Downs' Dam Feasibility Study

Myakka River Management Coordinating Council Public Meeting
May 21, 2021

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Presenters

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John Kiefer, PhD, PE, PWS

Project Sponsors

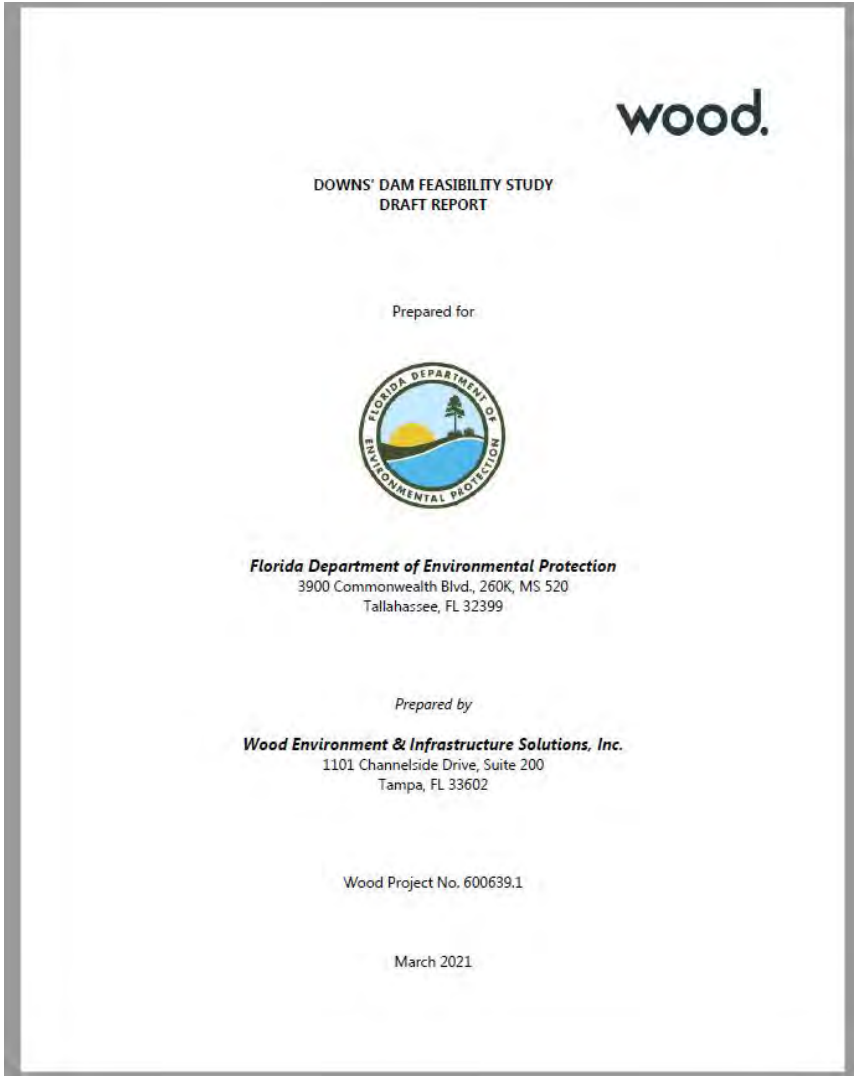
Florida Department of Environmental Protection – FDEP

Southwest Florida Water Management District – SWFWMD

Cooperative funding partner (CFI matching funds)

Study Components

- Project Objective
- Background Information
- Data Collection and Analysis
- Modeling
- Alternatives Analysis
- Summary & Conclusions



wood.

DOWNS' DAM FEASIBILITY STUDY
DRAFT REPORT

Prepared for

Florida Department of Environmental Protection
3900 Commonwealth Blvd., 260K, MS 520
Tallahassee, FL 32399

Prepared by

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Wood Project No. 600639.1

March 2021

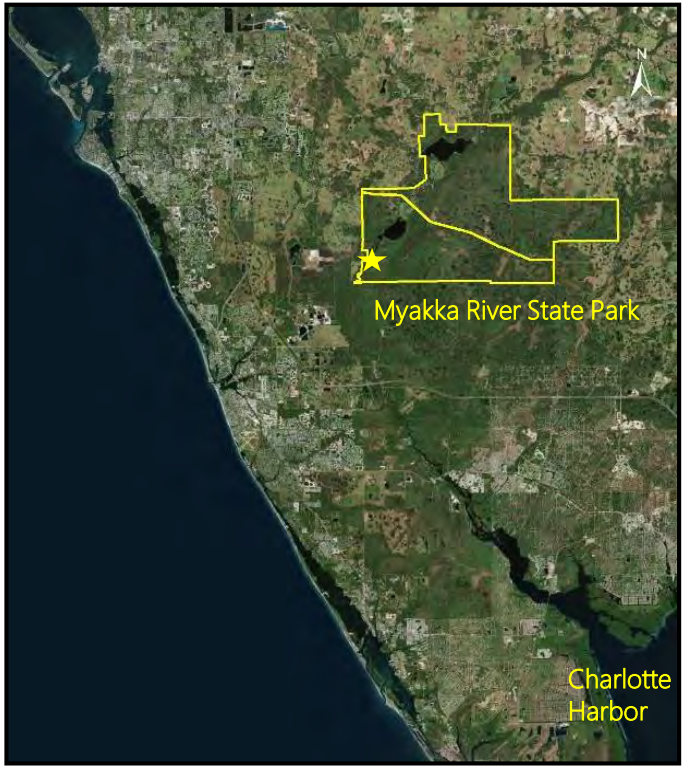
Project Objective

- Feasibility study to explore three alternatives, with the objectives of restoring natural systems and improving water quality in the Myakka River
  - Alt 1: Removing the dam
  - Alt 2: Amending the dam
  - Alt 3: Rebuilding the dam

