

Climate Change and the Endangered Species Act: The Difficulty of Proving Causation

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It is likely that environmental groups will view the Endangered Species Act as a legal tool for forcing action on climate change. This Comment examines the standard for proving causation under section 7 and section 9 of the ESA, and analyzes potential barriers to proving that an entity has violated section 7 or section 9 by contributing to climatic changes that harm a listed species.

Plaintiffs face two hurdles under section 7. Given the current models of climate change, defendants have ample evidence to argue that the present concentration of greenhouse gases is such that climate change will occur for many years. As a result, defendants can argue that past actions, not present actions, cause climate change. Furthermore, a defendant can argue that the emissions from a proposed action do not contribute significantly to climate change, and thus do not result in jeopardy.

Proving causation under section 9 is also problematic. First, the sheer number of sources of greenhouse gas emissions poses a problem because of the traditional requirement that an entity be liable for harm only if its conduct is a substantial factor in bringing about the harm. Further, the persistence of greenhouse gas emissions in the atmosphere makes it even more difficult to establish that any given emitter's emissions are a substantial factor in causing climate change harm. Third, it is nearly impossible to trace the lifecycle of greenhouse gas emissions from a particular source, which renders it virtually impossible to trace particular emissions to particular climate change harms.

Despite these obstacles, and in the aftermath of Massachusetts v. EPA, a plaintiff may still be able to make a reasonable argument that an action causes harm to a listed species. The question remains, however—how much greenhouse gas emissions are enough to satisfy a court's legal standard for causation under the ESA?

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Introduction.....	168
I. An Overview of the Endangered Species Act	170
II. Section 7 of the Endangered Species Act.....	171
A. Climate Change, Section 7, and Causation	172
B. Action Area.....	173
C. Action Area and Climate Change	175
D. The Environmental Baseline.....	177
E. Environmental Baseline and Climate Change.....	180
III. Section 9 of the Endangered Species Act.....	182
A. The Section 9 “Take” Prohibition: An Overview	182
B. Climate Change Litigation under Section 9: Three Main Issues ..	183
C. The Legal Standard for Proving Causation under Section 9: Applying the Standard to Climate Change Cases	186
1. The Problem of Multiple Actors and De Minimis Contributions	187
2. The Problem of the Persistence of Greenhouse Gases in the Atmosphere.....	188
3. The Difficulty of Tracing Particular Emissions to Particular Harms	189
D. Section 9 and Causation: A Summary	195
Conclusion.....	197

INTRODUCTION

In recent years, the Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) have received several petitions to list species under the Endangered Species Act (the ESA) based on the impacts of climate change. In 2006, NMFS listed two species of coral as threatened, due in large part to the effects of climate change on the oceans where the corals exist.¹ In 2007, FWS announced that it would receive public comments on a petition to list several penguin species under the ESA.² In a more highly publicized decision, FWS proposed to list the polar bear as a threatened species.³ That proposal followed in the wake of several studies that found that increased

1. Endangered and Threatened Species: Final Listing Determinations for Elkhorn Coral and Staghorn Coral, 71 Fed. Reg. 26852 (May 9, 2006) (to be codified at 50 C.F.R. pt. 223). NMFS identified eleven “stressors” which threaten the survival of elkhorn and staghorn coral; increased sea temperatures, an increase in the acidity of oceans, and a rise in sea level are three of the eleven factors. *Id.* at 26,857–58.

2. Endangered and Threatened Wildlife and Plants; 90-Day Finding on a Petition to List 12 Penguin Species as Threatened or Endangered under the Endangered Species Act, 72 Fed. Reg. 37,695 (Dep’t of Interior July 11, 2007) (to be codified at 50 C.F.R. pt. 17).

3. 50 C.F.R. § 17 (2008).

temperatures have reduced the extent of seasonal pack ice, which has reduced the availability of seals, polar bears' main food source.⁴

Once FWS lists a species, it is only a matter of time before an environmental group files suit under the ESA to stop a project on the basis that greenhouse gas emissions harm a listed species. Frustrated at the federal government's refusal to regulate greenhouse gas emissions, states and environmental groups have increasingly resorted to litigation to force legislative action; states and environmentalists have already tried to use the Clean Air Act, the National Environmental Policy Act, and common law to address the impacts of climate change.⁵ Undoubtedly, environmental groups will also view the ESA as a legal tool for forcing action on climate change. This was confirmed when the policy director at the Center for Biological Diversity, which filed petitions to list the staghorn and elkhorn coral (and the polar bear), stated, "We think this victory on coral critical habitat actually moves the entire Endangered Species Act onto a firm legal foundation for challenging global-warming pollution."⁶

How will climate change affect the workings of the Endangered Species Act? In some respects, the ESA will continue to function as it has for over thirty years. For example, suppose that FWS lists the polar bear as threatened and a private individual were to hunt a polar bear. Section 9 of the ESA would apply, and the individual would be guilty of a prohibited "take." If the federal government proposed oil drilling in polar bear habitat, and FWS concluded that the oil drilling would likely jeopardize the survival of polar bears as a species, section 7 would prohibit the federal government from going forward with the project.

The analysis becomes more complex, however, when the threat to the polar bear comes not from these traditional activities but from climate change and the greenhouse gas emissions that cause it. Suppose that a federal agency is involved in a project to build a coal-fired power plant in Ohio. Would section 7 of the ESA require the federal government to analyze the impacts of the coal plant on the survival and recovery of the polar bear species? Could a plaintiff argue that a coal plant in Ohio has violated section 9 by releasing carbon dioxide, which contributes to global warming, which causes disappearance of the sea ice, which caused a particular polar bear to drown in open water?

In the following Comment, I attempt to answer these questions by analyzing causation under sections 7 and 9 of the Endangered Species Act. Part

4. See, e.g., Ian Stirling et al., *Long-Term Trends in the Population Ecology of Polar Bears in Western Hudson Bay in Relation to Climatic Change*, 52 ARCTIC 294 (1999).

5. See *Massachusetts v. EPA*, 549 U.S. 497 (2007) (Clean Air Act); *Friends of the Earth, Inc. v. Mosbacher*, 488 F. Supp. 2d 889 (N.D. Cal. 2007) (NEPA); *Connecticut v. Am. Elec. Power Co.*, 406 F. Supp. 2d 265 (S.D.N.Y. 2005) (federal and state common law); *California v. Gen. Motors Corp.*, No. C06-05755, 2007 U.S. Dist. LEXIS 68547 (N.D. Cal. Sept. 17, 2007) (federal and state common law).

6. Mark Clayton, *New Tool to Fight Global Warming: Endangered Species Act?*, *Christian Science Monitor*, Sept. 7, 2007, at 3.

I provides a brief overview of the ESA. Part II examines causation under section 7 of the ESA. Part III analyzes causation under section 9 of the ESA. In each section, I discuss the considerable barriers a plaintiff in a climate change case will face in meeting the causation requirements of the ESA.

This Comment does not discuss how the final rule on consultation under the ESA issued in December 2008 may affect these issues.⁷

I. AN OVERVIEW OF THE ENDANGERED SPECIES ACT

Congress enacted the Endangered Species Act in 1973,⁸ declaring that its purpose was to “provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved” and “to provide a program for the conservation of such endangered species and threatened species.”⁹ The ESA attempts to prevent species from going extinct through the following mechanisms.

First, FWS or NMFS lists a species as “threatened” or “endangered” under the ESA.¹⁰ The ESA provides two main protections for listed species. Section 7 of the ESA requires all federal agencies to consult with FWS or NMFS to ensure that no agency action jeopardizes the survival or recovery of a listed species.¹¹ Section 9 of the ESA prohibits any person (not just federal agencies) from “taking” a listed species.¹² In addition to listing the species for purposes of protection, FWS or NMFS must designate critical habitat for the species and formulate a recovery plan¹³ in order to increase the numbers of the species to a point where it can remove the species from the list.¹⁴

7. See Department of the Interior, Department of Commerce, *Interagency Cooperation under the Endangered Species Act*, 73 Fed. Reg. 76,272 (Dec. 16, 2008). The outgoing Bush administration took care to publish the final rule in the Federal Register early enough to ensure that it would become effective prior to President Barack Obama’s first day in office. The rule became effective on January 15, 2009. This Comment does not discuss the potential impacts of the rule or the prospects for reversing the rule through regulatory, legislative, or judicial means.

8. Endangered Species Act of 1973, Pub. L. No. 93-205, 87 Stat. 884 (codified at 16 U.S.C. §§ 1531–1544) (2006).

9. 16 U.S.C. § 1531 (2006).

10. The agency must make the listing determination “solely on the basis of the best scientific and commercial data available.” *Id.* § 1533(b)(1)(A). In deciding whether to list a species, the agency must consider five factors: “the present or threatened destruction, modification, or curtailment of its habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; disease or predation; the inadequacy of existing regulatory mechanisms; or other natural or manmade factors affecting its continued existence.” *Id.* §§ 1533(a)(1)(A)–(E). A species is “endangered” if it is “in danger of extinction throughout all or a significant portion of its range.” *Id.* § 1532(6). A species is “threatened” if it “is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” *Id.* § 1532(20).

11. *Id.* § 1536(a)(2).

12. *Id.* § 1538.

13. “Critical habitat” is the area occupied by the species at the time of listing which is “essential to the conservation of the species,” as well as areas not occupied by the species at the time of listing but which are essential to its conservation. *Id.* §§ 1532 (5)(A)(i)–(ii). To the maximum extent practicable, critical habitat should be designated at the time a species is listed. *Id.* § 1533(a)(3)(A)(i). FWS or NMFS may decline to designate critical habitat if they determine that it is not “prudent,” for one of two reasons:

This Comment does not attempt to grapple with all of the ways in which climate change will affect the workings of the Endangered Species Act. Instead, I will focus on sections 7 and 9 of the ESA.

II. SECTION 7 OF THE ENDANGERED SPECIES ACT

Section 7 of the ESA requires every federal agency to “insure that any action authorized, funded or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species.”¹⁵ Section 7 applies only to federal agency actions and private actions that have some federal nexus.¹⁶

To comply with section 7, the federal agency must first request information from FWS or NMFS (the “consulting agency”) as to whether any listed species, or candidate species,¹⁷ exists in the area of the proposed agency action.¹⁸ Using the “best scientific and commercial data available,” the consulting agency decides whether endangered, threatened, or candidate species exist in the area.¹⁹ If it concludes that such a species is present, the action agency must conduct a biological assessment to determine whether the species is “likely to be affected by” the proposed action.²⁰

Furthermore, if the action agency concludes that the proposed action is likely to affect an endangered or threatened species, it must begin formal consultation with FWS or NMFS.²¹ The consulting agency then provides the action agency with a written biological opinion describing how the proposed agency action will affect the species and its critical habitat.²² The biological opinion answers two critical questions: (1) will the agency action “jeopardize the continued existence” of an endangered species or threatened species?²³ and

designating critical habitat would increase the threat to the species by increasing human taking of the species; or designating critical habitat would not help the species. 50 C.F.R. § 424.12(a)(1)(i)–(ii) (2008).

