TULANE ENVIRONMENTAL LAW JOURNAL

VOLUME 33 SUMMER 2020 ISSUES 1 / 2

From Bail Out to Righting the Course: The Commonsense Action the United States Must Take to Address Its Flood Crisis

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The threats of the climate change crisis and sea level rise to U.S. infrastructure, military readiness, food security, and the economy are most evident in America's floodplains, where the National Flood Insurance Program (NFIP) has worsened flooding and floodplain development by providing insurance policies that obscure risk and provide discounted coverage. Meanwhile, the United States contributes significantly to global greenhouse gas emissions, which fuels the climate change crisis and worsens flooding. The disconnect between subsidizing development in floodplains and the fact that the United States has made those floodplains even more vulnerable to flooding by leasing federal fossil fuels that contribute to the climate change crisis and sea level rise has cost U.S. taxpayers billions of dollars and put millions of people and our nation's most imperiled species at increased risk.

Flooding will only get more expensive and devastating, especially if the United States continues in "business as usual" fossil fuel extraction and emissions, disproportionately putting vulnerable communities at risk. Congress must immediately end federal fossil fuel leases and require that federal agencies that fund, authorize, or permit fossil fuel activities analyze the indirect greenhouse gas emissions impacts of those activities. Congress must also require FEMA to use the best available climate change and sea level rise mapping to reflect actual flood risk, provide a nationwide plan for flood disclosure and risk, analyze and avoid impacts to wildlife habitat, and pursue buyouts.

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I would like to thank Spring Gaines for her research assistance, and to Dr. Shaye Wolf and Howard Crystal who provided feedback on this Article, and the law students of the *Tulane Environmental Law Journal* who provided thoughtful edits and cite checks.

I. INTRODUCTION

The threats of the climate crisis and sea level rise to U.S. infrastructure, military readiness, food security, and the economy are most evident in America's floodplains where, despite ambitions to the contrary, the National Flood Insurance Program (NFIP) has encouraged floodplain development by providing insurance policies that obscure risk and provide discounted coverage.[1] At the same time, the United States annually

1. R.J. Lehman, *Preparing for the Storm: Reauthorization of the National Flood Insurance Program, Testimony Before the U.S. H. Comm. on Financial Servs.*, 116th Cong. (2019) [hereinafter *Preparing for the Storm*]; *see also* J.S. HOLLADAY & J.A. SCHWARTZ, INST. FOR POLICY INTEGRITY, POLICY BRIEF NO. 7, FLOODING THE MARKET: THE DISTRIBUTIONAL CONSEQUENCES OF THE NFIP (Apr. 2010), https://policyintegrity.org/documents/FloodingtheMarket.pdf; PEW

contributes 15% of global greenhouse gas emissions, fueling the climate crisis and worsening flooding, and has recently accelerated efforts to make federal fossil fuels even more accessible to the energy industry.[2] The disconnect between subsidizing development in floodplains and the fact that the United States has made those floodplains even more vulnerable to flooding by leasing federal fossil fuels that contribute to the climate crisis and sea level rise has cost U.S. taxpayers billions of dollars and put millions of people and our nation's most imperiled species at increased risk of harm.

Congress has tasked the Federal Emergency Management Agency (FEMA) with developing comprehensive criteria for land use and management to limit development of land exposed to flood risk, guiding development away from lands threatened by flood hazards, assisting in reducing damage caused by floods, and improving the long-range land management and use of flood prone areas.[3] Communities that voluntarily participate in the NFIP and adopt land use and control measures get their homeowners lower-cost flood insurance.[4] Thus, while an overarching purpose of the NFIP was to keep development out of flood prone areas, it has wildly missed its mark.[5]

In 2018, FEMA updated the NFIP to implement the legislative requirements of the Biggert-Waters Flood Insurance Reform Act of 2012 (BW-12) and the Homeowner Flood Insurance Affordability Act of 2014 (HFIAA) and to come into compliance with the Endangered Species Act (ESA). The reforms were intended to allow the NFIP to function fiscally by creating a new structure to reflect the actual threats and effects of flooding, both monetarily and environmentally.[6] Unfortunately, the 2018 update failed on multiple fronts, most importantly by ignoring climate change and sea level rise science in mapping flood areas, and in foisting FEMA's ESA responsibilities upon local communities.

OCEANS, AMERICA'S LIVING OCEANS 53 (May 2003), https://www.pewtrusts.org/-/media/assets/2003/06/02/full_report.pdf; A.B. Lemann, *Assumption of Flood Risk*, 51 ARIZ. ST. L.J. 163, 165-66 (2019); J.D. Shilling et al, *Flood Insurance, Wealth Redistribution, and Urban Property Values*. J. URB. ECON. 26, 43-53 (1989).

2. *Energy & Environment*, WHITE HOUSE, https://www.whitehouse.gov/issues/energy-environment/.

3. FEMA, NATIONAL FLOOD INSURANCE PROGRAM: FINAL NATIONAL PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT 1-2 to 1-3 (Sept. 2017) [hereinafter FINAL PEIS], https://www.fema.gov/media-library-data/1507908193592-653fa352f5084b01dfdc57f7a81a82dd/NFIPFinalNPEISChapters1-6_508.pdf.

4. 42 U.S.C. § 4012(c)(2) (2012).

5. *See* FINAL PEIS, *supra* note 3, at 1-3.

6. *See id.* at 1-6.

Meanwhile, U.S. federal fossil fuel leasing is reaching all-time highs with little-to-no analysis from the federal government as to how the fossil fuels will result in greenhouse gas emissions and worsen the climate crisis and sea level rise, much less any analysis as to how such federal leasing and attendant greenhouse gas emissions will contribute to flood impacts in NFIP flood-prone areas. Greenhouse gas emissions from U.S. federal fossil fuel leases make up about a quarter of all domestic emissions, and despite Congress's clear mandate requiring that all federal agencies analyze the indirect effects of their major federal actions under the National Environmental Policy Act (NEPA), the U.S. Supreme Court, in *Department of Transportation v. Public Citizen*, created uncertainty regarding federal agencies' obligations to analyze the indirect greenhouse gas effects of the projects they fund or authorize.[7] The Supreme Court held that because the Department of Transportation was not the proximate cause of and had no statutory authority to address transboundary air pollution resulting from cross-border traffic enabled by its regulations, it was not required to analyze that effect under NEPA. The holding in *Public Citizen* undermines the underlying purpose of NEPA—informed agency decision-making—and enables agencies to blindly authorize federal activities that are likely to worsen climate change-fueled flooding.

This Article argues that for the United States to bail the NFIP out of insolvency and actually minimize flood hazard risk, especially in the wake of climate change and sea level rise, it must immediately implement commonsense measures across multiple agencies. Congress must end federal fossil fuel leases and require federal agencies that fund, authorize, or permit fossil fuel activities to analyze the indirect greenhouse gas emissions impacts of those activities. Congress must also require FEMA to use the best available climate change and sea level rise mapping to reflect actual flood risk, provide a nationwide plan for flood disclosure and risk, analyze and avoid impacts to wildlife habitat, and pursue buyouts. Flooding will only get more expensive and devastating, especially if the United States engages in "business as usual" fossil fuel extraction and emissions, disproportionately putting vulnerable communities at risk. Eliminating those emissions could reduce the devastating impacts of climate change-related flooding, including sparing millions of people exposed to sea level rise risk, giving coastal species a fighting chance at survival, and saving the United States economy billions of dollars. A national program for addressing flooding in the era of climate change is

7. 541 U.S. 752, 773 (2004).

destined for failure without significant reductions in U.S. fossil fuels and aggressive action curbing floodplain development.

II. THE NATIONAL FLOOD INSURANCE PROGRAM PUTS VULNERABLE COMMUNITIES AT RISK

The NFIP is $21 billion in debt and has facilitated development in flood-prone areas of the United States for decades. It has also increased flooding in floodplains, as development of natural landscapes increases flooding.[8] The climate crisis and sea level rise increase the risk of flooding in these areas, disproportionately impacting already vulnerable communities and the United States' most imperiled species. Congress has amended the NFIP several times, but the program has never achieved its original intent and instead continues to facilitate floodplain development placing communities at risk and driving species toward extinction.

A. Legislative Background & Statutory Framework

The United States' history of insuring properties in flood areas spans over fifty years. The purpose of the National Flood Insurance Act of 1968 was to provide affordable flood insurance and encourage sensible land use that minimizes the exposure of built structures to flood damage.[9] The 1973 Flood Disaster Protection Act made flood insurance mandatory for property owners with property in vulnerable areas with mortgages from federally regulated lenders.[10] The 1994 National Flood Insurance Reform Act sought to strengthen mandatory purchase requirements in Special Flood Hazard Areas (SFHA). Meanwhile, the 2004 Bunning-Bereuter-Blumenauer Flood Insurance Program attempted to require mitigation for

8. *See* Samuel D. Brody, Sammy Zahran, Praveen Maghelai, Himanshu Grover & Wesley E. Highfield, *The Rising Costs of Floods: Examining the Impact of Planning and Development Decisions on Property Damage in Florida*, 73 J. AM. PLANNING ASS'N 330, 330 (2007); Bülent Cengiz, *Urban River Landscapes, in* 21 ADVANCES IN LANDSCAPE ARCHITECTURE (Murat Ozyavuz ed., 2013); James M. Holway & Raymond J. Burby, *The Effects of Floodplain Development Controls on Residential Land Values*, 66 LAND ECON. 3, 259 (1990); C.P. Konrad, *Effects of Urban Development on Floods*, U.S. GEOLOGICAL SURV. (Nov. 29, 2016), https://pubs.usgs.gov/fs/fs07 603; *see also* James Schilling, C.F. Sirmans & John D. Benjamin, *Flood Insurance, Wealth Distribution, and Urban Property Values*, 26 J. URB. ECON. 43, 45 (1989); Raghav Tripathi et al., *Climate Change, Urban Development, and Community Perception of an Extreme Flood: A Case Study of Vernonia, Oregon, USA*, 46 APPLIED GEOGRAPHY 137, 137-46 (2014).

9. 42 U.S.C. § 4001(a)-(e) (2018).

10. *Why You Need Flood Insurance*, FEMA: NAT'L FLOOD INSURANCE PROGRAM, https:// www.floodsmart.gov/faqs (last visited Apr. 8, 2020).

properties that suffer repetitive flood loss by requiring higher premiums for those who opt to not mitigate.[11]

Under the current NFIP, the federal government underwrites flood insurance in participating communities to cover flood-related losses and damages sustained by residential and commercial structures.[12] FEMA dictates minimum floodplain management standards and identifies flood hazards by providing Flood Insurance Rate Maps (FIRMs). FEMA is charged with developing comprehensive criteria for land use and management that constricts development of land exposed to flood risk, guides development away from lands threatened by flood hazards, assists in reducing damage caused by floods, and otherwise improves the long-range land management and use of flood-prone areas.[13] Communities can then volunteer to participate in the NFIP, and in doing so, adopt land use and control measures to obtain lower cost flood insurance.[14] To date more than 22,000 communities throughout the United States participate in this program allowing property owners to purchase flood insurance as a condition of receiving federally related financial assistance to acquire or improve land.[15]

The National Flood Insurance Act requires that FEMA "identify and publish information with respect to all flood plain areas, including coastal areas located in the United States, which has special flood hazards,"[16] and that at least once every five years the Administrator assess the need to revise and update the flood maps "based on an analysis of all natural hazards affecting flood risks."[17] A SFHA is defined as "the land in the flood plain within a community subject to a 1 percent or greater chance of flooding in a given year."[18] FEMA puts data regarding the locations of SFHA and regulatory floodways on FIRMs.[19] The FIRMs then provide the basis both for the requirement that a developer obtain flood insurance as well as the calculation of the actual flood insurance rate for any new construction.[20] Through BW-12, Congress required that FEMA phase out

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11. *See* Bunning-Bereuter-Blumenauer Flood Insurance Reform Act, Pub. L. No. 108-264, § 102(h), 118 Stat. 713 (2004) (codified as 42 U.S.C. § 4001).

12. FEMA, F-084, ANSWERS TO QUESTIONS ABOUT THE NFIP 1 (Mar. 2011), https://www.fema.gov/media-library-data/20130726-1438-20490-1905/f084_atq_11aug11.pdf.

13. *Id.* at 2.

14. 42 U.S.C. § 4012(c) (2016).

15. *Id.* § 4012(b); *Why You Need Flood Insurance*, *supra* note 10.

16. 42 U.S.C. § 4101(a)(1).

17. *Id.* § 4101(e).

18. 44 C.F.R. § 59.1 (2019).

19. *Why You Need Flood Insurance*, *supra* note 10.

20. FEMA, *supra* note 12.

subsidies for certain pre-FIRM properties, establish a Reserve Fund, and create a Technical Mapping Advisory Council (TMAC) to develop recommendations for FEMA's flood mapping program.[21] The phase out of subsidies requirement was to be applicable to properties that are a non-primary residence, business, substantially improved or damaged, or those in which the payout exceeds the fair market value. Congress required that premium rates be increased by 25% each year until the risk rate is met.[22]

Those reforms proved too controversial, and two years later, Congress repealed and modified certain provisions of BW-12 with HFIAA.[23] HFIAA removed some of BW-12's provisions that required a phase out of subsidies on pre-FIRM properties; required the application of full risk rates to policies renewed after a lapse; required a phase out of subsidies on all pre-FIRM properties at a rate of no less than 5% but not more than 15% per year, subject to exceptions established by statutes, including BW-12; and set a quicker phase out for certain pre-FIRM properties, to all be phased out within fifteen to twenty years.[24] HFIAA implemented a surcharge for all new and renewed policies to be assessed at $25 for primary residences and $250 for all other policies, with all funds from the surcharge being deposited into the Reserve Fund established by BW-12.[25] Under HFIAA, FEMA was to set premium rates for newly mapped SFHA properties at the same rate as Preferred Risk Policies.[26]

HFIAA directed the TMAC to make recommendations concerning (1) the "accuracy [and] general quality . . . of flood insurance rate maps and risk data"; (2) "performance metrics and milestones required to effectively and efficiently map flood risk areas in the United States"; and (3) "guidelines for (A) flood insurance rate maps; and (B) data accuracy, data quality, data currency, and data eligibility."[27] Congress also directed the TMAC to

> (A) develop recommendations on how to (i) ensure that flood insurance rate maps incorporate the best available climate science to assess flood risks; and (ii) ensure that FEMA uses the best available methodology to consider the impact of (I) the rise in the sea level; and (II) future development on flood risk.[28]

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21. FINAL PEIS, *supra* note 3, at 2-1 to 2-2.
22. *Id.* at 2-2.
23. *Id*. at 1-5.
24. *Id.* at 1-6.
25. *Id.*
26. *Id.* at 1-4.
27. 42 U.S.C. § 4101a(c) (2016).
28. *Id.* § 4101a(d)(1)(A).

Congress required that FEMA incorporate these recommendations into its update and revisions of the NFIP[29] and report annually to Congress on its recommendations and actions to address those recommendations.[30] It also directed FEMA to "identify, review, update, maintain, and publish" its rate maps by including "any relevant information or data of the National Oceanic and Atmospheric Administration and the United States Geological Survey relating to the best available science regarding future changes in sea levels, precipitation, and intensity of hurricanes."[31]

As a result of these new laws, FEMA embarked on a seven-year journey through NEPA to reform the NFIP. In April 2019, FEMA released its record of decision (ROD) on the NFIP, approving its preferred alternative that would phase out certain pre-FIRM subsidies at annual 25% premium increases for nonprimary residences, business properties, severe repetitive loss, substantially damaged or improved properties, and properties for which cumulative claims payments exceed fair market value.[32] The ROD also noted that FEMA planned to phase out all other pre-FIRM subsidies with annual premium rate increases of 5%-15%[33] and in lieu of FEMA consulting with federal wildlife management agencies, require that communities comply with the ESA, as a condition of issuing floodplain development permits or issuing a letter of map changes. Notably, and despite congressional and TMAC mandates, FEMA still refuses to use climate change and sea level rise science in mapping.[34]

No court has yet determined the lawfulness of the ROD, but one court has found FEMA's biological evaluation, which the ROD in-part relied upon, to be unlawful.[35] On May 15, 2019, Northern District of California Judge James Donato held FEMA's biological evaluation was "arbitrary, capricious, an abuse of discretion or otherwise not in accordance with law."[36] The biological evaluation was based on FEMA's finding that (1) floodplain development should not be included in the scope of the evaluation because state and local governments, not FEMA, control and authorize development permits; and (2) the NFIP does not directly or

29. *Id.* § 4101a(d)(1)(B).
30. *Id.* § 4101a(l).
31. *Id.* §§ 4101b(1), (3).
32. FEMA, NATIONAL FLOOD INSURANCE PROGRAM: RECORD OF DECISION 1 (Apr. 2018), https://www.fema.gov/media-library-data/1525199455110-5d24bdbd352e2792f6cd196b3dd779e2/NFIP_NPEIS_ROD.pdf.
33. *Id.*
34. *Id.* at 9-10.
35. *See* Ecological Rights Found. v. FEMA, 384 F. Supp. 3d 1111, 1111, 1124 (N.D. Cal. 2019).
36. *Id.* at 1124.

indirectly cause or encourage floodplain development.[37] The court found that FEMA "simply turned an intentionally blind eye toward the broad scope of FEMA's floodplain management authority,"[38] and that FEMA's "denial of any meaningful involvement flies in the face of the record and artificially truncates the scope of its actions" in the context of the Endangered Species Act.[39] The court did not order an injunction but did require FEMA to redo its biological evaluation in compliance with the ESA.[40] It is unclear how that process might ultimately impact the NFIP.

