

COMPREHENSIVE EVERGLADES RESTORATION PLAN

LAKE OKEECHOBEE WATERSHED RESTORATION

INTEGRATED PROJECT IMPLEMENTATION REPORT
& ENVIRONMENTAL IMPACT STATEMENT

17-May-2017

*Trusted Partners Delivering Value
Today for a Better Tomorrow*





INTRODUCTION



BUILDING STRONG

- Welcome to the May PDT meeting of 2017 for the Lake Okeechobee Watershed Restoration Project
- Attendance – CERP Team and Public
- Housekeeping Items:
 - Please keep phones on mute unless you are talking
 - Please state your name and who you are representing before making a statement or asking a question
 - REMINDER: This is a CERP PDT meeting and follows FACA Requirements as outlined in CGM 011.02. A Public Comment period has been established at the end of our agenda.
- Agenda Overview



AGENDA



BUILDING STRONG

1. Introduction (Tim Gysan, USACE) 9:00 – 9:10
2. 90-day Look Ahead (Tim Gysan, USACE) 9:10 – 9:20
3. Sub-team Updates 9:20 – 10:40
 - a) Round 1 Alternatives Discussion including ROM costs and habitat units (Lisa Aley, USACE)
 - b) Round 2 Alternatives Discussion (Lisa Aley, USACE)
 - c) Wetland Design and ROM Costs (Zulamet Vega-Liriano, USACE)
4. Public Comment Period 10:40 – 10:55
5. Closing remarks and Adjourn 10:55 – 11:00





90 DAY LOOK AHEAD



BUILDING STRONG

WE ARE HERE





ALTERNATIVES INCLUDED IN FIRST ROUND OF MODELING



BUILDING STRONG

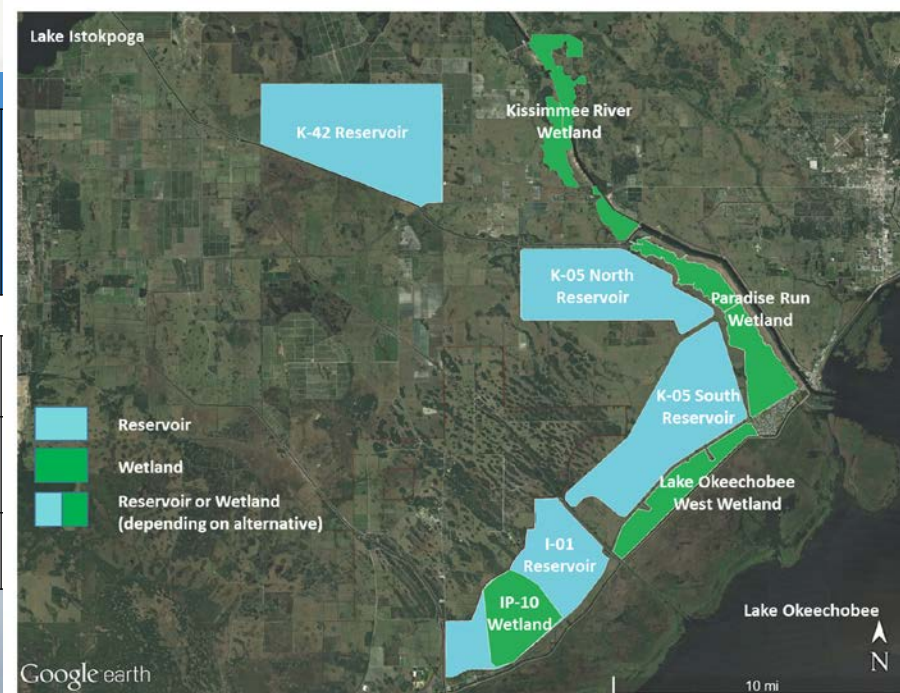
Previous reservoir footprint map

LAKE OKEECHOBEE WATERSHED PROJECT ALTERNATIVES FOR CONSIDERATION

Alternative	Reservoir Component		ASR Component		Rough Costs
	Reservoir (s)	Storage Capacity (total acre-feet)	# of ASR wells	Storage Capacity (acre-feet per year)	

ALTERNATIVES INCLUDED IN FIRST ROUND OF MODELING

Alternative 1a	K05 North and K-05 South	267,000	110	616,000	\$2.7B
Alternative 2	K-05 North, K-05 South, and K-42	437,000	110	616,000	\$3.9B
Alternative 3	K-42 and I-01	295,000	112	627,200	\$2.9B





FIRST ROUND OF MODELING HABITAT UNIT RESULTS



BUILDING STRONG

Northern Estuaries PMs	ECB	FWO	ALT1	ALT2a	ALT3	Max HUs
Caloosahatchee Habitat Units (acres)	2839	39038	43297	44717	42587	70979
St. Lucie Habitat Units (acres)	2099	6447	8397	*8097	*8097	14994
Overall NE Habitat Units (acres)	4,938	45,485	51,694	52,814	50,684	85,973
Northern Estuaries Potential Lift (acres)	-40,547	0	6,209	7,329	5,199	40,488

Lake Okeechobee PMs	ECB	FWO	Alt 1	Alt 2a	Alt 3	Max HUs
Ecological PM Hus (acres)	108,675	107,100	111,825	111,825	110,250	157,500
Stage Envelope PM Hus (acres)	26,100	27,000	32,850	34,650	33,750	45,000
Extreme Stage PM Hus (acres)	41,850	41,850	43,200	43,200	43,200	45,000
Overall Lake O Habitat Units	176,625	175,950	187,875	189,675	187,200	247,500
Lake O Potential Lift (acres)	675	0	11,925	13,725	11,250	71,550

Total Potential Lift	-39,872	0	18,134	21,054	16,449	112,038
-----------------------------	----------------	----------	---------------	---------------	---------------	----------------

ROM Costs			\$2.7B	\$3.9B	\$2.9B	
Cost-Effective?			Yes	Yes	No	





LESSONS LEARNED FROM 1ST ROUND OF ALTERNATIVES



BUILDING STRONG

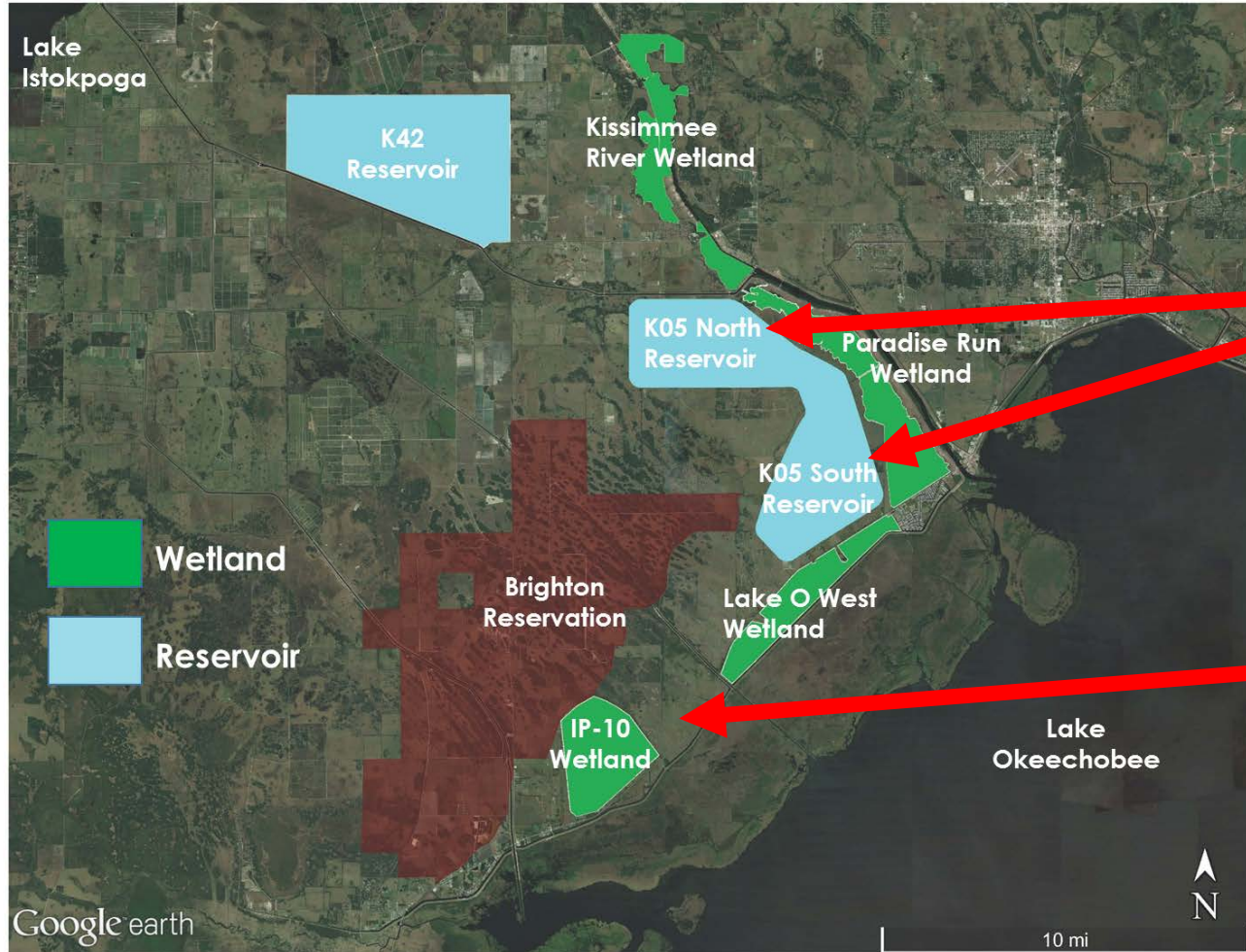
Alternative ID	Lessons Learned	Retain?
Alternative 1a	<ul style="list-style-type: none">Generated the most cost-effective habitat unitsK05 South Footprint unacceptable to Seminole Tribe of Florida	Retain for second round but revise K05 South- Alternative 1b
Alternative 2	<ul style="list-style-type: none">Cost effective but higher increment of cost per benefitLarger storage doesn't necessarily yield commensurate benefitsK05 South Footprint unacceptable to Seminole Tribe of Florida	Retain as a maximum storage alternative but revise K05 South- Alternative 2a
Alternative 3	<ul style="list-style-type: none">Not cost-effectiveProduced least habitat units1-01 footprint unacceptable to Seminole Tribe of Florida	Do not retain



