

# **SUSTAINABLE DEVELOPMENT AND MANAGEMENT OF FLOODPLAINS IN URBAN AREAS:**

**A COMPARATIVE ANALYSIS OF BRAYS BAYOU TO BUFFALO BAYOU**

**LESTER O. KING, PHD., AICP, LEED**

**RICE UNIVERSITY**

**LOK1@RICE.EDU**

**TEXAS ASSOCIATION OF ENVIRONMENTAL PROFESSIONALS**

**THURSDAY, OCTOBER 18, 2018**

# **SUSTAINABLE DEVELOPMENT**

## **A COMPARATIVE ANALYSIS OF BRAYS BAYOU AND BUFFALO BAYOU**



- 1. PHILOSOPHICAL FRAME**
- 2. PHILOSOPHICAL FRAME APPLIED TO FLOODPLAIN PLANNING & MANAGEMENT**
- 3. PHILOSOPHICAL FRAME IMPLEMENTED**
- 4. CASE STUDY: BUFFALO VS BRAYS**
- 5. SUSTAINABILITY ASSESSMENT: BUFFALO VS BRAYS**
- 6. SUSTAINABILITY PLANNING FOR RESILIENCE OF MID - BRAYS BAYOU COMMUNITIES**

# **SUSTAINABLE DEVELOPMENT**

A COMPARATIVE ANALYSIS OF BRAYS BAYOU AND BUFFALO BAYOU



## **1. PHILOSOPHICAL FRAME**

# SUSTAINABLE DEVELOPMENT

## A COMPARATIVE ANALYSIS OF BRAYS BAYOU AND BUFFALO BAYOU

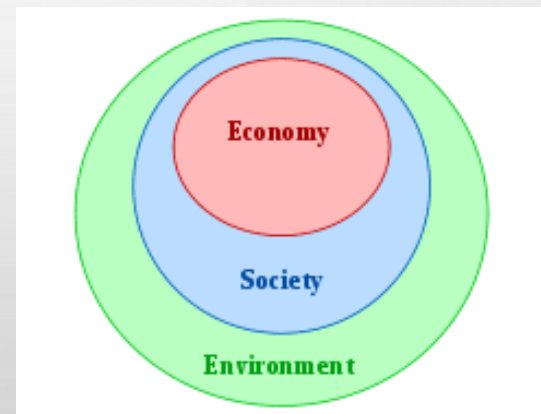
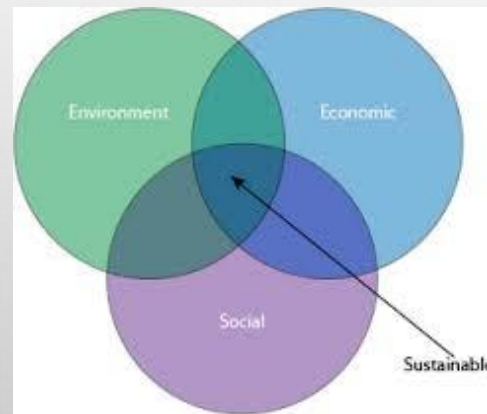


- **DEFINITION OF SUSTAINABLE DEVELOPMENT:**

- Development that meets the needs of the present generation without compromising the ability for future generations to meet their own needs.
  - Brundtland Commission, 1987

- **THREE PILLARS:**

- **Social Development | Economic Development | Environmental Development**



# SUSTAINABLE DEVELOPMENT

## A COMPARATIVE ANALYSIS OF BRAYS BAYOU AND BUFFALO BAYOU

- **THREE PILLARS:**

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1979



- Scott Campbell, 1996



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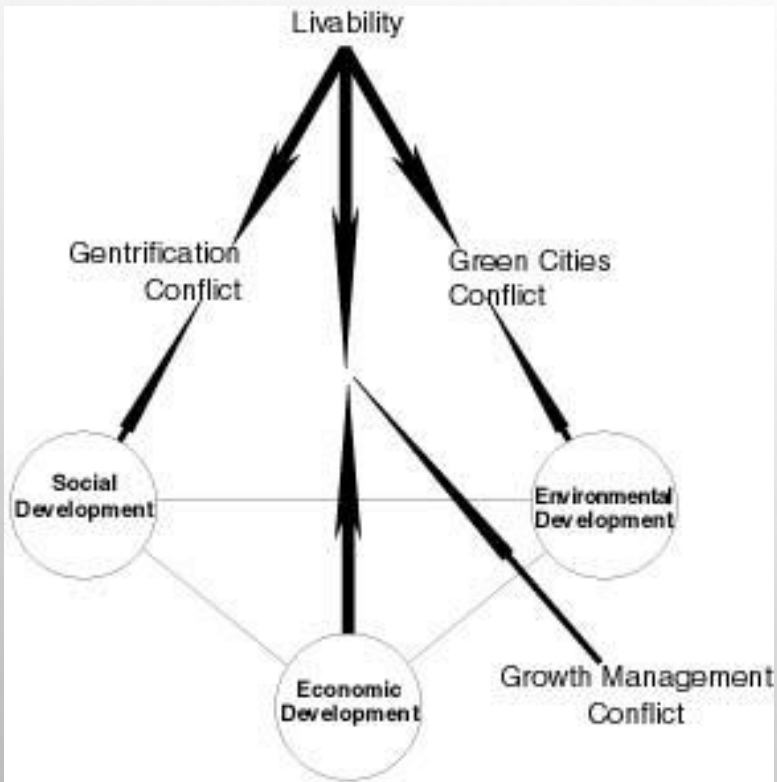
- Wuppertal Institute, 1997

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The sustainability prism. Sustainability is at the center (Godschalk, 2004)

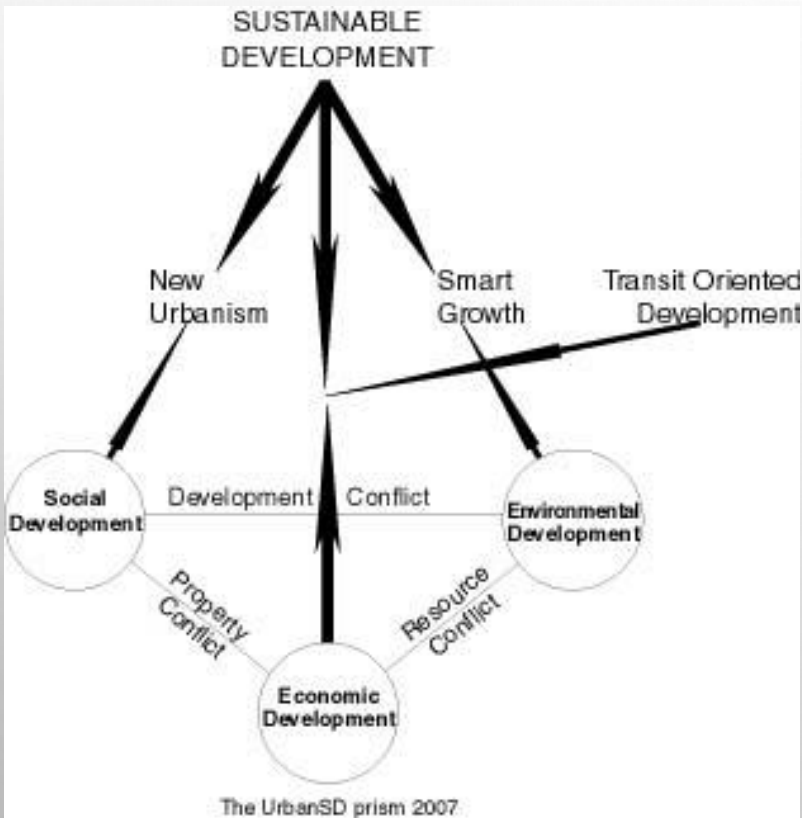
- David Godschalk, 2004

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- Lester King, 2007

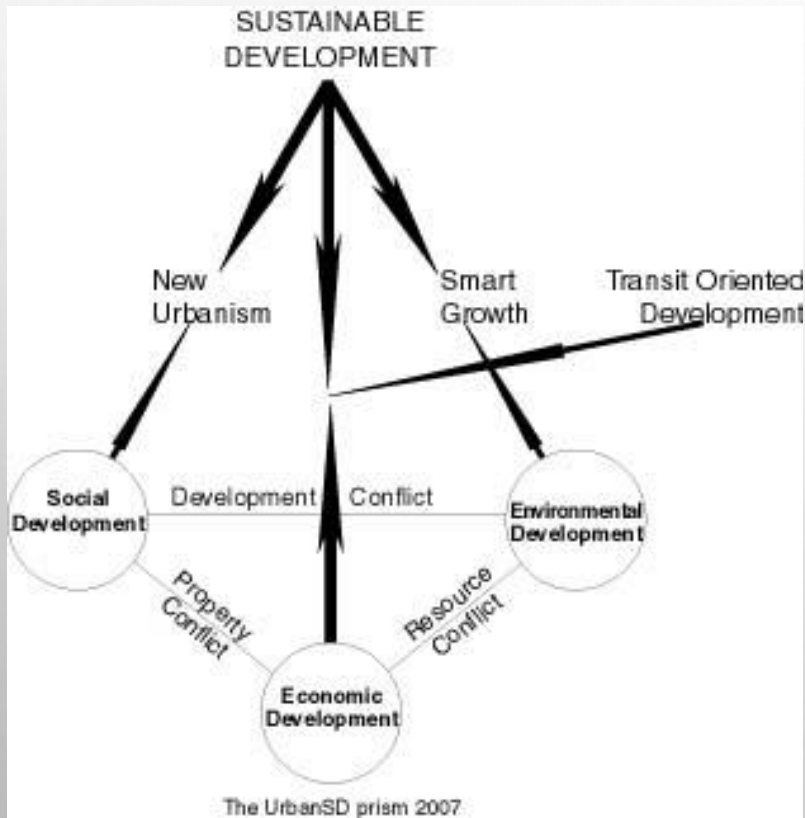


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# **SUSTAINABLE DEVELOPMENT**

