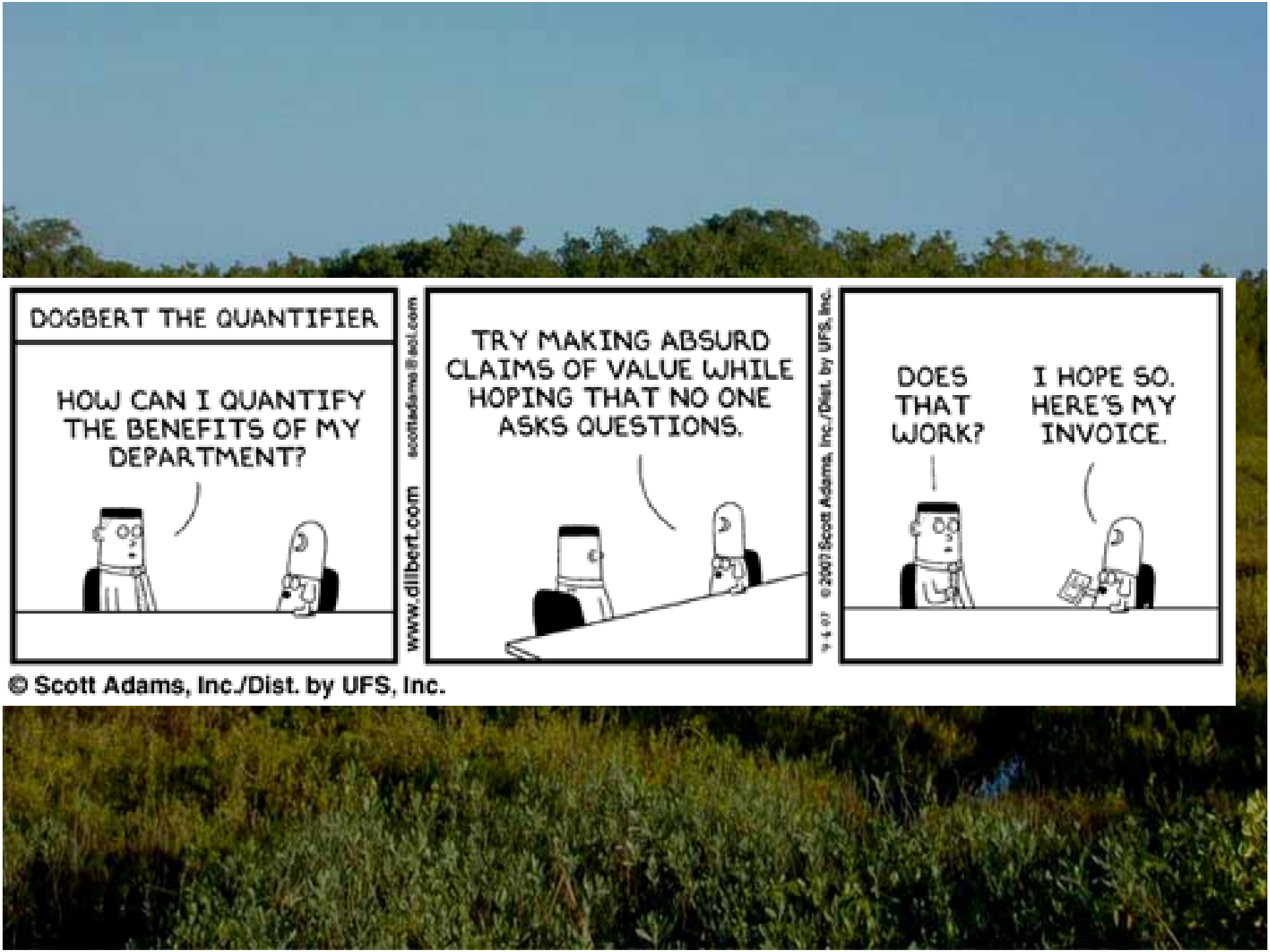
Overview of the
CERP Adaptive Management
Program
A Management Approach for
Achieving Restoration Success
July 2008
the journey to restore
America's Everglades

"…treat management as an adaptive learning process where management activities themselves are viewed as the primary tools for experimentation..."
(C.J. Walters 1986)
"…plans…designed from the outset to test clearly formulated hypotheses about…the system being changed…"
(Lee 1993)



© Scott Adams, Inc./Dist. by UFS, Inc.

Overview

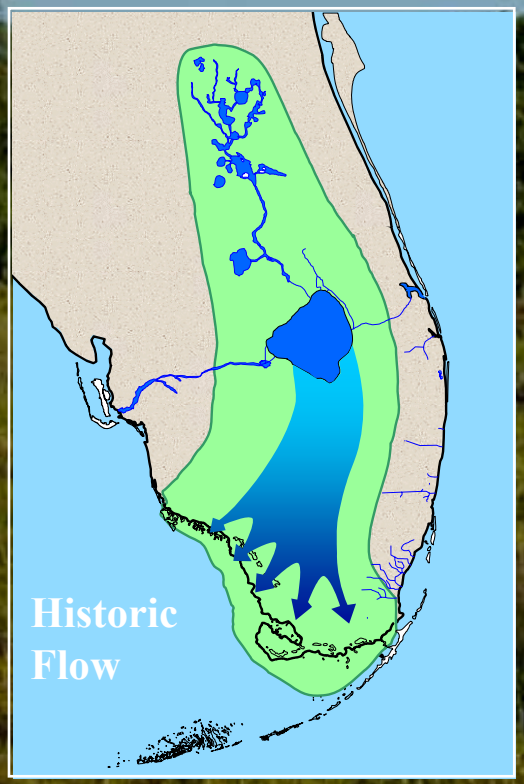
- Describing AM
- Background and History
- Benefits of AM
- Determining When to Apply AM
- Applying AM to CERP (project and program-level)
- Next Steps and challenges

