



# Best Practices for Coastal Louisiana

New Partners for Smart Growth

February 2011

C.J. Gabbe, AICP

Fregonese Associates

# The Best Practice Manual

- Strategies that are appropriate to Louisiana's unique geographies and cultures.
- Empowering local decision makers
- Community scale tools and strategies
- Building scale tools and techniques

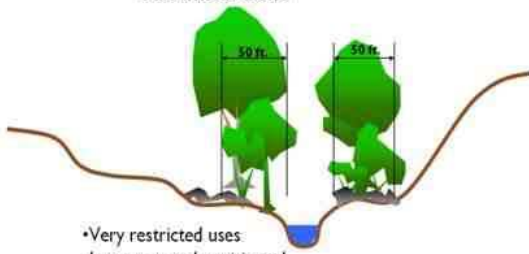




# Development near water: Elsewhere, USA

## 3-Zone Stream Corridor Protection

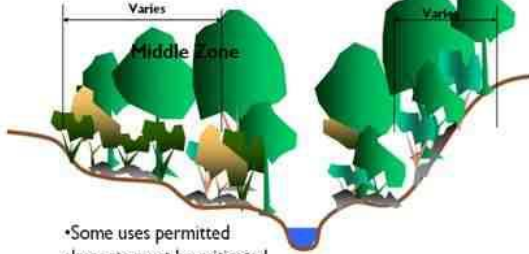
### Streamside Zone



- Very restricted uses
- Impacts must be mitigated
- Target vegetation is to retain or establish riparian buffer

## 3-Zone Stream Corridor Protection

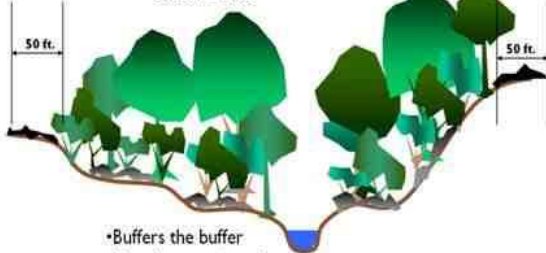
### Middle Zone



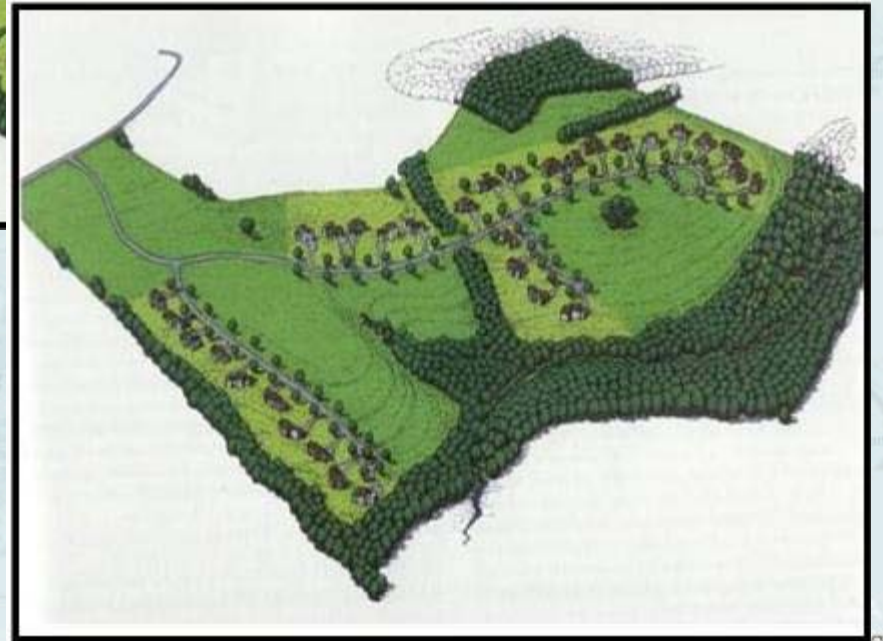
- Some uses permitted
- Impacts must be mitigated
- Retain natural vegetation to the extent possible

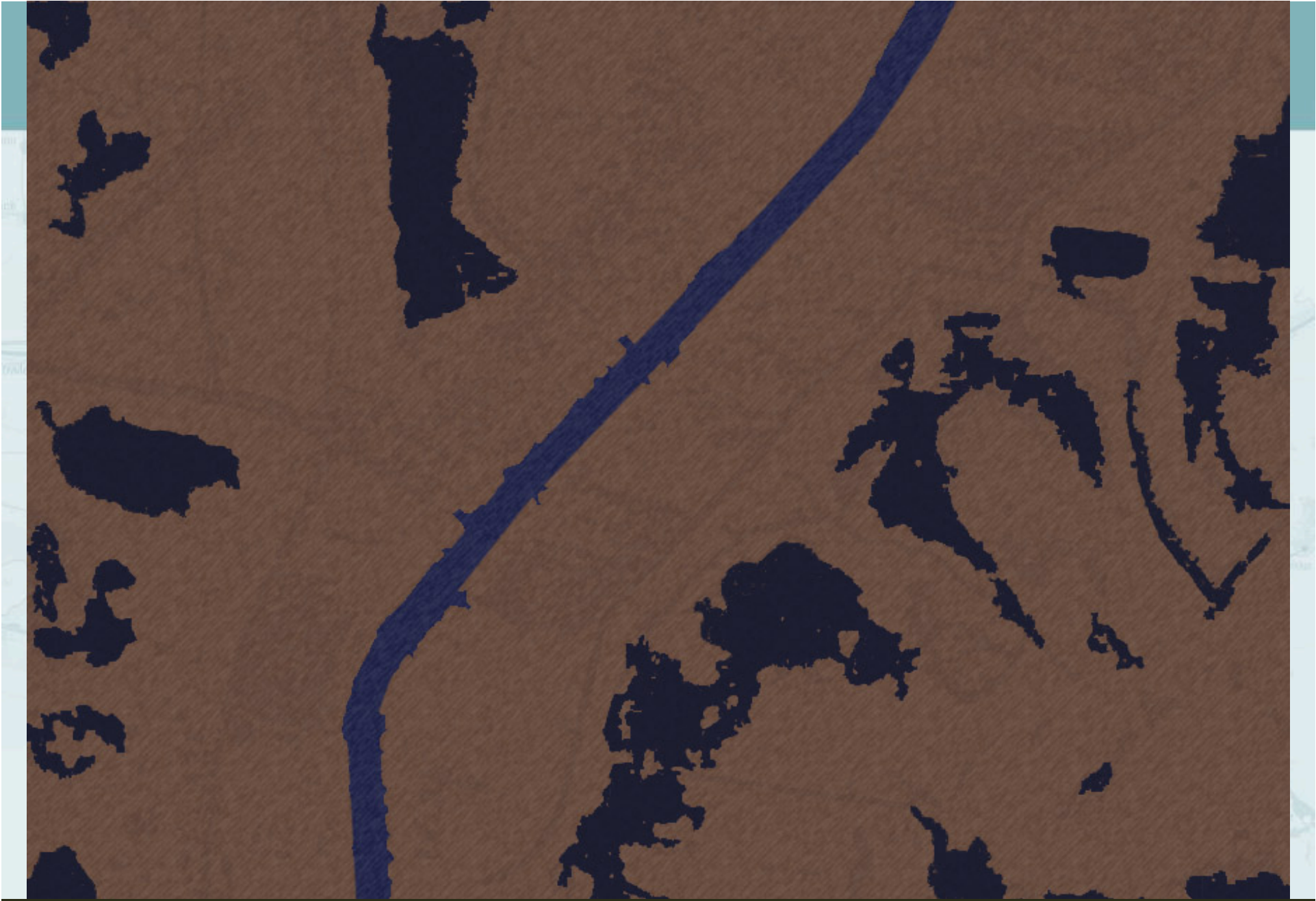
## 3-Zone Stream Corridor Protection

### Outer Zone



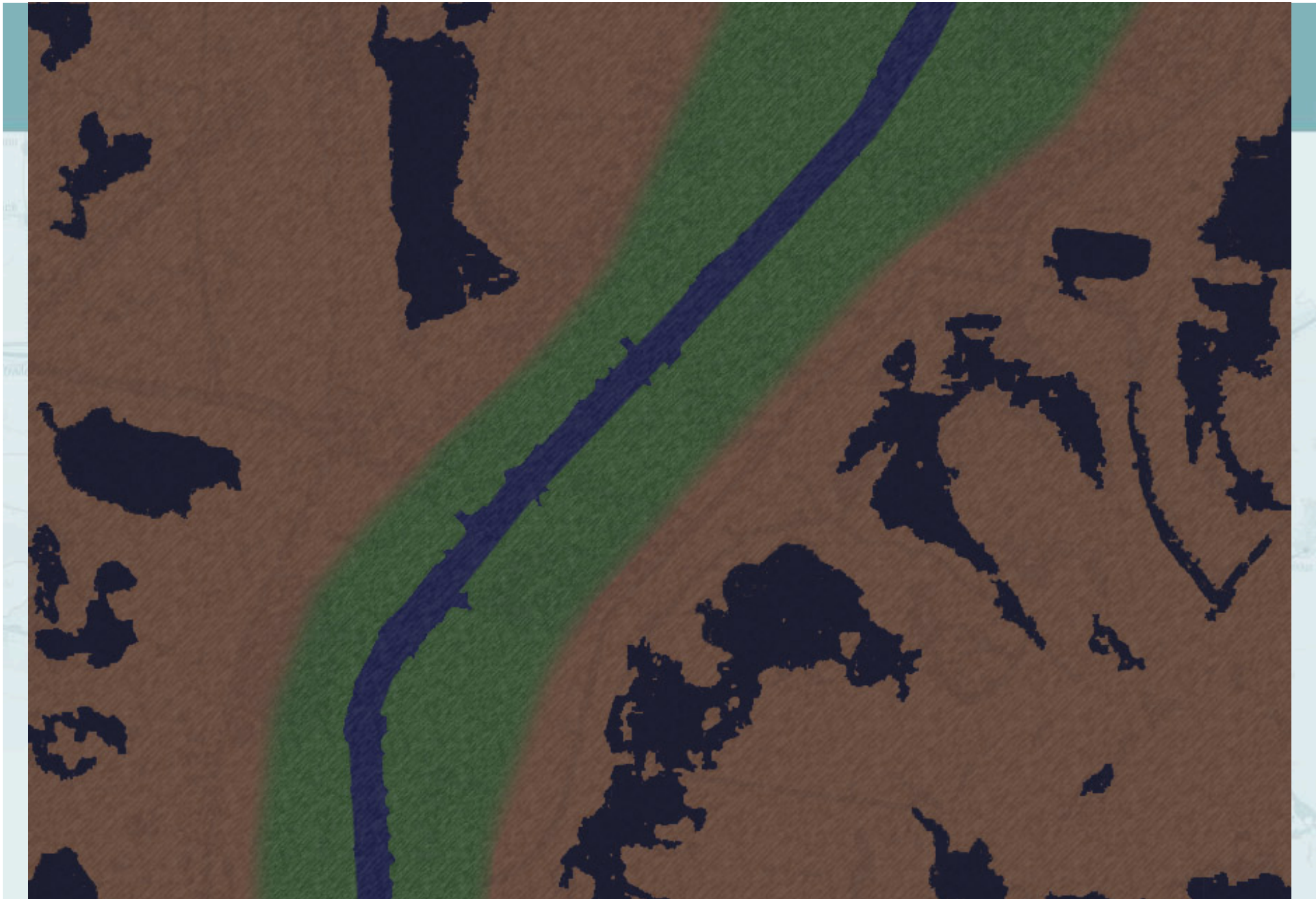
- Buffers the buffer
- Uses less restricted
- No impervious surfaces / buildings