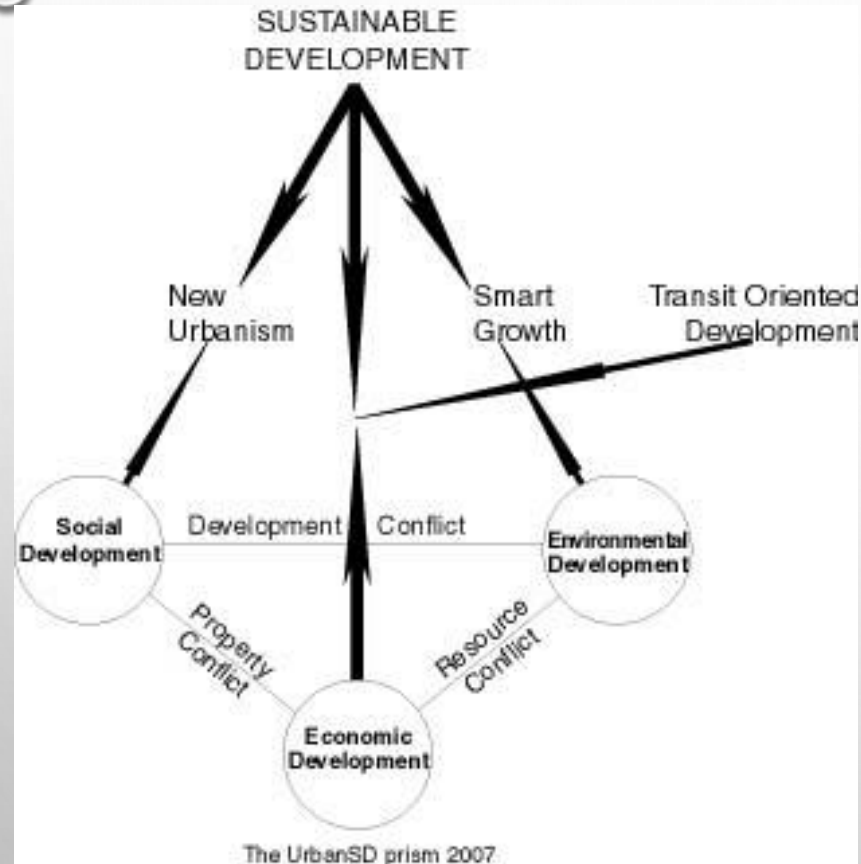
A COMPARATIVE ANALYSIS OF BRAYS BAYOU AND BUFFALO BAYOU



## **2. PHILOSOPHICAL FRAME APPLIED TO FLOODPLAIN PLANNING & MANAGEMENT**

# SUSTAINABLE DEVELOPMENT

## A COMPARATIVE ANALYSIS OF BRAYS BAYOU AND BUFFALO BAYOU



## THREE PILLARS | INTERSECTIONS

**Social Development | Economic Development = Property Conflict**

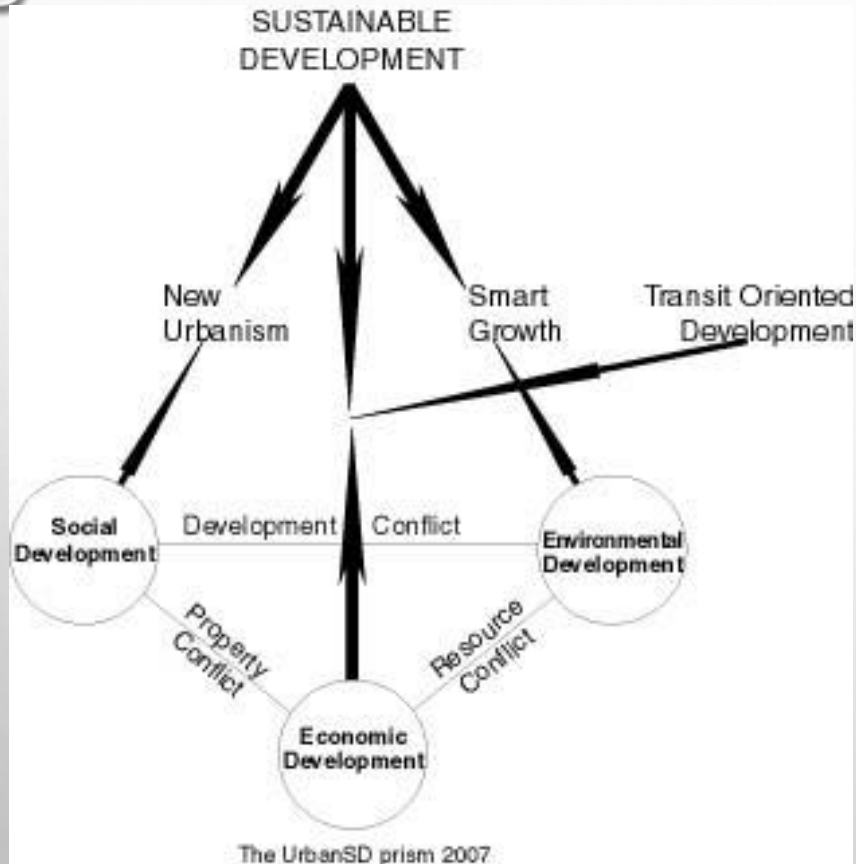
- Richard Fogelson, 1986 – Property Contradiction.
  - Housing and land is defined as Private Commodity, Yet depends on government intervention for beneficial social aspects such as Zoning
- **Peoples Homes vs Flooded property**
- **Existing Communities**
- Homeownership Associations | Subdivision Regulations
- Abraham Maslow, 1943 – Fundamental Needs include 'Shelter'
- NIMBYism
- Property Value Protections
- Takings

# SUSTAINABLE DEVELOPMENT

## A COMPARATIVE ANALYSIS OF BRAYS BAYOU AND BUFFALO BAYOU

### THREE PILLARS | INTERSECTIONS

**Environmental Development | Economic Development = Resource Conflict**



- Wilbert Chapman, 1949 - Sustained Yield
  - How much ecological resource can be consumed without disrupting the natural cycle of growth
- **Business Raw Material vs Ecological Protection**
- Sand Mining Operations in the North-East of the county
- San Jac Waste Pits
- Wetlands along San Jacinto River
- Groundwater extraction / Land Subsidence

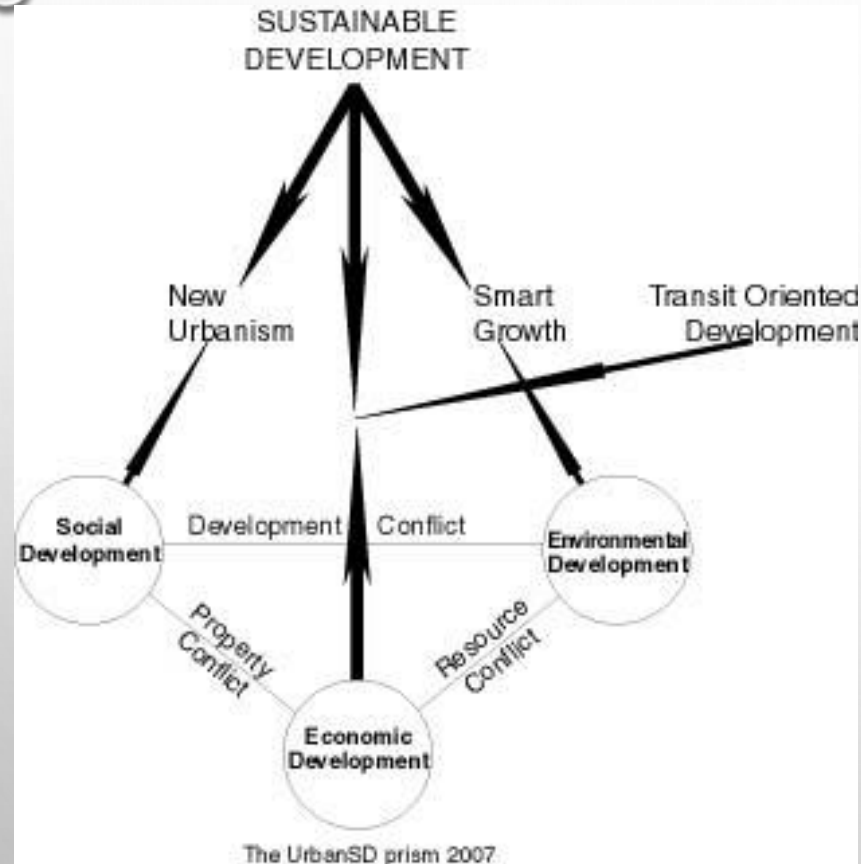


# SUSTAINABLE DEVELOPMENT

## A COMPARATIVE ANALYSIS OF BRAYS BAYOU AND BUFFALO BAYOU

### THREE PILLARS | INTERSECTIONS

**Social Development | Environmental Development = Development Conflict**



- NEPA, 1969 – Purpose
  - “To declare a national policy which will encourage productive and enjoyable harmony between man and his environment...”
- **Foster Social Equity & Protect the Environment**
- **Green Infrastructure?**
- **Protect Existing Communities vs Protect Floodplains**
- Developing New Subdivisions in Natural Floodplains
- How do we objectively prioritize resilience projects across Harris County or Houston? Do we divide the funds equally?



