
JUST ENVIRONMENTS LAB

UNIVERSITY OF CALIFORNIA BERKELEY

COLONIA FLOODING

AN INSTITUTIONAL ANALYSIS
FOR THE LOWER RÍO GRANDE
VALLEY

JUNE 2022

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JUST ENVIRONMENTS LAB

The Just Environments Lab's mission is to conduct community-led research in support of underrepresented communities by centering justice and equity in the fight for environmental freedom. Just Environments Lab's main objective is to place justice and equity first in all discussions of the future of our environment. Without centering justice and equity, visions of the future remain systemically unjust. We seek to understand a past, present, and future of our environment rooted in the struggle for environmental freedom.

EXECUTIVE SUMMARY OF THE REPORT

This report explores the sources and extents of flooding experienced across Lower Río Grande Valley (LRGV) colonias. Colonias are rural and exurban communities historically experiencing disinvestment in basic utilities and services, as well as a lack of adequate political representation. While some critical infrastructures have been delivered to colonias due to their remarkable activism, here we examine one form of infrastructure which remains under-resourced: stormwater management.

LRGV colonias have faced persistent issues of flooding, affecting their health and safety. As we show, this crisis is both local (based on individual characteristics of each colonia), regional (borne from the LRGV's historic floodways), and international (tied to United States (U.S.)/Mexico border water treaties)—making addressing colonia flooding intensely fraught. These concerns are recognized by the Texas Water Development Board (TWDB) who commissioned a series of flooding studies from 2014-2016. Here, we examine these reports, their findings, and other data sources to identify the characteristics and policy mechanisms rendering LRGV colonias susceptible to flooding.

Most importantly, we examine how colonia flooding may be exacerbated by (1) the LRGV's risks of tropical storms and hurricanes and (2) the impacts of climate change in the region. Given the

LRGV's adjacency to the Gulf of Mexico, initial climate change modeling projects that the intensity and frequency of major storms will increase. This will have significant repercussions for flood-prone regions of the LRGV, many colonias in particular. A key area of emphasis in this report is that localized colonia flooding is not inherently part of their urban form and, as a result, a variety of mitigation techniques are needed to respond to these varying conditions.

The report closes with a summation of the major findings and policy recommendations for the use of colonia-based activists and organizers. In particular, we conclude with three foci for improving colonia flooding through policy, planning, and design:

- 1) Broadening the impacts of investment into flood mitigation via the identified solutions by ascertaining other areas of colonia resident concern.
- 2) Identifying why rural communities (like many LRGV colonias) face numerous governance barriers to accessing adequate stormwater management, hazards planning, and climate adaptation and mitigation.
- 3) Developing typologies of colonia flooding to better scope the stormwater and drainage needs across varying colonia conditions.



ACKNOWLEDGEMENTS

We thank the following nonprofits and organizations for their assistance in the creation of this report (over eight years in the making!) and dedicate the findings to them.

ARISE
bcWORKSHOP
CDC of Brownsville
LUPE
Proyecto Azteca
Proyecto Juan Diego
Texas Housers

We hope this report aids you in your critical endeavors!

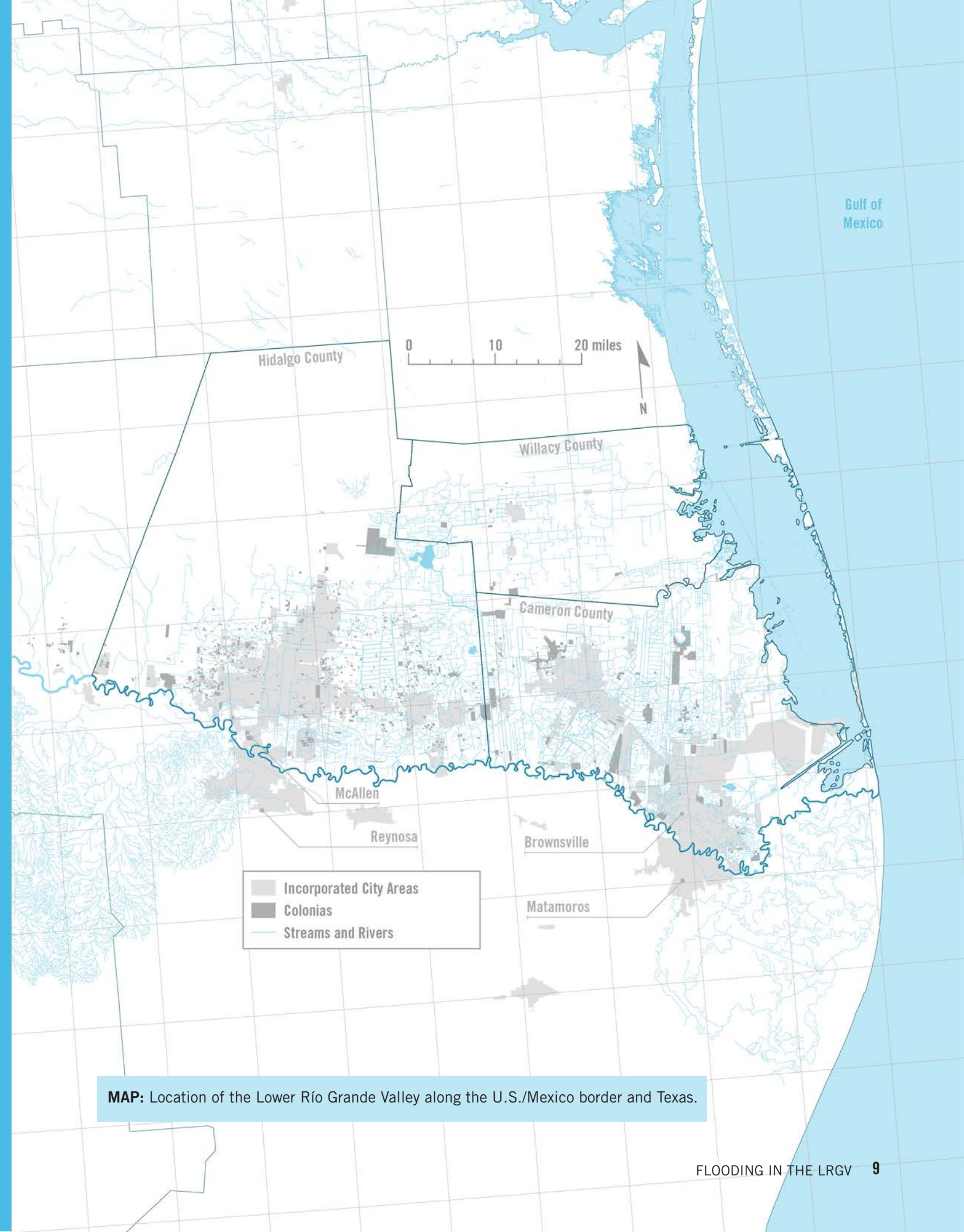
Specifically, we thank **bcWORKSHOP**, **Texas Housers**, and the **Texas Water Development Board** for their critical analyses and efforts regarding flooding in LRGV colonias and other regions of Texas, which this report is deeply built upon and indebted to.

Most notably, many thanks to Landscape Architect **Hugo Colón** for his indelible contributions to identifying and magnifying the issue of colonia flooding. This report is a direct continuation of Hugo's great work!

Lastly, thank you to several experts who kindly reviewed and assisted this report before its publishing: Dr. Edna Ely-Ledesma, Dr. Bára Šafářová, Dr. Alejandra Reyes, Dr. Deyanira Nevárez Martínez, and Dr. Noah Durst.

FLOODING IN THE LOWER RÍO GRANDE VALLEY

This section outlines the geographic scope of this report, introducing the Lower Río Grande Valley (LRGV) and its history of flooding and stormwater management. Flooding has always been part of the LRGV's history. Its rivers and estuaries naturally migrate leading to widespread inundation across the region, posing numerous risks to its communities.



MAP: Location of the Lower Río Grande Valley along the U.S./Mexico border and Texas.

THE LOWER RÍO GRANDE VALLEY

This report focuses on the Lower Río Grande Valley (LRGV or Valley).¹

The LRGV is a tri-county region of southern Texas encompassing Cameron, Hidalgo, and Willacy counties. This region is distinguished socio-culturally by its history as the last area of modern-day Texas to be annexed to the United States (U.S.). The LRGV is also distinguished by its location within the bi-national estuary of the Río Grande. Major cities in the Valley include: Brownsville, McAllen, La Feria, Mercedes, Donna, Harlingen, San Juan, and Weslaco, among many others. These cities create a chain of urbanized areas running parallel to the U.S./Mexico border along an historic railroad which is surrounded by rural agricultural lands. In the LRGV's rural areas, the economy is historically reliant on agriculture and tourism, due to its subtropical climate which keeps temperatures warm year-round. Cotton, grapefruit, sorghum, maize, and sugarcane are prominent crops. The region is the epicenter of citrus and vegetable production in Texas. Along the coast, South Padre Island and Port Isabel form major tourism centers. The coast is also home to the Port of Brownsville and, more recently, SpaceX's Vertical Launch facility, both of which bring substantial industrial and economic activities to the region.

According to the 2020 U.S. Census, the LRGV has an estimated population of 1.3 million people, of whom approximately 89% identify as Latinx.²

¹ This subregion was chosen to mirror the Texas Water Development Board's report. In other JE-L reports, we use the Río Grande Valley (RGV) as our focus area. Locally, RGV typically refers to Cameron, Hidalgo, and Starr counties.

² Total populations per county are as follows for 2020: Hidalgo County (870,781 people, 92%

Compared to 16.8% of Texas, Hidalgo and Cameron counties have higher rates of foreign-born residents (28.4% and 25.6% respectively).³ Willacy County has a lower percent of foreign-born residents (12.9%), likely because much of its area (especially in its northern reaches) is dominated by historic ranchlands. The LRGV is also deeply impacted socioeconomically from several global forces with local impacts along the U.S./Mexico border region, namely: the legacy of the U.S. Bracero Program, the decline of U.S. citrus in favor of Mexican citrus, and the rise of maquiladoras due to the North American Free Trade Agreement (NAFTA). This impacted the otherwise highly productive agricultural region, leading to a rapid rise in poverty rates in the LRGV over the past two decades of 25-28%, nearly double the rate of Texas (14.2%).⁴ This disinvestment and poverty are readily apparent in the lack of access to healthcare in the counties (27-31% of LRGV residents lack access to healthcare) and, as is discussed later, the lack of access to other basic services and utilities.⁵

Latinx), Cameron County (421,017 people, 89% Latinx), and Willacy County (20,164 people, 87% Latinx).

³ Percent of the population who are foreign-born per county are as follows for 2020: Hidalgo County (26.3%), Cameron County (22.6%), and Willacy County (12.9%).

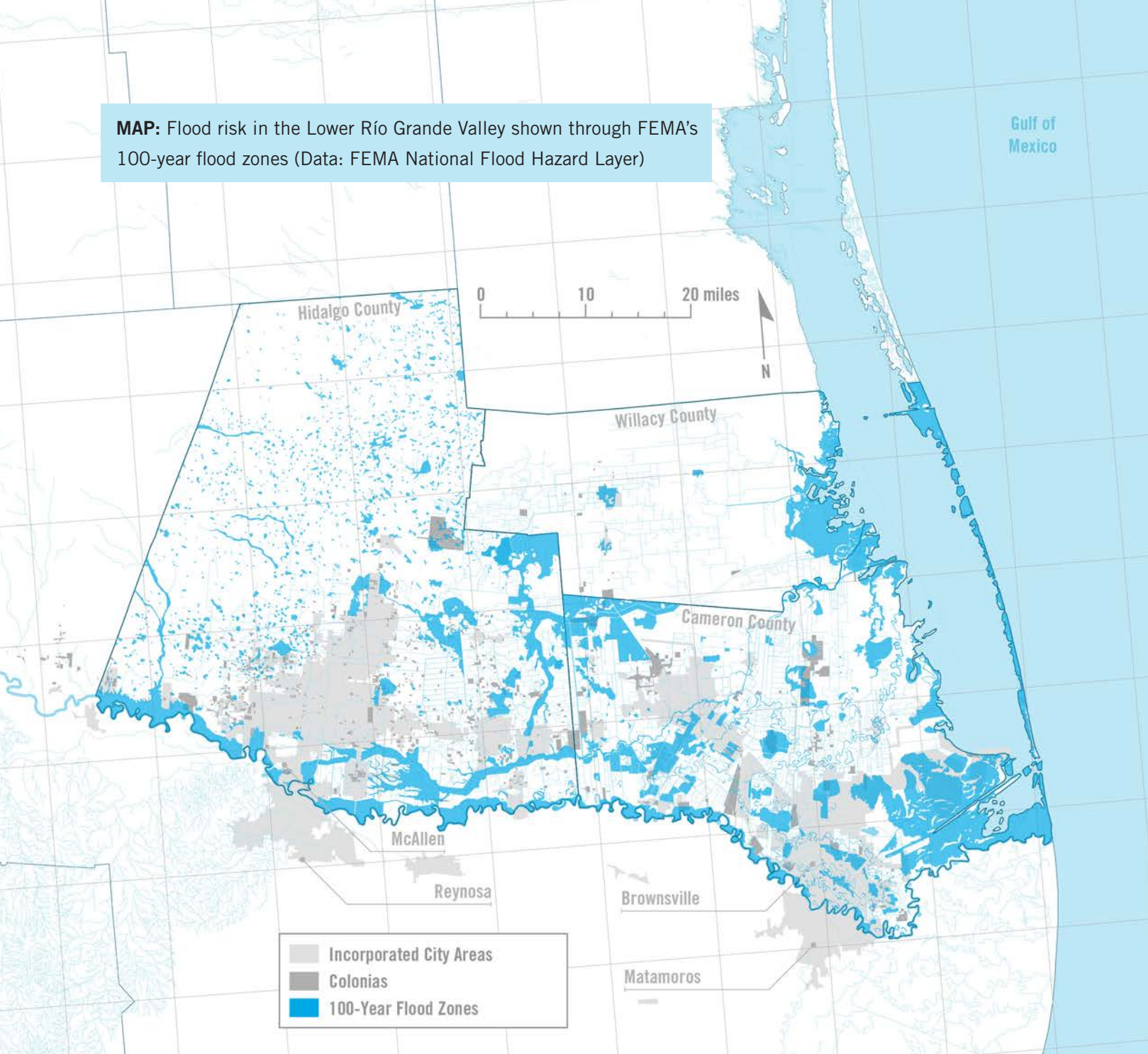
⁴ Poverty rates per county are as follows for 2020: Hidalgo County (28.4%), Cameron County (26.7%), and Willacy County (25.6%).

