Performance Measure Name and Number

Loxahatchee River Watershed Restoration Project PM# 4 – **Hydrologic Regimes of Major Plant Communities in the Loxahatchee Watershed and Adjacent Wetlands**

Justification

The basin historically included more than 350 square miles of inland sloughs and wetlands. Today, because of drainage basin fragmentation and diversion of some drainage to other basins, approximately 240 square miles of the original watershed drain to the Loxahatchee River and Estuary (Van Arman, et al., 2005). Historically, the drainage basin contained large tracts of pine flatwoods interspersed with cypress sloughs, hardwood swamps, marshes and wet prairies. Land development, construction and operation of drainage and flood control facilities, and consumptive use withdrawals in the watershed, especially during the past fifty years, have resulted in localized and region-wide changes in major wetland systems in the watershed (Treasure Coast Regional Planning Council [TCRPC], 1999; Martin County Growth Management Department, 2000). Hydrologic alterations by regional drainage canals and other human activities have disrupted pre-development surface water flow through wetland systems in the study area. Wetlands have been degraded in quality due to excessive flooding or drainage, resulting in increased susceptibility to fires and shifts in vegetation patterns from natural wet prairie and cypress communities to uplands or to cattail- and willow-dominated wetland systems (Van Arman, et al., 2005). A study in the Cypress Creek area showed that there has been a 50% loss in wet prairies over the last 60 years (C&N Environmental Consultants, 2002). Changes in hydrologic regimes have also allowed invasive exotic plants to move into areas that were once high quality wetlands. In the Loxahatchee Slough, which was classified as an area of high quality wetlands, heavy infestation of melaleuca is exhibited on some privately held properties and other exotics are evident in some areas. One of the goals of the Loxahatchee River Watershed Restoration Project (LRWRP) project is to achieve appropriate depth, duration and frequency targets in the Loxahatchee watershed wetlands (USACE and SFWMD, 2014).

The draft Loxahatchee Watershed Conceptual Ecological Model (2004) states that general hydrologic requirements need to be defined for each of the major plant communities identified within the indicator regions. As described by the Florida Natural Areas Inventory (FNAI 1990), fifteen of these distinct natural communities are found within Jonathan Dickinson State Park (Roberts et al. 2006) and the Loxahatchee River watershed. The eight that are the most predominate are: mesic and wet flatwoods, wet prairie, floodplain and dome swamp, depression marsh and mesic and hydric hammock. The species composition and distribution of plant communities in a given locale is a function of hydrologic regimes (depth of water table, length and frequency of inundation) as well as soil type, frequency of fire, and climate. Fire frequency is especially important as longer fire intervals often lead to invasion of wax myrtle and other hardwoods and can cause a shift in the communities as modeled in Duever and Roberts (2013). These plant communities are important in providing food and/or habitat for various fish and wildlife. Therefore, changes in the distribution, abundance, and species composition of plant communities have a direct effect on the type and quality of associated animal communities (Sharitz and Gibbons 1989, Kraus et al. 1999). Detailed information on each of the identified plant community type in relation to vegetative composition, fire frequency, wildlife utilization, effects of altered hydrology and impacts of exotics etc. can be found in FNAI (2010) and Duever and Roberts 2013).

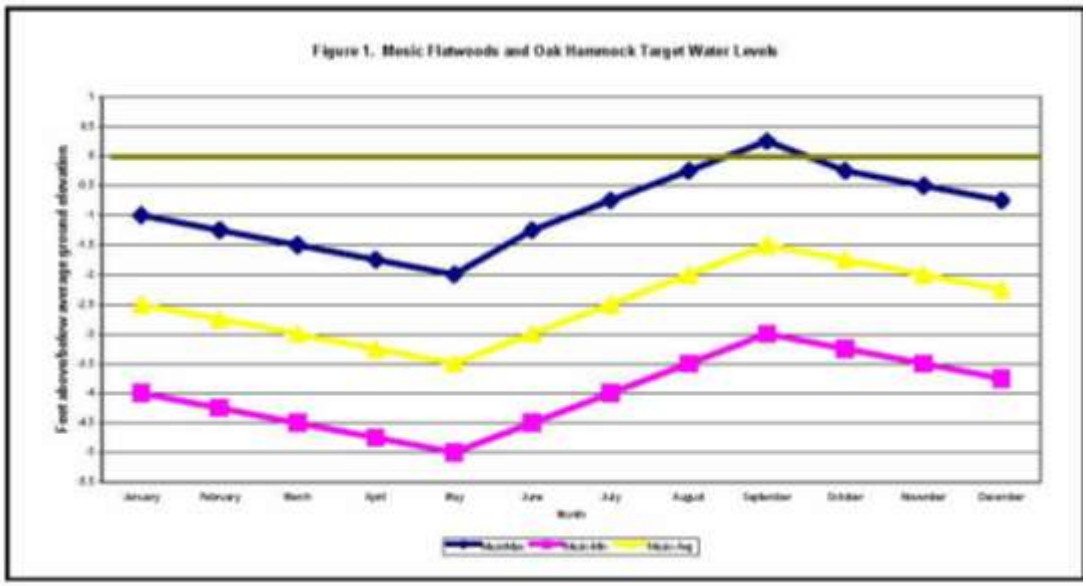
Indicator regions: Some of the major freshwater wetland systems within the watershed are located in the Loxahatchee Slough, Hungryland Slough, J.W Corbett Wildlife Management Area, along Cypress Creek, Kitching Creek, the Pal Mar system, and in Jonathan Dickinson State Park. The southern part of the Loxahatchee Slough, considered historically to be the headwaters of the federally-designated Wild and Scenic Northwest Fork of the Loxahatchee River, is the City of West Palm Beach Water Catchment Area, a portion of which is now known as Grassy Waters Preserve. A separate performance measure has been established for Grassy Waters Preserve.

CERP Evaluation Target

The performance measure target is as follows:

"Seasonal hydrologic regimes to be within five percent (plus or minus) of desired values for major wetland plant communities at specified indicator regions. Desired values will be based on literature data (Figures 1-8; Table 1) and/or model outputs for predevelopment conditions or existing conditions in unimpacted areas. At minimum these literature based community hydrologic regimes will be used as targets for each major wetland plant community. However, they are subject to refinement based on comparison and validation of model outputs from Lower East Coast Sub-Regional Model (LECsR) to actual field conditions in unimpacted areas.