REVISED PROJECT MAP



BUILDING STRONG



Revised K05 North and K05 South footprints

I-01 Reservoir not carried forward



ALTERNATIVE MODELING STRATEGY



BUILDING STRONG

LAKE OKEECHOBEE WATERSHED PROJECT ALTERNATIVES FOR CONSIDERATION

Alternative	Reservoir Component		ASR Component		Rationale
	Reservoir (s)	Storage Capacity (ac-ft)	# of ASR wells	Storage Capacity (ac-ft per year)	
ALTERNATIVES FOR SECOND ROUND OF MODELING					
Alternative 2a	Revised K-05 North and revised K-05 South, and K-42	369,005	110	616,000	Maximum storage
Alternative 2b	Revised K05 North and K-42	275,838	70	390,915	STOF 'least objectionable alternative,' RESOPS-informed ASR
Alternative 1b	Revised K05 North and revised K-05 South	198,815	80	448,000	Maximize public lands, RESOPS-informed ASR
Alternative 2c	K-42	170,085	50	280,000	Least-cost, minimum storage, watershed only ASR (no reservoir-assisted ASR)

More reservoir storage

 Less reservoir storage



ALTERNATIVE 2a



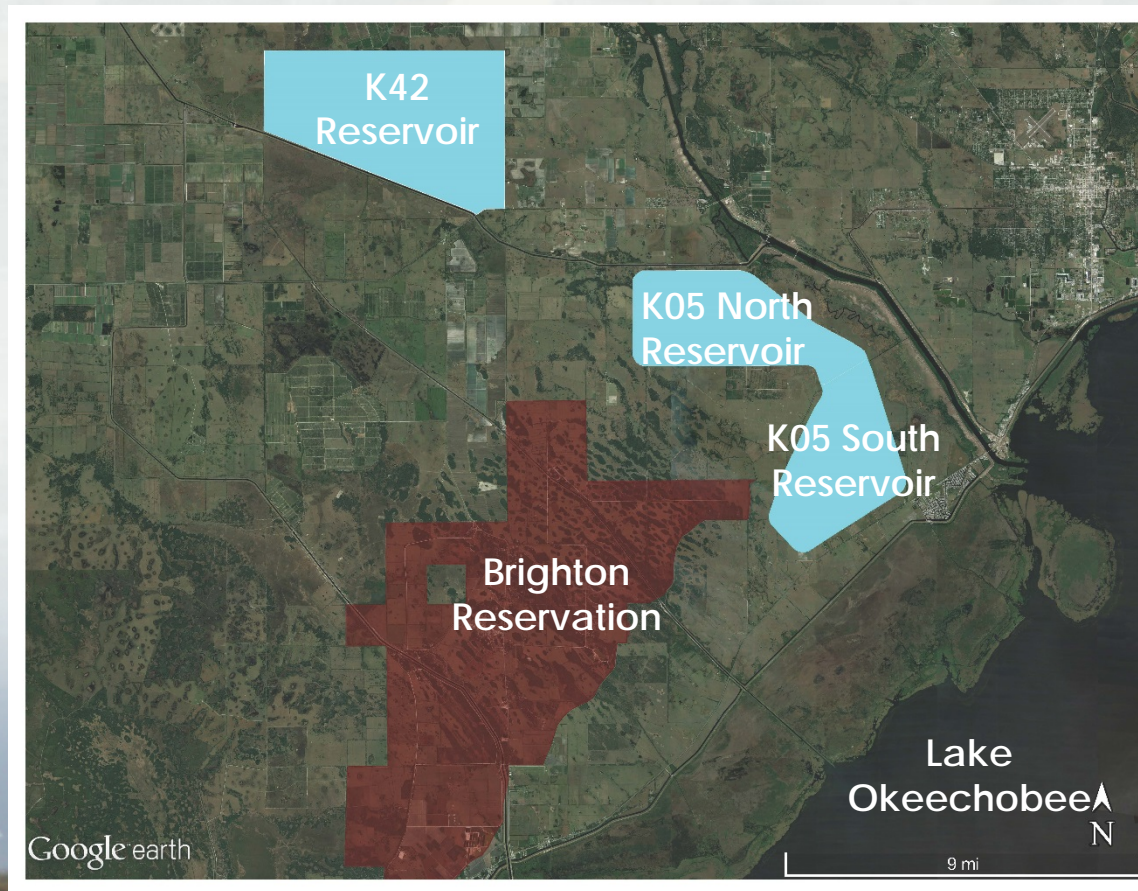
BUILDING STRONG

LAKE OKEECHOBEE WATERSHED PROJECT ALTERNATIVES FOR CONSIDERATION

Alternative	Reservoir Component		ASR Component	
	Reservoir (s)	Storage Capacity (ac-ft)	# of ASR wells	Storage Capacity (ac-ft per year)
Alternative 2a	Revised K-05 North and revised K-05 South, and K-42	369,005	110	616,000

Rationale: Maximum 'cost-effective' reservoir and ASR storage to set upper limit for project benefits

- Including both watershed and reservoir-assisted ASR
- Wetlands TBD (add-on feature)






