



The Baldwin County Wetland Conservation Plan: Watershed-based Criteria used to determine wetland function

**National Symposium on Compensatory
Mitigation and the Watershed Approach**

May 19, 2004

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Baldwin County Commission,

Baldwin County, Alabama



What is the Baldwin County Wetland Conservation Plan?

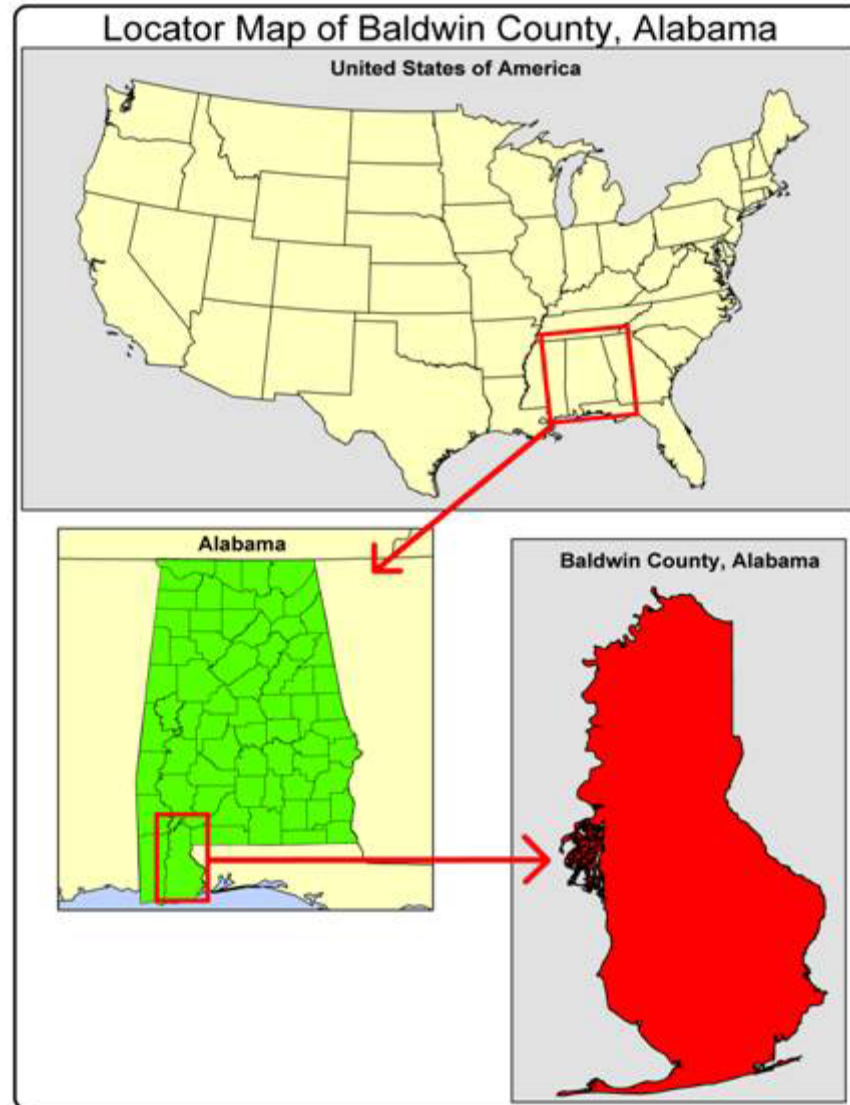
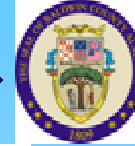
A multi-year effort to identify, assess, and restore wetland resources in Baldwin County, Alabama

