

25 Sea-Level Rise and Species Survival along the Florida Coast

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Introduction

This chapter describes how the Endangered Species Act¹ can help wildlife managers and communities plan for and adapt to sea-level rise while conserving species' habitats. This chapter does not address the most important aspect of adaptation, which is mitigation through reduction of greenhouse gas emissions. Instead, it focuses on how sections 4 and 7 of the Endangered Species Act can help identify and protect the habitat of imperiled species, specifically, nesting habitat for loggerhead sea turtles in Florida. Section 4 of the Act authorizes the designation of suitable, unoccupied upland habitat, and can help wildlife managers proactively identify and manage upland habitat for species retreat as rising seas and increasing storms threaten coastal species' habitats.² Section 7 ensures that federal agency actions do not jeopardize species or adversely modify their habitats.³ The chapter addresses critical habitat for loggerhead sea turtles and how the National Flood Insurance Program can be helpful in preventing construction in flood plains and species' coastal habitats.

I. Sea-Level Rise and the Loggerhead Sea Turtle

A. STORMS, STORM SURGE, AND FLOODING

Global average sea levels rose by about eight inches over the past century, and sea-level rise continues to accelerate in pace.⁴ Mean global sea level is predicted to rise by one to two meters by the end of this century, while intensifying storms and storm surge will worsen the effects of sea-level rise.⁵ As sea level rises, storm surges will be riding on a higher sea surface that will push water farther inland and upland.⁶ Extreme rainfall events leading to flooding may also occur with increasing frequency.⁷

Sea-level rise projections for the southeastern United States are 0.2 m to 0.5 m relative to 2008 levels by 2050.⁸ Many areas of the Southeast coast, particularly south Florida,

¹ 16 U.S.C. §§ 1531–1544 (2012).

² *Id.* § 1533.

³ *Id.* § 1536.

⁴ THOMAS R. KARL ET AL., GLOBAL CLIMATE CHANGE IMPACTS IN THE UNITED STATES 18 (2009).

⁵ See generally J.B. Elsner et al., *The Increasing Intensity of the Strongest Tropical Cyclones*, 455 NATURE 92–95 (2008); M.A. Bender et al., *Modeled Impact of Anthropogenic Warming on the Frequency of Intense Atlantic Hurricanes*, 327 SCI. 454–58 (2010).

⁶ See generally Claudia Tebaldi et al., *Modeling Sea Level Rise Impacts on Storm Surges along US Coasts*, 7 ENVT. RES. LETTERS 1 (2011).

⁷ SIMON K. ALLEN ET AL., MANAGING THE RISKS OF EXTREME EVENTS AND DISASTERS TO ADVANCE CLIMATE CHANGE ADAPTATION. A SPECIAL REPORT OF WORKING GROUPS I AND II OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, A DECADE OF WEATHER EXTREMES. NATURE CLIMATE CHANGE 13 (2012), available at <http://ipcc-wg2.gov>.

⁸ Tebaldi et al., *supra* note 6, figure 2.

have elevations at or below one to two meters, making these areas particularly vulnerable to sea-level rise.⁹ Large parts of the Atlantic coast and Gulf of Mexico coast have already experienced significantly higher rates of relative sea-level rise than the global average, in part due to land subsidence.¹⁰

Sea-level rise, storms and storm surge, and flooding will significantly impact U.S. coastal communities where nearly 40 percent of U.S. residents live.¹¹ A nationwide study estimated that 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, California, New York, and New Jersey.¹² Rates of sea-level rise along portions of the U.S. Atlantic Coast are increasing three-to-four times faster than globally.¹³ Meanwhile an estimated 40 percent of U.S. endangered species inhabit coastal ecosystems.¹⁴ Significant risks of habitat loss and of entrapment between rising sea-levels and human developments that prevent landward movement, leading to “coastal squeeze,” have been predicted.¹⁵ Moreover, human responses to sea-level rise, including coastal armoring and inland development, pose significant risks to the ability of species and ecosystems to move inland. Florida’s population density along the coast is already three times greater than in inland counties.¹⁶

⁹ J.L. Weiss et al., *Implications of Recent Sea Level Rise Science for Low-Elevation Areas in Coastal Cities of the Coterminous*, 105 U.S.A. CLIMATIC CHANGE 635 (2011).

¹⁰ KARL ET AL., *supra* note 4, at 37. See also V.R. Burkett et al., *Sea-Level Rise and Subsidence: Implications for Flooding in New Orleans, Louisiana*, in *U.S. Geological Survey Subsidence Interest Group Conference, Proceedings of the Technical Meeting, Galveston, Texas, Nov. 27–29, 2001* (2003), available at <http://pubs.usgs.gov/of/2003/ofro3-308/pdf/OFR03-308.pdf> (noting that land subsidence occurs when land sinks relative to surrounding lands; it can be caused by sediment compaction, oil and gas extraction, water pumping, drainage projects, and tectonic activity).

¹¹ *The U.S. Population Living at the Coast: State of the Coast*, NOAA.GOV, <http://stateofthecoast.noaa.gov/population/welcome.html> (last visited July 16, 2014).

¹² Benjamin Strauss et al., *Tidally Adjusted Estimates of Topographic Vulnerability to Sea Level Rise and Flooding for the Contiguous United States*, 7 ENVTL. RES. LETTERS 014033 (2012).

¹³ See generally Asbury Sallenger et al., *Hotspot of Accelerated Sea-Level Rise on the Atlantic Coast of North America*, 2 NATURE CLIMATE CHANGE 884 (2012).

¹⁴ Olivia E. LeDee et al., *The Challenge of Threatened and Endangered Species Management in Coastal Areas*, 38 COASTAL MGMT. 4 (2010).

¹⁵ D. Scavia et al., *Climate Change Impacts on US Coastal and Marine Ecosystems*, 25 ESTUARIES 149 (2002); D.M. FitzGerald et al., *Coastal Impacts due to Sea-Level Rise*, 36 ANN. REV. EARTH & PLANETARY SCI. 601 (2008); O. Defeo et al., *Threats to Sandy Beach Ecosystems: A Review*, 81 ESTUARINE, COASTAL AND SHELF SCI. 1–12 (2009); C. Craft et al., *Forecasting the Effects of Accelerated Sea-Level Rise on Tidal Marsh Ecosystem Services*, 7 FRONTIERS ECOLOGY & ENV’T 73 (2009); LeDee et al. 2010, *supra* note 14; S. Menon et al., *Preliminary Global Assessment of Terrestrial Biodiversity Consequences of Sea-Level Rise Mediated by Climate Change*, 19 BIODIVERSITY & CONSERVATION 1599 (2010); R.F. Noss, *Between the Devil and the Deep Blue Sea: Florida’s Unenviable Position with Respect to Sea Level Rise*, 107 CLIMATIC CHANGE 1 (2011).

