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## **Maintaining the World's Marine Biodiversity: Using the Endangered Species Act to Stop the Climate Change Induced Loss of Coral Reefs**

*Blake Armstrong*<sup>1</sup>

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### **Abstract**

This note explores whether and how the Endangered Species Act ("ESA") can be used to prevent the climate change induced extinction of coral reefs. It will explore how climate change is affecting coral reefs, look at the key provisions of the Endangered Species Act and examine how they apply to climate change, and look at how the Endangered Species Act has been, to date, applied to two species of coral that were listed as "threatened" under the Endangered Species Act in 2008. This note will also

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1. The author is a student at the University of California, Hastings in San Francisco. He would like to thank Professor David Takacs for his guidance during the drafting of this Note.

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address pending litigation regarding the critical habitat designation for the listed corals. Ultimately, this note concludes that while the Endangered Species Act could provide a means of reducing greenhouse gas emissions in circumstances of major federal action, the statute cannot by itself prevent the conditions that are leading to the extinction of the world's coral reefs. As such, the Endangered Species Act is a valuable tool, but not the solution in addressing climate change.

## **I. Introduction: Coral Reefs, Climate Change, and the Endangered Species Act**

Climate change is killing the world's coral reefs.<sup>2</sup> This is happening in two ways: from coral "bleaching" that results from warmer ocean temperatures, and from ocean acidification, a process that is fundamentally changing the chemistry of the oceans.<sup>3</sup> Damage to coral reefs from climate change threatens the livelihoods of 500 million people and puts at risk billions of dollars that coral reefs contribute to the global economy.<sup>4</sup> The loss of coral reefs will also have devastating effects on biodiversity, potentially leading to the extinction of a million species that depend on coral for their survival.<sup>5</sup> Due to the fact that global warming will put much of the world's coral in danger of extinction,<sup>6</sup> it is important to look at the legal tools available to protect coral. One statute is particularly relevant here: the Endangered Species Act. This Note will analyze the ways in which the Endangered Species Act can and cannot be used to prevent the climate change-induced loss of coral reefs. While the Endangered Species Act does provide a means to protect coral from certain threats, the Statute alone is ill equipped to protect coral reefs from the existential threat of climate change.

The first substantive section, section two, will discuss the ways in which global warming adversely affects coral reefs. Section three addresses the value of coral reefs to people and the environment. Section four addresses the key provisions of the Endangered Species Act that may be used to protect coral reefs from the effects of global warming — specifically, Sections 4, 7, and 9. Section five presents the cases of the Elkhorn and Staghorn corals that were listed as "threatened" under the ESA in 2008, and analyzes the potential legal challenge to the National Marine Fisheries Service's ("NMFS") designation of critical habitat for those species of coral.

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2. Elizabeth Kolbert, *The Darkening Seas*, *The New Yorker*, Nov. 20, 2006, at 66.

3. GLOBAL CORAL REEF MONITORING NETWORK AND INTERNATIONAL CORAL REEF INITIATIVE, *CLIMATE CHANGE AND CORAL REEFS: CONSEQUENCES OF INACTION* (2010), available at [http://www.icriforum.org/sites/default/files/GCRMN\\_Climate\\_Change.pdf](http://www.icriforum.org/sites/default/files/GCRMN_Climate_Change.pdf).

4. *Id.*

5. Kolbert, *supra* note 2, at 72.

6. *Id.*

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In that section, I examine the Center for Biological Diversity's likelihood of success in challenging critical habitat designation under the Endangered Species Act. Section six highlights the well-known case of the Polar Bear and tries to take away some lessons that can be applied to the case of coral reefs. Finally, section seven discusses various federal statutes, beyond the Endangered Species Act, that may also have some value in preserving coral.

## II. The Effects of Climate Change on Coral Reefs

### A. Coral Bleaching

Climate change is causing ocean temperatures to rise.<sup>7</sup> This rise in temperature is causing coral "bleaching," which is threatening coral reefs with mass extinction.<sup>8</sup> Coral is extremely sensitive to temperature, so when water temperatures rise, even one or two degrees Celsius above the normal summer maximum, coral lose or eject<sup>9</sup> algae called zooxanthellae that nourish them.<sup>10</sup> Some corals can retain their algae and recover but it renders most coral more susceptible to diseases and reduces their reproductive and growth rates.<sup>11</sup> If the increased temperatures persist, the corals die.<sup>12</sup>

Ocean temperatures are already one degree Celsius closer to the upper thermal tolerance limits than 100 years ago, and bleaching is likely to become an annual event.<sup>13</sup> In fact, scientists studying coral in the Caribbean are suggesting that 2010 might be the worst year ever for coral death in that region.<sup>14</sup> In light of the above facts, rising sea temperatures will threaten coral for the foreseeable future.

### B. Ocean Acidification

The world's oceans absorb massive amounts of the greenhouse gases that are released into the atmosphere.<sup>15</sup> In fact, around half of the carbon that has been emitted since the start of the nineteenth century has been

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7. GLOBAL CORAL REEF MONITORING NETWORK, *supra* note 3.

8. *Id.*

9. Kolbert, *supra* note 2.

10. GLOBAL CORAL REEF MONITORING NETWORK, *supra* note 3.

11. *Id.*

12. *Id.*

13. GLOBAL CORAL REEF MONITORING NETWORK, *supra* note 3.

14. Eli Kintisch, *Caribbean Die-Off Could be Worst Ever*, Science Magazine, Oct. 14, 2010, <http://news.sciencemag.org/sciencenow/2010/10/caribbean-coral-die-off-could-be.html>.