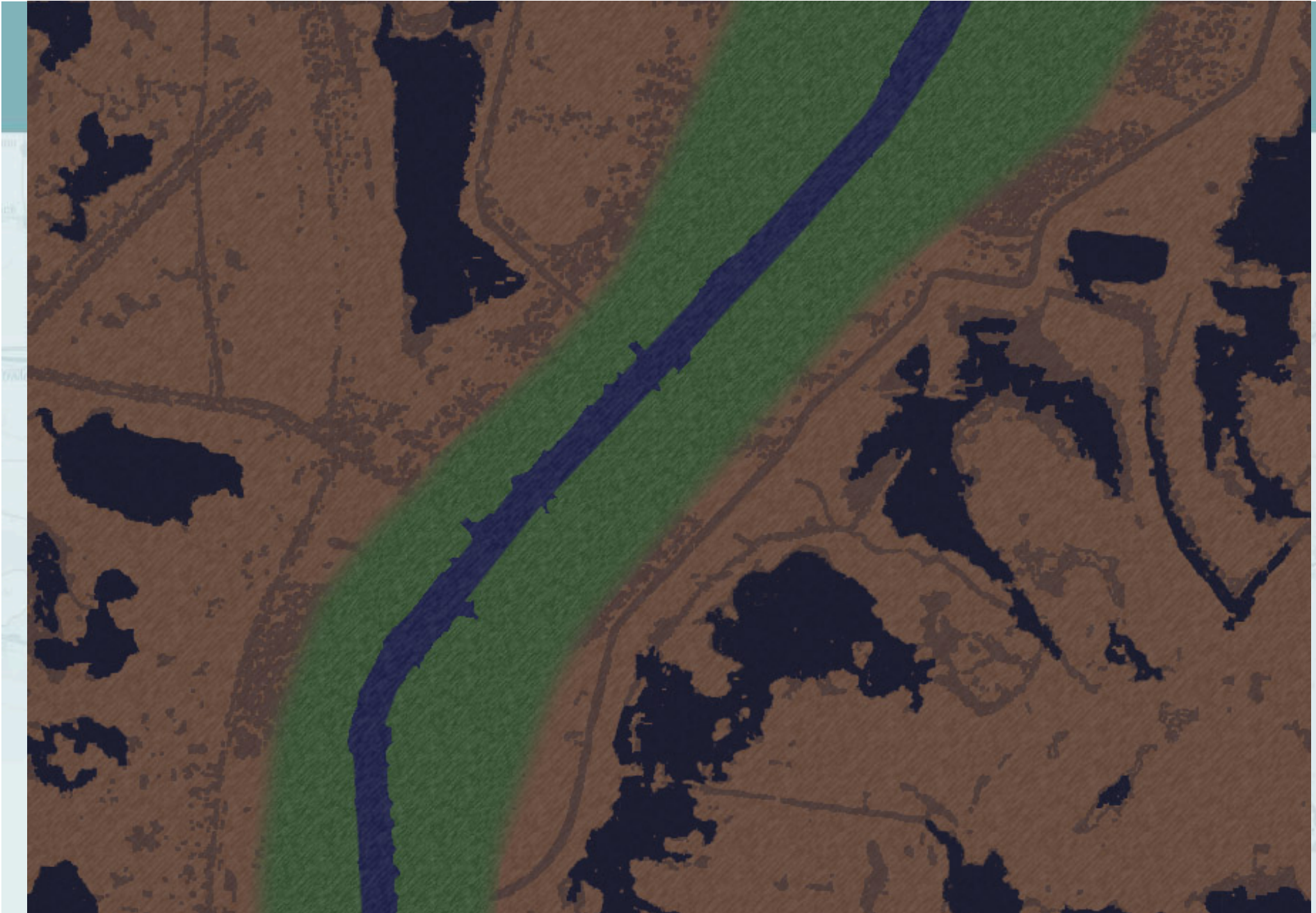


**Coastal Landscape**



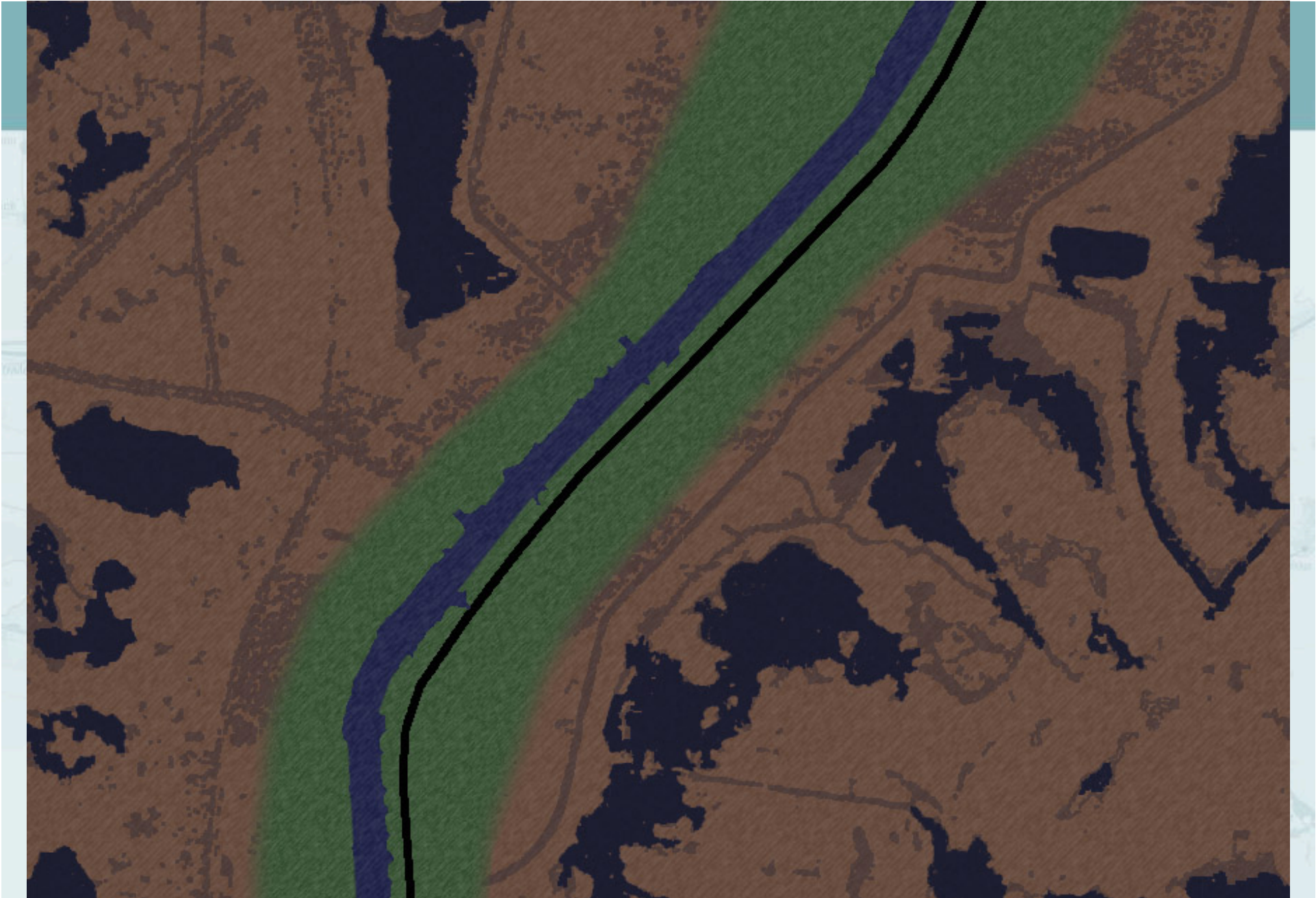


**Higher land near river banks**



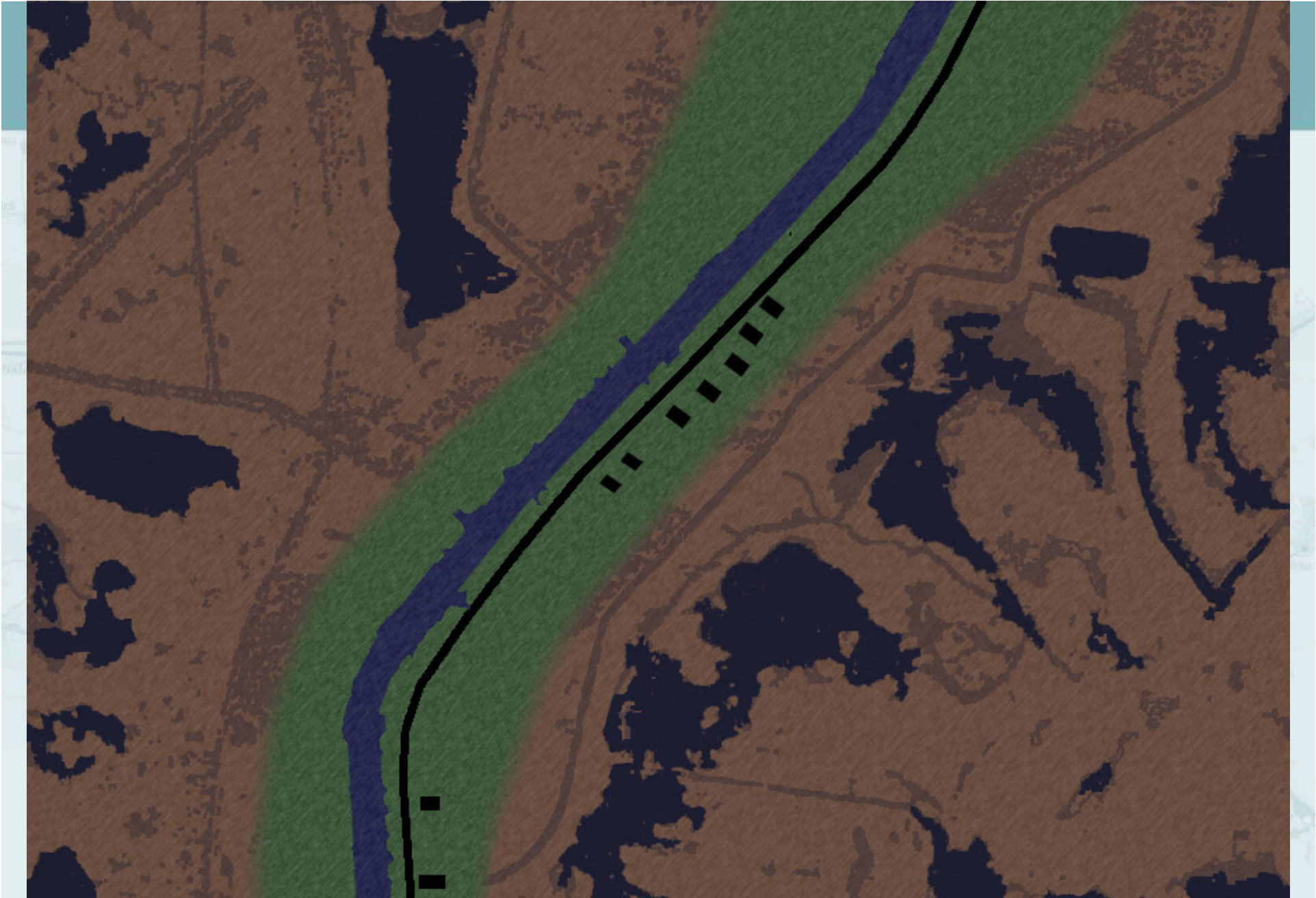
**Over time, water levels have risen...**





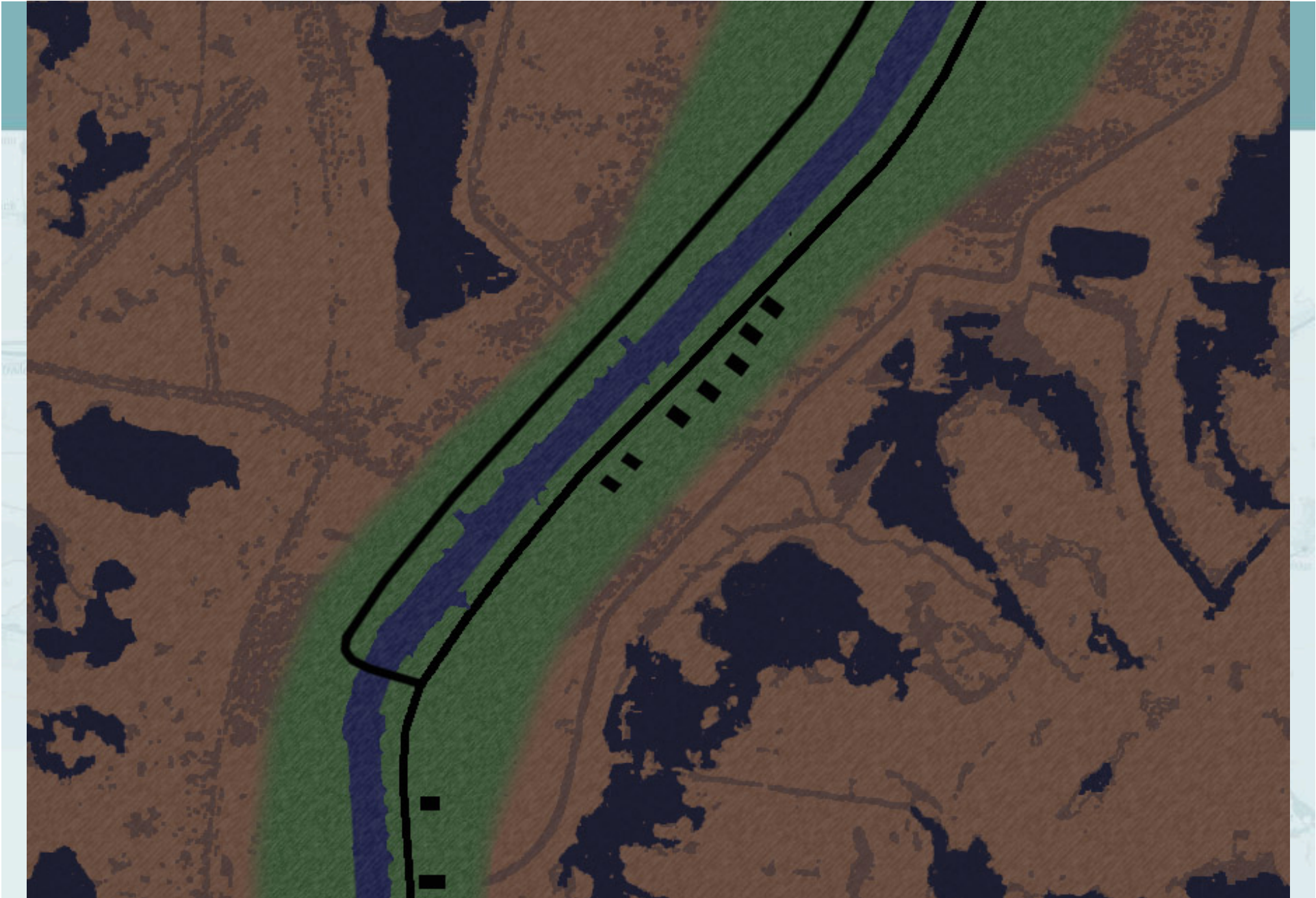
**Roadways and settlement in the region clustered along riverbanks...**





