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FROM RISK TO RESILIENCE: ADVANCING EQUITABLE, CROSS-CUTTING NATURE-BASED SOLUTIONS IN TEXAS

OPPORTUNITIES AND BEST PRACTICES FOR ACTION



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**texas coast
& water
program**

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1 INTRODUCTION: THE CASE FOR EQUITABLE NATURE-BASED SOLUTIONS IN TEXAS

Texas is growing fast, and with that growth comes new risks and opportunities. Increasing development and extreme weather demand forward-thinking infrastructure solutions. In this context, *nature-based solutions* - leveraging the role of nature for protection and other important contributions - are receiving heightened attention as dynamic solutions to meet today's challenges while delivering long-term community and environmental benefits, offering cross-cutting benefits that support multiple priorities at once. These cost-effective solutions can play a central role in buffering communities and ecosystems against present and future hazards while soaking up stormwater, reducing extreme heat, and storing carbon dioxide, providing both climate adaptation and mitigation benefits. Nature-based solutions also support the physical and mental health of Texans by reducing heat exposure, improving air quality, and increasing access to safe green spaces, benefits that are especially critical in communities facing the greatest environmental burdens.

Unlike single-purpose gray infrastructure, nature-based solutions (NBS) often provide multiple, stacked benefits, like improving water quality, enhancing biodiversity, sequestering carbon, and offering recreational opportunities—making them potentially more cost-effective and sustainable long-term. They harness natural processes and leverage the protection of land and other natural resources, turning features like floodplains and coastal marshes into functional infrastructure.

1.1

A State of Risk and Opportunity

This approach is timely for Texas, given its rapid population growth (projected over 70% increase by 2070¹), expanding energy and consumptive water needs, and intensifying climate impacts that are placing growing strain on land, water, and infrastructure systems. Extreme weather events are becoming increasingly common; the state leads the nation in billion-dollar disasters, experiencing 190 such events between 1980 and early 2025, with costs exceeding \$300 billion (see Figure 1).²

In recent years, Texas has been battered by a surge in extreme weather events. The state has experienced eight major hurricanes, one of which was amongst the most expensive natural disasters in U.S. history. As the state's coastal belt grapples with the growing barrage of storms, Texas has also struggled with periodic, intensifying drought. Climate change will continue to intensify these extreme events affecting the communities, ecosystems and biodiversity all across the state. In 2023, the state was hit by 16 major extreme events including drought, severe storm, hail and tornadoes causing damages between \$10-\$20 billion. Recent catastrophic flooding in the Texas Hill Country in July 2025 resulted in tragic loss of life and caused an estimated \$18 billion to \$22 billion in total economic loss, including damage to homes, businesses, recreation facilities, infrastructure, and tourism, as well as emergency response and cleanup costs.³

Historically, the solutions to addressing risks from these events emphasized the use of structural or engineered solutions, such as levees, sea walls, and stormwater drainage channels. The limitations of such hard infrastructure approaches (e.g., cost, failure points, risks of maladaptation) in an era of rapid climate change are becoming all too evident, particularly in coastal areas where hardened infrastructure can diminish the natural landscapes that drive tourism and recreation. Rapid population growth and associated land use and land cover change such as increased impervious surfaces, loss of natural buffers, and development in high-risk areas further compound these limitations, driving higher costs and greater vulnerability when infrastructure is not designed to withstand changing climate and landscape conditions.

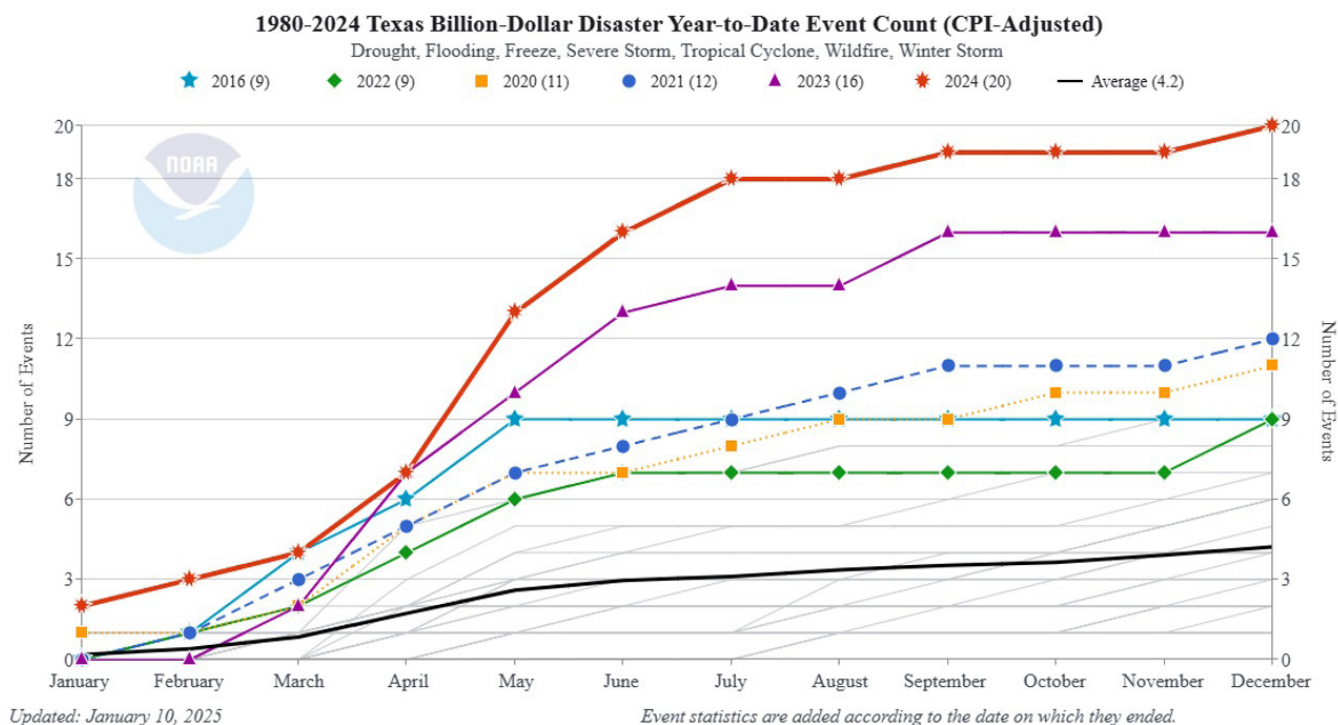
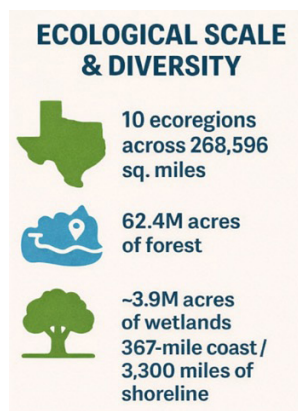


Figure 1. Rising number of billion-dollar extreme weather disasters in Texas, 1980–2024. Source: [NOAA](#).

At the same time, Texas' scale, ecological diversity, and natural capital position it uniquely to lead the nation on NBS implementation. The state's vast size (268,596 sq miles) encompasses ten distinct ecoregions, each with unique characteristics and opportunities for nature-based interventions.⁴ In terms of natural assets, 62.4 million acres of forests, 3.9 million acres of wetlands, and a 367-mile coastline with 3,300 miles of shoreline, provide a powerful toolkit.^{5,6}

Coastal systems buffer storm surge, riparian corridors filter water and reduce floods, forests sequester carbon, and urban green spaces mitigate heat, manage stormwater, and support physical and mental health. Texas' prairies, grasslands, working ranchlands, and agricultural landscapes that historically covered an estimated 60 % of Texas's landscape⁷ also offer opportunities for NBS, supporting biodiversity, soil health, water regulation, carbon storage, public health, cultural and economic heritage across the state. These systems also deliver direct benefits for biodiversity by restoring and protecting habitat, improving ecological connectivity, and supporting native species across landscapes. These assets are foundational for building resilience. By harnessing these assets, Texas can turn risk into resilience, protect biodiversity, save lives and improve public health, and reduce long-term disaster costs while improving quality of life across communities.