15. Kolbert, *supra* note 2, at 68.

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absorbed by the oceans.<sup>16</sup> The absorption of greenhouse gases has actually slowed global warming, because it has absorbed carbon that otherwise would have gone into the atmosphere, but it is also fundamentally changing the chemistry of the oceans.<sup>17</sup> This process has been coined “ocean acidification.” Basically, when CO<sub>2</sub> dissolves into water, it produces carbonic acid, which in large quantities can change the water’s pH.<sup>18</sup> As pH rises, water’s acidity rises exponentially: A 0.1 percent drop in pH represents a thirty percent rise in acidity.<sup>19</sup> Already, the oceans have absorbed 120 tons of carbon, which has resulted in a 0.1 percent drop in pH.<sup>20</sup>

Acidification will have a chilling effect on marine life, and especially on calcifying organisms like coral reefs.<sup>21</sup> Calcifying organisms build their shells from calcium carbonate, which is found in seawater.<sup>22</sup> The absorption of greenhouse gases reduces the amount of calcium carbonate in the water, reducing the amount of building material with which calcifying animals can build their shells.<sup>23</sup> Coral reefs need to constantly rebuild themselves, because organisms that subsist on coral, like parrot fish and sponges, are constantly eating away at coral in search of food or protection.<sup>24</sup> “If a reef were ever to stop calcifying, it would start to shrink and eventually would disappear.”<sup>25</sup> In other words, ocean acidification poses an existential threat to coral reefs.<sup>26</sup>

### **III. The Value of Coral Reefs for People and the Environment**

Healthy coral reefs benefit people in a variety of ways. Coral reefs contribute an estimated \$100 billion per year to the global economy.<sup>27</sup> According to the United Nations Environmental Program (“UNEP”), each square kilometer of coral is worth hundreds of thousands of dollars per year.<sup>28</sup> Coral reefs contribute billions of dollars annually to fisheries alone,

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16. *Id.*

17. *Id.*

18. *Id.* at 69.

19. *Id.*

20. *Id.*

21. Kolbert, *supra* note 2, at 70.

22. *Id.*

23. *Id.* at 72

24. *Id.*

25. *Id.* at 73.

26. *Id.* 74-75.

27. GLOBAL CORAL REEF MONITORING NETWORK, *supra* note 3.

28. UNITED NATIONS ENVIRONMENT PROGRAM - WORLD CONSERVATION MONITORING CENTER, IN THE FRONT LINE: SHORELINE PROTECTION AND OTHER ECOSYSTEM SERVICES FROM

as well as providing billions of tourist dollars per year.<sup>29</sup> Revenue from the dive industry alone in the Caribbean generates over two billion dollars per year.<sup>30</sup> Coral also benefits people by preventing coastal erosion by absorbing wave energy from storms and hurricanes, valued at \$9 billion annually throughout the world.<sup>31</sup> Furthermore, 500 million people depend on coral reefs in some way (for food, coastal protection, or income), and 30 million of those are virtually dependent on coral reefs for their livelihoods.<sup>32</sup> Some of those 30 million, namely the people who live on atolls, actually depend on coral reefs for the very land on which they live.<sup>33</sup> Apart from the monetary value of coral, these numbers demonstrate the strong connection between people and coral reefs, and show that, if coral's demise continues, there will be significant impacts on people.

Coral reefs are also critical to the marine environment. Coral reefs provide home, shelter, and food for nearly one quarter of all marine species,<sup>34</sup> including fish, shellfish, fungi, sponges, sea anemones, sea urchins, sea snakes, sea stars, worms, jellyfish, turtles, and snails.<sup>35</sup> It is estimated that, as a result of climate change, around a million species are in danger of extinction.<sup>36</sup> Hence, while the loss of coral itself would be a tragedy, the consequences for the marine environment would be virtually apocalyptic.

#### IV. The Endangered Species Act: Applying Key Sections to Climate Change

The Endangered Species Act ("ESA") was enacted in 1973 to provide for the conservation of endangered or threatened species and their ecosystems.<sup>37</sup> The ESA is considered by some to be the most radical

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MANGROVES AND CORAL REEFS (2006), *available at* [http://www.unep.org/pdf/infrontline\\_06.pdf](http://www.unep.org/pdf/infrontline_06.pdf).

29. HERMAN CESAR, LAURETTA BURKE & LIDA PET-SOEDE, THE ECONOMICS OF WORLDWIDE CORAL REEF DEGRADATION 10 (2003), *available at* <http://assets.panda.org/downloads/cesardegredationreport100203.pdf>.

30. CONSERVATION INTERNATIONAL, ECONOMIC VALUES OF CORAL REEFS, MANGROVES, AND SEAGRASSES: A GLOBAL COMPILATION, 1 (2008), *available at* [http://www.icriforum.org/sites/default/files/Economic\\_values\\_global%20compilation.pdf](http://www.icriforum.org/sites/default/files/Economic_values_global%20compilation.pdf).

31. CESAR, BURKE AND PET-SOEDE, *supra* note 29, at 10.

32. GLOBAL CORAL REEF MONITORING NETWORK, *supra* note 3.

33. *Id.*

34. CESAR, BURKE & PET-SOEDE, *supra* note 29, at 8.

35. ENVIRONMENTAL PROTECTION AGENCY, CORAL REEF BIOLOGICAL CRITERIA: USING THE CLEAN WATER ACT TO PROTECT A NATIONAL TREASURE 2-1 (2010), *available at* [http://www.epa.gov/bioindicators/pdf/EPA-600-R-10-054\\_CoralReefBiologicalCriteria\\_UsingtheCleanWaterActtoProtectaNationalTreasure.pdf](http://www.epa.gov/bioindicators/pdf/EPA-600-R-10-054_CoralReefBiologicalCriteria_UsingtheCleanWaterActtoProtectaNationalTreasure.pdf).

36. Kolbert, *supra* note 2.

37. 16 U.S.C. § 1531 (2010).

environmental law in the United States because it places the conservation of endangered species above most governmental and economic interests. Despite the broad goals of the ESA, climate change does not fit neatly within the statute's parameters. Arguably, the ESA was enacted to address proximate threats to endangered or threatened species, like bulldozers and dams, rather than global, multi-causal issues like climate change.<sup>38</sup> In this section I will explore the provisions of the ESA that could be used to regulate greenhouse gases and I will explain why, because of issues with causation, the ESA does not have the legal muscle to prevent the climate change induced harm to coral reefs.

