



APPLICATION OF FUNCTIONALITY METHODS IN WETLAND IMPACT QUANTIFICATION AND MITIGATION ESTIMATION

By

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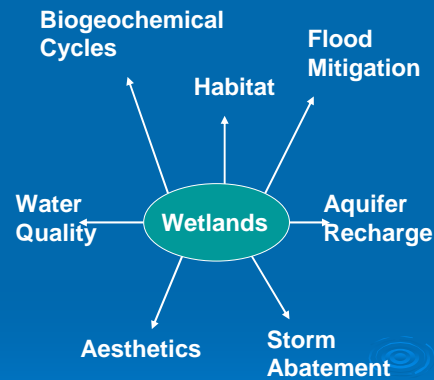
Wetland Management in the US

- Relies on executive orders, a “No Net Loss of Wetland Functions” policy and the Section 404 dredge-and-fill program of the CWA
- The policy supports projects for restoration, creation, preservation or enhancement of wetlands



Quantifying Wetland Values

- Number of efforts have been made to quantify the “free services” of wetlands
- Activities under EIS, two kinds of evaluation:
 - Ecological value
 - Economic value



Quantifying Wetland Values

- Over 40 wetlands assessment methods have been published since 1990 (Fennessy et al., 2004)
 - Habitat Evaluation Procedures
 - Wetland Evaluation Technique
 - Wetland Rapid Assessment Procedures
 - Uniform Mitigation Assessment Method



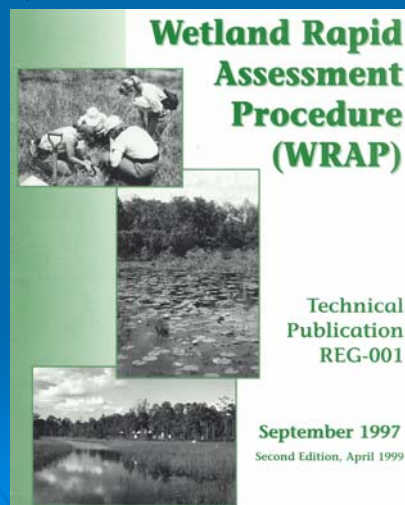
Mission Impossible?

- Measure all functions of all types of wetlands, surface waters, and benthic communities in all parts of the State
- Practical and simple to use given permitting time frames
- Technical enough to give accurate answers
- Repeatable
- Compatible with present rules
- Provide answers similar to present practice
- Withstand test of legal validity

Wetland Rapid Assessment Procedures (WRAP)

Miller and Gunsalus, 1997

- Rating Index- assist in the regulatory evaluation of wetland sites
- Objectives:
 - Establish a simple, accurate, consistent and timely regulatory tool
 - Track trends over time
 - Offer guidance for environmental site plan development



WRAP Variables

- **Wildlife Utilization**
 - Wide variety including birds, fish and invertebrates
- **Wetland Overstory/Shrub Canopy**
- **Wetland Vegetative Ground Cover**



WRAP Variables

- **Adjacent Upland/Wetland Buffer**
- **Field Indicators of Wetland Hydrology**
- **Water Quality Inputs and Treatments**



Uniform Mitigation Assessment Method (UMAM)

- Developed by Department of Environmental Protection (DEP) and Water Management Districts
- DEP adopts the method by rule- FAC 62-345, Effective February 2, 2004
- UMAM determines the
 - Assessing functionality
 - Reduction by proposed impact
 - Amount of mitigation necessary to offset loss
- Used by state and local governments

UMAM- Goals in Developing Method

- Practical to use within permitting timeframes
- Consistent process
- Use with scientific judgment
- Account for different ecological communities in different areas



Part I- Qualitative Characterization

Office Module

- Provides a “frame of reference”
- Aerial photographs, topographic and other maps, scientific literature, technical reports, surveys, etc.

PART I – Qualitative Description (See Section 62-345.400, F.A.C.)			
Site/Project Name	Application Number	Assessment Area Name or Number	
FLUCCs code	Further classification (optional)	Impact or Mitigation Site?	Assessment Area Size
Basin/Watershed Name/Number	Affected Waterbody (Class)	Special Classification (i.e. DFW, AP, other local/state/federal designation of importance)	
Geographic relationship to and hydrologic connection with wetlands, other surface water, uplands			
Assessment area description			
Significant nearby features		Uniqueness (considering the relative rarity in relation to the regional landscape.)	
Functions		Mitigation for previous permit/other historic use	
Observed Evidence of Wildlife Utilization (List species directly observed, or other signs such as tracks, droppings, casings, nests, etc.):			
Additional relevant factors:			
Assessment conducted by:		Assessment date(s):	

Part II: Assessment and Scoring of a Freshwater Wetland

Part II- Quantification of Assessment Area

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

Site/Project Name	Application Number	Assessment Area Name or Number
Impact or Mitigation	Assessment conducted by:	Assessment date:
Scoring Guidance The scoring of each indicator is based on what would be suitable for the type of wetland or surface water assessed.	Optimal (10) Condition is optimal and fully supports wetland/surface water functions	Moderate (7) Condition is less than optimal, but sufficient to maintain most wetland/surface water functions
	Minimal (4) Minimal level of support of wetland/surface water functions	Not Present (0) Condition is insufficient to provide wetland/surface water functions
.5006(a) Location and Landscape Support		
No pres or current with 4 0		
.5006(b) Water Environment (via for uplands)		
No pres or current with 7 0		
.5006(c) Community structure		
1. Vegetation and/or 2. Benthic Community No pres or current with 7 0		
Score = sum of above		
Delta = ()		

Three sections for scoring:

Location and Landscape Support

Water Environment

Community Structure

Overall score of the assessment area as well as adjustments to scoring based on time lag and risk factors