B. Financial Costs & Environmental Impacts

The NFIP is both desperately in debt and the catalyst for disastrous land use decisions in America's floodplains. As of August 2019, the NFIP is in debt to the amount of just under $21 billion.[41] NFIP has provided more than $68 billion in payouts for damages caused by flooding, by providing 5.1 million flood insurance policies with $1.3 trillion in coverage.[42] Eighty-five percent of those properties pay less than the full risk-based cost.[43] More than 300,000 coastal homes with thirty-year mortgages are at risk of chronic, disruptive flooding of at least twenty-six times a year, putting $136 billion at risk by 2045.[44] Nearly 2.5 million properties valued at $1.07 trillion will be at risk of chronic flooding by 2100.[45] Annual coastal property damage from sea level rise and climate fueled storms are expected to cost $4-$6 billion a year.[46] It is estimated

37. *Id.* at 1118.
38. *Id.* at 1121.
39. *Id.*
40. *Id.* at 1124; *see also* FINAL PEIS, *supra* note 3, at 2-2 to 2-3.
41. U.S. DEP'T OF THE TREASURY, BUREAU OF THE FISCAL SERV., MONTHLY TREASURY STATEMENT 15, tbl.6, sched. C (Aug. 2019), https://fiscal.treasury.gov/files/reports-statements/mts/mts0819.pdf.
42. *NFIP Loss Statistics Countrywide*, FEMA, https://bsa.nfipstat.fema.gov/reports/1040.htm; *see also* CONG. BUDGET OFFICE, BASELINE FOR USDA'S MANDATORY FARM PROGRAMS (May 2, 2019). The Congressional Budget Office has estimated federal crop insurance will cost tax payers an additional $8 billion a year through 2029. *Id.*; *Policy Statistics*, FEMA (Sept. 30, 2018), https://bsa.nfipstat.fema.gov/reports/1011.htm.
43. CONG. BUDGET OFFICE, THE NATIONAL FLOOD INSURANCE PROGRAM: FINANCIAL SOUNDNESS AND AFFORDABILITY CONGRESSIONAL BUDGET OFFICE 16 (2017), https://www.cbo.gov/system/files/115th-congress-2017-2018/reports/53028-nfipreport.pdf.
44. UNION OF CONCERNED SCIENTISTS, UNDERWATER: RISING SEAS, CHRONIC FLOODS, AND THE IMPLICATIONS FOR U.S. COASTAL REAL ESTATE 2 (June 2018), https://www.ucsusa.org/sites/default/files/attach/2018/06/underwater-analysis-full-report.pdf.
45. *Id.*
46. KATE LARSEN ET AL., THE RHODIUM GRP., AMERICAN CLIMATE PROSPECTUS: ECONOMIC RISKS IN THE UNITED STATES 91-95 (2014), https://rhg.com/wp-content/uploads/2014/10/AmericanClimateProspectus_v1.2.pdf.

that NFIP policies may increase by 100% by 2100 due to climate change and larger SFHAs.[47]

The cost of unmitigated flood damage is felt across the nation. Over 650 million acres of federally managed lands are vulnerable to climate change and sea level rise.[48] Hurricane Florence damaged Marine Corps facilities in North Carolina in 2018, costing taxpayers $3.6 billion; Hurricane Michael caused taxpayers an additional $3 billion in damage to an Air Force base in Florida.[49] It is estimated it will cost more than $400 billion in the next twenty years to provide coastal armoring of areas of coast with public infrastructure to protect against sea level rise, and that only accounts for 10%-15% of the total measures needed to survive sea level rise.[50] There were $14 billion weather and climate disaster events in 2018, totaling $91 billion in damage,[51] and these disaster costs are expected to increase due to climate change.

The Fourth National Climate Assessment summarizes scientific research on observed and projected regional changes in precipitation, drought, storms, and flooding, with key findings as follows:

- How much the climate changes will depend primarily on global emissions of greenhouse gases and on the response of Earth's climate system to human-induced warming.
- Global average sea level has risen by about seven to eight inches (about sixteen to twenty-one cm) since 1900, with almost half this rise occurring since 1993 as oceans have warmed and land-based ice has melted. Relative to the year 2000, sea level is very likely to rise one to four feet (0.3-1.3 m) by the end of the century.

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47. SCOTT EDELMAN ET AL., AECOM, THE IMPACT OF CLIMATE CHANGE AND POPULATION GROWTH ON THE NATIONAL FLOOD INSURANCE PROGRAM THROUGH 2100, at ES-7 to ES-8 (June 2013), https://www.aecom.com/content/wp-content/uploads/2016/06/Climate_Change_Report_AECOM_2013-06-11.pdf.

48. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-13-253, CLIMATE CHANGE: VARIOUS ADAPTATION EFFORTS ARE UNDER WAY AT KEY NATURAL RESOURCE MANAGEMENT AGENCIES 2 (2013), https://www.gao.gov/assets/660/654991.pdf.

49. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-19-157SP, HIGH RISK SERIES: SUBSTANTIAL EFFORTS NEEDED TO ACHIEVE GREATER PROGRESS ON HIGH-RISK AREAS, 116, (2019), https://www.gao.gov/assets/700/697245.pdf.

50. SVERRE LEROY & RICHARD WILES, CTR. FOR CLIMATE INTEGRITY, HIGH TIDE TAX: THE PRICE TO PROTECT COASTAL COMMUNITIES FROM RISING SEAS 1 (June 2019), https://www.climatecosts2040.org/files/ClimateCosts2040_Report.pdf.

51. *Climate Change Opportunities to Reduce Federal Fiscal Exposure: Hearing Before the H. Comm. on the Budget*, 116th Cong. (June 11, 2019) (testimony of J. Alfredo Gomez, Director of Natural Resources and Environment).

- Annual precipitation since the beginning of the last century has increased across most of the northern and eastern United States and decreased across much of the southern and western United States. Observed increases in the frequency and intensity of heavy precipitation events in most parts of the United States are projected to continue.
- Increases in greenhouse gases and decreases in air pollution have contributed to increases in Atlantic hurricane activity since 1970. In the future, Atlantic and eastern North Pacific hurricane rainfall and intensity are projected to increase.
- Regional changes in sea level rise and coastal flooding are not evenly distributed across the United States; ocean circulation changes, sinking land, and Antarctic ice melt will result in greater-than-average sea level rise for the Northeast and western Gulf of Mexico under lower scenarios and most of the U.S. coastline other than Alaska under higher scenarios.
- The frequency, depth, and extent of tidal flooding are expected to continue to increase in the future, as is the more severe flooding associated with coastal storms, such as hurricanes and nor'easters.[52]

The frequency of high-severity Atlantic hurricanes is also increasing,[53] which will result in more frequent and severe storm-generated surge events and wave heights.[54] The speed at which North Atlantic hurricanes

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52. U.S. GLOB. CHANGE RESEARCH PROGRAM, FOURTH NATIONAL CLIMATE ASSESSMENT II, IMPACTS, RISKS, AND ADAPTATION IN THE UNITED STATES (REPORT-IN-BRIEF) 64-66 (D.R. Reidmiller et al. eds., 2018), https://nca2018.globalchange.gov/downloads/NCA4_Report-in-Brief.pdf.

53. U.S. GLOB. CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS IN THE UNITED STATES: THE THIRD NATIONAL CLIMATE ASSESSMENT 41 (D.R. Reidmiller et al. eds., 2014), http://s3.amazonaws.com/nca2014/low/NCA3_Climate_Change_Impacts_in_the_United%20States_LowRes.pdf?download=1; *see also* C.M. Kishtawal et al.. *Tropical Cyclone Intensification Trends During Satellite Era (1986-2010),* 39 GEOPHYSICAL RES. LETTERS L10810, 5-6 (2012); Morris A. Bender et al., *Modeled Impact of Anthropogenic Warming on the Frequency of Intense Atlantic Hurricanes*, 327 SCIENCE 454, 454 (2010), https://science.sciencemag.org/content/327/5964/454; James B. Elsner, James P. Kossin & Thomas H. Jagger, *The Increasing Intensity of the Strongest Tropical Cyclones*, 455 NATURE 92, 92-95 (2008), https://www.nature.com/articles/nature07234; Laura Tenenbaum, *Global Warming Causes More Intense Hurricanes*, FORBES (Sept. 1, 2019), https://www.forbes.com/sites/lauratenenbaum/2019/09/01/global-warming-causes-more-intense-hurricanes/#44c2930455a1.

54. *See* Aslak Grinsted, John C. Moore, & Svetlana Jevrejeva, *Homogeneous Record of Atlantic Hurricane Surge Threat Since 1923*, 109 PROC. NAT'L ACAD. SCI. U.S. 19,601, 19,601 (2012); *see also* Paul D. Komar & Jonathan C. Allan, *Increasing Hurricane-Generated Wave Heights Along the U.S. East Coast and Their Climate Controls*, 24 J. COASTAL RES. 479, 479-88 (2007), https://www.jcronline.org/doi/pdf/10.2112/07-0894.1.

travel has slowed 17% from 1944 to 2017,[55] and tropical cyclones are stalling worldwide.[56] Large storm surge events of Hurricane Katrina-magnitude have already doubled in response to warming during the twentieth century.[57] A recent study projected a twofold to sevenfold increase in the frequency of Atlantic hurricane surge events for each 1°C in temperature rise.[58] Another study projected that, under the RCP 4.5 emissions scenario (which the world is exceeding),[59] the intensity of Atlantic hurricanes will increase, accompanied by a median increase in storm surge of 25% to 47%.[60] The study highlighted that the risks to coastal populations are highly nonlinear, with the population at risk from storm surge flooding increasing by a median of 30% to 154%, and up to 434%. A study that accounted for the combined effects of sea level rise and changes in storm intensity projected substantial increases in flooding risk along the East Coast.[61] Hurricane Dorian, a stunning example of climate injustice,[62] devastated the Bahamas in September 2019, was the

55. Timothy M. Hall & James P. Kossin, *Hurricane Stalling Along the North American Coast & Implications for Rainfall*, 2 CLIMATE CHANGE & ATMOSPHERIC SCI. 1, 2 (2019), https://www.nature.com/articles/s41612-019-0074-8.pdf.

56. James P. Kossin, *A Global Slowdown of Tropical-Cyclone Translation Speed*, 558 NATURE 104, 104 (2018).

57. Aslak Grinsted, John C. Moore & Svetlana Jevrejeva, *Projected Atlantic Hurricane Surge Threat from Rising Temperatures*, 110 PROC. NAT'L ACAD. SCI. 5369, 5369 (2013).

58. *Id.*

59. The IPCC RPC or representative concentration pathways to aid in climate modeling. IPCC 4.5 reflects an assumption that global greenhouse gases will peak in 2040 and then decline. Detlef P. van Vuuren et al, *The Representative Concentration Pathways: An Overview*, 109 CLIMATE CHANGE 5, 12, 21 (2011).

60. Karthik Balaguru & David R. Judi, *Future Hurricane Storm Surge Risk for the U.S. Gulf & Florida Coasts Based on Projections of Thermodynamic Potential Intensity*, 138 CLIMATIC CHANGE 99, 99 (2016).

61. Christopher M. Little et al., *Joint Projections of U.S. East Coast Sea Level & Storm Surge*, 5 NATURE CLIMATE CHANGE 1114, 1120 (2015).

62. *See* Bernard Ferguson, *Hurricane Dorian Was a Climate Injustice*, NEW YORKER (Sept. 12, 2019), https://www.newyorker.com/news/news-desk/hurricane-dorian-was-a-climate-injustice?fbclid=IwAR0O4nl-SUTvk6EwRhQ5m0SlNKJkjVT1eisKTlLDS7qCEQd35_zL-WLW72s. Despite the Bahama's small carbon footprint, it gets hit with much of the consequences of climate change. *Id.*

second-strongest Atlantic storm on record, and could cause insurance industry losses of up to $25 billion,[63] and the retail industry $1.5 billion.[64]

Flooding due to climate change-induced heavy rains is another threat to flood areas. A study that examined coastal flooding risk when storm surge and heavy precipitation co-occur found that the "number of compound events has increased significantly over the past century at many of the major coastal cities."[65] Heavy rains have increased since the 1950s and are expected to continue to increase.[66] In 2017, Hurricane Harvey levied the largest amount of rainfall ever recorded in United States history at more than sixty inches in just four days,[67] killing at least sixty-eight people and amassing $125 billion in estimated damages.[68]

Nuisance flooding, also called tidal or "sunny day" flooding, is another flood risk and occurs when high tide conditions are exacerbated by sea level rise by overtopping seawalls or shorelines and overwhelming gravity-based drainage systems. It erodes infrastructure, disrupts day-to-day activities, and poses a public health and safety risk by jeopardizing septic and sewage systems.[69] Nuisance flooding has increased substantially on the East, Gulf, and West coasts by 300% to 925% since the 1960s, primarily due to sea level rise.[70] In Florida and Virginia, the

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63. *Hurricane Dorian Could Cost Insurers $25 Billion, UBS Says*, CNBC (Sept. 2, 2019), https://www.cnbc.com/2019/09/02/hurricane-dorian-could-cost-insurers-25-billion-ubs-says.html; *see also* Jessica Kwong*, As Tropical Storm Dorian Heads for U.S., Trump Drains Millions from FEMA's Disaster Relief Fund*, NEWSWEEK (Aug. 27, 2019), https://www.newsweek.com/tropical-storm-dorian-trump-drains-fema-1456432 (explaining that, just moments before Hurricane Dorian made landfall in Puerto Rico in 2019, the Trump administration funneled $155 million from FEMA's disaster relief fund to fund migrant detention centers).

64. Jasmine Wu, *Hurricane Dorian to Cost Retailers $1.5 Billion & Threaten Back to School Sales*, CNBC (Sept. 4, 2019), https://www.cnbc.com/2019/09/04/hurricane-dorian-to-cost-retailers-1point5-billion-threaten-back-to-school-sales.html.

65. Thomas Wahl et al., *Increasing Risk of Compound Flooding from Storm Surge & Rainfall for Major U.S. Cities*, 5 NATURE CLIMATE CHANGE 1093, 1093 (2015).

66. JOHN WALSH & DONALD WUEBBLES ET AL., CLIMATE CHANGE IMPACTS IN THE UNITED STATES: THE THIRD NAT'L CLIMATE ASSESSMENT 19, 36 (2014), http://s3.amazonaws.com/nca2014/low/NCA3_Full_Report_02_Our_Changing_Climate_LowRes.pdf?download=1.

67. ERIC S. BLAKE & DAVID A. ZELINSKY, NOAA & NAT'L WEATHER SERV., NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT 1, 6 (2017), https://www.nhc.noaa.gov/data/tcr/AL092017_Harvey.pdf.

68. *Id.* at 8-9.

69. WILLIAM SWEET ET AL., NOAA, 2018 STATE OF U.S. HIGH TIDE FLOODING WITH A 2019 OUTLOOK 14 (2019), https://tidesandcurrents.noaa.gov/publications/Techrpt_090_2018_State_of_US_HighTideFlooding_with_a_2019_Outlook_Final.pdf; Hamed R. Moftakhari et al., *What Is Nuisance Flooding? Defining and Monitoring an Emerging Challenge*, 54 WATER RESOURCES RESEARCH 4218, 4218 (2018); *Nuisance Flooding*, NAT'L OCEAN SERV. (Oct. 22, 2015), https://oceanservice.noaa.gov/podcast/oct15/dd63-nuisance-flooding.html.

70. WILLIAM SWEET ET AL., NOAA & NAT'L WEATHER SERV., SEA LEVEL RISE & NUISANCE FLOOD FREQUENCY CHANGES AROUND THE UNITED STATES 1 (2014), https://tidesand

significant increase in nuisance flooding due to sea level rise has already resulted in severe property damage and social disruption.[71] Scientific studies project that nuisance flooding will continue to become much more frequent and severe in the next few decades.[72] For example, an analysis by Dahl et al. (2017) projected that tidal flooding will increase substantially in the near-term at all fifty-two study locations along the East and Gulf coasts: "long before areas are permanently inundated, the steady creep of sea level rise will force many communities to grapple with chronic high tide flooding in the next 15 to 30 years."[73]

C. FEMA Is Putting Vulnerable Communities at Risk

More than half (52%) of US residents live in coastal watershed counties,[74] and as a consequence of NFIP-enabled growth, millions of people live in flood-prone areas throughout the United States. Approximately 3.7 million Americans live within one meter of high tide and are at extreme risk of flooding from sea level rise in the next few decades, with Florida as the most vulnerable state, followed by Louisiana,

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currents.noaa.gov/publications/NOAA_Technical_Report_NOS_COOPS_073.pdf; William Sweet & Joseph Park, *From the Extreme to the Mean: Acceleration & Tipping Points of Coastal Inundation from Sea Level Rise*, 2 EARTH'S FUTURE 579, 579 (2014) https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2014EF000272; *What Is High Tide Flooding?,* NOAA (June 25, 2018), https://oceanservice.noaa.gov/facts/nuisance-flooding.html.

71. Larry Atkinson et al., *Sea Level Rise & Flooding Risk in Virginia*, 5 SEA GRANT L. & POL'Y 3, 3 (2013), https://digitalcommons.odu.edu/cgi/viewcontent.cgi?article=1116&context=ccpo_pubs; Shimon Wdowinski et al., *Increasing Flooding Hazard in Coastal Cmtys. Due to Rising Sea Level: Case Study of Miami Beach, Florida*, 126 OCEAN & COASTAL MGMT. 1, 1 (2016) https://www.flseagrant.org/wp-content/uploads/Increasing-flood-haz._MB-case-study-2016.pdf.

72. *See* ERIKA SPANGER-SIEGFRIED ET AL., UNION OF CONCERNED SCIENTISTS, ENCROACHING TIDES: HOW SEA LEVEL RISE & TIDAL FLOODING THREATEN U.S. EAST & GULF COAST COMMUNITIES OVER THE NEXT 30 YEARS 1, 1 (2014), https://www.ucsusa.org/sites/default/files/attach/2014/10/encroaching-tides-full-report.pdf; *see also* Kristina Dahl et al., *Sea Level Rise Drives Increased Tidal Flooding Frequency at Tide Gauges Along the U.S. East & Gulf Coasts: Projections for 2030 & 2045*, 12 PLOS ONE 1, 1 (2017), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5291542/; Hamed Moftakhari et al., *Increased Nuisance Flooding Along the Coasts of the United States Due to Sea Level Rise: Past & Future*, 42 GEOPHYSICAL RES. LETTERS 9846, 9846 (2015), https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2015GL066072; Justin Gillis*, Flooding of Coast, Caused by Global Warming, Has Already Begun*, N.Y. TIMES (Sept. 3, 2016), https://www.nytimes.com/2016/09/04/science/flooding-of-coast-caused-by-global-warming-has-already-begun.html; Eric Holthaus, *Record-Breaking Flooding in Nebraska Is Visible from Space*, GRIST (Mar. 18, 2019), https://grist.org/article/record-breaking-flooding-in-nebraska-is-visible-from-space/?utm_medium
=email&utm_source=newsletter&utm_campaign=daily.

