

***Progress Toward Restoring the
Everglades:
The Sixth Biennial Review, 2016***

**Committee on Independent Scientific
Review of Everglades Restoration Progress**

**National Academies of Sciences, Engineering, and
Medicine**

David Ashley, Committee Chair

Committee Membership

- **DAVID ASHLEY** (*Chair*),* University of Southern California
- **MARY JANE ANGELO**, University of Florida
- **WILLIAM BOGGESS**, Oregon State University
- **CHARLES DRISCOLL**, Syracuse University
- **SIOBHAN FENNESSY**, Kenyon College
- **WILLIAM GRAF**, University of South Carolina
- **KARL HAVENS**, University of Florida
- **WAYNE HUBER**, Oregon State University
- **FERNANDO MIRALLES-WILHELM**, Univ. of Maryland
- **DAVID MOREAU**, University of North Carolina, Chapel Hill
- **GORDON ORIAN**S, University of Washington
- **DENISE REED**,* The Water Institute of the Gulf
- **JAMES SAIERS**, Yale University
- **JEFFREY WALTERS**,* Virginia Tech

NRC Staff:

Stephanie Johnson,* David Policansky, Ed Dunne, and Brendan McGovern

**Attending briefings*

The Study

- **Congressionally mandated study of the Comprehensive Everglades Restoration Plan (CERP) under the Water Resources Development Act (WRDA) 2000.**
 - ❖ “The Secretary, the Secretary of the Interior, and the Governor, in consultation with the South Florida Ecosystem Restoration Task Force, shall establish an independent scientific review panel convened by a body, such as the National Academy of Sciences, to review the Plan’s progress toward achieving the natural system restoration goals of the Plan.”
 - ❖ “The panel ... shall produce a biennial report to Congress, the Secretary, the Secretary of the Interior, and the Governor that includes an assessment of ... measures of progress in restoring the ecology of the natural system, based on the Plan.”
- **Study funded under a 5-yr contract with the USACE, with funding support from DOI and SFWMD**

Statement of Task

The committee will produce biennial reports providing:

1. An assessment of progress in restoring the natural system
2. Discussion of significant accomplishments of the restoration
3. Discussion and evaluation of specific scientific and engineering issues that may impact progress in achieving the natural system restoration goals of the plan
4. Independent review of monitoring and assessment protocols to be used for evaluation of CERP progress

