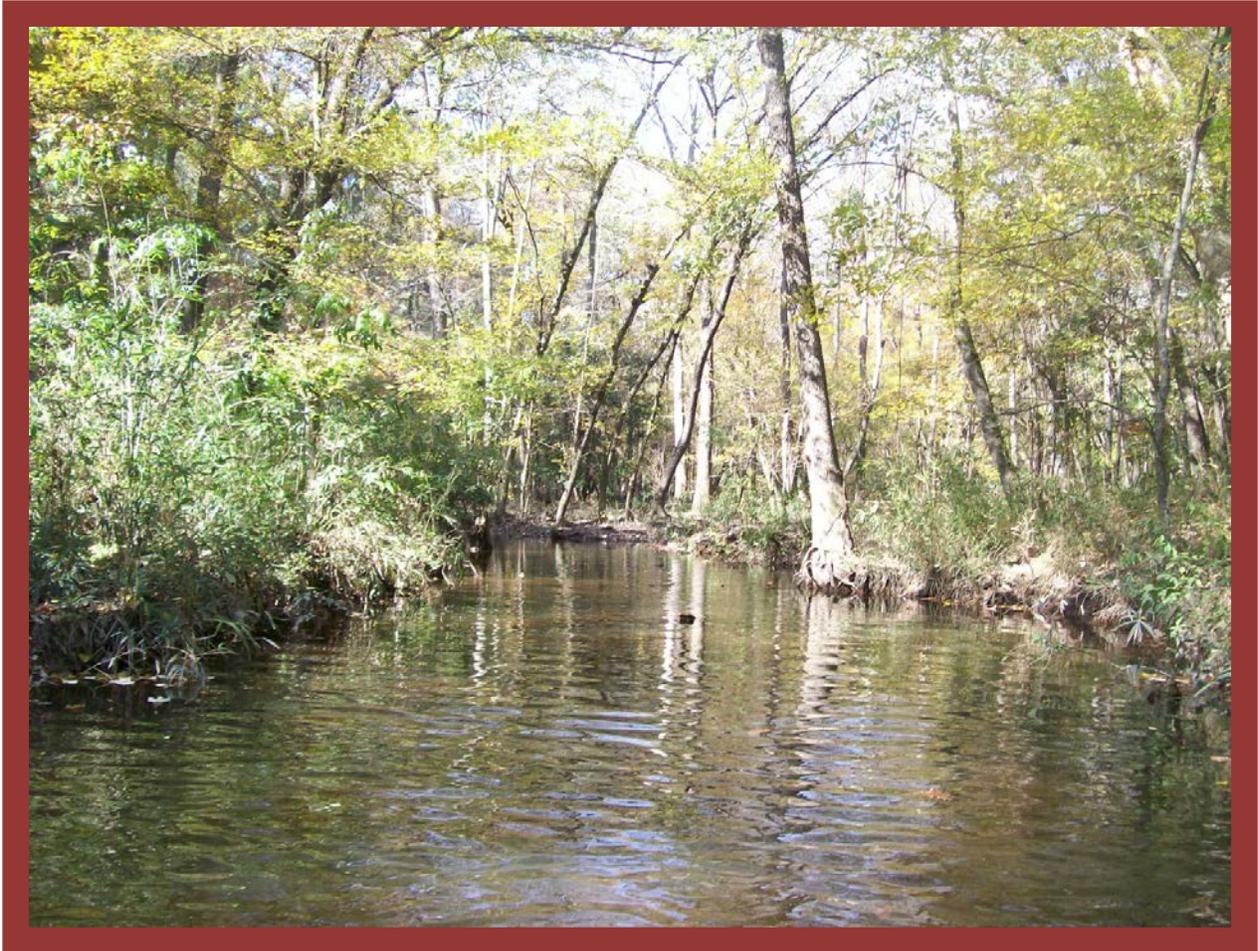


**APPENDIX K:
WETLAND MITIGATION WHITE PAPER**

WHITE PAPER

Wetland Mitigation Opportunities in the Houston-Galveston Region



Prepared by



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Photo Credit: Paniz Bighash

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EXECUTIVE SUMMARY

This paper examines an approach for wetland mitigation in the Houston-Galveston Region as related to Regional Transportation Plan (RTP) implementation. The development of transportation projects sometimes require unavoidable impacts to wetland resources that normally convey a multitude of ecosystem services. In such circumstances, the US Army Corp of Engineers (USACE) requires transportation authorities to pursue compensatory mitigation to offset adverse impacts associated with a transportation project impacting jurisdictional wetlands. This system allows for communities to sustain the functionality and protection that wetlands provide while allowing for transportation facilities that support and sustain economic development within the same area. Impacts to wetland areas must be avoided and minimized to the greatest degree practicable, but if impacts are ultimately unavoidable, there are three approaches that may be used to satisfy compensatory mitigation requirements:

- Implement a mitigation project that is constructed and managed by the responsible party,
- Purchase compensatory mitigation credits from an approved third-party mitigation bank, or
- Use in-lieu fees (ILF) paid to a third party government or non-profit organization to implement and manage a mitigation site for the permittee.

Within the Houston-Galveston Region, there are a number of existing and pending wetland mitigation banks in the region and a number of qualified potential partners. The extent and location of potential transportation projects as identified in the 2040 Regional Transportation Plan, the Houston-Galveston Area Council is attempting to identify and minimize future impacts generated by these projects by examining mitigation banking processes as they apply to the region, understanding the existing conditions, and identify opportunities for future engagement. This entails creating a comprehensive inventory of these banks (Figure 1, Table 2) and applicable regulations and mitigation processes that might be required. The intent is to determine if and where mitigation banks are available and evaluate if current banks are sufficient enough to offset impacts of future transportation projects in the region.

An inventory of local mitigation banks which includes the entity information, acres and credits available has been compiled. An estimate of wetland impacts associated with potential RTP projects within the Metropolitan Planning Organization (MPO) boundaries has also been created (Figure 2). When this information is combined, it becomes apparent that the 6,194 compensatory mitigation credits available (Table 4) are disproportionately distributed within the Houston-Galveston Region. The northern (portions of Harris, Montgomery and Waller counties) and, to a lesser extent, the southern (portions of Brazoria, Chambers, Galveston, and Harris counties) areas of the region (NW1, NE1, SE1, and SE2) lack approved mitigation banking options (Figure 1). Considering that these banks also provide credits to other commercial and residential developments, it becomes clear that future planning should consider expanding the location and credits available to offset future wetland impacts from RTP projects.

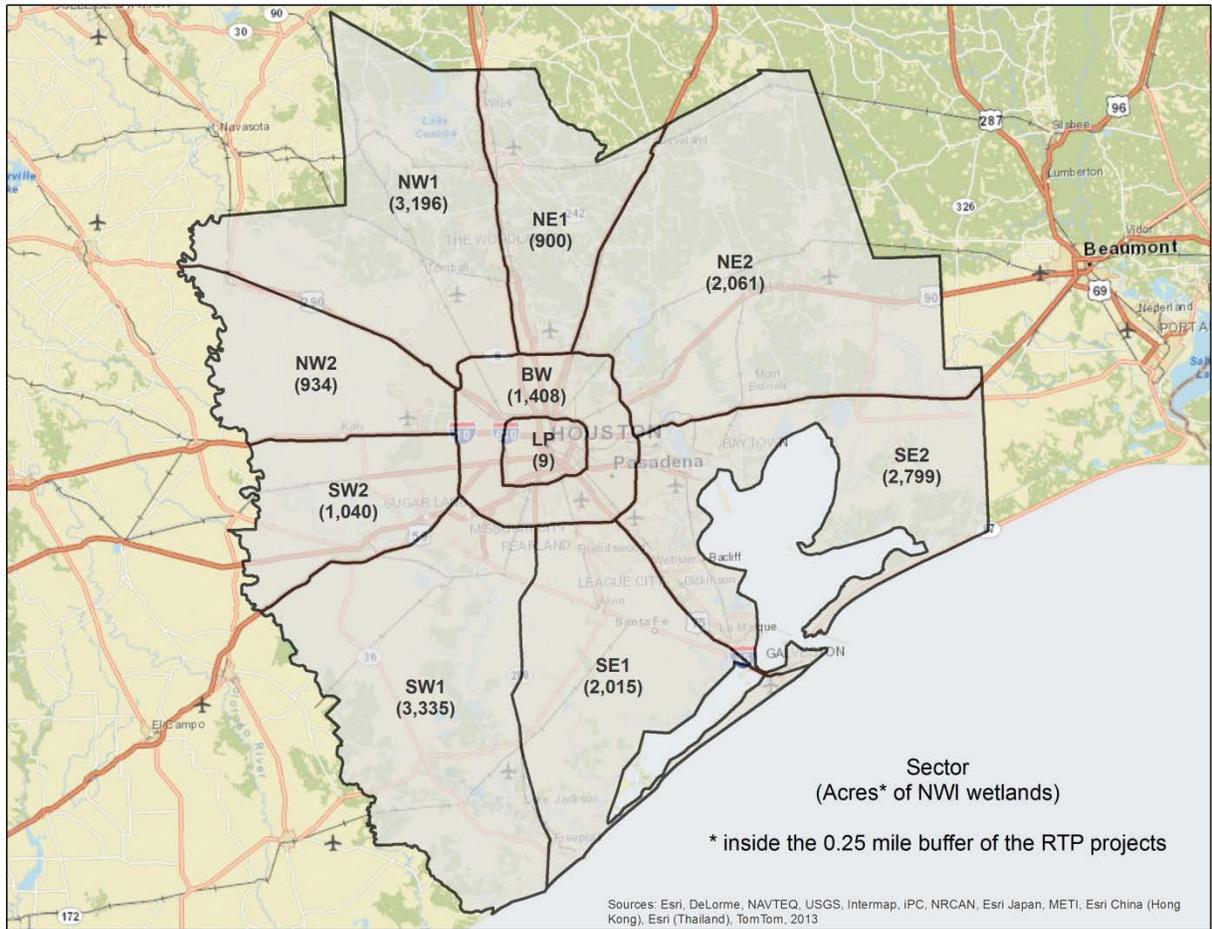


Figure 2 Potential RTP impacts in Acres to National Wetland Inventory delineated wetlands using 0.25 mile buffer across ten RTP planning sectors. Acres of NWI wetland are in parenthesis.

