

**Habitat Mapping and Trend Analyses: Rookery Bay Watershed
Discharge Locations**

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Table of Contents

Introduction.....	1
Study Site	1
Methods.....	2
Aerial Photography and Remote Sensing Resources.....	2
<i>USGS 2005 Mangrove Map</i>	2
<i>Collier County Property Appraiser’s Aerial Photography</i>	2
<i>Digital Orthophoto Quarter-Quadrangles (DOQQs)</i>	4
<i>South Florida Water Management District Aerial Photography</i>	4
<i>1940s Aerial Photography</i>	4
<i>Light Detection and Ranging (LiDAR) Data 2007</i>	4
Vegetation Classification System	5
Ground-Truthing.....	5
Digitizing Following Ground-Truthing	6
Results.....	6
Field surveys and ground-truthing	6
All sites	8
Lely Main Canal	9
Lely Manor Canal-12_1	13
Lely Manor Canal 01-2.....	17
Lely Manor Canal-13.....	20
C-4_CANAL-00 (Eagle Creek and Fleisher Parcels).....	24
BelleMeade7_HendersonCreek	27
Belle Meade 9 (Fiddler’s Creek).....	30
US_41_OUTFALL_SWALE_NO_2-00 (Auto Ranch)	33
Bridge 37. Collier-Seminole State Park, South Old Marco Road area.....	37
Acknowledgements.....	41
References.....	41
Appendix.....	42

Table of Figures

Figure 1. Study site showing discharge areas where mapping took place.	8
Figure 2. Digitized vegetation map for Lely Main Canal 1940.	11
Figure 3. Digitized vegetation map for Lely Main Canal 2010.	12
Figure 4. Digitized vegetation map for Lely Manor Canal 12_1, 1940.	15
Figure 5. Digitized vegetation map for Lely Manor Canal 12_1. 2010.	16
Figure 6. Digitized vegetation map for Lely Manor Canal 01-2 1940.	18
Figure 7. Digitized vegetation map for Lely Manor Canal 01-2 2010.	19
Figure 8. Digitized vegetation map for Lely Manor Canal 13 1940.	22
Figure 9. Digitized vegetation map for Lely Manor Canal 13 2010.	23
Figure 10. Digitized vegetation map for Eagle Creek Fleisher 1940.	25
Figure 11. Digitized vegetation map for Eagle Creek Fleisher 2010.	26
Figure 12. Digitized vegetation map for Belle Meade Henderson Creek 2010.	28
Figure 13. Digitized vegetation map for Belle Meade Henderson Creek 2010.	29
Figure 14. Digitized vegetation map for Belle Meade, Fiddlers Creek 1940.	31
Figure 15. Digitized vegetation map for Belle Meade, Fiddlers Creek 2010.	32
Figure 16. Digitized vegetation map for autoranch 1940.	35
Figure 17. Digitized vegetation map for autoranch 2010.	36
Figure 18. Digitized vegetation map Bridge 37. Collier-Seminole State Park, South Old Marco Road area 2010.	39
Figure 19. Digitized vegetation map for Bridge 37. Collier-Seminole State Park, South Old Marco Road area 2010.	40

List of Tables

Table 1 List of vegetation codes utilized in areas mapped	42
Table 1. Lely Main Canal. Changes in vegetation from 1940 to 2010 and associated acres of change	45
Table 2. Lely Manor Canal-12 1. Vegetation changes 1940-2010 and acres of change.	54
Table 3. Lely Manor Canal 01-2. Vegetation changes 1940-2010 and acres of change.	57
Table 4. Lely Manor Canal-13. Vegetation changes from 1940-2010 and acres of change.	59
Table 5. C-4 CANAL-00. (Eagle Creek and Fleisher Parcels), vegetation changes from 1940-2010 and acres of change.	64
Table 6. BelleMeade7 HendersonCreek. Vegetation changes from 1940-2010 and acres of change.	66
Table 7. Fiddlers Creek. Vegetation changes from 1940-2010 and acres of change.	68
Table 8. Autoranch. Vegetation changes from 1940-2010 and acres of change.	72
Table 9 Collier-Seminole State Park, South Old Marco Road. Vegetation changes from 1940-2010 and acres of change.	75

EXECUTIVE SUMMARY

Vegetation mapping by hand digitizing using aerial photography and ground-truthing were conducted by the Institute for Regional Conservation. Vegetation data layers were created for 1940 and 2010 at the discharge locations of the most important water control or canal features that enter the Northern portion of Rookery Bay National Estuarine Research Reserve. The differences between 1940 and 2010 are summarized with possible causes suggested below. The 2010 maps will be utilized to assess future changes.

Mapping Area	Vegetation Trends from 1940 to 2010	Suspected Causes
Lely Main Canal (405 acres)	Freshwater and brackish (already tidally influenced in 1940) marshes changed to mangrove and buttonwood dominated wetlands. Remnants of the end of the cypress strand destroyed by the Lely canal excavation changed to mangrove forest. Large areas of slash pine dominated areas in lower elevations were replaced by buttonwood.	Sea level rise, increased inland access by tides from downstream ditches, and shortened freshwater hydroperiods upstream with less sheet flow.
Lely Manor Canal-12_1 (155 acres)	Freshwater and brackish marshes changed to mangrove and buttonwood dominated wetlands. A large freshwater forested wetland trended towards freshwater shrub or buttonwood and mangrove dominated wetlands. The end of the cypress strand converted to shrub wetland. Of the small amount of pineland mapped, the edges changed to buttonwood.	Sea level rise, minor increase in tidal access from downstream ditching, altered or shortened freshwater hydroperiod at end of cypress strand.
Lely Manor Canal 01-2 (139 acres)	Cypress strands shifted to mixed pine and cypress wetland. Although most of mapped area was above direct tidal influence in 1940, cypress and pineland shifted to cabbage palm and in some cases buttonwood in the lowest elevations downstream.	Shortened freshwater hydroperiod and only minor influence of sea level rise at the most downstream locations.
Lely Manor Canal-13 (431 acres)	The biggest change in acreage observed was cypress strand shifting to mixed pine and cypress wetland. Fresh and brackish (already tidally influenced in 1940) marshes shifted to mangrove and buttonwood dominated areas. The ends of the cypress strands and some lower edges of pineland converted to cabbage palm and freshwater shrub dominated wetlands.	Shortened freshwater hydroperiod and influence of sea level rise at the most downstream locations.

Mapping Area	Vegetation Trends from 1940 to 2010	Suspected Causes
C-4_CANAL-00 (Eagle Creek and Fleisher Parcels) (62 acres)	Direct human impacts already evident in area in 1940 from farming, human habitation, and dredging of Eagle Creek wetlands. Dredging soon followed along Henderson creek. Freshwater and brackish marsh changed to buttonwood and mangrove dominated areas. Pineland shifted to buttonwood or cabbage palm woodlands. Cypress died off at the ends of the strands which were cut off by development just upstream (off site).	Direct human impacts changed physiography of site. Sea level rise and elimination of freshwater sheet flow from upstream.
BelleMeade7 and HendersonCreek (407 acres)	Cypress wetlands shifted to wax-myrtle or mixed cypress and slash pine dominated areas suggesting shortened hydroperiods. Organic soil loss evident. Mangroves confined to ditches thus far.	Shortened freshwater hydroperiod. Direct human impacts from development south of U.S. 41.
Belle Meade 9 (Fiddler's Creek) (385 acres)	Reduction in fresh and brackish marsh with increase in buttonwood and mangrove. Slash pine shifting to buttonwood. Buttonwood areas along edge of development with whitevine thickets and abundant cattail in the marshes suggesting potentially high nutrient inputs.	Sea level rise, altered distribution of freshwater inputs with elimination of sheet flows, constricted or partially obstructed tidal flows downstream. Possible increased nutrient inputs from upstream housing development.
US_41_OUTFALL_SWALE_NO_2-00 (Auto Ranch Road) (148 acres)	Cypress and hardwood wetlands showed only minor changes since 1940. Large areas of marsh have become dominated by willow. Cattail is very abundant, and it is suspected to have increased, but an increase since 1940 cannot be determined because of a lack of clear signature in 1940. This site has high elevation uplands, high relief, most of which seem more or less un-changed except for very long fire suppressed and increased abundance of woody vegetation.	Sea level rise, but tidal flows obstructed and constricted by downstream spoil features. Possible lengthened freshwater hydroperiod and possible increased nutrient inputs from upstream agriculture.
Bridge 37 (Collier-Seminole State Park, South Old Marco Road) (846 acres)	Nearly half of the marsh areas became mangrove or buttonwood dominated, as well as some cypress and hardwood swamp. Pineland has shifted to buttonwood dominated woodlands on West side. Cypress died back in the lower elevation center at the ends of the strands leaving hardwood or palm woodlands just above the mangrove ecotone. Cypress also died back along the outside edges of the strand swamp further upstream.	Sea level rise, increased inland access by tides from downstream ditches, shortened freshwater hydroperiods upstream, freshwater sheet flow also disrupted by spoil from road features, and suspected increased nutrient inputs in northwest corner of mapped area.

Introduction

Explaining patterns of species distributions along environmental gradients has long been a central and dominant focus in ecology. Vegetation in estuarine environments exhibit distinct patterns along horizontal and vertical gradients. These gradients are generally characterized by a plants ability to tolerate salt directly through the roots or from salt spray. In estuarine marshes there is decreasing salinity from the coast going inland which leads to a formation of salt, brackish and fresh water marshes each with distinct vegetation types. Plant distributions are further subject to tidal storm surges, and influenced by the frequency and duration of flooding along an elevation gradient.

A complex interplay between biotic and abiotic factors ultimately determines where a plant will grow. Studies show that salt marsh (halophytes) species are excluded from tidal fresh water marches through competition with freshwater species (glygophytes), whereas glygophytes are excluded from salt marshes by physiological stress (Crain et al. 2004; Engels & Jensen 2010). Temporal oscillations in vegetation boundaries are increasingly becoming obvious as sea level rise and hydrological alterations affect ecosystems adjacent to the ocean. Tidal wetlands such as salt, brackish, and freshwater marshes are most affected by these changes, however, vegetation shifts are progressively happening further away from the coast.

In this study we look at vegetation changes at Rookery Bay National Estuarine Research Reserve (RBNERR) from the 1940's to 2010 through field work, ground-truthing, and interpretation of aerial photography and satellite imagery. This project also establishes baseline data for future detailed comparisons of vegetation and ecosystems changes. Because of the diversity of habitats and elevations, the proximity to developed land, and the changes in hydrology, a detailed vegetation map is an important tool for the complex issues involved in land management. As RBNERR is largely Estuarine, mapping vegetation becomes essential to monitor long term expected changes due to hydrology alterations associated with the acceleration in sea level rise and fresh water delivery. Specifically these mapping efforts are focused on areas within and adjacent to the uppermost portions of RBNERR around discharge locations of important water control or canal features. Several of these features were also recently altered in an effort to reduce their historical negative impacts on adjacent habitats. Therefore this mapping effort, focused on 2010 extents, will also function as a baseline to discern future trends which may result from these efforts.

Study Site

The study is focused around RBNERR (Figure 1). Rookery Bay Reserve is located in Collier County on the southwest coast of Florida, between Naples to the north and Everglades National Park to the south. Collier County is the second largest county in Florida, with approximately 2,025 square miles of land. RBNERR is comprised of approximately 110,000 acres of open water, mangrove wetlands, and uplands. The total estimated surface area of open waters



encompassed within RBNERR boundaries is 70,000 acres. The remaining 40,000 acres are composed primarily of mangroves, fresh to brackish water marshes, and pine and oak upland habitats. Although most of the area is aquatic or marine, it includes a variety of ecosystems from mangroves to pine flat woods, freshwater wetlands, and rare xeric oak habitats in high relict dune ridges. A particularly notable xeric oak habitat is found on Sandhill, which is over 5m in elevation yet surrounded by mangroves. Due to its location of RBNERR to the city of Naples, much of the edge has been disturbed and/or hydrologically altered and infested by invasive exotic plants.

Methods

A classified vegetation map with an extensive geodatabase, was assembled with past (1940) and present (2010) vegetation types based on aerial photograph interpretation and field ground-truthing. Field work involved on-the-ground vegetation data collection using hand held sub-meter accuracy global positioning system (GPS). A polygon map was hand-digitized starting with existing data from past maps as a base, and modified as ground-truthing progressed.

Aerial Photography and Remote Sensing Resources

USGS 2005 Mangrove Map

Boundaries of open water, mangrove, forested and non-forested coastal habitats were delineated using Collier County Property Appraiser's 2005 and aerial photography from the USGS. These layers were utilized directly as a base for outlining polygons during digitizing vegetation. One problem with the layer is that the 2005 aerial photography has some geo-referencing errors.

Collier County Property Appraiser's Aerial Photography

True-color, digital aerial photography taken by Collier County annually from 2000-2007, (except for 2004) and most recently in 2009-2014 (<http://www.collierappraiser.com>) were used. These exceptionally high quality images were used both in the field as maps and for digitizing habitat types. Because these aerial photos were used so intensively, the geodatabase created for this project used the same projection as these aerial images (NAD83 State Plane, Florida East). For each year of imagery there are certain advantages and disadvantages, as detailed below:

2000 rural imagery with 2-foot resolution was used frequently because it covered large areas of the study area. Because it marks 10 years prior to current mapping efforts, these aerials provided clues to the trends in longer term changes since 1940.

2001 imagery had higher spatial resolution than 2000 imagery for much of the area. The higher resolution images were used because they distinguished cabbage palm (*Sabal palmetto*) from other tree canopies. Most importantly, these aerials were taken just days after a hard freeze in early 2001 which made it especially useful to identify the more cold tolerant black mangroves in



basins mixed with other mangrove species which were frozen back and represented by reddish-brown dead leaves in the aerials.

2002 imagery had higher spatial resolution than imagery from other years. The higher resolution images were used because they distinguished cabbage palm (*Sabal palmetto*) from other tree canopies. These aerials also provided clues to the trends in longer term changes since 1940. More importantly, as in the 2001 photography, these aerials were taken after a hard freeze in early 2001 which made it especially useful to identify the more cold tolerant black mangroves in basins mixed with other mangrove species which were frozen back and represented by grey top-killed trunks in the aerials.

2003 imagery was used mainly for large-scale printouts, because these 1-meter resolution maps covered the entire area. Certain features were more easily distinguished in color; for example, graminoid areas and black mangrove areas showed up well.

2005, 2-foot resolution, images covering the entire area, were overall dark in contrast, but showed good contrast between upland areas (light green) and mangroves (dark green). The 2005 photographs were not georeferenced the same as other photographs, and appeared to be offset several feet to the east throughout the mapping area. Therefore they were not used for digitizing, but were used for vegetation interpretation.

2006 imagery was taken just after Hurricane Wilma (October 2005). The 2006 imagery was particularly useful for recognizing wind damage to mangrove canopies. Large areas of mangroves remained leafless for weeks, especially mature red and black mangrove forests.

2007 imagery with 6-inch pixel resolution was occasionally utilized and covered much of the area along with 2-foot resolution that covered the entire area. Color balancing was not as useful because the greens tended to blend together in that image.

2008 imagery with 6-inch pixel resolution was occasionally utilized and covered much of the area along with 2-foot resolution that covered the entire area. Color balancing resulted in somewhat darker aerials, although not as dark as 2005. In many cases slash pine trees showed up better over the darker background making these aerials sometimes useful to delineate pinelands.

2009 imagery is an important layer for all dynamic coastal areas and for determining the extent of vegetation types because it was the most recent complete photographic collection available having 2 foot pixels. Buttonwood and Brazilian pepper associations showed up nicely as a lime green color in the 2009 aerials and were readily identifiable.

2010 aerial photos have high quality 6-inch pixel resolution. These aerials are the most important set for the project because they cover most of the project area and they correspond to the data layers being edited in the polygon geodatabase. In areas 2010 aerials were not available, 2009 extents were utilized with examination of 2012 aerials to examine how quickly the ecotones have shifted in that time period.

2012 aerial photos included both high quality 6-inch pixel resolution and 2-foot pixels. These aerials have a color balance which is helpful in pulling out buttonwood and Brazilian pepper. In



absence of 2010 aerials in some areas, these aerials along with 2009 aerials were utilized to estimate vegetation extents in the 2010 data layer.

2014 aerial photos included most of the northern half of the RBNERR with high quality 6-inch pixel resolution and the rest of the RBNERR with 2-foot pixels. These aerials are utilized to reference current condition from field work associated with this project and identify signatures which may be similar to 2010. From these aerials we can examine recent trends to see if any vegetation community shift has occurred since 2010 while digitizing.

Digital Orthophoto Quarter-Quadrangles (DOQQs)

Several aerial photographs, including the 1995 and 1999 infrared DOQQ aerial photos, were used for hand-digitizing habitats (Florida Department of Environmental Protection Land Boundary Information System; <http://data.labins.org>). These photos provided information on habitat signatures otherwise not evident in the true color imagery. True color photography was also available at this site in various projections. These photos were similar to Collier County Property Appraiser imagery, but generally had lower spatial resolution (up to 1-meter).

South Florida Water Management District Aerial Photography

These photographs, projected in NAD83 UTM 17N, are true color aerials in TIF format, and were taken of the outer islands and mangrove forests of Ten Thousand Islands National Wildlife Refuge (TTINWR) and RBNERR areas. These aerials were especially useful in observing shoals and shallow areas in the submerged lands because they were taken at low tide.

1940s Aerial Photography

Georeferenced 1940s aerial photography was received from the USGS (Coffin et al. 2003; http://sofia.usgs.gov/projects/summary_sheets03/digarchive.html). These images were used to complete the 1940 vegetation layer. These black and white images vary in quality, often with good spatial resolution, but sometimes too dark or out of focus. However, though these images were georeferenced they had lower precision than the newer aerial photographs. To improve the 1940s layers, we added control points when digitizing in specific areas where the USGS layer is off more than 5-10m, and utilized the georeferencing toolbar in ArcGIS. After adding control points for specific areas on the images, a new image with better georeferencing was created and labeled for that specific area. Not all images were regeorectified to the same level of accuracy because of the variability in image quality and difficulty finding good control points to improve georeferencing of parts of the image. RBNERR also provided additional versions of these aerial photographs from Collier County, some that were already georeferenced. These images were in “negative” color scheme, but were reversed for use in digitizing polygons.

Light Detection and Ranging (LiDAR) Data 2007

LiDAR remote sensing elevation data (2007) were acquired from the SFWMD and were relied on heavily for digitizing habitats. These data were instrumental in locating shell mounds and other above-mean-high-tide areas in these coastal systems. Using LiDAR data as a colored transparency over aerial photography proves to be the most useful way to begin polygon digitizing. They were extremely useful in identifying uplands, especially scrub ridges.



Reliability of identifying uplands proved to be less than 100% as areas within mangroves with concentrations of organic debris periodically showed up as uplands, while other areas did not show up, presumably due to dense canopy closure. Nevertheless, these data were useful layers in the vegetation mapping effort.

Vegetation Classification System

Vegetation code types used for this project follow the Comprehensive Everglades Restoration Plan (CERP) (Rutchev et al. 2006;

<http://science.nature.nps.gov/im/units/sfcn/docs/Vegetation%20Classification%20-%20v6.15.09.xls>). Any vegetation types encountered during field work that were not found in the referenced report were documented and labeled appropriately. These habitat types were added to the classification system.

Ground-Truthing

The ground-truthing methodology consisted of stratified random sampling by transects on foot, covering as many aerial signatures as possible in the field. A hand-held Thales Mobile Mapper GPS unit was used in the field for data collection. ArcPad software was used with the polyline feature class with custom designed data fields with drop-down menus for vegetation type and exotic plant species density/cover codes exported from the geodatabase. Five additional point feature classes were used to document other exotic species, rare plants, rare or exotic animals, other points of interest, and fixed point photographs. The GPS unit allowed for the use of digital aerial photography while in the field to help insure the location of signatures in question.

Exotic species were mapped using the existing geodatabase and methodology based on the FNAI Florida Invasive Plants Geodatabase project (<http://fnai.org/invasivespecies.cfm>), with modifications. These modifications included expanding the scope of species mapped, as well as incorporating survey track logs with percent cover of dominant exotic species along the track route to strengthen the dataset for production of polygon maps in the office. All Florida Exotic Pest Plant Council (FLEPPC) category I and II species were recorded in the field, as they were in the FNAI methods (FLEPPC 2009).

Transects on foot were used to bisect as many different aerial signatures or vegetation types as possible. Transect locations were roughly plotted prior to field work. Priorities for transect locations also changed and evolved as progress was made in the vegetation map, and aerial photograph signature recognition improved. Polyline data were collected, using the hand held GPS unit, by streaming data every 5 meters. When more precise vertices were needed (<5m), they were added to the polylines manually while streaming in the field. Each time a new vegetation type or ecotone was crossed a new line segment was initiated. Streaming continued until either vegetation type or exotic species canopy coverage changed, at which time the segment was ended and the data recorded in the geodatabase. When more precision was needed, for example when a narrow (<5 meter wide) but distinct shell midden ridge extended into mangroves from a larger mound, manual points (using 30-point averaging option) were taken to assist when digitizing. Besides vegetation type and canopy coverage of exotics, a comments



field was also used to describe co-dominants to assist in final habitat type determinations for the polygon map.

Photo points were periodically taken at the center of a characteristic vegetation type, or other ecologically significant location. Locations were recorded using the GPS and stored in the “photo_pts” feature class in the IRC_Master_GDB.mdb geodatabase. Photographs were taken facing north, then shooting adjacent areas in a clock-wise pattern. Any interesting plants or features were also photographed after completion of the cardinal directions. Most photos were taken in portrait orientation due to the thick vegetation, and sometimes shots of the canopy and other interesting items like cypress stumps, were included.

Digitizing Following Ground-Truthing

To construct the vegetation maps, multiple years of aerial photography (see section above for more detail on imagery) were examined to assist with vegetation signature recognition. The 2007 LiDAR data were used in conjunction with the other images while digitizing polygons, especially to discern signatures blended together, such as small forested high spots in large expanses of mangroves. After examining vegetation signatures from the imagery, polygons were hand digitized to encompass the signature.

All data from the ground-truthing feature classes are manually incorporated into the geodatabase. Once existing ground-truthed data are incorporated into a polygon for a specific area, digitizing continued outward from the ground-truthed areas. The attribute table for polygons is populated with values based on aerial photo signature interpretation and LiDAR data according to the similarity of the ground-truthed polygons. Exotic species coverage were also entered into the attribute table according to general similarity and proximity to ground-truthed signatures.

Data points collected in the field were also used to identify past vegetation types. For example, cypress stumps and cabbage palm stumps are used to determine pre-drainage vegetation. Fields in the attribute table of the polygon map were populated for vegetation types from current conditions, 1940s or “pre-drainage” conditions. Notes and points from the comments fields from the attribute table are extremely important feature classes that were utilized while digitizing to help identify and populate data fields.

Results

Field Surveys and Ground-Truthing

Field data utilized for vegetation type delineation / aerial photograph signature interpretation included all existing data collected within 500m of the mapped areas as well as data collected specifically for the project in 2015. All newly collected data were incorporated into the IRC_Master_GDB.mdb geodatabase along with all data collected for RBNERR over the past ten years since Mike Barry began



collecting these data as an employee of the TTINWR which co-manages some of the same areas as RBNERR.

A total of 1,348 track segment records logged into the field_survey_tracklog feature class in the geodatabase were utilized for vegetation type delineation and aerial photograph signature interpretation. Each record corresponds to a specific vegetation type with associated aerial photograph signature. Of the total, 304 records were collected in 2015 associated directly with this project, while the remaining records were collected primarily in the 2011 to 2014 time period, but with less than 100 records dating back to 2008-2009 as well. Of the areas specifically surveyed for this project, total distance surveyed was 27,232m on foot with over eight field days in 2015. The 304 tracklog segments documented 77 distinct vegetation types and a variety of past (1940) conditions and levels of invasive exotic species cover.

A total of 319 miscellaneous points, including 174 existing locations within 500m of mapped areas and 145 new points specifically collected for the project, were utilized for GIS aerial photograph interpretation and vegetation type digitizing for this project. Miscellaneous points are valuable especially for establishing location and extent of past vegetation types including locations of dead slash pine, cabbage palm, cypress, buttonwood, live oak, and other species. Any other potentially important features of the landscape, not specifically falling within the other data collection categories, are housed in this feature class.

A total of 36 fixed point photograph locations have been established to document conditions in and within 500m of the project mapped areas, including 12 new locations established specifically as a part of this project. Most of these are 360 degree photo points but a few are “plant voucher” photographs documenting past (dead) or present plants of significance found at certain locations in the area. These photograph locations are not only valuable in providing images of specific vegetation types, but they will also provide an opportunity to return to these sites in the future to re-take photographs to assess changes over time.

A total of 215 exotic plant points were utilized for digitizing in this project. Exotic plant cover data is primarily recorded in the field_survey_tracklog feature class discussed above, but points are utilized for isolated populations or less common species. Nearly all had been taken prior to this year but a few isolated populations of interest were recorded such as additional locations of *Ardisia elliptica* on Treviso Bay property for example. These data are not specifically important for determining how hydrological regimes relate to vegetation types.



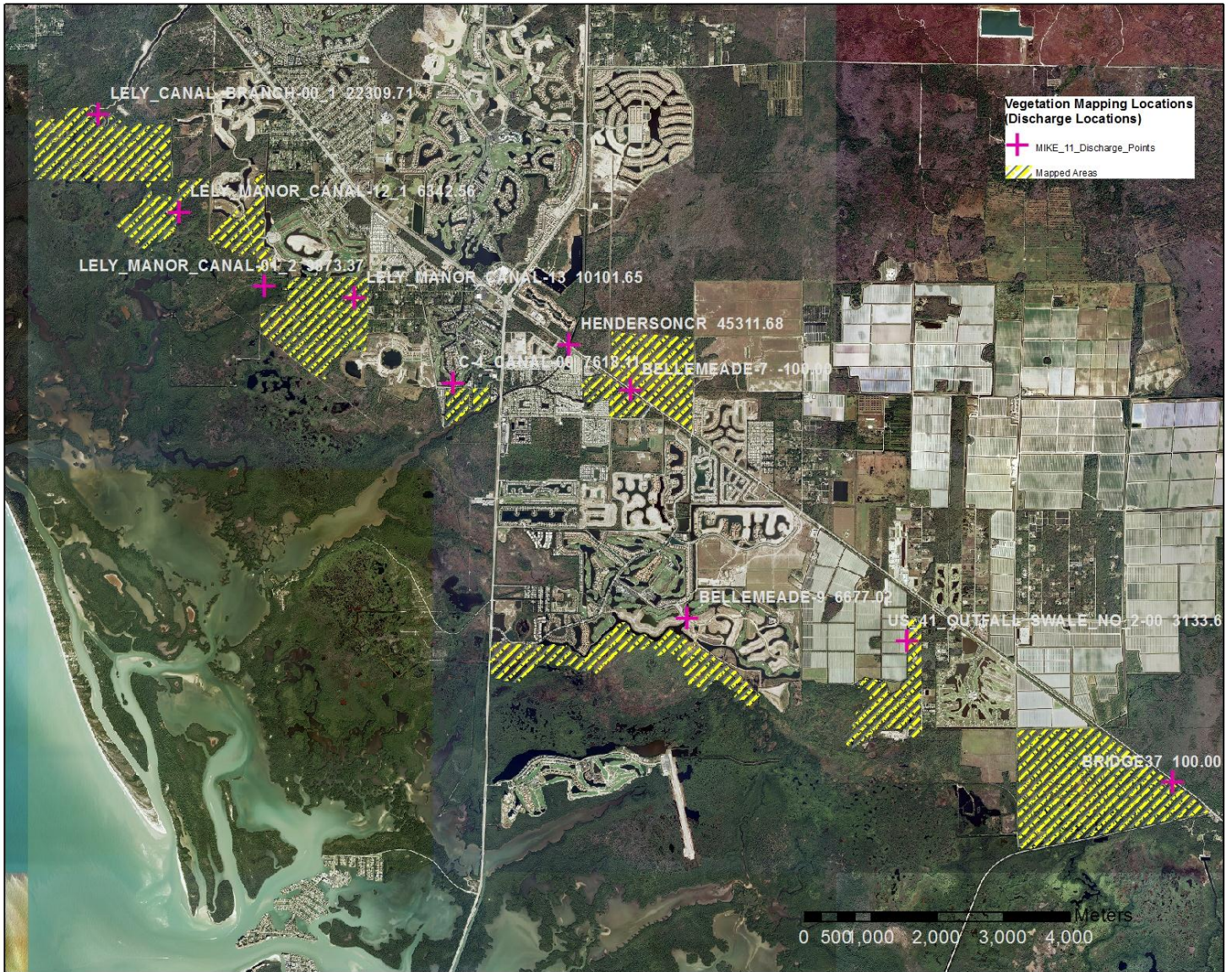


Figure 1. Study site showing discharge areas where mapping took place.

All sites

Throughout all the study sites (Figure 1), there were common changes that occurred between 1940-2010. In general, the study sites were more open and less woody vegetation occurred in 1940. This is most likely due to less occurrence of wildfires over the past 70 years, although some state and privately owned lands engage in prescribed fire programs and are well managed areas. Fire promotes more open graminoid ecosystems, while a lack of fire encourages more shrubs and tree species. From 1940-2010 there has been approximately 23cm of sea level rise and changes in freshwater sheet flow (Maul and Martin 1993, U.S. Army Corps of Engineers and South Florida Water Management District 2004, Krauss et al. 2011). Additionally, there has been large areas of direct clearing for development which were mapped as Human Impacted (HI). Substantial invasive exotic plant infestations now occur in all



areas. Additional mapping information (including vegetation codes) for all sites can be found in the Appendix.

Lely Main Canal

Total mapped acreage 405 acres.

