CENTRAL EVERGLADES PLANNING PROJECT

Working Group
Sponsored Workshop

PRESENTED BY

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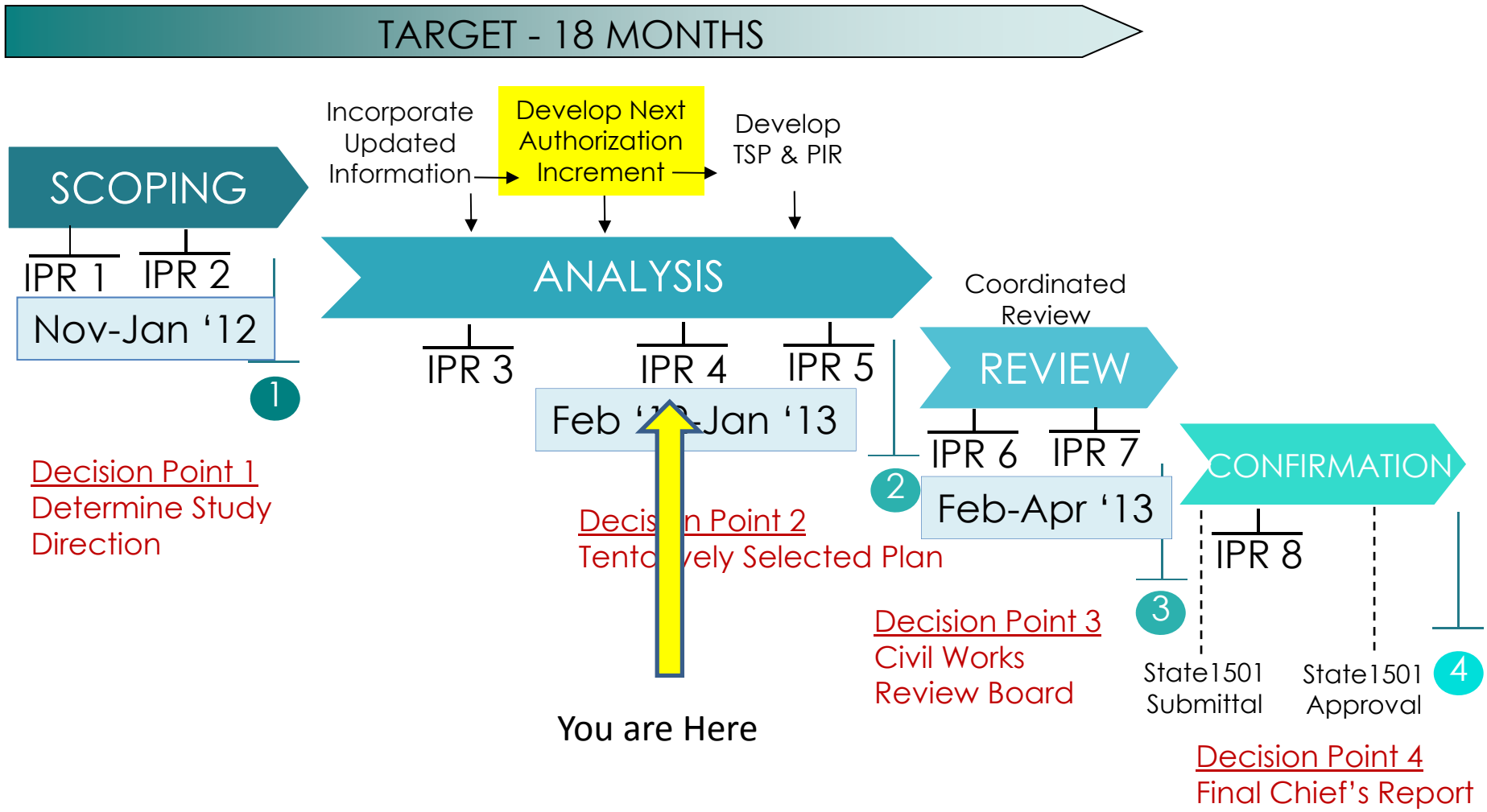
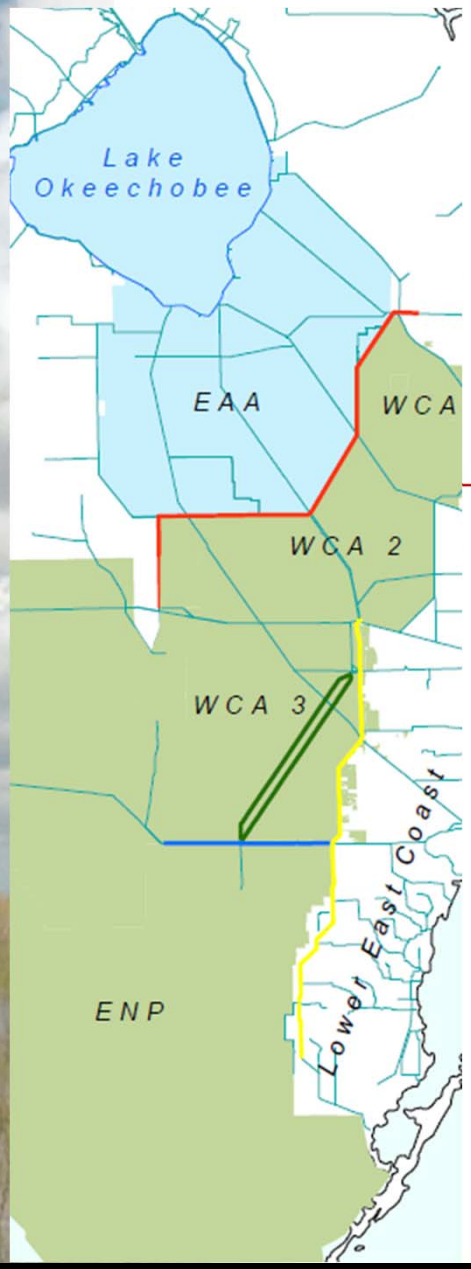
November 16, 2012

CENTRAL EVERGLADES PROCESS



IPR: In-Progress Review with Corps Leadership

PLAN FORMULATION FRAMEWORK



TREATMENT /STORAGE

CONVEYANCE/DISTRIBUTION/SEEPAGE

INITIAL SCREENING

RANGE OF SIZES

SCREEN AND OPTIMIZE
(RESOPS, Eco-criteria, Cost)

Option A | Option B

WATER BUDGET

COMBINE OPTION A AND OPTION B WITH CONVEYANCE, DISTRIBUTION AND SEEPAGE MEASURES

NOTE: Potentially large number of combinations

SCREEN AND OPTIMIZE
(RSM, Parametric Costs, Eco-Criteria)

A1 A3 A7 B2 B3 B6

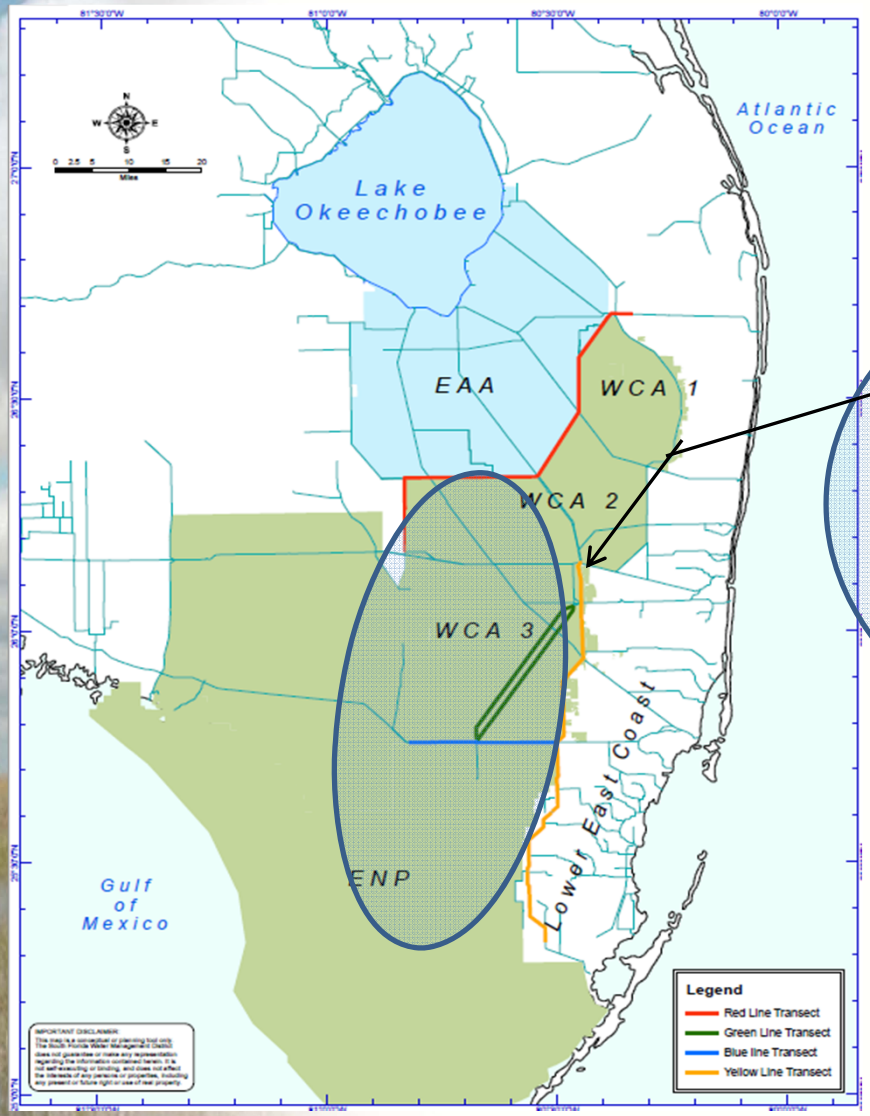
Final Array of Alternatives

We Are Here

DETAILED EVALUATION
(Ecological benefits, Planning-level Costs, CE/ICA, P&G criteria, System of Accounts)

TSP

SPATIAL PERSPECTIVE



REDLINE –Flows from the Everglades Agricultural Area (EAA) into WCA 3A *(L-4, L-5 and L-6 levees and canals)*

GREENLINE – Flows through WCA 3A and WCA 3B *(L-67A and C levees and associated canals)*

BLUELINE – Flows from WCA 3A/3B into Everglades National Park (ENP) *(Tamiami Trail roadway and L-29)*

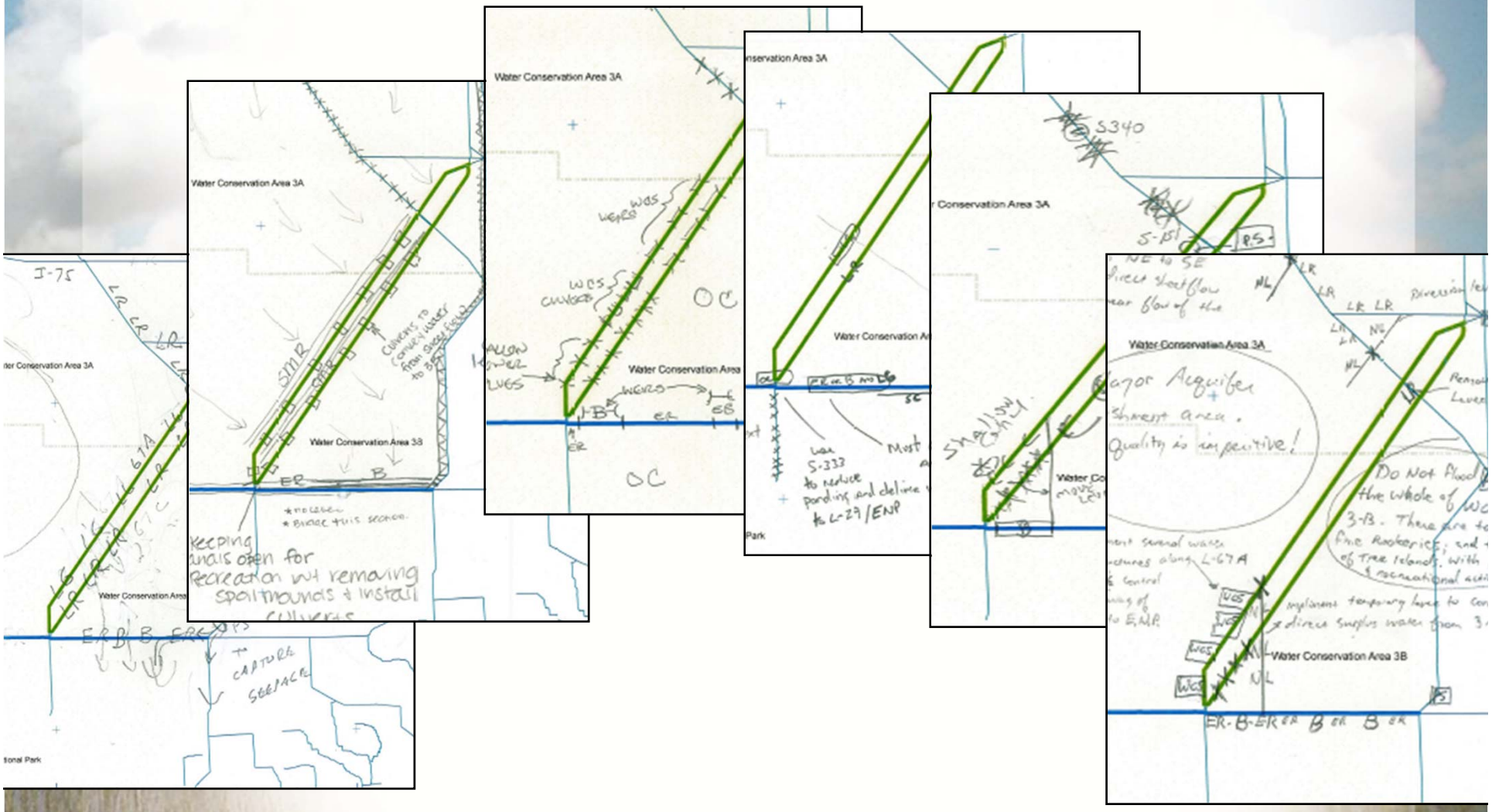
YELLOWLINE –Flows from WCA 3A/3B and ENP to the lower east coast *(east coast protective levee system, the L-30 and L-31N)*