¹⁶ JUDITH KILDOW, *PHASE I FACTS AND FIGURES FLORIDA’S OCEAN AND COASTAL ECONOMIES* (2006), available at http://www.floridaoceanscouncil.org/reports/Florida_Facts_&_Figures.pdf.

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Therefore, coastal species are at risk of being trapped between rising sea levels and human developments.¹⁷

B. FUTURE SUITABLE UPLAND HABITAT FOR THE LOGGERHEAD SEA TURTLE

The loggerhead sea turtle nests on beaches from Texas to Virginia, and faces significant loss of nesting habitat due to sea-level rise.¹⁸ About 90 percent of U.S. loggerhead sea turtle nesting occurs in Florida, and most of that occurs in Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, and Sarasota counties.¹⁹ According to the U.S. Army Corps of Engineers, sea-level rise projections for Broward and Palm Beach counties are estimated at 8 to 18 cm (3 to 7 inches) by 2030, 23 to 61 cm (9 to 24 inches) by 2060, and 48 cm to 1.45 m (19.5 to 57 inches) by 2100, relative to 2010 levels.²⁰

Areas of the Florida coast at or below one to three meters elevation significantly overlap with mean annual loggerhead sea turtle nest density.²¹ The predicted sea-level rise this century will significantly diminish available sea turtle nesting habitat. Tropical Storm Debby may be a preview of what is to come for this region. The July 2012 storm brought high winds and several feet of storm surge on the southwest coast of Florida along loggerhead nesting beaches. In what would have been a banner year for loggerhead nesting on the west coast of Florida, Debby swept thousands of eggs into the Gulf of Mexico before wildlife managers and volunteers were able to rescue some of them. In Collier County, 78 percent of loggerhead nests were lost; 71 percent of nests on Captiva Island were lost; Fort Myers Beach lost 52 percent of its nests; and Naples beaches lost 90 percent of their nests.²²

¹⁷ Defeo et al., *supra* note 15.

¹⁸ NATIONAL MARINE FISHERIES SERVICE & U.S. FISH AND WILDLIFE SERVICE, RECOVERY PLAN FOR THE NORTHWEST ATLANTIC POPULATION OF THE LOGGERHEAD SEA TURTLE: *CARETTA CARETTA*, II-53 (2d rev. 2008), available at http://www.nmfs.noaa.gov/pr/pdfs/recovery/turtle_loggerhead_atlantic.pdf; see generally Mariana Fuentes et al., *Potential Impacts of Projected Sea Level Rise on Sea Turtle Rookeries*, 30 AQUATIC CONSERV.: MARINE AND FRESHWATER ECOSYSTEMS 132 (2009).

¹⁹ See FWC Fish and Wildlife Conservation Commission, Loggerhead Nesting in Florida, <http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead/> (last visited Feb. 14, 2014); FWC Fish and Wildlife Research Institute Statewide Nesting Beach Survey Program Loggerhead Nesting Data, 2008–2012, <http://myfwc.com/media/2078432/LoggerheadNestingData.pdf>.

²⁰ SOUTHEAST FLORIDA REGIONAL CLIMATE CHANGE COMPACT TECHNICAL, UNIFIED SEA LEVEL RISE PROJECTION FOR SOUTHEAST FLORIDA 27 (2011), available at <http://southeastfloridaclimatecompact.org>.

²¹ Weiss et al. 2011 at figure 1, *supra* note 9; *Statewide Nesting Beach Survey Program, Loggerhead Nesting Data*, FED. FISH WILDLIFE CONSERV. COMM'N., <http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead/> (last visited July 16, 2014).

²² Andrea Stetson, *Loggerhead Turtle Eggs Rescued after Debby Hatch on Fort Myers Beach*, TORTOISE BLOGS (July 10, 2012, 10:23 PM), <http://tortoise2013.wordpress.com/2012/07/11/loggerhead-turtle-eggs-rescued-after-debby-hatch-on-fort-myers-beach/>; J. McCarthy, *Debby Damages Turtle Nests*, NEWSHERALD.COM (June 27, 2012), <http://www.newsherald.com/articles/nests-103739-panama-beach.html#ixzz1zm4FwHfT>,

It is no surprise that sea-level rise is a primary threat to sea turtle nesting beaches and nesting success.²³ It is predicted that up to one-third to three-quarters of the current available sea turtle nesting areas could be lost with projected sea-level rise.²⁴ In addition to the threats from rising seas, increased storms and storm surge, and flooding, rising water tables due to sea-level rise can flood turtle nests from below and reduce reproductive output.²⁵

It is likely that the effects of sea-level rise will be exacerbated by coastal armoring efforts to protect human development, which will restrict landward beach recession as sea levels rise and prevent turtles from nesting farther up the beach away from flooded areas.²⁶ Coastal armoring, beach renourishment,²⁷ and beachfront development can also render sand inappropriate for nesting, disorient turtles, and block beach access.²⁸ In Florida, passive erosion at seawalls appears to inhibit turtle nesting inland on the armored beaches, and nests in front of sea walls are more likely to be washed away in storms.²⁹ As pressure to armor coasts mounts with rising sea levels and storm activity, loggerhead nesting beaches will be increasingly at risk from coastal squeeze.³⁰

Loggerhead nesting beaches are also warming as temperatures rise. In the southeastern United States, annual average temperature has risen about 2°F since 1970, with a temperature rise of 1.2°F in spring and 1.6°F in summer during sea turtle nesting season.³¹

C. Waterfield, *Southwest Florida's Sea Turtles and Tropical Storm Debby*, TWENTYFIFTY (June 29, 2012), <http://www.twenty-fifty.com/southwest-floridas-sea-turtles-after-tropical-storm-debby>.

