

Climate Change Attribution Science and the Endangered Species Act

Jessica Wentz[†]

Climate change poses an enormous risk to plant and animal species across the planet. Mean global temperatures have already increased by approximately 1°C, causing environmental changes that affect species abundance, distribution, behavior, physiology, genetics, and survival prospects. These changes, combined with other human stressors, have already resulted in the extinction of some species and imperiled many others.

In the United States, the Endangered Species Act (ESA) is the primary legal vehicle for the protection and management of species at risk of extinction. The statute and accompanying regulations outline a science-based framework for identifying endangered and threatened species, establishing critical habitat boundaries, and mitigating the harmful impacts of public and private-sector activities on listed species. Although climate change is not explicitly mentioned in the statute, there is no question that agencies must consider climate-related threats when implementing the ESA.

This Article examines the uniquely important role of climate change detection and attribution research in federal decision-making and judicial review under the ESA. This research provides insights on how climate change is already affecting species and habitats and is therefore integral to decisions about: (i) whether to list a species as threatened or endangered on the basis of climate-related threats, and (ii) how to support species recovery through critical habitat designations and other management actions. Courts have held that attribution research qualifies as the “best available science” that must be considered in ESA decision-making and that agencies cannot ignore attribution research on the basis of uncertainty or imprecision where the data suggests that there is a probable threat to a species. They have also consistently upheld the federal government’s use of attribution data to support ESA protections for climate-imperiled species.

The Article concludes with recommendations and best practices pertaining to the use of climate attribution data in ESA management and litigation. It outlines areas where additional guidance may help agencies improve and standardize their approach to climate impact analysis, as well as regulatory amendments that could improve the consideration of climate science in ESA

[†] Non-Resident Senior Fellow, Sabin Center for Climate Change Law, Columbia Law School. The author would like to thank Michael Burger, Radley Horton, and Daniel Metzger for their feedback on this Article.

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decision-making and enable agencies to make better management decisions in light of their scientific analysis. It also offers recommendations regarding the use of attribution data in ESA petitions and lawsuits aimed at achieving greater protections for species imperiled by climate change.

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Introduction

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services' *Global Assessment on Biodiversity and Ecosystem Services* (2019) estimated that approximately one million species are currently at risk of extinction, with climate change being a major driver of accelerating extinction risk.¹ Global average temperatures have risen by more than 1 °C above pre-industrial levels, and we are on track to exceed 2 °C of warming in this century.² Recent research on climate change detection and attribution—which examines how anthropogenic climate change is currently affecting our planet—has shown that habitats and species are already being adversely affected by phenomena such as warming land and water temperatures, ice and permafrost melt, sea level rise, more extreme weather events, and other changes in the bioclimatic conditions of habitats.³ These phenomena are driving changes in species distribution, phenology, and population dynamics, as well as changes in the structure and function of ecosystems and the timing of ecological processes.⁴

These impacts have profound implications for biodiversity, ecosystem health, and species survival prospects. Research indicates that nearly half of threatened terrestrial mammals and one quarter of threatened birds are already adversely affected by climate change.⁵ Whether species can adapt to changing conditions is often dependent on their ability to disperse geographically. Differential impacts on species, such as on predators and prey, and competition with new invasives can also affect a species' survival prospects. Numerous studies have documented geographic shifts in the ranges of species, especially towards higher mean elevations and latitudes, as a result of warming temperatures and other impacts.⁶ Climate change has also driven widespread

1. INTERGOVERNMENTAL SCI.-POLICY PLATFORM ON BIODIVERSITY AND ECOSYSTEM SERVS., GLOBAL ASSESSMENT REPORT ON BIODIVERSITY AND ECOSYSTEM SERVICES xxviii (Sandra Díaz et al. eds., 2019) [hereinafter IPBES 2019] <https://ipbes.net/global-assessment> [<https://perma.cc/AZX4-9AJF>].

2. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC), CLIMATE CHANGE 2021: THE PHYSICAL SCIENCE BASIS. CONTRIBUTION OF WORKING GROUP I TO THE SIXTH ASSESSMENT REPORT OF THE IPCC (Valérie Masson-Delmotte et al. eds., 2021).

3. Climate change detection and attribution research—hereafter referred to as “attribution research”—seeks to isolate the effect of human activities on the global climate system and corresponding impacts on other natural and human systems. See Nathan L. Bindoff, Peter A. Stott, Krishna Mirle AchutaRao, Myles R. Allen, Nathan Gillett, David Gutzler, Kabumbwe Hansingo, Gabriele Hegerl, Yongyun Hu, Suman Jain, Igor I. Mokhov, James Overland, Judith Perlwitz, Rachid Sebbari & Xuebin Zhang, *Detection and Attribution of Climate Change: from Global to Regional*, in CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS, CONTRIBUTION OF WORKING GROUP I TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 867 (2013). For a more expansive discussion on the nexus between attribution research and litigation, see Michael Burger, Jessica Wentz & Radley Horton, *The Law and Science of Climate Change Attribution*, 5 COLUM. J. ENV'T L. 57 (2020).

4. IPBES 2019, *supra* note 1, §§ 2.2.5.3.2, 2.2.5.2.3, 2.2.6.2.

5. *Id.* § 2.2.6.2.

6. See, e.g., Camille Parmesan & Gary Yohe, *A Globally Coherent Fingerprint of Climate Change Impacts Across Natural Systems*, 421 NATURE 37 (2003); I-Ching Chen, Jane K. Hill, Ralf Ohlemüller, David B. Roy & Chris D. Thomas, *Rapid Range Shifts of Species Associated with High Levels of Climate Warming*, 333 SCIENCE 1024 (2011); Jonathan Lenoir & Jens-Christian Svenning, *Climate-Related Range Shifts – A Global Multidimensional Synthesis and New Research Directions*, 38 ECOGRAPHY 15 (2015); Courtney L. Angelo & Curtis C. Daehler, *Upward Expansion of Fire-Adapted*

reductions and extinctions in local populations of many species.⁷ Some of the most vulnerable species are those that are particularly sensitive to temperature change and those that cannot migrate due to geography (e.g., islands and mountains) or habitat fragmentation. Researchers believe that the Bramble Cay melomys, a small rodent that lived on a vegetated coral cay in the Great Barrier Reef, is the first mammal to have gone extinct as a direct result of anthropogenic climate change—specifically sea level rise and higher storm surge.⁸ Some have noted the extinction could have been prevented through a captive breeding program, but the species recovery plan, which was drafted in 2008, downplayed the risk of sea level rise, tropical storms, and coastal flooding and thus failed to provide for this more proactive intervention.⁹

The risks to species will become more pronounced as the climate continues to change due to rising concentrations of greenhouse gases (GHGs).¹⁰ Even if global warming is limited to between 1.5 and 2.0 °C, scientists predict dramatic reductions in the ranges of most terrestrial species and significant threats to the survival of vulnerable species such as corals.¹¹ Thus, although GHG mitigation

Grasses Along A Warming Tropical Elevation Gradient, 36 *ECOGRAPHY* 551 (2013); Benjamin G. Freeman, Micah N. Scholer, Viviana Ruiz-Gutierrez & John W. Fitzpatrick, *Climate Change Causes Upslope Shifts and Mountaintop Extirpations in a Tropical Bird Community*, 115 *PROC. NAT'L ACAD. SCI.* (Oct. 29, 2018), <https://www.pnas.org/doi/10.1073/pnas.1804224115> [<https://perma.cc/33VG-JCLC>].

7. IPBES 2019, *supra* note 1, § 2.2.6.2; see John Wiens, *Climate-Related Local Extinctions Are Already Widespread Among Plant and Animal Species*, *PLOS BIOLOGY* (Dec. 8, 2018), <https://doi.org/10.1371/journal.pbio.2001104> [<https://perma.cc/N7TX-L47V>] (finding that climate-related local extinctions have already occurred in hundreds of species, including 47% of the 976 species surveyed).

8. See, e.g., Graham R. Fulton, *The Bramble Cay Melomys: The First Mammalian Extinction Due to Human-induced Climate Change*, 23 *PAC. CONSERVATION BIOLOGY* 1 (2017).

9. PETER LATCH, QUEENSLAND ENV'T PROT. AGENCY RECOVERY PLAN FOR THE BRAMBLE CAY MELOMYS (*MELOMYS RUBICOLA*) 8 (2008) (“[The] likely consequences of climate change, including sea-level rise and increase in the frequency and intensity of tropical storms, are unlikely to have any major impact on the survival of the Bramble Cay melomys in the life of this plan.”).

10. Modeling studies have predicted that various levels of species loss will result from this future climate change, ranging from 0% to >50% of all species currently known. See Mark Urban, *Accelerating Extinction Risk From Climate Change*, 348 *SCIENCE* 571 (2015); see also Anne Marie Panetta, Maureen L. Stanton & John Harte, *Climate Warming Drives Local Extinction: Evidence From Observation and Experimentation*, *SCI. ADVANCES* (Feb. 21, 2018), <https://www.science.org/doi/10.1126/sciadv.aqa1819> [<https://perma.cc/8A4C-BPY7>] (discussing evidence that warming is driving population declines and local extinctions); Cagan H. Sekercioglu, Stephen H. Schneider, John P. Fay & Scott R. Loarie, *Climate Change, Elevational Range Shifts, and Bird Extinctions*, 22 *CONSERVATION BIOLOGY* 140 (2007) (estimating bird extinctions under different warming scenarios); Stefan Dullinger, Andreas Gattlinger, Wilfried Thuiller, Dietmar Moser, Niklaus E. Zimmermann, Antoine Guisan, Wolfgang Willner, Christoph Plutzer, Michael Leitner, Thomas Mang, Marco Caccianiga, Thomas Dirnböck, Siegrun Ertl, Anton Fischer, Jonathan Lenoir, Jens-Christian Svenning, Achilleas Psomas, Dirk R. Schmatz, Urban Silc, Pascal Vittoz & Karl Hülber, *Extinction Debt of High-Mountain Plants Under Twenty-First-Century Climate Change*, 2 *NATURE CLIMATE CHANGE* 619 (2012) (predicting extinction risks for 150 high mountain plant species in the European alps); Marguerite Xenopoulos, David M. Lodge, Joseph Alcamo, Michael Märker, Kerstin Schulze & Detlef P. Van Vuuren, *Scenarios of Freshwater Fish Extinctions from Climate Change and Water Withdrawal*, 11 *GLOB. CHANGE BIOLOGY* 1557 (2005) (evaluating scenarios of freshwater fish extinction due to climate change).

11. See INTERGOVERNMENTAL SCI.-POLICY PLATFORM ON BIODIVERSITY AND ECOSYSTEM SERVS., SUMMARY FOR POLICYMAKERS OF THE GLOBAL ASSESSMENT REPORT ON BIODIVERSITY AND ECOSYSTEM SERVICES 16 (Sandra Díaz et al. eds., 2019).

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is essential for conservation efforts, some form of adaptive management will also be needed to protect many plants and animals from extinction.

In the United States, the Endangered Species Act (ESA) is the primary legal vehicle for the protection and management of species at risk of extinction. As other legal scholars have noted, climate science is integral to decision making and adaptive management under the ESA and other natural resource management statutes.¹² Much of the existing scholarship addresses how laws and management practices need to be modified to account for shifting baselines and uncertainty associated with future climate changes.¹³ This Article seeks to build upon the existing literature by elucidating the uniquely important role of detection and attribution research as a tool for assessing and responding to both immediate and long-term threats to species in ESA listing decisions, critical habitat designations, and recovery programs.¹⁴

Attribution science can help decisionmakers identify general trends in the effect of climate change on species and habitats,¹⁵ evaluate the extent to which species are already imperiled as a result of climate change,¹⁶ and develop better

12. See J.B. Ruhl, *Climate Change and the Endangered Species Act: Building Bridges to the No-Analog Future*, 88 B.U. L. REV. 1 (2008); Kalyani Robbins, *The Biodiversity Paradigm Shift*, 27 FORDHAM L. REV. 57 (2015); Alejandro E. Camacho, *Adapting Governance to Climate Change: Managing Uncertainty Through a Learning Infrastructure*, 59 EMORY L.J. 1 (2009) [hereinafter Camacho, *Adapting Governance to Climate Change*]; Eric Biber, *Which Science, Whose Science: How Scientific Disciplines Can Shape Environmental Law*, 79 U. CHI. L. REV. 471 (2012); Alejandro E. Camacho, *Assisted Migration: Redefining Nature and Natural Resource Law Under Climate Change*, 27 YALE J. ON REGUL. 171 (2010).

13. See, e.g., Camacho, *Adapting Governance to Climate Change*, *supra* note 12.

14. There are several different streams of attribution research, including: (i) climate change attribution research which examines how increases in GHG concentrations affect the global climate system; (ii) extreme event and impact attribution studies which examine how changes in the global climate system are affecting other human and natural systems; and (iii) source attribution studies which identify the extent to which different sectors, activities, and entities have contributed to global climate change. See Burger et al., *supra* note 3. This Article focuses on how the first two types of attribution research can be used in ESA decision-making to address the effects of climate change on species and habitats. Some commentators have recommended that GHG emissions should serve as a potential trigger for a jeopardy determination under the ESA, and source attribution research could factor into that analysis as well. However, that topic is beyond the scope of this Article. For more on GHG emissions and jeopardy determinations, see Michael C. Blumm & Kya B. Marienfeld, *Endangered Species Act Listings and Climate Change: Avoiding the Elephant in the Room*, 20 LEWIS & CLARK ANIMAL L. REV. 277 (2014); ROBERT MELTZ, CONG. RSCH. SERV., RS22906, USE OF THE POLAR BEAR LISTING TO FORCE REDUCTION OF GREENHOUSE GAS EMISSIONS: THE LEGAL ARGUMENTS (2008).

15. See, e.g., Cristian Román-Palacios & John J. Wiens, *Recent Responses to Climate Change Reveal the Drivers of Species Extinction and Survival*, 117 PROC. NAT'L ACAD. SCI. (Feb. 10, 2020), <https://www.pnas.org/doi/10.1073/pnas.1913007117> [<https://perma.cc/33VG-JCLC>] (looking at data from surveys of 538 plant and animal species at risk of extinction—44% of which have already had local extinctions at one or more sites—and finding that increases in maximum temperature are more strongly correlated with extinctions than increases in average temperature); Abigail Cahill, Matthew E. Aiello-Lammens, M. Caitlin Fisher-Reid, Xia Hua, Caitlin J. Karanewsky, Hae Yeong Ryu, Gena C. Sbeglia, Fabrizio Spagnolo, John B. Waldron, Omar Warsi & John J. Wiens, *How Does Climate Change Cause Extinction?*, PROC. ROYAL SOC'Y (Sept. 24, 2012), <http://dx.doi.org/10.1098/rspb.2012.1890> [<https://perma.cc/FX8M-757W>] (examining population declines and relationship to climate variables and finding that there was not a straightforward relationship between local extinction and limited tolerances to high temperature; rather species interactions—for example, decreases in food availability—were the main driver of extinction).

16. See, e.g., Barry Sinervo, Donald B. Miles, Yayong Wu, Fausto R Méndez-De La Cruz, Sebastian Kirrhof & Yin Qi, *Climate Change, Thermal Niches, Extinction Risk and Maternal-effect*

management solutions to address the risks posed by climate change.¹⁷ Attribution science can also improve predictions of future impacts under different warming scenarios by providing insights into how climate change is already affecting species and habitats today.¹⁸ This type of information can help support a variety of ESA management actions, including:

- Determinations as to whether a species is threatened or endangered as a result of climate change and other stressors;
- Estimating the population size and characteristics needed for species survival and recovery;
- Defining critical habitat boundaries, including newly occupied areas and unoccupied habitat for species that may need to disperse geographically in order to adapt to climate change;
- Identifying conservation and mitigation measures for the purpose of species recovery plans, habitat conservation plans, and incidental take permits;
- Justifying additional protections and more proactive interventions, such as captive breeding and assisted migration programs, for those species that are at the greatest risk of extinction.

Scientists have already begun to weigh in on the nature and magnitude of the threats that climate change poses to endangered and threatened species in the

Rescue of Toad-headed Lizards, Phrynocephalus, in Thermal Extremes of the Arabian Peninsula to the Qinghai-Tibetan Plateau, 13 INTEGRATIVE ZOOLOGY 450 (2018); Stefano Mammola, Sara L. Goodacre & Marco Isaia, *Climate Change May Drive Cave Spiders to Extinction*, 41 ECOGRAPHY 233 (2018); Emerson Pontes-da-Silva, William E. Magnusson, Barry Sinervo, Gabriel H. Caetano, Donald B. Miles, Guarino R. Colli, Luisa M. Diele-Viegas, Jessica Fenker, Juan C. Santos & Fernanda P. Werneck, *Extinction Risks Forced by Climatic Change and Intraspecific Variation in the Thermal Physiology of a Tropical Lizard*, 73 J. THERMAL BIOLOGY 50 (2018); Damien A. Fordham, Barry W. Brook, Conrad J. Hoskin, Robert L. Pressey, Jeremy VanDerWal & Stephen E. Williams, *Extinction Debt From Climate Change for Frogs in the Wet Tropics*, Biology Letters, PROC. ROYAL SOC'Y (Sept. 20, 2016), <http://dx.doi.org/10.1098/rsbl.2016.0236> [<https://perma.cc/3WD5-CUFM>]; Peter Soroye, Tim Newbold & Jeremy Kerr, *Climate Change Contributes to Widespread Declines Among Bumble Bees Across Continents*, 367 SCIENCE 685 (2020); Natalie L. Waller, Ian C. Gynther, Alastair B. Freeman, Tyrone H. Lavery & Luke K.-P. Leung, *The Bramble Cay Melomys (Rodentia: Muridae): A First Mammalian Extinction Caused by Human-induced Climate Change?*, 44 WILDLIFE RSCH. 9 (2017); Carlos Riquelme, Sergio A. Estay, Rafael Contreras & Paulo Corti, *Extinction Risk Assessment of a Patagonian Ungulate Using Population Dynamics Models Under Climate Change Scenarios*, 64 INT'L J. BIOMETEOROLOGY 1847 (2020).

17. See, e.g., Andrew J. Suggitt, Robert J. Wilson, Nick J. B. Isaac, Colin M. Beale, Alistair G. Auffret, Tom August, Jonathan J. Bennie, Humphrey Q. P. Crick, Simon Duffield, Richard Fox, John J. Hopkins, Nicholas A. Macgregor, Mike D. Morecroft, Kevin J. Walker & Ilya M. D. Maclean, *Extinction Risk from Climate Change Is Reduced by Microclimatic Buffering*, 8 NATURE CLIMATE CHANGE 713 (2018) (identifying the critical role of topographic variation in creating microrefugia and concluding that microclimatic heterogeneity can substantially reduce extinction risk from climate change); Fabio Attorre, Thomas Abeli, Gianluigi Bacchetta, Alessio Farcomeni, Giuseppe Fenu, Michele De Sanctis, Domenico Gargano, Lorenzo Peruzzi, Chiara Montagnani, Graziano Rossi, Fabio Conti & Simone Orsenigo, *How To Include the Impact of Climate Change in the Extinction Risk Assessment of Policy Plant Species?*, 44 J. FOR NATURE CONSERVATION 43 (2018) (examining circumstances where assisted migration may be a viable option to help species adapt to climate change).

18. See, e.g., Ilya M. D. MacLean & Robert J. Wilson, *Recent Ecological Responses to Climate Change Support Predictions of High Extinction Risk*, 108 PROC. NAT'L ACAD. SCI. (June 13, 2011), <https://www.pnas.org/doi/pdf/10.1073/pnas.1017352108> [<https://perma.cc/4KKW-BM8H>] (finding that recent ecological responses to climate change support predictions of high extinction risk).

