

LOXAHATCHEE RIVER WATERSHED RESTORATION PROJECT

Monitoring and Adaptive Management Plan

Introduction for the PDT

December 2016



One of the Last Old Growth Cypress
Floodplains in the SE Florida



Last Large Freshwater Wetland
Corridor in Project Area



Vulnerable estuarine habitats

What is a Project's **Monitoring and Adaptive Management Plan**?

The Plan is a combination of two required pieces of CERP Project Implementation Reports (PIRs):

- **A *monitoring plan*** specifies the data collection, analysis, and reporting that will inform project performance

- **An *Adaptive Management Plan*** guides the use of collected data to:
 - Address uncertainties related to project performance
 - Maximize project benefits while reducing project costs
 - Help inform implementation sequencing of LRWRP
 - Understand how monitoring will determine if adjustments are needed in project implementation to improve performance

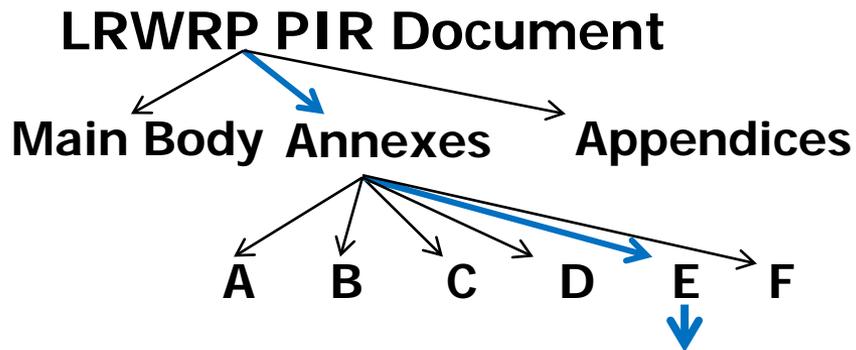


Figure 1. Location of the Monitoring and Adaptive Management Plan in the LRWRP PIR document

Monitoring and Adaptive Management Plan.

Introduction

Part 1: Adaptive Management Plan (AM Plan). Will include AM-relevant uncertainties, strategies, and recommendations. Will refer to other monitoring where possible.

Part 2: Hydrometeorological Monitoring

Part 3: Water Quality Monitoring

Part 4: Ecological Monitoring

Parts 2-4 are typical sections for a CERP monitoring plan

How does the AM Plan relate to the rest of the Monitoring Plan?

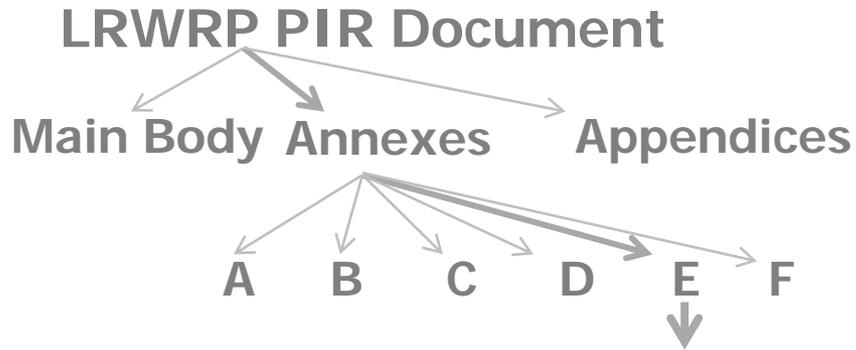


Figure 2. Relationship between the LRWRP Adaptive Management Plan and Monitoring (linkages highlighted in purple)

Monitoring and Adaptive Management Plan.