Nature-based solutions are already proving their value in Texas. In Galveston, the [Laffite's Cove living shoreline](#), built in 2006 for just \$35,000, weathered Hurricanes Ike and Harvey, protecting homes and habitat.⁸ During Hurricane Beryl, Galveston Bay Foundation's new headquarters in Kemah, Texas, was also largely [spared from flooding](#) thanks to a similar project: the conservation nonprofit built a 905 foot living shoreline that reduced wave energy during the storm; nearby restored marshes also helped absorb water and slowed erosion. Along Galveston Bay, [more than 22 miles of shoreline have been restored](#) using nature-based methods, many at a fraction of the cost of concrete solutions.⁹ These living shorelines projects, which last longer and require fewer repairs, [average \\$361 per foot](#), approximately one-third the cost of concrete bulkheads at \$1,022 per foot. The upfront savings are significant, but the long-term economic benefits extend far beyond. For example, [every dollar spent on wetland restoration yields seven dollars in flood protection](#).¹⁰ And some projects may even pay for themselves, like the upcoming [Kohfeldt Marsh](#) in Texas City, which aims to offset its \$1 million cost through carbon credits from restored wetlands.¹¹

TERMINOLOGY AT A GLANCE

Different audiences use different terms to describe nature-based approaches. In this report, we use nature-based solutions (NBS) - *actions that protect, restore, or manage ecosystems to address societal challenges while benefiting people and biodiversity* - as the overarching term that includes the related concepts below:

Natural Infrastructure

Existing natural systems (e.g., wetlands, forests, floodplains) that function like infrastructure.

Green Infrastructure

Primarily urban or built applications of NBS (e.g., rain gardens, green roofs, permeable pavement) for stormwater management.

Natural and Nature-Based Features (NNBF)

Engineering term used by the U.S. Army Corps of Engineers for natural or nature-mimicking hazard-mitigation features.

Ecosystem-Based Adaptation / Natural Climate Solutions

Specialized subsets of NBS focused on climate adaptation or climate mitigation and carbon benefits respectively.

Source: Terminology summarized and adapted from Pathak et al. (2022), Incorporating Nature-based Solutions into Community Climate Adaptation Planning, National Wildlife Federation & EcoAdapt.

Nature-based solutions are not solely environmental initiatives; they are intrinsically linked to Texas's economic vitality, its cultural heritage, and the sustainable management of its natural resources. Implementing NBS can generate significant economic co-benefits and create synergies between conservation and development goals. Healthy ecosystems underpin agriculture through services like pollination and soil formation, while improved water quality and quantity benefit multiple industries. Coastal NBS like reef and wetland restoration protect valuable infrastructure and support commercial and recreational fisheries and tourism.¹² Nature-based solutions support outdoor recreation, tourism, and local economies by maintaining access to beaches, bays, rivers, trails, and parks that Texans value deeply. Enhanced forests, prairies, and parks boost recreational opportunities and associated spending, contributing to local economies. Furthermore, the design, implementation, and maintenance of NBS projects create jobs in fields like ecological restoration, landscape architecture, engineering, and monitoring.¹³

Coastal near-shore wetlands serve as important nurseries for fish, crab, and other shellfish. The total economic impact of commercial fishing at the wholesale level is more than \$400 million annually, employing about 30,000 coastal residents, all dependent on the wetlands! The total economic impact of saltwater sport fishing in Texas is almost \$2 billion annually, employing about 25,000 coastal residents. In addition to fishing, hunting and bird-watching are also economically important. Wildlife watching is the fastest growing segment of the tourism industry. In 1996, 3.8 million U.S. residents spent \$1.2 billion watching wildlife in Texas.¹⁴

Research on Galveston Bay estimated the annual value of ecosystem services from salt marshes at approximately \$268 million and mangroves at \$120 million per year. Wetlands in the Greater Houston–Galveston region have been valued at roughly \$124 million per year for water quality improvement, reflecting the role of natural systems in filtering pollutants and supporting healthy communities. Commercial fisheries harvests in the Galveston Bay system have been valued between about \$6 million and \$27 million per year (with broader economic output of roughly \$77 million) in past analyses, supporting jobs and livelihoods. Recreational use of the bay, particularly sport fishing, has had estimated impacts of over \$170 million, with boating, swimming, and other activities contributing additional economic value. The climate regulation service (carbon sequestration) of Galveston Bay salt marshes alone was valued at roughly \$9 million per year (in 2017 dollars).¹⁵

By quantifying the economic benefits of water supply, drought resilience, clean water, flood mitigation and recreational access that can be provided by NBS, Texas can make a stronger business case for investing in its natural capital as a core component of its economic development and resource management strategy.

1.2

Why Equity Matters in Nature-Based Solutions

The success of NBS, like all adaptation strategies, hinges on equitable planning and implementation. Historically marginalized communities - those most vulnerable to flooding, pollution, and heat - must be prioritized in the planning, funding, and benefit distribution of NBS projects. Equity is not an optional add-on but an imperative for long-term social resilience and environmental sustainability. Three key dimensions of equity to center in planning and implementing NBS include:

Procedural Equity: ensuring meaningful participation from impacted communities;

Distributional Equity: directing resources where need is greatest;

Recognition Equity: honoring community knowledge, history, and priorities.

Equity in NBS means addressing all three of these dimensions: making sure benefits are shared broadly, the process empowers communities, and projects honor local identities and needs. Equitable NBS offer a real opportunity to help communities bridge differences, grow the conservation movement, and train up a next generation of practitioners and leaders in Texas. They do this when project proponents and planners work with communities as partners: learning from local knowledge, sharing decision-making, and building long-term capacity rather than designing projects from the outside. This approach can help repair some of the harm historically attributed to traditional conservation efforts lacking community involvement, strengthen project outcomes, and make conservation more relevant to everyday concerns like flooding, heat, health, and livelihoods. When people see how conservation improves their daily lives, they are more likely to support and participate in it.

This report is a practical guide to advance NBS in Texas. It's built for practitioners, policymakers, community leaders, and anyone working to create a safer, healthier, and more resilient Texas. The report synthesizes best practices, funding opportunities, implementation strategies, and case studies, found primarily in Texas, that showcase accessible and innovative approaches to working with communities to pursue NBS.

WAYS CONSERVATION PRACTITIONERS ARE SUPPORTING EQUITY IN NBS



The National Wildlife Federation supports NBS when pursued in alignment with equity principles and best practices. Conservation practitioners at the Federation and various other organizations are already advocating for equitable planning and projects through multiple avenues. Some examples include:

Inclusive decision-making: Promoting involvement and representation in the planning and decision-making processes related to NBS, addressing the needs and concerns of these communities.

Financial resources: Identifying and promoting access to funding for nature-based projects to marginalized and underserved communities at the federal, state and local levels.

Knowledge and capacity building: Providing education, targeted outreach, access to information and training opportunities to marginalized groups.

Language and communication support: Communicating about NBS in multiple languages and formats to make it accessible to all members of the community, particularly those who speak indigenous or minority languages.

Advocacy for policy change: Pushing for the development and implementation of legal and policy frameworks that promote environmental justice and equity in NBS planning and decision-making.

Inclusive policies: Advocating for inclusive planning processes, regulations to prevent environmental harm, and enforcement mechanisms to ensure accountability and transparency.



View of the Margaret Hunt Hill Bridge over the Trinity River in Dallas. The floodway beneath the bridge is being developed into a park and nature preserve.