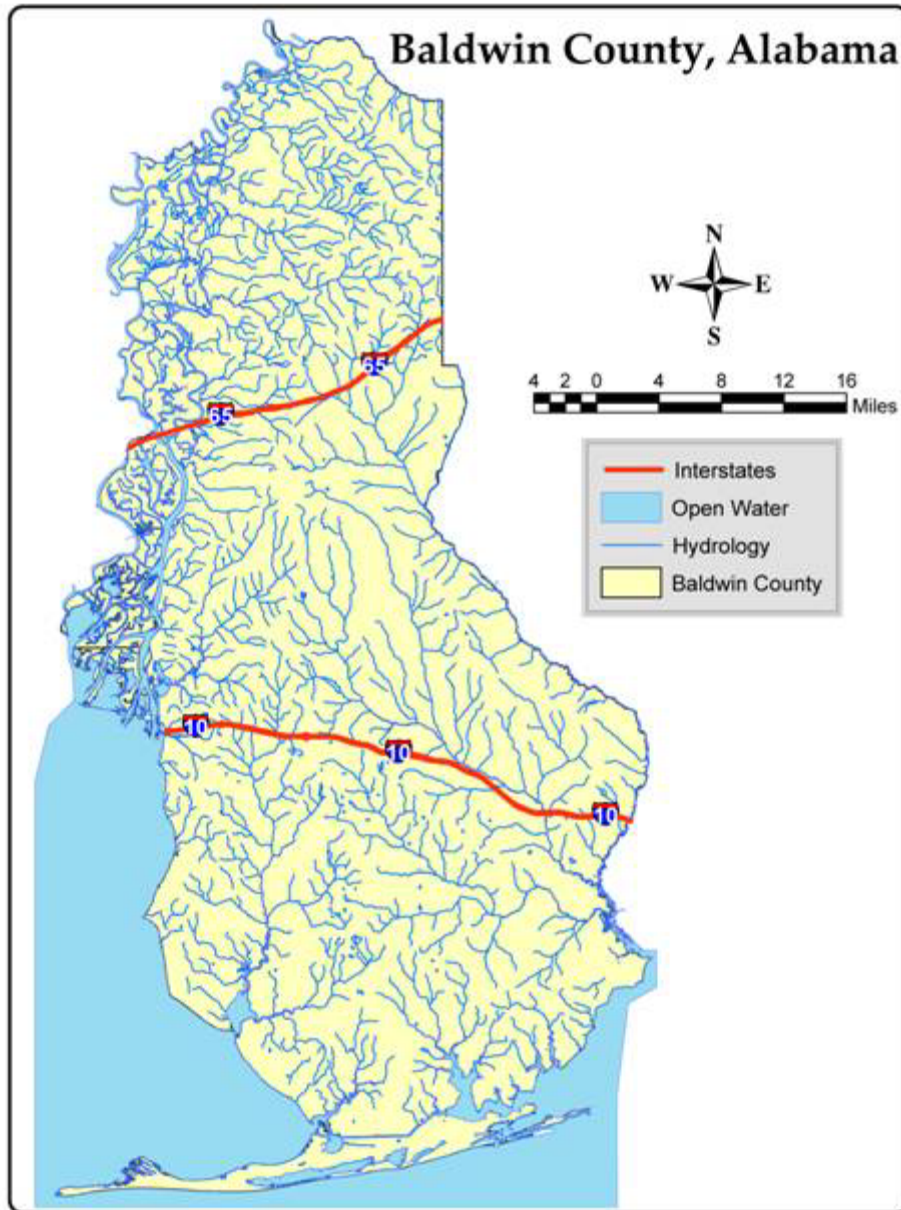


**Project is funded
through a
EPA Section IV State
Wetland Program
Development
Grant**



The Baldwin County Wetland Conservation Plan



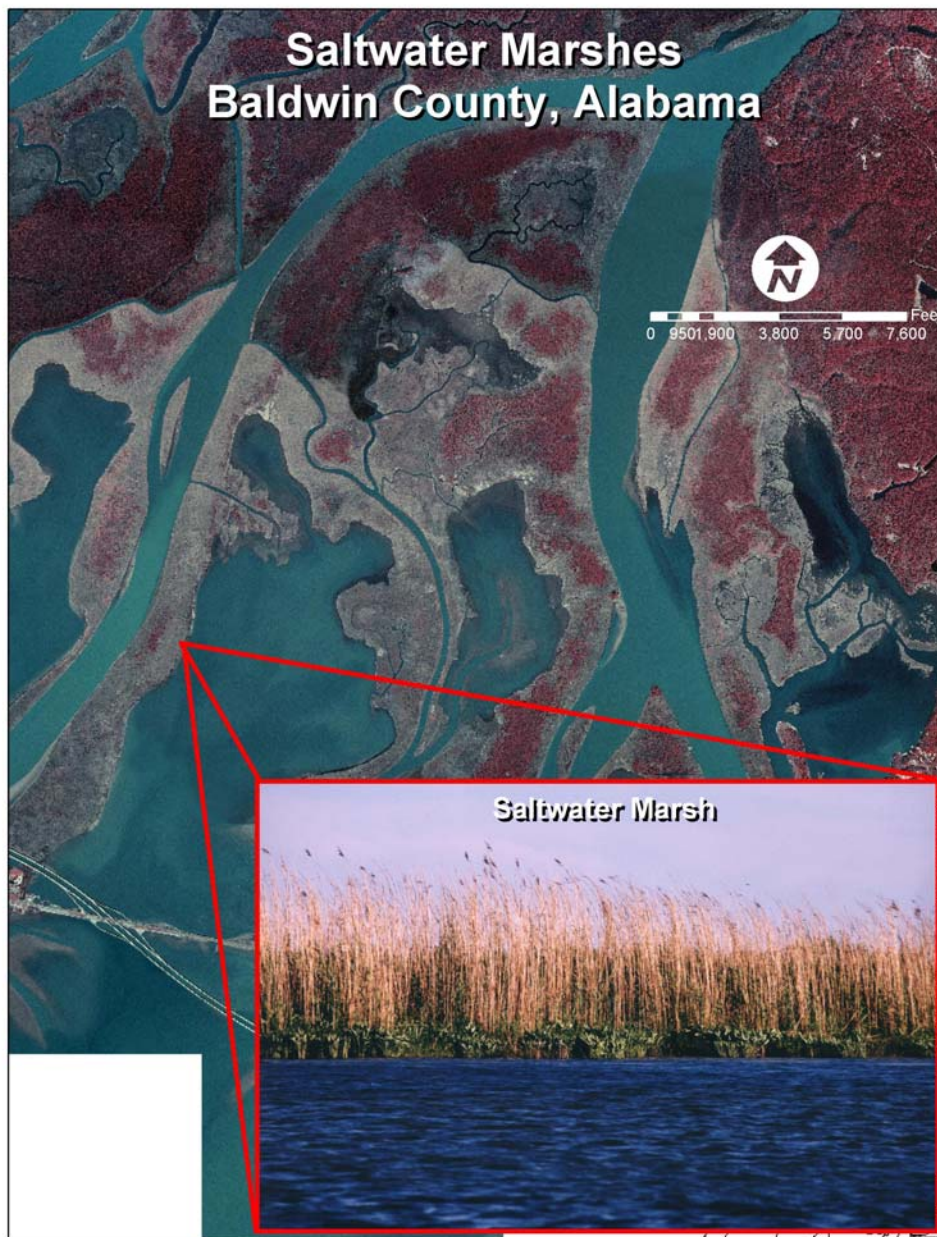


Baldwin County, AL general statistics

- 1600 square miles
- 1400 miles of rivers and streams
- 500 square miles of wetlands

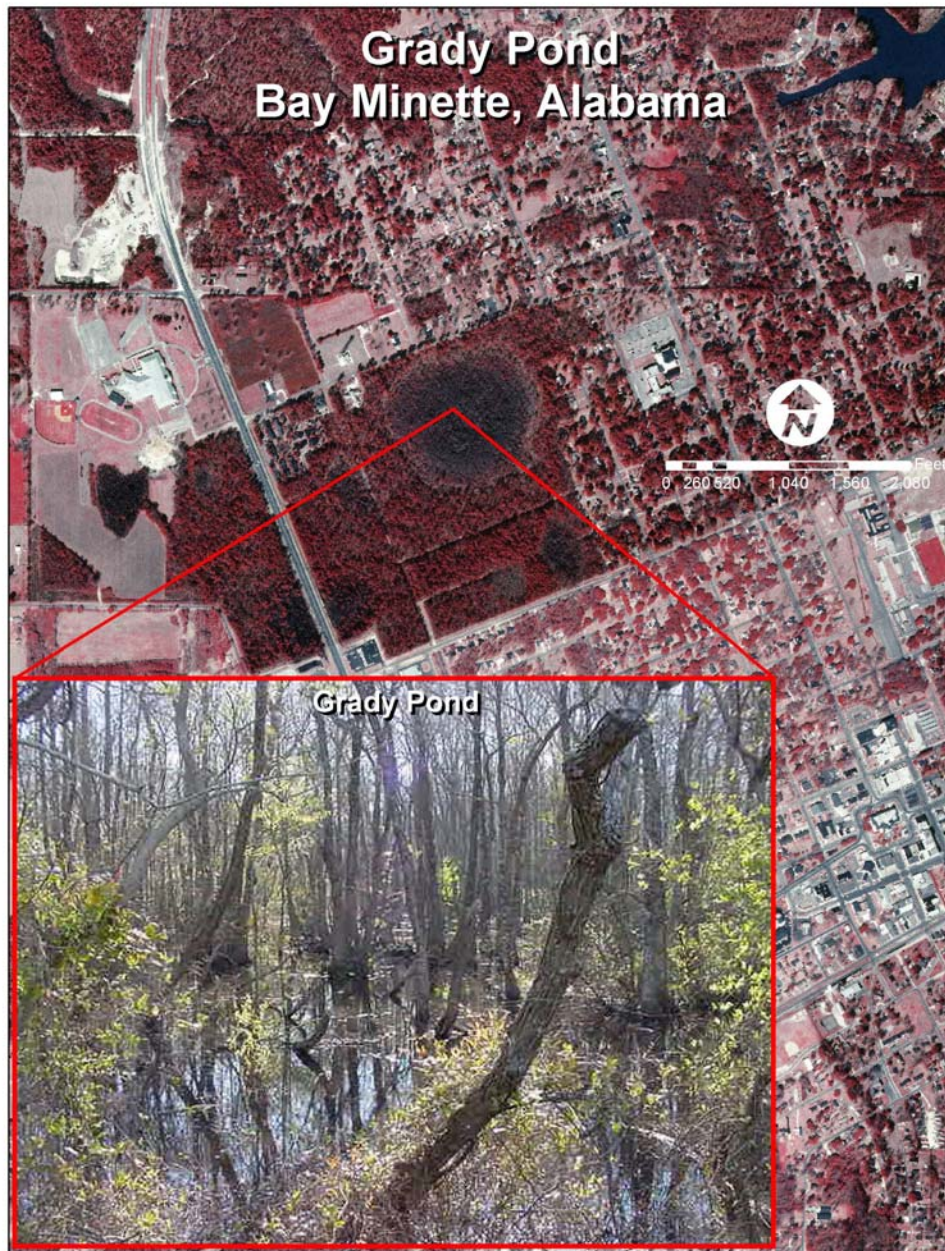


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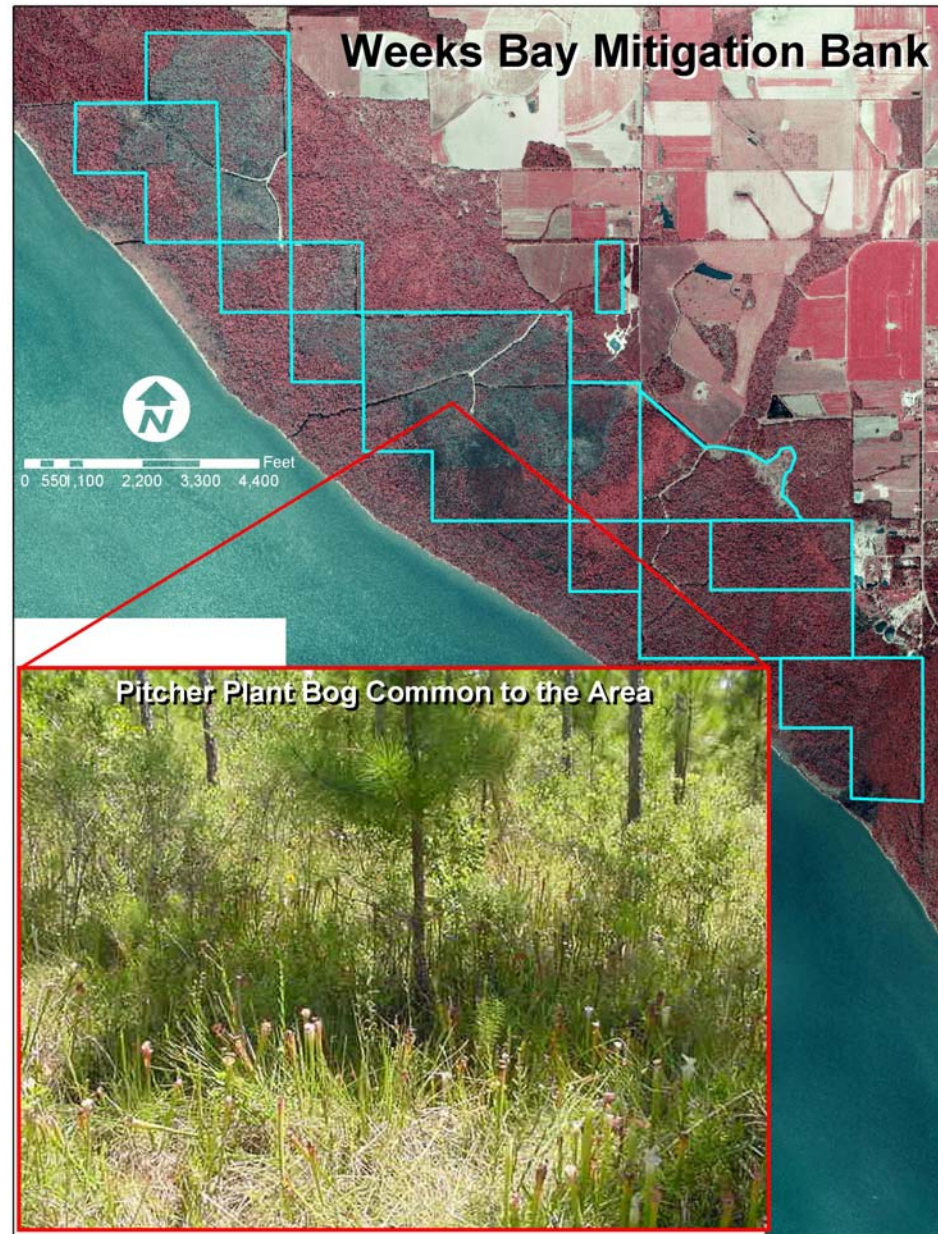
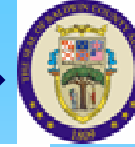


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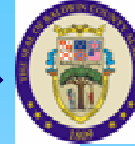


