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Αρκτούρος:

Protecting Biodiversity Against the Effects of Climate Change Through the Endangered Species Act

James Ming Chen*

During the Phanerozoic Eon, a span of 542 million years from the initial emergence of hard-shelled animals to the present,¹ the earth has experienced at least five catastrophic losses of biodiversity: the Ordovician-Silurian, the late Devonian, the Permian-Triassic, the Triassic-Jurassic, and the Cretaceous-Paleogene extinction events.² Climate change is driving a sixth great death spasm,³ one that deserves to be called the Anthropocene extinction.⁴ Large-scale

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1. See, e.g., Alexander V. Markov & Andrey V. Korotayev, *Phanerozoic Marine Biodiversity Follows a Hyperbolic Trend*, 16 PALAEO WORLD 311 (2007); Kenneth G. Miller et al., *The Phanerozoic Record of Global Sea-Level Change*, 310 SCIENCE 1293 (2005). The term *Phanerozoic* is derived from the ancient Greek words *φανερός* and *ζωή*, which together mean "visible life."

2. See David M. Raup & J. John Sepkoski, Jr., *Mass Extinctions in the Marine Fossil Record*, 215 SCIENCE 1501 (1982). Nearly everyone of a certain age knows the Cretaceous-Paleogene extinction by a different name, the *Cretaceous-Tertiary*. The International Commission on Stratigraphy has deprecated the term *Tertiary* and substituted the terms *Paleogene* and *Neogene* as designations for the periods of the Cenozoic Era. But this decision trashes "terminology with nearly 250 years of history" and contradicts popular references to "the extinction of the dinosaurs at the Cretaceous-Tertiary (or K-T) boundary." Robert A. Rohde, *Whatever Happened to the Tertiary and Quaternary?*, Jan. 18, 2005, available at <http://stratigraphy.org/bak/geowhen/TQ.html>.

3. See, e.g., ELIZABETH KOLBERT, *THE SIXTH EXTINCTION: AN UNNATURAL HISTORY* (2014); RICHARD LEAKEY & ROGER LEWIN, *THE SIXTH EXTINCTION: PATTERNS OF LIFE AND THE FUTURE OF MANKIND* (1996).

4. See, e.g., Will Steffen, Jacques Grinewald, Paul Crutzen & John McNeill, *The Anthropocene: Conceptual and Historical Perspectives*, 369 PHIL. TRANS. ROYAL SOC'Y A 843 (2011); Jan Zalasiewicz et al., *The New World of the Anthropocene*, 44 ENVTL. SCI. & TECH.

habitat destruction puts many plant and animal species at the risk of extinction. Although “organisms respond to climate and climatic change in a variety of ways, depending on the nature, rate and duration of the change, and the range of available biological responses,”⁵ paleontology has connected “[t]he three best-studied mass extinction events” to “sharp changes in climate.”⁶ Humility about the human impact on natural history and the biosphere provides ample reason to presume “that rapid shifts in climate can reduce global diversity.”⁷

In a 2005 survey of biodiversity law that I conducted at the behest of Charles R. McManis, I did not discuss climate change in detail, even as I acknowledged the phenomenon as a “potent driver of ecological ruin and evolutionary change.”⁸ In this tribute to Professor McManis on the occasion of his retirement, I now wish to address this scholarly oversight.

In fairness to my decision to reserve that discussion for “another time, though not necessarily another scholar,”⁹ both law and science have achieved a considerably stronger basis over the past decade for addressing biodiversity loss attributable to climate change. Scientific evidence attributing severe, even catastrophic, climate change to anthropogenic emissions of greenhouse gases has long passed the point of reasonable doubt.¹⁰

For their part, federal courts have lost patience with expert agencies’ pleas that scientific uncertainty warrants further study

2228 (2010). The term *Anthropocene* is derived from *ἄνθρωπος* and *καινός*, the ancient Greek words for *human* and *new* (or *recent*).

5. Douglas H. Erwin, *Climate as a Driver of Evolutionary Change*, 19 *CURRENT BIOL.* R575, R575 (2009). See generally Camille Parmesan, *Ecological and Evolutionary Response to Recent Climate Change*, 37 *ANN. REV. ECOL. EVOLUTIONARY SYS.* 637 (2006).

6. Erwin, *supra* note 5, at R581.

7. *Id.*

8. Jim Chen, *Across the Apocalypse on Horseback: Imperfect Legal Responses to Biodiversity Loss*, 17 *WASH. U. J.L. & POL’Y* 12, 31 (2005).

9. Jim Chen, *A Vision Softly Creeping: Congressional Acquiescence and the Dormant Commerce Clause*, 88 *MINN. L. REV.* 1764, 1795 (2004).

10. Solely on the narrow question of climatic impacts on Arctic Ocean sea ice, exemplary citations include Michael A. Alexander, K. Halimeda Kilbourne & Janet A. Nye, *Climate Variability During Warm and Cold Phases of the Atlantic Multidecadal Oscillation (AMO), 1871–2008*, 133 *J. MARINE SYS.* 14 (2014); Elizabeth N. Cassano, John J. Cassano, Matthew E. Higgins & Mark C. Serreze, *Atmospheric Impacts of an Arctic Sea Ice Minimum as Seen in the Community Atmosphere Model*, 34 *INT’L J. CLIMATOLOGY* 766 (2014).

