Mobile-Tensaw-Apalachee (MTA) Watershed Management Plan Scoping

An exercise to find efficiencies for watershed planning for the Mobile Delta

Prepared for:
Mobile Bay National Estuary Program
118 N. Royal St.
Mobile, AL 36602

moffatt & nichol

Prepared by:
Moffatt & Nichol
5 Dauphin Street, Ste. 100
Mobile, AL 36602

Sept 2017

Table of Contents

Introduction

The Mobile Bay National Estuary Program (MBNEP) has been funding Watershed Management Plan efforts throughout Mobile and Baldwin County. These plans are in different stages of development: a few are completed; several are in process; and several are proposed awaiting funding from several sources. These will result in project recommendations which will drive restoration efforts throughout the lower coastal Alabama basin.

The management plans which are based on the EPA 9 elements of watershed plans, address numerous issues presented by the stakeholders in the respective watersheds. In order to understand the overall impact of these restoration efforts and to place them into the context of overall basin processes, the MBNEP through its Science Advisory (SAC) and Project Implementation (PIC) Committees, is developing a restoration decision support tool where these individual plans can be coalesced into a holistic systems approach to restoration project prioritization and implementation.

The entire Mobile River Basin covers 75% of the State of Alabama and portions of Tennessee, Mississippi, and Georgia. Some 20% of the nation's freshwater flows through numerous sub-watersheds into the lower basin deltaic lands and ultimately into Mobile Bay and the Gulf of Mexico. The Tensaw-Apalachee watershed, as currently defined and funded for planning by the NEP, includes three HUC-12 watersheds (Tensaw-Apalachee, Grand Bay, and The Basin watersheds) and encompass the lower delta (Figure 1).

Due to the complexity and size of the entire larger watershed system (Figure 2), this scoping exercise was commissioned to lay the ground work for the watershed plan including defining the area that could be covered to leverage and find efficiencies in planning. Development of a comprehensive watershed plan for the entire lower basin, commonly referred to as the Mobile-Tensaw Apalachee (MTA) basin, presents an opportunity to connect watershed management issues in the upper basins (e.g. Alabama and Tombigbee River Basins) as they relate to the health of the lower basin.

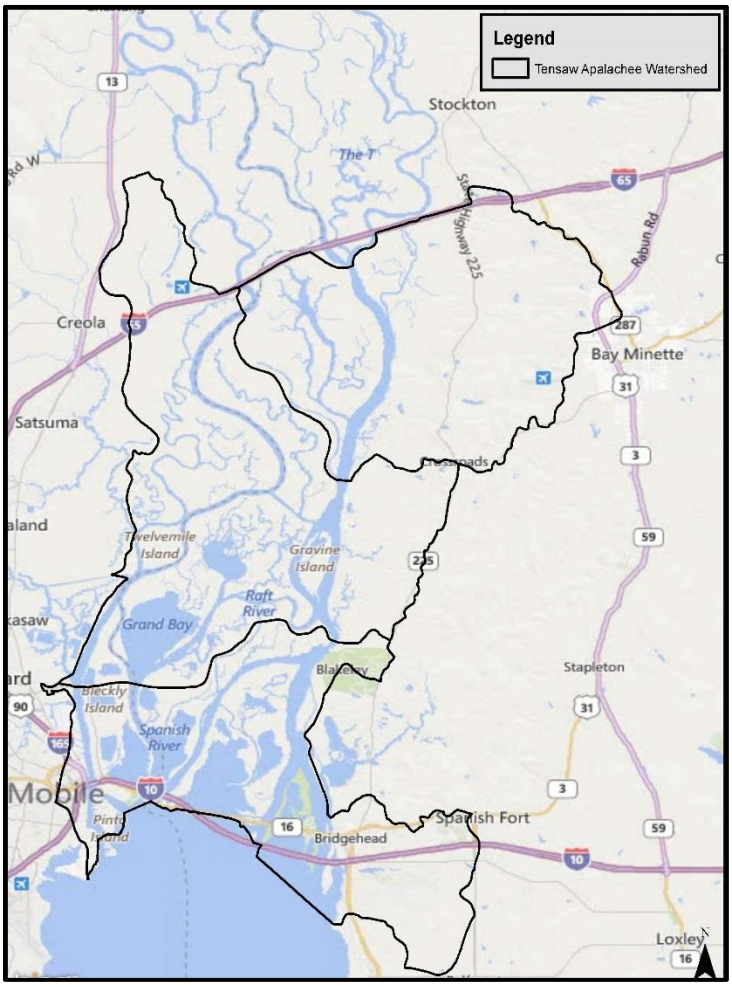


Figure 1. Tensaw Apalachee Watershed as defined by MBNEP for watershed planning. Includes three HUC-12 watersheds (Tensaw-Apalachee, Grand Bay, and Basin watersheds).

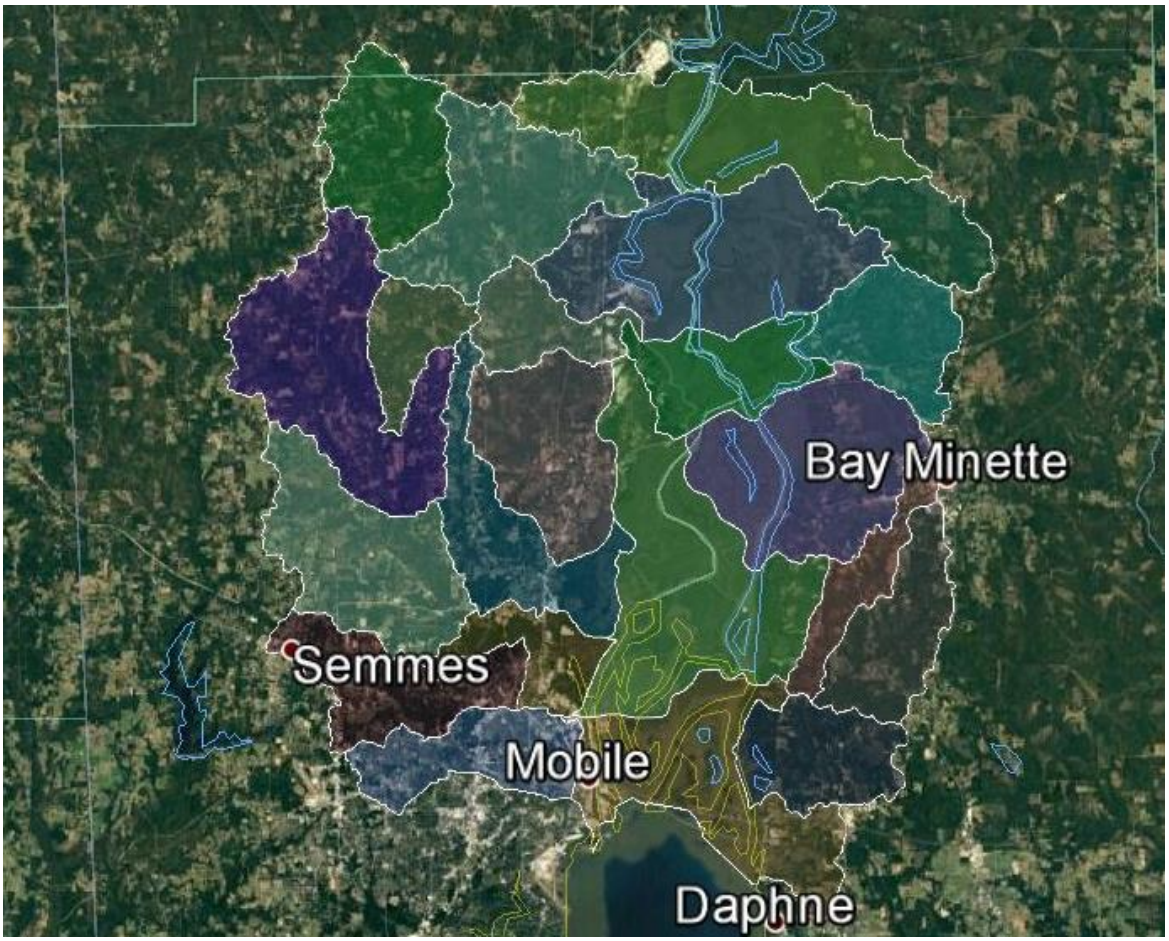


Figure 2. Map displaying all the watersheds surrounding the deltaic system highlighting the complexity in watershed planning for this area.

Purpose / Goals

The overall purpose of this scoping exercise was to define the watershed planning tasks for the Tensaw-Apalachee watershed plan. This included interviewing major stakeholders within the influence of the larger basin, assessing the available science and gaps, identifying major environmental impacts, collating current and ongoing monitoring programs, and finding linkages to upstream restoration and conservation activities.

The specified goals of this scoping process were the following:

- Define watershed area for efficient management planning
- Conduct preliminary data, resource, stakeholder and cost benefit analyses to guide the development of a watershed plan scope focused on components providing the greatest return on investment; and
- Assess opportunities to connect watershed planning efforts downstream with water management efforts upstream.

Methods for Scoping Tasks

There were five discrete tasks identified to fulfill the goals of this task scoping project:

1. Conduct background surveys throughout the basin to develop an inventory of governmental agencies and others involved with the numerous planning and restoration efforts.
2. Conduct a gap analysis to ascertain potential synergies or conflicts with ongoing and planned upstream efforts.
3. Conduct a Watershed Planning cost analysis to determine levels of investment for each component of a comprehensive watershed plan
4. Develop a base project scope for the Tensaw-Apalachee watershed management plan, including a schedule of scope additions, their costs, potential funding sources, and funding availability
5. Prepare Final Report and present to SAC and PIC.

Background Surveys

We used two techniques to query key stakeholders. First, strategic questions were developed and posed to key individuals in personal interviews. Appendix 1 provides a list of questions asked of the key stakeholders to guide the discussions. The stakeholders identified for interview as directed by the MBNEP included relevant governmental agency staff at Federal, State, and Local levels.

Table 1 provides a list of interviewees that were engaged from relevant organization's staff at Federal, State, and local levels.

Agency	Persons	Date of Interview
Alabama Department of Conservation and Natural Resources	Hunter	08-Feb-17
Alabama Department of Conservation and Natural Resources	Brantley, Hunter	06-Mar-17
Alabama Department of Conservation and Natural Resources	Powell	03-Apr-17
Alabama Department of Conservation and Natural Resources	Hinesley, Shelton	17-Apr-17
Alabama Department of Conservation and Natural Resources	Ferraro	25-Apr-17
Alabama Department of Economic and Community Affairs	Hinesley	17-May-17
Alabama Department of Environmental Management	Leslie	03-Apr-17
Alabama Department of Transportation	Davis	25-Jun-17
Alabama Forest Resources Center	Dumont	23-Feb-17
Alabama State Docks	Harris	10-Mar-17
Alabama State Docks	Adams	24-Mar-17
Commissioner of Ag & Industries	McMillan	TBA
Geological Survey of Alabama	Jones	13-Apr-17
Geological Survey of Alabama	Jones	16-Mar-17
Manufacture Alabama	Cagle	10-May-17
U.S. Army Corp of Engineers	Godsey	14-Jul-17

Science Advisory Committee Survey

A survey of the MBNEP Science Advisory Committee (SAC) was performed on 5/24/2017 with 39 people in attendance. The SAC represents various scientists representing agencies (e.g. USFWS; ADEM; etc), academic types (e.g. USA; DISL), and industries in South Alabama (e.g. consultants and industrial reps). The purpose was to reach a broader scientific audience that included non-governmental organizations, local consultants, and academics. The Powerpoint associated software *Turning Point* was utilized during the SAC meeting in May 2017 to elucidate scoping information. This Powerpoint- associated software allows for surveys utilizing a clicker for participants resulting in instantaneous survey answers. Multiple-choice and ranking questions were developed based on input received from governmental agencies to focus the feedback on stakeholders, data gaps, issues, and restoration priorities to address this watershed plan (Appendix 2). The survey target area covered both the bay and upstream watersheds and identified organizations, activities, and where available, ongoing investments in water and habitat management programs. The queries also included a survey of available resources (e.g. data, reports, historic planning efforts) for watershed planning focused on the wider Mobile Bay Watershed activities.

Gap Analysis

A gap analysis was performed on existing and planned efforts in order to inform tasks to be undertaken for the watershed plan scope of work. A review of existing watershed background, resource management science, and monitoring data was be performed. Databases available in the USEPA BASINS system supplemented by information derived in the USEPA's existing Healthy Watersheds report (USEPA, 2014 - EPA 841-R-14-002) were used to define baseline information as a starting point. Other initiatives, agency priorities and efforts were considered in the analysis of the state of the overarching systems approach for conserving the physical, chemical and biological systems throughout the entire Mobile Bay Watershed. A Microsoft Access database of these documents was assembled and can be used in the watershed planning process.

Watershed Plan Budgeting Needs

A summary of existing watershed plans and expected products were prepared to determine the adequacy of overall project budget(s). Based on the gap analysis, we estimated additional budgetary requirements to fill in any potential shortfalls in funding to complete the watershed assessment(s) and planning tasks.

Mobile-Tensaw-Apalachee Watershed Scope

We used all the information gathered above to flesh out a watershed plan scope including tasks and sub-tasks that will provide the best information and cost efficiency for watershed restoration and protection purposes. We identified potential funding sources for additional planning efforts to augment the base scope and a proposed timeline of when the various resources may be available.

A project task database (MS-Access) was utilized to track all tasks and meetings, and to document all contacts, notes, documents and other items collected during this effort. The entire database was transferred to MBNEP for future utilization.

Results

Defining the Focus for Watershed Planning

The large river systems that flow through the deltaic wetlands and feed Mobile Bay are largely influenced by the larger basins upstream (Alabama River and Tombigbee Basins). They share similar identified threats and issues that require restorative actions to collectively make a positive ecological difference in the MTA and ultimately in Mobile Bay and Gulf of Mexico. It is not small task considering the quantity and quality of the water that flows from upstream watersheds. But there are some clear issues that have been identified by stakeholders that can addressed.

Defining the watershed planning area became an important task as we interviewed key stakeholders and tried to focus and leverage the MBNEP efforts. Through our discussion with the MBNEP and other stakeholders we were able to group the watersheds that would best serve the issues that have been identified in stakeholder interviews and the current approved funding sources for watershed planning (RESTORE Act and NFWF GEBF).

Collectively we recommend the following watersheds be combined and tackled as one watershed management plan called the **Mobile-Tensaw-Apalachee (MTA)** watershed (Figure 3). This would start at the Baldwin and Mobile County lines where the confluence of the Tombigbee and Alabama Rivers flow into what is commonly called the Delta – the forested wetlands in which the Mobile, Tensaw, Apalachee, Blakeley, and Spanish Rivers flow. This would include the following ten HUC-10 watersheds from north to south: Farris Creek-Barrow Creek, Big Chippewa Lake, Mittlin Lake, The Basin, Grand Bay, and Tensaw-Apalachee River. Within this deltaic system, habitat type, land ownership, and strong influences of upper basins helped to define this grouping.

There are major land management and land use stressors that helped in defining the focus of the watershed planning area. In general, there industrial influences from the watersheds to the west of the Mobile River that can be addressed within those watersheds. There should be some consideration of using the Mobile River as the boundary to group the watersheds to the west of Delta (including Cold Creek, Bayou Sara, Gunnison Creek, and Lower Chasaw, parts of Big Chippewa Lake, Farris Creek/Barrow Creek and Tensaw-Apalachee). To the east, the three Bay Minette Basins group well together, with similar issues to those faced in D'Olive with development pressures.

