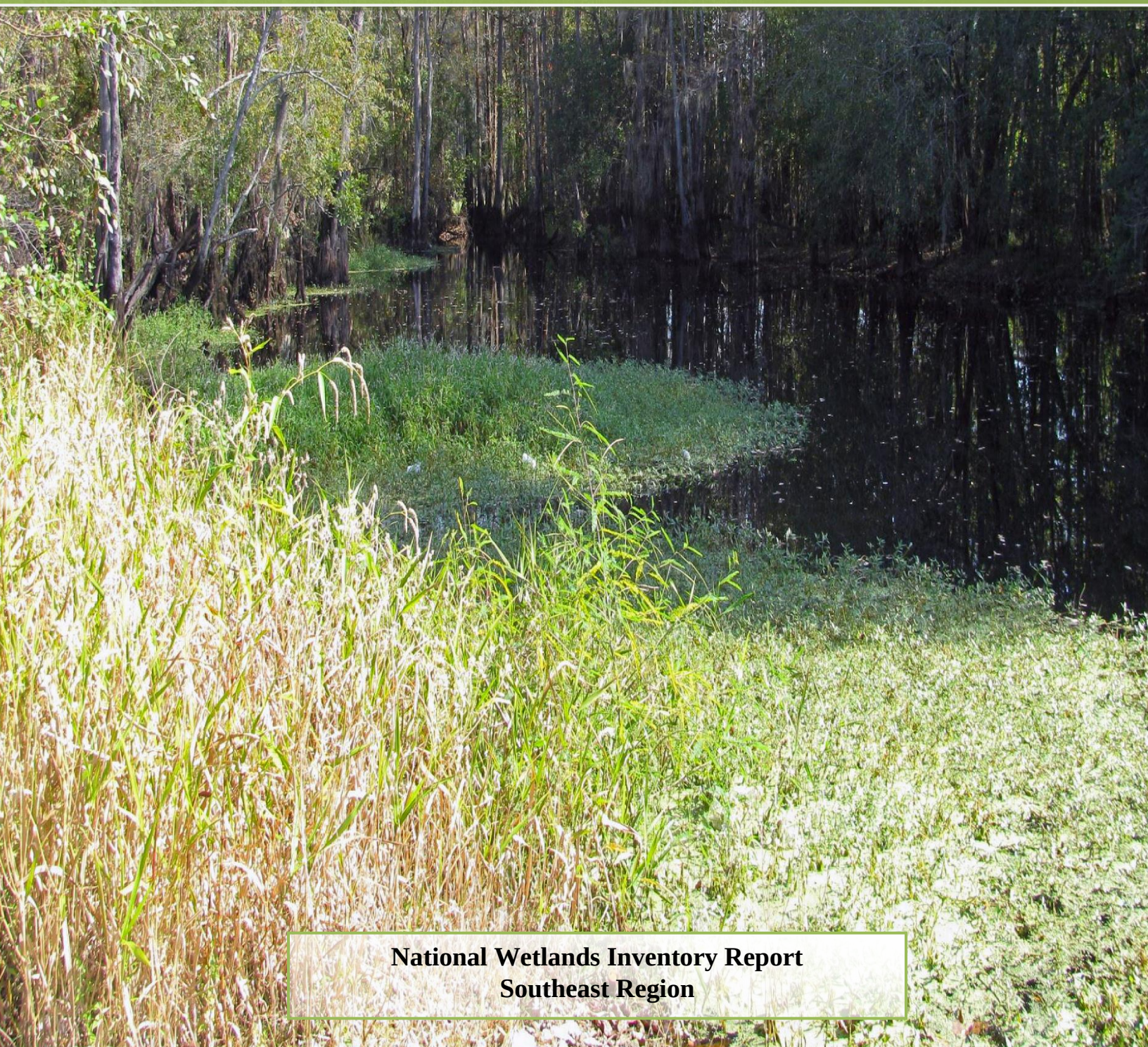
Wetlands Status and Trends for Jasper County, South Carolina 1994-2006



National Wetlands Inventory Report
Southeast Region

WETLANDS STATUS AND TRENDS FOR JASPER COUNTY, SOUTH CAROLINA: 1994-2006

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Table of Contents

List of Figures

List of Tables

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. Jasper County, South Carolina 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 Jasper 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 dry land 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.