14. 16 U.S.C. § 1533(f)(1) (2006); 50 C.F.R. § 402.02 (2008). Unless FWS or NMFS determines that a recovery plan will not “promote the conservation of the species,” the Secretary must develop “recovery plans” for endangered and threatened species. 16 U.S.C. § 1533(f)(1).

15. *Id.* § 1536(a)(2).

16. Section 7 directs “each Federal agency” to ensure that its actions do not jeopardize the continued existence of a listed species or adversely modify the habitat of a listed species. *Id.* § 1536(a)(2). This command does not apply to purely private actions.

17. Candidate species are species that are being considered for listing under the ESA. *See* Endangered and Threatened Species; Revision of Species of Concern List, Candidate Species Definition, and Candidate Species List, 71 Fed. Reg. 61,022 (Oct. 17, 2006).

18. 16 U.S.C. § 1536(c)(1) (2006).

19. *Id.*

20. *Id.*

21. *Id.* § 1536(a)(2).

22. *Id.* § 1536(b)(3)(A).

23. 16 U.S.C. § 1536(a)(2).

(2) will the agency action “result in the destruction or adverse modification of habitat” of endangered or threatened species?²⁴

FWS and NMFS have promulgated joint regulations that define “jeopardize” to mean “an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species.”²⁵ The joint FWS and NMFS regulations define “adverse modification” as

a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical.²⁶

A finding of jeopardy or adverse modification means that the project cannot go forward as proposed. If the biological opinion concludes that the proposed action will either jeopardize the continued existence of the species, or result in adverse modification of its habitat, the Secretary²⁷ suggests reasonable and prudent alternatives that would not result in jeopardy or adverse modification.²⁸ To comply with section 7, the reasonable and prudent alternative need only avoid jeopardy; the alternative does not have to be that which would best protect the species.²⁹ If, on the other hand, the biological opinion concludes that the action will not cause jeopardy or adverse modification, the agency deems its impact on the species “incidental” and the agency action can proceed without violating section 7.³⁰

A. *Climate Change, Section 7, and Causation*

Section 7 prohibits agencies from taking actions that would jeopardize the survival of a listed species or result in the adverse modification of habitat of a listed species. What matters for section 7 purposes is the impact of the agency action on the species as a whole—not the harm to individual organisms. To take the example of polar bears, a valid section 7 claim would need to show that an agency action harmed not just one or two polar bears, but jeopardized polar bears as a species.

Thus, in order to apply section 7 to a climate change case, a plaintiff would need to prove two causation elements. First, the plaintiff would need to

24. *Id.*

25. 50 C.F.R. § 402.02 (2008).

26. *Id.*

27. “Secretary” refers to the Secretary of the Interior or the Secretary of Commerce, depending on whether FWS or NMFS is involved.

28. 16 U.S.C. § 1536(b)(3)(A) (2006).

29. *Sw. Ctr. for Biological Diversity v. U.S. Bureau of Reclamation*, 143 F.3d 515, 523 (9th Cir. 1998).

30. 16 U.S.C. §§ 1536(b)(4)(A)–(B).

demonstrate that climate change causes harm to the survival or recovery of a species, rather than harm to merely a few organisms. Second, the plaintiff would need to show that the specific agency action at issue causes jeopardy or adverse modification. For climate change, this means showing that a particular agency action causes climate change.

Plaintiffs will likely have little difficulty establishing that climate change threatens the survival or recovery of a listed species.³¹ NMFS, by listing the elkhorn and staghorn corals as threatened, has already recognized that species may warrant listing on the basis of changes caused by climate change.³² FWS, in proposing to list the polar bear as threatened, has indicated a similar willingness to accept that climate change may imperil the survival of a species.³³ Given these developments, I proceed under the assumption that there is no logical or doctrinal barrier to a plaintiff's proving that climate change threatens the survival or recovery of a species. I do not suggest that this will be easy to prove, but the problem is an evidentiary one, not a doctrinal one.

Even if a plaintiff can prove that climate change jeopardizes a listed species, can a plaintiff prove that a specific agency action causes climate change? Answering this question requires an understanding of the case law concerning causation under section 7. Two causation issues that arise in the case law are particularly relevant to climate change. First, when a federal agency proposes an action, how far must it look to determine the impacts of the proposed action? Under the ESA, this inquiry is resolved through the "action area." Second, what is the baseline against which the incremental impact of a proposed action is measured? Under the ESA, this issue is addressed through the "environmental baseline." The legal definitions of the "action area" and the "environmental baseline" illustrate the challenges plaintiffs will face in proving that an agency action impacted a species via climate change.

B. Action Area

A significant causation obstacle in a climate change case is that the effects of greenhouse gas emissions may appear in places far removed from the source of the emissions. To return to the polar bear example, emissions in the lower forty-eight states affect polar bears in Alaska. Assuming polar bears were listed

31. The literature on the impacts of climate change on the viability of species is vast and growing more so. See, e.g., Camille Parmesan, *Ecological and Evolutionary Response to Recent Climate Change*, 37 ANN. REV. OF ECOLOGY, EVOLUTION AND SYSTEMATICS 637 (2006) (reviewing the kinds of impacts that climate change is having on species); Robert J. Wilson et al., *Changes to the Elevational Limits and Extent of Species Ranges Associated with Climate Change*, 8 ECOLOGY LETTERS 1138 (2005) (discussing changes in the distribution of butterflies as a result of climate change); Erik A. Beever et al., *Patterns of Apparent Extirpation Among Isolated Populations of Pikas (*Ochotona princeps*) in the Great Basin*, 84 J. MAMMOLOGY 37 (2003) (finding that climate change has reduced the distribution of pikas); Stirling, *supra* note 4 (discussing the impact of climate change on polar bears in Hudson Bay).

32. See *supra* note 1.

33. See *supra* note 2.

as threatened, would a federal action that would lead to greenhouse gas emissions in California require an assessment of the potential impacts on polar bears in Alaska under section 7?

Courts have addressed this issue, in part, through the concept of “action area,” which is the area in which a federal agency must assess the impacts of its proposed action. Courts have upheld the joint NMFS and FWS regulations that define “action area” as “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.”³⁴ The federal agency must analyze the effects of its proposed action on the listed species even if those impacts occur on lands not owned and managed by the agency.³⁵ However, courts have held that the “action area” does not necessarily include the species’ entire habitat; it includes only those areas in which the proposed federal action will have an effect on the species.³⁶

Two cases illustrate the legal requirements for defining an “action area.” In *Defenders of Wildlife v. Babbitt*, plaintiffs challenged the biological opinions of several federal agencies’ actions that could affect the endangered Sonoran pronghorn.³⁷ The National Park Service (NPS) and Bureau of Land Management argued that they needed to analyze the impacts of their proposed actions only in the immediate area of the action, and did not need to consider impacts on lands they did not manage.³⁸ NPS argued that for its proposed activities in Organ Pipe Cactus National Monument, the Service needed to analyze only the impacts on the pronghorn within the monument.³⁹

Evidence in NPS’s Biological Opinion, however, indicated that a road running through the monument could prevent pronghorn from traveling through it, and thereby sever the pronghorn into two populations, one east of the monument, and one west.⁴⁰ Thus, the evidence suggested that NPS’s proposed federal actions within the monument would have effects on pronghorn outside of it. As a result, the court held that the regulations prohibit the agency from limiting the action area to the park.⁴¹

34. For the joint NMFS and FWS regulations, see 50 C.F.R. § 402.02 (2008). For cases upholding the regulations, see, for example, *Native Ecosystems Council v. Dombeck*, 304 F.3d 886 (9th Cir. 2002).

35. *Defenders of Wildlife v. Babbitt*, 130 F. Supp. 2d 121, 128–29 (D.D.C. 2001).

36. *Oceana, Inc. v. Evans*, 384 F. Supp. 2d 203, 229 (D.D.C. 2005). In *Oceana*, plaintiffs challenged a Biological Opinion by NMFS that concluded that amendments to a Fishery Management Plan for the scallop fishery would not result in jeopardy to loggerhead sea turtles. *Id.* at 228. In its Biological Opinion, NMFS confined its analysis to the area in which the scallop fishery operates. *Id.* Plaintiffs claimed that this analysis was unduly narrow and failed to consider impacts throughout the turtles’ entire range, including impacts from sources other than the scallop fishery. *Id.* The court upheld the action area in the Biological Opinion, since there was no evidence in the record that the scallop fishery had indirect effects on sea turtles which were outside the area in which the scallop fishery operated. *Id.* at 228–29.

37. *Defenders of Wildlife v. Babbitt*, 130 F. Supp. 2d at 122. The federal agency defendants included, among others, the National Park Service and the Bureau of Land Management.

38. *Id.* at 129.

39. *Id.* at 129 n.10.

40. *Id.*

41. *Defenders of Wildlife v. Babbitt*, 130 F. Supp. 2d 121, 129 n.10 (D.D.C. 2001).

In *Native Ecosystems Council v. Dombeck*, two environmental groups sued to stop a timber sale because the U.S. Forest Service (USFS) had failed to analyze adequately the impacts of the action on threatened grizzly bears.⁴² The agency action in question was a 226-acre timber sale.⁴³ In the Biological Assessment for the timber sale, USFS selected an action area extending 16.5 miles to the west of the timber sale and 1.5 miles to the east of the boundary of the timber sale.⁴⁴ Plaintiffs claimed that the selection of this action area was arbitrary and capricious.⁴⁵

The Ninth Circuit asserted that ordinarily an agency is entitled to deference in selecting the action area, since the decision involves application of scientific expertise.⁴⁶ USFS failed in this instance, however, to provide *any* evidence that justified its choosing the particular boundaries in question.⁴⁷ Accordingly, the court held that USFS had failed to comply with the regulations, which required it to construe the action area based on the areas that would “actually be affected by the timber sale (by determining, for instance, where displaced bears might wander).”⁴⁸

Furthermore, the environmental group plaintiffs presented evidence that the action area chosen by USFS excluded certain areas in which the proposed action would affect grizzly bears.⁴⁹ The Biological Assessment stated that the timber sale would cause grizzly bears to move outside the timber sale, and a sheep grazing allotment was just beyond the eastern boundary of the Biological Assessment’s action area.⁵⁰ If the bears moved onto the grazing allotments, they faced the risk of being “removed or killed due to conflicts with livestock.”⁵¹ The court determined that USFS had acted arbitrarily by failing to justify its exclusion of the grazing allotment from the action area.⁵²

C. Action Area and Climate Change

The concept of the “action area” addresses one causation issue—when an entity acts, what is the geographic scope of the effects for which it is responsible? The action area answers this question by limiting the effects for which the agency is responsible to the geographic area where the agency action has direct and indirect effects on the listed species,⁵³ as evidenced by the

42. *Native Ecosystems Council v. Dombeck*, 304 F.3d 886, 891 (9th Cir. 2002).

