

APPENDIX A— ENVIRONMENTAL ANALYSES, METHODS AND DATA

ENVIRONMENTAL ANALYSES

Development of recommended MFLs typically includes consideration of biologic and topographic information collected in the field with information from the scientific literature to develop a recommended MFLs hydrologic regime. This section describes the methods used in the MFLs determination process for Lake Butler, including field procedures such as site selection and field data collection, data analyses, and levels determination criteria. Additional descriptions of MFLs methods are included in SJRWMD's (draft) Minimum Flows and Levels Methods Manual (SJRWMD 2006b) and the SJRWMD MFLs methods paper (Neubauer et al. 2008).

Field Methods

Field Site Selection

Many factors are considered in the selection of field transect sites. Transects are fixed sample lines across a river, lake, or wetland floodplain. MFL transects usually extend from open water to uplands. Elevation, soils, and vegetation are sampled along transects in order to characterize the influence of surface water flooding on the distribution of soils and plant communities.

Field site selection began with the implementation of a site history survey and data search. All available pertinent information was gathered. The types of information include:

- On-site and regional vegetation surveys and maps
- Aerial photography (existing and historical)
- Remote sensing (vegetation, land-use, etc.) and topographic maps
- Soil surveys, maps and descriptions
- Hydrologic data (hydrographs and stage duration curves)
- Environmental, engineering, or hydrologic reports
- Topographic survey profiles
- Occurrence records of rare and endangered flora and fauna

These data were reviewed to familiarize the investigator with site characteristics, locate important basin features that needed to be evaluated, and assess prospective sampling locations. Copies of this information were organized and placed in permanent files for future reference and archiving.

Potential transect locations were initially identified from maps of wetlands, soils, and topography. Specific transect site selection goals included:

- Establishing transects at sites where multiple wetland communities of the most commonly occurring types;
- Selecting multiple transect locations which have common wetland communities among them;
- Establishing transects which traverse unique wetland communities; and
- Prioritizing public lands or private lands unlikely to be altered to allow for future MFLs monitoring data collection at these transects

Transect characteristics were subsequently field verified to ensure that the transect locations contained representative wetland communities, hydric soils, and reasonable upland access.

Lake Butler MFLs fieldwork was originally conducted on sites with minimal anthropogenic alterations and targeted areas with relatively intact vegetation communities. SJRWMD staff and Jones Edmunds and Associates (JEA) staff conducted fieldwork in 2004. SJRWMD staff conducted additional fieldwork in 2009 and 2018. A total of 9 transects were selected for vegetation and soil data collection, and field data was collected at a total of 8 deep marsh transects (Figure 1 and Tables 1). Transect 3 had been affected by residential landscaping and mowing when fieldwork was conducted in 2009, and therefore was not used.

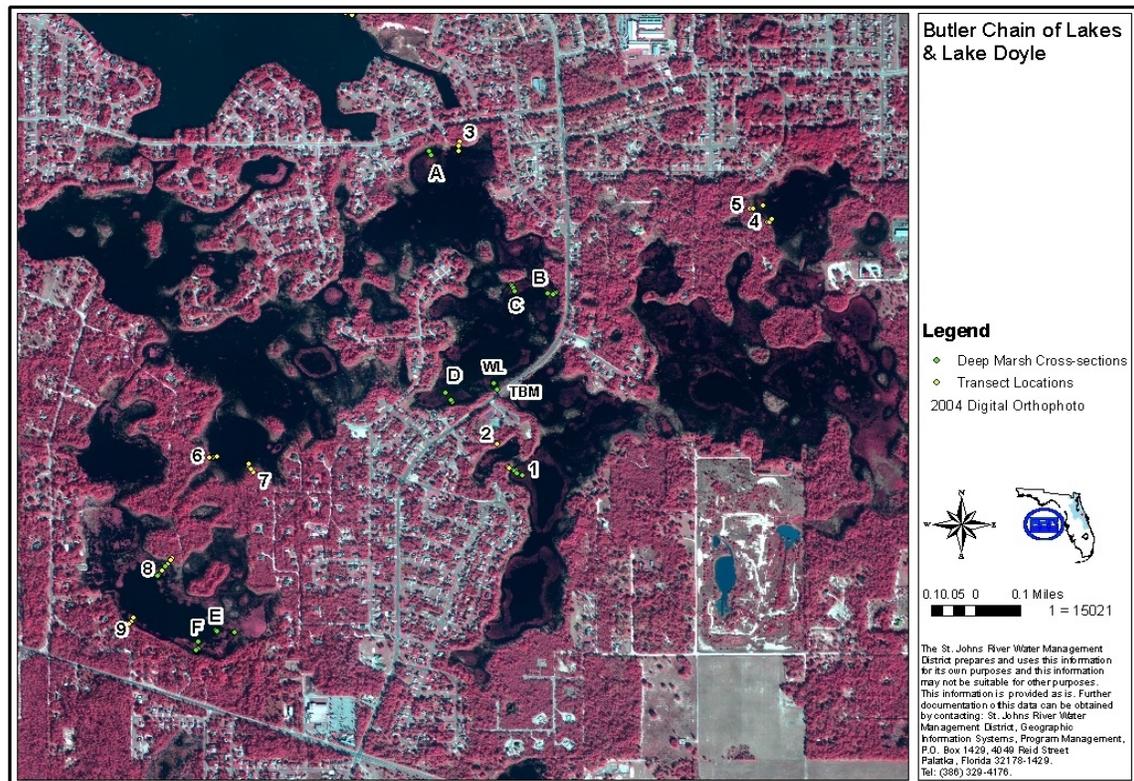


Figure 1. Location of 2009 MFLs Transects and deep marsh cross-sections overlaid on a 2004 digital orthophoto

Field Data Collection

The field data collection procedure for determining MFLs involved gathering information related to system specific protection criteria. Sampling elevations, hydric soils, and vegetation along fixed transects across a hydrologic gradient (i.e., from uplands, across wetlands, to open water) was performed. Transects were mainly established in areas where there were changes in vegetation and soils, and the hydrologic gradient was marked (SJRWMD 2006b). The main purpose in using transects in these situations, where the change in vegetation and soils is clearly directional, was to describe maximum variations over the shortest distance in the minimum amount of time (Kent and Coker 1992).

Table 1. Latitude and longitude data for Transects 1 through 9

	Latitude	Longitude	Latitude	Longitude
	Beginning		End	
Transect 1	28°51'58.6"	-81°10'50.6"	28°51'58.2"	-81°10'49.6"
Transect 2	28°52'01.5"	-81°10'52.1"	28°52'00.3"	-81°10'51.3"
Transect 3	28°52'38.8"	-81°10'57.2"	28°52'37.7"	-81°10'57.3"
Transect 4	28°52'28.7"	-81°10'16.1"	28°52'29.3"	-81°10'15.4"
Transect 5	28°52'30.6"	-81°10'18.3"	28°52'30.9"	-81°10'16.7"
Transect 6	28°51'59.7"	-81°10'30.9"	28°51'59.9"	-81°11'29.6"
Transect 7	28°51'57.9"	-81°11'24.7"	28°51'59.1"	-81°11'25.3"
Transect 8	28°51'47.4"	-81°11'35.5"	28°51'45.8"	-81°11'36.8"
Transect 9	28°51'39.2"	-81°11'41.2"	28°51'40.0"	-81°11'40.6"
Deep Marsh Transects				
A	28°52' 37.62"	-81°11'1.18"	28°52'35.90"	-81°11'0.53"
B	28°52' 20.20"	-81°10'44.20"	28°52'20.08"	-81°10'45.35"
C	28°52' 21.15"	-81°10'50.14"	28°52'20.35"	-81°10'49.77"
D	28°52' 6.52"	-81°10'58.07"	28°52'7.87"	-81°10'58.96"
1	28°51' 58.27"	-81°10'49.90"	28°51'57.66"	-81°10'48.71"
8	28°51' 46.29"	-81°11'36.32"	28°51'45.24"	-81°11'37.33"
E	28°51' 38.21"	-81°11'27.16"	28°51'38.39"	-81°11'29.47"

In 2004 field investigations were conducted surrounding Lake Butler. Vegetation, elevation, and soils data were collected. Vegetation data from the original field investigations were from low diversity wet prairie, shallow marsh, and deep marsh wetland communities. This is likely due to the shifting boundaries of sandhill lake wetland communities, the effect of disturbance on biodiversity, and the anthropogenic physical alterations to most of the area lakes.

Additional vegetation data were collected in 2009 (January 6-7, and April 9 and 16) confirming the low diversity of the wetland vegetation between the open water and the upland, as well as the upland boundary. Elevations of the extent of the deep marsh community were determined in eight areas at Lake Butler during this time (Figure 1). Additional spot elevations of saw palmetto (*Serenoa repens*) and sand live oak (*Quercus geminata*) were taken at the Lake Butler Chain and Lake Doyle transects (Transects 1, 2, 4, 6-9) on September 28 and October 7, 2010. Transect 3 was not replicable due to physical alterations since 2004. Field visits were ongoing from 2018-2019 to observe upland encroachment receding due to high water levels along with bathymetry data collection.

Site Survey

Once a transect was established at Lake Butler, vegetation was trimmed to allow a line-of-sight along the length of the transect. A measuring tape was then laid out along the transect. Elevation measurements were surveyed at regular intervals on the ground along the length of the transect using a rod and transit, recorded to the nearest hundredth of a foot. Elevations were recorded at about 2-ft intervals. Additional elevations were measured including obvious elevation changes, vegetation community changes, and soil changes.

SJRWMD staff (T. Richardson, S. Hall, J. Mace, H. Neufeld, J. Slater, and T. Rodgers), BCI Engineers and Scientists staff (J. Slater and G. Tibbetts) and Jones, Edmunds and Associates staff (D. Segal, R. Ellis, and T. Osborne) collected vegetation and soils data between 2004 and 2010. Division of Survey staff collected elevation data in 2004 (M. Willick, S. King, W. Ryals, and E. Sayre), 2018, and 2019 (M. Willick, M. Deloach, and K. Hilliard). Survey elevations of transects were determined from SJRWMD and Florida Department of Environmental Protection (DEP) benchmarks. Specific transect locations and 5ft linear increments were recorded with a Trimble GeoXT.

Soil Sampling Procedures

Detailed soil profiles are described along each transect to gain an understanding of past and present hydrologic, geologic, and anthropogenic processes that have occurred, resulting in the observed transect soil features. The primary soil characteristics considered in the MFLs determinations and reevaluations are the presence and depth of organic soils and the extent of these organic soils and hydric soil indicators (NRCS 2018). Soil series are determined by using taxonomic keys (SSS 1999) to determine soil classification and by consulting series criteria found in official series descriptions (SSS 2007, 2008). Soil borings are taken at various points on the transect lines to sample all significant geomorphic features, landscape positions, and plant communities. Permanently flooded areas such as deep marshes are generally not sampled due to difficulty in obtaining soil samples. Soil profile descriptions followed NRCS guidelines (Schoeneberger et al. 2002). Soil descriptions include the horizon depth, texture, color, redoximorphic features, and consistence of soil materials. Additional soil sampling procedures are documented in SJRWMD's Minimum Flows and Levels Methods Manual (SJRWMD 2006b).

Vegetation Sampling Procedures

Plant communities and transition zones were delineated along a specialized line transect called a belt transect. A belt transect is a line transect with width (belt width) to form a long, thin, rectangular plot divided into smaller sampling areas called quadrats that correspond to the spatial extent of plant communities or transitions between plant communities. The belt transect width will vary depending upon the type of plant community to be sampled (SJRWMD 2006). For example, a belt width of 10 ft (5 ft on each side of the transect line) may suffice for sampling herbaceous plant communities of a floodplain marsh. However, a belt width of 50 ft (25 ft on each side of the line) may be required to represent a forested community adequately.

The spatial extent of plant communities or transition zones (i.e., ecotones) between plant communities was determined using reasonable scientific judgment. Reasonable scientific judgment involves the ability to collect and analyze information using technical knowledge, and personal skills and experience to serve as a basis for decision making (Gilbert et al. 1995). In this case, such judgment was based upon field observations of relative abundance of dominant plant species, occurrence and distribution of soils and hydric soil indicators, and changes in land slope or elevation along the hydrologic gradient.

Plants were identified and the percent cover of plant species was estimated if they occurred within the established belt width for the plant community under evaluation (quadrat). Percent cover is

defined as the vertical projection of the crown or shoot area of a plant to the ground surface and is expressed as a percentage of the quadrat area (Table 2). The canopies of the plants inside the quadrat will often overlap each other, so the total percent cover of plants in a single quadrat will frequently sum to more than 100% (SJRWMD 2006). Percent cover was estimated visually using cover classes (ranges of percent cover). The cover class and percent cover ranges are a variant of the Daubenmire method (Mueller-Dombois and Ellenberg 1974) and summarized in SJRWMD's (draft) Minimum Flows and Levels Methods Manual (SJRWMD 2006).

Relevé and line-intercept are two methods used in the MFL program to measure plant cover along transects. The data are then used in two different approaches to delineating plant community boundaries.

The relevé method involves first delineating the boundaries of plant communities in the field based on the observer's judgement of areas having uniform vegetation characteristics. Changes in dominant plant species, indicator plant species, soil characteristics, land slope, and elevation may all be used to determine community boundaries. Transition zones or ecotones where vegetation characteristics change rapidly are identified separately from uniform vegetation zones. Vegetation community names are assigned to different portions of the belt based on a SJRWMD classification system developed by Kinser (1996). Ocular estimates of cover for each species are assigned to broad cover classes. Broad classes are preferable because results are more likely to be consistent between observers. The cover classes are based on the Braun-Blanquet cover abundance scale, as follows: 5: >75% cover, 4: 50-75% cover, 3: 25-50% cover, 2: 10-25 % cover, 1: 1-10% cover, 0: <1 % cover. Belt width varies depending on the type of plant community being sampled. For an herbaceous community, belt width may be as little as 10 feet in width but for forested systems, a 50-foot wide belt is used (SJRWMD, 2006).

Line-intercept is the second technique used in the MFL program to measure plant cover. It is a quantitative method that involves measuring by plant species the lengths of vegetation that overlap the transect line. Cover intervals are measured to the nearest foot. Annuals, vines, and floating species, which are not reliable indicators of site hydrology, are excluded. Cover interval data are converted to cover abundance data for use in plant community delineation.

Plant Community Delineation

Plant associations are well-documented groupings of vegetation stands that have relatively consistent floristic composition, uniform physiognomy, and a distribution that is characteristic of a particular habitat (Barbour et al., 1999). For purposes of the MFLs program, plant associations are referred to as communities. Ecotones are intermediate habitats that have characteristics of more than one adjoining community. Community boundaries are spatial localities where the magnitude of change in species composition is greatest (Fagan et al., 2003).

Plant communities are identified in the field using vegetation characteristics supplemented by soil and landscape features. Delineation of communities is a matter of expert judgement refined by extensive experience in a particular region. In an effort to minimize subjectivity, a technique known as Split Moving Windows (SMW) gradient analysis was also used to detect community boundaries. SMW is described by Cornelius and Reynolds (1991), Hennenberg et al. (2005), and Boughton et al. (2006) and was modified by Epting (2010) for use at SJRWMD.

The SMW procedure views vegetation abundance along the line transect through a series of 3-foot wide windows. Species composition is compared between adjacent groups of window pairs, which may range from 2 to 20 windows in width. For each window pair, the mean dissimilarity coefficient for species composition (z-score) is calculated. Z-scores are the sum of squared differences standardized by the mean and standard deviation for each window mid-point position. Average z-scores are plotted against transect length and peaks in the z-scores are generally deemed to be community boundaries if they exceed one standard deviation. Moving Window Regression Analysis (MWRA) calculates the slope of the z-score line and can be used to define ecotone width and ecotone boundaries on either side of the community boundary. Boundaries between ecotones and stable communities are defined as those points where regression slope has a maximum value >0 or a minimum value <0 between a community boundary and the next change of sign (or hitting zero).

The SMW procedure works best in transects where there is a regular gradient from one community to another rather than discontinuities generally associated with sharp microrelief. Discrepancies in community boundaries based on relevé vs. line intercept methods (upon which SMW analysis is based) may also occur because the belt transects sample a wider zone than the line intercept. Therefore, in many instances expert judgement must be used to evaluate community breaks assigned by the SMW procedure.

Table 2. Summary of cover classes and percent cover ranges (Source: Mueller-Dombois and Ellenberg 1974)

Cover Class	Percentage Cover Range	Descriptor
0	< 1 %	Rare
1	1–10 %	Scattered
2	11–25 %	Numerous
3	26–50 %	Abundant
4	51–75 %	Co-dominant
5	> 75 %	Dominant

Hydroperiod Tool DEM

A hydroperiod-tool based assessment of habitat was undertaken to establish the relationship between groundwater withdrawal and habitat reductions. A detailed digital elevation map (DEM; Figure 2) was not initially available for Lake Butler. Field work from 2018-2019 focused on collecting additional soundings to increase the resolution of the DEM for Lake Butler. Acoustic Doppler Profiling (ADP) and soundings were combined with light detection and ranging (LIDAR) imagery and processed aerial images. Data collection focused on filling gaps within the existing bathymetry and exploratory soundings to identify possible sinkhole locations. See main report for description of hydroperiod tool metrics, impact threshold and habitat area calculations.