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United States, in some cases publishing studies to support protections for specific species.¹⁹ The scientific literature illustrates the importance of integrating comprehensive climate science assessments into all stages of ESA decision-making.²⁰

The Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS), the agencies tasked with implementing the ESA, have started analyzing climate risks in listing and management decisions for species that are particularly vulnerable to phenomena such as higher temperatures and melting sea ice. These assessments have been driven by citizen petitions and lawsuits as well as advances in the underlying science. Unfortunately, there is still a significant gap between the severity of risk posed by climate change and the extent to which FWS and NMFS are accounting for that risk in ESA decisions. One recent study found that 99.8% of the endangered species listed under the ESA are sensitive to climate change, but that agencies considered climate change as a threat to only 64% of species and plan management actions for only 18% of species.²¹ Sound consideration of attribution research could help fill this gap.

Part I of this Article examines how attribution science has influenced agency decision-making and legal battles involving protections for imperiled species such as polar bears, Arctic seals, and wolverines. The science has featured prominently in ESA rulemakings for these species due to their dependence on cold climates and unique vulnerability to climate change. It has also been used in the courtroom to both compel and defend listing decisions and other ESA protections. For example, attribution science has helped to persuade judges that certain species are imminently imperiled by climate change, to bolster predictions of future climate-related risks, and to support proactive measures to protect species against climate-related threats, such as the designation of critical habitat in areas that are presently unoccupied by the species but are nonetheless valuable as future refugia or habitat corridors. Courts have also held that FWS and NMFS cannot ignore attribution research due to uncertainty or imprecision

19. See, e.g., Jonathan A. Hare, John P. Manderson, Janet A. Nye, Michael A. Alexander, Peter J. Auster, Diane L. Borggaard, Antonietta M. Capotondi, Kimberly B. Damon-Randall, Eric Heupel, Ivan Mateo, Loretta O'Brien, David E. Richardson, Charles A. Stock & Sarah T. Biegel, *Cusk (Brosme brosme) and Climate Change: Assessing the Threat to a Candidate Marine Fish Species Under the U.S. Endangered Species Act*, 69 ICES J. MARINE SCI. 1753 (2012).

20. See Erin E. Seney, Melanie J. Rowland, Ruth Ann Lowery, Roger B. Griffis & Michelle M. McClure, *Climate Change, Marine Environments, and the U.S. Endangered Species Act*, 27 CONSERVATION BIOLOGY 1138 (2013); Michelle McClure, Michael Alexander, Diane Borggaard, David Boughton, Lisa Crozier, Roger Griffis, Jeffrey C. Jorgensen, Steven T. Lindley, Janet Nye, Melanie J. Rowland, Erin E. Seney, Amy Snover, Christopher Toole & Kyle Van Houtan, *Incorporating Climate Science in Applications of the U.S. Endangered Species Act for Aquatic Species*, 27 CONSERVATION BIOLOGY 1222 (2013); Russell E. Brainard, Mariska Weijerman, C. Mark Eakin, Paul Mcelhany, Margaret W. Miller, Matt Patterson, Gregory A. Piniak, Matthew J. Dunlap & Charles Birkeland, *Incorporating Climate and Ocean Change into Extinction Risk Assessments for 82 Coral Species*, 27 CONSERVATION BIOLOGY 1169 (2013).

21. Aimee Delach, Astrid Caldas, Kiel M. Edson, Robb Krehbiel, Sarah Murray, Kathleen A. Theoharides, Lauren J. Vorhees, Jacob W. Malcom, Mark N. Salvo & Jennifer R. B. Miller, *Agency Plans Are Inadequate To Conserve U.S. Endangered Species Under Climate Change*, 9 NATURE CLIMATE CHANGE 999 (2019) (examining agency practice between 1973 and 2018).

where the data indicates that there is a probable risk of harm to a species. However, courts grant considerable deference to the services' technical conclusions, such as those pertaining to species' survival prospects and critical habitat boundaries, and it is difficult for environmental plaintiffs to overcome that deference even where there is compelling evidence of climate change-related threats to a species. It is therefore important for the federal government to take proactive measures aimed at improving the utilization of climate attribution data in ESA decisions.

Part II outlines recommendations and best practices pertaining to the use of climate attribution data in ESA management and litigation. It identifies areas where additional guidance may help agencies improve and standardize their approach to climate impact analysis, as well as regulatory amendments that could improve the consideration of climate science in ESA decision-making and enable agencies to make better management decisions in light of their scientific analysis. The recommendations include: (i) issuing technical guidance on the utilization of attribution research and climate science in specific ESA contexts; (ii) establishing procedures to periodically review and update listing decisions habitat designations, and management decisions to reflect new data on climate impacts; (iii) extending the requirement to use the "best available science," including attribution research, to species recovery plans; (iv) conducting cumulative impact analysis for informal consultations as well as formal consultations; and (v) providing for adaptive management in habitat conservation plans and safe harbor agreements. This Part also discusses the importance of revoking certain regulatory amendments issued by the Trump Administration which were intended to weaken ESA protections and curtail the consideration of climate change under the ESA. Part II concludes with recommendations on how attribution data can be used to strengthen ESA petitions and lawsuits aimed at achieving greater protections for species imperiled by climate change.

I. Attribution Science in ESA Decision-Making and Litigation

The ESA provides for the protection, conservation, and recovery of fish, wildlife, and plants that are at risk of extinction in the United States. It establishes procedures for listing endangered and threatened species, designating critical habitat, and conserving listed species through habitat protections, take restrictions, and other measures.²² Although the risks of climate change have been recognized for decades, agencies did not start to incorporate climate science into most ESA listing and management decisions until the late 2000s.²³ This

22. 16 U.S.C. §§ 1532-1544.

23. There were occasional references to "climate change" in ESA decisions prior to this time period, but these were typically limited to a cursory statement by the agency or comments submitted by outside organizations. *See, e.g.*, Threatened Status for Johnson's Seagrass, 63 Fed. Reg. 49,035, 49,038 (Sept. 14, 1998); Proposed Rule Governing Take of Threatened Snake River, Central California Coast, South/Central California Coast, Lower Columbia River, Central Valley California, Middle Columbia

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change appears to have been driven by advances in climate science as well as lawsuits challenging the exclusion of climate-related considerations in ESA decisions.

A series of court decisions starting in the mid-2000s helped to clarify that the “best available science” that must be considered across a range of ESA actions includes available climate data, such as attribution research and model predictions. FWS and NMFS must account for such data in their scientific analysis and make decisions that reflect a rational interpretation of the data. That said, courts will generally defer to the services’ findings as long as they are based on a reasoned analysis and do not show a blatant disregard for or misapplication of the science, consistent with the rules of the Administrative Procedure Act (APA) and the principle that courts should not substitute their judgment for that of the agency.²⁴

One of the earliest cases, *Natural Resources Defense Council v. Kempthorne*, involved a 2005 Biological Opinion (BiOp) for a major water management project in California and its evaluation of impacts on the threatened delta smelt,²⁵ a keystone fish species in the Sacramento-San Joaquin Rivers Delta and San Francisco Bay.²⁶ The BiOp did briefly mention climate change, but “[did] not gauge the potential effect of various climate change scenarios on Delta hydrology,” and there was “no discussion of when and how climate change impacts will be addressed, whether existing take limits will remain, and the probable impacts on CVP–SWP [Central Valley Project and the State Water Project] operations.”²⁷ A federal district court found that FWS’s failure to meaningfully discuss climate data was arbitrary and capricious in violation of the APA. The court further noted that there were “at least half a dozen models” regarding the impacts of climate change in California and that these “sophisticated regional climate models” constituted “best available scientific data” that must be considered.²⁸

River, and Upper Willamette River Evolutionarily Significant Units (ESUs) of West Coast Steelhead, 64 Fed. Reg. 73,479, 73,482 (Dec. 30, 1999); Proposal to List the Chiricahua Leopard Frog as Threatened With a Special Rule, 65 Fed. Reg. 37,343, 37,350 (June 14, 2000).

24. The APA instructs courts to “hold unlawful and set aside agency actions, findings, and conclusions found to be arbitrary, capricious, [or] an abuse of discretion.” 5 U.S.C. § 706(2)(A). Under the arbitrary and capricious standard, courts must determine whether the agency “examine[d] the relevant data and articulate[d] a satisfactory explanation for its action, including a ‘rational connection between the facts found and the choice made,’” but the standard prohibits courts from substituting their judgment for that of the agency. *Motor Vehicle Mfrs. Ass’n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983); *see Bennett v. Spear*, 520 U.S. 154, 176 (1997); *see also San Luis & Delta-Mendota Water Auth. v. Locke*, 776 F.3d 971, 994 (9th Cir. 2014) (applying the arbitrary and capricious standard in context of the “best available science” requirement); *W. Watersheds Project v. Kraayenbrink*, 632 F.3d 472, 481 (9th Cir. 2011) (“Irrespective of whether an ESA claim is brought under the APA or the citizen-suit provision, the APA’s ‘arbitrary and capricious’ standard applies; and, an agency’s ‘no effect’ determination under the ESA must be upheld unless arbitrary and capricious.”).

25. At the time of the case, the delta smelt was listed as threatened under the Federal ESA and the California Endangered Species Act (CESA). In 2010, CESA status was changed to endangered. CAL. CODE REGS. tit. 14, § 670.5 (2010).

26. *Nat. Res. Def. Council v. Kempthorne*, 506 F. Supp. 2d 322 (E.D. Cal. 2007).

27. *Id.* at 370.

28. *Id.* at 367.

Kemphorne was followed by several more district court decisions vacating BiOps that failed to analyze the effects of climate change on hydrology and aquatic species.²⁹ These early decisions established two fundamental principles for climate-related practice under the ESA, specifically that: (i) the services cannot predicate species assessments or management decisions on historical conditions where climate data suggests that conditions are changing—these determinations should reflect changing environmental baselines; and (ii) the services cannot simply dismiss climate data due to uncertainty; rather, they must consider different plausible scenarios and outcomes based on available climate data and models.

Once the obligation to account for climate data had been established in court, the focus of litigation shifted to the reasonableness of the services' findings with respect to listing decisions, habitat designations, and jeopardy determinations for species imperiled by climate change. FWS and NMFS have fielded a number of lawsuits from states and landowners alleging that climate change-related risks are "too speculative" to provide a basis for ESA protections. Attribution research has played an important role in these cases, as FWS and NMFS have relied on the research to show that climate change is already affecting species and to lend credibility to future predictions of risk. Courts have specifically cited the attribution data when determining that that climate-related threats to species are reasonably foreseeable and thus actionable under the ESA.

The services have also been sued by environmental groups asserting that greater protections are needed for certain species in light of climate change. Plaintiffs in these cases have relied on attribution research to show that the services overlooked or unreasonably downplayed the potential risks to species.³⁰ Although courts have demonstrated significant deference to agency findings in many of these cases, plaintiffs have at times successfully challenged listing decisions, habitat designations, and biological assessments where the services either ignored attribution data or reached arbitrary conclusions about climate-related threats.

The following sections detail how the science has been used in cases involving listing decisions, critical habitat designations, and other management decisions under the ESA.

A. Listing Decisions

The ESA directs FWS and NMFS to consider both natural and manmade factors when determining whether to list a species as endangered or threatened,

29. *Pac. Coast Fed'n Fishermen's Ass'ns v. Gutierrez*, 606 F. Supp. 2d 1122, 1184 (E.D. Cal. 2008); *South Yuba River Citizens League v. NMFS*, 723 F. Supp. 2d 1247, 1274 (E.D. Cal. 2010); *Ctr. for Biological Diversity v. Salazar*, 804 F. Supp. 2d 987, 1008 (D. Ariz. 2011).

30. The attribution research presented in these cases is generally limited to research that was on the administrative record for the ESA decision at issue. When environmental groups seek ESA protections based on new scientific evidence, they must file an ESA petition and wait for an agency response before filing a lawsuit.

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including but not limited to habitat destruction, disease or predation, and the adequacy of existing regulatory mechanisms for conservation purposes.³¹ An “endangered species” is defined as “any species which is in danger of extinction throughout all or a significant portion of its range,”³² and a “threatened species” is defined as “any species which is likely to become an endangered species within the foreseeable future.”³³ Listing decisions must be based on the “best scientific and commercial data available”³⁴ and predicated solely on the potential threat to the species and its survival.³⁵

Interested parties may submit petitions to list a species as endangered or threatened. If FWS or NMFS determines that the petitions present “substantial scientific or commercial information” indicating that the action may be warranted, the service must immediately commence a review of the evidence and determine within one year whether the petition is warranted or not warranted.³⁶ As illustrated below, such petitions have played a major role in securing ESA protections for species imperiled by climate change.

Some of the most detailed scientific debates have occurred in the context of listing decision litigation, specifically where FWS or NMFS has decided whether to list a species as “threatened” on the basis of climate threats. The administrative record in such cases typically includes a significant amount of climate science, both compiled and in some instances generated by the services and submitted by third parties through listing petitions and comments on proposed rules. As discussed in the case studies that follow, the litigation has established important parameters for the use of climate science, including attribution science, in listing decisions:

- When determining whether a species is threatened, the services may find “likely” risk of endangerment where climate trends are clear, even where there is significant uncertainty about the actual magnitude of future impacts. Moreover, the ESA probability standard of “likely” does not need to match the Intergovernmental Panel on Climate Change (IPCC) definition of the term, even where agencies are using IPCC reports.
- There is no set timeframe that services must use when defining the “foreseeable” future in a threatened species listing decision; this timeframe depends on available data and confidence in predictions.

31. 16 U.S.C. § 1533(a)(1).

32. 16 U.S.C. § 1532(6).

33. 16 U.S.C. § 1532(20).

34. 16 U.S.C. § 1533(b)(1)-(2).

35. See H.R. REP. NO. 97-567, at 9 (1982) (stating that “the principal purpose of the amendments to section 4 is to ensure that decisions pertaining to the listing and delisting of species are based solely upon biological criteria and to prevent non-biological considerations from affecting such decisions”).

36. 16 U.S.C. § 1533(b)(3)(B), (D). The service may also conclude that the petition is warranted but precluded by other pending proposals, in which case it must show that “expeditious progress” is being made to update the endangered and/or threatened species lists as appropriate. 16 U.S.C. § 1533(b)(3)(B)(iii).

Courts have found sufficient data to support predictions through the second half of the twentieth century.

- The services cannot require too high a level of scientific certainty or precision prior to issuing ESA protections where the best available science indicates that there is a probable risk of threat to the species.
- A listing of “threatened” rather than “endangered” can likely be justified, even in the face of severe climate-related threats, if the species has not yet been restricted to a critically small range or critically low numbers.

These standards influenced the outcome of litigation over listing decisions for polar bears, Arctic seals, grizzly bears, and wolverines, all of which are under peril due to increasing temperatures and other climate change impacts. Attribution research featured prominently in these cases due to the severity and immediacy of climate-related threats to these species.

1. Polar Bears

Attribution research helped to support the 2008 listing of the polar bear as “threatened” and FWS’s defense of that listing decision in court. The D.C. Circuit’s decision upholding the rule also played a key role in clarifying that the services can make determinations about the likelihood and foreseeability of risk on a case-by-case basis, taking into account the best available scientific data. This means that the services must account for attribution data in their risk assessments, but they have considerable discretion over how that data influences final decisions, such as the chosen timeframe for the foreseeable future and the decision as to whether to list a species as endangered or threatened. This seminal case set the stage for much of the subsequent ESA litigation on listing decisions.

In 2005, the Center for Biological Diversity (CBD) submitted a petition to list the polar bear as a threatened species under the ESA.³⁷ The petition asserted that the polar bear faced a very real likelihood of extinction in the foreseeable future that could not be dismissed as mere speculation, because the bear’s primary habitat, Arctic sea ice, was already melting due to global warming, and this trend would continue absent a significant reduction in anthropogenic GHG emissions.³⁸ The petition relied heavily on climate attribution research and observational data showing present and near-term impacts to the bear’s habitat. For example, it cited research from the *Arctic Climate Impact Assessment* finding that winter temperatures in Alaska and Western Canada had increased by as much as 3-4° C in the previous fifty years, that the annual average sea-ice extent had decreased by approximately 8% in the previous thirty years, and that summer sea-ice extent had declined even more dramatically, with a loss of 15-20% of

37. *Petition to List the Polar Bear (Ursus maritimus) as a Threatened Species Under the Endangered Species Act*, CTR. FOR BIOLOGICAL DIVERSITY (Feb. 16, 2005), https://www.biologicaldiversity.org/species/mammals/polar_bear/pdfs/15976_7338.pdf [<https://perma.cc/HR8Z-JY2E>].

38. *Id.* at i.

late-summer ice coverage over that same period.³⁹ The petition also cited a study on how climate change was negatively affecting Canada's Western Hudson Bay population of polar bears.⁴⁰ Some of the observed impacts included a reduced hunting season for polar bears due to the loss of ice, particularly late summer ice; thinner bear populations; lower female reproductive rates; and lower juvenile survival rates.⁴¹ At the time of the petition, researchers had not yet observed a significant decline in polar bear populations, but the existing data provided strong support for model predictions of future population declines. Subsequent studies have affirmed the validity of those predictions.⁴²

After FWS failed to act on the petition, CBD filed a lawsuit which resulted in a settlement agreement and the promulgation of a 2008 rule listing the polar bear as threatened.⁴³ The listing rule incorporated much of the scientific evidence included in the petition and concluded that the polar bear was likely to become endangered throughout all of its range by mid-century. The rule was challenged by environmental groups (including CBD) advocating for a more protective "endangered" species listing for the bear, as well as the state of Alaska and industry groups arguing that the listing was based on speculation.⁴⁴ The environmental challenge was driven, in large part, by advances in attribution science since the initial petition⁴⁵—for example, a 2007 study had shown a 22% decline in the Hudson Bay polar bear population.⁴⁶ The state and industry challenge was driven, in large part, by the view that FWS could not reliably predict how climate change would affect the polar bear by mid-century.⁴⁷

39. *Id.* at iv, 30-31; see Susan Joy Hassol, Arctic Climate Impact Assessment, *Impacts of a Warming Arctic*, ARCTIC MONITORING & ASSESSMENT PROGRAM (2004), <https://www.amap.no/documents/download/1058/inline> [<https://perma.cc/Z4C4-DWTN>] (identifying climate change as a "dominant factor" in patterns of Arctic change that had emerged in recent decades).

40. *Petition to List the Polar Bear*, *supra* note 37, at v, 38-40; see Andrew E. Derocher, Nicholas J. Lunn & Ian Stirling, *Polar Bears in a Warming Climate*, 44 INTEGRATIVE & COMPAR. BIOLOGY 153 (2004).

41. *Petition to List the Polar Bear*, *supra* note 37 (citing Derocher et al., *supra* note 40).

42. See, e.g., Eric V. Regehr, Kristin L. Laidre, H. Resit Akcakaya, Steven C. Amstrup, Todd C. Atwood, Nicholas J. Lunn, Martyn Obbard, Harry Stern, Gregory W. Thiemann & Øystein Wiig, *Conservation Status of Polar Bears (Ursus maritimus) in Relation to Projected Sea-Ice Declines*, BIOLOGY LETTERS (Oct. 21, 2016), <http://dx.doi.org/10.1098/rsbl.2016.0556> [<https://perma.cc/EY83-3V9V>].

43. Determination of Threatened Status for the Polar Bear (*Ursus maritimus*) Throughout Its Range, 73 Fed. Reg. 28,212 (May 15, 2008).

44. See *In re Polar Bear Endangered Species Act Listing & 4(d) Rule Litig.*, 794 F. Supp. 2d 65 (D.D.C. 2011).

45. Final Opposition Brief of Intervenor-Defendants-Appellees at *3-5, *In re Polar Bear Endangered Species Act Listing & 4(d) Rule Litig.*, 794 F. Supp. 2d.