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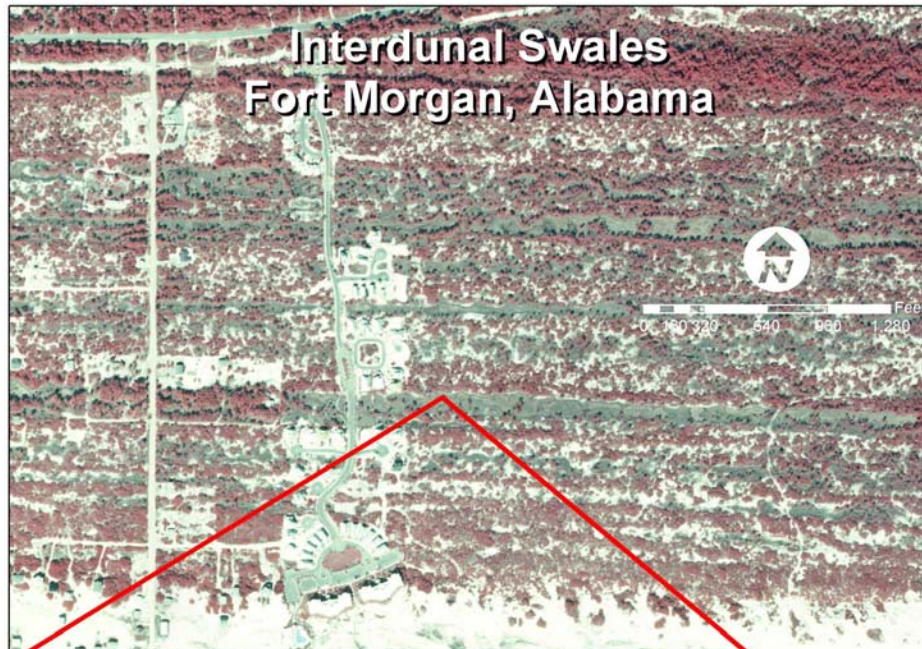


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Intertidal Swales Fort Morgan, Alabama



Intertidal Swale



The Baldwin County Wetland Conservation Plan

Why?

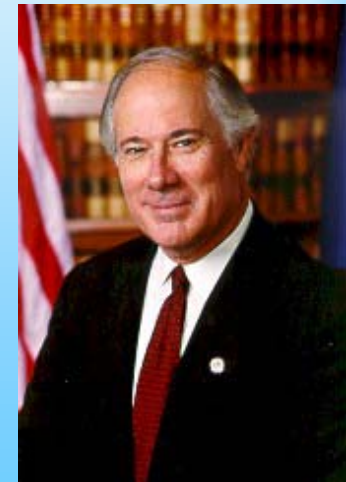
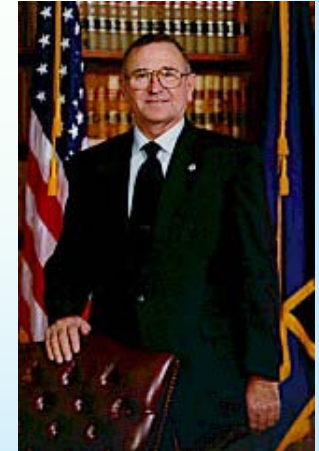
1. Filling permits based on 404(b) guidelines – limited local authority
2. The county is experiencing rapid development and explosive growth
3. Lucrative fishing and tourist industry
4. Groundwater is source drinking water supply
5. Potential hurricane damage





Objective of the Baldwin County Wetland Conservation Plan

To provide the best information regarding wise land-use decisions to the public and local leaders.



The Baldwin County Commission



Project Tasks

1. Develop Wetlands Protection Overlay District (WPOD) and incorporate into the Baldwin County Zoning Regulations
2. Develop a wetlands education/outreach program
3. Research, design and implement wetland restoration/construction projects
4. Develop a GIS wetlands data layer containing information on wetland locations, types and functional capacity for wetlands throughout Baldwin County



Baldwin County Digital Wetland Layer

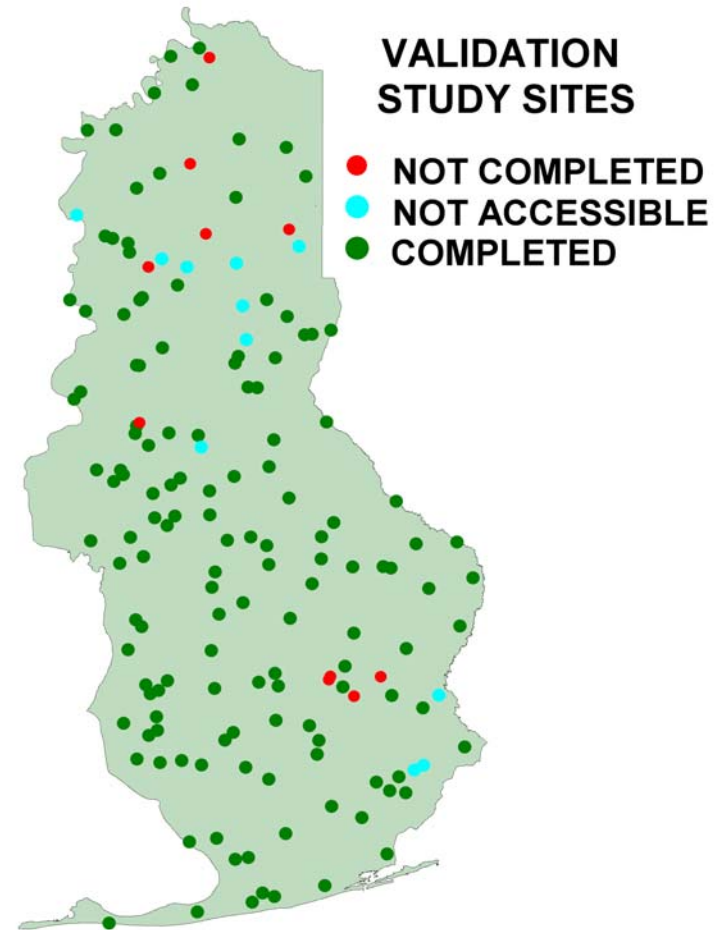
Developed from:

- National Wetland Inventory Data
- USGS digital wetland data
 - CIR derived
 - NWI protocol
- Quadrangles edge-matched to create a continuous county-wide coverage



Validation of the Baldwin County Digital Wetland Layer

Statistically compared digital wetland coverage to Corps of Engineer Wetland determinations





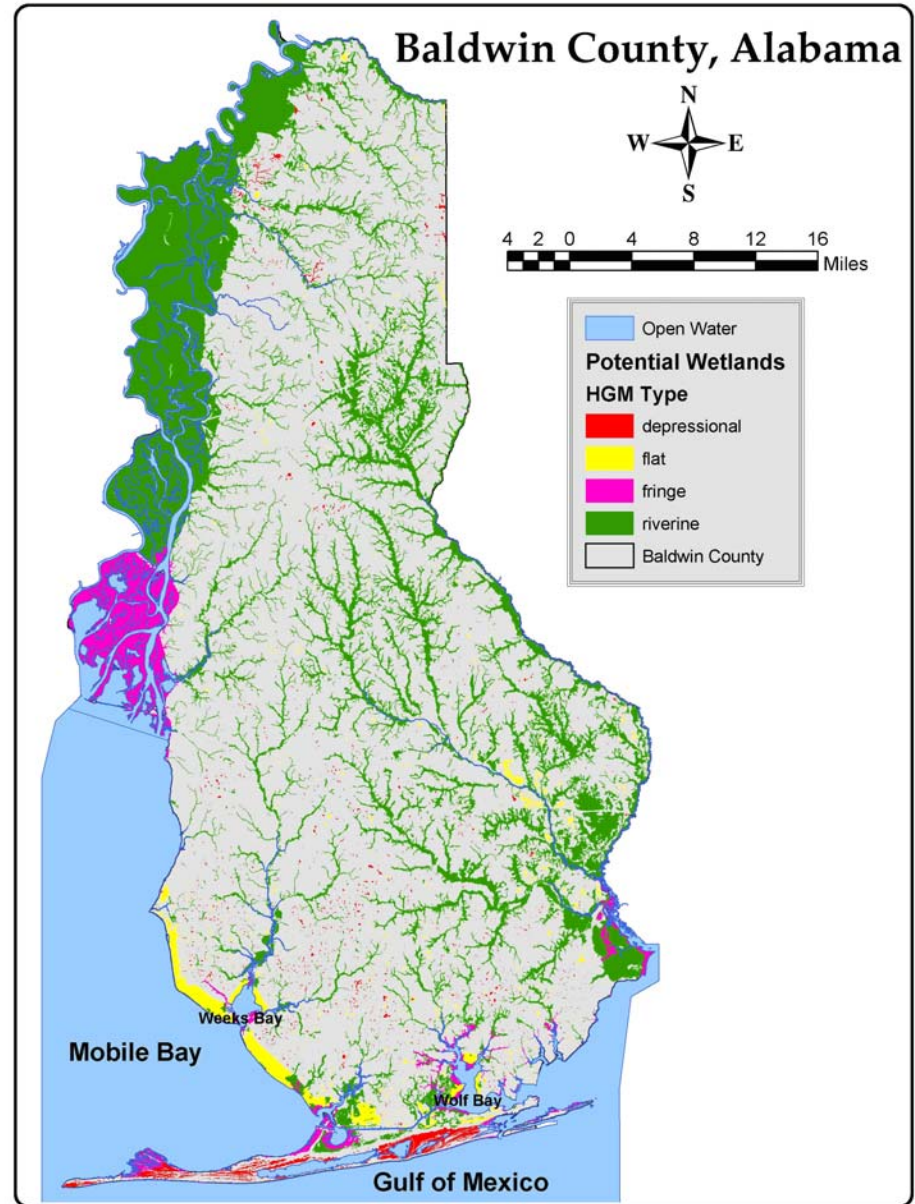
Wetland Validation Project

	Wetlands		Uplands		Total	
	#	%	#	%	#	%
Correct	34	79.1	84	88.4	118	85.6
Incorrect	9	20.9	11	11.6	20	14.5
Actual/Field	43	100	95	100	138	100