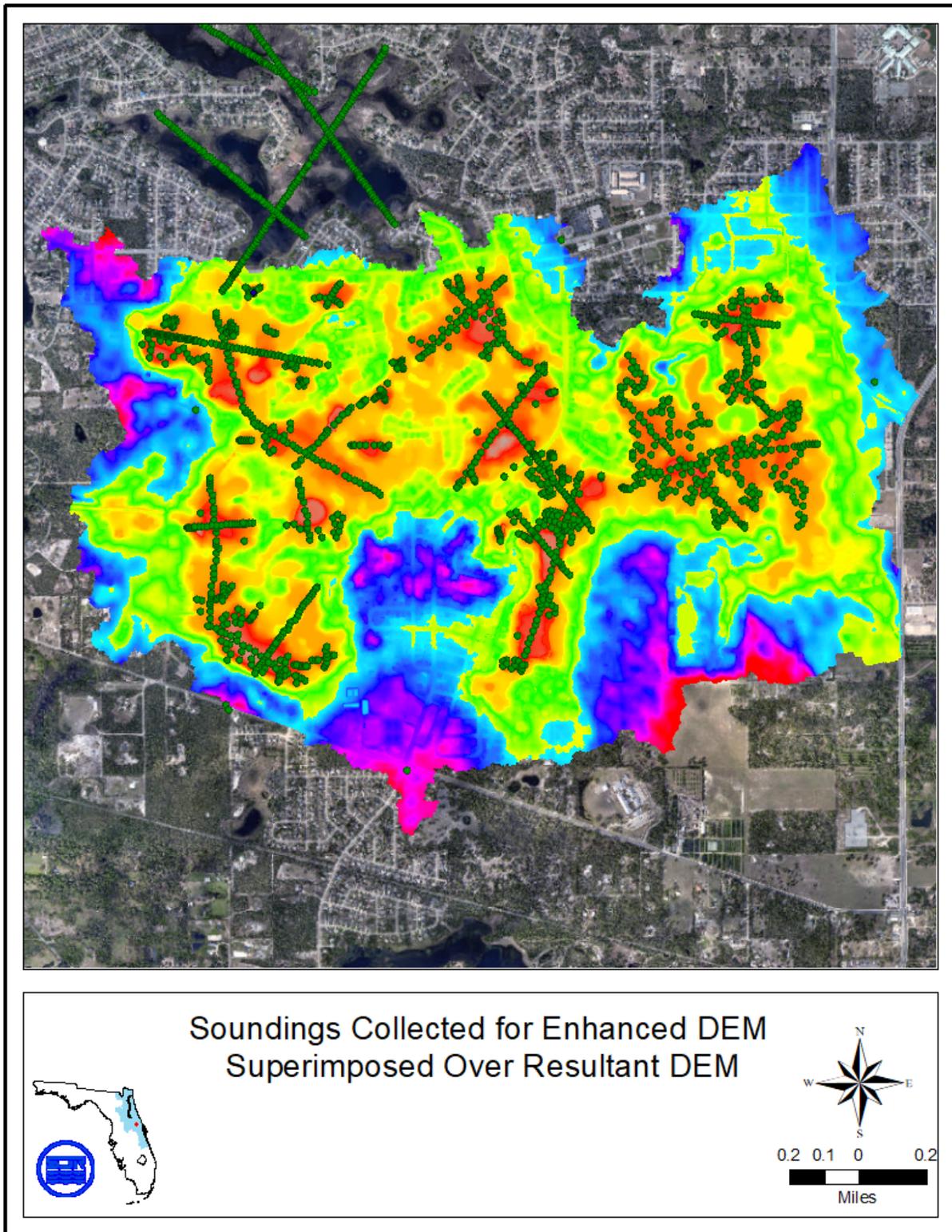


Figure 2. Superimposition of collected soundings along with the DEM developed from them

RESULTS AND DISCUSSION

A summary of the elevations of vegetation communities and hydric indicators observed in 2004 are presented in Table 3. The average upland elevations used in determining the infrequent high are shown in Table 4.

Lake Butler Data

Transects 1, 2, 4-7 were located among various lobes of the partially developed Butler Chain of Lakes. All transects exhibited low diversity wetlands between the upland and open water. All seven transects had a zone of remnant trunks and stumps (most < 6" dbh and, most < 3 ft in height) of dead pine trees between the wet prairie and the deep marsh, some more dense than others.

Any deep marsh vegetation was sparse or not well established on all but two transects. Transect 1 had a narrow band of deep marsh (white water lily) occurring in the deeper water. Transect 2 had small white water lily (*Nymphaea odorata*) plants in 2009, but traversed a depressional area and did not end in open water. No white water lily plants larger than 1 in. in diameter were observed on Transect 2 during a site visit in October 2010.

Sand live oak occurred on or near Transects 1, 2, 4, 6, and 7. Waterward elevations of sand live oak were surveyed on September 28 and October 7, 2010 and are described in the sand live oak section below. Plant samples were collected and verified by C. Ware (SJRWMD staff).

Established saw palmetto occurred on all transects reevaluated in 2009 with the exception of Transect 5. Waterward elevations of saw palmetto were surveyed on September 28 and October 7, 2010 and are described in the saw palmetto section below.

Lake Doyle Data

Transects 8 and 9 exhibited low diversity fringe wetlands between the upland and the open water. Transect 8 had a zone of remnant trunks and stumps (usually < 6" dbh, most < 3 ft high) of dead pine trees in or near the water's edge. Deep marsh vegetation was sparse on Transect 9, but was better established on Transect 8 and other areas of the lake.

Sand live oak occurred near both Transect 8 and 9. Waterward elevations of sand live oak were surveyed on September 28 and October 7, 2010 and are described in the sand live oak section below. Plant samples were collected and verified by C. Ware (SJRWMD staff).

Saw palmetto occurred on both Transect 8 and 9. Waterward elevations of saw palmetto were surveyed on September 28 and October 7, 2010 and are described in the saw palmetto section below. Three areas of established deep marsh, dominated by white water lily, were surveyed on Lake Doyle to determine its extent and elevations (Figure 5). One of these areas was on Transect 8. Additional transects examined deep marsh communities, however these communities changed over time (Figure 5, Figure 6, Figure 7)

Edge of Upland Elevations

The minimum elevation of the upland communities on the Lake Butler Chain and Lake Doyle transects were determined during the original vegetation assessment in 2004 (see below for data tables) and confirmed in the reassessment in 2009 (see below for data tables). Transects 2, 3, and 4 were excluded from analyses for the following reasons:

- Transect 3 was unable to be reestablished in 2009 because of residential development.

- Transect 2 had a trail near the upland edge which caused discrepancies between vegetation community boundaries in 2004 and 2009.
- Transect 4 had grossly different upland edge breaks in 2004 than 2009, possibly due to the transect being improperly located during reestablishment in 2009.

Transects with agreement between 2004 and 2009 upland boundaries were used for analyses. The minimum elevations of the upland communities from Transect 1 and Transects 5-9 from 2004 and 2009 were averaged to obtain an overall average minimum elevation of the upland community of 24.1 ft NAVD for Lake Doyle and the Lake Butler Chain (Table 4). This elevation was the focus of the minimum infrequent high magnitude component.

The tree species most commonly located at the minimum edge of uplands were slash pine (*Pinus elliotii*), with oak species (usually *Quercus geminata*) occurring near to or upslope of the community boundary. Common mid-story species for the upland community included saw palmetto, shiny lyonia (*Lyonia lucida*), staggerbush (*L. mariana*), rusty lyonia (*Lyonia ferruginea*), and gallberry (*Ilex glabra*). Saw palmetto (*Serenoa repens*) was often dense at the higher elevations, then occasionally scattered down to the minimum edge of the upland community. Other mid-story species, such as saw palmetto, sometimes extended a little below the minimum elevation of the upland community into a transition zone or the upper wet prairie community.

Waterward of the minimum elevation of the upland community were low diversity wet prairie, shallow marsh, and deep marsh communities. There was minimal to no overstory in the wet prairie and no overstory in the shallow or deep marshes (Appendices B and C).

Flora and Fauna

Documented species lists of flora and fauna were not found surrounding Lake Butler during data searches. Observed flora are listed on the vegetation surveys for each transect (Tables 7-23). During the deep marsh assessment in 2009, and bathymetry data collection in 2018, sandhill cranes (*Grus canadensis*) were observed nesting on the Lake Butler Chain (Figure 8). It is possible that these nesting cranes were the endemic Florida sandhill crane subspecies (*Grus canadensis pratensis*, FLFWCC 2009b), which is listed as Threatened in the state of Florida (FLFWCC 2009a). Other sandhill cranes have been observed foraging at most of the lobes of Lake Butler, but it is undetermined whether these individuals are the non-migratory endemic Florida subspecies or the migratory greater sandhill crane subspecies (*G. canadensis tabida*). The greater sandhill crane subspecies (*G. canadensis tabida*) does not nest in Florida, but nest in the Great Lakes region (FLFWCC 2009b). Derelict nests were observed on May 3rd 2018 along with foraging chicks adjacent to Festival Park. Brooding was observed in 2019 at numerous locations.

No other endangered, threatened, or species of concern were observed during field data collection. Invasive or non-indigenous species noted are discussed in the Non-indigenous Species section below.

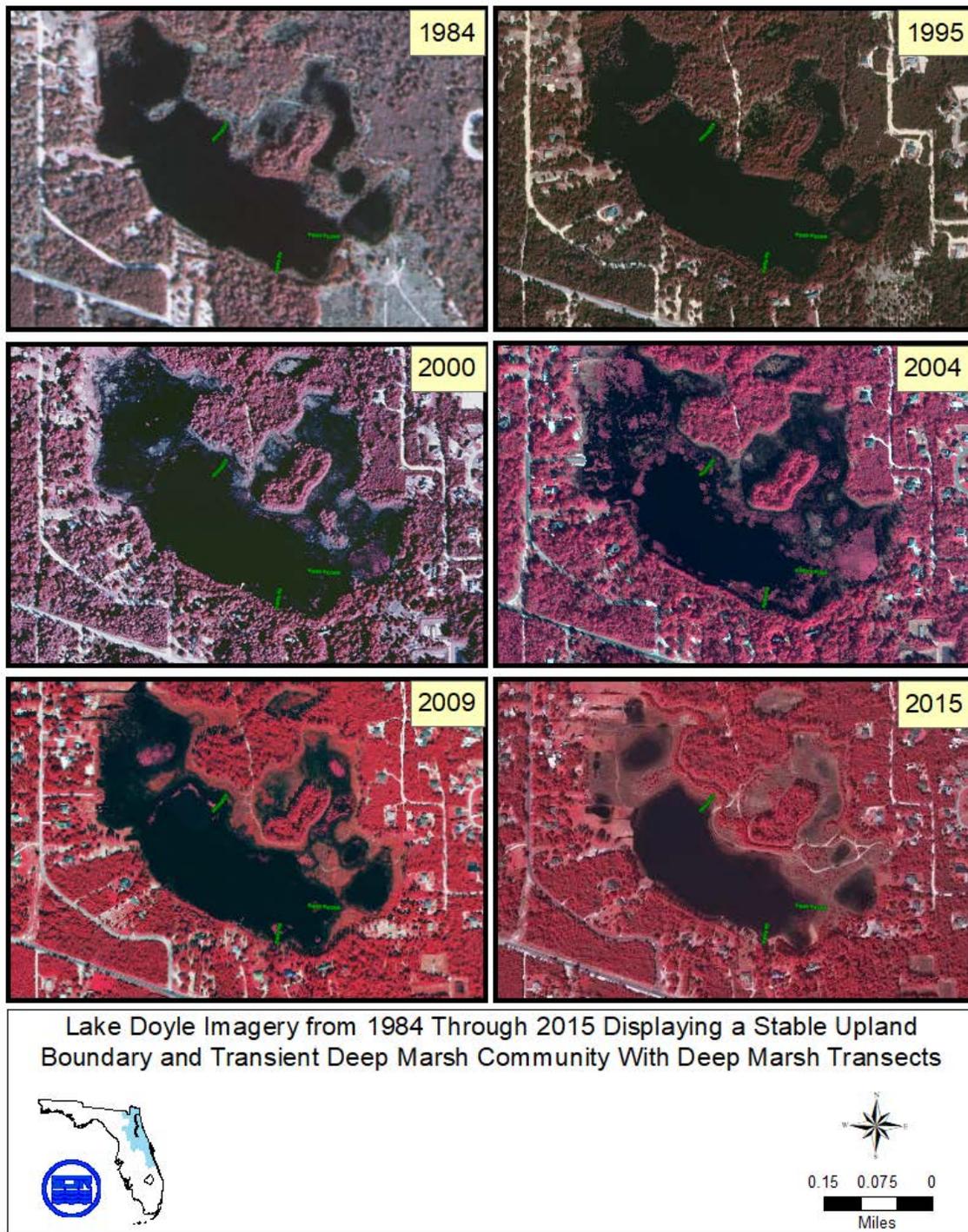


Figure 3. Location of Lake Doyle 2009 MFLs Transects and deep marsh cross-sections overlaid on infrared digital orthophotographs to illustrate the differences in the extent of deep marsh from 1984 through 2015

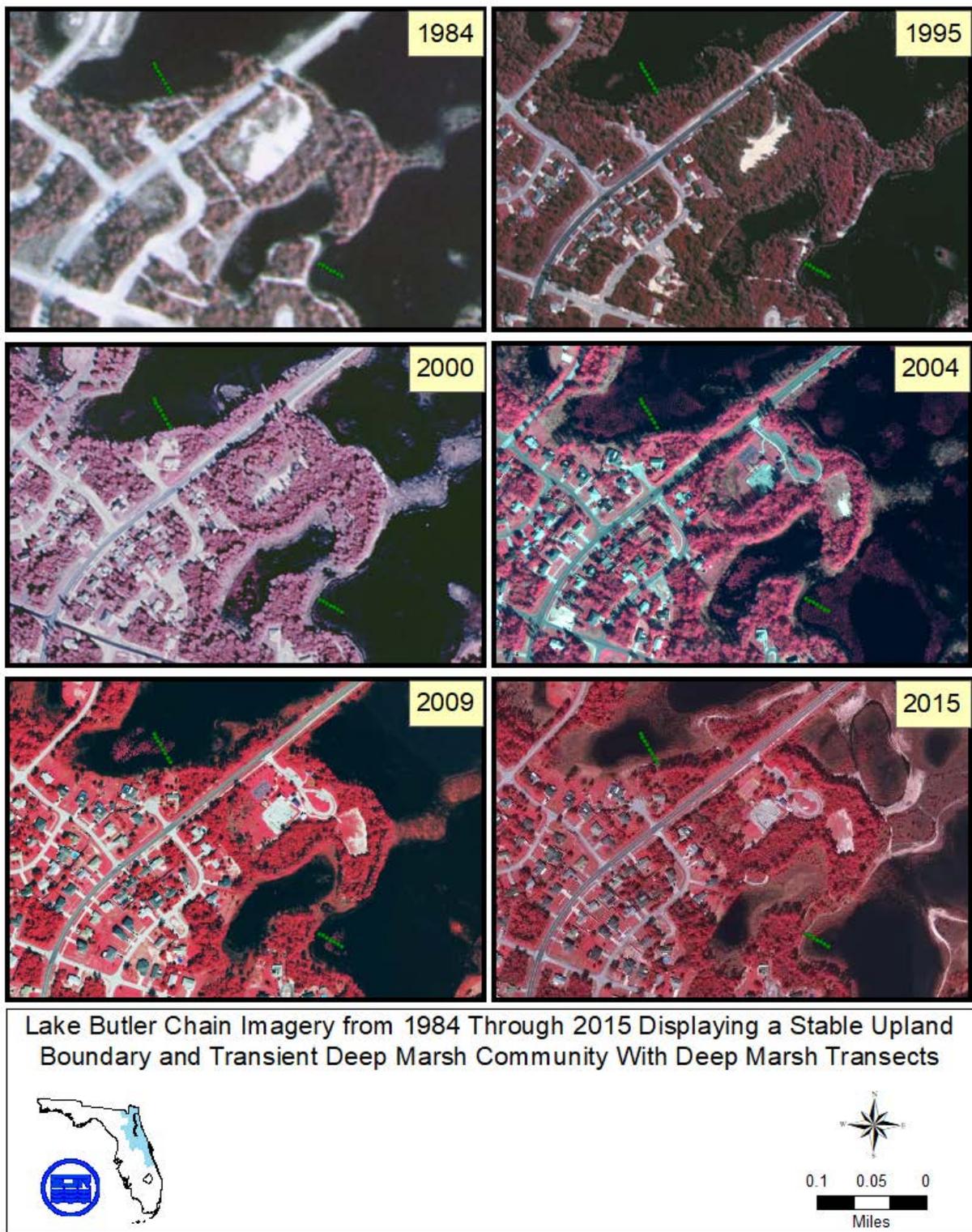


Figure 4. Location of Lake Butler 2009 MFLs Transects and deep marsh cross-sections overlaid on infrared digital orthophotographs to illustrate the differences in the extent of deep marsh from 1984 through 2015

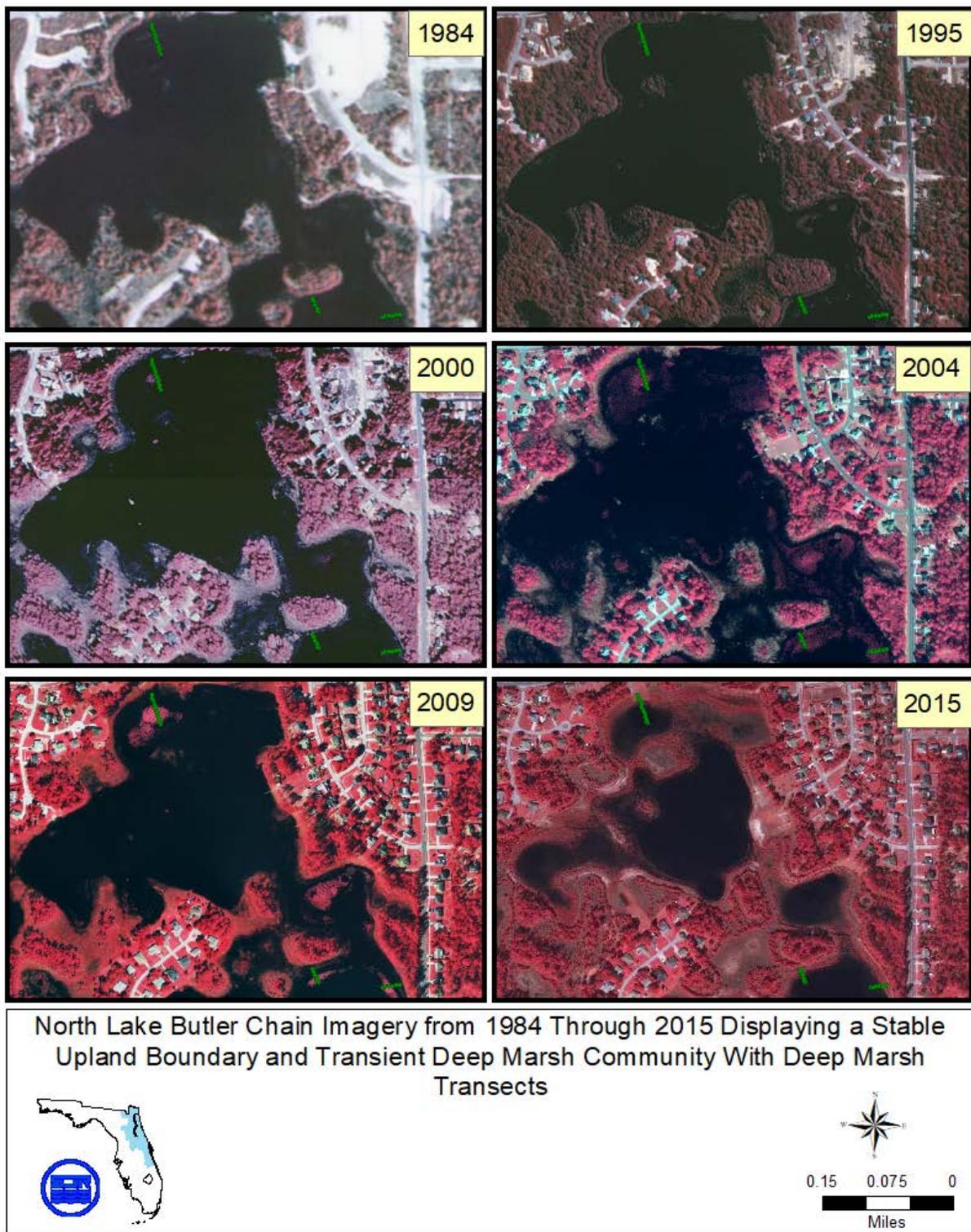


Figure 5. Location of more Lake Butler 2009 MFLs Transects and deep marsh cross-sections overlaid on infrared digital orthophotographs to illustrate the differences in the extent of deep marsh from 1984 through 2015



