WETLAND ASSESSMENT PROCEDURE (WAP)

INSTRUCTION MANUAL FOR ISOLATED WETLANDS

March 2005

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and

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1.0. INTRODUCTION

This instruction manual is designed to guide the user through the steps necessary to apply the Wetland Assessment Procedure (WAP), including the installation of wetland transects and the performance of the periodic evaluations. The WAP was originally developed in 2000 as part of the Environmental Management Plan (EMP – March 4, 2000) – a plan used to collect data to be used in the management of the Central System wellfields included in Tampa Bay Water's Consolidated Water Use Permit. This instruction manual constitutes the first revision of the original WAP, and replaces Attachments C through F of the EMP.

Note that certain words and phrases used throughout this manual (presented in bold type) are defined in Appendix B. Abbreviated definitions are sometimes included within the text of this instruction manual, but the user should review the more detailed definition of terms in Appendix B. Please be aware that some definitions have been modified for the WAP and may deviate from generic definitions.

The objective of the WAP is to collect information on vegetation, **hydrology**, soils, and other pertinent variables in monitored wetlands to accurately characterize the ongoing biological condition and health of each wetland. This information will be used for a variety of water management purposes, including wellfield management considerations, the development of minimum flows and levels, and the assessment of recovery in areas that have experienced historic hydrologic and biologic impacts due to ground-water withdrawals. It is important to understand that although the WAP seeks to document and monitor many aspects of wetland health, many of these aspects are not the procedure's focus. Many wetlands are also subject to negative health impacts caused by surrounding land management and drainage practices, encroaching development, cattle operations, **exotic plant** species introduction, disease, and other variables, but the WAP attempts to focus on the collection of data that will be used to assess biologic changes caused by the hydrologic effects of ground-water withdrawals.

Note that as of 2005, this WAP methodology is appropriate for isolated wetlands only. The Southwest Florida Water Management District (SWFWMD) suggests that evaluators continue assessing flow systems as appropriate, but evaluators should not apply this revised method to flow systems. An assessment methodology for flow systems will be addressed at a later date.

The results of the WAP include health assessment scores, data collection, observations, and other general information. One critical aspect of the procedure is the written documentation requested to explain various decisions made by the evaluator, as well as a written, ongoing history of each site. The written explanations and comments are intended to document the evaluators logic in deriving scores, provide a basis for ongoing quality control (as well as future correction of errors), and provide the evaluator the ability to document potentially important wetland health-related observations that may not be fully included in the current procedure. Therefore, it is important to realize that the written explanations, comments, and history are essential products of the WAP, and should not be considered optional.

An attempt has been made to make the following instructions as comprehensive as possible. However, if an evaluator finds a situation that is apparently not included in these instructions, the situation should be documented, and the documentation forwarded as soon as possible to Tampa Bay Water and/or the SWFWMD for clarification or resolution before long-term decisions are made.

2.0. DATA REPORTING AND FORMATS

The type and format of data to be submitted to Tampa Bay Water and/or the SWFWMD will be dependent on the current databases and data processing tools. Therefore, the details of data reporting and formatting will be addressed in a separate document, based on procedures agreed upon by both the SWFWMD and Tampa Bay Water. Data to be submitted will include:

a. Wetland history information (see Appendix E)
b. Documentation of transect, well, and **staff gage** installations (see Appendix F)
c. Soils information (see Section 4.1 below)
d. Annual WAP data (see Section 5.0 below)

3.0. ACTIVITIES TO BE PERFORMED FOR INITIAL WETLAND SETUP

3.1. Historical Assessment

A history of the wetland should be established (referred to as the "wetland history" throughout this document). The wetland history should include an initial evaluation of the status of the wetland condition based on several factors, which may include: 1) study of **historical** aerial photography, 2) interviews with previous evaluators, 3) review of previous studies in the area, and 4) initial field visits to the wetland (including documentation of long-term biologic indicators of past hydrologic conditions). The purpose of the **historical** assessment is to provide information on the wetland condition, **historical stresses**, and potential existing **stresses** in the area. See Appendix E for a more detailed discussion of information that should be included in the wetland history.

3.2. WAP Transect Selection and Setup

Once a wetland is chosen for monitoring, the following steps are necessary to establish the **WAP Transect**. Unless the **WAP Transect** needs to be moved or reestablished, this process should only need to be performed once. See Appendix F for a detailed list of information that should be included in the documentation of the transect setup.

WAP Transect selection. All vegetation assessments will be conducted along a **WAP Transect**. The **WAP Transect** is a straight line from the **historic wetland edge** to the **wetland interior**, and should be chosen such that it provides the best opportunity to fully assess all aspects of the wetland, including the **transition zone** (see below). Practical considerations, such as access issues, existing disturbance, minimizing vegetation disturbances while monitoring, and lines of sight, should also be taken into account when choosing a **WAP Transect**. If a **wetland well**, **upland well**, and/or a **staff gage** have been previously established, consideration should be given to including their location in the **WAP Transect**. If wells and/or a **staff gage** have not been established, they should be installed as close to the **WAP Transect** as possible.

The area to be assessed from the **WAP Transect** will be referred to as the **Assessment Area**. Whenever possible, the width of the **Assessment Area** will be approximately ten meters in width (including ten meters beyond the **wetland interior**). If the evaluator determines that critical information concerning the **zonation** condition of the wetland exists beyond the standard ten meter-wide **Assessment Area**, a wider **Assessment Area** may be used (up to the entire area of the wetland). However, when an **Assessment Area** greater than ten meters is used, the evaluator must 1) justify the larger transect size on the field sheet and in the database, 2) approach all critical areas at a distance from which elevations and species identification can be readily determined, and 3) accurately describe the size of the **Assessment Area** on the field sheet and in the database. Future evaluators should use the **Assessment Area** established by previous evaluators unless there is strong evidence to do otherwise. Evaluators should stay on the **WAP Transect** as much as possible to avoid unnecessary trampling of vegetation, but can walk throughout the wetland if critical for an accurate evaluation.

Establishment of Historic Normal Pool and other reference points. Once the location of the **WAP Transect** is chosen, the **historic normal pool** and **historic wetland edge** need to be established. Appendix C contains the definitions and procedures necessary to make these determinations. Once these elevations are determined, the elevations six-inches below **historic normal pool** (**NP-6**) and twelve-inches below **historic normal pool (NP-12)** should be established along the **WAP Transect**. The **NP-6** and **NP-12** elevations must be permanently marked for future reference. If possible, markers should also be placed at the **historic wetland edge**, as well as the **wetland interior**. The **staff gage** can serve as the **wetland interior** marker if it is placed appropriately. All four points should also be recorded using the Geographic Positioning System (GPS), and documented with detailed notes, for future reference.

The **NP-6** elevation, **NP-12** elevation, **historic wetland edge**, and **wetland interior** will be used to designate the three **wetlands zones** used in the WAP analysis. The area within the **Assessment Area** between the **historic wetland edge** and the **NP-6** marker is referred to as the **transition zone**. The area within the **Assessment Area** between the **NP-6** marker and the **NP-12** marker is referred to as the **outer deep zone**. The area within the **Assessment Area** between the **NP-12** marker and the **wetland interior** marker is referred to as the **deep zone**. Note that the **NP-6** and **NP-12** elevations may not necessarily coincide with existing vegetational indicators if the **hydrology** of the wetland has been altered, or due to natural short-term fluctuations.

If the **transition** or **outer deep zones** of the wetland are very narrow, an assessment of these **zones** may not be practical or appropriate. The **transition zone** or **outer deep zone** can be naturally narrow, can become narrow due to disturbance by surrounding land use activities, or can have become narrow due to **subsidence** in the wetland. If possible, the **WAP Transect** should be chosen in a portion of the wetland with a **transition zone** and **outer deep zone** that are wide enough for adequate monitoring. However, if no such area exists, or if an existing **WAP Transect** has a narrow **transition zone** or **outer deep zone**, and the assessor determines that the value of the maintaining the existing **WAP Transect** outweighs the value of moving the **WAP Transect**, the narrow **transition zone** or **outer deep zone** should not be monitored. In this case, the situation should be clearly discussed in the wetland history. A **zone** that is too narrow for practical evaluation is generally considered to be one meter or less in width (from the **historic wetland edge** to the **NP-6** elevation for the **transition zone**, or from the **NP-6** elevation to the **NP-12** elevation for the **outer deep zone**), but the determination of whether or not a **zone** is too narrow for evaluation is a decision of the assessor (subject to SWFWMD and Tampa Bay Water consensus).