GREENLINE and BLUELINE Formulation Process
Plan formulation and iModel Parallel Paths

Upstream CEPP infrastructure: A1/A2 jointly operated FEB, Spreader Canal/HRF, and Miami Canal Backfill included in all configurations.

- **Step 1: Conceptual Configurations**
  - **Plan Formulation:** Compiled management measures
  - **iModel:** Two configurations: with vs. without WCA3B Flow-way (Green2 vs. Green1)
- **Step 2: Holistic Targets**
  - **Plan Formulation:** Identified transitional ecological targets and system limitations (target contradictions, infrastructure limitations, water availability) using output from Step 1 iModel Output
  - **iModel:** Performed a series of runs to determine operations that meet holistic targets based on input from plan formulation and ecological sub-teams. Identify causal relationships.
- **Step 3: Infrastructure Options**
  - **Plan Formulation:** Analysis of Steps 1 and 2 iModel output resulted in ten efficient infrastructure configurations identified
  - **iModel:** Ran ten iModel options using operational targets defined in Step 2
- **Step 4: Preliminary Option Screening for Final Array Consideration**
  - Analysis of infrastructure options resulting in four configurations
- **Next Steps**: Confirm, identify and refine configurations for final array

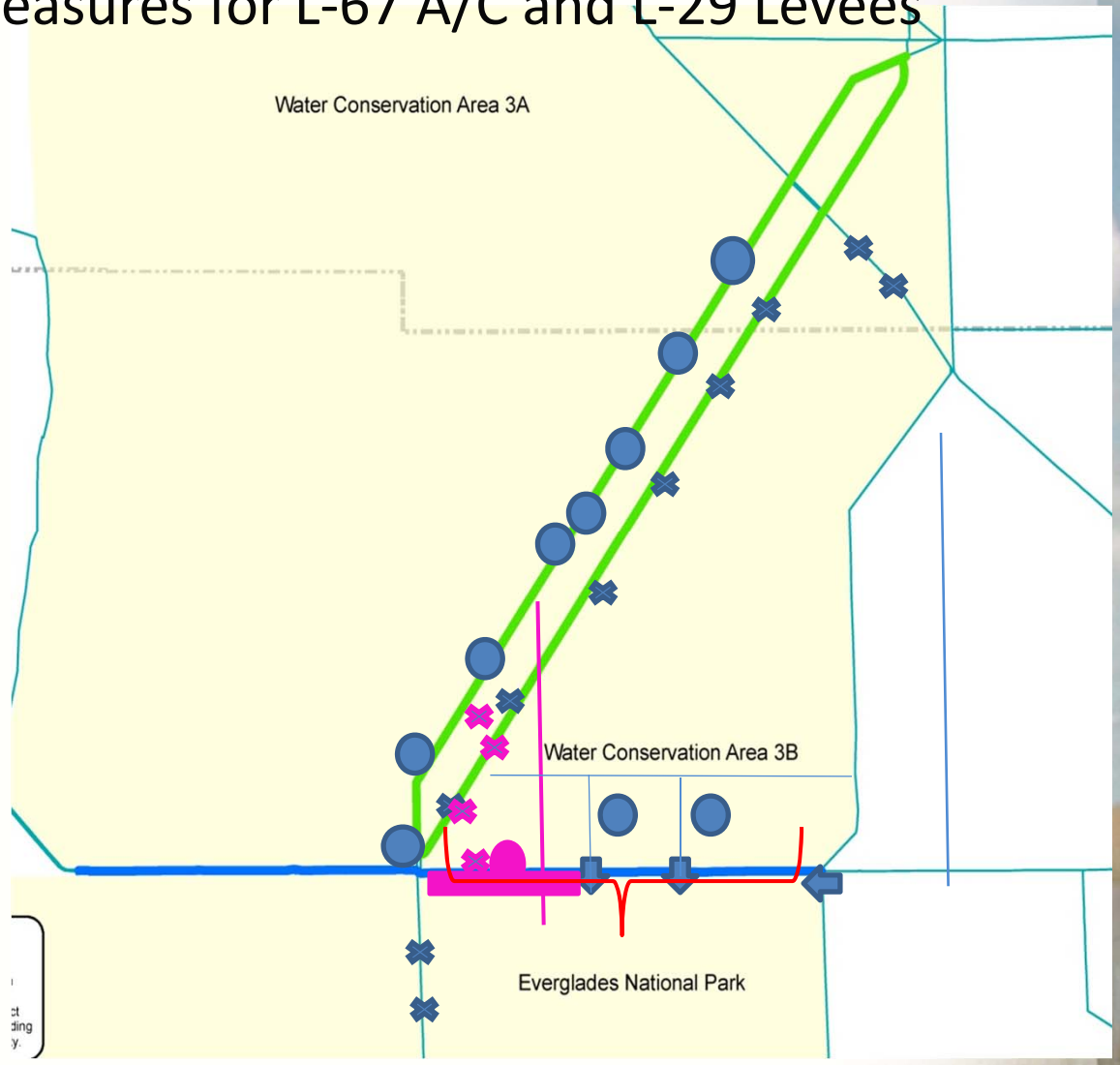
Step 1: Conceptual Configurations: Configuration Development Exercise



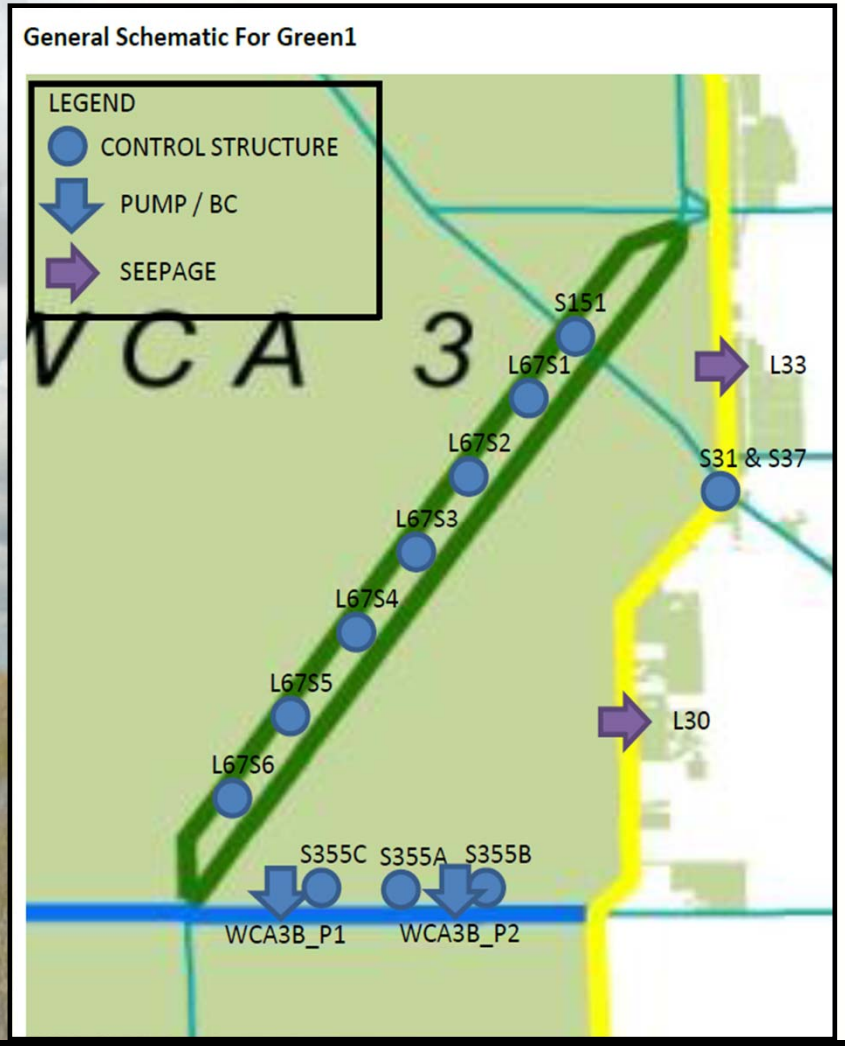
Step 1: Conceptual Configurations:

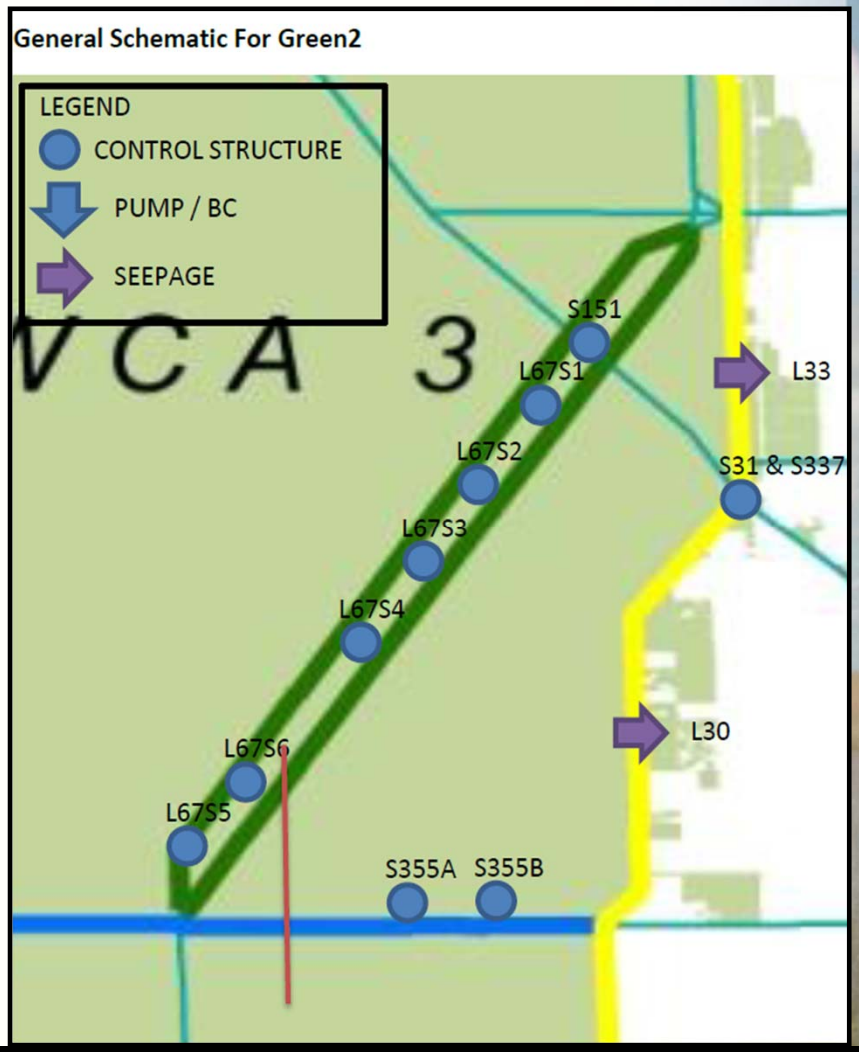
Management Measures for L-67 A/C and L-29 Levees