46. See Eric V. Regehr, Nicholas J. Lunn, Steven C. Amstrup & Ian Stirling, *Effects of Earlier Sea Ice Breakup on Survival and Population Size of Polar Bears in Western Hudson Bay*, 71 J. WILDLIFE MGMT. 2673 (2007); see also Anthony S. Fischbach, Steven C. Amstrup & David C. Douglas, *Landward and Eastward Shift of Alaskan Polar Bear Denning Associated with Recent Sea Ice Changes*, 30 POLAR BIOLOGY 1395 (2007) (finding that the proportion of polar bear maternal dens on pack ice decreased between 1985 and 2005 in the Southern Beaufort Sea as fall ice freeze-up was delayed and stable ice and snow cover declined).

47. State of Alaska Complaint, ¶ 50, *In re Polar Bear Endangered Species Act Listing & 4(d) Rule Litig.*, 794 F. Supp. 2d; California Cattlemen's Association Complaint, ¶ 65, *In re Polar Bear Endangered Species Act Listing & 4(d) Rule Litig.*, 794 F. Supp. 2d.

The D.C. district court upheld the listing rule, finding that FWS had made a reasoned determination based on the “best available climate data,” including research on observed and attributed impacts as well as predictions of future impacts.⁴⁸ The court found that FWS had adequately supported its determination that the polar bear was likely to become endangered in the foreseeable future, in part through its reliance on model predictions and in part through observational data and attribution research.

The district court also upheld FWS’s decision to list the species as threatened rather than endangered despite data indicating that climate change posed an existential threat to the bear and some bear populations were already declining as a result of sea ice loss. The court held that the threatened listing was reasonable, because “the evidence before the agency showed that at the time of listing the polar bear was a widespread, circumpolar species that had not been restricted to a critically small range or critically low numbers, nor had it suffered precipitous reductions in numbers or range.”⁴⁹ The environmental petitioners did not appeal their claims, and thus the D.C. Circuit did not weigh in on this issue. Nonetheless, the district court’s analysis provides insight on how attribution data could factor into subsequent litigation over listing decisions.

Responding to an appeal from state and industry petitioners, the D.C. Circuit affirmed the district court decision, finding that FWS’s “scientific conclusions [were] amply supported by data and well within the mainstream on climate science and polar bear biology.”⁵⁰ For example, FWS had explained that: (i) “the rapid retreat of sea ice in the summer and overall diminishing sea ice throughout the year in the Arctic is unequivocal and extensively documented in scientific literature”;⁵¹ (ii) current summer sea ice loss appeared to be approximately thirty years ahead of the ensemble of model predictions, which suggested that the loss of sea ice was occurring more rapidly than the models

48. *In re Polar Bear Endangered Species Act Listing & 4(d) Rule Litig.*, 794 F. Supp. 2d, *aff’d sub nom. In re Polar Bear Endangered Species Act Listing & Section 4(d) Rule Litig.*, 709 F.3d 1 (D.C. Cir. 2013).

49. *Id.* at 84. One threshold question was whether FWS improperly determined that the polar bear must have been facing “imminent” extinction in order to be listed as endangered, rather than threatened, under ESA. The district court held that FWS’s reliance on this standard was improper, because “[t]he distinction between the ‘threatened’ and ‘endangered’ categories is not based solely and unambiguously on the imminence of the species’ anticipated extinction.” *In re Polar Bear Endangered Species Act Listing & 4(d) Rule Litig.*, 748 F. Supp. 2d 19, 27 (D.D.C. 2010). Other factors, such as the magnitude of the threat, may also influence this determination. *Id.* On remand, FWS issued a supplemental memorandum identifying other factors which would support an endangerment finding—for example, species that had been reduced to “critically low numbers or restricted ranges” and species “with relatively widespread distribution that have nevertheless suffered ongoing major reductions in numbers, range, or both” would qualify as endangered. *In re Polar Bear Endangered Species Act Listing & 4(d) Rule Litig.*, 794 F. Supp. 2d at 83.

50. *In re Polar Bear Endangered Species Act Listing & 4(d) Rule Litig.*, 709 F.3d at 8. The D.C. Circuit did not address whether the climate data used by FWS qualified as the “best available science” because plaintiffs dropped that argument on appeal. Rather, the D.C. Circuit held that FWS’s scientific analysis (e.g., reliance on climate models) and conclusions were reasonable. Nonetheless, the D.C. Circuit decision covered many of the scientific issues addressed by the district court.

51. *Id.* at 6.

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indicated;⁵² and (iii) “[a]s already evidenced in the Western Hudson Bay and Southern Beaufort sea populations, polar bears would experience reductions in survival and recruitment rates” and all populations were likely to become in danger of extinction throughout all of the polar bear’s range due to declining sea ice habitat.⁵³ The strength of this observational data thus provided significant support for FWS’s predictions of future extinction risk.

In upholding the listing rule, the D.C. Circuit answered a number of discrete questions pertaining to the use of climate science under the ESA. These standards have since been adopted by other courts, including the Ninth Circuit Court of Appeals.

First, the D.C. Circuit held that it was reasonable for FWS to define the “foreseeable future” as a forty-five-year timeframe between 2005 and 2050, during which FWS predicted that all polar bear populations would be adversely affected by substantial declines in sea ice. FWS determined that it was possible to make reasoned predictions about population trends during this period based on the outputs of climate models and other available data. FWS specifically pointed to the climate change projections from the IPCC’s Fourth Assessment Report (AR4) as supporting this forty-five-year timeframe.⁵⁴ State and industry petitioners argued that this decision was arbitrary and capricious, because the timeframe was based only on biological factors and risks to the species, and FWS could not issue reasonable predictions about other factors, such as regulatory mechanisms, over such a long period.

Both the district court and D.C. Circuit upheld FWS’s determination, noting that neither the ESA statute nor regulations defined “foreseeable future” and that this concept is likely to vary for each species depending on the species’ characteristics and scientific data available to the agency.⁵⁵ The D.C. Circuit emphasized the reasonableness of this timeframe in light of “widely accepted” and “state-of-the-art” climate models from the IPCC and others which demonstrated “general agreement . . . about warming and sea ice trends until about mid-century, at which point they diverge on the basis of uncertainties.”⁵⁶ Both courts also rejected the idea that FWS must be able to make confident predictions about other factors, such as regulatory mechanisms, in order to use a longer timeframe for the purpose of assessing threats to species.⁵⁷

Second, the D.C. Circuit addressed whether FWS should have used the numeric standard of “likelihood” used in IPCC AR4 (67-90% certainty) as the basis for its listing decision, since FWS had relied so heavily on that report in its decision. Both the district court and the D.C. Circuit rejected this argument,

52. *Id.*

53. *Id.*

54. *See In re Polar Bear Endangered Species Act Listing & 4(d) Rule Litig.*, 794 F. Supp. 2d at 93-96.

55. “Therefore, a bright-line rule of foreseeability is inappropriate.” *Id.* at 95.

56. *In re Polar Bear Endangered Species Act Listing & 4(d) Rule Litig.*, 709 F.3d at 15-16.

57. *In re Polar Bear Endangered Species Act Listing & 4(d) Rule Litig.*, 794 F. Supp. 2d at 113 n.56; *In re Polar Bear Endangered Species Act Listing & 4(d) Rule Litig.*, 709 F.3d at 16.

finding that neither the ESA statute nor regulation defines “likelihood” and thus this is a species-specific determination that the agency must make based on available data and its reasoned judgment. The D.C. Circuit further noted that FWS had reasonably used the “ordinary meaning” or “dictionary definition” of the term “likely,” which does not encompass any sort of quantitative threshold.⁵⁸

Third, the D.C. Circuit held that it was reasonable for FWS to rely on limited or imperfect models where such limitations were disclosed and did not undermine the validity of FWS’s final determination. FWS had relied on two population models developed by the United States Geological Survey (USGS) to help inform population projections in the listing rule. Industry and state challengers argued that FWS erred in relying on these models as USGS itself had conceded that one key assumption underlying the model (that population density would remain constant over time) was “almost certainly not valid.”⁵⁹ However, FWS had disclosed the limitations of these models in the final rule and explained that it had only used them for the limited purpose of confirming “the general direction and magnitude” of the population trends already forecast on the basis of other record evidence.⁶⁰ The D.C. Circuit held that this use of models was reasonable, since the agency had explained “how the models’ shortcomings did not undercut the challenged rule.”⁶¹ The general rule articulated by the court was that “while courts routinely defer to agency modeling of complex phenomena, the agency must explain the assumptions and methodology used in preparing the model and provide a complete analytic defense should the model be challenged.”⁶²

2. Arctic Seals

Climate science also factored heavily into litigation pertaining to ESA protections for Arctic seals, particularly NMFS decisions about whether to list the ribbon seal, Pacific bearded seal, and ringed seal as threatened. As with the polar bear, the primary threat to Arctic seal survival is the rapid loss of sea ice due to warming Arctic temperatures. Ocean warming and acidification also pose a threat to seal survival, as they can affect food chains as well as internal physiological processes within seals. In litigation over listing decisions for the seals, courts affirmed many of the standards articulated in the D.C. Circuit’s decision on the polar bear listing rule, particularly that the services have considerable discretion over conclusions about risk and foreseeability, and that the services can define concepts like the “foreseeable future” on a case-by-case basis. Due to the level of deference afforded to NMFS, environmental challengers were unsuccessful in seeking a threatened species listing for the

58. *In re Polar Bear Endangered Species Act Listing & 4(d) Rule Litig.*, 709 F.3d at 14.

59. *Id.* at 13.

60. *Id.*

61. *Id.*

62. *Id.* (citing *Appalachian Power Co. v. EPA*, 249 F.3d 1032, 1053-54 (D.C. Cir. 2001) and *Columbia Falls Aluminum Co. v. EPA*, 139 F.3d 914, 923 (D.C. Cir. 1998)).

ribbon seal despite compelling data showing observed declines of sea ice within the seals' habitat. However, NMFS was able to successfully defend threatened species designations for the Pacific bearded seal and ringed seal that were predicated on similar evidence of sea ice loss. These cases illustrate the challenge of overcoming judicial deference to the services. This is one reason that the recommendations in Part II focus on measures that the services can implement to improve the utilization of climate attribution data in ESA decision-making.

a. Ribbon Seal

The first round of litigation involved NMFS's 2008 decision to reject a listing petition for the ribbon seal, the habitat of which encompasses both Arctic and sub-Arctic zones. CBD had submitted a lengthy petition outlining threats to the seal, many of which were related to climate change.⁶³ In the notice of its decision to reject the petition, NMFS acknowledged the possibility of climate-related threats to the ribbon seal, but found that these threats were less certain than those to the polar bear.⁶⁴ For example, NMFS explained that data showing severe declines in the extent of summer sea ice was a major factor in the polar bear listing, but ribbon seals were expected to experience little to no effects from declines in summer sea ice because they reside in sub-Arctic waters in the summer months.⁶⁵ NMFS also dismissed other climate-related threats, particularly those arising from ocean acidification, as too speculative to provide a basis for threatened species status.⁶⁶

In its analysis, NMFS did not fully engage with compelling attribution research and observational data discussed in the listing petition. The petition cited evidence that Arctic climate change was occurring at a pace that exceeded the predictions of climate models, that Arctic temperatures had increased twice as much as the global average during the twentieth century, and that the Arctic was experiencing a rapid loss of winter and spring ice which was critical to ribbon seal survival, as well as summer ice. For example, there had been significant declines in sea ice extent in the Bering and Okhotsk Seas during the spring when the ribbon seals relied on that ice for reproduction and molting.⁶⁷ In addition, Arctic-wide winter sea ice extent in 2006 and 2007 had "declined to record minima which most climate models forecast[ed] would not be reached until 2050 or later."⁶⁸

63. *Petition to List the Ribbon Seal (Histriophoca fasciata) as a Threatened or Endangered Species Under the Endangered Species Act*, CTR. FOR BIOLOGICAL DIVERSITY (Dec. 20, 2007) [hereinafter *CBD Petition*], https://www.biologicaldiversity.org/species/mammals/ribbon_seal/pdfs/Ribbon-Seal-Petition.pdf [<https://perma.cc/L5W4-BB69>].

64. *Endangered and Threatened Wildlife; Notice of 12-Month Finding on a Petition to List the Ribbon Seal as a Threatened or Endangered Species*, 73 Fed. Reg. 79,822 (Dec. 30, 2008).

65. *Id.* at 79,826.

66. *Id.*

67. *CBD Petition*, *supra* note 63, at 2.

68. *Id.*

NMFS's technical assessment acknowledged that there was a possibility of winter and spring sea ice loss but treated this risk as speculative. For example, the technical report asserted that warming conditions "could limit the future arrival of sea ice"⁶⁹ and stated that "[i]f ribbon seal habitat within the current range is reduced by climate change, it is plausible that the population will adjust by shifting its range to include new habitat made suitable by, for example, a northward shift of the typical spring ice edge."⁷⁰ NMFS sought to distinguish the seal's habitat in the northern Bering Sea as an area where sea ice loss was more speculative as compared to other water bodies—but in doing so, NMFS appeared to cherry-pick observational data.⁷¹ NMFS also justified its decision through model results indicating that the Bering Sea would continue to have ice cover in winter and early spring for the next forty years.⁷² NMFS reached a similar conclusion about the Sea of Okhotsk but with far less analysis.⁷³ Subsequent observations have shown dramatic reductions in winter-spring ice in the Okhotsk and Bering Seas and throughout the Arctic.⁷⁴ In sum, the NMFS's assessment treated sea ice loss in the ribbon seal habitat as a speculative, future event, despite the availability of attribution research showing that such loss was already occurring as well as climate models indicating that such loss was almost certain to accelerate as a result of increased warming.

CBD filed a lawsuit in federal district court in California alleging that NMFS had ignored the "best available science" on climate change and sea ice loss in its decision to reject the listing petition.⁷⁵ More specifically, CBD argued that NMFS: (i) failed to adequately consider observed declines in monthly ice in the Bering Sea from March through July, a critical period for ribbon seal reproduction and molting, and the implications for future sea ice loss;⁷⁶ and (ii) ignored the effects of climate change in the Okhotsk sea, which provided habitat for approximately half of the global ribbon seal population.⁷⁷ For example, NMFS's technical assessment did not engage with a study showing that reported that sea ice extent in the Sea of Okhotsk had declined by 9.3% per decade during

69. NAT'L OCEANIC & ATMOSPHERIC ADMIN., STATUS REVIEW OF THE RIBBON SEAL 36 (2008).

70. *Id.* at 32 (emphasis added).

71. *Id.* at 36 (focusing on 2008 as a case study).

72. *Id.* at 39.

73. *Id.* at 40.

74. See P.J. Stabeno, R.L. Thoman & K. Wood, *Recent Warming in the Bering Sea and Its Impact on the Ecosystem*, NAT'L OCEANIC & ATMOSPHERIC ADMIN. (Dec. 6, 2019), <https://arctic.noaa.gov/Report-Card/Report-Card-2019/ArtMID/7916/ArticleID/846> [<https://perma.cc/SUQ4-4446>]; Miriam C. Jones, Max Berkelhammer, Katherine J. Keller, Kei Yoshimura & Matthew J. Wooller, *High Sensitivity of Bering Sea Winter Sea Ice to Winter Insolation and Carbon Dioxide over the Last 5500 Years*, SCI. ADVANCES (Sept. 2, 2020), <https://www.science.org/doi/10.1126/sciadv.aaz9588> [<https://perma.cc/58YY-P8BB>]; Seongmok Paik, Seung-Ki Min, Yeon-Hee Kim, Baek-Min Kim, Hideo Shioyama & Joonghyeok Heo, *Attributing Causes of 2015 Record Minimum Sea-Ice Extent in the Sea of Okhotsk*, 30 J. CLIMATE 4693 (2017).

75. *Ctr. for Biological Diversity v. Lubchenco*, 758 F. Supp. 2d 945 (N.D. Cal. 2010).

76. *Id.* at 974.

77. *Id.* at 957.

1979-2006 and that the declines were significant during the months when ribbon seals used the sea ice.⁷⁸

The court held that NMFS had considered the data presented by CBD and had adequately justified its decision with other evidence, such as the model results forecasting that there would still be winter and early spring sea ice in the Bering Sea over the next forty years. With regards to the omitted study, the court held that it had been included in the administrative record “which indicate[d] that it was considered by NMFS,” even though it was not discussed in NMFS’s decision.⁷⁹ The court also noted that NMFS’s technical assessment included a “new analysis of sea ice trends in the Sea of Okhotsk . . . by [an] NMFS climate scientist . . . who reached a different conclusion.”⁸⁰ The court concluded that it was within NMFS’s discretion to weigh competing scientific evidence as it saw fit.

CBD also argued that NMFS had used an improperly truncated time frame of forty-three years as the “foreseeable future” when evaluating loss of sea ice, noting that it had used longer time frames when assessing threats to other species such as the killer whale. Citing the D.C. Circuit’s decision in the polar bear litigation, the court held that decisions about how to frame the “foreseeable future” fell within the agency’s expertise and discretion.⁸¹ It noted that the use of different time frames was appropriate due to differences in the nature of threats and availability of data for various species.⁸²

As discussed below, NMFS took a different approach in subsequent listing decisions involving the ringed and bearded seals, examining climate risks through 2100 and concluding that threatened status was warranted for the other seal species. Nonetheless, NMFS denied a subsequent petition to list the ribbon seal submitted by CBD in 2013, even after evaluating climate risks through 2100.⁸³ In that review, NMFS acknowledged the likelihood of sea ice loss⁸⁴ but found that the ribbon seal did not warrant listing due to physiological features which may allow them to adapt to sea ice loss more readily than other seals.⁸⁵

78. *Id.*

79. *Id.*

80. *Id.*

81. *Id.*; *see also* Ctr. for Biological Diversity v. Bernhardt, No. 3:18-CV-00064-SLG, 2019 WL 4725124, at *9 (D. Alaska Sept. 26, 2019) (finding that it was reasonable for FWS to define the foreseeable future for determining walrus’s risk of extinction as 2060, even though FWS had acknowledged that sea ice loss could be predicted through 2100, where FWS was “uncertain[] about the magnitude of the effect that climate change will have on the full suite of environmental conditions . . . or how the species will respond to those changes”)

82. *Id.* at 968.

83. NAT’L OCEANIC & ATMOSPHERIC ADMIN., STATUS REVIEW OF THE RIBBON SEAL (2013); Determination on Whether to List the Ribbon Seal as Threatened, 78 Fed. Reg. 41,371 (July 10, 2013).

84. *Id.* at 41,383.