⁵ Percent of the population without healthcare per county are as follows for 2020: Hidalgo County (30.6%), Cameron County (28.6%), and Willacy County (27.1%).



IMAGE: Río Grande at the Santa Ana Wildlife Refuge (Credit: Danielle Rivera, January 2020).

MAP: Flood risk in the Lower Río Grande Valley shown through FEMA's 100-year flood zones (Data: FEMA National Flood Hazard Layer)



FLOODING ACROSS THE LRGV

Flooding is endemic to the LRGV given its geology. The rivers in this region have historically migrated with the seasons and the estuaries dominating this landscape naturally mitigated water levels. This can most clearly be seen in Brownsville, where older tracks of the Río Grande have been preserved as small lakes called resacas. Elsewhere in the LRGV, former tracks of the river have been filled. Additionally, the region contains critical wetlands habitats, from the Santa Ana Wildlife Refuge, Laguna Atascosa National Wildlife Refuge, and Boca Chica State Park. This also poses numerous risks to its communities.

Today, the Río Grande's path remains constricted by a system of levees, reservoirs, and channels to both control flood risk and to prevent movement of the U.S./Mexico border. Within this altered landscape of the delta region, the Texas Water Development Board (TWDB) attributes flooding to four concerns (see figure below):¹

1. Inadequate topographic relief: The terrain of the Río Grande delta is flat, making shedding water more difficult.

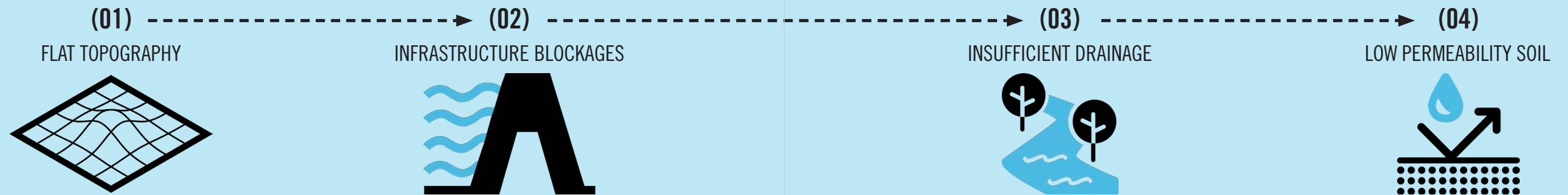
¹ TWDB, *Stormwater Drainage Planning: The Colonias of the Lower Río Grande Valley (LRGV) Report* (Austin, TX: TWDB, 2014), p. 2. (Referred to as "Report 1A").

2. Blockages created by transportation and irrigation infrastructure: Areas where roads and railways are raised form impediments to natural water flows due to the LRGV's flat terrain.
3. Insufficient drainage systems: Presence and quality of stormwater management is not equitably distributed in the LRGV due to governance barriers (i.e., lack of local governance).
4. Low permeability of the soils: Low permeability means water is slow to infiltrate into the ground, often due to finer-grained soils, leading to run-off. The LRGV's soil is predominantly a mixture of sand, silt, and clay – with clay being most dominant. This soil mixture prevents water from being readily absorbed into the ground and, as a result, moisture takes longer to infiltrate.

The LRGV's location within the delta of the Río Grande and its soil composition add to its flood vulnerability. Topographically, the delta region is exceptionally flat, making elevated railways and highways into major water barriers.

Due to these concerns, many areas of the LRGV flood in even the lightest rainstorms.

FOUR MAJOR CONTRIBUTORS TO LRGV FLOOD RISK



LRGV HISTORIES OF STORMS

Hurricanes and tropical storms shape the LRGV and its history. The region's adjacency to the Gulf of Mexico makes it susceptible to these major storms. Major historic storms figure prominently in the memories of LRGV communities. Most notably are Hurricanes Beulah, Allen, and Dolly. Most recently, Hurricane Hanna made landfall in the LRGV on July, 25, 2020. It was quite devastating to the region striking it as a Category 1 Hurricane. The storm dropped 18 inches to 48 inches of water across Hidalgo and Cameron counties.¹

While hurricanes have historically dealt greater damage, slow-moving tropical storms and large rainstorms may pose the greatest threat to the region moving forward, bringing large amounts of precipitation for longer periods of time and inundating already strained drainage systems. As a recent example, the "Great June Floods" struck the LRGV from June 18-22 in 2018. These widespread floods were caused, not by a tropical storm or hurricane, but by a massive rainstorm that brought an estimated 12-18 inches of rain as it lingered atop the region over a three-day period. It is estimated that the damage from

1 National Weather Service, "Hurricane Hanna Brings Flooding Rains," NOAA, https://www.weather.gov/bro/2020event_hanna.

the Great June Floods was more severe than Hurricane Dolly, which made landfall in the LRGV in 2008.² These lingering rainstorms are projected to increase in frequency with climate change. Specifically, climate change projections for the region show increasing temperatures and decreasing precipitation; however, there will be more frequent storms and high tide flooding events.³ Combined, this exacerbates a known issue in Texas, namely:

Texas is a State of perpetual drought, broken by the occasional [devastating] flood.⁴

~ Texas-Based Meteorologist

Together, the LRGV may experience more hydrophobic⁵ soils with climate change which may exacerbate flooding as water seeps into the ground more slowly or not much at all.

2 National Weather Service, "The Great June Flood of 2018 in the RGV," NOAA, https://www.weather.gov/bro/2018event_greatjuneflood.

3 "Climate Dashboard," NOAA, www.climate.gov.

4 National Weather Service, "The Great June Flood of 2018 in the RGV," NOAA, https://www.weather.gov/bro/2018event_greatjuneflood.

5 "Hydrophobic" is defined by Corrosionpedia as: "a property of a substance that repels water. It means lacking affinity for water, and tending to repel or not to absorb water."

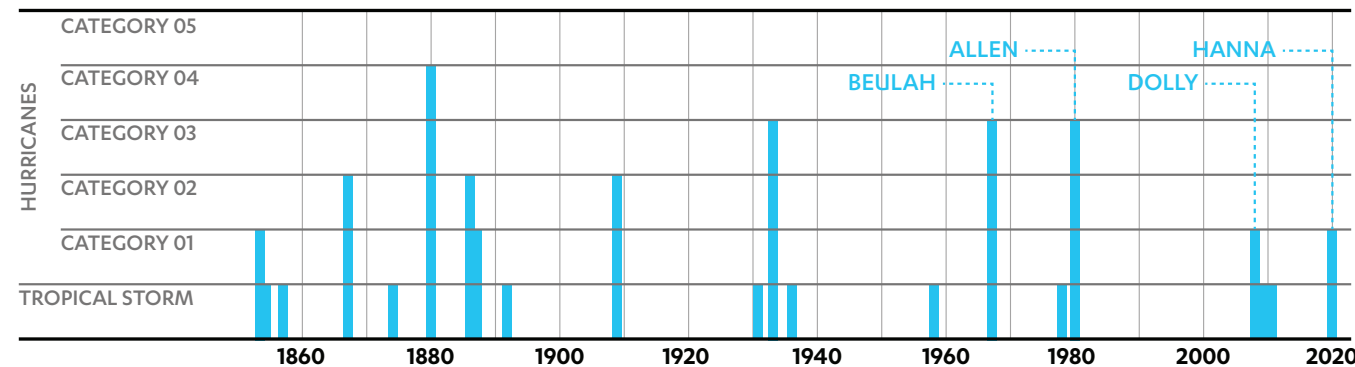
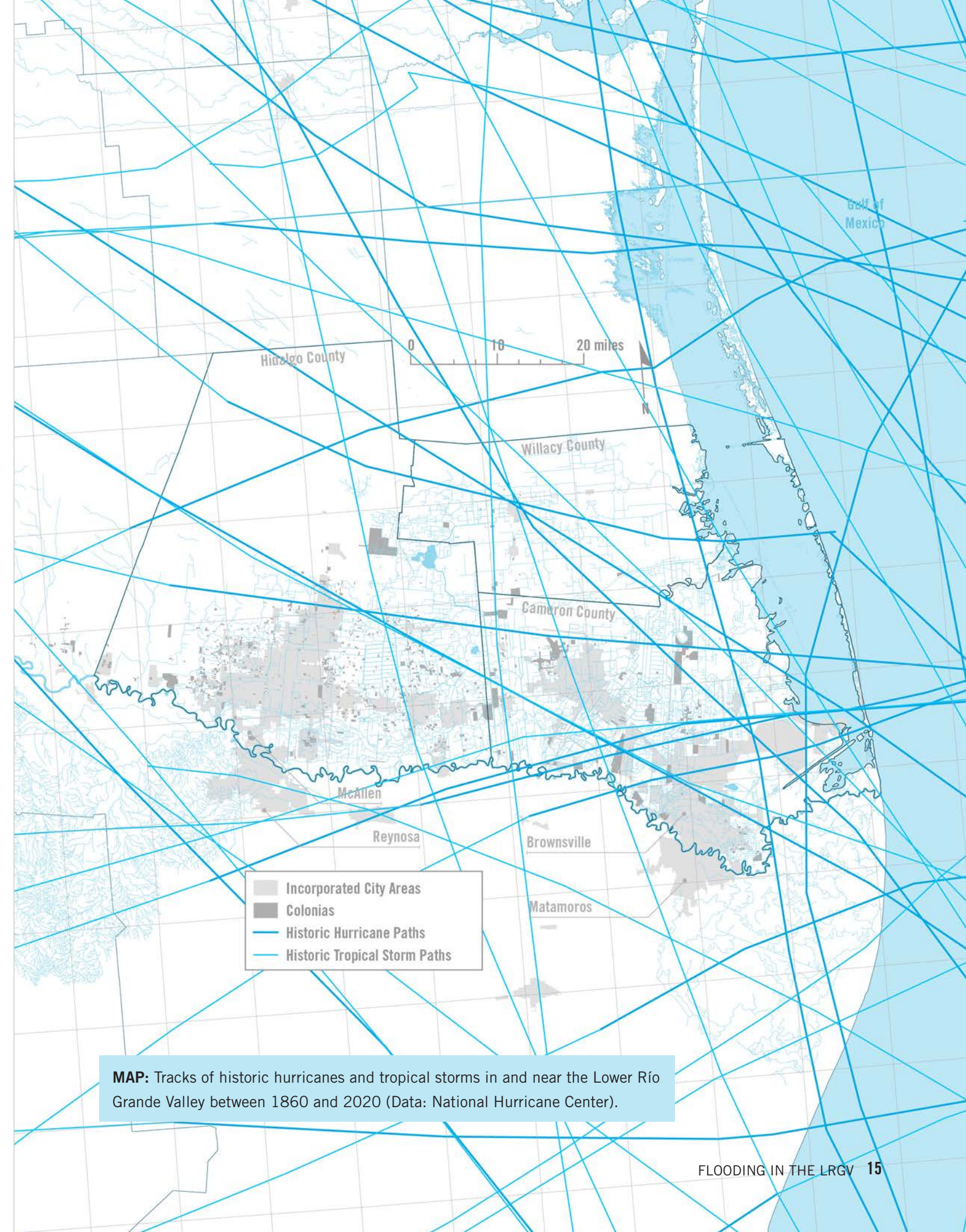


CHART: Intensities of historic hurricanes and tropical storms that have made landfall in the Lower Río Grande Valley between 1860 and 2020 (Data: National Hurricane Center).