43. *Id.* at 889.

44. *Id.* at 901.

45. *Id.*

46. *Id.* at 902.

47. *Native Ecosystems Council v. Dombeck*, 304 F.3d 886, 902 (9th Cir. 2002).

48. *Id.*

49. *Id.*

50. *Id.*

51. *Id.*

52. *Native Ecosystems Council v. Dombeck*, 304 F.3d 886, 902 (9th Cir. 2002).

53. 50 C.F.R. § 402.02 (2008).

record,⁵⁴ even if the impacts occur on lands not owned or managed by the action agency.⁵⁵ To date, the chains of causation in section 7 cases have been tightly linked, as far as geography is concerned: a timber sale caused grizzly prey to avoid the action area, so the grizzlies moved outside of the area as well;⁵⁶ a road into a national monument restricted the movement of pronghorn outside of the monument.⁵⁷

Climate change strains the concept of “action area” because the effects of greenhouse gas emissions occur around the globe. To return to the polar bear example, a potential plaintiff might argue that a federal action related to a proposed coal plant in Ohio requires an assessment of the impact that the plant’s greenhouse gas emissions will have on polar bears in Alaska. There is nothing in existing regulations or case law that would prevent the Ohio coal plant’s action area from extending to impacts in Alaska. Based on traditional action area requirements, the plaintiff could submit evidence in the record that greenhouse gas emissions from other coal plants in Ohio have an indirect effect on polar bears in Alaska, and thus the action area should include polar bear habitat in Alaska.

The policy problem with making such an argument is that the action area expands exponentially if an agency is required to consider the possible impacts of the emissions from the project on all listed species. It may be important that courts normally remedy section 7 violations with injunctive relief, and monetary damages are simply not available in the ESA context, although civil penalties are.⁵⁸ This may alleviate some of the concerns voiced in a recent public nuisance suit, in which a district court declined to impose liability on entities for harm from climate change, in part because of the court’s reluctance to impose expansive liability.⁵⁹ However, a prior lawsuit based on the theory that harm from climate change is a public nuisance was dismissed as well, even though the plaintiffs sought only injunctive relief.⁶⁰ As a result, it is unclear

54. *Native Ecosystems Council v. Dombeck*, 304 F.3d 886, 902–03 (9th Cir. 2002).

55. *Defenders of Wildlife v. Babbitt*, 130 F. Supp. 2d 121, 129 (D.D.C. 2001).

56. *Native Ecosystems Council*, 304 F.3d at 901–03.

57. *Defenders of Wildlife v. Babbitt*, 130 F. Supp. 2d at 129 n.10.

58. The ESA authorizes the federal government to enforce the Act through civil penalties, injunctive relief, and criminal penalties. 16 U.S.C. §§ 1540(a)–(b) (2006). The ESA permits citizens to sue only for injunctive relief; citizens cannot sue under the ESA for civil penalties or damages. *Id.* § 1540(g).

59. See *California v. Gen. Motors Corp.*, No. C06-05755, 2007 U.S. Dist. LEXIS 68547, at *47–48 (N.D. Cal. Sept. 17, 2007) (holding that a suit to hold automobile manufacturers liable for damages from global warming was a non-justiciable political question, and noting that the plaintiff sought “damages on a much larger and unprecedented scale” than traditional public nuisance suits).

For an explicit discussion of the role of limiting liability in determining the scope of a defendant’s duty to a plaintiff, see *Strauss v. Belle Realty Co.*, 482 N.E.2d 34 (1985) (holding that it is still the responsibility of courts, in fixing the orbit of duty, “to limit the legal consequences of wrongs to a controllable degree and to protect against crushing exposure to liability” (internal citations omitted)).

60. See *Connecticut v. Am. Elec. Power Co.*, 406 F. Supp. 2d 265, 272, 274 (S.D.N.Y. 2005) (dismissing the suit for injunctive relief against five power companies as a non-justiciable political

whether the absence of a request for money damages in a section 7 suit will alleviate the concerns expressed by courts in recent cases seeking relief from entities alleged to have contributed to global warming. Even with the limited scope of remedies available for section 7 violations, it seems reasonable to assume that many courts would hesitate to interpret section 7 as requiring federal agencies to consider the impacts of their actions' emissions on all listed species.

D. *The Environmental Baseline*

Once the proper action area is established, the section 7 jeopardy analysis attempts to quantify the incremental impact of an agency action upon a listed species. The joint regulations require FWS and NMFS, when conducting section 7 consultations, to evaluate "the current status of the listed species or critical habitat" and "the effects of the action and cumulative effects on the listed species or critical habitat."⁶¹ The current status of the species is determined through the "environmental baseline," which is defined in the joint regulations as the

past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process.⁶²

What information is included in the environmental baseline often determines whether the agency will find that the action jeopardizes a listed species. Likewise, the manner in which the agency measures the project's effects against the environmental baseline can determine the outcome of the jeopardy analysis.

To clarify the use of the environmental baseline in the section 7 jeopardy analysis, I will use a hypothetical. Imagine that FWS determines that to survive as a species, the northern spotted owl needs a minimum of one hundred mature individuals, each of which needs a minimum of one thousand acres of suitable habitat. Assume that at present, there are only eighty owls, some of which have access to one thousand acres of habitat, and some of which have access to less than one thousand acres of habitat. The species does not have the minimum population size and the minimum habitat necessary to survive as a species. Consequently, the species is in jeopardy status.

Given this set of facts, I will work through three scenarios. First, suppose that the National Forest Service proposes a timber sale. The timber sale will occur in habitat that is not suitable for spotted owls, and will thus have no

question, and noting that the "scope and magnitude of the relief Plaintiffs seek reveals the transcendently legislative nature of this litigation").

61. 50 C.F.R. § 402.14 (2008).

62. *Id.* § 402.02.

impact on the spotted owl. As a result, the agency action will not jeopardize the spotted owl. Note that the spotted owl will still be in jeopardy status, since, after the agency action, there will still be only eighty owls, some of which have inadequate habitat. Nonetheless, the proposed timber sale will not violate section 7, because the agency action has not caused any deterioration in the status of the species.⁶³

In the second scenario, the Forest Service proposes a timber sale and as part of the project, the agency proposes to create two thousand acres of habitat for spotted owls. After the agency action, the number of spotted owls with one thousand acres of suitable habitat will increase, but fewer than one hundred owls will have suitable habitat. There will still be too few owls and too little habitat to survive as a species. Thus, after the proposed timber sale, the survival of the spotted owl will remain jeopardized. Nevertheless, the agency action will not violate section 7, because the agency action has not worsened the plight of the spotted owl—in fact, it has improved it.⁶⁴

In the third scenario, USFS proposes a timber sale that will destroy five thousand acres currently used by spotted owls. In this scenario, it is possible that the agency action will violate section 7. Before the proposed action, the spotted owl was in jeopardy—the environmental baseline was so poor that the spotted owl was already likely to face extinction. Nonetheless, the proposed timber sale will violate section 7 if it harms the spotted owl by hastening its extinction.⁶⁵ Very few cases have addressed whether a species must experience a threshold quantity of harm to its chance of survival in order to trigger a section 7 violation.⁶⁶ FWS has taken the position that an agency action violates

63. *See Nat'l Wildlife Fed'n v. Nat'l Marine Fisheries Serv.*, 481 F.3d 1224, 1236 (9th Cir. 2007).

64. *See id.*

65. *See id.*

66. Recently, the Ninth Circuit characterized jeopardy as an action that causes “some deterioration” or that causes “additional harm”—but did not quantify the requisite amount of harm. *Id.*; *see also Am. Rivers v. Nat'l Marine Fisheries Serv.*, No. 97-36159, 1999 U.S. App. LEXIS 3860, at *12 (9th Cir. March 8, 1999) (holding that the regulation defining “to jeopardize” as to “appreciably reduce the likelihood” of both survival and recovery does not set a quantitative threshold for when an action causes jeopardy, and deferring to the agency’s determination of the threshold level of harm that will cause jeopardy). *See also Forest Guardians v. Veneman*, 392 F. Supp. 2d 1082 (D. Ariz. 2005). In *Forest Guardians*, the Forest Service proposed to renew grazing permits in areas used as habitat by two threatened species of fish. *Id.* at 1087. FWS issued Biological Opinions concluding that no jeopardy would result to the fish, even though the proposed grazing would “adversely affect the survival and recovery” of the fish and “some degradation will continue.” *Id.* at 1088. FWS justified this conclusion based on its interpretation of its regulations, which define “to jeopardize” as to “reduce appreciably” the likelihood of both survival and recovery. *Id.* at 1091–92. FWS interpreted “appreciably” to mean “considerably” or “significantly.” *Id.* Thus, according to FWS, an action that results in some harm, but not significant harm, to a species’ chance of survival does *not* jeopardize the species. *Id.* at 1092. Deferring to the agency’s interpretation of its own regulation, the court upheld the agency’s conclusion that the predicted harm to the fish would not result in jeopardy. *Id.*

section 7 only if it produces a *significant* adverse effect on a species' chance of survival.⁶⁷

These three scenarios illustrate two critical aspects of the jeopardy analysis. First, the jeopardy analysis requires the agency to assess the effects of the action once those effects are added to the environmental baseline. A biological opinion cannot simply mention the environmental baseline and then analyze the impacts of the action independently from the species' actual baseline status.⁶⁸ Second, the jeopardy analysis looks only at the incremental impact of the agency action, when that impact is added to the environmental baseline. The jeopardy analysis does *not* require an agency to combine all impacts to make an aggregate jeopardy determination.⁶⁹ Nonetheless, a degraded environmental baseline makes a jeopardy finding more likely.⁷⁰

National Wildlife Federation v. National Marine Fisheries Service provides a useful summary of the role of the environmental baseline in the section 7 jeopardy analysis.⁷¹ The National Wildlife Federation sued NMFS based on its 2004 Biological Opinion, which concluded that operation of dams and related facilities of the Federal Columbia River Power System would not jeopardize thirteen species of salmon.⁷²

To determine whether the proposed action would jeopardize the salmon, NMFS measured the baseline conditions and then estimated the effects of the proposed agency action. NMFS then compared the effects of the agency action to the baseline conditions; since the effects of the action were no worse than the baseline conditions, NMFS concluded that the proposed action would not jeopardize the salmon.⁷³ NMFS contended that to conclude otherwise would expand the meaning of "agency action" to include preexisting harms to the species.⁷⁴ NMFS argued that under such an approach, once baseline conditions

67. The joint FWS and NMFS handbook for section 7 consultations states that harm to individuals of a listed species results in jeopardy only if it "is likely to result in *significant* adverse effects throughout the species' range." NAT'L MARINE FISHERIES SERV. & U.S. FISH & WILDLIFE SERV., ENDANGERED SPECIES CONSULTATION HANDBOOK: PROCEDURES FOR CONDUCTING SECTION 7 CONSULTATIONS AND CONFERENCES 4-34 (March 1998), available at <http://www.fws.gov/endangered/consultations/S7HNDBK/s7hndbk.htm> (emphasis added).