before concrete action. As the Supreme Court noted in the landmark 2007 case of *Massachusetts v. EPA*,¹¹ no agency can “avoid its statutory obligation” to enforce federal environmental law “by noting the uncertainty surrounding various features of climate change and concluding that it would therefore be better not to regulate at this time.”¹² Because the relevant “statutory question is whether sufficient information exists to make an endangerment finding,” and not whether the agency “would prefer not to regulate greenhouse gases because of some residual uncertainty,” an agency wishing to defer “a reasoned judgment as to whether greenhouse gases contribute to global warming” must explicitly declare that “the scientific uncertainty is so profound” as to paralyze the agency as a matter of law.¹³

Meanwhile, an agency that does proceed in the face of some uncertainty will find ample judicial deference, especially where its statutory authority “is ‘precautionary in nature’ and ‘designed to protect the public health,’ and the relevant evidence is ‘difficult to come by, uncertain, or conflicting because it is on the frontiers of scientific knowledge.’”¹⁴ Reviewing courts remain painfully aware that they lack the “training [and] experience” that a “chemist, biologist or statistician” might apply to a controversy involving biodiversity and climate change.¹⁵

In the United States alone, many legal tools are emerging as instruments of climate change policymaking. For example, the Environmental Protection Agency (EPA) has not only the authority but also the obligation under the Clean Air Act to regulate greenhouse gas emissions from new motor vehicles.¹⁶ The Energy Policy and Conservation Act¹⁷ and the National Environmental Policy Act¹⁸ require the National Highway Transportation Safety

11. 549 U.S. 497 (2007).

12. *Id.* at 534.

13. *Id.*

14. *Coalition for Responsible Regulation, Inc. v. EPA*, 684 F.3d 102, 121 (D.C. Cir. 2012) (quoting *Ethyl Corp. v. EPA*, 541 F.2d 1, 28 (D.C. Cir.1976)), *aff'd in part, rev'd in part sub nom. Utility Air Regulatory Group v. EPA*, 134 S. Ct. 2427 (2014).

15. *Ethyl Corp.*, 541 F.2d at 36.

16. *See Massachusetts v. EPA*, 549 U.S. 497 (2007).

17. 49 U.S.C. §§ 32901–32919.

18. 42 U.S.C. §§ 4321–4370e.

Administration to address carbon emissions through corporate average fuel efficiency (CAFE) standards, or at least to explain why the agency has declined to adopt more stringent CAFE standards.¹⁹

This Essay will focus on one specific climate change strategy under federal environmental law: the use of the Endangered Species Act²⁰ to protect biodiversity from the effects of climate change. Whatever its shortcomings, the Act deserves credit for “preventing the ultimate extinction of the vast majority of protected species.”²¹ The application of the Act to species most immediately menaced by climate change offers a promising set of remedies for the seemingly relentless emission of greenhouse gases and the anthropogenic contribution to global climate change.

The Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) (known together as the “Services”) collectively enforce the Act. The FWS administers the Act for terrestrial and freshwater species, while the NMFS administers the Act for most marine species.²² A species is defined as *endangered* if it “is in danger of extinction throughout all or a significant portion of its range.”²³ A *threatened species* is one “which is likely to become an endangered species within the foreseeable future.”²⁴

Of particular interest in the context of climate change is the time frame deemed *foreseeable*. Because neither the Act nor its implementing regulations define the term *foreseeable future*, the Services determine foreseeability on a case-by-case basis.²⁵ Definitions of foreseeability have varied considerably. One federal district court has declined to decide whether a risk that the coho

19. See *Coalition for Biological Diversity v. National Highway Transp. Safety Admin.*, 538 F.3d 1172 (9th Cir. 2008); *Coalition for Biological Diversity v. National Highway Transp. Safety Admin.*, 508 F.3d 508 (9th Cir. 2007).

20. 16 U.S.C. §§ 1531–1544 (2015). Subsequent statutory references will cite both the Act and its codified form in the United States Code.

21. J.B. Ruhl, *Climate Change and the Endangered Species Act: Building Bridges to the No-Analog Future*, 88 B.U. L. REV. 1, 5 (2008).

22. See 50 C.F.R. § 402.01. Maritime mammals straddle both sides of this jurisdictional divide. Polar bears, dugongs, walruses, and sea otters fall on the FWS side. The NMFS governs whales, dolphins, and seals. *Id.*

23. E.S.A. § 3(6), 16 U.S.C. § 1532(6).

24. E.S.A. § 3(20), 16 U.S.C. § 1532(20).

25. See *In re Polar Bear Endangered Species Act Listing & Section 4(d) Rule Litig.*, 709 F.3d 1, 15 (D.C. Cir.), *cert. denied*, 134 S. Ct. 310 (2013).

salmon might become endangered within “30 or 100 years” satisfied the statutory definition of *foreseeable future*, because an administrative determination that this species “would not become endangered within the next two years” would “fall[] far short of any reasonable definition of the ‘foreseeable future.’”²⁶ Another court has noted—albeit without endorsement or rejection—the assumption that twenty-four years constitutes the “foreseeable future” for purposes of predicting the likelihood of endangerment.²⁷ In listing decisions involving salamanders, foreseeability has been set at forty years.²⁸ By contrast, one court has held that the same forty-year time horizon, from 2010 to 2050, as identified in projections of deleterious effects from climate change, was not sufficiently foreseeable to warrant the listing of the ribbon seal as a threatened species.²⁹ The FWS, of its own accord, has declined to list the American pika as threatened or endangered on the basis of climate change risks beyond 2050.³⁰

Listing as an endangered or threatened species is a prerequisite to protection under the Act. The Services must base their listing decisions on five factors:³¹

1. The present or threatened destruction, modification, or curtailment of a species’ habitat or range
2. The overutilization of a species for commercial, recreational, scientific, or educational purposes
3. Disease or predation
4. The inadequacy of existing regulatory mechanisms
5. Other natural or manmade factors affecting a species’ continued existence

26. Oregon Natural Res. Council v. Daley, 6 F. Supp. 2d 1139, 1151 (D. Or. 1998).

27. See Trout Unlimited v. Lohn, 645 F. Supp. 2d 929, 954 n.18 (D. Or. 2007), *aff’d*, 559 F.3d 946 (9th Cir. 2009).

28. See Siskiyou Mountains Salamander (*Plethodon stormi*) & Scott Bar Salamander (*Plethodon asupak*), 73 Fed. Reg. 4380, 4381 (Jan. 24, 2008).