## **A. Section 4**

### **1. The Listing Process**

The Section 4 listing process is the foundation of the Endangered Species Act. It provides for the listing of an endangered or threatened species and therefore is the basis for species protection under the Act.<sup>39</sup> A species is "endangered" if it "is in danger of extinction throughout all or a significant portion of its range."<sup>40</sup> A species is "threatened" if it "is likely to become an endangered species within the foreseeable future."<sup>41</sup> If a species is found to be "endangered" or "threatened," the agency has a mandatory and non-discretionary duty to list the species.<sup>42</sup>

The listing process only requires a species be listed, not that any action be taken to protect the species. For this reason, it is an area of the ESA in which there has not been a conflict with the climate change issue: pursuant to petitions from the environmental groups, species threatened by climate change have been listed under the ESA. In 2006, NOAA's National Marine Fisheries Service ("NMFS") listed Elkhorn and Staghorn Coral as threatened under the ESA, partially due to threats from climate change.<sup>43</sup> More famously, the Polar Bear was listed as a threatened species in 2008, largely due to the adverse effect of climate change on the Polar Bear's sea-ice habitat.<sup>44</sup> More climate change-threatened species are currently being

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38. Lara Hansen & Christopher R. Pyke, *Climate Change and Federal Environmental Law*, 7 SUSTAINABLE DEV. L. & POL'Y 26 (2007).

39. 16 U.S.C. § 1533 (2010).

40. 16 U.S.C. § 1532(6) (2010).

41. 16 U.S.C. § 1532(20) (2010).

42. TONY SULLINS, *ESA: ENDANGERED SPECIES ACT* at 6 (2001).

43. Final Listing Determinations for Elkhorn Coral and Staghorn Coral, 50 C.F.R. § 223 (2006).

44. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Polar Bear (*Ursus maritimus*) Throughout Its Range, 73 Fed. Reg. 28212 (May 15, 2008).

considered for listing: the Ribbon Seal is currently a “species of concern,” for the NMFS;<sup>45</sup> the Fish and Wildlife Service (“FWS”) recently deemed the Pacific Walrus worthy of ESA protection;<sup>46</sup> and the NMFS is in the process of rulemaking to decide whether eighty-two species of coral also should be covered under the ESA.<sup>47</sup>

## **2. Designation of Critical Habitat**

The ESA requires the designation of “critical habitat” concurrently with the listing of a species.<sup>48</sup> This designation brings a species’ habitat under the protection of Section 7, which requires a consultation process to ensure that any federal actions do not “result in the destruction or modification of habitat of such species.”<sup>49</sup> This critical habitat designation is therefore an integral part of species protection under the ESA.

The ESA defines critical habitat as areas in which physical and biological features essential to the conservation of the species are found or which may require special management considerations or protection.<sup>50</sup> NMFS rules require the agency to “focus on the principal physical and biological constituent elements within the defined area that are essential to the conservation of the species.”<sup>51</sup> Those constituent elements include “roost sites, nesting grounds, spawning sites, feeding sites, seasonal wetland or dryland, water quality or quantity, host species or plant pollinator, geological formation, vegetation type, tide, and specific soil types.”<sup>52</sup> Critical habitat must be designated based on “the best scientific data available.”<sup>53</sup>

The critical habitat designation is the only place in the ESA where the agency has explicit authority to take economic or other impacts into consideration.<sup>54</sup> Section 4(b)(2), states that the Secretary shall designate critical habitat:

After taking into consideration the economic impact, the impact

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45. *Ribbon Seal (Histriophoca fasciata)*, NOAA FISHERIES available at <http://www.nmfs.noaa.gov/pr/species/mammals/pinnipeds/ribbonseal.htm> (last visited Feb. 25, 2012).

46. *Walrus*, U.S. FISH & WILDLIFE SERVICE available at <http://alaska.fws.gov/fisheries/mmm/walrus/esa.htm> (Feb. 10, 2011).

47. *Corals That Are Candidates for Listing Under the ESA*, NOAA NATIONAL MARINE FISHERIES SERVICE, available at <http://www.nmfs.noaa.gov/pr/species/invertebrates/corals.htm> (last visited Feb. 25, 2012).

48. 16 U.S.C. § 1533(a)(3)(A) (2010).

49. 16 U.S.C. § 1536(a)(2).

50. 16 U.S.C. § 1532(5)(A)(i) (2010).

51. Criteria for designating Critical Habitat, 50 C.F.R. § 424.12.

52. *Id.*

53. *Id.*

54. 15 U.S.C. § 1533(b)(2).

on national security, and any other relevant impact, of specifying any particular area as critical habitat. The Secretary may exclude any area from critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he determines, based on the best scientific and commercial data available, that the failure to designate such an area as critical habitat will result in the extinction of the species concerned.<sup>55</sup>

An October 2008 Department of the Interior Solicitor's Memorandum clarified this provision, stating "[i]f, in the absence of designating a particular area, the species would go extinct, but the designation of that area would prevent that extinction, the Secretary must designate the area."<sup>56</sup> In other words, this provision only prevents exclusion of "but for" causes of extinction.<sup>57</sup>

Applying this section to climate-change-threatened coral reefs, Section 4(b)(2) seems to provide a lot of discretion to the agency to exclude critical habitat. The agency can take into consideration economic, national security, and any other relevant impact into consideration when designating critical habitat.<sup>58</sup> If, for example, a critical habitat designation included water temperature or quality, then federal action which "adversely modified" those elements by emitting greenhouse emissions could be subject to the Section 7 consultation process. That consultation process could potentially prevent the federal action from being licensed or otherwise occurring. To prevent this from happening, an agency could exclude the critical habitat under Section 4(b)(2) by arguing that the benefits, economic and otherwise, of excluding the area from critical habitat would outweigh the benefits of designating it. Because climate change is a problem coming from actors all over the world, and greenhouse gases emitted today will affect ocean temperature and acidification of the oceans for decades,<sup>59</sup> it is virtually impossible to prove that the failure to designate critical habitat is a "but for" cause of extinction. Section 4(b)(2) is therefore an escape route for agencies that do not want to manage the sources of climate change, though to date, it has not been used as such.

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55. *Id.*

56. Federico Cheever, *Critical Habitat*, in *Endangered Species Act: Law, Policy, and Perspectives*, 41, 57 (Donald Baur & Robert Irvin eds., 2010).

57. *Id.*

58. 15 U.S.C. § 1533(b)(2).

59. *Future Temperature Changes*, ENVIRONMENTAL PROTECTION AGENCY, available at <http://www.epa.gov/climatechange/science/futuretc.html#ref> (last visited Feb. 25, 2012).