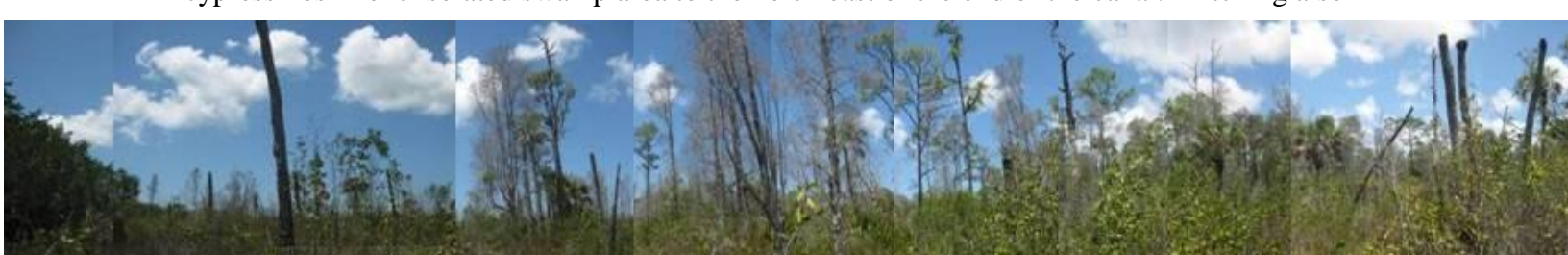
The site has been fire suppressed and heavily infested by invasive exotic vegetation including melaleuca, Brazilian pepper, and downy rose myrtle. Since 2010 mitigation funding has provided resources to kill large areas of exotic vegetation and fire was re-introduced into the ecosystem. This was in exchange for developing areas just inland and adjacent to the mapped areas.

In 1940, this site was comprised of a long strand swamp coming in from the northeast and extending towards the southwest and grading into freshwater and brackish marshes, then mangroves and some open water. The strand splits the site into two distinct areas. A nearly level, low lying, mostly hydric flatwoods area was found to the northwest of the strand. While to the south and east of the strand the area is much more varied in topography with some relatively high scrubby flatwoods ridges and marshes in-between and with some fairly open water holes.

As the Lely area was developed (30-40 years ago), a deep drainage canal was dug along the northeast to southwest cypress strand swamp. Smaller ditches were dug that radiate out and connect the end of the cypress strand swamp and canal terminus through the marsh to the nearest mangroves with isolated open water lagoons. Additional ditching downstream of this area, to the west, connects the system to tidal creeks, allowing substantial drainage of fresh water, and opening the interior, like the cypress swamp, to direct tidal influence. Around 2009-2010 the end of the canal was leveled and a new broad crested weir was installed along with a sizable pond to help create more sheetflow and freshwater storage. However, the drainage ditches in the mangroves downstream were not plugged, thus allowing tidal influences into these areas to continue.

The greatest mapped change from 1940 consisted of 93 acres, or 62%, of the mapped Marsh (M, MF, MS) to Buttonwood/Mangrove areas (CM, SM, WM, FM). This change is likely influenced by both the drainage canals and sea level rise, as documented in the TTINWR marsh areas (Krauss et al. 2011). The 1940's aerial signatures in the southwest corner of the study site were very dark, smooth textured signature suggesting black rush marsh, which was still present in 2001/2002 aerials just to the north. The quality of the image in the southwest corner is poor so it is possible there were shrub mangroves in 1940 which would make this an overestimate of changes. However, based on best interpretation of the imagery this area is recorded as black rush marsh. Areas adjacent to the canals would be considered most affected by the drainage, with isolated marshes further to the east between the pine ridge probably less affected. To a lesser extent, lowered fire-frequency and less frequent intense freezes may also be impacting the areas relative to 1940.

Cypress swamp, 6.5 acres, (FSt/WSt) changed to mangroves which is 45% of the area mapped as cypress. One live cypress tree was located at the end of this canal which seemed partially buried in spoil from the original canal. Additionally, live cypresses were observed in this area in years prior to 2008 when paddling down the old canal. Dead and live cypress cannot be distinguished in aerial photography because aerials are taken during cypress leafless stage. The rest of the acreage of live cypress lies in one isolated swamp area to the north-east of the end of the canal. Ditching also



continues connecting the cypress area to downstream open tidal water. This allowed saltwater to come straight up into the cypress with no marsh/mangrove filter, and allowed freshwater to drain out of the cypress depression leaving it vulnerable to tide water during dry periods. This was the most dramatic change in a cypress swamp with the next closest shift seen at the ends of cypress strands in Collier-Seminole swamp, of the sites mapped in this project. No doubt the bulk of this shift was due to the canals and drainage, but higher tides from seal level rise also contributed to the change.

Twenty seven acres of hydric Pineland (WSp) and cabbage palm woodland (WSs) areas changed to mangrove/buttonwood dominated vegetation types (CM, SM, WM, FM). The area west of the Lely Canal is very flat in topography and low lying pinelands have become too saline (based on halophytic vegetation amongst dead pineland species). Dead pine trees were GPS'd in the field over a large area corresponding to the 1940 aerial signatures. Stressed chlorotic and dying or recently dead individual pines were located and photographed along the edge of existing pinelands supporting the hypothesis of large changes since 1940. The ditching and canals allow tidal water to move further inland and now reach these areas, while also draining freshwater out more quickly. Therefore, there is no persistent freshwater hydraulic head (as in the cypress area discussed above). Higher inclusions in WSp (all mapped areas, like WSpX for example, have lots of small upland patches included) include saw palmetto heads with live oak which have also shrunk as evident from data collected in the field (GPS points and photographs). These changes for upland species indicate that sea level rise is also a driving factor as they would not have been replaced with buttonwood/mangroves with just drainage alone due to relative elevation of the area.

Roughly 3 acres or 20% of the mapped Cypress (WSt, FSt) changed to hammock, pineland, or mix of cypress with pines (FH, WSp, WStp, FStp). Most of this change was observed around the outer transitional edges of the much healthier strand swamp to the northeast of the canal area. This shift suggests a shortened hydroperiod as vegetation has changed to shorter hydroperiod species. In the case of cypress conversion to cabbage palm it can also be an indication of increased salinities from the ground water. Cabbage palms are not as susceptible to low amounts salinity as cypress.

Freshwater marsh and Sawgrass marsh (M, MF, MS) areas (4 acres or 4.5% of the 91 acres of freshwater marsh in 1940) converting to pine or cabbage palm woodland (WSp, WSs) suggests potential shortened hydroperiod. Although, with respect to vegetation change to pines, an additional contributing factor could be lack of fire. However these areas are on the upper edges of the marshes and are not adjacent to mangroves, suggesting the hydroperiod has been shortened to some degree.

Approximately 9 acres or 8% of the hydric pine areas have changed to freshwater wetland shrub dominated communities (CS) or cabbage palm woodlands (WSs) since the 1940's. This change suggests either hydroperiod has been lengthened or salinities have increased (cabbage palm and wax myrtle dominated ecosystems have been observed in many areas of RBNERR), persisting in areas of encroaching and surrounding mangroves and buttonwood whereas pineland does not. The change is not due to fire because fire can kill pines but does not kill palms/wax myrtle. In actuality these areas are fire suppressed and are found as slivers along the mangrove marsh ecotone areas, primarily on the east side of the canal area between existing hydric pinelands and buttonwood dominated areas. Because of the proximity to tidal influence and buttonwood dominated areas, tidal influence and sea level rise should also be considered. A shortened hydroperiod upstream from drainage can actually allow more tidal influence thus increasing salinities and causing vegetation shifts.



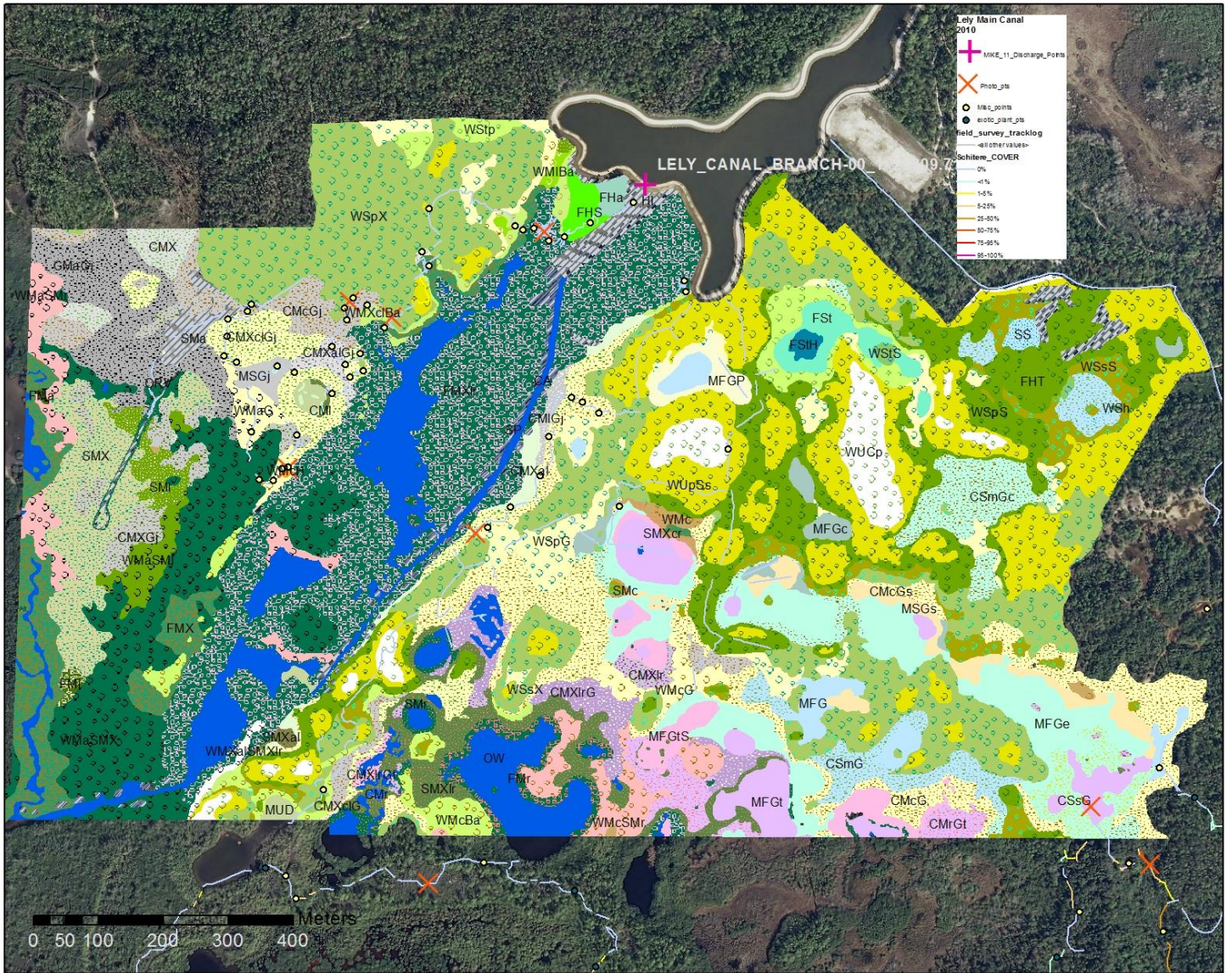


Figure 3. Digitized vegetation map for Lely Main Canal 2010.



Lely Manor Canal-12 1

154 total mapped acres.

This site is centered around the end of a long northeast to southwest strand swamp, in an area where freshwater transitions into a tidal marsh/mangrove ecotone. There are some relatively level pinelands adjacent to the swamp areas and some smaller and higher scrubby flatwoods mostly to the south but also a few to the west. A north-south drainage canal was excavated as the area was developed, terminating at the end of the cypress strand coming in from the northeast. There also appears to be some smaller ditching installed radiating out into the marsh area that historically separated the end of the cypress from a large hardwood swamp. Development to the northeast is likely to have significantly altered the fresh water flow into the cypress strand. The severe fragmentation upstream results in the strand receiving less water from its original source to the east/northeast.

Roughly 67 acres of Marsh (M, MF, MS) changed to Buttonwood/Mangrove areas (CM, SM, WM, FM) or 75% of the mapped marsh area in 1940. Much of the area still functions as marsh consisting of scattered shrub mangroves (CM), larger buttonwoods, or white mangroves (WMC, WMI, WMXcl) in a matrix of brackish marsh species or leather fern. Only about 10 acres of former marsh areas were mapped as dense shrub mangrove. As discussed above, these changes are likely a result of combined sea level rise and hydrological alteration working together to shift vegetation types of large areas.

Cypress (8 acres) changed to a mixture of freshwater Swamp hardwoods (WSh), swamp scrub (CS) and shrublands (SS), representing just under 50% of the areas mapped as cypress swamp in 1940. These changes were all located in the deepest center areas and at the end of the northeast to southwest oriented cypress strand. This is just upstream of the hardwood swamp separated by a freshwater marsh. The cypress, at the time of this report are dying off, and the causes are likely due to increased salinities although no mangroves made it up that far as yet. Cypress have deep roots and are affected by salinity increases. This has been documented in other areas for example downstream of Picayune Strand Restoration Project where strands have retreated over 200m in some areas leaving more shallow rooted shrubs, cabbage palms and some hardwoods.

Live cypress currently exist on slightly higher areas on edges of strands, dead cypress dominate the center. This pattern is opposite what would be seen if the shorter hydroperiods were causing the die-offs as the cypress in the center would be the last to die.

IRC previously established fixed points where 360° photos were taken at the end of this cypress strand. One photo point established in 2011 could not be re-photographed this year because it had become completely dominated by cattail eliminating the view of the dead and dying cypress.

Just downstream of the end of the cypress strand, much of the 30 acres mapped as freshwater wetland hardwood woodland (WSh) in the 1940 aerial changed dramatically. Roughly 7 acres or 22% of the hardwood swamp changed to buttonwood/mangrove dominated areas (CM, SM, WM, FM) while roughly 8 acres or 27% of the hardwood swamp changed to freshwater shrubland (SS) or cabbage palm woodland (WSs). These changes are probably influenced by tides and increasing salinities, and in fact some of the hardwoods observed in 2011 had recently died prior to the site visit in 2015. Leather fern (*Acrostichum aureum*) had increased while shield fern (*Thelypteris* spp.) decreased in the understory.



Less freshwater sheetflow into this area, either by drainage upstream or the apparent ditching in the marsh separating this area from the cypress strand to the northeast, would also exacerbate changes from the longer term effects of sea level rise.

Some of the edges of the adjacent pine lowlands (WSp) were included in the mapped areas, representing only slivers along ecotones and totaled 4 acres. About half of these mapped areas shifted to buttonwood and mangrove dominated areas (WMc, WMXcl) by 2010. This also suggests increasing salinities along the edges of the pinelands. The wetland changes could be a result of both drainage features and sea level rise. Additionally, another 1.2 acres of pine lowland (WSp) changed to cabbage palm woodland (WSs) which is also a strong indicator of increased salinity as cabbage palms seem to tolerate changes in salinity longer than slash pine and often persist in buttonwood dominated areas. Other changes include very small acreages of cypress strand (FSt) further upstream which changed to a mix of cypress with pines (FStp) potentially suggesting a shortened hydroperiod upstream. Ground-truthing found that typically shorter hydroperiod plant species have moved in along the edges.



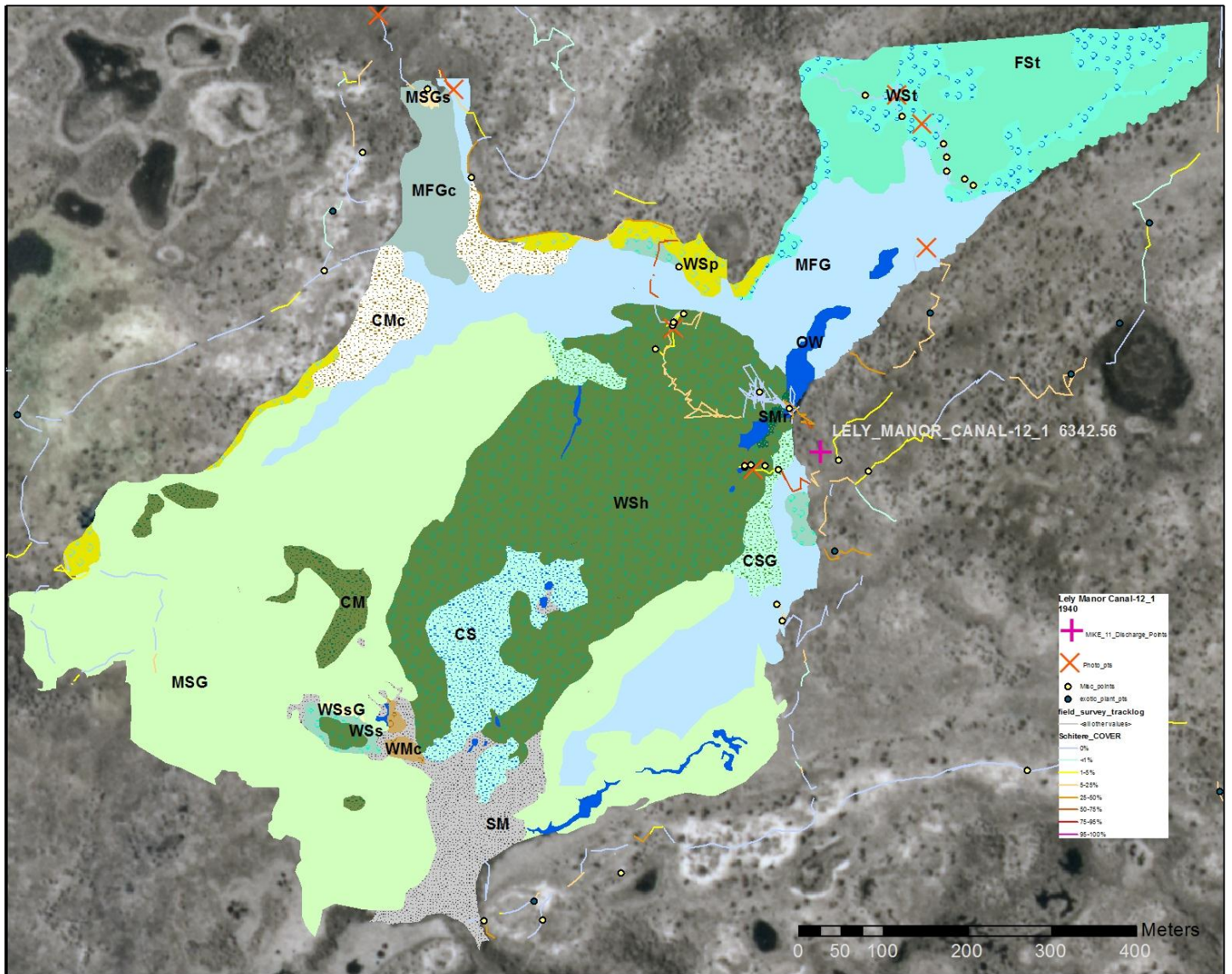


Figure 4. Digitized vegetation map for Lely Manor Canal 12_1, 1940.



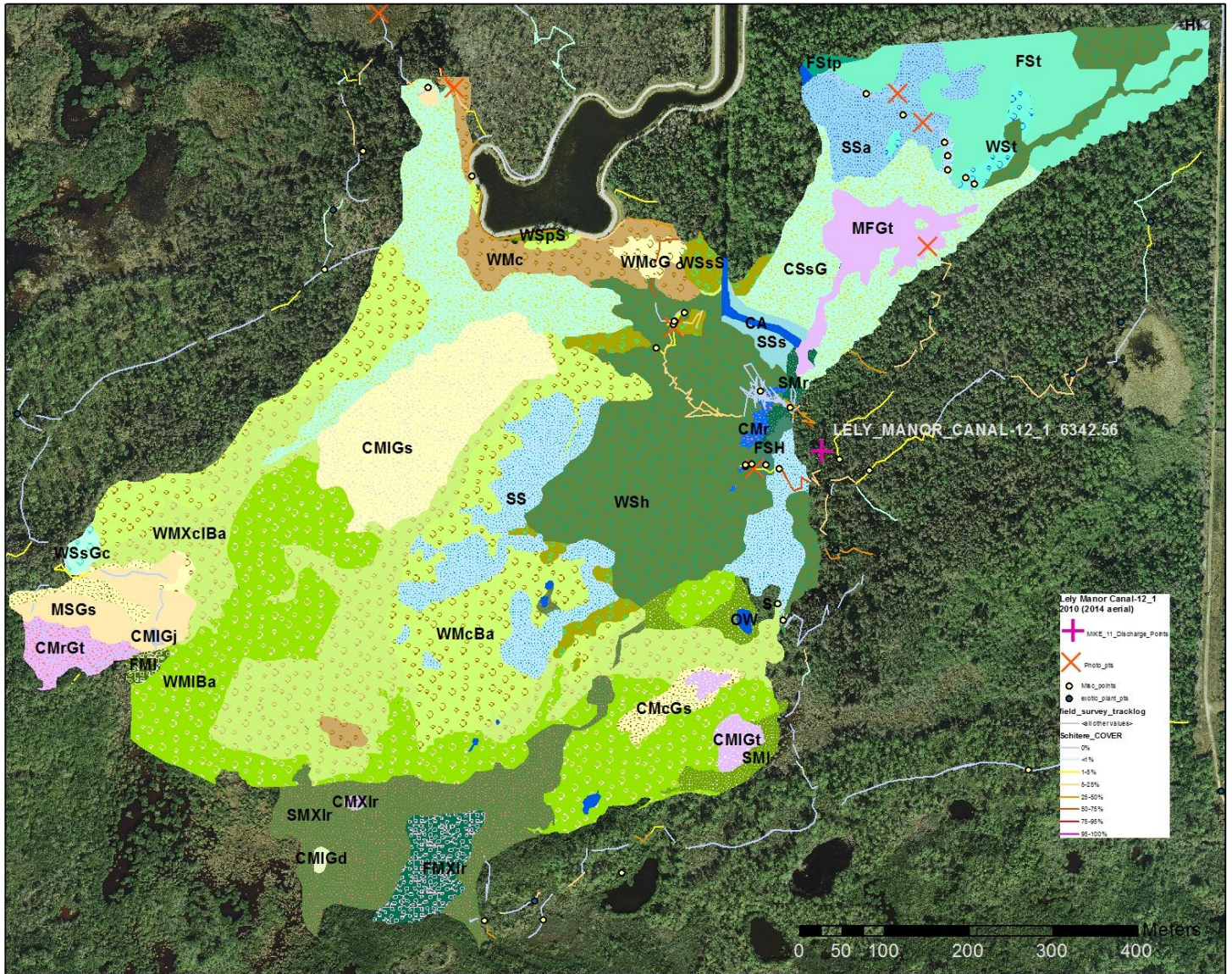


Figure 5. Digitized vegetation map for Lely Manor Canal 12_1, 2010.



Lely Manor Canal 01-2

Total mapped 138 acres.

This area is highly impacted by development. Most of the mapped area is above the tidally influenced areas of the marsh/mangrove ecotone and is primarily focused on cypress strand areas. Since 1940, much of the areas to the east were cut off from the wetlands and a north-south canal was excavated into the area leading down towards the south and flowing out through disturbed agricultural areas to the south. Recently with the development of Treviso Bay, changes were made to the canal terminus including a large borrow lake and a control structures/box culverts installed at the road crossing of the cypress swamp. Observations were made on stressed pine growing in the cypress areas that are showing the effects of this recent change.

Approximately 22 acres of cypress (WSt/FSt) changed to a mix of cypress with pines (FStp, WStp). This is about 40% of the 55 acres mapped as cypress swamp, not including the roughly 25 acres that were already mapped as cypress and pine mixed woodland (WStp). This increase in pine suggests a possibly shortened hydroperiod with pines moving into the cypress along the edges of the strands. These areas are inland and not at the ends of the strand indicating that salinity is not a factor. Interestingly, some dying pines were seen near the recently constructed lake at the new canal spillway north of the impounding road by the Treviso Bay golf club parking lot indicative that the recent construction may be now shifting the vegetation in the opposite direction to a more cypress dominated area with a longer hydroperiod.

Mapped cypress-dominated areas (FSt, WSt) changed to cabbage palm-dominated areas (WSs) (4 acres out of the total 80 acres) since 1940. This shift suggests shortened hydroperiod and/or impacts from salinities depending on where it is observed and which species is now dominant. The large areas of cabbage palm that dominate areas right near buttonwood woodlands are most likely caused by tidal influence.

The change from Cypress to freshwater wetland shrub scrub marsh (CS) and to buttonwood woodland (WMc) is also occurring at the ends of the strands (near the change just discussed above) totaling less than an acre. This is the same type of shift at two previously discussed sites and is most likely linked to increased salinities or tidal influence aggravated by changes to, or diversion of, freshwater inputs.

About 2 acres of pineland (WSp) changed to cabbage palm woodland (WSs). Areas are long-term fire suppressed so fire is not a factor. This change suggests either the hydroperiod has been lengthened or salinities have increased (swamp hardwoods, cabbage palm and wax myrtle dominated ecosystems persist in areas of encroaching and surrounding mangroves and buttonwood whereas pineland does not). The mapped shift is observed both near and far away from tidal influences so both factors are likely to play together; shortened hydroperiod and tidal influence.

Less than 2 acres out of the total of 11 acres of freshwater marsh changed from 1940 to 2010. Freshwater marsh (MFG) to pine or cabbage palm woodland (WSp, WSs) suggests shortened hydroperiod.



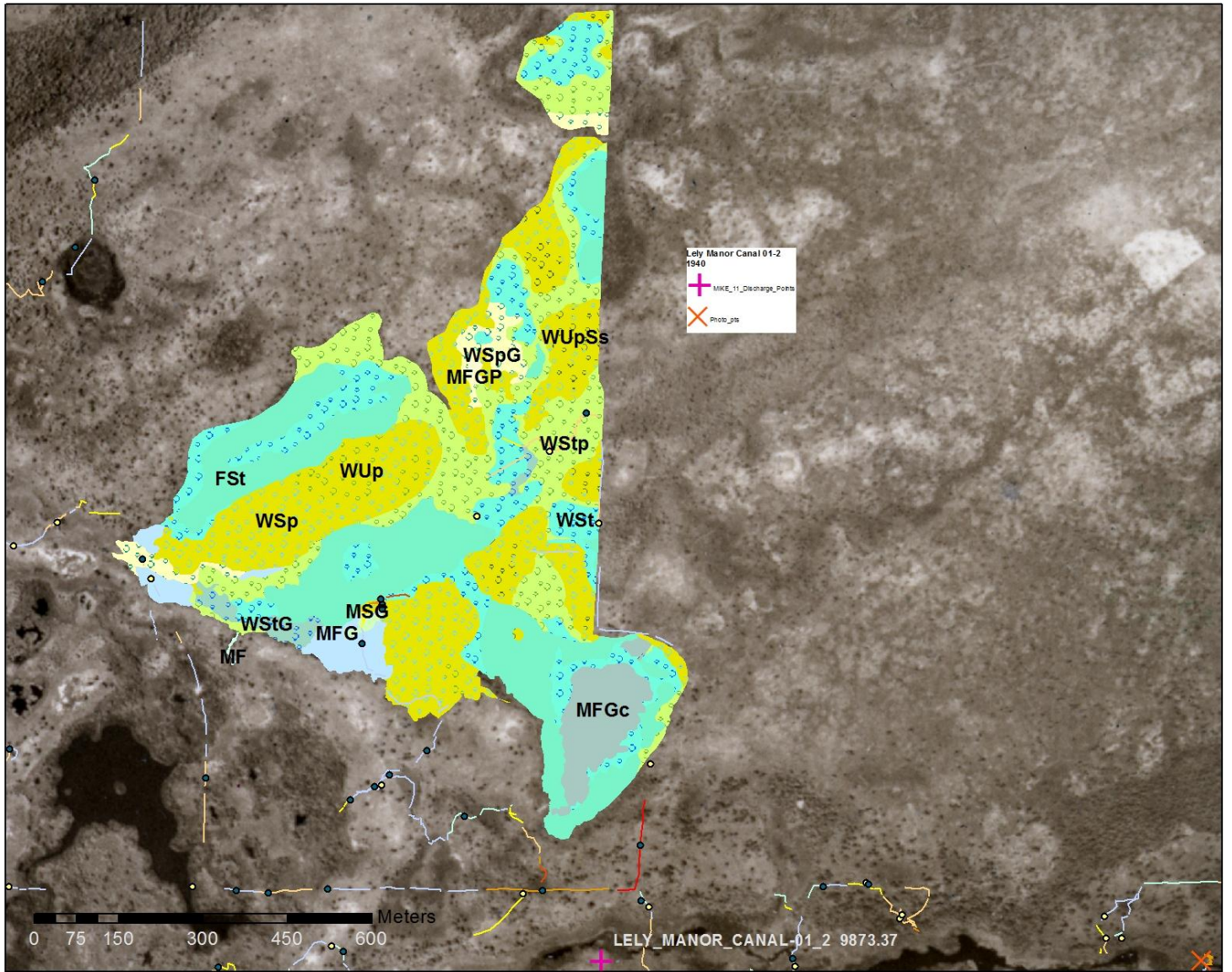


Figure 6. Digitized vegetation map for Lely Manor Canal 01-2 1940.



