INTEGRATING CURRENT RESEARCH INTO MANAGEMENT DECISIONS AT THE ARTHUR R. MARSHALL LOXAHATCHEE NATIONAL WILDLIFE REFUGE

Marcie Kapsch
Wildlife Biologist
Arthur R. Marshall Loxahatchee NWR
A science-based approach fosters expert knowledge to aid in management decisions.

The Refuge would like to help universities and other researchers develop projects that answer specific management questions.
Combination of focused monitoring, modeling & experimentation leads to successful adaptive management.

Mechanisms for conducting research:
- Special Use Permits (SUP)
  - Conduct research with independent funding.
  - Refuge biologists determine if projects are appropriate to answer management questions.
- Cooperative Agreements
  - Collaboration between the Refuge and researchers.
  - CESU agreements with UF, FIU, and FAU.
**Using Scientific Research in Management Decisions?**

- **Water Regulation Schedule (WRS)**
  - Benefits Anticipated from the 1995 WRS for Refuge
    - Completed in 2006 by Laura Brandt.
    - Assessed all ecological and hydrological research projects at the Refuge to determine if the current WRS had an increase in ecological benefits and what benefits were expected.

- **Comprehensive Conservation Planning (CCP)**
- **Habitat Management Plans (HMP)**
- **Inventory, Monitoring and Research Plan (IMR)**
How does water management effect this keystone species?

- **Direct effects**
  - Nesting success, distribution, abundance, health, and body condition.

- **Indirect effects**
  - Relationships between hydrology and nesting effort.

How would a managed alligator hunt effect the population on the Refuge?
Long term monitoring since 1998 (Laura Brandt and Frank Mazzotti, UF).

- Marsh and canal surveys and captures as part of the RECOVER Monitoring and Assessment Plan (MAP).
  - Determine patterns of relative abundance of alligators in marsh and canal habitats in relation to water levels and season.
  - Body condition assessed through captures.

- Provide long term monitoring for evaluation of Refuge conditions and effects of the Comprehensive Everglades Restoration Plan (CERP).

- Nest surveys 2000-2004 (5 years of data).
Apple Snails
Specific Management Needs

- What is the distribution, production, and abundance?
- What was the historic distribution of this species?
- What are the relationships between apple snails, periphyton compositions, and changes in water quality?
Apple Snails
Research Projects

- Apple snail density within the Refuge (Phil Darby, UWF).
- Predator prey dynamics (Joel Trexler, FIU).
- Growth and survival in a water quality gradient (Rebekah Gibble, USFWS).
- Analysis of the relationship between copper-based herbicides and natural populations of the Florida apple snail (Shannon Ladd and Matt Harwell, USF, Thesis 2010).
What biocontrols are effective for those exotics species?

What are the effects of hydrology and fire on priority exotic species?

- Melaleuca (*Melaleuca quinquenervia*)
- Old World Climbing Fern (*Lygodium microphyllum*)

Create monitoring program for exotic fauna?
**Exotics Control**

**Research Projects**

- **USDA-ARS Invasive Plant Research**
  - Biocontrol agents for exotics (Dr. Anthony Boughton, Dr. Robert Pemberton).
  - Water lettuce population dynamics in Florida (Phillip Tipping).

- **Herbicide trials for control of *Lygodium*** (Jeff Hutchinson, UF).
  - Native and exotic recovery post treatment
  - Determine if burning tree islands results in greater native or exotic coverage.

- **Monitoring program for invasive amphibians and reptiles** (Mazzotti, UF).
  - Determine status and spread of existing population, and occurrence of new populations of invasive reptiles and amphibians in ECISMA lands.
What was the historic role and pattern of fire throughout the Everglades ecosystem?

What are the main differences and effects of peat vs. surface fires?
Fire
Research Projects

★ Evaluate the effects of prescribed marsh burns on water quality, especially the release of sequestered phosphorous (Todd Osborne, UF).

★ Evaluate the potential for exotic and invasive species control, through prescribed burns.

★ Effects of herbicide and prescribed fire on Lygodium (Jeff Hutchinson).

★ Evaluate effects of fire on reducing Lygodium and increasing native plant cover that have been treated with herbicide.

★ Determine if fire and a reduction of Lygodium rachis mats result in greater native plant cover or an increase in Lygodium.
What are impacts of hydrology to:
- Tree islands diversity
- Elevation relative to slough
- Historic vs. current conditions

How can tree islands be maintained in the absence of historic sheet flow?

What will Laurel Wilt do to overall species composition of the tree islands.
Vegetational and geochemical history of tree islands based on soil cores (Debra Willard and William Orem, USGS).

