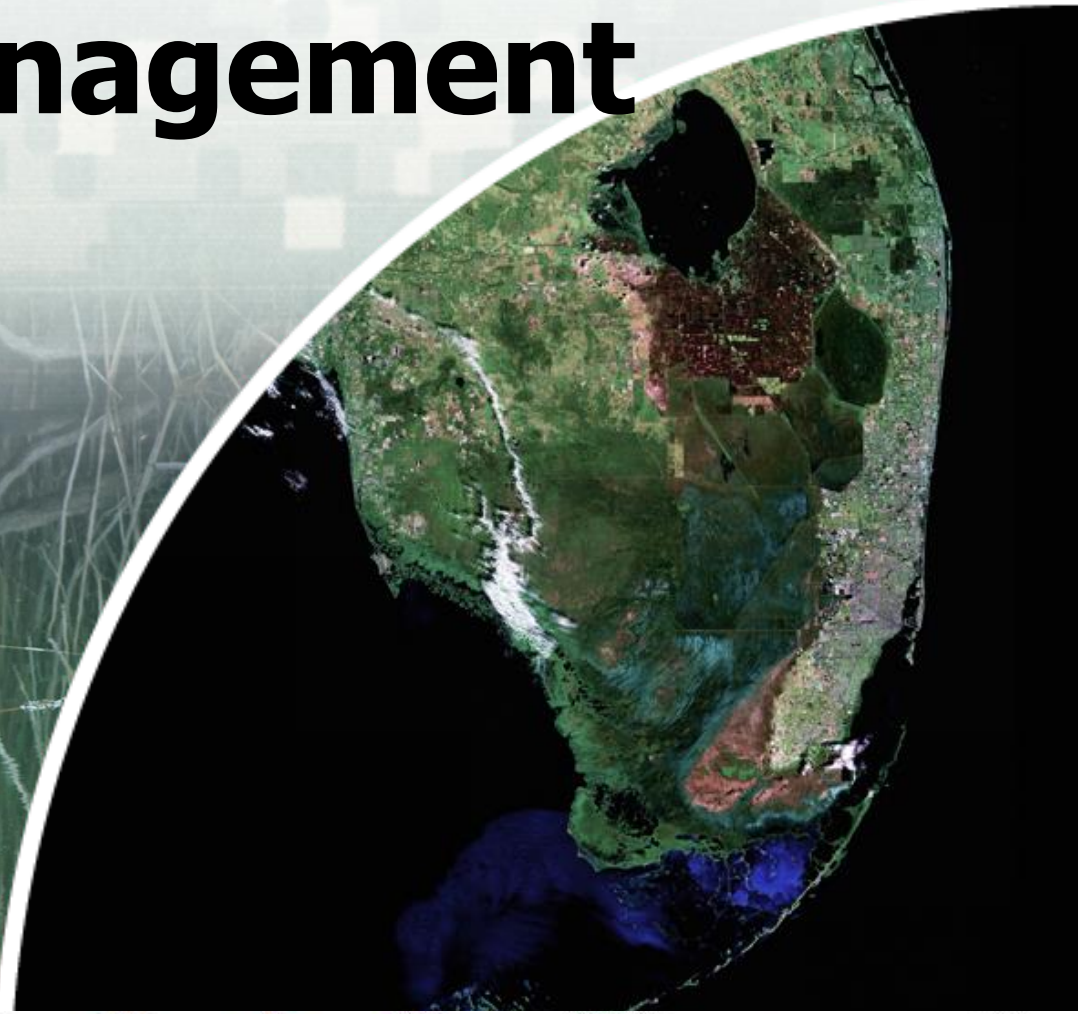
Lessons Learned from the Everglades Collaborative Adaptive Management Program



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Disclaimer

The opinions expressed in this presentation are those of the author. They do not reflect Agency policy, endorsement, or action.

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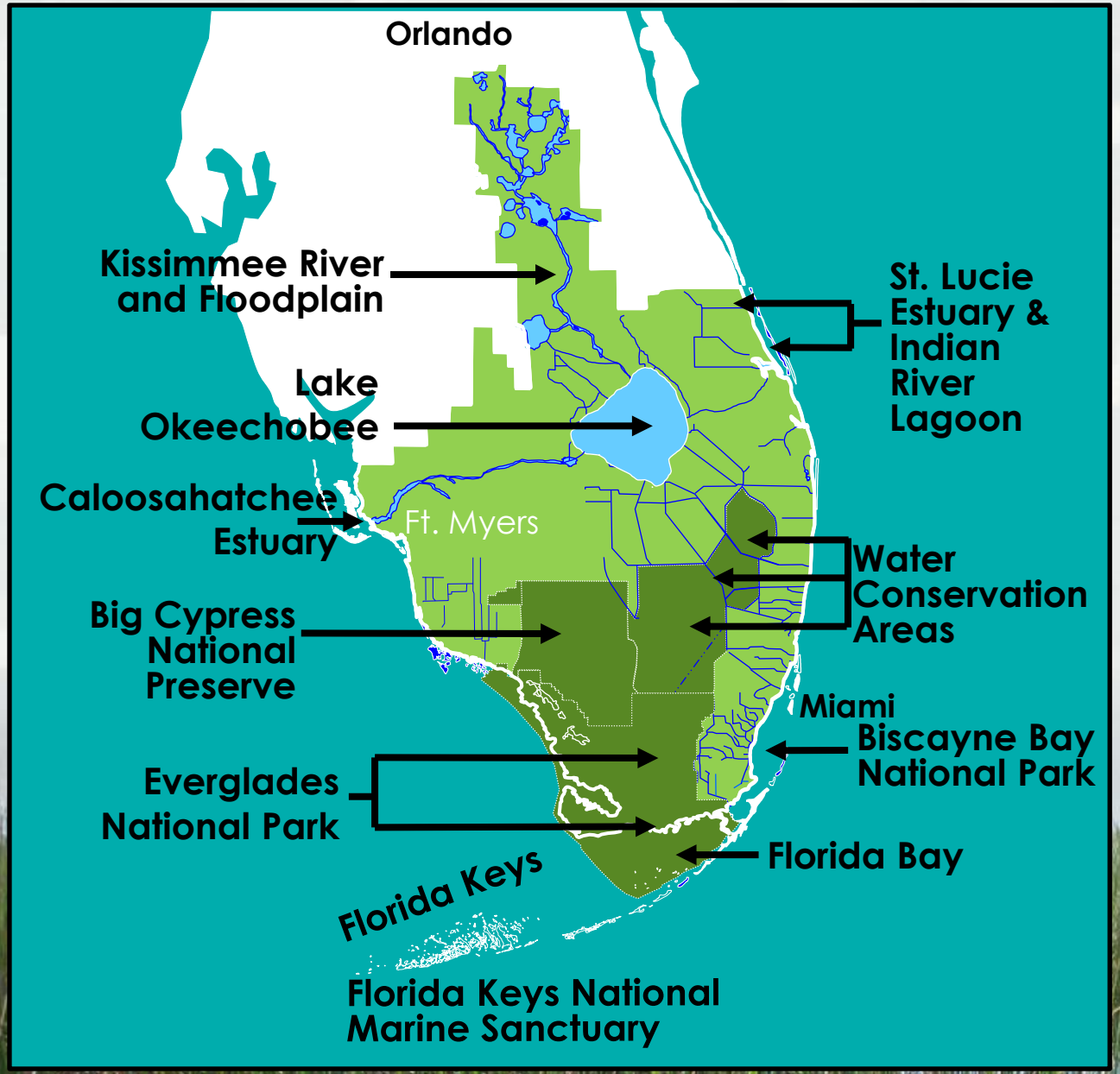
Overview

