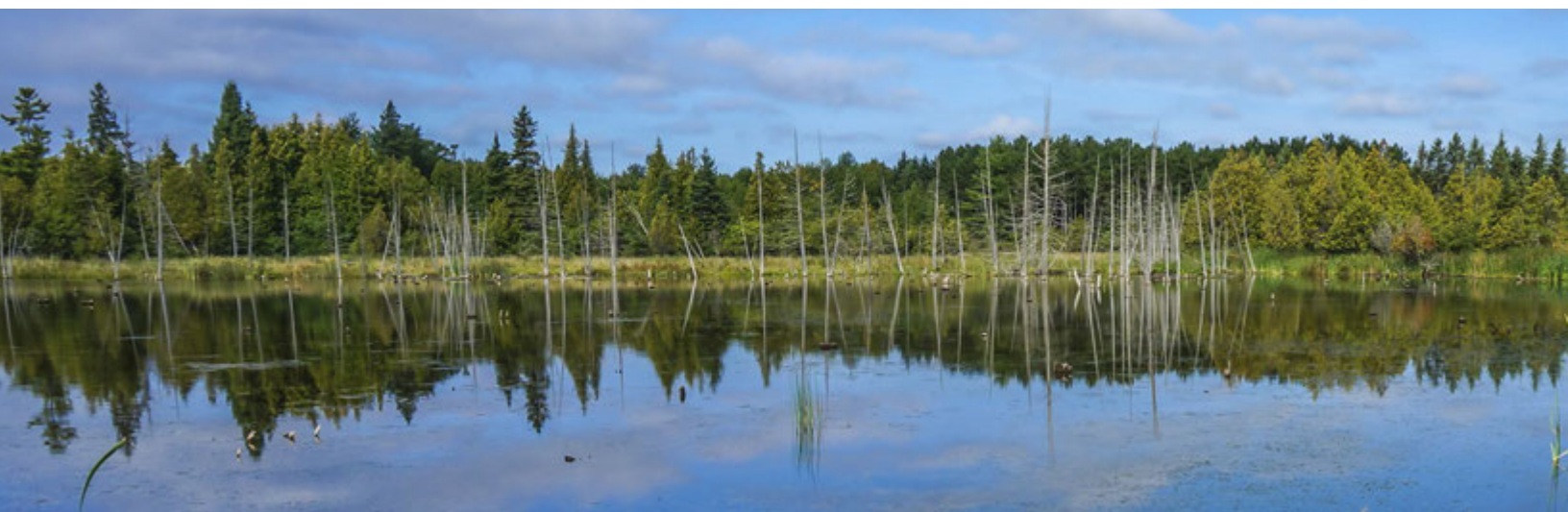


Southeast Regional Land Cover Change Report

1996–2010



About This Report

The *Southeast Regional Land Cover Change Report, 1996–2010*, is the first in a series of regional reports that summarize the land cover status of the coastal United States in 2010 and land cover changes over the previous decade and a half. This report provides an overview of key findings using reader-friendly maps and graphics.

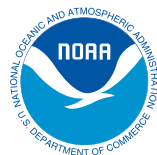
About the Coastal Change Analysis Program

Satellite imagery is a great way to get a big-picture view of the cumulative impacts of changes along our nation's coasts. The Coastal Change Analysis Program (C-CAP) within the National Oceanic and Atmospheric Administration (NOAA) Office for Coastal Management produces nationally standardized land cover and land cover change information for coastal regions of the United States, including the Southeast, using multiple dates of satellite imagery. C-CAP's data products provide inventories of coastal intertidal areas, wetlands, and adjacent uplands at approximately five-year intervals. This information helps to support decision-making about coastal resources and communities. The raster-based maps generated by C-CAP serve as a baseline for studies of coastal changes and evaluations of past or future management actions.

To learn more about the C-CAP data products used in this report and to access the data sets, please visit www.coast.noaa.gov/digitalcoast/data/ccapregional.

About the NOAA Office for Coastal Management

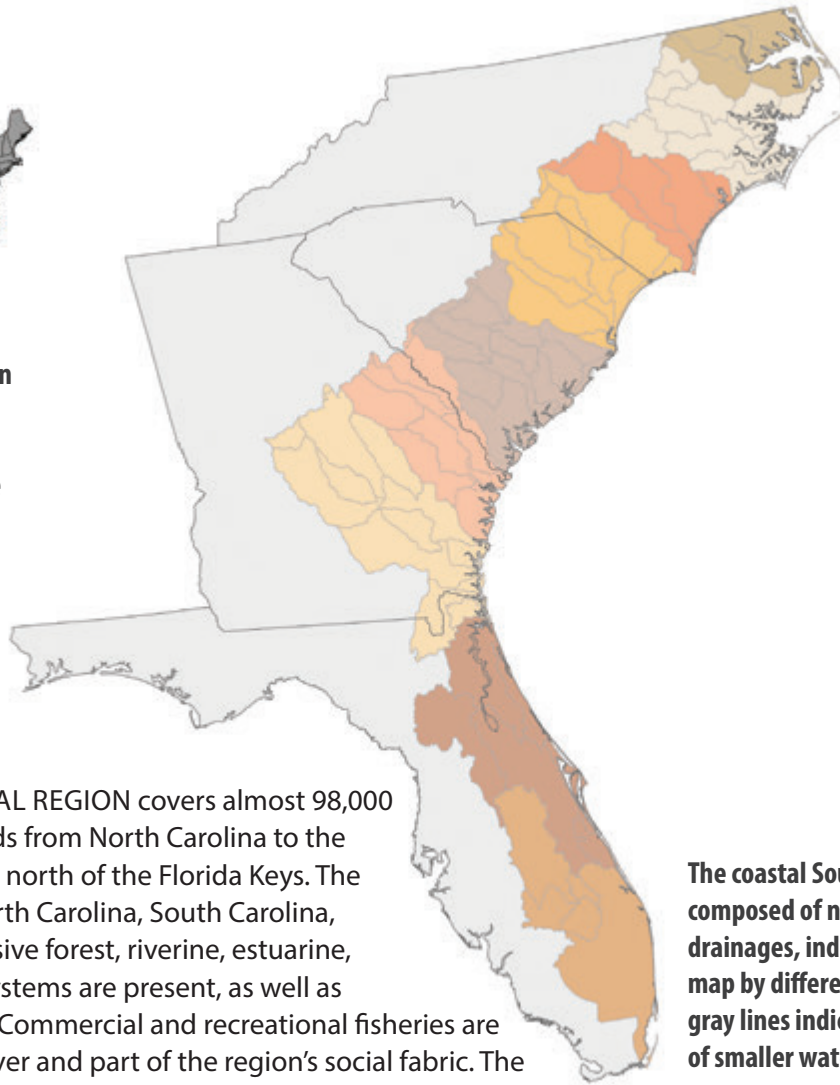
NOAA's Office for Coastal Management works at the center of the nation's coastal management efforts. From implementing the National Coastal Zone Management Program to providing technical assistance to coastal communities through the Digital Coast, the organization strives to help the nation's coastal communities prosper in the face of numerous natural and man-made challenges. To learn more, visit the website at www.coast.noaa.gov.



INTRODUCTION



Location of the Southeast region (red) within the Coastal Change Analysis Program's mapping coverage area (dark gray) in the contiguous United States.