2 BEST PRACTICES FOR EMBEDDING EQUITY IN NATURE-BASED SOLUTIONS

As with environmental and economic co-benefits, NBS can help address inequities through a multi-faceted approach that prioritizes inclusivity and community engagement. A portfolio of past projects proves that without careful planning, well-meaning NBS projects can in fact perpetuate historical injustices, displace residents through “green gentrification,” or distribute benefits unfairly, particularly disadvantaging low-income communities and communities of color who often face the greatest environmental risks. *(See Appendix for a detailed discussion of challenges).*

This section presents a set of best practices collected across multiple readily available academic and lesser-known “gray literature” sources including government reports and nonprofit publications that are often more difficult to access. These could assist practitioners, planners, engineers, developers, policymakers, and community leaders in enhancing equitable engagements across all NBS project phases, from planning to implementation. Many of these practices are intuitive but are often not considered by those leading stakeholder engagement processes and planning.

2.1

Addressing Historical Injustices

RECOGNITIONAL EQUITY

- Recognize Historical Injustices:** Prior to implementing an NBS project, acknowledging and addressing historical injustices, such as land dispossession and environmental racism, is the first step towards fostering trust and collaboration. Stemming from historical disenfranchisement and a lack of pre-existing protections, NBS might be an unattractive choice for marginalized communities who may prioritize solutions perceived as more reliable and proven, such as concrete infrastructure. Before proposing NBS, practitioners should openly acknowledge such histories and their lasting impacts. This might involve listening sessions where residents share experiences of neglect or harm, and incorporating that understanding into project goals.
- Build Trust Through Transparency and Repair:** A community that has faced decades of flooding or pollution without relief will understandably be skeptical of promises. Trust-building is critical. Project leaders should engage in honest dialogue about how NBS can help and where they have limits. Where appropriate, efforts to remedy past harms should accompany NBS projects – for instance, pairing a wetland restoration with job training for local residents, or ensuring a flood protection park is paired with policies to prevent displacement of low-income residents. In cases of Indigenous communities, this may mean advocating for land rights or co-management agreements as part of the project. Demonstrating a commitment to both acknowledge and address historical injustices can turn skepticism into cautious optimism and lay the groundwork for genuine partnership.

Case Study:

A Greener Gulfton - A Community Action Plan for Improved Health, Climate Resilience, and Biodiversity

For the last several years, the Gulfton community in Houston has been working with a team of primarily locally-based consultants including The Nature Conservancy of Texas, to develop meaningful relationships and a vision of resilience for the community. Understanding and articulating past injustices in Gulfton have been key to shaping the group's effort and the resulting community action plan, and the "Understanding Phase" was named as their first step in their broader process. Only after the Understanding Phase, did the group, led by different committees, move into subsequent phases of "Envision and Act", which included pilot projects. The resulting plan not only includes NBS, but it also includes approaches focused on mobility, community capacity, and more.

Source: The Nature Conservancy. 2022. *Greener Gulfton Community Summary: For Improved Health, Climate Resilience, and Biodiversity*. https://www.nature.org/content/dam/tnc/nature/en/documents/Greener_Gulfton_Community_Summary_English.pdf



2.2

Recognizing and Preserving Cultural Significance

RECOGNITION EQUITY, PROCEDURAL EQUITY

- **Recognize and Preserve Cultural Heritage:** In the same vein as addressing historical injustices, conservation professionals must recognize and respect the cultural and spiritual significance of landscapes to Indigenous and other historically marginalized communities that have historically been displaced by some conservation and restoration efforts. In protected areas, actions such as respecting, preserving, and ensuring continued Indigenous access to sacred sites within parks, setting and achieving inclusive hiring goals, offering culturally relevant programming, including materials in Indigenous languages shared by Indigenous Peoples, can be some ways to strengthen community connections to the land and promote cultural resilience as part of an NBS project.¹⁶
- **Incorporate Indigenous Perspectives and Traditional Knowledge:** NBS implemented with the full engagement and free, prior, and informed consent of Indigenous Peoples and local communities in a way that respects their cultural and ecological heritage can foster a sense of rightful leadership, empowerment, and wellbeing of the local stewards, leading to successful initiatives with societal benefits.¹⁷ This can be accomplished by forging formal partnerships - through grant agreements, memorandums of understanding, or contracts - and co-designing projects with Indigenous stakeholders.
- **Protect Land Rights and Strengthen Legal Protections:** NBS must be based on the principle that safeguarding and strengthening the rights to access and benefit from land, water and other natural resources is critical for Indigenous Peoples.¹⁸ For other communities, such as low-income renters, migrant farmworkers, or descendants of freedmen, it means ensuring NBS investments do not contribute to displacement or "green gentrification." Conservation professionals should support policies and practices that protect both physical space and cultural lifeways, whether through zoning reforms, inclusive park design, land trusts, or community land ownership. Studies also suggest that NBS can play an emancipatory function by giving new rights and reparations to marginalized residents. Such projects can guarantee reproductive and/or productive functions and help secure economic resources and cultural practices for vulnerable groups.¹⁹

Case Study

Enhancing Cultural Resilience through Longleaf Pine Restoration Efforts

The longleaf pine tree is deeply entrenched in the Alabama-Coushatta Tribe's history and culture, which includes making handmade baskets from its needles. With increasing wildfires and policies focused on suppressing fires, over 95% of longleaf forests have been lost, risking losing tribal traditions and practices over time. In East Texas, the Alabama-Coushatta Tribe of Texas and The Nature Conservancy (TNC) of Texas have teamed up to save the longleaf pines by bringing back "good fire" through prescribed burning. Many Indigenous tribes have set small fires for centuries, and the approach is now being used across the country to curb wildfires and restore native grasslands. Through collaboration with TNC, the tribe has received crucial support in the form of funding, equipment, and training for their Wildland Fire Management crew. Additionally, support from entities such as the Bureau of Indian Affairs Southern Plains Region has further bolstered the Tribe's capacity to implement longleaf restoration initiatives on both tribal and collaborator lands.

With the mature longleaf available on tribal lands, members of the Tribe are able to continue their tradition of needle harvesting and basket weaving, passed down from generation-to-generation and preserving a piece of their history. By restoring natural fire regimes, this effort demonstrates how non-structural NBS like prescribed fire can strengthen ecosystem health, reduce wildfire risk, and support ecological, cultural, and community resilience.

Source: The Nature Conservancy. *Ensuring a Legacy of Longleaf*.

<https://www.nature.org/en-us/about-us/where-we-work/united-states/texas/stories-in-texas/alabama-coushatta-tribe-of-texas/#:~:text=The%20Alabama%2DCoushatta%20are%20stewards,100%20years%20of%20fire%20suppression.>



2.3

Recognizing and Engaging Community Expertise

PROCEDURAL EQUITY

- **Engage Community Expertise:** Community members are experts of their own places, needs, and lived experiences. Local leaders and environmental professionals should center the extensive local knowledge of residents when developing projects. Supporting local residents to exercise choice and make decisions²⁰ is crucial to designing NBS projects that address the needs and concerns of disproportionately vulnerable groups. Meaningful engagement also requires professionals to provide accessible information on trade-offs and opportunities for public input and feedback, thus ensuring a level of transparency. Additionally, involving communities in every step of the process (from design to implementation and evaluation) will foster a culture of solidarity and collective responsibility to address environmental challenges.
- **Support Communities:** Marginalized communities should be true partners, not only engaged subjects or stakeholders. This means equipping communities with opportunities for active participation and agency in decision-making, ensuring that community perspectives are valued. Project managers should also consider compensating community members and experts for their time on the projects. This compensation does not have to be limited to cash payments; it could include a wide range of actions in the form of capacity building, training, local procurements, etc.

Case Study

Equity Informed Climate Resilience Plan in Port Arthur, Texas

In 2024, the Houston Advanced Research Center and the Community In-Power and Development Association released the Equity-Informed Climate Resilience Plan for Port Arthur. Funded by the National Academies Gulf Research Program, the plan was developed through deep community engagement, including door-to-door surveys and public meetings. It focuses on health and social vulnerability in a historically marginalized, predominantly African American city influenced by the petroleum industry and systemic racial injustice. The plan combines community input with data analysis to guide disaster preparedness, infrastructure planning, and climate resilience. Recommendations include strengthening equitable emergency response systems, improving coordination among government agencies, prioritizing NBS, accounting for 500-year flood zones, and integrating climate projections into development decisions. The plan reflects the cultural richness and strength of Port Arthur's diverse residents.