- New water control structures
- Levee degrade
- New pump stations
- New bridge
- Relocated (new) levee
- Road Raising



Green1 and Green2





HOLISTIC OPERATIONAL TARGETS

Step 2: Holistic Operational Targets

"Using NSM ridge and slough hydrologic goals as a base, refine and optimize targets to ensure targets harmoniously optimize the holistic system"

- Transitional Ecological Targets used during Screening
  - Do no damage to WCA 1 and WCA 2
  - Three Primary Regions: WCA 3A, WCA 3B and ENP
    - Balance variable ecological communities
      - Ridge and Slough, Tree Islands, Sawgrass Plains, Marl Prairie, Terrestrial Habitat
    - Balance variable landscape pattern changes and degree of degradation
  - Recession Rates
  - Wet Season – Dry Season variability
  - T&E Species
- Infrastructure limitations
  - Redline water budget
  - L-29
    - Operational Stage of Canal
    - Design Specification of Levee
- Recreational Accessibility

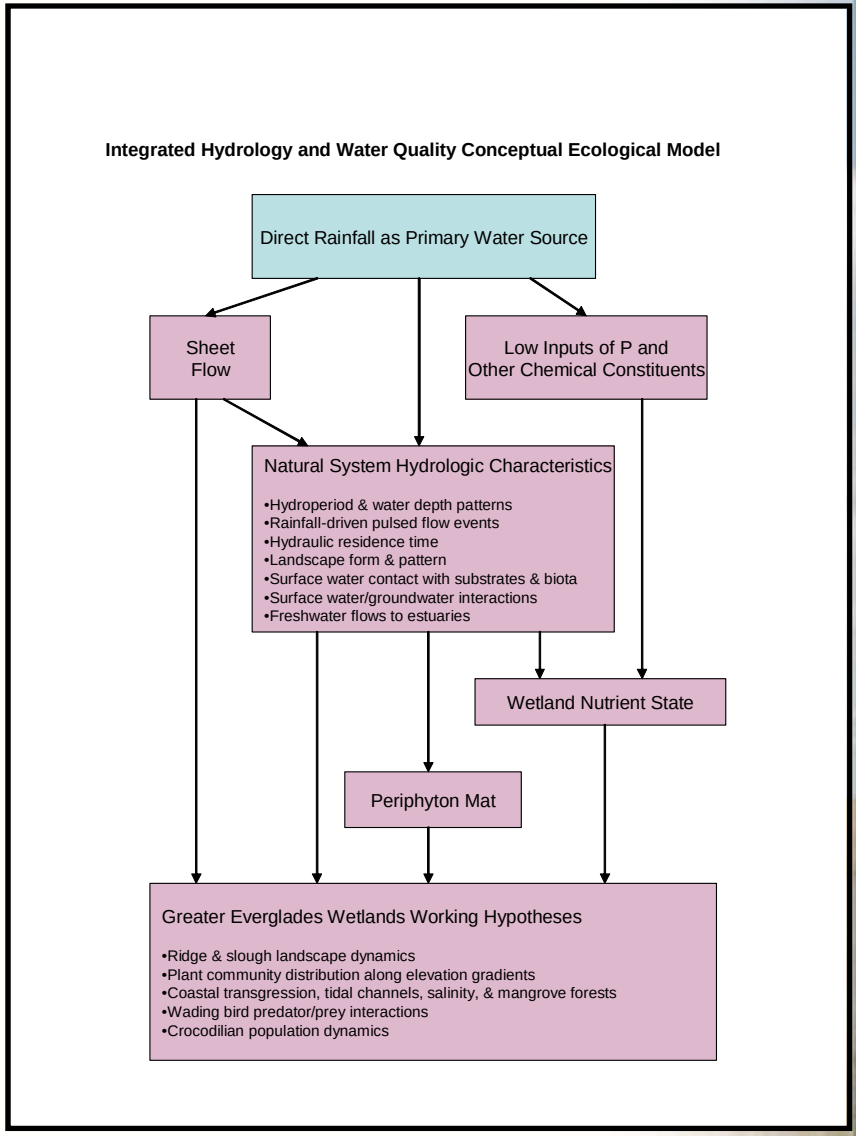
CEPP Performance Measures and Benefits Analysis Overview

CEPP PERFORMANCE MEASURES

- Performance measures are indicators of conditions in the natural system that have been determined to be characteristic of a healthy, restored ecosystem.
  - Used to measure response of stressors and/or ecological attributes to restoration actions (alternative plans).
- Reviewed system-wide performance measures reviewed and approved by RECOVER for use in CERP projects.
- Used RECOVER approved performance measures to expedite necessary USACE review of CEPP Planning Model.
- RECOVER has established a process by which all performance measures are reviewed and accepted. Several levels of review to RECOVER partners and public.

CEPP PERFORMANCE MEASURES

- Developed from Conceptual Ecological Models. Based on Peer-Reviewed Scientific Relationships.
- Each performance measure has a predictive metric and a desired target representative of historical conditions within the study area.
- Performance measure targets primarily based on output from the Natural System Model, which simulates the hydrologic response of a pre-drained Everglades. Targets vary by location within study area.



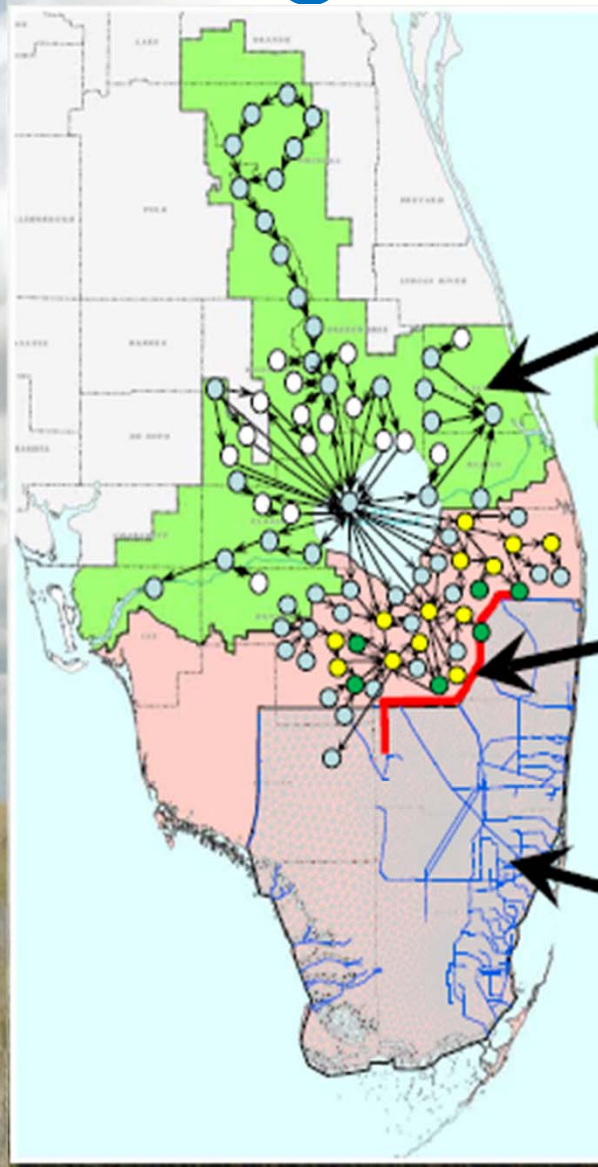
CEPP PERFORMANCE MEASURES - RECOVER APPROVED

PLANNING REGION	PERFORMANCE MEASURE	DESCRIPTION
Northern Estuaries	**Salinity Envelopes**	Measure of flow events correlated to be representative of median salinities favorable to marine fish, shellfish, oyster and SAV. Based on frequency of flows from S-79 and S-80.
Greater Everglades	**Hydrologic Surrogate for Soil Oxidation**	Measure of cumulative drought intensity to reduce exposure of peat to oxidation
	Inundation Pattern in Greater Everglades Wetlands	Measure of the number and duration of inundation events used to calculate the percent period of record of inundation
	Number and Duration of Dry Events in Shark River Slough	Measure of the number of times and mean duration in weeks that water drops below ground
	Sheet flow in the Everglades Ridge and Slough Landscape	Measure of the timing and distribution of sheet flow across the landscape.
	Slough Vegetation Suitability	Measure to evaluate the hydrologic suitability for slough vegetation
Southern Coastal Systems	**Salinity in Florida Bay**	Measure to evaluate salinity optima for plant and animal species common to historical communities in Florida Bay.

PROJECT OBJECTIVES

Project Performance Measures	OBJ 1: Restore seasonal hydroperiods and freshwater distribution to support a natural mosaic of wetland and upland habitat in the Everglades system.	OBJ 2: Improve sheet flow patterns and surface water depths and durations in the Everglades system in order to reduce soil subsidence, frequency of damaging fires, and decline of tree islands and decrease salt water intrusion.	OBJ 3: Reduce water loss out of the natural system to promote appropriate dry season recession rates for wildlife utilization.	OBJ 4: Restore more natural water level responses to rainfall to promote plant and animal diversity and habitat function.	OBJ 5: Reduce high volume discharges from Lake Okeechobee to improve the quality of oyster and SAV habitat in the northern estuaries.
NE: High and Low Flow					X
GE:Inundation Duration	X	X	X	X	
GE: Sheetflow	X	X		X	
GE:Soil Oxidation	X	X	X		
GE:Dry Events in Shark River Slough	X	X	X	X	
GE:Slough Vegetation Suitability	X	X			
SCS: Salinity in Florida Bay	X	X		X	