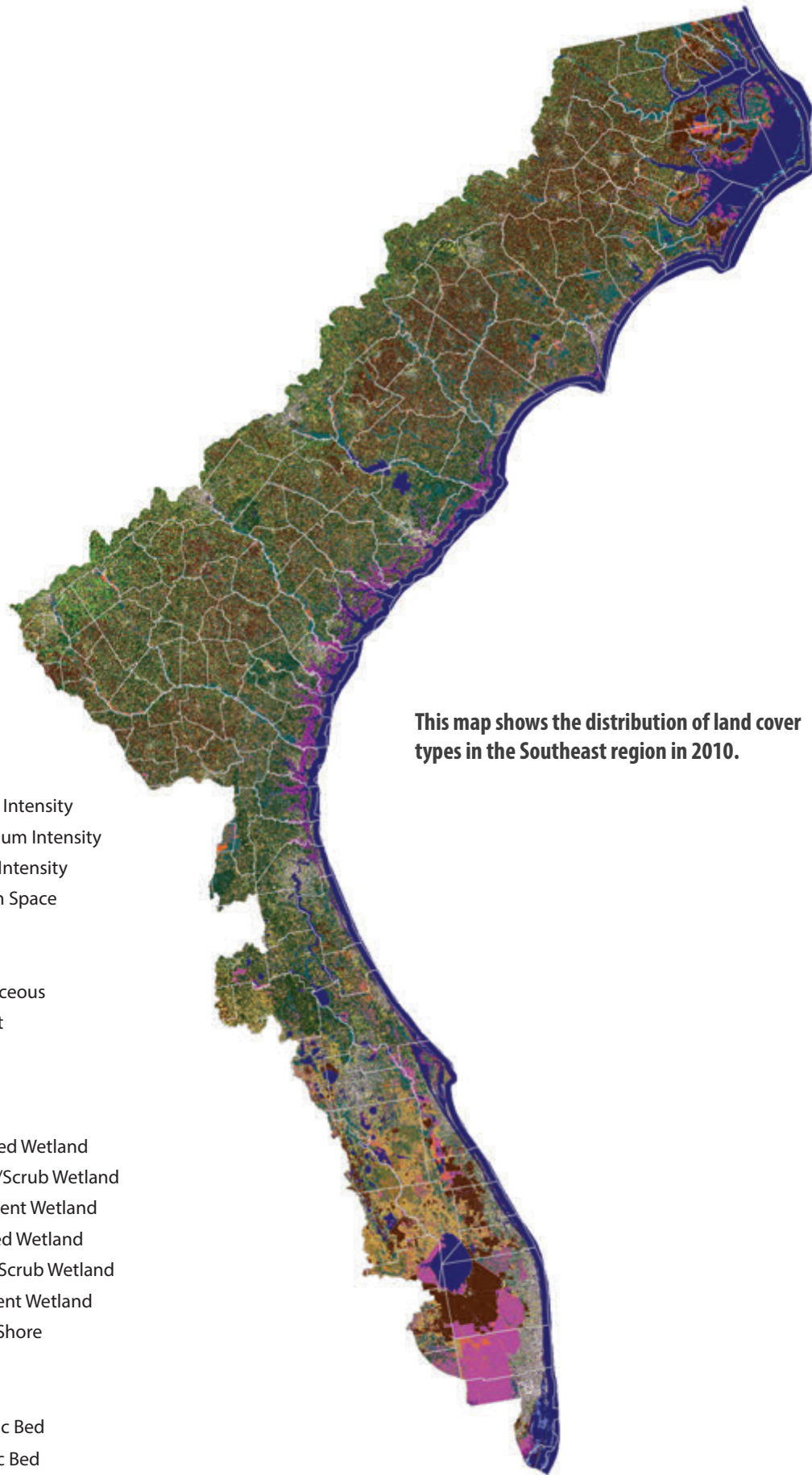
The coastal Southeast is composed of nine major drainages, indicated on the map by different colors. Thin gray lines indicate boundaries of smaller watersheds.

THE SOUTHEAST COASTAL REGION covers almost 98,000 square miles and extends from North Carolina to the southern end of Miami, just north of the Florida Keys. The region includes parts of North Carolina, South Carolina, Georgia, and Florida. Extensive forest, riverine, estuarine, marsh, and barrier-island systems are present, as well as mangroves and coral reefs. Commercial and recreational fisheries are an important economic driver and part of the region's social fabric. The states of the Southeast service cargo and passenger ships with facilities that include some of the country's largest and fastest-growing container ports. Natural and human-influenced hazards to the region include thunderstorms and tornadoes, floods and debris flows, earthquakes, tsunamis, drought, wildfires, winter storms, subsidence, saltwater intrusion, coastal erosion, and tropical storms.

The population along the coast of the Southeast states continues to grow rapidly. Thirty-seven percent of the 43 million people in these states live in coastal counties bordering the Atlantic Ocean. The expansion of recreation and tourism, residential development, service industries, and commercial space has transformed the social, economic, and physical landscape. The demand on natural resources has increased, including water for residential, agricultural, industrial, and recreational uses. Climate change impacts and degraded water quality are also concerns for natural and human communities in the region.

Many types of land cover, such as forest, wetland, and agriculture, occur in the Southeast, and the amount of each land cover type changes over time. Using images and data collected by satellites, NOAA's Coastal Change Analysis Program (C-CAP) measured the area of each land cover type gained or lost from 1996 to 2010. In this report, 22 land cover classes are grouped into eight general categories: developed, agriculture, grass, shrub, upland forest, wetland, barren, and water.

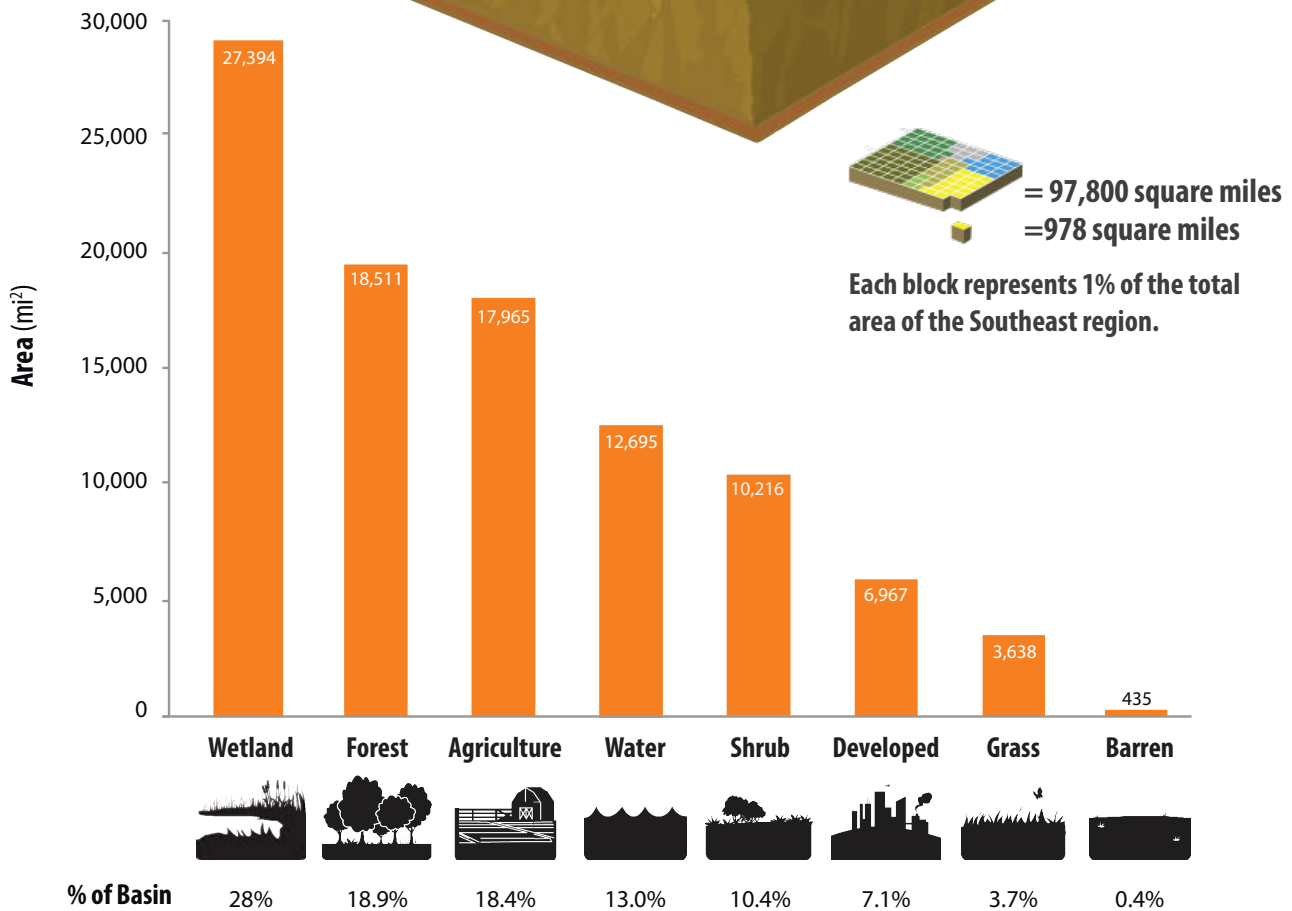
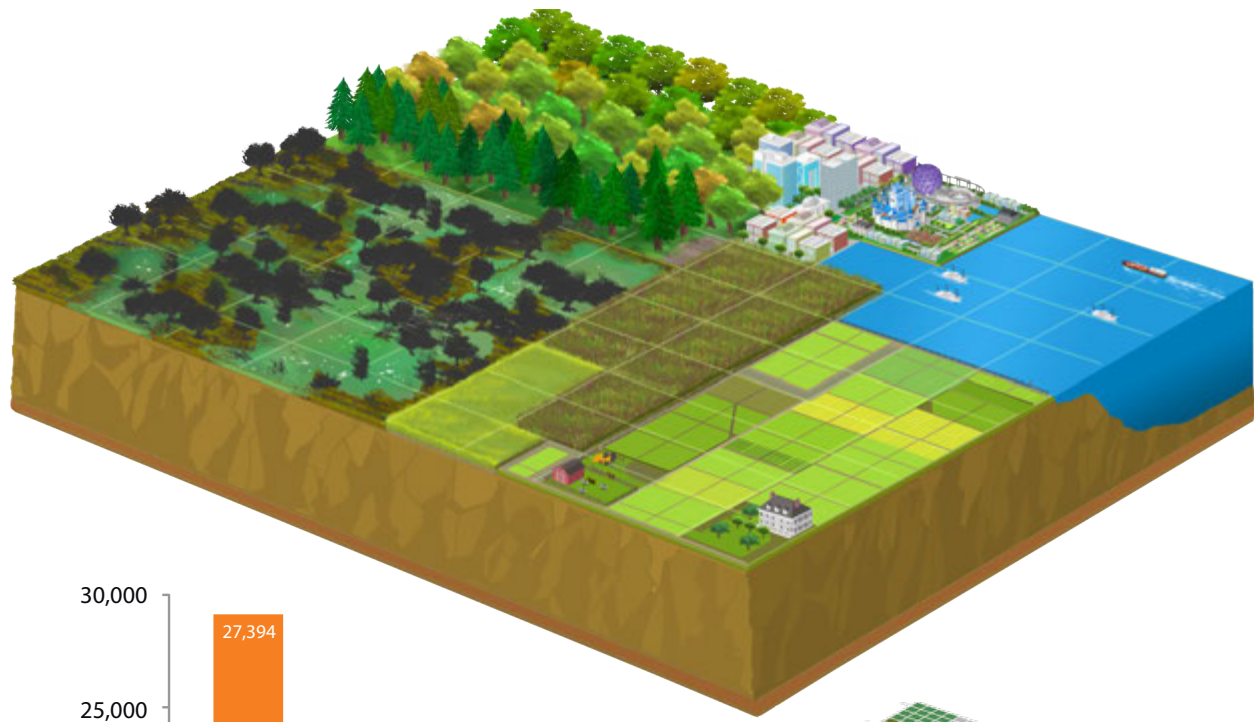
LAND COVER