Figure 6. Sandhill crane incubating eggs on nest within Lake Doyle on the 11th of April 2018

Table 3. Summary of 2004 vegetation community and hydric soils elevation data for Lake Butler Chain and Lake Doyle (ft NAVD88)

Vegetation	Statistic	Transect Elevations (ft NAVD88)								
		Lake Butler Chain							Lake Doyle	
		1	2	3	4	5	6	7	8	9
Upland	Min	24.82	24.22	23.86	23.76	24.51	24.02	24	24.21	23.93
Wet Prairie	Max	24.82	24.22	23.86	23.76	24.51	24.02	24	24.21	23.93
	Mean	23.82	23.39	23.55	23.55	24.19	23.51	23.56	23.52	23.61
	Min	22.68	22.45	22.89	23.39	23.7	23	23.12	22.89	23.22
Shallow Marsh	Max	22.68	22.45	22.89	23.39	23.7	23	23.12	22.89	23.22
	Mean	20.92	21.02	21.04	22.15	22.05	21.31	21.76	21.53	21.7
	Min	19.37	19.74	19.22	20.94	20.59	19.71	20.3	20.56	20.37
Deep Marsh	Max	19.61	19.74	19.22	20.94	20.59	19.71	20.3	20.56	20.37
	Mean	17.32	18.63	18.24	19.3	19.02	18.88	19.72	18.15	18.07
	Min	16.68	17.9	17.65	18.04	18.04	17.69	19.23	16.3	15.99
Landward Hydric Soil Indicators		1	2	3	4	5	6	7	8	9
S6 - Stripped Matrix (6")		23.89	24.66				23.07	23.72	23.82	24.02
A7 - Mucky Mineral		22.14								
A8 - Muck Presence		21.64	21.32				21.61	21.92	22.02	21.62
Stripped Matrix (5")		23.31	24.42	24.29	24.02	23.52	22.92	23.42	23.72	23.72
Dark Splotches		21.22	21.32	-0.98	22.12	21.32	21.32	21.02	20.62	21.62
Degrading Spodic				21.32			19.85			
1" Muck		20.77								
Max. Elev Hydric Soil Indicators		23.89	24.66	24.29	24.02	23.52	23.07	23.72	23.82	24.02

Table 4. Average minimum elevation of uplands on Lake Butler Chain and Lake Doyle

UPLAND EDGE						
Lake	Transect	2004 Station (ft)	2004 Elevation (ft NAVD)	2009 Station (ft)	2009 Elevation (ft NAVD)	Average Elevation (ft NAVD)
Butler Chain	1	22	24.3	24	24.0	24.2
	5	14	24.5	13	24.6	24.5
	6	16	24.0	16	24.0	24.0
	7	34	24.0	34	24.0	24.0
Doyle	8	18	24.2	18	24.2	24.2
	9	6	23.9	6	23.9	23.9
Average		2004	24.1	2009	24.1	24.1
* Transects 2, 3, & 4 were not included: Transect 2 trail disturbance, Transect 3 unrecoverable, Transect 4 may not have been reestablished correctly						

VEGETATION DATA

Data Collected in 2004

Data collected during the 2004 field work is presented in the following tables (5-13). Numbers and abbreviations presented in the tables correspond to the following information:

1. **FWMD code indicator categories established in The Florida Wetlands Delineation Manual (Gilbert et al. 1995):**
 - a. **UPL = Upland plants that occur rarely in wetlands but occur almost always in uplands**
 - b. **FAC = Facultative plants with similar likelihood of occurring in both wetlands and uplands**
 - c. **FACW = Facultative wet plants that typically exhibit their maximum cover in areas subject to surface water flooding and/or soil saturation but may also occur in uplands**
 - d. **OBL = Obligate plants that are found or achieve their greatest abundance in an area, which is subject to surface water flooding and/or soil saturation; rarely uplands**
2. **Plant community abbreviations:**
 - a. **Up = Uplands**
 - b. **WP = Wet Prairie**
 - c. **SM= Shallow Marsh**
 - d. **DM = Deep Marsh**
3. **Plant Species Cover Estimates: Areal extent of vegetation species along transect within a given community where:**
 - a. **0 = <1% (rare)**
 - b. **1-10% (scattered)**
 - c. **11-25% (numerous)**
 - d. **26-50% (abundant)**
 - e. **51-75% (codominant)**
 - f. **5 = >75% (dominant)**
4. **Floating vegetation**

Table 5. Plant species, FWDM wetland indicator status, and estimated species occurrence for each plant community type occurring on Transect 1 at the Lake Butler Chain, Volusia County, FL in 2004

Scientific Name	Common Name	Vegetation Community ²				
		Name	UP	WP	SM	DM
		Start (ft)	0	22	38	86
		Stop (ft)	22	38	86	116
FWDM Code ¹	Plant Species Cover Estimates ³					
<i>Andropogon virginicus</i>	Broomsedge	FAC		3	1	
<i>Centella asiatica</i>	Coinwort	FACW			0	
<i>Cephalanthus occidentalis</i>	Buttonbush	OBL			1	
<i>Drosera capillaris</i>	Pink sundew	FACW			1	
<i>Eleocharis</i> sp.	Spikerush	OBL			1	
<i>Eriocaulon compressum</i>	Pipewort	OBL		1	0	
<i>Eupatorium capillifolium</i>	Dog fennel	FAC		1	2	
<i>Galactia elliotii</i>	Milkpea	UPL		1		
<i>Hypericum fasciculatum</i>	St. John's wort	OBL		0	1	
<i>Ilex glabra</i>	Gallberry	UPL	0	1		
<i>Lachnanthes caroliniana</i>	Redroot	FAC			0	
<i>Lycopodiella alopecuroides</i>	Fox club moss	FACW			1	
<i>Lyonia ferruginea</i>	Rusty lyonia	UPL	3	0		
<i>Lyonia lucida</i>	Shiny lyonia	FACW	1	2		
<i>Nymphaea odorata</i>	Fragrant water lily	OBL			1	3
<i>Panicum hemitomon</i>	Maidencane	OBL			1	1
<i>Panicum repens</i>	Torpedo grass	FACW			0	0
<i>Panicum</i> sp.	Panicum	UPL		0		
<i>Pinus elliotii</i>	Slash pine	UPL	1			
<i>Pluchea rosea</i>	Fleabane	FACW			0	
<i>Quercus geminata</i>	Sand live oak	UPL	3			
<i>Quercus myrtifolia</i>	Myrtle oak	UPL	3			
<i>Sabatia grandiflora</i>	Sabatia	FACW		0		
<i>Scleria reticularis</i>	Nut rush	FACW			2	
<i>Serenoa repens</i>	Saw palmetto	UPL	3			
<i>Smilax</i> sp.	Catbriar	UPL	1			
<i>Vaccinium myrsinites</i>	Shiny blueberry	UPL	1	0		

Table 6. Plant species, FWDM wetland indicator status, and estimated species occurrence for each plant community type occurring on Transect 2 at the Lake Butler Chain, Volusia County, FL in 2004

Scientific Name	Common Name	Vegetation Community ²				
		Name	UP	WP	SM	DM
		Start (ft)	0	28	48	86
		Stop (ft)	28	48	86	140
		FWDM Code ¹	Plant Species Cover Estimates ³			
<i>Amphicarpum muhlenbergianum</i>	Blue maidencane	FACW		1	0	
<i>Andropogon virginicus</i>	Broomsedge	FAC		3		
<i>Centella asiatica</i>	Coinwort	FACW		1	0	
<i>Drosera capillaris</i>	Pink sundew	FACW			1	
<i>Eriocaulon compressum</i>	Pipewort	OBL		1	0	
<i>Eupatorium capillifolium</i>	Dog fennel	FAC		1	1	
<i>Fuirena scirpoidea</i>	Fringe rush	OBL		1	3	
<i>Ilex glabra</i>	Gallberry	UPL	1	1		
<i>Lyonia ferruginea</i>	Rusty lyonia	UPL	3			
<i>Lyonia lucida</i>	Shiny lyonia	FACW	2	1		
<i>Nymphaea odorata</i>	Fragrant water lily	OBL			1	1
<i>Panicum hemitomon</i>	Maidencane	OBL		1	1	
<i>Panicum repens</i>	Torpedo grass	FACW				0
<i>Persea palustris</i>	Swamp bay	OBL	1			
<i>Pinus clausa</i>	Sand pine	UPL	1			
<i>Pinus elliotii</i>	Slash pine	UPL		2	0	
<i>Quercus geminata</i>	Sand live oak	UPL	2			
<i>Richardia scabra</i>	Florida pusley	UPL		0	0	
<i>Scleria reticularis</i>	Nut rush	FACW			2	
<i>Serenoa repens</i>	Saw palmetto	UPL	3			
<i>Smilax</i> sp.	Catbriar	UPL	1	0		
<i>Vaccinium myrsinites</i>	Shiny blueberry	UPL	1			

Table 7. Plant species, FWDM wetland indicator status, and estimated species occurrence for each plant community type occurring on Transect 3 at the Lake Butler Chain, Volusia County, FL in 2004

Scientific Name	Common Name	Vegetation Community ²				
		Name	UP	WP	SM	DM
		Start (ft)	0	32	40	58
		Stop (ft)	32	40	58	110
FWDM Code ¹	Plant Species Cover Estimates ³					
<i>Acer rubrum</i> (seedlings 2" tall)	Red maple	FACW			1	
<i>Andropogon virginicus</i>	Broomsedge	FAC	2	3	0	
<i>Centella asiatica</i>	Coinwort	FACW		1	2	
<i>Erechtites hieracifolia</i>	Fireweed	FAC			0	
<i>Eriocaulon compressum</i>	Pipewort	OBL		2	1	
<i>Eupatorium capillifolium</i>	Dog fennel	FAC		0	1	
<i>Fuirena scirpoidea</i>	Fringe rush	OBL		2	2	
<i>Hypericum fasciculatum</i>	St. John's wort	OBL			1	
<i>Ilex glabra</i>	Gallberry	UPL	1	1	0	
<i>Juncus</i> sp.	Rush	OBL		1	1	
<i>Lachnanthes caroliniana</i>	Redroot	FAC		0	1	
<i>Lycopodium alopecuroides</i>	Fox club moss	FACW			0	
<i>Lyonia lucida</i>	Shiny lyonia	FACW	1			
<i>Lyonia mariana</i>	fetter bush	FACW	1			
<i>Nymphaea odorata</i>	Fragrant water lily	OBL				1
<i>Panicum hemitomon</i>	Maidencane	OBL	0			
<i>Panicum portoricense</i>	Puerto Rico panic grass	UPL		0	1	
<i>Pinus clausa</i>	Sand pine	UPL	0			
<i>Pinus elliottii</i>	Slash pine	UPL	3	1	0	
<i>Quercus myrtifolia</i>	Myrtle oak	UPL	2			
<i>Quercus virginiana</i>	Live oak	UPL	3			
<i>Sabatia grandiflora</i>	Sabatia	FACW		1	0	
<i>Serenoa repens</i>	Saw palmetto	UPL	1	0		
<i>Smilax</i> sp.	Catbriar	UPL	1			

Table 8. Plant species, FWDM wetland indicator status, and estimated species occurrence for each plant community type occurring on Transect 4 at the Lake Butler Chain, Volusia County, FL in 2004

Scientific Name	Common Name	Vegetation Community ²				
		Name	UP	WP	SM	DM
		Start (ft)	0	28	32	60
		Stop (ft)	28	32	60	100
FWDM Code ¹	Plant Species Cover Estimates ³					
<i>Andropogon virginicus</i>	Broomsedge	FAC	1	1		
<i>Centella asiatica</i>	Coinwort	FACW			1	
<i>Eriocaulon compressum</i>	Pipewort	OBL		0	0	
<i>Eupatorium capillifolium</i>	Dog fennel	FAC			0	
<i>Fuirena scirpoidea</i>	Fringe rush	OBL			3	1
<i>Galactia elliotii</i>	Milkpea	UPL	1		1	
<i>Hypericum fasciculatum</i>	St. John's wort	OBL			2	1
<i>Ilex cassine</i>	Dahoon holly	OBL			1	
<i>Ilex glabra</i>	Gallberry	UPL	1	1	0	
<i>Juncus</i> sp.	Rush	OBL		0		
<i>Lycopodium alopecuroides</i>	Fox club moss	FACW			1	
<i>Lyonia lucida</i>	Shiny Lyonia	FACW	2			
<i>Lyonia mariana</i>	fetter bush	FACW	0	2	0	
<i>Nymphaea odorata</i>	Fragrant water lily	OBL			0	2
<i>Panicum hemitomon</i>	Maidencane	OBL	1	2	3	1
<i>Panicum repens</i>	Torpedo grass	FACW				1
<i>Pinus elliotii</i>	Slash pine	UPL	2	0	0	
<i>Quercus myrtifolia</i>	Myrtle oak	UPL	2			
<i>Quercus virginiana</i>	Live oak	UPL	4			
<i>Sabatia grandiflora</i>	Sabatia	FACW		1		
<i>Sagittaria</i> sp.	arrowhead	OBL			0	0
<i>Serenoa repens</i>	Saw palmetto	UPL	2			
<i>Smilax</i> sp.	Catbriar	UPL	1			
<i>Vaccinium myrsinites</i>	Shiny blueberry	UPL	3			
<i>Vaccinium stamineum</i>	Deerberry	UPL	2			

Table 9. Plant species, FWDM wetland indicator status, and estimated species occurrence for each plant community type occurring on Transect 5 at the Lake Butler Chain, Volusia County, FL in 2004

Scientific Name	Common Name	Vegetation Community ²				
		Name	UP	WP	SM	DM
		Start (ft)	0	14	22	60
		Stop (ft)	14	22	60	152
FWDM Code ¹	Plant Species Cover Estimates ³					
<i>Eupatorium capillifolium</i>	Dog fennel	FAC			2	
<i>Fuirena scirpoidea</i>	Fringe rush	OBL			3	1
<i>Galactia elliotii</i>	Milkpea	UPL	0	1	0	
<i>Hypericum fasciculatum</i>	St. John's wort	OBL			2	1
<i>Ilex glabra</i>	Gallberry	UPL	2	1	1	
<i>Lachnanthes caroliniana</i>	Redroot	FAC			0	
<i>Limnobiium spongia</i>	Frog's bit	OBL				1
<i>Ludwigia peruviana</i>	Primrose willow	OBL			1	
<i>Lyonia lucida</i>	Shiny lyonia	FACW	0	1		
<i>Myrica cerifera</i>	Wax myrtle	FAC			0	
<i>Nymphaea odorata</i>	Fragrant water lily	OBL			0	3
<i>Panicum hemitomon</i>	Maidencane	OBL	0	1	3	
<i>Panicum repens</i>	Torpedo grass	FACW			0	1
<i>Pinus elliotii</i>	Slash pine	UPL	2			
<i>Pluchea rosea</i>	Fleabane	FACW			0	
<i>Quercus laurifolia</i>	Laurel oak	FACW	3			
<i>Quercus myrtifolia</i>	Myrtle oak	UPL	1			
<i>Sagittaria</i> sp.	arrowhead	OBL			1	0
<i>Smilax</i> sp.	Catbriar	UPL	0	1		
<i>Vaccinium myrsinites</i>	Shiny blueberry	UPL	2			
<i>Vaccinium stamineum</i>	Deerberry	UPL	2			
<i>Vitis rotundifolia</i>	Muscadine grape	UPL	2	1	2	

Table 10. Plant species, FWDM wetland indicator status, and estimated species occurrence for each plant community type occurring on Transect 6 at the Lake Butler Chain, Volusia County, FL in 2004

