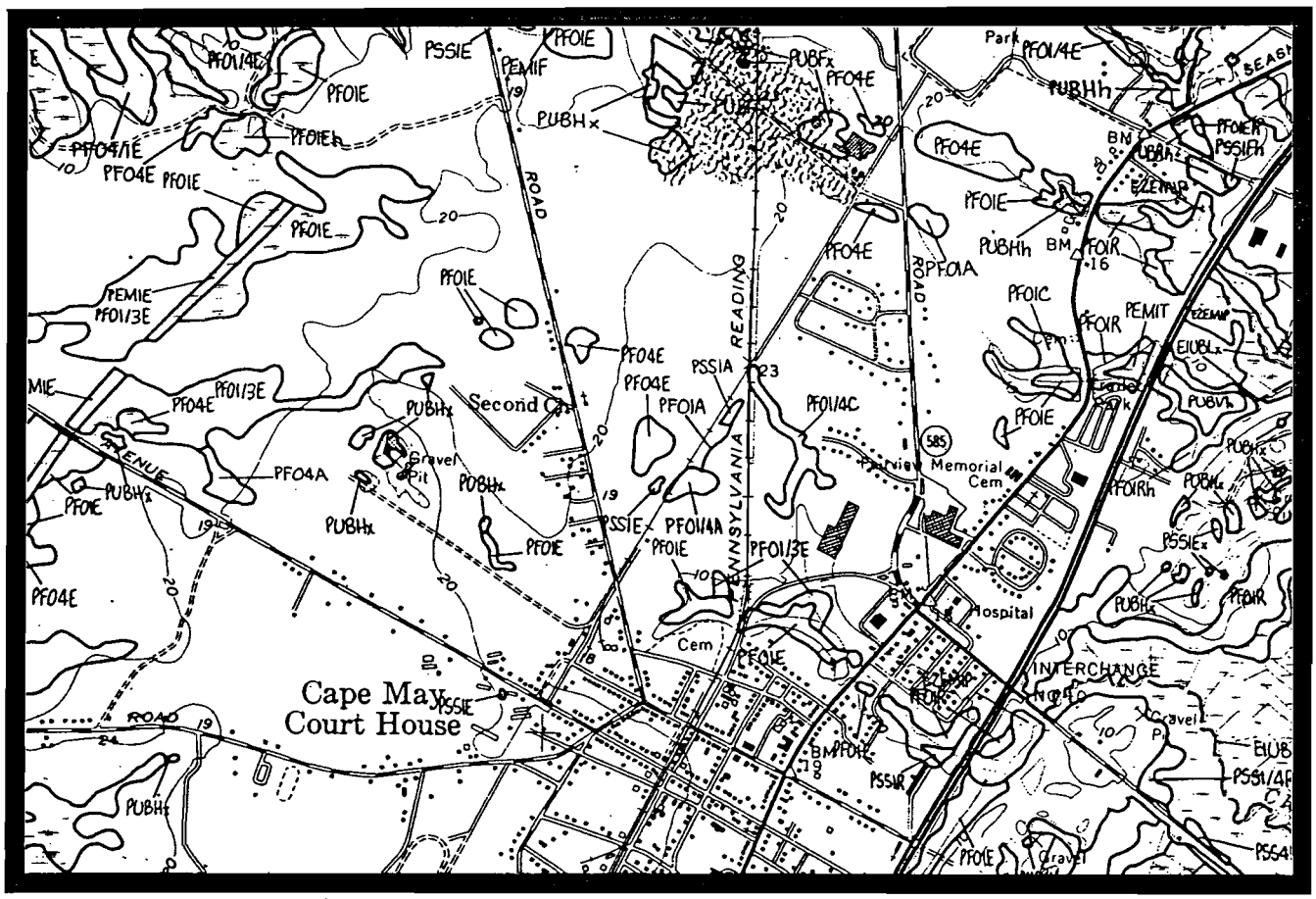
# Status and Trends of Wetlands in Cape May County, New Jersey and Vicinity (1977 to 1991)




**U.S. Department of the Interior** | **U.S. Environmental Protection Agency**

Fish and Wildlife Service | Region II

# STATUS AND TRENDS OF WETLANDS IN CAPE MAY COUNTY, NEW JERSEY AND VICINITY (1977 to 1991)

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## INTRODUCTION

Wetlands are subjected to a multitude of impacts, both natural and human-induced. Wetlands may change slowly from one type to another, e.g., emergent wetland to scrub-shrub wetland, due to natural succession or to minor filling or alteration of hydrology. Some wetlands undergo almost immediate change and/or destruction at the hands of man. Other wetlands are subject to a dynamic existence, driven by the forces of nature as in the case of coastal erosion and deposition. Most wetlands, however, change more slowly over time. Knowledge of wetland losses and gains is important for evaluating the effectiveness of government programs designed to protect them and for developing alternative strategies to reverse undesirable trends.

In 1992, EPA Region II provided funding to the U.S. Fish and Wildlife Service, Region 5 for conducting a wetland trends study in Cape May County, New Jersey. Both EPA and the Service are interested in learning how wetlands have recently changed in the county and what types of activities are responsible for these alterations. The purpose of this report is to present the findings of this study.