²³ Fuentes et al. 2009, *supra* note 18; L.A. Hawkes et al., *Climate Change and Marine Turtles*, 7 ENDANGERED SPECIES RES. 137 (2009); M.J. Witt et al., *Predicting the Impacts of Climate Change on a Globally Distributed Species: The Case of the Loggerhead Turtle*, 213 J. EXPERIMENTAL BIOLOGY 901 (2010); Mariana Fuentes et al., *Vulnerability of Sea Turtle Nesting Grounds to Climate Change*, 17 GLOBAL CHANGE BIOLOGY 140 (2010); M. Chaloupka et al., *Is Climate Change Affecting the Population Dynamics of the Endangered Pacific Loggerhead Sea Turtle?*, 356 J. EXPERIMENTAL MARINE BIOLOGY & ECOLOGY 136 (2008).

²⁴ R.C. Daniels, T.W. White & K.K. Chapman, *Sea-Level Rise: Destruction of Threatened and Endangered Species Habitat in South Carolina*, 17 ENVTL. MGMT. 373–85 (1993); M.R. Fish et al., *Predicting the Impacts of Sea-Level Rise on Caribbean Sea Turtle Nesting Habitat*, CONSERVATION BIOLOGY 482–91 (2005); J.D. Baker et al., *Potential Effects of Sea Level Rise on the Terrestrial Habitats of Endangered and Endemic Megafauna in the Northwestern Hawaiian Islands*, 4 ENDANGERED SPECIES RES. 1 (2006); A.D. Mazaris et al., *Evaluating the Impacts of Coastal Squeeze on Sea Turtle Nesting*, 52 OCEAN & COASTAL MGMT. 139 (2009).

²⁵ Fuentes et al., *supra* note 18; Witt et al., *supra* note 23.

²⁶ Carol E. Rizkalla & Anne Savage, *Impact of Seawalls on Loggerhead Sea Turtle (Caretta caretta) Nesting and Hatching Success*, 27 J. COASTAL RES. 166, 166 (2010); B.A. Shroeder & A.E. Mosier, *Between a Rock and a Hard Place: Coastal Armoring and Marine Turtle Nesting Habitat in Florida*, in PROCEEDINGS OF THE 18TH INTERNATIONAL SEA TURTLE SYMPOSIUM (MAZATLAN, MEXICO) 290–92. (F.A. Abreu-Grobois et al. eds., 1998).

²⁷ Hawkes et al., *supra* note 23; Kelly A. Brock et al., *The Effects of Artificial Beach Nourishment on Marine Turtles: Differences between Loggerhead and Green Turtles*, 17 RESTORATION ECOLOGY 297–307 (2007).

²⁸ Hawkes et al., *supra* note 23.

²⁹ See Rizkalla & Savage, *supra* note 26.

³⁰ Witt et al., *supra* note 23.

³¹ Karl et al., *supra* note 4, at 111.

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Under a lower emissions scenario, average temperatures in the region are projected to rise by about 4.5°F by the 2080s.³² Rising temperatures may skew sex ratios toward more female-dominated clutches and may result in the northward shift of loggerhead nesting aggregations to cooler climates.³³

II. The Endangered Species Act and Habitat Protection

The Endangered Species Act (ESA) is “the most comprehensive legislation for the preservation of endangered species ever enacted by any nation.”³⁴ “The plain intent of Congress in enacting this statute was to halt and reverse the trend toward species extinction, whatever the cost.”³⁵ The ESA 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.”³⁶

A. SECTION 4: AUTHORITY TO DESIGNATE SUITABLE UNOCCUPIED UPLAND HABITAT

The ESA requires the designation of critical habitat for listed species, encompassing all areas “essential to the conservation of the species.”³⁷ Critical habitat designation is intended to promote conservation of listed species by protecting both occupied and unoccupied essential habitat needed for recovery of the species.³⁸ “[T]he designation of critical habitat serves as ‘the principal means for conserving an endangered species, by protecting not simply the species, but also the ecosystem upon which the species depends.’”³⁹

The ESA explicitly allows federal wildlife management agencies, U.S. Fish and Wildlife Service (FWS), and National Marine Fisheries Service (NMFS) to designate critical habitat “outside the geographical area occupied by a species at the time it was listed, upon a determination that such areas are essential for the conservation of the species.”⁴⁰ As species and habitats shift in response to climate change, protecting habitat

³² *Id.* at 111.

³³ Hawkes et al. 2009, *supra* note 23; J.S. Reece et al., *Sea Level Rise, Land Use, and Climate Change Influence the Distribution of Loggerhead Turtle Nests at the Largest USA Rookery (Melbourne Beach, Florida)*, 493 MARINE ECOLOGY PROGRESS SERIES 259 (2013).

³⁴ *Tennessee Valley Auth. v. Hill*, 437 U.S. 153, 180 (1978).

³⁵ *Id.* at 184.

³⁶ *Id.* at 185.

³⁷ 16 U.S.C. § 1532(5)(A)(i) (2012).

³⁸ 16 U.S.C. § 1532(5)(A) (2012).

³⁹ *Ctr. for Biological Diversity v. Norton*, 240 F. Supp. 2d 1090, 1101 (D. Ariz. 2003).

⁴⁰ 16 U.S.C. § 1532(5) (2012).

areas outside of the current range, including areas that facilitate species movements, is critical to allowing species to persist in a changing climate.

Indeed, FWS has already designated unoccupied habitat as critical habitat for at least seven species to help protect them from climate change impacts. FWS designated unoccupied inland coastal habitat for the western snowy plover to facilitate inland movement in response to sea-level rise.⁴¹ It also designated unoccupied habitat for the Quino checkerspot butterfly in northern, higher-elevation habitat to facilitate movement in response to hotter, more arid conditions due to climate change.⁴² FWS similarly designated unoccupied critical habitat for the dusky gopher frog for the purposes of reestablishing a population to help buffer it from the effects of climate change.⁴³ FWS also designated unoccupied critical habitat for three montane plant species to facilitate upslope and downslope movement in response to climate change.⁴⁴ FWS designated more than 10,000 acres of critical habitat for the Cape Sable thoroughwort, a rare South Florida coastal species threatened with sea-level rise.⁴⁵

B. SECTION 7: DUTY TO ENSURE AGAINST JEOPARDY AND ADVERSE MODIFICATION

Section 7(a)(1) requires that all federal agencies utilize their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of endangered species and threatened species. Section 7(a)(2) requires that each federal agency “insure that any action authorized, funded, or carried out” is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of their habitat. If, after consultation, the wildlife management agency determines that the project will result in jeopardy or adverse modification, it shall suggest reasonable and prudent alternatives (RPAs) to help avoid the violation. The agency must then adopt the qualifying RPAs, abandon the project, or seek an exemption from the Endangered Species Committee.⁴⁶

This duty to consult and protect against jeopardy is triggered whenever a federal agency proposes to take discretionary action that “may affect” threatened or endangered

⁴¹ Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for the Pacific Coast Population of the Western Snowy Plover, 77 Fed. Reg. 36,728 (June 19, 2012).