- Developed, High Intensity
- Developed, Medium Intensity
- Developed, Low Intensity
- Developed, Open Space
- Cultivated Crops
- Pasture/Hay
- Grassland/Herbaceous
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Palustrine Forested Wetland
- Palustrine Shrub/Scrub Wetland
- Palustrine Emergent Wetland
- Estuarine Forested Wetland
- Estuarine Shrub/Scrub Wetland
- Estuarine Emergent Wetland
- Unconsolidated Shore
- Bare Land
- Open Water
- Palustrine Aquatic Bed
- Estuarine Aquatic Bed



IN 2010, WETLANDS (28%), UPLAND FOREST (19%), AND AGRICULTURE (18%) were the most common categories of land cover in the region, accounting for approximately two-thirds of the area. The next most common cover types were water (13%), shrub (10%), and development (7%). Less than 1% of the area was classified as barren.

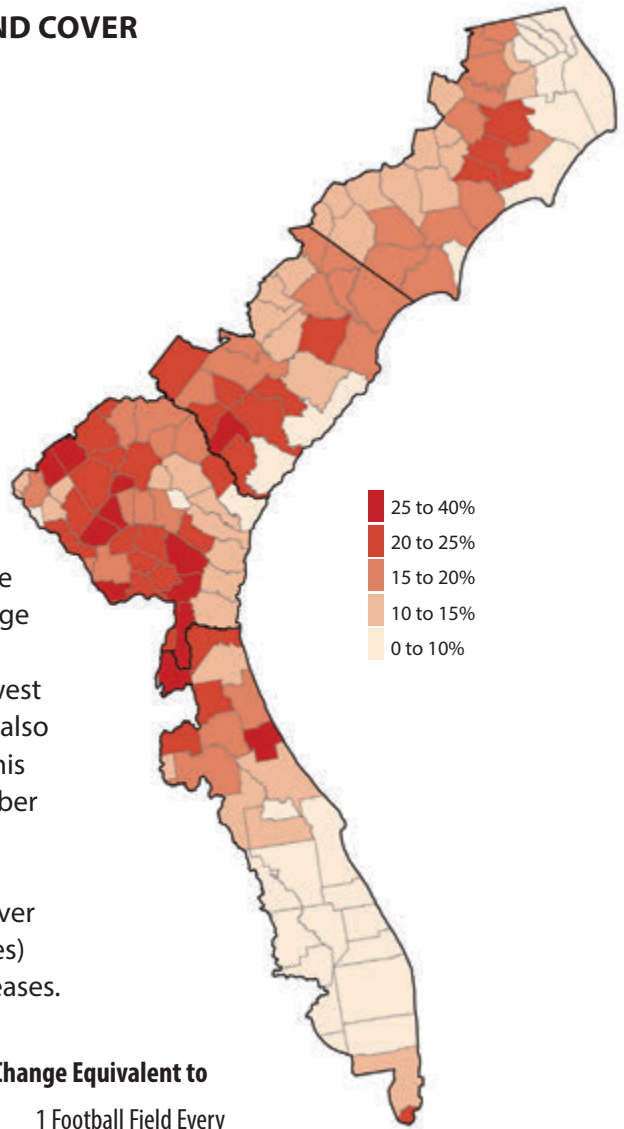


The 22 land cover classes in the Southeast region have been grouped into eight major categories that are displayed in the map graphic to highlight their relative distribution in 2010. More detailed information about these eight categories is displayed in the bar chart.

