System-wide Ecological Indicators for Everglades Restoration 2014

The South Florida
Ecosystem Restoration Task
Force
Strategy and Biennial Report
July 2012—June 2014

Working Group/Science Coordination Group Meeting April 2, 2014

Presented by Laura Brandt

System-wide Ecological Indicators Section of Biennial Report

- Shorter
- Focus on audience of Congress, Legislature, and Tribes
- Summary of indicators
  - Indicators at a glance
  - One page per indicator
- Case studies/story lines- examples of ecological responses to investments

System-wide Ecological Indicators

- Background
- Hydrologic Context for Water Years 2013 and 2014
- Indicators at a Glance
- One page for each indicator
- Case Studies

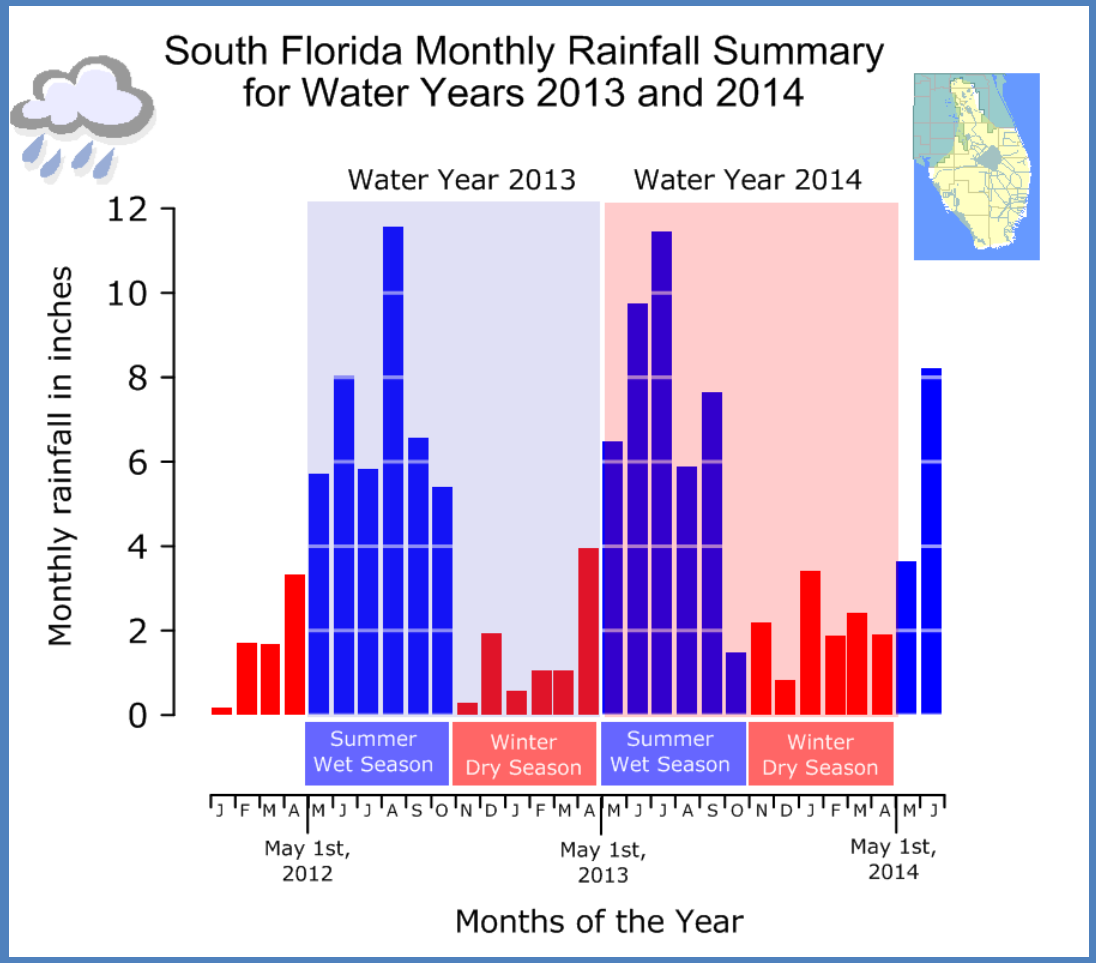
Links to more information in the full System-wide Ecological Indicators for Everglades Restoration 2014 Report , Systems Status Report, and South Florida Environmental Report

System-wide Ecological Indicators

- Invasive Exotic Plants
- Lake Okeechobee Nearshore Zone Submersed Aquatic Vegetation
- Eastern Oysters
- Crocodilians (American Alligators & Crocodiles)
- Fish and Macroinvertebrates
- Periphyton
- Wading Birds (White Ibis and Wood Stork)
- Southern Estuaries Algal Blooms
- Florida Bay Submersed Aquatic Vegetation
- Juvenile Pink Shrimp
- Wading Birds (Roseate Spoonbill)