Examining with other partners the potential impacts to natural resources generated by future transportation investments and addressing them can create long term benefits for the region that include:

- Advancing planning efforts to anticipate and mitigate impacts associated with roadway development such as induced secondary development,
- Leveraging private sector opportunities, interests, and needs,
- Engaging in earlier discourse with non-profits working in the region, and
- Partnering with conservation entities and establishing a relationship that enhances mutual conservation goals and building ‘good will’.

As a result of this exercise, an approach for the developers of the RTP to consider, include:

- **Mitigation Plan.** Develop and implement a regional mitigation plan that will offset future wetland mitigation, build in cost-saving efficiency, and recognize the need to develop banks now as the cost of land continues to increase.

- **Mitigation Banks and Credit Availability.** Recognizing that there could be a future deficit in available compensatory mitigation credits, expand the number of mitigation banks to increase the availability of mitigation credits.
- **Broaden Partnerships.** There is an opportunity to expand the RTP planning process to include additional partners to assist in coordinating the development of new banks, establishing common goals, and building support.
- **Identify Opportunities.** Through planning consider mitigating direct and secondary impacts to wetland and other natural resources through a larger regional approach that can be the nexus for implementing multiple local and regional planning goals. Banks and conservation lands can serve multiple quality of life purposes: support recreation, green space, improve water quality, prevent flooding, develop economic drivers (i.e. ecotourism, carbon credits), commercial and recreational fishing, and a destination for diversified workforce.

INTRODUCTION

The Houston-Galveston Region is growing at a rapid rate and is anticipated to double by 2050. As the population grows, so does the need for additional transportation infrastructure. The U.S. Department of Transportation (DOT) requires that regional transportation plans be conducted on a 20 year cycle. The current regional transportation plan for the Houston-Galveston Region extends until the year 2040. Implementing this regional transportation plan will have an effect on people and the environment.

The Moving Ahead for Progress in the 21st Century Act of 2012 (MAP-21) reauthorized federal aid for transportation projects and guides transportation policy. Included within MAP-21 are several provisions that guide long range planning of transportation projects. Section 1320 of MAP-21 encourages early coordination activities to avoid delays later in the process and Section 1311 of MAP-21 encourages the development of programmatic mitigation plans to help identify mitigation needs earlier in the transportation planning process to target conservation in a more effective manner (Ashe 2013, See Appendix A). In response to MAP-21, the Houston-Galveston Area Council created a Regional Transportation Plan that identifies transportation needs, goals, and policies through the year 2040.

Wetlands of various types are scattered throughout the region. Wetlands are a valued resource by many residents and serve important functions within the environment. Federal regulations state that impacts to jurisdictional wetlands should be minimized and avoided to the maximum extent practicable. When impacts cannot be avoided, compensatory mitigation may be required to offset these impacts. The compensatory mitigation process is lengthy (Figure 3) and can needlessly delay projects and cause cost over-runs if coordination and planning is insufficient. A region-wide planning approach to compensatory mitigation will assist transportation planners prevent these delays and garner public support while being strong stewards of the environment.

This paper defines an approach for addressing the jurisdictional wetland mitigation process associated with RTP implementation. Our recommendations are based upon analysis of proposed transportation corridor data from the RTP, wetland mitigation bank locations and estimated wetland coverage data. In addition, the region's environmental characteristics are reviewed and other resource conservation opportunities are considered beyond a strict jurisdictional approach. Our analysis and recommended approaches are consistent with all applicable regulations and requirements outlined in the compensatory mitigation 404(b)(1) Guidelines (40 CFR 230).

The purpose of this document is to aid stakeholders and project managers in minimizing project development costs, minimizing risk, and accelerating project delivery time by providing information and supplemental resources that will facilitate the completion of all phases of the mitigation planning process.

Wetland Mitigation Defined

Roadway and transportation infrastructure development is necessary to accommodate and sustain the region's extensive population and economic growth. The development of transportation infrastructure often times results in unavoidable impacts to natural resources. Wetlands are an essential component to the functioning natural system. Section 404 of the Clean Water Act prohibits the unauthorized discharge of dredged or fill material into navigable waters, including rivers, streams and wetlands, of the United States. The U.S. Army Corps of Engineers (USACE) is responsible for authorizing placement of dredged or fill material in these waters. One must apply for a permit with the USACE to receive authorization to place dredged or fill material into waters of the U.S. Permittees must demonstrate that they have avoided and minimized adverse impacts to wetlands to the maximum extent practicable. Any unavoidable impacts must be compensated through compensatory mitigation (Teal and Johnston 2004). The Clean Water Act Section 404(b)(1) Guidelines grant the authority to create guidelines governing the placement of dredged and fill material in waters of the US (Normanly and Vacca 2008). The regulations governing compensatory wetland mitigation to satisfy legal requirements are outlined in 40 CFR 230.91-99. 33 CFR 325.4(a) provides USACE authority to require compensatory mitigation as a result of the public interest review as well.

Mitigation intends to achieve the restoration, creation, enhancement, or preservation of a wetland, stream, or other habitat area for the purpose of compensating for unavoidable losses. This includes impacts associated with infrastructure development projects. There are three different approaches a permittee may use complete compensatory mitigation in accordance with state and Federal regulations;

- *Permittee-Responsible* - implement an on-site or off-site mitigation project that is constructed and managed by the permittee
- *Mitigation banking* - purchasing mitigation credits from an available and functioning third-party mitigation bank in or outside the affected watershed, or
- *In-lieu fee payment* – purchase mitigation credits through an approved in-lieu fee program established by a third party government or non-profit organization to implement and manage a mitigation site for the permittee in or outside the affected watershed.

TEXAS WETLAND MITIGATION BANKING PROCESS

In accordance with Federal regulations established for compensatory mitigation, Texas published guidelines that further define the rules and mitigation processes required for projects with adverse impacts to jurisdictional wetlands in the State. 31 TAC §501.23(a)(6) states that when adverse impacts to critical area functions and values must be replaced at a minimum offset to impact ratio of 1:1. There may be certain circumstances where the adverse effect is so severe that the activity may not be permitted regardless of the proposed compensatory mitigation plan (Teal and Johnston 2004). Figure 3 outlines the various steps one must take when compensatory mitigation is required to receive permit from USACE.

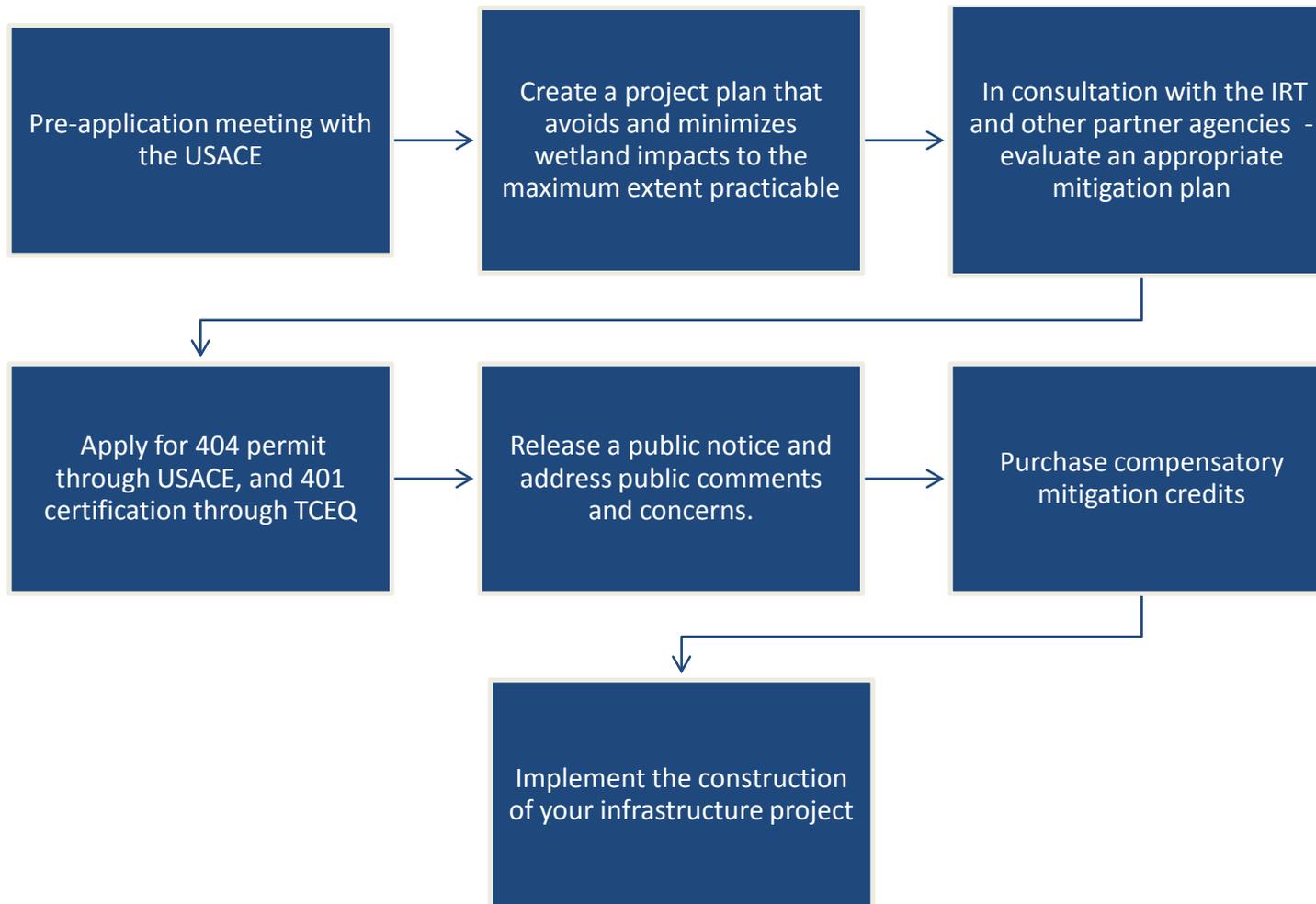


Figure 3 Flow Chart Illustrating the Clean Waters Act Section 404 Permitting Process

The USACE conducts a wetland functional assessment to determine the compensatory mitigation to be required for a permitted activity. Each USACE district has adopted a region specific functional assessment approach. The USACE Galveston District utilizes the Interim-Hydrogeomorphic Approach to Assessing Wetland Functions (iHGM) to conduct wetland functional assessments. There are iHGM models for 1) tidal wetlands, 2) forested riverine wetlands, 3) non-forested riverine wetlands, and 4) lacustrine (lakeside) wetlands. Refer to the USACE, Galveston District iHGM SOP when impacts exceed 3 acres in cumulative size.