MAP: Tracks of historic hurricanes and tropical storms in and near the Lower Río Grande Valley between 1860 and 2020 (Data: National Hurricane Center).



MAP: Locations of regional and international drainage systems in the LRGV, with levees shown (Data: TWDB and the U.S. Army Corps of Engineers).

CURRENT LRGV FLOOD SYSTEMS

The LRGV’s propensity for flooding and severe storms, given its soil composition combined with historic patterns of development, make addressing the issue of flooding particularly challenging. To handle this, the region contains an extensive network of irrigation systems engineered, first, to support agricultural land uses and, increasingly, for handling stormwater. Across the region, there are four major waterways:

- Río Grande System (U.S. International Boundary and Water Commission)
- Raymondville (Delta Lake Irrigation District)/North Main Drainage System (Hidalgo County)
- North Floodway/Arroyo Colorado System (U.S. International Boundary and Water Commission)
- Brownsville Area Systems (City of Brownsville)

This system of irrigation and grading, designed to hold water in farm fields, leaves the rural areas of the LRGV predisposed to flooding and more susceptible to the damages wrought by precipitation events. This is due to the dynamics between these waterways and the Río Grande waterway governed by the U.S. International Boundary and Water Commission (IBWC), a binational water commission established in 1889 between Mexico and the U.S. to govern the Río

Grande. In the LRGV today, the IBWC controls water flows amongst the Río Grande and the rest of the region, mainly through a series of border levee walls along the river. These levees contain floodgates that are designed to close in the event of a major rainstorm to prevent the Río Grande from rising and inundating the region. However, the closing of floodgates also prevents regional waterways from draining into the Río Grande without costly water pumps—which some areas lack to pump the stormwater over the levees. In the wake of hurricanes, Río Grande floodgates can remain shut for weeks or months, as the IBWC waits for the Río Grande to reach safe levels.¹

Most recently, the IBWC was forced to close the floodgates in 2010 when Hurricane Andrew struck the Mexican-side of the border region, causing the Río Grande to rise. The closure became problematic for the LRGV as a tropical depression struck the U.S.-side of the border shortly after the hurricane, preventing regional waterways from draining their stormwater.²

As a result, LRGV stormwater management contains three critical system levels: neighborhood systems, regional waterway systems, and the IBWC-controlled Río Grande system.

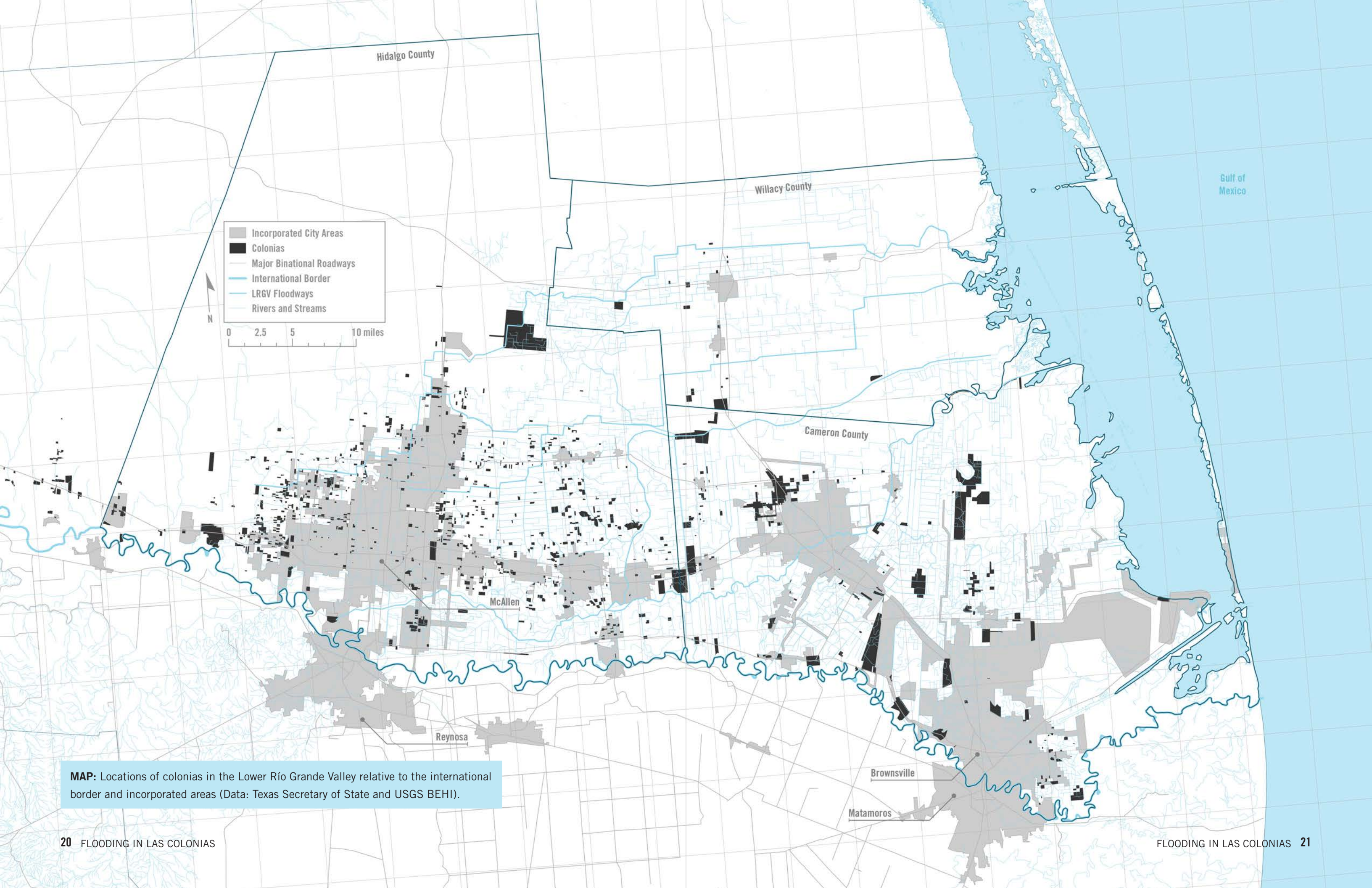
¹ TWDB, *Report 1A*, pp. 2-3.
² TWDB, *Report 1A*, p. 3.

FLOODING IN LAS COLONIAS

This section introduces the “colonias” of the Lower Río Grande Valley and their additional struggles with inadequate infrastructure and flood risk.



IMAGE: Property in a colonia north of Weslaco, Texas (Credit: Danielle Zoe Rivera, June 2015).



MAP: Locations of colonias in the Lower Río Grande Valley relative to the international border and incorporated areas (Data: Texas Secretary of State and USGS BEHI).

WHAT ARE “COLONIAS?”

Colonias are unincorporated rural and exurban¹ communities that have historically lacked access to basic utilities and infrastructures, such as electricity, potable water, wastewater management, paved roads, and stormwater infrastructure.² This inadequate access to infrastructure stems from decades of repressed political representation and economic/racial segregation in communities outside of incorporated cities.³ Frequently stigmatized as “informal” colonias are, in fact, more often legal communities that developed within a highly lax regulatory environment.⁴ However, these stigmas of “illegality” have frequently been used against residents seeking equitable access to resources.⁵ Colonias exist throughout the U.S./Mexico border region, but our focus, here, is on the intersection of colonia stigmatization and the high risk of flooding endemic to the Río Grande delta region. This intersection creates risks specific to LRGV colonias.

Within the LRGV, colonias are increasingly facing urbanization due to growing suburban

development at the fringes and outsides of the region’s cities. Particularly in Cameron County, the arrival of SpaceX and its involvement in programs for the City of Brownsville has driven gentrification across the city and county. Our growing concern is how changes in urbanization patterns coupled with unprecedented focus on flood mitigation might lead to the gentrification of colonias and the displacement of its long-term residents.

LRGV COLONIA DEMOGRAPHICS

Originally, colonias were developed to support migrant farmworkers working from the LRGV. These workers wanted a “home base” in the region. They would spend their springs and summers migrating across the West for various harvests, then return to the LRGV in the winters, living frugally off their earnings from the previous spring and summer.⁶ As a result, many migrant farmworkers could not afford property or rent in the region’s cities, instead moving into nearby rural enclaves. These communities were later referred to as “colonias.” Today, most colonia residents no longer work in migrant farming, but in the local service industry as cooks, construction workers, maids, and caretakers.

Across the LRGV, there are an estimated 988 colonias.⁷ These communities vary greatly in population, from a few dozen to a few hundred



IMAGE: Photograph from a United Farmworkers newsletter showing the conditions of early farmworker settlements in the LRGV, these developments later came to be known locally as “colonias” (Credit: Fishlow, 1967, p. 2).

households, and contain vastly differing population densities. Approximately 96% of colonia residents are Latinx, with most identifying as Mexican American, and 35% are foreign-born, larger than the rest of Texas.⁸ However, a common misconception is that most colonia residents are predominantly recent or first-generation immigrants. In their report, the Federal Reserve Bank of Dallas notes that across all Texan colonias 74% of residents are U.S. Citizens.⁹ For colonia

residents under 18 years old, the percentage of U.S. Citizens is as high as 94%. These statistics, along with research from colonia housing scholars such as Dr. Noah Durst,¹⁰ suggest that colonia residents are increasingly younger and second- and third-generation U.S. Citizens. This is also confirmed in colonia-based advocacy in the LRGV, which is increasingly led by youth organizers.¹¹

¹⁰ Noah J. Durst, “Second-Generation Policy Priorities for Colonias and Informal Settlements in Texas,” *Housing Policy Debate* 25, 2 (2015): 395-417.

¹¹ Interview, Colonia Organizer, April 2015. (Please note, we do not disclose the names of our interviewees or their organizations in this report to protect their identities from unscrupulous authorities and academics.)

¹ Exurban is a term for neighborhoods at the edges of suburban areas, but not necessarily fully rural.

² Danielle Zoe Rivera, “The Forgotten Americans: A Visual Exploration of Lower Rio Grande Valley Colonias,” *Michigan Journal of Sustainability*, 2 (2014): 119-130.

³ See Texas Housers for how this is being recognized elsewhere in Texan Policy: “HUD finds that Texas GLO discriminated against communities of color in \$4 billion CDBG-MIT program,” <https://bit.ly/3LYsohf>

⁴ Jane E. Larson, “Free Markets Deep in the Heart of Texas,” *The Georgetown Law Journal*, 84 (1995): 179-260.

⁵ Danielle Zoe Rivera, Bradleigh Jenkins, and Rebecca Randolph, “Procedural Vulnerability and Its Effects on Equitable Post-Disaster Recovery in Low-Income Communities,” *Journal of the American Planning Association*,

⁶ David M. Fishlow, *Sons of Zapata: A Brief Photographic History of the Farmworkers Strike in Texas* (Edinburg, TX: United Farmworkers, 1967), pp. 1-2.

⁷ TWDB Report 1A, p. 2.

⁸ Federal Reserve Bank of Dallas, *Las Colonias in the 21st Century: Progress Along the Texas-Mexico Border* (Dallas, Texas: 2015) p. 2. (We don’t use the 2020 Census due to massive colonia undercounts.)

⁹ Ibid.

LRGV COLONIA DEVELOPMENT

Colonias are frequently identified by their physical characteristics, particularly their access to basic services and infrastructure. Basic services, here, include access to potable water systems, wastewater systems, trash collection, electricity, political representation, and more. Infrastructure, here, includes access to streetlights, paved roads, stormwater management, parks and green spaces, sidewalks, disaster recovery, and more.

Developed outside of incorporated (city) areas, colonias historically lacked these basic services and infrastructure. Neighborhoods developed from agricultural lands that were either legally or illegally subdivided. Plots were sold to migrant farmworkers and service workers without a house or basic services and infrastructure. At the time most colonias developed, these practices were technically legal in rural, unincorporated Texas.¹ Residents were often promised that basic services and infrastructure would be delivered, however this rarely occurred.

The late 1980s, however, brought about significant change for colonias. In 1987, SB585 authorized the Texas Water Development Board (TWDB) to administer grants and services for improved water and wastewater services in colonias. Two years later, SB2 created the Economically Distressed Areas Program (EDAP) providing water and wastewater services to colonias residents that could not afford them. In 1995, two key policies were passed regarding colonia development and support. SB1509 generated “self-help centers” offering housing construction assistance to colonia households in nonprofit hubs, many of which still

exist today. HB1001 “halted” the development of new colonias by placing restrictions on rural subdivisions without platting and basic services, although the practice persists. Key in these early colonia policies is a focus on housing quality and access to water and wastewater management—but notably not stormwater management. Colonia infrastructure improvements were not even tracked until 2005 when SB827 established the Colonia Classification System – the first governmental effort to track the lack of drainage in colonias (covered in pages 26-27).