Sources: Drew and Schomer (1984); Duever et al (1984); Vince et al. (1989); Abrahamson and Harnett, 1990; Myers and Ewel, 1990; Mitsch and Gosselink, 1993; David, 1996; FDEP, 2003.



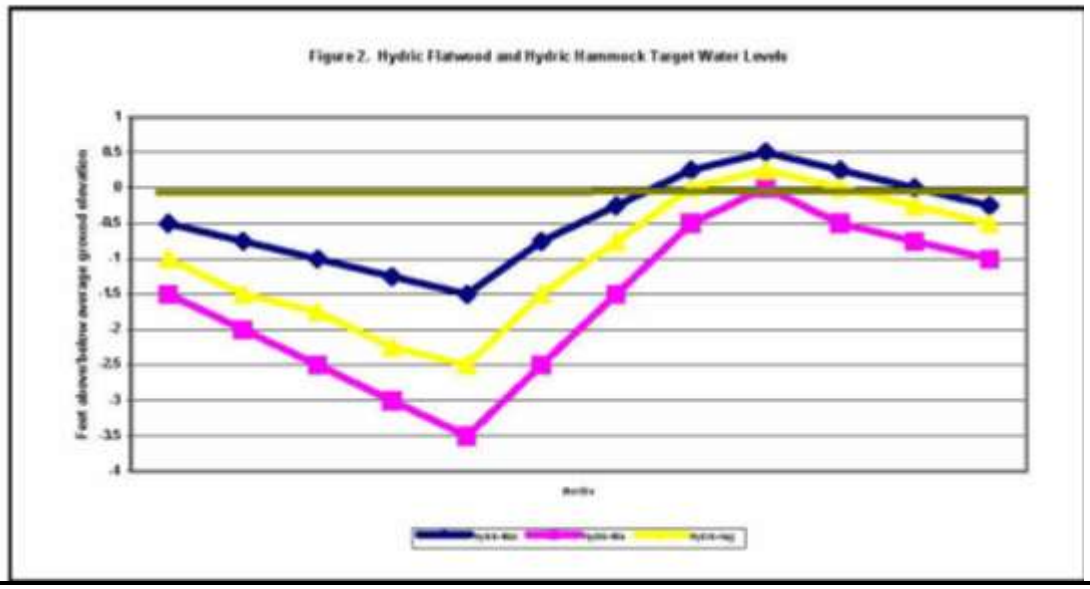


Figure 3. Depression Marsh Target Water Levels