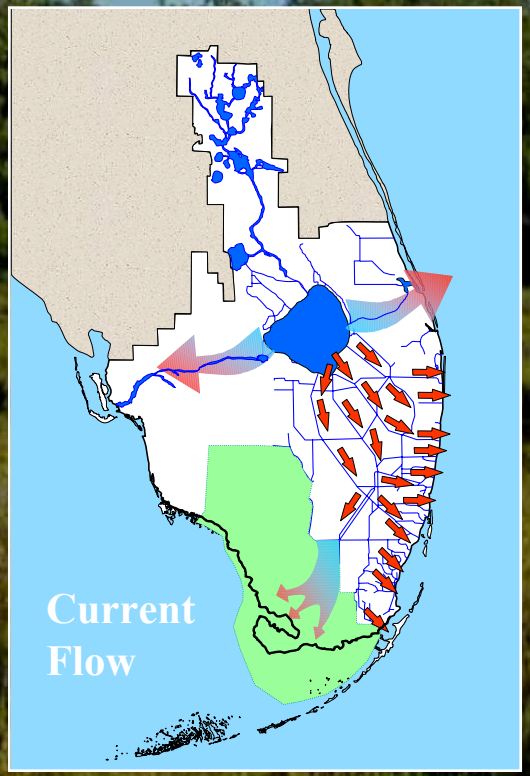
Habitat Restoration and Ecosystem Management

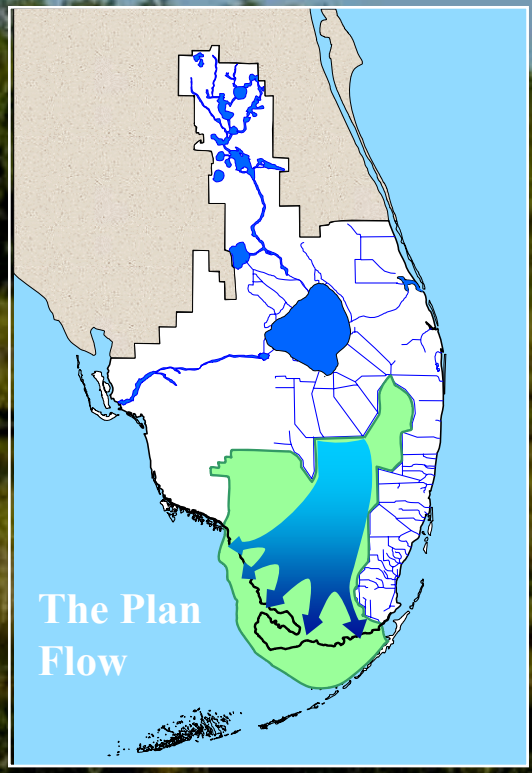
Restore natural hydrology quality, quantity, timing, distribution