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### 3. Section 4(d) Special Rules

Section 4(d) requires that when a species is listed as a threatened species, “the Secretary shall issue such regulations as he deems necessary and advisable to provide for the conservation of such species.”<sup>60</sup> The broad language in this section grants the agency discretion to reduce protection for a threatened species by eliminating application of the “take” prohibitions of Section 9, discussed below, to the threatened species.<sup>61</sup> For example, the NMFS crafted a special 4(d) rule for Salmon and Steelhead, which permits certain types of “takes” of the fish, without triggering the ESA.<sup>62</sup> In the context of climate change, the ability to craft 4(d) special rules provides the agency the regulatory flexibility to essentially preclude greenhouse gas emissions from being considered a “take” of the given species.<sup>63</sup> This has already been the case with the Polar Bear, which, discussed in Section 7 below, the Fish & Wildlife Service issued a special 4(d) rule removing the sources of climate change from the purview of Section 9.<sup>64</sup> For coral reefs, this 4(d) exception means that the NMFS could, if it wanted, make Section 9 inapplicable with regards to climate change, at least until some species of coral gain “endangered” status.

#### B. The Section 7 Consultation Process

Section 7 of the Endangered Species Act requires federal agencies to ensure that their actions are “not likely to jeopardize the continued existence” of a listed species or result in the “destruction or adverse modification” of critical habitat.<sup>65</sup> If a federal action is likely to jeopardize a species or adversely modify critical habitat, the agency must engage in a consultation process whereby the agency produces a biological opinion.<sup>66</sup> That biological opinion details the effect of the proposed action on the species or critical habitat, and determines whether the federal action can proceed.<sup>67</sup> If the action cannot proceed, the biological opinion suggests

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60. 15 U.S.C. § 1533(d).

61. J.B. Ruhl, *Climate Change and the Endangered Species Act: Building Bridges to the No-Analog Future*, 88 B.U.L. REV. 1, 32 (2008).

62. ESA 4(D) Rules (Protective Regulations), NOAA NATIONAL MARINE FISHERIES SERVICE, <http://www.nwr.noaa.gov/ESA-Salmon-Regulations-Permits/4d-Rules/> (last visited Feb. 25, 2012).

63. Ruhl, *supra* note 60, at 34.

64. Brendan R. Cummings & Kassie R. Siegel, *Biodiversity, Global Warming, and the United States Endangered Species Act: The Role of Domestic Wildlife Law in Addressing Greenhouse Gas Emissions*, in *Adjudicating Climate Change: State, National, and International Approaches* 145, 171 (William C.G. Burns & Hari M. Osofsky eds., 2009).

65. 16 U.S.C. § 1536(a)(2) (2010).

66. 16 U.S.C. § 1536(c).

67. *Id.*

reasonable and prudent alternatives that would be less harmful.<sup>68</sup>

Agency “action” in Section 7 is defined as “all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States.”<sup>69</sup> Examples of “action” include the granting of licenses and permits and “actions directly or indirectly causing modifications to the land, water, or air.”<sup>70</sup> Because greenhouse gases “directly or indirectly cause modifications to the land, water, or air,”<sup>71</sup> there is a strong argument that they fit under Section 7.

Still, recent correspondence between the EPA and NMFS suggests an understanding that the sources of carbon emissions are not subject to Section 7.<sup>72</sup> The NMFS is required to see if its actions “may affect listed species or critical habitat.”<sup>73</sup> In an August 2010 letter between the EPA and the NMFS, the NMFS said that agency action that emits carbon does not meet this “may affect” standard and therefore not trigger Section 7.<sup>74</sup> In that letter, the NMFS is responding to an EPA study that examined the impact of a coal-fired power plant on global warming.<sup>75</sup> That study suggested that any increase in temperature from the hypothetical power plant would occur approximately fifty years after the facility began emitting and would only correspond to 0.01 percent of the global temperature increase over that period.<sup>76</sup> In other words, the study suggested that any impact of a proposed federal action on global warming would be remote.<sup>77</sup>

In responding to the EPA study, the NMFS refers to a recent Ninth Circuit case, *Ground Zero Center for Non-Violent Action v. U.S. Department of the Navy*,<sup>78</sup> to support its position that Section 7 consultations are not required in the case of proposed actions that may emit greenhouse gases.<sup>79</sup> In that case, the Navy failed to consult with the NMFS on the potential impact of an

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68. 16 U.S.C. § 1536(b)(3)(A).

69. 50 C.F.R. § 402.02 (1998).

70. *Id.*

71. *Id.*

72. Letter from James Lecky, Director, Office of Protected Resources, National Oceanic and Atmospheric Administration’ Marine Fisheries Service, to Robert J. Meyers, Principal Deputy Assistant Administrator, Office of Air and Radiation, Environmental Protection Agency (Oct. 10, 2008), available at [http://peer.org/docs/noaa/08\\_14\\_10\\_noaa\\_ltr.pdf](http://peer.org/docs/noaa/08_14_10_noaa_ltr.pdf).

73. 50 C.F.R. § 402.14

74. Letter from James Lecky to Robert J. Meyers, *supra* note 72.

75. *Id.*

76. Letter from James Lecky to Robert J. Meyers, *supra* note 72.

77. *Id.*

78. 383 F.3d 1082 (2004).

79. Letter from James Lecky to Robert J. Meyers, *supra* note 72.

accidental missile explosion on two threatened salmon species.<sup>80</sup> The court held that, where the risk of jeopardy or adverse modification of habitat is remote, that Section 7 consultations do not apply.<sup>81</sup> Hence, the NMFS is likely to cite this case when any proposed federal actions that emits greenhouse gases are challenged on the grounds that it jeopardizes or adversely modifies critical habitat. Unfortunately, unless the courts hold otherwise, federal action that emits greenhouse gases will not be required to go through the Section 7 consultation because of the remote impact on climate change.<sup>82</sup>

### C. Section 9: The “Take” Provisions

Section 9 of the ESA establishes a broad prohibition against harming or killing listed species.<sup>83</sup> Specifically, Section 9 makes it illegal for any person in the United States to “take” any endangered species.<sup>84</sup> The ESA defines “take” as “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.”<sup>85</sup> “Harm” has been defined by the NMFS agency regulations as an act that “actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including, breeding, spawning, rearing, migrating, feeding, or sheltering.”<sup>86</sup>

The NFMS definition of harm has not yet been subject to judicial interpretation.<sup>87</sup> The almost identical FWS definition of harm, however, was reviewed in *Babbitt v. Sweet Home Chapter of Communities for a Great Oregon*.<sup>88</sup> In that case, groups dependent on the forest product industry brought a facial challenge to the rule, alleging that Congress did not intend “take” to encompass all modification or degradation of habitat, but only to direct application of force against the taken species.<sup>89</sup> Justice Stevens, writing for the majority, upheld the definition of “harm” to include habitat modification or degradation but limited its application to cases where actual death or injury of a protected animals occurs and where the plaintiff can prove that

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80. 383 F.3d at 1092.