68. *Defenders of Wildlife v. Babbitt*, 130 F. Supp. 2d 121, 127 (D.D.C. 2001) (holding that "[s]imply reciting the activities and impacts that constitute the baseline and then separately addressing only the impacts of the particular agency action in isolation is not sufficient" to comply with section 7).

69. *Defenders of Wildlife v. Norton*, No. 99-927, 2003 U.S. Dist. LEXIS 26558, at *20 (D.D.C., January 7, 2003) (rejecting the plaintiff's position that a Biological Opinion must analyze "whether the impacts of all of the agencies activities, taken together, are jeopardizing the species").

70. *Or. Natural Desert Ass'n v. Lohn*, 485 F. Supp. 2d 1190, 1199 (D. Or. 2007) (agreeing with NMFS that "[a]n environmental baseline that does not meet the biological requirements of a listed species may increase the likelihood that adverse effects of the proposed action will result in jeopardy to a listed species or in destruction or adverse modification of a designated critical habitat").

71. *Nat'l Wildlife Fed'n v. Nat'l Marine Fisheries Serv.*, 481 F.3d 1224 (9th Cir. 2007).

72. *Id.* at 1228-29.

73. *Id.* at 1235.

74. *Id.*

put a species in jeopardy, any agency action would violate section 7—a scheme which the agency found to be untenable.⁷⁵

The Ninth Circuit rejected NMFS's approach, ruling that a biological opinion must assess whether the proposed agency action, when added to the environmental baseline and cumulative effects of other agency actions, will jeopardize the species.⁷⁶ This does not mean that when baseline conditions already place a species in jeopardy, an agency action automatically violates section 7:

Agency action can only “jeopardize” a species’ existence if that agency action causes some deterioration in the species’ pre-action condition. . . . [A]n agency may not take action that will tip a species from a state of precarious survival into a state of likely extinction. Likewise, even where baseline conditions already jeopardize a species, an agency may not take action that deepens the jeopardy by causing additional harm.⁷⁷

Since NMFS failed to incorporate a degraded baseline into the jeopardy analysis, and NMFS did not add the action's effects to the environmental baseline, the court held that the biological opinion was legally insufficient.⁷⁸

E. Environmental Baseline and Climate Change

As previously discussed, agency regulations require that a section 7 consultation result in a biological opinion that calculates an environmental baseline, the impacts of the proposed action, and the cumulative effects of other actions.⁷⁹ The agency then adds all of these effects together to determine whether the proposed action will cause jeopardy or adverse modification of critical habitat.

This process has interesting implications when the impacts of a proposed action are greenhouse gas emissions. An agency, or an industry intervenor, could claim that the environmental baseline is a level of greenhouse gas emissions that already commits us to warming for at least several decades, if not centuries, and thus that any proposed agency action is irrelevant—harmful warming will occur anyway.

Support for this position comes from the Intergovernmental Panel on Climate Change (the IPCC), which released its Fourth Assessment Report in 2007. The report cites models indicating that even if global greenhouse gas

75. *Id.*

76. *Nat'l Wildlife Fed'n v. Nat'l Marine Fisheries Serv.*, 481 F.3d 1224, 1232 (9th Cir. 2007).

77. *Id.* at 1236.

78. *Id.* at 1235.

79. See 50 C.F.R. §§ 402.14(g), 402.02 (2008). Cumulative effects are the “effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur” within the action area. *Id.* § 402.02. Past and present effects of state and private actions, as well as federal actions, are included in the environmental baseline. I have not addressed the cumulative-effects analysis in a separate section because, with respect to climate change, the cumulative-effects analysis raises no significant issues that are not already raised by the environmental baseline analysis.

emissions were immediately cut to zero, the climate would continue to warm over the next several decades.⁸⁰ Even if the more modest goal of cutting emissions to 2000 levels was achieved, the climate would be expected to warm by 0.1 degree Celsius each decade for the next two decades.⁸¹

These long-term effects of emissions stem from the rate at which greenhouse gases are removed from the atmosphere. Different greenhouse gases persist in the atmosphere for different lengths of time. The IPCC report expresses the lifetime of a greenhouse gas as the length of time that it takes for a gas to reduce to 37 percent of its initial volume.⁸² The lifetime of methane is twelve years, hydrochlorofluorocarbon-22 (a refrigerant) is twelve years, and nitrous oxide is 110 years.⁸³ Carbon dioxide has no specific lifetime, but the report states that it takes roughly one hundred years to reduce an amount of carbon dioxide by half.⁸⁴ Roughly 20 percent of the amount of carbon dioxide emitted remains in the atmosphere for millennia.⁸⁵

What is the significance of greenhouse gas lifecycles for calculating the environmental baseline in a section 7 suit? It means that an agency could claim that the environmental baseline is an amount of greenhouse gases that commits us to warming for at least several decades. An agency could then claim that if jeopardy will result to the listed species, that jeopardy results from the emissions that are already in the atmosphere, rather than from the proposed agency action.

To illustrate, I return to the polar bear example. Imagine that it can be determined that an increase in atmospheric and sea temperatures of a certain magnitude will reduce the extent of the sea ice which will in turn jeopardize the survival of polar bears. While it does not matter what this magnitude is for my purposes, assume that it is three degrees Celsius above current temperatures. Further, imagine that a defendant can show that the present atmospheric concentration of greenhouse gases commits us to a warming of three degrees Celsius over the next century, even if emissions are immediately cut to zero. Such a defendant could plausibly claim that the proposed action does not jeopardize the survival of the polar bear, because the polar bear is already in jeopardy due to past emissions.

Ultimately, then, plaintiffs face two hurdles under section 7. Given the current models of climate change, defendants have ample evidence to argue

80. CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS 825 (Susan Salomon et al. eds., 2007), available at <http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter10.pdf>.

81. *Id.* at 12.

82. *Id.* at 824.

83. *Id.*

84. *Id.*

85. CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS, *supra* note 80, at 824.

that the present concentration of greenhouse gases is such that climate change will occur for many years. As a result, defendants can argue that past actions, instead of present actions, caused the climate change and consequently caused the harm of which the plaintiffs complain.

Furthermore, a defendant can argue that the emissions from a proposed action do not contribute significantly to climate change, and thus do not result in jeopardy. In support of this argument, a defendant could point to FWS position that only *significant* adverse impacts to a species' chance of survival violate section 7. This jeopardy analysis hinges on the quantity of harm to a species' chance of survival needed to constitute a section 7 violation. If an agency action that causes *any* deterioration in a species' baseline condition results in jeopardy, then proposed actions that emit virtually *any* amount of greenhouse gases will likely jeopardize a species sensitive to climate change. By contrast, if courts uphold the FWS position that only *significant* adverse impacts on a species' chance of survival violate section 7,⁸⁶ very few actions that emit greenhouse gases will result in jeopardy—since few actions emit enough greenhouse gases to have a significant impact on climate change.⁸⁷

III. SECTION 9 OF THE ENDANGERED SPECIES ACT

In Part III, I discuss the principal causation issues that could arise in a section 9 case brought based upon harm to species from climate change. First, I provide an overview of the section 9 prohibition on “taking” listed species. Second, I identify three main problems in proving that an entity's actions caused climate change and thereby caused a prohibited take. Third, I examine the legal standard for proving causation under section 9. Fourth, I apply this legal standard to the three causation problems I have identified, and ask how a court would resolve these causation issues in a section 9 climate change case. To answer this question, I rely largely on case law outside of the ESA, since there are so few section 9 cases that address causation.

A. *The Section 9 “Take” Prohibition: An Overview*

Along with section 7, section 9 is a critical provision of the Endangered Species Act. For endangered fish and wildlife, it is unlawful to “take any such species within the U.S. or the territorial sea of the United States” and also “upon the high seas.”⁸⁸ By virtue of FWS regulations, the take prohibition extends to threatened species of fish and wildlife, unless a specific regulation

86. *See supra* note 62.

87. The few courts that have confronted this question have upheld the agency's interpretation of the level of harm needed to violate the jeopardy standard. *See supra* note 61. But there are so few cases in this area that the issue remains unresolved.

88. 16 U.S.C. §§ 1538(a)(1)(B)–(C) (2006). Endangered species of plants have fewer protections. It is illegal to “remove and reduce to possession” an endangered plant from federal lands, but no such prohibition extends to non-federal lands. *Id.* § 1538(a)(2)(B).

provides otherwise.⁸⁹ NMFS extends the protections of section 9 to threatened species of fish and wildlife on a species-by-species basis.⁹⁰ Unlike section 7, which applies only to federal-agency actions, section 9 applies to all private as well as governmental actions.

“Take” is defined by the ESA as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.”⁹¹ FWS and NMFS have clarified the meaning of “harm” as an “act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.”⁹² Since harm includes habitat degradation, section 9 prohibits harming habitat when doing so injures a listed animal.⁹³ By itself, however, habitat degradation is not a prohibited “take.”⁹⁴

B. *Climate Change Litigation under Section 9: Three Main Issues*

Three aspects of climate change translate into three distinct problems for proving causation under section 9. First, a huge number of sources emit greenhouse gases at any given time, and each source emits only a small fraction of global emissions. The sheer volume of emitters poses a problem because of the traditional requirement that an entity be liable for harm only if its conduct is a substantial factor in bringing about the harm.

The persistence of greenhouse gas emissions in the atmosphere is also problematic, because any current harm is attributable not only to current emitters, but to past emitters as well. Consequently, it is even more difficult

89. 50 C.F.R. § 17.31 (2008).

90. *See id.* §§ 223.101–206.

91. 16 U.S.C. § 1532(19).

92. 50 C.F.R. § 17.3.

93. *Babbitt v. Sweet Home Chapter of Cmty. for a Great Or.*, 515 U.S. 687, 692, 697 (1995) (upholding regulations which define “take” to include “significant habitat modification or degradation where it actually kills or injures wildlife”). Since *Sweet Home* establishes that habitat modification that injures an animal violates section 9, *Sweet Home* means that indirect chains of causation can violate section 9. The *Palila* cases stand for precisely this principle. *See Palila v. Haw. Dep’t of Land and Natural Res. (Palila I)*, 639 F.2d 495, 497–98 (9th Cir. 1981) (holding that the Hawaii State government’s maintenance of feral sheep and goats violated section 9 because the goats and sheep destroyed the trees on which the endangered Palila bird depend); *see also Palila v. Haw. Dep’t of Land and Natural Res. (Palila II)*, 852 F.2d 1106, 1110 (9th Cir. 1988) (holding that by allowing mouflon sheep to adversely modify the habitat of the Palila bird, the State had violated section 9). Thus, I will not address the argument that harm to species from climate change stems from chains of causation too attenuated to violate section 9. I believe that the *Palila* cases and *Sweet Home* foreclose this argument.

