CENTER for BIOLOGICAL DIVERSITY Because life is good.

October 26, 2021

Via submission to Regulations.gov

National Highway Traffic Safety Administration
United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

ATTN: DOCKET NO. NHTSA-2021-0053

RE: ENDANGERED SPECIES ACT COMPLIANCE WITH RESPECT TO CORPORATE AVERAGE FUEL ECONOMY STANDARDS FOR MODEL YEARS 2024-2026 PASSENGER CARS AND LIGHT TRUCKS, 86 FED. REG. 49, 602

The Center for Biological Diversity ("Center") appreciates the opportunity to submit this letter on the National Highway Traffic Safety Administration's ("NHTSA") proposed Corporate Average Fuel Economy Standards for Model Years 2024-2026 Passenger Cars and Light Trucks (hereinafter, the "Rule"). Should NHTSA finalize the Rule, the Center urges you to undertake interagency consultation as required pursuant to Section 7 of the Endangered Species Act, 16 U.S.C. §§ 1531-44 ("ESA") ("Section 7 consultation"). Because the Rule will have an appreciable, cumulative impact on climate-threatened species as wells as species susceptible to criteria air pollution, NHTSA must consult with both the National Marine Fisheries Service and the U.S. Fish and Wildlife Service (collectively the "Services").[1] NHTSA's failure to undertake such consultation would violate both the procedural requirements of Section 7(a)(2) of the ESA as well as NHTSA's substantive duty to ensure against jeopardy of federally-listed species and the adverse modification of their habitats.

As explained below, while NHTSA's Rule reduces the total amount of greenhouse gas and other emissions that would have been emitted under the previous administration's Safer Affordable Fuel Efficient ("SAFE") Vehicles Rule, NHTSA's decision to finalize *this* Rule will nonetheless allow cars and light trucks to emit millions of metric tons of greenhouse gases and tens of thousands of tons of criteria pollutants. The impacts may be somewhat less harmful than

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[1] In *Massachusetts v. EPA*, the Supreme Court found that U.S. vehicle emissions represented a "meaningful contribution" to global emissions, and even addressing a fraction of these emissions was sufficient for standing purposes and requires EPA to take action. *Massachusetts v. EPA*, 549 US 497 (2007).

those under the SAFE Rule, but they still exist. And by undergoing consultation under the ESA, NHTSA could make discretionary decisions—such as regarding stringency levels and uses of credits and other flexibilities—that mitigate these effects. Consultation is also consistent with President Biden's "whole of government" approach to addressing the climate crisis, as well as Executive Order 13990, which states that all federal agencies "must be guided by the best science and be protected by processes that ensure the integrity of Federal decision-making."

I. LEGAL BACKGROUND ON THE ENDANGERED SPECIES ACT

Congress enacted the Endangered Species Act, 16 U.S.C. §§ 1531-44 ("ESA"), in response to growing concern over the extinction of plants, fish, and wildlife,[2] and recognized that certain species "have been so depleted in numbers that they are in danger of or threatened with extinction."[3] To that end, one primary purpose of the ESA is "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 . . . species."[4] According to the U.S. Supreme Court, in passing the ESA, Congress made a deliberate choice "to give endangered species priority over the 'primary missions' of federal agencies."[5] Accordingly, Section 2(c) of the ESA establishes that it is "the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act."[6] The ESA defines "conservation" to mean "the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary."[7] Even with a global threat to biodiversity such as climate change, "the plain intent of Congress in enacting this statute was to halt and reverse the trend toward species extinction, *whatever the cost*."[8]

To reach these goals, Section 7(a)(2) of the ESA requires federal agencies 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 [the critical] habitat of such species."[9] "Action" is broadly defined to include "all activities or programs of any kind authorized, funded, or carried out, in whole or in part" by federal agencies and includes conservation measures, granting permits and licenses, as well as actions that may directly or indirectly cause modifications to the land, water, or *air*.[10]

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[2] 16 U.S.C. § 1531(a)(1).
[3] *Id*. § 1531(a)(2).
[4] *Id*. § 1531(b).
[5] *Tenn. Valley Authority v. Hill* ("*TVA*"), 437 U.S. 153, 185 (1978) (emphasis added).
[6] 16 U.S.C. § 1531(c)(1).
[7] *Id*. § 1532(3).
[8] *TVA*, 437 U.S. at 184.
[9] *Id*. § 1536(a)(2); 50 C.F.R. § 402.14(a).
[10] 50 C.F.R. § 402.02.

While many of the ESA's provisions work to effectuate the conservation goals of the statute, the "heart of the ESA" is the interagency consultation requirements of Section 7 of the ESA.[11] At the first step of the consultation process, the "agency shall conduct a biological assessment" to identify species likely to be affected.[12] If the agency determines that an action *may affect* a species—even if the effect is small, indirect, or the result of cumulative actions—it must formally consult with the Services.[13] However, if the agency determines, after a biological assessment or through informal consultation with the Services, that the proposed action *may affect*, but is *not likely to adversely affect*, any listed species or habitat,[14] then it must obtain the written concurrence of the Services, and no further consultation is required.[15] In making these "effects determinations," agencies must use the "best scientific and commercial data available."[16]

The only exception to the consultation requirement for a discretionary federal action is if the agency concludes its action will have *no effect* on listed species or critical habitat.[17] The "inability to 'attribute[]' environmental harms 'with reasonable certainty' to [the action]. . . is not the same as a finding that [it] 'will not affect' or 'is not likely to adversely affect' listed species or critical habitat," and does not absolve the agency of its the duty to consult.[18]

Under the formal consultation process, if the Services find that the action will jeopardize a species or result in the destruction or adverse modification of critical habitat, they must identify "reasonable and prudent alternatives" for the action that comply with Section 7.[19] If the action will not result in jeopardy, the Services will still provide the action agency with a biological opinion, evaluating how the proposed action will affect listed species or habitat and recommending "reasonable and prudent measures" necessary to avoid jeopardy, as well as an "incidental take statement," which provides the action agency legal coverage for take that is unavoidable.[20] Thus, "because the procedural requirements [i.e., consultation] are designed to ensure compliance with the substantive provisions," "the strict substantive provisions of the ESA justify *more* stringent enforcement of its procedural requirements."[21]

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[11] *Western Watersheds Project v. Kraayenbrink*, 632 F.3d 472, 495 (9th Cir. 2011); 16 U.S.C. § 1536.
[12] 16 U.S.C. § 1536(c)(1).
[13] 50 C.F.R. §§ 402.02, 402.14(a), (g).
[14] A finding that the action "may affect" but is "not likely to adversely affect" means all effects are expected to be "discountable, insignificant, or completely beneficial." *Id.* at xv, 3-12, 3-13.
[15] 16 U.S.C. § 1536(c); 50 C.F.R. §§ 402.13(a), 402.14(b)(1).
[16] 16 U.S.C. §§ 1536(a)(2), (c)(1).
[17] 50 C.F.R § 402.14(b); *Am. Fuel*, 937 F.3d at 597. However, NHTSA is still encouraged to obtain written concurrence from the Services. *See* U.S. Fish &Wildlife Service National Marine Fisheries Service, *Endangered Species Consultation Handbook Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act* (1998), [hereinafter ESA Consultation Handbook] at B-55, and definitions of "Formal consultation" and "Informal consultation" at xiv, xv, *available at* https://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf.
[18] *Am. Fuel Mfrs.*, 937 F.3d at 597-598 (D.C. Cir. 2019) ("the EPA concluded that it is impossible to know whether the 2018 [Renewable Fuels Program] Rule will affect listed species or critical habitat. That is not the same as determining that the 2018 Rule 'will not' affect them.")
[19] 16 U.S.C. § 1536(b)(3)(A); 50 C.F.R. § 402.14(h)(3).
[20] 16 U.S.C. § 1536(b); 50 C.F.R. §§ 402.14(h), (i).
[21] *Thomas v. Peterson*, 753 F.2d 754, 764 (9th Cir. 1985).

II. THE ENDANGERED SPECIES ACT REQUIRES INTERAGENCY CONSULTATION ON THE ADOPTION OF THE REVISED VEHICLES RULE

A. NHTSA's adoption of the Rule triggers its duty to consult under Section 7 of the ESA.

The proposed Rule triggers NHTSA's procedural duty to undergo Section 7 consultation. First, the Rule is a discretionary federal action. Section 7 consultation is required on an agency action "so long as the agency has 'some discretion' to take action for the benefit of a protected species."[22] If "an agency has *any* statutory discretion over the action in question, that agency has the authority, and thus the responsibility, to comply with the ESA."[23] Second, as explained above, "action" is broadly defined to include "all activities or programs of any kind authorized, funded, or carried out, in whole or in part" by federal agencies.[24] The ESA's implementing regulations provide that actions triggering ESA consultation include those that "directly or indirectly caus[e] modifications to the land, water*, or air*."[25]

Here, NHTSA's adoption of the Rule is a discretionary government action that directly causes modifications to the air, and indirectly modify land and water, thus triggering the ESA Section 7 consultation requirement. For instance, NHTSA is making the discretionary decision to adopt the proposal rather than a more stringent alternative, and in doing so, is making the discretionary decision to allow millions of metric tons more greenhouse gases to be emitted than if it chose a different alternative. What is more, NHTSA is making the discretionary decision to include a number of different regulatory flexibilities and credits, which allow manufacturers to avoid or delay producing vehicles that would reduce their emissions.[26] Each of these

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22 *NRDC v. Jewell*, 749 F.3d 776, 779-80 (9th Cir. 2014). *See also Nat'l Wildlife Fed'n v. Nat'l Marine Fisheries Serv.,* 524 F.3d 917, 929 (9th Cir. 2008) ("When an agency, acting in furtherance of a broad Congressional mandate, chooses a course of action which is not specifically mandated by Congress and which is not specifically necessitated by the broad mandate, that action is, by definition, discretionary and is thus subject to Section 7 consultation").

23 *Am. Rivers v. United States Army Corps of Eng'rs*, 271 F.Supp.2d 230, 251 (D.D.C. 2003) (emph. added)). Consultations are not required only where Congress has eliminated *all* discretion and the statute compels an agency to act in a specific manner. *See Nat'l Ass'n of Home Builders v. Defenders of Wildlife*, 551 U.S. 644 (2007).

24 50 C.F.R. § 402.02. *See Karuk Tribe of Cal. v. U.S. Forest Serv.*, 681 F.3d 1006, 1011 (9th Cir. 2012) ("There is 'agency action' under Section 7 of the ESA whenever an agency makes an affirmative, discretionary decision about whether, or under what conditions, to allow private activity to proceed.").

25 *Karuk Tribe of Cal.*, 681 F.3d at 1020 (citing 50 C.F.R. § 402.02) (emphasis added) (agency's approval of mining permits for activities in endangered coho salmon's habitat constitutes "agency action" for purposes of Section 7 consultation). *See also Washington Toxics Coalition v. EPA*, 413 F. 3d 1024, 1031 (9th Cir. 2005) (ESA consultation triggered by EPA's registration of pesticide ingredients that are aerially applied and may harm endangered fish).

26 *See* Joint Summary Comments of Environmental, Advocacy, and Science Organizations, on behalf of The Center for Biological Diversity, Earthjustice, Environmental Law & Policy Center, Natural Resources Defense Council, Public Citizen, Inc., Sierra Club, Southern Environmental Law Center, and Union of Concerned Scientists, Re: Corporate Average Fuel Economy Standards for Model Years 2024-2026 Passenger Cars and Light Trucks, 86 Fed. Reg. 49, 602, submitted to Docket No. NHTSA-2021-0053.

discretionary decisions affects the greenhouse gas and criteria emissions over the next several years, and thus "may affect" endangered species or their habitat.

According to the Draft Supplemental Environmental Impact Statement, while the Rule (i.e., Alternative 2) projects a reduction in greenhouse gas emissions compared to the Trump administration's SAFE Rule rollback, it would still allow millions of metric tons of greenhouse gases and other criteria pollutants to be emitted. This is especially stark when the proposal is compared to NHTSA's suggested Alternative 3, which would save 29 million metric tons CO_2 and 1 metric ton of methane compared with the proposal through 2100.[27] In other words, by making the decision to adopt the proposal instead of Alternative 3, NHTSA is, in its discretion, authorizing an addition 29 million metric tons of CO_2, in addition to other greenhouse gases and increased criteria pollution. Of course, NHTSA could have also analyzed other alternatives stronger than Alternative 3, which would have made these emissions savings even higher. And as noted in our Joint Comments submitted with other NGOs, NHTSA relied on several inaccurate technical assumptions in its modeling, which understate the reductions in greenhouse gases and criteria pollutants that would result from stronger regulations.[28]

These numbers are not insignificant, and they can be directly tied to harm to species or critical habitat, such as to precise losses of sea ice and sea ice days in the Arctic.[29] This loss will have devastating consequences for polar bears, as described below.

