bear. *See* Endangered and Threatened Wildlife and Plans; 12-Month Petition Finding and Proposed Rule To List the Polar Bear (*Ursus maritimus*) as Threatened Throughout Its Range, 72 Fed. Reg. 1064, 1098 (proposed Jan. 9, 2007) (to be codified at 50 C.F.R. pt. 17).

[167] Prosecutorial discretion is relatively unbounded. *See* Heckler v. Chaney, 470 U.S. 821, 831 (1985) ("This Court has recognized on several occasions over many years that an agency's decision not to prosecute or enforce, whether through civil or criminal process, is a decision generally committed to an agency's absolute discretion.").

[168] The FWS cannot generally prevent citizen groups from launching such an enforcement effort, but the agency could do so in specific cases by listing a species as threatened and limiting the scope of the take prohibition with respect to that species, as it is authorized to do under Section 4(d) of the statute. *See supra* Part III.A.1.

> continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined . . . to be critical . . . .[169]

The statute builds an elaborate procedure for carrying out these consultations under which the agency proposing the action must "consult" with the FWS through a series of steps designed to predict the impact of the action on listed species, with the ultimate product being a "biological opinion" from the FWS "setting forth the [FWS's] opinion, and a summary of the information on which the opinion is based, detailing how the agency action affects the species or its critical habitat."[170]

The substantive content for conducting the consultation analysis is defined primarily in FWS regulations. "Jeopardize" is defined there as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species."[171] Five key regulatory definitions lay out the scope of effects that must be considered to determine whether an action triggers that standard:

> *Action* means "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas."[172]

> *Effects of the action* means "the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline."[173]

> *Environmental baseline* means "the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process."[174]

> *Indirect effects* are "those that are caused by the proposed action and are later in time, but still are reasonably certain to occur."[175]

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[169] 16 U.S.C. § 1536(a)(2) (2000). The provision also requires that "[i]n fulfilling the requirements of this paragraph each agency shall use the best scientific and commercial data available." *Id.* For discussion of the "best scientific data available" standard, see *infra* Part III.E.

[170] 16 U.S.C. § 1536(b)(3)(A).

[171] 50 C.F.R. § 402.02 (2006).

[172] *Id.*

[173] *Id.*

[174] *Id.*

[175] *Id.*

> *Cumulative effects* are "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation."[176]

The FWS has issued no official guidance on climate change with respect to the Section 7 jeopardy consultation program, but it takes no stretch of imagination to fit climate change into this framework. Consider a project being carried out, funded, or authorized by a federal agency, the construction of which will remove habitat of a listed species and the operation of which will emit greenhouse gases. The removal of habitat and emission of greenhouse gases are clearly direct effects of the action added to the environmental baseline,[177] both of which could have indirect effects that adversely affect the species. At some later time, the habitat removal could adversely affect the reproduction, numbers, or distribution of that species. Greenhouse gas emissions contribute to tropospheric warming, and the secondary effects of such warming could also, at some later time, adversely affect the species. Moreover, other state and private activities emitting greenhouse gases may also contribute to cumulative climate change effects that adversely affect the species. In short, greenhouse gas emissions and their climate change consequences both appear to be wrapped tightly into the framework for consultations under Section 7(a)(2).[178]

To be sure, as with the listing decision, the FWS consultation decision depends on a three-part causal chain: greenhouse gas emissions cause tropospheric warming, which in turn causes secondary climate change effects, which in turn cause ecological changes that adversely affect the species.

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[176] *Id.*

[177] Because past emissions of greenhouse gases will contribute to future climate change, *see supra* note 60, some increment of future climate change arguably already is within the environmental baseline. Nevertheless, until aggregate global emissions fall to levels that reduce tropospheric greenhouse gas concentrations to levels sufficient to arrest further climate change, all present and future emissions add to the environmental baseline.

[178] This reasoning is similar to guidance the Council on Environmental Quality (CEQ) issued in 1997 suggesting that the environmental impacts assessment process required of federal actions under the National Environmental Policy Act (NEPA) "provides an excellent mechanism for consideration of ideas related to global climate change." Draft Memorandum from Kathleen A. McGinty to Heads of Federal Agencies, Guidance Regarding Consideration of Global Climatic Change in Environmental Documents Prepared Pursuant to the National Environmental Policy Act 1 (Oct. 8, 1997), *available at* http://www.mms.gov/eppd/compliance/reports/ceqmemo.pdf. As CEQ explained:

> The available scientific evidence . . . indicates that climate change is "reasonably foreseeable" impacts [sic] of emissions of greenhouse gases, as that phrase is understood in the context of NEPA and CEQ regulations . . . .
>
> Specifically, federal agencies must determine whether and to what extent their actions affect greenhouse gases. Further, federal agencies must consider whether the actions they take, [for example], the planning and design of federal projects, may be affected by changes in the environment which might be caused by global climatic change.

Id. at 4. The CEQ has not issued further guidance or policy on the topic.

Although determining whether these downscale effects actually occur may be difficult to say in particular scenarios, the point is that they could occur. Unless the FWS intends on ruling out that possibility entirely – a difficult proposition after *Massachusetts v. EPA* – it stands to reason that consultations under Section 7(a)(2) should consider the possible direct, indirect, and cumulative effects of greenhouse gas emissions and climate change.

Indeed, one recent judicial opinion makes it clear that the FWS *must* at least address the effects of climate change in jeopardy consultations. In *Natural Resources Defense Council v. Kempthorne*,[179] the FWS had prepared its consultation report, known as a biological opinion (BiOp), regarding the effects of the Central Valley Project-State Water Project (CVP-SWP) in California on a small fish, the Delta smelt.[180] The BiOp's conclusions were based in part on the assumption that the hydrology of the water bodies affected by the project would follow historical patterns for the next 20 years.[181] Undercutting this assumption, a number of environmental groups directed FWS's attention to several studies on the potential effects of climate change on water supply reliability, urging that the issue be considered in the BiOp.[182] Reminiscent of the EPA's position in *Massachusetts v. EPA*, the FWS attempted to defend its failure to consider climate change at all, as the court summarized:

> Defendants and Defendant-Intervenors respond by arguing (1) that the evidence before FWS at the time the BiOp was issued was inconclusive about the impacts of climate change; and (2) that, far from ignoring climate change, the issue is built into the BiOp's analysis through the use of [saline water condition data] as a proxy for the location and distribution of Delta smelt.[183]

But the court evidenced little tolerance for the agency's failure to address these issues in the consultation documents:

> [T]he climate change issue was not meaningfully discussed in the biological opinion, making it impossible to determine whether the information was rationally discounted because of its inconclusive nature, or arbitrarily ignored . . . .
>
> . . . .
>
> The BiOp does not gauge the potential effect of various climate change scenarios on Delta hydrology. Assuming, *arguendo*, a lawful adaptive management approach, there is no discussion when and how climate

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[179] 506 F. Supp. 2d 322 (E.D. Cal. 2007).