94. *Ariz. Cattle Growers Ass’n v. U.S. Fish & Wildlife Serv.*, 273 F.3d 1229, 1238, 1240 (9th Cir. 2001) (holding that to prove a violation of section 9, the government must prove that habitat modification actually kills or injures a member of a listed species); *see also Defenders of Wildlife v. Bernal*, 204 F.3d 920, 924–25 (9th Cir. 1999) (holding that a school district did not violate section 9 by building at a construction site which was within the critical habitat of endangered pygmy owls but not actually used by any owls).

to establish that any given emitter's emissions are a substantial factor in causing climate change harm.

Third, it is nearly impossible to trace the lifecycle of greenhouse gas emissions from a particular source, which renders it virtually impossible to trace particular emissions to particular climate change harms. This aspect of greenhouse gas emissions poses a legal problem because of the traditional rule that an entity is liable only to the particular person whose injuries the entity actually caused.

Why focus on these three issues?⁹⁵ The principal reason is that courts have highlighted these three issues as obstacles to proving causation in climate change cases.⁹⁶ In particular, all three issues arose in *Massachusetts v. EPA*.⁹⁷ One of the central disputes between the majority and dissent in that case concerned whether the failure of the Environmental Protection Agency (EPA) to regulate emissions from new motor vehicles produced enough emissions to constitute a cause of Massachusetts's injury—at least for purposes of standing. EPA contended “its decision not to regulate greenhouse gas emissions from

95. These three issues are not an exhaustive list of the causation issues that may arise if a plaintiff tries to prove that emissions of greenhouse gases harm a species and thereby violate section 9. Instead of attempting to formulate an exhaustive list, I have focused on the causation issues that appear to me to pose the greatest barriers to a potential plaintiff.

One of the central elements of proximate cause that I do not discuss is foreseeability. Courts often frame the causation inquiry in terms of whether the harm inflicted was reasonably foreseeable at the time the defendant acted. *See, e.g.*, Judge Benjamin Cardozo's discussion of foreseeability in *Palsgraf v. Long Island R.R. Co.*, 162 N.E. 99 (N.Y. 1928); Judge Learned Hand's analysis in *Sinram v. Pennsylvania R.R. Co.*, 61 F.2d 767 (2d Cir. 1932). A defendant may be liable for negligence, however, even if the defendant could not have reasonably foreseen the full extent of the harm or the manner in which the harm would occur. *See* RESTATEMENT (SECOND) OF TORTS § 435(1) (1965).

To consider the application of foreseeability in the context of climate change, suppose that a plaintiff sues several coal-fired power plants in Ohio for emitting greenhouse gases that are harming polar bears in Alaska. The defendants could claim that they could not foresee that burning coal in Ohio would harm polar bears in Alaska. I think that such a defense could easily be rebutted. With the state of climate science in 2008, it would be difficult for an industrial or governmental entity in the United States to claim ignorance of the basic process by which emitting greenhouse gases contributes to climate change. A plaintiff would not need to show that a defendant understood the exact manner in which climate change would harm polar bears; likewise, the plaintiff need not show that the defendant should have known the full extent of the harm. The plaintiff need only show that a reasonable person would have known that emitting greenhouse gases would contribute to climate change, and, in turn, harm wildlife, including polar bears. Given the present ubiquity of information regarding climate change, I believe that it would be easy for a plaintiff to establish that harm from climate change to a species was reasonably foreseeable at the time the defendant emitted greenhouse gases.

To get a sense of the amount of information concerning climate change, I searched the major newspapers database in LexisNexis for articles that mention “climate change” or “global warming.” The database contains the records of ninety-four domestic and foreign newspapers. Between January 1, 2008, and April 11, 2008, these newspapers ran 12,647 stories containing either the phrase “climate change” or “global warming.” That means that on average each newspaper ran 1.3 stories per day that mentioned climate change or global warming. I had to divide my search into two-week periods, since Lexis will not run a search that returns more than three thousand results.

96. *See Massachusetts v. EPA*, 549 U.S. 497 (2007); *California v. Gen. Motors Corp.*, No. C06-05755, 2007 U.S. Dist. LEXIS 68547 (N.D. Cal. Sept. 17, 2007).

97. 549 U.S. 497 (2007).

new motor vehicles contribute[d] so insignificantly to petitioners' injuries that the agency [could not] be haled into federal court to answer for them."⁹⁸ Four Justices agreed with EPA. Chief Justice Roberts, writing for the dissent, pointed out the small role of American auto emissions in worldwide emissions, particularly given that the Clean Air Act regulates only emissions from new vehicles.⁹⁹ Roberts characterized these emissions as playing a "bit-part" in global emissions.¹⁰⁰ According to Roberts, such a small amount of emissions is not a legal cause of climate change, and thus cannot be the legal cause of Massachusetts's injury.¹⁰¹

The majority disagreed. The majority opinion, written by Justice Stevens, held that EPA's refusal to regulate carbon dioxide from automobiles did contribute to global warming, because American auto emissions represent a significant percentage of worldwide carbon dioxide emissions.¹⁰² Stevens cited the plaintiffs' allegation that 6 percent of worldwide carbon dioxide emissions are attributable to American automobile emissions.¹⁰³ This highlights the first issue I will discuss—what quantity of greenhouse gas emissions is enough to render an entity liable for injuries from climate change?

The Court in *Massachusetts v. EPA* also raised the second issue—how the persistence of greenhouse gas emissions compounds the problem of identifying a single source that contributes significantly to climate change. Chief Justice Roberts, writing for the dissent, noted that carbon dioxide emissions remain in the atmosphere for "50 to 200 years."¹⁰⁴ Roberts cited this fact¹⁰⁵ in support of his argument that EPA's action was responsible for too few emissions to be a cause of climate change injuries. Roberts implied that Massachusetts's injury is the result of emissions released over the last two hundred years. Thus, under this reasoning, EPA's fractional responsibility for Massachusetts's injury is even smaller than its fractional share of current, global emissions, because we must consider all past emissions of greenhouse gases in the aggregate.

Chief Justice Roberts's reasoning has a basis in generally accepted scientific models of the lifecycles of greenhouse gases.¹⁰⁶ The persistence of greenhouse gases in the atmosphere means that the total number of emitters who are responsible for climate change increases to include past emitters whose

98. *Id.* at 523–24. EPA also contested whether the plaintiffs established that a favorable decision would redress their injuries. *Id.* EPA's redressability argument stressed that carbon dioxide emissions from new motor vehicles in the United States are responsible for only a small percentage of global greenhouse gas emissions. *Id.* Furthermore, according to EPA, increases in emissions from developing countries would offset any reduction in carbon dioxide emissions from the United States. *Id.*

99. *Id.* at 542–43.

100. *Id.* at 544.

101. *Massachusetts v. EPA*, 549 U.S. 497, 544 (2007).

102. *Id.* at 524–25.

103. *Id.* at 523–24.

104. *Id.* at 542–43.

105. Roberts is somewhat imprecise in his characterization of the length of time that carbon dioxide remains in the atmosphere, but his general point is sound. See *supra* Part II.E.

106. See discussion *supra* Part II.E.

greenhouse gas emissions are still present in the atmosphere. As a result, the fractional responsibility of each emitter decreases, thereby making it more difficult to establish that any one emitter is a substantial factor in bringing about harm from climate change.

Lastly, the Court in *Massachusetts v. EPA* raised the third causation issue—the difficulty of tracing emissions from a particular defendant to a particular harm. Chief Justice Roberts argued that Massachusetts could not trace particular emissions to a particular injury, given the uncertainties of how emissions lead to climate change.¹⁰⁷ Both the scientific and legal literature has identified the difficulty of tracing particular greenhouse gas emissions throughout their lifecycle.¹⁰⁸

C. *The Legal Standard for Proving Causation under Section 9: Applying the Standard to Climate Change Cases*

How would a court resolve these three causation issues in a case brought under section 9 of the ESA? For instance, assuming that the polar bear is eventually listed as threatened, how would a court resolve each of these three issues if a plaintiff claimed that a coal plant in Ohio was “taking” polar bears in Alaska?

The first place to turn is to case law under the ESA. The Supreme Court has stated that section 9 requires a plaintiff to prove proximate cause and foreseeability. Justice Stevens, writing for the majority in *Sweet Home*, stated:

Respondents have suggested no reason why either the “knowingly violates” or the “otherwise violates” provision of the statute—or the “harm” regulation itself—should not be read to incorporate ordinary requirements of proximate causation and foreseeability. In any event, neither respondents nor their *amici* have suggested that the Secretary employs the “otherwise violates” provision with any frequency.¹⁰⁹

To answer these causation problems, the Supreme Court has instructed courts to use “ordinary requirements of proximate causation” as the legal standard for proving causation under section 9.¹¹⁰ Unfortunately, in the aftermath of *Sweet Home*, very few cases have shed light on how courts should apply the

107. *Massachusetts v. EPA*, 549 U.S. 497, 544 (2007).

108. *See supra* Part II.E. (concerning the uncertainty surrounding the persistence of carbon dioxide in the atmosphere).

109. *Babbitt v. Sweet Home Chapter of Cmty. for a Great Or.*, 515 U.S. 687, 697 n.9 (1995). Then-Justice O'Connor, in her concurrence in *Sweet Home*, agreed with Justice Stevens that section 9 includes a proximate cause requirement. O'Connor wrote that the “harm” regulation prohibited significant habitat modification that proximately causes death or injury to animals listed under the ESA. *Id.* at 713–14. O'Connor wrote that *Palila II* was wrongly decided because the plaintiffs had not shown that maintenance of the mouflon sheep proximately caused injury to any identifiable *Palila* birds. *Id.* “Destruction of the seedlings did not proximately cause actual death or injury to identifiable birds; it merely prevented the regeneration of forest land not currently sustaining actual birds.” *Id.*

110. *See Sweet Home*, 515 U.S. at 697 n.9.

requirements of proximate cause to section 9.¹¹¹ Thus, to resolve each of the three climate change causation issues, I will turn to sources on proximate cause outside of the ESA where necessary.

1. *The Problem of Multiple Actors and De Minimis Contributions*

The first causation issue is whether an action contributes enough greenhouse gases to cause a legal harm to a species from climate change. Accordingly, the fundamental legal question is, when harm results from the aggregate effects of multiple actions, what is the minimum threshold at which an actor will be liable for contributing to the harm? Applied to the climate change context, what is the minimum amount of emissions that will render an entity liable for harms from climate change?

ESA case law provides virtually no guidance on this issue. To date, the number of actors who have contributed to takes of listed animals has been small. Only one published case deals with the issue, and only in passing.¹¹² Given the lack of ESA cases on point, other areas of the law, particularly tort law, provide guidance on the issue of the minimum amount of responsibility that will render an entity a legal cause of harm.