Part II Cont'd: Scoring

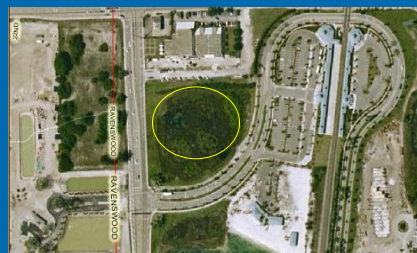
- Score each category with a whole number from 0 to 10
- Specific guidance is provided for a score of 0, 4, 7 and 10
 - 0=not present
 - 4=minimal
 - 7=moderate
 - 10=optimal

Location and Landscape Support

- Support to wildlife by outside habitats



Aerial photo of habitat providing full range of habitats needed to support wildlife species of the assessment area



Outside habitat fails to provide support or provides minimal support for many wildlife species

Location and Landscape Support

- Presence of exotic invasive species or other invasive plant species



Old-world climbing fern



Melaleuca trees

Location and Landscape Support

- **Wildlife access**
 - Fragmentation
- **Downstream benefits**
 - Hydrologic connections
- **Impacts of land uses**
- **Protection of wetland function**



Water Environment

➤ Water level indicators

- Moss collars
- Lichen lines
- Water marks



Water Environment

➤ Water Quantity

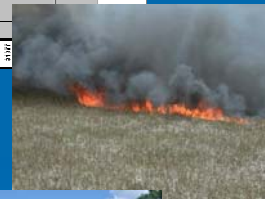
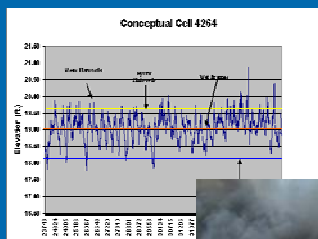
- Timing, distribution, depth and duration of inundation/saturation

➤ Soil Moisture

➤ Soil Erosion/Deposition

➤ Evidence of Fire History

➤ Vegetation Community Zonation



Water Environment

- Hydrologic stress
- Use by animal species
- Plant community composition
- Standing water
- Existing water quality data
- Water depth



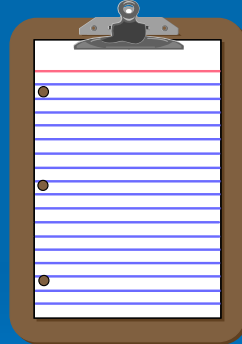
Community Structure

- Vegetation and/or Benthic Community
- Species composition
- Regeneration/ recruitment
- Age, size distribution
- Invasive/exotic species
- Topographic features



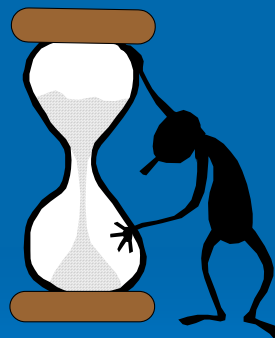
Part II. Scoring Continued

- Total the scores of indicator categories and divide by 30 (20 for uplands) to derive overall score between 0 -1
- Compare current and “with” conditions to get “delta”



Adjustments

- Time Lag: 1 (immediate) to 3.91 (>55 years), table
- Risk: 1 (no/minimal) to 3 (high), 0.25 increments



Time Lag

- Time period between loss of functions and gain of functions
- Forested = longer time lag
- Time necessary for physical, chem. & bio processes
- Time lag = 1 for upfront mitigation

TABLE 1.

Year	T-factor
≤ or = 1	1
2	1.03
3	1.07
4	1.10
5	1.14
6-10	1.25
11-15	1.46
16-20	1.68
21-25	1.92
26-30	2.18
31-35	2.45
36-40	2.73
41-45	3.03
46-50	3.34
51-55	3.65
>55	3.91

Mitigation Risk

- Uncertainty that proposed conditions will be achieved:
 - Hydrology
 - Establishment of the proposed plant community type(s)
 - Water quality inputs
 - Future direct or secondary impacts
 - Exotic/nuisance vegetation

Guidance on Risk (not in rule)

1= mitigation already trending toward success

3= probably not appropriate as mitigation

Generally, in order of risk (low to high):

- Preservation
- Enhancement
- Restoration
- Creation

But must be evaluated case by case!

Functional Loss/Gain

➤ Functional Loss (FL) = Impact Delta x
Impact Acres

➤ Relative Functional Gain (RFG)
= $\frac{\text{Mitigation Delta}}{\text{(Risk X Time Lag)}}$

Note: RFG is the gain per acre

➤ Mitigation = FL/RFG

An Example:

Filling 1 acre of a wetland

- Location= 2
- Water= 4
- Veg/Structure= 3
- $9/30 = 0.3$

With project

- $0/30 = 0$

Delta= **0.3**

Functional Loss=
 $0.3 \times 1 \text{ ac} = 0.3$



Mitigation Plan- Restoration/ Enhancement on site

- Location current= 2 with=7
- Water current= 4 with=8
- Veg current= 3 with=8
- Delta= with-current/ 30
- = $23-9/30 = 0.46$
- Risk= 1
- Time lag (4 years) =1.1
- So functional gain is
 $0.46/(1 \times 1.1) = 0.42$ per acre



- **What does that mean?**
- **It takes 0.71 acres to offset 1 acre of impact ($0.30/0.42=0.71$)**

Final Calculation

- **Goal: Functional Gain > Functional Loss**
- **Gets complex with multiple mitigation types**
- **May want to use another method, such as WRAP, for comparisons**

Issues

- **Risk**
- **Scale issues with location scoring**
- **Minor enhancement activity: score as preservation or enhancement?**