Design for More Equitable Neighborhood Adaptation: Climate Resiliency and Public Space Planning in U.S. Border Colonias

by

Mikaela Strech
B.A. Political Science
Oakland University, 2016

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ABSTRACT

The relationship between environmental harms and the political and economic marginalization of communities cannot be easily disentangled in today's world. Consequently, this thesis reexamines the relationships between planners, designers, and communities in response to environmental challenges that marginalized communities face. I advocate for beginning with incremental advancements in adaptation in design using community organization and a site and services approach as a way of contending with resource constraints and urgent issues. Acknowledging that this design work simultaneously enhances social resiliency, I argue that the timeliness of this approach promotes resilience.

The research analyzes design and planning strategies for neighborhood-scale environmental design, drawing from case studies in Puerto Rico, Detroit, Nairobi, and Texas. These insights inform conceptual framework plans in three neighborhoods to test what an incremental, nature-based approach to environmental hazards might accomplish, and how. This thesis has a specific focus on US border colonias in Texas, where flooding and disparities in adaptation and recovery resources are especially relevant. Considering the projected growth of fringe neighborhoods across the United States, this study contributes to the dialogue on equitable resilience.

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Thesis by: Mikaela Strech
Master in City Planning, Certificate in Urban Design, 2023
Mel King Thesis Fellowship, Kresge Foundation

"Floods are 'acts of God,' but flood losses are largely acts of man."

Gilbert F. White

Table of Contents

Abstract

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An Introduction to Climate Change, Adaptation, and Equity in Planning

Climate Change

There is overwhelming scientific evidence that climate change is happening. Further, the Intergovernmental Panel on Climate Change (IPCC), a United Nations body that assesses the scientific knowledge on climate change, has concluded that human activities are the main cause.[1]

With an anticipated minimum 1.5 degrees Celsius of change in the atmosphere, the IPCC reports that climate changes will exacerbate hazards to our environment at an accelerating pace. As our world becomes increasingly warm, the experiences we have with the earth (such as stormwater flooding, owing to our design of the built environment) are expected to become more extreme.[2]

The Social Dimensions of Climate Change's Impacts

These impacts are not equally distributed, as has been documented and discussed in political and academic circles across the global stage for decades. Some communities are more vulnerable to the impacts of climate change than others, and more likely to experience negative consequences as a result. In fact, an important factor that contributes to the unequal distribution of the impacts of climate change is geography, such as communities located in low-lying areas that are prone to flooding, or those located in areas that are prone to extreme heat or drought. These communities are often poorer, or marginalized, or both.

Resiliency, Adaptation, and Equity

To address the challenges posed by climate change, governments, organizations, and individuals around the world have taken action to adapt our environments, cultures, and communities, as well as to mitigate the accelerating rate of climate change by modifying the ways that we live that contribute. However, much more needs to be done.

Resiliency planning within urban or city planning involves developing strategies and initiatives to help cities and communities prepare for, withstand, and recover from natural disasters and other disruptions. This can include measures such as improving infrastructure, implementing land use regulations, and promoting emergency preparedness and response capabilities.

Another major component is physical adaptation projects, an essential component of resiliency planning. These projects involve the design and implementation of physical infrastructure, systems, and technologies to reduce the impact of natural disasters and other disruptive events. They may include measures such as building sea walls and levees to protect coastal communities from storm surges or constructing green roofs and rain gardens to manage stormwater runoff in urban areas.

The role of physical adaptation projects in resiliency planning is to provide the necessary protection and infrastructure to help communities withstand and recover from disruptive events. They are critical for minimizing the loss of life and property damage and for ensuring that essential services, such as power and water, remain operational during and after an event.

Urban designers and planners are key stakeholders in developing adaptation projects. Increasingly relevant to resiliency planning and the ecosystem of adaptation projects is a landscape urbanism approach to urban design that emphasizes the importance of landscape in shaping the form and function of cities. This approach sees the urban landscape as a complex and interconnected system that includes natural and built elements, and seeks to create resilient and sustainable urban environments by incorporating ecological, social, and economic considerations into the design process. However,

there are limitations to projects that follow the traditional landscape urbanism approach for adaptation projects when it comes to scale and distributional equity.

When it comes to adaptation projects, there can be a tendency for large, boutique solutions to be implemented in wealthy areas. These projects can be meaningful, demonstrate a proof of concept, and set a "gold standard" for urbanism's involvement in adaptation and resiliency projects. Some examples might include the Netherlands' Floating City proposal, which envisions a sustainable, resilient, and self-sufficient city that floats on water, or the BIG U proposal for New York City, which includes a protective system that wraps around the lower Manhattan coastline to defend the city from the impact of future storm surges.[3] The proposal includes a series of raised parks and promenades that act as protective barriers and serve as public spaces for the community. On the other hand, large adaptation projects that are needed in poor communities often don't happen. One such example includes the levee repairs in the Pajaro River in California, wherein repairs "did not make financial sense to protect the low-income area", leading to multiple instances of flooding, including one major flood of the predominantly migrant, farmworker town in Wastonville that took place during the time of this study.[4]

This is not to say that there aren't planning initiatives in cities that don't focus on innovation in design, crossing scales, and distributional equity; for example, the Miami-Dade Sea Level Rise strategy is a county-wide effort that involves engaging residents in adapting to their homes and communities. But there are also more challenges, of course, in working in under-served, overwhelmed, and disinvested areas for resilience and adaptation. And these solutions can perpetuate or exacerbate existing inequalities: poorer areas may not receive the same level of attention or resources as their wealthier neighbors, or households with some level of mobility may leave for areas with some investment in public infrastructure or adaptation measures.

In the following pages, this thesis explores the following question: how can planners help marginalized communities facing climate change impacts?

Landscape Urbanism, Adaptation, and Governance

There are deep political tensions in resiliency planning. The first is that governance is, simply put, important for it. Upon reading a potential case study document for this research, I found that this author articulated the benefits of social governance thoughtfully:

> "Governance influences tenure security, access and operations of basic infrastructure and services, delivery of social protection, and livelihood support, all of which have a critical bearing on risk and resilience. Similarly, urban governance has a significant role in integrating programs and activities across policy areas and different scales (individual, household, neighborhood, city, national), which is of major importance in building urban resilience more broadly—and resilience of the urban poor in particular."[5]

Of course this is true. Good governance is both fundamental and aspirational. But because it is also aspirational, we have to adapt ourselves. Sometimes we have to do this urgently, and in the face of important crises. In environmental disasters, some research shows that many established organizations neither show up when needed nor are prepared with guidelines to help those most in need.[6]

This thesis is about two kinds of urgent adaptation: one being our landscape in the face of climate threat, and the second being our collective ability and philosophy of planning in contexts that can be described as governmental lack of capacity or alignment at best, or as discrimination and neglect, all too often.

Reconciling the application of urbanism frameworks within various political economies is not achievable within the scope of this document (or likely for me, my lifetime). Acknowledging that better resilience would ideally be achieved through a safety net, this thesis recognizes the role of planners and designers in addressing physical and place-based problems at a neighborhood scale, where their work can have a direct and tangible impact on the communities they serve. Therefore, this document explores how resilience can be built using “everyday” urbanism, how planners can collaborate differently with communities to achieve this, the challenges, and implications. A subsequent thread in this exploration is the relationship between low-capacity communities and planner’s interest in relying on community capacity as a response to the “weak” state.

Within the landscape adaptation component of this study, this paper focuses on mitigation and adaptation solutions for two hazards: flooding and heat. It focuses this research in rural areas, where we may underestimate the impact of heat and where resources may be slow to mobilize. While cities are often associated with heat islands and extreme heat events, rural areas are, of course, also vulnerable to the impacts of heatwaves. This is particularly true for rural poor communities, where access to air conditioning and other forms of relief from extreme heat may be limited. In these areas, heatwaves can have serious consequences, including increased morbidity and mortality. In a sense, because of their vulnerability rather than their likelihood or risk, these communities are the most “impacted” by heatwaves.[7] Despite global trends in urbanization, our (planners) perceptions of heat as disproportionately an urban phenomena due to the urban heat island may further exacerbate issues of distributional equity when it comes to addressing general heat mitigation, or even planning. So goes for many of planners considerations, which are increasingly oriented towards population centers in response to global trends in urban growth. However, the relationship between highly planned and theorized cities and their sometimes under-planned rural counterparts is a major equity concern. Not only are rural areas less studied by planners and designers, the rates of poverty are higher across the United States.[8]

Exploring Site and Services Theory for Resiliency Planning

Under-resourced governments or those that actively and institutionally disenfranchise communities amplify the challenges to needed adaptation in communities. When focusing on these areas, planners focused on equity may need to take a different approach to community based projects in order to urgently respond to environmental justice concerns. In the face of a wicked problem, can we do anything that is creative and that embraces and leverages local context?

This study focuses on exploring the potential of site and services on resiliency projects as a means of fostering self-reliance and empowerment among communities in the absence of government support. This has two major differences in execution than traditional planning in the United States. First, it allows for incremental steps as part of this process, which may involve difficult trade offs in favor of momentum. Second, it means that community engagement is not just a social process for developing ideas, but that people can implement solutions. This means that planners that have design knowledge and can work with people to guide solutions in these areas as educators first, and that the process reflects the local ways of working.

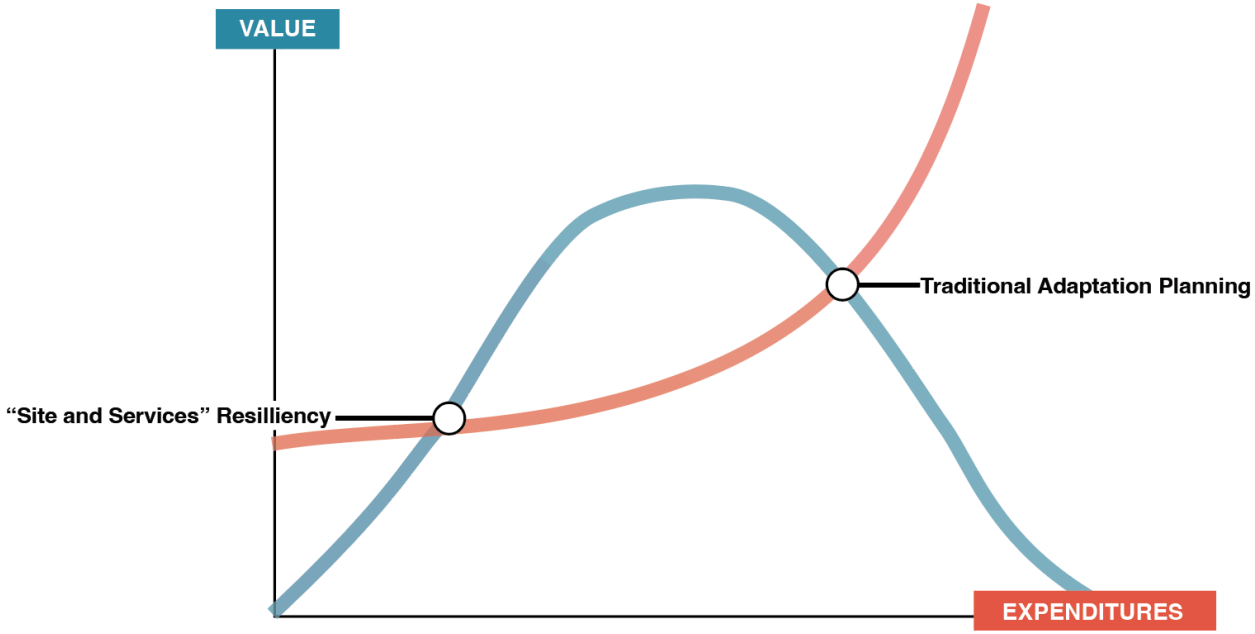
It's important to note: this should not be seen as an excuse for the government to neglect their responsibilities. Rather, this is a timely challenge to re-envision old methods in new applications to creatively engage with community.

Site and Services

Site and services housing is a housing development model in which land and infrastructure, such as roads, water and sewer systems, and utilities, are provided, and then plots of land are sold or leased to low-income families, who then complete the construction of their own homes.[9] The idea is for families to take ownership of the gradual building of their own homes, while also providing them with the basic necessities to do so that they would not reasonably acquire on their own.

The origins of site and services can be traced back to the 1970s. The model has been used previously where national and international aid agencies' policy programs failed to generate housing in the 1950s and 1960s in developing countries. It is focused on reducing the costs of

RESILIENCY SOLUTIONS IN LOW-RESOURCE CONTEXTS: VARIOUS APPROACHES



implementation via sweat equity.

In many countries where site and services has been used as an implementation tool, construction has been required to meet some minimal building codes, but generally is quite liberal towards meeting minimum viability products. In her critique, Lisa Peattie writes: “it still harbours potentially damaging and regressive aspects. Attention to it should never distract energies from other lines of approach which build even more directly on the vitality of the autonomous progressive development.”[10] In other words, that lowering the standards of reasonable development comes at cost and further prevents resources and time going into meaningful pro-social planning processes. While sharing and acknowledging these serious concerns in his work, Reinhard Goethert advocates that the process of “microplanning” can be key to the success of developing equity in low-income fabrics as a viable affordable option.[11]

The sweat equity that is core to traditional site and services planning could translate across housing sector to resiliency, stormwater, and hazard mitigation management, and legitimized as a meaningful contribution to community projects. More detail is offered in the discussion chapter of this thesis.

It is unfair to ask who has to be resilient. Further, someone exploring this approach must recognize that it is unfair to shift the burden of resiliency planning onto the already burdened everyman. But when planners talk about building resilience, its important to note *whos* resilience. But a site and services approach can actively engage with communities, taking into account their local knowledge and the sweat equity they have already invested in their properties over time into action on burdens that are weighing heavier and heavier.

Combining sweat equity with resiliency projects can solve a major challenge. Hwang and Feng report that even small-scale, traditional international slum upgrading poses a challenge with a lack of community buy in, a mismatch between needs and designs, and disproportionate allocation of resources for construction and maintenance.[12]

In the absence of meaningful conversations and proportional responses to climate hazards, such as equitable planned relocation or government investments in adaptation, co-designed, sweat

equity projects could be applied as an urgent response here if it can successfully navigate state and community relationships by empowering local communities. This framework can build community resiliency, or the social fabric, in ways that might not have occurred otherwise, or at least leverage community organizing and labor. Later, this thesis discusses a resquache tradition in latino urbanism that should be recognized to the benefit of these communities.

Colonias as a Case Study

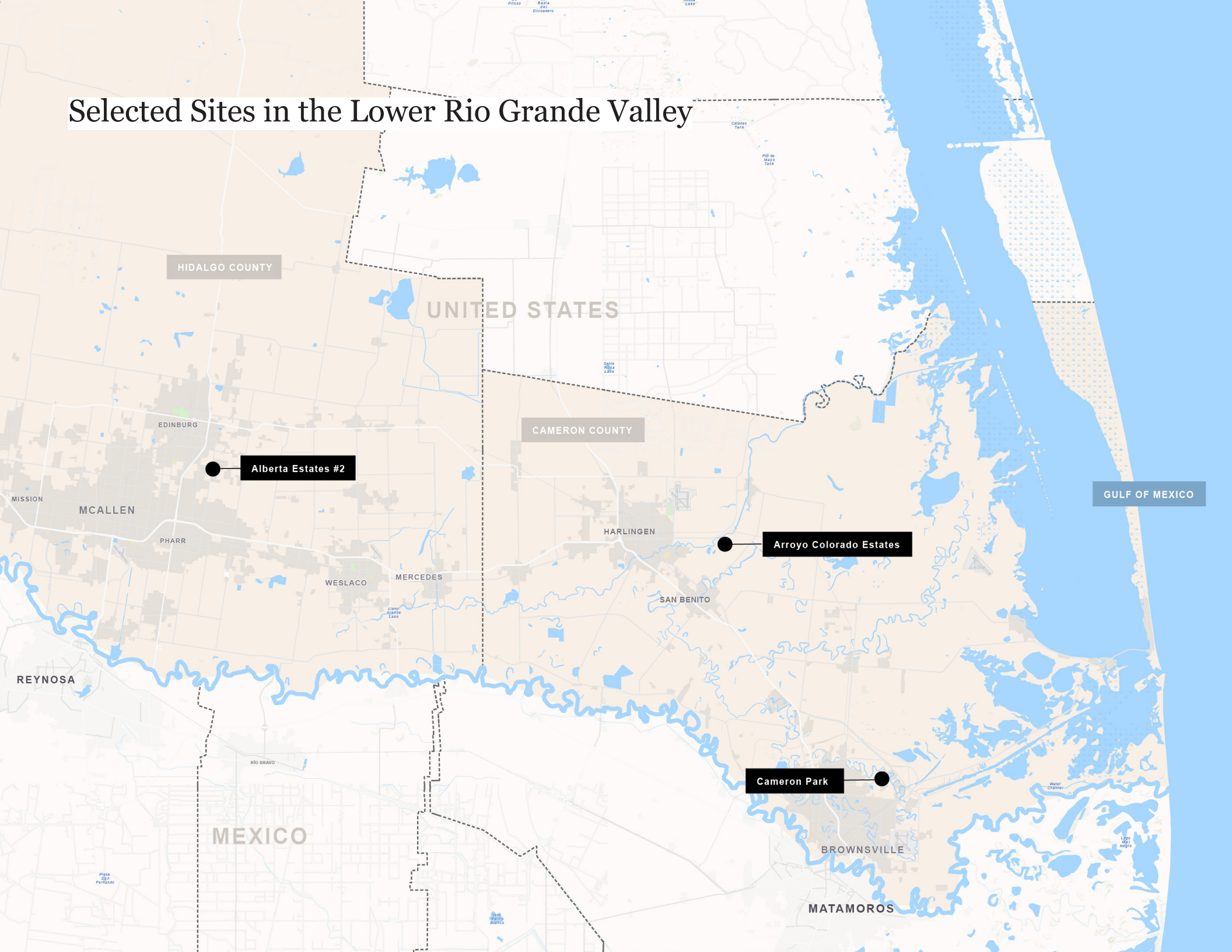
What are Colonias?

Colonias in the United States are settlements within approximately 150 miles of the US-Mexico border that are predominantly families of Mexican heritage. Colonias are characterized together but developed from a variety of different structural and geographic forces across the southern sunbelt border states, leading to different social, physical, and economic characteristics. Because of this, when considered together, the residents of these geographically non-contiguous colonias compose one of the largest poverty groups in the nation. So we must both talk about them by generalizing them and also acknowledging their differentiation. However, colonias are typically characterized by low home values and high cost burdens.[13] They often are defined by their high poverty (twice the national average, at 27%)[14] and substandard living conditions.

The History of Colonias

In the 1940s, the Bracero Program brought millions of workers from Mexico into the United States. In many cases, residents built their own homes on agriculturally-valueless farmland with few land regulations sold to newly arriving immigrants in a predatory Contract for Deed practice that dates back to the 1950s. Despite the 1980's attempt to prevent land being sold without infrastructure via the Model Subdivision Rule (MSR), an under developed and under infrastructured neighborhood typology remain part of the characteristics of colonias generations later, which come with a

Selected Sites in the Lower Rio Grande Valley



repression and a stigma that prevent colonia residents' from accessing major improvements.[15]

Most US colonias are Texan, and most Texas colonias are in the Lower Rio Grande Valley. Across the LRGV, there are an estimated 988 colonias.[16] The location of most colonia neighborhoods in extra territorial jurisdictions (ETJs) or in unincorporated county land are two frequent characteristics that further reduce governmental oversight. An extra territorial jurisdiction in Texas refers to an area outside of a city's limits, but within a certain distance of the city, where the city has the authority to regulate land use and development. In Texas, a home rule state with limited zoning and building code adoption or enforcement, cities have the authority to regulate land use and development within their own boundaries, as well as in their ETJ.

The Lower Rio Grande Valley (LRGV)

The Lower Rio Grande Valley is a misnomer for a river delta that was massively deforested in favor of citrus monoculture, but ended up flooding instead, so large-scale landowners instead used low-value, flood-prone agricultural land for homes. These areas are also characterized by extremely poor clay soil conditions. Today, a complicated system of irrigation and stormwater drainage exists in many colonias, but is limited and often over capacity.

The Lower Rio Grande Valley has undergone significant transformation over the years, with rapid population growth and urbanization driving changes in the region's demographics and urban landscape that follows general trends of the sunbelt state population growth.

One of the most pressing issues in the LRGV is the vulnerability of its communities to flooding. As a river delta, the region is prone to both riverine and nuisance stormwater flooding (though it is worth noting that the region oscillates between drought and these increasingly poorly located and intense rains). These floods can have devastating impacts on the region's residents, particularly those in colonias, as many homes are not up to code and are more vulnerable to flood damage. As a result, residents may not be able to receive assistance from agencies like the Federal Emergency Management Agency (FEMA). Additionally, they face discrimination in assessment and assistance.