73. Dahl et al., *supra* note 72, at 1.

74. KRISTEB CROSSET ET AL., NOAA, NATIONAL COASTAL POPULATION REPORT 1, 3 (2013), https://aamboceanservice.blob.core.windows.net/oceanservice-prod/facts/coastal-population-report.pdf.

California, New York and New Jersey.[75] Regional studies have also projected significant impacts. Rates of sea level rise are increasing three-to-four times faster along portions of the U.S. Atlantic Coast than globally.[76] In Louisiana, rising seas will lead to the permanent flooding of the Mississippi River delta and the loss of 10,000 to 13,500 km^2 of coastal lands by 2100.[77] In California, sea level rise of 1.4 meters by 2100 would put 480,000 people and $100 billion worth of property at risk of flooding,[78] and an earthquake magnitude 8 or larger in this region could cause sea level to rise suddenly by an additional meter or more.[79]

Nearly 15 million people live in the 100-year floodplain, and more than 30 million people live in the combined 100 and 500-year floodplain.[80] A study that ignored FEMA maps and instead relied on flood modeling calculated that nearly 41 million people live in floodplains, and that this number will only increase with population growth and climate change.[81] Thirty-three percent of households living in the combined floodplains have children and 29% have seniors.[82] As compared to the U.S. population, a greater percentage of Hispanics live in floodplains (while a lower percentage of whites live in floodplains).[83] On average, policyholders have higher incomes than non-policy holders in flood

75. Benjamin Strauss et al., *Tidally Adjusted Estimates of Topographic Vulnerability to Sea Level Rise & Flooding for the Contiguous United States*, 7 ENVTL. RES. LETTERS 1, 1 (2012), https://iopscience.iop.org/article/10.1088/1748-9326/7/1/014033/p

76. Asbury Sallenger, Jr. et al., *Hotspot of Accelerated Sea-Level Rise on the Atlantic Coast of North America*, 2 NATURE CLIMATE CHANGE 884, 884 (2012).

77. Michael Blum & Harry Roberts, *Drowning of the Mississippi Delta Due to Insufficient Sediment Supply & Global Sea-Level Rise*, 2 NATURE GEOSCIENCE 488, 488 (2009), https://www.nature.com/articles/ngeo553.

78. MATTHEW HEBERGER ET AL., CAL. CLIMATE CHANGE CTR., THE IMPACTS OF SEA-LEVEL RISE ON THE CALIFORNIA COAST, at xi (2009), https://pacinst.org/wp-content/uploads/2014/04/sea-level-rise.pdf.

79. COMM. ON SEA LEVEL RISE IN CAL., OR., & WASH., SEA-LEVEL RISE FOR THE COASTS OF CALIFORNIA, OREGON, & WASHINGTON: PAST, PRESENT, & FUTURE 1, 3 (2012), https://www.nap.edu/resource/13389/sea-level-rise-brief-final.pdf.

80. CAROLINE PERI ET AL., NYU FURMAN CTR., POPULATION IN THE U.S. FLOODPLAINS 1 (2017), https://furmancenter.org/files/Floodplain_PopulationBrief_12DEC2017.pdf.

81. Oliver Wing et al., *Estimates of Present & Future Flood Risk in the Coterminous United States*, 13 ENVTL. RES. LETTERS 1, 1 (2018), https://iopscience.iop.org/article/10.1088/1748-9326/aaac65/pdf.

82. PERI ET AL., *supra* note 80, at 3.

83. *Id.*

zones,[84] with 51% of non-policy holders in SFHAs being low income.[85] Mean income for policyholders was higher outside SFHAs than inside, but the opposite was true for non-policy holders which tend to be lower income in SFHAs and have higher median incomes outside of SFHAs.[86]

Traditionally underserved communities may be most at risk of future flooding and financial loss,[87] with 40% of communities experiencing significant chronic flooding by 2045 with above average rates of poverty.[88] Communities with high populations of elderly are also at greater risk of losing generational wealth and being disproportionately impacted by rising seas.[89] Another study found that the more disaster-related damages a county suffers, the more wealth white residents tended to accumulate and the more wealth black residents tended to lose.[90] Renters may be hit hardest where landlords refuse to repair damage caused by hurricanes.[91] Flood zones also disproportionately have dangerous hazardous waste, like coal ash, that put these communities at even greater risk of disease or death.[92]

Coastal flooding, in particular, is projected to worsen. The rate of sea level rise over the last thirty years is twice the rate of the 20th century and is accelerating.[93] Numerous studies have highlighted the vulnerability of coastal populations to increasing flood risk due to climate change.[94] Hauer

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84. FEMA, AN AFFORDABILITY FRAMEWORK FOR THE NATIONAL FLOOD INSURANCE PROGRAM 1, 3 (2018), https://www.eenews.net/assets/2018/04/17/document_gw_06.pdf ("Price is one of the best signals of risk that a consumer receives; any affordability assistance should be delivered with communication of the policyholder's full-risk, non-discounted rate . . . .").

85. *Id.* at 6, 12.

86. *Id.* at 6.

87. NAT'L ACAD. OF SCI., ENG'G, & MED., FRAMING THE CHALLENGE OF URBAN FLOODING IN THE UNITED STATES 1, 3 (2019), https://www.ncbi.nlm.nih.gov/books/NBK541180/.

88. UNION OF CONCERNED SCIENTISTS, *supra* note 44, at 9.

89. *Id.*

90. Junia Howell & James Elliott, *As Disaster Costs Rise, So Does Inequality*, 4 SOCIUS: SOCIOLOGICAL RESEARCH FOR A DYNAMIC WORLD 1, 1 (2018), https://www.researchgate.net/publication/329405372_As_Disaster_Costs_Rise_So_Does_Inequality.

91. Molly Prindle, *Landlords' Responsibilities Under the Implied Warranty of Habitability & the Covenant of Quiet Enjoyment Extend to Hurricane-Caused Damage*, 68 AM. U. L. REV. F. 91, 91 (2019).

92. Zack Colman, *The Toxic Waste Threat that Climate Change Is Making Worse*, POLITICO (Aug. 26, 2019), https://www.politico.com/story/2019/08/26/toxic-waste-climate-change-worse-1672998.

93. R.S. Nerem et al., *Climate-Change-Driven Accelerated Sea-Level Rise Detected in the Altimeter Area*, 115 PNAS 2022, 2023 (2018), https://www.pnas.org/content/pnas/115/9/2022.full.pdf.

94. Jeremy Weiss et al., *Implications of Recent Sea Level Rise Science for Low-Elevation Areas in Coastal Cities of the Coterminous U.S.A.: A Letter*, 105 CLIMATIC CHANGE 635, 635 (2011); Strauss et al., *supra* note 75, at 1.

et al. (2016) forecast that 13.1 million people in coastal areas of the United States would be at risk of flooding from sea level rise by 2100, which would drive mass human migration.[95] In an analysis of recent and future flood losses for 136 of the world's largest coastal cities, Hallegatte et al. (2013) estimated that global flood losses of $6 billion per year in 2005 would increase to $1 trillion or more per year by 2050 when accounting for the combined effects of climate change, subsidence, and socio-economic change.[96] The study highlighted the United States as particularly vulnerable, since three U.S. cities—Miami, New York, and New Orleans—would account for more than 30% of global aggregate losses.

1. FEMA Is Dangerously Ignoring Climate Science

Despite Congressional mandates and common sense, FEMA continues to refuse incorporating climate change and sea level rise data in mapping flood areas. In December 2015 TMAC issued its BW-12 recommendations regarding flood map revisions, called the *TMAC Future Conditions Risk Assessment & Modeling* (hereinafter "the TMAC Report").[97] The TMAC Report notes that historically, FEMA has not considered sea level rise prospectively.[98] It explained that because both sea level rise and long-term erosion have been "politically controversial," it was not until passage of BW-12 that FEMA was allowed to consider these factors.[99] Recognizing that "flood damages are increasing due to sea level changes [and] changing climatological patterns," and that most maps "are a snapshot in time, showing only the *current* flood risk," TMAC's goal was to provide recommendations "intended to counsel FEMA on the utilization and incorporation of best available climate science and methodology to assess possible future flood risk."[100]

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95. Mathew Hauer et al., *Millions Projected to Be at Risk from Sea-Level Rise in the Continental United States*, 6 NATURE CLIMATE CHANGE 691, 691 (2016), https://Mathewhauer.Github.Io/Papers/2016-Nclimhauer.Pdf.

96. Stephane Hallegatte et al., *Future Flood Losses in Major Coastal Cities*, 3 NATURE CLIMATE CHANGE 802, 802 (2013).

97. TECHNICAL MAPPING ADVISORY COUNCIL (TMAC), TMAC FUTURE CONDITIONS RISK ASSESSMENT & MODELING 1, 16 (2015) [hereinafter TMAC REPORT], https://www.fema.gov/media-library-data/1454954261186-c348aa9b1768298c9eb66f84366f836e/TMAC_2015_Future_Conditions_Risk_Assessment_and_Modeling_Report.pdf.

98. *Id.* at 10.

99. *Id.* at 12.

100. *Id.* at 1-2 (summarizing TMAC's mandate to "develop recommendations for incorporating the best available climate science in flood insurance studies and maps and using the best available methodology when considering the impacts of sea level rise and future development on flood risk").

The TMAC Report acknowledged the overwhelming scientific consensus regarding climate change, stating that the Third National Climate Assessment "was very clear in stating that the climate is changing, will continue to change for the foreseeable future, and may accelerate in the future if global greenhouse gas emissions continue."[101] It also recognized that climate change leads to sea level rise,[102] and further summarized sea level rise modeling, concluding the models indicate two to six feet of sea level rise by 2100, and that, even if the modeling is not entirely accurate, sea level rise is "expected to continue well beyond this century as a result of both past and future emissions from human activities."[103]

The TMAC Report also summarized the 2013 AECOM Report, *Impact of Climate Change and Population Growth on the National Flood Insurance Program*, which considered the impacts of climate change on the NFIP. As the TMAC Report explains, the 2013 AECOM Report found that by 2100, the 1% annual-chance flood depth and flood hazard areas are expected to increase on average by about 45% in riverine areas. It concluded that about 30% of flooding may be attributed to increased runoff caused by growth of impervious land area caused by population growth/development, while the remaining 70% represents the influence of climate change. It also found that by 2100, coastal SFHAs may increase anywhere from 0% to 55% depending on type and scale of shore protection measures; the total number of NFIP insurance policies is likely to increase by approximately 80% to 100%; and individual premiums per policy are projected to increase by 10% to 70% to offset the projected increase in flood losses.[104]

In light of these findings, the TMAC Report called on FEMA to provide flood hazard "products and information" that include the future effects of long-term erosion and sea level rise.[105] It called on FEMA to rely on the 2012 National Oceanic and Atmospheric Administration's (NOAA) Technical Report, *Global Sea Level Rise Scenarios for the United States*

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101. *Id.* at 23 ("These changes are evident in many places, and are becoming increasingly disruptive.").

102. *Id.* at 2-24.

103. *Id.* at 5-30 ("[I]n general, higher emissions scenarios that lead to more warming would be expected to lead to higher amounts of SLR.").

104. *See id.* at 2-16. This conclusion is consistent with an earlier FEMA study also relied on in the Final PEIS, *The Impact of Climate Change and Population Growth on the National Flood Insurance Program Through 2100,* which concluded climate change and sea level rise will have concrete impacts on flood hazard risks and the location of SFHAs. *E.g.*, *id.* at 5-12 (table showing "growth in Special Flood Hazard Area due to climate change and population").

105. *Id.* at 16.

National Climate Assessment, or other similar sea level scenarios to determine future flood risk.[106] The TMAC Report explained that FEMA should consult with other agencies to provide a set of regional sea level rise scenarios, based on the 2012 NOAA Report out to the year 2100 for future flood risk evaluation.[107] The TMAC Report also recommended that "[c]ommunities should be consulted to determine which scenarios and time horizons to map based on risk tolerance and criticality."[108]

With respect to riverine flood hazards, the TMAC Report recommended that FEMA "[p]rovide future conditions flood risk products and information for riverine areas that include the impacts of: future development, land use change, erosion, and climate change, as actionable science becomes available."[109] As the 2003 AECOM Report recognized, climate change will have significant impacts on riverine areas, finding that climate change will be responsible for almost a third of the increased growth "in the 1% annual chance floodplain."[110] The TMAC Report found that "[a]ctionable science supporting the future impacts of climate change on hydrology is still evolving,"[111] and based on this premise "at the current time, available and actionable science does not support the development of a *single, nationwide method for determining future riverine flood risk* boundaries based on projected future changes to the watershed due to geomorphological or climate changes;"[112] however, it qualified this determination by encouraging FEMA to develop regional methods for determining riverine flood risk boundaries based on demonstration projects.[113]

The TMAC Report detailed the science on both climate change and sea level rise, and recommended that FEMA incorporate that science into its decision-making.[114] The Report also specifically recommended that "[f]uture flood hazard calculation and mapping methods and standards should be updated periodically as we learn more through observations and

106. *Id.* at 5-14.

107. *Id.* at 11, 25 ("Future flood hazard calculation and mapping methods and standards should be updated periodically as we learn more through observations and modeling of land surface and climate change, and as actionable science evolves.").

108. *Id.* at 5-11, 16.

109. *Id.* at 16.

110. EDELMAN ET AL., *supra* note 47, at ES-7.

111. TMAC REPORT, *supra* note 97, at 25.

112. *Id.* at 18.

113. *Id.* at 19 ("Therefore, as outlined in Recommendations 6 and 7, FEMA should build on the current science, support research and innovation, and inform the process with best practices and lessons learned from demonstration projects and information.").

114. *Id.* at 11.

modeling of land surface and climate change and as actionable science evolves."[115] Despite the TMAC report findings, and Congressional mandate to account for sea level rise in mapping, FEMA refuses to take into account sea level rise impacts on the NFIP, taking the untenable position that "implementation of the TMAC recommendations, including recommendations concerning mapping climate change, is not an alternative that is ripe for inclusion as an alternative that warrants analysis of environmental impact."[116]

2. FEMA Is Unlawfully Ignoring the Effect of the NFIP on Climate Change

In addition to ignoring the impact climate changes and associated sea level rise will have on the NFIP, FEMA has ignored the impact the NFIP has and will have on climate change and sea level rise. NEPA is the "basic national charter for protection of the environment"[117] that "makes environmental protection a part of the mandate of every federal agency and department."[118] NEPA's policy goals are "realized through a set of 'action-forcing' procedures" that require agencies to take [a] hard look, and to "broad[ly] disseminat[e] . . . relevant environmental information."[119] Federal agencies are thus responsible for considering and reporting on the potential environmental impacts of their proposed actions. Federal agencies must "include in every recommendation or report on proposals for . . . major Federal actions significantly affecting the quality of the human environment, a detailed statement," which, among other things, sets forth "the environmental impact of the proposed action," unavoidable "adverse environmental effects" if the proposal is implemented, and "alternatives to the proposed action."[120] The required NEPA analysis and disclosure "ensure[] that important effects will not be overlooked or underestimated only to be discovered after resources have been committed or the die otherwise cast."[121]

To comply with NEPA, federal agencies must fully analyze and disclose all of the direct, indirect, and cumulative impacts of the proposed

115. *Id.*
116. FEMA, *supra* note 32, at 9.
117. 40 C.F.R. § 1500.1(a) (2012).
118. Calvert Cliffs' Coordinating Comm., Inc. v. U.S. Atomic Energy Comm'n, 449 F.2d 1109, 1112 (D.C. Cir. 1971).
119. Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 350 (1989).
120. 42 U.S.C. §§ 4332(C)(i)-(iii) (2012).
121. *Robertson*, 490 U.S. at 349.

action.[122] "Direct" effects are those which are "caused by the action and occur at the same time and place" as the proposed project.[123] "Indirect" effects are also "caused by the action," but they occur "later in time" or farther . . . in distance" and yet are "still reasonably foreseeable."[124] Effects are "reasonably foreseeable" when they are "sufficiently likely to occur that a person of ordinary prudence would take [them] into account in reaching a decision."[125]

FEMA's Final Programmatic Environmental Impact Statement (Final PEIS) on the NFIP—the document that is supposed to reflect FEMA's NEPA analysis of the NFIP's impact on the human environment—says very little about climate change. While it contains several pages discussing the impacts of climate change generally,[126] it concludes that the NFIP has no impact on greenhouse gas emissions and no impact on climate change.[127] FEMA reached this conclusion by relying on its position that "FEMA has no land use authority," and claiming that, as a result, it has no impact on the actual development that occurs as a result of the NFIP.[128] Indeed, FEMA has taken the position that the only climate change impact associated with carrying out the legislatively required changes to the NFIP could be "the use of general office equipment such as computers or printers" to make the legislatively required changes to insurance policies."[129]

Numerous studies have explained that the artificially low insurance rates of the NFIP act as a subsidy to encourage unsustainable development in high-risk and ecologically sensitive areas, externalizing the inherent risks of building in flood zones and eroding natural defenses to flooding risks.[130] While the NFIP was originally intended to reduce flood zone

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122. "Effects and impacts as used in these regulations are synonymous." 40 C.F.R. §§ 1502.16, 1508.7, 1508.8, 1508.25(c).

123. *Id.* § 1508.8(a).

124. *Id.* § 1508.8(b); New York v. Nuclear Regulatory Comm'n, 681 F.3d 471, 476 (D.C. Cir. 2012).

125. EarthReports, Inc. v. FERC, 828 F.3d 949, 955 (D.C. Cir. 2016) (quoting Sierra Club v. FERC, 827 F.3d 36 (D.C. Cir. 2016)).