Regional Hydrologic Models



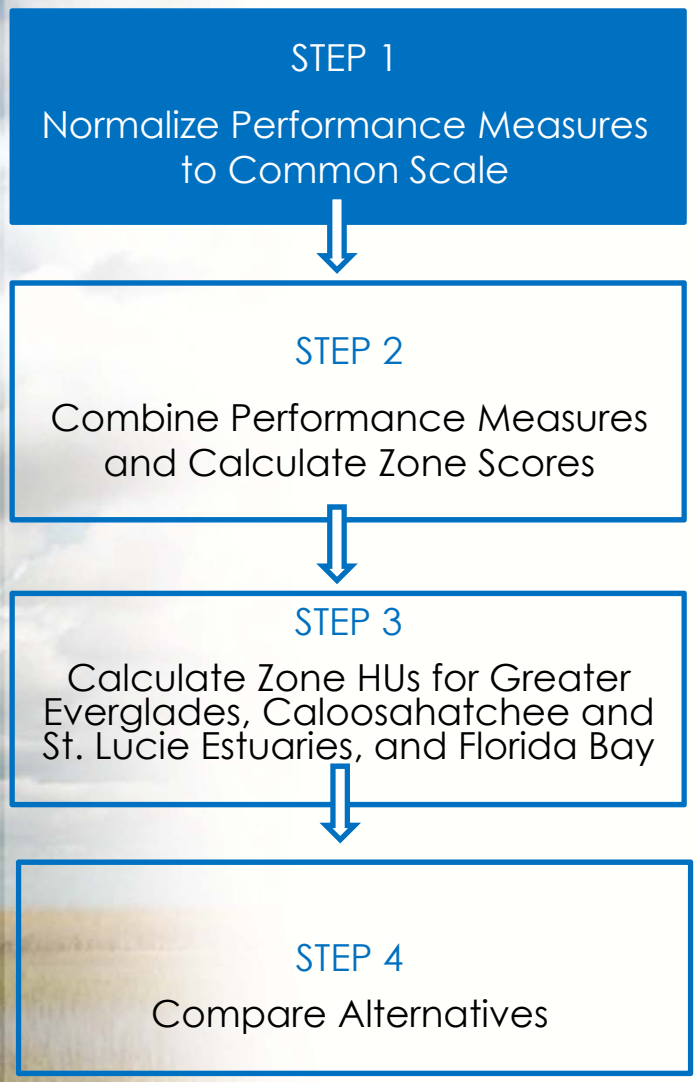
RSMBN:
EAA Storage & Treatment

Northern Everglades

Interface ("Red Line"):
Flow Volumes

Southern Everglades

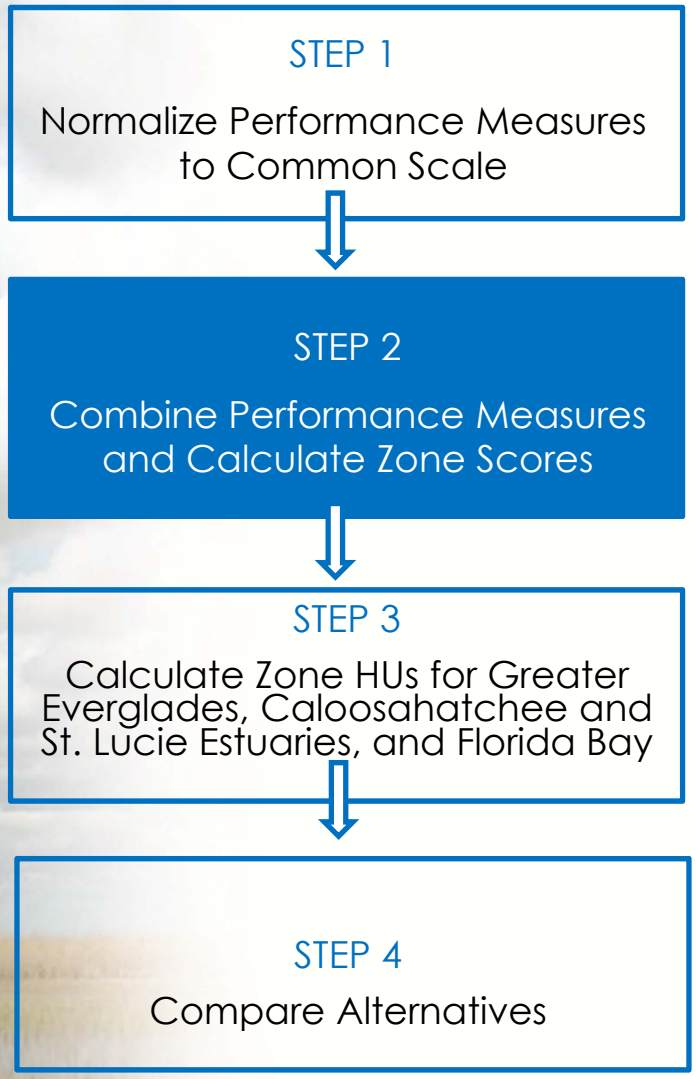
RSMGL:
Decompartmentalization & Seepage Management



METHODOLOGY FOR QUANTIFYING ECOLOGICAL BENEFITS ON THE FINAL ARRAY

Step 1: Normalize Performance Measures to Common Scale

- Raw performance measures linearly re-scaled between 0 and 100.
- To establish what constitutes minimum value, output from the ECB was used to set the minimum score (GE and NE).
- Ecological performance measured as a percent achievement of the target.

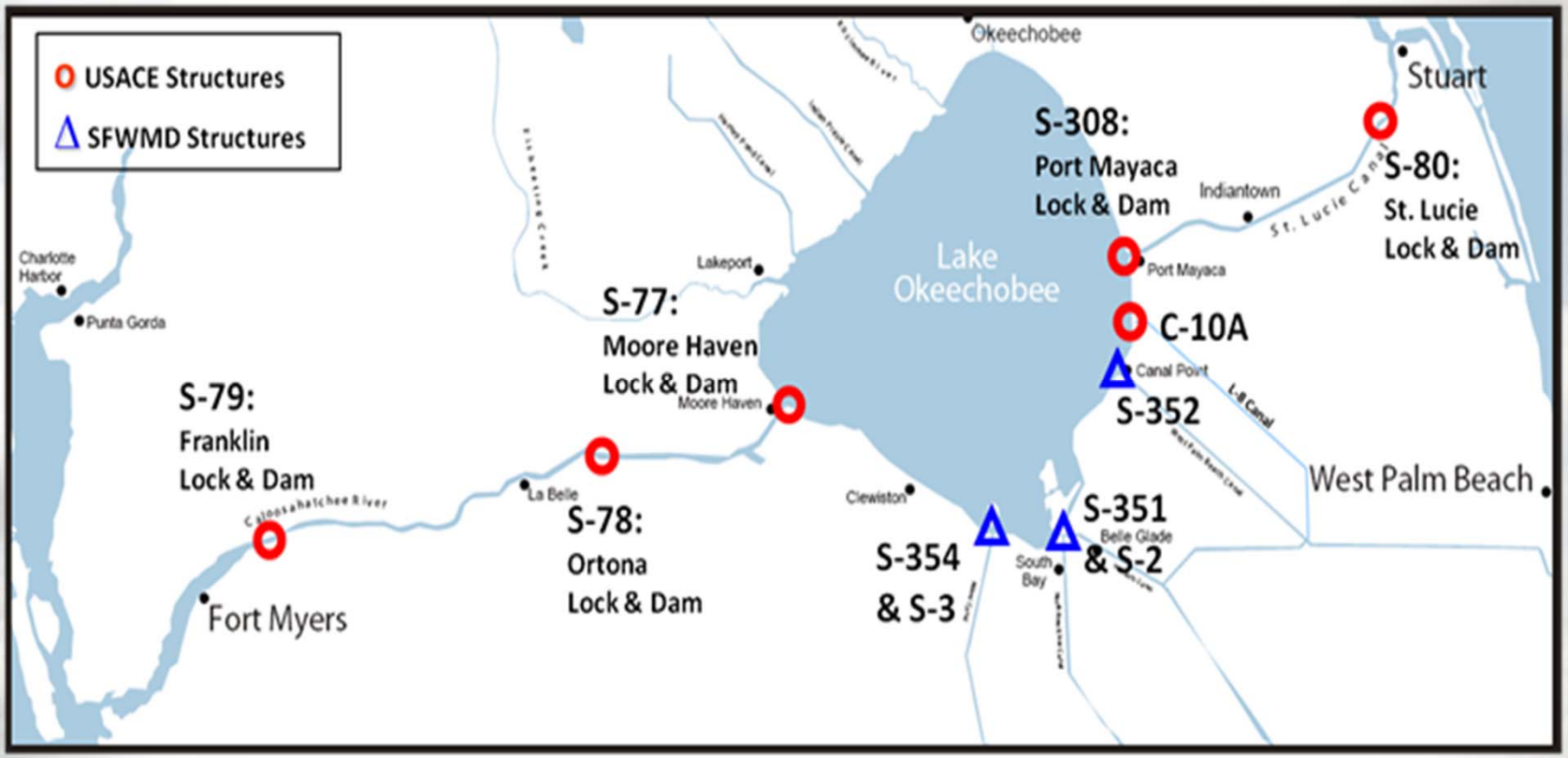


METHODOLOGY FOR QUANTIFYING ECOLOGICAL BENEFITS ON THE FINAL ARRAY

Step 2:
Combine Project Performance Measure and Calculate Zone Scores

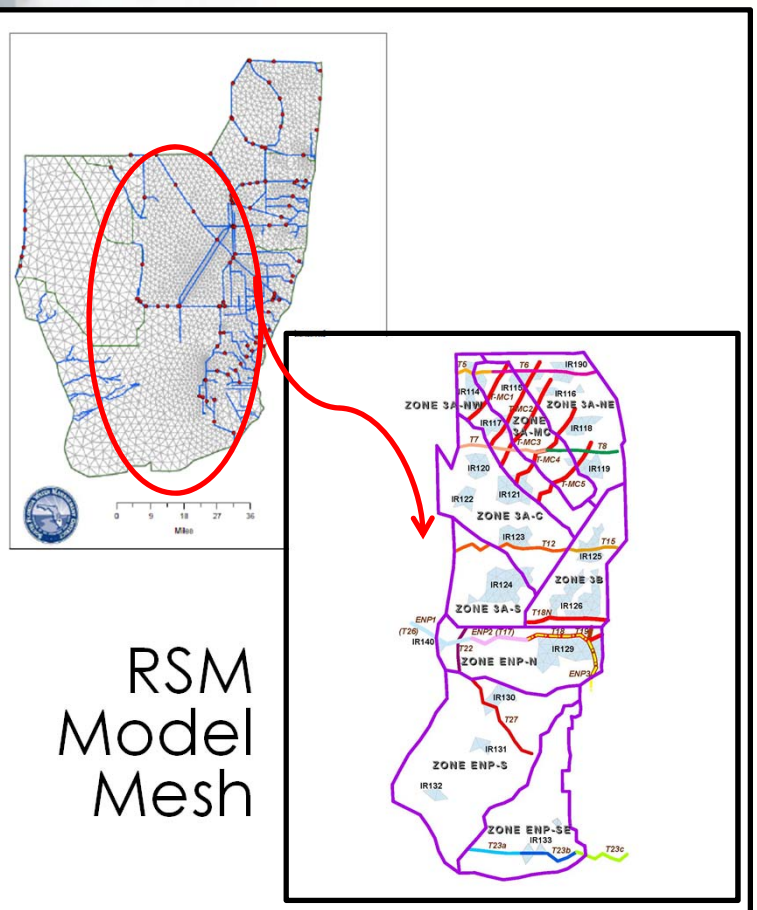
- Within each zone, performance measure scores are combined for each project alternative to produce a net zone benefits score between 0 and 1.

- Performance measures with multiple sub-metrics are accounted for to prevent a performance measure with multiple sub-metrics from contributing disproportionately.



METHODOLOGY FOR QUANTIFYING ECOLOGICAL BENEFITS ON THE FINAL ARRAY

- Performance measures within the northern estuaries will be used to measure the suitability for oyster and SAV habitat based on target flows from S-79 and S-80.
- Calculation of habitat benefits will be restricted to portions of the estuary where changes in salinity in relation to freshwater flows at S-79 and S-80 can be reasonably predicted.



RSM Model Mesh

RSM Zones:

- 3A-NE
- 3A-NW
- 3A-MC
- 3A-C
- 3A-S
- 3B
- ENP-N
- ENP-S
- ENP-SE

METHODOLOGY FOR QUANTIFYING ECOLOGICAL BENEFITS ON THE FINAL ARRAY

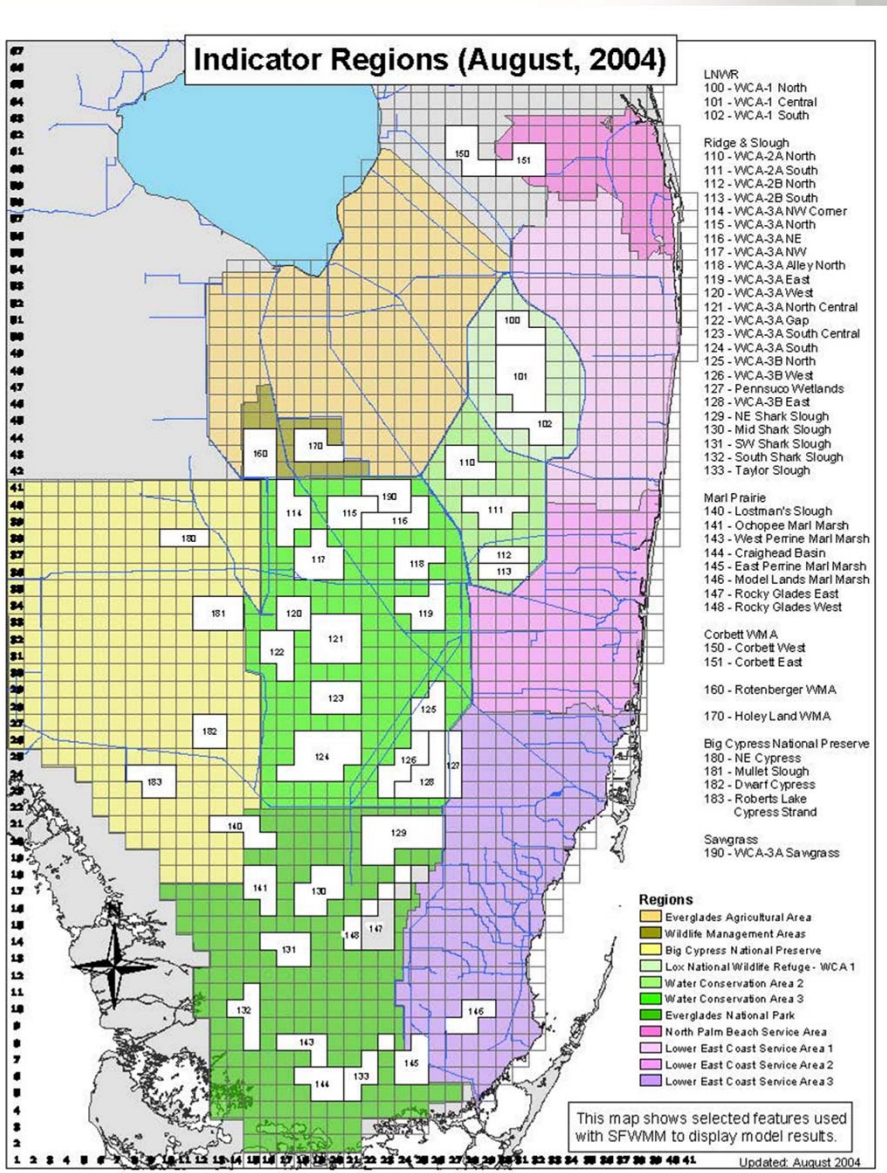
Greater Everglades:

- Indicator regions used for performance measures which measure depth, distribution and duration of surface flooding.
- Transects used for performance measures which measure timing and distribution of flows.
- Because indicator regions and transects cover only a portion of the project area, the region is divided into nine zones to extrapolate from the indicator regions and/or transects to the larger areas they represent.
- Zones delineated to capture the spatial extent of the structural components and were based on differences in existing conditions within the study area.

