

Palm Beach County 2007 Habitat Mapping Project Analysis and Conclusions

Introduction

The quality of life and the economy of Florida's coastal communities are intrinsically related to marine and coastal resources. Florida's coastal lagoons and estuaries are extremely important ecosystems, as they support important fish and wildlife populations. They provide food, habitat, and refuge to invertebrates, birds, sea turtles, manatees, and many commercial and recreational fish species. To better manage and protect marine and coastal resources, it is necessary to identify and characterize the types and the extent of habitats that exist in the Lake Worth Lagoon (LWL) and Palm Beach County's (PBC) estuarine waters. In 2007, aerial photography of the LWL and PBC estuarine waters was acquired to map and classify essential fish habitats, specifically seagrasses, mangroves, oyster reefs, and spartina/cordgrass, to determine the current extent of the areas and the large-scale trends between the habitats originally identified in 2001 aerial photography.

The present study was initiated in 2006, however due to unfavorable field conditions aerial photography was not acquired until 2007. Successful aerial photography imagery was obtained during the months of June, July, and August 2007 to coincide with seagrass growing season. The imagery was converted into digital orthophotography and used to map and classify essential fish habitats, including seagrasses, mangroves, oysters, and spartina/cordgrass. The individual habitat boundaries were mapped according to photographic signatures apparent on the photography; the same techniques were used to create the 2001 habitat maps. Groundtruthing methodologies were also applied to verify photographic signatures with actual field conditions.

2007 Countywide Results

Seagrass

Results of the 2007 countywide mapping showed that seagrass beds covered at least 2,033 acres, or 18%, of the County's submerged estuarine habitat (Table 2a), which is an increase of 62 acres over the 2001 calculation of 1,971 acres (Table 1a). The majority of the increase can be attributed to an increase of patchy seagrass beds countywide and an increase of continuous beds in the South LWL and South Intracoastal Waterway (ICW) segments (Table 7a).

Mangroves

The mangrove habitat in PBC estuarine waters continues to show an upward increase of mangrove habitat from 631 acres in 1985, to 654 acres in 2001, and 710 acres in 2007, for a 12.56% (79 acre) increase (Table 4a). This represents a 3.63% (23 acre) increase in mangrove coverage from 1985 to 2001; and an 8.62% (56 acre) increase from 2001 to 2007. Over the past 22 years, increases in mangrove habitat were observed within the boundaries of the North ICW (34.2 acres), North LWL (33.1 acres), Central LWL (5.8 acres) and South ICW (9.7 acres), while a decrease of mangrove habitat was observed in the South LWL (-3.6 acres). In the northern ICW, the substantial increase of mangrove habitat between 1985 and 2007 can be attributed to the maturity of mitigation projects

that were completed during the 1980's and more recent County restoration projects, including Coral Cove Waterway Park, Sims Creek, Jupiter Inlet Natural Area, and Frenchman's Forest Natural Area. Additional increases can also be attributed to exotic vegetation removal that has allowed for the mangroves to be more visible in current imagery. Lastly, in some instances the resolution from the 1985 aerials was not as clear as that of 2001 and 2007 aerials, which may also explain some of the increase in the northern ICW mangrove habitat. In the northern LWL and central LWL, the increase can be attributed to County restoration projects, including Munyon, Peanut Island, John's Island, and Snook Islands. In addition to the County's restoration projects, the removal of exotics and the protection and natural recruitment of mangroves along the shoreline of John D. MacArthur Beach State Park appears to have increased the mangrove habitat in the northern segments of the LWL.

2007 Lake Worth Lagoon Habitat Classification Results:

Seagrass:

Results of the mapping showed that seagrass beds covered at least 1,688 acres, or 21.74%, of the LWL (Table 2b). This is a 2.5% (42 acre) increase over the 2001 calculation of 1,646 acres (Table 1b) and is probably not a significant increase given the resolution of the project. The majority of the increase can be attributed to an increase of patchy seagrass beds throughout the LWL (Table 7b).