ALTERNATIVE 2a

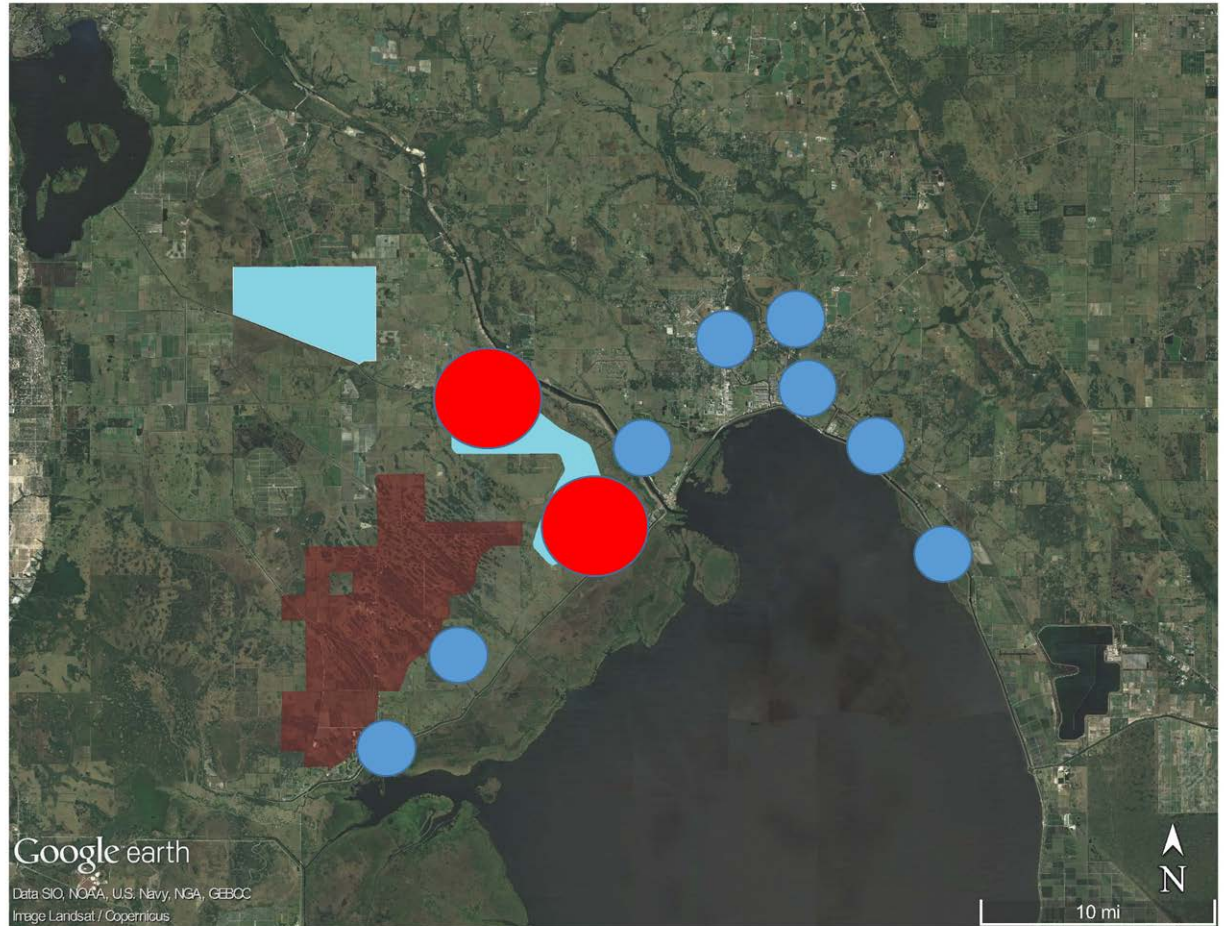


BUILDING STRONG

110 ASR Wells

 10 ASR Wells: UFA + APPZ

 15 ASR Wells: UFA + APPZ



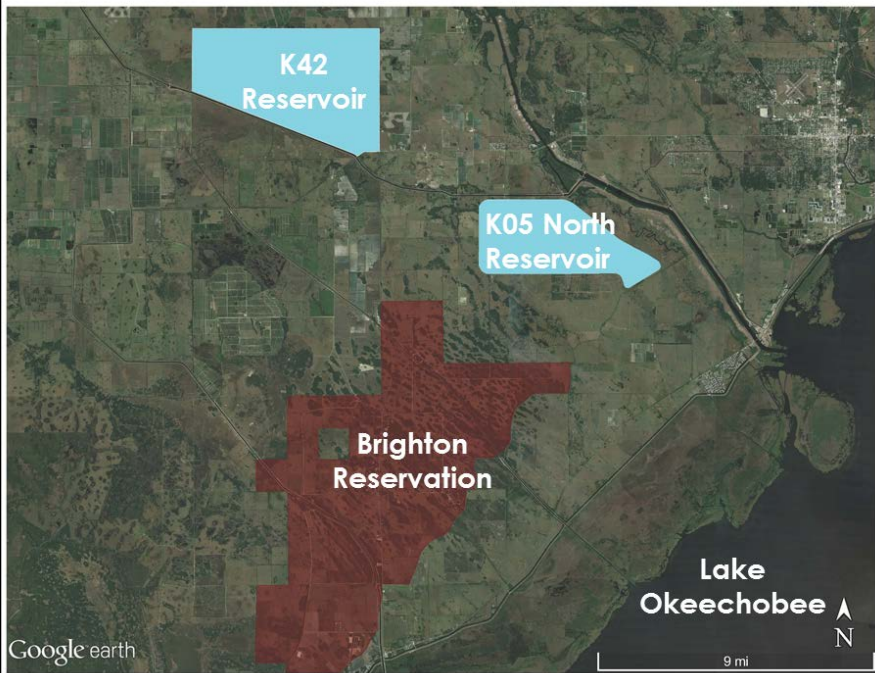


ALTERNATIVE 2b



LAKE OKEECHOBEE WATERSHED PROJECT ALTERNATIVES FOR CONSIDERATION

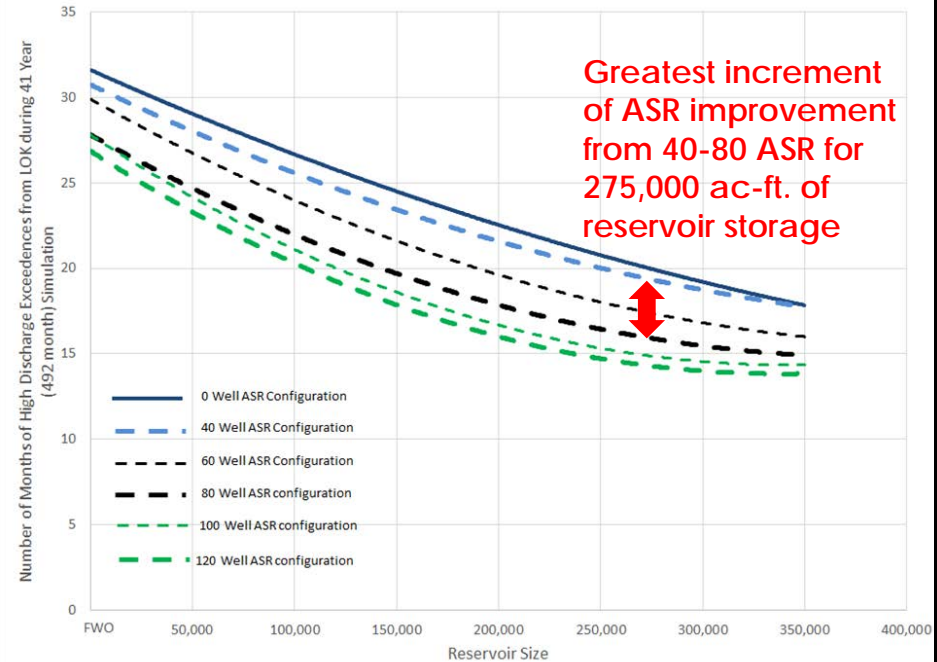
Alternative	Reservoir Component		ASR Component	
	Reservoir	Storage Capacity (ac-ft)	# of ASR wells	Storage Capacity (ac-ft per year)
Alternative 2b	Revised K05 North and K-42	275,838	70	390,915



Rationale: STOF 'least objectionable alternative ASR range optimized for greatest increment of improvement based on reservoir storage

- Including both reservoir-assisted and watershed ASR
- Wetlands TBD (add-on feature)

Caloosahatchee Estuary High Discharge Months from Lake Okeechobee vs. Reservoir Size