Drawn largely from longer list of measures from RECOVER

Hydrologic Context



WY13- Average rainfall

Wet beginning and end of wet season

WY14- Above average rainfall

Unusually wet spring

Indicators at a Glance 2014

	Previous Status	Current Status
	WY2012	WY2014
Invasive Exotic Plants		
Lake Okeechobee Nearshore Zone Submerged Aquatic Vegetation		
Eastern Oysters- Modified **(Northern estuaries only)**		
Crocodilians (American Alligators & Crocodiles)- **Modified (DOI Lands Only)**		
Fish and Macroinvertebrates (WCA3 and ENP only)		
Periphyton- **Modified (no species composition)**		
Wading Birds (White Ibis and Wood Stork)		
Florida Bay Algal Blooms- **Modified (no southwest shelf)**		
Florida Bay Submerged Aquatic Vegetation		
Juvenile Pink Shrimp- **Modified (no sampling)**		
Wading Birds (Roseate Spoonbill)		

Crocodilians (American alligator and American crocodile)

Status	Previous	Current
	WY2012	WY2014
System-wide, modified-DOI lands only		

A full system-wide status for crocodilians for WY2012–WY2014 cannot be provided because funding was suspended in 2012. However, surveys have continued on Department of Interior lands (Arthur R. Marshall Loxahatchee National Wildlife Refuge, Big Cypress National Preserve, Crocodile Lake National Wildlife Refuge, Biscayne National Park, and Everglades National Park).

The stoplight color for the crocodilian indicator in the areas listed above has changed to red for WY2014, although positive responses of crocodiles to restoration actions by Everglades National Park {link to project sheet} have occurred around Cape Sable {*Link to Cape Sable Case study*} and the interagency efforts in the C-111 Basin (link to C111 case study). In addition, encounter rates of alligators in areas with longer hydroperiods (periods of seasonal flooding) are generally increasing or remaining constant {*Link to full Stoplight report and SSR*}. The change from yellow to red from WY2012 to WY2014 is a reflection of two factors: lower survival rates of juvenile crocodiles in Biscayne Bay, and an overall index that has consistently hovered near the threshold between yellow and red.

Data collected during 2004–2014 were used to refine what is known about the relationship between alligators and hydrology, and this information was used to plan for the Central Everglades Planning Project (CEPP). Alligator relative abundance is stable or increasing in areas with longer hydroperiods such as the southwest portion of Water Conservation Area 3, but declining in areas that dry out more frequently such as Water Conservation Area 3A north and northeastern Shark Slough in Everglades National Park downstream of the Tamiami Trail bridge project {also link to fact sheet and SRR}. Alligators south of the Tamiami Trail bridge project currently have low body condition (are skinnier than target levels) and low relative abundance, but increasing trends in these measures are expected as hydrologic regimes are restored.

Data relating salinity to growth and survival of juvenile crocodiles were used as an ecological planning tool for CEPP, which helped to evaluate alternatives and understand the benefits of the various plans. Analysis of data collected during 1978–2013 within Everglades National Park supports the hypothesis that juvenile survival and growth rates increase with lower salinity levels {*link to full report*}.

Fish and Macroinvertebrates

Status	Previous	Current
	WY2012	WY2014
System-wide		

The stoplight color for the fish and macroinvertebrates assessed in ENP (Shark and Taylor Sloughs) and WCA 3A and WCA 3B remains red for WY2014. This summary is based on the density of all small fish and crayfish collected in monitoring programs using a 1-m^2 throw trap in these areas. This method effectively captures aquatic animals between 0.5 and 3.5 inches in length, which is representative of key food species for apex predators in the region. Production of these animals is affected by hydrology, nutrient status, and abundance of their predators, but they are particularly impacted by marsh drying events (hydrology). They are assessed by comparison of observed densities to densities predicted based on rainfall for that year. Stoplights are assigned based on how many times densities are above or below rainfall-based values after accounting for key aspects of model uncertainty {link to full report}. This stoplight also incorporates assessment of non-native fish species.

The WY2014 red assessment was based on fewer fish than expected at multiple sites in Shark River and Taylor Sloughs, as well as WCA 3B and WCA 3A north of I-75. Three out of six sites in Shark River Slough had markedly fewer fish than expected based on rainfall, and three of five sites in Taylor Slough. Northeast Shark River Slough and the southern reaches of Taylor Slough (Craighead Pond, for example) dried more than expected based on rainfall, leading to fewer fish than expected. Everglades crayfish were frequently more abundant than expected based on rainfall at the sites where there were too few fish. This crayfish increases in frequency in dry conditions.