The seagrass coverage varies throughout the lagoon, with more seagrass found in the northern end than in the central or southern end of the lagoon. Specifically 65% of the seagrasses in LWL are in the northern segment (Little Lake Worth just north of PGA Blvd. to Flagler Memorial Bridge), 12% of the seagrasses are in the central segment (Flagler Memorial Bridge to Lake Ave. Bridge) and 23% of the seagrasses are in the southern segment (Lake Ave. Bridge to Ocean Ave. Bridge in Boynton Beach.) When comparing the 2001 maps to the 2007 maps, a 58 acre decrease of seagrass cover in the northern segment, a 9 acre increase in the central segment, and a 91 acre increase in the southern segment were noted (Table 7b).

Mangroves:

The mangrove habitat in the LWL continues to show an upward increase of mangrove habitat from 248 acres in 1985, to 264 acres in 2001, and 283 acres in 2007 (Table 4b). The LWL area has seen a 14% (35 acre) increase in mangrove habitat since 1985. The majority of the increase has been in the northern and central portions of the lagoon, associated with County restoration projects, including Munyon Island, Peanut Island, John's Island and Snook Islands. A 3.67 acre decrease in the southern segment of the lagoon was observed and can be attributed to increased development of the coastal shorelines in this area.

Oysters and Spartina:

This mapping project also identified 4.2 acres of natural oyster reef, and 1.5 acres of spartina/cordgrass within the LWL. Oysters and spartina comprise a very small percentage of the estuarine habitats in the LWL.

Background Information:

Seagrass and mangrove protection are mandated through PBC Comprehensive Plan – Coastal Management Element, and the 2008 Lake Worth Lagoon Management Plan. In addition listed species of seagrass are protected by the Federal Endangered Species Act and mangroves are protected by Florida Statute 403.9323 – Mangrove Trimming Preservation Act.

In 1990, Palm Beach County completed extensive surveys, inventories and analyses of the LWL's natural resources and compiled that data in the *Lake Worth Lagoon Natural Resources Inventory and Enhancement Study*. In 1992, the surveys were expanded countywide to include estuarine natural resources outside of the LWL and that data was compiled into the *Palm Beach County Estuarine Natural Resources Inventory and Resource Enhancement Study*. Since the completion of these inventories, additional studies regarding water quality, bathymetry, sediment characterization, shoreline characterization, seagrasses, mangroves, oysters, sea turtles, and manatees have been collected over the years. The details regarding these projects are summarized in the *2008 Lake Worth Lagoon Management Plan*.

In 2001, true color aerial photography of the LWL and the entire ICW was acquired for mapping and classifying seagrass and other submerged aquatic vegetation (SAV). This imagery allowed for photointerpretation of SAV within the Lake Worth Lagoon utilizing photogrammatic mapping equipment. The 2001 project produced maps and associated Geographic Information System (GIS) coverage of LWL's seagrasses and identified approximately 1,646 acres of seagrass beds.

In 2003, the project was expanded to map SAV resources countywide, including the ICW north and south of the LWL and within the Loxahatchee River area. The SAV resources were mapped utilizing the 2001 imagery. Other tasks associated with the 2003 project included mapping mangrove communities countywide, identifying the estuarine shoreline characteristics Countywide, and providing a trend analysis of these two parameters between 1985 and 2001 photography. The shoreline characteristics that were mapped included seawalls, seawalls with rip-rap, riprap revetment, exotic woody vegetation, mangrove swamp, and developed unarmored shoreline. The overall shoreline trend showed a conversion from natural shoreline to armoring during the period from 1985 to 2001. In Palm Beach County, 177 miles were armored in 1985 compared to 213 miles in 2001, a 17% increase. In LWL, 67 miles were armored in 1985 compared to 75 miles in 2001, a 10% increase.

Conclusions / Recommendations:

Since 2001, there has been a modest (2.5%) increase in seagrass acreage and a more substantial (8.6%) increase in mangrove acreage. It appears that the effects of continuing development are being offset by habitat restoration and the efforts to improve water quality. Essentially, the systems have shown some slight improvements over time but

this is balanced against the habitat losses and alternations caused by continued dense development.

Countywide, areas of seagrass, mangroves, oyster reefs, and cordgrass were identified. Seagrass habitat between 2001 and 2007 has increased by approximately 62 acres, 42 of which occurs within the LWL. These results are considered an underestimate of seagrass cover, as this mapping project was designed to detect large scale changes. In addition, the project only mapped seagrass beds that were 0.25 acre or greater in size.

