Testimony of Mr. Collin O'Mara
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Before the United States Senate
Committee on Environment and Public Works
"Examining the Benefits of Investing in USACE Water Infrastructure Projects"

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Chairman Carper, Ranking Member Capito, and Members of the Committee, thank you for the opportunity to testify before you today on the vital issue of improving the resilience of our nation's water resources and the communities and wildlife those resources sustain.

The National Wildlife Federation is the nation's largest conservation advocacy organization with more than six million members and supporters and 53 state and territorial affiliates. Our members represent the full spectrum of people who care deeply about wildlife: they are bird and wildlife watchers, hikers, gardeners, anglers, hunters, forest stewards, and farmers. The National Wildlife Federation has championed clean and healthy rivers and streams since our founding in 1936. Conserving our wetlands, streams, rivers, and shorelines for wildlife and communities is at the core of our mission.

Today, the resilience of America's communities and infrastructure is being tested like never before. Increasingly severe storms and floods, extreme droughts, massive wildfires, and record high temperatures—fueled by a rapidly changing climate—are wreaking havoc on people and wildlife alike. They're also exacerbating historic inequities among vulnerable populations. The changing climate, combined with historic and ongoing degradation of vast swaths of habitat, have thrust America's wildlife into crisis. Our freshwater species, which are most affected by water resources projects, have been particularly hard hit. The overwhelming societal and economic toll of these crises affects us all.

The Army Corps of Engineers (Corps) plays an integral role in our nation's response to these interconnected crises, bolstering community resilience, in addressing generational inequities, and securing clean and healthy waters for people and wildlife alike. But to do this—and break the cycle of suffering caused by natural disasters—the Corps needs a new playbook that sees nature as our ally and not our enemy.

The Corps has been asked to fight against natural systems for more than 200 years, embedding this approach into its organizational structure and its very DNA. But we now know that healthy natural systems are essential for our well-being and our very survival. As we struggle to adapt to the increasingly dire effects of a changing climate, the Corps must much more to embrace nature as an essential ally. And this change must happen quickly. We do not have the time for incremental evolution if our communities, economy, and wildlife are to survive and thrive. The Corps must be quickly transformed into an agency that protects and uses nature to build resilience into projects, operations, and planning across all Corps business lines.

Recent bipartisan water resources bills developed by this Committee and passed by Congress have made important strides to this end, directing the Corps to modernize its approach to project planning, including by protecting and leveraging the risk-reduction potential of our natural defenses like healthy wetlands and floodplains. Congress has also directed the Corps to improve its engagement with environmental justice and Tribal communities—a critical step toward more equitable project delivery. The next water resources development bill comes at a pivotal moment and presents an opportunity to build upon this momentum to increase the Corps' capacity to contribute strategically to our nation's overall resilience before disasters strike.

This conversation comes at a critical time as Congress debates infrastructure investments. Despite the devastating and escalating drought, fires, flooding, and hurricanes of recent years, resilience investments continue to receive woefully inadequate attention (currently only 1-2% of overall proposed infrastructure spending and virtually nothing for the resilience and ecological restoration programs of the Corps). This is simply inadequate, especially when we know that every $1 that we spend on pre-disaster mitigation will save $6 to $8 in avoided costs and damages, including hundreds of billions of dollars in future federal debt. We believe that the root of the problem is archaic budgetary rules that make it much easier to spend after a disaster through a supplemental appropriation than it is to invest in the ounce of prevention that could have mitigated the damage in the first place. The fundamental disconnect is that CBO rules currently score the $1 of mitigation, but does not account for the long-term federal savings from avoided expenditures on disaster relief and recovery. This is particularly shortsighted when considering that we have spent nearly $300 billion in disaster supplementals over the past decade, much of which could have been avoided, and that number will grow significantly in the next decade. We would strongly encourage this committee to work with other committees of jurisdiction and Leadership to allow resilience investments with a demonstrated long-term savings to be exempted from such rules to allow the level of investment necessary to protect communities and wildlife from floods, hurricanes, fires, drought, and extreme temperatures. While we appreciate the proposed $50 billion investment in resilience, we believe that the level needed to keep communities safe should be on the order of $200-$250 billion (including at least $36.5 billion for the resilience and restoration programs of the Corps and EPA and $10 billion for NOAA's resiliency grants program). This would prevent the need nearly a trillion dollars of post-disaster federal spending in the coming decade.

In the testimony below, we provide additional details about the crises facing our communities and wildlife and outline recommendations for alleviating these crises by: leveraging all Corps programs to improve resilience; removing outdated technical barriers to resilience planning; improving planning for fish and wildlife resilience; and advancing resilient solutions to redress environmental injustices. The National Wildlife Federation urges Congress to implement these recommendations to advance the resilience of our nation's water resources.