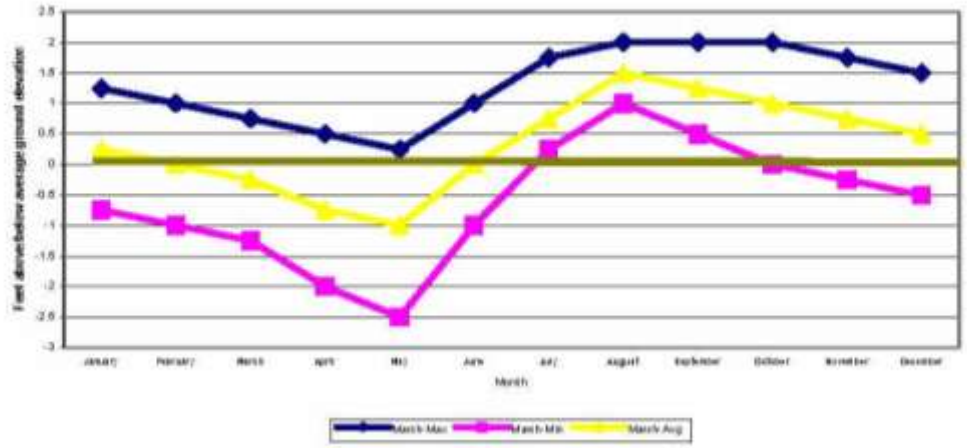


Figure 4. Wet Prairie Target Water Levels

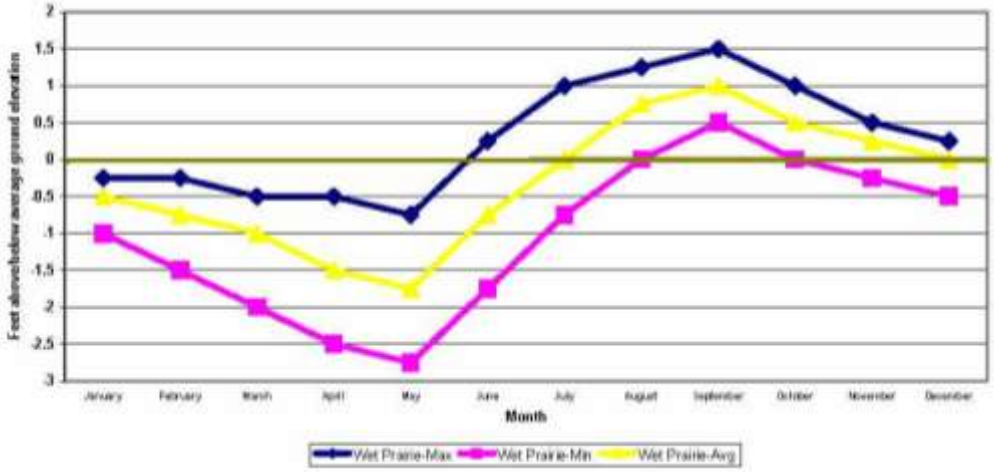
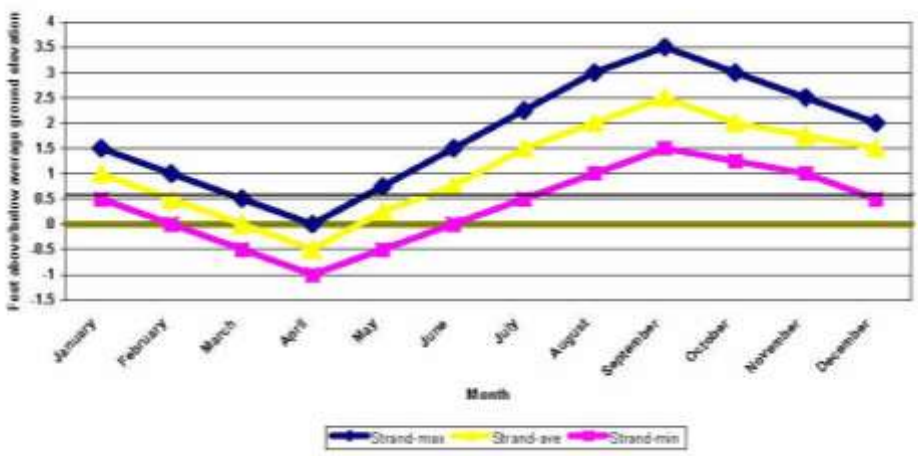
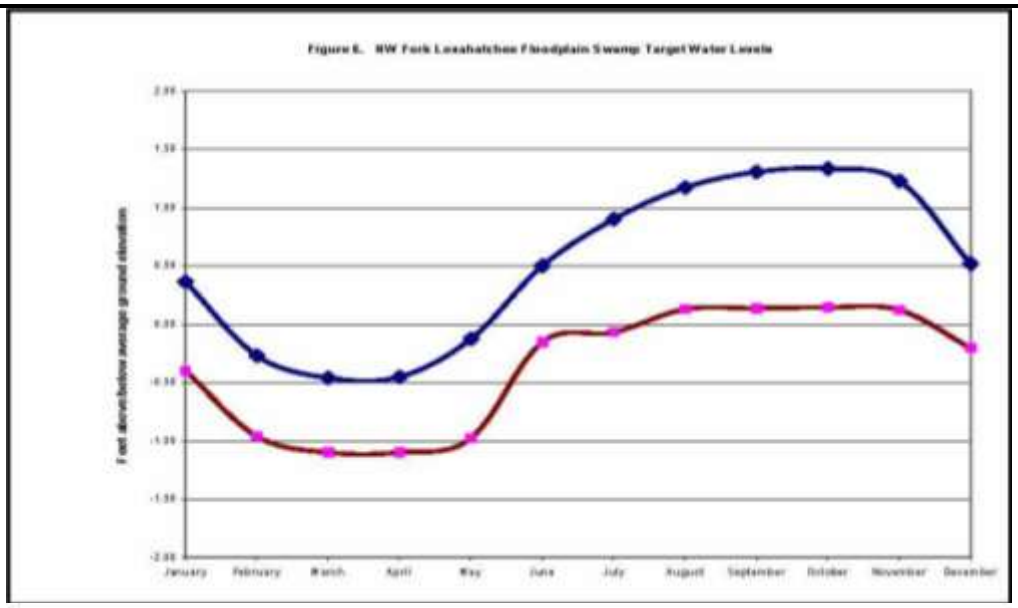
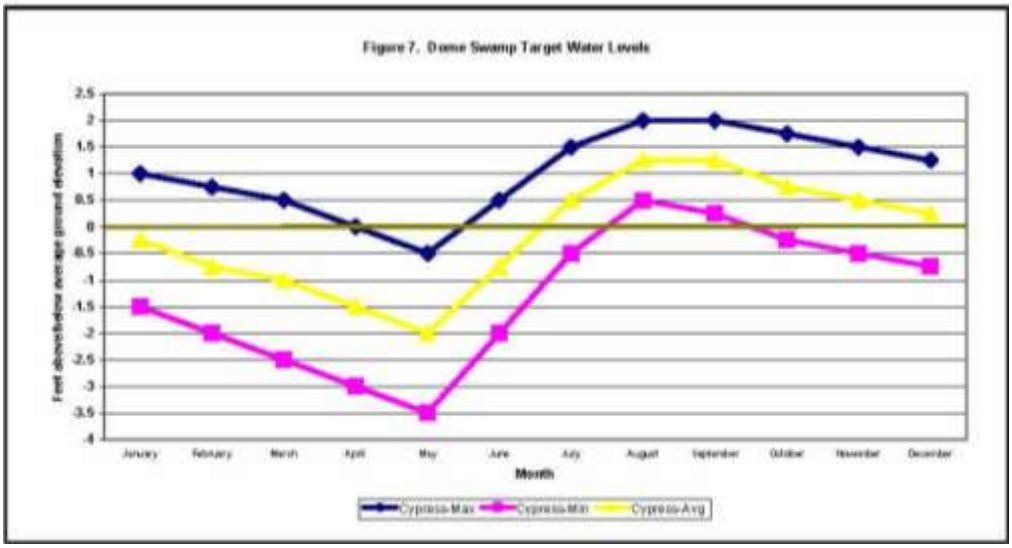