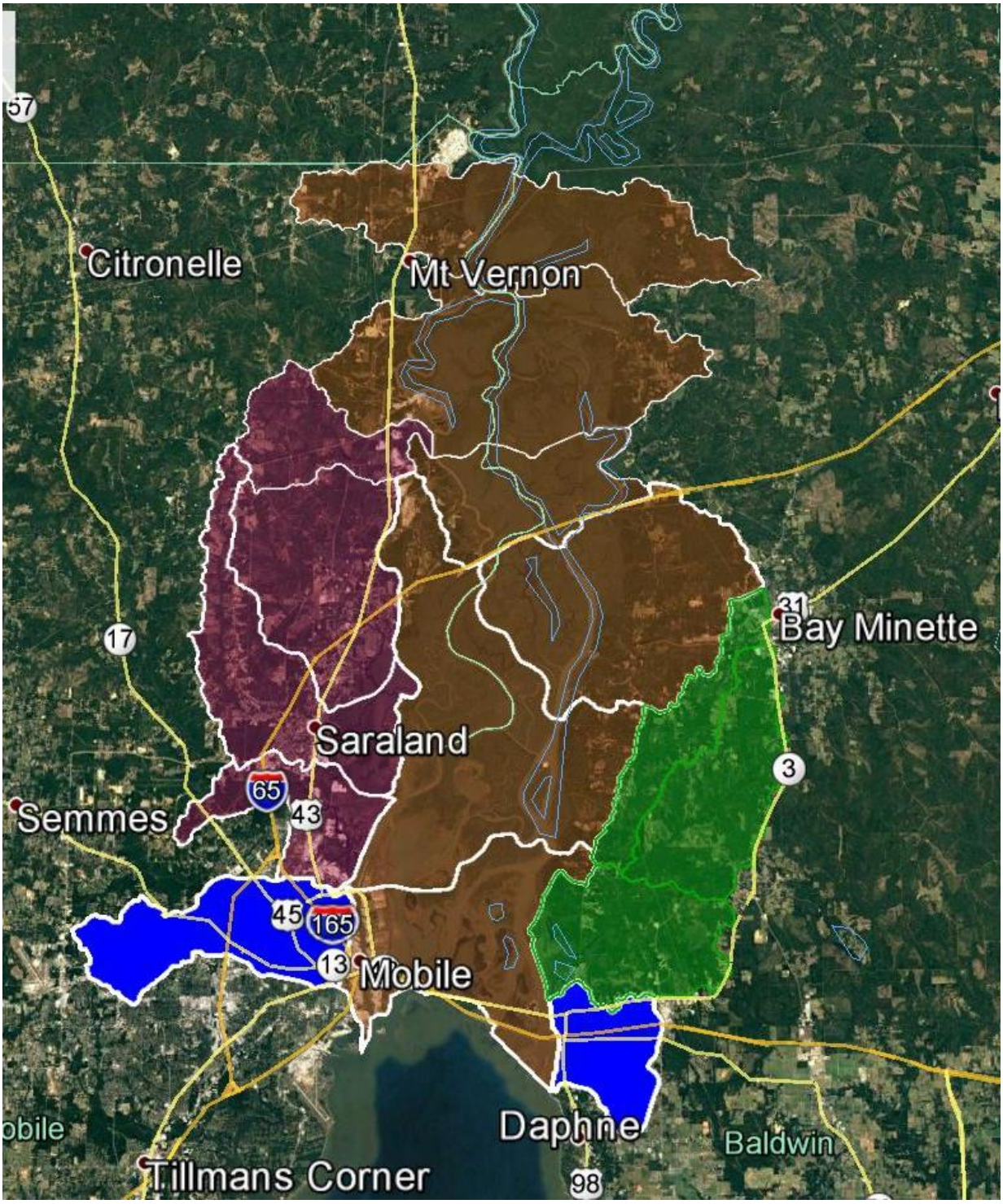


Figure 3. Suggested groupings for watershed planning associated with the Mobile Delta. MTA Watershed Management Plan would include 6 sub-basins starting at the confluence of the Alabama and Tombigbee Rivers close to the Baldwin and Mobile County lines and extending to Mobile Bay (brown). The green highlighted area would group the Bay Minette basins and the pink highlighted areas would include those basins west of the Mobile River. Blue highlighted basins have been completed.

Identified Issues / Threats

Table 2. Collation of issue categories based on individual interviews. Percent response of SAC members to question on the three key driving issues that need to be addressed. Results indicate that SAC members agree with agencies on importance of all these issues with slight priority ranking of hydrology, then land use, followed by habitat management, pollutants, and habitat conservation.

Issue	Description	Agency	SAC
Habitat Conservation	• Currently opportunistic land conservation efforts • More strategic approach is warranted considering public ownership and to ensure connectivity and best return on investment from a landscape perspective. • Need mapping and outreach to identify willing landholders in targeted areas. • Education of conservation tools and best management practices. • Use of third party land trusts	AFRC ADCNR ADEM	16%
Habitat Management	• Urban growth and development • Fragmentation and parcelization • Changing markets • Invasive species • Insect and disease • Wildlife • Catastrophic weather events • Air quality • Climate change • Longleaf – restore	AFRC, ADCNR	20%
Land Use	• Revisit Best Management Practices to encourage volunteer compliance • Re-evaluate current BMPs to suggest higher standards. • Educate landholders.	AFRC	22%
Hydrology	• Impediments to flow • Removal of natural levees • Sedimentation • Water quantity • Water regime • Ground water / aquifers • Canal in-filling • Causeway	ADEM GSA ADCNR	26%
Pollutants	• Point – hot spots • Non-point - Highway development; Boat houses and fish camps • Legacy pollution – mercury, DDT		17%
Access	• Access expansion • Access promotion of current areas (USACE, ADCNR) • Navigation - Alabama State Port Authority; Deepening / widening the channel	ADCNR, ASPA, USACE	n/a

Upper Basin Issue Comparison

We made an effort to also identify common issues with upper watersheds (e.g. Tombigbee and Alabama River Watershed Basins) that can be addressed collectively to make a difference at a larger Mobile River Basin level. The Alabama River Basin and Tombigbee Basin Management Plans were reviewed and goals/strategies that overlapped with issues identified through stakeholder interviews were identified.

- Alabama River Basin Management Plan
    - Goal 2 – Reduce nonpoint source pollution from forestry activities – continued implementation of BMPs, reduced sediment loading from land, streambank erosion from riparian buffer loss
        - Implement forestry mgmt. BMPs for stream buffers and wetlands in commercially forested areas
        - Educate forest landowners concerning BMPs in reducing nonpoint source pollution associated with timber management
    - Goal 7 – Protect and restore wetlands and fish and wildlife habitat
        - Identification and prioritization of areas for restoration and protection
        - Pursue habitat protection through acquisition and easements
- Tombigbee Basin Management Plan
    - Goal 2 – Reduce nonpoint source pollution from forestry activities – continued implementation of BMPs, reduced sediment loading from land, streambank erosion from riparian buffer loss
        - Implement forestry mgmt. BMPs for stream buffers and wetlands in commercially forested areas
        - Educate forest landowners concerning BMPs in reducing nonpoint source pollution associated with timber management

Gap Analysis

The research conducted resulted in the collation of several pertinent documents for the MTA watershed (available in supplemental Microsoft Access file).

We also compiled a list of most of the major recent monitoring efforts. Combined with some of the previous efforts for historical data

Agency	Period of Record	Report or Program Title	Information Type
MBNEP	2017	Habitat mapping	SAV, Wetland Habitats
MBNEP	2015	Sea Level Affecting Marshes Model (Warren-Pinnacle, other WMP outputs)	SLR scenarios
MBNEP	Commenced for MTA 2017	Marlon Cook	Sediment, flow
ADCNR	2015	Causeway study (monitoring effort within)	
USACE	2016/2017	General Reevaluation Report for Ship Channel – Monitoring data lower delta	Hydrology
GSA	1960s to present	Various studies and reports pertaining to water quality, aquatic fauna, and groundwater.	Biological, chemical, physical
ADEM	2017	One year of wetland monitoring in lower delta, continuing in 2018	Wetlands
ADEM	Trend Stations	Contact ADEM	Biological
NPDES permits	1990-present	Discharge Information Zone Surveys	Point source discharges
USGS NAWQA	1997 – 2003	National Water-Quality Assessment Program	Chemical, physical, habitat, biological

Gaps in monitoring data were evident from the research and from interviewees comments. The data gaps that were identified include:

- Hydrology
    - Stream gages – expansion (GSA)
    - Ground water / aquifer monitoring (flow, elevation, quality) (GSA)
    - Surface water quality - expansion to upper MTA (ADEM)
    - Baseline flow - expansion to upper MTA (Marlon Cook)
- Biological monitoring - expansion of GSA and ADEM efforts as determined necessary for project specific species

Major themes of important gaps in studies or assessments that are required to also move forward with watershed planning and restoration project identification included the following:

- Assess/prioritize new potential conservation lands – connectivity/corridors
- Assess and prioritize canal/channel locations affecting hydrology
- Assess/study – current conservation lands and management needs

Scoping Framework

We used all the information gathered above to categorize watershed issues and associated potential tasks including components providing the best information and cost-benefit for watershed restoration and protection purposes. We identified potential funding sources for additional planning efforts to augment the base scope and have proposed timeline of when the various resources may be available.

The scoping exercise has allowed us, in advance of initiating watershed planning, to identify the most important studies and assessment tasks that are required to identify discrete projects that will result in measurable change. We are suggesting these outlined tasks will result in identification of important projects that can be implemented in the next 5-10 years of funding cycles. Implementation of the specific study and assessment tasks may require a longer development period for the watershed management plan but will result in a much better list of prioritized projects that result in the most effective management outcomes of this complicated watershed.

The MTA watershed management plan may be better served if held off until 2018 when USACE data on lower delta is available for use in informing hydrology. The Bay Minette sub-basins and western sub-basin watershed plans could be started immediately upon receiving RESTORE Act funding (approved FPL- Bucket 2). Pollutants issue tasks should be addressed with the western watershed plans.

Overall, based on the uniqueness of the ownership and land-use of the MTA watershed, we suggest that the plan itself reflect more closely a Habitat Conservation and Management Plan that ultimately provides a blueprint for the federal and state owners to better manage their lands for invasives species and hydrology; address land use opportunities and access; and allow for strategic expansion of conservation lands utilizing a third party land trust. Outreach efforts should focus more on private land owner education on best management actions and access opportunities.

1- Science and Foundational Monitoring

Description

Foundational monitoring is required to fill in some of the gaps in data discussed above. Addressing the above gaps is required to provide the foundational information required to recommend restoration projects within the watershed management plan. This section is equivalent to many of the science sections in the watershed management plans to date.

Objectives

1.) Synthesize the scientific studies and monitoring data that is already out there (See table of studies and monitoring) 2.) Collect further data in priority data gap areas.

#	Sub-task	Implementation Entity	Timing
SCIENCE			
1.1	Synthesize the current science knowledge (typical watershed management planning) and monitoring data	Program manager for the MTA	To be conducted immediately based on documents collected for through this scoping exercise (see Microsoft Access database supplemental info). Key information is being compiled by COE contractor for SEIS the draft of which will be available summer 2018.
MONITORING			
1.2	Identify where to Install stream gages, groundwater gages (GSA), and flow gages (USACE, GSA) and install for data collection (1 year worth of data)	Implementation for this task is recommended to be performed by those organizations that have been doing these efforts to date in other locations in the Tensaw Apalachee watershed. • GSA – describe their efforts and how to expand….outline important areas that require the above data. • USACE – describe how their efforts in lower delta can be expanded to upper reaches of watershed. Suggest locations of where • ADEM / GSA – expand biological monitoring as appropriate	12-18 months – Year 1 and 2 of planning exercise. Performed by State agencies.

2 - Assessments

Description

The following sub-tasks are recommended to conduct the needed assessments as part of the watershed planning process. Although these may extend the planning process, they will provide vital data to make good parcel-level decisions on restoration projects and their effectiveness.

Objective - Effectively identify parcel level restoration potential for five issue categories 1.) Habitat conservation, 2.) Habitat management, 3.) Land-use, 4.) Hydrology, 5.) Pollutant sources,

#	Sub-task	Implementation Entity	Timing
HABITAT CONSERVATION			
2.1	Conduct geospatial exercise to map out priority locations for conservation efforts	Third party land conservation group already active in the area. Requires dedicated staff person(s) (1 FTE) to conduct geospatial analysis and then target key parcels owners to identify willing participants and conduct education/outreach (cross over with outreach Task).	To be conducted immediately – Year 1 of planning
HABITAT MANAGEMENT			
2.2	Conduct invasive species mapping and ground-truthing on MTA State protected lands	Specialized contractor in collaboration with ADCNR staff.	To be conducted immediately – Year 1 of planning
LAND USE			
2.3	Assess current voluntary Best Management Practices for riparian and forestry practices and recommend updates.	Specialized contractor or state/federal appointed representative that can recommend and enact change to current BMPS	To be conducted immediately – Year 1 of planning
HYDROLOGY			
2.4	Conduct geospatial analysis of canals, channels, levees in the watershed area and ground-truthing	Specialized geospatial contractor.	To be conducted immediately – Year 1 of planning
2.5	Expand current modeling efforts to upper MTA areas (e.g. flow, quantity, quality)	Specialized hydrodynamic modeling contractor.	Dependent on other modeling efforts and funding opportunities to decide what exactly needs to be conducted – delay until GRR PEIS is available to study in detail and further information compiled under Task 1.
POLLUTANTS			
2.6	Identify and sample legacy areas of contamination to determine hot spots of continued contamination	Specialized contractor in collaboration with ADEM, ADCNR, responsible federal agencies, and local communities/landholders.	Will depend on Management priorities and implementation of specific projects, may proceed on an as-needed basis unless science assessment indicates critical issue

3 – Key Stakeholder Engagement (education/outreach)

Description

Education and outreach for the MTA watershed takes a very different form than previously conducted urban watersheds. Key stakeholders are unique providing challenges that require targeted outreach efforts. Blanket public meetings would not serve this watershed plan well. Therefore, targeted key stakeholder engagement tasks are recommended.

Objective - Effectively conduct key stakeholder engagement on targeted issues categories and potential resulting restoration project types.

#	Sub-task	Implementation Entity	Timing
HABITAT CONSERVATION EDUCATION			
3.1	Conduct education and outreach to key stakeholders on conservation options (MOU, CE, fee simple)	Third party land conservation group already active in the area. Requires dedicated staff person(s) (1 FTE) to target key parcels owners.	To be conducted immediately – Year 1 of planning
LAND USE EDUCATION AND OUTREACH			
3.2	Education of major key private landholders on voluntary Best Management Practices for riparian and forestry practices and recommend BMPs.	Third party land conservation group in conjunction with NRCS, ADCNR. Overlap with Task 3.1	To be conducted immediately – Year 1 of planning
3.3	Outreach and education to public on current access opportunities and project ideas that would affect their navigation and use of MTA.	Specialized outreach specialist	Last quarter of project
POLLUTANT OUTREACH			
3.4	Outreach to major Industrial/manufacturing stakeholders	Specialized contractor in collaboration with Manufacture-Alabama.	Concurrently with other outreach functions

MTA Task Framework based on RFQ template

Task categories are based on the *Conceptual Approach & Methodology* section that is outlined in the MBNEP RFQ template for watershed management planning. Tasks are cross referenced to the issue categories discussed in previous section as determined by stakeholder interviews. We have identified the appropriate entity to perform the tasks and the timing for the task base on a quarterly time schedule with a year timeframe for completion.