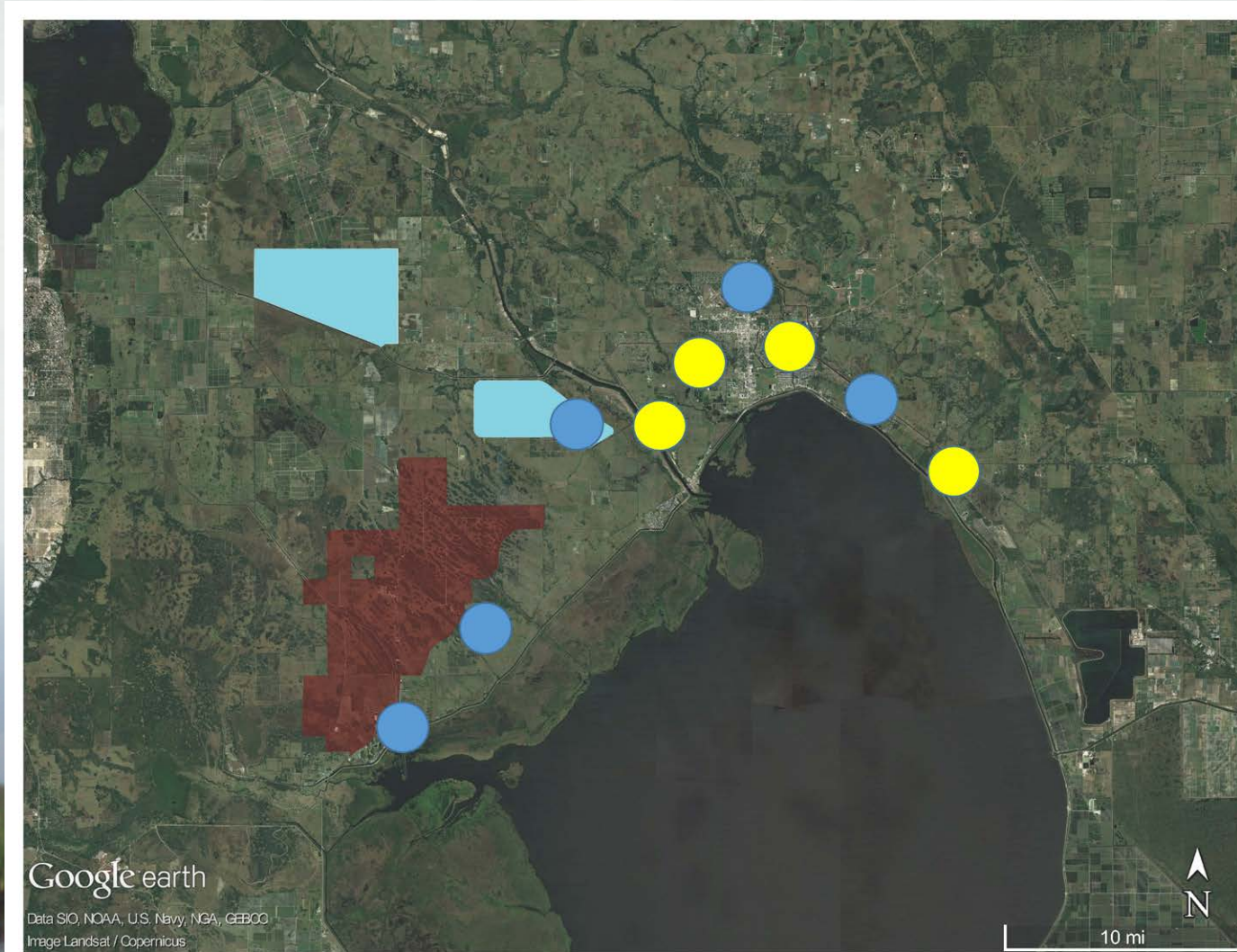
ALTERNATIVE 2b



BUILDING STRONG

70 ASR Wells

-  5 wells: UFA
-  10 wells: UFA + APPZ



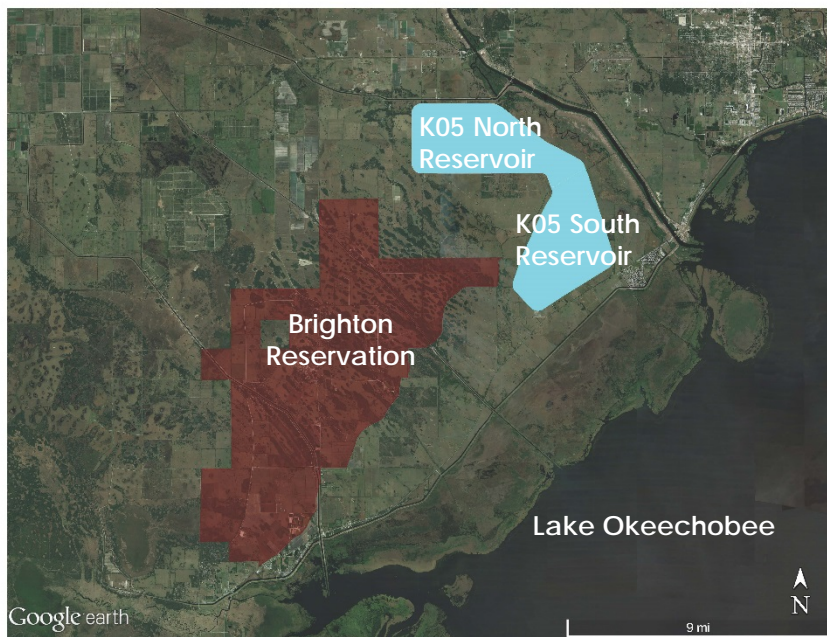


ALTERNATIVE 1b



LAKE OKEECHOBEE WATERSHED PROJECT ALTERNATIVES FOR CONSIDERATION

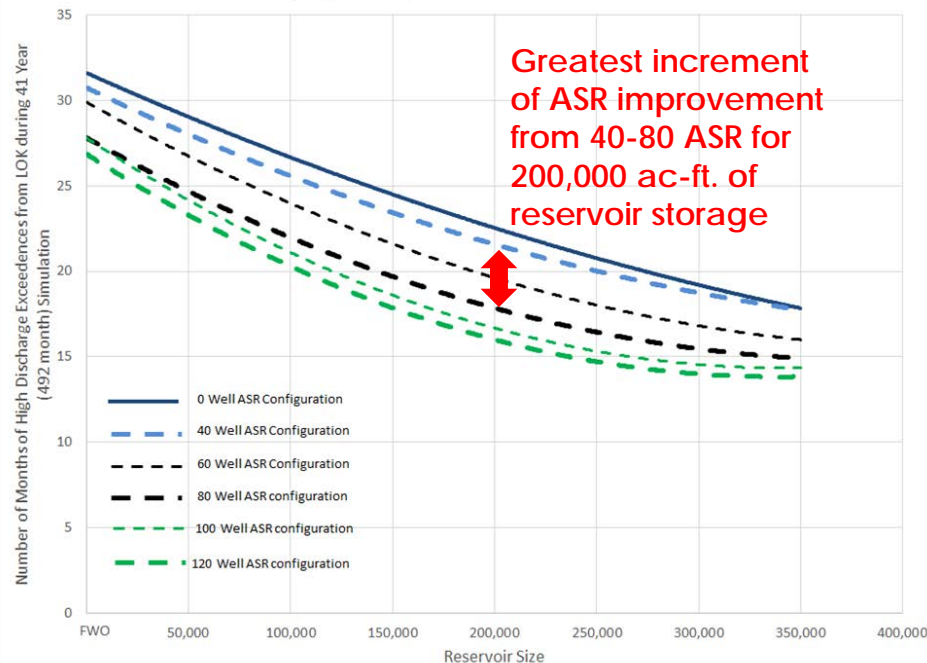
Alternative	Reservoir Component		ASR Component	
	Reservoir	Storage Capacity (ac-ft)	# of ASR wells	Storage Capacity (ac-ft per year)
Alternative 1b	Revised K05 North and revised K05 South	198,815	80	448,000



Rationale: Maximize public lands, ASR range optimized for greatest increment of improvement based on reservoir storage

- Including both reservoir-assisted and watershed ASR
- Wetlands TBD (add-on feature)

Caloosahatchee Estuary High Discharge Months from Lake Okeechobee vs. Reservoir Size





ALTERNATIVE 1b



BUILDING STRONG

80 ASR Wells



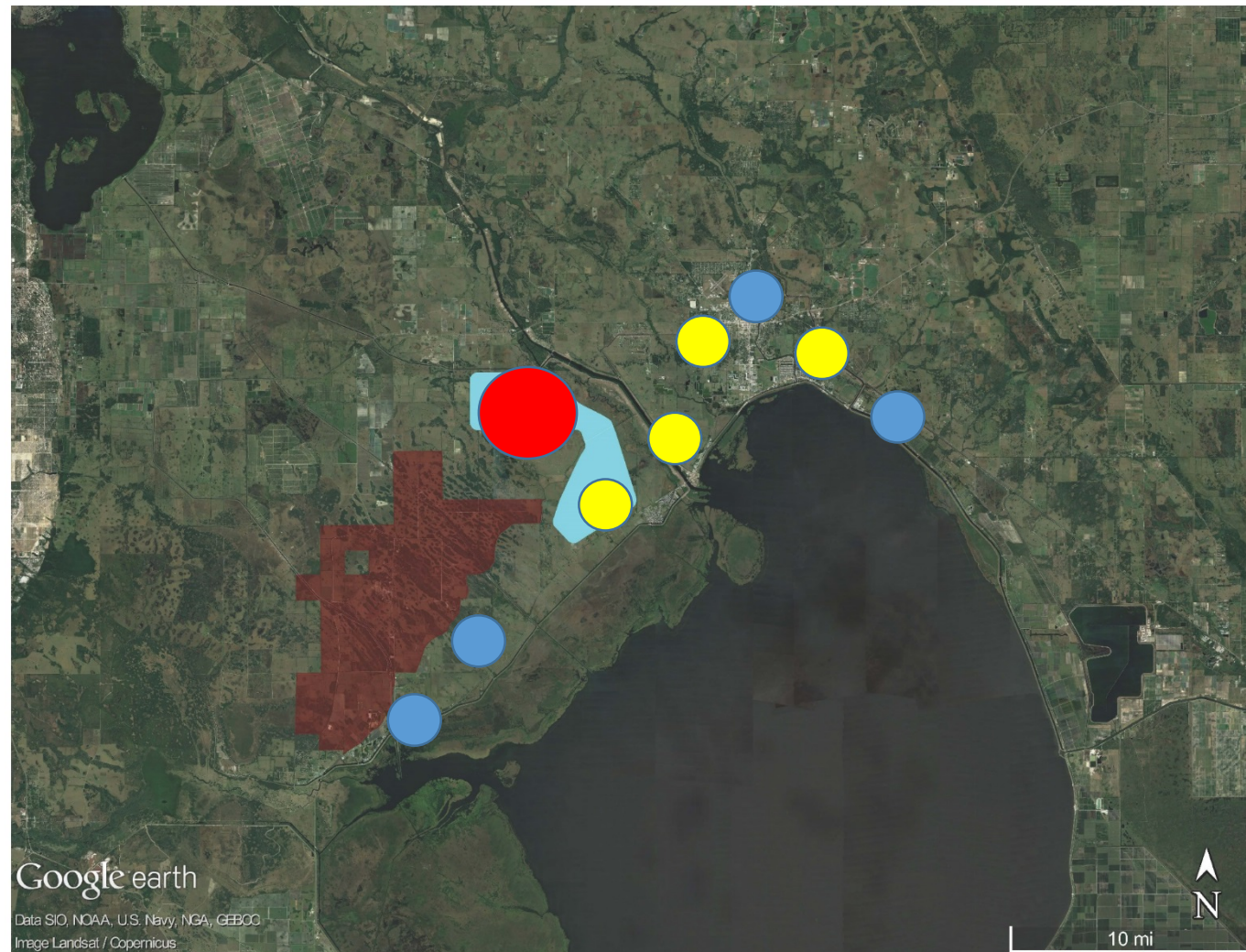
5 wells: UFA



10 wells: UFA + APPZ



20 wells: UFA + APPZ





ALTERNATIVE 2c



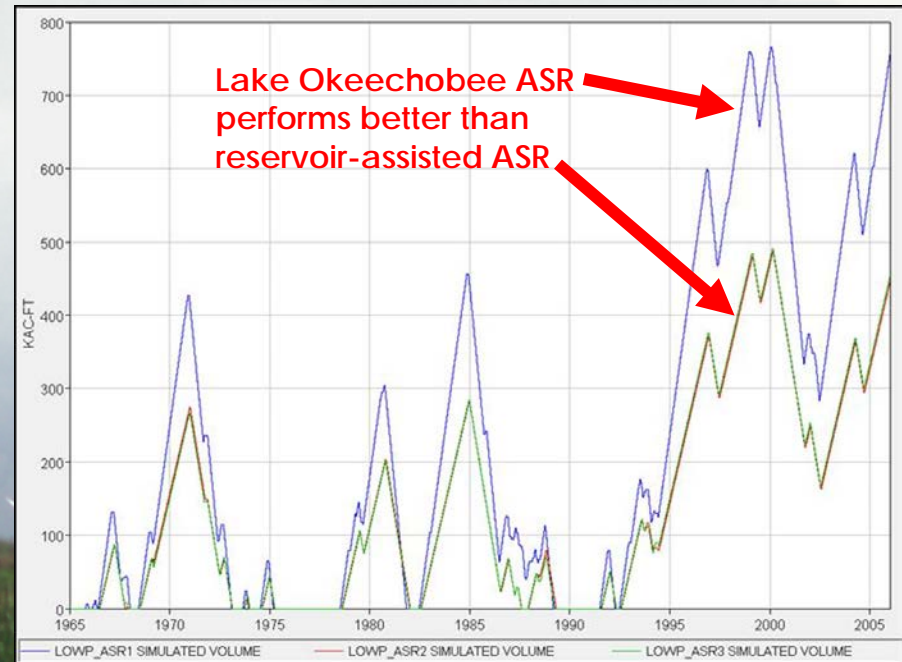
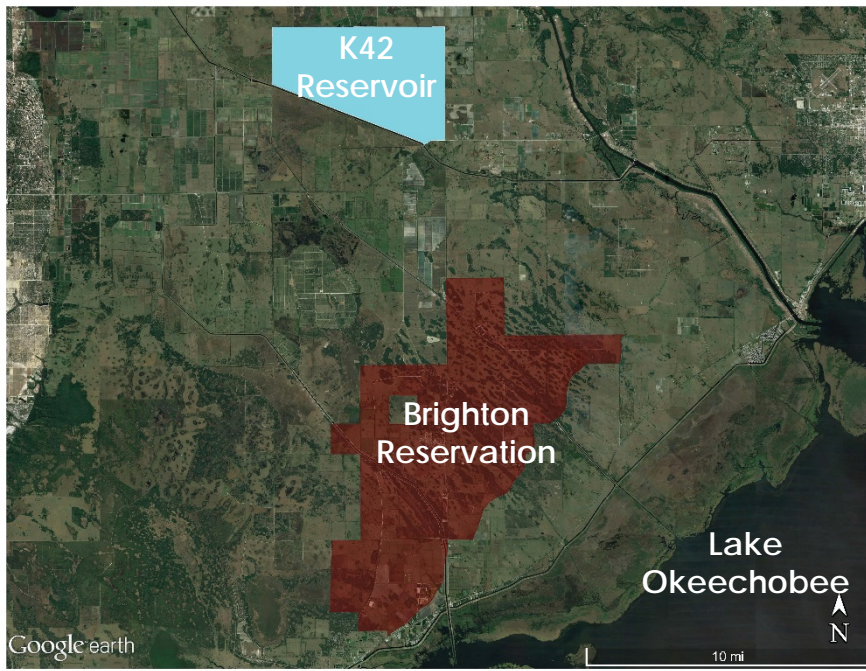
BUILDING STRONG