TOTAL CHANGE IN LAND COVER

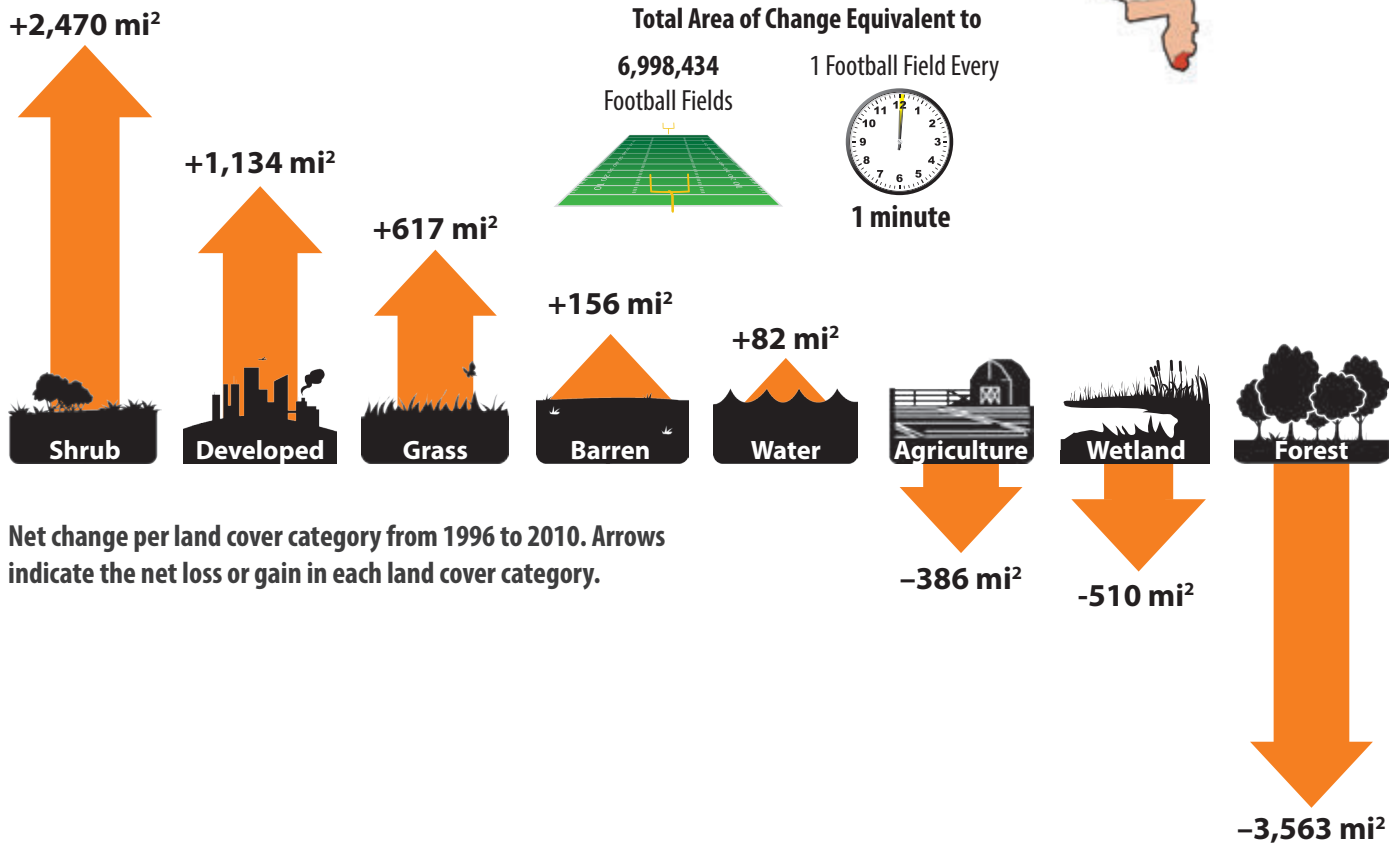
AREA OF CHANGE
14,420 square miles

15% OF REGION



FROM 1996 TO 2010, LAND COVER changed on 14,420 square miles, or almost 15%, of the Southeast region. Areas of change were most common in counties inland from those most shore adjacent, particularly in southern South Carolina and Georgia west of Brunswick. Flagler County, Florida, (north of Daytona Beach) also had a high percentage of change during this period. Much of this change is associated with silviculture activities, common in timber management in the southeastern U.S.

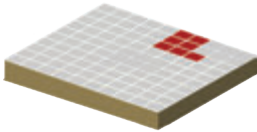
With a loss of 3,563 square miles, upland forest was the land cover with the greatest net decrease in area. Shrub (2,470 square miles) and development (1,134 square miles) had the largest net increases.



DEVELOPED AREA

6,967 square miles

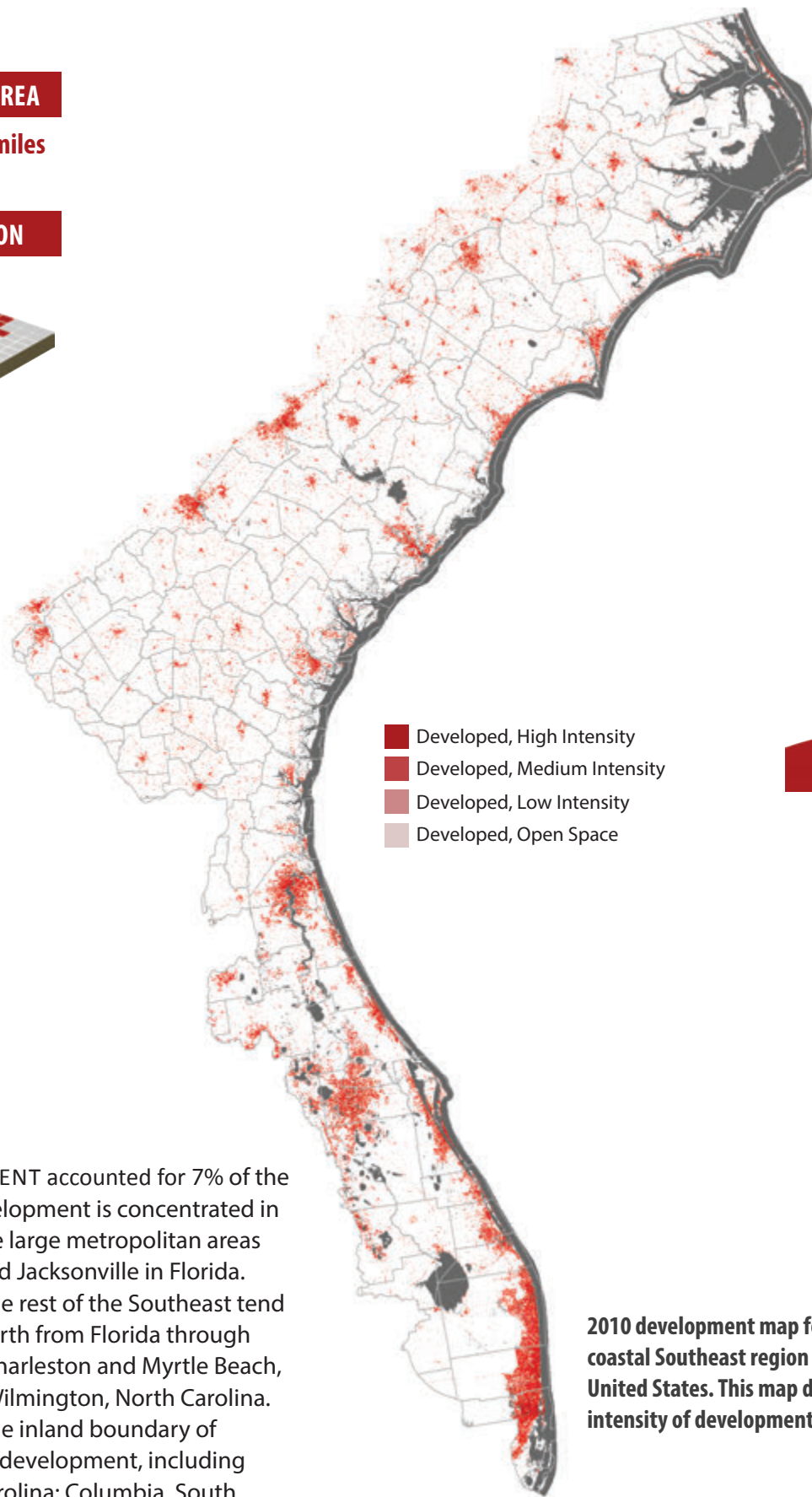
7% OF REGION



DEVELOPED



- Developed, High Intensity
- Developed, Medium Intensity
- Developed, Low Intensity
- Developed, Open Space