- Part 1: Complexity
- Part 2: Adaptive Management Framework
- Part 3: Top 5 Adaptive Management Lessons

Part 1:

Complexity



- ✓ Area - 18,000 square miles
- ✓ Population today - 6.5+ million

A Complex Ecosystem

- Too much or too little water for the South Florida ecosystem
- 50 percent reduction in spatial extent of natural system
- Declining estuary health
- Massive reductions in wading bird populations
- Degradation of water quality
- Loss of native habitat to invasive exotic vegetation
- 68 federally-listed threatened and endangered species
- Repetitive water shortages and salt water intrusion

Mission Statements - 1

- **Provide vital public engineering services** in peace and war to strengthen our Nation's security, energize the economy, and reduce risks from disasters.
- **Manage and protect water resources** of the region by balancing and improving water quality, flood control, natural systems and water supply.
- **Work with others to conserve, protect, and enhance** fish, wildlife, plants, and their habitats for the continuing benefit of the American people.

Mission Statements - 2

- **Protecting Florida's environment and natural resources** to serve the current and future needs of the state and its visitors. Common sense management and conservation decisions are guided toward more protection and less process.
- **Provide reliable scientific information** to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

Mission Statements - 3

- **Preserves unimpaired the natural and cultural resources** and values of the national park system for the enjoyment, education, and inspiration of this and future generations. Cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

- Protect and evaluate the Tribe's land and water resources and to **facilitate the wise use and conservation of these resources.**

Mission Statements - 4

- **Protect human health and the environment.**
- **Managing fish and wildlife resources for their long-term well-being** and the benefit of people.
- **Conserving and protecting the state's** agricultural and natural **resources** by reducing wildfires, promoting environmentally safe agricultural practices, and managing public lands.

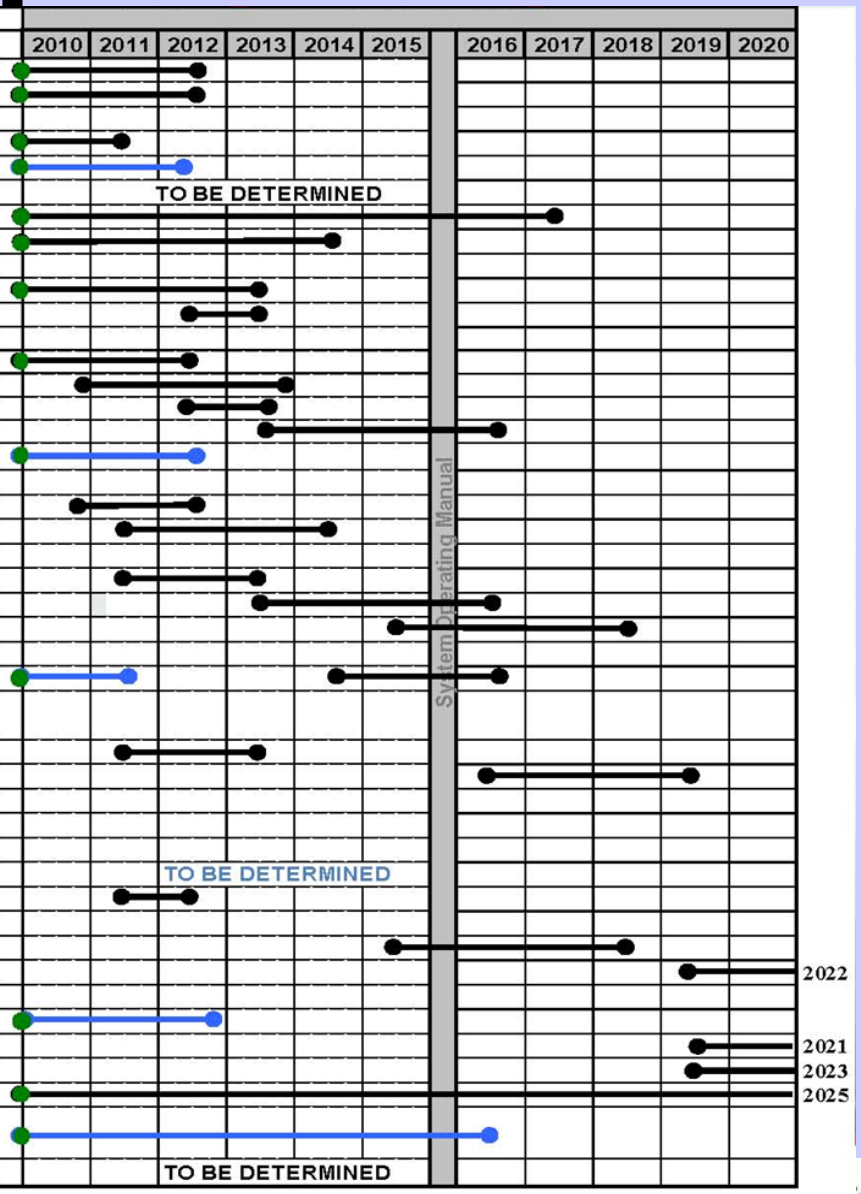
Restoration Plan Complexity

68 components implemented over 35 years:

Surface Water Storage Reservoirs	Removing Barriers to Sheetflow
Aquifer Storage & Recovery	Wastewater Reuse
Stormwater Treatment Areas	Operational Changes
Seepage Management	