Restore and maintain biodiversity of the natural communities

WATER FLOW PATTERNS

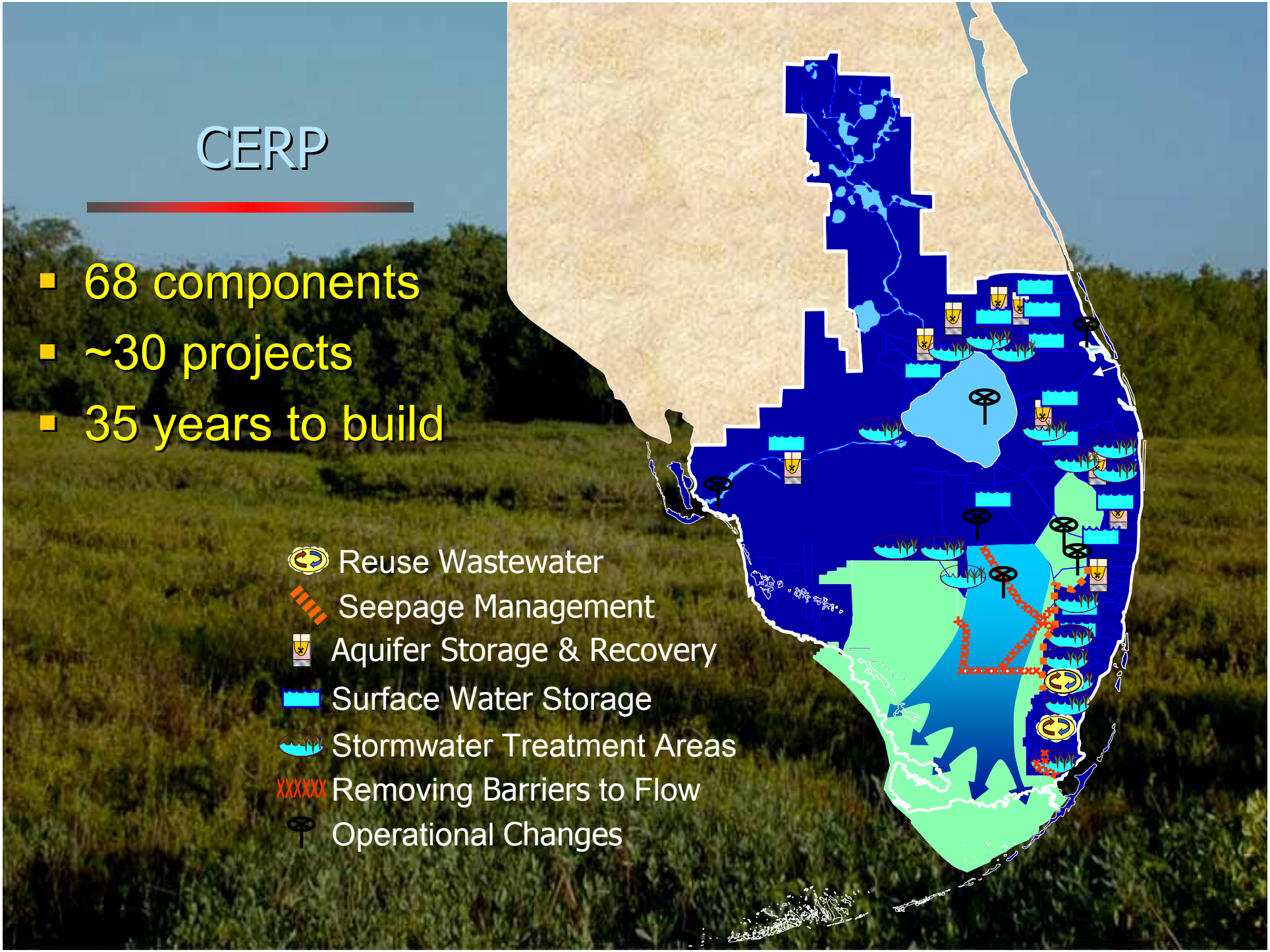






CERP

- 68 components
- ~30 projects
- 35 years to build



Intent of Adaptive Management

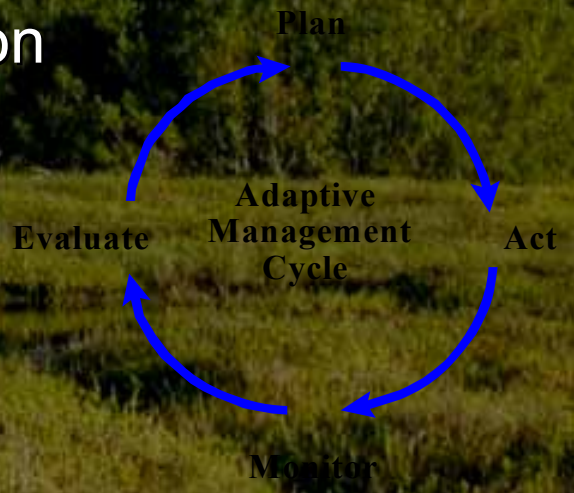
- To make learning part of the action, i.e., "*a structured process of learning by doing*"
  - – and using the results to adjust the action
    - e.g., North American waterfowl management; fisheries in Australia, British Columbia
    - see WEB Journal: Conservation Ecology

What is Adaptive Management?

- Alternative management approach to achieve success
- Formal process to enable informed decision-making
- Ability to act confidently in the face of uncertainty
- Stakeholder engagement and collaboration
- “Learning by Doing” NOT “Trial and Error”

History

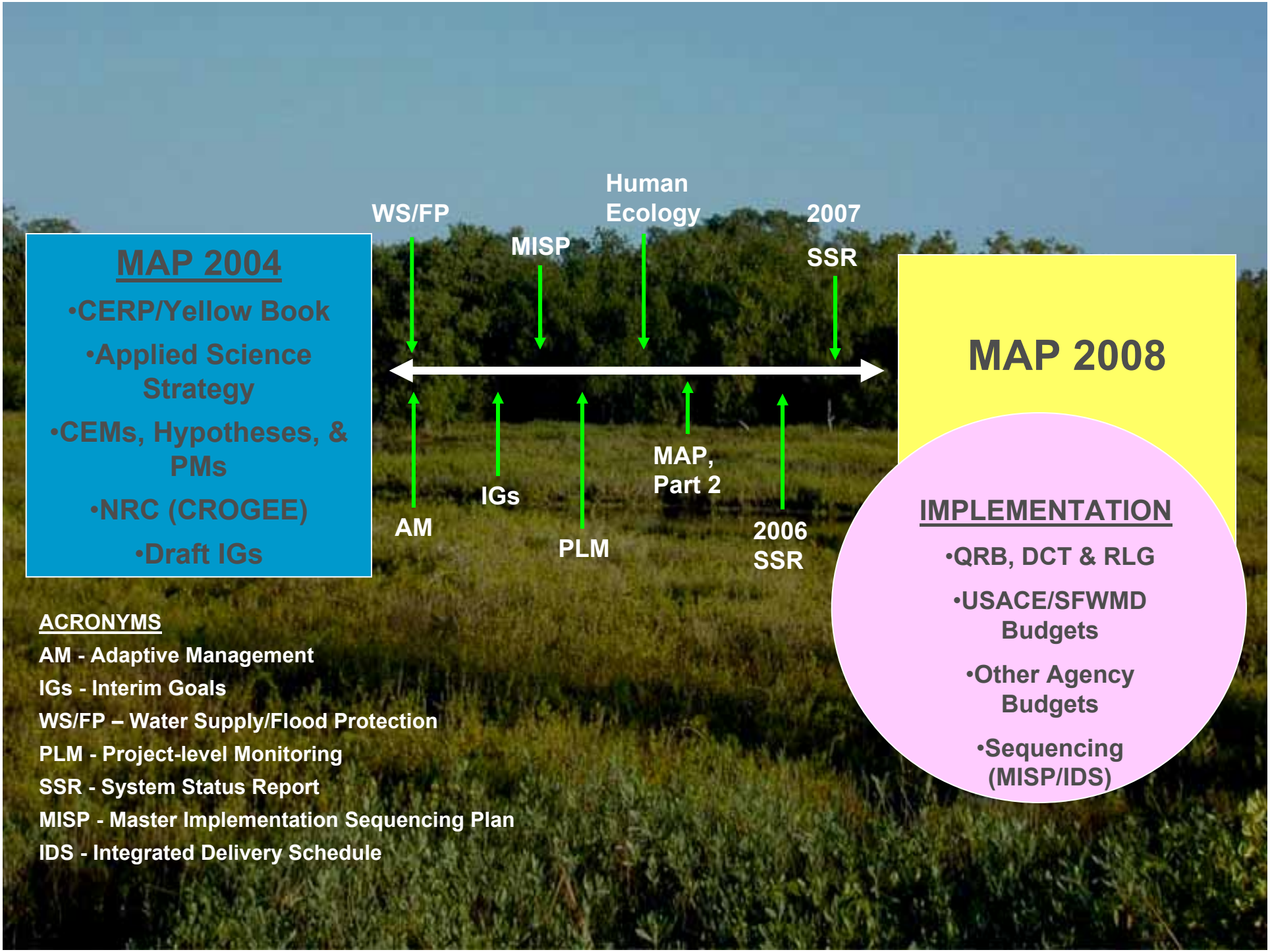
- Adaptive management
  - poorly understood concept
  - haphazard or inconclusive application
  - regulatory constraints (e.g., *NEPA*)
  - institutional resistance