In very shallow wetland systems, it may not be possible to establish an **NP-6** or **NP-12** elevation (i.e., the wetland has no **deep zone** and/or **outer deep zone**). In these cases, the situation should be clearly discussed in the wetland history.

The **WAP Transect** and supporting elevations should be fully documented (using the worksheet in Appendix F). Based on the documentation and specific wetland situation, an on-site verification may be required. If the **WAP Transect** needs to be moved during the course of wetland monitoring, all appropriate elevations should be re-established, and the information on the new **WAP Transect** must be documented.

4.0. ACTIVITIES TO BE PERFORMED AT LEAST EVERY FIVE YEARS

4.1. Soils Assessment

The evaluator should perform a thorough assessment of the condition of the soils. Any significant findings should be added to the wetland history.

The assessor should attempt to walk the entire wetland, looking for signs of soil loss or **oxidation, subsidence** caused by karst activity, soil lowering caused by compaction, or disturbance caused by other activities. Indications of the spatial distribution and depth of soil impacts should be documented. The following should be used as guidance:

- Substantial soil **subsidence**/**oxidation**: This condition occurs when **subsidence** greater than or equal to six inches is observed.
- Moderate soil **subsidence**/**oxidation**: This condition occurs when **subsidence** greater than two inches but less than six inches is observed.
- Little or no evidence of soil **subsidence**/**oxidation**: This condition occurs when **subsidence** less than two inches is observed, and when no other evidence of oxidized conditions is apparent.

See Appendix B for more details.

4.2. Wetland History Update

Update the original wetland history with any significant new observations based on the annual evaluations, soils assessments, and other information. The evaluator is encouraged to update the wetland history on a frequent basis, but at least every five years. Information recorded in the "Additional Information" section can be used for this purpose (see Section 5.0 below). See Appendix E for a discussion of information that should be included in the wetland history.

5.0. ACTIVITIES TO BE PERFORMED ANNUALLY

The following information must be collected annually during the May/June time period. All of the data must be entered into an approved electronic database. A form for use in data collection in the field will be provided in a separate document. The following describes the information to be collected during the annual evaluations.

WELLFIELD/PROPERTY Identify wellfield associated with the wetland assessment (if any). If none, state property monitored, project, or regional control.

STATION ID Identify the wetland station ID.

HISTORIC FLUCCS CODE Identify the **historical** Florida Land Use, Cover and Forms Classification System (**FLUCCS**) code for the wetland. A table is provided in the EMP that cross-references the **FLUCCS**, Florida Natural Areas Inventory (FNAI) and SWFWMD codes.

WETLAND TYPE Identify wetland type from Appendix D that most closely represents the wetland being assessed .

PERSONNEL Identify organization and person(s) conducting the wetland assessment.

DATE Date (within the May/June time period).

TIME Time of arrival

GROUND PHOTOGRAPHY

Photos As a minimum, photos should be taken of the **wetland interior** at the **staff gage**, of the **transition zone** at the **NP-6** marker, and of the entire wetland from outside the wetland (as practical). If useful, photos should be taken in each cardinal direction at each location. Optionally, if the wetland has been monitored for several years, photos should be taken at previously-chosen photo points. In this case, the photo points must be clearly described in the wetland documentation and identified by accurate latitude and longitude coordinates (if possible) to assure photo views are the same for each assessment. The photography must be digital format, and the resolution of the submitted image files must be at least the equivalent of those obtained by a three megapixel camera at full resolution. Digital image files should be clearly labeled with wetland ID, location, and date, and stored in an appropriate database.

WATER LEVEL

Describe water level conditions in the wetland at the time of the assessment. Water levels from the **staff gage** should be noted, and an estimate of the percent of the wetland inundated should be mentioned. If there is no standing water in the wetland, an estimate of soil moisture or saturation, and, if possible, depth to water, should be made. Saturation can be determined by rolling a golf ball-

sized ball of soil in your palm. If soil is saturated moisture will appear on the soil and in your palm. Depth to water can be estimated by the degree of soil saturation, or through the use of the **wetland well**. The goal of this evaluation is to provide a general description of water level conditions at the time of the assessment.

VEGETATION ZONATION

The following section provides direction to assess the **composition** and **zonation** of the most common **groundcover**, **shrub**, and **tree** species in the monitored wetland. The vegetation assessment will be conducted within the **Assessment Area** from the **WAP Transect** (unless the **Assessment Area** goes beyond the standard ten-meter width, as described earlier). The purpose is to assess vegetation characteristics and distribution with respect to **hydrology**. It is assumed that normal **composition** and **zonation** of species are a result of normal wetland **hydrology**. Altered **hydrology** is assumed to affect plant community **composition** and plant species **zonation**.

Groundcover is defined as all woody species less than one meter in height, and all non-woody species (regardless of height), rooted in the ground. **Vines** originating from within the **historic wetland edge** (but not on **hummocks**) should be considered **groundcover**. For clarity, *Eupatorium* spp., *Typha* spp., and *Rubus* spp., and certain other species generally thought of as herbaceous will only be assessed as **groundcover** regardless of their height.

Shrubs and small trees are defined as woody plants greater than one meter in height and less than four centimeters **Diameter at Breast Height** (**DBH**). Shrubs usually have multiple permanent stems. When greater than one meter in height, *Hypericum* spp. and *Ilex glabra* are considered shrubs. *Myrica cerifera*, and *Lyonia* spp., and other woody plants with multiple stems that are greater than one meter tall are always assessed as **shrubs and small trees**. Cabbage palms with trunks greater than one meter tall but less than six meters are considered **shrubs**. Only **shrubs and small trees** rooted in the ground (not on **hummocks**) will be considered.

Trees are defined as woody plants that are greater than or equal to one meter in height and greater than or equal to four centimeters **DBH**. *Myrica cerifera*, *Lyonia* spp. and other woody plants with multiple stems that are greater than one meter tall are assessed as **shrub and small trees**. Cabbage palms with trunks greater than one meter tall but less than six meters are considered **shrubs**. Some non-forested wetlands such as marshes may have enough **trees** to provide useful information. The **tree** category should be scored in marsh and wet prairie systems if the evaluator believes that useful information can be obtained from scoring. Only **trees** rooted in the ground (not on **hummocks**) will be considered.

The species found in Appendix A have been determined to be common species in west-central Florida that are useful in determining the status of wetland **zonation**. Each species has been designated a **wetland zone** classification as follows:

Upland (U) – Plant species that are not expected to be seen in wetlands. It is possible that a few of these species may be found along wetland edges, but are not expected throughout the **transition zone**.

Adaptive (AD) – Plants species designated as FAC or Upland by DEP, but commonly seen in the **transition zone** in limited numbers. When **adaptive** plants are found in the **outer deep** or **deep zones**, they should be treated the same as **transition zone** plants.

Transition (T) – Plant species commonly found in the **transition zone**, and designated either FACW or OBL by DEP.

Outer Deep (OD) – Plant species commonly found in the **outer deep zone**, and designated either FACW or OBL by DEP.

Deep (D) - Plant species commonly found in the **deep zone**, and designated either FACW or OBL by DEP.

For each category of vegetation (**groundcover**, **shrub and small tree**, and **tree)**, the assessment should be performed as follows:

1) The assessor should walk along the **WAP Transect** and list the species that occur within each **zone** (within the **Assessment Area**), keeping the following in mind:

a. Only rooted vegetation growing within the **historic wetland edge** should be included in the assessment. **Floating vegetation** should not be considered in the **zonation** evaluation, but may be noted.
b. Vegetation growing on **hummocks** or upland islands should not be considered.
c. Vegetation overhanging from the uplands, such as saw palmetto, should not be considered. Keep in mind that the **historic wetland edge** is typically uneven and meandering.
d. **Vines** in the **canopy** that originate from outside the **historic wetland edge**, or from **hummocks**, should not be included in the assessment.
e. Only consider living, non-dormant vegetation in the assessment.
f. It is possible that there may be topographically higher areas within the wetland. For example, there can be areas of the wetland within the **deep zone** that are shallow enough to become less than **NP-6**. In this case, that area should be considered to be part of the **transition zone**. This may not be easy to distinguish visually, so great care should be taken to identify and document such areas.
g. If the wetland does not have a **transition zone**, **outer deep zone**, or **deep zone**, NA (not applicable) should be written in the appropriate area of the field sheet, and an explanation should be included.
h. Evaluators should stay on the **WAP Transect** to avoid unnecessary trampling of vegetation, but can walk throughout the wetland if critical for an accurate evaluation.