81. *Id.*

82. Letter from James Lecky to Robert J. Meyers, *supra* note 72.

83. 16 U.S.C. § 1538(a) (2010); 16 U.S.C. § 1532(19) (2010).

84. 16 U.S.C. § 1538(a); 16 U.S.C. § 1532(19).

85. *Id.*

86. 50 C.F.R. § 222.102.

87. Steven P. Quarles & Thomas R. Lundquist, *The Endangered Species Act: Species, Projects, and Statute at Risk*, AMERICAN LEGAL INSTITUTE - AMERICAN BAR ASSOCIATION CONTINUING LEGAL EDUCATION (Nov. 5-6, 2009), SR021 ALI-ABA 169.

88. 115 S. Ct. 2407 (1995).

89. *Id.* at 2410.

the challenged action is a proximate cause of that injury or death.<sup>90</sup>

Thus, in order for Section 9 to apply to an action that emits greenhouse gases, that action must be a proximate cause of harm to the listed species or its habitat. This is a critical barrier to bringing a “take” claims against the sources of greenhouse gases that indirectly harm coral reefs. Still, not all sources of greenhouse gas emissions would be excluded: major federal actions that have a substantial effect on climate change could theoretically be enjoined under Section 9.<sup>91</sup> *Massachusetts v. EPA*<sup>92</sup> provides some guidance into what sort of action would meet these hurdles in the context of global warming litigation. In that case the Supreme Court addressed the question of whether the EPA’s failure to regulate greenhouse gases from new motor vehicles provided a sufficient basis of causation to confer standing to plaintiffs who alleged a variety of harms based on the effects of climate change.<sup>93</sup> The majority in that case found that the failure to regulate, which allegedly contributed to six percent of yearly global emissions, was substantial enough to confer standing.<sup>94</sup> While *Massachusetts v. EPA* did not discuss the Endangered Species Act, the six percent of yearly global emissions that was sufficient in that case to establish standing does provide a starting point for the type of action that, in theory, may meet the “proximate cause” requirement of Section 9.<sup>95</sup> In other words, the few federal actions that cause the emission of very large quantities of greenhouse gases might permit an environmental group to make a successful claim for a “take.” Otherwise, the many smaller sources of greenhouse gas emissions (and coral death) are outside the purview of Section 9.

## **V. Case Study: Elkhorn and Staghorn Coral and Critical Habitat**

On May 9, 2006, two species of coral were listed under the Endangered Species Act: elkhorn coral (*Acropora palmata*) and staghorn coral (*Acropora cervicornis*).<sup>96</sup> These Caribbean corals are found in U.S. waters off Florida, the U.S. Virgin Islands, and Puerto Rico.<sup>97</sup> Prior to the 1980s, *Acropora* corals were the most abundant and important coral reefs in the Caribbean; today,

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90. *Id.* at 2412-2413.

91. Matthew Gerhart, *Climate Change and the Endangered Species Act: The Difficulty of Proving Causation*, 36 *ECOLOGY L.Q.* 167, 184 (2009).

92. 549 U.S. 497 (2007).

93. *Id.* at 526.

94. *Id.*

95. *Id.*

96. Final Listing Determinations for Elkhorn Coral and Staghorn Coral, 50 C.F.R. § 223 (2006).

97. Critical Habitat for Threatened Elkhorn and Staghorn Corals, 50 C.F.R. §§ 223, 226 (2008).

the corals have suffered a 90 percent decline throughout their range.<sup>98</sup> Climate change, along with disease, is to blame for the collapse of *Acropora* populations: these corals need very specific water temperatures to survive, so they are extremely vulnerable to bleaching when temperature rises, and ocean acidification impedes their ability to grow.<sup>99</sup> These corals have gone from “the most visible and ecologically most important coral of Caribbean reefs, a position they have held for at least 3,000 years, to species whose continued existence beyond the next few decades is now in serious doubt.”<sup>100</sup>

The NMFS listed the *Acropora* corals as “threatened” under the ESA.<sup>101</sup> This “threatened” status means that Section 9’s “take” prohibitions do not apply to the *Acropora* corals.<sup>102</sup> Unlike the Fish & Wildlife Service, who automatically apply Section 9 to threatened species, the NMFS presumes that Section 9 does not apply to threatened species unless a specific 4(d) rule is made to apply those prohibitions to the species.<sup>103</sup> NMFS declined to promulgate a 4(d) rule. Section 7, however, which requires that federal agencies make sure their actions do not “jeopardize the continued existence” of these corals, does apply.<sup>104</sup>

The critical habitat designation for these corals has been a source of controversy: the NMFS designated 2,959 acres of critical habitat for the corals, but did not identify water quality or temperature as primary constituent elements in that designation.<sup>105</sup> When determining critical habitat, NMFS rules require the agency to “focus on the principal physical and biological constituent elements within the defined area that are essential to the conservation of the species.”<sup>106</sup> Those constituent elements include “roost sites, nesting grounds, spawning sites, feeding sites, seasonal wetland or dryland, *water quality or quantity*, hot species or plant pollinator, geological formation, vegetation type, tide, and specific soil types.”<sup>107</sup> The sole “primary constituent element” listed by the agency is coral substrate, or “consolidated hardbottom or dead coral skeleton that is free from micro algae cover and sediment cover, occurring in water depths from the mean

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98. Cummings, *supra* note 64, at 151.

99. *Id.*

100. *Id.*

101. 50 C.F.R. § 223.208.

102. Cummings, *supra* note 64.

103. *Id.*

104. 16 U.S.C. § 1536(a)(2).

105. 50 C.F.R. §§ 223, 226 (2008).

106. Criteria for designating Critical Habitat, 50 C.F.R. § 424.12.

107. *Id.* (emphasis added).