- Monitoring
  - good research but wrong question
  - lack of statistical rigor and quality control
  - inconsistency in methods and data collection
  - no (or weak) link to decision making

CERP AM Background and History

- December 2000 - Congress Authorized AM for CERP
- November 2003 - CERP Pro Regs required development of AM program
- January 2004 - CERP AM Monitoring and Assessment Plan
- April 2006 - CERP AM Strategy Published by RECOVER
- August 2006 - NRC endorses the CERP AM program
- June 27 2008 - Complete Draft CERP AM Guidance Manual


MAP 2004
•CERP/Yellow Book
•Applied Science Strategy
•CEMs, Hypotheses, & PMs
•NRC (CROGEE)
•Draft IGs
WS/FP
MISP
Human Ecology
2007 SSR
AM
IGs
PLM
MAP, Part 2
2006 SSR
MAP 2008
IMPLEMENTATION
•QRB, DCT & RLG
•USACE/SFWMD Budgets
•Other Agency Budgets
•Sequencing (MISP/IDS)
ACRONYMS
AM - Adaptive Management
IGs - Interim Goals
WS/FP – Water Supply/Flood Protection
PLM - Project-level Monitoring
SSR - System Status Report
MISP - Master Implementation Sequencing Plan
IDS - Integrated Delivery Schedule

Proposed Implementation Process of MAP 2008

MAP Module Refinement

RECOVER-wide Perspective

Management Perspectives

Science Influences

MAP 2008 "Workshop Series"