The increased methane emissions are particularly alarming. Immediate, deep reductions in methane emissions are critical for lowering the rate of global warming in the near-term, preventing the crossing of irreversible planetary tipping points, and avoiding harms to species and ecosystems from methane's intensive near-term heating effects and ground-level ozone production.[30] Methane is a super-pollutant 87 times more powerful than CO_2 at warming the atmosphere over a 20-year period,[31] and is second only to CO_2 in driving climate change during the industrial era.[32] Methane also leads to the formation of ground-level ozone, a dangerous air pollutant, that harms ecosystems and species by suppressing plant growth and reducing plant productivity and carbon uptake.[33] Because methane is so climate-damaging but also comparatively short-lived with an atmospheric lifetime of roughly a decade, cutting methane has a relatively immediate effect in slowing the rate of temperature rise in the near-term. Critically,

[27] National Highway Traffic Safety Administration, Draft Supplemental Environmental Impact Statement for Model Year 2024-2026 Corporate Average Fuel Economy Standards (2021), Table 5.4.1-2.
[28] *See* Joint Summary Comments of Environmental, Advocacy, and Science Organizations, *supra* note 26.
[29] Declaration of Steven Amstrup, *Competitive Enterprise Inst. et al. v. National Highway Traffic Safety Admin. et al.,* Case No. 20-1145, Document No. 1880214 (filed Jan. 14, 2021).
[30] United Nations Environment Programme and Climate and Clean Air Coalition, Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions, Nairobi: United Nations Environment Programme (2021) [hereinafter Global Methane Assessment], https://www.unep.org/resources/report/global-methane-assessment-benefits-and-costs-mitigating-methane-emissions, at 11.
[31] Myhre, G. et al., Anthropogenic and Natural Radiative Forcing. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F. et al. (eds.)] (2013), *available at* https://www.ipcc.ch/report/ar5/wg1/ at Table 8.7.
[32] Global Methane Assessment at 11.
[33] *Id.* at 11, 69.

deep cuts in methane emissions of ~45% by 2030 would avoid 0.3°C of warming by 2040 and are considered necessary to achieve the Paris Agreement's 1.5°C climate limit and prevent the worst damages from the climate crisis.[34] Deep cuts in methane emissions that reduce near-term temperature rise are also critical for avoiding the crossing of planetary tipping points—abrupt and irreversible changes in Earth systems to states wholly outside human experience, resulting in severe physical, ecological and socioeconomic harms.[35]

Accordingly, NHTSA's discretionary actions meet the broad—and extremely low—"may affect" threshold under the ESA and its implementing regulations that trigger NHTSA's Section 7 consultation duty.[36] The "may affect" standard includes "[a]ny possible effect, whether beneficial, benign, adverse or of an undetermined character."[37] As discussed below, the increases in greenhouse gas and criteria emissions—associated with the agency decisions described above—may impact the hundreds of federally protected species and their critical habitats that are imperiled due specifically to exacerbated climate change, nitrogen deposition, and greater levels of particular air pollutants from vehicle emissions. Courts have found that similar agency actions resulting in increases of criteria air pollutants may impact federally-listed species and result in environmental harms.[38]

In light of the Rule's effects, "[i]n no uncertain terms, the [ESA] mandates that [EPA] shall engage in consultation before taking any action that could jeopardize the continued existence of any endangered species or threatened species."[39] Separately, the finalization of the proposed Rule also triggers NHTSA's substantive duty under Section 7(a)(2) of the ESA to "insure" against a likelihood of jeopardizing federally-listed species which would be impacted by the Rule's adoption.[40] Agencies are required to give the benefit of the doubt to federally-listed species, thus placing the ultimate burden of protecting species against risk and uncertainty on the agency itself.[41] Accordingly, should NHTSA adopt the Rule without undergoing Section 7 consultation, NHTSA will have failed its substantive duty to insure that the Rule will not jeopardize listed species or adversely modify their critical habitat.

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[34] *Id.* at 11.
[35] Hoegh-Guldberg, O. et al., Impacts of 1.5°C Global Warming on Natural and Human Systems, In: Global Warming of 1.5°C, An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V. et al. (eds)] (2018), https://www.ipcc.ch/sr15/chapter/chapter-3/, at 262.
[36] 50 C.F.R. § 402.02.
[37] *Karuk Tribe*, 681 F.3d at 1027 (quoting 51 Fed. Reg. 19,926, 19,949 (June 3, 1986)).
[38] *See*, *e.g.*, *Center for Biological Diversity v. EPA*, 861 F.3d 174, 183 (D.C. Cir. 2017) (holding EPA's registration of a certain pesticide without ESA consultation created a demonstrable risk to identified listed species because crops on which the product could be used were located near the species or their critical habitat); *Massachusetts v. EPA*, 549 U.S. 497, 524 (2007) (holding that decrease in U.S. vehicle emissions, though small on global scale, could nonetheless reduce the risk of harm to plaintiffs caused by climate change).
[39] *Center for Biological Diversity v. EPA*, 861 F.3d at n. 10.
[40] *Id.* § 1536(a)(2).
[41] *Sierra Club v. Marsh,* 816 F.2d 1376, 1386 (9th Cir. 1987).

B. NHTSA's Vehicles Rule Will Affect Federally Protected Species.

As discussed above, the "may affect" threshold for triggering Section 7 consultation is low. NHTSA's decision to finalize its proposal will allow cars and light trucks to emit millions of metric tons of greenhouse gases and tens of thousands of tons of criteria pollutants—even though NHTSA has the discretion to reduce them. These emissions will affect climate change, air quality, and species and their habitats in ways that are direct and predictable.

i. Climate change has clear and documented adverse impacts on federally protected species.

This section describes the hundreds of federally-listed species—including the iconic polar bear[42]—whose very existence is jeopardized by increasing GHG emissions and exacerbated climate change—as legally determined by the Services in response to these species' listing petitions. The proposal, if finalized, would directly contribute to significantly higher GHG emissions and exacerbate climate change, and thus jeopardize the endangered and threatened species, as well as their critical habitats, that are specifically at risk due to exacerbated climate change.

a. An overwhelming international scientific consensus has established that human-caused climate change is already causing severe and widespread harms to life on Earth, and these threats are becoming more dangerous as greenhouse gas emissions continue unabated.

An overwhelming international scientific consensus has established that human-caused climate change is already causing severe and widespread harms and that climate change threats are becoming increasingly dangerous. The Intergovernmental Panel on Climate Change (IPCC), the international scientific body for the assessment of climate change, concluded in its *Climate Change 2021: The Physical Science Basis* report that: "[i]t is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred," and further that "[t]he scale of recent changes across the climate system as a whole and the present state of many aspects of the climate system are unprecedented over many centuries to many thousands of years."[43]

The U.S. federal government has repeatedly recognized that human-caused climate

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[42] *See*, *e.g*, U.S. Fish and Wildlife Service, Determination of Threatened Status for the Polar Bear (*Ursus maritimus*) Throughout Its Range, 73 Fed. Reg. 28212, 28293 (May 15, 2008) (to be codified at 50 CFR Pt. 17) (listing polar bear as threatened due to climate change effects on the species' habitat).

[43] Intergovernmental Panel on Climate Change, Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (2021), https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/ at SPM-5 and SPM-9.

change is causing widespread and intensifying harms across the country in the authoritative National Climate Assessments, scientific syntheses prepared by hundreds of scientific experts and reviewed by the National Academy of Sciences and federal agencies. Most recently, the Fourth National Climate Assessment, comprised of the 2017 *Climate Science Special Report* (Volume I)[44] and the 2018 *Impacts, Risks, and Adaptation in the United States* (Volume II),[45] concluded that "there is no convincing alternative explanation" for the observed warming of the climate over the last century other than human activities.[46] It found that "evidence of human-caused climate change is overwhelming and continues to strengthen, that the impacts of climate change are intensifying across the country, and that climate-related threats to Americans' physical, social, and economic well-being are rising."[47] The Fourth National Climate Assessment warns that "climate change threatens many benefits that the natural environment provides to society," and that "extinctions and transformative impacts on some ecosystems" will occur "without significant reductions in global greenhouse gas emissions."[48]

As detailed in the National Climate Assessments, the widespread, intensifying, and often long-lived harms from climate change include soaring air and ocean temperatures; more frequent and intense heat waves, floods, and droughts; more destructive hurricanes and wildfires; coastal flooding from sea level rise and increasing storm surge; declining food and water security; accelerating species extinction risk; melting Arctic sea ice, glaciers, and ice sheets; the collapse of Antarctic ice shelves; ocean acidification; and the collapse of coral reefs.[49]

b. Fossil fuels are the dominant driver of the climate crisis.

The National Climate Assessments decisively recognize the dominant role of fossil fuels in driving climate change. As stated by the Third National Climate Assessment: "observations unequivocally show that climate is changing and that the warming of the past 50 years is primarily due to human-induced emissions of heat-trapping gases. These emissions come mainly from burning coal, oil, and gas."[50] In parallel, the Fourth National Climate Assessment reported that "fossil fuel combustion accounts for approximately 85 percent of total U.S. greenhouse gas

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[44] U.S. Global Change Research Program, Climate Science Special Report: Fourth National Climate Assessment, Vol. I (2017) [Wuebbles, D.J. et al. (eds.)] [hereinafter Fourth National Climate Assessment, Vol. I], https://science2017.globalchange.gov/.
[45] U.S. Global Change Research Program, Impacts, Risks, and Adaptation in the United States, Fourth National Climate Assessment, Vol. II (2018) [Reidmiller, D.R. et al. (eds.)] [hereinafter Fourth National Climate Assessment Vol. II], https://nca2018.globalchange.gov/.
[46] Fourth National Climate Assessment, Vol. I at 10.
[47] Fourth National Climate Assessment, Vol. II at 36.
[48] *Id.* at 51.
[49] Melillo, Jerry M. et al. (eds.), Climate Change Impacts in the United States: The Third National Climate Assessment, U.S. Global Change Research Program (2014) [hereinafter Melillo 2014]; Fourth National Climate Assessment, Vol. I; Fourth National Climate Assessment, Vol. II.
[50] Melillo 2014 at 2. *See also* Report Finding 1 at 15: "The global warming of the past 50 years is primarily due to human activities, predominantly the burning of fossil fuels."

emissions,"[51] which is "driving an increase in global surface temperatures and other widespread changes in Earth's climate that are unprecedented in the history of modern civilization."[52]

c. The choices made now on reducing greenhouse gas pollution will affect the severity of the climate change damages that will be suffered in the coming decades and centuries.

The National Climate Assessments make clear that the harms of climate change are long-lived, and the choices we make now on reducing greenhouse gas pollution will affect the severity of the climate change damages that will be suffered in the coming decades and centuries: "[t]he impacts of global climate change are already being felt in the United States and are projected to intensify in the future—but the severity of future impacts will depend largely on actions taken to reduce greenhouse gas emissions and to adapt to the changes that will occur."[53] As the Fourth National Climate Assessment explains: "[m]any climate change impacts and associated economic damages in the United States can be substantially reduced over the course of the 21st century through global-scale reductions in greenhouse gas emissions, though the magnitude and timing of avoided risks vary by sector and region. The effect of near-term emissions mitigation on reducing risks is expected to become apparent by mid-century and grow substantially thereafter."[54] Similarly, a 2014 White House report found that the cost of delay on reducing emissions is not only extremely steep but also potentially irreversible, and the costs rise exponentially with continued delays.[55] As summarized by the National Research Council:

> Emissions of carbon dioxide from the burning of fossil fuels have ushered in a new epoch where human activities will largely determine the evolution of Earth's climate. Because carbon dioxide in the atmosphere is long lived, it can effectively lock Earth and future generations into a range of impacts, some of which could become very severe. [E]mission reduction choices made today matter in determining impacts experienced not just over the next few decades, but in the coming centuries and millennia.[56]

d. The **IPCC 2018 Special Report, as reinforced by the 2021 IPCC Sixth Assessment Report, make clear that global** ***greenhouse gas emissions must be***

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[51] Fourth National Climate Assessment, Vol. II at 60.
[52] *Id.* at 39.
[53] *Id.* at 34.
[54] *Id.* at 1347.
[55] The White House, The Cost of Delaying Action to Stem Climate Change (July 29, 2014), *available at* https://obamawhitehouse.archives.gov/the-press-office/2014/07/29/white-house-report-cost-delaying-action-stem-climate-change at 2.
[56] National Research Council, Warming World: Impacts by Degree, based on Climate Stabilization Targets: Emissions, Concentrations, and Impacts over Decades to Millennia (2011) at 3.

***halved by 2030* to avoid catastrophic damages of climate change.**

In 2018, the IPCC issued a *Special Report on Global Warming of 1.5°C* that quantified the devastating harms that would occur at 2°C warming, highlighting the necessity of limiting warming to 1.5°C to avoid catastrophic impacts to people and life on Earth.[57] The IPCC 2018 *Special Report* provides overwhelming evidence that aggressive reductions in emissions within this decade are essential to avoiding catastrophic climate change harms.

The *Special Report* quantifies the harms that would occur at 2°C warming compared with 1.5°C, and the differences are stark. According to the IPCC's analysis, the damages that would occur at 2°C warming compared with 1.5°C include dramatically increased species extinction risk, including a doubling of the number of vertebrate and plant species losing more than half their range, and the virtual elimination of coral reefs; significantly more deadly heatwaves, drought and flooding; 10 centimeters of additional sea level rise within this century; a greater risk of triggering the collapse of the Greenland and Antarctic ice sheets with resulting multi-meter sea level rise; 1.5 to 2.5 million more square kilometers of thawing permafrost area with the associated release of methane, a potent greenhouse gas; and a tenfold increase in the probability of ice-free Arctic summers.[58]

The IPCC report concludes that pathways to limit warming to 1.5°C with little or no overshoot require "a rapid phase out of CO_2 emissions and deep emissions reductions in other GHGs and climate forcers."[59] In pathways consistent with limiting warming to 1.5°C, global net anthropogenic CO_2 emissions must decline by about 45 percent from 2010 levels by 2030, reaching net zero around 2050.[60]

Similarly, the IPCC *Climate Change 2021* report concludes that global warming will exceed 1.5°C and 2°C by 2100 unless we make immediate, deep reductions in CO_2 and other greenhouse gas emissions.[61] Only the most stringent emissions reduction scenario—SSP1-1.9 in which global emissions fall steeply in the near-term, reach net zero in 2050, and become net negative afterward—is consistent with a 1.5°C climate target. In this low emissions SSP1-1.9 scenario, global average surface temperature is projected to reach 1.5°C above pre-industrial in the near-term (2021-2040), overshoot and peak at 1.6°C in the mid-term (2041-2060), and drop down to 1.4°C in the long-term (2081-2100).[62]

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[57] Intergovernmental Panel on Climate Change, Global Warming of 1.5°C, An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty (2018) [hereinafter IPCC 1.5°C Report 2018].
[58] IPCC 1.5°C Report 2018 at SPM-8 to SPM-14.
[59] *Id.* at 2-28.
[60] *Id.* at SPM-15.
[61] Intergovernmental Panel on Climate Change, Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (2021), https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/ at SPM-17.
[62] *Id.* at Table SPM.1.