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high water line to thirty meters.”<sup>108</sup>

The Center for Biological Diversity is in the process of suing NMFS under the ESA’s citizen suit provision,<sup>109</sup> on the basis that it did not rely on the “best available science” when it failed to include water temperature and quality in the designation of critical habitat, and therefore acted arbitrarily and capriciously.<sup>110</sup> In a “Frequently Asked Questions” bulletin published by the NMFS, the agency addressed these concerns, writing that, “NOAA Fisheries Service determined that increased water temperature and ocean acidity are more appropriately viewed as sources of impacts that can harm the corals directly. Therefore, impacts from these stressors will be analyzed through the jeopardy analysis of ESA section 7.”<sup>111</sup>

Still, recent case law seems to suggest that the Center for Biodiversity may have a legitimate argument that the failure to identify essential elements in the critical habitat designation is a violation of the ESA. In *Home Builders Assn. of Northern California v. U.S. Fish & Wildlife Service*, the plaintiff contested designation of critical habitat for the threatened Alameda Whipsnake, claiming that the FWS failed to identify the physical or biological features in the critical habitat that are essential to the species.<sup>112</sup> The court found that, as a matter of law, the FWS must determine what physical or biological features are essential to the conservation of the species, and that these constituent elements must be listed with the critical habitat description.<sup>113</sup> The FWS did identify some elements essential to the Whipsnake, like “plant canopy covers that supply a suitable range of temperatures of the species,” but the court found this inadequate because it did not “explain what such a suitable range or temperatures would actually be.”<sup>114</sup> Because the FWS failed to identify the essential elements in meaningful way, the critical habitat designation was held to be in violation of the ESA.<sup>115</sup>

Another case, *NRDC v. Kempthorne*, suggests that a court may rebuke an agency where it fails to take climate change into consideration when making

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108. Marta Nammack, NOAA Fisheries and ESA Endangered Species Act Listing Process for 82 Species of Coral, NATIONAL MARINE FISHERIES SERVICE (Feb. 24, 2010), available at [http://www.coralreef.gov/meeting23/pdf/nammack\\_dc\\_2010.pdf](http://www.coralreef.gov/meeting23/pdf/nammack_dc_2010.pdf).

109. 16 U.S.C. § 1540 (2010).

110. Notice of Intent to Sue from Miyoko Sakashita, The Center for Biological Diversity, to Carlos M. Gutierrez, U.S. Dept. of Commerce, and Dr. James W. Balsiger, Acting Assistant Administrator of Fisheries (Nov. 25, 2008) (on file with author).

111. *Critical Habitat Designations for Elkhorn and Staghorn Coral: Frequently Asked Questions*, NOAA FISHERIES SERVICE, available at <http://sero.nmfs.noaa.gov/pr/pdf/AcroporaFinalCHFAQs.pdf> (last visited Feb. 25, 2012).

112. 268 F.Supp.2d 1197, 1209 (2003).

113. *Id.* at 1211.

114. *Home Builders Ass’n.*, 286 F.Supp.2d at 1213.

115. *Id.* at 1214.

decisions about species that are affected by climate change.<sup>116</sup> In that case, federal water projects in the Sacramento-San Joaquin Valley threatened the habitat of the Delta Smelt, a species listed as threatened under the ESA and which lives in the delta.<sup>117</sup> The plaintiff environmental group argued that the FWS ignored data about climate change in its biological opinion (“BiOp”).<sup>118</sup> The FWS responded that it did not discuss climate change in the BiOp because of its uncertainty about the effects of climate change on the Smelt.<sup>119</sup> The court found this argument unpersuasive and held that, by not meaningfully discussing climate change, the FWS failed to “consider an important aspect of the problem,” and the agency acted arbitrarily and capriciously.<sup>120</sup>

Applying these principles to the case at hand, a strong argument could be made that the NMFS critical habitat designation for the coral is inadequate. In *Home Builders Assn.*, the court said that even though the FWS had identified essential elements to the species, the failure to describe these elements with specificity rendered the critical habitat designation a violation of the ESA.<sup>121</sup> In the case at hand, the critical habitat designation is even more deficient: The agency entirely omitted water quality and temperature from the critical habitat designation, despite the fact that the agency is explicitly directed to “focus on”<sup>122</sup> these elements. Furthermore, in light of *Kempthorne*, the Center for Biological Diversity has a legitimate argument that the agency failed to employ the “best available science” and failed to adequately consider climate change, which is obviously an “important aspect” of the Acropora corals’ designation.

Still, even if a court found the NMFS critical habitat designation in violation of the ESA, the designation would likely be remanded to the agency, and then the NMFS could make an argument that water temperature and quality can be excluded under section 4(b)(2). This section, discussed in section four of this Note, allows the NMFS to take into account economic or otherwise relevant impacts when designating critical habitat and the Secretary can exclude areas from critical habitat if the benefits of excluding the area outweigh the benefits of designating the area, unless the exclusion will result in the extinction of the species.<sup>123</sup> Because coral reefs are threatened by climate change, the failure to designate critical habitat itself would not be a “but for” cause of extinction of the species and therefore

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116. 506 F.Supp.2d 322, 367 (2007).

117. *Id.* at 328-29.

118. *Id.* at 367.

119. *Id.* at 368.

120. *Id.* at 370.

121. *Home Builders Ass’n.*, 286 F. Supp. 2d at 1214.

122. Criteria for designating Critical Habitat, 50 C.F.R. § 424.12.

123. 15 U.S.C. § 1533.

critical habitat could be excluded at the discretion of the agency. This argument, however, is unlikely to persuade a court, because section 4(b)(2) applies to critical habitat itself, and does not extend to the listing of primary constituent elements.<sup>124</sup>

Even if the Center for Biological Diversity were to succeed in getting the NMFS to identify these elements as primary constituent elements, it would ultimately bring those elements within the purview of the Section 7 consultation process. As discussed above, recent case law by the Ninth Circuit indicates that Section 7 consultations are not triggered where the effect of a proposed action on critical habitat is remote.<sup>125</sup> So unless the federal action being challenged significantly contributes to climate change, it is unlikely the critical habitat designation will result in a reduction of greenhouse gas emissions or protect coral from climate change.