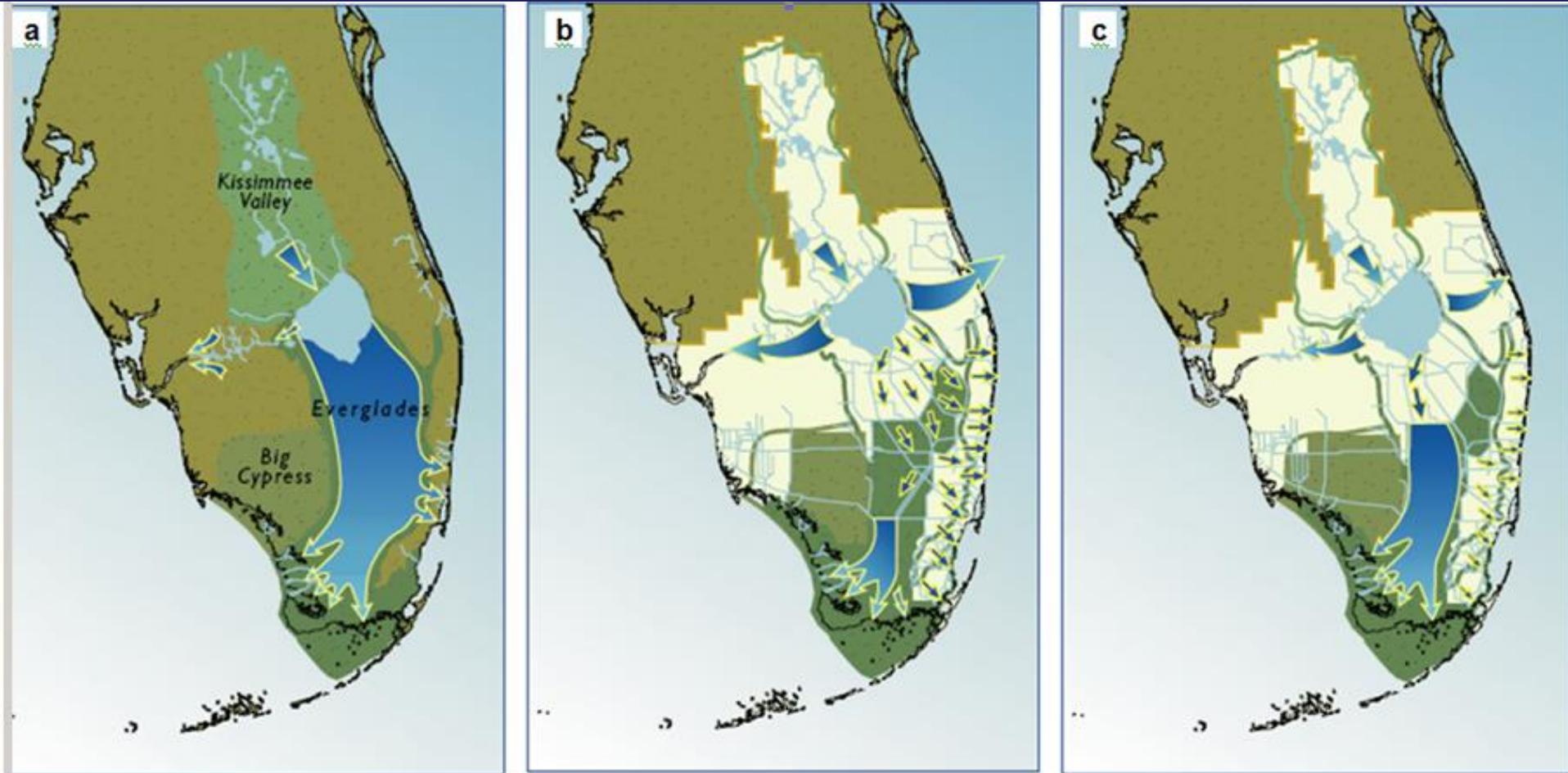


Study Process

- 5 in-person meetings (4 information gathering)
 - Presentations or public comment from ~65 individuals (federal/state/local agencies, Tribes, NGOs, individuals)
 - field trips
- Briefings/presentations from many individuals and agencies/organizations, and
- Peer-reviewed consensus report

Everglades Restoration

“Getting the Water Right”: Quality, Quantity, Timing, and Distribution + Flow



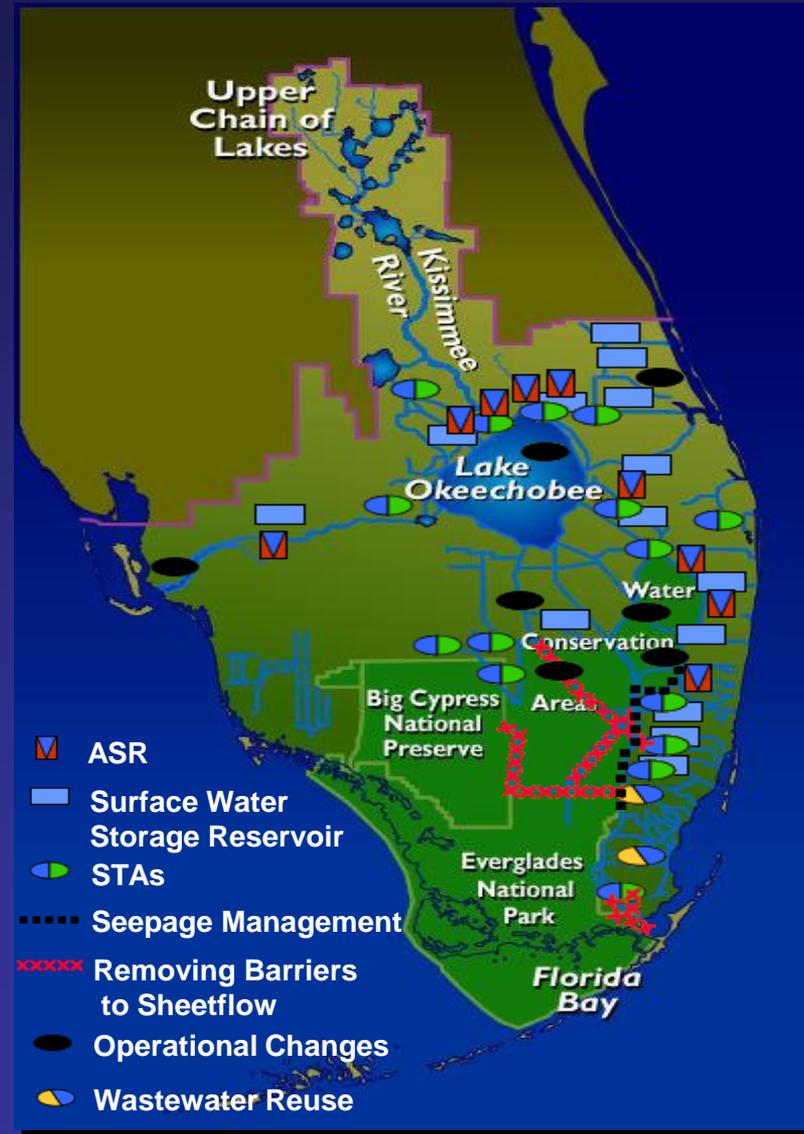
Pre-drainage Flow

Current Flow

Restored Flow

Comprehensive Everglades Restoration Plan (CERP)