Figure 5. Strand Swamp Target Water Levels







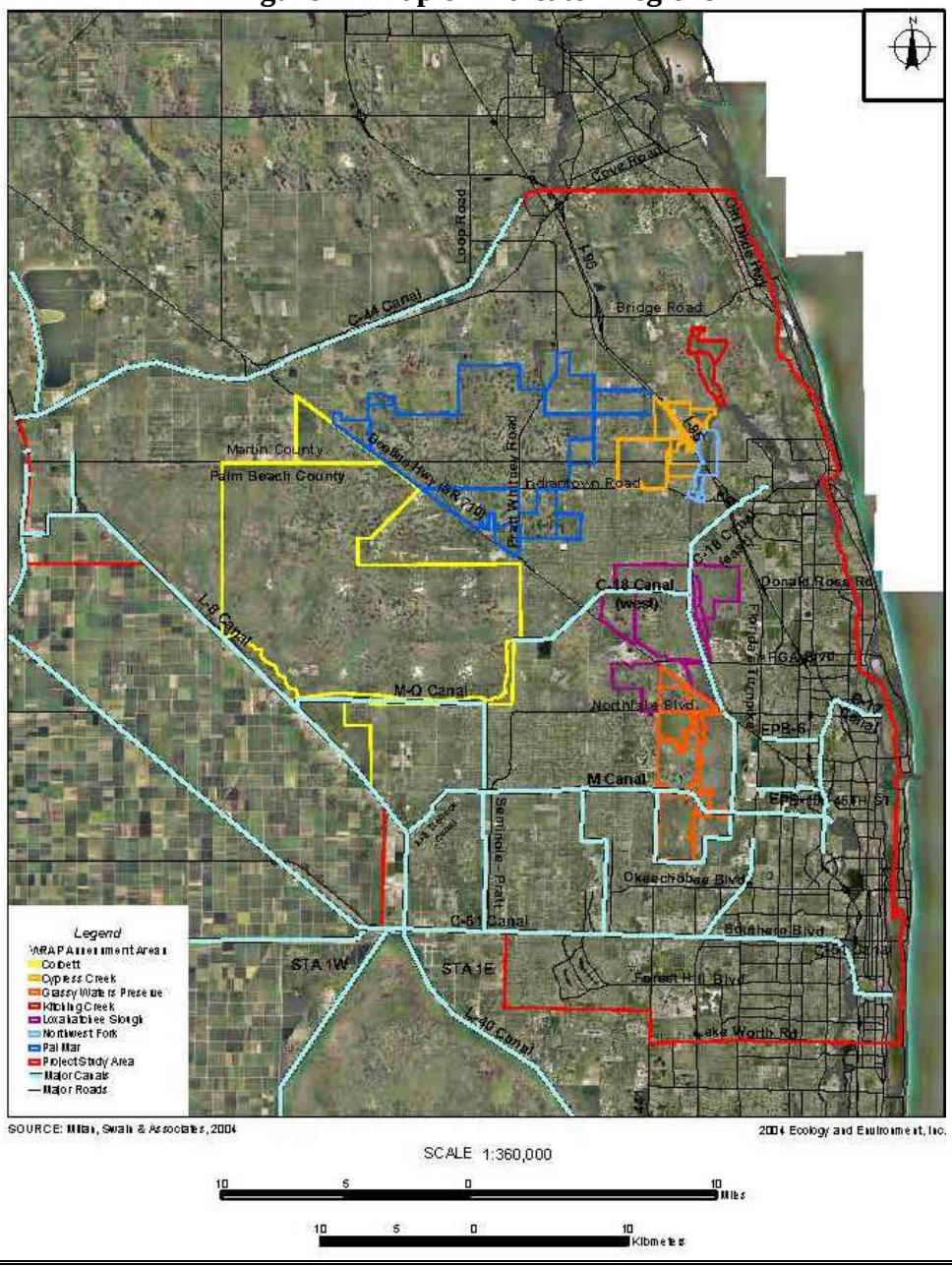
Plant Community Type	Annual Avg. Water Depth (inches)	Inundation Duration* (days/yr)	Median Inundation Duration (days/yr)
Mesic Flatwood	Below ground	≤30	15
Mesic (Oak) Hammock	Below ground	0-60	30
Hydric Flatwood	0-6	30-60	45
Hydric Hammock	0-6	30-60	45
Depression Marsh	12-24	180-300	240
Wet Prairie	6-16	60-180	120
Strand Swamp	18-36	210-300	255
Floodplain Swamp	12-30	120-240	180
Dome Swamp	12-24	210-300	255
* Frequency coincides with wet weather patterns and existing groundwater conditions			

Table - 1. Annual average water depth and annual inundation for major wetland plant communities identified within the Loxahatchee watershed.

Evaluation Protocol

Evaluation Polygons or Indicator Regions – Indicator regions helped simplify the evaluation process for assessing such a large watershed with an understanding that contiguous wetland/upland systems that exhibit similar hydrologic conditions, functionality and impacts can be grouped together. Indicator regions were only identified in areas where hydrologic restoration may be achieved by the project. In addition, key unimpacted areas were also assigned indicator regions to serve as reference sites for those areas (i.e. portions of J.W. Corbett, Pal-Mar, Grassy Waters Preserve [GWP]) where not impacts should occur as a result of the project. Land managers familiar with specific regions within the project study area were consulted in the determination of each indicator region (see **Figure 1** Map of Indicator Regions) within their respective area. An indicator region is not limited to any one specific wetland type, and quite frequently contains a number of different wetland systems. Therefore, the assessment of each indicator region included field surveys of the different wetland systems in order to more accurately assess each system within that polygon.

Figure 1 - Map of Indicator Regions

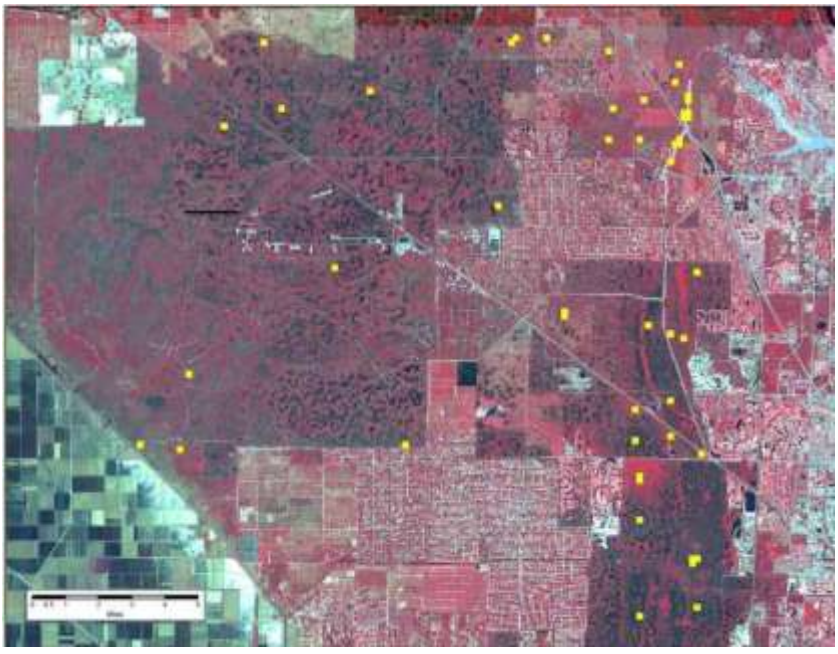


Elevation Data: In order to better assess hydrologic impacts of various alternatives to different types of wetland/upland systems, LIDAR was used. LIDAR data is currently available for most of the project study area and provide specific ground level elevations within each LECsR model cell. During WRAP field assessments, verification of the LIDAR data was also conducted at several locations using a laser level to verify field elevations of specific plant communities. The LIDAR data was then used with the model runs to determine relative community types with respect to elevation and landscape position.