## **VI. Lessons from the Polar Bear**

A discussion of the ESA and climate change would thus be incomplete without looking to the listing of the Polar Bear for guidance. The Polar Bear's ESA listing under the ESA has seen far more litigation, and received significantly more public attention, than the listing of the Acropora corals.

Along with coral reefs, climate change is likely causing the slow extinction of the Polar Bear.<sup>126</sup> This is happening primarily as a result of warmer temperatures breaking up Arctic sea-ice early in the season, reducing the Polar Bears feeding and mating cycles.<sup>127</sup> The result is thinner bears, lower reproductive rates, higher mortality of juvenile bears, and ultimately a smaller Polar Bear population.<sup>128</sup>

In response to the threats, the Polar Bear was listed as "threatened" under the ESA in May 2008.<sup>129</sup> In December 2008, the Fish & Wildlife Service promulgated a special 4(d) rule for the Polar Bear;<sup>130</sup> a 4(d) rule can "relax the normal ESA restrictions to reduce conflicts between people and the protections provided to the threatened species by the ESA."<sup>131</sup> The 4(d) rule for the Polar Bear does just that, by exempting greenhouse gas emissions

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124. Email from Miyoko Sakashita, Center for Biological Diversity to author, Dec. 14, 2010 (on file with author).

125. *Ground Zero Ctr. for Non-Violent Action v. U.S. Dept. of Navy*, 383 F.3d 1082 (9th Cir. 2004).

126. Cummings, *supra* note 64.

127. *Id.*

128. *Id.*

129. *Id.*

130. *Id.*

131. *Little Known But Important Features of the Endangered Species Act*, U.S. FISH & WILDLIFE SERVICE, available at <http://www.fws.gov/pacific/news/grizzly/esafacts.htm> (last visited Feb. 25, 2012).

from Section 9's "take" provisions. In other words, emissions of greenhouse gases are explicitly beyond the reach of the ESA Section 9, despite the "harm" they cause to the Polar Bear.

In a further denial of environmentalists' hopes that the Polar Bear listing would actually protect the species from extinction, the Bush Administration revised regulations under Section 7 to explicitly remove greenhouse gas emissions from Section 7's consultation process.<sup>132</sup> The Obama Administration rescinded these regulations upon taking office, and Section 7 therefore applies to the Polar Bear today.<sup>133</sup> While this seemed to have indicated an Administration in tune with environmental concerns, Secretary of the Interior Ken Salazar retained the 4(d) rule for the Polar Bear.<sup>134</sup> In a press release from the Interior Department, Salazar stated, "the Endangered Species Act is not the proper mechanism for controlling our nation's carbon emissions."<sup>135</sup> He further commented on his — and the Administration's — commitment to fighting climate change,<sup>136</sup> but the message is clear: even a Democratic administration will not allow the Endangered Species Act to be used to fight climate change.

Unsurprisingly, environmental groups are unwilling to refrain from trying to make sure every tool at their disposal is used to save the Polar Bear. The Center for Biological Diversity, along with other environmental groups, recently pursued litigation in an effort to eliminate the 4(d) rule.<sup>137</sup> The groups filed suit against the FWS to try to force the FWS to upgrade the Polar Bear's status from "threatened" to "endangered," which would eliminate the 4(d) rule because Section 9 applies to all "endangered" species and thus provide further protection to the Polar Bear.<sup>138</sup> In November 2010, a U.S. District Judge Emmet Sullivan rejected the Department of the Interior's contention that extinction must be "imminent" in order for a species to be "endangered," rather than "threatened," and he ordered the FWS to reconsider.<sup>139</sup> But in December 2010, Secretary Salazar filed a

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132. Quarles & Lundquist, *supra* note 86, at 178-82.

133. *Id.* at 184.

134. *Id.* (citing *Salazar Retains Conservation Rule for Polar Bears*, U.S. FISH & WILDLIFE SERVICE (May 8, 2009), available at <http://www.fws.gov/news/NewsReleases/showNews.cfm?newsId=20FB90B6-A188-DB01-04788E0892D91701>).

135. Quarles & Lundquist, *supra* note 86, at 184 (citing *Salazar Retains Conservation Rule for Polar Bears*, U.S. FISH & WILDLIFE SERVICE (May 8, 2009), available at <http://www.fws.gov/news/NewsReleases/showNews.cfm?newsId=20FB90B6-A188-DB01-04788E0892D91701>).

136. *Id.*

137. *Ruling Offers Polar Bears New Chance at Full Protection*, CENTER FOR BIOLOGICAL DIVERSITY (Nov. 4, 2010), [http://www.biologicaldiversity.org/news/press\\_releases/2010/polar-bear-11-04-2010.html](http://www.biologicaldiversity.org/news/press_releases/2010/polar-bear-11-04-2010.html).

138. *Id.*

139. *Id.*

response that the FWS would not upgrade the bear's status.<sup>140</sup> In February 2011 the parties went back to court, and Judge Sullivan was reluctant to remand the Polar Bear's status, citing deference to agency expertise and rejecting the Center for Biological Diversity's contention that the FWS did not rely on the "best available science" when it failed to list the Polar Bear as "endangered."<sup>141</sup> In more recent litigation, the Center for Biological Diversity filed a motion for summary judgment on the 4(d) rule, alleging that the FWS "purposely and unlawfully crafted its Special Rule in such a way as to avoid addressing this threat, in contravention of the ESA's conservation mandate."<sup>142</sup> Judge Sullivan, though sympathetic to conservation groups, denied the motion for summary judgment and wrote:

"[t]he question at the heart of this litigation – whether the ESA is an effective or appropriate tool to address the threat of climate change – is not a question that this Court can decide based upon its own independent assessment, particularly in the abstract. The answer to that question will ultimately be grounded in science and policy determinations that are beyond the purview of this Court."<sup>143</sup>

Judge Sullivan's statement illustrates the landscape under which those who wish to protect coral reefs and polar bears are operating. Judges do not feel that they are the right players to be making national energy policy, and make decisions based on that instinct. At the same time, government agencies are doing everything in their power to refrain from using the ESA to regulate climate change because they know that doing so would render the ESA and the regulating agency political targets.<sup>144</sup> Meanwhile, the sea ice continues to recede for the Polar Bear: The U.S Geological Survey in Alaska tracked a female Polar Bear who swam nine days in frigid water before reaching an ice flow 426 miles offshore.<sup>145</sup> The bear lost 22 percent of her

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140. *Feds Deny Polar Bear Endangered Status*, NATIONAL WILDLIFE FEDERATION (Dec. 23, 2010), <http://www.nwf.org/News-and-Magazines/Media-Center/News-by-Topic/Wildlife/2010/12-23-10-Feds-Deny-Polar-Bears-Endangered-Status.aspx>.