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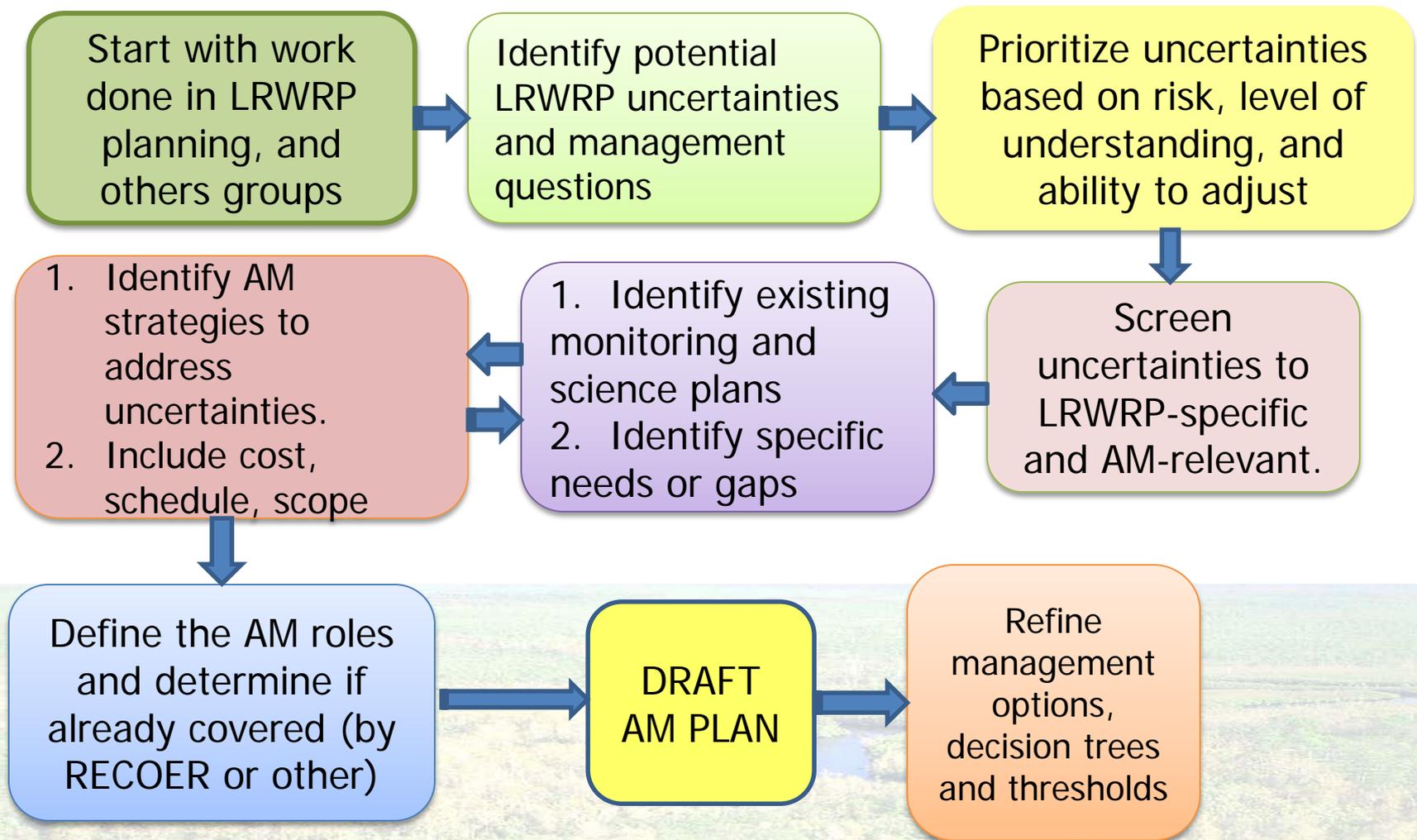
How will the AM and Monitoring Plan be developed?

- **Monitoring plans will be developed based on ecological needs to determine project success**
- **AM plan development is being led by the Ecosubteam and will coordinate with PDT, other subteams (engineering, water quality), RECOVER, Science Coordination Group**
- **Starting point includes AM work already available from other projects, science programs, and LRWRP teams**

ADAPTIVE MANAGEMENT STEPS TO BE COORDINATED WITH THE TEAMS AND GROUPS:

1. Identify and prioritize LRWRP uncertainties that can be addressed
2. Define strategies to address key uncertainties:
 - Maximize use of existing ecosystem monitoring and that are listed in other sections of the LRWRP AM and Monitoring Plan
 - Testing of project features
3. Define how incoming data will be processed and reported for maximum use by project decision-makers over time
4. Process for informing project implementation

Process for AM Plan Development



AM Plan Development

1. Identify LRWRP uncertainties
2. Screen uncertainties
3. Prioritize uncertainties
4. Identify adaptive management strategies to address top tier uncertainties
5. Define AM roles
6. Draft the AM Plan and refine with TSP
7. Refine management options and develop decision trees and thresholds