Tort law deals with this question by dividing causes into “but-for” and “proximate” causes.¹¹³ Any action that was a necessary condition of the harm occurring is a but-for cause, but only those actions which were a substantial factor in bringing about the harm are a proximate cause; liability requires both but-for and proximate causation.¹¹⁴ The Restatement provides a three-factor test for determining whether an action is a “substantial factor” in bringing about the harm. The three factors are (1) the number of other factors that produced the harm and the extent of the effect; (2) whether the actor created a force which continued until the harm occurred, or created a situation which was harmless until an independent force intervened; and (3) the lapse of time between the action and the harm.¹¹⁵

111. The cases that have attempted to follow Justice Stevens’s admonition to apply ordinary requirements of proximate cause have often seemed ambiguous as to just what those “ordinary requirements” are. See *Seattle Audobon Soc’y v. Sutherland*, No. CV06-1608, 2007 U.S. Dist. Lexis 31880, at *34–36 (W.D. Wash. May 1, 2007) (citing both federal and state law on proximate cause, and a wide range of sources, in an attempt to define the elements of proximate cause under section 9).

112. See *Pyramid Lake Paiute Tribe of Indians v. U.S. Dep’t of the Navy*, 898 F. 2d 1410, 1420 (9th Cir. 1990) (suggesting that plaintiffs’ section 9 claim failed in part because plaintiffs could not attribute any drop in the lake level to the Navy, as opposed to other water users).

113. The legal standard for causation in tort law varies by jurisdiction. For ease of discussion, I have confined my analysis to the Restatement (Second) of Torts (“Restatement”), which is widely followed.

114. RESTATEMENT (SECOND) OF TORTS § 431 (1965).

115. *Id.* at § 433. The comment to the first factor states, “[A]lthough no one of the contributing factors may have such a predominant effect, their combined effect may, as it were, so dilute the effects of the actor’s negligence as to prevent it from being a substantial factor.” *Id.*

What are the consequences of applying the substantial factor test to a case in which the plaintiff claims that an entity's emissions caused the take of a listed species? To return to the polar bear example: Can a plaintiff prove that a coal plant, or even a collection of coal plants, in Ohio is a substantial factor in bringing about harm to polar bears in Alaska?

Based on *Massachusetts v. EPA*, a court will consider an action that emits 6 percent of annual, global carbon dioxide emissions a legal cause of injuries related to climate change, at least for purposes of standing.¹¹⁶ For any action that emits less than 6 percent, one can only speculate whether a court would hold that the action is a cause of injuries related to climate change. The purpose of proximate cause is to separate the many but-for causes into insignificant and significant causes, which in turn determines liability. Most entities, and most actions, emit only a very small fraction of global greenhouse gas emissions.¹¹⁷ As a result, plaintiffs face a serious obstacle in showing that a given action is a substantial factor in contributing to a harm caused by climate change.

2. *The Problem of the Persistence of Greenhouse Gases in the Atmosphere*

The second causation issue stems from the nature of greenhouse gas emissions, which persist in the atmosphere for many years. The IPCC calculates that 50 percent of the initial volume of carbon dioxide released into the environment remains in the atmosphere after one hundred years.¹¹⁸ By contrast, only 37 percent of the initial volume of methane released remains in the atmosphere after just twelve years.¹¹⁹

These scientific aspects of climate change pose legal challenges to proving causation. The persistence of greenhouse gases in the atmosphere means that the number of emitters responsible for causing climate change includes both present and past emitters. As the total number of emitters increases, the proportional responsibility of each emitter decreases.

This has consequences for a causation analysis, because an entity that is a but-for cause will be liable for harm only if it is also a proximate cause, and thus a "substantial factor in bringing about the harm."¹²⁰ As the total number of emitters, and the total amount of emissions, increases, it becomes more difficult

116. See *Massachusetts v. EPA*, 549 U.S. 497, 522–25 (2007).

117. In *Connecticut v. American Electric Power*, the plaintiffs claimed that five electric utilities collectively emit 10 percent of global carbon dioxide emissions. 406 F. Supp. 2d 265, 268 (S.D.N.Y. 2005). Although this seems like a significant amount of greenhouse gases, it seems less significant when one determines the numbers for each utility. Assume, for illustrative purposes only, that each utility emits an identical amount of carbon dioxide. Then each utility emits only 2 percent of global carbon dioxide emissions. Each power plant emits less than 2 percent, and probably much less than 1 percent of global carbon dioxide emissions.

118. *Id.*

119. *Id.* at 824.

120. RESTATEMENT (SECOND) OF TORTS § 431 (1965).

to say that any emitter is a “substantial factor” in bringing about the total concentration of emissions.

Massachusetts v. EPA illustrates this phenomenon. One of the central disputes in the case was whether EPA’s failure to regulate carbon dioxide made the agency responsible for enough emissions to deem EPA’s inaction a legal cause of climate change injury. The majority accepted the petitioner’s claim that EPA’s failure to regulate accounted for 6 percent of global, yearly emissions of carbon dioxide. The majority then concluded that this amount was significant enough to be a legal cause of injuries from climate change, at least for purposes of Article III standing.

Suppose that the majority focused instead on what percentage of the *total* concentration of carbon dioxide in the atmosphere was attributable to EPA’s failure to regulate. This number would be considerably less than 6 percent. Because carbon dioxide persists in the atmosphere for centuries, the atmospheric concentration of carbon dioxide is the result of not just last year’s emissions, but from emissions stretching back hundreds of years. Suppose that the petitioners claimed that EPA’s failure to regulate was responsible for, say, 1 percent of the concentration of carbon dioxide in the atmosphere. Would the case have come out differently? Would at least one justice have switched over to the dissent, and held that an action responsible for so small a concentration of carbon dioxide was simply too insignificant to be deemed a legal cause of injury?

Posing this question demonstrates that proving that an action is a legal cause of injury from climate change is more difficult than recent cases such as *Massachusetts v. EPA* indicate. The persistence of greenhouse gases in the atmosphere means that, over time, the number of emitters responsible for climate change increases, and the fractional responsibility of each emitter decreases. Once the courts recognize that greenhouse gases persist in the atmosphere over time, it may become even more difficult for plaintiffs to prove that a given action emits enough greenhouse gases to be a substantial factor in bringing about harm from climate change.

3. *The Difficulty of Tracing Particular Emissions to Particular Harms*

The third causation issue stems from scientists’ present inability to trace the path of particular emissions in the atmosphere. At present, there is no way to “mark” particular emissions and determine what exactly happens to those emissions, including how long they remain in the atmosphere. For example, if our hypothetical coal plant in Ohio released carbon dioxide ten years ago, we cannot identify with any certainty where along their lifecycles those emissions are, and consequently, what portion of those emissions remain in the atmosphere.

This aspect of greenhouse gas emissions poses a legal problem in proving causation because of the traditional requirement of “individual causation.” By

“individual causation” I mean the general rule that a plaintiff can recover from a defendant only if the plaintiff can prove that a particular defendant’s conduct caused her injuries.

At first glance, it seems that the requirement of individual causation is not a problem in the context of climate change, because every emitter of greenhouse gases contributes to climate change. It would seem that there is no danger of holding a defendant liable for harm that it did not cause, given that contemporaneous greenhouse gas emissions have the same effect on climate change regardless of where they are emitted. Presumably, a plaintiff only needs to know who emitted greenhouse gases, and in what quantities, and can apportion liability based purely on quantity of gases emitted.

Some greenhouse gases, however, have different effects on climate change depending on where they are released. For instance, nitrous oxides released by aircraft at high elevations contribute more to global warming than an equivalent amount of nitrous oxides released at sea level.¹²¹ Thus, one could not claim that emitters of nitrous oxide have contributed to climate change in direct proportion to the amount of nitrous oxide they have emitted—to do so would be to impose too much liability on some entities, and too little on others.

Furthermore, even for a gas such as carbon dioxide, which appears to have the same effect on climate change regardless of where it is released,¹²² the inability to trace particular emissions still poses a problem. This is because various processes are constantly removing carbon dioxide from the atmosphere. Thus, the fact that an entity emitted ten tons of carbon dioxide into the atmosphere ten years ago does not mean that all ten tons are still in the atmosphere and contributing to climate change. If a plaintiff attempts to hold a defendant liable for contributing to climate change, the plaintiff will want to know not just how much the defendant emitted, but how much of those emissions remains in the atmosphere—and this requires being able to trace the lifecycle of particular emissions.

Given that it is presently not possible to trace the lifecycle of particular emissions, this Subpart asks whether that poses a legal impediment to proving that a particular defendant’s emissions caused a particular harm from climate change. To ask the question more generally, in what cases can a plaintiff hold a defendant liable when the plaintiff cannot trace the defendant’s conduct to her injury?

There are numerous exceptions to the general rule that a defendant is liable only if the plaintiff can prove that the defendant’s tortious conduct caused her injury. Many of the exceptions have little application in the context

121. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, AVIATION AND THE GLOBAL ATMOSPHERE, at Summary for Policy Makers 4.2 (Joyce E. Penner et al. eds., 1999), available at <http://www.ipcc.ch/ipccreports/sres/aviation/006.htm#spm42>.

122. *Id.* at 1.3.1, available at <http://www.ipcc.ch/ipccreports/sres/aviation/016.htm#131>.

of climate change.¹²³ But there are two exceptions which hold some promise as a way around the individual causation requirement in climate change cases. These two exceptions are the rule set forth in *Borel v. Fibreboard*, an asbestos case, and the doctrine of market share liability.

Asbestos litigation may seem like an unlikely source to draw upon for climate change litigation, but the process by which asbestos causes injury is similar to that of climate change. Exposure to asbestos causes two principal diseases, asbestosis and mesothelioma.¹²⁴ These diseases usually result not from one exposure to asbestos, but from repeated exposures.¹²⁵ Moreover, each exposure to asbestos fibers results in both new, separate injury, and in the worsening of previous asbestos injuries.¹²⁶ In *Borel*, the court summarized these effects by noting, “the effect of the disease may be cumulative since each exposure to asbestos dust can result in additional tissue changes. A worker’s present condition is the biological product of many years of exposure to asbestos dust, with both past and recent exposures contributing to the overall effect.”¹²⁷ As a consequence, it is impossible to determine which particular exposure to asbestos caused a plaintiff’s injuries.¹²⁸ Plaintiffs thus have difficulty meeting the legal requirement that they identify which defendant’s tortious conduct caused their injury, and to what extent.

Recognizing that the plaintiff had precisely this problem of meeting the individual causation requirement, the *Borel* court nonetheless held that each defendant that had tortiously exposed the plaintiff to asbestos fibers was liable

123. The most notable exceptions are: *res ipsa loquitur*, the concert of action theory, alternative liability, and market share liability. *Res ipsa loquitur* permits a plaintiff to hold a defendant liable for negligence when the “event is of a kind which ordinarily does not occur in the absence of negligence,” “other responsible causes, including the conduct of the plaintiff and third persons, are sufficiently eliminated by the evidence,” and “the indicated negligence is within the scope of the defendant’s duty to the plaintiff.” RESTATEMENT (SECOND) OF TORTS § 328D (1965). *Res ipsa loquitur* is not applicable to climate change because the sources of greenhouse gases are known: there is generally no difficulty in identifying the sources of greenhouse gases and of presenting evidence that they did in fact emit greenhouse gases.

