APPENDIX A – DATA COLLECTION METHODS FOR FIELD SURVEYS

An Evaluation of the Effectiveness of Mitigation Banking in Florida: Ecological Success and Compliance with Permit Criteria

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Standard field procedures included completion of the Uniform Mitigation Assessment Method (UMAM), Wetland Rapid Assessment Procedure (WRAP), and when applicable the Hydrogeomorphic wetland assessment (HGM) and the Florida Wetland Condition Index (FWCI) for macrophytes and macroinvertebrates. The Landscape Development Intensity (LDI) index was calculated after the field surveys using Geographic Information Systems (GIS). The following appendices present field methods and data sheets specific to UMAM (Appendix A-1), WRAP (Appendix A-2), HGM (Appendix A-3), FWCI (Appendix A-4), and LDI index (Appendix A-5).

Appendix **Page**

APPENDIX A-1 Uniform Mitigation Assessment Method (UMAM)

The Uniform Mitigation Assessment Method (UMAM) is fully described in Ch. 62-345, F.A.C., which was adopted in February of 2004. UMAM includes completion of Part I - Qualitative Description, see section 62-345.400, F.A.C., and Part II - Quantification of Assessment Area (impact or mitigation), see Sections 62-345.500 and .600, F.A.C. Most of Part I is completed in the office before going into the field, using appropriate references and resources for the site. Part II is scored in the field. Standard guidance from Ch. 62-345, F.A.C. was followed for scoring each wetland assessment area. Standard field sheets from 62-345.900, F.A.C. were used (see below). Although Ch. 62-345, F.A.C. does not specify standard field protocol , data collection for the purpose of this study followed the same method as that employed for the Wetland Rapid Assessment Procedure (WRAP) (Miller and Gunsalus 1999). During the site visit, notes were taken on general site conditions including identification of flora, observed wildlife (e.g., visual sightings, calls), evidence of wildlife (e.g., tracks, nests, etc.), and occurrence of listed species. Scores were for site current condition. Each of the three scoring categories (Location and Landscape Support, Water Environment, and Community Structure) were assigned whole numbers between 0-10, representing the current wetland condition. These numbers were summed and the result was divided by 30 to attain the total UMAM score, ranging from 0.00-1.00.

PART I – Qualitative Description
(See Section 62-345.400, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number

FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size

Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e.OFW, AP, other local/state/federal designation of importance)

Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands

Assessment area description

Significant nearby features	Uniqueness (considering the relative rarity in relation to the regional landscape.)

Functions	Mitigation for previous permit/other historic use

Anticipated Wildlife Utilization Based on Literature Review (List of species that are representative of the assessment area and reasonably expected to be found)	Anticipated Utilization by Listed Species (List species, their legal classification (E, T, SSC), type of use, and intensity of use of the assessment area)

Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):

Additional relevant factors:

Assessment conducted by:	Assessment date(s):

Form 62-345.900(1), F.A.C. [effective date 02-04-2004]

PART II – Quantification of Assessment Area (impact or mitigation)
(See Sections 62-345.500 and .600, F.A.C.)

Site/Project Name	Application Number	Assessment Area Name or Number
Impact or Mitigation	Assessment conducted by:	Assessment date:

Scoring Guidance	Optimal (10)	Moderate(7)	Minimal (4)	Not Present (0)
The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed	Condition is optimal and fully supports wetland/surface water functions	Condition is less than optimal, but sufficient to maintain most wetland/surface waterfunctions	Minimal level of support of wetland/surface water functions	Condition is insufficient to provide wetland/surface water functions

.500(6)(a) Location and Landscape Support	w/o pres or current	with
.500(6)(b)Water Environment (n/a for uplands)	w/o pres or current	with
.500(6)(c)Community structure 1. Vegetation and/or 2. Benthic Community	w/o pres or current	with

Score = sum of above scores/30 (if uplands, divide by 20)	
current or w/o pres	with
0	

If preservation as mitigation,
Preservation adjustment factor =
Adjusted mitigation delta =

For impact assessment areas
FL = delta x acres =

Delta = [with-current]

If mitigation
Time lag (t-factor) =
Risk factor =

For mitigation assessment areas
RFG = delta/(t-factor x risk) =

Form 62-345.900(2), F.A.C. [effective date 02-04-2004]

APPENDIX A-2 Wetland Rapid Assessment Procedure (WRAP)

The Wetland Rapid Assessment Procedure (WRAP) is fully described in Wetland Rapid Assessment Procedure Technical Publication REG-001 (Miller and Gunsalus 1999). We used the revised version, updated August 1999 (from the original version dated 1997). WRAP assessment includes an Office Evaluation, a Field Evaluation, and calculation of the WRAP score.