Wetland Rapid Assessment Procedure (WRAP) Assessments: Functional assessments of wetlands/uplands were conducted by wetland scientists, biologists, engineers and watershed managers using WRAP. This evaluation process and the associated modifications are discussed in more details under the subsequent section 2.3 of the WRAP Final Report on Ecological Benefits (Ecology and Environment[E&E], 2004). The WRAP process is documented in the Wetland Rapid Assessment Procedure report (Miller and Gunsalus, 1999).

Lower East Coast Sub-Regional Model (LECsR) - LECsR has been modified for this project study area and will be utilized to characterize future without conditions and compare the effects of various watershed management alternatives. This predictive hydrologic model generates daily average water elevations above and below ground to compare inter-annual and seasonal fluctuations with respect to depth, duration and frequency of inundation at specified areas. The results of the alternative model runs will be compared to the hydrologic targets for the project area indicator regions. Fifty LECsR Model cells were randomly selected in indicator regions (**Figure 2)**. Field measurements of current hydrological conditions were conducted using a laser level and field indicators of hydrology (i.e. moss collars, lichen lines, stain lines, adventitious rooting, old growth dahoon holly, etc.). This information was used to confirm and update the current base model outputs for stages/hydroperiods in selected model cells. Further details can be found in Final Report on Procedural Approach for Ecological benefit and Impact Analyses of Alternative Plans – North Palm Beach County Part 1 Watershed Wetlands (E&E 2004).

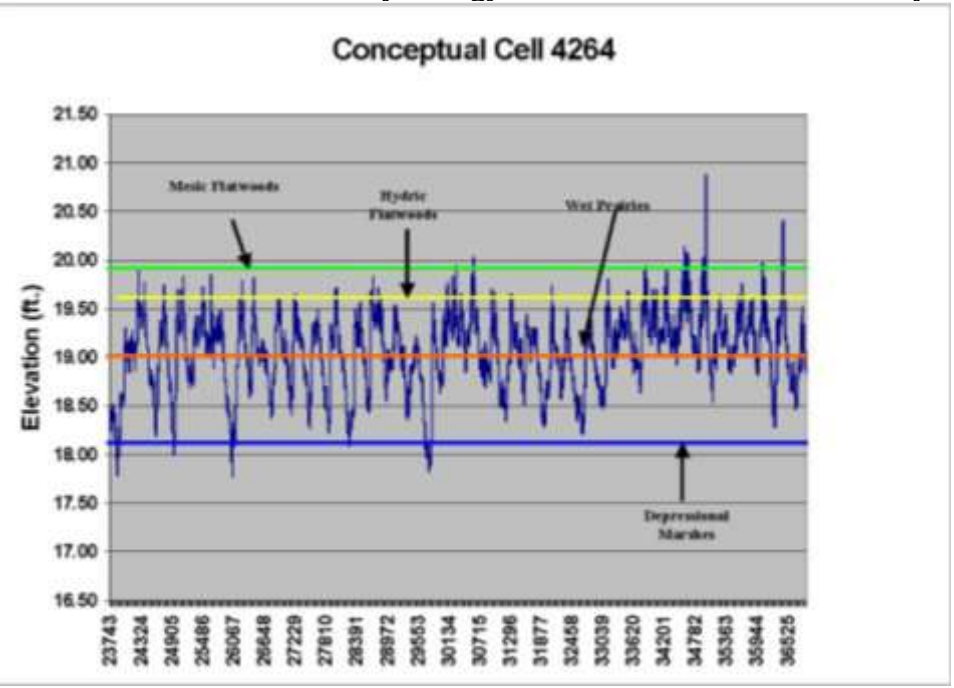
Figure 2 – MAP of Selected LECsR Model Cells in Each Indicator Region



The best topographic data available was used with the model runs to determine relative community types with respect to elevation and landscape position. Topographic data provide specific elevations within each cell. This data can then be used to determine upper (25%) and lower (25%) averages for land surface elevations relative to

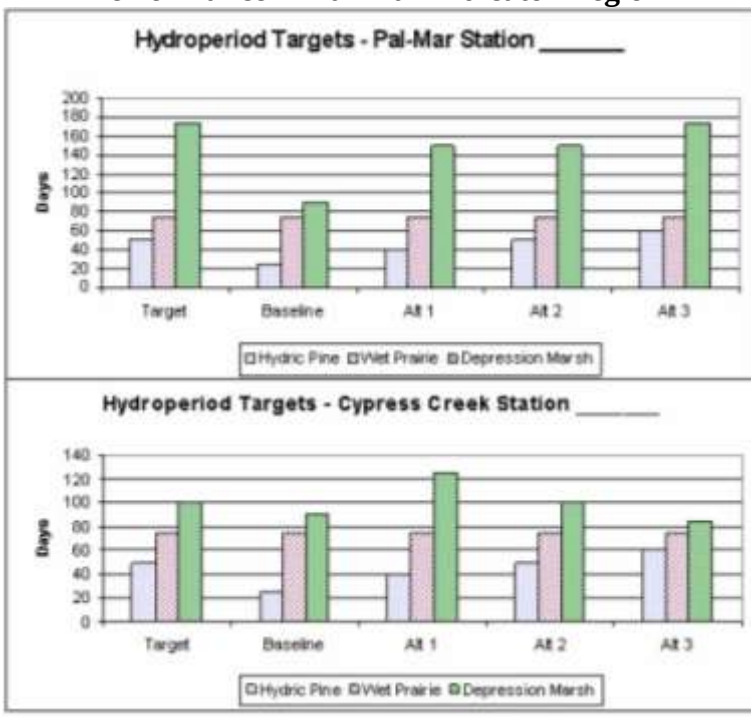
an individual cell. Upper level land elevations typically reflect upland plant communities whereas lower level elevations reflect wetland areas with the deepest and longest hydroperiods. Land elevations in between upper and lower limits can be used to differentiate plant community types and their associated hydrologic regimes (**Figure 3**).