⁴² Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for the Quino Checkerspot Butterfly (*Euphydryas editha quino*), 74 Fed. Reg. 28,776 (June 17, 2009).

⁴³ Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Dusky Gopher Frog (Previously Mississippi Gopher Frog), 77 Fed. Reg. 35,118 (June 12, 2012).

⁴⁴ Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for *Ipomopsis polyantha* (Pagosa skyrocket), *Penstemon debilis* (Parachute beardtongue), and *Phacelia submutica* (DeBeque phacelia), 77 Fed. Reg. 48,368 (Aug. 13, 2012).

⁴⁵ Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for *Chromolaena frustate* (Cape Sable thoroughwort), 79 Fed. Reg. 1,552 (Jan. 8, 2014).

⁴⁶ 16 U.S.C. § 1536 (2012).

species.⁴⁷ Agency action includes those “actions directly or indirectly causing modifications to the land, water, or air” where federal agencies exercise control.⁴⁸ The Federal Emergency Management Agency (FEMA) exercises discretionary control over parts of the National Flood Insurance Program (NFIP); therefore, the implementation of the NFIP is an agency action subject to ESA consultation.⁴⁹

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.⁵⁰ FEMA dictates minimum floodplain management standards and identifies flood hazards by providing Flood Insurance Rate Maps (FIRMs). By statute, 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.⁵¹ Communities can then volunteer to participate in the NFIP, and in doing so, adopt land use and control measures in order to obtain lower-cost flood insurance.⁵² As of 2012, 21,000 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.⁵³

Congress recently authorized a NFIP extension that would keep the program operational through September 30, 2017.⁵⁴ The extension included a number of reforms that will likely help FEMA accomplish some of its goals with the NFIP. For example, FEMA can now phase in actuarial rates over a five-year period for nonresidential properties, non-primary residences, homes substantially damaged or improved, homes with multiple claims, and properties purchased after enactment, and is prohibited from extending

⁴⁷ *Id.*

⁴⁸ 50 C.F.R. § 402.02(d) (2013).

⁴⁹ *Florida Key Deer v. Paulison*, 522 F.3d 1133 (11th Cir. 2008), *Nat'l Wildlife Fed'n v. FEMA*, 345 F. Supp. 2d 1151 (W.D. Wash. 2004), *Florida Key Deer v. Stickney*, 864 F. Supp. 1222 (S.D. Fla. 1994).

⁵⁰ 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. The 1973 Flood Disaster Protection Act made flood insurance mandatory for property owners with property in vulnerable areas with mortgages from federally regulated lenders. The 1994 National Flood Insurance Reform Act sought to strengthen mandatory purchase requirements in Special Flood Hazard Areas (SFHAs). The 2004 Bunning-Bereuter-Blumenauer Flood Insurance Program attempted to require mitigation for properties that suffer repetitive flood loss by requiring higher premiums for those who opt to not mitigate. See AMERICAN INSTITUTE FOR RESEARCH, A CHRONOLOGY OF MAJOR EVENTS AFFECTING THE NATIONAL FLOOD INSURANCE PROGRAM (2005).

⁵¹ 42 U.S.C. § 4011(a) (2012).

⁵² 42 U.S.C. § 4012 (2012).

⁵³ FEMA, ADOPTION OF FLOOD INSURANCE RATE MAPS BY PARTICIPATING COMMUNITIES (2012), http://www.fema.gov/media-library-data/20130726-1903-25045-4716/fema_495.pdf.

⁵⁴ H.R. 4348, 112th Cong. § 100203 (2012).

discounted rates to new or lapsed policies.⁵⁵ The reforms require FEMA to better communicate with homeowners about flood risks, geographical boundaries of flood zones, and the requirement to purchase flood insurance, and to provide a general estimate of the cost.⁵⁶ Congress also authorized communities to use Community Development Block Grants to fund outreach regarding flood insurance rates and mapping, and to supplement existing state and local funding for building code enforcement.⁵⁷

Despite these recent positive developments, significant problems with NFIP remain. Although NFIP was intended to discourage development in flood-prone areas, Congress and the Department of the Interior have found that the availability of federal flood insurance is often a significant factor in development of these areas.⁵⁸ Recognizing that flooding continues to be a primary source of damage from natural hazards in the United States,⁵⁹ and that NFIP has not achieved its primary goals of keeping development out of flood areas and providing affordable flood insurance, FEMA is undertaking a review of the NFIP.

FEMA has not historically engaged in broad, nationwide ESA consultation with FWS in implementing the NFIP. This is in spite of FWS's "...numerous factual and policy determinations...that implementation of the NFIP by FEMA facilitates and encourages new development in undeveloped areas."⁶⁰ Indeed, a series of lawsuits brought against FEMA have alleged that the NFIP has had a detrimental effect on the habitat of endangered and threatened species.⁶¹ FEMA must ensure that future implementation of NFIP does not jeopardize the survival or recovery of imperiled species, particularly in light of the predicted impacts of climate change on low-lying areas.

In *Florida Key Deer v. Stickney*, the U.S. District Court for the Southern District of Florida held that FEMA has broad discretion in issuing regulations implementing NFIP

⁵⁵ What the Biggert-Waters Flood Insurance Reform Act Means for Communities, Jan. 7, 2013, <http://us.stormsmart.org/2013/01/07/what-flood-insurance-reform-means/>.

⁵⁶ H.R. 4348, 112th Cong. § 100216(d)(1)(C) (2012).

⁵⁷ H.R. 4348, 112th Cong. § 100243 (2012).