[180] *Id.* at 328.

[181] *Id.* at 367.

[182] *Id.* at 367-68.

[183] *Id.* at 369.

> change impacts will be addressed, whether existing take limits will remain, and the probable impacts on CVP-SWP operations.
>
> FWS acted arbitrarily and capriciously by failing to address the issue of climate change in the BiOp.[184]

As did the majority in *Massachusetts v. EPA*, however, the *Kempthorne* court made it clear that at this stage of the litigation "[t]here is no basis to determine what weight FWS should ultimately give the climate change issue in its analysis."[185] The agency's error, in other words, was in not addressing climate change *at all.* By contrast, once it has taken up the subject in a consultation, the agency may have considerable latitude in evaluating the indirect and cumulative effects of climate change, given that they must be "reasonably certain to occur" and must "reasonably... be expected" to jeopardize the species.[186]

As with the Section 9 take prohibition, however, the problem with fitting climate change into the consultation framework is that it exhibits more certainty at macro levels than at micro levels. Consider, for example, the proposed coal-fired power plant in Florida and its effects on the pika in the Sierra Nevada Mountains.[187] It would seem quite a stretch to conclude that the power plant emissions will jeopardize the pika. Yet, at a macro level the analysis is rather straight forward: the power plant emits greenhouse gases (a direct effect of the action), greenhouse gases are reasonably certain to warm the troposphere (an indirect effect of the action), a warming troposphere is reasonably certain to adversely alter ecological conditions for the pika, and it is reasonably expected that such ecological changes will bring an end to the pika. At the micro level, however, it becomes difficult to link the *individual* plant's emissions as the jeopardizing agent for the pika, given that *all* greenhouse gas emissions worldwide are subject to the same macro analysis. Other than quantity of emissions, the FWS would have no reasoned basis for distinguishing between the power plant in Florida, a farm in Kansas, or an

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[184] *Id.* at 369-70.

[185] *Id.* at 370 n.28.

[186] *See supra* text accompanying notes 171, 174-75.

[187] The considerable distance between the action and the species is not determinative. The FWS consultation regulations define "action area" – the geographic scope of the consultation analysis – as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." 50 C.F.R. § 402.02 (2006). Thus, the analysis is not limited to the "footprint" of the action, nor is it limited by the Federal agency's authority. Rather, it is a biological determination of the reach of the proposed action on listed species. Subsequent analyses of the environmental baseline, effects of the action, and levels of incidental take are based upon the action area. *Id.* (defining "environmental baseline" and, by incorporation, "effects of the action" as based on action area).

elementary school in Oregon.[188] All have an adverse effect on the pika – and some arguably have more of an effect – but given the small proportion of total greenhouse gas emissions that each represents, the FWS can likely justify finding that none of the emitting land uses jeopardizes the species.

Given these attributes of greenhouse gas emission effects on climate, it is difficult to conceive of how the agency would go about aggressively regulating greenhouse gas emissions through the jeopardy consultation program. The FWS does not have the pollution control expertise of the EPA, nor does any provision of the ESA explicitly provide authority to engage in emissions regulation. Given that all emission sources contribute to warming effects, the threat of jeopardy findings would have to be applied universally to all sources. This, in turn, might induce emission sources to engage in emission offsets (e.g., by purchasing forestation credits) or technological and operational emission reductions. But is the FWS equipped to assume the role of nation-wide regulator of farms, industrial facilities, auto emissions, and everything else? In short, the idea that *all* emission sources present jeopardy conditions to each and every climate-threatened species would prove too much, and likely render the ESA and the FWS political targets in the first degree.

On the other hand, the climate change issue in *Kempthorne* did not involve analysis of the indirect effects of a project's greenhouse gas emissions, but rather focused on how the cumulative effects of climate change will influence the effects of a project on a protected species.[189] The FWS evaluated the effects of the project on the smelt assuming no change in hydrology relevant to the smelt, but there was evidence that climate change could adversely affect hydrological conditions for the smelt in a way that could have altered the consultation effects analysis. The effect of *Kempthorne* is to require that where downscale modeling and field observations indicate it is "reasonably certain" that climate change will lead to changes in ecological conditions to the detriment of a protected species, the FWS *must* engage in a consultation to determine whether the project, taking those changes into account as cumulative effects, is "reasonably expected" to jeopardize the species. The FWS may in many cases point to the difficulty of downscaling climate change effects to support a no-jeopardy finding,[190] but that does not absolve it of the duty to conduct the analysis.

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[188] Staff members of the Center for Biological Diversity have suggested that federal actions contributing "appreciable amounts" of greenhouse gases – whether individual actions, such as approval of a large coal fired power plant, or aggregate actions, such as setting fuel standards for SUVs – are appropriate for Section 7 consultations. *See* Cummings & Siegel, *supra* note 163, at 7. They do not, however, provide a rationale for drawing the line between "appreciable" and "not appreciable," nor do they offer a basis for not subjecting all emissions to consultation given that all contribute to climate change.

[189] *See Kempthorne*, 506 F. Supp. 2d at 368-70.

[190] Many commentators have argued that the ESA inherently demands implementation under an implied background principle of affirmative conduct favoring conservation of protected species. The most prominent example is found in the 1995 report of the National

Like the EPA under the Clean Air Act, therefore, the FWS has no room to dodge its mandate to consider the effects of climate change in consultations under Section 7(a)(2) of the ESA. The fact that most consultations will not reach a jeopardy finding based on the indirect effects of the action's greenhouse gas emissions or the cumulative effects of climate change is beside