Task Category	Tasks	Entity to perform task	Approximate cost	Timing
Literature Review				
	Data/Literature Review	completed		
	Data/Literature synthesis – typical science collation Task (Task 1.1)	contractor	$50,000	Q1
Field Assessment				
	Land Management, Invasives - Conduct invasive species mapping and ground-truthing on MTA State protected lands (Task 2.2)	contractor	$50,000	Q1/Q2
	Land Management, Hydrologic modifications – Field identification of canals, channels, levees in the watershed area (Task 2.4)	contractor	$50,000	Q1/Q2
Additional data sets	Sediment study	ongoing (Marlon Cook)		
Additional data sets	Identify where to Install stream gages, groundwater gages (GSA), and flow gages (USACE, GSA) and install for data collection (1 year worth of data) (Task 1.2)	State / Fed	$250,000	As funding is available
Data Analysis				
	Land Conservation - Conduct geospatial analysis to map out priority locations for conservation efforts (Task 2.1)	third party Land Trust	$50,000	Q2/Q3
	Land Management, Hydrologic modification - Conduct geospatial analysis of canals, channels, levees in the watershed area (Task 2.4)	contractor	$50,000	Q2/Q3
	Land use - Assess current voluntary Best Management Practices for riparian and forestry practices (Task 2.3).	contractor	$25,000	Q2
Modeling				
	Climate Change / Sea Level Rise	complete		
	Hydrologic modeling – Expand current modeling efforts to upper MTA areas (e.g. flow, quantity, quality) (Task 2.5)	contractor	$1M	2018 with release of USACE model of lower delta. Or as funding available

Community Input				
	Land Conservation – Conduct education and outreach to key stakeholders on conservation options (MOU, CE, fee simple) (Task 3.1)	third party Land Trust	$12,500	Q2
	Land Management – Engagement of current public land holders (ADCNR, USACE) on management activity and development of land management plan	Preliminary interviews conducted, contractor to engage on details	$25,000	Q2
	Land-use - Education of major key private landholders on voluntary Best Management Practices for riparian and forestry practices. (Task 3.2)	third party Land Trust	$12,500	Q2
	Land-use - Outreach and education to public on current access opportunities and project ideas that would affect their navigation and use of MTA (Task 3.3)	contractor	$25,000	Q2
Financing				
	Alternatives for financing long-term management	contractor	Part of engagement task	Q3/Q4
Regulatory				
	Recommend updates for voluntary Best Management Practices for riparian and forestry practices (Task 2.3).	contractor	$25,000	Q4
Monitoring System for Management Measures				
	Develop strategic monitoring system, building off of current monitoring efforts and gaps	contractor	$12,500	Q4
	Develop monitoring strategy around Land Management activities (invasive removal; hydrologic restoration) and BMP implementation.	contractor	$12,500	Q4

Total for tasks to be accomplished with current watershed mgmt. plan funds:
Contractor with a third party Land Trust sub - **$400,000**

Total Funds that need to be leveraged from other sources:
Modeling and foundational data capture - **$1.25M**

Recommendations for MTA Watershed Management Planning Efforts

The scoping analyses presented in this report are based on interviews and surveys of various State and Federal entities, with input from additional from the MBNEP's Science Advisory Committee. The most critical items as determined through our interviews are conservation of lands (through acquisition/ easements) and managing conservation lands which are located within the Mobile Tensaw Apalachee Watershed. The majority of the habitats identified are palustrine wetlands which are primarily (74%) in public ownership (State or Federal entities). Long term planning dictates that these areas be conserved for future habitat management in anticipation of rising sea-level and demands of the working MTA Delta. This dictates that a different approach for watershed planning is necessary for this unique watershed. We recommend that a team consisting of governmental agencies along third party land conservation entities be convened to determine the best path forward for land conservation, land management, and land-use issues.

The second item identified with this scoping was the need for elucidating the complex hydrology in the area. This could be accomplished by numerical modeling, however, much information on groundwater and seasonal surface water inputs is still necessary. Thus the first task will be collecting the available science from existing and ongoing studies such as the ongoing U.S. Army Corps of Engineers study of the Delta and Bay hydrodynamics for the Mobile Bay Harbor Study (GRR). Data collection by the USACE has recently ended and the final calibration and modeling analysis is underway. The preliminary results of these studies will be available by summer of 2018, with the final results being available the following year with the publication of the Mobile Harbor Supplemental Environmental Impact Study in 2019. Before any additional modeling is planned, the results of these studies should be thoroughly reviewed to determine if additional modeling studies are necessary; what platform will serve the NEP with the best analysis for future planning; and what additional data should be collected to properly calibrate the selected model. This will require seeking out additional funding and leveraging sources. We recommend a modeling team consisting of various agencies and other technical stakeholders be formed under the auspices of the SAC to suggest the best approach. However, in the meantime, the existing information should be thoroughly compiled and a gap analysis performed so the future committee has the information needed to proceed in a timely manner.

In order to collate and obtain adequate stakeholder information to inform the processes recommended above, we suggest that a MTA Habitat Management Plan and Conservation Framework (HMPCF) be formalized by collating the available information identified in this scoping document along with additional information as it becomes available. We suggest the HMCPF be developed by a contractor who will perform the following major tasks as identified in the Scoping Section above. The major elements of the effort will be as follows and could be covered by current available funds for the Tensaw-Apalachee Watershed Management Plan (NFWF/RESTORE Bucket 2):

- Data synthesis and compilation
- Further data gap identification
- GIS data synthesis of habitats and priority areas for acquisition
- Ground-truthing for invasives and hydrologic restoration opportunities
- Outreach on land-use

However, significant effort is still needed to fill foundational data gaps with at least a one year monitoring program ($250,000) and a comprehensive modeling effort to better understand hydrology ($1M). Without these elements, a full watershed management plan with identified projects will be difficult to achieve and may result in identification and prioritization of projects that will not have an optimized environmental result. We suggest movement forward with some of tasks but with the understanding that other funding will be required to collect scientific data important to project identification. Interim 'low-hanging fruit' projects report could be produce with the caveat that further data collection will refine the watershed project list and prioritization.

Appendices

Appendix 1- Questions provided to key stakeholders to guide discussions.

- How do we link Upper Watershed Management Plans for Alabama and Tombigbee to Lower Mobile-Tensaw-Apalachee (MTA) Basin Watershed Plans.
- Who are the Key stakeholders in the MTA basin.
- What are the driving key issues in your experience that need to be addressed by the NEP (e.g. hydrology, sedimentation, forestry, industry, etc.)?
- What are the main foundational gaps in information that require understanding in moving forward with Basin-wide planning for the MTA?
- What will be the main hurdles in attempting MTA Basin-wide Watershed Management and how does the MBNEP address these issues? (Political; Interagency; Industry; Institutional)
- Who are the major key stakeholders affecting or having influence on the Mobile Basin Watershed? (forestry, State Lands, other landowners, recreational users, others?)
- What are the current monitoring data, past monitoring data, documents, reports, plans that are available for the basin? Do you believe it is sufficiently documented and organized? Is this information up to date and accurate?
- What would be the most beneficial restoration activities that could be performed in the MTA (Hydrological, Stream Restoration, Conservation (purchase and conservation easements)
- Do you believe restoration activities would benefit habitats and resources in Mobile Bay in general?
- What potential funding sources do you know of or have available through your organization that we can leverage for this type of project?

Appendix 2 – PowerPoint Presentations to SAC/PIC

Tensaw-Apalachee-Mobile Watershed Management

Scoping Project

Presentation to Watershed Group

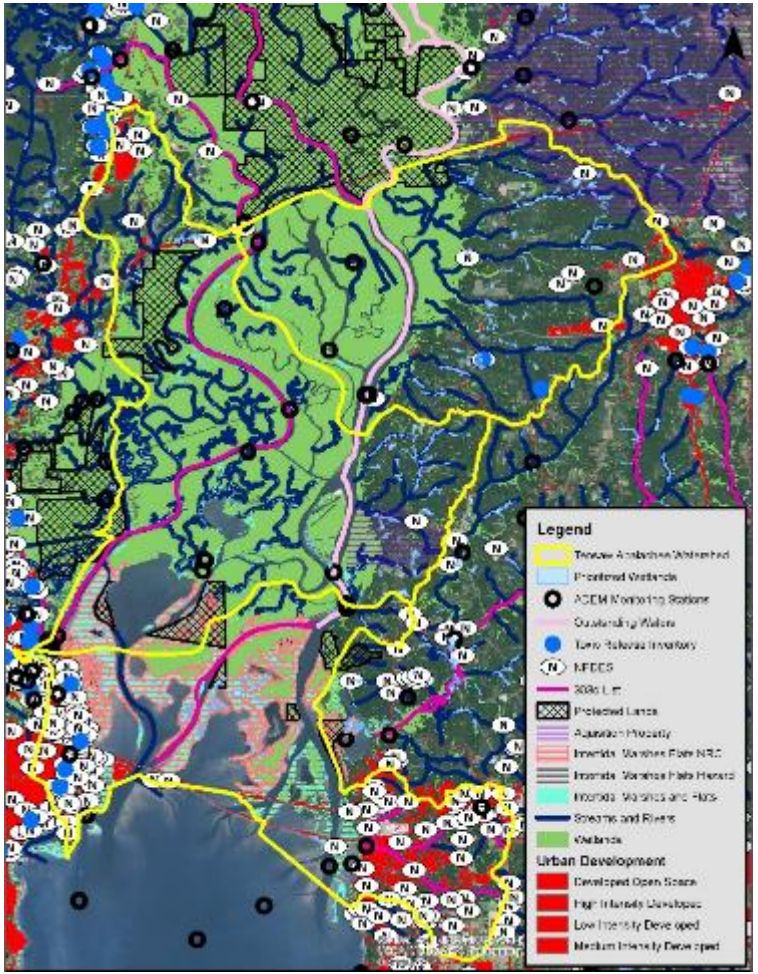
Don Blancher & Meg Goecker

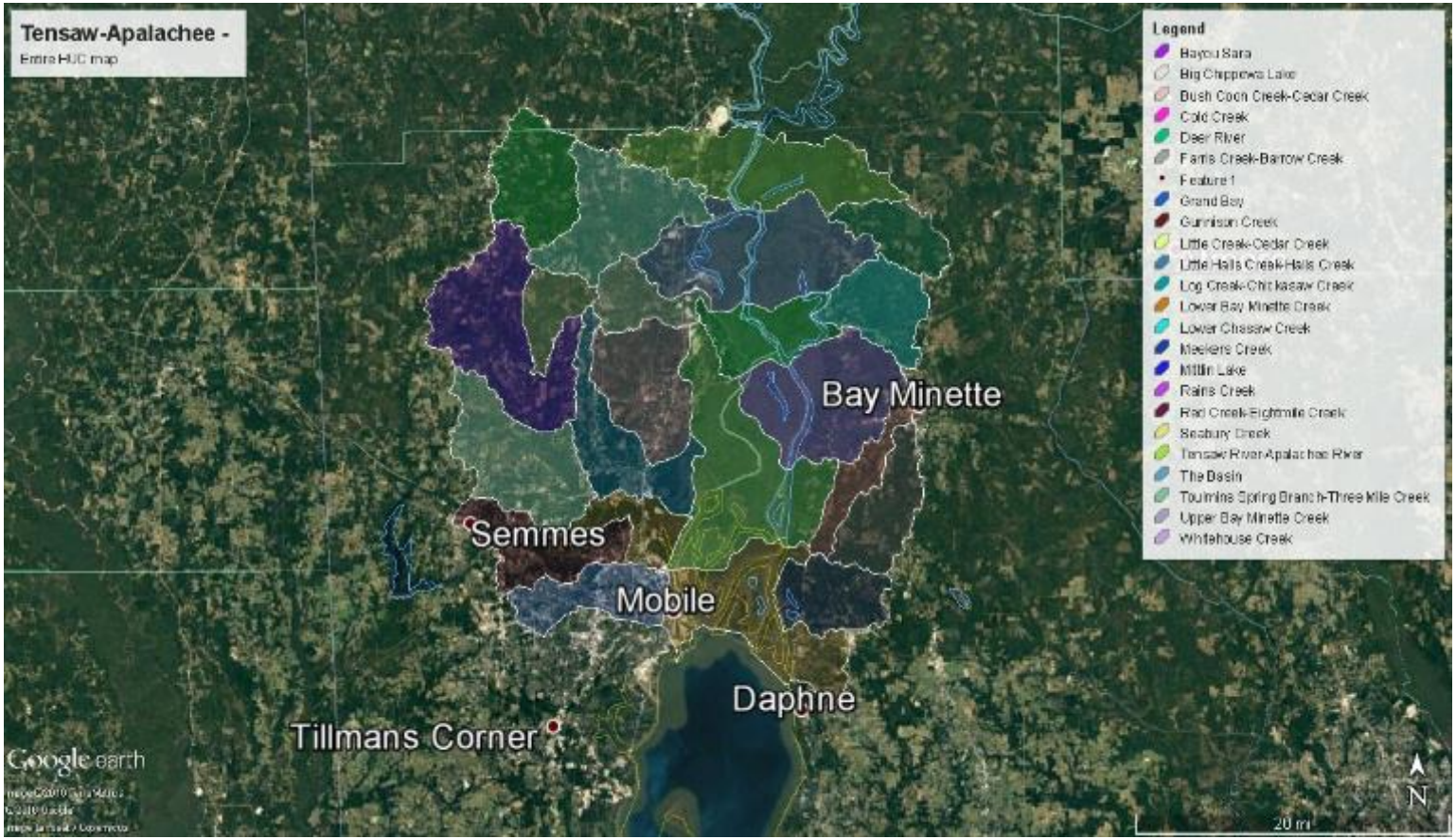
9-19-2017

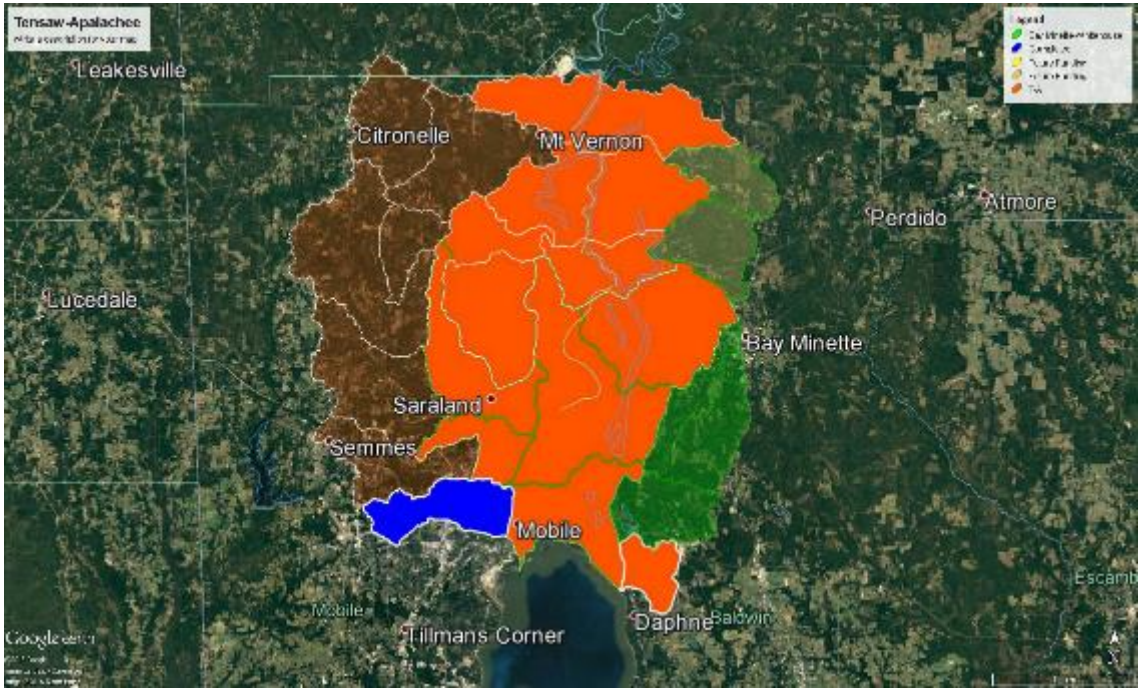
Goals

- To conduct preliminary data, resource, stakeholder and cost benefit analyses to guide the development of a watershed plan scope focused on components providing the greatest return on investment; and
- To assess opportunities to connect watershed planning efforts downstream with water management efforts upstream.