The Office Evaluation includes gathering pertinent information prior to the field visit. First, the evaluator must identify the site using aerial maps and delineate the project boundaries. Second, the evaluator must identify land use adjacent to and surrounding the project site, this includes identifying developmental encroachment and type; natural areas and plant communities; roads, canals, well fields, and other potentially isolating or impacting features; and water quality pre-treatment systems. Third, the evaluator must define the wetland area within the project site that will be assessed using WRAP. Further description of the wetland area should include use of soil survey maps; identification of wetland community type; Florida Land Use, Cover and Forms Classification System (FLUCCS) codes for the assessment area and surrounding areas; access points; canals and ditches within the area; potential transect location(s); and a review of any wildlife studies conducted within the assessment area or nearby. Further review of site conditions begins on-site with an overview of regional hydrology, site management, maintenance plans, and a consideration of seasonal variability, drought, fires, excessive rainfall, and other pertinent site specific information.

The Field Evaluation includes walking a minimum of 50% of the wetland perimeter and a visual inspection of 100% of the wetland perimeter. While inspecting the site, the evaluator should note direct (e.g., sighting, calls, etc.) and indirect (e.g., tracks, scat, etc.) wildlife observations, plant community composition (i.e., including plant species coverage, cover by nuisance and/or exotic species, shifts in species such as encroachment by upland or transitional species), and hydrologic indicators (e.g., lichen lines, rafted debris, crayfish chimneys, obligate species, etc.). Notes should be recorded on the field data sheet as baseline conditions for future references and comparisons. For this study, we developed a two-sided field sheet for WRAP assessment that included additional space for notes on site condition (see below). In addition to these standard procedures, we also included a transect through the wetland, to investigate the interior of the wetland assessment area.

Calculation of scores for WRAP were for site current condition. Each of the scoring categories was assigned a number between 0.0-3.0, in 0.5 increments, representing the current wetland condition. Scores and WRAP calculations follow guidance provided in the Wetland Rapid Assessment Procedure Technical Publication REG-001 (Miller and Gunsalus 1999).

Wetland Rapid Assessment Procedure (WRAP)

All Data Sheets for Existing Conditions. Sheets designed for Mitigation Bank Study - K.C.Reiss. 5/2005

Project Name: SITE CODE, Site Name Mitigation Bank

Date:

Evaluator(s):

Wetland Type/Description:

Wetland Assessment Area:

FLUCCS Code/Description:

	Wildlife Utilization (WU)
	Wetland Canopy (O/S)
	Wetland Ground Cover (GC)
	Habitat Support/Buffer
	Field Hydrology (HYD)
	WQ Input & Treatment (WQ)
	SUM
	Count
	WRAP

	Wildlife Utilization (WU)

	Wetland Canopy (O/S)

	Wetland Ground Cover (GC)

0.0 Habitat Support/Buffer

Buffer Type	(Score) x	(% of Area)	= Sub Total
		Total =	

	Field Hydrology (HYD)

0.0 WQ Input & Treatment (WQ)*

**The value of WQ is obtained by adding the TOTAL scores of Land Use Category and Pretreatment Category then dividing by 2.*

LANDUSE CATEGORY (LU)

Land Use Category		(Score) x	(% of Area)	= Sub Total
			LU Total =	

PRETREATMENT CATEGORY (PT)

Pretreatment Category	(Score) x	(% of Area)	= Sub Total
		PT Total =	

Additional Notes:

APPENDIX A-3 Hydrogeomorphic wetland assessment (HGM)

The Hydrogeomorphic wetland assessment (HGM) was completed for both flats wetlands in the Everglades and depressional wetlands of peninsular Florida using United States Army Corps of Engineer guidebooks developed specifically for these wetland types. Standard procedures followed guidebook directions, which vary somewhat among wetland types.

Flats Wetlands in the Everglades

Flats wetlands in the Everglades have been divided into marl, rocky, or organic flats wetlands (Noble et al. 2002). Data gathered for calculation of variables include both field data and GIS information. Field sheets for flats wetlands follow (Figures 64-66 from guidebook). Four functions for flats wetlands in the Everglades include Surface and Subsurface Water Storage, Cycle Nutrients, Characteristic Plant Community, and Wildlife Habitat. Once the variables are calculated, the four functional capacity index (FCI) scores for each Everglades flats wetland can be calculated using the following equations (Noble et al. 2002):

Function 1: Surface and Subsurface Water Storage

A. For Rocky Flats wetlands of the Florida Everglades:

$$FCI = \left(\frac{V_{SURTEX} + V_{SOILTHICK} + V_{MICRO} + \left(\frac{V_{WOODY} + V_{PERI}}{2} \right)}{4} \right)$$

B. For Marl Flats wetlands of the Florida Everglades:

$$FCI = \left(\frac{V_{SURTEX} + V_{MICRO} + \left(\frac{V_{WOODY} + V_{PERI}}{2} \right)}{3} \right)$$

C. For Organic Flats wetlands of the Florida Everglades:

$$FCI = \left(\frac{V_{SURTEX} + V_{MICRO} + V_{WOODY}}{3} \right)$$

Function 2: Biogeochemical Processes (Cycle Nutrients)

A. For Rocky Flats wetlands of the Florida Everglades:

$$FCI = \left(\frac{\left(\frac{V_{SURTEX} + V_{MICRO}}{2} \right) + \left(\frac{V_{MAC} + V_{PERI} + V_{NATIVE}}{3} \right)}{2} \right)$$