Incremental Implementation

	Project	Total Project Cost ($M)
1	Seminole Big Cypress	$60
2	West Palm Beach Canal/STA-1E	$318
3	C-111 Spreader Canal	$154
	Design Test	$2
	Western Project	$150
4	L-31N Seepage Management Pilot Project	$16
5	C-111 South Dade	$391
6	Kissimmee River Restoration	$636
7	Modified Water Deliveries to Everglades National Park	$414
	Tamiami Trail Modifications	$113
	Conveyance and Seepage Control Features	$51
8	Picayune Strand Restoration	$448
	Merritt Pump Station	$65
	Faka Union Pump Station	$100
	Flood Protection Features	$30
	Miller Pump Station	$75
9	Lakeside Ranch STA Phase 1	$105
10	Site 1 Impoundment	$109
	Phase 1	
	Phase 2	
11	Indian River Lagoon-South	$1,882
	C-44 Intake Canal	$45
	C-44 Reservoir	$205
	C-44 STA	$115
12	Biscayne Bay Coastal Wetlands	$595
	Phase 1	$162
13	Water Conservation Area 3 Decompartmentalization and Sheetflow Enhancement (Decomp)	$390
	Decomp Physical Model	$10
	Decomp Part 1	$196
	Decomp Part 2	$133
	Decomp Part 3	$52
14	Caloosahatchee River (C-43)	$977
	West Basin Storage Reservoir	$595
15	Melaleuca Eradication and Other Exotic Plants	$17
16	Broward County Water Preserve Areas	$901
	C-11 Impoundment	
	WCA 3A&3B Levee/S-356	
	C-9 Impoundment	
17	North Palm Beach County Part 1	$287
18	ENP Seepage Management	$532
19	Lake Okeechobee Watershed	$1,561
20	Herbert Hoover Dike Rehabilitation	$991
21	Long-Term Plan for Achieving Water Quality Goals in the Everglades Protection Area Projects (100% State)	$1,500
22	Central Everglades Storage Project	TBD



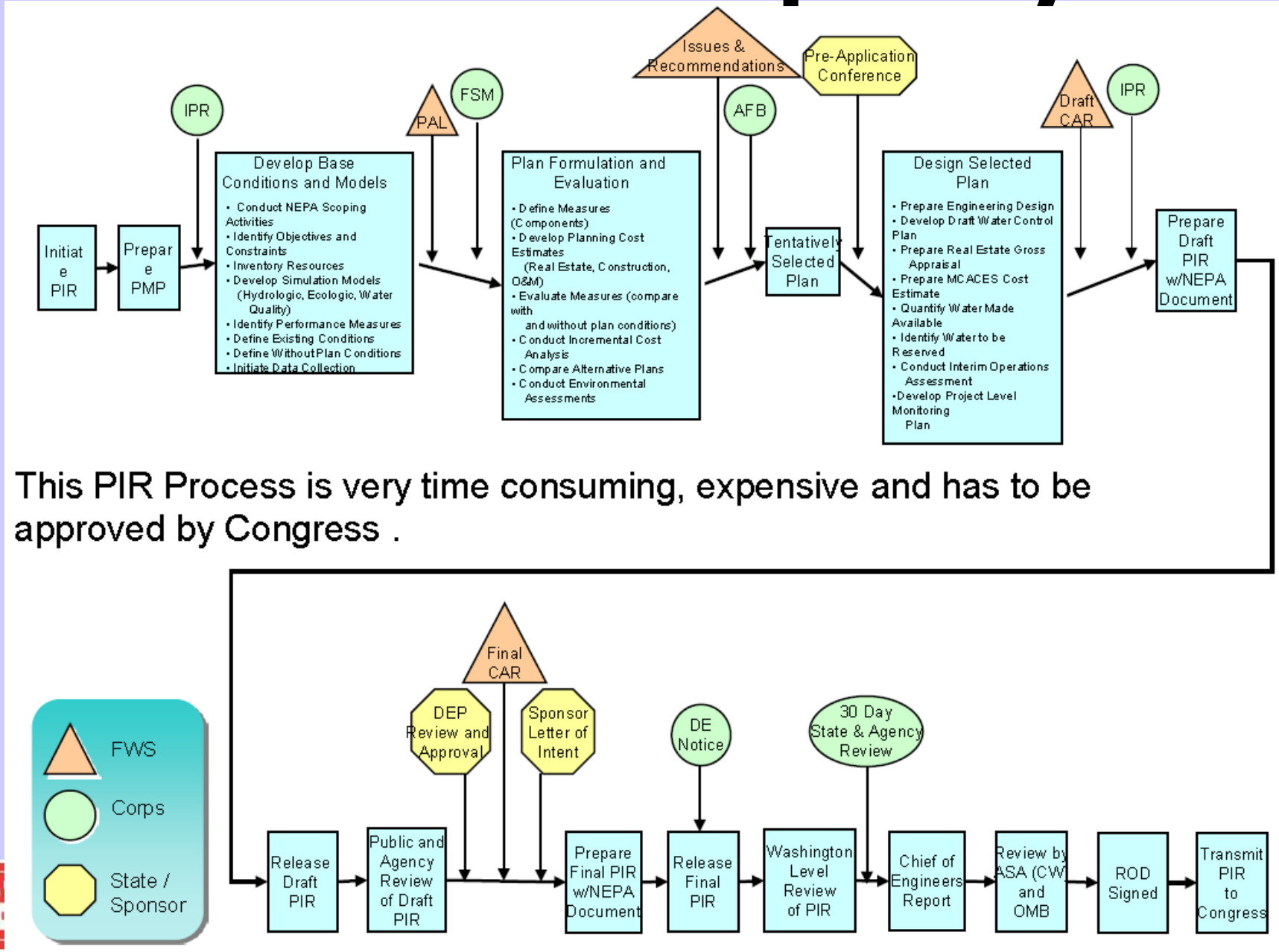
Projects are currently federal construction.

Projects are currently non-federal construction, subject to change based on further authorization and funding.