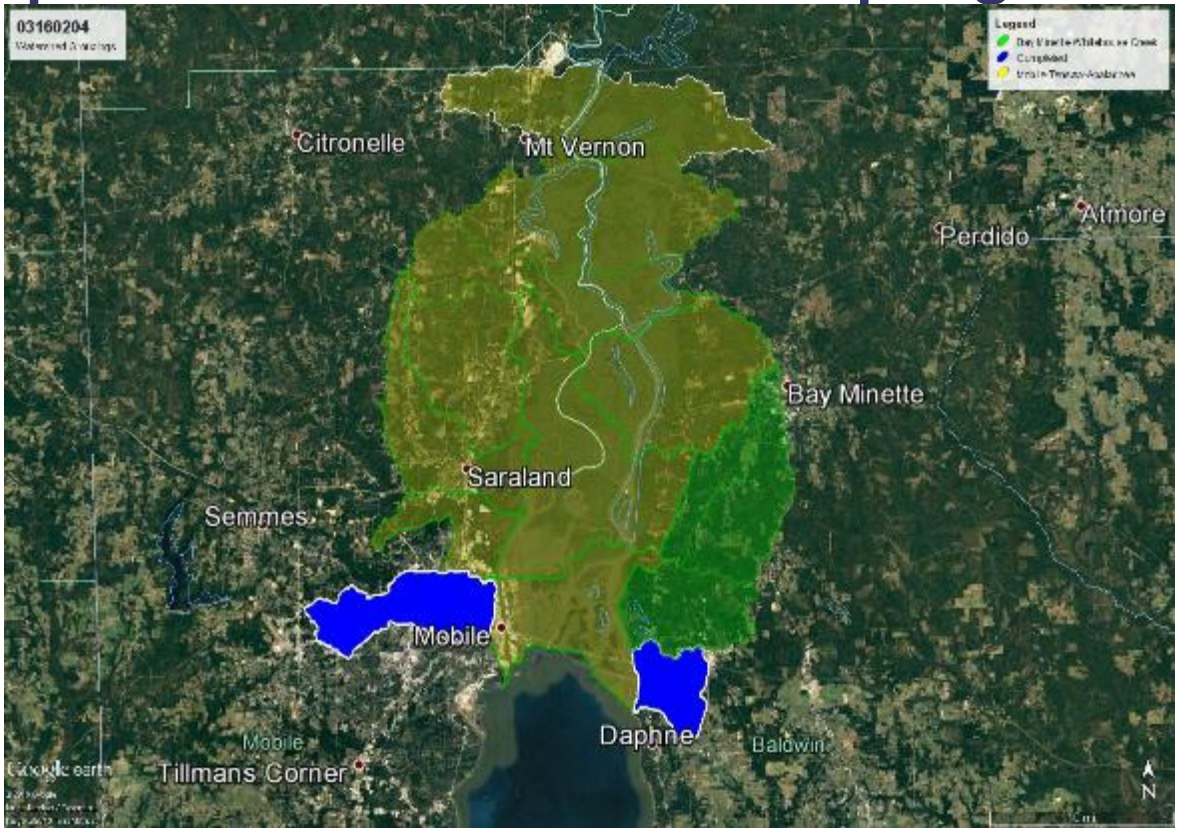
Original Study Area



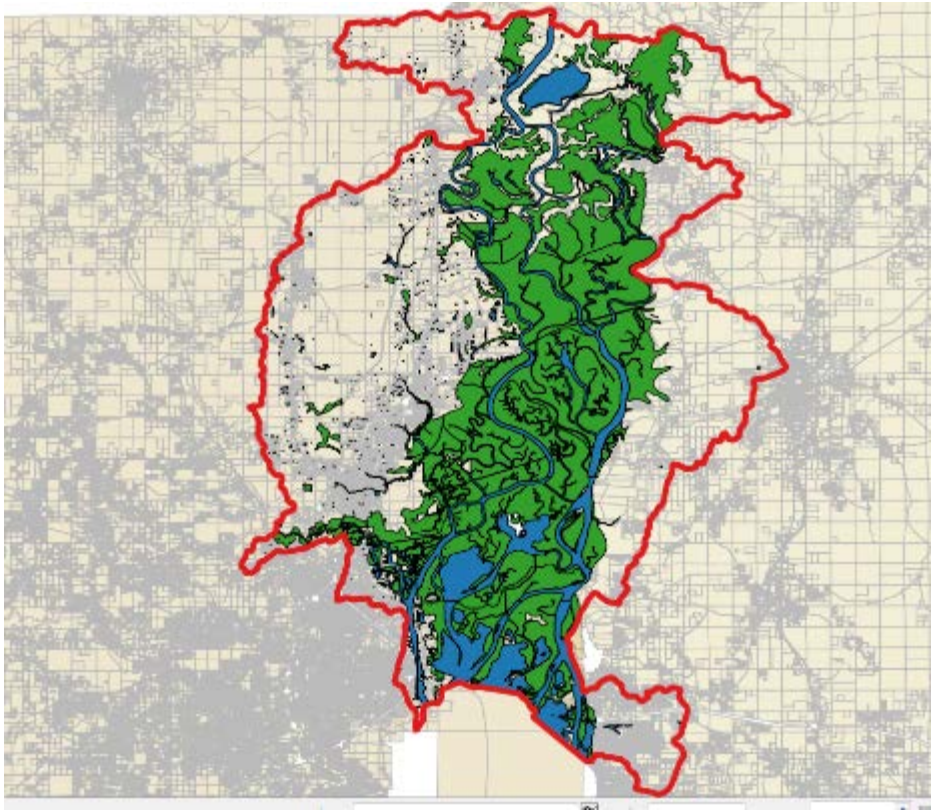

Tensaw-Apalachee -
Entire HUC map
Legend
Bayou Sara
Big Chippewa Lake
Bush Coon Creek-Cedar Creek
Cold Creek
Deer River
Farris Creek-Barrow Creek
Feature 1
Grand Bay
Gunnison Creek
Little Creek-Cedar Creek
Little Halls Creek-Halls Creek
Log Creek-Chickasaw Creek
Lower Bay Minette Creek
Lower Chassaw Creek
Meekers Creek
Millin Lake
Rains Creek
Red Creek-Eightmile Creek
Seabury Creek
Tensaw River-Apalachee River
The Basin
Toulmins Spring Branch-Three Mile Creek
Upper Bay Minette Creek
Whitehouse Creek
Bay Minette
Semmes
Mobile
Daphne
Tillmans Corner
Google earth
N
20 mi

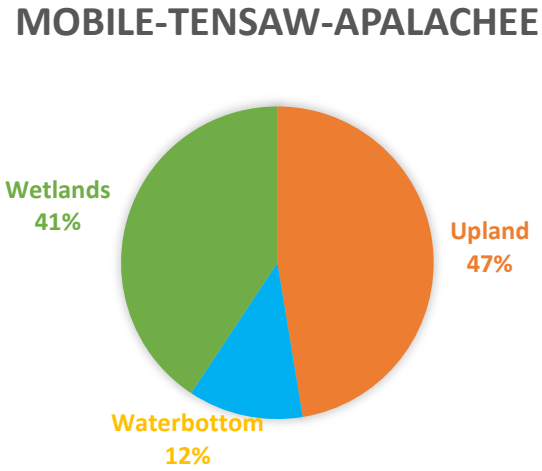

Tensaw-Apalachee
Leakesville
Citronelle
Mt Vernon
Perdido
Atmore
Lucedale
Bay Minette
Saraland
Semmes
Mobile
Daphne
Tillmans Corner

Proposed Watershed Groupings

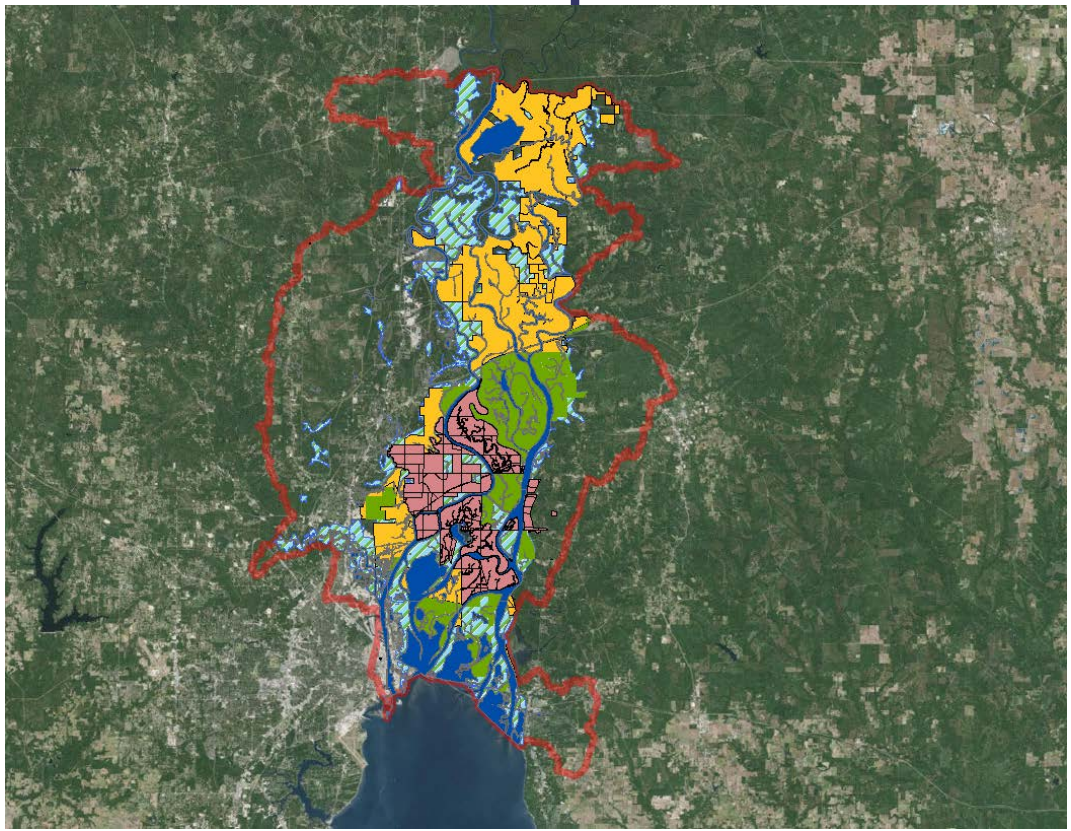


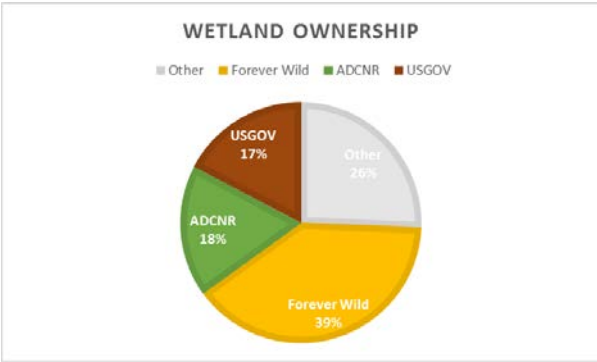
Mobile – Tensaw – Apalachee – 10 Sub-basins



