# CENTRAL EVERGLADES PLANNING PROJECT

## Adaptive Management and the Role of Ecological Thresholds

### GEER Conference 2015 Session 15

**Performance Measures for Central Everglades Adaptive Management**

**Presented by: Eric Bush**
**U.S. Army Corps of Engineers, Jacksonville District**

**April 21, 2015**

# THE EVERGLADES

**NATIONAL/INTERNATIONAL SIGNIFICANCE**

**and more than half of the original Everglades is gone…**
**…what is left is dying**

# CENTRAL EVERGLADES
## PLANNING PROJECT

**Achieves ~ 70% of targets for central Everglades restoration**

**Increases water flow >20% to the central Everglades and Florida Bay**

**Reduces undesirable fresh water discharges > 20% to the Caloosahatchee and St. Lucie estuaries**

# CENTRAL EVERGLADES THE RISK OF NOT ACTING

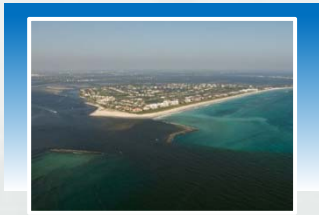
**DIMINISHED HABITAT/ LANDSCAPE PATTERNS** that Support Biological Diversity

**INCREASED LOSS OF SOIL** by Oxidation & Fires

**INCREASED THREAT TO 68 LISTED SPECIES**

**DIMINISHED HEALTH OF COASTAL ESTUARIES** & Economies Dependent on Them

**DIMINISHED OPPORTUNITIES TO ADDRESS WATER SUPPLY NEEDS** of Environmental, Agricultural & Urban Users



**DECREASED OPPORTUNITY FOR CLIMATE ADAPTATION** to Reduce Salt Water Intrusion/ Sea-Level Rise

U.S.ARMY

# CEPP PROJECT OBJECTIVES

## OBJECTIVES

- **Project Objective Summary:** Restore seasonal water depths, durations, distribution & timing of water flow to support a natural mosaic of wetland & upland habitat in the central Everglades, which promotes natural plant & animal diversity

RELATIONSHIP OF LANDSCAPE TO HABITAT, FORAGING AND LIFECYCLES OF SPECIES

PERIPHYTON GROWTH AND TURTLES

SAWGRASS, APPLE SNAILS, AND SNAIL KITES

ROOKERIES, WOODSTORKS, AND SMALL FISH

# CENTRAL EVERGLADES THE BENEFITS

**IMPROVED**
**HABITAT/ LANDSCAPE PATTERNS TO SUPPORT BIOLOGICAL DIVERSITY**

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**994,000 ACRES IMPROVED IN WCA 3 & ENP**

**REDUCED**
**SOIL LOSS BY OXIDATION & FIRES**

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**213,000 ACRE-FEET OF PEAT SOILS RESTORED**

**REDUCED GREENHOUSE GAS**

**REDUCED TAX PAYER COSTS, HEALTH RISKS, AND ROAD CLOSURES**

**MORE DAYS OF RECREATION ANNUALLY**

**DECREASED**
**THREAT TO 68 LISTED SPECIES**

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**1.5 MILLION ACRES OF IMPROVED HABITAT**

**IMPROVED**
**HEALTH OF COASTAL ESTUARIES & ECONOMIES DEPENDENT ON THEM**

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**86,000 ACRES IMPROVED IN NORTHERN ESTUARIES**

**COMMERCIAL SHRIMP FISHERIES IMPROVED**

**INCREASED SALTWATER FISHING OPPORTUNITIES**

**REDUCED TAX PAYER COSTS (REDUCED SEDIMENTATION)**

**MORE**
**OPPORTUNITIES TO ADDRESS WATER SUPPLY NEEDS OF ALL USERS**

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**MORE WATER FOR ENVIRONMENT**