Scientific names should always be used when listing species. Comments and/or notes on the observed vegetation species, including those not to be considered in the **zonation** evaluation, are encouraged in the documentation. Identification in the field, even for the plants on the limited list given in Appendix A, can be very difficult. It is strongly recommended that when the assessor is unsure of determination, small non-destructive samples be taken for further study or expert identification. Useful references for species identification include Wunderlin and Hansen (2003), Tobe and others (1998), and http://www.plantatlas.usf.edu

2) Estimate the percent **cover** of each species. Each percentage should be the percent of the wetland **zone** covered by the specific species. If the entire **cover** of a species includes only one or two plants, denote the **cover** as one or two plants rather than as a percentage. When coverage is greater than one or two plants, estimate the coverage as either 5 percent, or increments of 10 percent (10, 20, 30, etc.). Note that **cover** that is significantly disturbed by paths or trails used to

enter the wetland should not be considered in the assessment. Add any notes necessary to explain the results of the percentage estimates.

3) Indicate the **wetland zone** classification for each species found in Appendix A. If the species is not found in Appendix A, no **wetland zone** designation should be assigned.

4) Using the Ranking Scale and Guidance below, indicate the category that best describes the **zonation** of each vegetation type (**groundcover**, **shrubs and small trees**, and **trees**), and provide an explanation that clearly outlines the reasons for your choice. A species is considered to have "moved" when a species with a **wetland zone** classification closer to the **historic wetland edge** is found in a **zone** closer to the **wetland interior**. Assigning half points between categories is not acceptable. For all categories evaluated, a choice of 1-5 must be made, or **NA** must be chosen.

Ranking Scale

1. Species with an **upland** classification have moved into the **deep zone** in high numbers and distribution.

Guidance:

a. For **groundcover**, "high numbers" usually means greater than 25 percent **cover**.
b. For **shrubs and small trees**, and **trees**, "high numbers" usually means greater than 5 to 10 specimens.
c. "High distribution" usually means located throughout the **zone**.

2. Species have moved in two **zones** in high numbers and distribution, and/or some species with an **upland** classification have moved into the **deep zone**.

Guidance:

a. For **groundcover**, "high numbers" usually means greater than 25 percent **cover**.
b. For **shrubs and small trees**, and **trees**, "high numbers" usually means greater than 5 to 10 specimens.
c. "High distribution" usually means located throughout the **zone**.
d. A "2" should be chosen if any species have moved in three **zones**, regardless of numbers and distribution.

3. Species have moved in one **zone** in high numbers and distribution, and/or some plants have moved in two **zones**.

Guidance:

a. For **groundcover**, "high numbers" usually means greater than 25 percent **cover**.
b. For **shrubs and small trees**, and **trees**, "high numbers" usually means greater than 5 to 10 specimens.
c. "High distribution" usually means located throughout the **zone**.
d. A "3" should be chosen if any species have moved in two **zones**, regardless of numbers and distribution.

4. Species have moved in one **zone** in enough numbers and distribution to be of concern, and/or species with an **adaptive** classification are **extensive** in numbers and distribution in the **transition zone**.

Guidance:

a. For **groundcover**, "enough numbers" usually means greater than 5 percent **cover** for all species.

b. For **shrubs and small trees** and **trees**, "enough numbers" usually means two or three specimens.

c. "Enough distribution" or "**extensive** distribution" usually means located beyond a few feet of the appropriate **zone**.

d. For **adaptive species** in the **transition zone**, "**extensive** in numbers" usually means greater than 25 percent.

5. Normal **zonation**. Some species may have migrated inward one **zone**, but they are small in number and/or right along the **zone** edge. **Adaptive species** in the **transition zone** are not considered abnormal if they are not **extensive** in numbers and distribution.

Guidance: Choose a "5" if:

a. All identified species are in their appropriate **zone**, or

b. All **groundcover** species in inappropriate **zone**s combine for less than 5 percent coverage, or

c. All species in inappropriate **zones** are within approximately one foot of the appropriate **zone**. Any topographic changes in the deeper **zone** should be carefully considered when making this decision.

NA Not enough **cover** to make evaluation

Guidance: If you feel there is not enough of the **cover** to make a meaningful score, choose NA.

Examples of species moving two **zones** include species with an **upland** classification being found in the **outer deep zone**, or species with an **adaptive** or **transition** classification being found in the **deep zone**. Examples of a species moving one **zone** include species with an **upland** classification being found in the **transition zone**, species with an **adaptive** or **transition** classification being found in the **outer deep zone**, or species with an **outer deep** classification being found in the **deep zone**.

5) Provide an explanation and any necessary comments to describe your choices.

The main factors in the rank chosen must be documented in the **explanation** section. If **NA** is chosen, clearly explain the reason, and, if a permanent condition, include in the updated wetland history.

ADDITIONAL INFORMATION

This section seeks additional information concerning the state and condition of the wetland. This information collected in this section can be used to help update the wetland history.

Some of this information may directly relate to the hydrologic condition of the wetland, while the relationship of some information to the hydrologic condition of the wetland may be unclear. Some of the information requested may assist in the eventual interpretation of wetland health. Please answer all questions to the best of your ability based on your observations – no in-depth analysis or expertise in each issue is expected. Update the wetland history with any pertinent information, especially if the new condition appears to be permanent.

Disturbance

Check the following only if it is your considered opinion that such an extensive amount of physical alteration of the wetland (clearly not related to ground-water withdrawals) has occurred that you do not believe it makes sense to use the wetland data for purposes such as MFL development, recovery assessment, etc. Such impacts could include **extensive** fill, **extensive** clearing, severe fire damage, significant fragmentation by roads or other construction, etc. If this comment is checked, please fully explain, and include the explanation in the wetland history.

____ Future users of this data may not want to analyze/compare this data with other wetlands due to the **extensive** level of non-ground-water withdrawal related disturbance.

Check the following only if it is your considered opinion that such an extensive amount of subsidence of the wetland has occurred that you do not believe it makes sense to use the wetland data for purposes such as MFL development, recovery assessment, etc. Such impacts could include severe soil loss, karstic activity that has substantially lowered the wetland bottom, etc. If this comment is checked, please fully explain, and include the explanation in the wetland history.

____ Future users of this data may not want to analyze/compare this data with other wetlands due to the **extensive** level of **subsidence**.

Vegetation Health

The following section provides direction to assess the status of **stress** and death of **shrub and small tree** and **tree** species within the wetland. As part of this section of the wetland assessment, the evaluator is asked to decide if a species is **appropriate** or **inappropriate**. A **shrub and small tree** or **tree** is **appropriate** if it is growing in a **wetland zone** appropriate for its **zone** classification. A **shrub and small tree** or **tree** is **inappropriate** if it is growing in a **zone** that is inappropriate for its **zone** classification. For example, since *Myrica cerifera* is classified as a **transition zone** species, it would be **appropriate** if it is found growing in the **transition zone**, but **inappropriate** if it is found growing in the **outer deep** or **deep zones** (assuming it is not on a **hummock**).

Stress of Appropriate Shrubs and Small Trees
In the space provided in the field sheet, indicate the category below that best describes the **stress** of all **appropriate species** of **shrub and small trees**. Include any standing **shrubs and small trees** that are dead. Do not include species growing in **hummocks**. Finally, explain your choice, including a listing of the species you consider to be **appropriate**, the **zone**s in which they are found, and the nature/symptoms of the **stress**.

____ showing little to no signs of stress
____ showing noticeable signs of stress
____ showing significant signs of stress
____ NA

Stress of Inappropriate Shrubs and Small Trees
In the space provided in the field sheet, indicate the category below which best describes the **stress** of all **inappropriate species** of **shrubs and small trees**. Include any standing **shrubs and small trees** that are dead. Do not include species growing in **hummocks**. Finally, explain your choice, including a listing of the species you consider to be **inappropriate**, the **zones** in which they are found, and the nature/symptoms of the **stress**.