29. See Center for Biological Diversity v. Lubchenco, 758 F. Supp. 2d 945 (N.D. Cal. 2010).

30. See Twelve-Month Finding on a Petition to List the American Pika as Threatened or Endangered, 75 Fed. Reg. 6,438 (Feb. 9, 2010).

31. See E.S.A. § 4(a), 16 U.S.C. § 1533(a).

The decision to list rests solely on biological grounds and must be made “without reference to possible economic or other impacts of [that] determination.”³² Moreover, listing decisions must be made “solely on the basis of the best scientific and commercial data available.”³³ The requirement to use the best *available* data is not tantamount to a command to seek and apply “the best . . . possible” data.³⁴ Rather, this requirement prevents the Services from disregarding evidence that is better than the scientific basis on which the Services do base their listing decisions.³⁵

After listing a species as endangered or threatened, the Services must also designate *critical habitat* “to the maximum extent prudent and determinable.”³⁶ Critical habitat includes areas containing “physical and biological features” that are “essential to the conservation of the species and which may require special management considerations or protection.”³⁷ Critical habitat may also include areas outside a species’ current range if such habitat is essential to the conservation of that species.³⁸ Although the designation of critical habitat must “tak[e] into consideration the economic impact” of designating any particular area, the Services may not deny the critical habitat designation to any area where the “best scientific and commercial data available” indicate that “the failure to designate such area as critical habitat will result in the extinction of the species.”³⁹

Because the Act aspires not merely to “halt” but also to “reverse the trend towards” biodiversity loss,⁴⁰ the Act directs the Services to develop a recovery plan aimed at improving the status of each listed species so that listing is no longer necessary.⁴¹ A recovery plan must

32. 50 C.F.R. § 424.11(b).

33. E.S.A. § 4(b), 16 U.S.C. § 1533(b).

34. *Building Indus. Ass’n of Superior Cal. v. Norton*, 247 F.3d 1241, 1246 (D.C. Cir. 2001) (emphasis added).

35. *City of Las Vegas v. Lujan*, 891 F.2d 927, 933 (D.C. Cir. 1989); *accord In re Polar Bear Endangered Species Act Listing & § 4(d) Rule Litig.*, 794 F. Supp. 2d 65, 106 (D.C. Cir. 2011), *aff’d*, 709 F.3d 1 (D.C. Cir.), *cert. denied*, 134 S. Ct. 310 (2013).

36. E.S.A. § 4(a)(3), 16 U.S.C. § 1533(a)(3).

37. E.S.A. § 3(5)(A)(i), 16 U.S.C. § 1532(5)(A)(i).

38. *See* E.S.A. § 3(5)(A)(ii), 16 U.S.C. § 1532(5)(A)(ii).

39. E.S.A. § 4(b)(2), 16 U.S.C. § 1533(b)(2).

40. *Tennessee Valley Auth. v. Hill*, 437 U.S. 153, 184 (1978).

41. *See* E.S.A. § 4(f), 16 U.S.C. § 1533(f).

identify “management actions necessary . . . for the conservation and survival of the species,” to the point of either “recommend[ing] corrective action” or explaining why such action “is impracticable or unnecessary.”⁴² Although a recovery plan need not specify a precise timetable, it must include estimates for the time needed to perform recovery measures.⁴³ The ultimate factors for delisting a species are the same as those that inform the decision to list a species as endangered or threatened.⁴⁴

Section 7 of the Act requires each federal agency to ensure that its actions are “not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of [critical] habitat.”⁴⁵ The jeopardy prong of Section 7 addresses the impact of agency action on the survival and recovery of a listed species.⁴⁶ By contrast, the adverse modification prong concerns critical habitat. A determination that proposed agency action “may affect” a listed species or its critical habitat triggers the obligation to formally consult the FWS or NMFS, as appropriate.⁴⁷

Formal consultation under Section 7 typically results in the issuance of a biological opinion evaluating jeopardy to a listed species’ continued existence and adverse modification of its habitat.⁴⁸ At the very least, where a biological opinion has found that proposed federal action will directly affect a listed species for reasons independent of climate change, that biological opinion must also address the cumulative effects of climate change on that species.⁴⁹ In this regard, the obligation to examine climate change in biological opinions that have already found direct, non-climate-related impacts on a listed species resembles an existing strategy for regulating greenhouse gas emissions under the Clean Air Act. The EPA has invoked its so-called “anyway” authority to require the installation of

42. *Fund for Animals v. Babbitt*, 903 F. Supp. 96, 108 (D.D.C. 1995).

43. *See Defenders of Wildlife v. Babbitt*, 130 F. Supp. 2d 121, 134 (D.D.C. 2001).

44. *See Fund for Animals*, 903 F. Supp. at 111.

45. E.S.A. § 7(a)(2), 16 U.S.C. § 1536(a)(2); *accord Hill*, 437 U.S. at 183–84.

46. *See Sierra Club v. U. S. Fish & Wildlife Serv.*, 245 F.3d 434, 441 (5th Cir. 2001).

47. *See* 50 C.F.R. § 402.14(a); *Bennett v. Spear*, 520 U.S. 154, 158 (1997).