Scientific Name	Common Name	Vegetation Community ²				
		Name	UP	WP	SM	D M
		Start (ft)	0	16	28	8 0
		Stop (ft)	16	28	80	1 2 0
FWDM Code ¹	Plant Species Cover Estimates ³					
<i>Amphicarpum muhlenbergianum</i>	Blue maidencane	FACW			1	
<i>Andropogon virginicus</i>	Broomsedge	FAC	0	3	0	
<i>Centella asiatica</i>	Coinwort	FACW		0	1	
<i>Erechtites hieracifolia</i>	Fireweed	FAC			0	
<i>Eriocaulon compressum</i>	Pipewort	OBL			1	
<i>Fuirena scirpoidea</i>	Fringe rush	OBL		1	3	1
<i>Hypericum fasciculatum</i>	St. John's wort	OBL			1	
<i>Lachnanthes caroliniana</i>	Redroot	FAC			1	
<i>Limnobium spongia</i>	Frog's bit	OBL			1	1
<i>Ludwigia suffruticosa</i>	Primrose willow	FACW		0	1	
<i>Lycopodium alopecuroides</i>	Fox club moss	FACW			1	
<i>Lyonia ferruginea</i>	Rusty lyonia	UPL	2	0		
<i>Lyonia lucida</i>	Shiny lyonia	FACW	1	1		
<i>Nymphaea odorata</i>	Fragrant water lily	OBL				1
<i>Panicum hemitomon</i>	Maidencane	OBL			2	1
<i>Panicum portoricense</i>	Puerto Rico panic grass	UPL			0	
<i>Persea palustris</i>	Swamp bay	OBL	1			
<i>Pinus clausa</i>	Sand pine	UPL	2	1		
<i>Pinus elliotii</i>	Slash pine	UPL	2	2	0 (seedling)	
<i>Quercus geminata</i>	Sand live oak	UPL	2			
<i>Richardia scabra</i>	Florida pusley	UPL		0		
<i>Sabatia grandiflora</i>	Sabatia	FACW		0	0	
<i>Sagittaria</i> sp.	arrowhead	OBL			1	
<i>Scleria reticularis</i>	Nut rush	FACW			1	
<i>Serenoa repens</i>	Saw palmetto	UPL	3			

Table 11. Plant species, FWDM wetland indicator status, and estimated species occurrence for each plant community type occurring on Transect 7 at the Lake Butler Chain, Volusia County, FL in 2004

Scientific Name	Common Name	Vegetation Community ²				
		Name	UP	WP	SM	DM
		Start (ft)	0	34	52	106
		Stop (ft)	34	52	106	120
FWDM Code ¹	Plant Species Cover Estimates ³					
<i>Amphicarpum muhlenbergianum</i>	Blue maidencane	FACW			2	
<i>Andropogon virginicus</i>	Broomsedge	FAC	1	3	0	
<i>Eriocaulon compressum</i>	Pipewort	OBL		1	1	
<i>Eupatorium capillifolium</i>	Dog fennel	FAC		0	1	
<i>Fuirena scirpoidea</i>	Fringe rush	OBL		1	3	1
<i>Hypericum fasciculatum</i>	St. John's wort	OBL			2	
<i>Ilex glabra</i>	Gallberry	UPL	1	2		
<i>Juncus</i> sp.	Rush	OBL		0	1	
<i>Lachnanthes caroliniana</i>	Redroot	FAC		0	1	
<i>Limnobiium spongia</i>	Frog's bit	OBL			1	1
<i>Ludwigia suffruticosa</i>	Primrose willow	FACW		0	2	0
<i>Lyonia lucida</i>	Shiny Lyonia	FACW	3	2		
<i>Myrica cerifera</i>	Wax myrtle	FAC			0	
<i>Nymphaea odorata</i>	Fragrant water lily	OBL			0	1
<i>Panicum hemitomom</i>	Maidencane	OBL			1	1
<i>Panicum portoricense</i>	Puerto Rico panic grass	UPL	1	1	1	
<i>Pinus clausa</i>	Sand pine	UPL	1			
<i>Pinus elliotii</i>	Slash pine	UPL	2	2		
<i>Polygala rugelii</i>	Yellow Milkwort	FACW		1	1	
<i>Quercus geminata</i>	Sand live oak	UPL	2			
<i>Sabatia grandiflora</i>	Sabatia	FACW		0	0	
<i>Sagittaria</i> sp.	arrowhead	OBL			1	
<i>Serenoa repens</i>	Saw palmetto	UPL	1	0		

Table 12. Plant species, FWDM wetland indicator status, and estimated species occurrence for each plant community type occurring on Transect 8 at the Lake Butler Chain, Volusia County, FL in 2004

Scientific Name	Common Name	Vegetation Community ²				
		Name	UP	WP	SM	DM
		Start (ft)	0	18	44	90
		Stop (ft)	18	44	90	200
FWDM Code ¹	Plant Species Cover Estimates ³					
<i>Amphicarpum muhlenbergianum</i>	Blue maidencane	FACW			1	
<i>Andropogon virginicus</i>	Broomsedge	FAC	1	3	0	
<i>Centella asiatica</i>	Coinwort	FACW		0	1	
<i>Drosera capillaris</i>	Pink sundew	FACW			1	
<i>Erechtites hieracifolia</i>	Fireweed	FAC			0	
<i>Eriocaulon compressum</i>	Pipewort	OBL			1	
<i>Eupatorium capillifolium</i>	Dog fennel	FAC		0	1	
<i>Fuirena scirpoidea</i>	Fringe rush	OBL			3	1
<i>Hypericum fasciculatum</i>	St. John's wort	OBL			1	1 (most dead)
<i>Ilex glabra</i>	Gallberry	UPL	2	2		
<i>Lachnanthes caroliniana</i>	Redroot	FAC			1	0
<i>Limnobium spongia</i>	Frog's bit	OBL			1	0
<i>Lycopodium alopecuroides</i>	Fox club moss	FACW			1	
<i>Lyonia ferruginea</i>	Rusty lyonia	UPL	3	2		
<i>Lyonia mariana</i>	Fetter bush	FACW	1			
<i>Nymphaea odorata</i>	Fragrant water lily	OBL			0	3
<i>Panicum hemitomon</i>	Maidencane	OBL		0	2	1
<i>Panicum portoricense</i>	Puerto Rico panic grass	UPL		0	0	
<i>Persea palustris</i>	Swamp bay	OBL	0	1		
<i>Pinus elliotii</i>	Slash pine	UPL	2	2	1	
<i>Quercus geminata</i>	Sand live oak	UPL	2			
<i>Quercus myrtifolia</i>	Myrtle oak	UPL	1			
<i>Richardia scabra</i>	Florida pusley	UPL		0	1	
<i>Sabatia grandiflora</i>	Sabatia	FACW		0	1	
<i>Sagittaria</i> sp.	arrowhead	OBL			1	0
<i>Scleria reticularis</i>	Nut rush	FACW			1	
<i>Vaccinium myrsinites</i>	Shiny blueberry	UPL	3			
<i>Vaccinium stamineum</i>	Deerberry	UPL	1			

Table 13. Plant species, FWDM wetland indicator status, and estimated species occurrence for each plant community type occurring on Transect 9 at the Lake Butler Chain, Volusia County, FL in 2004

Scientific Name	Common Name	Vegetation Community ²				
		Name	UP	WP	SM	DM
		Start (ft)	0	6	12	38
		Stop (ft)	6	12	38	90
		FWDM Code ¹	Plant Species Cover Estimates ³			
<i>Centella asiatica</i>	Coinwort	FACW			1	
<i>Eupatorium capillifolium</i>	Dog fennel	FAC			2	
<i>Fuirena scirpoidea</i>	Fringe rush	OBL			1	1
<i>Hydrocotyle</i> sp.	pennywort	FACW			1	0
<i>Ilex glabra</i>	Gallberry	UPL	1			
<i>Lachnanthes caroliniana</i>	Redroot	FAC			1	
<i>Limnobiium spongia</i>	Frog's bit	OBL			1	0
<i>Ludwigia suffruticosa</i>	Primrose willow	FACW			1	1
<i>Lyonia lucida</i>	Shiny lyonia	FACW	1	1	1	
<i>Lyonia mariana</i>	fetter bush	FACW	1			
<i>Nymphaea odorata</i>	Fragrant water lily	OBL			0	3
<i>Panicum hemitomon</i>	Maidencane	OBL	0	1	3	1
<i>Pinus elliotii</i>	Slash pine	UPL	2	2	0	
<i>Quercus myrtifolia</i>	Myrtle oak	UPL	2	1		
<i>Smilax</i> sp.	Catbriar	UPL	1	1	0	
<i>Vaccinium stamineum</i>	Deerberry	UPL	1			

Data collected in 2009

Data collected during the 2009 field work is presented in the following tables (14-21). Numbers presented in the tables correspond to the following information:

1. **FWMD code indicator categories established in The Florida Wetlands Delineation Manual (Gilbert et al. 1995):**
 - a. **UPL = Upland plants that occur rarely in wetlands but occur almost always in uplands**
 - b. **FAC = Facultative plants with similar likelihood of occurring in both wetlands and uplands**
 - c. **FACW = Facultative wet plants that typically exhibit their maximum cover in areas subject to surface water flooding and/or soil saturation but may also occur in uplands**
 - d. **OBL = Obligate plants that are found or achieve their greatest abundance in an area, which is subject to surface water flooding and/or soil saturation; rarely uplands**
2. **Plant community abbreviations (if multiple communities present then abbreviation is followed by community #):**
 - a. **Up = Uplands**
 - b. **WP = Wet Prairie**
 - c. **SM= Shallow Marsh**
 - d. **DM = Deep Marsh**
 - e. **Trz = Transitional Zone**
 - f. **Ow = Open Water**
3. **Plant Species Cover Estimates: Areal extent of vegetation species along transect within a given community where:**
 - a. **0 = <1% (rare)**
 - b. **1-10% (scattered)**
 - c. **11-25% (numerous)**
 - d. **26-50% (abundant)**
 - e. **51-75% (codominant)**
 - f. **5 = >75% (dominant)**
4. **Floating vegetation**

Table 14. Plant species, FWDM wetland indicator status, and estimated species occurrence for each plant community type occurring on Transect 1 at the Lake Butler Chain, Volusia County, FL in 2009

Scientific Name	Common Name	Vegetation Community ²									
		Name	UP	WP	SM 1	SM 2	TRZ	DM 1	DM 2	OW	DM 3
		Start (ft)	0	24	45	55	74	81	91	96	130
		Stop (ft)	24	25	55	74	81	91	96	130	200
FWDM Code ¹	Plant Species Cover Estimates ³										
<i>Amphicarpum muhlenbergianum</i>	Blue maidencane	FACW		1	3	1					
<i>Andropogon brachystachyus</i>	Shortspike bluestem	FAC		5	1	0					
<i>Andropogon</i> sp.	Bluestem grass	UL						1			
<i>Centella asiatica</i>	Coinwort	FACW									
<i>Dichantherium erectifolium</i>	Panic Grass	OBL		0	1	2					
<i>Dichantherium portoricense</i>	Hemlock Witchgrass	UL		1	1	0					
<i>Drosera</i> sp.	Sundew	UL			1	1					
<i>Eragrostis spectabilis</i>	Purple lovegrass	FAC		1							
<i>Eupatorium capillifolium</i>	Dog fennel	FAC			0	1					
<i>Fuirena scirpoidea</i>	Fringe rush	OBL				2		2			
<i>Hypericum</i> sp.	St. Johns wort	UL						1			
<i>Ilex glabra</i>	Gallberry	UL	1								
<i>Lachnocaulon</i> sp.	Bogbutton	UL				1					
<i>Ludwigia</i> sp.	Ludwigia	UL				1	1				
<i>Lyonia ferruginea</i>	Rusty lyonia	UL	3								
<i>Lyonia lucida</i>	Shiny lyonia	FACW	1								
<i>Lyonia mariana</i>	Staggerbush	FACW	0	1							
<i>Nymphaea odorata</i>	Fragrant waterlily	OBL					1		1		4
<i>Panicum hemitomon</i>	Maidencane	OBL						1			
<i>Pinus elliotii</i>	Slash pine	UL	3								
<i>Pinus</i> sp. (seedlings)	Pine	UL			0	1					
<i>Quercus geminata</i>	Sand live oak	UL	2								
<i>Quercus myrtifolia</i>	Myrtle oak	UL	1								
<i>Serenoa repens</i>	Saw palmetto	UL	2								
<i>Utricularia radiata</i>	Bladderwort	OBL						3			
<i>Vaccinium myrsinites</i>	Shiny blueberry	UL	1								
<i>Xyris</i> sp.	Yellow-eye grass	UL			1	2		1			

Table 15. Plant species, FWDM wetland indicator status, and estimated species occurrence for each plant community type occurring on Transect 2 at the Lake Butler Chain, Volusia County, FL in 2009

Scientific Name	Common Name	Vegetation Community ²							
		Name	UP	TRZ 1 (Trail)	TRZ 2	SM 1	SM 2	DM 1	DM 2
		Start (ft)	0	5	15	37	50	70	116
		Stop (ft)	5	15	37	50	70	116	140
		FWDM Code ¹	Plant Species Cover Estimates ³						
<i>Amphicarpum muhlenbergianum</i>	Blue maidencane	FACW	1		3	3	2		
<i>Andropogon brachystachyus</i>	Shortspike bluestem	FAC	1		3	4	2	1	
<i>Dichantheium erectifolium</i>	Panic Grass	OBL				0	1		
<i>Dichantheium portoricense</i>	Hemlock Witchgrass	UL			1	0			
<i>Drosera</i> sp.	Sundew	UL				1	1		
<i>Eupatorium capillifolium</i>	Dog fennel	FAC				0	1	1	
<i>Ilex glabra</i>	Gallberry	UL	1						
<i>Lachnocaulon</i> sp.	Bogbutton	UL				1	1		
<i>Ludwigia repens</i>	Red ludwigia	OBL					2	1	
<i>Lyonia ferruginea</i>	Rusty lyonia	UL	3						
<i>Lyonia lucida</i>	Shiny lyonia	FACW	2						
<i>Persea borbonia</i> var. <i>humilis</i>	Red bay	UL	2						
<i>Pinus clausa</i>	Sand pine	UL	0						
<i>Pinus elliotii</i>	Slash pine	UL	0		3				
<i>Pinus</i> sp. (seedlings)	Pine	UL			0	0	1		
<i>Quercus geminata</i>	Sand live oak	UL	2						
<i>Serenoa repens</i>	Saw palmetto	UL							
<i>Utricularia</i> sp.	Bladderwort	OBL					1	5	5
<i>Vaccinium myrsinites</i>	Shiny blueberry	UL							
<i>Xyris</i> sp.	Yellow-eye grass	UL					1	1	1

Table 16. Plant species, FWDM wetland indicator status, and estimated species occurrence for each plant community type occurring on Transect 4 at the Lake Butler Chain, Volusia County, FL in 2009

Scientific Name	Common Name	Vegetation Community ²								
		Name	UP	TRZ 1 (Trail)	WP	TRZ 2	SM	TRZ 3	DM 1	DM 2
		Start (ft)	0	10	20	33	46	54	59	69
		Stop (ft)	10	20	33	46	54	59	69	83
		FWDM Code ¹	Plant Species Cover Estimates ³							
<i>Amphicarpum muhlenbergianum</i>	Blue maidencane	FACW	0	3	4	5	2	1		
<i>Andropogon sp. (glauca)</i>	Bluestem grass	UL		1	1					
<i>Andropogon sp.</i>	Bluestem grass	UL				2	1	1	1	
<i>Centella asiatica</i>	Coinwort	FACW			1	1				
<i>Eupatorium capillifolium</i>	Dog fennel	FAC						1	1	
<i>Fuirena scirpoidea</i>	Fringe rush	OBL					0	2	1	
<i>Hypericum fasciculatum</i>	St. Johns wort	OBL					1	1		
<i>Hypericum tetrapetalum</i>	St. Peter's wort	FAC			1	0				
<i>Ilex cassine</i>	Dahoon holly	OBL				1				
<i>Ilex glabra</i>	Gallberry	UL		1	1					
<i>Ludwigia sp.</i>	Ludwigia	UL						0		
<i>Lyonia lucida</i>	Shiny lyonia	FACW	3	1						
<i>Lyonia mariana</i>	Staggerbush	FACW	1		1					
<i>Myrica cerifera</i>	Wax myrtle	FAC				1		0		
<i>Panicum hemitomon</i>	Maidencane	OBL								1
<i>Pinus sp. (seedlings)</i>	Pine	UL	0	0	1	0				
<i>Quercus geminata</i>	Sand live oak	UL	3							
<i>Serenoa repens</i>	Saw palmetto	UL	1							
<i>Vaccinium myrsinites</i>	Shiny blueberry	UL	2	1						

Table 17. Plant species, FWDM wetland indicator status, and estimated species occurrence for each plant community type occurring on Transect 5 at the Lake Butler Chain, Volusia County, FL in 2009

Scientific Name	Common Name	Vegetation Community ²						
		Name	UP	TRZ	SM 1	SM 2	OW	SM 3
		Start (ft)	0	13	26	58	136	153
		Stop (ft)	13	26	58	136	153	190
FWDM Code ¹	Plant Species Cover Estimates ³							
<i>Amphicarpum muhlenbergianum</i>	Blue maidencane	FACW	1	4	3	1		
<i>Andropogon</i> sp.	Bluestem grass	UL			4	3		
<i>Andropogon</i> sp. (var. <i>glauca</i>)	Bluestem grass	UL			1			
<i>Centella asiatica</i>	Coinwort	FACW			1			
<i>Eupatorium capillifolium</i>	Dog fennel	FAC		0	1	0		
<i>Fuirena scirpoidea</i>	Fringe rush	OBL			0			
<i>Hypericum fasciculatum</i>	St. Johns wort	OBL			1	0		
<i>Ilex glabra</i>	Gallberry	UL	3	2				
<i>Ludwigia</i> sp.	Ludwigia	UL			2	1		
<i>Lyonia lucida</i>	Shiny lyonia	FACW		1				
<i>Myrica cerifera</i>	Wax myrtle	FAC			1			
<i>Nymphaea odorata</i>	Fragrant waterlily	OBL				1		
<i>Panicum hemitomon</i>	Maidencane	OBL						2
<i>Pinus</i> sp. (seedlings)	Pine	UL		2				
<i>Quercus geminata</i>	Sand live oak	UL	2					
<i>Quercus laurifolia</i>	Laurel oak	FACW	3	1				
<i>Quercus minima</i>	Dwarf live oak	UL	1					
<i>Quercus</i> sp.	Oak	UL	2					
<i>Serenoa repens</i>	Saw palmetto	UL	1					
<i>Spartina</i> sp.	Cordgrass	UL		1	1	0		
<i>Vaccinium myrsinites</i>	Shiny blueberry	UL	1	0				