- The largest of several South Florida restoration initiatives
- Designed to “get the water right”
- ~50 major projects and 68 project components
- Joint federal-state program, launched in 2000, estimated then at \$8 billion and 30 years, current cost estimates ~\$16 billion



2015-16 Context

- 2015 localized drought causes seagrass die off
- 2016 extreme high water
 - Flood conditions in WCAs
 - Large estuary discharges
 - Algal blooms
- Highlights constraints of existing water management infrastructure
 - More restoration progress needed to address



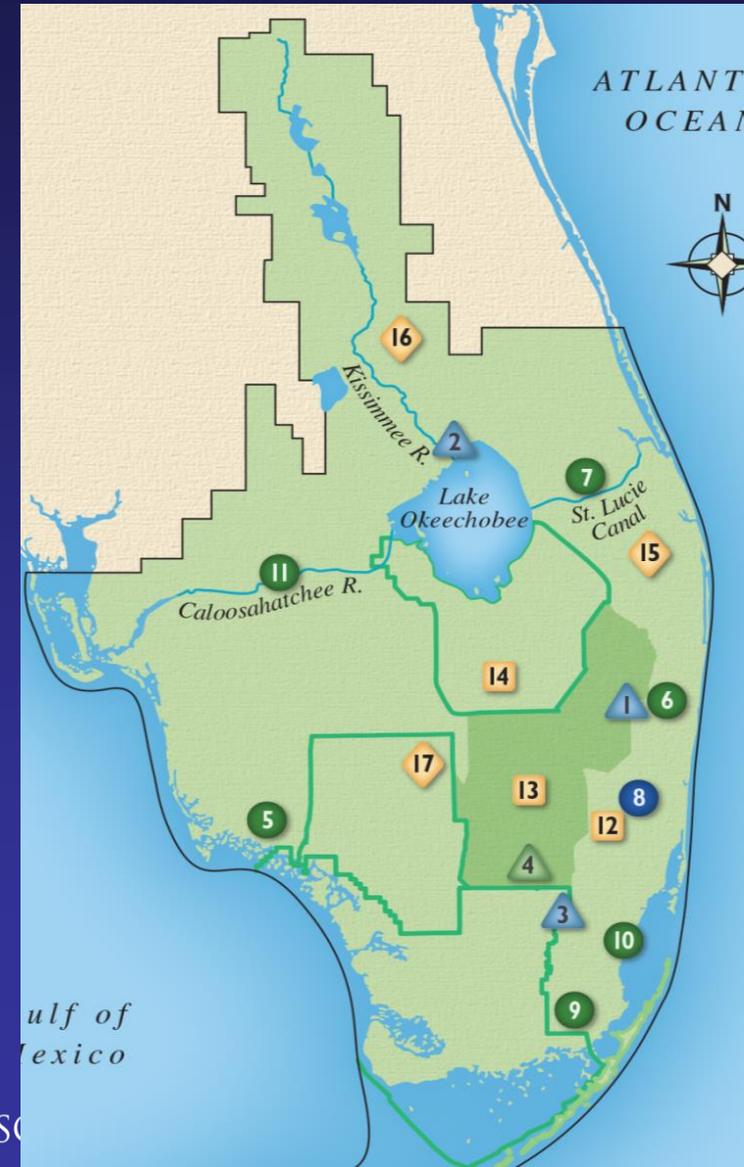
2016 Biennial Report Focal Areas

- Review of Restoration Progress
- Implications of Knowledge Gained since 1999
- Looking Forward

CERP Restoration Progress

Important progress in implementation:

- One CERP project completed
 - Melaleuca Eradication
- Two CERP projects nearing completion
 - Picayune Strand
 - C-111 Spreader Canal
- Four CERP projects ongoing
 - C-43 Reservoir
 - C-44 Reservoir (IRL)
 - Biscayne Bay Coastal Wetlands
 - Site 1 Impoundment