48. *See* E.S.A. § 7(a)(2), 16 U.S.C. § 1536(a)(2); 50 C.F.R. § 402.14.

49. *See* 50 C.F.R. § 402.14(g); *Pacific Coast Fed’n of Fishermen’s Ass’ns v. Gutierrez*, 606 F. Supp. 2d 1122, 1184 (E.D. Cal. 2008); *Natural Res. Def. Council v. Kempthorne*, 506 F. Supp. 2d 322, 374–76 (E.D. Cal. 2007).

the best available control technology for greenhouse gases at facilities whose emissions of conventional pollutants would subject them to the EPA's permitting authority under Title V and/or the Prevention of Significant Deterioration provisions of the Clean Air Act.⁵⁰

It is not statutory language, but administrative practice and judicial review that have infused the Endangered Species Act with the power to address climate change. As a textual matter, the Act does not obligate the Services, in their discharge of their obligations under Sections 4 and 7, to consider the impact of climate change.⁵¹ Nor does the Act require that the Services account for climate change in their critical habitat designation decisions.⁵² The proclamation that the Act contains “no statutory requirement” compelling the Services “to consider climate change in [their] listing decisions”⁵³ echoes judicial sentiments expressed a generation earlier. In the 1990s, federal courts had opined that conservation biology—a diverse science whose concerns span “population dynamics, species turnover, patch size, recolonization problems, fragmentation problems, edge effects, and island biogeography”—need not guide federal administrative decisionmaking.⁵⁴

More recent judicial decisions have breathed new power into the Endangered Species Act as a legal tool for addressing the effects of climate change. The Ninth Circuit decided in 2011 to invalidate the Fish and Wildlife Service's attempt to delist Yellowstone grizzly bears as a threatened species, on the grounds that the Service had

50. See *Utility Air Regulatory Grp. v. EPA*, 134 S. Ct. 2427, 2447–49 (2014).

51. See *Colorado River Cutthroat Trout v. Salazar*, 898 F. Supp. 2d 191, 206-07 (D.D.C. 2012).

52. See *Alliance for the Wild Rockies v. Lyder*, 728 F. Supp. 2d 1126, 1140 (D. Mont. 2010).

53. *Colorado River Cutthroat Trout*, 898 F. Supp. 2d at 207; see also *Interagency Cooperation Under the Endangered Species Act*, 73 Fed. Reg. 47,686, 47,872 (Aug. 15, 2008) (opining that federal agencies face “no requirement to consult” the NMFS or FWS “on greenhouse gas (GHG) emissions’ contribution to global warming and its associated impacts on listed species”).

54. *Sierra Club v. Marita*, 46 F.3d 606, 618–20 (7th Cir. 1995); see also *id.* at 623 (declining to transform even valid “general theor[ies]” of science “into a management tool unless [an agency] can apply it to a concrete situation”); *Fund for Animals v. Babbitt*, 903 F. Supp. 96, 106 (D.D.C. 1995) (declining to endorse specific techniques for managing “distinct geographic ecosystems . . . inhabited by grizzly bears”).

failed to properly account for the impact of climate change on the whitebark pine, a primary source of food for grizzlies.⁵⁵ The climate-driven loss of whitebark pine trees could foreseeably increase conflicts between bears and humans and thereby harm the bears' prospects for reproductive success and overall survival.⁵⁶

Thanks to its breadth, Section 7's requirement that other federal agencies consult the FWS or NMFS if proposed action "may affect" a listed species or its critical habitat has the potential to cover "any action that results in non-trivial net increases" in greenhouse gases.⁵⁷ As between administrative discretion and judicial review, more aggressive enforcement of the Endangered Species Act by the Services will have greater impact on efforts to mitigate climate change. Because reviewing courts are admonished "not to substitute [their] judgment for that of [an] agency," especially where disputed matters involve "a high level of technical expertise,"⁵⁸ courts will hesitate to reverse agency action on the basis of challenges "amount[ing] to nothing more than competing views about policy and science."⁵⁹

Section 9's prohibition against the "tak[ing]" of endangered species⁶⁰ dramatically expands the scope of the Act from agencies of the federal government to all actors, including the entire private sector. Notably, the Act does not directly prohibit the taking of a *threatened* species. Section 9, however, does punish the "violat[ion of] any regulation pertaining . . . to any threatened species of fish or

55. See *Greater Yellowstone Coal., Inc. v. Servheen*, 665 F.3d 1015, 1026 (9th Cir. 2011).

56. See *id.*

57. John Kostyack & Dan Rohlf, *Conserving Endangered Species in an Era of Global Warming*, 38 ENVTL. L. REP. 10,203, 10,212 (2008); see also *Kemphorne*, 506 F. Supp. at 331–32 (E.D. Cal. 2007) (ordering the Bureau of Reclamation, under authority of § 7 of the Endangered Species Act, to consult with FWS regarding the impact of climate change on the threatened Delta smelt [*Hypomesus transpacificus*]); Ruhl, *supra* note 21, at 45–46 (discussing *NRDC v. Kemphorne*).

58. *Marsh v. Oregon Natural Res. Council*, 490 U.S. 360, 377 (1989).

59. *In re Polar Bear Endangered Species Act Listing & Section 4(d) Rule Litig.*, 709 F.3d 1, 3 (D.C. Cir. 2013).

