Potential Effects of Water Management Practice on Wetland-Dependent Species in the St. Johns River, Florida

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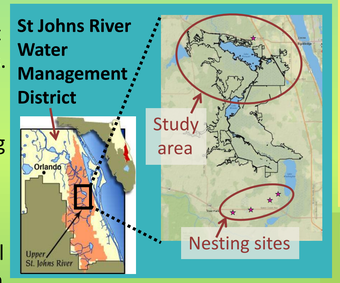
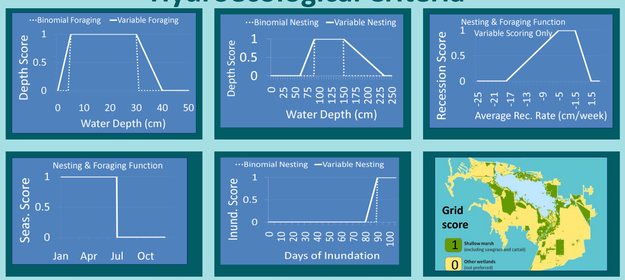
Objective: Develop a tool to quantitatively predict impacts of hydrological management practices on wetland-dependent species

Hydroecological criteria (i.e. wetland community preference, salinity tolerance, inundation, recession rate and depth requirements) can be defined at the taxonomic level of interest and evaluated under various hydrological management options. Results provide potential impacts to foraging and/or reproductive habitats. As a demonstration case for the modeling effort, wood stork nesting and foraging habitat during the nesting season in central Florida over a 10 year period (1996-2005) was predicted for two different management options. Initial assessment utilized binary scoring for broad effects, with subsequent score refinement to allow for marginal habitat. Seasonal summaries were generated annually for each scenario and converted to hectare-days of inundation.



Wood Stork Evaluation

Hydroecological Criteria



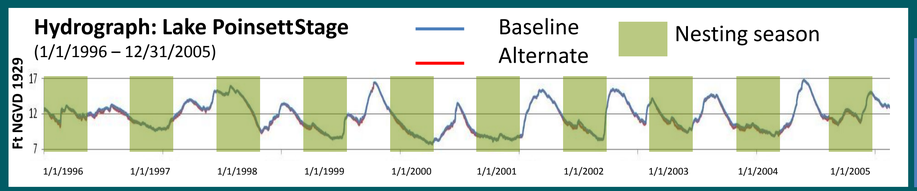
Scoring Criteria

- Unavailable = 0
- Sub-optimal 0>score>1
- Optimal score = 1

Criteria based on Curtis et al. 2012 and Tarboton et al. 2004

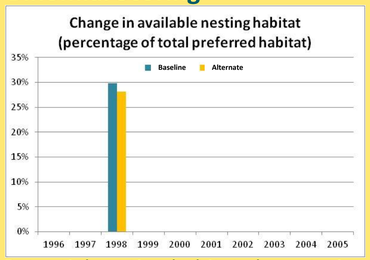
Ponded Depth Calculation (GIS: Hydroperiod Tool)

Ponded depth was generated using a grid-cell (raster) based method evaluating stage (water elevation) and DEM (land elevation) data; ponded depth equals stage minus DEM (after Sorenson and Maidment, 2004). Total wetland area evaluated was 82 km^2. Using a 15 meter grid and daily time step over 10 years for 2 scenarios (baseline and alternate), a total of 2,650,524,285 grid cell values were generated.



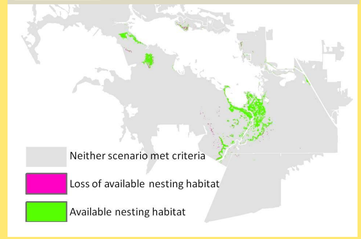
NESTING

Binomial Scoring

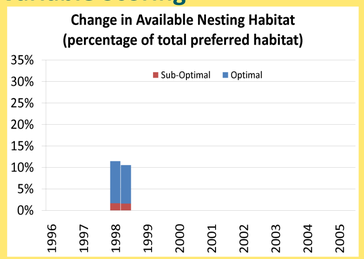


Potential nesting habitat characterized by optimal depth and duration

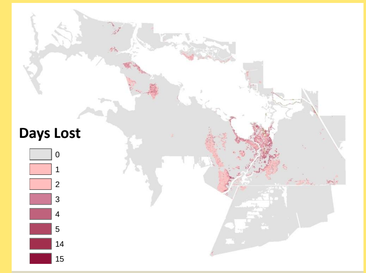
Comparison of **wood stork nesting habitat during the 1998 nesting season** between baseline and alternate scenarios