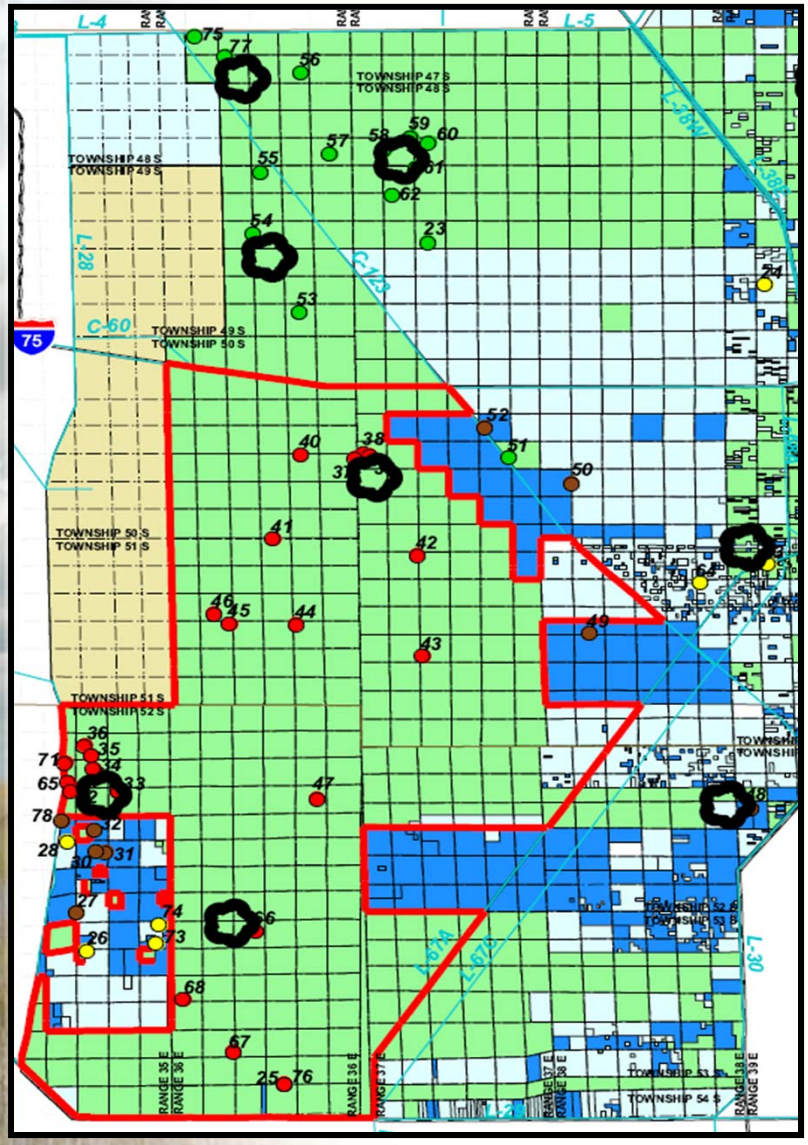
METHODOLOGY FOR QUANTIFYING ECOLOGICAL BENEFITS ON THE FINAL ARRAY

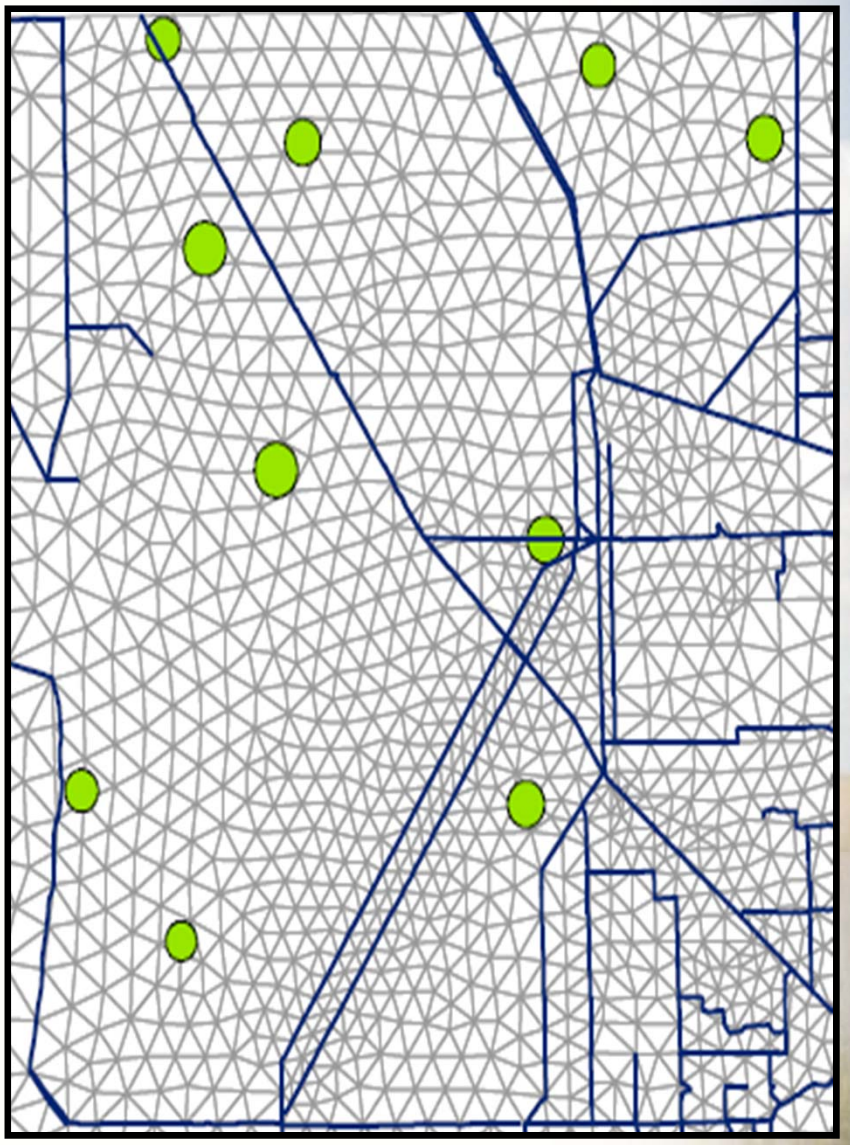
Greater Everglades:

- Indicator regions for RSMGL were adapted from indicator regions from SFWMM.
- Cells within an indicator region are intended to be homogeneous in soil type, vegetative structure, and topography.
- Identified as Ridge and Slough, Sawgrass Plains, and/or Marl Marsh.
- Performance measures are not scored at each IR, only those that are appropriate .
  - Slough Vegetation Suitability PM only applied to IRs identified as Ridge and Slough.

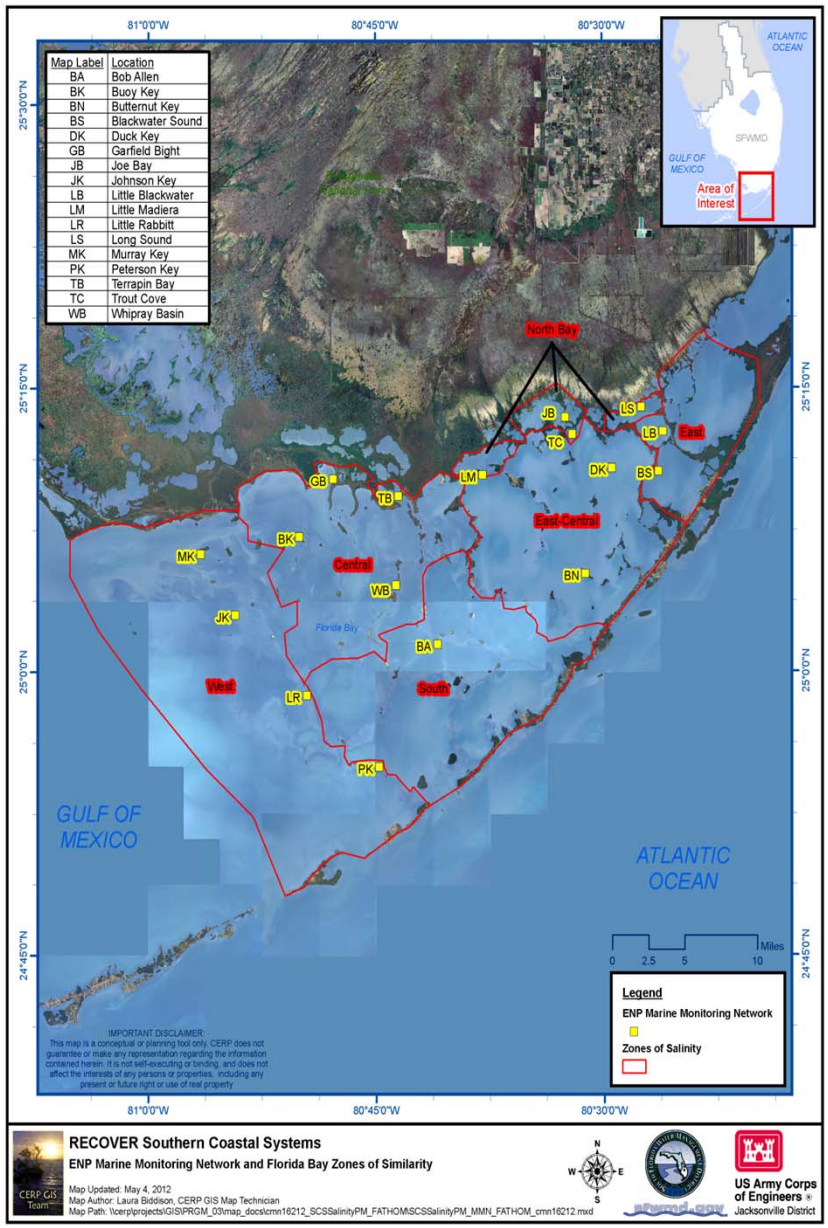


Regional Systems Model – Mesh



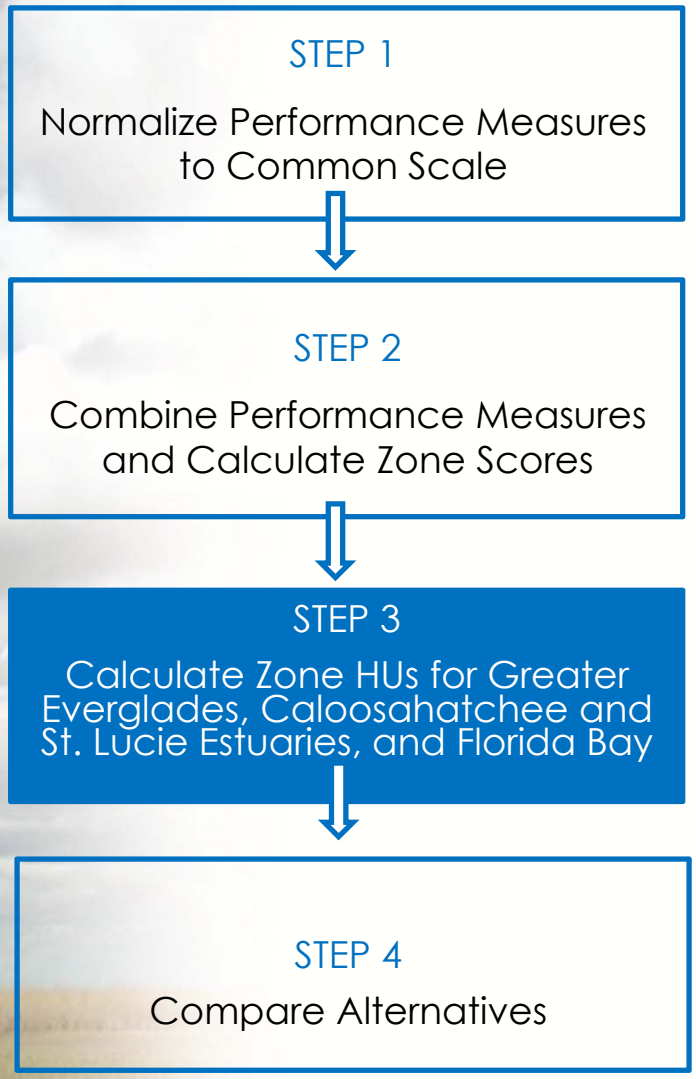


METHODOLOGY FOR QUANTIFYING ECOLOGICAL BENEFITS ON THE FINAL ARRAY



Florida Bay:

- Performance measure scored at marine monitoring network stations (squares) in ENP.
- Targets are based on paleo-adjusted NSM using hydrologic input from the RSMGL.
- The region is divided into six zones of similarity based on water quality characteristics (outlined in red).



