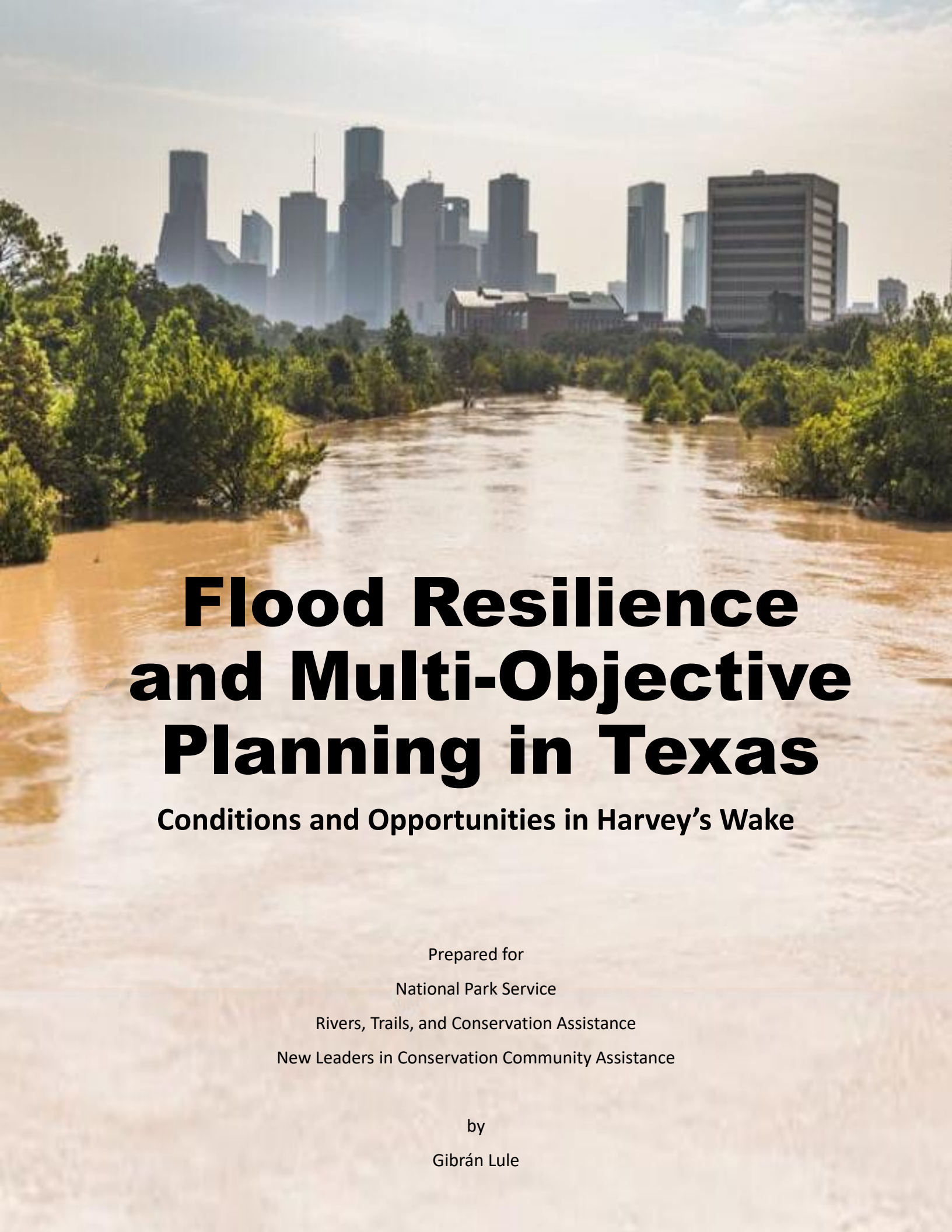


A photograph of a flooded river with a city skyline in the background. The river is wide and filled with brown, murky water. Lush green trees and bushes line the banks. In the distance, a city skyline with several tall skyscrapers is visible under a hazy sky.

Flood Resilience and Multi-Objective Planning in Texas

Conditions and Opportunities in Harvey's Wake

Prepared for

National Park Service

Rivers, Trails, and Conservation Assistance

New Leaders in Conservation Community Assistance

by

Gibrán Lule

Executive Summary

Flood events affecting communities in East and Coastal Texas which have increased in both frequency and severity. Over the last five years, communities in these regions have been seriously impacted by flooding in May 2015, April 2016, May 2016, and, most detrimentally, by Hurricane Harvey in August 2017. These serious events have created increased awareness about the risks posed by flooding, strengthening the resolve of local governments to buy out properties in high-risk areas and carry out flood mitigation projects.

As area governments engage in buyouts and infrastructure improvements, opportunities exist for integrating elements of resiliency, conservation, and recreation into flood mitigation projects. Counties and municipalities consulted mentioned a strong interest in developing bought-out lots into floodplain parks and trails. Other areas of need include capacity building and ideas on funding, developing, and operating parks.

Obstacles impeding flood affected communities in Texas from initiating green infrastructure projects include lack of funding for recreation and conservation projects, lack of planning, grant writing and project management capacity at the local level, and lack of dedicated park staff.

Introduction

The purpose of this research is to explore possibilities for multi-objective flood mitigation projects in Texas. For the purposes of this research, multi-objective flood mitigation projects are defined as planning efforts to reduce flood loss that incorporate elements of conservation, restoration, or recreation. As the major area of focus in the Hurricane Harvey-impacted area, the report begins with a brief summary of recent flood events which have seriously impacted East and Coastal Texas, serving to contextualize the increased incidence of detrimental flooding in the region.