____ showing little to no signs of stress
____ showing noticeable signs of stress
____ showing significant signs of stress
____ NA

Stress of Appropriate Trees
In the space provided in the field sheet, indicate the category below that best describes the **stress** of all **appropriate species** of **trees**. Unlike with **shrubs and small trees**, do not include any standing **trees** that are dead. Do not include species growing in **hummocks**. Finally, explain your choice, including a listing of the species you consider to be **appropriate**, the **zones** in which they are found, and the nature/symptoms of the **stress**.

____ showing little to no signs of stress
____ showing noticeable signs of stress
____ showing significant signs of stress
____ NA

Stress of Inappropriate Trees
In the space provided in the field sheet, indicate the category below that best describes the **stress** of all **inappropriate species** of **trees**. Include any standing **inappropriate trees** that are dead. Do not include species growing in **hummocks**. Finally, explain your choice, including a listing of the species you consider to be **inappropriate**, the **zones** in which they are found, and the nature/symptoms of the **stress**.

____ showing little to no signs of stress
____ showing noticeable signs of stress
____ showing significant signs of stress
____ NA

Dead and Leaning Trees
In the space provided in the field sheet, indicate the category below that best describes the presence of **leaning** and/or dead **trees** within the entire wetland. Include standing dead **trees**, **trees** that are dead on the ground, and **trees** that are known to have died during the period of wetland observation and are no longer in the wetland. Do not include any timbered **trees**, or **trees** growing on **hummocks**. Restrict the analysis to **appropriate species**. Finally, explain your choice, including your best estimate of the number or percentage of **dead and leaning trees**.

____ Little to no (normal amount of) dead and/or leaning trees
____ Noticeable amount of dead and/or leaning trees
____ Significant amount of dead and/or leaning trees
____ NA

Signs of Tree Recovery

Are young **appropriate trees** starting to grow in wetland locations in such a way that would suggest hydrologic recovery? Yes ____ No ____ Not Sure _____ Not applicable_____

Please explain your answer, including the species to which are referring, and the **zones** in which they are found.

Vines

Are **inappropriate vines** dropping leaves or dying in a way that would suggest hydrologic recovery?
Yes ____ No ____ Not Sure ____ Not applicable ____

Please explain your answer, including the species to which are referring, and the **zones** in which they are found.

The following questions can be answered for either the Assessment Area or for the entire wetland. Please include comments to explain the area being described.

Are any of the following conditions apparent and obvious (explain any checks)?

Wetland edges have been filled or disturbed	Yes ____ No____ Not Sure _____
Excessive dumping or trash in wetland	Yes ____ No____ Not Sure _____
Hog disturbance	Yes ____ No____ Not Sure _____
Significant impact from cattle (trampling, etc.)	Yes ____ No____ Not Sure _____
Vehicles driving though wetland (including bicycles)	Yes ____ No____ Not Sure _____
Insect damage	Yes ____ No____ Not Sure _____
Disease	Yes ____ No____ Not Sure _____

Are there signs of fire (comment on approximate year, expanse, and intensity)?
Yes ____ No____ Not Sure _____

Hydrology

Does the wetland have **augmentation** equipment in place? Yes __ No __ Not Sure __
If yes, was **augmentation** taking place at the time of your visit? Yes __ No __ Not Sure __

Is there clear evidence of direct stormwater inflow via a ditch or other manmade conveyance? Yes __ No __ Not Sure __

Is there clear evidence of direct drainage from the wetland via ditch or other manmade conveyance? Yes __ No __ Not Sure __

Is there a borrow pit or retention pond in the vicinity of the wetland? Yes __ No __ Not Sure __

Are there any other drainage activities in the area of note? Yes __ No __ Not Sure __

Soils

Are there any new signs of soils **oxidation** or **subsidence** (since last 5-year review)? Yes __ No __ Not Sure __

For lakes only

Indicate the category that best describes the docks for the entire lake.

Ranking Scale

1. Docks completely out of the water.
2. Docks touching the water or with <50% of the dock over water.
3. Docks >50% over water.

Is the littoral **zone** stranded? Yes _____ No _____

Protected Wildlife and Plants

Note any **protected species** of plants and animals that are observed directly or can be identified by call, tracks or scat during the wetland assessment. Also include the activity noted such as nesting, foraging, feeding, mating, resting, burrowing, etc. and any additional notes or observations.

Note any **wetland dependent species** of animals that are observed directly or can be identified by call, tracks, or scat during the wetland assessment. List birds, fishes, reptiles, mammals or amphibians.

Activity codes (M = mating, F = foraging, FT = flyover/traveling, N = nesting, OT = other)
Observation codes (O = observed, S = sign [scat, tracks, call or other signs of presence])

Appendix A. Plant list used for WAP methodology.

Botanical Name	Common Name	Synonymy	Wetland Zone
Acer rubrum	red maple		OD
Amaranthus australis	southern amaranth		T
Ambrosia artemisiifolia	common ragweed		U
Amorpha fruticosa	Bastard indigobush; false indigobush		T
Ampelopsis arborea	Peppervine		AD
Amphicarpum muhlenbergianum	blue maidencane		OD
Andropogon glomeratus	bushy bluestem		T
Andropogon glomeratus var. glaucopsis	purple bluestem		OD
Andropogon virginicus	broomsedge bluestem		AD
Andropogon virginicus var. decipiens	broomsedge bluestem		AD
Andropogon virginicus var. glaucus	chalky bluestem		U
Axonopus spp.	Carpetgrass		AD
Baccharis spp.	silverling, groundsel tree, sea myrtle		AD
Bacopa caroliniana	lemon bacopa; blue waterhyssop		OD
Berchemia scandens	alabama supplejack; rattan vine		T
Callicarpa americana	American beautyberry		U
Campsis radicans	trumpet creeper		T
Carex longii	long's sedge		T
Celtis laevigata	sugarberry; hackberry		T
Centella asiatica	Spadeleaf		T
Cephalanthus occidentalis	common buttonbush		D
Cinnamomum camphora	Camphortree		U
Cirsium nuttallii	Nuttall's thistle		T
Commelina diffusa	common dayflower		T
Conyza canadensis var. pusilla	Canadian horseweed		AD
Cornus foemina	swamp dogwood; stiff dogwood		OD
Cynodon dactylon	Bermudagrass		U
Dichondra caroliniensis	Carolina ponysfoot		AD
Digitaria floridana	Florida crabgrass		U
Diodia virginiana	Virginia buttonweed		OD
Diospyros virginiana	common persimmon		AD
Drymaria cordata	drymary; West Indian chickweed		AD
Eclipta prostrate	false daisy	*Eclipta alba*	T
Eleocharis baldwinii	Baldwin's spikerush; roadgrass		T
Erechtites hieraciifolius	American burnweed; fireweed		AD
Erythrina herbacea	coralbean; Cherokee bean		U
Eupatorium capillifolium	Dogfennel		AD

Appendix A (continued). Plant list used for WAP methodology.

Botanical Name	Common Name	Synonymy	Wetland Zone
Eupatorium leptophyllum	falsefennel		OD
Eupatorium mohrii	Mohr's thoroughwort	*Eupatorium recurvans*	AD
Eupatorium serotinum	lateflowering thoroughwort		AD
Euthamia caroliniana	slender flattop goldenrod	*Euthamia minor*	AD
Fraxinus caroliniana	Carolina ash; water ash; pop ash		D
Galactia elliottii	Elliott's milkpea		U
Gordonia lasianthus	loblolly bay		OD
Gratiola ramosa	branched hedgehyssop		T
Hydrocotyle umbellata	manyflower marshpennywort		OD
Hypericum fasciculatum	sandweed; peelbark St. John's-wort		OD
Hypericum mutilum	dwarf St. John's-wort		T
Hypericum myrtifolium	myrtleleaf St. John's-wort		T
Hypericum tetrapetalum	fourpetal St. John's-wort		AD
Ilex cassine	dahoon		OD
Ilex glabra	inkberry; gallberry		AD
Itea virginica	Virginia willow; Virginia sweetspire		OD
Leersia hexandra	southern cutgrass		OD
Lindernia grandiflora	Savannah false pimpernel		T
Liquidambar styraciflua	sweetgum		T
Ludwigia peruviana	Peruvian primrosewillow		OD
Lycopus rubellus	taperleaf waterhorehound		OD
Lyonia ligustrina var. foliosiflora	maleberry		T
Lyonia lucida	fetterbush		T
Magnolia virginiana	sweetbay		OD
Melaleuca quinquenervia	punktree		AD
Melothria pendula	creeping cucumber		T
Mikania spp.	hempvine		T
Myrica cerifera	southern bayberry; wax myrtle		AD
Nyssa sylvatica var. biflora	swamp tupelo		D
Oldenlandia uniflora	clustered mille graine	*Hedyotis uniflora*	T
Oplismenus hirtellus	woodsgrass; basketgrass	*Oplismenus setarius*	T
Osmunda cinnamomea	cinnamon fern		T
Paederia foetida	skunkvine		AD
Panicum anceps	beaked panicum		AD
Panicum rigidulum	redtop panicum		OD
Panicum verrucosum	warty panicgrass		T
Paspalum conjugatum	sour paspalum; hilograss		AD
Paspalum laeve	field paspalum		T

Appendix A (continued). Plant list used for WAP methodology.