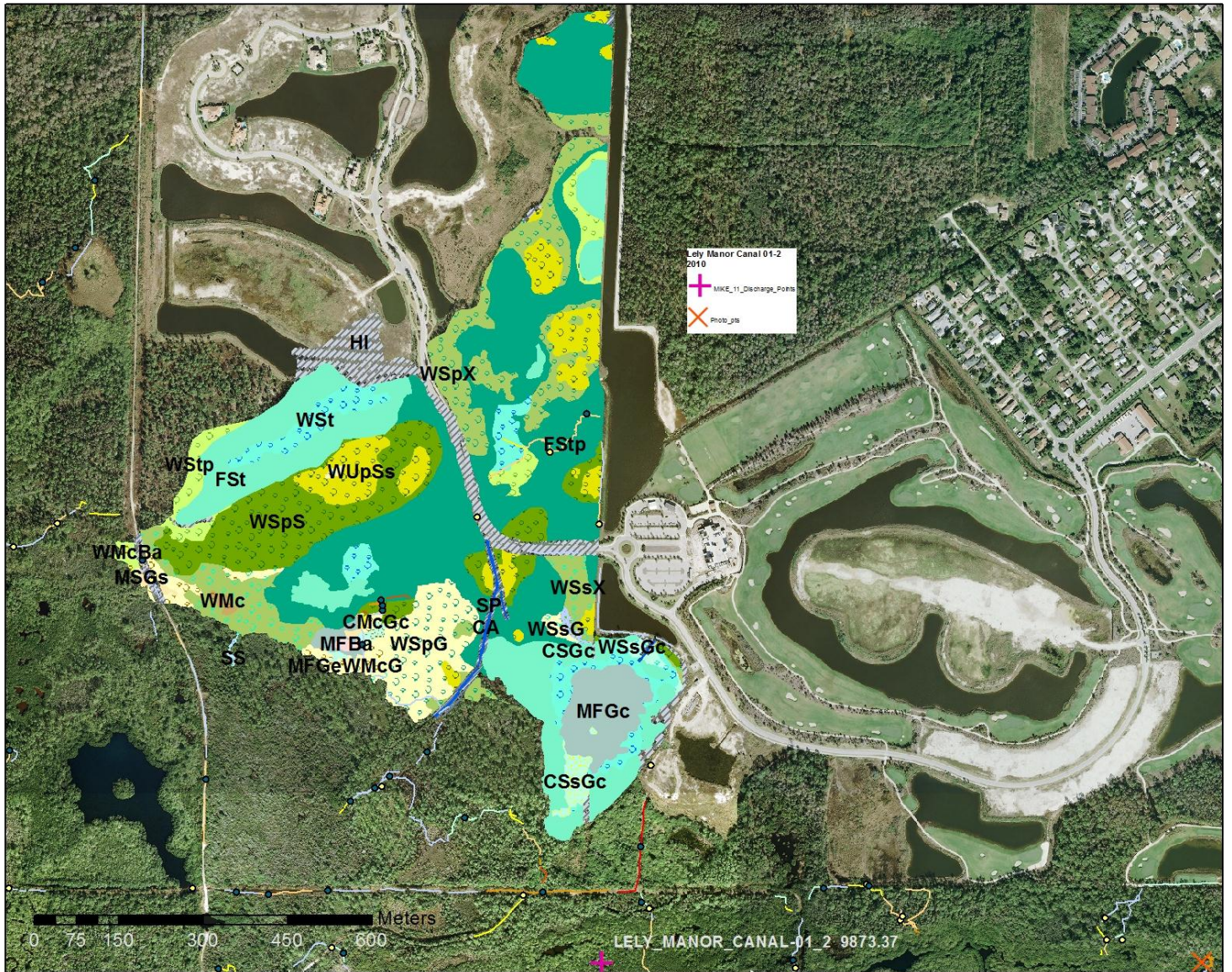


Figure 7. Digitized vegetation map for Lely Manor Canal 01-2 2010.



Lely Manor Canal-13

Approximately 430 acres were mapped.

The site consists of cypress strands which historically entered the area from the east-northeast and flowed toward the west out into tidal marshes. Some of the flow likely went south and southwest over pinelands as sheet flow into other marshes towards the southwest. Now a north-south canal discharges into the north-east corner of the mapped area and abandoned agricultural fields cover the former pineland. Ditches and berms separated many of the cypress areas and further disrupted historical flows. Substantial direct human impacts in the area made it hard to find clues of past vegetation types, specifically discerning hydric from mesic pinelands (WSp vs. WUp) in the agricultural field. Because of the lack of evidence it is difficult to ascertain the previous hydrological conditions of this area. Currently, a ditch extends down the east side of the abandoned farm fields likely also affecting areas upstream.

Approximately 21 acres of Cypress (FSt, WSt) or 32% of the mapped cypress areas changed to a mix of cypress with pines (WStp, FStp), or pineland (WSp), or cypress mixed with pine (WStp) changing to pineland (WSp). This suggests shortened hydroperiod because the shorter hydroperiod species have moved in along the edges of cypress. These areas are more inland, not at the ends of the strand and therefore are not attributed to salinity increases.

Five acres of cypress (FSt, WSt), or 7% of the mapped cypress areas, changed to cabbage palm dominated areas (WSs, FHa). This can suggest shortened hydroperiod and/or impacts from salinities depending on where it is observed and which plant species are coming in. At this site the change is probably indicative of both shortened hydroperiod and tidal influence. Large areas of WSsS now dominate in former WSt at the ends of the strands and are also completely dominated by Brazilian pepper from previous agricultural disturbance around the strands.

Cypress (FSt, WSt) (2 acres) changed to freshwater wetland shrub scrub marsh (CS, SS) occurring at the ends of the strands adjacent to some of the shifts to cabbage palm woodland (WSs) (discussed above). This shift is most likely linked to increased salinities or tidal influence exacerbated by changes to or diversion of freshwater inputs.

About 4 acres of pine lowland (WSp) changed to cabbage palm dominated vegetation types (WSs, FHa). This is about 3.5% of the total acreage mapped as pine lowland in 1940. This change would suggest either hydroperiod has been lengthened or salinities have increased (swamp hardwoods, cabbage palm and wax myrtle dominated ecosystems persist in areas of encroaching and surrounding mangroves and buttonwood whereas pineland does not). Most of this shift is observed near tidal influence and can be attributed to salinity increases but some are more isolated from tidal influence and therefore hydroperiod may be a factor in the vegetation changes. Those isolated shifts highlight the complexity of the area with respect to elevation and ground disturbance/development upstream and the alteration of the hydrology. Each location within the larger mapped may have had unique changes to site conditions.

One acre of hydric Pineland (WSp) and cabbage palm woodland (WSs) areas changed to mangroves/buttonwood, which is an obvious shift relating to salinity and elevation. This habitat type is



associated with the edges of existing pinelands and palm dominated areas and could be affected by both sea level rise and drainage.

Freshwater marsh changing to pine or cabbage palm woodland suggests a shortened hydroperiod. This can be seen by 11 acres, or 25% of areas mapped as freshwater marsh, changing to pine or palm woodlands (WSp, WSs). These data provide substantial support for less sheetflow reaching the wetlands south of the agricultural field as most of the change is mapped just south of the field. Restoration efforts will have to carefully address this issue as well as the ends of the cypress strands to the northwest of the abandoned agricultural fields.

The same changes observed elsewhere occurred at the marsh/mangrove ecotone. Roughly 17 acres of Marsh (M, MF, MS) changed to Buttonwood/Mangrove areas (CM, SM, WM, FM) or 20% of the mapped marsh area from 1940. Much of the area still functions as marsh consisting of scattered shrub mangroves (CM) or larger buttonwoods or white mangroves (WMc, WMI, WMXcl) in a matrix of brackish marsh species or leather fern. Only about 4 acres of former marsh areas were mapped as dense shrub mangrove. As discussed above, these changes are likely a result of a combination of sea level rise and hydrological alterations.



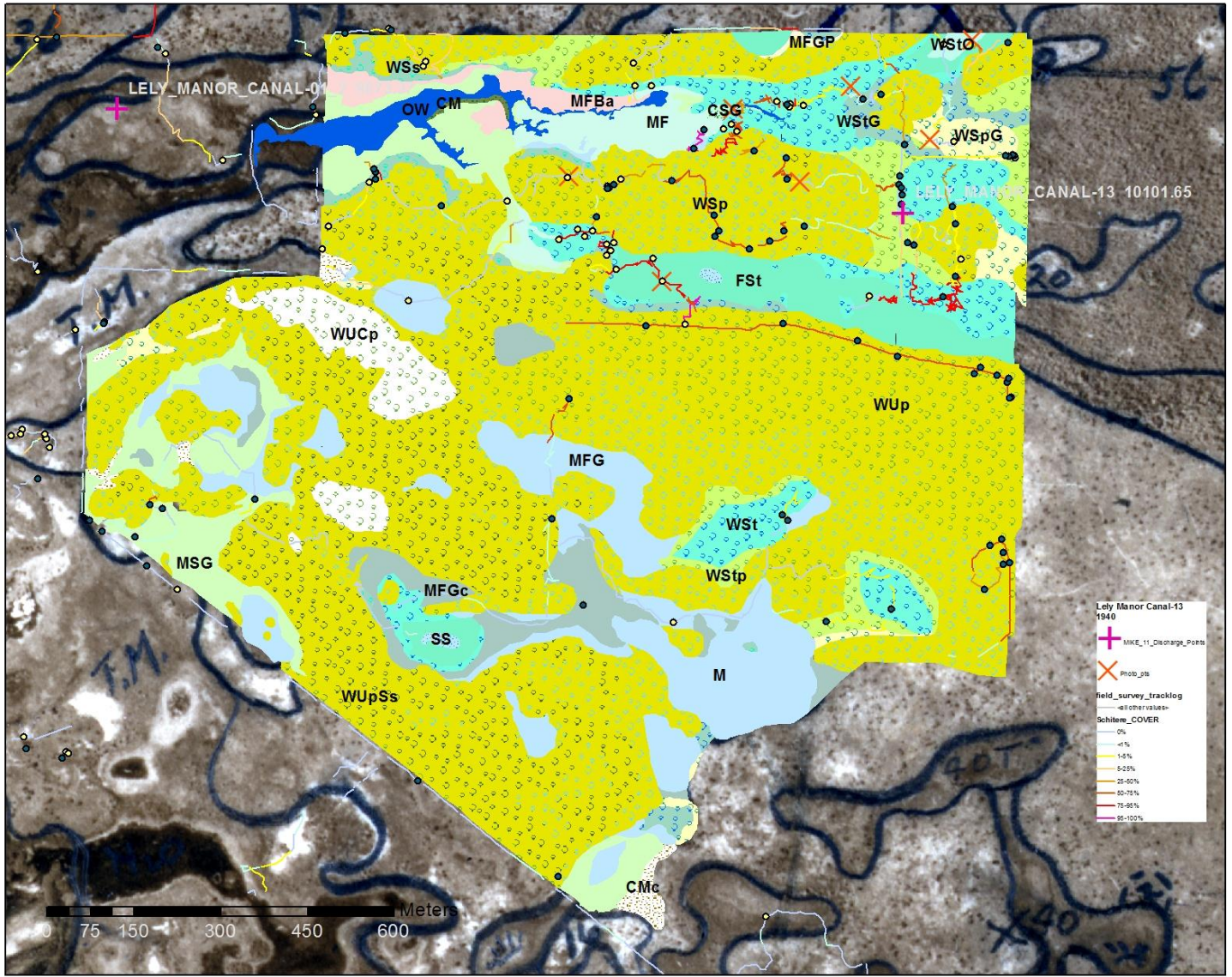


Figure 8. Digitized vegetation map for Lely Manor Canal 13 1940.

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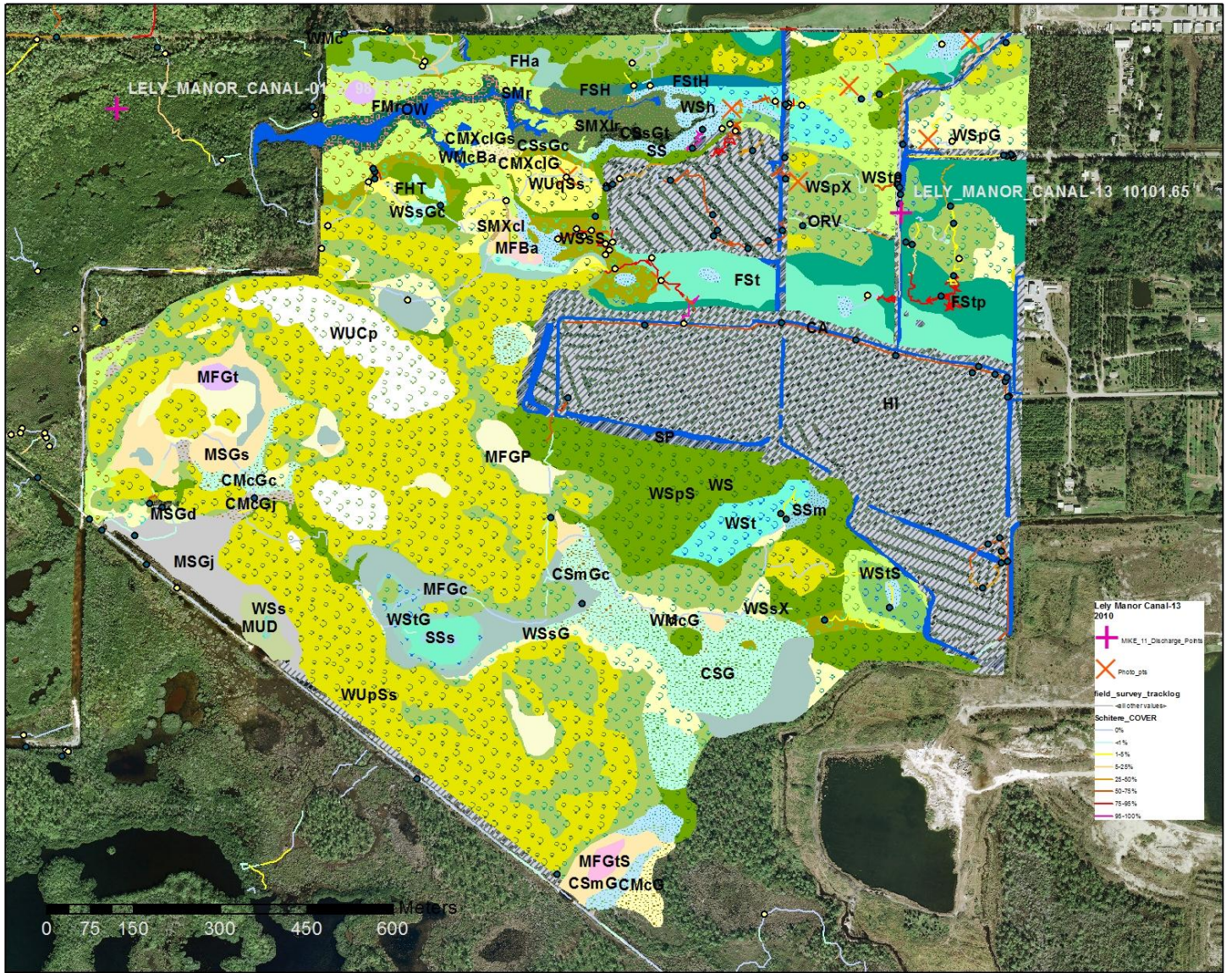


Figure 9. Digitized vegetation map for Lely Manor Canal 13 2010.



C-4 CANAL-00 (Eagle Creek and Fleisher Parcels)

Total mapped acreage 62 acres.

This site is highly disturbed; even in 1940 much of this area had already been cleared and farmed. Very little was mapped because nearly all of the area around this discharge point has currently been developed. Exotic vegetation now dominates, especially areas farmed in the past. It is difficult to ascertain why vegetation changes occurred because it is a highly altered site and includes altered hydrology, sea level rise and direct disturbance from development. Ground-truthing focused on the far western portion of the site because it had less direct disturbance, was not farmed, and there are cypress signature in the imagery from the 1940 imagery.

In 1940, about 1.4 acres were mapped as marsh of which nearly all has changed to mangrove or buttonwood dominated communities. It is difficult to tell what type of marsh occurred in the 1940's because so little evidence remains. However, due to the 1940 signature and the abundance of leather fern on site at present it is likely that much of the marsh was dominated by leather fern.

Almost 6 acres were mapped as scrub mangrove (CM) in 1940, much of which functioned as a marsh, judging by the signatures. Currently very little acreage functions as marsh but leather fern is still abundant under the mangrove canopy in many areas. These changes, with the exception of the areas directly disturbed by human development, are likely due to the combination of sea level rise and altered hydrology. The areas mapped as scrub mangrove (CM) in 1940 along Henderson creek were directly altered by dredging and deposition of spoil (SP). In general the creek area is highly disturbed.

A small portion of cypress signature can be seen on the 1940 aerial at the north end of the slough on the Eagle Creek parcel, right at the current bridge on Tower road. In fact dead cypress are found in the mangroves. One acre mapped as former cypress (WSt) changed to mangrove or buttonwood habitats (FMc, FMXcl, FMXlr). Where the east branch of this slough reaches the road there may likely have been some cypress in 1940, but no evidence was found while ground-truthing, so it was not mapped as such. Live cypresses do still exist just across the road at that location. It is possible that all evidence of cypress were lost during disturbance associated with construction of the road many years ago, or it was indeed the end of the strand at its current location. Regardless, it is pretty clear mangroves did not reach that far upstream at this location in 1940. The inland migration of mangroves is most likely a combination of a lack of freshwater inputs (east branch) or severely altered flows (bridge location) exacerbating by the effects of sea level rise.

About 1.2 acres or 10% of the pine lowland (WSp) changed to buttonwood woodland (WMc) and a small area changed directly to mangrove forest (FM). Roughly 3 acres or 28% of the total pine lowland (WSp) changed to cabbage palm woodland (WSs) adjacent to the areas that changed to buttonwood. Recently dead pines and chlorotic stressed and dying pines were found adjacent to the areas that changed to cabbage palm woodland (WSs). Once again, sea level rise seems to be continuing to affect vegetation on higher ground, especially without freshwater sheetflow to help hold back the saline water. Without hydrological restoration, which would be very difficult at this site surrounded by development, sea level rise would be expected to convert the entire pine lowland habitat to buttonwood and mangroves in the near future.



The remaining pine uplands are highly disturbed with heavy exotic infestation and/or long fire suppression with live oak encroaching into the canopy. However, a few patchy areas still remain in good shape, especially on the Eagle Creek parcel. Interestingly, a couple of the largest diameter pine heartwood (lighter) stumps we have ever seen in the study area were found on this site.

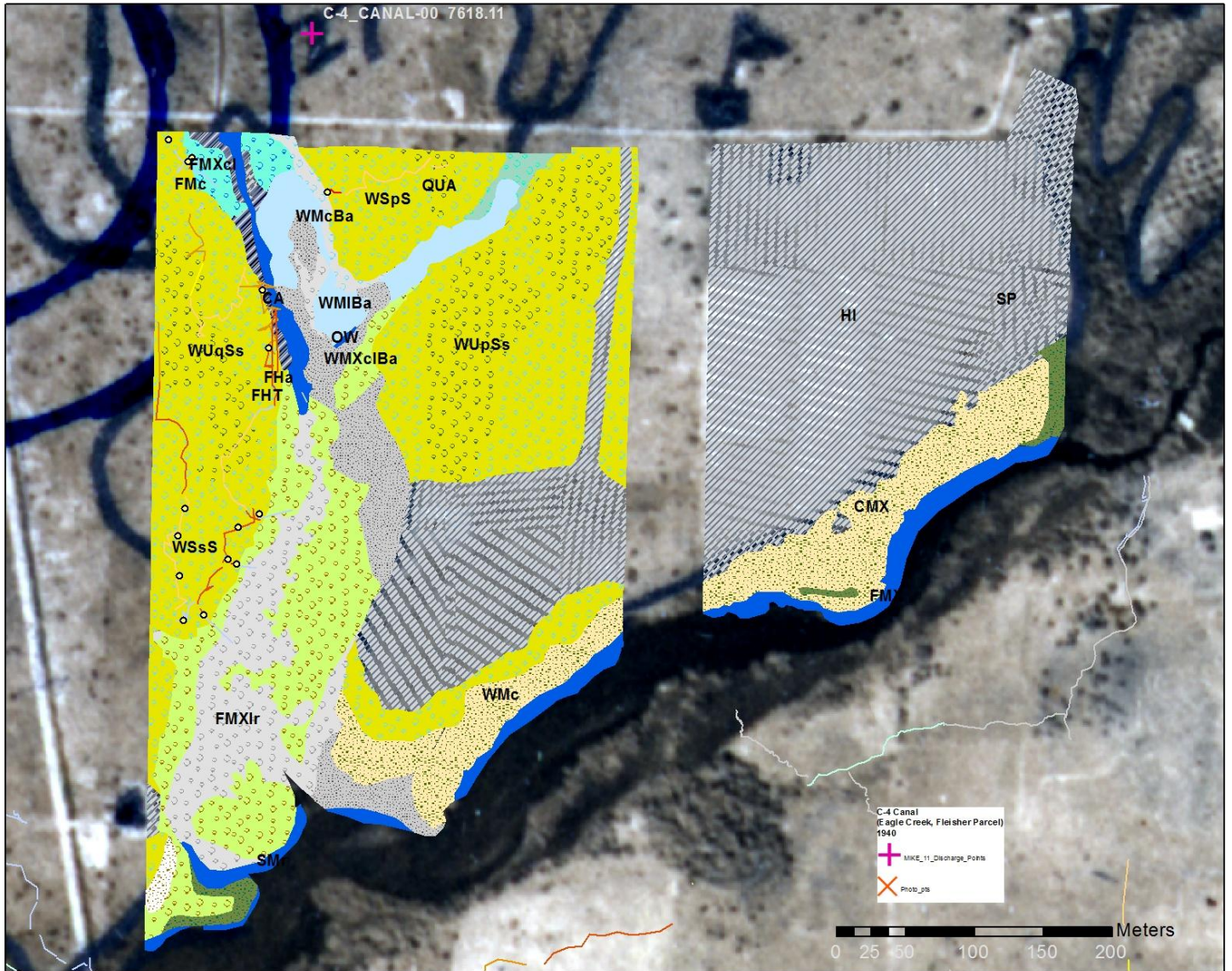


Figure 10. Digitized vegetation map for Eagle Creek Fleisher 1940.



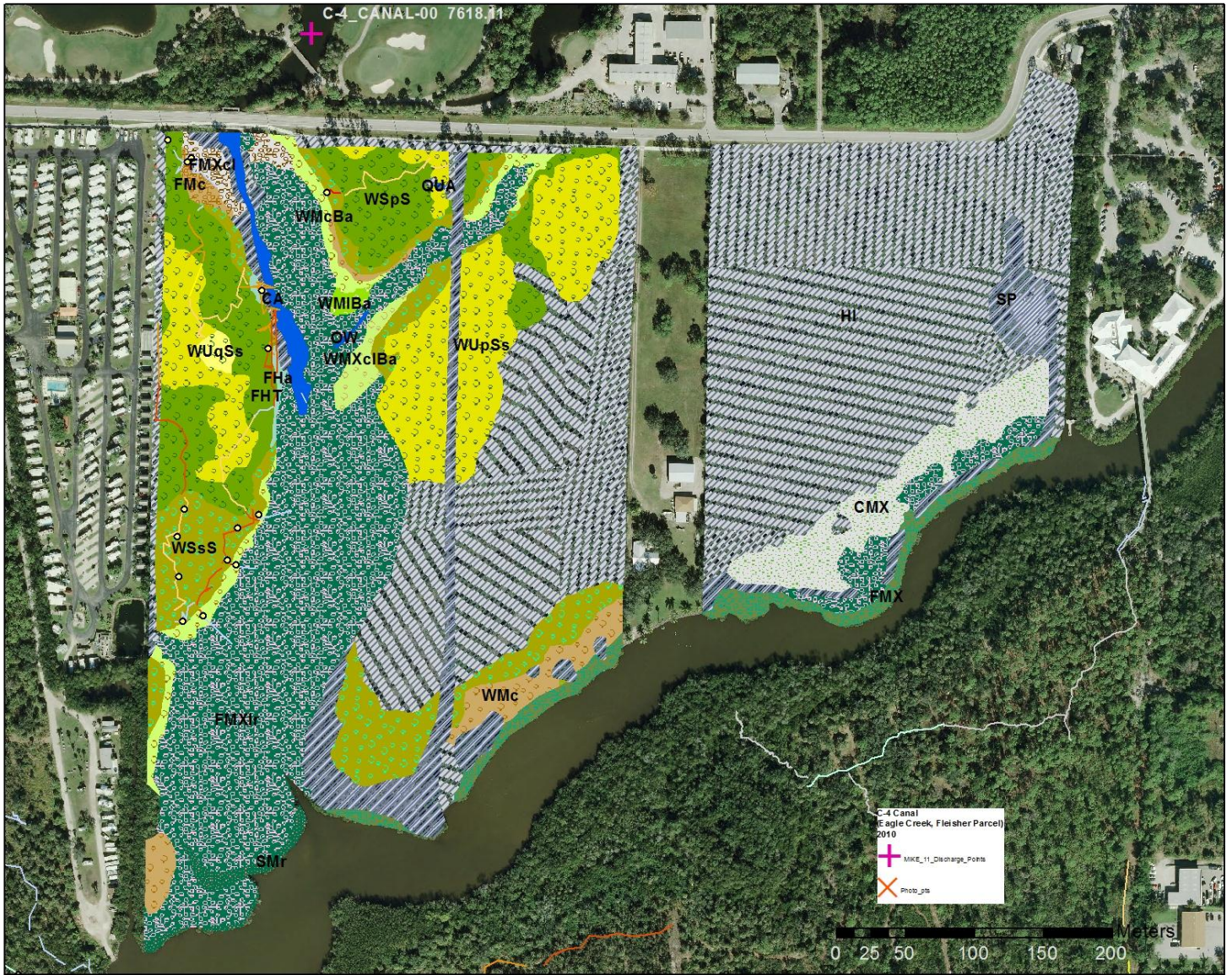


Figure 11. Digitized vegetation map for Eagle Creek Fleisher 2010.



BelleMeade7 HendersonCreek

Total acreage mapped is 407 acres.

In 1940, the site was largely a cypress woodland (WSt) with broad sheetflow areas from the northeast flowing down into a narrow low cypress strand that entered Henderson Creek towards the southwest. Tamiami Trail split the site into two pieces as early as the 1920's and 30's with associated borrow ditches altering the flow. Sometime after the 1940's aerial were taken, Henderson Creek itself was dredged and ditches and canals were excavated where the cypress swamp originally gradually entered the creek. The surrounding development completely altered the areas on the south side of U.S. 41. This site is most impacted near U.S. 41 and to the south by Manatee Road.

The swales along U.S. 41 and the ditching leading to Henderson Creek and surrounding development have impacted the hydrology of the site substantially. Several spoil piles (SP) are scattered around the site, some at seemingly random locations away from the ditching. In short, areas south of U.S. 41 are drastically different with much of the area being cleared and spoil moved around. Former cypress areas on the 1940's aerial signature are gone, and existing cypress has obvious signs of shortened hydroperiod, along with many exotics, including melaleuca and earleaf acacia monocultures. The area north of U.S. 41 is generally less disturbed (directly) and has less exotics (though some areas are melaleuca dominated), but closer to U.S. 41 there is more indication of shortened hydroperiods.

No mangrove dominated vegetation types were mapped but GPS locations of mangroves are the furthest inland recorded. Shrub red and white mangroves dominating the ditch on the site south of U.S. 41 and off-site in the ditch along the north side of U.S. 41. Downstream along Henderson Creek, mangroves have encroached inland, such as at the site discussed above for the C4 canal outfall location.

North of U.S. 41, large areas of dead cypress, old down, dead and burnt trunks on the ground, mark the nearly 30 acres of cypress woodland (WSt) in 1940 which changed to wax-myrtle scrub with graminoid marsh (CSmG). This area experienced some kind of catastrophic fire since 1940 which either killed many of the cypress directly or just scorched already dead trunks found laying all over the ground. It is not evident whether the cypress died due to shortened hydroperiod and then burnt or if a catastrophic fire killed the cypress.

Approximately 112 acres, or 34% of total cypress acreage in 1940, changed from cypress dominated (WSt, FSt) to a mix of cypress with pines (FStp, WStp), or pineland (WSp), or cypress mixed with pine in 1940 (WStp) changing to pineland (WSp). This change strongly suggests shortened hydroperiod. This shift was more obvious south of 41 but substantial acreage of this ecosystem change is also observed north of U.S. 41.

While conducting field surveys in the historically deeper cypress locations north of U.S. 41, observations were made at the bases of large cypress stumps that indicate that organic soil loss of >0.5m has occurred. The soil loss was determined by examining the bases of larger old cypress trees through the area. A plant voucher photo point was taken of one very large cypress tree showing the soil loss. The organic soil loss is similar to severely drained strands of Picayune Strand State Forest and can be caused by shortened hydroperiod (organic soils oxidation) and/or catastrophic fires.



Finally, 1.5 acres mapped as freshwater marsh or wet prairie (MFG, MFGP) with no tree canopy in 1940 was mapped as pine lowland (WSp) in 2010. This also suggests shorter hydroperiod than historically occurred. Because of the low elevation of these large areas and the direct connection to mangrove dominated swales, without hydrological restoration these areas will be vulnerable to conversion to mangrove dominated ecosystems in the near future with projected sea level rise. It would be important to act fast to restore sheet flow to prevent long term damage from saltwater intrusion.