Why Talk About Colonias with Regard to Adaptation? Equity.

Many colonias are located in floodplains, which may fundamentally speak to the equity of geographical distribution of living spaces. However, as assessed by Danielle Rivera and the Texas Water and Development Board, flooding is also often a localized issue and part of the way we have managed the built environment:

> "...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."[17]

In a general sense, colonias are socially ignored: it is challenging to get new infrastructure in old colonias or stormwater infrastructure and adaptation projects in continuously developing model subdivisions. They are this way because the lax environment in border states and the prejudices against people of color have allowed for the forming neighborhoods without care for the people living in them and neglected land conditions.

Generalizability

Colonias as a phenomenon of "informality" insofar as they fall outside of major government control and regulation are not unique to the U.S.-Mexico border region. Informal settlements are commonly found in other parts of the world. Like other global informal settlements, colonias

are located in areas that are prone to natural disasters, such as floods, earthquakes, or hurricanes, and are vulnerable to the impacts of climate change. However, colonias are vastly different than slums, in that they not characterized by extra-legality. They are not typologically similar to their nearby Mexican border colonia counterparts. But new research suggests that fringe, under-regulated, and at risk communities increasingly describe rapidly growing communities across in the United States.

The estimates for the number of residents in colonias vary widely, with some estimates landing at approximately 1.6 million residents.[18] But how do we define these communities today? If we consider Americans living in mobile homes, the number of people living in fringe communities and non-standard housing increases to approximately 20 million.[19] In Vermont, one in three of these types of communities, even when only narrowly defined as mobile home communities, are located in floodplains.[20] In Montana, it's one in five.[21] And planning major efforts can take years, at best. So at the same time that resiliency planning is expanding, US planners may find ourselves in need of more practice in dealing with fringe conditions, as well.

A Need for Solutions

Though community engagement is not new to resiliency planning efforts, this study posits that a site and services response should specifically be considered in colonia planning.

The day to day survival and planning ahead for disaster is a common tension in colonias. In colonias, for example, neighborhoods fill their own potholes, in a ***resquache*** tradition, which researcher Lucas Belury describes as "a subversive and inventive approach to survival".[22] This legacy of gradual improvements and survival, stemming back centuries, as evidenced from its origins in the Aztec Nahuatl language, is part of the reason that embracing everyday urbanism for resiliency planning here may not just be viable, but essential to it's future.

In Mexico, colonias on the other side of the border are embraced and responded to by local and state government. The planning and development of informal settlements often involve community-based and incremental approach, where

community members play a key role in shaping the development of their neighborhoods. Peter Ward suggests that this is due to the "settlement" versus the "community" practice that followed the first wave of immigration into survival mode in the US.[23] As the built environment changes the way that young and future generations establish themselves, a community-building type of effort may be more possible than it was before. And certainly, colonia action and community building projects are not new to the US side, either.

Why talk about this type of approach now?

Where we need to, we are doing nothing, slowly, and asking people to wait for us, while they are at risk. Perhaps our solutions are too expensive, inaccessible, or both.

In "Second-Generation Policy Priorities for Colonias and Informal Settlements in Texas", Durst suggests that the policy around colonias is now entering a needed new era to reflect demographic changes, the needs and capacities of families to pursue self-help home improvements and renovation, and urbanization. In short, that the condition of housing and infrastructure has improved in recent years in colonias.[24] In my fieldwork, I also observed a surprising yet clear emergence of a middle class.

Durst argues that this calls for "second-generation policy priorities" that address long-term and ongoing problems, including facilitating ongoing investment in colonia infrastructure and developing sustainable forms of governance. Additionally, components of new policy priorities should support suitable, sustainable, and affordable housing improvements, promoting long-term title clarity and tenure security, and promoting and maintaining community organizing in new and aging settlements.

In reflecting on this, perhaps the growth of the middle class can help indicate that for the first time there is enough resources to help mobilize these efforts. And perhaps it means that there are higher stakes to financial losses of floods and a new opportunity to meaningfully address the social components of building a future for colonias.

Research and Design Methods

The goal of this study is to apply this theory to the context of colonias to explore how far an incremental, sweat-equity approach to neighborhood planning, as I can imagine it, can address stormwater and heat mitigation issues. To this end, a multi-method approach will be used.

The study began, of course, with a review of relevant literature on self-reliant resiliency practices, informal settlements, and colonias in the Lower Rio Grande Valley.

Using a 2016 Texas Water and Development Board (TWDB) study on colonia flooding solutions, I examined local conditions for randomly selected - but significant number - of colonias named in the report through discovery mapping exercises at local and regional scales, walking google street view, and most importantly, in the early phases of this document, through historical maps, to see if there was obviously missing green infrastructure opportunities (such as daylighting streams, etc.), in response to critique of a lack of green infrastructure solutions in the TWDB recommendations, to be discussed in the coming literature review.

After choosing neighborhoods that showcase different characteristics, issues, and typologies, I visited during a Winter 2023 site visit to the Lower Rio Grande Valley to ground-truth local conditions (such as lot size, road conditions, vacant parcels), observe, and meet with ethnographers, colonia activists and organizing experts, and experts in land use planning, and hydrology.

Following the site visit, I explored drainage district maps and the Texas Colonia Health, Infrastructure, and Platting Status (CHIPS) website to understand nuisance flooding at a high-level for concept studies.

In addition to these data collection methods, mitigation and design concepts were researched by precedent and similar scale projects in the region, methods of open space, research into local government regulations informs constraints and challenges to feasibility of implementation.

Site Selection

Three specific sites have been selected for the study for their varying levels of drainage infrastructure and different adjacent land uses and densities, with the goal of understanding how different conditions may require different physical approaches and how these may impact the potential for self-reliant resiliency practices.

The first, Cameron Park, is located near Brownsville in Cameron County. This site has been selected because it is located in an urban area with curbs and gutters, and it has a mix of residential and mixed-use development. The adjacent land uses pose a challenge to managing impervious rainfall, but it is a site that has been historically well-organized to accomplish significant infrastructural advances.

The second, Arroyo Colorado Estates, is located near San Benito in Cameron County. This site has been selected because it is adjacent to the Arroyo Colorado river, and it has adjacent agricultural land uses with wide open space.

The third, Alberta Estates #2, is located in Hidalgo County near McAllen. This site has been selected because it has lower density, larger lot sizes and is located in a relatively exurban area with higher permeability. This pilot project will provide an opportunity to learn about what modest projects could take form in suburban streets.

Colonia Typology Diversity

Arroyo Colorado Estates

"Traditional" colonia that punctures the agricultural landscape with a small suburb

Cameron Park

Dense, urban neighborhood surrounded by the City of Brownsville.

Alberta Estates #2

Suburban colonia immediately adjacent to several other colonias that together form an exurb around city boundaries.

Local Climate Hazards and Studies

Planning

Traditional city planning process often involves comprehensive master plans, zoning regulations, and building codes. By contrast, colonias typically lack a formal planning process due to their locations commonly in unincorporated county land or extra-territorial jurisdictions (ETJs). In unincorporated land, the county has limited oversight outside of ensuring that new developments comply with the Municipal Subdivision Rule with water and sewer infrastructure (but notably, not stormwater, which has been missing from many planning studies mostly focused on housing conditions and sewer connections)[25]. For extra-territorial jurisdictions, cities can plan for future land use and expansion of services, offer fire and rescue services, but do not administer zoning ordinances.

Resiliency plans are another form of related planning that focuses on the economic, social, and environmental resiliency of a community or a region. Resiliency plans may stand alone from comprehensive plans, using funding from federal, state, or city resources, and sometimes private funds.

Hazard Mitigation Planning

Hazard mitigation planning is a formal process of identifying, assessing, and prioritizing risks from natural hazards, and then taking action to reduce or eliminate those risks. These plans are developed in collaboration with local communities and stakeholders, and must identify the hazards and risks that a community faces, as well as strategies to reduce those risks. Many plans can be characterized

by poor levels of participation and “checkbox” approaches to engagement. However, communities with plans and organization can often influence them for funding.

As long as a community (state, county, and local governments) has an regularly updated (every five years) approved Hazard Mitigation Plan (HMP), they can apply for funding from various FEMA programs, such as the Building Resilient Infrastructure and Communities (BRIC) program, the Hazard Mitigation Grant Program (HMGP), the Pre Disaster Mitigation Program, and the Flood Mitigation Assistance Program (FMA).

The BRIC program provides funding for projects that improve infrastructure and community resilience against natural hazards, such as building sea walls, elevating homes, and strengthening buildings.

The HMA program provides funding for activities that reduce or eliminate the long-term risk of natural hazards to people and property, such as buying out flood-prone properties, retrofitting buildings, and developing early warning systems.

The HMGP program provides funding for state, local, and tribal governments to implement long-term hazard mitigation measures after a presidentially declared disaster. PDM program provides funding for states and local communities to implement pre-disaster mitigation projects that reduce the risk of future disasters.

Unique to colonia planning is a special designation of CDBG funding. Through HUD, each border state is required to allocate a portion of its Community Development Block Grant funds to projects benefiting designated colonias. This funding is often limited by political will and routinely reduced.

The FMA program provides funding to reduce or eliminate the risk of repetitive flood damage to buildings insured under the National Flood Insurance Program.

FEMA infuses billions of dollars into local projects through these programs annually, so often centered around the HMP. All these programs are designed to reduce the impact of natural hazards on communities, and thus reduce the cost of recovery from natural disasters.

In recent years, the Biden Administration has introduced the Justice40 initiative, which focuses on allocating 40% of resources towards communities that are

marginalized and underfunded, in order to address the historic disparities in access to resources and support in hazard mitigation and disaster recovery. To qualify for these federal programs and take advantage of this new initiative however, local governments must participate and prioritize the pursuit of projects that align with the Justice40 Initiatives.

Flooding as a Hazard

The LRGV struggles with flooding for a few reasons that make it physically less adaptable to flooding.

First, it is a flat and low lying river delta. Second, it has a history of deforestation and land use changes, particularly the conversion of natural habitats into monoculture citrus orchards. This has led to the loss of vegetation that would have helped absorb rainwater and reduce runoff, as well as loss of the habitats and ecosystems that would have helped mitigate the effects of floods.

Thirdly, the soil in the Lower Rio Grande Valley region is relatively poor and clay-based. This means that the soil is not able to absorb water as well as other areas, which leads to increased runoff in urban areas and poor permeability in others. Additionally, insufficient drainage systems do not meet the capacity, where they are present at all.

Finally, the area is prone to droughts, which can exacerbate the effects of floods when they do occur. The dry soil is not able to absorb as much water, so when it does rain, the water runs off more quickly and can cause more severe flooding.

Colonias, which were often located in direct floodplains as a site selection characteristic, are particularly vulnerable to flooding. In other areas, as the urban condition develops around them, permeability and runoff become more severe.

As climate change makes rains less frequent but more intense, conditions that amplify the area's physical resiliency decrease in capacity as conditions increase in risk.

Some of the key reasons to prepare for frequent nuisance flooding include:

Damage and disruption: Even small amounts of flooding can cause damage to buildings, roads, and other infrastructure in colonias. This can be costly to repair and can disrupt essential services and activities, such as getting to work.

Health risks: Flooding can also pose health risks in colonias, as it can create mold, which will in turn be exacerbated by heat, or create breeding grounds for pests such as mosquitoes.

Economic vulnerabilities: During a site visit in early 2023, I observed that one could find significant economic diversity within one neighborhood or colonia, namely via significant investments into homes and evidence of middle-class households in colonias. I find it hard to imagine, in light of documented discrimination from FEMA assessors, that daily flooding with an impact on homes wouldn't pose a threat to this growing middle class, in addition to the households who can't afford to - or have time to - think about these vulnerabilities.

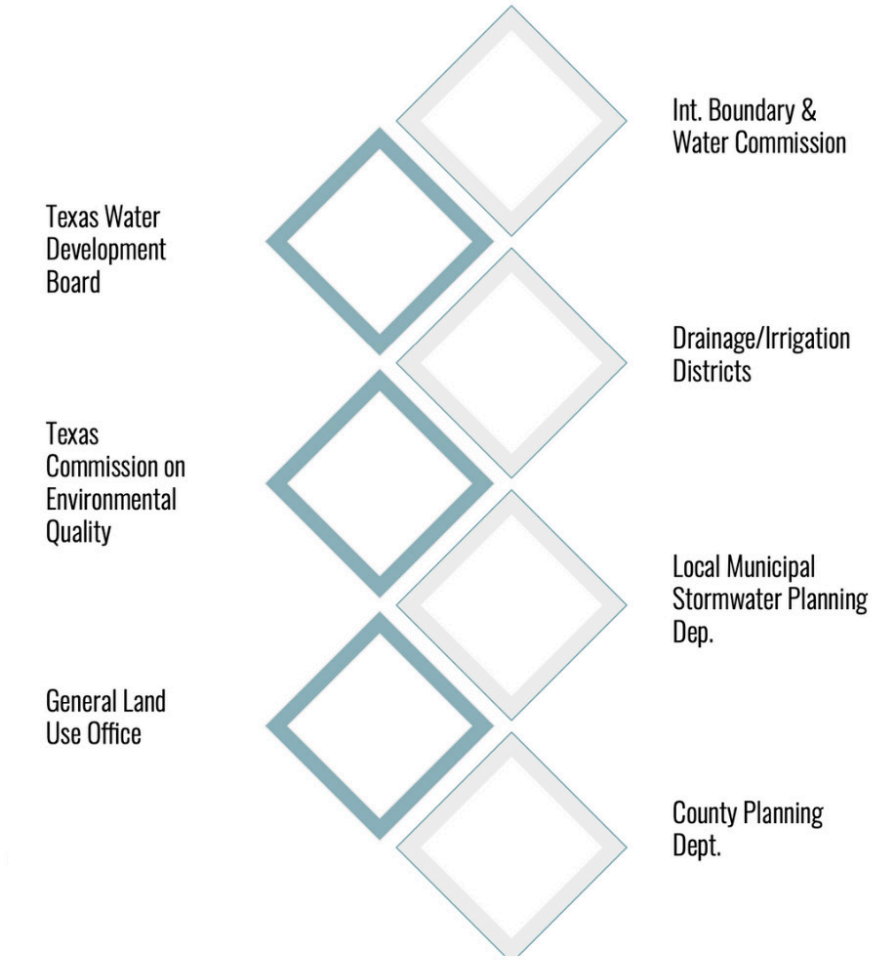
Stormwater Plans

A stormwater management plan is a comprehensive strategy that outlines measures and actions that will be taken to manage stormwater runoff within a particular area or property. Stormwater management plans are often required by local or state regulations and may be necessary for obtaining permits for land development or construction projects. The goal of a stormwater management plan is to minimize the negative impact of rainwater runoff on the environment and prevent erosion and flooding. In some cases, a drainage district may be responsible for implementing aspects of a stormwater management plan, such as the construction of drainage infrastructure or the operation of detention ponds or other BMPs.

The LRGV TPDES Stormwater Task Force maintains the Stormwater Management Program (currently active from January 2019 – January 2024). They are a coalition of 23 local governments to operate and administer regional stormwater management programs for various levels of government and intensity. As it applies to this study, this stormwater plan applies to Cameron County, Brownsville, Edinburg, and San Benito. In short, the stormwater management plan applies to two of the three colonias as they reside in Cameron County, but more stringent regulations would apply to Cameron Park and Alberta Estates if they were incorporated but not ETJs of nearby cities Brownsville and Edinburg, respectively, because regulations are determined based on size, population, and characteristics of a defined geography.

Organizations / Bodies

Owing to the nearby border and larger watershed from the Rio Grande, drainage and irrigation are highly regulated in the LRGV, despite that stormwater management is under capacity. Major stakeholders include the International Boundary and Water Commission, which regulates Regional Floodways, the Texas Water Development Board, and the Texas General Land Office. More local management and planning of drainage and irrigation ditches are managed by municipal stormwater authorities (which deal with limited resources in a conglomerate task force), local authorities, irrigation and drainage districts, and often, private landowners, as can be seen in the images to the right.



Source: Chrisafis, C., Julien, K., Rodriguez, B., & Rivera, D. Z. (2020). Flooding in the Forgotten Americas. Boulder, CO: Just Environments Lab. For PLAN3100/4100: Texas Colonias Studio.

Studies on Colonia Flooding

The Texas Water Development Board (TWDB) is a state agency that is responsible for planning and managing the state's water resources. The TWDB is responsible for implementing the state's water plans, which outline the state's water needs and the strategies for meeting those needs. The TWDB also administers programs and grants related to water resources management and infrastructure development, and provides technical and financial assistance to water utilities and other stakeholders.

In 2016, the TWDB completed a multi-year study of colonia flooding solutions across the LRGV. The purpose of the study was to determine drainage infrastructure needs in the colonias with the greatest need for solutions, the origin of their flooding type, and generate high-level feasibility concepts.

These studies separated colonias into categories based on flooding severity, and found that the majority of flooding solutions needed were "A1" - or local conditions that needed local flooding solutions.

These studies looked at 2, 5, 10, 25 and 100- year storm impacts on 78 colonia neighborhoods using advanced modeling that accounted for impermeability, terrain, soil type, and so on.

In 2022, the UC-Berkeley Just Environments Lab issued an Institutional Analysis on Colonia Flooding, which analyzed the TWDB findings, along with an assessment of the policy, planning, and design context surrounding flooding in colonias. In addition to other holistic recommendations, this study posited that attempts to identify green infrastructure were under-explored as a response to stormwater management, which is both lacking and a necessary part of addressing colonia issues.

In previous iterations of this study, I explored - broadly - to attempt to identify places where green infrastructure was under-explored, but found that things like stream restoration weren't applicable here. To that end, this study seeks to explore, simply, how everyday urbanism can better align with

mitigation techniques, in direct response to the recommendations from the TWDB flooding report, and offers a small suggestion on how this can potentially occur using the site and services model, while, as the report states, we advocate for broad flood justice techniques and "more extensive flood modeling that broadly examines flood risk across all unincorporated spaces of the LRGV."[26]

One additional component of the TWDB and the corresponding Just Environments Lab Institutional Analysis notes that "the median costs of these flood mitigation proposals is $961,550, with projects ranging between $24,935 and $51,974,526."[27] This wide range is unsurprising, as the areas of these colonias vary widely (from as small as an acre, more commonly, to upwards of a thousand acres in some cases). These figures are seemingly cost prohibitive in this planning context, and reducing them to the ends of increasing their likelihood is an important consideration of this study.

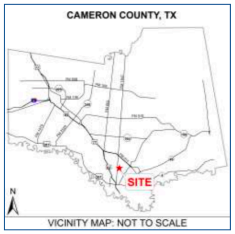
Colonia: Cameron Park, Cameron County

Basin: Brownsville North Main Drain

Category: A1

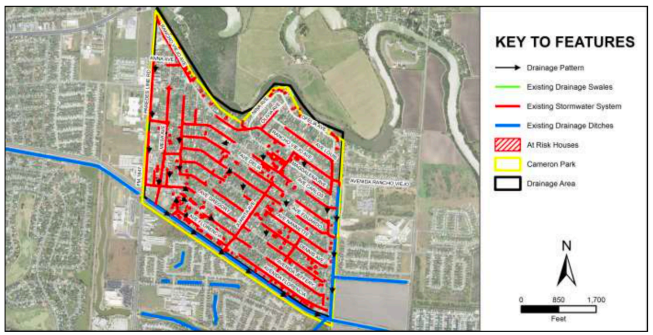
Hydrology / Hydraulic Analysis:

A two-dimensional hydrodynamic model of the Cameron Park colonia was built using the software program InfoWorks ICM. The model integrates hydrologic and hydraulic modeling and simulates the interactions of the storm drain system and the movement of overland flow using a three-dimensional digital terrain model of the existing ground surface. This report assesses the adequacy and capacity of the existing drainage system and recommends system improvements that will provide protection from flooding for up to the 10-year storm. Rainfall-runoff simulations were conducted for the 2-, 5-, 10-, 25-, and 100-year storm events. Please refer to the Localized Analysis Document for modeling and mapping methodology and assumptions.



Areas of Risk:

Drainage patterns within this 20-acre colonia are generally to the south and west. The existing drainage system consists of a small stormwater system and roadside swales that are generally undersized and restricted by sediment and vegetation. Cameron Park experiences residential lot, street, and structure flooding in nearly every rainfall event. Figures 1-5 illustrate the existing and proposed conditions inundation maps for the 2-, 5-, 10-, 25-, and 100-year storms, respectively. These maps illustrate the depth of flooding as follows: light blue represents a depth of 6 to 9 inches, blue 9 to 12 inches, green 1 to 1.5 feet, yellow 1.5 to 2 feet, orange 2 to 3 feet, and red more than 3 feet.