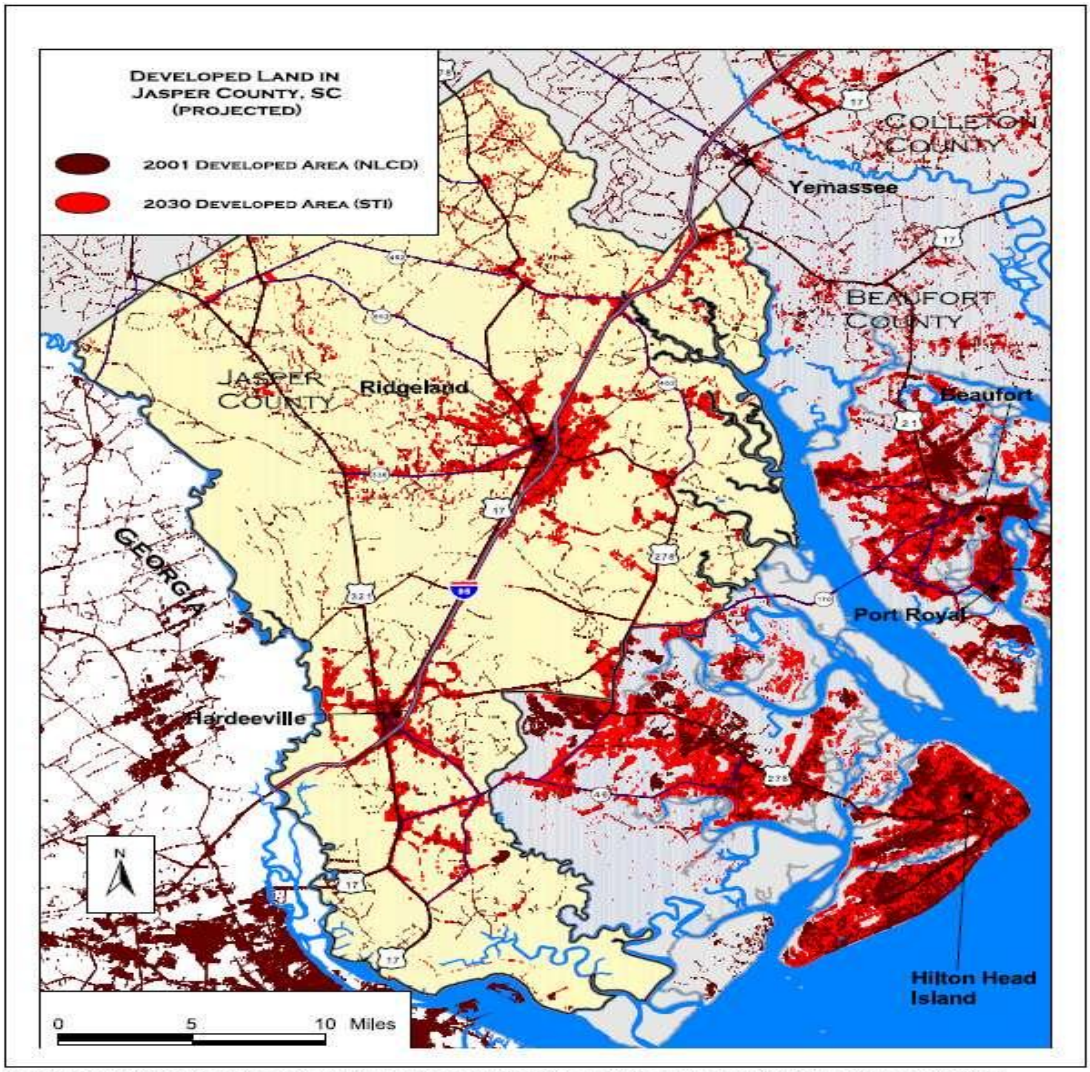
STUDY AREA

Jasper County is a part of the South Carolina Lowcountry, renowned worldwide for its unique history and natural assets. The boundaries of Jasper County are defined by two rivers, on the west the Savannah and to the east the Broad (South Carolina, A Handbook. 1927). The county encompasses 662 square miles of which 290 square miles are wetlands that include bottomland hardwoods, cypress swamps, and tidal marshes. In addition, 73 square miles of deepwater habitats include a variety of rivers, lakes and estuaries.

