



NATURE-BASED SOLUTIONS to Flooding in the Hill Country

The Texas Hill Country is prone to both prolonged drought and catastrophic flash floods, and those extremes will only get more intense. Future rainfall is projected to be increasingly concentrated in short, intense storm events, further increasing flood risks. As Texas invests in flood infrastructure, it is critical that we prioritize nature-based solutions to flood mitigation.

Nature-based flood mitigation solutions offer a cost-effective approach to flood mitigation that yields multiple benefits. Unlike traditional grey infrastructure (such as concrete culverts, dams, and retention ponds), nature based solutions can provide recreational opportunities, scenic value, improved air and water quality, carbon sequestration, and wildlife habitat.

Texas has launched a statewide Flood Infrastructure Fund to invest in flood mitigation measures. Texas is also embarking on a first-of-its-kind regional and statewide flood planning process that will determine which flood mitigation strategies can be funded with state dollars. Nature-based flood mitigation solutions should be

prioritized when allocating these funds and should be featured prominently in regional and state flood plans because of their effectiveness and multiple benefits.

This issue paper introduces some of the nature-based, and green infrastructure strategies available to reduce the impacts of flooding in the Hill Country. These solutions can be implemented at multiple scales, from the site or building level, throughout a community, or across an entire region or landscape.

Nature Based Solutions (NBS) use natural systems to provide critical services, such as wetlands for flood mitigation or rainwater gardens for stormwater management. These solutions can also synergize with grey infrastructure, forming so-called “hybrid” solutions. NBS can provide a cost-effective and flexible approach for disaster risk and water resource management.

Funding Sources for Nature-Based Flood Mitigation Projects

	Flood Infrastructure Fund	TIRF Floodplain Management Account	HUD's CDBG- MIT	FEMA's Flood Mitigation Assistance Grant Program	EPA's Drinking Water State Revolving Fund	EPA's Clean Water State Revolving Fund
LAND CONSERVATION	✓		✓		✓	✓
GREEN INFRASTRUCTURE	✓		✓		✓	✓
LAND STEWARDSHIP AND HABITAT RESTORATION	✓		✓	✓	✓	✓
BUYOUTS	✓		✓	✓		
PUBLIC EDUCATION, AWARENESS, ENGAGEMENT	✓	✓	✓			