85. *Id.* at 41,380.

b. Pacific Bearded Seal

The Pacific bearded seal is another seal species that inhabits Arctic and sub-Arctic waters. In 2012, NMFS listed as threatened two distinct population segments (DPS)—the Beringia and Okhotsk DPSs. In the listing rule, NMFS explained that, since its 2008 decision on the Ribbon seal, it had “revised [its] analytical approach to the foreseeability of threats and responses to those threats, adopting a more threat-specific approach based on the best scientific and commercial data available for each specific threat” and that its analysis for the Pacific bearded seal included an assessment of climate impacts through 2100 due to the availability of IPCC data during that period.⁸⁶ Within that timeframe, NMFS determined that bearded seals were at greater risk due to climate-related threats than ribbon seals, because bearded seals are usually located farther north and in heavier ice packs during the breeding season.⁸⁷ However, NMFS did not identify sufficient risk to justify listing the entire species as threatened—in part because overall populations were abundant. The areas inhabited by the two listed DPSs, the Bering Sea and the Sea of Okhotsk, are located further south and projected to experience more rapid sea ice decline as well as increases in ocean temperatures.⁸⁸

Industry groups and the state of Alaska challenged the listing, arguing that it was arbitrary and capricious to adopt a longer timeframe for the foreseeability analysis and to conclude that these DPSs were threatened when their population numbers were still relatively abundant. A district court in Alaska initially held in favor of plaintiffs with respect to the Beringia DPS, concluding that (i) NMFS had not forecasted a major threat to the seal before 2090, (ii) NMFS lacked data to assess the actual impact of sea ice loss on the DPS, and therefore (iii) “forecasting more than 50 years into the future [was] simply too speculative and remote to support a determination that the bearded seal is in danger of becoming extinct.”⁸⁹

The Ninth Circuit Court of Appeals reversed, finding that NMFS’s projections for the second half of the century were “reasonable, scientifically sound, and supported by evidence.”⁹⁰ In reaching this conclusion, the court noted that “observational data confirmed that the amount of summer sea ice in the areas populated by the Beringia DPS was 40% below the long-term average” and that this data therefore supported long-term projections of sea ice loss and habitat

86. Endangered and Threatened Species; 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, 76,741 (Dec. 28, 2012).

87. NAT’L OCEANIC & ATMOSPHERIC ADMIN., STATUS REVIEW OF THE BEARDED SEAL 11 (2010).

88. *Id.* at 195-96.

89. *Alaska Oil & Gas Ass’n v. Pritzker*, No. 4:13-CV-00018-RRB, 2014 WL 3726121, at *15 (D. Alaska July 25, 2014), *rev’d*, 840 F.3d 671 (9th Cir. 2016). The district court only issued this holding with respect to the Beringia DPS because it found that plaintiffs lacked standing to challenge the Okhotsk DPS.

90. *Alaska Oil & Gas Ass’n*, 840 F.3d at 679.

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changes.⁹¹ Importantly, even though the projections between 2050 and 2100 were subject to a fair amount of uncertainty, the court found that “there was scientific consensus regarding the ‘direction and effect’ of climate change” and that there would be significant sea ice loss in the seal’s habitat, even if the precise quantity and pace of that loss were unknown.⁹² Again, the court placed emphasis on the value of attribution research:

Climate studies released and noticed for public comment after the publication of the Proposed Listing Rule indicated that the Arctic was warming at a much faster rate than anticipated by the IPCC mid-century projections. Those studies, which are included in the administrative record, advised that observational data regarding current temperature increases indicated that Arctic sea ice may disappear as early as 2040—approximately 50 years earlier than NMFS predicted when it suggested the Beringia DPS would lose its sea ice habitat by 2095.⁹³

The Ninth Circuit also found that NMFS had supported the connection between sea ice loss and extinction threat by demonstrating that the seals used the ice for “critical life events” such as mating, birthing, and nursing.⁹⁴ The court asserted that neither the ESA nor the case law required an agency “to calculate or otherwise demonstrate the “magnitude” of a threat to a species’ future survival before it may list a species as threatened”—rather, an agency need only show that the threat is “likely,” as in “probable.”⁹⁵

c. Ringed Seal

In 2013, NOAA Fisheries listed four subspecies of the Arctic ringed seal as threatened and one subspecies as endangered under the ESA. The justification for the listing and timeframe used for the foreseeable future analysis were largely the same as those which underpinned the bearded seal listing. The Lake Ladoga population was determined to be at a greater risk of extinction due to observational data (ice cover had diminished about 12% in fifty years over the lake), small population size, bycatch mortality, and geographic isolation which would restrict their ability to shift range in response to snow and ice loss.⁹⁶

The ringed seal listing rule was challenged on roughly the same grounds as the bearded seal listing rule, and an Alaska district court vacated the rule just months before the Ninth Circuit had issued its clarifying decision in the bearded seal case.⁹⁷ The Ninth Circuit subsequently overturned the district court decision and upheld the ringed seal listing rule for the same reasons it had upheld the bearded seal listing rule. The court reiterated that it was reasonable to project

91. *Id.*

92. *Id.* at 680.

93. *Id.* at 680-81.

94. *Id.* at 679.

95. *Id.* at 684.

96. Threatened Status for the Arctic, Okhotsk, and Baltic Subspecies of the Ringed Seal and Endangered Status for the Ladoga Subspecies of the Ringed Seal, 77 Fed. Reg. 76,706 (Dec. 28, 2012).

97. Alaska Oil & Gas Ass’n v. Nat’l Marine Fisheries Serv., No. 4:14-CV-00029-RRB, 2016 WL 1125744, at *1 (D. Alaska Mar. 17, 2016), *rev’d and remanded sub nom.* Alaska Oil & Gas Ass’n v. Ross, 722 F. App’x 666 (9th Cir. 2018).

climate risks through 2100 and that the agency need not provide definitive quantitative data to justify a finding that the seal subspecies were “more likely than not” to become endangered in the foreseeable future.⁹⁸

3. Grizzly Bears

Climate science also played a significant role in litigation concerning the FWS’s 2007 removal of the Yellowstone DPS of grizzly bears from the threatened species list. Attribution research did not feature as prominently in this case as in litigation over the polar bear and Arctic seals. Nonetheless, the Ninth Circuit’s decision overturning the delisting rule has important implications for the use of attribution research in ESA decision-making, as it established limits on the extent to which the services can rely on scientific uncertainty as a basis for inaction under the ESA.

In the delisting decision, FWS acknowledged that climate change had the “potential to impact several of the Yellowstone grizzly bear’s food sources,” but it dismissed these risks because “the extent and rate to which each of these food sources will be impacted is difficult to foresee with any level of confidence.”⁹⁹ Environmental groups filed a lawsuit alleging that FWS had not adequately considered the impacts of climate change on the bear’s food sources, particularly whitebark pine nuts.

On review, the Ninth Circuit found that FWS had failed to articulate a rational connection between the data before it—which showed that climate change could cause a serious decline in this food source—and its conclusion that such declines were not likely to threaten the Yellowstone grizzly bear.¹⁰⁰ The court found that FWS was requiring too high a level of certainty for the purposes of ESA protection. It recognized that “scientific uncertainty generally calls for deference to agency expertise” but explained that it was insufficient for an agency to merely invoke “scientific uncertainty” to justify an action such as a delisting decision, particularly where there is evidence, however uncertain, of a threat to the species.¹⁰¹ To the contrary, FWS needed to rationally explain why uncertainty about the impact of whitebark pine loss on the grizzly bear would justify a delisting decision rather than further study.¹⁰²

FWS again sought to delist the Yellowstone grizzly bear DPS in 2017, which gave rise to another lawsuit. Again, the Ninth Circuit found that FWS had

98. *Alaska Oil & Gas Ass’n*, 722 F. App’x at 668.

99. Final Rule Designating the Greater Yellowstone Area Population of Grizzly Bears as a Distinct Population Segment; Removing the Yellowstone Distinct Population Segment of Grizzly Bears from the Federal List of Endangered and Threatened Wildlife; 90-Day Finding on a Petition To List as Endangered the Yellowstone Distinct Population Segment of Grizzly Bears, 72 Fed. Reg. 14,865 (Mar. 29, 2007).

100. *Greater Yellowstone Coalition, Inc. v. Servheen*, 665 F.3d 1015 (9th Cir. 2011).

101. *Id.* at 1028.

102. *Id.*

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failed to justify the delisting decision—however, the appellate decision did not touch on climate-related threats or climate science.¹⁰³

4. Wolverines

A district court decision involving a delisting rule for the North American wolverine reaffirmed the standard articulated by the Ninth Circuit in the grizzly bear litigation: the services cannot require too high a level of certainty for ESA protections. In this case, attribution science clearly influenced the court’s determination that FWS had arbitrarily determined that threats to the wolverine were too speculative to warrant its threatened species status.

In 2013, FWS proposed listing a DPS of the North American wolverine as threatened.¹⁰⁴ FWS had concluded that the “effects to wolverine habitat from climate change is the primary threat to the DPS,” since the wolverine relies on cold weather and persistent snow cover for its survival.¹⁰⁵ FWS convened a panel of experts to review the proposal and to assess the available scientific information on the potential impacts of climate change on wolverines and their habitat. Most of the experts agreed that threatened status was warranted in light of future climate risks, predictions of which were bolstered by observational evidence (e.g., indicating that the onset of snow melt is happening two to three days earlier per decade due to warming temperatures).¹⁰⁶ Nonetheless, FWS withdrew the proposed rule in 2014 based on its conclusion that the factors identified as affecting the DPS were not as significant as believed at the time of the proposal.¹⁰⁷

On review, a district court in Montana held that FWS had arbitrarily ignored that peer review report and “unlawfully ignored the best available science” by dismissing the threat to the wolverine posed by climate change, genetic isolation, and small population size.¹⁰⁸ The court closely scrutinized some of the scientific arguments advanced in FWS’s notice of withdrawal.

For example, FWS asserted that it could not determine with certainty whether climate change would impact wolverine reproductive denning because:

103. *Crow Indian Tribe v. United States*, 965 F.3d 662, 670 (9th Cir. 2020). Although the appellate decision did not discuss climate science, the district court decision did mention that FWS had misconstrued a study on the importance of genetic diversity and need for greater population size to cope with stressors such as climate change. *See Crow Indian Tribe v. United States*, 343 F. Supp. 3d 999, 1020 (D. Mont. 2018), *aff’d in part, remanded in part*, 965 F.3d 662 (9th Cir. 2020).

104. *Threatened Status for the Distinct Population Segment of the North American Wolverine in the Contiguous United States*, 78 Fed. Reg. 65,248 (Oct. 31, 2013).

105. *Establishment of a Nonessential Experimental Population of the North American Wolverine in Colorado, Wyoming, and New Mexico*, 78 Fed. Reg. 7890, 7898 (Feb. 4, 2013).

106. *Wolverine Sci. Panel, Wolverine Science Panel Workshop*, FISH & WILDLIFE SERV. (2014), https://www.fws.gov/mountain-prairie/science/PeerReviewDocs/Final_Wolverine_Panel_Report.pdf [<https://perma.cc/6MJF-FNVG>].

107. *Threatened Status for the Distinct Population Segment of the North American Wolverine Occurring in the Contiguous United States; Establishment of a Nonessential Experimental Population of the North American Wolverine in Colorado, Wyoming, and New Mexico*, 79 Fed. Reg. 47,521 (Aug. 13, 2014).

108. *Def. of Wildlife v. Jewell*, 176 F. Supp. 3d 975 (D. Mont. 2016).

(i) the scale of future snowpack decline models was too coarse, and (ii) it was impossible to predict how the wolverine would react to changes in snow depth, because the precise reason why wolverines den in deep snow is unknown. FWS claimed that it would need better “downscaling techniques” or more granular data to accurately assess the threat to the wolverine. The court held that FWS could not simply ignore the data on declining snowpack, which constituted the best available science on the issue, due to imprecision, particularly in light of the expert panel’s conclusions that the climate study at issue had “correctly projected decreased snow cover through 2045, likely underestimated snow cover losses through 2085, and correctly captured, without systematic error, wolverine habitat through snow cover projections.”¹⁰⁹ In effect, FWS had ignored the “best available science” because there was no “better science” available.¹¹⁰

As with the grizzly bear decision, the district court further held that FWS “sought certainty beyond what is required by the ESA and case law interpreting it when it demanded the precise mechanism behind the wolverine’s established need for snow for reproductive denning purposes.”¹¹¹

On remand FWS conducted another species status assessment in 2018 in which it evaluated climate threats to the wolverine over the next thirty-eight to fifty years. Again FWS determined that threatened species status listing was unwarranted despite relatively low population numbers (less than 300 wolverines remain in the U.S.) and clear threats from climate change.¹¹² To justify this conclusion, FWS pointed to new wolverine research which, it claimed, provided evidence that snow cover is not as critical as previously thought to denning because some individuals had been observed outside previously modeled projections of spring snow cover.¹¹³ Conservation groups sued over this decision at the end of 2020 and, at the time of this writing, the lawsuit is currently underway.¹¹⁴

109. *Id.* at 1002.

110. *Id.* at 1001. “The [ESA] is concerned with protecting the future of [a listed] species, not merely the preservation of existing [members of the species].” *Alaska Oil & Gas Ass’n v. Jewell*, 815 F.3d 544, 555 (9th Cir. 2016). To that end, “it requires use of the best available technology, not perfection.” *Id.* (citing *San Luis & Delta-Mendota Water Auth. v. Jewell*, 747 F.3d 581, 602 (9th Cir. 2014)); *see also* *Bldg. Indus. Ass’n of Super. Col. v. Norton*, 247 F.3d 1241, 1246-47 (D.C. Cir. 2001); *Jewell*, 176 F. Supp. 3d at 999.

111. *Jewell*, 176 F. Supp. 3d at 1003. The court explained:

[T]he Service’s stance here borders on the absurd—if evidence shows that wolverines need snow for denning purposes, and the best available science projects a loss of snow as a result of climate where and when wolverines den, then what sense does it make to deny that climate change is a threat to the wolverine simply because research has yet to prove exactly why wolverines need snow for denning? There is near universal agreement that wolverines require deep snow for reproductive denning purposes.

Id. at 1004.

112. *Withdrawal of the Proposed Rule for the North American Wolverine*, 85 Fed. Reg. 64,618 (Oct. 13, 2020); *see* FISH & WILDLIFE SERV., SPECIES STATUS ASSESSMENT FOR THE NORTH AMERICAN WOLVERINE (2018), <https://localnews8.b-cdn.net/2020/10/North-American-Wolverine-USFWS-study.pdf> [<https://perma.cc/WTC5-3B2V>].

113. FISH & WILDLIFE SERV., *supra* note 112, at iii.

114. *Ctr. for Biological Diversity v. Bernhardt*, No. 9:20-cv-00181 (D. Mont. filed Dec. 14, 2020).

5. Other Species

There are a number of other cases involving ESA listing decisions which, though they did not entail the same in-depth examination of climate science, further illustrate the importance that courts place on observational data and attribution research. In particular, evidence of how climate change is already affecting a species plays a key role in supporting predictions of future risk and demonstrating a likelihood of endangerment in the foreseeable future. Evidence of observed climate impacts and associated risks to species is particularly important in ESA enforcement actions against agencies as there must be compelling evidence of a threat in order to overcome the judicial deference granted to agencies with respect to scientific conclusions. Citizen groups have used attribution data in challenging decisions not to grant threatened status to species such as the coastal marten and the Upper Missouri River Valley distinct population segment of Arctic grayling. In both cases, district courts found that FWS had failed to adequately analyze risks to the species in light of data on current climate impacts—specifically the effect of more severe and frequent wildfires on the coastal marten,¹¹⁵ and the effect of warming water temperatures and decreasing water flow on the Arctic grayling.¹¹⁶

As illustrated in the polar bear and Arctic seals litigation, the services also use attribution data to justify conclusions about both present and future climate threats when defending listing decisions. More recently, a Colorado district court upheld FWS’s 2014 decision to list the Gunnison sage grouse as threatened, noting that that FWS’s record showed that (i) temperature increases and precipitation decreases were already affecting the sage grouse’s habitat, and (ii) past observational evidence showed “an affirmative association between past drought conditions in Colorado and reductions to all Gunnison sage-grouse populations, including the Gunnison Basin population which experienced a thirty percent decline during a serious past drought.”¹¹⁷

The services have also been able to justify decisions not to list species as “threatened” due to climate stressors where the observational record does not show clear and immediate harm to the species as a result of changing climatic conditions.¹¹⁸ One such case involved FWS’s 2012 decision not to list the

115. *Ctr. for Biological Diversity v. Fish & Wildlife Serv.*, 246 F. Supp. 3d 1272 (N.D. Cal. 2017).

116. *Ctr. for Biological Diversity v. Zinke*, 900 F.3d 1053 (9th Cir. 2018).

117. *Colorado v. Fish & Wildlife Serv.*, 362 F. Supp. 3d 951, 971 (D. Colo. 2018). The Trump Administration subsequently sought to withdraw the threatened species listing decision—however, this withdrawal was also vacated in court for reasons other than an insufficient discussion of climate science. *Desert Survivors v. U.S. Dep’t of the Interior*, 231 F. Supp. 3d 368 (N.D. Cal. 2018).

118. *See, e.g., Ctr. for Biological Diversity v. Zinke*, 868 F.3d 1054 (9th Cir. 2017) (holding that FWS’s decision not to list the Sonoran Bald Eagle was justified in part because there was no evidence that the species was under immediate threat from climate change); *Ctr. for Biological Diversity v. Fish & Wildlife Serv.*, 488 F. Supp. 3d 1219 (S.D. Fla. 2020) (finding it reasonable for FWS to conclude that the Florida Keys mole skink had demonstrated resilience to coastal climate stressors such as sea level rise); *Ctr. for Biological Diversity v. Bernhardt*, No. 3:18-CV-00064-SLG, 2019 WL 4725124 (D. Alaska Sept.

Sonoran Desert Area bald eagle as threatened.¹¹⁹ In its decision document, FWS had discussed model predictions of how the landscape would be affected by future climate change but concluded that the actual threat posed by climate change was uncertain, because the bald eagles in that area had been shown to be highly adaptable as they fed on a variety of prey, nested in many different structures, and bred in a variety of habitats.¹²⁰ The Ninth Circuit Court of Appeals found that FWS's decision was reasonable due to FWS's discussion of observed impacts on the eagle population as well as its conclusions about the eagle's adaptability.¹²¹

* * *

Overall, the growing body of climate attribution research—and the increasingly robust record of immediate climate impacts—seems to be driving an increase in ESA listing decisions predicated on climate risks. The services have entered into numerous settlements with environmental groups in which they have agreed to complete proposed listing decisions for species imperiled by climate change. Attribution science has factored into many of the initial listing petitions as well as proposed and final listing rules.¹²² There are also a number of pending cases where attribution data may play a pivotal role in supporting arguments for why species should be listed as threatened in light of climate change impacts.¹²³

26, 2019) (holding that FWS decision not to list Pacific walrus as threatened was justified in part based on FWS's finding that the walrus population was recovering since the 1980s).

119. *Zinke*, 868 F.3d 1054.

120. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition To List the Sonoran Desert Area Bald Eagle as Threatened or Endangered, 77 Fed. Reg. 25,791 (May 1, 2012).

121. *Zinke*, 868 F.3d at 1062.

122. *See, e.g.*, Ctr. for Biological Diversity v. Salazar, No. 10-cv-0992 (N.D. Cal. filed June 3, 2010) (resulting in FWS's agreement to complete proposed listings for seven penguin species); Determination of Threatened Status for Five Penguin Species, 75 Fed. Reg. 45,497 (Aug. 3, 2010); Ctr. for Biological Diversity v. Jewell, No. 1:16-cv-00503 (D.D.C. filed Mar. 16, 2016) (resulting in FWS's agreement to issue findings on ESA listings for four species affected by climate change: the Barrens topminnow, the foothill yellow-legged frog, the Northern Rockies fisher, and the Virgin River spinedace); Endangered Species Status for Barrens Topminnow, 84 Fed. Reg. 56,131 (Oct. 21, 2019); Nat. Res. Def. Council v. Ross, No. 1:19-cv-00431 (D.D.C. filed Feb. 21, 2019); Ctr. for Biological Diversity v. Bernhardt, No. 1:19-cv-01071 (D.D.C. filed Apr. 17, 2019); Ctr. for Biological Diversity v. Bernhardt, No. 9:20-cv-00038 (D. Mont. filed Mar. 18, 2020); Ctr. for Biological Diversity v. Bernhardt, No. 3:19-cv-02843 (N.D. Cal. filed May 23, 2019); Ctr. for Biological Diversity v. Bernhardt, No. 2:19-cv-00265 (D. Idaho filed July 10, 2019).