Table 18. Plant species, FWDM wetland indicator status, and estimated species occurrence for each plant community type occurring on Transect 6 at the Lake Butler Chain, Volusia County, FL in 2009

Scientific Name	Common Name	Vegetation Community ²					
		Name	UP	WP	SM	TRZ	DM
		Start (ft)	0	16	31	51	75
		Stop (ft)	16	31	51	75	128
FWDM Code ¹	Plant Species Cover Estimates ³						
<i>Amphicarpum muhlenbergianum</i>	Blue maidencane	FACW		2	4	3	2
<i>Andropogon virginicus</i>	Broomsedge	FAC		2		0	1
<i>Baccharis halimifolia</i>	Salt myrtle	FAC				0	
<i>Bejaria racemosa</i>	Tarflower	UL	1				
<i>Dichantheium portoricense</i>	Hemlock Witchgrass	UL		2	1	1	
<i>Drosera</i> sp.	Sundew	UL			1	1	
<i>Erechtites hieraciifolius</i>	Fireweed	FAC					0
<i>Eupatorium capillifolium</i>	Dog fennel	FAC		0	1	1	
<i>Fuirena scirpoidea</i>	Fringe rush	OBL					2
<i>Hypericum fasciculatum</i>	St. Johns wort	OBL			0	1	0
<i>Hypericum</i> sp.	St. Johns wort	UL					1
<i>Ludwigia</i> sp.	Ludwigia	UL			1	1	0
<i>Lyonia ferruginea</i>	Rusty lyonia	UL	2				
<i>Lyonia lucida</i>	Shiny lyonia	FACW	1	0			
<i>Lyonia mariana</i>	Staggerbush	FACW	1				
<i>Pinus clausa</i>	Sand pine	UL	1				
<i>Pinus elliotii</i>	Slash pine	UL	3				
<i>Pinus</i> sp. (seedlings)	Pine	UL		0	0	3	
<i>Quercus geminata</i>	Sand live oak	UL	1				
<i>Serenoa repens</i>	Saw palmetto	UL	4				
<i>Utricularia</i> sp.	Bladderwort	OBL					4

Table 19. Plant species, FWDM wetland indicator status, and estimated species occurrence for each plant community type occurring on Transect 7 at the Lake Butler Chain, Volusia County, FL in 2009

Scientific Name	Common Name	Vegetation Community							
		Name	UP	TZ1	TZ2	SM 1	SM2	SM3	DM
		Start (ft)	0	34	45	52	68	95	107
		Stop (ft)	34	45	52	68	95	107	154
		FWDM Code	Plant Species Cover Estimates						
<i>Amphicarpum muhlenbergianum</i>	Blue maidencane	FACW				1	4	4	1
<i>Andropogon sp.</i>	Bluestem grass	UL	1	4	4	3	0		
<i>Andropogon sp. (var. glauca)</i>	Bluestem grass	UL				1	1		
<i>Centella asiatica</i>	Coinwort	FACW					1	1	
<i>Cladonia sp.</i>	Reindeer moss	-	1	0					
<i>Dichanthelium erectifolium</i>	Panic Grass	OBL						0	1
<i>Dichanthelium portoricense</i>	Hemlock Witchgrass	UL			1	2	1	1	
<i>Eragrostis spectabilis</i>	Purple lovegrass	FAC			0	1	1		
<i>Eupatorium capillifolium</i>	Dog fennel	FAC				1	0	1	0
<i>Fuirena scirpoidea</i>	Fringe rush	OBL						2	4
<i>Hypericum fasciculatum</i>	St. Johns wort	OBL						1	0
<i>Hypericum sp.</i>	St. Johns wort	UL	1						
<i>Ilex glabra</i>	Gallberry	UL	1	2					
<i>Lachnocaulon sp.</i>	Bogbutton	UL				0	1	0	
<i>Ludwigia sp. 1</i>	Ludwigia	UL				1	0	1	0
<i>Ludwigia sp. 2</i>	Ludwigia	UL						0	0
<i>Lyonia lucida</i>	Shiny Lyonia	FACW	4	2					
<i>Lyonia mariana</i>	Staggerbush	FACW	1	1					
<i>Myrica cerifera</i>	Wax myrtle	FAC					0		
<i>Pinus clausa</i>	Sand pine	UL	1						

<i>Pinus elliottii</i>	Slash pine	UL	2	1	1				
<i>Pinus elliottii</i> (seedlings)	Slash pine	UL				0	0		
<i>Quercus geminata</i>	Sand live oak	UL	1						
<i>Rhynchospora sp.</i>	Beak rush	UL						0	0
<i>Xyris sp.</i>	Yellow-eye grass	UL					1	0	0

Table 20. Plant species, FWDM wetland indicator status, and estimated species occurrence for each plant community type occurring on Transect 8 at Lake Doyle, Volusia County, FL in 2009

Common Name	Vegetation Community									
	Name	UP	TZ	SM 1	SM2	TZ	DM1	DM2	DM3	DM4
	Start (ft)	0	18	44	76	96	109	140	166	195
	Stop (ft)	18	44	76	96	109	140	166	195	270
	FWDM Code	Plant Species Cover Estimates								
Blue maidencane	FACW		0	5	5	5	4			
Bluestem grass	UL	1	5	1	2	1				
Coinwort	FACW				1	1				
Panic Grass	OBL						0	0		
Hemlock Witchgrass	UL		0	0	0					
Sundew	UL				1	1				
Dog fennel	FAC			0	1	1	1	1		
Fringe rush	OBL						0	1		
St. Johns wort	OBL		0	1	1	1				
Gallberry	UL	1	2	0						
Smalls's bogbutton	OBL				1	1				
Ludwigia	UL				0	0	0			
Clubmoss	FACW					1	0			
Rusty lyonia	UL	4	1							

Fragrant waterlily	OBL						1	2	1	1
Swamp bay	OBL	1								
Slash pine	UL	3	3							
Slash pine	UL	1		0	1	0				
Sand live oak	UL	2								
Myrtle & Dwarf live oak	UL	0								
Saw palmetto	UL	1								
Bladderwort	OBL					0	1	0		
Shiny blueberry	UL	1								

Table 21. Plant species, FWDM wetland indicator status, and estimated species occurrence for each plant community type occurring on Transect 9 at Lake Doyle, Volusia County, FL in 2009

Scientific Name	Common Name	Vegetation Community							
		Name	UP1	UP2	WP	SM	DM1	DM2	DM3
		Start (ft)	0	6	12	38	48	68	72
		Stop (ft)	6	12	38	48	68	72	108
		FWDM Code	Plant Species Cover Estimates						
<i>Andropogon glomeratus</i> var. <i>glaucopsis</i>	Broomsedge	FACW			1	1	1		
<i>Baccharis halimifolia</i>	Salt myrtle	FAC				0			
<i>Centella asiatica</i>	Coinwort	FACW			1	2			
<i>Eupatorium capillifolium</i>	Dog fennel	FAC			3	2	1		
<i>Fuirena scirpoidea</i>	Fringe rush	OBL				2	2		
<i>Hypericum fasciculatum</i>	St. Johns wort	OBL			1	1			
<i>Ilex glabra</i>	Gallberry	UL		1					
<i>Ludwigia</i> sp.	Ludwigia	UL			1	2	0		
<i>Lyonia lucida</i>	Shiny lyonia	FACW							
<i>Lyonia mariana</i>	Staggerbush	FACW	1	1					
<i>Myrica cerifera</i>	Wax Myrtle	FAC		0		1			
<i>Nymphaea odorata</i>	Fragrant waterlily	OBL					1	2	2
<i>Panicum hemitomon</i>	Maidencane	OBL						0	
<i>Panicum</i> sp.	Panicum	UL	0	0	3	2	1		
<i>Pinus elliotii</i>	Slash pine	UL	2	3					
<i>Quercus myrtifolia</i>	Myrtle Oak	UL	2						
<i>Quercus virginiana</i>	Live Oak	UL	3						
<i>Rhynchospora chalarocephala</i>	Beakrush	FACW						1	
<i>Vaccinium myrsinites</i>	Shiny blueberry	UL	1						

SOILS DATA:**Jones Edmunds Report (Transects 1-7)**

Saint Johns River Water Management District contracted JEA (2006; Project No. 19750-030-03) to perform soil analysis at Lake Butler. An additional attempt was made in 2018 to discover if organic soils were present to no avail. The following figures (Figures 9-15) and tables (Table 22) are from the JEA report describing soils at transects 1-9. Figures and tables have been updated to NAVD88 from NGVD29. The USDA NRCS field indicators of hydric soils Version 5.01 was used during soil examinations made in 2004 as presented in the JEA report.

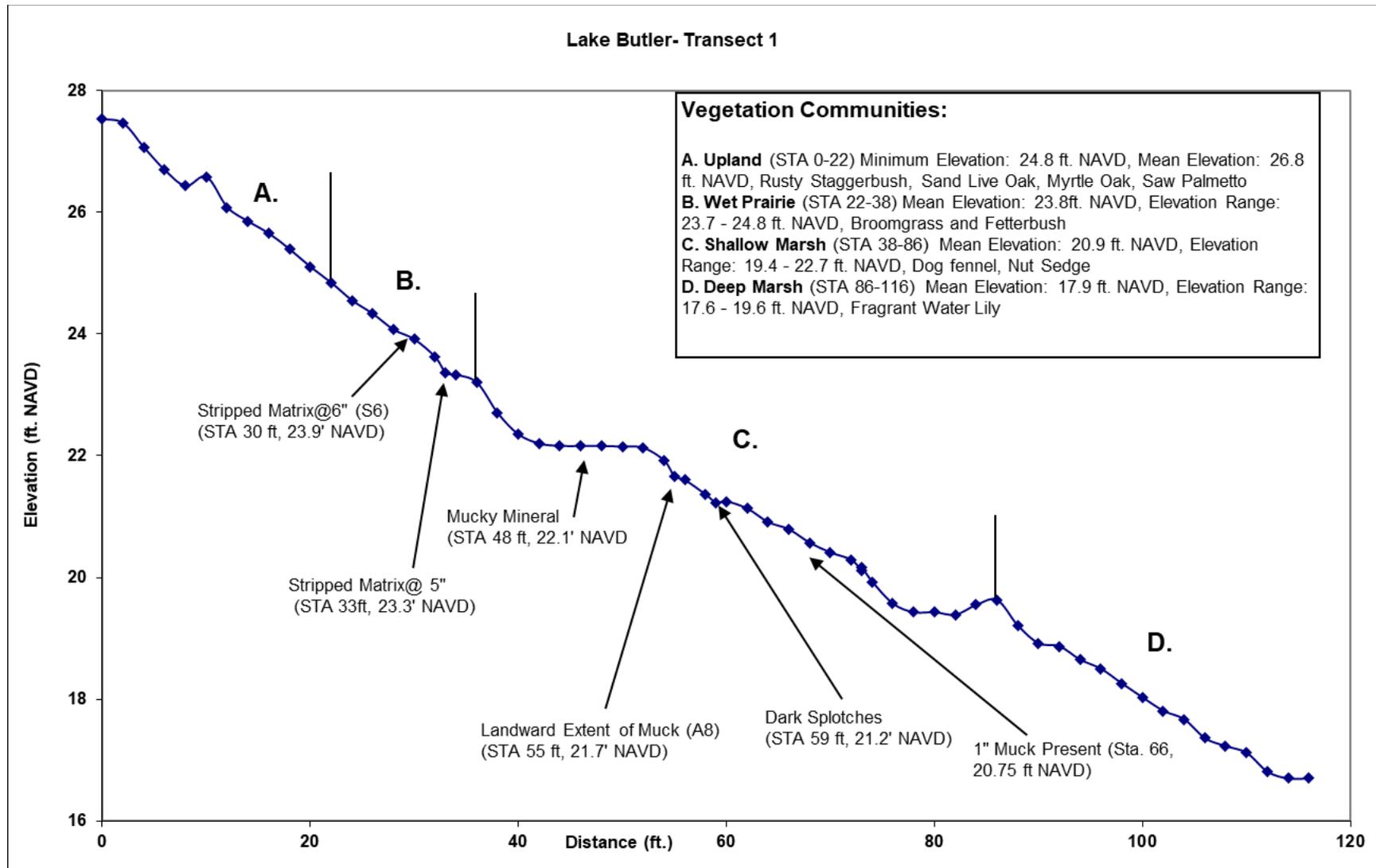


Figure 7. Transect 1 – Relating Soils, Vegetation and Topography in the Lake Butler Chain

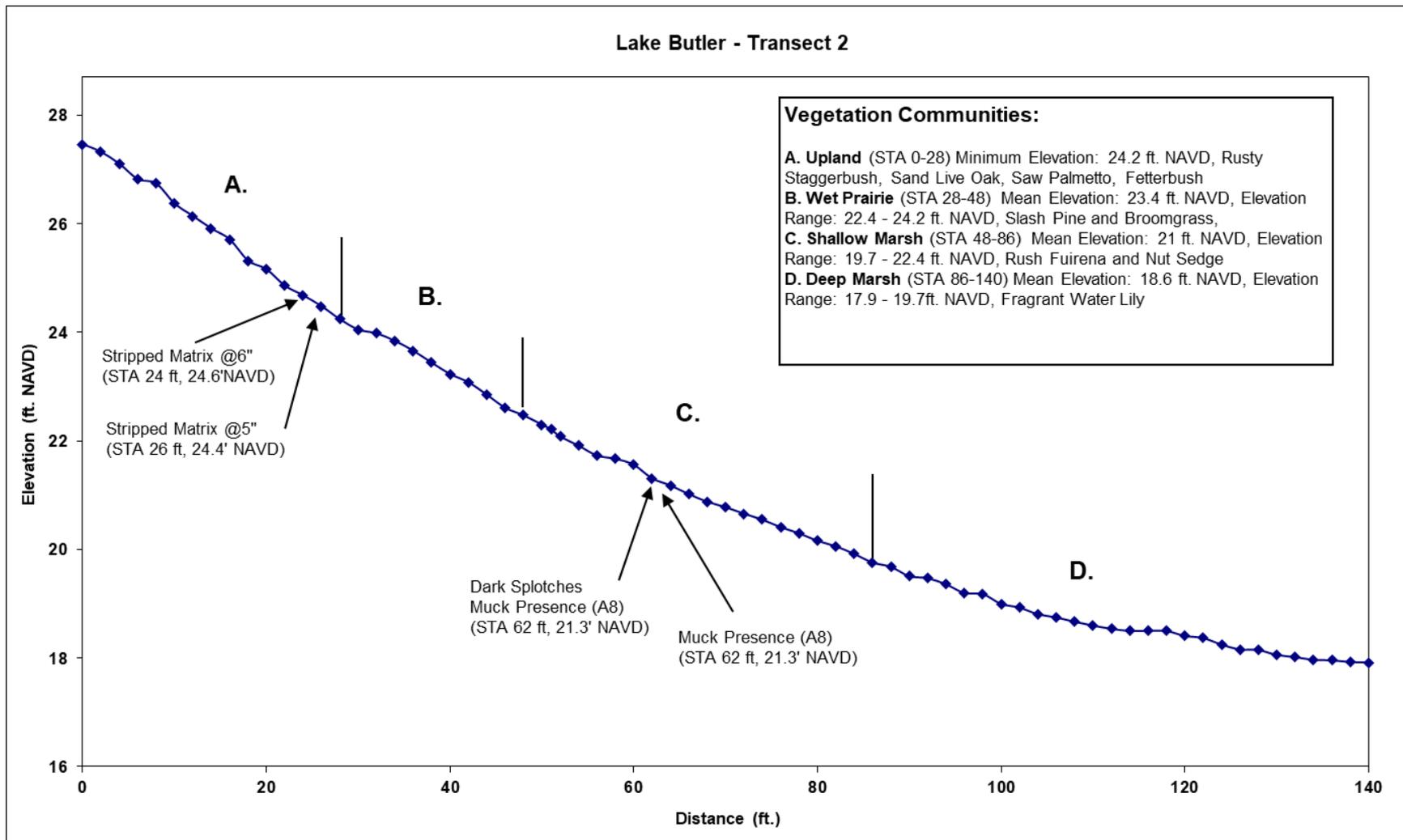


Figure 8. Transect 2 – Relating Soils, Vegetation and Topography in the Lake Butler Chain