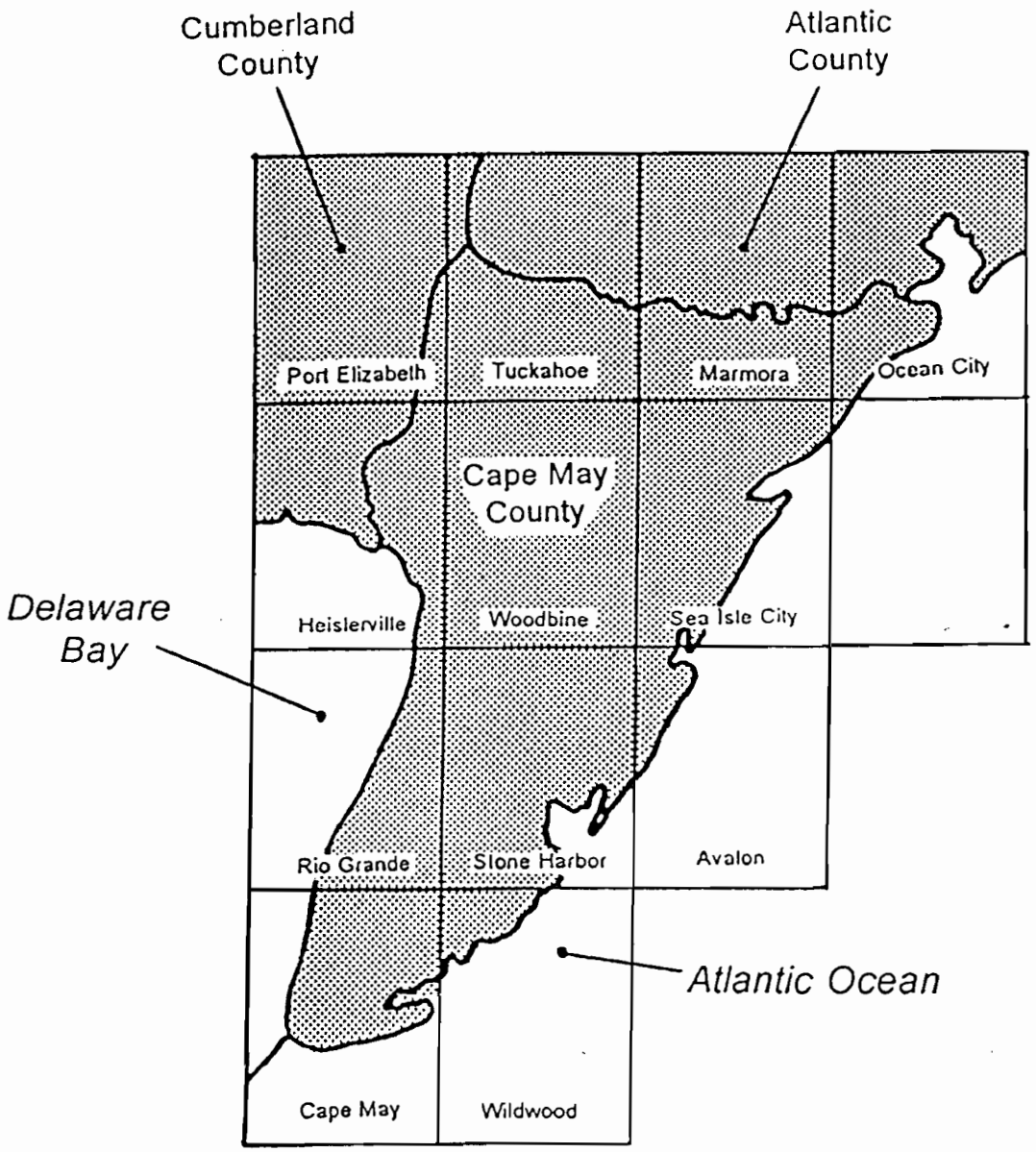
## STUDY AREA

The study area encompasses Cape May County, New Jersey and vicinity (some adjacent areas in Cumberland and Atlantic Counties; Figure 1.) The entire area lies on the Atlantic Coastal Plain. The lower portion of Cape May County forms a peninsula which is the southernmost part of the State, bordering Delaware Bay to the west and the Atlantic Ocean to the east. The study area has a land surface area of 416 square miles. It includes 13 large-scale (1:24,000) U.S. Geological Survey topographic quadrangles: Cape May, Rio Grande, Port Elizabeth, Tuckahoe, Marmora, Ocean City, Heislerville, Woodbine, Sea Isle City, Sea Isle City East, Stone Harbor, Avalon and Wildwood.

## METHODS

Wetland trends analysis involves detecting changes in the extent of wetlands by comparing aerial photography from at least two time periods for a given area. For the present study, aerial photos from three time periods (1977, 1984, and 1991) were evaluated to determine the extent of wetland changes (losses, gains, or changes in wetland type) that occurred between 1977 and 1991. During the time period, wetland regulations became increasingly significant, first in 1970 with passage of the State's coastal wetlands protection law, second in the mid-70's with increased Federal regulation through Section 404 of the Clean Water Act, and later in 1987 with passage of the State freshwater wetlands protection act.

**Figure 1.** **Location of study area : Cape May County, New Jersey and vicinity. The named rectangles represent the twelve U.S.G.S. (1:24,000) maps covering the study area.**



The original NWI maps for the study area were produced from 1977 black and white, 1:80K photography. For this project, more recent (1984, color infrared, 1:58K scale) photographs, acquired by the U.S. Geological Survey's National High-Altitude Photography Program (NHAP), were interpreted following standard NWI mapping conventions (National Wetlands Inventory, 1990). Wetlands and deepwater habitats were classified according to the Service's official wetland classification system (Cowardin, et al. 1979). A new set of draft NWI maps was initially produced from the 1:58K photos. These maps received extensive field review (see New Jersey Field Office, 1992). These draft maps were edited based on this field review, plus examination of 1991 aerial photos. These most recent photographs were 1:40,000-scale color infrared (CIR) aerial photography acquired by the National Aerial Photography Program (NAPP). With three sets of different photos, wetland trends from 1977 to 1984 and from 1984 to 1991 could be determined.

Aerial photographs from two time periods were compared using a Bausch and Lomb SIS-95 zoom stereoscope. In the first phase of the analysis, the 1977 photos were compared to the interpretations of the 1984 photos. All changes occurring during that time period were delineated on mylar overlays attached to the 1977 photographs. Causes of change were recorded for each change polygon delineated. In the next phase of the analysis, the 1984 photos were compared to the most recent 1991 photos. In addition to delineation of changes and notation of causes of change, the higher resolution of the latter photography enabled the interpreter to refine and enhance draft delineations on the 1:58K photos. These refinements and revisions were incorporated into the final map product, thereby increasing the accuracy of both delineations and classifications. The minimum mapping unit for this study was generally 1/2 acre, although changes as small as 1/5th acre were recorded. Wetland boundaries were improved and previously undetected wetlands were added to the original maps because the larger scale of the NAPP photos in combination with more apparent seasonal signs of wetland hydrology improved our ability to detect and classify wetlands. Delineated changes and map refinements were then transferred to an NWI map using an Ottico Meccanica Italiana Stereo Facet Plotter. Quality control of all photo interpretations was performed by another trained photointerpreter.

Field work was conducted to verify wetland locations of more difficult wetland types (e.g., temporarily flooded) and changes in classification in areas with questionable photographic signatures. A total of 16 weeks were spent reviewing the draft maps (see New Jersey Field Office, 1992 for specific results of this review). These results were used to improve wetland delineation for the original time period, especially for temporarily flooded, broad-leaved deciduous forested wetlands and small wetlands that had been missed during the original interpretation.

# RESULTS

## *Current Wetland Acreage*

In 1991, the study area possessed approximately 112,778 acres (or 176.2 square miles) of wetlands. This amounts to 42.4% of the area's land surface. Table 1 summarizes the acreage of the different wetland types found in the area.

Estuarine wetlands predominate, accounting for nearly 61% (68,484 acres) of the area's total wetlands (Figure 2). Estuarine emergent wetlands (salt marsh and brackish marsh) represent 99.5% (66,902 acres) of the estuarine vegetated wetlands while estuarine forested, and estuarine scrub-shrub wetlands represent 0.2% (145 acres) and 0.3% (215 acres), respectively.

Approximately 38% of the wetlands in the study area fall into the palustrine wetland category. Palustrine wetlands account for nearly 42,762 acres. Palustrine forested wetlands predominate, covering 37,575 acres which represent 91% of palustrine vegetated wetlands. Eighty-seven percent of these forested wetlands are inland or nontidal while the remaining 13% experience tidal influence. Included within the palustrine forested wetland category are over 1,181 acres of Atlantic white cedar swamp (Chamaecyparis thyoides). An additional 614 acres of Atlantic white cedar was identified as the dominant sub-canopy species in deciduous forested wetlands. The remaining 9% of palustrine vegetated wetlands are divided among palustrine scrub-shrub (6.3%) and palustrine emergent wetlands (2.8%). Roughly 39% (1,014 acres) of the scrub-shrub wetlands and 16% (193 acres) of the emergent wetlands experience tidal influence. Over 300 acres of Atlantic white cedar scrub-shrub wetland were included within the palustrine scrub-shrub category. An additional 54 acres of Atlantic white cedar mixed with deciduous shrubs were also mapped as scrub-shrub wetlands.

Deepwater habitats within the study area encompass 215,467 acres or roughly 337 square miles. Included in this category are lacustrine unconsolidated bottom habitats (permanently flooded freshwater bodies greater than 20 acres), estuarine unconsolidated bottom habitats (subtidal estuarine waters) and marine unconsolidated bottom habitats which are the subtidal waters of the Atlantic Ocean.