126. *See* FINAL PEIS, *supra* note 3, at 3-326 to 3-334.

127. *Id.* at 4-32 to 4-35.

128. *Id.* at 4-32 (claiming that because "[f]looplain development is not authorized, funded, or carried out by FEMA pursuant to the NFIP," and because "FEMA has no role in the issuance, denial, or enforcement of individual permits," the floodplain development that occurs as a direct result of the NFIP is "not [action] that [is] included" in the analysis because "these actions are not taken under the NFIP").

129. *Id.* at 4-35.

130. Even flood survivors are begging "Stop building in floodplains." Harriet Festing, *Stop Building in Floodplains,* PROGRESSIVE (June 18, 2019), https://progressive.org/op-eds/stop-

development and risk, it has instead encouraged risky development while providing a subsidy to coastal and floodplain developers, repetitive loss property owners, and the private insurance industry.

> [P]erhaps the largest fault of the NFIP is that it encourages development in environmentally sensitive areas, decreasing the likelihood of development at a sustainable scale. The program externalizes the risk associated with building while imposing the added social cost of foregone ecosystem services. In providing flood protection, even the best structural measures usually fail as sufficient substitutes for intact natural capital.[131]

Another analysis concluded that "[t]he program encourages building in floodplains by providing insurance policies that private insurers find too risky to write. The less expensive it is to insure a property in the floodplain against loss, the stronger the incentive to build in that floodplain and the more risk becomes concentrated in areas covered by the NFIP."[132] Similarly, another report explained, "cheap flood insurance and a period of relatively few hurricanes, have contributed to billions of dollars' worth of real estate development in high-risk and environmentally fragile coastal areas."[133] Yet FEMA has never meaningfully addressed NFIP's impact on development or its resulting contribution to global greenhouse gas emissions.

Therefore, in addition to ignoring the best available science demonstrating that climate change causes an increasing flood risk by heightening coastal exposure to high-tide flooding, storm surge, and wave action,[134] FEMA is also dangerously ignoring the climate change impact of facilitating floodplain development.

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building-in-floodplains-festing-190618/?fbclid=IwAR1do60nuuzdUOEq7CDWUwPpmfk6zlvBBgk8fwunSpfiVTakOlXSJUoXzQc; Sebastian Malo, *Stop Building on Floodplains, Say Flood-Hit U.S. Families*, REUTERS (June 24, 2019), https://www.reuters.com/article/us-climate-change-usa-floods/stop-building-on-floodplains-say-flood-hit-us-families-idUSKCN1TP2TY; Sam Spence, *Sounding the Alarm,* CHARLESTON CITY PAPER (Aug. 21, 2019), https://www.charlestoncitypaper.com/TheBattery/archives/2019/08/21/sounding-the-alarm-on-development-related-flooding-johns-island-groups-unveil-lowcountry-flooding-declaration.

131. K.J. Bagstad et al., *Taxes, Subsidies, and Insurance as Drivers of United States Coastal Development*, 63 ECOLOGICAL ECON. 285, 288 (2007).

132. HOLLADAY & SCHWARTZ, *supra* note 1.

133. PEWS OCEANS, *supra* note 1, at 52.

134. Claudia Tebaldi et al., *Modelling Sea Level Rise Impacts on Storm Surges Along U.S. Coasts*, 7 ENVTL. RES. LETTERS 1 (2012), https://iopscience.iop.org/article/10.1088/1748-9326/7/1/014032/pdf; GREG GRIGGS ET AL., CAL. OCEAN PROT. COUNCIL SCI. ADVISORY TEAM WORKING GRP., RISING SEAS IN CALIFORNIA: AN UPDATE ON SEAL-LEVEL RISE SCIENCE (2017), http://www.opc.ca.gov/webmaster/ftp/pdf/docs/rising-seas-in-california-an-update-on-sea-level-rise-science.pdf; W.V. SWEET ET AL., NOAA, NOAA TECHNICAL REPORT NOS CO-OPS 083, GLOBAL AND REGIONAL SEA LEVEL RISE SCENARIOS FOR THE UNITED STATES 2 n.2 (2017), https://tidesandcurrents.noaa.gov/publications/techrpt83_Global_and_Regional_SLR_Scenarios_for_the_US_fi

D. FEMA Is Putting Imperiled Species at Risk

FEMA identifies and maps flood hazards. It provides flood insurance for structures built in SFHAs, areas that are subject to 1% chance of annual flood. Construction in these areas can impact imperiled species by altering species' habitat. FEMA also allows landowners to remove their flood-prone lands from regulated SFHAs by filling in the floodplain above the base flood elevation. This loophole incentivizes filling in floodplains so as to avoid more restrictive development regulations. Combined, these practices reduce and degrade species' habitat.

An estimated 40% of U.S. endangered species inhabit coastal ecosystems,[135] and the NFIP enables development in their habitat. Despite multiple federal judges holding to the contrary, FEMA maintains that it is in compliance with the ESA regarding the NFIP.[136] The ESA is "the most comprehensive legislation for the preservation of endangered species ever enacted by any nation."[137] It reflects "an explicit congressional decision to require agencies to afford *first priority* to the declared national policy of saving endangered species" and "a conscious decision by Congress to give endangered species priority over the 'primary missions' of federal agencies."[138] It was enacted by Congress to "halt and reverse the trend toward species extinction, whatever the cost."[139]

The ESA requires all federal agencies to "conserve" threatened and endangered species[140] and to utilize their authorities in furtherance of the purposes of the Act.[141] Perhaps the most important provision of the ESA is the interagency consultation requirements of section 7 of the ESA.[142] Section 7(a)(2) requires federal agencies to "insure that *any action* authorized, funded, or carried out by" the agency "is not likely to

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nal.pdf. President Obama had required that FEMA to take climate change into account in establishing a federal flood risk, Exec. Order 13,690 (Jan. 30, 2015), *reprinted as amended in* 80 Fed. Reg. 6428, but President Trump revoked the order, Exec. Order 13,807 (Aug. 15, 2017).

135. Olivia LeDee, Kristen Nelson & Francesca Cuthbert, *The Challenge of Threatened and Endangered Species Management in Coastal Areas,* 38 COASTAL MGMT. 337, 337 (2010).

136. FINAL PEIS, *supra* note 3, at 1-6, 2-2, 4-112 to 4-113.

137. TVA v. Hill, 437 U.S. 153, 180 (1978).

138. *Id.* at 185 (emphasis added).

139. *Id*.

140. The statute defines "endangered species" as "any species which is in danger of extinction throughout all or a significant portion of its range," and "threatened species" as "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." 16 U.S.C. § 1532(6) (2012).

141. *Id.* § 1531(c)(1). "Conserve" is defined 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 chapter are no longer necessary . . . ." *Id.* § 1532(3).

142. *Id.* § 1536; W. Watersheds Project v. Kraayenbrink, 632 F.3d 472, 495 (9th Cir. 2011).

jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification" of the designated critical habitat of such species.[143] To achieve this substantive goal, section 7(a)(2) imposes procedural duties on the action agency to consult with the Services before engaging in any discretionary "agency action" that "may affect" a listed species or its critical habitat.[144]

Studies that have focused on sea level rise impacts to coastal species and ecosystems (i.e., wetlands and sandy beaches) have predicted significant risks of habitat loss and of entrapment between rising sea levels and human developments that prevent landward movement, leading to "coastal squeeze."[145] Habitat destruction and fragmentation is the leading cause of species extinction worldwide.[146] Some species may be particularly vulnerable to habitat loss and fragmentation because of their relatively low numbers, large home ranges, and interactions with humans.[147] Their low fecundity and long generation times result in reduced levels of genetic variation.[148] Habitat loss and fragmentation can lead to

143. 16 U.S.C. § 1536(a)(2).

144. Turtle Island Restoration Network v. Nat'l Marine Fisheries Serv., 340 F.3d 969, 974 (9th Cir. 2003). The "agency action" that triggers section 7 consultation 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. 50 C.F.R. § 402.02 (2019).

145. Christopher Craft et al., *Forecasting the Effects of Accelerated Sea-Level Rise on Tidal Marsh Ecosystem Services,* 7 FRONTIERS ECOLOGY & ENV'T 73, 73 (2009); Omar Defeo et al., *Threats to Sandy Beach Ecosystems: A Review,* 81 ESTUARINE, COASTAL & SHELF SCI. 1, 1 (2009); Duncan FitzGerald et al., C*oastal Impacts Due to Sea-Level Rise,* 36 ANN. REV. EARTH & PLANETARY SCI. 601, 601 (2008); LeDee, Nelson & Cuthbert, *supra* note 135; Shaily Menon et al., *Preliminary Global Assessment of Terrestrial Biodiversity Consequences of Sea-Level Rise Mediated by Climate Change*, 19 BIODIVERSITY & CONSERVATION 1599, 1599 (2010); Reed Noss, *Between the Devil and the Deep Blue Sea: Florida's Unenviable Position with Respect to Sea Level Rise,* 107 CLIMATIC CHANGE 1, 1 (2011); Donald Scavia et al., *Climate Change Impacts on U.S. Coastal and Marine Ecosystems,* 25 ESTUARIES 149, 149 (2002).

146. LARRY HARRIS, THE FRAGMENTED FOREST: ISLAND BIOGEOGRAPHY THEORY AND THE PRESERVATION OF BIOTIC DIVERSITY (1984); GARY MEFFE, PRINCIPLES OF CONSERVATION BIOLOGY (2d ed. 1997).

147. Reed Noss et al., *Conservation Biology and Carnivore Conservation in Rocky Mountains,* 10 CONSERVATION BIOLOGY 949, 949 (1996); Rosie Woodroffe & Joshua Ginsberg, *Edge Effects and the Extinction of Populations Inside Protected Areas*, 280 SCIENCE 2126, 2126 (1998); Kiersten Cook, Space Use and Predictive Habitat Models for American Black Bears (Ursus Americanus) in Central Georgia, USA (2007) (unpublished thesis, University of Georgia) (on file with University of Georgia Theses and Dissertations Collection).

148. *See* Zhi Lu et al., *Patterns of Genetic Diversity in Remaining Giant Panda Populations*, 15 CONSERVATION BIOLOGY 1596, 1596 (2001); Melody Roelke et al., *The Consequences of Demographic Reduction and Genetic Depletion in the Endangered Florida Panther*, 3 CURRENT BIOLOGY 340, 340 (1993).

increased mortality,[149] reduced abundance,[150] disruption of the social structure of populations,[151] reduced population viability,[152] isolated populations with reduced population sizes, and decreased genetic variation.[153] Loss of genetic variation may reduce the ability of individuals to adapt to a changing environment, cause inbreeding depression,[154] reduce survival and reproduction,[155] and increase the probability of extinction.[156] Sea level rise and climate change are compounding the impact of NFIP-enabled floodplain development for coastal species. As global sea levels are projected to rise by one to two meters within this century, and storm surge will be exacerbated by sea level rise, many coastal species will lose habitat and be forced upland. These species face

149. Erik Jules, *Habitat Fragmentation and Demographic Change for a Common Plant Trillium in Old-Growth Forest,* 79 ECOLOGY 1645, 1645 (1998).

150. Curtis Flather & Michael Bevers, *Patchy Reaction-Diffusion and Population Abundance: The Relative Importance of Habitat Amount and Arrangement,* 159 AM. NATURALIST 40, 40 (2002).

151. Peter Cale, *The Influence of Social Beavior, Dispersal and Landscape Fragmentation on Population Structure in a Sedentary Bird*, 109 BIOLOGICAL CONSERVATION 237, 237 (2003); Rolf Ims & Harry Andeassen, *Effects of Experimental Habitat Fragmentation and Connectivity on Root Vole Demography*, 68 J. ANIMAL ECOLOGY 839, 839 (1999).

152. *See generally* DAVID LINDENMEYER & JOERN FISHER, HABITAT FRAGMENTATION AND LANDSCAPE CHANGE: AN ECOLOGICAL AND CONSERVATION SYNTHESIS (2006); *see also* Sukamol Srikwan & David S. Woodruff, *Genetic Erosion in Isolated Small-Mammal Populations Following Rainforest Fragmentation*, *in* GENETICS, DEMOGRAPHY, AND VIABILITY OF FRAGMENTED POPULATIONS 149-72 (Young & Clarke ed. 2000); Cale, *supra* note 151, at 23; Susan Harrison & Emilio Bruna, *Habitat Fragmentation and Large Scale Conservation: What Do We Know for Sure?*, 22 ECOGRAPHY 225, 225 (1999).

153. Richard Frankham, *Relationship of Genetic Variation to Population Size in Wildlife*, 10 CONSERVATION BIOLOGY 1500, 1500 (1996).

154. Dieter Ebert, *A Selective Advantage to Immigrant Genes in a Daphnia Metapopulation*, 295 SCIENCE 485, 485 (2002).

155. Richard Frankham, *Inbreeding and Extinction a Threshold Effect,* 9 CONSERVATION BIOLOGY 792, 792 (1995); David Reed & Richard Frankham, *Correlation Between Fitness and Genetic Diversity*, 17 CONSERVATION 230, 230 (2003).

156. William B. Sherwin & Craig Moritz, *Managing and Monitoringgenetic Erosion, in* GENETICS, DEMOGRAPHY, AND VIABILITY OF FRAGMENTED POPULATIONS 9-34 (Young & Clarked ed. 2000); Stephanie Kramer-Schadt et al., *Fragmented Landscapes, Road Mortality and Patch Connectivity: Modeling Influences on the Dispersal of Eurasian Lynx*, 41 J. APPLIED ECOLOGY 711, 711 (2004); Benjamin H. Letcher et al.,. *Population Response to Habitat Fragmentation in a Stream-Dwelling Brook Trout Population*, 2 PLOS ONE 1, 1(2007); V. Ruiz-Gutierrez et al., *Habitat Fragmentation Lowers Survival of a Tropical Forest Bird*, 18 ECOLOGICAL APPLICATION 838, 838 (2008); Ilik Saacheri et al., *Inbreeding and Extinction in a Butterfly Metapopulation*, 392 NATURE 491, 491 (1998); Ronald Westemeier et al., *Tracking the Long-Term Decline and Recovery of an Isolated Population*, 282 SCIENCE 1695, 1695 (1998).

being trapped between rising seas and human development, which often obstructs landward or upland migration.[157]

FEMA is adamant in its position that "private floodplain development is not FEMA's action, in that FEMA does not authorize, fund, or carry out private floodplain development," and that "[b]ecause private floodplain development is not FEMA's action, section 7 would be inapplicable to these actions."[158]

FEMA has asserted:

> Floodplain development itself is not an action under the NFIP, and FEMA does not control the rate or quantity of development in floodplains or the effects those development activities may have on ESA species, designated critical habitats, or EFH . . . . The NFIP does not cause development to occur, nor does it facilitate or encourage floodplain development.[159]

This is both factually and legally incorrect. In the context of the ESA, direct effects are caused by the action and occur at the same time and place; indirect effects are caused by the action later in time but are still reasonably foreseeable.[160] Indirect effects include "growth inducing effects and other effects related to induced changes in land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems."[161] FEMA has claimed that because it does not fund, authorize, or carry out floodplain development with the implementation of the NFIP, it does not play a significant role in facilitating or encouraging floodplain development, and that any evidence to the contrary is merely anecdotal.[162]

FEMA has asserted that the NFIP "is currently in compliance with the ESA, but recognizes the need to make program changes that demonstrate ESA compliance to the public."[163] This claim relied heavily on FEMA's November 2016 biological evaluation, which concluded that FEMA's implementation of the NFIP had "no effect on species listed as threatened or endangered under the [ESA] or on the designated critical

157. Jaclyn Lopez, *Biodiversity on the Brink: The Role of "Assisted Migration" in Managing Endangered Species Threatened with Rising Seas,* 39 HARV. ENVTL. L. REV. 157, 157 (2014).

158. FINAL PEIS, *supra* note 3, at 3-115.

159. *Id.* at 4-11.

160. 44 C.F.R. § 1508.8 (West through Apr. 2, 2020).

161. *Id.* § 1508.8(b).

162. FINAL PEIS, *supra* note 3, at 4-4.

163. *Id.* at 1-6.

habitat of such species."[164] To the contrary, FEMA has failed to undertake formal consultation of its implementing agency actions with U.S. Fish and Wildlife Service and the National Marine Fisheries Service that would result in a biological opinion on the Program's effects on listed species and their habitats, as required under section 7 of the ESA.[165] FEMA argued that its NFIP implementation does not include the action of floodplain development, and thus the implementation of the NFIP with respect to floodplain development does not constitute an agency action implicating the ESA.[166] According to the agency, "FEMA has no compliance responsibilities under the ESA with respect to private floodplain development."[167] It argued that for the agency actions that FEMA asserts are within the NFIP, those components also have no effect on listed species and their critical habitat, according to FEMA.[168] These components are categorized into three large categories, each consisting of multiple agency actions: (i) floodplain management, which includes setting building and development standards for those flood risk areas; (ii) flood insurance, which provides subsidized insurance for communities adopting those standards; and (iii) flood hazard mapping, which identifies flood risks and maps them.[169] Finally, FEMA asserted that the cumulative effects of the NFIP "cannot be reasonably quantified" because of the scope of the effects: "the reasonably foreseeable future actions are those State, Tribal, and local development projects in the SFHAs nationwide likely to occur within the next 20-30 years" and involve more than 22,000 NFIP-participating communities.[170] FEMA stated that "[w]hile it is reasonably foreseeable that there will be private floodplain development in the [a]ction [a]rea within the next 20 to 30 years, the extent and the impacts of such development is not reasonably foreseeable."[171]

Numerous lawsuits, biological opinions, and other resources demonstrate that the NFIP influences floodplain development and impacts species, thereby triggering formal consultation under section 7 of the ESA,

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164. FEMA, NATIONAL FLOOD INSURANCE PROGRAM: BIOLOGICAL EVALUATION, at C-xii (2016) [hereinafter BE], https://www.fema.gov/media-library-data/1534526543526-7009254395f7f55c82c4477bd72d4e48/NFIP.pdf

165. *Id.*

166. *Id.* at C-vi; *see also* NOAA FISHERIES, BIOLOGICAL OPINION FOR FEMA'S NFIP IN THE STATE OF OREGON (July 2016), https://archive.fisheries.noaa.gov/wcr/publications/habitat/fact_sheets/7.13.2016_oregon_fema_biop_qa.pdf.