# **SUSTAINABLE DEVELOPMENT**

A COMPARATIVE ANALYSIS OF BRAYS BAYOU AND BUFFALO BAYOU



## **3. PHILOSOPHICAL FRAME IMPLEMENTED**

# SUSTAINABLE DEVELOPMENT

A COMPARATIVE ANALYSIS OF BRAYS BAYOU AND BUFFALO BAYOU



## VISION FOR SUBDIVISION DESIGN in FLOOD HAZARD AREAS

APA 2015

Adopt a comprehensive and integrated approach to protecting **floodplains** and other natural areas and aligning **development** with **community goals**, in order to increase community resiliency and reduce flood hazard risks.

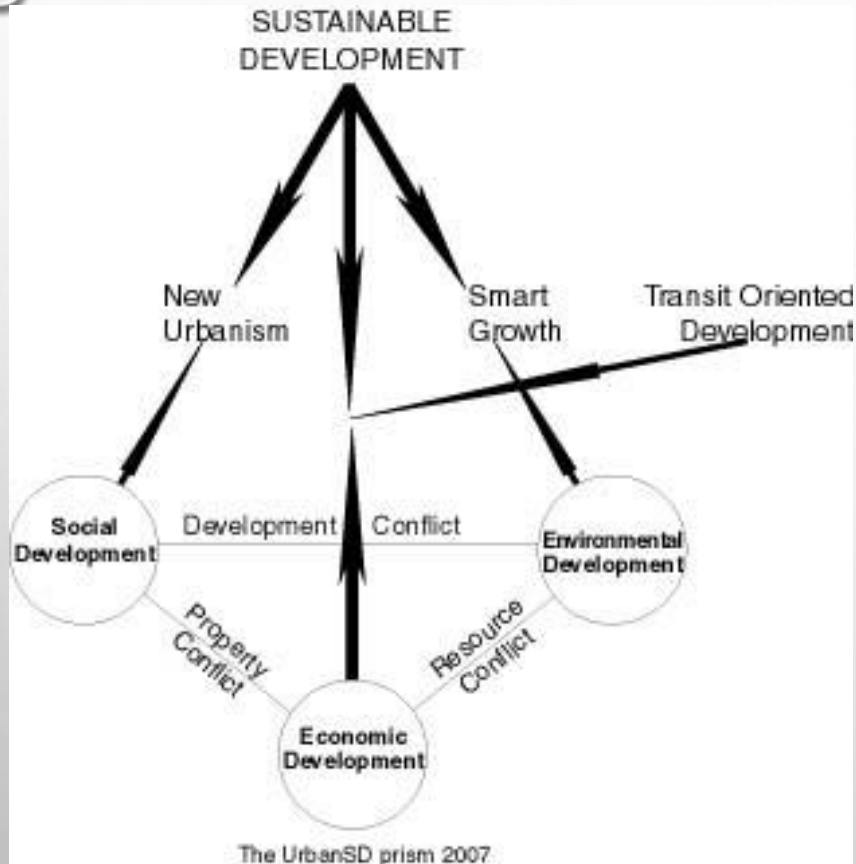
Environment – **Floodplains**

Economic – **Development**

Social – **Community Goals**

# SUSTAINABLE DEVELOPMENT

## A COMPARATIVE ANALYSIS OF BRAYS BAYOU AND BUFFALO BAYOU



## PRINCIPLES FOR SUBDIVISION DESIGN in FLOOD HAZARD AREAS

APA 2015

1. **Development Conflict:** Maintain **natural** and **beneficial** functions of the floodplain.
2. **Development Conflict:** Avoid new **development** in the floodplain whenever feasible.
3. **Development Conflict:** Consider future conditions of the floodplain, including **development impacts** and **climate change**.
4. **Property Conflict:** Adopt a **No Adverse Impact** approach to floodplain management.
5. Focus on data-driven decision making, using only the best available data to assess risk and inform decisions.

# SUSTAINABLE DEVELOPMENT

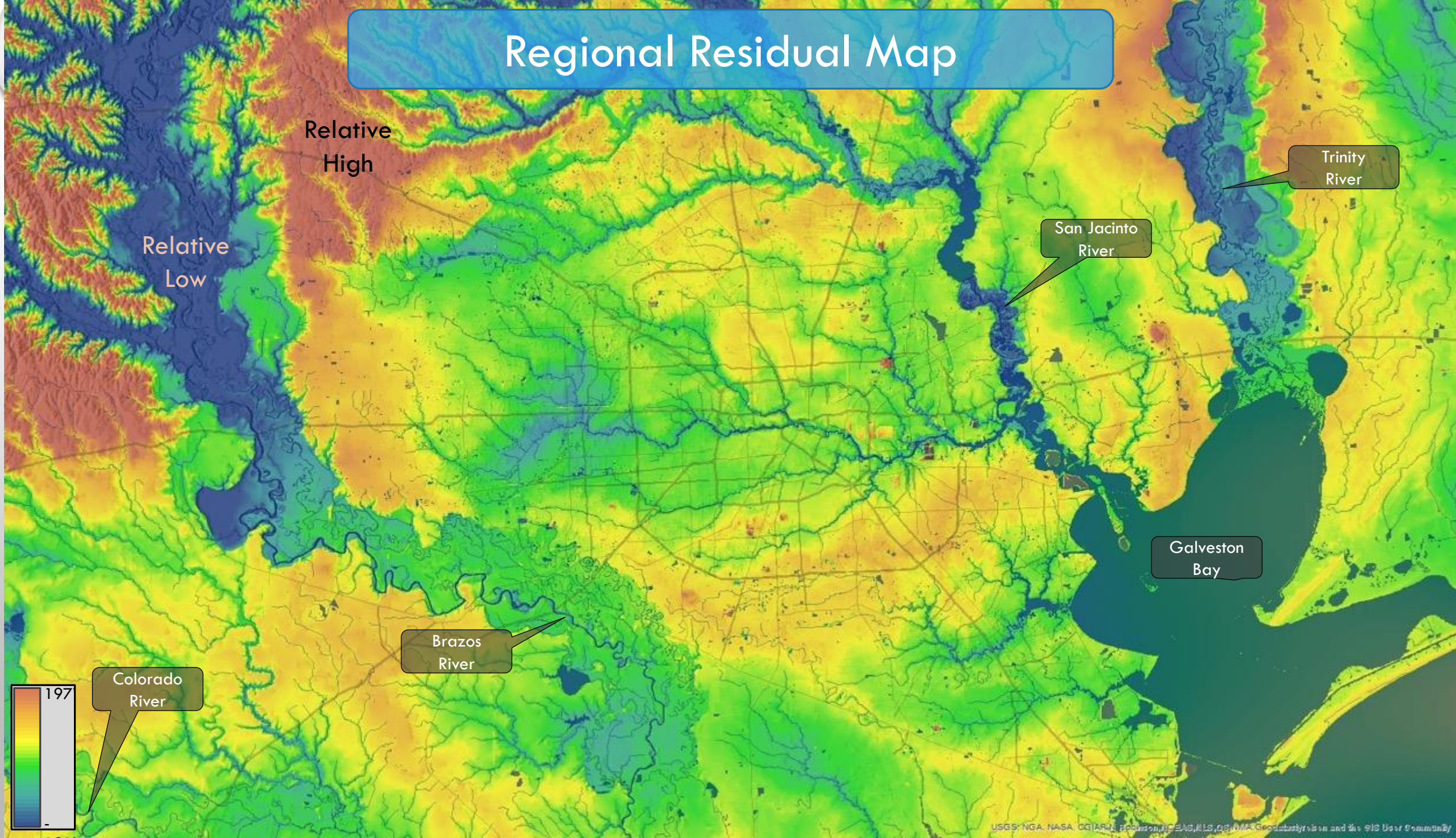
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## 4. CASE STUDY: BUFFALO VS BRAYS