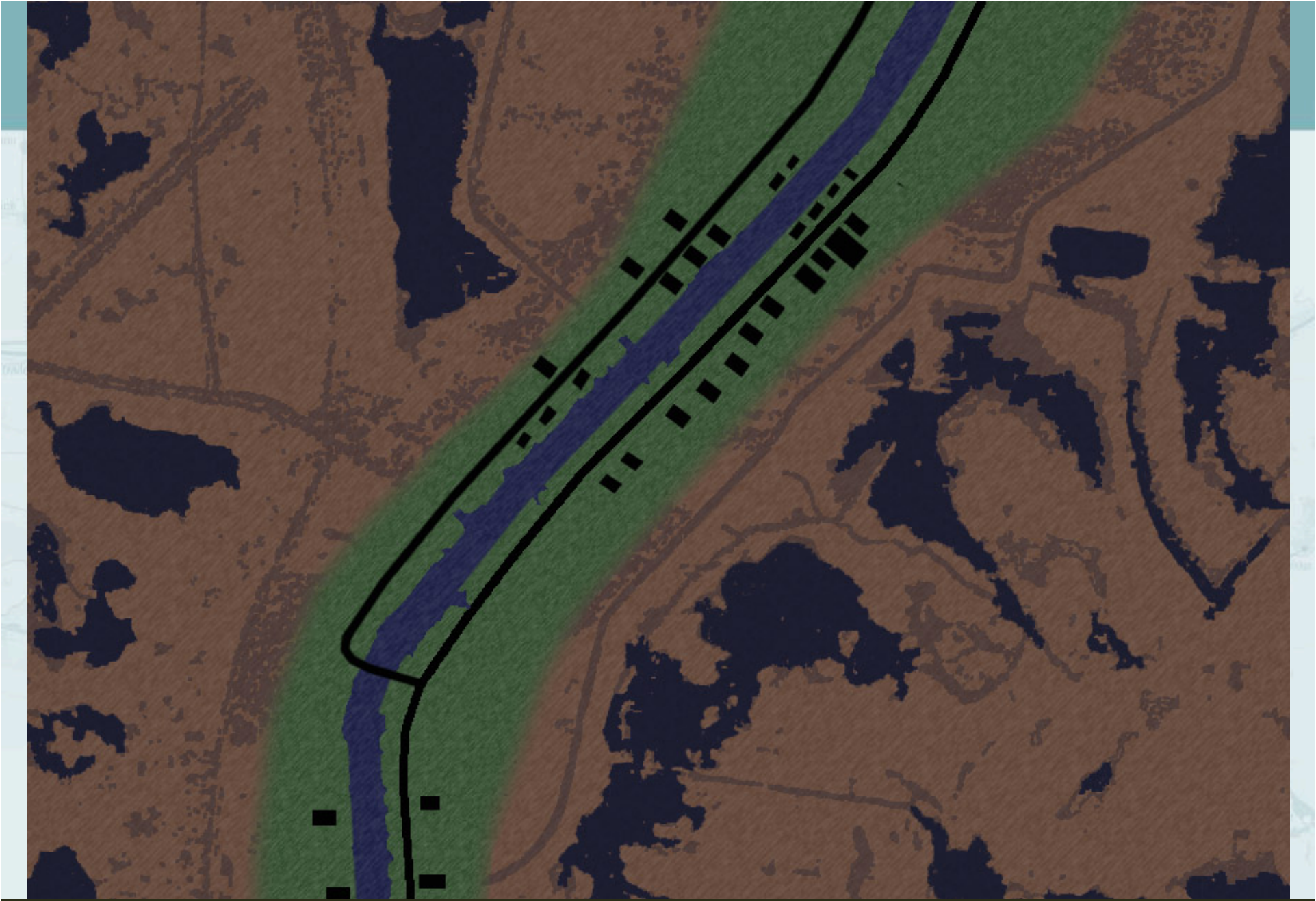
Historic building patterns...





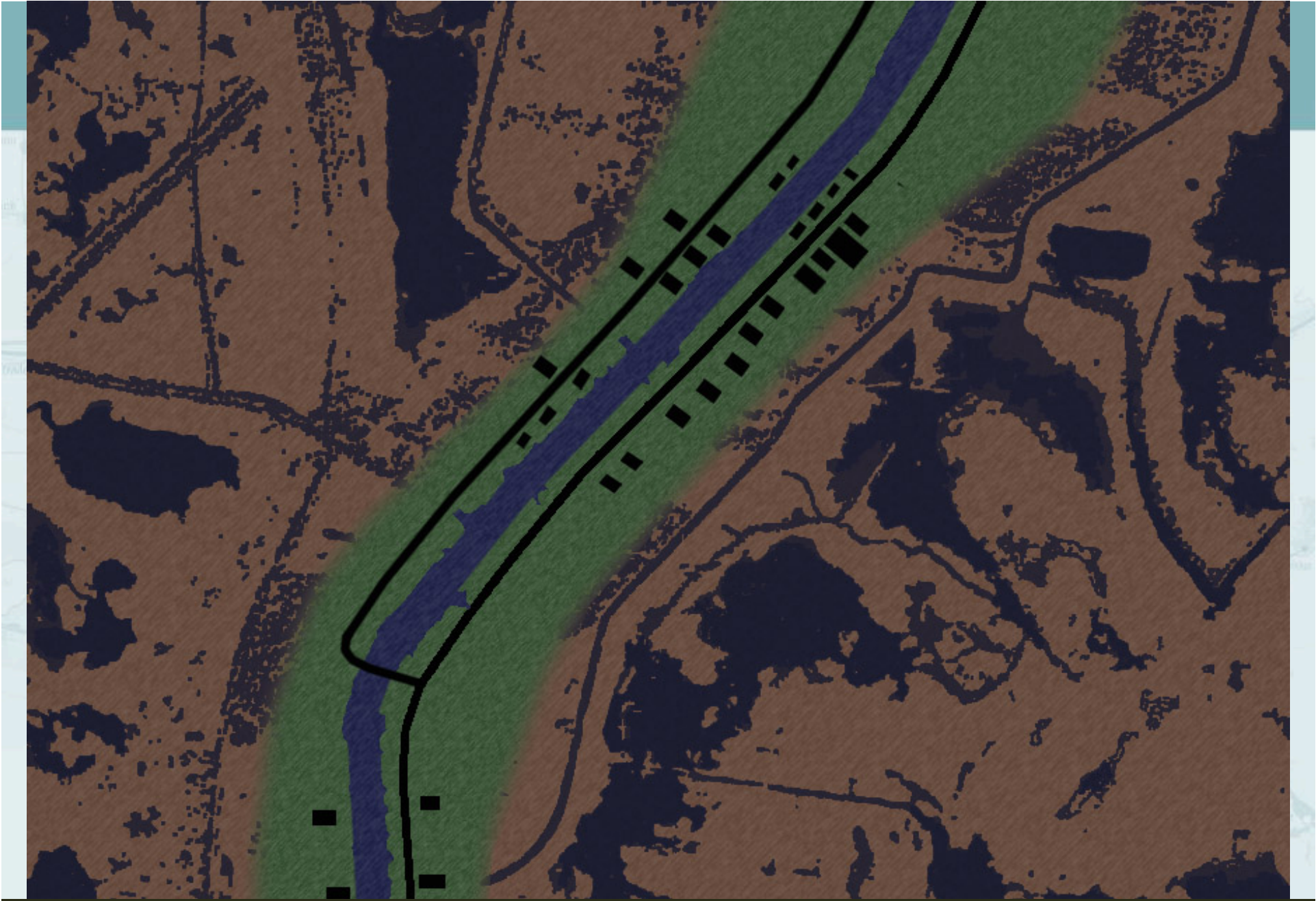
Historic building patterns...





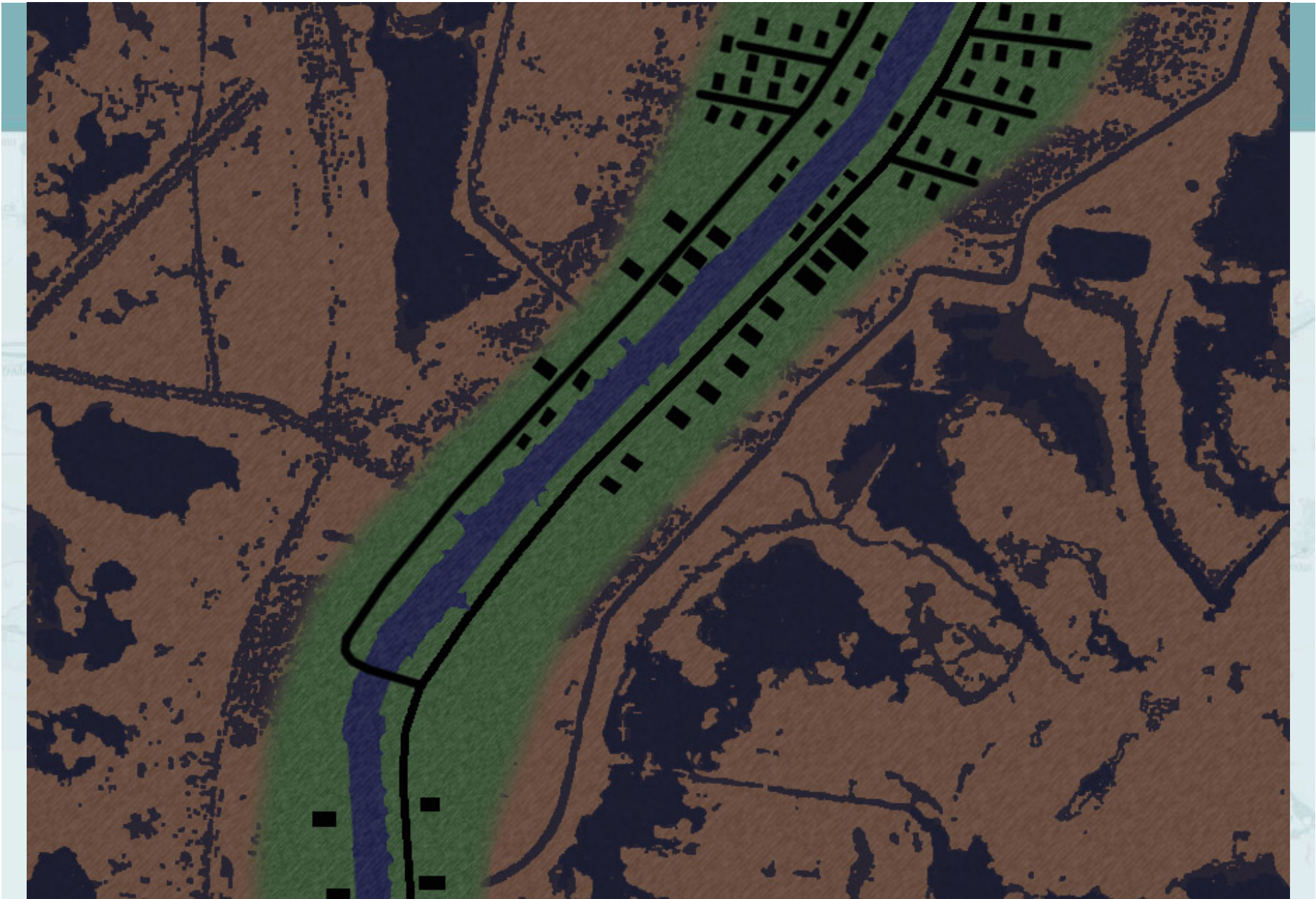
Historic building patterns...





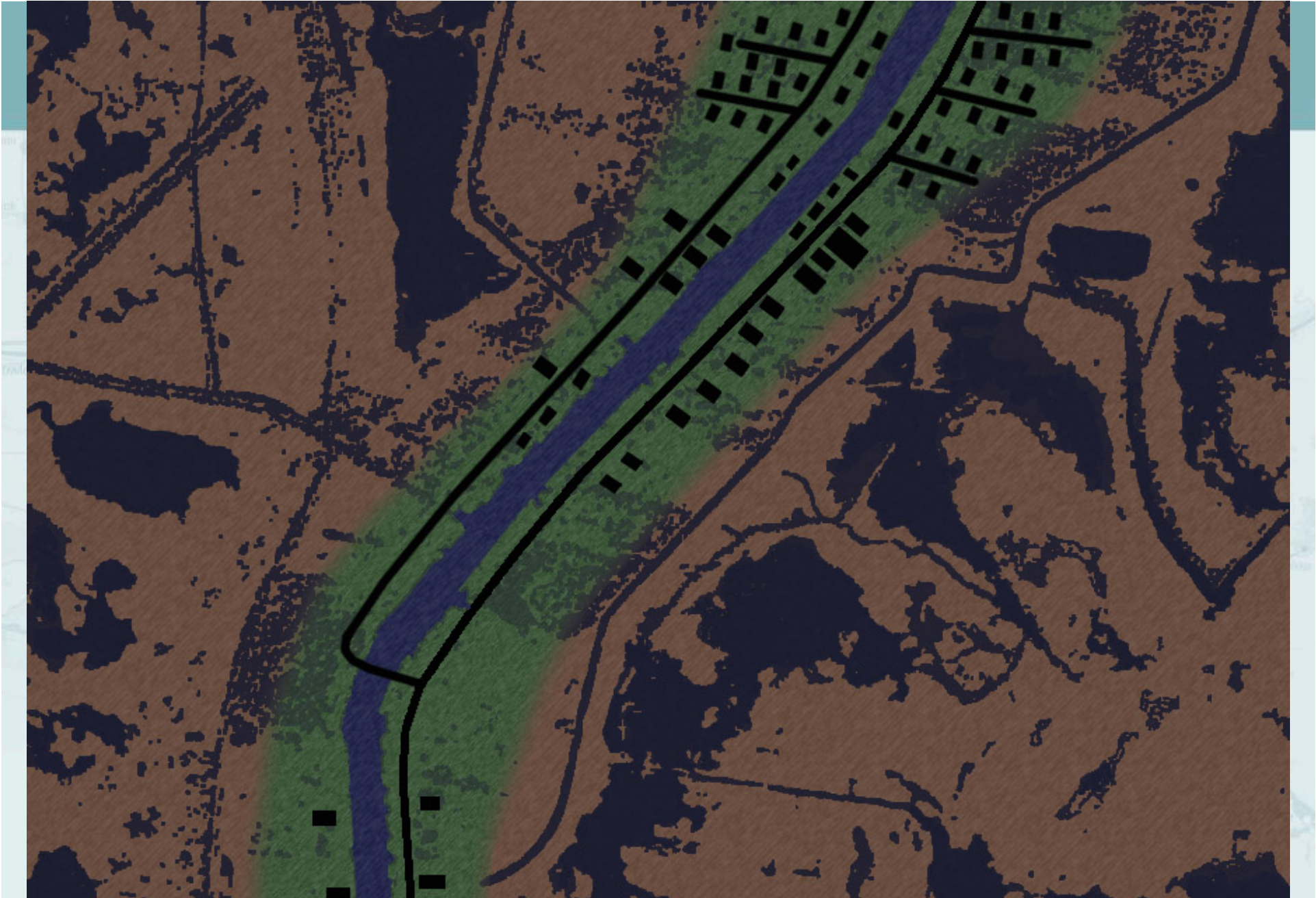
Historic building patterns...