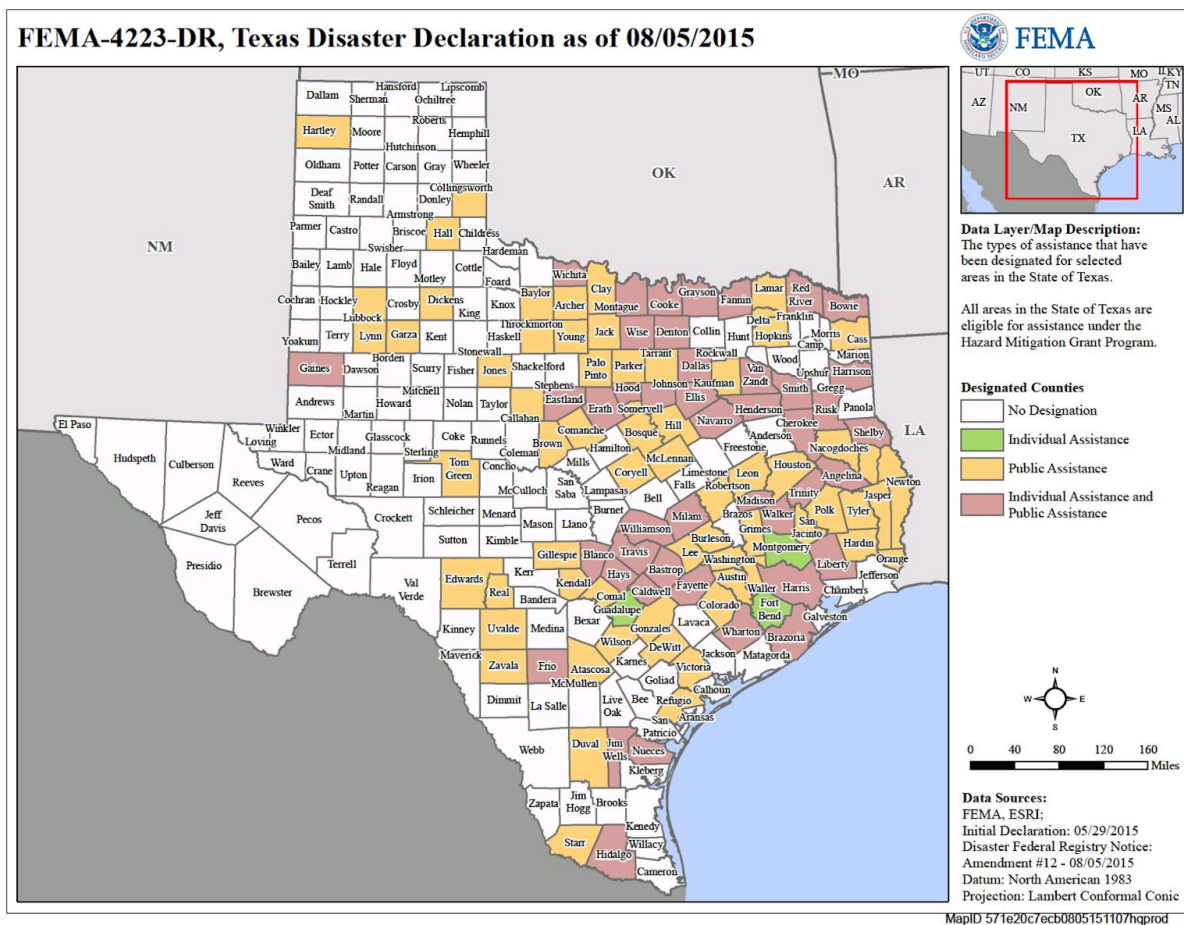
The research was informed by case studies and lessons learned from a nationwide survey of completed multi-objective flood mitigation projects. This first phase of research is briefly discussed in the Research Process and Lessons Learned sections. The final section discusses potential multi-objective cases that would benefit from RTCA support.

Flooding in East and Coastal Texas

Over the last five years, East and Coastal Texas has been seriously affected by flood events which have increased in both frequency and severity (Shah 2017, FEMA 2011). Most of the communities contacted for this research suffered significant flooding in 2015, 2016, and 2017.

May 2015 (Memorial Day Flood)

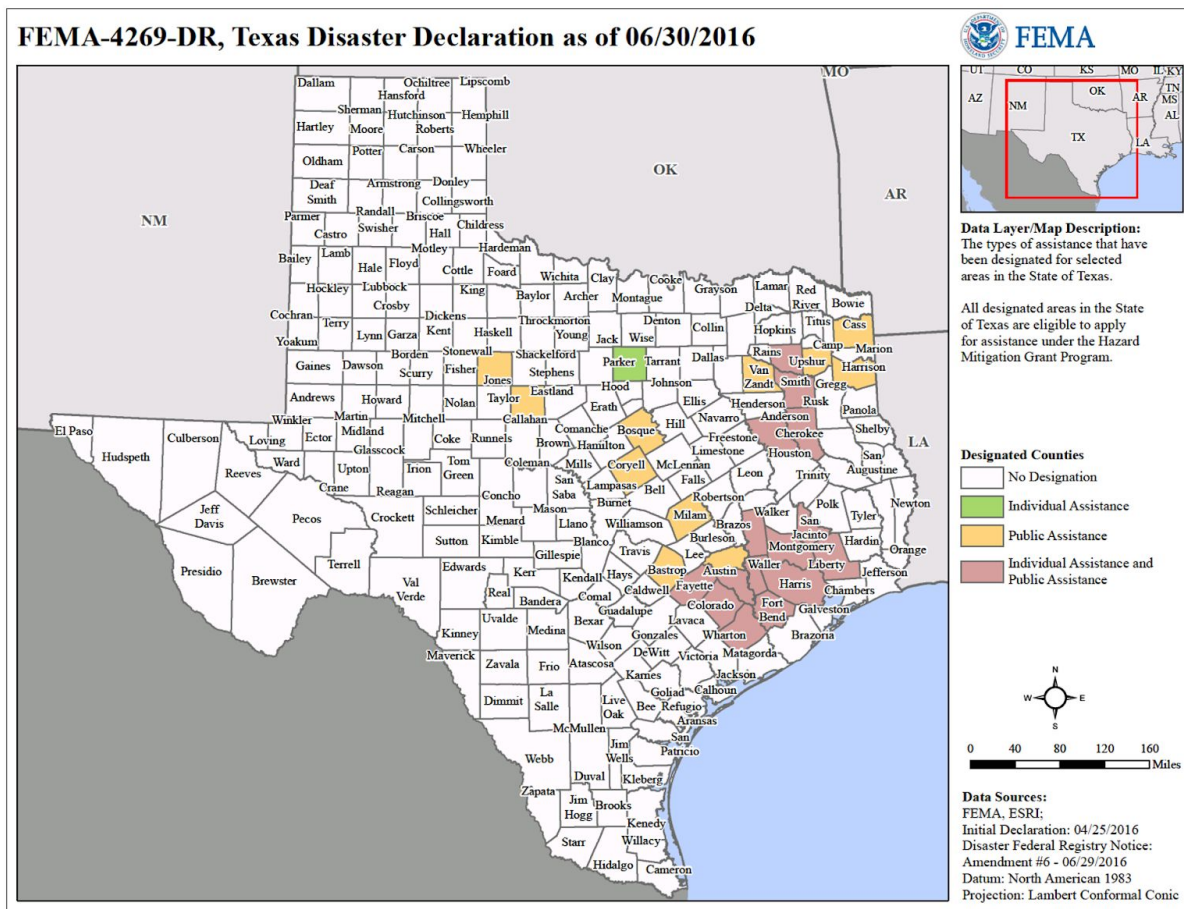
Heavy rains lasting from May 24 to May 26, 2015 led to serious flooding in Texas and Oklahoma. The ground in the most affected areas was already saturated, following ten days of heavy rains which started on May 14. In Texas, 27 flood-related deaths and a federal disaster declaration was issued for forty-nine counties (see Figure 1). The storm system also created multiple strong tornadoes in both Texas and Oklahoma (Erdman, 2016).