Page 1

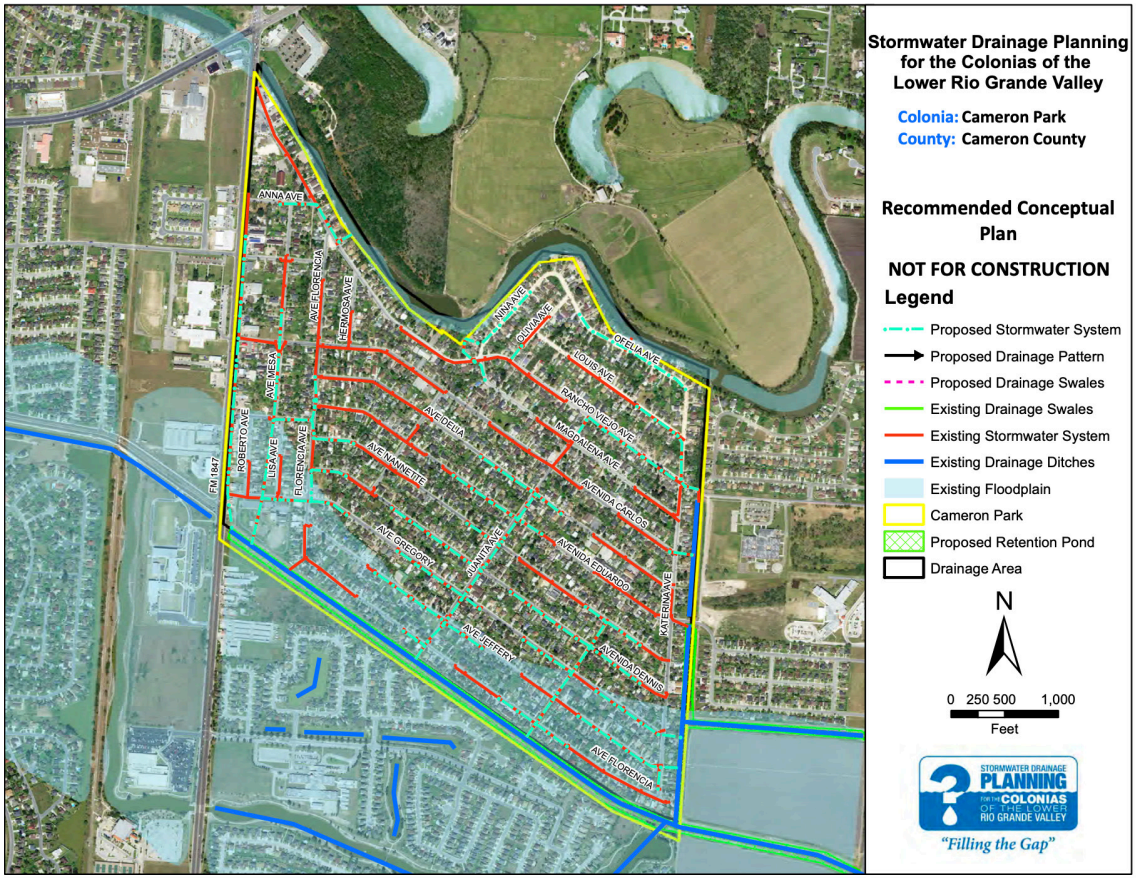


Image Source: JSW Hazard Mitigation Associates, HALFF, RPS Epsey, Brown Leal & Associates, R. Gutierrez Engineering, ERO Architects Stormwater Drainage Planning: The Colonias of the Lower Rio Grande Valley (LRGV) Located within the Counties of Cameron, Hidalgo, and Willacy. 2016.

Heat as a Hazard

In addition to flooding, extreme heat is also a hazard to human life with serious consequences for public health and well-being. Heat is the greatest weather-related cause of death[28], and can cause heat stroke, dehydration, and other heat-related illnesses, which can be particularly dangerous for vulnerable populations such as the elderly, young children, and those with preexisting health conditions.

As climate change makes our environment oscillate between extreme temperatures and stranger durations for different weather conditions, preparing for extreme heat is an important part of life in the drought- and heat- prone humid subtropical climate of the LRGV region of Texas. It is worth noting that in this region, prevailing winds move west at approximately 11 miles per hour, on average.

In terms of vulnerability, many elderly folks live in rural colonias and are vulnerable to heat.

Local Studies on Heat

Hidalgo County does not have an available Hazard Mitigation Plan. In 2021, H20 Partners, a consulting hazard mitigation group, prepared the Hazard Mitigation Action Plan Update for Cameron County. An initial review of this work suggests that heat, a known hazard, poses significant issues in the Hazard Identification and Risk Assessment (HIRA). This work suggests several mitigation programs in the Action Plan for repetitive loss properties and for infrastructure improvements at targeted areas in participating Cities[29], but not infrastructure that benefits colonias.

By failing to identify spaces in unincorporated county land and ETJs for infrastructure upgrades - the Counties strongly reduce their chance for funding for colonias and fails to study the identified impacts on vulnerable populations, which are documented as larger in ETJ areas.

Public Space as an Equity Issue

While some colonias, perhaps those that are more rural in nature with larger lot sizes, have open and vacant spaces, programmed or active community space is not often present. From the developer perspective, there is no economic incentive to offer public space or public realm infrastructure as part of a platte.

This condition is particularly noteworthy due to the isolated nature of these communities, which often lack access to recreational, health, and social opportunities that can foster engagement, collaboration, and community building. As a result, the absence of open spaces can further exacerbate the isolation and marginalization that many residents of colonias experience. Open spaces will be an important consideration as the LRGV region continues to grow.

Previous efforts to mobilize and plan for open space (as well as flooding) are studied in future sections as precedents for mitigation and organizational approaches.

Approaches to Adaptation, Precedents, and Case Studies

This section first reviews relevant planning techniques and theory for flooding, open space, and heat resiliency in brevity - from cloud and sponge city to low impact development and wetland restoration. Though there are many types of flood mitigation, across social and economic programs such as insurance; building mitigation such as floodproofing with materials and architecture-scale designs; zoning and development regulations such restricted growth areas and smart development regulations, and more regional hydrological engineering solutions such as levees and floodwalls; this focuses on the everyday urbanism approaches that are applicable to the neighborhood-scale.

Numerous techniques for addressing environmental challenges are documented in how-to guides and best management practices (BMP) guides. These guides provide valuable resources for communities looking to implement sustainable and resilient design solutions tailored to their unique context and would be a next step in a Site and Services Resiliency approach in colonias. The scope of this project, however, is not to compile a comprehensive how-to guide for various techniques but rather to reflect on the potential strategies that would be appropriate at modest scales or resident-owned implementation aspirations for a neighborhood framework in US colonias.

The case studies that follow are documented for the purposes of understanding existing approaches to process, relationships, and design. Following these case studies are a few precedent colonia-specific planning and mobilization efforts.

Planning and Design Approaches: Physical Flood Mitigation and Heat Resiliency Techniques

The following are included as part of documenting an extended design research, ideation and iteration for the three concepts explored later.

Design approaches to flood mitigation

Leveraging green infrastructure is a key technique for design at the landscape level. “Sponge cities are part of a worldwide movement that goes by various names: green infrastructure in Europe, low-impact development in the United States, water-sensitive urban design in Australia, natural infrastructure in Peru, nature-based solutions in Canada.”[30] The purpose of these approaches is to mimic natural systems. Studies suggest that these approaches help reduce overflows and help with drainage capacity of pipe networks - a major issue in the region.

Although not exclusively green infrastructure, the following are the flood techniques and best management practices that some of these design approaches may employ - from infiltration, vegetation, flow management, and source control or combined approaches.

Strategies for holding water to slowly drain without inundating communities include:

Re/detention ponds
Constructed ponds that hold water.

Cisterns and rain barrels
DIY solution to catch water from a surface.

Infiltration trenches
Shallow trenches filled with permeable materials to capture stormwater runoff.

Constructed wetlands
Regionally demonstrated across the LRGV as an essential part nature-based drainage infrastructure.

Strategies for moving water out of a geography during a period of intense rainfall can include:

Bioretention cells and rain gardens
Depressed areas that can be designed to work in areas with low permeability soils.

Permeable interlocking pavers
Paving alternative to reduce impermeable surfaces. Unlikely to work in the region, as they also require the soil itself to be permeable.

Grassed bio swales
Vegetated channels designed to manage stormwater runoff.

Although some of these DIY solutions are thought of as an individual property management effort, when done in a coordinated effort across a neighborhood, they may be elevated to a community resiliency strategy.

Design Approaches to Heat Mitigation in Tropical and Rural Areas

There are few documented precedents for wide-scale implementation of cooling techniques for albedo and thermal mass reduction approaches in small cities or rural areas, as much design research goes into dense urban areas such as NYC or Tokyo to combat urban heat islands, rather than generally helping rural populations with heat waves, where they are vulnerable to the social impacts due to a lack of air conditioning or amenities. To this end, the techniques of these design approaches should be adapted to exurban, rural, and suburban frameworks. The solutions to rural heat vulnerability are not only design problems, but that there are some notable considerations for tropical areas that could be adapted to this context. For example, unlike in drier places, adding significant vegetation has its limits, whereas increasing shading or ventilation can help.[31]

Many of the blue-green infrastructure approaches for flooding help with or overlap with the strategies used to mitigate heat. It is worth noting that the Cool Cities (or Heat Resilient Cities) framework is used by urban planners, designers, and policymakers, as well as public health officials and researchers concerned with the health impacts of extreme heat on urban populations.

The following are the cooling techniques and BMPs that these design approaches may employ to reduce albedo, or help thermal mass:

Green roofs and walls
Installing vegetation on roofs and walls to provide insulation and evaporative cooling. These may not be appropriate due to climate, typology, or capacity.

Reflective materials
Increasing reflective surfaces on buildings and pavements can reduce heat absorption.

Shade structures
Public pergolas, sails, or canopies. Window structures to keep direct sunlight out of homes.

The following are the cooling techniques and BMPs to increase ventilation and shading:

Parks
Preserving green space for cooling. From pocket size to neighborhood-scale parks, greenways, or linear parks.

Passive solar design techniques
Orienting buildings and windows to face north and south can help to reduce the heat that enters buildings.

Trees and vegetation
Planting and maintaining near enough to homes to cast shade at the right time of day, but far enough to avoid damage during strong winds.

Design Approaches to Open Space

Tactical urbanism involves using low-cost, temporary interventions to transform spaces quickly and easily. This approach can be used to create parks, pedestrian plazas, or bike lanes, and can be scaled up to create a network of interconnected public spaces. Similarly, placemaking networks involve creating spaces that are designed to foster social interaction and community engagement.

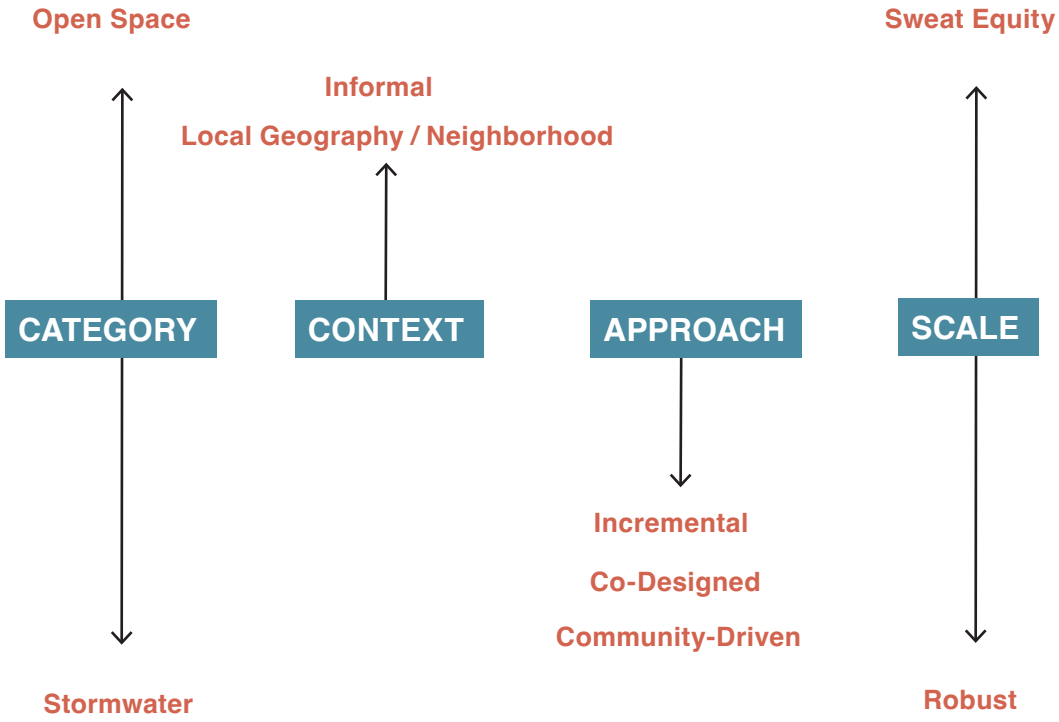
Just as many of the approaches for flood mitigation, such as rain gardens and bioswales, also help with heat mitigation, there is significant crossover to open space with heat mitigation opportunities. This thesis seeks to combine efforts to find sites appropriate for climate adaptation and combine them with open spaces wherever possible. Ideally, spaces are both resilient/sustainably built and provide places of resilience.

Case Studies and Precedents

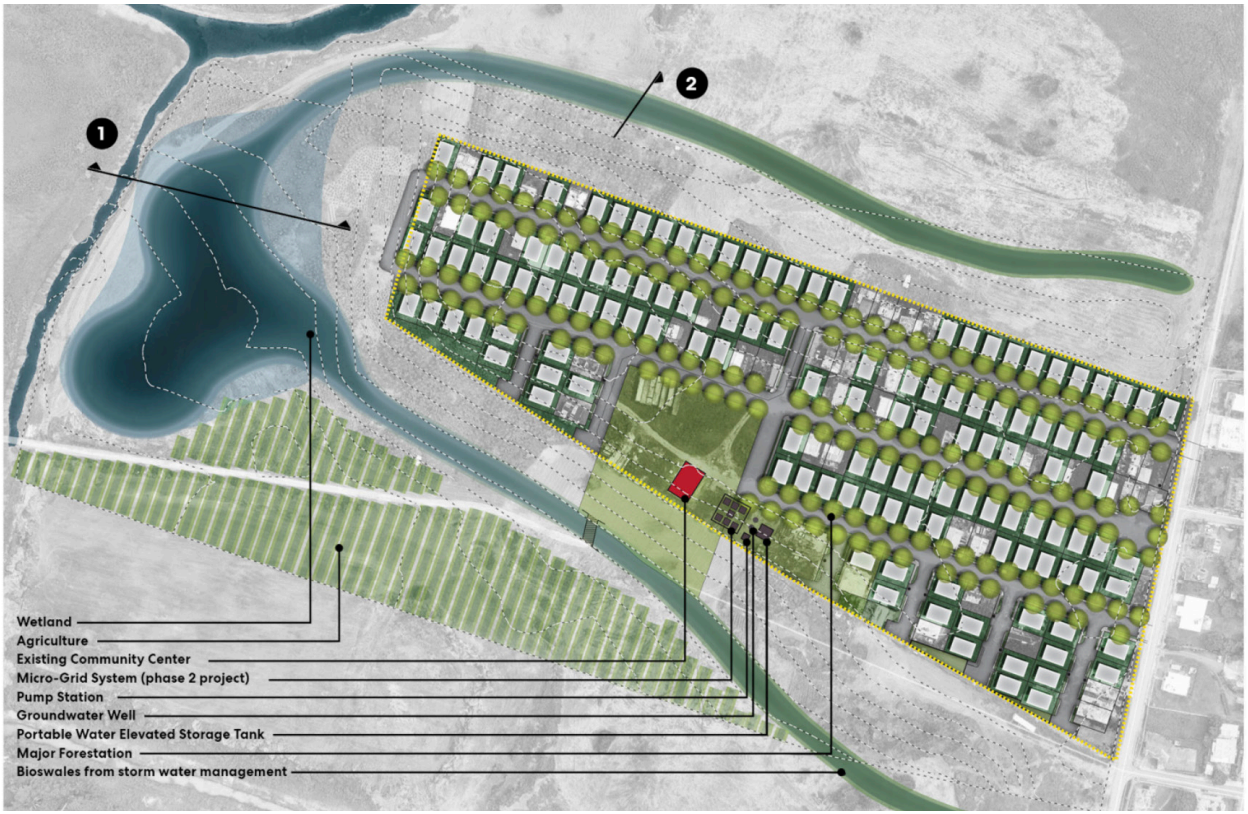
The following case studies have been used to identify responses to issues of flooding and open space in challenged neighborhoods. Case studies were chosen based on the novelty of their programming, process, and where possible, the similarities between their context and the challenges of colonias.

In addition to the international case studies are two important and related colonia-planning and mobilization precedents. These efforts clarify that there is a history of organizing and activism around flood justice in the region.

CASE STUDY PROJECT SELECTION



Case Study: Villas del Sol Resilient Planning Framework



ResilientSEE: A Framework to Achieve Resilience Across Scales. (n.d.). ResilientSEE: A Framework to Achieve Resilience Across Scales. Retrieved April 9, 2023, from https://perkinswill.com/news/resilientsee-a-framework-to-achieve-resilience-across-scales/

Quick Facts

Partners
Sol es Vida, a nonprofit cooperative organization of Villas del Sol community, and ResilientSEE-PR collaborators (Perkins&Will, WSP, Moffatt & Nichols)

Location
Toa Baja, Puerto Rico

Context
The community organized as a cooperative and developed a regulatory lot plan in response to a lack of infrastructure in the settlement.

Approach
Adding stormwater management, potable water, electric, sewage, and green-open space at the neighborhood scale.

The Villas del Sol Resilient Planning Framework demonstrates a comprehensive, community-driven approach to addressing infrastructure needs. The following lessons are organized based on applications (or not) to colonias.

Include Passive GI and NBS Systems

The design approach embraces green infrastructure and nature-based solutions, seamlessly integrating with open spaces. Specifically, it introduces a passive system that discharges stormwater into bioswales and a wetland.

Prepare for Future Growth and Parcelization

This project underscores the importance of considering existing parcelization, a crucial factor for future planning in local colonias with room for expansion and a need to strategize around them.

Consider DIY Collection Practices

A final technique the Framework Plan includes relies on residents to acquire water collection. This practice, already common in colonias, is worth recognizing as a scalable DIY approach, that at a community level, can help with water management.

There are components of this case study that do not translate to colonia contexts or the scope of this approach. The comprehensive schematic design provides a clear understanding of what a well-rounded response to pertinent issues looks like in terms of scale. In this particular case, considerable resources were invested in the project to span across multiple scales, with efforts undertaken simultaneously at the Toa Baja site, municipal, and island levels. This multi-scalar approach may not be directly applicable to this study, which, at least from an incremental urbanism approach, seeks more localized solutions that are based on the capacity of the community to implement.

Some other important notes and lessons from this particular Framework Plan should be documented. The companion “design for island communities” publication related to this project outlines essential principles for colonia planning efforts: avoid constructing in flood-prone areas; incorporate flood mitigation strategies into designs when building in such areas; and, if these measures are not initially taken, plan land use accordingly and retrofit houses. These guidelines form a solid long-term framework for colonia planning initiatives. The publication also offers a suite of reading materials that could be applied to DIY upgrading projects in colonias, providing valuable resources for community-driven improvement efforts.

Case Study: Caño Martín Peña Restoration Project's Smart Growth Implementation Assistance

Various green infrastructure techniques are proposed in the design options. The site analysis and stakeholder conversations helped influence the stormwater management approach for each site. The green infrastructure tools proposed in the design options are the following:

+ **Bioswale:** a vegetated drainage swale that filters runoff as it flows through the site.
+ **Detention Pond:** a vegetated excavated area that captures, stores, and slows stormwater runoff.
+ **Soil Cells:** engineered structures that suspend the pavement system and increase the soil volume available to trees below paved surfaces. They also provide stormwater storage capacity.
+ **Permeable Paving:** a range of materials that allow for the movement of stormwater through their surface.
+ **Water Plaza:** a combination of a detention basin and a plaza that can hold water during storm events and then drains to function as an urban plaza. These can function at a variety of sizes and shapes and host a range of activities.
+ **Underground Stormwater Detention:** a subsurface system of chambers or tanks that store stormwater.

References:
Planning Report for the Stormwater Collection System Conceptual Design for Buena Vista Santurce Community, 2016. Conceptual Design Stormwater Collection System- Buena Vista Santurce Community.

