

# Wetland Loss in the Lower Galveston Bay Watershed: Causes and Concerns



Erin L. Kinney

Lisa A. Gonzalez

John S. Jacob

Rebecca R. DaVanon

Bradley S. Neish



**HARC**

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EXTENSION



# Wetland Values

## Biological Population Values

- Populations that depend on wetland habitats for their survival
- Waterfowls, Fish, Shellfish, Timber, T&E species

## Ecosystem Values

- Flood mitigation
- Fisheries support
- Storm surge protection
- Aquifer recharge
- Water quality improvement
- Aesthetics & Recreation

## Regional and Global Values

- Nitrogen, Sulfur, Carbon Cycles



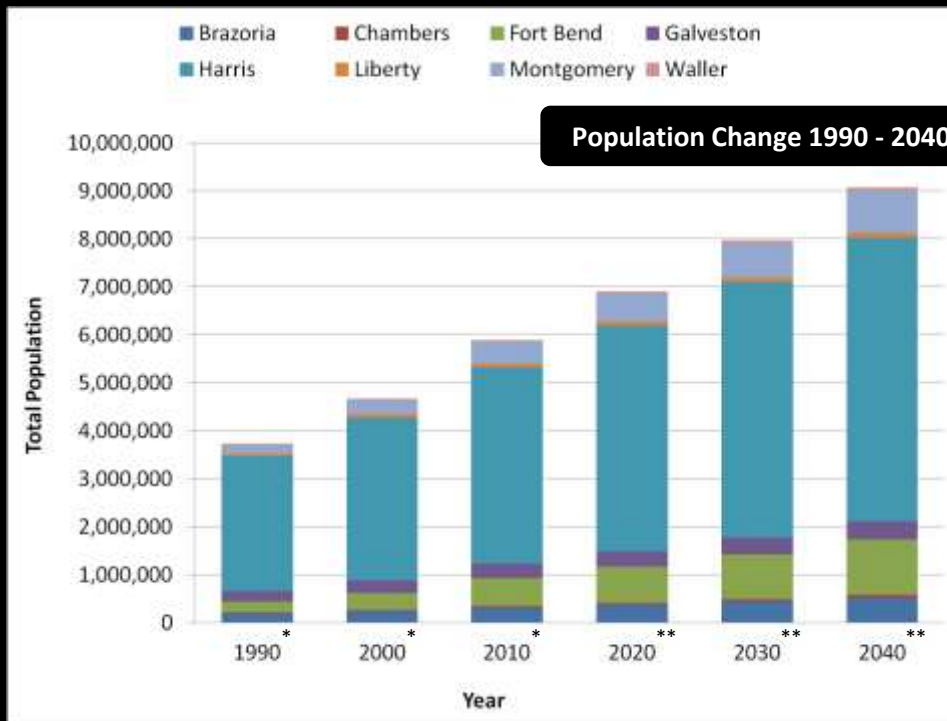
*Wetlands are “multiple-value” systems – valuable for many different reasons and the reasons may be different or mean more/less depending on the stakeholder*