CERP Restoration Progress



Demonstrable ecosystem restoration benefits from early CERP components

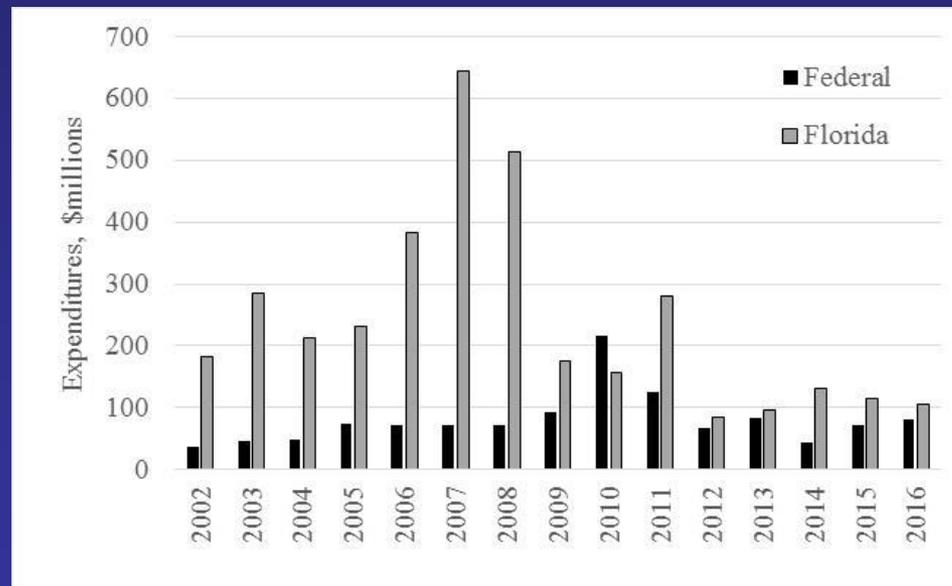


Documented CERP benefits on periphery

- Represent a small proportion of overall ecosystem footprint

CERP Restoration Progress

- Funding modestly improved since 2012
 - 16 to 18% of CERP has been funded
 - At current rate of funding, CERP completion will take >50 years



Non-CERP Restoration Progress

Three major projects—
Kissimmee, C-111 South
Dade, and Mod Waters—
anticipated to be completed
and operating in next 5 years

STA outflow water quality
continues to improve

- Lowest mean outflow (17 ppb) concentrations in 21 years

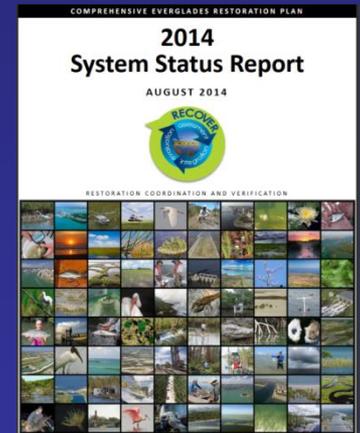
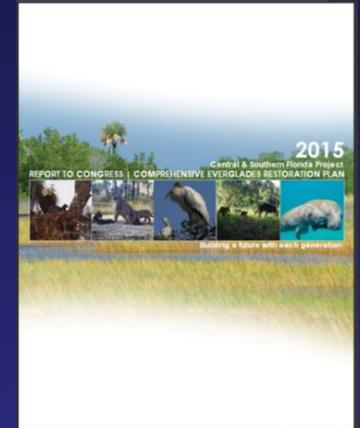
Lake Okeechobee water quality
remains degraded



Other Restoration Progress Issues

Additional attention needed toward assessing and reporting natural system restoration progress

- CERP reports should clearly describe ecosystem benefits relative to expectations, goals, and baseline/reference conditions
- Effective reporting ensures accountability



Other Restoration Progress Issues

Conflicts between restoration objectives and needs of protected species require programmatic solutions

- Currently addressed locally, incident by incident
- Comprehensive conservation plan holds potential for long-term solution for sparrow
- STA performance impacts from kites and stilts need to be quantified



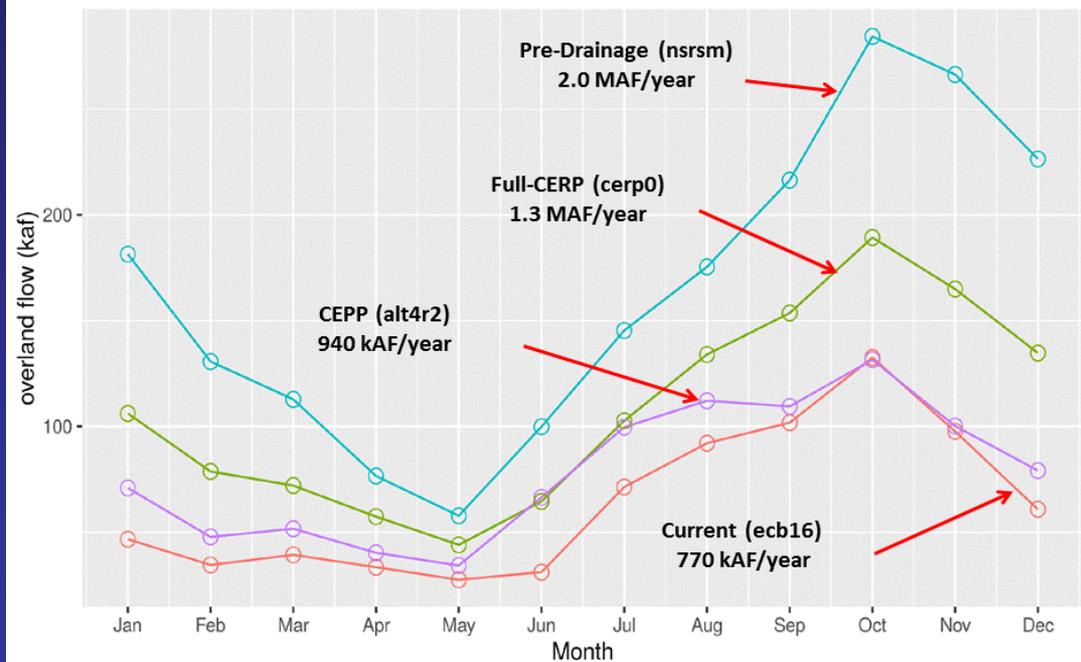
Knowledge Gained Since 1999

Major advancements in knowledge since the CERP was developed in the 1990s:

- Pre-drainage hydrology,
- Climate change and sea level rise,
- Feasibility of storage alternatives

Knowledge Gained Since 1999: Predrainage Hydrology

Shark River Slough Average Annual Flows (Blue Line)

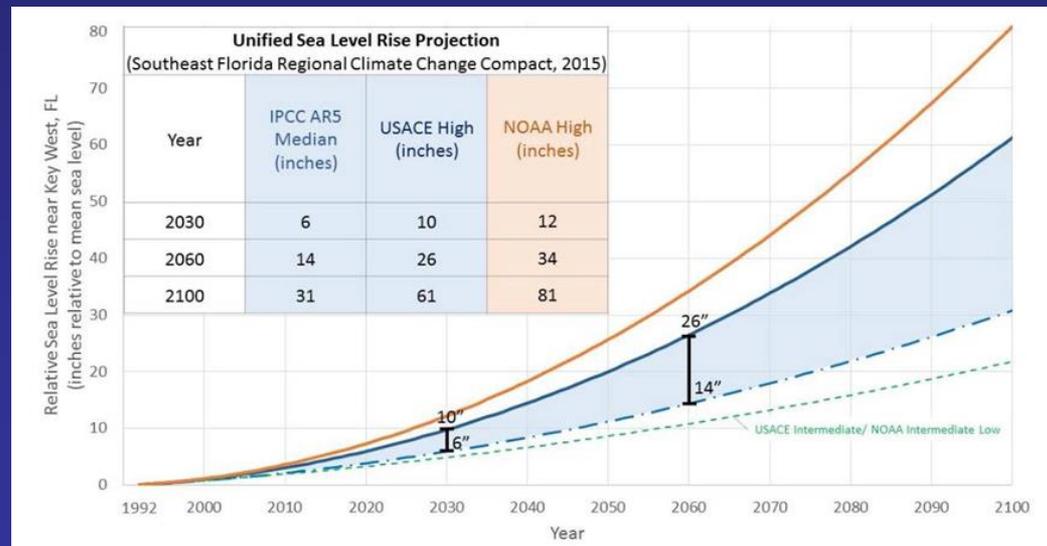
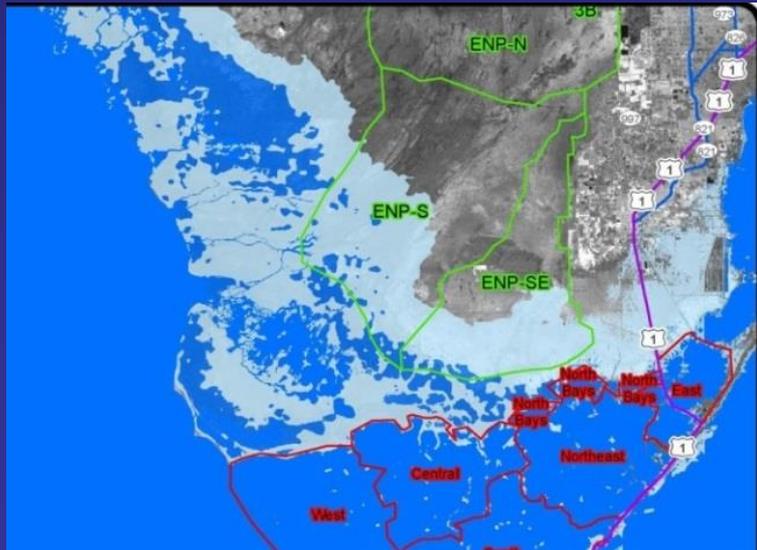