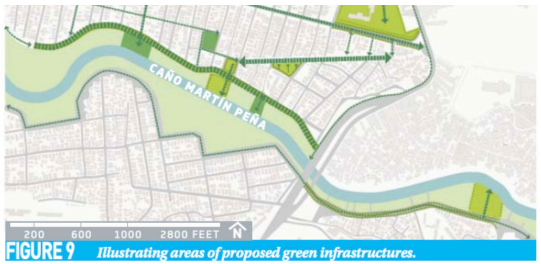


FIGURE 9 *Illustrating areas of proposed green infrastructures.*

Proposed Complete Streets Proposed Open Space

FIGURE 10 *Illustrating areas of proposed gray infrastructures.*

18" Pipe 24" Pipe Main Collection Pipe Existing Pump Station Proposed Pump Station

Spackman Mossop Michaels. (2018). Smart Growth Implementation Assistance, Caño Martín Peña, San Juan, Puerto Rico. https://www.epa.gov/sites/default/files/2018-04/documents/sgia_cano_martin_pena_final_report_-english.pdf

Quick Facts

Partners
As part of the Comprehensive Development Plan by ENLACE with partners G8 (community), Fideicomiso de la Tierra del Caño Martín Peña (land trust), Spackman Mossop Michaels (via EPA Smart Growth Grant).

Location
Buena Vista Santurce settled informally in the mangrove wetlands.

Context
Following Hurricane Maria, serious health impacts of repetitive flooding called attention to the need for a green infrastructure design framework for the community.

Approach
Interconnected green infrastructure plazas reduce flooding; a framework of civic spaces strengthen the social fabric of the community.

The Caño Martín Peña Restoration Project demonstrates how green infrastructure can be employed to not only manage flooding but also improve overall community health.

We can organize the lessons from this case study as they apply to colonias, and document which aspects do not necessarily apply.

One key component of the design and approach clearly applies to colonias:

Focus on Civic Spaces

The project's focus on creating a framework of civic open spaces to strengthen the social fabric of the community showcases the potential for well-designed public spaces to not only serve functional purposes, such as flood mitigation, but also to foster social cohesion and improve the overall quality of life for residents. This approach can be adapted to colonias, where incremental urbanism efforts can similarly emphasize the importance of designing spaces that address both practical and social needs.

Leveraging Limited Land

For dense urban spaces that are fully or nearly fully built out, the development of green infrastructure at civic spaces, is a key element of the Caño Martín Peña Restoration Project. Without further building up development around the water channel, green infrastructure is dispersed across existing real estate with tenants such as schools and libraries.

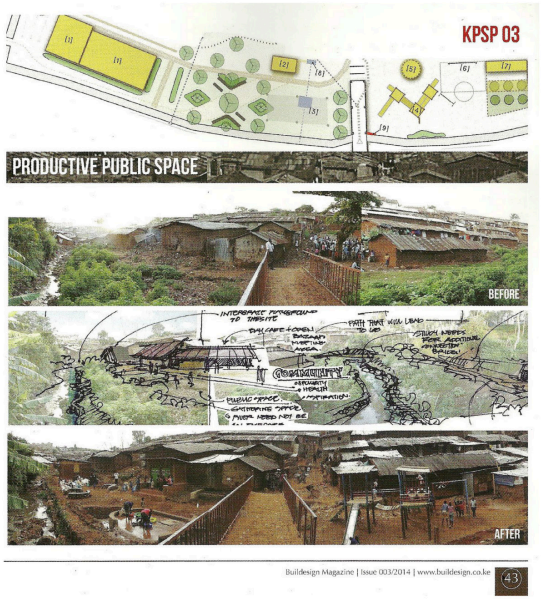
There are a few components of this case study that do not translate to colonia contexts or the scope of this approach. They are as follows:

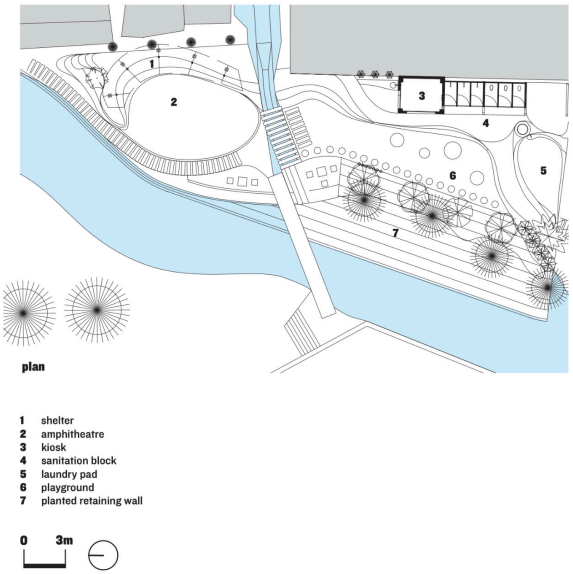
The involvement of the EPA and the need for several feasibility studies offer a vastly more complex process than what might be anticipated for a resident-driven incremental urbanism approach to flooding. Nonetheless, this case study outlines a valuable framework and major design approaches for dense urban areas adjacent to and within flood zones. For future expansion of project development and capacity, the following consideration is key.

Involve Multi-Level Government Coordination

This open space plan also provides for hard grey infrastructure improvements that involve significant coordination among administrative authorities, ranging from grassroots community organizations to federal agencies. Although an important component of a long-term strategy, the beginnings of an equitable design project may not necessarily need to include these components, which take years and sophisticated levels of political organization to accomplish.

Case Study: Kibera Public Space Initiative





Kounkuey Design Initiative: The Kibera Public Space Project. (2015, November 2). Kounkuey Design Initiative: The Kibera Public Space Project. https://afritekt.wordpress.com/2015/11/02/kounkuey-design-initiative-the-kibera-public-space-project/

Quick Facts

Partners
Kounkuey Design Initiative

Location
Nairobi, Kenya

Context
The Kibera Public Space Project co-develops mitigation and infrastructure in the informal settlement by building a network of community-designed and managed public spaces that reduce flood risk.

Approach
Kibera residents lead the implementation of codesigned plans, from materials to construction. In 10 different sites and growing, rather than neighborhood frameworks, interventions include bridges, septic tanks, wetlands, rainwater harvesting, or an underground stormwater detention tank made of upcycled plastic crates.

The Kibera Public Space Projects (KPSP) serve as an inspiring case study for addressing the challenges faced by US border colonias through everyday urbanism, focusing on resident-led flooding and open space planning solutions.

Adaptable design solutions and building codes

While the KPSP often involves the use of low-cost and locally available materials, such as plastic crates, for constructing public spaces and amenities, it is essential to consider building codes and regulations in the US border colonias context, which are important under current regulation to accessing future infrastructure investment. However, low-cost solutions may not always meet county building codes, they can serve as a source of inspiration for temporary or alternative solutions, especially in areas struggling to get connected to essential infrastructure due to non-compliance with building codes. Designers and residents could explore adaptable, low-cost, and locally-sourced materials that meet the required standards while addressing flooding and open space issues.

Community-driven approach and capacity building

One of the key success factors of the KPSP is its participatory approach, which involves residents in the design, planning, and implementation of the projects. This approach could be highly relevant for colonias, where resident-led initiatives can help to address flooding and open space issues in areas where the government has been unable or unwilling to intervene. Additionally, the skills training and capacity-building programs associated with the KPSP can help to create economic opportunities for colonias residents.

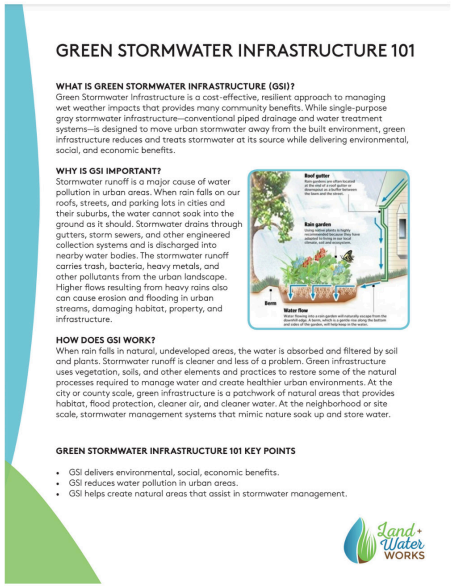
Differences in context and needs

It is important to recognize that the context and needs of Kibera residents differ significantly from those in US border colonias, particularly in the scope of this study. The scale of the informal settlement is much larger (geographically) than that of colonias. However, the overarching theme of addressing infrastructure gaps and improving living conditions through community-driven efforts remains highly relevant and demonstrates an interesting relationship between designer-organization and planning community.

Duration and complexity of projects

The KPSP projects typically takes about six months to complete, demonstrating that proper design education can allow for complex construction projects by local stakeholders within a relatively short time frame. This timeline could be a point of reference for colonias' resident-led initiatives. In this case, residents do not travel across neighborhoods to scale up their efforts with topic-specific knowledge, but rather, each community gains some generalist knowledge to make decisions.

Case Study: The Greening of Detroit



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Quick Facts

Partners
Greening of Detroit, Land+Water WORKS coalition, community residents

Location
Detroit, Hamtramack, MI, US

Context
Green Infrastructure Department focuses on Community Forestry, Stormwater Management projects, and administering tree nursery operations at Walter Meyers Nursery. This coalition has planted over 135,000 trees in 30 years.

Approach
Highly trained volunteers, the Citizen Foresters, are responsible for leading groups of up to 20 volunteers on planting days. Citizen Foresters demonstrate best practices for planting a tree and are quality control supervisors and motivational leaders during tree planting events in the spring and fall.

The Greening of Detroit is an initiative that aims to transform Detroit's vacant land and urban spaces into vibrant, green, and sustainable landscapes. This project offers valuable insights into community engagement, capacity building, and multi-stakeholder partnerships.

Community involvement and capacity building

The Greening of Detroit's Citizen Forester program provides local residents with training in various aspects of urban greening, such as tree planting, volunteer management, community outreach, tree identification, maintenance, pruning, invasive species identification and removal, and green stormwater infrastructure (GSI). This approach can be highly relevant for colonias, where resident-led initiatives can help to address flooding and open space issues, while also building skills and fostering a sense of ownership and pride in their community. Residents travel across neighborhoods to work with local non-profits, corporations, community groups, and government agencies.

Multi-stakeholder partnerships

The Greening of Detroit is itself not a design organization that contracts with community organizations. It is a volunteer organization collaborating with a robust network of partners. This model of collaboration offers an alternative to the KPSP: in contrast to building place-specific planning knowledge, the Greening of Detroit disperses subject matter experts across geography.

Resource provision and shared learning

As part of the Land+Water WORKS program, the Greening of Detroit experts collaborate with a coalition of independent non-profits to provide Detroit residents with resources and learning opportunities related to green stormwater infrastructure and environmental stewardship. This approach demonstrates the value of pooling resources and expertise to address common challenges. In the context of US border colonias, similar coalitions could be formed to support resident-led initiatives and share knowledge and resources related to flooding and open space planning. Many of their companion materials focus on providing resources for all residents to learn about green stormwater.

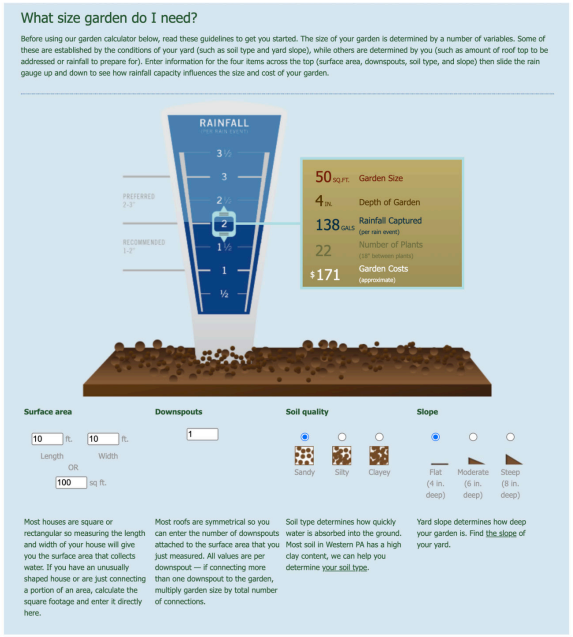
While the Greening of Detroit primarily focuses on urban greening, tree planting, and green stormwater infrastructure, the strategies employed by this initiative may not directly translate to the neighborhood planning framework that colonias may pursue, or at least within the scope of this study. However, the overarching theme of using green infrastructure to address environmental challenges, improve quality of life, and create more sustainable communities remains

Case Study: Soak Up New Hampshire

Rain Garden Planning

Resources for Planning a Rain Garden

- Rain Garden Do-It-Yourself Fact Sheet: Includes a list of recommended materials and equipment, step-by-step instructions, and helpful hints for installing a rain garden.
- Native Plants for New England Rain Gardens: This list, developed by NHDES and UNH Cooperative Extension, contains New England native perennials, shrubs, grasses, ferns, rushes, and sedges appropriate for rain gardens and other vegetated stormwater practices.
- The Benefits of Native Plants in Your Garden: A summary of some of the great reasons to use native plants in your gardens
- How to Do a Simple Infiltration Test: Instruction for doing a simple to test to see if a rain garden (or other infiltration practice) will work in your yard.
- Interactive Rain Garden Sizing Calculator: Enter information such as for the surface area to be treated, soil type, and slope to see how they affect the size and cost of a rain garden installation.



About - SOAK up the Rain NH. About - SOAK up the Rain NH. Retrieved April 10, 2023, from https://www4.des.state.nh.us/SoakNH/about/

Quick Facts

Partners
Voluntary program managed by the New Hampshire Department of Environmental Services

Location
New Hampshire

Context
Provides information about how our properties create stormwater pollution and how to prevent it.

Approach
Individual property owners can learn how to reduce runoff from their properties with DIY guides. SOAKNH builds partnerships with local lake and watershed groups.

The SOAKUP NH program focuses on individual property owners and educating them on how to reduce stormwater pollution and runoff from their properties. This program offers insights into the potential for community-driven, small-scale interventions in addressing flooding and open space planning challenges in US border colonias.

Scalability of DIY projects

The SOAKUP NH program provides Do-It-Yourself (DIY) fact sheets, guides, and resources for individual property owners to implement stormwater management solutions on their properties. This approach can be adapted and enhanced for colonias by bringing these DIY projects to a community level. The collective impact of multiple small-scale interventions can lead to significant improvements in flood mitigation and open space planning.

Potential for local partnerships

SOAKUP NH builds partnerships with local lake and watershed groups, providing messaging, training, and assistance to promote and install practices that reduce stormwater runoff and pollution. Similarly, colonias can establish partnerships with local organizations and experts to access resources, knowledge, and support for their community-driven efforts in flood mitigation and open space planning.

Lessons from similar US programs

Numerous programs like SOAKUP NH exist across the United States, focusing on empowering individual property owners and communities to address stormwater management challenges. By studying these programs and their approaches, colonias can gather ideas, best practices, and lessons learned that can be adapted and applied to their unique context.

It is worth noting that while the primary focus of this thesis is on the relationship between designer-planners and communities in addressing flooding and open space challenges in colonias, exploring the potential for local administrative programs to engage with colonias in planning efforts is also a valuable consideration. Government involvement in fostering collaborations and providing support to colonias through well-designed programs can significantly enhance the effectiveness of the community-driven approaches discussed in this thesis. By leveraging the expertise, resources, and authority of local administrative bodies, more comprehensive and sustainable solutions can be developed and implemented to tackle the unique challenges faced by colonias. This integrated approach, combining the strengths of both community-led initiatives and government support, could pave the way for more resilient colonias.

In summary, the SOAKUP NH program offers valuable insights into the potential for community-driven, small-scale interventions in addressing flooding and open space planning challenges.

Precedent: Flooding in the Forgotten Americas

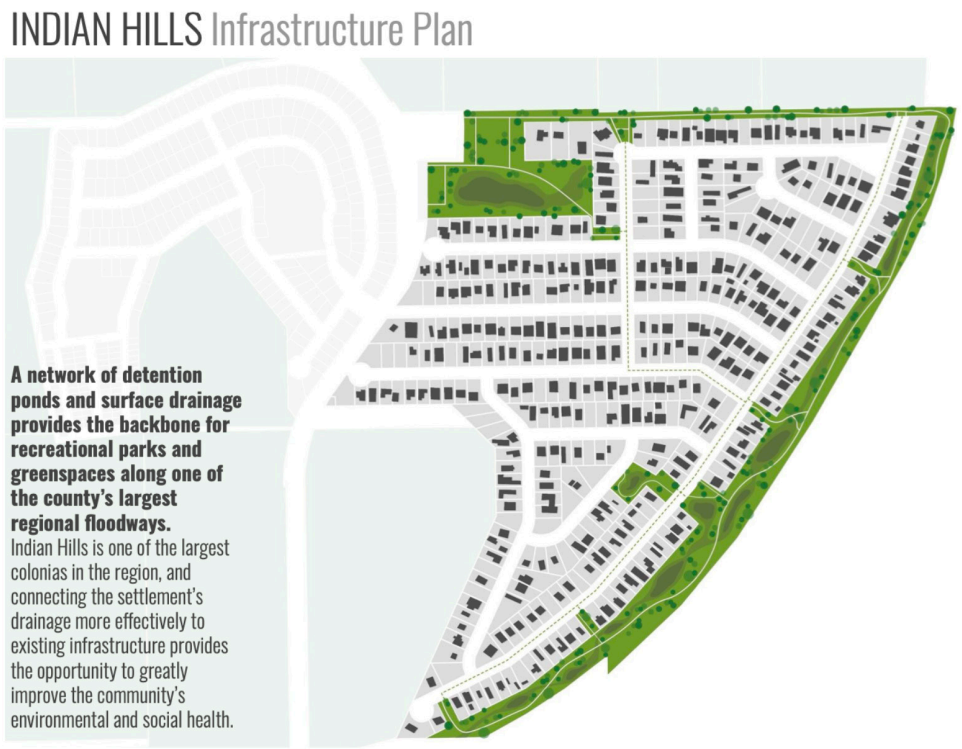


Image Source: Chrisafis, C., Julien, K., Rodriguez, B., & Rivera, D. Z. (2020). Flooding in the Forgotten Americas. Boulder, CO: Just Environments Lab. For PLAN3100/4100: Texas Colonias Studio.

Quick Facts

Partners
Just Environments Lab. For PLAN3100/4100: Texas Colonias Studio. University of Colorado - Boulder Environmental Design Program, Texas Colonias Studio with Danielle Rivera

Location
US Border Colonias Muniz, Olivarez, and Indian Hills in Hidalgo County

Approach
To use green infrastructure and low impact development solutions with systems that handle water on site.

This design research showcases how simple interventions can offer significant help with drainage and flooding. This studio informed part of the basis of this proposal, by generating the idea that neighborhood scale planning is both viable and legitimate method for solving local flooding issues that are more nuisance level in nature, rather than focusing on the regional level and high intensity floods.

Affordable and Low Impact

While this was not intended for ome level of site and services, this design component of this effort seeks to demonstrate that green infrastructure development is already offering interventions are both affordable. In some cases, the research demonstrates that a bioswale can be less than $20 per square foot, as opposed to traditional expensive projects.

Green Infrastructure, Open Space, and Co-Benefits

Added co-benefits of this intervention and many of the efforts in this studio support other health goals that are relevant to many colonias. For example, by pairing simple nature based infrastructure with open space and recreational space in the Indian Hills infrastructure plan, the social and environmental resilience are tied together through temporal changes to spaces primary functions based on the neighborhoods needs.