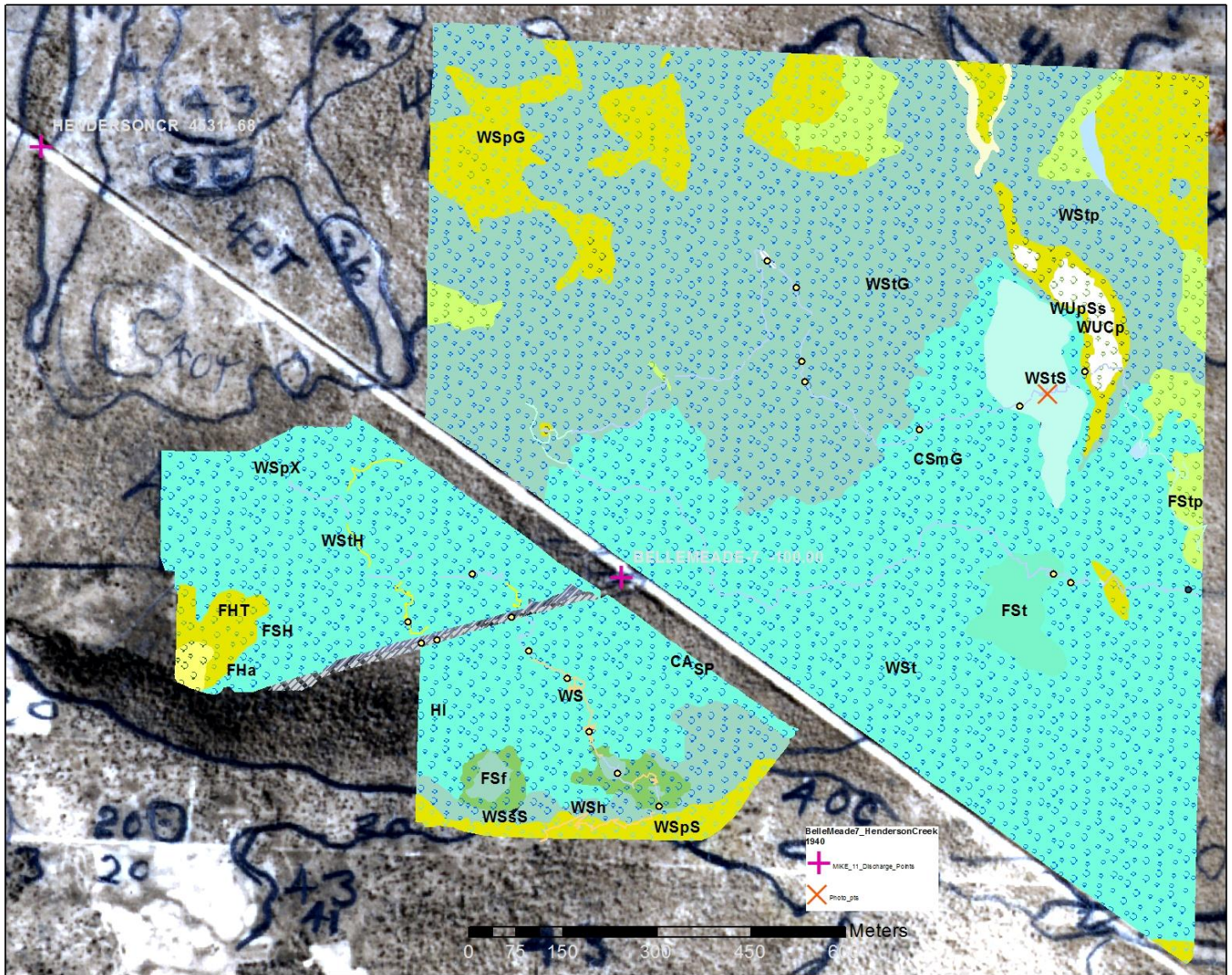


Figure 12. Digitized vegetation map for Belle Meade Henderson Creek 2010.



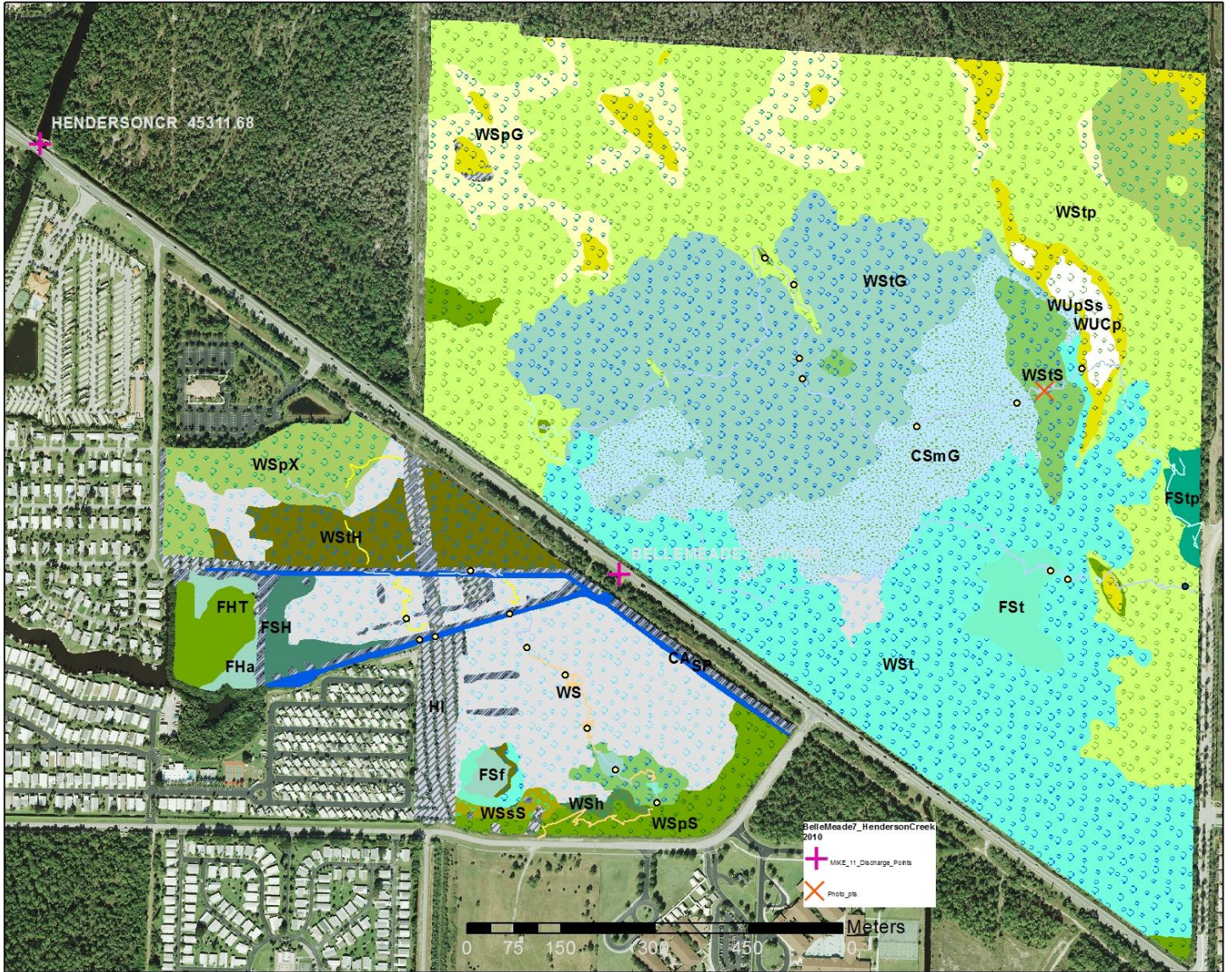


Figure 13. Digitized vegetation map for Belle Meade Henderson Creek 2010.



Belle Meade 9 (Fiddler's Creek)

A total of 384 acres are mapped at this site.

Additional acreage was previously mapped (downstream) but not included in this summary.

This site has been highly disturbed from an early time when the old Marco Road was built in the early 1900's and then later on with the construction of Tamiami Trail. The roads altered flow towards the site from the north (of the map), and C.R. 951. All of these spoil and borrow ditches made this area a complex mess of drainage and impounding, further complicated by the explosive development in recent times including the Marco Island airport and housing developments including Fiddler's creek. The water flow has been cut off and somewhat impounded upstream by CR 951 to the west, and development to the south including Marco Island Airport while the historic sheetflow from the north and northeast has been cut off completely.

There was a drastic change from marsh (M, MF, MS) to mangrove and buttonwood dominated ecosystems (CM, SM, WM, FM) totaling roughly 210 acres or 70% of the 300 acres mapped as marsh in 1940. This includes a marked and visible reduction in sawgrass marsh (MFGc) as well as conversion of salt marsh (MSG) to mangroves. This supports the hypothesis that some kind of interruption of freshwater sheetflow has occurred despite apparent impounding effects by development downstream. This marsh to mangrove shift is caused by the combined effect of sea level rise and altered freshwater hydroperiods (shortened). To a much lesser extent lowered fire frequency and less frequent intense freezes may also be impacting the area relative to 1940.

Twenty-nine acres of pine and palm woodlands (WSp, WSs), or about 50% of the acreage mapped changed to buttonwood or mangrove dominated vegetation types (CM, WM, FM). Most of these areas are isolated rises or ridges extending down from above Old Marco Road. Remaining pinelands have many visibly stressed (chlorotic) and dying pines. Salinity, as evidenced by the habitat shift to buttonwood, and lengthened hydroperiod seem to both be likely factors to the change in this low elevation area. The largest acreage of pineland to buttonwood change was likely pine with graminoid (WSpG) that was close to tidal influence. Without actual data on salinity and hydroperiod it will be difficult to know how best to restore these areas.

Development upstream may also be increasing nutrient inputs into the marsh system as observed while field surveying. Cattail and white vine (*Sarcostema clausa*) suggest high nutrient inputs from Fiddler's creek golf course. White vine thickets in buttonwood form marsh thickets that are nearly impenetrable. White vine seems worse next to the borrow lake which is where the nutrients are expected to be the highest. In our experience, the only other place we have observed such thickets mixed with buttonwood is on Sanibel Island in the mid 1990's while delineating wetlands just downstream of the sewage treatment plant with obvious nutrient inputs.



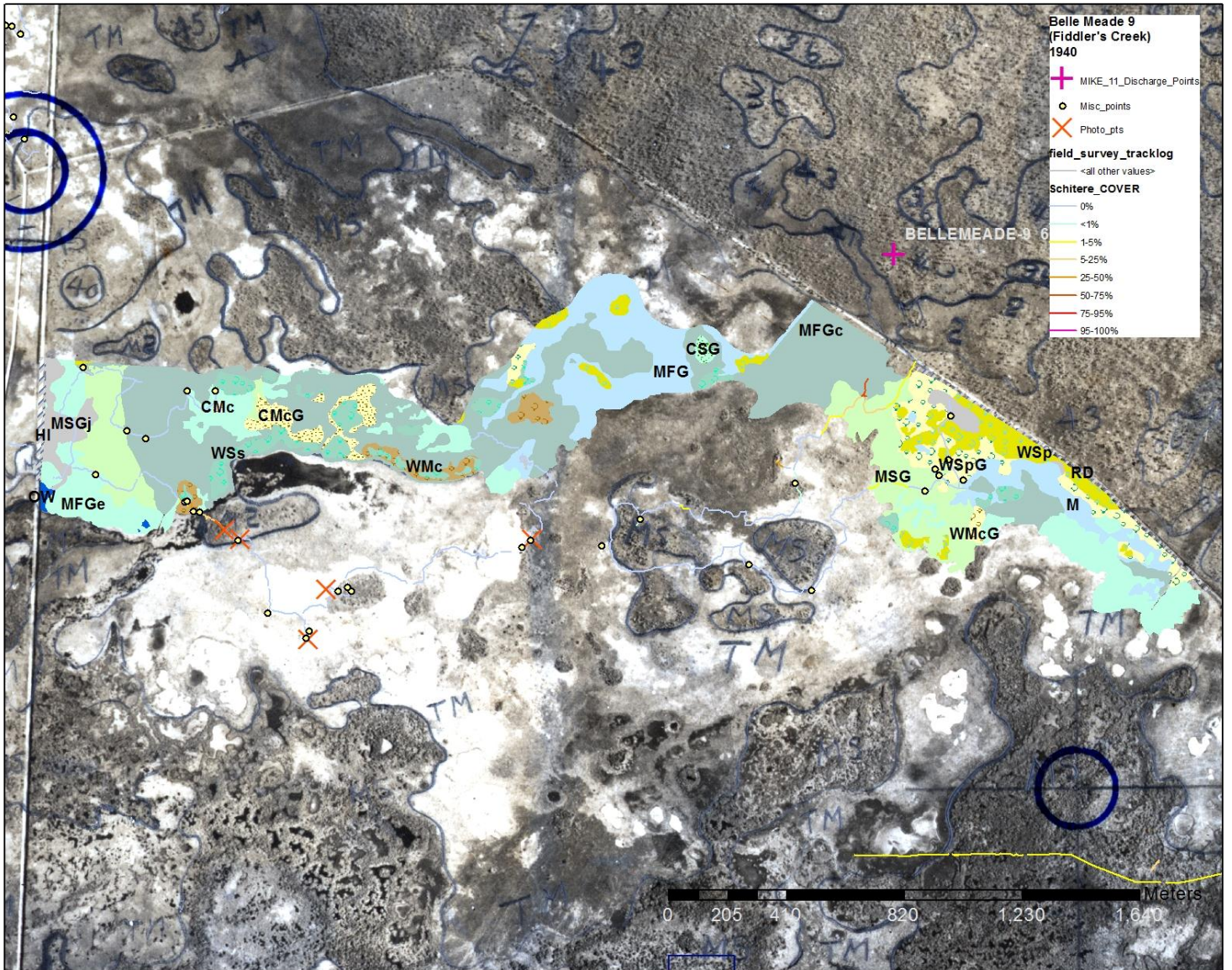


Figure 14. Digitized vegetation map for Belle Meade, Fiddlers Creek 1940.





Figure 15. Digitized vegetation map for Belle Meade, Fiddlers Creek 2010.



US 41 OUTFALL SWALE NO 2-00 (Auto Ranch)

Total area mapped 147 acres.

This site was difficult to access in the field due to high water, exotic infestation, and schedule constraints placed on us by private landowners whose land we crossed to access the woods.

This area had the highest relief of all the sites, ranging from very high scrubby flat woods to very low open marsh areas, with the transitions over very short distances. For example, one of the access points took us from waist to chest deep water to high and dry scrubby flat woods in just 30 meters of distance. The agricultural fields and the pumping of water for irrigation in the north of the site have also altered the hydrology.

Since 1940 the marsh changed (8 acres or 60% of total acreage mapped) to be more enclosed by willow and woody vegetation. Willow has encroached and taken over large areas of marsh since 1940, but encroachment has occurred as recently as 2001. This could be due to lengthened hydroperiod, more nutrients, and certainly fire suppression. Agricultural water pumping would also reduce the likelihood of fire in the marsh by keeping it wetter at the beginning of rainy season when natural lightning fires may start.

It is impossible to tell from aerials whether the extent of cattail has increased since 1940. Examining the aerials from 2001 to 2014 suggests the cover by cattail is increasing in areas remaining open marsh, however the dramatic increase in willow does somewhat complicate the analysis of this trend. Increased nutrient flows from farming upstream might be expected to increase cattail, as well as impoundments and other disturbance which may disrupt more stable marsh dominants such as sawgrass. Cattails are also somewhat opportunistic and thrive in higher nutrient environments, eventually outcompeting other vegetation. For restoration purposes nutrient inputs would need to be monitored given the agricultural activity adjacent to the site.

The changes in cypress swamp acreage are minimal, since 1940, relative to the other sites. Less than 1 acre or 1.5% of areas of cypress (WSt) changed to swamp hardwoods (WSh), and to swamp scrub (CS) and shrubland (SS). This is a small change relative to acreage of hardwood and cypress swamps (<2% mapped cypress swamp). We checked some WSh in the field without finding dead cypress; however, upon looking at our tracklog and the 1940 signature, it appears that we were near an area with cypress signature in 1940 but not in 2010 (the changed area discussed here). The areas we field checked somehow missed the previous cypress signatures that previously were clearly with cypress trees. It would be good to return to those areas in the field; however there is no easy way to get in there so it would be a costly, slow, tedious venture at best.

Approximately 4.5 acres of pine lowland (WSp) or 30% of areas mapped as pine lowland shifted to palm dominated (WSs, FHa) habitat. This transformation suggests changes from either hydroperiod lengthening due to impounding by Old Marco road, pumping upstream, and/or from sea level rise. In addition, increases in ground water salinities might explain the shift (swamp hardwoods, cabbage palm and wax myrtle dominated ecosystems persist in areas of encroaching and surrounding mangroves and buttonwood whereas pineland does not). It should be noted the shift is not due to fire, which can kill pines but not palms/wax myrtle, as these are long fire suppressed areas and are slivers along the ecotone to marsh areas. The areas mapped with this change are close to the tidal influence (scrub red and white mangroves in deep part of adjacent marsh) which suggests tidal influence. Sea level rise can



actually increase freshwater stage levels, and potentially also lengthen hydroperiod, where fresh water stacks up against rising tides without adding salinity (Stabenau et al. 2011). Additionally, agricultural pumping at the beginning and end of the dry season when farmers pump excess water in to this area could artificially lengthen the hydroperiod.

There are some smaller areas mapped as marsh in 1940 which changed to WSpG (pine lowland, graminoid) in 2010, which would suggest shortened hydroperiod. These results again illustrate the complexities with altered hydrology on a small scale, but it could also indicate that no pine trees grew at those small locations in 1940 due to burning and clearing (pine densities all around are lower in 1940). These areas are close to human impacted (HI) areas so there may also have been direct impacts to canopy prior to 1940 aeriels.

One and half acres mapped as Marsh in 1940 changed to Buttonwood/Mangrove areas by 2010. Although the signature in 1940 is potentially freshwater shrub, it was difficult to ascertain if there were small patches of mangroves in 1940. These changes can be caused by the combined effects of sea level rise and altered hydrology, although impounding seems to have limited shortening of the hydroperiod compared to other sites. To a much lesser extent lowered fire frequency and less frequent intense freezes may also be impacting the areas relative to 1940. Because of the difficulty in determining the mangrove extent in 1940 on this complex site with abundant woody vegetation in 1940 (dark signatures), it is important to further tighten up their current extents to better establish trends in the future with projected sea level rise.



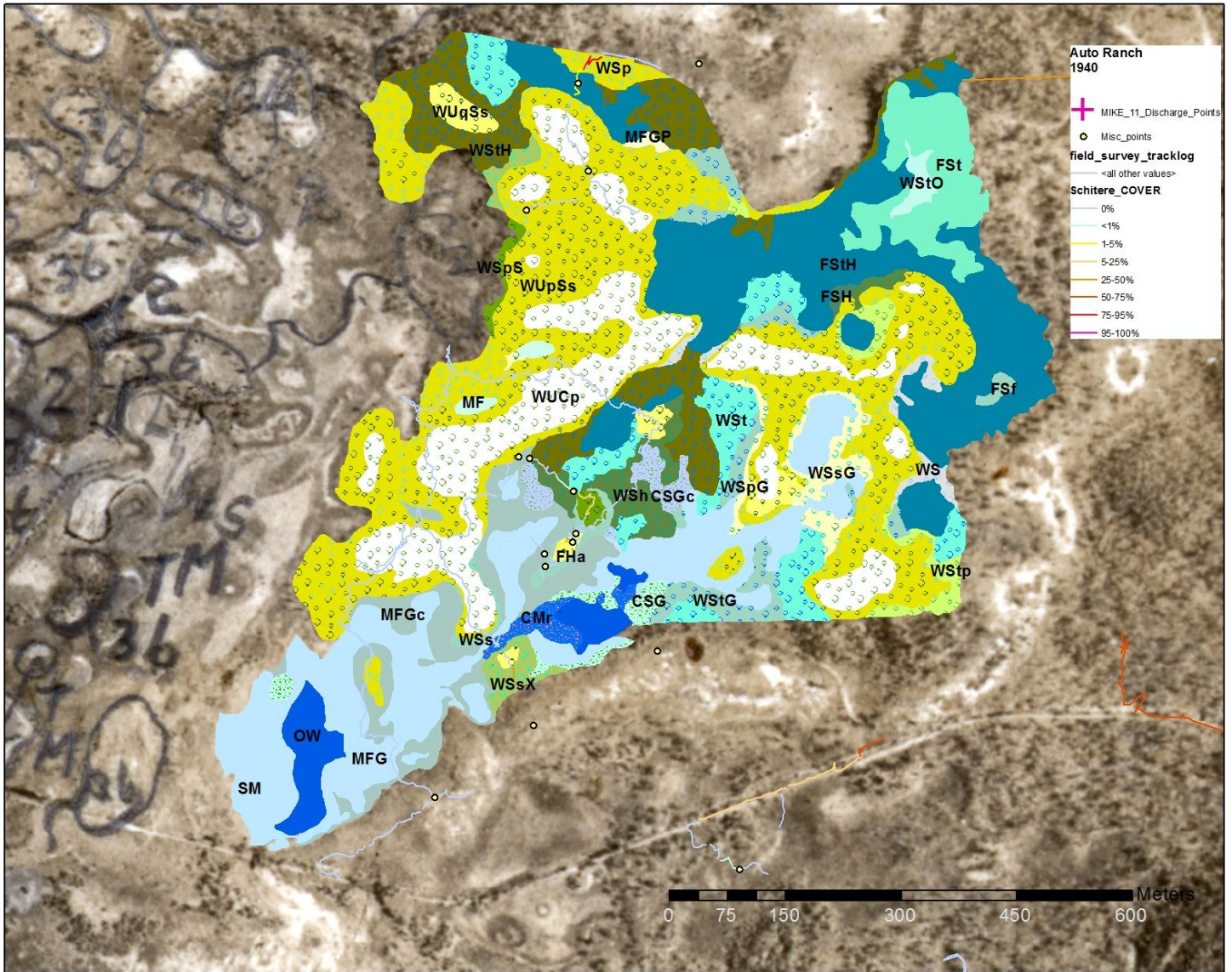


Figure 16. Digitized vegetation map for autoranch 1940.



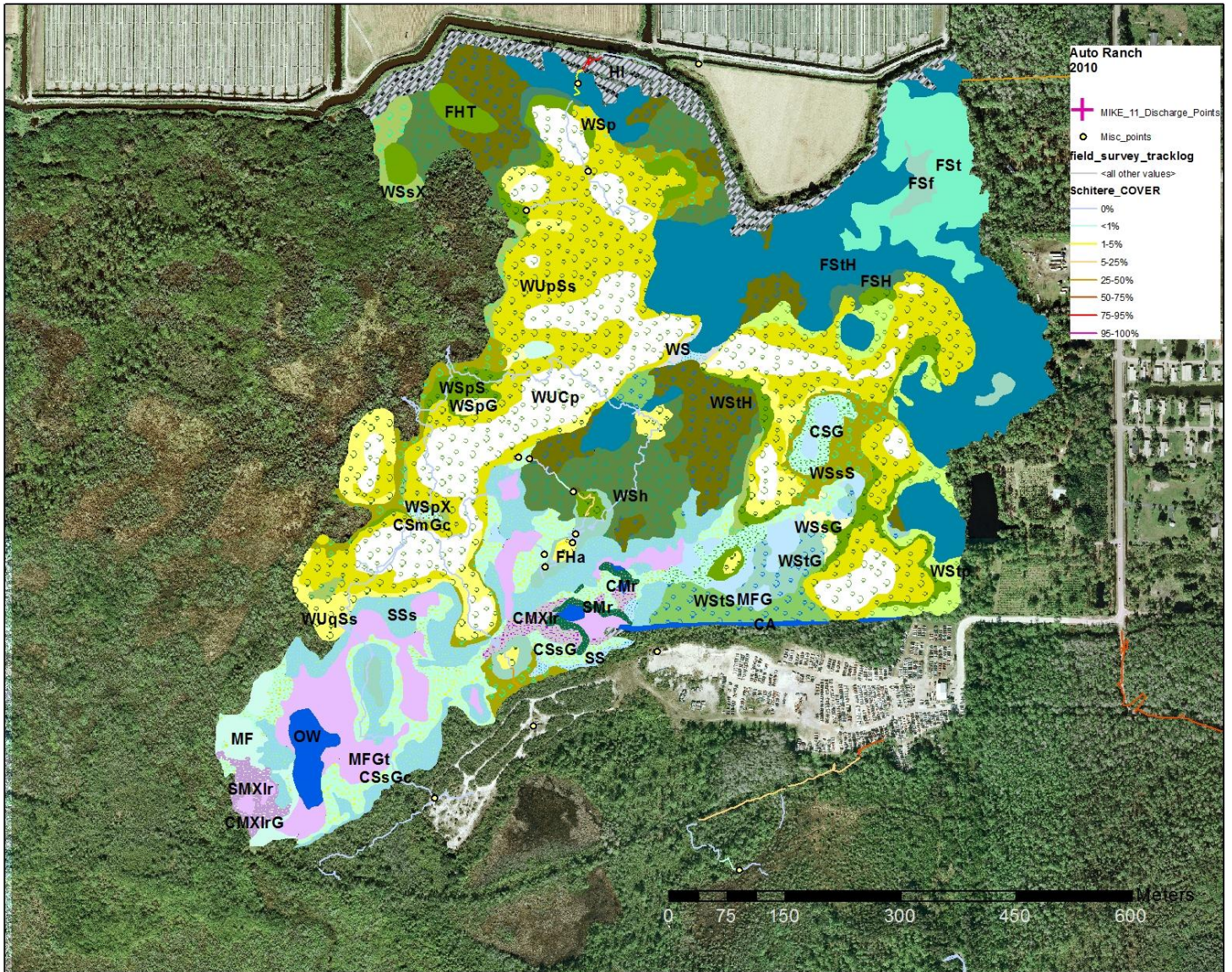


Figure 17. Digitized vegetation map for autoranch 2010.



Bridge 37. Collier-Seminole State Park, South Old Marco Road area

846 acres were mapped.

The mapped area was larger than initially planned due to the complexities of the site. The area is bounded on the northeast by U.S. 41 (Tamiami trail built in 1920's) and to the south by C.R. 92, with the Old Marco Road (built early 1900's), the flow into and out of the site has been severely altered. A large agricultural field was already established by the 1940's. In the 1950's a north-south canal was also excavated in a natural slough on the east side of the site further draining the area. Finally the northwest area consists of highly disturbed areas associated with a rock quarry (to the West off-site) and active agricultural fields (just north of the site) which likely increased nutrient loads to what is left of the sheet flow over the western half of the site.

The hydrological effect of all of these human impacts likely varies within this site, depending on distance from the canals/ditches, spoil and impounding features, agricultural fields, and tidal influence. For instance, areas along Old Marco Road are likely cut off from freshwater inputs from the north and flow is concentrated to just a few culvert crossings creating different hydrological regimes along the old road feature. Despite all of the hydrological disturbance, some of the natural communities are in great shape with very high plant diversity that have been maintained by prescribed burning. Proximity to the surrounding roads further complicates things, with the downstream connection to tidal areas also changed by C.R. 92 making it impossible to make blanket statements about the entire site, except that it has been severely altered.

The biggest change since 1940 was along the southern and southwestern portion of the site with almost 50% of the 174 acres of marsh (M, MF, MS) mapped in 1940 changing to mangrove or buttonwood dominated vegetation types (CM,SM,WM,FM). No doubt the ditch along C.R. 92 and freshwater flow alterations upstream influenced the shift, but sea level rise brought tidal influence further into the marshes as well. With no hydrological restoration, sea level rise will continue to shift mangrove and buttonwood dominated communities inland from the southern and southwestern portion of the site, as well as up the canals themselves both on site as well as north of the site along U.S. 41.

In the areas where the cypress strands ended in 1940, grading into hardwood swamps, freshwater shrub wetlands, and eventually fresh and brackish marshes, drastic changes occurred. Approximately 15 acres of hardwood and cypress swamp (WS, FS) changed to buttonwood and mangrove dominated communities (CM,SM,WM) or to large Brazilian pepper thickets with scattered cabbage palms (primarily mapped as WSsS). This is roughly 8.3% of the freshwater swamp (FS,WS) that existed in 1940, and with all of the change concentrated at the ends of the strands.

One fixed point 360 photograph location was established where shrub red mangroves (SMr) reached former cypress swamp with old trunks and knees of cypress in the photo with prop roots of red mangrove. The only other site with such extreme change was the Lely Main Canal site. Other photo point sites were also established in former cypress areas now mapped as wetland hardwood woodland (WSh)

Cypress and hardwood swamps (FS, WS) (13 acres) shifted primarily to cabbage palm woodland (WSs) along the edges of the strands. Roughly 25 acres of cypress swamp changed to mixed cypress



and pine WStp. Both of these shifts suggest shortened hydroperiods. Dead cypress was found lying on the ground in some of these areas.

Additionally, 50 acres appear to have changed from a mixture of pine and cypress (WStp) in 1940 to pineland (WSp); however, more groundtruthing is needed to verify if the cypress is indeed gone, as the canopy of pine and subcanopy of shrubs is much more dense than in 1940 and may be obscuring the view of cypress. A shortened hydroperiod could cause the loss of cypress. Much of this area is possibly also influenced by agricultural activities to the north and the long term changes in the timing and severity of fires may be resulting in a denser canopy (Maulik Patel, personal communication).

Twenty-eight acres of pine and palm woodlands (WSp, WSs) in 1940 changed to mangrove or buttonwood dominated communities (CM, SM, WM, FM). This is about 12% of the total pine and palm woodlands in 1940. Nearly all of this change is a shift to buttonwood woodland (WMc) with less than an acre changing to mixed scrub mangrove (CMX) and mixed red and white mangrove shrubland (SMXlr). These changes occurred on the west side of the mapped area which has nearly level topography and low lying pinelands. They have likely become too saline (based on halophytic vegetation amongst dead pineland species). The ditching and canals along C.R. 92 may allow tidal water to reach them easier from the southwest corner of the mapped area, and drain freshwater out quicker. Sea level rise obviously would increase the tidal flow and salinities and explain much of the shift to buttonwood. The shift will likely continue, as is evidenced by stressed and chlorotic, dying pines observed in the area. This shift is similar to the marsh changes in similar areas with primarily buttonwood encroachment.

Similarly, 7 acres of pine lowland (WSp) shifted to palm woodland (WSs) or freshwater shrub dominated areas (CS, SS) since 1940. These areas are primarily near the shifts to buttonwood and may in fact be due to increasing salinities as this phenomena of pines dying before palms and shrubs are established is observed throughout RBNERR. Otherwise, the shift could suggest some other change such as lengthened hydroperiod or past fire event not evident anymore.