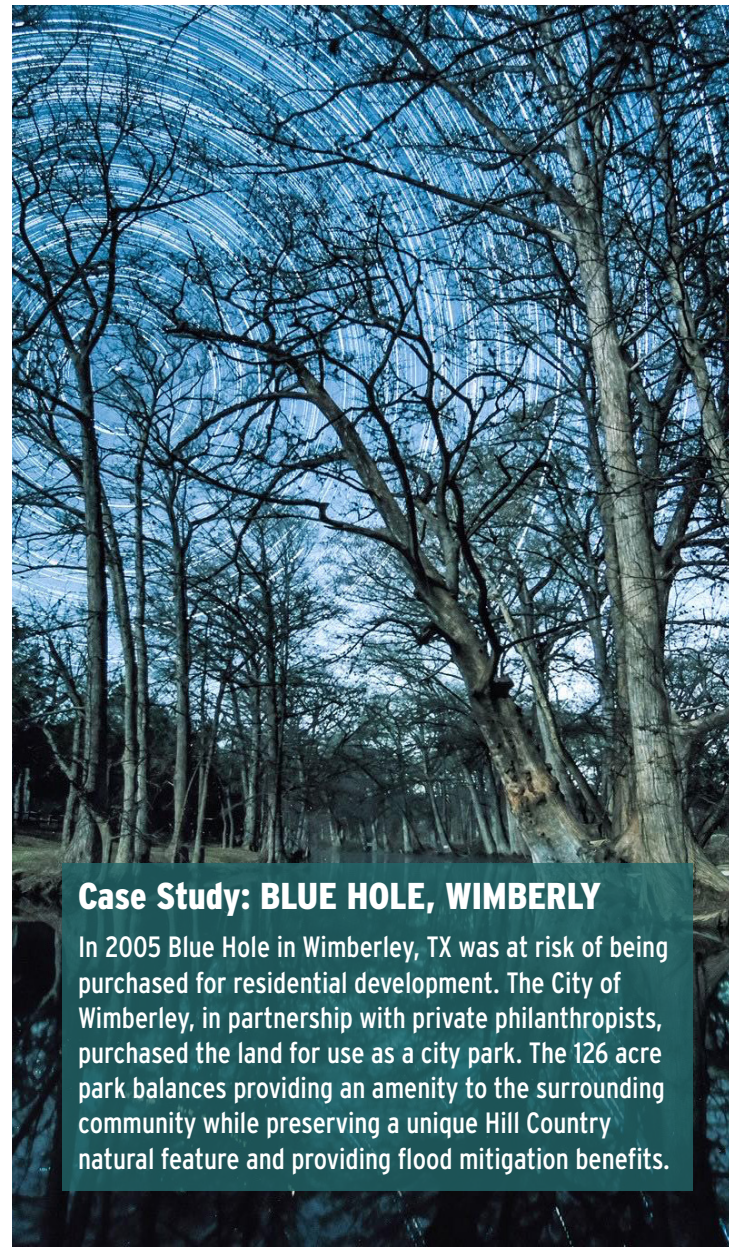
LAND CONSERVATION

Land conservation is an essential nature-based tool to mitigate flooding. As the Hill Country develops, more impervious surfaces such as pavement and rooftops exacerbate flooding by reducing the ability of stormwater to slowly seep into the land, which can mean faster, “flashier” flood events, and can negatively impact the long term health of our creeks and waterways.

Permanently protecting land from development provides natural flood mitigation benefits by maintaining existing landscape function for slowing, spreading, sinking, and storing stormwater. This reduces runoff, and alleviates strain on traditional drainage systems and other flood infrastructure in the process.

Land conservation can be achieved through various acquisition mechanisms, including fee simple purchase or conservation easements and are most effective at flood abatement if integrated across an entire neighborhood, community, or region. Examples of land conservation projects that can provide flood mitigation benefits include:

- Protecting riparian areas and floodways from development;
- Connecting greenspaces to increase the ability of open areas to capture and store water;
- Prioritizing land acquisition around key areas that are known to provide flood mitigation benefits.