NSRSM predrainage flows vs. NSM

North of WCAs	+67%
Shark River Slough	+24%
Florida Bay	+46%

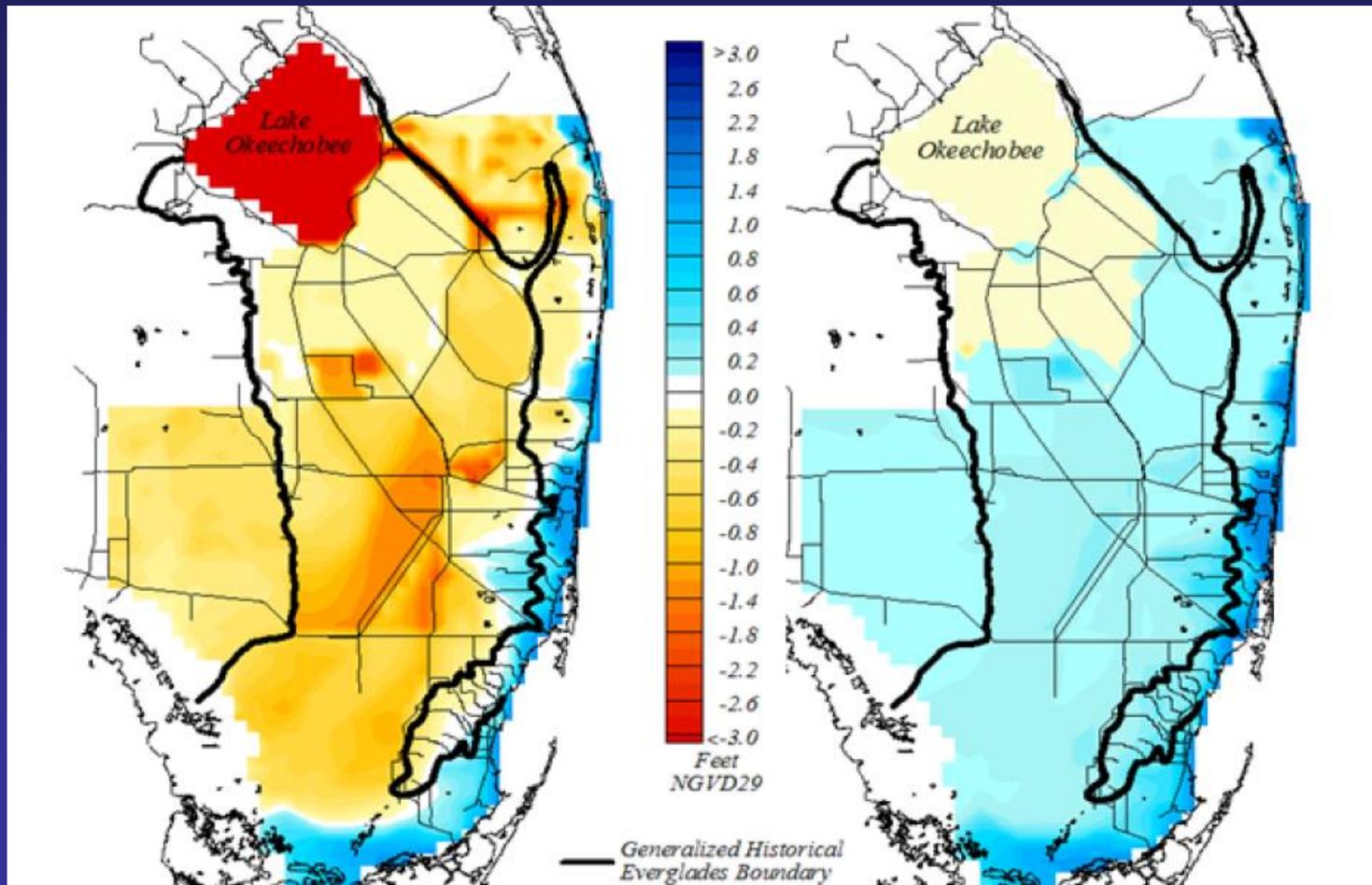
Knowledge Gained Since 1999: Sea Level Rise

- Will impact estuaries and Florida Bay, reduce extent of wetlands,
- Increased flooding and salt water intrusion



Knowledge Gained Since 1999: Climate Change

- Changes to precipitation frequency or intensity could increase need for water storage



Knowledge Gained Since 1999: Major Reductions in Water Storage

Major features infeasible or highly uncertain

CERP Surface reservoirs:

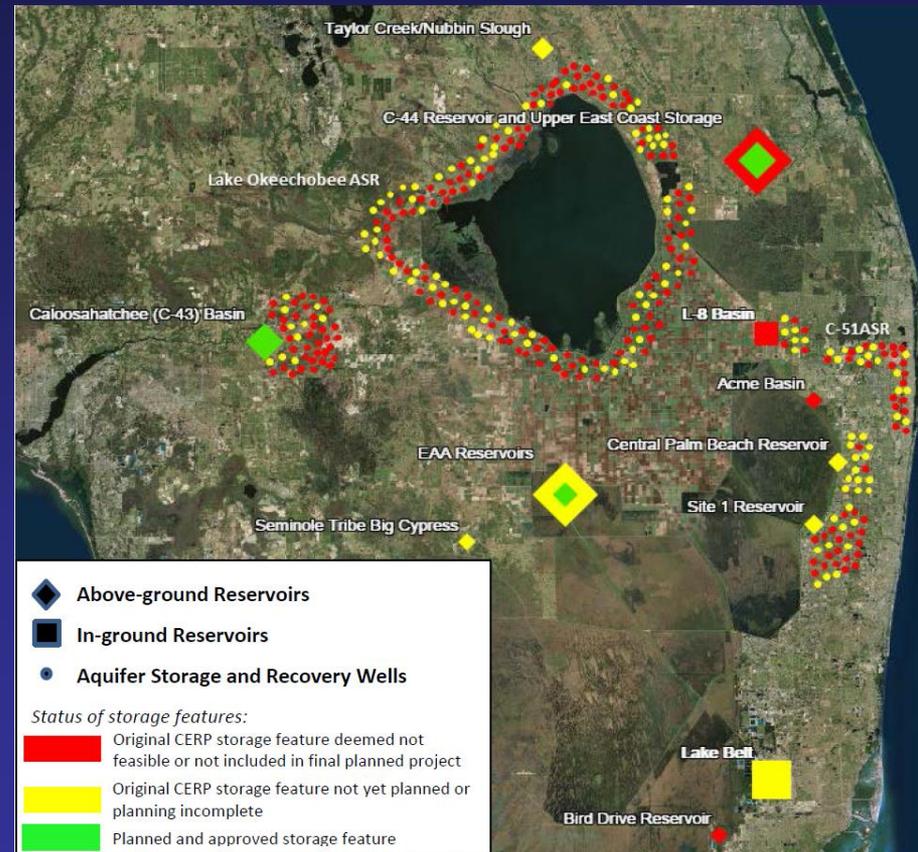
- Of 1.5 MAF, only 386 kAF with planning complete.
- Lake Belt reservoirs (277kAF) highly uncertain