Mitigation and Credit Process Requirements for Transportation in Texas and Peer States

The USACE set up rules in 1994 for transportation related mitigation banks. The Texas Department of Transportation (TxDOT), Fort Worth District, established three mitigation banks in the 90's using state funds that were brokered by the Texas Parks and Wildlife Department (TPWD). These mitigation banks, Anderson Tract (TxDOT's first wetlands bank), Blue Elbow, and Yoakum – Columbia Bottomlands (Table 1), were set up specifically for the purpose of preservation due to an identified imminent threat. Several people who have been involved in the process about the creation of these wetland banks and how they are run were contacted.

All “reasonable and feasible” methods are used to avoid damage to a wetlands site, but when it can't be avoided wetlands at sites are taken against the bank total at a ratio depending on the wetland type and age. Banks are expected to serve an area for more than 15 years– Conversation with Tom Bruecher – FHWA

Creating a new land bank approved is a time consuming process – at least 1.5 years, there is a time limit which USACE had to approve them. TxDOT has a manual about how to secure mitigation in advance – a way for them to spend the money, but removes their liability – the banks are run privately. Costs are determined by a variety of factors including size, but there are also many fixed costs such as land, management, maintenance, liability, and potential disasters. It also depends on if they are doing restoration or enhancement.

– Conversation with Travis Hamrick of Restoration Systems (NC)

TxDOT's mitigation banks are used exclusively to compensate for unavoidable impacts resulting from TxDOT transportation projects. Because these are TxDOT exclusive banks, project managers do not purchase mitigation credits, but rather deduct from the accounting ledger pursuant to any USACE permit. TxDOT has designated TPWD as the responsible party for long-term management of the sites (Teal and Johnston 2004).

Texas is one of four states (also North Carolina, Kentucky and Minnesota) that allow third party mitigation agents to manage the short and long term aspects of wetland banking. The Texas Parks and Wildlife Department serves as the third party mitigation agent for TxDOT. Water rights and mineral rights can raise challenges for mitigation banks if these rights are not secured with the title easement.

Mitigation Bank	Banker	Manager	Land Owner	Total Acres	Available Credits	Mitigation Method
Blue Elbow Swamp	TxDOT Susan Shuffield	TPWD	TPWD	2841	2432.6	Preserved and Enhanced
Coastal Bottomlands	TxDOT Susan Shuffield	TPWD	TxDOT	3552	1016.8	Preserved, Restored, Enhanced, and Created

Table 1 List of TxDOT Mitigation Banks in the Region as of December 2013

Analysis and Assumptions

The analysis that follows uses current projected RTP projects within the Metropolitan Planning Organization sectors for the Houston-Galveston region (Figure 2). The analysis while a useful tool for the planning purposes of the RTP should not be used to account for future direct wetland impacts due to too much uncertainty:

- 0.25 and 0.5 mile buffers were used to represent a typical 120 foot wide road project since road alignments are not currently set.
- USFWS National Wetlands Inventory (NWI) was developed to provide wetland analysis at a national or state scale and under reports at a local or regional scale. NWI is not collected to delineate jurisdictional wetland boundaries, and thus this analysis should not be considered as defining future regulatory mitigation requirements. It is assumed that when NWI identifies a wetland, then the wetland is present.

These buffered road “corridors” were then placed over NWI data for the region to estimate potential wetland impacts within the MPO sectors (Figure 2, Table 9). When the corridor bisects an identified wetland, the amount (acre) of wetland the corridor covered up was considered impacted. A similar process was performed for:

- Mitigation Bank Primary Service Area (Figure 1, Table 4)
- H-GAC’s Ecologic, a habitat model that prioritizes important habitats as either “high” or “low” value throughout the region (Figure 6, Table 12).

Analysis of Existing Mitigation Banks

There are several approved and pending (typically available in 1-3 years) mitigation banks within the region that can be utilized for compensatory mitigation (Table 2, Table 3). These banks may be used for a transportation project if the project boundary falls outside of the primary service area for a TxDOT mitigation bank. Estimated wetland impacts associated with the H-GAC RTP plan were determined Table 4 presents mitigation bank available credits in relation to wetland impacts from potential RTP projects. An evaluation of the cumulative acreage impacts from potential RTP projects using sectorized areas (Figure 2) that fall within approved mitigation bank primary service areas in the region are presented in Table 5. Approximately 16% of impacts associated with potential RTP projects fall outside of the current mitigation bank

primary service area and would possibly require mitigation through an alternative off-site mitigation strategy.

Mitigation Bank	Banker	Total Acres	Available Credits
Pineywoods	Preston Smith Working-Lands Investment Partners, LLC	19,079	> 2,000 (Pending Credit Releases)
Danza Del Rio	Codi Moore Delta Land Services	604	~78
Katy Prairie Stream	George Howard & Travis Hamrick Restoration Systems, LLC	500-550	~20,000 (Pending Credit Releases)
Greens Bayou	Glenn Laird & Becky Martinez For Harris County Flood Control District	1,400	~30 (Pending Credit Releases)
Lower Brazos River	Keith Morgan Berg-Oliver Associates, Inc.	297	Sold Out/Reserved (Pending Credit Releases)
Mill Creek	Larry Gremminger Gremminger and Associates, Inc.	188.6	Sold Out (Pending Credit Releases)
Gulf Coastal Plains	Danny Moran EcoSystem Renewal	1850	928
Daisetta Swamp	Troy Madrigal Mitigation Solutions USA	604	Biological: 19.9* Total: ~ 130
Spellbottom	Troy Madrigal Mitigation Solutions USA	851	Sold Out (Pending Credit Releases)
Katy-Cypress	Lieven Van Riet KC Wetlands	483	Sold Out

Table 2 List of approved mitigation banks in the Houston-Galveston Region as of April 2014.

Note: Additional credit releases are scheduled where mentioned, which will re-open or increase the available credits for purchase in the future.

**Biological credits are the limiting factor. Once Biological is sold out, no other credits are available for purchase.*

Mitigation Bank	Banker	Total Acres	Anticipated Credits
Cedar Bayou	Danny Moran EcoSystem Renewal	1061	758 Wetland 20,425 Stream LF
Columbia Bottomlands Conservation MB	Will Donaldson Resource Environmental Solutions	952	Unknown
Gin City	Michael Souliere SWCA	544	Unknown
Pierce Ranch	Keith Morgan Berg-Oliver Associates, Inc.	1368	Unknown
Spindletop Bayou	Danny Moran EcoSystem Renewal	400	266 Wetland 9,000 Stream LF

Table 3 List of mitigation banks in the area pending approval as of April 2014

Name	Available Credits	0.5 mile buffer		0.25 mile buffer	
		Total Acres	Potential Impaired Wetland Acres	Total Acres	Potential Impaired Wetland Acres
Blue Elbow Swamp	2,387	30,922	3,142	15,190	1,424
Cedar Bayou	758	22,797	3,088	10,986	1,412
Coastal Bottomlands	1,150	277,692	18,862	140,824	8,268
Daisetta Swamp	131	6,920	166	3,374	100
Gin City	544	27,423	3,739	13,468	1,648
Greens Bayou	30	237,356	15,210	113,224	6,887
Gulf Coastal Plains	928	9,052	340	4,541	173
Spindletop Bayou	266	109	14	1	0
Totals	6,194	612,270	44,560	301,608	19,911
<ul style="list-style-type: none"> <i>Note: Wetland impacts presented here and other tables were delineated by NWI and do not determine a jurisdictional wetland impact. Use of 0.25 and 0.5 mile buffers to represent a typical 120 foot wide road project since road alignments are not set.</i> 					

Table 4 Total acres and wetland acres impacted within the primary service area of mitigation banks in the Region.

We have identified the location of all approved wetland and stream mitigation banks in the area (Figure 1). It is evident that the northern and to a lesser extent southern reaches of the region lack approved mitigation banking options (Table 5); however, there are several pending mitigation banks that may fill this deficit within the coming years (Table 3). It should be noted that the service area locations for each mitigation bank are not shown here but may potentially extend into the un-represented spatial zones (i.e., SW2, NW1, NE1, SE1, and SE2). It should also be noted that these credits are available on a "first come, first served basis" and could be sold to private interest (e.g. residential and commercial developments, pipeline construction, etc.) that might be in competition with future RTP projects

Land Trusts

There are three accredited land trusts in the area: Texas Land Conservancy, Bayou Land Conservancy, and Galveston Bay Foundation. Land Trusts are accredited by the Land Trust Accreditation Commission based on Land Trust Standards and Practices – to measure the quality of a land trust’s work and its ability to meet obligations to the land and landowners based on the following criteria: responsible governance, ethical operations, protection of public interests, sound and sustainable land transactions and stewardship, accountability to the public and donors, and compliance with laws.

Section	0.5 mile buffer				0.25 mile buffer			
	Inside WMB Primary Service Areas	Outside WMB Primary Service Areas	Total Impact	Percent Inside WMB Primary Service Areas	Inside WMB Primary Service Areas	Outside WMB Primary Service Areas	Total Impact	Percent Inside WMB Primary Service Areas
BW	68,477	0	68,477	100%	33,424	0	33,424	100%
LP	12,236	0	12,236	100%	5,673	0	5,673	100%
NE1	12,497	19,506	32,003	39%	5,766	9,454	15,220	38%
NE2	33,596	9,029	42,625	79%	15,982	4,419	20,401	78%
NW1	57,785	48,799	106,584	54%	27,787	23,699	51,485	54%
NW2	23,028	2,953	25,981	89%	10,776	1,365	12,141	89%
SE1	93,470	261	93,731	100%	47,884	62	47,945	100%
SE2	59,329	1,013	60,342	98%	29,177	485	29,663	98%
SW1	93,626	3,117	96,743	97%	47,495	1,339	48,834	97%
SW2	53,841	11,122	64,963	83%	25,940	5,208	31,148	83%
Total	507,886	95,800	603,685	84%	249,902	46,031	295,933	84%

Table 5 Potential RTP project wetland impacts using a 0.25 and 0.5 mile buffer that could require mitigation through current or future mitigation banks based on the banks' primary service area.