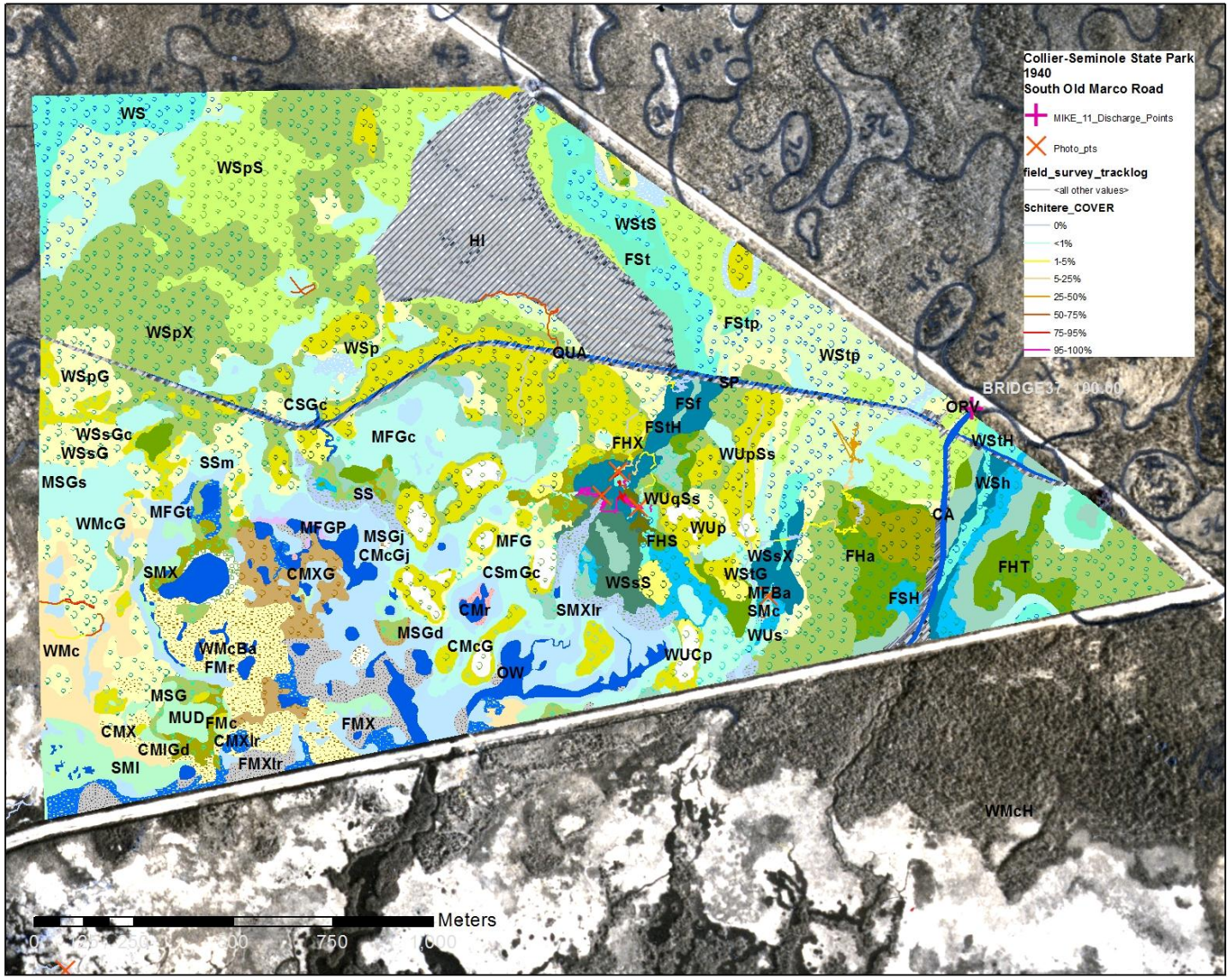


Figure 18. Digitized vegetation map Bridge 37. Collier-Seminole State Park, South Old Marco Road area 2010.



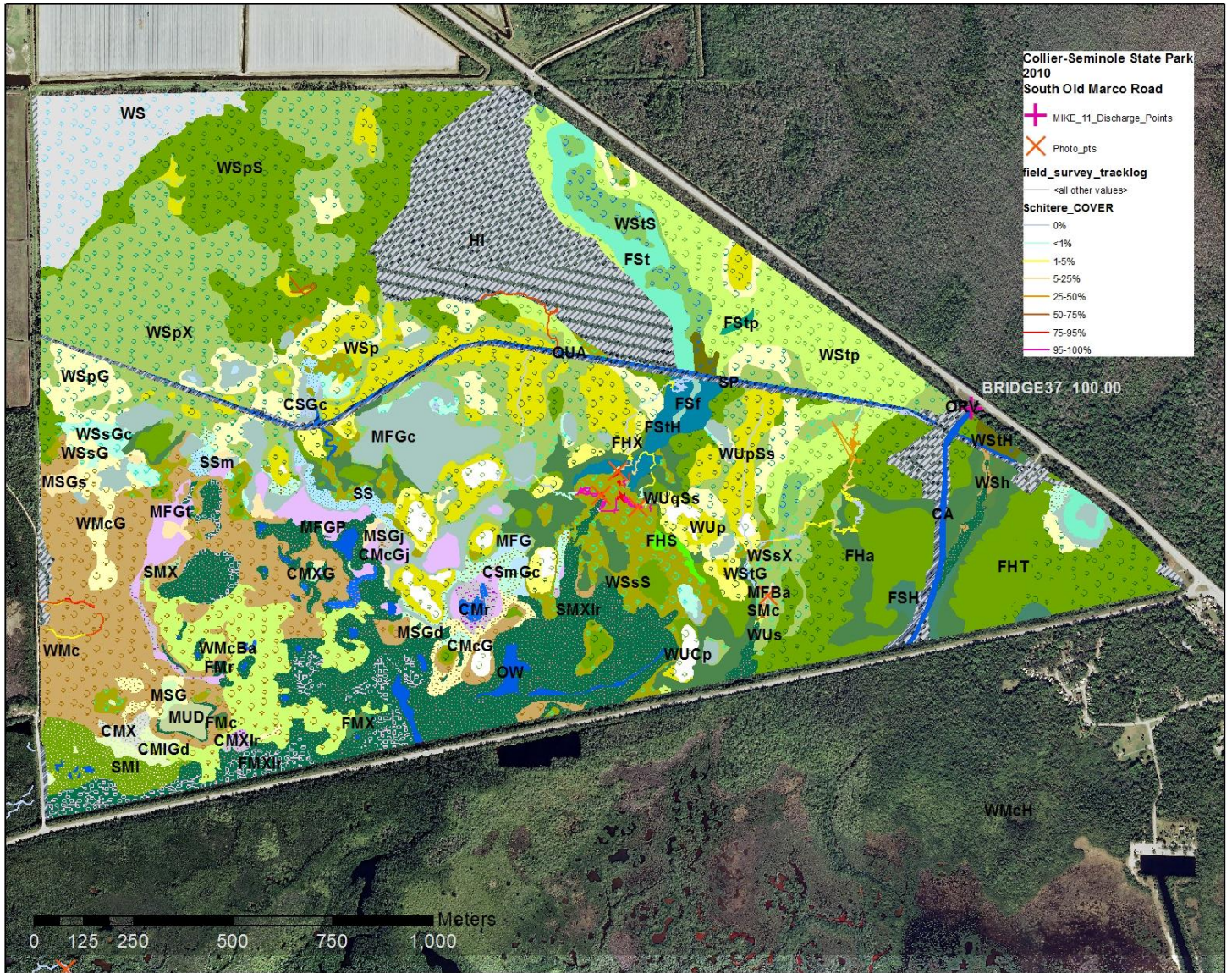


Figure 19. Digitized vegetation map for Bridge 37. Collier-Seminole State Park, South Old Marco Road area 2010.



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Appendix

Table 1 List of Vegetation Codes Utilized in Areas Mapped

Class_ID	Name
FM	Mangrove Forest
FMc	Buttonwood Forest
FMI	White Mangrove Forest
FMr	Red Mangrove Forest
FMX	Mixed Mangrove Forest
FMXcl	Buttonwood-White Mangrove Forest
FMXcr	Buttonwood-Red Mangrove Forest
FMXlr	White Mangrove-Red Mangrove Forest
FSH	Hardwood Swamp Forest
FSt	Cypress Forest
FStH	Cypress-Hardwood Forest
FStp	Cypress-Pine Forest
FHa	Cabbage Palm Hammock
FHS	Tropical Hardwood Hammock
FHT	Temperate Hardwood Hammock
FHX	Xeric Hammock
FSf	Pop Ash Forest
WM	Mangrove Woodland
WMc	Buttonwood Woodland
WMcG	Buttonwood Woodland-Graminoid
WMcBa	Buttonwood Woodland-Leather Fern
WMcH	Buttonwood Woodland w/hardwoods
WMaG	Black Mangrove-Graminoid
WMIaBa	White Mangrove Woodland-Leather Fern
WMX	Mixed Mangrove Woodland
WMXacBa	Mixed Mangrove Woodland Conoec, Avicerm and Leather Fern
WMXclBa	Mixed Buttonwood and White Mangrove Woodland-Leather Fern
WS	Swamp Woodland
WSp	Pine Lowland
WSpG	Pine Lowland-Graminoid
WSpS	Pine Lowland-Shrub
WSpX	Pine Lowland-Mixed
WSt	Cypress Woodland
WStG	Cypress Woodland-Graminoid
WStO	Cypress Woodland-Open Marsh
WStS	Cypress Woodland-Shrub



WStp	Cypress-Pine Woodland
WStH	Cypress-Hardwood Woodland
WSs	Cabbage Palm Lowland
WSsG	Cabbage Palm Lowland-Graminoid
WSsGc	Cabbage Palm Lowland-Sawgrass
WSsS	Cabbage Palm Lowland-Shrub
WSsX	Cabbage Palm Lowland-Mixed
WSh	Hardwood Swamp Woodland
WUp	Pine Upland
WUpS	Pine Upland-Shrub
WUpSs	Pine Upland-Saw Palmetto
WUs	Cabbage Palm Upland
WUqSs	Live Oak Woodland with Saw Palmetto
WUCp	Scrubby Flatwoods
S	Shrubland
SM	Mangrove Shrubland
SMc	Buttonwood Shrubland
SMl	White Mangrove Shrubland
SMr	Red Mangrove Shrubland
SMX	Mixed Mangrove Shrubland
SMXcl	Buttonwood-White Mangrove Shrubland
SMXcr	Buttonwood-Red Mangrove Shrubland
SMXlr	White Mangrove-Red Mangrove Shrubland
SS	Swamp Shrubland
SSa	Pond Apple Shrubland
SSm	Wax Myrtle Shrubland
SSs	Willow Shrubland
CM	Mangrove Scrub
CMG	Mangrove Scrub-Graminoid
CMaG	Black Mangrove Scrub-Graminoid
CMc	Buttonwood Scrub
CMcG	Buttonwood Scrub-Graminoid
CMcGc	Buttonwood Scrub-Sawgrass
CMcGd	Buttonwood Scrub-Saltgrass
CMcGj	Buttonwood Scrub-Black Rush
CMcGs	Buttonwood Scrub-Cordgrass
CMcGt	Buttonwood Scrub-Cattail
CMl	White Mangrove Scrub
CMlG	White Mangrove Scrub-Graminoid
CMlGd	White Mangrove Scrub-Saltgrass
CMlGj	White Mangrove Scrub-Black Rush
CMlGs	White Mangrove Scrub-Cordgrass



CMIGt	White Mangrove Scrub-Cattail
CMr	Red Mangrove Scrub
CMrGe	Red Mangrove Scrub-Spikerush
CMrGt	Red Mangrove Scrub-Cattail
CMX	Mixed Mangrove Scrub
CMXG	Mixed Mangrove Scrub-Graminoid
CMXGj	Mixed Mangrove Scrub-Black Rush
CMXarGe	Black Mangrove-Red Mangrove Scrub-Spikerush
CMXclG	Buttonwood-White Mangrove Scrub-Graminoid
CMXclGs	Buttonwood-White Mangrove Scrub-Cordgrass
CMXlr	White Mangrove-Red Mangrove Scrub
CMXlrG	White Mangrove-Red Mangrove Scrub-Graminoid
CS	Swamp Scrub
CSG	Swamp Scrub-Graminoid Marsh
CSGc	Swamp Scrub-Sawgrass
CSmG	Wax Myrtle Scrub-Graminoid Marsh
CSmGc	Wax Myrtle Scrub-Sawgrass
CSsG	Willow Scrub-Graminoid Marsh
CSsGc	Willow Scrub-Sawgrass
CSsGt	Willow Scrub-Cattail
CStG	Cypress Scrub-Graminoid Marsh
M	Marsh
MSG	Graminoid Salt Marsh
MSGd	Saltgrass
MSGj	Black Rush
MSGs	Cordgrass
MF	Freshwater Marsh
MFBa	Leather Fern
MFG	Graminoid Freshwater Marsh
MFGc	Sawgrass
MFGe	Spikerush
MFGt	Cattail
MFGtS	Cattail Sparse
MFGP	Graminoid Freshwater Prairie
HI	Human Impacted
CA	Canal
ORV	ORV Trail
QUA	Quarry
RD	Road
SP	Spoil
MUD	Mud
OW	Open Water



Table 2. Lely Main Canal. Changes in vegetation from 1940 to 2010 and associated acres of change

1940		2010		Change
Class ID	Name	Class ID	Name	Acres
FSt	Cypress Forest	FMXlr	White Mangrove-Red Mangrove Forest	3.130
FSt	Cypress Forest	FSt	Cypress Forest	2.462
FSt	Cypress Forest	FHS	Tropical Hardwood Hammock	0.037
FSt	Cypress Forest	WMXclBa	Mixed Buttonwood and White Mangrove Woodland-Leather Fern	0.217
FSt	Cypress Forest	HI	Human Impacted	0.373
FHa	Cabbage Palm Hammock	FHS	Tropical Hardwood Hammock	0.099
FHS	Tropical Hardwood Hammock	FHS	Tropical Hardwood Hammock	0.555
FHS	Tropical Hardwood Hammock	HI	Human Impacted	0.081
WM	Mangrove Woodland	FMX	Mixed Mangrove Forest	1.058
WMc	Buttonwood Woodland	FMX	Mixed Mangrove Forest	2.161
WMc	Buttonwood Woodland	FMXlr	White Mangrove-Red Mangrove Forest	0.599
WMc	Buttonwood Woodland	WMcBa	Buttonwood Woodland-Leather Fern	0.886
WMc	Buttonwood Woodland	WMaSMX	Black Mangrove Woodland w/ mixed shrub mangrove	3.278
WMcG	Buttonwood Woodland-Graminoid	WMaSMX	Black Mangrove Woodland w/ mixed shrub mangrove	0.790
WMcG	Buttonwood Woodland-Graminoid	WMXalSMXlr	Mixed Black and White Mangrove Woodland with Mixed White and Red Mangrove Shrubland	0.238
WMcG	Buttonwood Woodland-Graminoid	CMXGj	Mixed Mangrove Scrub-Black Rush	0.107
WMaSMX	Black Mangrove Woodland w/ mixed shrub mangrove	FMXlr	White Mangrove-Red Mangrove Forest	8.159
WMaSMX	Black Mangrove Woodland w/ mixed shrub mangrove	WMaSMX	Black Mangrove Woodland w/ mixed shrub mangrove	3.131
WMaSMX	Black Mangrove Woodland w/ mixed shrub mangrove	WMXalSMXlr	Mixed Black and White Mangrove Woodland with Mixed White and Red Mangrove Shrubland	0.247
WMaSMX	Black Mangrove Woodland w/ mixed shrub mangrove	CA	Canal	0.351
WMaSMX	Black Mangrove Woodland w/ mixed shrub mangrove	ORV	ORV Trail	0.030
WMaSMX	Black Mangrove Woodland w/ mixed shrub mangrove	SP	Spoil	0.129
WMaSMX	Black Mangrove Woodland w/ mixed shrub mangrove	MUD	Mud	0.018
WSp	Pine Lowland	FMX	Mixed Mangrove Forest	0.071
WSp	Pine Lowland	WMc	Buttonwood Woodland	0.060



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
WSp	Pine Lowland	WMcG	Buttonwood Woodland-Graminoid	0.610
WSp	Pine Lowland	WMcBa	Buttonwood Woodland-Leather Fern	0.687
WSp	Pine Lowland	WMlBa	White Mangrove Woodland-Leather Fern	0.111
WSp	Pine Lowland	WMXclBa	Mixed Buttonwood and White Mangrove Woodland-Leather Fern	0.812
WSp	Pine Lowland	WSpS	Pine Lowland-Shrub	21.064
WSp	Pine Lowland	WSpX	Pine Lowland-Mixed	14.696
WSp	Pine Lowland	WSsS	Cabbage Palm Lowland-Shrub	2.517
WSp	Pine Lowland	WSsX	Cabbage Palm Lowland-Mixed	2.047
WSp	Pine Lowland	CMAgj	Black Mangrove Scrub-Black Rush	1.910
WSp	Pine Lowland	CMcG	Buttonwood Scrub-Graminoid	0.997
WSp	Pine Lowland	CMcGj	Buttonwood Scrub-Black Rush	3.620
WSp	Pine Lowland	CMX	Mixed Mangrove Scrub	1.306
WSp	Pine Lowland	CMXGj	Mixed Mangrove Scrub-Black Rush	0.314
WSp	Pine Lowland	CMXclGj	Buttonwood-White Mangrove Scrub-Black Rush	4.574
WSp	Pine Lowland	CSmG	Wax Myrtle Scrub-Graminoid Marsh	0.256
WSp	Pine Lowland	CSmGc	Wax Myrtle Scrub-Sawgrass	0.013
WSp	Pine Lowland	HI	Human Impacted	1.575
WSp	Pine Lowland	ORV	ORV Trail	0.038
WSpG	Pine Lowland-Graminoid	WMcBa	Buttonwood Woodland-Leather Fern	0.393
WSpG	Pine Lowland-Graminoid	WMXclBa	Mixed Buttonwood and White Mangrove Woodland-Leather Fern	0.131
WSpG	Pine Lowland-Graminoid	WSpG	Pine Lowland-Graminoid	6.016
WSpG	Pine Lowland-Graminoid	WSpS	Pine Lowland-Shrub	0.340
WSpG	Pine Lowland-Graminoid	WSpX	Pine Lowland-Mixed	2.482
WSpG	Pine Lowland-Graminoid	WSsS	Cabbage Palm Lowland-Shrub	1.931
WSpG	Pine Lowland-Graminoid	WSsX	Cabbage Palm Lowland-Mixed	1.086
WSpG	Pine Lowland-Graminoid	CMAgj	Black Mangrove Scrub-Black Rush	0.371
WSpG	Pine Lowland-Graminoid	CMcG	Buttonwood Scrub-Graminoid	2.665
WSpG	Pine Lowland-Graminoid	CMcGj	Buttonwood Scrub-Black Rush	0.190
WSpG	Pine Lowland-Graminoid	CMXal	Black Mangrove-White Mangrove Scrub	0.320
WSpG	Pine Lowland-Graminoid	CMXclG	Buttonwood-White Mangrove Scrub-Graminoid	0.067
WSpG	Pine Lowland-Graminoid	CMXclGj	Buttonwood-White Mangrove Scrub-Black Rush	2.175
WSpG	Pine Lowland-Graminoid	CSmG	Wax Myrtle Scrub-Graminoid Marsh	0.797
WSpG	Pine Lowland-Graminoid	SP	Spoil	0.120
WSpS	Pine Lowland-Shrub	FMXlr	White Mangrove-Red Mangrove Forest	0.598
WSpS	Pine Lowland-Shrub	WSpS	Pine Lowland-Shrub	0.202



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
WSpX	Pine Lowland-Mixed	WMcG	Buttonwood Woodland-Graminoid	0.279
WSpX	Pine Lowland-Mixed	WSpS	Pine Lowland-Shrub	1.892
WSpX	Pine Lowland-Mixed	WSpX	Pine Lowland-Mixed	27.913
WSt	Cypress Woodland	FMXlr	White Mangrove-Red Mangrove Forest	3.151
WSt	Cypress Woodland	FStH	Cypress-Hardwood Forest	0.437
WSt	Cypress Woodland	FHa	Cabbage Palm Hammock	0.549
WSt	Cypress Woodland	FHS	Tropical Hardwood Hammock	0.042
WSt	Cypress Woodland	WSpS	Pine Lowland-Shrub	0.109
WSt	Cypress Woodland	WStS	Cypress Woodland-Shrub	0.236
WSt	Cypress Woodland	WStp	Cypress-Pine Woodland	0.358
WSt	Cypress Woodland	HI	Human Impacted	1.268
WStG	Cypress Woodland-Graminoid	WSpG	Pine Lowland-Graminoid	0.306
WStG	Cypress Woodland-Graminoid	WStS	Cypress Woodland-Shrub	0.103
WStG	Cypress Woodland-Graminoid	WStp	Cypress-Pine Woodland	1.566
WSs	Cabbage Palm Lowland	FMX	Mixed Mangrove Forest	0.048
WSs	Cabbage Palm Lowland	WMc	Buttonwood Woodland	0.026
WSs	Cabbage Palm Lowland	WMcBa	Buttonwood Woodland-Leather Fern	0.853
WSs	Cabbage Palm Lowland	WMaSMX	Black Mangrove Woodland w/ mixed shrub mangrove	0.151
WSs	Cabbage Palm Lowland	WMXclBa	Mixed Buttonwood and White Mangrove Woodland-Leather Fern	0.147
WSs	Cabbage Palm Lowland	WSsS	Cabbage Palm Lowland-Shrub	0.040
WSsG	Cabbage Palm Lowland-Graminoid	FMXlr	White Mangrove-Red Mangrove Forest	0.067
WSsG	Cabbage Palm Lowland-Graminoid	WSsS	Cabbage Palm Lowland-Shrub	0.104
WSsGc	Cabbage Palm Lowland-Sawgrass	FMX	Mixed Mangrove Forest	0.448
WSsGc	Cabbage Palm Lowland-Sawgrass	WMlBa	White Mangrove Woodland-Leather Fern	0.274
WSsGc	Cabbage Palm Lowland-Sawgrass	WSsX	Cabbage Palm Lowland-Mixed	0.863
WSsGc	Cabbage Palm Lowland-Sawgrass	CMcG	Buttonwood Scrub-Graminoid	0.415
WSsGc	Cabbage Palm Lowland-Sawgrass	HI	Human Impacted	0.035
WSsS	Cabbage Palm Lowland-Shrub	FMX	Mixed Mangrove Forest	0.302
WSsS	Cabbage Palm Lowland-Shrub	FHS	Tropical Hardwood Hammock	0.358
WSsX	Cabbage Palm Lowland-Mixed	FMXlr	White Mangrove-Red Mangrove Forest	1.325
WSsX	Cabbage Palm Lowland-Mixed	WMc	Buttonwood Woodland	0.290
WSsX	Cabbage Palm Lowland-Mixed	WMXclBa	Mixed Buttonwood and White Mangrove Woodland-Leather Fern	0.276
WSsX	Cabbage Palm Lowland-Mixed	WSsS	Cabbage Palm Lowland-Shrub	1.765
WSsX	Cabbage Palm Lowland-Mixed	SMc	Buttonwood Shrubland	0.071
WSsX	Cabbage Palm Lowland-Mixed	CMXal	Black Mangrove-White Mangrove Scrub	0.148



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
WSsX	Cabbage Palm Lowland-Mixed	CSmGc	Wax Myrtle Scrub-Sawgrass	0.142
WSsX	Cabbage Palm Lowland-Mixed	HI	Human Impacted	0.059
WSsX	Cabbage Palm Lowland-Mixed	CA	Canal	0.099
WSsX	Cabbage Palm Lowland-Mixed	SP	Spoil	0.067
WUpSs	Pine Upland-Saw Palmetto	FHT	Temperate Hardwood Hammock	0.819
WUpSs	Pine Upland-Saw Palmetto	WMcH	Buttonwood Woodland w/hardwoods	0.062
WUpSs	Pine Upland-Saw Palmetto	WSpS	Pine Lowland-Shrub	0.270
WUpSs	Pine Upland-Saw Palmetto	WSpX	Pine Lowland-Mixed	0.050
WUpSs	Pine Upland-Saw Palmetto	WUpSs	Pine Upland-Saw Palmetto	38.058
WUCp	Scrubby Flatwoods	WUCp	Scrubby Flatwoods	7.167
SMr	Red Mangrove Shrubland	FMXlr	White Mangrove-Red Mangrove Forest	0.733
SMr	Red Mangrove Shrubland	WMaSMr	Black Mangrove Woodland w/shrub red mangrove	0.933
SS	Swamp Shrubland	SS	Swamp Shrubland	0.525
CM	Mangrove Scrub	FMX	Mixed Mangrove Forest	0.036
CM	Mangrove Scrub	FMXlr	White Mangrove-Red Mangrove Forest	0.274
CM	Mangrove Scrub	CA	Canal	0.077
CMc	Buttonwood Scrub	WMcSMr	Buttonwood Woodland w/shrub red mangrove	0.750
CMc	Buttonwood Scrub	WMaSMX	Black Mangrove Woodland w/ mixed shrub mangrove	0.328
CMcG	Buttonwood Scrub-Graminoid	FMX	Mixed Mangrove Forest	0.053
CMcG	Buttonwood Scrub-Graminoid	WMc	Buttonwood Woodland	0.072
CMcG	Buttonwood Scrub-Graminoid	WMaG	Black Mangrove-Graminoid	1.508
CMcG	Buttonwood Scrub-Graminoid	WMaSMX	Black Mangrove Woodland w/ mixed shrub mangrove	0.289
CMcG	Buttonwood Scrub-Graminoid	SMXcr	Buttonwood-Red Mangrove Shrubland	0.051
CMcG	Buttonwood Scrub-Graminoid	CMaGj	Black Mangrove Scrub-Black Rush	0.806
CMcG	Buttonwood Scrub-Graminoid	CMX	Mixed Mangrove Scrub	0.554
CMcG	Buttonwood Scrub-Graminoid	CMXGj	Mixed Mangrove Scrub-Black Rush	0.289
CMcG	Buttonwood Scrub-Graminoid	CMXalGj	Black Mangrove-White Mangrove Scrub-Black Rush	0.878
CMcG	Buttonwood Scrub-Graminoid	MSGj	Black Rush	0.815
CMcG	Buttonwood Scrub-Graminoid	MFGe	Spikerush	0.030
CMcG	Buttonwood Scrub-Graminoid	ORV	ORV Trail	0.095
CMcG	Buttonwood Scrub-Graminoid	OW	Open Water	0.023
CMcGj	Buttonwood Scrub-Black Rush	WMaSMX	Black Mangrove Woodland w/ mixed shrub mangrove	5.057
CMcGj	Buttonwood Scrub-Black Rush	WMXclBa	Mixed Buttonwood and White Mangrove Woodland-Leather Fern	0.081
CMcGj	Buttonwood Scrub-Black Rush	SMX	Mixed Mangrove Shrubland	0.464



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
CMcGj	Buttonwood Scrub-Black Rush	CMaGj	Black Mangrove Scrub-Black Rush	4.887
CMcGj	Buttonwood Scrub-Black Rush	CMcGj	Buttonwood Scrub-Black Rush	0.625
CMcGj	Buttonwood Scrub-Black Rush	CMXGj	Mixed Mangrove Scrub-Black Rush	0.431
CMcGj	Buttonwood Scrub-Black Rush	CMXclG	Buttonwood-White Mangrove Scrub-Graminoid	0.106
CMcGj	Buttonwood Scrub-Black Rush	CA	Canal	0.096
CMcGj	Buttonwood Scrub-Black Rush	ORV	ORV Trail	0.052
CMcGj	Buttonwood Scrub-Black Rush	SP	Spoil	0.038
CS	Swamp Scrub	FMXlr	White Mangrove-Red Mangrove Forest	0.224
CS	Swamp Scrub	CMcG	Buttonwood Scrub-Graminoid	3.044
CS	Swamp Scrub	CSmG	Wax Myrtle Scrub-Graminoid Marsh	0.911
CS	Swamp Scrub	CSmGc	Wax Myrtle Scrub-Sawgrass	0.003
CS	Swamp Scrub	OW	Open Water	0.081
CSG	Swamp Scrub-Graminoid Marsh	WSsS	Cabbage Palm Lowland-Shrub	0.237
CSG	Swamp Scrub-Graminoid Marsh	HI	Human Impacted	0.168
CSmGc	Wax Myrtle Scrub-Sawgrass	WMcG	Buttonwood Woodland-Graminoid	0.895
CSmGc	Wax Myrtle Scrub-Sawgrass	CSmG	Wax Myrtle Scrub-Graminoid Marsh	1.940
M	Marsh	WMXclBa	Mixed Buttonwood and White Mangrove Woodland-Leather Fern	0.067
M	Marsh	CMXal	Black Mangrove-White Mangrove Scrub	0.231
M	Marsh	CMXclGj	Buttonwood-White Mangrove Scrub-Black Rush	0.061
M	Marsh	MSGs	Cordgrass	1.393
MSG	Graminoid Salt Marsh	CMXlrGt	Mixed Red and White Mangrove Scrub w/cattail	0.340
MSG	Graminoid Salt Marsh	FMa	Black Mangrove Forest	0.073
MSG	Graminoid Salt Marsh	FMr	Red Mangrove Forest	0.069
MSG	Graminoid Salt Marsh	FMX	Mixed Mangrove Forest	1.518
MSG	Graminoid Salt Marsh	FMXlr	White Mangrove-Red Mangrove Forest	0.908
MSG	Graminoid Salt Marsh	WMcBa	Buttonwood Woodland-Leather Fern	1.172
MSG	Graminoid Salt Marsh	WMcSMr	Buttonwood Woodland w/shrub red mangrove	3.083
MSG	Graminoid Salt Marsh	WMaSMl	Black Mangrove Woodland w/shrub white mangrove	1.990
MSG	Graminoid Salt Marsh	WMaSMr	Black Mangrove Woodland w/shrub red mangrove	2.246
MSG	Graminoid Salt Marsh	WMaSMX	Black Mangrove Woodland w/ mixed shrub mangrove	2.241
MSG	Graminoid Salt Marsh	WMXclBa	Mixed Buttonwood and White Mangrove Woodland-Leather Fern	0.062
MSG	Graminoid Salt Marsh	SMa	Black Mangrove Shrubland	0.009
MSG	Graminoid Salt Marsh	SMI	White Mangrove Shrubland	1.511