In short, the IPCC Assessment Reports, U.S. National Climate Assessments, and tens of thousands of studies make clear that fossil-fuel driven climate change is a "code red for humanity,"[63] and that every additional ton of CO_2 and fraction of a degree of temperature rise matters. As warned by the IPCC, "every tonne of CO_2 emissions adds to global warming."[64]

e. Climate change has clear and documented adverse impacts on biodiversity.

The best available science shows that anthropogenic climate change is causing widespread harm to life across the planet, disrupting species' distribution, timing of breeding and migration, physiology, vital rates, and genetics—in addition to increasing species extinction risk.[65] Climate change is already affecting 82% of key ecological processes that underpin ecosystem function and support basic human needs.[66] Climate change-related local extinctions are widespread and have occurred in hundreds of species, including almost half of the 976 species surveyed.[67] Nearly half of terrestrial non-flying threatened mammals and nearly one-quarter of threatened birds are estimated to have been negatively impacted by climate change in at least part of their range.[68] Furthermore, across the globe, populations of terrestrial birds and mammals that are experiencing greater rates of climate warming are more likely to be declining at a faster rate.[69] Genes are changing, species' physiology and physical features such as body size are changing, species are moving to try to keep pace with suitable climate space, species are shifting their timing of breeding and migration, and entire ecosystems are under stress.[70]

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[63] United Nations Secretary-General, *Secretary-General's statement on the IPCC Working Group 1 Report on the Physical Science Basis of the Sixth Assessment*, Aug. 9, 2021, https://www.un.org/sg/en/content/secretary-generals-statement-the-ipcc-working-group-1-report-the-physical-science-basis-of-the-sixth-assessment.

[64] IPCC Climate Change 2021, Summary for Policymakers at SPM-37.

[65] Warren, Rachel et al., Increasing impacts of climate change upon ecosystems with increasing global mean temperature rise, 106 Climatic Change 141 (2011).

[66] Scheffers, Brett R. et al., The broad footprint of climate change from genes to biomes to people, 354 Science 719 (2016).

[67] Wiens, John J., Climate-related local extinctions are already widespread among plant and animal species, 14 PLoS Biology e2001104 (2016).

[68] Pacifici, Michela et al., Species' traits influenced their response to recent climate change, 7 Nature Climate Change 205 (2017). The study concluded that "populations of large numbers of threatened species are likely to be already affected by climate change, and … conservation managers, planners and policy makers must take this into account in efforts to safeguard the future of biodiversity."

[69] Spooner, Fiona E.B. et al., Rapid warming is associated with population decline among terrestrial birds and mammals globally, 24 Global Change Biology 4521 (2018).

[70] Parmesan, Camille & Gary Yohe, A globally coherent fingerprint of climate change impacts across natural systems, 421 Nature 37 (2003); Root, Terry L. et al., Fingerprints of global warming on wild animals and plants, 421 Nature 57 (2003); Parmesan, Camille, Ecological and evolutionary responses to recent climate change, 37 Annual Review of Ecology Evolution and Systematics 637 (2006); Chen, I-Ching et al., Rapid range shifts of species associated with high levels of climate warming, 333 Science 1024 (2011); Maclean, Ilya M. D. & Robert J. Wilson, Recent ecological responses to climate change support predictions of high extinction risk, 108 PNAS 12337 (2011); Warren, Rachel et al., Increasing impacts of climate change upon ecosystems with increasing global mean temperature rise, 106 Climatic Change 141 (2011); Cahill, Abigail E. et al., How does climate change cause extinction?, 280 Proceedings of the Royal Society B 20121890 (2012).

Species extinction risk will accelerate with continued greenhouse gas pollution. One million animal and plant species are now threatened with extinction, with climate change as a primary driver.[71] At 2°C compared with 1.5°C of temperature rise, species' extinction risk will increase dramatically, leading to a doubling of the number of vertebrate and plant species losing more than half their range, and a tripling for invertebrate species.[72] Numerous studies have projected catastrophic species losses during this century if climate change continues unabated: 15 to 37% of the world's plants and animals committed to extinction by 2050 under a mid-level emissions scenario[73]; the potential extinction of 10 to 14% of species by 2100[74]; global extinction of 5% of species with 2°C of warming and 16% of species with business-as-usual warming[75]; the loss of more than half of the present climatic range for 58% of plants and 35% of animals by the 2080s under the current emissions pathway, in a sample of 48,786 species[76]; and the loss of a third or more of animals and plant species in the next 50 years.[77]

As summarized by the Third National Climate Assessment, "landscapes and seascapes are changing rapidly, and species, including many iconic species, may disappear from regions where they have been prevalent or become extinct, altering some regions so much that their mix of plant and animal life will become almost unrecognizable."[78]

f. Greenhouse gas pollution has clear and documented adverse impacts on federally protected species.

Greenhouse gas emissions harm endangered species in ways that are not only measurable but also causally understood. Climate change impacts such as sea ice loss, ocean heat stress and ocean acidification, sea level rise, the increasing frequency of extreme weather events, decreasing snowpack, and elevational and latitudinal shifts in habitat are several of the ways that greenhouse gas emissions harm hundreds of federally protected species—and has been recognized as such in federal listing determinations under the Endangered Species Act.

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[71] Brondizio, E.S. et al. (eds.), IPBES, Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, IPBES secretariat, Bonn, Germany (2019), *available at* https://ipbes.net/global-assessment.
[72] IPCC Climate Change 2021, Summary for Policymakers.
[73] Thomas, Chris. D. et al., Extinction risk from climate change, 427 Nature 145 (2004).
[74] Maclean, Ilya M. D. & Robert J. Wilson, Recent ecological responses to climate change support predictions of high extinction risk, 108 PNAS 12337 (2011).
[75] Urban, Mark C., Accelerating extinction risk from climate change, 348 Science 571 (2015).
[76] Warren, Rachel et al., Quantifying the benefit of early climate change mitigation in avoiding biodiversity loss, 3 Nature Climate Change 678 (2013).
[77] Román-Palacios, Cristian & John J. Wiens, Recent responses to climate change reveal the drivers of species extinction and survival, 117 PNAS 4211 (2020).
[78] Melillo 2014 at 196.

The Polar Bear (Ursus maritimus) and Loss of Sea Ice. In 2008, the FWS listed the polar bear (*Ursus maritimus*) as a threatened species due to climate change and the loss of sea ice.[79] *See also In re Polar Bear Endangered Species Act Listing*, 709 F.3d 1 (D.C. Cir. 2013) (affirming FWS's decision to federally list the polar bear as threatened due to the effects of global climate change on polar bear habitat).

***Figure 1*. Polar bear (*Ursus maritimus*)**
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The loss of sea ice is one of the clearest and most obvious consequences of global warming. As highlighted by the Fourth National Climate Assessment, Alaska and the Arctic have experienced some of the most severe and rapid warming associated with climate change, with temperatures rising at twice the rate of the rest of the globe on average.[80] Arctic summer sea ice extent and thickness have decreased by 40% during the past several decades,[81] with each metric ton of CO_2 emissions causing a sustained loss of three square meters of summer sea ice area.[82] The Arctic lost 95% of its oldest and thickest sea ice during the past three decades, and the remaining thinner, younger ice is more vulnerable to melting.[83] Sea ice loss has

[79] 73 Fed. Reg. 28212 at 28293.
[80] Fourth National Climate Assessment, Vol. II at 92.
[81] Meier, Walter N. et al., Arctic sea ice in transformation: A review of recent observed changes and impacts on biology and human activity, 51 Reviews of Geophysics 185 (2014); Fourth National Climate Assessment, Vol. I at 29, 57, 303; Fourth National Climate Assessment, Vol. II at 1192-1193; IPCC Climate Change 2021, Summary for Policymakers at SPM-6.
[82] Notz & Stroeve 2016.
[83] Osborne, Emily, et al. (eds.), Arctic Report Card 2018, NOAA (2018), https://www.arctic.noaa.gov/Report-Card/Report-Card-2018 at 2.

accelerated since 2000, with Alaska's coast suffering some of the fastest losses.[84] The length of the sea ice season is shortening as ice melts earlier in spring and forms later in autumn.[85] Along Alaska's northern and western coasts, the sea ice season has already shortened by more than 90 days.[86] As summarized by the Fourth National Climate Assessment:

> Since the early 1980s, annual average arctic sea ice has decreased in extent between 3.5% and 4.1% per decade, become thinner by between 4.3 and 7.5 feet, and began melting at least 15 more days each year. September sea ice extent has decreased between 10.7% and 15.9% per decade (*very high confidence*). Arctic-wide ice loss is expected to continue through the 21st century, *very likely* resulting in nearly sea ice-free late summers by the 2040s (*very high confidence*)."[87]

It is precisely this sea ice loss, and the lack of adequate regulatory mechanisms addressing greenhouse gas pollution, that led FWS to list the polar bear (*Ursus maritimus*) as a threatened species in 2008.[88] As a top Arctic predator, the polar bear relies on sea ice for all its essential activities, including hunting for prey, moving long distances, finding mates, and building dens to rear cubs.[89] Separately, recognizing the critical importance of sea ice for polar bear survival, FWS designated sea ice habitat off Alaska as critical habitat for the polar bear in 2010.[90]

Federal documents acknowledge that shrinkage and premature breakup of sea ice due to climate change is the primary threat to the species, leaving bears with vastly diminished hunting grounds, less time to hunt, and a shortage of sea ice for other essential activities such as finding mates and resting.[91] As summarized in FWS's 2017 5-year review, sea ice loss and a shorter sea ice season makes hunting calorie-rich seals more difficult for polar bears, leading to nutritional

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[84] Fourth National Climate Assessment, Vol. I at 305.
[85] Parkinson, Claire L., Spatially mapped reductions in the length of the Arctic sea ice season, 41 Geophysical Research Letters 4316 (2014).
[86] Fourth National Climate Assessment, Vol. I at 307.
[87] *Id.* at 29, 303.
[88] 73 Fed. Reg. 28212 at 28293: "On the basis of our thorough evaluation of the best available scientific and commercial information regarding present and future threats to the polar bear posed by the five listing factors under the Act, we have determined that the polar bear is threatened throughout its range by habitat loss (i.e., sea ice recession). We have determined that there are no known regulatory mechanisms in place at the national or international level that directly and effectively address the primary threat to polar bears—the rangewide loss of sea ice habitat."
[89] *Ibid.*
[90] U.S. Fish and Wildlife Service, Designation of Critical Habitat for the Polar Bear (*Ursus maritimus*) in the United States, 75 Fed. Reg. 76086 (Dec. 7, 2010) (to be codified at 50 CFR Pt. 17).
[91] 73 Fed. Reg. 28212 at 28303; U.S. Fish and Wildlife Service, Polar bear (*Ursus maritimus*) Conservation Management Plan, Final. U.S. Fish and Wildlife Service, Region 7, Anchorage, Alaska (2016) [hereinafter Polar Bear Conservation Management Plan 2016]; U.S. Fish and Wildlife Service, Polar Bear (*Ursus maritimus*) 5-Year Review: Summary and Evaluation, U.S. Fish and Wildlife Service, Marine Mammals Management, Anchorage, Alaska (Feb. 3, 2017) [hereinafter Polar Bear 5-Year Review 2017].

stress, reduced body mass, and declines of some populations.[92] As the sea ice retreats, polar bears have been forced to swim longer distances,[93] which is more energetically costly,[94] and they are spending more time on land where they have reduced access to food.[95] Females are denning more often on land than on ice, increasing the potential for conflicts with humans.[96] Because polar bears have high metabolic rates, increases in movement resulting from loss and fragmentation of sea ice result in higher energy costs and are likely to lead to reduced body condition, recruitment and survival.[97]

In the southern Beaufort Sea of Alaska, polar bears declined by 40 percent over a recent 10-year period,[98] and this decrease has been attributed to sea ice loss that limited access to prey over multiple years.[99] For the bears in this population, research has linked sea ice loss to decreases in survival,[100] lower success in rearing cubs,[101] shrinking body size,[102] and increases in fasting and nutritional stress.[103] The loss of sea ice also jeopardizes the polar bear's sea-ice dependent prey species—the ringed seal and bearded seal—which were listed as threatened in 2012 due to sea ice loss from climate change.[104]