# Wetland Regulation



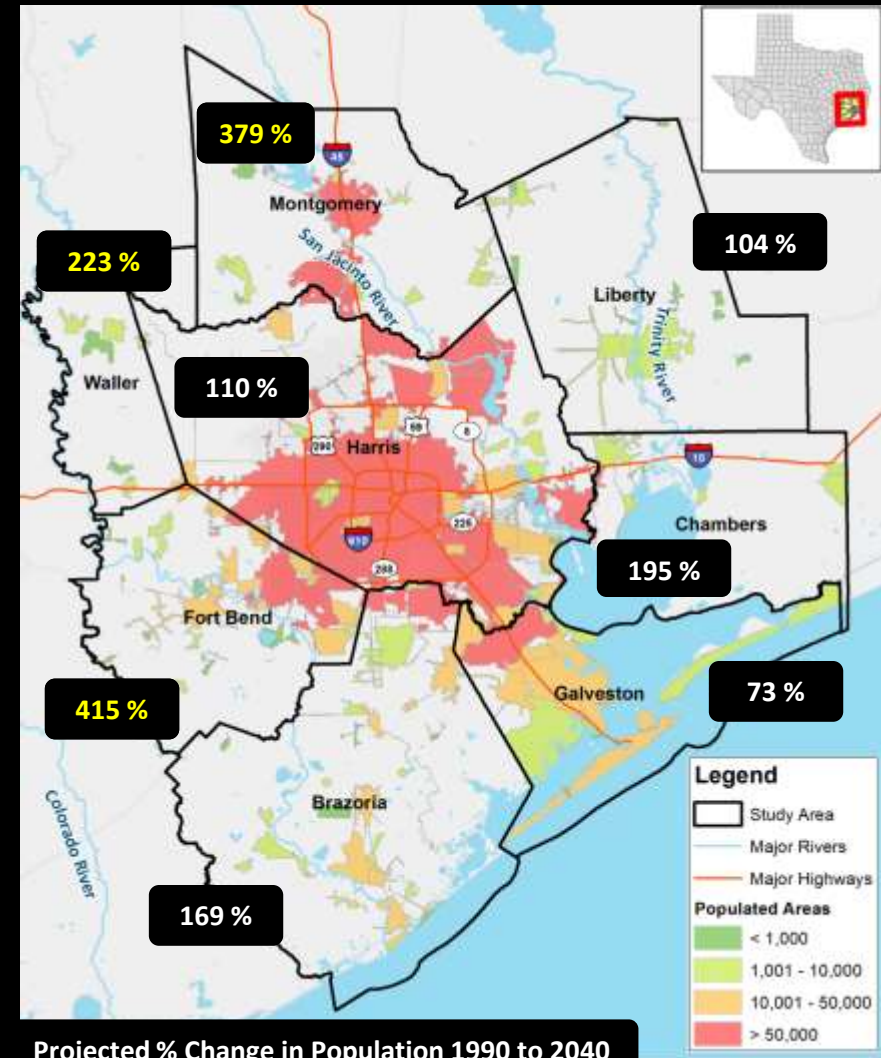
- **Federal**
  - No Net Loss Policy
  - CWA Sec 404; U.S. Army Corps of Engineers (USACE)
  - Supreme Court rulings: SWANCC & Rapanos-Carabell
  - US Army Corps of Engineers and EPA: Joint Guidance
- **Federal Consistency Review**
  - Clean Water Act Sec 401: implemented by TCEQ
  - Coastal Zone Management Act: implemented by GLO
  - Others...
- **Public comment**
  - Nonprofits
  - Citizens
- **Local**
  - Land development codes for subdivision plats and site plans in 8 counties and 118 municipalities in the study area

