

Task Force Discussion

Assessing and Communicating System-wide Indicators

February 28, 2008

Purpose

- The Task Force will report on the status of the System-wide Indicators included in the 2006 Strategy for the first time in the 2008 Biennial Report.
- A recommended approach for communicating the status of the System-wide Indicators in the Biennial Report will be presented for discussion and guidance.

Background

REPORTING SYSTEM-WIDE INDICATORS

- **Every two years the Task Force prepares:**
- A Strategic plan that includes strategic goals, system-wide indicators and also outlines how restoration will occur
- A Biennial Report that describes restoration activities and progress to include the status of the System-wide Indicators

- **In 2004 the Task Force directed the SCG** to develop a small set of System-wide Indicators for Restoration (scientifically based, independently reviewed, open and transparent process with public participation)
- **The SCG developed** (in close coordination with RECOVER) a robust process to identify indicators using criteria established in the literature
 - Ecological Indicators (Goal 1 & 2)
 - Indicators of Compatibility (Goal 3)
 - Indicator Report and independent review report are available at: www.sfrestore.org
- These indicators are included in the **Task Force 2006 Strategic Plan**

System-wide Indicators

1. **Periphyton-Epiphyton**
2. **Fish**
3. **Roseate Spoonbills**
4. **Wood stork & White Ibis**
5. **Oysters**
6. **Juvenile Pink Shrimp**
7. **Florida Bay Algal Blooms**
8. **Florida Bay Submerged Aquatic Vegetation (SAV)**
9. **Lake Okeechobee Littoral Zone**
10. **Crocodylians (Alligators & Crocodiles)**
11. **Exotic Plants**
12. **Water Volume**
13. **Salinity Intrusion in the Biscayne Aquifer**
14. **Flood Protection – C-111 Basin**

How we got there

Four Step Process

- 1. The SCG did a thorough review of the scientific literature on indicators, their use and applications**
- 2. Based on the literature the SCG developed guidelines to evaluate relevant indicators for Everglades Ecosystem applicability, and their individual and collective value and coverage of Everglades' "Features" (i.e. ecosystem Regions, Characteristics, Trophic Interactions, and Functions)**
- 3. Using the guidelines the SCG evaluated south Florida and other national restoration programs for indicators for possible application to the Task Force suite of system-wide indicators**
- 4. Recommended System-wide suite of indicators for the 2006 Strategy**

Selection Guidelines

1. Is the indicator relevant to the ecosystem and does it respond to variability at a scale that makes it applicable to the entire system or an important portion of it?
2. **Is the indicator feasible to implement (i.e. is someone already doing it?)**
3. Is the indicator sensitive to system drivers?
4. **Is the indicator interpretable in a “common” language?**
5. Are there situations where an “optimistic” trend in the indicator might suggest a “pessimistic” restoration trend?
6. **Are there situations where a “pessimistic” trend in the indicator may be unrelated to restoration?**
7. Is the indicator scientifically defensible?
8. **Can clear measurable targets be established for the indicator to allow for evaluation of success?**
9. Does the indicator have enough specificity to be able to be used to correct or redirect restoration actions?
10. **Does the suite of indicators cover the critical range of ecosystem “features” including processes and structures?**

Everglades Ecosystem “Features”

➤ Landscape Characteristics

- Hydro-patterns
- Vegetation Pattern/Patchiness
- Productivity
- Native Biodiversity
- Oligotrophy
- “Prinstineness”
- “Intactness”
- Trophic Balance
- Habitat Balance

➤ Trophic Constituents – Biodiversity

- Primary Producers
- Primary Consumers
- Secondary & Tertiary Consumers

➤ Physical Properties

- Water Quality, Depth, Duration, Timing
- Water Management
- Exotics
- Salinity
- Nutrients
- Contaminants