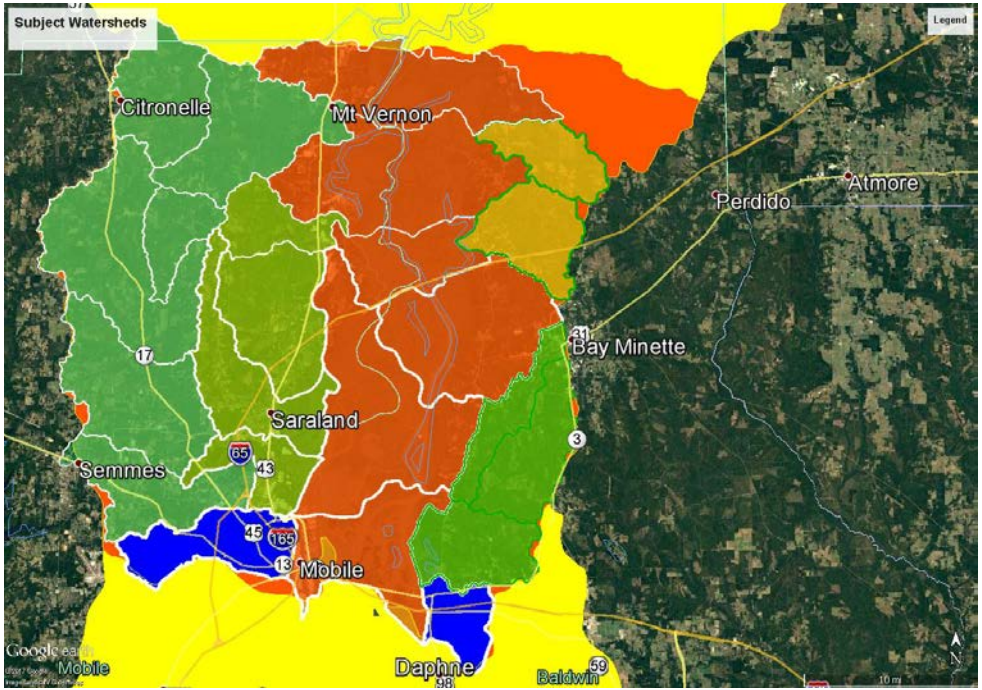


Wetland Ownership of M-T-A



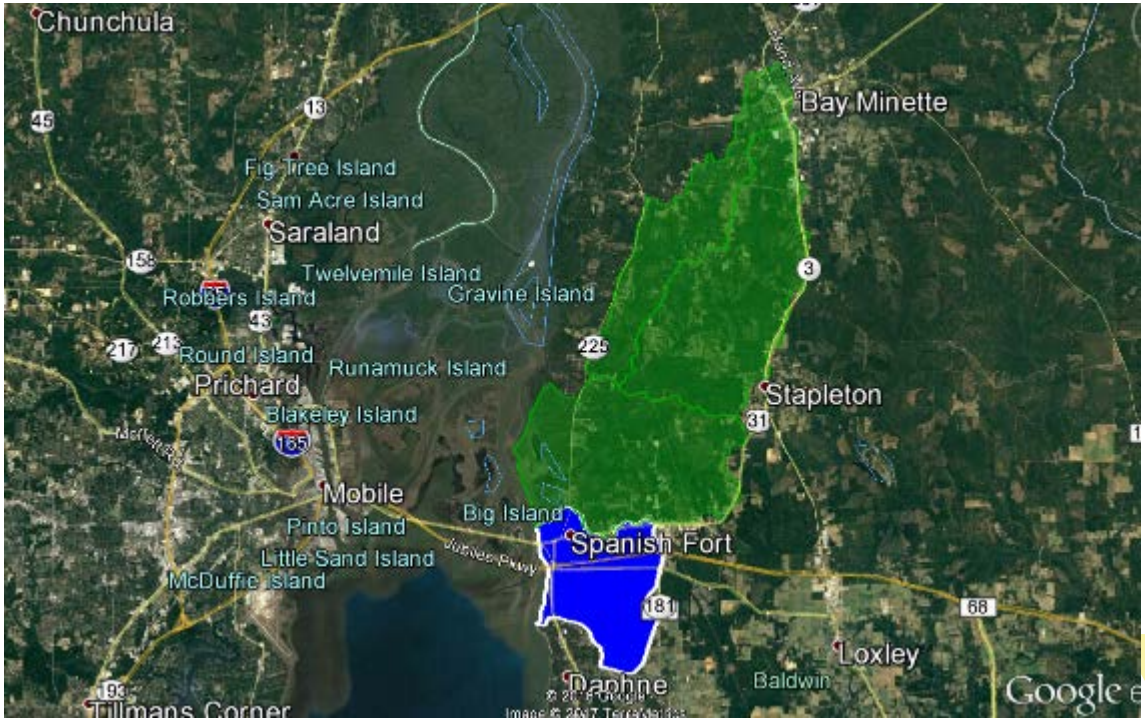


Proposed Watershed Groupings



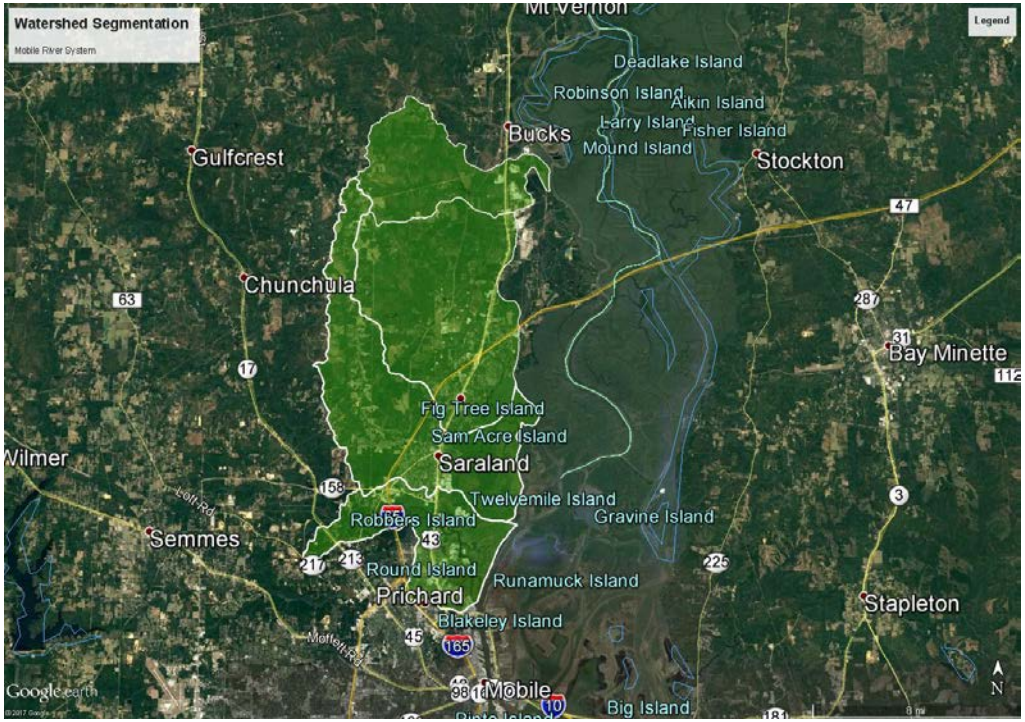
Bay Minette – Whitehouse Creek (3-Sub-basins)

- Stormwater and watershed erosion issues
- Development pressures
- Downstream Watershed Impacts



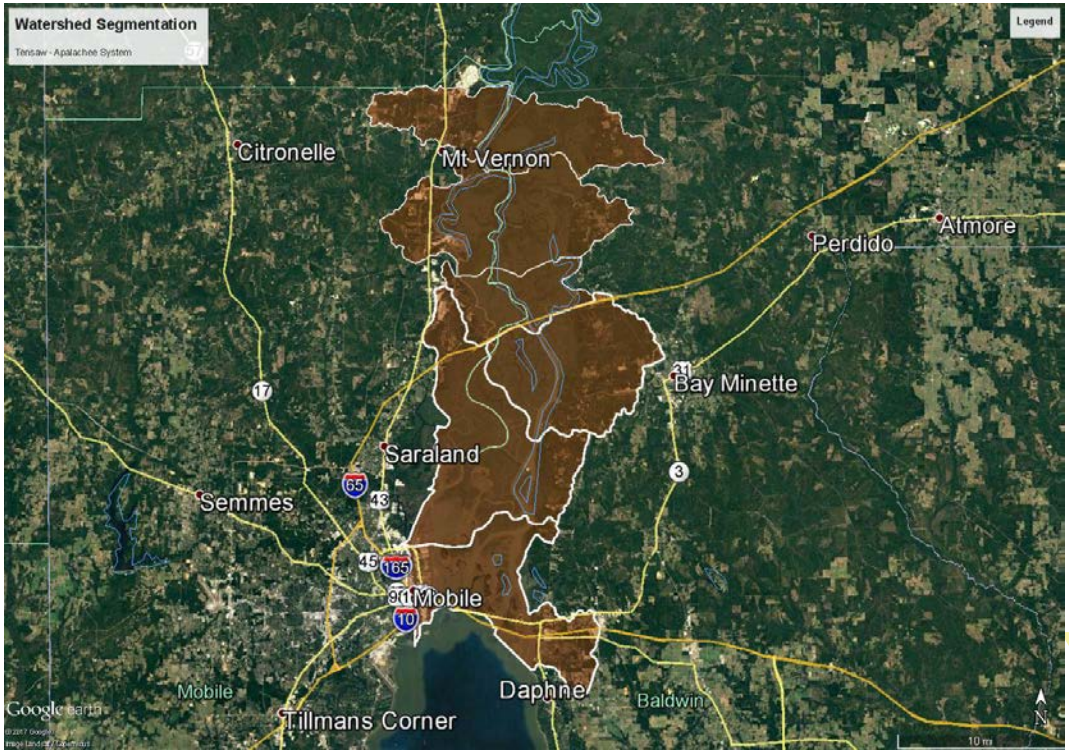
Mobile River Creek (4-Sub-basins)

- Stormwater and watershed erosion issues
- Development pressures
- Downstream Watershed Impacts



Tensaw Apalachee (6-Sub-basins)

- Habitat Conservation and Management
- Mosaic of Governmental Ownership
- Impact of Sea Level Rise
- Invasive Species
- LandTrust involvement
- Funding for Acquisition



Issues Identified for T-A Watershed

- Habitat Conservation
  - Support Land Acquisition and Public Trust ownership
- Habitat Management
- Land Use
- Hydrology
  - Surface Water Flows
  - Groundwater Flows

- Long Term Monitoring
  - Hydrology – expand-extend COE work, GSA work Causeway
  - Water Quality – Continue ADEM work and expand as practical
  - Biology – expand and extend GSA and ADEM efforts

Other Issues/Stakeholders

- Geographic Information System (GIS)
  - Much of the work outlined is a GIS Exercise
- Creative Monitoring Programs – Tap into Available Resources
  - Satellite Info- Tap into data syntheses
  - Volunteer Monitoring Programs

Task	Sub-task	Approximate Dollar value	Timing (Quarter 1-6)	Current Funding Sources	Recommended Entity Performing Work
Task 1.1 SCIENCE	Synthesize the current science knowledge (typical watershed management planning) and monitoring data	$50,000	1	NFWF/RESTORE Bucket 2	Contractor
Task 1.2 MONITORING	Identify where to Install stream gages, groundwater gages (GSA), and flow gages (USACE, GSA) and install for data collection (1 year worth of data)	$250,000+	1-2	Future funding	State Agencies
Task 2.1 HABITAT CONSERVATION	Conduct geospatial exercise to map out priority locations for conservation efforts	$50,000	1	NFWF/RESTORE Bucket 2	Land Conservation Entity
Task 2.2 HABITAT CONSERVATION	Engage prioritized landholders (see outreach task below)	$50,000	1	NFWF/RESTORE Bucket 2	Land Conservation Entity
Task 2.3 HABITAT MANAGEMENT	Conduct invasive species mapping and ground-truthing on MTA State protected lands	$50,000	1	NFWF/RESTORE Bucket 2	Contractor
Task 2.4 LAND USE	Assess current voluntary Best Management Practices for riparian and forestry practices and recommend updates.	$50,000	1	NFWF/RESTORE Bucket 2	Contractor
Task 2.5 HYDROLOGY	Conduct geospatial analysis of canals, channels, levees in the watershed area	$50,000	1	NFWF/RESTORE Bucket 2	Contractor
Task 2.6 HYDROLOGY	Expand current modeling efforts to upper MTA areas (e.g. flow, quantity, quality)	$1MM	2019	Future Funding	Contractor
Task 2.7 POLLUTANTS	Identify and sample legacy areas of contamination to determine hot spots of continued contamination	$25,000	4-6	NFWF/RESTORE Bucket 2	Contractor

Task 3.1 HABITAT CONSERVATION EDUCATION	Conduct education and outreach to key stakeholders on conservation options (MOU, CE, fee simple)	$12,5000	1	NFWF/RESTORE Bucket 2	Land Conservation Entity
Task 3.2 LAND USE EDUCATION AND OUTREACH-STAKEHOLDERS	Education of major key private landholders on voluntary Best Management Practices for riparian and forestry practices and recommend BMPs.	$12,500	1	NFWF/RESTORE Bucket 2	Land Conservation Entity
Task 3.3 LAND USE EDUCATION AND OUTREACH – RECREATIONAL USERS	Outreach and education to public on current access opportunities and project ideas that would affect their navigation and use of MTA.	$25,000	4-6	RESTORE Bucket 2	Contractor
Task 3.4 POLLUTANT OUTREACH-AFFECTED STAKEHOLDERS	Outreach to major Industrial/manufacturing stakeholders	$25,000	4-6	RESTORE Bucket 2	Contractor
Task 4.1 DECISION MATRIX FOR PLANNING	Create decision-making matrix through establishment of issue specific criteria (developed through SAC)	$25,000	4-6	RESTORE Bucket 2	Contractor
TOTAL for tasks that could be accomplished with current from T-A watershed mgmt. plan funds		$300,000 Contractor $150,000 Land Trust			
TOTAL FUNDS that need to be leveraged from other sources: modeling and monitoring foundational data		$1,250,000			

End

- Thank you for your Attention

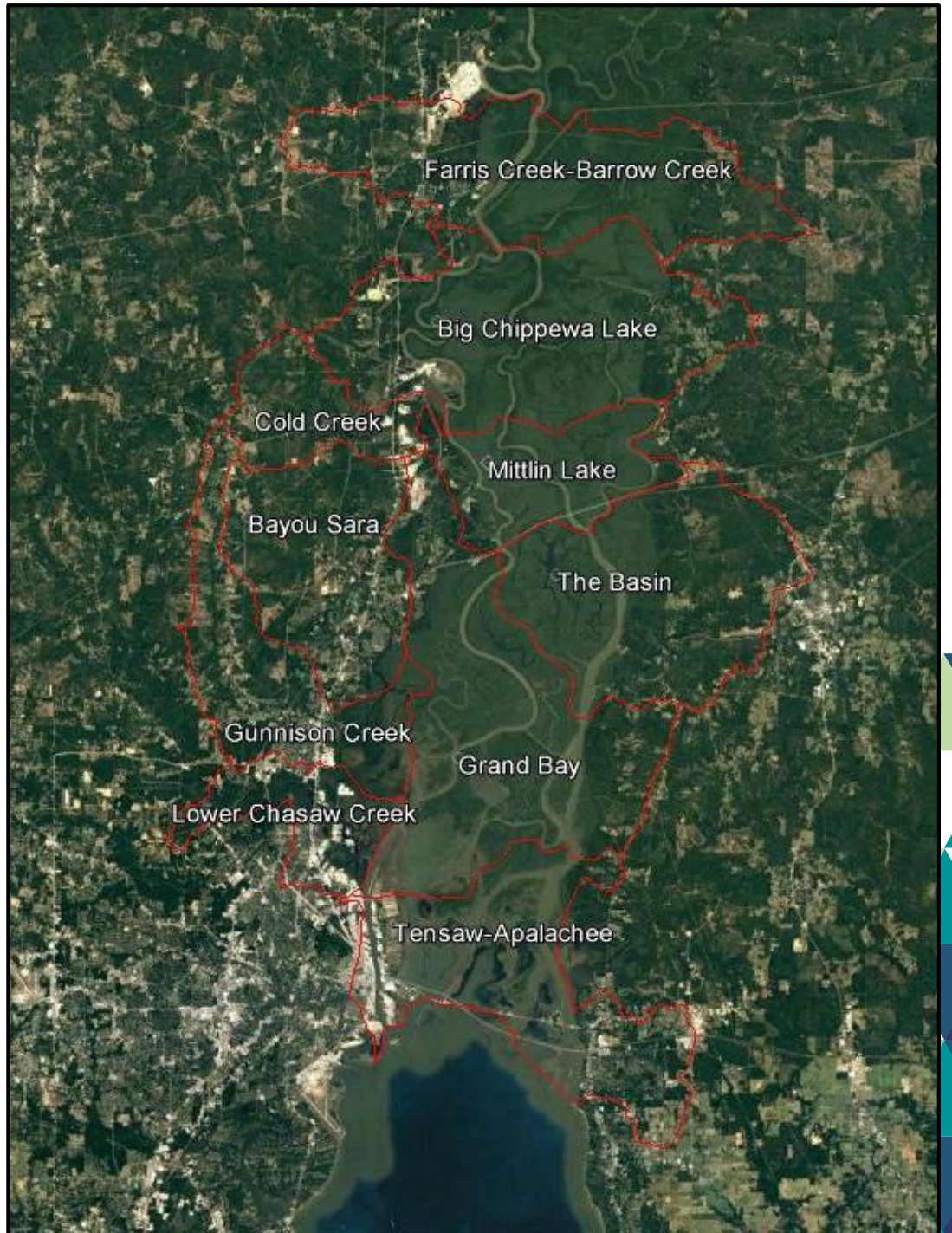
Tensaw-Apalachee Watershed Management Plan