Source: FEMA, 2015

April 2016 (Tax Day Flood)

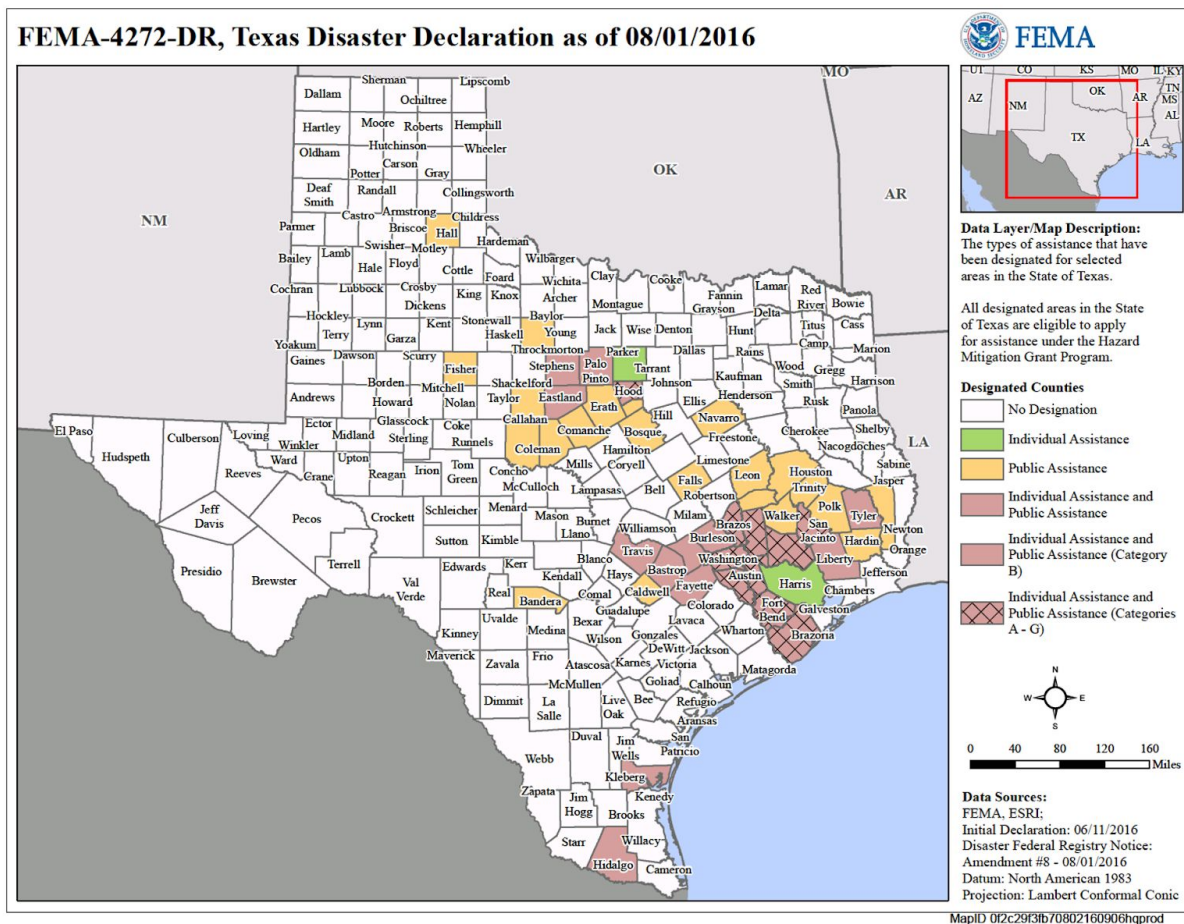
Unlike the May 2015 floods—which affected almost every region of the state save the Trans-Pecos—the Tax Day Flood of 2016 mostly impacted East and Southeast Texas. Parts of Houston received over 17 inches of rain in one 24-hour period and over 1100 homes were flooded in Harris County alone. Eight flood-related fatalities were confirmed (*ibid*). A federal disaster declaration was issued on April 25, 2016 identifying twenty-five counties as the most affected (see Figure 2).