Traditionally the economy of Jasper County has been based on agriculture, the production of forest products, row crops, vegetables and livestock and is still a way of life for many residents. The County's fertile soil, mild climate and abundant groundwater also offer potential for alternative agricultural enterprises such as kiwi fruit and catfish production (Jasper County Chamber of Commerce, 2005). Changing times have brought tourism and other industries to the forefront. Timber harvesting has been scaled back, but freshwater forested wetlands are still being impacted by silviculture and other logging practices. The forest industry in the southeastern United States owns and leases forest lands largely for pulp and paper production (McKnight et al. 1981).

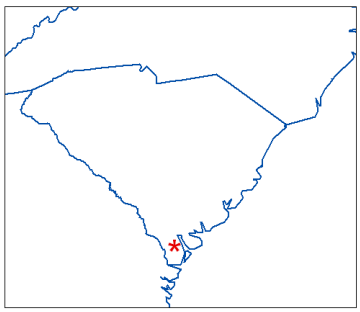
Jasper County is facing a potential population increase and a swell in development over the next several years (Figure 1). Because of this concern, Jasper County citizens and conservation community are developing growth management tools to protect natural resources and work in conjunction with developers (Jasper County 2008). Impacts to wetlands from transitional and residential development could be considerable, and measures need to be implemented to reduce the negative influence on wetland habitats as much as possible.

Figure 1: Growth Projections for Jasper County



Compiled by Craig Campbell from EPA, National Land Cover 2001 Data and Clemson Unniversity Strom Thurmond Institute

Locus Map



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. We examined aerial imagery to determine wetland trends for the time period 1994-2006.

Data Sources

The 2006 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 1994 color-infrared Digital Ortho Quarter Quads (DOQQs) were acquired from the South Carolina Department of Natural Resources. In support of the contemporary period (2006), one-foot resolution true color digital imagery was obtained from USDA NAIP program. These sources allowed an assessment of wetland gains, losses and changes from 1994 to 2006. Digital soils data available from the USDA Natural Resources Conservation Service 1980 survey (USDA-SCS, 1980) were consulted to help delineate drier-end wetlands (e.g., seasonally saturated flatwoods) that typically are hard 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 2006 NWI wetlands to the 1994 imagery. The most current NWI data and the 2006 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 http://www.fgdc.gov/standards/projects/FGDC-standards-projects/wetlands-mapping/index_html) which is the national standard for wetland classification.

Wetland changes between 1994 and 2006 were identified by overlaying the 2006 NWI data on the 1994 imagery. The causes of the changes were determined by consulting the 2006 images. 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 consistently detected was approximately 0.5 acre.

Data Analysis and Tabulation

Geospatial data were analyzed through geographic information system technology, using ArcGIS 9.3 (Environmental Systems Research Institute, Inc., ESRI). Statistics addressing wetland status

and trends for the study were generated using this program. For the 2006 NWI data, the target mapping unit (tmu) was approximately 0.5 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: 2006

Wetland and deepwater habitats occupied 362 square miles of the study area and amounts to fifty-five percent of Jasper County (details in Table 1). Forested wetlands were the dominant type, accounting for 109,221 acres of wetlands (Figure 2). Emergent wetlands were next in abundance, accounting for 52,098 acres, followed by scrub-shrub wetlands with nearly 22,000 acres inventoried. Ponds (e.g. palustrine unconsolidated bottoms and shores) totaled nearly 700 acres. Estuarine wetlands represented 32,770 acres. The deepwater portion of the study area had almost 47,000 acres inventoried. Estuarine open water had 40,996 acres and fresh water deepwater habitats (lacustrine and riverine) totaled 5,535 acres (Table 1).