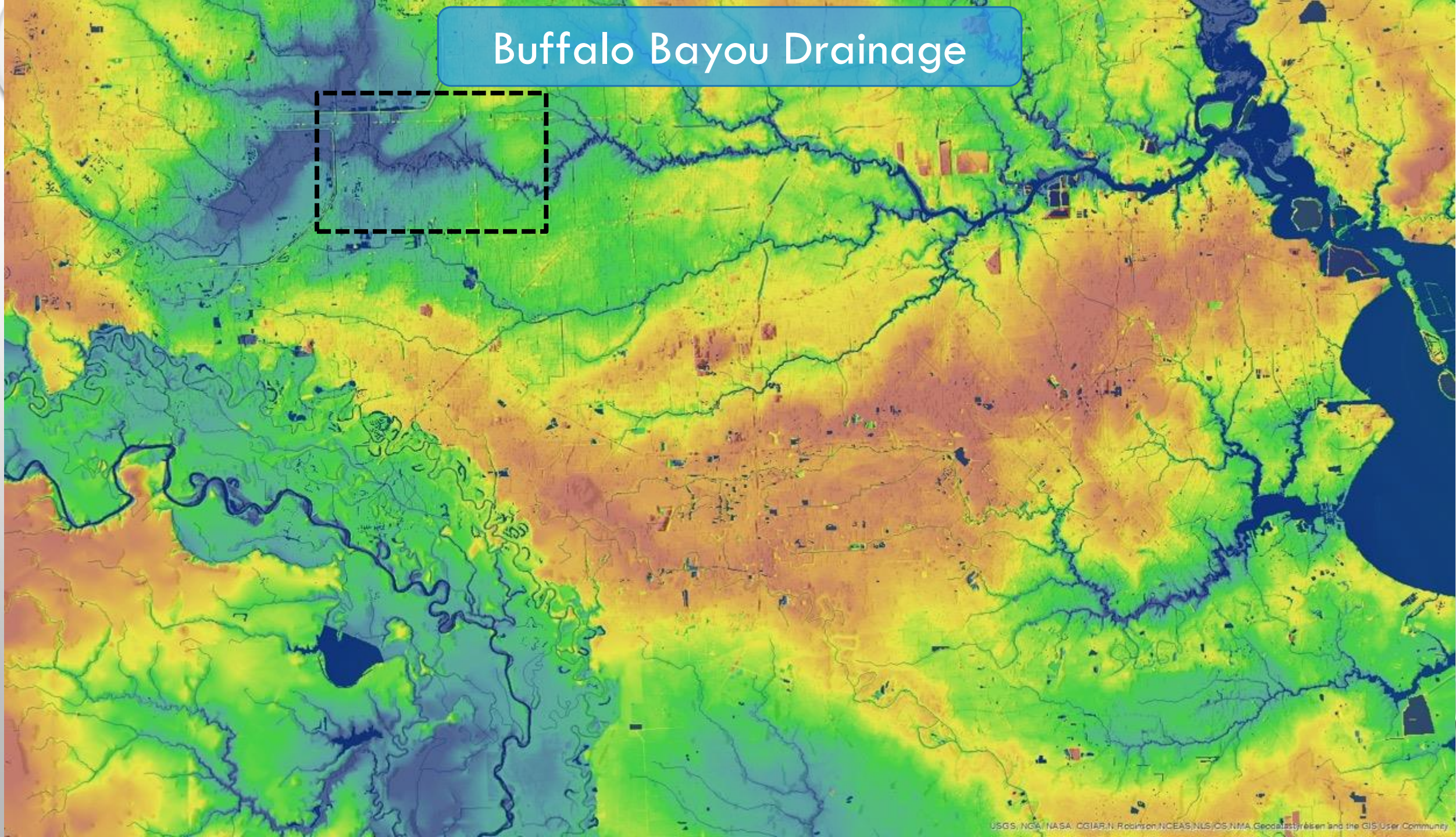


# Regional Residual Map





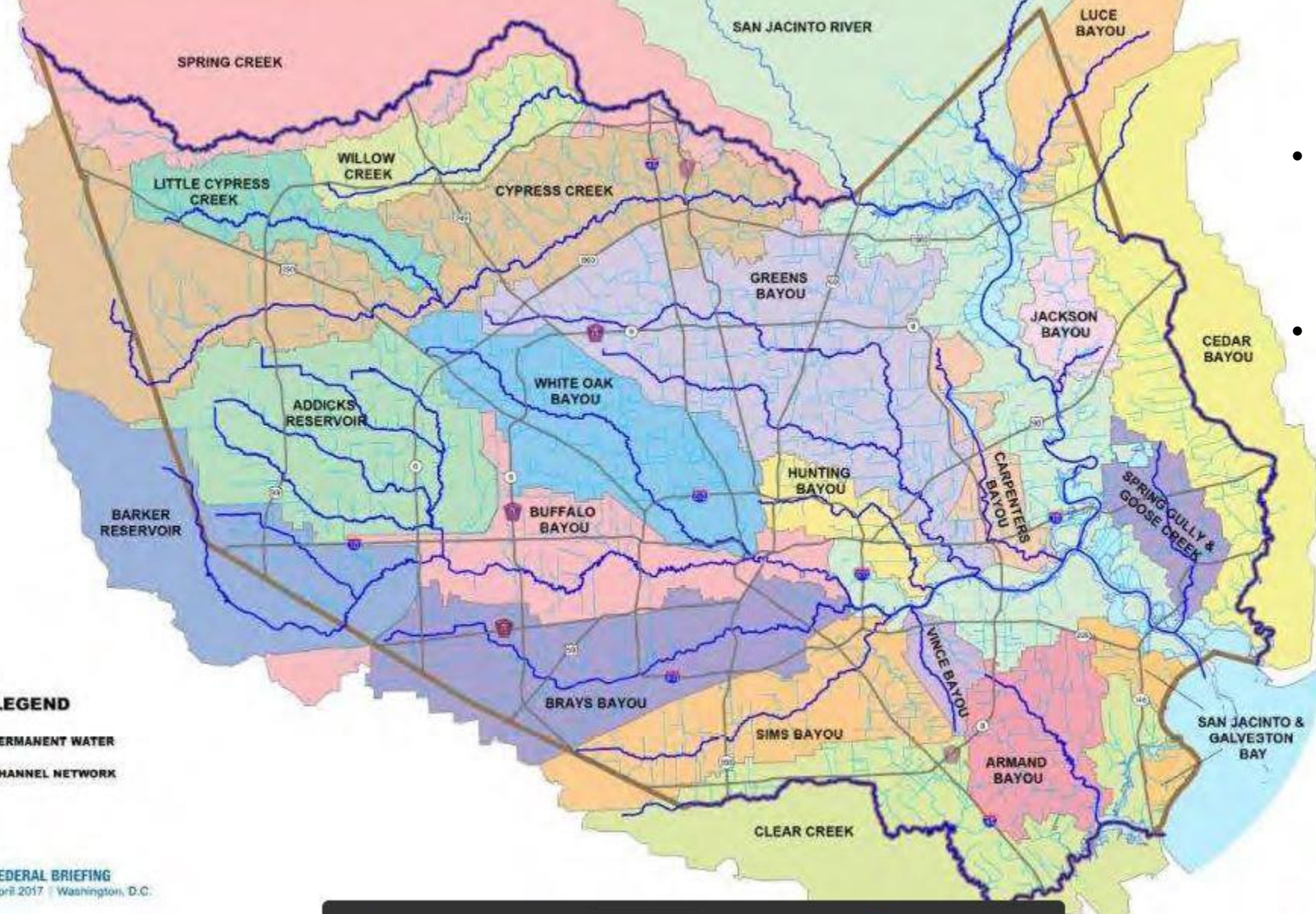
# Buffalo Bayou Drainage







# SUSTAINABLE DEVELOPMENT

## A COMPARATIVE ANALYSIS OF BRAYS BAYOU AND BUFFALO BAYOU



- **BUFFALO BAYOU WATERSHED**
  - 102 Sq. Miles
  - 444,602 population (2010)
- **BRAYS BAYOU**
  - 127 Sq. Miles
  - 717,198 population (2010)