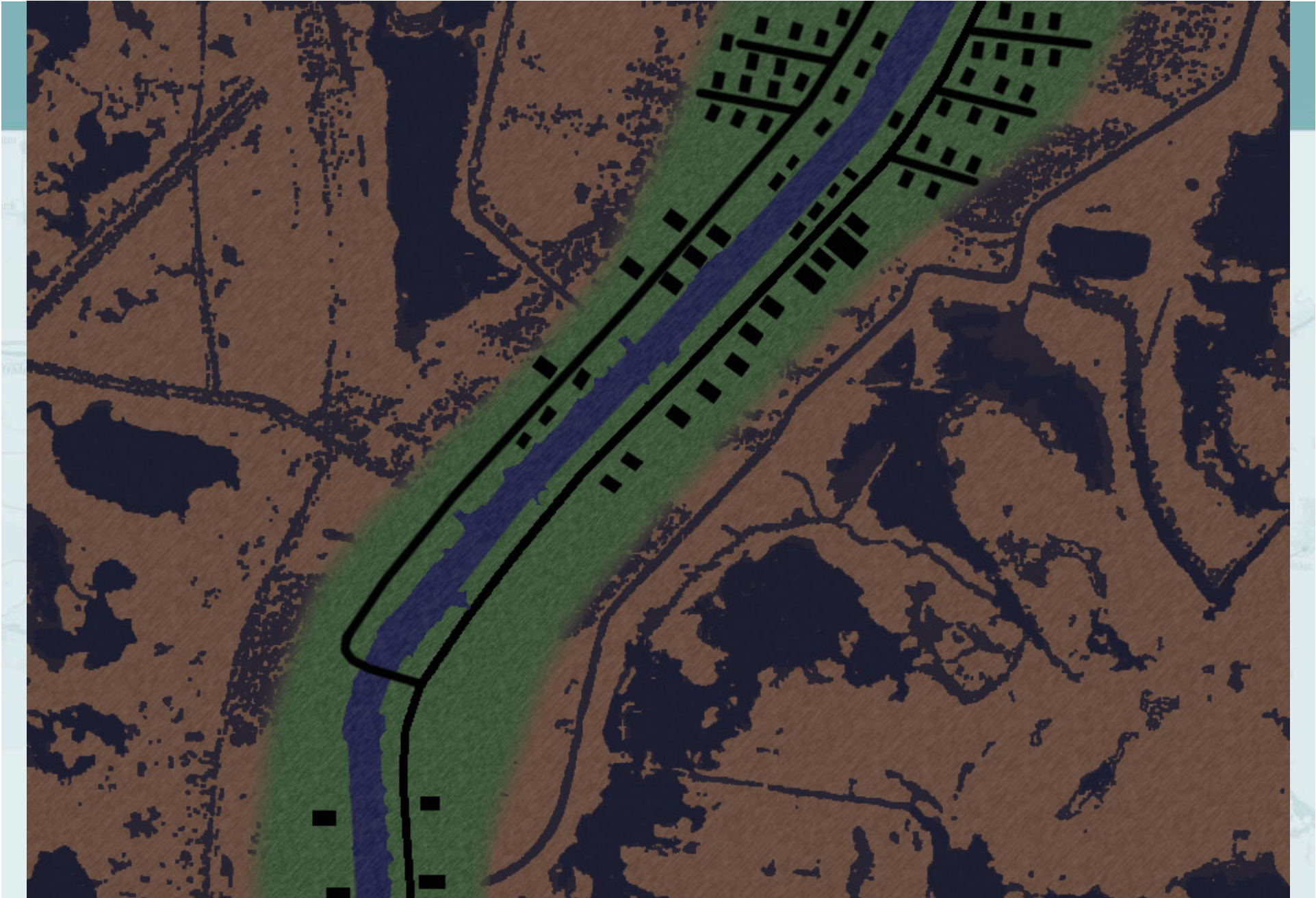
Historic building patterns...





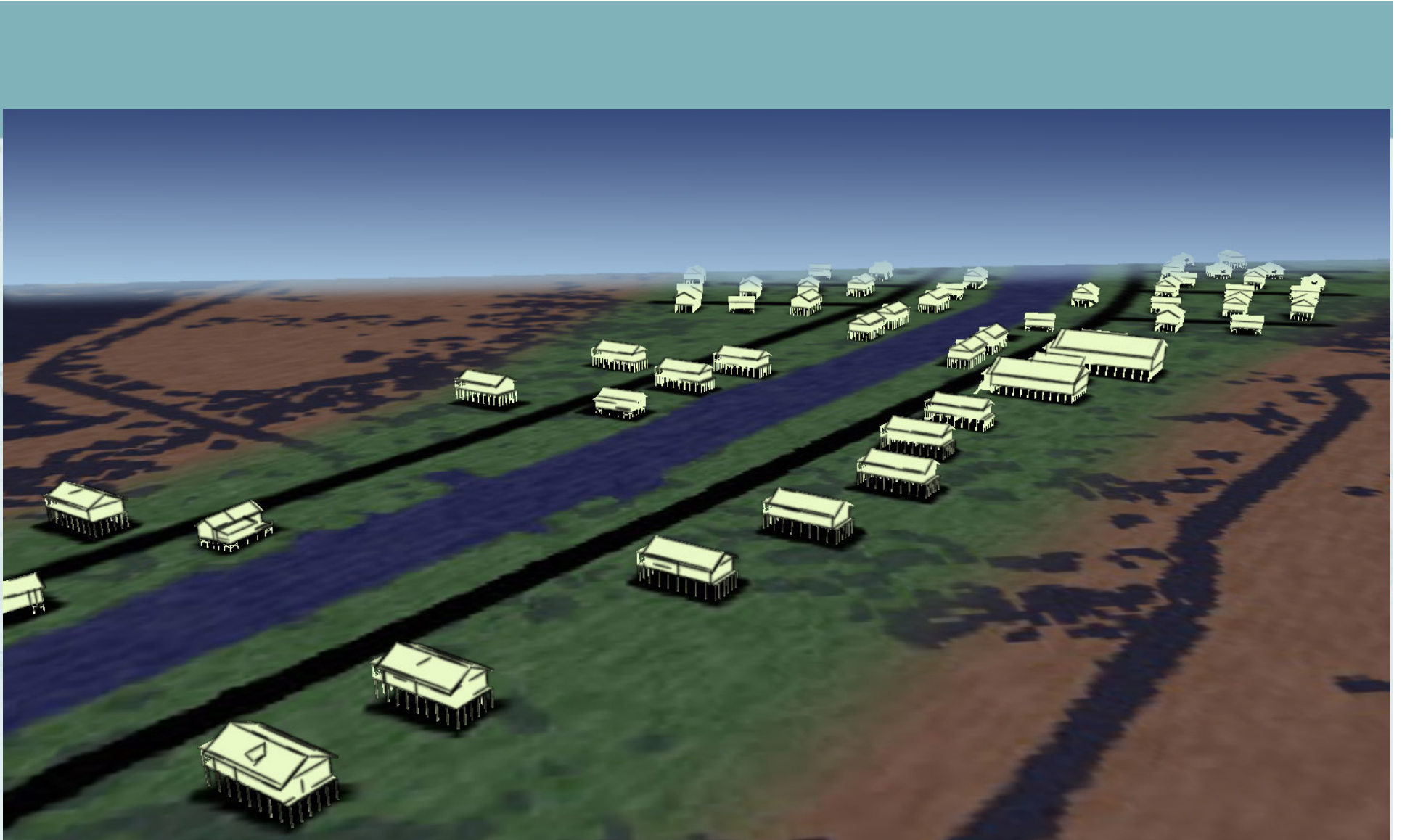
**Water levels have continued to rise...**