# Population Growth



\* US Census Bureau, Population Census

\*\* TX State Data Center, Population Projection



Projected % Change in Population 1990 to 2040



# Regional Wetland Loss

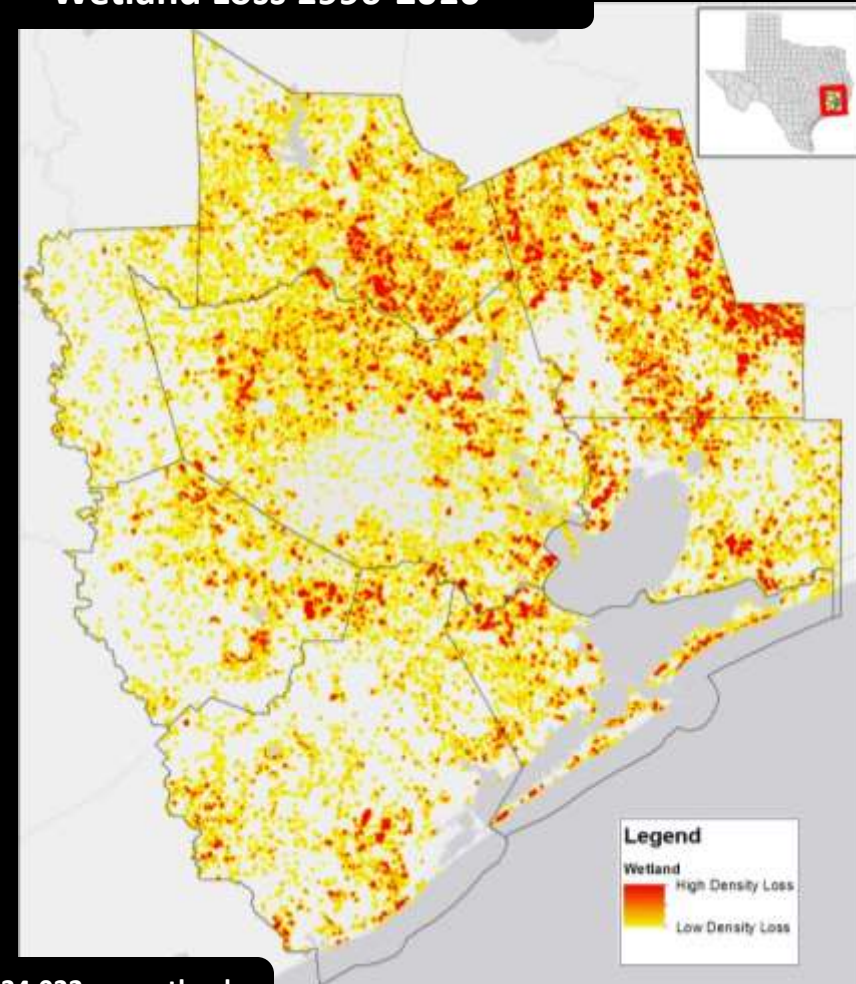


Wetland Classification	1953-1989 Change (Acres )	1996-2010 Change (Acres )
Estuarine Emergent	-9,480	580
Palustrine Emergent	-25,640	2,715
Palustrine Forested	+3,610	-43,492
Palustrine Scrub/Shrub	-860	1,304
<b>Total</b>	<b>-32,370</b>	<b>-38,893</b>

*Source:  
30 Quads  
(White et al.  
1993)*

*Data Source:  
8 Counties  
(NOAA C-CAP  
2010)*

## Wetland Loss 1996-2010



34,022 ac. wetlands  
lost to development



# 1996-2010 Wetland Change in 8 Counties

	Estuarine Emergent Wetland	Palustrine Emergent Wetland	Palustrine Forested Wetland	Palustrine Scrub/Shrub Wetland	<b>TOTAL</b>
Brazoria	71	653	-2,496	-1,442	<b>-3,214</b>
Chambers	331	-115	-2,222	-643	<b>-2,648</b>
Fort Bend	1	235	-3,088	-1,067	<b>-3,919</b>
Galveston	142	-1,117	-1,082	-1,289	<b>-3,346</b>
Harris	25	104	-10,918	-1,987	<b>-12,776</b>
Liberty	6	2,547	-15,035	6,238	<b>-6,244</b>
Montgomery	1	281	-8,220	1,296	<b>-6,642</b>
Waller	2	127	-430	198	<b>-103</b>
<b>TOTAL</b>	<b>580</b>	<b>2,715</b>	<b>-43,492</b>	<b>1,304</b>	<b>-38,893</b>

# Wetland Ecosystems Services

- Water Quantity

- Groundwater recharge
- Slowing surface runoff

- Water Quality

- Debris, suspended solids allowed to settle out
- Freshwater wetlands retain nutrients (Forbes et al. 2012)
- Freshwater wetlands retain bacteria
  - Longer residence times => better retention (Knox et al. 2008)

- Flood control

# Consequences of Wetland Alteration

- Most important built environment indicator of flood damage
- Wetlands reduce property loss from floods more so than Dams
- The Clean Water Act: to discharge dredged or fill material into the waters (including adjacent wetlands) of the U.S., must obtain a Section 404 permit from the U.S. Army Corps of Engineers (Corps)

County	Date	# of permits issued by Corps	Rainfall event in inches	Property Damage
Galveston	April 1997	546	.09	\$5,000
	September 2000	921	.09	\$100,000
Brazoria	June 1997	356	1.5	\$5,000
	August 2001	615	1.5	\$500,000
Harris	April 1997	685	3.66	\$131,000
	May 2000	1217	1.3	\$200,000

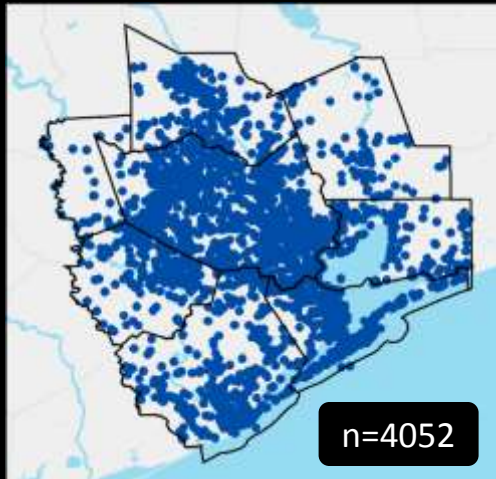




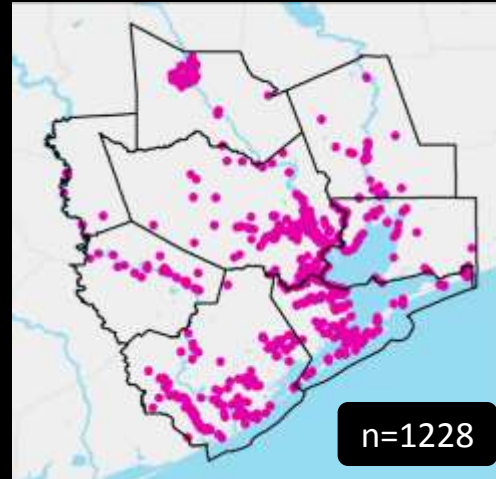
# **Army Corps of Engineers ORM II Permit Database**