**$25 MILLION MORE IN DRINKING WATER (~200,000 MORE PEOPLE)**

**IMPROVED**
**OPPORTUNITY FOR CLIMATE ADAPTATION TO DELAY SEA-LEVEL CHANGE EFFECTS BY REDUCING SALTWATER INTRUSION**

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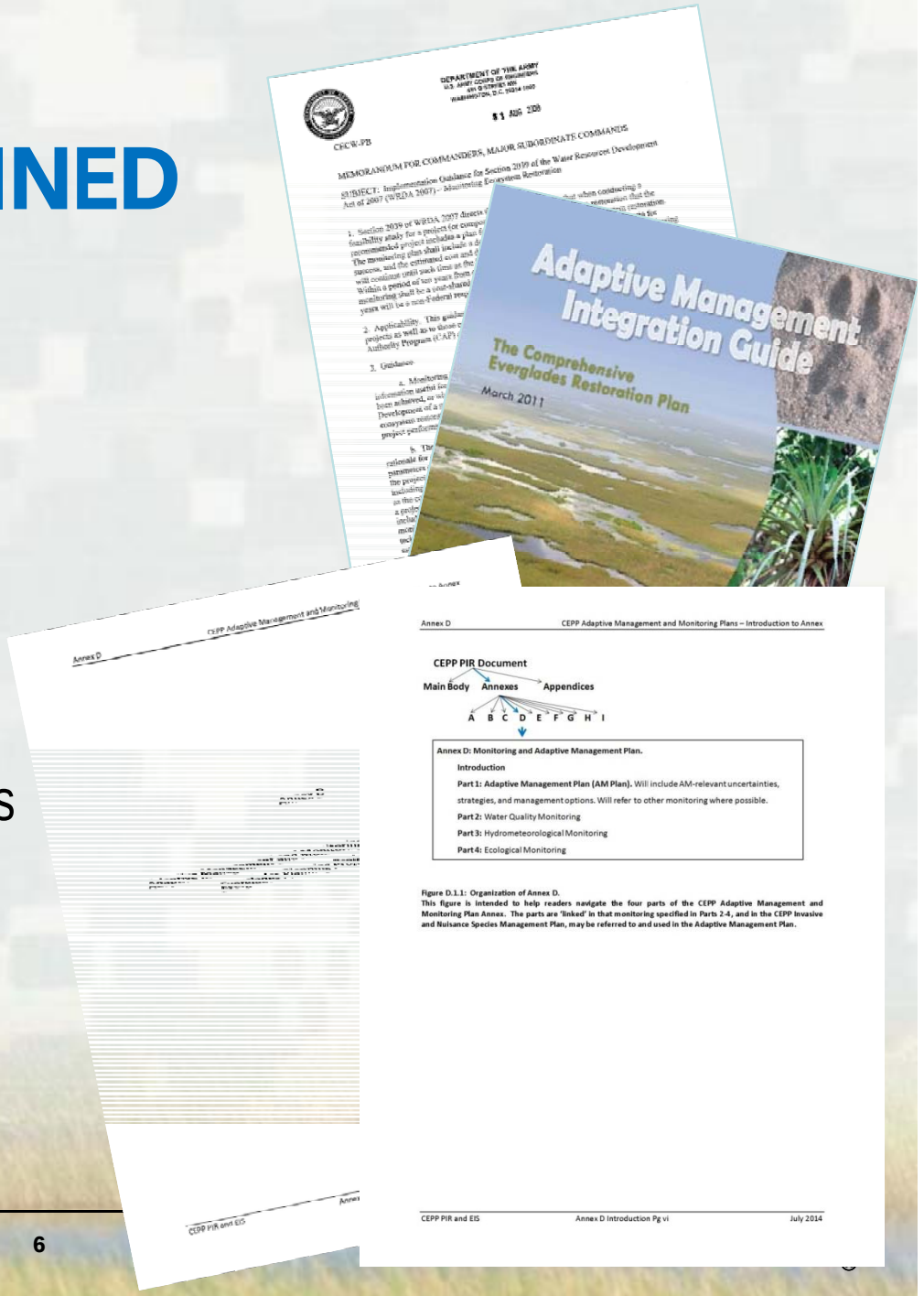
**476,000 ACRES IMPROVED IN FLORIDA BAY**