Presentation Quality and Analysis

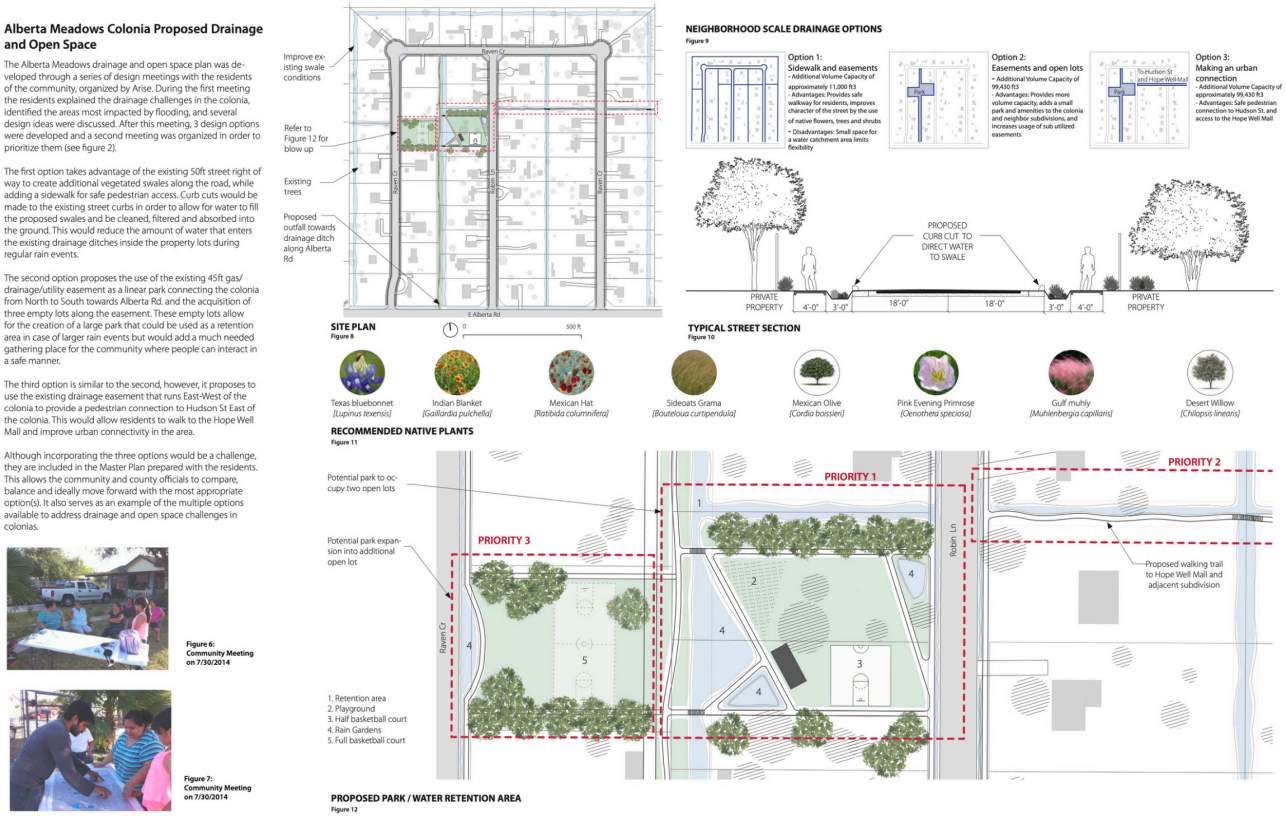
By creating easy-to-understand educational materials and linking concepts to an analysis of local policy and administrative stakeholders, planners can help ensure that green infrastructure solutions are implemented effectively.

Academic Documentation

The case study notes two things related to this case study's relation to academic work. First, the report analyzed for this thesis was an academic project from publicly available materials from a studio. Additionally, it had limited or no documented engagement with community members from colonias. As a result, it is unlikely to be implemented. However, it can still serve as a precedent for future organizing materials.

By working closely with researchers, local activists, residents, organizations, and stakeholders, planners can find ways to provide the proper materials and implement green infrastructure solutions effectively.

Precedent: Land Use Colonia Housing Action (LUCHA) Neighborhood and Drainage Plans in English, “FIGHT!”



buildingcommunityWORKSHOP, CDC Brownsville, LA UNION DEL PUEBLO ENTERO, & A Resource in Serving Equality. Alberta Meadows: Stormwater Management and Open Space Plan. LUCHA. Retrieved April 10, 2023, from https://static1.squarespace.com/static/587e49ea579fb39e319c6c64/t/5953d9209f7456dd6dea8b41/1498667310595/ALBERTA+MEADOWS.pdf

Quick Facts

Partners
La Unión del Pueblo Entero (LUPE), along with Arise, CDC-B, and Texas Low Income Housing Information organizations

Location
Lower Rio Grande Valley colonias

Approach
In 2012, nonprofit design studio bcWorkshop became the consultant to communities as part of the Colonia Neighborhood Plan Implementation Strategies to demonstrate a community design process for previously unplanned areas. bcWorkshop was also involved with LUCHA’s neighborhood planning efforts.

The LUCHA initiative represents a pioneering effort in colonia planning and community empowerment in the LRGV. Through holistic planning and community-driven processes, LUCHA has set a high standard for addressing the unique needs of colonias through vision planning. This case study aims to highlight three major takeaways from the LUCHA initiative's neighborhood plans.

Comprehensive Approach to Colonia Planning

The LUCHA initiative exemplifies a comprehensive approach to colonia planning. Shown on the previous page is a sample of one of six water and drainage plans for colonias, however, this effort it goes far beyond just addressing water and drainage issues. The initiative has produced numerous neighborhood vision plans, which provide recommendations to local policymakers, county planning commissions, and other stakeholders. However, to enhance the impact of these plans, it's essential to consider how implementation can be incentivized, such as exploring site and services programs.

Empowerment Through the LUCHA Library

The LUCHA Library serves as a vital resource for Rio Grande Valley residents by providing accessible, community-driven information on key issues. Developed in collaboration with LUPE and ARISE, the library supports community organizing efforts by empowering residents with knowledge. A crucial aspect of the library's success is its focus on creating informative, community-oriented materials that are publicly available. This approach ensures that residents can access and utilize the information they need to advocate for their communities effectively.

Overcoming Political Challenges for Community Engagement

The LUCHA initiative has demonstrated the power of community engagement, as evidenced by the community's response to Texas Water Development Board studies on neighborhood flooding. However, the political climate, particularly during the previous presidential term, has created significant challenges for community engagement due to concerns about citizenship and public safety. These obstacles highlight the importance of reparative trust-building and meaningful engagement in order to address environmental justice issues effectively. By fostering a supportive environment, LUCHA can continue to empower communities to advocate for their needs and priorities.

Case Study Analysis

The chapter's case studies provide a rich tapestry of examples, showcasing diverse approaches to resilient planning. A significant takeaway from the case studies is that while community building in the planning process can create a positive atmosphere, it does not always result in actual implementation of resilient initiatives.

The Caño Martín Peña Restoration Project highlights the significance of multi-level government coordination and a holistic framework for successful restoration efforts. Caño Martín Peña shows a gold-standard for transformation and deployment of major federal resources on a local equity and resiliency issue. However, it also stands out as a project of it's kind that actually has been implemented, to no fault of the communities or the designers on other projects. It just simply begain with an investment in resources.

It is important to recognize that community engagement alone or when partnered with sensible designs may not be sufficient to drive tangible outcomes.

However, the case studies also showcase the potential of DIY or sweat equity projects as alternative avenues for adopting a Site and Services resiliency planning approach. These projects offer valuable insights into implementing incremental projects and finding success within a framework of limited resources. They demonstrate that by leveraging local resources, knowledge, and collaborative efforts, communities can make meaningful progress towards resilience goals even with constrained capacities.

The Kibera Public Space Projects demonstrate the impressive capacity of residents to implement sophisticated solutions within short timelines. The case study emphasizes the rapid development of general expertise through locally pedagogical approaches in Site and Services Resiliency Planning. This highlights the potential benefits of empowering communities with knowledge and skills for resilient action.

In contrast, the Greening of Detroit case study emphasizes the advantages of subject-specific skill building and the deployment of community volunteers in a region. This approach enables the continuity of contracts and the accumulation of expertise, enhancing replicability and feasibility. In the LRGV, this could enable skilled workers to continue with contracts helping

their neighbors across the region and building future cross-regional connections.

Neither the KPSP or the Greening of Detroit are silver-bullet solutions if replicated in the LRGV. They may both be viable approaches forward for communities or could operate in tandem, as a two-pronged approach.

Defining the scale of a problem is an interesting final takeaway of a few case studies documented here. For example, the Soak Up NH case study showcases the capacity-building potential of individual homeowners and DIY initiatives. It suggests that scaling up these efforts through community-level coordination and organization could yield broader benefits.

Finally, the Flooding in the Forgotten Americas case study, which challenges the conventional approach of solely focusing on regional-level and high-intensity floods. Instead, it suggests that neighborhood-scale planning can effectively address nuisance-level flooding issues. This perspective opens up new possibilities for localized flood mitigation strategies.

Incremental, Everyday Urbanism + Site and Services Resiliency Planning for Border Colonias

Scope

In many colonias, simple rainwater creates nuisance flooding regularly - frequently - that disrupts life. The threat of the 100-year storm, by contrast, likely has further impacts that cannot be mitigated by local interventions. In 2021, the Cameron County Drainage District 5 manager suggested that any massive flooding infrastructure system was difficult to create.[32] Types of abandonment and disinterest in deploying or implementing equitable solutions are a key part of this political economy here. In Texas, a lassaiz-faire conservatism and rasquashe tradition - combined with a need for solutions - indicates that exploring everyday urbanism as an approach to building momentum could be an important step forward.

To this end, the scope of the following designs or effort in this study is not to solve flooding in the LRGV region, to apply this concept here to begin the urgent work of increasing resiliency across colonias.

Proposal

An everyday incremental urbanism and site and services resiliency approach to transforming colonia flooding, climate, and public space justice issues across the Lower Rio Grande Valley.

Example Applications Explored in Conceptual Neighborhood Framework Designs

Incremental Everyday Urbanism

Rain Gardens + Cooling Spaces

My neighbors and I begin to collect rainwater and identify sites appropriate for rain gardens on our private property, which we construct in the next few months without any needed permissions. In a public space, we spend a weekend building a nonpermanent shade structure.

Site and Services Resiliency

Wetland Demonstration Project

Other local residents and I learn how and where to construct wetlands with a new organization and we find creative contracts with local municipalities to do this labor on various colonia property after negotiating with each respective single landowner.

Traditional Planning

Connecting to Irrigation Districts

My neighborhood organization gets funding to work with a nonprofit designer and engineer. We bring plans to planning meetings for future funding, and negotiate with local authorities to install traditional infrastructure for stormwater planning. We find ways to offset the traditionally prohibitive costs of this.

Conceptual Applications to Colonias

In the following designs, I draw from case studies and precedents on neighborhood frameworks, DIY stormwater management guides, organizational projects, site visits, and urban design research. Each of the neighborhoods have different levels of available data, all quite limited.

For the purposes of defining what incremental actions that residents could take using a “DIY” approach to pursue a neighborhood framework, I will use the term this as “everyday urbanism incremental resiliency” and use this to examine what residents can accomplish on their “own”, by working collectively. Largely unregulated communities like ETJs have many challenges, but potentially offer experimentation potential, as well, particularly with incremental efforts.

By contrast, “site and services resiliency”, includes work that may include negotiating with local authorities and administrators, landowners, or receiving funding for the traditional “site” components that would be needed for resiliency planning - such as infrastructures that cannot be reasonably acquired. The difference between this and traditional planning is that it should still entrench in the resquache tradition by marrying government funding, design sensibilities, and planning capacity with resident sweat equity. Perhaps this conceptual definition or differentiation would change over time as capacity is built.

The impacts of these approaches or “phases” have on designs are explored in the following conceptual applications.

The green infrastructure designs to follow are modest. They have been proposed before, in other capacities, with open space studies in a range of colonia typologies and low impact development solutions. They are done as conceptual framework studies only, without community engagement or endorsement, to explore this theoretical model. The designs that are proposed are one component of a strategy suite that involves co-design to demonstrate how this could work under the “site and services”.

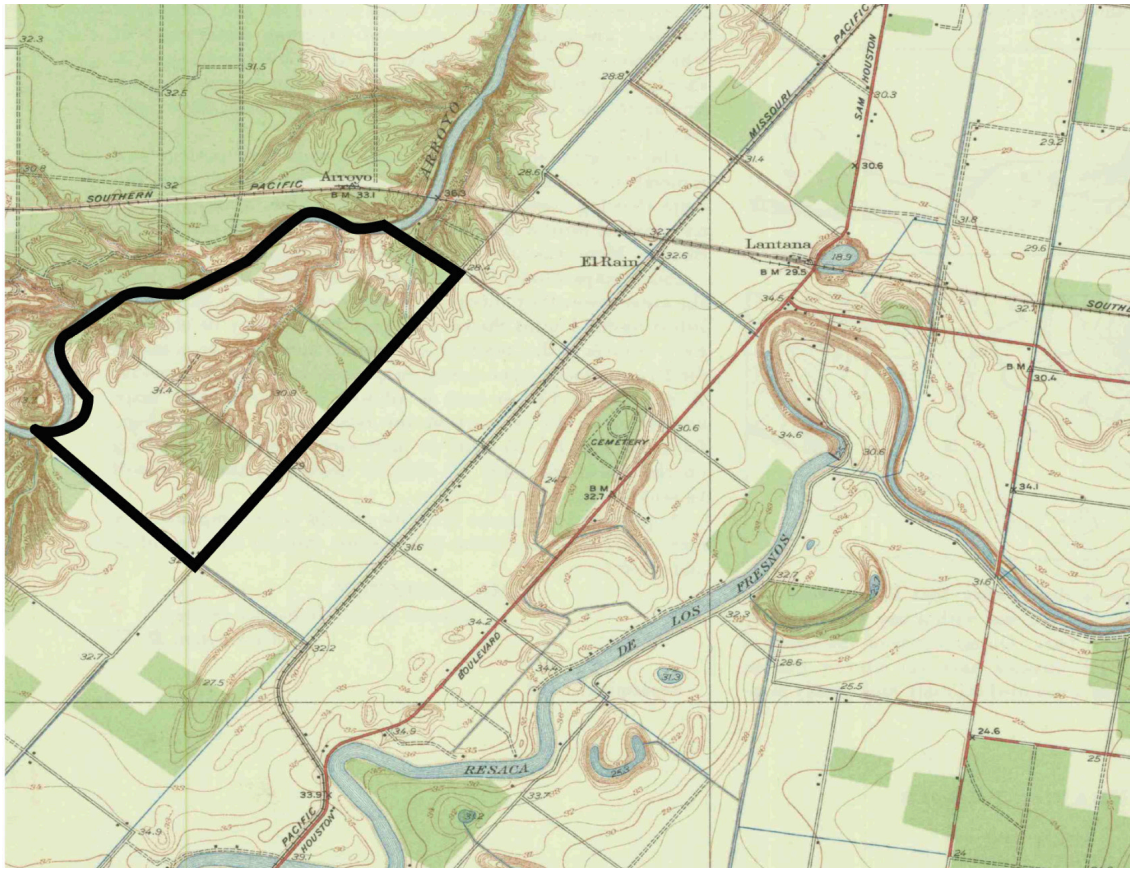
Site and Services / Everyday Incremental Urbanism Design Studies

The actual intended implications of these three conceptual framework plans are to offer options for the County to include in their next five year Hazard Mitigation Plan. This will seek to demonstrate that hazard mitigation planning should be equity focused at the county level. Many of the following projects are likely partially available for BRIC, HMA, and FMA funding from FEMA with some level of local participation and county reception. Presently, the Texas General Land Office (GLO) is undertaking an effort to hear about new, innovative ways to incorporate community efforts and scale up efforts across the region with respect to stormwater efforts in colonias.

Arroyo Colorado Estates

Elevated Mobile Home under semipermanent structures.

Flood path from the Arroyo Colorado, which serves as an opportunity to formalize and program.

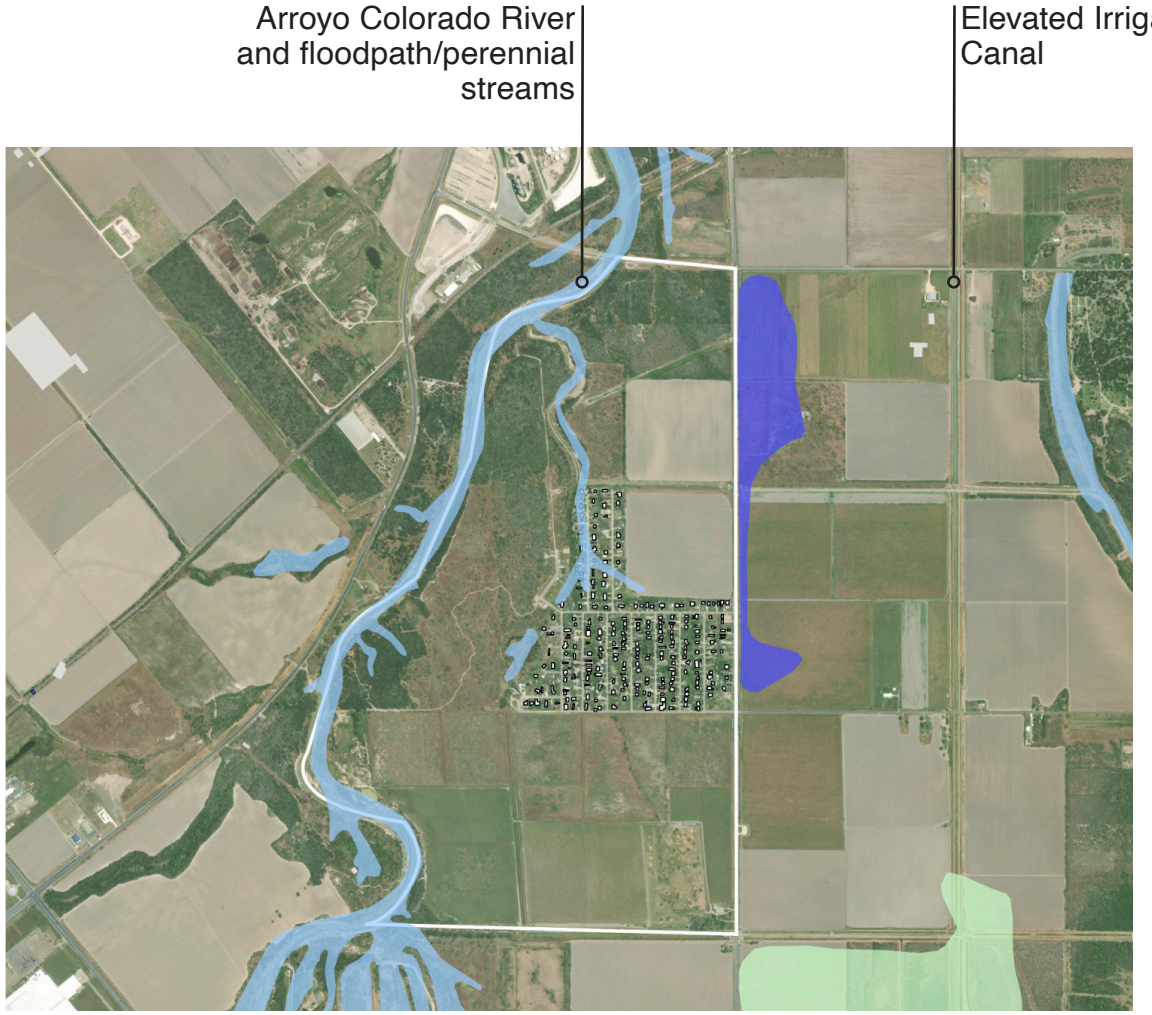


Historic Topography

The original platte is an ETJ in Cameron County from 1962, which means that it initially did not require water or wastewater services before the Model Subdivision Rules, although today it has both.

There are approximately 982 quarter and half acre lots developed in the site, and a significant amount of undeveloped space across the platte. The land is largely divided between suburban configured lots with tree cover but streetscapes and shared open spaces are nonexistant nearby. Due to the nature of the isolation of the site, this leaves residents with limited options for nearby recreation or connection.

Map: 1932 Rio Hondo Topography Map. USGS.



Site Context

Uniquely, Arroyo Colorado Estates is adjacent the Arroyo Colorado River and within proximity to the Cities of San Benito and Harlingen. The State's identification of the platte indicates that it is only partially developed and could potentially experience further development. Site visit research reveals a Phase II under way, with new streets and stormwater infrastructure serving a few new homes moving up the direct floodplain route towards the Arroyo Colorado.

FEMA Special Flood Hazard Area Zones[35]

- A (1%)
- AH
- X (.2%)

Site Context continued

Although not formally within a flood zone, a review of recent news suggests that nuisance flooding can be devastating to residents. Based on the FEMA flood maps, Arroyo Colorado Estates is at risk for fluvial (river) flooding, due to proximity from the Arroyo Colorado, which can at times be poor quality.[33] Additionally, they experience stormwater flooding, as reported in 2018 news reports, from nearby agricultural fields,[34] which is illegal.

Arroyo Colorado Estates is in Cameron County Drainage District 3. This area has drainage swales, but not sufficient for capacity.

Concept Proposal

Land with significant tree cover could be set aside and preserved. This could serve two benefits. The first is to keep air quality from further degrading, and the second is to create open space and connections to the river.

To serve as flooding, heat, and connection to the Arroyo Colorado; adjacent to the site, neighbors could consider creating a bioswaled linear park. This could redirect water around the site.

A green linear path to wetlands along the Arroyo Colorado can create biodiversity, provide some green space and shade. Review of local watershed plans and organizations finds that the Arroyo Colorado Watershed is invested in improvements to the river very close to the site.[36]

A detention pond can be used temporally as open space when it isn't holding water. Nearby to the detention pond might be an ideal site for a public space, given it's adjacency to new housing development and one of the neighborhood's larger intersections.