The three local land trusts do not run their own banks, but hold the easements for mitigation banks. A considerable amount of land is held under conservation easements in the Houston-Galveston Region (Figure 4) Texas land trusts present an opportunity for transportation planning to develop local public-private partnerships. As stated previously, MAP-21 spells out the need for long range mitigation planning. Land trusts also engage in long range planning and have conservation and restoration goals in mind. Land trusts and other conservation organizations target large conservation projects and look for opportunities to establish conservation corridors (e.g. Houston Parks Board’s Bayou Greenways 2020 and Houston Wilderness’ Sam Houston Greenbelt Network) to offset the problems that stem from habitat fragmentation and to provide broader ecological benefits and long range land management cost savings.

For the RTP, there are benefits in long range planning and coordination with land trust and other conservation organizations. Coordinating provides: long-term management and monitoring experience, conservation practices that are scientifically-based, and an opportunity to build mutual trust and good will during the decision making process.

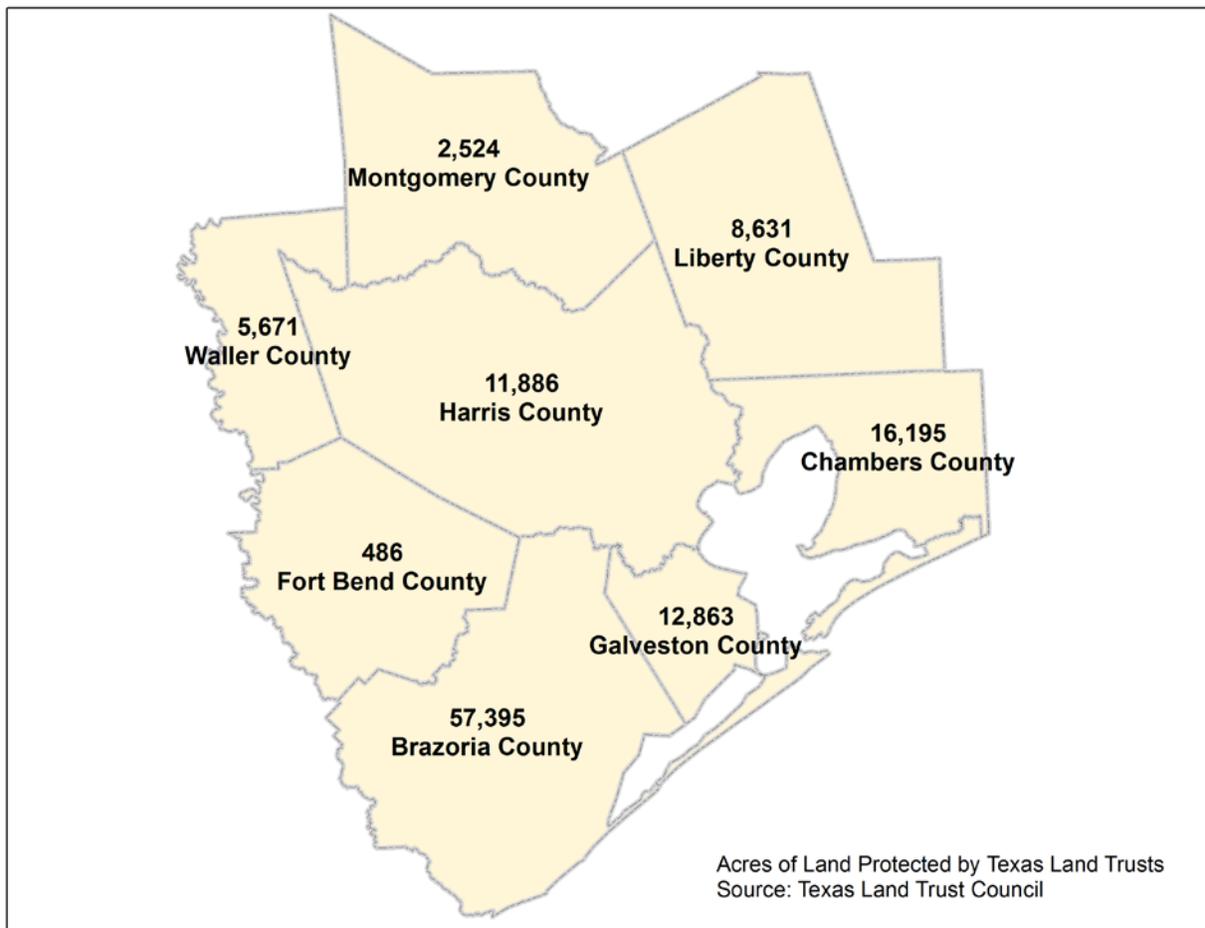


Figure 4 Acres of land protected by Texas land trusts for each county in the region

Potential Partners

There are numerous potential private partners representing profit and not for profit organizations within the region (Table 7, Table 8). In areas where current mitigation banks do not exist, these partners present an opportunity to coordinate development of a new bank or an in-lieu fee program. The funding programs listed below do not provide funding for mitigation costs, but rather provide funding for the purchase of conservation easements or fee simple acquisition. Thus, these programs could help support the purchase of land that could contain a future mitigation bank or in-lieu fee program in conjunction with a local partner.

Environmental Characterization

The USACE defines a wetland as an area that is inundated or saturated by ground or surface water at a frequency to support the formation of hydric soils and hydric vegetation. Wetland habitats can exist across the state of Texas. These wetlands can be tidally influenced by the Gulf of Mexico, non-tidally influenced or even isolated depressions. We have provided a brief description of the various wetland types typically encountered (Table 6).

Acres of Impact of RTP Projects

Of the total wetland acres impacted by potential RTP projects in the region as identified in the 2040 RTP Update, approximately 6-7% would be to wetland areas (Table 9) currently delineated by the National Wetlands Inventory (NWI). A total of 40,342 acres of wetlands might require mitigation by TxDOT and other transportation authorities (Table 9).

Wetland Type	Description
Estuarine Emergent	Tidal wetlands dominated by rooted emergent herbaceous vegetation. Water levels fluctuate with tidal cycle in these areas.
Estuarine Scrub-Shrub	A coastal swamp in subtropic and tropical wetlands that is tidal and dominated by halophytic (salt-tolerant) woody species, including mangroves.
Lacustrine Emergent	Herbaceous rooted vegetation found in the “shore-zone” along lakes and deep reservoirs, lacking persistent vegetative cover.
Palustrine Aquatic Bed	Dominated by floating or submerged aquatic vegetation. These areas are typically covered with persistent vegetative cover.
Palustrine Emergent	Wetlands dominated by rooted emergent herbaceous vegetation that are bounded by uplands and/or not tidally influenced. These areas are typically covered with persistent vegetative cover.
Palustrine Forested	Dominated by woody species greater than 6m in height usually within the floodplain of a river. These areas usually experience seasonal flooding. Common species include cottonwood and bald cypress. These areas are typically covered with persistent vegetative cover.
Palustrine Scrub-Shrub	Dominated by woody species less than 6m in height usually within the floodplain of a river. These areas usually experience seasonal flooding. A common species is willow. These areas are typically covered with persistent vegetative cover.

Table 6 Texas wetland types define

Although compensatory mitigation is primarily required to offset impacts to jurisdictional wetlands, Figure 5 shows land coverage of important alternative ecosystem types (Ecological) that provide similar benefits and functions as jurisdictional wetlands. It is important to pursue mitigation and conservation efforts in all valuable eco type regions as the ultimate outcome provides the same benefits for local citizens and communities. Additional information about other resource opportunities can be found in Other Resource Conservation Opportunities of this paper.

Projections

According to Working Lands Investment Partners, Texas is experiencing significant growth in mitigation banking. Mitigation banks have become an increasingly profitable industry, especially in regions experiencing rapid growth such as the greater Houston area. With the total population expected to double by the year 2050, infrastructure development must expand at a comparable rate. With the expectation that there will be an increasing number of development projects requiring compensatory mitigation, the demand for mitigation banks throughout the region will steadily increase. With this in mind, bank sponsors will need to expand and create new banks at a rapid pace in order to keep up with the competition for mitigation bank credits; therefore, a proper evaluation of available land in the area with high ecological significance is essential. The inventory mitigation banks (Table 2 and 3, Figure 1) and development of appropriate locations for future banks in the region is a valuable and appropriate tool for the RTP to consider. Whether the bank is self-managed (i.e. Harris County Flood Control District) or developed through a third party, identifying locations early in the planning stages has the added benefit for budgeting for land acquisitions at today's cost, saving money on what are mostly publicly funded projects.

Peer State Wetlands Mitigation

Compensatory wetland mitigation to offset unavoidable impacts to wetlands and watersheds are federally enforced; however, every state employs their own unique programs and wetlands mitigation land banking systems (Table 10). The following table and subsequent text summarize techniques and programs adopted by peer states with similar coastal ecosystems and wetland environments.