⁵⁸ See COASTAL BARRIERS STUDY GROUP, REPORT TO CONGRESS: COASTAL BARRIER RESOURCES SYSTEM REPORT (1988), available at <http://catalog.hathitrust.org/Record/002498823>; see also U.S. DEPARTMENT OF THE INTERIOR, FINAL SUPPLEMENTAL LEGISLATIVE ENVIRONMENTAL IMPACT STATEMENT ON THE PROPOSED CHANGES TO THE COASTAL BARRIER RESOURCES SYSTEM (1988), available at <http://catalog.hathitrust.org/Record/002473407>.

⁵⁹ USGS, Flood Hazards—A National Threat (2006), <http://pubs.usgs.gov/fs/2006/3026/2006-3026.pdf>; National Weather Service, NWS Weather Fatality, Injury and Damage Statistics, <http://www.nws.noaa.gov/om/hazstats.shtml> (last visited Feb. 19, 2014).

⁶⁰ *Florida Key Deer v. Stickney*, 864 F. Supp. 1222, 1231 (S.D. Fla. 1994).

⁶¹ *Nat'l Wildlife Fed'n v. FEMA*, 345 F. Supp. 2d 1151 (W.D. Wash. 2004) (holding FEMA's implementation of NFIP constitutes a discretionary and continuing action subject to the Endangered Species Act and FEMA's passage of minimum eligibility criteria, floodplain mapping, and implementation of the community rating system have ongoing effects on Chinook salmon habitat); *Audubon Society of Portland v. FEMA*, Case no. 3:09-cv-729-HA (D. Or. 2010); *Wildearth Guardians v. FEMA*, 1:09-cv-00882-RB-WDS (D.N.M. Feb. 11, 2011).

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and is therefore subject to ESA consultation requirements.⁶² The court also found that NFIP encouraged development of species' habitat and ordered FEMA to initiate consultation. As a result of the court order and subsequent consultation, FWS 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' swallow-tail butterfly, silver rice rat, Garber's sponge, and Stock Island tree snail, and proposed RPAs, which FEMA adopted. Environmental groups then filed an amended complaint in 1997 claiming that the biological opinion and RPAs violated the ESA.

In 2003, FWS and FEMA reinitiated consultation and FWS issued an amended biological opinion, again finding the NFIP jeopardized listed species. Plaintiffs again filed suit challenging the sufficiency of the 2003 biological opinion. The court agreed that it was arbitrary and capricious and that FEMA had failed to implement any conservation plan with respect to listed species as required by ESA section 7(a)(1).⁶³ The court also enjoined FEMA from providing any flood insurance for new developments in the suitable habitat of listed species in Monroe County pending consultation.⁶⁴ The Eleventh Circuit Court of Appeals affirmed both of the district court orders.⁶⁵

FEMA recently agreed to settle another lawsuit in Florida between it and the National Wildlife Federation and Florida Wildlife Federation over its implementation of NFIP.⁶⁶ In that settlement agreement, the parties stipulated that FEMA violated section 7 of the ESA by not consulting with FWS and NMFS on the impacts of five species of sea turtles in Florida. Pursuant to the agreement, FEMA will initiate consultation and produce a biological assessment.⁶⁷

III. Protection of Loggerhead Nesting Habitat under the Endangered Species Act

Loggerhead sea turtle nesting sites will experience rapid change in the coming decades due to climate change and human response to it. If loggerhead sea turtles are to survive into the next century, FWS will need to protect important U.S. nesting habitat. The Endangered Species Act provides FWS with several tools to help ensure that loggerheads continue to enjoy viable nesting habitat. The Endangered Species Act authorizes FWS to designate unoccupied habitat, which will allow loggerhead sea turtles to naturally migrate to new suitable beaches, and requires that federal agency actions do not destroy or adversely modify critical habitat.⁶⁸

⁶² *Florida Key Deer*, 864 F. Supp. at 1231.

⁶³ *Florida Key Deer v. Brown*, 364 F. Supp. 2d 1345, 1361 (S.D. Fla. 2005).

⁶⁴ *Florida Key Deer v. Brown*, 386 F. Supp. 2d 1281, 1294 (S.D. Fla. 2005).

⁶⁵ *Florida Key Deer v. Paulson*, 522 F.3d 1133 (11th Cir. 2008).

⁶⁶ *Nat'l Wildlife Fed'n v. Fugate*, Case 1:10-cv-22300-KMM (S.D. Fla. July 13, 2010).

⁶⁷ *Id.*

⁶⁸ 16 U.S.C. § 1532(5)(A)(ii) (2012).

A. SECTION 4: DESIGNATE SUITABLE UNOCCUPIED UPLAND HABITAT

FWS and NMFS have designated critical habitat for the loggerhead sea turtle.⁶⁹ Although the agencies recognized that climate change, and specifically sea-level rise, threaten nesting loggerheads, they did not take measures to identify the upland or more northerly areas that will become important habitat for the landward migration of these imperiled species as the coasts are inundated by projected sea-level rise and intensified storm surge in this century.⁷⁰ Because other federal agencies have an obligation to refrain from taking or funding actions that are likely to “destroy or adversely modify” species habitat, identification and protection of this upland habitat will be vital to the continued existence of these species.

Climate change poses serious and increasing threats to loggerhead sea turtles and their nesting beaches, where rising sea levels, increasing hurricane intensity and storm surge, and warming temperatures are primary threats.⁷¹ While the agencies considered the projected and reasonably likely impacts of climate change on terrestrial critical habitat, they failed to designate unoccupied areas at the time of listing, instead deferring to a later date when more specific forecasting becomes available.⁷²

Designation of critical habitat in inland areas would have buffered loggerhead sea turtles from sea-level rise. Currently suitable nesting beaches will experience increasing inundation and erosion from sea-level rise, stronger storms, and increasing storm surge and flooding. At many current nesting sites, upslope retreat is blocked by development and coastal armoring. FWS must proactively identify, designate, and restore potential inland habitat in undeveloped areas to facilitate inland movement and compensate for increasing habitat loss and degradation due to climate change. Sea turtle experts have explicitly recognized the importance of “protecting beaches through changes to policy and legislation to ensure that sufficient nesting habitat is available in the future” to mitigate climate change threats.⁷³

⁶⁹ Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Northwest Atlantic Ocean Distinct Population Segment of the Loggerhead Sea Turtle, 79 Fed. Reg. 39,756 (July 10, 2014); Endangered and Threatened Species: Critical Habitat for the Northwest Atlantic Ocean Loggerhead Sea Turtle Distinct Population Segment (DPS) and Determination Regarding Critical Habitat for the North Pacific Ocean Loggerhead DPS, 79 Fed. Reg. 39,856 (July 10, 2014).