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
MSG	Graminoid Salt Marsh	SMr	Red Mangrove Shrubland	0.265
MSG	Graminoid Salt Marsh	SMX	Mixed Mangrove Shrubland	6.454
MSG	Graminoid Salt Marsh	SMXlr	White Mangrove-Red Mangrove Shrubland	2.817
MSG	Graminoid Salt Marsh	CMaGj	Black Mangrove Scrub-Black Rush	0.300
MSG	Graminoid Salt Marsh	CMI	White Mangrove Scrub	0.016
MSG	Graminoid Salt Marsh	CMr	Red Mangrove Scrub	0.089
MSG	Graminoid Salt Marsh	CMXGj	Mixed Mangrove Scrub-Black Rush	2.280
MSG	Graminoid Salt Marsh	CMXclGj	Buttonwood-White Mangrove Scrub-Black Rush	0.595
MSG	Graminoid Salt Marsh	CMXlr	White Mangrove-Red Mangrove Scrub	0.269
MSG	Graminoid Salt Marsh	CMXlrG	White Mangrove-Red Mangrove Scrub-Graminoid	1.915
MSG	Graminoid Salt Marsh	HI	Human Impacted	0.689
MSG	Graminoid Salt Marsh	CA	Canal	0.377
MSG	Graminoid Salt Marsh	SP	Spoil	0.166
MSG	Graminoid Salt Marsh	MUD	Mud	0.156
MSG	Graminoid Salt Marsh	OW	Open Water	0.976
MSGj	Black Rush	FMI	White Mangrove Forest	0.374
MSGj	Black Rush	FMX	Mixed Mangrove Forest	4.540
MSGj	Black Rush	FMXlr	White Mangrove-Red Mangrove Forest	1.610
MSGj	Black Rush	WMcG	Buttonwood Woodland-Graminoid	0.264
MSGj	Black Rush	WMaSMI	Black Mangrove Woodland w/shrub white mangrove	0.182
MSGj	Black Rush	WMaSMr	Black Mangrove Woodland w/shrub red mangrove	0.997
MSGj	Black Rush	WMaSMX	Black Mangrove Woodland w/ mixed shrub mangrove	5.899
MSGj	Black Rush	SMI	White Mangrove Shrubland	0.287
MSGj	Black Rush	SMr	Red Mangrove Shrubland	0.130
MSGj	Black Rush	SMX	Mixed Mangrove Shrubland	2.092
MSGj	Black Rush	SMXal	Black Mangrove-White Mangrove Shrubland	0.268
MSGj	Black Rush	SMXlr	White Mangrove-Red Mangrove Shrubland	0.708
MSGj	Black Rush	CMaGj	Black Mangrove Scrub-Black Rush	0.083
MSGj	Black Rush	CMcGj	Buttonwood Scrub-Black Rush	0.824
MSGj	Black Rush	CMI	White Mangrove Scrub	0.087
MSGj	Black Rush	CMIGj	White Mangrove Scrub-Black Rush	0.463
MSGj	Black Rush	CMX	Mixed Mangrove Scrub	0.035
MSGj	Black Rush	CMXGj	Mixed Mangrove Scrub-Black Rush	0.519



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
MSGj	Black Rush	CMXal	Black Mangrove-White Mangrove Scrub	0.837
MSGj	Black Rush	CMXclGj	Buttonwood-White Mangrove Scrub-Black Rush	0.839
MSGj	Black Rush	MSGj	Black Rush	0.106
MSGj	Black Rush	HI	Human Impacted	0.045
MSGj	Black Rush	CA	Canal	0.542
MSGj	Black Rush	SP	Spoil	0.303
MSGj	Black Rush	MUD	Mud	0.244
MSGj	Black Rush	OW	Open Water	0.555
MSGs	Cordgrass	CMcG	Buttonwood Scrub-Graminoid	2.037
MSGs	Cordgrass	MSGs	Cordgrass	1.719
MF	Freshwater Marsh	FMX	Mixed Mangrove Forest	0.360
MF	Freshwater Marsh	FMXlr	White Mangrove-Red Mangrove Forest	17.864
MF	Freshwater Marsh	WMaSMX	Black Mangrove Woodland w/ mixed shrub mangrove	0.575
MF	Freshwater Marsh	CMIGj	White Mangrove Scrub-Black Rush	0.143
MF	Freshwater Marsh	HI	Human Impacted	0.307
MF	Freshwater Marsh	CA	Canal	0.831
MF	Freshwater Marsh	SP	Spoil	1.051
MF	Freshwater Marsh	OW	Open Water	0.766
MFG	Graminoid Freshwater Marsh	FMX	Mixed Mangrove Forest	0.024
MFG	Graminoid Freshwater Marsh	WMc	Buttonwood Woodland	0.168
MFG	Graminoid Freshwater Marsh	WMcG	Buttonwood Woodland-Graminoid	0.687
MFG	Graminoid Freshwater Marsh	WSpS	Pine Lowland-Shrub	0.353
MFG	Graminoid Freshwater Marsh	WSsS	Cabbage Palm Lowland-Shrub	0.632
MFG	Graminoid Freshwater Marsh	WSh	Hardwood Swamp Woodland	0.031
MFG	Graminoid Freshwater Marsh	SMr	Red Mangrove Shrubland	0.452
MFG	Graminoid Freshwater Marsh	SMXcr	Buttonwood-Red Mangrove Shrubland	0.317
MFG	Graminoid Freshwater Marsh	SMXlr	White Mangrove-Red Mangrove Shrubland	0.922
MFG	Graminoid Freshwater Marsh	SS	Swamp Shrubland	0.181
MFG	Graminoid Freshwater Marsh	CMcG	Buttonwood Scrub-Graminoid	7.069
MFG	Graminoid Freshwater Marsh	CMcGj	Buttonwood Scrub-Black Rush	0.614
MFG	Graminoid Freshwater Marsh	CMcGs	Buttonwood Scrub-Cordgrass	0.036
MFG	Graminoid Freshwater Marsh	CMrGt	Red Mangrove Scrub-Cattail	3.102
MFG	Graminoid Freshwater Marsh	CMXlr	White Mangrove-Red Mangrove Scrub	0.851
MFG	Graminoid Freshwater Marsh	CMXlrG	White Mangrove-Red Mangrove Scrub-Graminoid	1.939
MFG	Graminoid Freshwater Marsh	CSmG	Wax Myrtle Scrub-Graminoid Marsh	1.815
MFG	Graminoid Freshwater Marsh	CSmGc	Wax Myrtle Scrub-Sawgrass	0.326



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
MFG	Graminoid Freshwater Marsh	CSsG	Willow Scrub-Graminoid Marsh	3.038
MFG	Graminoid Freshwater Marsh	MSGs	Cordgrass	0.192
MFG	Graminoid Freshwater Marsh	MFG	Graminoid Freshwater Marsh	1.174
MFG	Graminoid Freshwater Marsh	MFGc	Sawgrass	0.113
MFG	Graminoid Freshwater Marsh	MFGe	Spikerush	14.310
MFG	Graminoid Freshwater Marsh	MFGt	Cattail	1.969
MFG	Graminoid Freshwater Marsh	MFGtS	Cattail Sparse	2.345
MFG	Graminoid Freshwater Marsh	HI	Human Impacted	0.531
MFG	Graminoid Freshwater Marsh	OW	Open Water	0.646
MFGc	Sawgrass	WMcG	Buttonwood Woodland-Graminoid	0.048
MFGc	Sawgrass	WSpG	Pine Lowland-Graminoid	2.520
MFGc	Sawgrass	WSpX	Pine Lowland-Mixed	0.192
MFGc	Sawgrass	WStp	Cypress-Pine Woodland	2.231
MFGc	Sawgrass	WSsS	Cabbage Palm Lowland-Shrub	0.171
MFGc	Sawgrass	WSsX	Cabbage Palm Lowland-Mixed	0.206
MFGc	Sawgrass	SMI	White Mangrove Shrubland	0.105
MFGc	Sawgrass	CMcG	Buttonwood Scrub-Graminoid	1.121
MFGc	Sawgrass	CMcGs	Buttonwood Scrub-Cordgrass	0.249
MFGc	Sawgrass	CSmGc	Wax Myrtle Scrub-Sawgrass	6.506
MFGc	Sawgrass	MSGs	Cordgrass	0.374
MFGc	Sawgrass	MFG	Graminoid Freshwater Marsh	2.282
MFGc	Sawgrass	MFGc	Sawgrass	2.084
MFGe	Spikerush	FMr	Red Mangrove Forest	0.168
MFGe	Spikerush	FMXlr	White Mangrove-Red Mangrove Forest	1.617
MFGe	Spikerush	SMr	Red Mangrove Shrubland	0.004
MFGe	Spikerush	OW	Open Water	4.336
MFGP	Graminoid Freshwater Prairie	MFGP	Graminoid Freshwater Prairie	1.691
MUD	Mud	MUD	Mud	0.408
OW	Open Water	FMr	Red Mangrove Forest	2.271
OW	Open Water	FMX	Mixed Mangrove Forest	0.061
OW	Open Water	FMXlr	White Mangrove-Red Mangrove Forest	1.071
OW	Open Water	SMr	Red Mangrove Shrubland	0.718
OW	Open Water	SMXlr	White Mangrove-Red Mangrove Shrubland	2.253
OW	Open Water	CMXlr	White Mangrove-Red Mangrove Scrub	0.024
OW	Open Water	CMXlrG	White Mangrove-Red Mangrove Scrub-Graminoid	0.140
OW	Open Water	MFGt	Cattail	5.110
OW	Open Water	MFGtS	Cattail Sparse	1.570



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
OW	Open Water	CA	Canal	0.017
OW	Open Water	SP	Spoil	0.013
OW	Open Water	MUD	Mud	0.187
OW	Open Water	OW	Open Water	12.067
SF	Barren Salt Flat	HI	Human Impacted	0.239
Total				405.485



Table 3. Lely Manor Canal-12 1, vegetation changes 1940-2010 and acres of change.

1940		2010		Change
Class ID	Name	Class ID	Name	Acres
FSt	Cypress Forest	FSt	Cypress Forest	7.995
FSt	Cypress Forest	WSt	Cypress Woodland	0.803
FSt	Cypress Forest	SS	Swamp Shrubland	0.143
FSt	Cypress Forest	SSa	Pond Apple Shrubland	2.041
FSt	Cypress Forest	CSsG	Willow Scrub-Graminoid Marsh	0.334
FSt	Cypress Forest	HI	Human Impacted	0.103
WMc	Buttonwood Woodland	WMlBa	White Mangrove Woodland-Leather Fern	0.377
WSp	Pine Lowland	WMc	Buttonwood Woodland	0.418
WSp	Pine Lowland	WMcG	Buttonwood Woodland-Graminoid	0.103
WSp	Pine Lowland	WMcBa	Buttonwood Woodland-Leather Fern	0.682
WSp	Pine Lowland	WSpS	Pine Lowland-Shrub	0.141
WSp	Pine Lowland	WSsGc	Cabbage Palm Lowland-Sawgrass	0.417
WSp	Pine Lowland	WSsS	Cabbage Palm Lowland-Shrub	0.795
WSp	Pine Lowland	CA	Canal	0.042
WSt	Cypress Woodland	FStp	Cypress-Pine Forest	0.212
WSt	Cypress Woodland	WSh	Hardwood Swamp Woodland	2.363
WSt	Cypress Woodland	SSa	Pond Apple Shrubland	2.095
WSt	Cypress Woodland	CSsG	Willow Scrub-Graminoid Marsh	0.950
WSt	Cypress Woodland	CA	Canal	0.051
WSs	Cabbage Palm Lowland	WMcG	Buttonwood Woodland-Graminoid	0.267
WSs	Cabbage Palm Lowland	WMXclBa	Mixed Buttonwood and White Mangrove Woodland-Leather Fern	0.484
WSs	Cabbage Palm Lowland	WSh	Hardwood Swamp Woodland	0.373
WSsG	Cabbage Palm Lowland-Graminoid	WMXclBa	Mixed Buttonwood and White Mangrove Woodland-Leather Fern	0.133
WSh	Hardwood Swamp Woodland	FSH	Hardwood Swamp Forest	0.300
WSh	Hardwood Swamp Woodland	WMc	Buttonwood Woodland	0.353
WSh	Hardwood Swamp Woodland	WMcBa	Buttonwood Woodland-Leather Fern	4.916
WSh	Hardwood Swamp Woodland	WMlBa	White Mangrove Woodland-Leather Fern	0.399
WSh	Hardwood Swamp Woodland	WMXclBa	Mixed Buttonwood and White Mangrove Woodland-Leather Fern	0.791
WSh	Hardwood Swamp Woodland	WSsS	Cabbage Palm Lowland-Shrub	1.544
WSh	Hardwood Swamp Woodland	WSh	Hardwood Swamp Woodland	15.092
WSh	Hardwood Swamp Woodland	SS	Swamp Shrubland	6.561
WSh	Hardwood Swamp Woodland	CMr	Red Mangrove Scrub	0.156
SM	Mangrove Shrubland	FMXlR	White Mangrove-Red Mangrove Forest	1.632



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
SM	Mangrove Shrubland	WMIBa	White Mangrove Woodland-Leather Fern	0.981
SM	Mangrove Shrubland	WMXclBa	Mixed Buttonwood and White Mangrove Woodland-Leather Fern	0.179
SM	Mangrove Shrubland	SMXlr	White Mangrove-Red Mangrove Shrubland	2.753
SMr	Red Mangrove Shrubland	SMr	Red Mangrove Shrubland	0.178
CM	Mangrove Scrub	WMCBa	Buttonwood Woodland-Leather Fern	0.576
CM	Mangrove Scrub	WMXclBa	Mixed Buttonwood and White Mangrove Woodland-Leather Fern	1.541
CM	Mangrove Scrub	CMXlr	White Mangrove-Red Mangrove Scrub	0.091
CMc	Buttonwood Scrub	WMC	Buttonwood Woodland	1.336
CMc	Buttonwood Scrub	WMCBa	Buttonwood Woodland-Leather Fern	2.577
CS	Swamp Scrub	WMCBa	Buttonwood Woodland-Leather Fern	4.697
CS	Swamp Scrub	WMIBa	White Mangrove Woodland-Leather Fern	0.595
CS	Swamp Scrub	SMXlr	White Mangrove-Red Mangrove Shrubland	0.255
CSG	Swamp Scrub-Graminoid Marsh	WMCBa	Buttonwood Woodland-Leather Fern	0.757
CSG	Swamp Scrub-Graminoid Marsh	WSh	Hardwood Swamp Woodland	0.106
CSG	Swamp Scrub-Graminoid Marsh	SS	Swamp Shrubland	1.233
MSG	Graminoid Salt Marsh	FMI	White Mangrove Forest	0.347
MSG	Graminoid Salt Marsh	FMXlr	White Mangrove-Red Mangrove Forest	0.755
MSG	Graminoid Salt Marsh	WMCg	Buttonwood Woodland-Graminoid	0.203
MSG	Graminoid Salt Marsh	WMCBa	Buttonwood Woodland-Leather Fern	1.116
MSG	Graminoid Salt Marsh	WMIBa	White Mangrove Woodland-Leather Fern	16.494
MSG	Graminoid Salt Marsh	WMXclBa	Mixed Buttonwood and White Mangrove Woodland-Leather Fern	13.502
MSG	Graminoid Salt Marsh	SMI	White Mangrove Shrubland	1.257
MSG	Graminoid Salt Marsh	SMXlr	White Mangrove-Red Mangrove Shrubland	6.419
MSG	Graminoid Salt Marsh	CMcGs	Buttonwood Scrub-Cordgrass	0.773
MSG	Graminoid Salt Marsh	CMIGd	White Mangrove Scrub-Saltgrass	0.108
MSG	Graminoid Salt Marsh	CMIGj	White Mangrove Scrub-Black Rush	0.069
MSG	Graminoid Salt Marsh	CMIGs	White Mangrove Scrub-Cordgrass	8.719
MSG	Graminoid Salt Marsh	CMIGt	White Mangrove Scrub-Cattail	0.521
MSG	Graminoid Salt Marsh	CMrGt	Red Mangrove Scrub-Cattail	1.532
MSG	Graminoid Salt Marsh	MSGs	Cordgrass	2.878
MSGs	Cordgrass	MSGs	Cordgrass	0.112
MFG	Graminoid Freshwater Marsh	WMC	Buttonwood Woodland	1.749



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
MFG	Graminoid Freshwater Marsh	WMcG	Buttonwood Woodland-Graminoid	0.321
MFG	Graminoid Freshwater Marsh	WMlBa	White Mangrove Woodland-Leather Fern	1.555
MFG	Graminoid Freshwater Marsh	WMXclBa	Mixed Buttonwood and White Mangrove Woodland-Leather Fern	1.825
MFG	Graminoid Freshwater Marsh	WSh	Hardwood Swamp Woodland	1.038
MFG	Graminoid Freshwater Marsh	S	Shrubland	0.261
MFG	Graminoid Freshwater Marsh	SMl	White Mangrove Shrubland	0.599
MFG	Graminoid Freshwater Marsh	SMr	Red Mangrove Shrubland	0.031
MFG	Graminoid Freshwater Marsh	SS	Swamp Shrubland	0.990
MFG	Graminoid Freshwater Marsh	SSs	Willow Shrubland	0.778
MFG	Graminoid Freshwater Marsh	CMcGs	Buttonwood Scrub-Cordgrass	0.987
MFG	Graminoid Freshwater Marsh	CMlGt	White Mangrove Scrub-Cattail	0.253
MFG	Graminoid Freshwater Marsh	CSsG	Willow Scrub-Graminoid Marsh	10.534
MFG	Graminoid Freshwater Marsh	MFGt	Cattail	2.631
MFG	Graminoid Freshwater Marsh	CA	Canal	0.308
MFG	Graminoid Freshwater Marsh	OW	Open Water	0.110
MFGc	Sawgrass	CSsG	Willow Scrub-Graminoid Marsh	3.503
OW	Open Water	WMcBa	Buttonwood Woodland-Leather Fern	0.079
OW	Open Water	WMlBa	White Mangrove Woodland-Leather Fern	0.268
OW	Open Water	WMXclBa	Mixed Buttonwood and White Mangrove Woodland-Leather Fern	0.041
OW	Open Water	SMr	Red Mangrove Shrubland	0.252
OW	Open Water	CMlGt	White Mangrove Scrub-Cattail	0.135
OW	Open Water	CMr	Red Mangrove Scrub	0.190
OW	Open Water	CSsG	Willow Scrub-Graminoid Marsh	0.354
OW	Open Water	MFGt	Cattail	0.311
OW	Open Water	OW	Open Water	0.150

Total 154.978



Table 4. Lely Manor Canal 01-2, vegetation changes 1940-2010 and acres of change.

1940		2010		Change
Class ID	Name	Class ID	Name	Acres
FSt	Cypress Forest	FSt	Cypress Forest	20.823
FSt	Cypress Forest	FStp	Cypress-Pine Forest	9.692
FSt	Cypress Forest	WStp	Cypress-Pine Woodland	0.092
FSt	Cypress Forest	HI	Human Impacted	0.484
FSt	Cypress Forest	CA	Canal	0.155
FSt	Cypress Forest	SP	Spoil	0.255
WSp	Pine Lowland	FStp	Cypress-Pine Forest	0.107
WSp	Pine Lowland	WMcG	Buttonwood Woodland-Graminoid	0.051
WSp	Pine Lowland	WSpG	Pine Lowland-Graminoid	6.511
WSp	Pine Lowland	WSpS	Pine Lowland-Shrub	14.752
WSp	Pine Lowland	WSpX	Pine Lowland-Mixed	9.273
WSp	Pine Lowland	WSsX	Cabbage Palm Lowland-Mixed	1.604
WSp	Pine Lowland	HI	Human Impacted	1.016
WSp	Pine Lowland	CA	Canal	0.161
WSp	Pine Lowland	SP	Spoil	0.367
WSpG	Pine Lowland-Graminoid	FStp	Cypress-Pine Forest	2.302
WSpG	Pine Lowland-Graminoid	WMcG	Buttonwood Woodland-Graminoid	0.352
WSpG	Pine Lowland-Graminoid	WMcBa	Buttonwood Woodland-Leather Fern	0.346
WSpG	Pine Lowland-Graminoid	WSpX	Pine Lowland-Mixed	0.693
WSpG	Pine Lowland-Graminoid	WSsX	Cabbage Palm Lowland-Mixed	0.403
WSpG	Pine Lowland-Graminoid	HI	Human Impacted	0.119
WSpG	Pine Lowland-Graminoid	SP	Spoil	0.067
WSt	Cypress Woodland	FStp	Cypress-Pine Forest	8.405
WSt	Cypress Woodland	WSt	Cypress Woodland	7.056
WSt	Cypress Woodland	WStp	Cypress-Pine Woodland	3.426
WSt	Cypress Woodland	WSsG	Cabbage Palm Lowland-Graminoid	0.296
WSt	Cypress Woodland	WSsGc	Cabbage Palm Lowland-Sawgrass	0.238
WSt	Cypress Woodland	WSsX	Cabbage Palm Lowland-Mixed	0.606
WSt	Cypress Woodland	HI	Human Impacted	1.237
WSt	Cypress Woodland	CA	Canal	0.027
WSt	Cypress Woodland	SP	Spoil	0.061
WStG	Cypress Woodland-Graminoid	WMc	Buttonwood Woodland	0.254
WStG	Cypress Woodland-Graminoid	WStp	Cypress-Pine Woodland	0.384
WStG	Cypress Woodland-Graminoid	WSsX	Cabbage Palm Lowland-Mixed	1.457
WStp	Cypress-Pine Woodland	FStp	Cypress-Pine Forest	18.965
WStp	Cypress-Pine Woodland	WSsG	Cabbage Palm Lowland-Graminoid	0.062
WStp	Cypress-Pine Woodland	WSsX	Cabbage Palm Lowland-Mixed	1.563
WStp	Cypress-Pine Woodland	CSGc	Swamp Scrub-Sawgrass	0.259



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
WStp	Cypress-Pine Woodland	HI	Human Impacted	4.349
WStp	Cypress-Pine Woodland	SP	Spoil	0.083
WUp	Pine Upland	WUpSs	Pine Upland-Saw Palmetto	3.844
WUp	Pine Upland	CA	Canal	0.032
WUp	Pine Upland	SP	Spoil	0.083
WUpSs	Pine Upland-Saw Palmetto	WSpS	Pine Lowland-Shrub	0.004
WUpSs	Pine Upland-Saw Palmetto	WUpSs	Pine Upland-Saw Palmetto	5.196
WUpSs	Pine Upland-Saw Palmetto	HI	Human Impacted	0.274
WUpSs	Pine Upland-Saw Palmetto	CA	Canal	0.066
WUpSs	Pine Upland-Saw Palmetto	SP	Spoil	0.164
MSG	Graminoid Salt Marsh	WMcG	Buttonwood Woodland-Graminoid	0.262
MSG	Graminoid Salt Marsh	MSGs	Cordgrass	0.084
MF	Freshwater Marsh	SS	Swamp Shrubland	0.083
MFG	Graminoid Freshwater Marsh	WMcG	Buttonwood Woodland-Graminoid	1.613
MFG	Graminoid Freshwater Marsh	WSsG	Cabbage Palm Lowland-Graminoid	0.408
MFG	Graminoid Freshwater Marsh	WSsX	Cabbage Palm Lowland-Mixed	0.388
MFG	Graminoid Freshwater Marsh	CMcGc	Buttonwood Scrub-Sawgrass	0.192
MFG	Graminoid Freshwater Marsh	MSGs	Cordgrass	0.170
MFG	Graminoid Freshwater Marsh	MFBa	Leather Fern	0.180
MFG	Graminoid Freshwater Marsh	MFGc	Sawgrass	0.712
MFG	Graminoid Freshwater Marsh	MFGe	Spikerush	0.188
MFG	Graminoid Freshwater Marsh	HI	Human Impacted	0.252
MFG	Graminoid Freshwater Marsh	SP	Spoil	0.122
MFGc	Sawgrass	WSsGc	Cabbage Palm Lowland-Sawgrass	0.251
MFGc	Sawgrass	CSsGc	Willow Scrub-Sawgrass	1.111
MFGc	Sawgrass	MFGc	Sawgrass	5.091
MFGc	Sawgrass	CA	Canal	0.043
MFGc	Sawgrass	SP	Spoil	0.026
MFGP	Graminoid Freshwater Prairie	WSpX	Pine Lowland-Mixed	0.249

Total 139.439



Table 5. Lely Manor Canal-13, vegetation changes from 1940-2010 and acres of change.

1940		2010		Change
Class ID	Name	Class ID	Name	Acres
FSt	Cypress Forest	FSt	Cypress Forest	12.728
FSt	Cypress Forest	FStp	Cypress-Pine Forest	1.779
FSt	Cypress Forest	WSsS	Cabbage Palm Lowland-Shrub	0.946
FSt	Cypress Forest	SS	Swamp Shrubland	0.169
FSt	Cypress Forest	HI	Human Impacted	0.299
FSt	Cypress Forest	CA	Canal	0.426
FSt	Cypress Forest	SP	Spoil	0.192
WSp	Pine Lowland	FHa	Cabbage Palm Hammock	1.564
WSp	Pine Lowland	FHT	Temperate Hardwood Hammock	2.079
WSp	Pine Lowland	WMc	Buttonwood Woodland	0.031
WSp	Pine Lowland	WMcBa	Buttonwood Woodland-Leather Fern	0.184
WSp	Pine Lowland	WSpG	Pine Lowland-Graminoid	2.826
WSp	Pine Lowland	WSpS	Pine Lowland-Shrub	25.484
WSp	Pine Lowland	WSpX	Pine Lowland-Mixed	41.063
WSp	Pine Lowland	WSs	Cabbage Palm Lowland	0.113
WSp	Pine Lowland	WSsG	Cabbage Palm Lowland-Graminoid	0.523
WSp	Pine Lowland	WSsGc	Cabbage Palm Lowland-Sawgrass	0.732
WSp	Pine Lowland	WSsS	Cabbage Palm Lowland-Shrub	0.813
WSp	Pine Lowland	WSsX	Cabbage Palm Lowland-Mixed	0.037
WSp	Pine Lowland	WUpSs	Pine Upland-Saw Palmetto	0.096
WSp	Pine Lowland	CSmGc	Wax Myrtle Scrub-Sawgrass	0.265
WSp	Pine Lowland	MSGj	Black Rush	0.257
WSp	Pine Lowland	HI	Human Impacted	30.950
WSp	Pine Lowland	CA	Canal	2.539
WSp	Pine Lowland	ORV	ORV Trail	0.178
WSp	Pine Lowland	SP	Spoil	1.752
WSpG	Pine Lowland-Graminoid	FStp	Cypress-Pine Forest	0.185
WSpG	Pine Lowland-Graminoid	WMcBa	Buttonwood Woodland-Leather Fern	0.089
WSpG	Pine Lowland-Graminoid	WSpG	Pine Lowland-Graminoid	3.442
WSpG	Pine Lowland-Graminoid	WSpS	Pine Lowland-Shrub	1.116
WSpG	Pine Lowland-Graminoid	WSpX	Pine Lowland-Mixed	0.561
WSpG	Pine Lowland-Graminoid	CMcGj	Buttonwood Scrub-Black Rush	0.136
WSpG	Pine Lowland-Graminoid	HI	Human Impacted	0.599
WSpG	Pine Lowland-Graminoid	CA	Canal	0.041
WSt	Cypress Woodland	FSH	Hardwood Swamp Forest	0.439
WSt	Cypress Woodland	FSt	Cypress Forest	0.222
WSt	Cypress Woodland	FStH	Cypress-Hardwood Forest	0.901
WSt	Cypress Woodland	FStp	Cypress-Pine Forest	8.088



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
WSt	Cypress Woodland	WSpG	Pine Lowland-Graminoid	0.213
WSt	Cypress Woodland	WSt	Cypress Woodland	6.447
WSt	Cypress Woodland	WStG	Cypress Woodland-Graminoid	1.641
WSt	Cypress Woodland	WStS	Cypress Woodland-Shrub	3.301
WSt	Cypress Woodland	WStp	Cypress-Pine Woodland	3.279
WSt	Cypress Woodland	WSsS	Cabbage Palm Lowland-Shrub	1.515
WSt	Cypress Woodland	WSh	Hardwood Swamp Woodland	0.125
WSt	Cypress Woodland	SS	Swamp Shrubland	0.960
WSt	Cypress Woodland	SSm	Wax Myrtle Shrubland	0.058
WSt	Cypress Woodland	HI	Human Impacted	0.212
WSt	Cypress Woodland	CA	Canal	0.495
WSt	Cypress Woodland	ORV	ORV Trail	0.028
WSt	Cypress Woodland	SP	Spoil	0.311
WStG	Cypress Woodland-Graminoid	FStp	Cypress-Pine Forest	1.188
WStG	Cypress Woodland-Graminoid	WSpG	Pine Lowland-Graminoid	0.209
WStG	Cypress Woodland-Graminoid	WSpS	Pine Lowland-Shrub	0.209
WStG	Cypress Woodland-Graminoid	WSpX	Pine Lowland-Mixed	0.220
WStG	Cypress Woodland-Graminoid	WStp	Cypress-Pine Woodland	2.118
WStG	Cypress Woodland-Graminoid	WSsS	Cabbage Palm Lowland-Shrub	0.153
WStG	Cypress Woodland-Graminoid	SS	Swamp Shrubland	0.543
WStG	Cypress Woodland-Graminoid	HI	Human Impacted	0.439
WStG	Cypress Woodland-Graminoid	CA	Canal	0.198
WStG	Cypress Woodland-Graminoid	SP	Spoil	0.027
WStO	Cypress Woodland-Open Marsh	SS	Swamp Shrubland	0.649
WStp	Cypress-Pine Woodland	FStH	Cypress-Hardwood Forest	0.218
WStp	Cypress-Pine Woodland	FStp	Cypress-Pine Forest	2.638
WStp	Cypress-Pine Woodland	FHa	Cabbage Palm Hammock	1.194
WStp	Cypress-Pine Woodland	WSpG	Pine Lowland-Graminoid	0.303
WStp	Cypress-Pine Woodland	WSpS	Pine Lowland-Shrub	2.873
WStp	Cypress-Pine Woodland	WStp	Cypress-Pine Woodland	4.649
WStp	Cypress-Pine Woodland	WSsS	Cabbage Palm Lowland-Shrub	0.746
WStp	Cypress-Pine Woodland	HI	Human Impacted	0.714
WStp	Cypress-Pine Woodland	CA	Canal	0.417
WStp	Cypress-Pine Woodland	ORV	ORV Trail	0.102
WSs	Cabbage Palm Lowland	FHa	Cabbage Palm Hammock	0.932
WSs	Cabbage Palm Lowland	WMcBa	Buttonwood Woodland-Leather Fern	0.151
WSs	Cabbage Palm Lowland	WSsG	Cabbage Palm Lowland-Graminoid	0.174
WSs	Cabbage Palm Lowland	WSsGc	Cabbage Palm Lowland-Sawgrass	0.146
WSs	Cabbage Palm Lowland	WSsS	Cabbage Palm Lowland-Shrub	1.905