# Corps of Engineers 404 Permits

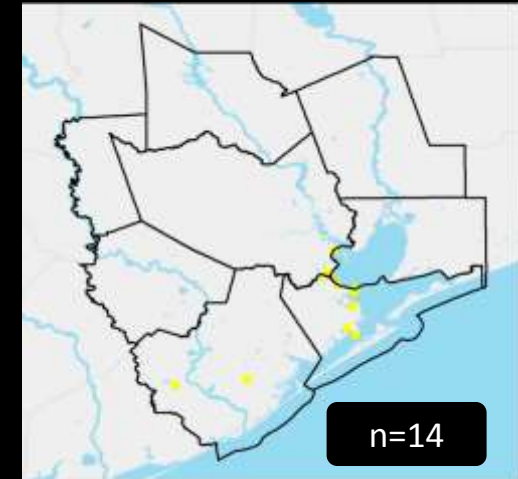
## 7,052 Permits by Type (1990-2012)



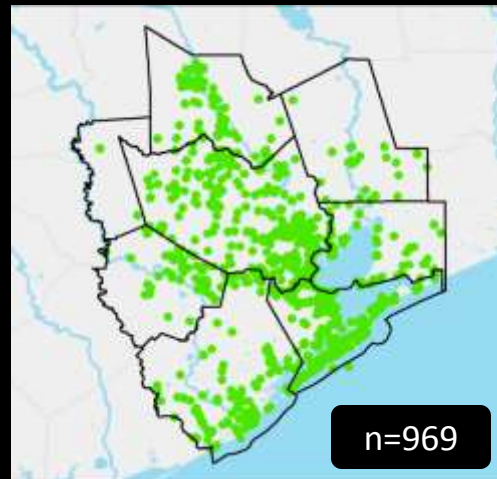
Nationwide Permit



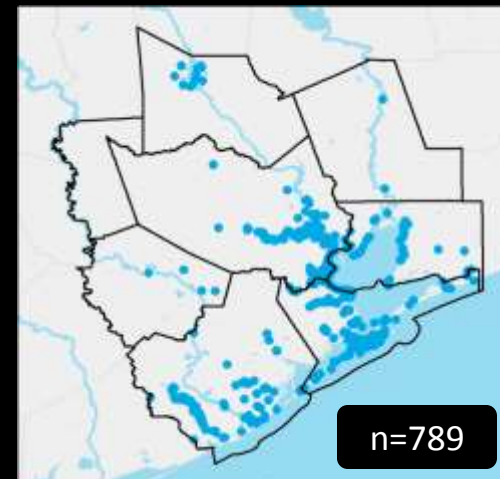
Regional General Permit



Programmatic General Permit

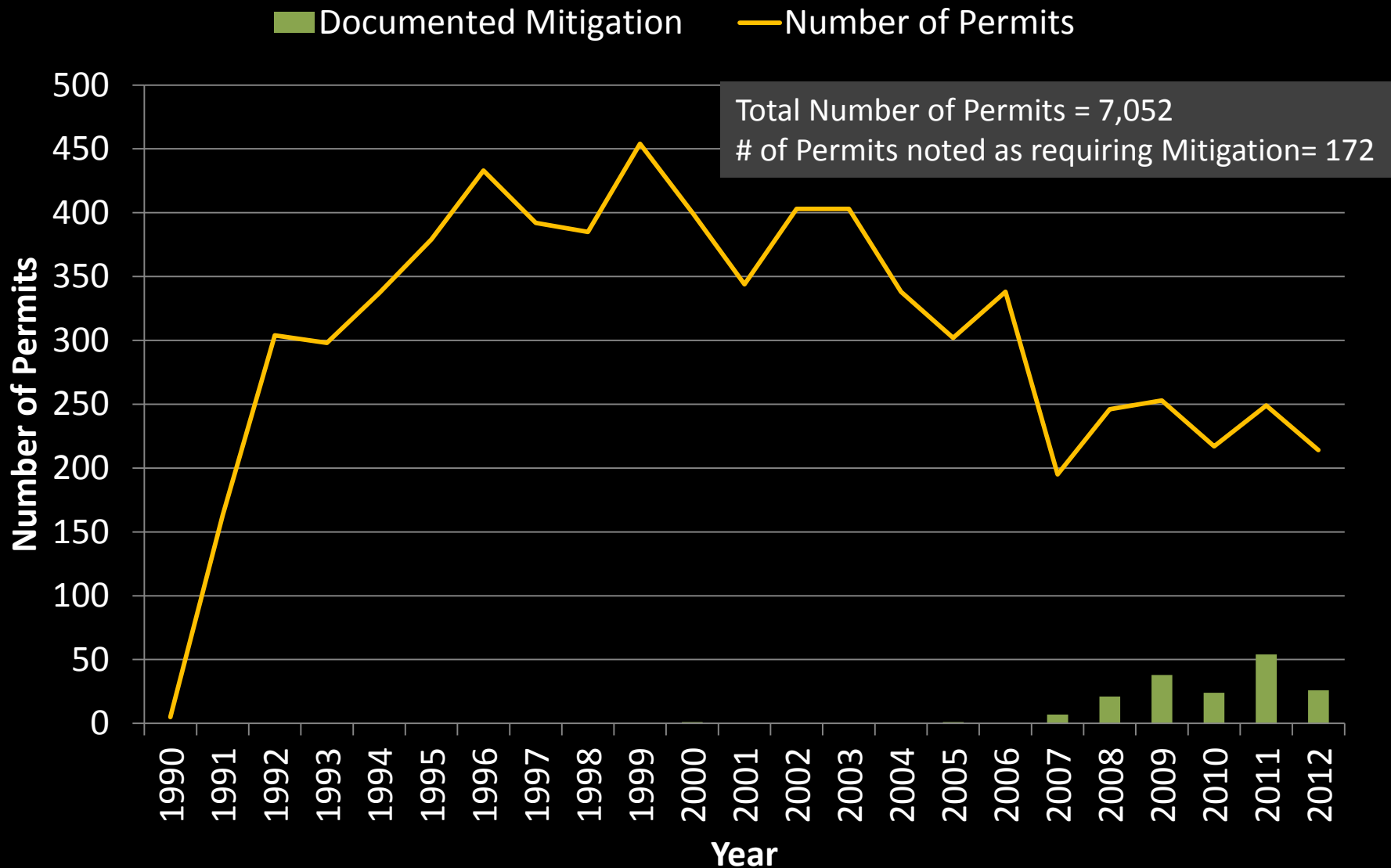


Standard Permit



Letter of Permission

# Required Mitigation by Year



**Of the 7,052 permits analyzed, 172 permits were documented as requiring mitigation.**



# Full Permit Analysis

# ORM II Permit Data Sampling Protocol



- Compiled list of ORM II and other known permits
  - 1990-2012
  - SP & NWP majority of permits listed as “mitigated” in ORM II
  - Sampled randomly: 3 time periods, 8 counties, wetland types, floodplain
- Randomly selected 100 permits
- FOIA Requests for full administrative record

## Review of Full Permit Records Complete (n=95)

- Focused on SP & NWP
- Pre-SWANCC, SWANCC, Post-Rapanos
- Inside/outside flood plain
- 8 counties
- Wetland type

# Full Permits

- Received 95 full permit records
- 50% SP, 50% NWP
- Much information in ORM II did not match full permit record
- Need full permit to examine compliance

## Review of Full Permit Records Complete (n=95)

- **42% out of compliance**
- **50% required mitigation**
- **58% of permits requiring mitigation out of compliance**
- **7 of 95 permits had compliance inspections on file**



# Corps Performance Targets



<b>USACE Regulatory Performance Measure</b>	<b>USACE Target FY2013</b>	<b>2008-2012</b>
General Permit Inspection Compliance	5%	9%
Individual Permit Inspection Compliance	10%	15%
Mitigation Site Inspection Compliance	5%	18%

# Full Permit Compliance



<b>Full Permit Compliance</b>	<b>This Study: 1990-2012 (n=95)</b>
Nationwide Permit Compliance	60%
NWPs with Mitigation Compliance	41%
Standard Individual Permit Compliance	53%
SPs with Mitigation Compliance	40%



# Compensatory Mitigation

- 3 types of Compensatory Mitigation
  - Permittee Responsible
  - In-Lieu Fee
  - Mitigation Bank
- 40 Permits had Permittee Responsible Mitigation
- 11 Permits had ILFs or Mitigation Banks
  - 2 permits for ILFs withdrawn
- Expect a shift from PR to MBs



