

National Park Service
South Florida/Caribbean Network
Inventory and Monitoring Program

Baseline Vegetation Mapping for Big Cypress
National Preserve, Everglades National Park and the
Florida Panther Refuge

Final Technical Report



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1.0 Introduction

The purpose of this report is to explain the methods utilized to generate the deliverables required for the Baseline Vegetation Mapping being conducted for Big Cypress National Preserve, Everglades National Park and the Florida Panther Refuge. The report will discuss the procedures utilized by Avineon for major tasks including field work, photointerpretation, and GIS processing.

Quality assurance procedures are identified and relevant issues encountered during the completion of the project are documented.

A summary of information obtained during field work and photointerpretation is presented herein. This includes an Attribute Summary table which lists all vegetation classification codes used in the study area as well as the frequency at which they were used.

2.0 Study Area

The project encompasses the Florida Panther National Wildlife Refuge, Big Cypress National Preserve, and the Everglades National Park. The project is divided into four separate delivery areas as described below.

Delivery Area 1 encompasses all of the Florida Panther National Wildlife Refuge.

Delivery Area 2 is contained in the northern half of the Big Cypress National Preserve. The southern boundary of Delivery Area 2 is approximately 7 miles south of Interstate 75. The North, East, and West boundaries are contained within the Big Cypress National Preserve boundaries.

Delivery Area 3 is the southern half of the Big Cypress National Preserve. The northern boundary is approximately 7 miles south of Interstate 75 and extends to the northern boundary of the Everglades National Park. The east and west boundaries are contained within the Big Cypress National Park boundaries.

Delivery Area 4 encompasses the extreme western section of the Everglades National Park. This section is bounded on the north by the Big Cypress Preserve and on the south by Florida Bay.

Figure 1 depicts the project area along with each delivery area.

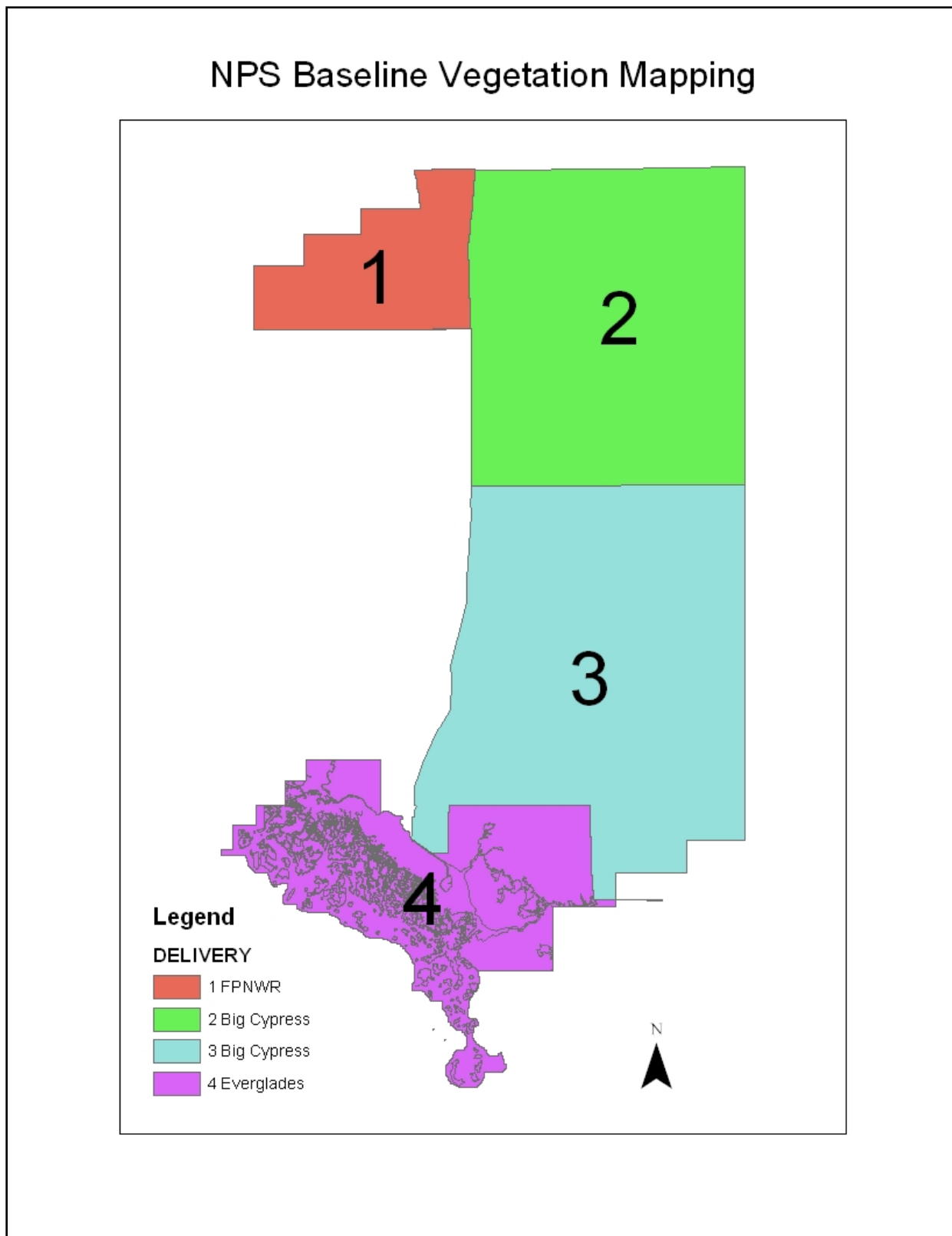


Figure 1

3.0 Methods Utilized

The South Florida Water Management District originally designed the mapping methodology for the project and NPS has adopted the majority of those methods. Mapping is accomplished by the attribution of a ¼ hectare digital grid superimposed over controlled aerial photography within an analytical stereoplotter. Rather than photointerpret precise polygon boundaries representing vegetation cover types visible on the aerial photography, the photointerpreters attribute each ¼ hectare grid cell individually using the Vegetation Classification System for South Florida National Parks. This method requires that each ¼ hectare grid cell is evaluated for vegetative specie signatures, compared to field and/or ancillary data, and attributed according to the classification system.

3.1 Aerial Photography and Aerotriangulation

Mapping is being accomplished utilizing 1:24,000 scale film-based color infrared aerial photography acquired on February 1, 2006. The aerial photography was acquired using a Wild RC30 aerial camera at a flight height of 12,020 feet above mean terrain.

Ground control for the aerial photography was derived using a combination of airborne GPS coordinates acquired during acquisition and photo-identifiable ground control coordinates surveyed in the field after aerial photography acquisition.

Aerotriangulation was accomplished so that the resultant spatial accuracy is much better than the contractually required specification of USGS National Map Accuracy Standards (NMAS) for 1:12,000 scale map products.

The root mean square error (RMSE) of the ground control point residuals in METERS are as follows:

RMSE-X	RMSE-Y	RMSE-Z
0.370	0.273	0.278

Appendix E contains the "AEROTRIANGULATION REPORT (Job # J06-0007) BIG CYPRESS NATIONAL PARK, FLORIDA" which further describes the aerotriangulation process and the results obtained after the bundle adjustment.

Aerotriangulation Quality Assurance

The results of aerotriangulation were carefully inspected prior to mapping. Adjusted coordinate residuals were inspected to ensure compliance with the project's accuracy requirements of USGS National Map Accuracy Standards (NMAS) for 1:12,000 scale map products.

The rectified imagery was again tested against existing Collier County's high accuracy digital orthophotography. Photo-identifiable points which were visible on both the project's imagery and Collier County's imagery were compared to ensure that only minor offsets existed. The project's imagery was also compared to USGS Digital Orthophoto Quarter Quads (DOQQ) to ensure accuracy.

The aerotriangulation solution is also constantly tested in the field by Avineon's photointerpreters. The field crew selects field point coordinates from the rectified aerial photography appearing within the stereoplotter. They then visit the field point coordinates using GPS to document vegetation. The field points have continuously aligned to the photo-identifiable features apparent on the aerial photography.

3.2 Photointerpretation

The photointerpretation process begins with loading adjacent pairs of aerial photos (or stereo pairs) onto the analytical stereoplotter stages so that they can be viewed as three dimensional images in stereo. The overlapping portion of adjacent photographs is called a model. The photointerpreter can collect any data that is viewable within the model.

Prior to photointerpretation the aerial photographic model must be oriented so that all coordinate positions on the model can be tied to real ground coordinates on the Earth. The orientation software used at Avineon is P-CAP, available from Z/I Imaging Corporation. The software requires the measurement and input of the inner, then the relative, and finally the absolute orientation of the stereo pair. The inner orientation measures the corner and side fiducials of the photographs wherever they have been placed on the stereoplotter plates so that they are oriented to the stereoplotter. This establishes an X-Y coordinate system for the photos with the principle point acting as the origin. The relative orientation requires the user to identify matching features between the two photos so that they are oriented to each other. This results in an un-scaled and un-georeferenced model of the two photographs. The relative angles between the photos themselves and any features viewed on the photos are then anchored relative to one another. The final orientation step is referred to as absolute orientation. Absolute orientation is performed by locating/inputting ground control points used for aerotriangulation. This step orients the photography to the real world coordinate system which in this case is Universal Transverse Mercator (UTM).

All control points used during the model set-up process have their coordinates stored in a ground control file which is imported into P-CAP during the orientation process. When a point is measured and named during absolute orientation, P-CAP looks up the name in the control point file and links coordinates to that point. After the control points are measured, the model is oriented in space and P-CAP can then report the real world XYZ coordinates of any position driven to in the model.

As photointerpretation commences, vegetation cover types are carefully analyzed by the photointerpreter within each independent grid cell appearing over the stereo models. Each grid cell is then attributed (i.e. labeled) according to the Vegetation Classification System for South Florida National Parks. Approximately, 3000 - ¼ hectare grid cells exist within one stereo model. Each grid cell requires photointerpretation and attribution.

In order to speed up the attribution process, Avineon completed several software applications aimed at streamlining the process. We previously created a “drive file” for the stereoplotters based on the ¼ hectare grid spacing. Typically a drive file is used within photogrammetric workstations to capture digital terrain models (i.e. elevation values) at equidistant posting locations throughout the stereo model. We have utilized the same process for the attribution of the grid cells. Specifically, the software drives the stereo models so that the cursor (or stereoplotter reticle) moves from one position to the next along a straight line without the need for the photointerpreter to do this manually. The process allows the photointerpreter to attribute a grid cell and automatically move to the exact center of the next grid cell. The next grid cell is then attributed and the cursor moves to the following grid cell center. This process is continued until all grid cells within the photographic model are attributed. The application also allows the photointerpreter to complete attribution without using the drive file where necessary.

Avineon utilizes MicroStation V8 software (Bentley Microsystems, Inc) coupled with our analytical stereoplotters to store graphic and attribute information during photointerpretation. The workstations allow for the direct capture of digital data in MicroStation which is then imported to ArcGIS software.

3.3 Field Methods

The fieldwork process allows the photointerpreters to correlate signatures (i.e. colors, tones, and textures) on the photography with in-field conditions to determine exact grid cell classification. It is necessary to correlate aerial photography signatures with field conditions so that exact classification can be accomplished regardless of any environmental differences within the study area and regardless of any differences between flight lines.

Field work is designed to 1) ensure that *signature identification* is accomplished prior to photointerpretation; and 2) accomplish problem resolution and *groundtruthing* during photointerpretation.

Signature identification fieldwork is conducted prior to photointerpretation. This phase of fieldwork is conducted so that photographic signatures can be verified and compared to field conditions.

Groundtruthing fieldwork is conducted after and/or during draft photointerpretation in order to solve classification and boundary problems uncovered during the process of photointerpretation. Avineon has found that as photointerpretation commences, questions can arise in determining exact breaks between signatures and cover types particularly within mixed community situations. These questions can sometimes only be resolved by once again visiting the field.

Prior to visiting the field, the photointerpreters visually review various grid cells within the stereoplotter in order to locate potential problem areas. Check sites which represent numerous vegetative signatures are selected during this process. The coordinates used for each field check site are equivalent to the grid centroid coordinates. The grid cell centroid coordinates are then loaded into GPS equipment so that they can be visited in the field. This process ensures that checksites chosen in the office are accurately

located in the field. The process also ensures that field analysis starts at a grid centroid thus ensuring that classification is accurately accomplished with the cell. During this pre-field preparation task, a field route is planned in accordance with the number and location of check sites within the areas to be visited.

Avineon has also produced one-meter pixel resolution digital orthophotographs so that they can be taken to the field and analyzed. These are loaded within ArcMap software run on a laptop computer. A GPS module is integrated within the equipment platform so that the photointerpreter can see his coordinate position in the field superimposed over the orthophoto imagery. The laptop displays the vector based grid, the imagery, and the classification attributes determined on the stereoplotter. This process enables Avineon to accurately see the field site bounded by the grid square in relation to the position of the helicopter.

While in the field, classification is determined and entered manually on a Field Data Sheet and then entered into the GIS Fieldwork Shapefile developed for the project. The Field Data Sheet serves as a backup in case the digital data is lost or corrupted. A digital photograph is taken at each field site and included with the deliverables.

Ground Based Field Work

Avineon conducted ground based fieldwork within selected areas of the project. This fieldwork is accomplished using four wheel drive vehicles, swamp buggies, boats and hiking. Ground based fieldwork is confined to accessible areas and results in “ground level” identification of species, community types, and sub-canopies which may not be readily identifiable from the air.

Helicopter Based Field Work

The majority of fieldwork accomplished for the project was performed using a helicopter. While on helicopter reconnaissance, Avineon personnel direct the helicopter pilot to pre-selected grid centroids. While using the helicopter to hover over the centroid, Avineon identifies species in their order of dominance and acquires digital photographs of the area. When traveling from point to point, if Avineon notices a distinct area of interest not previously identified on the photography, the area is documented “on-the-fly” using the GPS enabled laptop.

Field Shape File

All information acquired in the field, is analyzed for accuracy and documented into a Fieldwork Shapefile. The shapefile contains the following information fields:

- Point number (ID/OBJECTID)
- X coordinate (easting)
- Y coordinate (northing)
- In field classification (field_class)
- Personnel (author)
- Field Photo (Photolink)
- Date of Field Visit (Field_Date)
- Field Comments (comments)
- Species 1 (most dominant) (implemented in Section 2)
- Species 2 (implemented in Section 2)
- Species 3 (least dominant) (implemented in Section 2)
- Unique ID (UNIQUEID)

3.4 Ancillary Data Usage

Avineon downloaded soils and contour maps of Collier County from SOFIA. Though these maps were helpful to some extent, they did not completely assist in identifying certain key areas. For example, the hammock forests of the FPNWR were not identifiable on the soils map and in some instances the soils map depicted wet areas, while the photograph indicated upland hammock forests. Another example of this inconsistency was that the soil maps identified an area of dry soils while that same area was populated with cypress trees. Appendix A: Vegetation Mapping Examples shows examples of how the soils map information conflicts with actual field conditions.

Avineon has also acquired a historical vegetation map entitled "Vegetation Map of Southern Parts of Sub Areas A and C, Big Cypress Swamp, Florida" created by Benjamin F. McPherson 1973. This map depicts locations of various vegetative communities within the project study area. As with the soils and contour data, this map is being used as collateral data and cannot be heavily relied upon during photointerpretation.

Ancillary imagery which includes USGS DOQQS and county produced orthophotos are also referred to during photointerpretation in order to see how a given covertype appears on imagery captured during a different timeframe.

3.5 Quality Assurance Procedures

In-Process Photointerpretation Quality Assurance

Photointerpretation quality control reviews were on-going during the creation of the maps. Avineon's lead photointerpreter systematically reviewed each completed model directly after completion to ensure adherence to classification specifications and consistency among the photointerpreters. Suggested corrections were pointed out to the original photointerpreter or to the entire photointerpretation team as necessary.

An analytical stereoplotter with dual optics was also used. This instrument allows two photointerpreters to view the images simultaneously to aid in training and classification discussion.

Logical Consistency Checks

A logical consistency quality control step was completed for all photointerpretation completed within the delivery areas. During this process, each cell within the completed MicroStation grid files was color coded. Each color represents a unique class within the vegetation classification system. The grid was then digitally plotted on-screen. The color plot was reviewed for logical classification consistency requiring the identification of the following two important anomalies.

- **Regional Anomalies** are classes that are unlikely to occur within a given landscape or region of the project area. For example, **FMr** Red Mangrove is highly unlikely to occur within the totally freshwater systems in the center of Florida Panther National Wildlife Refuge. Grid cells color coded as mangrove in these areas would be suspect and therefore rechecked on the aerial photographs.
- **Attribution Anomalies** are classification codes which are unlikely to appear adjacent to, or in proximity of, one another. Specific vegetative species typically do not exist adjacent to other species within a given landscape unless very unique hydrologic and/or soil conditions exist. Unfortunately, much of the study area contains vegetation that does not adhere to this natural condition due to long and short term man-made hydrologic disturbances. Nevertheless, this QC step helps identify those types of anomalies. For example, **PGc** Sawgrass (*Cladium jamaicense*) is unlikely to occur within areas surrounded completely by **PGjs** Black rush (*Juncus roemerianus*). Grid cells color coded as sawgrass surrounded by grid cells coded as black needlerush would be suspect and therefore rechecked on the aerial photographs.

The above types of logic consistency checks require an advanced understanding of wetland vegetation distribution in Florida. They were performed on all photointerpreted work prior to delivery to the National Park Service staff.

Digital Data Quality Control

Automated quality control software programs were developed by Avineon to check for errors. One check identifies missing grid cell labels. Another check identifies and flags classification codes not appearing within the classification system. If found, these errors are corrected using the imagery and the stereoplotter.

Each MicroStation design file was checked against the project's established data model to ensure that all data is formatted within the correct MicroStation level and is portrayed according to the graphics definitions supplied for the project. Model specific grid files were checked against adjacent model files to ensure that no overlaps occurred.

ArcGIS files were also checked to ensure that the attribution tables were in accordance with NPS specifications and that the files are projected correctly.

4.0 Fieldwork Summary

This section describes the fieldwork accomplished for the project. Since fieldwork was accomplished in stages according to the four delivery Areas established for the project, each Area is described independently below.

4.1 Area 1 Fieldwork

Fieldwork for Area 1 was conducted on the following dates using the transportation indicated:

- August 15, 2006 – Ground
- August 16, 2006 - Ground
- September 7, 2006 - Helicopter
- October 4, 2006 – Helicopter
- November 20, 2006 - Helicopter

Avineon performed ground based fieldwork within Area 1 at the start of the project. During this first field trip, Avineon field staff visited the Florida Panther National Wildlife Refuge (FPNWR) on August 15, 2006 and August 16, 2006 jointly with NPS and NWR staff so that all could test and participate in the process. Field work was accomplished using a Swamp Buggy vehicle capable of traversing difficult terrain.

A total of five days of fieldwork was accomplished within Area 1. Avineon collected a total of 93 field points.



Swamp Buggy trail in Panther

4.2 Area 2 Fieldwork

Field work for Area 2 was conducted on the following dates using the transportation indicated:

- November 20, 2006 — Helicopter
- December 22, 2006 — Helicopter
- January 8, 10, 26, 2007 — Helicopter
- June 21, 2007 — Ground
- June 22, 2007 — Helicopter

Field work on June 21, 2007 was conducted with NPS staff which included Jim Burch and Kevin Whelan. During this trip, Avineon staff met with Jim Burch and Kevin Whelan at the NPS offices located in Ochopee, FL. The meeting began with the review of digital map plots within Area 2 (Image ID: 0730, 0919, 0927, 1017, 1025) and Area 3 (Image ID: 0714, 0914, 0916, 0917). The plots were used to promote discussion on the differences between Freshwater Graminoid Prairies (MFGP), Freshwater Graminoid Marsh (MFG), and Freshwater Broadleaf Marsh (MFB). Other habits were discussed such as Temperate Hardwood Hammocks (FHT), Tropical Hardwood Hammocks (FHS), and abandoned agriculture fields.

During the meeting, it was suggested by NPS that Avineon document the processes utilized when determining that an abandoned agriculture field has been restored to a particular vegetation classification. This process is discussed in detail under section 7.0 *Process Guidance and Changes (# 9)*.

After the meeting, fieldwork commenced within the area north of 1-75 on the ORV trails that extend off the northern end of Turner River Road. The June 21, 2007 meeting and fieldwork provided valuable information as to ground conditions and vegetation communities found throughout both Area 2 and Area 3.

A total of 7 days of field work was accomplished within Area 2. Avineon collected a total of 160 field points within Area 2. 152 of those points were collected by helicopter reconnaissance and the remaining 8 points were collected on the ground with NPS staff on June 21, 2007.



Ghost Orchid in Big Cypress

4.3 Area 3 Fieldwork

Field work for Area 3 was conducted on the following dates using the transportation indicated:

- June 21, 2007 — Ground (With NPS Staff)
- June 22, 2007 — Helicopter
- August 13, 2007 — Helicopter
- October 9, 2007 — Ground (With NPS Staff)
- October 10, 2007 — Ground
- December 12, 2007 — Airboat (With NPS Staff)
- January 22, 2007 — Canoe (With NPS Staff)

During the fieldwork conducted with NPS staff on June 21, 2007, Avineon was able to collect 11 field points within Area 3. The general area visited on the June 21st trip was along Turner River Road and a small access road located off of Turner River Road to the east. Many of the items discussed for Delivery Area 2 were issues that affected Delivery Area 3 as well.

Avineon conducted field work with NPS staff member Kevin Whelan on October 9, 2007. This trip was similar in nature to the ground efforts on June 21, 2007. Avineon selected sites in the office to visit within the park. Unfortunately due to recent rains creating standing water, some of the ORV trails were inaccessible by truck. However, the field team was able to successfully visit and hike to many sites. Having the aerial photography and populated grid cells visible on a laptop coupled with a GPS for real time navigation allowed the field team to pick new sites while in the field to help make up for the inaccessible sites.

Originally a helicopter was to meet Avineon staff in Everglades City on October 10, 2007. This was cancelled due to helicopter maintenance issues. Alternatively, Avineon field staff decided to spend time spot checking populated cells by driving through the park and comparing the ground vegetation to the digital map data. Most of the cells visited in the field were classified correctly. A few cells were reclassified based on field observation.

Avineon conducted field work with NPS staff members Jim Burch and Kevin Whelan on December 12, 2007. An airboat was used to access 37 field points south of Tamiami Trail and east of Everglades City

and State Road 29. The majority of the points focused on individual mangrove species as well as mixed mangrove communities. The data gathered led to changes to the map attributes located in the southwest portion of Area 3.

It was determined during the field survey that Black Mangrove was not a wide spread species in Area 3. Furthermore, Avineon was able to determine the White Mangrove signature on the CIR imagery where it existed in relatively pure stands. The field data gathered on 12/12/07, used in conjunction with previously collected field data, revealed a fairly definitive boundary between the White Mangrove and Buttonwood transitional area. While this boundary seems definitive for this section of Area 3, other areas are more difficult in terms of separating White Mangrove from Buttonwood.

On January 22, 2008 Avineon met with NPS staff members Kevin Whelan, Jim Burch and 2 NPS interns. This trip utilized a canoe to navigate to selected points along the Turner River. The focus of this trip was to look for a clear break between Fresh Water Marsh and Saltwater Marsh communities. Only the Saltwater Marsh community was present during this trip with the majority of the community being dominated by *Spartina*. Additional points were also collected along the river allowing documentation of various mangrove and wet hardwood communities. Brazilian Pepper was noted along the river, proving to be a similar signature to mangrove when sharing the same environment. At least one Brazilian pepper dominated cell was changed from a mangrove attribution. Pond Apple also appeared quite heavily throughout the Turner River area. Many cells that were previously coded as Pop Ash have since been changed following this trip.

A total of 169 field sites were collected over the 7 days of field work for Area 3.



Mangrove tunnel along Turner River

4.4 Area 4 Fieldwork

Field work for Area 4 was conducted on the following dates using the transportation indicated:

- February 15, 2007 — Helicopter
- February 21, 2007 — Boat (With NPS staff)
- August 8, 2008 — Helicopter

During the February 15th trip, Avineon was able to visit 66 sites via helicopter. The main focus of this trip was to identify and verify different mangrove communities located within the Red Mangrove fringe of the mangrove islands. Black mangrove communities and mixed communities of Red and White mangroves were identified.

On February 21st and 22nd Avineon staff met with Kevin Whelan and Everglades NP rangers to conduct fieldwork via Boat. A total of 52 sites were visited. Many unusual signatures along mangrove island shorelines that were visible on the photography were verified to be FHC (coastal hammock). These were valuable sites to see, primarily consisting of Gumbo Limbo, Jamaican Dogwoods, and Buttonwoods. Additionally, many sites focused on verifying the fringe Red Mangrove community. As noted in section 6 the mangrove signature has changed from area to area. For example, the Red Mangrove signature in area 3 was a more vibrant red, while red mangroves within area 4 had a duller washed out signature.

Avineon staff collected an additional 38 field pts via helicopter on August 8, 2008. The helicopter service was provided by Suncoast Florida Helicopters located at Sarasota International Airport. The purpose of gathering additional field data was to improve mangrove classification accuracy and to target regions within Everglades National Park that were not visited during prior field trips.



Black Mangrove

4.5 Fieldwork Shapefile Summary by Area

AREA 1

Table 4.5.1 contains a frequency report generated from the field data collected by Avineon for Area 1. Please note that the codes in the table separated by commas are not multi-label codes. They reflect ecotonal boundaries or difficulties in determining understory composition. Avineon photointerpreters loaded these problematic points into MircoStation as a reference file and verified the correct code using the color-infrared aerial photography.

Table 4.5.1

FREQUENCY of CLASSIFICATION	CLASSIFICATION
11	FHT
11	WSpG
9	FStS
6	FSaf
6	FStH
5	MFB
5	WUpFS
4	CSWGP
5	MFGP
4	SS
4	WSpS
3	WUsS
2	CStGP
2	FStD
2	FStp
2	SSs
1	FHS
1	FHT,FHS
1	FSH
1	FStS,FStH
1	MFGc,WStG
1	SSf
1	SUs
1	WSpS,WSpG
1	WStG
1	WUpFG
1	WUpFSs
1	WUpSs

As depicted in the table, Avineon spent a large percentage of field time visiting hammocks within the Florida Panther National Wildlife Refuge (FPNWR) in order to ensure correct classification. Of the 93 field points visited, 13 (or 14%) were points that contained possible hammock signatures. After reviewing the field points in conjunction with the CIR aerial photography, 11 of those 13 field points were labeled Temperate Hardwood Hammock (FHT). The remaining 2 field points were labeled Tropical Hardwood Hammock (FHS). These results agree with the information given by NPS regarding hammock forests in FPNWR. The majority of hammocks within FPNWR are of the temperate variety.

Table 4.5.2 reflects the percentages of each classification level obtained during fieldwork in Delivery Area 1. Please note that all percentages are rounded to the nearest whole number.