**Table 1. Acreage of wetland types in Cape May County and vicinity (1991).**

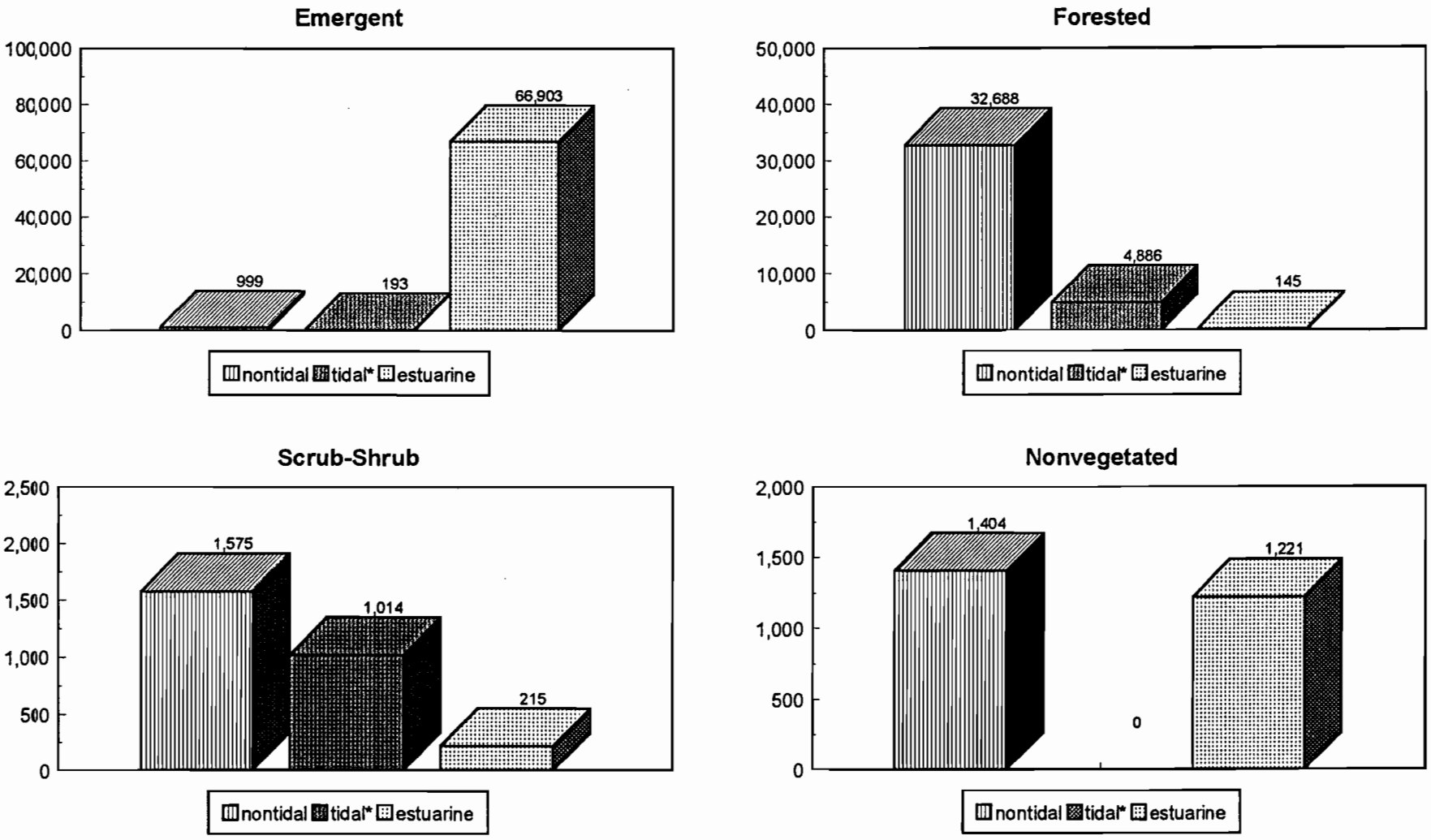
| Wetland Types | Acres |
|---|---|
| PALUSTRINE WETLANDS | |
| Tidal Emergent | |
| Regularly Flooded | 43.0 |
| Temporarily Flooded-Tidal | 0.6 |
| Seasonally Flooded-Tidal | 118.5 |
| Semipermanently Flooded-Tidal | 30.9 |
| (Subtotal Tidal) | (193.0) |
| Nontidal Emergent | |
| Seasonally Flooded | 51.0 |
| Seasonally Flooded/Saturated | 601.1 |
| Semipermanently Flooded | 346.2 |
| Permanently Flooded | 0.5 |
| (Subtotal Nontidal) | (998.8) |
| **Total Palustrine Emergent Wetlands** | **1,191.8** |
| Tidal Forested | |
| *Deciduous* | |
| Seasonally Flooded-Tidal | 3,667.3 |
| Temporarily Flooded-Tidal | 522.9 |
| *Evergreen* | |
| Seasonally Flooded-Tidal | 332.1 |
| Temporarily Flooded-Tidal | 19.1 |
| Dead | 19.3 |
| (Subtotal Tidal) | (4,560.7) |
| Nontidal Forested | |
| *Deciduous* | |
| Temporarily Flooded | 1,168.5 |
| Seasonally Flooded | 3,129.4 |
| Seasonally Flooded/Saturated | 21,164.2 |
| Semipermanently Flooded | 21.0 |
| Saturated | 35.4 |

| | |
|---|---|
| *Evergreen* | |
| Temporarily Flooded | 1,110.1 |
| Seasonally Flooded | 1,275.8 |
| Seasonally Flooded/Saturated | 2,965.6 |
| Saturated | 10.6 |
| Dead | 13.0 |
| (Subtotal Nontidal) | (30,893.5) |
| Mixed Deciduous/Atlantic White Cedar (Forested) | |
| Tidal | |
| Seasonally Flooded-Tidal | (9.5) |
| Nontidal | |
| Saturated | 26.9 |
| Seasonally Flooded/Saturated | 587.3 |
| (Subtotal Mixed Deciduous) | (614.1) |
| Evergreen - Atlantic White Cedar (Forested) | |
| Tidal | |
| Seasonally Flooded-Tidal | (316.2) |
| Nontidal | |
| Temporarily Flooded | 7.2 |
| Seasonally Flooded | 10.9 |
| Seasonally Flooded/Saturated | 1,163.3 |
| (Subtotal Evergreen) | (1,181.4) |
| **Total Palustrine Forested Wetlands** | **37,575.3** |
| Tidal Scrub-Shrub | |
| *Deciduous* | |
| Seasonally Flooded-Tidal | 640.4 |
| Semipermanently Flooded-Tidal | 9.8 |
| *Evergreen* | |
| Seasonally Flooded-Tidal | 217.5 |
| (Subtotal Tidal) | (867.7) |
| Nontidal Scrub-Shrub | |
| *Deciduous* | |
| Temporarily Flooded | 40.1 |
| Seasonally Flooded | 65.0 |
| Seasonally Flooded/Saturated | 927.8 |
| Semipermanently Flooded | 68.6 |

| | |
|---|---|
| *Evergreen* | |
| Saturated | 2.0 |
| Seasonally Flooded/Saturated | 251.1 |
| (Subtotal Nontidal) | (1,354.6) |
| Mixed Deciduous/Atlantic White Cedar (Scrub-Shrub) | |
| Tidal | |
| Seasonally Flooded-Tidal | 21.4 |
| Nontidal | |
| Seasonally Flooded/Saturated | 32.8 |
| (Subtotal Mixed Deciduous) | (54.3) |
| Evergreen - Atlantic White Cedar (Scrub-Shrub) | |
| Tidal | |
| Seasonally Flooded-Tidal | 125.0 |
| Nontidal | |
| Seasonally Flooded/Saturated | 186.6 |
| (Subtotal Evergreen) | (311.6) |
| **Total Palustrine Scrub-Shrub Wetlands** | **2,588.2** |
| Aquatic Beds | 3.1 |
| *Total Palustrine Vegetated Wetlands* | *41,358.4* |
| Unconsolidated Bottom (Ponds) | 1,376.7 |
| Unconsolidated Shores | 26.8 |
| *Total Palustrine Nonvegetated Wetlands* | *1,403.5* |
| **GRAND TOTAL PALUSTRINE WETLANDS** | **42,761.9** |
| ESTUARINE WETLANDS | |
| Emergent | |
| Irregularly Exposed | 1,806.5 |
| Regularly Flooded | 1,697.6 |
| Irregularly Flooded | 66,398.3 |
| **Total Estuarine Emergent Wetlands** | **66,902.4** |

| | |
|---|---|
| Forested | |
| *Deciduous* | |
| Irregularly Flooded | 9.2 |
| *Evergreen* | |
| Irregularly Flooded | 123.9 |
| *Dead* | 12.0 |
| **Total Estuarine Forested Wetlands** | **145.1** |
| Scrub-Shrub | |
| *Deciduous* | |
| Irregularly Flooded | 148.6 |
| *Evergreen* | |
| Irregularly Flooded | 66.7 |
| **Total Estuarine Scrub-Shrub Wetlands** | **215.3** |
| *Total Estuarine Vegetated Wetlands* | *67,262.0* |
| *Total Estuarine Unconsolidated Shore* | *1,220.6* |
| **GRAND TOTAL ESTUARINE WETLANDS** | **68,483.5** |
| LACUSTRINE WETLANDS | |
| Unconsolidated Shore | 58.0 |
| **GRAND TOTAL LACUSTRINE WETLANDS** | **58.0** |
| MARINE WETLANDS | |
| Unconsolidated Shore | 1,474.9 |
| **GRAND TOTAL MARINE WETLANDS** | **1,474.9** |
| **TOTAL WETLANDS** | **112,778.2** |

# Figure 2. Acreage of wetland types in Cape May County and vicinity - 1991.




**Freshwater areas that are subject to freshwater tidal influence.*

## *Wetland Trends: 1977 to 1984*

The results of the wetland trends analysis study for the Cape May County area for this period are presented in Tables 2 through 7 and Figure 3. The following discussion highlights the more significant or interesting findings from 1977 to 1984.