Botanical Name	Common Name	Synonymy	Wetland Zone
Paspalum notatum	bahiagrass		U
Paspalum setaceum	thin paspalum		AD
Persea palustris	swamp bay		OD
Phyla nodiflora	turkey tangle fogfruit; capeweed	*Lippia nodiflora*	AD
Phytolacca americana	American pokeweed		U
Pinus clausa	sand pine		U
Pinus elliottii	slash pine		AD
Pinus palustris	Longleaf pine		U
Pinus taeda	loblolly pine		AD
Pluchea rosea	rosy camphorweed		OD
Polygonum hydropiperoides	mild waterpepper; swamp smartweed		OD
Psidium cattleianum	strawberry guava		AD
Ptilimnium capillaceum	mock bishopsweed; herbwilliam		T
Quercus laurifolia	laurel oak; diamond oak		T
Quercus nigra	water oak		T
Quercus virginiana	live oak		U
Rubus argutus	sawtooth blackberry	*Rubus betulifolius*	AD
Saccharum giganteum	sugarcane plumegrass	*Erianthus giganteus*	OD
Salix caroliniana	Carolina willow; coastalplain willow		OD
Sambucus nigra subsp. *canadensis*	American elder; elderberry	*Sambucus canadensis*	AD
Sapium sebiferum	popcorntree; Chinese tallowtree		AD
Schinus terebinthifolius	Brazilian pepper		AD
Scoparia dulcis	sweetbroom; licoriceweed		AD
Setaria parviflora	yellow bristlegrass; knotroot foxtail	*Setaria geniculata*	AD
Smilax bona-nox	saw greenbrier		AD
Solanum viarum	Tropical soda apple		U
Stenotaphrum secundatum	St. Augustinegrass		AD
Stillingia aquatica	water toothleaf; corkwood		D
Symphyotrichum elliottii	Elliott's aster	*Aster elliottii*	T
Taxodium spp.	Cypress		D
Toxicodendron radicans	eastern poison ivy		AD
Ulmus americana	American elm		T
Urena lobata	caesarweed		U
Vaccinium corymbosum	highbush blueberry		T
Vaccinium myrsinites/darrowii	shiny blueberry		U
Vitis rotundifolia	muscadine	*Vitis munsoniana*	AD

APPENDIX B

Definition of Wetland Assessment Procedure (WAP) Terms

Adaptive (AD) species
Plants species designated as FAC or Upland by DEP, but commonly seen in the **transition zone** in limited numbers. When **adaptive** plants are found in the **outer deep** or **deep zones**, they should be treated the same as **transition zone** plants.

Appropriate Species
Term used to describe plant species that are found in a **wetland zone** in which they would normally be expected. See the definition of **Inappropriate Species**.

Assessment Area
The area to be assessed from the **WAP Transect**. Whenever possible, the width of the Assessment Area will be approximately ten meters in width (including ten meters beyond the **wetland interior**). If the evaluator determines that critical information concerning the **zonation** condition of the wetland exists beyond the standard ten meter-wide Assessment Area, a wider Assessment Area may be used (up to the entire area of the wetland). However, when an Assessment Area greater than ten meters is used, the evaluator must 1) justify the larger transect size on the field sheet and in the database, 2) approach all critical areas at a distance from which elevations and species identification can be readily determined, and 3) accurately describe the size of the Assessment Area on the field sheet and in the database. Future evaluators should use the Assessment Area established by previous evaluators unless there is strong evidence to do otherwise. Evaluators should stay on the **WAP Transect** as much as possible to avoid unnecessary trampling of vegetation, but can walk throughout the wetland if critical for an accurate evaluation.

Augmentation
The procedure or practice of artificially adding freshwater to a surface-water body. Augmentation can be done as part of a mitigation measure or can be part of an overall aesthetic or functional hydrologic plan to increase the amount of water that a wetland or water body receives. Augmentation can be derived from various water sources, including ground water, storm water, or water diverted from surface flows.

Canopy
The top layer of the forest. The definition further qualifies canopy species as woody plants or palms with a main trunk at least ten centimeters in diameter at a point 1.4 meters (4.5 feet) above the base of the tree (**Diameter at Breast Height** (**DBH**)). If the **tree** is on a slope, the **DBH** is measured from the mid-point of the base of the tree on the slope. Cabbage palms are considered canopy only when greater than six meters in height. **Vines** are not considered as canopy species.

Composition
The **assemblage** of plant species that occur within a plant community or plant community **zone**. For the WAP, composition is defined as the species that make up the different **strata** in a **wetland zone**. The **strata** include **tree**, **shrub**, and **groundcover** species (if present).

Cover
The area of ground covered by the vertical projection of the aerial parts of plants of one or more species.

Deep (D) species
Plant species commonly found in the **deep zone**, and designated either FACW or OBL by DEP.

Deep Zone
The lower portion of the **WAP Transect** extending from the **NP-12** marker to the **wetland interior**. The deep zone has the longest hydroperiod and the greatest depth of the **zones** found in a wetland.

Diameter at Breast Height (DBH)
The diameter of a plant's trunk or main stem at a height of 1.4 meters (4.5 feet) above ground.

Exotic plant
A plant not indigenous to Florida.

Extensive
A description used to characterize the categories of Disturbance, Drainage or Fire that indicates that greater than 50% of the assessed portion of the wetland (as determined from the **WAP Transect**) has been influenced. (See definition of **localized**).

FAC plants (Facultative)
Species of plants that are so widespread in their distribution as to render them inappropriate for indicating inundation or soil saturation. Specifically included are **exotic plants** with a **weedy** distribution (F.A.C. Section 62-340.200).

FACW plants (Facultative Wet)
Species of plants that under natural conditions typically exhibit their maximum **cover** in areas subject to surface water inundation and/or soil saturation, but can also be found in uplands (F.A.C. Section 62-340.200).

Floating Vegetation
Any plant not rooted in the ground.

FLUCCS
The Florida Land Use, Cover and Forms Classification System. A standardized numeric code developed by the Florida Department of Transportation for the classification of land use and plant communities. The code is used to identify natural and manmade land features using number codes (levels). Typically three or four digit numbers are used. A manual with descriptions of each code is available to assist with classifications (Florida Department of Transportation, 1999).

For the WAP, Level III FLUCCS code is used to identify wetland types.

Groundcover
All woody species less than one meter in height, and all non-woody species (regardless of height), rooted in the ground. Groundcover is the lower most of the three **strata** of vegetation. For the

WAP, *Eupatorium* spp., *Typha* spp., and *Rubus* spp., and certain other species generally thought of as herbaceous even though greater than one meter will only be assessed as groundcover.

Historic (**Historical**)
Characteristics assumed to be indicators of non-impacted or pre-impacted conditions. Historical wetland characteristics occur because of decades of normal ecological conditions.

Historic Normal Pool
The **normal pool** elevation of a wetland that formed under non-impacted natural or unaltered conditions. Historic normal pool can be determined from those **normal pool** indicators that change only extremely slowly with the absence of surface water. See Appendix C for details on establishing historic normal pool.

Historic Wetland Edge
The boundary between wetland and upland vegetation and soils formed under non-impacted natural or unaltered conditions. The historic wetland edge is the landward edge of the **WAP Transect** and the landward edge of the **transition zone**. The assessment of the **transition zone** begins at the historic wetland edge. See Appendix C for details on establishing historic wetland edge.