Source: Houston Advanced Research Center (HARC) and Community In-Power and Development Association. 2024. *Equity-Informed Climate Resilience Plan for Port Arthur, Texas*. <https://harcresearch.org/wp-content/uploads/2024/03/EQUIP-PA-Full-Report.pdf>

“Rain to River” Plan to Protect Waterways, Communities and Address Climate Injustice in Austin, Texas

In 2022, Austin's Watershed Protection Department launched a process to overhaul its current strategic plan to address the contemporary challenges like climate change, population growth, and racial inequities. The Department started with a robust listening phase, where the city dedicated extra time and resources to hearing from residents who have been left out of past planning processes. Outreach strategies included hiring ambassadors from within the neighborhoods they served to gather stories from racially and economically diverse communities, awarding \$5,000 grants to organizations that can help increase engagement, and reaching out to community leaders and stakeholder groups to make new connections. Building on this foundation, in 2024, the city launched a Community Activation Group (CAG) to guide the next phase of the planning process. The CAG includes diverse leaders in environment, health, and disaster resilience, ensuring community voices remain central throughout the process. In 2025, the Department launched a second community survey, *Your Voice, Shaping Our Priorities*, to better understand residents' values and priorities when faced with difficult decisions and limited resources. Community feedback revealed strong support for NBS, including green infrastructure and watershed restoration, as approaches that can reduce flooding and heat while improving neighborhood health and access to green space. The Rain to River plan is expected to be completed and brought to Austin City Council for adoption in Spring 2026. Before adoption, the Department will conduct a final phase of outreach to familiarize community members and stakeholders with the draft plan. The Department intends to continue working closely with residents and partners to implement the Rain to River plan they helped create, supporting long-term stewardship and community-driven climate resilience.

Source: City of Austin Watershed Protection Department. *Rain to River: A Strategic Plan to Protect Austin's Creeks and Communities*. <https://raintoriveratx-austin.hub.arcgis.com/>



- **Foster Multi-Sectoral Collaboration:** Foster partnerships between academic institutions, government agencies, and community-based organizations to facilitate knowledge sharing and skill development within marginalized communities. In Houston, the Brownfields Strategic Plan involves collaboration between city officials, community activists, academic researchers, and local residents to address issues related to gentrification and environmental justice.²¹ Working across disciplines also brings in multiple and diverse knowledge systems (such as Western and Indigenous) which are vital to the development of equitable NBS.
- **Facilitate Community-Driven Partnerships:** It is crucial to enable collaborative approaches that involve communities in decision-making processes. The Community-Science Partnership to Enhance Stormwater Management and Equity project in Dallas is an example where residents co-design green infrastructure interventions with Texas A&M AgriLife and the University of North Texas. Such approaches will build trust, share knowledge, mobilize collective action, forge new networks, and develop transdisciplinary, inclusive partnerships and governance approaches.

Case Study:

RiverSmart Homes Rain Gardens, Washington, DC Department of Energy and Environment

DC's RiverSmart Homes program started in 2008, and offers assistance to residents to install up to two small, cost-effective rain gardens per property, each approximately 50 sq. ft. in size and about \$100 in costs, in addition to green roofs, permeable pavers, and other green infrastructure. The program is a public-private partnership that implements small-scale projects with onsite benefits that collectively results in large-scale reduction in harmful stormwater runoff into DC's waterways and the Chesapeake Bay. Residents who are interested in the RiverSmart Homes program first fill out an interest form; they then work with a program auditor and landscaper to develop an onsite plan. Homeowners are responsible for a \$100 copay, and after installation by the program landscaper, they receive additional assistance to maintain the rain garden. The City of D.C. can then issue rebates to the resident as a direct reimbursement, at a rate of \$3 per sq. ft. of garden— up to \$2,200. The rebate program is administered by the Alliance for the Chesapeake Bay, a local nonprofit organization. RiverSmart Homes has installed over 20,000 green features, including 1,639 rain gardens, on residential properties since 2008, which totals more than 2.7 million gallons of treated stormwater.

Source: *Department of Energy and Environment (DOEE). RiverSmart Homes Program.*
<https://www.riversmarthomes.org/about>

Urban Heat Island Mapping in Dallas, Texas

In 2023, the city of Dallas collaborated with the National Oceanic and Atmospheric Administration and 18 other communities to collect data on the ground to map where people are most at risk during extreme heat. The objectives of the study were to identify these areas of the city, develop high resolution maps of air temperature and heat index, and ultimately better understand and address the risks from extreme heat. About 70 community volunteers collected ambient temperature and humidity data by mounting sensors onto their vehicles as they drove across the city. Volunteers included City of Dallas staff, Dallas Environmental Commissioners, recent high school and college graduates, UT Southwestern Sustainability Committee members, Texas Trees Foundation representatives, retirees, and others. Through this process,



... **CASE STUDY CONTINUED** partnerships emerged between local stakeholders like residents, municipal staff, health officials, emergency responders, researchers, and non-profit organizations where the participants learned about the Urban Heat Island effect in their area and raised awareness of the issue through training, discussions, and media coverage. The study revealed that the Medical District, West Dallas, and Bishop Arts in Oak Cliff - areas that have historically experienced environmental injustice - have the highest temperatures.

Source: City of Dallas Office of Environmental Quality and Sustainability. *Urban Heat Island Study*.
<https://www.dallasclimateaction.com/urbanheatislandstudy>

2.5

Capacity Building for Local Institutions

DISTRUBTIONAL EQUITY

- **Empower Local Institutions:** NGOs and local leaders should invest in capacity-building programs for local institutions, including community-based organizations and grassroots initiatives, to effectively engage in NBS planning, implementation, and management. Local community organizations can also represent the values and needs of marginalized communities more closely as they partner with outside organizations to bring much-needed resources to the community.
- **Provide Technical Assistance:** Agencies and organizations should offer technical assistance, training programs, and resources to strengthen the organizational and leadership skills of local stakeholders. This can be done by passing-through funds, helping craft grant applications, and sharing resources to support capacity-limited local organizations.
- **Youth Leadership Development:** Encourage programs that engage youth and young professionals from the community in NBS initiatives – internships, training programs, and school-based projects. This not only builds immediate capacity (through added team members and fresh ideas) but also cultivates the next generation of local environmental leaders, creating a pipeline of talent to sustain and strengthen NBS efforts.

Case Study:

Supporting Environmentally Healthy Communities through Grassroots Initiatives

The Houston-based organization Texas Environmental Justice Advocacy Services (TEJAS) is working in the low-income Manchester neighborhood to address flooding and pollution concerns. Residents are predominantly Hispanic and Latino, living within walking distance of the Houston Ship Channel's chemical plants. TEJAS is installing rain gardens, bioswales, and other green infrastructure features to capture stormwater, reduce runoff, and improve water quality. TEJAS works closely with residents of Manchester to build their capacity to advocate for their needs through community meetings, workshops, and leadership development programs. The organization also provides technical support, advocacy, and community outreach to ensure that their projects meet the needs and priorities of Manchester residents and contribute to building community resilience. TEJAS' partnership with Furr High School led to a number of green initiatives throughout Houston and made Furr High School the first environmental justice school in the nation.