⁷⁰ 79 Fed. Reg. 39,756, 39,764. FWS states “[a]s more specific forecasts become available in the future, a revision of critical habitat may be required to more effectively provide for the conservation of the species. At this time, however, such forecasts are unavailable.”

⁷¹ Fuentes et al., *supra* note 23, at 132–39; Hawkes et al., *supra* note 23; Witt et al., *supra* note 23.

⁷² FWS did note however, that “[a]reas that are important to the conservation of the species, both inside and outside the critical habitat designation, may continue to be the subject of conservation actions, regulatory protections, and prohibitions on taking of the species, including taking caused by actions that affect habitat.” 79 Fed. Reg. 39,756, 39,763.

⁷³ M.M.P.B. Fuentes et al., *Management Strategies to Mitigate the Impacts of Climate Change on Sea Turtle’s Terrestrial Reproductive Phase*, 17 MITIGATION ADAPTATION STRATEGIES GLOBAL CHANGE 51 (2012).

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A recovery goal in the Loggerhead Sea Turtle Recovery Plan is the development of a model to identify climate change impacts on nesting habitat.⁷⁴ FWS has already employed this type of modeling to identify unoccupied upland habitat areas for critical habitat designation for the western snowy plover. In applying this modeling to this species, FWS: (1) used high-resolution Light Detection and Ranging (LiDAR) data to determine how unit boundaries should be extended to compensate for habitat loss due to sea-level rise,⁷⁵ (2) designated critical habitat outside of the snowy plover's occupied range to ensure the conservation of the plover under threats from sea-level rise,⁷⁶ and (3) proposed to restore habitat to increase the amount of suitable habitat for plovers to offset losses from sea-level rise and other threats.⁷⁷ FWS should use a similar approach for the loggerhead sea turtle.

B. SECTION 7: ENSURE FEDERAL AGENCY ACTIONS DO NOT ADVERSELY MODIFY CRITICAL HABITAT

The NFIP covers over 21,000 communities from all fifty states, plus a few territories. FEMA must assess the nationwide impact of NFIP on coastal species in light of climate change, and Florida nesting loggerhead sea turtles can provide a valuable, illustrative starting point for FEMA's analysis. During the coming decades, these beach nesting areas are expected to be impacted by sea-level rise, likely moving landward. Likewise, FEMA's future mapping, taking into account impacts of climate change, will likely expand the special flood hazard areas inland to reflect predicted impacts of climate change. It is evident that loggerhead sea turtles, and other coastal species, will not be able to survive increased development along the coastline compounded by sea-level rise and armoring in response to it. FEMA must exercise its authority and ensure that it is not subsidizing development in these areas.

In 2012, Congress ordered FEMA to overhaul its program.⁷⁸ FEMA should take this opportunity to update its mapping to reflect the best available science on the effects of climate change, identify suitable upland habitat for imperiled species, and eliminate federally subsidized destruction or adverse modification of species' habitat.

⁷⁴ NATIONAL MARINE FISHERIES SERVICE & U.S. FISH AND WILDLIFE SERVICE, *supra* note 18.

⁷⁵ Endangered and Threatened Wildlife and Plants; Revised Critical Habitat for the Pacific Coast Population of the Western Snowy Plover, 76 Fed. Reg. 16046, 16050 (Mar. 22, 2011).

⁷⁶ *Id.* at 16051.

⁷⁷ *Id.* at 16048, 16053.

⁷⁸ Two proposed bills, Homeowner Flood Insurance Affordability Act of 2014 (S. 1926) and Homeowner Flood Insurance Affordability Act of 2013 (H.R. 3370) threaten to delay the implementation of aspects of the Biggert-Water Flood Insurance Reform Act of 2012.

1. Update Maps Using the Best Available Science

FEMA dictates minimum floodplain management standards and identifies flood hazards by providing FIRMs. FEMA must update these maps to reflect the growing scientific consensus regarding the impacts of climate change. The effects of climate change, including sea-level rise, increased storms, storm surge, and flooding activity threaten coastal ecosystems. In the coming decades, our shorelines will continue to change—through these natural systems and through human-made response to these changes—and these changes will impact coastal species. FEMA must use the best available science in anticipating these changes and mapping areas that will be increasingly vulnerable to flood damage. FEMA must use its authority to strengthen restrictions on floodway development, discourage fill in floodplains, and account for the impacts of floodplain development on the natural and beneficial functions of floodplains to include endangered and threatened species. FEMA's implementation of NFIP must take into account the certainty that coastal species' habitat will be lost to climate change impacts and new development in response to it.

2. No Flood Insurance for Post-NFIP Structures Built in Species' Habitat

FEMA identifies and maps flood hazards. It provides flood insurance for structures built in Special Flood Hazard Areas (SFHAs), areas that are subject to 1 percent chance of annual flood. Construction in these areas can impact imperiled species by altering species' habitat. FEMA also provides a loophole that allows landowners to remove their flood-prone lands from regulated special flood hazard areas by filling 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. Federal funds must not be used to drive species toward extinction. FEMA must strengthen restrictions in floodways to inhibit development, prohibit deposit of fill material in floodplains, remove subsidies for nonresidential structures and non-primary residences, phase out subsidies for remaining structures, and account for the impacts of floodplain development on the natural and beneficial functions of floodplains to include endangered and threatened species.

3. Adjust Premiums to Reflect Risks

NFIP insures 5.6 million homeowners, renters, and business owners and \$1.2 trillion in assets. It generates about \$2.3 billion in annual premiums and offers coverage of up to \$250,000 for residential buildings and \$500,000 for commercial buildings.⁷⁹ Between

⁷⁹ DAN HUBER, *FIXING A BROKEN NATIONAL FLOOD INSURANCE PROGRAM: RISKS AND POTENTIAL REFORMS*, CENTER FOR CLIMATE AND ENERGY SOLUTIONS (2012), http://www.eenews.net/assets/2012/06/25/document_pm_02.pdf.