B. For Marl Flats wetlands of the Florida Everglades:

$$FCI = \left(\frac{\left(\frac{V_{SURTEX} + V_{MICRO}}{2} \right) + \left(\frac{V_{MAC} + V_{PERI} + V_{COMP}}{3} \right)}{2} \right)$$

C. For Organic Flats wetlands of the Florida Everglades:

$$FCI = \left(\frac{\left(\frac{V_{SURTEX} + V_{MICRO}}{2} \right) + \left(\frac{V_{MAC} + V_{COMP}}{2} \right)}{2} \right)$$

Function 3: Characteristic Plant Community

A. For Rocky Flats wetlands of the Florida Everglades:

$$FCI = \left(\left(\frac{\left(\frac{\left(\frac{V_{MAC} + V_{PERI}}{2} \right) + V_{INVASIVE}}{2} \right) + V_{NATIVE}}{2} \right) \times \left(\frac{V_{SURTEX} + V_{SOILTHICK} + V_{MICRO}}{3} \right) \right)^{½}$$

B. For Marl Flats wetlands of the Florida Everglades:

$$FCI = \left(\left(\frac{\left(\frac{\left(\frac{V_{MAC} + V_{PERI}}{2} \right) + V_{INVASIVE}}{2} \right) + V_{COMP}}{2} \right) \times \left(\frac{V_{SURTEX} + V_{MICRO}}{2} \right) \right)^{½}$$

C. For Organic Flats wetlands of the Florida Everglades:

$$FCI = \left(\left(\frac{\left(\frac{V_{MAC} + V_{INVASIVE}}{2} \right) + V_{COMP}}{2} \right) \times \left(\frac{V_{SURTEX} + V_{MICRO}}{2} \right) \right)^{½}$$

Function 4: Provide Wildlife Habitat

A. For Rocky Flats wetlands of the Florida Everglades:

$$FCI = \left(\left(\frac{\left(\frac{V_{CONNECT} + V_{CORE} + V_{TRACT}}{3} \right) + \left(\frac{V_{SURTEX} + V_{SOILTHICK} + V_{MICRO}}{3} \right)}{2} \right) \times \left(\frac{V_{MAC} + V_{PERI} + V_{INVASIVE} + V_{NATIVE}}{4} \right) \right)^{½}$$

B. For Marl Flats wetlands of the Florida Everglades:

$$FCI = \left(\left(\frac{\left(\frac{V_{CONNECT} + V_{CORE} + V_{TRACT}}{3} \right) + \left(\frac{V_{SURTEX} + V_{MICRO}}{2} \right)}{2} \right) \times \left(\frac{V_{MAC} + V_{PERI} + V_{INVASIVE} + V_{COMP}}{4} \right) \right)^{½}$$

C. For Organic Flats wetlands of the Florida Everglades:

$$FCI = \left(\left(\frac{\left(\frac{V_{CONNECT} + V_{CORE} + V_{TRACT}}{3} \right) + \left(\frac{V_{SURTEX} + V_{MICRO}}{2} \right)}{2} \right) \times \left(\frac{V_{MAC} + V_{INVASIVE} + V_{COMP}}{3} \right) \right)^{½}$$

Rocky Flats Everglades Field Data Sheet

Assessment Team:_____
Project Name:_____
Location:_____
Date:_____ **Subclass: Rocky**

Sample variables 1-4 using aerial photography, topographic maps, National Wetland Inventory maps, soils survey maps, etc.

1. V_{TRACT} Area of wetland that is contiguous with WAA ..... _____ ha

2. V_{CORE} Percent of wetland tract that is >300 m from unsuitable habitat ..... _____ %

3. $V_{CONNECT}$ Percent of wetland tract perimeter that is "connected" to suitable habitat ..... _____ %

4. V_{MICRO} Percent of wetland area that has altered microtopographic features ..... _____ %

Sample variables 5-7 from a representative number of locations in the WAA using a 0.04-ha circular plot (11.3-m (37-ft) radius)

5. V_{WOODY} Percent cover of woody vegetation ≥1 m (3.3 ft) in height (average of 0.04-ha values on next line) ..... _____ %
   Average of 0.04-ha plots sampled: _____% _____% _____%

6. $V_{INVASIVE}$ Percent cover of invasive vegetation from all strata (average of 0.04-ha values on next line)..... _____ %
   Average of 0.04-ha plots sampled: _____% _____% _____%

7. V_{NATIVE} The total number of native wetland species in Rocky Everglades wetlands ..... _____ #

Sample variables 8-11 in three (3) 1-m^2 subplots placed in representative locations of each quadrant of the 0.04-ha plot

8. V_{MAC} Percent cover of emergent macrophytic vegetation (average of 0.04-ha values on next line)..... _____ %
   Average of 0.04-ha plots sampled: 1_____% 2_____% 3_____%
   4_____% 5_____% 6_____%
   7_____% 8_____% 9_____%