Fire on tree islands following *Lygodium* treatment (Jeff Hutchinson, UF).

Assess hurricane damage to tree islands and recovery (Hongjun Chen, UF).

Determine nutrient availability in tree islands spatially with seasonal hydro-dynamics (Pam Sullivan, FIU).

Determine how hydrologic conditions and shallow groundwater chemistry differ in tree islands containing peat versus limestone cores (Pam Sullivan, FIU).
Laurel wilt, a disease that causes mortality in bay trees, was confirmed in the Refuge interior in January 2012. This disease is spread through the exotic beetle, *Xyloborus glabratus*, which introduces the fungal pathogen *Rafaellea lauricola*. It is possible that up to 30% of the bay trees will demonstrate resistance to the disease (Cameron et al. 2008). However, with the projected bay loss of 70% or more, the fundamental structure and function of the tree islands will be dramatically altered. Canopy gaps will create understory openings which previously did not exist.

- To collect baseline data documenting plant community composition on tree islands within the Refuge.
- To establish long-term monitoring sites for assessing tree island condition in terms of vegetation communities.
- To establish protocol for monitoring impacts of laurel wilt in the Refuge.
Baseline data was collected in 2000 for a potential restoration project.

Cypress Swamp has been dry for many years, and the risk of fire has increased.

Data will be collected in summer 2012 to re-assess species composition of the cypress swamp.
How does hydrology and water quality effects migratory and other birds such as snail kites?

What are the best recession rates for successful nesting and reproduction?
Trust Resources
Research Projects

- Long term snail kite research (Wiley Kitchens, UF).
  - Monitor survival, reproduction, and estimate population size.
- Wood stork monitoring (SFWMD, UF).
- Wading bird monitoring (SFWMD, UF).
- Bald eagle nest checks (Refuge staff).
- Secretive marsh bird monitoring (USFWS).

Photo credit, Charles Slavens
What effects do water management have on nesting?

What effects do hydrology have on prey?

What are the anthropogenic causes of spatial patterns when nesting?
Wading Birds
Research Projects

- **SFWMD Wading Bird Report** (Mark Cook and Mac Kobza, SFWMD).
  - Weekly flights throughout Everglades system to provide yearly comprehensive report.

- **Wading bird nesting trends on the Refuge** (Peter Frederick, UF).
  - Monthly flights covering 100% of the Refuge.

- **Determine the availability of prey to wading birds during the dry season** (Dale Gawlik, FAU).

- **Relationship between landscape prey availability patterns and physiological conditions of adult great egret and white ibis** (Dale Gawlik, FAU).

- **Study of white ibis diet** (Robin Boyle and Nathan Dorn, FAU).
What are the effects of:

- Hard water
- Chloride
- Sulfur
- Phosphorus
- Water intrusion
Enhanced Water Quality Network (LOXA flights) (Refuge).
  Vegetation monitoring at each water quality site to document any changes over time.

Ecological effects of canal water intrusion (Paul McCormick).

Fire effects on Water Quality (Todd Osborne, UF).

Spatial Patterns of Phosphorus Storage (Todd Osborne, UF).

Weather station monitoring (Carolyn Price, USGS).

Total Maximum Daily Loads for Refuge (Jason Storrs, FLDEP).

Effects of conductivity on food-web structure (Joel Trexler, FIU).

Long term fish mercury levels (Ted Lang, FWC and Nicole Niemeyer, SFWMD).

Part of an ongoing monitoring program to evaluate mercury trends in fisheries of the Everglades region.
Aquatic Fauna
Research Projects

- **CERP aquatic fauna and periphyton** (Joel Trexler, FIU).
  - Sample wetland fishes, crayfish, grass shrimp, amphibians and periphyton to obtain data for establishing pre-CERP reference conditions.

- **Field research and monitoring for CERP and MAP** (Sue Newman, SFWMD).
  - Sampled water quality, soil chemistry, and periphyton and invertebrate taxonomy.

- **Crawfish and fish sampling** (John Volin and Nathan Dorn, FAU).

- **Hydroperiod influence on the occupancy rates of anuran species in the Refuge** (Ryan Lynch and Laura Brandt, Thesis, UF).
Critical Needs
Still Missing…

- **Climate**
  - Implications of sea level rise, rising temperatures.

- **Integration**
  - Decision support tools.
  - Looking at water management effects at different spatial, temporal, and ecological scales.

- **Model**
  - Conceptual ecological model and hydrodynamic model.

- **Communication/Education**
  - To the general public and legislators.

- **Public Support**
  - Understanding current and future land and water use requirements.