FCE ASM 2013
Water Policy & Practices CCT

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Post Doc
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CENTRAL QUESTIONS

GENERAL QUESTION 5: How do climate change and SLR interact with water management practices to control hydrologic conditions in the oligohaline ecotone?

Hypothesis 5.1: Variable inflows from upstream sources, SLR, and storm surge interact to alter surface water residence time, salinity, and groundwater intrusion in the oligohaline ecotone.

Hypothesis 5.2: Stakeholder uncertainties over SLR will increase conflicts over Everglades restoration implementation and will affect freshwater delivery to the oligohaline ecotone.
Hypothesis 5.1: Variable inflows from upstream sources, SLR, and storm surge interact to alter surface water residence time, salinity, and groundwater intrusion in the oligohaline ecotone.

- Variable inflows from upstream sources have increased water levels in northern Shark and Taylor Sloughs but not in the oligohaline ecotone (Smith III, Engel, Saha, Sullivan, Sandoval).

- Inflows are significant in the wet season and mostly non-existent in the dry season (Sullivan, Sandoval).

- Inflows have not been successful in decreasing seawater intrusion into the groundwater (Saha, Sandoval).

- Residence times (Flushing times) in southern Taylor Slough are dependent upon water volumes and ET rates (Sandoval).
In 2000-2002, managed water inputs into N. Taylor Slough changed from point source discharge from S332 Pump station, to more diffuse flow from 4 retention basins.
Water budget and trend analysis in water levels between 1997 and 2011 determined that although the diffusive restoration efforts occurred during years of below average rainfall, there was an increase in groundwater discharge to surface water both east (away from Taylor Slough) and west (into Taylor Slough) (Sullivan et al., submitted 2013).
Z Score values from Mann--Kendall trend analysis for the average A. Annual, B. dry season (February-April) and C. wet season (August-October) water levels from 1997 – 2011. Dark areas denote a decline in water levels, while light areas denote increase in water levels Overall there was a decline in surface water flow towards southern Taylor Slough.

(Sullivan et al, submitted 2013).
Results

Residence Time \((V/Q_{out})\)
Average amount of time a water molecule stays in a reservoir

Flushing time \((V/Q_{out})\)
Total amount of time all water remains in a system. More appropriate for a wetland that experienced dry-down.

(Flushing times varied from 3 - 78 days, Averaging 40 days in 10 years.

(Sandoval, 2013)
Results

Flushing times varied from 3 - 78 days, averaging 40 days in 10 years.

Flushing Time (*T_f*)

Evapotranspiration

Surface water volume

Water flushing times varied seasonally with shorter times in May and highest in December.

Water flushing times were inversely correlated with ET.

Longer water flushing times when surface water volume was greater than ET.

(Sandoval, 2013)
Results

Avg. Monthly Chemistry Data from Isco samplers

Chloride and TN were inversely correlated with water flushing times at TS/PH-3.

TP initially increased with a decrease in water flushing times in March but decreased in April and May.

(Sandoval, 2013)
Results

Chloride was inversely correlated with water flushing times at oligohaline sites.

TN did not vary with water flushing times at sites TS/PH-6 and 7.

TP at TS/PH-7 was inversely correlated with water flushing times.

(Sandoval, 2013)
Remote sensing monitoring of tide propagation through coastal wetlands

- **Radarsat-2 interferogram** (24 days between acquisitions)

- **Location (yellow square)**

- Interferogram shows high fringe gradients along tidal channels.
- It indicates large water level changes due to rapid tidal propagation along the channels.
- More explanations in the poster

Wdowinski
Hypothesis 5.2: Stakeholder uncertainties over SLR will increase conflicts over Everglades restoration implementation and will affect freshwater delivery to the oligohaline ecotone.

