NATIONAL WETLANDS INVENTORY REPORT
SOUTHEAST REGION

WETLANDS STATUS AND TRENDS FOR HARRISON COUNTY, MISSISSIPPI 1997-2007

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U.S. Fish and Wildlife Service
National Wetlands Inventory Program

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The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the U.S. Fish and Wildlife Service.

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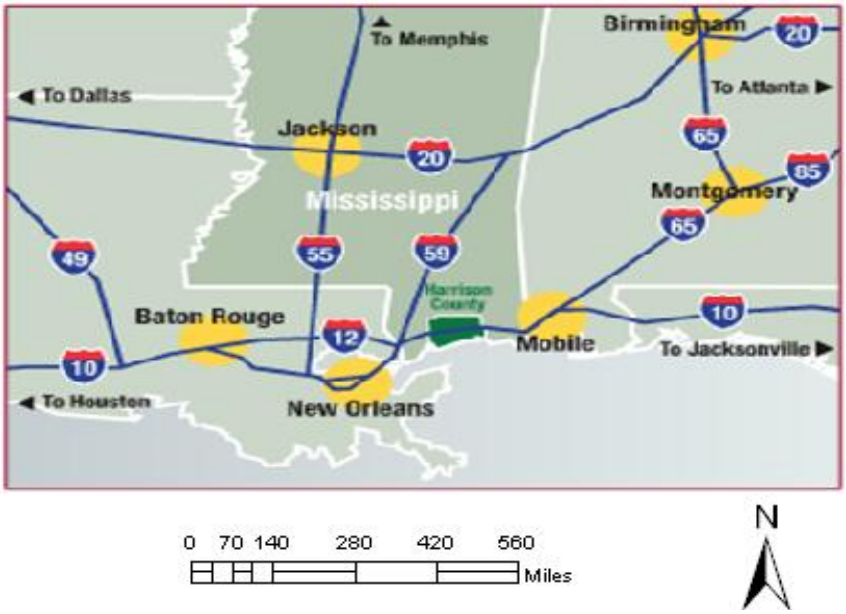
INTRODUCTION

The U.S. Fish and Wildlife Service's National Wetlands Inventory Program (NWI) is responsible for mapping the nation's wetlands and for conducting assessments of wetland trends. Harrison County, Mississippi is an area where wetlands have been significantly impacted by urban development where information on the current status and recent trends are needed. Consequently, the NWI initiated a local wetland trends study to evaluate the extent of these impacts and to address the status of wetlands in terms of wetland acreage. This report summarizes the study findings and makes government agencies and the public aware of the general status of and recent changes in wetlands in Harrison County. Some changes are natural such as vegetation succession, and plant colonization of shallow water, while other changes are human-induced including creation of wetlands and loss of wetlands to uplands for a variety of purposes. In addition to increasing public awareness of the status of wetlands, the findings may be used by public agencies and private nonprofit organizations to develop wetland conservation strategies that aid regional and local natural resource planning efforts.

STUDY AREA

Harrison County is located in the southern portion of the state of Mississippi and adjoins the Mississippi Sound in the Gulf of Mexico (Figure 1). Within the county are two distinct physiographic divisions; the Gulf Coast flatwoods and the Southern Lower Coastal Plain. Several broad shallow valleys exist in the county and three major rivers (the Wolf in the west, the Biloxi in the north central region and the Tchoutacabouffa in the eastern section) drain most of the county (Soil Survey 1975). Along with agricultural activities, Harrison County offers a wealth of recreational opportunities including fishing, hunting, canoeing and wildlife-watching. Many of the natural environs (beaches, bayous, forest and open fields) that have made Harrison County so attractive to tourism will experience increased pressure in the coming years.

Figure 1: Location of Harrison County



Of the six coastal counties in Mississippi, Harrison County has the largest population. At present the majority of the population is centered along the coast, but with recent increases in population, data indicates that urban development is moving into the northern sections that are currently dominated by agriculture and natural areas. As the population continues to grow, land use outlooks predict that over the next 30 years 40,000 acres of land could transition from rural to residential. With the legalization of gaming in 1990, the population increased by more than 193,000 by 2005 (Harrison County 2008). The additional jobs, essential housing and related businesses have put a strain on the County's ecosystems. In addition to increased growth, the rebuilding effort after Hurricane Katrina has also impacted strategic coastal wetlands and associated uplands (Figure 2). Man made impacts such as shoreline hardening and other coastal development activities may have an adverse impact on estuarine habitats. Natural impacts expected from climate change will also impact wetland habitats as existing marshes migrate inland. Minimizing current wetland losses will aid in natural barriers that can reduce impacts from future storms.