However, there is a sense that colonias have “fallen out of favor” with politicians and academics, leading to slowed progress on needed service and infrastructure delivery.² As one example, Governor Abbott discontinued the Colonia Classification System in 2017. The demographics and histories of LRGV colonias generate massively uneven power relationships between colonia residents and the officials making policy decisions surrounding basic services and infrastructure. Their lack of competitiveness with local cities and relative isolation were often given as the reasons for their diminishing foci in policy-making, as one organizer told us:

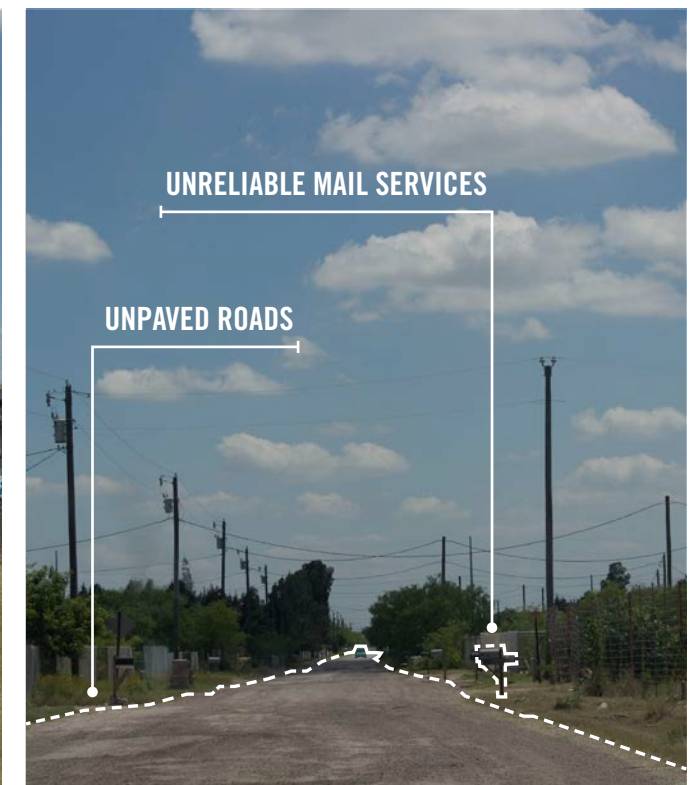
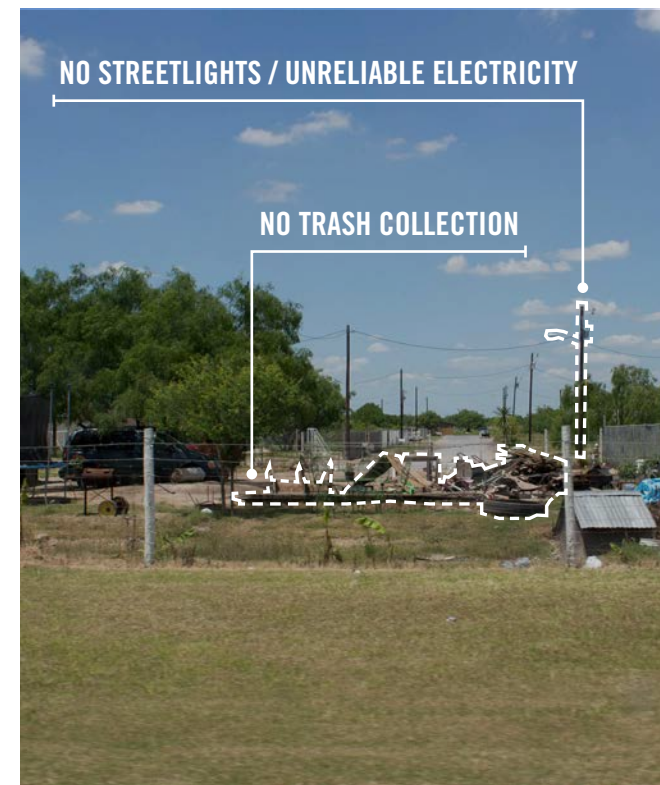
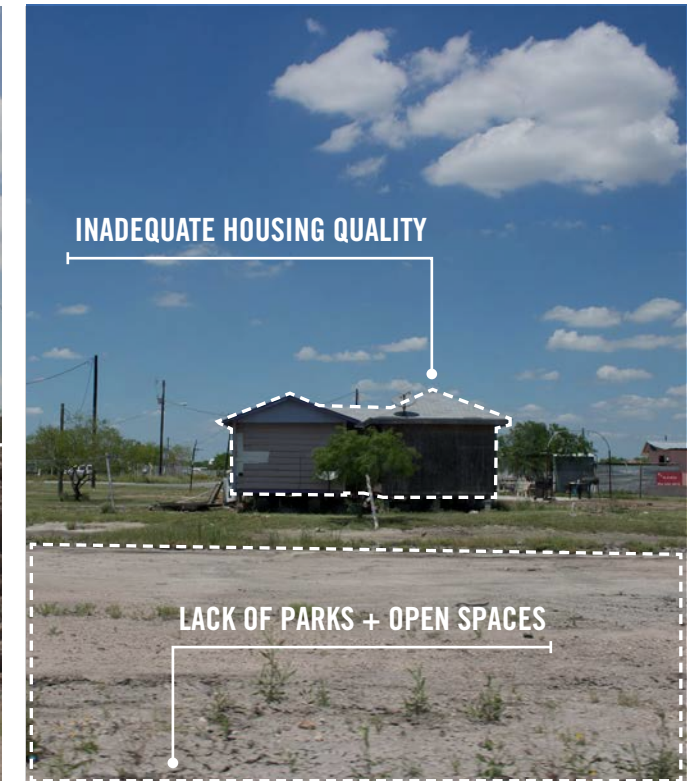
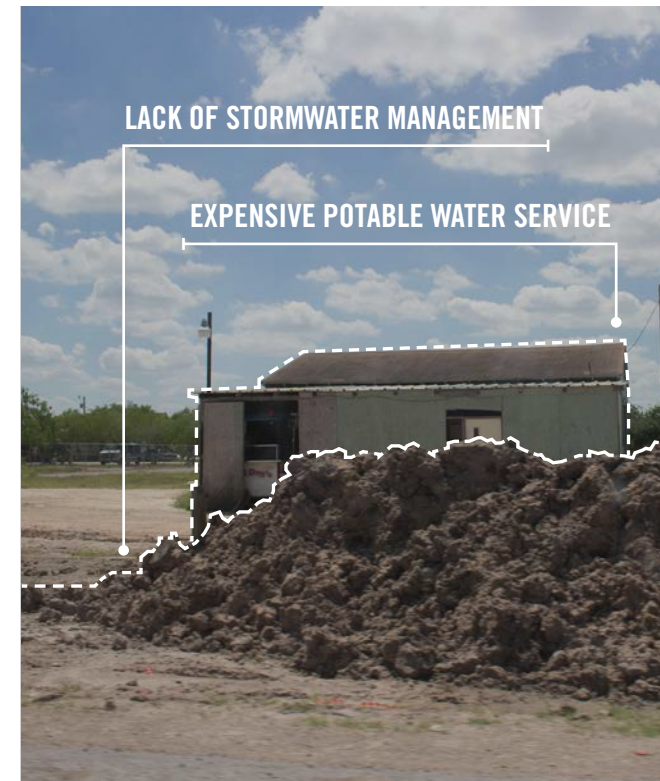
They [colonia residents] are so isolated away from community services. They need streetlights. They need garbage collection. They need parks and recreational areas... sidewalks... Things you would find in an average city. But they don't have these things.

Colonia Organizer, Interview, March 2015

Following up on this statement, we asked the organizer what is needed to address these issues, they stated: “Resources.”

² Interview, Colonia Organizer, September 2016.

¹ Jane E. Larson, “Free Markets Deep in the Heart of Texas,” *The Georgetown Law Journal*, 84 (1995): 179-260.



IMAGES: Photographs from several colonias north of Weslaco, Texas highlighting the most common infrastructure challenges discussed by colonia residents and organizers (Credit: Danielle Zoe Rivera, April 2015).

UNRELIABLE DATA ON COLONIAS

The physical conditions in colonias vary widely, as some colonias (often through extensive activism) have received basic services and infrastructure, while others have not. However, even when colonias receive needed services and infrastructure, frequent issues are they are too expensive and/or are of exceptionally poor quality. This has been the case for potable water delivery. Water lines now reach most LRGV colonias; however, the quality of the water is poor and the costs of the water is high. As a result, most colonia households quickly returned to collecting rainwater and buying water jugs.¹ This has also been the case for colonia stormwater management, highlight in this excerpt from *Texas Public Radio*:

Garza [a colonia resident in Ramirez Subdivision #4] said some parts of her property held up to 10 inches of stagnant water but the City of Palmview has yet to come and pump it out. Her colonia is now within city limits. She pays city taxes which maintain the paved streets, drinkable water, streetlights and even gives them a drainage system. Four years ago, the city created the system by digging trenches and installing culverts that were meant to reroute water away from her neighborhood's properties. But they've instead acted as receptacles for rainwater, retaining it for days on end. Now, for Garza and her neighbors, the flooding seems worse than ever.

Colonia resident as quoted in Culler (2021)²

This remains a significant concern, as the colonia *Ramirez Subdivision #4* is not listed in colonia databases as “in a floodplain” or even as “experiencing flooding.” Yet, changing urban

¹ Interview, Colonia Organizer, March 2014.

² Carolina Cuellar, “Colonias Bear The Heaviest Burden When Rain Falls In The Rio Grande Valley,” *Texas Public Radio* (July 22, 2021).

forms and conditions create and exacerbate flood risk in new areas of the LRGV each year: new roadways and railines form drainage barriers, new stormwater management systems in cities re-direct water into colonias, and climate change generates stronger and more persistent storms.

Quantifying and surveying physical conditions in colonias is fraught for several reasons. Colonias are severely undercounted in the U.S. Census. As a result, a long-term database was needed to monitor projects, set priorities, and measure quality-of-life indicators within colonias. The Texas Secretary of State (Texas SOS) maintained the Colonia Classification System from 2006-2017. The database classified colonias relative to their health risks by examining: access to basic infrastructure (water, wastewater, paved roads), platting, and access to health care.³ The criteria for these classifications are then based on the status of their infrastructure and summarized overall as the Colonias Health, Infrastructure, and Platting Status (CHIPS). There are three classifications for colonias in CHIPS:

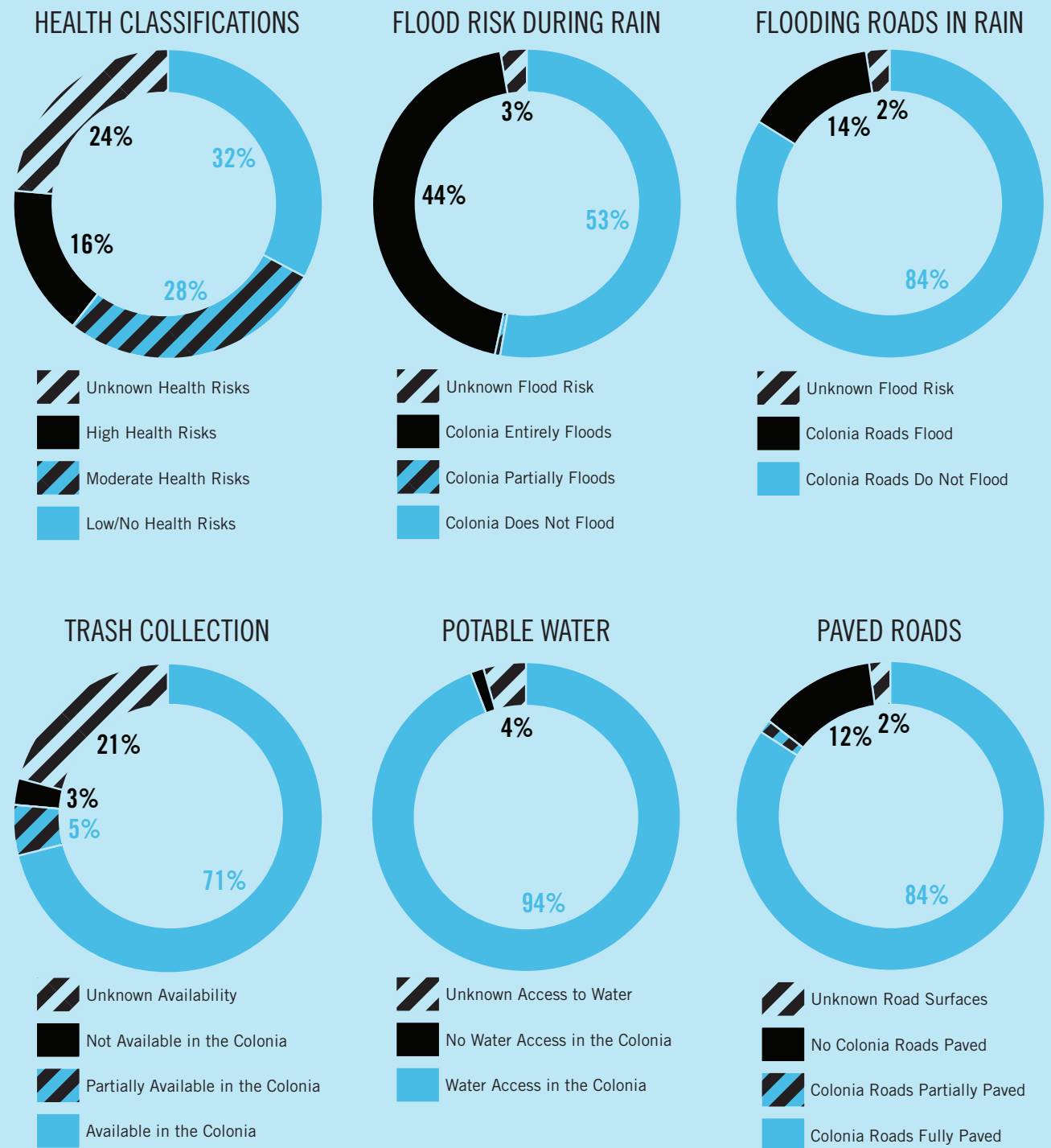
- **Red:** High Health Risks
- **Yellow:** Moderate Health Risks
- **Green:** Low to No Health Risks

These results have been spatialized by the Texas SOS with accompanying colonia data associated to each colonia by a unique identification number (ID). This information was often outdated and incomplete due to changing urban conditions in and around colonias. It also misidentified or failed to identify all the colonias in the LRGV.