➤ Ecological Regions

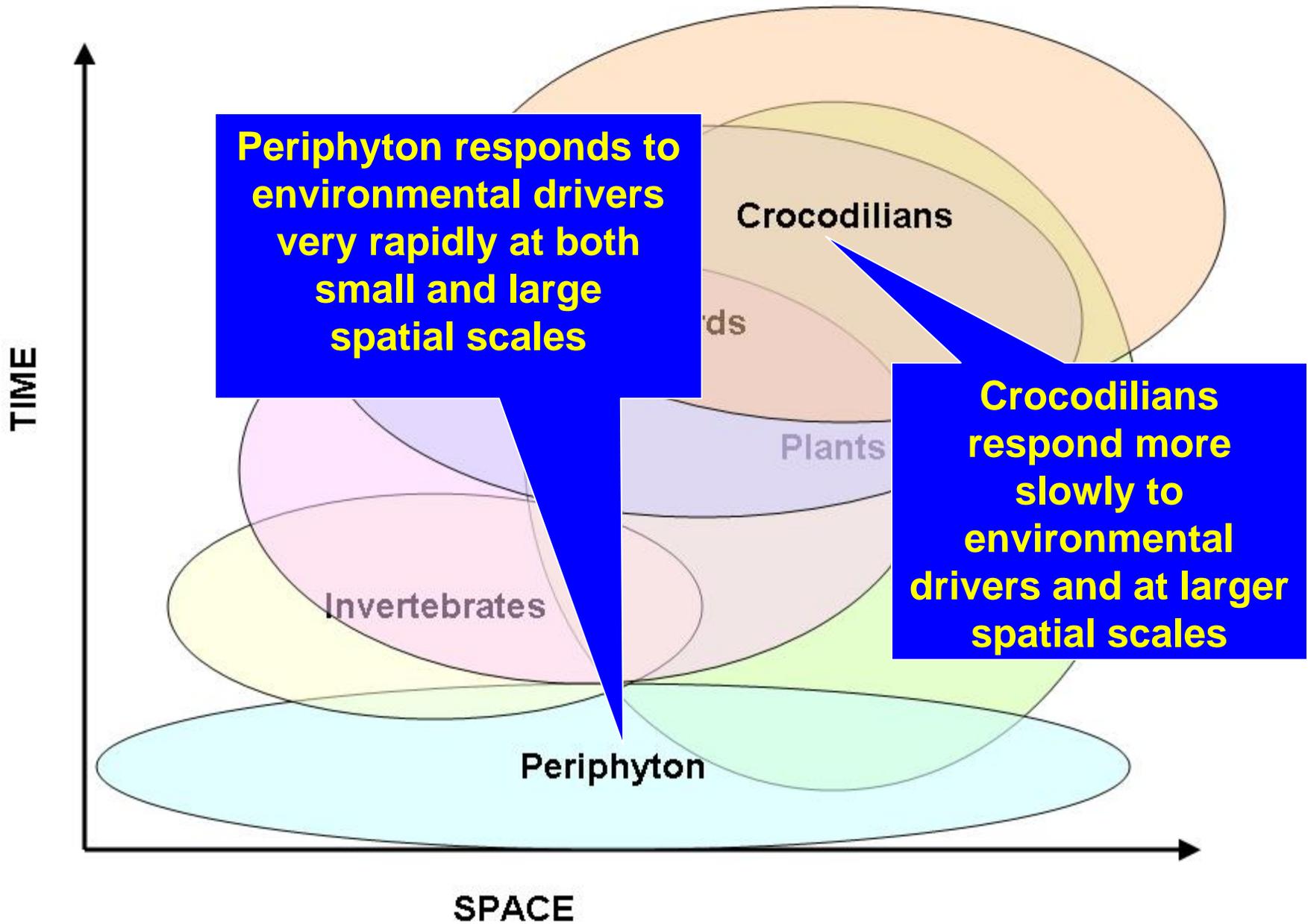
- i.e. Modules & “un-modulated” areas

➤ Temporal Scales

- Indicators that respond rapidly to environmental changes
- Indicators that respond more slowly to environmental changes

How Indicators Apply System-wide

- The System-wide Ecological Indicators are populations or communities of organisms
- Indicators need to “cover” as many Everglades “Features” as possible to be considered System-wide
- The indicators should cover both the spatial and temporal aspects of the Everglades