Background Information

- Location
- Project Site
- Current Conditions

Location


N
Myakka River State Park
Charlotte
Harbor

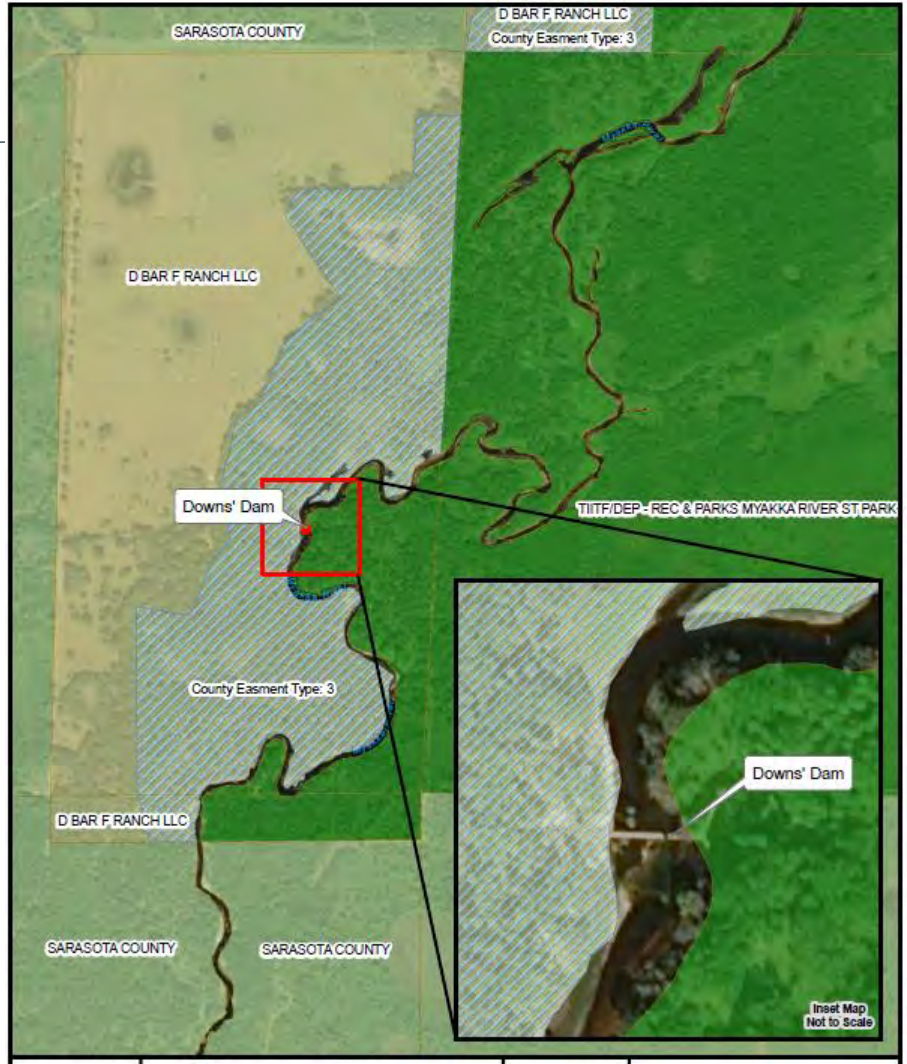

Lower Myakka Lake
Downs' Dam

Project Site

- Privately constructed in 1942 to hold back freshwater in the dry season for cattle operations
- Constructed on a limestone shoal
- Dam is ~90 ft long and 4 ft tall with a 50 ft long wing wall on NE side
- Notch 5 ft wide by 4 ft historically used as a gate for retaining water
  - Verbal agreement between landowner and MRSP to leave gate open

Project Site

- Dam ownership not clear; no identified party owns the abandoned dam
- No longer operated or maintained
- Myakka River waterway is Sovereign and Submerged Lands (state owns land underlying the dam)
- State owns East side (MRSP)
- West side privately owned (O Bar O Ranch); 162 acres under Conservation Easement recorded by Sarasota County in 2008



Project Site

Current Conditions

- Abutment erosion (breach) on east side of dam
- Cracks on west side of dam


2008


2010


2012


2014


2016


2018


2019


2020

No Action Alternative

- East breach would continue to erode
  - Loss of park property
  - Increased sedimentation downstream
  - Debris field
- Erosion on west bank likely to continue
- Potential avulsion
- Addressing issues here is part of MRSP's Unit Management Plan

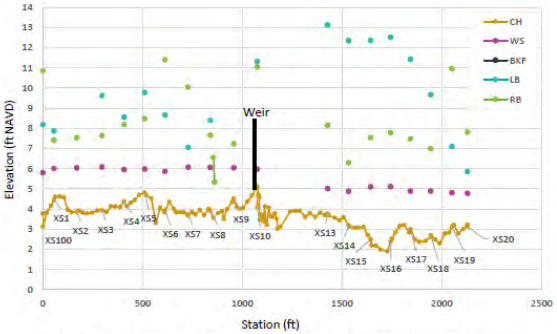
→ No action is not a viable alternative

Data Collection

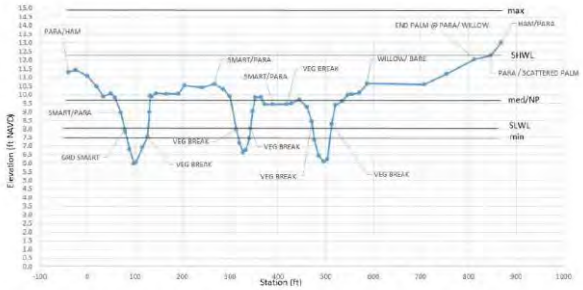
- Survey
- Water Levels
- Sediment
- Water Quality
- Vegetation & Wildlife

Survey

- River survey
  - Profile and cross sections
- LML
  - Outlet
  - Bathymetry



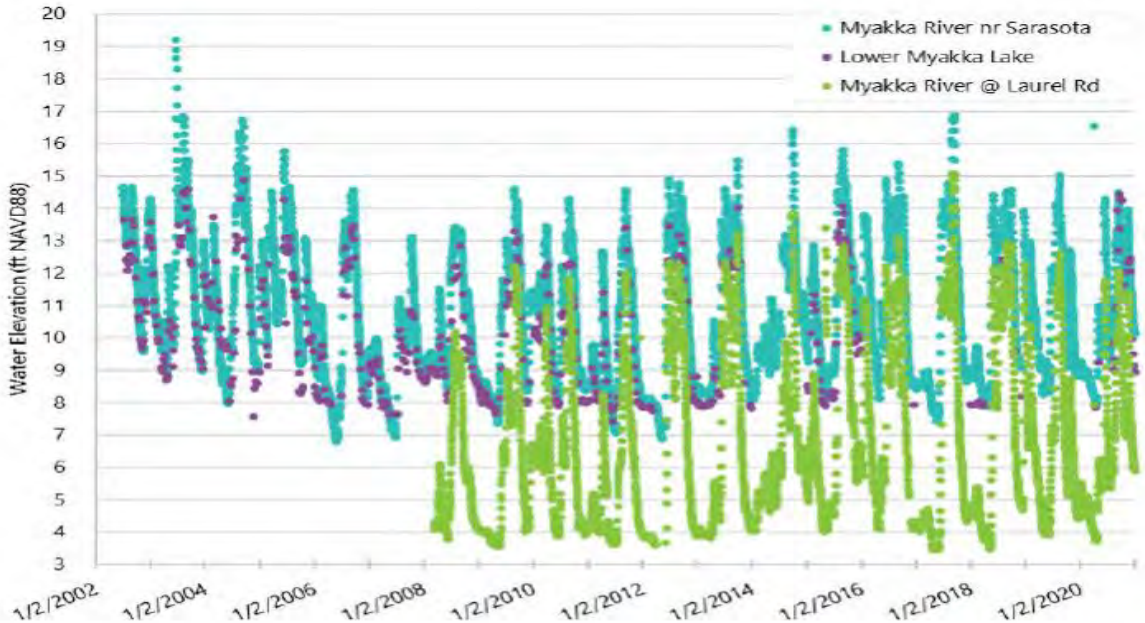
CH = channel bottom; WS = water surface; BKF = bankfull; LB = left bank; RB = right bank



Notes: Med/NP = median/normal pool; SHWL = seasonal high water level; SLWS = seasonal low water level; max = maximum; min = minimum. Hydrologic elevations derived from LML stage duration curve (Appendix C).