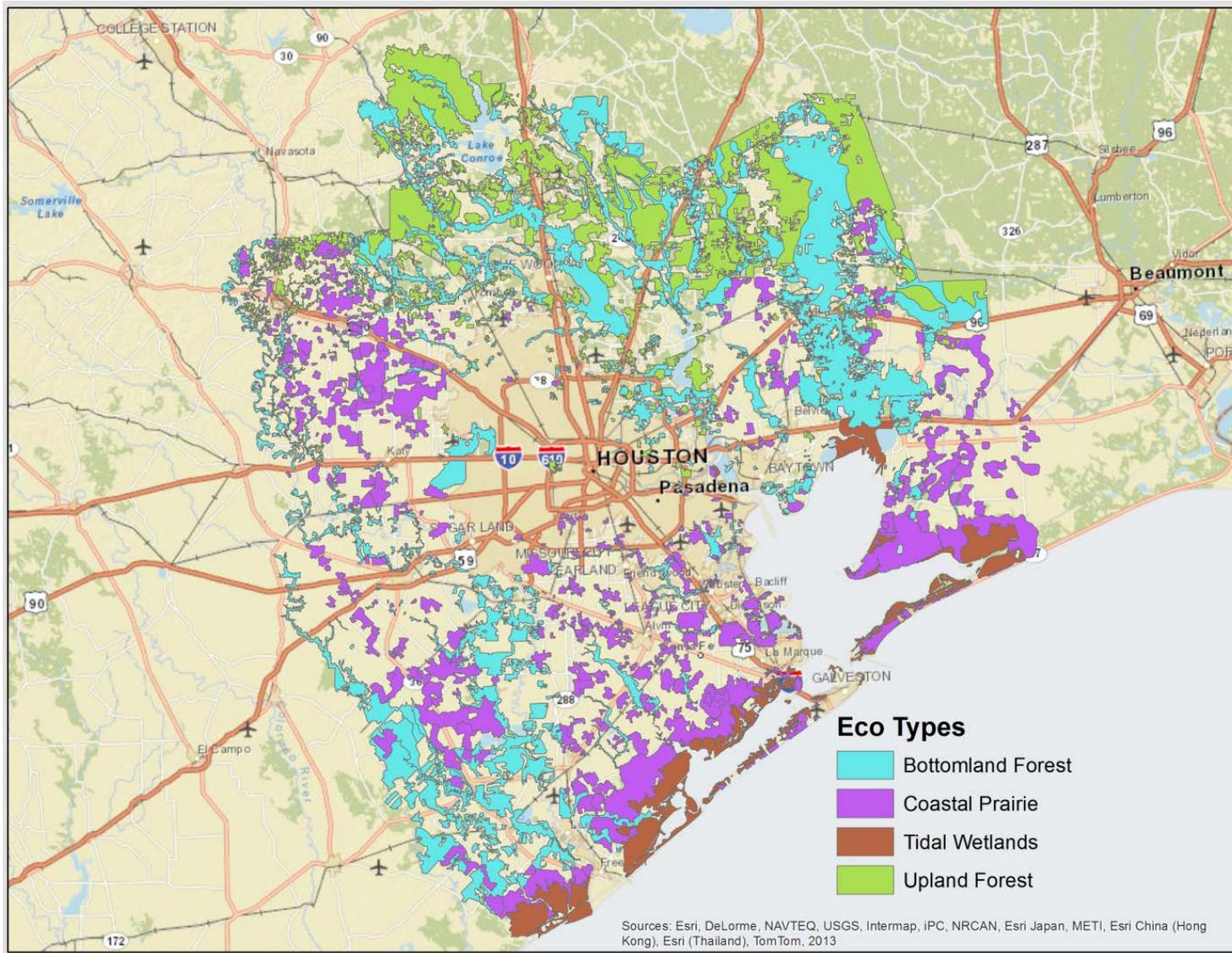


Figure 5 Ecotypes as defined by Ecological

Organization		Eligible Land						Mitigation Services										Credits				Other							
		Residential	Agricultural	Forested	Prairie	Historical Wetland Areas	Wetlands	Riparian Areas	Wetlands mitigation	Stream Mitigation	Habitat Conservation	Land Acquisition via Donation	Land Acquisition via Purchase	Conservation Easement	Restoration	Enhancement	Preservation	Creation	In-Lieu Fee Program	Credit Marketing / Sales	Available Wetland Bank Credits	Pending Credit Releases	Stream Bank LF Credits	Technical Assistance	Permitting Assistance	Education/Outreach	Long-Term Management Agreements	Funding/Grants	
Private	Working-Lands Investment Partners, LLC			X		X	X	X	X	X		X	X	X	X	X			X	X	X		X				X		
	Delta Land Services		X				X		X	X		X		X	X	X	X		X	X	X	X	X	X			X		
	Restoration Systems, LLC	X	X	X	X	X	X	X	X	X		X	X	X	X	X			X	X	X						X		
	Mitigation Solutions USA	X	X	X	X	X	X	X	X	X		X		X	X	X	X		X	X	X		X		X	X			
	Berg-Oliver Associates, Inc.						X		X			X		X	X	X	X		X		X		X			X			
	Gremming and Associates, Inc.					X	X		X			X		X	X	X	X		X		X		X	X			X		
	EcoSystem Renewal	X	X	X	X	X	X	X	X	X	X		X		X	X	X	X		X	X	X		X	X	X	X		
	Resource Environmental Solutions	X	X	X	X	X	X	X	X	X	X		X		X	X	X		X		X	X		X		X	X		
	SWCA			X	X	X	X	X	X	X	X		X		X	X	X	X		X		X		X	X		X		
Non Profit	Houston County Flood Control District	X	X	X	X	X	X	X	X	X	X			X	X	X	X		X	X	X		X	X			X		
	Trinity River Restoration Program					X	X	X	X					X	X								X		X	X			
	Houston Audubon & Texas Audubon			X	X		X	X	X	X				X	X	X							X		X	X			
	Galveston Bay Foundation	X	X	X	X	X	X	X	X	X	X		X			X			X				X	X	X	X			
	Texas Land Conservancy	X	X	X	X	X	X	X	X	X	X		X			X			X								X		
	Bayou Land Conservancy	X	X	X	X	X	X	X	X	X	X		X			X			X								X		
	Gulf Coast Bird Observatory			X	X		X	X	X	X	X		X			X											X		
	Big Thicket Natural Heritage Trust			X	X		X	X	X	X	X		X			X											X		
	Katy Prairie Conservancy			X	X		X	X	X	X	X		X			X											X		
	The Nature Conservancy			X	X		X	X	X	X	X		X			X											X		
	Ducks Unlimited			X	X		X	X	X	X	X		X			X											X		

Table 7 List of potential partners in the area and the services they provide

Organization		Eligible Land							Mitigation Services										Credits				Other					
		Residential	Agricultural	Forested	Prairie	Historical Wetland Areas	Wetlands	Riparian Areas	Wetlands mitigation	Stream Mitigation	Habitat Banking	Land Acquisition via Donation	Land Acquisition via Purchase	Conservation Easement	Restoration	Enhancement	Preservation	Creation	In-Lieu Fee Program	Credit Marketing / Sales	Available Wetland Bank Credits	Pending Credit Releases	Stream Bank LF Credits	Technical Assistance	Permitting Assistance	Education/Outreach	Long-Term Management Agreements	Funding/Grants
Non Profit	Native Prairies Association of Texas			X	X	X	X	X	X	X	X		X			X											X	
	Texas Agricultural Land Trust		X	X	X	X	X	X	X	X	X		X			X											X	
	Cradle of Texas Conservancy			X	X		X	X	X	X	X		X			X											X	
	Colorado River Land Trust			X	X		X	X	X	X	X		X			X											X	
	Scenic Galveston			X	X		X	X	X	X	X		X			X											X	
	Legacy Land Trust			X			X	X	X	X	X		X	X	X	X		X								X	X	
Funding Program	Galveston Bay Estuary Program																											X
	Houston Endowment																											X
	General Land Office																											X

Table 8 List of potential partners and the services they provide continued.

Section	0.5 mile buffer				0.25 mile buffer			
	Wetlands	Not Wetlands	Total Impact	Percent Wetlands	Wetlands	Not Wetlands	Total Impact	Percent Wetlands
BW	3,014	65,464	68,477	4%	1,408	32,016	33,424	4%
LP	33	12,203	12,236	0%	9	5,663	5,673	0%
NE1	2,134	29,869	32,003	7%	900	14,320	15,220	6%
NE2	4,434	38,191	42,625	10%	2,061	18,340	20,401	10%
NW1	6,877	99,707	106,584	6%	3,196	48,289	51,485	6%
NW2	2,249	23,732	25,981	9%	934	11,207	12,141	8%
SE1	4,824	88,907	93,731	5%	2,015	45,930	47,945	4%
SE2	6,629	53,713	60,342	11%	2,799	26,863	29,663	9%
SW1	7,502	89,241	96,743	8%	3,335	45,499	48,834	7%
SW2	2,647	62,316	64,963	4%	1,040	30,108	31,148	3%
Total	40,342	563,343	603,685	7%	17,697	278,235	295,933	6%

Table 9 Acres impacted by potential RTP projects with a 0.50 mile buffer and 0.25 mile buffer

State	Mitigation Program/ Regulations	Type	Outcome / Requirements
Texas	TXDOT	Onsite Mitigation Three Dedicated TXDOT Banks	<ul style="list-style-type: none"> ▪ Partnering can be beneficial for public use ▪ Not currently allowing in lieu fees ▪ Hard to manage due to size of state, diversity of wetland, and number of watersheds, number of transportation districts ▪ Not many private banks available in the watersheds where they are needed
Florida	FDOT Mitigation Program / Florida Statutes	Regional Mitigation Plan	<ul style="list-style-type: none"> ▪ State WMDs are responsible for implementing compensatory mitigation plans for FDOT ▪ FDOT submits an annual environmental impact inventory to designated WMD ▪ WMD creates a Mitigation Plan to offset impacts included in FDOTs environmental impact inventory ▪ FDOT escrows \$75,000 per acre of impacted land on a quarterly basis ▪ Once Corps approved WMDs Mitigation Plan, WMD uses FDOT escrowed funds to implement mitigation.
Georgia	<i>Past:</i> GDOT Umbrella Mitigation Banking Instrument (GUMBI)	Statewide Umbrella Banking Instrument exclusively for GDOT	<ul style="list-style-type: none"> ▪ GUMBI was effective for a short time in 2003 ▪ Idea was to have one Bank Instrument (BI) responsible for all GDOT mitigation sites in the State ▪ GDOT later decided to no longer pursue permittee-responsible mitigation, which ended the GUMBI
	<i>Present:</i> Federal Guidelines	GDOT encouraged to purchase credits or ILFs only	<ul style="list-style-type: none"> ▪ All GDOT compensatory mitigation shall be satisfied through credit purchases or participation in ILF programs ▪ The Corps, Savannah District is responsible for the approval of bank credit and ILF purchases by GDOT ▪ All mitigation banks are implemented by organizations with proper technical knowledge & training for improved bank success
Louisiana	Coastal Management Regulations	Regional Mitigation focused on the coast	<ul style="list-style-type: none"> ▪ All mitigation efforts along coastal Louisiana must be consistent with the Coastal Master Plan ▪ Mitigation encouraged to be located on-site of the impacted area or within same basin ▪ LA DOT uses third party mitigation bankers almost exclusively
North Carolina	North Carolina Water Quality Certification Rules	Additional State regulations for any impacts to water resources that may affect water quality; including NCDOT compensatory mitigation requirements	<ul style="list-style-type: none"> ▪ Director of NC Division of Water Resources (DWR) is responsible for review and approval of certificates. ▪ Requires transportation authorities to implement compensatory mitigation for impacts equal to or greater than 150 linear feet per stream, or 1 acre of wetland ▪ Mitigation must provide at least a 1:1 ratio of wetland replacement acres through restoration or creation <i>before</i> pursuing enhancement or preservation ▪ The State requires that all mitigation plans be implemented and/or constructed before any road or transportation project is opened to the public.