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Academy of Sciences' National Research Council (NRC), in which NRC engaged in a top-to-bottom review of the role of science in ESA decision making and concluded, among other things, that the precautionary principle should be applied in ESA contexts so as to impose the burden of proving no harm on the proponent of an action. *See* NAT'L RESEARCH COUNCIL, *supra* note 118, at 169. Indeed, some passages of the legislative history of the jeopardy consultation provisions suggest that Congress believed the FWS and the NMFS should, or at least could, "give the benefit of the doubt to the species" when information is not conclusive, as might often be the case with respect to climate change effects. *See* H.R. CONF. REP. NO. 96-697, at 12 (1979), *as reprinted in* 1979 U.S.C.C.A.N. 2557, 2576. In these and other decision-making settings, where incomplete or inconclusive information requires the agency to make a close call, several courts have also endorsed the idea of giving the benefit of the doubt to the species. *See, e.g.*, Conner v. Burford, 848 F.2d 1441, 1451-54 (9th Cir. 1988) (requiring the FWS to "give the benefit of the doubt to the species" when the FWS concluded that there was "insufficient information available to render a comprehensive biological opinion" concerning oil and gas leases); Defenders of Wildlife v. Babbitt, 958 F. Supp. 670, 677, 680 (D.D.C. 1997) (stating that the FWS must "give 'the benefit of the doubt to the species'" and list the Canada Lynx despite the FWS's claim that there was not "substantial information that the southern Rocky Mountain population of the Canada lynx meets the definition of a 'species'"). Also, the NMFS has on occasion announced in listing and jeopardy consultation decisions that it would provide that benefit of the doubt to the species or, in the same spirit, would "err on the side of the species." *See, e.g.*, Regulations Governing the Approach to Humpback Whales in Alaska, 66 Fed. Reg. 29,502 (May 31, 2001) (codified at 50 C.F.R. pt. 224) (promulgating regulations under the ESA governing treatment of listed whales, in part to implement a precautionary principle approach); Endangered and Threatened Species; Endangered Status for Snake River Sockeye Salmon, 56 Fed. Reg. 58,619 (Nov. 20, 1991) (codified at 50 C.F.R. pt. 22) (deciding to list a population of salmon notwithstanding uncertainty as to whether it was genetically distinct from other populations); Nat'l Marine Fisheries Serv., Section 7 Consultation Biological Opinion for Bering Sea/Aleutian Islands Groundfish Fisheries 133 (Oct. 19, 2001) (explaining that the agency conducted the consultation by at all times giving the "benefit of the doubt" to the species); Nat'l Marine Fisheries Serv., Section 7 Consultation Biological Opinion on Atlantic Highly Migratory Species Fishery Management Plan 99 (June 14, 2001) (explaining that in selecting takes of turtles from specified activities the agency would "err on behalf of the species"); *see also* Or. Natural Res. Council v. Daley, 6 F. Supp. 2d 1139, 1149 (D. Or. 1998) (quoting an NMFS official's rationale for recommending listing of a population of salmon as being the "err on the side of the species" principle). But it is clear that the statute *imposes* no such default rule, and the agencies have not officially adopted one as formal policy. Saying that the FWS and the NMFS *may* err on the side of the species in the face of inconclusive evidence, including in the case of climate change effects, does not mean that they *must*. *See infra* Part III.E (discussing the "best scientific data available" standard).

the point – most consultations already do not reach jeopardy findings.[191] Conducting the climate change analyses, however, will improve knowledge about the effects of climate change on species and, thus, is by no means a waste of agency resources.

D. *Section 10: Incidental Take Permits and Experimental Populations*

Section 10 of the ESA contains a hodge-podge of permitting programs and other exceptions to the proscriptions found elsewhere in the statute, primarily the Section 9 take prohibition. Two such programs that are likely to be at the center of the agency's climate change policy are the incidental take permit program and the experimental populations program.

1. Adaptive Management Provisions of Incidental Take Permits

Section 10(a) of the ESA establishes a procedure under which the FWS may approve take of listed species otherwise prohibited under Section 9 for actions that are incidental to otherwise lawful actions and not subject to the Section 7 jeopardy consultation process.[192] To seek approval, an applicant must submit a habitat conservation plan (HCP), describing the project and its impact on the species.[193] The agency must then find that the HCP ensures that "the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking" and that "the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild."[194] Because the FWS's issuance of an HCP permit is a federal action within the meaning of the Section 7(a)(2) jeopardy consultation, the reasoning of the *Kempthorne* case outlined above in Part III.C will carry over to the environmental assessment process for HCP permits. The HCP program contains the additional requirement that the applicant will "minimize and mitigate" the incidental take impacts "to the maximum extent practicable." If the FWS took the great leap of characterizing greenhouse gas emissions as causing take of climate-threatened species under Section 9, the agency could assert that applicants

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[191] From 1998-2001, the FWS conducted over 300,000 consultations, the vast majority of which resulted in findings that the action would not adversely affect the species or that, if there was an effect, it would not jeopardize the species. *See* U.S. FISH & WILDLIFE SERV., CONSULTATIONS WITH FEDERAL AGENCIES: SECTION 7 OF THE ENDANGERED SPECIES ACT 2 (2007), *available at* http://www.fws.gov/endangered/pdfs/consultations.pdf.

[192] For a concise but comprehensive overview of the structure, history, and policy of the HCP program, see generally Robert D. Thornton, *Habitat Conservation Plans: Frayed Safety Nets or Creative Partnerships?*, 16 NAT. RESOURCES & ENV'T 94 (2001). Actions that must track through the jeopardy consultation process can receive incidental take authorization in connection with the consultation pursuant to "reasonable and prudent measures that [FWS] considers necessary and appropriate to minimize such impact." *See* 16 U.S.C. § 1536(b)(4)(ii) (2000).

[193] *See* 16 U.S.C. § 1539(a)(2)(A) (2000).

[194] *Id.* § 1539(a)(2)(B)(ii), (iv).

must reduce or offset greenhouse gas emissions to satisfy this demand, using the "maximum extent practicable" standard to moderate what is expected. Even if greenhouse gases are kept off the table as a regulatory target, the "minimize and mitigate" requirement could limit overbearing effects of human adaptation to climate change for land uses requiring an HCP permit.