Rationale: Least-cost and storage

- Including watershed-only ASR to maximize performance with limited wells
- Wetlands TBD (add-on feature)

LAKE OKEECHOBEE WATERSHED PROJECT ALTERNATIVES FOR CONSIDERATION

Alternative	Reservoir Component		ASR Component	
	Reservoir	Storage Capacity (ac-ft)	# of ASR wells	Storage Capacity (ac-ft per year)
Alternative 2c	K-42	~170,000	50	280,000







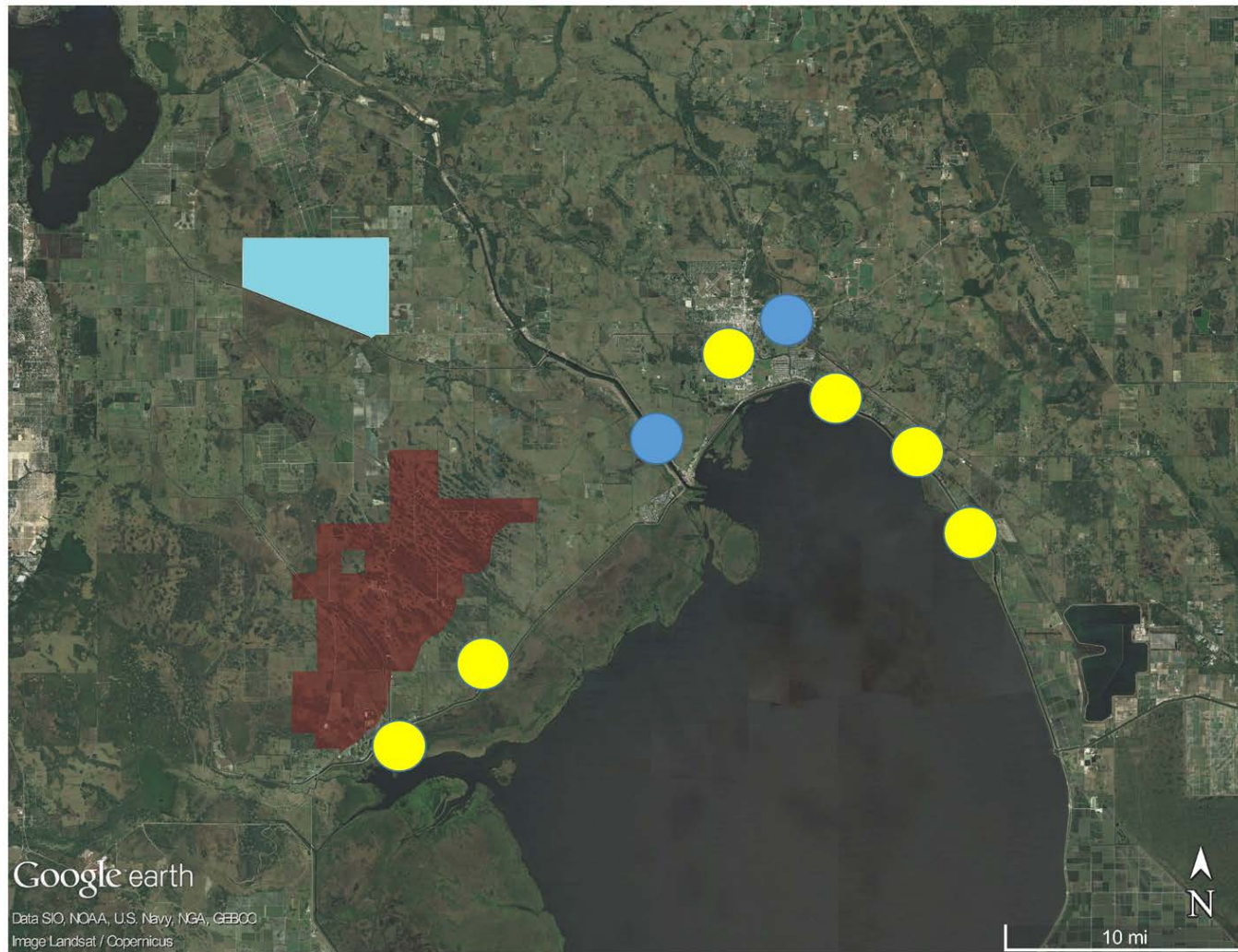
ALTERNATIVE 2c



BUILDING STRONG

50 ASR wells

-  5 wells: UFA
-  10 wells: UFA + APPZ





DEEP INJECTION WELL FORMULATION



BUILDING STRONG

- Feedback from USACE vertical team on DIWs:
 - Evaluation of the application of DIWs should be done through a regional study to consider system-wide Everglades impacts
- Therefore, DIWs will no longer be included as a management measure in the LOWRP to reduce undesirable discharges to the Caloosahatchee and St. Lucie estuaries
- DIW technology could be investigated further through a follow-up study to determine the optimal functionality and determine impacts to the regional system.



ALTERNATIVE SCREENING CONSIDERATIONS-P&Gs



BUILDING STRONG

Principals and Guidelines (P&Gs) recommend using the below four evaluation criteria in the screening of alternative plans:

1. **Completeness:** Does the alternative rely on substantial activity by others or can it provide benefits relatively independently?
2. **Effectiveness:** How well does the alternative meet planning objectives?
3. **Efficiency:** Provide cost-effective benefits
4. **Acceptability:** Acceptance by State and local entities, Tribes, stakeholders, and the public and compatibility with existing laws, regulations, and public policies. Can be technical economic, financial, environmental, social, political, legal, or institutional.

Feedback needed
on all categories,
but especially
ACCEPTABILITY of
alternatives





ALTERNATIVE SCREENING CONSIDERATIONS-P&Gs



BUILDING STRONG

The P&G also established four accounts to facilitate evaluation and the display of the effects of alternative plans.

- 1. National Ecosystem Restoration:** How well outputs from ecosystem restoration projects contribute to the Federal objective of Corps civil works.
- 2. Regional Economic Development:** Changes in regional economic activity resulting from each alternative
- 3. Environmental Quality:** favorable or undesirable changes in the ecological, aesthetic, and cultural attributes of natural and cultural resources. (takes information from NEPA analysis)
- 4. Other Social Effects:** Including but not limited to community impacts; life, health, and safety factors; displacement.

Feedback needed on all categories, but especially **ENVIRONMENTAL QUALITY** and **OTHER SOCIAL EFFECTS** of alternatives