Water Levels

- Reviewed available hydrologic data
  - FDEP Lower Myakka Lake; 2002-current (2018-2020 sporadic)
  - USGS Myakka River near Laurel; 2008-current

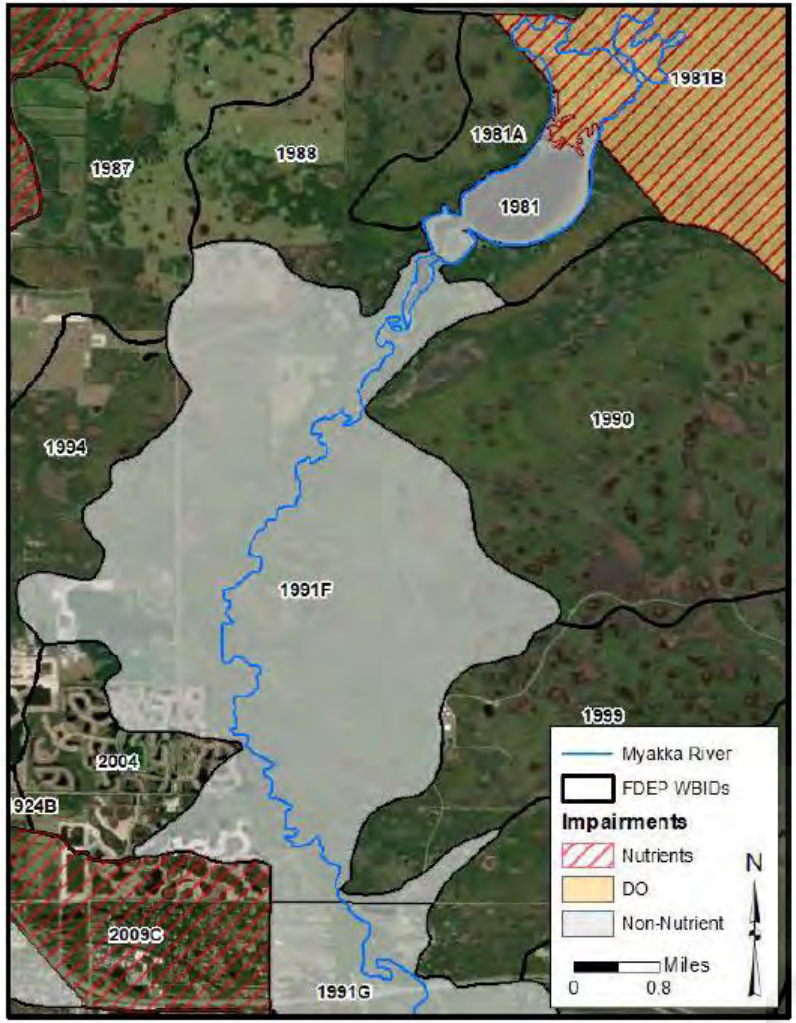


Sediment

- Sediment cores collected at 5 locations
  - 3 upstream of dam
  - 2 downstream of dam
- Sediment Characteristics
  - Mostly sandy sediments
  - Higher levels of organic material upstream of dam
  - Minimal possibility for mobilization; far-reaching sediment transport not expected

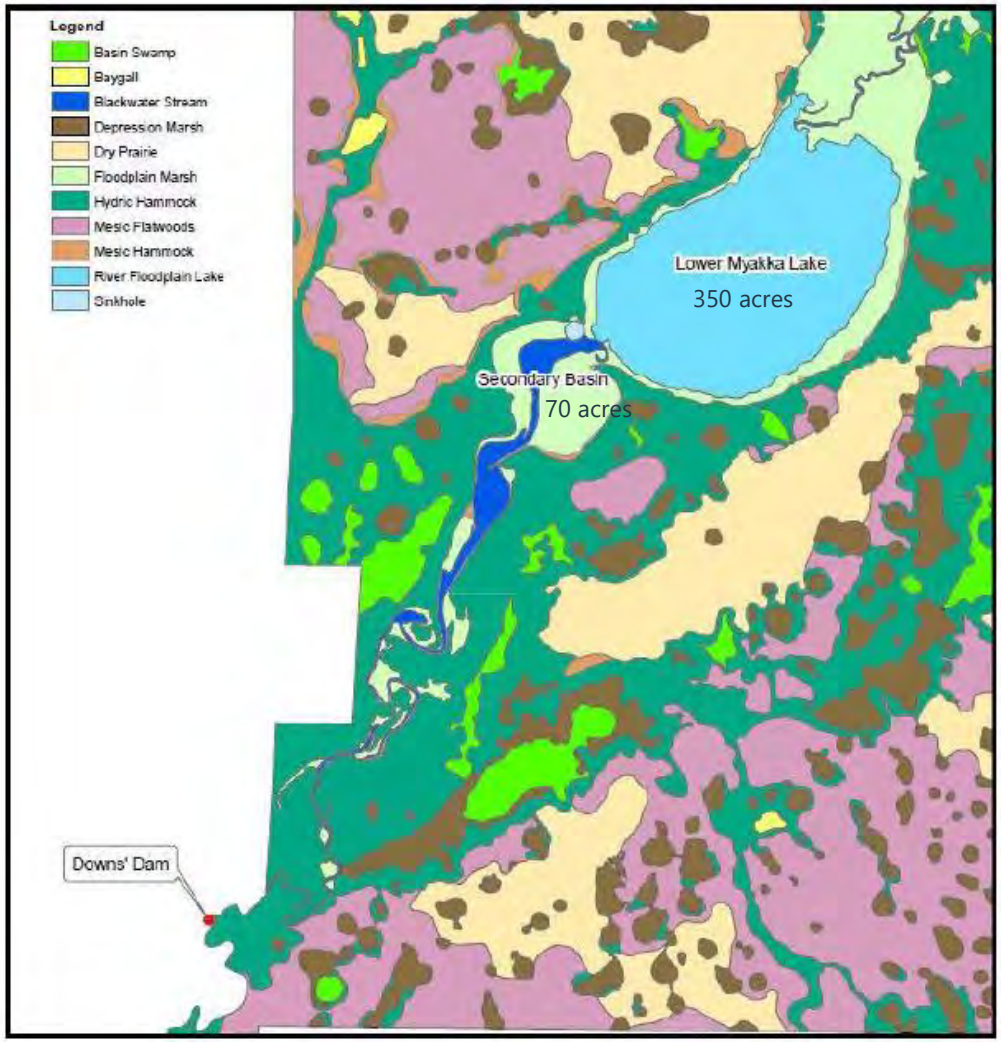
Water Quality

- Identified existing water quality impairments
- Non-nutrient impairments (mercury – fish tissue) in LML and Myakka River below and above Blackburn Bridge