Source: FEMA, 2016

May 2016 (Memorial Day Flood II)

The May 26-27 2016 flood primarily impacted Southeast Texas, leading to record-breaking stream crests in many locations, including the Brazos, which crested at 54.8 feet at Richmond, Texas—nearly four-and-a-half feet higher than its previous record. Ten flood-related deaths were reported in Texas, including nine soldiers washed away during a training exercise in Fort Hood (*ibid*). A federal disaster declaration was issued on May 29, identifying twenty-four counties for individual assistance (see Figure 3).

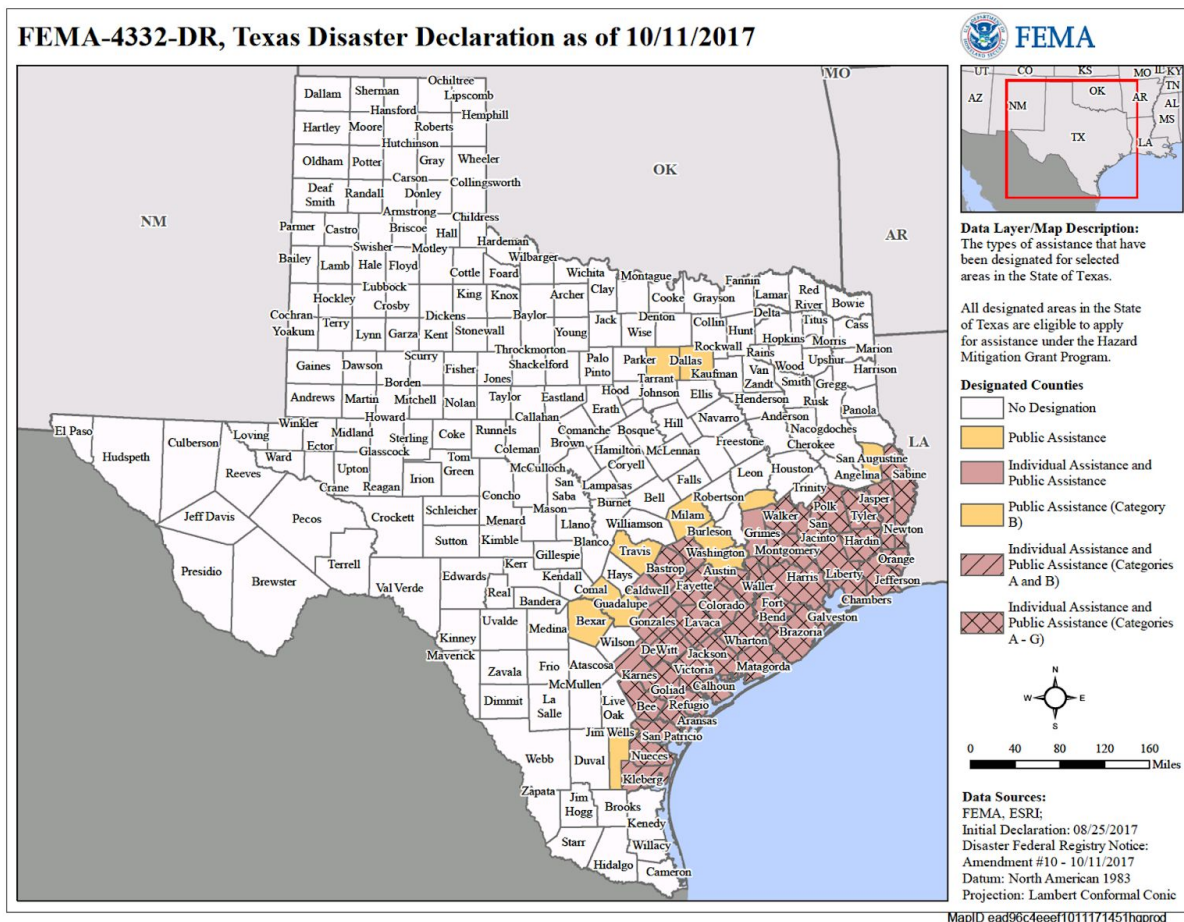


Source: FEMA, 2016

Hurricane Harvey

Hurricane Harvey made landfall at San Jose Island, a barrier island east of Rockport, on August 26, 2017. At the time, it was a Category 4 hurricane with winds of 130 miles per hour. It advanced just into the mainland and stalled over Southeast Texas for two days, with decreased wind intensity but continuously heavy rainfall of up to fifty total inches in some areas. The system reversed course and reentered the gulf on August 28, before making landfall again near Cameron, Louisiana and dissipating on September 1.

Harvey caused 106 deaths in the United States and damages totaling \$125 billion, a monetary figure on par with Hurricane Katrina (NOAA 2018). Harvey holds the record for maximum rainfall caused by a hurricane or tropical storm in the US and caused the displacement of over 32,000 people. The federal disaster declaration for Hurricane Harvey identifies forty-one Texas counties as eligible for individual assistance (see Figure 4). The unprecedented levels of flooding and damage experienced during Harvey have led to an increased interest in floodplain management and flooding mitigation efforts.



Source: FEMA, 2017

Buyouts

Local governments in the affected areas are eligible for FEMA's Hazard Mitigation Grant Program (HMGP) assistance, covering up to 75% of cost for buyouts in high-risk areas. Complementary funding is available through HUD's Community Development Block Grant-Disaster Recovery (CDBG-DR), among others, to cover the remaining 25% of the cost of buyouts. HUD prioritizes communities with 75% or greater low- and moderate-income households.

Green Resiliency

The considerable amount of land eligible for buyouts and billions of dollars in funding have generated a great number of opportunities for multi-objective mitigation approaches. In a multi-objective approach, solutions that reduce flood loss are combined with opportunities to improve existing conditions and increase the resource's value to the community. This approach can include objectives such as habitat restoration, recreational uses, economic revitalization, environmental education, and fisheries improvements (NPS, 1996).