Increasingly Severe Storms and Floods Are Wreaking Havoc on Communities

The nation is facing increasingly severe storms and floods, extreme droughts, massive wildfires and record high temperatures, fueled by a rapidly changing climate.[1] We have suffered more billion-dollar

[1] For example, a recent study concludes that climate change-induced sea level rise accounted for 13% of the damage caused by Hurricane Sandy (approximately $8.1 billion of the $62.5 billion in total damages) and 54% of the people affected (71,000 people out of the total of 131,000 people affected). Strauss, B.H., Orton, P.M., Bittermann, K. et al Economic damages from Hurricane Sandy attributable to sea level rise caused by anthropogenic climate change. Nat Commun 12, 2720 (2021). https://doi.org/10.1038/s41467-021-22838-1.

inland flood disasters in the last decade than in the prior three decades combined. We have endured more billion-dollar hurricane disasters in the last five years than in the decade before.[2] The human suffering caused by these and many smaller disasters is unfathomable, with low-income and frontline communities bearing a disproportionate share of the harm.

The ever-mounting toll of human suffering and economic loss from natural disasters shows no sign of abating and every sign that it will continue to grow. Research shows that both the intensity and number of extreme storms will continue to increase appreciably as our climate warms. In some locations, future extreme events could be twice as intense as historical averages.[3] By 2100, previously rare extreme rainstorms could happen every two years.[4] By 2050, high tides could cause "sunny day" flooding in coastal communities 25 to 75 days a year.[5] By the end of the century, homes and commercial properties currently worth more than $1 trillion could be at risk of chronic flood inundation.[6]

Storms and floods in the U. S. disproportionately harm Black, Latinx, Indigenous, low-income, and frontline communities. For example, the neighborhood that suffered the worst flood damage during Hurricane Harvey was in an area of southwest Houston where 49 percent of the residents are people of color. Damage from Hurricane Katrina was most extensive in the region's Black neighborhoods. In four of the seven ZIP codes that suffered the costliest flood damages from Hurricane Katrina at least 75 percent of residents were Black.[7] Over the next 30 years, the "risk of coastal floods damaging or destroying low-income homes will triple" resulting in the flooding of more than 25,000 affordable housing units each year.[8]

In addition, "while severe storms fall on the rich and poor alike, the capacity to respond to and recover from flooding is much lower in socially vulnerable populations that even in the best of times are struggling to function."[9] Even low levels of flooding can wreak havoc on buildings and the residents who live in them, damaging belongings, disrupting electrical equipment, contaminating water sources and septic systems, and generating mold. These impacts can "cause profound disruptions to families already struggling to make ends meet" and can be particularly challenging to remedy in affordable housing units, which are often in poor repair to begin with.[10]

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[2] NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2021) (https://www.ncdc.noaa.gov/billions/), DOI: 10.25921/stkw-7w73 (inland flooding "caused by billion-dollar hurricanes (i.e., Harvey, Florence, Matthew) has also increased").

[3] E&E News, Anne C. Mulkern, Climate drives rise in global damage from storms — study, July 12, 2021; Madakumbura, G.D., Thackeray, C.W., Norris, J. et al. Anthropogenic influence on extreme precipitation over global land areas seen in multiple observational datasets. Nat Commun 12, 3944 (2021). https://doi.org/10.1038/s41467-021-24262-x.

[4] Inside Climate News, New Study Shows Global Warming Intensifying Extreme Rainstorms Over North America, June 2, 2020; Megan C. Kirchmeier-Young, Xuebin Zhang, Human influence has intensified extreme precipitation in North America, Proceedings of the National Academy of Sciences Jun 2020, 117 (24) 13308-13313; DOI:10.1073/pnas.1921628117.

[5] NOAA High Tide Flooding Report, 2021 State of High Tide Flooding and Annual Outlook.

[6] Union of Concerned Scientists. Underwater: Rising Seas, Chronic Floods, and the Implications for US Coastal Real Estate (2018).

[7] Thomas Frank, Flooding Disproportionately Harms Black Neighborhoods, Scientific American (June 2, 2020).

[8] Maya K Buchanan *et al,* Sea level rise and coastal flooding threaten affordable housing, *Environ. Res. Lett.,* 15 124020/ (2020).

[9] National Academies of Sciences, Engineering, and Medicine 2019. Framing the Challenge of Urban Flooding in the United States. Washington, DC: The National Academies Press. https://doi.org/10.17226/25381.

[10] Buchanan *et al,* Sea level rise and coastal flooding threaten affordable housing (see footnote 8).

The Changing Climate and Massive Habitat Losses Have Pushed Wildlife to the Brink

The changing climate, combined with historic and ongoing destruction and degradation of vast swaths of habitat, have pushed America's wildlife into crisis, helping to drive the planet's ongoing 6th Mass Extinction of species.[11] As many as one-third of America's plant and wildlife species are vulnerable, with one in five imperiled and at high risk of extinction.[12]

America's freshwater species, which are most affected by water resources projects, have been particularly hard hit. Approximately 40 percent of the nation's freshwater fish species are now rare or imperiled.[13] Nearly 60 percent of the nation's globally significant freshwater mussel species are imperiled or vulnerable, and an additional 10 percent are already extinct.[14]

Our wildlife crisis extends well beyond rare and endangered species, and now affects many widespread and previously abundant creatures, such as the little brown bat, monarch butterfly, and many of our most beloved songbirds. State fish and wildlife agencies have identified more than 12,000 species nationwide in need of conservation action, and fully one-third of North America's bird species require urgent conservation attention.[15] The best way spur collaborative, proactive recovery efforts to save these thousands of species of greatest conservation need is to pass the bipartisan Recovering America's Wildlife Act (S.2372) and we respectfully encourage this committee to take immediate action.