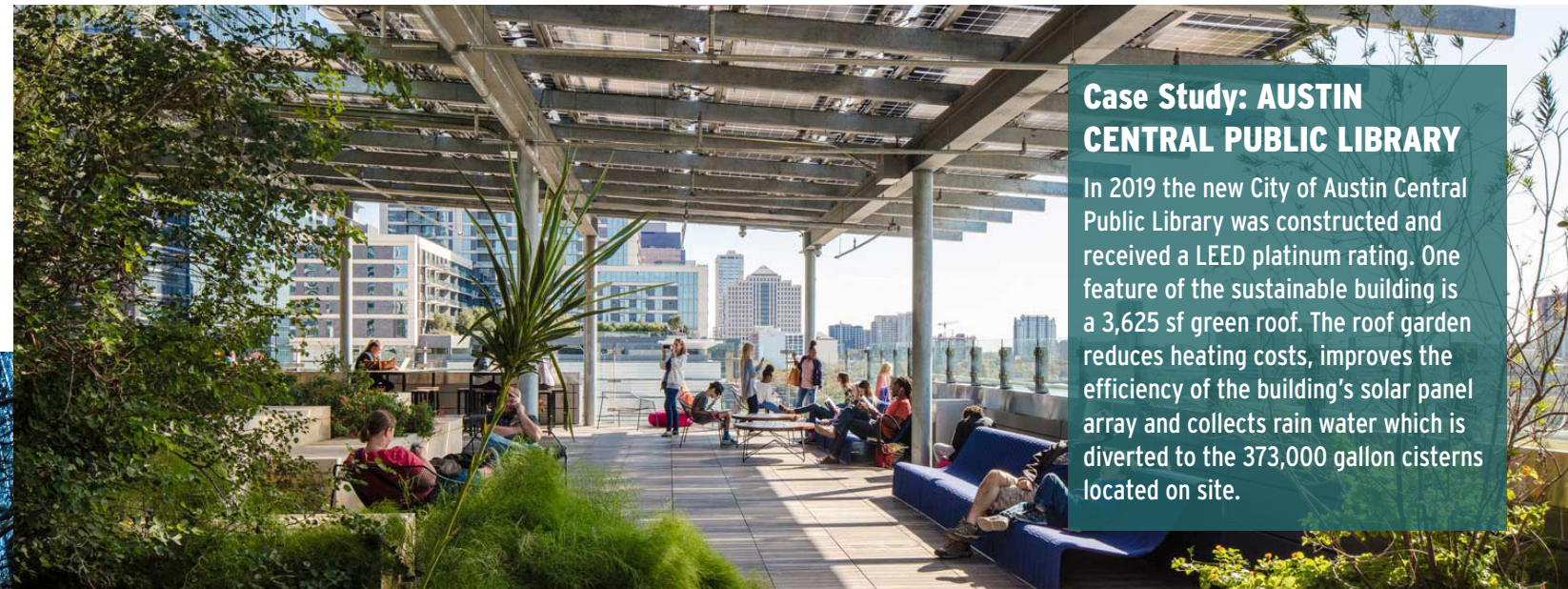
Case Study: BLUE HOLE, WIMBERLY

In 2005 Blue Hole in Wimberley, TX was at risk of being purchased for residential development. The City of Wimberley, in partnership with private philanthropists, purchased the land for use as a city park. The 126 acre park balances providing an amenity to the surrounding community while preserving a unique Hill Country natural feature and providing flood mitigation benefits.

GREEN INFRASTRUCTURE

Green infrastructure (GI) is an integrated approach to urban stormwater management that uses natural features designed to mimic or preserve natural drainage processes. These features capture stormwater runoff as close as possible to where it is generated to improve water quality and reduce flooding. Low-impact development (LID) is a closely related term that is often used interchangeably with GI for stormwater management.

GI techniques include the use of plant or soil systems and permeable surfaces, such as rain gardens, bioswales (i.e., vegetated trenches), green roofs, as well as other approaches to reduce stormwater flows to sewer systems and surface waters. These techniques can be applied to an individual building or site; however, they are most effective at flood abatement if distributed and integrated across an entire neighborhood or community.

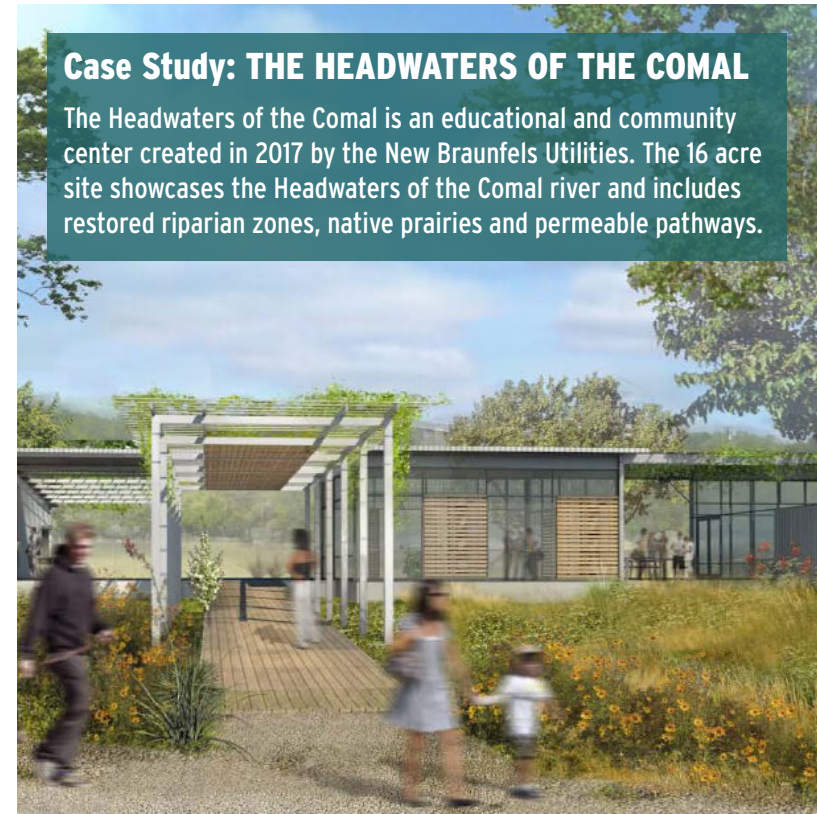


Case Study: AUSTIN CENTRAL PUBLIC LIBRARY

In 2019 the new City of Austin Central Public Library was constructed and received a LEED platinum rating. One feature of the sustainable building is a 3,625 sf green roof. The roof garden reduces heating costs, improves the efficiency of the building's solar panel array and collects rain water which is diverted to the 373,000 gallon cisterns located on site.