Assessing and Communicating System-wide Indicators

8 Essentials

1. **Scientific Consensus** on Ecosystem Structure & Function – CEMS
2. **Indicators** (e.g. fish) with metrics for Ecosystem Structure or Function (Environmental Conditions)
 1. Species whose status is indicative of larger functional groups
 2. Species whose status reflects status of key habitats
 3. Species that serve as an “early warning sign” of anticipated stressors
3. **Baselines** (reference periods) to establish points of comparison
4. **Monitoring Program** to collect the data for assessments
5. **Performance Measures** (e.g. bluefin kilifish per unit area) using metrics to compare interim and end point results with desired outcomes
6. **Targets** for indicators (e.g. bluefin kilifish per unit area relative to water depth) to set interim or end points against which to measure trends
7. **Assessments** to analyze the data and evaluate the progress and results
8. **Communication Tools** to inform, advise and educate the restoration community

Communicating the Status of the System-wide Indicators

Linking Complex Data Analyses to the Stoplights

ALGAL BLOOMS - SOUTHERN ESTUARIES

TIER ONE

PERFORMANCE MEASURE	LAST STATUS ^a	CURRENT STATUS ^a	2-YEAR PROSPECTS ^b	CURRENT STATUS ^a	2-YEAR PROSPECTS ^b
Chlorophyll a BARNES, MANATEE & BLACKWATER SOUNDS (BMS)	Red	Red	Yellow	This region of the bay experienced an unusual cyanobacterial bloom in 2006. The bloom was initiated by a large spike in phytoplankton from a combination of natural processes and higher concentrations of nutrients from the south hurricane season. The bloom has almost entirely faded but chlorophyll concentrations have not returned to previous levels.	Unless total construction is completed, we expect that this area will return to its green condition that existed from 1998 until 2006.
Chlorophyll a NORTHEAST FLORIDA BAY (NEFB)	Yellow	Yellow	Yellow	The current status is due to influence of the cyanobacterial bloom from Barnes, Manatee and Blackwater Sounds periodic separation into the region.	The return to a green condition for this region of the bay depends on total management activities impacting flows into the C-113 basin and Tupper Slough.
Chlorophyll a NORTH-CENTRAL FLORIDA BAY (NCFB)	Green	Yellow	Yellow	The current status is due to the presence of a seasonal cyanobacterial bloom in both early and late 2006. These blooms do not appear every year, but have occurred sporadically over the past 15 years.	Unless improvements in freshwater flows to FWFB Bay the area will probably remain yellow.
Chlorophyll a SOUTH FLORIDA BAY (SFB)	Yellow	Yellow	Yellow	The current status is due to the column of the cyanobacterial bloom from the north-central region of the bay during both years. This has occurred intermittently over the past 15 years and is unlikely that the region is being left to return to green.	Since flows in this area are driven by estuarine flows, it is expected that water quality events may occur.
Chlorophyll a WEST FLORIDA BAY (WFB)	Green	Green	Green	The current status derives in this region for both 2006 and current were not as distinct or enhanced as in the past.	This region is influenced primarily by South Slough outflow and weatherily transport of Gulf of Mexico water along the Gulf Breeze Shoal. Conditions are therefore dependent on estuarine flows.
Chlorophyll a MANORVILLE TRANSITION ZONE (MTZ)	Yellow	Yellow	Yellow	Chlorophyll concentrations were slightly higher in this region for 2006. This may have been due to the winter 2006 hurricane season and is unlikely to indicate a negative long term trend.	The return to a green condition for this region of the bay depends on total management activities impacting flows into the C-113 basin and Tupper Slough.
Chlorophyll a SOUTHWEST FLORIDA SHELF (SWFS)	Yellow	Yellow	Yellow	The chlorophyll concentrations were slightly higher in this region for both 2006 & 2007. This may have been due to the winter 2006 hurricane season and is unlikely to indicate a negative long term trend.	This region is influenced primarily by South Slough outflow and weatherily transport of Gulf of Mexico water. Conditions are therefore dependent on estuarine flows.
Chlorophyll a NORTH BISCAYNE BAY (NBB)	Yellow	Yellow	Yellow	The chlorophyll concentrations were higher than the baseline for the past five years.	Without any major freshwater or changes in water flows to this region, it is expected that this region will remain yellow. Significant inputs from the north will continue to affect this area until about flow is reduced.
Chlorophyll a CENTRAL BISCAYNE BAY (CBB)	Yellow	Yellow	Yellow	The chlorophyll concentrations were higher than the baseline for the past five years.	Without any major freshwater or changes in water flows to this region, it is expected that this region will remain yellow.
Chlorophyll a SOUTH BISCAYNE BAY (SBB)	Yellow	Yellow	Yellow	The chlorophyll concentrations were higher in this region for 2006. This area was also influenced by periodic separation of cyanobacterial bloom from Barnes, Manatee and Blackwater Sounds into this region.	Without any major freshwater or changes in water flows to this region, it is expected that this region will remain yellow.