60. See E.S.A. § 9(a)(1), 16 U.S.C. § 1538(a)(1) ("it is unlawful for any person subject to the jurisdiction of the United States to . . . take any [endangered] species within the United States or the territorial sea of the United States [or] take any such species upon the high seas").

wildlife listed pursuant to” Section 4 of the Act.⁶¹ By regulation, the Services have defined the taking of a threatened species as a violation of Section 9.⁶²

The statutory definition of *take* and its administrative interpretation are the true source of legal power in Section 9’s prohibition against the taking of endangered species. The Act defines *take* to mean “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect” a member of an endangered species.⁶³ In turn, regulations issued by the Services have defined the term *harm* as including “significant habitat modification or degradation” adversely affecting an endangered or threatened species, with no regard to intent to injure any individual specimen. The celebrated Supreme Court case of *Babbitt v. Sweet Home Chapter of Communities for a Great Oregon*⁶⁴ upheld the application of these expanded definitions of *take* and *harm* to significant habitat modification.

With a reach that exceeds that of Sections 4 and 7, Section 9 may yet be construed to treat greenhouse gas emissions as a legally critical link in a causal chain leading to the unlawful “taking” of an endangered species.⁶⁵ The application of Section 9 to climate change would represent a significant step beyond Justice O’Connor’s *Sweet Home* concurrence, which emphasized limitations imposed “by ordinary principles of proximate causation,” including embedded “notions of foreseeability,”⁶⁶ in order to curb the perceived excesses of the Ninth Circuit’s 1988 *Palila* decision.⁶⁷ In 1995 Justice O’Connor questioned whether Section 9 could be lawfully construed to reach destruction of the palila bird’s habitat in Hawaii through sheep-grazing. The question in 2015 is whether Section 9 may be

61. E.S.A. § 9(a)(1)(G), 16 U.S.C. § 1538(a)(1)(G); *see also* E.S.A. § 4(d), 16 U.S.C. § 1533(d) (“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”).

62. 50 C.F.R. § 17.31.

63. E.S.A. § 3(19), 16 U.S.C. § 1532(19).

64. 515 U.S. 687 (1995).

65. *See* Brendan Cummings & Kassie R. Siegel, *Ursus maritimus: Polar Bears on Thin Ice*, 22 NATURAL RES. & ENV’T 3, 4, 7 (2007).

66. *Sweet Home*, 515 U.S. at 709 (O’Connor, J., concurring).

67. *See* *Palila v. Hawaii Dep’t of Land & Natural Res.*, 852 F.2d 1106 (9th Cir. 1988).

applied to significant modification or degradation of habitat traceable to anthropogenic climate change.

Climate change has figured prominently in both listing and critical habitat designation decisions for species ranging from subtropical elkhorn and staghorn coral⁶⁸ to sage grouse and wolverine on the North American mainland⁶⁹ and bearded and ringed seals in northern seas.⁷⁰ Nevertheless, Endangered Species Act cases addressing climate change have extended the law's longstanding tendency to focus on "large, charismatic fauna over all other threats to biodiversity."⁷¹ The signature battle over the application of the Act to

68. See *Center for Biological Diversity v. National Marine Fisheries Serv.*, 977 F. Supp. 2d 55 (D.P.R. 2013); Final Listing Determinations for Elkhorn Coral & Staghorn Coral, 71 Fed. Reg. 26,852 (May 9, 2006) (to be codified at 50 C.F.R. pt. 223); Critical Habitat for Threatened Elkhorn & Staghorn Corals, 73 Fed. Reg. 72,210 (Nov. 26, 2008) (to be codified at 50 C.F.R. pts. 223, 226). See generally Blake Armstrong, Note, *Maintaining the World's Marine Biodiversity: Using the Endangered Species Act to Stop the Climate Change Induced Loss of Coral Reefs*, 18 HASTINGS W-NW. J. ENV'T'L L. & POL'Y 429 (2012).

69. See *American Lands Alliance v. Norton*, 242 F. Supp. 2d 1, 6 (D.D.C. 2003) (identifying climate change as a factor favoring the listing of the Gunnison sage grouse as an endangered species); Endangered Status for Gunnison Sage-Grouse, 78 Fed. Reg. 2486 (proposed Jan. 11, 2013) (to be codified at 50 C.F.R. pt. 17); Threatened Status for the Distinct Population Segment of the North American Wolverine Occurring in the Contiguous United States, 78 Fed. Reg. 7865 (proposed Feb. 4, 2013) (to be codified at 50 C.F.R. pt. 17); cf. *Friends of the Wild Swan, Inc. v. U.S. Fish & Wildlife Serv.*, 12 F. Supp. 2d 1121, 1127–28 (D. Or. 1997) (acknowledging the vulnerability of the bull trout to climate change). See generally Michael C. Blumm & Kya B. Marienfeld, *Endangered Species Act Listings and Climate Change: Avoiding the Elephant in the Room*, 20 ANIMAL L. 277, 294–305 (2014) (discussing the sage grouse and wolverine listing decisions); Robin Kundis Craig, *Climate Change, Regulatory Fragmentation, and Water Triage*, 79 U. COLO. L. REV. 825, 879–80 (2008) (discussing *American Lands Alliance*, *Wild Swan*, and the *Acropora* coral listing decision).

70. See Threatened Status for the Beringia and Okhotsk Distinct Population Segments of the *Erignathus barbatus nauticus* Subspecies of the Bearded Seal, 77 Fed. Reg. 76,740 (Dec. 28, 2012); Threatened Status for the Arctic, Okhotsk, and Baltic Subspecies of the Ringed Seal and Endangered Status for the *Lagoda* Subspecies of the Ringed Seal, 77 Fed. Reg. 76,706 (Dec. 28, 2012); cf. *Greenpeace v. National Marine Fisheries Serv.*, 237 F. Supp. 2d 1181, 1188 (W.D. Wash. 2002) (recognizing the impact of climate change on reductions in the population of the Stellar sea lion). The FWS has designated the Pacific walrus as a candidate for threatened status, but has not yet listed that species. See Twelve-Month Finding to List the Pacific Walrus as Threatened or Endangered, 76 Fed. Reg. 7634 (Feb. 10, 2011).