Technique	Addressing	Definition	Scale	Impl.		Long Term Maintenance Considerations
Wetlands	Riverine Flooding	An area of land where water covers the soil all or part of the time, characterized by specific plant and animal communities	Neighborhood	Site and Services	$$	Periodic removal of invasive species, sediment and debris buildup, and water quality monitoring
Bioswale Linear Park	Open Space	Green area for public recreation and leisure	Neighborhood	Site and Services	$	Routine maintenance of park features
Detention Pond	Riverine and Stormwater Flooding	A man-made pond or basin that is designed to temporarily hold and release stormwater runoff	Neighborhood	Site and Services	$$	Periodic sediment removal, vegetative maintenance, and structural repairs
Gazebo	Heat	A freestanding outdoor structure, typically octagonal in shape, with a roof and open sides	Site	Incremental	$	Regular cleaning, repairs, and repainting
Rain Gardens	Stormwater Flooding	A landscape feature designed to collect, filter, and absorb rainwater runoff from impervious surfaces	Site/ Household	Incremental	$	Routine weeding, pruning, and mulching

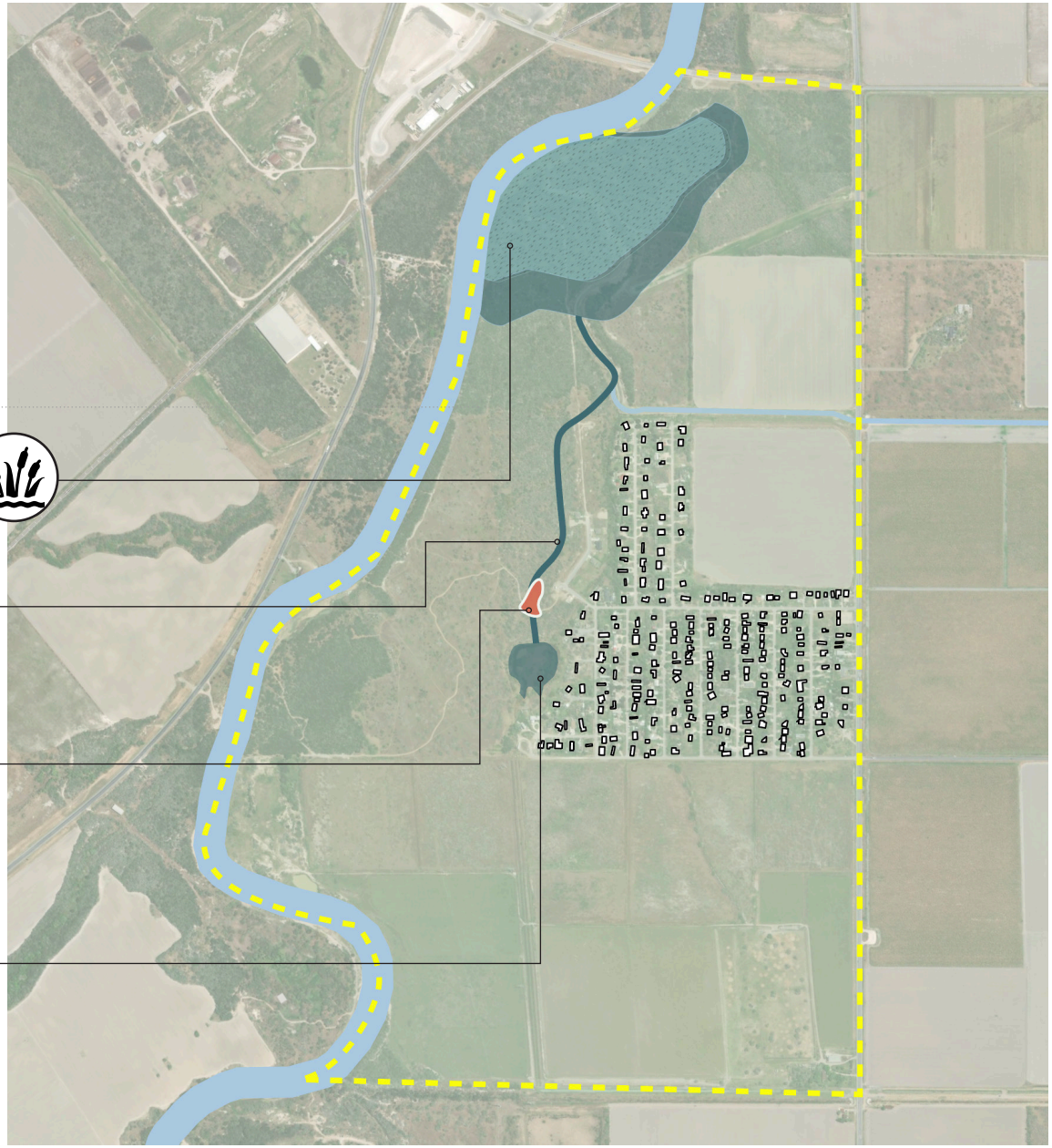
Neighborhood Level

Wetlands absorb Arroyo Colorado flooding

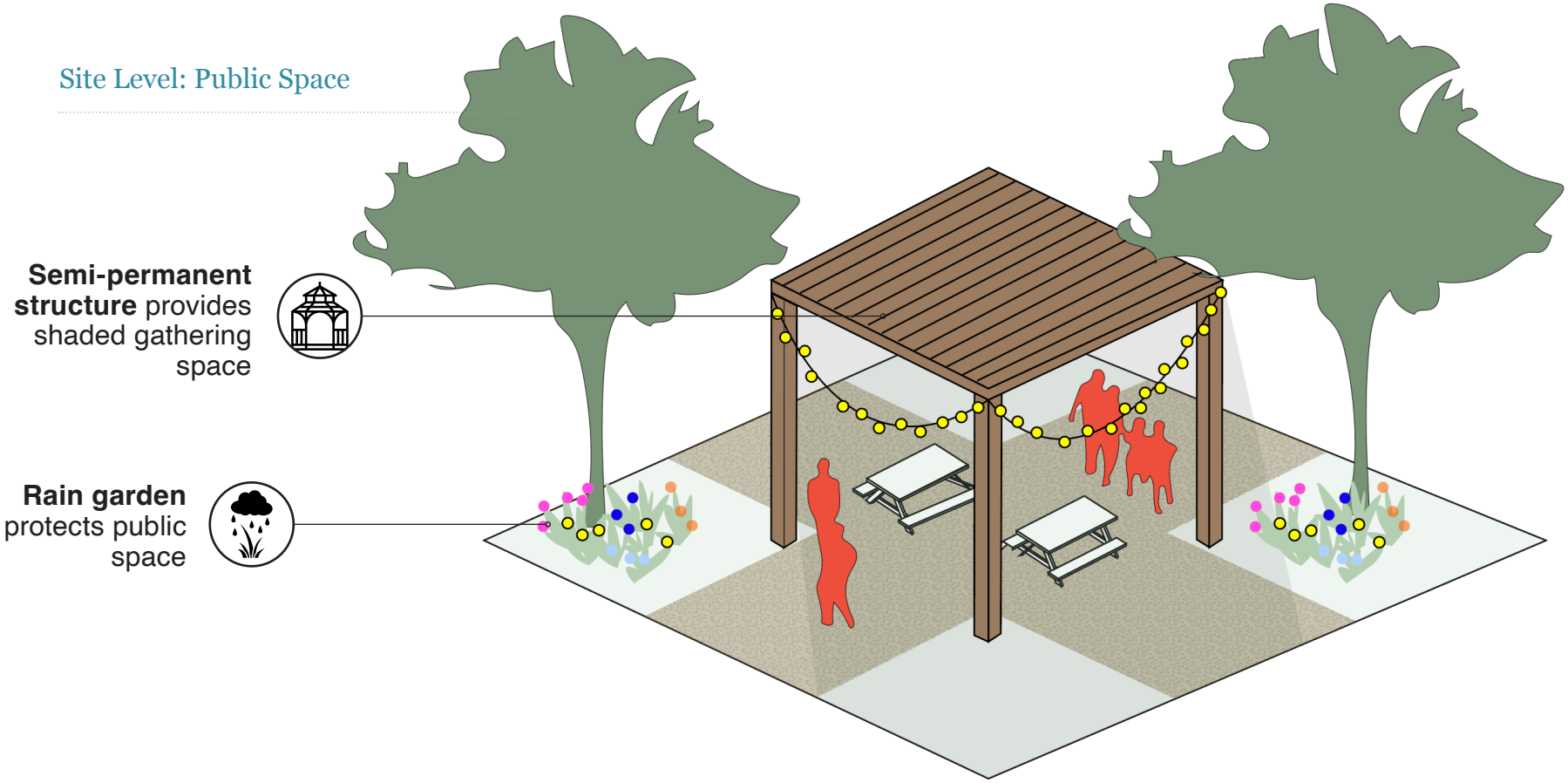
Bioswale re-directs water around homes

Public space

Retention pond holds water



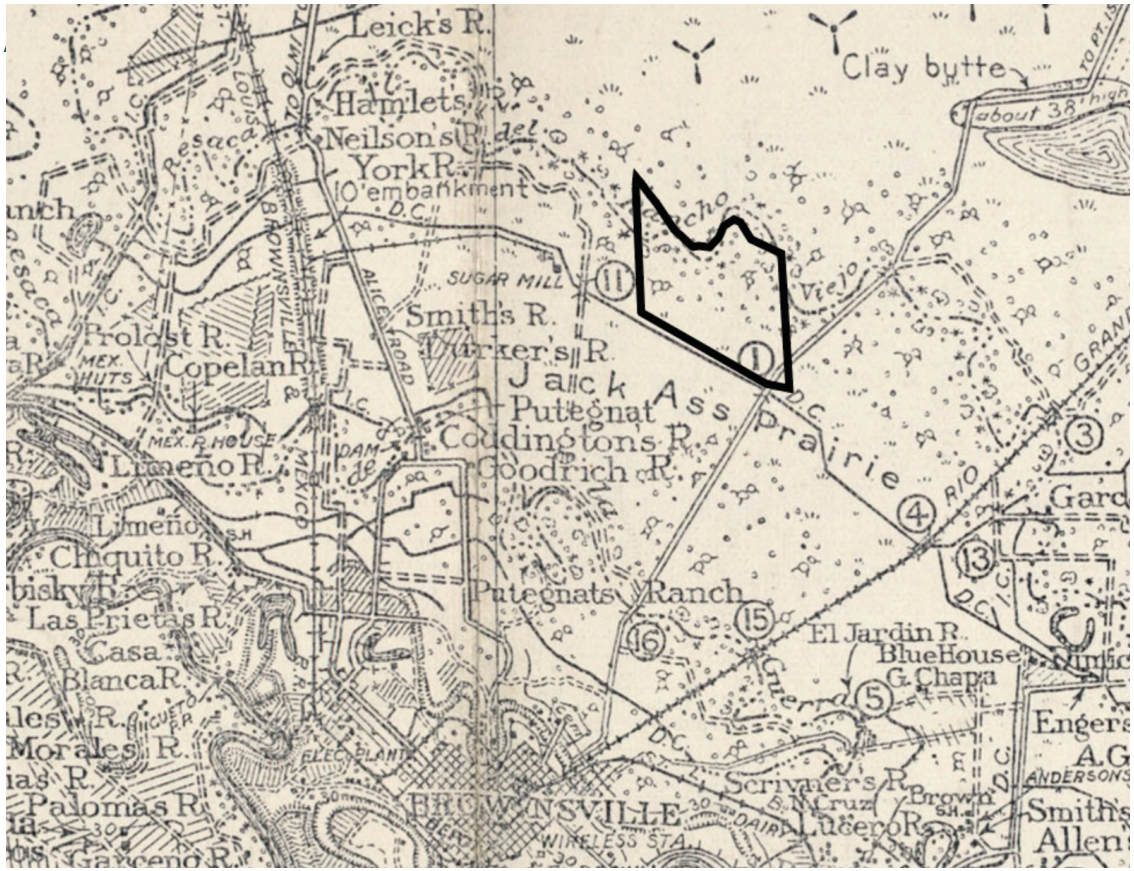
Site Level: Public Space



Cameron Park

Semi-permanent structures in front yards for gathering and shade.

Adjacent, fenced-off Resaca de Las Palmas open space.

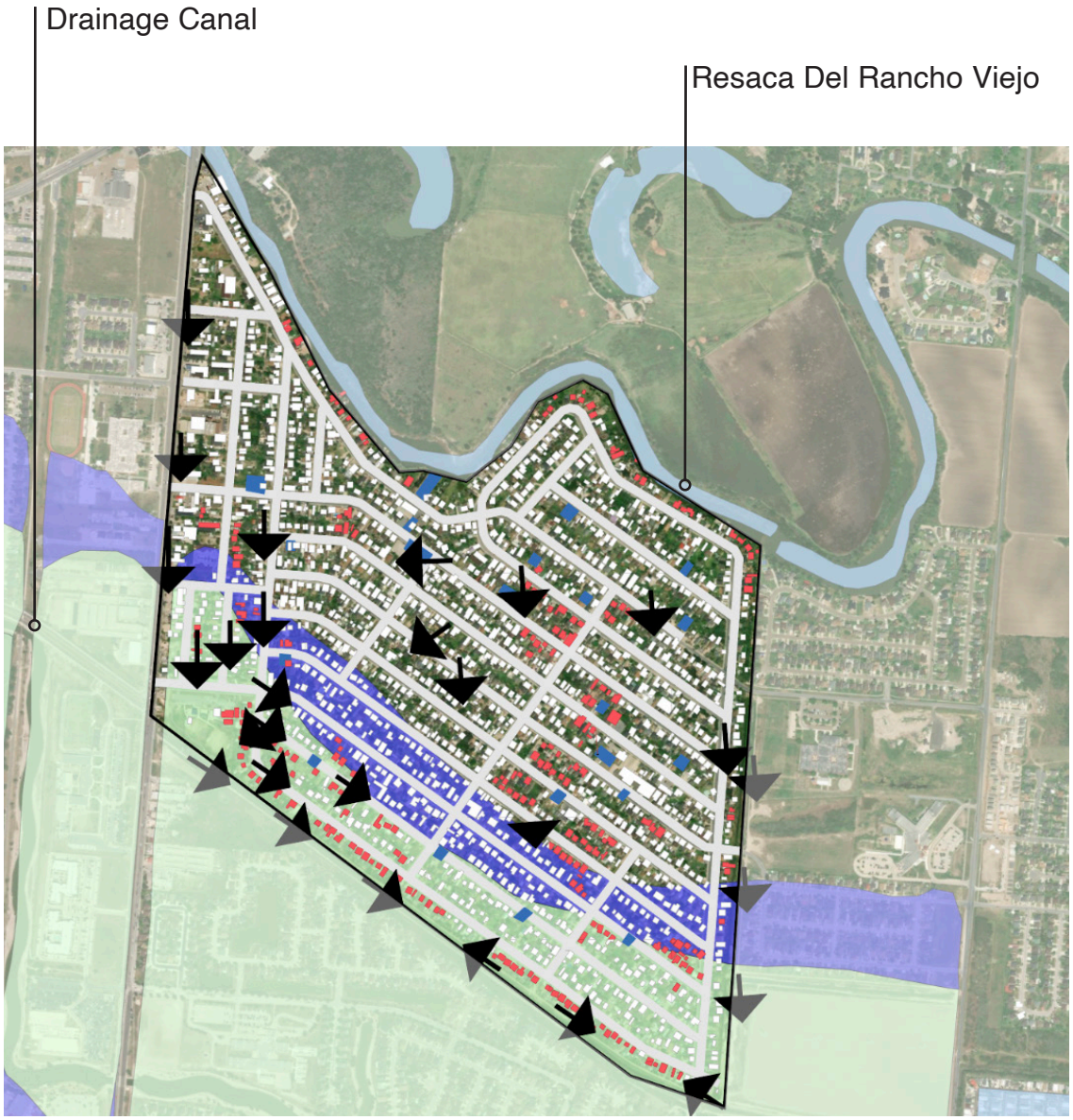


Historic Topography

Cameron Park is one of the oldest Texas colonias, having originated in 1961. It is composed of two census tracts that represent its development in two phases - beginning near the resaca.

Approximate location on map.

Map: Progressive Military Map of the United States Southern Department. Courtesy University of Texas Libraries.



Site Context

Cameron Park is an urban colonia in Cameron County that is surrounded on four sides by the city of Brownsville, and adjacent to the Resaca de las Palmas. It is approximately 300 acres with 1/8 acre lots. Approximately 6,500 residents live in Cameron Park, according to 2020 census. Formerly the poorest neighborhood in the United States, Cameron Park is one

- Water Direction
- Homes at Risk of Inundation
- Vacant Lots

FEMA Special Flood Hazard Area Zones[37]

- A (1%)
- AH
- X (.2%)

of the most well-mobilized colonias, and possibly neighborhoods, in Texas.

Cameron Park is at risk of stormwater flooding. It is in Cameron County Drainage District #1. Despite an existing stormwater system on nearly every street, the neighborhood needed evacuation in 2021 from storm flooding as infrastructure is operating overcapacity. In 2021, residents still needed evacuation from stormwater flooding by emergency vehicle.

According to the 2016 Texas Water and Development Board report, “the existing drainage system consists of a small stormwater system and roadside swales that are generally undersized and restricted by sediment and vegetation. Cameron Park experiences residential lot, street, and structure flooding in nearly every rainfall event.” The report recommends new underground drainage system and grassy swales between lots in a two year storm, this reduces inundated structures from 54 to 36; in a 10 year storm, 102 to 57.

Concept Proposal

A combination of techniques can be used to create improvements in mitigating heat at a local level while also contributing to street improvements and the public realm.

An interview with a landscape architect and site planner local to Brownsville indicates that some traditional low impact stormwater management such as permeable paving are limited due to soil conditions.

Unique to the colonias examined as part of this study, Cameron Park is an impermeable environment that should also consider reducing phosphates and managing water movement in the environment, as environmental quality is poor.

Creating a network of rain barrels can help heat while also collecting 93,500 gallons of water - or almost 50,000 gallons if 50% of houses adapt them - which is roughly the first two inches of water in a storm. While this does not contribute significantly to flooding, it can help manage environmental quality.