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[92] Polar Bear 5-Year Review 2017 at 16.
[93] Durner, George M. et al., Consequences of long-distance swimming and travel over deep-water pack ice for a female polar bear during a year of extreme sea ice retreat, 34 Polar Biology 975 (2011); Pagano, Anthony M. et al., Long-distance swimming by polar bears (*Ursus maritimus*) of the southern Beaufort Sea during years of extensive open water, 90 Canadian Journal of Zoology 663 (2012); Pilfold, Nicholas W. et al., Migratory response of polar bears to sea ice loss: to swim or not to swim, 40 Ecography 189 (2017).
[94] Griffen, Blaine D., Modeling the metabolic costs of swimming in polar bears (*Ursus maritimus*), 41 Polar Biology 491 (2018).
[95] Cherry, Seth G. et al., Fasting physiology of polar bears in relation to environmental change and breeding behavior in the Beaufort Sea, 32 Polar Biology 383 (2009) [hereinafter Cherry 2009]; Whiteman, John P. et al., Summer declines in activity and body temperature offer polar bears limited energy savings, 349 Science 295 (2015) [hereinafter Whiteman 2015].
[96] Olson, J.W. et al., Collar temperature sensor data reveal long-term patterns in southern Beaufort Sea polar bear den distribution on pack ice and land, 564 Marine Ecology Progress Series 211 (2017); Polar Bear 5-Year Review 2017 at 20-21.
[97] Polar Bear 5-Year Review 2017 at 17; Pagano, Anthony M. et al., High-energy, high-fat lifestyle challenges an Arctic apex predator, the polar bear, 359 Science 568 (2018).
[98] Bromaghin, Jeffrey F. et al., Polar Bear Population Dynamics in the Southern Beaufort Sea during a Period of Sea Ice Decline, 25 Ecological Applications 634 (2015) [hereinafter Bromaghin 2015].
[99] Obbard, Martyn E. et al., eds, Polar Bears: Proceedings of the 15th Working Meeting of the IUCN/SSC Polar Bear Specialist Group, Copenhagen, Denmark, 29 June–3 July 2009 (2010) at 52 ("Thus, the SB subpopulation is currently considered to be declining due to sea ice loss"); Bromaghin 2015.
[100] Regehr, Eric V. et al., Survival and breeding of polar bears in the southern Beaufort Sea in relation to sea ice, 79 Journal of Animal Ecology 117 (2010); Bromaghin 2015.
[101] Regehr, Eric V. et al., Survival and breeding of polar bears in the southern Beaufort Sea in relation to sea ice, 79 Journal of Animal Ecology 117 (2010); Bromaghin 2015.
[102] Rode, Karyn D. et al., Reduced body size and cub recruitment in polar bears associated with sea ice decline, 20 Ecological Applications 768 (2010).
[103] Cherry 2009); Whiteman 2015.
[104] National Marine Fisheries Service, Threatened Status for the Arctic, Okhotsk, and Baltic Subspecies of the Ringed Seal and Endangered Status for the Ladoga Subspecies of the Ringed Seal, 77 Fed. Reg. 76706 (Dec. 28, 2012) (to be codified at 50 CFR pts. 223 and 224); National Marine Fisheries Service, Threatened Status for the Beringia and Okhotsk Distinct Population Segments of the *Erignathus barbatus nauticus* Subspecies of the Bearded Seal, 77 Fed. Reg. 76,740 (Dec. 28, 2012) (to be codified at 50 CFR Pt. 223).

If current greenhouse gas emissions trends continue, scientists estimate that two-thirds of global polar bear populations will be lost by 2050, including the loss of both of Alaska's polar bear populations, while the remaining third will near extinction by the end of the century due to the disappearance of sea ice.[105] However, aggressive emissions reductions will allow substantially more sea ice to persist and increase the chances that polar bears will survive in Alaska and across their range.[106] Highlighting the importance of reducing greenhouse gas emissions to protect sea ice and sea-ice dependent species, one recent study estimated that each metric ton of CO_2 emission results in a sustained loss of 3 ± 0.3 m^2 of September Arctic sea ice area based on the robust linear relationship between monthly-mean September sea ice area and cumulative CO_2 emissions.[107] Similar to other research,[108] the study concluded that limiting warming to 2°C is not sufficient to allow Arctic summer sea ice to survive, but that a rapid reduction in emissions to achieve a 1.5°C global warming target gives Arctic summer sea ice "a chance of long-term survival at least in some parts of the Arctic Ocean."[109]

As such, FWS's 2016 Final Polar Bear Conservation Management Plan clearly stated that the polar bear cannot be recovered without significant reductions in the greenhouse gas emissions driving Arctic warming and sea ice loss: "It cannot be overstated that the single most important action for the recovery of polar bears is to significantly reduce the present levels of global greenhouse gas (GHG) emissions, which are the primary cause of warming in the Arctic."[110]

If the Rule is finalized as proposed, greenhouse gases emitted will exacerbate the loss of sea ice, causing the likelihood of survival and recovery of the polar bear to diminish appreciably. NHTSA must consult on how the Rule would affect sea ice loss for a listed species like the polar bear.

Elkhorn, Staghorn and other Coral Species & Ocean Heat Stress and Ocean Acidification. As of the date of this letter, 22 species of corals are listed under the Endangered Species Act due primarily to threats from ocean warming and ocean acidification, direct consequences of climate change. In 2006, NMFS listed elkhorn and staghorn corals (*Acropora palmata* and *A.*

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[105] Amstrup, Steven C. et al., Forecasting the Range-wide Status of Polar Bears at Selected Times in the 21st Century, U.S. Department of the Interior and U.S. Geological Survey, USGS Science Strategy to Support U.S. Fish and Wildlife Service Polar Bear Listing Decision, Reston, Virginia (2007); Amstrup, Steven C. et al., Greenhouse Gas Mitigation Can Reduce Sea Ice Loss and Increase Polar Bear Persistence, 468 Nature 955 (2010) [hereinafter Amstrup 2010].
[106] Amstrup 2010; Atwood, Todd C. et al., Forecasting the Relative Influence of Environmental and Anthropogenic Stressors on Polar Bears, 7 Ecosphere e01370 (2016); Regehr, Eric V. et al., Conservation status of polar bears (*Ursus martimus*) in relation to projected sea-ice declines, 12 Biology Letters 20160556 (2016) [hereinafter Regehr 2016].
[107] Notz & Stroeve 2016.
[108] Schleussner, Carl-Friedrich et al., Science and policy characteristics of the Paris Agreement temperature goal, 6 Nature Climate Change 827 (2016) at 830.
[109] Notz & Stroeve 2016 at 3-4.
[110] Polar Bear Conservation Management Plan 2016 at 11.

cervicornis) as threatened, citing ocean warming as a key threat to these species.[111] In 2014 NMFS reaffirmed that ocean warming due to climate change and ocean acidification are primary threats to these species.[112] In 2014 NMFS listed 20 additional corals as threatened, including five Caribbean coral species and fifteen Indo-Pacific coral species,[113] determining that the most important threats contributing to extinction risk for these species are ocean warming, disease (as related to climate change), and ocean acidification.[114] NMFS stated that "these impacts are currently occurring, and are expected to worsen, posing increasingly severe effects on the species considered in this final rule."[115]

Ocean warming and ocean acidification, two incontrovertible environmental impacts caused by greenhouse gas pollution, are wreaking havoc on marine ecosystems and causing a global collapse of coral reefs. The world's oceans have absorbed more than 90 percent of the excess heat caused by greenhouse gas warming, resulting in average sea surface warming of 1.3°F (0.7°C) per century since 1900.[116] Marine heat waves—periods of extreme warm surface temperature—have become longer-lasting and more frequent due to climate change, with the number of heat wave days doubling between 1982 and 2016 and projected to increase 23 times under 2°C warming.[117] At present, 87 percent of marine heat waves are attributable to human-induced warming.[118] Global average sea surface temperature is projected to rise by 4.9°F (2.7°C) by the end of the century under a higher emissions scenario, with even greater warming in the coastal waters of the Northeastern U.S. and Alaska.[119] Rapid ocean warming has widespread impacts on species and ecosystems, contributing to rising sea levels, declining ocean oxygen levels, increasing rainfall intensity, and ice loss from glaciers, ice sheets and polar sea ice, and is the primary driver of mass coral bleaching events that are devastating coral reef ecosystems.[120]

Exacerbating the harms from rising temperatures, the global oceans have absorbed more than a quarter of the CO_2 emitted to the atmosphere by human activities, which has significantly increased the acidity of the surface ocean in a process called ocean acidification, and has reduced the availability of key chemicals—aragonite and calcite—that many marine species use to build

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[111] National Marine Fisheries Service, Endangered and Threatened Species: Final Listing Determinations for Elkhorn Coral and Staghorn Coral, 71 Federal Register 26852 (May 9, 2006) (to be codified at 50 CFR Pt. 223) at 26859.
[112] National Marine Fisheries Service, Endangered and Threatened Wildlife and Plants: Final Listing Determinations on Proposal to List 66 Reef-Building Coral Species and to Reclassify Elkhorn and Staghorn Corals, 79 Fed. Reg. 53852 (Sept. 10, 2014) at 53965, 53973.
[113] *Id*. The five Caribbean coral species are *Dendrogyra cylindrus, Orbicella annularis, Orbicella faveolata, Orbicella franksi,* and *Mycetophyllia ferox*; and the fifteen Indo-Pacific coral species are *Acropora globiceps, Acropora jacquelineae, Acropora lokani, Acropora pharaonis, Acropora retusa, Acropora rudis, Acropora speciosa, Acropora tenella, Anacropora spinosa, Euphyllia paradivisa, Isopora crateriformis, Montipora australiensis, Pavona diffluens, Porites napopora,* and *Seriatopora aculeata.*
[114] *Id. at* 53885, 53886.
[115] *Id.* at 53885.
[116] Fourth National Climate Assessment, Vol. I at 364, 367.
[117] Frolicher, Thomas L. et al., Marine heatwaves under global warming, 560 Nature 360 (2018).
[118] *Id*.
[119] Fourth National Climate Assessment, Vol. I at 368.
[120] Cheng, Liging et al., How fast are the oceans warming?, 363 Science 128 (2019).

their shells and skeletons.[121] Ocean acidification caused by the ocean's absorption of anthropogenic CO_2 has already resulted in more than a 30 percent increase in the acidity of ocean surface waters, at a rate likely faster than anything experienced in the past 300 million years.[122] Ocean acidity could increase by 150 percent by the end of the century if CO_2 emissions continue unabated.[123] In the United States, the West Coast, Alaska, and the Gulf of Maine are experiencing the earliest, most severe changes due to ocean acidification,[124] although regions of the East and Gulf Coasts are also vulnerable.[125]

Ocean acidification negatively affects a wide range of marine species by hindering the ability of calcifying marine creatures like corals, oysters, and crabs to build protective shells and skeletons and by disrupting metabolism and critical biological functions.[126] The adverse effects of ocean acidification are already being observed in wild populations, including reduced coral calcification rates in reefs worldwide,[127] severe shell damage to pteropods (marine snails at the base of the food web) along the U.S. west coast,[128] and mass die-offs of larval Pacific oysters in the Pacific Northwest.[129] A U.S. expert science panel concluded in 2016 that "growth, survival and behavioral effects linked to OA [ocean acidification] extend throughout food webs, threatening coastal ecosystems, and marine-dependent industries and human communities."[130] As stated by the 2018 IPCC *Special Report on Global Warming of 1.5°C*, "[t]he level of ocean acidification due to increasing CO_2 concentrations associated with global warming of 1.5°C is projected to amplify the adverse effects of warming, and even further at 2°C, impacting the growth, development, calcification, survival, and thus abundance of a broad range of species, e.g., from algae to fish (*high confidence*)."[131]

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[121] Fourth National Climate Assessment, Vol. I at 371-372.
[122] Hönisch, Bärbel et al., The geological record of ocean acidification, 335 Science 1058 (2012); USGCRP Vol I 2017 at 372, 374.
[123] Orr, James C. et al., Anthropogenic ocean acidification over the twenty-first century and its impact on calcifying organisms, 437 Nature 681 (2005); Feely, Richard et al., Ocean acidification: Present conditions and future changes in a high CO_2 world, 22 Oceanography 36 (2009).
[124] Feely, Richard A. et al., Evidence for upwelling of corrosive 'acidified' water onto the continental shelf, 320 Science 1490 (2008); Ekstrom, Julia A. et al., Vulnerability and adaptation of U.S. shellfisheries to ocean acidification, 5 Nature Climate Change 207 (2015) [hereinafter Ekstrom 2015]; Mathis, Jeremy T. et al., Ocean acidification in the surface waters of the Pacific-Arctic boundary regions, 28 Oceanography 122 (2015) [hereinafter Mathis 2015]; Chan, F. et al., The West Coast Ocean Acidification and Hypoxia Science Panel: Major Findings, Recommendations, and Actions, California Ocean Science Trust (April 2016) [hereinafter Chan 2016].
[125] Ekstrom 2015.
[126] Fabry, Victoria J. et al., Impacts of ocean acidification on marine fauna and ecosystem processes, 65 ICES Journal of Marine Science 414 (2008); Kroeker, Kristy J. et al., Impacts of ocean acidification on marine organisms: quantifying sensitivities and interactions with warming, 19 Global Change Biology 1884 (2013).
[127] Albright, Rebecca et al., Reversal of ocean acidification enhances net coral reef calcification, 531 Nature 362 (2016).
[128] Bednaršek, N. et al., *Limacina helicina* shell dissolution as an indicator of declining habitat suitability owing to ocean acidification in the California Current Ecosystem, 281 Proceedings of the Royal Society B 20140123 (2014).
[129] Barton, Alan et al., The Pacific oyster, *Crassostrea gigas*, shows negative correlation to naturally elevated carbon dioxide levels: Implications for near-term ocean acidification effects, 57 Limnology and Oceanography 698 (2012).
[130] Chan 2016 at 4.
[131] IPCC 1.5°C Report 2018 at SPM-10-11.