### LEGEND

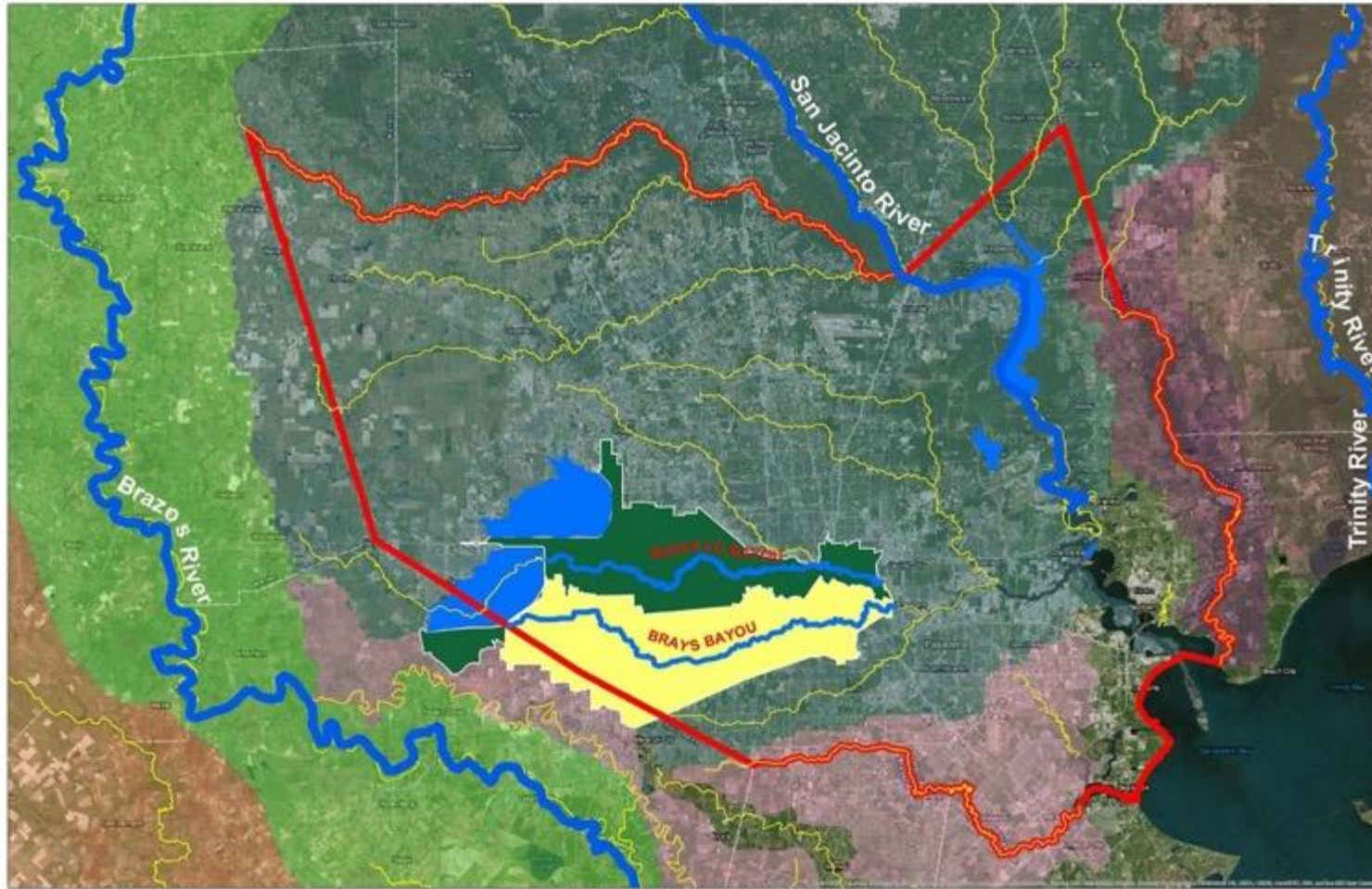
-  PERMANENT WATER
-  CHANNEL NETWORK



# SUSTAINABLE DEVELOPMENT

## A COMPARATIVE ANALYSIS OF BRAYS BAYOU AND BUFFALO BAYOU

Brays Bayou & Buffalo Bayou Watersheds



Brays Bayou & Buffalo Bayou Watersheds

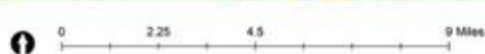
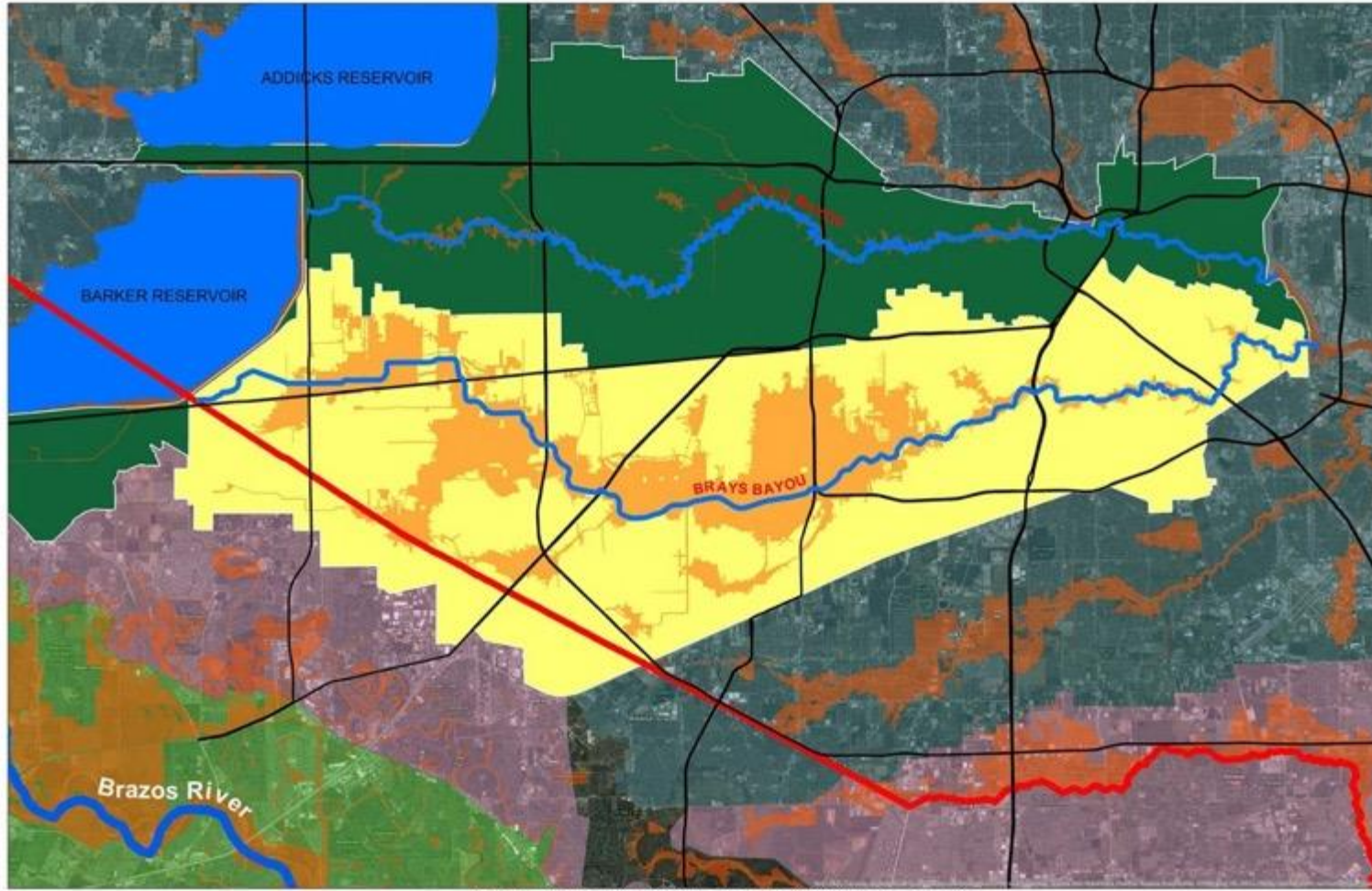
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# SUSTAINABLE DEVELOPMENT

## A COMPARATIVE ANALYSIS OF BRAYS BAYOU AND BUFFALO BAYOU

Brays Bayou & Buffalo Bayou 100-Yr Floodplain

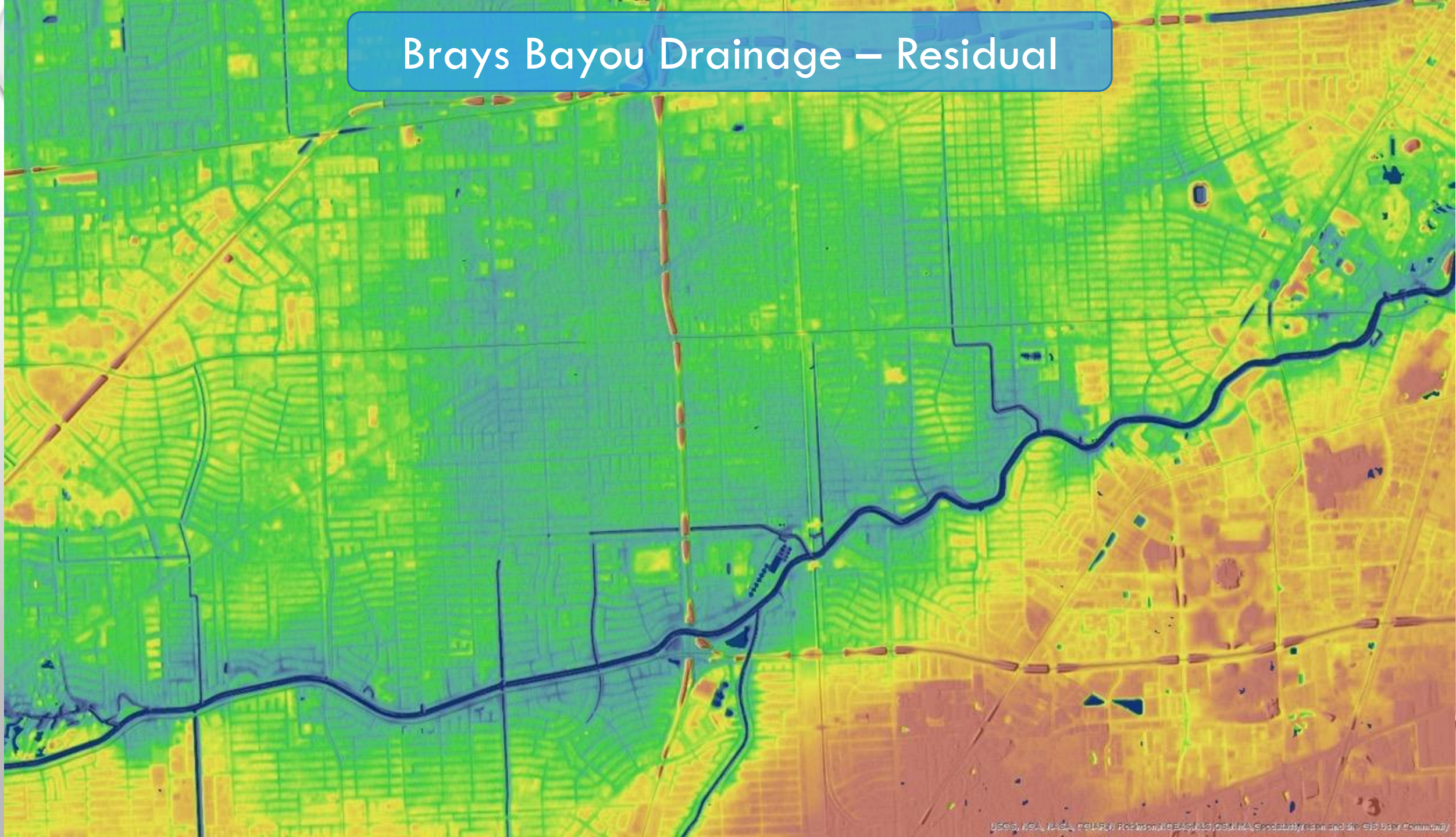


Brays Bayou & Buffalo Bayou 100-Yr Floodplain

- BUFFALO BAYOU WATERSHED
  - 102 Sq. Miles
  - 444,602 population (2010)
  - **Homes Lost in Harvey – 17,090 (HCFCF 2018)**
- BRAYS BAYOU
  - 127 Sq. Miles
  - 717,198 population (2010)
  - Channelized 1960(Concrete)
  - **Homes Lost in Harvey – 23,810 (HCFCF 2018)**