Variable Scoring



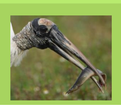
Inclusion of marginal habitat and recession rate

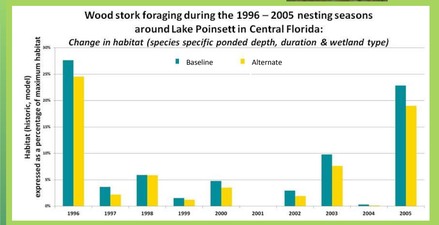


Projected loss of **wood stork nesting habitat during the 1998 nesting season** as a result of alternate scenario

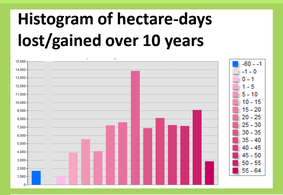
FORAGING

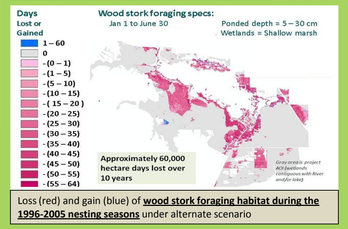
Binomial Scoring





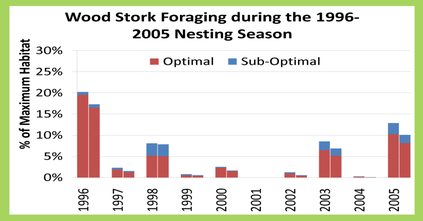
Potential foraging habitat characterized by optimal depth and wetland community



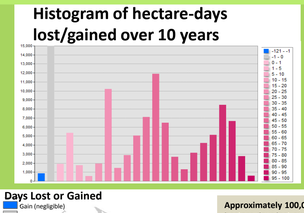


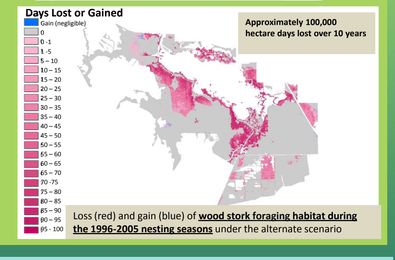
Loss (red) and gain (blue) of **wood stork foraging habitat during the 1996-2005 nesting seasons** under alternate scenario

Variable Scoring



Baseline and alternate scenarios respectively, including marginal habitat and recession rate





Loss (red) and gain (blue) of **wood stork foraging habitat during the 1996-2005 nesting seasons** under the alternate scenario

Conclusions

- Wood stork nesting habitat was available in 1998 and unavailable during all other years
- Small hydrologic changes can have a large effect on projected foraging area
- Alternate Scenario had measurable effects on wood stork foraging habitat
- Overall inclusion of additional criteria (recession rate) and score refinement reduced overall available foraging and nesting habitat, but did not alter relative changes between scenarios

References

Curtis, D. (2012). Floodplain Wildlife. *In* Lowe, E.F., Battoe, L.E., Wilkening, D.H., Cullum, M., and Bartol, T. (Eds.), *St. Johns River Water Supply Impact Study.* Tech. Pub. St. Johns River Water Management District, Palatka, Florida.

Sorenson, J. K. and D.R. Maidment. (2004). Temporal Geoprocessing for Hydroperiod Analysis of the Kissimmee River, CRWR Online Report 04-05, Center for Research in Water Resources, Bureau of Engineering Research, The University of Texas at Austin.

Tarboton, K.C., M M Irizarry-Ortiz, D P Loucks, S M Davis, J T Obeysekera .(2004). Habitat Suitability Indices for Evaluating Water Management Alternatives. Tech Pub. Office of Modeling, South Florida Water Management District, West Palm Beach, Florida.

http://www.fws.gov/northflorida/WoodStorks/wood-storks.htm