Rising ocean temperatures and ocean acidification driven by greenhouse gas pollution threaten the continued survival of corals and coral reef ecosystems due to the increasing frequency of mass bleaching events and the dissolution of corals due to ocean acidification.[132] Scientific research has definitely linked anthropogenic ocean warming to the catastrophic, mass coral bleaching events that have been documented since 1980 and are increasing in frequency and intensity as atmospheric CO_2 increases.[133] Severe bleaching events have increased five-fold in the past several decades and now occur every six years on average, which is too frequent to allow full recovery of coral reefs.[134] The global coral bleaching event that lasted from 2014 to 2017 was the longest, most widespread, and almost certainly most destructive on record, affecting more reefs than any previous mass bleaching event and causing mass bleaching of reefs that had never bleached before, with U.S. reefs particularly hard-hit.[135] For example, in Papahānaumokuākea Marine National Monument in Northwestern Hawaiian Islands, a 2017 study concluded that "heat stress in 2014 was unlike any previous event and that the exposure of corals to the bleaching-level heat stress has increased significantly in the northern PMNM since 1982, highlighting the increasing threat of climate change to reefs."[136] In the Caribbean, many important reef-building corals have not recovered from repeated bleaching events due to climate change.[137] According to a 2021 study that projected changes in coral reef growth (net carbonate production) under ocean warming and acidification across 183 reefs worldwide, 94% of coral reefs globally will be eroding by 2050 if greenhouse gas emissions continue unabated. In contrast, if emissions are immediately and drastically reduced (i.e., RCP 2.6 emissions scenario), coral reef growth will still decline dramatically, but 63% of reefs will still be able to grow at the end of the century.[138] A 2017 scientific review concluded that "unless rapid advances to the goals of the Paris Climate Change Agreement occur over the next decade" that "coral reefs are likely to degrade rapidly over the next 20 years, presenting fundamental challenges for the 500

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[132] Hoegh-Guldberg, Ove et al., Coral reefs under rapid climate change and ocean acidification, 318 Science 1737 (2007) [hereinafter Hoegh-Guldberg 2007]; Eakin, C. Mark et al., Caribbean corals in crisis: record thermal stress, bleaching, and mortality in 2005, 5 PLoS ONE e13969 (2010) [hereinafter Eakin 2010].

[133] Hoegh-Guldberg 2007; Donner, Simon D., et al, Coping with commitment: projected thermal stress on coral reefs under different future scenarios, 4 PLoS ONE e5712 (2009) [hereinafter Donner 2009]; Eakin 2010; National Marine Fisheries Service, Recovery Plan for Elkhorn Coral (*Acropora palmata*) and Staghorn Coral (*A. cervicornis*), Southeast Regional Office (March 3, 2015) [hereinafter Coral Recovery Plan 2015] at 51; Hughes, Terry P. et al., Spatial and temporal patterns of mass bleaching of corals in the Anthropocene, 359 Science 80 (2018) [hereinafter Hughes 2018].

[134] Hughes 2018 at 80.

[135] Eakin, C. Mark et al., Unprecedented three years of global coral bleaching 2014-17. In: State of the Climate in 2017, 99 Bulletin of the American Meteorological Society S74 (2018).

[136] Couch, Courtney S. et al., Mass coral bleaching due to unprecedented marine heatwave in Papahānaumokuākea Marine National Monument (Northwestern Hawaiian Islands), 12 PLoS ONE e0185121 (2017).

[137] Neal, Benjamin P. et al., Caribbean massive corals not recovering from repeated thermal stress events during 2005-2013, 7 Ecology and Evolution 1339 (2017).

[138] Cornwall, Christopher E. et al., Global declines in coral reef calcium carbonate production under ocean acidification and warming, 118 PNAS e2015265118 (2021), https://doi.org/10.1073/pnas.2015265118.

million people who derive food, income, coastal protection, and a range of other services from coral reefs."[139]

As discussed, 22 species of corals are listed under the Endangered Species Act due primarily to threats from ocean warming and ocean acidification. Specifically, listed elkhorn and staghorn corals—once abundant throughout the Caribbean Sea—precipitously declined by 92 to 97 percent, largely due to disease. Research indicates that the outbreaks of white-band disease that decimated these corals were driven by heat stress from rising ocean temperatures.[140] Research has also documented that ocean warming increases the susceptibility to disease, fragmentation, and mortality of elkhorn and staghorn corals, while ocean acidification decreases their fertilization, settlement success, growth and calcification.[141] For listed pillar corals (*Dendrogyra cylindrus*) which have suffered catastrophic declines in Florida in recent years, research indicates that black band disease first emerged following bleaching events in 2014 and 2015 spurred by abnormally high water temperatures.[142] The three listed star corals in the Caribbean—boulder star coral (*Orbicella franksi*), mountainous star coral (*Orbicella faveolata*), and lobed star coral (*Orbicella annularis*)—have experienced long-term declines in reproduction following bleaching events caused by high water temperatures, which scientists warned "may be catastrophic for the long-term maintenance of the population."[143]

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[139] Hoegh-Guldberg, Ove et al., Coral reef ecosystems under climate change and ocean acidification, 4 Frontiers in Marine Science Article 158 (2017).
[140] 71 Fed. Reg. 26,852 at 26,872.; Randall, C. J. & R. van Woesik, Contemporary white-band disease in Caribbean corals driven by climate change, 5 Nature Climate Change 375 (2015); van Woesik, R. & C.J. Randall, Coral disease hotspots in the Caribbean, 8 Ecosphere e01814 (2017).
[141] Albright, Rebecca et al., Ocean acidification compromises recruitment success of the threatened Caribbean coral *Acropora palmata*, 107 PNAS 20400 (2010); Roth, L. et al., Tracking *Acropora* fragmentation and population structure through thermal-stress events, 263 Ecological Modelling 223 (2013); Enochs, I.C. et al., Effects of light and elevated pCO_2 on the growth and photochemical efficiency of *Acropora cervicornis*, 33 Coral Reefs 477 (2014); Camp, E.F. et al., Acclimatization to high-variance habitats does not enhance physiological tolerance of two key Caribbean corals to future temperature and pH, 283 Proceedings of the Royal Society B 20160442 (2016); Williams, D.E. et al., Thermal stress exposure, bleaching response, and mortality in the threatened coral *Acropora palmata*, 124 Marine Pollution Bulletin 189 (2017); Langdon, Chris et al., Two threatened Caribbean coral species have contrasting responses to combined temperature and acidification stress, 63 Limnology and Oceanography 2450 (2018); Muller, Erinn M. et al., Bleaching causes loss of disease resistance within the threatened coral species *Acropora cervicornis*, 7 eLife e35066 (2018).
[142] Lewis, Cynthia L. et al., Temporal dynamics of black band disease affecting pillar coral (*Dendrogyra cylindrus*) following two consecutive hyperthermal events on the Florida Reef Tract, 36 Coral Reefs 427 (2017).
[143] Levitan, Don R. et al., Long-term reduced spawning in *Orbicella* coral species due to temperature stress, 515 Marine Ecology Progress Series 1 (2014).

Figure 2**. Mountainous star coral (*****Orbicella faveolata*****)**
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Scientific research and federal documents conclude that greenhouse gas emissions must be immediately and rapidly reduced—with the target of keeping global average temperature rise below 1.5°C and returning atmospheric CO_2 levels below 350 ppm—to prevent catastrophic loss and degradation of corals. For example, a 2012 study concluded that protecting at least half of the world's coral reefs requires limiting global average temperature rise to 1.2°C, while preserving greater than 10 percent of the world's reefs would require limiting warming to below 1.5°C. [144] Similarly, a 2014 study projected that under the low emissions pathway (RCP 2.6) that limits temperature rise below 2°C, the vast majority (88%) of global reef locations would still experience severe bleaching events annually by the end of the century, indicating that 2°C of warming would be devastating for corals.[145] The 2018 IPCC *Special Report on Global Warming of 1.5°C* stated that coral reefs "are projected to decline by a further 70–90% at 1.5°C (*high confidence*) with larger losses (>99%) at 2ºC (*very high confidence*)."[146] As summarized by a 2018 study:

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[144] Frieler, K., et al., Limiting global warming to 2ºC is unlikely to save most coral reefs, 3 Nature Climate Change 165 (2012) [hereinafter Frieler 2012].
[145] van Hooidonk, R. et al., Opposite latitudinal gradients in projected ocean acidification and bleaching impacts on coral reefs, 20 Global Change Biology 103 (2014).
[146] IPCC 1.5°C Report 2018 at SPM-10.

> Even the aspirational Paris Agreement target of constraining global warming to 1.5°C above pre-industrial levels is unlikely to be sufficient to prevent drastic modifications and reconfigurations of the community structure and make-up of coral reefs. For the 100 reef locations examined here and given current rates of warming, the 1.5°C global warming target represents twice the thermal stress they experienced in 2016. The 2°C global target would result in 3 times the 2016 level of thermal stress and 3 °C, which is currently being tracked with the NDCs, would be over 6 times the 2016 level of stress.[147]

Based on this evidence, coral scientists have recommended returning the atmospheric CO_2 concentration to less than 350 ppm to protect coral reefs, and have suggested a target of 320 ppm which is the level that pre-dates the onset of mass bleaching events.[148]

NMFS' 2015 Final Recovery Plan for Elkhorn and Staghorn Corals states that ocean warming and acidification are "among the greatest threats" to these corals, and recommends actions to reduce greenhouse gas emissions to reduce these threats: "the combination of rising temperature and ocean acidification both resulting primarily from anthropogenic increases in atmospheric CO_2, are likely to have synergistic effects and are among the greatest threats to elkhorn and staghorn coral recovery"[149] and "therefore, actions must be taken to address ocean warming and acidification impacts on these species."[150] NMFS's recovery plan includes a recovery criterion with specific targets for ocean surface temperatures and ocean acidification levels[151] that are lower than today's levels and are consistent with a return to an atmospheric CO_2 concentration of less than 350 ppm,[152] as recommended by numerous scientific studies that have examined coral species viability in response to ocean warming and ocean acidification.[153] The

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[147] Lough, J.M. et al., Increasing thermal stress for tropical coral reefs: 1871-2017, 8 Scientific Reports 6079 (2018).
[148] Veron, John E.N. et al., The coral reef crisis: the critical importance of <350 ppm CO_2, 58 Marine Pollution Bulletin 1428 (2009) [hereinafter Veron 2009].
[149] Coral Recovery Plan 2015 at I-31-32.
[150] *Id.* at ix.
[151] *Id. See* Recovery Criterion 5: "Sea surface temperatures across the geographic range have been reduced to Degree Heating Weeks less than 4; and Mean monthly sea surface temperatures remain below 30°C during spawning periods; and Open ocean aragonite saturation has been restored to a state of greater than 4.0, a level considered optimal for reef growth."
[152] As stated by the Recovery Plan: "Current projections of increases in ocean temperature, coupled with the numerous other stressors acting on these depleted species, will inhibit recovery. Thus, reducing atmospheric CO_2 levels is likely needed to support recovery of elkhorn and staghorn corals. Model simulations by Donner et al. (2009) suggest that atmospheric CO_2 concentrations may need to be stabilized below 370 ppm to avoid degradation of coral reef ecosystems. Veron et al. (2009), based on the recent history of frequent mass bleaching events and correlated climate conditions, advocated the importance of atmospheric CO_2 concentrations of less than 350 ppm for coral reef health, as mass bleaching events, often associated with El Niño, began when atmospheric CO_2 concentrations were approximately 340 ppm. Veron et al. (2009) also discussed the 1997/98 mass bleaching event, when atmospheric CO_2 concentrations were 350 ppm, as the beginning of a decline in coral reef health from which there has been no significant long-term recovery."
[153] These studies include: (1) Veron et al. (2009) which recommends an atmospheric CO_2 concentration of less than 350 ppm to protect coral reef health, and suggests a target of 320 ppm which is the level that pre-dates the onset of mass bleaching events; (2) Donner (2009) which suggests an atmospheric CO_2 concentration target below 370 ppm

Recovery Plan also recognizes that a primary threat to listed corals is the inadequacy of existing regulations to control greenhouse gas emissions. It specifies a recovery criterion calling for the adoption of "adequate domestic and international regulations and agreements" to abate threats from increasing atmospheric CO_2 concentrations,[154] including a recovery action to "develop and implement U.S. and international measures to reduce atmospheric CO_2 concentrations to a level appropriate for coral recovery."[155] As acknowledged by the Recovery Plan:

> The final listing rule (NMFS 2006) identified inadequacy of regulatory mechanisms as a threat contributing to the threatened status of elkhorn and staghorn corals. Additionally, the 2014 final rule maintaining the threatened status of elkhorn and staghorn corals (NMFS 2014) identifies the inadequacy of existing regulations to control greenhouse gas emissions, and thus the high importance threats linked to climate change, as contributing to the status and risk of extinction of these two species. Because existing regulatory mechanisms are insufficient to provide appropriate threat abatement for elkhorn and staghorn corals, they are impeding recovery of these species. The threat posed by inadequacy of existing regulatory mechanisms is high (4) throughout the region (see Table 1) because several of the major threats affecting these species are amenable to regulation, albeit with difficulty. National and international efforts are needed to address global climate change while additional international protections are needed to protect populations of elkhorn and staghorn corals throughout their ranges.[156]

Since the ocean has absorbed more than 90 percent of the excess heat caused by greenhouse gas warming and more than a quarter of the CO_2 emitted by human activities,[157] it is critical for the survival of the elkhorn and staghorn corals to prevent many additional millions of tons of CO_2 from being released. At a minimum, NHTSA must assess how the increases in carbon dioxide emissions will affect these climate-sensitive ocean species.

<u>Other Coastal Species and Sea Level Rise</u>. Global average sea level rose by seven to eight inches (0.2 m) since 1901 as the oceans have gotten hotter and land-based ice has melted.[158] Global average sea level has risen faster since 1900 than in any other century in at least the last

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to avoid degradation of coral reef ecosystems; (3) Simpson et al. (2009) which correlates a Caribbean open-ocean aragonite saturation state of 4.0, which is recommended by the Recovery Plan, with an atmospheric CO_2 level at 340 to 360 ppm; and (4) Frieler et al. (2012) which shows that limiting warming to ~1ºC above pre-industrial levels is needed to protect Caribbean coral reefs from degradation. Veron 2009; Donner 2009; Simpson, M.C. et al., An overview of modeling climate change impacts in the Caribbean Region with contribution from the Pacific Islands, United Nations Development Programme (2009); Frieler 2012.

