COASTAL RESILIENCE AND LANDSCAPE CONSERVATION DESIGN IN SW FLORIDA

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“We must act now, as if the future of fish and wildlife and people hangs in the balance — for indeed, all indications are that it does.”

– FWS Climate Change Strategic Plan “Rising to the Urgent Challenge,” 2010

“the region faces threats on multiple fronts – from increasing urbanization and land use changes to invasive species, rising seas, and shifting weather and temperature patterns.”
Outline of Presentation

I. Threats
II. Landscape conservation design
III. The White House land and water resilience project
IV. Ecosystem Services
V. Conservation/adaptation strategies
Florida and LCC Structure
\[ y = 0.0081e^{0.1693x} \]
\[ R^2 = 0.8538 \]

MSL Relative to MLLW in Meters

\[ y = 0.0024x - 0.1855 \]
\[ R^2 = 0.8931 \]

Good news! At the current rate of global warming we should be able to just swim over there and eat him in under five years...!

Projected population: 1 Billion by 2100

Urbanization, loss/conversion of Ag-land/Open spaces

Source: A. Pidgeon UWI. http://silvis.forest.wisc.edu/old/Library/HousingData.php
Florida’s Natural Resources

Florida’s State Wildlife Action Plan

A comprehensive wildlife conservation strategy

Gulf Coast Vulnerability Assessment

Defining Conservation Targets on a Landscape-scale
**SCENARIO 1**

50% Fee Simple 50% Easement +
Florida Forever targets

Low density greenfield development
Existing distribution of density

**SCENARIO 2**

10% Fee Simple | 90% Easement +
Florida Forever targets

Green infrastructure +
Redevelopment + Densification

**SCENARIO 3**

10% Fee Simple | 90% Easement +
P1-CLIP 3.0

Green infrastructure +
Redevelopment + Densification
The CCB and PFLCC goal and guiding principles are dedicated to the creation and use of voluntary and non-regulatory conservation incentives that can be applied to a comprehensive vision of wildlife habitat and connectivity priorities across Florida. A broad array of incentives is needed for conservation in SW Florida due to a very heterogeneous landscape and large tracts of open and working lands. The landscape conservation design and mapping of priority resources for SW Florida will be the foundation framework to determine where to focus various conservation incentives. The strong partnerships involved will provide the needed interagency coordination and landowner and stakeholder involvement to apply incentives to meet the conservation targets for this region and provide resilience from future threats.
Landscape Conservation Design Framework

Direct Drivers (Future Scenarios)
- Climate Change Vulnerability - incorporated as impacts to habitat
- Human Growth Impact Areas - including impact buffers
- Direct Loss of Habitat - from sea level rise or other applicable factors

Indirect Drivers
- Management Directives
- Conservation Partner Opportunities
- Use of Directed Funding/Programs
- Habitat Improvement - (will be incorporated as a direct driver in scenarios if possible and available, e.g. fire regimes, water management)

Conservation Priorities
- Imperiled Species / Expert Selection Species
- Impacted Habitats
- Underrepresented Habitats
- Priority Linkages
- Network Criteria
- Ecosystems?

Current Plans and Management Actions
- All applicable current management and conservation plan directives and goals will be incorporated into the landscape conservation designs for the focal sites
Species Selection for Impact Assessment

- American swallow-tailed kite (Elanoides forficatus)
- Big Cypress fox squirrel (Sciurus niger avicennia)
- Eastern diamondback rattlesnake (Crotalus adamanteus)
- Eastern indigo snake (Drymarchon couperi)
- Florida black bear (Ursus americanus floridanus)
- Florida burrowing owl (Athene cunicularia)
- Florida panther (Puma concolor coryi)
- Gopher tortoise (Gopherus polyphemus)
- Mangrove cuckoo (Coccyzus minor)
- Red-cockaded woodpecker (Picoides borealis)
- Snowy plover (Charadrius nivosus)
- Southern chorus frog (Pseudacris nigrita)
- Wading birds group: consisting of roseate spoonbill (Platalea ajaja), little blue heron (Egretta caerulescens), reddish egret (Egretta rufescens), snowy egret (Egretta thula), tricolored heron (Egretta tricolor), and white ibis (Eudocimus albus)
Impact Analysis
Examples for Florida Panther

• SLR: Sea Level Rise, 52cm rise in sea surface elevation
• SLR impact (red areas) corresponds directly to the level of sightings in the Habitat Activity Class groupings

• Greenways Development Loss (red through green) are the areas of FEGN-designated critical linkages and undeveloped greenways that would be lost to development in Scenario 1
Design Process

Site Selection
- “Trigger” impact areas identified from impact analyses
- Core study area delineation
- Identification of overlapping, spatially-defined, non-scenario driven impacts to targets that warrant inclusion in the design

Establish Conservation Targets within Core Areas
- Individual or suites of species
- Habitats
- Ecosystems
- Other resource priorities?
- Goals/priorities from previous/current studies

Define Explicit Focus of Design Framework
- Scale
- Extent
- Temporal- can be tied to future scenario generations
- Target-specific