Table 10. Summary table of peer state compensatory mitigation programs for transportation projects.

Peer State Lessons Learned



Peer states have adopted various forms of local, regional, and statewide compensatory mitigation programs exclusively for transportation projects.



All peer states prefer purchase of credits or ILFs for offsetting impacts associated with transportation projects. Florida realized greater efficiency by long range mitigation planning.



Ideally, mitigation banks should aim to link regional wildlife corridors to create one large, consolidated conservation area. Mitigation success rate increased with up-front planning.



Maintaining an escrow account or trust fund specifically for transportation project mitigation costs has proven to be a successful approach

COMPARISON OF NATURAL AND CREATED WETLANDS

Within the Houston-Galveston region and USACE Galveston district there is a great diversity of wetlands and ecological zones. As mentioned, the USACE preference is for restoration, creation and/or enhancement of wetland over the preservation of natural wetlands in an effort to meet national goals of no net loss. However, sometimes USACE can be swayed due to a property's unique or scarce wetland or eco-type that a consensus of regional perspectives highly value. There are benefits to preserving natural wetlands. Table 11 lists several pros and cons associated with pursuing a natural wetland versus a constructed wetland to satisfy compensatory mitigation requirements.

North Carolina evaluated mitigation success across all types of mitigation through metrics set out during planning. Overall, it was found that preservation was the most successful method of mitigation (approximately 25% more successful than alternative methods), due to the fact that

preserved sites are already functioning, natural environments (Hill et al. 2011). Enhancement was the next most successful method of mitigation, followed by restoration, and finally creation. North Carolina ultimately found that as more work is required to construct a wetland the greater the decrease in the chances for success.

	Natural	Constructed
Pros	<ul style="list-style-type: none"> • Greater species diversity • High soil organic material • Broader trophic support • More mature vegetation • Resilience • Increased function/nutrient cycling • Less intensive land management (i.e. cost savings) 	<ul style="list-style-type: none"> • Can maintain greater control over environmental conditions • Lower cost to permittee if they choose this option • More options for site selection (i.e. cost savings) • USACE prefers from compensatory mitigation perspective • May support alternative benefits like carbon sequestration, water quality improvement, green space enhancement, etc.
Cons	<ul style="list-style-type: none"> • Limited availability • Higher cost to permittee if they choose to preserve • Preservation, as compensatory mitigation, results in wetland deficit 	<ul style="list-style-type: none"> • Typically more compacted soils • Low soil organic material • Decreased wetland function and biodiversity • Usually costly and time intensive to develop • May require more active management initially until vegetative communities established (high management costs) • Lower species diversity • More long term intensive management

Table 11 Comparison between natural and created wetlands

PRIVATE SECTOR OPPORTUNITY FOR INVESTMENT

Returns on Investment

The purchase of wetland mitigation bank credits or the development of a permittee-responsible mitigation must be completed before construction of the transportation project may begin unless the permittee decides to participate in an in-lieu fee program.

If the permittee opts to establish their own wetland mitigation bank, it may take 12-24 months before they see any returns on investment. According to Mr. Steve Pouns of EcoSystem Renewal, the initial site investigation, land acquisition and permitting phase usually takes anywhere from 12-18 months. The next step is to place the developed mitigation area under a conservation easement and receive approval by pertinent State and Federal agencies before the bank is eligible for credit sales (12-18 months after land acquisition). Once credits are sold, those funds are used to establish and maintain the property in perpetuity. Additional credit releases occur at different phases of implementation and are based on ongoing milestones identified through long-term monitoring efforts.

Mitigation banks, whether they are sponsored by the permittee, a mitigation banker, or in-lieu fee program sponsor, offer various incentives and private sector opportunities for investment. The following is a general overview of various avenues that can be used to receive the most return on investment when sponsoring a mitigation bank.

Credit Sales

Compensatory mitigation site sponsors generate revenue through the sale of credits. Although, not all bank credits are immediately available for sale. Credit releases are scheduled at different milestones throughout the mitigation project based on various milestones that are set during the planning and permitting phases.

Compatible Land Uses

Additional revenue can be generated through the actual use of the mitigation site, so long as that use is not an incompatible use. An incompatible use is any use that may jeopardize the objectives of the compensatory mitigation project. Incompatible uses must be prohibited, to the extent appropriate and practicable, in the real estate instrument, management or other long-term protection mechanism for the mitigation site. Examples of compatible uses, where appropriate, include leasing grazing rights, carbon credits, ecotourism (i.e. bird or wildlife viewing), or access for fishing (Normanly and Vacca 2008).

Tax Incentives

Tax incentives – removing five year agricultural valuation requirements, small real estate transfer fees for urban and public land transactions, wetlands valuation that is lower than an agricultural valuation, ad valorem tax exemption for active management, federal income tax credit for maintaining high-quality wetlands, federal estate tax changes, conservation easements yield lower property taxes.

Other Resource Conservation Opportunities

The primary focus of this paper has been on regulatory mitigation for impacts to wetlands. In this section we will explore the opportunity for using planning as a vehicle for addressing impacts on a broader scale. Use of available tools like Ecological in conjunction with the RTP can prove beneficial in the larger picture of regional planning where 21% of identified high conservation priority acres could potentially be impacted by future transportation project development activities (Table 12).

There are two occurrences where there may be a regulatory requirement to mitigate for non-aquatic impact. The first instance, the loss of non-aquatic resources may require mitigation for certain situations. These non-aquatic resources must be proven essential to maintaining the ecological viability of adjoining aquatic resources (40 CFR 230.98). These resources include riparian areas, buffers, and/or upland areas that have a direct impact on the aquatic resources. The USACE district engineer makes determinations as to whether non-aquatic resources can be used as compensatory mitigation for impacts to aquatic resources.

Section	0.5 mile buffer				0.25 mile buffer			
	High Conservation Priority	Low Conservation Priority	Total Impact	Percent High Conservation Priority	High Conservation Priority	Low Conservation Priority	Total Impact	Percent High Conservation Priority
BW	4,493	63,984	68,477	7%	2,172	31,251	33,424	6%
LP	71	12,165	12,236	1%	23	5,650	5,673	0%
NE1	10,542	21,461	32,003	33%	5,063	10,157	15,220	33%
NE2	13,149	29,476	42,625	31%	6,277	14,124	20,401	31%
NW1	27,150	79,435	106,584	25%	11,769	39,716	51,485	23%
NW2	4,272	21,709	25,981	16%	1,734	10,407	12,141	14%
SE1	25,467	68,264	93,731	27%	12,441	35,504	47,945	26%
SE2	12,649	47,693	60,342	21%	5,803	23,860	29,663	20%
SW1	21,275	75,468	96,743	22%	10,135	38,699	48,834	21%
SW2	7,553	57,410	64,963	12%	3,295	27,853	31,148	11%
Total	126,620	477,065	603,685	21%	58,712	237,221	295,933	20%

Table 12 Acres of priority conservation lands (Ecological) impacted by RTP projects.

In the second instance, endangered species may be present and require some form of mitigation. If USFWS or National Marine Fisheries Service believes a project will have an adverse effect on listed species, a level of incidental take will be calculated. This amount, whether it is the number of species or amount of habitat lost, must be mitigated for. Conservation banks for endangered species are created and operated in a similar fashion as a mitigation bank for wetlands.

Conservation banks provide many of the same benefits that mitigation banks provide over smaller, permittee responsible projects (e.g. greater financial resources, scientific expertise, planning resources, economy of scale). Conservation banks can be created in several ways: (1) acquisition of existing habitat; (2) protection of existing habitat through conservation easements; (3) restoration or enhancements to disturbed habitat; (4) creation of new habitat in some situations; and (5) prescriptive management of habitats for specified biological characteristics (U.S. Fish and Wildlife Service 2003). Similar real estate agreements must provide long term protection for the conservation bank in perpetuity. There are several endangered species that may be found throughout the Houston-Galveston Region (Table 13)

Outside of regulatory requirements, the RTP process possess an opportunity to engage other local and regional partners in broad regional planning. Wetland loss is but one impact due to road and infrastructure projects. There are other direct and indirect effects associated with transportation projects including impacts to air quality, increased roadway noise, impacts to hydrology and water quality, loss of green space and induced secondary development. However, the lack of any federal or state requirements often precludes consideration and poses a challenge to local and regional organizations.

COUNTY	Houston Toad	Whooping Crane	Northern Aplomado Falcon	Red-cockaded woodpecker	Piping Plover	Attwater's Greater Prairie Chicken	Eskimo Curlew	Texas Prairie dawn-flower
Austin	x	x						
Brazoria		x			x			
Chambers					x	x		
Colorado	x	x				x		
Fort Bend		x						x
Galveston					x	x	x	x
Harris								x
Liberty				x				
Matagorda		x	x		x			
Montgomery				x				
Walker				x				
Waller		x						
Wharton		x						

Table 13 USFWS list of threatened and endangered species by county in the Houston-Galveston region.

Note: Sea turtles were not included on this list but several species do occur throughout the coastal counties

The RTP is driven by the desire to accommodate the region's growth and mobility needs. The RTP can open a dialogue for regional planning that encapsulates a regional vision. Surveys

taken of Texas voters have demonstrated concern and support for green space preservation, maintaining water quality, improving air quality, while balancing these needs in support of a vibrant economy. Houston voters have supported tackling flood and stormwater issues via increased taxes (KHOU 2010) and have passed bond referendums in support of parks and open space (Mellon 2012). The America's WETLAND Foundation found that 77 percent of Texas voters are concerned about the loss of wetlands and other critical habitats (Tresaugue 2014).

Florida provides an example of statewide planning that uses wetland mitigation to create wildlife corridors. Florida creates an impact inventory that informs the mitigation plan which includes all proposed projects acreage, and type; state water quality classification of impacted wetlands and other surface waters; any other state or regional designations for these habitats; and a list of threatened species, endangered species, and species of special concern affected by the proposed project.