123. *See, e.g.*, Nat. Res. Def. Council v. Oliver, No. 1:20-cv-01150, (D.D.C. filed May 4, 2020) (challenging NMFS's decision not to list alewife or blueback herring as threatened species); Ctr. for Biological Diversity v. Bernhardt, No. 4:20-cv-03037 (N.D. Cal. filed May 4, 2020) (seeking a final determination on the proposed listing of the Humboldt marten as a threatened species); Buffalo Field Campaign v. Skipwith, No. 1:20-cv-00798 (D.D.C. filed Mar. 23, 2020) (challenging FWS's decision not to initiate a status review of the Yellowstone bison); Ctr. for Biological Diversity v. U.S. Dep't of Interior, No. 2:20-cv-00943 (E.D. La. filed Mar. 19, 2020) (seeking a final determination on the proposed listing of the eastern black rail); Sierra Forest Legacy v. Fish & Wildlife Serv., No. 5:20-cv-05800 (N.D. Cal. filed Aug. 18, 2020) (challenging FWS's determination that the California spotted owl did not warrant protection under the ESA); WildEarth Guardians v. Bernhardt, No. 1:20-cv-01035 (D.D.C. filed Apr. 21, 2020) (seeking final determinations on petitions to list five aquatic species that inhabit western rivers and riparian ecosystems); Ctr. for Biological Diversity v. Zinke, No. 1:18-cv-00862 (D.D.C. filed Apr. 12, 2018) (seeking final determination on petitions to list the Tinian monarch as endangered or threatened).

B. Critical Habitat Designations

FWS and NMFS are required to designate critical habitat concurrent with a listing rule wherever feasible.¹²⁴ Such critical habitat should encompass the geographical areas occupied by the species at the time it is listed which: (i) are essential to the conservation of the species, and (ii) may require special management considerations or protection.¹²⁵ The designation should also encompass any areas outside of the geographical area currently occupied by the species if the listing agency determines that such areas are essential for the conservation of the species.¹²⁶

As with listing decisions, agencies must make critical habitat designations on the basis of the “best scientific and commercial data available.”¹²⁷ But whereas listing decisions must be predicated solely on the potential threat to the species and its survival,¹²⁸ the services may consider “the economic impact, the impact on national security, and any other relevant impact, of specifying any particular area as critical habitat.”¹²⁹ However, agencies may only exclude areas from critical habitat if: (i) the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, and (ii) the failure to designate such area as critical habitat will not result in the extinction of the species concerned.¹³⁰

Climate science and attribution research factors significantly in litigation over critical habitat designations, particularly concerning the issue of whether and when it is reasonable or necessary under the ESA to designate critical habitat in areas that are not presently occupied by the species. Data on how climate change is already affecting bioclimatic conditions can be used to assess whether the species will be able to survive within its current range, to ascertain the short- and long-term conservation value of specific habitat areas, and to identify areas which could serve as migratory corridors or refugia for species imperiled by climate change.

The decisions discussed in further detail in this section offer key principles and identify key questions for critical habitat designation and management:

- Attribution research can play a key role in supporting determinations that geographic areas are “essential to the conservation of [a] species” because they contain physical or biological features that will support the long-term survival and recovery of a species as bioclimatic envelopes

124. 16 U.S.C. § 1533(a)(3)(i).

125. 16 U.S.C. § 1532(5)(A)(i).

126. 16 U.S.C. § 1532(5)(A)(ii).

127. 16 U.S.C. § 1533(b)(1), (2).

128. H.R. REP. NO. 97-567, at 9 (1982) (stating that “the principal purpose of the amendments to section 4 is to ensure that decisions pertaining to the listing and delisting of species are based solely upon biological criteria and to prevent non-biological considerations from affecting such decisions”).

129. 16 U.S.C. § 1533(b)(2).

130. *Id.*

shift and habitat conditions change. Such areas may be located within or outside of the species' historical range.

- It is reasonable for the services to designate unoccupied areas as critical habitat to provide for species adaptation where the data indicates that a species' range is shifting as a result of climate change. For example, the services may designate unoccupied areas to serve as future migratory corridors and refugia. Such designations are reasonable even where it is unclear exactly how or where the species will migrate in response to climate change.¹³¹
- There is an open question as to whether the services may designate unoccupied areas as critical habitat if those areas are not presently habitable by the species. In *Weyerhaeuser v. FWS*, the Supreme Court held that unoccupied areas must qualify as "habitat" within the meaning of the ESA, but it did not articulate criteria for defining that term.¹³² If "habitat" is limited to areas that are currently habitable by a species, this could constrain the services' ability to account for future climate threats in habitat designations.¹³³ However, attribution research could be used to identify areas of habitat outside of a species' current or historical range that meet this habitability requirement while also providing long-term conservation benefits in the context of climate change.¹³⁴

The sections that follow detail how courts have handled attribution research in the context of habitat designations for the polar bear, Canada lynx, jaguar, and Gunnison sage grouse, all of which will potentially experience range shifts as a result of climate change.

1. Polar Bear

Litigation involving the habitat designation for the polar bear illustrates how the services can use attribution data to justify the designation of critical habitat in areas that are not currently used by a species so that the species can adapt to the effects of climate change. The Ninth Circuit upheld the habitat designation, finding that FWS's findings on climate change-related risks were reasonable in light of both observational evidence and predictive models. In this case, the disputed area of habitat was not treated as "unoccupied" habitat, but the Ninth Circuit's reasoning could easily be applied to cases involving unoccupied habitat.

131. See *infra* Section I.B.3 (discussing the jaguar).

132. *Weyerhaeuser Co. v. Fish & Wildlife Serv.*, 139 S. Ct. 361 (2018).

133. As discussed below, FWS and NMFS issued a new regulation limiting ESA habitat to presently habitable areas during the Trump Administration, but FWS has since signaled its intent to rescind this regulation. See *infra* Sections I.B.5, II.A.4.

134. For example, attribution research can be used to evaluate whether new conditions which would make an area suitable as habitat are anomalous or part of a long-term trend that can be expected to continue.

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In 2010, FWS issued a critical habitat designation for the polar bear which included a five-mile buffer of coastal zone and land outside of known denning areas—one key goal being to give the bears more room to roam and den in light of coastal erosion and sea ice loss caused by climate change.¹³⁵ As with the polar bear listing rule, FWS relied on attribution research showing that coastal erosion was accelerating as a result of warming temperatures and sea level rise in the Arctic, and used this research to extrapolate future coastal erosion trends through 2050.¹³⁶ The critical habitat designation also went into detail about how existing changes in sea ice were affecting the bear’s habitat:

As a result of changes to the sea-ice habitat due to climate change, there is fragmentation of sea ice, a dramatic increase in the extent of open water areas seasonally, a reduction in the extent and area of sea ice in all seasons, a retraction of sea ice away from productive continental shelf areas throughout the Polar Basin, a reduction of the amount of thicker and more stable multi-year ice, and declining thickness and quality of shore-fast ice.¹³⁷

These findings were used to support FWS’s determination that the area designated as critical habitat contained: “physical or biological features (i) essential to the conservation of the species and (ii) which may require special management considerations or protection,” as required by the ESA.¹³⁸

On review, the Ninth Circuit Court of Appeals addressed two key issues related to climate change: (i) whether it was permissible for FWS to designate prospective denning areas as critical habitat to allow the polar bear to adapt to future climate impacts where there was no proof that the bears currently used those areas for denning, and (ii) whether the evidence of future climate impacts was too speculative to justify the inclusion of the five-mile buffer zone in the habitat designation.¹³⁹

With regards to the first issue, the Ninth Circuit held that future climate change was an appropriate consideration in critical habitat designations, as the ESA is “concerned with protecting the future of the species, not merely the preservation of existing bears.”¹⁴⁰ The court explained that a “narrow construction of critical habitat rules,” which would limit habitat designations to areas actively used by the species, would run “directly counter to the Act’s conservation purposes.”¹⁴¹ Moreover, the D.C. Circuit had already upheld the polar bear listing rule based on “the very climatic factors that Plaintiffs now

135. Designation of Critical Habitat for the Polar Bear (*Ursus maritimus*) in the United States, 75 Fed. Reg. 76,086 (Dec. 7, 2010).

136. *Id.* at 76,094 (citing research showing that coastal erosion along a sixty-four-kilometer (forty-mile) stretch of the Beaufort Sea has more than doubled since the mid-1950s to a rate of 13.7 meters per year (forty-five feet per year between 2002 and 2007).

137. *Id.* at 76,115.

138. 16 U.S.C. § 1532(5)(A)(i).

139. *Alaska Oil & Gas Ass’n v. Jewell*, 815 F.3d 544 (9th Cir. 2016).

140. *Id.* at 555.

141. *Id.*

criticize” and concluded that it made sense for FWS to consider these same factors in its habitat designation.¹⁴²

Turning to the second issue, the Ninth Circuit found that FWS had adequately justified its predictions of climate impacts in part through reliance on observational and attribution data. For example, the court cited record evidence showing “that the rapid retreat of sea ice in the summer and the overall erosion of sea ice throughout the year in the Arctic is unequivocal and extensively documented in scientific literature” and that the “observational record of current sea ice losses indicates that losses seem to be about 30 years ahead of the modeled values, which suggests that a seasonally ice-free Arctic may come a lot sooner than expected.”¹⁴³ The court also held that FWS had reasonably designated a broad area for denning purposes as it could not predict precisely where polar bears would move within that denning habitat in the future.¹⁴⁴

2. Canada Lynx

The Canada lynx is another species that is significantly affected by climate change due to its reliance on cold temperatures and snow. The litigation involving the critical habitat designation for the lynx illustrates the difficulty that citizen-petitioners face in seeking more expansive habitat designations: because they do not receive the judicial deference granted to agencies, such petitioners must present compelling evidence that additional habitat areas are essential to species survival. In this case, petitioners were unsuccessful with their lawsuits, in part due to a lack of robust attribution or observational evidence showing that the Canadian lynx was already migrating to the areas that they sought to include in the habitat designation.

FWS first listed the Canada lynx as threatened in 2000.¹⁴⁵ At that time, FWS concluded that “[t]here is no evidence to support global warming as a threat to the lynx.”¹⁴⁶ When FWS finally designated critical habitat for the lynx in 2006, it recognized that climate change may pose a risk to the lynx but concluded that “[t]he extent that climate change might affect lynx habitat is not known.”¹⁴⁷ The agency did not “know if any areas within the contiguous United States would mitigate for habitat changes due to climate change” and “did not have sufficient data to accurately delineate areas in the contiguous United States that might

142. *Id.* at 558-59.

143. *Id.* at 559 (internal citations omitted).

144. *Id.*

145. Determination of Threatened Status for the Contiguous U.S. Distinct Population Segment of the Canada Lynx and Related Rule, 65 Fed. Reg. 16,051 (Mar. 24, 2000).

146. *Id.* at 16,069; *see also* Notice of Remanded Determination of Status for the Contiguous United States Distinct Population Segment of the Canada Lynx; Clarification of Findings; Final Rule, 68 Fed. Reg. 40,075, 40,083 (July 3, 2003) (“We conclude the potential for long-term reductions in snow depth because of climate change is speculative at this time and is not a threat to lynx within the foreseeable future.”).

147. Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx, 71 Fed. Reg. 66,007, 66,014 (Dec. 11, 2006).

provide travel, serve as sites for colonization or corridors, or mitigate for climate change.”¹⁴⁸

In 2009, FWS issued a revised and expanded critical habitat designation for the lynx, in which it recognized that “new information on regional climate changes and potential effects to lynx habitat . . . suggests that climate change may be an issue of concern for the future conservation of lynx because lynx distribution and habitat is likely to shift upward in elevation within its currently occupied range as temperatures increase.”¹⁴⁹ Nonetheless, FWS only expanded the critical habitat to include other areas that were presently occupied by the species, while recognizing that future revisions “may be necessary” to accommodate range shifts necessitated by climate change.¹⁵⁰

Various commenters argued that climate change would render some of the proposed habitat areas unsuitable for the lynx and that FWS should designate additional habitat in presently unoccupied areas that would provide refugia for the lynx as temperatures increased.¹⁵¹ FWS responded by asserting that (i) “reliable projections of future climate in lynx habitat in the contiguous United States [were] not available” at the time, and (ii) the designation included the “highest-elevation habitat” occupied by the lynx, and this would allow for lynx distribution and habitat to shift upward in elevation as temperatures increased.¹⁵²

A district court in Montana found that FWS had adequately supported its conclusion that the available science did not allow for climate predictions at the “appropriate scale” to enable it to designate unoccupied habitat because the science did not “provide the specificity needed to identify the location of lynx habitat in the future.”¹⁵³ The court deferred to FWS on this issue despite some compelling evidence submitted by environmental plaintiffs in the case. Specifically, to support their claims, the plaintiffs cited research on the record which found that potential lynx habitat could decrease by up to two-thirds in the contiguous U.S. by the year 2100, and a study which identified some areas as potential refugia.¹⁵⁴ Based on this information, plaintiffs contended that there was adequate data available to designate areas of unoccupied habitat that would “be available for occupancy in the future as habitat is lost and shifts due to climate change.”¹⁵⁵ The court rejected this argument, deferring to FWS’s determination that the research lacked the specificity needed for the habitat

148. *Id.* Some comments on the 2006 habitat designation recommended including specific areas that would mitigate the effects of climate change by providing habitat for range dispersal and travel corridors between the United States in Canada, but FWS dismissed these suggestions, stating that it “did not have sufficient data to accurately delineate areas in the contiguous United States that might provide travel, serve as sites for colonization or corridors, or mitigate for climate change.” *Id.* at 66,015.

149. Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx, 74 Fed. Reg. 8615, 8617 (Mar. 27, 2009).

150. *Id.* at 8617.

151. *Id.* at 8621.

152. *Id.*

153. All. for Wild Rockies v. Lyder, 728 F. Supp. 2d 1126, 1140-43 (D. Mont. 2010).

154. *Id.* at 1140-43.

155. Plaintiffs’ Memorandum in Support of Plaintiffs’ Motion for Summary Judgment at 11, All. for Wild Rockies v. Lyder, 728 F. Supp. 2d 1126 (D. Mont. 2010) (No. CV 09-73-M-DWM).

designation.¹⁵⁶ The court also found that plaintiffs had failed to show any research demonstrating “potential lynx habitat emerging in the contiguous United States that would justify additional habitat designation.”¹⁵⁷ It ultimately concluded that it was reasonable for FWS to wait to designate additional areas of unoccupied habitat until a future date when it had more precise data regarding habitat-level impacts from climate change.

The court did, however, remand the critical habitat designation to FWS due to other deficiencies. FWS issued a revised habitat designation in 2014 which added some areas but also removed some areas (in part due to FWS’s new determination that those areas likely were not occupied by the lynx at the time of the listing).¹⁵⁸ Environmental petitioners filed another lawsuit and once again raised arguments about the need to designate additional areas of critical habitat to serve as travel corridors and climate refugia for the lynx. The petitioners were quite specific about areas which they believed should be designated—for example, they pointed to the Kettle Range in northeastern Washington, which contained “boreal forest landscapes with sufficient snowshoe hare densities and winter snow, making it ideal for the lynx.”¹⁵⁹ However, the reviewing court once again deferred to FWS on its decision not to list this area as critical habitat, because it could not conclude that the area was “essential to the conservation and recovery of the” lynx.¹⁶⁰

The critical habitat designation was remanded yet again, for other reasons. However, FWS has not yet issued any proposed revisions to the habitat rule. This delay triggered yet another lawsuit, which is currently underway.¹⁶¹

3. Jaguar

The services have designated critical habitat in unoccupied areas for some species imperiled by climate change, particularly where the observational record indicates that such areas are essential for species adaptation. Courts have upheld unoccupied habitat designations for the jaguar and, as discussed below, the sage grouse. The decision upholding the habitat designation for the jaguar only briefly touches on attribution research, but is nonetheless worth highlighting insofar as it articulates factors which support unoccupied habitat designations, specifically the need to provide for habitat connectivity, geographic dispersal, and genetic diversity to improve species resiliency to changing bioclimatic conditions.

156. *Lyder*, 728 F. Supp. 2d at 1140-42.

157. *Id.*

158. Revised Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx and Revised Distinct Population Segment Boundary, 79 Fed. Reg. 54,781, 54,818 (Sept. 12, 2014).

159. *WildEarth Guardians v. U.S. Dep’t of the Interior*, 205 F. Supp. 3d 1176, 1186 (D. Mont. 2016). Petitioners also argued that record evidence suggested this area was actually occupied by the lynx at the time of listing.

160. *Id.* at 1187.

161. *See WildEarth Guardians v. Skipwith*, No. 9:20-cv-00097 (D. Mont. filed July 1, 2020).

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The jaguar was first listed as an endangered species in 1972 due to threats associated with habitat loss and wildlife trafficking.¹⁶² In 2014, FWS issued a final rule designating critical habitat for the jaguar in Arizona and New Mexico. In the habitat designation, FWS recognized the importance of protecting jaguar populations “at the edge of [the] species’ range” (i.e., in the northernmost extent of the jaguar’s habitat, which is located in the southwestern United States), because such populations “play a role in maintaining the total genetic diversity of a species,” which “may be particularly important considering the potential threats of global climate change.”¹⁶³ FWS also included some unoccupied areas of habitat in the designation so as to provide connectivity between jaguar habitat in Mexico and the southwestern United States.¹⁶⁴

FWS was subsequently sued over the approval of a copper mine located within the area designated as critical habitat.¹⁶⁵ One question raised in the case was whether the critical habitat designation was unlawful in part due to the inclusion of unoccupied areas. A district court in Arizona held that FWS’s decision to designate these unoccupied areas was reasonable in light of the scientific evidence demonstrating the utility of maintaining periphery populations of jaguars and the necessity of habitat connectivity to allow for geographic disperse and genetic diversity of the species.¹⁶⁶ The court specifically found that “[i]t is essential that species are protected in all their ecological settings because this provides protection from climate change and more adaptability.”¹⁶⁷

4. Sage Grouse

A district court decision upholding the habitat designation for the sage grouse affirmed the validity of designating unoccupied areas for species adaptation, even where there was no evidence that the unoccupied habitat was presently “habitable.” As discussed below, the *Weyerhaeuser* case casts some doubt on the validity of this decision. Attribution science may play an even more important role in justifying unoccupied habitat designations if courts determine that the services must show that such designations only encompass presently habitable areas.

In 2014, FWS listed the greater sage grouse as threatened based, in part, on climate-related threats, including the effects of drought and higher temperatures on the sage grouse habitat, as well as the potential for climate change to

162. Conservation of Endangered Species and Other Fish or Wildlife; List of Endangered Foreign Fish and Wildlife, 37 Fed. Reg. 6476 (Mar. 30, 1972).

163. Designation of Critical Habitat for Jaguar, 79 Fed. Reg. 12,571, 12,574 (Apr. 4, 2014).

164. *Id.* at 12,591.

165. *Ctr. for Biological Diversity v. Fish & Wildlife Serv.*, 441 F. Supp. 3d 843, 874 (D. Ariz. 2020).

166. *Id.* at 874 (“Connecting land is essential for genetic diversity, especially in fragmented areas.”)