Table 4.5.2

Level 1	Percent of Total	Level 2	Percent of Total	Level 3	Percent of Total	Level 4	Percent of Total	Level 5	Percent of Total	Level 6	Percent of Total
F	43	FH	14	FHT	12	—	—	—	—	—	—
—	—	—	—	FHS	2%	—	—	—	—	—	—
—	—	FS	29	FStH	6	FStD	2	—	—	—	—
—	—	—	—	FSaf	6	FStS	11	—	—	—	—
—	—	—	—	FSH	1	—	—	—	—	—	—
—	—	—	—	FStp	2	—	—	—	—	—	—
W	30	WS	17	WSp	16	—	—	WSpG	13	—	—
—	—	WU	13	WUp	10	WUpF	7	WUpFS	6	WUpFSs	1
—	—	—	—	—	—	—	—	WUpFG	1	—	—
—	—	—	—	—	—	—	—	WUpS	1	WUpSs	1
S	9	SS	7	SSs	2	—	—	—	—	—	—
—	—	—	—	SSf	1	—	—	—	—	—	—
—	—	SU	1	SUs	1	—	—	—	—	—	—
M	11	MF	11	MFB	5	—	—	—	—	—	—
—	—	—	—	MFGP	5	—	—	—	—	—	—
C	6	CS	6	CSW	4	—	—	CSWGP	4	—	—
—	—	—	—	CSt	2	—	—	CStGP	2	—	—

AREA 2

Table 4.5.3 is a frequency report generated from the field data collected by Avineon for Delivery Area 2. Please note: None of the codes in the table separated by “ / or , ” are multi-label codes. They reflect ecotonal boundaries or difficulties in determining understory composition. Avineon photointerpreters loaded these problematic points into MicroStation as a reference file and verified the correct code using the color-infrared aerial photography.

Table 4.5.3

FREQUENCY OF CLASSIFICATION	CLASSIFICATION
2	CSE
1	CSm
2	CStGP
1	CSWG
2	CSWGP
1	CU
1	EeD
4	FHp
2	FHS
32	FHT
2	FS
2	FSf
1	FSH
6	FStD
8	FStH
10	FStS
7	MFB
1	MFB,MFGtD
2	MFB,MFGtS
1	MFBt
9	MFG
1	MFG/MFB
1	MFGc
6	MFGP
1	MFGP,MFGtS
2	MFGt
1	MFGtD
1	MFGtM
1	MFO,EeS
1	SS
1	SSm
5	SSs
1	SSs,MFGtS
1	SU
5	SUs
2	SUT
1	WS

FREQUENCY OF CLASSIFICATION	CLASSIFICATION
2	WSh
1	WSpFS
3	WSpG
1	WSpS
5	WSsG
4	WStG
2	WStS
1	WUh
1	WUpFS
4	WUpS
1	WUpS/WUsS
2	WUpSs
1	WUpX
3	WUsS
1	WUsSs

Avineon focused a great deal of effort in determining the temperate and tropical characteristics of the hammocks located within Big Cypress National Park. Of the 34 hammocks visited in the field, 32 (94%) were of the temperate variety (FHT). The remaining 2 (6%) were of the tropical variety (FHS). The data collected during the ground field survey, and the data gathered from Jim Burch and Kevin Whelan (NPS), were used in classifying the remaining hammock communities throughout Area 2.

Avineon is confident that there is a direct correlation between ground conditions and the CIR photography when determining the boundary between various marsh communities (i.e. MFG, MFGP, and MFB). This determination process has been a problematic area in the photointerpretation process. Since spending time in the field with NPS staff, the subtleties that define these specific marsh communities have been noted and utilized during photointerpretation.

AREA 3

Table 4.5.4 is a frequency report generated from the field data collected by Avineon for Delivery Area 3. Please note: Avineon photointerpreters loaded all ecotonal boundary and problematic points into MicroStation as a reference file and verified the correct code using the color-infrared aerial photography.

Table 4.5.4

FREQUENCY OF CLASSIFICATION	CLASSIFICATION
1	AF
3	CSGP
2	CSmGP
1	CStG
1	EsD
2	FHS
10	FHT
1	FHT,EsS
5	FMX
6	FMXal

FREQUENCY OF CLASSIFICATION	CLASSIFICATION
5	FMXlr
12	FMI
4	FMr
18	FSH
1	FSH,EsDT
1	FSH,EsS
1	FStS
1	FSa
2	FStH
2	FStS
1	HI
5	MFG
7	MFGP
5	MFGc
2	MFGe
3	MSG
1	MSGj,MFGtD
9	MSGs
1	SMXar
1	SMXcr
1	SMXlr
7	SMr
5	SS
3	SSa
2	SSs
1	SSs,MFGtD
1	SU
3	SUs
3	WM
2	WSP
1	WSh
2	WSpG
7	WSpS
1	WSpS,EsS
2	WSpX
1	WSsS
1	WSsS,EsS
1	WStG
6	WUpFS
4	WUpFSs
1	WUsSs

Avineon focused a great deal of effort in determining the various mangrove communities located within Big Cypress National Park. Of the 140 field points collected in Area 3, 27 (26%) were of the mangrove variety (i.e. FM, SM, WM, etc.). The mangrove data collected during the ground field survey on 12/12/2007 was used in correcting the mangrove community problems encountered during the PI of Area 3.

AREA 4

Table 4.5.5 is a frequency report generated from the field data collected by Avineon for Delivery Area 4. Please note: Avineon photointerpreters loaded all ecotonal boundary and problematic points into MicroStation as a reference file and verified the correct code using the color-infrared aerial photography.

Table 4.5.5

FREQUENCY OF CLASSIFICATION	CLASSIFICATION
1	AMA
4	BCH
1	CMrG
2	EsD
1	EsDT
7	FHC
1	FHM,EsS
1	FM
1	FMX
10	FMXal
16	FMXar
20	FMXlr
7	FMa
5	FMI
28	FMr
1	FSB
1	FSH
1	FStH
2	MFG
2	MFG,MFGtD
2	MFG,MFGtS
1	MFGtM
3	MSG
1	MSS
4	OW
10	SF
1	SM
1	SMXar
3	SMa
1	SMI
5	SMr
1	SMr,MFGtS
5	WM
2	WMc
1	WSpG
2	WSsS
1	WU

Avineon focused a great deal of effort in determining the various mangrove communities located within Everglades National Park. Of the 156 field points collected in Area 4, 109 (70%) were of the mangrove variety (i.e. FM, SM, WM, etc.).

5.0 Map Attribute Summary

5.1 Attribute Summary By Area

AREA 1

The following table was created from the ArcGIS files delivered for Area 1. It shows the number of grid cells (i.e. frequency) of classification codes along with the total acreage of each code.

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
110	AG	67.95509187770
1	CA	0.61776345367
1	CS	0.61776345367
4	CSG	2.47105381467
18	CSGP	11.11980394240
8	CSGc	4.94210762934
4	CSGt	2.47105381467
229	CSWD	141.46783089000
4	CSWE	2.47105381467
67	CSWG	41.39027494840
640	CSWGP	395.37071075600
1	CSt	0.61776345367
25	CStD	15.44445699980
1	CStE	0.61776345367
15	CStG	9.26651358136
8	CStG,MFGtD	4.94210762934
367	CStGP	226.72116437600
22	CStGc	13.59085775700
115	FHS	71.04310605350
3617	FHT	2234.46715337000
549	FHa	339.15343336700
27	FS	16.67973680170
1741	FSH	1075.53191805000
495	FSaf	305.79531885500
69	FSs	42.62580185580
28	FSt	17.29762380810
1	FSt,MFGtD	0.61776345367
2	FSt,MFGtS	1.23552690734
716	FStD	442.32135098500
10804	FStH	6674.35484022000
11296	FStS	6978.30267570000
896	FStp	553.51821665900
33	HI	20.38637930010
353	MFB	218.07222890700
2	MFB,MFGtS	1.23565046003
5	MFB,P	3.08887904468
3	MFBa	1.85329036100
1	MFBp	0.61776345367
49	MFBt	30.27059455880
1	MFF,EpiD	0.61776345367

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
3	MFFI	1.85329036100
110	MFG	67.95422700890
3	MFG,P	1.85329036100
828	MFGP	511.50857207100
2	MFGP,MFGtS	1.23552690734
7	MFGPc	4.32434417568
24	MFGPcps	14.82632288800
26	MFGa	16.06197334810
14	MFGc	8.64875012770
20	MFGcS	12.35533084970
1	MFGtM	0.61776345367
18	MFO	11.11986571870
1	MFO,EpiD	0.61776345367
4	MFO,P	2.47105381467
2	MFPO	1.23552690734
12	ORV	7.41316144401
58	OW	35.83052741810
346	RD	213.74683452100
375	SS	231.66246887600
1	SS,P	0.61782523001
3	SSB	1.85329036100
6	SSa	3.70658072201
35	SSf	21.62184443110
1	SSm	0.61776345367
424	SSs	261.93312521100
2	SSs,P	1.23552690734
25	SU	15.44420989440
13	SUT	8.03092489768
44	SUs	27.18159196140
185	WS	114.28679491600
28	WSp	17.29743847900
2338	WSpG	1444.33929448000
2027	WSpS	1252.21337777000
1	WSpS,EsS	0.61776345367
211	WSpX	130.34901536900
8	WSt	4.94210762934
612	WStG	378.07290161800
6	WStG,P	3.70658072201
3	WStO	1.85329036100
343	WStS	211.89403837100
8	WU	4.94210762934
4	WUp	2.47105381467
161	WUpFG	99.46041025130
1512	WUpFS	934.06390185400
848	WUpFSs	523.86674464500
113	WUpFX	69.80776447520
33	WUpG	20.38637930010

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
370	WUpS	228.57377516000
9	WUpSs	5.55999463570
8	WUs	4.94210762934
266	WUsG	164.32551111000
688	WUsS	425.02242987400
1	WUsS,EsS	0.61776345367
8	WUsSs	4.94216940569
9	WUsX	5.55987108301

AREA 2

The following table was created from the ArcGIS files delivered for Area 2. It shows the number of grid cells (i.e. frequency) of classification codes along with the total acreage of each code.

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
385	AG	237.84035054300
220	CA	135.90882467600
2	CA,EeM	1.23552690734
4	CA,MFFI	2.47105381467
8	CA,MFGtS	4.94210762934
100	CS	61.77683957760
3	CS,MFGtD	1.85329036100
3	CS,MFGtS	1.85329036100
23	CSE	14.20874476340
1	CSE,MFGtS	0.61776345367
123	CSG	75.98589323500
793	CSGP	489.88981645800
1	CSGP,MFGtS	0.61776345367
126	CSmGP	77.83881292560
1	CSs	0.61776345367
2	CSs,MFGD	1.23552690734
142	CSsE	87.72302818430
5	CSsE,MFGtS	3.08881726834
200	CSsG	123.55299961500
5	CSsG,MFGtS	3.08881726834
21	CSsGc	12.97340318510
1	CSsO	0.61776345367
5	CSt	3.08881726834
1	CSt,MFGtS	0.61776345367
248	CStD	153.20576894400
2	CStD,MFGtS	1.23552690734
24	CStE	14.82656999340
5487	CStG	3389.69359902000
11	CStG,MFGtS	6.79539799035
61	CStGc	37.68369422640
1	CStGc,MFGtS	0.61776345367
1754	CStGP	1083.56500512000
2	CStGt	1.23565046003

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
379	CStO	234.13407867800
1	CSW	0.61776345367
43	CSWD	26.56382850770
3	CSWE	1.85329036100
385	CSWG	237.84016518900
3	CSWG,MFGtS	1.85329036100
3	CSWGc	1.85329036100
538	CSWGP	332.35859136400
390	CU	240.93046510200
987	CUG	609.73679135100
6	EeD	3.70658072201
2	EeS	1.23552690734
3	FH	1.85329036100
535	FHa	330.50548635600
921	FHp	568.96353854000
238	FHS	147.02838151300
14248	FHT	8801.95398171000
12	FHT,MFGtS	7.41328499671
134	FS	82.78240318720
14	FS,EsS	8.64899723308
2	FS,MFGtS	1.23552690734
2	FSa	1.23552690734
792	FSf	489.27162059400
1	FSf,MFGtS	0.61776345367
2532	FSH	1564.19189108000
5	FSH,MFGtS	3.08881726834
15	FSs	9.26663713406
1749	FSt	1080.47767855000
12837	FStD	7930.29099685000
4	FStD,MFGtD	2.47105381467
7	FStD,MFGtS	4.32434417568
6931	FStH	4281.75111534000
4	FStH,EeD	2.47105381467
3	FStH,MFGtS	1.85329036100
707	FStp	436.76079229500
12780	FStS	7895.06314669000
1	FStS,MFGtD	0.61776345367
6	FStS,MFGtS	3.70658072201
58	HI	35.83028031270
3	HI,MFGtS	1.85329036100
2	LEV	1.23552690734
14	MF	8.64868835135
1	MF,MFGtS	0.61776345367
3791	MFB	2341.96015652000
36	MFB,MFGtD	22.23973143740
130	MFB,MFGtS	80.30980496400
69	MFBt	42.62580185580

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
2	MFBt,MFGtS	1.23552690734
16	MFF	9.88427703503
11	MFFI	6.79558331938
13907	MFG	8591.29658228000
1	MFG,EeS	0.61776345367
34	MFG,MFGtD	21.00408097740
220	MFG,MFGtS	135.90913355800
3	MFGa	1.85329036100
1019	MFGc	629.50590140800
1	MFGc,MFGtD	0.61776345367
40	MFGc,MFGtS	24.71078525210
32096	MFGP	19827.87077570000
4	MFGP,MFGtD	2.47105381467
49	MFGP,MFGtS	30.27053278240
72	MFGPc	44.47915399310
528	MFGt	326.18175992000
73	MFGtD	45.09741168230
34	MFGtM	21.00408097740
2	MFGtS	1.23552690734
298	MFO	184.09425050900
1	MFO,EeS	0.61776345367
6	MFO,MFGtS	3.70658072201
346	ORV	213.74807003600
34	OW	21.00395742470
1	OW,EeS	0.61776345367
894	RD	552.28540792300
2	RD,MFGtS	1.23552690734
1	RES	0.61776345367
13	SP	8.03092489768
1197	SS	739.46853748900
2	SS,EeS	1.23552690734
8	SS,MFGtS	4.94216940569
5	SSa	3.08887904469
40	SSf	24.71078525210
19	SSm	11.73750561970
3549	SSs	2192.45719985000
5	SSs,MFGtD	3.08881726834
67	SSs,MFGtS	41.39058383020
5642	SU	3485.44623978000
1	SU,MFGtS	0.61776345367
76	SUH	46.95033136050
1777	SUs	1097.77356458000
591	SUT	365.10110465500
1	SUT,MFGtS	0.61776345367
86	WS	53.12802767350
485	WSh	299.61731364800
1	WSh,MFGtS	0.61776345367

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
52	WSp	32.12376136710
4170	WSpG	2576.09071389000
203	WSpS	125.40709306900
468	WSpX	289.11619981700
19	WSs	11.73750561970
1078	WSsG	665.95190655500
3	WSsG,EeS	1.85335213735
4	WSsG,MFGtS	2.47105381467
1	WSsGc	0.61776345367
207	WSsS	127.87802333100
4	WSsS,EeS	2.47105381467
112	WSsX	69.19105124420
1	WSsX,MFGtS	0.61776345367
55	WSt	33.97705172810
6	WSt,MFGtD	3.70658072201
2	WSt,MFGtS	1.23552690734
5884	WStG	3634.94586044000
1	WStG,MFGtD	0.61776345367
8	WStG,MFGtS	4.94210762934
112	WStO	69.18975391620
1	WStO,MFGtS	0.61776345367
906	WStS	559.69819873300
8	WStS,MFGtS	4.94216940569
79	WU	48.80386882690
1374	WUh	848.81112438000
3	WUh,MFGtS	1.85329036100
890	WUpFS	549.81256259400
1	WUpFX	0.61776345367
230	WUpG	142.08670631800
5336	WUpS	3296.40739768000
1	WUpS,MFGtS	0.61776345367
353	WUpSs	218.07142579000
1078	WUpX	665.95388338500
1	WUs	0.61776345367
387	WUsG	239.07606275400
3414	WUsS	2109.05672433000
1205	WUsSs	744.41181884400
189	WUsX	116.75791050700

AREA 3

The following table was created from the ArcGIS files delivered for Area 3. It shows the number of grid cells (i.e. frequency) of classification codes along with the total acreage of each code.

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
118	AB	72.89695240170
7	AB,MFGtD	4.32446772837
61	AF	37.68381777910
197	CA	121.70020346500
24	CA,MFGtD	14.82638466440
21	CA,MFGtS	12.97315607970
3	CM,MFGtD	1.85329036100
3	CMc	1.85329036100
239	CMG	147.64620674300
6	CMGs	3.70658072201
1	CMI,MFGtS	0.61776345367
3	CMO	1.85329036100
141	CMr	87.10514117790
2	CMr,MFGtD	1.23552690734
344	CMrG	212.51279024600
2	CMrG,MFGtD	1.23552690734
1	CMrG,MFGtS	0.61776345367
15	CMrGe	9.26645180502
4	CMrGs	2.47105381467
4	CMrH	2.47105381467
37	CMrO	22.85730956210
6	CMX	3.70658072201
1	CMX,MFGtS	0.61776345367
1	CMXarG	0.61776345367
2	CMXclGs	1.23552690734
56	CMXG	34.59500052320
2	CMXGc	1.23552690734
79	CMXGs	48.80399237960
2	CMXO	1.23552690734
19	CS	11.73750561970
2	CS,MFGtD	1.23552690734
1	CSD	0.61776345367
1	CSE	0.61776345367
72	CSG	44.47915399310
6	CSGc	3.70658072201
3	CSGc,MFGtS	1.85329036100
2355	CSGP	1454.84226165000
3	CSGP,EsS	1.85329036100
3	CSGP,MFGtD	1.85329036100
6	CSGP,MFGtS	3.70658072201
85	CSmGP	52.51001711450
16	CSs,MFGtD	9.88433881138
5	CSs,MFGtS	3.08881726834
4	CSsE	2.47105381467

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
112	CSsG	69.18993924520
1	CSsG,MFGtD	0.61776345367
16	CSsG,MFGtS	9.88452414042
50	CSsGc	30.88860511780
2	CSsGc,MFGtD	1.23552690734
5	CSsGc,MFGtS	3.08881726834
5	CSt	3.08881726834
928	CStG	573.28782092700
1	CStG,MFGtS	0.61776345367
4	CStGc	2.47111559102
1330	CStGP	821.63132392000
2	CStGs	1.23552690734
8	CStH	4.94210762934
4	CStO	2.47105381467
5	CSW	3.08887904469
4	CSW,MFGtS	2.47105381467
2	CSWD	1.23552690734
65	CSWG	40.15487159380
15	CSWGc	9.26663713405
62	CSWGP	38.30189011450
18	CUG	11.11980394240
1	EeM	0.61776345367
3	EsD	1.85329036100
1	EsS	0.61776345367
9	FH	5.55987108301
1	FH,EsD	0.61776345367
58	FHa	35.83034208910
3	FHa,MFGtD	1.85329036100
647	FHp	399.69554913000
3	FHp,EsS	1.85329036100
760	FHS	469.50207807800
2645	FHT	1633.99662857000
8	FHT,EsS	4.94210762934
1	FHT,MFGtD	0.61776345367
1	FHT,MFGtS	0.61776345367
20	FM	12.35533084970
7	FM,MFGtD	4.32434417568
5	FM,MFGtS	3.08881726834
18	FMa	11.11980394240
33	FMc	20.38619397100
671	FMI	414.52224267600
170	FMr	105.02052844000
3	FMr,MFGtD	1.85329036100
3	FMr,MFGtS	1.85335213734
561	FMX	346.56801569200
2	FMX,MFGtD	1.23552690734
3	FMXac	1.85335213736

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
414	FMXal	255.75715863600
11	FMXar	6.79545976669
8	FMXcl	4.94210762934
754	FMXcr	465.79710354100
1	FMXcr,MFGtD	0.61776345367
654	FMXlr	404.02112883200
71	FS	43.86139053950
2	FS,EsS	1.23552690734
1	FS,MFGtS	0.61776345367
2	FSa	1.23552690734
73	FSB	45.09673211780
5	FSB,MFGtD	3.08881726834
10	FSB,MFGtS	6.17763453668
35	FSBT	21.62178265470
456	FSf	281.70137040000
6389	FSH	3946.92004929000
1	FSH,EeD	0.61776345367
2	FSH,EeS	1.23552690734
19	FSH,EsDT	11.73812338310
102	FSH,EsS	63.01218115590
2	FSH,MFGtD	1.23552690734
9	FSH,MFGtS	5.55993285936
241	FSt	148.88154832100
1	FSt,MFGtD	0.61776345367
10962	FStD	6771.97179599000
1	FStD,MFGtD	0.61776345367
6	FStD,MFGtS	3.70658072201
7100	FStH	4386.14757918000
3	FStH,EsS	1.85329036100
2152	FStp	1329.43553923000
1	FStp,EsS	0.61776345367
22770	FStS	14066.57582620000
1	FStS,EeS	0.61776345367
1	FStS,EsD	0.61776345367
1	FStS,EsS	0.61776345367
3	FStS,MFGtD	1.85335213735
6	FStS,MFGtS	3.70658072201
445	HI	274.90566352700
4	HI,EsDT	2.47105381467
3	HI,EsS	1.85329036100
2	HI,EsST	1.23552690734
1	HI,MFGtD	0.61776345367
1	HI,MFGtS	0.61776345367
203	MFB	125.40666063400
6	MFB,MFGtD	3.70658072201
15	MFB,MFGtS	9.26645180502
1	MFF	0.61776345367

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
1	MFFI	0.61776345367
7709	MFG	4762.37435644000
91	MFG,MFGtD	56.21665961280
307	MFG,MFGtS	189.65498646100
1586	MFGc	979.77895337600
2	MFGc,MFGtD	1.23552690734
94	MFGc,MFGtS	58.07044418460
864	MFGe	533.75133056200
7	MFGe,MFGtD	4.32434417568
33	MFGe,MFGtS	20.38625574740
1	MFGj	0.61776345367
39581	MFGP	24451.86916070000
14	MFGP,EsS	8.64868835135
4	MFGP,MFGtD	2.47111559103
28	MFGP,MFGtS	17.29756203170
16	MFGpa	9.88421525869
24	MFGPc	14.82644644070
6	MFGPm	3.70658072201
5	MFGr	3.08881726834
5	MFGt	3.08881726834
4	MFGtD	2.47105381467
251	MFGtM	155.05992417400
1	MFGz	0.61776345367
56	MFO	34.59512406350
3	MFO,MFGtS	1.85335213736
2191	MSG	1353.52874636000
76	MSG,MFGtD	46.95002247880
162	MSG,MFGtS	100.07811192900
705	MSGj	435.52601477100
28	MSGj,MFGtD	17.29756203170
45	MSGj,MFGtS	27.79941719140
1446	MSGs	893.29293476800
10	MSGs,MFGtD	6.17775808937
80	MSGs,MFGtS	49.42138517520
3	MSGtM	1.85329036100
285	MSO	176.06351095300
2	MSO,MFGtD	1.23552690734
72	MSSb	44.47896866410
6233	ORV	3850.54895859000
798	OW	492.97993105400
1	OW,EeD	0.61776345367
1	OW,EeS	0.61776345367
1	OW,EsS	0.61776345367
8	OW,MFGtD	4.94229295837
8	OW,MFGtS	4.94216940569
650	RD	401.54921016100
3	RD,EeS	1.85329036100

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
5	RD,EsS	3.08881726834
5	RD,MFGtD	3.08881726834
10	RD,MFGtS	6.17763453668
6	SF	3.70658072201
190	SM	117.37536507900
2	SM,MFGtD	1.23552690734
2	SM,MFGtS	1.23552690734
23	SMa	14.20855943440
335	SMc	206.95335158500
41	SMI	25.32861048210
1593	SMr	984.10459487900
3	SMr,MFGtD	1.85329036100
353	SMX	218.07247600000
1	SMX,MFGtD	0.61776345367
1	SMX,MFGtS	0.61776345367
8	SMXar	4.94210762934
5	SMXcl	3.08881726834
1478	SMXcr	913.05994440500
71	SMXlr	43.86157586850
1	SP	0.61776345367
942	SS	581.93669463200
1	SS,EeD	0.61776345367
1	SS,EsDT	0.61776345367
57	SS,EsS	35.21282574080
11	SS,MFGtD	6.79539799035
20	SS,MFGtS	12.35533084970
18	SSa	11.12005104780
1	SSa,MFGtS	0.61776345367
19	SSB	11.73750561970
2	SSB,MFGtS	1.23552690734
20	SSBT	12.35533084970
75	SSf	46.33256790680
1	SSm	0.61776345367
959	SSs	592.43922933100
1	SSs,EsS	0.61776345367
44	SSs,MFGtD	27.18171551410
48	SSs,MFGtS	29.65307821050
973	SU	601.09180958000
2	SUa	1.23558868368
31	SUH	19.15066706370
1956	SUs	1208.35408762000
155	SUT	95.75413841100
141	WM	87.10532650700
30	WMc	18.53290361000
102	WS	63.01242826120
1	WS,EsD	0.61776345367
367	WSh	226.72017591800

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
1	WSh,EsDT	0.61782523001
1	WSh,EsS	0.61776345367
694	WSp	428.72993724100
1	WSp,EsS	0.61776345367
17704	WSpG	10936.95658580000
1	WSpG,EeS	0.61776345367
4	WSpG,EsS	2.47105381467
4	WSpG,MFGtD	2.47105381467
1	WSpG,MFGtS	0.61776345367
891	WSpS	550.43094379900
12	WSpS,EsS	7.41316144402
745	WSpX	460.23698535300
33	WSs	20.38644107640
1	WSs,EsS	0.61776345367
116	WSsG	71.66105483620
2	WSsG,EsS	1.23552690734
1	WSsG,MFGtS	0.61776345367
4	WSsGc	2.47105381467
804	WSsS	496.68539978900
2	WSsS,EsD	1.23558868367
42	WSsS,EsS	25.94705350030
1	WSsX	0.61776345367
15	WSt	9.26651358136
7179	WStG	4434.95223663000
2	WStG,EsS	1.23552690734
22	WStO	13.59091953340
1248	WStS	770.97552381200
2	WStS,EsS	1.23552690734
58	WU	35.83040386540
590	WUh	364.48198207300
57	WUp	35.21294929350
2916	WUpFS	1801.41145106000
2834	WUpFSs	1750.75503319000
840	WUpFX	518.92568721400
6	WUpG	3.70658072201
28	WUpS	17.29756203170
2	WUpS,EsS	1.23552690734
10	WUpX	6.17763453668
5	WUs	3.08900259738
3	WUsG	1.85329036100
180	WUsS	111.19841010600
76	WUsSs	46.95039313680

AREA 4

The following table was created from the ArcGIS files delivered for Area 4. It shows the number of grid cells (i.e. frequency) of classification codes along with the total acreage of each code.