MAP 2008

MAP Monitoring Component Refinement

Management Influences

IG update

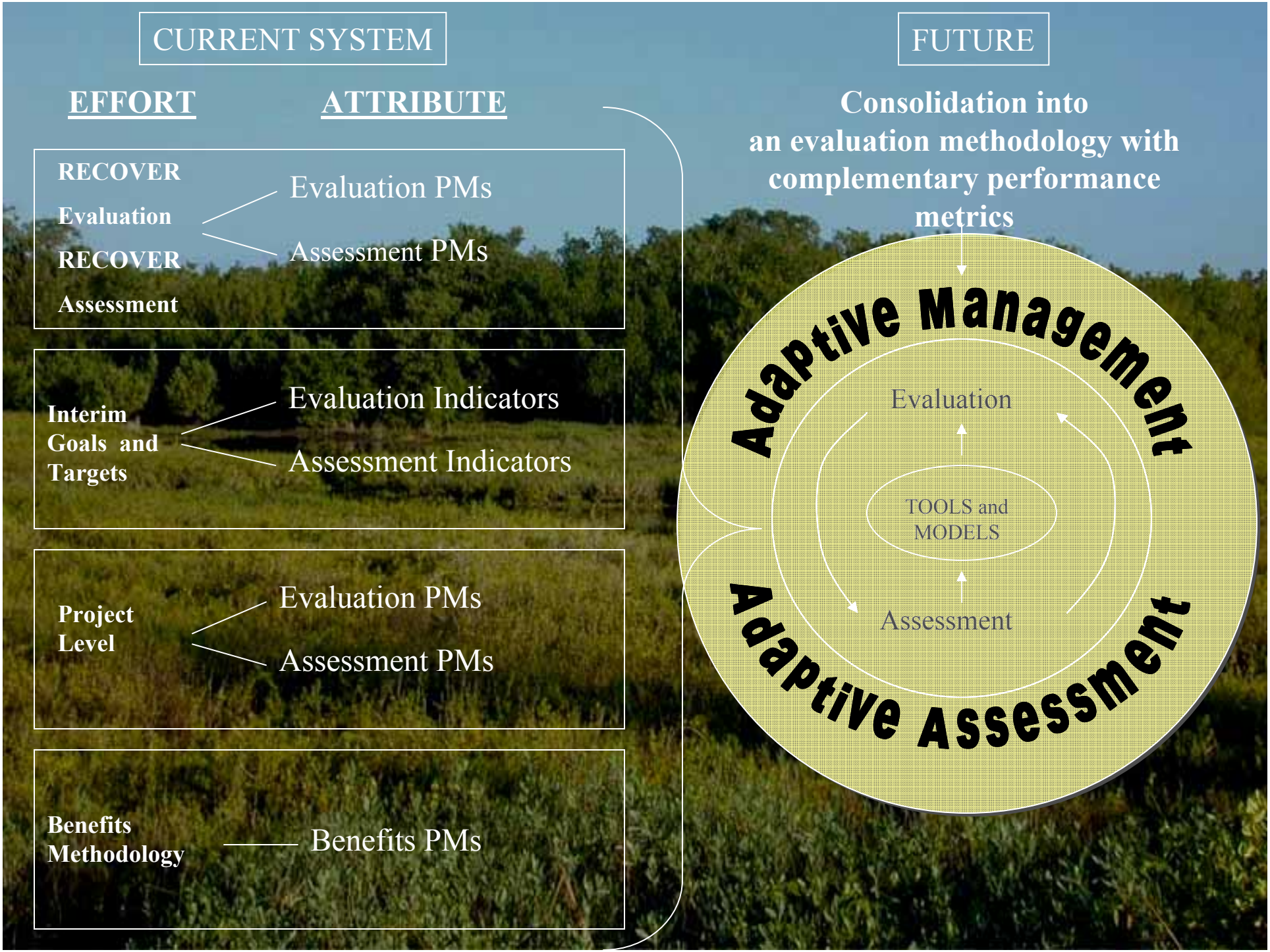
Update inventory of all monitoring

PM refinement

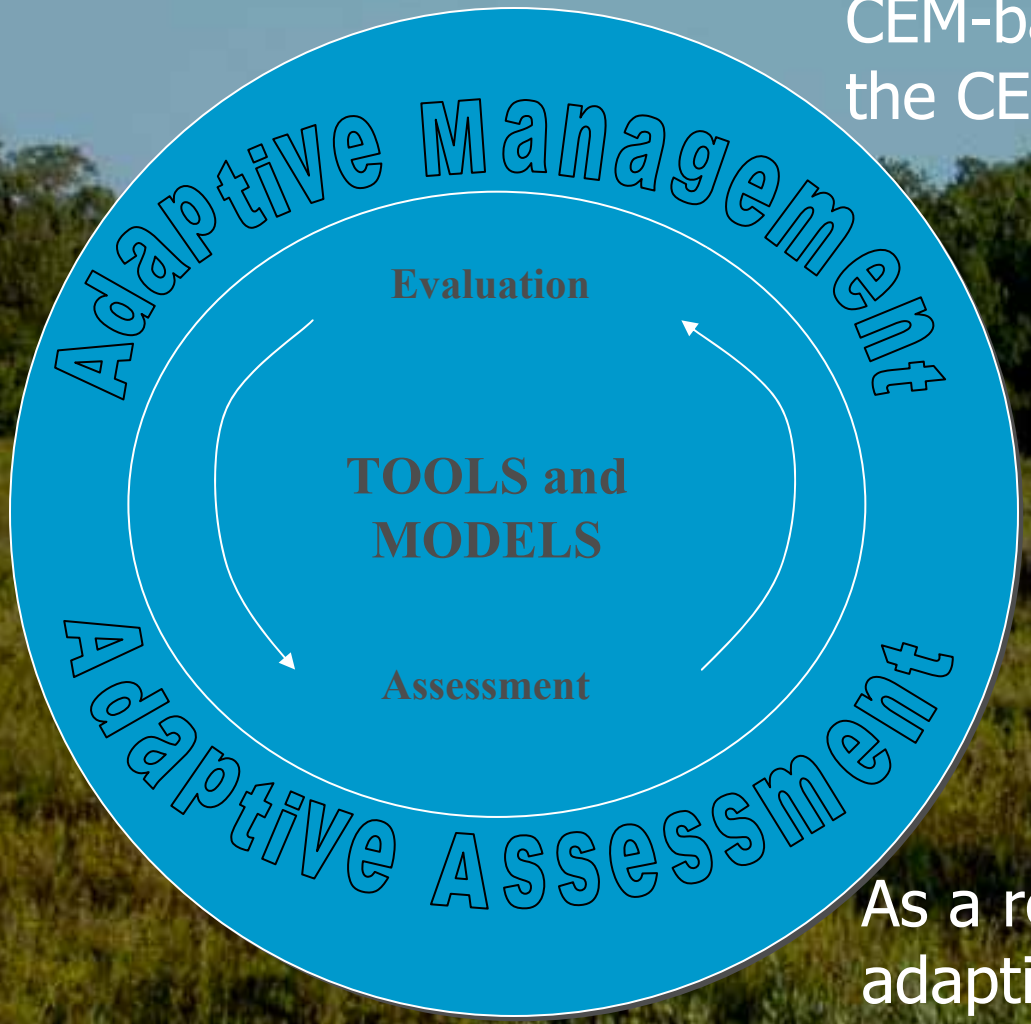
Benefits of AM

- Improved probability of restoration success
- Addresses decision-limiting questions (uncertainty)
- A forum for dialogue between scientists and managers
- Ability to adjust restoration implementation
- Long-term collaboration with stakeholders

PLANNING
MUCH WORK REMAINS TO BE DONE BEFORE WE CAN ANNOUNCE
OUR TOTAL FAILURE TO MAKE ANY PROGRESS.
www.despair.com


CURRENT SYSTEM
FUTURE
EFFORT
ATTRIBUTE
RECOVER Evaluation
RECOVER Assessment
Evaluation PMs
Assessment PMs
Interim Goals and Targets
Evaluation Indicators
Assessment Indicators
Project Level
Evaluation PMs
Assessment PMs
Benefits Methodology
Benefits PMs
Consolidation into an evaluation methodology with complementary performance metrics
Adaptive Management
Evaluation
TOOLS and MODELS
Assessment
Adaptive Assessment

PROPOSAL



Develop an Evaluation Methodology using the CEM-based attributes that the CERP will monitor.