9. V_{PERI} Percent cover of periphyton (average of 0.04-ha values on next line)..... _____ %
   Average of 0.04-ha plots sampled: 1_____% 2_____% 3_____%
   4_____% 5_____% 6_____%
   7_____% 8_____% 9_____%

10. V_{SURTEX} Soil texture of surface horizon or layer of the WAA as a percent (average of 0.04-ha values on next line)..... _____ %
    Average of 0.04-ha plots sampled: 1_____% 2_____% 3_____%
    4_____% 5_____% 6_____%
    7_____% 8_____% 9_____%

11. $V_{SOILTHICK}$ Average soil thickness over limestone bedrock in centimeters (average of 0.04-ha values on next line)..... _____ cm
    Average of 0.04-ha plots sampled: 1_____% 2_____% 3_____% _____
    4_____% 5_____% 6_____% _____
    7_____% 8_____% 9_____%

Figure 64. Sample field data sheet for Rocky Flats Everglades wetlands

Marl Flats Everglades Field Data Sheet

Assessment Team:_____

Project Name:_____

Location:_____

Date:_____ **Subclass: Marl**

Sample variables 1-4 using aerial photography, topographic maps, National Wetland Inventory maps, soils survey maps, etc.

1. V_{TRACT} Area of wetland that is contiguous with WAA..... _____ ha

2. V_{CORE} Percent of wetland tract that is >300 m from unsuitable habitat ..... _____ %

3. $V_{CONNECT}$ Percent of wetland tract perimeter that is "connected" to suitable habitat ..... _____ %

4. V_{MICRO} Percent of wetland area that has altered microtopographic features ..... _____ %

Sample variables 5 & 6 from a representative number of locations in the WAA using a 0.04-ha circular plot (11.3-m (37-ft) radius)

5. V_{WOODY} Percent cover of woody vegetation ≥1 m (3.3 ft) in height (average of 0.04-ha values on next line) ..... _____ %
   Average of 0.04-ha plots sampled: _____% _____% _____%

6. $V_{INVASIVE}$ Percent cover of invasive vegetation from all strata (average of 0.04-ha values on next line)..... _____ %
   Average of 0.04-ha plots sampled: _____% _____% _____% _____

Sample variables 8-12 in three (3) 1-m^2 subplots placed in representative locations of each quadrant of the 0.04-ha plot

8. V_{MAC} Percent cover of emergent macrophytic vegetation (average of 0.04-ha values on next line)..... _____ %
   Average of 0.04-ha plots sampled: 1_____% 2_____% 3_____%
   4_____% 5_____% 6_____%
   7_____% 8_____% 9_____%

9. V_{PERI} Percent cover of periphyton (average of 0.04-ha values on next line)..... _____ %
   Average of 0.04-ha plots sampled: 1_____% 2_____% 3_____%
   4_____% 5_____% 6_____%
   7_____% 8_____% 9_____%

10. V_{SURTEX} Soil texture of surface horizon or layer of the WAA as a percent (average of 0.04-ha values on next line)..... _____ %
    Average of 0.04-ha plots sampled: 1_____% 2_____% 3_____%
    4_____% 5_____% 6_____%
    7_____% 8_____% 9_____%

12. V_{COMP} Concurrence with dominants (average of 0.04-ha values on next line) _____ %
    Average of 0.04-ha plots sampled: 1_____% 2_____% 3_____%: _____
    4_____% 5_____% 6_____% _____
    7 % 8 % 9 %

Figure 65. Sample field data sheet for Marl Flats Everglades wetlands

Organic Flats Everglades Field Data Sheet

Assessment Team:_____

Project Name:_____

Location:_____

Date:_____ **Subclass: Organic**

Sample variables 1-4 using aerial photography, topographic maps, National Wetland Inventory maps, soils survey maps, etc.

1. V_{TRACT} Area of wetland that is contiguous with WAA ..... _____ ha

2. V_{CORE} Percent of wetland tract that is >300 m from unsuitable habitat ..... _____ %

3. $V_{CONNECT}$ Percent of wetland tract perimeter that is "connected" to suitable habitat ..... _____ %

4. V_{MICRO} Percent of wetland area that has altered microtopographic features ..... _____ %

Sample variables 5 & 6 from a representative number of locations in the WAA using a 0.04-ha circular plot (11.3-m (37-ft) radius)

5. V_{WOODY} Percent cover of woody vegetation ≥1 m (3.3 ft) in height (average of 0.04-ha values on next line) ..... _____ %
   Average of 0.04-ha plots sampled: _____% _____% _____%

6. $V_{INVASIVE}$ Percent cover of invasive vegetation from all strata (average of 0.04-ha values on next line)..... _____ %
   Average of 0.04-ha plots sampled: _____% _____% _____%

Sample variables 8, 10, & 12 in three (3) 1-m^2 subplots placed in representative locations of each quadrant of the 0.04-ha plot

8. V_{MAC} Percent cover of emergent macrophytic vegetation (average of 0.04-ha values on next line)..... _____ %
   Average of 0.04-ha plots sampled: 1_____% 2_____% 3_____%
   4_____% 5_____% 6_____%
   7_____% 8_____% 9_____%