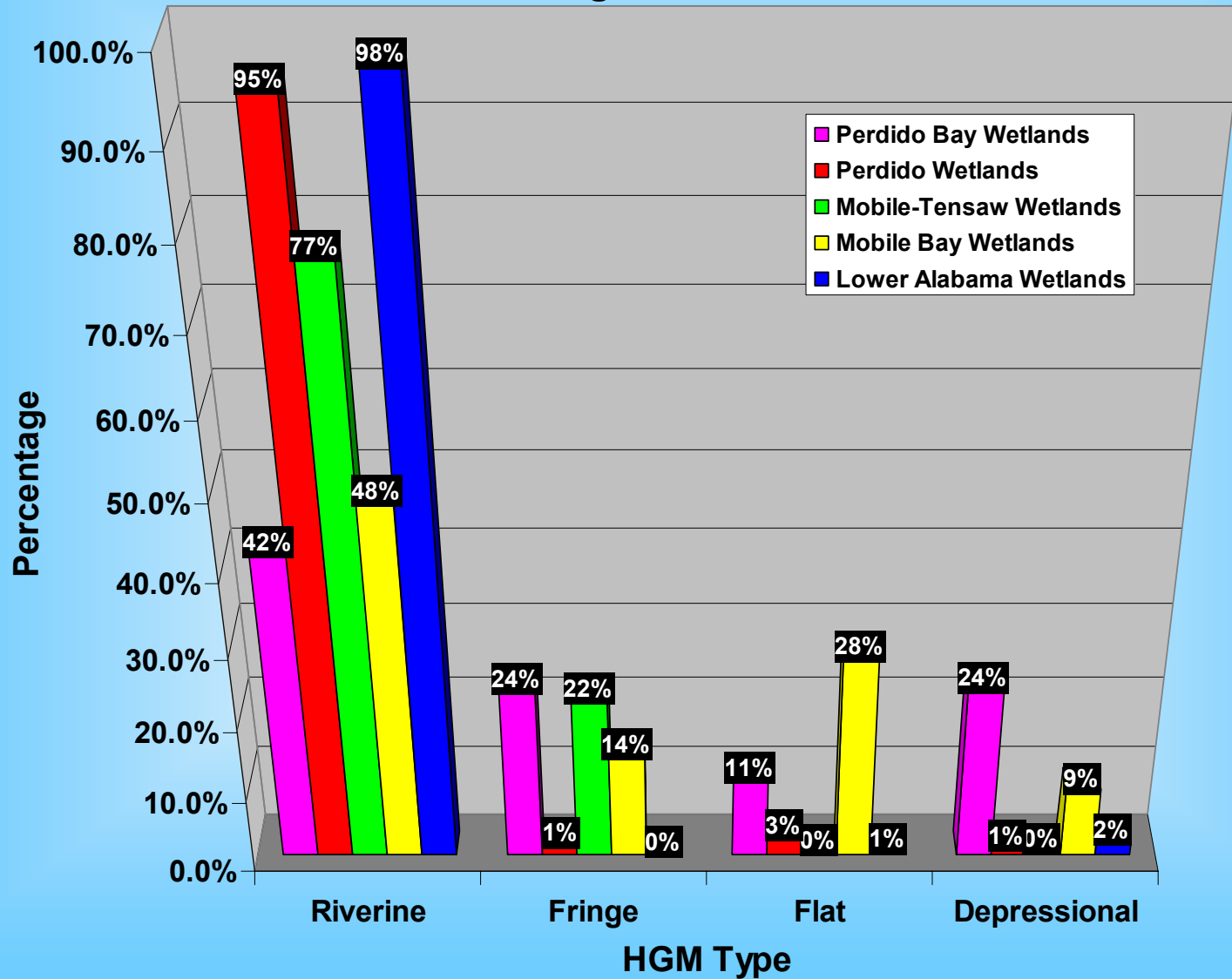
HGM Classification:

- Hydrologic spatial relationships
- CIR photointerpretation



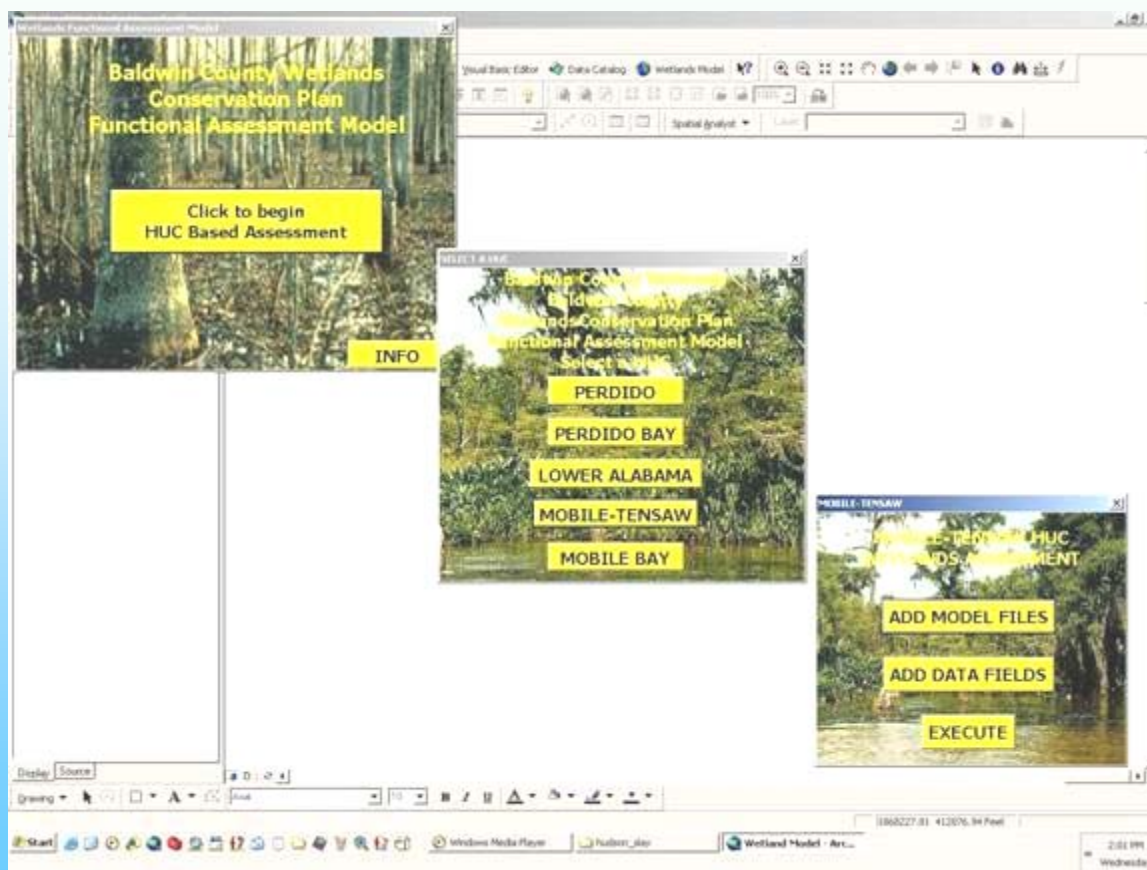


HGM Percentage Per Watershed





Remote Wetland Functional Assessment Model RWFAM

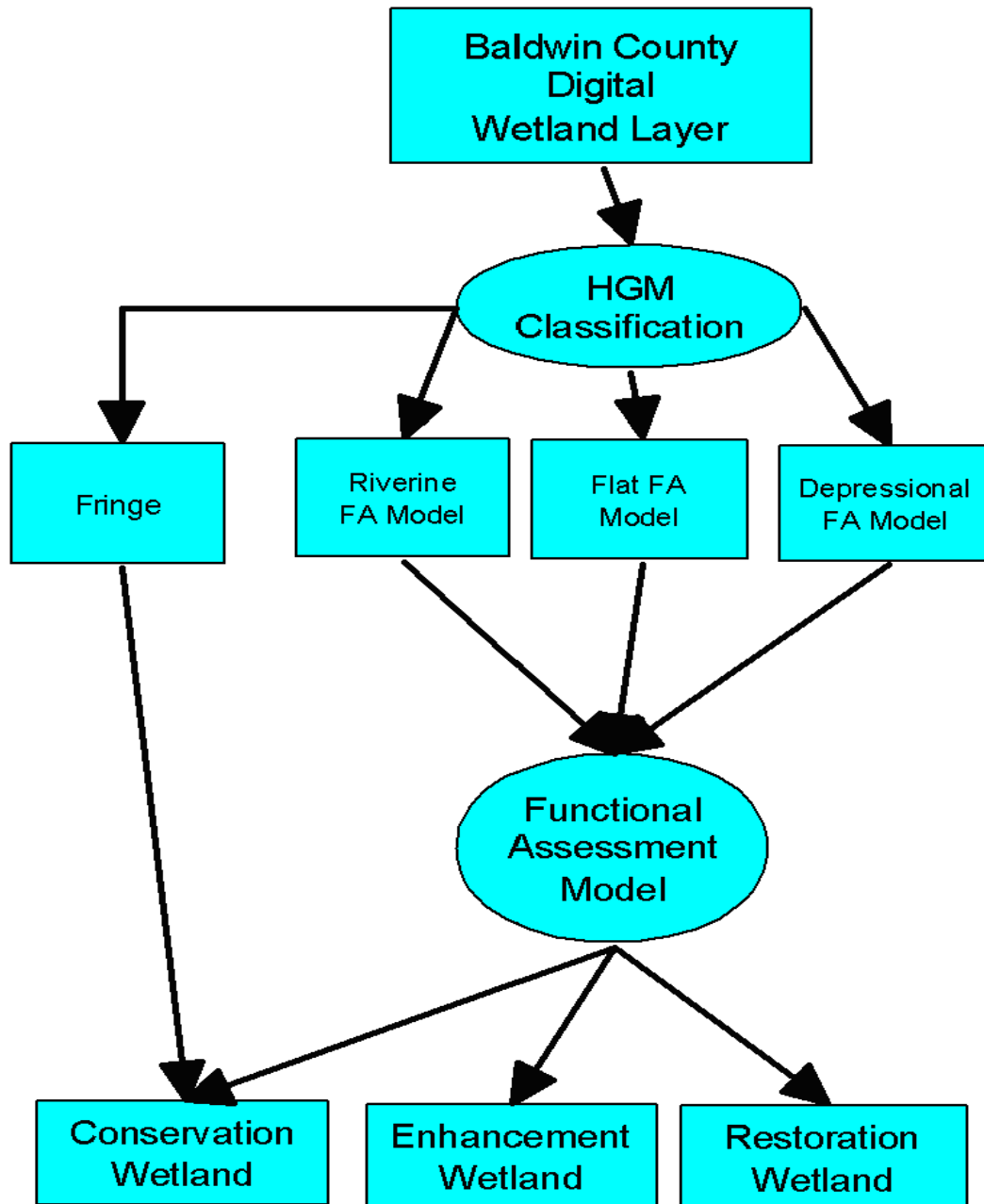


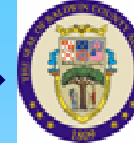


Remote Wetland Functional Assessment Model

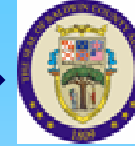
RWFAM

- Each Model consists of several questions for each HGM type
- Fringe model was not developed due to several reasons:
 - ❖ Buffering from Erosion
 - ❖ Fish Habitat
 - ❖ Limited Extent
- Flat: 13 total Questions
- Riverine: 16 total Questions
- Depressional: 11 total Questions





Criteria	Remote Data Layer
Size of wetland	NWI (polygon)
Presence of ditches	NWI
Surrounding land use	NLCD
Water regime	NWI
Presence of Roads	BC Planimetric Data
Threatened and Endangered Species	TNC; ADCNR
Wellhead Protection Areas	EPA
Flood Zones	FEMA
Digital Soil Data	NRCS (not used in Phase I)

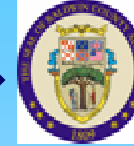


Remote Wetland Functional Assessment Model RWFAM

- Using several GIS-based layers the model classifies wetland polygons into Wetlands suitable for:
 - Restoration
 - Conservation
 - Enhancement

The screenshot displays a GIS application window titled 'Wetland Model - ArcMap - ArcView'. The main window shows a data table with the following columns: ID, Shape, AREA, PERCENT, ATTRIBUTE, WETLAND, TYPE, ACRES, Wetland, Acres, State, and ESTATE. The table contains 30 rows of data, each representing a polygon. The 'WETLAND' column lists various codes such as 'WETLAND', 'WETLAND', 'WETLAND', etc. The 'ACRES' column shows values ranging from approximately 1.3 to 14.4. The 'Wetland' column shows values like 'WETLAND', 'WETLAND', 'WETLAND', etc. The 'Acres' column shows values like '1.360', '11.42076', etc. The 'State' column shows values like 'GA', 'GA', 'GA', etc. The 'ESTATE' column shows values like 'A', 'A', 'A', etc.

ID	Shape	AREA	PERCENT	ATTRIBUTE	WETLAND	TYPE	ACRES	Wetland	Acres	State	ESTATE
287	Polygon	89543.8271	2073.242	WFO47C	WETLAND		208.720	62.8224			
287	Polygon	3020.83463	520.2748	WFO47C	WETLAND		1.360	5.71425			
287	Polygon	128247.4281	1035.4281	WFO47C	WETLAND		28.491	11.42076			
288	Polygon	70857.2273	4450.7085	WFO47C	WETLAND		18.898	7.30807			
288	Polygon	12384.4161	803.1268	WFO47C	WETLAND		7.492	3.06267			
288	Polygon	146226.4748	1290.892	WFO47C	WETLAND		33.08	13.42596			
287	Polygon	157750.8223	3443.8478	WFO47C	WETLAND		34.705	14.04720			
288	Polygon	114126.2017	859.3828	WFO47C	WETLAND		26.1	10.48234			
288	Polygon	428167.7982	1817.8271	WFO47C	WETLAND		38.728	16.99250			
287	Polygon	827940.9158	1278.4249	WFO47C	WETLAND		82.730	32.22875			
287	Polygon	18884.06342	2240.1254	WFO47C	WETLAND		4.589	1.85709			
287	Polygon	30745.12712	2205.4768	WFO47C	WETLAND		3.816	2.84027			
287	Polygon	348600.8645	1891.4821	WFO47C	WETLAND		88.228	35.47900			
288	Polygon	37580.45726	3146.3284	WFO47C	WETLAND		7.132	2.86828			
287	Polygon	123241.1887	1820.8074	WFO47C	WETLAND		28.522	11.78842			
286	Polygon	14240.71342	240.8414	WFO47C	WETLAND		4.416	1.76600			
287	Polygon	118180.14381	1433.4526	WFO47C	WETLAND		23.12	10.91406			
288	Polygon	10428.11738	304.1878	WFO47C	WETLAND		7.444	3.01288			
288	Polygon	26267.48815	2243.2287	WFO47C	WETLAND		38.897	16.49382			
287	Polygon	112347.2811	1227.2688	WFO47C	WETLAND		48.24	19.28281			
287	Polygon	138762.48274	1800.4757	WFO47C	WETLAND		29.382	12.00405			
287	Polygon	7202.24384	493.1446	WFO47C	WETLAND		16.684	6.76119			
287	Polygon	107889.128	7798.4737	WFO47C	WETLAND		22.422	9.06000			
286	Polygon	62401.62239	7889.3888	WFO47C	WETLAND		14.38	5.81234			
287	Polygon	262341.8123	1862.5768	WFO47C	WETLAND		48.817	20.62490			
287	Polygon	138814.78726	3274.1337	WFO47C	WETLAND		27.424	12.71209			
287	Polygon	17481.14291	3271.8258	WFO47C	WETLAND		4.416	1.42416			
287	Polygon	673248.18332	674.9878	WFO47C	WETLAND		14.678	5.68706			
287	Polygon	16374.74236	2884.8762	WFO47C	WETLAND		2.76	1.52147			
287	Polygon	881848.9824	3178.8828	WFO47C	WETLAND		158.845	64.88898			
287	Polygon	188406.64826	7120.7123	WFO47C	WETLAND		42.463	17.34022			
287	Polygon	18448.14734	287.2748	WFO47C	WETLAND		1.66	1.07464			
287	Polygon	58290.5283	8627.8747	WFO47C	WETLAND		13.380	5.41808			
284	Polygon	198246.14878	4270.3284	WFO47C	WETLAND		29.778	10.88840			
287	Polygon	1022397.9820	2742.3888	WFO47C	WETLAND		224.781	94.87096			
287	Polygon	2348482.715	10832.2255	WFO47C	WETLAND		128.257	20.81428			