Figure 2: Freshwater forested wetland

Wetland Trends

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

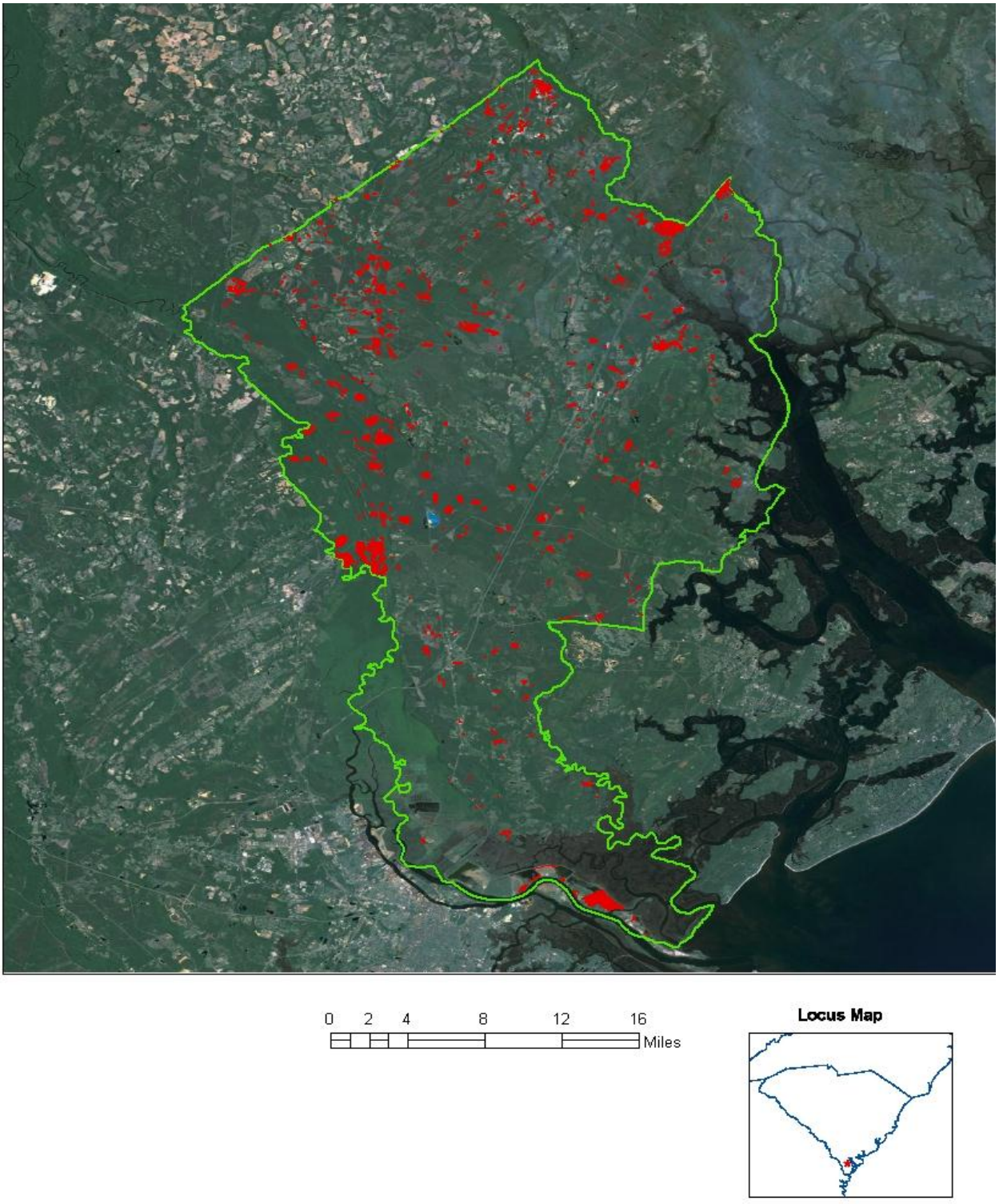
Vegetated Wetlands

Losses and Changes in Wetland Type

From 1994-2006, a total of 6956 acres of vegetative wetlands were loss due to land use changes (Table 2). In addition, 255 acres of vegetated wetlands were converted to non-vegetated wetlands (ponds) (Table 3). The largest wetlands losses were attributed to silviculture and related land management activities which accounted for 71 percent. Additional vegetated losses were attributed to industrial development at 8 percent, total losses related to agricultural activities at 7 percent, transitional lands (lands that are in transition to a variety of development types) were responsible for 6 percent of the losses. Other losses included conversions to rangelands at 5 percent, 2 percent of the losses reflect residential development, 0.5 percent of the losses attributed to transportation activities; and 0.5 percent was due to commercial development. The average annual loss of vegetated wetlands during this period was 580 acres. Forested wetlands received the brunt of the impacts, declining by more almost 5,900 acres. This amounts to a 5 percent loss of forested wetland and comprised 84 percent of the vegetated wetland losses. Emergent wetlands absorbed the second heaviest loss during this period with 1,085 acres lost representing 2 percent of this wetland type. Scrub-shrub vegetation losses totaled 568 acres. Other impacts on vegetative wetlands were identified by way of timber harvesting and pond conversion which impacted over 10,000 acres of change in wetland types.

Figure 3: Estuarine wetland marsh

Figure 4: Area of Wetland Losses Jasper County



Gains

For the time period 1994-2006, a total of almost twenty five acres of vegetative wetlands were added due to changes in land use (Table 5).

Forested Wetland Cuts (Conversion due to timber harvesting)

Due to timber harvesting within Jasper County, 10,000 acres of forested wetlands were converted into other vegetated wetland types (mostly wetland emergent and /or shrubs) (Table 4).

Nonvegetated Wetlands

Losses

Nonvegetated wetlands in Jasper County are ponds. No more than 110 acres of these habitats were lost to uplands during the time period 1994-2006 (Table 6). Most of them were filled in for upland development or conditions related to timber harvesting.

Gains

Increases in nonvegetated wetlands mainly through pond construction on uplands occurred throughout the study period. Palustrine unconsolidated bottom acreage rose by twenty-seven percent. Overall, pond acreage (palustrine unconsolidated bottom) increased by 471 acres during the 12-year period (Table 7).

Estuarine Wetlands

Over the study period (1994-2006), there was insignificant change detected in estuarine wetlands for Jasper County.