The historic loss and degradation of wildlife habitat across the country makes each additional acre of wetland lost or natural stream segment channelized even more consequential for the long-term viability of our nation's fish and wildlife. At least ten states have lost more than 70 percent of their wetlands, which provide essential fish and wildlife habitat, while 22 states have lost 50 percent or more of their original wetland acreage.[16] The construction of levees to reduce the frequency and duration of flooding

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[11] Gerardo Ceballos, Ehrlich Paul, Raven Peter, Vertebrates on the brink as indicators of biological annihilation and the sixth mass extinction. Proceedings of the National Academy of Sciences Jun 2020, 117 (24) 13596-13602; DOI: 10.1073/pnas.1922686117 ("The ongoing sixth mass extinction may be the most serious environmental threat to the persistence of civilization, because it is irreversible. . . . the sixth mass extinction is human caused and accelerating. . . . species are links in ecosystems, and, as they fall out, the species they interact with are likely to go also. . . . Our results reemphasize the extreme urgency of taking massive global actions to save humanity's crucial life-support systems.")

[18] U.S. Geological Survey, Ecological Health in the Nation's Streams, Fact Sheet 2013-3033 (July 2013); Carlisle, D.M., Meador, M.R., Short, T.M., Tate, C.M., Gurtz, M.E., Bryant, W.L., Falcone, J.A., and Woodside, M.D., 2013, The quality of our Nation's waters—Ecological health in the Nation's streams, 1993–2005: U.S. Geological Survey Circular 1391 (120 pp).

[12] Stein, B. A., L. S. Kutner, J. S. Adams eds. 2000. Precious Heritage: The Status of Biodiversity in the United States. New York: Oxford University Press.

[13] Jelks, H. L., S.J. Walsh, N.M. Burkhead, et al. 2008. Conservation status of imperiled North American freshwater and diadromous fishes. Fisheries. 33: 372-407.

[14] Williams, J. D., M. L. Warren, K. S. Cummings, J. L. Harris, and R. J. Neves. 1993. Conservation status of freshwater mussels of the United States and Canada. Fisheries 18: 6–22; Lydeard, C., R. H. Cowie, W. F. Ponder, et al. 2004. The global decline of nonmarine mollusks. BioScience 54 321-330.

[15] Stein, B. A., N. Edelson, L. Anderson, J. Kanter, and J. Stemler. 2018. Reversing America's Wildlife Crisis: Securing the Future of Our Fish and Wildlife. Washington, DC: National Wildlife Federation.

[16] T.E. Dahl and S.M. Stedman. 2013. Status and trends of wetlands in the coastal watersheds of the Conterminous United States 2004 to 2009. U.S. Department of the Interior, Fish and Wildlife Service and National Oceanic and Atmospheric Administration, National Marine Fisheries Service. (46 pp); Dahl, T.E. 2006. Status and trends of wetlands in the conterminous United States 1998 to 2004. U.S. Department of the Interior, Fish and Wildlife

in the lower Mississippi River Valley is the single largest contributor to wetland losses in the country, according to the Department of the Interior.[17] Fish and wildlife have also been severely harmed through the pervasive alteration of natural stream flows, including from reservoirs and locks and dams, which have occurred in 86 percent of the almost 3,000 streams assessed by the U. S. Geological Survey.[18]

It is past time that we turn to the most ingenious engineer on the planet—nature—to help protect people and wildlife alike with natural infrastructure.

A New, More Effective and Fiscally-Responsible Approach is Urgently Needed

If our communities, economy, and wildlife are to survive and thrive, we must quickly implement a new approach to managing the nation's water resources. Maintaining the status quo, relying on incremental change, or trusting in vague promises of future changes to entrenched planning processes, will relegate our communities and wildlife to repeated cycles of ever-increasing hardship and loss. This in turn will lead to calls for more and more water resources projects that will be forced to compete for construction dollars with the Corps' already significant $109 billion backlog of projects.

A new approach that prioritizes nature-based pre-disaster mitigation and resilience will save taxpayers money and make our communities safer. Far too often, we approach water resources planning through the lens of disaster response and recovery rather than through proactive efforts to increase the resilience of vulnerable communities and water resources before disaster strikes, as evidenced by the Corps' history of supplemental appropriations. From 2005 to 2016, the Corps received $31. 4 billion in supplemental funding, which amounts to almost half of the agency's annual discretionary appropriations over that same period.[19] Of those supplemental funds, 87 percent ($27.2 billion) was provided to respond to flooding and other disasters. With ever increasing effects from storms, these emergency supplemental appropriations have also dramatically increased over time, with the Corps receiving "$1.1 billion in the 1990s, $19.2 billion in the 2000s, and $29.0 billion in the 2010s."[20] Many of these expenditures could have been avoided, if we had invested in the necessary resilience projects. Even though we know that ever $1 we invest in pre-disaster mitigation, will save us $6 is avoided costs, Congressional budgetary rules continue to make it much easier to fund an emergency supplemental

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Service, Washington, D.C. (112 pp); Dahl, T.E. 2000. Status and trends of wetlands in the conterminous United States 1986 to 1997. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. (82 pp); Dahl, T.E., and Johnson, C.E., 1991, Status and trends of wetlands in the conterminous United States, mid-1970's to mid-1980's. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. (28 pp).