^a Data in the Current Status column for the algal bloom indicator reflect data inclusive of calendar year 2006.
^b The assumption being used for the 2-Year Prospects Column is: There will be no changes in water management from the date of the current status assessment.

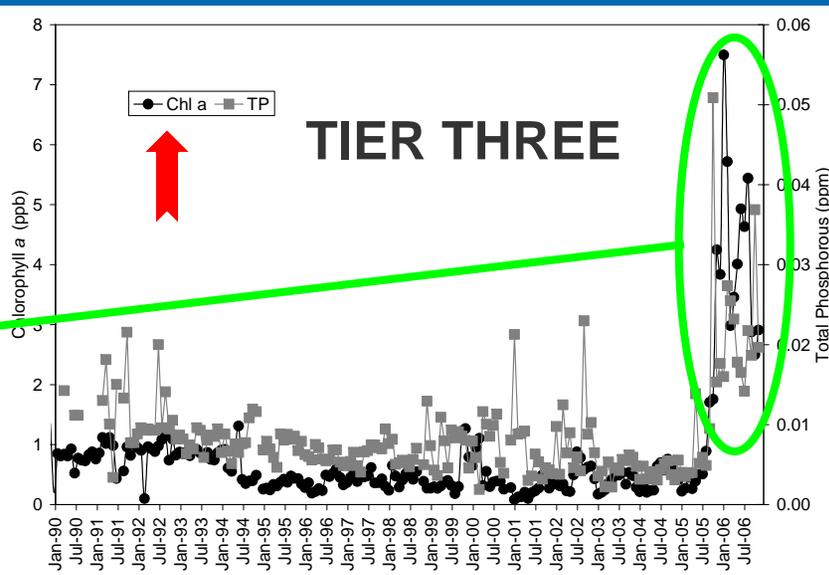
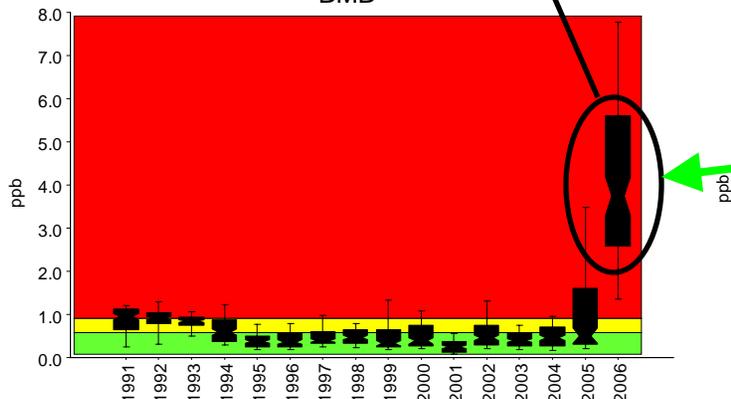
Science Report

provides direct and transparent links from the data to the stoplights

OUR GOAL IS TO:

- Develop Stoplights that are empirically based
- Develop performance measures that are dynamic & reflect natural variation
- Distinguish between natural and management effects on targets where possible