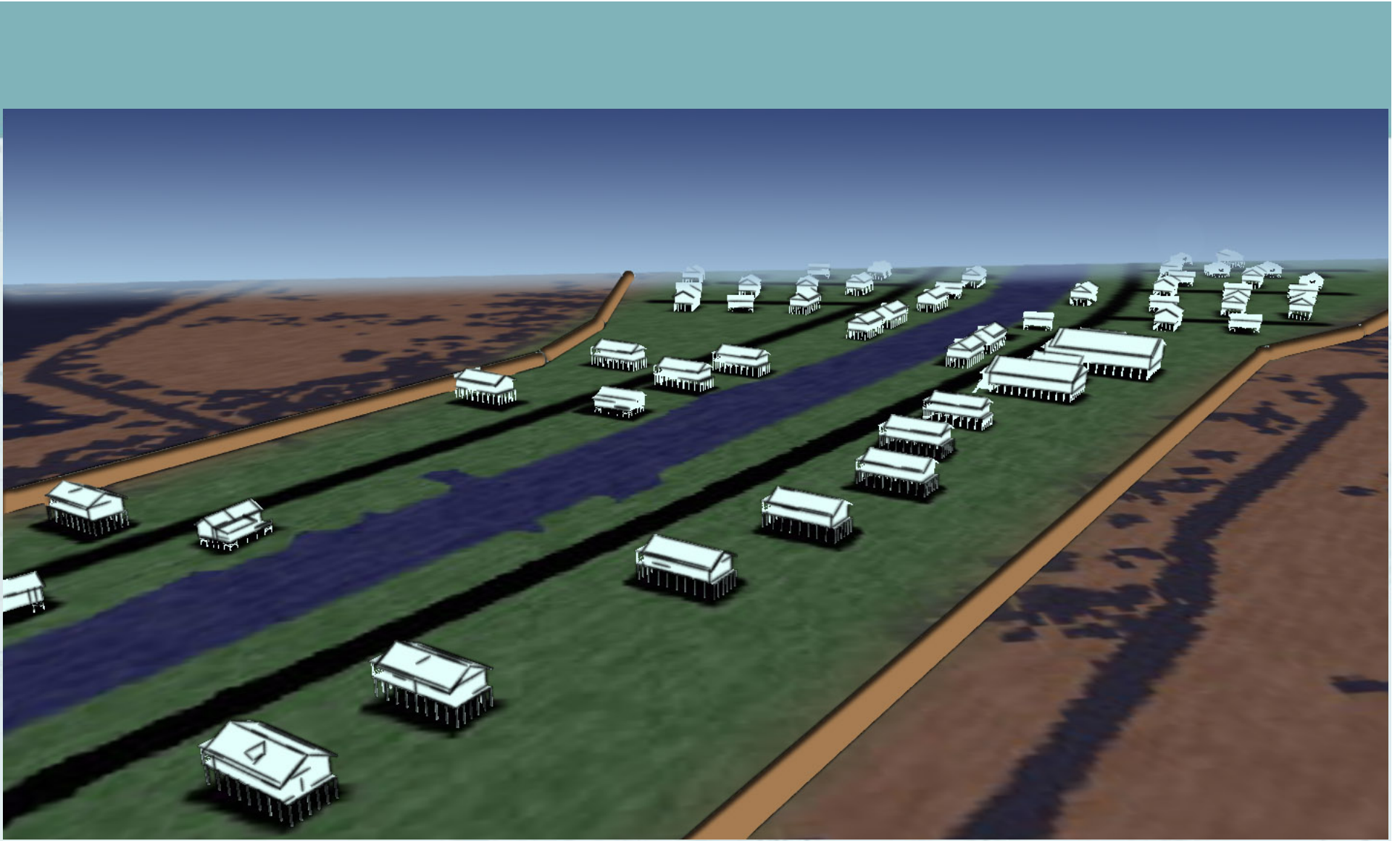


**Communities struggle to adapt...**



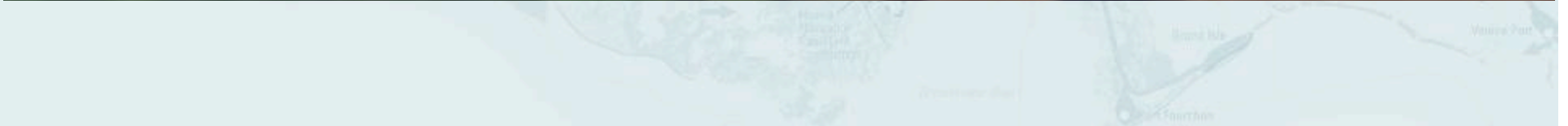
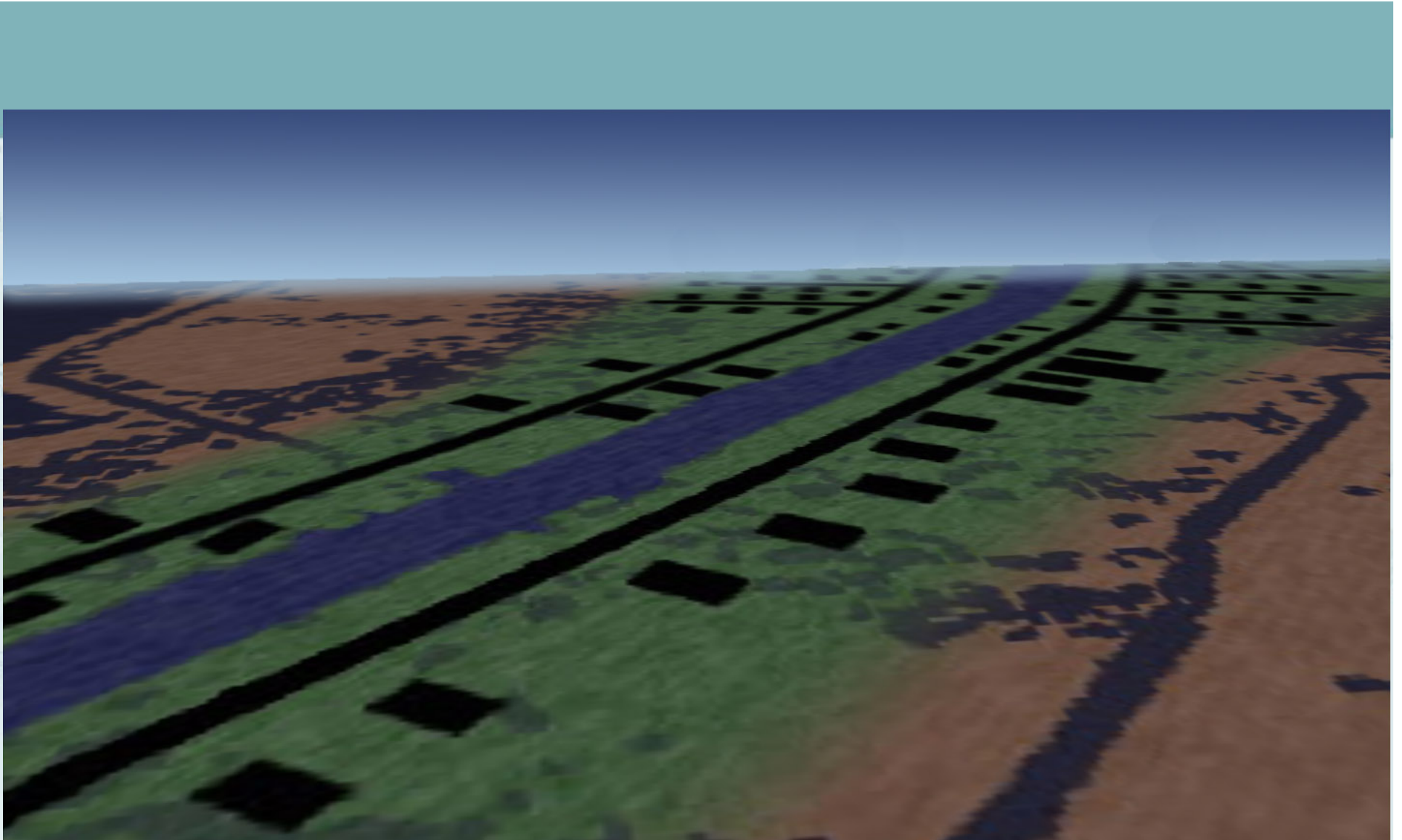


Options include elevating....



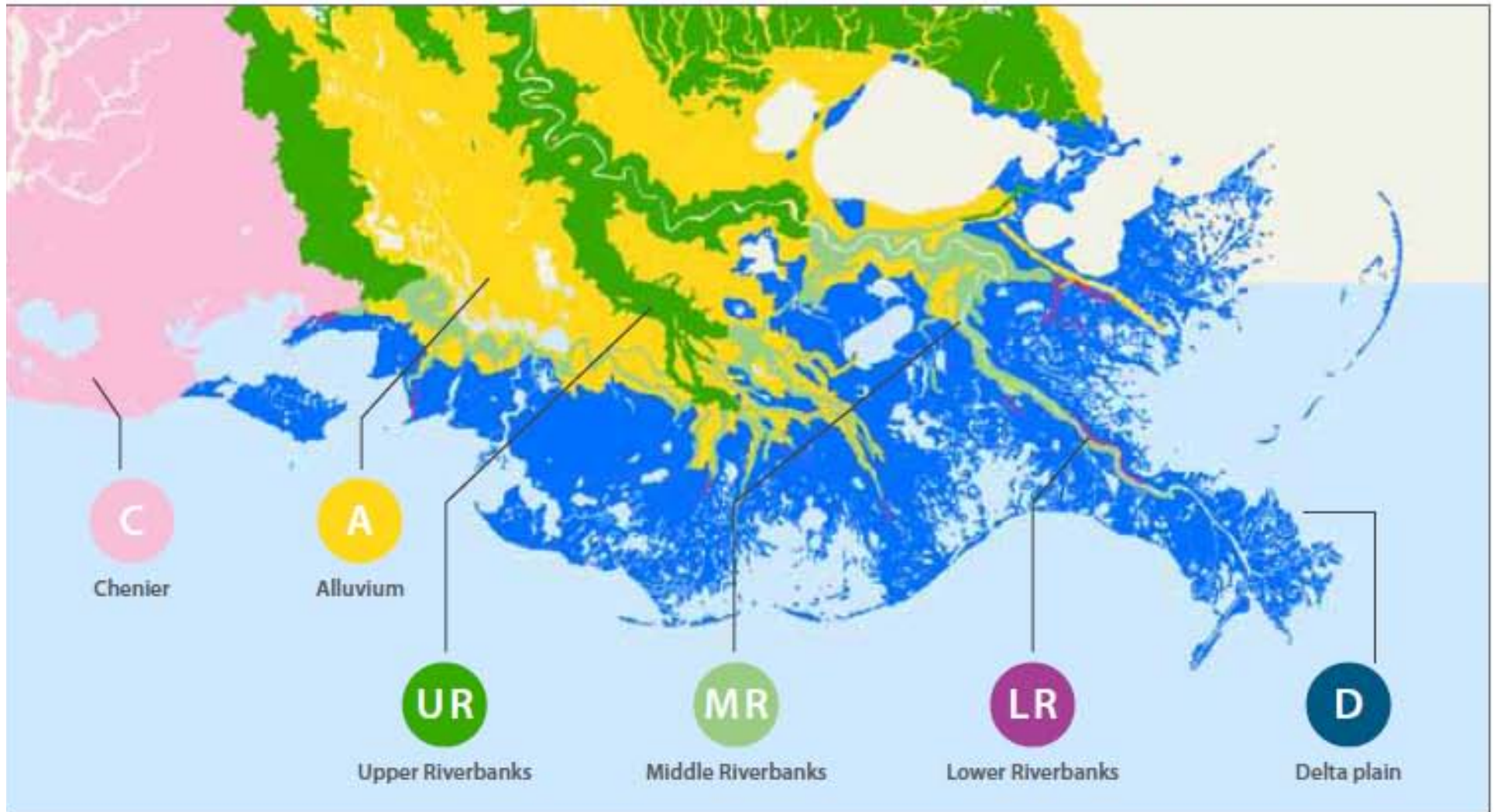
Elevating and fortifying...





**And abandoning when absolutely necessary**

# Louisiana's Coastal Regions





# Tying Strategies to the Geotypes

## Strategy Matrix

### GEOTYPES



DELTA



LOWER RIVERBANKS



MIDDLE RIVERBANKS



UPPER RIVERBANKS



CHENIER



ALLUVIUM

### COMMUNITY

#### PLANNING AND EDUCATION STRATEGIES

Community Planning	●	●	●	●	●	●
Emergency response plans	●	●	●	●	●	●
Evacuation routes	●	●	●	●	●	●

#### INFRASTRUCTURE DESIGN STRATEGIES

Protect roads and street networks	●	●	●	●	◐	●
Protect electrical networks	●	●	●	●	◐	●
Elevate infrastructure hubs	●	●	●	●	◐	●

#### WATER MANAGEMENT STRATEGIES

Employ sustainable water management	●	●	●	●	●	●
Conserve and restore wetlands	●	●	●	●	●	●
Levees and berms	●	◐	◐	◐	◐	◐
Community planning design	◐	◐	◐	◐	◐	●
Elevate multiple buildings	◐	◐	◐	◐	◐	◐

### SITE AND BUILDING

#### PLANNING AND EDUCATION STRATEGIES

Educate home and business owners	●	●	●	◐	●	●
Relocate strategically	●	●	◐	◐	◐	◐

#### SITE DESIGN STRATEGIES

Secure the structure	●	●	●	◐	●	◐
Floodproof and secure the building envelope	●	●	●	◐	●	●
Prepare the property						
Elevate living space above DFE	●	●	●	◐	●	●
Utilize adaptive and temporary structures	●	●	◐	◐	◐	◐
Utilize floating houses	◐	◐	◐	N/A	◐	◐
Siting homes, businesses and civic buildings	◐	●	●	●	●	◐
Using native plants for protection	●	●	●	●	●	●

# Strategy Format

- Where is each strategy most applicable?

Key for connecting strategies to geotypes

## Protect Roads and Street Networks

Raising roads on three or more feet of fill can usually protect them from local flooding. However, if the roads are regional serving or contain a control-of-access point flood protection may require more than fill. Elevating roadways on pilings is another effective option. Pilings allow water to flow freely under the road and ensures that roads have good drainage.

● = Essential    MR   LR   D   C   A  
◐ = Encouraged    UR

## Protect Electrical Networks

In the event of a storm or flooding, uninterrupted access to electricity is vitally important for the safety and well-being of communities. Emergency management, public safety and utilities, hospitals and medical facilities, and homes and businesses rely on consistent electric service to power.

● = Essential    MR   LR   D   C   A  
◐ = Encouraged    UR



# Strategies for communities

- **Prevent flooding** – Build levees; Sediment diversion; Strengthen borders of flood prone areas; Armor and fill
- **Adapt to occasional flooding** – Develop community-wide approaches that adapt to occasional floodwaters; Develop resiliency; Minimize property damage from flooding
- **Relocate when absolutely necessary** – Relocate part or all of a community to a more stable area

# Prevent flooding – global examples

- Build ***barriers*** to fortify borders of flood-prone areas
- Use ***natural processes***: sediment diversion to rebuild land area; wetland restoration to prevent land loss



# Prevent flooding: barriers

## Delta Works

*Netherlands*

*Major engineering project (1950-1997) to shorten the Dutch coastline and reduce miles of needed dikes*

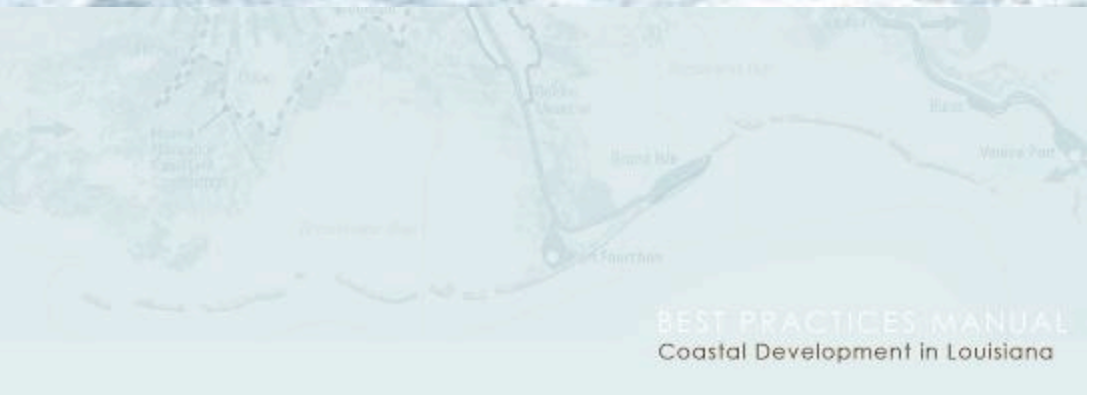


# Prevent flooding: barriers



## Netherlands

*Seawall protecting against a storm surge*





# Prevent flooding: barriers

## Sand Dunes (*natural*)



# Prevent flooding: barriers

**Dikes** (*man-made*)





# Prevent flooding: barriers

## Bangladesh

*Retractable brick walls can be moved as necessary to protect the community*





Is the water clean?

## California

The water quality is not good. The water is not clean. The water is not safe to drink. The water is not good for the environment. The water is not good for the economy. The water is not good for the health of the people.