Another wrinkle of the HCP program arises under the so-called No Surprises policy for HCP permits Under this controversial process, a permittee is relieved of the need to address "unforeseen circumstances" but must agree to manage and respond to the effects of "changed circumstances" identified in the permit documents.[195] Under No Surprises, the FWS provides participants in an approved, properly implemented HCP the assurance that the Service will not impose additional mitigation requirements in the event that unforeseen circumstances negatively impact the species over time.[196] Unforeseen circumstances means changes affecting an HCP covered species or geographic area that could not reasonably have been anticipated by plan developers and the Service at the time of the plan's development, and that result in a substantial and adverse change in the status of the covered species.[197]

On the other hand, the No Surprises rule recognizes that plan developers and the Service can reasonably anticipate and plan for some changes in circumstances affecting a species or geographic area covered by an HCP (e.g., the listing of new species, or a fire or other natural catastrophic event in areas prone to such events).[198] To the extent such changed circumstances are provided for in the HCP's operating conservation program, the permittee must implement the appropriate measures in response to the changed circumstances.[199] Often these response measures are detailed and provided for under the permit provisions dealing with "adaptive management."[200]

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[195] *See* Habitat Conservation Plan Assurances ("No Surprises") Rule, 63 Fed. Reg. 8859 (Feb. 23, 1998) (codified at 50 C.F.R. §§ 17.22, 17.32 (2006)). The policy has been described as an essential component of the HCP program, necessary to make HCPs attractive to landowners. *See* Fred P. Bosselman, *The Statutory and Constitutional Mandate for a No Surprises Policy*, 24 ECOLOGY L.Q. 707, 717-19 (1997). The No Surprises policy, then rule, has been the subject of intense procedural and substantive legal challenges. *See, e.g.*, Spirit of the Sage Council v. Norton, 294 F. Supp. 2d 67, 92 (D.D.C. 2003) (finding the rule was not procedurally valid). Recently, however, the court presiding over the litigation found that all procedural defects had been corrected and deemed the rule substantively valid under the ESA. *See* Spirit of the Sage Council v. Kempthorne, 511 F. Supp. 2d 31, 44-46 (D.D.C. 2007).

[196] *See* 50 C.F.R. § 17.22(b)(5)(iii).

[197] *See id.* § 17.3.

[198] These are known as "changed circumstances." *Id.*

[199] *See id.* § 17.22(b)(5)(i).

[200] Under adaptive management, regulators use models of natural resource systems to develop performance measurements and initial policy choices, but build into the regulatory implementation framework a process for continuous monitoring, evaluation, and adjustment of decisions and practices:

The FWS has not directly addressed the issue of how climate change and greenhouse gas emissions play out under the unforeseen circumstances/ changed circumstances dichotomy. In the preamble to the rule as adopted in 1998, however, the FWS (with the NMFS) responded to comments raising the topic:

> The concept of adaptive management promotes the notion that management policies should be flexible and should incorporate new information as it becomes available. New management actions should build upon the results of previous experiments in an iterative process. It stresses the continuous use of scientific information and monitoring to help organizations and policies change appropriately to achieve specific environmental and social objectives.

NAT'L RESEARCH COUNCIL, THE MISSOURI RIVER ECOSYSTEM: EXPLORING THE PROSPECTS FOR RECOVERY 18-19 (2002). There is broad consensus today among resource managers and academics that adaptive management is the only practical way to implement ecosystem management policy. *See* Ronald D. Brunner & Tim W. Clark, *A Practice-Based Approach to Ecosystem Management*, 11 CONSERVATION BIOLOGY 48, 56 (1997); Anne E. Heissenbuttel, *Ecosystem Management – Principles for Practical Application*, 6 ECOLOGICAL APPLICATIONS 730, 730 (1996); Paul L. Ringold et al., *Adaptive Monitoring Design for Ecosystem Management*, 6 ECOLOGICAL APPLICATIONS 745, 746 (1996). Indeed, the Ecological Society of America's comprehensive study of ecosystem management treats the use of adaptive management methods as a given. *See* Norman L. Christensen, *The Report of the Ecological Society of America Committee on the Scientific Basis for Ecosystem Management*, 6 ECOLOGICAL APPLICATIONS 665, 666 (1996). Appropriately, therefore, the FWS has announced it will administer HCP permits, where gaps in information can run high, using adaptive management as a means to "examine alternative strategies for meeting measurable biological goals and objectives through research and/or monitoring, and then, if necessary, to adjust future conservation management actions according to what is learned." *See* Notice of Availability of a Draft Addendum to the Final Handbook for Habitat Conservation Planning and Incidental Take Permitting Process, 64 Fed. Reg. 11,485, 11,486-87 (Mar. 9, 1999). HCPs thus are acknowledged to be working hypotheses of how species will respond to changes in habitat size, location, configuration, and quality. To truly integrate adaptive management into an HCP, the plan must include a monitoring program to evaluate the performance of mitigation measures and a system that automatically triggers alternative conservation actions in the event that performance fails to meet conservation goals. Gregory A. Thomas, *Incorporating Adaptive Management and the Precautionary Principle into HCP Design*, 18 ENDANGERED SPECIES UPDATE 32, 33 (2001); George F. Wilhere, *Adaptive Management in Habitat Conservation Plans*, 16 CONSERVATION BIOLOGY 20, 22 (2002). The FWS has thus portrayed adaptive management as an important practical tool that "can assist the Services and the applicant in developing an adequate operating conservation program and improving its effectiveness." *See* Notice of Availability of a Final Addendum to the Handbook for Habitat Conservation Planning and Incidental Take Permitting Process, 65 Fed. Reg. 35,242, 35,252 (June 1, 2000). For in-depth discussions of the integration of adaptive management into the HCP program, see generally Holly Doremus, *Adaptive Management, the Endangered Species Act, and the Institutional Challenges of "New Age" Environmental Protection*, 41 WASHBURN L.J. 50, 68-74 (2001) [hereinafter Doremus, *Adaptive Management*], and J.B. Ruhl, *Regulation by Adaptive Management – Is It Possible*, 7 MINN. J. L. SCI. & TECH. 21 (2005).

> Issue 7: Many commenters stated that the applicant is legally required to address all unforeseen circumstances in the HCP pursuant to section 10. They noted that fire, disease, drought, flood, global climate change, and non-point source pollution may be unforeseen, but are not uncommon. . . . In addition, commenters noted that the nature of many of the HCPs that the Services are approving increases the likelihood for unforeseen events to happen (i.e., the permits are issued for many years and cover large areas and many species).
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> Response 7: The Services disagree that HCPs must address *all* hypothetical future events, no matter how remote the probability that they may occur. Rather, the Services believe that only reasonably foreseeable changes in circumstances need to be addressed in an HCP. Moreover, these circumstances are likely to vary from HCP to HCP given the ever changing mix of species and affected habitats covered by a given plan . . . . [U]nforeseen circumstances will only include events that could not reasonably have been anticipated. *All reasonably foreseeable circumstances, including natural catastrophes that normally occur in the area, should be addressed in the HCP.*[201]

By incorporating a "reasonably foreseeable" standard, the FWS thus opened the door to the same kind of framework the *Kempthorne* court adopted for consultations under Section 7(a)(2): the FWS *must* consider climate change when evaluating an HCP, and from there any reasonably foreseeable ecological effects should be taken into account under the changed circumstances category, not the unforeseen circumstances category. For long-term HCPs authorizing ongoing effects over decades, such as an industrial facility or regional development plan, a regime of adaptive management measures can be designed to integrate the capacity for the project to adjust operations and other parameters over time in response to the reasonably foreseeable climate change effects.[202] Even short-term projects, such as small subdivision developments,

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[201] Habitat Conservation Plan Assurances ("No Surprises") Rule, 63 Fed. Reg. 8859, 8863 (Feb. 23, 1998) (codified at 50 C.F.R. §§ 17.22, 17.32 (2006)).