167. BE, *supra* note 164, at C-vi.

168. *Id.* at C-ix to C-xi, tbl.ES-1.

169. *Id.*

170. *Id.* at C-x, tbl. ES-1.

171. *Id.* at C-xi.

which ensures agency actions are not likely to jeopardize species or adversely modify their habitat.[172] For example, in *Florida Key Deer v. Stickney*, a Southern District of Florida court held that FEMA has broad discretion in issuing regulations implementing NFIP and is therefore subject to ESA consultation requirements.[173] The court also found that NFIP encouraged development of species' habitat and ordered FEMA to initiate consultation.[174] An associate solicitor of the U.S. Department of Interior, who found that FEMA is obligated to initiate formal consultation if the NFIP may affect a listed species, stated:

> Thus, in making its decisions on whether to determine eligibility for particular communities to participate in the flood insurance program, FEMA must follow the provisions of the National Flood Insurance Act, and it must also insure that its actions that indirectly or directly authorize or subsidize construction or acquisition in flood plain areas are not likely to jeopardize listed species or result in the destruction or adverse modification of critical habitat. The implicit approval of construction or acquisition and the issuance of flood insurance to make available needed financing for such projects clearly involve the de facto authorization of such actions by FEMA; "but for" the all-pervasive activities of FEMA, development in flood plains would probably not take place. Therefore, the activities of that agency are covered by Section 7(a)(2) of the Act.[175]

As a result of the court order and subsequent consultation, US. Fish and Wildlife Service determined that FEMA's administration of the NFIP was jeopardizing the Key deer, Key Largo cotton mouse, Key Largo woodrat, Key tree-cactus, Lower Keys marsh rabbit, Schaus' swallowtail butterfly, silver rice rat, Garber's sponge, and Stock Island tree snail and proposed reasonable and prudent alternatives (RPAs) that FEMA adopted.[176] Environmental groups then filed an amended complaint in 1997 claiming that the biological opinion and RPAs violated the ESA.[177] In 2003, the U.S. Fish and Wildlife Service and FEMA reinitiated consultation, and the U.S. Fish and Wildlife Service issued an amended biological opinion, again finding the NFIP jeopardized listed species.[178] Plaintiffs again filed suit challenging the sufficiency of the 2003 biological

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172. *See* Fla. Key Deer v. Paulison, 522 F.3d 1133, 1133 (11th Cir. 2008); *see also* Nat'l Wildlife Fed'n v. FEMA, 345 F. Supp. 2d 1151 (W.D. Wash. 2004); *see also* Fla. Key Deer v. Stickney, 864 F. Supp. 1222 (S.D. Fla. 1994).

173. *Stickney*, 864 F. Supp. at 1240.

174. *Id.* at 1242.

175. *Id.*

176. Fla. Key Deer v. Brown, 364 F. Supp. 2d 1345, 1348 (S.D. Fla. 2005).

177. *Id.*

178. *Id.* at 1348-49.

opinion.[179] The court agreed that the biological opinion was arbitrary and capricious and that FEMA had failed to implement any conservation plan with respect to listed species as required by the ESA section 7(a)(1).[180] The court also enjoined FEMA from providing any insurance for new developments in the suitable habitat of listed species in Monroe County pending consultation.[181] The Eleventh Circuit Court of Appeals affirmed both district court orders.[182]

There are several other cases throughout the United States that have compelled FEMA to comply with the ESA. FEMA recently agreed to settle another lawsuit between it and National Wildlife Federation and Florida Wildlife Federation over its implementation of NFIP.[183] In that settlement agreement, the parties stipulate that FEMA violated section 7 of the ESA by not consulting with the U.S. Fish and Wildlife Service (FWS) or National Marine Fisheries Service (NMFS) on the impacts of five sea turtles.[184] Pursuant to the agreement, FEMA will initiate consultation and produce a biological assessment.[185] In *National Wildlife Federal v. FEMA*, a Western District of Washington court held that FEMA's implementation of the NFIP constituted a discretionary and continuing action subject to ESA review.[186] It also held that FEMA's passage of minimum eligibility criteria, the mapping of floodplains, and the implementation of the community rating system have ongoing effects that extended beyond their mere approval that could affect Chinook salmon habitat.[187] The court ordered FEMA to initiate consultation with the National Marine Fisheries Service on the impacts of its implementation of NFIP on listed salmonids.[188]

In Audubon Society of Portland, National Wildlife Federation, Northwest Environmental Defense Center, Association of Northwest Steelheaders v. FEMA, FEMA agreed to initiate formal consultation with NMFS on impacts to fifteen ESA-listed species.[189] In 2011, a U.S. District Court for the District of New Mexico approved a stipulated agreement between WildEarth Guardians and FEMA requiring FEMA to initiate

179. *Id.* at 1349.
180. *Id.* at 136.
181. *Id.* at 1294.
182. Fla. Key Deer v. Paulison, 522 F.3d 1133 (11th Cir. 2008).
183. Nat'l Wildlife Fed'n v. Fugate, Case 1:10-cv-22300-KMM, 1, 2 (S.D. Fla. 2011).
184. *Id.* at 1.
185. *Id.* at 2.
186. 345 F. Supp. 2d 1151 (W.D. Wash. 2004).
187. Nat'l Wildlife Fed'n v. FEMA, 345 F. Supp. 2d 1151, 1177 (W.D. Wash. 2004).
188. *Id.*
189. Audubon Soc'y of Portland v. FEMA, Case no. 3:09-cv-729-HA (D. Or. 2010).

formal consultation with the U.S. Fish and Wildlife Service over NFIP's impacts on species in New Mexico.[190] This settlement was born in-part from earlier litigation between environmental groups and FEMA where the plaintiffs argued that FEMA was violating section 7 of the ESA by failing to consult with the U.S. Fish and Wildlife Service and jeopardizing thirteen listed species by providing flood insurance for communities developing within the floodplains.[191] FEMA agreed to submit a biological assessment to the U.S. Fish and Wildlife Service on the effects of NFIP and initiate consultation.[192] In 2009, WildEarth Guardians went back to court to enforce the terms of the 2002 agreement.[193]

More recently, in the National Marine Fisheries Service's 2016 biological opinion on Oregon's NFIP implementation (2016 Oregon Biological Opinion), the agency concluded that FEMA's implementation of the NFIP in Oregon affects the survival of at least seventeen species and their critical habitat because the NFIP results in floodplain development that "reduces the quantity and quality of floodplain and in-channel habitat."[194] Similarly, the U.S. Fish and Wildlife Service "has made numerous factual and policy determinations, at the highest level of the [FWS], representing the agency's best professional judgment, based on the views of experts on its staff and a review of available information, that implementation of the NFIP by FEMA facilitates and encourages new development in undeveloped areas."[195]

The fact that individual biological opinions have been undertaken on NFIP implementation is evidence that the NFIP as currently implemented is a discretionary agency action that may affect species and is thus subject to section 7 consultation. Moreover, in May 2019, a federal district court judge added to the volume of cases finding that FEMA has an obligation to consult, in rejecting FEMA's 2016 biological evaluation on the NFIP.[196]

FEMA's failure to undergo formal section 7 consultation with the Services puts vulnerable species at risk[197] and has led to a waste of public and judicial resources. FEMA has faced numerous ESA-based lawsuits,

190. WildEarth Guardians v. FEMA, 1:09-cv-0082-RB-WDS (D.N.M. Feb. 2011).
191. *Id.* at 2.
192. *Id.* at 3.
193. *Id.* at 2.
194. *Id.*
195. Fla. Key Deer v. Stickney, 864 F. Supp. 1222, 1231 (S.D. Fl. 1994).
196. Ecological Rights Found. v. FEMA, 384 F. Supp. 3d 1111, 1124 (N.D. Cal. 2019).
197. CTR. FOR BIOLOGICAL DIVERSITY, DEADLY WATERS: HOW RISING SEAS THREATEN 233 ENDANGERED SPECIES 15 (2013), https://www.biologicaldiversity.org/campaigns/sea-level_rise/pdfs/Sea_Level_Rise_Report_2013_web.pdf.

which have resulted in courts compelling FEMA repeatedly to undertake formal section 7 consultation with the Services with respect to statewide and local species impacted by NFIP implementation.[198]

III. U.S. FOSSIL FUEL LEASING INCREASES CLIMATE CHANGE-FUELED FLOODING

Fossil fuels from U.S. land and submerged offshore land leases comprise 21%-25% of U.S. greenhouse gas emissions and 3%-4% global emissions.[199] Domestic oil and gas production has increased 85% from 2010 to 2018, and now the United States is now the largest oil and gas producer globally.[200] The United States is on track to double its oil output from 2017 to 2030[201] and dramatically increase gas production from 2017 to 2025.[202] It is also the third largest coal producer,[203] with federal leases making up about 40% of all U.S. coal produced.[204]

A. Current and Projected Federal Leasing of Fossil Fuels

Despite the United States' recent fossil fuel ramp up, the amount of CO_2e currently not under federal lease is still far greater than the amount of CO_2 potential from existing federal leases.

198. *See, e.g.,* WildEarth Guardians v. FEMA, 2011 U.S. Dist. LEXIS 31017 (approving a stipulated agreement requiring FEMA to initiate a formal consultation with the U.S. Fish and Wildlife Service over NFIP's impacts in New Mexico).

199. STRATUS CONSULTING, GREENHOUSE GAS EMISSIONS FROM FOSSIL ENERGY EXTRACTED FROM FEDERAL LANDS AND WATERS 11 (Apr. 8, 2020), http://riggingthesystem.org/wp-content/uploads/2017/07/Stratus-Report.pdf; Jeremy Martinich et al., *Chapter 29: Reducing Risks Through Emissions Mitigation, in* II U.S. GLOB. CHANGE RESEARCH PROGRAM, FOURTH NATIONAL CLIMATE ASSESSMENT, IMPACTS, RISKS, AND ADAPTATIONS IN THE UNITED STATES 1358 fig.29.2, 1360 fig.29.3 (D.R. Reidmiller et al. eds., 2018) [hereinafter II FOURTH NATIONAL CLIMATE ASSESSMENT], https://nca2018.globalchange.gov/downloads/NCA4_2018_FullReport.pdf1346; News Release, U.S. Bureau of Econ. Analysis, BEA-19-16, GDP by Industry: Value Added by Industry as a Percentage of Gross Domestic Product (Apr. 19, 2019), https://www.bea.gov/system/files/2019-04/gdpind418_0.pdf.

200. *The United State Is Now the Largest Global Crude Oil Producer*, U.S. ENERGY INFO. ADMIN. (Sept. 12, 2018), https://www.eia.gov/todayinenergy/detail.php?id=37053.

201. Estimates for oil include crude oil, condensate, and natural gas liquids.

202. Estimates for gas include gas and flared gas.

203. Rob Smith, *These Are the World's Biggest Coal Producers*, WORLD ECON. F. (Jan. 11, 2018), https://www.weforum.org/agenda/2018/01/these-are-the-worlds-biggest-coal-producers/.

204. DEP'T OF THE INTERIOR, FEDERAL COAL PROGRAM PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT-SCOPING REPORT 6-45 (2017), https://www.eenews.net/assets/2017/01/11/document_gw_02.pdf.

Leased	Unleased
Federal crude oil 6.95-7.92 Gt CO_2e[205]	Federal crude oil 37.03-42.19 Gt CO_2e[206]
Federal natural gas 10.39-7.92 Gt CO_2e[207]	Federal natural gas 37.86-47.26 Gt CO_2e[208]
Federal coal 10.689-12.88 Gt CO_2e[209]	Federal coal 115.32-212.26 Gt CO_2e[210]
Federal leased oil shale 1.94-2.23 Gt CO_2e[211]	Federal oil shale 123.17-142.07 Gt CO_2e[212]

The potential greenhouse gas emission of leased and unleased fossil fuels is 349-492 Gt CO_2e, which represent 46%-50% of potential emissions from all remaining U.S. fossil fuels, and unleased federal fossil fuels make up 91% of the potential.[213]

The United States leases federal fossil fuel resources on federal submerged lands and federal terrestrial lands. The Outer Continental Shelf Lands Act (OCSLA) sets forth the administration of all offshore leases for oil and gas exploration in the Outer Continental Shelf (OCS).[214] Congress enacted OCSLA in 1953 to give the Secretary of the Interior authority to lease land for oil and gas.[215] Recognizing the OCS as "a vital national resource reserve held by the Federal Government for the public," the 1978 Amendments to OCSLA provided for development of resources on the OCS, "subject to environmental safeguards."[216] Additionally, "operations in the outer Continental Shelf should be conducted in a safe manner by well-trained personnel using . . . precautions . . . sufficient to prevent or minimize the likelihood of blowouts . . . or other occurrences which may

205. MULVANEY ET AL., CTR. FOR BIOLOGICAL DIVERSITY, ECO-SHIFT CONSULTING, THE POTENTIAL GREENHOUSE GAS EMISSIONS FROM U.S. FEDERAL FOSSIL FUELS 17 tbl.3 (2015), https://www.biologicaldiversity.org/publications/papers/Potential-Greenhouse-Gas-Emissions-U-S-Federal-Fossil-Fuels.pdf.

206. *Id.*

207. *Id.*

208. *Id.*

209. *Id.*

210. *Id.*

211. *Id.*

212. *Id.*

213. *Id.* at 3.

214. 43 U.S.C. § 1331 (West through P.L. 116-140).

215. *Id.*

216. *Id.* § 1332(3).

cause damage to the environment or to property, or endanger life or health."[217]

OCSLA delineates four distinct stages of oil and gas development activities on the outer Continental Shelf: (1) the development of a five-year leasing plan; (2) issuance of oil and gas leases; (3) approval of lessee's exploration plans; and (4) approval of lessee's development and production plans.[218] Responsibility for many of OCSLA's mandates has been delegated to the Bureau of Ocean Energy Management, Regulation, and Enforcement (BOEM), an agency within the Department of Interior's purview.[219] President Obama withdrew certain areas of the OCS from leasing,[220] but President Trump revoked the withdrawals.[221] On March 29, 2019, a federal court in Alaska vacated President Trump's revocation of President Obama's withdrawals of Arctic and Atlantic areas from oil and gas leasing.[222] That decision is under appeal.[223]

The Minerals Leasing Act of 1920 authorizes the Bureau of Land Management (BLM) to manage the subsurface right on 700 million acres of federal, state, tribal, and private lands.[224] Land that BLM does not lease through auction are available for an administrative fee plus a $1.50 per acre rental fee for ten years.[225] Nearly 25% of the acres BLM has leased in

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217. *Id.* § 1332(6).

218. *Id.* §§ 1331, 1337, 1340, 1344-5, 1351.

219. By Secretarial Order 3302, issued on June 18, 2010, the Minerals Management Service was renamed the Bureau of Ocean Energy, Management, Regulation, and Enforcement. 76 Fed. Reg. 64,432, 64,432 (Oct. 18, 2011).

220. Exec. Order 13,754, 81 Fed. Reg. 90,669, § 3 (Dec. 9, 2016); Presidential Memoranda, The White House, President Obama, Memorandum on Withdrawal of Certain Areas of the United States Outer Continental Shelf Offshore Alaska From Leasing Disposition (Jan. 27, 2015), https://obamawhitehouse.archives.gov/the-press-office/2015/01/27/presidential-memorandum-withdrawal-certain-areas-united-states-outer-con; Presidential Memoranda, The White House, President Obama, Memorandum on Withdrawal of Certain Portions of the United States Arctic Outer Continental Shelf From Mineral Leasing, The White House President Obama (Dec. 20, 2016), https://obamawhitehouse.archives.gov/the-press-office/2016/12/20/presidential-memorandum-withdrawal-certain-portions-united-states-arctic.

221. Exec. Order 13,795, 82 Fed. Reg. 20,815 (Apr. 28, 2017).

222. League of Conservation Voters v. Trump, Case No. 3:17-cv-00101-SLG (Alaska Mar. 29, 2019), http://blogs2.law.columbia.edu/climate-change-litigation/wp-content/uploads/sites/16/case-documents/2019/20190329_docket-317-cv-00101_order-1.pdf.

223. Notice of Appeal, *League of Conservation Voters*, Case No. 3:17-cv-00101-SLG, http://blogs2.law.columbia.edu/climate-change-litigation/wp-content/uploads/sites/16/case-documents/2019/20190528_docket-317-cv-00101_notice-of-appeal.pdf.

224. Mineral Leasing Act of 1920 as Amended (2007), 30 U.S.C. § 181 (West through P.L. 116-140); Clayton R. Elliott, *Innovation in the U.S. Bureau of Land Management: Insights from Integrating Mule Deer Management with Oil and Gas Leasing*, 42 (Aug. 2010) (unpublished Ph.D. and Master's dissertation, University of Michigan).

225. *General Oil and Gas Leasing Instructions*, BUREAU LAND MGMT., https://www.blm.gov/programs/energy-and-minerals/oil-and-gas/leasing/general-leasing (last visited Dec. 22, 2019).

the last ten years have been through this noncompetitive leasing process.[226] On June 30, 2019, groups launched a lawsuit over a BLM lease of 201 oil and gas leases covering more than 68,000 acres of land in New Mexico.[227] Meanwhile, President Trump has also canceled the review process for the BLM fracking rule.[228]

In general, President Trump has launched an unprecedented attack on measures to curb climate change.[229] A 2019 report by Wentz and Gerrard details the multitude of climate change rollbacks, including the cross-state air pollution rule; vehicle standards-penalties; hydrofluorocarbon product standards; methane standards for municipal landfills; energy efficiency standards; mercury and air toxics standards; heavy-duty vehicle standards; CO_2 new source performance standards for power plants; Clean Power Plan; light-duty vehicle standards; methane new source performance standards for oil and gas sources; methane waste prevention rule; coal ash rule; and coal, oil, and gas valuation rule.[230] The Trump Administration has opened up portions of two national monuments, Bears Ears National Monument and Grand Staircase Escalante National Monument, to allow oil and gas exploration and development and threatened opening an additional twenty-seven national monuments.[231]

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226. Kate Kelly et al., *Backroom Deals: The Hidden World of Noncompetitive Oil and Gas Leasing*, CTR. FOR AM. PROGRESS (May 23, 2019, 12:01 AM), https://www.americanprogress.org/issues/green/reports/2019/05/23/470140/backroom-deals/.