[17] Report to Congress by the Secretary of the Interior, The Impact of Federal Programs on Wetlands, Volume II, at 145 (1994). Approximately 80 percent of the bottomland hardwood wetlands in the lower Mississippi River basin have already been lost approximately. Report to Congress by the Secretary of the Interior, The Impact of Federal Programs on Wetlands, Volume I at 39.

[18] U.S. Geological Survey, Ecological Health in the Nation's Streams, Fact Sheet 2013-3033 (July 2013); Carlisle, D.M., Meador, M.R., Short, T.M., Tate, C.M., Gurtz, M.E., Bryant, W.L., Falcone, J.A., and Woodside, M.D., 2013, The quality of our Nation's waters—Ecological health in the Nation's streams, 1993–2005: U.S. Geological Survey Circular 1391 (120 pp).

[19] Congressional Research Service, Army Corps Supplemental Appropriations: History, Trends, and Policy Issues, Updated January 3, 2018.

[20] Congressional Research Service, Supplemental Appropriations for Army Corps Flood Response and Recovery, February 20, 2020. Of the $29.0 billion in supplemental funding provided in the 2010s, $18.6 billion was for completing new or ongoing flood risk reduction projects. During the same period, construction funding for flood risk reduction projects through the regular appropriations process averaged $8.4 billion a year. Id.

appropriation after a disaster than to invest in the ounce of prevention that could have saved money and reduced damage in the first place.

We must implement a system that can break the cycle of disaster suffering, including by building resilience into Corps projects, operations, and planning across all Corps business lines. A resilient system can withstand changing conditions and readily recover from extreme floods, storms, and droughts. Working with nature is an indispensable part of resilience because healthy natural systems provide free and self-sustaining protections and benefits, including reducing flood risks, sustaining fish and wildlife, improving water quality, regulating sediment loading, stabilizing soil, sequestering carbon, and providing recreational opportunities.

Building resilience into Corps planning means protecting our wetlands and rivers, along with the hydrologic processes that maintain these systems. It means restoring critical natural systems that have been lost or damaged. It means pre-planning to ensure that disaster response activities will build community resilience for future storms and increase habitat for wildlife. Critically, it means making the use of natural infrastructure the rule for Corps projects rather than the exception.

The value and importance of natural infrastructure is well recognized, as evidenced by the numerous tools and authorities to drive its use enacted in the bipartisan Water Resources Development Act of 2020. These provisions elevate consideration of nature's potential to improve our nation's resilience, and level the playing field for use of natural infrastructure (also known as natural and nature-based solutions) to reduce flood and storm damages while protecting and restoring fish and wildlife habitat and providing vital co-benefits for communities. Notably, the diverse environmental benefits provided by sustainable and cost-effective natural infrastructure can be particularly valuable for under-served communities suffering from flooding and other cumulative environmental assaults.

Protecting and investing in our natural infrastructure makes communities safer and more resilient by absorbing floodwaters, buffering storm surges, and giving rivers room to spread out without harming homes and businesses. Natural infrastructure reduces the need for new, often expensive structural flood projects, and provides an important extra line of defense when levees or other structures are required. Natural infrastructure also avoids unintended adverse impacts such as diverting floodwaters onto other communities and inducing development in high risk areas.

An Ounce of Prevention is Worth a Pound of Cure

The value of natural systems for protecting communities is well recognized, and evidence of their effectiveness in reducing flood and storm damages continues to mount, as highlighted in the National Wildlife Federation's report on The Protective Value of Nature[21] and in the examples provided as an attachment to this testimony. As aptly noted by the Reinsurance Association of America: "One cannot overstate the value of preserving our natural systems for the protection of people and property from catastrophic events."[22]

As an example, wetlands prevented $625 million in flood damages in the 12 coastal states affected by Hurricane Sandy, and reduced damages by 20 to 30 percent in the four states with the greatest wetland

[21] Glick, P., E. Powell, S. Schlesinger, J. Ritter, B.A. Stein, and A. Fuller. 2020. The Protective Value of Nature: A Review of the Effectiveness of Natural Infrastructure for Hazard Risk Reduction. Washington, DC: National Wildlife Federation.

