Using FLUCCS Codes and GIS Spatial Analyst Tools for Wetland Restoration

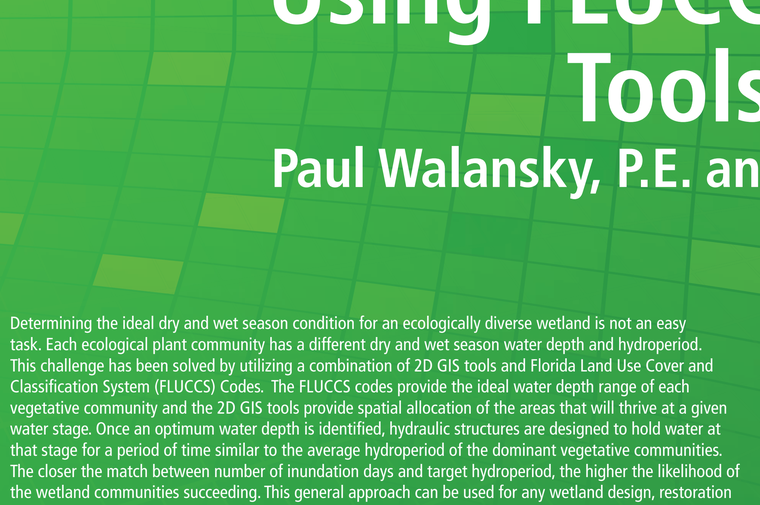
Paul Walansky, P.E. and Kwaku Oben, P.E. Stanley Consultants, West Palm Beach

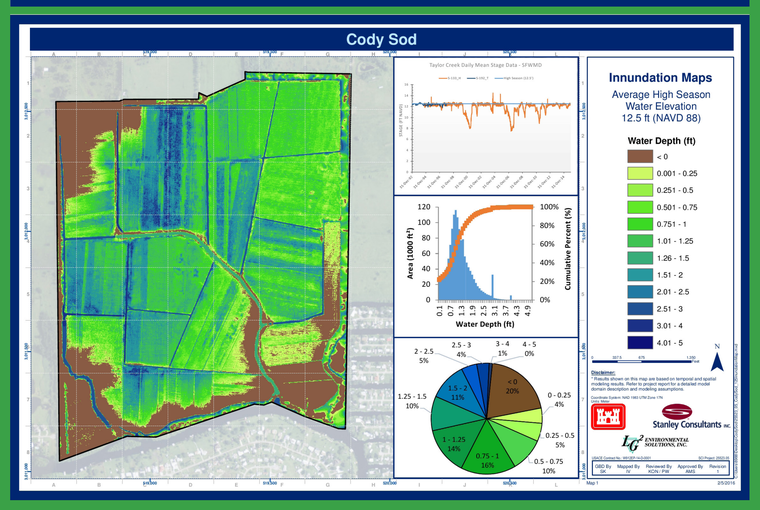
Determining the ideal dry and wet season condition for an ecologically diverse wetland is not an easy task. Each ecological plant community has a different dry and wet season water depth and hydroperiod. This challenge has been solved by utilizing a combination of 2D GIS tools and Florida Land Use Cover and Classification System (FLUCCS) Codes. The FLUCCS codes provide the ideal water depth range of each vegetative community and the 2D GIS tools provide spatial allocation of the areas that will thrive at a given water stage. Once an optimum water depth is identified, hydraulic structures are designed to hold water at that stage for a period of time similar to the average hydroperiod of the dominant vegetative communities. The closer the match between number of inundation days and target hydroperiod, the higher the likelihood of the wetland communities succeeding. This general approach can be used for any wetland design, restoration or management.

Stanley Consultants is under contract with the USACE to perform wetland restoration analysis and design of improvements for three restoration sites in their Wetland Reserve Program. (WRP). The WRP is a voluntary program that offers to landowners the opportunity to protect, restore, and enhance wetlands on their property. The USDA Natural Resources Conservation Service (NRCS) provides technical and financial support to help landowners with their wetland restoration efforts through WRP. This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection. The goal of these projects is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program.

Our team conducted detailed onsite assessments to document the current conditions of the restoration properties. We collected information on habitat types, hydric soil indicators, soil types, hydrologic indicators, and vegetation. Shallow borings were also performed to examine soil conditions. In addition, the current land use and vegetative communities map based on the FLUCCS was studied at each site.