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1980 and 2005, insurers paid out \$320 billion in weather-related insurance claims,⁸⁰ but because collected premiums have not been sufficient to cover losses, the U.S. Treasury is in growing debt of approximately \$20 billion. As a result, the U.S. Government Accountability Office rates the NFIP as high risk.⁸¹ A recent report concluded that flooding due to climate change is likely to widen the gap, and recommends that reforms be instituted to fully account for the increased risk posed by climate change.⁸² The study found that premiums are priced below private sector rates, “thereby offering below-market coverage to development in areas that are both environmentally sensitive and have high disaster risk. . . .”⁸³ FEMA should adjust premiums to reflect risk, remove subsidies for nonresidential structures and non-primary residences, and phase out subsidies for remaining structures.

The current NFIP \$18 billion debt is due to high interest rates and premium rates that do not reflect actual experiences or future risk. From 1978 to 2004, NFIP claims and expenses have exceeded income from flood insurance premiums by 5 percent. Since Hurricane Katrina, and the other named storms from 2005 to date, the program has continued to suffer even more significant financial shortfalls.⁸⁴ The projected increased storm activity and sea-level rise will only make risk of flooding and property damage worse.

NFIP offers subsidized and full risk premiums. In the past, FEMA has grandfathered properties that are identified as at risk, for the sake of equity, and to encourage participation in the NFIP. Homeowners in homes that were built before the NFIP was implemented, which accounts for 22 percent of NFIP-covered properties, pay only 35–40 percent of what FEMA considers actuarial risk.⁸⁵ This policy has resulted in continued lowered premium rates: mapping expands areas prone to flooding, yet structures are entitled to lower rates. Recognizing that newer mapping will reflect greater likelihood of flooding due to climate change, FEMA must eliminate or minimize the grandfathering of properties that are identified as within a flood zone. A separate program should be established to provide needs-based subsidies to homeowners in flood-prone areas.

⁸⁰ JOHN B. STEPHENSON, U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-07-820T, FINANCIAL RISKS TO FEDERAL AND PRIVATE INSURERS IN THE COMING DECADES POTENTIALLY SIGNIFICANT (2007), *available at* <http://www.gao.gov/assets/120/116474.pdf>.

⁸¹ U.S. GOV'T ACCOUNTABILITY OFFICE, HIGH RISK SERIES, GAO-13-283, HIGH-RISK SERIES, AN UPDATE (2013), *available at* <http://www.gao.gov/assets/660/652133.pdf>.

⁸² HUBER, *supra* note 76.

⁸³ *Id.* at 3.

⁸⁴ CONG. BUDGET OFF., THE NATIONAL FLOOD INSURANCE PROGRAM: FACTORS AFFECTING ACTUARIAL SOUNDNESS (2009), *available at* <http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/106xx/doc10620/11-04-floodinsurance.pdf>.

⁸⁵ ORICE W. BROWN, U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-10-631T, NATIONAL FLOOD INSURANCE PROGRAM CONTINUED ACTIONS NEEDED TO ADDRESS FINANCIAL AND OPERATIONAL ISSUES (2010), *available at* <http://www.gao.gov/new.items/d10631t.pdf>.

Furthermore, sea-level rise, erosion, land subsidence, and increased storm intensity, storm surge, and heavy rainfall threaten to inflict more damage than previously experienced.⁸⁶ One study found that sea-level rise could double the average annual loss from storm surge by 2030.⁸⁷ Therefore, FEMA is under even more pressure to promptly adjust premiums to reflect risk. Moving forward, FEMA must take the best available science into account in updating its maps and setting premium levels. In determining rates, FEMA should identify how many major storms are expected over a variety of time frames in various regions, ascertain how much natural buffer is predicted to be lost in critical areas, and consider creating separate risk levels for flooding, including flood probability of greater to and lesser than 100 years or 1 percent probability.

4. Enforce Existing Flood Insurance Requirements

Structures that occur within SFHAs that are financed by federally backed mortgages must be covered by flood insurance. Communities that participate in NFIP enable property owners to purchase subsidized flood insurance. A condition of participation in NFIP is that the community must require that properties located in SFHAs receive permits for new development, and mandate that the first floor must be above the base 100-year flood elevation.⁸⁸ However, actual flood insurance coverage in these SFHAs falls well below 100 percent.⁸⁹

One study found that only about 75–80 percent of homes in SFHAs actually have flood insurance coverage,⁹⁰ while other studies indicate coverage is far less. A review of homeowners in northern Vermont after storms in 1998 found that 84 percent of homeowners in SFHAs did not have flood insurance, even though 45 percent were required to have it.⁹¹ Another study concluded that only about 50 percent of property owners with property in SFHAs in the Northeast and Midwest that were required to have flood insurance actually had it.⁹² In yet another study, four flood determination companies

⁸⁶ Evan Lehmann, *Flood-Prone Land Likely to Increase by 45 Percent—A Major Challenge to Federal Flood Insurance Program*, N.Y. TIMES, July 22, 2011, <http://www.nytimes.com/cwire/2011/07/22/22climatewire-flood-prone-land-likely-to-increase-by-45-a-19117.html>.

⁸⁷ LLOYD'S OF LONDON, COASTAL COMMUNITIES AND CLIMATE CHANGE: MAINTAINING FUTURE INSURABILITY (2008), http://www.lloyds.com/~media/lloyds/reports/360/360%20climate%20reports/360_coastalcommunitiesandclimatechange.pdf#search=%27360%20Risk%20Project%20Maintaining%20Future%20Insurability%27.

⁸⁸ JACQUELYN MONDAY ET AL., AN EVALUATION OF COMPLIANCE WITH THE NATIONAL FLOOD INSURANCE PROGRAM PART A: ACHIEVING COMMUNITY COMPLIANCE (2006).

⁸⁹ *Id.*

⁹⁰ Lloyd Dixon et al., *The National Flood Insurance Program's Market Penetration Rate*, FEMA.GOV (Feb. 2006), http://www.fema.gov/media-library-data/20130726-1602-20490-6272/nfip_eval_market_penetration_rate.txt.

⁹¹ Howard Kunreuther & Erwann Michel-Kerjan, *Encouraging Adaptation to Climate Change: Long-Term Flood Insurance*, U. PA. WHARTON SCH., 09-13 (2009), <http://opim.wharton.upenn.edu/risk/library/RFF-IB-09-13.pdf>.