Source: ABC13 Houston. 2022. *Earth Day 2022: How T.E.J.A.S. is fighting for environmental justice in Houston neighborhood*.
<https://abc13.com/tejas-texas-environmental-justice-advocacy-services-equity-juan-parras/11779398/>



3 IMPLEMENTING EQUITABLE NATURE-BASED SOLUTIONS IN TEXAS

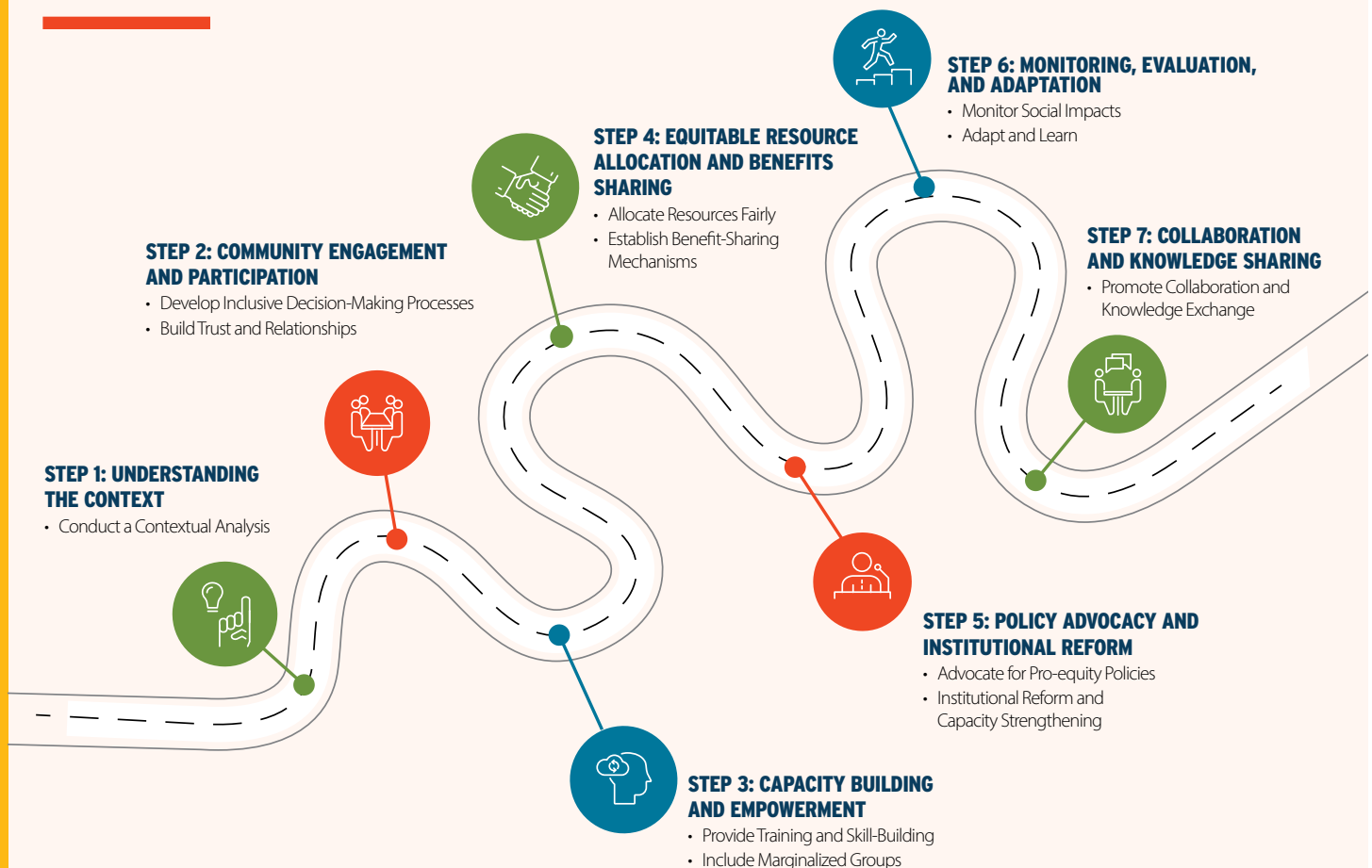
Translating the potential of equitable NBS into widespread practice requires a clear roadmap for action. This section provides strategic guidance for practitioners, addresses the realities of the Texas political and funding landscape, and offers policy recommendations.

3.1

A Roadmap for Equitable Implementation of Nature-Based Solutions

This section provides high-level guidance on actionable steps for practitioners including planners, engineers, conservation professionals, developers, policymakers, and community leaders to integrate equity into NBS planning and implementation. It synthesizes the best practices and gaps discussed above into a sequence of steps that can guide project planning and implementation.

THE ROADMAP AT GLANCE





STEP 1: UNDERSTANDING THE CONTEXT

Conduct a Contextual Analysis:

- Identify communities and groups most affected by past conservation and land-use interventions.
- Analyze historical injustices, power dynamics, and social inequities within the target area.
- Explore NBS or interventions that are tailored to the specific needs, vulnerabilities, and cultural contexts of different communities. Assess community needs comprehensively, considering factors such as socio-economic status, ethnicity, age, and disability, to inform the design and implementation of NBS projects.
- Example: Conducting community surveys, vulnerability assessments, focus group discussions, and participatory mapping exercises to identify marginalized communities and understand their socio-economic context.



STEP 2: COMMUNITY ENGAGEMENT AND SHARED DECISION-MAKING

Develop Inclusive Decision-Making Processes:

- Establish mechanisms for meaningful participation of marginalized groups in planning and decision-making.
- Conduct community consultations and engage in dialogue to understand local perspectives and priorities.
- Example: Establishing community advisory boards or councils composed of diverse stakeholders to provide input and guidance on NBS.

Build Trust and Relationships:

- Foster trust and partnerships with local communities, Indigenous groups, and other stakeholders.
- Respect traditional knowledge systems and cultural practices.
- Example: Organizing cultural exchange events or community celebrations to build rapport and strengthen relationships with local communities.



STEP 3: CAPACITY BUILDING AND EMPOWERMENT

Provide Training and Skill-Building:

- Offer capacity building workshops on sustainable resource management, entrepreneurship, and leadership.
- Support the development of local enterprises and community-led initiatives.
- Example: Offering training workshops on federal, state, regional, and local funding opportunities and NBS design guidelines to empower local communities economically.

Include Marginalized Groups:

- Promote equity and social inclusion by supporting Indigenous people, marginalized communities and other socially vulnerable groups such as minorities, women, and youth.
- Expand access to funding, technical assistance, and implementation resources.
- Example: Implementing Indigenous-led programs that provide them access to land tenure, financial resources, and leadership opportunities in decision-making.



STEP 4: EQUITABLE RESOURCE ALLOCATION AND BENEFITS SHARING

Allocate Resources Fairly:

- Support fair, community-defined opportunities to benefit from land, water, and other natural resources through NBS, while respecting Indigenous sovereignty and existing land rights.
- Implement policies and mechanisms to prevent land grabbing and ensure land rights for Indigenous peoples and local communities.
- Example: Implementing community forestry and other conservation programs with support for title clearing

services for owners of heirs property - land that is passed down informally generation-to-generation without a legally recognized will or estate plan; the leading cause of involuntary land loss amongst Black landowners in the U.S. (source: [whatneedtoknow_heirprop.pdf](#))

Establish Benefit-Sharing Mechanisms:

- Develop revenue-sharing agreements and community benefit schemes to ensure that the benefits derived from NBS are equitably distributed.
- Create opportunities for local economic development and livelihood enhancement.
- *Example: Creating community-managed funds financed by revenue generated from activities such as ecotourism, with profits shared among local communities for development projects.*



STEP 5: POLICY ADVOCACY AND INSTITUTIONAL REFORM

Advocate for Pro-equity Policies:

- Advocate for policies and legal frameworks that promote social justice, equity, and inclusion in NBS efforts.
- Advocate for the recognition of Indigenous land rights* and the inclusion of marginalized communities in decision-making processes.
- *Example: Promoting the inclusion of marginalized voices in national conservation policies and advocating for the formal recognition of Indigenous land rights.*
- **Note: Non-Indigenous groups should not advocate for Indigenous rights or land recognition without the explicit consent, leadership, and direction of the relevant Indigenous community.*

Institutional Reform and Capacity Strengthening:

- Strengthen institutional capacity within government agencies and non-profit organizations to address equity issues effectively.
- Promote transparency, accountability, and good governance in NBS initiatives.
- *Example: Implementing diversity and inclusion training programs within organizations alongside updates to hiring practices, project review processes, and community engagement protocols, to promote cultural sensitivity and responsiveness.*



STEP 6: MONITORING, EVALUATION, AND ADAPTATION

Monitor Social Impacts:

- Implement robust monitoring and evaluation systems to assess the social impacts of NBS.
- Collect disaggregated data to track progress on equity goals and identify areas for improvement.
- Track indicators such as community participation, benefit distribution, workforce involvement, and access to project outcomes to assess equity over time.
- *Example: Conducting periodic social impact assessments to evaluate the distribution of benefits and the extent to which NBS initiatives are reaching marginalized communities.*

Adapt and Learn:

- Use monitoring data and feedback from communities to adapt and refine conservation and restoration goals and strategies.
- Foster a culture of learning and continuous improvement within organizations and agencies.
- *Example: Hosting community feedback sessions to gather input on the effectiveness of programs and adjusting strategies based on community needs and preferences.*



STEP 7: COLLABORATION AND KNOWLEDGE SHARING

Promote Collaboration and Knowledge Exchange:

- Facilitate collaboration and knowledge sharing among practitioners, researchers, and policymakers.
- Share best practices, lessons learned, and success stories to inspire and inform equitable action.
- *Example: Facilitating peer-to-peer learning exchanges between practitioners working in different regions to share successful approaches and lessons learned in promoting equity.*



◀ Ship Channel
in Port
Arthur, Texas

3.2

Navigating the Texas Political and Funding Landscape

Advancing NBS in Texas requires acknowledging and strategically navigating the state's unique political climate and funding realities, and framing NBS benefits in terms that resonate across the political spectrum can be more effective. Emphasizing tangible, localized advantages such as:

- **Flood and Drought Resilience:** Protecting homes, businesses, and infrastructure from costly disasters.
- **Extreme Heat Reduction:** Lowering urban temperatures, improving public health, and reducing energy demand through shade, vegetation, and cooling landscapes.
- **Economic Development:** Creating jobs, boosting tourism and recreation, and enhancing property values.
- **Cost Savings:** Highlighting the potential for NBS to be less expensive than traditional infrastructure over the long term, reducing taxpayer burden.
- **Water Security and Quality:** Protecting and conserving water supplies for communities, agriculture, and industry, while promoting responsible water use, pollution prevention, and conservation practices that safeguard long-term water availability and quality.
- **Wildlife Benefits:** Maintaining habitat to support wildlife helps to avoid the potential for costly restrictions to land and water resources due to species being listed under the Endangered Species Act.
- **Local Workforce Development and Stewardship:** Investing in workforce development and community-based partnerships to ensure NBS are maintained over time, creating local jobs, building local capacity, and strengthening long-term project success.

Overcoming funding constraints requires demonstrating value and diversifying funding streams. Strategies include:

- **Quantifying Benefits:** Using ecosystem service valuation and benefit-cost analyses to demonstrate strong returns on investment.²²
- **Stacking Benefits:** Designing projects with multiple co-benefits to appeal to a wider range of funders with different missions (e.g., flood control, habitat, water quality, recreation).²³
- **Exploring Innovative Finance:** Investigating blended finance models, public-private partnerships, environmental impact bonds, or payments for ecosystem services where appropriate, although these may require significant capacity building.²⁴
- **Highlighting Job Creation:** Emphasizing the local jobs supported by NBS projects.

In recent years, Texas has taken significant steps forward to elevate the role of NBS. The Legislature's approval and subsequent overwhelming voter support of the \$1 billion Centennial Parks Conservation Fund in 2023 signals public support for conservation investment.²⁵ The establishment of the state-funded Flood Infrastructure Fund as a response to Hurricane Harvey provides a significant source of financing specifically for flood mitigation, explicitly including NBS as eligible activities.²⁶ Successfully navigating this landscape involves strategic communication that aligns NBS benefits with existing state priorities and demonstrates tangible value to Texas communities and taxpayers.

To accelerate the adoption of equitable NBS, targeted policy actions at both the state and local levels are needed:

State Level:

- **Funding Prioritization:** State agencies such as the Texas Water Development Board (TWDB), General Land Office (GLO), Texas Parks and Wildlife Department (TPWD), and Texas Commission on Environmental Quality (TCEQ) should explicitly prioritize nature-based solutions (NBS) within relevant grant programs they administer, such as the Flood Infrastructure Fund (FIF), Coastal Management Program (CMP), and State Wildlife Grants (SWG), particularly when projects demonstrate cost-effectiveness, multiple benefits, and strong equity components.
- **Technical Assistance:** Increase state-level technical assistance and guidance for communities seeking to implement NBS, building on efforts like TWDB's upcoming NBS guidance manual and the San Antonio River Authority's (SARA) Low Impact Development (LID) resources.^{27 28}
- **Streamlined Permitting:** Evaluate and potentially streamline permitting processes for common, low-impact NBS practices (e.g., living shorelines, small-scale bioretention) while maintaining environmental safeguards. GLO's simplified 5-step permitting pathway for living shorelines offers a useful model that could be expanded or replicated across other agencies and practices.
- **Integrate into State Plans and Strengthen Coordination:** Ensure NBS are fully integrated into statewide planning documents, including the State Flood Plan, State Water Plan, State Hazard Mitigation Plan, Coastal Resiliency Master Plan, and transportation plans. Strengthen coordination across regional flood and water planning groups, and other planning bodies to better align priorities, share data, and capitalize on the multiple benefits that NBS can deliver across water supply, flood mitigation, ecosystem health, and community resilience.
- **Update Guidance and Standards:** Incorporate NBS best practices into state guidance for infrastructure development, building codes, and land use planning.
- **Incentives for NBS Adoption:** Embed clear incentives within existing state programs, where feasible, and help shift them to prioritized strategies across state planning and funding decisions. Examples include awarding significant additional application points for projects that incorporate NBS, expanding co-benefits (flood mitigation, habitat, heat reduction), demonstrating strong community engagement to prioritize nature-based approaches; and elevating social and economic co-benefits such as workforce development and public health within project evaluation frameworks.

Local Level

- **Adopt Supportive Ordinances:** Municipalities and counties should adopt or update ordinances to incentivize or require LID, green infrastructure, riparian buffer protection, and open space conservation. Tools such as Florida's local ordinance audit ([Code Audit Spreadsheet Tool or CAST](#)) for NBS offers a useful model that could be adapted for Texas communities to assess and strengthen local policy readiness.
- **Integrate into Local Plans:** Embed NBS strategies within local comprehensive plans, hazard mitigation plans, capital improvement programs, park master plans, regional planning efforts, and municipal and regional transportation projects.
- **Establish Local Funding:** Explore dedicated local funding mechanisms for NBS, such as stormwater utility fees or local bonds. Partner with community-based organizations to co-design funding strategies that align project scale, community benefits, and long-term stewardship goals.
- **Lead by Example:** Implement NBS on public properties (parks, municipal buildings, schoolyards, rights-of-way) to demonstrate feasibility and benefits and normalize NBS in the community.

Securing funding is often a primary hurdle for implementing NBS projects. Fortunately, several Texas state agencies administer grant and loan programs that can potentially support various types of NBS initiatives. Navigating this diverse funding landscape can be challenging. As federal funding is cyclical, competitive, and often limited to specific programs or project phases, it is increasingly important for Texas to develop and sustain robust state-level funding pathways. The table below summarizes key state programs relevant to NBS.