10. V_{SURTEX} Soil texture of surface horizon or layer of the WAA as a percent (average of 0.04-ha values on next line)..... _____ %
    Average of 0.04-ha plots sampled: 1_____% 2_____% 3_____%
    4_____% 5_____% 6_____%
    7_____% 8_____% 9_____%

12. V_{COMP} Concurrence with dominants (average of 0.04-ha values on next line) _____ %
    Average of 0.04-ha plots sampled: 1_____% 2_____% 3_____%:
    4_____% 5_____% 6_____%:
    7_____% 8_____% 9_____%:

Figure 66. Sample field data sheet for Organic Flats Everglades wetlands

Depressional Wetlands in Peninsular Florida

Depressional wetlands in peninsular Florida have been divided into herbaceous depressions and cypress domes (Noble et al. 2004). Data gathered for calculation of variables include both field data and GIS information. Field sheets for depressional wetlands follow (Figures 58-61 from guidebook). Five functions for depressional wetlands include Surface Water Storage, Subsurface Water Storage, Cycle Nutrients, Characteristic Plant Community, and Wildlife Habitat. Once the variables are calculated, the five functional capacity index (FCI) scores for each depressional wetland can be calculated using the following equations (Noble et al. 2004):

Function 1: Surface Water Storage

A. For Herbaceous Depressional Wetlands:

$$FCI = \left(V_{WETVOL} \times \left(\frac{\left(\frac{V_{CATCH} + V_{UPUSE}}{2} \right) + V_{SUROUT}}{2} \right) \right)^{½}$$

B. For Cypress Dome Depressional Wetlands:

$$FCI = \left(V_{WETVOL} \times \left(\frac{\left(\frac{V_{CATCH} + V_{UPUSE}}{2} \right) + \left(\frac{V_{SUROUT} + V_{CANOPY}}{2} \right)}{2} \right) \right)^{½}$$

Function 2: Subsurface Water Storage

A. For Herbaceous Depressional Wetlands and Cypress Dome Depressional Wetlands:

$$FCI = \left(\frac{\left(\frac{V_{CATCH} + V_{UPUSE}}{2} \right) + \left(\frac{V_{SUBOUT} + V_{SURTEX}}{2} \right)}{2} \right)$$

Function 3: Cycle Nutrients

A. For Herbaceous Depressional Wetlands:

$$FCI = \left(\frac{V_{SURTEX} + V_{MAC} + \left(\frac{V_{CATCH} + V_{UPUSE} + V_{SUROUT}}{3} \right)}{3} \right)$$

B. For Cypress Dome Depressional Wetlands:

$$FCI = \left(\frac{V_{SURTEX} + \left(\frac{V_{CATCH} + V_{UPUSE} + V_{SUROUT}}{3} \right) + \left(\frac{V_{TBA} + V_{SSD}}{2} \right)}{3} \right)$$

Function 4: Characteristic Plant Community

A. For Herbaceous Depressional Wetlands:

$$FCI = \left(\left(\frac{V_{MAC} + V_{HCOMP}}{2} \right) \times \left(\frac{V_{SURTEX} + V_{SUBOUT}}{2} \right) \right)^{1/2}$$

B. For Cypress Dome Depressional Wetlands:

$$FCI = \left(\left(\frac{\left(\frac{V_{TBA} + V_{SSD}}{2} \right) + V_{TCOMP}}{2} \right) \times \left(\frac{V_{SURTEX} + V_{SUBOUT}}{2} \right) \right)^{1/2}$$

Function 5: Provide Wildlife Habitat

A. For Herbaceous Depressional Wetlands:

$$FCI = \left(\frac{\left(\frac{V_{SUBOUT} + V_{ZONES}}{2} \right) + \left(\frac{V_{UPUSE} + V_{WETPROX}}{2} \right)}{2} \times \left(\frac{\left(\frac{V_{MAC} + V_{HCOMP}}{2} \right) + V_{SURTEX}}{2} \right) \right)^{1/2}$$

B. For Cypress Dome Depressional Wetlands:

$$FCI = \left(\frac{\left(\frac{V_{SUBOUT} + V_{ZONES}}{2} \right) + \left(\frac{V_{UPUSE} + V_{WETPROX}}{2} \right)}{2} \times \left(\frac{\left(\frac{V_{CANOPY} + V_{TBA}}{2} \right) + V_{TCOMP} + V_{SURTEX}}{3} \right) \right)^{1/2}$$