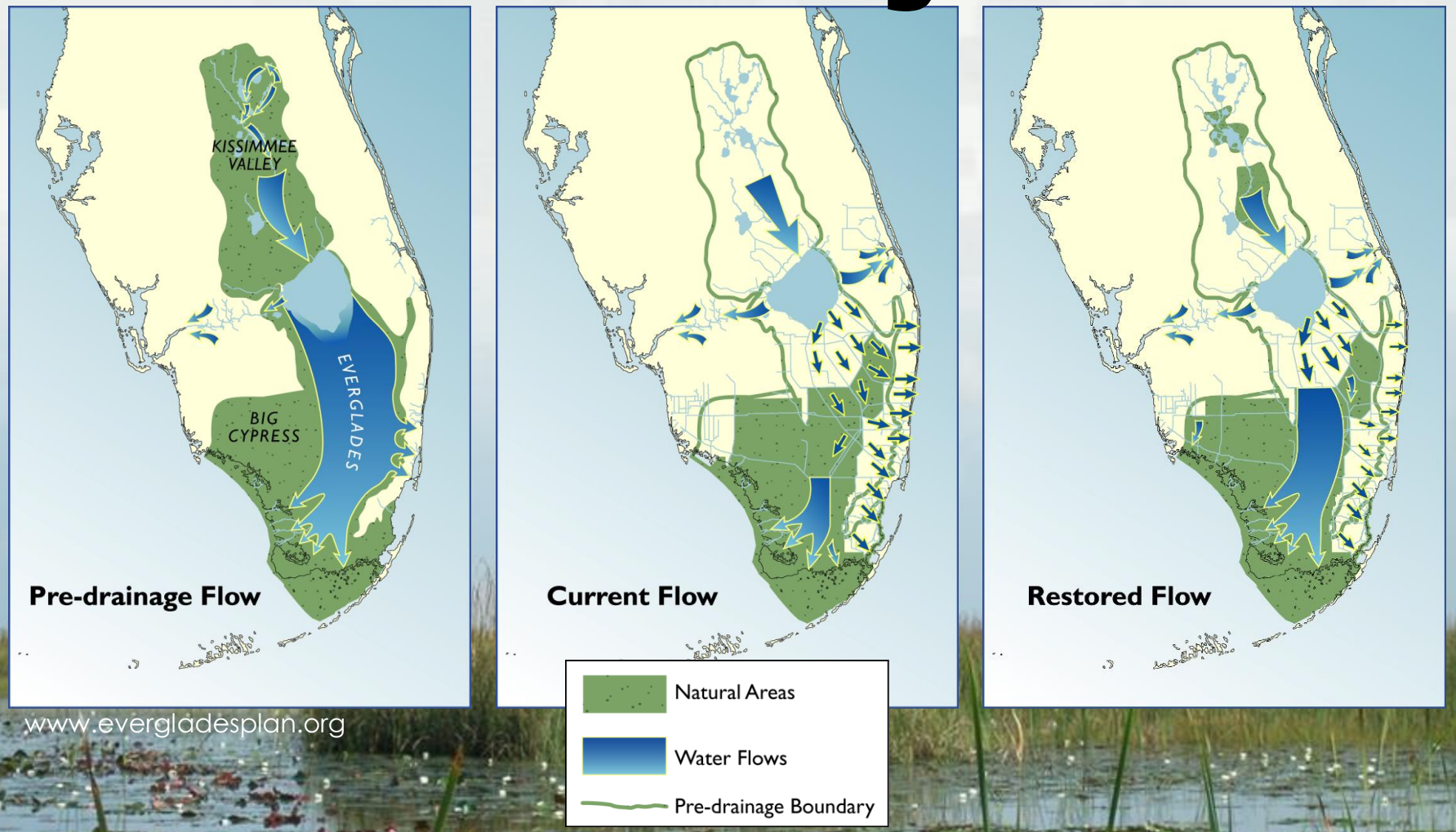
Construction has started on these projects.

October 2010

Process Complexity



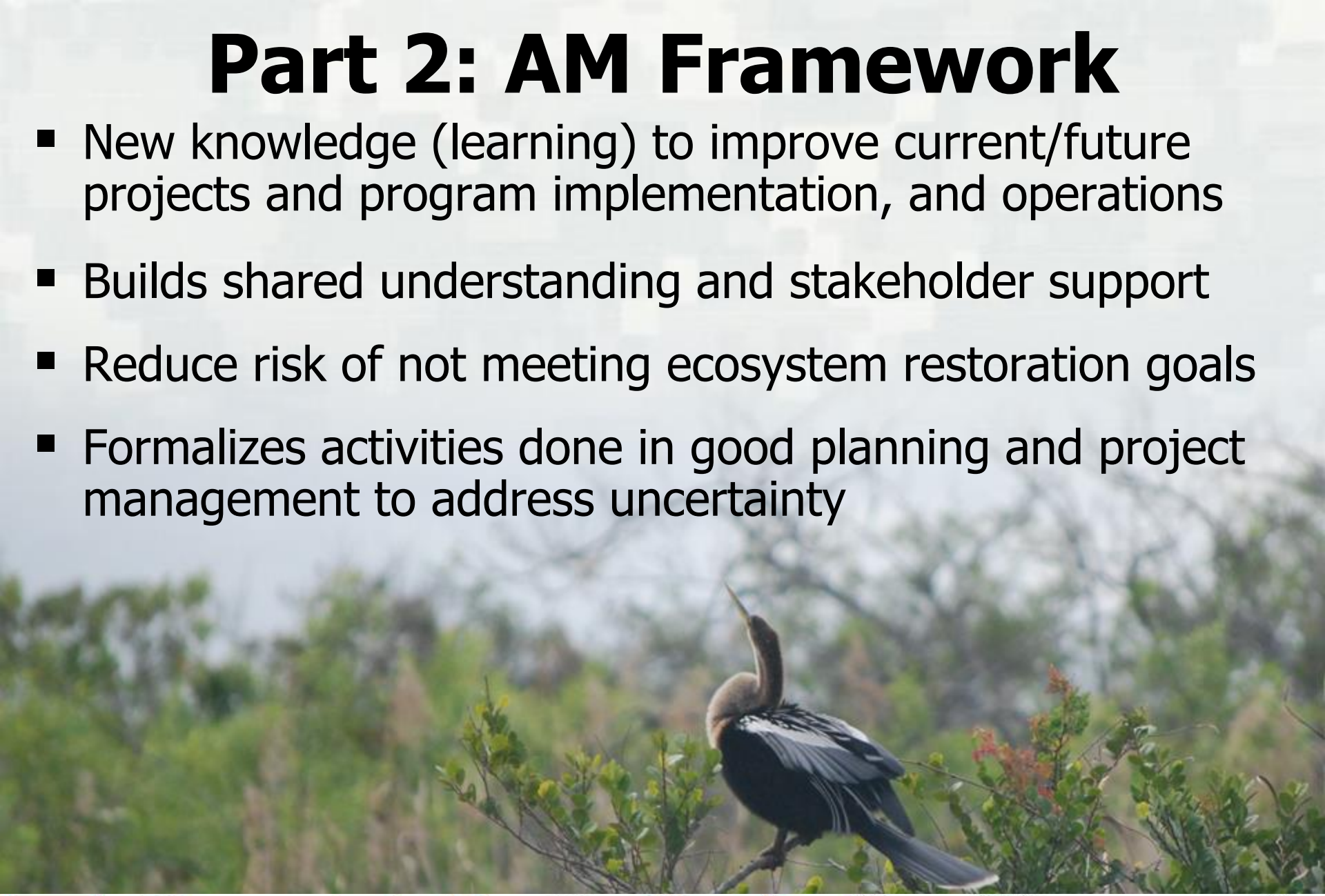
Given all this complexity, what is the goal?