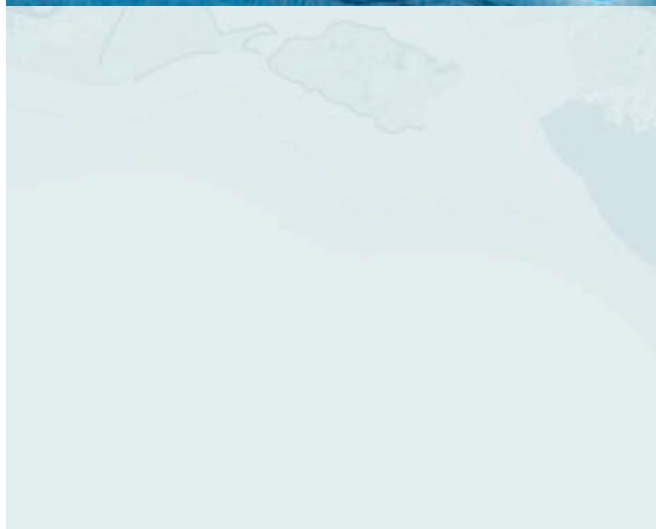
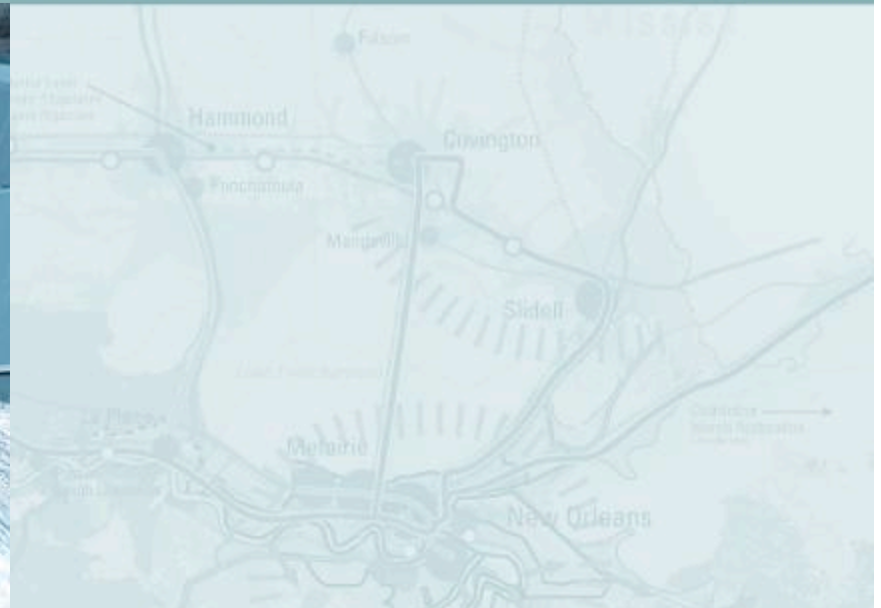
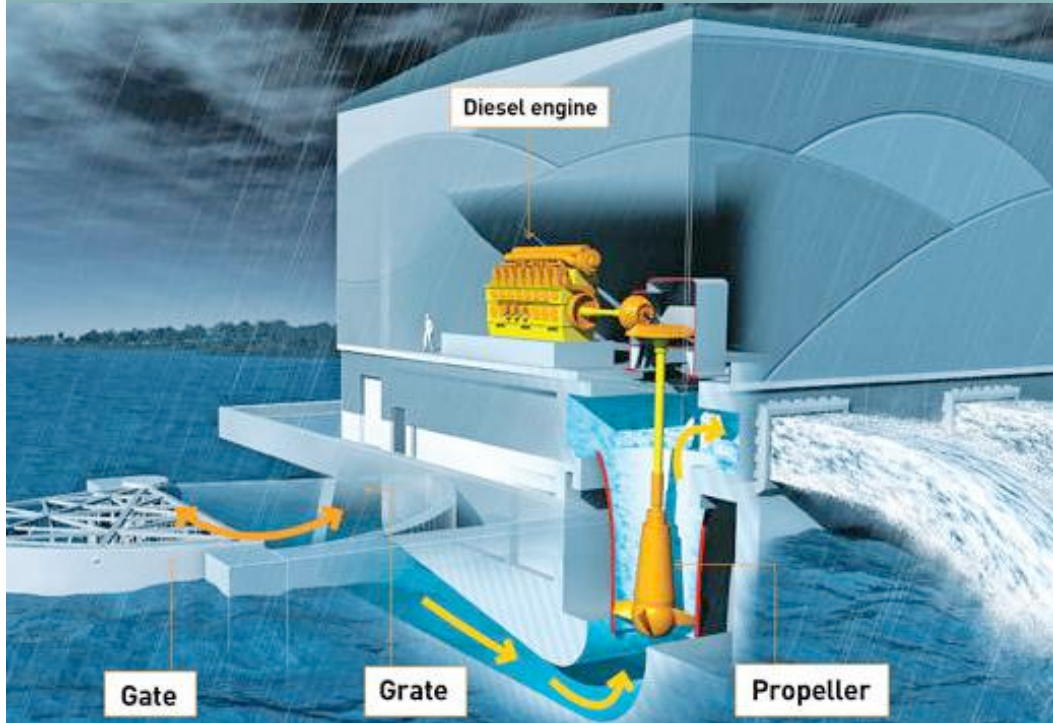
# Prevent flooding: barriers

## **Delta Works** *Netherlands*





# Prevent flooding: pump



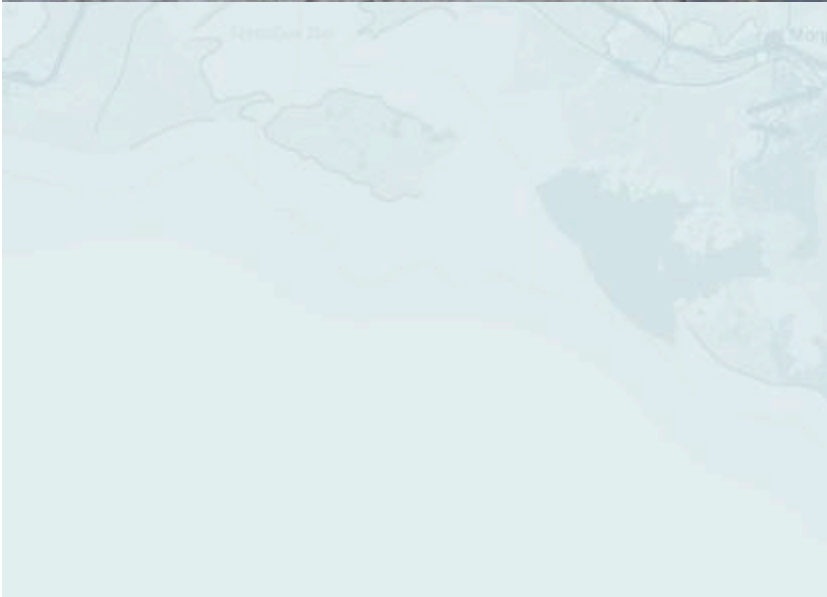


# Prevent flooding – watery city

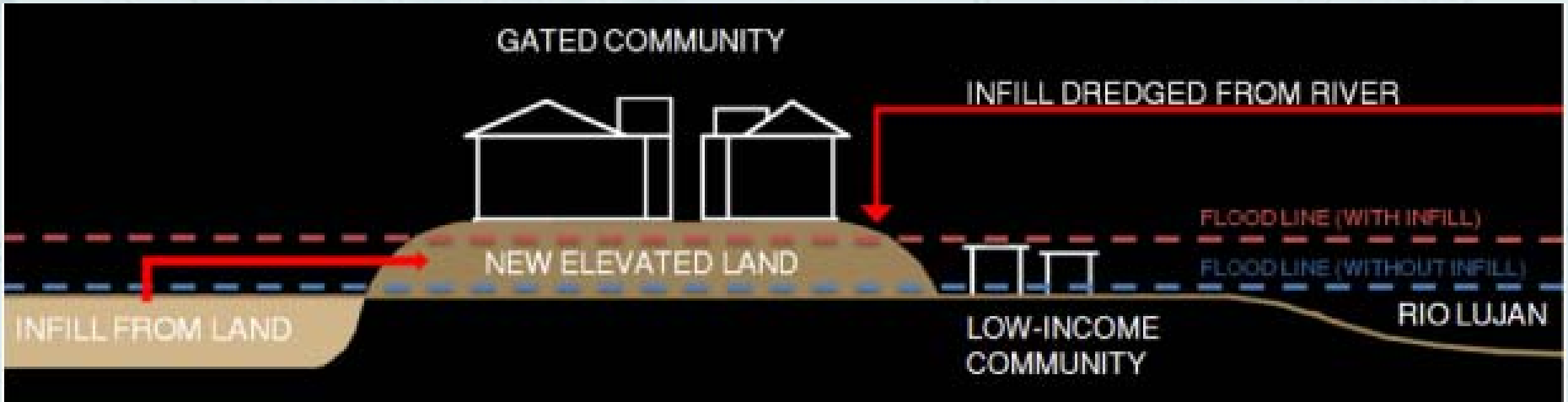


## **Tigre Delta, Argentina**

*The city relies on waterways and boats for transportation.*



# Subsidence Effects on Homes



The diagram shows that the gated community's elevated land, created through land infill and dredging, provides a significant elevation advantage. This elevation helps protect the community from flooding, a risk that is much higher for the low-income community located closer to the river. The flood lines indicate that without the infill, the water level would be high enough to inundate the low-income community.

The diagram also highlights the role of 'INFILL DREDGED FROM RIVER' in creating the elevated land for the gated community. This practice allows for the construction of higher ground in areas that would otherwise be low-lying and vulnerable to flooding.



Source: Columbia University Planning Studio



# Subsidence



Before

After

Subsidence is the gradual sinking or settling of the ground and man-made structures. It can be caused by natural processes or human activities. In coastal areas, subsidence is often exacerbated by sea level rise and saltwater intrusion. This can lead to structural damage to buildings and infrastructure, as well as increased flooding risk.

# Adapt to occasional flooding

- **Community approaches to live with occasional flooding**
  - Structural responses that *avoid* or *allow* floodwaters
  - Develop resilience to occasional flooding, prepare property and vital infrastructure
  - Build strong communities where flooding is a nuisance, not a disaster



# Adapt: controlled flooding

## **Netherlands**

*CANALS allow for controlled flooding into pasture lands as needed*





# Adapt: accept occasional floodwaters

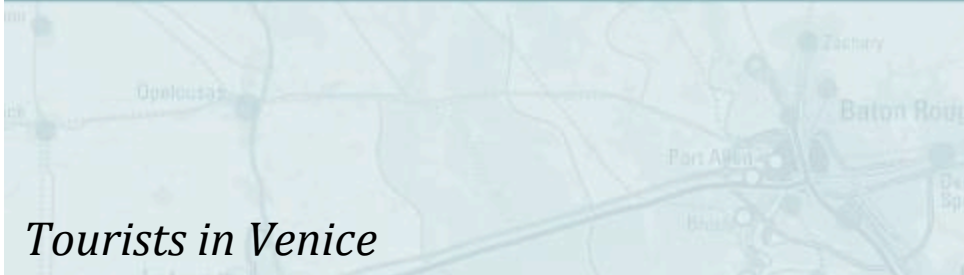
## Venice, Italy

*Residents prepare for floodwaters entering buildings and public spaces*





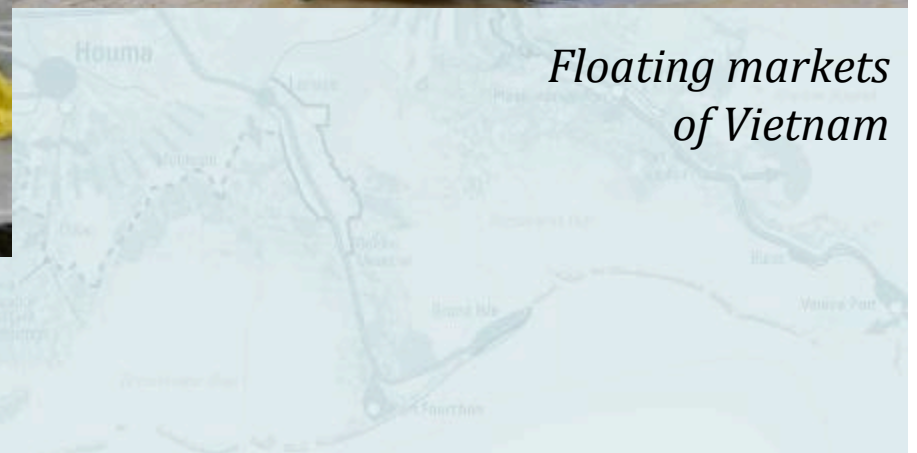
# Adapt: activities and attitudes



*Tourists in Venice*



*Floating markets of Vietnam*













# Relocate

- **Relocating part or all of a community away from flood danger may be the best option in some scenarios**
  - Cost to stay > cost to move
  - Use of temporary or low-cost structures
  - Seasonal or vacation inhabitation



# Relocate

## **Mekong Delta, Vietnam:**

*As part of LIVING WITH FLOODS program, the Vietnamese government has begun relocating flood-prone, high-risk communities to “residential clusters” on higher ground.*



# Relocate

**Po Delta, Italy**  
*Abandoned fishing villages*





# Relocate

*After decades of frequent flooding, water encroachment, and land subsidence, they faced the painful decision of whether to stay or go.*