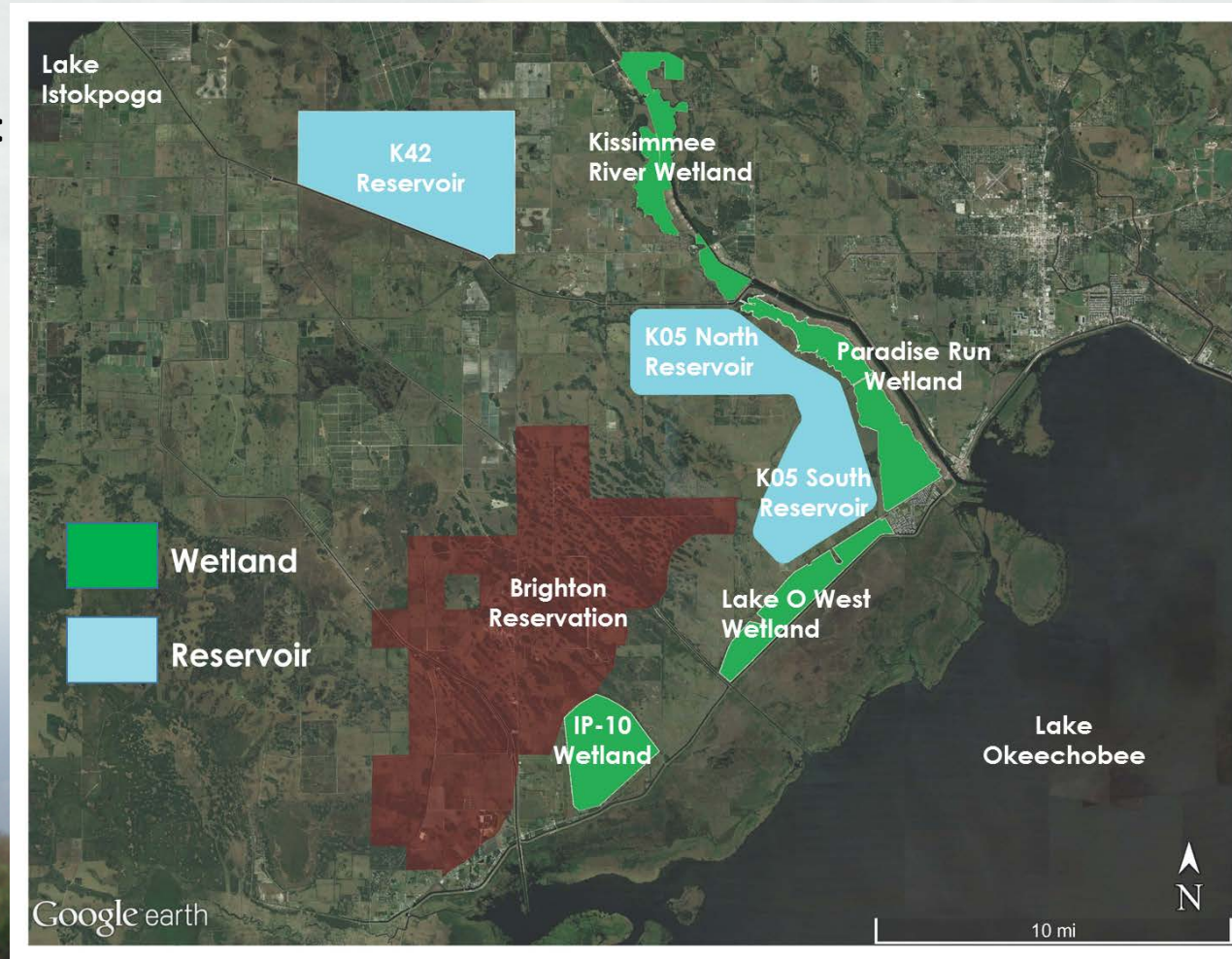
Wetland Design Overview



BUILDING STRONG

LOWRP Wetlands (green):

- 1) Kissimmee River – 2,817 acres
 - a) North – 713 acres
 - b) Center – 1,477 acres
 - c) South – 627 acres
- 2) Paradise Run – 4,083 acres
 - a) North – 1,547 acres
 - b) South – 2,537 acres
- 3) IP-10 – 3,471
- 4) Lake O West – 2,800 acres





Wetland Design Overview



BUILDING STRONG

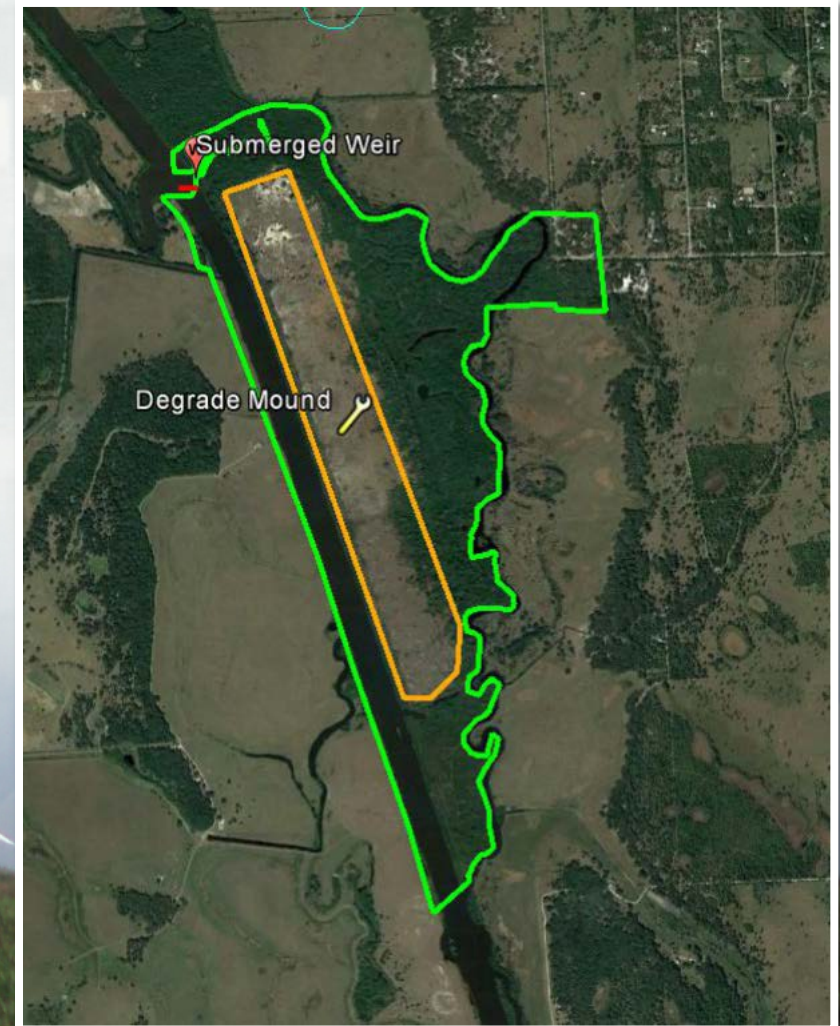
Kissimmee River - North

General:

- Area: 713 acres
- Land: 0% land acquisition, 100% publicly owned lands

Proposed features:

- Degrade spoil mound (approx. 225 acres)
- Install submerged weir within C-38 canal to divert water to the eastern bank



Watershed Assessment Model (WAM)				
Water Availability: Existing Conditions Results				
	Reach 106 (ac-ft/mo)	Reach 108 (ac-ft/mo)	Subtotal (ac-ft/mo)	Depth (inch)
Mon Avg	222.6	221.1	443.7	3.4
Ann Avg	2,671.2	2,653.3	5,324.5	41.2
Avg Wet Season	2,125.2	2,085.8	4,211.0	32.6
Avg Dry Season	545.9	567.5	1,113.4	8.6

***Kissimmee North (770 acres). Reach 106 included flows from reach 107 and Reach 108 included flows from reaches 109 and 110.



Wetland Design Overview



BUILDING STRONG

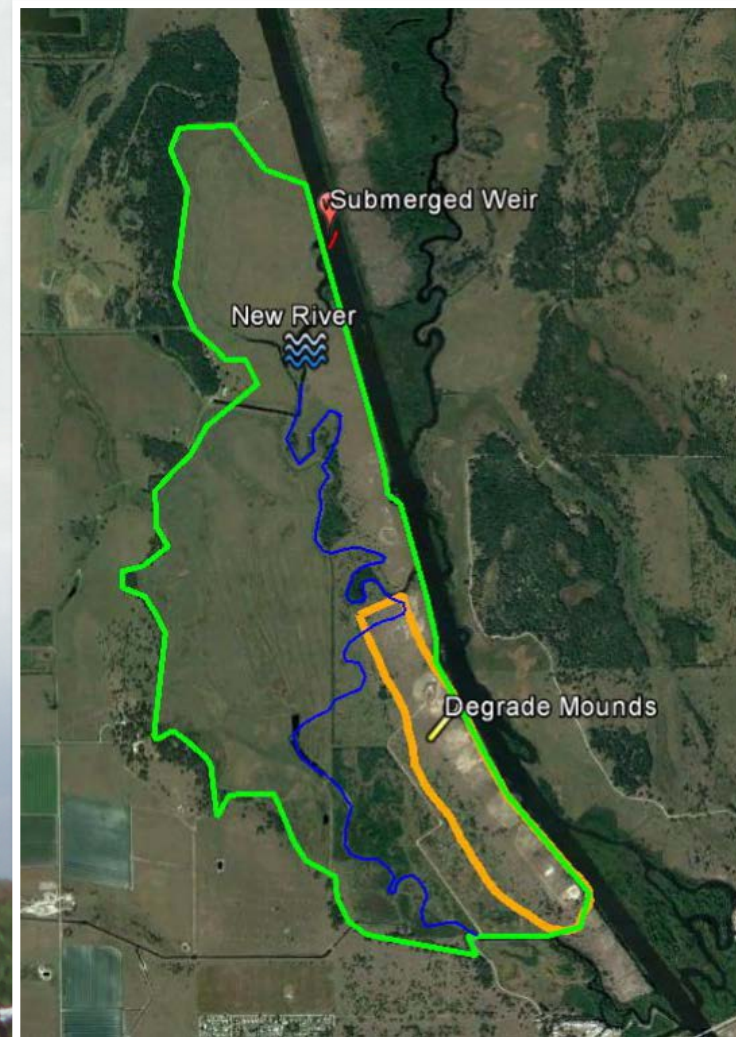
Kissimmee River - Center

General:

- Area: 1,477 acres
- Land: 97% land acquisition, 3% publicly owned lands

Proposed features:

- Degrade spoil mound (approx. 226 acres)
- Install submerged weir within C-38 canal to divert water to the western bank
- New river through the site to imitate historical water flow (21,500 LF)