[154] Coral Recovery Plan 2015, *See* Recovery Criterion 8.

[155] *Id.*, *See* Recovery Action 9.

[156] *Id.* at I-37.

[157] Fourth National Climate Assessment, Vol. I at 364.

[158] IPCC Climate Change 2021, Summary for Policymakers at SPM-6.

3,000 years.[159] Sea level rise is accelerating in pace: the recent rate of sea level rise has nearly tripled compared with the rate between 1901-1971 (3.7 mm per year from 2006-2018 versus 1.3 mm per year from 1901-1971).[160] The Fourth National Climate Assessment estimated that global sea level is very likely to rise by 1.0 to 4.3 feet by the end of the century relative to the year 2000, with sea level rise of 8.2 feet possible.[161] Sea level rise will be much more extreme without strong action to reduce greenhouse gas pollution. By the end of the century, global mean sea level is projected to increase by 0.8 to 2.6 feet under a lower emissions RCP 2.6 scenario, compared with 1.6 to 6 feet under a high emissions RCP 8.5 scenario.[162]

According to the IPCC's *Climate Change 2021* report, even under a very low GHG emissions scenario, it is likely that global sea level rise by 2100 will be about one to two feet (0.28-0.55 m) compared to 1995-2014. Under an intermediate scenario, sea level rise is likely to be as high as 2.5 feet (0.44-0.76 m), and under a very high GHG emissions scenario it is likely to be close to three feet (0.37-0.86 m). Sea level rise above the likely range, approaching seven feet (2 m) by 2100 under a very high GHG emissions scenario cannot be ruled out due to uncertainty around the melting of ice sheets. Regardless, the impacts of sea level rise will be long-lived: under all emissions scenarios, sea levels will continue to rise for many centuries.[163]

Scientific research and federal documents recognize that many coastal listed species are threatened by sea level rise driven by climate change. According to a 2013 analysis, on the current emissions trajectory, rising seas driven by warming temperatures threaten at least 17 percent of our nation's federally protected species, totaling 233 species in 23 coastal states.[164] For example, more than half of Florida's endangered species are threatened by rising sea levels and associated groundwater contamination.[165] Recent FWS listing rules for Florida coastal species have determined that sea level rise resulting from climate change, and the inadequacy of existing regulatory mechanisms to address climate change, are primary threats endangering these species, including the Florida bonneted bat (*Eumops floridanus*),[166] Cape Sable thoroughwort (*Chromolaena frusrata*),[167] Florida semaphore cactus (*Consolea corallicola*),[168] aboriginal

[159] *Id.* at SPM-9.
[160] *Id.* at SPM-6.
[161] Fourth National Climate Assessment, Vol. II at 74, 487, 758.
[162] Fourth National Climate Assessment, Vol. I at 344.
[163] IPCC Climate Change 2021, Summary for Policymakers at SPM-28.
[164] Center for Biological Diversity, Deadly Waters: How Rising Seas Threaten 233 Endangered Species (Dec. 2013) [hereinafter Center for Biological Diversity 2013].
[165] *Id.*
[166] U.S. Fish and Wildlife Service, Endangered and Threatened Wildlife and Plants; Endangered Species Status for the Florida Bonneted Bat, 78 Federal Register 61004 (Oct. 2, 2013) (to be codified at 50 CFR Pt. 17) at 61004.
[167] U.S. Fish and Wildlife Service, Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for *Chromolaena frustrata* (Cape Sable Thoroughwort), *Consolea corallicola* (Florida Semaphore Cactus), and *Harrisia aboriginum* (Aboriginal Prickly-Apple), 78 Fed. Reg. 63796 (Oct. 24, 2013) at 63816.
[168] *Id.* at 63817.

prickly-apple (*Harrisa aboriginum*),[169] and Florida bristle fern (*Trichomanes punctatum ssp. floridanum*).[170]

Research and federal documents have also highlighted sea-level rise as a primary threat to sea turtles by eroding nesting beaches and reducing nesting success.[171] For example, most (87 percent) loggerhead sea turtle (*Caretta caretta*) nesting occurs on the east coast of Florida,[172] where 43 percent of the turtle's nesting beaches are projected to disappear with just 1.5 feet of sea level rise.[173] The listing rules for the green sea turtle[174] and loggerhead sea turtle[175] conclude that sea level rise is likely to have negative effects on these species through beach loss and reduced nesting success.

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[169] *Id.* at 63817.

[170] U.S. Fish and Wildlife Service, Endangered and Threatened Wildlife and Plants; Endangered Species Status for *Trichomanes punctatum ssp. floridanum* (Florida Bristle Fern), 80 Fed. Reg. 60440 (Oct. 6, 2015) at 60440.

[171] Fuentes, M.M.P.B. et al., Potential impacts of projected sea-level rise on sea turtle rookeries, Aquatic Conserv: Mar. Freshw. Ecosyst. (2009); Hawkes, Lucy A. et al., Climate change and marine turtles, 7 Endang. Species. Res. 137 (2009); Witt, M. J. et al., Predicting the impacts of climate change on a globally distributed species: the case of the loggerhead turtle, 213 J. of Experimental Biology 901 (2010); Fuentes, M.M.P.B. et al., Vulnerability of sea turtle nesting grounds to climate change, 10 Global Change Biology 140 (2010); Chaloupka, Milani et al., Is climate change affecting the population dynamics of the endangered Pacific loggerhead sea turtle? 356 J. of Experimental Marine Biology and Ecology 136 (2008).

[172] National Oceanic and Atmospheric Administration, Proposed Listing of Nine Distinct Population Segments of Loggerhead Sea Turtles as Endangered or Threatened, 75 Fed. Reg. 12598 (2010) (to be codified at 50 CFR pts. 223 and 224).

[173] Reece, Joshua S. et al., Sea level rise, land use, and climate change influence the distribution of loggerhead turtle nests at the largest USA rookery (Melbourne Beach, Florida), 493 Marine Ecology Progress Series 259 (2013).

[174] U.S. Fish and Wildlife Service and National Marine Fisheries Service, Endangered and Threatened Wildlife and Plants; Final Rule To List Eleven Distinct Population Segments of the Green Sea Turtle (*Chelonia mydas*) as Endangered or Threatened and Revision of Current Listings Under the Endangered Species Act, 81 Fed. Reg. 20058 (Apr. 6, 2016) (to be codified at 50 CFR pt. 17) at 20078.

[175] U.S. Fish and Wildlife Service, National Marine Fisheries Service, Endangered and Threatened Species; Determination of Nine Distinct Population Segments of Loggerhead Sea Turtles as Endangered or Threatened, 76 Fed. Reg. 58868 (Sept. 22, 2011) (to be codified at 50 CFR pt. 17) at 58910.

Figure 3. **Loggerhead sea turtle (*Caretta caretta*)**
© National Wildlife Federation

Finalizing the Rule is likely to result in a significant increase of CO_2 emissions and worsen sea level rise. The proposed Rule thus triggers NHTSA's legal duty under the ESA to consult on how continued habitat loss due to sea level rise will adversely affect the loggerhead sea turtle and other listed species threatened by sea level rise.

Sample of Recent Species Listed Due to Climate Change. In addition, the Environmental Groups' analysis of federal listing rules found that FWS and/or NMFS determined that human-caused climate change was a current or potential threat for more than 70 percent of all species listed during 2012 to 2015. The table below includes examples of species listed during 2006 to 2015 for which climate change was a listing factor. Climate change is also a growing threat to many threatened and endangered species that were first listed for other reasons.

Table 1. ESA-Listed Species Threatened By Climate Change (Listed during 2006-2015)

Common name	**Scientific name**	**Year listed**
Elkhorn coral	*Acropora palmata*	2006
Staghorn coral	*Acropora cervicornis*	2006
Steelhead trout (Puget Sound DPS)	*Oncorhynchus mykiss pop. 37*	2007
Polar bear	*Ursus maritimus*	2008
Black abalone	*Haliotis cracherodii*	2009
Pacific eulachon (Southern DPS)	*Thaleichthys pacificus*	2010
DeBeque phacelia	*Phacelia scopulina var. submutica*	2011
Casey's june beetle	*Dinacoma caseyi*	2011
Miami blue butterfly	*Cyclargus thomasi bethunebakeri*	2012

Franciscan manzanita	*Arctostaphylos franciscana*	2012
Fern (no common name)	*Doryopteris takeuchii*	2012
A`e	*Zanthoxylum oahuense*	2012
Alani	*Melicope christophersenii*	2012
Alani	*Melicope hiiakae*	2012
Alani	*Melicope makahae*	2012
Haha	*Cyanea calycina*	2012
Haha	*Cyanea lanceolata*	2012
Ha`iwale	*Cyrtandra kaulantha*	2012
Ha`iwale	*Cyrtandra sessilis*	2012
Hala pepe	*Pleomele forbesii*	2012
Hulumoa	*Korthalsella degeneri*	2012
Kaulu	*Pteralyxia macrocarpa*	2012
Ko`oko`olau	*Bidens amplectens*	2012
Flowering plant (no common name)	*Cyanea purpurellifolia*	2012
Flowering plant (no common name)	*Cyrtandra gracilis*	2012
Flowering plant (no common name)	*Cyrtandra waiolani*	2012
Flowering plant (no common name)	*Platydesma cornuta var. cornuta*	2012
Flowering plant (no common name)	*Platydesma cornuta var. decurrens*	2012
Flowering plant (no common name)	*Tetraplasandra lydgatei*	2012
Wild coffee, Oahu	*Psychotria hexandra ssp. oahuensis*	2012
Blackline Hawaiian damselfly	*Megalagrion nigrohamatum nigrolineatum*	2012
Crimson Hawaiian damselfly	*Megalagrion leptodemus*	2012
Oceanic Hawaiian damselfly	*Megalagrion oceanicum*	2012
Llanero coqui	*Eleutherodactylus juanariveroi*	2012
Choctaw bean	*Villosa choctawensis*	2012
Round ebonyshell	*Fusconaia rotulata*	2012
Southern kidneyshell	*Ptychobranchus jonesi*	2012
Alabama pearlshell	*Margaritifera marrianae*	2012
Fuzzy pigtoe	*Pleurobema strodeanum*	2012
Narrow pigtoe	*Fusconaia escambia*	2012
Tapered pigtoe	*Fusconaia burkei*	2012
Southern sandshell	*Hamiota australis*	2012
Hawaiian Islands false killer whale	*Pseudorca crassidens*	2012
Bearded seal (Beringia DPS)	*Erignathus barbatus*	2012
Ringed seal (Arctic DPS)	*Pusa hispida*	2012
Ko`oko`olau	*Bidens campylotheca pentamera*	2013
Ko`oko`olau	*Bidens campylotheca waihoiensis*	2013

Ko`oko`olau	*Bidens conjuncta*	2013
Hillegrand's reedgrass	*Calamagrostis hillebrandii*	2013
`Awikiwiki	*Canavalia pubescens*	2013
Haha	*Cyanea asplenifolia*	2013
Haha	*Cyanea duvalliorum*	2013
Haha nui	*Cyanea horrida*	2013
Haha	*Cyanea kunthiana*	2013
Haha	*Cyanea magnicalyx*	2013
Haha	*Cyanea maritae*	2013
Haha	*Cyanea mauiensis*	2013
Haha	*Cyanea munroi*	2013
Haha	*Cyanea obtusa*	2013
Flowering plant (no common name)	*Cyanea profuga*	2013
Popolo	*Cyanea solanacea*	2013
Ha`iwale	*Cyrtandra ferripilosa*	2013
Ha`iwale	*Cyrtandra filipes*	2013
Ha`iwale	*Cyrtandra oxybapha*	2013
Flowering plant (no common name)	*Festuca molokaiensis*	2013
Nohoanu	*Geranium hanaense*	2013
Nohoanu	*Geranium hillebrandii*	2013
Sea bean	*Mucuna sloanei persericea*	2013
Kolea	*Myrsine vaccinioides*	2013
Newcomb's tree snail	*Newcombia cumingi*	2013
Lanai tree snail	*Partulina semicarinata*	2013
Lanai tree snail	*Partulina variabilis*	2013
`Ala `ala wai nui	*Peperomia subpetiolata*	2013
Flowering plant (no common name)	*Phyllostegia bracteata*	2013
Flowering plant (no common name)	*Phyllostegia haliakalae*	2013
Flowering plant (no common name)	*Phyllostegia pilosa*	2013
Flowering plant (no common name)	*Pittosporum halophilum*	2013
Hala pepe	*Pleomele fernaldii*	2013
Flowering plant (no common name)	*Schiedea jacobii*	2013
Flowering plant (no common name)	*Schiedea laui*	2013
Flowering plant (no common name)	*Schiedea salicaria*	2013
Flowering plant (no common name)	*Stenogyne kauaulaensis*	2013
Flowering plant (no common name)	*Wikstroemia villosa*	2013
Diminutive amphipod	*Gammarus hyalleloides*	2013
Pecos amphipod	*Gammarus pecos*	2013
Diamond tryonia	*Pseudotryonia adamantina*	2013