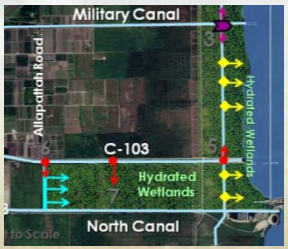
# ADAPTIVE MANAGEMENT DEFINED

- Structured management approach to address uncertainties by testing hypotheses
- Links science to decision making
- Adjusts implementation, as necessary, to improve the probability of achieving restoration success



# EVOLUTION OF CERP ADAPTIVE MANAGEMENT

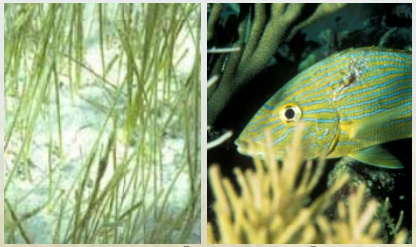
| WRDA 2000: AUTHORIZED CERP / REQUIRES ADAPTIVE MANAGEMENT (AM) FOR CERP | |
|---|---|
| **PROJECT** | **AM PLAN?** |
| Aquifer Storage & Recovery Pilot Projects | No (Test Program) |
| **WRDA 2007: AUTHORIZED CERP PROJECTS / REQUIRES MONITORING OF RESTORATION SUCCESS** | |
| Indian River Lagoon – South | No |
| Picayune Strand | No |
| Site 1 Impoundment | No |
| Melaleuca Eradication | No (Adaptive Management Implementation outlined in PIR) |
| **WRDA 2009: USACE HQ POLICY REQUIRING AM FOR ECOSYSTEM RESTORATION PROJECTS** | |
| C-111 Spreader Canal | No (Adaptive Management Implementation outlined in PIR) |
| **2011: CERP ADAPTIVE MANAGEMENT INTEGRATION GUIDE RELEASED** | |
| DECOMP WCA 3 | Yes |
| Biscayne Bay Coastal Wetlands | Yes |
| Broward County Water Preserve Areas | Yes |
| Central Everglades Planning Project | Yes |




**BISCAYNE BAY COASTAL WETLANDS**

**Improved Freshwater Wetlands Habitat**

**Improved Saltwater Wetlands Habitat**



**Improved Nearshore Habitat**

# EXAMPLE OF ADDRESSING UNCERTAINTY

**LEGEND:**

**PROJECT FEATURES**
- L-6 Diversion
- S-8 Modifications
- L-4 Degrade & Structure
- L-5 Canal Improvements
- Miami Canal Backfill