The concert of action theory holds *X* liable for the harm caused by *Y* if *X* acted tortiously with *Y* “pursuant to a common design,” or if *X* knows that *Y*’s conduct is tortious and assists *Y*, or if *X* acts tortiously and also assists *Y* in his tortious conduct. RESTATEMENT (SECOND) OF TORTS § 876 (1965). Most emitters of greenhouse gases do not act pursuant to a common plan, or offer significant assistance to each other, so concert of action is not applicable.

Summers v. Tice, 199 P.2d 1 (Cal. 1948), exemplifies the doctrine of alternative liability. That case held two men liable because each had negligently fired a gun at the plaintiff, even though only one gunshot injured the plaintiff and he could not identify which defendant had fired the shot that injured him. *Id.* at 1–4. Alternative liability, as laid out in *Summers*, does not help us in climate change cases. Climate change results from the aggregate emissions of thousands of sources, not from one source. *Summers* would be on point if, of the thousands of greenhouse gas sources, only one source resulted in climate change. This, of course, is not the case, so alternative liability is not a useful framework.

124. *Borel v. Fibreboard Paper Products Corp.*, 493 F.2d 1076, 1083 (5th Cir. 1973).

125. *Id.*

126. *Id.*

127. *Id.*

128. *Id.*

for plaintiff's injuries.¹²⁹ The court noted that it was uncontested that the asbestos caused plaintiff's diseases, and that each defendant's products had exposed the plaintiff to asbestos.¹³⁰ Moreover, the effects of the multiple exposures to asbestos were cumulative, since each exposure "may result in an additional and separate injury."¹³¹ The court upheld the verdict against the defendants and held that each defendant was jointly and severally liable for the plaintiff's injuries.¹³²

Market share liability is the second doctrine that holds some promise as a way around the individual causation requirement. The leading case in market share liability is *Sindell v. Abbott Labs.*¹³³ In *Sindell*, a class of daughters who were exposed to a drug (DES) that their mothers ingested during pregnancy sued the drug manufacturers for birth defects.¹³⁴ The problem in *Sindell*, as in subsequent DES cases, was that there were over two hundred manufacturers of DES between the 1940s and the 1960s.¹³⁵ By the time the plaintiffs brought their action, virtually no plaintiff could prove which defendant had manufactured the DES that her mother ingested.¹³⁶ As a result, the trial court had dismissed the plaintiffs' complaint because they could not identify which defendant caused their injuries.¹³⁷

The California Supreme Court began its analysis by noting that, "as a general rule, the imposition of liability depends upon a showing by the plaintiff that his or her injuries were caused by the act of the defendant or by an instrumentality under the defendant's control."¹³⁸ As a result, under California tort law, the defendants would not be liable for the plaintiffs' injuries. To remedy this result, the court fashioned a doctrine out of the rule in *Summers v. Tice.*¹³⁹ If a plaintiff proved that her injuries resulted from the use of DES, then each defendant would be liable for a percentage of the judgment equal to the defendant's share of the national market in DES at the time the plaintiff's mother took DES.¹⁴⁰ The court justified its rule as ensuring that "each manufacturer's liability for an injury would be approximately equivalent to the damage caused by the DES it manufactured."¹⁴¹

129. *Borel v. Fibreboard Paper Products Corp.*, 493 F.2d 1076, 1094 (5th Cir. 1973).

130. *Id.*

131. *Id.*

132. *Id.* at 1096.

133. *Sindell v. Abbott Labs*, 607 P.2d 924 (Cal. 1980). *See also* *Hymowitz v. Eli Lilly & Co.*, 539 N.E.2d 1069, 1077-79 (N.Y. 1989) (adopting the rule of market share liability, and holding that each defendant who manufactured DES would be liable for a fraction of the harm equal to the fraction of the defendant's national market share in DES).

134. *Sindell*, 607 P.2d at 925.

135. *Id.* at 931.

136. *Id.* at 926-27.

137. *Id.* at 926.

138. *Sindell v. Abbott Labs*, 607 P.2d 928 (Cal. 1980).

139. *Id.* at 936-37.

140. *Id.* at 937.

141. *Id.* at 938.

Can these two doctrines—the rule in *Borel*, and the doctrine of market share liability—be applied to a climate change case? The facts that often provide the basis for market share liability are not present in the area of climate change. In the DES cases, market share liability assumed that each plaintiff's injuries stemmed from the drugs of one manufacturer. The problem was that most plaintiffs could not identify which pills her mother had taken. Generally, one defendant had caused each plaintiff's injuries, but the plaintiff could not identify that defendant.

The harms from climate change, in contrast, do not result from one unidentifiable emitter of greenhouse gases, but instead from the aggregate emissions of thousands of sources. In the DES context, a proper analogy would be a scenario where the combination of three hundred pills that each of the plaintiffs' mothers ingested injured the plaintiffs. Thus, market share liability seems like a poor fit in the climate change context.¹⁴²

Injuries from exposure to asbestos provide a closer analogy to harm from climate change. A plaintiff trying to prove causation in a climate change case will have some of the same difficulties as the plaintiff did in *Borel*. The *Borel* court noted that it is the cumulative exposure to asbestos particles over time that produces disease; this generally involves exposure to asbestos from many different products over a number of years.¹⁴³ A disease results from the cumulative effect of exposure to asbestos, and each exposure to asbestos can both worsen existing injuries and contribute separate, additional injuries.¹⁴⁴ It

142. Courts have refused to impose market share liability based on several factors. Many courts have declined to apply market share liability when a plaintiff is able to identify some of the defendants that caused her injury. *See, e.g., Celotex Corp. v. Copeland*, 471 So. 2d 533, 538 (Fla. 1985) (rejecting market share liability in a case in which the plaintiff could identify several manufacturers of asbestos products to which he had been exposed). In a climate change case, a plaintiff will undoubtedly be able to identify at least some emitters of greenhouse gases, which would provide one reason for a court to refuse to apply market share liability.

Courts have rejected market share liability where it would be difficult to identify the boundaries of the relevant market. *See, e.g., Goldman v. Johns-Manville Sales Corp.*, 514 N.E.2d 691, 700 (Ohio 1987) (agreeing with *In re Related Asbestos Cases* that defining the relevant market in asbestos products would be so complex that market share liability was not appropriate).

Furthermore, courts have refused to adopt market share liability where the products cause different degrees of harm. Asbestos products contain different quantities and types of asbestos fibers, which have different toxicities. *See, e.g., In re Related Asbestos Cases*, 543 F. Supp. 1152, 1158 (N.D. Cal. 1982) (distinguishing *Sindell* on the grounds that DES was a "fungible commodity," whereas asbestos fibers are of several varieties, each used in varying quantities by defendants in their products, and each differing in its harmful effects). Carbon dioxide emissions are equivalent in terms of their harm, and thus seem more analogous to DES than to asbestos. Some models, however, suggest that carbon dioxide emissions are not equivalent over time. Emissions may differ in their effects based on factors such as the concentration of gases already in the atmosphere. In other words, increasing volumes of greenhouse gas emissions may not produce warming effects in a linear fashion, and thus greenhouse gas emissions may be more comparable to asbestos than DES.

143. *Borel v. Fibreboard Paper Products Corp.*, 493 F.2d 1076, 1083 (5th Cir. 1973).

144. *Id.*

is impossible to determine which exposure caused the disease; one cannot trace exposure to each asbestos product to an identifiable portion of the harm.¹⁴⁵

Greenhouse gas emissions are in some ways similar to exposure to asbestos. Each given greenhouse gas emission has some small effect on global climate, but it is the aggregate amount of emissions that produces the overall impact. Each emission of greenhouse gases adds to the effect of gases already in the atmosphere, often in non-linear ways, such as through feedback loops.¹⁴⁶

Borel is significant because it indicates that courts have relaxed the causation requirement in situations where the cumulative effects of multiple actions cause harm and the plaintiff cannot identify which defendant caused which portion of the harm. For several reasons, though, *Borel* does not offer a paradigm that fits the climate change context neatly. First, many jurisdictions have refused to apply the *Borel* rule even in asbestos cases.¹⁴⁷ Second, even if a jurisdiction follows the rule of *Borel*, the number of defendants in *Borel* was small, and all of the defendants had acted tortiously by creating a dangerous product. By contrast, in a climate change suit, the number of potential defendants (i.e., entities that emit greenhouse gases) is exponentially higher, and the act of emitting greenhouse gases is not generally considered tortious activity.

In conclusion, the inability to trace the course of particular emissions presents problems in holding an emitter liable for the harms caused by climate change. It is important to note that these problems are different from the problem presented in conventional tort cases. In the DES cases, for example, a defendant who manufactured DES did not necessarily cause the medical injuries of a particular plaintiff, because a particular defendant might not have manufactured the pill that a particular plaintiff's mother ingested. By contrast, in the climate change context, every emitter of greenhouse gases *has* contributed to climate change, so there is no danger of holding a defendant liable for harm that the defendant has not caused. Rather, the problem is that the *amount* of each defendant's contribution cannot be determined solely from the amount of emissions released, because emissions are removed from the

145. *Id.*

146. For a discussion of feedback loops and climate change, see Chapter 7 of the Fourth Assessment Report of the IPCC. CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 80. One example of a feedback loop, in the climate change context, is the melting of sea ice. Climate change causes accelerated melting of sea ice, which leads to more open ocean. The ocean absorbs heat more than ice does, since the ocean is less reflective than sea ice. The ocean's increased absorption of solar radiation can accelerate climate change. See Marika M. Holland et al., *Future Abrupt Reductions in the Summer Arctic Sea Ice*, GEOPHYS. RESEARCH LETTERS, Dec. 12, 2006.

147. See, e.g., *Lohrmann v. Pittsburgh Corning Corp.*, 782 F.2d 1156, 1163–64 (4th Cir. 1986); *but see Rutherford v. Owens-Illinois, Inc.*, 941 P.2d 1203, 1218–20 (Cal. 1997); *Lockwood v. A C & S, Inc.*, 722 P.2d 826, 840–41 (Wash. Ct. App. 1986). For an overview of the ways different jurisdictions have responded to the problem of causation in asbestos litigation, see Simcha David Schonfeld, *Establishing the Causal Link in Asbestos Litigation: An Alternative Approach*, 68 BROOK. L. REV. 379 (2002).

atmosphere at varying rates and by different processes. In other words, unless one can trace a particular defendant's emissions over time, one cannot know the precise amount of climate change attributable to a particular defendant.