LAND STEWARDSHIP AND HABITAT RESTORATION

Land Stewardship and Habitat Restoration are key strategies for creating a strong watershed. Healthy riparian habitat, wetlands, prairies, and urban ecosystems within a watershed can serve as natural defenses against flooding. Restoration and responsible stewardship of natural habitats and open spaces enhance the flood mitigation capacity of these systems. For example, improving soil organic matter by 1% can provide an additional 20,000 gallons of water retention capacity per acre, effectively enhancing infiltration rates and reducing runoff and peak flows. Restoration techniques vary and can include approaches like native plantings and rotational grazing. Riparian and habitat restoration is often implemented at a large scale to maximize the ability of these systems to reduce flood risk and enhance overall habitat value for people and wildlife. However, small-scale restoration efforts can also enhance the ability of habitats to serve as natural defenses against flooding.



Case Study: THE HEADWATERS OF THE COMAL

The Headwaters of the Comal is an educational and community center created in 2017 by the New Braunfels Utilities. The 16 acre site showcases the Headwaters of the Comal river and includes restored riparian zones, native prairies and permeable pathways.

STRATEGIC BUYOUTS

Strategic Buyout Programs can play an essential role in flood mitigation, though significant care must be taken to ensure that buyouts do not result in the displacement of marginalized communities. For properties impacted by repeat flooding events, the best solution may be for the state or local government to purchase the property, remove the structure, provide due compensation to the resident, and ensure no development occurs on the property in the future.

Buyout programs are best implemented strategically where large contiguous areas are bought out and managed as open spaces for added flood mitigation. Buyouts are often done voluntarily, with the homeowner applying to the local, state, or federal government to buyout their property. They can be applied to an individual home, residence or building. Buyout candidates should be prioritized based on an individual's vulnerability to flooding and ability to move out of the floodplain.

Case Study: UPPER UNION CREEK FLOOD RISK REDUCTION PROJECT

In response to repeated devastating flooding and property damage in the area, a plan was developed that includes optional buyouts of several homes along Upper Union Creek in Austin, TX. Homes purchased for this projects will be removed and the land will be regraded, revegetated and ultimately designated as open space in perpetuity. There is also the potential for this open space to be used for trails, community gardens or other community benefits in the future.

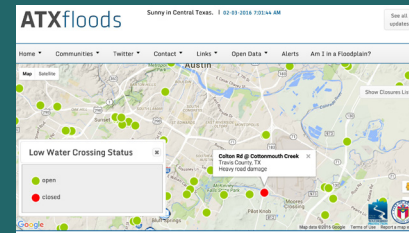
PUBLIC OUTREACH, AWARENESS & ENGAGEMENT

Public Outreach, Awareness and Engagement campaigns are an integral part of raising awareness of the role of Nature Based Solutions to flooding in our region. Conservation of open spaces, stewardship of healthy watershed lands and incorporation of Green Infrastructure techniques rely on the willing cooperation of landowners, developers and the construction community. There are a variety of ways to educate and engage the public about flood risk and mitigation, including educational campaigns, community advisory groups, collaborative research, citizen science, demonstration projects and participatory arts.

Case Study: YOUR REMARKABLE RIPARIAN

is an education tool that presents information on riparian ecosystems and plant life in all regions of Texas. The Remarkable Riparian booklet features photos and descriptions of the native species most commonly found along Texas Rivers. A twenty page "Owner's Manual" serves as a complement to the Remarkable Riparian booklet, and instructs land owners on best management practices for land management in riparian ecosystems.

engagement strategies can be implemented at a neighborhood, municipal, regional or state-wide scale and are most effective when they reach a large proportion of residents.



Better Data and Improved Early Warning Systems

are necessary in protecting life and property from flooding. The Hill Country needs greater communications tools to quickly convey important information to help prepare and protect communities from the next flood. Improving the quality and access to flood data allows for better prediction of future storm events. When based on good data, advanced warning systems can save lives and reduce property and infrastructure damage. Existing examples include: the ATXfloods, a user-friendly website providing Austin residents with real time status updates of low water crossings.

Here are some components of good early warning systems:

- Network of early warning flood sensors and gauges
- Low water crossing closures
- Emergency shelter and disaster response information (text alerts)
- More communication between emergency managers across different counties and district

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Texas
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