141. Lawrence Hurley, *Judge Skeptical About Remanding Polar Bear Case to Obama Admin*, N.Y. TIMES, Feb. 23, 2011, available at <http://www.nytimes.com/gwire/2011/02/23/23greenwire-judge-skeptical-about-remanding-polar-bear-cas-71783.html>.

142. *In re Polar Bear Endangered Species Act Listing and § 4(d) Rule Litigation* from *Center for Biological Diversity v. Salazar*, No. 09-0764, Memorandum Op. at 3, (D.C. Circuit Oct. 17, 2011).

143. *Id.* at 40.

144. Hurley, *supra* note 141.

145. Kim Murhy, *Polar Bear's Long Swim Illustrates Ice Melt*, LOS ANGELES TIMES, Jan. 29, 2011, available at <http://articles.latimes.com/2011/jan/29/nation/la-na-polar-bears-20110129>.

body fat, as well as her one-year-old cub during the journey.<sup>146</sup> Even though coral reefs are indisputably more important for biological diversity than the Polar Bear, if images of drowning Polar Bears are not persuading judges or agencies to act on climate change, even the least cynical person would agree that an image of a decaying coral reef will not either.

## VII. Other Federal Environmental Laws and Climate Change

Even if the Endangered Species Act is not the silver bullet that saves coral reefs from extinction, other federal laws are also beginning to be used to address climate change. Given that greenhouse gas emissions exist in the air, the Clean Air Act is the most obvious place to look in addressing climate change. In *Massachusetts v. EPA*, the Supreme Court ruled that greenhouse gas emissions fit within the Clean Air Act's definition of "air pollutant," and therefore could be regulated.<sup>147</sup> Following that decision, the EPA promulgated a rule setting emissions standards for light-duty motor vehicles in April 2010.<sup>148</sup> In May 2010, the EPA announced greenhouse gas emission regulations for stationary sources.<sup>149</sup> The Clean Water Act is another federal statute being used to address climate change. The EPA settled a lawsuit in 2010 with the Center for Biological Diversity over whether Washington State's coastal waters should be considered "impaired" for their level of marine pH for the purposes of Section 303 of the Clean Water Act.<sup>150</sup> The case resulted in the issuance of a memorandum by the EPA on November 15, 2010, which urged coastal states and territories to seriously consider ocean acidification while monitoring activities under the CWA.<sup>151</sup> This memorandum, however, is of only limited value for coral reefs because it merely urges states to consider ocean acidification, rather than mandating it.<sup>152</sup> Nevertheless, one should be optimistic at this news: by establishing that ocean acidification should be considered under the CWA, the EPA has opened a door for litigation and potential regulation of the causes of ocean acidification.

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146. *Id.*

147. 549 U.S. 497, 528 (2007).

148. Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, 40 C.F.R. § 85 (2010).

149. Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 40 C.F.R. § 51 (2010).

150. *Questions and Answers on Ocean Acidification and the Clean Water Act 303(d) Program 2*, ENVIRONMENTAL PROTECTION AGENCY (Nov. 15, 2010), available at [http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/upload/qa\\_oa\\_memo\\_nov2010.pdf](http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/upload/qa_oa_memo_nov2010.pdf).

151. Memorandum from Denise Keehner, Dir., Office of Wetlands, Oceans and Watersheds, Environmental Protection Agency to Water Division Directions, Regions 1-10 (Nov. 15, 2010), [http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/upload/oa\\_memo\\_nov2010.pdf](http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/upload/oa_memo_nov2010.pdf).

152. *Id.*

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## VIII. Conclusion

The Endangered Species Act alone has limited power to protect coral reefs from the effects of climate change. While several sections of the ESA look promising at first glance, they do not in fact provide substantive protection to coral reefs. The critical habitat provision of Section 4 permits exclusion of critical habitat for any reason unless it is a “but for” cause of extinction. Section 7 does not seem to apply to situations where the cause of jeopardy or adverse modification of habitat is remote. Finally, Section 9 requires proximate causation for it to apply. In effect, the ESA needs clear causal connections between greenhouse gas emissions and harm to coral reefs, and clear causal connections simply do not exist in a problem as global and multi-causal as climate change. For this reason, it looks like other federal environmental laws, for the time being, will be more effective in addressing climate change. In the future, if technology is developed which would allow harm to coral reefs to be traced back to a specific source of greenhouse emissions, the ESA will be a powerful tool. By the time that date comes, however, it may already be too late for the world’s coral.

There is, however, another flaw in the ESA that makes it unlikely to save species from climate change. In essence, the statute only comes into effect in times of crisis. As demonstrated by the Polar Bear, a species must be “endangered” for the full protection of the ESA to apply. Unfortunately, by the time a species is “endangered,” any regulation of greenhouse emissions as a result of the “endangered” status would not save that species, because climate change would persist decades or even centuries beyond the date of regulation. Even if the ESA were ever to become *the* tool to solve climate change, Congress would probably amend the statute to explicitly exclude greenhouse gases from the purview of the ESA. In the absence of Congress limiting the statute, however, the language of the ESA is so powerful that the statute will continue to be used by environmental groups to put pressure on government agencies to address the issue. At the time of writing, the NMFS failed to meet its deadline in listing 82 species of climate change-threatened corals under the Act, and the Center for Biological Diversity is preparing to sue the agency.<sup>153</sup> Until climate change is addressed holistically, litigation and debate over whether the ESA is the appropriate place to combat greenhouse gas emissions will continue indefinitely.

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153. *Lawsuit Seeks Protection for 82 Corals Facing Extinction*, CENTER FOR BIOLOGICAL DIVERSITY (Jan. 25, 2011), available at [http://www.biologicaldiversity.org/news/press\\_releases/2011/corals-01-25-2011.html](http://www.biologicaldiversity.org/news/press_releases/2011/corals-01-25-2011.html).

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