Figure 2: Examples of Coastal Development

METHODS

Wetland trends involve conducting an area-wide inventory of wetlands covering multiple time periods. This approach is generally used for small geographic areas where more detailed investigations can be carried out. For this study, we chose the inventory of change approach to evaluate wetland trends. Change detection was done through image interpretation procedure that examined aerial imagery to determine wetland trends for the time period 1997-2007.

Data Sources

The 2007 NWI data were available for this study and served as the foundation for the project. These data were derived by a combination of aerial image analysis and interpreting collateral

data sources. Aerial image interpretation was done via onscreen techniques. The 1997 color-infrared 1 meter data were acquired from the Mississippi Department of Natural Resources (DNR). In support of the contemporary period 2007 color-infrared 1 meter DOQQs were obtained from the Mississippi DNR. These sources allowed an assessment of wetland changes from 1997 to 2007. Digital SSURGO soils data available from the USDA Natural Resources Conservation Service were consulted to help delineate drier-end wetlands (e.g., seasonally saturated flatwoods) that typically are challenging to detect through conventional image interpretation.

Interpretation of Trends

Changes in wetlands due to both natural and human-induced actions were detected on the imagery by directly comparing the status of wetlands on each set of imagery. An on-screen, "heads up" process was used for detection and delineation. This method required working back in time comparing the 2007 NWI wetlands to the 1997 imagery. The most current NWI data and the 2007 imagery (from which it was derived) were used as the foundation for the trends assessment. Wetlands were added, deleted, or their boundaries were reconfigured to more accurately represent their status at the applicable time period. Wetlands and deepwater habitats were classified according to the Service's official wetland classification system (Cowardin et al. 1979) which is the national standard for wetland classification http://www.fgdc.gov/standards/projects/FGDC-standards-projects/wetlands-mapping/index_html

Wetland changes between 2007 and 1997 were identified by overlaying the 2007 NWI data on the 1997 imagery. The causes of the changes were determined by consulting the 2007 image. Each change was digitized, with the cause recorded, creating a trends data layer. Conversions of wetlands to non-wetlands were labeled by their respective land use or land cover classification following (Anderson et al. 1976). The minimum area of change detected was approximately 0.2 acre.

Figure 3: Freshwater Wetland along I-10 Corridor in Harrison County

Data Analysis and Tabulation

Geospatial data were analyzed through geographic information system technology, using ArcMap 10 (Environmental Systems Research Institute, Inc., ESRI). Statistics addressing wetland status and trends for the study were generated using this program. For the 2007 NWI data, the target mapping unit (tmu) was approximately 1 acre, recognizing the inherent limitations of image interpretation for mapping wetlands (Tiner 1990). Such targets are for general guidance only, and many conspicuous, smaller wetlands are often mapped, with ponds being the most common wetland type mapped below the tmu.

RESULTS

Wetland and Deepwater Habitat Status: 2007

Wetland and deepwater habitats occupied 136 square miles in Harrison County and wetland habitats cover twenty-three percent of the land area. Forested wetlands were the dominant type, representing seventy-four of the area's wetlands. Scrub-shrub wetlands were next in abundance, accounting for nine percent of the wetlands, followed by emergent wetlands with nearly 4,300 acres inventoried. Ponds (e.g., palustrine unconsolidated bottoms and shores) totaled 2,460 acres comprising about three percent of the area's wetlands. Estuarine wetlands represented 5,572 acres and the majority of the wetland type were emergent (4,738 acres). The deepwater portion of the study area had over 8,500 acres inventoried. Estuarine open water at 6,750 acres was the largest deepwater habit in Harrison County, followed by fresh water lacustrine and riverine habitats (Table 1).

Wetland Trends

The general trends for the region were losses of vegetated wetlands (forested, scrub-shrub, and emergent types) and gains in non-vegetated wetlands (ponds and shallow lakes/impoundments) (Figures 2).

Vegetated Wetlands

Losses and Changes in Wetland Type

In the study period 1997-2007, a total of 2077 acres of vegetative wetlands were lost due to land use changes (Table 2). The largest wetlands loss came from transitional lands (lands that are in transition to a variety of development types) which accounted for almost 695 acres. The second largest contributor to wetlands losses were attributed to residential development which accounted for 628 acres. Commercial development activities were the third largest attributor of losses in Harrison County with 325 acres impacted. Transportation expansion in Harrison County revealed over 151 acres of loss. Impacts from agricultural actions resulted in 82 acres of wetlands losses for the County. Less significant development activities from industrial (six percent) and recreational (three percent) round out the losses. The average annual loss of wetlands during this period was 208 acres. Forested wetlands received the brunt of the impacts, declining by more than 1,700 acres or eighty-two percent of the total vegetated wetland losses.