1. Environmental Perceptions Research
   a. Survey of Environmental NGO’s Attitudes (Garvoille, Van Lent, Ogden, Rivera, & Ogden)
   b. Interviews with Urban Residents of South Florida about land stewardship & sense of place (Ogden)
   c. Ethnographic research with Everglades recreationalists, farmers, Big Cypress Reservation, & gladesmen (Catellino, Garvoille)
   d. Interviews with Environmental NGO’s (Schwartz)

2. Politics of Climate Change (Mic, Eisenhauer)
Results: Key Findings for NGO survey

Top four reasons for restoration:
1. To pass on a healthy landscape to my children and grandchildren
2. To create a healthy wild place
3. To ensure regional sustainability
4. To correct past mistakes made in south Florida

Top Barriers

1. Insufficient or Uncertain Funding
2. Politics and Lack of Political Will
3. Limited Public Knowledge or Interest
4. Competing Interests, Priorities and Ideas about Restoration
   a. Lawsuits
   b. Influence of special Interests including agriculture
Results: Key Findings from Ethnographic Research

**Garvoille:** showing how restoration & past land management decisions contribute to political identity (oppositional)

**Cattelino:** how residents in Clewiston & on the Big Cypress Reservation value water and how this relates to political identity

Gateway arch to Collier County, soon after the road was open to the public ca. 1928 (photo courtesy NPS).


PRODUCTS TO DATE

Publications accepted
1. Ogden, Laura, William Hall and Kimiko Tanita. Animals, Plants and People: A Review of Multispecies Ethnography. Environment & Society. Accepted pending revisions

Publications Submitted
4. Sullivan, P.S., R.M. Price, J.L. Schedlbauer, A. Saha,,E.E. Gaiser,, The influence of hydrologic restoration on groundwater-surface water interactions in a karst wetland, the Everglades (FL, USA), WETLANDS,
PRODUCTS TO DATE

**Thesis & Dissertations**

PRODUCTS TO DATE

Leveraged Proposals; Total: 3.9M


4. Building strategic interdisciplinary partnerships among natural and social scientists and practitioners to foster sustainability in a rapidly changing world, National Science Foundation, 2011-12. S. Pickett (PI), T. Chapin, L. Ogden, C. Duke, and F. Steiner, (co-PI’s), $125,000.

5. Collaborative Research: Ecological Homogenization of Urban America, National Science Foundation. PI P.M. Groffman (Cary Institute of Ecosystem Studies), and Co-PIs (in alphabetical order of last name): J.M. Cavender-Bares (University of Minnesota-Twin Cities), J.M. Grove (USDA Forest Service), S.J. Hall (Arizona State University), J.B. Heffernan (Florida International University), S.E. Hobbie (University of Minnesota-Twin Cities), K.L. Larson (Arizona State University), C. Neill (Woods Hole Marine Biological Laboratory), K.C. Nelson (University of Minnesota-Twin Cities), L. Ogden (Florida International University), D.E. Pataki (University of California-Irvine), C. Polsky (Clark University) and R. Roy Chowdhury (Indiana University). $3,216,952.
DISCUSSION POINTS

What are some of the issues that need to be addressed in breakouts? What are integrative research needs and how can we attain them? Are further working group workshops necessary?

Weaknesses:
Given that the FCE correctly focuses on "... how socio-ecological systems respond to and mitigate the effects of climate change and freshwater allocation decisions", there is not an explicit examination of water policies and management which correspond to the "allocation decisions". Specifically, there are no links with the SFWMD and ACOE at a policy and regulatory level (while there is a link with research staff at SFWMD to study seagrass). There is no explicit plan to look at how the water system affecting FCE is managed. The FCE is poised to go beyond Mark Twain's quote "whiskey is for drinking, water is for fighting" and tackle the harder, but broader, policy and regulatory questions.
WHERE WE NEED TO BE

Publication submitted prior to renewal proposal focused on:

Goal I (Water) Evaluate the source of sociopolitical conflicts over freshwater distribution, and how solutions that improve inflows to the Everglades mediate the effects of climate change (especially SLR) on freshwater sustainability in the coastal zone.

Steps

• Draft Conceptual Model this year

• Annual meeting of Water CCT group (and possibly with other groups) twice a year, one at ASM the other by phone

• Synthesis Meeting during year 5
Synthesis Model: Starting Point

Demographic Change

Water Politics
- Restoration
- Water demand conflicts
- Livelihoods

Hydrologic System
- Water Availability
- Hydrologic connectivity
- Water Quality

Climate Variability/SLR