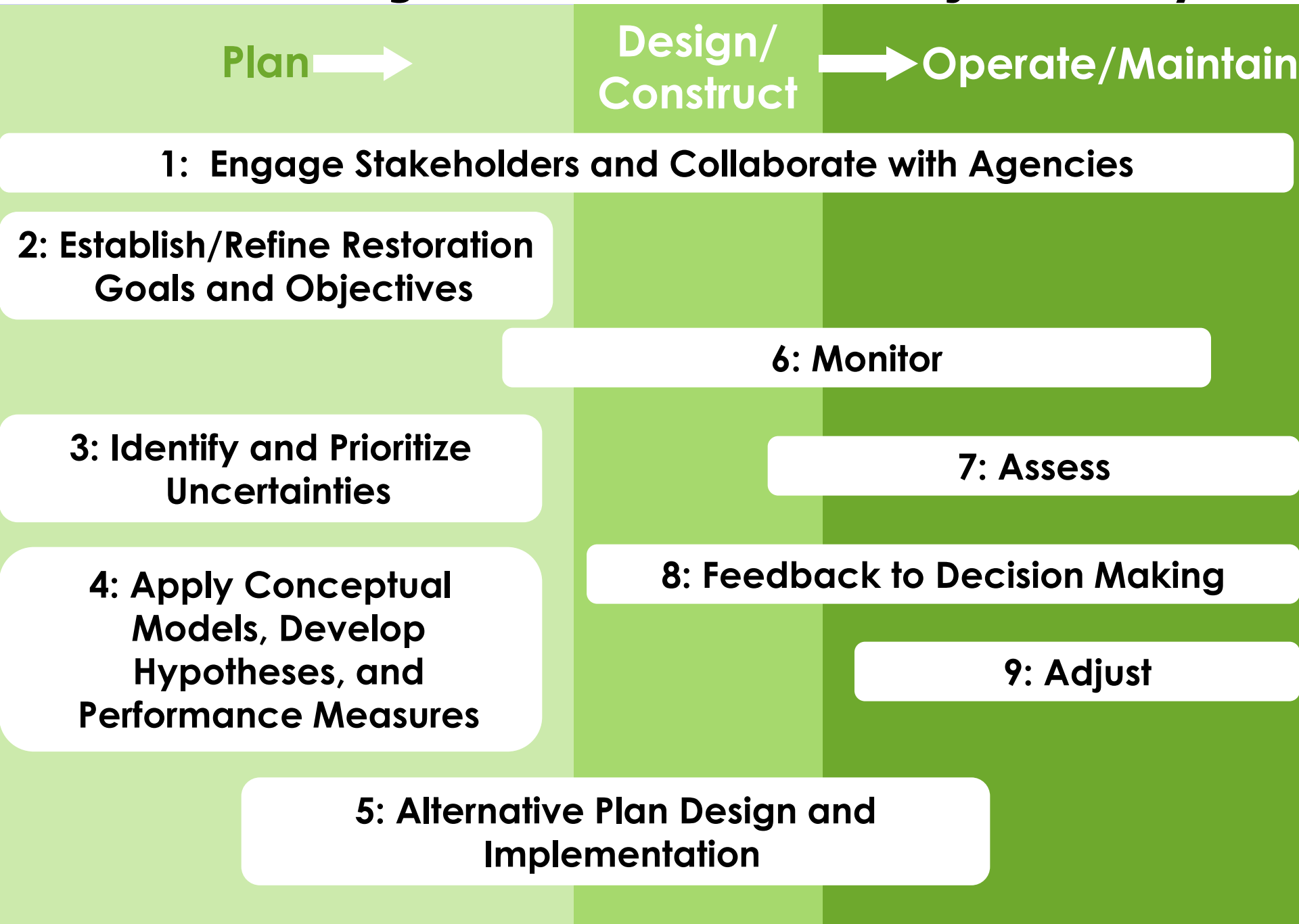
www.evergladesplan.org

Part 2: AM Framework

- New knowledge (learning) to improve current/future projects and program implementation, and operations
- Builds shared understanding and stakeholder support
- Reduce risk of not meeting ecosystem restoration goals
- Formalizes activities done in good planning and project management to address uncertainty