Vegetation & Wildlife

- Ecological Communities
  - Floodplain marsh, hydric hammock, mesic hammock
  - Dam affects natural drawdown of LML
- Invasive Plants and Fish
- Dam is an obstacle to fish and wildlife
  - American eel, striped mullet, Atlantic tarpon, snook
  - Manatee stranding



Modeling

- Three Alternatives
- Storm Event Modeling
- Natural Systems Assessment
- Fish and Wildlife Passage

Alternatives

- Alt 1: Removing Downs' Dam and creating a more historic flow pattern structure
- Alt 2: Modifying Downs' Dam with considerations for fish/wildlife passage (lower dam & widen opening)
- Alt 3: Rebuilding Downs' Dam to its state prior to the breach

Exhibit 9. Proposed Alternative 1 Dam Removal Cross Section

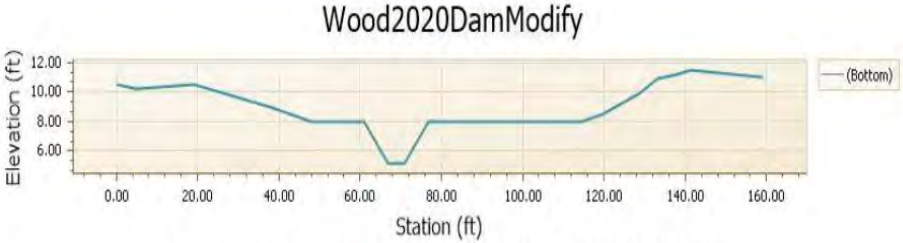


Exhibit 10. Proposed Alternative 2 Dam Modification Cross Section

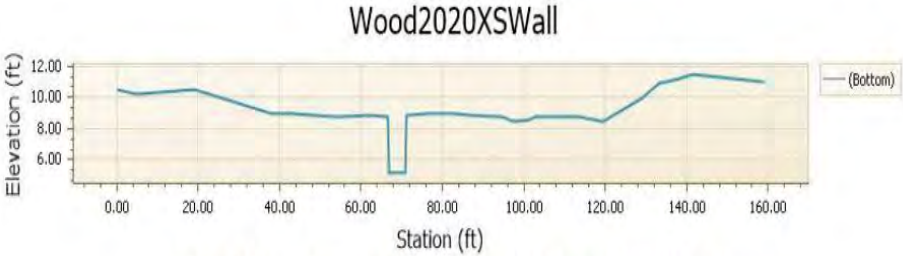


Exhibit 11. Proposed Alternative 3 Dam Rebuild Cross Section

Storm Event Modeling

- Used MRWI ICPR4 to assess flooding impacts during three 24-hour design storms:
  - 2.33-year/mean annual (4.5 inches)
  - 25-year (8 inches)
  - 100-year (10 inches)
- Existing Conditions
  - *Includes removal of UML weir + bypass*
  - *Includes current conditions with breach*
- Three Alternatives

Modeling Results

Table 9. Summary of Peak Flood Elevations Differences (Alternative - Existing)

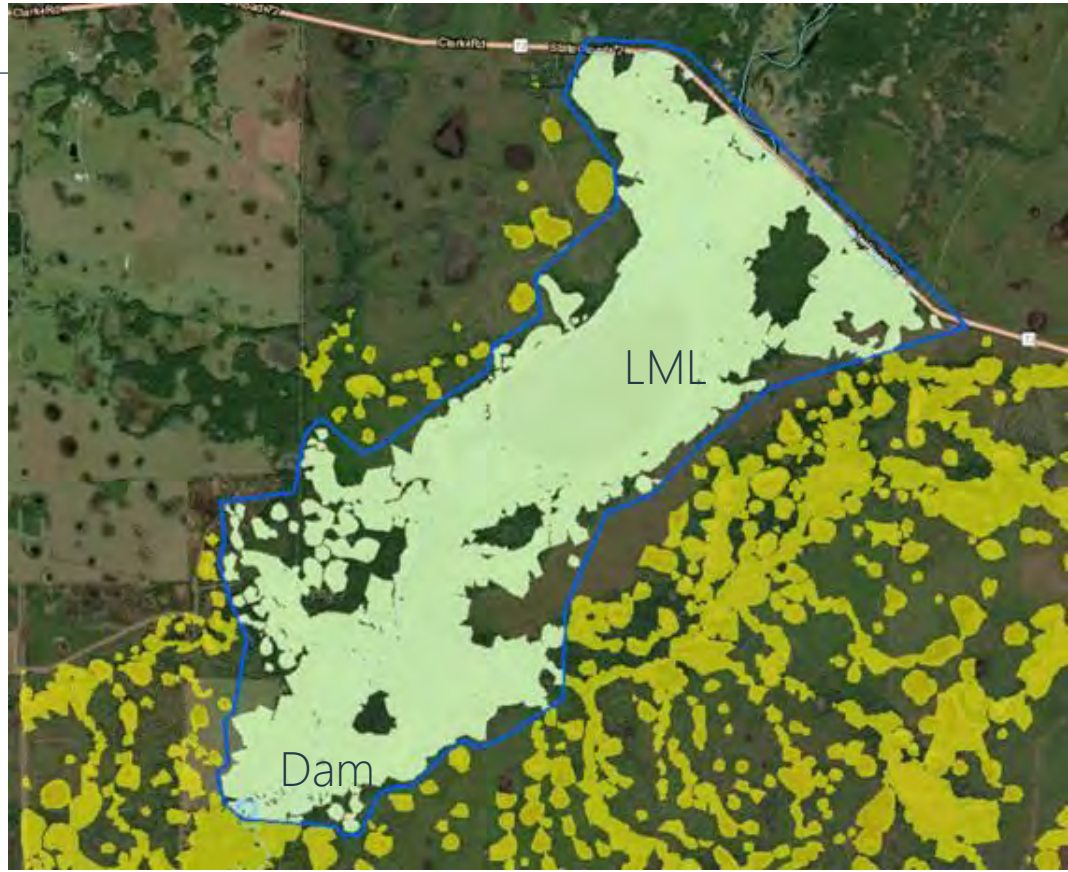
ICPR Model	Reference Nodes	Location	Mean Annual (ft)	25-Yr., 24-Hr. (ft)	100-Yr., 24-Hr. (ft)
Alternative 1 (Remove)	LM_A01820_N	State Road 72 Bridge	0	0	0
	LM_A01700_N	Lower Myakka Lake	0	0	0
	LM_A01430_N	Downs' Dam	-0.04	0	0
	LM_A00680_N	Interstate 75 Bridge	0	0	0
Alternative 2 (Modify)	LM_A01820_N	State Road 72 Bridge	0	0.01	0.01
	LM_A01700_N	Lower Myakka Lake	0	0	0
	LM_A01430_N	Downs' Dam	0.11	0.02	0.01
	LM_A00680_N	Interstate 75 Bridge	0	0	0
Alternative 3 (Rebuild)	LM_A01820_N	State Road 72 Bridge	0	0.01	0.01
	LM_A01700_N	Lower Myakka Lake	0.01	0.01	0
	LM_A01430_N	Downs' Dam	0.23	0.03	0.02
	LM_A00680_N	Interstate 75 Bridge	0	0	0