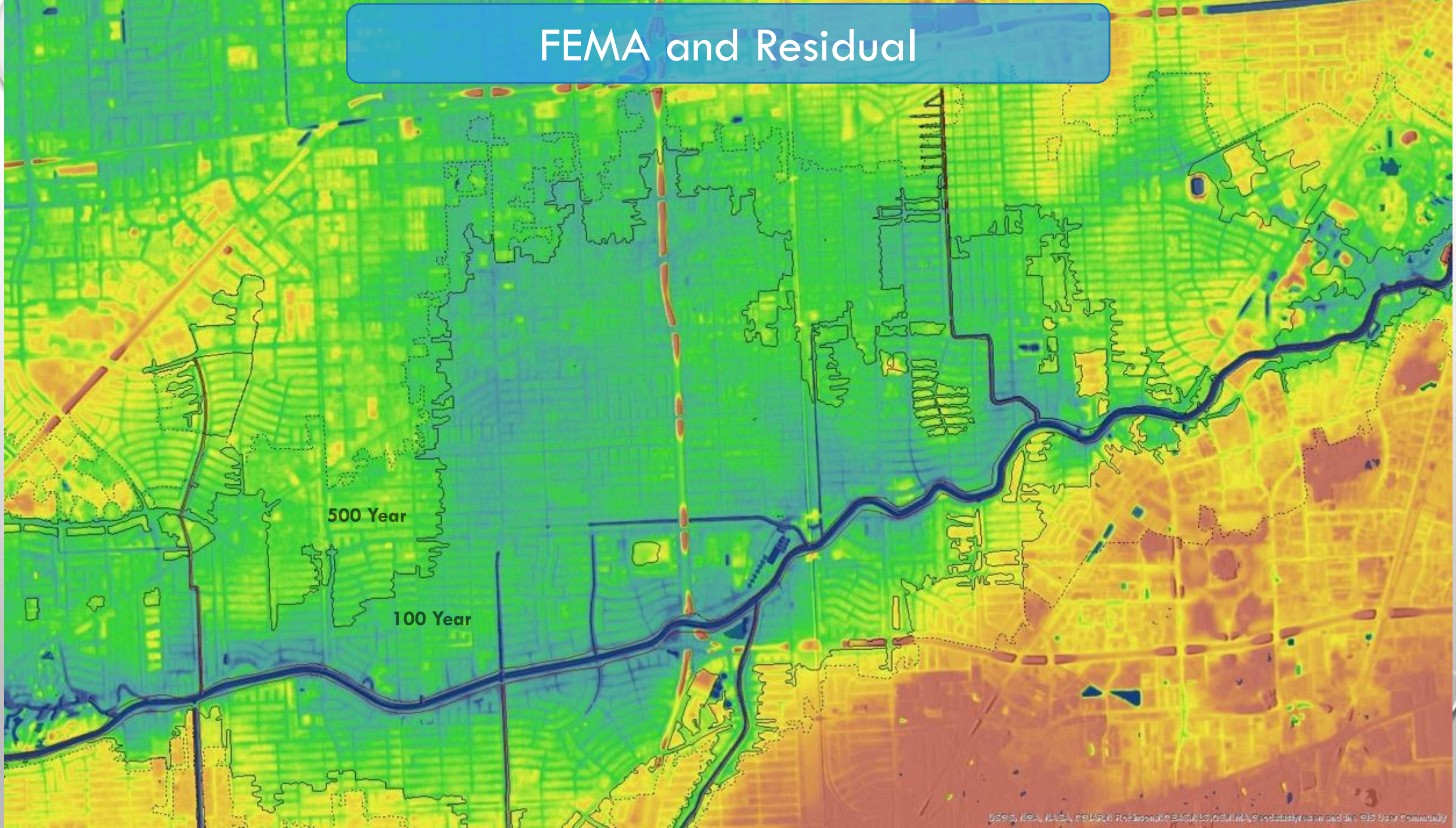


# Brays Bayou Drainage – Residual



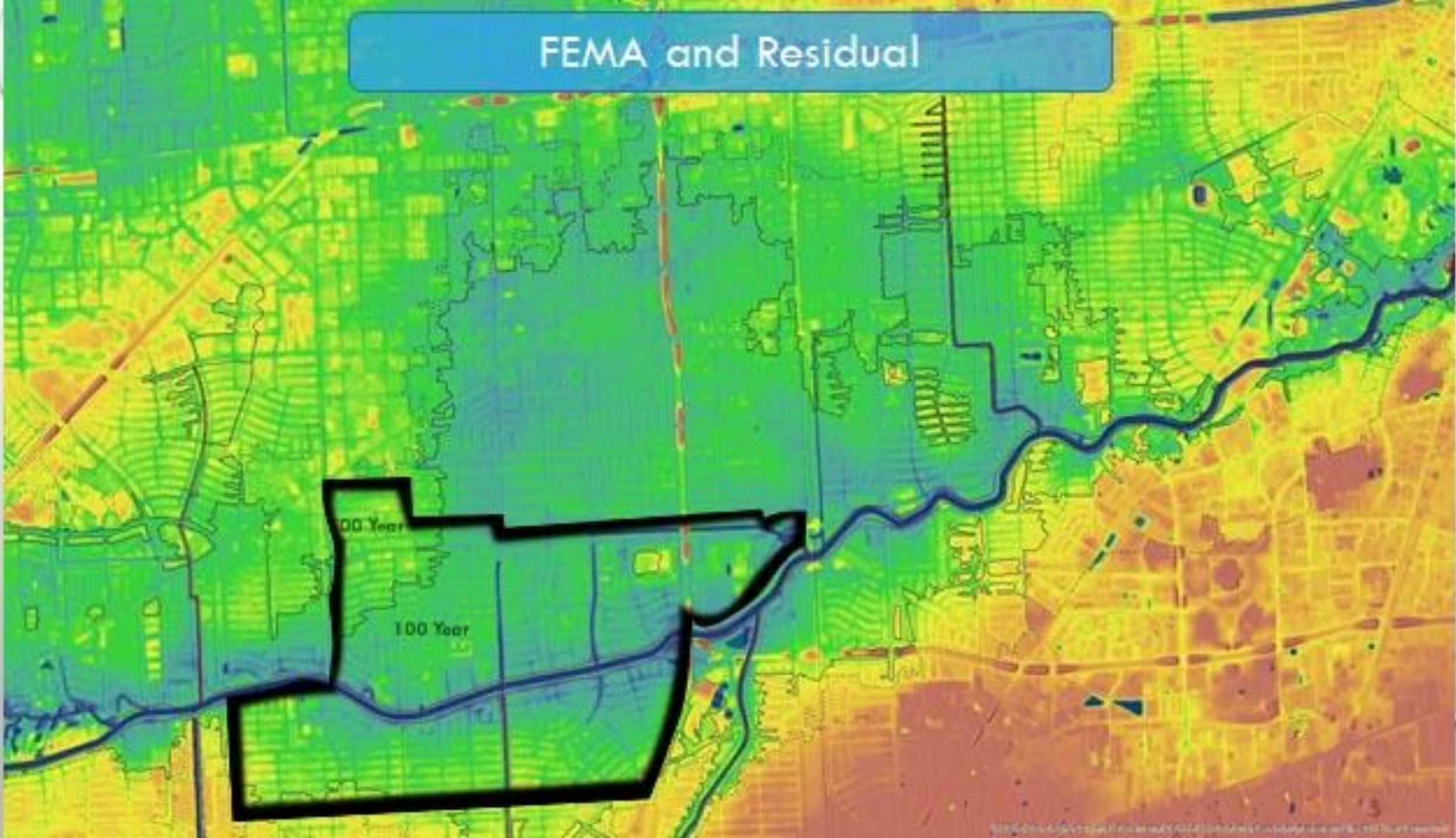


## FEMA and Residual





## FEMA and Residual





# SUSTAINABLE DEVELOPMENT

## A COMPARATIVE ANALYSIS OF BRAYS BAYOU AND BUFFALO BAYOU

Houston Flood Plain Expansion 2000 - 2012

### Floodplain Expansion

25.5% - Houston in Floodplain

148,853 – Housing units in Floodplain

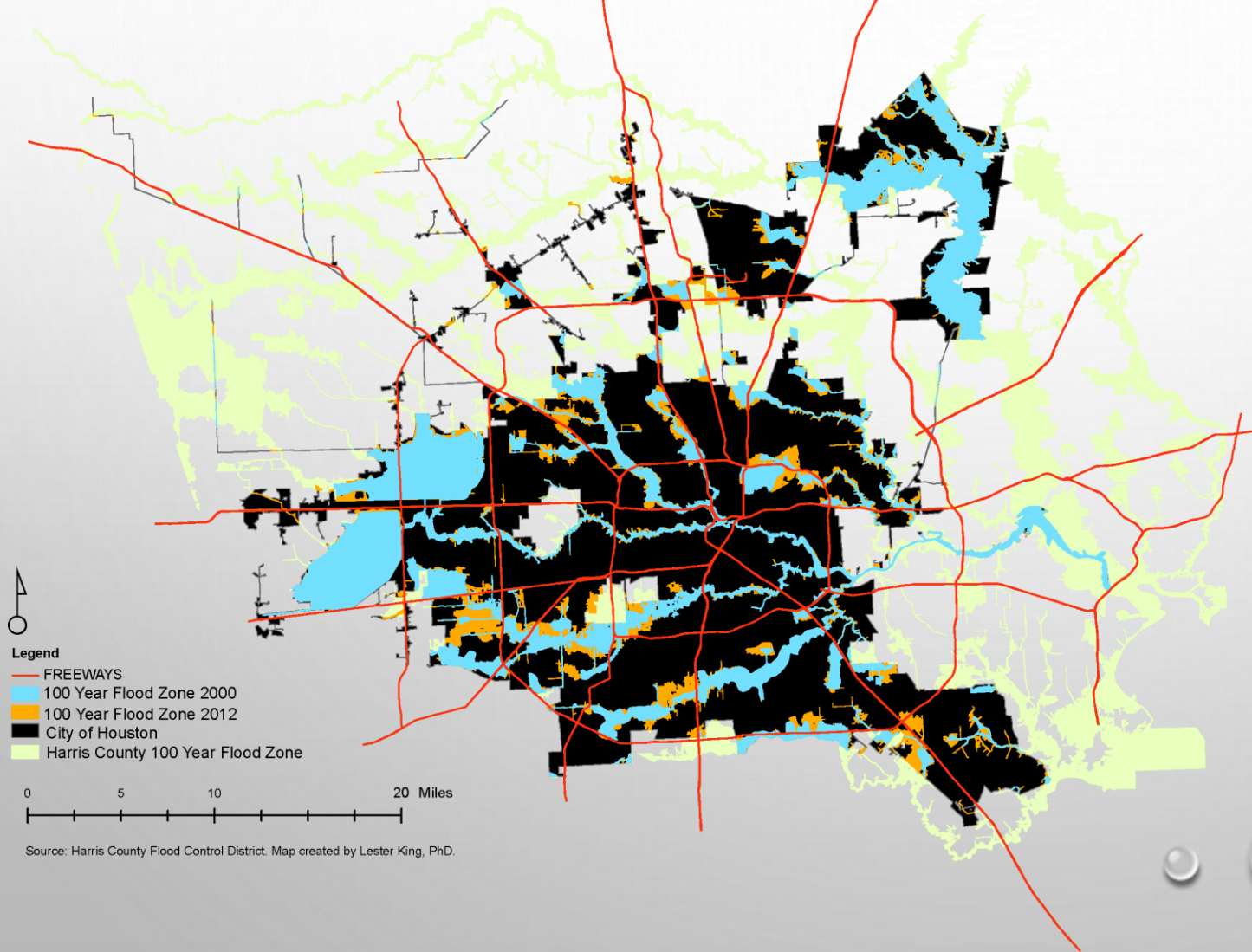
\$18.5billion – Housing damage risk

### Land Cover

78% - Urbanized

16% - High Intensity Development

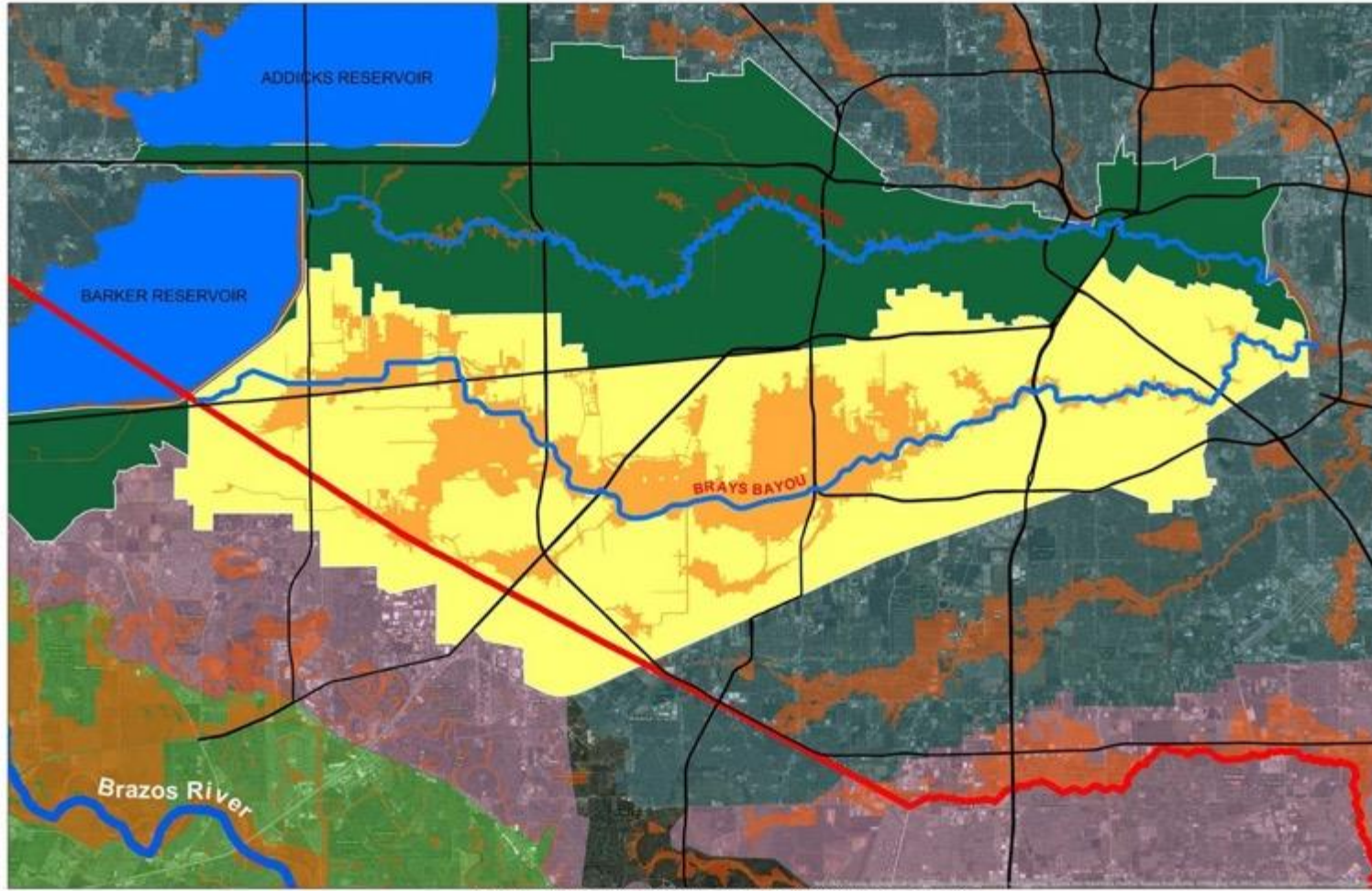
46% - Medium-low Intensity Development



# SUSTAINABLE DEVELOPMENT

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Brays Bayou & Buffalo Bayou 100-Yr Floodplain



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# SUSTAINABLE DEVELOPMENT

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## 5. SUSTAINABILITY ASSESSMENT: BUFFALO VS BRAYS



# SUSTAINABLE DEVELOPMENT

## A COMPARATIVE ANALYSIS OF BRAYS BAYOU AND BUFFALO BAYOU



<b>Social/ Economic</b>	<b>Buffalo Bayou &amp; 100 Yr Floodplain</b>	<b>Brays Bayou &amp; 100 Yr Floodplain</b>
Public Access	Very Limited	Yes
Home & Business Proximity to channel	Adjacent	Separated by Roads
Residential Activity	Yes	Yes