Hummock
A raised substrate (at or above the **historic normal pool**) in a wetland generally comprised of congregated root masses associated with **trees**, **shrubs** or some species of **groundcover** such as ferns. Hummocks can also include old tree bases and stumps that have been subsequently colonized by vegetation other than or including the species comprising the majority of plant matter that constitutes the hummock. Hummocks are associated with plant growth in frequently inundated wetlands, and are not part of the wetland floor.

Hydrology
The properties that deal with the distribution and circulation of water within a wetland or upland/wetland system.

Inappropriate Species
Term used to describe plant species that are found in a **wetland zone** in which they would not normally be expected. See the definition of **Appropriate Species**.

Localized
A description used to characterize the categories of Disturbance, Drainage and Fire where less than 50% of the assessed portion of the wetland (as determined from the **WAP Transect**) has been influenced. (See definition of **extensive**).

Leaning Trees
Trees that are generally at a 30-degree angle (or greater) from vertical due to uprooting or loss of support. The reasons for leaning trees are many and varied, and include soil **subsidence** where the soil support for trees roots has been impacted to the point that a tree cannot stand, or wind throw due to severe storm events.

Normal Pool
A water level elevation based on consideration of certain biological indicators of sustained inundation, utilizing reasonable scientific judgment. See Appendix C for a discussion of these biological indicators.

NP-6
The elevation six inches below **historic normal pool**. The NP-6 represents the boundary between the **transition zone** and the **outer deep zone** of the wetland.

NP-12
The elevation twelve inches below **historic normal pool**. The NP-12 represents the boundary between the **outer deep zone** and the **deep zone** of the wetland.

OBL plants (Obligate)
Species of plants that under natural conditions are only found or achieve their greatest abundance in an area that is subject to frequent or continuous surface-water inundation and/or soil saturation. Included in this category are the littoral plants and emergent aquatics, such as *Nymphaea* spp. (water lilies), *Nelumbo* spp. (lotus), and *Nuphar luteum* (spatterdock). Some OBL plant species can be observed in uplands, especially under a controlled environment.

As defined by the USACE, OBL species are those plants that occur almost always (estimated probably > 99%) in wetlands under natural conditions (USACE, 1987).

Outer Deep Zone
The portion of the **WAP Transect** extending from the **NP-6** marker to the **NP-12** marker.

Outer Deep (OD) species
Plant species commonly found in the **outer deep zone**, and designated either FACW or OBL by DEP.

Oxidation
A condition in which organics in the soils react with free oxygen. The result of soil oxidation is loss of organic constituents and possible lowering of the soil surface. The lowering of the soil surface is also called **subsidence**.

Fire within a wetland causes rapid oxidation. Fire, under dry conditions, can burn organic soils causing soil oxidation and/or soil **subsidence**. When oxidation is recorded, special care to determine signs of fire and other environmental conditions should be noted.

Protected Species
Species that include both flora and fauna that have some degree of protection under the law by local, State, and Federal agencies. Official lists have been developed for these species.

> Federally Protected Flora and Fauna Species are listed by:
> U.S. Fish and Wildlife Service (Endangered or Threatened Species). 50 CFR 17 (animals) and 50 CFR 23 (plants)
> http://endangered.fws.gov/wildlife.htm#species
>
> State Protected Fauna Species are listed by:

Florida Game and Freshwater Fish Commission (Endangered, Threatened Species and Species of Special Concern) Rules 3927.003-.005, Florida Administrative Code (F.A.C.) http://fac.dos.state.fl.us/faconline/chapter68.pdf

Florida State Protected Flora Species are list by:
The Florida Department of Agriculture & Consumer Services (Endangered, Threatened Species and Commercially Exploited). Chapter 5B-40 F.A.C.
http://fac.dos.state.fl.us/faconline/chapter05.pdf

Saw Palmetto Fringe
The rooted base of saw palmetto (*Serenoa repens)* nearest the wetland. Care must be taken in assessing whether the saw palmetto fringe has been altered by land use practices when considering its use in setting the **historic normal pool** or **wetland edge**.

Shrubs and Small Trees
Woody plants greater than one meter in height and less than four centimeters **Diameter at Breast Height** (**DBH**). Shrubs usually have multiple permanent stems. When greater than one meter in height, *Hypericum* spp. and *Ilex glabra* are considered shrubs. *Myrica cerifera*, and *Lyonia* spp., and other woody plants with multiple stems that are greater than one meter tall are always assessed as **shrubs and small trees**. Cabbage palms with trunks greater than one meter tall but less than six meters are considered **shrubs**.

Staff Gage
A water level measuring device used to measure above-ground surface water levels in a wetland. The staff gage is normally placed in a **deep zone** of the wetland, preferably at the **wetland interior**.

Strata
The defined layers of the vegetation community found within an ecosystem **zone**. Each wetland system can contain any and all of the three following strata: **Groundcover**, **Shrubs and Small Trees**, and **Trees**.

Stress
A physiological condition of a plant, as a result of external or internal conditions, which inhibits the normal growth and functions of the plant. Stressful conditions can include too much water or too little water. Stress can occur over short or long periods of time. Severe stress to a plant can result in plant death.

Indications of physiologic stress manifested during the growing season (generally during March - September) include: reduced numbers of leaves on stems/branches (a sparsely vegetated appearance), chlorosis of leaf tissue (a pale green, yellow or red/brown hue), leaf wilting (curling at edges, drooping of normally erect leaf tissue), or abscission (leaf drop). In addition, late leaf-out at the onset of the growing season (delayed onset of growth) or premature senescence of leaves prior to the fall may be indicators of stress.

As guidance for the WAP, stress can be caused by a variety of reasons aside from water stress. The assessor should look for other factors that may be contributing to the observed stress indicators (i.e., excessive flooding of less tolerant species, insect damage, disease, fire stress, frost damage, mechanical injury/damage to bark or root systems). Suspicion of non-water related stress should be discussed in comments.

Subsidence
The lowering of the soil levels caused by a variety of mechanisms, including **oxidation**, compaction, and karst activity (sinkholes). Subsidence is evident when the lowering of soil can be measured as a decrease in the soil volume and soil structure. Soil subsidence in wetlands can occur in highly organic soils that have experienced long periods of depressed water levels. In forested wetlands, subsidence often results in tree root exposure. In non-forested wetlands, subsidence is often evident by the appearance of soil fissures. In various types of wetlands, cattle trampling and karst activity can cause subsidence, which is apparent as soil slumping between **trees** or abnormal lowering of the wetland soil surface levels.

Transition Zone
The upper portion of the **WAP Transect** extending from the **historic wetland edge** to the **NP-6** marker. The transitional zone contains one vegetation community, or an arbitrary grouping of more than one vegetation community, with a shorter hydroperiod than the **outer deep** or **deep zones**.

Transition (T) species
Plant species commonly found in the **transition zone**, and designated either FACW or OBL by DEP.

Trees
Woody plants that are greater than or equal to one meter in height and greater than or equal to four centimeters **DBH**. *Myrica cerifera*, *Lyonia* spp. and other woody plants with multiple stems that are greater than one meter tall are assessed as **shrub and small trees**. Cabbage palms with trunks greater than one meter tall but less than six meters are considered **shrubs**.
Note that trees that are greater than or equal to four centimeters **DBH** and less than ten centimeters **DBH** are considered the sub-canopy, and trees greater than or equal to ten centimeters **DBH** are considered the tree **canopy**.

Trees, Small
Woody tree species greater than one meter and less than four centimeters **DBH**. The size class is the same as **shrubs** and is intended to specify tree species at the sapling stage. Wax myrtle, *Lyonia* spp. and other woody plants with multiple stems that are greater than one meter tall are assessed as **shrub and small trees**. Cabbage palms with trunks greater than one meter tall but less than six meters are considered **shrubs**.

Upland (U) species
Plant species that are not expected to be seen in wetlands. It is possible that a few of these species may be found along wetland edges, but are not expected throughout the **transition zone**.

As defined by DEP, upland plants are those species that under natural conditions are only found or achieve their greatest abundance in an area that is considered upland.