Scrub-shrub wetlands absorbed the second heaviest losses during this period with 250 acres lost and emergent vegetation losses totaled 126 acres.

Wetland type changes in the study area totaled 543 acres with 338 acres of vegetative wetlands going to pond construction (Table 4). Ninety-one percent of the conversion from vegetative to non- vegetated (ponds) types were related to forested and scrub shrub wetlands. The remaining nine percent of non-vegetated conversion went to emergent wetlands.

Figure 4. Transitional Wetland Loss

Gains

There were approximately 12 acres of vegetative wetland gains for the time period 1997-2007. Most of the gains resulted from alterations of agricultural and transitional areas. Almost fifty percent of the wetland vegetation gained was identified as emergent.

Non-vegetated Wetlands

Losses

Non-vegetated wetlands in Harrison County are ponds. Approximately forty-seven acres of these habitats were altered during the time period 1997-2007 (Table 5). Most of them were filled in for upland development or in transition from non-vegetative wetland to potential development.

Gains

Increases in non-vegetated wetlands mainly through pond construction occurred throughout the ten year study period. Overall, pond acreage (palustrine unconsolidated bottom) increased by nearly 524 acres (Table 7).

Changes

There was change activity in non-vegetated wetland to vegetated (53 % emergent, 43% scrub-shrub, 4% other) wetland over the study period. Roughly 59 acres transitioned in this manner from 1997-2007 (Table 6).

Figure 5: Forested Wetland Loss to Agriculture

Table 1. Extent of wetlands and deepwater habitats in Harrison County, 2007

	NWI Classification		*Acreage*
Habitat	**System**	**Class**	
Wetland	**Estuarine**	**Emergent**	**4,737.5**
		Scrub-Shrub	**137.1**
		Unconsolidated Shore	**697.1**

		Total Estuarine Wetlands	**5,571.7**
	Lacustrine	**Aquatic Bed**	**4.5**
		Unconsolidated Shore	**70.8**

		Total Lacustrine Wetlands	**75.3**
	Palustrine	**Aquatic Bed**	**319.2**
		Emergent	**4,242.5**
		Forested	**58,400.8**
		Scrub-Shrub	**7,399.9**
		Unconsolidated Bottom	**2,420.4**
		Unconsolidated Shore	**39.8**

		Total Palustrine Wetlands	**72,822.6**
	Riverine	**Unconsolidated Shore**	**205.5**

		Total Riverine Wetlands	**205.5**
	GRAND TOTAL –WETLAND		**78,675.1**
Deepwater Habitat			
	Lacustrine	**Unconsolidated Bottom**	**721.3**
	Estuarine	**Unconsolidated Bottom**	**6,750.1**
	Riverine	**Unconsolidated Bottom**	**1,066.1**
	GRAND TOTAL-DEEPWATER HABITAT		**8,537.5**

Table 2. Causes of vegetated wetland trends. (Losses)

Nature of Change	*Cause of Change*	*Wetland Type Affected*	*Acres Changed*
LOSS to	**Agriculture**	**Emergent**	**7.0**
		Forested	**63.6**
		Scrub-Shrub	**11.7**
		(Subtotal)	***(82.3)***
	Commercial Development	**Emergent**	**25.1**
		Forested	**224.9**
		Scrub-Shrub	**74.6**
		(Subtotal)	***(324.6)***
	Industrial Development	**Emergent**	**30.8**
		Forested	**68.8**
		Scrub-Shrub	**21.9**
		(Subtotal)	***(121.5)***
	Recreational Development	**Emergent**	**10.8**
		Forested	**57.9**
		Scrub-Shrub	**8.1**
		(Subtotal)	***(76.8)***
	Residential Development	**Emergent**	**19.5**
		Forested	**562.8**
		Scrub-Shrub	**45.4**
		(Subtotal)	***(627.7)***
	Transitional Development	**Emergent**	**20.2**
		Forested	**602.1**
		Scrub-Shrub	**73.1**
		(Subtotal)	***(695.4)***
	Transportation Development	**Emergent**	**12.7**
		Forested	**120.4**
		Scrub-Shrub	**15.1**
		(Subtotal)	***(151.3)***
	TOTAL VEGETATED LOSSES		**2,076.6**

Table 3. Causes of vegetated wetland trends. (Gains)