227. Petition for Review of Agency Action, WildEarth Guardians v. Bernhardt, Case 1:19-cv-00505 (N.M. June 30, 2019), https://pdf.wildearthguardians.org/support_docs/Greater%20Carlsbad%20Oil%20and%20Gas%20Leasing%20Complaint.pdf.

228. Press Release, Bureau of Land Mgmt., BLM Rescinds Rule on Hydraulic Fracturing (Dec. 28, 2017), https://www.blm.gov/press-release/blm-rescinds-rule-hydraulic-fracturing.

229. Jessica Wentz & Michael B. Gerrard, Persistent Regulations: A Detailed Assessment of the Trump Administration's Efforts to Repeal Federal Climate Protections (Columbia Law Sch., Sabin Ctr. for Climate Change Law, White Paper, June 2019), http://columbiaclimatelaw.com/files/2019/06/Wentz-and-Gerrard-2019-06-Persistent-Regulations.pdf.

230. *Id.* To date, the Trump administration's climate change rollbacks have not survived legal challenge. Dena P. Adler, U.S. Climate Change Litigation in the Age of Trump: Year Two, at i (Columbia Law Sch., Sabin Ctr. for Climate Change Law White Paper, June 2019), http://Columbiaclimatelaw.com/files/2019/06/Adler-2019-06-US-Climate-Change-Litigation-in-Age-of-Trump-Year-2-Report.pdf.

231. Nat'l Res. Def. Council, Inc. v. Trump, Case No. 1:17-cv-02606 (D.D.C. Dec. 7, 2017), https://earthjustice.org/sites/default/files/files/Bears%20Ears%20complaint.pdf; Environmental groups promptly challenged these rules. Complaint for Injunctive and Declaratory Relief, Wilderness Soc'y v. Trump, No. 1:17-cv-02587 (D.D.C. Dec. 4, 2017), https://www.nrdc.org/sites/default/files/complaint-grand-staircase-escalante-20171204.pdf; Complaint, Hopi Tribe v. Trump, No. 1:17-cv-02590, 2019 WL 2494161, at *2 (D.D.C. Dec. 4, 2017), https://www.narf.org/wordpress/wp-content/uploads/2017/08/20171204bears-ears-complaint.pdf.

The Environmental Protection Agency (EPA), pursuant to President Trump's Executive Order 13,783, which directed the EPA to "review existing regulations that potentially burden the development or use of domestically produced energy resources and . . . rescind those that unduly burden the development of domestic energy resources,"[232] rescinded the Obama-era Clean Power Plan with the Affordable Clean Energy rule.[233] While the EPA claims that the Affordable Clean Energy rule will reduce CO_2, mercury, and other greenhouse gas emissions,[234] a recent analysis of the rule concluded that the rule will actually increase CO_2, SO_2, and NO_x emissions.[235] The American Lung Association, American Public Health Association, along with seventy-two health and medical organizations, environmental organizations, and twenty-two states,[236] have filed a lawsuit challenging the rule.[237] Under President Trump, the EPA proposed a rollback to methane emissions rules that require oil and gas companies to detect and fix methane leaks.[238] Methane is a potent greenhouse gas, trapping twenty to twenty-five times the heat of CO_2 and composing 10% of U.S. greenhouse gases.[239]

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232. Exec. Order No. 13,783, 82 Fed. Reg. 16,093 (Mar. 31, 2017) (signed Mar. 28, 2017). Meanwhile, the Clean Power Plan has been wrapped up in litigation pending the implementation of the new regulations. Petition for Review, West Virginia v. EPA, No. 15-1363 (D.C. Cir. *Docketed* Oct. 23, 2015); Clean Air Council v. Pruitt, 862 F.3d 1, 5-6, 8 (D.C. Cir. 2017) (per curiam).

233. Repeal of the Clean Power Plan; Emission Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units; Revisions to Emission Guidelines Implementing Regulations, 84 Fed. Reg. 32,520, at 32,521 (July 8, 2019).

234. Press Release, EPA, EPA Finalizes Affordable Clean Energy Rule, Ensuring Reliable, Diversified Energy Resources while Protecting our Environment (June 19, 2019), https://www.epa.gov/newsreleases/epa-finalizes-affordable-clean-energy-rule-ensuring-reliable-diversified-energy.

235. Amelia T. Keyes et al., *The Affordable Clean Energy Rule and the Impact of Emissions Rebound on Carbon Dioxide and Criteria Air Pollutant Emissions*, 14 ENVTL. RES. LETTERS 1 (2019).

236. Petition for Review, New York v. EPA, No. 19-1165 (D.C. Cir. Aug. 13, 2019), http://cdn.cnn.com/cnn/2019/images/08/13/2019_08_13_final_petition_for_review.pdf.

237. *See*, *e.g.*, Sarah Sloat, *2 Top US Health Organizations Are Filing a Lawsuit Against Trump's EPA*, INVERSE (July 8, 2019), https://www.inverse.com/article/57458-affordable-clean-energy-rule-lawsuit.

238. Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources Review; Proposed Rule, 84 Fed. Reg. 50,244 (Sept. 24, 2019).

239. Emily Holden, *Trump Administration Rolls Back Methane Pollution Regulations*, HIGH COUNTRY NEWS (Aug. 30, 2019), https://www.hcn.org/articles/climate-desk-trump-administration-rolls-back-obama-era-methane-regulations. States have vowed to litigate that rules as well. *See*, *e.g.*, Molly Dove, *Attorney General Phil Weiser Vows to Challenge Federal Rollback of Methane Standards*, ASPEN PUB. RADIO (Sept. 2, 2019), https://www.aspenpublicradio.org/post/attorney-general-phis-weiser-vows-challenge-federal-rollback-methane-standards.

B. U.S. Federal Agencies Routinely Ignore the Greenhouse Gas Impacts of Major Federal Actions

U.S. federal agencies funding or authorizing actions that result in greenhouse gas emissions have been reluctant to analyze the impacts of those actions despite NEPA's unequivocal mandate to analyze the indirect effects of agency-authorized action.[240] Complicating matters, the U.S. Supreme Court in *Department of Transportation v. Public Citizen* clouded this area of law in holding that the Department of Transportation (DOT) need not analyze greenhouse gas emissions because it lacks the discretion to prevent cross-border operations causing emissions because it must register any motor carrier willing and able to comply with safety and financial rules.[241]

In *Public Citizen*, the U.S. Supreme Court reviewed whether the DOT's failure to conduct an environmental analysis in promulgating regulations regarding Mexican trucks entering the United States violated NEPA.[242] Pursuant to a North American Free Trade Agreement (NAFTA) arbitral panel that concluded the United States' refusal to allow Mexican trucks into the United States violated NAFTA, the President announced he would lift the moratorium after the DOT issued certain regulations governing those trucks, including safety and auditor-certification regulations.[243] The DOT published the rules without first analyzing the impacts in an environmental impact statement (EIS), instead finding that the rules either would not have a significant impact or were categorically excluded from NEPA.[244] The lower court found that the DOT's rules were major federal actions and that after implementing the new regulations, cross-border truck traffic and greenhouse gas emissions would increase, and held the agency's failure to analyze the regulations with an EIS under NEPA arbitrary and capricious.[245]

In a unanimous decision delivered by Justice Thomas, the Court held that because the President, not the DOT, was the proximate or legal cause of transboundary air pollution resulting from the operations, the agency need not analyze the indirect effects of the activity.[246] It also enshrined the notion that "inherent in NEPA and its implementing regulations" is "that

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240. *See* Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions, 84 Fed. Reg. 123 (June 26, 2019).

241. DOT v. Pub. Citizen, 541 U.S. 752, 756, 758-59 (2004).

242. *Id.* at 756.

243. *Id.* at 759-60.

244. *Id.* at 761-62.

245. Pub. Citizen v. DOT, 316 F.3d 1002, 1031-32 (9th Cir. 2003).

246. *Pub. Citizen*, 541 U.S. at 770.

agencies determine whether and to what extent to prepare an EIS based on the usefulness of any new potential information to the decision-making process."[247] It upheld the agency's decision to not prepare an EIS as it would not satisfy NEPA's "rule of reason" test because the DOT did not have the discretion or ability to stop the President from lifting the moratorium on cross-border truck activity.[248] Its critical holding, and a new addition to NEPA caselaw, was "where an agency has no ability to prevent a certain effect due to its limited statutory authority over the relevant actions, the agency cannot be considered a legally relevant 'cause' of the effect."[249]

Following *Public Citizen*, courts in the D.C., Ninth, and Tenth Circuit Courts of Appeals have maintained that agencies must analyze the indirect greenhouse gas emissions impacts of the actions they authorize as downstream effects within the scope of indirect impacts that should be reviewed under NEPA as "reasonably foreseeable."[250] For example, in *Sierra Club v. FERC* (*Sabal Trail*), the D.C. Circuit Court of Appeals held that the Federal Energy Regulatory Commission (FERC) violated NEPA by failing to analyze the burning of natural gas, a greenhouse gas, transported by the "Sabal Trail" natural gas pipeline, finding, "[G]reenhouse-gas emissions are an indirect effect of authorizing this project, which FERC could reasonably foresee, and which the agency has legal authority to mitigate."[251] In making this finding, the court reasoned:

> It's not just the journey, though, it's also the destination. All the natural gas that will travel through these pipelines will be going somewhere: specifically, to power plants in Florida, some of which already exist, others of which are in the planning stages. Those power plants will burn the gas, generating both electricity and carbon dioxide. And once in the atmosphere,

247. *Id*. at 767.

248. *Id.* at 772-73.

249. *Id.* at 770. The Council on Environmental Quality's Draft National Environmental Act Guidance on Consideration of Greenhouse Gas Emissions, which would replace President Obama's Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews, pursuant to Executive Order 13,783 "Promoting Energy Independence and Economic Growth," would essentially codify the holdings in *Public Citizen* as they pertain to indirect effects of greenhouse gas emissions. 84 Fed. Reg. 30,097 (June 26, 2019).

250. 40 C.F.R. § 1508.8(b) (West through Apr. 9, 2020). *But see* EarthReports, Inc. v. FERC, 828 F.3d 949 (D.C. Cir. 2016); Sierra Club v. FERC, 827 F.3d 36 (D.C. Cir. 2016); Sierra Club v. FERC (Sabine Pass), 827 F.3d 59 (D.C. Cir. 2016).

251. (*Sabal Trail*), 867 F.3d 1357, 1374 (D.C. Cir. 2017); *see also* WildEarth Guardians v. Zinke, 368 F. Supp. 3d 41, 74-75 (D.D.C. 2019); Sierra Club v. USDA, 777 F. Supp. 2d 44, 55-57 (D.D.C. 2011).

> that carbon dioxide will add to the greenhouse effect, which the EIS describes as "the primary contributing factor" in global climate change.[252]

The D.C. Circuit Court of Appeals in *Sabal Trail* held FERC failed to discharge its duty to evaluate the reasonably foreseeable "downstream effects" of authorizing natural gas pipelines when it ignored the fact that power plants would use the natural gas to create electricity, which would emit greenhouse gases.[253] The court found that it was not only reasonably foreseeable that the power plants would use the gas to make electricity, but that it was the project's entire purpose.[254]

The D.C. Circuit in *Sabal Trail* distinguished *Public Citizen*, explaining that "Congress broadly instructed the agency to consider" public benefits against adverse effects, and therefore, "[b]ecause FERC could deny a pipeline certificate on the ground that the pipeline would be too harmful to the environment, the agency is a 'legally relevant cause' of the direct and indirect environmental effects of pipelines it approves."[255] "*Public Citizen* thus did not excuse FERC from considering these indirect effects."[256] Following *Sabal Trail*, FERC adopted a policy that declared upstream and downstream emissions associated with permitting natural gas pipelines are not cumulative or indirect impacts and are therefore outside the scope of NEPA.[257] This policy was unsuccessfully litigated.[258]

The Ninth Circuit Court of Appeals has likewise held that federal agencies must analyze downstream greenhouse gas emissions that affect the human environment as indirect effects under NEPA.[259] In *South Fork Band Council of West Shoshone of Nevada v. U.S. Department of the Interior*, the Ninth Circuit Court of Appeals explained that "[t]he air quality impacts associated with transport and off-site processing of the five

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252. *Sabal Trail*, 867 F.3d at 1371.

253. 40 C.F.R. § 1502.16(b) (West through Apr. 9, 2020); *Sabal Trail*, 867 F.3d at 1371.

254. *Sabal Trail*, 867 F.3d at 1372.

255. *Id*. at 1373.

256. *Id.*; *see also* Sierra Club v. Mainella, 459 F. Supp. 2d 76, 105 (D.D.C. 2006) ("The holding in *Public Citizen* extends only to those situations where an agency has 'no ability' because of lack of 'statutory authority' to address the impact . . . .").

257. Order Denying Rehearing, *Dominion Transmission, Inc.*, No. CP14-497, 163 FERC ¶ 61,128 (2018).

258. Otsego 2000 v. FERC, No. 18-1188 (D.C. Cir. May 9, 2019) (per curiam).

259. Save Our Sonoran v. Flowers, 408 F.3d 1113, 1122 (9th Cir. 2005) ("[I]t is the impact of the permit on the environment at large that determines the Corps' NEPA responsibility."). *But see* Friends of the Earth, Inc. v. Mosbacher, 488 F. Supp. 2d 889, 918 (N.D. Cal. 2007) ("Because the Court is unable to determine whether the alleged actions would have gone forward without Defendants' participation and cannot determine whether Defendants could exercise control over the projects, the Court cannot determine whether Defendants are a legally relevant cause of the alleged effects on the domestic environment.").

million tons of refractory ore are prime examples of indirect effects that NEPA requires be considered."[260] Applying this authority, many district courts in the Ninth Circuit Court of Appeals have reached similar holdings.[261]

The Tenth Circuit Court of Appeals has also held that federal agencies must analyze the downstream impacts of extractive activities as indirect effects under NEPA. For instance, in *WildEarth Guardians v. U.S. Bureau of Land Management*, the Tenth Circuit concluded that a BLM EIS unlawfully failed to review impacts from coal combustion emissions.[262] In *Colorado Environmental Coalition v. Office of Legacy Management*, the U.S. District Court for the District of Colorado found an agency unlawfully failed to consider the indirect effects of processing ore that would be mined with agency-issued permits.[263]

Despite these holdings, agencies continue to ignore the indirect greenhouse gas impacts of the actions they authorize, and some courts continue to allow them,[264] building on the United States' long history of ignoring the greenhouse gas impacts of the activities it authorizes.

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260. 588 F.3d 718, 725 (9th Cir. 2009) (finding the Bureau of Land Management failed to evaluate the environmental impacts of transporting and processing ore at a facility seventy miles away); *see* also N. Plains Res. Council, Inc. v. Surface Transp. Bd., 668 F.3d 1067, 1077-79 (9th Cir. 2011) (finding an EIS for a railroad line failed to review cumulative impacts from a coal mine that would utilize the rail line).

261. *See, e.g.*, Mont. Envtl. Info. Ctr. v. U.S. Office of Surface Mining, 274 F. Supp. 3d 1074, 1090-99 (D. Mont. 2017) (finding an EA for the expansion of a coal mine failed to take a hard look at the indirect and cumulative effects of coal transportation, coal combustion, and foreseeable greenhouse gas emissions); WildEarth Guardians v. Office of Surface Mining, Reclamation & Enf't, No. 14-103-BLG-SPW, 2015 U.S. Dist. LEXIS 145149, at *19-20 (D. Mont. Oct. 23, 2015) (finding the Office of Surface Mining's FONSI failed to take a hard look at environmental impacts including downstream greenhouse gas emissions from federal coal leasing), *report and recommendation adopted in part, rejected in part on other grounds*, 2016 U.S. Dist. LEXIS 7223 (D. Mont. Jan. 21, 2016).

262. 870 F.3d 1222, 1233-40 (10th Cir. 2017).

263. 819 F. Supp. 2d 1193, 1212 (D. Colo. 2011), *amended in part on other grounds by* No. 08-01624-WJM-MJW, 2012 U.S. Dist. LEXIS 24126 (D. Colo. Feb. 27, 2012); *see also* Sierra Club v. U.S. Dep't of Energy, 255 F. Supp. 2d 1177, 1185 (D. Colo. 2002) (holding the agency must review impacts from a "reasonably foreseeable" mine on private land when preparing a NEPA document for federal land easement related to the future mine); High Country Conservation Advocates v. U.S. Forest Serv., 52 F. Supp. 3d 1174, 1189-94 (D. Colo. 2014) (finding an EIS for coal lease modification and mine expansion must consider downstream emissions from coal combustion); Diné Citizens Against Ruining Our Env't v. Office of Surface Mining, Reclamation & Enf't, 82 F. Supp. 3d 1201 (D. Colo. 2015) (holding the agency improperly limited its scope of review by failing to assess the indirect and cumulative impacts of a coal mine expansion that would create an additional 12.7 million tons of coal combustion), *order vacated in part, appeal dismissed in part as moot by* 643 Fed. App'x 799 (10th Cir. 2016).