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
WUp	Pine Upland	FHT	Temperate Hardwood Hammock	0.744
WUp	Pine Upland	WUpSs	Pine Upland-Saw Palmetto	12.094
WUp	Pine Upland	WUqSs	Live Oak Woodland with Saw Palmetto	5.296
WUp	Pine Upland	HI	Human Impacted	43.160
WUp	Pine Upland	CA	Canal	2.959
WUp	Pine Upland	SP	Spoil	0.327
WUpSs	Pine Upland-Saw Palmetto	FHT	Temperate Hardwood Hammock	1.648
WUpSs	Pine Upland-Saw Palmetto	WSpX	Pine Lowland-Mixed	1.654
WUpSs	Pine Upland-Saw Palmetto	WUpSs	Pine Upland-Saw Palmetto	72.282
WUpSs	Pine Upland-Saw Palmetto	WUqSs	Live Oak Woodland with Saw Palmetto	0.257
WUpSs	Pine Upland-Saw Palmetto	HI	Human Impacted	0.151
WUpSs	Pine Upland-Saw Palmetto	CA	Canal	0.037
WUpSs	Pine Upland-Saw Palmetto	SP	Spoil	0.215
WUCp	Scrubby Flatwoods	WUCp	Scrubby Flatwoods	10.287
SS	Swamp Shrubland	SS	Swamp Shrubland	0.183
SS	Swamp Shrubland	SSs	Willow Shrubland	0.310
CM	Mangrove Scrub	FMr	Red Mangrove Forest	0.331
CMc	Buttonwood Scrub	WMcBa	Buttonwood Woodland-Leather Fern	0.283
CMc	Buttonwood Scrub	WUpSs	Pine Upland-Saw Palmetto	0.539
CMc	Buttonwood Scrub	CMcG	Buttonwood Scrub-Graminoid	1.324
CMc	Buttonwood Scrub	CMcGj	Buttonwood Scrub-Black Rush	0.318
CSG	Swamp Scrub-Graminoid Marsh	SS	Swamp Shrubland	0.244
M	Marsh	CSG	Swamp Scrub-Graminoid Marsh	9.679
M	Marsh	MSGs	Cordgrass	0.274
M	Marsh	MFGc	Sawgrass	3.277
MSG	Graminoid Salt Marsh			0.110
MSG	Graminoid Salt Marsh	FMr	Red Mangrove Forest	0.098
MSG	Graminoid Salt Marsh	WMcBa	Buttonwood Woodland-Leather Fern	8.078
MSG	Graminoid Salt Marsh	WSsGc	Cabbage Palm Lowland-Sawgrass	0.305
MSG	Graminoid Salt Marsh	SMXcl	Buttonwood-White Mangrove Shrubland	0.132
MSG	Graminoid Salt Marsh	SMXlr	White Mangrove-Red Mangrove Shrubland	0.234
MSG	Graminoid Salt Marsh	CMcGj	Buttonwood Scrub-Black Rush	0.810
MSG	Graminoid Salt Marsh	CMXclG	Buttonwood-White Mangrove Scrub-Graminoid	0.185
MSG	Graminoid Salt Marsh	CMXclGs	Buttonwood-White Mangrove Scrub-Cordgrass	0.335
MSG	Graminoid Salt Marsh	CSmG	Wax Myrtle Scrub-Graminoid Marsh	0.930



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
MSG	Graminoid Salt Marsh	MSGd	Saltgrass	0.241
MSG	Graminoid Salt Marsh	MSGj	Black Rush	5.544
MSG	Graminoid Salt Marsh	MSGs	Cordgrass	7.862
MSG	Graminoid Salt Marsh	OW	Open Water	0.107
MF	Freshwater Marsh	WMcBa	Buttonwood Woodland-Leather Fern	0.646
MF	Freshwater Marsh	SMXlr	White Mangrove-Red Mangrove Shrubland	2.617
MF	Freshwater Marsh	SS	Swamp Shrubland	2.318
MF	Freshwater Marsh	CSsGt	Willow Scrub-Cattail	0.754
MF	Freshwater Marsh	MSGs	Cordgrass	0.054
MF	Freshwater Marsh	MFBa	Leather Fern	0.523
MFBa	Leather Fern	WMcBa	Buttonwood Woodland-Leather Fern	2.589
MFBa	Leather Fern	SMXlr	White Mangrove-Red Mangrove Shrubland	1.134
MFBa	Leather Fern	MFGt	Cattail	0.410
MFG	Graminoid Freshwater Marsh	WMcG	Buttonwood Woodland-Graminoid	0.127
MFG	Graminoid Freshwater Marsh	WMcBa	Buttonwood Woodland-Leather Fern	0.044
MFG	Graminoid Freshwater Marsh	WSpG	Pine Lowland-Graminoid	2.591
MFG	Graminoid Freshwater Marsh	WSpS	Pine Lowland-Shrub	5.889
MFG	Graminoid Freshwater Marsh	WSpX	Pine Lowland-Mixed	0.308
MFG	Graminoid Freshwater Marsh	WSsG	Cabbage Palm Lowland-Graminoid	1.206
MFG	Graminoid Freshwater Marsh	WSsGc	Cabbage Palm Lowland-Sawgrass	0.064
MFG	Graminoid Freshwater Marsh	WSsX	Cabbage Palm Lowland-Mixed	0.238
MFG	Graminoid Freshwater Marsh	SSm	Wax Myrtle Shrubland	0.573
MFG	Graminoid Freshwater Marsh	CMcGc	Buttonwood Scrub-Sawgrass	1.581
MFG	Graminoid Freshwater Marsh	CSmG	Wax Myrtle Scrub-Graminoid Marsh	0.444
MFG	Graminoid Freshwater Marsh	CSmGc	Wax Myrtle Scrub-Sawgrass	0.000
MFG	Graminoid Freshwater Marsh	CSsGc	Willow Scrub-Sawgrass	0.299
MFG	Graminoid Freshwater Marsh	MSGs	Cordgrass	0.518
MFG	Graminoid Freshwater Marsh	MFGc	Sawgrass	1.433
MFG	Graminoid Freshwater Marsh	MFGt	Cattail	0.632
MFG	Graminoid Freshwater Marsh	MFGtS	Cattail Sparse	0.674
MFG	Graminoid Freshwater Marsh	MFGP	Graminoid Freshwater Prairie	5.973
MFG	Graminoid Freshwater Marsh	HI	Human Impacted	0.092
MFG	Graminoid Freshwater Marsh	SP	Spoil	0.072
MFG	Graminoid Freshwater Marsh	MUD	Mud	1.514
MFGc	Sawgrass	WSpG	Pine Lowland-Graminoid	0.871
MFGc	Sawgrass	WSpS	Pine Lowland-Shrub	0.157
MFGc	Sawgrass	CSmGc	Wax Myrtle Scrub-Sawgrass	4.194



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
MFGc	Sawgrass	MFGc	Sawgrass	6.442
MFGc	Sawgrass	HI	Human Impacted	0.033
MFGc	Sawgrass	CA	Canal	0.102
MFGc	Sawgrass	SP	Spoil	0.096
MFGP	Graminoid Freshwater Prairie	WSpG	Pine Lowland-Graminoid	0.405
MFGP	Graminoid Freshwater Prairie	WSpS	Pine Lowland-Shrub	0.062
MFGP	Graminoid Freshwater Prairie	CA	Canal	0.020
MFGP	Graminoid Freshwater Prairie	SP	Spoil	0.027
OW	Open Water	FMr	Red Mangrove Forest	2.075
OW	Open Water	WSt	Cypress Woodland	0.002
OW	Open Water	SMr	Red Mangrove Shrubland	0.004
OW	Open Water	SMXlr	White Mangrove-Red Mangrove Shrubland	0.168
OW	Open Water	SS	Swamp Shrubland	0.086
OW	Open Water	CA	Canal	0.007
OW	Open Water	SP	Spoil	0.006
OW	Open Water	OW	Open Water	2.959

Total 431.418



Table 6. C-4 CANAL-00 (Eagle Creek and Fleisher Parcels), vegetation changes from 1940-2010 and acres of change.

1940		2010		Change
Class ID	Name	Class ID	Name	Acres
Unknown	Undetermined	HI	Human Impacted	0.292
WM	Mangrove Woodland	FMXlr	White Mangrove-Red Mangrove Forest	3.158
WM	Mangrove Woodland	HI	Human Impacted	0.009
WM	Mangrove Woodland	SP	Spoil	0.314
WMcBa	Buttonwood Woodland-Leather Fern	FMXlr	White Mangrove-Red Mangrove Forest	4.720
WMcBa	Buttonwood Woodland-Leather Fern	WMXclBa	Mixed Buttonwood and White Mangrove Woodland-Leather Fern	0.318
WS	Swamp Woodland	WMcBa	Buttonwood Woodland-Leather Fern	0.285
WSp	Pine Lowland	FMc	Buttonwood Forest	0.088
WSp	Pine Lowland	FHa	Cabbage Palm Hammock	0.097
WSp	Pine Lowland	FHT	Temperate Hardwood Hammock	0.370
WSp	Pine Lowland	WMc	Buttonwood Woodland	0.179
WSp	Pine Lowland	WMcBa	Buttonwood Woodland-Leather Fern	0.423
WSp	Pine Lowland	WSpS	Pine Lowland-Shrub	3.802
WSp	Pine Lowland	WSsS	Cabbage Palm Lowland-Shrub	3.465
WSp	Pine Lowland	WUpSs	Pine Upland-Saw Palmetto	0.748
WSp	Pine Lowland	HI	Human Impacted	3.190
WSp	Pine Lowland	SP	Spoil	0.231
WSt	Cypress Woodland	FMc	Buttonwood Forest	0.069
WSt	Cypress Woodland	FMXcl	Buttonwood-White Mangrove Forest	0.371
WSt	Cypress Woodland	FMXlr	White Mangrove-Red Mangrove Forest	0.103
WSs	Cabbage Palm Lowland	FMXlr	White Mangrove-Red Mangrove Forest	0.047
WSs	Cabbage Palm Lowland	WMcBa	Buttonwood Woodland-Leather Fern	0.194
WUpSs	Pine Upland-Saw Palmetto	WSpS	Pine Lowland-Shrub	0.177
WUpSs	Pine Upland-Saw Palmetto	WUpSs	Pine Upland-Saw Palmetto	4.490
WUpSs	Pine Upland-Saw Palmetto	WUqSs	Live Oak Woodland with Saw Palmetto	0.146
WUpSs	Pine Upland-Saw Palmetto	HI	Human Impacted	0.161
WUpSs	Pine Upland-Saw Palmetto	QUA	Quarry	0.008
WUpSs	Pine Upland-Saw Palmetto	SP	Spoil	0.283
SM	Mangrove Shrubland	FMXlr	White Mangrove-Red Mangrove Forest	1.816
SM	Mangrove Shrubland	WMlBa	White Mangrove Woodland-Leather Fern	0.019
SM	Mangrove Shrubland	SP	Spoil	0.567



1940		2010		Change
Class ID	Name	Change	Name	Acres
CM	Mangrove Scrub	FMXlr	White Mangrove-Red Mangrove Forest	0.261
CM	Mangrove Scrub	HI	Human Impacted	0.111
CM	Mangrove Scrub	SP	Spoil	0.193
CMG	Mangrove Scrub-Graminoid	FMX	Mixed Mangrove Forest	0.067
CMG	Mangrove Scrub-Graminoid	FMXlr	White Mangrove-Red Mangrove Forest	0.824
CMG	Mangrove Scrub-Graminoid	WMc	Buttonwood Woodland	0.692
CMG	Mangrove Scrub-Graminoid	WSsS	Cabbage Palm Lowland-Shrub	0.545
CMG	Mangrove Scrub-Graminoid	CMX	Mixed Mangrove Scrub	1.975
CMG	Mangrove Scrub-Graminoid	HI	Human Impacted	0.143
CMG	Mangrove Scrub-Graminoid	SP	Spoil	0.717
CMc	Buttonwood Scrub	WMc	Buttonwood Woodland	0.158
M	Marsh	FMXlr	White Mangrove-Red Mangrove Forest	1.257
M	Marsh	WMlBa	White Mangrove Woodland-Leather Fern	0.086
M	Marsh	SP	Spoil	0.045
M	Marsh	OW	Open Water	0.008
HI	Human Impacted			0.080
HI	Human Impacted	HI	Human Impacted	20.844
HI	Human Impacted	SP	Spoil	1.022
CA	Canal	CA	Canal	0.458
SP	Spoil	SP	Spoil	0.333
OW	Open Water	FMX	Mixed Mangrove Forest	1.176
OW	Open Water	SMr	Red Mangrove Shrubland	0.353
OW	Open Water	SP	Spoil	0.206
OW	Open Water	OW	Open Water	0.017

Total 61.708



Table 7. BelleMeade7 HendersonCreek, vegetation changes from 1940-2010 and acres of change.

1940		2010		Change
Class ID	Name	Class ID	Name	Acres
FSt	Cypress Forest	FSt	Cypress Forest	4.701
FSf	Pop Ash Forest	FSt	Cypress Forest	0.066
FSf	Pop Ash Forest	FSf	Pop Ash Forest	1.194
WSp	Pine Lowland	WSpG	Pine Lowland-Graminoid	16.730
WSp	Pine Lowland	WSpS	Pine Lowland-Shrub	4.727
WSp	Pine Lowland	WSpX	Pine Lowland-Mixed	8.448
WSp	Pine Lowland	HI	Human Impacted	0.634
WSpG	Pine Lowland-Graminoid	WSpG	Pine Lowland-Graminoid	0.354
WSt	Cypress Woodland	FSH	Hardwood Swamp Forest	2.565
WSt	Cypress Woodland	FHa	Cabbage Palm Hammock	1.667
WSt	Cypress Woodland	WS	Swamp Woodland	32.539
WSt	Cypress Woodland	WSpX	Pine Lowland-Mixed	9.524
WSt	Cypress Woodland	WSt	Cypress Woodland	73.381
WSt	Cypress Woodland	WStG	Cypress Woodland-Graminoid	0.918
WSt	Cypress Woodland	WStp	Cypress-Pine Woodland	15.803
WSt	Cypress Woodland	WStH	Cypress-Hardwood Woodland	10.938
WSt	Cypress Woodland	CSmG	Wax Myrtle Scrub-Graminoid Marsh	27.676
WSt	Cypress Woodland	HI	Human Impacted	6.029
WSt	Cypress Woodland	CA	Canal	1.972
WSt	Cypress Woodland	SP	Spoil	5.259
WStG	Cypress Woodland-Graminoid	WS	Swamp Woodland	2.963
WStG	Cypress Woodland-Graminoid	WSpS	Pine Lowland-Shrub	2.304
WStG	Cypress Woodland-Graminoid	WStG	Cypress Woodland-Graminoid	51.630
WStG	Cypress Woodland-Graminoid	WStS	Cypress Woodland-Shrub	0.396
WStG	Cypress Woodland-Graminoid	WStp	Cypress-Pine Woodland	78.382
WStG	Cypress Woodland-Graminoid	WSsS	Cabbage Palm Lowland-Shrub	1.028
WStG	Cypress Woodland-Graminoid	WSh	Hardwood Swamp Woodland	0.754
WStG	Cypress Woodland-Graminoid	HI	Human Impacted	0.718
WStG	Cypress Woodland-Graminoid	SP	Spoil	0.058
WStO	Cypress Woodland-Open Marsh	WStS	Cypress Woodland-Shrub	5.910
WStO	Cypress Woodland-Open Marsh	CSmG	Wax Myrtle Scrub-Graminoid Marsh	1.795
WStS	Cypress Woodland-Shrub	FSt	Cypress Forest	0.582
WStS	Cypress Woodland-Shrub	WSt	Cypress Woodland	0.470
WStS	Cypress Woodland-Shrub	WStS	Cypress Woodland-Shrub	2.165
WStS	Cypress Woodland-Shrub	WStH	Cypress-Hardwood Woodland	0.254
WStp	Cypress-Pine Woodland	FStp	Cypress-Pine Forest	1.927
WStp	Cypress-Pine Woodland	WSpS	Pine Lowland-Shrub	1.407
WStp	Cypress-Pine Woodland	WStp	Cypress-Pine Woodland	9.333



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
WUp	Pine Upland	FHT	Temperate Hardwood Hammock	3.019
WUp	Pine Upland	WUpSs	Pine Upland-Saw Palmetto	3.921
WUp	Pine Upland	HI	Human Impacted	0.273
WUp	Pine Upland	SP	Spoil	0.093
WUpSs	Pine Upland-Saw Palmetto	FHT	Temperate Hardwood Hammock	0.088
WUpSs	Pine Upland-Saw Palmetto	WUpSs	Pine Upland-Saw Palmetto	4.865
WUqSs	Live Oak Woodland with Saw Palmetto	FHT	Temperate Hardwood Hammock	0.893
WUCp	Scrubby Flatwoods	WUCp	Scrubby Flatwoods	2.725
MFG	Graminoid Freshwater Marsh	WSpG	Pine Lowland-Graminoid	0.612
MFG	Graminoid Freshwater Marsh	WStp	Cypress-Pine Woodland	0.145
MFGP	Graminoid Freshwater Prairie	WSpG	Pine Lowland-Graminoid	0.701
HI	Human Impacted	CA	Canal	1.350
SP	Spoil	SP	Spoil	0.921

Total 406.804



Table 8. Fiddlers Creek, vegetation changes from 1940-2010 and acres of change.

1940		2010		Changes
Class ID	Name	Class ID	Name	Acres
WMc	Buttonwood Woodland	FMc	Buttonwood Forest	3.156529
WMc	Buttonwood Woodland	FMXcr	Buttonwood-Red Mangrove Forest	0.910234
WMc	Buttonwood Woodland	WMcG	Buttonwood Woodland-Graminoid	2.760508
WMc	Buttonwood Woodland	WMXacBa	Mixed Mangrove Woodland Conoerec, Avicgerm and Leather Fern	0.685483
WMcG	Buttonwood Woodland-Graminoid	WMc	Buttonwood Woodland	1.352031
WMcG	Buttonwood Woodland-Graminoid	HI	Human Impacted	0.029412
WSp	Pine Lowland	FMc	Buttonwood Forest	0.560606
WSp	Pine Lowland	WMc	Buttonwood Woodland	1.562935
WSp	Pine Lowland	WMcG	Buttonwood Woodland-Graminoid	1.579663
WSp	Pine Lowland	WSpS	Pine Lowland-Shrub	2.715165
WSp	Pine Lowland	WSpX	Pine Lowland-Mixed	7.661955
WSp	Pine Lowland	WSsS	Cabbage Palm Lowland-Shrub	2.819001
WSp	Pine Lowland	WSsX	Cabbage Palm Lowland-Mixed	0.267409
WSp	Pine Lowland	CMcGt	Buttonwood Scrub-Cattail	0.190971
WSp	Pine Lowland	HI	Human Impacted	2.104975
WSp	Pine Lowland	QUA	Quarry	0.709521
WSpG	Pine Lowland-Graminoid	WMc	Buttonwood Woodland	0.099437
WSpG	Pine Lowland-Graminoid	WMcG	Buttonwood Woodland-Graminoid	4.54465
WSpG	Pine Lowland-Graminoid	WSsS	Cabbage Palm Lowland-Shrub	0.315551
WSpG	Pine Lowland-Graminoid	CMcG	Buttonwood Scrub-Graminoid	0.420812
WSpG	Pine Lowland-Graminoid	CMcGj	Buttonwood Scrub-Black Rush	6.195482
WSpG	Pine Lowland-Graminoid	HI	Human Impacted	7.637659
WSs	Cabbage Palm Lowland	FMc	Buttonwood Forest	1.497747
WSs	Cabbage Palm Lowland	FMXcr	Buttonwood-Red Mangrove Forest	0.346587
WSs	Cabbage Palm Lowland	WMc	Buttonwood Woodland	7.371581
WSs	Cabbage Palm Lowland	WMcG	Buttonwood Woodland-Graminoid	3.969695
WSs	Cabbage Palm Lowland	WSsS	Cabbage Palm Lowland-Shrub	5.411189
WSs	Cabbage Palm Lowland	HI	Human Impacted	0.069407
WSs	Cabbage Palm Lowland	SP	Spoil	0.25569
CMc	Buttonwood Scrub	WMc	Buttonwood Woodland	0.285028
CMcG	Buttonwood Scrub-Graminoid	WMcG	Buttonwood Woodland-Graminoid	8.029005
CSG	Swamp Scrub-Graminoid Marsh	CSsGc	Willow Scrub-Sawgrass	1.235276
M	Marsh	WMcG	Buttonwood Woodland-Graminoid	9.552945
M	Marsh	HI	Human Impacted	3.477103
MSG	Graminoid Salt Marsh	WMcG	Buttonwood Woodland-Graminoid	18.38221
MSG	Graminoid Salt Marsh	SMXcr	Buttonwood-Red Mangrove Shrubland	0.105439



1940		2010		Changes
Class ID	Name	Class ID	Name	Acres
MSG	Graminoid Salt Marsh	CMaG	Black Mangrove Scrub-Graminoid	4.05143
MSG	Graminoid Salt Marsh	CMcG	Buttonwood Scrub-Graminoid	0.467977
MSG	Graminoid Salt Marsh	CMcGd	Buttonwood Scrub-Saltgrass	5.719371
MSG	Graminoid Salt Marsh	CMcGj	Buttonwood Scrub-Black Rush	2.484501
MSG	Graminoid Salt Marsh	CMcGs	Buttonwood Scrub-Cordgrass	0.968527
MSG	Graminoid Salt Marsh	CMIG	White Mangrove Scrub-Graminoid	0.626158
MSG	Graminoid Salt Marsh	CMIGj	White Mangrove Scrub-Black Rush	0.723476
MSG	Graminoid Salt Marsh	CMrGe	Red Mangrove Scrub-Spikerush	4.362205
MSG	Graminoid Salt Marsh	CMXarGe	Black Mangrove-Red Mangrove Scrub-Spikerush	2.152648
MSG	Graminoid Salt Marsh	CSsGc	Willow Scrub-Sawgrass	0.667039
MSG	Graminoid Salt Marsh	MFGe	Spikerush	3.438303
MSG	Graminoid Salt Marsh	MFGt	Cattail	0.282342
MSG	Graminoid Salt Marsh	HI	Human Impacted	2.96494
MSGj	Black Rush	FMX	Mixed Mangrove Forest	1.42019
MSGj	Black Rush	WMcG	Buttonwood Woodland-Graminoid	0.1819
MSGj	Black Rush	SMXlr	White Mangrove-Red Mangrove Shrubland	1.123546
MSGj	Black Rush	CMaG	Black Mangrove Scrub-Graminoid	0.878543
MSGj	Black Rush	CMcGj	Buttonwood Scrub-Black Rush	1.225724
MSGj	Black Rush	CMX	Mixed Mangrove Scrub	0.714248
MSGj	Black Rush	CMXGj	Mixed Mangrove Scrub-Black Rush	3.605039
MSGj	Black Rush	MSGj	Black Rush	0.25678
MSGj	Black Rush	HI	Human Impacted	1.844358
MFG	Graminoid Freshwater Marsh	FMc	Buttonwood Forest	0.046674
MFG	Graminoid Freshwater Marsh	WMc	Buttonwood Woodland	0.202327
MFG	Graminoid Freshwater Marsh	WMcG	Buttonwood Woodland-Graminoid	34.47099
MFG	Graminoid Freshwater Marsh	CMcG	Buttonwood Scrub-Graminoid	0.732167
MFG	Graminoid Freshwater Marsh	CMcGj	Buttonwood Scrub-Black Rush	0.198471
MFG	Graminoid Freshwater Marsh	CSsGc	Willow Scrub-Sawgrass	0.180771
MFG	Graminoid Freshwater Marsh	MFG	Graminoid Freshwater Marsh	0.404845
MFG	Graminoid Freshwater Marsh	MFGt	Cattail	1.702334
MFG	Graminoid Freshwater Marsh	HI	Human Impacted	3.099865
MFG	Graminoid Freshwater Marsh	QUA	Quarry	1.283442
MFGc	Sawgrass	WMc	Buttonwood Woodland	0.107015
MFGc	Sawgrass	WMcG	Buttonwood Woodland-Graminoid	58.71364
MFGc	Sawgrass	WMX	Mixed Mangrove Woodland	0.388804
MFGc	Sawgrass	CMcG	Buttonwood Scrub-Graminoid	11.64635
MFGc	Sawgrass	CMcGc	Buttonwood Scrub-Sawgrass	0.530193



1940		2010		Changes
Class ID	Name	Class ID	Name	Acres
MFGc	Sawgrass	CMcGj	Buttonwood Scrub-Black Rush	0.217912
MFGc	Sawgrass	CMcGs	Buttonwood Scrub-Cordgrass	1.158203
MFGc	Sawgrass	CMIG	White Mangrove Scrub-Graminoid	0.420549
MFGc	Sawgrass	CMr	Red Mangrove Scrub	0.229913
MFGc	Sawgrass	CMrGe	Red Mangrove Scrub-Spikerush	4.647684
MFGc	Sawgrass	CSsGc	Willow Scrub-Sawgrass	6.457104
MFGc	Sawgrass	MSG	Graminoid Salt Marsh	0.074698
MFGc	Sawgrass	MSGj	Black Rush	0.061334
MFGc	Sawgrass	MFG	Graminoid Freshwater Marsh	0.740414
MFGc	Sawgrass	MFGc	Sawgrass	3.768136
MFGc	Sawgrass	MFGe	Spikerush	9.00346
MFGc	Sawgrass	MFGt	Cattail	13.24355
MFGc	Sawgrass	HI	Human Impacted	16.1368
MFGc	Sawgrass	SP	Spoil	0.944447
MFGe	Spikerush	FMXlr	White Mangrove-Red Mangrove Forest	0.865291
MFGe	Spikerush	WMcG	Buttonwood Woodland-Graminoid	6.922478
MFGe	Spikerush	WMcBa	Buttonwood Woodland-Leather Fern	0.368901
MFGe	Spikerush	WMaG	Black Mangrove-Graminoid	1.268884
MFGe	Spikerush	WMX	Mixed Mangrove Woodland	2.865237
MFGe	Spikerush	SMXlr	White Mangrove-Red Mangrove Shrubland	3.785536
MFGe	Spikerush	CMaG	Black Mangrove Scrub-Graminoid	2.810259
MFGe	Spikerush	CMcG	Buttonwood Scrub-Graminoid	4.007919
MFGe	Spikerush	CMcGj	Buttonwood Scrub-Black Rush	0.917181
MFGe	Spikerush	CMr	Red Mangrove Scrub	12.65381
MFGe	Spikerush	CMXGj	Mixed Mangrove Scrub-Black Rush	0.421072
MFGe	Spikerush	CSsGc	Willow Scrub-Sawgrass	11.99642
MFGe	Spikerush	MSG	Graminoid Salt Marsh	1.752297
MFGe	Spikerush	MSGd	Saltgrass	1.192699
MFGe	Spikerush	MFG	Graminoid Freshwater Marsh	2.16761
MFGe	Spikerush	MFGt	Cattail	2.386211
MFGe	Spikerush	HI	Human Impacted	1.819422
HI	Human Impacted	HI	Human Impacted	1.008294
RD	Road	RD	Road	1.742787
RD	Road	SP	Spoil	3.695626
OW	Open Water	FMXcr	Buttonwood-Red Mangrove Forest	0.278474
OW	Open Water	FMXlr	White Mangrove-Red Mangrove Forest	0.094161



1940		2010		Changes
Class ID	Name	Class ID	Name	Acres
OW	Open Water	SMXlr	White Mangrove-Red Mangrove Shrubland	0.234197
OW	Open Water	CMr	Red Mangrove Scrub	0.136449
OW	Open Water	OW	Open Water	0.01642
Total				384.6478



Table 9. Autoranch, vegetation changes from 1940-2010 and acres of change.