71. Chen, *supra* note 8, at 17. See generally Nigel Leader-Williams & Holly T. Dublin, *Charismatic Megafauna as "Flagship Species,"* in PRIORITIES FOR THE CONSERVATION OF MAMMALIAN DIVERSITY: HAS THE PANDA HAD ITS DAY?, at 53 (2000) (urging the de-emphasis of large mammals in favor of more holistic conservation models that integrate social concerns with biological concerns encompassing multiple species and biodiversity at large); Diogo Verissimo, Douglas C. MacMillan & Robert J. Smith, *Toward a Systematic Approach for Identifying Conservation Flagships*, 4 CONSERVATION LETTERS 1 (2011) (proposing a new

climate change has involved, quite unsurprisingly, the polar bear.⁷² Litigation has swamped all aspects of the FWS's efforts to protect the polar bear, from its listing as a threatened species⁷³ to the designation of large portions of the Arctic as critical habitat⁷⁴ and the application of Section 9's prohibition against takings of polar bears.⁷⁵

The English word *Arctic*, after all, stems from the Greek word for *bear*, in honor of the constellation that other ancient people called *Ursa Major*.⁷⁶ *Arcturus*, the celebrated northern star, means the "guardian of the bear."⁷⁷ While courts debate legal remedies for the loss of *human* habitats in polar regions,⁷⁸ the existential threat to the

definition of flagship species that emphasizes the role of charismatic megafauna in promoting awareness of and support for biodiversity conservation).

72. See generally Louis A. Di Leo, *The Polar Bear Ethic: From the Reactionary Trend in Environmental Lawmaking to the Climate Change Imperative*, 28 J. ENVTL. L. & LITIG. 347 (2013); Maggie Kuhn, Note, *Climate Change and the Polar Bear: Is the Endangered Species Act Up to the Task?*, 27 ALASKA L. REV. 125 (2010).

73. See *In re* Polar Bear Endangered Species Act Listing & Section 4(d) Rule Litig., 709 F.3d 1 (D.C. Cir. 2013), *cert. denied*, 134 S. Ct. 310 (2013).

74. See *Alaska Oil & Gas Ass'n v. Salazar*, 916 F. Supp. 2d 974 (D. Alaska 2013).

75. See *In re* Polar Bear Endangered Species Act Listing & Section 4(d) Rule Litig., 818 F. Supp. 2d 214 (D.D.C. 2011).

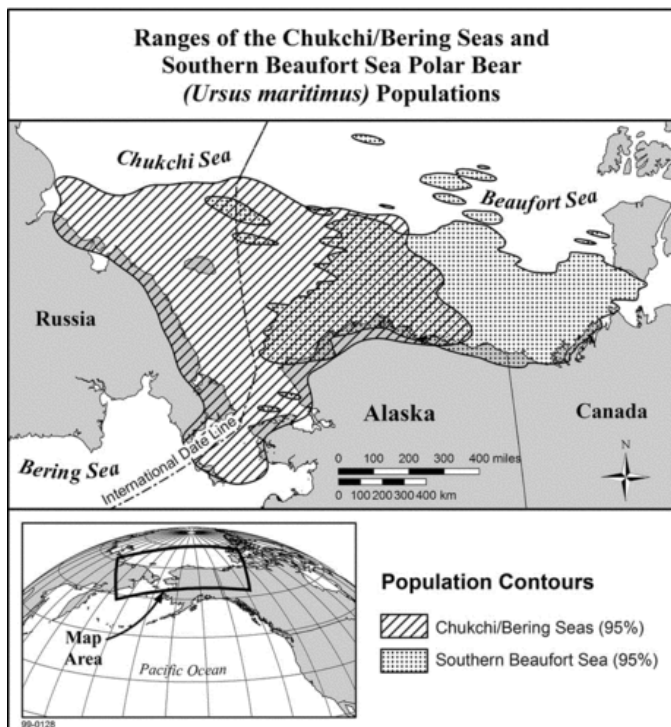
76. Douglas Harper, *Arctic definition*, ONLINE ETYMOLOGY DICTIONARY, available at <http://www.etymonline.com/index.php?term=arctic>. The Greek form of the word is *ἀρκτος*, as in *πολική ἀρκτος* (polar bear).

77. Douglas Harper, *Arcturus definition*, ONLINE ETYMOLOGY DICTIONARY, available at <http://www.etymonline.com/index.php?term=arcturus>. This Essay takes its name from the ancient Greek form of Arcturus: *Ἀρκτοῦρος*.

78. See *Native Village of Kivalina v. ExxonMobil Corp.*, 663 F. Supp. 2d 863, 876 (N.D. Cal. 2009), *aff'd*, 696 F.3d 849 (9th Cir. 2012) (describing "the harm from global warming" as a causally remote "series of events disconnected from the discharge" of "greenhouse gases," which must then "combine with other gases in the atmosphere which in turn results in the planet retaining heat, which in turn causes the ice caps to melt and the oceans to rise, which in turn causes the Arctic sea ice to melt, which in turn allegedly renders Kivalina [and other polar communities] vulnerable to erosion and deterioration resulting from winter storms"); see also *Native Village of Point Hope v. Salazar*, 680 F.3d 1123, 1135 (9th Cir. 2012) (affirming the Bureau of Ocean Energy Management's conclusion that an Arctic oil exploration plan would not "probably cause serious harm or damage" to life, property or the human, marine, or coastal environment in violation of 43 U.S.C. §§ 1334(a)(2)(A)(i), 1340(c)(1), 30 C.F.R. §§ 550.202, 550.233). Compare *American Elec. Power Co. v. Connecticut*, 131 S. Ct. 2527, 2537 (2011) (holding that "the Clean Air Act and the EPA actions it authorizes displace any federal common law right to seek abatement of carbon-dioxide emissions from fossil-fuel fired power plants"), with *City of Milwaukee v. Illinois*, 451 U.S. 304, 318–19 (1981) (holding that the Water Pollution Act Amendments of 1972 displaced federal common law claims arising from a sewage discharge). See generally Hari M. Osofsky, *The Inuit Petition as a Bridge? Beyond Dialectics of Climate Change and Indigenous People's Rights*, 31 AM. IND. L. REV. 675 (2007);