The National Park Service Rivers Trails and Conservation Assistance program (RTCA) has successfully worked on various multi-objective approaches that mitigate flood loss and capitalize on recreation and conservation opportunities. *Floods, Floodplains and Folks*—a casebook of multi-objective flood mitigation projects—was compiled by RTCA in 1996 and includes dozens of projects receiving assistance from this program and other federal agencies (*ibid*).

An almost invariable element in successful cases utilizing the multi-objective approach is the participation of multiple partners, including nonprofit organizations, educational institutions, private sector companies, and agencies from multiple levels of government. The cases are also generally locally defined, led and implemented, with substantial technical assistance and capacity building from partner agencies. Informed by that format and approach, this research attempts to identify potential multi-objective flood mitigation projects in Texas by understanding the current conditions, local capacity, mitigation needs, and locally identified project ideas of communities in the Hurricane Harvey-impacted area.

Understanding Current Conditions and Identifying Potential Projects in Texas

Research Process and Methodology

Two stages of research were conducted in order to identify potential flood mitigation projects integrating recreation or conservation elements in the Harvey-impacted area. The first stage focused on identifying successful nationwide cases integrating recreation or conservation elements into flood resiliency projects. This stage of research resulted in a website showcasing these projects and the lessons learned through their implementation: www.greenresiliency.wordpress.com. The second stage focused on understanding the needs and limitations of recovering communities in the Harvey-impacted area, with a specific focus on resiliency, recreation and conservation opportunities. This assessment of opportunities and needs was informed by the background research conducted and cases compiled during stage one.

Stage One: Successful Cases Nationwide

This portion of research was most informed by resiliency planning guidelines and documents, as well as interviews conducted with municipalities and agencies responsible for carrying out cases identified as successful projects.

Documents and guidelines on resiliency planning, such as EPA's Coastal Adaptation Toolkit, the National Sea Grant's Resilience Toolkit, and the US Climate Resilience Toolkit were consulted for guidance and background information on resiliency planning. Forty-four cases were identified from these and other sources, including NOAA's Digital Coast, Great Lakes Coastal Resilience Planning Guide, and the Landscape Architecture Foundation's Landscape Performance Series.

Following case identification and background research, phone interviews were conducted with agencies and organizations responsible for twenty-one of the identified cases. These interviews included the guiding questions in Appendix A and supplementary questions relevant to each case. The information collected for each case was summarized and formatted for inclusion in a publicly-accessible website of multi-objective cases, currently viewable at www.greenresiliency.wordpress.com.

Stage Two: Conditions and Potential Projects in Texas

In order to assess conditions and identify potential projects in the Harvey-impacted zone, relevant communities were identified using FEMA's October 2017 disaster declaration for Texas. Within this declaration, forty-one counties in the state were identified as the most heavily impacted (counties

warranting both individual and public assistance from FEMA, see Figure 4): Aransas, Austin, Bastrop, Bee, Brazoria, Caldwell, Calhoun, Chambers, Colorado, DeWitt, Fayette, Fort Bend, Galveston, Goliad, Gonzales, Grimes, Hardin, Harris, Jackson, Jasper, Jefferson, Karnes, Kleberg, Lavaca, Lee, Liberty, Matagorda, Montgomery, Newton, Nueces, Orange, Polk, Refugio, Sabine, San Jacinto, San Patricio, Tyler, Victoria, Walker, Waller, Wharton.

The emergency management coordinators (EMC) and offices of emergency management (OEM) of these counties were contacted for potential interviews, as well as ten municipalities in the impacted area. Seven county representatives were interviewed by phone, two site visits were conducted (Fayette and Colorado counties), and one council of governments was interviewed (Houston-Galveston Area Council). Guiding questions in Appendix B were used for these interviews. These interviews focused on current conditions, potential areas of assistance, and existing barriers to implementing multi-objective flood mitigation projects; they included supplementary questions relevant to each entity and potential project. The information collected through these interviews was reviewed for common threads and potential areas of assistance, resulting in the final sections of this document.

Lessons Learned from Nationwide Cases

The cases consulted in research phase one vary greatly in size, scope, goals, and location. However, many of the responsible parties cited common elements which helped make their project successful. The most salient of these were partnerships, public engagement, persistence, policy, political support, and timing.

Partnerships

Strong partnerships have proven important at all stages of a project: from preliminary planning, through construction, and into operations and maintenance. In cases involving multiple organizations, land-holding agencies, and jurisdictions, partnerships are necessary to develop and implement a shared vision. Even in cases entirely within one jurisdiction, partnerships can prove fruitful in building capacity, developing ideas, and securing funding for proposed projects. Engaging potential partners early in the process is key to consistent participation and buy-in.

Public Engagement

The vast majority of successful cases involved a robust public engagement process. Successful public engagement strategies go beyond basic informational meetings, but rather invite communities to become advocates for the project and help make decisions in the planning and design process. Public engagement should serve not only to present options and assuage fears, but also to generate ideas, grow support, and promote future stewardship of a recreation or conservation project.

Persistence

Multiple cases highlight the importance of persistence and determination in achieving results. This can be especially important when working with agencies and organizations that have become accustomed to approaching infrastructure improvement projects in a particular way. Ongoing conversations and hard facts about the infrastructure and community benefits of low-impact development and greenspace can eventually bring initially hesitant parties around to supporting new ideas.

Policy

It is important to keep an eye on relevant local, state, and national policies which might affect a project's legality, requirements for approval, long-term operations and maintenance, and eligibility for funding or assistance. Some projects have to wait decades for policy shifts to occur, which can tip the scales into fiscally sound and legally viable territory. When feasible, the interested organizations and public can advocate for policy supporting the proposed project.

Political Support

Gaining support from elected officials can help legitimize an initiative, increase a project's visibility, and be considered for government funding. Cultivating continued political support is especially important in projects requiring resolutions or legislation for funding and implementation.

Timing

Capitalizing on civic and political will is a major factor in the cases consulted. Oftentimes, this willingness to act is linked to events that make communities aware of the risks posed by flooding in their areas. Acting quickly—while the effects and risks remain fresh in the collective memory—is key in cases which require broad public or political support.