The DES and asbestos cases provide insight for thinking about ways that plaintiffs can surmount this obstacle. As I have suggested, while market share liability and the *Borel* rule hold some appeal, there are numerous difficulties in analogizing those rules to the climate change context. Nonetheless, they provide useful starting points in thinking about whether plaintiffs can overcome the problem of proving individual causation.

D. Section 9 and Causation: A Summary

Case law interpreting section 9 indicates that an entity "takes" a listed animal when the entity harms the habitat of a species and this harm results in injury to identifiable animals.¹⁴⁸ Under certain circumstances, a governmental entity violates section 9 if it licenses or authorizes an activity that takes a listed animal.¹⁴⁹ Thus, to return to the example of the polar bear, we know that by authorizing a coal plant to emit greenhouse gases, a governmental agency could violate section 9 if the emissions from the plant harm habitat and thereby injure or kill listed animals.

But the Supreme Court has stated that a section 9 claim requires a showing that a defendant was a proximate cause of the harm to the listed species.¹⁵⁰ Does a coal plant emitting greenhouse gases in Ohio proximately cause the take of a polar bear injured by a reduction in arctic sea ice? ESA case law does not answer this question directly, and there is a paucity of cases addressing proximate cause under section 9 in general.

Cases from other areas of the law cast doubt on the proposition that any single action, or collection of actions, can be the proximate cause of a take due to its contribution to climate change. The Restatement of Torts holds an entity liable only when it is a "substantial factor" in bringing about an injury.¹⁵¹ The requirement that an act be a substantial factor lies at the heart of the concept of proximate cause, which is meant to distinguish the many "but-for" causes from the few substantial causes.

148. *Babbitt v. Sweet Home Chapter of Cmty. for a Great Or.*, 515 U.S. 687, 697–701 (1995); *Ariz. Cattle Growers Ass'n v. U.S. Fish & Wildlife Serv.*, 273 F.3d 1229, 1238, 1240 (9th Cir. 2001).

149. *Strahan v. Coxe*, 127 F.3d 155, 161–64 (1st Cir. 1997) (holding that the state of Massachusetts could be held liable for issuing gill net and lobster net licenses where the use of the nets caused injury to endangered northern right whales and it was not possible to use the nets without harming whales); see also *Loggerhead Turtle v. County Council*, 148 F.3d 1231, 1250 (11th Cir. 1998) (concluding that the plaintiffs had standing to sue based on Volusia County's inadequate regulation of beachfront lighting which was a cause of harm to endangered and threatened sea turtles); *Defenders of Wildlife v. EPA*, 882 F.2d 1294, 1300–01 (8th Cir. 1989) (affirming the district court's determination that EPA's registration of pesticides containing strychnine violated the ESA by leading to the take of endangered species).

150. *Sweet Home*, 515 U.S. at 699, 713–14.

151. RESTATEMENT (SECOND) OF TORTS § 431 (1965).

The challenge is to pinpoint actions that emit enough greenhouse gases to be deemed a “substantial factor” in bringing about the climate change which harms a species. In *Massachusetts v. EPA*, the five Justices in the majority thought that an action that allegedly contributed 6 percent of global carbon dioxide emissions was substantial enough to confer standing.¹⁵² The problem is that the agency action at issue in *Massachusetts v. EPA* is anomalous; it is rare to find a single agency action, or private action, that emits 6 percent of annual, global carbon dioxide emissions. More common are actions like the licensing of a coal plant, which undoubtedly contributes only a fraction of a percent of annual, global carbon dioxide emissions. Thus, one practical barrier to a section 9 suit may be the difficulty of finding actions that emit enough greenhouse gases to be “substantial factors” in bringing about the quantum of climate change that takes a listed animal.

More important than this practical barrier is a doctrinal barrier of causation: some will argue that *no* source of greenhouse gases can ever be significant enough to constitute a proximate cause of climate change harm. Chief Justice Roberts appears to make precisely this argument in his dissent in *Massachusetts v. EPA*.¹⁵³ Two of Roberts’s main points are that carbon dioxide remains in the atmosphere for decades and that EPA’s action is responsible for only 4 percent of annual, global emissions from carbon dioxide.¹⁵⁴ Taken together, these points support the argument that EPA’s action emits such a small amount of carbon dioxide in relation to present and past emitters that it cannot be a legal cause of climate change, and hence cannot be a legal cause of Massachusetts’s injury.

Furthermore, few courts have dealt with this issue of proximate causation. Courts have fashioned numerous alternative theories to deem defendants the legal cause of an injury, mainly to address situations in which the plaintiff cannot identify the particular defendant responsible for the harm. This trend has arisen most frequently in toxic exposure cases, such as the DES and asbestos cases. Even in the scenarios most analogous to climate change, the number of potentially responsible defendants pales in comparison to the number of actors responsible for climate change. In *Borel*, for instance, the court assigned liability to a limited number of companies, each of which had exposed the plaintiff to a dangerous product.¹⁵⁵

In the climate change context, it is perhaps even more appropriate to think that all emitters have contributed to a particular harm caused by climate change, since emissions generally have the same effect regardless of where

152. See *Massachusetts v. EPA*, 549 U.S. 497, 522–25 (2007).

153. *Id.* at 543–44.

154. *Id.*

155. *Borel v. Fibreboard Paper Products Corp.*, 493 F.2d 1076, 1086 (5th Cir. 1973). Borel sued eleven companies which manufactured asbestos insulation to which Borel was exposed. *Id.* at 1086. After Borel settled with four companies, and the court directed a verdict as to one company, only six companies remained. *Id.*

they are released. Nevertheless, the unique aspect of climate change is that a large number of entities emit greenhouse gases. Courts have often been reluctant to announce a rule with the potential to impose such expansive liability.¹⁵⁶

CONCLUSION

Frustrated with the lack of legislative action at the federal level on climate change, states and private organizations have been pursuing climate change litigation in the federal courts. In recent years, plaintiffs have brought suits seeking to hold entities liable for their emissions that contribute to climate change under the Clean Air Act, NEPA and federal common law.¹⁵⁷ It is likely that in the next few years, someone will sue under the ESA claiming that by contributing to climate change, an agency action jeopardizes the survival of a listed species, or that an action resulted in the “take” of a listed animal. Whether the ESA is the proper policy tool for addressing climate change is a topic for a separate paper. The question addressed here is whether plaintiffs can prove causation.

In a section 7 suit, a plaintiff must prove that an action jeopardizes the existence of a species, or that an action adversely affects critical habitat of a species. In a section 9 suit, a plaintiff must prove that an action harms an identifiable organism. As a result, plaintiffs have very different burdens in a section 7 case as compared to a section 9 case. Nonetheless, bringing a suit based on harm from climate change raises many of the same issues in both contexts.

Some aspects of causation should not be a problem. Harm from climate change often occurs at distances far removed from the source of the emission, but this is not unique to climate change. Many types of pollution share this characteristic and courts and legislatures have been able to assign liability nonetheless. Harm from climate change often occurs years, even decades after the greenhouse gases are released into the atmosphere, but this time lag between action and injury is again not unique to climate change. While many medical injuries resulting from exposure to toxic substances have a long latency period, this has not prevented plaintiffs from recovering in, for example, many DES and asbestos cases.

What is unique about climate change is the sheer number of sources of greenhouse gases that combine to create the atmospheric concentration of gases necessary to cause harm. At any one time, there are millions of sources of greenhouse gases around the globe. Moreover, the atmospheric concentration of gases at any given time is the result of emissions over a span of decades, if not centuries. Thus, each source makes only a small, *de minimis* contribution to the atmospheric concentration of greenhouse gases that cause climate change.

156. *See supra* Part II.C.

157. *See supra* note 5.

This raises the central issue in climate change and causation: when does an action emit enough greenhouse gases to be a legal cause of climate change?

This was precisely the source of disagreement between the majority and the dissent in *Massachusetts v. EPA*. While the outcome of the case may seem like a positive development, there are reasons to be less than hopeful about climate change litigation under the ESA. First, as a practical matter, it will be difficult for plaintiffs to find actions that, like EPA's action, contribute 6 percent of global, annual carbon dioxide emissions—most agency actions will contribute far fewer emissions. Applying causation doctrine, then, it is possible that even the five Justices in the majority in *Massachusetts v. EPA* would hold that an action that contributes less than 1 percent of global greenhouse gases is not a legal cause of injuries from climate change.

Second, even if there is no doctrinal barrier to finding that an entity is the proximate cause of an injury stemming from climate change, the task of assessing the relative contribution of entities to climate change is exceedingly complex. Courts in the public nuisance cases used the political question doctrine to avoid making these complex calculations and to avoid having to impose damages or injunctive relief.¹⁵⁸ Similarly, a court in an ESA case may use proximate cause to avoid having to make the complex and contentious calculations necessary to apportion liability.

Third, courts may be reluctant to impose expansive liability on entities for the impacts of climate change. Particularly in the context of section 7, it seems unlikely that courts will force federal agencies to consider the impacts of climate change on all listed species vulnerable to climate change. If a federal agency must consult over the impact that its greenhouse gas emissions cause on polar bears in Alaska, then it is logical to require the agency to consult over impacts to listed species anywhere. In the language of section 7, courts may hesitate to make the "action area" extend around the globe.

Lastly, defendants may use the language of section 7's environmental baseline to argue that the environmental baseline commits us to climate change, and hence to harm to species. Given widely accepted models of climate change, such as those mentioned in the IPCC's Fourth Report, it is plausible to claim that harm from climate change would result even if total global emissions were immediately cut to zero.¹⁵⁹ Defendants may thus argue that the environmental baseline, not current emissions, causes the present harms of climate change. Of course, plaintiffs can respond by arguing that a degraded environmental baseline makes harm to listed species more likely, and that defendants are responsible for the incremental harm which they contributed to the environmental baseline. Who has the winning argument depends on whether

158. See *Connecticut v. Am. Elec. Power Co.*, 406 F. Supp. 2d 265, 272–73 (S.D.N.Y. 2005); *California v. Gen. Motors Corp.*, No. C06-05755, 2007 U.S. Dist. LEXIS 68547, at *46 (N.D. Cal. Sept. 17, 2007).

159. CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 80.

jeopardizing the continued existence of a species means *any* harm to a species' chance of survival, or includes only *significant* reductions in a species' chance of the survival. While this is still an unresolved issue, a few courts have deferred to the position of FWS that section 7 prohibits only significant harm to a species' chance of a survival.¹⁶⁰

Despite all of these obstacles, if a plaintiff challenges an action that emits a sufficiently large quantity of greenhouse gases, the plaintiff can make a reasonable argument that the action causes harm to a listed species. In the aftermath of *Massachusetts v. EPA*, a court may deem an action that emits 6 percent of annual, global carbon dioxide a legal cause of injuries resulting from climate change—at least for purposes of Article III standing. Just where the threshold is—what amount of emissions is so small that a court will not consider it a legal cause of injuries from climate change—remains unclear. What does seem clear, however, is that future courts will have to grapple with this issue.

160. See *supra* notes 66–67.