polar bear has spurred legal action against the vectors of anthropogenically induced climate change.

In 2008 the FWS listed the polar bear as threatened by the effects of climate change on the bear's Arctic habitat.⁷⁹ Although the FWS initially declined to designate critical habitat for the polar bear, it dramatically reversed course in 2010 by designating 187,157 square miles in Alaska and adjacent waters of the United States and its territories.⁸⁰



Matthew Gerhart, Comment, *Climate Change and the Endangered Species Act: The Difficulty of Proving Causation*, 36 *ECOLOGY L.Q.* 167 (2009).

79. See Determination of Threatened Status for the Polar Bear (*Ursus maritimus*) Throughout Its Range, 73 Fed. Reg. 28,212 (2008) [hereinafter *Polar Bear Listing Determination*], codified at 50 C.F.R. pt. 17.

80. See Designation of Critical Habitat for the Polar Bear (*Ursus maritimus*) in the United States, 75 Fed. Reg. 76,085, 76,088 (Dec. 7, 2010), codified in 50 C.F.R. pt. 17, available at <https://www.federalregister.gov/articles/2010/12/07/2010-29925/endangered-and-threatened-wildlife-and-plants-designation-of-critical-habitat-for-the-polar-bear#t-1>

Of central importance to the listing of the polar bear and to the designation of its habitat as critical is the existential threat that climate change poses to Arctic sea ice.⁸¹ A sympathetic D.C. Circuit recognized that irreversible “changes to the polar bear's habitat will soon pose an existential threat to the species”:⁸²

Productivity, abundance, and availability of ice seals, the polar bear's primary prey base, would be diminished by the projected loss of sea ice, and energetic requirements of polar bears for movement and obtaining food would increase. Access to traditional denning areas would be affected. In turn, these factors would cause declines in the condition of polar bears from nutritional stress and reduced productivity. As already evidenced in the Western Hudson Bay and Southern Beaufort Sea populations, polar bears would experience reductions in survival and recruitment rates. The eventual effect is that polar bear populations would decline. The rate and magnitude of decline would vary among populations, based on differences in the rate, timing, and magnitude of impacts. However, within the foreseeable future, all populations would be affected, and the species is likely to become in danger of extinction throughout all of its range due to declining sea ice habitat.⁸³

Indeed, even the color of ice itself contributes to a significant albedo effect: as ice melts, the darkening of the sea or land surface absorbs more solar energy and accelerates global warming even more.⁸⁴ Albedo has sufficient climatic impact to warrant serious consideration of geoengineering projects designed to alter the color

81. See *Polar Bear Listing Determination*, 73 Fed. Reg. 28,212, 50 C.F.R. pt. 17.

82. *In re Polar Bear Endangered Species Act Listing & Section 4(d) Rule Litig.*, 709 F.3d 1, 6 (D.C. Cir.), cert. denied, 134 S. Ct. 310 (2013).

83. *Id.* (quoting *Polar Bear Listing Determination*, 73 Fed. Reg. at 28,292–93). This passage echoes the Supreme Court's endorsement of the FWS's identification of mortal threats to the snail darter in *TVA v. Hill*, *TVA v. Hill*, 437 U.S. 153, 162 (1978): “[T]he snail darter occurs only in the swifter portions of shoals over clean gravel substrate in cool, low-turbidity water. Food of the snail darter is almost exclusively snails, which require a clean gravel substrate for their survival. The proposed impoundment of water behind the proposed Tellico Dam would result in total destruction of the snail darter's habitat.”

84. See *Polar Bear Listing Determination*, 73 Fed. Reg. at 28,225.

of the earth,⁸⁵ even to the point of turning the daytime sky from blue to white.⁸⁶

Federal courts have upheld most aspects of the FWS's polar bear decisions.⁸⁷ The United States District Court for the District of Alaska did invalidate the FWS's designation of Unit 2, a stretch of northern Alaska spanning the Canadian border and the town of Barrow, because the FWS used its finding of a need to isolate polar bear dens from humans and human activities, an "essential feature" of Unit 2 that constituted only "approximately one percent of the entire area," as an improper basis for "designat[ing] a large swath of land . . . as 'critical habitat.'"⁸⁸

For its part, the United States District Court for the District of Columbia has rejected a challenge to the FWS's decision to limit the protection of polar bears under Section 9 of the Act according to exemptions granted by the Marine Mammal Protection Act⁸⁹ and the Convention on International Trade in Endangered Species⁹⁰ and to refrain from enforcing Section 9 to activities outside the polar bears' range, notwithstanding those activities' incidental impact on polar bears.⁹¹ Using its authority under the Marine Mammal Protection Act,⁹² the FWS has routinely authorized nonlethal, incidental takings

85. See, e.g., Peter J. Irvine, Andy Ridgwell & Daniel J. Lunt, *Climatic Effects of Surface Albedo Engineering*, 116 J. GEOPHYS. RES. D24,112 (2011); Joy S. Singareyer, Andy Ridgwell & Peter Irvine, *Assessing the Benefits of Crop Albedo Bio-Geoengineering*, 4 ENVTL. RES. LETTERS 045110 (2009).