167. *Id.*

exacerbate the spread of West Nile virus.¹⁶⁸ FWS designated critical habitat at the same time as listing which included unoccupied areas that would “offer[] the potential for range expansion and migration, whether associated with environmental (e.g., climate change), demographic (e.g., population growth), or catastrophic (e.g., large fires) factors.”¹⁶⁹ A significant portion of the habitat designation—forty-three percent—consisted of unoccupied areas. To support both rules, FWS pointed to evidence that temperatures were already increasing more rapidly in the sage grouse habitat as compared with other parts of the United States,¹⁷⁰ and discussed the effects of such temperature increases on precipitation patterns, sagebrush growth, wildfire, and disease vectors.¹⁷¹

In a subsequent legal challenge, a district court in Colorado found that both the listing decision and the habitat designation were lawful.¹⁷² With regards to the habitat designation, the court addressed the question of whether it was lawful for FWS to designate unoccupied critical habitats in areas that were “presently . . . unsuitable as grouse habitat” (i.e., areas that may serve as future habitat for the grouse). The court found that:

The statute does not require that the designated unoccupied land be habitable; the plain language of the statute reads that unoccupied land be ‘essential to the conservation of the species.’ Congress has likewise not defined essential to mean ‘habitable.’ Indeed, there is no habitability requirement in the text of the ESA or in its implementing regulations. Nor has any Circuit Court interpreted it to so require.¹⁷³

The court thus upheld the designation of critical habitat for the sage grouse even in areas that had not been shown to be presently habitable, as it found FWS had presented adequate evidence that such areas would be essential to the future conservation of the species.

However, shortly after this district court decision, the Supreme Court issued its decision in *Weyerhaeuser Co. v. FWS*, a case involving the dusky gopher frog. This case did not implicate questions of climate science, but one key issue raised in opposition to an unoccupied habitat designation for the frog was that “habitat cannot include areas where the species could not currently survive.”¹⁷⁴ The Fifth Circuit Court of Appeals found that there was “there was no habitability requirement in the text of the ESA or the implementing regulations” for unoccupied habitat designations.¹⁷⁵ But the Supreme Court vacated this aspect of the decision, finding that even unoccupied habitat must still qualify as habitat,

168. Threatened Status for Gunnison Sage-Grouse, 79 Fed. Reg. 69,191 (Nov. 20, 2014).

169. *Id.* at 69,337.

170. *Id.* at 69,254.

171. *Id.* at 69,254-55.

172. *Colorado v. Fish & Wildlife Serv.*, 362 F. Supp. 3d 951, 970 (D. Colo. 2018).

173. *Id.* at 985 (citing *Markle Interests, L.L.C. v. Fish & Wildlife Serv.*, 827 F.3d 452, 467 (5th Cir. 2016)).

174. *Weyerhaeuser Co. v. Fish & Wildlife Serv.*, 139 S. Ct. 361, 369 (2018).

175. *Markle Interests, L.L.C. v. Fish & Wildlife Serv.*, 827 F.3d 452, 468 (5th Cir. 2016), *vacated and remanded sub nom. Weyerhaeuser Co. v. Fish & Wildlife Serv.*, 139 S. Ct. 361 (2018), *and cert. granted, judgment vacated sub nom. Markle Interests, L.L.C. v. Fish & Wildlife Serv.*, 139 S. Ct. 590 (2018).

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and remanded to the Court of Appeals to “interpret the term ‘habitat’” and reassess the legality of the habitat designation.¹⁷⁶

The lower courts did not have the opportunity to interpret this term, as FWS ultimately settled with the plaintiffs and separately promulgated a regulatory definition of habitat. The new regulation, which was issued during the Trump Administration, defined “habitat” as areas that can currently support endangered species, thus limiting recovery options for species imperiled by climate change.¹⁷⁷ However, FWS has since stated that it intends to rescind this regulation and that “a regulatory definition is not required to designate critical habitat in compliance with [*Weyerhaeuser*].”¹⁷⁸ It therefore remains to be seen how FWS and courts will interpret this term in future habitat designations and litigation.

If the services or courts conclude that it is necessary to demonstrate habitability, this could have implications for the role of attribution research in habitat designations. For example, attribution research could be used to demonstrate that (i) there are emergent conditions which could support species survival in an area that was previously uninhabitable by the species, (ii) these conditions are not anomalous but rather a result of long-term trends that can be expected to continue, and (iii) thus the area has become habitable as a result of climatic changes. Alternatively, the services may be able to justify unoccupied habitat designations by advocating for an expansive definition of “habitat” which encompasses areas that will be habitable in the foreseeable future, consistent with the ESA’s precautionary purpose.¹⁷⁹

C. Species Management: Biological Opinions, Jeopardy Determinations, Incidental Take Permits, and Recovery Plans

The ESA contains a number of additional protections aimed at promoting the survival and recovery of species listed as endangered and threatened. These include requirements for federal agencies to ensure that their activities will not jeopardize a listed species’ survival prospects, in part through preparation of a biological opinion (BiOp) which assesses the threat to the species; a prohibition on any private activities which would result in a “taking” (i.e., harm) to species, unless they obtain an incidental take permit; and directives to FWS and NMFS to develop and implement recovery plans for species.

Litigation involving BiOps, incidental take permits, and recovery plans illustrates how attribution science can and should factor into analyses of how

176. *Weyerhaeuser*, 139 S. Ct. at 369.

177. *See infra* Section II.B.4.

178. Press Release, *U.S. Fish and Wildlife Service and NOAA Fisheries to Propose Regulatory Revisions to Endangered Species Act*, FISH & WILDLIFE SERV. (June 4, 2021) [hereinafter FWS Press Release], <https://www.fisheries.noaa.gov/press-release/noaa-fisheries-and-us-fish-and-wildlife-service-propose-regulatory-revisions> [<https://perma.cc/A7BD-5CVD>].

179. *See infra* Section II.B.4.

specific projects and management actions may either help or harm species that are also affected by climate change. In this context, courts have made clear that:

- Agencies cannot predicate jeopardy determinations or management decisions on historical conditions where climate data suggests that conditions are changing—these determinations must reflect changing environmental baselines.
- Agencies cannot simply dismiss climate data due to uncertainty; rather, they must consider different plausible scenarios or outcomes when justifying a federal project or a private take permit.
- Agencies cannot limit their analysis to the direct effects of climate change on the species. They must consider how climate change will affect the specific project or action under review and whether this has implications for how the action will then affect the species—for example, by exacerbating harmful impacts or undermining mitigation measures used to justify a no jeopardy determination.

These cases generally involve questions of the adequacy of analysis of or rationality of findings predicated on climate science. Plaintiffs must generally present robust and specific arguments in order to overcome agency deference in these cases. As illustrated below, attribution science has helped support quite a few lawsuits which have resulted in agency decisions being vacated where the agency ignored climate data or reached erroneous conclusions on the basis of that data.¹⁸⁰ Due to the number of cases involving such decisions, the sections below consist of summaries and syntheses of litigation involving BiOps and jeopardy determinations, incidental take authorizations, and recovery plans rather than detailed case studies like those presented for listing decisions and critical habitat designations.

1. BiOps and Jeopardy Determinations

All federal agencies are required to ensure that activities which they implement, fund, or authorize are not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of the critical habitat of such species.¹⁸¹ To that end, federal agencies must consult with FWS or NMFS on any prospective projects and permit applications which may result in such jeopardy.¹⁸²

180. At the time of this writing, there are numerous pending cases involving the analysis of climate science in BiOps and incidental take authorizations. The decisions in these cases will likely flesh out some of the legal standards discussed herein. *See, e.g.*, *Defs. of Wildlife v. Fish & Wildlife Serv.*, No. 5:16-cv-1993 (N.D. Cal. filed Apr. 15, 2016); *Ctr. for Biological Diversity v. Haaland*, No. 18-73400 (9th Cir. filed Dec. 17, 2018); *Cal. Nat. Res. Agency v. Ross*, No. 1:20-cv-00426 (E.D. Cal. filed Feb. 20, 2020); *Save the Colorado v. Semonite*, No. 1:18-cv-03258 (D. Colo. filed Dec. 19, 2018); *Complaint, Cook Inletkeeper v. Ross*, No. 3:19-cv-00238 (D. Alaska June 15, 2020); *Complaint, Ksanka Kupaqa Xa'lcin v. Fish & Wildlife Serv.*, No. 9:19-cv-00020 (D. Mont. Jan. 25, 2019); *Ctr. for Biological Diversity v. Bernhardt*, No. 4:20-cv-00106 (D. Ariz. filed Mar. 13, 2020); *Ctr. for Biological Diversity v. Bernhardt*, No. 4:20-cv-00075 (D. Ariz. filed Feb. 13, 2020).

181. 16 U.S.C. § 1536(a)(2).

182. 16 U.S.C. § 1536(a)(3)-(4).

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If endangered or threatened species may be present in the area of a proposed action, FWS or NMFS must conduct an informal consultation and prepare a preliminary biological assessment to determine whether there are any such species that are likely to be affected by such action.¹⁸³ If the agency determines that the action is likely to adversely affect a listed species, this triggers a formal consultation process and a requirement to prepare a full BiOp to determine whether the action is likely to jeopardize the continued existence of a listed species and/or result in the destruction or adverse modification of critical habitat. As with listing and habitat designations, the BiOp must be based on the best available science.¹⁸⁴ It must also account for cumulative effects in determining whether federal actions jeopardize a species' survival.¹⁸⁵ If jeopardy is likely, the proposing agency must identify project modifications and/or reasonable alternatives that will not result in jeopardy.¹⁸⁶ The proposing agency may proceed with an action that is reasonably certain to result in the incidental take of a species, so long as it is not likely to jeopardize the species' continued existence and an incidental take statement is included with the biological opinion.¹⁸⁷

As discussed earlier, some of the earliest cases involving the use of climate science in ESA management involved situations where courts vacated BiOps for federal projects where agencies had wholly failed to disclose the potential effects of climate change in the project area. Subsequent decisions have made clear that agencies must not only disclose those effects but also discuss potential implications for project operations and species impacts, particularly as these pertain to jeopardy determinations.¹⁸⁸

Courts are generally deferential to agency conclusions about project impacts and species jeopardy so long as the agency has not wholly ignored potential risks or scientific data (including climate science) or reached erroneous conclusions in its analysis.¹⁸⁹ Where downscaled information about climate impacts is absent from the administrative record, courts may defer to agency conclusions that the scientific data on climate impacts are “too inconclusive” to provide a basis for accurate predictions regarding the cumulative impacts of a project and potential for species jeopardy in light of climate change.¹⁹⁰ To

183. 16 U.S.C. § 1536(c)(1).

184. 16 U.S.C. § 1536(a)(2); 50 C.F.R. § 402.14(g)(8) (2021).

185. 50 C.F.R. § 402.14(c)(1)(iv); 50 C.F.R. § 402.14(g)(3)-(4).

186. 16 U.S.C. § 1536(b)(4).

187. *Id.*

188. *See, e.g., Wild Fish Conservancy v. Irving*, 221 F. Supp. 3d 1224, 1233 (E.D. Wash. 2016). (holding that National Wildlife Federation's 2015 BiOp for Leavenworth National Fish Hatchery was arbitrary and capricious for failing to adequately consider effects of climate change, because there was “no discussion whatsoever of the potential effects of climate change in the BiOp's analysis of the Hatchery's future operations and water use”).

189. *See, e.g., Ctr. for Biological Diversity v. Fish & Wildlife Serv.*, 441 F. Supp. 3d 843, 874 (D. Ariz. 2020) (finding that FWS adequately accounted for cumulative effects of climate change in a BiOp, which was remanded for other reasons).

190. *See, e.g., Oceana, Inc. v. Pritzker*, 75 F. Supp. 3d 469, 492 (D.D.C. 2014) (upholding NMFS's qualitative discussion of climate impacts where NMFS explained that “data are too inconclusive

successfully challenge the adequacy of an agency's climate impact analysis or conclusions, plaintiffs will need to identify specific ways in which the agency ignored or misinterpreted climate data.¹⁹¹

In several cases, courts have vacated BiOps and jeopardy determinations due to specific deficiencies in the climate analysis. Attribution data has played a key role in these cases.

For example, in one case involving a 2013 BiOp for the continued operation of seven fisheries and effects on Loggerhead sea turtles, the D.C. district court remanded the BiOp for inadequate analysis of and arbitrary conclusions regarding the implications of short-term climate impacts (even though the court found that the analysis of long-term impacts was sufficient).¹⁹² NMFS had argued that the effects of climate change would be seen primarily on a "century scale" and concluded that "it is unlikely that climate related impacts will have a significant effect on the status of . . . sea turtles . . . in the short-term future."¹⁹³ The court found that the BiOp contradicted NMFS's position, as it contained "clear evidence that climate change is exerting significant environmental impacts right now, as well as evidence that these impacts will persist or accelerate in the immediately approaching decades."¹⁹⁴ NMFS had discounted this data by arguing that it was "unknown" whether present and near-term changes (e.g., increases in sea surface temperature and sea level rise) would contribute to shifts in the range or distribution of sea turtles. However, the court found that the BiOp did not include a "sufficient explanation of the link between the substantial evidence of significant short-term climate change effects . . . and the agency's ultimate conclusion that any short-term impacts on loggerheads will be negligible."¹⁹⁵ The court specifically cited sea-level rise, which would "result in increased erosion rates along nesting beaches," as a factor which would affect loggerheads in both the present and near-term future.¹⁹⁶ The court noted that the significance of sea-level rise was reinforced by a "recent study by the U.S. Geological Survey [finding] that sea levels in a 620-mile 'hot spot' along the

to provide a basis for accurate predictions regarding impacts on loggerheads" and "the available science only enables it to offer these predictions at such a general, qualitative, and relatively speculative level").

191. See, e.g., *id.* at 493 (finding that the plaintiff did "not explain how climate change-related data might have been more thoroughly evaluated with respect to the jeopardy analysis"). In *WildEarth Guardians v. Fish & Wildlife Service*, the court upheld a BiOp where FWS considered climate change impacts on the Mexican spotted owl, determining that increases in forest fires were a major threat and thus that continued fuels reduction and forest restoration would help enable the species' survival. 416 F. Supp. 3d 909, 934-35 (D. Ariz. 2019). Plaintiffs sought more detailed analysis from the service but were not specific about what this would entail, and the court therefore concluded that "[w]here a plaintiff fails to point to data omitted from consideration, the claim fails." *Id.* at 935.

192. *Oceana, Inc. v. Pritzker*, 125 F. Supp. 3d 232 (D.D.C. 2015).

193. *Id.* at 252.

194. *Id.* at 251-52 (citing record evidence that temperature rise and "observed changes in marine systems" have occurred "over the past few decades"; that "[a] warming of about 0.2°C (0.4°F) per decade is projected for the next two decades"; and that "[w]arming is very likely to continue in the U.S. over the next 25 to 50 years It is very likely that the magnitude and frequency of ecosystem changes will increase in the next 25 to 50 years, and it is possible that changes will accelerate")

195. *Id.* at 252.

196. *Id.*

East Coast are rising three to four times faster than the global average.”¹⁹⁷ The court thus remanded to NMFS to revise its analysis of present and near-term impacts of climate change.

In another case involving a 2014 BiOp for the Federal Columbia River Power System and its effects on sockeye and chinook salmon, an Oregon district court similarly found that NMFS had failed to properly analyze the effects of climate change by ignoring the implications for project management and environmental outcomes.¹⁹⁸ In particular, the court concluded that NMFS had “overlooked important aspects of the problem” insofar as it did not adequately discuss the “additive harm” of climate change, how it may reduce the effectiveness of habitat conservation measures that were not expected to achieve full benefits for decades, and how it may increase the probability of events that would be “catastrophic” for the survival of affected endangered and threatened species.¹⁹⁹ The court found that NMFS had information which may “well diminish or eliminate the effectiveness of some of the BiOp’s habitat mitigation efforts, but [NMFS] does not appear to have considered or analyzed that information.”²⁰⁰ The court also found that NMFS had dismissed a “warm ocean scenario” without adequate explanation as to why it was not representative of expected future climate conditions, particularly in light of comments suggesting that even the warm scenario may underestimate future temperature increases.²⁰¹

Finally, in a case involving a BiOp and Environmental Impact Statement (EIS) analyzing the effects of a forest management plan on the northern spotted owl, a district court in California remanded the BiOp because FWS had not tailored its discussion of uncertainty (including climate-related uncertainty) to the specific plan under review.²⁰² The National Environmental Policy Act (NEPA), rather than ESA, provided the primary basis for remand in that case. But the general principle underpinning the court’s decision remains equally valid in the ESA BiOp context: in addition to disclosing climate impacts, agencies must also evaluate the implications of those impacts for project management and species impacts.

2. Incidental Take Authorizations

The ESA prohibits the taking, importation, exportation, possession, and sale of endangered fish and wildlife.²⁰³ The term “take” is defined as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect” or to attempt to

197. *Id.*

198. *Nat’l Wildlife Fed’n v. Nat’l Marine Fisheries Serv.*, 184 F. Supp. 3d 861, 873-74 (D. Or. 2016), *injunction upheld by Nat’l Wildlife Fed’n v. Nat’l Marine Fisheries Serv.*, 886 F.3d 803 (9th Cir. 2018).

199. *Nat’l Wildlife Fed’n*, 184 F. Supp. 3d at 873-74.

200. *Id.*

201. *Id.* at 874.

202. *Conservation Cong. v. USFS*, 235 F. Supp. 3d 1189, 1204 (E.D. Cal. 2017), *aff’d*, 775 F. App’x 298 (9th Cir. 2019).

203. 16 U.S.C. § 1538.

engage in any such acts.²⁰⁴ “Take” has also been interpreted to encompass actions which adversely affect the species’ critical habitat in a way that may disrupt feeding, breeding, or other species activities.²⁰⁵ The statute specifies that these takings prohibitions apply to all fish or wildlife species listed as endangered. FWS and NMFS may also issue protective regulations which extend these prohibitions to any endangered or threatened species, including plants. Up until 2019, the ESA implementing regulations contained a provision known as the “blanket 4(d) rule,” which automatically extended most of the taking prohibitions to all threatened and endangered species.²⁰⁶ This provision was removed from the regulations during the Trump Administration, but FWS has since signaled its intent to reinstate the blanket 4(d) rule.²⁰⁷

The ESA was amended in 1982 to include some exemptions to the taking prohibitions. Landowners may apply for an incidental take permit under certain circumstances.²⁰⁸ To be eligible for such a permit, the landowner must develop a habitat conservation plan which demonstrates that (i) impacts to the species and habitat will be minimized “to the maximum extent possible”, and (ii) the proposed take will not reduce the likelihood of species survival and recovery.²⁰⁹ The regulations for habitat conservation plans were amended in 1994 with a “no surprises policy” which guarantees that the terms of such plans will not be altered over a specified period between twenty five and 100 years.²¹⁰ Landowners who adopt voluntary measures to maintain, create, restore or improve habitat for endangered or threatened species may also qualify for safe harbor agreements, pursuant to which the landowner can receive formal assurances from the federal government that no additional management actions will be required so long as they fulfill the conditions of the original agreement.²¹¹ As discussed in Part III, these policies may prove problematic for the purposes of managing species in a changing climate, unless adaptive management provisions are explicitly written into habitat conservation plans and safe harbor agreements.²¹²

The services must also consider climate change when issuing incidental take permits and determining whether habitat conservation plans developed to

204. 16 U.S.C. § 1532(19). There are also prohibitions on the importation, exportation, and commercial use of endangered plants as well as activities that harm endangered plants under federal jurisdiction; however, endangered plants located on private property may be destroyed or otherwise “taken” unless the responsible agency issues regulations prohibiting such conduct. *See* 16 U.S.C. § 1538(a)(2).

205. *See* *Babbitt v. Sweet Home Chapter Cmty. for Or.*, 515 U.S. 687, 708 (1995) (affirming FWS’s interpretation of “harm” as including “significant habitat modification or degradation that actually kills or injures wildlife”).

206. 50 C.F.R. §§ 17.31 (wildlife), 17.71 (plants) (2018).