# Mitigation Banks

- 10 24 Mitigation Banks with service areas within study area
  - 3 closest to Houston: Katy Prairie is full, Greens Bayou and Gin City are private
  - Only 3 of 10 MB permits use MBs in same HUC8 watershed as the impacted site (all Greens Bayou, none within HUC12)

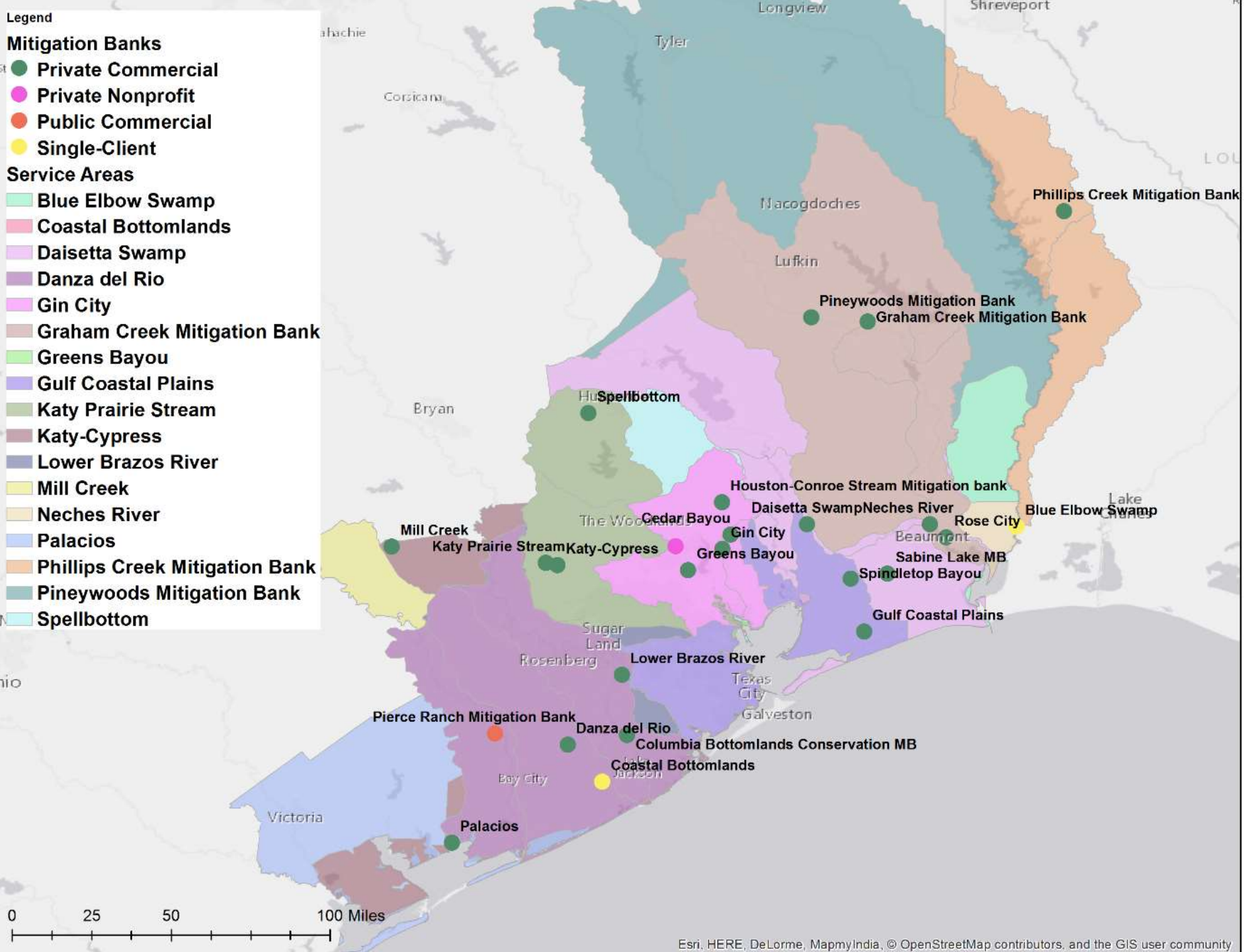
Legend

Mitigation Banks

- Private Commercial
- Private Nonprofit
- Public Commercial
- Single-Client

Service Areas

- Blue Elbow Swamp
- Coastal Bottomlands
- Daisetta Swamp
- Danza del Rio
- Gin City
- Graham Creek Mitigation Bank
- Greens Bayou
- Gulf Coastal Plains
- Katy Prairie Stream
- Katy-Cypress
- Lower Brazos River
- Mill Creek
- Neches River
- Palacios
- Phillips Creek Mitigation Bank
- Pineywoods Mitigation Bank
- Spellbottom