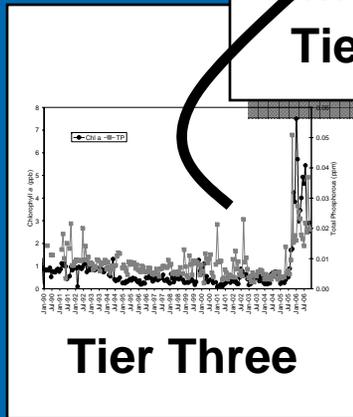
TIER TWO BMB



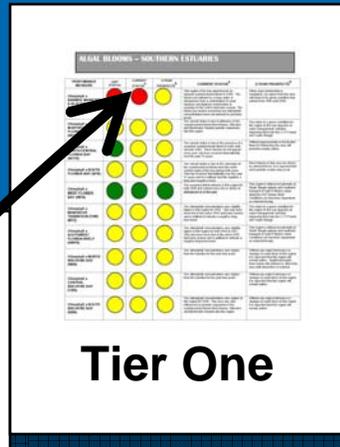
Science Report



Tier Two



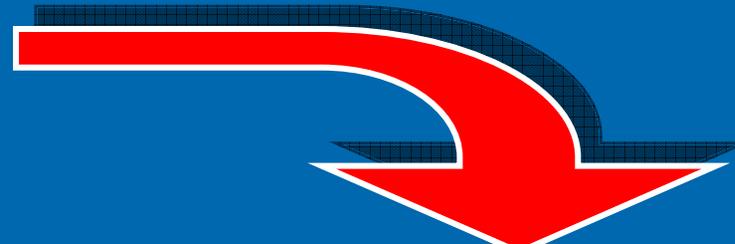
Tier Three



Tier One

Linking data to the Stoplights

- Tier 1. Stoplight Reports
- Tier 2. Summary graphics and data charts
- Tier 3. Detailed data, theory, and analyses



Task Force Biennial Report

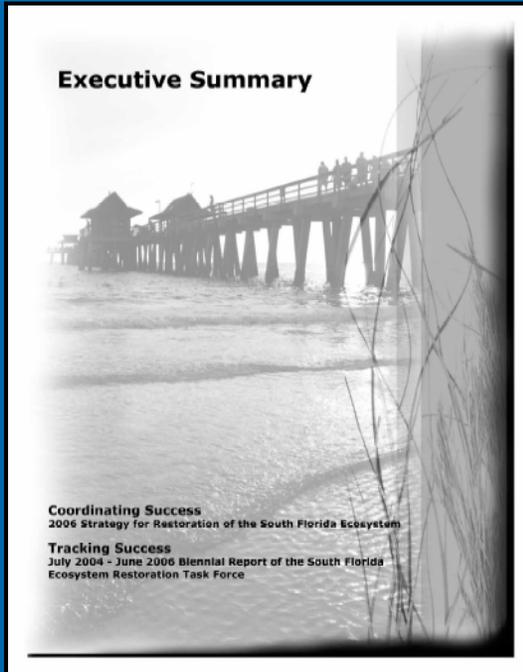
STOPLIGHTS - ALGAL BLOOMS SOUTHERN ESTUARIES

Performance Measure Chlorophyll a	CURRENT STATUS ²	CURRENT STATUS
BARNES, MANATEE & BLACKWATER SOUNDS (BMB)		The region of the bay experienced an unusual cyanobacterial bloom in 2006. The bloom was related by a large spike in phosphorus from a combination of highway construction and canal releases in response to the active hurricane season. The bloom has abated somewhat but chlorophyll concentrations have not returned to previous levels.
NORTHEAST FLORIDA BAY (NEFB)		The current status is due to the periodic expansion of the cyanobacterial bloom from Barnes, Manatee and Blackwater Sounds into this region.
NORTH-CENTRAL FLORIDA BAY (NCFB)		The current status is due to the presence of a seasonal cyanobacterial bloom in both early and late 2006. These blooms do not appear every year, but have occurred intermittently over the past 15 years. It is unlikely that this signifies a long-term negative trend.
SOUTH FLORIDA BAY (SFB)		The current status is due to the extension of the cyanobacterial bloom from the north-central region of the bay during both years. This has occurred intermittently over the past 15 years and it is unlikely that this signifies a long-term negative trend.
WEST FLORIDA BAY (WFB)		The seasonal diatom blooms in this region for both 2006 and current were not as dense or widespread as in the past.
MANGROVE TRANSITION ZONE (MTZ)		The chlorophyll concentrations were slightly higher in this region for both 2006 & 2007. This may have been due to the active 2005 hurricane season and is unlikely to indicate a negative long-term trend.
SOUTHWEST FLORIDA SHELF (SWFS)		The chlorophyll concentrations were slightly higher in this region for both 2006 & 2007. This may have been due to the active 2005 hurricane season and is unlikely to indicate a negative long-term trend.
NORTH BISCAYNE BAY (NBB)		The chlorophyll concentrations were slightly higher in this region for both 2006 & 2007. Neither year had concentrations that were significantly higher than baseline.
CENTRAL BISCAYNE BAY (CBB)		The chlorophyll concentrations were slightly higher in this region for both 2006 & 2007. Neither year had concentrations that were significantly higher than baseline.
SOUTH BISCAYNE BAY (SBB)		The chlorophyll concentrations were slightly higher in this region for both 2006 & 2007. This area was also influenced by periodic expansion of the cyanobacterial bloom from Barnes, Manatee and Blackwater Sounds into the region.