207. Under the amended text, FWS and NMFS must promulgate species-specific rules to extend the taking prohibitions to any species listed or reclassified as threatened after the effective date of the amendments. *See infra* Section II.B.5.

208. 16 U.S.C. § 1539.

209. 16 U.S.C. § 1539(a)(2)(B).

210. Habitat Conservation Plan Assurances (“No Surprises”) Rule, 63 Fed. Reg. 8859 (Feb. 23, 1998).

211. 50 C.F.R. §§ 17.22, 17.32.

212. *See infra* Section II.A.5.

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support such permits adequately demonstrate that (i) impacts to the species and habitat will be minimized “to the maximum extent possible”, and (ii) the proposed take will not reduce the likelihood of species survival and recovery.²¹³ As with the analysis in BiOps, courts will defer to agency conclusions about the effects of climate change in an incidental take authorization so long as those conclusions are supported by the record and the agency hasn’t overlooked any significant climate data. This deference may extend to conclusions about uncertainty, unless plaintiffs can point to specific climate data showing a clear risk to the species that has been ignored or dismissed by the agency.

One of the earliest cases illustrating the level of deference that may be granted to an agency involved incidental take regulations for oil and gas activities affecting polar bears which were issued by FWS in 2006, prior to the listing of the polar bear as a threatened species.²¹⁴ Because the polar bear had not yet received ESA protection, the case centered on whether FWS had complied with the Marine Mammal Protection Act (MMPA) and NEPA when issuing the incidental take authorization. Although the case did not involve interpretation of the ESA, the discussion of climate science and uncertainty is nonetheless relevant to judicial review under the ESA, even though the legal standards applied under the MMPA are slightly different than those used for ESA take permits.

FWS had acknowledged that polar bears were vulnerable to climate change but concluded that the incidental take regulation for oil and gas operations, which had a five-year term, would have a “negligible impact” on affected polar bears. Plaintiffs challenged this conclusion, arguing that FWS had ignored how the “weakened state” of polar bears caused by climate change (e.g., reduced body fat of denning females) would render them more vulnerable to disturbance impacts from oil and gas operations.²¹⁵ The Ninth Circuit acknowledged that “[r]educed physical fitness due to climate change likely poses a serious threat to the Beaufort Sea polar bear population” but nonetheless found that “the Service could reasonably conclude that such a threat could not be ‘reasonably expected’ to manifest itself in the context of regional oil and gas activities.”²¹⁶

In issuing this holding, the Ninth Circuit asserted that it “need not determine whether the Service actually analyzed the effects of weakened physical fitness of bears, as the relationship between such fitness and industrial activities was speculative” and FWS’s MMPA regulations only required it to analyze those effects that are “reasonably expected” and “reasonably likely.”²¹⁷ To support its

213. 16 U.S.C. § 1539(a)(2)(B).

214. *Ctr. for Biological Diversity v. Kempthorne*, 588 F.3d 701, 705 (9th Cir. 2009); *see also* *Ctr. for Biological Diversity v. Salazar*, No. 3:08-CV-0159-RRB, 2010 WL 11530782, at *1 (D. Alaska Jan. 8, 2010), *aff’d*, 695 F.3d 893 (9th Cir. 2012) (finding that a 2008 rule allowing nonlethal, incidental take of small numbers of pacific walruses and polar bears during oil and gas exploration activities in the Chukchi Sea and adjacent western coast of Alaska was lawful, based on the Ninth Circuit’s analysis in *Ctr. for Biological Diversity v. Kempthorne*).

215. *Ctr. for Biological Diversity*, 588 F.3d at 711.

216. *Id.*

217. *Id.* (citing 50 C.F.R. § 18.27(c))

determination that this relationship was speculative, the court acknowledged that impacts such as industrial noise “may cause females to abandon their dens prematurely.”²¹⁸ But the court also stated that the noise may not be close enough to the dens to cause such a response, and ultimately concluded that “the seriousness of industrial disturbance impacts is subject to legitimate scientific dispute.”²¹⁹ The court thus deferred to FWS’s judgment on how to weigh competing evidence in the record.

Plaintiffs had also challenged FWS’s finding of no significant impact under NEPA and failure to prepare an EIS on similar grounds. They asserted that this finding ran contrary to the record evidence because oil and gas activities already had a documented adverse effect on polar bears in the area. However, the court found that the record did not demonstrate any direct polar bear deaths caused by oil and gas activities during the period covered by past incidental take regulations, and thus deferred to FWS’s finding of no significant impact. The court emphasized that “[a] typical incidental take provokes only short-term change and pose little threat to survival and recruitment.”²²⁰

This decision on the incidental take regulations for polar bears illustrates how courts focus on more near-term impacts when evaluating the effects and reasonableness of incidental take authorizations—particularly where such authorizations are only valid for a finite period.²²¹ In this context, attribution data is essential to understanding how the cumulative effects of climate change may affect or compound species impacts from a proposed project.

A more recent case involving the effects of a water project on various salmonoid species illustrates how climate science may be useful in establishing that private activities have resulted in an unlawful take and that an incidental take authorization must be issued for ongoing activities.²²² In that case, a federal district court in California denied a motion to dismiss after determining that there was a factual dispute as to whether the U.S. Bureau of Reclamation and private contractors had caused and may continue to cause takings through operation of the project. With regards to climate-related claims, the court found that environmental plaintiffs had presented evidence to support assertions that (i) the water project may have caused substantial temperature-related mortality for listed salmonoids by diverting and transferring water in 2014 and 2015 without an appropriate permit, and (ii) conditions similar to the dry conditions in 2014 and 2015 could recur due to climate change. The court thus concluded that plaintiffs had established a likelihood of future recurrence that was sufficient to

218. *Id.* at 704.

219. *Id.* at 711.

220. *Id.* at 712.

221. *See also* *Friends of Animals v. Phifer*, 238 F. Supp. 3d 119, 146 (D. Me. 2017) (upholding an incidental take permit issued to the State of Maine for hunting activities and the Canada Lynx, as well as FWS’s finding of no significant impact under NEPA, despite plaintiffs’ argument that agency failed to adequately account for long-term cumulative effects of climate change, while emphasizing that the duration of the permit was only fifteen years)

222. *Nat. Res. Def. Council v. Zinke*, 347 F. Supp. 3d 465 (E.D. Cal. 2018).

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withstand the motion to dismiss. At the same time, the court also found that there was evidence which cast doubt on the conclusion that the Sacramento River’s temperature during 2014 and 2015 was the actual source of salmonoid mortality. The court thus called for a trial to address the factual issues raised on both sides.²²³

3. Recovery Plans

FWS and NFMS are required to develop and implement recovery plans for the conservation and survival of listed endangered and threatened species. For the purposes of the Act, “conservation” is defined as “the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this chapter are no longer necessary” and may include proactive measures such as research, habitat acquisition and maintenance, propagation live trapping, and transplantation.²²⁴ Recovery plans must include a description of site-specific management actions; objective, measurable criteria for determining when a species has recovered and can be delisted; and an implementation schedule with priorities and cost estimates.²²⁵ The agencies must monitor and periodically report on the recovery of listed species.²²⁶ They may also issue protective regulations as necessary for the conservation of listed species.²²⁷

There is not yet a significant body of case law pertaining to the assessment of climate science in the context of recovery plans. One threshold question is whether the requirement to predicate management actions on the “best available science” applies in this context. In a recent case involving the Mexican Grey Wolf Recovery Plan, a district court in Arizona held that the ESA’s recovery plan provision does not impose a “best available science” mandate—and as a result, the court dismissed various claims pertaining to FWS’s treatment of climate science in the plan.²²⁸ The court reached this interpretation because the statutory provision that deals with recovery plans does not specifically incorporate a “best available science” requirement.²²⁹ However, this interpretation has not been affirmed by any appellate courts.²³⁰

As discussed in Part II, this interpretation of the ESA is problematic—agencies should be consulting the best available science across all ESA

223. *Id.* at 525.

224. 16 U.S.C. § 1532(3).

225. 16 U.S.C. § 1533(f)(1).

226. 16 U.S.C. § 1533(f)(3), (g).

227. 16 U.S.C. § 1533(d).

228. *Ctr. for Biological Diversity v. Zinke*, 399 F. Supp. 3d 940, 949 (D. Ariz. 2019). In this case, plaintiffs alleged, among other things, that the recovery plan failed to utilize best available science to assess threats to the endangered Mexican wolf, including threats from ongoing and future impacts of climate change.

229. 16 U.S.C. § 1533(f).

230. One other district court has adopted this interpretation. *See Ctr. for Biological Diversity v. Bernhardt*, No. CV 19-109-M-DLC, 2020 WL 7640045, at *4 (D. Mont. Dec. 23, 2020).

management actions. To address this issue, future amendments to the ESA regulations could explicitly apply the best available science requirement to the development of recovery plans.²³¹

II. Recommendations: Promoting Best Practices in the Use of Climate Attribution Science in ESA Decision-Making

Attribution research and observational data provide critical insights into both the immediate and future impacts of climate change on species and their habitats. In particular, they are early indicators of climate trends that will likely increase in severity over the coming decades. As such, they should be given considerable weight in ESA decision-making. The services should use this data, wherever possible, to inform their analysis of species survival prospects, how species can or will adapt to climate change (e.g., through geographic range shifts), and whether government and private actions will cause further jeopardy to imperiled species. Such analysis is necessary to ensure that the services adequately account for climate risks in ESA decision-making.²³²

As detailed above, attribution data can be used in the courtroom to demonstrate the significance and immediacy of climate change-related threats to species in order to support listing decisions and habitat designations. Courts are particularly receptive to finding species risk where climate change can be linked not only to habitat modifications (e.g., sea ice loss) but also specific impacts on species abundance, health, or distribution. As attribution research progresses and the impacts of climate change become more pronounced, it will be increasingly possible to demonstrate such linkages for various species. There are a variety of ways in which the federal government could promote use of the best available attribution and climate science. One important step is to rescind some of the ESA amendments enacted during the Trump Administration. There are also a number of other options for regulatory amendments and federal guidance that could help with this endeavor.

Most of the recommendations in this Part are targeted at FWS and NMFS because the services are in the best position to ensure that adaptation research and climate science are adequately accounted in ESA decision-making. This is in part due to the level of judicial deference afforded to the services and the challenge that environmental plaintiffs face when pursuing litigation aimed at compelling listing decisions or habitat designations for species imperiled by climate change. However, this Part does conclude with some recommendations for environmental groups and citizens regarding the use of attribution data in ESA petitions and lawsuits.

231. See *infra* Section II.B.2.

232. As noted in the introduction, researchers have found that climate change poses a risk to nearly all of the species currently listed under the ESA, yet climate change does not factor into many listing decisions and management decisions. Sound consideration of attribution research can help fill this gap. See Delach et al., *supra* note 21.

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A. Measures to Promote Sound Consideration of Climate Science

FWS and NMFS could adopt guidance or regulatory amendments aimed at: (i) addressing legal barriers to sound climate analysis under the ESA, (ii) resolving areas of uncertainty with respect to how and when the services should account for climate science, and (iii) otherwise improving the ways in which climate science is utilized to support ESA decisions. In some cases, regulatory amendments may be the best course of action to overcome some of the judicial interpretations discussed above, such as the district court decisions holding that the ESA's best available science mandate does not apply to recovery plans.

1. Technical Guidance on Utilization of Attribution Research and Climate Science

FWS and NMFS should adopt and update guidance aimed at standardizing and improving the ways in which attribution research—and other forms of climate science—are used across different ESA actions. NMFS adopted guidance on this topic in 2016 which outlines some technical standards pertaining to the utilization of climate science.²³³ For example, the guidance states that “NMFS will use climate indicator values projected under the Intergovernmental Panel on Climate Change (IPCC)’s Representative Concentration Pathway 8.5 when data are available” and that “NMFS will project climate change effects for the longest time period over which we can reasonably foresee the effects of climate change on the species’ status” when issuing listing decisions, conducting federal consultations, and evaluating takings permits.²³⁴ It also states that “NMFS will consider proactive designation of unoccupied habitat when there is adequate data to support a reasonable inference that the habitat is essential for the conservation of the species because of the function(s) it is likely to serve as climate changes.”²³⁵

The services should issue joint guidance or updated guidance documents aimed at further articulating and clarifying how climate science should factor into ESA decisions—particularly in light of recent changes brought about by court decisions and regulatory amendments. This guidance could include:

- A policy clarifying that the services should seek to account for relevant climate science across all ESA decisions, which is reasonable and prudent in light of recent research demonstrating the prevalence of climate risks for endangered species. This policy could also outline a scoping process whereby relevant climate risks are identified.
- Qualitative or quantitative metrics for determining how climate science should factor into listing decisions—and in particular at what point climate risks may warrant listing a species as endangered rather than

233. NAT'L MARINE FISHERIES SERV., REVISED GUIDANCE FOR TREATMENT OF CLIMATE CHANGE IN NMFS ENDANGERED SPECIES ACT DECISIONS (2016).

234. *Id.* at 2-3.

235. *Id.* at 4.

threatened. Such metrics could address the role of attribution data in listing determinations, potentially clarifying that an endangerment listing is warranted where there is observed evidence of significance impacts to species abundance, health, or distribution.

- More technical guidelines outlining when and how the services should designate unoccupied critical habitat on the basis of observed or predicted climate impacts. For example, the guidance could direct FWS and NMFS to evaluate possible areas to serve as refugia or habitat corridors when there is evidence that a species' range is shifting as a result of climate change (or that such shifts may occur in the foreseeable future).
- Clear instructions on how the services should evaluate climate impacts during federal consultations and when evaluating takings permits. At minimum, these instructions should direct the services to account for the effects of climate change on the species and its habitat, as well as on the action that is being reviewed, to determine whether there will be cumulative effects that could jeopardize the species' survival prospects.

There are numerous scientific resources that could be used to inform the content of such guidance, as well as databases and periodic reports that could be included in the guidance as potential sources of climate data.²³⁶

2. Review of Listing Decisions, Habitat Designations, and Management Decisions for Species Imperiled by Climate Change

Attribution research provides an early indicator of climate trends, many of which will accelerate and become more pronounced as GHGs continue to accumulate in the atmosphere. ESA decision-making processes should be structured to account for the increasing severity of impacts on species and habitats. More specifically, FWS and NMFS should introduce procedures whereby listing decisions, habitat designations, and recovery plans are periodically reviewed and revised in light of new scientific data on climate change. Such procedures would be especially important where: (i) the services have decided not to list a species or have listed a species as threatened rather than endangered, (ii) the services have deferred decisions about whether to designate unoccupied habitat as refugia or habitat corridors due to uncertainty about climate change, and (iii) the mitigation measures in existing recovery plans are inadequate to ensure species recovery due to climate-related threats.

Consider NMFS's decision not to list the ribbon seal as threatened in 2008 and 2013 due to uncertainty about winter and spring sea ice loss and the NMFS's

236. See, e.g., IPBES 2019, *supra* note 1; INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, WORKING GROUP I CONTRIBUTION TO THE SIXTH ASSESSMENT REPORT (Richard P. Allen et al. eds., 2021); *Climate Attribution Database*, SABIN CTR. FOR CLIMATE CHANGE LAW (Jan. 18, 2022), <https://climateattribution.org> [<https://perma.cc/S7Y9-EGYS>]; *Climate Change Indicators in the U.S.*, ENV'T PROT. AGENCY (Dec. 21, 2021), <https://www.epa.gov/climate-indicators> [<https://perma.cc/YM3M-EZ3E>].

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belief that the seal could adapt to changing conditions.²³⁷ Since those decisions were issued, there have been significant declines in both winter and spring sea ice which cast doubt on the analysis underpinning those decisions.²³⁸ NOAA researchers have also documented decreases in the body size of ribbon seals (as well as harbor seals), leading them to conclude that these “these typically resilient, long-lived, generalist predators can be impacted by bottom-up forcing” associated with rapid changes in the Arctic.²³⁹ Ideally, procedures would be in place whereby significant new research on this effect would trigger an obligation to review the listing status. Without such procedures, it is frequently up to environmental groups to use the ESA’s citizen enforcement provisions to request reconsideration.

3. Using the Best Available Science in Recovery Plans

At least two district courts have held that the ESA’s best available science requirement does not apply to the development of recovery plans and have dismissed citizen enforcement actions for this reason.²⁴⁰ Although the ESA statute does not explicitly reference this standard in the section dealing with recovery plans, this does not mean that agencies can ignore scientific data when promulgating such plans. The entire purpose of the recovery plan is to provide for the conservation and survival of a species, and “conservation” is defined to include “all activities associated with scientific resources management.”²⁴¹ Ignoring scientific evidence would be arbitrary and capricious in this context.

FWS and NMFS could respond to these court decisions by adopting a new regulatory provision clarifying their obligation to consider the best available science when preparing recovery plans and in all other ESA actions. This would not necessitate a major shift in the services’ practices (as scientific evidence already factors into recovery planning) nor would it alter the balancing of other factors in recovery planning, but it would expand the opportunities for judicial review of scientific claims.

4. Cumulative Impact Analysis in Informal Consultations

In a case involving a BiOp reviewing the effects of federal grazing authorizations on the threatened bull trout, a federal district court in Oregon dismissed claims pertaining to inadequate analysis of climate science because it found that the ESA imposed no duty on federal agencies to consider any

237. See *supra* Section I.A.2.

238. See, e.g., Jones et al., *supra* note 74.

239. Peter L. Boveng, Heather L. Ziel, Brett T. McClintock & Michael F. Cameron., *Body Condition of Phocid Seals During a Period of Rapid Environmental Change in the Bering Sea and Aleutian Islands, Alaska*, SCI. DIRECT, Dec. 2020, at 1.

240. See *supra* Section I.C.3.

241. 16 U.S.C. § 1532(3).

cumulative effects during an informal consultation.²⁴² According to the court’s logic, FWS need not consider how climate change may affect baseline conditions in the area when assessing the effects of the grazing authorizations on the species. This decision undermines the purpose of informal consultations, which is to allow agencies to determine whether a project may result in the jeopardy of a species and whether formal consultation is required. Cumulative effects must be considered during formal consultation,²⁴³ so it does not make sense to exclude them from the scoping process. Moreover, if a project’s impacts will jeopardize the survival or recovery of a species, this is almost certainly due to the cumulative effect of the project and other environmental stressors. There are few circumstances—if any—where a federal action is the sole cause of jeopardy to a species.

FWS and NMFS could address the confusion caused by this decision by updating the ESA regulations to clarify that cumulative effects should be considered during informal consultations. This would be consistent with the overall conservation purpose of the Act as well as the structure of the federal consultation process.

5. Provide for Adaptive Management in Habitat Conservation Plans and Safe Harbor Agreements

The services’ ability to act on new climate data may be constrained by the “no surprises” policy for habitat conservation plans developed to support incidental take permits as well as the federal assurances provided in conjunction with voluntary safe harbor agreements.

The regulations that govern habitat conservation plans prohibit FWS and NMFS from imposing any new conservation and mitigation measures in response to “unforeseen circumstances” without the landowner’s consent; however, the landowner can be required to implement additional measures in response to “changed circumstances” if they are explicitly provided for in the plan.²⁴⁴ The services could revise these regulations to rescind or significantly narrow this “no surprises” policy. Otherwise, the services should seek to incorporate provisions related to climate change and adaptive management into habitat conservation plans such that they can rely on the “changed circumstances” provision if and when necessary to respond to new conditions.²⁴⁵

242. Or. Wild v. U.S. Forest Serv., 193 F. Supp. 3d 1156, 1167 (D. Or. 2016) (concluding that the Forest Service “had no obligation to consider cumulative effects at all, let alone in conjunction with the proposed action and climate change . . .”).

243. 50 C.F.R. § 402.14(c)(1)(iv), (g)(3)-(4) (2021).