[202] Some commentators posit that the No Surprises approach may constrain the use of adaptive management, as it cuts off revision of prior agreements about the HCP's conservation measures. *See* Doremus, *Adaptive Management*, *supra* note 200, at 72-73. On the other hand, one might just as reasonably complain that adaptive management undermines the No Surprises policy, as its very purpose is to ensure the ability to adjust decisions after the HCP is issued. In fact, the two approaches seem to me to be complementary, not conflicting. The No Surprises policy simply defines who is responsible for measures necessary to address unforeseen circumstances, and a comprehensive, criteria-specific adaptive management provision in an HCP negates the argument that matters contemplated as the subject of adaptive management were unforeseen for purposes of the No Surprises policy. It should therefore be in the interests of both the agency and the applicant to negotiate an adaptive management provision that spells out its scope and

may rely on long-term mitigation measures, such as habitat preserves, which may be influenced by climate change and which therefore should integrate long-term adaptive management measures.

2. Assisted Migration Through Experimental Populations

My earlier observation that pikas cannot fly away from the mountaintop predicament, but that we might fly them away, was not meant to be facetious. The emerging topic of assisted migration posits just that – move stranded species away from their degrading natural habitat to suitable habitat located beyond the species' migratory capacity. Ironically, it may be the case that this suitable habitat is not "natural" to where it is located, but rather has been forming far outside the doomed species' range because of climate change.

The agency appears to have the authority to engage in assisted migration. Section 10(j) of the ESA allows the FWS to transport and release members of an endangered or threatened species to areas outside its current range as an "experimental population," if the agency "determines that such release will further the conservation of such species."[203] The release must be to an area that contains suitable natural habitat within the "probable historic range" of the species, unless such habitat has been destroyed, in which case the release may be to areas not formerly occupied by the species.[204] A species losing habitat within its current and historic range because of climate change effects, but which at the same time is gaining habitat outside its historic range because of climate change, appears to fit these conditions, though there is no instance in which the FWS (or the NMFS) has exercised this option with respect to a species listed under the ESA because of threats resulting from climate change.

E. *The Ubiquitous "Best Science" Standard*

As an intersection between biological science and law, the reliability of decision making under the ESA necessarily depends on the quantity and quality of scientific information available to and used by the decision makers. The ESA could hardly operate on less than robust and reliable scientific data. But what is the agency supposed to do about defining, obtaining, and evaluating the universe of data about climate change and its effects in order to

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subject matter with clarity and precision, including the reasonably foreseeable effects of climate change.

[203] 16 U.S.C. § 1539(j)(2)(A) (2000). Authorization for an agency or organization relocating the population is obtained under Section 10(a)(1)(A) of the ESA, which provides for the FWS to grant permits "to enhance the propagation or survival of the affected species, including, but not limited to, acts necessary for the establishment and maintenance of experimental populations." *Id.* § 1539(a)(1)(A). The "but not limited to" language of this permitting provision suggests other potential applications may arise in connection with enhancing the survival of climate-threatened species. *Id.*

[204] *See* 50 C.F.R. § 17.81(a) (2006).

make its substantive decisions under the listing, take prohibition, consultation, and HCP programs? What is its decision-making method to be?

The ESA's answer is the so-called "best scientific data available" standard, which permeates several of the statute's major programs. For example, when deciding whether to list a species, the FWS and NMFS must consider factors such as loss of habitat[205] using only "the best scientific and commercial data available."[206] Similarly, the biological component of the decision whether to designate critical habitat must use the "best scientific data available."[207] And the "no jeopardy" and "no adverse modification" directives to federal agencies adopt the same standard.[208] Although the ESA leaves this "best scientific data available" standard of evidentiary quality undefined,[209] in *Bennett v. Spear*[210] a majority of the Supreme Court suggested that its "obvious purpose . . . is to ensure that the ESA not be implemented haphazardly, on the basis of speculation or surmise" and "to avoid needless economic dislocation produced by agency officials zealously but unintelligently pursuing their environmental objectives."[211] It can act, in other words, as a check on both the hasty application of regulatory power and the uninformed use of science. Accordingly, the courts have interpreted it to impose several practical guidelines on the agencies:[212]

- The agencies may not manipulate their decisions by unreasonably relying on certain sources to the exclusion of others.
- The agencies may not disregard scientifically superior evidence.[213]

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[205] *See* 16 U.S.C. § 1533(a)(1)(A) (2000).

[206] *Id.* § 1533(b)(1)(A).

[207] *See id.* § 1533(a)(3), (b)(2).

[208] *See id.* § 1536(c); 50 C.F.R. § 402.14(g)(8) (2006).

[209] Although several other environmental statutes use the phrase or something close to it, all leave it undefined. *See* Michael J. Brennan et al., *Square Pegs and Round Holes: Application of the "Best Scientific Data Available" Standard in the Endangered Species Act*, 16 TUL. ENVTL. L.J. 387, 402 n.81 (2003) (collecting statutes); Holly Doremus, *Listing Decisions Under the Endangered Species Act: Why Better Science Isn't Always Better Policy*, 75 WASH. U. L.Q. 1029, 1034 n.9 (1997) (collecting statutes) [hereinafter Doremus, *Listing Decisions*].

[210] 520 U.S. 154 (1997).

[211] *Id.* at 176-77.

[212] *See* Sw. Ctr. for Biological Diversity v. Norton, Civ. No. 98-934 (RMU/JMF), 2002 WL 1733618, at *8-9 (D.D.C. July 29, 2002) (summarizing the existing body of case law). *See generally* Brennan et al., *supra* note 209, at 396-430; Laurence Michael Bogert, *That's My Story and I'm Stickin' To It: Is the "Best Available" Science* Any *Available Science Under the Endangered Species Act?*, 31 IDAHO L. REV. 85 (1994); Doremus, *Listing Decisions*, *supra* note 209, at 1051-85; John Earl Duke, Note, *Giving Species the Benefit of the Doubt*, 83 B.U. L. REV. 209 (2003).