METHODOLOGY FOR QUANTIFYING ECOLOGICAL BENEFITS ON THE FINAL ARRAY

Step 3: Calculate Zone Habitat Units

- The 0 to 1 benefits score for each zone is then multiplied by the acreage of the zone to generate a HU value for the zone.
  - $HU_{(zone)} = Index \times Acreage_{(zone)}$
- HU values for zones within the Greater Everglades are summed to produce a total HU value for each alternative. Single HU values are also produced for Caloosahatchee, St. Lucie Estuaries and zones within Florida Bay.

Step 4: Compare Alternative Plans

- HU Lift = Alternative – FWO Project Condition

INFRASTRUCTURE SCREENING

Step 3: Infrastructure Formulation

Key Questions for Trend Analysis :

1. Is restoration of/and conveyance through 3B needed to progress towards meeting targets in ENP and southern WCA3A?

2. Where (in general) should we send water across the L-67s if a degree of restoration in 3B is attainable and/or WCA 3B is needed to get restoration targets in the park and southern 3A?

3. In the absence of the Blue Shanty flowway, are pumps necessary to flow water out of 3B, and if so how many,? Is this tied to particular inflow location into 3B?

4. What additional benefits are provided by the Blue Shanty flowway?

Step 3: Infrastructure Formulation

- Identified large array of feasible configurations of management measures
  - Organized by “trend analysis” driven infrastructure needs and locations
  - Resulted in 23 identified options

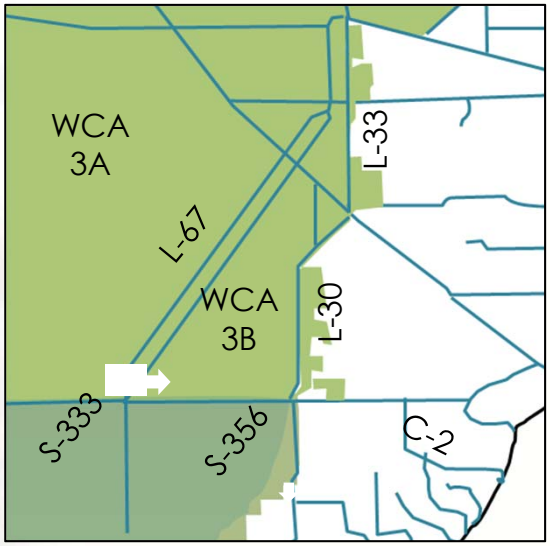
- Identified a refined array of options to undergo iModel infrastructure screening analysis
  - Using iModel output from Step 1 and Step 2
  - Identify preferentially utilized structures and pumps
  - Establish bookends: Minimal configuration to configurations that maximize achievement of holistic operational targets
  - Incrementally build intermediate options from the minimal to maximal practicable to ensure robust evaluation
  - Resulted in 10 additional iModel scenarios

Not all possible configurations need to be modeled, but all configurations identified to be modeled should provide insight

Step 3: Infrastructure Options

Option	Title	S-333	3B/L-67A levee	L67C levee	L-29 levee	Blue Shanty levee, 3B	3B Seepage Management
1A	No - WCA 3B	2000					Constrained
3A1	Southerly Orientation 3B	2000	S4, S5, S6 @500cfs	Gaps at structures	355A,B,C		Unconstrained
3A2	Southerly Orientation 3B	2000	S4, S5, S6 @750cfs	Gaps at structures	355A,B,C		Unconstrained
3B2	Southerly Orientation 3B	2000	S 4, S5, S6 @750 cfs	Gaps at structures	355A,B,C Pump 1		Unconstrained
3B3	Southerly Orientation 3B	2000	S 4, S5, S6 @750 cfs	Gaps at structures	355A,B,C Pump 1		Constrained
4A	Southwest 3B - Blue Shanty	Existing	S5, S6 and S1-4	Degrade west of Blue Shanty levee	Degrade west of blue shanty levee	From L67A to L-29	Constrained
4B	Southwest 3B - Blue Shanty	Existing	S5, S6 and S4	Degrade west of Blue Shanty levee	Degrade west of blue shanty levee	From L67A to L-29	Constrained
4C	Southwest 3B - Blue Shanty	Existing	S5, S6	Degrade west of Blue Shanty levee	Degrade west of blue shanty levee	From L67A to L-29	Constrained
9A	Entire L-67A extent	2000	6 structures S(1-6)	Gaps at structures	more 355s; gravity		Unconstrained
10A	North/South	2000	S2,S3 S5,S6 @500cfs	Gaps at structures	355A,B,C 2 pumps @500cfs		Unconstrained

Step 3: Infrastructure Options

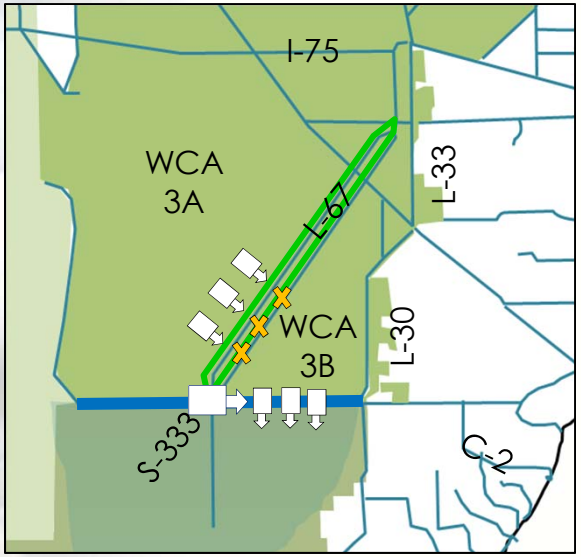


Option 1A:

Increase S-333 to 2,000cfs

Unconstrained L-29 stage

Step 3: Infrastructure Options



Option 3A1 and 3A2:

Increase S-333 to 2,000cfs

Three controlled structures on L-67A

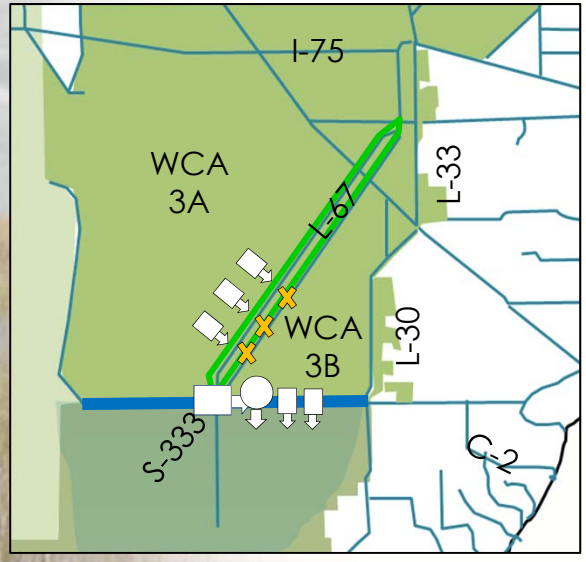
@500cfs for 3A1 and @750cfs for 3A2

Gaps on L-67C Levee @ structures

One additional outflow structure on L-29 Levee

S-355 existing A&B and new C

Unconstrained L-29 stage



Option 3B1 and 3B2:

Increase S-333 to 2,000cfs

Three controlled structures on L-67A

@500cfs for 3B1 and @750cfs for 3B2

Gaps on L-67C Levee @ structures

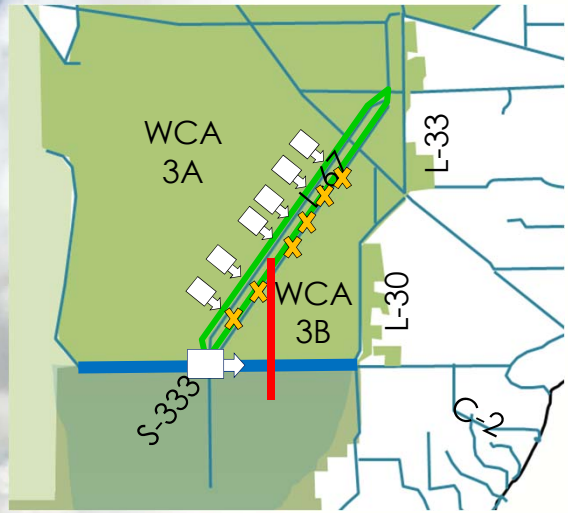
One additional outflow structure on L-29 Levee

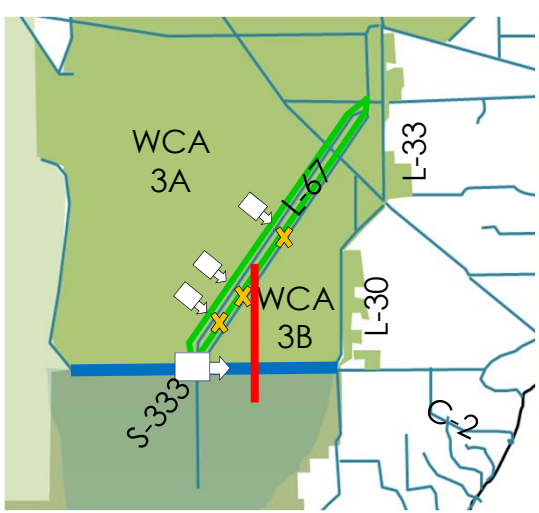
S-355 A&B and new C w/**1,000cfs pump**

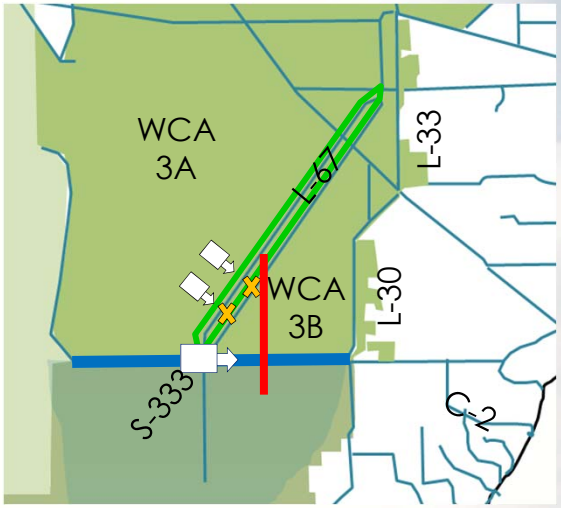
Unconstrained vs. Constrained Seepage (3B1 vs. 3B2)

Unconstrained L-29 stage

Step 3: Infrastructure Options







Option 4A, Option 4B Option 4C

Increase S-333 to 2,000cfs

Blue Shanty Levee from L-67A down into ENP w/ divide structure in L-29 Canal

Degrade L-29 in Blue Shanty Flowway

Controlled structures on L-67A

6 structures for 4A, 3 structures for 4B, and 2 structures for 4C

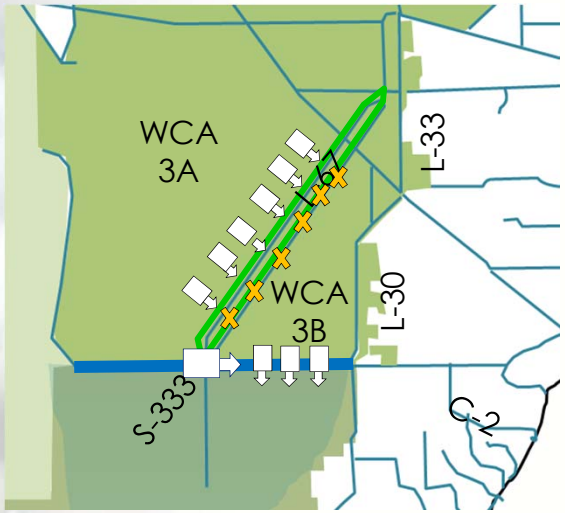
Gaps on L-67C Levee @ structures outside Blue Shanty Flowway