Figure 5: Area of Wetland Gains Jasper County

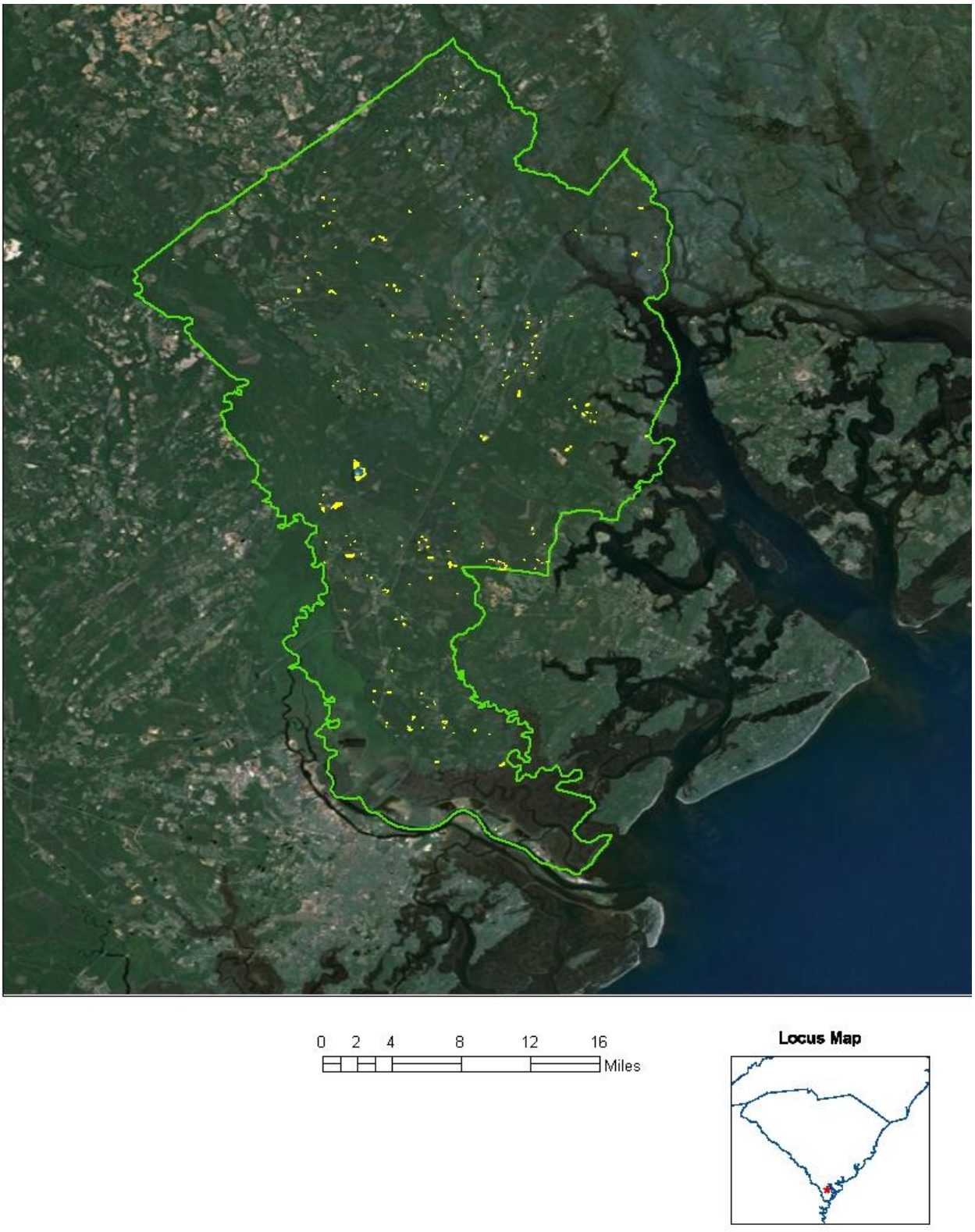


Table 1. Extent of wetlands and deepwater habitats in Jasper County, 2006

	NWI Classification		*Acreage*
Habitat	System	Class	
Wetland	Estuarine	Emergent	32,193.9
		Forested	43.2
		Scrub-Shrub	167.1
		Unconsolidated Shore	365.7

		Total Estuarine Wetlands	32,769.9
	Lacustrine	Emergent	26.1
		Unconsolidated Shore	238.5

		Total Lacustrine Wetlands	264.6
	Palustrine	Emergent	19,877.8
		Forested	109,178.1
		Scrub-Shrub	21,466.7
		Unconsolidated Bottom	1,601.3
		Unconsolidated Shore	93.4

		Total Palustrine Wetlands	152,217.3
	Riverine	Unconsolidated Shore	11.1
		Total Riverine Wetlands	11.1

	GRAND TOTAL –WETLAND		**185,262.9**
Deepwater Habitat			
	Estuarine	Unconsolidated Bottom	40,996
	Lacustrine	Unconsolidated Bottom	1,052.4
	Riverine	Unconsolidated Bottom	4,482.6
	GRAND TOTAL-DEEPWATER HABITAT		**46,531**