[213] *Sw. Ctr.*, 2002 WL 1733618, at *8.

- Relatively minor flaws in scientific data do not render that information unreliable.[214]
- The agencies must use the best data available, not the best data possible.[215]
- The agencies may not insist on conclusive data in order to make a decision.[216]
- The agencies are not required to conduct independent research to improve the pool of available data.[217]
- The agencies thus must rely on even inconclusive or uncertain information if that is the best available at the time of the decision.[218]
- The agencies must manage and consider the data in a transparent administrative process.[219]

Similarly, in 1994 the FWS and NMFS issued a joint policy providing guidelines for how the agencies will ensure their ESA decisions incorporate this evidentiary standard.[220] The policy directs the agencies to follow six guidelines in ESA implementation decisions (including species listing, jeopardy consultations, and incidental take authorizations):[221]

- Require that all biologists evaluate all scientific and other information that will be used to make the decision;
- Gather and impartially evaluate biological, ecological, and other information that disputes official positions, decisions, and actions proposed or taken by the FWS or NMFS;
- Ensure that biologists document their evaluation of information that supports or does not support a position being proposed by the agency;
- Use primary and original sources of information as the basis for consultation decisions or recommendations;
- Adhere to the timeframes or "schedules" established by the ESA; and

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[214] *Id.* (citing Bldg. Indus. Ass'n of Superior Cal. v. Norton, 247 F.3d 1241, 1246-47 (D.C. Cir. 2001)).

[215] *Id.*

[216] *See id.* at *9.

[217] *See id.* (citing Sw. Ctr. for Biological Diversity v. Babbitt, 215 F.3d 58 (D.C. Cir. 2000))

[218] *See id.*

[219] *See* Doremus, *Listing Decisions*, *supra* note 209, at 1084-87.

[220] Endangered and Threatened Wildlife and Plants: Notice of Interagency Cooperative Policy on Information Standards Under the Endangered Species Act, 59 Fed. Reg. 34,271, 34,271 (July 1, 1994).

[221] *Id.*

- Conduct management-level review of documents developed by the agency to verify and assure the quality of the science used to establish official positions.

All that sounds impressive, but the question arises whether appending "best," "scientific," and "available" to the general standards of administrative review makes any appreciable difference in the substantive discretion the agency enjoys.[222] After all, the default rules already are provided in the conventional judicial review provisions of the Administrative Procedure Act (APA), under which any court would routinely find that an agency's reliance on sloppy, biased, or haphazard evidence is arbitrary and capricious.[223] It is difficult to pinpoint the incremental legal effect, if any, the "best scientific data available" standard adds to that baseline. On the one hand, the courts behave as if the standard means *something*,[224] yet it is not clear that any of the rulings based on the standard would have turned out differently under the conventional APA judicial review tests. It is not possible to extract from case law, administrative policy, or legislative intent any independent mandate of agency decision-making method or standard of judicial review the provision adds to

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[222] I have examined this question in more detail elsewhere. *See* J.B. Ruhl, *Is the Endangered Species Act Ecopragmatic?*, 87 MINN. L. REV. 885, 927-29 (2003); Ruhl, *Methodology*, *supra* note 110, at 579-84.

[223] The conventional rules of judicial review – the default rules when the agency's organic act is silent – are found in the Administrative Procedure Act (APA). 5 U.S.C. § 706 (2000). These rules require the courts to apply considerable deference to the agency's decision. A reviewing court may not substitute its judgment for the agency's, but must undertake a "thorough, probing, in-depth review" of the agency's decision. Citizens to Preserve Overton Park, Inc. v. Volpe, 401 U.S. 402, 415-16 (1971). Thus, a court will reject an agency's decision if it is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A); *see, e.g.*, Biodiversity Legal Found. v. Babbitt, 146 F.3d 1249, 1252 (10th Cir. 1998). An agency decision is arbitrary and capricious if the agency has either "relied on factors which Congress had not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation . . . counter to the evidence . . . , or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise," or if it has failed to "articulate a satisfactory explanation for its action including a 'rational connection between the facts found and the choice made.'" Motor Vehicles Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 43 (1983). The ESA has been widely interpreted as being subject to these rules with no substantial exceptions. *See, e.g.*, Am. Wildlands v. Norton, 193 F. Supp. 2d 244, 251 (D.D.C. 2002); Loggerhead Turtle v. County Council of Volusia County, 120 F. Supp. 2d 1005, 1013 (M.D. Fla. 2000); Friends of the Wild Swan, Inc. v. U.S. Fish & Wildlife Serv., 945 F. Supp. 1388, 1394 (D. Or. 1996).

[224] *See, e.g.*, Sw. Ctr. for Biological Diversity v. Norton, Civ. No. 98-934 (RMU/JMF), 2002 WL 1733618, at *8-9 (D.D.C. July 29, 2002) (discussing at length the meaning of the "best evidence standard").

the picture.[225] Nor does commentary on the standard suggest that it imposes higher duties.[226]

On the other hand, if it does establish anything, the standard acknowledges that the FWS is the expert science agency when it comes to defining threats to species and the measures needed for conservation of species.[227] Hence, while the FWS is not the nation's expert science agency on the physical causes and consequences of climate change, it should be responsible for being the repository of knowledge and research on the biological effects of climate change on species. Whether it is through the "best available scientific evidence" standard or through plain vanilla APA judicial deference, if the agency lives up to that responsibility, its exercise of discretion within the bounds detailed above should be respected.

The "best scientific data available" standard can be flexibly employed by the FWS to carry out either a passive or aggressive climate change policy. After *Massachusetts v. EPA*, the FWS, like any other regulatory agency, would be hard-pressed to plead "scientific uncertainty" in taking the position that species are not threatened by climate change and thus no FWS responsibilities are triggered by the ESA. Indeed, the *Kempthorne* court rejected that position in no uncertain terms. In its effort to force the FWS to consider the effects of climate change in the biological opinion covering the Central Valley Project, the plaintiff environmental group had argued that "[r]egardless of the uncertainty involved in predicting the consequences of climate change, FWS had an obligation under the ESA to address the probable effects on Delta smelt."[228] The defendant water contractors responded that *Bennett v. Spear* "intended to preclude exactly this kind of argument."[229] The district court rebuffed that interpretation of *Bennett*, explaining that the *Bennett* Court held only "that persons who are economically burdened by a decision made under the ESA fall within the zone of interests the statute protects for the purposes of standing."[230] The district court opined further that "*Bennett* sheds little light on the current inquiry – whether and to what extent the data that was before the

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[225] For example, courts have been reluctant to uphold challenges to the substance of FWS jeopardy opinions based on allegations that the best available science standard adds some special kick to the default rules of the APA. *See* Katherine Renshaw, *Leaving the Fox To Guard the Henhouse: Bringing Accountability to Consultation Under the Endangered Species Act*, 32 COLUM. J. ENVTL. L. 161, 172-81 (2007).