244. 50 C.F.R. § 17.22(b)(5).

245. FWS has recognized the utility of incorporating adaptive management protocols into habitat conservation plans where “existing data makes it difficult to predict exactly what conservation and mitigation measures are needed to achieve a biological objective.” *Habitat Conservation Plans FAQ*, FISH & WILDLIFE SERV. (July 15, 2013), <https://www.fws.gov/endangered/what-we-do/hcp-faq.html> [<https://perma.cc/58NH-XL8H>].

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A safe harbor agreement is issued when a private landowner voluntarily agrees to undertake an activity that will provide a “net conservation benefit” to a species but also involves an incidental take.²⁴⁶ Such agreements could play an important role in non-governmental species adaptation programs. For example, this tool could be used by a private organization seeking to undertake an assisted migration program for a species that cannot migrate naturally in response to changing climatic conditions. However, the regulations prohibit the federal government from modifying the terms of these agreements in order to account for unforeseen or changed circumstances.²⁴⁷ Here, again, the services could either modify the regulations to allow for changes or explicitly write adaptive management protocols into individual safe harbor agreements.

B. Responding to Trump-Era Amendments to the ESA Regulations

In 2019 and 2020, FWS and NMFS, acting under the direction of the Trump Administration, issued amendments to the ESA regulations which affected provisions pertaining to listing decisions, critical habitat designations, and interagency consultations.²⁴⁸ The regulatory changes have the potential to weaken ESA protections, particularly for threatened species, making it easier for projects to gain approvals despite potentially adverse impacts on endangered and threatened species. Several lawsuits have been filed challenging the amendments,²⁴⁹ and the Biden Administration is in the process of reviewing, modifying, and rescinding many of these amendments.²⁵⁰

The sections below detail some of the changes that are particularly relevant to the listing and management of species imperiled by climate change and discuss why these provisions should be revoked or modified to ensure sound consideration of climate science in ESA decision-making.

1. Threatened Species and the “Foreseeable Future”

Many of the species imperiled by climate change have been classified as “threatened” rather than “endangered” based on the agencies’ determination that they are “likely” to become extinct in the “foreseeable future.” The 2019 amendments contained a new provision aimed at narrowing the circumstances in

246. 50 C.F.R. § 17.22(c)(1).

247. 50 C.F.R. § 17.22(c)(5)(ii).

248. Regulations for Listing Endangered and Threatened Species and Designating Critical Habitat, 85 Fed. Reg. 81,411 (Dec. 16, 2020); Regulations for Designating Critical Habitat, 85 Fed. Reg. 82,376 (Dec. 18, 2020); Regulations for Prohibitions to Threatened Wildlife and Plants, 84 Fed. Reg. 44,753 (Aug. 27, 2019); Regulations for Interagency Cooperation, 84 Fed. Reg. 44,976 (Aug. 27, 2019); Regulations for Listing Species and Designating Critical Habitat, 84 Fed. Reg. 45,020 (Aug. 27, 2019).

249. See, e.g., *Animal Legal Def. Fund v. Bernhardt*, No. 4:19-cv-06812 (N.D. Cal. filed Oct. 21, 2019); *Ctr. for Biological Diversity v. Bernhardt*, No. 3:19-cv-05206 (N.D. Cal. filed Aug. 21, 2019); *California v. Bernhardt*, No. 3:19-cv-06013 (N.D. Cal. filed Sept. 25, 2019).

250. Exec. Order No. 13,990, *Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis*, 86 Fed. Reg. 7037 (Jan. 20, 2021); FWS Press Release, *supra* note 178.

which such threatened species determinations may be made. The amended text specifies that:

The term foreseeable future extends only so far into the future as the Services can reasonably determine that both the future threats and the species' responses to those threats are likely. The Services will describe the foreseeable future on a case-by-case basis, using the best available data and taking into account considerations such as the species' life-history characteristics, threat-projection timeframes, and environmental variability.²⁵¹

On its face, this new definition does very little (if anything) to clarify the statutory requirements. The ESA already specifies that the endangerment must be "likely" within the "foreseeable" future. However, insofar as this language appears aimed at limiting the scope of the foreseeable future analysis, it could influence future agency decisions or judicial review of threatened species listing decisions for species imperiled by climate change.

Although FWS has signaled its intent to revise the rule which contained this provision, FWS has not specified whether it will rescind this provision. At the time of this writing, FWS has continued to apply this standard in listing decisions, explaining that "the foreseeable future is the period of time in which we can make reliable predictions."²⁵² This has not prevented FWS from including climate predictions in its risk assessments.²⁵³ Nonetheless, it would still be prudent for FWS to rescind this provision when it revises the regulations.

2. Exception to Critical Habitat Designations

The revised regulations authorize FWS and NOAA Fisheries to determine that the designation of critical habitat is not prudent in situations where "threats to the species' habitat stem solely from causes that cannot be addressed by management actions that may be identified through consultation" under the ESA.²⁵⁴

A precise reading of the standard would not, in most instances, preclude FWS or NMFS from designating critical habitat for species that are threatened by climate change, because in most, and perhaps all, cases there are at least some threats to the species' habitat that can be addressed through management actions identified in ESA consultations. Consider the example of the polar bear, which is primarily threatened by climate change but also adversely affected by other human activities such as hunting and energy development. The designation of critical habitat for the bear is beneficial insofar as it triggers the requirement to evaluate federal proposals that affect that habitat (e.g., oil and gas drilling) and

251. 50 C.F.R. § 424.11(d) (2021); *see* Regulations for Listing Species and Designating Critical Habitat, 84 Fed. Reg. 45,020 (Aug. 27, 2019).

252. *See, e.g.*, Endangered Species Status With Critical Habitat for Guadalupe Fatmucket, Texas Fatmucket, Guadalupe Orb, Texas Pimpleback, and False Spike, and Threatened Species Status With Section 4(d) Rule and Critical Habitat for Texas Fawnsfoot, 86 Fed. Reg. 47,916, 47,932 (Aug. 26, 2021).

253. *Id.* at 47,938.

254. 50 C.F.R. § 424.12.

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either reject those proposals or incorporate mitigation measures to prevent jeopardy to the species. While protecting the polar bear’s critical habitat will not stop sea ice from melting, it will give the bear a better chance of surviving and adapting to changing conditions.

Nonetheless, in issuing this rule, FWS and NMFS signaled an intent to use this new standard to avoid designating critical habitat for species affected by climate change. Specifically, in the text accompanying the final rule, the agencies stated that examples of where a critical habitat designation would be imprudent would include “species experiencing threats from melting glaciers, sea level rise, or reduced snowpack but no other habitat-related threats.”²⁵⁵ The problem with this approach is that the critical habitat designation is part of a broader process through which habitat-related threats are to be assessed (e.g., through federal consultations)—it is unreasonable for an agency to assume, at the outset, that there are “no other habitat-related threats” to species imperiled by those types of climate impacts. That is a case-by-case determination that should be made through the existing procedures outlined in the ESA.

At the time of this writing, FWS has not announced plans to revise or rescind this rule, but rather has cited this standard as its rationale for not designating critical habitat where climate change is the primary threat to newly listed species.²⁵⁶ FWS should reverse this rule for the reasons stated above.

3. Constraining Agency Discretion to Designate Critical Habitat in Unoccupied Areas

As discussed above, the ESA defines “critical habitat” to include areas “outside the geographical area occupied by the species at the time it is listed . . . upon a determination by the Secretary that such areas are essential for the conservation of the species.”²⁵⁷ This provision may prove very important for the conservation of species imperiled by climate change, insofar as their key habitat will likely shift due to changes in temperature, precipitation, sea level rise, and other climate-related phenomena. For example, in 2016 the FWS had to initiate a relocation program for the Haleakala silversword—an endangered plant species limited to a small range at higher elevations on one mountain in East Maui. The establishment of additional populations of the plant in previously unoccupied areas was essential for its continued survival.²⁵⁸

255. Regulations for Listing Species and Designating Critical Habitat, 84 Fed. Reg. 45,020, 45,052 (Aug. 27, 2019).

256. See, e.g., Proposed Rule: Threatened Species Status for Mount Rainier White-Tailed Ptarmigan With a Section 4(d) Rule, 86 Fed. Reg. 31,668, 31,669 (June 15, 2021) (“We have determined that habitat degradation resulting from climate change will affect the Mount Rainier white-tailed ptarmigan within the foreseeable future . . . We find that threats to Mount Rainier white-tailed ptarmigan habitat stem solely from causes that cannot be addressed through management actions resulting from consultations on these species under section 7(a)(2) of the Act. Therefore, we have determined that designation of critical habitat for this subspecies is not prudent.”).

257. 16 U.S.C. § 1532(5).

258. BIOLOGICAL OPINION AND INFORMAL CONSULTATION FOR THE OPERATION AND MANAGEMENT OF THE HALEAKALĀ NATIONAL PARK, FISH & WILDLIFE SERV. (Dec. 2012); Paul D.

The 2019 regulatory amendments imposed new constraints on when unoccupied areas can be designated as critical habitat, specifically:

The Secretary will only consider unoccupied areas to be essential where a critical habitat designation limited to geographical areas occupied would be inadequate to ensure the conservation of the species. In addition, for an unoccupied area to be considered essential, the Secretary must determine that there is a reasonable certainty both that the area will contribute to the conservation of the species and that the area contains one or more of those physical or biological features essential to the conservation of the species.²⁵⁹

This requirement that there be “reasonable certainty” with respect to conservation value goes beyond what the ESA statute requires and could impose a significant barrier to including unoccupied areas in critical habitat designations. There is always some uncertainty inherent in agency decisions about endangered species management and the efficacy of conservation measures. Recognizing this, the ESA statute and regulations generally employ standards related to “likelihood”—for example, federal agencies must show that their actions are not *likely* to jeopardize the continued existence of endangered wildlife or fish.²⁶⁰ This new standard of “reasonable certainty” appears nowhere else in the Act or the previous implementing regulations. It is contrary to the purposes of the ESA to introduce a novel standard for an important conservation standard which exists for preventing jeopardy to species.

The requirement for a determination that an existing habitat is “inadequate” to ensure the conservation of the species poses yet another barrier to designating unoccupied areas as critical habitat. This language is, to some extent, consistent with the statutory text, which states that the unoccupied areas should be “essential” for species recovery—the plain meaning of which is “absolutely necessary” or “extremely important.” However, it imposes yet another evidentiary burden on the agency, requiring that they demonstrate both the inadequacy of the existing habitat as well as reasonable certainty with respect to the conservation value of the unoccupied areas.

In 2020, FWS and NMFS promulgated amendments imposing further constraints on habitat designations.²⁶¹ The 2020 amendments provide that:

[I]f the Secretary determines that the benefits of excluding a particular area from critical habitat outweigh the benefits of specifying that area as part of the critical habitat, then the Secretary shall exclude that area, unless the Secretary determines, based on the best scientific and commercial data available, that the failure to designate that area as critical habitat will result in the extinction of the species concerned.²⁶²

Krushelnycky, Jesse M. Felts, Robert H. Robichaux, Kasey E. Barton, Creighton M. Litton & Matthew D. Brown, *Clinal Variation in Drought Resistance Shapes Past Population Declines and Future Management of a Threatened Plant*, 90 *ECOLOGICAL MONOGRAPHS*, Feb. 2020, at 1.

259. 50 C.F.R. § 424.12 (2021); see 84 Fed. Reg. at 45,053.

260. 16 U.S.C. § 1536.

261. Regulations for Designating Critical Habitat, 85 Fed. Reg. 82,376 (Dec. 18, 2020).

262. 50 CFR § 17.90(e).

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Again, this language imposes a standard of certainty—that the failure to designate *will result* in extinction—which is at odds with and undermines the protective and precautionary purposes of the ESA.

These provisions could be used to justify the exclusion of unoccupied areas from critical habitat designations even where those areas are essential to species recovery. They could also be used to challenge agency critical habitat designations in court. This is problematic for the purposes of managing climate change-imperiled species—if anything, greater flexibility is needed for agencies to accommodate shifting geographic ranges through the designation of unoccupied areas as critical habitat.

FWS has not yet announced plans to revise or rescind this rule and has continued to cite this standard as a rationale for not including unoccupied areas in critical habitat designations.²⁶³ FWS should reverse this rule for the reasons stated above.

4. New Definition of “Habitat”

In 2020, FWS and NMFS issued a new regulation defining “habitat” in the wake of the Supreme Court’s decision in *Weyerhaeuser*.²⁶⁴ The rule defines “habitat [as] the abiotic and biotic setting that currently or periodically contains the resources and conditions necessary to support one or more life processes of a species.”²⁶⁵ It thus precludes from “habitat” any areas that are not found to be currently suitable for the species, even if those areas are projected to become suitable in the foreseeable future as conditions change and bioclimatic envelopes shift as a result of the warming climate. In other words, this definition significantly constrains the ability of the services to account for projected impacts of climate change in habitat designations.²⁶⁶

FWS has announced that it intends to rescind this regulation and that it does not believe it is necessary to issue a regulatory definition of “habitat” in order to comply with *Weyerhaeuser*.²⁶⁷ Nonetheless, FWS and NMFS will need to determine whether critical habitat may encompass presently uninhabitable areas in future designations. Given the precautionary nature of the ESA, it may be permissible for the services to adopt an expansive interpretation of habitat. Scientists acting as *amici curiae* in the *Weyerhaeuser* case properly noted that the concept of habitat “should be viewed at a landscape scale; may vary in suitability or quality, and this variance itself may change over time; may not be currently occupied; may be restorable or restored; and may be as-yet

263. See, e.g., Designation of Critical Habitat for Yellow Lance, 86 Fed. Reg. 18,189 (Apr. 8, 2021).

264. Regulations for Listing Endangered and Threatened Species and Designating Critical Habitat, 85 Fed. Reg. 81,411 (Dec. 16, 2020).

265. 50 C.F.R. § 424.02.

266. For more on this topic, see Isabella Kendrick, *Critical Habitat Designations Under the Endangered Species Act in an Era of Climate Crisis*, 121 COLUM. L. REV. 81 (2021).

267. FWS Press Release, *supra* note 178.

unrecognized.”²⁶⁸ This statement highlights several key considerations that should factor into any future definition of habitat: (i) landscapes are constantly changing, and a static definition of what qualifies as “habitable” fails to capture this change; (ii) whether an area is habitable depends not only on preexisting conditions but also management and restoration activities, and (iii) there is inherent uncertainty as to the full extent of a species’ habitat, and thus requiring proof of current habitability may act as an unwarranted constraint on habitat designations.²⁶⁹

Alternatively, if the courts find that present habitability is a requirement for habitat designations, the services should adopt procedures for periodic review and revision of such designations in light of climate change.

5. Eliminating Taking Prohibitions for Threatened Species

The 2019 amendments included a rule which revoked regulatory provisions extending most takings prohibitions to threatened species of fish, wildlife, and plants.²⁷⁰ Under the amended text, FWS and NOAA Fisheries must issue species-specific rules to extend the taking prohibitions to species listed as threatened. This would prove problematic for climate-imperiled species, as many are listed as “threatened” rather than endangered. Fortunately, FWS has since signaled its intent to revoke this amendment and reinstate the prior regulations.²⁷¹

C. Improving the Evidentiary Basis for Petitions and Lawsuits Seeking ESA Protections for Climate Change-Imperiled Species

As attribution research progresses, there will be additional opportunities for ESA petitions and lawsuits aimed at securing greater protections for species imperiled by climate change. Environmental petitioners can draw on lessons learned from past cases as well as new evidence from attribution studies to support arguments about climate impacts and risk.

For example, the litigation involving polar bears and Arctic seals provides insights on evidence which would weigh in favor of a determination that a species should be listed as endangered rather than threatened based on climate-related threats. Specifically, if the record shows that a species has experienced significant population declines or a significant reduction in range, then this would indicate that it is “in danger of extinction throughout all or a significant

268. Brief of Amici Curiae Scientists in Support of Respondents at 16, *Weyerhaeuser Co. v. Fish & Wildlife Serv.*, 139 S. Ct. 361 (2018) (No. 17-71).

269. See Kendrick, *supra* note 266, at 109 (proposing an alternate definition of habitat that better supports climate adaptation: “The physical and biological setting in which organisms live and in which the other components of the environment are encountered; or areas that may reasonably serve as this physical and biological setting in the future, including with restoration or modification efforts”).

270. Regulations for Prohibitions to Threatened Wildlife and Plants, 84 Fed. Reg. 44,753 (Aug. 27, 2019) (amending 50 C.F.R. §§ 17.31 (wildlife), 17.71 (plants)).

271. FWS Press Release, *supra* note 178.

portion of its range.”²⁷² This is particularly true where observed population declines or range reductions can be attributed to climatic changes which can be expected to continue and accelerate in the foreseeable future. The combination of such observational data and attribution research may be sufficiently compelling to overcome judicial deference in litigation over listing decisions.

Attribution research may also be integral to supporting petitions and lawsuits aimed at expanding or modifying critical habitat designations so as to support species recovery and survival in the context of climate change. In order to establish that areas are “essential” to species conservation, petitioners would likely need to submit robust evidence of how climate change is already affecting the range and distribution of a species or otherwise altering habitat conditions that the species depends on (e.g., shifting the range of the species’ primary food sources). As with listing decisions, attribution research could be used to show that any observed shifts in species range or bioclimatic conditions are part of long-term climate change trends that can be expected to continue. Such data could support a determination that areas that were not historically part of a species’ range, including presently unoccupied areas, have become “habitable,” consistent with the Supreme Court’s decision in *Weyerhaeuser*.

Finally, environmental groups and other parties who are interested in improving ESA protections for climate change-imperiled species should coordinate with the scientific community when scoping petitions (e.g., identifying species that should be listed) and when developing the scientific arguments contained within those petitions. At the time of this writing, there are already a number of initiatives underway to facilitate collaboration between scientists, lawyers, and other stakeholders to improve the utilization of climate science in policy-making and in the courtroom. For example, the Union of Concerned Scientists has created a Science Hub for Litigation, which works to build greater capacity within the scientific community to conduct and communicate legally relevant research.²⁷³ The Sabin Center for Climate Change Law and Lamont-Doherty Earth Observatory at Columbia University have created a Climate Attribution Database, which serves as a thematically organized repository of state-of-the-art climate change attribution science.²⁷⁴ Prospective petitioners may benefit from such initiatives and resources, as well as direct dialogue with attribution scientists whose work focuses on the attribution of biodiversity impacts.

Conclusion

Attribution research has played a pivotal role in supporting ESA protections for climate-imperiled species. The contributions from this field provide evidence

272. 16 U.S.C. § 1532(6).

273. *The UCS Science Hub for Climate Litigation*, UNION OF CONCERNED SCIENTISTS (Aug. 3, 2020), <https://www.ucsusa.org/resources/science-hub-climate-litigation> [<https://perma.cc/WRX6-FCJD>].

274. *Climate Attribution Database*, SABIN CTR. FOR CLIMATE CHANGE LAW (Jan. 18, 2022), <https://climateattribution.org> [<https://perma.cc/S7Y9-EGYS>].

of existing climate-related harms and bolster predictions of future harm, thus informing both near- and long-term threat assessments and management decisions. Litigation has helped to ensure that both FWS and NMFS give meaningful consideration to attribution research across a wide range of ESA actions, including listing decisions, critical habitat designations, and jeopardy assessments. Litigation will likely continue to play a key role in promoting best practices in the utilization of attribution research, but the federal government could also adopt more proactive measures—such as regulatory amendments or technical guidance—aimed at improving the ways in which this science informs ESA management decisions. Given the severity of the threat that climate change poses to biodiversity and individual species, responding to and adapting to climate change should be a key priority for ESA implementation.