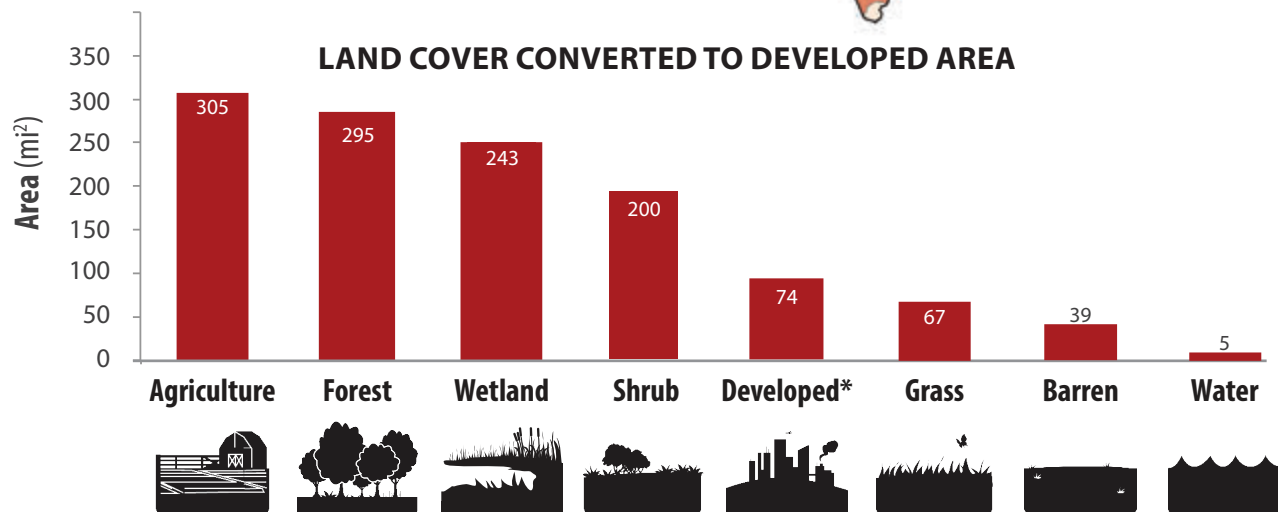
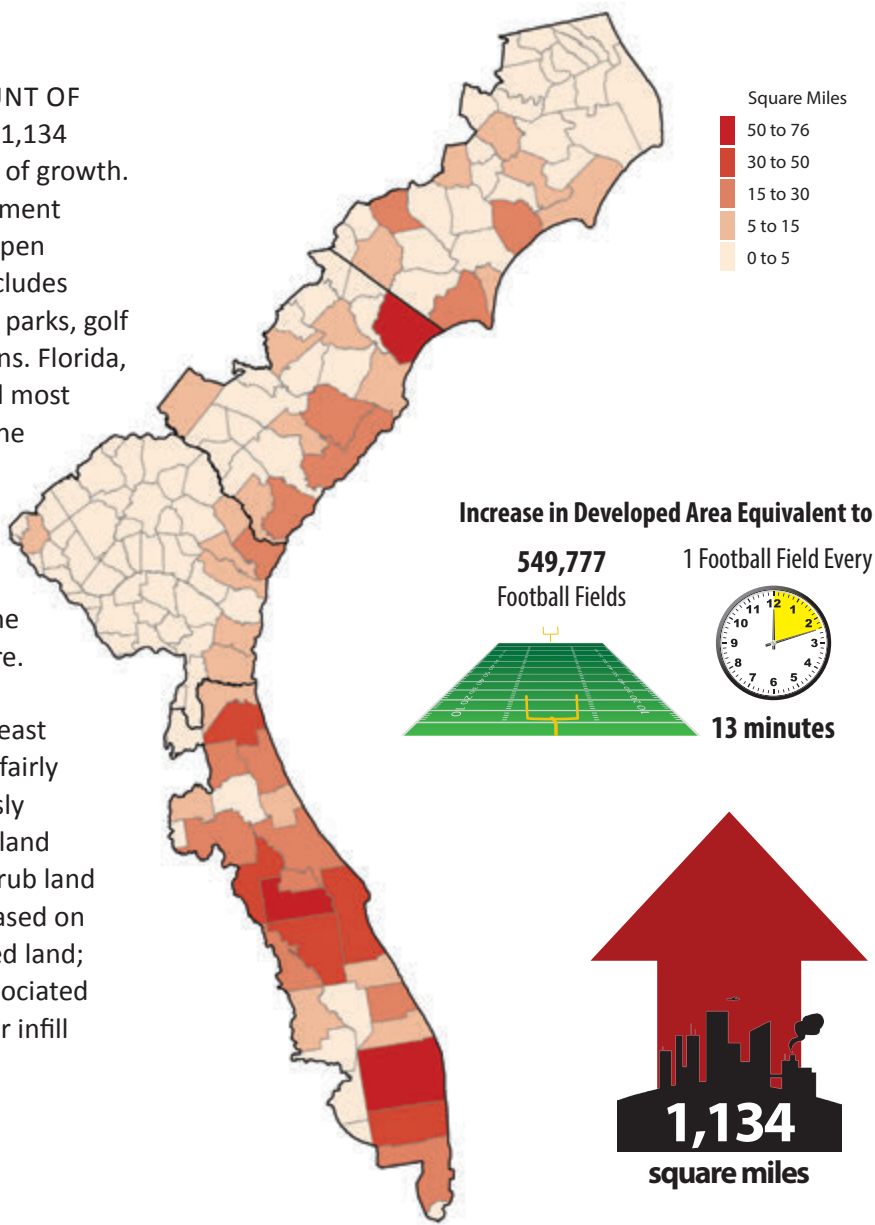
IN 2010, DEVELOPMENT accounted for 7% of the Southeast. This development is concentrated in areas surrounding the large metropolitan areas of Miami, Orlando, and Jacksonville in Florida. Developed areas in the rest of the Southeast tend to follow the coast north from Florida through Savannah, Georgia; Charleston and Myrtle Beach, South Carolina; and Wilmington, North Carolina. Several cities along the inland boundary of this region also show development, including Fayetteville, North Carolina; Columbia, South Carolina; and Augusta and Macon, Georgia.

2010 development map for the coastal Southeast region of the United States. This map depicts intensity of development.

INCREASE IN DEVELOPED AREA

FROM 1996 TO 2010, THE AMOUNT OF DEVELOPED AREA increased by 1,134 square miles, or an almost 20% rate of growth. More than 70% of this new development was classified as low intensity and open space developed, which typically includes suburban and rural features such as parks, golf courses, and housing with large lawns. Florida, which contains the largest cities and most development in the region, added the greatest area of new development during this period. Areas surrounding the cities of Orlando, Miami, Savannah, Charleston, and Myrtle Beach are all prominent in the maps of developed change seen here.

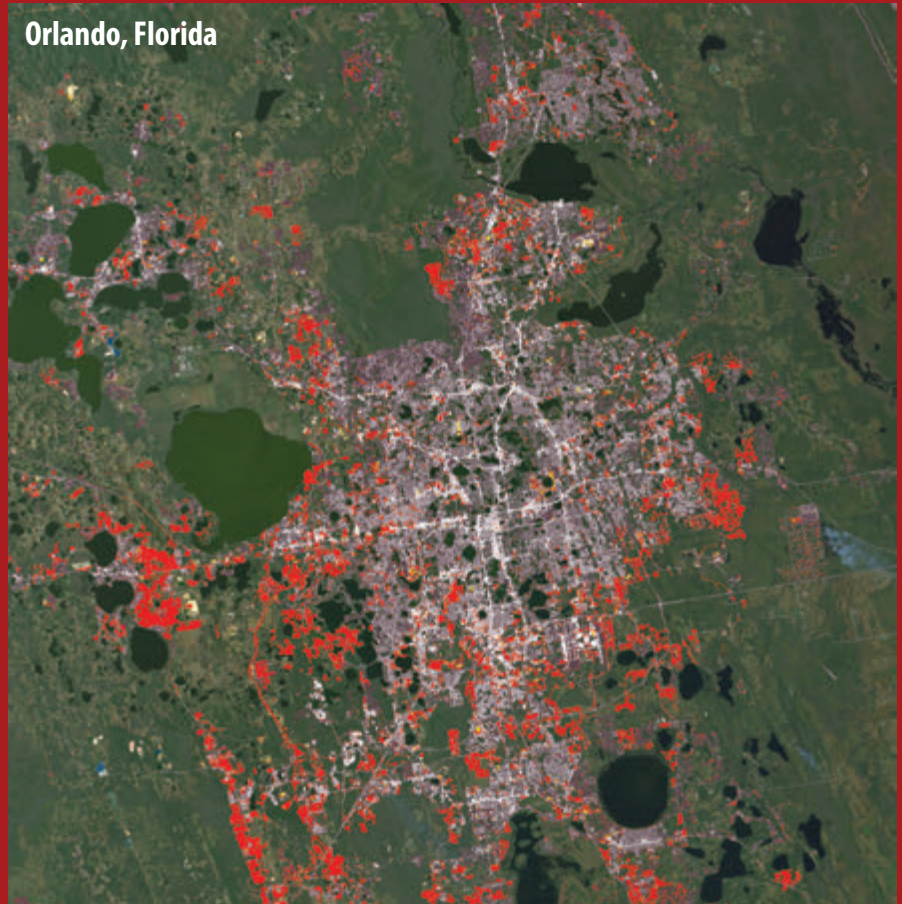
New development across the Southeast during the 14-year time period was fairly evenly distributed on lands previously categorized as agriculture (26%), upland forest (25%), wetland (21%), and shrub land (17%). Development intensity increased on 74 square miles of already developed land; this type of change is commonly associated with increasing density of housing or infill development within city limits.



This bar graph shows the area of each land cover that was converted to development between 1996 and 2010.