[226] *See, e.g.*, LIEBESMAN AND PETERSEN, *supra* note 7, at 16 (discussing the standard in the context of the basic APA judicial review criteria); Brennan et al., *supra* note 209, at 412-32 (thorough review of cases interpreting the "best scientific data available" standard).

[227] *See, e.g.*, *Loggerhead Turtle*, 120 F. Supp. 2d at 1023 ("Where there is a substantial volume of research, data, and comments, the agency exercises its expertise to make a reasonable decision based on all of the data and information.").

[228] Natural Res. Def. Council v. Kempthorne, 506 F. Supp. 2d 322, 369 n.27 (E.D. Cal. 2007).

[229] *Id.*

[230] *Id.*

FWS regarding climate change should have been considered and addressed in the [biological opinion]."[231]

Yet, assuming the agency must peer into the climate change blender, the FWS has substantial leeway as to what it sees; downscaling global and regional models of climate change impacts to specific species and their local ecological contexts is difficult and, on this score, the FWS is *the* expert agency. Provided the agency acts within its statutory bounds by considering climate change where it must or may, engaging the available downscaling science, and assessing its application to a particular species with the air of its expert position evident in the record, courts will be hard-pressed to look behind the agency's conclusion one way or the other. This applies to questions regarding the level of threat climate change poses to a species, the areas appropriate for designation as critical habitat for a species threatened or endangered by climate change, and the effects of a proposed land use on such a species. Of course, as the downscaling science becomes "better" and more "available," the agency will be more constrained in this regard, having to acknowledge greater or less uncertainty where it plainly exists, but environmental or industry groups will have to establish that in the courts case by case. Overall, therefore, the "best scientific data available" standard appears to provide the FWS a background source of discretion that may, for the foreseeable future, be quite substantial in scope and useful to the agency in shaping policy choices under each of the ESA's primary programs.

IV. USING THE ESA TO CARRY SPECIES TO THE NO-ANALOG FUTURE

The task ahead of the FWS is daunting, and it must use the discretion outlined in Part III to develop a plan soon, lest climate change sweep away its mission along with its charges. As Part I explained, manifestations of climate change already are well underway and already have had adverse impacts on some species. More can be expected. Indeed, the FWS must assume that more climate change impacts will unfold even if the global community takes measures to mitigate greenhouse gas emissions. As Part II demonstrated, this assumption poses complex policy questions for the FWS, though Part III showed that the agency has considerable flexibility in how it answers them. It has the discretion, within bounds, to adopt passive or aggressive policies for how to integrate climate change in ESA programs.

With that foundation established, what should define the agency's set of operating assumptions about how the global community responds generally to climate change – pessimism or optimism? A worst case scenario would have the global community utterly fail to contain greenhouse gas emissions and, as a result, climate change spiraling into chaos for centuries. In that scenario, the FWS might as well pack up its bags and close shop, as climate change will become an unassailable force in ecological reshuffling, overwhelming any

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[231] *Id.*

management of ecosystems or species. Exercising the ESA, in other words, is pointless in this scenario.

On the other hand, the agency also cannot afford to assume a Pollyanna future in which the global community comes together tomorrow, drastically reduces emissions, somehow sucks carbon dioxide out of the troposphere, and reaches 1990 overall levels by the end of this decade. The message of *Massachusetts v. EPA* is that a regulatory agency can't assume someone else will address the climate change problem. Each agency must "whittle away" with whatever knife Congress has provided it.

The ESA will be best served if the FWS adopts a cautious optimism that recognizes the limits of the ESA but keeps the statute relevant. Conceding that some human-induced climate change is inevitable even in the best of circumstances does not concede that it will be perpetual and chaotic. Rather, the FWS can reasonably assume that the global community will eventually arrest greenhouse gas emissions to a benchmark level and that, as a consequence, climate regimes will eventually settle into a new "natural" pattern of variation.[232] We have no analog for what that pattern will be, and the transition from the present to that future will be, by all appearances, a rocky ride, but in all probability we will get there. The job of the ESA is to help as many species as is reasonably possible get there with us – to serve as their bridge across the climate change transition into the no-analog future.

Ironically, to do this will take some humility and restraint. Going for the jugular by regulating greenhouse gas emissions is *not* where the ESA can be of most help to imperiled species. There is little to be gained for the FWS or for climate-threatened species by having the agency go down this road. The agency has no explicit authority to do so, does not have the expertise to do so, and would risk undermining the political viability of the ESA by doing so. Rather, the FWS can provide expert assistance to the agencies more appropriately charged with regulating greenhouse gas emissions, such as the EPA, by advising them about the effects of climate change on species.[233]

As for its direct role in addressing climate change, the FWS can employ the ESA most effectively by identifying species threatened by climate change, identifying which of those can be helped through the ESA's habitat-based programs, and devising a management plan – one that uses regulatory action as well as recovery planning – to build each such species its bridge. Indeed, this strategy allows the FWS to dispense with the distinction between human-

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[232] There is strong evidence that almost every flow system in nature, from Earth's jet streams to Jupiter's banded winds, responds to disturbances by moving toward self-organized order. *See* Richard A. Kerr, *Order from Chaos, Power from Dissipation in Planetary Flows*, 317 SCIENCE 449, 449 (2007).

[233] For example, federal agencies required to prepare environmental impact statements under the National Environmental Policy Act in connection with projects they carry out, fund, or authorize must "[o]btain the comments of any Federal agency which has . . . special expertise with respect to any environmental impact involved." 40 C.F.R. § 1503.1(a)(1) (2007).

induced and natural climate variation. Climate change is climate change – it does not matter to the species what is causing it. What does matter to them is whether and in what shape they survive it.