- No adverse impacts for any of the three alternatives

Natural Systems

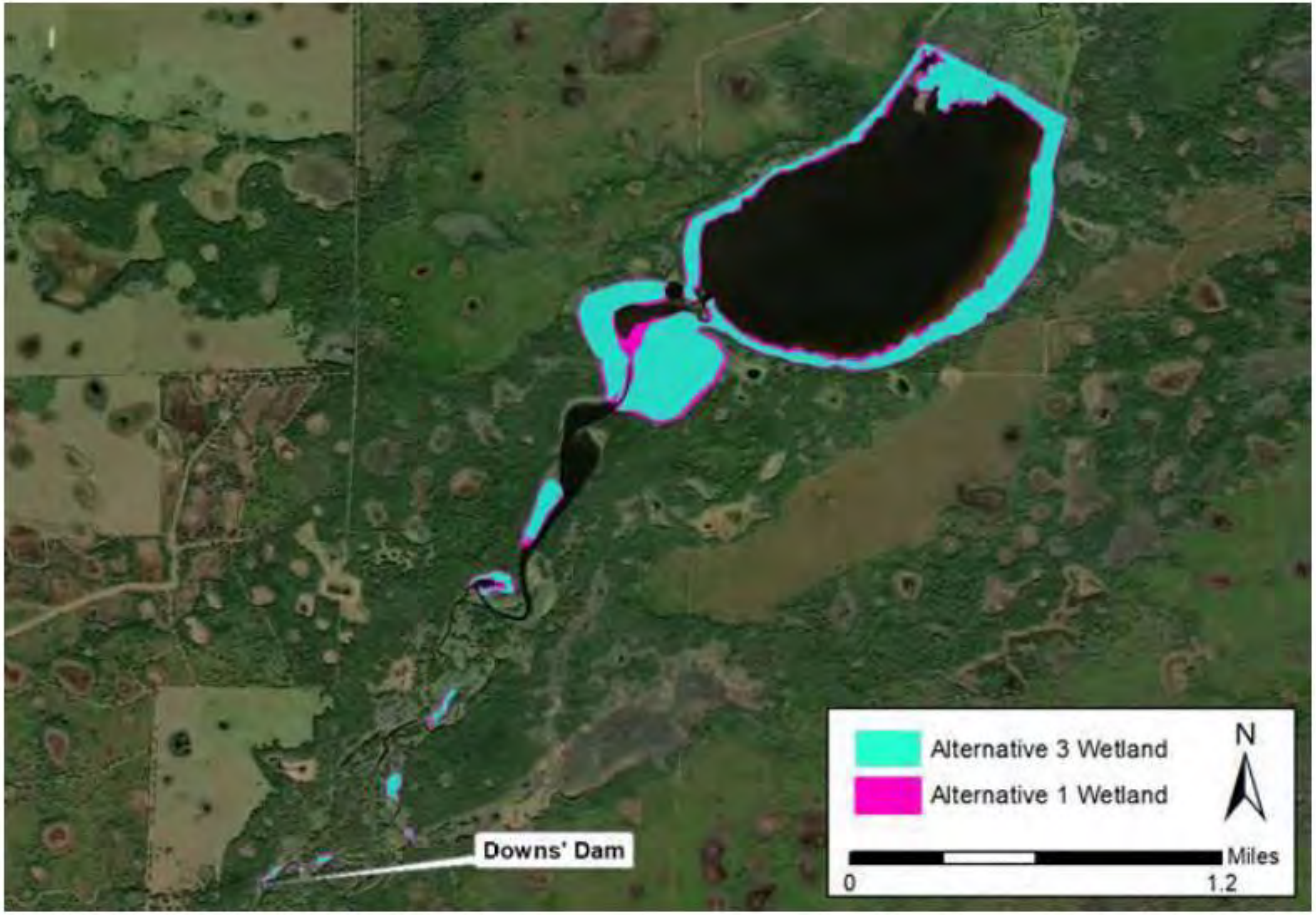
- Seasonal High Water
  - As expected, very little differences among alternatives during high water conditions

Model (mean annual peak stages)	Floodplain Acres (in clipped region)
Existing	2,727.16
Alt 1 (Remove)	2,726.26
Alt 2 (Modify)	2,728.52
Alt 3 (Rebuild)	2,728.87



Natural Systems

- Seasonal Low Water
  - Expected to decrease by ~0.3 ft
  - Based on lower draw-down, ~13.5 acres of floodplain marsh would be restored in Lower Myakka Lake



Fish and Wildlife Passage

- HEC-RAS model to assess passage
- Dam over-topped 35% of time or 18 weeks per year - predominantly during wet season
- Removal would increase passage time across the existing shoal from just 18 weeks per year to at least 50 weeks per year (95% of the time)
  - Benefits to snook – migrate up rivers in fall to exploit prey resources being forced off floodplain as high summer waters recede. Dam inhibits snook in Myakka from accessing vast amount of habitat that could benefit the population.
  - Much of prey upstream of dam is non-native exotic species – studies indicate snook eat large quantities of exotic prey.

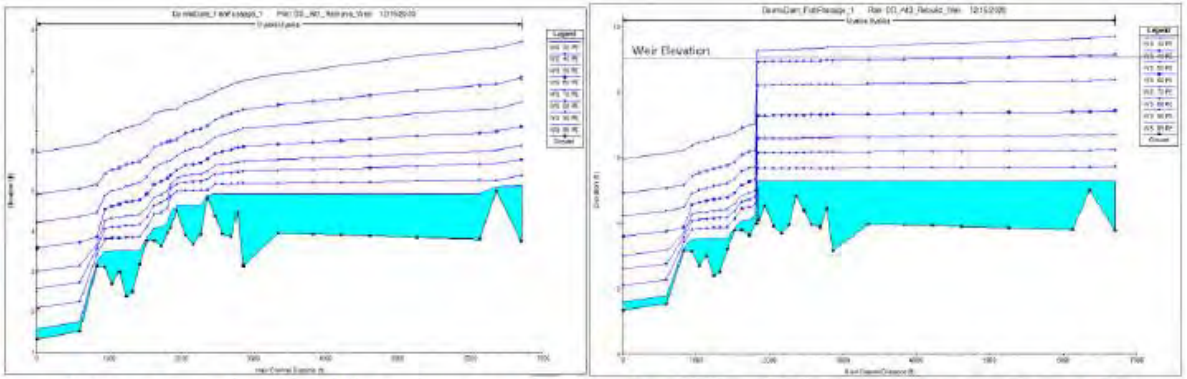


Exhibit 4.4 – HEC-RAS Water Surface Profiles for 30% - 95% Percent Exceedance Flow Values (Alternative 1-Left vs Alternative 3-Right)

