Everglades Vegetation Succession Modeling
For Restoration Planning And Climate Change
Everglades Landscape
Vegetation Succession (ELVeS) Model

• CERP Restoration Planning and Assessment

• Temporally Dynamic Wildlife Habitat Layers

• Climate and Sea Level Change Scenarios
Freshwater Marsh Vegetation Communities

Community

1. Spikerush
2. Cattail
3. Open Marsh
4. Floating Emergent Marsh
5. Muhlenbergia Wet Prairie
6. Mixed Marl Wet Prairie
7. Sawgrass
8. Open Water

Adapted from Rutchey et al. 2006
Vegetation Classification for South Florida Natural Areas
EDEN Hydrologic Metrics  Examples (from 49 Total)

- number of days water above 0 mm
- number of days where water above 50 mm
- number of days where water below -50 mm
- mean annual water depth
- standard deviation of annual water depth
- median annual water depth
- upper quartile annual water depth
- lower quartile annual water depth
- mean annual water depth where water above 50 mm
- minimum of the seventeen day moving average water depth
- maximum of the seventeen day moving average water depth
- day of year seventeenDayWaterDepthMin occurred
- day of year seventeenDayWaterDepthMax occurred
Skewed Distributions

Example: Mean Annual Water Depth (mm)
Class confusion

17 Day Water Depth Min

17 Day Water Depth Max

Mean Annual Water Depth

Standard Deviation Annual Water Depth

Loss on Ignition

- Spikerush
- Graminoid Marsh
- Willow
- Cattail
- Open Marsh
- Floating Emergent Marsh
- Muhlenberia Wet Prairie
- Mixed Marl Wet Prairie
- Sawgrass
- Herbaceous Marsh
- Open Water
Community Drivers

Hydrology Metrics

Mean Annual Depth

Std. Dev. Annual Depth

17 Day Depth Min.

17 Day Depth Max.

Derived from EDEN 2003 water depth data
Soil Metrics

Soil Total Phosphorus

Loss on Ignition (LOI)

Interpolated from Newman and Osborne 2003 data, unpublished
Joint Probabilities

- Open Water
- Sawgrass
- Floating Emergent Marsh
- Cattail
- Mixed Marl Wet Prairie
- Muhly Wet Prairie
- Spikerush
- Open Marsh
Succession

RECOVER-SFWMD/GAP  
50m spatial resolution

EDEN 2003  
400m spatial resolution

SFWMM ECB3 1997  
400m spatial resolution
## Model Parameterization

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Temporal Lag Routine

Joint Instantaneous Probabilities at GridCell \((x_i, y_j)\) in Year \(k\)

Year Counter
Increment + 1

Community Replacement Probability Distribution

Keep current class

Replace with new dominate class

Replace with “unclassified”

Is Random Number > CPD value?

Other classes with higher probabilities?

Year Counter Reset to zero

Yes

No

0
0.2
0.4
0.6
0.8
1
0
1
2
3
4
5

# of contiguous Unfavorable Years
Temporal Vegetation Community Probabilities

1997

SFWMM ECB3

Vegetation Class
- Spikerush
- Cattail
- Open Marsh
- Floating Emergent
- Muhly
- Mixed Marl
- Sawgrass
- Open Water
Summary

• ELVeS models probabilistic functions of vegetation community response to changing environmental conditions.

• Design encourages updating

• Additional communities and processes planned for future versions.

• Link with wildlife models

• Hierarchically link with finer scale process models

• Improved parameterization requires tighter observed relations between hydrologic processes & vegetation