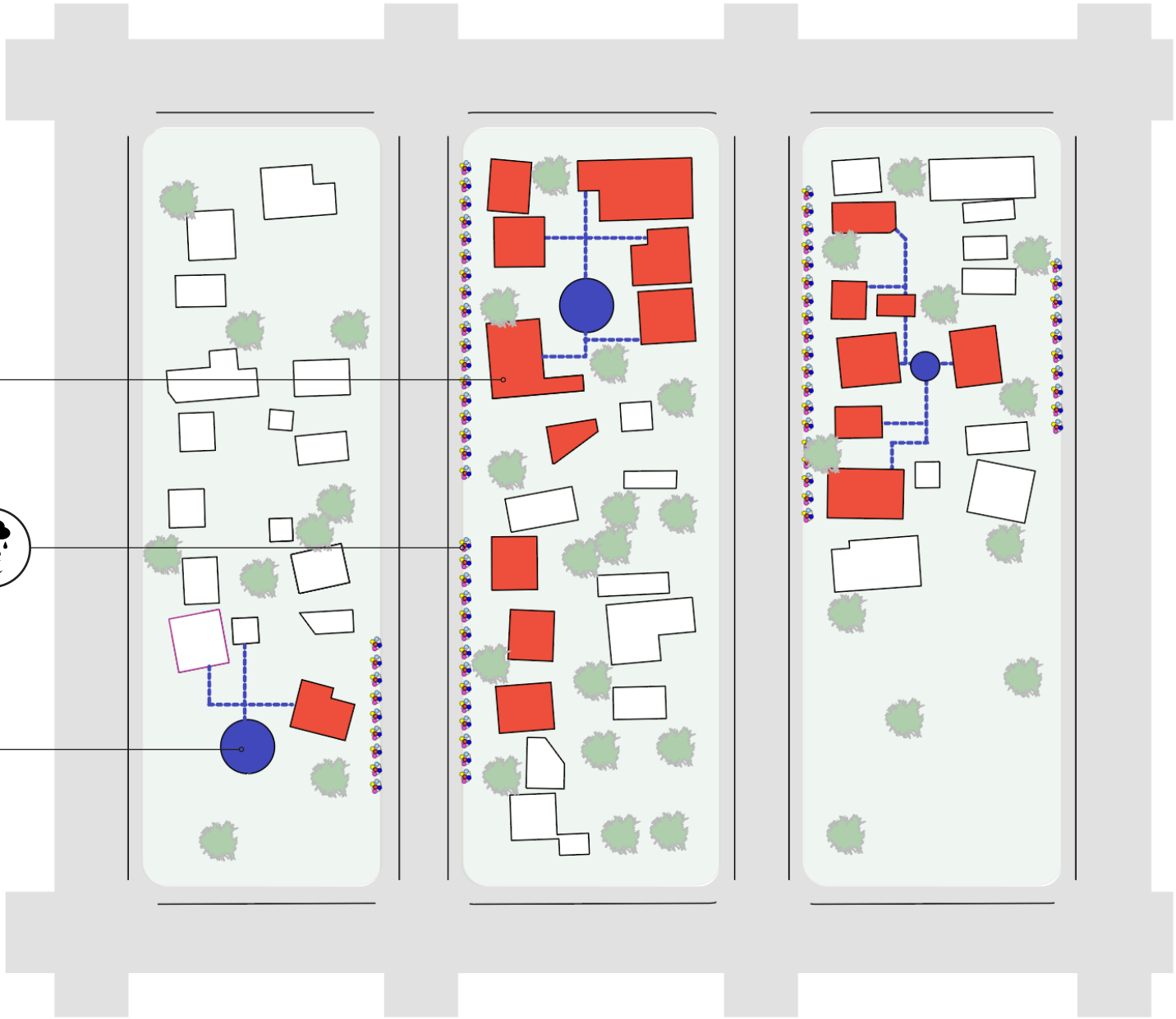
Technique	Addressing	Definition	Scale	Impl.		Long Term Maintenance Considerations
Collective Curb Management	Stormwater Flooding and Open Space	The parking strip can be used for low impact stormwater management by incorporating vegetation like rain gardens to capture and filter runoff.	Neighborhood	Incremental	$	Periodic removal of invasive species, sediment and debris buildup.
Painted Surfaces	Heat	White paint on rooftops and impervious pavement can improve ambient temperature, indoor temperature, and energy costs.	Site/ Neighborhood	Incremental	$	As the region's typologies continue transitioning from self-built housing and towards affordable mobile homes, leveraging modular or prefabricated mobile home design with heat-friendly materials could be a significant change to the landscape of LRGV colonia infrastructure.
Rain Collection	Stormwater Flooding	A man-made pond or basin that is designed to temporarily hold and release stormwater runoff	Site/ Neighborhood	Incremental	$$	Periodic cleaning
Drywells	Stormwater Flooding	A landscape feature designed to collect, filter, and absorb rainwater runoff similar to rain gardens, but with more capacity.	Site/ Neighborhood	Incremental	$	Periodic removal of invasive species, sediment and debris buildup.

Block Level

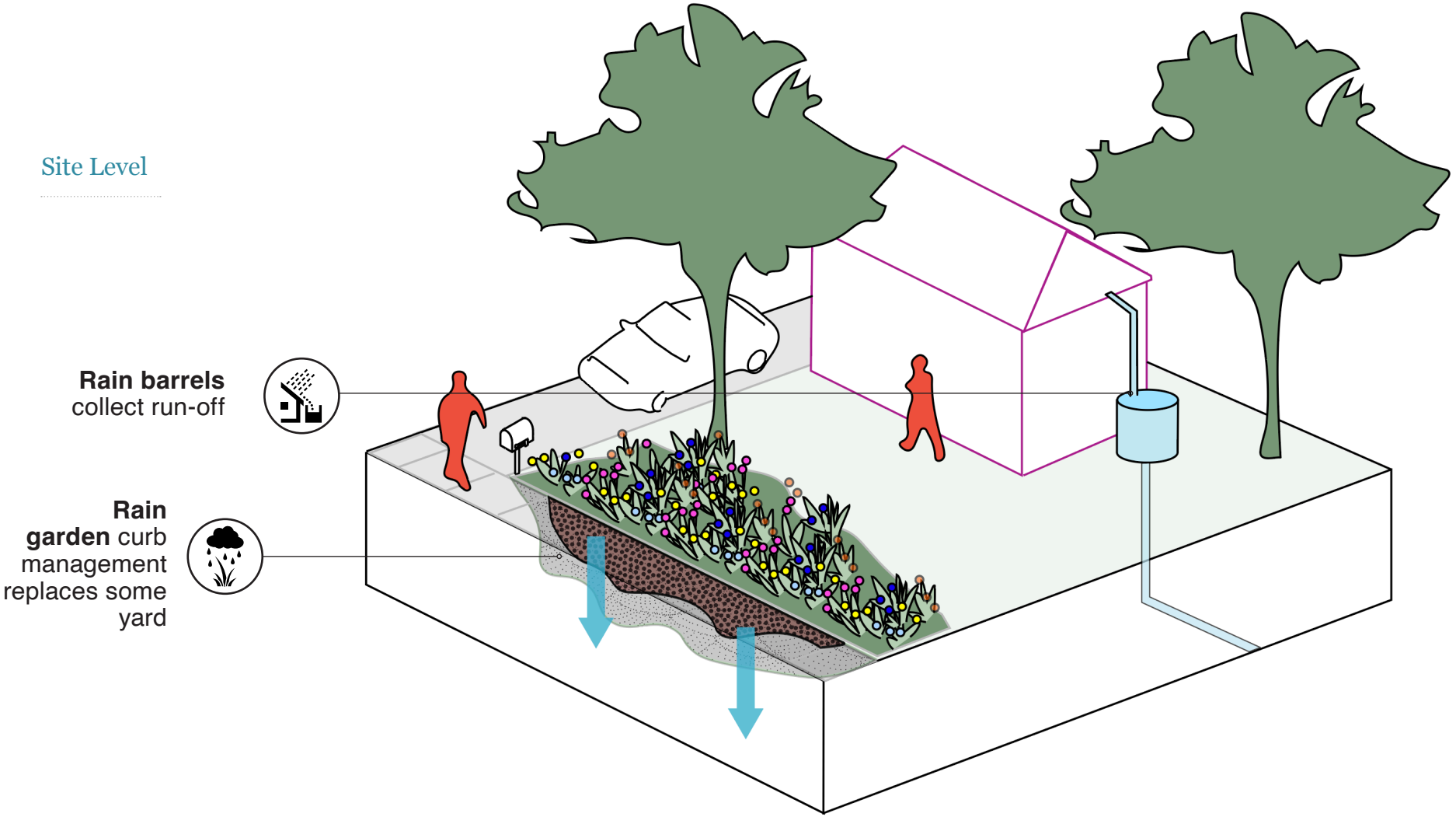
At Risk Housing

Rain Gardens and LID Curb Management create continuous absorption on street

Drywell and **Rain Barrel** Network



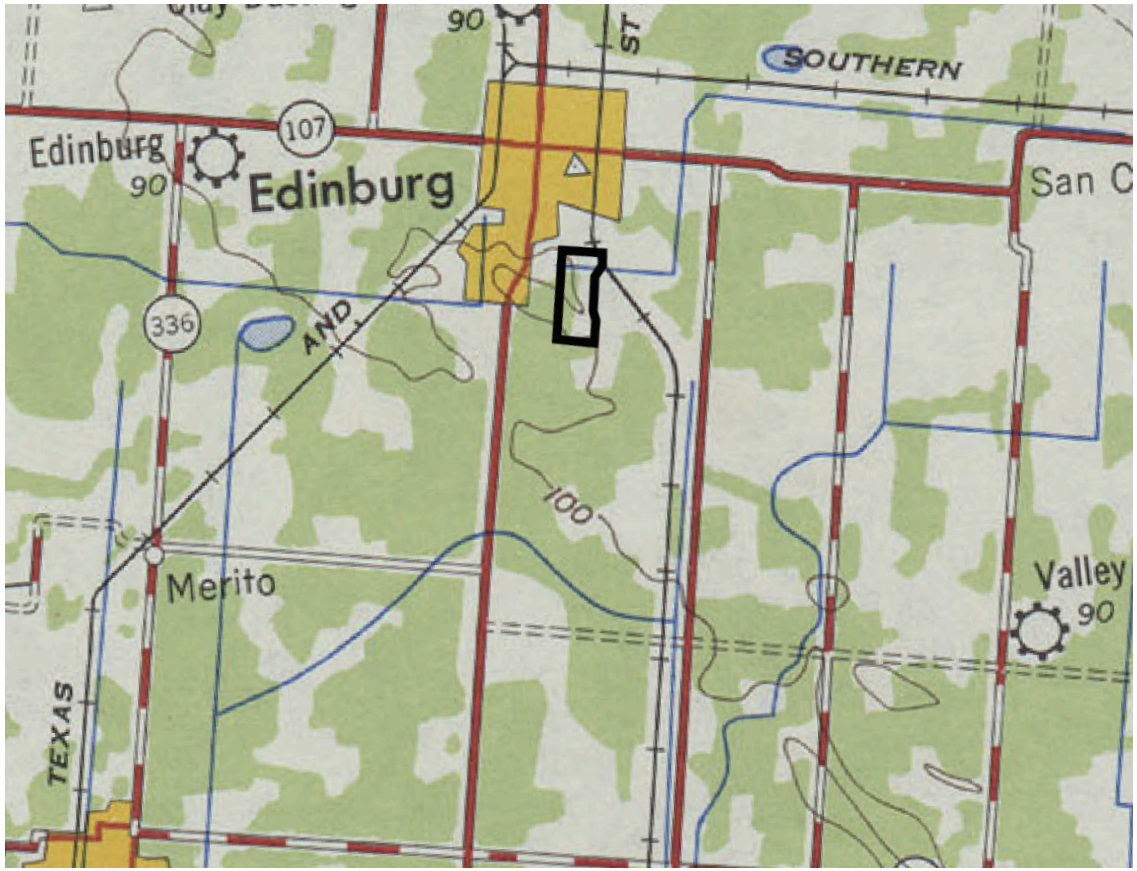
Site Level


Rain barrels collect run-off
Rain garden curb management replaces some yard


Alberta Estates #2

Grassroots pot-hole filling in Alberta Estates #2.

A nearby drainage canal that overflows during rainstorms.

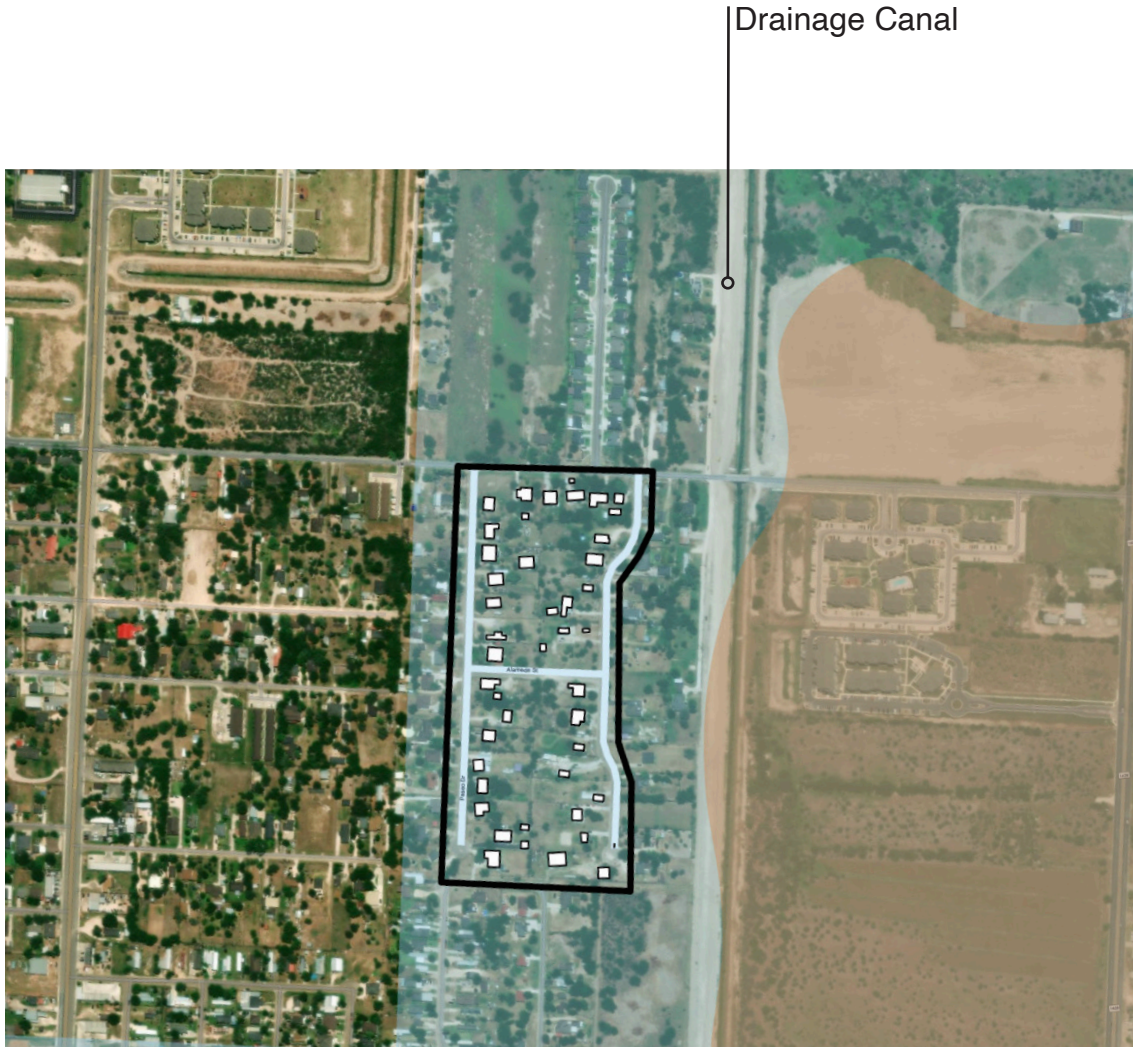


Historic Topography

The original platte, from 1992, is a model subdivision with 18 acres.

Approximate location on map.

Map: 1949 USGS Topological Map. Courtesy University of Texas Libraries.



Existing Conditions

Alberta Estates, northeast of McAllen in Lopezville/Edinburgh in Hidalgo County, is an ETJ. In the rapid urban expansion of McAllen - it is possible that the increase of impermeable pavement exacerbates flooding conditions of Alberta Estates and the 27 nearby colonias. The neighborhood, according to the state, has partial water service.

Alberta Estates has approximately 30 developed lots ranging in size

FEMA Special Flood

A (1%)

AH

from quarter to full acre. Estimated median income is $27,000 as of 2020 for the block group, which includes adjacent neighborhood colonias of similar size and characteristics.

According to the Texas Water and Development Board's 2016 study, the neighborhood has no stormwater management. It is in Hidalgo County Drainage District #1 (Precinct 4). It is adjacent to one drainage swale on Alberta Road. In a ten year storm, there is 2,450 linear feet of inundated roadway.

The 2016 TWDB recommendations proposes a new underground drainage system, a retention pond southeast of the site, new curb inlets, and grassy swales between lots. These proposals reduce the structure and roadway flooding almost entirely.

The street conditions suggest that there is limited tree canopy. Vacant lots, with no tree canopy, suggest opportunity to pool resources and invest in place-based shared structures.

Concept Proposal

Alberta Estates could have swales between houses in between parcels, where there are currently fences. Bioswales that can be used to detain water without disrupting daily life can keep water local, build flexibility, and plant vegetation that increases biodiversity.

Leveraging vacant parcels for retention ponds to catch water earlier in the drainage pattern (which moves from northwest to southeast, and where TWDB previously proposed detention ponds at the farthest southeast corner outside of the site).

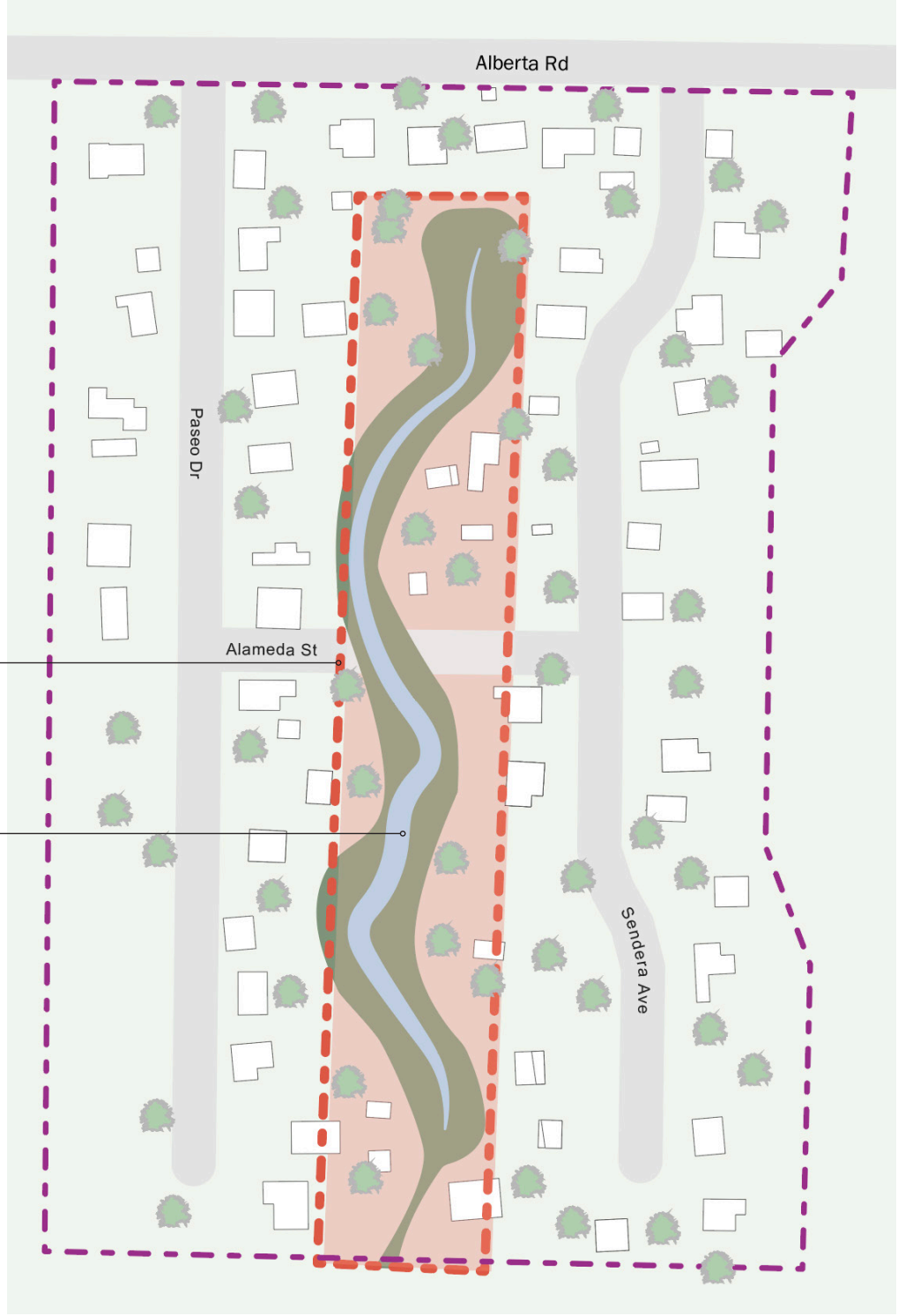
Additionally, small interventions - such as solar lights, may be useful in accompanying roadside infiltration trenches for safety and to enhance the public realm.