Phantom tryonia	*Tryonia cheatumi*	2013
Gonzales tryonia	*Tryonia circumstriata (=stocktonensis)*	2013
Phantom springsnail	*Pyrgulopsis texana*	2013
Diamond darter	*Crystallaria cincotta*	2013
Gierisch mallow	*Sphaeralcea gierischii*	2013
Jollyville Plateau salamander	*Eurycea tonkawae*	2013
Austin blind salamander	*Eurycea waterlooensis*	2013
Jemez Mountains salamander	*Plethodon neomexicanus*	2013
Neosho mucket	*Lampsilis rafinesqueana*	2013
Rabbitsfoot	*Quadrula cylindrica cylindrica*	2013
Mount Charleston blue butterfly	*Plebejus shasta charlestonensis*	2013
Slabside pearlymussel	*Pleuronaia dolabelloides*	2013
Fluted kidneyshell	*Ptychobranchus subtentum*	2013
Acuna cactus	*Echinomastus erectocentrus var. acunensis*	2013
Fickeisen plains cactus	*Pediocactus peeblesianus fickeiseniae*	2013
Florida bonneted bat	*Eumops floridanus*	2013
Cape Sable thoroughwort	*Chromolaena frustrata*	2013
Florida semaphore cactus	*Consolea corallicola*	2013
Aboriginal prickly-apple	*Harrisia (=Cereus) aboriginum (=gracilis)*	2013
Kookoolau	*Bidens hillebrandiana ssp. hillebrandiana*	2013
Ko`oko`olau	*Bidens micrantha ctenophylla*	2013
Blue-billed curassow	*Crax alberti*	2013
Haha	*Cyanea marksii*	2013
`aku	*Cyanea tritomantha*	2013
Haiwale	*Cyrtandra nanawaleensis*	2013
Haiwale	*Cyrtandra wagneri*	2013
Hawaiian picture-wing fly	*Drosophila digressa*	2013
Brown-banded antpitta	*Grallaria milleri*	2013
Flowering plant (no common name)	*Phyllostegia floribunda*	2013
Flowering plant (no common name)	*Pittosporum hawaiiense*	2013
Flowering plant (no common name)	*Platydesma remyi*	2013
Lo`ulu	*Pritchardia lanigera*	2013
Flowering plant (no common name)	*Schiedea diffusa ssp. Macraei*	2013
Ma`oli`oli	*Schiedea hawaiiensis*	2013
Flowering plant (no common name)	*Stenogyne cranwelliae*	2013
Anchialine pool shrimp	*Vetericaris chaceorum*	2013

Spring pygmy sunfish	*Elassoma alabamae*	2013
Georgetown salamander	*Eurycea naufragia*	2014
Salado salamander	*Eurycea chisholmensis*	2014
Lesser prairie-chicken	*Tympanuchus pallidicinctus*	2014
Mountain yellow-legged frog (Northern California DPS)	*Rana muscosa*	2014
Sierra Nevada yellow-legged frog	*Rana sierrae*	2014
Yosemite toad	*Anaxyrus canorus*	2014
Narrow-headed garter snake	*Thamnophis rufipunctatus*	2014
Northern Mexican gartersnake	*Thamnophis eques megalops*	2014
New Mexico meadow jumping mouse	*Zapus hudsonius luteus*	2014
Short's bladderpod	*Physaria globosa*	2014
Sharpnose shiner	*Notropis oxyrhynchus*	2014
Smalleye shiner	*Notropis buccula*	2014
Zuni bluehead sucker	*Catostomus discobolus yarrowi*	2014
European sturgeon	*Acipenser sturio*	2014
Bartram's hairstreak butterfly	*Strymon acis bartrami*	2014
Florida leafwing butterfly	*Anaea troglodyta floridalis*	2014
Vandenberg monkeyflower	*Diplacus vandenbergensis*	2014
Oregon spotted frog	*Rana pretiosa*	2014
Carter's small-flowered flax	*Linum carteri carteri*	2014
Florida Brickell-bush	*Brickellia mosieri*	2014
Coral (no common name)	*Agave eggersiana*	2014
Flowering plant (no common name)	*Gonocalyx concolor*	2014
Flowering plant (no common name)	*Varronia rupicola*	2014
Yellow-billed cuckoo (Western U.S. DPS)	*Coccyzus americanus*	2014
Boulder star coral	*Orbicella franksi*	2014
Coral (no common name)	*Acropora globiceps*	2014
Coral (no common name)	*Acropora jacquelinae*	2014
Coral (no common name)	*Acropora lokani*	2014
Coral (no common name)	*Acropora pharaonis*	2014
Coral (no common name)	*Acropora retusa*	2014
Coral (no common name)	*Acropora rudis*	2014
Coral (no common name)	*Acropora speciosa*	2014
Coral (no common name)	*Acropora tenella*	2014
Coral (no common name)	*Anacropora spinosa*	2014
Coral (no common name)	*Euphyllia paradivisa*	2014
Coral (no common name)	*Isopora crateriformis*	2014

Coral (no common name)	*Montipora australiensis*	2014
Coral (no common name)	*Pavona diffluens*	2014
Coral (no common name)	*Porites napopora*	2014
Coral (no common name)	*Seriatopora aculeata*	2014
Lobed star coral	*Orbicella annularis*	2014
Mountainous star coral	*Orbicella faveolata*	2014
Pillar coral	*Dendrogyra cylindricus*	2014
Rough cactus coral	*Mycetophyllia ferox*	2014
Gunnison sage-grouse	*Centrocercus minimus*	2014
Red knot	*Calidris canutus rufa*	2015
Northern long-eared bat	*Myotis septentrionalis*	2015
Aplokating-palaoan	*Psychotria malaspinae*	2015
Berenghenas halomtano	*Solanum guamense*	2015
Cebello halumtano	*Bulbophyllum guamense*	2015
Fadang	*Cycas micronesica*	2015
Flowering plant (no common name)	*Dendrobium guamense*	2015
Flowering plant (no common name)	*Eugenia bryanii*	2015
Flowering plant (no common name)	*Maesa walkeri*	2015
Flowering plant (no common name)	*Nervilia jacksoniae*	2015
Flowering plant (no common name)	*Phyllanthus saffordii*	2015
Flowering plant (no common name)	*Tabernaemontana rotensis*	2015
Flowering plant (no common name)	*Tinospora homosepala*	2015
Flowering plant (no common name)	*Tuberolabium guamense*	2015
Fragile tree snail	*Samoana fragilis*	2015
Guam tree snail	*Partula radiolata*	2015
Humped tree snail	*Partula gibba*	2015
Langford's tree snail	*Partula langfordi*	2015
Mariana eight-spot butterfly	*Hypolimnas octocula mariannensis*	2015
Mariana wandering butterfly	*Vagrans egistina*	2015
Pacific sheath-tailed bat	*Emballonura semicaudata rotensis*	2015
Paudedo	*Hedyotis megalantha*	2015
Rota blue damselfly	*Ischnura luta*	2015
Slevin's skink	*Emoia slevini*	2015
Ufa-halomtano	*Heritiera longipetiolata*	2015
Florida bristle fern	*Trichomanes punctatum ssp. floridanum*	2015

In sum, the single most important action to avoid further jeopardizing climate-threatened species is achieving emissions reductions that keep warming below 1.5°C and meaningfully lessens carbon dioxide-induced ocean acidification.[176] Section 7 consultation under the ESA is the critical first step to preventing the worst impacts of climate change and ocean acidification on endangered species. As described above, the Rule, if finalized, would directly contribute to significantly higher emissions and their attendant climate change and ocean acidification effects, and thus triggers the duty to consult on those impacts to climate-threatened species—including polar bears and corals—to ensure that any final agency is not likely to jeopardize these and other species or result in the adverse modification of their critical habitat. Failure to conduct this consultation would render any final Rule unlawful.

ii. Nitrogen pollution from vehicle exhaust has documented adverse impacts on federally protected species, and NHTSA's adoption of the proposed Rule will allow cars and light trucks to emit nitrogen pollution and impact these federally-listed species.

This section describes the numerous federally-listed species whose existence is jeopardized by increases in nitrogen oxide (NOx) emissions. Once NHTSA corrects its technical assumptions, as described in the Joint Comments submitted with other NGOs, it will be clear that increasing stringency while reducing available credits could save even more NOx than Alternative 2 alone. Consequently, the Rule, if finalized, would directly contribute to NOx emissions from vehicle exhaust and increase nitrogen deposition in the areas where such vehicles are operating. Accordingly, increased levels of nitrogen deposition may impact critically imperiled species, including the bay and quino checkerspot butterflies and desert tortoise, whose populations are at heightened risk of extinction directly due to increased nitrogen pollution in their locations and critical habitats. Yet NHTSA has declined consultation to study the effects of the proposal on endangered species.

Fossil fuel combustion from vehicles produces nitrogen oxide (NOx) air pollutants including nitrous oxide (N_2O), as well as nitric acid (HNO_3), nitrate (NO_3^-), and ammonia (NH_3), which have contributed to the significant increase in nitrogen deposition globally and in many parts of the United States,[177] resulting in widespread impacts to species and ecosystems.[178]

A recent study of the effects of nitrogen pollution on federally-listed species, based on analysis of USFWS and NMFS documents, found that this threat is "substantial" and "geographically widespread."[179] The study found evidence for harm from nitrogen pollution for at least 78 federally protected taxa.[180] This includes at least 50 invertebrates such as mollusks

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[176] IPCC 1.5°C Report 2018.
[177] Fowler, David et al., The global nitrogen cycle in the twenty-first century, 368 Phil Trans R Soc B 20130164 (2013).
[178] Fenn, Mark E., Ecological effects of nitrogen deposition in the Western United States, 53 BioScience 404 (2003) [hereinafter Fenn 2003]; Hernandez, Daniel L. et al., Nitrogen pollution is linked to US listed species declines, 66 BioScience 213 (2016) [hereinafter Hernandez 2016].
[179] Hernandez 2016 at 220.
[180] *Id*. at 215, 220.

and anthropods, at least 18 vertebrate species of fish, amphibians, and reptiles, and at least 8 plants.[181] Harms from nitrogen pollution fell into four main categories: (1) direct toxicity or lethal effects of nitrogen, (2) eutrophication lowering dissolved oxygen levels in water or causing algal blooms that alter habitat by covering up substrate, (3) nitrogen pollution increasing nonnative plant species that directly harm a plant species through competition, and (4) nitrogen pollution increasing nonnative plant species that indirectly harm animal species by excluding their food sources.[182]

Bay checkerspot butterfly (*Euphydryas editha bayensis*) Nitrogen deposition from vehicle exhaust is a well-documented threat to the bay checkerspot butterfly (*Euphydryas editha bayensis*), which is restricted to patches of low-nutrient serpentinite soil in the San Francisco Bay area.[183] Nitrogen deposition has allowed exotic grasses to replace native forbs, including the bay checkerspot's larval host plant, leading to butterfly population declines and local extirpations.[184] USFWS in its most recent 5-year review for the bay checkerspot butterfly found that nitrogen deposition from smog created soil conditions that allowed for invasion of non-native plants, where the level of impact increased with proximity to a major interstate highway:

Figure 4. Bay checkerspot butterfly *Euphydryas editha bayensis*) © Wikimedia Commons

> Weiss (1999, p. 1476) determined that while the initial cause of the butterfly declines were the result of rapid invasion by nonnative annual grasses that crowded out the butterfly's larval host plants, the evidence indicated that dry nitrogen deposition from smog was responsible for creating soil conditions that allowed the observed grass invasion. Weiss (1999, p. 1482) estimated nitrogen deposition rates south of San Jose to be 10-15 kg of nitrogen per hectare per year (kg-N/ha/yr). Weiss (2002, p. 31) further demonstrated these

[181] *Id.* at 216-217 at Tables 1, 2, 3.
[182] *Id.* at 215-217.
[183] Fenn 2003; U.S. Fish and Wildlife Service, Quino checkerspot butterfly (*Euphydryas editha bayensis*) 5-Year Review: Summary and Evaluation, Sacramento Fish and Wildlife Office (August 2009) [hereinafter USFWS Bay checkerspot butterfly 5-Year Review]; Hernandez 2016.
[184] Weiss, Stuart B., Cars, cows and checkerspot butterflies: nitrogen deposition and management of nutrient-poor grasslands for a threatened species, 13 Conservation Biology 1476 (1999); Huenneke Laura F. et al., Effects of soil resources on plant invasion and community structure in Californian serpentine grassland, 71 Ecology 478 (1990); Vallano, Dena M. et al., Simulated nitrogen deposition enhances the performance of an exotic grass relative to native serpentine grassland competitors, 213 Plant Ecology 1015 (2012).

effects by analyzing the pattern of non-native grass invasion resulting from nitrogen deposition at Edgewood Park, and observed that the cover of non-native Italian ryegrass (*Lolium multiflorum*) decreased with distance from Interstate Highway 280 (I-280), while *Plantago erecta* cover increased with distance. *Plantago erecta* cover was also higher upwind of I-280 than downwind.[185]

In its 5-year review, USFWS concluded that "the butterfly is still at great risk from invasion of non-native vegetation, exacerbated by nitrogen deposition from air pollution."[186]

Presidio clarkia (*Clarkia franciscana*) Endangered plant species such as the Presidio clarkia (*Clarkia franciscana*)—a beautiful flowering plant native to California serpentine grasslands—are also being harmed by nitrogen deposition from vehicle pollution which gives a competitive advantage to nonnative plants.[187] USFWS in its most recent 5-year review for the Presidio clarkia identified nitrogen deposition from air pollution as a principal threat, explaining that "elevated inputs of atmospheric nitrogen deposition from air pollution have further accelerated the encroachment of native shrubs and nonnative shrubs and nonnative grasses and forbs…into *Clarkia franciscana* habitat."[188]

Figure 5. Presidio clarkia (*Clarkia franciscana*) © California Fish and Wildlife Department

The USFWS 5-year review specifically highlights vehicle pollution as a key contributor to the nitrogen deposition harming the Presidio clarkia:

> Elevated atmospheric nitrogen deposition from air pollution is particularly harmful to the nutrient-poor serpentine grasslands where the *Clarkia franciscana* occurs because nitrogen is the primary limiting nutrient for plant growth on serpentine soils (Weiss 1999). The use of catalytic converters on vehicles has increased the availability of nitrogen in a form that is directly absorbed by plants (EBRPD 2009a). The excess nitrogen deposited leads to increases in nonnative annual grasses which outcompete the native flora (Fenn *et al*. 2003, Weiss 1999).