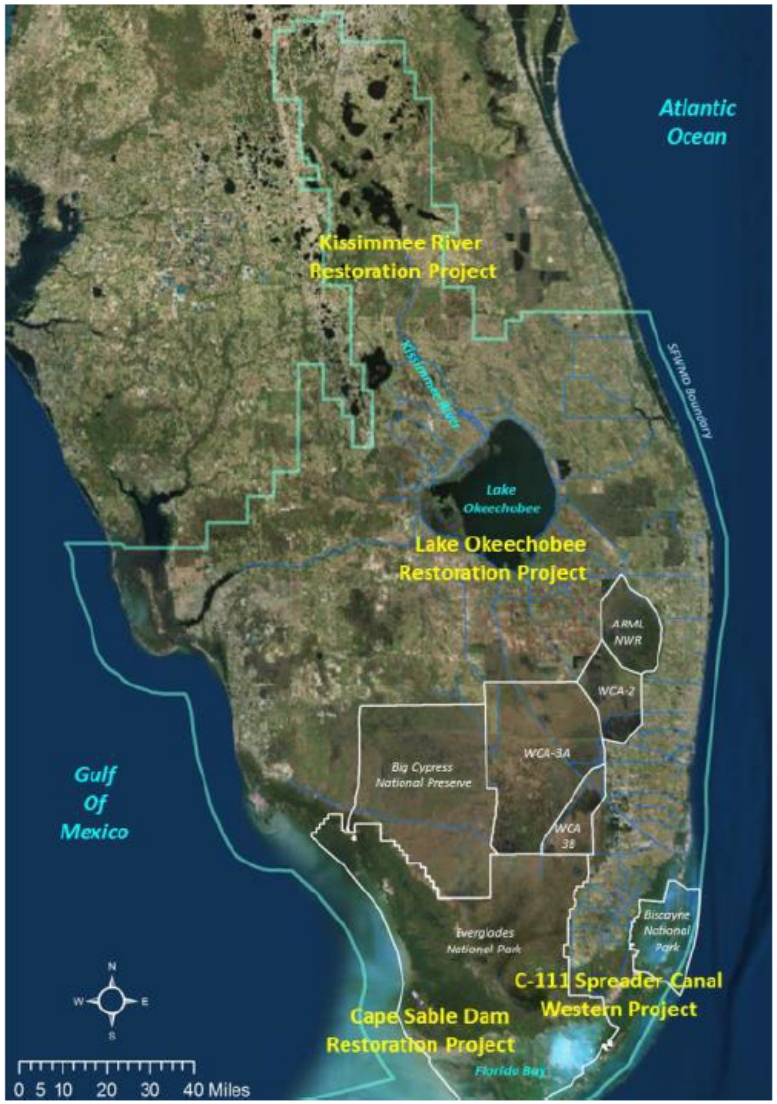
Non-native fishes have increased in numbers since their decline immediately following the January 2010 cold temperature event. We have observed an increase of non-native fish in Shark and Taylor Sloughs and the ENP Panhandle region, though they have not passed the arbitrary cut-off of 2% that yields a red value for that component of the stoplight. Mayan cichlids remain the most commonly collected non-native fish, though jewelfish are increasing in frequency of capture at some sites. Swamp eels and spotfin spiny eels were also common at times in Taylor Slough.

Persistent patterns of drying in Shark River Slough and Taylor Slough, may explain a general trend in declining fish and crayfish biomass in these areas. This long-term trend is observed after accounting for annual drying events and may be the result of a loss of recovery capacity in communities experiencing recurrent disturbances. This is discussed in more detail in the *RECOVER System Status Report {Link}*.

Four Case Studies

Examples where local restoration actions have resulted in the type of positive ecological responses that we expect to see one day system-wide

- Kissimmee River Restoration Project
- Lake Okeechobee Restoration Project
- C-111 Spreader Canal Western Project
- Cape Sable Canals Restoration Project



- Five of 11 indicators have been modified because of challenges with funding
- Originally developed for system-wide purposes- modifications are compromising the original purpose
- Red and yellow show that we have not made significant progress system-wide
- However; case studies show where local projects are achieving smaller scale benefits

Questions?

Lead Scientist for Indicator Report

First Name	Last Name	Agency	Indicator
Chris	Kelble	NOAA	Florida Bay Algal Blooms **
Joan	Browder	NOAA	Pink Shrimp
Peter	Frederick	UF	White Ibis and Wood Stork
Evelyn	Gaiser	FIU	Periphyton
Jerry	Lorenz	Audubon of Florida	Roseate Spoonbill **
Chris	Madden	SFWMD	Florida Bay SAV **
Frank	Mazzotti	UF	Crocodilians
LeRoy	Rodgers	SFWMD	Invasive Exotic Species **
Andy	Rodusky	SFWMD	Lake Okeechobee Nearshore **
Joel	Trexler	FIU	Fish and Macroinvertebrates
Aswani	Volety	FGCU	Oysters

Others involved

Dave	Rudnick	NPS	Florida Bay Algal Blooms **
Steve	Kelly	SFWMD	Florida Bay Algal Blooms **
Peter	Ortner	RSMAS	Florida Bay Algal Blooms
Dale	Gawlik	FAU	White Ibis and Wood Stork
Jeff	Beauchamp	UF	Crocodilians
Laura	Brandt	FWS	Crocodilians **
Michael	Cherkiss	USGS	Crocodilians **
Angie	Huebner	ACOE	Invasive Exotic Species **
Bruce	Sharfstein	SFWMD	Lake Okeechobee Nearshore **
Steve	Geiger	FWC	Oysters
Melanie	Parker	FWC	Oysters
Alice	Clarke	NPS	Technical Editing
Lawrence	Glenn	SFWMD	Kissimmee Case Study
Ellen	Hardy	NPS	Technical Editing
Bob	Sobczak	NPS	Hydrology

** Contributed to case studies