

Conceptual Ecological Models and Performance Measures

March, 2003

John C. Ogden, Chief Scientist
Office of RECOVER



Conceptual Ecological Model

A **conceptual model** is a diagram of a set of relationships among certain factors that are believed to impact or cause a certain result.

The **Everglades conceptual models** show how we think the natural areas of south Florida have been stressed, and present the working hypotheses that explain current ecological linkages between stressors and attributes in these altered systems.

For the Comprehensive Everglades Restoration Plan the conceptual ecological models are used as planning tools to:

- Convert broad policy-level goals into specific, measurable indicators of the “health” of natural and human systems (performance measures), and**
- Develop a suite of working hypotheses that explain the cause and effect linkages among stressors and attributes, as a basis for identifying restoration and research priorities**

Existing Conceptual Models

- **Lake Okeechobee**
- **Caloosahatchee Estuary**
- **St. Lucie Estuary**
- **Everglades Ridge and Slough**
- **Everglades Marl Prairies**
- **Big Cypress Basin**
- **Southern Mainland Mangrove Swamps**
- **Florida Bay**
- **Biscayne Bay**
- **Total System (in prep.)**

Total System Conceptual Model

- **The Total System Conceptual Ecological Model identifies the most important ecological stressors operating at the total system scale, and the key biological indicators of the effects of these stressors?**
- **The model identifies the best set of performance measures that should be used to assess the success of ecosystem restoration at system-wide scales?**

Total System Conceptual Model

Stressors:

- Loss of Spatial Extent
- Compartmentalization
- Altered Hydropatterns
- Excess Nutrients
- Pollutants & Contaminants
- Exotics

Total System Conceptual Model

Attributes (Indicators):

Wading Birds (nesting patterns; prey availability)

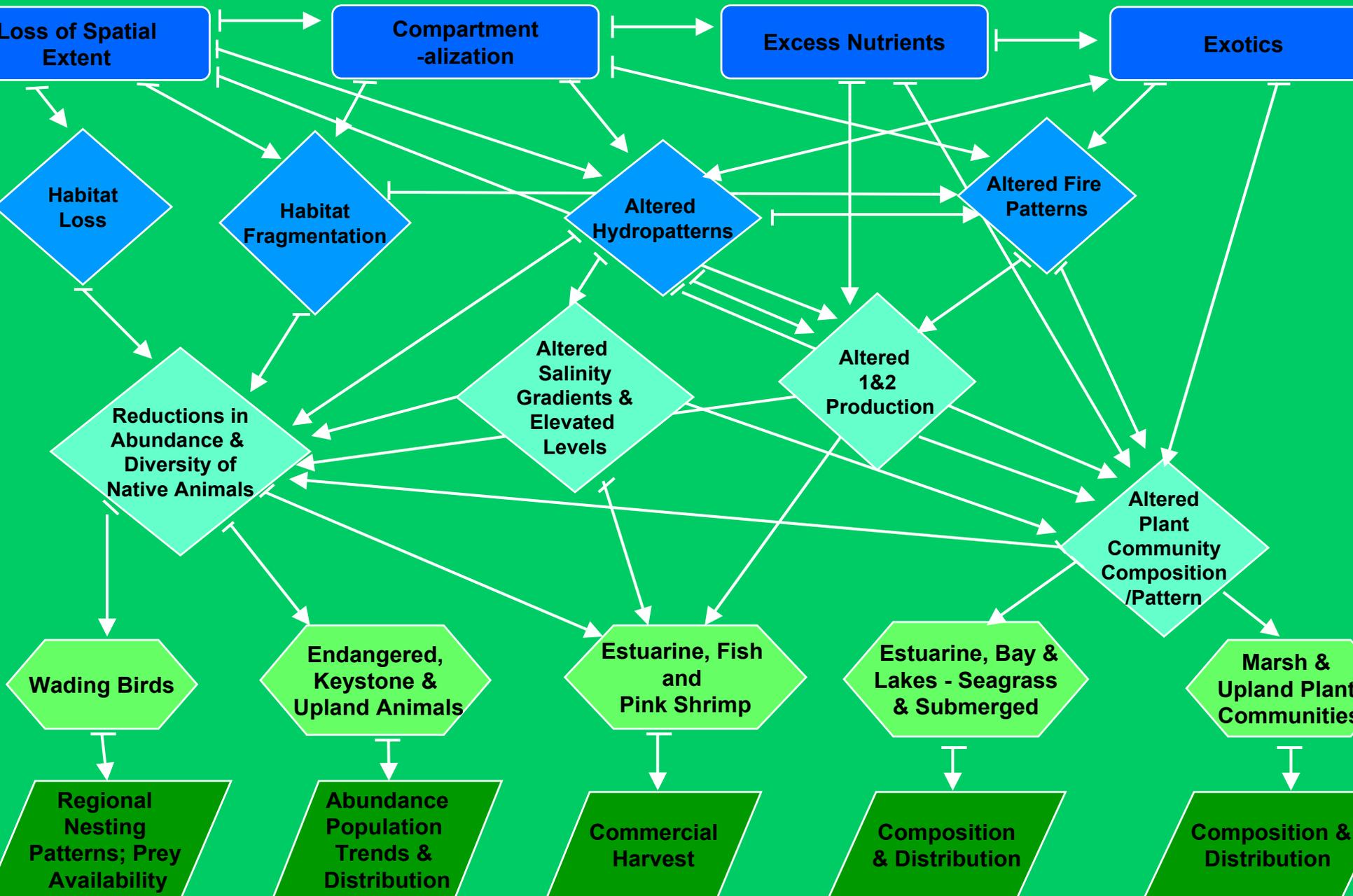
**Endangered, Keystone & Upland Species
(abundance, trends & distribution)**