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
61	AM	37.68412666090
78	AMA	48.18573471510
235	AMS	145.17527648100
104	BCH	64.24851116800
16	CA	9.88421525869
6	CM	3.70701316878
72	CMaG	44.47909221680
1	CMaGs	0.61776345367
19	CMaO	11.73750561970
97	CMcG	59.92324033480
23	CMcO	14.20855943440
211	CMG	130.34864472300
4	CMG,MFGtS	2.47105381467
12	CMI	7.41316144401
4	CMIG	2.47117736736
1	CMIO	0.61776345367
93	CMO	57.45224829650
14	CMr	8.64868835135
3	CMrD	1.85329036100
215	CMrG	132.81988385500
5	CMrG,MFGtD	3.08881726834
10	CMrG,MFGtS	6.17763453668
178	CMrO	109.96257430500
4	CMrO,MFGtS	2.47105381467
26	CMX	16.06215867710
2	CMXarG	1.23552690734
15	CMXG	9.26657535772
2	CMXGs	1.23552690734
46	CMXO	28.41761307950
9	CSGP	5.55987108301
6	CSmGc	3.70658072201
13	CSs,MFGtD	8.03098667403
8	CSsG	4.94216940569
13	CSsG,MFGtD	8.03092489768
17	CSsG,MFGtS	10.50210226500
16	CStD	9.88421525869
77	CStG	47.56809481420
1	CStGc	0.61782523001
707	CStGP	436.76117102100
7	CStGPs	4.32434417568
1	CStGs	0.61776345367
14	CStO	8.64875012770
1	CU	0.61776345367
14	EsD	8.64887368039

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
54	EsDT	33.35922649810
1	FHa	0.61776345367
48	FHC	29.65351065730
43	FHM	26.56382850770
5	FHM,EsS	3.08881726834
15	FHp	9.26651358136
15	FHT	9.26645180502
238	FM	147.02906105300
2	FM,MFGtS	1.23558868369
8954	FMa	5531.49486019000
5	FMa,EsST	3.08881726834
426	FMc	263.16859034200
1339	FMI	827.19125677900
4	FMI,EsS	2.47105381467
11	FMI,EsST	6.79539799035
8045	FMr	4969.95090783000
2508	FMX	1549.36365310000
1	FMX,EsD	0.61776345367
1	FMX,EsS	0.61776345367
2	FMX,MFGtS	1.23552690734
8	FMXac	4.94216940570
3928	FMXal	2426.59374957000
2	FMXal,EsS	1.23558868368
6629	FMXar	4095.17815074000
6	FMXar,EsD	3.70664249835
20	FMXar,EsS	12.35545440240
3	FMXar,EsST	1.85329036100
2	FMXcl	1.23552690734
546	FMXcr	337.30230517800
4270	FMXlr	2637.87095118000
36	FSB	22.24004031920
2	FSB,MFGtD	1.23552690734
3	FSB,MFGtS	1.85335213735
45	FSBT	27.79960252040
5	FSBT,MFGtS	3.08881726834
19	FSf	11.73750561970
109	FSH	67.33689598960
2	FSH,MFGtD	1.23558868368
2	FSH,MFGtS	1.23552690734
2	FSt	1.23552690734
373	FStD	230.42688020500
629	FStH	388.57537452900
1	FStH,MFGtD	0.61776345367
3	FStH,MFGtS	1.85329036100
71	FStp	43.86132876310
1545	FStS	954.44941627300
398	HI	245.87207850800

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
3763	ITF	2324.67087255000
1	MFFI	0.61776345367
2313	MFG	1428.89360198000
331	MFG,MFGtD	204.48062982200
880	MFG,MFGtS	543.63363074200
26	MFGc	16.06191157170
220	MFGh	135.90826868900
10	MFGh,MFGtS	6.17763453668
5093	MFGP	3146.29187975000
4	MFGP,MFGtS	2.47105381467
34	MFGtD	21.00395742470
134	MFGtM	82.78110588400
197	MFO	121.69983281900
8	MFO,MFGtS	4.94210762934
13	MFPO	8.03092489768
2385	MSG	1473.37825411000
16	MSG,EsST	9.88421525869
1	MSG,MFGtD	0.61776345367
19	MSG,MFGtS	11.73756739600
620	MSGd	383.01612122200
5	MSGj	3.08881726834
1476	MSGs	911.82534415500
482	MSO	297.76389973500
3	MSO,MFGtS	1.85329036100
49	MSS	30.27084166410
25	MUD	15.44420989440
6	ORV	3.70664249835
39767	OW	24566.81968050000
3	OW,MFGtS	1.85329036100
57	RD	35.21270218810
498	SM	307.64792966400
116	SMa	71.66111661260
596	SMc	368.18918057100
359	SMI	221.77961269700
3492	SMr	2157.25011941000
8	SMr,MFGtD	4.94210762934
59	SMr,MFGtS	36.44878508250
393	SMX	242.78295235800
1	SMX,MFGtD	0.61776345367
3	SMXac	1.85329036100
39	SMXal	24.09302179840
342	SMXar	211.27646023400
581	SMXcr	358.92371718700
123	SMXlr	75.98576967000
29	SS	17.91520193270
1	SS,MFGtS	0.61776345367
1	SSB	0.61776345367

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
30	SSm	18.53290361000
245	SSs	151.35389943900
98	SSs,MFGtD	60.54143622290
139	SSs,MFGtS	85.86986137600
9	SU	5.55987108301
8	SUC	4.94210762934
9	SUs	5.55993285936
2380	WM	1470.28851018000
3	WM,EsD	1.85329036100
65	WM,EsDT	40.15480981750
34	WM,EsS	21.00401920110
8	WM,EsST	4.94210762934
377	WMa	232.90028150800
1	WMa,EsD	0.61776345367
1857	WMc	1147.19420841000
1	WMcG	0.61776345367
8	WSp	4.94223118203
665	WSpG	410.81516774300
42	WSpS	25.94637393580
21	WSpX	12.97303252700
32	WSs	19.76843051740
16	WSsG	9.88421525869
1	WSsG,MFGtS	0.61776345367
1493	WSsS	922.32602555200
1	WSsS,EsD	0.61776345367
11	WSsS,EsS	6.79564509573
590	WStG	364.48309404700
7	WStO	4.32434417568
30	WStS	18.53315072780
86	WU	53.12771879180
13	WUh	8.03092489768
37	WUpFS	22.85737133840
19	WUpFSs	11.73750561970
1	WUpS	0.61776345367

Final Section Map

The following table was created from the ArcGIS files delivered for Areas 1, 2, 3, and 4. It shows the number of grid cells (i.e. frequency) of classification codes along with the total acreage of each code.

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
118	AB	72.89695240160
7	AB,MFGtD	4.32446772837
61	AF	37.68381777910
495	AG	305.79544242000
61	AM	37.68412666090
78	AMA	48.18573471510
235	AMS	145.17527648100
104	BCH	64.24851116800
434	CA	268.11082153700
2	CA,EeM	1.23546513099
4	CA,MFFI	2.47105381467
24	CA,MFGtD	14.82638466440
29	CA,MFGtS	17.91526370910
6	CM	3.70701316878
3	CM,MFGtD	1.85329036100
72	CMaG	44.47909221680
1	CMaGs	0.61776345367
19	CMaO	11.73750561970
3	CMc	1.85329036100
97	CMcG	59.92324033480
23	CMcO	14.20855943440
450	CMG	277.99485146600
4	CMG,MFGtS	2.47105381467
6	CMGs	3.70658072201
12	CMI	7.41316144401
1	CMI,MFGtS	0.61776345367
4	CMIG	2.47117736736
1	CMIO	0.61776345367
96	CMO	59.30553865750
155	CMr	95.75382952930
2	CMr,MFGtD	1.23552690734
3	CMrD	1.85329036100
559	CMrG	345.33267410100
7	CMrG,MFGtD	4.32434417568
11	CMrG,MFGtS	6.79539799035
15	CMrGe	9.26645180502
4	CMrGs	2.47105381467
4	CMrH	2.47105381467
215	CMrO	132.81988386700
4	CMrO,MFGtS	2.47105381467
32	CMX	19.76873939910
1	CMX,MFGtS	0.61776345367
3	CMXarG	1.85329036100
2	CMXclGs	1.23552690734

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
71	CMXG	43.86157588090
2	CMXGc	1.23552690734
81	CMXGs	50.03951928690
48	CMXO	29.65313998680
120	CS	74.13210865090
5	CS,MFGtD	3.08881726834
3	CS,MFGtS	1.85329036100
1	CSD	0.61776345367
24	CSE	14.82650821710
1	CSE,MFGtS	0.61776345367
199	CSG	122.93610104300
14	CSGc	8.64868835135
3	CSGc,MFGtS	1.85329036100
3175	CSGP	1961.41167006000
3	CSGP,EsS	1.85329036100
3	CSGP,MFGtD	1.85329036100
7	CSGP,MFGtS	4.32434417568
4	CSGt	2.47105381467
6	CSmGc	3.70658072201
211	CSmGP	130.34883004000
1	CSs	0.61776345367
2	CSs,MFGD	1.23552690734
29	CSs,MFGtD	17.91532548540
5	CSs,MFGtS	3.08881726834
146	CSsE	90.19408199900
5	CSsE,MFGtS	3.08881726834
320	CSsG	197.68510826600
14	CSsG,MFGtD	8.64868835135
38	CSsG,MFGtS	23.47544367380
71	CSsGc	43.86200830290
2	CSsGc,MFGtD	1.23552690734
5	CSsGc,MFGtS	3.08881726834
1	CSsO	0.61776345367
11	CSt	6.79539799035
1	CSt,MFGtS	0.61776345367
289	CStD	178.53444120300
2	CStD,MFGtS	1.23552690734
25	CStE	15.44433344710
6507	CStG	4019.81602834000
8	CStG,MFGtD	4.94210762934
12	CStG,MFGtS	7.41316144401
88	CStGc	54.36349280450
1	CStGc,MFGtS	0.61776345367
4158	CStGP	2568.67868859000
7	CStGPs	4.32434417568
3	CStGs	1.85329036100
2	CStGt	1.23565046003

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
8	CStH	4.94210762934
397	CStO	245.25388262000
6	CSW	3.70664249835
4	CSW,MFGtS	2.47105381467
274	CSWD	169.26718630500
7	CSWE	4.32434417568
517	CSWG	319.38531173100
3	CSWG,MFGtS	1.85329036100
18	CSWGc	11.11992749510
1240	CSWGP	766.03125962800
391	CU	241.54822855600
1005	CUG	620.85659529300
6	EeD	3.70658072201
1	EeM	0.61776345367
2	EeS	1.23552690734
17	EsD	10.50216404140
54	EsDT	33.35922649810
1	EsS	0.61776345367
12	FH	7.41316144401
1	FH,EsD	0.61776345367
1143	FHa	706.10692417700
3	FHa,MFGtD	1.85329036100
48	FHC	29.65351065730
43	FHM	26.56382850770
5	FHM,EsS	3.08881726834
1583	FHp	977.92560125000
3	FHp,EsS	1.85329036100
1113	FHS	687.57356564400
20525	FHT	12679.68057720000
8	FHT,EsS	4.94210762934
1	FHT,MFGtD	0.61776345367
13	FHT,MFGtS	8.03104845037
258	FM	159.38439190200
7	FM,MFGtD	4.32434417568
7	FM,MFGtS	4.32440595203
8972	FMa	5542.61466414000
5	FMa,EsST	3.08881726834
459	FMc	283.55478431300
2010	FMI	1241.71349945000
4	FMI,EsS	2.47105381467
11	FMI,EsST	6.79539799035
8215	FMr	5074.97143627000
3	FMr,MFGtD	1.85329036100
3	FMr,MFGtS	1.85335213734
3069	FMX	1895.93166880000
1	FMX,EsD	0.61776345367
1	FMX,EsS	0.61776345367

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
2	FMX,MFGtD	1.23552690734
2	FMX,MFGtS	1.23552690734
11	FMXac	6.79552154305
4342	FMXal	2682.35090821000
2	FMXal,EsS	1.23558868368
6640	FMXar	4101.97361051000
6	FMXar,EsD	3.70664249835
20	FMXar,EsS	12.35545440240
3	FMXar,EsST	1.85329036100
10	FMXcl	6.17763453668
1300	FMXcr	803.09940871900
1	FMXcr,MFGtD	0.61776345367
4924	FMXlr	3041.89208001000
232	FS	143.32353052800
16	FS,EsS	9.88452414041
3	FS,MFGtS	1.85329036100
4	FSa	2.47105381467
495	FSaf	305.79531907700
109	FSB	67.33677243690
7	FSB,MFGtD	4.32434417568
13	FSB,MFGtS	8.03098667403
80	FSBT	49.42138517520
5	FSBT,MFGtS	3.08881726834
1267	FSf	782.71049661300
1	FSf,MFGtS	0.61776345367
10771	FSH	6653.98006679000
1	FSH,EeD	0.61776345367
2	FSH,EeS	1.23552690734
19	FSH,EsDT	11.73812338310
102	FSH,EsS	63.01218115580
4	FSH,MFGtD	2.47111559102
16	FSH,MFGtS	9.88427703503
84	FSs	51.89243898980
2020	FSt	1247.89237759000
2	FSt,MFGtD	1.23552690734
2	FSt,MFGtS	1.23552690734
24888	FStD	15375.01095450000
5	FStD,MFGtD	3.08881726834
13	FStD,MFGtS	8.03092489768
25463	FStH	15730.21247090000
4	FStH,EeD	2.47105381467
3	FStH,EsS	1.85329036100
1	FStH,MFGtD	0.61776345367
6	FStH,MFGtS	3.70658072201
3826	FStp	2363.57587695000
1	FStp,EsS	0.61776345367
48391	FStS	29894.39079530000

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
1	FStS,EeS	0.61776345367
1	FStS,EsD	0.61776345367
1	FStS,EsS	0.61776345367
4	FStS,MFGtD	2.47111559102
12	FStS,MFGtS	7.41316144401
934	HI	576.99440164800
4	HI,EsDT	2.47105381467
3	HI,EsS	1.85329036100
2	HI,EsST	1.23552690734
1	HI,MFGtD	0.61776345367
4	HI,MFGtS	2.47105381467
3763	ITF	2324.67087255000
2	LEV	1.23552690734
14	MF	8.64868835135
1	MF,MFGtS	0.61776345367
4347	MFB	2685.43892391000
42	MFB,MFGtD	25.94631215940
147	MFB,MFGtS	90.81190722900
5	MFB,P	3.08887904468
3	MFBa	1.85329036100
1	MFBp	0.61776345367
118	MFBt	72.89633463820
2	MFBt,MFGtS	1.23552690734
17	MFF	10.50204048870
1	MFF,EpiD	0.61776345367
16	MFFI	9.88440058772
24039	MFG	14850.51790280000
1	MFG,EeS	0.61776345367
456	MFG,MFGtD	281.70137041200
1407	MFG,MFGtS	869.19775076000
3	MFG,P	1.85329036100
29	MFGa	17.91470772200
2645	MFGc	1633.99551648000
3	MFGc,MFGtD	1.85329036100
134	MFGc,MFGtS	82.78122943670
20	MFGcS	12.35513912830
864	MFGe	533.75133056200
7	MFGe,MFGtD	4.32434417568
33	MFGe,MFGtS	20.38625574740
220	MFGh	135.90826868900
10	MFGh,MFGtS	6.17763453668
1	MFGj	0.61776345367
77598	MFGP	47937.54040190000
14	MFGP,EsS	8.64868835135
8	MFGP,MFGtD	4.94216940570
83	MFGP,MFGtS	51.27467553620
16	MFGpa	9.88421525869

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
103	MFGPc	63.62994460950
24	MFGPcps	14.82632288800
6	MFGPm	3.70658072201
5	MFGGr	3.08881726834
533	MFGt	329.27057718800
111	MFGtD	68.57242292160
420	MFGtM	259.46287448900
2	MFGtS	1.23552690734
1	MFGz	0.61776345367
569	MFO	351.50907311100
1	MFO,EeS	0.61776345367
1	MFO,EpiD	0.61776345367
17	MFO,MFGtS	10.50204048870
4	MFO,P	2.47105381467
15	MFPO	9.26645180502
4576	MSG	2826.90700046000
16	MSG,EeST	9.88421525869
77	MSG,MFGtD	47.56778593240
181	MSG,MFGtS	111.81567932500
620	MSGd	383.01612122200
710	MSGj	438.61483204000
28	MSGj,MFGtD	17.29756203170
45	MSGj,MFGtS	27.79941719140
2922	MSGs	1805.11827892000
10	MSGs,MFGtD	6.17775808937
80	MSGs,MFGtS	49.42138517520
3	MSGtM	1.85329036100
767	MSO	473.82741068800
2	MSO,MFGtD	1.23552690734
3	MSO,MFGtS	1.85329036100
49	MSS	30.27084166410
72	MSSb	44.47896866410
25	MUD	15.44420989440
6597	ORV	4075.41683257000
40657	OW	25116.63409640000
1	OW,EeD	0.61776345367
2	OW,EeS	1.23552690734
1	OW,EeS	0.61776345367
8	OW,MFGtD	4.94229295837
11	OW,MFGtS	6.79545976669
1946	RD	1202.17243767000
3	RD,EeS	1.85329036100
5	RD,EeS	3.08881726834
5	RD,MFGtD	3.08881726834
12	RD,MFGtS	7.41316144401
1	RES	0.61776345367
6	SF	3.70658072201

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
688	SM	425.02329474300
2	SM,MFGtD	1.23552690734
2	SM,MFGtS	1.23552690734
139	SMa	85.86967604700
931	SMc	575.14253215600
400	SMI	247.10822317900
5085	SMr	3141.35471429000
11	SMr,MFGtD	6.79539799035
59	SMr,MFGtS	36.44878508250
746	SMX	460.85542835800
2	SMX,MFGtD	1.23552690734
1	SMX,MFGtS	0.61776345367
3	SMXac	1.85329036100
39	SMXal	24.09302179840
350	SMXar	216.21856786300
5	SMXcl	3.08881726834
2059	SMXcr	1271.98366159000
194	SMXlr	119.84734553800
14	SP	8.64868835135
2543	SS	1570.98256766000
1	SS,EeD	0.61776345367
1	SS,EsDT	0.61776345367
59	SS,EsS	36.44835264810
11	SS,MFGtD	6.79539799035
29	SS,MFGtS	17.91526370910
1	SS,P	0.61782523001
29	SSa	17.91427528750
1	SSa,MFGtS	0.61776345367
23	SSB	14.20855943440
2	SSB,MFGtS	1.23552690734
20	SSBT	12.35533084970
150	SSf	92.66519759000
51	SSm	31.50593613710
5177	SSs	3198.18345800000
1	SSs,EsS	0.61776345367
147	SSs,MFGtD	90.81196900530
254	SSs,MFGtS	156.91352341700
2	SSs,P	1.23552690734
6649	SU	4107.54213034000
1	SU,MFGtS	0.61776345367
2	SUa	1.23558868368
8	SUC	4.94210762934
107	SUH	66.10099842420
3786	SUs	2338.86917701000
759	SUT	468.88616796400
1	SUT,MFGtS	0.61776345367
2521	WM	1557.39383669000

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
3	WM,EsD	1.85329036100
65	WM,EsDT	40.15480981750
34	WM,EsS	21.00401920110
8	WM,EsST	4.94210762934
377	WMa	232.90028150800
1	WMa,EsD	0.61776345367
1887	WMc	1165.72711202000
1	WMcG	0.61776345367
373	WS	230.42725085000
1	WS,EsD	0.61776345367
852	WSh	526.33748956600
1	WSh,EsDT	0.61782523001
1	WSh,EsS	0.61776345367
1	WSh,MFGtS	0.61776345367
782	WSp	483.09336826900
1	WSp,EsS	0.61776345367
24877	WSpG	15368.20203020000
1	WSpG,EeS	0.61776345367
4	WSpG,EsS	2.47105381467
4	WSpG,MFGtD	2.47105381467
1	WSpG,MFGtS	0.61776345367
3163	WSpS	1953.99769264000
13	WSpS,EsS	8.03092489768
1445	WSpX	892.67517768000
84	WSs	51.89237721350
1	WSs,EsS	0.61776345367
1210	WSsG	747.49717664900
3	WSsG,EeS	1.85335213735
2	WSsG,EsS	1.23552690734
6	WSsG,MFGtS	3.70658072201
5	WSsGc	3.08881726834
2504	WSsS	1546.88944867000
4	WSsS,EeS	2.47105381467
3	WSsS,EsD	1.85335213734
53	WSsS,EsS	32.74269859600
113	WSsX	69.80881469790
1	WSsX,MFGtS	0.61776345367
78	WSt	48.18567293880
6	WSt,MFGtD	3.70658072201
2	WSt,MFGtS	1.23552690734
14265	WStG	8812.45395397000
2	WStG,EsS	1.23552690734
1	WStG,MFGtD	0.61776345367
8	WStG,MFGtS	4.94210762934
6	WStG,P	3.70658072201
144	WStO	88.95830798630
1	WStO,MFGtS	0.61776345367

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	TOTAL ACREAGE
2527	WStS	1561.10096916000
2	WStS,EsS	1.23552690734
8	WStS,MFGtS	4.94216940569
231	WU	142.70409911300
1977	WUh	1221.32403135000
3	WUh,MFGtS	1.85329036100
61	WUp	37.68400310820
161	WUpFG	99.46041025130
5355	WUpFS	3308.14771238000
3701	WUpFSs	2286.35928345000
954	WUpFX	589.35136145500
269	WUpG	166.17966634000
5735	WUpS	3542.89649833000
2	WUpS,EsS	1.23552690734
1	WUpS,MFGtS	0.61776345367
362	WUpSs	223.63142042600
1088	WUpX	672.13151792200
14	WUs	8.64884138833
656	WUsG	405.25442326600
4282	WUsS	2645.27770180000
1	WUsS,EsS	0.61776345367
1289	WUsSs	796.30438138700
198	WUsX	122.31778159000

6.0 Problems and Solutions

The following section is an aggregate listing of problems, solutions, and potential solutions discovered and discussed with NPS regarding the entire project. Each subsection lists all problems and solutions for each particular delivery area. Appendix A contains examples of the photointerpretation decision making process along with examples of problematic classes.

6.1 Delivery Area 1

Soils Map Ancillary Data

The soils maps utilized as ancillary data for the project are problematic and are not a reliable guide to wetland vs. upland vegetation within Area 1. Soils maps were downloaded from the SOFIA (<http://sofia.usgs.gov/>) web site. In addition, the NPS staff provided eight paper soils maps of Collier County. These eight maps were produced by the United States Department of Agriculture in 1954. Avineon scanned the paper soils maps and georeferenced the scanned images. These georeferenced images of the soils maps were displayed along with the grid while the mapping was in progress.

During photointerpretation, aerial photographic signatures take priority over soils map information.

Classification Decision Making – Grid Cell Boundaries

The actual boundary of each grid cell strongly affects classification decision making. Photointerpreters must not only identify vegetative species within a grid cell, but must also calculate through visual analysis the area occupied by the species within the cell. This percent area calculation can be subjective.

We attempt to control this subjectivity by developing photointerpretation rules aimed at showing examples of grid cells and their associated classification. Furthermore, collaboration with NPS is ongoing so that all project parties understand the rationale for classification.

Classification Decision Making – Vegetation Percent Cover

The percent cover of each vegetation species must be ascertained within each grid cell during interpretation. Dominant vegetation within each grid cell is identified and compared to surrounding vegetation within the cell. Determining the percent cover occupied by each species within a grid cell can be problematic given the small scale of the aerial photography. This can be especially problematic within mixed communities where individual species are heavily intermixed.

We control this by developing photointerpretation rules aimed at showing examples of grid cells and their associated classification. Field work is increased within these cover types. Collaboration with NPS is ongoing so that field accuracy assessment procedures are in accordance with photointerpretation decision making.

Wetland vs. Upland Classification

The classification system is very thorough in documenting the various vegetative assemblages existing within the study area. Within the classification system, selected species are listed both within upland and wetland classification categories because this occurs within the project area.

During the photointerpretation of Area 1, difficulties arose in clearly separating upland hammock vegetation from wetland vegetation. The aerial photographic signatures do not always clearly enable separation of wetland vs. upland. The soils maps are not complete in determining this division.

As a solution to this problem, Avineon conducted additional field work in order to improve classification of upland versus wetland vegetation within Area 1. The NPS also provided invaluable input into this decision making process.

Cypress Strands vs. Cypress Domes

Within the Florida Panther National Wildlife Preserve, Avineon discovered situations where cypress domes were intertwined with cypress strands. Even though the center of the dome was visible, the determination of cypress dome versus cypress strand was somewhat difficult within selected locations.

The NPS staff decided that either of the two classifications would be accepted during accuracy assessment.

Accuracy Assessment Points within Area 1

National Park Service decided to provide Avineon with all the Accuracy Assessment points for Delivery Area 1. The reasoning behind giving Avineon all the AA points was to allow the use of these points as a training set. Avineon examined, evaluated and referenced all 171 AA points and adjusted Delivery Area 1 to conform to the AA points. The information provided within the 171 AA points was then used to assist revision of grid cells throughout Area 1. While updating the models to reflect the AA points, Avineon not only changed the AA cell, but also changed all cells within the Area which exhibited the same signature.

The Area 1 AA points which identified hammocks provided the most helpful information. The information gathered from the hammock signatures within Area 1 will also assist with the identification of hammocks in other Delivery Areas. In addition, the information provided for cypress and hardwood mixtures will assist classification within Delivery Areas 2, 3 and 4.

Avineon has updated 63 of the previously accepted 68 Accuracy Assessment points to reflect the field data and classification gathered by IRC at a higher level of detail. The 63 AA points were used as a reference file to change the corresponding cells' attribution. The points were also used as a training set to change cell attribution when that cell depicted a similar vegetation signature as that of the AA point.

Three AA points were not updated because Avineon determined a higher level of detail than that of the field crew. AA point number 90 was classified by the field crew as WSp, Swamp Pine Woodland. Avineon determined through photointerpretation that wet shrubs predominantly occupied the understory and labeled the cell WSpS. AA point 135 was classified by the field crew as WS, Swamp Woodland. Avineon determined through photointerpretation that the cell contained 10% - 60% pine with a predominately wet graminoid understory and labeled the cell WSpG. AA point 149 was classified by the field crew as WUpF,

Pine Flatwoods. Avineon determined through photointerpretation that upland shrubs predominantly occupied the understory and labeled the cell WUpFS.

Two AA points were not updated because they reflected a newer version of the classification system that was not utilized during the photointerpretation of Delivery Area 1. AA points 53 and 141 were determined by the field crew to be predominantly Pop Ash of forest height. The only classification code available to Avineon during the PI process was FSaf, Pond Apple/Pop Ash forest. Therefore, in order to remain consistent with the classification of Delivery Area 1, AA points 53 and 141 were not changed during revisions.

AA point 59, similar to AA points 53 and 141, remained unchanged in order to remain consistent with the classification of Delivery Area 1. The field crew depicted a Pop Ash/Pond Apple mix of shrub height (SSaf), but SSf was the only classification available during photointerpretation.

Verify Attribute Tool Updated

Avineon compiled the software entitled “Verify Attribute Tool” to check for attribution errors that may have escaped visual quality assurance reviews. The first software version of this tool did not check for multi-label errors. The tool was then updated to check extensively for an array of multi-label errors.

A concern identified within Delivery Area 2 was that several multi-label errors were making it through the quality control process. Avineon has since amended the software and has added conditions to check for the validity of all multi-labels used during photointerpretation. After the tool was updated it was then run on the latest version of Delivery Area 1 and errors were corrected.