### *Vegetated Wetlands*

In 1977, the study area possessed approximately 112,988 acres of wetland including 109,257 acres of vegetated wetland (Table 2). During the seven-year period between 1977 and 1984, there were over 350 changes affecting over 1,358 acres or 1.2% of the wetlands in the study area, including the loss* of over 257 acres or vegetated wetlands. Over 38% of all changes to wetlands and deepwater habitats were caused by coastal erosion and deposition along the marine and estuarine shorelines (Table 3).

Estuarine emergent marshes were the most adversely impacted wetland type overall, with over 147 acres lost (Tables 3, 4 and 5; Figure 3). Nearly 60% (87.8 acres) of these losses were due to dredge spoil deposition within the estuarine marshes, while the coastal deposition process converted over 13% (19.3 acres) to upland. Housing development and commercial development destroyed* 6.6% (9.7 acres) and 1.6% (2.3 acres) respectively, while 19.2% (28.3 acres) was lost to unknown activities. The "unknown" cause category is used to identify changes in two situations: (1) where the ongoing activity causing the change is not apparent, and (2) where the final use of the area or structures built are not identifiable through photointerpretation. In addition to these losses, another 73.3 acres of estuarine vegetated wetland was converted to nonvegetated wetlands and deepwater habitats.

Unknown activities were responsible for the loss of 22% of vegetated wetland loss including the destruction of over 28 acres of estuarine marsh, 12.6 acres of palustrine emergent, 5.5 acres of palustrine scrub-shrub wetland and 4.5 acres of palustrine forested wetland. Coastal erosion was also the chief cause of conversion of 48.1 acres of estuarine vegetated wetlands to deepwater habitats.

Trailer park developments, commercial developments and construction of federal facilities caused destruction of over 40 acres of palustrine scrub-shrub wetlands with losses of 11 acres, 20 acres and 9 acres, respectively. Unknown activities were responsible for the loss of 12.6 acres of palustrine emergent wetland, 5.5 acres of

*For the purposes of this report, the terms "loss" or "destroyed" refer to conversion of wetland to upland.

**Table 2. Total wetland acreage by type (1977).**

| Wetland Type | Acreage |
|---|---|
| Palustrine Emergent | 1,197.2 |
| Palustrine Forested | 37,829.2 |
| Palustrine Scrub-Shrub | 2,659.8 |
| Palustrine Aquatic Bed | 3.1 |
| Palustrine Unconsolidated Bottom (Pond) | 1,031.2 |
| Palustrine Unconsolidated Shore (Pond Shore) | 19.7 |
| Estuarine Emergent | 67,199.9 |
| Estuarine Forested | 145.1 |
| Estuarine Scrub-Shrub | 222.5 |
| Estuarine Unconsolidated Shore | 1,086.6 |
| Marine Unconsolidated Shore | 1,594.1 |
| **Total** | **112,988.4** |

**Table 3. Changes due to coastal erosion and deposition in Cape May County and vicinity (1977 to 1984).**

| To / From | E1UB | E2US | M1UB | M2US | Upland | TOTAL |
|---|---|---|---|---|---|---|
| E1UB | - | 2.5 | - | 3.2 | - | 5.7 |
| E2EM | 1.4 | - | 46.7 | 17.8 | 19.3 | 85.2 |
| E2US | 15.9 | - | - | - | 7.8 | 23.7 |
| M1UB | - | 9.3 | - | 54.5 | 20.4 | 84.2 |
| M2US | 7.0 | 1.0 | 233.4 | 33.0 | 19.3 | 293.7 |
| PSS | - | - | 3.4 | 3.4 | 1.1 | 7.9 |
| Upland | 1.3 | - | 17.1 | 4.2 | - | 22.6 |
| TOTAL | 25.6 | 12.8 | 300.6 | 116.1 | 67.9 | 523.0 |

**Table 4. Changes of vegetated wetlands in Cape May County and vicinity (1977 to 1984).**

| Wetland Type | Converted To Uplands (acres) | Changed to Other Vegetated Wetlands* (acres) | Changed to Nonvegetated Wetlands (acres) | Converted to Deepwater Habitats (acres) |
|---|---|---|---|---|
| Palustrine Emergent | 13.7 | 0.0 | 5.0 | 0.0 |
| Palustrine Scrub-Shrub | 51.4 | 3.0 | 13.4 | 3.0 |
| Palustrine Forested | 40.0 | 13.6 | 5.4 | 0.0 |
| Estuarine Emergent | 147.4 | 0.0 | 19.3 | 53.1 |
| Estuarine Scrub-Shrub | 5.0 | 0.0 | 0.0 | 0.0 |
| Total | 257.4 | 16.6 | 43.1 | 56.1 |

*Represents changes in class (e.g., emergent to scrub-shrub) but not changes in water regime within a given wetland class.

palustrine scrub wetland and 4.5 acres of palustrine forested wetland. Housing developments caused the loss of nearly 29 acres of palustrine forested wetland, while road construction was responsible for another 5.6 acre loss of palustrine forested wetlands. In addition to actual losses of vegetated wetland types, agricultural and unknown activities converted nearly 17 acres of palustrine scrub-shrub and forested wetlands to other vegetated wetland types (Table 4). Just under 24 acres of palustrine emergent, scrub-shrub and forested wetlands were converted to nonvegetated wetlands by pond construction, man induced successional changes and unknown actions. Coastal erosion converted over 3 acres of palustrine scrub-shrub wetlands into deepwater habitats.

During this period from 1977 to 1984, there were small gains in palustrine vegetated wetlands. Palustrine scrub-shrub acreage increased by nearly 24 acres due to unknown causes and revegetation in sand and gravel excavations.