SCOPING EXERCISE

moffatt & nichol

Mobile-Tensaw-Apalachee Watershed

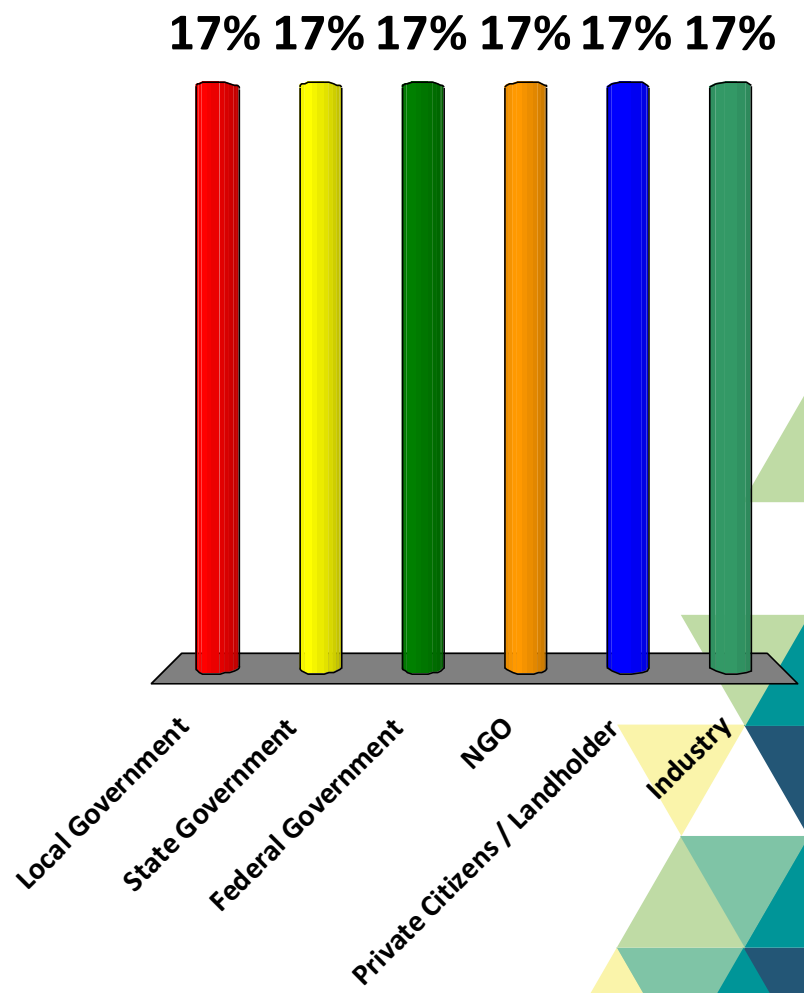
- Redefined area – for efficiencies in planning



Stakeholders

Rank your top three key stakeholder groups for the MTA watershed. Your first choice will be highest priority.

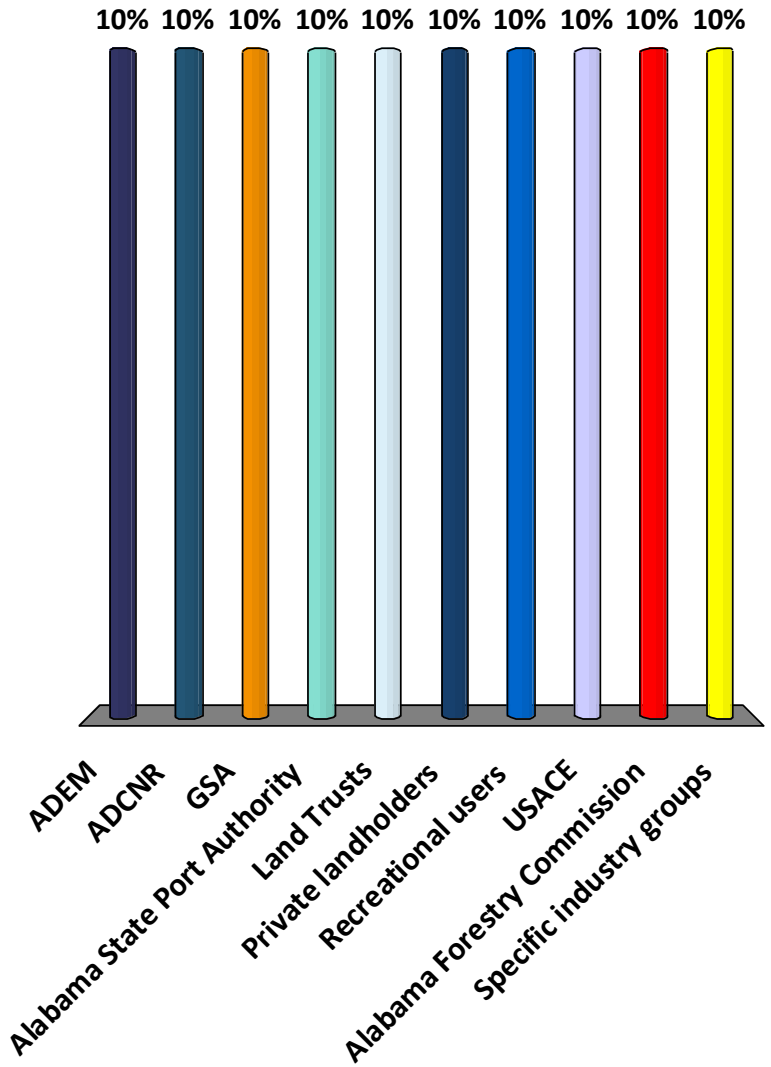
A. Local Government
B. State Government
C. Federal Government
D. NGO
E. Private Citizens / Landholder
F. Industry



Of the key stakeholder groups, rank the top 3 that have the most influence on the MTA Watershed?

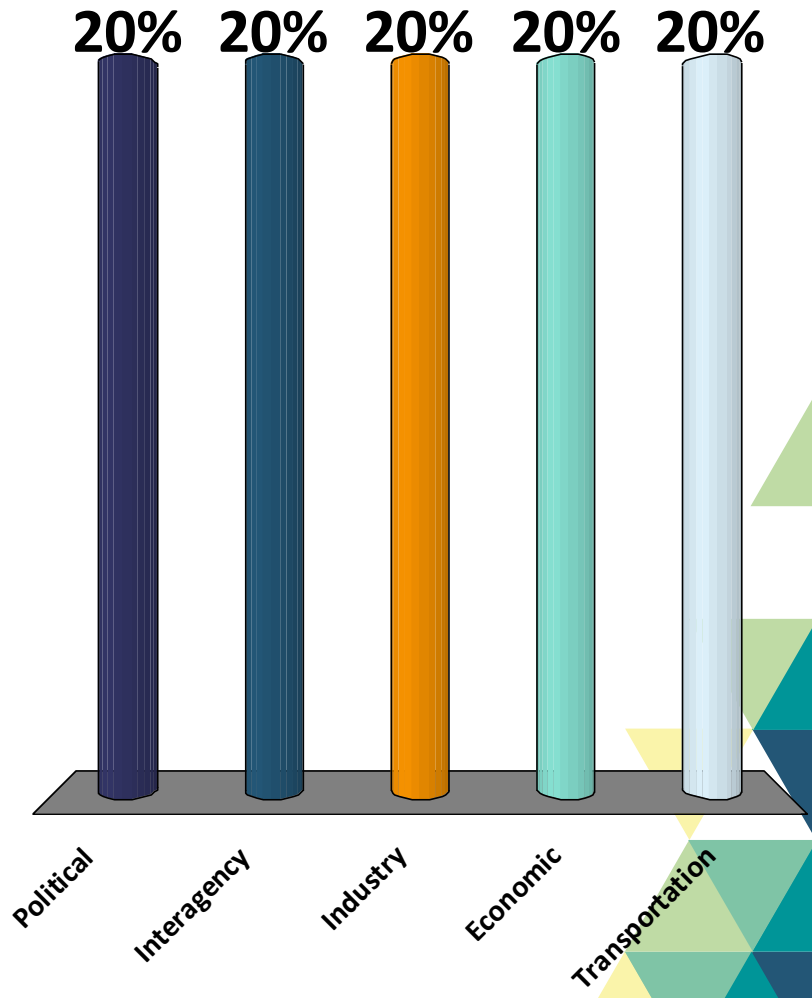
Your first choice will be highest priority.

A. ADEM
B. ADCNR
C. GSA
D. Alabama State Port Authority
E. Land Trusts
F. Private landholders
G. Recreational users
H. USACE
I. Alabama Forestry Commission
J. Specific industry groups



What are/will be the obstacles for the main stakeholders in management/restoration of the MTA Watershed? Choose all that apply

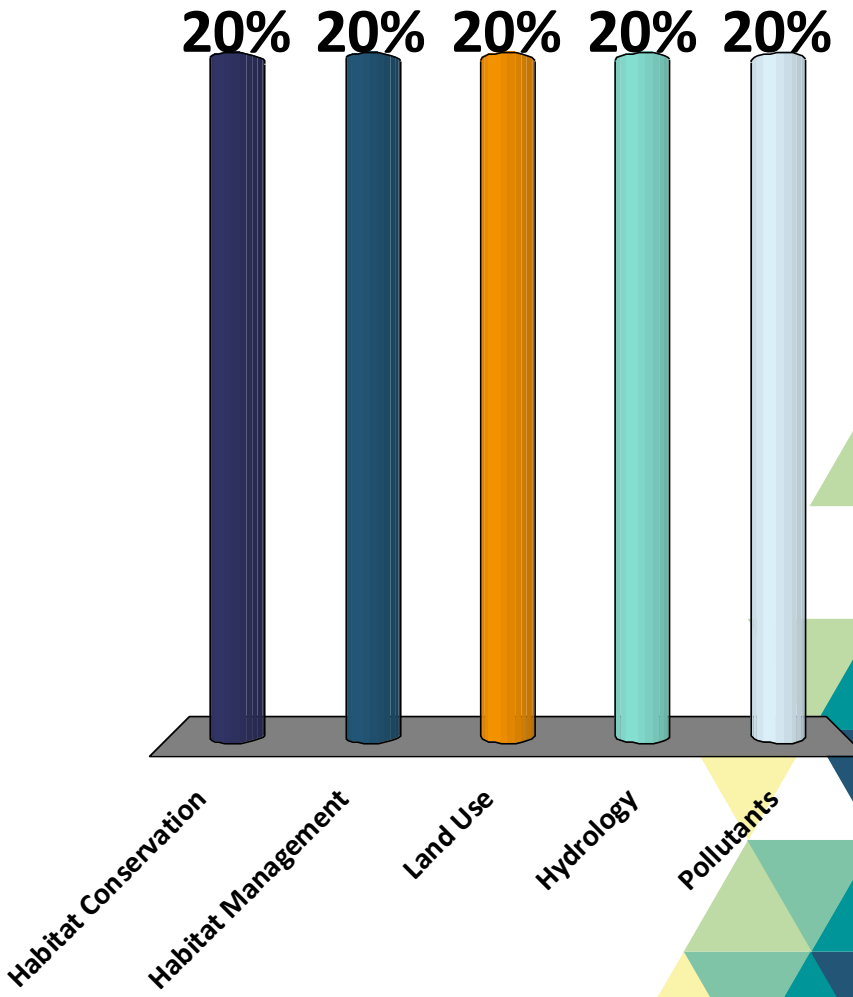
A. Political
B. Interagency
C. Industry
D. Economic
E. Transportation



Issues

Rank the top three key driving issues that need to be addressed for the MTA Watershed Management Plan.

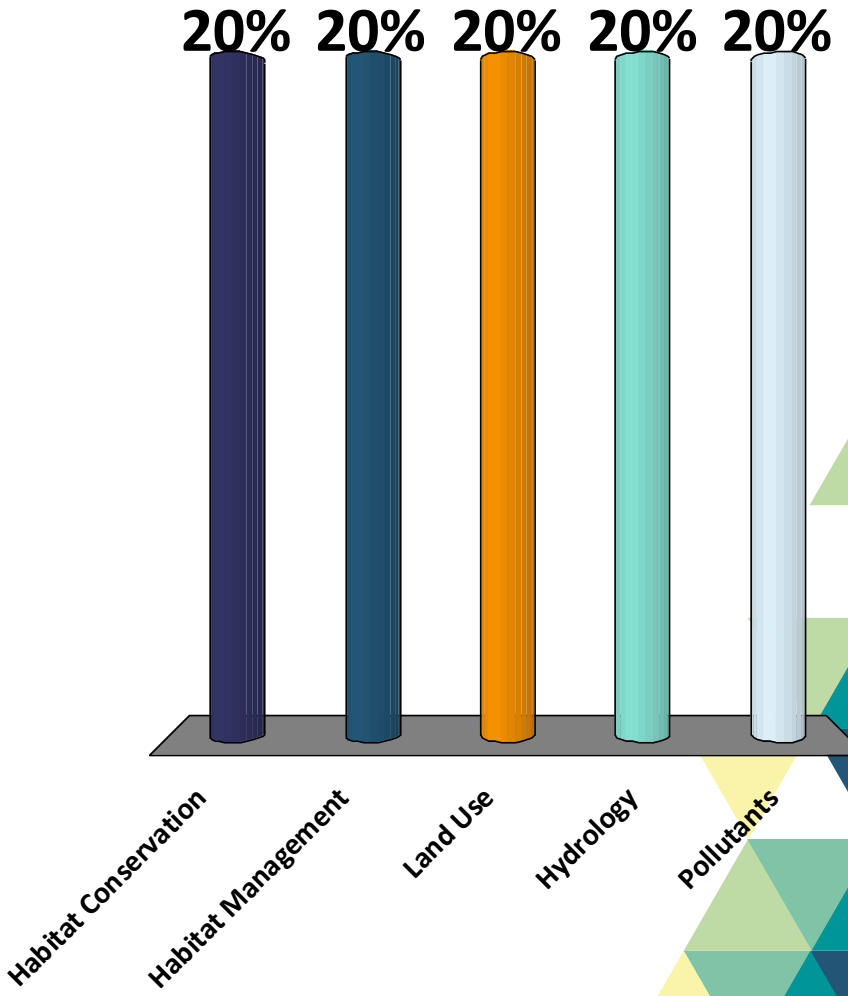
A. Habitat Conservation
B. Habitat Management
C. Land Use
D. Hydrology
E. Pollutants



Data gaps

Of the issues identified, rank the top 3 that have the largest data gaps that need to be addressed