[22] Restore America's Estuaries, Jobs & Dollars BIG RETURNS from coastal habitat restoration (September 14, 2011).

coverage.[23] The forest and other conservation lands that make up the 28,000 acre Meramec Greenway along the Meramec River in southern Missouri contribute about $6,000 per acre in avoided flood damages annually.[24] Wetlands in the Eagle Creek watershed of central Indiana reduce peak flows from rainfall by up to 42 percent, flood area by 55 percent, and maximum stream velocities by 15 percent. [25] Coastal wetlands reduced storm surge in some New Orleans neighborhoods by two to three feet during Hurricane Katrina, and levees with wetland buffers had a much greater chance of surviving Katrina's fury than levees without wetland buffers.[26]

Natural infrastructure is also often more cost-effective than structural measures. A recent study documents that using natural infrastructure solutions for reducing coastal flood risks in Texas, Louisiana, Mississippi, and Florida would have a benefit-cost ratio of 3.5 compared to just 0.26 for levees and dikes. Restoring wetlands in this region could prevent $18.2 billion in losses while costing just $2 billion to carry out.[27] Natural infrastructure also has the significant added benefits of being self-sustaining and avoiding the risk of catastrophic structural failures. Importantly, natural infrastructure can work both alone and in combination with more traditional grey infrastructure to reduce flood and storm risks.

Structural solutions, while necessary in some places, can cause significant damage in other locations. For example, a study published just this month found that building one large seawall in a small portion of California's San Francisco Bay could significantly increase flooding in other areas, causing up to $723 million of flood damages to those areas during each flood event[28]—an estimate that is highly conservative as it "doesn't account for potential damage to ecosystems and fisheries."[29]

Recommendations

Through our extensive experience with Corps projects across the country—and with communities affected by those projects—it is clear that community and water resources resilience will only be achieved if the Corps embraces a shift in its approach to project design and planning to prioritize

[23] Narayan, S., Beck, M.B., Wilson, P., et al., The Value of Coastal Wetlands for Flood Damage Reduction in the Northeastern USA. Scientific Reports 7, Article number 9463 (2017), doi:10.1038/s41598-017-09269-z.
[24] Kousky, C., M. Walls, and Z. Chu. 2014. Measuring resilience to climate change: The benefits of forest conservation in the floodplain. p 345–360. In: V.A. Sample and R.P. Bixler, eds. Forest Conservation and Management in the Anthropocene: Conference Proceedings. Proceedings RMRS-P-71. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
[25] Javaheri, A., and M. Babbar-Sebens. 2014. On comparison of peak flow reductions, flood inundation maps, and velocity maps in evaluating effects of restored wetlands on channel flooding. Ecological Engineering 73: 132–145.
[26] Bob Marshall, Studies abound on why the levees failed. But researchers point out that some levees held fast because wetlands worked as buffers during Katrina's storm surge, The New Orleans Times-Picayune (March 23, 2006).
[27] Borja G. Reguero et al., "Comparing the Cost Effectiveness of Nature-Based and Coastal Adaptation: A Case Study from the Gulf Coast of the United States," PLoS ONE 13, no. 4 (April 11, 2018), https://doi.org/10.1371/journal.pone.0192132.
[28] Michelle Hummel, Griffin R., Arkema K., Guerry A., PNAS 2021 Vol. 118 No. 29 e2025961118, Economic evaluation of sea-level rise adaptation strongly influenced by hydrodynamic feedbacks https://doi.org/10.1073/pnas.2025961118 (July 2021) (documenting that the seawall would divert 36 million cubic meters of flood waters (9.5 billion gallons) onto other communities, and demonstrating the value of natural infrastructure for alleviating flooding and damages along other stretches of the coastline.).
[29] Matt Simon, Be very careful where you build that seawall, WIRED (July 14, 2021).

protecting, restoring, and using healthy natural systems to bolster community resilience. To help the Corps achieve these vital goals, the National Wildlife Federation respectfully urges Congress to enact the policy reforms outlined below in the next Water Resources Development Act (WRDA).

We also urge Congress to ensure that the Corps continues to swiftly advance important ecosystem restoration efforts, including those designed to restore America's Everglades, coastal Louisiana, and the Ohio River, the Delaware, and the effort to stem the ongoing threat and harm from invasive carp through the Brandon Road Lock and Dam project. The National Wildlife Federation greatly appreciates the committee's role in advancing and overseeing the Corps' implementation of these projects that are so vitally important to the health, well-being, and resilience of people and wildlife.

1. Remove Outdated Technical Barriers to Resilience Planning

The Water Resources Development Act of 2020 enacted a suite of planning reforms that provide critical tools for improving the resilience of our vital natural infrastructure—our rivers, streams, floodplains, wetlands, and coasts—and the wildlife and communities that rely on those resources. However, Corps planners remain hampered by a suite of outdated technical barriers to effective resiliency planning. To help remove these barriers and advance strategic resiliency planning, Congress should modernize the Corps' assessment of project benefits and costs and provide tools needed to advance resilient solutions.

Modernize the Corps' Assessment of Project Costs and Benefits

One of the key barriers is the Corps' current approach to calculating project benefits and costs—a process that in many ways is fundamentally broken. Among other things, the outdated procedures used by the Corps: (1) fail to capture critical benefits provided by natural infrastructure, especially when that infrastructure can lessen the impact of a future storm or natural disaster; (2) fail to equitably evaluate flood damage benefits provided to disadvantaged and low-income communities; and (3) fail to account for the inherent limitations on the use of benefit-cost analysis as a precise decision tool. These problems are magnified by the Corps' tangled array of outdated guidance documents and directives that add to the unwieldiness of the Corps' current approach.