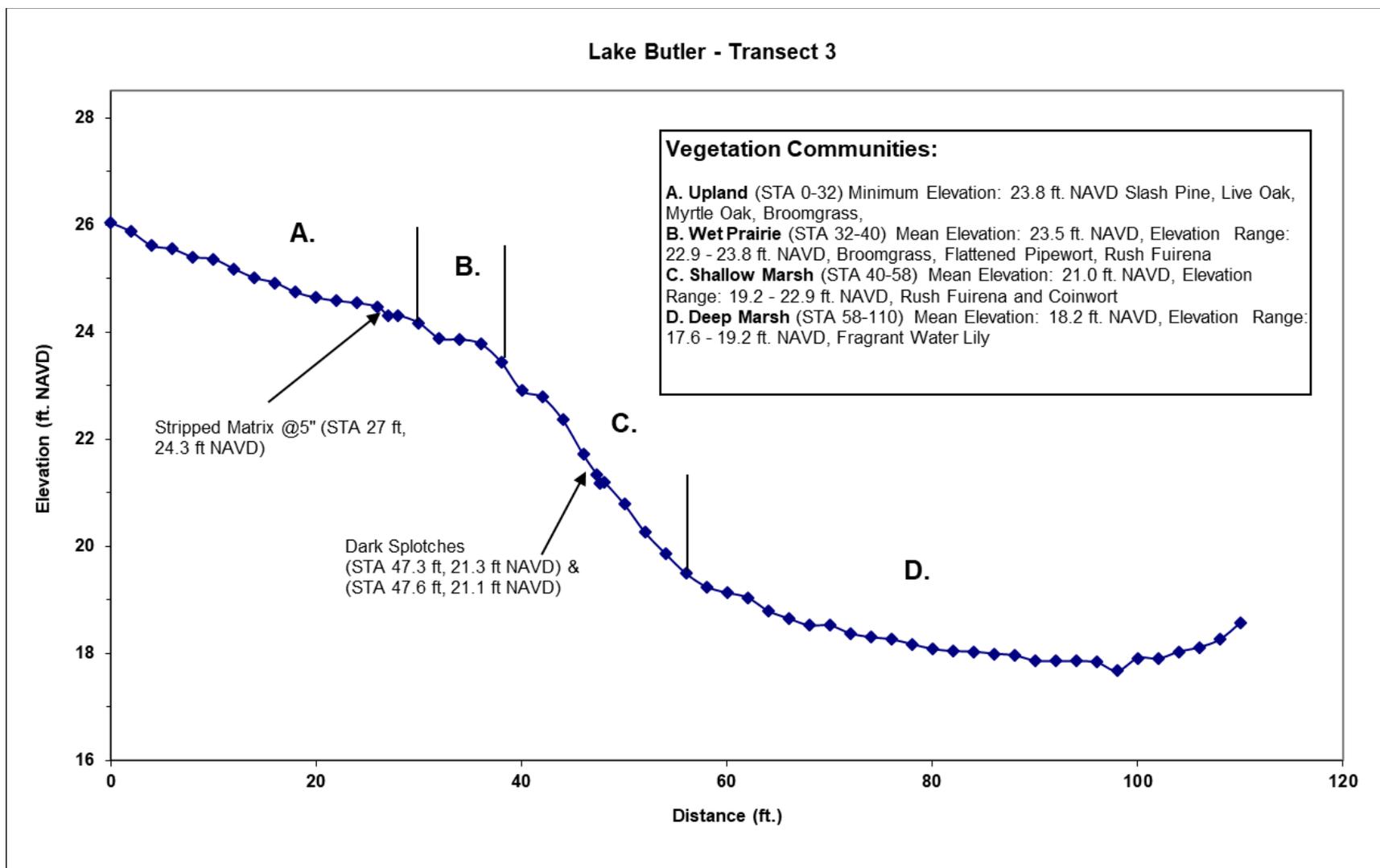


Figure 9. Transect 3 – Relating Soils, Vegetation and Topography in the Lake Butler Chain

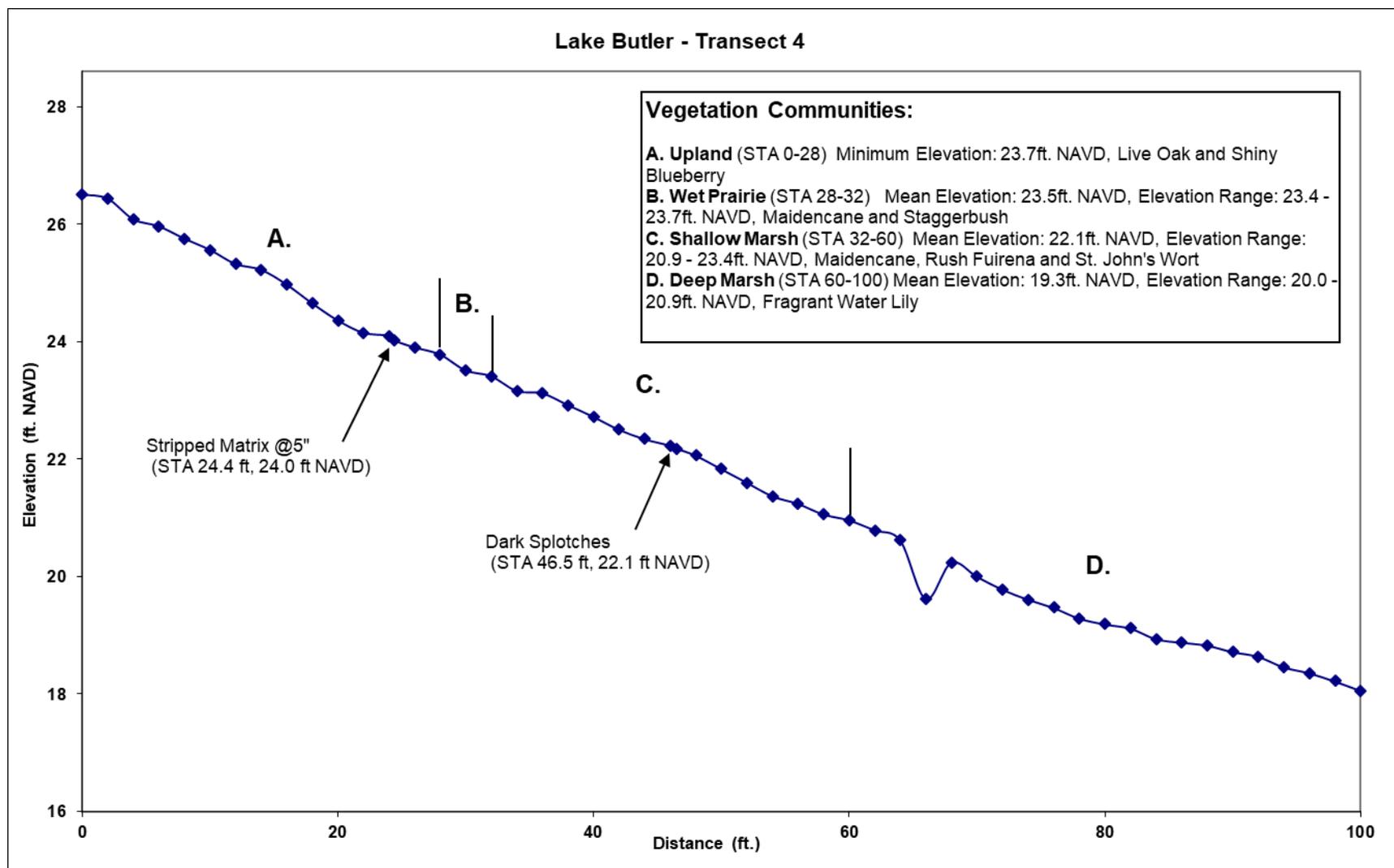


Figure 10. Transect 4 – Relating Soils, Vegetation and Topography in the Lake Butler Chain

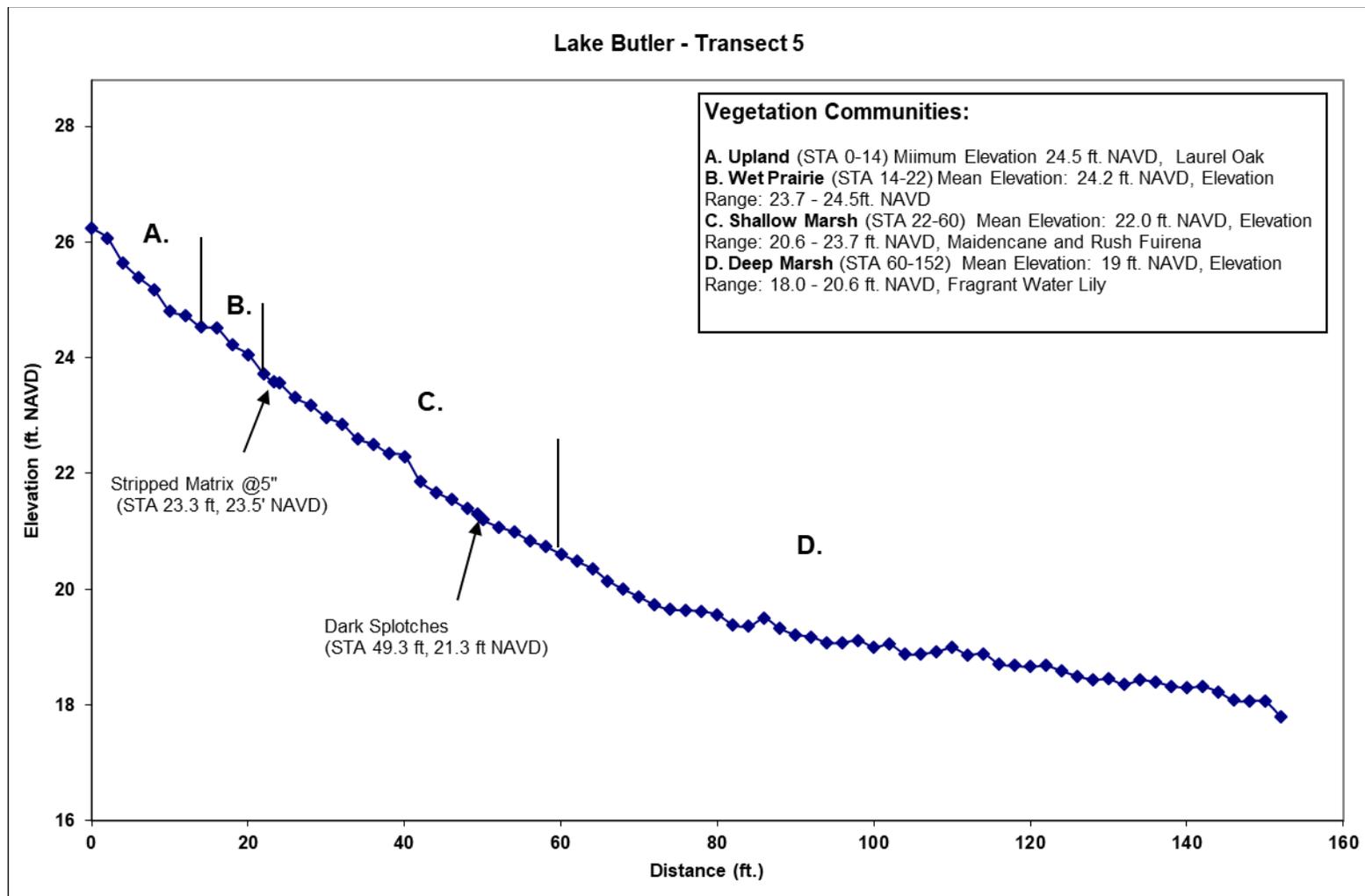


Figure 11. Transect 5 – Relating Soils, Vegetation and Topography in the Lake Butler Chain

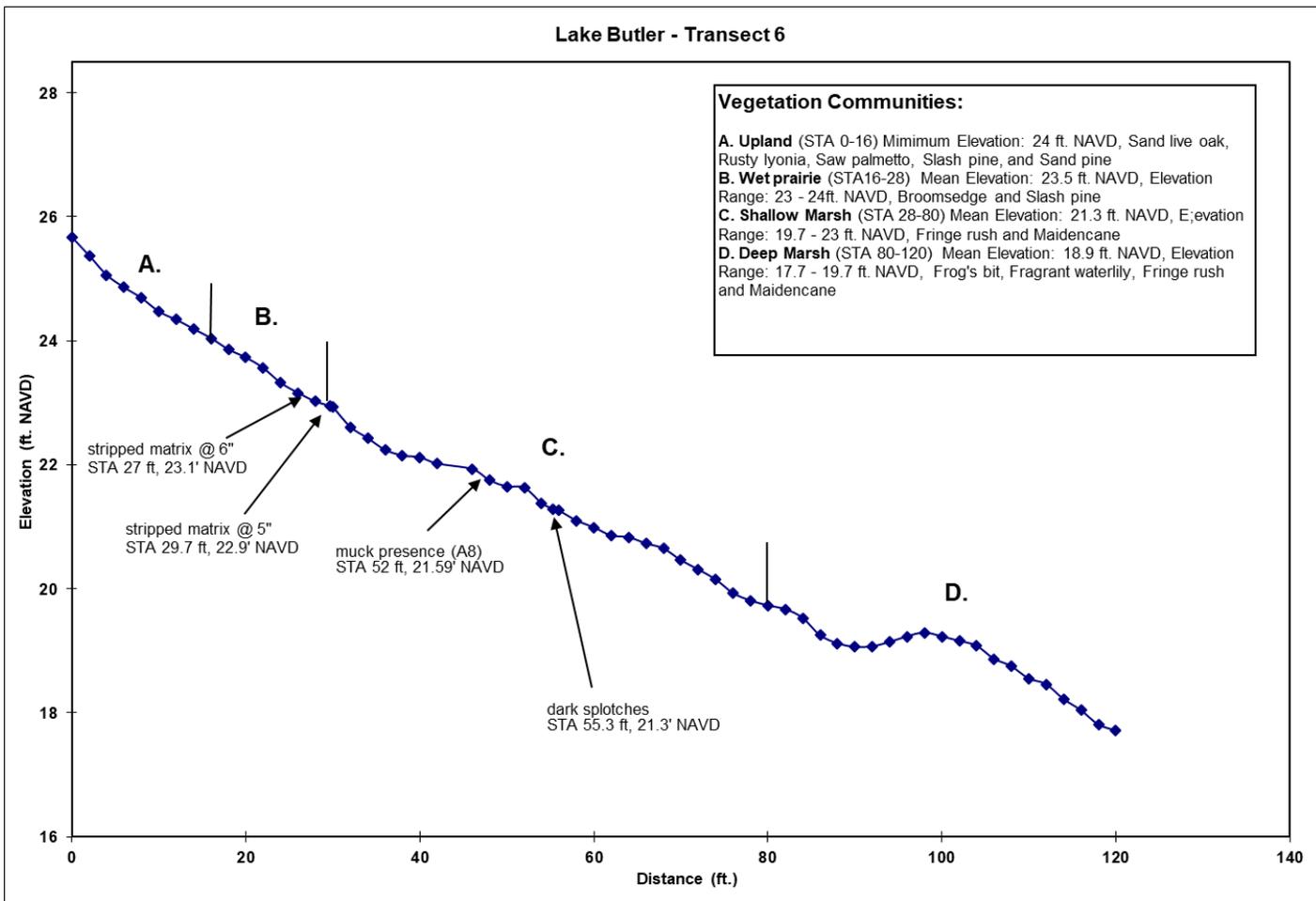


Figure 12. Transect 7 – Relating Soils, Vegetation and Topography in the Lake Butler Chain

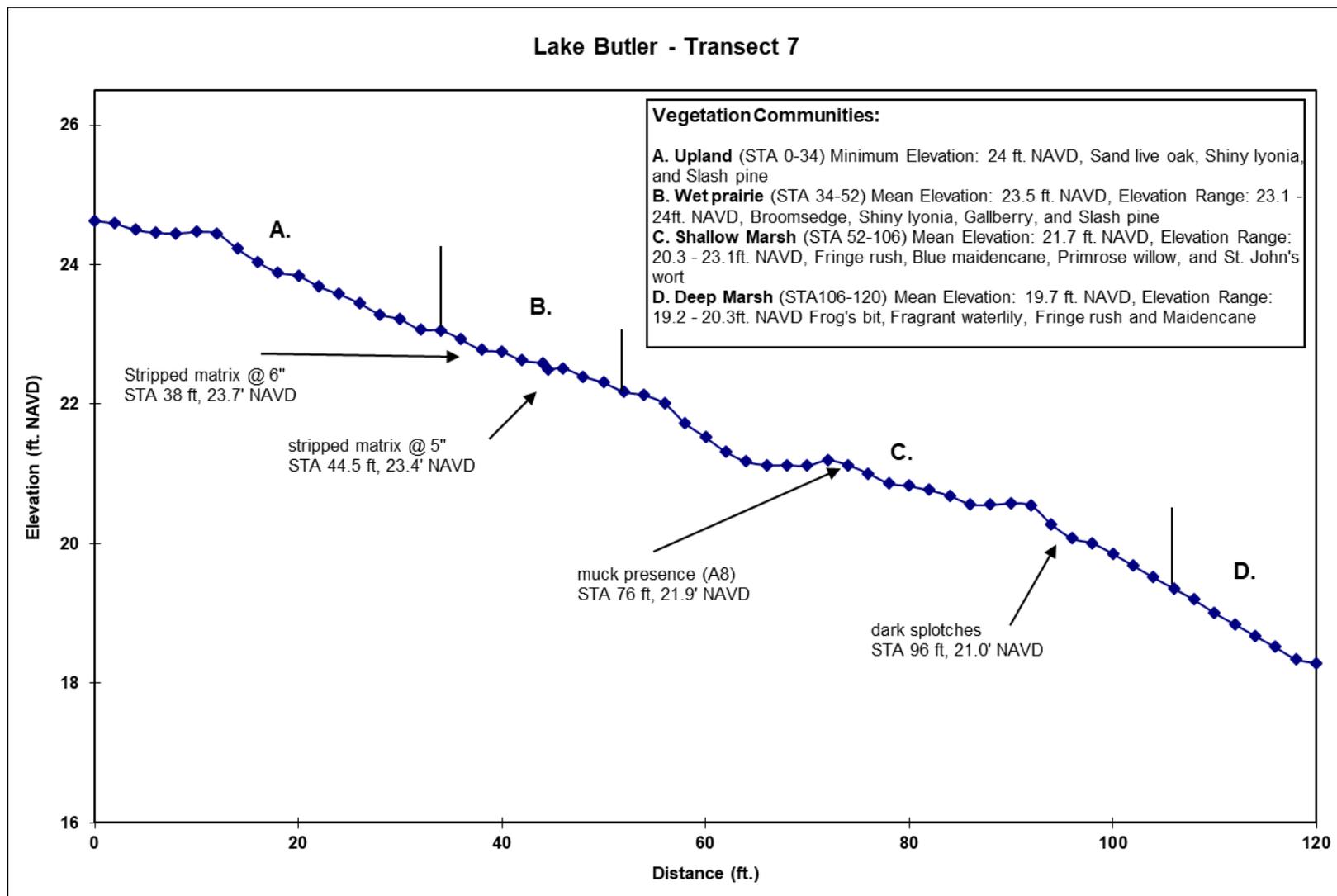


Figure 13. Transect 7 – Relating Soils, Vegetation and Topography in the Lake Butler Chain