³ Danielle Zoe Rivera, “The Forgotten Americans: A Visual Exploration of Lower Rio Grande Valley Colonias,” *Michigan Journal of Sustainability*, 2 (2014): 119-130.

COLONIA CONDITIONS ACCORDING TO TEXAS SECRETARY OF STATE (2015)

Using Texas SOS Colonia IDs, we combined several datasets to gain the most accurate view of LRGV colonia conditions possible. Here, we focus on several key areas regarding colonia infrastructure and service access across all 988 of the LRGV's colonias, keeping in mind the shifting physical conditions they are experiencing.



TEXAS WATER DEVELOPMENT BOARD: COLONIA FLOODING REPORTS

This section introduces the Texas Water Development Board (TWDB) and their survey on flood risk within LRGV colonias.

INTRODUCTION TO THE TWDB REPORTS

Texas Water Development Board (TWDB) is the key state-level agency of Texas providing water planning, data collection and dissemination, financial assistance, and technical assistance services across Texas. Its mission originally entailed foci on potable water delivery and wastewater management; however, in recent years the TWDB has received more responsibilities for addressing flooding (particularly since 2007).

As part of their increasing focus on flooding, TWDB conducted a series of surveys in LRGV colonias from 2014-2016. The study was funded by part of a U.S. Housing and Urban Development (HUD) Community Development Block Grant (CDBG) set-aside. Their goal through this study was "...to examine the drainage infrastructure needs of the Colonias and identify drainage study and infrastructure gaps that need to be filled in order address the drainage issues." The findings of these surveys were compiled in a report called "Stormwater Drainage Planning - The Colonias of the Lower Rio Grande Valley." The report is divided into three phases:

Phase 1A (June 2014) compiles existing data to assess and prioritize the needs of LRGV colonias. This phase identifies the most "at-risk" colonias, defined as those lacking drainage and stormwater infrastructure.

Phase 1B (December 2015) presents analyses of 78 LRGV colonias identified in Phase 1A. Each of these colonias were extensively surveyed and modeled to assess the frequency of flooding.

Phase 2 (December 2016) publishes data concerning the states' water system, along with proposed projects for each of the 78 colonias. It also recommends a regional analysis.

This three-part report forms a critical milestone in exploring issues of flooding for LRGV colonias, many of which have historically lacked involvement from state agencies.

LRGV COLONIAS STUDIED

While there are an estimated 988 colonias throughout the LRGV, the TWDB unfortunately did not have sufficient funds to conduct flooding surveys in these communities. As a result, the TWDB created “prioritization criteria” to establish which LRGV colonias have high flood risk and are least likely to receive any stormwater mitigation or assistance. In tandem, these two issues pointed to the more vulnerable communities, which TWDB deemed as most needing assistance from their office. Report 1A establishes these “prioritization criteria” following data across three categories:¹

- 1) **Jurisdictional Boundaries:** To determine which colonias are outside of city or drainage district boundaries, and at higher risk of flooding (i.e., population, city boundaries, and drainage district boundaries).
- 2) **Flooding Information:** To understand soil types, floodplains, historic reports of flooding, and terrain across the LRGV and identify conditions presenting higher risks of flooding (i.e., historic flood patterns, floodplains, soil surveys, and low terrain analyses).
- 3) **Infrastructure and Planning Data:** To identify colonias lacking drainage infrastructure and/or any funded drainage projects (i.e., model subdivision data, existing drainage structures, and existing/proposed projects).

Information on the locations of existing colonias were taken from the Texas Secretary of State (Texas SOS). As the TWDB discovered in their survey, Texas SOS data is outdated,² however updating this database is costly. Not discussed in the

¹ TWDB Report 1A, pp. 8-10.

² Danielle Zoe Rivera, “The Forgotten Americans: A Visual Exploration of Lower Rio Grande Valley Colonias,” *Michigan Journal of Sustainability*, 2 (2014): 119-130.

TWDB reports is how the use of outdated data to identify colonias led to an initial misidentification of abandoned lots and high income parcels as “colonias.” This drew colonia-based organizers into action as they vied against the TWDB survey.³ Over one weekend, they sent approximately 500 postcards to the TWDB office showing an image of a misidentified colonia on one side, and the contact information for the colonia-based organizations on the other side. The tactic worked and TWDB began working more closely (at each survey phase) with local organizations.⁴

These prioritization criteria were then compiled to achieve a ranking of the most at-risk colonias. TWDB identified 100 LRGV colonias as “high flood risk” and hoped to survey all 100, which they estimate are home to 50,300 people.⁵ Unfortunately, they lacked the resources to do so and reduced their survey to 78 colonias with the highest flood risk as determined by the prioritization criteria rankings.⁶

These 78 colonias were subsequently surveyed for their flood risks by a hazards mitigation consultancy. They examined each colonia for flood risks to the urban environment (streets and lots) and to individual structures (homes and businesses). Flood risk was established through a series of rain simulations for 2-, 5-, 10-, 25-, and 100-year storms, measuring outcomes in: linear feet of roads inundated, number of structures inundated, and number of lots inundated. From this, stormwater management strategies were proposed for each of the 78 colonias.

³ Interview, Colonia Organizer, June 2018.

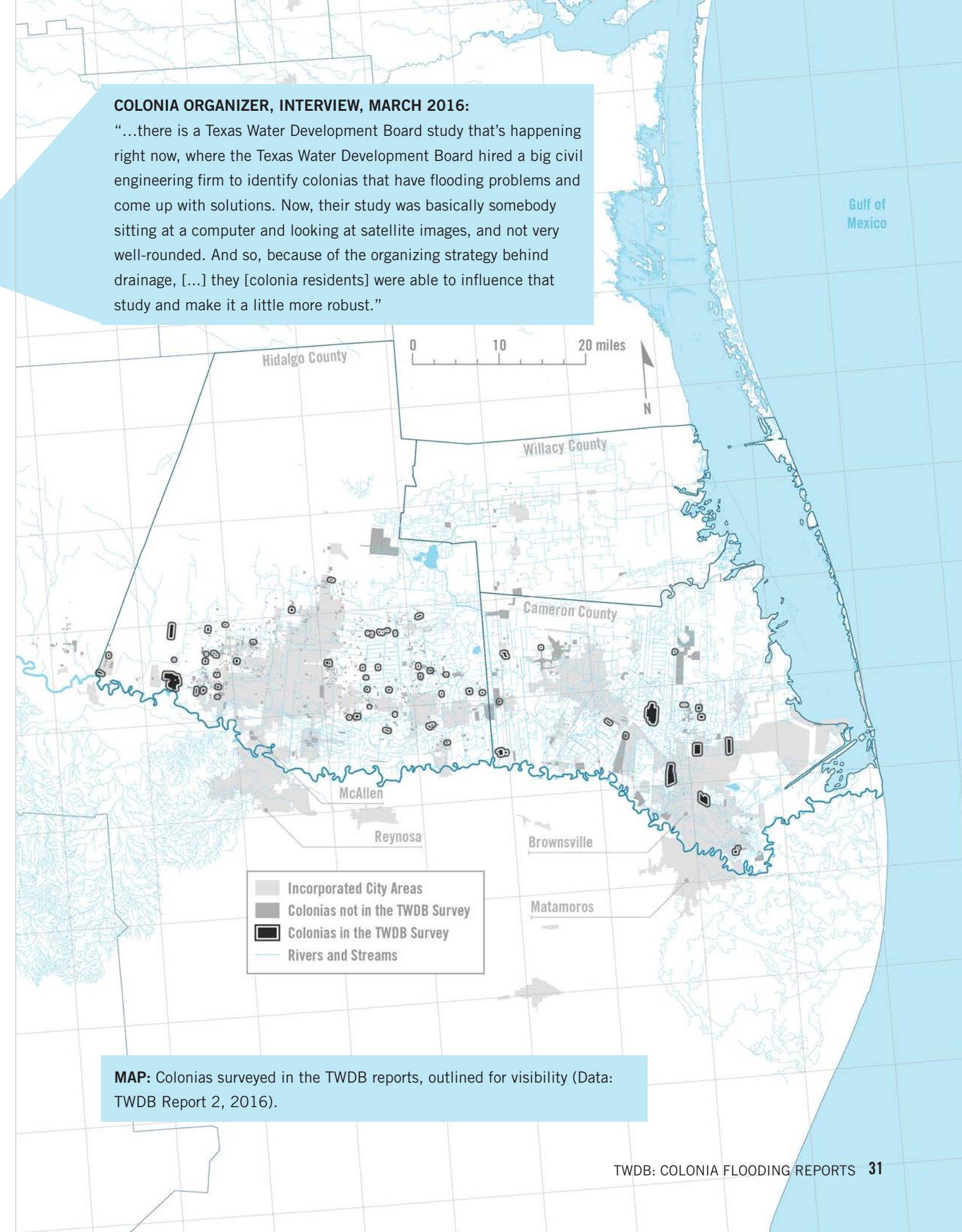
⁴ *Ibid.*

⁵ TWDB Report 1A, p. 14.

⁶ TWDB Report 1A, p. 8.

COLONIA ORGANIZER, INTERVIEW, MARCH 2016:

“...there is a Texas Water Development Board study that’s happening right now, where the Texas Water Development Board hired a big civil engineering firm to identify colonias that have flooding problems and come up with solutions. Now, their study was basically somebody sitting at a computer and looking at satellite images, and not very well-rounded. And so, because of the organizing strategy behind drainage, [...] they [colonia residents] were able to influence that study and make it a little more robust.”

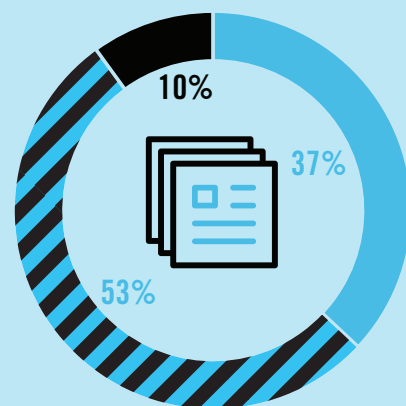


MAP: Colonias surveyed in the TWDB reports, outlined for visibility (Data: TWDB Report 2, 2016).

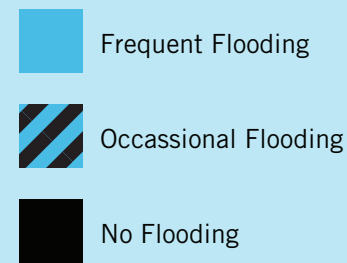
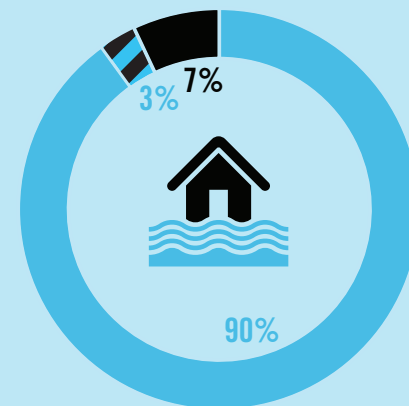
LRGV COLONIA FLOODING STATISTICS

TWDB's data from the 78 study colonias examining their access to flood mitigation against their reported frequency of flooding. These metrics were used (alongside other conditions) by TWDB to create "prioritization criteria," identifying the colonias most in need of their flood survey.