**Isle de Jean Charles, Louisiana**  
*Biloxi-Chitimacha-Choctaw tribe*



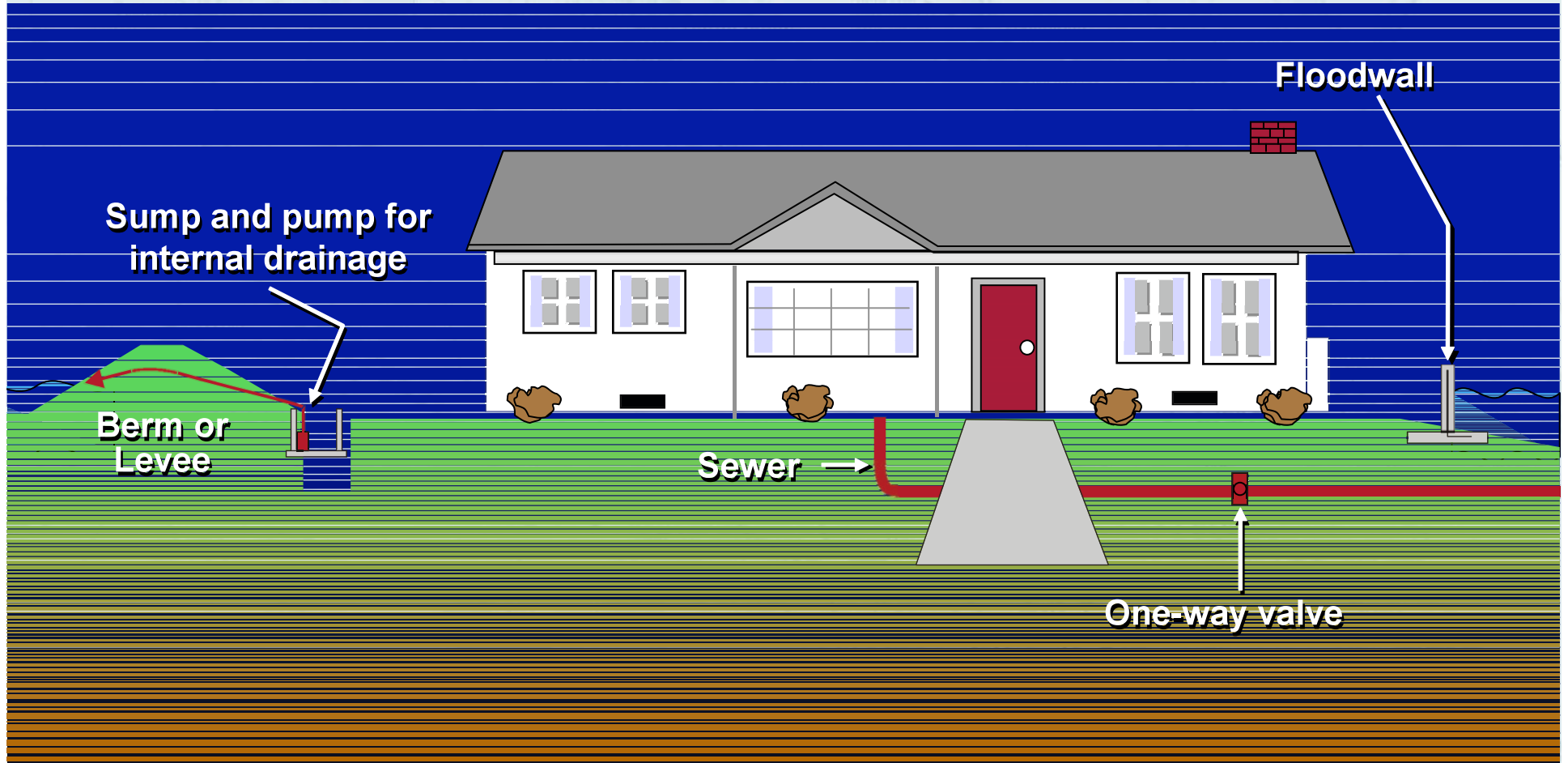
*Images: NOLA.com*

# Strategies for Structures

- **Berm and armor** to protect structures and keep water out
- **Elevate with stilts or pole structure** to move structures above floodwaters.
- **Flood proofing** of buildings so that they can be readily cleaned and returned to active use quickly.
- **Temporary structures** that can be rebuilt with relative ease because of lower investment costs.
- **Floating structures** either permanently on the water or on land that can float when/if needed.



# Best Practices



# Building Elevation

## Common Strategy

*Innovative and traditional development patterns and styles avoid flood damage*

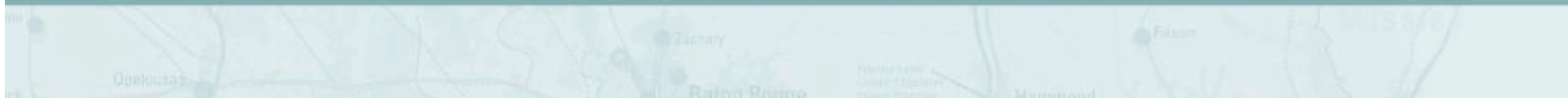
*Around the world, entire communities are raised on stilts to avoid structural flooding, while accommodating the occasional land flooding*



*Tigre, Argentina*



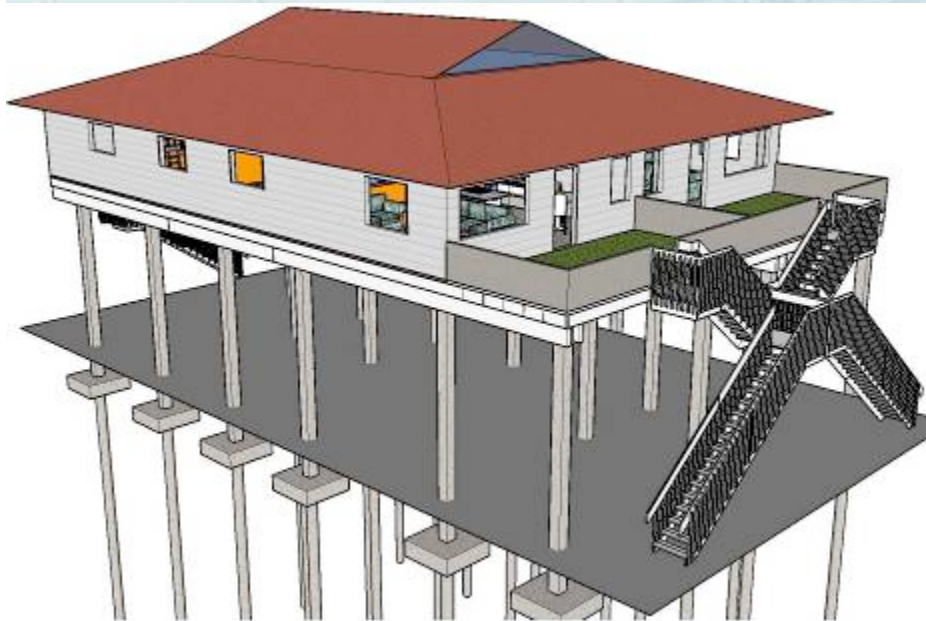
# Building Elevation



*Coastal Louisiana*



# Building Elevation



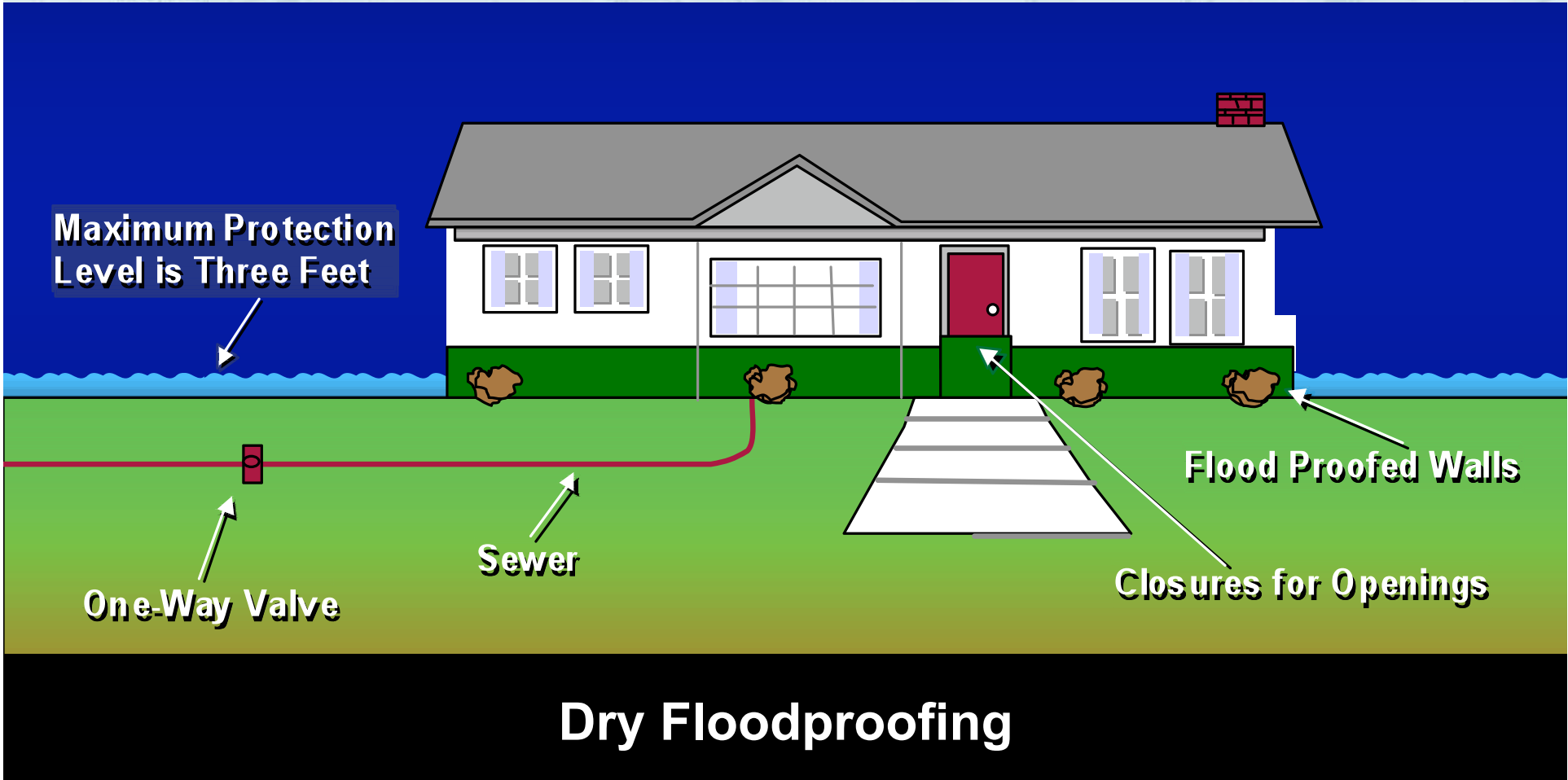
**Pier Foundation**



# Building Elevation

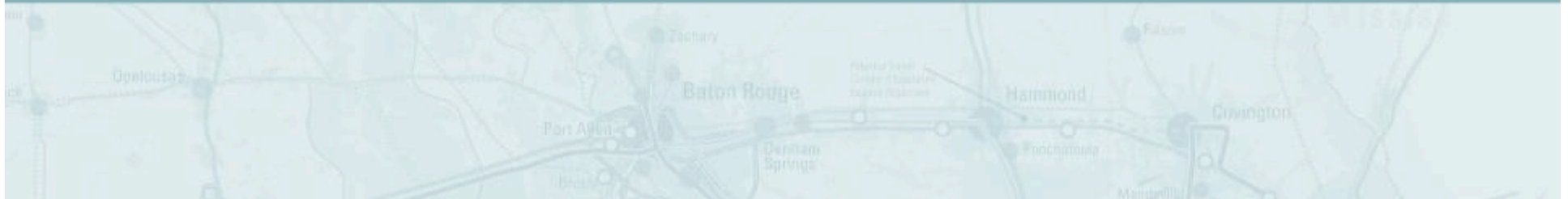


# Free??see?h??





# Pre-see-h?



Furnace and Utilities Relocated

Appliances Moved or Wrapped in Waterproof Bags

Opening to Let Water In

## Wet Floodproofing

# How to Design a Tiny House





# Floating Structures



# Floating Structures

## The FLOAT House, New Orleans





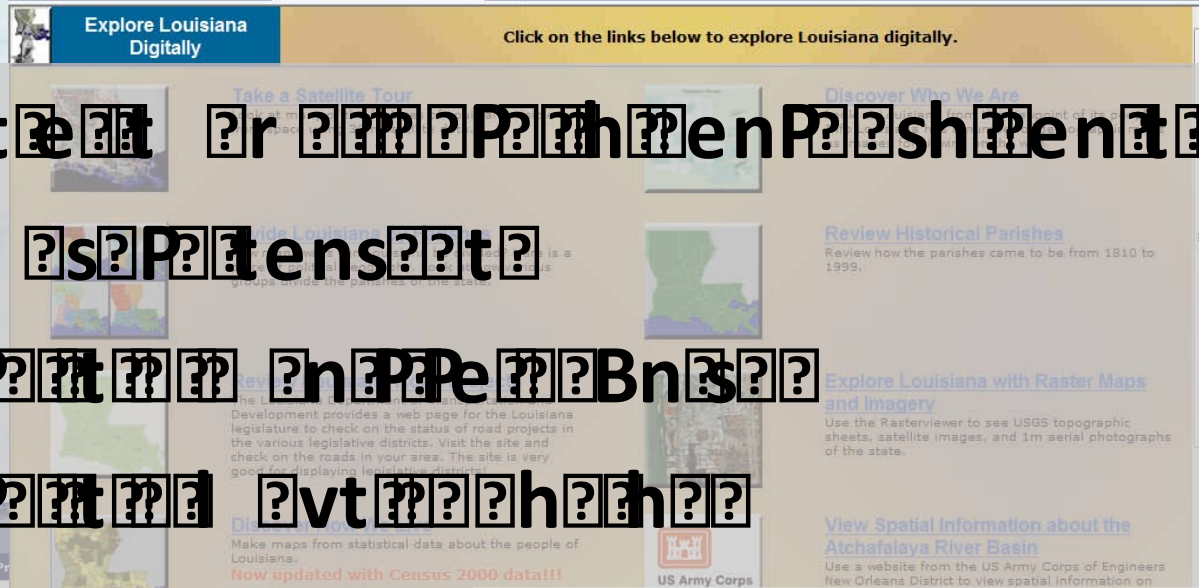
A light blue map of Louisiana serves as the background. The map shows major cities and regions, including Baton Rouge, Hammond, New Orleans, and Lafayette. A dark teal horizontal bar is at the top of the page. The title text is centered over the map.

# Implementing Best Practices

Data Resources and  
Small Area Planning

# How to use the Louisiana Statewide GIS System

## Getting Started



1. Get the Louisiana Statewide GIS System

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## Data Access and Planning Resources

### For Federal, State and Regional; Community; and Site and Building Scales



The information on this page represents current data and resources available at the time of this publication. Please note new resources and updated data are frequently available.