Herbaceous Field Data Sheet

Assessment Team:____

Project Name:____

Location:____

Date:____ **Subclass: herbaceous depression**

Sample variables 1-3 using aerial photography, topographic maps, National Wetland Inventory maps, soils survey maps, etc.				
1.	V_{CATCH}	Percent change in the size of the catchment (if no impact to catchment, variable subindex = 1.0)…………………………………………………………………….. Size of original catchment _______ha; Size of current catchment _______ ha	_____	%
2.	V_{UPUSE}	Percent cover of upland landuse (if native landscape in good condition, variable subindex = 1.0)……………………………………………………………………... Cover type _______ Curve #______ % ___Cover type ________ Curve #_____ % Cover type _______ Curve #______ % ___Cover type ________ Curve #_____ % Cover type _______ Curve #______ % ___Cover type ________ Curve #_____ % Cover type _______ Curve #______ % ___Cover type ________ Curve #_____ % Cover type _______ Curve #______ % ___Cover type ________ Curve #_____ %	_____	%
3.	$V_{WETPROX}$	Distance from wetlands edge to nearest depressional wetland within 500 m……… Sector 1 ______ m Sector 2 ______ m Sector 3 _______ m Sector 4 _______ m Sector 5 ______ m Sector 6 ______ m Sector 7 _______ m Sector 8 _______ m	_____	m
Sample variables 4-7 during on site field reconnaissance				
4.	V_{WETVOL}	Change in the volume of the wetland (if no fill or excavation variable subindex = 1.0)………………………………………………………………………………….. Diameter of wetland north-south ____m; Diameter of wetland north-south ____m Depth of the wetland_________m Length of fill material _____m; Width of fill material ____ m; Average thickness of fill material ___m	_____	% m
5.	V_{SUBOUT}	Percent of wetland effected by lateral effect of ditches to surface water storage…... Difference in elevation of bottom of ditch and bottom of wetland ____m; Lateral effect of ditch _____ m; Distance of ditch to wetland _____ m	_____	%
6.	V_{SUBOUT}	Percent of wetland effected by lateral effect of ditches to subsurface water storage Difference in elevation of bottom of ditch and bottom of wetland + 6 in _____m; Lateral effect of ditch _____ m; Distance of ditch to wetland _____ m	_____	%
7.	V_{ZONES}	Change in the number of wetland zones (if no change in the number of zones variable subindex = 1.0)………………………………………………………………		#
Sample variables 8-10 along 4 or more transects that cross each wetlands zone				
8.	V_{MAC}	Percent cover of emergent macrophytic vegetation……………………………………		%
10.	V_{SURTEX}	Average soil texture of surface horizon or layer of the WAA or PWAA…………. Subindex score of sample point: Transect 1 zone1_____; zone2_____; zone3_____; zone 4_____ Transect 2 zone1_____; zone2_____; zone3_____; zone 4_____ Transect 3 zone1_____; zone2_____; zone3_____; zone 4_____ Transect 4 zone1_____; zone2_____; zone3_____; zone 4_____	_____	
13.	V_{HCOMP}	Average percent concurrence of dominant species from all wetland zones present.. Wet meadow zone __________ % Shallow marsh zone _________ % Deep marsh zone ___________ %	_____	%

Figure 58. Data Form 1, sample field data sheet for herbaceous depressional wetlands

Cypress Dome Field Data Sheet

Assessment Team:_____

Project Name:_____

Location:_____

Date:_____ **Subclass: cypress dome**

Sample variables 1-3 using aerial photography, topographic maps, National Wetland Inventory maps, soils survey maps, etc.				
1.	V_{CATCH}	Percent change in the size of the catchment (if no impact to catchment, variable subindex = 1.0)……	_____	%
		Size of original catchment _____ha Size of current catchment _____ ha		
2.	V_{UPUSE}	Percent cover of upland landuse (if native landscape in good condition, variable subindex = 1.0)……	_____	%
		Cover type _____ Curve #_____ % ____Cover type _____ Curve #____ % Cover type _____ Curve #_____ % ____Cover type _____ Curve #____ % Cover type _____ Curve #_____ % ____Cover type _____ Curve #____ % Cover type _____ Curve #_____ % ____Cover type _____ Curve #____ % Cover type _____ Curve #_____ % ____Cover type _____ Curve #____ %		
3.	$V_{WETPROX}$	Distance from wetlands edge to nearest depressional wetland within 500 m……..	_____	m
		Sector 1 m Sector 2 m Sector 3 m Sector 4 m Sector 5 m Sector 6 m Sector 7 m Sector 8 m		
Sample variables 4-7 during on site field reconnaissance				
4.	V_{WETVOL}	Change in the volume of the wetland (if no fill or excavation variable subindex = 1.0)……..	_____	%
		Diameter of wetland north-south _____m; Diameter of wetland north-south ___m Depth of the wetland_____m Length of fill material ____m; Width of fill material ____ m; Average thickness of fill material ____m		
5.	V_{SUBOUT}	Percent of wetland effected by lateral effect of ditches to surface water storage…..	_____	%
		Difference in elevation of bottom of ditch and bottom of wetland _____m; Lateral effect of ditch _____ m; Distance of ditch to wetland _____ m		
6.	V_{SUBOUT}	Percent of wetland effected by lateral effect of ditches to subsurface water storage	_____	%
		Difference in elevation of bottom of ditch and bottom of wetland + 6 in _____m; Lateral effect of ditch _____ m; Distance of ditch to wetland _____ m		
7.	V_{ZONES}	Change in the number of wetland zones……		#
Sample variables 8-11 along 4 or more transects that cross each wetlands zone				
9.	V_{CANOPY}	Percent cover of cypress trees in the tree zone……..		%
10.	V_{SURTEX}	Soil texture of surface horizon or layer of the WAA or PWAA……	_____	
		Subindex score of sample point: Transect 1 zone1_____; zone2_____; zone3_____; zone 4_____ Transect 2 zone1_____; zone2_____; zone3_____; zone 4_____ Transect 3 zone1_____; zone2_____; zone3_____; zone 4_____ Transect 4 zone1_____; zone2_____; zone3_____; zone 4_____		
11.	V_{TBA}	Average tree basal area within tree zone……	_____	m^2/ha
		Plot 1_____ m^2/ha; Plot 2_____ m^2/ha; Plot 3 _____ m^2/ha;Plot 4 _____ m^2/ha		
12.	V_{SED}	Average % cover of emergent macrophytic and woody vegetation >1 m in height and <10 cm dbh……..		%
14.	V_{TCOMP}	Average percent concurrence of dominant species from the tree zone wetland zones……..		%