KEY TEXAS STATE FUNDING PROGRAMS FOR NATURE-BASED SOLUTIONS

Agency	Program Name	Primary NBS Relevance	Eligible NBS Activities Highlights	Key Eligibility (Entity Type)
GLO	Coastal Management Program (CMP) Grants	Coastal Resilience, Habitat Restoration, Water Quality	Habitat restoration (wetlands, dunes), green infrastructure, living shorelines	Local gov, state agencies, NGOs
GLO	Coastal Erosion Planning & Response (CEPRA)	Coastal Erosion Control, Habitat Restoration	Beach/dune restoration, living shorelines, beneficial use	Public or private entities
GLO	CDBG-MIT Coastal Resiliency Program	Coastal Resilience, Flood Mitigation	Green/gray infrastructure from TCRMP (wetland/reef restoration, stormwater improvements)	Cities, counties, districts, NGOs, state agencies
TWDB	Flood Infrastructure Fund (FIF)	Flood Mitigation, Watershed Health	Green infrastructure, riparian/wetland/floodplain restoration, living shorelines	Political subdivisions
TWDB	FEMA FMA Grant	Flood Mitigation (Repetitive Loss focus)	Primarily structure mitigation; potentially minor NBS if cost-effective & meeting FMA goals	Political subdivisions (NFIP participating)
TWDB	Clean Water State Revolving Fund (CWSRF)	Water Quality, Stormwater Management, Estuary Management	Green infrastructure, wetland/riparian restoration (under Green Project Reserve)	Cities, counties, districts, river authorities
TPWD	State Wildlife Grants (SWG)	Habitat Restoration, Wildlife Conservation (SGCN focus)	Habitat restoration/management for SGCN	IHEs, gov agencies (non-DOI), NGOs [501(c)(3)]
TPWD	Section 6 Grants (CESCF)	Habitat Restoration, Land Acquisition (Listed Species)	Habitat restoration/acquisition for federally listed/candidate species	TPWD applies; partners implement
TCEQ	Nonpoint Source (NPS) Grant Program (319h)	Water Quality (NPS reduction), Watershed Implementation	Green infrastructure, stream restoration, wetland restoration, education	State/local gov, regional authorities, IHEs, NGOs

4 CONCLUSION AND NEXT STEPS

The journey toward advancing effective and equitable NBS in Texas demands bold leadership, inclusive processes, and sustained commitment from practitioners, policymakers, funders, and communities alike. As the state grapples with intensifying climate impacts, rapid development, and rising disaster costs, it is increasingly clear that traditional, engineered responses alone are insufficient. NBS offer a proactive, cost-effective, and adaptive alternative, grounded in the protective benefits of natural systems, the recreational and quality of life value they provide, and the lived experience of local communities. Centering equity in NBS implementation is not just a moral imperative; it is essential for achieving long-term environmental and social resilience. That means recognizing past harms, honoring cultural identities, recognizing community expertise, and ensuring inclusive participation from the outset.

The insights, best practices, and examples presented throughout this report illustrate how practitioners across Texas are already working with stakeholders and residents to transform landscapes and communities. Leveraging these success stories can bring more supporters and practitioners to the table and help bring NBS to scale.

The path toward a more resilient and equitable Texas, fortified by nature, requires concerted action from all stakeholders:

- **Practitioners (Planners, NGOs, Local Governments, Community Leaders):** Utilize the best practices, roadmap strategies, and funding information presented in this report to initiate, design, and implement effective and equitable NBS projects. Prioritize community engagement, context-specific design, multi-benefit approaches, and robust monitoring. Leverage existing state resources like ecological mapping data and planning frameworks.
- **Policymakers (State Legislature, State Agencies):** Create an enabling policy and funding environment for equitable NBS. This includes explicitly prioritizing NBS in relevant grant programs (FIF, CMP, etc.), streamlining permitting where appropriate, investing in technical assistance for communities, integrating NBS into statewide plans and infrastructure guidance, and ensuring state funding mechanisms incorporate equity criteria.
- **Researchers and Academic Institutions:** Continue to advance the science and understanding of NBS performance, cost-effectiveness, and long-term resilience within the diverse Texas context. Develop and refine monitoring protocols and valuation methodologies. Partner with practitioners and communities to support evidence-based decision-making and adaptive management.
- **Funders (Public and Private):** Recognize the multifaceted value of NBS and increase investment in these solutions and the stakeholders working to advance them. Explore innovative financing mechanisms like blended finance and support projects that demonstrate strong ecological, economic, social, and equity outcomes. Prioritize long-term monitoring to build the evidence base.
- **Community Members:** Champion NBS initiatives within local communities. Participate actively in planning processes to ensure projects reflect local needs and values. Engage in stewardship activities to support the long-term success of implemented projects. Advocate for policies that support investment in natural infrastructure.
- **Communicators (Media, Storytellers, Outreach Professionals, Educators):** Translate NBS benefits into clear, compelling, and culturally relevant stories that resonate with diverse audiences. Elevate community voices, highlight local successes, and help build public understanding and support for equitable NBS.

By embracing NBS as integral components of its infrastructure and development strategy, and by ensuring these solutions are implemented equitably, Texas can unlock the full potential of its landscapes and people.



▶ Mueller Lake Park located in the Mueller Development in East Austin

▶ APPENDIX. CHALLENGES TO EQUITABLE NATURE-BASED SOLUTIONS

A core tenet of the environmental justice movement is that we must recognize that not all communities experience environmental risks, harms, or benefits equally. For example, communities of color and lower-income communities are more likely to live in proximity to polluting facilities.²⁹ These communities often bear the vulnerability to and brunt of climate change impacts, yet they may also have limited access to resources for building resilience, especially through nature-based solutions. Additionally, historic disinvestment has led to deteriorating or inadequate infrastructure and depressed property values; at the same time, residents are often concerned that once amenities are built, they will be displaced through gentrification.

Several conservation groups, including the National Wildlife Federation, are working at different levels - from local to federal - to support nature-based solutions by advocating for policies that favor and incentivize such projects, building community capacity through education and outreach, and directing funding towards communities to plan and directly implement projects.

Sometimes, even well-intentioned efforts can fail to receive community buy-in.* A community's lack of acceptance can potentially stop an initiative altogether, lead to unsuccessful projects, or limit the benefits that they intend to provide. There are no one-size-fits-all approaches to hazard risk reduction and adaptation to climate change. This section raises some of the inequities that need to be carefully considered and evaluated on a community-by-community basis *before entering a community to promote* nature-based solutions for risk reduction or advocating for them on a community's behalf.

*In 2017, the Trinity Park Conservancy in Dallas, Texas was established to oversee the design and implementation of the current Trinity River Corridor plan aimed at enhancing flood protection, recreation, environmental restoration, economic development, and major transportation components along the river's path. Led by a well-known local architect and urban planner, the plan places community engagement and participation at the heart of the process, even hiring a dedicated community engagement associate. While many locals spoke of their admiration for the new organization and its staff, they also expressed disinterest in the park itself. Some residents said that they felt the park was not for them; in other cases, they remained skeptical in keeping with the fate of past plans along the river. Source: How West Dallas Became "Somewhere", Except For Its Residents (bcnuej.org).

Climate vulnerability describes the degree to which natural, built, and human systems are at risk of exposure to climate change impacts. Vulnerable communities experience heightened risk and increased sensitivity to climate change impacts and have less capacity and fewer resources to cope with, adapt to, or recover from these impacts. These disproportionate effects are caused by physical (built and environmental), social, political, and/or economic factors, which are exacerbated by climate impacts. These factors include, but are not limited to, race, class, sexual orientation and identification, national origin, income inequality, and disability.

Source: Governor's Office of Planning and Research. 2018. Defining Vulnerable Communities in the Context of Climate Adaptation. Integrated Climate Adaptation and Resiliency Program.

https://lci.ca.gov/docs/20180723-Vulnerable_Communities.pdf

Historical Environmental Injustices

Natural infrastructure projects such as parks, forests, green roofs, stream restoration, and community gardens have historically benefited predominantly white and affluent communities.³⁰ Vulnerable communities, particularly those with a history of colonization, displacement, environmental injustice, or long-term lack of necessary infrastructure investments (“infrastructure disinvestment”), may have feelings of distrust towards government leaders who have historically concentrated environmental burdens in their neighborhoods, or excluded them from beneficial investments. In some cases, past experiences with universities conducting extractive research (“data mining”) or nonprofit organizations implementing short-term, disconnected interventions have further reinforced skepticism and fatigue toward outside-led initiatives. This distrust can extend to nature-based solutions, and some communities may view these projects as further impositions on their land and resources, or even as less protective alternatives to built infrastructure.