Table 2. Causes of vegetated wetland trends: Losses to upland

Nature of Change	*Cause of Change*	*Wetland Type Affected*	*Acres Changed*
LOSS to	Agriculture	Emergent	19.3
		Forested	477.5
		Scrub-Shrub	4.7
		(Subtotal)	***501.5***
	Commercial Development	Emergent	4.0
		Forested	35.6
		Scrub-Shrub	0.5
		(Subtotal)	***40.1***
	Industrial Development	Forested	6.8
		Emergent	566.8
		(Subtotal)	***573.6***
	Rangeland	Emergent	0.8
		Forested	324.1
		Scrub-Shrub	6.5
		(Subtotal)	***331.4***
	Residential Development	Emergent	12.1
		Forested	96.5
		Scrub-Shrub	4.6
		(Subtotal)	***113.2***
	Timber Harvesting	Emergent	355.3
		Forested	4,040.9
		Scrub-Shrub	535.7
		(Subtotal)	***4,931.9***
	Transitional Development	Emergent	84.0
		Forested	301.4
		Scrub-Shrub	15.4
		(Subtotal)	***400.8***
	Transportation Development	Emergent	43.5
		Forested	19.9
		Scrub-Shrub	0.4
		(Subtotal)	***63.8***
	TOTAL VEGETATED LOSSES		**6,956.3**