# 95 Full Permits: Wetland Acres Impacted and Mitigated

- Permittee Responsible Mitigation
  - 257 acres permanent impacts
  - 887 acres mitigated
- Mitigation Bank Credits
  - 111 acres permanent impacts
  - 24 credits + 302 acres





# Full Permit Analysis Conclusions

- ORM II dataset doesn't tell us enough about net wetland loss
- Federal permit inspection targets (5% compliance) met, but compliance is still low (58% all permits, 42% mit permits)
- Are mitigation acres staying within the same watershed?
- Development decisions of 8 counties and 118 municipalities in the study area are disconnected from the federal process

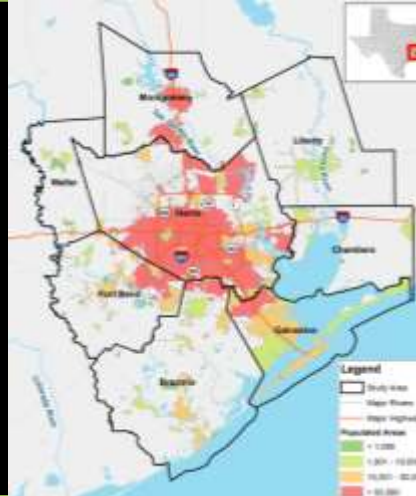


# Local Governments

# Local Land Use Permitting



## Building Permit Considerations



	Brazoria	Chambers	Fort Bend	Galveston	Harris	Liberty	Montgomery	Waller
Impacts to Wetlands / 404 Permit	✓	✓		✓	✓			
100-year Floodplain / Flood Mitigation	✓	✓	✓	✓	✓	✓	✓	✓
Septic Systems	✓	✓	✓	✓	✓	✓	✓	✓
Alteration of Natural Waterway			✓					
State Coastal Management Plan				✓				
Stormwater Management					✓		✓	
Low Impact Development					✓			
Parks & Open Space (in Subdivisions)		✓						

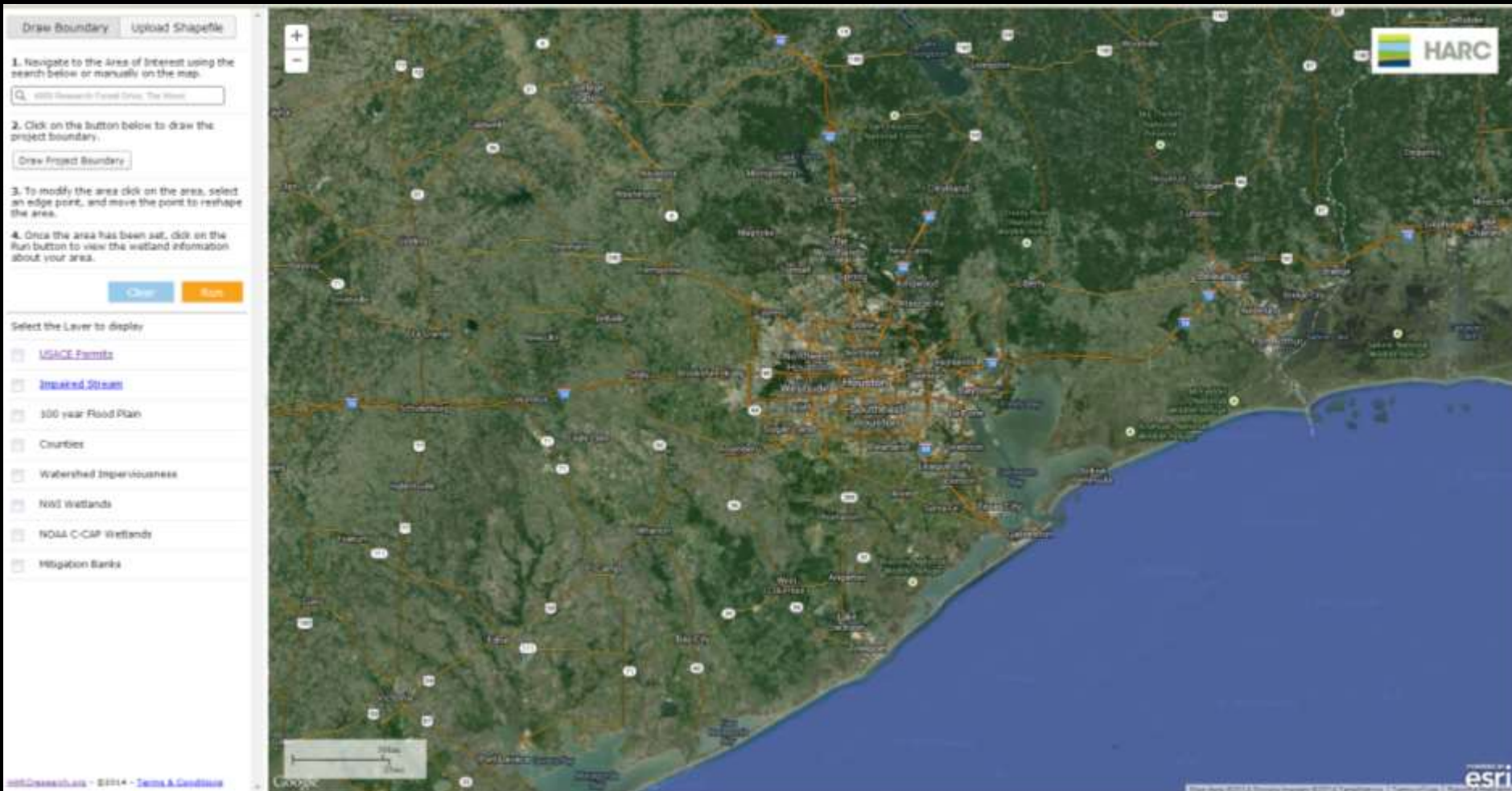
# Wetland Conservation on a Watershed Scale