STATUS OF MITIGATION PROJECTS



FREQUENCY OF FLOODING



TWDB COLONIA FLOODING

Through the creation of their prioritization criteria, the TWDB amassed much data on colonias, data that is sometimes difficult to obtain. By examining the Texas Secretary of State's (Texas SOS) colonia database, 90% of colonias in the study area were reported to have frequent flooding issues, with 3% reporting occasional flooding, and 7% rarely experiencing flooding.¹ This can be contrasted against only 37% of colonias with funded or implemented mitigation projects and 53% are in areas where projects have been proposed but not funded, and the rest have no identified mitigation projects.²

However, not all colonias are experiencing the same flooding issues. A long-standing assumption surrounding colonia flooding is that their high flood risk is due to their development from agricultural lands, which were initially graded to retain water near crops. However, the TWDB's initial survey identified inconsistencies with this dominant narrative. TWDB found that this development history may only hold true for approximately 27% of LRGV colonias, leading to concerns that flooding in this region comes from a wider variety of sources.³ A key area of emphasis in this report is that localized colonia flooding is not inherently part of their urban form and, as a result, a variety of mitigation techniques are needed to respond to these varying conditions.

In their stormwater modeling, however, the TWDB followed three specific mitigation goals:⁴

1 TWDB Report 1A, p. 11.
 2 TWDB Report 1A, p. 12.
 3 TWDB Report 1A, p. 11; TWDB, *Stormwater Drainage Planning: The Colonias of the Lower Rio Grande Valley (LRGV) Report* (Austin, TX: TWDB, 2016), p. 2 (Referred to as "Report 1B").
 4 TWDB Report 1B, p. 7.

- 1) Protect structures from the 10% (10-year) local storm event.
- 2) Convey the 10% (10-year) local drainage in a regional storm drainage system.
- 3) Retain the 4% (25-year) local drainage using a detention or retention pond.

From this analysis, the TWDB identified two "categories" of needed flooding mitigation in the surveyed colonias (n=78). From their study, they identified two overarching sources of LRGV colonia flooding:⁵

- 1) Colonias requiring INTERNAL solutions: these colonias experience flooding due to a lack of proper outfalls or internal drainage systems.
- 2) Colonias requiring EXTERNAL solutions: these colonias experience flooding due to a lack of adequate connection to regional drainage systems.

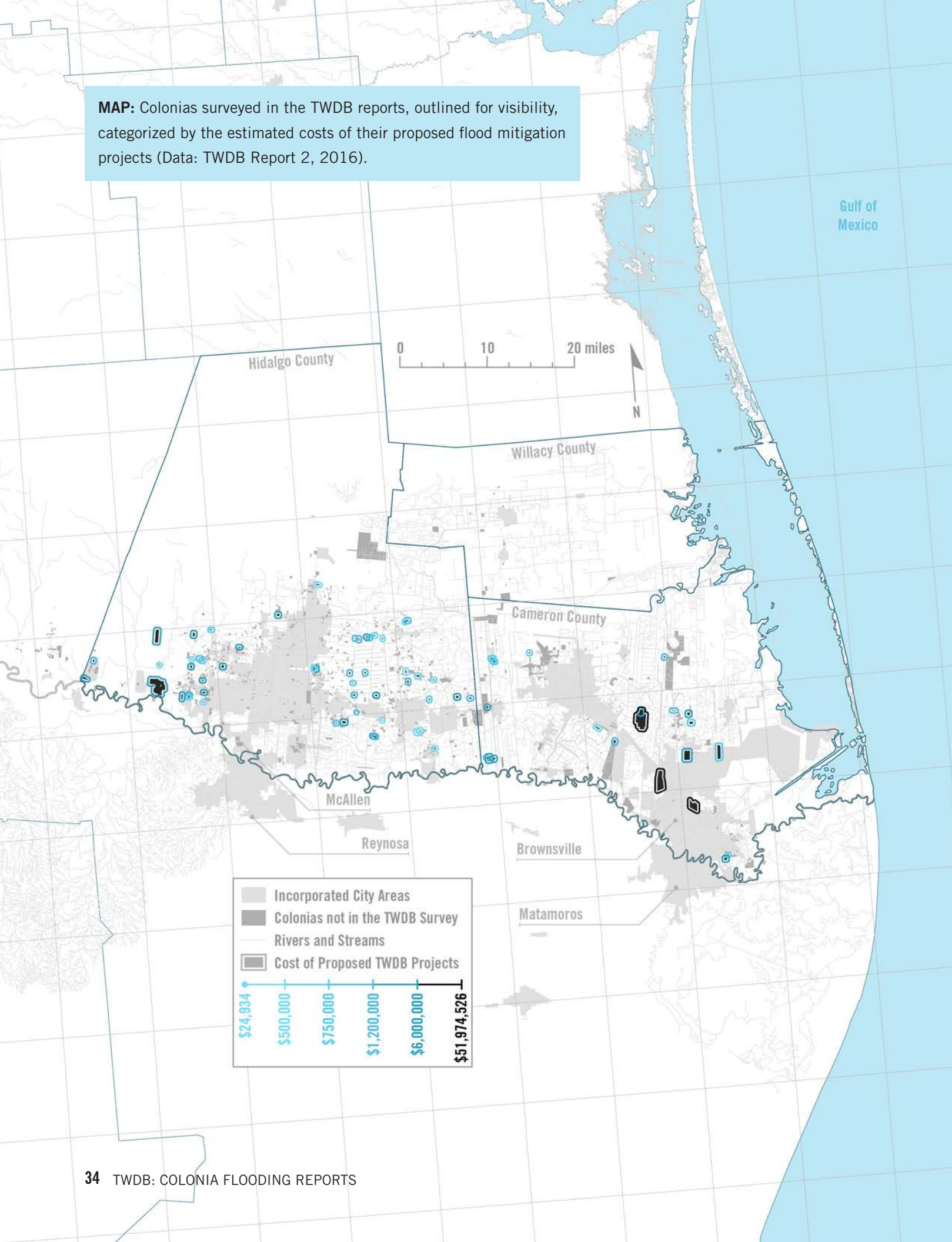
This is also complicated due to the fact that colonias reside within several drainage systems, including (of the 988 in the LRGV):

- Río Grande System (30 colonias)
- Raymondville (Delta Lake Irrigation District)/ North Main Drainage System (Hidalgo County) (580 colonias)
- North Floodway/Arroyo Colorado System (US International Boundary and Water Commission) (290 colonias)
- Brownsville Area Systems (City of Brownsville) (90 colonias)

From cursory categorizations and our own analyses, it is clear that a subsequent typology of mitigation strategies is needed for LRGV colonias.

5 TWDB Report 1B, pp. 2-3.

MAP: Colonias surveyed in the TWDB reports, outlined for visibility, categorized by the estimated costs of their proposed flood mitigation projects (Data: TWDB Report 2, 2016).



EXAMINING THE PROPOSED FLOOD MITIGATION PROJECTS

From our own colonia database, we analyzed the basic attributes of the 78 study colonias against TWDB’s flood modeling and mitigation proposals.

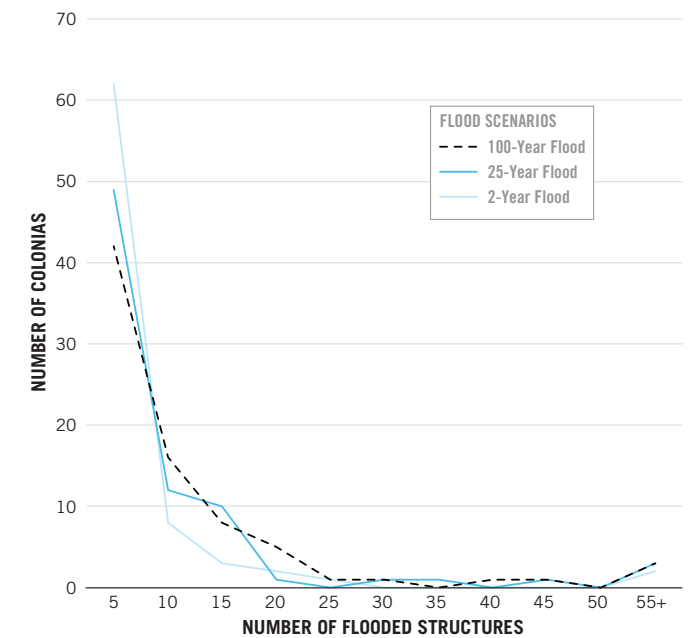
The TWDB proposal for each colonia covers the results of flood modeling and their suggestions for mitigating each colonia’s flood risk. While the modeling was produced for many more flood scenarios, we compiled the results only for 2-year, 25-year, and 100-year flood scenarios. From these scenarios, the modeling calculated the risk to each colonia’s lots, roadways, and structures. In the 100-year storm simulation, flooding impacted an average of 93 lots, 981 linear feet of roadways, and 13 structures per colonia. This is significant as many colonias become impassable in rainstorms, with severe inundation in lots and roadways. Yet, lot and roadway flooding may not inspire sufficient action from state and federal agencies, many of whom are primarily concerned about damage to structures. The median costs of these flood mitigation proposals is \$961,550, with projects ranging between \$24,935 and \$51,974,526. This wide range is unsurprising, as the areas of these colonias vary widely (from one acre to 1,235 acres), as does the estimated population of each colonia (from nine residents to 5,282 residents).

Examining these projects, it is clear that LRGV colonias, as a whole, present a massive population and area sustaining flood risk. However, despite the identifiable need for flood mitigation in these 78 study colonias (alone), our database shows:

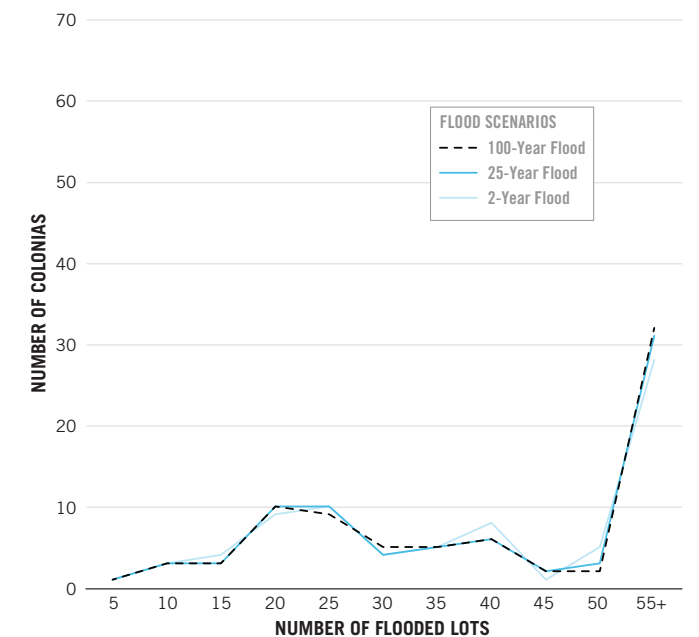
Only 54.5% of the 78 colonias are labeled as “flooding” in the Texas SOS database and only 42.9% are marked as “in a floodplain” by FEMA.

CHARTS: These charts highlight the propensity for lots, not necessarily structures, to flood in colonias (Data: TWDB Report 2, 2016). This follows insights from colonia residents, who state that flooding most frequently prevents them from leaving their neighborhoods for work or school, costing them important opportunities.

NUMBER OF FLOODED STRUCTURES PER COLONIA



NUMBER OF FLOODED LOTS PER COLONIA



THREE KEY CONCERNS FOR ADDRESSING COLONIA FLOODING

This section provides an analysis of the report's findings by identifying the three major issues barring redressing colonia flood risk in the LRGV.

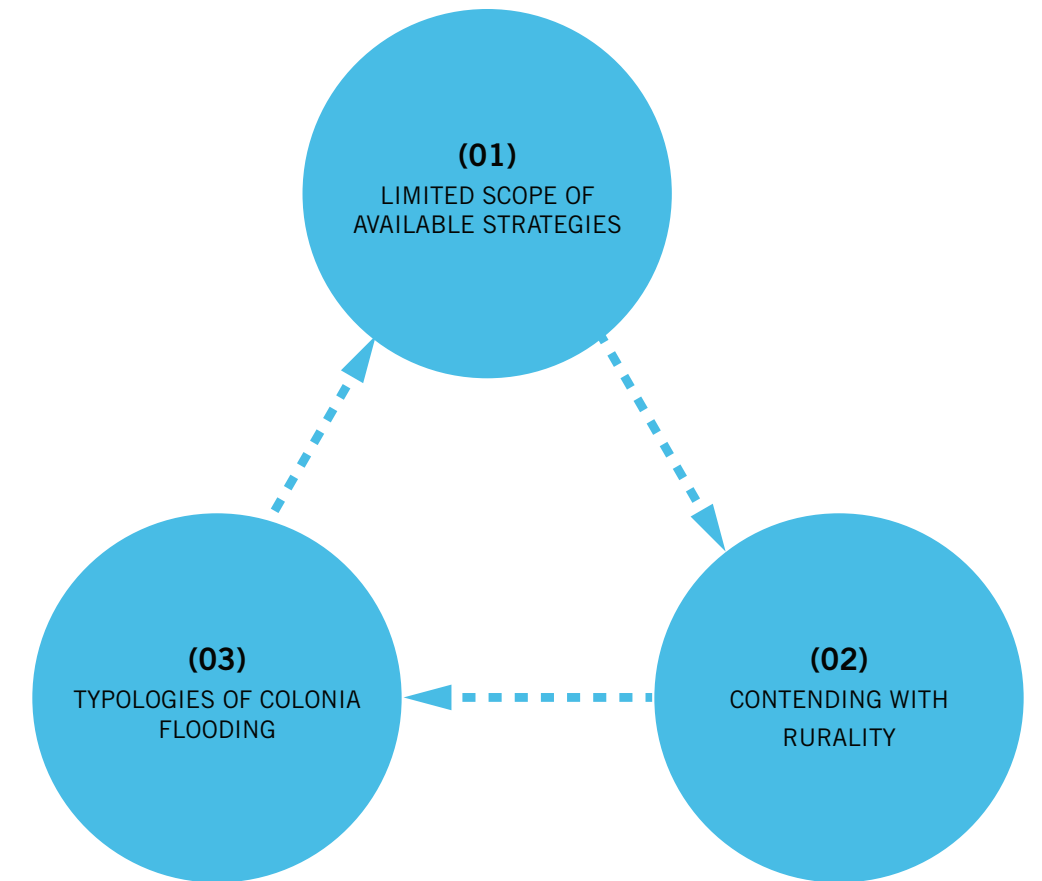


FIGURE: Three key concerns for equitably addressing LRGV colonia flooding identified through this report.