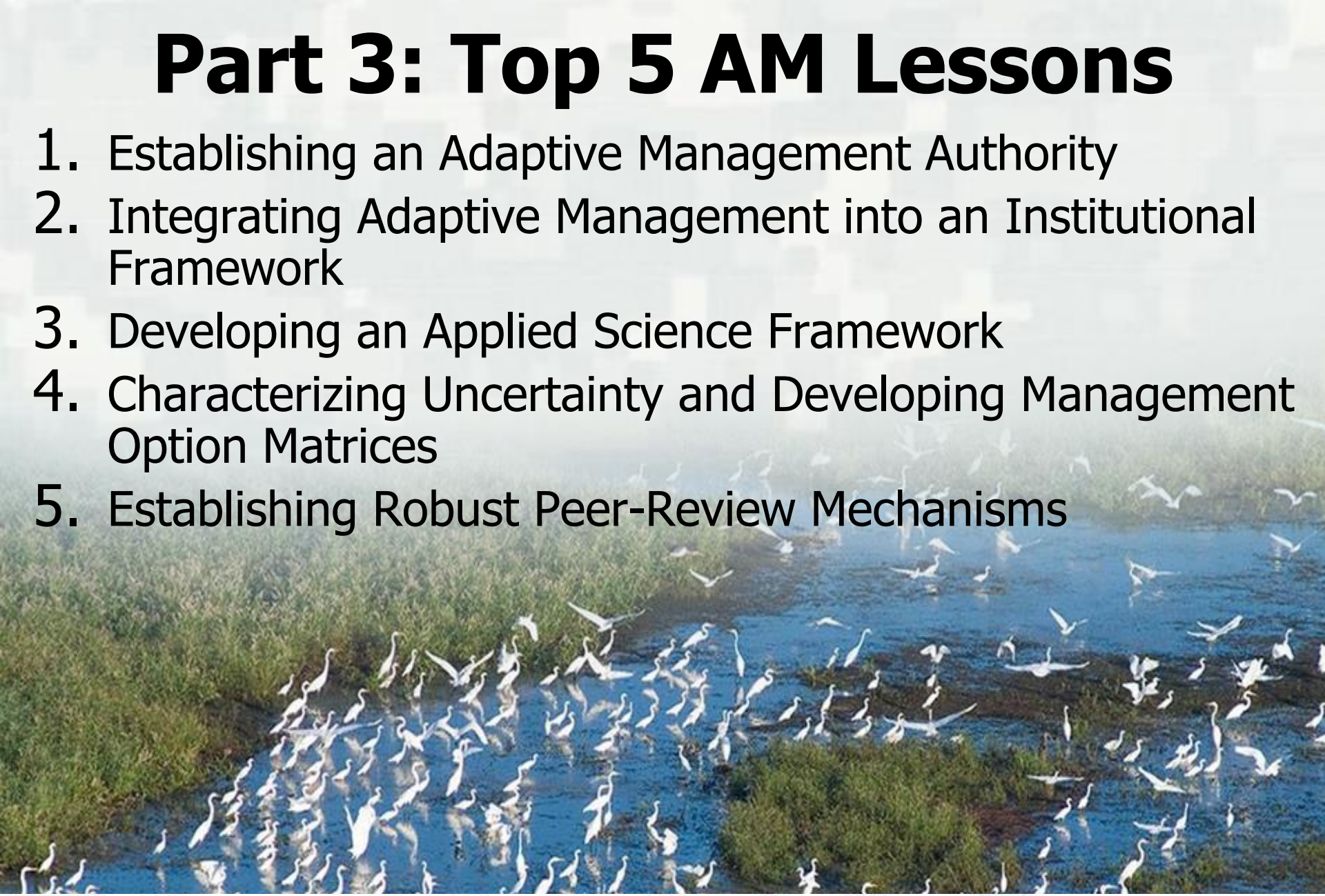


9 Activities Integrates AM into USACE Project-Life Cycle



Part 3: Top 5 AM Lessons

1. Establishing an Adaptive Management Authority
2. Integrating Adaptive Management into an Institutional Framework
3. Developing an Applied Science Framework
4. Characterizing Uncertainty and Developing Management Option Matrices
5. Establishing Robust Peer-Review Mechanisms



Lesson 1: Establish an Adaptive Management Authority

- Legislative and regulatory authority
  - Anchors commitment of agencies responsible
  - Develop, fund, and implement AM programs

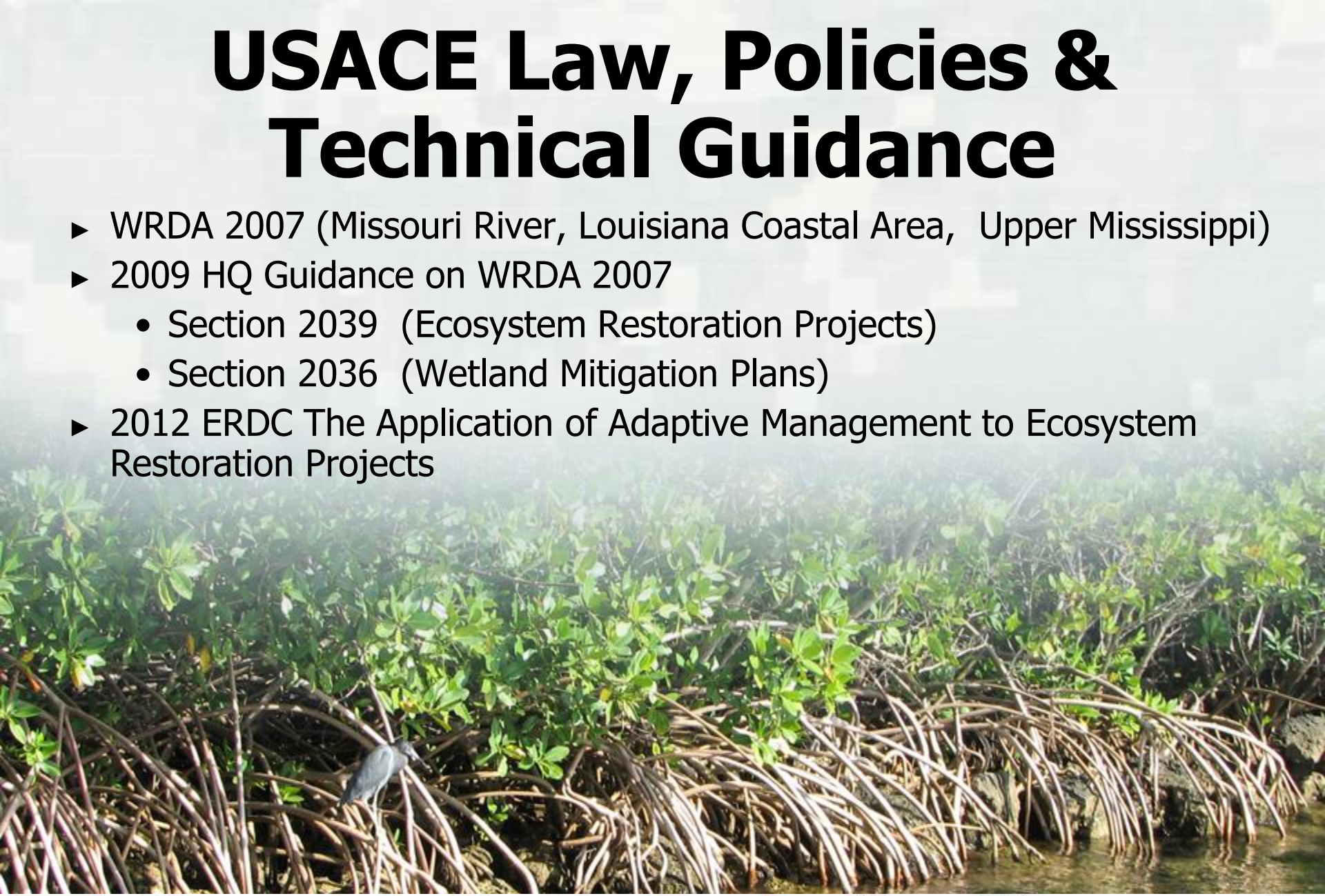
- Change happens
  - Without this commitment, development and implementation of AM disrupted

Foundational Elements of Everglades AM Program

- 1992-1999 Science Foundation for CERP Adaptive Management
- 2000 WRDA Authorized CERP and Adaptive Assessment and Monitoring
- 2003 CERP Programmatic Regulations required development of AM Program

USACE Law, Policies & Technical Guidance

- WRDA 2007 (Missouri River, Louisiana Coastal Area, Upper Mississippi)
- 2009 HQ Guidance on WRDA 2007
  - Section 2039 (Ecosystem Restoration Projects)
  - Section 2036 (Wetland Mitigation Plans)
- 2012 ERDC The Application of Adaptive Management to Ecosystem Restoration Projects