Technique	Addressing	Definition	Scale	Impl.		Long Term Maintenance Considerations
Bioswales	Stormwater Flooding	Green area for public recreation and leisure	Neighborhood	Site and Services	$	Routine maintenance of vegetation
Detention Pond	Stormwater Flooding	A man-made pond or basin that is designed to temporarily hold and release stormwater runoff	Neighborhood	Site and Services	$$	Periodic sediment removal, vegetative maintenance, and structural repairs
Infiltration Trenches	Stormwater Flooding	A shallow roadside excavation for gravel or stone to allow and direct water away from roads	Street	Incremental	$$	Routine maintenance of vegetation
Curb Solar Lights	Open Space	Small ground-level reflective lights that can encourage evening outdoor activity for heat considerations and contribute to a sense of place, and driver safety during nighttime	Street	Incremental	$	Minor mechanical maintenance
Rain Gardens	Stormwater Flooding	A landscape feature designed to collect, filter, and absorb rainwater runoff from impervious surfaces	Site/Household	Incremental	$	Routine weeding, pruning, and mulching

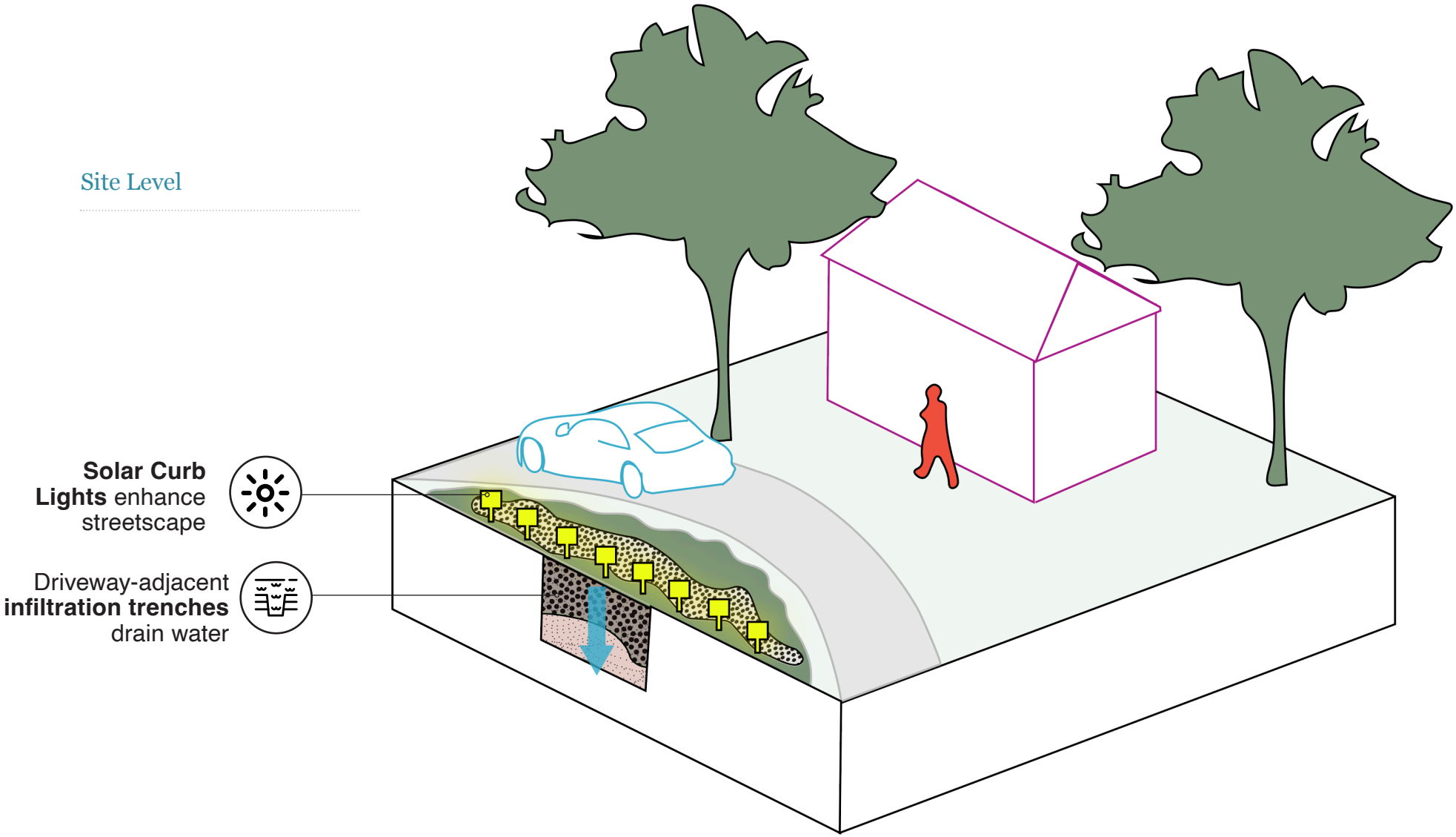
Neighborhood Level

LID Easement sets aside some space for collective conservation and LID interventions

Bioswale helps collect and redirect water



Site Level


Solar Curb Lights enhance streetscape
Driveway-adjacent **infiltration trenches** drain water

Discussion

In summary, “Incremental everyday urbanism” refers to the small but significant steps that residents can take towards creating a neighborhood framework using a DIY approach - such as building temporary cooling structures to share public spaces or offer shade, or digging infiltration trenches near driveways on a street that regularly floods. This should not excuse the government of their responsibilities. This approach emphasizes collective action and enables residents to achieve tangible results.

“Site and services resiliency” here integrates the resquache tradition by combining government funding, design expertise, and resident participation in the design and most importantly, the implementation. Site and services approach may need to come first, such that residents can decide on capacity to implement important projects with government funding first, or ideally to identify government implemented projects first, and then supplement this with their own work, through incremental everyday urbanism. It may be difficult to grow everyday urbanism without the organizing structures that make possible the site and services resiliency first.

After examining the potential application of these two approaches in three pre-conceptual colonia resiliency framework plans, it is important to and identify key takeaways for residents, planners, and designers. This section explores the potential outcomes and challenges of these approaches, and where further research is needed.

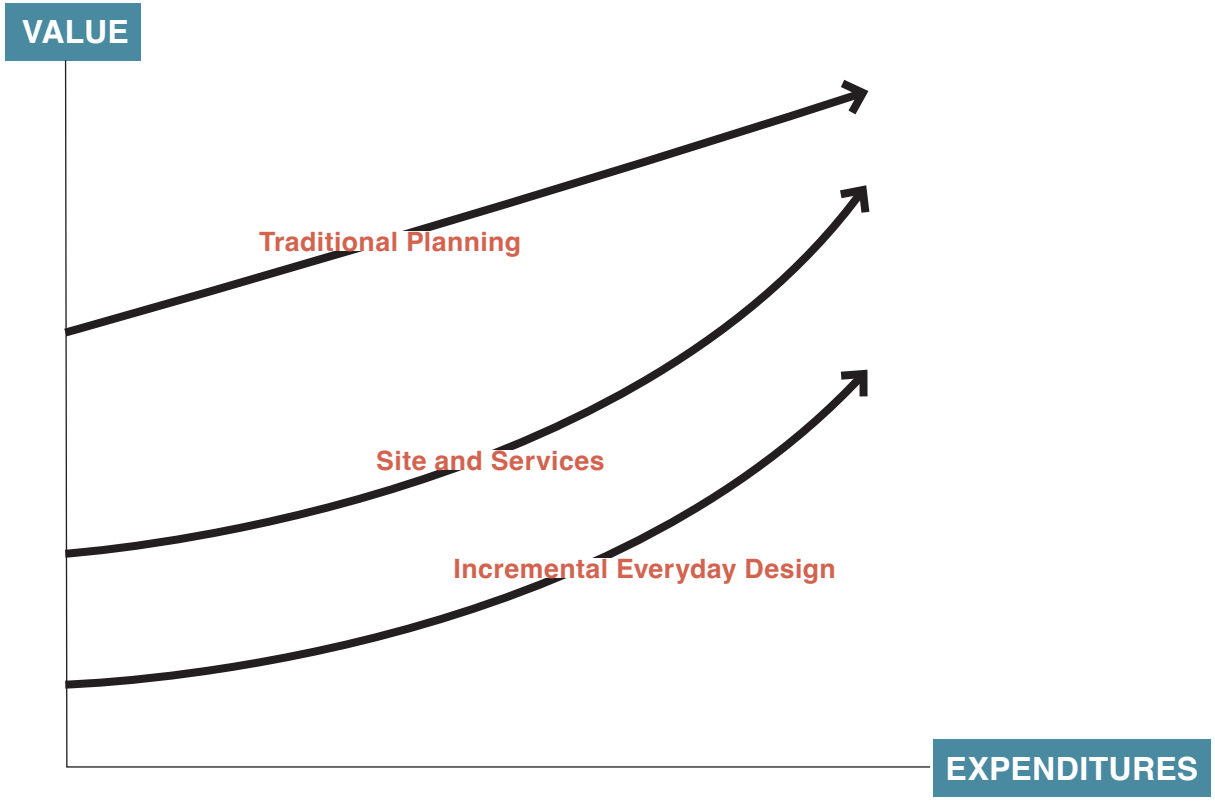
How much might the Site and Services Resiliency approach accomplish?

While getting closer to traditional planning methods is undoubtedly preferred, planners have to meet people where they are, even if that means taking smaller, incremental steps.

Colonias are not a monolith, and while some are highly organized, many are low capacity, which is a characteristic both intertwined with and somewhat independent of general income and class.

Should this approach be able to transform a low-capacity community into an organized body that can solve problems, there would likely still have to be trade-offs based on capacity that is not limitless.

RESILIENCY SOLUTIONS IN LOW-RESOURCE CONTEXTS: VARIOUS APPROACHES (REVISED FOR CONCLUSION)



For instance, choosing a solution that can be implemented now for $10,000 that offers 30% benefit to flooding, versus selecting a more comprehensive solution that is currently cost-prohibitive at $100,000 but offers 70% of the flood protection needed. In much more specific terms, early estimates place the average cost of the neighborhood-scale suite of nature based solutions proposed in this report at $70,000, which is drastically less than the $971,550 average per neighborhood found in the TWDB reports.

In a sense, an “everyday urbanism” approach fills in some adaptation needs when the cost of an average traditional planning project is prohibitive, and the financial trade-offs and deferments of “ideal” solutions fill in this gap when everyday viability of a neighborhood is compromised. Perhaps in a temporal strategy, the site and services approach can strike a balance between practicality and comprehensiveness when implementing urgent resiliency solutions.

In conclusion, the “incremental everyday urbanism” approach has notable limitations in proportional responses but could be a valuable tool for taking action towards creating more resilient neighborhoods. By acknowledging the financial trade-offs and limitations that communities face on a daily basis, planners can work towards finding practical solutions that can have a meaningful impact on communities.

How Could S+S Work?

To understand how the "site and services resiliency" approach could retroactively apply to existing neighborhoods, the following are some potential approaches and their implications on residents, governments, and planners.

One possibility is for the government to put out a Request for Proposals (RFP) for local community based organizations, who already advocate for basic utilities and services, to form a memorandum of understanding and explore opportunities for pilot projects. This could occur either by neighborhood or across the region for communities that want a particular effort (such as regional wetland demonstration projects, which then further could benefit from local wetland demonstration

organizations; or rain gardens and SUDs in one neighborhood). This could help match them with other citizen subject matter expert groups. Providing small grants and other resources for this type of program would enable residents to select their own level of interest and obtain small exploratory funding grants to determine their own abilities.

Existing partnerships in the region, such as the Public Design Impact Initiative (PDII), by bcWorkshop, demonstrate how designers can enter into community based agreements. PDII similarly requests RFPs from nonprofits in the area.[39]

However, it's crucial to ensure that site and services are well defined. Some studies suggest that site and services can be frustrating if the level of services provided is inadequate,[40] while others indicate that design education is a critical component. Therefore, agreeing on timelines, leadership, and sharing an understanding of obligations and rules is key, as is building cultural communication and trust, which is discussed later in this section.

Furthermore, there must be goals and metrics that define success, which the community generally agrees with. This could involve tracking flood protection to homes or improvements in a community's ability to recover from heatwaves. These metrics may need to be creatively defined in a memorandum of understanding.

Major Challenges to S+S Projects

Implementing the "site and services resiliency" approach requires careful consideration of several factors.

First, design education is a crucial component of the "site and services resiliency" approach. Residents need to be educated on the fundamental principles of resilient design and how to integrate them into their community. This includes capacity building, training, and management organizations that oversee the local implementation of such development.

An example of this is Soak NH, which offers education, site selection, DIY sheets, timelines for planning, preparing, ordering, recruiting, permitting, material acquisition, documentation, and monitoring. Similar advocacy materials have been seen in colonias as well, as part of the LUCHA projects that pilot educational materials examined in the precedent projects.

An important aspect to kicking off an effort like this regionally is the need for more data. This data should engage residents to ground truth levels of flooding, resilience to heat, and other planning needs. This collection and communication process would be essential for agreeing on priorities, distributing grants, and other planning initiatives.

Another significant challenge is the unclear jurisdiction of ETJs (Extraterritorial Jurisdictions) and drainage districts, as this ambiguity creates confusion and complicates planning efforts.[41] It's essential that the government has a unified understanding of this issue and can negotiate with residents while navigating administrative and bureaucratic obstacles.

Maintenance of nature based solutions can also be a significant issue. Having the community organizations and structures that can endure and maintain the implemented solutions is crucial. This requires developing long-term maintenance plans and engaging community members to ensure that the solutions remain effective and sustainable over time.

Finally, and most importantly, this approach is still limited by relationships between community and government or policy organizations. Specifically, while one government arm might attempt to build new opportunities and relationships with residents, antagonism from the other remains prevalent. The resulting disenfranchisement not only exacerbates the living challenges of colonia residents, and forces them to focus their advocacy efforts on citizenship and safety, but fractures potential trust with other programs. Decades of harm cannot simply be undone, and residents should not have to risk added vulnerability to other arms of government in order to participate in new programs.

Takeaways For Planners and Designers

Bringing a design sensibility to the table that a community may not yet have is an important component for designers, as is meeting communities where they are and helping them make trade-offs. To do so requires us to have more trauma informed processes.

The most critical consideration for planners and designers is not only their relationship with the community but also the urbanism that they create and their role in developing

expertise in this area. While it is important to have vision, building everyday urbanism may require a more creative and activist-driven approach. In short, embracing that many high-impact projects are not necessarily geographically large projects with destination-based activations, but modest designs that are part of the "everyday".

Takeaways For Residents

Because this work asserts that our problems are urgent enough that we have to take one step at a time, little by little, this work does not offer solutions to mediate equity issues in power dynamics, and only partially does this idea address resource distribution. As a result, residents may have the most challenging position in participating in a project like this for two main reasons. First, they may find it difficult to find organizational time. In addition to making trade offs, the time and resources it takes to learn new material and implement or monitor and maintain projects can be considerable when, for some residents, day to day survival is overwhelming. Ideally, residents are compensated for this work through a site and services arrangement.

Second, representatives to navigate new programs like this may be difficult to find. Fears of further marginalization, distrust, and exploitation are valid responses to historical prejudices and today's political economy. Without reparations, trust building is simply a leap of faith.

Despite the challenges, by taking action towards creating more resilient and sustainable neighborhoods, residents have the most to gain. Perhaps one of these potential gains is a sense of empowerment in creating a more resilient community and neighborhood future.

Takeaways For Policy Organizations

These notes presuppose that there are policy organizations, if not local administrations, are searching for new ways to successfully transform this region and respond to urgent adaptation needs.

These solutions can lower costs and improve relationships with residents, however, implementing the "site and services resiliency" approach poses challenges for governments. These include cross-collaboration between different administrative

bodies to collect and disperse data, jurisdictional complexities, and long-term maintenance.

The two critical components for governments in accomplishing this are as follows: seeing this project not as an engineering solution, but disentangling a planning initiative from its physical components in favor of an approach that is centered on community building. Second, and more importantly, to facilitate the implementation of this approach, governments must reduce administrative barriers to creative collaboration projects, less this community building will lack the trust from marginalized residents to take place. One example of this might be the Vermont Flood Resilient Communities Fund, which focuses on “natural infrastructure and nature-based solutions for flood storage or improved floodplain and river functions, green infrastructure, and low-impact development to manage stormwater and reduce future flooding” specifically for marginalized neighborhoods - and has been used with Tri-Park, helping offset the cost of new mobile homes for affordable buyout programs.[42]

Further Research

These modest local designs for regular nuisance flood management and traditional summer heatwaves move us in the right direction. In resiliency planning, we talk about being socially equitable and sustainable. But projects also need to be economically-viable. Bringing community to the table, and building resiliency and community to the design process in the meantime, adds some value.

This work does not claim to solve equity issues related to resource distribution. However, it emphasizes the urgent need to take action in the face of pressing challenges. The work argues that waiting for broader societal change or political shifts is not an option when facing immediate threats. Instead, we must find creative and practical ways to take control of the situation and address the problems at hand, one step at a time.

In the long term, I deeply believe that sustainable and large scale solutions are needed, and acknowledge that this is only one step in the right direction, however, it feels unwise to ignore that moving from 0 to 1 is the hardest part - and extremely hard work for community organizers to take on the burden of. It seems that these projects can be done in part by residents with

minimal amounts of information, and the next step is for a precedent organizing program to undertake these efforts and continue to give out resources for citizen planners to vet their own projects and create as many neighborhood scale fully-vetted framework plan and self-advocacy story to help them secure public or grant funding.

Further research is needed on systemic and regional solutions. What could a billion dollars fix here? How can we change our political environment to secure the needed funding? Better yet, how can we change our institutions to better create a safety net for colonia residents? Alternatively, how can we prepare for discussions about equitable planned relocation? The Army Corps of Engineers can infuse billions of dollars into projects, what is the potential of their involvement in the area?

In the meantime, people keep living in floodplains. We live in areas where there is flooding risk, because that's where people can afford to live. Until a larger discussion on equity takes place, it is likely we will need to continue accepting incremental changes with collaborative community work. In the face of long-term theorizing about climate change and equity, we can't stop moving forward.

Author Reflection

Initially, this thesis was driven by a desire to explore potential solutions for addressing issues of flood justice in the LRGV and to examine the scholarly discourse surrounding this topic. However, I soon realized that the complexity of the political and bureaucratic landscape made it difficult to solve, which forced me to confront some of my own beliefs. Consequently, I shifted my approach and began to explore incremental equity strategies as an alternative means of addressing these challenges.

As a visitor - a white researcher exploring environmental design for the first time - my hope was to learn more about adapting the most challenging and modest neighborhoods that represent the hardships of American livelihoods in the face or climate change, a wicked problem. I approach my positionality in theorizing resiliency, neighborhood planning, or relationships with practitioners in a majority latino region with great trepidation and consideration. Ideally, this work would result from a deep community engagement process or from a member of the community themselves. Without a participatory design capacity during the scope of this effort, this project offers some pre-conceptual thinking on the relationships planners have with communities and how planners, in positions of power, can envision a transition of power towards the community while responding to their context with great urgency. It would need, of course, significant time entrenched in practice to be modified, adopted, and realized.

The methodologies I employ are limited not just by time constraint of a masters thesis, but are designed

to limit the extractive nature of participatory research to be mindful of participation fatigue in over-studied communities. However, the purpose of this research is to fundamentally explore the possibilities for over-studied communities to respond to a lack of action using methods commonly employed in other aspects of their lives, or that are common in other areas of planning.

I have sat with this as well and problematized it. I accept that exploring this theory in any capacity here is uncomfortable.

I also know from my own lived experiences that planning ahead is a privilege not offered to everyone. I apply this concern not just to this task but to my hypothesis: do either the emerging middle class or the folks trying to get by day by day want to or have capacity to do this organizing work? And to my own relationship to work in these spaces: that with the privilege I have to do so now, I seek to continue on a reflective journey of study, even though I cannot yet fully reconcile these power dynamics. In this effort, I aim to reflect on the ways that a white planner can reduce the potential harms of an outsider's perspective when entering a community to which I do not belong, by finding ways to elevate existing practices.

A complicating factor in doing so is a fear of a horseshoe effect. The context which I am working in is extremely conservative, and where I legitimize bootstrap mentality as a way to shift power to others and respond to their preferences, I fear that I lose sight of my own core values. Perhaps this is a temporary embrace of this particular idea as I learn to acknowledge that my beliefs are not right for every context, or that my preferences are simply not compatible with how the world works. To be specific, I have a strong personal and professional preference for a governance style that proactively embraces social welfare projects and to also shift the underlying systems that create vulnerability. Even to embrace bootstrap mentalities as a valid, acute response to neoliberal abandonment of vulnerable communities with urgent issues, while potentially practical, feels like a fracturing of what I actually do usually advocate for. Further, I do believe in the value of designers and seek not to disempower the vision and technical skills they offer. However, my theory of change is that people are struggling for change now, and that the context of the now is the timeframe in which I will work.

Acknowledgments

I am very thankful for my partner, Jake. Without his meals and support, I may have dined at the MIT banana lounge. He was also writing his thesis at MIT during much of this time, and still fed us. Your balance and joy is inspirational to me, every day.

I would also like to express my gratitude to the many researchers and designers who helped me navigate the complex world of resiliency, flooding, and colonias. I was in touch with most of the leaders behind the work documented in this report, the authors I've cited, local practitioners, and many others. Without their guidance and expertise, I would have been even more lost.

Special thanks to my advisor Brent Ryan, for offering insightful provocations, helping me "right-size" this project, and allowing me to encode many of our discussions about the role of the planner in this document through some of my favorite lessons in graduate school.

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Last but not least, I deeply acknowledge my dog, Beans, for his contributions. He made sure I took breaks by physically inserting himself between me and my computer. Additionally, I wrote about planning to the ends of creating a better environment for people, but his presence serves as a friendly reminder to simultaneously strive to plan human settlements for a better impact on the natural environment. This is particularly salient, as it becomes increasingly difficult to plan a better environment for people if we do not, in turn, have a better impact on the environment. He will never read this, but I would like to say it all the same. Thanks, buddy.

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