Remote Wetland Functional Assessment Model RWFAM

- ArcGIS
- Visual Basic
- Selects Spatial information
- Watershed-based

```
Microsoft Visual Basic - Wetland Model.mxd - [Module4 (Code)]
File Edit View Insert Format Debug Run Tools Add-Ins Window Help
Project - Project
Normal (Normal.mxd)
Project (Wetland Model.mxd)
  ArcMap Objects
  This Document
  Forms
  info
  loweralabama
  mobilebay
  mobiletensaw
  model
  perido
  peridobay
  Selecthuc
  wetlandtype
  Modules
  Module1
  Module2
  Module3
  Module4
  References
  Reference to Normal.mxd
Properties - Module4
Module4 Module
Alphabetic Categorized
(Name) Module4

Public Sub SelectIfIntersectSpecies ()
    Dim pMxdDoc As IMxDocument
    Dim pFeatureLayer1 As IFeatureLayer
    Dim pFeatureLayer2 As IFeatureLayer
    Dim pFeatureSelection1 As IFeatureSelection
    Dim pFeatureSelection2 As IFeatureSelection
    Dim pFeatureCursor1 As IFeatureCursor
    Dim pFeatureCursor2 As IFeatureCursor
    Dim pFeature As IFeature

    Set pMxdDoc = ThisDocument
    Set pFeatureLayer1 = pMxdDoc.FocusMap.Layer(0)
    Set pFeatureLayer2 = pMxdDoc.FocusMap.Layer(1)
    Set pFeatureCursor1 = pFeatureLayer1.FeatureClass.Search(Nothing, True)

    Set pFeature = pFeatureCursor1.NextFeature
    If pFeature Is Nothing Then Exit Sub

    Dim pGeometry As IGeometry
    Dim pSpatialFilter As ISpatialFilter

    ' clear any selection in the wetlands layer
    Set pFeatureSelection1 = pFeatureLayer2
    pFeatureSelection1.Clear

    Do While Not pFeature Is Nothing

        Set pGeometry = pFeature.ShapeCopy
        Set pSpatialFilter = New SpatialFilter

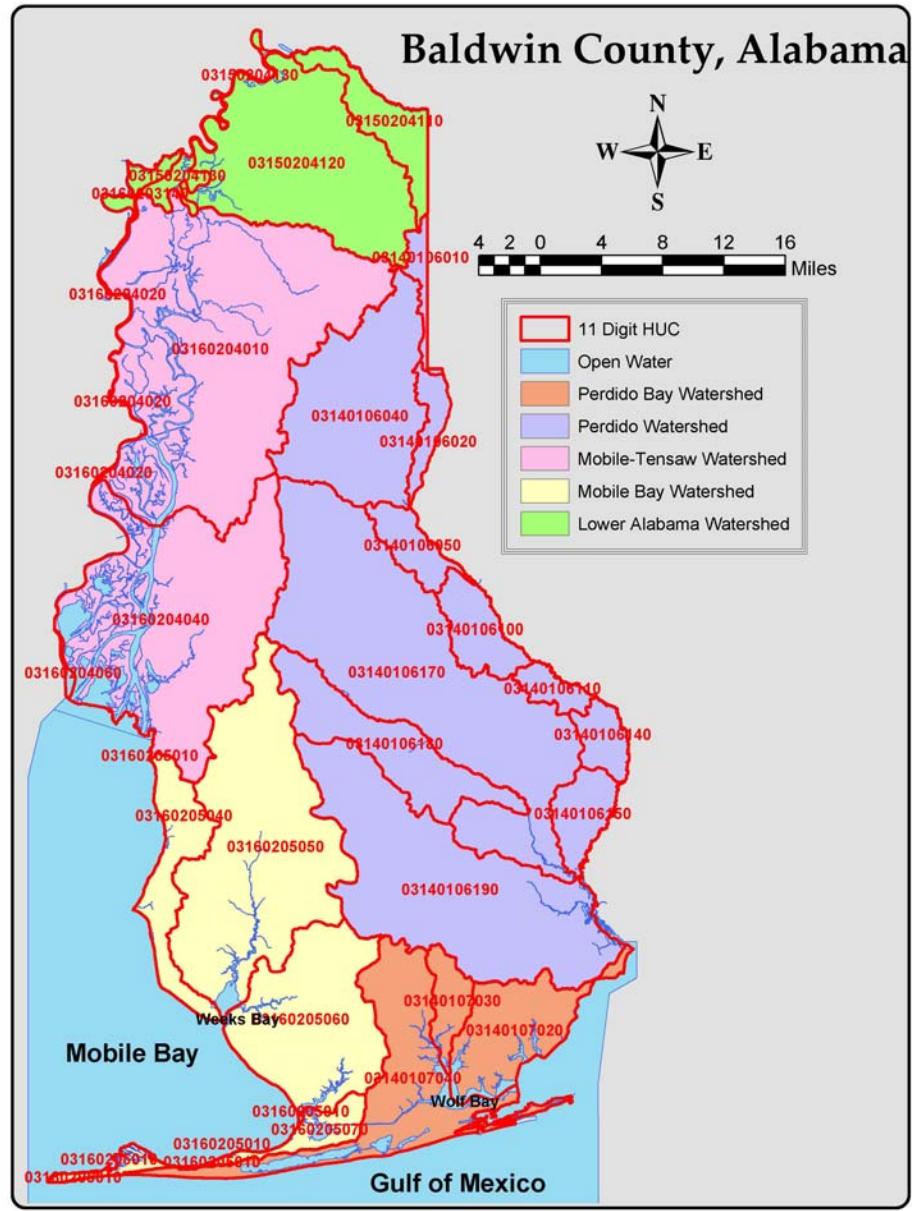
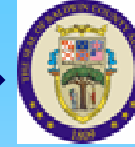
        pSpatialFilter.SpatialRel = esriSpatialRelIntersects
        Set pSpatialFilter.Geometry = pGeometry

        pFeatureSelection1.SelectFeatures pSpatialFilter, esriSelectionResultAdd, False
        Set pFeature = pFeatureCursor1.NextFeature
    Loop

    ..
    Dim pCursor As IFeatureCursor
    Dim pFeature2 As IFeature
    Dim pSelectionSet As ISelectionSet
    Dim pField As IField
    Dim pFeatureClass As IFeatureClass
    Dim pLayerFields As IFields
    Dim pModelField As IField
```



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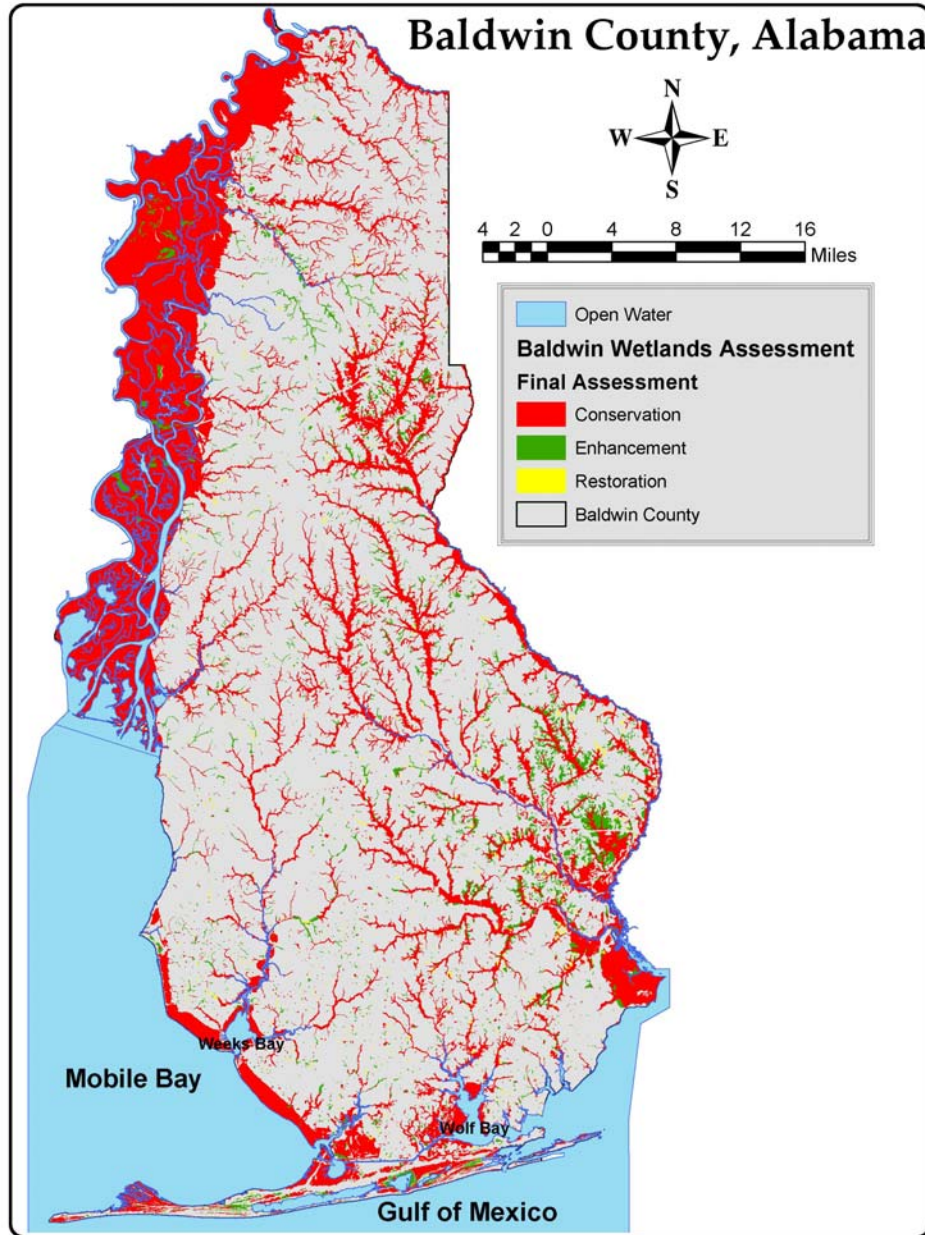
Remote Wetland Functional Assessment Model RWFAM

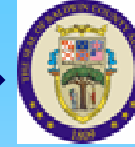
1. Is the wetland within the 100 year floodplain?
2. Is the wetland impacted by the presence of a road?
3. Is the wetland in a wellhead protection area?
4. Has the wetland been subjected to a forest fire?
5. What is the acreage of the wetland?
6. Are there known endangered species near this wetland?
7. What is the land-use surrounding the wetland; agriculture, forest, urban?