Common Elements in Texas Communities

The interviews and site visits provided substantial background information on how each community was impacted by recent floods, as well as potential flood mitigation, conservation, and recreation projects in each. Furthermore, these conversations yielded common threads in recreation and resiliency planning, which are relevant throughout the affected area.

Interest in Resiliency

The municipalities suffering the most serious damages are in low-lying coastal or riparian areas, and have long been aware of the risks posed by flooding. The increased frequency and severity of flooding in these communities have created an interest in and necessity for resiliency planning. As many of the counties in the area are rural and have limited economic opportunity, elected officials and public service employees are committed to protecting and securing existing resources of these communities.

Lack of Capacity

Most of the interviewees mentioned a lack of capacity in designing and implementing hazard mitigation, green infrastructure, and recreation projects. Most counties and municipalities contacted do not have dedicated grant writers or parks departments, these responsibilities often falling on elected officials or various city departments. Interviewee's expressed interest in capacity-building programs and assistance in grant writing and management.

Limiting Government Structures

Smaller counties and municipalities in this region generally do not have parks departments. Depending on the entity, parks and open space can end up being the purview of the public works department, county commissioner, facilities department, or office of emergency management. Interest was expressed in public land management strategies and partnerships. For the latter, Texas A&M Forest Service, Texas Parks and Wildlife, local municipalities, neighboring counties, and the Lower Colorado River Authority were mentioned as potential partners in park operations and management.

Lack of Funding for Conservation or Recreational Improvements

Local governments in the affected areas are eligible for FEMA's Hazard Mitigation Grant Program (HMGP) assistance, covering up to 75% of cost for buyouts in high-risk areas. Complementary funding is available through HUD's Community Development Block Grant-Disaster Recovery (CDBG-DR), among others, to cover the remaining 25% of the cost of buyouts. Despite the availability of these funds, some interviewees expressed hesitation about acquiring properties through buyouts. The main concerns were lack of funding for maintenance, conservation or restoration-associated costs, and recreation improvements on these properties. Some smaller counties also cited decreasing their tax base as a factor in disinclination to carry out wide-reaching buyouts.

Potential Projects

City of Aransas Pass

Population: 8,393

Counties: Aransas, Nueces, San Patricio

Contact: Katherine Comeaux, Superintendent of Development Services



Opportunities:

The City of Aransas has great interest in increasing their recreational amenities while also boosting flood resiliency.

There is a large amount of undeveloped, constantly waterlogged land on Conn Brown Harbor, north of the existing seawall. There is an active advocacy group interested in having these declared wetlands and restored using native species. The land is currently zoned G, with fractions owned by the city and others by private landowners.

An unused rail line runs through the city parallel to the water. Aransas Pass is interested in the possibility of developing this corridor into a rail-trail. The line has not been declared abandoned and initial efforts to contact the railroad have not borne fruit.

There is great interest in waterfront access in this coastal community. Currently, the city owns some kayak launches, but no beaches or large waterfront areas. San Patricio County is open to restoring a waterfront area in the southern part of Aransas Pass into a sanctuary or open space that doubles as a drainage area.

Stedman Island and Harbor Island are popular spots for camping in Aransas Pass. Stedman Island is privately owned, but the city has not been able to get in touch with the owners. Developing these islands into camping spots for locals, tourists, and birders is of interest to the city.

Obstacles:

It is difficult to find funding for buying out properties on Conn Brown Harbor, as they did not have structures which sustained flood damage—a condition on many grants.

The City of Aransas Pass does not have a parks department. Parks and open space are managed by the Public Works Department.

Capacity and Potential Partners:

The City of Aransas Pass has developed capacity in working with multiple partners, a necessity for a city whose limits stretch into three counties.

Coastal Bend Bays and Estuaries can provide guidance and support for the coastal restoration and conservation projects.

The **Rails to Trails Conservancy** might be able to offer support for the rail-trail project.

The **Coastal Bend Council of Governments** has capacity in writing and managing grants, which could prove useful as the city identifies potential sources of funding to carry out coastal restoration and flood mitigation projects.

City of Wharton

Population: 8,785

County: Wharton

Contact: Gwyneth Teves, Community Development Coordinator



Opportunities:

The City of Wharton has been funded for a levee project in partnership with Lower Colorado River Authority and the US Army Corps of Engineers. The design will include multiple sumps ranging from five to eighty acres in size, which the city would like to see become recreational spaces.

The City of Wharton's floodplain park along the Colorado River was significantly damaged during Hurricane Harvey. The city's fishing pier and canoe launch were destroyed by the rushing waters. One area of potential assistance is assisting with a restoration plan for the park and identifying potential sources of funding.

The city is considering buyouts and acquisitions in the Colorado River floodplain. Ideally these properties would be used for flood mitigation and recreation purposes.

Obstacles:

Recreational use and design of sumps will have to comply with Army Corps of Engineers' levee design and specifications. Recreational uses were not included in the initial proposal/design.

Capacity and Potential Partners:

The City of Wharton's **Facilities and Maintenance Department** handles parks.

It will be necessary to work with the **Army Corps of Engineers** as the levee system reaches final design and enters the construction phase.

Hardin County

Population: 55,865

County Seat: Kountze

Setting: Rural

Contact: Aaron Tupper, Emergency Management Coordinator



Opportunities:

Hardin County is exploring the possibility of carrying out buyouts in Lumberton and Sour Lake. These could be contiguous with previously bought-out parcels that have not been turned into parks.

Obstacles:

Hardin County is hesitant to buy out more properties, which incurs continuing costs and shrinks the tax base. They are exploring options of acquiring land without buyout monies and restrictions. This land would then be placed back on the market with floodplain restrictions.

The county does not have a parks department; county commissioners would be responsible for parks in their precincts.

Capacity and Potential Partners:

Hardin County has carried out buyouts before, primarily in Lumberton and Sour Lake. The county maintains the parcels, but they have not been turned into parks because they are not contiguous.