While recognizing that there is a regulatory responsibility to perform wetland mitigation, there is also a responsibility and some benefits to mitigate impacts to other habitats. The location of these mitigation projects can help offset many of the non-wetland direct and indirect impacts if mitigation serves as a physical buffer between transportation projects and development. These projects would be considered "green infrastructure" and can be incorporated into transportation projects if partners are brought in to the planning process early.

The development of the Texas Pollution Discharge Elimination System (TPDES) in the late nineties for example places responsibility for maintaining and improving water quality in the hands of local jurisdictions. A regional mitigation plan could be created that considers TPDES and wetland mitigation, capturing broader growth concerns and building common solutions to mitigate impacts to water quality. Additionally regional partners have the opportunity to marry habitat and wetland mitigation with other long range planning efforts like the Houston Parks Board's Bayou Greenways 2020 and Houston Wilderness' Sam Houston Greenbelt Network supporting multifunctional projects.

CONCLUSION

Wetland mitigation banking has been successfully implemented throughout the Houston-Galveston Region. There are several banks that have been in existence since the early 90s and TxDOT policy dictates that third-party mitigation be used when possible. Wetland mitigation banks are a useful tool to assist in the long range planning for transportation projects and to meet Federal regulatory objectives. The regulatory community emphasizes the importance of no net loss of wetland acreage in the region; therefore restoration, enhancement, and establishment mitigation are preferred over preservation options.

Some neighboring coastal states have programs that may have some useful takeaways for our region: the state of Florida completes regional long-term mitigation planning through an escrow account with the State Transpiration Trust Fund; the state of Louisiana created a coastal Master

Plan with an in-lieu fee trust fund for permittee payments; the state of North Carolina requires permittees to define mechanisms to evaluate their success, rather than just goals.

As the region continues to grow, it is important to have an inventory of mitigation banks and a comprehensive understanding of options available. An inventory of local mitigation banks has been compiled with the entity information, acres and credits available along with potential RTP projects and their potential impact areas. This information illustrates the number of acres available for mitigation versus the number of acres needed in the different RTP regions/sectors. Regional transportation planners can review this information to increase awareness of potential issues that would have a negative effect on project costs, efficiency and the communities these projects are designed to serve. Planning for future impacts could have long term benefits such as: developing private sector opportunities, advancing planning to mitigate secondary impacts such as development following roads, and early partnering and discourse with non-profits working in the region, supporting mutual conservation goals and building ‘good will’ throughout the community.

As a result of this exercise, an approach for the developers of the RTP to consider, include:

- **Mitigation Plan.** Develop and implement a regional mitigation plan that will offset future wetland mitigation, build in cost-saving efficiency, and recognize the need to develop banks now as the cost of land continues to increase.
- **Mitigation Banks and Credit Availability.** Recognizing that there could be a future deficit in available compensatory mitigation credits, expand the number of mitigation banks to increase the availability of mitigation credits.
- **Broaden Partnerships.** There is an opportunity to expand the RTP planning process to include additional partners to assist in coordinating the development of new banks, establishing common goals, and building support.
- **Identify Opportunities.** Through planning consider mitigating direct and secondary impacts to wetland and other natural resources through a larger regional approach that can be the nexus for implementing multiple local and regional planning goals. Banks and conservation lands can serve multiple quality of life purposes: support recreation, green space, improve water quality, prevent flooding, develop economic drivers (i.e. ecotourism, carbon credits), commercial and recreational fishing, and a destination for diversified workforce.

APPENDIX A

SUMMARY OF APPLICABLE REGULATIONS AND MITIGATION AND CREDIT PROCESS

Clean Water Act, Section 404(b)(1) Compensatory Mitigation Guidelines

The U.S. Environmental Protection Agency (USEPA) and the U.S. Army Corps of Engineers (USACE) published a final rule concerning wetland mitigation in 2008 (73 FR 19687, Apr. 10, 2008) that is codified under 40 CFR Part 230. 40 CFR Part 230 Subpart J establishes the standards and criteria for the use of all types of compensatory mitigation to offset unavoidable impacts to waters of the United States pursuant to Section 404 of the Clean Water Act (33 U.S.C. 1233). Unavoidable impacts are those that cannot be avoided or minimized to the maximum extent practicable. Practicable is defined as available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes (40 CFR Part 230). Compensatory mitigation can be completed through mitigation banking, in-lieu fee banking and permittee responsible mitigation. Refer to 40 CFR Part 230 Subpart J for specific compensatory mitigation regulations.

The Moving Ahead for Progress in the 21st Century Act

The Moving Ahead for Progress in the 21st Century Act (MAP-21) of 2012 reauthorized the Federal-aid highway program for two years. Included within MAP-21 are provisions that address compensatory mitigation for Federally-funded highway projects to ensure compliance with the compensatory mitigation requirements outlined in 40 CFR Part 230. Section 1320 of MAP-21 encourages early coordination activities to avoid delays later in the process and Section 1311 of MAP-21 encourages the development of programmatic mitigation plans to help identify mitigation needs earlier in the transportation planning process to target conservation in a more effective manner (Ashe 2013). 23 USC 119(g)(4) states “preference shall be given, to the maximum extent practicable, to mitigation an environmental impact through the use of a mitigation bank, in-lieu fee, or other third party mitigation arrangement” if compensatory mitigation is required and approved by the applicable Federal agency. This directs the U.S. Department of Transportation to conduct compensatory mitigation through mitigation banking and in-lieu programs to the maximum extent practicable.

- Requirements:
 - Discussion of potential environmental and storm water mitigation activities and potential areas to carry out these activities
 - Include activities that may have the greatest potential to restore and maintain the environmental functions affected by the plan
- Eligible Activities :
 - Allows for participation in natural and wetlands mitigation efforts
 - Participation in natural habitat and wetlands mitigation banks
 - Contributions to statewide and regional efforts to conserve, restore, enhance and create natural habitats and wetlands

Development of statewide and regional natural habitat and wetlands conservation and mitigation plans

Mitigation and Crediting Process

Compensation for unavoidable impacts is the third step in the mitigation process. The CWA encourages actions on the part of the permittee to first avoid impacts, second minimize impacts and only then to provide adequate compensation.

General Mitigation Rules

The district engineer at USACE must determine the amount of compensatory mitigation to be required in a permit with unavoidable impacts to aquatic resources. In many cases, the ratio of compensatory mitigation necessary to replace lost functions is greater than the amount of aquatic resources impacted. The district engineer must assess several factors when making their compensatory mitigation determination, including:

1. the likelihood of ecological success and sustainability
2. the location of the compensation site relative to the impact site and their significance within the watershed, and;
3. the costs of the compensatory mitigation projects

Mitigation can be accomplished through restoration, enhancement, establishment, and/or preservation. Restoration is when site characteristics are manipulated to return the site to its natural/historic aquatic resource functions. Enhancement is when site characteristics are manipulated to heighten, intensify, or improve specific aquatic resource function. Establishment, also known as creation, occurs when aquatic resource functions are created where they did not previously exist. Preservation is undertaken by removing or preventing threats to aquatic resources and their functions. Generally speaking, the district engineer prefers that the method of compensatory mitigation be restoration, then enhancement, then establishment, and then in some cases, preservation. The likelihood of success is highest with restoration and decreases with each option after that with the exception of preservation. The primary reason why preservation is not preferred is because it does not typically result in a positive gain (i.e. fails to meet “no net loss”) in aquatic resource function.

Required compensatory mitigation should generally be located within the same watershed as the impact site. Mitigation banks and in-lieu fee programs create geographic boundaries for themselves, called a service area that limits the amount of area eligible to sell credits for. This increases the likelihood to successfully replace lost functions and services associated with the impact site. All compensatory mitigation projects must be provided long term protection through a real estate instrument (e.g. conservation easement, title transfer, or restrictive covenants).

40 CFR Part 230 Subpart J, explains that mitigation banking is preferred over in-lieu fee program mitigation and permittee-responsible mitigation. It goes further to state that in-lieu fee program mitigation is preferred over permittee-responsible mitigation. Federal aquatic resource restoration funding cannot be used for generating compensatory mitigation credits unless it has been specifically authorized to do so. Mitigation banks and in-lieu fee project sites must be planned and designed to be self-sustaining over time to the maximum extent practicable. However, scheduled maintenance and adaptive management may be needed to ensure ecological success. A brief description concerning each type of compensatory mitigation is included below.

Mitigation Banking

Mitigation banking is a suitable form of compensatory mitigation for unavoidable impacts to aquatic resources pursuant to Section 404 of the Clean Water Act. Mitigation banking establishes a “bank” of restored, enhanced, established, and/or preserved aquatic resources that can be used as compensatory mitigation for permitted impacts pursuant to Section 404 of the Clean Water Act. The creator of the mitigation bank sells credits to a permittee, thus assuming legal responsibility to perform compensatory mitigation for the permittees actions, thus transferring legal liability from the permittee to the mitigation bank. The number of credits a mitigation bank can sell is determined using a functional assessment tool specific to each USACE district. These credits can be measured in acres, linear feet or other functional assessment units (e.g. biological, chemical, physical). Once the number of credits is determined and those credits are approved for release by the district engineer, the bank sponsor can sell those credits. The bank sponsor determines the price for credits sold.

In-Lieu Fee Program Mitigation

An in-lieu fee program performs compensatory mitigation through funds paid to a governmental or non-profit natural resource management entity to satisfy requirements for permitted activities pursuant to Section 404 of the Clean Water Act. In-lieu fee programs and mitigation banks sell compensatory mitigation credits in a similar fashion but in-lieu fee programs can receive authorization to sell advance credits (i.e. credits that are available for sale prior to being fulfilled in accordance with an approved mitigation project plan). The district engineer, in consultation with the IRT, will determine the number of advance credits that will be available for sale using a functional assessment tool. The money from the sale of credits is then used for land selection and acquisition, design, implementation and management of the in-lieu fee project. All in-lieu fee projects must receive prior approval from the USACE district engineer prior to funding approval. The in-lieu fee program sponsor must complete the compensatory mitigation within a set time frame (typically 3rd full growing season after the first advance credit is sold). Once an in-lieu fee program sells credits to a permittee, the program assumes responsibility to perform compensatory mitigation for the permittees actions, thus transferring legal liability from the permittee to the in-lieu fee program.