Figure 59. Data Form 2, sample field data sheet for cypress dome wetlands

Tree Basal Area Field Data Sheet

Assessment Team:____

Project Name:____

Location:____

Date:____**Subclass: cypress dome**

Record the species and dbh (cm) of all trees (i.e., woody stems $\geq$ 10 cm (4 in.) in the plot within the tree zone

1	2	3	4	1	2	3	4
species code	dbh (cm)	area (cm^2)	area (m^2)	species code	dbh (cm)	area (cm^2)	area (m^2)

Figure 60. Data Form 3, sample field data sheet for tree basal area for cypress dome wetlands

Transect Point Sampling Field Data Sheet

Assessment Team:_____

Project Name:_____

Location:_____

Date:_____ **Subclass:**

Record the transect #, zone (i.e., wet meadow, shallow marsh, deep marsh, tree), sample point, strata (i.e., herbaceous for herbaceous wetlands) (i.e., herbaceous, shrub, tree for cypress dome wetlands) and species

1	2	3	4	5	6			7
Transect #	zone	point #	# of species	species	% cover by point			% cover by species
					H	S	T	
				Total herbaceous cover zone (%)				
				Total shrub cover zone (%)				
				Total tree cover zone (%)				

Figure 61. Data Form 4, sample point transect field data sheet for herbaceous and cypress dome depressional wetlands

APPENDIX A-4 Florida Wetland Condition Index (FWCI)

The Florida Wetland Condition Index (FWCI) was completed for macrophyte and macroinvertebrate communities at depressional herbaceous (Lane et al. 2003), depressional forested (Reiss and Brown 2005a), and forested strand and floodplain wetlands (Reiss and Brown 2005b). Detailed standard operating procedures are available in these documents. Equations used to calculate score each metric can also be found in these documents.

Depressional Wetland Macrophyte FWCI Protocol

1. Using a compass, locate the 4 cardinal point directions (north, south, east, and west). The 4 transects will begin at each cardinal point running from the edge of the wetland into the interior/middle of the wetland. These 4 transects will intersect in the middle and divide the wetland into 4 approximately equal sections.
2. At the beginning of each transect, delineate the edge of the wetland using a combination of wetland plants and hydric soils. Be conservative on the side of the wetland.
3. Establish the transect using the meter tapes. Start with 0 meters at the wetland edge, and increase distance towards the wetland interior.
4. Use a separate field data sheet for each cardinal direction. If the number of species located on a transect exceeds the number of columns on the data sheet, start a new data sheet.
5. Creating quadrats that are 0.5 m on either side of the transect (1 m wide) and 5 m long, record all species present within these elongated quadrats.
6. Plant species names are recorded on the data sheets using the full genus and species names. Each unknown species is given a unique ID code using the transect location (ex. N-1).
7. Voucher specimens for all unknown species are collected, being sure to get plant inflorescence and roots, tagged with properly labeled masking tape, and put into a labeled collection bag. Note the color of the inflorescence on the label, as the flowers often do not preserve well. Index cards can be used to protect especially sensitive parts.
8. All collected plants are identified in the field on the day of sampling and placed in a plant press for further clarification and identification. Plant nomenclature follows FDEP's *Florida Wetland Plant Identification Manual* (Tobe et al. 1998).

Forested Strand Wetland Macrophyte FWCI Protocol

1. Note the direction of flow through the landscape.
2. Locate a line running through the center of the strand along the flow gradient. This is the center-line.
3. Randomly select a starting point for the initial transect. Each consecutive transect will begin approximately 25 m upstream of the initial transect, so that a stretch of approximately 100 m will be sampled along the length of the strand. Run transects perpendicular to the main channelized flow.
4. At the beginning of each transect, delineate the edge of the wetland using a combination of wetland plants and hydrologic indicators. Be conservative on the side of the wetland.
5. Establish the transect using a meter tape and a compass. Each transect will start with 0 meters at the wetland edge and run into the center-line (established in step 2).
6. Use a separate field data sheet for each transect. If the number of species located on a transect exceeds the number of columns on the data sheet, start a new data sheet. Be

