WETLAND CLASSIFICATION & BASIN CHARACTER STUDY

Tasks

– Re-Evaluate Hydric/Non-Hydric Interface Location (119 sites)
– Soil Characterization at 46 District Sites
– Wetland Hydrologic Analysis
– Develop a Wetland Classification System
Background

- Soils consist of natural bodies that occur on a landform within a landscape and have properties that result from the integrated effects of climate and living organisms, acting on parent material, as conditioned by relief, over a period of time.

- Soil physical characteristics are specifically tied to the location where they form and conditions that they form under.
Hydric Soils

- Definition
  - Saturated, flooded, or ponded (5% - 18.25 days/year)

- Types:
  - S6. Stripped matrix,
  - S7. Dark surface,
  - A6. Organic bodies,
  - A7. Mucky mineral,
  - A8. Muck presence,
  - S5. Sandy Redox
HYDRIC/NON-HYDRIC RE-EVALUATION

S6. over Dark surface

S7. Dark surface

Non-hydric
HYDRIC/NON-HYDRIC RE-EVALUATION

A6. Organic bodies
S5. Sandy Redox
HYDRIC/NON-HYDRIC RE-EVALUATION
HYDRIC/NON-HYDRIC REFERENCES
HYDRIC/NON-HYDRIC RE-EVALUATION

- 2003 Wade Hurt of UF
  - Conducted the hydric/non-hydric soil (H/NH) evaluation at 119 wetlands to determine if that interface was within the wetland boundary, near the wetland boundary (palmetto fringe), or outside the wetland boundary.

- In 2008 and 2009
  - Repeating 2003 Hurt work
    - Compare elevation and horizontal results
    - Results can provide insight into re-hydration or dehydration of previously impacted wetlands
HYDRIC/NON-HYDRIC RE-EVALUATION

**Methods**
- Evaluating 119 wetlands,
- 3 to 8 pits per wetland
- Characterize H/NH interface location to 12-16”
- H/NH marked in field with PVC pole
  - Location recorded with GPS
  - Elevation determined from District bench mark
- H/NH location measured from/to the wetland edge (saw palmetto fringe) and to previous evaluation
- Compare all results to control wetland
HYDRIC/NON-HYDRIC RE-EVALUATION

Preliminary Results

- Reference wetlands (Green Swamp)
  - H/NH at or above the palmetto fringe

- Well field wetlands (no confining layer)
  - H/NH interface inside the wet prairie, marsh, or cypress communities versus in the saw palmetto community
  - Some no longer have hydric soil indicator within 6 or 12 inches
  - Many H/NH interfaces have moved toward the palmetto fringe compared to 5 years ago
**HYDRIC/NON-HYDRIC RE-EVALUATION**

- **Preliminary Results**
  
  (red H/NH moved down the hill and blue H/NH moved up the hill)
Overview

- Soil assessments should provide additional insight into the historic and current hydroperiod of wetlands.
- Detailed soil characteristics within each vegetative community of 46 wetlands. Three pits per community:
  - One pit to a depth of 6 feet below grade or to a confining layer
  - Two pits to a depth 10” and 16” inches
DETAILED SOIL EVALUATION

**Methods**

- Soil transects paralleled WAP transects or were adjacent to the Wade Hurt evaluation transects
- Open face soil auger and a soil spade
- Evaluation points located with sub-meter GPS
- Generated cross-section graphs of soil transects
DETAILED SOIL EVALUATION

- Preliminary Results (Upper Hillsborough FDA)
DETAILED SOIL EVALUATION

- Preliminary Results (Reference Site (Green Swamp))
Preliminary Results (Starkey C (Dehydrated Soils))
Future Analysis

– Further characterize wetlands susceptible to drawdown
– Use results to develop wetland classification system that incorporates vulnerability
– Incorporate hydrologic data (historic normal pool and annual average water levels)
– Apply annual, seasonal, and long term average water levels can be applied to graphs
  ▪ Compare soil characteristics to water levels
  ▪ Compare water levels year by year
WETLAND HYDROLOGIC ANALYSIS

- **Background**
  - 2000-2004 USGS Study (Haag 2005)
    - Wetland bathymetry - 10 District wetlands
      - Survey intensity (3 approaches)
      - Stage area/stage volume relationships
    - Installed water level recorders for 2 years
      - Generated flood frequency distributions
      - Compared natural & impaired marsh marsh
      - Flood frequency distributions - valuable data for District managers
    - Valuable monitoring tool for water resource managers
What about LiDAR?