* Increases in development intensity

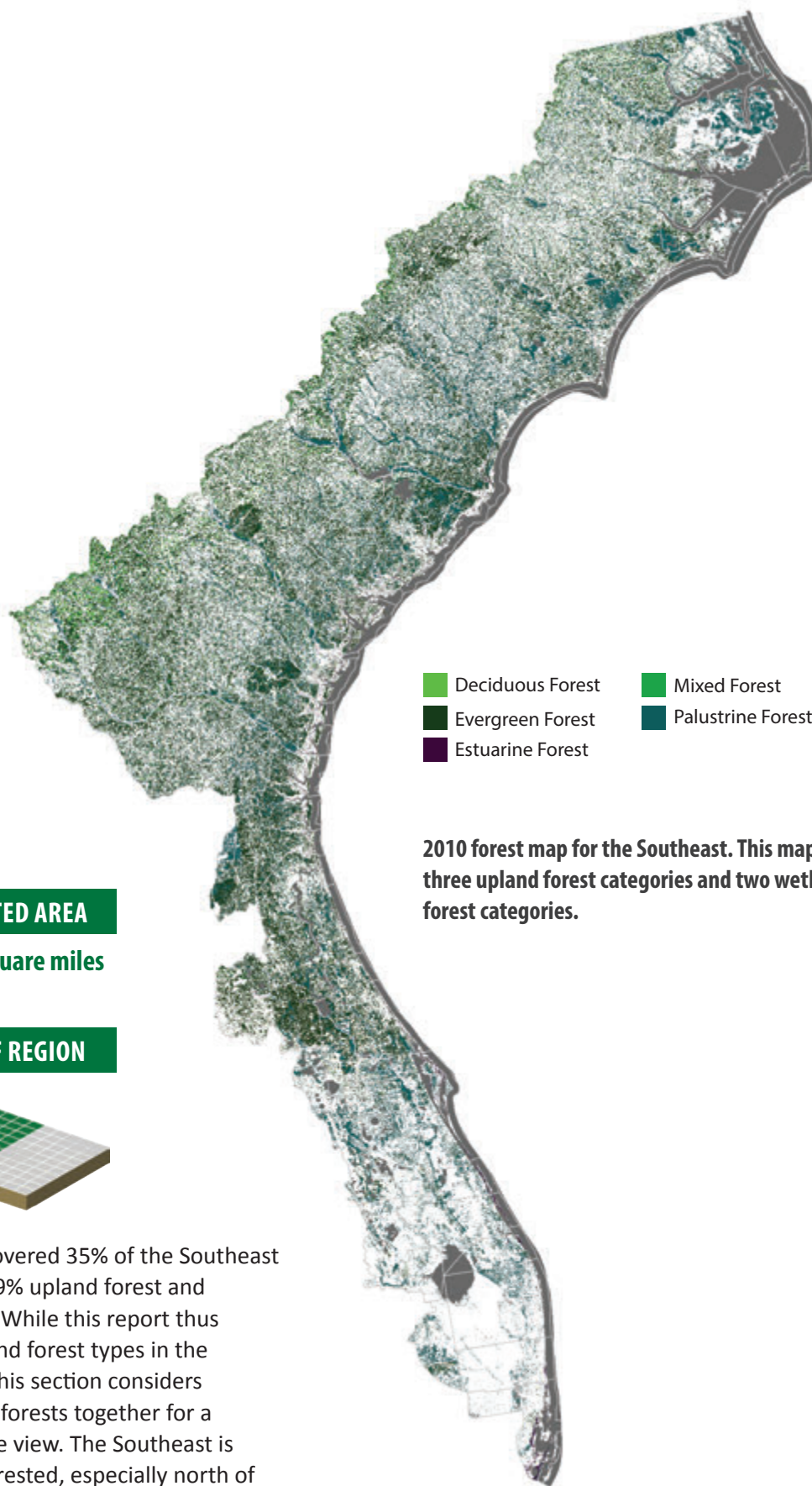
HIGHLIGHT: METROPOLITAN DEVELOPMENT TRENDS



■ Pre-1996 High Intensity ■ Pre-1996 Moderate Intensity ■ Increased Intensity ■ New Development

These images of metropolitan areas within the Southeast region show patterns of new development (red) and increased density or infill development (yellow). This development often forms a halo pattern around a preexisting city core, reflecting the expansion of major roads and population growth away from the downtown. Background images: Esri

FOREST

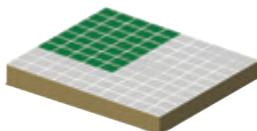


- Deciduous Forest
- Evergreen Forest
- Estuarine Forest
- Mixed Forest
- Palustrine Forested Wetland

2010 forest map for the Southeast. This map depicts three upland forest categories and two wetland forest categories.

FORESTED AREA
34,267 square miles

35% OF REGION

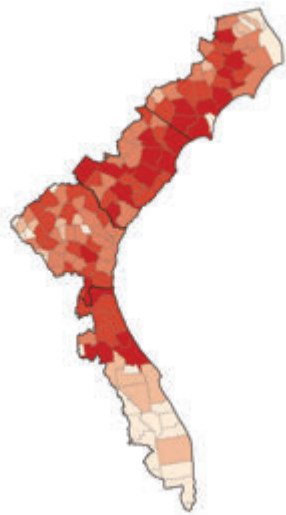


IN 2010, FOREST covered 35% of the Southeast region, including 19% upland forest and 16% wetland forest. While this report thus far has placed wetland forest types in the wetlands category, this section considers upland and wetland forests together for a more comprehensive view. The Southeast is fairly consistently forested, especially north of the Everglades and the dominant agricultural landscape of southern Florida.

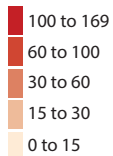


FOREST AREA LOST

8,525 square miles



Square Miles

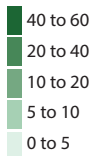


FOREST AREA GAINED

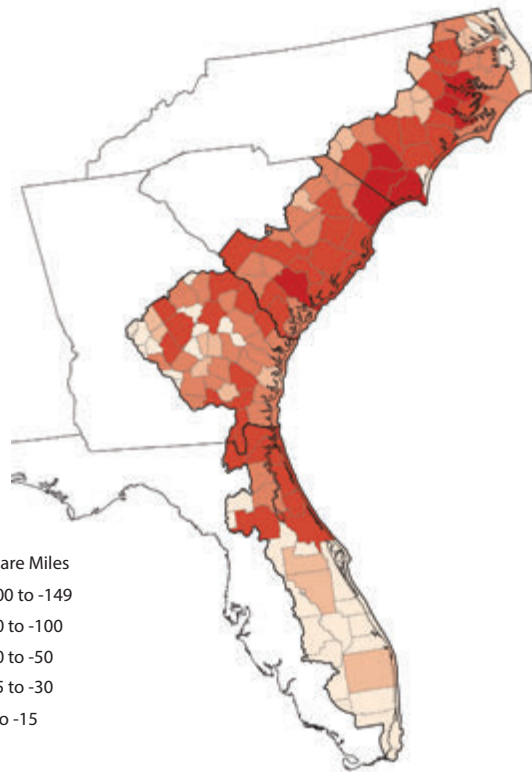
1,852 square miles



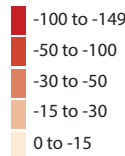
Square Miles



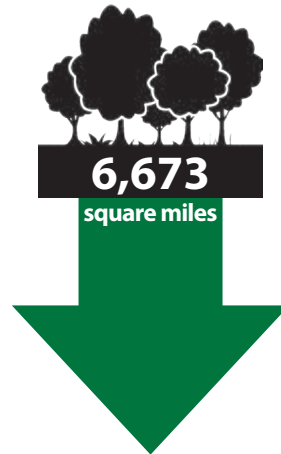
**NET CHANGE
IN FOREST AREA**



Square Miles

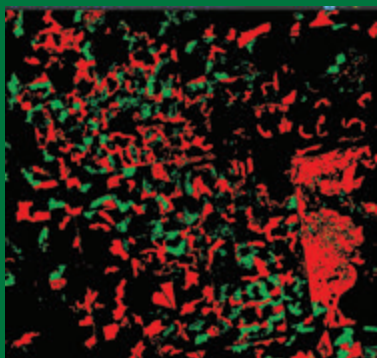


FROM 1996 TO 2010, 8,525 SQUARE MILES OF FOREST changed to other types of land cover (above left), and 1,852 square miles of other land cover changed to forest (above center). The result was a net loss of over 6,673 square miles of forest; most of these changes occurred throughout the region, except in the southern half of Florida.



Silviculture Activities in Forest Lands

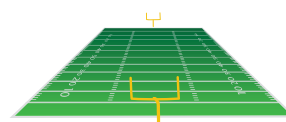
Timber activities (i.e., silviculture) often result in a patchwork appearance in the landscape. The C-CAP change map on the lower left shows forest cuts (red) and regrowth from previous cuts (green) that have occurred during this period in a portion of central Florida. The image on the right is satellite imagery of the same area.