In Texas, we don't have to look far to find examples of communities with long histories of injustice described above. For example, the legacy of environmental racism and industrial pollution in places like Port Arthur, home to the largest oil refinery in North America, is known to have inflicted health disparities and environmental injustices - with higher rates of cancer compared to those in less polluted areas - on its predominantly low-income Black and Brown communities.³¹ The siting of petrochemical plants and oil refineries in Port Arthur has subjected residents to air pollution, causing disproportionate health risks and social and economic disparities. Similarly, in Houston's predominantly Black neighborhoods of Third Ward and Sunnyside, the legacies of discriminatory housing policies and environmental racism have left lasting scars.

Failure to address long-term and systemic inequities as a result of these past injustices in communities like Port Arthur and Houston's Third Ward can lead to missed or failed project opportunities, resulting in continued vulnerability to climate and non-climate challenges, and ultimately undermining the overall resilience of communities. In considering past and/or chronic injustices unique to each community, investing in and implementing nature-based solutions within these communities will require the intentional groundwork to first acknowledge and address these injustices rather than avoiding or working around them as though those issues have no connection to the success or failure of nature-based initiatives.

Risk of Displacement and Gentrification

Nature-based solutions when specifically implemented alongside other revitalization projects, can increase property values and accelerate real estate speculation in the surrounding neighborhoods. This in turn can lead to gentrification or *green gentrification*, forcing longtime residents out due to raised property taxes and increased costs of living.³² Gentrification is the process of changing the character of a neighborhood through the influx of more affluent residents and investment, and green gentrification, such as the building of large-scale green spaces in neighborhoods, can inadvertently push out residents from the surrounding areas as it increases property values.³³ For example, in Texas, according to a Rice University study, the revitalization of Houston's Buffalo Bayou Park, through the East Master Plan that aims to add 40 miles of new and improved trails and bikeways and 200 acres of parks and open spaces, has led to concerns about gentrification in nearby neighborhoods such as the historic Fifth Ward.³⁴

Gentrification often exacerbates inequity as many longtime residents, particularly those from marginalized communities, find themselves unable to afford the rising housing costs and are forced to relocate to more affordable areas further from the city center, sometimes into flood-prone or environmentally hazardous areas, increasing their vulnerability to future disasters. And while it can be slow moving, gentrification has sweeping impacts over time. For example, a 2020 study seeking to gain insight into how gentrification affected the Black community in East Austin, all study participants expressed decreased social connection stemming from displacement *over the last 20 years*.³⁵ Black Austinites expressed they haven't just been pushed out of their neighborhoods, they've been *pushed out of the city* and data confirms that Austin's Black population has indeed declined to less than 8% of the total population in the city, compared to approximately 10% in the year 2000.

Understanding a particular community's history of gentrification and long-term displacement patterns is important to truly knowing that community, and it is especially helpful when seeking to connect with older residents who have witnessed and experienced these changes firsthand. If there is a history of gentrification, especially green gentrification, then pitfalls and approaches to avoid must be understood to help inform updated approaches and alternative project ideas to be developed

with the community members themselves.

Inequitable Access and Distribution of Benefits

When planners or conservation professionals fail to employ inclusive design standards, socially vulnerable groups may be excluded from the benefits of greenspaces and other projects. Nature-based solutions may not always be accessible to all members of the community, particularly those with disabilities or limited mobility, which can lead to feelings of exclusion and outsidership.³⁶ Satellite imagery and data from NatureQuant (a platform that quantifies the health benefits of nature in a composite NatureScore) shows that white households, highly educated households, and high-income households are more likely to have proximity and access to the benefits of nature and natural resources.³⁷

While outside of Texas, a relevant and timely example that highlights these issues is occurring in East Boston, Massachusetts, where most new green infrastructure projects aim to protect newly constructed luxury housing and stop short of providing flood protection to older housing stock in working-class Latino and Italian neighborhoods.³⁸ As a result, despite a range of completed and pending green infrastructure projects in close proximity to the long-term residents of these East Boston neighborhoods, they have reported that not only do they not benefit from these projects, but they feel deeply socially and culturally excluded from these new green spaces.

*“Many civic groups in East Boston seem unsatisfied that green spaces in the neighborhood lack access points, are impacted by restrictive rules on park hours and conditions, and that new developments are creating a barrier for residents that live in the interior of the neighborhood and who cannot easily access the greened and climate-protected waterfront areas. A Harborkeepers activist (2019) complained about this difficult real access and the need to build greater ownership of new green spaces for working class groups: ‘you can look at the water and that’s it. **We’re asking for more than that. We’re asking for this coastal community to be allowed to be coastal, which means interacting with the water, which means learning about the environment, which means accessing any place**’.”³⁹ (pg. 13)*

Even when nature-based solutions are specifically planned in low-income and communities of color, the benefits derived from the project(s) such as improved air and water quality, enhanced biodiversity, or climate change mitigation, may not reach all members of a community equitably.

In a study of urban parks in 99 U.S. cities including three in Texas - Austin, Dallas, and Laredo - authors found that affluent, majority-white municipalities had higher quality park systems than those with larger concentrations of low-income ethnic minority people, and predominantly Latino municipalities.⁴⁰ Adding to this issue, depending on the particular community, the types of organizations leading projects and funding programs can influence project scale, quality, and long-term impact. For example, in Baltimore, Maryland, natural infrastructure projects in Black neighborhoods tended to be built by NGOs and community groups instead of local governments. The projects also tended to be limited to small-scale initiatives like rain gardens or micro-bioretenement facilities; as compared to the large-scale city-funded projects in neighboring communities.⁴¹

These examples again highlight the importance of understanding that there is no community or approach to nature-based solutions that can be considered one-size-fits-all, requiring careful consideration of each plan and project phase, partner, funding source, etc. to select the most appropriate project with a community and work towards its success.

Land Rights and Legal Injustices

Implementing nature-based solutions often requires land, which can lead to conflicts over land tenure and rights. Indigenous communities, in particular, have faced systemic barriers in asserting their rights to ancestral lands, leaving them vulnerable to displacement and environmental degradation without meaningful recourse or legal protections. The framing of nature-based solutions can be problematic to Indigenous communities and others who might view it as yet another ploy by outsiders to greenwash and commodify Indigenous lands.⁴²

At a national scale, the history of our national parks is riddled with unlawful takings from Indigenous Peoples, including



◀ Natural features such as oyster reefs in Galveston Bay protect homes and marshes from storm surge while providing habitat for many species of wildlife

Photo by Kaila Drayton for National Wildlife Federation

evictions and land-grabbing - in the name of protecting wildlife and preserving the environment. Researchers have even linked many of today's park access and equity problems, such as inequitable park availability and quality, as well as non-visitation of people of color to these structural injustices.⁴³ Locally, mandatory buyout programs,⁴⁴ floodplain restoration projects, and newly established protected areas, can negatively impact the identity and well-being of historically disenfranchised communities, particularly Indigenous and Black communities who have experienced generations of inequitable policy implementation that has placed restrictions on their livelihoods or limited their ability to maintain close relationships and engage in traditional practices.⁴⁵ Listening to community members describe programmatic missteps in efforts that have come before will help nature-based solutions proponents do better.

Present-day legal injustices, moreover, compound these challenges by failing to adequately protect the land rights and other legal protections of vulnerable populations. As discussed earlier in the section "Historical Environmental Injustices," communities of color and low-income neighborhoods often bear a disproportionate share of environmental hazards, such as pollution and toxic exposure, due to lax enforcement or regulatory loopholes.⁴⁶ The American legal system has historically made it difficult for impacted parties to gain standing to pursue legal action against a polluter, as confirmed by the U.S. Commission on Civil Rights when it wrote in regards to environmental justice communities: "...it is clear that plaintiffs alleging discrimination based on disparate impact are substantially limited in their ability to bring these claims to court."⁴⁷

Past harm of this nature and the lack of remedies in the legal system can contribute to a sense of helplessness, lack of control, distrust, and ultimately undermine a community's sense of resilience. When attempting to work with a community to plan and implement nature-based solutions it will be important to develop strategies that avoid triggering these negative feelings and similar outcomes.

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