Permittee-Responsible Mitigation

Permittee-responsible mitigation occurs when a permittee undertakes mitigation for their permitted activity and assumes the liability for the success of the compensatory mitigation. This is the least often preferred form of mitigation by the USACE for several reasons. Mitigation banks and in-lieu fee programs are able to consolidate compensatory mitigation projects where they are ecologically appropriate, consolidate resources and provide financial planning and scientific expertise that a permittee is often unable to provide. This leads to uncertainty whether a permittee-responsible mitigation project will be successful. The permittee-responsible mitigation option is preferred when there are no approved mitigation banks or in-lieu fee programs located within the watershed of the permitted activity.

Average Costs & Economics in Bank Success

The average costs associated with mitigation bank credits and cost of implementation by acre varies depending on site location, size, and wetland type (creation, enhancement, restoration, or preservation). Other factors include presence of endangered species or species of concern, method of compensatory mitigation (bank credits vs. in-lieu fees vs. permittee-responsible mitigation), and demand for mitigation bank credits in the area. Generally, constructed banks (i.e., created, enhanced, restored) will have higher construction costs and resulting credit costs than that of natural banks (i.e., preserved); However, the preferred methods are restoration, enhancement, or creation *before* pursuing preservation in order to ensure there is a net gain of wetland areas within the region. It should be noted that when purchasing credits from an existing bank, the offset to impact ratio varies depending on the method used. For example, if purchasing compensatory mitigation credits from a preserved bank, your offset to impact ratio may be as high as 7:1 whereas the ratio for a restored, enhanced, or created site may be closer to a 1:1 ratio.

According to the Society of Wetland Scientists at the National Wetlands Research Center in Lafayette, LA, the associated average cost per mitigated acre in the Galveston District is estimated to be approximately \$15,000, so the total cost associated with the construction and implementation of a typical mitigation bank is highly variable depending on the size and efforts necessary to create, restore, or enhance the area. Credit costs are equally variable as the cost per credit is decided upon by the sponsor and is based primarily on market value and demand. A survey of bank credit costs in the region generated an estimated range of \$200-\$400 per linear foot of stream bank credits and approximately \$12,000-\$200,000 per wetland bank credit.

A permittee considering permittee responsible mitigation must contemplate long term provisioning for management and maintenance. According to 40 CFR 230.97(b)(1):

“Compensatory mitigation projects shall be designed, to the maximum extent practicable, to be self-sustaining once performance standards have been achieved. This includes minimization of active engineering features (e.g., pumps) and appropriate siting to ensure that natural hydrology landscape context will support long-term sustainability.”

Where active long-term management and maintenance are necessary to ensure long term sustainability (e.g., prescribed burning, invasive species control, maintenance of water control structures, easement enforcement), the responsible party must provide for such management and maintenance. This includes the provision of long-term financing mechanisms where necessary.”

If a permittee decides to implement a permittee-responsible mitigation bank, costs for long-term management shall be funded through the sale of credits as well as utilizing other compatible land uses and tax incentives that are further discussed in section 5 of this paper. Purchasing bank or in-lieu fee credits may be the more cost effective option in certain circumstances because the permittee pays one lump sum to a third-party organization that is responsible for the long-term management of the site in accordance with the above excerpt. This way, permittees do not have to worry about unexpected expenses associated with the various phases of construction and implementation of a permittee-responsible mitigation bank (i.e., preparation of conceptual plans, design, construction, staff support, future maintenance, and monitoring of the mitigated area over time).

Mitigation Bank Transaction

The following diagram outlines the mitigation bank process in accordance with state and federal regulations. The credit release schedule is determined by project specific milestones proposed during the mitigation bank regulatory approval phase. These milestones are based on the establishment of equivalent wetland functions being established during the credit generation phase (restoration, establishment, enhancement, and/or preservation).

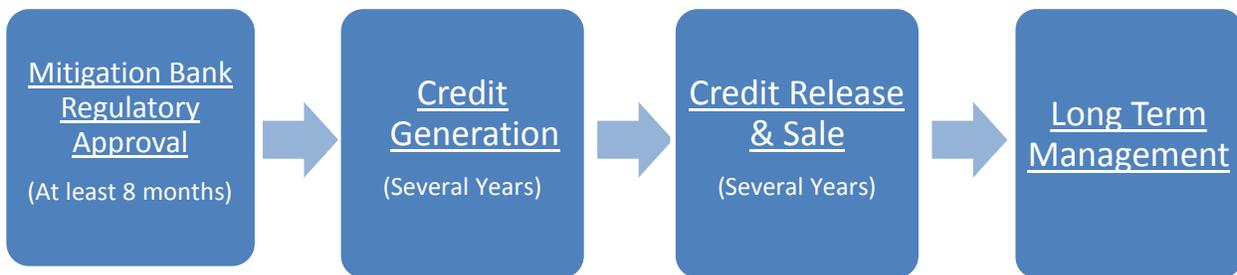


Figure 6 Diagram depicting third-party mitigation bank creation process

APPENDIX B

PEER STATE WETLAND MITIGATION EXAMPLES

Florida

The state of Florida is the first of its kind to establish an interconnected, regional mitigation plan developed for the State. In 1996, the State Legislature created the Florida Department of Transportation (FDOT) Mitigation Program. This Program emphasizes the efficiency of regional, long-range mitigation planning as opposed to the traditional, on-site; project-by-project mitigation planning that had previously been employed. The Program ultimately aims to link regional wildlife corridors throughout the State in order to create one large, consolidated conservation area that satisfies compensatory mitigation efforts for transportation projects. The

FDOT, or any other transportation authority established pursuant of chapters 348 and 349 of the Florida Statutes, is required to set aside funds in an escrow account within the State Transportation Trust Fund on a quarterly basis that will later be used to implement the approved Mitigation Plan. Funds from the escrow account are transferred to the designated WMD in one lump sum which will then be used to cover all mitigation costs, including: preparation of conceptual plans, design, construction, staff support, future maintenance, and monitoring of the mitigated area. The cumulative environmental impact inventory issued through FDOTs Mitigation Program since 1996 through to 2020 includes a total of 159 transportation projects accounting for over 680 acres of wetland impacts that have been, or are proposed to be, offset by mitigation projects implemented by State WMDs.

Georgia

The Georgia Department of Transportation (GDOT) in partnership with the USACE and other Federal and State Agencies established the GDOT Umbrella Mitigation Banking Instrument (GUMBI) in 2003. However, the GUMBI was only in effect for a short time in the state of Georgia because GDOT project managers decided it would be more efficient to utilize third party bankers rather than implement and construct permittee-responsible mitigation banks that would be addenda to the GUMBI.

Currently, GDOT follows federal guidelines regarding compensatory mitigation to offset unavoidable impacts through credit purchases and participation in ILFs. In order to facilitate the crediting process, the Corps, Savannah District has created Standard Operating Procedures pertaining to the various phases of compensatory mitigation in the State. GDOT project managers and permittees can refer to the compensatory mitigation SOP for information regarding the development, implementation, and success of Site Specific Mitigation Plans.

Louisiana

Louisiana's coastal area has been greatly affected by natural and anthropogenic forces that have been gradually deteriorating and diminishing the functional wetlands and coastal marshes in the State. Considering Louisiana, *and* the US's, dependence on the Working Coast as a source of employment, commerce, and resource production – sustaining the coastal area of Louisiana has

been the number one priority. In order to address this issue, the State developed a “Master Plan for a Sustainable Coast”, hereafter referred to as The Master Plan. The Master Plan serves as a guide for the state’s coastal investments for the next 50 years. All State activities that occur within the coastal zone must be consistent with The Master Plan. The State has established an in-lieu fee mitigation trust fund where permittee payments will be allocated. This trust fund is the primary financial backbone to all compensatory mitigation projects implemented by the in-lieu fee instrument.

Louisiana’s OCM is the primary agency responsible for mitigation plan review and approval for the State, with final approval required from the Corps. The main difference between the State and Federal regulations is the order of priority given to each mitigation option. State regulations prefer 1) Individual Mitigation by landowner, 2) Purchase of bank credits, and 3) In-lieu fee options. Federal regulations however, prefer 1) Purchase of credits, 2) In-lieu fee programs, and 3) Permittee-responsible mitigation. The Louisiana Department of Transportation uses third party mitigation bankers almost exclusively (M. Teal and E. Johnston. *TxDOT Wetland Mitigation Alternatives: Options and Procedures for In-Kind Mitigation*. Publication FHWA/TX-05/0-4545-1. Texas Department of Transportation, Austin, TX, 2004. p31).

North Carolina

Compensatory mitigation requirements in North Carolina follow guidelines presented in Sections 404/401 of the CWA, the State’s Coastal Area Management Act (CAMA), and USACE’s Dredge and Fill Act. In addition, the State developed and adopted Water Quality Certification Rules (15A NCAC 2H .0500) effective October 1 of 1996. In accordance with 15A NCAC 02H .0506(h) and 15A NCAC 02H(g), the Division of Water Resources (DWR) in the state of North Carolina, requires transportation authorities to implement compensatory mitigation for all linear and non-linear public transportation projects where impacts are equal to or greater than 150 linear feet per stream, or 1 acre of wetland. In addition, mitigation for unavoidable impacts of one acre of wetlands or greater must provide at least a 1:1 ratio of wetland replacement acres through restoration or creation before pursuing enhancement or preservation methods to satisfy mitigation requirements (15A NCAC 02H .0506(h)(6)). The State requires that all mitigation plans be implemented and/or constructed before any road or transportation project is opened to the public. To satisfy this requirement, proof of mitigation bank credit purchases, payments to an in-lieu fee program, or completion of an approved permittee-responsible mitigation bank must be submitted to the DWR.

The North Carolina Ecosystem Enhancement Program (EEP) is the only organization offering an in-lieu fee instrument to permittees in the State. The EEP worked closely with the Corps, EPA, and other State and federal agencies to develop the in-lieu fee program in July of 2010. Since then, the EEP has established and preserved nearly 600 mitigation projects with over three million feet of stream miles and fifty thousand wetland acres. Fee schedules and credit cost information is updated annually and posted on the EEP website. Fee costs per unit range from

approximately \$200-\$400 per linear foot of stream bank and approximately \$20,000-\$170,000 per acre of wetland banks. Additional information about the in-lieu fee program and EEP services can be found on their website.

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