The county has limited grant writing and grant management capacity. Some Homeland Security and local grants are managed by the county, but most large grants are outsourced to an external grant manager.

Big Thicket National Preserve owns property in Hardin County. The park might be interested in joint management or acquisition of contiguous parcels.

FEMA and **HUD** for funding buyouts.

Polk County

Population: 49,972

County Seat: Livingston

Setting: Rural

Contact: Courtney Comstock, Emergency Management Coordinator



Opportunities:

Polk County is interested in buying out 38 damaged homes in wooded area below the Lake Livingston Dam. The county is open to the possibility of turning these properties into a park or conservation area.

Obstacles:

The county judge and commissioners of Polk County have expressed concerns about managing the bought-out properties. County leadership would prefer that another local or state agency hold and manage these lands.

The county has limited staff time available to manage monies and grant writing.

County judge and commissioners would prefer the county not become responsible for these properties/green space. They would prefer another agency take on and manage the bought out properties, such as the Texas Forest Service.

Capacity and Potential Partners:

Polk county has a limited capacity for grant writing and project management.

The **Deep East Texas Council of Governments (DETCOG)** can help manage funds and grants.

The county has considered partnerships with the **Texas A&M Forest Service** or the **Trinity River Authority** for restoration and management.

FEMA and **HUD** for funding buyouts.

Montgomery County

Population: 537,559

County Seat: Conroe

Setting: Suburban/Rural

Contact: Darren Hess, Emergency Management Coordinator



Opportunities:

The Montgomery County Office of Emergency Management is considering using FEMA hazard mitigation grants and HUD CDBG disaster recovery funding to develop 10-square-mile detention project along Spring Creek. There are existing trails on Spring Creek, which are managed jointly by Harris County and Montgomery County. If funding is acquired, the detention area can be developed into trails, green space and an anchor park. If buyout funds and mitigation project are approved, eminent domain can be used by county to acquire the properties in question.

Montgomery County has bought out 38 properties after the 2016 floods.

Obstacles:

So far, properties acquired by the county have not been contiguous, making it difficult to create parks and expand the trail network.

Montgomery County does not have a parks department, so recreation and mitigation projects would be contracted out of the Office of Emergency Management.

HUD Community Development Block Grant - Disaster Resilience funds prioritize communities with greater than 75% low- and moderate-income households, which Montgomery County does not meet.

Capacity and Potential Partners:

The county has successfully engaged in property buyouts after the 2016 floods.

While the county does not have a parks department, an agreement is in place with Harris County for joint management of the existing Spring Creek trails.

FEMA and **HUD** CDBG for funding.

Texas Water Development Board for advice and planning.

Houston-Galveston Area Council

Fort Bend County

Population: 716,087

County Seat: Richmond

Setting: Suburban

Contact: Doug Barnes, Emergency Management Coordinator



Opportunities:

Areas of Fort Bend County suffered significant flooding during Hurricane Harvey and previous floods. There are low-lying areas near creeks and small tributaries of the Brazos in Richmond, Rosenberg, and Simonton which suffered serious flooding.

Fort Bend County is buying out 42 homes in these municipalities and considering further buyouts as funds become available. As the FEMA grants require bought-out properties to remain free of structures, the county is planning on maintaining mown lawns on parcels in subdivisions and restoring native vegetation in areas along streams. The county is also considering leasing parcels surrounded by homes to neighbors for access and maintenance but no structural improvements.

Obstacles:

Some of the properties identified are in the middle of subdivisions and surrounded by homes, making it difficult to convert them into sizeable parks or trail systems.

The county emergency management department has limited experience with buyouts.

Capacity and Potential Partnerships:

The county plans on seeking external support to carry out buyouts and manage funds. Potential partners for this step include the local council of governments (**HGAC**) or private grant managers.

FEMA and **HUD** for funding property buyouts.

Local municipalities are receptive to assisting with managing the properties.

Fayette County

Population: 25,110

County Seat: La Grange

Setting: Rural

Contact: Janet Carrigan, Emergency Management Coordinator



Opportunities:

Fayette County is buying out two acres and seven homes west of La Grange. These properties ring three-quarters of a golf course and could become a trail or parkland. The outgoing county judge and some of the commissioners are interested in increasing outdoor recreation and active transportation options in the county.

The county is also interested in working with landowners to acquire parcels along Buckner's Creek. The creek runs through a subdivision west of La Grange and damaged homes during the flood. It is mostly privately owned and undisturbed. Detention ponds would alleviate some of the flooding issues, and acquired parcels could be used to create a trail network, parks, or environmental education areas.

Obstacles:

Fayette County does not have a parks department. Trails and parks would fall under the purview of the commissioner in the district.

Acquisitions will be contingent on owners' willingness to sell. The county is aware that convincing landowners to sell parcels or easements can be an arduous task. Buy-in for the projects might be slowed further by the long amount of time it takes to successfully restore and redevelop a formerly private lot into an attractive park or open space.

Funding mitigation improvements to Buckner's Creek.

Capacity and Potential Partners:

Elected county officials will be key to engage, as they will be directly responsible for parks and open space in their precincts.

The county has contacted **Texas A&M's Coastal Risk Reduction and Resilience** program to receive advice and guidance on effective flood mitigation planning.

Fayette county has an active chapter of **Texas Master Gardeners** that can be engaged for restoration and environmental education work.

Municipalities within the county and the **Lower Colorado River Authority (LCRA)** manage parks within the county. They can be engaged to explore potential of joint park and open space management.

Colorado County

Population: 20,870

County Seat: Columbus

Setting: Rural

Contact: Charles Rogers, Emergency Management Coordinator



Opportunity:

Colorado County suffered significant flooding and streambank erosion along the banks of the Colorado River, with some areas losing over 100 feet of banks. This erosion also washed out a county boat ramp, seriously affected Beason's Park, owned and managed by the Lower Colorado River Authority, and caused a breach on the north bank downstream from Columbus, leading to flooding on private land.