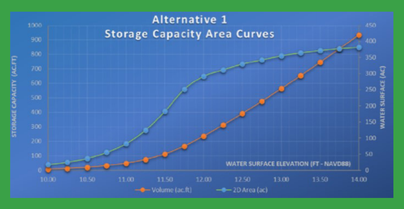
To support the efficient evaluation and development of these wetland restorations, hydrologic and hydraulic models were used in parallel to evaluate both overall and detailed site conditions. Given that our project sites are generally flat and restoration goals will be achieved by retaining water on the site, advanced GIS tools and 2D modeling software were used to design and evaluate the proposed alternatives. Our modeling tools used the FLUCCS codes of the vegetative communities proposed to evaluate the improved hydrology and water conditions at the site. This was a different approach to the methodology that has previously been used to understand the potential success of the proposed restoration improvements. With this method of analysis the success rate of these wetland restoration projects can be greatly increased.

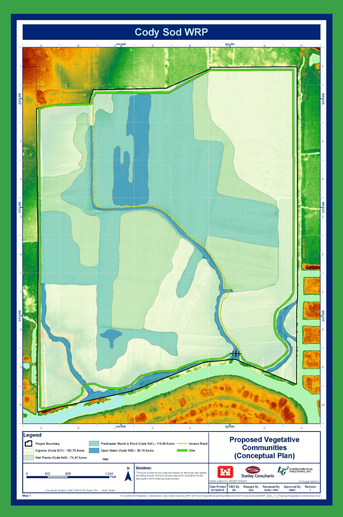




ALTERNATIVE 1 – PLANTING REVEGETATION

Cypress (Code 621)	182.75
AcresFreshwater Marsh & Pond (Code 641)	119.66 Acres
Wet Prairie (Code 640)	74.47 Acres
Open Water (Code 500)	30.16 Acres





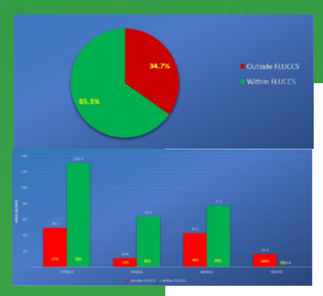
FLUCCS Classification Cross-reference Table

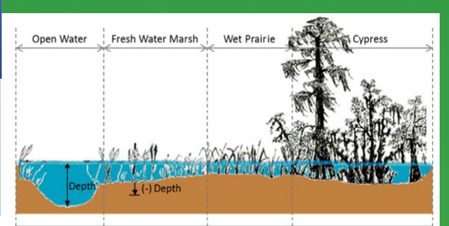
FLUCCS	FNAI	SCS	FWC	NWI
630 - *Wetland Forested Mixed*				
631 - Wetland Scrub	Bog, Wet Flatwoods, Bottomland Forest, Floodplain Forest, Flatwoods/Prairie/ Marsh Lake	22-Shrub Bog/Bay Swamp	15-Shrub Swamp	PSS-Palustrine, Scrub Shrub
640 - *Vegetated Non-Forested Wetlands*				
641 - Freshwater Marshes	Basin Marsh, Depression Marsh, Swale, Mart Prairie, Flatwoods/Prairie/Marsh Lake	25-Freshwater Marsh, 24-Sawgrass Marsh	11-Freshwater Marsh and wet Prairie	PEM- Palustrine, Emergent, R2EM-Riverine,Lower Perennial, Emergent, non-persistent, R4SB-Riverine, Intermittent, Streambed, L2EM-Lacustrine, Littoral, Emergent, Non-Persistent
643 - Wet Prairies	Wet Prairie, Mart Prairie, Seepage Slope, Swale, Basin Marsh, Flatwoods/Prairie/Marsh Lake	23-Pitcher Plant Bog, 25-Freshwater Marsh	11-Freshwater Marsh and wet Prairie	PEM-Palustrine, Emergent, R2EM- Riverine, Lower Perennial,Emergent, non-persistant, R4SB-Riverine Intermittent, Streambed, L2EM-Lacustrine, Littral, Emergent, non-preistant
644 - Emergent Aquatic Vegetation	Basin Marsh, Depression Marsh, Floodplain Marsh, Flatwoods/Prairie/Marsh Lake	25-Freshwater Marsh, 24-Sawgrass Marsh	11-Freshwater Marsh and wet Prairie	R2AB-Riverine, Lower Perennial, Aquatic Bed, R3AB-Riverine, Upper Perennial, Aquatic Bed, L1AB-Lacustrine, Limnetic, Aquatic Bed, L2AB-Lacustrine, Littoral, Aquatic Bed, PAB3-Palustrine, Aquatic Bed, Rooted Vascular, PAB4-Palustrine, Aquatic Bed, Floating Vascular
645 - Submerged Aquatic Vegetation	River Floodplain Lake/Swamp Lake	25-Freshwater Marsh	11-Freshwater Marsh and wet Prairie	R2AB- Riverine, Lower Perennial, Aquatic Bed, R3AB- Riverine, Upper Perennial, Aquatic Bed, L1AB-Lacustrine, Limnetic, Aquatic Bed, L2AB-Lacustrine, Littoral, Aquatic Bed, PAB3-Palustrine, Aquatic Bed, Rooted Vascular
646 - Treeless Hydric Savanna	Wet Flatwoods	26-Slough	3-Pinelands, 11-Freshwater marsh and wet prarie	PFO4-Palustrine, Forested, Needle-Leaved Evergreen
653 - Intermittent Ponds	Depression Marsh	25-Freshwater Marsh, 26-Slough	11-Freshwater Marsh and wet Prairie	PEM1-Palustrine, Forested, Broad-Leaved Deciduous, PABA- Palustrine, Aquatic Bed, Floating Vascular