Adaptive Management

A scientific process for continually improving management policies and practices by learning from their outcomes

- A structured approach for addressing uncertainties by testing for best project designs and operations to achieve restoration goals and objectives, linking science to decision making, and adjusting implementation, as necessary, to improve the probability of restoration success

Uncertainty

A question faced during planning or implementation regarding the best actions to achieve desired goals and objectives within constraints, which cannot be fully answered with available data or modeling

Management Options

Potential structural, non-structural, and/or operational alternatives to be undertaken to improve restoration performance

Adaptive management plans contain potential management actions “options” to improve performance in meeting project/program goals and objectives

Strategies

A plan to address one or more uncertainties identified in the adaptive management plan

- *Active Adaptive Management* - Multiple pilot projects or design tests are implemented to determine the most efficient and effective way to achieve desired goals and objectives
- *Passive Adaptive Management* – One project component or set of operational criteria is implemented to test its ability to achieve desired goals and objectives.

Uncertainty Screening Criteria

1. Affect LRWRP's ability to meet its goals and objectives and remain within its constraints
2. Be at an appropriate LRWRP-scale spatially and temporally
3. Have options for adaptive management actions such as potential project adjustments
4. Have a combination of high importance to LRWRP and high uncertainty that could be reduced by practical adaptive management means

Criteria to prioritize uncertainties

- 1. Risk:** What is the risk (high, medium, low) of not meeting LRWRP restoration goals if this uncertainty is not addressed?
- 2. Knowledge:** What is the level of (high, medium, low) understanding of this uncertainty (i.e., how much is known about this uncertainty)?
- 3. Relevance to Adaptive Management for LRWRP:** What is the level of confidence (high, medium, low) that anything could be done to address the uncertainty?

LRWRP Goals, Objectives and Performance Measures

LRWRP Objective (Abbreviated)	PM 1 – Flow and Salinity	PM 4 – Watershed Hydrology	PM 9 - Connectivity
1. Restore wet and dry season flows to Northwest Fork of Loxahatchee River	√		
2. Restore and/or maintain estuarine communities (oysters, fish, seagrass)	√		
3. Increase natural area extent of wetlands	√	√	
4. Restore connections between natural areas	√	√	√
5. Restore native plant and animal species abundance and diversity	√	√	√

Screened Uncertainties

1. Will natural sheetflow and vegetation return to restoration of areas that are currently/formerly in agricultural use?
2. How will restoration enhance species abundance and diversity in the watershed, river and estuary (fish, species returning to the area, project list, wetland indicator species)?
3. How will future water withdrawals for potable water affect our ability to restore natural resources in that area?
4. How will invasive species hinder the project from reaching project goals?
5. How do unanticipated habitat shifts affect restoration (wetlands, uplands, river, estuaries)?
6. How might sea level rise affect salinity envelopes?
7. What are the impacts of ASR to wellfields (future drinking water supply)?
Municipal water supply (quality and quantity)?
8. How will climate change affect project?
9. Stormwater Treatment Areas and FEBs - Are there going to be any unintended consequences to species when the project is implemented?
10. Will there be unanticipated changes in water levels that impact existing level of service to nearby residential areas?

Prioritized Uncertainties

1. How will new invasive plant species affect the restoration?
2. Based on future drinking water supply, will the ASR wells be able to deliver the proposed quantities and timing of water to the NW Fork?
3. Will there still be impediments to sheetflow in natural areas that were high and low impact agriculture?
4. Restoration of vegetation - will wetland vegetation establish in areas that were high impact ag? Will we need to seed or plant?
5. How will restoration enhance species abundance and diversity in the watershed?
6. Will the changes in hydrology hinder invasive plant species?
7. How will new invasive faunal species affect the restoration?
8. Is there potential for the project to transfer/expand invasive plants to other areas?
9. How will invasive species that are not managed on private property affect restoration?
10. How does the timing in salinity changes and ranges affect seagrass and oysters?
11. As we change salinity ranges and locations, do we have the proper substrate for the new salinity?
12. How can the project counteract climate change affects that were not anticipated?
13. Will changing rainfall patterns affect the ability to deliver the quantity of water for the project?
14. Will there be unanticipated changes in water levels that impact existing level of service to nearby residential areas?