1940		2010		Change
Class ID	Name	Class ID	Name	Acres
FSH	Hardwood Swamp Forest	FSH	Hardwood Swamp Forest	0.175
FSt	Cypress Forest	FSt	Cypress Forest	5.609
FStH	Cypress-Hardwood Forest	FStH	Cypress-Hardwood Forest	21.321
FStH	Cypress-Hardwood Forest	HI	Human Impacted	0.295
FHa	Cabbage Palm Hammock	FHa	Cabbage Palm Hammock	0.630
FSf	Pop Ash Forest	FSf	Pop Ash Forest	0.266
WS	Swamp Woodland	WS	Swamp Woodland	0.229
WS	Swamp Woodland	WStp	Cypress-Pine Woodland	0.834
WSp	Pine Lowland	FSH	Hardwood Swamp Forest	0.294
WSp	Pine Lowland	FHa	Cabbage Palm Hammock	0.277
WSp	Pine Lowland	FHT	Temperate Hardwood Hammock	0.227
WSp	Pine Lowland	WSp	Pine Lowland	0.206
WSp	Pine Lowland	WSpS	Pine Lowland-Shrub	3.514
WSp	Pine Lowland	WSpX	Pine Lowland-Mixed	0.350
WSp	Pine Lowland	WSsS	Cabbage Palm Lowland-Shrub	2.459
WSp	Pine Lowland	WSsX	Cabbage Palm Lowland-Mixed	0.975
WSp	Pine Lowland	WSh	Hardwood Swamp Woodland	0.442
WSp	Pine Lowland	HI	Human Impacted	1.597
WSpG	Pine Lowland-Graminoid	WSpG	Pine Lowland-Graminoid	0.073
WSpG	Pine Lowland-Graminoid	WSpS	Pine Lowland-Shrub	0.246
WSpG	Pine Lowland-Graminoid	WSsX	Cabbage Palm Lowland-Mixed	0.271
WSpS	Pine Lowland-Shrub	FHa	Cabbage Palm Hammock	0.067
WSpS	Pine Lowland-Shrub	WSpS	Pine Lowland-Shrub	0.287
WSpS	Pine Lowland-Shrub	WSsX	Cabbage Palm Lowland-Mixed	0.384
WSt	Cypress Woodland	FStH	Cypress-Hardwood Forest	0.474
WSt	Cypress Woodland	WStG	Cypress Woodland-Graminoid	0.726
WSt	Cypress Woodland	WStS	Cypress Woodland-Shrub	0.887
WSt	Cypress Woodland	WStH	Cypress-Hardwood Woodland	3.605
WSt	Cypress Woodland	WSh	Hardwood Swamp Woodland	0.766
WSt	Cypress Woodland	HI	Human Impacted	0.229
WStG	Cypress Woodland-Graminoid	WStG	Cypress Woodland-Graminoid	0.615
WStG	Cypress Woodland-Graminoid	WStS	Cypress Woodland-Shrub	1.176
WStG	Cypress Woodland-Graminoid	WStp	Cypress-Pine Woodland	0.386
WStG	Cypress Woodland-Graminoid	WStH	Cypress-Hardwood Woodland	0.461
WStG	Cypress Woodland-Graminoid	WSh	Hardwood Swamp Woodland	0.833
WStG	Cypress Woodland-Graminoid	HI	Human Impacted	0.218
WStO	Cypress Woodland-Open Marsh	FSf	Pop Ash Forest	0.574
WStp	Cypress-Pine Woodland	WStp	Cypress-Pine Woodland	1.544



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
WStp	Cypress-Pine Woodland	HI	Human Impacted	0.126
WStH	Cypress-Hardwood Woodland	WStS	Cypress Woodland-Shrub	0.414
WStH	Cypress-Hardwood Woodland	WStH	Cypress-Hardwood Woodland	4.765
WStH	Cypress-Hardwood Woodland	WSh	Hardwood Swamp Woodland	1.685
WStH	Cypress-Hardwood Woodland	SS	Swamp Shrubland	0.083
WStH	Cypress-Hardwood Woodland	HI	Human Impacted	2.277
WSs	Cabbage Palm Lowland	WSsS	Cabbage Palm Lowland-Shrub	0.302
WSsG	Cabbage Palm Lowland-Graminoid	WSsG	Cabbage Palm Lowland-Graminoid	0.414
WSsG	Cabbage Palm Lowland-Graminoid	WSsS	Cabbage Palm Lowland-Shrub	1.325
WSsX	Cabbage Palm Lowland-Mixed	FHa	Cabbage Palm Hammock	0.390
WSsX	Cabbage Palm Lowland-Mixed	WSsS	Cabbage Palm Lowland-Shrub	0.581
WSsX	Cabbage Palm Lowland-Mixed	WSh	Hardwood Swamp Woodland	0.478
WSh	Hardwood Swamp Woodland	FSH	Hardwood Swamp Forest	0.308
WSh	Hardwood Swamp Woodland	WSh	Hardwood Swamp Woodland	2.317
WUpSs	Pine Upland-Saw Palmetto	FHT	Temperate Hardwood Hammock	1.316
WUpSs	Pine Upland-Saw Palmetto	WUpSs	Pine Upland-Saw Palmetto	21.060
WUpSs	Pine Upland-Saw Palmetto	WUqSs	Live Oak Woodland with Saw Palmetto	3.819
WUqSs	Live Oak Woodland with Saw Palmetto	FHa	Cabbage Palm Hammock	0.043
WUqSs	Live Oak Woodland with Saw Palmetto	FHT	Temperate Hardwood Hammock	0.783
WUqSs	Live Oak Woodland with Saw Palmetto	WUqSs	Live Oak Woodland with Saw Palmetto	1.170
WUqSs	Live Oak Woodland with Saw Palmetto	HI	Human Impacted	0.007
WUCp	Scrubby Flatwoods	WUqSs	Live Oak Woodland with Saw Palmetto	0.516
WUCp	Scrubby Flatwoods	WUCp	Scrubby Flatwoods	15.687
SM	Mangrove Shrubland	SMXlr	White Mangrove-Red Mangrove Shrubland	0.010
CMr	Red Mangrove Scrub	SMr	Red Mangrove Shrubland	0.104
CMr	Red Mangrove Scrub	CMXlr	White Mangrove-Red Mangrove Scrub	0.960
CSG	Swamp Scrub-Graminoid Marsh	SS	Swamp Shrubland	0.358
CSG	Swamp Scrub-Graminoid Marsh	SSs	Willow Shrubland	0.377
CSG	Swamp Scrub-Graminoid Marsh	CSsG	Willow Scrub-Graminoid Marsh	0.477
CSGc	Swamp Scrub-Sawgrass	WSh	Hardwood Swamp Woodland	1.288
MF	Freshwater Marsh	WSpG	Pine Lowland-Graminoid	0.227
MF	Freshwater Marsh	MF	Freshwater Marsh	0.173
MF	Freshwater Marsh	MFG	Graminoid Freshwater Marsh	0.034
MFG	Graminoid Freshwater Marsh	SMr	Red Mangrove Shrubland	0.043
MFG	Graminoid Freshwater Marsh	SSs	Willow Shrubland	2.889



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
MFG	Graminoid Freshwater Marsh	CMXlr	White Mangrove-Red Mangrove Scrub	0.041
MFG	Graminoid Freshwater Marsh	CMXlrG	White Mangrove-Red Mangrove Scrub-Graminoid	0.909
MFG	Graminoid Freshwater Marsh	CSG	Swamp Scrub-Graminoid Marsh	1.648
MFG	Graminoid Freshwater Marsh	CSsG	Willow Scrub-Graminoid Marsh	1.733
MFG	Graminoid Freshwater Marsh	CSsGc	Willow Scrub-Sawgrass	3.600
MFG	Graminoid Freshwater Marsh	MF	Freshwater Marsh	1.431
MFG	Graminoid Freshwater Marsh	MFG	Graminoid Freshwater Marsh	2.048
MFG	Graminoid Freshwater Marsh	MFGt	Cattail	5.210
MFGc	Sawgrass	WSh	Hardwood Swamp Woodland	0.073
MFGc	Sawgrass	SSs	Willow Shrubland	5.202
MFGc	Sawgrass	CSmGc	Wax Myrtle Scrub-Sawgrass	0.155
MFGc	Sawgrass	CSsG	Willow Scrub-Graminoid Marsh	0.076
MFGc	Sawgrass	CSsGc	Willow Scrub-Sawgrass	1.526
MFGc	Sawgrass	MFG	Graminoid Freshwater Marsh	0.022
MFGP	Graminoid Freshwater Prairie	WSh	Hardwood Swamp Woodland	0.180
OW	Open Water	SMr	Red Mangrove Shrubland	0.450
OW	Open Water	CMr	Red Mangrove Scrub	0.032
OW	Open Water	CMXlr	White Mangrove-Red Mangrove Scrub	0.053
OW	Open Water	CSsG	Willow Scrub-Graminoid Marsh	0.057
OW	Open Water	MFGt	Cattail	1.323
OW	Open Water	HI	Human Impacted	0.053
OW	Open Water	CA	Canal	0.015
OW	Open Water	OW	Open Water	1.363
			Total	147.533



Table 10 Collier-Seminole State Park, South Old Marco Road, vegetation changes from 1940-2010 and acres of change.

1940		2010		Change
Class ID	Name	Class ID	Name	Acres
FM	Mangrove Forest	FMXlr	White Mangrove-Red Mangrove Forest	1.136
FSH	Hardwood Swamp Forest	WSsS	Cabbage Palm Lowland-Shrub	5.301
FSH	Hardwood Swamp Forest	WSh	Hardwood Swamp Woodland	0.402
FSH	Hardwood Swamp Forest	SMXlr	White Mangrove-Red Mangrove Shrubland	0.416
FSt	Cypress Forest	FSt	Cypress Forest	11.679
FSt	Cypress Forest	FStp	Cypress-Pine Forest	0.442
FStH	Cypress-Hardwood Forest	FSH	Hardwood Swamp Forest	0.869
FStH	Cypress-Hardwood Forest	FStH	Cypress-Hardwood Forest	6.712
FStH	Cypress-Hardwood Forest	WSpS	Pine Lowland-Shrub	0.989
FStH	Cypress-Hardwood Forest	WSsS	Cabbage Palm Lowland-Shrub	1.808
FStH	Cypress-Hardwood Forest	WSsX	Cabbage Palm Lowland-Mixed	3.422
FStH	Cypress-Hardwood Forest	WSh	Hardwood Swamp Woodland	1.767
FHa	Cabbage Palm Hammock	FHa	Cabbage Palm Hammock	5.152
FHa	Cabbage Palm Hammock	FHT	Temperate Hardwood Hammock	6.590
FHa	Cabbage Palm Hammock	HI	Human Impacted	0.758
FHT	Temperate Hardwood Hammock	FHS	Tropical Hardwood Hammock	0.495
FHT	Temperate Hardwood Hammock	FHT	Temperate Hardwood Hammock	6.586
FSf	Pop Ash Forest	FSf	Pop Ash Forest	0.424
FSf	Pop Ash Forest	MFGc	Sawgrass	0.583
WMc	Buttonwood Woodland	FMc	Buttonwood Forest	0.000
WMc	Buttonwood Woodland	WMc	Buttonwood Woodland	8.416
WMc	Buttonwood Woodland	WMcBa	Buttonwood Woodland-Leather Fern	1.812
WMc	Buttonwood Woodland	CMIGd	White Mangrove Scrub-Saltgrass	0.000
WSp	Pine Lowland	FHa	Cabbage Palm Hammock	1.998
WSp	Pine Lowland	WMc	Buttonwood Woodland	2.305
WSp	Pine Lowland	WSp	Pine Lowland	0.411
WSp	Pine Lowland	WSpG	Pine Lowland-Graminoid	0.807
WSp	Pine Lowland	WSpS	Pine Lowland-Shrub	2.222
WSp	Pine Lowland	WSpX	Pine Lowland-Mixed	1.557
WSp	Pine Lowland	WSsS	Cabbage Palm Lowland-Shrub	3.453
WSp	Pine Lowland	CMX	Mixed Mangrove Scrub	0.138
WSp	Pine Lowland	HI	Human Impacted	0.898
WSpG	Pine Lowland-Graminoid	FHa	Cabbage Palm Hammock	0.359
WSpG	Pine Lowland-Graminoid	WMc	Buttonwood Woodland	15.310
WSpG	Pine Lowland-Graminoid	WMcG	Buttonwood Woodland-Graminoid	0.434



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
WSpG	Pine Lowland-Graminoid	WSp	Pine Lowland	0.327
WSpG	Pine Lowland-Graminoid	WSpG	Pine Lowland-Graminoid	18.864
WSpG	Pine Lowland-Graminoid	WSpS	Pine Lowland-Shrub	1.973
WSpG	Pine Lowland-Graminoid	WSpX	Pine Lowland-Mixed	7.240
WSpG	Pine Lowland-Graminoid	WSsG	Cabbage Palm Lowland-Graminoid	1.340
WSpG	Pine Lowland-Graminoid	WSsGc	Cabbage Palm Lowland-Sawgrass	3.147
WSpG	Pine Lowland-Graminoid	WSsS	Cabbage Palm Lowland-Shrub	1.450
WSpG	Pine Lowland-Graminoid	WSsX	Cabbage Palm Lowland-Mixed	0.566
WSpG	Pine Lowland-Graminoid	CSmGc	Wax Myrtle Scrub-Sawgrass	0.694
WSpG	Pine Lowland-Graminoid	HI	Human Impacted	0.467
WSpG	Pine Lowland-Graminoid	SP	Spoil	0.129
WSpS	Pine Lowland-Shrub	FHa	Cabbage Palm Hammock	5.083
WSpS	Pine Lowland-Shrub	FHT	Temperate Hardwood Hammock	10.344
WSpS	Pine Lowland-Shrub	WSpS	Pine Lowland-Shrub	1.355
WSpX	Pine Lowland-Mixed	FHa	Cabbage Palm Hammock	0.742
WSpX	Pine Lowland-Mixed	FHT	Temperate Hardwood Hammock	0.526
WSpX	Pine Lowland-Mixed	WMc	Buttonwood Woodland	0.710
WSpX	Pine Lowland-Mixed	WSpS	Pine Lowland-Shrub	29.587
WSpX	Pine Lowland-Mixed	WSpX	Pine Lowland-Mixed	78.008
WSpX	Pine Lowland-Mixed	WSsS	Cabbage Palm Lowland-Shrub	0.207
WSpX	Pine Lowland-Mixed	WSsX	Cabbage Palm Lowland-Mixed	1.119
WSpX	Pine Lowland-Mixed	CSmGc	Wax Myrtle Scrub-Sawgrass	0.275
WSpX	Pine Lowland-Mixed	HI	Human Impacted	0.506
WSt	Cypress Woodland	FSH	Hardwood Swamp Forest	0.643
WSt	Cypress Woodland	WMc	Buttonwood Woodland	0.427
WSt	Cypress Woodland	WS	Swamp Woodland	12.060
WSt	Cypress Woodland	WStS	Cypress Woodland-Shrub	11.056
WSt	Cypress Woodland	WStH	Cypress-Hardwood Woodland	2.258
WSt	Cypress Woodland	WSsS	Cabbage Palm Lowland-Shrub	1.153
WSt	Cypress Woodland	WSsX	Cabbage Palm Lowland-Mixed	0.048
WSt	Cypress Woodland	SMXlr	White Mangrove-Red Mangrove Shrubland	1.898
WSt	Cypress Woodland	MFBa	Leather Fern	0.118
WSt	Cypress Woodland	HI	Human Impacted	0.531
WStG	Cypress Woodland-Graminoid	WS	Swamp Woodland	10.809
WStG	Cypress Woodland-Graminoid	WSpS	Pine Lowland-Shrub	0.491
WStG	Cypress Woodland-Graminoid	WSpX	Pine Lowland-Mixed	0.284
WStG	Cypress Woodland-Graminoid	WStG	Cypress Woodland-Graminoid	0.095
WStG	Cypress Woodland-Graminoid	WStp	Cypress-Pine Woodland	25.665



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
WStG	Cypress Woodland-Graminoid	WSsX	Cabbage Palm Lowland-Mixed	1.393
WStG	Cypress Woodland-Graminoid	HI	Human Impacted	0.269
WStp	Cypress-Pine Woodland	WS	Swamp Woodland	0.543
WStp	Cypress-Pine Woodland	WSp	Pine Lowland	1.427
WStp	Cypress-Pine Woodland	WSpG	Pine Lowland-Graminoid	2.942
WStp	Cypress-Pine Woodland	WSpS	Pine Lowland-Shrub	46.686
WStp	Cypress-Pine Woodland	WSpX	Pine Lowland-Mixed	1.402
WStp	Cypress-Pine Woodland	WStp	Cypress-Pine Woodland	16.380
WStp	Cypress-Pine Woodland	HI	Human Impacted	3.048
WStH	Cypress-Hardwood Woodland	WSsS	Cabbage Palm Lowland-Shrub	0.948
WSs	Cabbage Palm Lowland	FHa	Cabbage Palm Hammock	1.522
WSs	Cabbage Palm Lowland	WMc	Buttonwood Woodland	0.317
WSs	Cabbage Palm Lowland	WSsS	Cabbage Palm Lowland-Shrub	1.615
WSs	Cabbage Palm Lowland	WSsX	Cabbage Palm Lowland-Mixed	4.379
WSsG	Cabbage Palm Lowland-Graminoid	FHa	Cabbage Palm Hammock	2.232
WSsG	Cabbage Palm Lowland-Graminoid	WSsS	Cabbage Palm Lowland-Shrub	0.202
WSsG	Cabbage Palm Lowland-Graminoid	WSsX	Cabbage Palm Lowland-Mixed	1.061
WSsG	Cabbage Palm Lowland-Graminoid	CSmGc	Wax Myrtle Scrub-Sawgrass	0.967
WSsG	Cabbage Palm Lowland-Graminoid	MFGc	Sawgrass	0.164
WSsGc	Cabbage Palm Lowland-Sawgrass	FHa	Cabbage Palm Hammock	4.767
WSsGc	Cabbage Palm Lowland-Sawgrass	WSsGc	Cabbage Palm Lowland-Sawgrass	0.159
WSsGc	Cabbage Palm Lowland-Sawgrass	WSsS	Cabbage Palm Lowland-Shrub	2.334
WSsGc	Cabbage Palm Lowland-Sawgrass	WSsX	Cabbage Palm Lowland-Mixed	1.172
WSsS	Cabbage Palm Lowland-Shrub	FHa	Cabbage Palm Hammock	3.647
WSsS	Cabbage Palm Lowland-Shrub	WMc	Buttonwood Woodland	3.417
WSsS	Cabbage Palm Lowland-Shrub	WMcBa	Buttonwood Woodland-Leather Fern	0.940
WSsS	Cabbage Palm Lowland-Shrub	WSsS	Cabbage Palm Lowland-Shrub	0.028
WSsX	Cabbage Palm Lowland-Mixed	FHa	Cabbage Palm Hammock	0.929
WSsX	Cabbage Palm Lowland-Mixed	WMc	Buttonwood Woodland	3.818
WSsX	Cabbage Palm Lowland-Mixed	WMcG	Buttonwood Woodland-Graminoid	0.543
WSsX	Cabbage Palm Lowland-Mixed	WSsS	Cabbage Palm Lowland-Shrub	2.439
WSsX	Cabbage Palm Lowland-Mixed	WSh	Hardwood Swamp Woodland	0.310
WSsX	Cabbage Palm Lowland-Mixed	SMXlr	White Mangrove-Red Mangrove Shrubland	0.267
WSh	Hardwood Swamp Woodland	FSH	Hardwood Swamp Forest	1.523
WSh	Hardwood Swamp Woodland	FHa	Cabbage Palm Hammock	3.737
WSh	Hardwood Swamp Woodland	WSsS	Cabbage Palm Lowland-Shrub	4.096
WSh	Hardwood Swamp Woodland	WSsX	Cabbage Palm Lowland-Mixed	0.978
WSh	Hardwood Swamp Woodland	HI	Human Impacted	0.311



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
WUp	Pine Upland	FHa	Cabbage Palm Hammock	0.091
WUp	Pine Upland	FHT	Temperate Hardwood Hammock	0.597
WUp	Pine Upland	FHX	Xeric Hammock	0.173
WUp	Pine Upland	WSpS	Pine Lowland-Shrub	0.458
WUp	Pine Upland	WUpSs	Pine Upland-Saw Palmetto	5.668
WUp	Pine Upland	WUqSs	Live Oak Woodland with Saw Palmetto	1.401
WUpS	Pine Upland-Shrub	FHT	Temperate Hardwood Hammock	5.863
WUpSs	Pine Upland-Saw Palmetto	FHS	Tropical Hardwood Hammock	0.466
WUpSs	Pine Upland-Saw Palmetto	WSp	Pine Lowland	0.486
WUpSs	Pine Upland-Saw Palmetto	WUp	Pine Upland	1.423
WUpSs	Pine Upland-Saw Palmetto	WUpSs	Pine Upland-Saw Palmetto	32.679
WUpSs	Pine Upland-Saw Palmetto	WUqSs	Live Oak Woodland with Saw Palmetto	3.772
WUs	Cabbage Palm Upland	WUs	Cabbage Palm Upland	0.036
WUqSs	Live Oak Woodland with Saw Palmetto	FHT	Temperate Hardwood Hammock	2.947
WUqSs	Live Oak Woodland with Saw Palmetto	WUqSs	Live Oak Woodland with Saw Palmetto	2.729
WUCp	Scrubby Flatwoods	WUqSs	Live Oak Woodland with Saw Palmetto	0.648
WUCp	Scrubby Flatwoods	WUCp	Scrubby Flatwoods	8.165
SM	Mangrove Shrubland	FMX	Mixed Mangrove Forest	0.582
SM	Mangrove Shrubland	FMXlr	White Mangrove-Red Mangrove Forest	8.355
SM	Mangrove Shrubland	WMcBa	Buttonwood Woodland-Leather Fern	0.415
SM	Mangrove Shrubland	SMXlr	White Mangrove-Red Mangrove Shrubland	3.492
SMc	Buttonwood Shrubland	WMc	Buttonwood Woodland	0.395
SMr	Red Mangrove Shrubland	WMc	Buttonwood Woodland	0.054
SMr	Red Mangrove Shrubland	CMXlr	White Mangrove-Red Mangrove Scrub	0.492
SS	Swamp Shrubland	WMcBa	Buttonwood Woodland-Leather Fern	0.146
SS	Swamp Shrubland	SMc	Buttonwood Shrubland	0.021
CM	Mangrove Scrub	FMXlr	White Mangrove-Red Mangrove Forest	4.916
CM	Mangrove Scrub	WMc	Buttonwood Woodland	0.507
CM	Mangrove Scrub	SMXlr	White Mangrove-Red Mangrove Shrubland	1.739
CM	Mangrove Scrub	CMXlr	White Mangrove-Red Mangrove Scrub	0.712
CMc	Buttonwood Scrub	WMcBa	Buttonwood Woodland-Leather Fern	0.467
CMc	Buttonwood Scrub	CMcGj	Buttonwood Scrub-Black Rush	0.129
CMcG	Buttonwood Scrub-Graminoid	WMcBa	Buttonwood Woodland-Leather Fern	18.718



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
CMcG	Buttonwood Scrub-Graminoid	SMXlr	White Mangrove-Red Mangrove Shrubland	2.069
CMcG	Buttonwood Scrub-Graminoid	CMcG	Buttonwood Scrub-Graminoid	0.578
CMcG	Buttonwood Scrub-Graminoid	CMX	Mixed Mangrove Scrub	1.524
CMI	White Mangrove Scrub	SMI	White Mangrove Shrubland	0.000
CMI	White Mangrove Scrub	CMIGd	White Mangrove Scrub-Saltgrass	0.000
CMI	White Mangrove Scrub	SP	Spoil	0.000
CMXG	Mixed Mangrove Scrub-Graminoid	WMc	Buttonwood Woodland	0.195
CSGc	Swamp Scrub-Sawgrass	WSsS	Cabbage Palm Lowland-Shrub	0.503
CSGc	Swamp Scrub-Sawgrass	SMXlr	White Mangrove-Red Mangrove Shrubland	3.644
CSGc	Swamp Scrub-Sawgrass	SS	Swamp Shrubland	2.570
CSGc	Swamp Scrub-Sawgrass	CSmGc	Wax Myrtle Scrub-Sawgrass	0.579
CStG	Cypress Scrub-Graminoid Marsh	WSpG	Pine Lowland-Graminoid	1.130
CStG	Cypress Scrub-Graminoid Marsh	WSpS	Pine Lowland-Shrub	0.076
CStG	Cypress Scrub-Graminoid Marsh	WSpX	Pine Lowland-Mixed	0.414
CStG	Cypress Scrub-Graminoid Marsh	WStp	Cypress-Pine Woodland	1.457
CStG	Cypress Scrub-Graminoid Marsh	WSsS	Cabbage Palm Lowland-Shrub	1.244
M	Marsh	FMr	Red Mangrove Forest	0.239
M	Marsh	FMXlr	White Mangrove-Red Mangrove Forest	0.888
M	Marsh	WMc	Buttonwood Woodland	4.575
M	Marsh	WMcBa	Buttonwood Woodland-Leather Fern	3.344
M	Marsh	WSsS	Cabbage Palm Lowland-Shrub	0.032
M	Marsh	SMI	White Mangrove Shrubland	0.803
M	Marsh	SMXlr	White Mangrove-Red Mangrove Shrubland	24.166
M	Marsh	CMcG	Buttonwood Scrub-Graminoid	0.223
M	Marsh	CMr	Red Mangrove Scrub	0.568
M	Marsh	CMXG	Mixed Mangrove Scrub-Graminoid	0.211
M	Marsh	CMXlr	White Mangrove-Red Mangrove Scrub	1.971
M	Marsh	MSGd	Saltgrass	0.475
M	Marsh	MSGj	Black Rush	0.356
M	Marsh	MSGs	Cordgrass	1.073
M	Marsh	MFGt	Cattail	9.268
M	Marsh	MFGP	Graminoid Freshwater Prairie	0.136
M	Marsh	HI	Human Impacted	0.076
M	Marsh	OW	Open Water	0.065
MSG	Graminoid Salt Marsh	WMc	Buttonwood Woodland	2.720
MSG	Graminoid Salt Marsh	WMcG	Buttonwood Woodland-Graminoid	0.193
MSG	Graminoid Salt Marsh	WMcBa	Buttonwood Woodland-Leather Fern	0.000



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
MSG	Graminoid Salt Marsh	SMI	White Mangrove Shrubland	7.862
MSG	Graminoid Salt Marsh	SMX	Mixed Mangrove Shrubland	0.414
MSG	Graminoid Salt Marsh	SMXlr	White Mangrove-Red Mangrove Shrubland	2.137
MSG	Graminoid Salt Marsh	CMcG	Buttonwood Scrub-Graminoid	0.338
MSG	Graminoid Salt Marsh	CMIGd	White Mangrove Scrub-Saltgrass	0.641
MSG	Graminoid Salt Marsh	MSG	Graminoid Salt Marsh	0.603
MSG	Graminoid Salt Marsh	MSGs	Cordgrass	0.565
MSG	Graminoid Salt Marsh	MFGt	Cattail	0.077
MSG	Graminoid Salt Marsh	SP	Spoil	0.410
MSG	Graminoid Salt Marsh	MUD	Mud	1.970
MSGs	Cordgrass	WMc	Buttonwood Woodland	11.655
MSGs	Cordgrass	SMXlr	White Mangrove-Red Mangrove Shrubland	1.051
MSGs	Cordgrass	CMIGd	White Mangrove Scrub-Saltgrass	1.233
MSGs	Cordgrass	HI	Human Impacted	1.012
MFG	Graminoid Freshwater Marsh	WSpG	Pine Lowland-Graminoid	0.355
MFG	Graminoid Freshwater Marsh	MFG	Graminoid Freshwater Marsh	0.132
MFG	Graminoid Freshwater Marsh	MFGc	Sawgrass	1.214
MFG	Graminoid Freshwater Marsh	MFGt	Cattail	0.928
MFGc	Sawgrass	FHa	Cabbage Palm Hammock	0.431
MFGc	Sawgrass	WMc	Buttonwood Woodland	4.185
MFGc	Sawgrass	WMcG	Buttonwood Woodland-Graminoid	4.189
MFGc	Sawgrass	WMcBa	Buttonwood Woodland-Leather Fern	0.102
MFGc	Sawgrass	WS	Swamp Woodland	2.622
MFGc	Sawgrass	WSp	Pine Lowland	1.545
MFGc	Sawgrass	WSpG	Pine Lowland-Graminoid	6.397
MFGc	Sawgrass	WSpS	Pine Lowland-Shrub	14.954
MFGc	Sawgrass	WSpX	Pine Lowland-Mixed	1.709
MFGc	Sawgrass	WSsGc	Cabbage Palm Lowland-Sawgrass	2.460
MFGc	Sawgrass	WSsS	Cabbage Palm Lowland-Shrub	0.560
MFGc	Sawgrass	WSsX	Cabbage Palm Lowland-Mixed	2.280
MFGc	Sawgrass	SMXlr	White Mangrove-Red Mangrove Shrubland	5.376
MFGc	Sawgrass	SS	Swamp Shrubland	1.217
MFGc	Sawgrass	SSm	Wax Myrtle Shrubland	0.019
MFGc	Sawgrass	CMcG	Buttonwood Scrub-Graminoid	3.096
MFGc	Sawgrass	CSGc	Swamp Scrub-Sawgrass	0.601
MFGc	Sawgrass	CSmGc	Wax Myrtle Scrub-Sawgrass	2.960
MFGc	Sawgrass	MSGd	Saltgrass	0.148



1940		2010		Change
Class ID	Name	Class ID	Name	Acres
MFGc	Sawgrass	MSGs	Cordgrass	1.410
MFGc	Sawgrass	MFG	Graminoid Freshwater Marsh	1.303
MFGc	Sawgrass	MFGc	Sawgrass	30.367
MFGc	Sawgrass	MFGt	Cattail	0.625
MFGc	Sawgrass	HI	Human Impacted	1.157
MFGt	Cattail	WMc	Buttonwood Woodland	0.285
MFGt	Cattail	SMXlr	White Mangrove-Red Mangrove Shrubland	0.269
MFGP	Graminoid Freshwater Prairie	WSpG	Pine Lowland-Graminoid	0.289
MFGP	Graminoid Freshwater Prairie	WSpS	Pine Lowland-Shrub	0.151
HI	Human Impacted	WSsS	Cabbage Palm Lowland-Shrub	0.372
HI	Human Impacted	HI	Human Impacted	60.782
CA	Canal	HI	Human Impacted	0.206
CA	Canal	CA	Canal	2.462
QUA	Quarry	QUA	Quarry	4.076
RD	Road	HI	Human Impacted	0.298
RD	Road	SP	Spoil	5.276
SP	Spoil	SP	Spoil	1.328
OW	Open Water	WMc	Buttonwood Woodland	0.795
OW	Open Water	SMI	White Mangrove Shrubland	0.064
OW	Open Water	SMX	Mixed Mangrove Shrubland	0.039
OW	Open Water	SMXlr	White Mangrove-Red Mangrove Shrubland	13.256
OW	Open Water	CMr	Red Mangrove Scrub	1.373
OW	Open Water	CMXG	Mixed Mangrove Scrub-Graminoid	0.037
OW	Open Water	CMXlr	White Mangrove-Red Mangrove Scrub	0.096
OW	Open Water	MFGt	Cattail	0.471
OW	Open Water	OW	Open Water	4.955

Total 846.047