The Verify Attribute tool, after encountering a multi-label, will check both labels for errors such as spelling. The tool will then check the first label to determine if it is an exotic species or not. An exotic species label should occur at the end of a multi-label string. If an exotic species label occurs at the beginning of a multi-label, then the program will flag the label as an error. Furthermore, the Verify Attribute tool will check the second label in a multi-label string. If it is not an exotic species label, the program will flag the label as an error.

There are certain multi-labels that may contain non-exotic labels as the ending label. The “I” (Island) and “P” (Periphyton) modifiers are non-exotic labels that may be used as the ending label in a multi-label string. The island modifier will be treated as an exotic label by the Verify Attribute tool and will be flagged if used as the first label in a multi-label string. It will not be flagged if it occurs at the end of a multi-label. The Periphyton modifier will not be used in Delivery Area 2, 3, and 4.

Other Concerns

A meeting was conducted with NPS on April 25, 2007 to discuss general concerns, problems and solutions in regards to Area 1. The outcome of this meeting will be applied to all future deliverables. Please refer to *Appendix B: Meeting Summary* for concerns addressed during this meeting.

6.2 Delivery Area 2

Broadleaf Marsh Communities

Based on feedback received by NPS on the preliminary example maps submitted by Avineon, it became apparent that the photointerpretation of broadleaf marsh species is problematic on the aerial

photography. Due to the aerial photographic scale selected for the project, Pontedaria and Sagittaria exhibit almost identical signatures.

Avineon has formally requested to NPS that all broadleaf marsh communities be labeled MFB, except for Thalia (MFBt). This would eliminate the need to classify individual broadleaf marsh species. Avineon has also recommended that if this simplification of the broadleaf class can not be made by NPS, that the acceptance criteria for this class be diminished or removed completely.

MFG vs. MFGP

One of the concerns that Avineon has had with Delivery Area 2 is delineating the boundary between Freshwater Prairie and Freshwater Marsh (i.e. MFG, MFGP). There are many areas throughout Big Cypress where the evidence of surface water is not easily detected on the imagery. Furthermore, the ancillary soils data has not aided in solving this particular issue.

Avineon formally requested to NPS that all field notes recorded during the IRC accuracy assessment of Study Area 2 example data (18pts), be sent to Avineon. This could help us in determining whether or not an indicator exists within the IRC field notes that could aid in decision making. Although there is doubt that a key vegetation indicator exists to distinguish between MFG and MFGP communities, Avineon would like the opportunity to review all existing field data gathered by IRC to possibly make the distinction between marsh and prairie.

After reviewing the large scale plots with NPS on June 21, 2007, it was determined that the majority of the large open expanses of graminoids which Avineon classified as Graminoid Prairie (MFGP) were indeed prairie. Avineon has used the information gathered from Jim Burch and Kevin Whelan during the June 21st field trip to make appropriate changes between MFG/MFGP communities. Freshwater Marshes (MFG) tend to be wetter, have longer hydro-periods, and produce greater growth of species such as Sawgrass and Willow.

A good example of the difference between Prairie and Marsh exists within the following file:

fieldwork_documentation\fieldwork_pictures\fieldphotos_6_21_07\014.jpg.

The above example image shows MFGP in the foreground and MFG/MFB in the background. After visiting these areas on the ground, the two communities appear very distinct. Again, the points gathered in the field which pertained to Prairies and Marshes were imported into MicroStation and used during the photointerpretation process. Avineon is confident that the problems associated with classifying this community type have been abated.

Upland Shrub / Lowland Graminoid Mixture

Delivery Area 2 had many areas (especially in the western area of Big Cypress) where saw palmetto (an upland shrub) was mixed 60/40 with a Freshwater Graminoid Prairie. In most of the other classifications, there is a specific class for mixed shrubs and graminoids. Usually, both the shrub and graminoid are either upland or lowland. In this instance, saw palmetto is an upland species, and the freshwater prairie consists of lowland species of graminoids.

If the cell was mixed, and saw palmetto made up 50% or more of the coverage, then the cell was classified as SUs (saw palmetto dominated shrub land). If the cell was mixed and saw palmetto only

made up 10%-49% of the coverage, then the cell was labeled as upland scrub in a graminoid mixture (CUG). If the cell was not mixed, then the dominant signature would determine the classification.

See the Delivery Area 2 section of Appendix A.

6.3 Delivery Area 3

For the most part, Area 3 consisted of terrain similar in nature to that of area 2. Many of the same difficulties encountered within Area 2 also proved to be difficult while mapping Area 3. In addition to the difficulties previously encountered, Area 3 also presented the following issues outlined below.

Saltwater Transition Zone

Delivery Area 3 begins the transition zone between estuarine and freshwater species. This area proved difficult in determining where to make the break between MSG and MFG break during photointerpretation.

Within the saline graminoid community, it was difficult at times to differentiate the signature between Black rush (*Juncus roemerianus*) and Cordgrass (*Spartina bakeri*) and/or Gulf Cordgrass (*S. spartinae*). Black rush and Cordgrass both typically have varying signatures that change with density and other species present. When this happens the signatures overlap resulting in confusion between the two communities.

Mangroves

Mangrove communities are also becoming apparent within Area 3. Similar to the graminoids mentioned above Mangrove species also have very similar overlapping signatures on the photography making it extremely difficult to correctly classify on the species level.

Avineon conducted additional field work with NPS staff on 12/12/07, and focused primarily on mangrove communities within Area 3. Avineon collected a total of 37 points relating to mangrove communities, and based upon the field data have made corrections to several of the mangrove cells located in the southwest portion of Area 3.

During the field survey it was determined that Black Mangrove was not widespread in Area 3, and a majority of the mixed mangrove communities were comprised predominately of Red, White, and Buttonwood species.

On January 22, 2008 Avineon completed additional fieldwork within the Mangrove communities along Turner River. These mangrove communities proved once again that mangrove signatures overlap one another and are challenging. One area in particular was mapped as red mangrove because of the cell having a dominate red mangrove signature, however no red mangroves were present. During this field trip, Avineon collected an additional 8 points relating to mangrove communities. This resulted in 45 mangrove field points collected out of 169 total field points for Area 3 (26%).

Due to the nature of the overlapping mangrove signatures, Avineon photointerpreters attempt to differentiate mangrove species where reasonable certainty exists on the aerial photography. However, where interpretation is in question, Avineon will classify mangroves to a less detailed level. This allowance is stated in the Statement of Work and should be considered during accuracy assessment where field derived classification is compared to imagery based classification.

Delivery 3 Sample Data

Avineon supplied 3 sample models to NPS for review and feedback. NPS overlaid previously collected Accuracy Assessment points on the data as well as giving the data a general review by looking over the hard copy plots that were also supplied.

In addition to the accuracy assessment results, Avineon was also supplied with a table outlining grid specific questions as to why certain classes were used.

Please refer to Delivery Area 3 of Appendix A for Avineon's responses regarding these questions.

General Map Changes

Changes were made to the selected map attribution based upon guidance from the Accuracy Assessment report generated by NPS (i.e. Hardwood Swamp Forest (FSH) changed to FStS and WSt in the northwest part of section 3).

Please refer to Delivery Area 3 within Appendix A Vegetation Mapping Examples for examples supplied by NPS.

6.4 Delivery Area 4

Mangroves

As mentioned above in Area 3 problems, Mangrove species have various overlapping signatures that make PI difficult. Area 4 is almost entirely comprised of various mangrove communities. Red Mangroves that typically have a strong, deep red signature were substantially brighter as well as having a different texture. This could possibly be due to different salinities and species height.

Area 4 Revisions

After receiving Accuracy Assessment feedback from NPS regarding Section 4, Avineon focused most of the correction effort into correcting errors regarding the mangrove communities. These errors arose because of the difficulty in determining mangrove species dominance, mixed mangrove communities, and transition areas between differing mixed and dominated mangrove communities on the aerial photography.

Avineon reviewed the linear discrepancies mention in the Accuracy Assessment Report. Avineon made edge matching corrections (North/South and East/West) that started between models 030708 and 050910 and finished between models 030203 and 050405. Edge matching was also corrected between models 071011 and 080708 (North/South and East/West) and finished between models 070506 and 080203.

The total number of cells changed for the entire revision, compared to the original Area 4 Delivery, was 24,920 out of 115,756 total cells. This resulted in an overall map percentage change of 21.53%. Of the total cells changed, 21,098 (84.66%) included mangrove related communities (*See table of classification changes below*).

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	CLASSIFICATION SUBTRACTED	CLASSIFICATION ADDED
61	AM	–	–
78	AMA	–	–
236	AMS	1	–
112	BCH	–	–
16	CA	–	–
6	CM	–	–
199	CMG	–	8
4	CMG,MFGtS	–	–
90	CMO	–	3
26	CMX	–	–
15	CMXG	–	2
2	CMXGs	–	1
45	CMXO	–	–
2	CMXarG	–	–
172	CMaG	–	–
2	CMaGs	–	–
44	CMaO	1	–
0	CMcO	–	1
12	CMI	–	–
7	CMIG	–	–

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	CLASSIFICATION SUBTRACTED	CLASSIFICATION ADDED
1	CMIO	–	–
14	CMr	–	–
3	CMrD	–	–
219	CMrG	2	–
5	CMrG,MFGtD	–	–
10	CMrG,MFGtS	–	–
176	CMrO	–	2
4	CMrO,MFGtS	–	–
9	CSGP	–	–
13	CSs,MFGtD	–	–
7	CSsG	–	–
12	CSsG,MFGtD	–	–
16	CSsG,MFGtS	–	–
16	CStD	–	–
88	CStG	–	–
705	CStGP	–	–
1	CStGc	–	–
14	CStO	–	–
1	CU	–	–
1	Es	1	–
75	EsD	61	–
54	EsDT	–	–
57	FHC	–	–
53	FHM	1	–
5	FHM,EsS	–	–
15	FHT	–	–
1	FHa	–	–
15	FHp	–	–
30	FM	9	–
716	FMX	–	1,128
0	FMX,EsD	–	1
0	FMX,EsS	–	1
2	FMX,MFGtS	–	–
7702	FMXal	4,787	–
34	FMXal,EsS	30	–
2	FMXal,EsST	2	–
3778	FMXar	–	5,863
0	FMXar,EsD	–	6
0	FMXar,EsS	–	41
1	FMXar,EsST	–	2
3	FMXar,MFGtS	–	–
5	FMXcl	3	–
67	FMXcr	–	34
11562	FMXlr	6,745	–
3	FMXlr,EsD	3	–
352	FMa	–	7,839
5	FMa,EsST	–	–

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	CLASSIFICATION SUBTRACTED	CLASSIFICATION ADDED
0	FMc	–	22
8189	FMI	6,967	–
4	FMI,EsD	4	–
17	FMI,EsS	13	–
11	FMI,EsST	–	–
4201	FMr	–	3,873
0	FMr,EsS	–	1
33	FSB	–	3
2	FSB,MFGtD	–	–
1	FSB,MFGtS	–	2
38	FSBT	–	7
5	FSBT,MFGtS	–	–
116	FSH	7	–
2	FSH,MFGtD	–	–
2	FSH,MFGtS	–	–
19	FSf	–	–
2	FSt	–	–
374	FStD	–	–
782	FStH	–	–
1	FStH,MFGtD	–	–
3	FStH,MFGtS	–	–
1406	FStS	–	–
60	FStp	–	–
398	HI	–	–
0	ITF	–	3,764
1	MFFI	–	–
2750	MFG	–	–
16	MFG,EsST	–	–
332	MFG,MFGtD	–	–
945	MFG,MFGtS	–	–
5109	MFGP	–	–
4	MFGP,MFGtS	–	–
26	MFGc	–	–
34	MFGtD	–	–
135	MFGtM	–	–
214	MFO	–	–
11	MFO,MFGtS	–	–
3928	MSG	–	3
1	MSG,MFGtD	–	–
19	MSG,MFGtS	–	–
5	MSGj	–	–
217	MSGs	–	–
519	MSO	–	–
3	MSO,MFGtS	–	–
49	MSS	–	–
25	MUD	–	–
6	ORV	–	–

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	CLASSIFICATION SUBTRACTED	CLASSIFICATION ADDED
39732	OW	–	26
3	OW,MFGtS	–	–
57	RD	–	–
3751	SF	3,751	–
153	SM	–	178
471	SMX	50	–
1	SMX,MFGtD	–	–
53	SMXal	6	–
3774	SMXar	1,973	–
1	SMXar,MFGtS	–	–
128	SMXcr	–	243
315	SMXlr	140	–
774	SMa	298	–
0	SMc	–	190
389	SMl	6	–
2733	SMr	–	425
8	SMr,MFGtD	–	–
59	SMr,MFGtS	–	–
29	SS	–	–
1	SS,MFGtS	–	–
0	SSB	–	1
244	SSs	–	–
98	SSs,MFGtD	–	–
140	SSs,MFGtS	–	–
9	SU	–	–
8	SUC	–	–
9	SUs	–	–
2656	WM	59	–
3	WM,EsD	–	–
65	WM,EsDT	–	–
34	WM,EsS	–	–
8	WM,EsST	–	–
4	WMc	–	1,151
3	WSp	–	–
681	WSpG	–	–
42	WSpS	–	–
14	WSpX	–	–
32	WSs	–	–
16	WSsG	–	–
1	WSsG,MFGtS	–	–
1562	WSsS	–	13
1	WSsS,EsD	–	–
11	WSsS,EsS	–	–
581	WStG	–	–
6	WStO	–	–
30	WStS	–	–
0	WU	–	86

FREQUENCY OF CLASSIFICATION	CLASSIFICATION	CLASSIFICATION SUBTRACTED	CLASSIFICATION ADDED
13	WUh	–	–
37	WUpFS	–	–
19	WUpFSs	–	–
1	WUpS	–	–
–	–	–	–

Revision #3 changes to Area 4 were made to the overall vegetation map on the basis of information gathered from inconsistencies found between the field survey and field photography. Furthermore, inconsistencies were found between the classification of certain field survey points and what classification was used on the vegetation map for the corresponding survey points ([Appendix A: Area 4 Revision - Document of Examples](#) & [Appendix B: Email correspondence from Tim Delaney to NPS describing Avineon's plan for revision and the discrepancies found between Avineon's field survey and the vegetation map classification](#)).

Imagery Dates

Model 306307 was comprised of photos with two separate imagery dates. Each image had unique signatures for the identical vegetation features resulting in one photo having brighter tones while the other was much duller. Water depth was also conflicting between the two dates. One photo showed deeper dark open water while the other photo showed a tidal flat. These problems resulted in the stereo model having poor interpretable features; however Avineon staff did the best they could under the circumstances.

Sample Models

As stated in the Scope of Work, Avineon supplied NPS with 3 sample models for review and feedback. Avineon uses this feedback to help the photointerpreters learn from mistakes and to verify that other cells are indeed being attributed correctly.

Avineon has not received any feed back resulting from the 3 sample models sent from delivery area 4.

MSG vs. MFG

A small section of Area 4 also encompasses some graminoids. These gramminoid communities are surrounded by mangrove and no clear break or dividing lines between MSG and MFG communities are visible.

Salt Flat vs. Intertidal Flat

Avineon used the Salt Flat (SF) classification to describe areas exposed during low tide. Based on feedback from NPS, it was determined that the majority of cells labeled Salt Flat were not hypersaline exposed flats and should be labeled as Intertidal Flat instead.

Avineon created a new layer called Intertidal Flat (ITF) and changed the majority of Salt Flat cells to Intertidal Flat. The new label was placed on level 12 in Microstation and was added to Avineon's Software Validation Process. The total number of cells changed to ITF was 3,752 (34.49%).

FStS vs. FStH

On the Accuracy Assessment report, IRC noted a cell that should have been labeled FStS because the hardwood layer was <5m in height (Point 104). Due to the low frequency of FStS/FStH areas in Section 4, Avineon reviewed all FStS and FStH cells. Avineon located areas where the cypress trees were extremely tall (10+ meters) and in some cases were double the height of the hardwood layer. In all instances, the hardwood layer was >5 meters in height. Given the height of the cypress trees, the IRC field crew may have had a difficult time in determining the height of the hardwood layer. Please refer to Delivery Area 4 within Appendix A for an example.

Requested Corrections for Final Section 4 Deliverable

NPS reported that the Section 4 Revision 3 map would be accepted with some modifications that would improve the overall map quality. The modifications (listed below) were provided to Avineon by NPS. Avineon Photo-interpreters thoroughly reviewed each one of the recommendations below and made corrections using their best judgment (See 'Correction' explanation).

1) In order to produce a more complete map and provide valuable information to the photo interpreters (Avineon) we have chosen to provide the spatial location of the accuracy assessment points (See excel file). For all 30 points that were found to be incorrect at the lowest level of the classification (marked by a 1 in the acceptable column) please update these cells and investigate/update the annotation of surrounding cells (using PI professional best judgment). Additionally, we flagged an additional 66 cells that were accepted, but the field classification was better. Please update these cells and investigate/update the annotation of surrounding cells (using PI professional best judgment). (see column named "check cell and near by cells")

Correction: PI's reviewed all 96 Accuracy Assessment point that needed updating. The PI's used this data to make corrections to the surrounding areas of each point and tied each correction to all adjacent models. This was done to improve the overall accuracy of the map and to avoid any false linear features.

2) Please examine Linear Features 5 and 6 and make corrections as needed.

Correction: PI's reviewed all linear features and made necessary corrections.

3) The shoreline shapefile has missed some areas. Figures 8, 9, and 10 indicate areas where the shoreline appears to be missing from the shoreline shapefile "dshore" that was included in Section 4 deliverable dated 3/30/2009. Figures 8 and 9 display large areas within the delivery area where no shoreline has been delineated. Figure 10 contains an area displaying a lagoon connected to open water.

Areas similar to this were located by selecting cells classed as "OW" that were located landward of the shoreline.

Correction: The missing shoreline features were caused by an error in the original shoreline coverage file. This error was corrected and a new shoreline map was processed. Any shoreline that was not delineated in the original coverage file was digitized and included in the new shoreline coverage and shapefile delivery.

6.5 Final Section Map

Requested Corrections for Final Map Deliverable

NPS requested changes to the overall map for the Final Map Delivery to be accepted. The recommendations for improvement to the overall map accuracy for the Final Deliverable were provided by NPS (see list below). Avineon Photo-interpreters thoroughly reviewed each one of the recommendations below and made corrections using their best judgment (See 'Correction' explanation).

Requests for completion of overall map project

Having completed all 4 sections, SFCN has the following requests before payment of the 5th installment:

- 1) *Complete changes to section 4 as requested above*

Correction: See Area 4 corrections.

- 2) *Investigate and correct as necessary Areas 1-4 as shown on Figure 1 below that show additional suspiciously linear features in Sections 2 and 3 that may indicate inconsistent photo-interpretation across models.*

- a. *Area 1. MFG appears to be classified on one side of the vertical line and MFGP on the other.*

Correction: Three models were reviewed (082425, 092526, 092425) and appropriate changes were made between the classification MFGP and MFG. A majority of the cells were changed to MFGP, thus eliminating the linear feature.

- b. *Area 2. Unsure if this is an error or just random effects, but please take a look.*

Correction: Two models were reviewed (102425, 112324) and appropriate changes were made between the classification CUG and SUs. The boundary between the two models was reviewed and in many instances CUG was changed to SUs, and SU was changed to SUs.

- c. *Area 3 & 4: Show MSG (Graminoid Salt Marsh) to the north and MFG (Graminoid Freshwater Marsh) to the south with an east-west demarcation line. This does not make sense biologically nor does there appear to be a linear feature on the imagery.*

Correction: Area 3 – The model reviewed was 080809. In this model the linear feature was between the classification MFG and MSG. Most of the MFG was changed to MSG and MSO appropriately.

Area 4 – The model reviewed was 090809. In this model the linear feature was between the classification MSG and MFG. In this instance, most of the MSG was changed to MFG.

- 3) *FGDC compliant XML metadata is required for each of the important shapefiles (section map, shoreline, field work, etc.). The NPS Metadata Tools and Editor is a tool that may be of assistance, although you are not required to use it. The tool makes it easier to meet NPS FGDC requirements using a template in ArcCatalog. It is available at <http://science.nature.nps.gov/nrdata/tools/>*

Correction: Avineon completed Metadata for each shapefile, as well as each DGN and coverage file. The NPS FGDC recommended template was utilized to complete the Metadata.

- 4) *Investigate shoreline for areas missed as described above and make corrections.*

Correction: See Area 4 corrections.

- 5) *Avineon gave digital copies of the aerial photography used in the project to SFCN for use in our accuracy assessment process. We are interested in including these in the final deliverable package to our National Park Service Vegetation Mapping Program office. We were given to understand that they were only georectified using a quick process rather than the more rigorous but time-intensive process typically used by Avineon. This is fine. We just want to give an accurate picture of the georectification process used to anyone who may wish to use them in the future and any cautions that should be given. Could you please give us a brief statement about the georectification process used and any cautions that should be included?*

Correction: See **Appendix E: Aerotriangulation Report and Orthorectification.**

Complete final deliverables and report as otherwise described in Avineon workplan (1.25.07 ver 4.)

Requested Corrections – Inconsistent changes to final map deliverable

The following table provides reasons and corrective actions taken for changes that were inconsistent with the IRC code or when a decision was made not to change a point. Changes described on the following table were made to models 050708, 080405, 080607, and 090708 (all in section 4).

	Point	Field Code (IRC)	Final Section 4 Annotation	Corrective Action Description
Incorrect points changed to code different from field code.	120	CSmGc	CSmGc	Original annotation - SSm. From the imagery, the height and density of the Myrica suggested a shrub classification.
	136	FM	FMXal	Used the species description from IRC field data to identify Avicennia and Languncularia and made the appropriate change to the area.
	50	WUs	WSsS	Understory appeared to be very wet and marshy. WSsS appeared to be the better call.
Acceptable points changed to	22	MFO	MFO	Original annotation – MSO. Labeled MSO because of Rizophora found in the area. Changed to MFO based on NPS feedback.

–	Point	Field Code (IRC)	Final Section 4 Annotation	Corrective Action Description
code different from field code.	184	WMcG	WMcG	Original annotation – WMc. It was difficult to see the understory from the imagery. Changed to WMcG based on NPS feedback.
	10	EsM	WMa,EsD	Original annotation – WMa. Shinus signature was not discernable on the imagery. Changed to WMc,EsD based on NPS feedback.
Correct points changed so no longer match field code.	132	FMI	FMXal	Used the species description from the nearby IRC field point 156. The signature from point 156 matched the signature from point 132.
	116	WMc	WMc	Original annotation – FMc. Appeared from the imagery that the canopy density was greater than 60% at 50% coverage. Cell appears to be on the edge – changed back to WMc.
Acceptable points not changed to field codes.	270	FMr	FMXlr	Used the field data from points 132 and 156. Languncularia signature is clearly visible in the imagery.
	154	FMr	FMr	Changed to FMr. No Shinus visible in the imagery.
	95	FMI	WM	The imagery shows a canopy density of less than 60%.
	202	FMX	FMXar	Used the species description from IRC field data. Avicennia and Rizophora signatures are discernable on the imagery.

Shoreline Information

The shoreline included in the final map delivery was digitized by Avineon using company produced software that utilizes Arc as the mapping environment. From this software, the data was exported into coverage, shapefile, DGN, and interchange files.

The digital orthographic imagery, described in Appendix E, was the sole image source utilized during the digitizing process. The minimal mapping unit of the 50 by 50 meter grid cell was maintained while digitizing the shoreline. In addition, if a shoreline feature was not large enough to fill the majority of a 50 by 50 meter grid cell, then the shoreline feature was not captured (i.e. small stand alone mangrove islands).

Any interior body of water or tidal creek that was not visibly connected to the larger open shoreline region was not included in the shoreline map. If a tidal creek entrance was at least 10 meters or greater, then the tidal creek was included in the shoreline map. Any tidal creek entrance that was less than 10 meters in most cases was not included in the shoreline map. The final decision to include or not include a shoreline feature was ultimately the discretion of the photo-interpreter.

7.0 Process Guidance and Changes

The following is a listing of guidance developed for the project aimed at improving classification and attribution.

1. Classification Decision Making – Vegetation Percent Cover. The percent cover definitions for classification only apply if the vegetation species are mixed throughout the cell rather than grouped in one portion of the cell.
2. Cabbage Palms are not to be used for main identification if other forest species are present. Cabbage Palms are not a strong indication of wetland versus upland condition.
3. The periphyton modifier is not to be used (delivery area 2 and beyond).
4. Classification of mixed cypress and hardwoods was clarified. In this delivery area, either a cypress area with 10%-49% hardwoods or a cypress area with 40-60% hardwoods will be accepted. In further delivery areas, only a cypress with 40%-60% hardwoods will be accepted.
5. New classification for Pop Ash forest was created (FSf). This classification is being utilized for all deliveries after delivery Area 1.
6. The Tree Island modifier will not be used within hardwood swamp shrubs.
7. The classification of Cabbage Palm Lowland (WSs) will be used starting with Delivery Area 2. This class will be determined predominantly by identifying a wetland graminoid understory.
8. Mixed graminoid prairies will be classified as MFGP.
9. Any abandoned agriculture fields that contain restored native vegetation communities will not retain the agriculture field classification (AG). In these instances the appropriate vegetation classification will be applied. Any abandoned agriculture fields that contain non-native species that tend to grow within disturbed areas will be classified as agriculture field (AG).

Classification Versions per Delivery Area

The table below describes each delivery area and its relevant classification scheme.

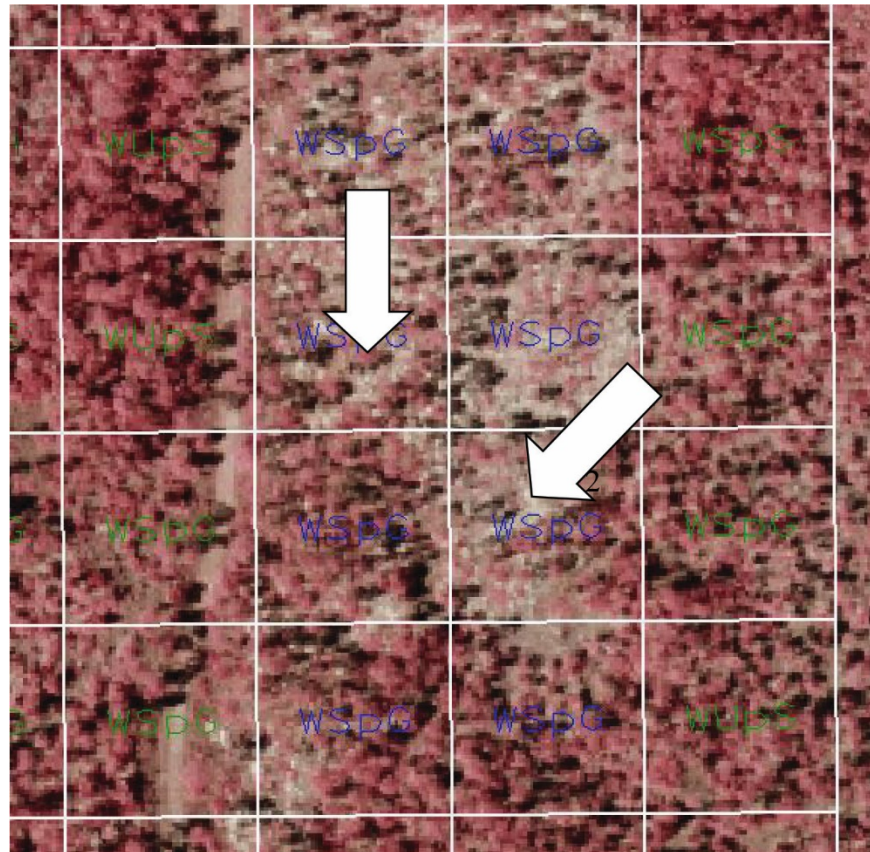
Delivery Area	Classification Version
Delivery Area 1	v9.7.06
Delivery Area 2	v5.22.07
Delivery Area 3	v5.22.07
Delivery Area 4	v5.22.07

Please note that Appendix B also contains guidance provided by NPS and SFWMD for the project.