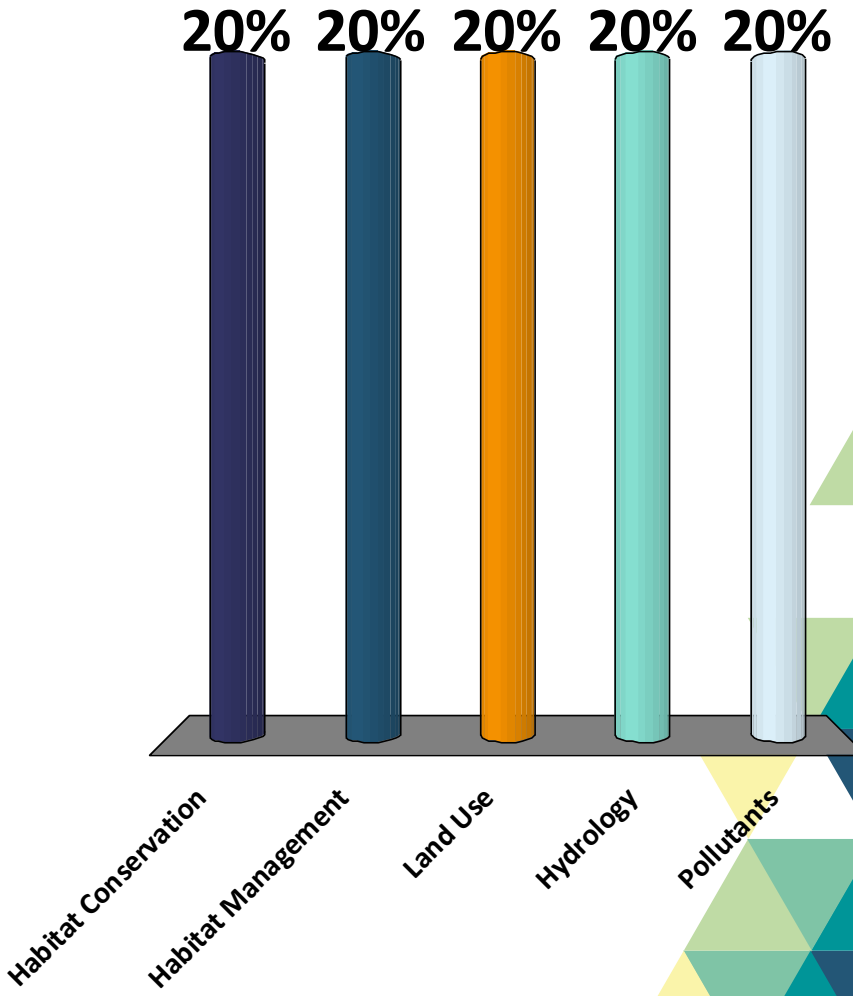
A. Habitat Conservation
B. Habitat Management
C. Land Use
D. Hydrology
E. Pollutants



Restoration

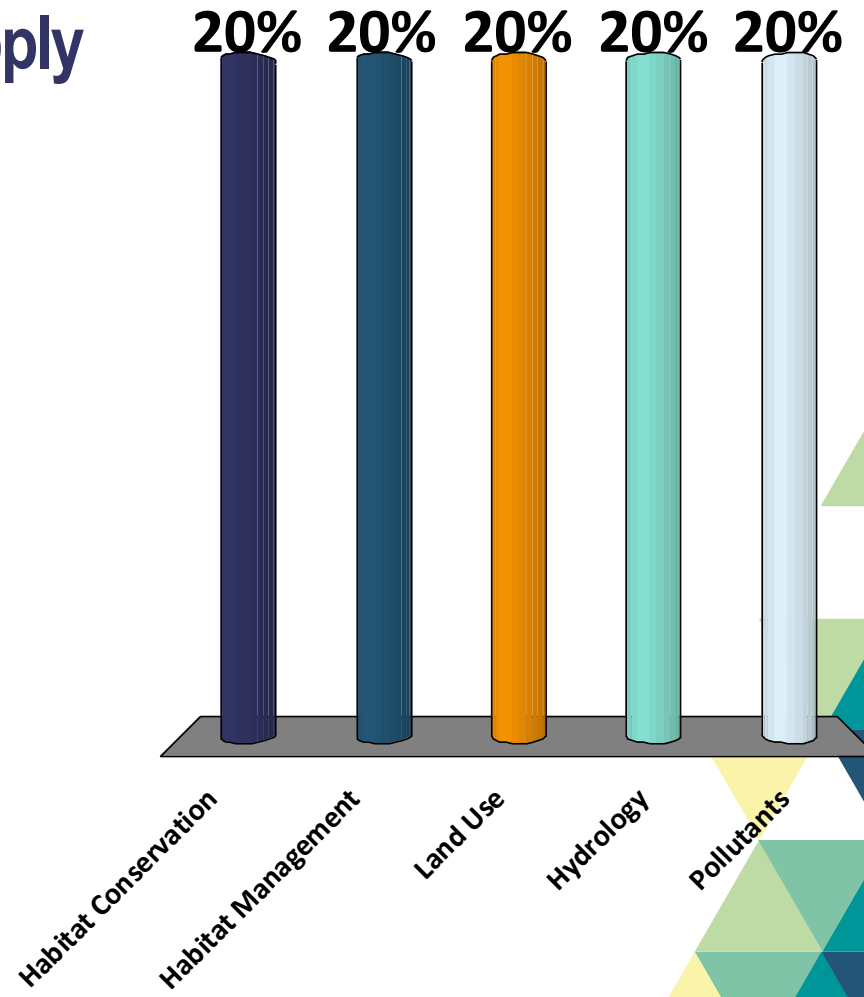
Rank the top 3 issues that would result in the most beneficial restoration activities in the MTA watershed?

A. Habitat Conservation
B. Habitat Management
C. Land Use
D. Hydrology
E. Pollutants



Which restoration activities do you feel link best to the upper basin watershed plans (e.g. Alabama and Tombigbee Basins)? Choose all that apply

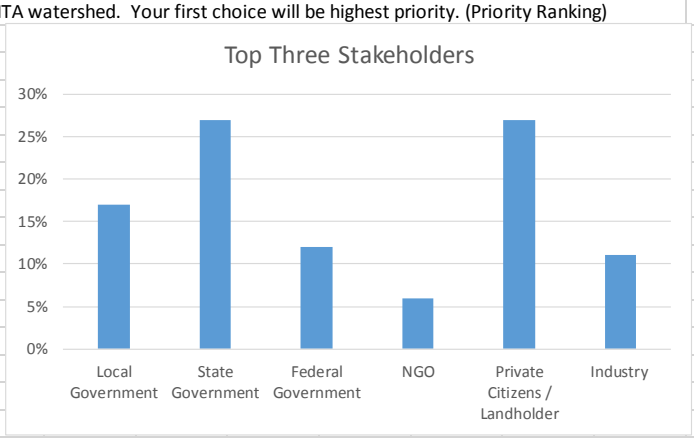
A. Habitat Conservation
B. Habitat Management
C. Land Use
D. Hydrology
E. Pollutants



Appendix 3 – Turning Point Presentations and Resulting Questions & Results

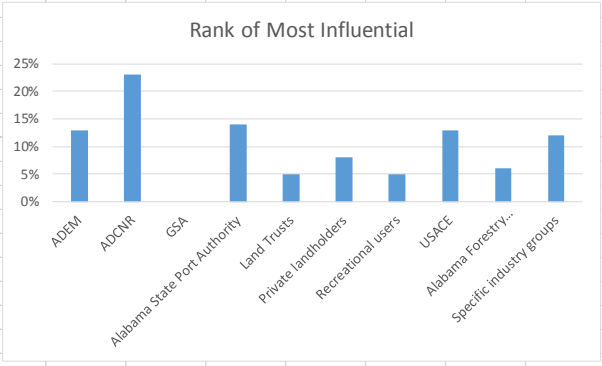
1. Rank your top three key stakeholder groups for the MTA watershed. Your first choice will be highest priority. (Priority Ranking)

	Responses	
	Percent	Weighted Count
Local Government	17%	163
State Government	27%	254
Federal Government	12%	115
NGO	6%	59
Private Citizens / Landholder	27%	254
Industry	11%	109
Totals	100%	954
Question Statistics		
Mean	3.33	
Median	3	
Variance	3	
Standard Deviation	1.73	



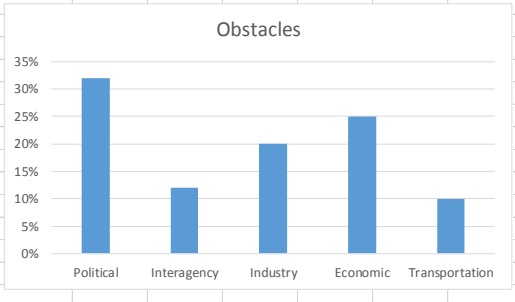
2. Of the key stakeholder gr rank the top 3 that have the most influence on the MTA Watershed? Your first choice will be highest priority. (Priority Ranking)

	Responses	
	Percent	Weighted Count
ADEM	13%	131
ADCNR	23%	228
GSA	0%	0
Alabama State Port Authorit	14%	138
Land Trusts	5%	53
Private landholders	8%	81
Recreational users	5%	47
USACE	13%	131
Alabama Forestry Commissi	6%	54
Specific industry groups	12%	114
Totals	100%	977
Question Statistics		
Mean	5.01	
Median	4	
Variance	9.67	
Standard Deviation	3.11	

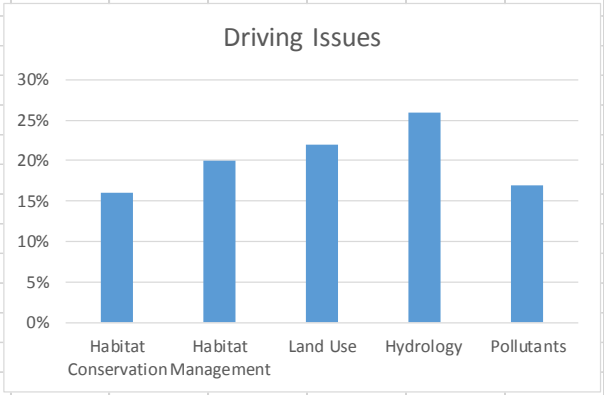


3. What are/will be the obstacles for the main stakeholders inï¿½management/restoration of theï¿½MTA Watershed? Choose all that apply (Multiple Choice - Multiple Response)

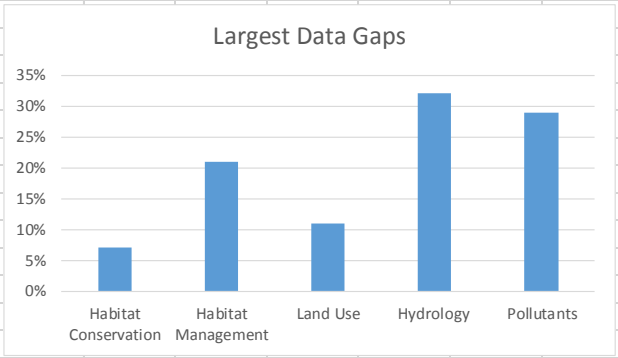
	Responses	
	Percent	Count
Political	32%	35
Interagency	12%	13
Industry	20%	22
Economic	25%	27
Transportation	10%	11
Totals	100%	108
Question Statistics		
Mean	2.69	
Median	3	
Variance	1.97	
Standard Deviation	1.41	



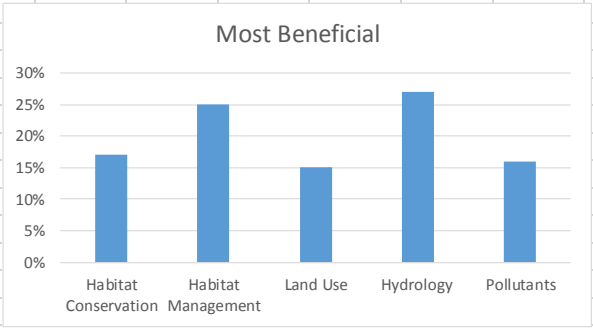
4. Rank the top three key driving issues that need to be addressed for the MTA Watershed Management Plan. (Priority Ranking)		
	Responses	
	Percent	Weighted Count
Habitat Conservation	16%	150
Habitat Management	20%	193
Land Use	22%	209
Hydrology	26%	252
Pollutants	17%	164
Totals	100%	968
Question Statistics		
Mean	3.09	
Median	3	
Variance	1.75	
Standard Deviation	1.32	



5. Of the issues identified	rank the top 3 that have the largest data gaps that need to be addressed (Priority Ranking)	
	Responses	
	Percent	Weighted Count
Habitat Conservation	7%	61
Habitat Management	21%	192
Land Use	11%	102
Hydrology	32%	291
Pollutants	29%	264
Totals	100%	910
Question Statistics		
Mean	3.55	
Median	4	
Variance	1.65	
Standard Deviation	1.29	

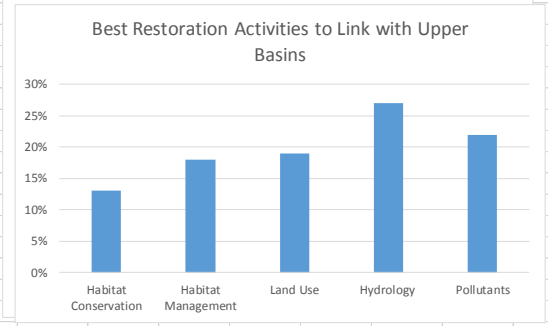


6. Rank the top 3 issues that would result in the most beneficial restoration activities in the MTA watershed? (Priority Ranking)		
	Responses	
	Percent	Weighted Count
Habitat Conservation	17%	164
Habitat Management	25%	240
Land Use	15%	147
Hydrology	27%	262
Pollutants	16%	158
Totals	100%	971
Question Statistics		
Mean	3.01	
Median	3	
Variance	1.84	
Standard Deviation	1.36	



7. Which restoration activities do you feel link best to the upper basin watershed plans (e.g. Alabama and Tombigbee Basins)? Choose all that apply (Multiple Choice - Multiple Response)

	Responses	
	Percent	Count
Habitat Conservation	13%	16
Habitat Management	18%	22
Land Use	19%	23
Hydrology	27%	32
Pollutants	22%	26
Totals	100%	119
Question Statistics		
Mean	3.25	
Median	3	
Variance	1.8	
Standard Deviation	1.34	



Appendix 4 –Database Reports

A project Task database (MS-Access) was utilized to track tasks and meetings, and to document all contacts, notes, documents and other items collected during this effort. The entire database was transferred to MBNEP on a flash drive for future utilization. The following reports generated from the database is presented here as an initial guide to the database:

Completed Tasks Report

Citations

Meetings Report

Completed Tasks

Task Title	Assigned To	Priority	Start Date	Due Date	Completed Date
Alternative Funding: Additional Grants	Don Blancher	(2) Normal	2/1/2017		8/15/2017
Watershed Plan Cost Analysis: Alternative Costing	Don Blancher	(2) Normal	4/1/2017		8/15/2017
Watershed Plan Scope: Component Vetting	Don Blancher	(2) Normal	4/1/2017		8/15/2017
Watershed Plan Scope: Component Development	Meg Goecker	(2) Normal	4/1/2017		8/15/2017
Gap Analysis:Technical Survey - Report	Don Blancher	(2) Normal	3/1/2017		8/15/2017
Gap Analysis:Technical Survey - Analyse	Don Blancher	(2) Normal	3/1/2017		8/15/2017
Gap Analysis: Technical Survey Development	Meg Goecker	(2) Normal	3/1/2017		8/15/2017
Scoping Document- Annotated Outline	Meg Goecker	(2) Normal	4/7/2017		7/31/2017
Gap Analysis:Technical Survey - Execute	Meg Goecker	(2) Normal	3/1/2017		7/31/2017
Gap Analysis: Discussions with MBNEP	Don Blancher	(2) Normal	3/1/2017		7/31/2017
Background Survey: Contact State Agencies-Determine Priorities	Don Blancher	(2) Normal	2/1/2017	7/31/2017	7/31/2017