	Conservation	Enhancement	Restoration
Riverine	>80%	60-80%	<60%
Flat	>61%	41-60%	<40%
Depressional	>50%	25-50%	<25%

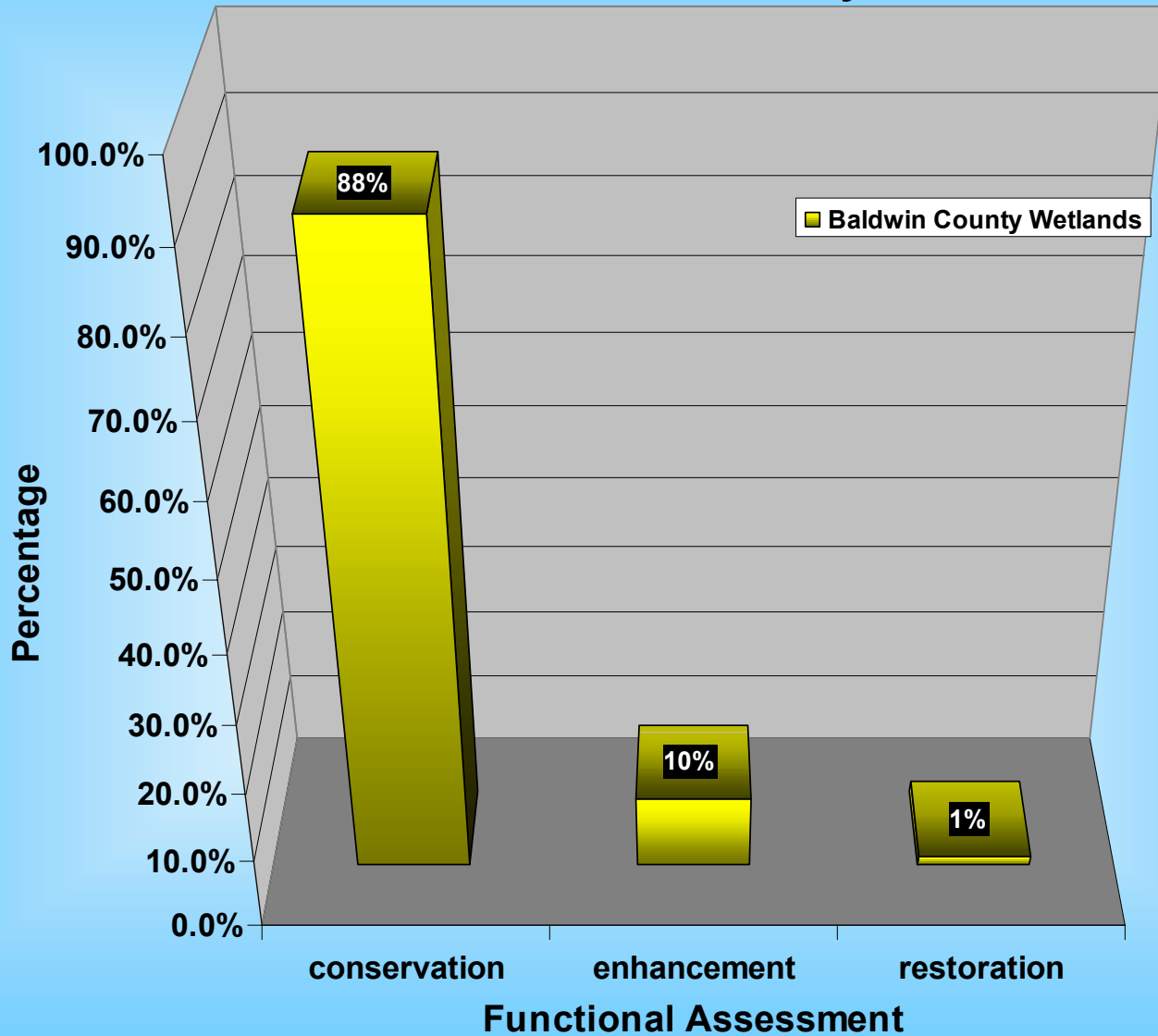


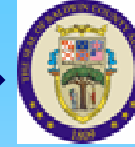
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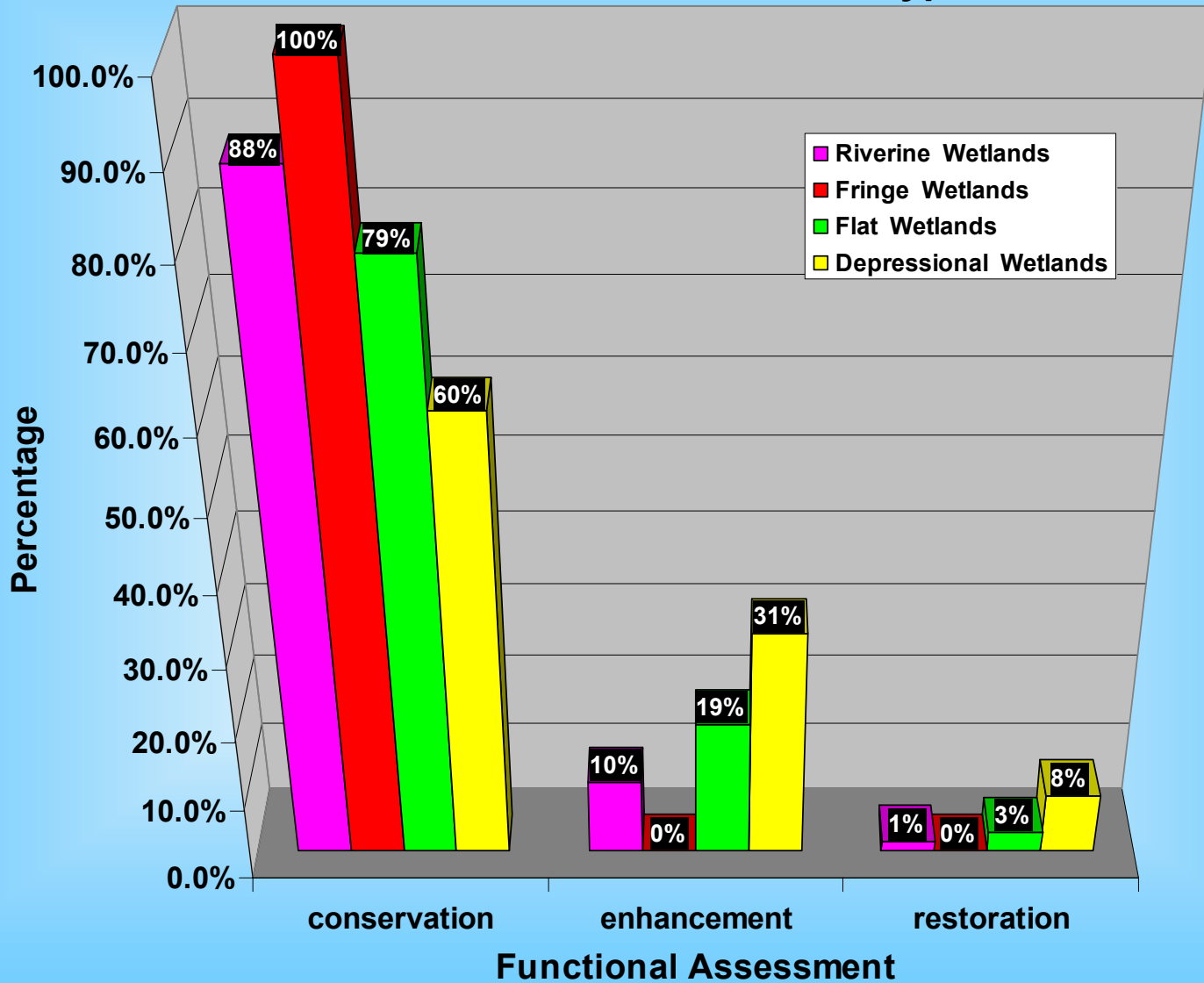


Functional Assessment Countywide



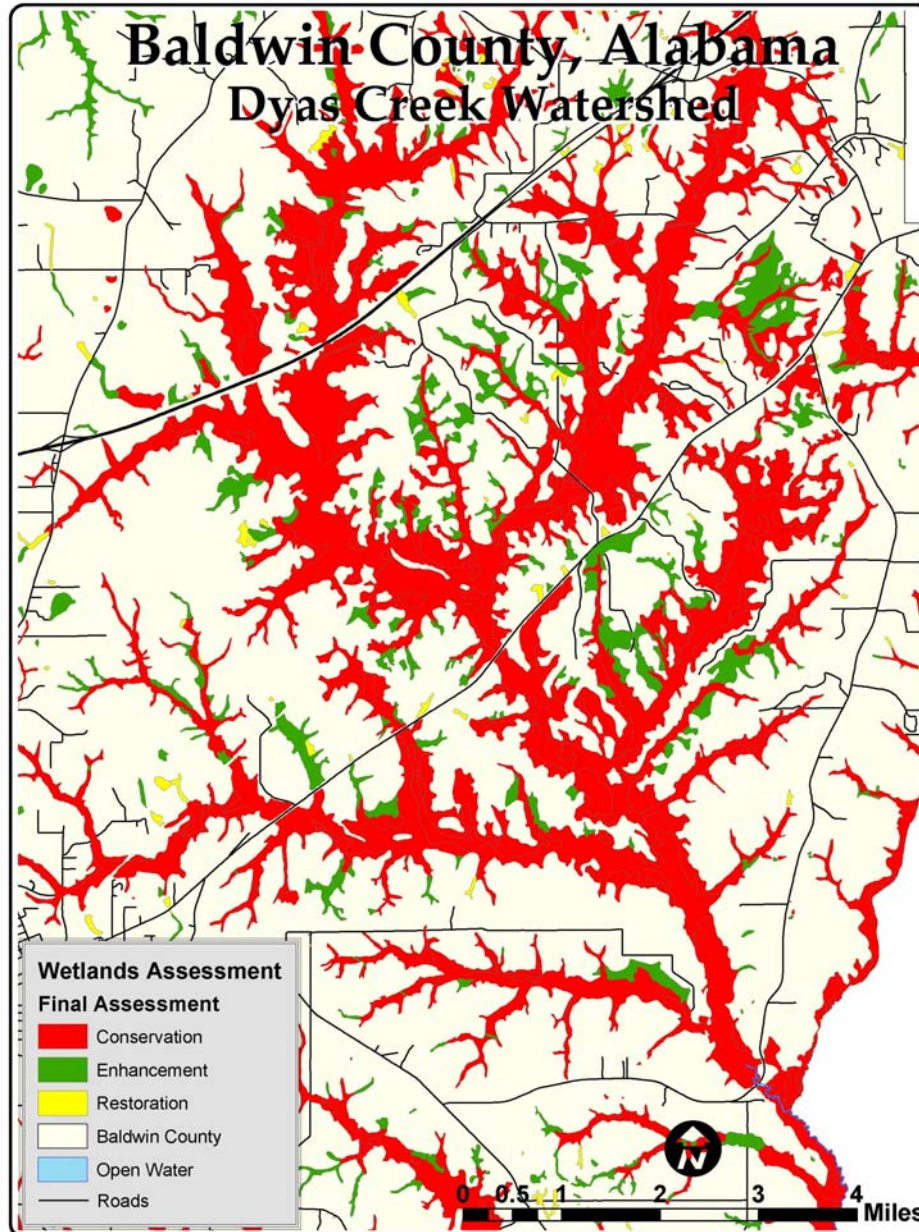
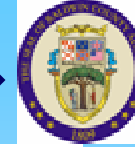