Degrade L-67C Levee in Blue Shanty Flowway

Constrained Seepage

Unconstrained L-29 stage west of Blue Shanty Levee (8.5 max stage east)

Step 3: Infrastructure Options



Option 9A:

Increase S-333 to 2,000cfs

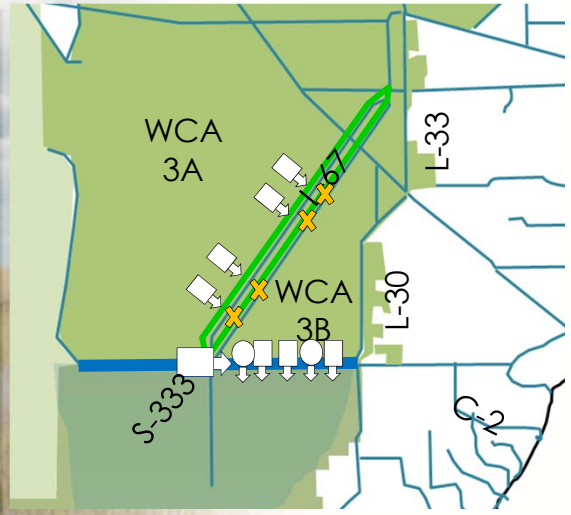
Six 500cfs controlled structures on L-67A

Gaps on L-67C Levee @ structures

One additional outflow structure on L-29 Levee

Existing S-355 A&B and new C

Unconstrained L-29 stage



Option 10A:

Increase S-333 to 2,000cfs

Four 500cfs controlled structures on L-67A

Gaps on L-67C Levee @ structures

Existing S-355 A&B and new C

Two 500 cfs pumps on L-29 Levee

Unconstrained L-29 stage

Step 4: Infrastructure Options Evaluation – Multi-Criteria Decision Analysis

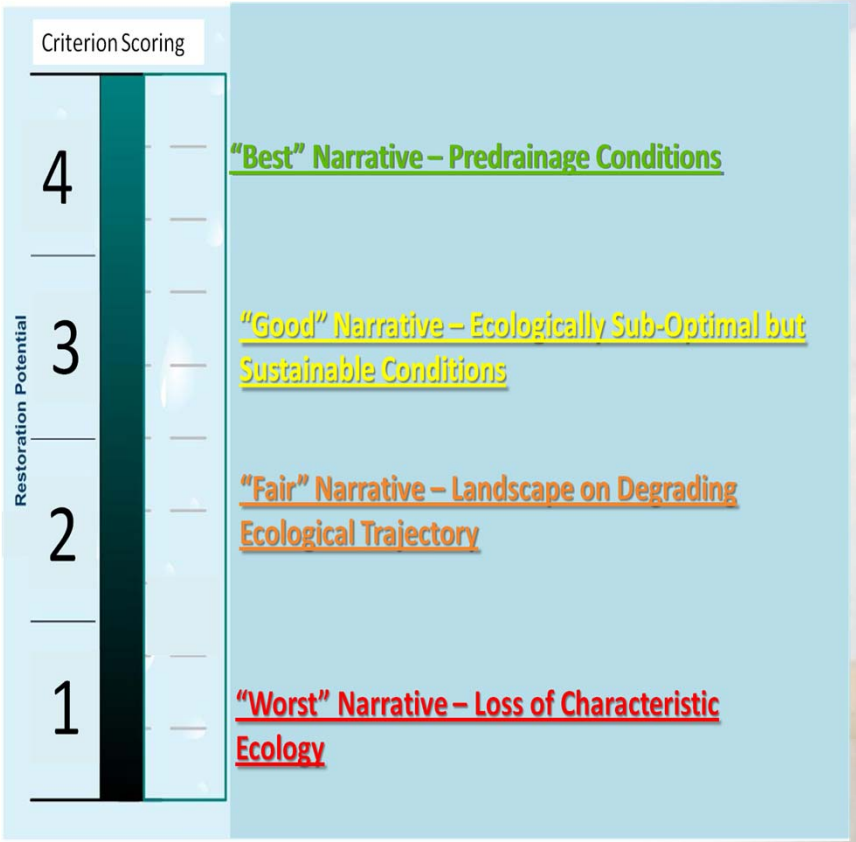
- Purpose:
  - Helps to identify and understand conflicts and trade-offs
  - Decisions supported by transparent and replicable analysis that are documented while objectively distinguishing unknowns from that which is known.
  - Identify performance trends for multiple options across numerous criteria
- Benefits:
  - Better decisions not perfect ones
  - Conflicts are identified but not always resolved
  - Trade-offs are illuminated
  - Decisions remain difficult with or without multi-criteria analysis, but MCDA makes process more transparent

Step 4: Infrastructure Options Evaluation – Criteria Hierarchy

- **Level 1** – Primary CEPP Ecological Objectives
  - Hydro-ecological target evaluation of iModel results
- **Level 2** – Other important considerations
  - **Connectivity**
    - Ecological connectivity vs. hydrologic connectivity
  - **Adaptability: Adaptive Management considerations**
    - Robustness
    - Future Compatibility
  - **Recreational Impacts**
    - Hunting/Fishing Impacts

Criterion Scoring

- 1 -4 rating system used for each criterion.
- Scores are ordinal in nature.
- There is NO inherent magnitude in the scores (i.e. a score 4 is not necessarily twice as good as a 2)



LEVEL 1
SCREENING CRITERIA

Step 4: Infrastructure Options Evaluation

Level 1 - Inundation and Ponding Criteria

- Measured as percent deviation from NSM ridge and slough targets quantified for two metrics:
  - Average % time above ground surface elevation (GSEL)
  - Average ponding depth (ft) above ground surface elevation (GSEL)
- Threshold for significant difference among options
  - If less than 2% difference in inundation duration between minimum and maximum options scores: "Performs Similarly"
  - If less than 0.2ft difference in depth between minimum and maximum options scores: "Performs Similarly"
- Options rated in evenly distributed quadrants(1-4 scale)
  - Established ecological threshold
  - Fourth Quartile = Most Improvement to First Quartile = Least Improvement
- Scores aggregated for three primary areas:
  - WCA 3A, WCA 3B and ENP
  - Multiple locations averaged for each primary area (to ensure areas with more locations are not over represented)

Step 4: Infrastructure Options Evaluation

Level 1 - Inundation and Ponding Criteria

- Measured as percent deviation from NSM target quantified for two metrics:
  - Average % time above ground surface elevation (GSEL)

Location	NSM Target	RSM ECB	RSM FWO	Option 1A	Option 3A1	Option 3A2	Option 3B2	Option 3B3
3ANW - Raw Scores	99.53	68.15	81.62	99.20	97.94	97.85	98.08	97.99
3ANW - % of Target		-31.53%	-18.00%	-0.33%	-1.60%	-1.69%	-1.46%	-1.55%

  - Average ponding depth (ft) above ground surface elevation (GSEL)

Location	NSM Target	RSM ECB	RSM FWO	Option 1A	Option 3A1	Option 3A2	Option 3B2	Option 3B3
3ANW - Raw Scores	2.07	0.25	0.46	1.17	1.16	1.16	1.17	1.17
3ANW - % of Target		-87.9%	-77.9%	-43.8%	-44.0%	-43.9%	-43.6%	-43.5%

Step 4: Infrastructure Options Evaluation

Level 1 - Inundation and Ponding Criteria

- Threshold for significant difference
  - If less than 2% difference in inundation duration between minimum and maximum options scores: “Performs Similarly”

Location	Option 1A	Option 3A1	Option 3A2	Option 3B2	Option 3B3	Option 4A	Option 4B	Option 4C	Option 9A	Option 10A
3ANW	99.20	97.94	97.85	98.08	97.99	98.78	99.11	99.06	98.13	97.75

Max	Min	Difference
99.20	97.75	1.45

  - If less than 0.2ft difference in depth between minimum and maximum options scores: “Performs Similarly”

Location	Option 1A	Option 3A1	Option 3A2	Option 3B2	Option 3B3	Option 4A	Option 4B	Option 4C	Option 9A	Option 10A
3ANW - Raw Scores	1.17	1.16	1.16	1.17	1.17	1.12	1.14	1.14	1.16	1.16

Max	Min	Difference
1.17	1.12	0.05

Step 4: Infrastructure Options Evaluation

Level 1 - Inundation and Ponding Criteria

- Options rated in quadrants (1 lowest -4 highest scale)
  - Calculated based on the largest deviation from target and the smallest deviation from target.
  - Ecological threshold established for scoring:
    - 3A4 (Site 64) existing condition considered to be sub-optimal but sustainable , so 3A4 Score = Quartile 3
    - Any Option scoring better than Site 64 scored at least Quartile 3

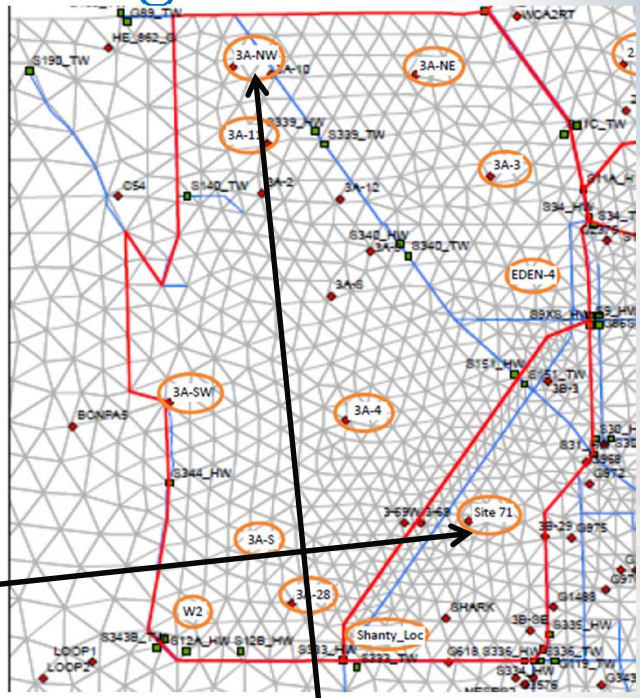
Quadrant Rating		
4 - Best	Midpoint between Max and 3A4 Score <Option X < Max Score	Inundation: 3A4 Score = -7.19%
3	3A4 Score < Option X < Midpoint between Max and 3A4 Score	
2	Midpoint between Min and 3A4 Score < Option X < 3A4 Score	Ponding: 3A4 Score = -40.55%
1 –Worst	Option X < Midpoint between Min and 3A4 Score	

Step 4: Infrastructure Options Evaluation

Level 1 - Inundation and Ponding Criteria

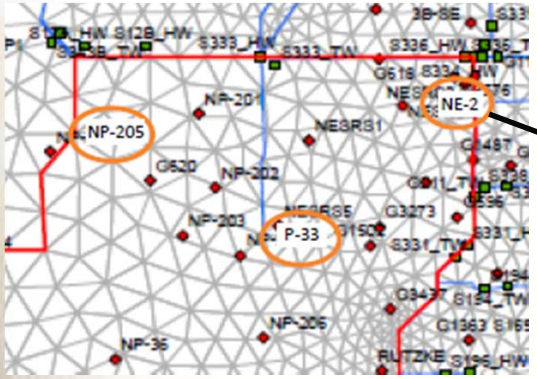
- Scores averaged across multiple locations for three primary areas:

Location	Option 1A	Option 3A1
3ANW	Performs Similarly	Performs Similarly
3ASW	4	4
W2	Performs Similarly	Performs Similarly
3A4	4	4
3AS	Performs Similarly	Performs Similarly
3ANE	Performs Similarly	Performs Similarly
3A28	4	4
EDEN-4	1	3
3A3	4	4
Site71	2	4
NP205	2	1
P33	Performs Similarly	Performs Similarly
NE2	Performs Similarly	Performs Similarly
NP46	2	1



WCA 3B
Site 71

WCA 3A	
3ANW	3AS
3A3	3ANE
3ASW	3A28
W2	EDEN-4
3A4	



ENP	
NE-2	P-33
NP205	P46

Step 4: Infrastructure Options Evaluation

Level 1 - Inundation and Ponding Criteria

Option	Title	Inundation WCA 3A	Inundation WCA 3B	Inundation ENP	Depth WCA 3A	Depth WCA 3B	Depth ENP
1A	No - WCA 3B	3.4	2.0	2.0	3.3	1.0	3.3
3A1	Southerly Orientation 3B	3.8	4.0	1.0	3.3	3.0	3.0
3A2	Southerly Orientation 3B	3.8	4.0	1.0	2.7	4.0	3.3
3B2	Southerly Orientation 3B	3.8	4.0	3.0	3.3	3.0	4.0
3B3	Southerly Orientation 3B	3.8	4.0	3.0	3.3	2.0	4.0
4A	Southwest 3B - Blue Shanty	3.8	3.0	1.5	4.0	2.0	3.0
4B	Southwest 3B - Blue Shanty	3.6	3.0	1.5	4.0	2.0	3.0
4C	Southwest 3B - Blue Shanty	3.8	1.0	1.5	4.0	1.0	3.0
9A	Entire L-67A extent	3.8	4.0	1.0	2.7	4.0	3.3
10A	North/South	4.0	4.0	2.0	3.3	4.0	3.7