Table 3. Causes of vegetated wetlands trends: Change in Wetland Type

Nature of Change	*Cause of Change*	*Wetland Type Affected*	*Acres Change*
CHANGE IN TYPE	Pond Creation	Emergent	12.9
	Pond Creation	Forested	229.4
	Pond Creation	Scrub-Shrub	12.7
		(Subtotal)	*255*
	TOTAL CHANGE IN VEGETATED		**255**

Table 4. Causes of vegetated wetlands trends: Change in Wetland Type Caused by Timber Harvesting

Nature of Change	*Wetland 1994*	*Wetland 2006*	*Acres Changed*
CUTS	Forested	Emergent	6,383.9
	Forested	Scrub-Shrub	3,434.7
	Scrub-Shrub	Emergent	3.2
		(Subtotal)	*10,321.8*
	TOTAL CHANGE IN VEGETATED		**10,321.8**

Table 5. Causes of vegetated wetlands trends: Gain

Nature of Change	*Cause of Change*	*Wetland Type Affected*	*Acres Change*
GAIN from	Timber Harvesting	Emergent	24.7
		(Subtotal)	*24.7*
	TOTAL GAIN IN VEGETATED		**24.7**

Table 6. Causes of nonvegetated wetland trends: Wetland Losses

Nature of Change	*Cause of Change*	*Wetland Type Affected*	*Acres Changed*
LOSS to	Agriculture	Unconsolidated Bottom	1.1
		Unconsolidated Shore	12.4
		(Subtotal)	***13.5***
	Commercial	Unconsolidated Bottom	0.1
		(Subtotal)	***0.1***
	Residential	Unconsolidated Bottom	2.1
		Unconsolidated Shore	1.7
		(Subtotal)	***3.8***
	Timber Harvesting	Unconsolidated Bottom	0.2
		(Subtotal)	***0.2***
	Transitional Development	Unconsolidated Bottom	5.7
		Unconsolidated Shore	86.1
		(Subtotal)	***91.8***
	TOTAL NONVEGETATED LOSSES		**109.4**

Table 7. Causes of nonvegetated wetland trends: Wetland Gains

Nature of Change	*Cause of Change*	*Nonvegettated Type*	*Acres Changed*
GAIN from	Agriculture	PUB	24.9
	Commercial Development	PUB	0.6
	Rangeland	PUB	29.9
	Residential Development	PUB	1.4
	Timber Harvesting	PUB	390.9
	Transitional Development	PUB	23.9
	TOTAL GAINS		**471.6**

STUDY LIMITATIONS

Wetlands identified with the 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 few 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. In addition, seasonal differences of the 2006 imagery (acquired in the spring & fall) and other confines related to detecting forested wetlands may have occurred. Examination of soil properties is usually required to verify the existence of these wetlands. Soil surveys conducted by the USDA, 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 impacts. 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 between 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 2006, wetlands and deepwater habitats represented fifty-five percent of Jasper County's total acreage. Forested wetlands remained the dominant type, occupying over 109,000 acres and accounting for fifty-nine percent of the county's wetlands. The county lost nearly four percent or 6,956 acres of its vegetated wetlands from 1994 to 2006, while nonvegetated wetland acreage (e.g., ponds) rose by twenty one percent or 362 acres. Timber harvesting was the main cause of the vegetated wetland loss, being responsible for seventy one percent of the losses from 1994 to 2006. A close second, transitional development was responsible for thirty-two percent of wetland losses.

Since timber removal generally occurs in 20-50 year rotations, careful harvest may not be a permanent threat to wetlands, but a variation in practices may occur. Adverse effects of timber harvest can include a rise in water table due to a decrease in transpiration, soil disturbance and compaction by heavy equipment, sedimentation and erosion from logging decks, skid trails, roads, and ditches, and drainage and altered hydrology from ditching, draining, and road construction (Shepard 1994). Figure 6 shows the impacts for timber harvesting in Jasper County.