There was an approximately 56 acre increase between the mangrove habitat identified in 2007 and that mapped in 2001, 35 of which occurs within the LWL. However, both increases in mangrove habitat and seagrass coverage can largely be attributed to the County's restoration projects, including Munyon Island, Peanut Island, John's Island and Snook Islands. This mapping project also identified 4.2 acres of natural oyster reefs, and 1.5 acres of spartina/cordgrass within the LWL boundaries. Overall, oysters and spartina/cordgrass comprise a very small percentage of the estuarine habitats in PBC and LWL.

When reviewing the mangrove habitat data it is necessary to take into consideration that data obtained from 2001 and 2007 were obtained using the same photometric standards. However when comparing the 1985 data to either 2001 or 2007, the 1985 aerial photographs were taken at a resolution of 1:58,000; compared to the scale of 1:10,000 for the 2001 and 2007 aerial photographs. The larger scale for the older maps made data interpretation more difficult combined with the inability to "groundtruth" them due to their age. The larger scale images also necessitated a larger minimum mapping unit for identifying the mangrove habitat at 2 acres compared to 0.25 acres for the 2001 and 2007 aerials. Because of these problems, the 1985 results should be used with caution and with the recognition that they are appropriate for depicting large scale changes only.

One similarity between the two monitoring years was that the County experienced drought conditions in the months prior to acquiring the aerial photography. This may explain why only a minimal change of 62 acres was observed in the seagrass coverage between 2001 and 2007. Overall, the project provides a reasonable estimate of the current acreage of mangrove and seagrass habitat and documents a positive trend. However, the conditions of the LWL (i.e. poor water quality and visibility) and species of seagrass, specifically *Halophila* due to its small size, make it very difficult to provide an accurate estimate of seagrass habitat within the County. Estimates of oyster reefs and spartina/cordgrass may also be underestimated, as they did not produce strong enough signatures to be clearly identified and mapped with this project.

The County has also been monitoring nine (9) locations of seagrass through a fixed transect method on an annual basis in the LWL since 2000. This project does provide species specific data and the condition of that particular transect, however it does not provide enough data to characterize the health of that particular seagrass bed, nor is it representative of the health of all seagrass beds within the LWL. The data collected from the transect monitoring efforts thus far has not documented any clear trends.

To obtain a true estimate of seagrass coverage and species density in the LWL and PBC a more field intensive monitoring effort should be implemented. The County is continuing to collaborate and form partnerships with various agencies, such as SFWMD, FFWC, FDEP and NOAA to obtain the necessary data to continue to evaluate and manage the coastal resources. The County will continue to be involved with any related working groups such as the Northern Estuaries Monitoring and Assessment Plan (NEMAP) Submerged Aquatic Vegetation Team.

Future Projects:

The County has performed the 2008 Fixed Transect Monitoring at the nine (9) locations within the lagoon and will continue to evaluate this monitoring effort.

The South Florida Water Management District (SFWMD) is planning to monitor five (5) 2-acre seagrass areas within the LWL. Two of the sites will be in the north segment of the LWL to measure the freshwater discharge effects of the C-17 canal on seagrasses. The remaining three sites will be in the central segments of the LWL to measure the freshwater discharge effects of the C-51 canal on seagrasses. Bimonthly monitoring will occur at each site through the random placement of 1 meter² quadrats to measure the presence and absence of seagrass species. This methodology will also quantify coverage and canopy height of seagrass beds.

Aerial photography is scheduled to be acquired at a minimum of a 5-year cycle, with the next images to be acquired in 2010. These images are to coincide with aerial photography taken in similar eastern estuaries, such as the Loxahatchee River, Indian River Lagoon, St. Lucie River, and the St. John's River.

SFWMD is also looking into other monitoring methods to augment the coverage obtained by aerial photography, with *in situ* monitoring that will occur through the random placement of 9 meter² quadrats (i.e. quadzilla) to characterize presence or absence of seagrass species.

Depending on the availability of funding, the County will consider monitoring additional sites, using the SFWMD seagrass monitoring methodologies of the 1 and 9 meter² quadrats, to better gauge the existing acreage of seagrass within the LWL. These methodologies will quantify presence or absence of seagrass, species, and percent coverage.

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