While the Corps' upcoming interagency guidelines for implementing the Planning Principles, Requirements, and Guidelines should, if properly implemented, provide important guidance for addressing some of these problems, Congressional action would ensure that the Corps accurately quantifies the full array of benefits whenever possible and fully accounts for all project costs, including by directing the Corps to:

- Comprehensively evaluate and include as benefits the value of: ecosystem services gained as a result of project construction and operation; and federal subsidies and/or federal disaster payments that would be avoided if a project reduces or eliminates uses that would trigger such payments.[30] Congress should also prohibit the Corps from counting project benefits produced by draining or degrading wetlands and from counting flood damage reduction benefits on conservation lands, and lands subject to flood easements.

- Equitably account for the benefits provided to disadvantaged and low-income communities. The Corps' current practice of calculating flood damage reduction benefits based on home prices can

[30] Ecosystem services include, but are not limited to, flood risk reduction, wildlife habitat, water quality, sediment regulation, soil stabilization, carbon sequestration, and recreation.

create significant barriers to the approval of flood projects critical to the safety and well-being of such communities.

- Accurately account for the true costs of a project by incorporating site-specific conditions and challenges into the assessment of project cost[31]; including the value of ecosystem services lost as a result of project construction and operations as a project cost; include full life-cycle costs into the cost assessment, including the costs of any future rehabilitation; and accounting for sub-optimal funding streams. This information is essential for establishing the true cost of a particular alternative.

- Apply the discount rate in a manner that accounts for the multigenerational benefits delivered by natural and nature-based projects that reduce future risks and restore ecosystems that will grow and build over time.

These changes are vitally important for improving Corps planning. However, no amount of tinkering with the benefit cost analysis process can compel the Corps to find the most equitable and environmentally-protective solution to a particular water resources problem, as explicitly required by longstanding federal law and policy.[32] Nor will benefit-cost changes compel Corps planners to meaningfully explore—and where appropriate recommend—the protection and use of natural systems to solve water resources problems. To address these problems, Congress should establish clear criteria to ensure that only projects that fully account for such legal and policy requirements are being compared through the benefit-cost analysis process, and enact the other reforms outlined in this testimony.

Provide Critical Tools for Resilient Solutions

Congress should ensure that the Corps has the tools it needs to develop and implement resilient solutions, including by:

- Eliminating an arbitrary, perceived barrier to comprehensive resilience planning by making "community and natural systems resilience" a co-equal project purpose for every water resources project. It is our experience that Corps planners typically believe they are prohibited from advancing activities that would increase resilience if those activities do not fall under a project's authorized purpose.

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[31] The failure to meaningfully assess conditions on the ground can lead to significant cost increases that add to the financial burdens on non-federal sponsors and federal taxpayers. In 2013, the Government Accountability Office found that at least two-thirds of the 87 Corps flood control projects budgeted for construction between FY2004 and FY2012 experienced cost increases. One project cost $10 million more than the authorized estimate because the construction site could not be accessed without carrying out major rehabilitation of a tunnel access point. The cost of a pumping plant required by a second project increased from the original estimate of $800,000 to $10.7 million due to design changes required to handle the actual site conditions. Government Accountability Office, Army Corps of Engineers, Cost Increases in Flood Control Projects and Improving Communication with Nonfederal Sponsors, GAO-14-35 (December 2013) at 11, 14, 15.

[32] These are among the well-recognized, inherent limitations of the benefit-cost analysis process which include: the inability to fully capture equity considerations and other relevant costs and benefits through quantitative assessments; the inability of the process to account for requirements and restrictions established by federal law and policy; and the inherent uncertainties associated with fully assessing project benefits and costs. National Research Council, Analytical methods and Approaches for Water Resources Project Planning, 2004 at 43 (National Academies Press).

- Facilitating the Corps' ability to focus on activities that increase resilience by: establishing a non-federal cost share for operation and maintenance of low use segments of the Inland Waterway System to minimize damage to those river segments if continued maintenance is not a priority for the non-federal sponsor; and accelerating the deauthorization and disposition of outdated infrastructure.

- Directing the Corps to map the many flood easements that the agency has already purchased across the country to facilitate consideration of those easements when planning future projects, and directing use of flood easements as an appropriate natural infrastructure solution.

2. Redress Environmental Injustices Through Resilient Solutions

The National Wildlife Federation appreciates the important provisions enacted in the Water Resources Development Act of 2020 that direct the Corps to improve consultation and coordination with Tribes and disadvantaged communities, prioritize resiliency planning for economically disadvantaged communities, and establish an important pilot program to facilitate effective flood risk management planning for underserved communities. However, much more needs to be done to redress pervasive environmental injustices that are deeply embedded in our systems and policies, and to ensure accountability within the agency as it seeks to better serve the most vulnerable communities. To that end, we urge Congress to take at least the following steps to build on the important progress made in WRDA 2020:

- Incorporate toxics remediation into ecological restoration, navigation, and flood resilience projects: For too long, Corps projects have failed to sufficiently remediate toxics in their project areas. We see this when some dredging project stir up heavy metals and polychlorinated biphenyls (PCBs) or when flood mitigation projects fail to consider the potential for inundation of heavily contaminated sites as we've recent recently during hurricanes impacting Texas. Significant opportunities exist to pilot the integration of toxic pollution remediation into ecological restoration, navigation, and flood resilience projects, such as in the Ohio River, the Delaware River (especially the Christina River), or the lower Mississippi (especially Cancer Alley). When conducting work in waterways or regions with high levels of pollutants, Congress should direct the Corps to coordinate closely with EPA, state environmental agencies, and regional coordinating bodies, such as the Delaware River Basin Commission or the Ohio River Valley Water Sanitation Commission, to maximize remediation of toxics to the greatest extent practicable. One effective model that could be replicated nationally is Delaware's Watershed Approach to Toxics Assessment and Restoration (WATAR) that works across brownfield and aquatic remediation programs at the state and federal levels to determine the source of persistent, bioaccumulative, and toxic substances (PCBs, dioxins and furans, mercury, organochlorine pesticides, etc.) and to implement innovative remediation strategies in urban and industrial areas. Ensuring sufficient funding for these efforts is critical because these working or industrial urban waterways historically only receive a fraction of the restoration investments of destination waterbodies like the Great Lakes or Chesapeake Bay.

- Increase Opportunities for Assistance: Congress should greatly expand the ten-community Pilot Program for Economically Disadvantaged Communities established by Section 118(b) of WRDA 2020. Congress should establish a separate program within the Corps to provide resiliency planning for Tribes, economically disadvantaged communities, and communities of color. Congress should direct the Corps to utilize existing mapping tools—such as the EPA's EJSCREEN

and FEMA's National Risk Index—to assist in identifying those communities most in need and at risk. Congress should enact criteria to ensure that the Corps' benefit-cost analyses fully account for, and allow projects to move forward to redress, systemic environmental and racial injustices.

- Increase Capacity and Expertise Within the Agency: Congress should establish a new position of Senior Advisor for Environmental Justice within the Office of the Chief of Engineers to increase the Corps' capacity to redress environmental injustice. Among other key issues, the Senior Advisor should revisit the way the Corps applies its "ability to pay" provision; address other barriers to access and participation in Corps programs; ensure culturally competent messaging in education and outreach materials; and assist in identifying and engaging with communities suffering from environmental injustice.

- Establish a Federal Advisory Committee on Environmental Justice: Congress should also establish a standing Federal Advisory Committee on Environmental Justice, in accordance with the Federal Advisory Committee Act, to advise the Chief of Engineers and the Assistant Secretary of the Army (Civil Works) on activities and actions that should be undertaken by the Corps to ensure more equitable delivery of services, projects, and project benefits through all Corps programs.

- Advance Environmental Justice Innovation: Congress should establish an Environmental Justice Innovation Center tasked with developing and training Corps staff to deliver innovative community-scaled solutions to water resources problems that are environmentally sustainable and cost-effective. The Innovation Center should prioritize working with smaller communities facing multiple, or particularly unique, water resources challenges. For example, the Innovation Center could work with a community and outside experts to incorporate bio-remediation or groundwater recharge maximization measures into a natural infrastructure project to increase water quality improvement co-benefits.

- Support Minority-Owned Businesses: Congress should direct the Corps to increase collaboration, contracting, and subcontracting with minority-owned businesses to improve gender-based and race-based outcomes. Many companies profit greatly from contracting with the Corps, including for post-disaster recovery work, and Congress should ensure that these benefits are inclusive of and prioritize minority-owned businesses. The distribution of funds should be tracked and reported to assess who benefits from economic opportunities.

3. Establish A Resilience Directorate to Leverage All Corps Programs

The Corps' historic focus on controlling nature combined with the programmatic silos created by the Corps' organizational structure prevent the agency from taking advantage of the full array of Corps programs and authorities to improve community and water resources resilience, including by leveraging the many free services provided by natural systems. These silos also promote piecemeal planning that has increased flood risks and flood recovery costs for some communities.

To help address these significant problems, Congress should establish a Resilience Directorate within the Office of the Chief of Engineers tasked with ensuring that the Corps takes full advantage of existing programs, authorities, and operations to leverage natural systems alone or in concert with structural solutions to: protect communities from floods; minimize expenditures for emergency response and

rebuilding; formulate resilience solutions for the most at-risk communities; and maximize co-benefits to communities including improved water quality and groundwater recharge, restored wildlife habitat, and a strengthened outdoor-based economy. The Directorate should have the resources and budgetary authority needed to transform the Corps into an agency that views nature as an ally, and prioritizes protecting and using natural systems in all Corps business lines to increase resilience.

A Resilience Directorate could: (1) infuse resilient approaches—including natural infrastructure—and best management practices into all Corps programs and activities; (2) facilitate multi-benefit projects, including through coordination across Corps business lines where appropriate; (3) identify and provide support to marginalized and economically disadvantaged communities, including through implementation of the pilot program authorized by Section 118 of WRDA 2020 and in coordination with the Senior Advisor for Environmental Justice (recommended above); (4) develop and implement resilience training for Corps leadership and staff; (5) analyze cost savings provided by natural infrastructure and improved resilience; (6) facilitate coordination and collaboration across mission areas, business lines, and districts to ensure that the Corps takes full advantage of all existing authorities to improve the resilience of the nation's water resources; and (7) enhance the Corps' coordination with other Federal agencies that have a role in community health and resilience (such as the EPA and FEMA) to promote holistic solutions that protect human health and the environment.