Alternatives Analysis

- Parameters Assessed
- Feasibility and Comparison

Parameters Assessed

- Water Quantity
- Natural Systems
- Sediment
- Water Quality
- Environmental Considerations
- Fish and Wildlife Passage
- Recreation/Culture
- Permitting
- Costs

Alternate 1 – Dam Removal

- Remove dam
- Selectively fill breach
- Stabilize banks
- Re-wild the Myakka River

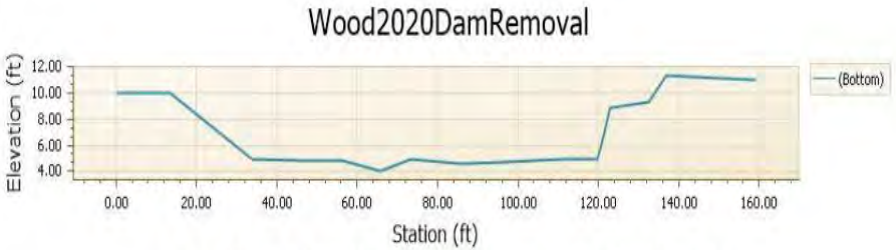


Exhibit 9. Proposed Alternative 1 Dam Removal Cross Section

THIS PLAN IS CONCEPTUAL!
Next phase = Final design

Parameter	Alternative 1 - Removal
Water Quantity	Restores a more natural lacustrine and riverine flow regime. No adverse offsite impacts in regard to flooding.
Natural Systems	Restores ~13.5 acres of floodplain marsh wetlands within the lake and river by lowering seasonal low water level in lake
Sediment	Reduces accumulation of organic material. Restores sediment transport regime.
Water Quality	Improves water quality through: - reduced lake volumes associated with dry season algal blooms and DO depletion - creation of additional areas of EAV and SAV which will provide nutrient uptake and storage and contribute additional color
Environmental Considerations	Greater drawdown aids weed control programs, habitat restoration, and fire program. Reduces biomass of exotic species.
Fish/Wildlife Passage	Removes barrier/hazard to the upstream migration of manatees and fish.
Recreation/Culture	Removes barrier/hazard to paddlers - will require increased patrol/enforcement. Removes cultural icon for the area and congregating point. Removes short (2 week) desirable fishing window when water just overtopping the dam.
Permitting	Federal (USACE) – Nationwide Permit 27 (habitat restoration) State/Local (SWFWMD) – General Permit. Must show no adverse impacts. Should be exempt from Myakka River Wild and Scenic River Rule
Cost Estimate	Total Estimate: $427,715 (O&M not required). Potential funding available from FWS and FWC since this is a restoration project.

Alternate 2 - Modification

- Lower invert by 0.9 ft
- Expand flashboard riser opening
- Selectively fill breach
- Stabilize banks

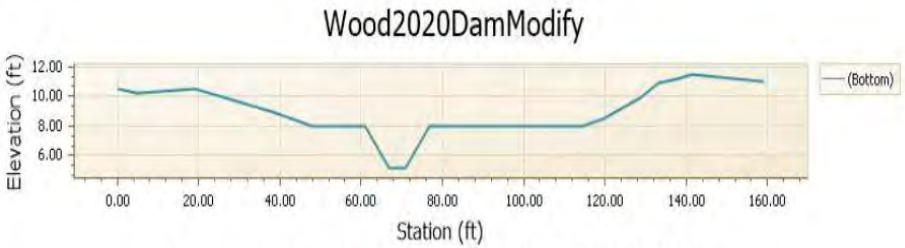


Exhibit 10. Proposed Alternative 2 Dam Modification Cross Section

Parameter	Alternative 2 - Modification
Water Quantity	Detains water during the dry season; does not impact wet season flows. No adverse offsite impacts in regard to flooding.
Natural Systems	Detains water during the dry season, inundating areas that historically would have been floodplain marsh. Increases seasonal high water inundation by 1 acre.
Sediment	Artificially increases sedimentation in lake and river by holding back water.
Water Quality	Artificially increases residence time and associated nutrient retention within the lake, which may extend beyond expected natural conditions to a point of saturation, thus converting the lake from being a sink to potentially a source of nutrient loading downstream.
Environmental Considerations	Detains water during the dry season hinders park maintenance activities such as weed control and burning.
Fish/Wildlife Passage	Reduces barrier/hazard to manatee and fish passage
Recreation/Culture	Reduces barrier/hazard to paddlers. Maintains cultural icon and congregating point. Maintains short (2 week) desirable fishing window when water just overtopping the dam.
Permitting	Federal (USACE) - may fall within Nationwide Permit 3 (Maintenance), 25 (Structural Discharges), or 42 (Recreational Facilities). May require a Standard Permit. State (SWFWMD) - Individual Permit.
Cost Estimate	Total Estimate: $519,632 (O&M required)

Alternate 3 – Rebuild

- Rebuild structure to historic state prior to recent failures
- Selectively fill breach
- Stabilize banks

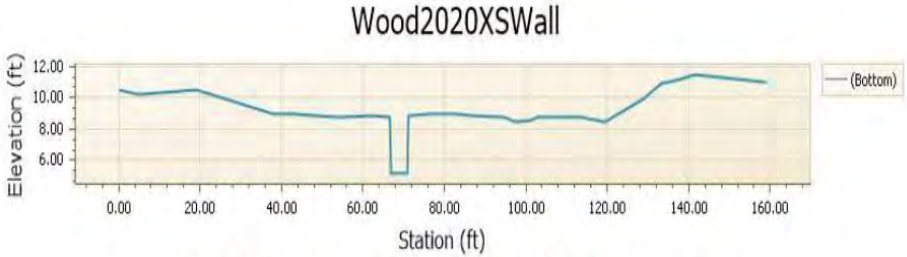


Exhibit 11. Proposed Alternative 3 Dam Rebuild Cross Section

Parameter	Alternative 3 - Rebuild
Water Quantity	Detains water during the dry season; does not impact wet season flows. No adverse offsite impacts in regard to flooding.
Natural Systems	Detains water during the dry season, inundating areas that historically would have been floodplain marsh. Increases seasonal high water inundation by 1.5 acres.
Sediment	Artificially increases sedimentation in lake and river by holding back water.
Water Quality	Artificially increases residence time and associated nutrient retention within the lake, which may extend beyond expected natural conditions to a point of saturation, thus converting the lake from being a sink to potentially a source of nutrient loading downstream.
Environmental Considerations	Detains water during the dry season hinders park maintenance activities such as weed control and burning.
Fish/Wildlife Passage	Maintains barrier/hazard to manatee and fish passage
Recreation/Culture	Maintains barrier/hazard to paddlers. Maintains cultural icon and congregating point. Maintains short (2 week) desirable fishing window when water just overtopping the dam.
Permitting	Federal (USACE) – may fall within Nationwide Permit 3 (Maintenance), 25 (Structural Discharges), or 42 (Recreational Facilities). May require a Standard Permit. State (SWFWMD) – Individual Permit.
Cost Estimate	Total Estimate: $546,480 (O&M required)