Build needed tools with MAP results – if already developed, use MAP results to refine tools.

As we monitor, we'll improve our ability to make ecological predictions.

As a result, when it's time to adaptively manage, we'll have a higher probability of **planning appropriately and reaching success**!

Example: Testing Sedimentation from Road Development/Maintenance

Mgmt Objective	Test (and monitoring) Hypothesis	Outcome	Data	Management Trigger	Response
Minimize sediment delivery to streams (from roads)	H_0: Sediment delivery does not differ from (model) predictions (H_1: it does differ)	Estimate expected amount of sediment delivery (from action)	Measure in tons (of sediment) per year (applying sampling design)	Net increase does not exceed 49% (if exceeds 49%)	Revise practices; Modify rules

(Plum Creek HCP: www.fws.gov/r1srbo/SRBO)

Proposed Adaptive Management Plan for Oysters

Stressor metric	Target	Management Action OPTION 1	Management Action OPTION 2	Management Action OPTION 3
Salinity	Salinity range of 10-25 ppt	Change operations to meet flows		
Substrate	Acres of suitable habitat	Add oyster shell cultch	Try different substrate (e.g., concrete)	Dredge muck
Recruitment	Presence/absence adults and larvae	Stock larvae	Stock adults	Change operations to avoid too much or too little flow in key months
Disease	Elimination	Operate flows to maintain salinity below maximum threshold	Lower salinity threshold and adjust operations accordingly	
Juvenile growth and mortality	Attain natural levels of growth and mortality	If flow/salinity events are affecting growth or mortality, adjust operations to eliminate or minimize events	Adjust flows to attain salinities similar to creeks where oyster growth is optimal	Excessive predation may require salinity adjustments through operations

Project Level AM Application

- **AM is not appropriate for all projects.**
- **AM should be applied if there is uncertainty about:**
  - (1) natural system structure and function;
  - (2) The most effective design and operation; and
  - (3) The desired endpoints
- **Use AM if decision-making is limited by these issues**
- **Projects can evaluate benefits of AM vs. Costs and Challenges**

Determining When To Apply AM (Program-Level)

- **CERP has applied AM principles stated in the CERP AM Strategy (2006)**
- **The following program activities apply AM for CERP:**
  - Yellow Book
  - MAP – Conceptual Modeling and Hypotheses
  - Performance Measures and Interim Goals
  - Future Assessment Report
  - System Operating Manual
  - Integrated Delivery Schedule
  - Comprehensive Plan Modification Report

Nine Activities to Apply AM for CERP

Plan Formulation | Design/Construction | Operations

Activity 1: *Engage Stakeholders and Collaborate with Agencies*

Activity 2: *Establish or Verify Program Goals and Objectives*

Activity 3: *Identify and Prioritize Unanswered Questions*

Activity 4: *Use Conceptual Models, Hypotheses, and Performance Measures*

Activity 5: *AM Integration into Restoration Plan*

Activity 6: *Monitoring*

Activity 7: *Assessment*

Activity 8: *Decision-Making*

Activity 9: *Implementation and Refinement*

CABLE
CROSSING
DO NOT ANCHOR
WITHIN 50 FEET

STAKEHOLDERS

- NGOs
- Decision Makers (agency and others)
- End users

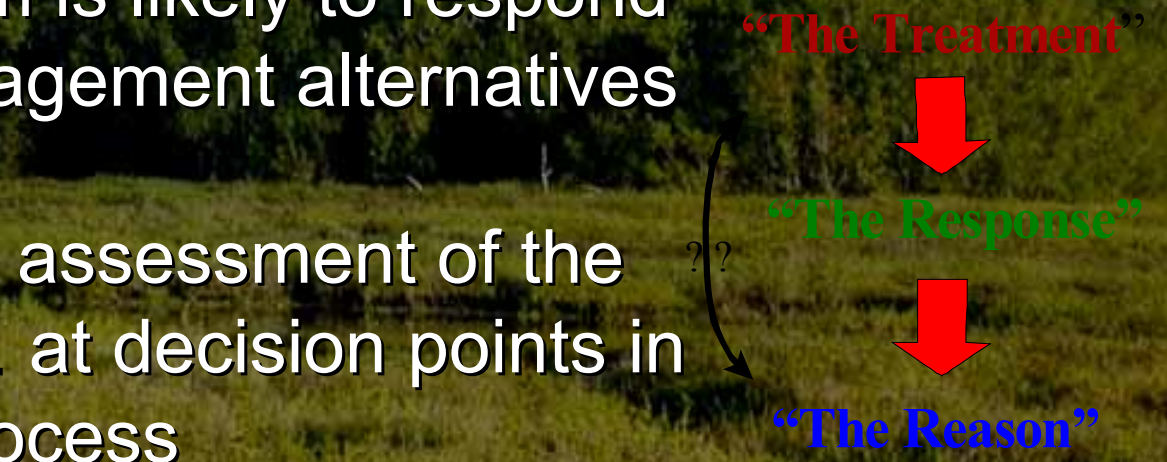
Why Monitor?

- Detect changes in:
  - species abundance, condition, population structure
  - habitat amount, condition
  - management actions
- Support management needs (primary reason)
  - provide early warning
  - measure species response to mgmt or other factors
  - provide basis for adjusting/modifying the action
- Other reasons:
  - improve information base – most commonly used

Role in Adaptive Management

- Provide knowledge of the manner in which the system is likely to respond to possible management alternatives
- Provide periodic assessment of the system's state… at decision points in management process
- Provide insights into cause-effect relations between stressors and responses

How will you ever know?