Table 22. Soil assessment for Lake Butler at Transect

Lake Butler Soils				
Station Name:	Lake Butler - Transect 1			
Field User:	R. Ellis			
Sample Date:	6/1/2004			
Station Point	28			
Soil Description	Stripping at 10"; Many roots to 10".			
Station Point	30			
Soil Description	Stripped Matrix at 6"; Hydric/Nonhydric Border.			
Station Point	33			
Frequent High Location	Stripping at 5"			
Soil Series	Immokalee			
Hydric Soil Indicators	Stripped Matrix			
Horizon	Depth	Color	Soil Texture	Soil Description
A	0 - 1	10YR 6/1 - gray	sand (medium)	Minimal Duff Layer
E1	1 - 5	10YR 6/1 - gray	sand (medium)	Stripping Begins About 3" but is < 10%
E1	1 - 5	10YR 7/1 - light gray	sand (medium)	Stripping Begins About 3" but is < 10%
E2	5 - 10	10YR 6/1 - gray	sand (medium)	10% stripping; Many roots 10% to 6"; stripping at 5"
E2	5 - 10	10YR 7/1 - light gray	sand (medium)	10% stripping; Many roots 10% to 6"; stripping at 5". Several photos showing high stripping (on left), 5" stripping (middle) and stripping too low (right).
E3	10 - 32	10YR 7/1 - light gray	sand (Medium)	(95%)matrix & 5% (10YR 3/1) splotches
Bh	32 - 42+	5Y 2.5/1 - black	sand (Medium)	
Station Point	48			
Soil Series	Immokalee			
Hydric Soil Indicators	Stripped Matrix; Mucky mineral			
Horizon	Depth	Color	Soil Texture	Soil Description
A	0 - 0.5	10YR 3/1 - very dark gray	Mucky sand	
E1	0.5 - 3	10YR 6/1 - gray	sand (Medium)	(60%)matrix & 20% (10YR 5/1) splotches & 20% (10YR 7/1)
E2	3 - 10	10YR 5/1 - gray	sand (Medium)	(80%) matrix & 10% (10YR 3/1) & 10% (10YR 6/1)
E3	10 - 32	10YR 7/1 - light gray	sand (Medium)	(95%)matrix & 5% (10YR 3/1) splotches

Lake Butler Soils				
Bh	32 - 42+	5Y 2.5/1 - black	sand (Medium)	
Station Point		55		
Soil Description		Landward or upward extent of muck		
Station Point		59		
Frequent Low Location		Dark Splotches		
Soil Series		N/A		
Hydric Soil Indicators		Muck, Stripped Matrix		
Horizon	Depth	Color	Soil Texture	Soil Description
Oa	0 - 0.25	10YR 2/1 - black	Sapric or muck	Think Layer of Muck
A	0.25 - 3.5	10YR 2/1 - black	sand (medium)	Black Surface Layer; not buried like other examples.
E	3.5 - 3.5+	10YR 6/1 - gray	sand (medium)	Light sand with small dark splotches.
Station Point		66		
Soil Series		N/A		
Hydric Soil Indicators		Muck		
Horizon	Depth	Color	Soil Texture	Soil Description
Oa	0 - 1	10YR 2/1 - black	Sapric or muck	
A	1 - 3	10YR 7/1 - light gray	sand (medium)	(70%) matrix & 30% (10YR 7/1) splotches
E	3 - 3+	10YR 4/1 - dark gray	sand (medium)	(80%)matrix & 20% (10YR 4/1) splotches
Station Name:		Lake Butler - Transect 2		
Field User:		R. Ellis		
Sample Date:		6/1/2004		
Station Point		5.5		
Soil Series		Immokalee		
Hydric Soil Indicators				
Horizon	Depth	Color	Soil Texture	Soil Description
Oe	0 - 3	5Y 2.5/3 - dark olive	Sapric or muck	
A	3 - 7	10YR 2/1 - black	sand (medium)	70% coated& 30% uncoated (10YR 8/1)
E1	7 - 17	10YR 6/ - gray	sand (medium)	
E2	17 - 44	10YR	sand (medium)	

Lake Butler Soils				
Bh	44 - 56	10YR 3/4 - dark yellowish brown	sand (medium)	44-56+; 90% 10YR 3/4 & 10% uncoated.
Station Point		24		
Soil Description		Stripped Matrix at 6"; Hydric/Nonhydric Border.		
Station Point		26		
Frequent High Location		Stripping at 5"		
Soil Series		Immokalee		
Hydric Soil Indicators		Stripped Matrix		
Horizon	Depth	Color	Soil Texture	Soil Description
A	0 - 5	10YR 6/1 - gray	Sand (medium)	
E1	5 - 9	10YR 6/1 - gray	Sand (medium)	50% of matrix is (10YR 6/1) & 50% of matrix is (10YR 7/1)
E2	9 - 17	10YR 7/1 - light gray	Sand (medium)	
E3	17 - 37	10YR 8/1 - white	Sand (medium)	
Bh1	37 - 40	10YR 3/1 - very dark gray	Sand (medium)	
Bh2	40 - 43	10YR 3/2 - very dark grayish brown	Sand (medium)	
Bw1	43 - 58	10YR 4/3 - brown	Sand (medium)	
Bw2	58 - 63	10YR 5/3 - brown	Sand (medium)	
Bh3	63 - 63+	10YR 3/3 - dark brown	Sand (medium)	63+
Station Point		51		
Soil Description		Landward or upward extent of muck		
Station Point		62		
Frequent Low Location		Dark Splotches		
Soil Series		Myakka		
Hydric Soil Indicators		Muck, Stripped Matrix		
Horizon	Depth	Color	Soil Texture	Soil Description
Oa	0 - 0.5	7.5YR 2.5/1 - black	Sapric or muck	FL Splotchy Profile that goes from dark to progressively lighter. Meets dark splotches criteria.
A	0.5 - 5.5	10YR 2/1 - black	Sand (medium)	60% (10YR 2/1) matrix with 30% (10YR 4/1) & 10% (10YR 7/1)
A/E	5.5 - 9	10YR 4/1 - dark gray	Sand (medium)	50% (10YR 4/1) and 50% (10YR 6/1) - splotchy & stripping.
E	9 - 21	10YR 6/1 - gray	Sand (medium)	30% (10YR 4/1)-SP

Lake Butler Soils				
Bh1	21 - 26	10YR 3/1 - very dark gray	Sand (medium)	Degrading Spodic.
Bh2	26 - 26+	5G 2.5/1 - greenish black	Sand (medium)	26+. Dark Splotches at this transect (A Horizon) were lighter in color and thicker in diffuses as compared to T-1. Fewer roots than T-1. The more diffused A horizon may indicate a louder fluctuating H2O level over a greater linear distance. FL corresponded to a distinct vegetation break.
Station Name:		Lake Butler - Transect 3		
Field User:		R. Ellis		
Sample Date:		6/7/2004		
Station Point		27		
Frequent High Location		Stripping at 5"		
Soil Series		Immokalee		
Hydric Soil Indicators		Stripped Matrix		
Horizon	Depth	Color	Soil Texture	Soil Description
A1	0 - 2	10YR 3/2 - very dark grayish brown	Sand (medium)	Hemic Sand; Color of OM in Horizon (hemic material) with many medium & fine roots. Sand grain uncoated with color of 10YR 5/1. Stripping occurs throughout A horizon, but increases with area and depth. Steep topography seems to influence indicators. There is a possibility that this lake was dredged. Stripping indicators could be relic. Dead pine trees ≈ 5-yrs old occurs in a gap between dead pine zone & shoreline. Perhaps indicating an elevation gap between the dead pine zone and elevations.
A2	2 - 5	10YR 5/1 - gray	Sand (medium)	95%; 5% stripping of 10 YR 7/1 at top of horizon. Common to many medium roots. Root size and stripping abundance; separate horizon. FH Stripping at 5"
A3	5 - 9	10YR 5/1 - gray	Sand (medium)	90% sand; 10% stripping of (10YR 7/1); common to many fine roots.
E	9 - 31	10YR 8/1 - white	Sand (medium)	
Bh	31 - 31+	5G 2.5/1 - greenish black	Sand (medium)	probable Bw horizons below.
Station Point		46		

Lake Butler Soils				
Soil Series		Ona		
Hydric Soil Indicators		Stripped Matrix		
Horizon	Depth	Color	Soil Texture	Soil Description
A	0 - 0.5	10YR 4/1 - dark gray	sand (medium)	Salt and Pepper. Ground Elevation at this lake drops rapidly down towards the lake. The shallow Bh in the vicinity of the FL becomes truncated near the lake, where it occurs at the ground surface at station 48.4, which is only 13" linear distance downslope of the FL..
Eg	0.5 - 9	10YR 5/1 - gray	Sand (medium)	
Bh	9 - 13	10YR 2/1 - black	Sand (medium)	
Bw	13 - 32	10YR 4/3 - brown	Sand (medium)	color lightens progressively with depth.
E	32 - 32+	10YR 6/3 - pale brown	Sand (medium)	
Station Point		47.3		
Frequent Low Location		Degrading Spodic		
Soil Series		Valkaria		
Hydric Soil Indicators		Stripped Matrix		
Horizon	Depth	Color	Soil Texture	Soil Description
A	0 - 0.5	10YR 3/1 - very dark gray	Sand (medium)	FL Location (Degrading Spodic)
Eg	0.5 - 3	10YR 5/1 - gray	Sand (medium)	
Bh	3 - 10	10YR 2/1 - black	Sand (medium)	
Bw	10 - 10+	10YR 4/3 - brown	Sand (medium)	
Station Name:		Lake Butler - Transect 4		
Field User:		R. Ellis		
Sample Date:		6/7/04		

Lake Butler Soils				
Station Point	24.4			
Frequent High Location	Stripping at 5"			
Soil Series	Immokalee			
Hydric Soil Indicators	Stripped Matrix			
Horizon	Depth	Color	Soil Texture	Soil Description
A	0 - 5	10YR 5/1 - gray	Sand (medium)	70% uncoated; 5% stripping pf (10YR 7/1). FH Stripping at 5"
A	0 - 5	10YR 7/1 - light gray	Sand (medium)	70% uncoated; 5% stripping pf (10YR 7/1)
Eg1	5 - 15	10YR 7/1 - light gray	Sand (medium)	50% stripped with (10YR 7/1) & 50% (10YR 6/1) sand; 10% stripping began at 5" & increases with depth.
Eg1	5 - 15	10YR 6/1 - gray	Sand (medium)	50% stripped with (10YR 7/1) & 50% (10YR 6/1) sand; 10% stripping began at 5" & increases with depth.
Eg2	15 - 34	10YR 7/1 - light gray	Sand (medium)	70% stripped w/ (10YR 7/1) & 30% of (10YR 6/1)
Bh1	34 - 37	10YR 2/1 - black	Sand (medium)	
Bh2	37 - 43	10YR 3/2 - very dark grayish brown	Sand (medium)	
Bw	43 - 43+	10YR 4/4 - dark yellowish brown	Sand (medium)	
Station Name:	Lake Butler - Transect 4 (continued)			
Station Point	46.5			
Frequent Low Location	Dark Splotches			
Soil Series	Smyrna			
Hydric Soil Indicators	Stripped Matrix			
Horizon	Depth	Color	Soil Texture	Soil Description
Oe	0 - 1	10YR 3/1 - very dark gray	Sand (medium)	FL Dark Splotches
A	1 - 4	10YR 2/1 - black	Sand (medium)	Some Splotchiness
Eg	4 - 16	10YR 6/1 - gray	Sand (medium)	45%; 45% (10YR 4/1); and 10%.
Eg	4 - 16	10YR 2/1 - black	Sand (medium)	45%; 45% (10YR 4/1); and 10%.
Bh1	16 - 22	N 2/1 - black	Sand (medium)	
Bh2	22 - 30	10YR 3/1 - very dark gray	Sand (medium)	
Bw	30 - 30+	10YR 4/1 - dark gray	Sand (medium)	
Station Name:	Lake Butler - Transect 5			
Field User:	R. Ellis			

Lake Butler Soils				
Sample Date:		6/7/04		
Station Point		23.3		
Frequent High Location		Stripping at 5"		
Soil Series		Myakka		
Hydric Soil Indicators		Stripped Matrix		
Horizon	Depth	Color	Soil Texture	Soil Description
A	0 - 5	10YR 5/1 - gray	Sand (medium)	FH Stripped Matrix
Eg	5 - 22	10YR 7/1 - light gray	Sand (medium)	approx. 50% splotches.
Eg	5 - 22	10YR 6/1 - gray	Sand (medium)	approx. 50% splotches.
Bh1	22 - 26	10YR 2/1 - black	Sand (medium)	
Bh2	26 - 34	5G 2.5/2 - very dark greenish gray	Sand (medium)	
Bw1	34 - 46	10YR 4/4 - dark yellowish brown	Sand (medium)	
Bw2	46 - 69+	10YR 5/4 - yellowish brown	Sand (medium)	
Station Point		49.3		
Frequent Low Location		Dark Splotches		
Soil Series		Valkaria		
Hydric Soil Indicators		Stripped Matrix		
Horizon	Depth	Color	Soil Texture	Soil Description
A	0 - 1.5	10YR 2/1 - black	Mucky sand	Located 200'N of T4; FL (dark splotches)
A/Eg	1.5 - 4.5	10YR 3/1 - very dark gray	Sand (medium)	60% A Material 10YR 3/1; and 40 % E Material 10YR 6/1; more live roots prob. Caused > amt. of OM leaching than Bw
Bw	4.5 - 11	10YR 3/1 - very dark gray	Sand (medium)	
Bh1	11 - 16	N 2/0 - black	Sand (medium)	
Bh2	16 - 22	10YR 2/2 - very dark brown	Sand (medium)	
Bw	22 - 48+	10YR 4/3 - brown	Sand (medium)	
Station Name:		Lake Butler - Transect 6		
Field User:		R. Ellis		
Sample Date:		6/11/04		
Station Point		27		

Lake Butler Soils				
Hydric Soil Indicators	Stripped Matrix at 6"; Hydric/Nonhydric Border.			
Station Point	29.7			
Frequent High Location	Stripping at 5"			
Soil Series	Immokalee			
Hydric Soil Indicators	Stripped Matrix			
Horizon	Depth	Color	Soil Texture	Soil Description
Oe	0 - 0.5	10YR 3/1 - very dark gray	Hemic or mucky peat	
A	0.5 - 4	10YR 5/1 - gray	sand (medium)	
Eg	4 - 39.5	10YR 7/1 - light gray	sand (medium)	FH Stripping at 5"
Bh1	39.5 - 44	10YR 2/1 - black	sand (medium)	
Bh2	44 - 55+	10YR 5/2 - grayish brown	sand (medium)	
Station Point	52			
Hydric Soil Indicators	Landward or upward extent of muck			
Station Point	55.3			
Frequent Low Location	Dark Splotches			
Soil Series	Valkaria			
Hydric Soil Indicators	Muck presence			
Horizon	Depth	Color	Soil Texture	Soil Description
Oa	0 - 0.5	N 2.5 - black	Sapric or muck	
A	0.5 - 3.5	10YR 3/1 - very dark gray	Sand (medium)	FL Dark Splotches
Eg	3.5 - 7	10YR 7/1 - light gray	Sand (medium)	
Bw1	7 - 13	10YR 5/1 - gray	Sand (medium)	
Bw2	13 - 22	10YR 4/1 - dark gray	Sand (medium)	
Bh1	22 - 29	10YR 2/1 - black	Sand (medium)	
Bh2	29 - 46+	10YR 3/2 - very dark grayish brown	Sand (medium)	
Station Name:	Lake Butler - Transect 7			
Field User:	R. Ellis			
Sample Date:	6/11/04			
Station Point	38			
Hydric Soil Indicators	Stripped Matrix at 6"; Hydric/Nonhydric Border.			

Lake Butler Soils				
Station Point	44.5			
Frequent High Location	Stripping at 5"			
Soil Series	Immokalee			
Hydric Soil Indicators	Stripped Matrix			
Horizon	Depth	Color	Soil Texture	Soil Description
Oe	0 - 0.5	7.5Y 3/1 - very dark gray	Hemic or mucky peat	
A	0.5 - 5.5	10YR 5/1 - gray	Sand (medium)	
E1	5.5 - 17	10YR 6/1 - gray	Sand (medium)	10% splotch at 5.5 inches.
E1	5.5 - 17	10YR 7/1 - light gray	Sand (medium)	10% splotch at 5.5 inches.
E2	17 - 22	10YR 7/1 - light gray	Sand (medium)	
E3	22 - 42	10YR 8/1 - white	Sand (medium)	
Bh1	42 - 49	10YR 3/2 - very dark grayish brown	Sand (medium)	
Bh2	49 - 55	7.5Y 3/2 - very dark grayish brown	Sand (medium)	
Bh3	55 - 57+	7.5Y 3/3 - dark brown	Sand (medium)	
Station Point	76			
Hydric Soil Indicators	Landward or upward extent of muck			
Station Point	96			
Frequent Low Location	Dark Splotches			
Soil Series	Immokalee			
Hydric Soil Indicators	Muck			
Horizon	Depth	Color	Soil Texture	Soil Description
Oa	0 - 0.25	7.5Y 2.5/1 - black	Sapric or muck	
A	0.25 - 3.25	10YR 3/1 - Very Dark Gray	Sand (medium)	
E	3.25 - 34	10YR 7/1 - light gray	Sand (medium)	
Bh	34 - 34+	10YR 3/2 - very dark grayish brown	Sand (medium)	probable - fine sand H2O Table Collapse.

Lake Doyle Soils (Transects 8-9)

Two transects were established perpendicular to the shore of Lake Doyle (Transect 8; Figure 16) and Transect 9; Figure 17) in 2004. The elevations, vegetation, and soils were surveyed and recorded at that time. In 2009, these transects were re-established and vegetation communities were re-evaluated.