Watershed Assessment Model (WAM)				
Water Availability: Existing Conditions Results				
	Reach 95 (ac-ft/mo)	Reach 98 (ac-ft/mo)	Subtotal (ac-ft/mo)	Depth (inch)
Mon Avg	17.5	211.4	228.9	2.4
Ann Avg	210.1	2,537.3	2,747.4	28.8
Avg Wet Season	169.2	1,982.0	2,151.2	22.5
Avg Dry Season	40.9	555.2	596.2	6.2

***Kissimmee Middle (1,145 acres). Reach 98 included flows from reaches 99 and 100



Wetland Design Overview



BUILDING STRONG

Kissimmee River – South #1

General:

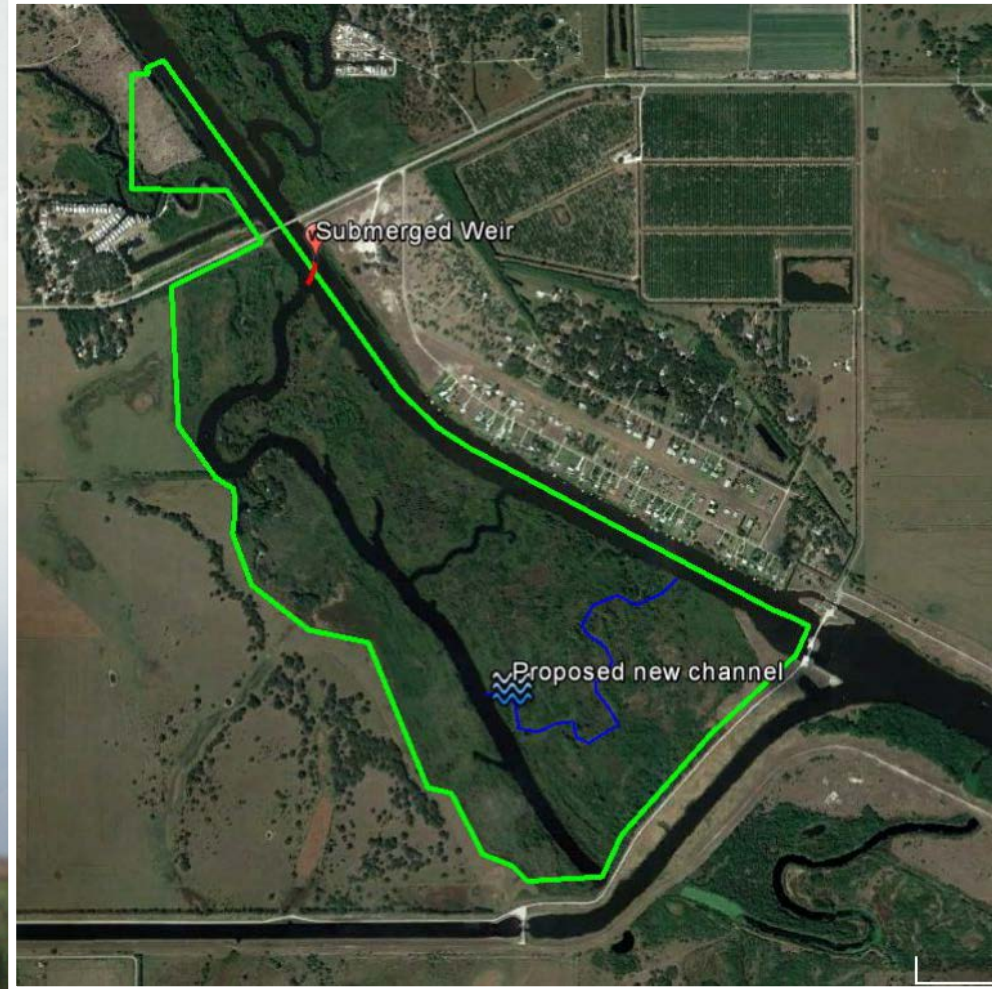
- Area: 627 acres
- Land: 0% land acquisition, 100% publicly owned lands

Proposed features:

- Install submerged weir within C-38 canal to divert water to the western bank
- New river within the southern portion of the easement to tie into C-38 canal (5,300 LF)

Watershed Assessment Model (WAM)		
Water Availability: Existing Conditions Results		
	Reach 89 (ac-ft/mo)	Depth (inch)
Mon Avg	64.5	1.2
Ann Avg	774.1	14.8
Avg Wet Season	620.6	11.9
Avg Dry Season	153.6	2.9

***Kissimmee South (627 acres).





Wetland Design Overview



BUILDING STRONG

Kissimmee River – South #2

General:

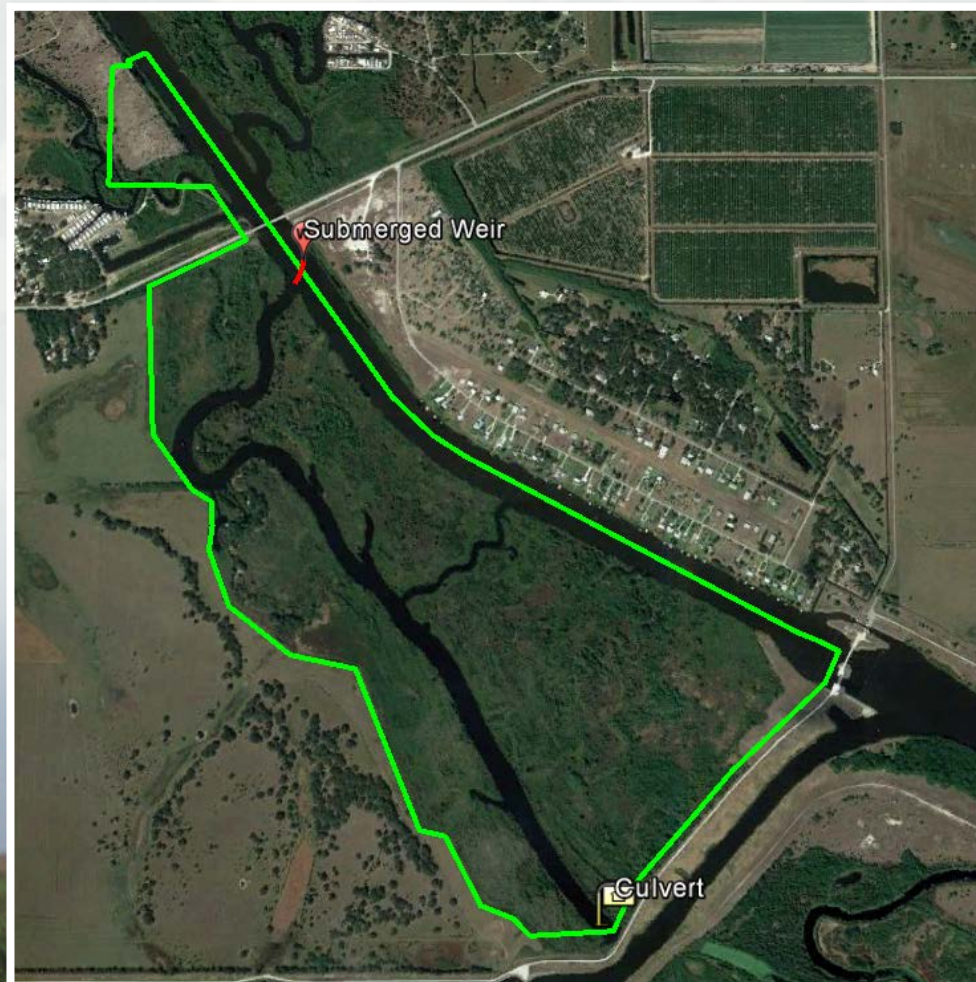
- Area: 627 acres
- Land: 0% land acquisition, 100% publicly owned lands

Proposed features:

- Install submerged weir within C-38 canal to divert water to the western bank
- New culvert through HDD with gates to tie into C-41A canal

Watershed Assessment Model (WAM)		
Water Availability: Existing Conditions Results		
	Reach 89 (ac-ft/mo)	Depth (inch)
Mon Avg	64.5	1.2
Ann Avg	774.1	14.8
Avg Wet Season	620.6	11.9
Avg Dry Season	153.6	2.9

***Kissimmee South (627 acres).





Wetland Design Overview



Paradise Run – North & South

General:

- Area: PRN-1,547 acres; PRS- 2,537 acres
- Land: PRN- 44% land acquisition, 56% publicly owned lands; PRS- 90% land acquisition, 10% publicly owned lands

Proposed features:

- New pump station to direct flow from C-41A into the wetland footprint
- New river through the site to imitate historical water flow (73,500 LF)
- Construct overflow/step weir (levee notch) to transport water from PR-north to PR-south
- New culvert through HHD with gates to tie into C-38 canal



Paradise Run North

Watershed Assessment Model (WAM)					
Water Availability: Existing Conditions Results					
	Reach 10	Reach 28	Reach 29	Subtotal	Depth
	(ac-ft/mo)	(ac-ft/mo)	(ac-ft/mo)	(ac-ft/mo)	(inch)
Mon Avg	85.2	81.6	41.0	207.8	1.6
Ann Avg	1,022.2	978.9	492.4	2,493.6	19.3
Avg Wet Season	769.9	743.9	362.5	1,876.2	14.6
Avg Dry Season	252.4	235.0	129.9	617.3	4.8

Paradise Run South

Watershed Assessment Model (WAM)				
Water Availability: Existing Conditions Results				
	Reach 4	Reach 13	Subtotal	Depth
	(ac-ft/mo)	(ac-ft/mo)	(ac-ft/mo)	(inch)
Mon Avg	185.5	54.9	240.5	1.1
Ann Avg	2,226.4	659.3	2,885.7	13.7
Avg Wet Season	1,427.7	517.8	1,945.5	9.2
Avg Dry Season	798.7	141.4	940.1	4.4

***Paradise Run South (2,537 acres). Reach 4 included flow from reach 5 to 9 and Reach 13 included flow from reach 14 to 20. Paradise Run North (1,547 acres) in C38 WAM domain.