Appendix A: Vegetation Mapping Examples

This appendix contains examples of how classification is determined during photointerpretation.

Delivery Area 1



EXAMPLE NUMBER: 1

CLASS ID: WSpG

CLASS NAME: Pine Lowland-Graminoid

CODE DESCRIPTION:

Specific described communities of low-density stands of trees (10 - 60% tree canopy cover) with heights greater than five meters in a matrix of shrubs, graminoids, and/or herbaceous vegetation.

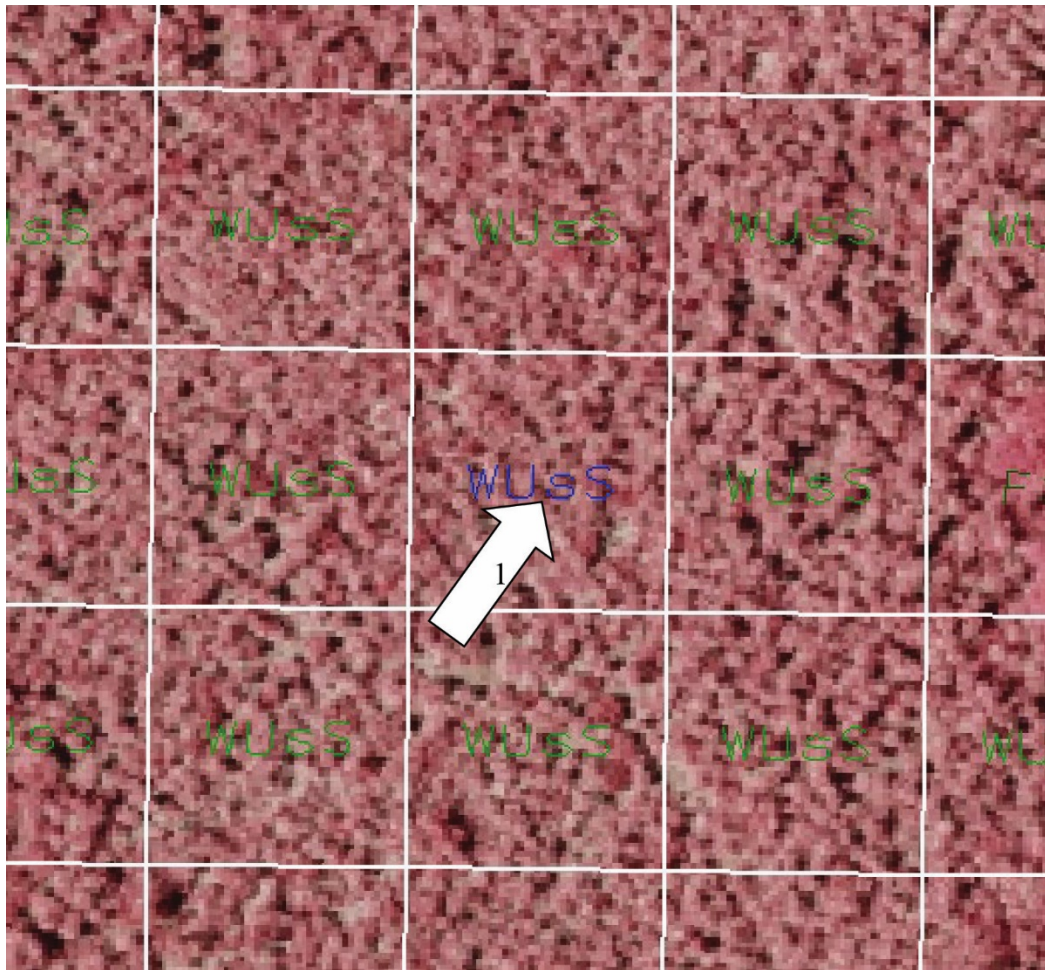
Slash Pine (*Pinus elliotti* var. *densa*) in a matrix composed predominately of graminoids, such as Sawgrass (*Cladium jamaicense*), Muhly Grass (*Muhlenbergia capillaris*), Panicgrass (*Panicum* spp.), Paspalum (*Paspalum* spp.), Little Bluestem (*Schizachyrium scoparium*), Flatsedge (*Cyperus* spp.), Spikerush (*Eleocharis* spp.), Fimbry (*Fimbristylis* spp.), Beaksedge (*Rhynchospora* spp.), Bulrush (*Scirpus* spp.), Nutrush (*Scleria* spp.), Yelloweyed Grass (*Xyris* spp.), Bluestem (*Andropogon* spp.), Threeawn (*Aristida* spp.), Witchgrass (*Dichanthelium* spp.), Lovegrass (*Eragrostis* spp.), Dropseed (*Sporobolus* spp.), and Hairsedge (*Bulbostylis* spp.).

COORDINATE: X=452594.7232 Y=2893053.2199 (Model – 020203)

COLLATERAL DATA: Soil map depicts non-hydric soils.

PHOTOINTERPRETATION: Arrow (1) shows the signature for Pine. Arrow (2) shows the signature for limestone outcrop.

COMMENT: Despite the soil map depicting non-hydric soils and the presence of limestone outcropping, the other understory component appears to be a mixture of wet graminoids (i.e. Muhly grass, Sawgrass). Thus the cell was given a classification of WSpG.



EXAMPLE NUMBER: 2

CLASS ID: WUss

CLASS NAME: Cabbage Palm Upland - Shrub

CODE DESCRIPTION:

Specific described communities of low-density stands of trees (10 - 60% tree canopy cover) with heights greater than five meters in a matrix of shrubs, graminoids, and/or herbaceous vegetation.

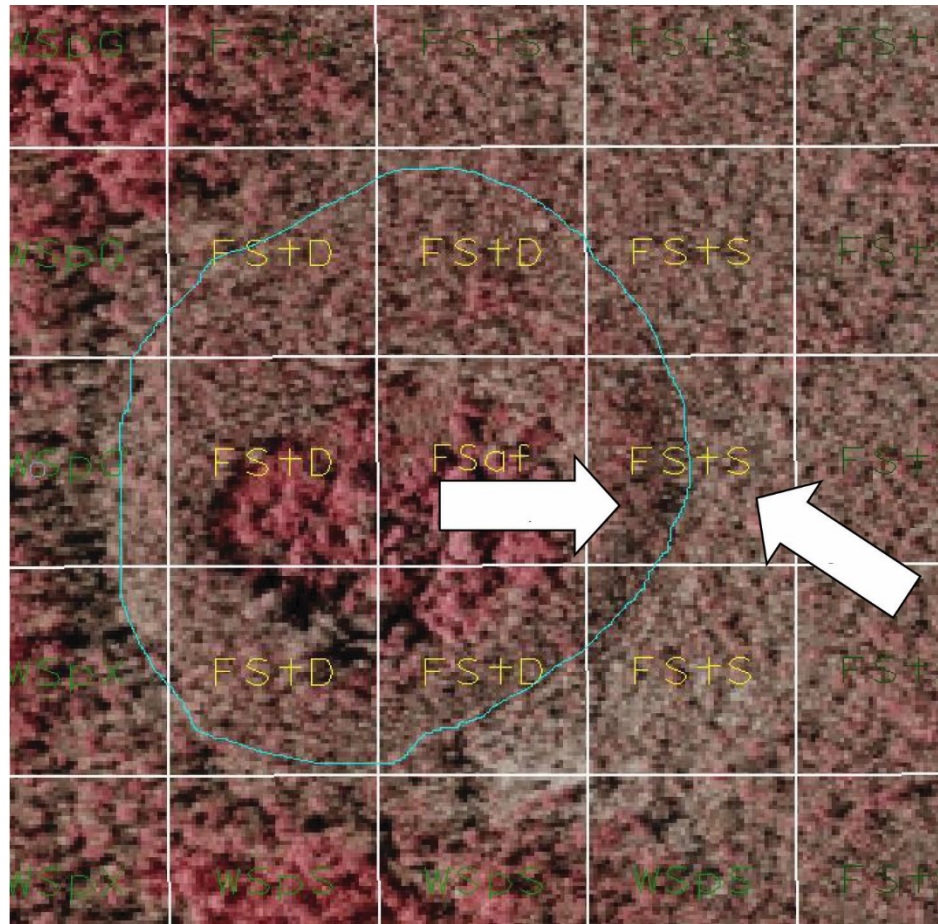
Cabbage Palm (*Sabal palmetto*) in a matrix composed predominately of upland shrubs, such as Saw Palmetto (*Serenoa repens*).

COORDINATE: X=451356.7600 Y=2893467.9000 (Model – 020304)

COLLATERAL DATA: Soil map depicts Arrow (1) cell as non-hydric.

PHOTOINTERPRETATION: Arrow (1) shows Cabbage Palm Upland with Shrub under-story.

COMMENT: Arrow (1) has been labeled WUss despite having canopy cover greater than 50%. The reason for this is because 40% – 50% of the Cabbage Palm cover is less than five meters in height, thus falling under the classification of shrub. The remainder of the 50% - 60% Cabbage Palm cover is greater than 5 meters, thus falling under the classification of woodland. Consider whether or not this line of reasoning correct, or should the canopy of Cabbage Palm in this case be considered greater than 50% coverage and classified as a Cabbage Palm Hammock (FHa)?



EXAMPLE NUMBER: 3

CLASS ID: FStS

CLASS NAME: Cypress-Forest - Strand

CODE DESCRIPTION: High-density stands of trees ($\geq 50\%$ tree canopy cover) with heights greater than five meters.

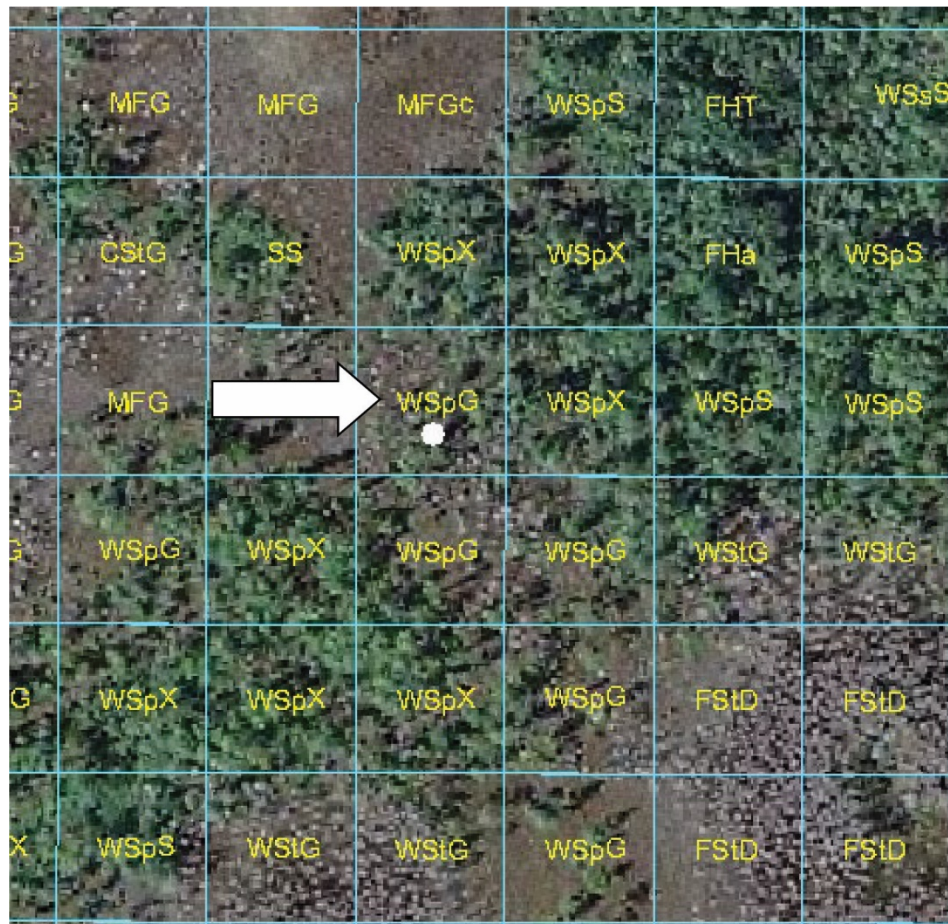
Pond Cypress (*Taxodium ascendens*) and/or Bald Cypress (*T. distichum*) dominant forest typically found in an elongated slough-like or open ended depression.

COORDINATE: X=451506.7493 Y=2896817.5880 (Model – 020405)

COLLATERAL DATA: N/A

PHOTOINTERPRETATION: Arrow (1) shows the portion of the cell that contains cypress dome (FStD), and Arrow (2) shows the portion of the cell that contains cypress strand (FStS). The blue line approximately divides the FStD and FStS signatures.

COMMENT: FStS has the greater percentage of coverage within the cell. Thus, despite the cell containing roughly 30% - 40% cypress dome, the cell was labeled FStS.



EXAMPLE NUMBER: 4

CLASS ID: WSpG

CLASS NAME: Pine Lowland-Graminoid

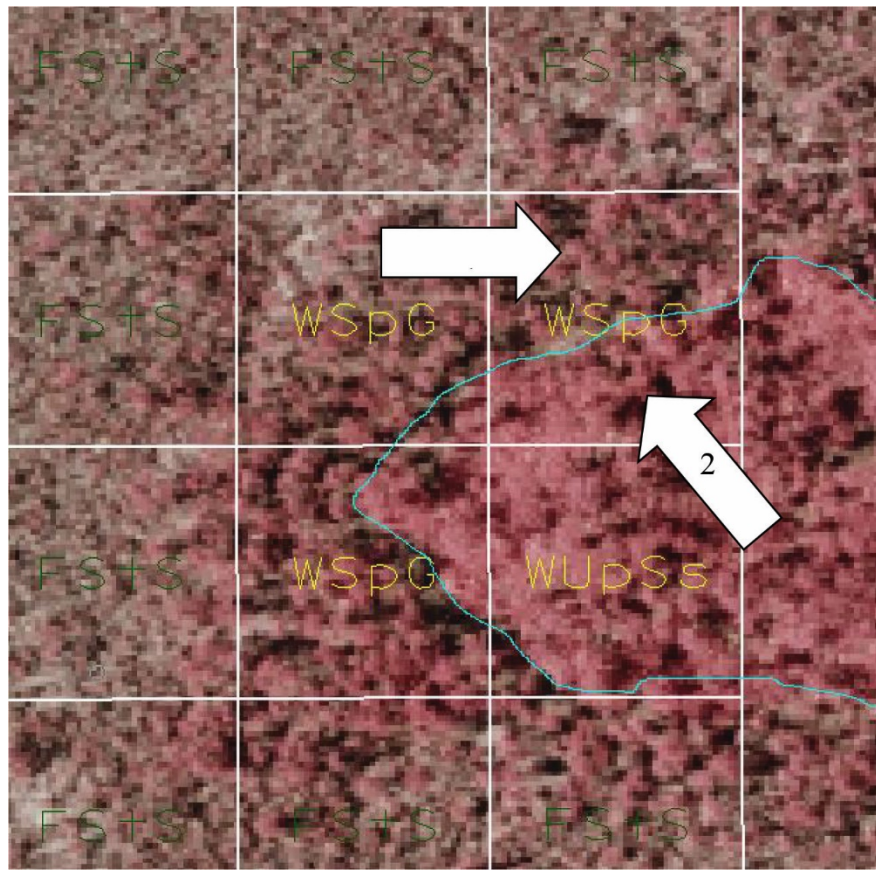
CODE DESCRIPTION:

Slash Pine (*Pinus elliotii* var. *densa*) in a matrix composed predominately of graminoids, such as Sawgrass (*Cladium jamaicense*), Muhly Grass (*Muhlenbergia capillaris*), Panicgrass (*Panicum* spp.), Paspalum (*Paspalum* spp.), Little Bluestem (*Schizachyrium scoparium*), Flatsedge (*Cyperus* spp.), Spikerush (*Eleocharis* spp.), Fimbry (*Fimbristylis* spp.), Beaksedge (*Rhynchospora* spp.), Bulrush (*Scirpus* spp.), Nutrush (*Scleria* spp.), Yelloweyed Grass (*Xyris* spp.), Bluestem (*Andropogon* spp.), Threeawn (*Aristida* spp.), Witchgrass (*Dichanthelium* spp.), Lovegrass (*Eragrostis* spp.), Dropseed (*Sporobolus* spp.), and Hairsedge (*Bulbostylis* spp.).

COORDINATE: X=472706.8349 Y=2889117.7834

PHOTOINTERPRETATION: The arrow indicates a cell that has both Cypress Forest and Pine Forest with a canopy cover within the 10%-60% criteria for Woodland.

COMMENT: Since there is more pine than cypress, it was classified as **WSpG Pine Lowland-Graminoid**



EXAMPLE NUMBER: 6

CLASS ID: WUpSs and WSpG

CLASS NAME: Pine Upland – Saw Palmetto

CODE DESCRIPTION:

Specific described communities of low-density stands of trees (10 - 60% tree canopy cover) with heights greater than five meters in a matrix of shrubs, graminoids, and/or herbaceous vegetation.

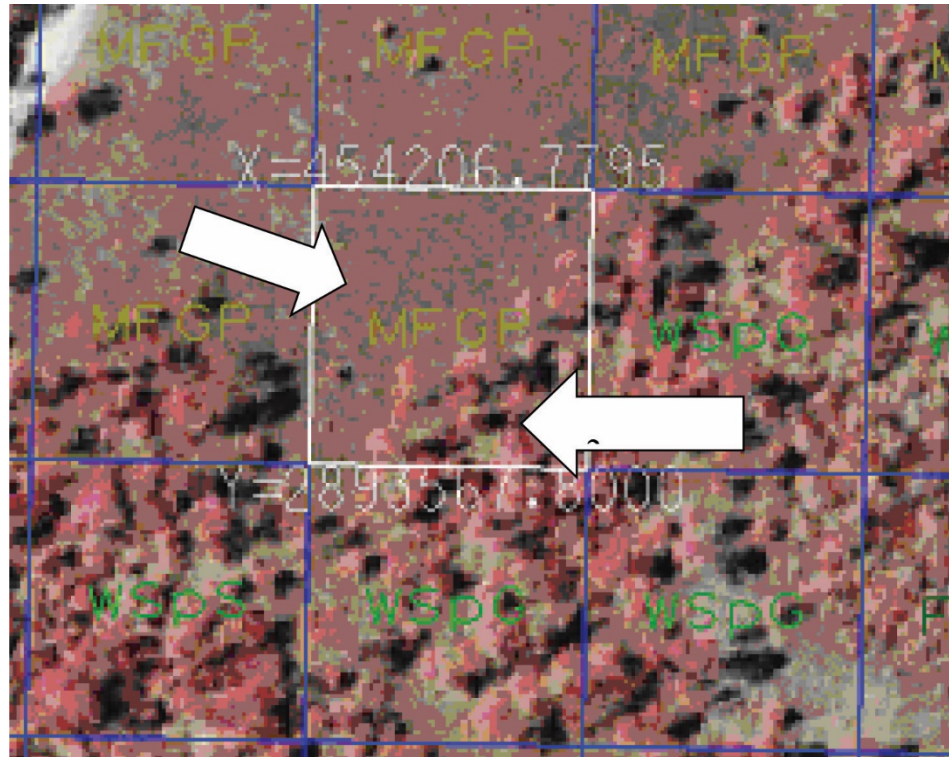
Slash Pine (*Pinus elliottii* var. *densa*) in a matrix composed predominately of Saw Palmetto (*Serenoa repens*).

COORDINATE: X=451206.7793 Y=2897067.9090 (**Model – 020405**)

COLLATERAL DATA: Soil map depicts non-hydric conditions.

PHOTOINTERPRETATION: Arrow (1) shows pine lowland with a graminoid under-story (WSpG), and Arrow (2) shows pine upland with a saw palmetto under-story.

COMMENT: The cell was labeled WSpG because pine lowland with a graminoid under-story dominated the majority of the cell (>50%). The blue line in the image depicts the approximate boundary between WSpG and WUpSs.



EXAMPLE NUMBER: 3

CLASS ID: MF GP

CLASS NAME: Graminoid Freshwater Prairie

CODE DESCRIPTION:

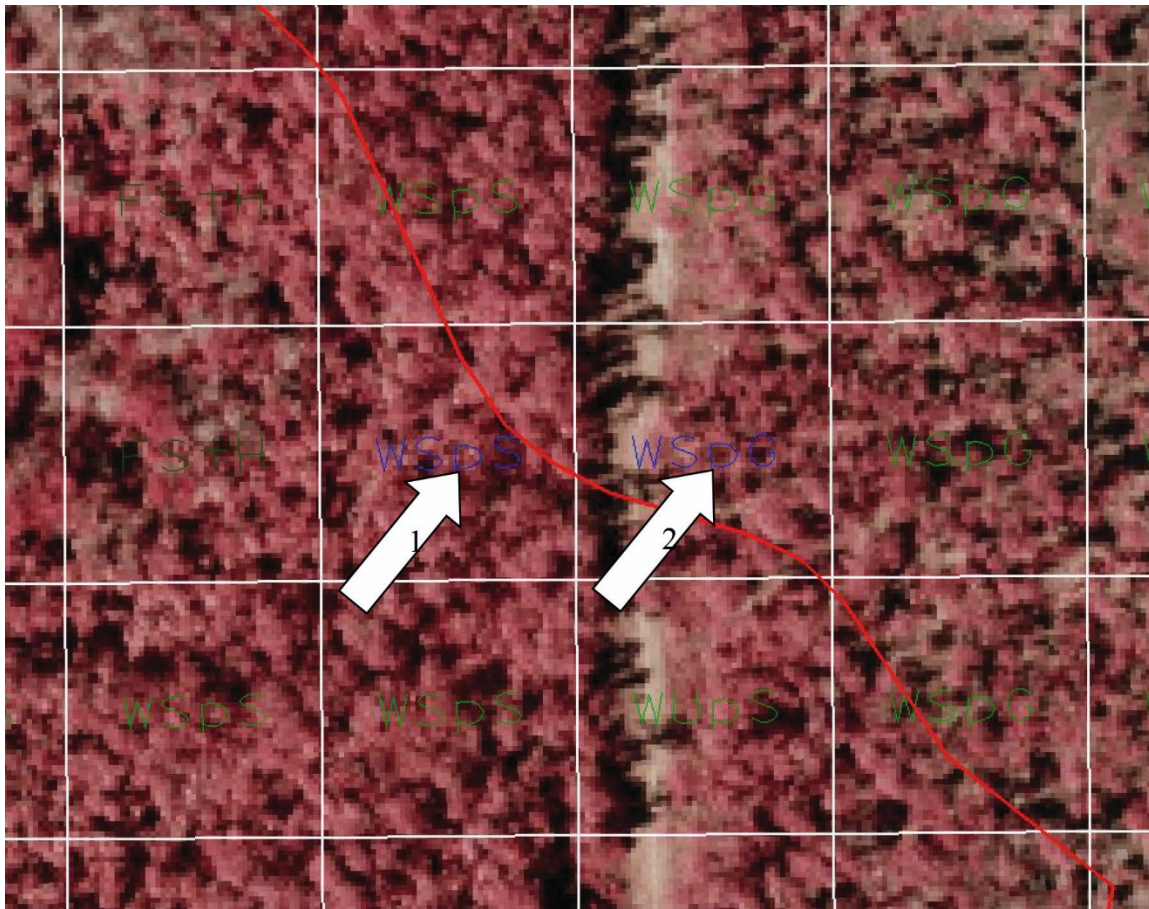
Short hydroperiod marsh characterized by a mix of graminoids that includes low-stature sawgrass (*Cladium jamaicense*), Muhly Grass (*Muhlenbergia capillaris* var. *filipes*), Little Bluestem (*Schizachyrium scoparium*), Gulf dune Paspalum (*Paspalum monostachyum*), Beakrush (*Rhynchospora* spp.), Black Sedge (*Schoenus nigricans*), among others.

COORDINATE: X=454206.7795 Y=2893567.8000 (Model 040304)

COLLATERAL DATA: Soil map shows this area as hydric soil.

PHOTOINTERPRETATION: Arrow (1) shows the signature for graminoid freshwater prairie. Arrow (2) shows the signature for slash pine with canopy cover sparse enough to meet the criteria for a Woodland class. (WSpG Pine Lowland-Graminoid)

COMMENT: Even though this cell was classified as MF GP, it could be classified as a woodland class. For a cell to be classified as woodland, only 10-60% of the tree canopy (over 5 meters in height) needs to occupy the cell.



EXAMPLE NUMBER: 4

CLASS ID: WSpS

CLASS NAME: Pine Lowland-Shrub

CODE DESCRIPTION:

Specific described communities of low-density stands of trees (10 - 60% tree canopy cover) with heights greater than five meters in a matrix of shrubs, graminoids, and/or herbaceous vegetation.

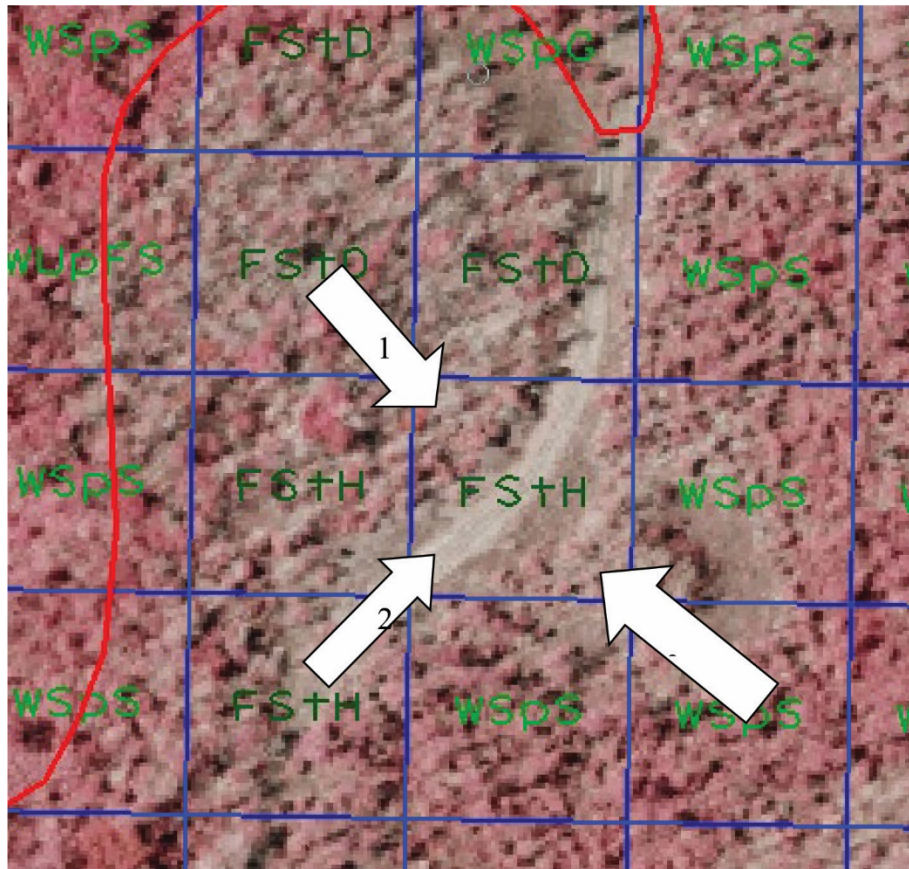
Slash Pine (*Pinus elliottii* var. *densa*) in a matrix composed predominately of shrubs and small trees, such as Wax Myrtle (*Myrica cerifera*), Cabbage Palm (*Sabal palmetto*), Dahoon Holly (*Ilex cassine*), Red Bay (*Persea palustris*), Buttonbush (*Cephalanthus occidentalis*), and other hardwood swamp species.