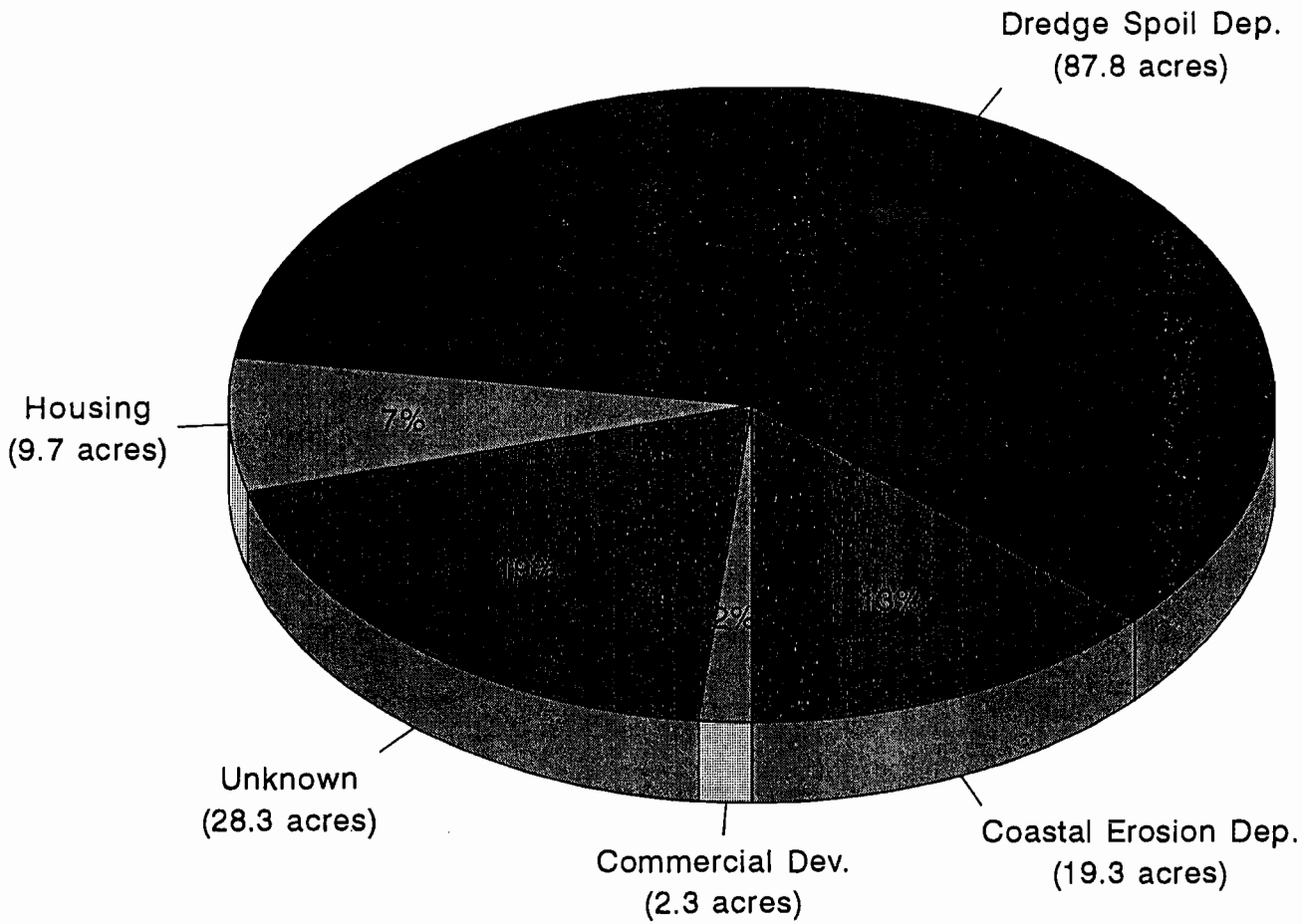
*Nonvegetated Wetlands*

Palustrine nonvegetated wetlands increased by nearly 400 acres due to the creation of ponds (Table 6). Ninety-five percent of these ponds were created in uplands largely due to excavations related to sand and gravel pit operations. Man-induced successional changes, pond construction and unknown activities created the additional 5% of the new ponds by conversion of existing vegetated wetlands. Sand and gravel pit excavations created approximately 117 acres of new deepwater habitat during the seven-year period (Tables 7 and 8).

**Table 5. Causes of vegetated wetland conversion (loss) to upland in Cape May County and vicinity (1977 to 1984).**

| Wetland Type | Acreage of Loss | Number of areas affected | Cause of Loss |
|---|---|---|---|
| Palustrine Emergent | 12.6 | 4 | unknown |
| | 1.1 | 1 | pond construction |
| Palustrine Scrub-Shrub | 20.0 | 1 | commercial development |
| | 11.0 | 1 | trailer park development |
| | 9.4 | 2 | federal property |
| | 5.5 | 1 | unknown |
| | 5.5 | 1 | coastal deposition |
| Palustrine Forested | 28.6 | 5 | housing development |
| | 5.6 | 4 | road construction |
| | 4.5 | 2 | unknown |
| | 0.5 | 1 | commercial development |
| | 0.8 | 1 | sand and gravel pits |
| Estuarine Emergent | 87.8 | 9 | dredge spoil deposition |
| | 28.3 | 9 | unknown |
| | 19.3 | 1 | coastal deposition |
| | 9.7 | 2 | housing development |
| | 2.3 | 2 | commercial development |
| Estuarine Scrub-Shrub | 4.9 | 4 | housing development |

# Figure 3. Causes of loss in estuarine emergent wetlands* in Cape May County and vicinity (1977 to 1984).




* All estuarine emergent wetlands lost were irregularly flooded.
** Percentages are rounded off.

**Table 6. Changes in palustrine nonvegetated wetlands in Cape May County and vicinity (1977 to 1984).**

| Wetland Type | Created from Uplands (acres) | Created in Vegetated Wetlands(acres) | Converted to Uplands (acres) |
|---|---|---|---|
| Palustrine Unconsolidated Bottom | 362.1 | 20.5 | 11.2 |
| Palustrine Unconsolidated Shore | 17.2 | 0.0 | 0.0 |
| Total | 379.3 | 20.5 | 11.2 |

**Table 7. Changes in wetlands and deepwater habitats due to sand and gravel pit operations in Cape May County and vicinity (1977 to 1984).**

| Habitat Type | Converted to Uplands (acres lost) | Converted from Uplands (acres gained) |
|---|---|---|
| Lacustrine Unconsolidated Bottom | 10.9 | 116.6 |
| Palustrine Unconsolidated Bottom | 3.9 | 294.2 |
| Palustrine Unconsolidated Shore | 0.0 | 17.2 |
| Palustrine Emergent | 0.0 | 0.3 |
| Palustrine Scrub-Shrub | 0.0 | 3.0 |
| Total | 14.8 | 431.3 |

## *Wetland Trends: 1984 to 1991*

The results of the wetland trend analysis from 1984 to 1991 are presented in Tables 8 to 12 and Figures 4 and 5. The more significant or interesting findings are discussed below.

### *Vegetated Wetlands*

In 1984 the study area possessed 112,865 acres of wetlands including 108,933 acres of vegetated wetlands (Table 8). During the seven year period between 1984 and 1991, the study area experienced over 600 changes affecting more than 1,540 acres of wetlands and deepwater habitats, including the loss of over 238 acres of vegetated wetlands (Table 9; Figure 4). Eighty-one percent (1,242 acres) of all changes were caused by three types of activities. Sand and gravel pit operations, coastal erosion and deposition, and housing developments accounted for 627 acres, 510 acres and 105 acres of change, respectively.

Palustrine forested wetlands suffered the greatest impacts of any wetland type, representing 53% of all losses from vegetated wetlands during this time period (Figure 5; Tables 9, 10 and 11). Housing development alone was responsible for 50% (62.9 acres) of the forested wetland loss (Table 9). Sand and gravel pit operations in combination with commercial development were responsible for 24% (30.6 acres) of the forested wetland loss. The other major contributors to forested wetland loss were trailer park development (6.5%), agriculture (5.4%), recreational facility development (4%) and road/highway construction (3.7%).

It is interesting to note that 64% of these overall losses and 63% of forested wetland changes occurred in areas classified as seasonally flooded/saturated which is the "wettest" forested wetland type in the project area (Table 10). In addition to actual loss of forested wetland types, there were nearly 70 acres which were converted to other vegetated wetland types, nonvegetated wetlands and deepwater habitats (Table 11). Sixty-three percent of these changes were caused by sand and gravel pit operations. Another 19% was caused by timber harvests and unknown actions.

Palustrine scrub-shrub wetlands were the next most highly impacted wetland type during this time period. Just under 42 acres of these wetlands were lost. Housing construction was the leading cause of destruction and was responsible for 24% (10.1 acres) of the palustrine scrub-shrub loss. Other major contributors to wetland loss in this category were agriculture at 21% (8.9 acres), commercial development at 17% (7.3 acres), unknown causes at 13% (5.5 acres) and road construction at 8%. Palustrine emergent wetlands lost over 33 acres, 25.4 acres or 76% of which was due to housing construction. Recreational development destroyed another 17% (5.8 acres).

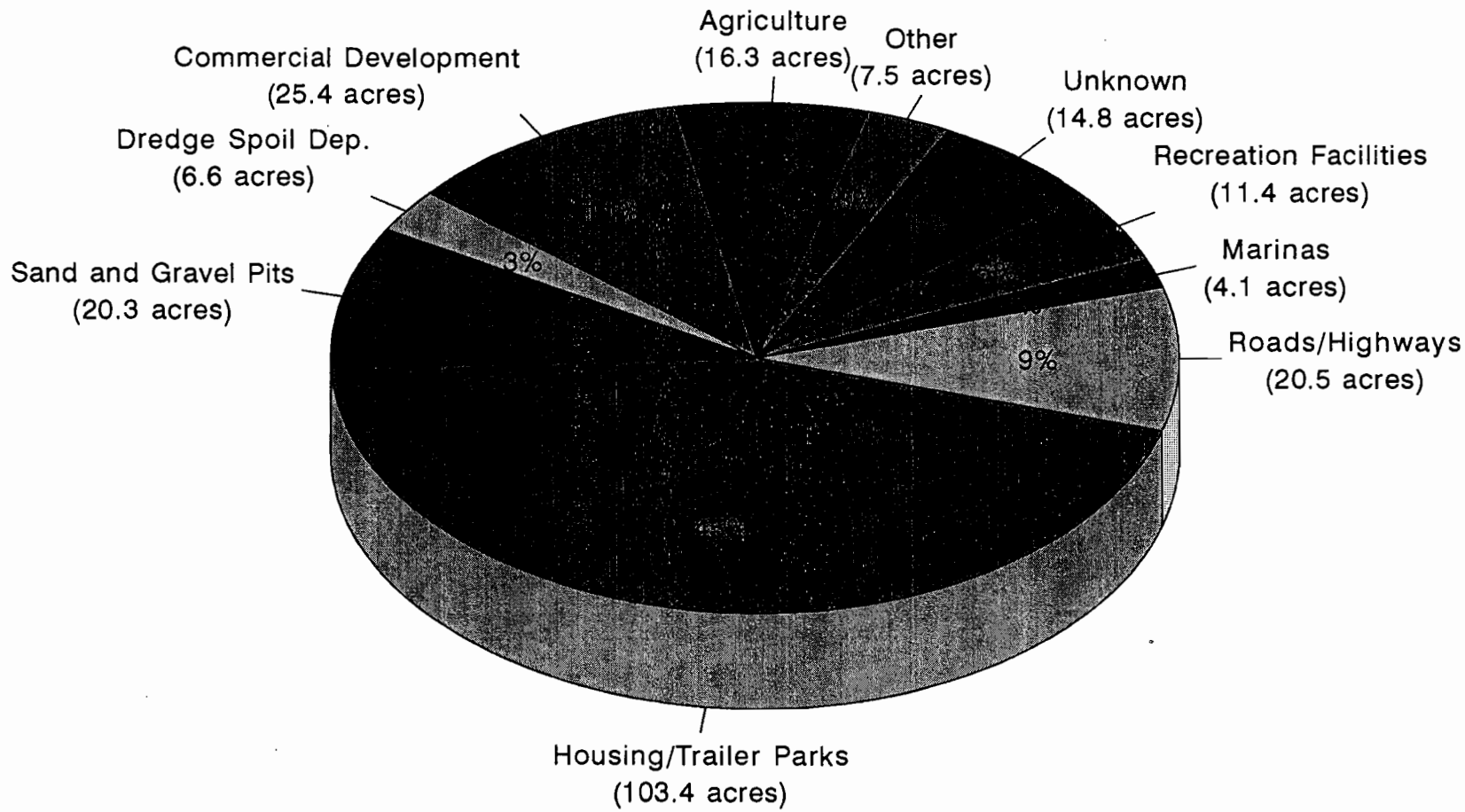
**Table 8. Total wetland acreage by type (1984).**