⁹² Dixon et al., *supra* note 87.

were asked to determine whether buildings covered by 9,500 loans were inside or outside SFHAs. One or more companies disagreed on the placement of 68 percent of the buildings,⁹³ indicating that homeowners, mortgage lenders, and insurers may not even be certain of whether flood insurance is required.

Compounding the compliance issues is the fact that FEMA's enforcement of flood insurance requirements is lacking. Currently, mortgage holders are typically left to enforce the flood insurance requirement. However, they are only required to verify coverage when a loan is made or modified, not when maps are updated. Lenders who do not comply with flood insurance regulations may be subject to fines; however, these are only levied where there is a pattern or practice of violations.⁹⁴ FEMA should explore other avenues to ensure that property owners are purchasing and maintaining flood insurance by enforcing existing requirements, including maintaining flood insurance and development consistent with building codes and floodway restrictions.

One possible reform is to mandate longer-term policies. Studies suggest that many property owners allow their one-year policies to lapse soon after purchase. One study indicates that from 2001 to 2009 the average tenure of new policies was 2–4 years, indicating that many policyholders allowed coverage to lapse soon after initial purchase.⁹⁵ Another study of Florida residents found that one-third cancel their policies after two years, and two-thirds cancel after five years.⁹⁶ Requiring longer-term policies would likely result in better coverage.

FEMA could also review whether it can require participating communities to better enforce local building codes. One study found that if current building codes were applied to all residential properties in coastal Florida and New York, there would be a 61 percent and 39 percent reduction, respectively, in loss for a 100-year return period, or a savings of \$51 billion.⁹⁷

5. Make Risk Mitigation Mandatory or Increase Incentives

Communities are required to adopt minimum floodplain management regulations that specify when building permits are required, that ensure development does not increase

⁹³ RICHARD J. TOBIN & CORINNE CALFEE, *THE NATIONAL FLOOD INSURANCE PROGRAM'S MANDATORY PURCHASE REQUIREMENT: POLICIES, PROCESS, AND STAKEHOLDERS* (2005).

⁹⁴ *Id.*

⁹⁵ Erwann Michel-Kerjan et al., *Policy Tenure under the U.S. National Flood Insurance Program (NFIP)*, 32 RISK ANALYSIS 4, 644 (2012).

⁹⁶ Erwann Michel-Kerjan & Carolyn Kousky, *Come Rain or Shine: Evidence on Flood Insurance Purchases in Florida*, J. RISK INS. (2009), available at http://opim.wharton.upenn.edu/risk/partners/7_Come-Rain-or-Shine.pdf.

⁹⁷ HOWARD C. KUNREUTHER & ERWANN MICHEL-KERJAN, *AT WAR WITH THE WEATHER: MANAGING LARGE-SCALE RISKS IN A NEW ERA OF CATASTROPHE* (2009), available at http://opim.wharton.upenn.edu/risk/library/WHARTON-Managing_Large-Scale_Risks_%28Exec_Summary%29.pdf.

flooding, and that require mitigation standards for new construction.⁹⁸ Despite the ever-present 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 percent had not taken any flood mitigation measures.⁹⁹ Additionally, the community rating system (CRS) is a voluntary incentive program that awards discounts in premium rates of up to 45 percent. The goal of the program is to reduce flood loss, facilitate accurate insurance ratings, and promote awareness of flood insurance. However, only 5 percent of communities participate in the CRS.¹⁰⁰

The purpose of risk mitigation should be to minimize flood damage and 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 non-repair or abandonment. Repetitive loss is defined as \$1,000 of flood damage claims made more than two times in less than ten years. Repetitive loss properties comprise only 1 percent of properties but represent 25–30 percent of claims,¹⁰¹ and the number of repetitive loss properties has increased more than 70 percent from 1997 to 2007.¹⁰² With the anticipated effects of climate change, the number of repetitive loss properties will likely grow. Therefore, FEMA should analyze the alternative of not funding flood insurance for repetitive loss properties or, at least require mitigation that accounts for impacts to the floodplain's natural and beneficial functions and to imperiled species' habitats.

Conclusion

The Endangered Species Act requires that wildlife managers and communities plan for and adapt to sea-level rise without jeopardizing endangered species.¹⁰³ Sections 4 and

⁹⁸ FEMA, Floodplain Management, <http://www.fema.gov/floodplain-management> (last visited Feb. 19, 2014).

⁹⁹ Abby Goodnough, *As Hurricane Season Looms, State Aim to Scare*, N.Y. TIMES, May 31, 2006, available at <http://www.nytimes.com/2006/05/31/us/31prepare.html>.

¹⁰⁰ Federal Emergency Management Agency Office of Inspector General, Community Rating System: Effectiveness and Other Issues (2002).

¹⁰¹ *Legislative Proposals to Reform the National Flood Insurance Program: Hearing on H.R. Before the Subcomm. on Insurance, Housing, & Community Opportunity of the H. Fin. Serv. Comm.*, 122nd Cong. (2011) (statement of Franklin W. Nutter, President, Reinsurance Association of America), available at <http://financialservices.house.gov/uploadedfiles/112-16.pdf>.

¹⁰² ORICE W. BROWN, U.S. GOV'T ACCOUNTABILITY OFFICE, GAO 11-670T, FLOOD INSURANCE PUBLIC POLICY GOALS PROVIDE A FRAMEWORK FOR REFORM, TESTIMONY BEFORE THE COMMITTEE ON BANKING, HOUSING, AND URBAN AFFAIRS (2011), available at <http://www.gao.gov/assets/130/126501.html>.

¹⁰³ 16 U.S.C. §§ 1531–1544 (2012).

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7 of the Endangered Species Act mandate that FWS identify and protect loggerhead sea turtle nesting habitat. Section 4 of the Act authorizes FWS to designate suitable, unoccupied upland habitat, which allows the proactive identification and management of upland habitat. Section 7 ensures that federal agency actions in response to climate change and sea-level rise do not jeopardize species or adversely modify their habitats.

FWS should proactively identify, designate, and restore potential inland and more northerly habitat in undeveloped areas to facilitate loggerhead movement and compensate for increasing habitat loss and degradation due to climate change. The prompt designation of unoccupied upland and northerly critical habitat will help buffer loggerhead sea turtles from sea-level rise. The designation will also require FEMA to assess the impact of NFIP on loggerhead nesting habitat. FEMA's flood zone mapping must take the impacts of climate change into account and ensure the agency does not subsidize development in loggerhead nesting habitat.