COORDINATE: X=453156.7734 Y=2892917.8900 (Model – 020203)

COLLATERAL DATA: Soil map (red line) depicts Arrow (1) cell as non-hydric and Arrow (2) as hydric.

PHOTOINTERPRETATION: Arrow (1) shows the signature WSpS, while Arrow (2) shows the signature for WSpG.

COMMENT: Arrow (1) has been labeled WSpS because the understory, made up of predominately Cabbage Palm, matches the description of WSpS in the Classification System. Thus, if Arrow (1) should have a label of WUpS instead of WSpS, then this would be very difficult to determine from the available imagery.



EXAMPLE NUMBER: 8

CLASS ID: FStH

CLASS NAME: Cypress-Hardwood Forest

CODE DESCRIPTION:

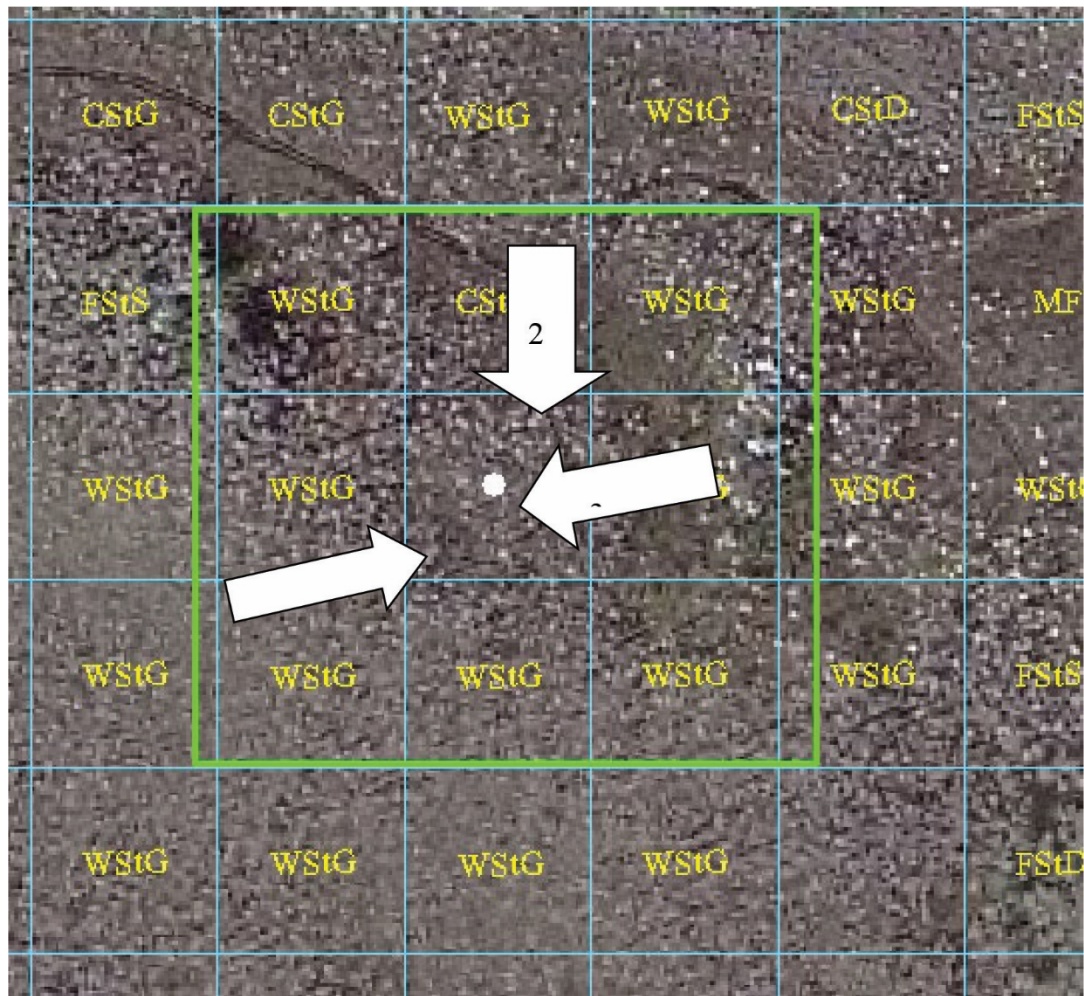
Co-dominant mix (60/40% or 40/60% split) of Cypress (*Taxodium* spp.) with lowland hardwood trees such as Red Maple (*Acer rubrum*) and Laurel Oak (*Quercus laurifolia*). Common understory vegetation often consists of Pond Apple (*Annona glabra*), Wax Myrtle (*Myrica cerifera*), Pop Ash (*Fraxinus caroliniana*), Cocoplum (*Chrysobalanus icaco*), and Leather Fern (*Acrostichum danaeifolium*).

COORDINATE: X=454572.0427 Y=2894489.4531 (Model 040304)

COLLATERAL DATA: Soil map shows this as hydric soil.

PHOTOINTERPRETATION: Arrow (1) shows the signature for cypress with a mix of hardwoods. Arrow 2 shows an ORV trail. Arrow 3 shows another area of cypress and hardwoods.

COMMENT: While there are several signatures in this cell and the cypress/hardwood signature is broken up, it still comprises the largest signature in the cell and comes closest to being 50% or more of the cell. One call on the accuracy assessment results seemed to indicate this as a problem between PI and AA FIELD classification.



EXAMPLE NUMBER: 9

CLASS ID: WSt

CLASS NAME: Cypress Woodland

CODE DESCRIPTION: Bald Cypress (*Taxodium distichum*) and/or Pond Cypress (*T. ascendens*) in a matrix composed of Open Marsh, graminoids, herbs, and/or shrubs.

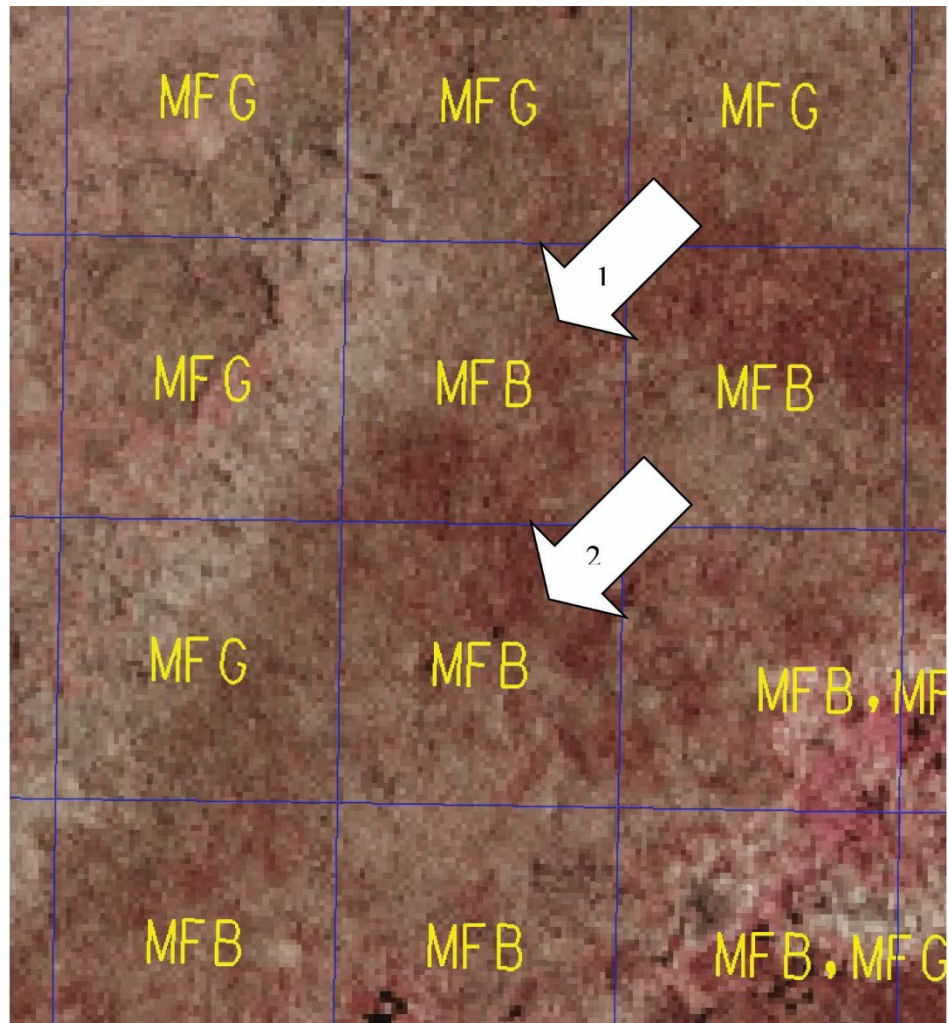
COORDINATE: X=473608.4487 Y=2889566.1885 (Model 092122)

COLLATERAL DATA: N/A

PHOTOINTERPRETATION: Arrow (1) shows an area of the cell that has Cypress Woodland (also some at the lower left corner of the cell). Arrow (2) shows another area of Cypress Woodland at the top of the cell. There are a few cypress trees in the middle area of the cell as well. Arrow (3) shows the middle of the cell which contains **cypress scrub** (>10% of the cell). (The forested cypress is approximately 7 meters high and the cypress scrub is approximately 3 meters high.)

COMMENT: This cell contains cypress of both tree height and scrub height. Also, the densities of both heights of cypress fall within either a cypress woodland class or a cypress scrub class. We would classify as Woodland because cypress greater than 5 meters occupies 10-60% and is the highest life form.

Delivery Area 2



EXAMPLE NUMBER: 1

CLASS ID: MFB

CLASS NAME: Broadleaf Emergent Marsh

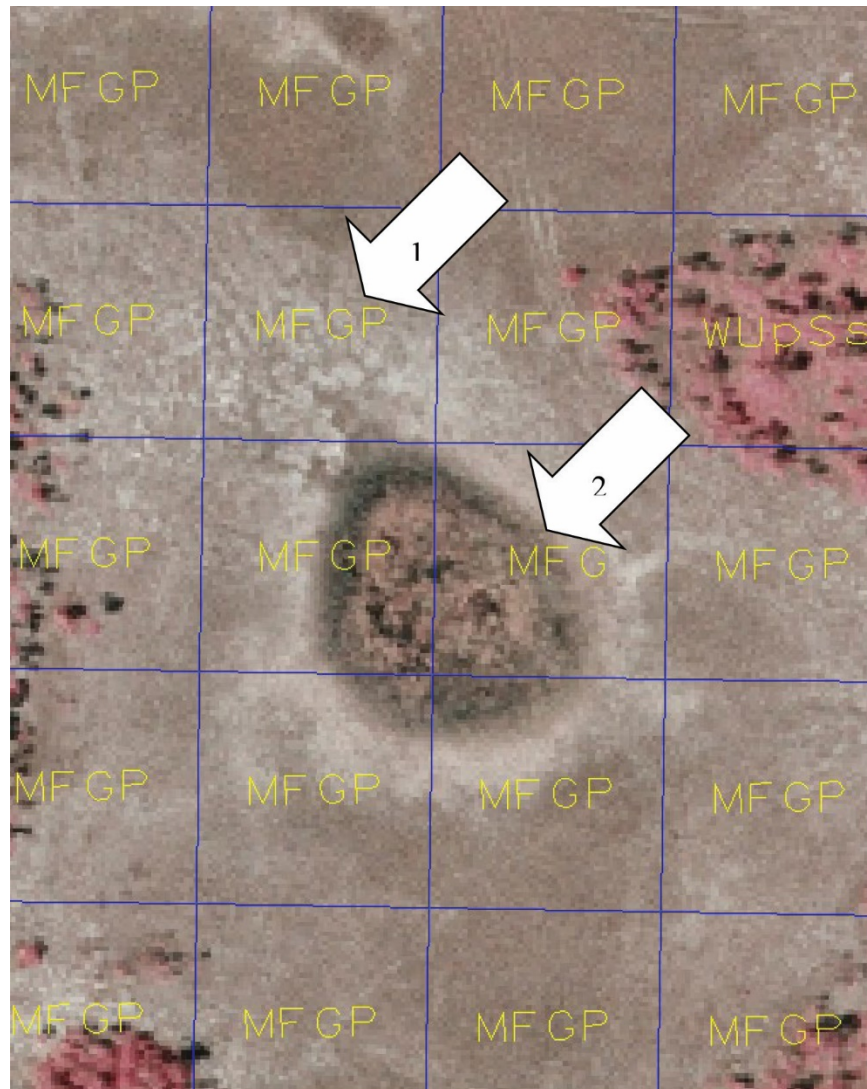
CODE DESCRIPTION: Broadleaf emergent dominated freshwater marsh.

COORDINATE: X=476906.8850 Y=2901067.8035 (Model 102425)

COLLATERAL DATA: N/A

PHOTOINTERPRETATION: Arrow (1) and Arrow (2) both point to Broadleaf Marsh signatures. Given certain aspects regarding the CIR imagery as well as their physiological similarities, Pontederia and Sagittaria have signatures that are difficult if not impossible to distinguish.

COMMENT: Avineon has tried to eliminate this problem by classifying up one level from the species level. Thus, any broadleaf marsh communities containing either Pontederia or Sagittaria have been labeled MFB. Avineon is awaiting official word on this issue from NPS.



EXAMPLE NUMBER: 2

CLASS ID: MFGP

CLASS NAME: Freshwater Graminoid Prairie

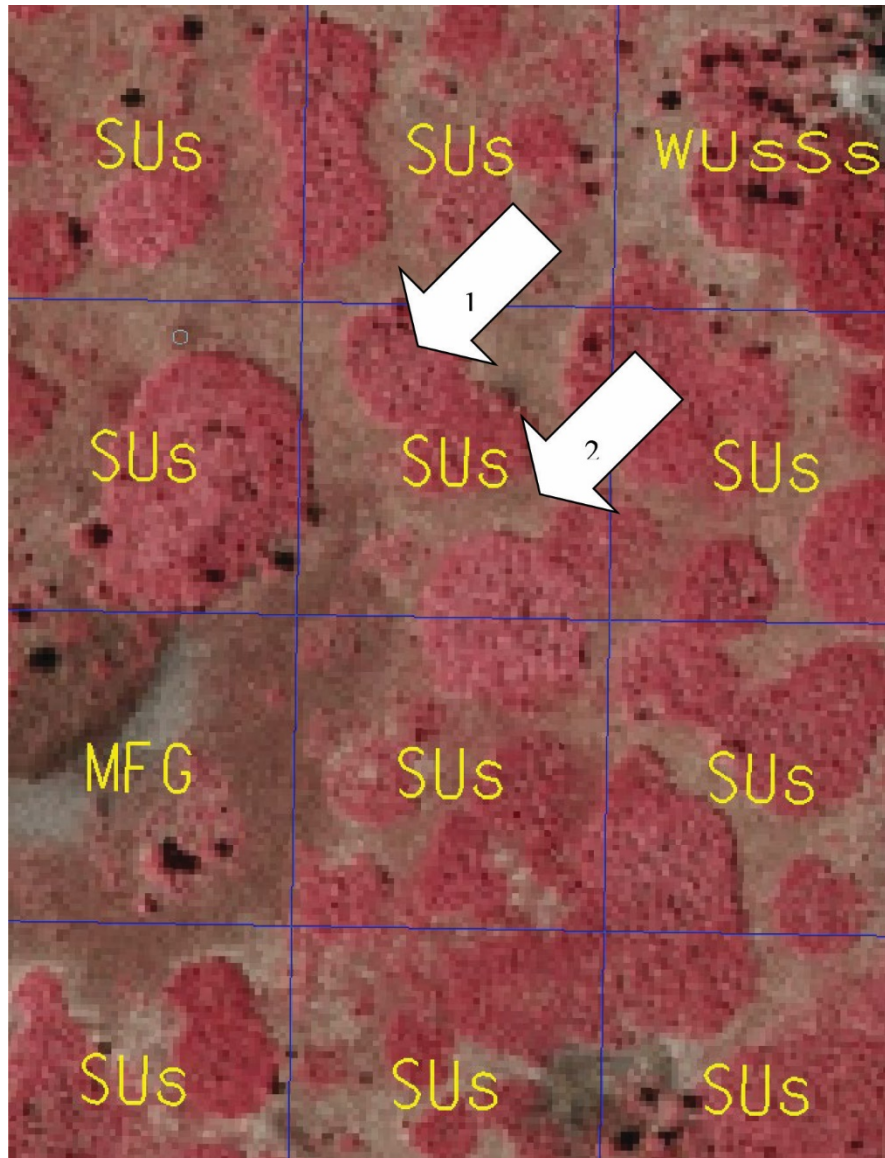
CODE DESCRIPTION: Short hydroperiod marsh characterized by a mix of graminoids that includes low-stature sawgrass (*Cladium jamaicense*), Muhly Grass (*Muhlenbergia capillaris* var. *filipes*), Little Bluestem (*Schizachyrium scoparium*), Gulf dune Paspalum (*Paspalum monostachyum*), Beakrush (*Rhynchospora* spp.), Black Sedge (*Schoenus nigricans*), among others.

COORDINATE: X=479356.5905 Y=2883869 (Model 101617)

COLLATERAL DATA: N/A

PHOTOINTERPRETATION: Arrow (1) points to a Freshwater Graminoid Prairie and Arrow (2) points to a Freshwater Marsh. Since Arrow (1) is relatively 'drier' than Arrow (2) and appears to have a shorter hydro period, Avineon labeled the cell MFGP.

COMMENT: Due to the lack of standing water in the photography and lack of high stature sawgrass and/or 'wet' graminoid mixture, the cell was labeled Prairie (MFGP). Again, this call is very subjective and could present a problem if a recent rain even occurred before the photo was taken. If the accuracy assessment team sees standing water in the cell depicted by Arrow (1), then the call may not be in Avineon's favor.



EXAMPLE NUMBER: 3

CLASS ID: [SUs](#)

CLASS NAME: [Saw Palmetto \(*Serenoa repens*\) shrubland.](#)

CODE DESCRIPTION: Saw Palmetto (*Serenoa repens*) dominant shrubland.

COORDINATE: X=479806.9162 Y=2901167.8166 (**Model 102425**)

COLLATERAL DATA: N/A

PHOTOINTERPRETATION: Arrow (1) points to a saw palmetto signature and Arrow (2) points to Freshwater Graminoid Prairie (MFGP). Since most of the cells in the image above are mixed and contain 50% or more of saw palmetto they were labeled SUs.

COMMENT: If the cells were not mixed, then the dominant signature would determine the cell attribution. Furthermore, if the cell was mixed but saw palmetto made up only 10%-49% of the overall coverage, then the cell would have been labeled as upland scrub in a mixture of graminoids (CUG).

Delivery Area 3

Images and Clarification of Delivery Area 3 Sample Data

Model Number	FID	Classification	NPS Comment	Avineon Comment
d111314	838	ORV	does this dominate cell?	Cell dominated by ORV.
d091415	368	MFGP	is this cell dominated by prairie?	Changes made to map based on NPS suggestion.
d091415	2823	MFGP	is this cell dominated by prairie?	Changes made to map based on NPS suggestion.
d091415	2647	MFGP	is this cell dominated by prairie?	Changes made to map based on NPS suggestion.
d091415	2429	ORV	–	Cell dominated by MFGP. Avineon classified correctly as MFGP.
d091415	2518	MFGP	If 2429 and 2607 are ORV why is 2518 MFGP?	ORV not present. Cell dominated by WSpG. Avineon classified correctly as WSpG.
d091415	2607	ORV	–	Cell dominated by MFGP not ORV. Avineon classified correctly as MFGP.
d090809	733	MFG	This is towards the south end of the turner river canal restoration sites. I noticed that in alot of the old canal which may have had its banks pushed back to ground level you used MFG. We should ask Jim Burch if he thinks this is correct. I would think this area someone could easily visit.	See email sent to Jim Burch which states that .

Model Number	FID	Classification	NPS Comment	Avineon Comment
d090809	39	MFG	This is towards the north end of the turner river canal restoration sites. I noticed that in alot of the old canal which may have had its banks pushed back to ground level you used MFG. We should ask Jim Burch if he thinks this is correct. I would think this area someone could easily visit.	See email sent to Jim Burch.
d090809	373	FMr	This is pretty far north in turner river to have red mangroves as a forest?	See email sent to Jim Burch.
d090809	22	FMr	This is pretty far north in turner river to have red mangroves as a forest?	See email sent to Jim Burch.
d090809	548	FMr	This is pretty far north in turner river to have red mangroves as a forest?	See email sent to Jim Burch.
d090809	636	FMr	This is pretty far north in turner river to have red mangroves as a forest?	See email sent to Jim Burch.
d090809	723	FMr	This is pretty far north in turner river to have red mangroves as a forest?	See email sent to Jim Burch.
d090809	1774	SMX	mangrove Shrubland?	See email sent to Jim Burch.
d090809	1862	SMX	mangrove Shrubland?	See email sent to Jim Burch.
d090809	1950	SMX	mangrove Shrubland?	See email sent to Jim Burch.
d090809	773	WSpG	Lowland pines dominate?	Cell dominated by WSpG. Cypress Dome is not the dominate signature.

Model: 111314

FID: 383

Avineon Classification: ORV

Clarification:

The cell depicted in the image below has been classified by Avineon as an ORV trail. NPS questions whether this cell is dominated by ORV or some other vegetation community. Using stereo-imaging to further review the cell, it appears as though the cell is dominated by an ORV trail. The ORV trails are outlined in red and clearly are the dominate signature inside the cell in question.



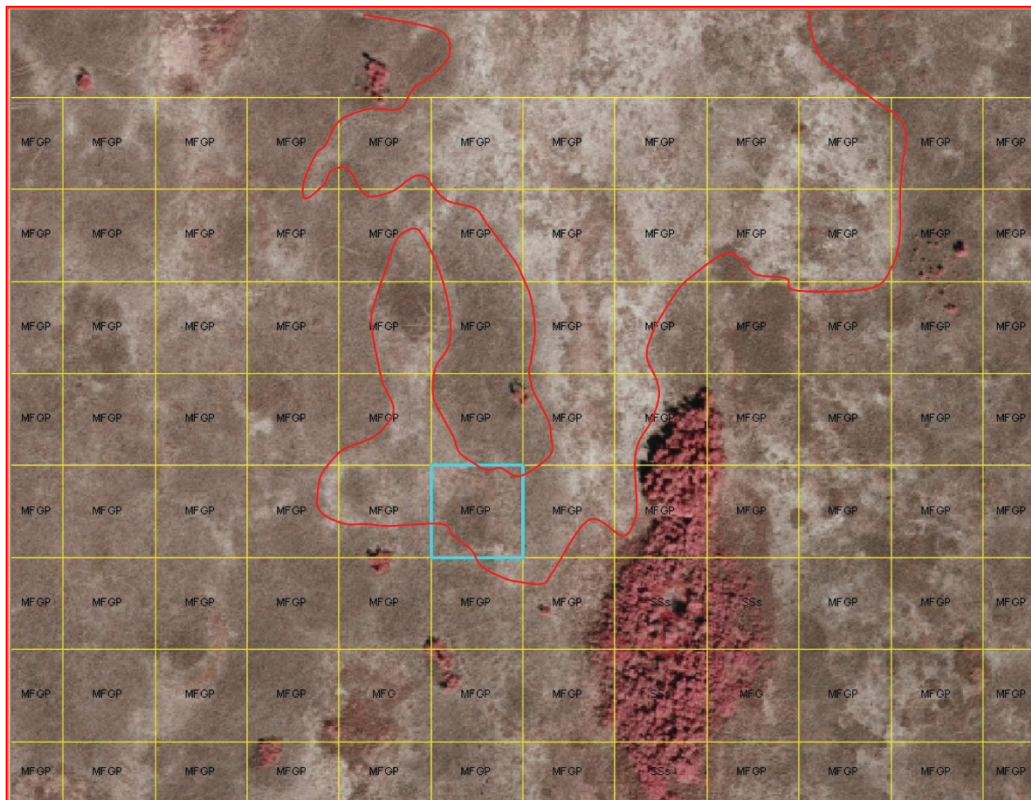
Model: 091415

FID: 368, 2823, and 2647

Avineon Classification: MFGP

Clarification:

The cell depicted (blue outline) in the image below has been classified by Avineon freshwater graminoid prairie (MFGP). NPS questions whether this cell is dominated by MFGP or freshwater marsh (MFG). Using stereo-imaging to further review the cell, it appears as though the cell is dominated by MFG. Avineon will make appropriate changes to the cell and to any cell with a related signature.



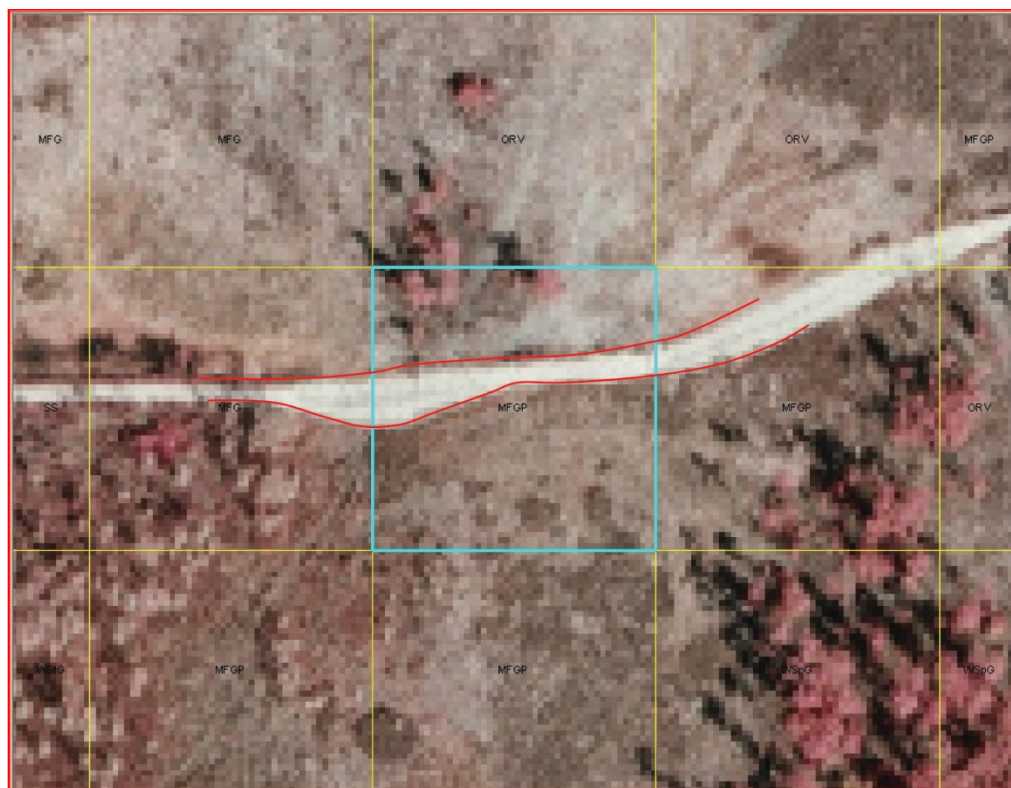
Model: 091415

FID: 2429

Avineon Classification: MFGP

Clarification:

The cell depicted in the image below has been classified by Avineon as freshwater graminoid prairie (MFGP). NPS questions whether this cell is dominated by MFGP or ORV trail. The ORV trail is outlined in red and is not the dominate signature within the cell.