TASK FORCE BIENNIAL REPORT – SYSTEM-WIDE INDICATOR

TWO PARTS

PART TWO INDIVIDUAL INDICATOR STOPLIGHT REPORTS



Executive Summary

Coordinating Success
2006 Strategy for Restoration of the South Florida Ecosystem

Tracking Success
July 2004 - June 2006 Biennial Report of the South Florida Ecosystem Restoration Task Force

- Water Quality
- Bivalves Asquifer Salinizer Invasions
- Flood Protection - C-111 Basin

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PART ONE INDICATOR EXECUTIVE SUMMARY

Ecological Indicators

Fish and Macroinvertebrates

Significance and background. Marsh and estuarine aquatic biota, including small fishes and crustaceans, are critical to the food web as primary and secondary consumers and as prey for focal Everglades predators such as wading birds. This indicator uses the density (number of animals per unit area) and community composition (how many of each species per unit area) of a suite of native fishes (e.g., eastern mosquitofish, bluefin killifish, stripedhead minnow, southern spot) and crustaceans (dough and Everglades crayfish, riverine grass shrimp) to describe trends in their populations related to hydrology.

Fish and macroinvertebrate responses are directly related to the suitability of environmental conditions. Correlations between biological responses and environmental conditions contribute to an understanding of the species' status and trends over time. The positive or negative trends of this indicator relative to hydrological changes permit an assessment of positive or negative trends in restoration.

Factors affecting success. The most important factors affecting fish abundances regionally are the loss of habitat, hydroperiod, and water depth and frequency of drying events. Because of relatively dry hydrological conditions in the Everglades Ecosystem resulting from water management over the past several decades, and a loss of habitat to agricultural and urban uses, fish and macroinvertebrate densities have decreased and community structure has changed.

Toward restoration. The broad restoration goals for this indicator are to enhance population density and community composition of fish and macroinvertebrates through hydrologic restoration and improved water management.

Wading Birds (White Ibis, Wood Stork, and Roseate Spoonbill)
Significance and background. Extremely large numbers of wading birds were one of the defining characteristics of the pre-drainage wetlands of south Florida. Of particular relevance to understanding the population dynamics of wading birds in the pre-drainage system are the combined features of large

* See Agency C-111 Biennial View of the Mission: The "Fishing in the Everglades" and "Everglades Ecosystem" sections (12/05)

KEY FINDINGS – SOUTHERN ESTUARIES

SUMMARY FINDING: Re-suspension of nutrients from the 2005 hurricane season resulted in algal blooms in many regions of the southern estuaries and may cause continued algal blooms in the bay for some time. However, this is expected to subside of further significant hurricane activity and should return to with the possible exception of BMB.

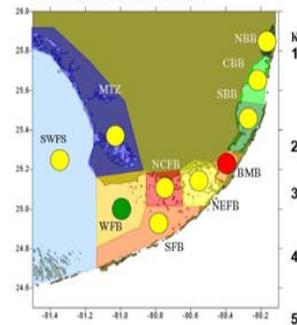


Figure 1. Map of Florida Bay regions with stoplight ratings by region

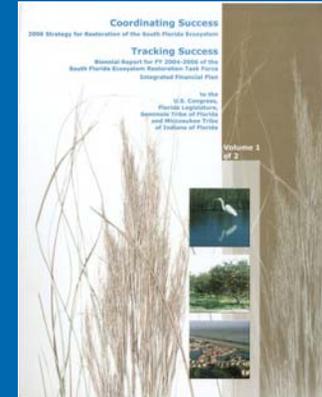
1. Continue monitoring water quality throughout the bay and the S of the post 2005 hurricane season.
2. Monitoring of Barnes, Manatee and Blackwater Sounds is critical.
3. Monitoring long term consequences of nutrient releases in hurricanes and human causes (e.g. road construction) and the (e.g. more fresh water flow into Florida Bay) is critical to evalu