Figure 3 – Land Elevation and Hydrology of Variation Plant Community Types



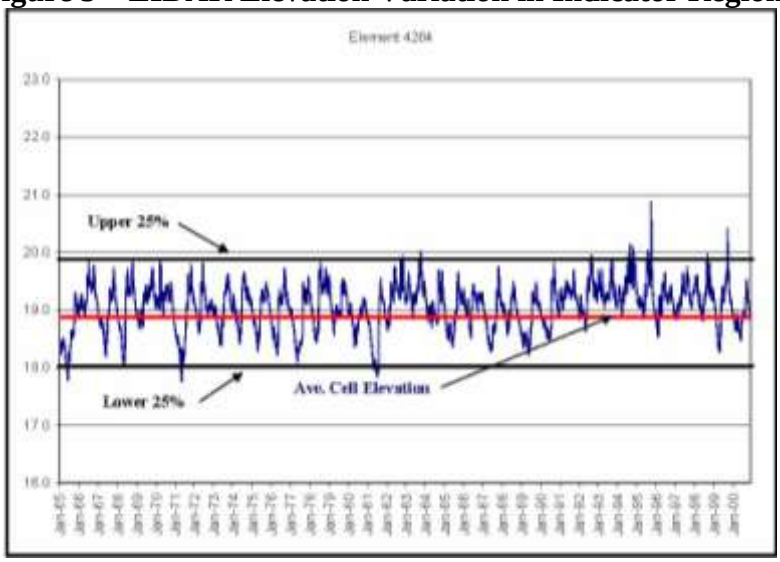
In addition to the stage hydrographs, hydroperiod graphs are created to compare alternatives at selected key indicator region cells (Figure 4).

Figure 4 – Comparing Hydroperiods Targets for Vegetation Communities to Alternative Plan Performance in Pal Mar Indicator Region



As the LIDAR data elevation for an indicator region varies amongst sites within an indicator region, the average LIDAR elevation is used to compare with hydrographs to determine plant communities types (see Figure 5).

Figure 5 – LIDAR Elevation Variation in Indicator Regions



WRAP Function Unit (FU) Scores: WRAP is a rating index that was developed, by the SFWMD, to assist in the regulatory evaluation of wetland sites that have been created, enhanced, preserved, or restored through the regulatory process. This standardized rating index is used in combination with professional judgment and field surveys to provide an accurate and consistent evaluation of wetland/upland systems.

The WRAP rating index establishes a numerical ranking for individual ecological and anthropogenic factors (variables) that can strongly influence the functionality of a natural system and, in turn, the overall success of environmental projects. Numerical output for the variables is then used to evaluate the current wetland condition. The rating index can be used to evaluate a wide range of wetland/upland systems (i.e. depression marsh, wet prairie, floodplain swamp, hydric flatwoods, etc.), but it is not intended to compare different wetland community types (i.e., marsh to wet prairie) to each other. The WRAP methodology includes the following variables:

- Wildlife utilization;
- Wetland overstory /shrub canopy;
- Wetland vegetative ground cover;
- Adjacent upland/wetland buffer;
- Field indicators of wetland hydrology; and
- Water quality input and treatment systems.

For each variable, the score assigned can range from 0 to 3, with 3 being the best possible score for the wetland community. The WRAP scoring system explains that a score of 3 is equivalent to the community providing 100% functional value for the variable being assessed, while scores of 2 and 1 are equivalent to 67% and 33% functionality, respectively. The authors of the WRAP recognized that it was inevitable that a community might not meet all the definitional requirements for a whole-number score within a variable, therefore, flexibility in the form of allowing the user to score the site in one-half point increments has been written into the procedure. Once each variable is scored, all of the points given to the "Evaluation Polygon" are totaled, and the final number is divided by the total available maximum score that the assessed polygon could have been awarded if it was a 100% functional system for all variables. The final number, the "WRAP score", is a numerical value between 0 and 1. As a general guideline, wetlands with WRAP scores ranging from 0.85 to 1.0 are high quality, 0.84-0.70

are medium high, 0.69-0.55 are medium, 0.54-0.40 are low quality and ≤0.39 are poor quality wetlands. A weighting factor was incorporated to provide a functional unit scaling to better discern differences between those areas that are functioning at a very high level (1-00-0.85) to those systems exhibiting heavy impacts and functioning at a low level (<0.40) (see **Table 2**)

WRAP Score	Weighting-Factor
1.00 – 0.85	1.0
0.84 – 0.70	0.75
0.69 – 0.55	0.50
0.54 – 0.40	0.25
<0.39	0.10

Table 2 – Comparison of WRAP Scores and Associated Weighting-Factors

In order to calculate the Functional Unit score for an alternative, the following equation is used:

$$(\text{WRAP}_{\text{score-x}} \times \text{Acres}_{\text{indictar region-x}}) * \text{Weighting}_{\text{factor-x}}$$

In order to calculate "Future Without Project Condition and Alternative X" WRAP scores, current base WRAP assessments/scores will be utilized to compare LECsR modeled hydrographs for specific areas within an evaluation polygon. The Existing Conditions Base WRAP scores are shown in Figure 6 and are further detailed in the 2004 Final WRAP Report (E&E, 2004).