Other Technical Guidance

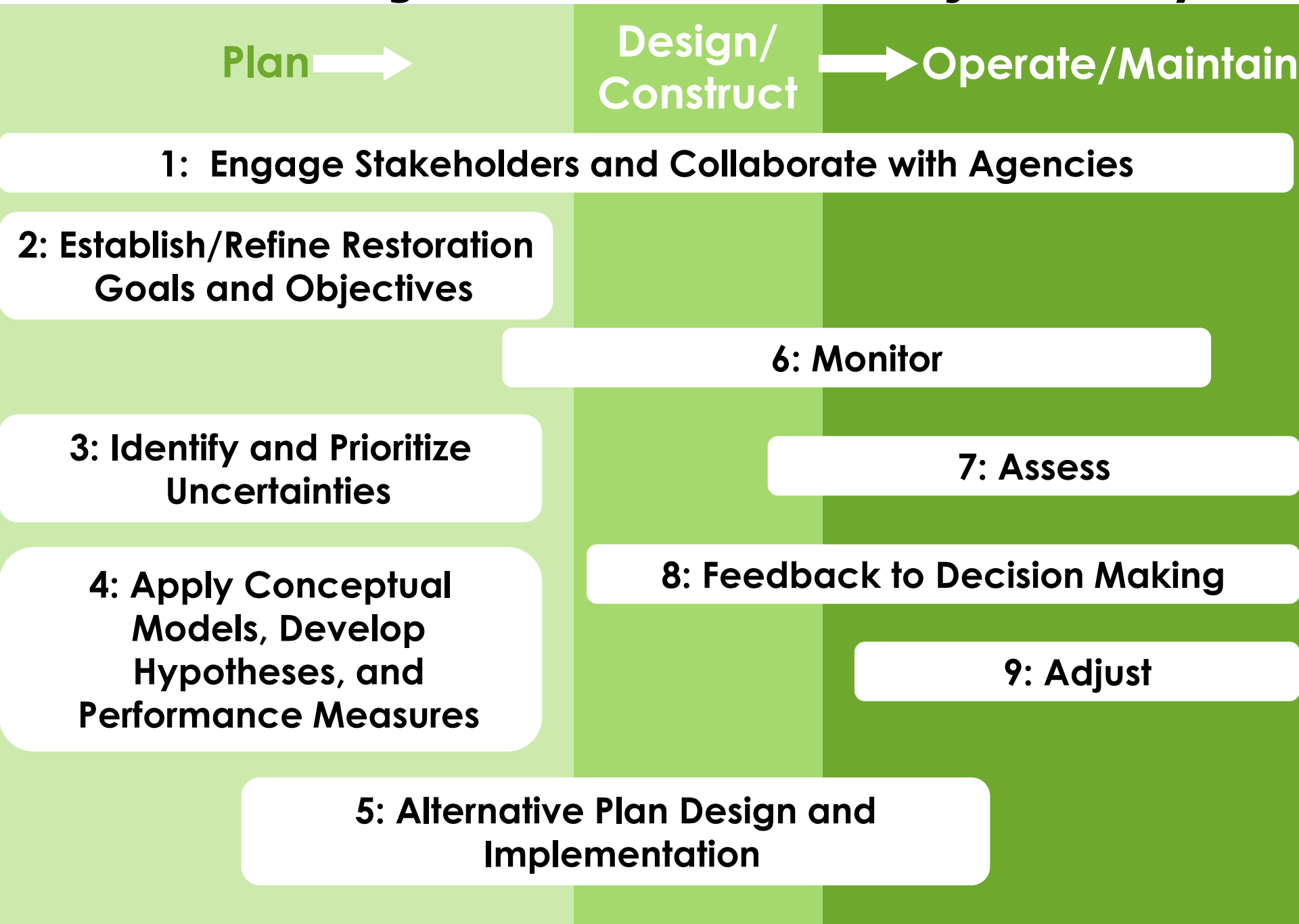
- National Research Council–
  - 2004 Adaptive Management for Water Resources Project Planning
  - Ecosystem-specific AM reviews
- 2009, 2012 Department of Interior AM Guides
- 2012 Council on Environmental Quality Adaptive Management Benchmarks for Climate Change

Lesson 2: Integrating AM into Institutional Authority

- Leverage existing institutional processes
  - Integration of adaptive management activities
  - Develop technical guidance (project and program)

- Ensure adaptive management activities are understood by various participants.
  - Roles and responsibilities are clearly articulated
  - Budgeting and scheduling of AM activities