thorough in completing field data sheets including information on site, transect direction, date, and data recorder. Specify if there are multiple field data sheets for a single transect.
7. Create quadrats that are 0.5 m on either side of the transect (1-m wide) and 5-m long, record all species rooted within these elongated quadrats.
8. Plant species names are recorded on the data sheets using the full genus and species names. Each unknown species is given a unique ID code using the transect number (ex. 1-1, 1-2, 1-3, 2-1, 2-2, etc.).
9. Collect voucher specimens for all unknown species being sure to get plant inflorescence and roots, tag samples with properly labeled masking tape, and put into a labeled collection bag. Note the color of the inflorescence on the label, as the flowers often do not preserve well. Index cards can be used to protect especially sensitive parts. When vegetation sampling is complete, store the collection bag in a cooler on ice until identification can be completed.
10. Voucher specimens are identified in the field on the day of sampling. Unidentified plants will be placed in a plant press for further clarification and identification. Plant nomenclature follows FDEP's *Florida Wetland Plant Identification Manual* (Tobe et al. 1998). If time prohibits immediate pressing, unknown plants should be stored in the cooler.

Depressional Wetland Macroinvertebrate FWCI Protocol

1. There are to be 20 sweeps (evenly divided into the vegetation/habitat zones) to send to FDEP unpicked for identification.
2. Always do your sweeps in undisturbed areas where you have not walked through yet.
3. A single sweep is one net width and two net lengths to equal 0.5 m^2.
4. Using a U.S. Standard 30 mesh net, sweep from the bottom of the substrate up the plant stalks. Use your hands to strip the plant of all material into the net. If you are in a forested site, use a brush to clean any snags and roots of material.
5. Vigorously sample the area repeatedly (3 times) to ensure good coverage.
6. Dip net into water repeatedly, without letting the sample out, to try and sift the muck and silt through the net.
7. Do not sample in the muck!
8. Place the contents of each sweep into the 3.8 L jar. When all 20 samples are complete, preserve the sample by adding Formalin at a rate of 10% of the sample volume. Seal the jar. Shake to ensure thorough mixing.
9. Place masking tape over the lid to prevent leakage during travel & shipment. Properly label the jar with the site name, date, and collector.
10. Thoroughly clean all equipment off with water.
11. Return samples to room 120 at the Center for Wetlands (UF) for later shipment to the FDEP.

FWCI - Field Data Sheet - Transects, 1 x 5 m quadrat presence - UF Center for Wetlands

Site: **Transect Number:**

Date: **Data Recorder:**

Species																										
0-5 m																										
5-10																										
10-15																										
15-20																										
20-25																										
25-30																										
30-35																										
35-40																										
40-45																										
45-50																										
50-55																										
55-60																										
60-65																										
65-70																										
70-75																										
75-80																										
80-85																										
85-90																										
90-95																										
95-100																										

APPENDIX A-5 Landscape Development Intensity (LDI) Index

Two scales of the Landscape Development Intensity (LDI) index were calculated: wetland scale LDI index for each of the 58 wetland assessment areas and bank scale LDI index for 26 banks. To calculate the wetland scale LDI index, a 100 m zone was delineated around the edge of each wetland assessment area and land uses within the zone were identified based on 2004 digital orthographic quarter quads and field notes for current surrounding land use from site visits. Lands surrounding wetland assessment areas within that zone that were within wetland mitigation bank boundaries were assigned the development intensity of "Natural Land," which suggests no use of nonrenewable energy, which is the anticipated future condition. To calculate the bank scale LDI index, a 100 m zone was constructed around the bank boundary and land uses within the zone were identified using 2000 land use cover maps (LU00), available from the Florida Geographic Data Library (http://www.fgdl.org/). Only 26 bank scale LDI calculations were completed, as the mitigation bank outline was not available for Boran Ranch Phase I; Phases I and II of the Everglades Mitigation Bank were combined into one bank scale LDI index; and year 2000 land use was not available for Garcon Peninsula.

The LDI index was calculated according to the equation for LDI that incorporates the amount of nonrenewable energy use (Table 2-4) weighted by area of land use. Brown and Vivas (2005) present the basis for LDI index calculations, and Vivas (2007) presents a modified equation, which was used in this study.

$$LDI = 10 * (\log (emPD_{Total}/emPD_{Renew}))$$

$$\text{where } emPD_{Total} = emPD_{Renew} + emPD_{NonRenew}$$

$empPD_{Total}$ is the total empower density (including the background environment) within the 100 m zone surrounding the wetland assessment area (wetland scale LDI) or the wetland mitigation bank (bank scale LDI).

$$emPD_{Renew} = 1.81 \text{ E15 sej/ha/yr}$$

$emPD_{Renew}$ is the empower density of the background environment (1.81 E15 sej/ha-yr, which is the empower density for rain in Florida) (Vivas 2007). [This value would vary based on location of a study.]

$$emPD_{NonRenew} = \sum (\%LU_i * emPD_i)$$

where %LUi is the percent of the total 100 m zone in land use i, and $emPD_i$ is the nonrenewable empower density for land use i from Table 2-4. This is the area weighted component of the equation.