Nature of Change	*Cause of Change*	*Vegetated Type*	*Acres Changed*
GAIN from	**Agriculture**	**Emergent**	**1.6**
	Agriculture	**Scrub-Shrub**	**1.1**
	Upland Forested	**Emergent**	**4.5**
	Upland Forested	**Scrub-Shrub**	**0.5**
	Residential Development	**Emergent**	**0.5**
	Residential Development	**Scrub-Shrub**	**1.4**
	Transitional Development	**Emergent**	**2.4**
	Transitional Development	**Scrub-Shrub**	**0.2**
	TOTAL VEGETATIVE GAINS		**12.2**

Table 4. Causes of vegetated wetlands trends. Change in Type

Nature of Change	*Wetland 1997*	*Wetland 2007*	*Acres Changed*
CHANGE IN TYPE	**Emergent**	**Unconsolidated Bottom**	**30.3**
	Forested	**Unconsolidated Bottom**	**300.4**
	Scrub-Shrub	**Unconsolidated Bottom**	**17.7**
	Emergent	**Forested**	**0.9**
	Forested	**Emergent**	**112.5**
	Forested	**Scrub-Shrub**	**25.3**
	TOTAL CHANGE IN VEGETATED		**487.1**

Table 5. Causes of non-vegetated wetland trends. (Losses)

Nature of Change	*Cause of Change*	*Wetland Type Affected*	*Acres Changed*
LOSS to	Agriculture	Unconsolidated Bottom	7.3
	Commercial	Unconsolidated Bottom	12.4
	Industrial	Unconsolidated Bottom	1.3
	Recreational	Unconsolidated Bottom	0.5
	Residential	Unconsolidated Bottom	7.9
	Transitional Development	Unconsolidated Bottom	15.1
	Transportation	Unconsolidated Bottom	2.2
	TOTAL NONVEGETATED LOSSES		46.7

Table 6. Causes of non-vegetated wetlands trends. Change in Type

Nature of Change	*Wetland 1997*	*Wetland 2007*	*Acres Changed*
CHANGE IN TYPE	Unconsolidated Bottom	Emergent	29.4
	Unconsolidated Bottom	Forested	2.5
	Unconsolidated Bottom	Scrub-shrub	23.6
	TOTAL CHANGE IN NONVEGETATED		55.5

Table 7. Causes of non-vegetated wetland trends. (Gains)

Nature of Change	*Cause of Change*	*Nonvegettated Type*	*Acres Changed*
GAIN from	**Agriculture**	**Unconsolidated Bottom**	**29.3**
	Commercial Development	**Unconsolidated Bottom**	**0.2**
	Rangeland	**Unconsolidated Bottom**	**136.9**
	Forested	**Unconsolidated Bottom**	**201.3**
	Recreational Development	**Unconsolidated Bottom**	**4.4**
	Residential Development	**Unconsolidated Bottom**	**20.9**
	Transitional Development	**Unconsolidated Bottom**	**129.8**
	Transportation Development	**Unconsolidated Bottom**	**0.9**
	TOTAL GAINS		**523.7**

STUDY LIMITATIONS

Wetlands identified with wetter water regimes such as permanently flooded, semipermanently flooded, and seasonally flooded are usually the most easily recognized types through image interpretation and are therefore the most accurately mapped. In contrast, seasonally saturated and temporarily flooded wetlands are quite challenging to detect through remote sensing techniques. These wetlands typically lack standing water except in shallow depressions that may contain water for brief periods after heavy summer rains. They have high water tables during these seasons that have supported the establishment of wetland vegetation and formation of hydric soils. The lack of surface wetness makes them particularly difficult to photo interpret as well as to recognize in the field. Examination of soil properties is usually required to verify the existence of these wetlands. Soil surveys conducted by the U.S. Department of Agriculture, Natural Resources Conservation Service provide a useful source of information to aid photointerpreters in mapping these difficult types. This information is now available in digital form to facilitate this process. Limited field checking in the general area by NWI personnel found that there was a good correlation between hydric soils and these drier-end wetlands. Nonetheless, the interpretation of these types should be considered conservative and field verification is

recommended to evaluate the potential uses of these types. Habitat fragmentation by roads and residential/commercial development has also played a significant role in adversely affecting wetlands. This type of development has often reduced the connectivity among wetlands, especially for those wetlands not intersected by streams. In addition, such development has most likely adversely impacted the hydrology of wetlands across the region as local drainage patterns have been disrupted

SUMMARY

In 2007, wetlands represented twenty-one percent of Harrison County. Forested wetlands remained the dominant type, occupying over 58,000 acres and accounting for seventy-four percent of the region's wetlands. The region lost nearly three percent or 2,078 acres of its vegetated wetlands from 1997 to 2007 while non-vegetated wetland acreage (e.g., ponds) rose by twenty-eight percent or 524 acres. Transitional land development was the main cause of the vegetated wetland loss, being responsible for thirty two percent of the losses from 1997 to 2007.

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