Upland Well
A surficial aquifer monitor well installed outside of the **historic wetland edge**, as required by the EMP. Some monitored wetlands do not have upland wells due to practical considerations (such as land management conflicts, private land access problems, etc.), or have a surficial aquifer monitor well installed in the **transition zone**, which substitutes for the upland well. All monitor wells require a construction permit from the SWFWMD, must be drilled by a licensed well driller, and should be constructed using the standards set forth in Chapter 40D-3, FAC. All monitor wells

should fully penetrate the surficial aquifer underlying and in connection with the monitored wetland (as per the judgment of a professional geologist or engineer).

Vines
Vines are linear woody or non-woody vegetation that utilizes the **tree canopy**, sub-canopy, or **shrub strata**, where they exist, for physical support. Where these **strata** are not present, vines will utilize **groundcover** vegetation and the forest floor as the physical substrate for support. Only vines originating from the wetland floor (within the **Assessment Area**) should be assessed as **groundcover**, while all others should not be included in the wetland assessment.

WAP Transect
A straight line from the **historic wetland edge** to the **wetland interior**, from which vegetative assessments in the **transition zone**, **outer deep**, and **deep zone** sections are made.

Weedy
A description of indigenous and non-indigenous species that interfere with management goals and objectives and are therefore unwanted. This definition is also known by the term "natural-area weed." More generically, weed is defined by the Weed Science Society of America as "a plant growing where it is not desired." Moreover, the presence of natural-area weeds infers that conditions within that ecosystem are such that the ecosystem's typical or characteristic species are replaced with species that are not typical of the ecosystem under natural hydrological or ecological conditions.

For the WAP, only weeds growing on the ground (and not on **hummocks)** will be considered.

Wetland Delineation Line
A boundary delineating the landward extent of wetlands under the current conditions using Chapter 62-340 FAC criteria. If a wetland has experienced hydrologic or other impacts, the wetland delineation line may not correspond with the **historic wetland edge**.

Wetland Dependent Species
Wildlife species that are closely associated with wetlands. The existence of individuals of wetland dependent species is threatened if wetland function is absent or there is a significant degradation of a wetland function. Wetland water levels, the duration of water levels, and the existence of aquatic plant and animal species may affect individuals of wetland dependent species.

Wetland Interior
The deepest part(s) of a wetland.

Wetland Plant Species
Plant species that have demonstrated ability (presumably because of morphological and/or physiological adaptations and/or reproductive strategies) to achieve maturity and reproduce in an environment where all or portions of the soil within the root zone become, periodically or continuously, saturated or inundated during the growing season (Reed, 1988).

Wetland Status
Term used in the Vegetative Index of Chapter 62-340 F.A.C to describe a plant's affinity to various hydrologic conditions. See Chapter 62-340 F.A.C. for more details.

Wetland Well
A surficial aquifer monitor well installed within the **deep zone** of a wetland, preferably within the **wetland interior**, as required by the EMP. All monitor wells require a construction permit from the SWFWMD, must be drilled by a licensed well driller, and should be constructed using the standards set forth in Chapter 40D-3, FAC. All monitor wells should fully penetrate the surficial aquifer underlying and in connection with the monitored wetland (as per the judgment of a professional geologist or engineer).

Wetland Zone
One of three subdivisions of a wetland used in the application of the WAP methodology. The three **zones** include the **transition zone**, the **outer deep zone**, and the **deep zone**, and are based upon elevation below **historic normal pool**.

Zonation
The distribution of plant species within a stratum. Three vegetation **strata** are designated in the WAP (**groundcover**, **shrubs and small trees**, and **trees**). Environmental conditions that may influence zonation include but are not limited to variations in **hydrology**, direct physical disturbance, and fire.

Zone
Refers to a **wetland zone**.

APPENDIX C

Methodology for Establishing Historic Normal Pool and Historic Wetland Edge

The **normal pool** of a wetland is an elevation datum established to standardize measured water levels and facilitate comparison among wetlands. The **normal pool** elevation is commonly used in the design of wetland storm water treatment systems (SWFWMD, 1988). This level can be consistently identified in cypress swamps based on similar vertical locations of several indicators of inundation (Hull et al, 1989; Biological Research Associates, 1996). In wetlands where declining water levels have caused the downward migration of certain **normal pool** indicators, or if significant **subsidence** has occurred as to physically lower all or parts of the wetland, more persistent indicators of the unaltered **normal pool** elevation or other considerations must be used to establish the datum. The datum determined by the persistent, unaltered indicators, is herein referred to as **historic normal pool**.

The **historic wetland edge** is a concept developed specifically for the WAP, and refers to the boundary between wetland and upland vegetation and soils prior to any hydrologic impacts. In a wetland that has not experienced any negative hydrologic impacts, this boundary would be the **wetland delineation line**. However, in wetlands that may have experienced hydrologic impacts, other biologic indicators must be used to identify the **historic wetland edge**.

Historic normal pool and **historic wetland edge** elevations will be established at environmental monitoring sites within one year of the initiation of the monitoring program. As described below, the elevations of at least five replicate **normal pool** indicators will be established in the field based on biological or physical indicators of sustained inundation. The final **historic normal pool** elevations will be based on the median of these elevations, plus any appropriate offset constants (as described below). The **historic normal pool** and supporting indicators used to develop the elevation must be surveyed to NGVD 29 by a professional land surveyor. The **historic wetland edge** need not be surveyed, but a permanent marker or other means of locating the **historic wetland edge** must be established. Together with the other information included with the establishment of a monitored wetland (see Section 3.2 of the WAP Instruction Manual), the **historic normal pool** elevation, **historic wetland edge** location, and the information used to determine them must be fully documented (see Appendix F). If necessary, Tampa Bay Water and the SWFWMD will perform field evaluations to verify the various elevations.

Establishing Historic Wetland Edge

When present, the preferred indicator of **historic wetland edge** is the rooted base of saw palmetto (*Serenoa repens*) immediately surrounding the wetland (referred to as the **saw palmetto fringe**). Unless the **saw palmetto fringe** is used to determine **historic normal pool**, there is no need to survey its elevation, but the location should be marked or otherwise clearly recorded for use as the landward edge of the **WAP Transect** and the landward edge of the **transition zone**. This indicator may not be reliable for wetlands if there is clear evidence that the **saw palmetto fringe** has been significantly altered by land management practices. In cases where the **saw palmetto fringe** has been altered, or where no **saw palmetto fringe** exists, other indicators should be used for **historic wetland edge**. Alternatives include **historic normal pool** minus 0.25 feet (Carr and others, 2004, Shultz and others, 2004), the elevation of the base of the outermost cypress plus 0.30 feet (Carr and

others, 2004, Schultz and others, 2004), or hydric soil indicators. In these cases, the final choice will be by consensus of Tampa Bay Water and the SWFWMD. If the wetland edge has been partially filled, the edge of the fill within the wetland can be considered the **historic wetland edge** (see Section 3..2 of the WAP Manual for more discussion on dealing with filled edges).

Establishing Historic Normal Pool

Historic normal pool will be set by one of the following methods (in order of priority, if present). Note that the value used as **historic normal pool** should be based on the median of at least five samples (although more samples are desirable), plus the applicable offset constant (as described below):

a. The elevation of the root crown of mature specimens of fetterbush (*Lyonia lucida*) on cypress **trees** or **hummocks**.
b. The inflection point on the buttress of cypress **trees**.
c. The lower limit of epiphytic bryophytes (aka moss collars) growing on cypress **trees** (*Taxodium* spp.).
d. The elevation of the rooted base of saw palmetto (*Serenoa repens*) immediately surrounding the wetland (referred to as the **saw palmetto fringe**). An offset factor of 0.25 feet must be added to the median value (Schultz and others, 2004). This indicator may not be reliable for wetlands if there is clear evidence that the **saw palmetto fringe** has been significantly altered by land management practices.
e. The ground elevation of cypress **trees** growing at the outside edge of the dome. An offset factor of 0.55 feet must be added to the median value (Schultz and others, 2004).
f. Indicators of hydric soil surrounding the wetland, as determined by a qualified soils scientist. This indicator may not be reliable in wetlands with evidence of significant soil **oxidation**.
g. Evidence of **historic** escarpment. This method may not be reliable in wetlands with clear evidence of significant filling along the wetland edge.
h. If none of the above indicators exist, a **historic normal pool** elevation should be proposed based on any form of evidence thought to be reasonable, including other biologic indicators, aerial photographic interpretation, etc.

A combination of any of the first three indicators is acceptable, as long as a minimum of five surveyed samples are used. The remaining four indicators should not be used in combination with other indicators.