264. *See generally* Ohio Valley Envtl. Coal. v. Aracoma Coal Co., 556 F.3d 177 (4th Cir. 2009); Sierra Club v. Clinton, 746 F. Supp. 2d 1025 (D. Minn. 2010), Sierra Club v. FERC, 827

IV. COMMON SENSE SOLUTIONS TO ADDRESS AMERICA'S FLOOD CRISIS

Because the NFIP incentivizes development in flood areas, subsidizes costs, and obscures risk,[265] the most obvious solutions are to not cover any new construction in 100-year floodplains, adjust rates on existing structures to reflect risk, and immediately transition away from fossil fuels.[266] If the United States' flood area residents are to survive climate change and sea level rise, the United States must immediately end all fossil fuel leasing, and FEMA must do a much better job reflecting the actuarial risk of home ownership in flood-prone areas and communicate the risks more clearly with policyholders.[267]

The top five measures Congress should immediately enact that would have the most protective, long-term effect on vulnerable communities and imperiled species are (1) ending leasing public lands for fossil fuel; (2) explicitly requiring that federal agencies permitting, approving, reviewing, or funding fossil fuel-related activities to analyze the greenhouse gas impacts; (3) requiring climate change and sea level rise mapping and risk disclosure; (4) minimizing and mitigating NFIP's impact on endangered and threatened species; and (5) mandating buyout programs.

F.3d 36 (D.C. Cir. 2016); Sierra Club v. FERC, 827 F.3d 59 (D.C. Cir. 2016); EarthReports, Inc. v. FERC, 828 F.3d 949 (D.C. Cir. 2016).

265. *See* Carolyn Kousky & Erwann Michel-Kerjan, *Examining Flood Insurance Claims in the United States: Six Key Findings*, 84 J. RISKS & INSUR. 819, 819 (2015); Jen Schwartz, *National Flood Insurance Is Underwater Because of Outdated Science,* SCI. AM. (Mar. 23, 2018), https://www.scientificamerican.com/article/national-flood-insurance-is-underwater-because-of-outdated-science/; Christopher Joyce, *Mapping Coastal Flood Risks Lags Behind Seal Level Rise,* NPR (July 27, 2017), https://www.npr.org/2017/07/27/539506529/mapping-coastal-flood-risk-lags-behind-sea-level-rise.

266. *Preparing for the Storm, supra* note 1, at 22-24 (statement of R.J. Lehman, Director of Finance, Insurance & Trade Policy, R Street Institute); Sarah Fox, *This Is Adaptation: The Elimination of Subsidies Under the National Flood Insurance Program*, 39 COLUM. J. ENVTL. L. 205, 244 (2014) (recommending that FEMA should "pair the elimination of subsidies with limited financial support to facilitate compliance and relocation"); Christine A. Klein, *The National Flood Insurance Program at Fifty: How the Fifth Amendment Takings Doctrine Skews Federal Flood Policy*, 31 GEO. ENVTL. L. REV. 285, 332 (2019).

267. U.S. DEP'T HOMELAND SEC., AN AFFORDABILITY FRAMEWORK FOR THE NATIONAL FLOOD INSURANCE PROGRAM 3 (Apr. 17, 2018), https://www.fema.gov/media-library-data/1524056945852-e8db76c696cf3b7f6209e1adc4211af4/Affordability.pdf ("Price is one of the best signals of risk that a consumer receives; any affordability assistance should be delivered with communication of the policyholder's full-risk, non-discounted rate . . . .").

A. Direct BOEM and BLM to Immediately End Fossil Fuel Leasing

The United States, along with most of the world's countries, has committed to the climate change target of holding the long-term global average temperature "to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels"[268] under the Paris Agreement. The Paris Agreement codifies the international consensus that climate change is an "urgent threat" of global concern.[269] The Agreement requires a "well below 2°C" climate target because 2°C of warming is no longer considered a safe guardrail for avoiding catastrophic climate impacts. The 2018 Intergovernmental Panel on Climate Change *Special Report on Global Warming of 1.5°C* 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.[270] The report warns that a target of 1.5°C as compared to 2°C will substantially reduce mean land and ocean temperatures, hot extremes, heavy precipitation, drought, extinction rates, sea level rise, and risks to human health and safety.[271] Globally, we have already reached 1°C rise above pre-industrial levels,[272] and if emissions continue at the current rate, we are likely to reach 1.5°C between 2030 and 2052.[273]

The Fourth National Climate Assessment estimates 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, with these amounts directly connected to the amount of greenhouse gases in the atmosphere.[274] Global mean sea level is projected to increase only by 0.8 to 2.6 feet under a lower emissions scenario, 1.1 to 3.1 feet under a mid-level emissions scenario, and 1.6 to 6 feet under a high emissions

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268. United Nations Framework Convention on Climate Change, Adoption of the Paris Agreement: Conf. of the Parties, art. 2, U.N. Doc. FCCC/CP/2015/L.9/Rev/1 (Dec. 12, 2015), http://unfccc.int/resource/docs/2015/cop21/eng/l09.pdf [hereinafter Paris Agreement].

269. *See id.* at 20.

270. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC), GLOBAL WARMING OF 1.5°C (2018) [hereinafter IPCC 2018 REPORT], https://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf (reporting 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).

271. *Id.* at 9-12.

272. *Id.*

273. *Id.*

274. Michael Culp et al., *Chapter 12: Transportation, in* II FOURTH NATIONAL CLIMATE ASSESSMENT, *supra* note 199, at 487; David R. Easterling et al., *Chapter 2: Our Changing Climate, in* II FOURTH NATIONAL CLIMATE ASSESSMENT, *supra* note 199, at 99; Adam Terando et al., *Chapter 19: Southeast, in* II FOURTH NATIONAL CLIMATE ASSESSMENT, *supra* note 199, at 758.

scenario.[275] Global mean sea level rise could be 0.1 meter lower with global warming capped at 1.5°C as compared to 2°C.[276] That reduction of just 0.1 m in global sea level rise could result in up to 10 million fewer people exposed to sea level rise related risks.[277]

The IPCC estimated that the remaining carbon budget for a 66% probability of limiting warming to 1.5°C is 420 to 570 Gt CO_2.[278] To put this in perspective, at the current global emissions rate of ~42 $GtCO_2$ (gigatons of equivalent carbon dioxide) per year, this carbon budget would be consumed in just ten to fourteen years. The U.S. carbon budget consistent with the 1.5°C Paris Agreement target is approximately 25 $GtCO_2eq$ to 57 $GtCO_2eq$,[279] depending on the equity principles used to apportion the global budget across countries.[280] In 2013, the United States contributed 15% of global emissions at 6.67 Gt CO_2e, with 85% coming from fossil fuels.[281] It is estimated that in 2012, federal fossil fuel emissions were 1.278-1.344 Gt CO_2e, amounting to 21%-25% of U.S. greenhouse gas emissions, or 3%-4% of global emissions.[282] In 2018, the U.S. Geological Survey and Department of the Interior estimated that carbon emissions released from extraction and end-use combustion of fossil fuels produced on federal lands alone—not including nonfederal

275. W.V. Sweet et al., *Chapter 12: Sea Level Rise, in* I U.S. GLOB. CHANGE RESEARCH PROGRAM, FOURTH NATIONAL CLIMATE ASSESSMENT: CLIMATE SCIENCE SPECIAL REPORT 344 (D.J. Wuebbles et al. eds., 2018) [hereinafter I FOURTH NATIONAL CLIMATE ASSESSMENT], https://science2017.globalchange.gov/downloads/CSSR2017_FullReport.pdf.

276. IPCC 2018 REPORT, *supra* note 270, at 7.

277. *Id.*

278. *Id.* at 12.

279. Yann Robiou du Pont et al., *Equitable Mitigation to Achieve the Paris Agreement Goals*, 7 NATURE CLIMATE CHANGE 38, 40 (2017). Quantities measured in $GtCO_2eq$ include the mass emissions from CO_2 as well as the other well-mixed greenhouse gases (CO_2,methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and SF6) converted into CO_2-equivalent values, while quantities measured in $GtCO_2$ refer to mass emissions of just CO_2 itself. *Id.*

280. Robiou du Pont et al. (2017) averaged across IPCC sharing principles to estimate the U.S. carbon budget from 2010 to 2100 for a 50% chance of returning global average temperature rise to 1.5°C by 2100, based on a cost-optimal model. The study estimated the U.S. carbon budget consistent with a 1.5°C target at 25 $GtCO_2eq$ by averaging across four equity principles: capability (83 $GtCO_2eq$), equal per capita (118 $GtCO_2eq$), greenhouse development rights (-69 $GtCO_2eq$), and equal cumulative per capita (-32 $GtCO_2eq$). The study estimated the U.S. budget at 57 $GtCO_2eq$ when averaging across five sharing principles, adding the constant emissions ratio (186 $GtCO_2eq$) to the four above-mentioned principles. However, the constant emissions ratio, which maintains current emissions ratios, is not considered to be an equitable sharing principle because it is a grandfathering approach that "privileges today's high-emitting countries when allocating future emission entitlements." Sivan Kartha et al., *Cascading Biases Against Poorer Countries*, 8 NATURE CLIMATE CHANGE 348, 348 (2018).

281. MULVANEY ET AL., *supra* note 205, at 6.

282. *Supra* note 199.

lands—accounted for approximately one quarter of total U.S. carbon emissions during 2005 to 2014.[283] If the United States ended new fossil fuel leasing now, it could keep up to 450 Gt CO_2e out of the atmosphere.[284] If it canceled existing leases too, it could save up to an additional 42 Gt CO_2e.[285] Perhaps most importantly, it would signal to the global community that the United States is finally ready to lead the world in addressing climate change.

These greenhouse gas savings could also help mitigate the climate crisis. The National Climate Assessment found that fossil fuel-driven climate change could destroy up to 10% of the U.S. GDP by 2100 through damage to infrastructure, and other climate-related impacts. It could cost U.S. workers $155 billion in lost wages and cause tens of thousands of premature deaths.[286] Meanwhile, in 2017, all mining accounted for 1.4% of the U.S. GDP,[287] employing less than 0.3 % of the U.S. labor force.[288] In addition to reducing sea level rise and climate change impacts, policies shifting the United States from fossil fuels to renewable energy by 2050 will lead to a net gain of more than 550,000 jobs a year.[289]

In 2017, Senator Jeff Merkley (D-OR) and Representative Jared Huffman (D-CA) introduced the "Keep It in the Ground Act" to prohibit the BOEM from leasing or authorizing exploration of oil or gas in any area of the Outer Continental Shelf, and to prevent the BLM from issuing leases for the exploration or production of any onshore fossil fuels. That bill did not pass.

On September 11, 2019, two bills aimed at limiting offshore leasing in federal waters passed the House. Representatives Cunningham (D-SC) and Rooney (R-FL) have proposed H.R. 1941, which would place a

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283. MATTHEW D. MERRILL ET AL., U.S. GEOLOGICAL SURVEY FEDERAL LANDS GREENHOUSE GAS EMISSIONS AND SEQUESTRATION IN THE UNITED STATES: ESTIMATES FOR 2005–14: SCIENTIFIC INVESTIGATIONS REPORT 2018–5131, at 8 (2018).

284. *Supra* notes 199, 205, 279.

285. MULVANEY ET AL., *supra* note 205, at 16.

286. Martinich et al., *supra* note 199, at 1346, 1358 fig.29.2, 1360 fig. 29.3.

287. U.S. BUREAU OF ECON. ANALYSIS, GDP BY INDUSTRY: VALUE ADDED BY INDUSTRY AS A PERCENTAGE OF GROSS DOMESTIC PRODUCT (Apr. 19, 2019), https://www.bea.gov/system/files/2019-04/gdpind418_0.pdf

288. *Current Employment Statistics, Table A-1. Employment Status of the Civilian Population by Sex and Age,* U.S. BUREAU LAB. STAT., https://www.bls.gov/news.release/empsit.t01.htm (last updated Apr. 3, 2020); *Current Employment Statistics,* https://data.bls.gov/cgi-bin/srgate (last visited Apr. 9, 2020) (input Series IDs: CES1021210001, CES1021100001, CES1021300001).

289. LABOR NETWORK FOR SUSTAINABILITY, 350.ORG, & SYNAPSE ENERGY ECONS., THE CLEAN ENERGY FUTURE: PROTECTING THE CLIMATE, CREATING JOBS, SAVING MONEY (Oct. 2015), http://climatejobs.labor4sustainability.org/national-report/.

permanent moratorium on offshore oil and gas leasing in the Atlantic Ocean, Straits of Florida, and Pacific Ocean,[290] and Representatives Rooney (R-FL) and Castor (D-FL) introduced H.R. 205, which would amend the Gulf of Mexico Energy Security Act of 2006 to make the current moratorium prohibiting offshore oil and gas leasing off Florida's Gulf Coast permanent.[291] However, neither bill goes far enough to meaningfully limit greenhouse gas emissions because they leave all other OCS waters and BLM land available to leasing. Congress should require on its own, or at least as it relates to the NFIP protecting against flood harm, that the United States end federal fossil fuel leasing.

B. Require Federal Agencies to Analyze the Greenhouse Gas Emissions Impacts of Their Actions

Congress should clarify that under NEPA, U.S. federal agencies have an obligation to analyze greenhouse gas emissions regardless of their ability to "prevent a certain effect."[292] At the moment, it is unknown exactly how much greenhouse gas the United States implicitly authorizes in permitting fossil fuel-related activities. Such vital information is necessary moving forward if the United States is to emerge, as it must, as a global leader in combatting climate change.

The holding in *Public Citizen* casts doubt on the applicability of NEPA in cases where the federal agency does not have direct control over an outcome or effect, which is plainly contrary to the intent of NEPA and the explicit language of Council on Environmental Quality regulations. In general, or at least as a part of the NFIP, Congress should act to clarify that federal agencies must analyze the greenhouse gas effects of their actions regardless of whether the agencies have direct control over the greenhouse gas effect.

290. Final Vote Results for Roll Call 525 for the Coastal and Marine Economies Protection Act, OFF. CLERK, U.S. HOUSE REPRESENTATIVES (Sept. 11, 2019), http://clerk.house.gov/evs/2019/roll525.xml.

291. Final Vote Results for Roll Call 525 for the Protecting and Securing Glorida's coastline Act of 2019, OFF. CLERK, U.S. HOUSE REPRESENTATIVES (Sept. 11, 2019), http://clerk.house.gov/evs/2019/roll521.xml.

292. DOT v. Pub. Citizen, 541 U.S. 752, at 770 (2004).

C. Mandate that FEMA Provide Sea Level Rise Mapping & Disclosure to Property Buyers

The consensus on sea level rise is that globally, seas will rise one to four feet by 2100,[293] yet FEMA has refused to take into account climate change and sea level rise in its maps, and therefore the maps do not reflect actuarial risk.[294] One of the express purposes of NFIP's most recent reform was to carry out "the legislative requirements" of BW-12.[295] That statute, in turn, specifically directed FEMA to "review, update and maintain" its rate maps by relying on "the best available science regarding future changes in sea levels, precipitation, and intensity of hurricanes."[296] It also directed that FEMA "shall incorporate" the TMAC's recommendations concerning "the best available science to assess flood risks" and "the best available methodology to consider the impact of sea level rise,"[297] and recommendations that include calling on FEMA to incorporate climate change and sea level rise data into "future coastal flood hazard estimates."[298] FEMA was required to incorporate climate change and sea level rise in mapping, and a purported lack of "actionable science" cannot serve as a basis for not doing so.

At a minimum, flood risk mapping should consistently use the most scientifically up-to-date and robust sea level rise and climate change

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293. D.J. Wuebbles et al., *Executive Summary, in* I FOURTH NATIONAL CLIMATE ASSESSMENT, *supra* note 275. About one quarter of sea level rise is attributable to melting mountain glaciers, and another quarter to Antarctic and Greenland ice sheet loss, and the other half is due to thermal expansion. J.A. Church et al., *Chapter 13: Sea Level Change*, *in* IPPC INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS (Stocker et al. ed. 2013), https://www.ipcc.ch/site/assets/uploads/2018/03/WG1AR5_SummaryVolume_FINAL.pdf. Therefore, the accuracy of IPCC's projections of eleven to thirty-nine inches of sea level rise by 2100 depends on future greenhouse gas emissions rates, and the projections are considered conservative because they do not take into account how Antarctic ice sheets could increase sea level rise. Robet M. DeConto & David Pollard, *Contribution of Antarctica to Past and Future Sea Level Rise*, 531 NATURE 591-591 (2016); A. Shepherd, et al. *Mass Balance of the Antarctic Ice Sheet From 1992 to 2017*, 556 Nature 209-209 (2018).

294. CONG. BUDGET OFFICE, PUB. NO. 4008, THE NATIONAL FLOOD INSURANCE PROGRAM: FACTORS AFFECTING ACTUARIAL SOUNDNESS 2 (2009), https://www.cbo.gov/sites/default/files/111th-congress-2009-2010/reports/11-04-floodinsurance.pdf; Jen Schwartz, *National Flood Insurance Is Underwater Because of Outdated Science*, SCI. AM. (Mar. 23, 2018), https://www.scientificamerican.com/article/national-flood-insurance-is-underwater-because-of-outdated-science/; *see generally* CLEETUS ET AL., UNION OF CONCERNED SCIENTISTS, SURVIVING AND THRIVING IN THE FACE OF RISING SEAS (2015), https://www.ucsusa.org/sites/default/files/attach/2015/11/surviving-and-thriving-full-report.pdf (climate change and sea level rise affects the risk of flooding posed to vulnerable communities).

295. FINAL PEIS, *supra* note 3, at 1-4 to 1-5.

296. 42 U.S.C. § 4101b (West through P.L. 116-130).

297. *Id.* § 4101a(d)(1)(A).

298. TMAC REPORT, *supra* note 97, at 11.

information, including high greenhouse gas emissions scenarios (e.g., the IPCC RCP 8.5 scenario) and high and extreme sea level rise scenarios (e.g., 2.0 and 2.5 meters of sea level rise by 2100 included the 2017 inter-agency Technical Report on sea level rise).[299] Development decisions made by communities based on the flood risk mapping will be long-lived, with most infrastructure design lifetimes intended to last for many decades. Therefore, the flood risk mapping must include sea level rise and climate change scenarios that encompass an appropriate time frame (i.e., through at least 2100) and that represent the plausible range of conditions that the infrastructure will experience over its design lifetime, including higher impact climate change scenarios.