Recreational Activities	Kayaking, Canoeing	Hike & Bike

1. Both Bayous and their 100 Yr Floodplains have a substantial degree of human activity.
2. Buffalo Bayou channel has more recreational use.
3. Brays Bayou has higher public accessibility

# SUSTAINABLE DEVELOPMENT

## A COMPARATIVE ANALYSIS OF BRAYS BAYOU AND BUFFALO BAYOU



Environmental	Buffalo Bayou & 100 Yr Floodplain	Brays Bayou & 100 Yr Floodplain
Natural Flood & Erosion	Reduce Flood Velocities, Stabilize Soils	No
Surface Water Quality	Reduce sediment, Filtration system	No
Groundwater Supply & Quality	Infiltration & Aquifer recharge	No
Flora	Biological Diversity	No
Fish & Wildlife Habitat	Breeding & Feeding grounds	Limited
Scientific Study	Ecological & Archaeological Studies	Very Limited

1. Buffalo Bayou channel is a highly functional ecological asset.
2. Brays Bayou channel is no longer a natural ecological asset, there is very limited ecologically beneficial use for protecting this channel.
3. Since Brays Bayou no longer functions in its natural capacity, the floodplain is not a natural asset. Therefore the sustainability approach would be to reduce the area of the 100 Yr. Floodplain to prevent loss of human life, property damage, and disruption of existing communities.