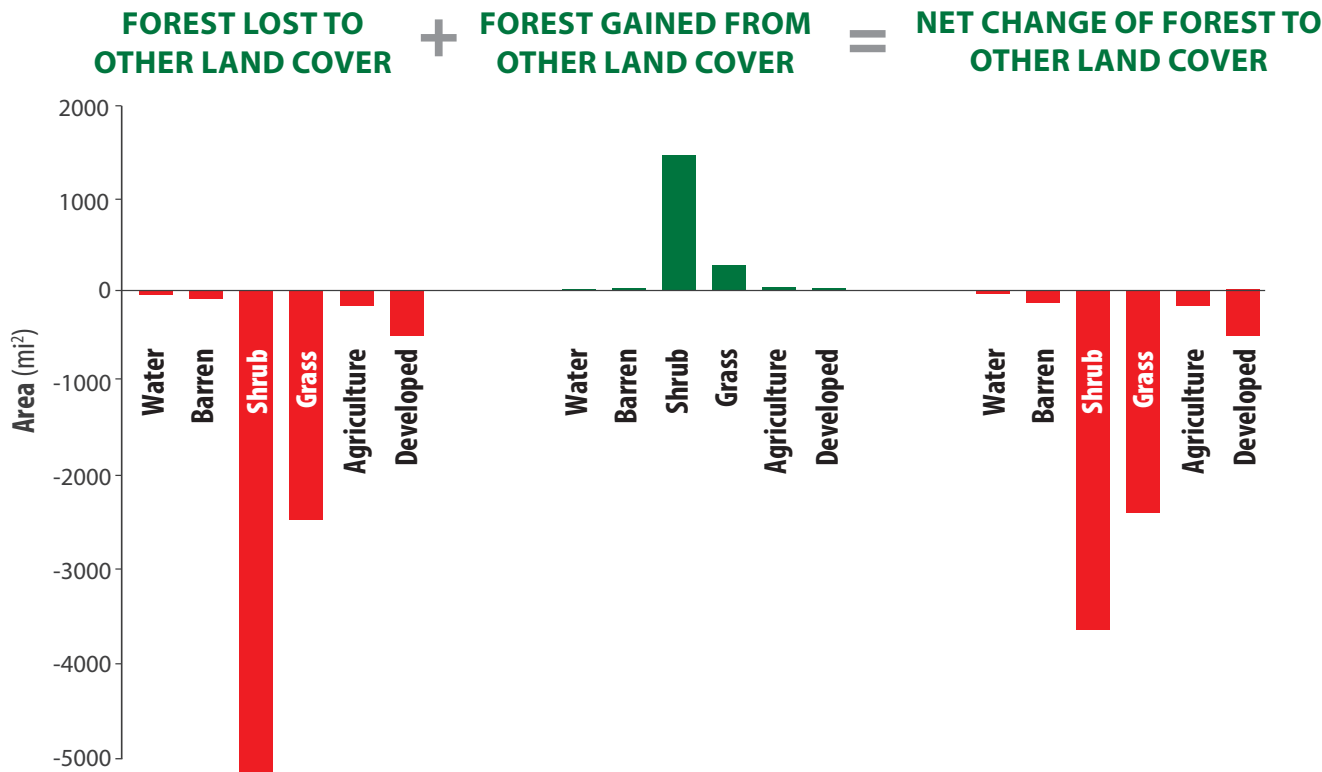
Decrease in Forest Area Equivalent to

3,229,732
Football Fields

1 Football Field Every



2 minutes



These graphs show the categories of land cover that forests were lost to or gained from, along with the resulting net change between each of these categories and forests between 1996 and 2010.

MOST OF THE LOSSES IN FOREST LAND COVER consisted of changes from forest to grass or shrub (89% of all forest losses, combined). At the same time, most gains came from areas that were formerly grass or shrub and changed to forest (98% of all gains, combined). This pattern suggests that many of the region's forested areas are undergoing transitions that

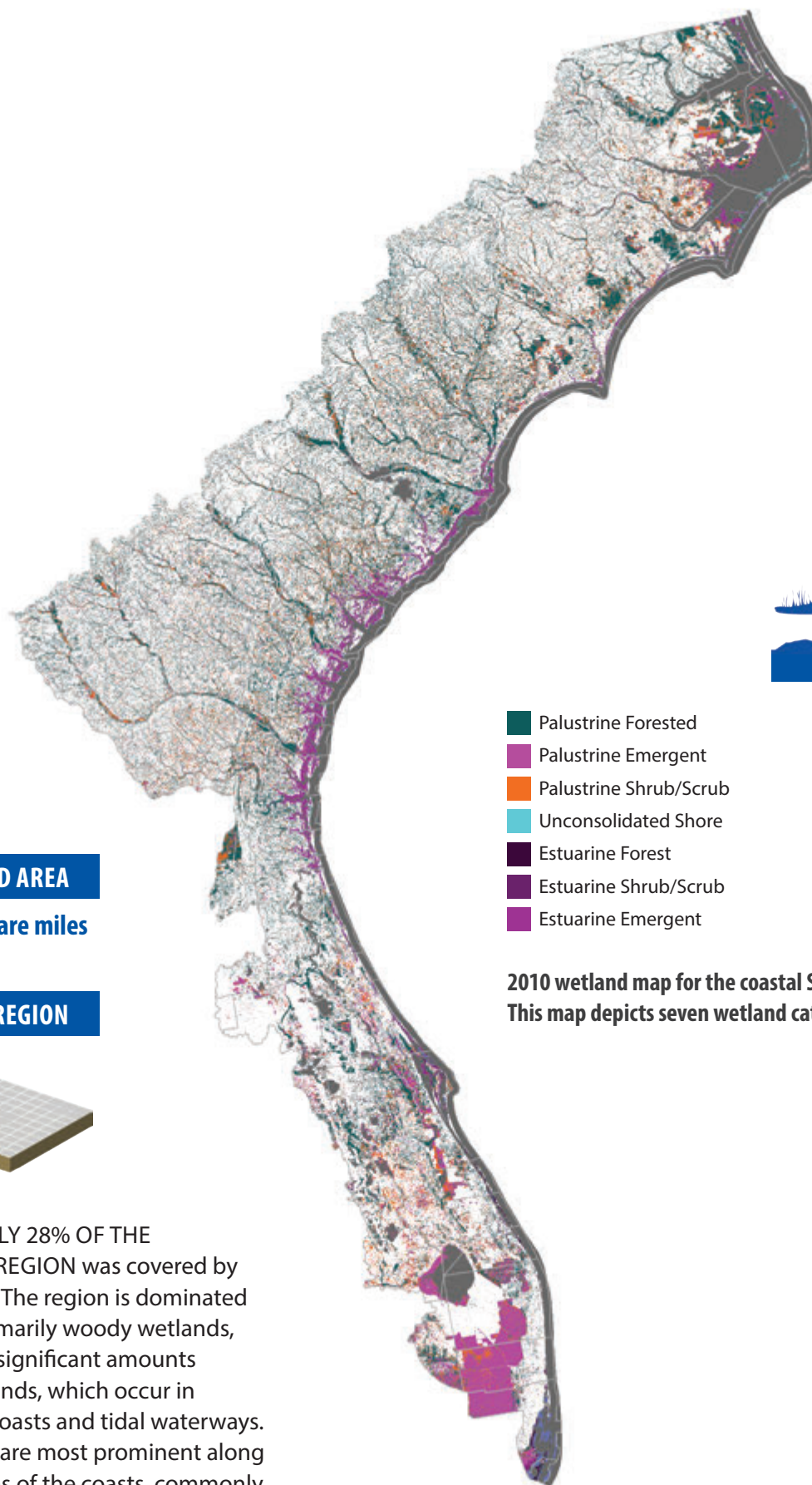
do not result in permanent loss. However, losses of forest to development are more likely to be permanent. Approximately 467 square miles of forest were lost to development during the study period, accounting for 7% of the net losses. Of these losses, 295 square miles were upland forests and the remaining 172 square miles were wetland forests.

HIGHLIGHT: EFFECTS OF PROTECTED LANDS ON FOREST LAND COVER

U.S. Fish and Wildlife Service National Wildlife Refuges and other managed lands often protect forests from timber management activities (i.e., silviculture). The Great Dismal Swamp (left) shows timber losses and significant change in forests occurring up to the boundaries of the refuge. A similar pattern can be seen in the Pocosin Lakes National Wildlife Refuge (right), but the change was caused by fire. The impacts were less severe within the refuge boundary, primarily because of a fire break and the refuge's restoration of 7,500 acres of wetlands and hydrologic function.



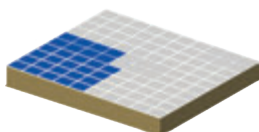
WETLAND



WETLAND AREA

27,394 square miles

28% OF REGION



- Palustrine Forested
- Palustrine Emergent
- Palustrine Shrub/Scrub
- Unconsolidated Shore
- Estuarine Forest
- Estuarine Shrub/Scrub
- Estuarine Emergent

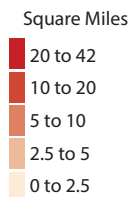
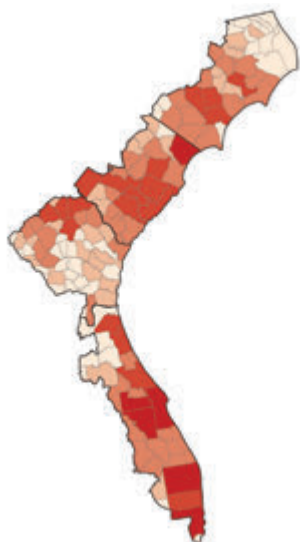
2010 wetland map for the coastal Southeast. This map depicts seven wetland categories.

APPROXIMATELY 28% OF THE SOUTHEAST REGION was covered by wetlands in 2010. The region is dominated by freshwater, primarily woody wetlands, but also includes significant amounts of estuarine wetlands, which occur in proximity to the coasts and tidal waterways. All wetland types are most prominent along the low-lying areas of the coasts, commonly referred to as the Lowcountry.