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[185] USFWS Bay checkerspot butterfly 5-Year Review at 13.
[186] *Id.* at 18 and 31.
[187] Hernandez 2016 at 218, Table 3.
[188] U.S. Fish and Wildlife Service, *Clarkia franciscana* (Presidio clarkia) 5-Year Review: Summary and Evaluation, Sacramento Fish and Wildlife Office (2010) at 43.

> The displacement of *Clarkia franciscana* and native bunchgrasses from serpentine soils in the Oakland Hills is attributed to the dry deposition of 10 – 15 kilograms nitrogen per hectare per year from smog allowing for the invasion of nonnative annual grasses, especially Italian ryegrass at Redwood Regional Park (EBRPD 2009a, Tonnesen *et al*. 2007). … Thus, *Clarkia franciscana* in the serpentine grasslands in the Oakland Hills continues to be threatened by elevated atmospheric nitrogen deposition from air pollution enabling the invasion of nonnative annual grasses into otherwise nutrient-poor soils.[189]

The USFWS 5-year review identifies other potential harms to the Presidio clarkia from nitrogen deposition such as decreased diversity of mycorrhizal communities and predisposing plants to environmental stresses such as elevated concentrations of ozone, drought, frost, or insect attacks.[190]

Other Species Threatened by Nitrogen Pollution. Similarly, USFWS has determined that nitrogen pollution threatens the federally protected Quino checkerspot butterfly (*Euphydryas editha quino*) and the desert tortoise (*Gopherus agassizii*) by facilitating the spread of non-native species that displace the butterfly's host plants[191] and the tortoise's forage plants, reducing the nutritional quality of available food for the desert tortoise.[192]

A review on the effects of nitrogen deposition in the western United States highlighted the need for policy changes at the national level for reducing air pollution to protect endangered species from nitrogen deposition: "local land management strategies to protect these endangered species may not succeed unless they are accompanied by policy changes at the regional or national level that reduce air pollution."[193]

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[189] *Id.* at 50.
[190] *Id.* at 50.
[191] USFWS Bay checkerspot butterfly 5-Year Review at 13, 15, 18.
[192] Nagy, Kenneth A. et al., Nutritional quality of native and introduced food plants of wild desert tortoises, 32 Journal of Herpetology 260 (1998); Allen, Edith B. et al., Impacts of atmospheric nitrogen deposition on vegetation and soils at Joshua Tree National Park, pages 78-100. In: The Mojave Desert: Ecosystem Processes and Sustainability [Webb, R.H. et al. (eds.)]. University of Nevada Press, Las Vegas (2009); U.S. Fish and Wildlife Service, Mojave population of the desert tortoise (*Gopherus agassizii)* 5-Year Review: Summary and Evaluation, Desert Tortoise Recovery Office (Sept. 2010) at 24, 33.
[193] Fenn 2003 at 416.

i. **Sulfur dioxide pollution has clear and documented adverse impacts on federally protected species, and NHTSA's adoption of the proposed Rule will allow cars and light trucks to emit sulfur dioxide pollution and impact these federally-listed species.**

This section describes the myriad federally-listed species whose existence is jeopardized by increases in sulfur dioxide ("SO_2") emissions. As with NOx, once NHTSA corrects its technical assumptions, as described in the Joint Comments submitted with other NGOs, it will be clear that increasing stringency while reducing available credits could save even more SO_2 than Alternative 2 alone. Consequentially, the Rule, if finalized as proposed, would directly contribute to SO_2 emissions and jeopardize numerous critically imperiled bird species and plant species, whose populations are at heightened risk of extinction directly due to increased sulfur dioxide pollution in their locations and critical habitats. Yet NHTSA has declined consultation to study the effects of the proposal on endangered species.

Strong evidence shows that SO_2, as well as precursors such as sulfur oxides ("SO_x"), harm endangered plant and animal species as well as aquatic and terrestrial ecosystems. As reviewed by EPA, the negative ecological effects of SO_2 pollution include acidification of aquatic and terrestrial ecosystems, nutrient enrichment of aquatic and terrestrial ecosystems, and facilitation of mercury methylation in aquatic ecosystems.[194] Acute and chronic exposure to SO_2 also leads to phytotoxic effects on plants, including foliar injury, decreased photosynthesis, and decreased growth.[195]

In its 2017 final Integrated Review Plan for Secondary Standards for Oxides of Sulfur, EPA acknowledged that there is "sufficient evidence to infer causal relationships" between exposure to SO_2 and SO_x and (a) aquatic acidification and the loss of acid-sensitive species, where more species are lost with greater acidification;[196] (b) changes in terrestrial biota due to acidifying sulfur deposition, such as decreased growth and increased susceptibility to disease and injury in sensitive tree species;[197] (c) increased mercury methylation in aquatic environments;[198] and (d) injury to vegetation, including decreased photosynthesis, decreased growth, and visible foliar injury.[199]

In terms of harms to endangered species, EPA acknowledged that acidifying sulfur deposition in aquatic ecosystems can cause the loss of acid-sensitive species, such as salmonids (many of which are endangered), and that disruption of food web dynamics can cause changes to

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194 U.S. Environmental Protection Agency, Integrated Review Plan for the Secondary National Ambient Air Quality Standards for Ecological Effects of Oxides of Nitrogen, Oxides of Sulfur and Particulate Matter, EPA-452/R-17-002 (January 2017) [hereinafter USEPA IRP NAAQS NoX, SoX, PM 2017] at 2-4 and 2-5.
195 *Id.* at 2-3 and 3-9.
196 *Id.* at 3-13.
197 *Id.* at 2-5 and 2-6.
198 *Id.* at 3-14 and 3-15.
199 *Id.* at 2-3 and 3-9.

the diet, breeding distribution and reproduction of bird species.[200] EPA further stated that current rates of acidifying SO_x deposition are still well above pre-acidification conditions in areas such as the Adirondacks and Shenandoah, and that sulfur and nitrogen deposition loadings of many Adirondack lakes and streams are at levels that can harm aquatic biota (e.g., levels associated with loss of fitness in species such as the Blacknose Dace).[201] EPA also acknowledged that there is a "causal relationship between Sulfur deposition *at current levels* and increased Hg methylation in aquatic environments,"[202] which is problematic because mercury is highly neurotoxic and, once methylated, can be taken up by zooplankton and macroinvertebrates, and bioaccumulate up the food web.[203]

Indeed, EPA's Integrated Review Plan acknowledges that SO_2 has the potential to negatively affect endangered species. The Risk and Exposure Assessment (REA) identified a range of ecosystem services that are affected by terrestrial acidification including "decreased habitat for threatened and endangered species."[204]

At-risk Plant Species. Federal wildlife agencies, and in particular FWS, have identified numerous federally endangered and threatened species that are negatively affected by atmospheric pollution from SO_2 and SO_x. Federally protected plant species identified by FWS as threatened by or susceptible to acidification and atmospheric pollution include the Harperella (*Ptilimnium nodosum*),[205] Zuni Fleabane (*Erigeron rhizomaxs*),[206] Mancos Milkvetch (*Astragalus humillimus*),[207] Blue Ridge Goldenrod (*Solidago spithamaea*),[208] Heller's Blazing Star (*Liatris helleri*),[209] Rock Gnome Lichen (*Gymnodema lineare*),[210] and Roan Mountain Bluet (*Hedyotis purpurea var. montana*).[211] For example, Heller's Blazing Star is a

Figure 5. Heller's Blazing Star (*Liatris helleri*) © BlueRidgeKitties via Flickr

[200] *Id.* at 2-5.
[201] *Id.* at 2-5.
[202] *Id.* at 3-14.
[203] *Id.* at 3-14 and 3-15.
[204] *Id.* at 4-11.
[205] U.S. Fish and Wildlife Service, Harperella (*Ptilimnium nodosum*) Rec
[206] U.S. Fish and Wildlife Service, Recovery Plan for Zuni Fleabane (*Erigeron rhizomaxs* Cronquist) (1988) at 12.
[207] U.S. Fish and Wildlife Service, Mancos Milkvetch (*Astragalus humillimus)* Recovery Plan (1989) at 13.
[208] U.S. Fish and Wildlife Service, Blue Ridge Goldenrod (*Solidago spithamaea* Curtis) Recovery Plan (1987) at 7, 20.
[209] U.S. Fish and Wildlife Service, Heller's Blazing Star (*Liatris helleri*) Recovery Plan (2000) [hereinafter Heller's Blazing Star Recovery Plan 2000] at iii, 7.
[210] U.S. Fish and Wildlife Service, Recovery Plan for Rock Gnome Lichen (*Gymnodema lineare*) (1997) [hereinafter Rock Gnome Lichen Recovery Plan 1997] at 4, 9.
[211] U.S. Fish and Wildlife Service, Recovery Plan for Roan Mountain Bluet (*Hedyotis purpurea var. montana*) (1996) at 20.

rare plant endemic to a limited area in the Blue Ridge Mountains of North Carolina, with only a few populations currently known to exist. The recovery plan for this species names acid precipitation as a "pervasive" threat.[212] The FWS recovery plan for the Rock Gnome Lichen, which is endemic to the Southern Appalachians, flags that "there is a high likelihood that current and previous air pollution levels, especially from sulfates, may be contributing to the decline of this species."[213]

<u>At-risk Animal Species.</u> FWS has also identified numerous animal species as being threatened by or susceptible to acidification and atmospheric pollution, including the Shenandoah Salamander (*Plethodon shenandoah*),[214] Cheat Mountain Salamander (*Plethodon neftiigi*),[215] Chiricahua Leopard Frog (*Rana chiricahuensis*),[216] Whooping Crane (*Grus americana*),[217] Roanoke Logperch (*Percina rex*),[218] Dwarf Wedge Mussel (*Alasmidonta heterodon*),[219] Mobile River Basin mussels,[220] and seven species of Southeast mussels.[221] For example, the recovery plan for the Chiricahua Leopard Frog states that acid rain has been found to adversely affect Chiricahua Leopard Frog populations,[222] likely through reduced hatching of eggs and reduced growth rates.[223]

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[212] Heller's Blazing Star Recovery Plan 2000 at 7.
[213] Rock Gnome Lichen Recovery Plan 1997 at 4.
[214] U.S. Fish and Wildlife Service, Shenandoah Salamander (*Plethodon shenandoah*) Recovery Plan (1994) at 1, 8-10.
[215] U.S. Fish and Wildlife Service, Cheat Mountain Salamander (*Plenthodon nettingi*) Recovery Plan (1991) at 12.
[216] U.S. Fish and Wildlife Service, Chiricahua Leopard Frog (*Rana chiricahuensis*) Final Recovery Plan (2007) [hereinafter Chiricahua Leopard Frog Final Recovery Plan 2007] at 23-25, 35, 40.
[217] U.S. Fish and Wildlife Service, International Recovery Plan: Whooping Crane (*Grus americana*): Third Revision (2007) at C-1.
[218] U.S. Fish and Wildlife Service, Roanoke Logperch (*Percina rex*) Recovery Plan (1992) at 17.
[219] U.S. Fish and Wildlife Service, Dwarf Wedge Mussel (*Alasmidonta heterodon*) Recovery Plan (1993) at 14.
[220] U.S. Fish and Wildlife Service, Recovery Plan for Mobile River Basin Aquatic Ecosystem (2000) at 12, 13; U.S. Fish and Wildlife Service, Recovery Plan for Six Mobile River Basin Snails (Cylindrical Lioplax, Flat Pebblesnail, Plicate Rocksnail, Painted Rocksnail, Round Rocksnail and Lacy Elimia) (2005) at 16.
[221] U.S. Fish and Wildlife Service, Recovery Plan for Fat Threeridge (*Amblema neislerii*), Shinyrayed Pocketbook (*Lampsilis subangulata*), Gulf Moccasinshell (*Medionidus penicillatus*), Ochlockonee Moccasinshell (*Medionidus simpsonianus*), Oval Pigtoe (*Pleurobema pyriforme*), Chipola Slabshell (*Elliptio chipolaensis*), and Purple Bankclimber (*Elliptoideus sloatianus*) (2003) at 56.
[222] Chiricahua Leopard Frog Final Recovery Plan 2007 at 40.
[223] *Id.* at 44.

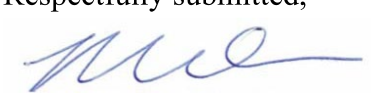
Figure 6. Whooping Crane (*Grus americana*) © National Wildlife Federation

Consultation under the ESA about impacts to species is essential. NHTSA's Proposal, if finalized, would directly contribute to higher emissions of SO_2, and thus triggers the duty to consult on those impacts to species at risk from atmospheric pollution from SO_2 and SO_x. Failure to conduct this consultation would render any final repeal unlawful.

III. Conclusion

The scientific evidence demonstrates that the Rule, if adopted as proposed, may affect hundreds of threatened and endangered species, and their critical habitats, due to the Rule's resulting increase in emissions of GHG, NOx, SO_2 and other criteria air pollutants. Accordingly, the finalization of the Rule triggers NHTSA's mandatory duty to initiate Section 7 consultation under the ESA to ensure that the Rule will not jeopardize the existence of these endangered species and their habitats, which have been legally identified by the Services as being at risk precisely due to the emissions of these air pollutant emissions. The Center urges NHTSA to undergo Section 7 consultation with the Services immediately.

Respectfully submitted,



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