Addressing Uncertainty

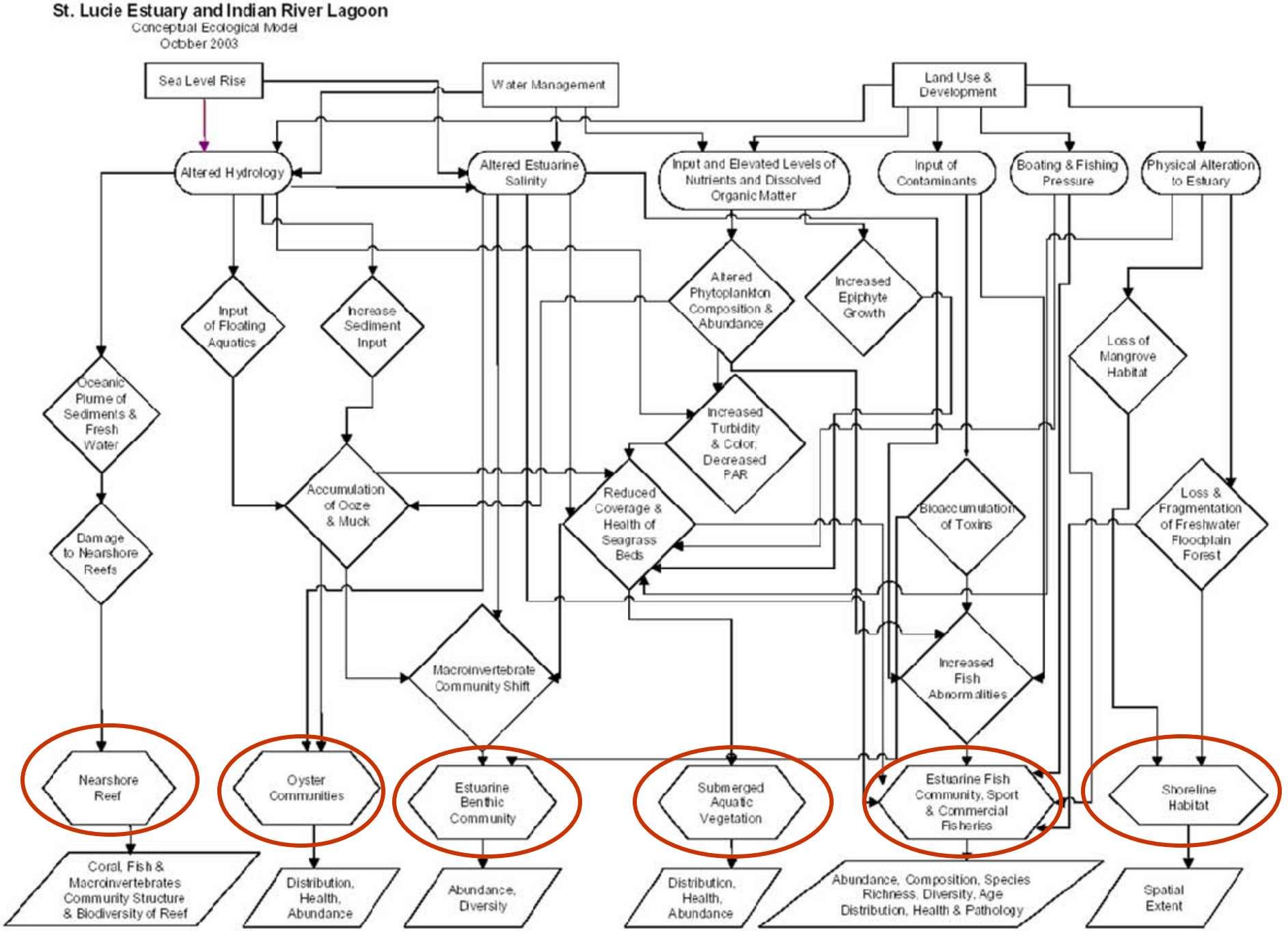
- AM means identifying and acknowledging uncertainty
  - recognize uncertainty as an attribute of management
  - use management (and monitoring) as a tool to reduce uncertainty