FNAI. Florida Natural Areas Inventory. 1990. Guide to the natural communities of Florida. Prepared by FNAI and Florida Department of Natural Resources, Tallahassee FL. 111 pp.
SCS. Soil Conservation Service, U.S. Department of Agriculture. 1984. 26 Ecological Communities of Florida.
FWC. Florida Fish and Wildlife Conservation Service. Land Cover map.
NWI. National Wetlands Inventory. Cowardin, L.M., V. Carter, F.C. Golet and E.T. Laroe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79/31. U.S. Fish and Wildlife Service / Department of the Interior, Washington, D.C. 103 pp.

2D SPATIAL ANALYST - STATIC MODEL

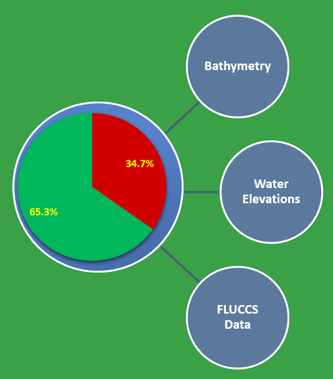
- Vegetative communities
- Seasonal water ranges
- Ground topography

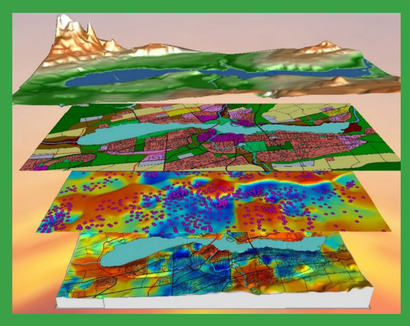




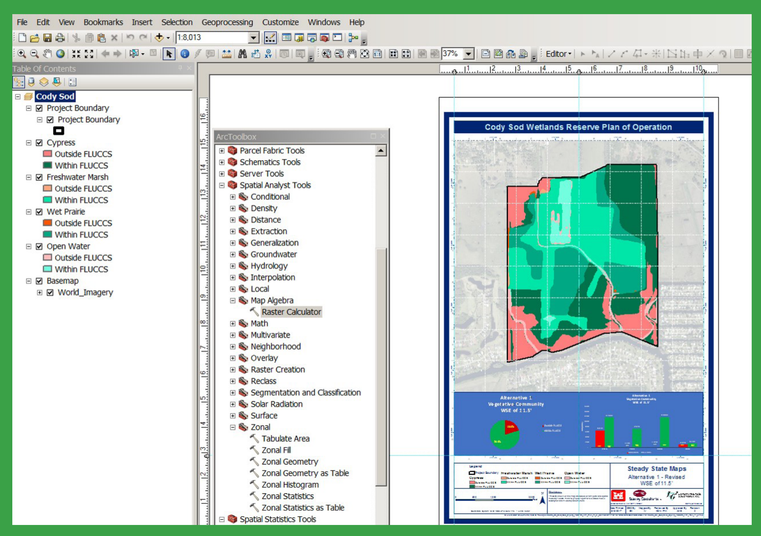
Vegetation Description	Open Water	Fresh Water Marsh	Wet Prairie	Cypress
FLUCCS Code #	510	641	640	621
Wet Season Water Depth Range	4'-5'	1' to 2'	0.5' to 1.5'	-0.5' to 2'
Dry Season Water Depth Range	1' to 2'	-1' to 0.5'	-1' to 0'	-1' to 0'