- Widely available
  - District projects
  - FDEM project
  - Cities/Counties
- Used extensively for SWFWMD WMP work
- District monitors ALOT of wetlands…400
  - Extremely cost effective
  - Data currently available in many areas
Project Purpose

- Evaluate LiDAR’s effectiveness in wetlands
- Conduct pilot project:
  - Compare LiDAR vs. traditional surveying data (USGS)
  - Stage Area/Stage Volume relationships
  - Flood Area Frequencies
WETLAND HYDROLOGIC ANALYSIS

- **Sites**
  - 4 District wetlands from USGS study
    - 2 reference sites (302 and 304 in Green Swamp)
    - 2 impacted sites (439/S-063 and 443/S-068 in Starkey Well Field)

- **Data Sources**
  - USGS survey data
  - LiDAR data (bare earth)
    - 2004 Pasco
    - 2006 North District (L470 and L471)
WETLAND HYDROLOGIC ANALYSIS

Methods
- USGS data prep
  - Obtained data in EXCEL
  - Converted from NGVD29 to NAVD88
    - -0.83 to 0.87 ft decrease
  - Generated TIN
WETLAND HYDROLOGIC ANALYSIS

Methods

- LiDAR data prep
  - Clipped to USGS wetland line (palmetto edge)
  - Reviewed outliers (> 0.5 ft) in field
    - Often logs and hummocks
    - Removal had minimal affect on RMSE
  - Generated TIN
- Calculated RMSE b/w LiDAR and USGS
  - Extracted elevation from USGS TIN
Methods

- Stage Area/Stage Volume Analysis
  - Automated ArcMap tool
    - Average end/area method for calculating volume
    - Elevation extraction interval of 0.1 ft from TIN
    - Results written to a database
WETLAND HYDROLOGIC ANALYSIS

Methods

- Flood Frequency Analysis
  - WMIS site
    - Sampling frequency varied (hourly, daily, bi-monthly)
  - Generated Flood Frequency Distributions in EXCEL
    - POR
    - 2004 (Wet year)
    - 2007 (Dry year)
Results

- 523 pts/ac with LiDAR
- 59 pts/ac with USGS
- RMSE
- Overall...very similar
WETLAND HYDROLOGIC ANALYSIS

Results
- 648 pts/ac with LiDAR
- 8 pts/ac with USGS
- RMSE
- Overall…… very similar

RMSE = 0.43 ft
RMSE W/Out Wetland Line = 0.47 ft
District RMSE = 0.07 ft

Wetland 443 (S-068) Comparison

LiDAR
USGS
WETLAND HYDROLOGIC ANALYSIS

Results

- 2374 pts/ac with LiDAR
- 18 pts/ac with USGS
- RMSE low
- Misclassification... bare earth may be top of veg
- No Class 11 points
- TIN could be adjusted

RMSE = 0.45 ft
RMSE W/Out Wetland Line = 0.71 ft
District RMSE = 0.68 ft
Results
- 523 pts/ac with LiDAR
- 18 pts/ac with USGS
- RMSE...a little high
- Misclassification.... bare earth may be top of veg
- No Class 11 points
- TIN could be adjusted
WETLAND HYDROLOGIC ANALYSIS

- Results
  - Wetland 443 (S-068)
    - POR
    - Wet Year; 2004
    - Dry Year; 2007
Results

- Wetland 302 – GS#5
  - POR
  - Wet year; 2004
  - Dry year; 2007
In Summary
- Results are promising
- Powerful wetland hydrology (health) monitoring tool
  - Cost effective…cheap
  - Can conduct assessment at various intervals
    - Annually
    - For POR
    - For only wet season/dry season
- Future LiDAR flights could generate acceptable data for wetland sites where currently unacceptable

Moving Forward
- SOP for evaluating LiDAR suitability
  - Need to develop thresholds or screening process
  - TIN adjustment based on known elevations at wetland (bench, well, staff gauge, WAP transects)
- Conduct analysis on 42 remaining wetlands