If there is evidence that declining water levels have caused the downward migration of certain **normal pool** indicators (moss collars are particularly susceptible to this), or if significant **subsidence** has occurred as to physically lower all or parts of the wetland, only the **saw palmetto fringe** indicators may be reliable. Several sources of information and field observation should be used to make this determination, which may include investigations of **historical** aerial photography; identification of signs of severe soil **oxidation** or compaction; obvious indications of sinkhole activity; long-term declines in **hydrology** (as observed in collected data); and changes in surveyed elevations. If the **normal pool** elevation determined by the above methods is found to be significantly below the **historic wetland edge**, it may not be representative of **historic normal pool** (Carr and Rochow, 2004).

APPENDIX D

Wetland Type Definitions

All monitored wetlands should be classified as one of the following wetland types. It is recognized that some wetlands may be difficult to classify, so the evaluator will need to use scientific judgment based on field experience. However, the classification system is for convenience and data management purposes only. In the future, the classification of wetlands or the definition of wetland types may change.

For purposes of this classification system, the term "isolated" refers to a wetland system that has no significant and regular channelized inflow. For example, some cypress wetlands may have channelized outflows to riverine systems, but since significant and regular channelized inflow is absent, they are considered isolated cypress wetlands. Systems that are not isolated by this definition will be referred to as "flow" systems. The current version of the WAP is not designed for flow systems.

The wetland types are:

Cypress Isolated --- Commonly known as "cypress domes", although their shape and size vary. Pond cypress is usually the dominant tree species.

Hardwood Isolated --- Commonly known as "bay swamps" or "gum swamps". Bays and gums are usually the dominant tree species.

Marsh Isolated --- Isolated wetlands with very few or no **trees**. Marshes are typically vegetated with broad-leaved herbaceous species such as pickerelweed, duck potato, water lily, and spatterdock in deeper areas, and grasses and sedges in shallower areas. Marshes are typically 1 to 3 feet in depth.

Cypress Marsh Isolated --- Isolated wetlands with well-developed cypress and marsh areas. Typically, cypress surrounds, or nearly surrounds, the deep-water marsh area. Cypress marshes should be composed of at least 20 percent cypress **trees** or 20 percent marsh vegetation.

Wet Prairie Isolated --- Isolated wetlands with very few or no **trees**. Typically, grasses and sedges dominate both shallow and deep-water areas of wet prairies. Wet Prairies differ from marshes in being shallower (usually <1 foot deep at the deepest point).

Cypress Continuous --- Flow systems dominated by cypress (typically bald cypress). The current version of the WAP is not designed for these types of wetland systems.

Hardwood Continuous --- Flow systems dominated by hardwoods (typically pop ash, elm, gum, red maple, water oak, and laurel oak). The current version of the WAP is not designed for these types of wetland systems.

Mixed Hardwood/Cypress Continuous --- Flow systems where a mixture of hardwoods and cypress occur and neither appears dominant. The current version of the WAP is not designed for these types of wetland systems.

Marsh Continuous --- Flow systems with very few or no **trees**. Marshes are typically vegetated with sawgrass and broad-leaved herbaceous species such as pickerelweed, duck potato, water lily, and spatterdock. The current version of the WAP is not designed for these types of wetland systems.

Lake Wetlands --- Wetlands similar to those described above but occurring contiguous to lakes.

APPENDIX E

Wetland History

The Wetland History is an ongoing narrative that describes what is known about the history of the wetland health during both the period of data collection, and prior to data collection. Its main use is to give the user of data collected as part of the WAP a better perspective on the activities surrounding the wetland, observations by evaluators, and other factors that may affect the interpretation of the data. The wetland history also provides a running set of notes for current and future evaluators that should assist in WAP assessments and interpretation of WAP data.

When monitoring begins on a wetland (or when establishing a wetland history for a currently monitored wetland for which there is no existing wetland history), some research should be done to gather existing information on the wetland, and to describe what is learned. Sources of information that should be reviewed include:

a. Aerial photography, available through the SWFWMD, Tampa Bay Water, or other sources (available back to 1938 at: http://www.uflib.ufl.edu/digital/collections/FLAP/)
b. Existing reports by SWFWMD, Tampa Bay Water, and others
c. Previous experience of others who have monitored the wetland in the past

Wetland histories included in many of the Tampa Bay Water Wellfield Annual Reports are a good start.

Once the initial wetland history has been established, the WAP methodology calls for updates on at least a 5-year basis, although more frequent updates as needed are recommended. Wetland history updates should include any significant changes to the transects, monitoring devices, surrounding land uses, physical impacts to the wetland (no matter the cause), and any significant changes to wetland health or **hydrology** (no matter the cause, and including **augmentation**).

APPENDIX F

Worksheet for Supporting Transect Information

The following is a checklist of information that should be collected and documented as part of the establishment of the transect to be used for the Wetland Assessment Procedure (WAP). Depending on the wetland being monitored, thorough documentation of the transect may preclude the need for a site evaluation by SWFWMD staff. While not required, including photographs may be helpful.

General Information

1. Wetland Name (and aliases)
2. Wetland Site Number(s)
3. Wetland type (See Appendix D)
4. Location information, including county, land owner, and Section, Township, and Range of wetland
5. Map of wetland location, showing approximate location of transect
6. Explanation of why the transect was chosen
7. Has a benchmark been established near the wetland by a professional surveyor?
8. If so,
    a. Has the benchmark been clearly marked?
    b. Has the benchmark been given an identification name or number?
    c. What is the NGVD 1929 elevation of the benchmark?
    d. Have all surveys for current installations requested below been made from this benchmark (i.e. **historic normal pool** indicators, current staff gage, current wells, NP-6, and NP-12)? If these have not been surveyed in this manner please explain.

Staff Gage(s)

1. What is the identification number of the current staff gage (or gages)?
2. Was the staff gage installed by Tampa Bay Water or the SWFWMD?
3. Who performed the surveying for this gage, and was this person a professional surveyor?
4. What benchmark was used to survey this gage?
5. What is the approximate period of record for this staff gage?
6. Is the staff gage direct reading?
7. If not, what is the adjustment to convert to NGVD 29?
8. What is the dry elevation of the staff gage?
9. Please provide the above information for any other previous staff gages.

Monitor Well(s)

1. Does the wetland have both a wetland well and upland well?
2. Are there any other wells?
3. What is the identification number of each existing well?
4. Which agency installed each well?
5. Who performed the surveying for each well, and was this person a professional surveyor?
6. What benchmark was used to survey each well?

7. What is the approximate period of record for each existing well?
8. What is the top of casing elevation for each well (NGVD 29), and is this the measuring point for each well?
9. What is the ground elevation (NGVD 29) at each well (or length of casing above ground)?
10. What is the dry elevation (NGVD 29) of each well (or total depth of each well)?
11. Please provide the general construction information for each well, including casing depth, total depth, well diameter, and general construction specifications.
12. Please provide the above information for any other previous wells used to monitor this wetland.

Establishment of Historic Normal Pool

1. What indicators of normal pool were used?
2. How many indicators were used?
3. How was the historic normal pool determined?
4. When was the historic normal pool established, and who set it?
5. What are the elevations of the indicators used and the elevation of the historic normal pool determined for this wetland? How were these determined?
6. Please describe the checks for subsidence that were performed.

Historic Wetland Edge

1. What indicators of historic wetland edge were used?
2. How was the historic wetland edge determined?
3. Has a marker been placed at the historic wetland edge? If no, please describe the location of the wetland edge.
4. What is latitude and longitude of historic wetland edge marker, or marked location along the transect, and how was this determined? Note: this can be estimated.

NP-6 and NP-12

1. What are the elevations (NGVD 29) of the NP-6 and NP-12 markers, and how were they determined?
2. Who performed the surveying for the markers, and was this person a professional surveyor?
3. What benchmark was used to survey the markers?
4. Describe the markers used to designate the NP-6 and NP-12.
5. What is the latitude and longitude of the NP-6 and NP-12 markers? Note: this can be estimated.

Wetland Interior

1. Has a marker been placed at the wetland interior (end of transect)? If no, please describe the location of the wetland interior.
2. What is latitude and longitude of wetland interior (end of transect), or marked location along the transect, and how was this determined? Note: this can be estimated.

APPENDIX G

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