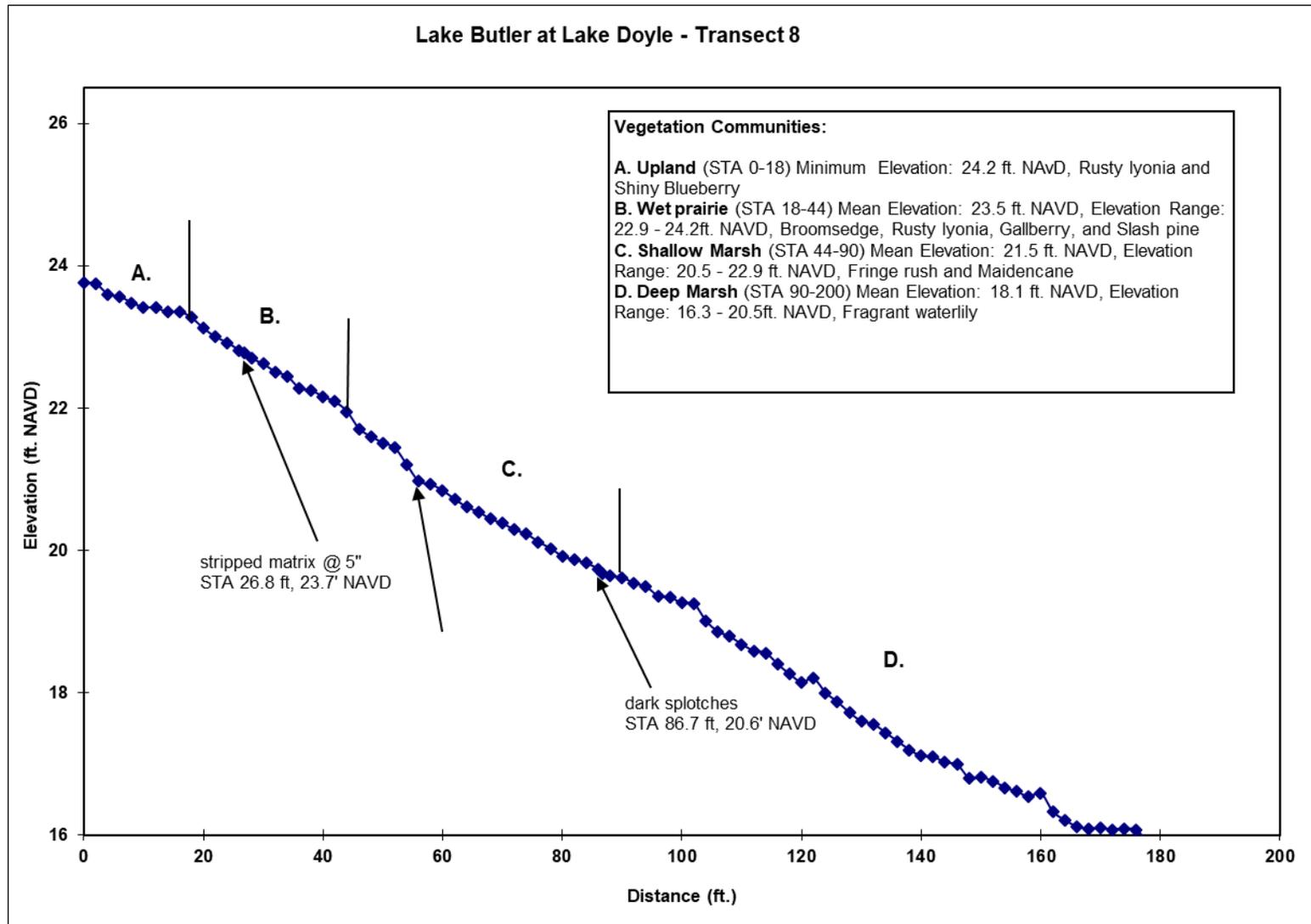


Figure 14. Relationship of Soils, Vegetation and Topography in Transect 6 of the Lake Butler Chain at Lake Doyle

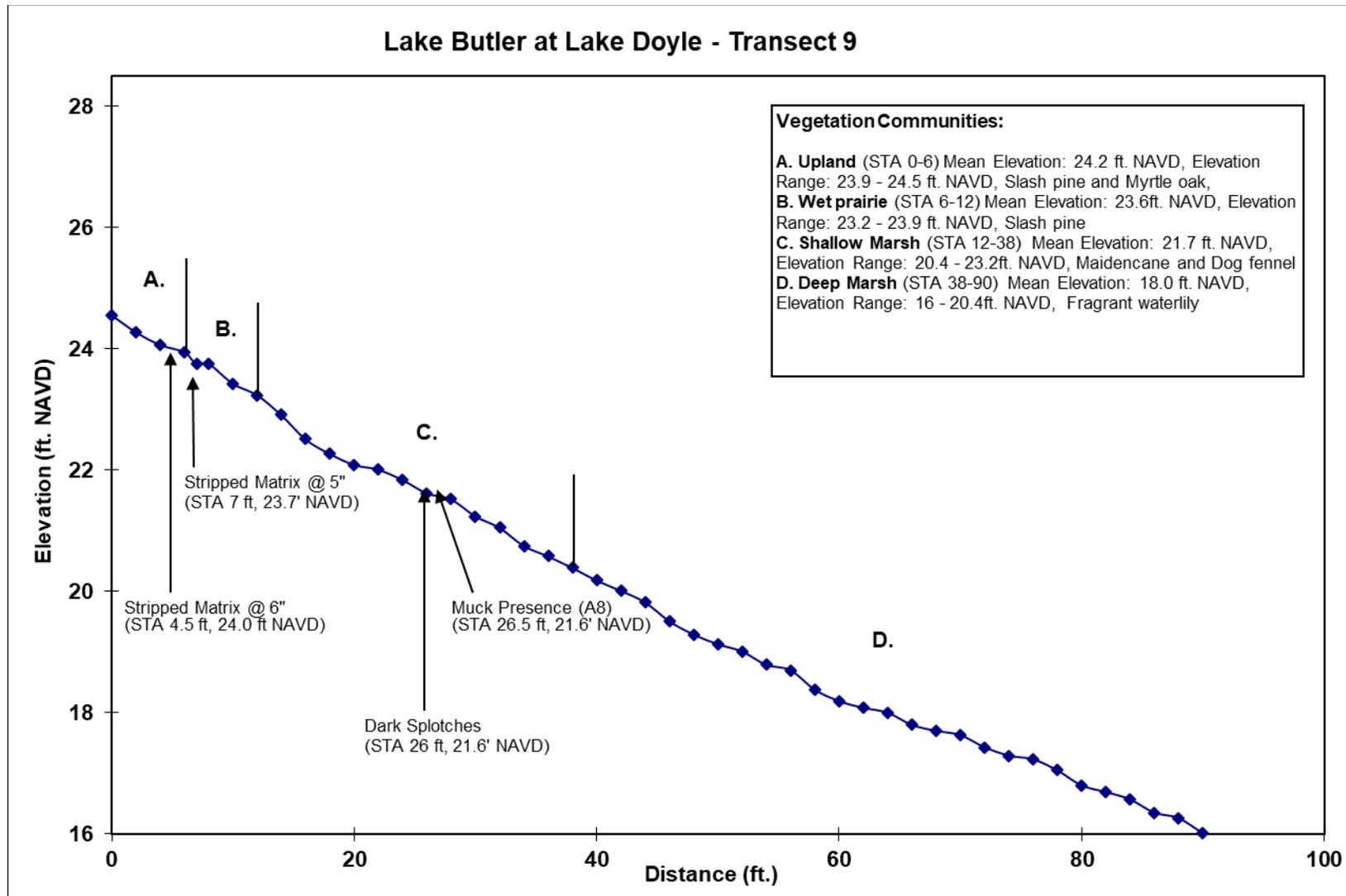


Figure 15. Relationship of Soils, Vegetation and Topography in Transect 6 of the Lake Butler Chain at Lake Doyle

HYDROPERIOD TOOL DATA

Table 23. Raw data used in assessment of hydroperiod tool metrics

Stage	Emergent Marsh Habitat (0 to 6 ft depth) (acres); loess smoothed; 10 ft window	Large Wading Bird Forage Habitat (0 to 1 ft depth) (acres); loess smoothed; 10 ft window	Small Wading Bird Forage Habitat (0 to 0.5 ft depth) (acres); loess smoothed; 10 ft window	Sandhill Crane Nesting Habitat (0.5 to 1 ft depth) (acres); loess smoothed; 10 ft window	Gamefish Spawning Habitat (1 to 4 ft depth) (acres); loess smoothed; 10 ft window
9.9	0.1	1.7	1.2	0.5	0.0
10	0.4	2.0	1.3	0.7	0.0
10.1	0.6	2.3	1.5	0.9	0.0
10.2	0.9	2.6	1.6	1.0	0.0
10.3	1.2	3.0	1.7	1.2	0.3
10.4	1.5	3.3	1.8	1.4	0.6
10.5	1.9	3.6	2.0	1.6	0.9
10.6	2.2	3.9	2.1	1.8	1.3
10.7	2.7	4.2	2.2	2.0	1.6
10.8	3.1	4.4	2.3	2.1	2.1
10.9	3.6	4.7	2.4	2.3	2.5
11	4.1	5.0	2.6	2.5	2.9
11.1	4.6	5.3	2.7	2.6	3.4
11.2	5.2	5.6	2.8	2.8	3.9
11.3	5.7	5.8	2.9	2.9	4.4
11.4	6.3	6.1	3.0	3.1	5.0
11.5	7.0	6.4	3.1	3.2	5.5
11.6	7.7	6.6	3.2	3.4	6.1
11.7	8.4	6.9	3.3	3.5	6.7
11.8	9.1	7.1	3.4	3.7	7.4
11.9	9.9	7.4	3.5	3.8	8.0

12	10.6	7.6	3.6	4.0	8.7
12.1	11.4	7.8	3.7	4.1	9.4
12.2	12.3	8.0	3.8	4.2	10.2
12.3	13.1	8.3	3.9	4.4	10.9
12.4	14.0	8.5	4.0	4.5	11.7
12.5	15.0	8.7	4.1	4.6	12.4
12.6	15.9	8.9	4.2	4.7	13.2
12.7	16.9	9.1	4.3	4.9	14.0
12.8	17.9	9.3	4.4	5.0	14.9
12.9	18.9	9.5	4.5	5.1	15.8
13	20.0	9.7	4.6	5.2	16.7
13.1	21.0	9.9	4.6	5.3	17.7
13.2	22.1	10.1	4.7	5.4	18.6
13.3	23.2	10.3	4.8	5.5	19.4
13.4	24.4	10.6	4.9	5.6	20.3
13.5	25.5	10.8	5.0	5.7	21.1
13.6	26.7	11.0	5.1	5.9	21.9
13.7	28.0	11.2	5.2	6.0	22.7
13.8	29.2	11.4	5.3	6.1	23.5
13.9	30.4	11.6	5.4	6.2	24.4
14	31.7	11.8	5.5	6.4	25.2
14.1	32.9	12.0	5.5	6.5	26.0
14.2	34.2	12.3	5.7	6.6	26.8
14.3	35.5	12.5	5.8	6.7	27.6
14.4	36.9	12.7	5.9	6.9	28.4
14.5	38.2	12.9	5.9	7.0	29.1
14.6	39.6	13.0	6.0	7.0	29.8
14.7	41.0	13.1	6.1	7.1	30.5
14.8	42.4	13.3	6.1	7.2	31.3
14.9	43.7	13.4	6.2	7.2	32.0

15	45.0	13.6	6.3	7.3	32.7
15.1	46.3	13.9	6.4	7.5	33.4
15.2	47.5	14.3	6.7	7.7	34.2
15.3	48.7	14.8	6.9	7.9	35.0
15.4	49.9	15.3	7.2	8.0	35.6
15.5	51.2	15.8	7.6	8.2	36.2
15.6	52.5	16.4	8.0	8.4	36.8
15.7	53.9	17.1	8.4	8.7	37.4
15.8	55.4	17.7	8.8	8.9	38.1
15.9	56.9	18.4	9.2	9.2	38.8
16	58.4	19.2	9.6	9.5	39.6
16.1	59.9	19.9	10.0	9.9	40.5
16.2	61.3	20.8	10.5	10.4	41.5
16.3	62.9	22.0	11.0	11.0	42.5
16.4	64.5	23.2	11.6	11.7	43.4
16.5	66.2	24.6	12.2	12.4	44.4
16.6	68.0	26.0	12.8	13.2	45.4
16.7	70.0	27.3	13.4	13.9	46.5
16.8	72.2	28.6	13.9	14.6	47.7
16.9	74.5	29.6	14.4	15.2	49.0
17	77.0	30.5	14.7	15.7	50.5
17.1	79.6	31.2	15.0	16.2	52.2
17.2	82.3	31.9	15.2	16.7	54.1
17.3	85.0	32.6	15.3	17.2	56.1
17.4	87.7	33.2	15.4	17.8	58.2
17.5	90.3	33.8	15.5	18.3	60.4
17.6	92.9	34.4	15.6	18.8	62.6
17.7	95.6	34.9	15.7	19.2	64.9
17.8	98.4	35.3	15.8	19.5	67.0
17.9	101.4	35.6	15.8	19.8	69.1

18	104.4	35.8	15.8	19.9	71.3
18.1	107.5	35.6	15.7	19.9	73.7
18.2	110.5	35.3	15.5	19.9	76.2
18.3	113.5	34.9	15.2	19.7	78.9
18.4	116.3	34.4	14.9	19.6	81.6
18.5	119.0	34.0	14.6	19.4	84.2
18.6	121.6	33.6	14.4	19.2	86.7
18.7	124.1	33.3	14.2	19.1	89.1
18.8	126.5	33.2	14.2	19.1	91.1
18.9	128.9	33.2	14.2	19.0	93.1
19	131.3	33.0	14.2	18.7	95.1
19.1	133.6	32.7	14.3	18.4	97.0
19.2	136.0	32.4	14.4	18.0	98.9
19.3	138.3	32.1	14.5	17.6	100.7
19.4	140.7	31.9	14.7	17.2	102.5
19.5	143.0	31.9	14.9	17.0	104.1
19.6	145.1	32.0	15.1	16.9	105.6
19.7	147.2	32.4	15.3	17.1	107.0
19.8	149.1	33.2	15.7	17.5	108.1
19.9	151.1	34.3	16.3	18.1	108.9
20	153.1	35.8	16.9	18.9	109.5
20.1	155.3	37.4	17.6	19.8	109.9
20.2	157.6	39.1	18.3	20.8	110.3
20.3	160.1	40.7	19.0	21.7	110.6
20.4	162.9	42.2	19.6	22.6	111.1
20.5	166.0	43.4	20.1	23.4	111.7
20.6	169.4	44.3	20.4	23.9	112.6
20.7	172.9	44.9	20.6	24.3	113.7
20.8	176.4	45.5	20.7	24.8	114.8
20.9	179.9	46.1	20.8	25.4	115.9

21	183.2	46.7	20.8	25.9	117.0
21.1	186.3	47.3	20.9	26.4	118.1
21.2	189.0	47.7	20.9	26.8	119.3
21.3	191.6	48.1	20.9	27.2	120.5
21.4	194.2	48.3	20.8	27.5	121.7
21.5	196.8	48.4	20.8	27.6	122.9
21.6	199.3	48.4	20.7	27.7	124.2
21.7	201.8	48.2	20.6	27.6	125.5
21.8	204.2	48.0	20.4	27.6	126.9
21.9	206.4	47.7	20.3	27.4	128.3
22	208.5	47.3	20.0	27.3	129.7
22.1	210.3	46.9	19.8	27.1	131.1
22.2	212.0	46.4	19.5	26.8	132.5
22.3	213.6	45.8	19.3	26.6	133.8
22.4	215.1	45.3	19.0	26.3	135.1
22.5	216.5	44.6	18.6	26.0	136.3
22.6	217.8	43.9	18.3	25.6	137.5
22.7	219.1	43.1	17.9	25.2	138.7
22.8	220.1	42.2	17.5	24.7	139.9
22.9	221.1	41.3	17.1	24.2	141.1
23	221.9	40.3	16.6	23.7	142.3
23.1	222.6	39.2	16.1	23.1	143.5
23.2	223.1	38.1	15.6	22.5	144.6
23.3	223.4	36.9	15.1	21.8	145.8
23.4	223.7	35.7	14.6	21.1	146.9
23.5	223.8	34.4	14.0	20.4	147.9
23.6	223.7	33.1	13.5	19.6	148.9
23.7	223.6	31.7	12.9	18.8	149.9
23.8	223.4	30.3	12.3	18.0	150.9
23.9	.	28.8	11.7	17.1	151.9

24	.	27.2	11.0	16.2	152.8
24.1	.	25.6	10.3	15.3	153.8
24.2	.	.	11.7	18.4	179.2
24.3	.	.	10.4	16.9	171.5
24.4	.	.	9.1	15.3	163.3
24.5	.	.	7.7	13.6	154.6
24.6	.	.	.	.	145.5
24.7	.	.	.	.	135.9
24.8	.	.	.	.	125.9
24.9	.	.	.	.	115.4

TRANSECT PHOTOGRAPHS

Images of the transects were collected during field work. The following figures (Figure 18-
Figure 24) show each transect described in this report.



Transect 2, Butler Chain of Lakes

1. Looking towards Upland



2. Wet Prairie



3. Shallow Marsh (Side view)



4. Wet Prairie, looking toward Deep Marsh



5. Open Water



Figure 16. Photographs of vegetation communities on the Lake Butler Chain, Transect 2

Transect 3, Butler Chain of Lakes

1. Looking towards Upland



2. Wet Prairie, looking toward Deep Marsh



3. Shallow Marsh, looking toward Deep Marsh



Figure 17. Photographs of vegetation communities on the Lake Butler Chain, Transect 3

Transect 5, Butler Chain of Lakes

1. Upland



2. Wet Prairie



3. Shallow Marsh looking towards Deep Marsh



4. Wet Prairie, looking toward Open Water



Figure 18. Photographs of vegetation communities on the Lake Butler Chain, Transect 5

Transect 6, Butler Chain of Lakes

1. Upland



2. Shallow Marsh, looking toward Upland



3. Shallow Marsh looking toward Open Water



Figure 19. Photographs of vegetation communities on the Lake Butler Chain, Transect 6

Transect 7, Butler Chain of Lakes

1. Upland



2. Wet Prairie looking toward Upland



3. Shallow Marsh looking toward Open Water



4. Shallow Marsh/Open Water (side view)



Figure 20. Photographs of vegetation communities on the Lake Butler Chain, Transect 7

Transect 8, Doyle Lake

1. Wet Prairie looking towards Upland



2. Shallow Marsh looking toward Upland



3. Shallow Marsh looking toward Open Water



4. Deep Marsh



5. Drainage Structure (to Lake Bethel)



Figure 21. Photographs of vegetation communities on Lake Doyle, Transect 8

Transect 9, Doyle Lake

1. Shallow Marsh looking at Upland



2. Deep Marsh



3. Drainage Structure



Figure 22. Photographs of vegetation communities on Lake Doyle, Transect 9

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