Ranking

Ranking Factor	Alternative 1 - Removal	Alternative 2 - Modification	Alternative 3 - Rebuild
Adverse offsite impacts (flooding)	0	0	0
Restores/improves wetland habitat	1	0	0
Reduces soft sediment accrual	1	-1	-1
Improves water quality	1	1	0
Improves fire and nuisance species activities	1	0	0
Improves fish/wildlife passage	1	1	0
Improves recreation/culture	0	0	0
Reduces maintenance costs	1	0	-1
Regulatory requirement/ease of permitting			
Local/State	1	0	1
Federal	1	0	1
Total	**8**	**1**	**0**

Recommended Alternative

Summary of Recommended Alternative (Removal) Benefits

- Restores natural flow regime / historic timing of flows
- No adverse offsite flooding impacts
- Restores floodplain marsh
- Improves nutrient load removal and algal suppression
- Reduces accumulation of organic material and restores sediment transport regime
- Greater drawdown aids weed control programs, habitat restoration, and fire program
- Removes barrier/hazard to upstream migration of manatees and fish
- Removes barrier/hazard to paddlers
- Reduces maintenance costs

Additional Considerations

- Ownership - permitting agencies may require all parties be co-applicants; activities on western bank must comply with Conservation Easement
- Liability – if dam rebuilt, FDEP would own and operate the new structure and state could be liable for potential injury or damage as well as for maintenance
- Logistics – construction cost estimates based on accessing site from east (MRSP), very long route with multiple low water crossings and a swath of floodplain forest to be temporarily disturbed. Logistics could significantly impact all cost estimates provided. Creative options being explored.

Next Steps

- Feasibility Study Final Report June 2021
- Final design/permitting in 2021-22
- 2022-23 implementation (construction/restoration)
  - Must be done in dry season

Questions?

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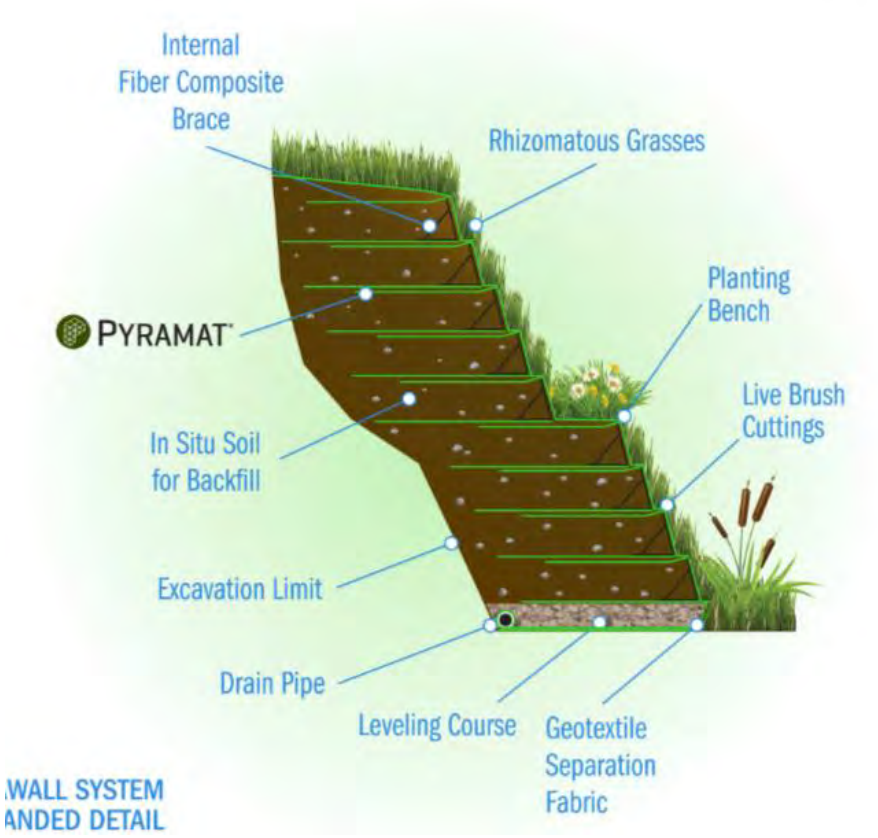
wood.

Permit Considerations

- Adjacent Land ownership
  - O Bar O Ranch
    - Co-applicant?
      - Ownership of dam not established
      - Western bank under OHWL (removal of concrete armoring, stabilization)
  - Conservation Easement
  - SHPO – in discussion with DRH, not built by CCC
  - FWS

Vegetation Reinforced Soil Slope



Project Support

- 2019 Myakka River State Park Unit Management Plan (UMP)
  - *"Weir to be removed if feasible"*
  - Approved at ARC public meeting 6/14/2019
- Myakka River Management Council - Public meeting 9/18/2020
- 2020 SWIM Plan – approved by Governing Board 11/17/2020
- CHNEP 2019 Comprehensive Conservation and Management Plan (CCMP)