Task Title	Assigned To	Priority	Start Date	Due Date	Completed Date
Background Survey: Contact State Agencies	Don Blancher	(2) Normal	2/1/2017	4/1/2017	7/31/2017
Background Survey: Contact State Agencies-Resource Interests	Don Blancher	(2) Normal	2/1/2017		6/30/2017
Total	13				

Documents

Wednesday, September 06, 2017
3:16:17 PM

ID	Citation	Website
1	Kleinschmidt, 2005. Alabama River Basin Management Plan. Prepared for the Alabma Clean Water Partnership, Montogomary, AL. 216 pp.	
2	Kleinschmidt, 2005. Tombigbee River Basin Management Plan,Prepared for the Alabma Clean Water Partnership, Montogomary, AL. 230 pp.	
3	Alabama Depaartment of Conservation and Natural Resources. 2017.Ciba-Geigy NPL Site, McIntosh, AL, Draft Restoration Plan and Programmatic Environmental Assessment	
4	Waselkov G. A., C. F. Andrus, and G. E. Plumb, editors. 2016. A state of knowledge of the natural, cultural, and economic resources of the Greater Mobile-Tensaw River Area. Natural Resource Report NPS/NRSS/BRD/ NRR—2016/1243. Biological Resources Division, National Park Service, Fort Collins, Colorado.	https://irma.nps.gov/DataStore/Reference/Profile/2230281
5	Cadmus Group, 2014. Alabama & Mobile Bay Basin Integrated Assessment of Watershed Health	
6	Horn, J. 2006. The National Coastal Assessment Alabama 2000-2004. Final Report. Prepared by Alabama Department of Environmental Management in cooperation with the US Environmental Protection Agency	
7	CH2MHill, 2004. Tallapoosa River Basin Management Plan. Prepared for the Alabama Clean Water Partnership. 295pp.	
8	Roy, J. 2016. 2015 Integrated Water Quality Monitoring and Assessment Report. Alabama Department of Environmental Management. 673pp.	
9	ADEM, 2016. ADEM Fish Tissue Monitoring Program 2015 Annual Report. 143pp.	
10	Tetra Tech, Inc., 2001. Loading Budget Analysis for Mobile Bay Modeling. Prepared for the Mobile Bay National Estuary Program and US Army Corp of Engineers. 163pp.	

ID	Citation	Website
11	O'Neill, P.E. 2007. A synoptic water-quality survey in the Upper Mobile-Tensaw River Delta, 2005-2007. Prepared for the Geological Survey of Alabama in cooperation with the USFWS Daphne Ecological Services Office. 55pp.	
13	Alabama Department of Conservation and Natural Resources. 2014a. State wildlife action plan DRAFT Chapter 1: Alabama's Wildlife. 2014 Sep 29. p i-50.	http://www.outdooralabama.com/sites/default/files/AL-SWAP-DRAFT-30JULY_0.pdf
14	Atkins JB, Zappia H, Robinson JL, McPherson AK, Moreland RS, Harned DA, Johnston BF, Harvill JS. 2004. Water quality in the Mobile River Basin, Alabama, Georgia, Mississippi, and Tennessee, 1999-2001. Reston VA: US Geological Survey. Circular 1231. 40 p.	http://pubs.usgs.gov/circ/2004/1231/pdf/circular1231.pdf
15	Baya EE, Yoke LS, Pinyerd CA III, Blancher EC, Sklenar SA, Isphording WC. 1998. Preliminary characterization of water quality of the Mobile Bay National Estuary Program (MBNEP) Study Area. Fairhope AL: Mobile Bay National Estuary Program. 305 p.	http://www.mobilebaynep.com/images/uploads/library/water_quality_characterization.pdf
16	Bonzongo J-CJ, Lyons WB. 2004. Impact of land use and physicochemical settings on aqueous methyl mercury levels in the Mobile-Alabama River system. Ambio 33:328-33.	
17	Byrnes MR, Berlinghoff JL, Griffee SF. 2013. Sediment dynamics in Mobile Bay, Alabama: development of an operational sediment budget. Mobile AL: Applied Coastal Research and Engineering. Technical report to the Mobile Bay National Estuary Program. 134 p. Available online http://www.mobilebaynep.com/images/uploads/library/mobile_bay_sediment_budget_final_report_plus_appendices_032013.pdf.	http://www.mobilebaynep.com/images/uploads/library/mobile_bay_sediment_budget_final_report_plus_appendices_032013.pdf
18	Carey, A. E., Nezat, C. A., Pennock, J. R., Jones, T., & Lyons, W. B. (2003). Nitrogen budget of the Mobile–Alabama River System watershed. Geochemistry: Exploration, Environment, Analysis, 3(3), 239-244.	
20	Duncan RS. 2013. Southern wonder: Alabama's surprising biodiversity. Tuscaloosa AL: University of Alabama Press. 464 p.	
21	Ellis JT, Spruce JP, Swann RA, Smoot JC, Hilbert KW. 2011. An assessment of coastal land-use and land-cover change from 1974-2008 in the vicinity of Mobile Bay, Alabama. Journal of Coastal Conservation 15:139-49.	

ID	Citation	Website
22	Goecker ME, Valentine JF, Sklenar SA, Chaplin GI. 2009. Influence from hydrological modification on energy and nutrient transference in a deltaic food web. Estuaries and Coasts 32:173-87.	
24	Valentine, J.F. and S. Sklenar. 2006. Mobile–Tensaw Delta Hydrological Modifications Impact Study. A final report. Mobile Bay Keepers and Mobile Bay National Estuary Program. 176 pages. http://www.mobilebaynep.com/site/news_pubs/research.htm.	http://www.mobilebaynep.com/images/uploads/library/DeltaFinalReport0828061.pdf
25	Valentine, J.F., S. Sklenar, and M. Goecker. 2004. Mobile–Tensaw Delta Hydrological Modifications Impact Study. Final Report to the Mobile Bay National Estuary Program. 139 pages.	
26	Harbinger Consulting Group. 2015b. A preliminary evaluation of opportunities for economic benefit associated with a new National Park Service unit in the Mobile-Tensaw Delta. 12 p.	http://harbingerconsult.com/wp-content/uploads/2015/09/MTD-NPP-econ-report-FINAL-050815.pdf
28	Isphording WC. 1994. Erosion and deposition in northern Gulf of Mexico estuaries. Transactions of the Gulf Coast Association of Geological Societies 44:305-14.	
29	Isphording WC, Imsand FD, Jackson RB. 1996. Fluvial sediment characteristics of the Mobile River Delta. Transactions of the Gulf Coast Association of Geological Societies 46:185-92.	
30	Johnson GC, Kidd RE, Journey CA, Zappia H, Atkins JB. 2002. Environmental setting and water-quality issues of the Mobile River Basin, Alabama, Georgia, Mississippi, and Tennessee. US Geological Survey Water-Resources Investigations Report 02-4162. 70 p. Available online http://pubs.usgs.gov/wri/wri024162/pdf/wrir4162.pdf. Accessed 2016 Feb 28.	https://pubs.usgs.gov/wri/wri024162/pdf/wrir4162.pdf
32	TetraTech. 2012. Mobile Bay modeling report. Submitted to Mobile Bay National Estuary Program [see figure C-11]. 63 p. Available online http://www.mobilebaynep.com/images/uploads/library/Mobile_Bay_Modeling_Report_(2012).pdf. Accessed 2016 Feb 25.	http://www.mobilebaynep.com/images/uploads/library/Mobile_Bay_Modeling_Report_(2012).pdf
33	[USFWS] US Fish and Wildlife Service. 2000. Mobile River Basin aquatic ecosystem recovery plan. Atlanta GA: Southeast Region, USFWS. 128 p.	https://www.fws.gov/southeast/grants/pdf/001117.pdf

ID	Citation	Website
34	Ward AK, Ward GM, Harris SC. 1992. Water quality and biological communities of the Mobile River drainage, eastern Gulf of Mexico region. In: Becker CD, Neitzel DA, editors. Water quality in North American river systems. Columbus OH: Battelle Press. p 277-304.	
35	Harbinger Consulting Group. 2015a. Potential economic impact of a National Park Service unit in the Mobile-Tensaw Delta: Technical Report. 31 p.	http://harbingerconsult.com/wp-content/uploads/2015/06/MTD-NPP-tech-report-FINAL-050715.pdf
37	Valentine, J and Sklenar, S. Assessment of Seidment Contamination in the Lower Mobiel-Tensaw Delta (Rangia Study) - Final Report. 38pp.	http://www.mobilebaynep.com/images/uploads/library/sedimentrangia2005.pdf
38	Hummel RL, Parker SJ. 1995. Holocene geologic history of Mobile Bay, Alabama (circular 186). Tuscaloosa AL: Geological Survey of Alabama. 97 p.	
39	Braun, D. and R. Neugarten. 2005. Mobile-Tensaw River Delta, Alabama Hydrological Modifications Impact Study. Prepared for Mobile BayKeeper.	
40	MBNEP. 2006. Conserving Alabama's Coastal Habitats: Acquisition and Restoration Priorities of Mobile and Baldwin Counties	
41	Alabama Forestry Commission. 2010. Forests at the Crossroads: Alabama's Forest Assessment and Resource Strategy.	
42	MBNEP. 2017. Questions for Agencies	
43	Google Earth Engine. 2017. CHIRPS Data	http://iri.columbia.edu/~pceccato/Google_Training_Health/CHIRPS_Precipitation.pdf
44	Google Earth Engine. 2017. NDVI From MODIS	http://iri.columbia.edu/~pceccato/Google_Training_Health/NDVI.pdf

ID	Citation	Website
45	Google Earth Engine. 2016. GEE Summit 2016. Slide show	http://earthenginesummit2016.earthoutreach.org/training-materials
46	Mattee, M.F., Shepard, T.E., Smith, J.B., McGregor, S.W., Johnson, C.C., and P.E. O'Neil. 2011. A survey for the Gulf sturgeon in the Mobile and Perdido Basins, Alabama. Circular 203. Geological Survey of Alabama Ecosystems Investigations Program. Tuscaloosa, Alabama. Pp. 90	
47	GSA, 1997. Results of surface-water sampling in the Tensaw River Watershed, Alabama: A report to the Alabama Department of Environmental Management for the Period of September 1, 1997-October 31, 1997. Geological Survey of Alabama, Contract No. AGY7049. Tuscaloosa, Alabama.	
48	O'Neil, P.E., Mettee, M.F., Shepard, T.E., and S.W. McGregor. 2005. An aquatic species ruvey of streams and rivers draining Forever Wild Lands in the Mobile-Tensaw Rive Delta 2002-05. Open-file report 0521. Geological Survey of Alabama, Tuscaloosa, AL. 19pp.	
49	O'Neill, P.E. and M.F. Mettee. 2008. A synoptic water-quality survey in the upper Mobile-Tensaw River Delta, 2005-07. Geological Survey of Alabama. Water Investigations Program. Tuscaloosa, AL. 50 pp.	
50	Harris, S.C. and P.E. O'Neil. 2015. Trichoptera of the Mobile-Tesnaw River Delta, Alabama, with description of the female of Phylocentropus harrisi and notes on other aquatic fauna. Bulletin 184. Geological Survey of Alabama Ecosystems Investigations Program. Tuscaloosa, AL. 91pp.	
51	O'Neil, P.E., Shepard, T.E., Mettee, M.F., and S.W. McGregor. 2007 A survey of Alabama's coastal rivers and streams for fishes of conservation concern, 2004-06. Bulletin 178. Geological Survey of Alabama Water Investigations Program. Tuscaloosa, AL. 101pp.	
52	USCOE. 2001. Upper Mobile Bay Ecosystem Restoration Project Proposed Modification of US Highway 90 (Causeway).	
53	Alabama Department of Conservation and Natural Resources. 2002. The Mobile Bay Causeway Existing Condition & Enhancement Opportunities.	
54	USCOE 2017. GRR Plan and Public Meeting info. USCOE Mobile District	http://www.sam.usace.army.mil/Missions/Program-and-Project-Management/Civil-Projects/Mobile-Harbor-GRR/Mobile-Harbor-GRR-Downloads/

ID	Citation	Website
55	USCOE 2017. Grid Map of Mobile-Tensaw-Apalachee Model Prepared for GRR. USCOE Mobile District	

Meeting Report

Meeting by Month	Meeting Date	Agency	Contact	Status	DateComplete	Summary
		Alabama Departme	Hinesley	Complete	4/17/2017	Need to ping Hinesley
		Geological Survey of	Newton	Complete		Steve Jones said Newton and O'Neill are working on Questions
		Commisioner of Ag	McMillan	pending		
		U.S. Army Corp of E	Rees	Complete		Spoke with Susan, Conference call with others, Converstion with Elizabeth Godsey
		Alabama Coastal Par	Stimpson	Complete		
February 2017	2/8/2017	Alabama Departme	Hunter	Complete	2/8/2017	Don met with Amy for a prlim meeting whil at MOSES. Set up a full meeting to come.
	2/23/2017	Alabama Forest Res	Dumont	Complete	2/23/2017	Don B And Meg G. met with Dan Dumont at his office and went through the questionaire. Indicated that acquisition is currently done opportunistaically, but shoul have a more focused approach.
March 2017	3/6/2017	Alabama Departme	Brantley, Hunter, Ferrar	Complete	3/6/2017	Don B met with Amy H. Will B (by phone) Will U. and H. Burch
	3/10/2017	Alabama State Dock	Harris	Complete		Don met briefly with Bob (15 minutes) followed up some at GRR meeting, but still open.
	3/16/2017	Geological Survey of	Jones	Complete	3/20/2017	Had preliminary meeting with GSA, Steve Jones; GSA preparing better answer to questions.
April 2017	4/3/2017	Alabama Departme	Powell	Complete	4/3/2017	Had Meeting in Montgomery to discuss possibility of giving carbon credits to private parties if forest restored on State lands
	4/3/2017	Alabama Departme	Leslie	Complete	4/3/2017	Had meeting with numerous ADEM folks in Montgomery to discuss the T-A WMP
	4/17/2017	Alabama Departme	Hinesley, Shelton	Complete	4/17/2017	Mike Shelton and Phillip Hinsley meeting
	4/25/2017	Alabama Departme	Ferraro	Complete	4/25/2017	Good input on Delta and Causeway
May 2017	5/3/2017	Alabama Coastal Fo	Berte	Complete	5/3/2017	
	5/19/2017	Mobile Bay National	Swann	Complete	5/24/2017	SAC Meeting and voting
	5/19/2017	Alabama Coastal Par	Cagle	Complete	6/7/2017	Met With ACP and MA

Meeting by Month	Meeting Date	Agency	Contact	Status	DateComplete	Summary
May 2017	5/25/2017	Alabama Wildlife Fe		Pending		
June 2017	6/5/2017	Alabama Coastal Par	Stimpson	Complete	6/5/2017	
	6/10/2017	Manufacture Alaba	Cagle	Complete	6/5/2017	Met with Cagle and Alabama Coastal Partnership to discuss TA issues. More interested in rec use promotion
	6/23/2017	Alabama Departme	Davis	Complete	6/25/2017	Questionaire received by email..
July 2017	7/14/2017	U.S. Army Corp of E	Godsey	Complete	7/14/2017	Phone call on data availability from GRR