86. See Giovanni Pitari et al., *Stratospheric Ozone Response to Sulfate Geoengineering: Results from the Geoengineering Model Intercomparison Project*, 4 J. GEOPHYS. RES. 2629 (2014).

87. See generally Alanna Kearney, Casenote, *The Battle May Be Over, But What About the War? Examining the ESA in the Crusade Against Global Warming After In Re Polar Bear Endangered Species Act Listing and Section 4(d) Rule Litigation*, 25 VILL. ENVTL. L.J. 529 (2014).

88. *Alaska Oil & Gas Ass'n v. Salazar*, 916 F. Supp. 2d 974, 1001-02 (D. Alaska 2013).

89. See 16 U.S.C. §§ 1373-1374.

90. Convention on International Trade in Endangered Species of Wild Fauna and Flora, signed at Washington, D.C., on March 3, 1973, art. VII, 27 U.S.T. 1087, TIAS 8249 ("Exemptions and Other Special Provisions Relating to Trade").

91. See *In re Polar Bear Endangered Species Act Listing & Section 4(d) Rule Litig.*, 818 F. Supp. 2d 214, 222-23 (D.D.C. 2011), *aff'd*, 709 F.3d 1 (D.C. Cir.), *cert. denied*, 134 S. Ct. 310 (2013).

92. 16 U.S.C. § 1371(a)(5)(A).

of polar bears and Pacific walruses.⁹³ The authority to permit incidental takings requires the Service to determine that such takings will have no more than a “negligible impact” on the affected population.⁹⁴

Humanity’s alteration of ecology to suit its own needs and tastes has triggered multiple *regime shifts* in terrestrial and aquatic environments.⁹⁵ If complex adaptive ecosystems are to regain their capacity to deliver services that humans prize, human institutions such as the law must work to sustain surviving ecosystems and to transform degraded ecosystems.⁹⁶ Although the law offers no conclusive answer to the question of “whether the [Endangered Species Act] is an effective or appropriate tool to address the threat of climate change,”⁹⁷ climate change and biodiversity conservation remain the most important things that the law can address.⁹⁸

The brief legal record of applying the Endangered Species Act to climate change has already shifted the policymaking terrain. Legal recognition of the ecological threat that climate change poses to the biosphere pays homage to the scholarly legacy of Charles R. McManis. Professor McManis’s work, after all, has always reflected the understanding that technological innovation depends on the conservation of biological diversity.⁹⁹

93. See *Center for Biological Diversity v. Salazar*, 695 F.3d 893 (9th Cir. 2012); see also *Center for Biological Diversity v. Kempthorne*, 588 F.3d 701 (9th Cir. 2009); *Incidental Take During Specified Activities*, 76 Fed. Reg. 47,010 (Aug. 3, 2011).

94. 16 U.S.C. § 1371(a)(5)(A)(i)(I); see *Kempthorne*, 588 F.3d at 710. In applying its incidental takings authority, the Service must analyze “reasonably expected” and “reasonably likely” effects leading to a “negligible impact,” but bears no obligation to consider speculative or uncertain effects. 50 C.F.R. § 18.27(c); accord *Kempthorne*, 588 F.3d at 710–11.

95. See generally Carl Folke, Steve Carpenter, Brian Walker, Marten Scheffer, Thomas Elmqvist, Lance Gunderson & C.S. Holling, *Regime Shifts, Resilience, and Biodiversity in Ecosystem Management*, 35 ANN. REV. ECOL. EVOL. & SYSTEMATICS 557 (2004).

96. See *id.*

97. *In re Polar Bear Endangered Species Act Listing*, 818 F. Supp. 2d at 234.

98. See Chen, *supra* note 8, at 13–14.

99. See, e.g., BIODIVERSITY AND THE LAW: INTELLECTUAL PROPERTY, BIOTECHNOLOGY AND TRADITIONAL KNOWLEDGE (Charles R. McManis ed., 2007); Charles R. McManis, *Intellectual Property, Genetic Resources and Traditional Knowledge Protection: Thinking Globally, Acting Locally*, 11 CARDOZO J. INT’L & COMP. L. 547 (2003); Charles R. McManis, *The Interface of Open Source and Proprietary Agricultural Innovation: Facilitated Access and Benefit-Sharing Under the New FAO Treaty*, 30 WASH. U. J.L. & POL’Y 405 (2009).

The Arctic has been justifiably described as the “last great wilderness.”¹⁰⁰ Wilderness areas have long offered the promise of providing refuges “where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain.”¹⁰¹ Despite their low levels of biodiversity, the Arctic and other cold and/or high-elevation locales may yet prove to be pivotal legal battlegrounds in the last-ditch effort to save the earth and its diverse forms of life from anthropogenically induced climate change. “The project of ameliorating humanity's environmental footprint demands humility, wonder, and above all a thorough scientific understanding of natural history and humanity’s place in it.”¹⁰²

100. See ROGER KAYE, *LAST GREAT WILDERNESS: THE CAMPAIGN TO ESTABLISH THE ARCTIC NATIONAL WILDLIFE REFUGE* (2006).

101. 16 U.S.C. § 1131(c).

102. Jim Chen, *Legal Mythmaking in a Time of Mass Extinctions: Reconciling Stories of Origins with Human Destiny*, 29 HARV. ENVTL. L. REV. 279, 279 (2005).