CERP underground storage

- 60% of ASR capacity infeasible

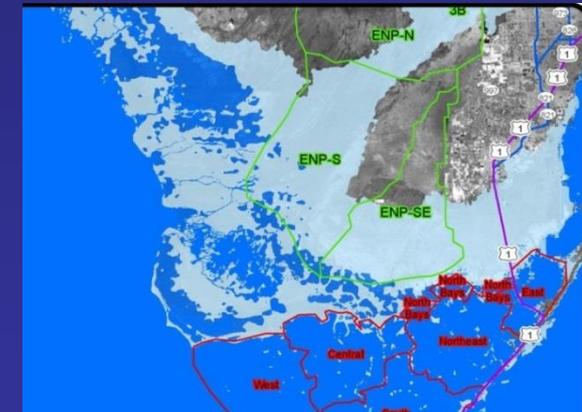
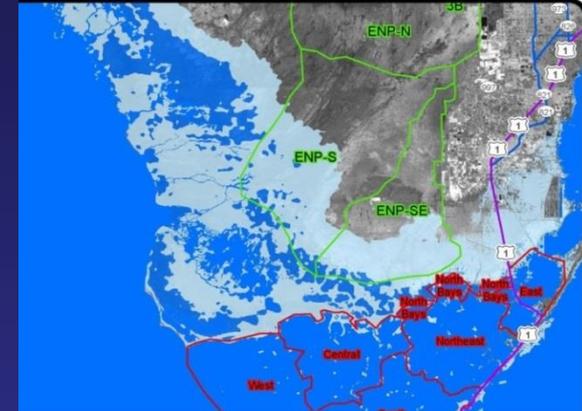
Lake Okeechobee

- 564 kAF lost of lake storage due to lake regulation schedule



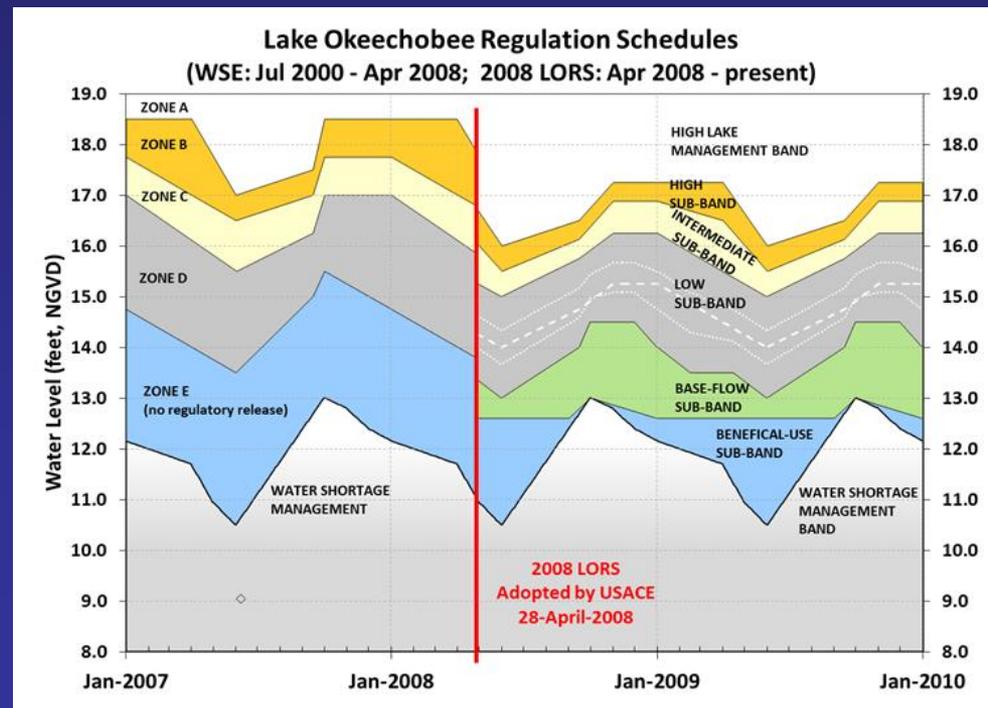
Implications of Knowledge Gained for CERP Planning