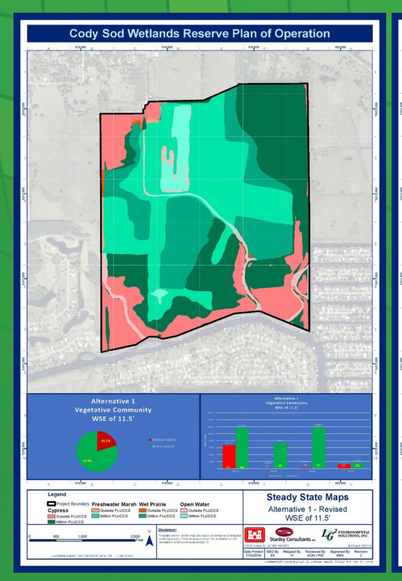
2D SPATIAL ANALYST – GRID LAYERS

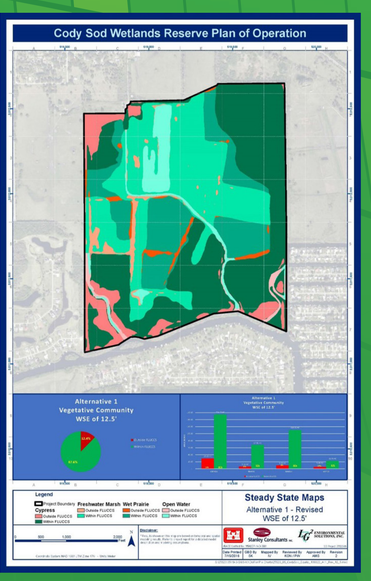


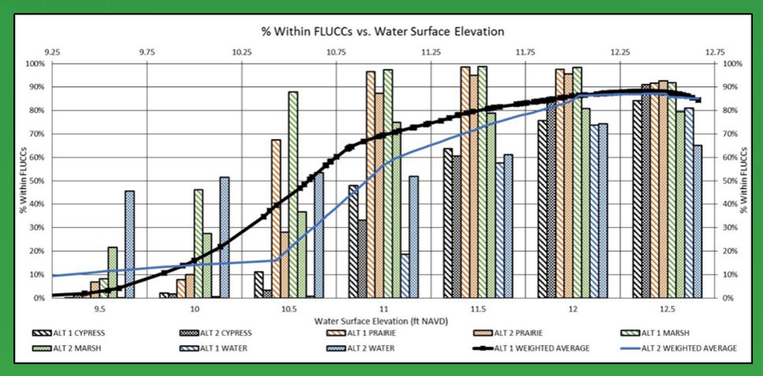


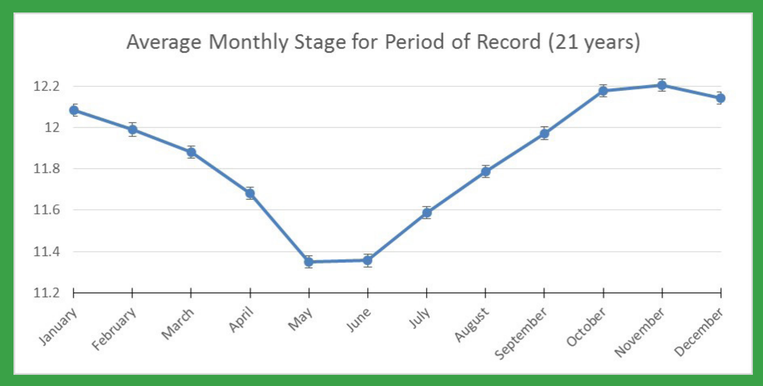
2D SPATIAL ANALYST TOOLS

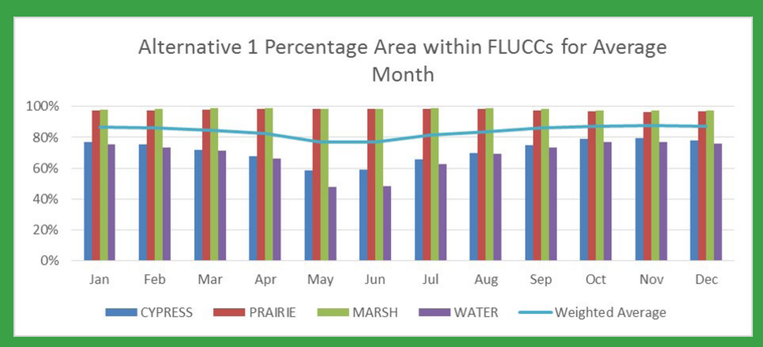












CONCLUSIONS

- 2D Spatial Analyst tools in ArcGIS are ideal for evaluating the performance of wetlands
- There are several visual display options available in ArcGIS which makes it easy for non-technical decision makers to understand the performance of a wetland areas
- For regions outside Florida, the equivalent of FLUCCS codes can be used to assess wetland areas – consult with your environmental scientist on the project for guidance

CONTACT INFORMATION:

Paul Walansky, P.E., 1641 Worthington Road, Suite 400, West Palm Beach, FL 33409, Phone: 561-584-8724, Fax: 561-689-3003, E-mail: walanskypaul@stanleygroup.com
Kwaku Oben, P.E., 1641 Worthington Road, Suite 400, West Palm Beach, FL 33409, Phone: 561-584-8718, Fax: 561-689-3003, E-mail: ObenKwaku@stanleygroup.com