Evaluation Trends

- Moderate benefits can be achieved in WCA 3A and ENP with no additional WCA 3B inflow (no benefits to WCA 3B)

- Pumps provide notably better performance for ENP
- Pumps reduce impacts to Marl Prairie (3A3 vs. 3B2)
- Constraining Seepage reduces benefits to WCA 3B (3B3 vs. 3B2)

- Blue Shanty Flowway provides greatest benefit to ENP ridge and slough
- Marl Prairie impacts need further examination (results in lower overall score in ENP)
- Constraining Seepage restricts benefits to WCA 3B

- Marl Prairie impacts need further examination (results in lower overall score in ENP duration)

- Including more structures distributed across L-67A provides greater benefit to WCA 3A and 3B

Step 4: Infrastructure Options Evaluation

Level 1 – Recession Rates

	% target reached for preferred	% target reached for marginal	Avg % of target met
ECB	51.12	65.97	58.55
FWO	53.36	66.60	59.98
Opt_1A	148.88	58.87	103.88
Opt_3A1	153.81	67.85	110.83
Opt_3A2	162.33	57.20	109.77
Opt_3B2	157.85	59.29	108.57
Opt_3B3	166.37	55.74	111.05
Opt_4A	148.43	57.20	102.82
Opt_4B	168.16	50.31	109.24
Opt_4C	154.71	53.03	103.87
Opt_9A	150.67	62.84	106.76
Opt_10A	156.50	62.63	109.57

Level 1 Result Summary

Option	Title	Inundation WCA 3A	Inundation WCA 3B	Inundation ENP	Depth WCA 3A	Depth WCA 3B	Depth ENP	Recession Rates	**Summary Level 1**	Total Cost	
1A	No - WCA 3B	2.8	3.0	2.0	3.3	1.0	3.3	1	16.5	6.2	1st
3A1	Southerly Orientation 3B	3.6	4.0	1.0	3.3	3.0	3.0	4	21.9	23	2nd
3A2	Southerly Orientation 3B	3.6	4.0	1.0	2.7	4.0	3.3	3	21.6	25.6	
3B2	Southerly Orientation 3B	3.8	4.0	3.0	3.3	3.0	4.0	3	24.1	52.5	3rd
3B3	Southerly Orientation 3B	3.8	4.0	3.0	3.3	2.0	4.0	4	24.1	52.5	
4A	Southwest 3B - Blue Shanty	3.8	3.0	1.5	4.0	2.0	3.0	1	18.3	65.7	
4B	Southwest 3B - Blue Shanty	3.6	3.0	1.5	4.0	2.0	3.0	3	20.1	50.4	
4C	Southwest 3B - Blue Shanty	3.8	1.0	1.5	4.0	1.0	3.0	1	15.3	45.3	
9A	Entire L-67A extent	3.6	4.0	1.0	2.7	4.0	3.3	2	20.6	38.2	
10A	North/South	4.0	4.0	2.0	3.3	4.0	3.7	3	24.0	55	3rd

Screening effort resulted in 3 cost-effective groupings

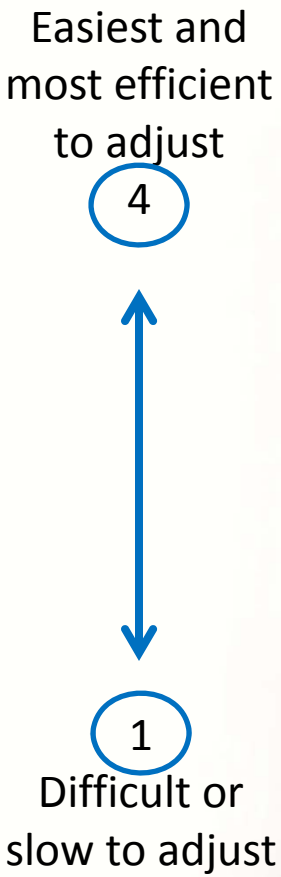
Level 2 Screening Criteria

- Level 2 is envisioned to identify options that were not identified as cost effective in Level 1, but may warrant additional consideration.
- Options identified through the Level 1 analysis will not be eliminated during the Level 2 analysis.
- Criteria include:
  - Adaptability
  - Connectivity
  - Recreation

Level 2 Screening Criteria: Adaptability

Sub Criteria

- Flexibility = Speed, ease, efficiency of moving water to adjust changing conditions such as storms or other real-time needs.
- Future Compatibility = Efficiency of using this configuration to compliment future CEPP increments.
- Robustness = Ability to function effectively in the face of variability and uncertainty of future events (NRC 2007). Ability to perform under broad shifts, such as climate change.



Level 2 Screening Criteria: Adaptability

General Trends

- Flexibility
  - Project configurations with the greatest amount of infrastructure would provide more operational flexibility. Operations can be changed rapidly to meet almost any conditions.
- Future Compatibility
  - Project configurations with the least amount of infrastructure would be more compatible with future CERP projects. Configurations would not need to be removed or vastly retrofitted in the future.
- Robustness
  - Project configurations scored similarly to ratings for operationally flexibility. Configurations with the greatest amount of infrastructure would improve ability to function effectively in the future, if there is a need to move more water through the system.

Level 2 Screening Criteria: Adaptability

Option	Title	Operational Flexibility	Future Compatibility	Robustness	Average
1A	No - WCA 3B	1	4	1	2
3A1	Southerly Orientation 3B	3	3	2	2.7
3A2	Southerly Orientation 3B	3	3	3	3
3B2	Southerly Orientation 3B	4	2	4	3.3
3B3	Southerly Orientation 3B	4	2	4	3.3
4A	Southwest 3B - Blue Shanty	3	1	3	2.3
4B	Southwest 3B - Blue Shanty	2	1	2	1.7
4C	Southwest 3B - Blue Shanty	2	1	2	1.7
9A	Entire L-67A extent	3	3	3	3
10A	North/South	4	2	4	3.3

Level 2 Screening Criteria: Ecologic Connectivity

- Criterion evaluates increases in wetland acreage and marsh connectivity directly associated with the removal of man-made barriers to flow.
- Canals, levees, and roads constructed under the C&SF Project have been identified as causing landscape fragmentation, loss of connectivity of the natural system, alteration of volume, timing, and distribution of regional hydropatterns and degradation of habitat of wetland organisms.
- The desired restoration condition is to maximize the ecological connectivity and acreage of wetlands in the Everglades by removing or reducing the effects of landscape discontinuities caused by levees, canals, drainage ditches and spoil banks.

Level 2 Screening Criteria: Ecologic Connectivity

- Prior screening efforts for CEPP measured ecologic connectivity using two separate metrics calculated with GIS:
  - ***Miles of Marsh Reconnected*** - quantifies the miles of marsh that are reconnected by full removal of levees and roads and by canal backfilling.
  - ***Acreage of Marsh Restored*** - quantifies the acreage of marsh restored by removal of levees and roads and by canal backfilling.
- Previous method used to calculate and apply criteria does not apply to Green Line/Blue Line configurations – majority of configurations do not contain removal of levees and/or backfilling of canals.
  - Blue Shanty Plans (Options 4A, 4B, and 4C degrade portions of L-67 C and L-29 Levee, but construct Levee in WCA 3B).
- Configurations do increase marsh connectivity by providing hydrologic re-connection from WCA 3A to WCA 3B and ENP. Rated configurations on 1 -4 scale.

Level 2 Screening Criteria: Ecologic Connectivity

- Option 1A provides limited ecological connectivity
- No Options provide the level of connectivity CERP envisioned
- Further consideration should be given to connectivity during final array configurations

Option	Title	Ecologic Connectivity
1A	No - WCA 3B	1
3A1	Southerly Orientation 3B	2
3A2	Southerly Orientation 3B	2
3B2	Southerly Orientation 3B	2
3B3	Southerly Orientation 3B	2
4A	Southwest 3B - Blue Shanty	2
4B	Southwest 3B - Blue Shanty	2
4C	Southwest 3B - Blue Shanty	2
9A	Entire L-67A extent	2
10A	North/South	2

Level 2 Screening Results

Option	Title	Summary Level 1	Operational Flexibility (narrative)	Adaptability - Robust	Adaptability - Future Increment	Connectivity	Summary Level 2	Combined Level 1 and 2	Total Cost	
1A	No - WCA 3B	16.5	1	1	4	1	8	24.5	6.2	1st
3A1	Southerly Orientation 3B	21.9	3	2	3	2	10	31.9	23	2nd
3A2	Southerly Orientation 3B	21.6	3	3	3	2	11	32.6	25.6	
3B2	Southerly Orientation 3B	24.1	4	4	2	2	12	36.1	52.5	3rd
3B3	Southerly Orientation 3B	24.1	4	4	2	2	12	36.1	52.5	
4A	Southwest 3B - Blue Shanty	18.3	3	3	1	2	9	27.3	65.7	
4B	Southwest 3B - Blue Shanty	20.1	2	2	1	2	7	27.1	50.4	
4C	Southwest 3B - Blue Shanty	15.3	2	2	1	2	7	22.3	45.3	
9A	Entire L-67A extent	20.6	3	3	3	2	11	31.6	38.2	
10A	North/South	24.0	4	4	2	2	12	36.0	55	3rd

Level 2 results support the trends identified in the Level 1 analysis

Step 3: Infrastructure Formulation

Key Questions for Trend Analysis :

1. *Is restoration of/and conveyance through 3B needed to progress towards meeting targets in ENP and southern WCA3A?*

   * Moderate progress can be noted in ENP and Southern WCA 3A bypassing WCA 3B, but no improvement is made to WCA 3B and benefits to ENP are limited

2. *Where (in general) should we send water across the L-67s if a degree of restoration in 3B is attainable and/or WCA 3B is needed to get restoration targets in the park and southern 3A?*

   * A South and/or Central orientation provides greater benefits than a Northerly orientation due to landscape pattern/topography in WCA 3B

Step 3: Infrastructure Formulation

Key Questions for Trend Analysis :

3. *In the absence of the Blue Shanty flowway, are pumps necessary to flow water out of 3B, and if so how many,? Is this tied to particular inflow location into 3B?*

*Pumps do a superior job of pushing water out of WCA 3B. Modeling has shown that 1,000cfs is needed. Two 500cfs pumps would provide greater operational flexibility. The corresponds to the South/Central orientation of inflow into WCA 3B.

4. What additional benefits are provided by the Blue Shanty flowway?

* The Blue Shanty flowway provides greater benefits to the ridge and slough areas of ENP. Impacts to the Marl Prairie need to be further examined. The Blue Shanty Levee provides seepage control and should be reexamined as a seepage measures.

GREENLINE and BLUELINE: Screening Results

- Screening effort resulted in 3 cost-effective groupings of options to be further consolidated and refined into the final array

I. Minimal structure on L-67A and increase S-333
   - Increase S-333 to 3,000cfs since structure frequently reached 2,000cfs capacity
   - Include minimal structure on L-67A to minimize further degradation in WCA 3B
   - Include minimal structure on L-67A to utilize existing S-355 A and B

II. Increase S-333 and install gated structures on the L-67A with gravity outflow from WCA 3B
   - Increase S-333 to 3,000cfs since structure frequently reached 2,000cfs capacity
   - Including two 500cfs and one 750cfs on the L-67A (flow distribution from iModel)
   - Include one additional outlet structures on L-29 west of S-355 A and B

III. Increase S-333 and install gated structures on the L-67A with pumped outflow from WCA 3
   - Increase S-333 to 3,000cfs since structure frequently reached 2,000cfs capacity
   - Including four 500cfs structures on the L-67A, to achieve greatest distribution of flow and benefits in WCA 3B (four smaller structures approximately equivalent in cost to three larger structures)
   - Include two 500cfs pumps in additional to S-355A and B to achieve the greatest distribution and flexibility (two smaller pumps approximately equivalent in cost to one larger pump)

What Next?

- Identify seepage management measures
  - RSM Sensitivity Analysis
- Combine seepage management measures with three recommendations from Greenline screening
- Identify any additional Greenline configurations that are high performing with varying degrees of seepage management

QUESTIONS?

Visit www.evergladesplan.org for updates and current information