EXAMPLE AREA TO RESTORE

STRESSOR

EFFECT

ATTRIBUTE

**IMPROVED HYDROPERIODS**

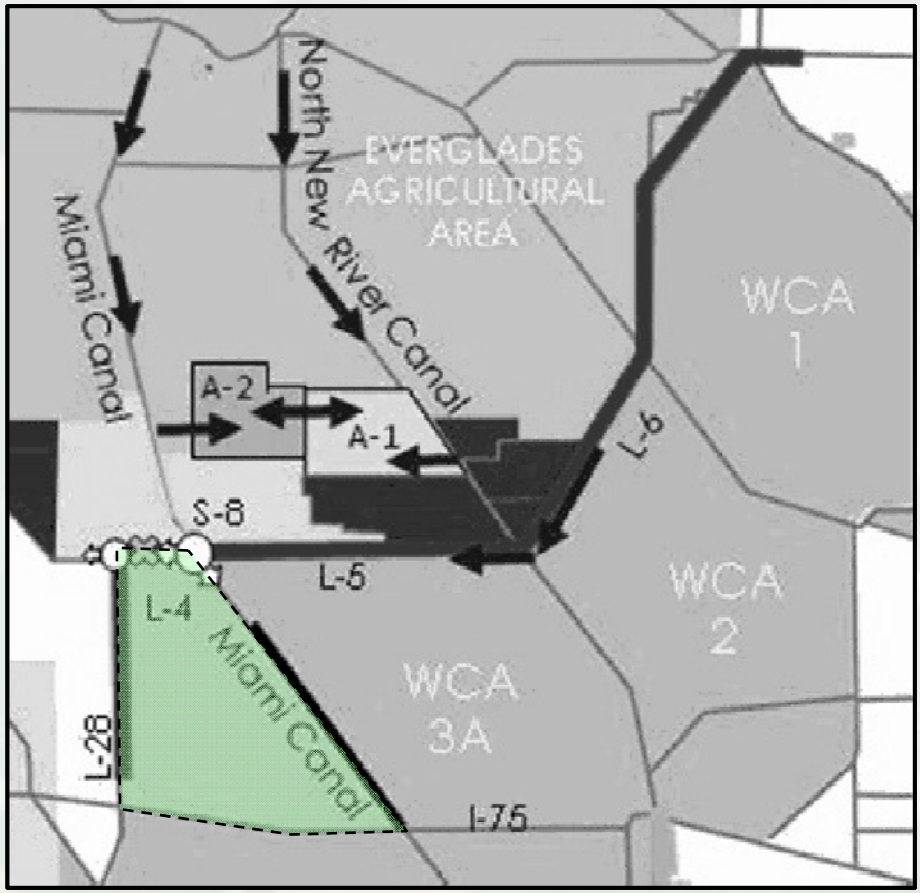
**INCREASED SHEETFLOW**

**PEAT ACCRETION**

**REDUCED FIRE RISK & SOIL OXIDATION**

**MORE FISH, ALLIGATORS & WADING BIRDS**

**RESTORED RIDGE & SLOUGH**



# IDENTIFY PERFORMANCE THRESHOLDS

| PERFORMANCE MEASURE | TARGET | CURRENT |
|---|---|---|
| Hydroperiods | 330-360 days/yr | 240-300 days/yr |
| Flow Velocity | 2.5 cm/s (4 weeks) | 1.0 cm/s |
| Flow Direction | Historic curved North to South flow paths | West to East |
| Peat Depth | Peat increase 2mm/yr | -1 mm/year |
| Vegetation | Sawgrass ridges Waterlilly sloughs | Woody shrubs, willow, cattail |

# CEPP ADAPTIVE MANAGEMENT IMPLEMENTATION

| Duration (Days) | CEPP | – YR 3 | – YR 1 | YR 1 | YR 3 | YR |
|---|---|---|---|---|---|---|
| A-1 FEB & Restoration Strategies meeting WQBEL | | | | | | |
| 8.5 SMA, C-111 SD, Existing S-356 Operational | | | | | | |
| MWD 1- Mile Bridge & Road Raising | | | | | | |
| 365 | L-6 Diversion | | | | | |
| 730 | S-8 Pump Modifications | | | | | |
| 730 | L-4 Levee Degrade and Pump Station | | | | | |
| 540 | L-5 Canal Improvements | | | | | |
| 913 | Backfill Miami Canal | | | | | |
| MONITORING | | | | | | |
| BWPA C-11 Impoundment | | | | | | |
| 365 | L-67A 500 CFS Structure North | | | | | |
| 180 | Spoil Mound Removal West L-67A (N) | | | | | |
| 180 | L-67C 6000' Levee Gap | | | | | |
| MONITORING | | | | | | |
| TTNS Bridging & Road Raising | | | | | | |
| 1186 | Increase S-356 | | | | | |
| 365 | Increase S-333 | | | | | |
| 365 | L-29 Gated Spillway | | | | | |
| 270 | L-67A 500 CFS Structures 2 & 3 South | | | | | |