FEMA could create or obtain high-resolution, digital elevation models to represent the topography of the coastal zone across the range of imperiled species from the twenty-meter elevation contour on land to the twenty-meter isobath in the water. FEMA could use maps that provide the spatial resolution and vertical accuracy needed for producing spatially relevant sea level rise vulnerability maps. Certain maps may already be publicly available through the NOAA Coastal Services Center Digital Coast. FEMA could also work with USGS and NOAA data providers to create maps using the highest-resolution datasets available to fill data gaps.

FEMA could use high-resolution sea level-rise coastal inundation models to model the effects of inundation of sandy shorelines under a range of possible sea level rise scenarios (zero to two meters) and rates of sea level rise at different time steps within this century that are useful for short- and long-term planning (2025, 2050, 2075, 2100).[300] The inundation model could be integrated with models to forecast the effects of storm surge, wave run-up, and coastal erosion, to make regionally specific predictions based on inputs of wave, wind, tidal, and bathymetric data. Areas with coastal armoring where landward migration of imperiled species could be constrained or prevented altogether could be mapped using Army Corps of Engineers data.

FEMA could also overlay the inundation models with coastal land cover data to identify developed, partially developed, and undeveloped areas, as well as types of land protection, for areas that will remain non-

299. SWEET ET AL., *supra* note 134, at vi.

300. *New Mapping Tool and Techniques for Visual Sea Level Rise and Coastal Flooding Impacts*, NOAA.GOV (2011), https://coast.noaa.gov/data/digitalcoast/pdf/slr-new-mapping-tool.pdf; *see also Sea Level Rise Viewer*, NOAA.GOV, https://coast.noaa.gov/digitalcoast/tools/slr.html (last visited Apr. 8, 2020).

inundated.[301] In consultation with the Services, FEMA could further determine the non-inundated areas that are most likely to provide suitable habitat as species migrate landward, based on species-specific criteria including ecological requirements and barriers to dispersal. To further evaluate the potential for current upland habitat to become future habitat for endangered species, FEMA could incorporate probabilistic vegetation state transition modeling to forecast the conversion of vegetation types in current upland habitat to the sandy shoreline (e.g., beach and dune) vegetation types utilized by the focal species.

FEMA should be providing decisionmakers with the "best available climate information" to plan for climate change risks,[302] and some communities like Broward County are already independently moving forward with updating its maps to reflect future conditions, including two feet of sea level rise.[303] A national program of disclosing risk must be implemented immediately to help consumers make better informed decisions[304] and to protect vulnerable communities and imperiled species.

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301. *C-CAP Land Cover Atlas*, NOAA.GOV https://coast.noaa.gov/digitalcoast/tools/lca.html (last visited April 9, 2020); *National Oceanic and Atmospheric Administration Protected Areas of the United States (PAD-US) Database*, USGS.GOV, https://www.usgs.gov/core-science-systems/science-analytics-and-synthesis/gap/science/pad-us-data-download?qt-science_center_objects=0#qt-science_center_objects (last visited Apr. 9, 2020).

302. *Climate Change: Opportunities to Reduce Federal Fiscal Exposure Hearing Before the H. Comm. on the Budget*, 15 (2019) (testimony of J. Alfredo Gomez, U.S. Gov't Accountability Office), https://www.gao.gov/assets/700/699605.pdf; *Preparing for the Storm, supra* note 1, at 7 (statement of Collin O'Mara, President and CEO, National Wildlife Federation), https://financialservices.house.gov/uploadedfiles/hhrg-116-ba00-wstate-omarac-20190313.pdf.

303. *Broward County Advances Updates to Flood Maps to Reflect Future Conditions*, SE. FLA. REG'L CLIMATE CHANGE COMPACT (Dec. 20, 2019), http://southeastfloridaclimatecompact.org/uncategorized/broward-county-advances-updates-to-flood-maps-to-reflect-future-conditions/.

304. UNDERWATER: RISING SEAS, CHRONIC FLOODS, AND THE IMPLICATIONS FOR U.S. COASTAL REAL ESTATE 16 (2018), https://www.ucsusa.org/sites/default/files/attach/2018/06/underwater-analysis-full-report.pdf; *Preparing for the Storm*, *supra* note 1, at 6 (statement of Raymond J. Lehmann, Director of Finance, Insurance and Trade Policy, Street Institute), https://financialservices.house.gov/uploadedfiles/hhrg-116-ba00-wstate-lehmannr-20190313.pdf; *id.* at 6 (statement of Velma Smith, Senior Officer, the Pew Charitable Trusts), https://financialservices.house.gov/uploadedfiles/hhrg-116-ba00-wstate-smithv-20190313.pdf; Dena Adler et al., *Changing the National Flood Insurance Program for a Changing Climate*, 49 ELR 10,320, 10,328 (2019); Christine A. Klein, *The National Flood Insurance Program at Fifty: How the Fifth Amendment Takings Doctrine Skews Federal Flood Policy*. 31 GEO. ENVTL. L. REV. 285, 311 (2019); Alexander B. Lemann, *Assumption of Flood Risk*, 51 ARIZ. ST. L.J. 163, 218-20 (2019).

D. Force FEMA to Consult with the U.S. Fish and Wildlife Service and National Marine Fisheries Service on the Impacts to Endangered Species Act-Listed Species

Recent biological opinions and lawsuits outline several measures that FEMA should be implementing to comply with the ESA, including:[305]

- Revised mapping protocols to improve the identification of special hazard areas, including channel migration zones and areas of future risk for listed species and their habitats.
- Revised floodplain management criteria to provide greater certainty that the impacts of development in area of high hazard will be avoided, minimized, and mitigated to protect natural floodplain functions to support any affected listed species and their habitats.
- Data collection and reporting requirements needed to accurately track floodplain development impacts and the implementation of these reasonable and prudent measures.
- Compliance and enforcement strategies to ensure that effects of floodplain development pursuant to the NFIP are avoided or reduced throughout the action area.[306]

FEMA has the discretion to implement these measures by including them in the flood management criteria and monitoring them accordingly. Instead, FEMA has established performance standards in the minimum floodplain management criteria at 44 CFR § 60.3. Communities are now required to obtain and maintain documentation to show mitigation to the maximum extent possible from any impacts caused by floodplain development. FEMA has stated that because the U.S. Fish and Wildlife Service and National Marine Fisheries Service have never formally reviewed what it would take to comply with sections 9 and 10 of the ESA, it cannot reasonably ascertain whether this would increase the levels of ESA compliance.[307] Meanwhile, it has displaced the burden of complying with the ESA—which includes ensuring actions are not jeopardizing imperiled species or adversely modifying their habitat—to local communities.[308]

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305. Letter from William W. Stelle, U.S. Dep't of Commerce, to Mark Eberlin, U.S. Dep't of Homeland Sec. (Apr. 14, 2016), https://archive.fisheries.noaa.gov/wcr/publications/habitat/2016_04-14_fema_nfip_nwr-2011-3197reducedsize.pdf.

306. *Id.*

307. FINAL PEIS, *supra* note 3, at 4-104.

308. Rep. DeFazio (D-OR) has repeatedly tried to exempt FEMA activities from ESA compliance. Miranda Green, *Provisions in FAA Bill Could Strip Endangered Species Protections*,

FEMA cannot ignore these plain obligations of the ESA any longer. Congress must immediately mandate that FEMA consult with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service using updated mapping informed by sea level rise and climate change science and implement reasonable and prudent measures or alternatives to ensure America's wildlife and habitat are protected.

E. Mandate FEMA Carryout Buyouts and Fully Fund Mitigation

Currently, FEMA's voluntary buyout program is administered by local emergency management agencies with FEMA typically providing 75% of the cost, and the local and state government providing the balance.[309] To be eligible, the homeowner's property must be in a participating community and is usually in SFHAs. Then the owner must complete an application. The home may be purchased at fair market value (assessed for its value before flood damage occurred) and must be clear of all encumbrances, including existing mortgages, which can be a problem if the appraised value comes back for less than the mortgage. Another problem is that the process can take years to complete.[310]

Communities are required to adopt minimum floodplain management regulations that specify when building permits are required, ensure development does not increase flooding, and require mitigation standards for new construction. Despite the ever-evident threats and risks of flooding and other natural disasters, there is little evidence that communities or property owners proactively take steps to mitigate risks. One survey of Atlantic and Gulf Coast residents found that 83% had not taken any flood mitigation measures.[311] Additionally, the community rating system is a voluntary incentive program that awards discounts in premium rates of up to 45%. The goal of the program is to reduce flood loss, facilitate accurate insurance ratings, and promote awareness of flood

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HILL (Apr. 24, 2018), https://thehill.com/policy/energy-environment/384621-provisions-in-faa-bill-could-strip-endangered-species-protections.

309. Press Release, FEMA, SRFO-NJ NR-023, For Communities Plagued by Repeated Flooding, Property Acquisition May Be the Answer (May 28, 2014), https://www.fema.gov/news-release/2014/05/28/communities-plagued-repeated-flooding-property-acquisition-may-be-answer; Press Release, FEMA, DR-4393-NC FS 062, FACT SHEET: Acquisition of Property After a Flood Event (Nov. 13, 2018), https://www.fema.gov/news-release/2018/11/13/fact-sheet-acquisition-property-after-flood-event.

310. Rob Moore, *Congress Wants to Know Why FEMA Buyouts Take So Long,* NRDC (June 26, 2018), https://www.nrdc.org/experts/rob-moore/congress-wants-know-why-fema-buyouts-take-long.

311. Abby Goodnough, *As Hurricane Season Looms, States Aim to Scare,* N.Y. TIMES. (May 31, 2006), http://www.nytimes.com/2006/05/31/us/31prepare.html?pagewanted=all.

insurance. However, only 5% of communities participate in the community rating system.[312]

The purpose of risk mitigation should be to lessen flood damage and to prepare existing structures for future sea level rise and the effects of climate change. Risk mitigation should include a variety of tactics, including wetlands restoration and prohibitions on construction within the floodplain. For repetitive loss properties, risk mitigation should be mandatory and should include nonrepair or abandonment. Repetitive loss is defined as $1000 of flood damage more than two times in less than ten years. Repetitive loss properties make up 1% of properties but represent 25%-30% of claims,[313] with the number of repetitive loss properties increasing 50% in the last decade.[314] With the anticipated effects of climate change, the number of repetitive loss properties will likely grow.

A "discounts for buyout" or "sea level purchase option" proposal would allow homeowners to voluntarily agree to accept a governmental buyout of their home if it is substantially damaged by a flood event in exchange for lower insurance rates.[315] The State of Florida has launched a $75 million program offering local governments funding to acquire residential properties in high-risk flood zones that were damaged by Hurricane Irma in 2017.[316]

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312. FEMA, OFFICE OF INSPECTOR GEN., COMMUNITY RATING SYSTEM: EFFECTIVENESS AND OTHER ISSUES 10 (2002), https://www.fema.gov/media-library-data/20130726-1557-20490-7202/igreport.pdf.

313. *Flood Insurance Public Policy Goals Provide a Framework for Reform, Hearing Before the S. Comm. on Banking, Hous., & Urban Affairs*, 112th Cong. (2011) (statement of Orice Williams Brown, Managing Director, Financial Markets and Community Investment), http://www.gao.gov/assets/130/126501.html.

314. *Legislative Proposals to Reform the National Flood Insurance Program, Hearing Before H. Fin. Servs. Subcomm. on Ins., Hous., & Cmty. Opportunity,* 112th Cong. 4 (2011) (statement of Franklin W. Nutter, President, Reinsurance Association of America), http://financialservices.house.gov/UploadedFiles/031111nutter.pdf.

315. Becky Hayat & Robert Moore, *Addressing Affordability and Long-Term Resiliency Through the National Flood Insurance Program*, 45 ELR 10,338, 10,348 (2015); Adler et al., *supra* note 304, at 10,320; R.T. Henderson, *Sink or Sell: Using Real Estate Purchase Options to Facilitate Coastal Retreat, 7*1 VAND. L. REV. 641, 656 (2018).

316. *Rebuild Florida Voluntary Home Buyout Program*, FLA. DEP'T ECON. OPPORTUNITY, http://www.floridajobs.org/community-planning-and-development/assistance-for-governments-and-organizations/disaster-recovery-initiative/hurricane-irma/irma-voluntary-home-buyout-program (last visited Apr. 9, 2020); *Rebuild Florida Hurricane Ima Impacted Communities Eligible for Assistance*, REBUILD FLA., http://www.floridajobs.org/docs/default-source/communicationsfiles/rebuild-florida-document/irma-eligible-communities-rebuild-florida-map-medium-quality.jpg?sfvrsn=6 (last visited Apr. 9, 2020).

Others have suggested exercising eminent domain as a means to protect the solvency of the NFIP and coastal communities.[317] The Fifth Amendment to the U.S. Constitution states that private property shall not be taken for public use without just compensation. The Supreme Court of the United States has established the federal government has broad authority to take private property for public purpose.[318]

Canada is already requiring forced buyouts, in lieu of paying residents to rebuild,[319] and the United States should follow suit. The cost of repetitive loss properties is far more expensive than buyouts, and buyouts are ultimately safer for residents living in flood-prone areas. But this method should be used only as a last resort when updated sea level rise mapping shows that even with mitigation, the property cannot be saved. Mitigation funding and programs to identify eligible properties should be prioritized, perhaps with the billions of dollars saved in fossil fuel subsidies.

Some have expressed concerns that buyouts cash in on inherent racial inequities in real estate pricing and harm underserved communities.[320] It is clear that sea levels will rise, and flooding will worsen. America needs a well-funded strategic plan for helping people move out of harm's way. The added benefit of doing so will be to provide a better buffer for remaining at-risk properties. Any buyout program must be designed to account for such inequities.[321] As part of NFIP, Congress must fully fund mitigation for properties capable of flooding, as informed by updated mapping that takes sea level rise into account. For properties that cannot be saved, Congress must require an equitable buyout program that fully compensates property owners and assists in finding nonvulnerable properties.

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317. A.S. Mendelson, *Taking Away the Tightrope: Fixing the National Flood Insurance Program Circus via Eminent Domain*. 83 BROOKLYN L. REV. 1519, 1536 (2018); T. Ruppert, *Managing Property Buyouts at the Local Level: Seeking Benefits and Limiting Harms,* 48 ELR 10,520 (2018) (supporting empowering local governments to integrate hazard mitigation goals with buyout programs).

318. Kelo v. City of New London, 545 U.S. 469 (2005); Haw. Hous. Auth. v. Midkiff, 467 U.S. 229 (1984).

319. Christopher Flavelle, *Canada Tries a Forceful Message for Flood Victims: Live Someplace Else*, N.Y. TIMES (Sept. 11, 2019), https://www.nytimes.com/2019/09/10/climate/canada-flood-homes-buyout.html.

320. Laura Thompson, *Hell and High Water: How Flooding and Buyouts Threaten Black History*, SCALAWAG MAG. (Mar. 11, 2019). https://www.scalawagmagazine.org/2019/03/texas-flooding-buyouts/.

321. *See* Katherine J. Mach et al., *Managed Retreat Through Voluntary Buyouts of Flood-Prone Properties*, 5 SCI. ADVANCES 1 (2019), https://advances.sciencemag.org/content/5/10/eaax8995.

V. CONCLUSION

Congress cannot continue to ignore the connection between subsidizing development in floodplains and the fact that the United States has made those floodplains even more vulnerable to flooding by leasing fossil fuels that worsen climate change and sea level rise. The climate crisis and sea level rise threaten the future of the United States, particularly its floodplains. Congress must act quickly to avoid the worst of the projected climate change impacts, which include widespread flooding. Congress must also reform the very policies that encourage development in the most flood-prone regions of the United States while shirking the realities of climate change. This mindset has already cost U.S. taxpayers billions and put millions of people and imperiled species at unacceptable risk of harm from climate-fueled flooding.

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, and with these amounts directly connected to the amount of greenhouse gases in the atmosphere.[322] Whether global mean sea level is only by 0.8 feet or 8 feet depends on how much greenhouse gas is released into the atmosphere.[323] Global mean sea level rise could be 0.1 meter lower with global warming capped at 1.5°C as compared to 2°C.[324] That reduction of just 0.1 meter in global sea level rise could spare 10 million fewer people from sea level rise related risks.[325]

The United States' portion of the remaining global carbon budget of 420 to 570 $GtCO_2e$ for limiting temperature rise to 1.5°C is approximately 25 to 57Gt CO_2e.[326] In order to hit that target and stave off the worst effects of climate change and sea level rise, the United States will have to drastically reduce emissions.[327] U.S. emissions are around 6 $GtCO_2$ a year and growing. Federal fossil fuel emissions compose 21%-25% of U.S. greenhouse gas emissions, or 3%-4% of global emissions, so eliminating that source of emission could have a significant effect on climate change and the environment.[328]

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322. II FOURTH NATIONAL CLIMATE ASSESSMENT, *supra* note 199, at 487, 758.
323. Sweet et al., *supra* note 275.
324. IPCC 2018 REPORT, *supra* note 270, at 7.
325. *Id.*
326. *Id.*
327. MULVANEY ET AL., *supra* note 205, at 6; NIKLAS HOHNE ET AL., CLIMATE ANALYTICS ARE GOVERNMENTS DOING THEIR "FAIR SHARE"? NEW METHOD ASSESSES CLIMATE ACTION (Mar. 27, 2015), https://climateanalytics.org/media/cat_fair_share.pdf.
328. *Supra* note 199.

For the United States to bail the NFIP out of insolvency and minimize flood hazard risk, especially in the wake of sea level rise and the climate crisis, it must immediately implement commonsense measures across multiple agencies. It must end fossil fuel leases and require that federal agencies that fund, authorize, or permit fossil fuel activities must analyze the greenhouse gas emissions and impacts of those activities. It must also require that FEMA use the best available sea level rise mapping to reflect actual flood risk, provide a nationwide plan for flood disclosure and risk, pursue involuntary buyouts, and analyze and avoid impacts to wildlife habitat.

Climate change is making flooding worse and it will only get more expensive and devastating, especially if the United States does not immediately reverse course and end fossil fuel leases. Its reckless policies have disproportionately put vulnerable communities at risk. Only a national program for addressing flooding in the era of climate change that includes significant reductions in U.S. fossil fuels will be successful, whether measured in dollars or human lives.