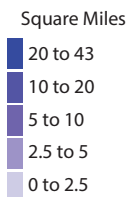
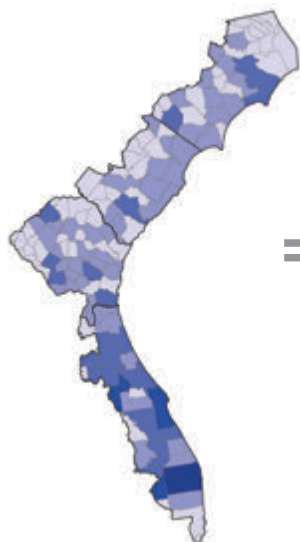
WETLAND AREA LOST

1,003 square miles

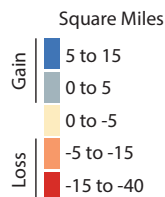
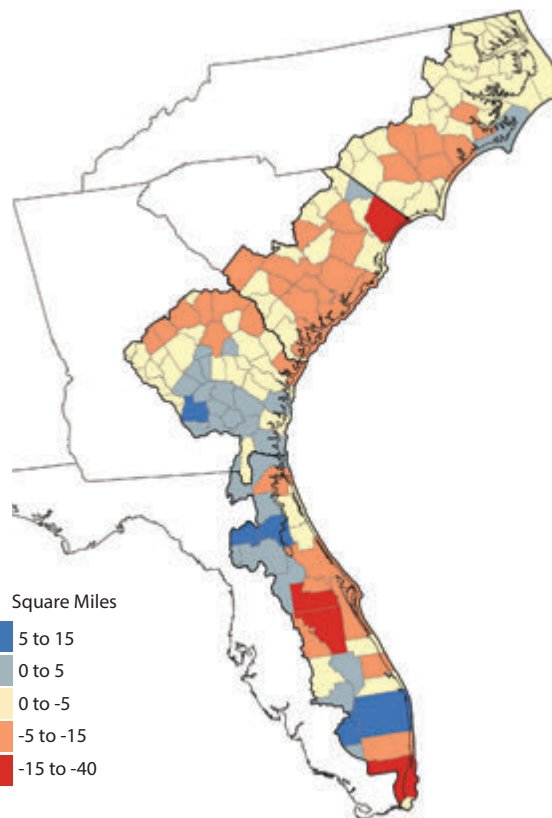


WETLAND AREA GAINED

493 square miles

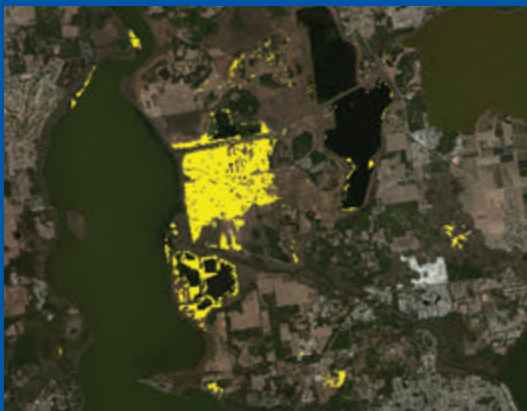
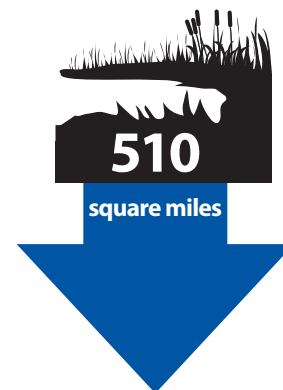


**NET CHANGE
IN WETLAND AREA**



TOTAL WETLAND AREA ACROSS THE REGION remained relatively stable from 1996 to 2010, with a loss of 1,003 square miles (above left) and a gain of 493 square miles (above center). Some areas had a net gain and others had a net loss (above right). The overall net change was a decrease of 510 square miles. This is a significant area, but it represents less than a 2% net loss of total wetlands present in 1996.

Freshwater forested wetlands such as cypress swamps and bottomland hardwoods are the most common type (58%) of wetland. Twenty-two percent of the region's wetlands are emergent wetlands, including salt marshes.

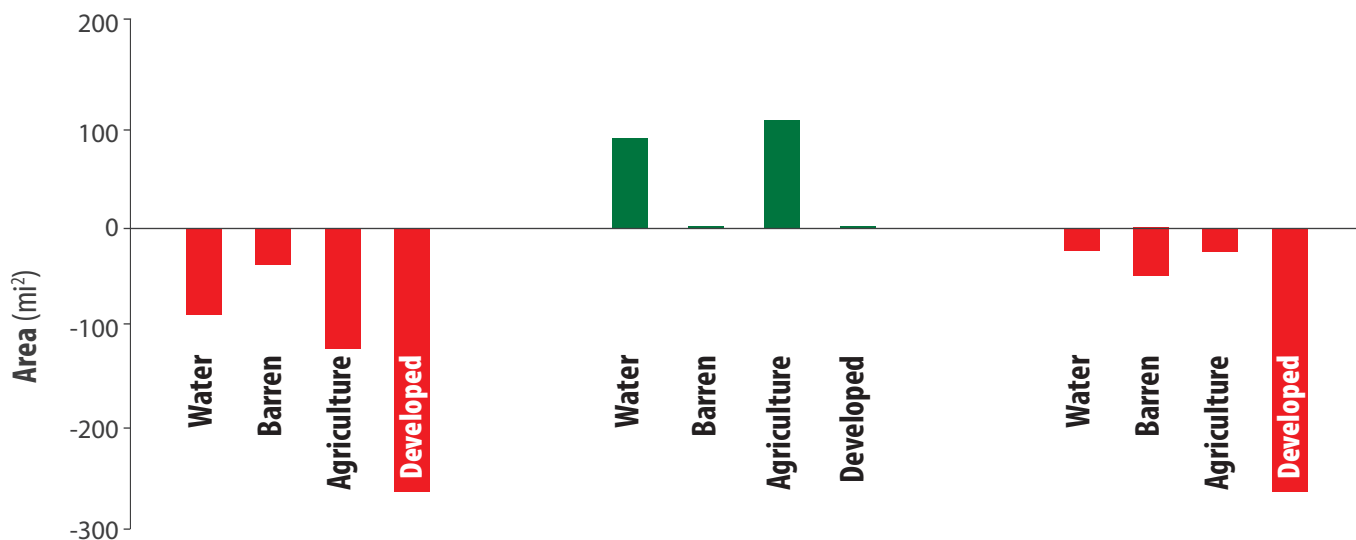


HIGHLIGHT: WETLAND CHANGES FROM HUMAN ACTIVITIES

Coastal areas are popular places to live, and account for much of the nation's population. In the Southeast, development is a major source of wetland loss. The images on the right show the appearance of a new neighborhood on the south side of Miami, Florida, on Biscayne Bay.

Another example of human influence is visible in the image on the left in the Emerald Marsh Conservation Area (Lake County, Florida). These historical wetlands were diked, drained, and converted to agriculture and pasture fields in the 1940s. The St. Johns River Water Management District purchased seven parcels between 1991 and 1993 and began restoration efforts in 1994. By 2010, the former fields had reverted primarily to wetland vegetation (yellow).

WETLAND LOST TO OTHER LAND COVER + **WETLAND GAINED FROM OTHER LAND COVER** = **NET CHANGE BETWEEN WETLAND AND OTHER LAND COVER**



These graphs show the categories of land cover that wetlands were lost to or gained from, along with the resulting net change between each of these categories and wetlands between 1996 and 2010.

WETLANDS IN THE SOUTHEAST REGION were primarily lost to development (49% of all wetlands lost), while nearly all wetlands gained came from agricultural features (57% of gains) and open water (39% of gains). The losses were most heavily concentrated in and around Orlando, Florida; in Horry County, South Carolina (home of Myrtle Beach); and outside of Miami, Florida, just north of the Florida Keys. Gains seen in the counties surrounding Gainesville and Ocala, Florida, are mostly the result of lake levels being low and the formerly submerged soils being exposed. This is also true of gains seen along the southern shore of Lake Okeechobee in Palm Beach County, though some of the gains in this area are from new water treatment facilities.

In addition to mapping areas of direct wetland loss, C-CAP also maps changes between the various types of wetlands through time. In the Southeast region, 3,096 square miles of changes to wetlands were mapped. As discussed in the forest section of the report, many of these changes were associated with timber, or silviculture, activities of forest cuts and regrowth through time. Certain areas were ditched and drained to support forestry, but these changes—perhaps from wetland to upland—are difficult to confirm without field visitations or more detailed information. While not reported here as losses, some of these changes do typically occur and could be reviewed to determine the additional amount or specific locations of losses.