Determining What to Monitor

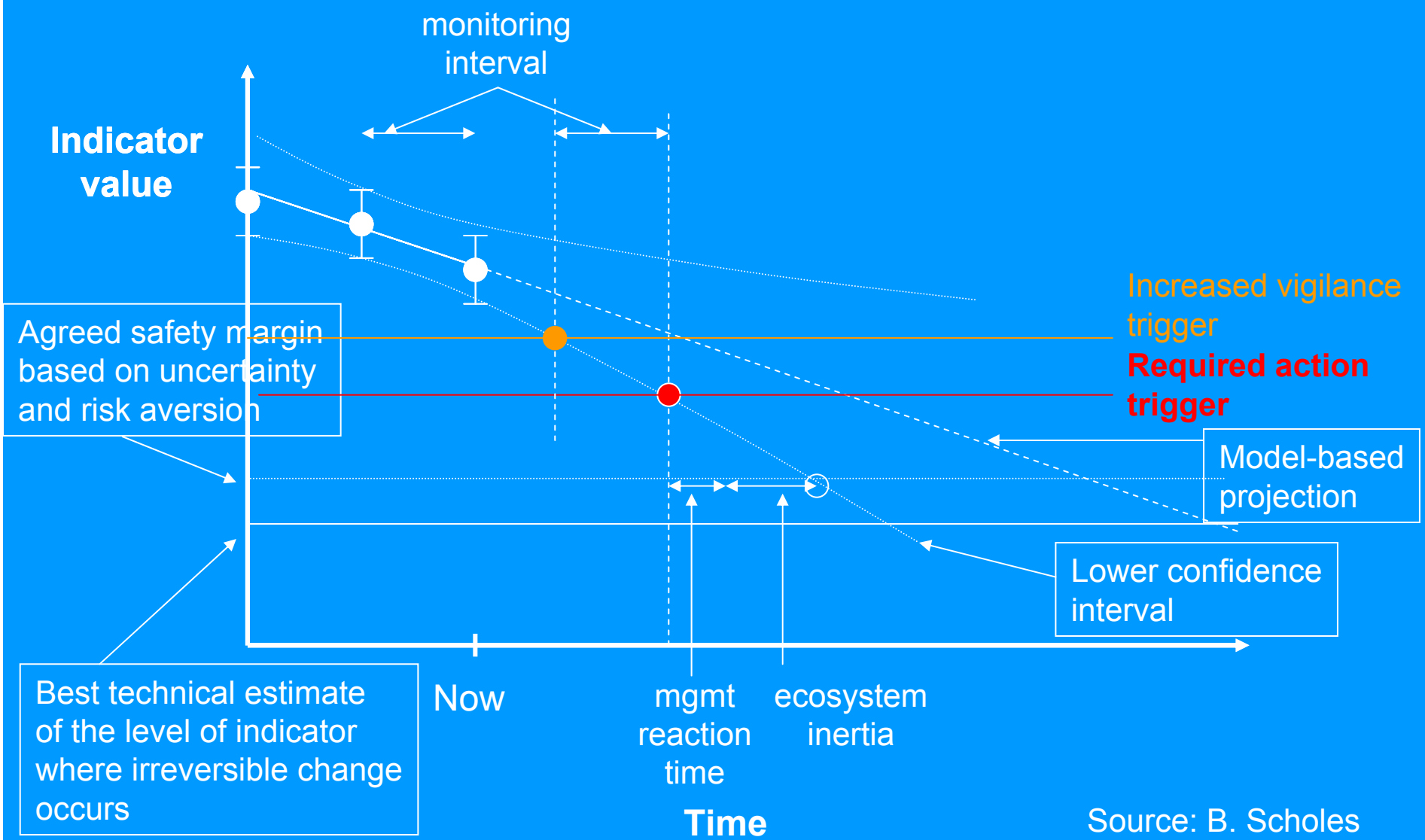
- What's your information need?
  - to improve your knowledge (baseline information)
  - to detect change in status or trends (species, habitat, threats)
  - to identify how the action was implemented
  - to understand effects of an action (on species or habitat)
  - to identify relations between observed trend and action
- Important to the type of monitoring needed
  - does your need relate to the management objectives?
  - can you quantify (what you need)? measure?
  - can you link results to possible decisions?

DECISION MAKING

- Annual Meetings
  - Interdisciplinary
  - Gray Beards
- MCDA or other methods


St. Lucie Estuary and Indian River Lagoon
Conceptual Ecological Model
October 2003
Sea Level Rise
Water Management
Land Use & Development
Altered Hydrology
Altered Estuarine Salinity
Input and Elevated Levels of Nutrients and Dissolved Organic Matter
Input of Contaminants
Boating & Fishing Pressure
Physical Alteration to Estuary
Input of Floating Aquatics
Increase Sediment Input
Altered Phytoplankton Composition & Abundance
Increased Epiphyte Growth
Loss of Mangrove Habitat
Oceanic Plume of Sediments & Fresh Water
Increased Turbidity & Color, Decreased PAR
Accumulation of Ooze & Muck
Reduced Coverage & Health of Seagrass Beds
Bioaccumulation of Toxins
Loss & Fragmentation of Freshwater Floodplain Forest
Damage to Nearshore Reefs
Macroinvertebrate Community Shift
Increased Fish Abnormalities
Nearshore Reef
Oyster Communities
Estuarine Benthic Community
Submerged Aquatic Vegetation
Estuarine Fish Community, Sport & Commercial Fisheries
Shoreline Habitat
Coral, Fish & Macroinvertebrates Community Structure & Biodiversity of Reef
Distribution, Health, Abundance
Abundance, Diversity
Distribution, Health, Abundance
Abundance, Composition, Species Richness, Diversity, Age Distribution, Health & Pathology
Spatial Extent

Logic for setting 'thresholds'



Source: B. Scholes

Next Steps

- Finish Version 2.2 of AM Guidance Manual
- AM Briefings and Training
- Explore Options for Project-level AM Application
- Continue to Integrate AM Into Program Activities

Future Challenges

- Re-authorization of AM program
  - Keeping the monitoring money flowing
  - Linking the scientists and the project planners
- Data management for the assessment
- Building the decision methodology
- AM champion
- Completing ecological models for assessment and evaluation
  - Relating this to Management measures
- IAR and planning at a reasonable level

Questions?

- **For more information, please contact:**

- **AT Chairs:**
  - Patti Sime, South Florida Water Management District (psime@sfwmd.gov);
  - Greg Graves, South Florida Water Management District (ggraves@sfwmd.gov);
  - Steve Traxler, U.S. Fish and Wildlife Service (Steve_Traxler@fws.gov).

  RLG members
  - Dave Tipple, U.S. Army Corps of Engineers (Dave.A.Tipple@usace.army.mil);
  - Bruce Sharfstein, South Florida Water Management District (bsharfs@sfwmd.gov);
  - Agnes McLean, National Park Service (Agnes_McLean@nps.gov); or
  - Lorraine Heisler, U.S. Fish and Wildlife Service (Lorraine_Heisler@fws.gov).

- **Additional information can be found at the following website:** http://www.evergladesplan.org/pm/program_docs/adaptive_mgmt.aspx