Next Steps

1. Develop management options to address the uncertainties

2. Identify existing monitoring and science plans

- 2010 Loxahatchee River Science Plan
- 2011 Addendum to the Restoration Plan for the Northwest Fork of the Loxahatchee River
- Loxahatchee River National Wild and Scenic River Management Plan
- 2006 Restoration Plan for the Northwest Fork of the Loxahatchee River

3. Identify monitoring gaps and needs

Schedule for Monitoring and AM Plan Development

October 2016:

- Kick off AM and Monitoring Plan activity
- Confirm process for AM Plan development
- "Strawman" AM products: uncertainties, criteria to prioritize and key AM-relevant topics for review
- Parallel process: Other sections of Monitoring plan will be coordinated

November – December 2016:

- Identify and Prioritize uncertainties
- Review existing monitoring plans

January 2017:

- Develop AM Strategies

February 2017:

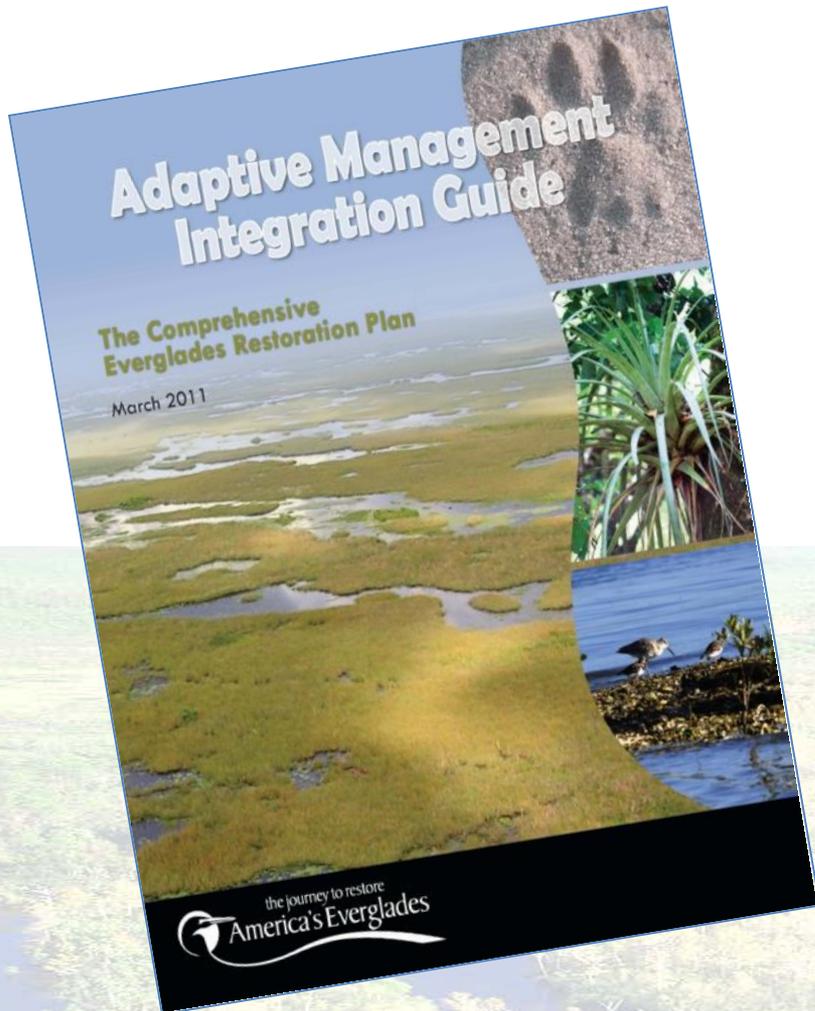
- Reviews of "strawman" products; will need to know TSP before finalizing
- Will include coordination with LRWRP water quality and engineering subteams, PDT, scientists and experts

May 2017:

- Finalize items to include in Plan based on TSP
- Coordinate with experts and other monitoring
- Identify AM strategies, decision trees, and implementation plan
- Present costs

June 2017: Monitoring and Adaptive Management Plan Deadline

Learn more about Adaptive Management in CERP



The Adaptive Management
Integration Guide

http://141.232.10.32/pm/pm_docs/adaptive_mgmt/062811_am_guide_final.pdf

CERP Program-Level AM Plan

http://www.saj.usace.army.mil/Portals/44/docs/Environmental/RECOVER/2015_1019_CERPPROGRAMAMPLAN_DCT_APPROVED.pdf