#### What Kinds of GIS Data Are Out There?

DATA TYPE	AGENCY	FREE ONLINE?
<b>Reference Layers</b>		
Aerial photography	Parishes, ESRI, Geocommunity.com	Sometimes
Transportation network (road, railroads, airports)	Parishes, State, ESRI	Yes
Parcels	Parishes	
Urbanized areas	Parishes, Census TIGER Files	Yes
<b>Political</b>		
Zoning	Parishes	Sometimes
Land Use	Parishes	Sometimes
Political Boundaries	Parishes, Census	Yes
Population (historic, present, forecasts)	US Census	Yes
<b>Local, Parish and State Planning</b>		
Louisiana Speaks (2007)	LSDC	Yes
Parish Plans (Land Use, Econ Dev, etc.)	Parishes	Sometimes
Transportation Plans	Parishes	Sometimes
Coastal Master Plans	DNR "SONRIS"	Yes
Hazard Mitigation		
Levees (large and small scale)	DNR "SONRIS"	Yes
Planned and completed state and federal restoration projects	DNR "SONRIS"	Yes
<b>Natural Systems</b>		
Land cover	LSDC	Yes
Rivers and waterways	FEMA, LSDC	Yes
Advisory Base Flood Elevations (ABFEs)	FEMA	Yes
Floodplains/DFIRM (where available)	FEMA, LSDC	Yes
Land loss	USGS	Yes
Geology	USGS	Yes

#### Community Scale Online Resources

Louisiana Statewide Data Catalog (LSDC)  
<http://lagic.lsu.edu/datacatalog/search.asp>

Atlas: The Louisiana Statewide GIS  
<http://atlas.lsu.edu/>

FEMA Hurricane Katrina Data  
[www.fema.gov/hazard/flood/recoverydata/katrina](http://www.fema.gov/hazard/flood/recoverydata/katrina)

LAGIC Hurricane Response Mapping  
<http://lagic.lsu.edu/hurricanes>

"SONRIS" Louisiana Department of Natural Resources  
[http://sonris-www.dnr.state.la.us/www\\_root/sonris\\_portal\\_1.htm](http://sonris-www.dnr.state.la.us/www_root/sonris_portal_1.htm)

Census TIGER Files  
[www.census.gov/geo/www/tiger](http://www.census.gov/geo/www/tiger)

USGS Louisiana Data  
<http://sdms.cr.usgs.gov/pub/la.html>

USGS Land Cover data  
<http://seamless.usgs.gov/>

U.S. Maps and Data  
<http://gos2.geodata.gov/wps/portal/gos>

#### Site and Building Scale Resources

International Code Council  
[www.iccsafe.org/](http://www.iccsafe.org/)

Flood Insurance maps and requirements  
[www.msc.fema.gov/](http://www.msc.fema.gov/)

Local zoning and land use codes  
<http://cpex.org/work/louisiana-land-use-toolkit>

## Agencies Involved In Coastal Water Management Issues

Overseeing coastal development and water management is a shared responsibility among federal, state and local governments. Many agencies at all three levels have roles in managing water and coastal development. In addition, non-governmental agencies are involved in managing and improving Louisiana's coastal areas.

### FEDERAL AGENCIES

It is important to be aware of the key federal agencies that provide an overall framework and set baseline standards for coastal development and coastal emergencies. The impacts of these agencies range from the Federal Emergency Management Agency (FEMA) issuing base flood elevations, to the U.S. Corps of Engineers providing risk reduction measures and administering the Section 404 program to the Environmental Protection Agency (EPA) providing guidance and environmental criteria over many resource issues.

#### Department of Agriculture

- Natural Resources Conservation Services

#### Department of Commerce

- National Oceanic and Atmospheric Agency (NOAA)
- NOAA Weather Service and River Forecast Center

#### Department of Defense

- U.S. Army Corps of Engineers

#### Department of Homeland Security

- Federal Emergency Management Agency (FEMA)
- U.S. Coast Guard

#### Department of the Interior

- U.S. Bureau of Reclamation
- U.S. Fish and Wildlife Service
- U.S. Geologic Survey Wetlands Research Center

#### Executive Office of the President

- Council on Environmental Quality

#### U. S. Environmental Protection Agency

### STATE AGENCIES

- Governor's Office of Coastal Activities
- Office of Coastal Protection and Restoration
- Department of Environmental Quality
- Department of Wildlife and Fisheries
- Department of Natural Resources
- Department of Health & Hospitals
- Department of Transportation and Development
- Department of Insurance
- Department of Economic Development
- Department of Agriculture and Forestry

### REGIONAL ORGANIZATIONS

- Regional Planning Districts (8)
- Levee districts
- Tri-Parish Partnership for the Atchafalaya East Watershed Group (Upper Terrebonne Basin)

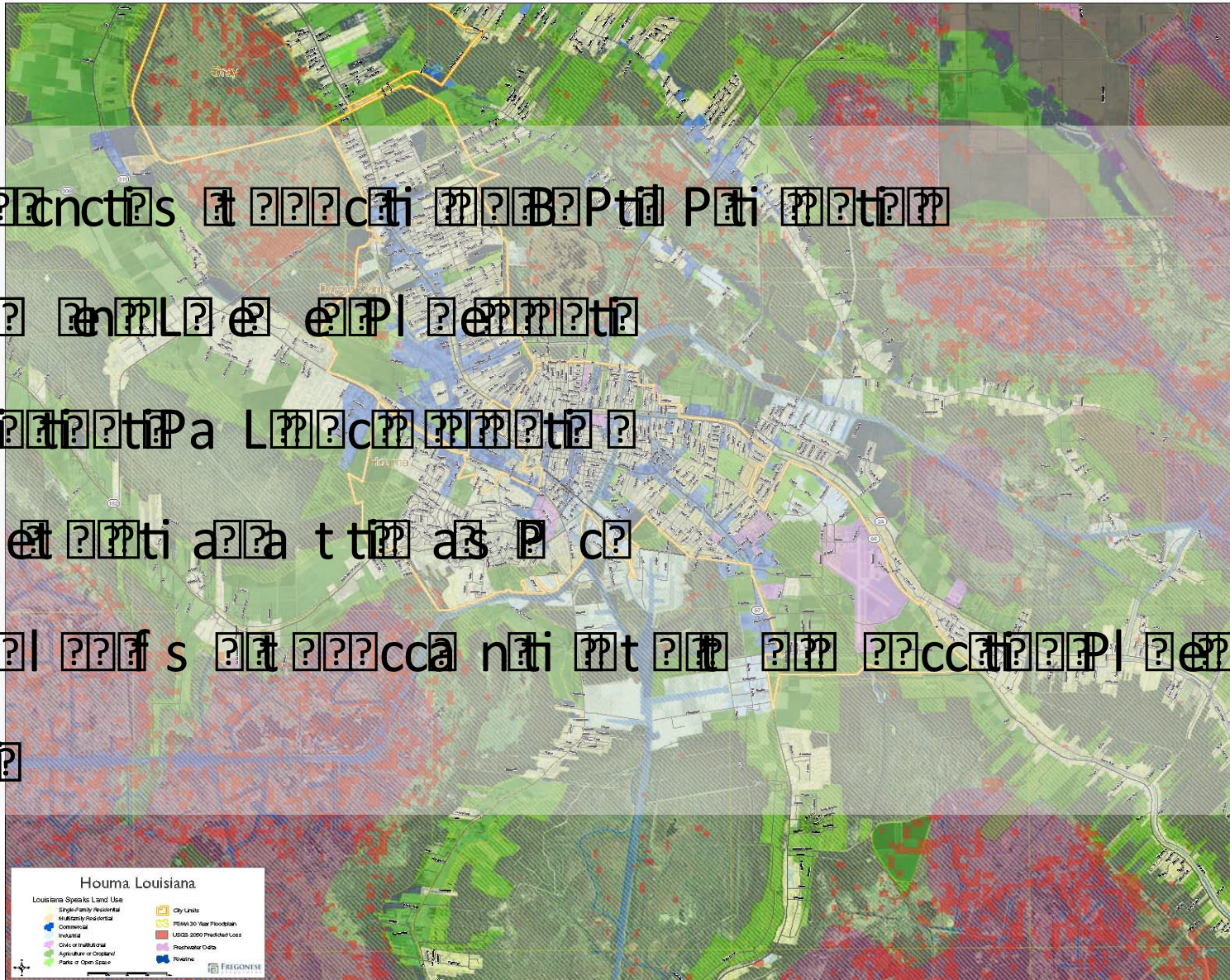
### NON GOVERNMENTAL ORGANIZATIONS

- Louisiana State University
- Tulane University
- Restore or Retreat
- Coalition to Restore Coastal Louisiana
- Environmental Defense
- The Nature Conservancy
- Barataria - Terrebonne National Estuary Program
- EPA's Gulf of Mexico Program
- Lake Pontchartrain Basin Foundation
- America's Wetland
- Ducks Unlimited



# Public Participation Methods and Tools

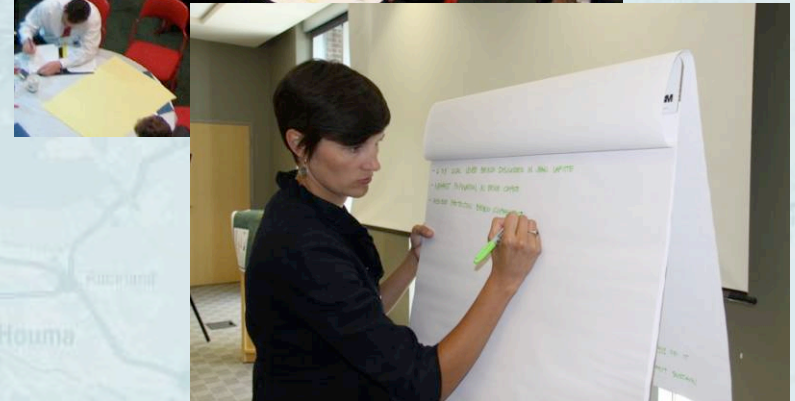
- Conduct a public participation process
- Develop a public participation plan
- Implement the public participation process
- Evaluate the public participation process
- Report on the public participation process





# A resource for planners – or anyone creating a coastal planning process

- Recommendations for developing a planning process
  - Purpose and boundary
  - Community participation
  - Develop guiding principles that define successful outcome
  - Assessment – opportunities and constraints, technical analysis
  - Plan elements or issues to be addressed

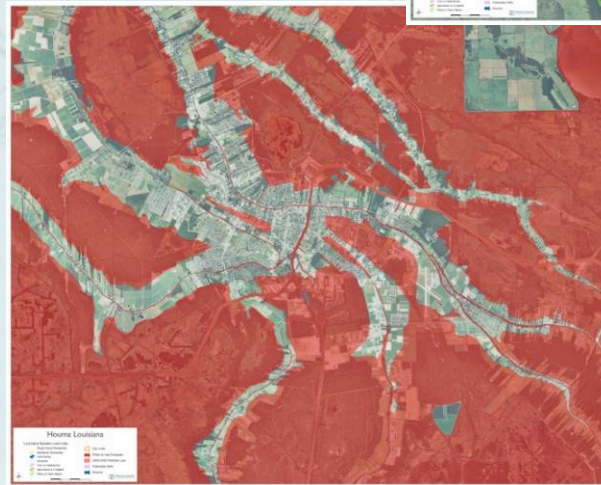
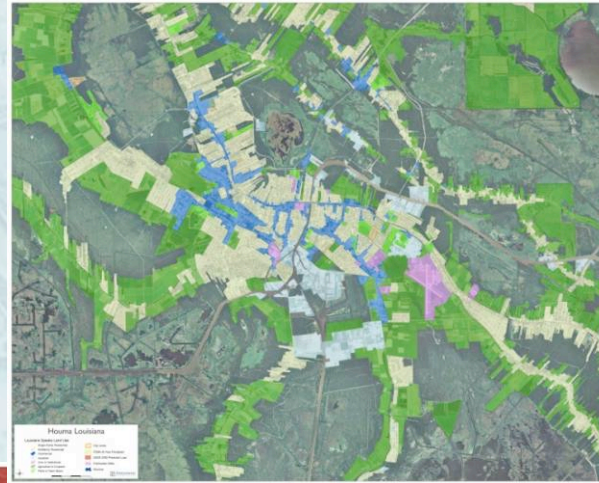




# Planning process recommendations

- Assessment – opportunities and constraints, technical analysis

- Infrastructure
- Land use
- Flooding
- Land loss
- Community assets





# Pointe Coupee Parish Comprehensive Plan

1. The Plan is to be a  
ti. The Plan is to be a

Land Use

Transportation

Economic Development

Housing

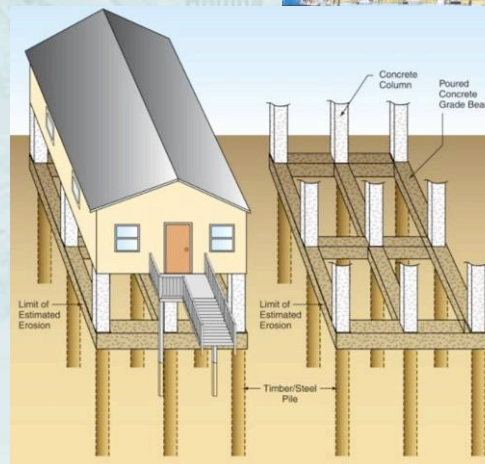
Parks, Trails and Open Space





# Pulling it all together – how to use this manual

- Examine your challenges and opportunities, look at the manual's vignettes, pick community and structural strategies that make the most sense for your community



*Thank you*

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