Model: 091415

FID: 2518

Avineon Classification: WSpG

Clarification:

The cell depicted in the image below has been classified by Avineon as lowland pine woodland with a graminoid understory (WSpG). NPS questions why the cell was labeled as prairie (MFGP) and not ORV trail. The cell is dominated by WSpG, and ORV trail is not present within the cell.



Model: 091415

FID: 2607

Avineon Classification: MFGP

Clarification:

The cell depicted in the image below has been classified by Avineon as freshwater graminoid prairie (MFGP). NPS questions whether this cell is dominated by MFGP or ORV trail. Using stereo-imaging to further review the cell, it appears as though the cell is dominated by MFGP and no ORV trail is present within the cell.



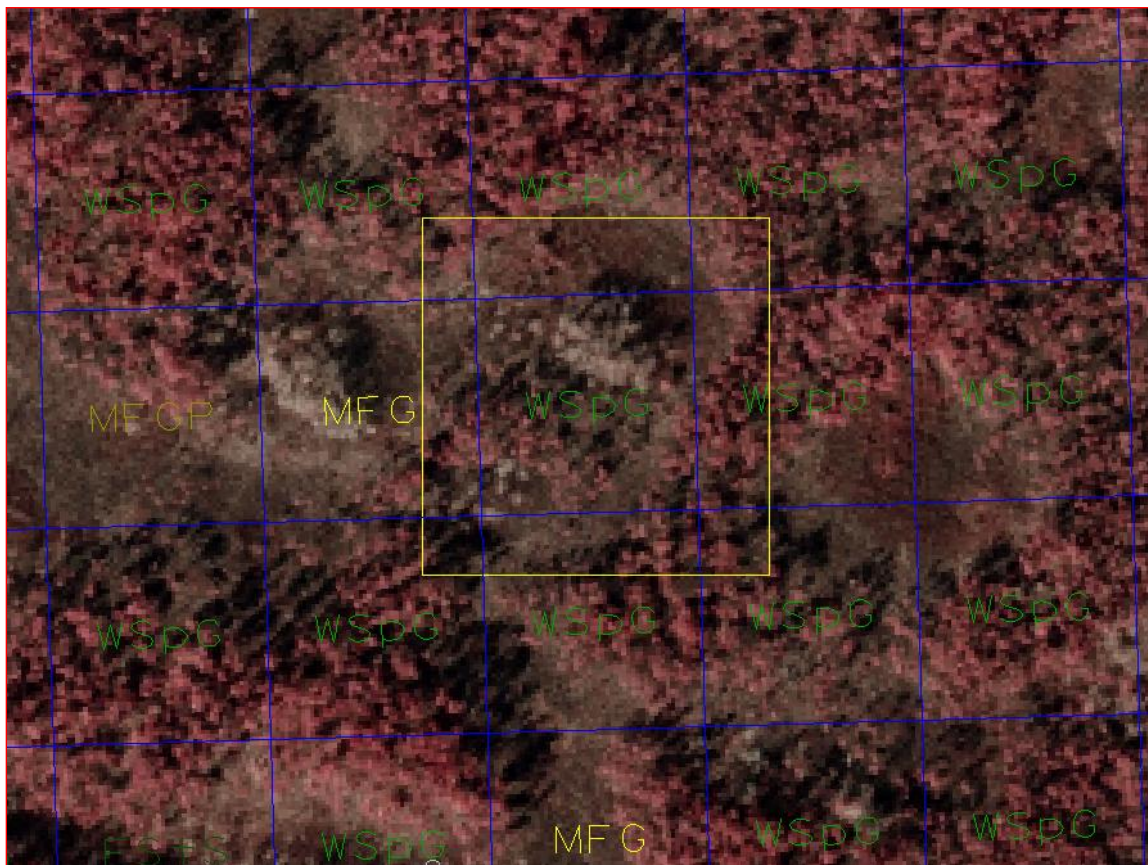
Model: 090809

FID: 773

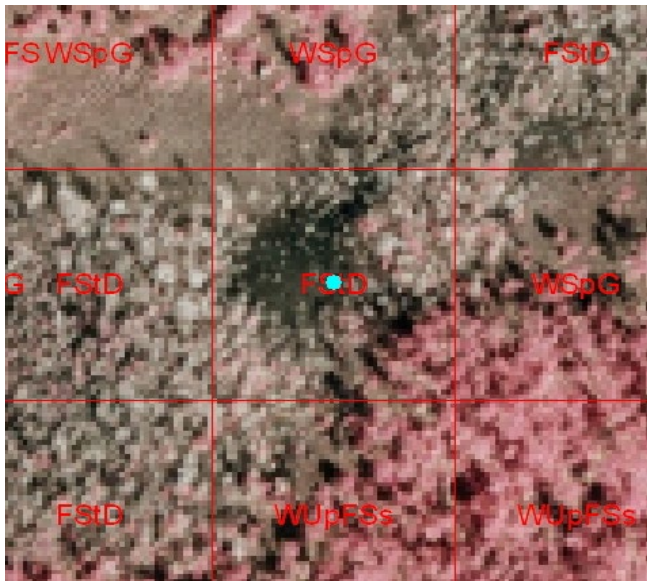
Avineon Classification: WSpG

Clarification:

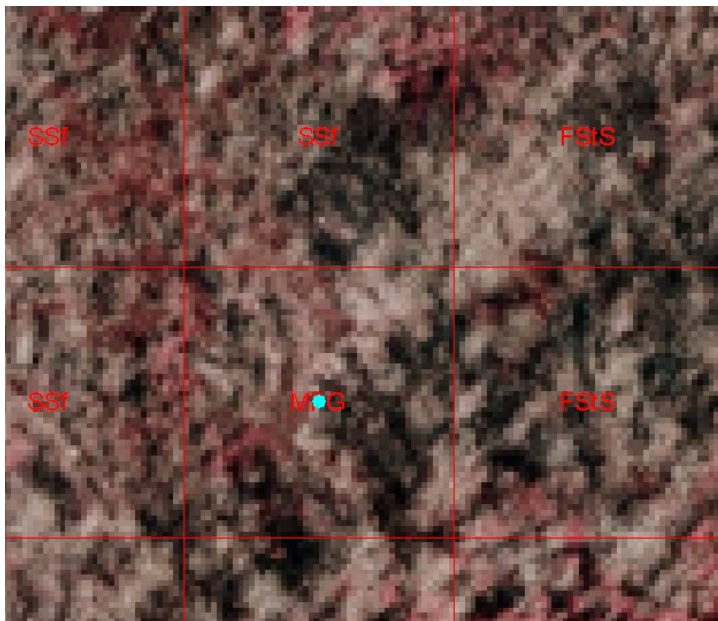
The cell depicted in the image below has been classified by Avineon as lowland pine woodland with a graminoid understory (WSpG). Using stereo-imaging to further review the cell, it appears as though the cell is dominated by WSpG. The Cypress dome in cell is not the dominate signature.



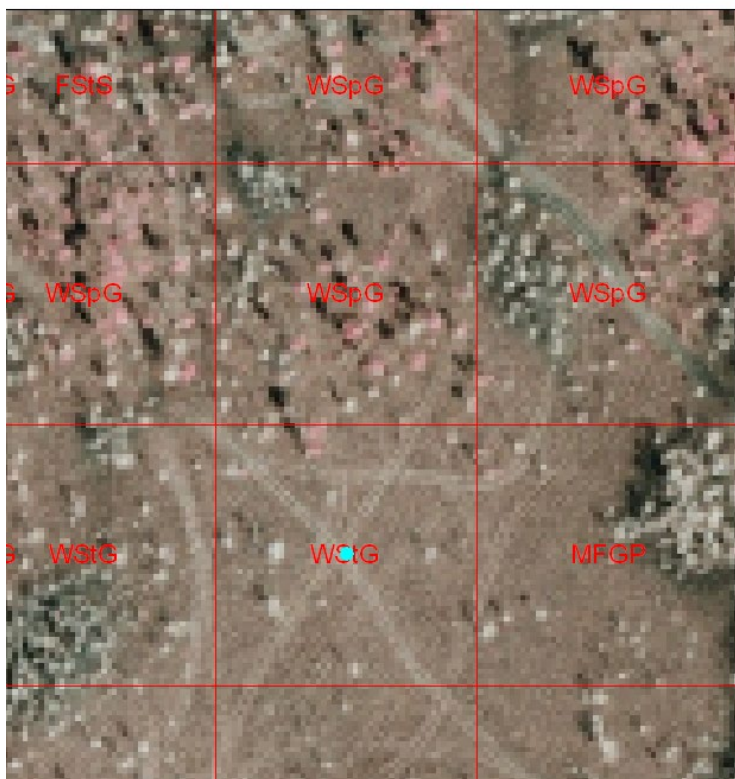
Examples of Accuracy Assessment errors for Area 3 (first delivery). Supplied by NPS on 12/19/07.



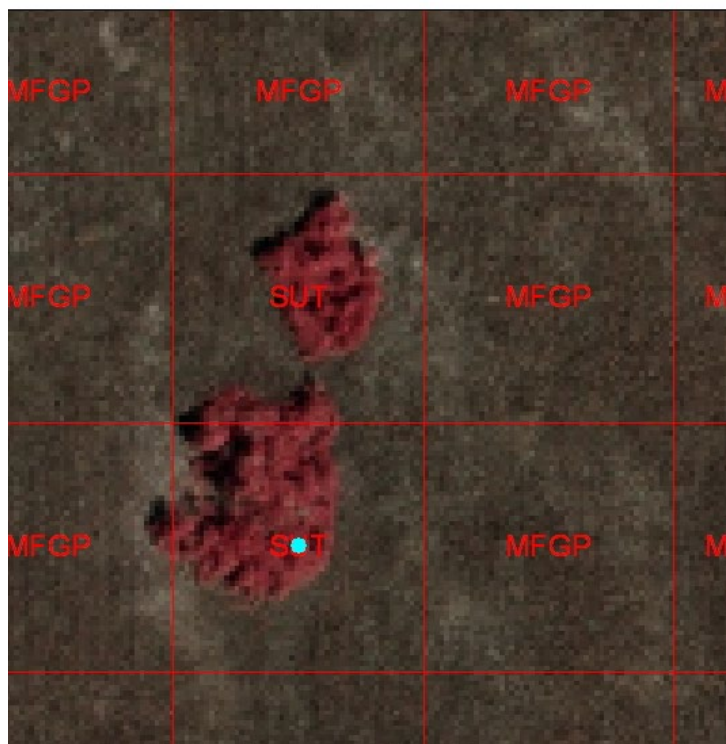
Here FSTD versus WST. WST is better than cypress dome. If you clump the parts of the other cypress domes together it still does not appear to be a cell dominated by Cypress dome.



Here the field classification found SSf not MFG as the dominant. I have a hard time finding any MFG in the photograph but I am assuming that in stereo you can.



MFGP was the classification from the field. Cypress does not make up 10% of the cell. If you look at the cell to the right it is classified as MFGP and excluding the clump of cypress looks to have about the same amount of canopy from the cypress.



The cell is not dominated by SUT. The SUT looks to make up about 25 % of the cell if you assume the dot is in the center of the cell. About 75% of the cell looks to be MFGP.



The cell is not dominated by *Avicennia* and red mangrove probably a lot of *Conocarpus* in this area.

Delivery Area 4

Model: 100506

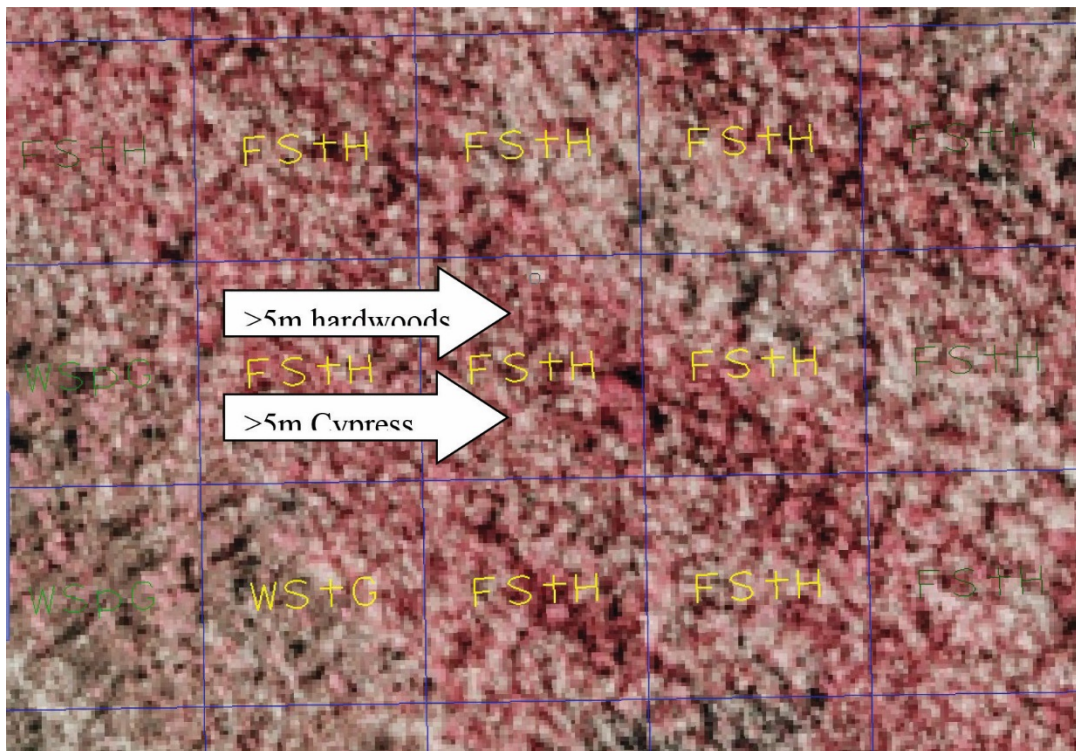
Photo ID: 1006

Avineon Classification: FStH

IRC Classification: FStS

Clarification:

Image depicts a common vegetation community found throughout the northeast area of Section 4. There are large strands of cypress forest with heights often exceeding 10 meters. In many instances the hardwood layer, despite sometimes being half the height of the cypress trees, is almost always greater than 5 meters in height. Thus, the cell would be labeled FStH (Cypress-Hardwood Forest) not FStS (Cypress Strand).

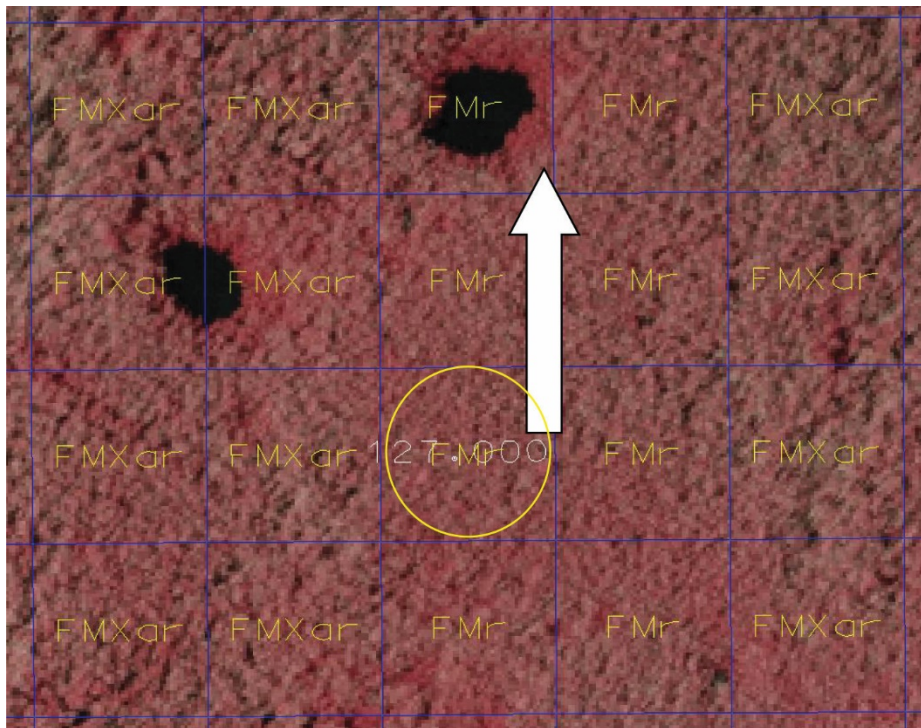


Area 4 Revision - Document of Examples:

Pt 126: After reviewing field photo, point classification was modified to FMXlr. No black mangroves in field image. Mix of white and red mangroves. Signature derived from this point was pertinent in the majority of changes made in the model. The signatures in pt 126 and pt 75 were key in the modifications made to western half of model 071011.

Pt 77 and 78: Signatures from these two points were concurrent with the signatures from pts 126 and 75. Both of these points were classified as FMXlr and helped in verifying the changes that were made to field pts 126 and 75.

Pt 127: Compared the field photos from this pt to the field photos from Pt 126. The majority of the species found within both of the photo sets were red mangrove and white mangrove. Black mangrove is either absent from the image or makes up less than 10% of the particular field pt/cell. Thus, the majority of the classification within the vicinity of these field pts should be FMr, FMI, or FMXlr.



Field Pt 127 – Photo is over the point (circle) looking toward the pond to the west (arrow).

Pt 33: After reviewing the field photos (below), it was determined that less than 10% black mangrove exist within and around the field pt cell. The cell is dominated by a mix of white and red mangrove species. Field point cell was changed from FMXar to FMXlr.



Field Pt 33 field photo

Pt 39: Based on field observation, cell was classified as FMXlr. Cell is labeled as FMXar. Cell should be classified as FMXlr.

Pt 40, 41: These field points were noted as being dominated by black mangrove. The signature and field photo (below) were used to improve the overall mapping accuracy for this model as well as for models throughout Area 4.



Field Pt 41 field photo

Pt 42: Field data indicates the majority of this cell is FMXlr. Some black mangrove mix is on the edge of cell. Cell was changed from the incorrect classification FMXar to FMXlr.

Pt 49: Field pt classifies cell as FMXal. Cell was labeled FMXar. This cell and cells within the surrounding vicinity and within surrounding models have been changed to FMXal.

Pt 50: Field pt classified the cell as FMXlr. Cell was labeled FMXar. After reviewing field photos (below) and cell signature, cell classification was changed from FMXar to FMXlr.



Field Pt 50 field photo

Pt 9 – Field pt classified as FMXlr. Cell was labeled FMXar. After reviewing field photos and cell signature, cell classification was changed from FMXar to FMXlr.

Pt 92 – Field pt classified as FMXlr. Cell was labeled FMXar. After reviewing field photos and cell signature, cell classification was changed from FMXar to FMXlr.

Appendix B: NPS Guidance

Email Correspondence with Jim Burch regarding mangroves and reclaimed canal north of Turner River Rd:

-----Original Message-----

From: Daniel Bubser

Sent: Friday, October 26, 2007 8:44 AM

To: 'jim_burch@nps.gov'

Cc: 'Kevin_R_Whelan@nps.gov'; Keith Patterson; Jonathan Ruebeling

Subject: Turner River Questions

Hey Jim,

I was wondering if you could help us out and lend us your expertise on what you believe these two areas in the attached image represent-

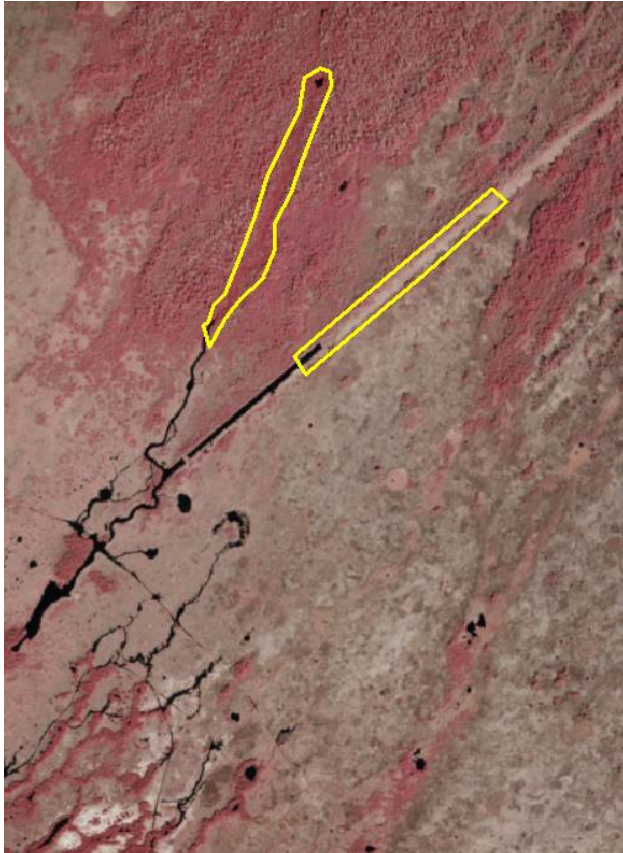
The top line circles part of the Turner River. We currently have portions of this labeled as Red Mangrove. There is a strong Red Mangrove signature present along the banks of the river here. To your knowledge, do Red Mangroves grow this far north? Have you been to this location and know exactly what specie of mangrove these are?

The second line circles the end of a canal that appears to have been filled in. We currently have this listed as MFG (Marsh Graminoids) as we can see some wet graminoids present. Do you feel this would be better suited as MFGP (Marsh Graminoid Prairie)? Or perhaps an entirely different call?

Please let me know what your thoughts are or of any problems viewing the attached.

Thanks for your time,

Dan



Dan Bubser
Project Coordinator
Avineon, Inc.
15500 Lightwave Drive Suite 200
Clearwater, FL 33760
☎ 727-539-1661 ext. 388
☎ Fax: 727-539-6954
✉ dbubser@avineon.com

-----Original Message-----

From: Jim_Burch@nps.gov [mailto:Jim_Burch@nps.gov]
Sent: Monday, October 29, 2007 7:11 PM
To: Daniel Bubser
Cc: Jonathan Ruebeling; Kevin_R_Whelan@nps.gov; Keith Patterson
Subject: Re: Turner River Questions

Dan, Keith

The area adjacent to Turner River is mangrove- mostly red mangrove *Rhizophora mangle*. There are probably some buttonwoods scattered in the margins, but primarily its dense red mangrove. It's a nice canoe trail. I have an idea that mangroves migrated upstream when drainage occurred years ago- they are kind of unusual that far inland.

The other straight-linear-type feature is filled canal with ruderals. I have not walked around this area to survey it, but the substrate is mineral soil, so that marsh may not fit as well as prairie. How about calling it disturbed?

Delivery Area 4 Technical Report, 9/12/2008

I regret I had to be away when your field time was planned- I hope you had success. Please inform me if you require further information.

James N. Burch, PhD.
Big Cypress National Preserve
33100 Tamiami Trail East
Ochopee, FL 34141
P:239-695-1111, F:239-695-3901
jim_burch@nps.gov

Periphyton modifier

-----Original Message-----

From: Kevin_R_Whelan@nps.gov [mailto:Kevin_R_Whelan@nps.gov]
Sent: Tuesday, November 21, 2006 2:39 PM
To: Keith Patterson
Cc: Aristos Georgiou; Daniel Bubser; Jonathan Ruebeling; Matt Patterson
Subject: Re: Use of Periphyton Modifier

Keith,

Yes, it is ok to not use the periphyton modifier. We have confirmed with Ken to make sure the map products (SFWMD and NPS) are similar. Thanks for asking the question.