- A reexamination of CERP restoration goals is in order
 - should consider the need for benefits that are robust in the face of climate change or mitigate its effects
- Uncertainties of future storage and climate should be incorporated into CERP planning



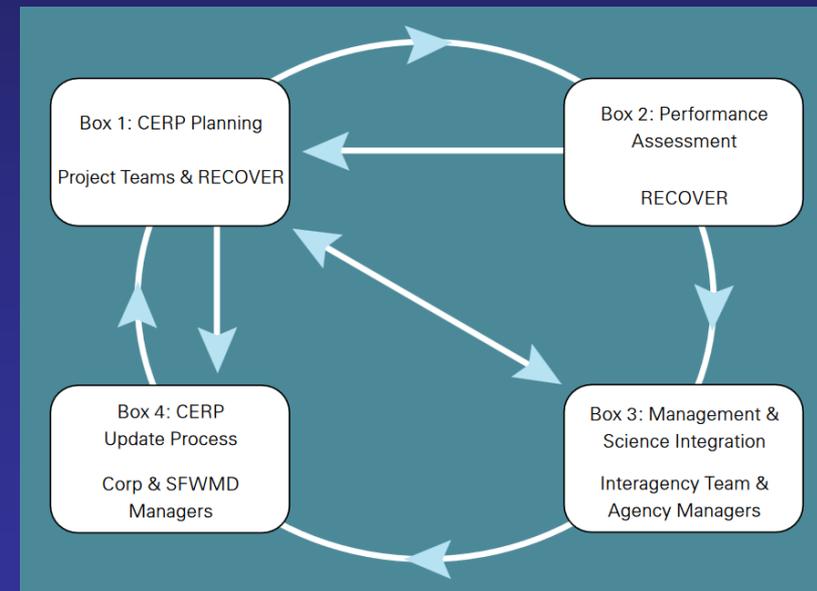
Implications of Knowledge Gained for CERP Planning

- Because Lake Okeechobee is central to water storage planning, revisions of the lake regulation schedule should begin as soon as possible.



Looking Forward: Adapting to Changed Conditions

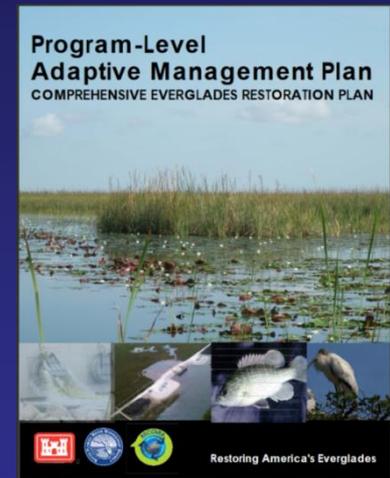
- CERP was founded on adaptive management (AM) to incorporate new information and address unforeseen issues
 - AM implemented at *project scale*
 - But the original vision for AM at the *program level* remains unfulfilled



Looking Forward: Adapting to Changed Conditions

Important steps:

- **RECOVER 2015 Program-Level Adaptive Management Plan** includes highly relevant, forward-looking questions
 - BUT, requires an implementation plan and sufficient resources to be effective.
- **Need to develop quantitative restoration objectives, reflecting new knowledge, to support AM**



Looking Forward

- A systemwide analysis of the potential future state of the Everglades ecosystem needs to be conducted
 - 5-yr CERP Update, required in *Programmatic Regs.* to consider new scientific, technical, and planning information, is long overdue
 - Should include scenario analyses of various levels of storage and climate change
 - Will inform planners on need for CERP modification
 - Need not impede ongoing or planned construction progress
 - Developed and developing modeling tools are available to support forward-looking analyses

Overall Summary

- Important progress in CERP implementation with demonstrable ecosystem improvements in some early projects
- Insufficient attention to adapting the CERP in light of important knowledge gained since 1999
- Critical need for forward-looking, systemwide analysis to examine restoration outcomes and revisit CERP goals and objectives in light of knowledge gained and potential future changes

Overall Summary

The Bottom Line

- Forward-looking analysis, in conjunction with adaptive management, will ensure that the CERP is based on the latest scientific and engineering knowledge, considers long-term systemwide needs, addresses potential restoration conflicts, and is robust to changing conditions

More Resources

- Full report at <http://www.nap.edu/>
- Additional resources under “Resources” tab:
 - 4-page report in brief
 - Press release
- Final book to be printed in spring 2017