This brings us to the six policy choice pressure points raised in Part II. To implement the proposed bridge policy, I suggest the FWS approach the policy choices as follows:

Identifying Climate-Threatened Species. The agency's objective should be to use the ESA to define and monitor the ecological reshuffling effects of climate change. The agency should aggressively identify species threatened by climate change. Early identification of species threatened by climate change and of the critical habitat they require for survival through climate change transition will help in defining the extent of ecological reshuffling and guide human adaptation programs. Early identification also will provide the basis for listing species as threatened, which provides more flexibility in terms of regulatory effects and recovery efforts.

Regulating Greenhouse Gas Emissions. The agency's objective should be to not squander agency resources in a futile effort for which the ESA is simply not equipped. The FWS should not attempt to use its Section 7 and Section 9 regulatory programs in an effort to regulate greenhouse gas emissions. As for the take prohibition, listing species as threatened early will allow the agency to remove greenhouse gas emissions from consideration under Section 9 while keeping the take prohibition active with respect to other contributing threats. If an animal species is in endangered status, meaning Section 9 necessarily applies in full force, difficulties in establishing the burden of proof would support the exercise of prosecutorial discretion not to attempt to regulate greenhouse gas emissions. Under the Section 7 consultation program, project-specific jeopardy analyses should promote other federal agencies to consider ways of reducing greenhouse gas emissions, but should not lead to jeopardy findings.

Regulating Non-Climate Effects To Protect Climate-Threatened Species. The agency's objective should be to support the bridge function of the ESA and to reduce the adverse impacts on species from human adaptation to climate change. Where a species weakened by climate change is also threatened by other anthropogenic sources, such as loss of habitat, and where the agency reasonably believes addressing the non-climate threats will help carry the species through the climate change transition, the agency should use Section 7 and Section 9 regulatory powers to the extent necessary. In particular, where human adaptation to climate change exacerbates threats to a species, the agency should aggressively employ its regulatory presence through Section 7 consultations and enforcement of the Section 9 take prohibition. The agency also must monitor the impacts of human adaptation on species that face no direct or secondary ecological threat from climate change and employ Section 7 and Section 9 powers accordingly. Clearly, however, innovative approaches will be needed, such as market-based incentives and regional planning efforts, to facilitate human adaptation measures as much as species can tolerate.

Designing Conservation and Recovery Initiatives. The agency's objective should be to get as many species with a long-term chance at survival and recovery through the transition to the other side of climate change as is realistically possible. The agency must initially differentiate between species that are unlikely to survive climate change under any circumstances and those that are likely to benefit from assistance in their home ecosystems. Agency resources should not be wasted in developing recovery plans or other conservation measures for non-recoverable species. For species that appear likely to withstand climate change under the ESA's protection, recovery plans should identify the expected intensity of assistance required to manage or respond to primary and secondary ecological effects. Conservation measures for species that require intensive assistance, particularly in Section 10 HCPs, should be designed around adaptive management techniques that involve ample monitoring and considerable room for adjustment of management actions in order to account for the possibility that continuing climate change will alter the effectiveness of those actions.

Species Trade-Offs. The agency's objective should be to not contribute to ecological reshuffling through its species management efforts. Where the measures described above are complicated by species trade-offs – when helping one may harm another – the agency should adopt an ecosystem-based management approach modeled on promoting long-term species diversity and ecosystem multi-functionality.[234] When ecological models do not point to a particular management action to serve those goals, general default priorities, such as assisting top-level predators and resisting induced invasions, may help mediate between species in conflict.

Dealing with the Doomed. The agency's objective should be to avoid accelerating the decline of species who stand no chance of surviving climate change, but not to take measures on their behalf which could pose threats to other species. Under this standard, assisted migration should be employed for such a species only if the FWS has assembled conclusive evidence of the extinction threat, a quantitative model showing the likely success of assisted migration for the species with de minimis anticipated effects on other species, and an assisted migration management plan including long term monitoring and active adaptive management.[235] Human adaptation measures that could accelerate the extinction of the species, which could cascade to affect other

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[234] Maximizing biodiversity will assist the ecosystems of the future, whatever pattern they assume, in establishing and maintaining resilience. *See* Andy Hector & Robert Bagchi, *Biodiversity and Ecosystem Multifunctionality*, 448 NATURE 188, 188 (2007).

[235] This approach is what McLachlan et al. refer to as "constrained assisted migration," as opposed to aggressive use of assisted migration at one extreme and total prohibition of the practice at the other extreme. *See* Jason S. McLachlan et al., *A Framework for Debate of Assisted Migration in an Era of Climate Change*, 21 CONSERVATION BIOLOGY 297, 299 (2007).

species, should be regulated under Section 7 and Section 9 as for any other listed species.

CONCLUSION

The "pit-bull" has met its match, but sometimes old dogs can learn new tricks. It is sobering to find that ecological reshuffling is inevitable and to realize that the ESA can't do anything about it. Yet this is precisely what leads me to my proposal that the statute be employed in a more focused manner in the decades leading to our no-analog future. What the statute has done best is stop the decline of imperiled species brought under its protective wings, and it has done so in the face of problems as intractable as urbanization and invasive species. The ESA has not solved urban sprawl or invasive species – it has helped species deal with them. Likewise, we must find a way for the ESA to help species deal with the effects of climate change, not its causes. The statute provides this flexibility – the means to proactively identify the threat of climate change and focus on helping those species that can be helped.

My proposal is unlikely to satisfy strong supporters of the ESA or its strong critics. The former are likely to believe the "pit bull" has found its ultimate calling in climate change. If there is any statute that can wrestle greenhouse gas emissions to the ground (i.e., to 1990 levels), they might think it is the ESA and its unrelenting biocentric mission, whereas my proposal keeps the statute at bay. The latter will object to my proposal's aggressive call for species listings, which is based on wholesale adoption of the premise of human-induced climate change, and to its continued use of the statute as a regulatory weapon against habitat loss and other non-climate threats to climate-threatened species.

Both views doom the ESA. Of course, that may be the intent and hope of the statute's critics, with or without climate change. But adopting the strong version of the ESA in the climate change era, in which the FWS charges hard after greenhouse gas emissions, would play right into the critics' hands – the statute is neither designed to regulate something so ubiquitous as greenhouse gas emissions nor so sacrosanct as to survive the political battle attempting to do so would ignite. Support for the ESA, therefore, must be tempered by practical and political reality if the ESA itself is to survive climate change. The trade-off I propose – standing back from greenhouse gas emissions but staying fully engaged in regulating non-climate threats, particularly those stemming from human adaptation to climate change – is the plan the ESA needs in order to build the bridge for species into the no-analog future.