Polygon ID	Key Natural Area	Site	Acreage	Dominant Community Types*	WU	O/S	GC	BUFF	HYD	WQ	WRAP Score	WRAP Multiplier	Functional Units Current Base	Functional Units Maximum
NWF-1	NW Fork of Loxahatchee River	Transect 1- Transect 2-1	206	FS; HH	2.50	3.00	3.00	2.40	2.88	2.10	0.81	0.75	125	155
NWF-2	NW Fork of Loxahatchee River	Transect 2-2, Transect 3 and 4	640	FS; HH	2.50	3.00	2.50	2.20	2.88	2.70	0.83	0.75	573	640
NWF-3	NW Fork of Loxahatchee River	Eastern Slough	50	FS; HH	2.88	2.50	1.50	2.24	1.58	2.50	0.88	0.50	17	58
HC-1	Hitching Creek	Headwaters	699	FS; HH	1.50	N/A	1.50	1.60	1.58	1.32	0.58	0.25	82	698
HC-2	Hitching Creek	Mid portion	594	FS; HH	2.50	3.00	2.50	2.00	2.58	2.00	0.81	0.75	355	594
HC-3	Hitching Creek	Lower portion	46	FS	2.50	2.00	1.50	3.00	1.58	1.90	0.68	0.50	17	46
MC-1	Moonshine Creek	Moonshine Creek/Hobe Grove Ditch	299	FS	1.00	1.00	0.50	2.00	0.58	1.50	0.38	0.10	15	299
CC-1	Cypress Creek	Transect 5	207	FS	2.88	2.00	1.00	2.25	1.88	1.95	0.88	0.50	98	207
CC-2	Cypress Creek	West of Gulf Stream Citrus	207	FS	1.50	2.00	1.50	1.60	0.88	2.25	0.68	0.50	57	207
CC-3	Cypress Creek	Loc River Natural Area/Gauge 2	394	WP; DS	2.50	3.00	3.00	2.50	2.68	2.50	0.85	1.00	335	394
CC-4	Cypress Creek	Renaissance Village Wetland	2,542	DM; WP; SS; HF	2.88	2.00	2.00	1.97	1.58	2.50	0.88	0.50	939	2542
GS-1	Cypress Creek	Gulfstream Citrus	1,261	N/A	1.00	0.50	0.50	2.00	0.58	1.50	0.33	0.10	42	1261
PM-1	Pal Mar (Martin Co.)	Unimproved Nine Gems Parcel	2,177	DM; WP	1.50	N/A	1.50	2.12	1.58	1.76	0.58	0.50	818	2177
PM-2	Pal Mar (Martin Co.)	Improved Nine Gems Parcel	1,452	DM; WP	1.00	N/A	1.00	1.60	1.58	1.50	0.41	0.25	148	1452
PM-3	Pal Mar (Martin Co.)	Area 3	709	DM; WP	2.50	N/A	2.50	1.91	2.58	2.75	0.81	0.75	431	709
PM-4	Pal Mar (Martin Co.)	Area 2	284	DM; WP	2.50	N/A	2.50	1.91	2.58	2.75	0.81	0.75	173	284
PM-5	Pal Mar (Martin Co.)	Unimpacted Pal Mar	10,672	DM; WP	2.50	N/A	3.00	2.30	2.58	2.75	0.87	1.00	17115	10672
PM-6	Pal Mar (Martin Co.)	Culpepper Ranch	838	DM; WP	1.50	N/A	1.00	2.20	0.58	1.37	0.42	0.25	84	838
PM-7	Pal Mar (FBC)	West of Pal-Mar south of Northlake Blvd.	4,236	DM; WP	2.50	N/A	2.00	1.75	2.58	2.75	0.79	0.75	2224	4239
PM-8	Pal Mar (FBC)	Impacted site next to motor sports park	671	DM; WP	2.50	N/A	2.50	1.90	2.50	2.75	0.79	0.75	398	671
PM-9	Pal Mar (FBC)	Impacted site	837	DM; WP	2.50	N/A	2.00	1.75	2.58	2.75	0.79	0.75	334	837
C-1	J.W. Corbett WMA	Edge effect along the M-8 Canal	1,642	DM; WP	1.50	N/A	1.50	1.75	2.58	2.50	0.67	0.50	588.8	1642.8
C-2	J.W. Corbett WMA	Edge effect along the L-8 Canal	1,226	DM; DS; WP; HF/MF; HH	2.50	2.50	2.50	2.20	2.58	2.50	0.78	0.75	898.8	1226.8
C-3	J.W. Corbett WMA	Moss Property	2,606	DS; FM; WP; HF	1.50	1.50	1.00	1.50	1.58	2.50	0.47	0.25	329.7	2606.8
C-4	J.W. Corbett WMA	Unimpacted areas	54,671	DM; WP; DS; SS	3.00	2.50	2.50	2.30	2.58	2.50	0.85	1.00	46634.8	54670.5
C-5	J.W. Corbett WMA	3000-Acre triangle	3,170	DM; WP; DS; SS; HF	3.00	2.50	2.50	2.30	2.58	2.50	0.85	1.00	2694.8	3170.4
LS-1	Loxahatchee Slough	Site 7	1,991	DM; WP; SS	2.50	N/A	2.50	1.70	2.58	2.75	0.78	0.75	1577.9	1991.8
LS-2	Loxahatchee Slough	West of C-18 Canal	3,645	DM; WP; SS	2.50	2.50	3.00	2.00	2.58	2.75	0.82	0.75	2267.1	3648.8
LS-3	Loxahatchee Slough	Sandhill Crane	1,451	WP; DM	2.50	N/A	2.00	1.30	1.58	2.75	0.64	0.50	464.4	1451.2
LS-4	Loxahatchee Slough	Roma Parcel	772	WP	1.00	0.50	1.50	1.00	1.58	2.75	0.48	0.25	88.8	772.1
LS-5	Loxahatchee Slough	East of C-18	1,780	DM; WP; SS	2.50	N/A	2.50	1.70	1.58	2.75	0.80	0.75	1068.2	1780.8
LS-6	Loxahatchee Slough	Melaleuca site south	406	DM; WP; SS	1.50	N/A	0.00	1.75	2.58	2.63	0.48	0.25	48.8	406.8
LS-7	Loxahatchee Slough	Site adj to melaleuca (SE)	428	SS	2.50	1.50	1.50	1.45	2.58	2.63	0.64	0.50	136.3	428.8
LS-8	Loxahatchee Slough	Southwest slough	1,668										0.0	1668.8
GWF-1	Grassy Waters Preserve	G-161 triangle	42	DS; DM; WP; SS; DS	1.50	2.00	2.00	1.45	1.58	2.75	0.62	0.50	13.8	42.8
GWF-2	Grassy Waters Preserve	West of G-161 triangle including Hog Island	397	DS; DM; WP; SS; DS; HF	2.88	2.50	2.00	2.05	2.58	2.75	0.74	0.75	220.3	397.8
GWF-3	Grassy Waters Preserve	Upper triangle- south of beeline and north of berm	308	DS; DM; WP; SS; DS; HF	2.50	2.00	2.50	2.10	2.58	2.75	0.77	0.75	177.8	308.8
GWF-4	Grassy Waters Preserve	South of the berm and west of Hog Island	755	DS; DM; WP; SS; DS; HF; MF	2.50	2.50	3.00	2.50	2.58	2.75	0.80	1.00	679.5	755.8
GWF-5	Grassy Waters Preserve	Northwest corner (willow area, ~1500 acres)	977	DS; DM; WP; SS; DS; HF	1.50	1.00	1.00	1.58	2.58	1.00	0.48	0.25	117.2	977.8
GWF-6	Grassy Waters Preserve	South of willow area & north of M-Canal	2,134	DS; DM; WP; SS; DS; HF	3.00	2.50	3.00	2.70	2.88	2.70	0.84	1.00	2558.8	2134.8
GWF-7	Grassy Waters Preserve	North of M-Canal east of Hog Island	2,682	DS; DM; WP; SS; DS; HF	3.00	2.50	3.00	2.70	2.88	2.70	0.84	1.00	2812.5	2682.8
GWF-8	Grassy Waters Preserve	M-Canal edge effects	594	DM; SS	1.50	2.00	1.00	2.00	2.88	1.60	0.58	0.50	168.3	594.8
GWF-9	Grassy Waters Preserve	South of M-Canal and west of Hog Island	2,518	DS; DM; WP; SS; DS; HF	3.00	2.50	3.00	2.70	2.88	2.70	0.84	1.00	2388.8	2518.8
GWF-10	Grassy Waters Preserve	Southeast corner	1,107	DS; DM; WP; SS; DS	3.00	2.50	2.50	2.50	2.88	2.75	0.80	1.00	886.3	1107.8