STOPLIGHTS – ALGAL BLOOMS SOUTHERN ESTUARIES

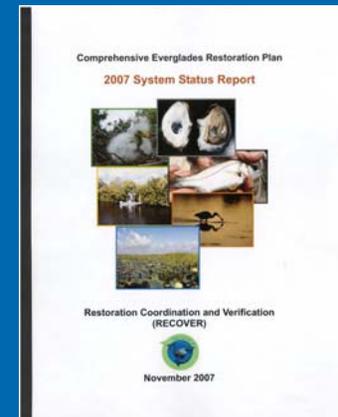
Performance Measure Chlorophyll <i>a</i>	CURRENT STATUS ¹	CURRENT STATUS
BARNES, MANATEE & BLACKWATER SOUNDS (BMB)	Red	This region of the bay experienced an unseasonal cyanobacterial bloom in 2005. The bloom was related to a large spike in chlorophyll <i>a</i> in a combination of higher turbidity and canal closures in response to the active hurricane season. The bloom has abated somewhat but chlorophyll concentrations have not returned to previous levels.
NORTHEAST FLORIDA BAY (NEFB)	Yellow	The current status is due to the periodic resuspension of the cyanobacterial bloom from Barnes, Manatee and Blackwater Sounds into the region.
NORTH-CENTRAL FLORIDA BAY (NCFB)	Yellow	The current status is due to the presence of a seasonal cyanobacterial bloom in both early and late 2005. These blooms do not appear every year, but have occurred sporadically over the past 10 years. It is unlikely that this region is a long term negative trend.
SOUTH FLORIDA BAY (SFB)	Yellow	The current status is due to the extension of the cyanobacterial bloom from the northern region of the bay during both years. This has occurred sporadically over the past 10 years and it is unlikely that this region is a long term negative trend.
WEST FLORIDA BAY (WFB)	Green	The seasonal bloom blooms in this region for both 2004 and current were not as dense as anticipated as in the past.
MANGROVE TRANSITION ZONE (MTZ)	Yellow	The chlorophyll concentrations were slightly higher in this region for both 2005 & 2007. This may have been due to the active 2005 hurricane season and is unlikely to indicate a negative long term trend.
SOUTHWEST FLORIDA SHELF (SWFS)	Yellow	The chlorophyll concentrations were slightly higher in this region for both 2005 & 2007. This may have been due to the active 2005 hurricane season and is unlikely to indicate a negative long term trend.
NORTH BISCAYNE BAY (NBB)	Yellow	The chlorophyll concentrations were slightly higher in this region for both 2005 & 2007. Another year had concentrations that were significantly higher than baseline.
CENTRAL BISCAYNE BAY (CBB)	Yellow	The chlorophyll concentrations were slightly higher in this region for both 2005 & 2007. Another year had concentrations that were significantly higher than baseline.
SOUTH BISCAYNE BAY (SBB)	Yellow	The chlorophyll concentrations were slightly higher in this region for both 2005 & 2007. This area was also influenced by periodic resuspension of the cyanobacterial bloom from Barnes, Manatee and Blackwater Sounds into the region.

**Reports are
all using the
same science**

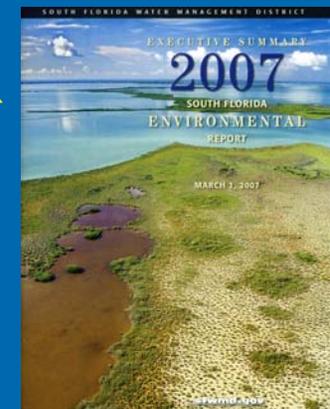
Task Force
Biennial Report



Partnerships
CERP System
Status Report



Agencies
South Florida
Environmental Report



NEXT STEPS

TIME LINE

➤ **May 2008**

- First draft science indicator report

➤ **July 2008**

- Final science indicator report
- Incorporation of science report findings into TF Biennial Report

➤ **September 2008**

- Final draft Biennial Report presented to Task Force



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ECOLOGICAL INDICATORS

Indicators for Everglades Restoration



Editor-in-chief
Felix Müller

Special Issue:
Evaluating sustainable forest management
An international collection of empirical and applied research
Guest Editor: Gordon M. Hickey

ECOLOGICAL INDICATORS JOURNAL

SPECIAL EVERGLADES INDICATOR ISSUE

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Questions or Comments

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