The county is interested in identifying strategies and funding sources for stabilizing these banks, with the primary goal of protecting communities and structures near the river while also increasing recreation options for locals and visitors.

The county is also interested in smaller mitigation projects, such as creek conservation and restoration, but the Colorado River bank stabilization is their primary concern.

Obstacles:

Most of the land in question is privately owned, so projects would require buy-in and close coordination with landowners and communities.

The county has limited planning capacity for large-scale projects such as riverbank stabilization.

Capacity and Potential Partnerships:

Colorado County does not have a dedicated parks department. Recreation or conservation areas could be managed by elected officials, office of emergency management, or other county departments.

The county would require significant assistance and expertise in riparian restoration and streambank stabilization to carry out the Colorado River project.

The Department of Agriculture's **Natural Resource Conservation Service** (NRCS) would be a useful partner, especially considering that great swaths of the river banks are privately owned agricultural lands.

The **Lower Colorado River Authority** would be a necessary partner throughout the planning and implementation process.

Houston-Galveston Area Council

Population served: 6,862,641

Member Counties: Austin, Brazoria, Chambers, Colorado, Fort Bend, Galveston, Harris, Liberty, Matagorda, Montgomery, Walker, Waller, Wharton

Contact: Joey Kaspar, HGAC Planning Division



Opportunities:

The Houston-Galveston Area Council (HGAC) has a low-impact development (LID) and green infrastructure (GI) program. Through this program, the council assists municipalities and counties to identify, plan, and fund low-impact development projects. HGAC is currently working with two communities to develop projects through a Texas Commission on Environmental Quality (TCEQ) grant.

Counties and municipalities served by the council have been inquiring about options for bought-out properties. There is an opportunity to collaborate with HGAC on developing a workshop for communities focused on how to manage and get the most out of properties acquired through buyouts.

The Trust for Public Land is interested in collaborating with Montgomery County to acquire large areas of land for conservation using FEMA and HUD funding.

Obstacles:

Buyout money timeframe (likely 18 months away)

Smaller counties and municipalities in the HGAC's service area lack grant-writing and grant-management capacity. HGAC can assist, but also has limited staff time to devote to this.

Further Potential Projects

The Texas General Land Office has completed a thorough scoping of project opportunities to build resiliency on the Texas Coast. The GLO's March 2017 Texas Resiliency Master Plan clearly outlines the present risks to coastal communities and identifies dozens of projects to improve coastal resiliency. These are categorized into four geographic regions and into seven strategic goals: restoration of beaches and dunes, bay shoreline stabilization and estuarine wetland restoration (living shorelines), stabilizing the Texas Gulf Intercoastal Waterway, freshwater wetlands and coastal uplands conservation, delta and lagoon restoration, oyster reef creation and restoration, and rookery island creation and restoration (Texas General Land Office 2017). The list of projects identified can be found here:

https://drive.google.com/open?id=1x_C3dNIEl3FdHvZkWqMbny9Vj09Xr7l5. The full 2017 report can be found here: <http://www.glo.texas.gov/coastal-grants/projects/files/Master-Plan.pdf>.

Conclusion

Green infrastructure projects can serve to reduce flood loss while increasing the amount of open space and recreational options available to communities. As such, this is a natural area for the National Park Service and other conservation or recreation-focused agencies to provide assistance with during the mitigation planning process sparked by Hurricane Harvey. Based on the lessons learned from successful cases nationwide, Texas communities interested in incorporating green infrastructure as part of their resiliency planning already has two great points in their favor: timing and political will to act. The remaining four points—persistence, policy, public engagement, and partnerships—will have to be assessed and cultivated on a case-by-case basis. Judging by the conditions communicated by interviewees, counties and municipalities should especially focus on forming strong partnerships with agencies and organizations that have strong planning, grant, and project management capacity.

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Appendices

Appendix A: Guiding Questions for Phase One Interviews

Project:

Location:

1. Who were the main parties involved?
2. Which of these parties were most important to the success of the project?
3. In what stage of implementation is the project currently?
4. Were community members consulted for their input and ideas?
 - a. If so, how?
5. How did the project change in response to community feedback/input?
6. Were there any special circumstances or constraints that had to be considered?
7. Were there any major setbacks or obstacles in the process?
 - a. How were they overcome?
8. Were any of the following elements included in the final plan:
 - a. Flood reduction
 - b. Flow control
 - c. Recreation
 - d. Conservation
 - e. Streambank stabilization
 - f. Restoration
 - g. Fisheries improvement
 - h. Wetland enhancement
 - i. Habitat improvement
 - j. Cultural resource enhancement
 - k. Economic revitalization
 - l. Environmental education
 - (1) why were these elements included?
 - (2) which were the most important elements?
9. How was funding acquired for implementation?
10. What innovative strategies were used in the planning process or final design?
11. What can others learn from this case?
12. Is there a media package for the case or are you willing to share photos and documents?
13. Are you okay with this case being featured on a publicly-accessible website?

Appendix B: Guiding Questions for Phase Two Interviews

1. Tell me more about your potential project/idea.
2. Tell me more about the community.
 - a. How did Harvey impact the community?
 - b. How has it fared in previous floods/storms?
3. What key organizations could collaborate to make the project happen?
4. Have similar projects been implemented in your area?
5. Have there been efforts to get this project underway in the past?
 - a. If so, what has hindered or quashed these efforts?
6. What are the major hurdles keeping the project from advancing currently?
 - a. Public opinion? Financial? Capacity? Regulatory? Others?
7. Have any local/state/federal organizations/agencies been contacted regarding the project?
8. Which of the following elements do you think could or should be incorporated into the project?
 - a. Flood reduction
 - b. Flow control
 - c. Recreation
 - d. Conservation
 - e. Streambank stabilization
 - f. Restoration
 - g. Fisheries improvement
 - h. Wetland enhancement
 - i. Habitat improvement
 - j. Cultural resource enhancement
 - k. Economic revitalization
 - l. Environmental education
9. Are there any other potential projects you can think of in your community or region?