| Wetland Type | Acreage |
|---|---|
| Palustrine Emergent | 1,187.3 |
| Palustrine Forested | 37,772.4 |
| Palustrine Scrub-Shrub | 2,625.8 |
| Palustrine Aquatic Bed | 3.1 |
| Palustrine Unconsolidated Bottom (Pond) | 1,404.1 |
| Palustrine Unconsolidated Shore (Pond Shore) | 40.0 |
| Estuarine Emergent | 66,981.9 |
| Estuarine Forested | 145.1 |
| Estuarine Scrub-Shrub | 217.5 |
| Estuarine Unconsolidated Shore | 1,075.7 |
| Marine Unconsolidated Shore | 1,412.2 |
| **Total** | **112,865.1** |

**Table 9. Causes of vegetated wetland conversion (loss) to upland in Cape May County and vicinity (1984 to 1991).**

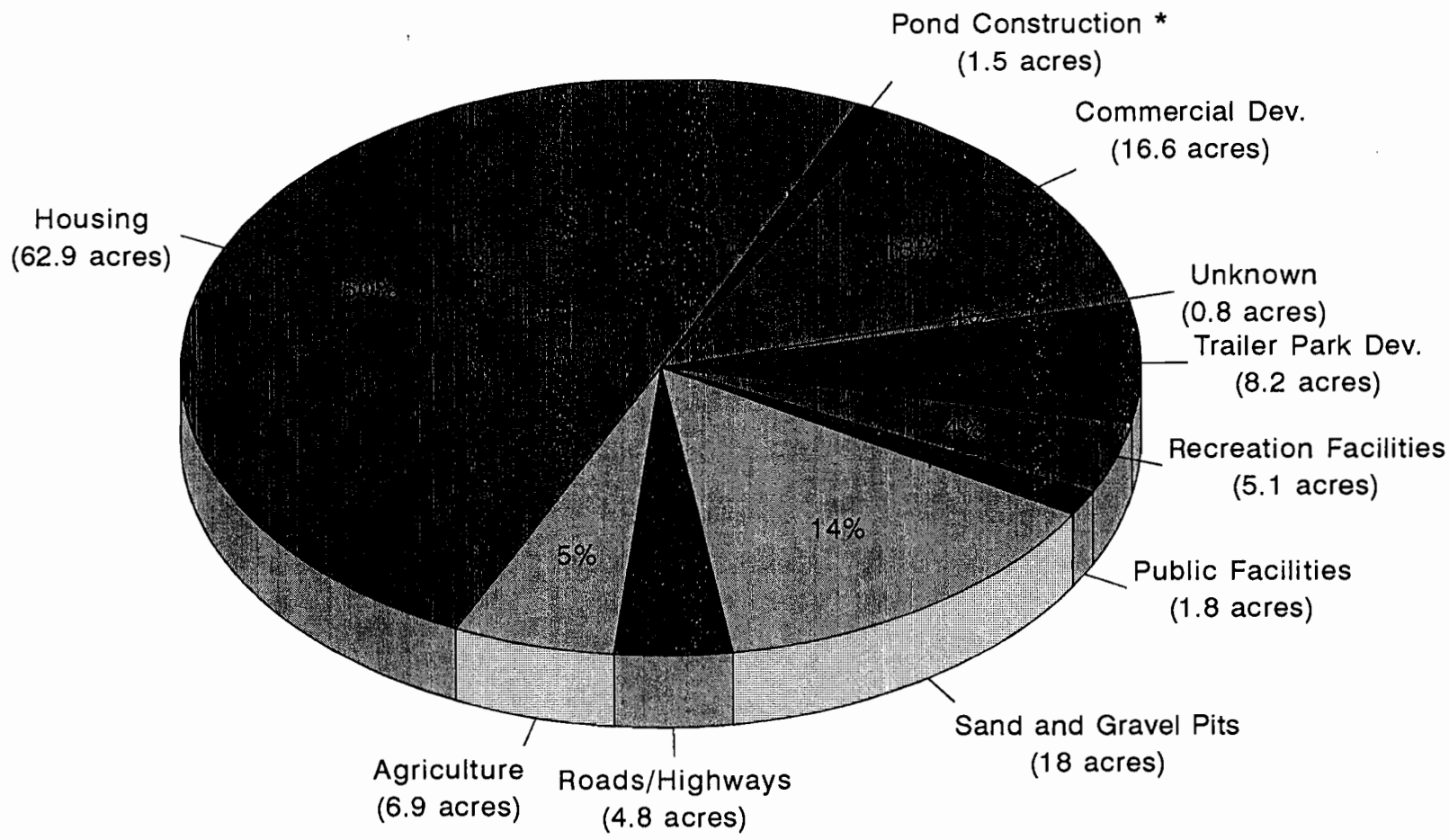
| Wetland Type | Acreage of Loss | Number of areas affected | Cause of Loss |
|---|---|---|---|
| Palustrine Emergent | 25.4 | 10 | housing development |
| | 5.8 | 3 | recreation facilities |
| | 1.0 | 1 | public facilities |
| | 0.5 | 1 | agriculture |
| | 0.3 | 1 | coastal deposition |
| | 0.3 | 1 | sand and gravel pits |
| Palustrine Scrub-Shrub | 10.1 | 6 | housing development |
| | 8.9 | 2 | agriculture |
| | 7.3 | 5 | commercial development |
| | 5.5 | 1 | unknown |
| | 3.4 | 3 | road construction |
| | 2.0 | 3 | sand and gravel pits |
| | 1.5 | 1 | coastal deposition |
| | 1.5 | 1 | junk yard |
| | 1.1 | 1 | public facility |
| | 0.4 | 1 | man-induced successional change |
| Palustrine Forested | 62.8 | 60 | housing development |
| | 18.1 | 16 | sand and gravel pits |
| | 12.5 | 10 | commercial development |
| | 8.2 | 3 | trailer park development |
| | 6.9 | 8 | agriculture |
| | 5.1 | 2 | recreation facilities |
| | 4.7 | 8 | road construction |
| | 4.1 | 2 | commercial business |
| | 1.4 | 2 | public facilities |
| | 1.2 | 1 | detention basin |
| | 0.7 | 2 | unknown |
| | 0.4 | 1 | public sewage |
| | 0.2 | 1 | pond construction |
| | 0.1 | 1 | highway construction |
| Estuarine Emergent | 12.3 | 2 | highway construction |
| | 8.5 | 6 | unknown |
| | 6.6 | 1 | dredge spoil deposition |
| | 4.1 | 2 | marina development |
| | 2.7 | 3 | housing development |
| | 0.5 | 1 | recreation facilities |
| Estuarine Scrub-Shrub | 2.3 | 6 | housing development |

# Figure 4. Causes of vegetated wetland conversion (loss) to upland in Cape May County and vicinity (1984 to 1991).




* Percentages are rounded off.