Here, we summarize our findings from analyses of the TWDB 2014-2016 flooding survey, geospatial analyses of data from other Texas agencies, colonia organizer interviews conducted between 2014-2020, and participant observations of protests and public meetings between 2014-2020. Synthesizing this information over eight years, we noted three clear, recurrent concerns that emerged throughout this time:

- 1) Limited Scope of Available Strategies
- 2) Contending with Rurality
- 3) Diverging Typologies of LRGV Colonia Flooding

We expand these three areas of concern here and provide definitions and additional context when necessary.

ISSUE #1

LIMITED SCOPE OF AVAILABLE STRATEGIES

In Report 2, the TWDB surveyed flooding conditions across the 78 colonias with the highest flood risks and identified strategies for mitigating their flood risk.¹ Of note, the TWDB only assessed local risks within each colonia, and did not assess their relationship with regional floodways.² Of the 78 surveyed colonias, TWDB found that only 17 colonias (22%) were affected by regional floodway or river/creek issues.³ The remaining colonias were found to be experiencing localized flooding within the colonia due to nonexistent or improper local drainage systems.

From this, we compiled the strategies proposed across these neighborhoods and found that drainage ditches and offsite (outside of the colonia) retention ponds were the two most commonly proposed flood mitigation strategies (proposed 83.3% and 80.5% respectively). The goal would be to invest in drainage ditches to move water out of flooding lots and roadways and convey into retention ponds. From there, stormwater could be collected and slowly filtered into the ground. Culverts were also proposed about 49.4% of the time to direct water from drainage ditches underneath roadways. Detention ponds were proposed in 76.6% of the colonias, oftentimes located underground and where a subsurface (underground) stormwater system already existed or was nearby. Similarly, stormwater

drains were only proposed as an alternative to drainage ditches 12.8% of the time and often in conjunction with a subsurface system.

As an additional study, we cross-examined the TWDB flood mitigation strategies against other known strategies. Of note, the vast majority of proposed solutions constitute gray infrastructure strategies, with the only proposed nature-based or green infrastructure strategies being bioswales (proposed in 46.8% of the colonias). Bioswales are often suggested by the TWDB to mitigate run-off between properties, with the potential to convey stormwater to drainage ditches in the event of major storms. In these respects, many key nature-based solutions were not examined with possible implications for ecological sustainability, outdoor recreation opportunities, and long-term maintenance and care in these colonias.

Undeniably, TWDB was likely unable to consider many green infrastructure solutions due to their higher installation costs, though green infrastructure often has lower long-term maintenance costs.⁴ Additionally, a cost-benefit analysis for solutions for these projects is particularly difficult, as some colonias experience widespread flooding on roadways and lots, but not necessarily within structures leading to skewed estimates of possible flood damage.⁵

1 TWDB, *Stormwater Drainage Planning: The Colonias of the Lower Rio Grande Valley (LRGV) Report: Phase 2 Report* (Austin, TX: TWDB, 2016). (Referred to as "Report 2")

2 TWDB Report 1B, p. 1.

3 TWDB Report 1B, pp. 2-3.

4 Marccus D. Hendricks, Galen Newman, Siyu Yu, and Jennifer Horney. "Leveling the Landscape: Landscape Performance as a Green Infrastructure Evaluation Tool for Service-Learning Products." *Landscape Journal* 37, no. 2 (2018): 19-39.

5 TWDB Report 1B, p. 8.

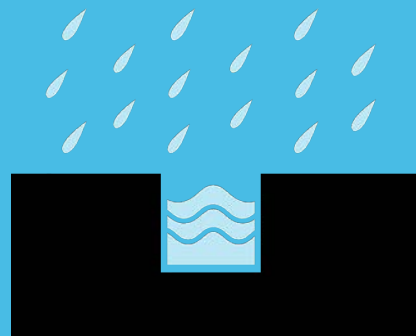
GREEN INFRASTRUCTURE SOLUTIONS	FREQUENCY OF USE
RAIN GARDENS	0%
BIORETENTION	0%
VEGETATED RETENTION PONDS	0%
BIOSWALES	46.8%
REFORESTING	0%
RECONSTRUCTED WETLANDS	0%
CREEK/STREAM DAYLIGHTING	0%
GREENROOFS	0%
GRAY INFRASTRUCTURE SOLUTIONS	FREQUENCY OF USE
BLUEROOFS	0%
DRYWELLS	0%
PERMEABLE PAVING	0%
ONSITE RETENTION PONDS	27.3%
OFFSITE RETENTION PONDS	80.5%
SUBSURFACE DETENTION	76.6%
DRAINAGE DITCHES	83.3%
CULVERTS	49.4%
STORMWATER DRAINS	12.8%

TABLE: Common green and gray infrastructure strategies with the frequencies these strategies were proposed in TWDB's LRGV colonia flooding survey (Data: TWDB Report 2, 2016).

ISSUE #1

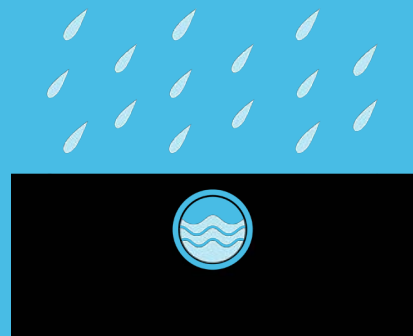
LIMITED SCOPE OF AVAILABLE STRATEGIES

Here we identify and define the six most common strategies proposed by the TWDB for mitigating LRGV colonia flooding. Only “bioswales” are considered “green infrastructure” or the management of water through filtration and movement through vegetation and their root systems. The remaining five strategies are considered “gray infrastructure” or the management of water via engineered hardscapes.



WHAT IS A DRAINAGE DITCH?

Drainage ditches are channels made in the ground to convey water from one location to another. In Texas, drainage ditches commonly run parallel to roadways to clear stormwater from roads, sidewalks, and adjacent lots.



WHAT IS A STORMWATER DRAIN?

Stormwater drains are subsurface pipes that collect stormwater and run-off from sidewalks, roads, and other surfaces. Stormwater drains collect these waters via grates and convey the water away from the site.

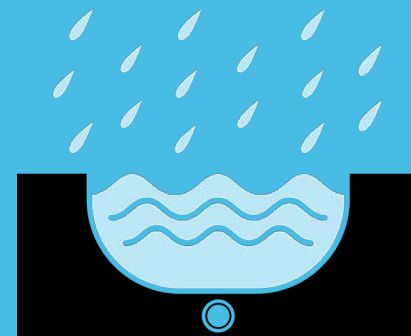


WHAT IS A CULVERT?

Culverts are a subterranean channels that convey water through a pipe or tunnel to bypass obstacles, such as roadways. Culvert refers specifically to the structure that holds the obstacle so the water can pass underneath it.

ON-SITE OR OFF-SITE RETENTION?

TWDB proposals carefully examined vacant lots and adjacent communities to determine whether retention ponds should be located “on-site” (taking up plots of land within the colonia) or “off-site” (taking up agricultural land outside the colonia).



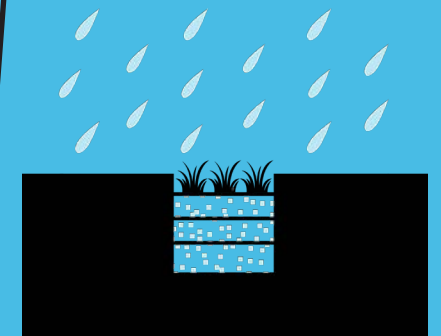
WHAT IS A DETENTION POND?

Detention ponds are permanent or semi-permanent artificial basins designed to hold water during storms. They are not vegetated and rely on subsurface drains and pipes to eventually release stormwater into a drainage system.



WHAT IS A RETENTION POND?

Retention ponds are permanent or semi-permanent artificial basins designed to hold water during storms. They are often vegetated at its edges to stabilize its banks and slowly release water into the ground, filtering it in the process.



WHAT IS A BIOSWALE?

Bioswales are vegetated ditches with a series of permeable layers, often located alongside streets and paved walkways. Their vegetation and permeable layers slowly filter and clean water before releasing it into the ground.

ISSUE #2

CONTENDING WITH RURALITY

For unincorporated colonias, weak or non-existent local governance means lack of access to the “best practices” in stormwater management.

Throughout the TWDB’s reports, they point put numerous frictions between local, regional, and international floodways in the LRGV, with colonias frequently positioned squarely within these frictions. In attempting to address their high flood risk, colonia residents and organizers are met with a constant stream of “no’s” from local to federal agencies.

This generates what we call the “Scales of ‘No’” or the unwillingness or inability for institutions and agencies to take responsibility for need infrastructure, thus generating inequitable access to basic services and infrastructure. In the case of LRGV colonias, there exist layers of institutions from the federal, state, regional, and local levels that have denied any ownership or role in addressing high colonia flood risk (See Figure). As organizers and advocates describe it, the “no’s” from different offices creates a web of finger pointing that is difficult to untangle.

The Scales of “No” illustrates a core concern in the fight to address/redress colonia flooding: there exist multiple institutional and policy-based barriers for implementing and maintaining stormwater infrastructure. Some of these concerns relate specifically to colonias (even LRGV colonias specifically) and other concerns are generalizable to rural, low-income communities of color. Here, we examine the various scales of “no” as uncovered

in the TWDB reports, organizer interviews, and observations of colonia-based workshops. They are presented in three scales:

- 1) Local-Level
- 2) State-Level
- 3) (Inter)National-Level

(1) Local-Level: THE “EXTRA-TERRITORIAL JURISDICTION”

In TWDB’s Report 1A, they note that of all colonias in the LRGV (n=988), 68% reside within an extraterritorial jurisdiction (ETJ).¹ In Texas, ETJs are contiguous, unincorporated areas immediately outside the city’s boundaries of varying distances² that can be leveraged as “growth boundaries.” This definition situates most LRGV colonias within the ETJ a local incorporated city, but not technically within the city itself, placing them in precarious situations regarding access to adequate stormwater management (which we detail further in the state-level discussion). Please note that fully incorporating colonias into local cities (annexing their lands to make them part of the city) remains highly controversial for both cities and colonia residents, the latter for whom city taxes represent

- 1 TWDB Report 1A. p. 11.
- 2 Bara Safarova, “Incremental Construction and House Value Segregation: The Case of Brownsville, Texas on the United States–Mexico Border,” PhD diss., (Texas A&M, 2019); Texas Local Government Code, Title 2C, Chapter 42: States that depending on the population size of the city, extraterritorial jurisdictions extend between half a mile to five miles outside the city borders. (<https://statutes.capitol.texas.gov/Docs/LG/htm/LG.42.htm>)

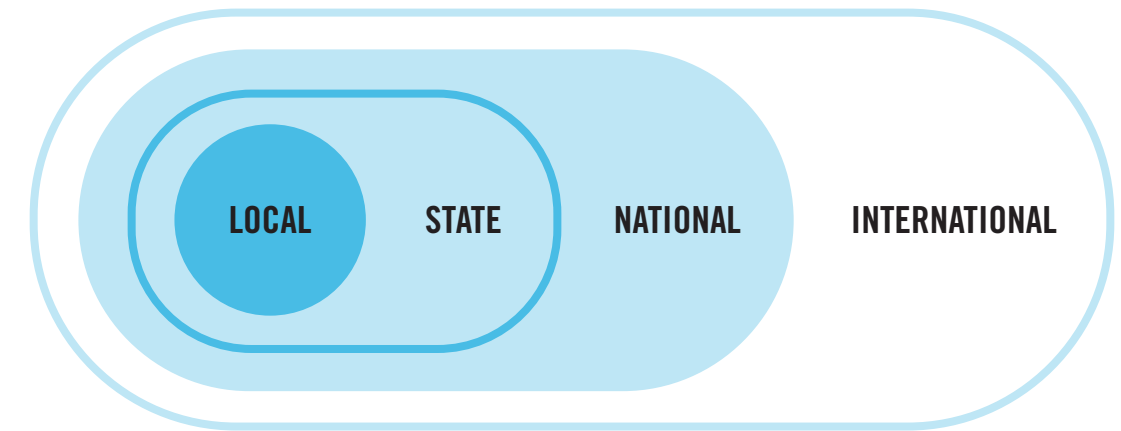


FIGURE: Scales of “No” highlighting the layers of institutions and agencies that generate inequitable access to basic infrastructure and services by saying “no, not our responsibility.” Rural communities are especially prone to Scales of “No” given they do not neatly map onto these layers of governance.

an incommensurate burden and, subsequently, would lead to resident displacement.³ In the absence of tax assistance programs, such as those undertaken in California to promote colonia incorporation,⁴ colonia incorporation becomes colonia displacement.