**Freshwater & Estuarine Fishes & Macroinvertebrates
(Pink Shrimp commercial harvest, etc.)**

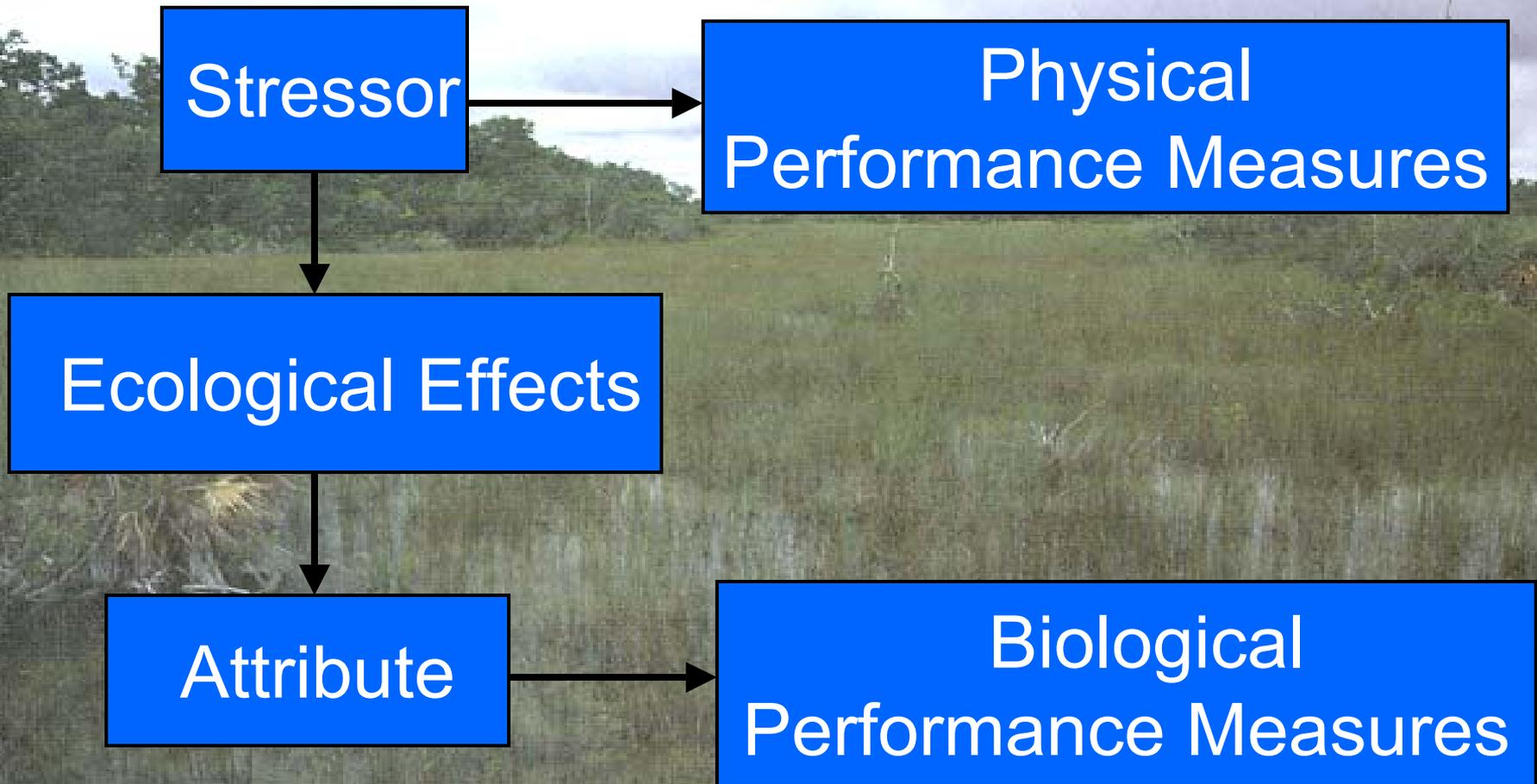
**Estuarine, Bay & Lakes: Seagrasses & Submerged
aquatics (composition & distribution)**

**Marsh & Upland Plant Communities (composition &
distribution)**

South Florida Total System Conceptual Ecological Model Version 1.0 (7)



Conceptual Ecological Models



Performance Measures

Collectively, well-selected set of performance targets provides system-wide characterization and restoration.

Performance measures are the quantitative indicators of conditions in natural and human systems that have been selected as targets for restoration.



Components of Performance Measures

Each performance measure identifies:

- **An element to be measured (e.g., alligator nesting)**
- **The appropriate parameter (e.g., number of eggs that hatch per nest)**
- **The restoration target (e.g., 75% average hatching rate)**

Hypothesis – Performance Measure - CERP Design (I)

Hypothesis: Compartmentalization has rearranged in time and location the patterns of deep/shallow depths and long/short hydroperiods... changed the timing and location of high and low density animal population centers... changed locations and timing of wading bird nesting colonies.

Hypothesis - Measure - CERP Design (II)

Assessment Performance Measure: Wading bird colony locations. Re-establish historical patterns for colony locations, including return of nesting to the southern Everglades marsh/mangrove ecotone.

Relevant CERP Projects:

- Decomp Phase I: Remove ponding effects of Miami Canal and Tamiami Trail
- Decomp Phase II: Reduce ponding effects of L-67A/C
- Big Cypress/L-28 Interceptor: Remove ponding effects of lower L-28



Questions?