# Figure 5. Causes of loss in palustrine forested wetlands in Cape May County and vicinity (1984 to 1991).




* Includes detention basins.

** Percentages are rounded off.

**Table 10. Causes of loss and changes in type in palustrine forested wetlands by water regime in Cape May County and vicinity (1984 to 1991).**

| Palustrine Forested Type | Acreage Converted | Cause of Loss or Change |
|---|---|---|
| Temporarily Flooded | 2.2 | Commercial Development |
| | 4.2 | Housing Development |
| | 1.2 | Changed to Other Wetland Types |
| Seasonally Flooded | 3.4 | Agriculture |
| | 3.1 | Commercial Development |
| | 1.2 | Detention Basins |
| | 0.8 | Sand and Gravel Pits |
| | 2.3 | Housing Development |
| | 0.3 | Unknown |
| | 12.7 | Changed to Other Wetland Types |
| Seasonally Flooded/Saturated | 3.0 | Agriculture |
| | 9.3 | Commercial Development |
| | 17.3 | Sand and Gravel Pits |
| | 38.4 | Housing Development |
| | 4.8 | Road/Highway Construction |
| | 0.3 | Pond Construction |
| | 0.7 | Public Facilities |
| | 5.1 | Recreation Facilities |
| | 1.1 | Trailer Park Development |
| | 0.5 | Unknown |
| | 28.7 | Changed to Other Wetland Types |
| Temporarily Flooded-Tidal | 0.5 | Agriculture |
| | 1.5 | Housing Development |
| | 7.1 | Trailer Park Development |
| | 0.6 | Changed to Other Wetland Types |
| Seasonally Flooded-Tidal | 2.0 | Commercial Development |
| | 16.6 | Housing Development |
| | 1.1 | Public Facilities |
| | 2.1 | Changed to Other Wetland Types |
| Total | 172.1 | |

**Table 11. Changes of vegetated wetlands in Cape May County and vicinity (1984 to 1991).**

| Wetland Type | Converted To Uplands (acres) | Changed to Other Vegetated Wetlands* (acres) | Changed to Nonvegetated Wetlands (acres) | Converted to Deepwater Habitats (acres) |
|---|---|---|---|---|
| Palustrine Emergent | 33.4 | 0.0 | 0.0 | 0.0 |
| Palustrine Scrub-Shrub | 41.7 | 0.8 | 3.6 | 0.0 |
| Palustrine Forested | 126.5 | 31.2 | 13.5 | 25.1 |
| Estuarine Emergent | 34.7 | 0.2 | 14.0 | 58.8 |
| Estuarine Scrub-Shrub | 2.3 | 0.0 | 0.0 | 0.0 |
| Total | 238.5 | 32.2 | 31.1 | 83.9 |

*Represents changes in class (e.g., emergent to scrub-shrub) but not changes in water regime within a given class.

Estuarine emergent wetlands, although not as heavily impacted during this current time period still experienced significant changes. Nearly 35 acres of estuarine marsh were lost while 73 acres were converted to other vegetated wetland types, nonvegetated wetlands and deepwater habitats. Highway construction was the leading cause of loss at 35% (12.3 acres), followed by unknown causes at 25% (2.5 acres), dredge spoil deposition at 19% (6.6 acres), marina development at 12% (4.1 acres), and housing construction at 8% (2.7 acres). Coastal erosion and deposition was responsible for conversion of 14 acres of estuarine marsh to nonvegetated wetland and 28.5 acres converted to deepwater habitat. Excavation of ditches and channels within the marsh converted approximately 30 acres to deepwater habitats. Estuarine scrub-shrub wetlands lost 2.3 acres of wetland to housing development.

Coastal erosion and deposition affected over 32 acres of estuarine unconsolidated shore. The effects of this coastal process fostered conversion of nearly 16 acres of estuarine unconsolidated shore to estuarine emergent marsh. Less than 2 acres of palustrine emergent wetland was created as a result of revegetation of a flooded sand and gravel excavation.

*Nonvegetated Wetlands*

Nonvegetated wetlands experienced both losses and gains in acreage during this time period (Table 12). Palustrine unconsolidated bottom wetlands (ponds) gained over 128 acres due to sand and gravel pit operations while nearly 114 acres of ponds were destroyed by the same types of operations. Excavated ponds in active sand and gravel operations appear to be ephemeral features.

**Table 12. Gains, losses and changes in nonvegetated wetlands in Cape May County and vicinity (1984 to 1991).**

| | GAINS | | LOSSES | | |
|---|---|---|---|---|---|
| Wetland Type | Created From Uplands (acres) | Created In Vegetated Wetlands (acres) | Converted to Uplands (acres) | Changed to Vegetated Wetlands (acres) | Changed to Other Nonvegetated Wetlands (acres) |
| Palustrine Unconsolidated Bottom | 190.7 | 17.1 | 160.6 | 12.3 | 1.5 |
| Palustrine Unconsolidated Shore | 3.3 | 0.0 | 14.9 | 0.0 | 0.0 |
| Estuarine Unconsolidated Shore | 16.3 | 14.0 | 0.0 | 15.9 | 0.0 |
| Marine Unconsolidated Shore | 0.0 | 0.0 | 1.2 | 0.0 | 1.7 |
| Total | 210.3 | 31.1 | 176.7 | 28.2 | 3.2 |

## SUMMARY

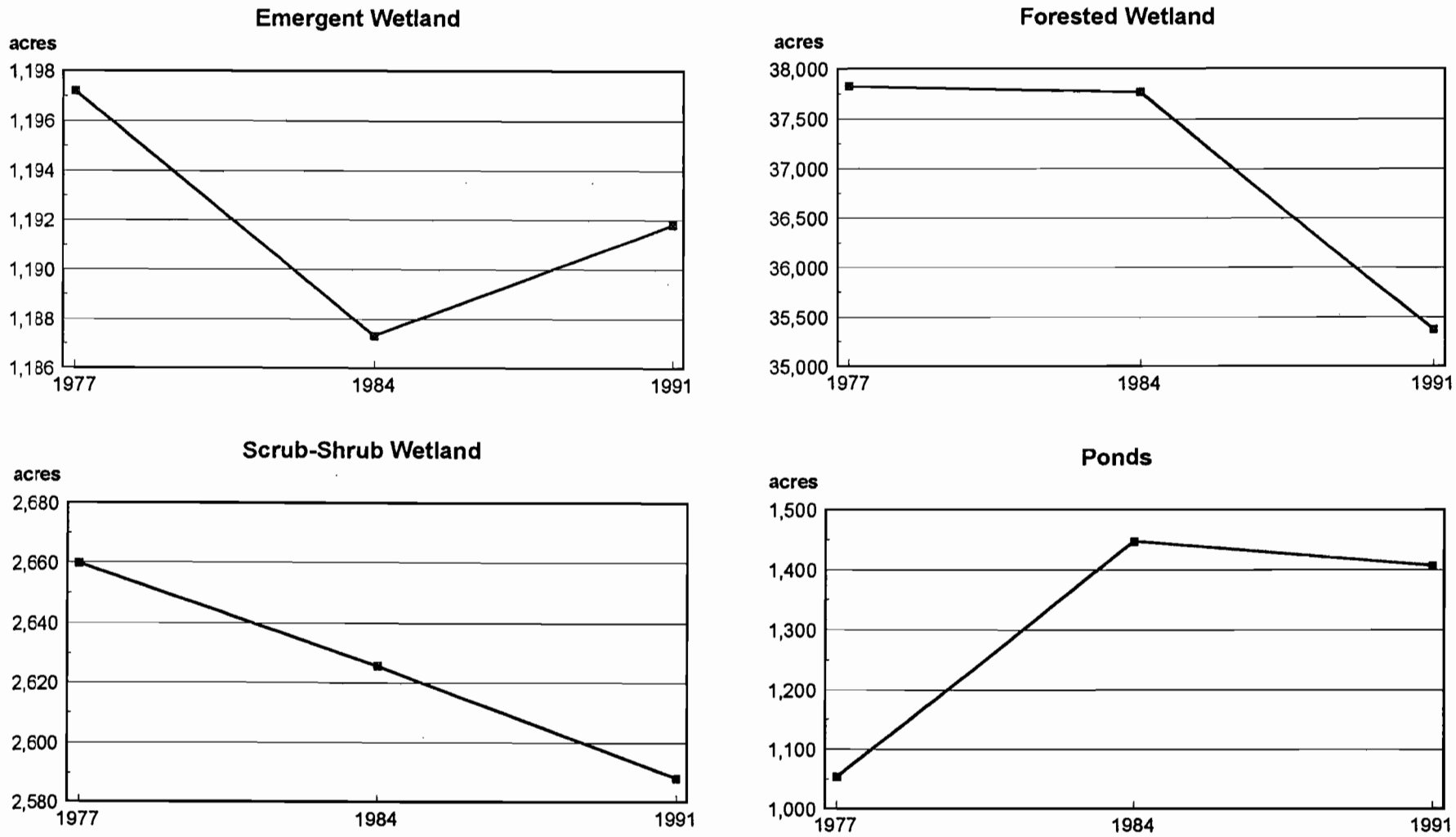
Cape May County and vicinity has 42.4% of its land area covered by wetlands. The current study identified a total of 112,778 acres of wetland. Estuarine emergent marsh is the dominant wetland type in the area.