Wetland Design Overview



BUILDING STRONG

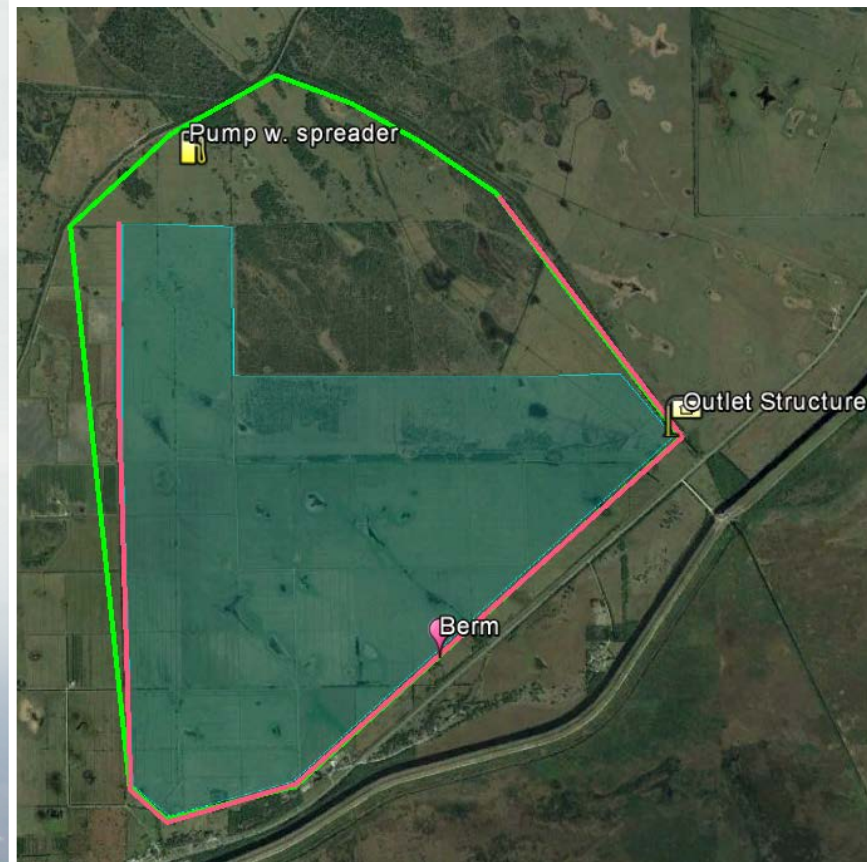
IP-10

General:

- Area: 3,471 acres
- Land: 100% land acquisition, 0% publicly owned lands

Proposed features:

- New pump station with spreader to direct flow from L-60 into the wetland footprint
- New perimeter berm along the southern, eastern, and western boundaries (36,500 LF)
- Land smoothing to remove agricultural landscaping (2,500 ac)
- New outlet structure in the eastern corner of the easement to move water offsite to L-48



Watershed Assessment Model (WAM)				
Water Availability: Existing Conditions Results				
	Reach 4 (ac-ft/mo)	Reach 10 (ac-ft/mo)	Subtotal (ac-ft/mo)	Depth (inch)
Mon Avg	64.1	67.8	131.9	0.5
Ann Avg	769.4	813.4	1,582.8	5.5
Avg Wet Season	589.8	615.4	1,205.3	4.2
Avg Dry Season	179.6	198.0	377.6	1.3

***IP-10 Site (3,471 acres) in L-49 Basin. Reach 4 included flow from reaches 5, 6, and 7 and Reach 10 included flow from reaches 11 and 12.



Wetland Design Overview



BUILDING STRONG

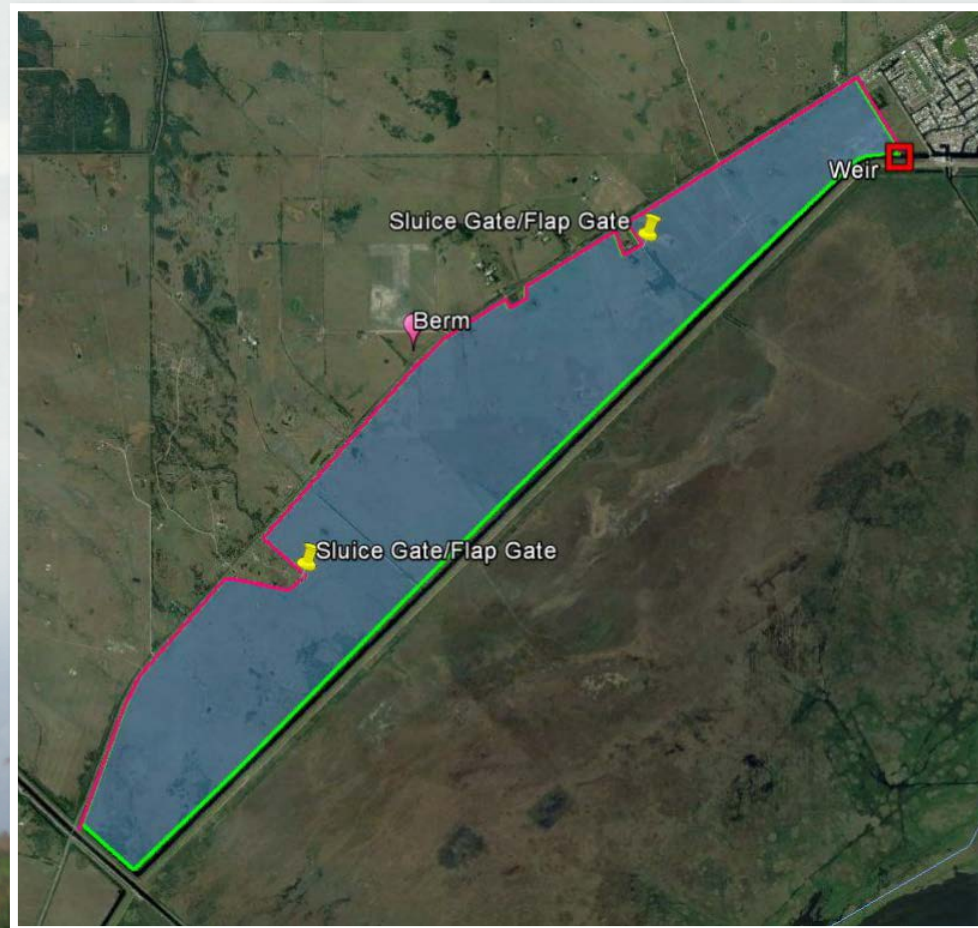
Lake O West

General:

- Area: 2,800 acres
- Land: 100% land acquisition, 0% publicly owned lands

Proposed features:

- New perimeter berm along the northern and eastern boundaries (43,000 LF) and install two culverts with gates
- Land smoothing to remove agricultural landscaping (700 ac)
- Install new above water weir to limit the flow of water in L-48 needed to inundate the wetland area



Watershed Assessment Model (WAM)				
Water Availability: Existing Conditions Results				
	Reach 36 (ac-ft/mo)	Reach 47 (ac-ft/mo)	Subtotal (ac-ft/mo)	Depth (inch)
Mon Avg	109.3	200.5	309.8	1.3
Ann Avg	1,311.7	2,405.6	3,717.3	15.9
Avg Wet Season	1,027.8	1,889.3	2,917.1	12.5
Avg Dry Season	283.9	516.3	800.1	3.4

***LO West Site (2,800 acres) in L-48 Basin. Reach 36 included flow from reach 37 to 44 and Reach 47 included flow from reach 48 to 63.



ESTUARY AND LAKE PERFORMANCE MEASURES



BUILDING STRONG

RECOVER Northern Estuaries Performance Measures

Salinity Envelope. The restoration goal is to re-establish salinity regimes suitable for the maintenance of healthy, naturally-diverse, and well-balanced estuarine ecosystems. Accomplishing restoration will require improving inordinate canal discharges (including regulatory releases from Lake Okeechobee) and insuring sufficient dry-season flows necessary to avoid ecologically damaging high and low salinity extremes.

RECOVER Lake Okeechobee Performance Measures

Lake Stage. Measures optimal stage conditions for Lake Okeechobee. Considers amount of time and distance of the lake stage outside of ecologically beneficial prescribed envelope (12 to 16 feet NVGD) and outside of extreme high and low lake stage events above 17 feet and below 10 feet NGVD.

Ecological Indicator Score. The desired restoration condition is a combination of lake stage envelope (12.5 ft NGVD-15.5 ft NGVD) and annual fluctuation in stage from maximum elevation at the end of the wet season (generally October) to minimum elevation at the end of the dry season (generally May) which results in a high annual point score for low cyanobacterial abundance and high epipelton, epiphyton, panfish abundance, and vascular SAV and Chara coverage.

- Caloosahatchee estuary: re-establish salinity range favorable to juvenile marine fish, shellfish, oysters, and SAV- stabilize salinity regimes that maintain low salinities in upper estuary
- St. Lucie Estuary: maintain salinity range favorable to fish, oysters, and SAV by addressing high volume long discharge events

Reduce frequent or prolonged departures of lake stage outside prescribed envelope and reduce extreme high and low lake stage events

Improve environmental health of the lake based on key ecological communities in nearshore and pelagic regions