For example, the Resilience Directorate could coordinate, focus, and leverage the multiple planning processes and projects on the Mississippi River to improve the resilience of the Mississippi River from its headwaters to the Gulf.[33] The Resilience Directorate could also coordinate with other federal agencies to facilitate remediation of toxic contamination in rivers, like the Ohio, that run through highly industrialized watersheds. Such approaches would reduce flood risks and improve water quality for millions of people, and improve habitat for hundreds of species of fish and wildlife.

The Resilience Directorate could also provide important input into necessary updates to dam and reservoir operating procedures,[34] including, for example, the updates required for the "extremely high risk" Addicks and Barker's reservoirs in Houston.[35] Infusing strategic resiliency planning into these updates would better protect Houstonians during future flood events and improve the ability of the region's streams, bayous, and wetlands to provide natural flood protection benefits. During Hurricane Harvey, the Corps released at least 13,000 cubic feet of water per second from these reservoirs to reduce the risks of overtopping and protect homes upstream. But those same releases flooded some 4,000 homes downstream that would otherwise have remained dry despite Harvey's onslaught.[36]

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[33] Planning processes currently underway or available to the Corps for the Mississippi River include: disposition studies for the river's uppermost locks and dams; updates to lock and dam water control manuals and navigation operation and maintenance plans, many of which are more than 40 years old; the Upper Mississippi River Comprehensive Plan; assessment of alternative management regimes for the Old River Control Structure; studies examining raising the Mississippi River mainline levees; a series of feasibility studies assessing restoration along the lower Mississippi River; the Lower Mississippi River Comprehensive Management Study; and assessments of projects to restore Louisiana's coastal wetlands, including through Mississippi River sediment diversions.

[34] The Corps operates 707 dams that it owns across the country and manages flood control operations at 134 dams constructed or operated by other federal, non-federal, or private agencies. Government Accountability Office, Army Corps of Engineers, Additional Steps Needed for Review and Revision of Water Control Manuals, GAO-16-685, July 2016. Many of these dams are relying on decades-old water control manuals.

[35] The reservoirs' dams have been classified by the Corps as being at "extremely high risk."

[36] KHOU.com, Houston Texas, Buffalo Bayou to remain at record level; Barker, Addicks reservoirs have peaked (September 1, 2017).

Upstream homes also flooded, including more than 5,000 of the 14,000 homes located *inside* the Corps reservoirs.[37]

4. Improve Planning for Fish and Wildlife Resilience

For decades, Congress has required mitigation for adverse impacts to fish and wildlife caused by Corps water resources projects. To assist the Corps in properly evaluating fish and wildlife impacts and needed mitigation, Congress also requires the Corps to consult with the U. S. Fish and Wildlife Service on fish and wildlife impacts from individual Corps projects and on opportunities for mitigating any such impacts. State fish and wildlife agencies are also encouraged to consult with the Corps on project-specific impacts and mitigation opportunities. The Corps is directed to give "full consideration" to these expert recommendations, that if followed would greatly improve Corps planning and mitigation.

All too often, however, the Corps fails to adhere to these important requirements, leading to projects and long-term project operations that cause profound harm to the nation's fish and wildlife. To address these problems, Congress should:

- Require the Corps to evaluate fish and wildlife impacts and mitigation opportunities in a manner consistent with Fish and Wildlife Coordination Act review recommendations that derive from the special expertise of federal and state fish and wildlife experts (e. g., recommendations regarding methods and metrics for assessing wildlife impacts; assessments and determinations of wildlife impacts; and methods for effectively mitigating wildlife impacts).

- Direct Corps planners to coordinate with State, Territorial, and Tribal Fish and Wildlife Agencies and ensure projects are consistent with the State Wildlife Action Plans or similar state-developed wildlife recovery plans.

- Close loopholes that have been used by the Corps to evade mandatory mitigation requirements.

Complying with existing mitigation requirements and utilizing carefully-developed recommendations from federal and state fish and wildlife experts, are cost-effective, common sense ways to improve the health and resilience of the nation's fish and wildlife resources and avoid impairing the flood risk and other resilience benefits provided by healthy natural systems.

Conclusion

The National Wildlife Federation appreciates the Committee's commitment to improving Corps planning to increase resilience and protect and restore the nation's vital water resources. We respectfully urge Congress to implement the reforms outlined in this testimony to make communities safer, ensure best uses of taxpayer dollars and allow the nation's treasured wildlife to thrive—and we stand ready to help make these recommendations a reality. Thank you again for the opportunity to testify before you today, and I look forward to your questions.

[37] The in-reservoir homes were built on 8,000 acres of land that the Corps opted not to buy when the reservoirs were constructed in the 1940s, even though the Corps knew the land would flood during large flood events. Al Shaw, Lisa Song, Kiah Collier, Neena Satija, How Harvey Hurt Houston, in 10 Maps, ProPublica (January 3, 2018).