Between 1977 and 1991, Cape May County and vicinity lost 495 acres of vegetated wetland as a result of 950 individually identified sites of change. Two hundred fifty-seven acres of vegetated wetland were lost between 1977 and 1984, followed by the loss of 238 acres in the next seven years. Changes in wetland acreages for palustrine and estuarine wetland types are shown in Figures 6 and 7. Estuarine emergent wetlands were the most frequently impacted wetland type during the first time period due to deposition of dredge spoil materials within the marsh. From 1984 to 1991, forested wetlands suffered the greatest impacts of vegetated wetland types, largely due to the construction of housing developments.

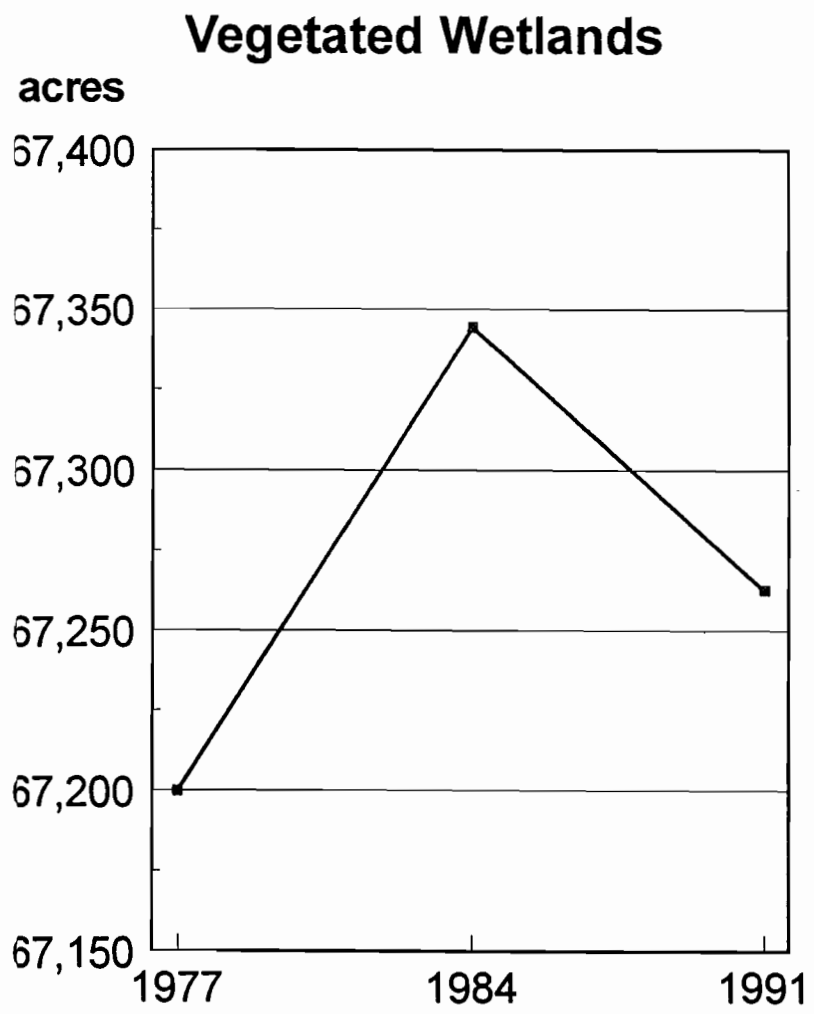
Sand and gravel pit operations produced significant changes in the project area during both time periods, including destruction of vegetated wetlands as well as creation of nearly 400 acres of ponds during the earlier period; and creation and destruction of nearly equal acreages of ponds during the later period. The significance of gains in ponds to fish and wildlife species has not been assessed and remains a point for discussion especially considering the ephemeral nature of these ponds as demonstrated in the 1984 to 1991 change data. The loss of vegetated wetlands, however, represents known losses of valuable fish and wildlife habitat, as well as the loss of other functions and values.

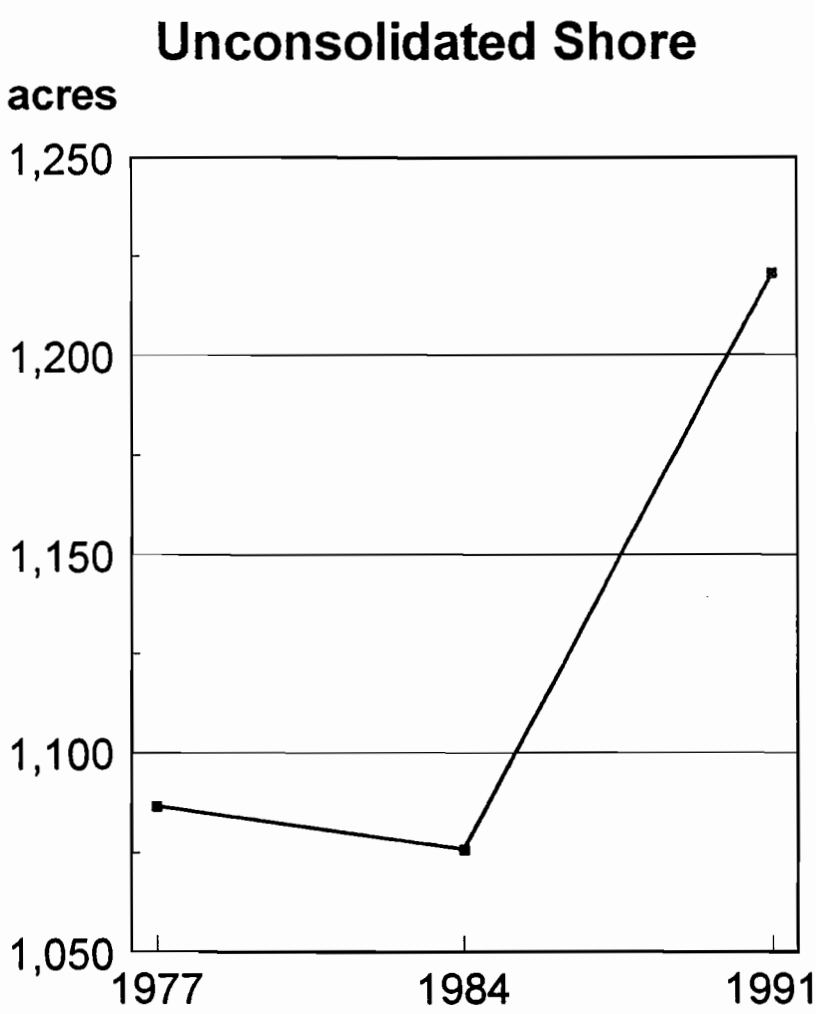
While this report documents recent trends in the project area, it does not address changes in the quality of the remaining wetlands. As development increases, the quality of wetlands and the values they provide can be expected to deteriorate due to urban and industrial runoff, increased sedimentation, groundwater withdrawals and increased water pollution as well as a host of other activities, unless adequate safeguards are taken to protect not only the existence of wetlands, but also their quality.

# Figure 6. Change in palustrine wetland acreage from 1977 to 1991.



# Figure 7. Change in estuarine wetland acreage from 1977 to 1991.



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