**LEGEND:**

- ○ AM STRATEGY STARTING POINT
- ——— BASELINE
- – – – CONSTRUCTION
- ····· POST-CONSTRUCTION

# CEPP ADAPTIVE MANAGEMENT IMPLEMENTATION

| CEPP PROJECT PHASE | AM PLAN COMPONENT | COST | TIME ESTIMATE* |
|---|---|---|---|
| Pre-Construction Engineering & Design | Data Investigation & Monitoring Plan Initiation | $40,000 | 2-3 years |
| Construction | Baseline & Construction Monitoring | $8,200,000 | 3-7 years |
| Operations | Post-Construction Monitoring, Modeling, & Assessment | $26,900,000 | 10-23 years |
| Adjust Implementation | Adaptive Management Plan Options; Project Sequence & Design; Operations | $23,500,000 | 3-20 years |
| Totals | | $58,600,000 | 20-26 years |

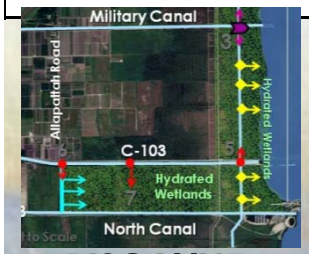
* Time varies based on implementation of CEPP project features & monitoring results verifying restoration success

# QUESTIONS?

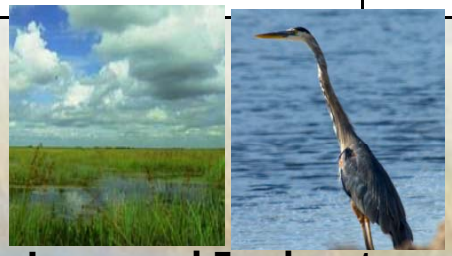
For More Information, Please Visit:
http://141.232.10.32/pm/projects/proj_51_cepp.aspx

# EVOLUTION OF CERP ADAPTIVE MANAGEMENT

| PROJECT | AM PLAN? | ADAPTIVE MANAGEMENT FEATURE |
|---|---|---|
| **WRDA 2000: AUTHORIZED CERP / REQUIRES ADAPTIVE MANAGEMENT (AM) FOR CERP** | | |
| Aquifer Storage & Recovery Pilot Projects | No | Testing pilot projects & sensitivity modeling |
| **WRDA 2007: AUTHORIZED CERP PROJECTS / REQUIRES MONITORING OF RESTORATION SUCCESS** | | |
| Indian River Lagoon – South | No | |
| Picayune Strand | No | Monitoring and assessment plan with recommendations to use adaptive management |
| Site 1 Impoundment | No | |
| Melaleuca Eradication | No | AM implementation strategy & some monitoring |
| **WRDA 2009: USACE HQ POLICY REQUIRING AM FOR ECOSYSTEM RESTORATION PROJECTS** | | |
| C-111 Spreader Canal | No | Design & operational tests, project phasing |
| **2011: CERP ADAPTIVE MANAGEMENT INTEGRATION GUIDE RELEASED** | | |
| DECOMP WCA 3 | Yes | Decomp Physical Model AM Field Test |
| Biscayne Bay Coastal Wetlands | Yes | Post-construction management options matrix & linked monitoring |
| Broward County Water Preserve Areas | Yes | Operational options linked to nutrient & ecological monitoring, & design improvements |
| Central Everglades Planning Project | Yes | Design tests, project phasing, post-construction contingency options, & operations linked to monitoring |

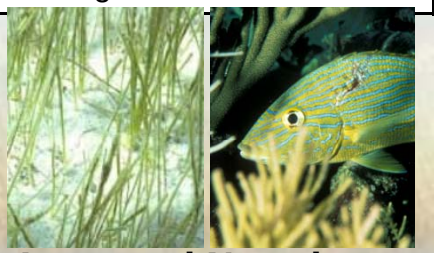



**BISCAYNE BAY COASTAL WETLANDS**



**Improved Freshwater Wetlands Habitat**

**Improved Saltwater Wetlands Habitat**



**Improved Nearshore Habitat**