Spatial Strategy
- “Trigger” impact areas protection/intervention
- Core areas protection
- Target-specific inclusions
- Fitting of delineated high priority corridors, areas, and buffers from previous studies
- Prioritization using network criteria and metacommunity concepts if species-specific information is available
Ecological resilience

• the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions
Resilient Land and Waters Initiative

President's Priority Agenda for Enhancing the Climate Resilience of America's Natural Resources,

- Goal is to build or maintain ecologically connected networks of terrestrial, coastal, and marine areas
- Increase resilient to climate change and support a broad range of fish, wildlife, and plants under changing conditions.
- Identifying such priority areas also benefits
- Including: wildfire management, mitigation investments, restoration efforts, water and air quality, carbon storage, and the communities that depend upon natural systems for their own resilience.
Resilience Lands and Water Rapid Analysis
(Application to the South Florida Region, GeoAdaptive 2015)

1. Driver Identification
Economic, population, social and climate change (SST, acidification, SLR), financial resources availability (now and in the future)

2. Priority Area Analysis
- Based on LCD Framework (targets and priority areas)
- Rapid Mapping of main Ecos. Serv.
- Key marine and coastal habitats

3. Vulnerability and Impact Analysis
Characterization of critical land & waters
Measurement of impacts (under each scenario)

Impact (on key areas under each scenario)

Respond (Adaptation planning)

Ecol. Resiliency Analysis
Which scenario provides a more resilient landscape
Which LCD designs and Marine Adaptations

Is the landscape resilient? Now? Future?

Policy & Management Targets
Conservation
Restoration & Management of Ecosystem Service

No
Yes

Drivers (conceptualization of region)

1. Driver Identification
Economic, population, social and climate change (SST, acidification, SLR), financial resources availability (now and in the future)

Drivers (conceptualization of region)

State (ecological assessment)

Pressure ID Analysis
Future landscape (spatial) transformation:
- urbanized, agriculture and conservation areas, marine and coastal areas under stress (triggers)

Pressures (ID from scenarios)

Figure 1: The DPSIR Framework for Reporting on Environmental Issues

Drivers

Responses

Pressures

Impact

State

Monitoring

*Developed by GeoAdaptive
**GeoAdaptive Resilience Geospatial Model**

**SPATIO-TEMPORAL MODEL AND APPROACH**

- Geographic simulation of resilience variables.
- Considering biophysical and socio-economic

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**Biophysical stressors (including climate change)**

**Socio-economic stressors**

**Resource Sensitivity**

**Exposure**

**Coping Capacity**

**Adaptive Capacity**

**Adaptation Framework Actions**

- Understand the impacts of stressors
- Understand the trigger points, and biological and physical controls

**Participatory & Integrated decision making and management**

**Outcome: Increased Resilience to Climate Change**

**Modeling Indicators**

**GeoAdaptive Resilience Geospatial Model**

**GeoAdaptive**
Resiliency and Resource Sensitivity

KEY ELEMENTS OF GEOADAPTIVE RESILIENCE GEOSPATIAL MODEL

**Biophysical and Socio-economic stressors:** are represented through the PFLCC scenarios (terrestrial: urbanization, agriculture, conservation and SLR) and the KEYSMAP scenarios (Sea-surface temperature, acidification, SLAMM results: SLR)

**Exposure** is measure through an spatial impact assessment where stressors are identified in space and overlapped over current and future conditions in marine and terrestrial areas (scenarios)

**Coping Capacity:** is analyzed by describing the conditions that leads each trigger point to transform the current state of species and habitats.

**Adaptive Capacity:** is explore through plausible responses by management through the design of adaptation actions – which are prioritized based on management and ecological criteria (conservation priorities, targets and marine management adaptations)

**Coping and adaptive capacity** are measured through a spatial analysis that looks at the landscape and marine configuration.
Figure 3a. Conceptual diagram of the Southwest Florida Shelf Barrier Islands Province ecosystem, processes operating upon it, and factors affecting its condition.
NOAA COCAs Project

Methodology

[Diagram showing the methodology with nodes such as Initial Management Meeting, Expert Opinion Polling, Pressure-States Ecosystem Services Model, Ecosystem Services Risk Assessment, Ecosystem Services Valuation, and Develop Decision-Support Tools.]

Products
- Relevant, Impending Management Decisions and Gaps
- ICEMS with linkages defined
- Ecological Response to Climate Change and Urbanization
- Ecosystem Services Response to Climate Change and Urbanization
- Economic Productivity under climate change & urbanization scenarios

Manager Engagement
- Identify & Prioritize Management Decisions to Target
- Quarterly meetings with managers to discuss high-priority pending management decisions
- Management decisions informed by predicted changes in ecosystem sustainability, ecosystem service production, ecosystem risk assessment, and economic valuation
High SLR 2060

http://sls.geoplan.ufl.edu/

High SLR 2100
PFLCC Conservation Planning ATLSS

- HUC 12
- Simple and complex viewers
- GIS data available
- Most PFLCC science products
- All SE LCCs have a CPA

http://pflcc.databasin.org/
SE Conservation Adaptation Strategy

LCC data under development
- Appalachian LCC
- Gulf Coast Prairie LCC
- Gulf Coastal Plains & Ozarks LCC
- Peninsular Florida LCC
- South Atlantic LCC
- Caribbean LCC

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