Figure 6: Areas of Wetland change by Timber Activities

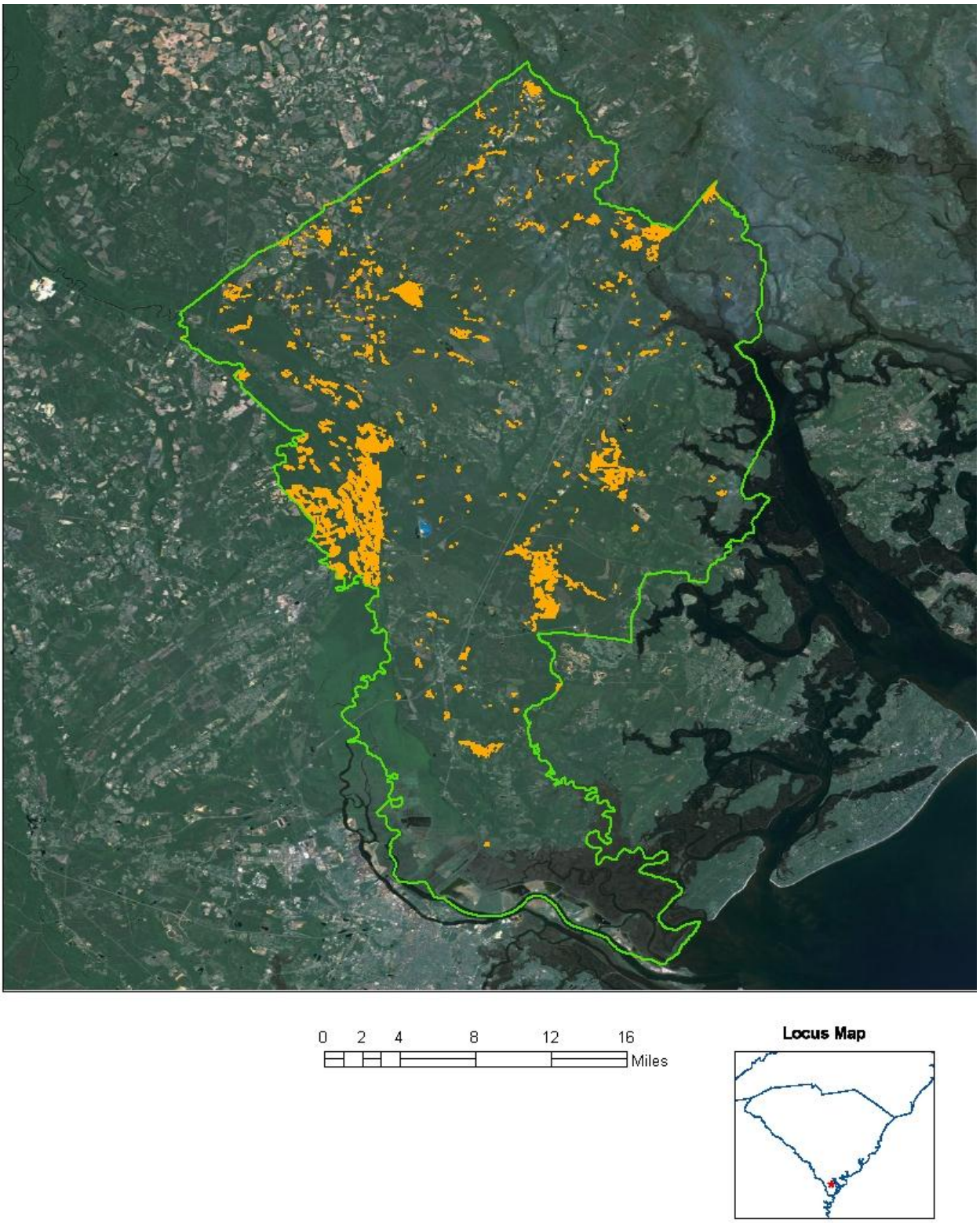


Figure 7: Pine Plantation in former wetland

Figure 8: Aerial Image of Wetland change in Type due to Timber Activities

ACKNOWLEDGEMENTS

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