Kevin

Kevin Whelan, Ph.D.
Aquatic Ecologist
South Florida / Caribbean Network
Inventory and Monitoring
National Park Service

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Suite 419
Miami, Florida 33157

Kevin_R_Whelan@nps.gov
305-252-0347
305-253-0463
www1.nature.nps.gov/im/units/sfcn/

```
|-----+----->
|           |           "Keith Patterson"| |
|           |           <kpatterson@avine|
|           |           on.com>           |
|           |           |                 |
|           |           11/16/2006 09:24 |
|           |           AM EST           |
|-----+----->
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>-----

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|

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Delivery Area 4 Technical Report, 9/12/2008

| To: <Kevin_R_Whelan@nps.gov>
|
| cc: "Matt Patterson" <Matt_Patterson@nps.gov>, "Aristos Georgiou"
<ageorgiou@avineon.com>, "Jonathan Ruebeling" |
| <JRuebeling@avineon.com>, "Daniel Bubser" <dbubser@avineon.com>
|
| Subject: Use of Periphyton Modifier
|

>-----
-----|

Kevin,

We have started seeing what appears to be periphyton on the imagery and we will be in the field next week. Our SFWMD Everglades mapping team was instructed, during one of their SFWMD in-house training sessions, not to use the periphyton modifier. Thus, it has not been used to date. We assume you do not want to apply this modifier either. Please confirm.

Thanks,

Keith

Keith Patterson, PSM
Director of Photogrammetry, Mapping and GIS
Avineon, Inc.
15500 Lightwave Dr. Suite 200
Clearwater, FL 33760

727-539-1661 ext. 321
kpatterson@avineon.com

www.avineon.com

Abandoned farms:

From: Kevin_R_Whelan@nps.gov
Sent: Thursday, November 09, 2006 1:13 PM
To: Aristos Georgiou
Subject: the agriculture picture

In the image you sent us. The agricultural land looks like it has been abandoned so we would suggest the Spoil (SP) category. The Agriculture category (AG) looks like it is for active agricultural lands.

I hope this helps.
Kevin

Kevin Whelan, Ph.D.
Aquatic Ecologist
South Florida / Caribbean Network
Inventory and Monitoring
National Park Service

18001 Old Cutler Road.
Suite 419
Miami, Florida 33157

Kevin_R_Whelan@nps.gov
305-252-0347
305-253-0463
www1.nature.nps.gov/im/units/sfcn/

Classification System Questions from IRC and NPS

-----Original Message-----

From: Andrea_Atkinson@nps.gov [mailto:Andrea_Atkinson@nps.gov]
Sent: Thursday, September 28, 2006 1:23 PM
To: Kevin_R_Whelan@nps.gov; bradley@regionalconservation.org; Keith Patterson;
krutchey@sfwmd.gov; Matt_Patterson@nps.gov; tschall@sfwmd.gov;
woodmansee@regionalconservation.org
Subject: An additional correction to the veg classification

Everyone,

Its been pointed out that the clarification of the Cypress-Hardwood Forest (FStH) (i.e. that cypress is dominant (>50%) and that hardwoods could be rom 10-49% of the canopy) was inconsistent with the definitions used for ther mixed categories such as the various mangrove forest mixes (FMXac, FMXal, etc.) and the Cypress-Pine Forest mix (FStp); which typically are a 50/50% mix but could go to 60/40% or 40/60% combinations of the two vegetation types (and either vegetation type in the name could be the 60% cover).

soooo...

For areas other than Section 1-FPNWR (e.g. Sections 2, 3, 4 in SFCN map),

Cypress-Hardwood Forest (FStH) should be between a 60/40% to 40/60% mix of the two. (Note: either Cypress or Hardwoods can be the 60% cover)

For Section 1 (FPNWR) either the previous definition (first paragraph) or this new definition will be accepted.

I've updated the Word document to reflect the above change in blue type.

Sorry for the confusion.

-- Andrea Atkinson

(See attached file: Ken and Ted answers-with FStH correction.doc)

Andrea Atkinson

Quantitative Ecologist

Inventory & Monitoring Program-South Florida/Caribbean Network

National Park Service

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(305) 253-0463 - fax

Email: andrea_atkinson@nps.gov

<http://www1.nature.nps.gov/im/units/sfcn/>

Delivery Area 4 Technical Report, 9/12/2008

-----Original Message-----

From: Kevin_R_Whelan@nps.gov [mailto:Kevin_R_Whelan@nps.gov]
Sent: Tuesday, September 19, 2006 12:16 PM
To: Keith Patterson; krutchey@sfwmd.gov; bradley@regionalconservation.org
Cc: Andrea_Atkinson@nps.gov; Matt_Patterson@nps.gov; tschall@sfwmd.gov
Subject: a word version of the corrections

Just so everyone can work on these in word here is a word file with our questions and answers and comments by Ken and Ted

ATTACHED FILE:

Hi Andrea and Kevin,

I like this idea of starting a "question and answer sheet to hand to both IRC and Avineon so we're all on the same page". I've indicated in red my answers.

Ken

-----Original Message-----

From: Andrea_Atkinson@nps.gov [mailto:Andrea_Atkinson@nps.gov]
Sent: Friday, September 15, 2006 2:28 PM
To: Schall, Theodore; Rutchey, Kenneth
Cc: Kevin_R_Whelan@nps.gov
Subject: more questions on vegetation classification

Dear Ken and Ted,

IRC has started doing accuracy assessment points for Florida Panther National Wildlife Refuge. They came up with several vegetation combinations that they couldn't find classifications for and asked if we could add categories. Plus they had several questions that need clarification. I've summarized their questions regarding new classifications and then drafted answers to several of their clarification questions. Could you review the following and see if you concur or if you have different answers? I want to create a question and answer sheet to hand to both IRC and Avineon so we're all on the same page. I already included Ted's answers on the Mangroves below.

New Categories

Pop Ash Forest: where should a cell dominated by pop ash but without pond apple be placed? Currently a pond apple/pop ash mix (FSaf) category exists but there is no case when pond apple is not in the mix. Pop Ash without pond apple is being seen in the field.

Recommendation: create new Pop Ash Forest (FSf) category **Agree**

Pop Ash / Pond Apple Shrubland: where should a pop ash/pond apple shrub mixture be placed? Currently a pond apple shrubland category exists (SSa) and a Pop Ash shrubland exists (SSf) but a mixture is not mentioned and is being seen in the field.

Recommendation: create a new Pop Ash/Pond Apple Shrubland (SSaf) category **Agree**

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Mixed Hardwood Swamp Shrubland (non-bayhead): where should a cell dominated by mixed hardwood shrubs (non-Bayhead) be created? In many cases the cell was clearly dominated by a mixture of hardwood swamp shrubs rather than any one type. The nearest classification would be Bayhead shrubland, but these cells don't involve tree islands.

Recommendation: create a new category mixed hardwood swamp shrubland (SSh) similar to the Hardwood Swamp Forest (FSh) category **Use SSB without the "I" indicator - Bayhead in this class doesn't mean tree island. It describes a group of species. "I" specifically designates a tree island.**

Where should a Cabbage Palm Lowland Woodland be placed?

Currently only Upland Cabbage Palm Woodland (WUs and sub-categories) exist in the classification. Apparently cabbage palm can be both upland and lowland (in fact its mostly lowland that's being seen). The only way to differentiate the two is from the understory species. Either we need to create a matching set of lowland categories (without the saw palmetto understory option) or the Cabbage Palm Woodland needs to be restated so it can be either lowland or upland. Currently WUsg mentions Muhly Grass so it isn't necessarily an upland category already. **Will need to get back to you on this one. Pines are designated in both upland and lowland so could also be done for Cabbage Palm.**

Where should a mixed graminoid prairie be placed?

Graminoid prairie mixtures are being seen that don't reflect any of the current category level 4 combinations. Should a new Mixed Graminoid Prairie category be created? At this point I think the more general Graminoid Freshwater Prairie (MFGP) should be used. **Agree - We are using MFGP the majority of the time because of limited detail in the photography. It is very difficult to go to lower levels without substantial ground-truthing.**

Clarification Questions

Question: In what general category should red mangroves that are 4 meters high, with 30% cover and a Black Rush understory covering 100% of the cell be placed?

Answer: The mangrove scrub category should only be used for mangroves < 2m high. In this case since the mangroves cover less than 50% of the cell, the category would be Black Rush (MSGj). **Agree**

Question: In what category should red mangroves that are <2 meters high and with 80% cover be placed? Answer: The classification should be Red Mangrove Scrub-Dominant (CMrD) **Agree**

Additional clarification on mangroves:

1) Mangrove Forest - High-density stands of trees (>50% tree canopy cover) with heights greater than five meters. Tree canopy cover from 50% - 60% will be considered Forest unless specifically described in the Woodland section of the classification system.

2) Mangrove Shrub - High-density stands of small trees and/or shrubs (> 50% tree/shrub canopy cover) with heights less than five meters.

Exception: Mangrove shrubs less than or equal to 2 meters are scrub - see scrub section. Note: In the case for mangrove shrubs and as a generally rule of the CERP mapping, we are only indicating these classes when they are the majority class. So 75% sawgrass with 25% red mangrove that is greater than 2 meters in height are labeled as sawgrass, "MFGc".

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Researchers did not indicate a strong desire to know where shrub height mangroves were located in sparse associations, so we are sticking to the majority class rule for labeling mangrove shrubs.

3) Mangrove Scrub - (0 to 2 meters in height with percent cover of 10% - 100%) - Note: When the percent cover of mangrove is less than 50% cover and less than or equal to 2 meters (e.g. 25% cover; 1.5 meter high red mangrove mixed with 75% sawgrass) then the majority vegetation, in this case sawgrass, is indicated with the minority vegetation, in this case red mangrove scrub. The resulting class would be "CMrGc". If the percentages were reversed and 75% red mangrove scrub was found mixed with 25% sawgrass, then we would simply indicate that the majority vegetation was red mangrove scrub. The resulting class would be "CMrD" or dominant red mangrove scrub. The reason for indicating the presence of mangrove scrub when it is not the majority of the signature in question is because researchers wanted to know where sparse associations of mangrove scrub are located.

Question: What is the difference between the Pine Upland (WUp) & Pine Flatwoods (WUpF) categories?

Answer: Pine Flatwoods (WUpF) is a sub-category under Pine Upland (WUp). Pine Rocklands (WUpR) are another sub-category. The general Pine Upland (WUp) category should only be used if it is impossible to distinguish between the two sub-categories. As the few pine rockland areas are known and can be identified by consultation with local botanists before mapping (and remaining pine uplands are all Pine Flatwoods), the sub-categories should be used unless true ambiguity exists. **Agree**

Question: What if the cell contains a mixed cypress canopy with some short cypress and some tall?

Answer: If the cypress canopy throughout the cell is tall with an understory of shorter cypress trees, then the classification would be Cypress Forest (FSt) **Depends on % of tall vs short**

If most of the cell is solid cypress < 5 meters tall and a corner of the cell has the beginning of a dome with taller trees (but is in less than 50% of the cell), then the classification would be Cypress Scrub-Dominant CStD). Please note that there is no cypress shrub category. **Agree**

Question: What if the cell is dominated by periphyton?

Answer: Record the vegetation community the periphyton is within (typically Open Marsh (MFO)) and include periphyton under the modifiers. **Agree**

Question: What if the cell contains 60% pine trees and 40% cypress trees all greater than 5 meters tall?

Answer: The Cypress-Pine Forest (FStp) category should be used. This was intended as a general mixed cypress-pine forest category and cypress does not necessarily need to be dominant, although it usually is. **Agree - If the two are segregated then choose the one that is the majority. If well mixed, choose the mixed class.**

Question: At what point does a sub-canopy of red maple in a cypress forest shift the classification from Cypress Forest (FSt) to Cypress-Hardwood Forest (FStH)?

Answer: If between 10-49% of the canopy or sub-canopy is red maple and/or laurel oak, then the classification is Cypress-Hardwood Forest (FStH) **Agree**

Delivery Area 4 Technical Report, 9/12/2008

New Answer (9/27/2006): The Cypress-Hardwood Forest (FStH) category is intended for mixtures of these two vegetation types that are around a 50%/50% split of canopy cover but could range from 40%/60% to 60%/40% combinations. Either vegetation type could be the 60%. Thus the point that a sub-canopy of red maple would shift the classification from Cypress Forest (FSt) to Cypress-Hardwood Forest (FStH) would be when hardwoods such as red maple were greater than 40% of the mixture.

Similar splits are found, for example, in the Mixed Mangrove Forest combinations (FMXac, FMXal, FMXar, FMXcl, FMXcr, FMXlr) as well as Cypress-Pine Forest (FStP).

Question: In a situation on the coast where the cell contains a tidal channel with some areas of mangroves and some of salt marsh, what classification should be used?

Answer: Choose the classification that occupies >50% of the cell. Open Salt Marsh (MSO) may be an option. Agree - Whatever signature is majority not necessarily 50% or greater - could be three or more categories.

Thanks !!!

■ Andrea Atkinson

Meeting Summary for meeting between NPS-SFC and Avineon regarding Vegetation Mapping Contract No. C211705992

April 25, 2007

Agenda

Introductions

Meeting Objectives/Expectations

NPS Objectives:

- Resolve issues with Section 1 Deliverables
- Increase accuracy of remaining vegetation map deliverables

NPS Concerns

Discussion & Next Steps

Schedule

Present:

Dan Bubser dbubser@avineon.com

Keith Patterson kpatterson@avineon.com

Chad Davis cdavis@avineon.com

Aristos Georgiou ageorgiou@avineon.com

Matt Patterson matt_patterson@nps.gov

Andrea Atkinson andrea_atkinson@nps.gov

Brian Witcher brian_witcher@nps.gov

Handouts from NPS:

A. Pages 2-3 of Avineon letter of April 23, 2007 showing comments on enclosed table

Handouts from Avineon:

B. Proposed scope changes to improve the accuracy assessment process

C. Avineon Accuracy Assessment Results

Also referenced: Avineon letter "Avineon Response to the NPS Report on the Avineon Vegetation Map Section 1 revision 2 and section 2 deliverable on Contract No. C211705992 to National Park Service South Florida / Caribbean Inventory and Monitoring Network" dated April 23, 2007.

Objectives for meeting

NPS-SFCN objectives

- Resolve issues with Section 1 Deliverables
- Increase accuracy of remaining vegetation map deliverables

Avineon objectives

- want a revision in scope and accuracy assessment methods
- want to find a path forward

NPS-SFCN Powerpoint summarizing concerns

NPS-SFCN presented a power point summarizing their concerns. The following issues were largely discussed during the presentation. (A copy of the powerpoint is attached(D)).

At the end of the powerpoint NPS summarized their concerns to be:

- Failing to meet vegetation classification accuracy.
- General lack of professional mapping product
 - incorrect acreage calculations.
 - non-existent vegetation codes.
 - Blank cells
- Lack of using additional knowledge for the map.
- Unclear usefulness of field effort.
- Lack of use of Park Botanist.

ACTION ITEM: Avineon requested that a copy of the power point presentation be sent to them.

Section 1 – Accuracy Assessment Points 59 and 174

2 of the 37 non-accepted Accuracy Assessment points given to Avineon to improve Section 1 remained unresolved as NPS did not understand why they were not changed to reflect the Accuracy Assessment classification and Avineon did not explain why in their technical report.

ACTION ITEMS:

- Point 59 will remain as SSf as this is consistent with the 9.15.2006 version of the classification used with this section.
- Point 174 will be changed to WUpFSs.
- The Section 1 technical report will be updated to show the version classification used.

68 Accepted Annotation Codes

NPS wondered why the 68 cells, that were initially not matching the accuracy assessment code but were later “accepted” by NPS, were not changed in the revised Section 1. Avineon responded that a) they felt those cells were accepted and thus did not need changing and b) to change those cells would create an inconsistent product as the methods used in those cells would be dependent on field assessment rather than photointerpretation.

NPS stated they wanted the best map product possible, that these cells were often accepted because they were on the edge between two categories, that they felt the field accuracy assessment was more reliable than the photointerpretation, and that reviewing these cells would help Avineon clarify the distinction between categories to assist with future mapping.

ACTION ITEMS:

- NPS stated they wanted the 68 cells reviewed and changed as part of acceptance of Section 1 as a deliverable. The handout of pages 2-3 of the Avineon April 23, 2007 letter was given out. The table included splitting the 68 cells into categories. NPS went through the table and discussed which classes they want changed (see handout).
- For cells which are changed for reasons other than because the field crew went to a lower level in the hierarchy, the surrounding cells should also be reviewed if they are the same classification to see if they should also be changed.

Vegetation Classification

The vegetation classification version used in Sections 1 and 2 has been unclear in the technical report.

ACTION ITEMS:

- In the future vegetation classification changes should be made with an official request from NPS that is acknowledged by Avineon.
- Which vegetation classification used will be included in future deliverable technical reports.
- For Section 1, the 9.15.2006 version of the classification was used
- For Section 2, the 2.1.2007 version of the classification will be used with the following caveats
- Avineon will do a global replace of FSs-Willow Forest with SSs-Willow Shrubland
- As Avineon had already begun mapping Section 2 when the 2.1.2007 version came out, reasonable alternates will be deemed acceptable for the following new codes found in the 2.1.2007 version
 - WSh-Hardwood Swamp Woodland
 - WUh-Upland Woodland

- FHp-Hardwood Hammock – Pine Forest

For example either Hardwood Hammock or Pine Forest would be acceptable for a cell classified as FHp by the Accuracy Assessment team.

- The 2.1.2007 definitions for Graminoid Freshwater Marsh and Graminoid Freshwater Prairie and associated sub-categories and components will be used as Avineon appears to be matching this classification more closely than the previous classification and thus doing slightly better on the accuracy assessment.

- For Sections 3 and 4, the 2.1.2007 version of the classification will be used.

Map Accuracy and Accuracy Assessment Methodology and requested scope change Avineon requested a change in scope regarding the vegetation classification and accuracy assessment methodology (see Handout B). The group went through key points in the handout.

Vegetation classification – Avineon gave out Handout C showing how many points NPS was shifting in to the “acceptable” column. They felt that this showed that this was a difficult classification with subjectivity on how to apply classes, although they appreciated the additional points deemed acceptable. They pointed out that this was a new and untested classification. The discussion focused in on the difference between graminoid freshwater marsh and graminoid freshwater prairie and the difficulty Avineon was having. Avineon pointed out that the University of Georgia map didn’t even try to make this separation. NPS said they did not want to discuss a change in the vegetation classification and what would be considered acceptable at this time.

NPS wishes Avineon to continue working on the distinction between graminoid freshwater marsh and graminoid freshwater prairie as this was stated to be important to Big Cypress. NPS reiterated their suggestion from the January 2007 meeting that Jim Burch, the Big Cypress National Preserve park botanist, was an excellent resource to use -- with training points, with helping with the split between marsh and prairie, with other vegetation types, and even being able to look over a map product and offer comments based upon his extensive knowledge of the park. Unfortunately Jimi Sadle the other botanist has just taken a new job with Everglades National Park and is no longer available. Avineon said they would be contacting Jim Burch.

Avineon expressed concern with the NPS accuracy assessment methodology. They said their own people had trouble when they went in the field with getting accurate locations in the helicopter and correctly finding the point (they were using their laptops to show the imagery with their current GPS position overlaid live on top). They felt it was hard to achieve accurate understanding of cell boundaries and that photos taken were unreliable. They were concerned that the NPS accuracy assessment points were also having positional problems and this was affecting their accuracy assessment rating.

Avineon said they would give NPS rectified project imagery so that this can be used during the accuracy assessment rather than the Collier County imagery. Avineon requested that after a Section failed its accuracy assessment, that the accuracy assessment locations be given to Dan Bubser, an Avineon photointerpreter who is not working on the project. Dan Bubser would evaluate the points for types of errors being made to assist the photointerpreters and also double-check the accuracy assessment work. Dan Bubser would not give the point locations to the photointerpreters actually working on the project (see Handout B for details of proposal).

NPS replied that their accuracy assessment crew did have a learning curve during the first day or two during which they found that the laptop method of overlaying position on imagery was not feasible and switched to printing out cell boundaries on Collier County imagery and taking those with them instead. This helped them double-check that they were looking at the right cell and relative proportion of different communities in the cell. NPS described the accuracy assessment methodology plus reasoning

for declaring a point “acceptable” when there initially was not a match with the accuracy assessment classification (see accuracy assessment report write-ups for Section 1 and Section 2 for a description).

NPS showed how the number of points required for 80% accuracy with 90% confidence is reported. Across all sections there should be a total of 1010 990 accuracy assessment points (correction to number of points made after meeting). NPS said that they were satisfied with their accuracy assessment procedures, that these issues were why NPS went through the additional steps outlined to determine whether a non-matching Avineon classification was still acceptable including overlaying cell boundaries on imagery, that they were unwilling to give their accuracy assessment points to Avineon as this would invalidate their procedures, and that given the other concerns NPS has raised, NPS was less willing to be sympathetic regarding changing the scope. NPS also encouraged asking of questions regarding the classification.

ACTION ITEMS:

- NPS will send Avineon a copy of their spreadsheet used for calculating accuracy assessment requirements, plus pages from Biostatistical Analysis by Zar describing the method used.
- Avineon will correct the number of field points listed in their technical reports
- Avineon will send to NPS the digital imagery for use in their accuracy assessment process as NPS is currently using Collier County imagery. These photos are not photomosaic'd nor been orthorectified using DEMs. Errors, delivery schedules Avineon said some of the reason for the errors NPS is finding is that products were being moved quickly out the door to meet deadlines in the contract. NPS said they would rather receive deliverables late but of good quality rather than receive them on time but filled with errors. It takes considerable staff time to review each product. Instead if a product will be late, please give NPS a call or email to let them know. Avineon said they needed to discuss this internally from a business management perspective.

ACTION ITEMS:

- As the schedule has already changed NPS requested that Avineon let NPS know roughly when to expect deliverables (see below)
- Avineon will inform NPS when products will be late so NPS can plan their time accordingly.
- Avineon is updating its automated accuracy assessment process to find the types of errors found by NPS (blank cells and non-existent vegetation codes).
- NPS also pointed out that the table of responses on page 4 of the 4/23/2007 letter from Avineon contains one more error (Row 7, “Avineon Comments” column should have SU,MFGt instead of SU,MFGP. This should be checked to make sure that the error does not also occur in the map.
- Acreage calculation errors will be corrected in Section 1 and 2 technical reports and future reports. Lack of using additional knowledge for the map. NPS was concerned that the provided accuracy assessment points from Section 1 to be used as training points did not seem to have been used to improve Section 2. Between the two versions of Section 2, only 70 cells changed and only two of these appeared to be actual class changes instead of filling blank cells or correcting typing errors. Avineon said they thought more changes had occurred.

ACTION ITEM:

- Avineon requested copy of spreadsheet used to compare 2.23.2007 version of Section 2 and the 3.16.2007 version.

Field effort

NPS was concerned that when they looked at the field points for Section 2 that for some of the points, the species in the notes field, the picture, and the cell classification did not make an obvious link and

had questions on 55/143 points (Section 1's picture filenames were cutoff and so couldn't be evaluated). Avineon said that their field points and photos did not necessarily represent the whole cell, that the photos were very problematic to take, and that they had trouble with accuracy in the helicopter which is why they wished to question NPS's accuracy assessment methodology. NPS commented that the number of field points and changes mentioned on the top of page 7 of Avineon's 4/23/2007 letter don't add up – that there are still 29 points unaccounted for. Avineon said these points were deemed of poor quality and so were not included and the number of points will be corrected in the technical report. Again NPS made suggestion to consult with Jim Burch, Big Cypress park botanist.

Project extension

Avineon stated that they will need a project extension. NPS (Matt Patterson) agreed that an extension was okay but preferred to do a no-cost extension once rather than multiple times and that was his reason for suggesting waiting a little longer.

ACTION ITEMS: deferred until later.

Microstation files

Avineon had questions about incorporating new changes in the vegetation classification into Microstation. As SFWMD will no longer be using Microstation in the future, maintaining a consistent microstation structure with them is no longer an issue.

ACTION ITEMS:

- Avineon will proceed with incorporation of new classes in the vegetation classification into Microstation in a way that works for them (e.g. next available level)
- As specified in the contract Avineon will turn in Microstation files to NPS as a deliverable.

Schedule

When requested for an estimated schedule, Avineon felt that Section 1 changes should be incorporated and re-delivered sometime next week. Section 2 changes will probably take 1 to 1 ½ months.

To complete Section 1

At the end of the meeting NPS and Avineon briefly reviewed the actions needed to complete Section 1. Many of these are described in greater detail above.

- Update accuracy assessment point 174 to WUpFSs
- Look at 68 "accepted" non-matching accuracy assessment points and as discussed and described on handout, update points and surrounding points to match field classification where applicable in map(see description above)
- Fix non-existent classification errors in map
- Fix acreage calculation error in technical report
- Fix fieldwork shapefile

ACTION ITEM: NPS will type up a meeting summary and send to all participants.

Email correspondence from Tim Delaney to NPS describing Avineon's plan for revision and the discrepancies found between Avineon's field survey and the vegetation map classification:

-----Original Message-----

From: Tim Delaney [mailto:tdelaney@avineon.com]

Sent: Thursday, January 29, 2009

To: Matt_Patterson@nps.gov

Subject: Update on project C2117051992

Hello Matt,

Delivery Area 4 Technical Report, 9/12/2008

Please see the updated Avineon Work Plan (attached). The updates have been added to the Record of Change on the second page of the document.

Avineon remains committed to finishing this project as quickly as possible and to the standards that have been defined. The grid-based photo interpretation method is an extremely hard methodology to apply traditional photo interpretation methods and accuracy assessments to but Avineon continues to strive to improve on this photo interpretation process.

After receiving your last e-mail, three Project Team Members came together as part of our ISO Continuous Improvement Process (CIP) to perform a full production assessment. It did not take long to find some significant problems between the field data and map classification and between the field data and field photography. While the assessment looked at several different production variables, the purpose of the investigation was to re-check all labels against the existing imagery signatures and against the field survey reports to ensure consistency with the image signatures and to ensure that the field surveys were called correctly. A new section was added to the Work Plan under Appendix A: Quality Assurance Plan that explains examples of what was found.

While I hope Friday's delivery will pass your accuracy assessment, I cannot guarantee it. I am confident that this Friday's delivery will be a better product that will allow us to quickly take the steps needed to apply the corrections needed from your assessment that will meet the quality standards with one more delivery. This is our top priority project so we will be able to immediately put our action plan into play based on your assessment.

I do not want to ignore the frustration that you are experiencing with this project but this has been my first opportunity to try to take control of a Section that had inconsistencies in signature calls in the product and inconsistencies between field photos and field notes. We are spending a lot of time, money and energy in trying to correct the mistakes of the past. I apologize that it has taken this long.

Thank you for your continued patience.

Tim

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Appendix C: AVINEON FIELD CHECKSITES

Please see the document entitled Area4fieldappendix.xls

Appendix D: Sample Readme File from Delivery Disk

NPS Delivery Files

Below shows the location of the delivery files with respect to their appropriate folders/sub-folders.

DELIVERABLE DESCRIPTION	FORMAT TO BE DELIVERED	DISC ROOT DIRECTORY NAME	DISC SUB-DIRECTORY NAME	DISC 2 nd SUB-DIRECTORY NAME
Transmittal Letter	Hard Copy	<i>NA</i>	<i>NA</i>	<i>NA</i>
	WORD file with Transmittal List and Acknowledgement Form	Transmittal.doc	<i>NA</i>	<i>NA</i>
Readme File describing contents of disc	WORD file	ReadMe.doc	<i>NA</i>	<i>NA</i>
Delivery Section Technical Report.	WORD file	Technical Report	<i>*.doc</i>	<i>NA</i>
Model Based Files	Microstation .dgn files	Model Files	Microstation Files	*.dgn
	Shapefiles	Model Files	Shapefiles	*.shp
	Coverages	Model Files	Coverage Files	(coverage Name)
	Arc Export (Interchange) Files	Model Files	Arc Export Files	*.e00
Section Map – All Model Files Merged into One Map	Shapefile	Section Map	Shapefile	*.shp
	Coverage	Section Map	Coverage File	(coverage name)
	Arc Export (Interchange) File	Section Map	Arc Export File	*.e00
Fieldwork Documentation	Shapefile	Fieldwork Documentation	Fieldwork Shapefile	<i>Fieldwork_shapefile</i>
	.jpg files	Fieldwork Documentation	Field Pictures	<i>Fieldwork_pictures</i>
Aerial Photography Index. Shows each exposure center.	.pdf file	Aerial Photography Index	<i>NA</i>	<i>NA</i>
Digital Shoreline (Note: does not appear within all four Delivery Sections)	Microstation .dgn files	Shoreline	Microstation File	<i>NA</i>
	Shapefile	Shoreline	Shapefile	<i>NA</i>
	Coverage	Shoreline	Coverage File	<i>NA</i>
	Arc Export (Interchange) File	Shoreline	Arc Export File	<i>NA</i>

Appendix E: Aerotriangulation Report and Orthorectification.

Please refer to attached file titled “Big Cypress AT Report_060206” for the Aerotriangulation Report. This file contains the horizontal and vertical accuracy being applied to the orthorectification process.

The orthorectification process is an application driven process that is dependent on the information contained in the aerotriangulation (AT) file (provided to Avineon by EarthData – see “Big Cypress AT Report_060206” for the Aerotriangulation Report).

ImageStation OrthoPro is the digital orthophoto production system used to create the orthophotos. The AT information was provided to Avineon from Earthdata in a P-CAP compliant format. The AT P-CAP file was imported into OrthoPro and a USGS 1:25,000 DEM was used as the source of elevation that is used by the application to rectify the aerial photography.

The workflow involves OrthoPro taking the AT solution and creating an 8th order algorithm that rebuilds the image based on the positioning of the plane and then incorporates the elevation data in order to place and resample the image appropriately. The results of the OrthoPro production system is a resampled image that reflects the real world environment.