Functional Assessment Per HGM Type



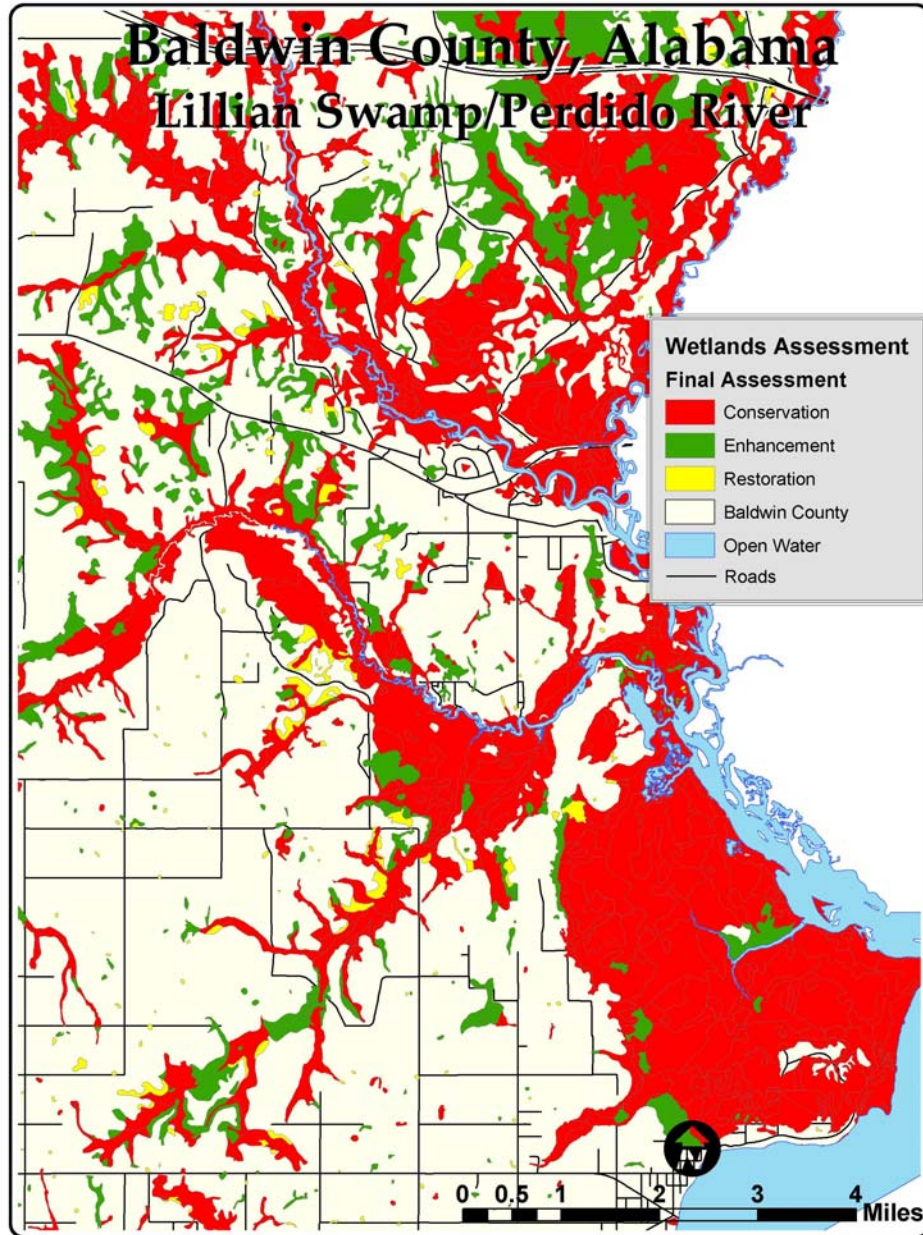


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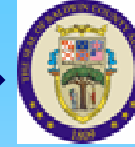


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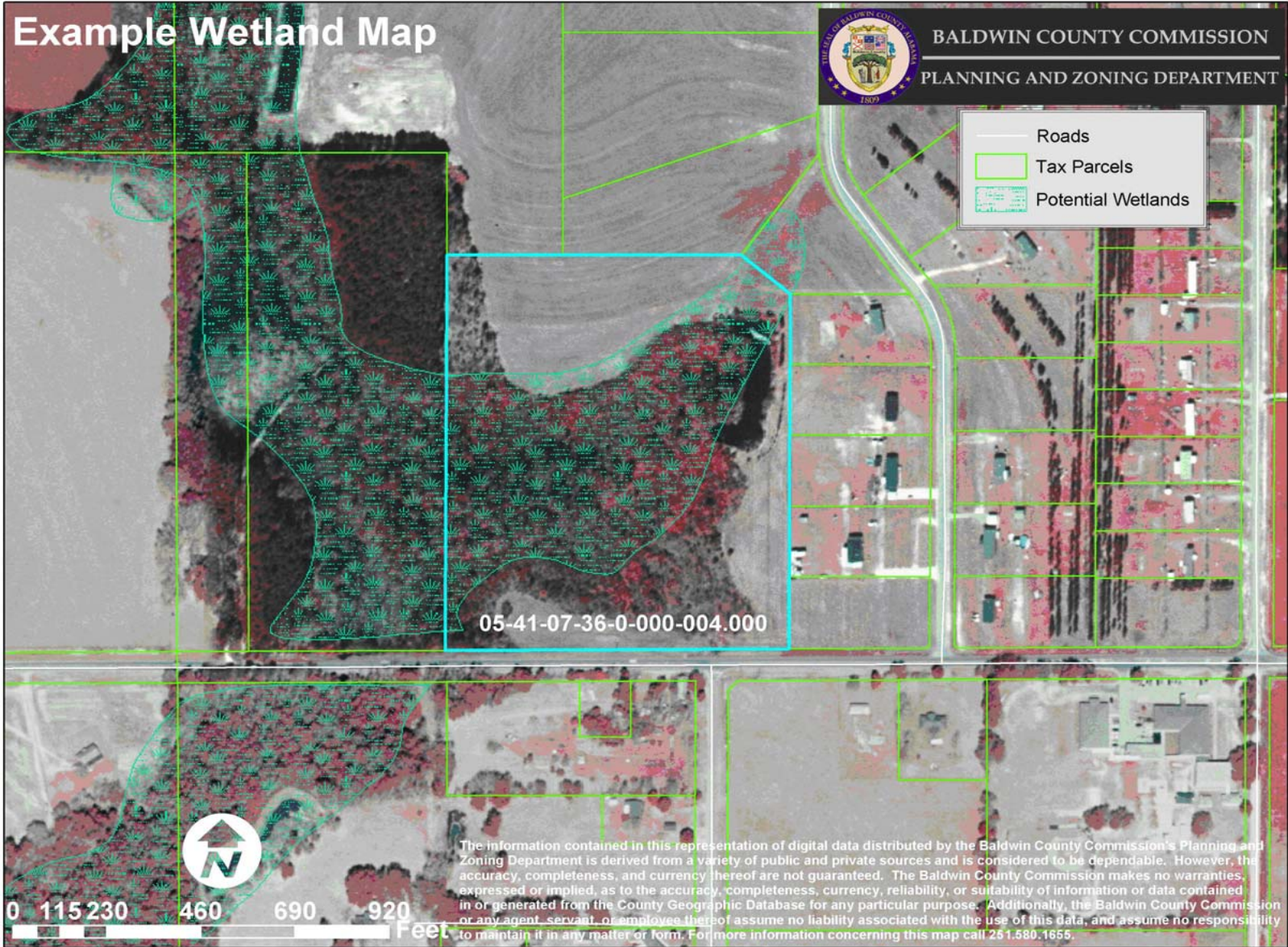


Example Wetland Map



BALDWIN COUNTY COMMISSION
PLANNING AND ZONING DEPARTMENT

- Roads
- Tax Parcels
- ▨ Potential Wetlands



05-41-07-36-0-000-004.000



0 115 230 460 690 920 Feet

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Final Products

- Updated and validated map products
- A digital layer of assessed wetland functions that will be available to citizens, elected officials and other public agencies for planning purposes
- Development of a program document that can be used to influence land use regulations





Acknowledgements

FUNDING

- Environmental Protection Agency Region IV
- US Army Corps of Engineers, Mobile District

ADVISORY

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- Alabama Department of Environmental Management (ADEM)
- US Fish and Wildlife Service, Daphne Field Office