9 Activities Integrates AM into USACE Project-Life Cycle



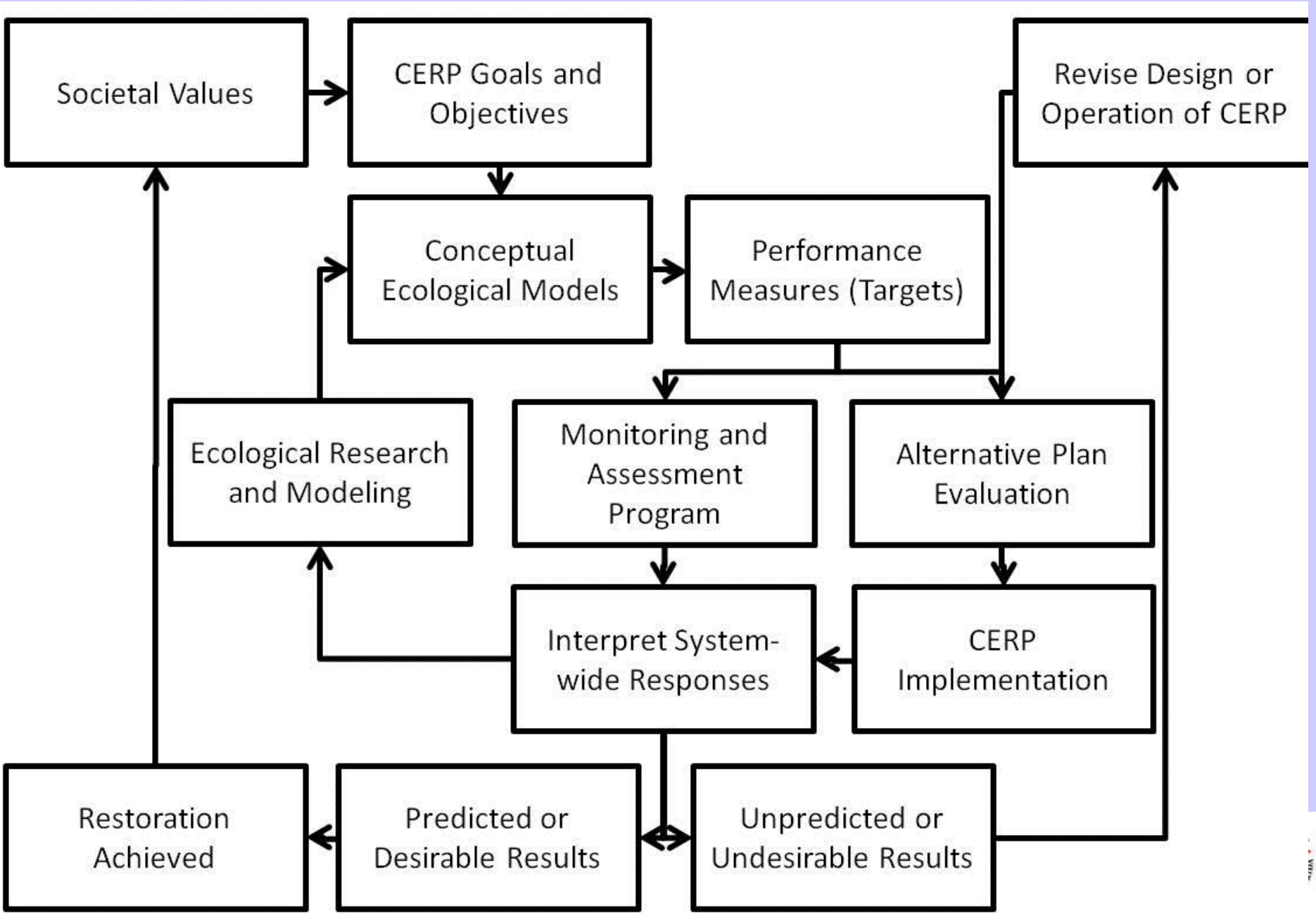
Project – Level AM Plans

Project	Life-Cycle Phase	AM Plan?	Adaptive Management Features
Aquifer Storage Recovery	Pilot Project Implemented	No*	**Testing Pilot Projects and Sensitivity Modeling**
Decomp of Water Conservation Area 3	Pilot Project, Planning , Construction	**Yes**	**Decomp Physical Model and PIR 1 AM Plan; Field Test**
C-111 Spreader Canal	Pilot Project and Chief's Report, Operations	No*	**Design Test and Operational Tests; Project Phasing**
Biscayne Bay Coastal Wetlands	Chief's Report	**Yes**	**Post Construction Contingency Options (MOM); Linked Monitoring**
Indian River Lagoon S	Construction	No	**Project Sequencing Adjustments**
Broward County Water Preserve Areas	Chief's Report, Design	**Yes**	**Operational Options and Design Improvements; Linked Monitoring**
Melaleuca	Implementation	No*	**AM Implementation Strategy; Some Monitoring**
Picayune Strand	Construction	No	**Monitoring and Assessment Plan with Recommendations to use AM**

Lesson 3: Developing an Applied Science Framework

- Organize scientific understanding of ecosystems
  - E.G., conceptual ecological models identify the ecological elements that best indicate the health of the system
  - Performance measures and restoration targets
- Foundation for a comprehensive monitoring program and adaptive assessment strategy
  - Links ecological indicators with management actions

Applied Science Framework



Lesson 4: Characterizing Uncertainty and Developing Management Option Matrices

Lesson 4

- Early identification of uncertainties
  - Informs initial restoration planning to prevent delays in project schedules
  - Identifies potential risks to meeting restoration goals
- As a result, hypothesis-driven strategies
  - Provide information for project planning, design, construction, and operations
  - Development of tools such as management options matrices (MOMs)
  - Link specific monitoring to options for adjustments if performance goals are not achieved

Management Option Matrix

Stressor Metric	Target	Management OPTION 1	Management OPTION 2	Program Management OPTION 3
Seepage Control	Maintain stages in Taylor Slough	Increase Frog Pond Stages	Increase Aerojet Canal Stages	System-wide/Regional issue (need additional water)
Salinity	Taylor River (0-9ppt); L. Madeira Bay (12-22 ppt) Terrapin Bay (12-26ppt)	Increase C-111 Stages	Adjust operations	System-wide/Regional issue (need additional water)
Seagrass Species and Area (SAV performance measure)	Seagrass Species and Area Increase Ruppia and Halodule species presence	Adjust operations to even salinity range transition and decrease salinities	Adjust Water Quality Source Control Measures	Targeted Seagrass Plantings
Wetland macro vegetation	Narrow mangrove fringe along shoreline; graminoid marsh inland from mangrove	Provide a more natural fire regime to promote and maintain graminoid marsh community	Physically remove forested wetland vegetation to promote growth and establishment of graminoids	

Lesson 5: Establishing Robust Peer-Review Mechanisms

- Independent external peer review of AM program and key AM activities
  - Feedback for maintaining/improving science
  - Highlight possible solutions; advice other systems
- Builds credibility among stakeholders
- Range of Peer-Review used for CERP AM
  - National Academy of Science
  - Peer-reviewed journals
  - Independent technical review panels

Peer Review Types

Type of Peer Review	Example	Purpose	References
National Academy of Science (Congress mandated)	Draft Monitoring and Assessment Plan (MAP)	Is MAP heading in right direction; help refine original MAP and distill hundreds of performance measures to manageable numbers	NRC (2003)
	MAP II – Assessment Strategy	Is the science assessment strategy effective at informing management decisions?	NRC (2007)
	CERP restoration progress overall	What is the status of CERP implementation and how effective is the science-management interface?	NRC (2007, 2008, 2011, 2012)
	Review of the overall CERP Adaptive Management Program	Peer reviews of the CERP Adaptive Management program by the National Academy of Science	NRC (2008,2010)
Type of Peer Review	**Example**	**Purpose**	**References**
Traditional Peer-Reviewed Journals	Conceptual Models across south Florida ecosystems	Review of a suite of conceptual ecological models used a framework for implementing MAP monitoring and assessment.	Special Issue of *Wetlands* (Vol 25, No 4, 2005)
	Indicators for Everglades Restoration	Review of a suite of system-wide ecological indicators for communicating to managers	Special Issue *Ecological Indicators* (2009; 9/6S)

Peer Review Types

Type of Peer Review	Example	Purpose	References
Independent Technical Review Panel	Avian Ecology Workshop	Review information on four species of concern and to provide scientific clarity that would allow managers to move forward with restoration in a multi-species framework.	SEI (2007)
	Water Quality Modeling for Restoration Planning	Independent technical review panel reviewed landscape scale water quality model to draw inferences about appropriate use in restoration planning	Mitsch et al. (2007)
	Hydrology performance measures for Restoration Planning	Review what is known about the ecological consequences of extreme depth events and recommend an approach to evaluating such effects for restoration planning	Bedford et al. (2012)
	Capturing Modeling Uncertainty in Restoration Planning	Development of uncertainty analysis recommendations for landscape scale hydrological modeling for restoration planning	Lall et al. (2002)
	CERP Adaptive Management Integration Guide	Adaptive management experts from other restoration programs independently reviewed the CERP Adaptive Management Integration Guide prior to finalization	CERP Adaptive Management Expert Panel report (2010)

Top 5 AM Lessons

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Look for Special Issue of *Ecology and Society* on AM

? Questions ?