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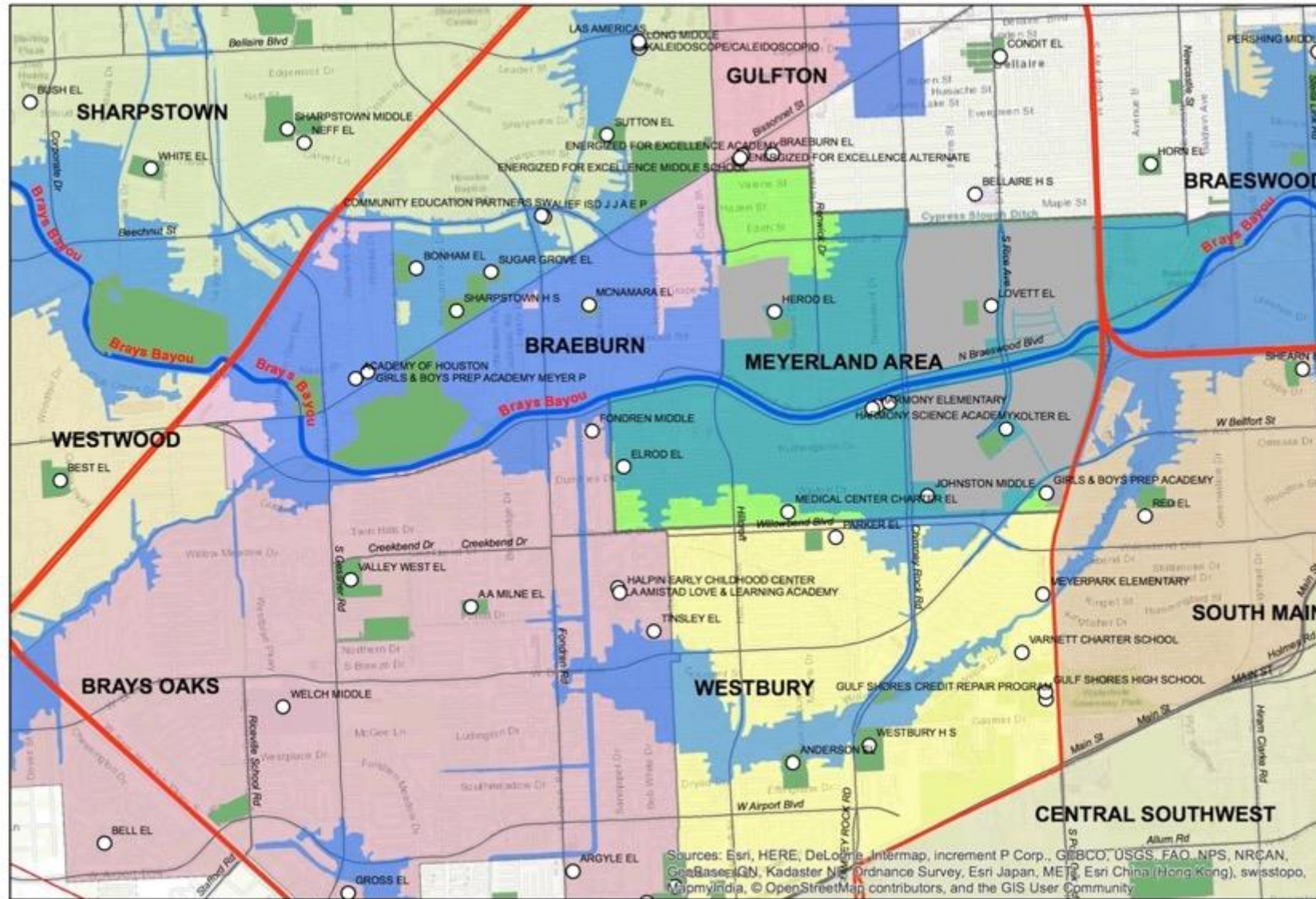


## **6. SUSTAINABILITY PLANNING FOR RESILIENCE OF MID - BRAYS BAYOU COMMUNITIES**



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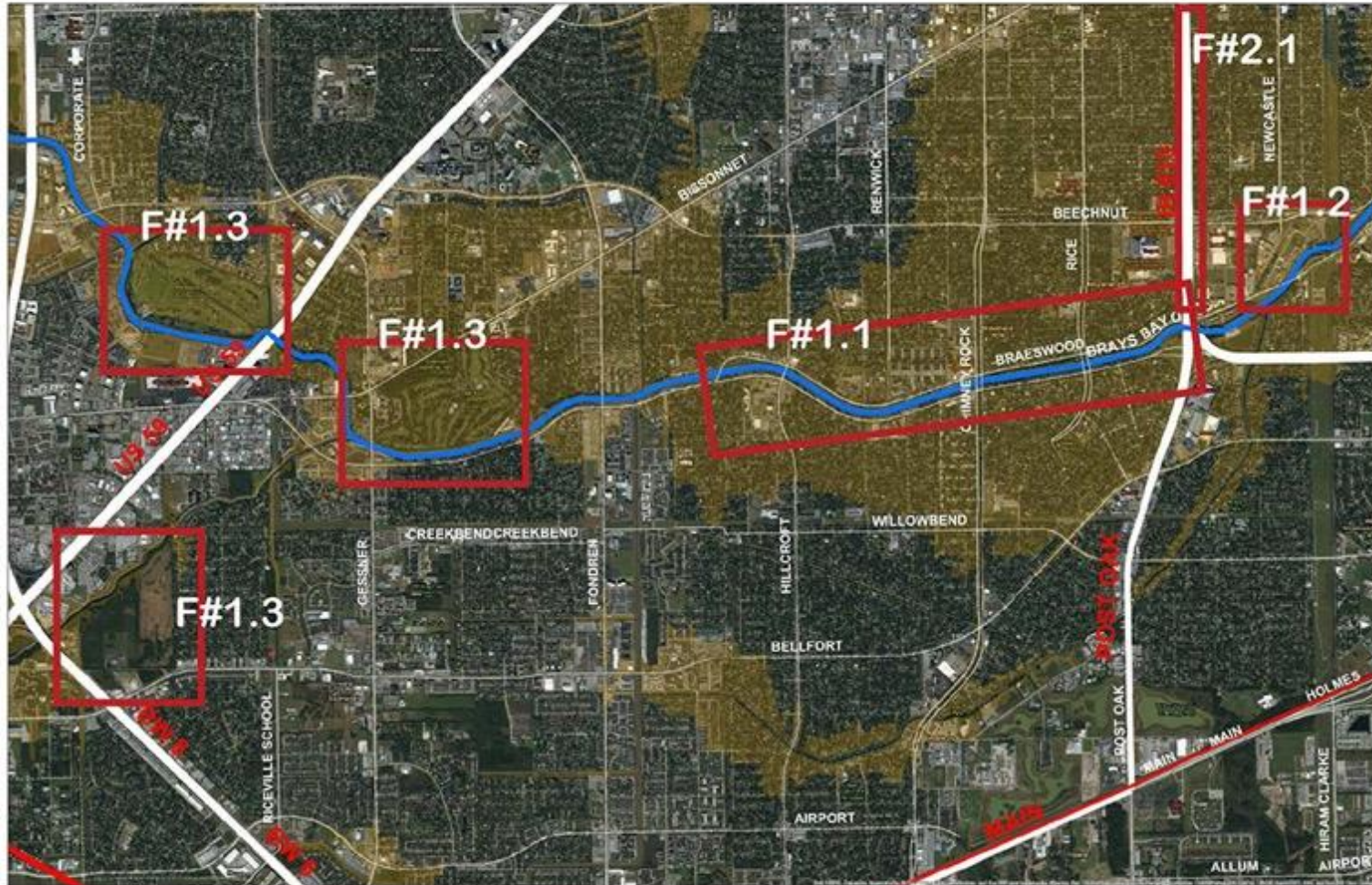
- San Jacinto Basin
- Brays Bayou Watershed
- Mid-Brays Communities
- SN: Greater Meyerland
- SN: Near Southwest
- SN: Westbury
- SN: Brays Oaks
- SN: Braeburn



# SUSTAINABLE DEVELOPMENT

## A COMPARATIVE ANALYSIS OF BRAYS BAYOU AND BUFFALO BAYOU

Mid - Brays Bayou Communities DRAFT Strategies



Mid - Brays Bayou Communities DRAFT Strategies

### Three Strategic Focus Areas for Brays Bayou Sustainability Planning

#### FOCUS AREA #1:

Business As Usual - Capacity and Additional Detention sites

#### FOCUS AREA #2:

Smart Infrastructure and Mitigation

#### FOCUS AREA #3:

Neighborhood/ Community level Mitigation and Adaptation (HOAs, SNs)



## NEW LIFE AT MEYERLAND VILLAGE



Shady Meadows Village, A Community on the Bayou





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