For the estimated 32% of LRGV colonias that reside outside of cities and ETJs,⁵ access to flood mitigation and adaptation remains particularly difficult. Across planning, design, and policy, there exist few flood mitigation and adaptation strategies that are not predicated on strong city government for funding, construction, and long-term maintenance.⁶ Additionally, many of the flood mitigation and adaptation options available to “deep rural” communities (those outside of any

reach of local government), often involve tasking levels of resident-led construction and long-term maintenance.⁷

Yet even for colonias within ETJs, despite proximity to local cities, access to local flood mitigation and adaptation still remains fraught. In Texas, cities are not necessarily compelled to extend basic services and infrastructure (such as drainage systems) to their ETJ areas, generating numerous equity concerns.⁸ This issue was well-documented and -studied by Dr. Noah Durst in terms of housing quality, where he noted that Texan cities are restricted in the types of regulations they can impose in ETJs, resulting in reduced access to adequate housing.⁹ Without regulation to extend drainage and stormwater management to colonias in ETJs, they remain in a complicated grey space in the scales of “no,” where it becomes difficult to ascertain whether the local city or the county should take responsibility for flood mitigation and adaptation.

- 3 Vinit Mukhija and David R. Mason, “Reluctant Cities, Colonias and Municipal Underbounding in the US: Can Cities be Convinced to Annex Poor Enclaves?” *Urban Studies* 50, no. 14 (2013): 2959-2975.
- 4 Ibid.
- 5 TWDB Report 1A, p. 11.
- 6 Danielle Zoe Rivera and Marccus D. Hendricks, “Municipal Undergreening: Framing the Planning Challenges of Implementing Green Infrastructure in Marginalized Communities” *Planning Theory & Practice*, Forthcoming.

- 7 Ibid.
- 8 Noah J. Durst, “Municipal Annexation and the Selective Underbounding of Colonias in Texas’ Lower Rio Grande Valley.” *Environment and Planning A* 46, no. 7 (2014): 1699-1715.
- 9 Ibid., p. 704.

ISSUE #2

CONTENDING WITH RURALITY

(2) State-Level:

ADDRESSING COUNTY CAPACITY TO UNDERTAKE FLOOD MITIGATION

In identifying strategies for addressing flood risk in colonias, a core issue consistently emerged: most policy and design tools for addressing flood risk are developed from and for cities with strong local-level governance. However, unincorporated colonias lack incorporation and local-level governance and must rely on county governments to provide services. LRGV county officials are not necessarily opposed to providing services to residents of unincorporated areas.

A strong case of such was LUPE's *Right to Light* campaign, which advocated for streetlights in unincorporated colonias. To accomplish this, the State of Texas needed to change its laws to permit county-level taxation, construction, and maintenance of streetlights. Through LUPE's efforts, county officials sided with the Right to Light campaign and the State granted counties the right to govern over streetlights in unincorporated areas.¹ From this experience, organizers assumed this same tactic could be leveraged to address other infrastructural issues.

However, in our interviews with colonia organizers and local design/engineering experts,

¹ Interview, Colonia Organizer, 2017; Michel Braier, "The Right to Light: Visibility and Government in the Rio Grande Valley Colonias." *Annals of the American Association of Geographers* 110, no. 4 (2020): 1208-1223.



IMAGE: Drainage system installed in Weslaco near, but not in, colonias (Credit: Danielle Rivera, April 2015).

we found a strong "no" from county officials regarding stormwater management. County officials felt ill-equipped and under-resourced to undertake the construction and maintenance of stormwater management.² Officials were concerned about the complexity and scope of installing and maintaining stormwater management, which necessitates a level of expertise not common within small Texas county governments. Additionally, liability concerns are much greater with stormwater management than with streetlights, making officials even more reticent to take up the cause. Capacity-building and support for county governments to undertake stormwater management and other types of hazard planning would greatly support the colonias (and other rural communities across Texas).

² Interview, Colonia Organizer, 2020; Interview, Nonprofit Worker, 2020.

(3) (Inter)National-Level:

DISCONNECTED FLOODWAYS

Even if local and state-level colonia issues are addressed, there remain fundamental concerns regarding the disconnections between regional floodways and the heavily regulated (and internationally-governed) systems of the IBWC floodways.³ This concern becomes particularly heightened during major storms when the stormwater systems of the Río Grande are closed to regional waterways. Without considering this, the LRGV as a whole, not just its colonias, are at high risk of flooding in areas without sufficient access to stormwater infrastructure. While retention and detention ponds can handle

³ TWDB Report 1B, p. 1.

stormwater until drainage is permitted again into the Río Grande (currently the most common approach), reconstructed wetlands across the region may also assist with stormwater issues, while providing additional benefits across the LRGV, such as strengthened wildlife corridors and enhanced open space access.

Thus, while local territorial issues must be taken into account between local cities and rural areas, the entire LRGV region faces injustices regarding flood mitigation and adaptation due to disconnections from the Río Grande (where stormwaters naturally want to flow to).



IMAGE: Where the levee border wall ends near Boca Chica State Park (Credit: Danielle Rivera, May 2015).

ISSUE #3

TYOLOGIES OF LRGV COLONIA FLOODING

One of the core issues with determining how to address colonia flood risk is the lack of adequate data surrounding the numbers and locations of colonias and model subdivisions (MSDs). As mentioned on pages 26-27, efforts to even identify the locations of colonias and colonia-like MSDs remains fraught, as state data is outdated and incomplete. As noted previously, colonia and MSD conditions vary widely across the LRGV. Over time, some colonias in the SOS database have been incorporated into surrounding municipalities, some experienced socio-demographics shifts, while others remain unincorporated (a key issue leading to TWDB’s initial inaccurate selection of colonias). This often stymies attempts to widely and comprehensively examine colonia flooding concerns across the LRGV.

First, to address these data constraints, we advocate for more extensive flood modeling that broadly examines flood risk across all unincorporated spaces of the LRGV. Additionally, an updated colonia and MSD database is sorely needed. The original colonia database was intended not just to track progress delivering services to Texas colonias, but to expose inequitable and fraudulent misdirection of colonia funding. In the absence of this tracking, colonia funds can be easily misappropriated.

Second, while the TWDB understandably did not survey incorporated colonias or those contained within existing drainage districts, these colonias

frequently experience stigmatization and lack of quality infrastructure despite their location within cities and drainage districts. The strategies available for assisting these colonias are more vast, given the local program and policy tools available to cities and drainage districts, but the organizing and activism necessary to help these colonias resides at a different scale and scope than for unincorporated colonias. At least two or three different flood justice techniques are needed to address colonia flooding.

Lastly, we recommend a clearer quantitative and qualitative assessments of the varied conditions colonias are experiencing relative to inadequate stormwater infrastructure and management of existing infrastructure. This assists as a method for allowing more targeted studies of specific flood conditions in LRGV colonias (similar to how the TWDB ultimately conducted their studies). This also acknowledges the realities of regional flooding which vary across the LRGV (as well as in Starr County which was not part of this study) and necessitate a variety of policy and design interventions. To reflect this, we gathered a number of variables here and compiled them into an initial table of colonia flood risk variables, with accompanying possible design and policy interventions. This list of variables and their accompanying suggested interventions are not meant to be exhaustive, but a launching point for multiple community-based inquiries.

LOCAL GOVERNMENT STATUS	
INCORPORATED AREA	Fully within the jurisdiction (control) of a local (municipal) government
UNINCORPORATED AREA	Outside the jurisdiction (control) of a local (municipal) government
EXTRATERRITORIAL JURISDICTION (ETJ)	Adjacent (within a specified distance) of a local government, giving that jurisdiction partial control of the area
SOURCES OF FLOOD RISK	
LOCAL FLOOD RISK	Risk comes from within the colonia
CREEK/STREAM DAYLIGHTING	Risk comes from regional floodways and/or adjacent communities
GREENROOFS	Risk comes from the U.S./Mexico border levee system
GEOPHYSICAL FACTORS	
SOIL TYPE	Material composition of earth on a site which determines its ability to drain stormwater
TERRAIN AND GRADING	Elevation changes across a site which determine its capacity to shed stormwater
RAISED INFRASTRUCTURE BARRIERS	Raised roads, levees, and railways forming engineered barriers to shedding stormwater
FLOODPLAINS	Areas located within low elevations or natural dips that are predisposed to flooding
VEGETATIVE DENSITY	Percent of a site containing plants which help filter and slow stormwater
PERMEABLE SURFACE DENSITY	Percent of surfaces on a site which do not block stormwater from entering the earth
CLIMATE CHANGE	
HURRICANES AND RAINSTORMS	Current/projected changes to frequencies and intensities of rainstorms and hurricanes
SEA LEVEL RISE	Current and projected changes to the level of the Gulf of Mexico which will affect coastal regions and rivers
DROUGHTS	Increases in the consecutive number of dry days which will reduce the soil’s capacity to drain stormwater
RISING GROUNDWATERS	Rising groundwater levels caused by sea level rise which will subsequently cause ponding and pooling in new areas

TABLE: From this report’s analyses, a listing of the various core elements contributing (or projected to contribute to) LRGV colonia flood risks. This is not an exhaustive list, but is intended to highlight several frequently overlooked colonia flood risk factors.

CONCLUSIONS + RECOMMENDATIONS

From the three major barriers identified for addressing colonia flood risks, we have identified a need to undertake three accompanying initiatives.

Recommendation 01:

BUILD A BROADER VISION FOR COLONIA (OPEN) SPACES

Reflecting upon Issue 01, there is a need to cultivate a broader vision for colonia open space based upon colonia residents' visions. bcWORKSHOP is uniquely situated to undertake such work and has, in the past, already laid the groundwork to undertake this task. Our core concern is to push state and county governments to not just view stormwater management investments on purely engineering terms, but to view investments and annexed spaces for flood mitigation as the basis for multi-use spaces in and for colonias, the uses of which should be defined by colonia residents. Over the course of attending community meetings, undertaking interviews, and talking to residents, there are a host of relevant intersecting colonia concerns that, paired with flood mitigation investments, could have broader positive impacts, ideas such as: the desire for safer active transportation systems, safe access to public transit, the need to access healthier and more affordable food options, the desire for sidewalks, and the need for community gathering spaces.



IMAGES: Murals evoking the liberatory struggles of the United Farmworkers in the community space of La Unión del Pueblo Entero (LUPE) (Photo Credit: Danielle Zoe Rivera, January 2020).

Recommendation 02:

BUILD COUNTY CAPACITY AND CONFIDENCE TO ADOPT STRONG COLONIA STORMWATER MANAGEMENT SYSTEMS

This may not necessarily entail county ownership of stormwater systems, but emphasizes county-based advocacy for the communities within their jurisdiction. Here, we advocate for county officials to pay greater attention to unincorporated colonias in their jurisdictions, not just incorporated areas that hold uneven power. Our contention is that counties (as the arm of the state) have an imperative to address colonia flooding when municipalities and their ETJs do not hold any claims on the colonia. However, it is apparent that there is a lack of support for county-level stormwater management. To support counties, the barriers they face to adopting stormwater management need to be addressed and colonia residents and advocates need to be heard in and through new county-level stormwater management initiatives.



IMAGE: Participatory affordable housing workshop (Credit: Danielle Zoe Rivera, March 2020).

Recommendation 03:

IDENTIFY AND ADDRESS FLOOD INJUSTICES FOR COLONIAS AT THE FRINGES OF INCORPORATED AREAS

Following Recommendation 02, there is a separate set of concerns facing colonias near and adjacent to incorporated cities, or those that have been incorporated. Colonias near cities may experience the negative externalities of city systems; for instance, having stormwaters pushed from urban areas into the colonia. ETJs, in particular, generate a muddy policy environment, where it is uncertain what the rights are of residents within the ETJ, and what services and infrastructure cities must deliver and when. Yet, within an ETJ, colonias cannot appeal to other municipalities for assistance and counties may also remain skeptical to assist. ETJs and unclear jurisdictions of their accompanying drainage districts remains one of the largest hurdles for colonias close to incorporated areas.



IMAGE: 2010 flood in Los Fresnos, showing impacts of elevated an road (Credit: National Weather Service).

Ultimately, we hope the data, analyses, and recommendations in this report support LRGV colonia residents and organizers in their efforts achieve flood justice. Should you have any questions about the analyses, recommendations, or suggestions for next steps, please do not hesitate to reach out:

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