- Development Permit Wetland Information Tool
  - Watersheds
  - Impervious Surface Area
  - 303d impacted streams
  - Wetland types (NWI and C-CAP)
  - 100 year floodplain
  - Mitigation Bank service areas
  - USACE Permits

<http://maps.harc.edu/WetlandTool>

# Development Planning & Watershed Information Tool



<http://maps.harcresearch.org/WetlandTool/>

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# Development Planning & Watershed Information Tool



## General Information

**Project Area:** 186.63 acres  
**County:** Harris  
**USACE Permits:** 1 SP

## Impacts

**Wetlands (C-CAP):** Palustrine Forested Wetland (81.3 acres)  
**Wetlands (NWI):** Freshwater Forested/Shrub Wetland  
**100-year Flood Plain:** Yes  
**Watersheds Impacted:** Clear Creek-Frontal Galveston Bay (22% imperviousness)  
**303(d) Impaired Streams:** [1197753](#)

## Mitigation

**Mitigation Banks:** [Coastal Bottomlands Primary](#), [Greens Bayou Primary](#), [Katy-Cypress Secondary](#), [Katy Prairie Stream Secondary](#), [Lower Brazos River Secondary](#), [Mill Creek Secondary](#)

Export as Shapefile

Export Results as CSV

<http://maps.harcresearch.org/WetlandTool/>

# Conclusions



- Federal regulatory policy of “No Net Loss” really means no net loss of jurisdictional wetlands
  - Transparency issues
    - Limited information available in ORM II database
    - Information in full permits difficult to access and analyze; barrier to public and private entities looking at wetland permitting
  - Success of mitigation unclear
    - Majority of mitigation is permittee responsible but changing with additional mitigation banks pending and approved
    - Mitigation likely not occurring at appropriate watershed scales (e.g. mitigation banks)
- Local permitting decisions disconnected from federal permitting process. Need to build decision making capacity of local governments.

# Next Steps – Phase II



- Compare Corps mitigation requirements to habitat restoration metrics from scientific literature
- Assess long term status of mitigation in region
  - Request additional mitigation information for permits issued since 2008
  - Ground truth mitigation sites with location information
- Reach out to local governments, planners, developers and citizens groups to enhance mapping tool and train on use



# Wetland Projects at HARC



## Galveston Bay Report Card

- [www.GalvBayGrade.org](http://www.GalvBayGrade.org)
- Freshwater and saltwater wetland loss grades by watershed

## Wetland Friendly Drilling Application

- [www.HARCresearch.org/WFDApp](http://www.HARCresearch.org/WFDApp)
- Searchable database of wetland impact minimization measures for oil and gas exploration

## Texas Gulf Coastal Wetlands StoryMap

- [www.HARCresearch.org/WFDStory](http://www.HARCresearch.org/WFDStory)
- GIS maps and applications illustrating wetland functions, bird and fish populations, and impacts of oil and gas exploration

# Thank You



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EXTENSION



TEXAS COASTAL WATERSHED  
PROGRAM