* Dominant Community Types = DM: Depression Marsh; WP: Wet Prairie; SS: Strand Swamp; DS: Dome Swamp; HF: Hydric Flatwoods; MF: Mesic Flatwoods; HH: Hydric Hammocks

LECsR Model Calculation of WRAP Scores - In order to standardize the calculation of model derived WRAP scores from field assessed scores, LECsR model results for the existing conditions base were scaled to the Eco-Subteam's field scores for the hydrology component only. This was accomplished by first establishing a target number of inundation days using the median value of the known desired range for each community type (See Table 1 above; Drew and Schomer 1984; Duever et al 1984; Vince et al. 1989; Abrahamson and Harnett 1990; Myers and Ewel 1990; Mitsch and Gosselink 1993; FDEP 2003.). Because the LECsR model uses a 36 period of record, the target for each community type was defined as the median value multiplied by 36 (S2DMM model cells use a 10 year period of record). The maximum WRAP score is three; therefore any WRAP cell equaling the target would get a score of three.

> **Example:** LS-2 (an evaluation cell in the Loxahatchee Slough) is a Depression Marsh. The median value is 240 (Table 2). In order for LS-2 to get a WRAP score of three, LECsR output would have to equal 240*36 = 8,640.

The conversion of the existing conditions field score for the WRAP hydrology variable to LECsR output assumes a linear relationship between the target days and the maximum WRAP score. The field score was divided by the maximum score and the resulting percentage was multiplied by the target days in order to determine the number of days over 36 years that the cell would be expected to be inundated. LECsR daily elevation data for each

WRAP cell were then examined to find the corresponding elevation that resulted in the calculated number of inundation days (the calibration line). This procedure was repeated for each evaluation cell in the existing conditions base condition to check and ensure they were similar.

> **Example**: LS-2 target = 8,640 inundation days; field score = 2. Field score / max score = 2/3 = 0.66. 0.66 * 8640 = 5,760 (the number of days the cell would have been inundated to receive a field score of two). For LS-2 in the existing conditions base, the cell would be inundated 5,773 days with the calibration line set to an elevation of 16.51.

Note that because there can be many days with the same elevation in the model output, there may be small deviations in the number of days a cell is inundated at the derived calibration line. For example, LS-2 is actually inundated 5,773 days at elevations above 16.51. This small deviation (13 days) is not enough to influence the WRAP score.

Each evaluation cell's calibration line was then used as the level above which that cell was considered inundated in the FWO and alternative conditions. In other words, for each WRAP cell as extracted from the LECsR output, the number of days above the calibration line were summed for the FWO condition and each of the alternatives. The total was then divided by the target and multiplied by three (the maximum WRAP score) to arrive at the calculated WRAP hydrology score for that cell. In cases where the number of LECsR inundation days exceeded the target, the inverse was applied and the target was divided by the number of inundation days and multiplied by three. In order to ensure that the correct calibration line had been calculated, this method was applied to the existing conditions base cells and compared to the field scores. In all cases the field and simulated scores were identical to one decimal place.

> **Example:** LS-2 target = 8,640; LS-2 calibration line = 16.51; number of days above calibration line in FWO LECsR output = 5,581. FWO WRAP hydrology score = (5,581/8,640)*3 = 1.9

The scores for each cell for the 2000B, FWO and each alternative were then used to determine habitat units using WRAP methodology. Per WRAP, the scores for each component (hydrology, wildlife utilization, adjacent buffer, etc.) are summed and divided by the maximum total points. For example, if six variables were measured in the field, then the total maximum points would be 18 (6x3). Because the hydrology variable is the only component being evaluated here, and each WRAP variable has a maximum value of 3 points, each calculated score is divided by three. The resulting value is then scaled by weighting factors (**Table 2** above) which differentiate between those systems functioning at very high levels (1.00 – 0.85) to those systems exhibiting heavy impacts and functioning at low levels (<0.40).

> **Example:** LS-2 LECsR FWO calculated WRAP score = 1.9. Adjusted score = 1.9/3 = 0.65. Weighting factor for 0.65 = 0.50.

> **Example** - L-2 LECsR Alternative X inundation duration is 7,776 days. 7,776/8640 = calculated score = 2.7. Adjusted score = 2.7/3 = 0.91. Weighting factor for 0.91= 1.0

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Contact

Boyd Gunsalus – South Florida Water Management District (SFWMD) Dick Roberts – Florida Department Environmental Protection (FDEP - Retired) Inger Hansen – FDEP Beth Kacvinsky - SFWMD

Ken Todd – Palm Beach County Patrick Painter – City of West Palm Beach Andy LoSchiavo – U.S. Army Corps of Engineers (USACE) Andy Gottlieb – South Florida Engineering and Consulting.