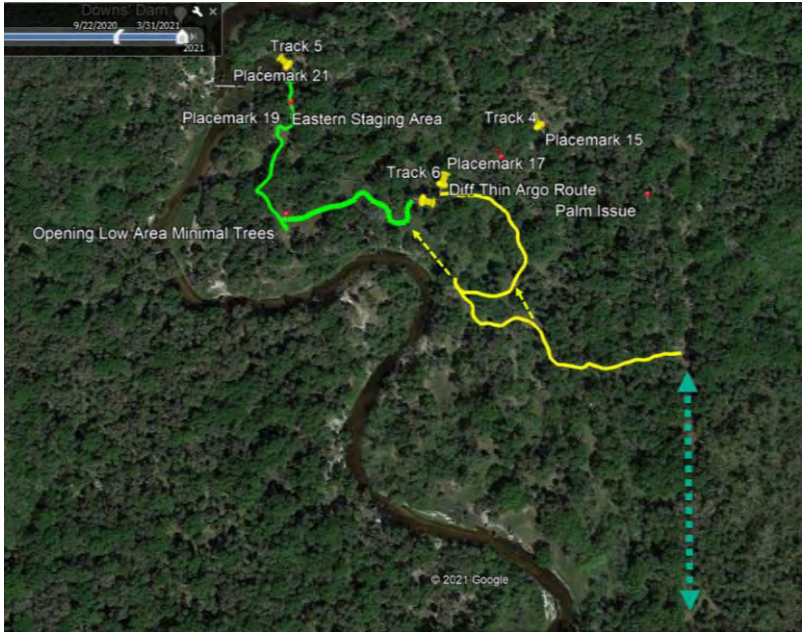
Project Sponsors

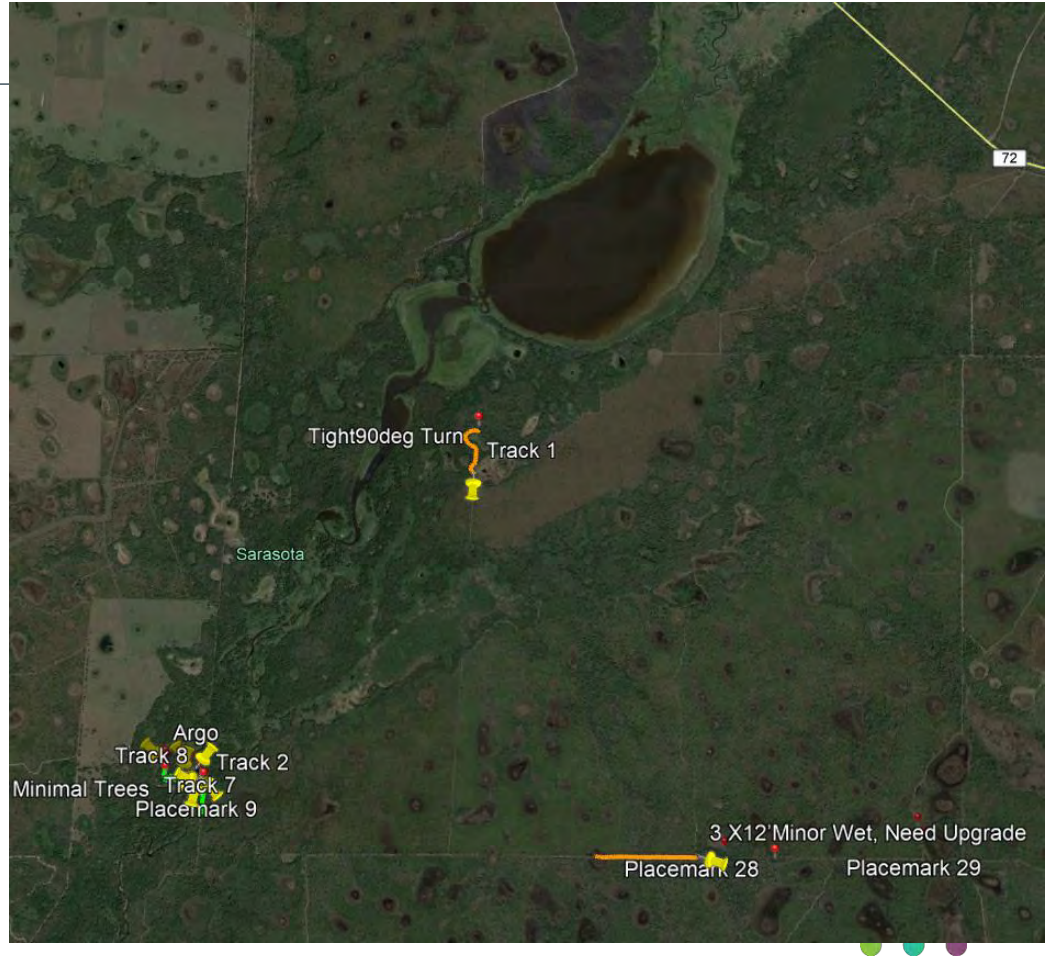
- Feasibility Study
  - FDEP
  - SWFWMD - Cooperative funding partner (CFI matching funds)
- Construction
  - FDEP
  - Funding from FWS/FWC

Fish Talking Points

- Snook are marine obligate spawners - they must have almost full strength seawater in order to successfully spawn. Therefore, most adult Snook are found in the lower harbor in marine waters during the summer. Around late September, October, and November Snook finish spawning in marine waters and many migrate up into the rivers to exploit prey resources that are being forced off of the floodplain as high summer waters recede.
- Snook abundance in the Peace River is positively related to river flow (R square = 0.88). The more flow during the summer of a given year the more snook that enter the river during the fall of that year.
- Snook condition (relative weight to length – basically how fat they are) is positively related to how long (# of days) the water stays high (R square = 0.65). The longer the water stays high on the floodplain during a given summer the heavier the Snook become. The longer the water stays up the more time for crayfish and Brown Hoplo populations to explode on the floodplain. Then those prey eventually enter the mainstem of the river in fall when the water recedes.
- There is a significant relationship between Snook, Largemouth Bass, and Florida Gar abundance and the percentage of snags along a shoreline. As the percentage of snags goes up so does fish abundance.
- Distribution of Snook was wide spread throughout the Peace River due to suitable depth and shoreline vegetation for cover.
- In the Myakka River Downs Dam inhibits Snook from accessing vast amounts of habitat that could benefit the population as a whole.
- During the late summer and early fall there are massive quantities of prey resources upstream of the dam that may be inaccessible to Snook; whereas, Snook in unregulated rivers, such as the Peace River, have complete access to all sections of the river to feed on important prey resources.
- Much of the prey in the Myakka river upstream of Downs Dam are non-native exotic fishes, species such as Brown Hoplo, Blue Tilapia, and Mayan Cichlid.
- Our diet studies show that Snook eat massive quantities of exotic prey and appear to eliminate Brown Hoplo in the mainstem of the Peace River by winter, which causes a shift in their diet to native species such as juvenile Channel Catfish and Bluegill.
- Only a small portion of the Snook population skips spawning each year (say approx. 10%; typically smaller adults) and may reside in rivers during the summer spawning season while their spawning counterparts are in the lower estuary spawning and residing in marine waters. In the Myakka River the small portion of the Snook population that skip spawns can enter the area upstream of Down's Dam during the summer rainy season when the water is typically high (mid-June thru August), but at this time much of the prey resides on the floodplain and is not always accessible to these large predators. In addition, these fish that go upstream of the dam must leave the upper portion of the river and be downstream of the dam by early fall or risk getting trapped. If trapped they will mostly likely die by alligator predation or succumb to winter cold temperatures as water levels drop.
- The Snook population as a whole should benefit by the removal of the dam and thus allowing the more Snook to access the prey rich upstream section of the river.

Route


Downs Dam
9/22/2020
3/31/2021
2021
Track 5
Placemark 21
Placemark 19
Eastern Staging Area
Track 4
Placemark 15
Placemark 17
Track 6
Diff Thin Argo Route
Palm Issue
Opening Low Area Minimal Trees
© 2021 Google

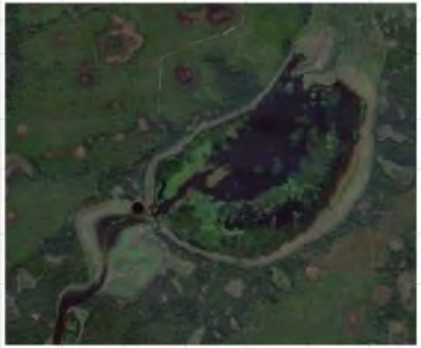

72
Tight90deg Turn
Track 1
Sarasota
Argo
Track 8
Track 2
Minimal Trees
Track 7
Placemark 9
3 X12'Minor Wet, Need Upgrade
Placemark 28
Placemark 29

<SLWL

(secondary basin exposed)

5/7/07 @ 7.71

SLWL



12/1/10 @ 8.01

b/t SLWL & median

12/14/08 @ 8.66

median

(secondary basin inundated)

12/31/05 @ 9.34

b/t median & SHWL

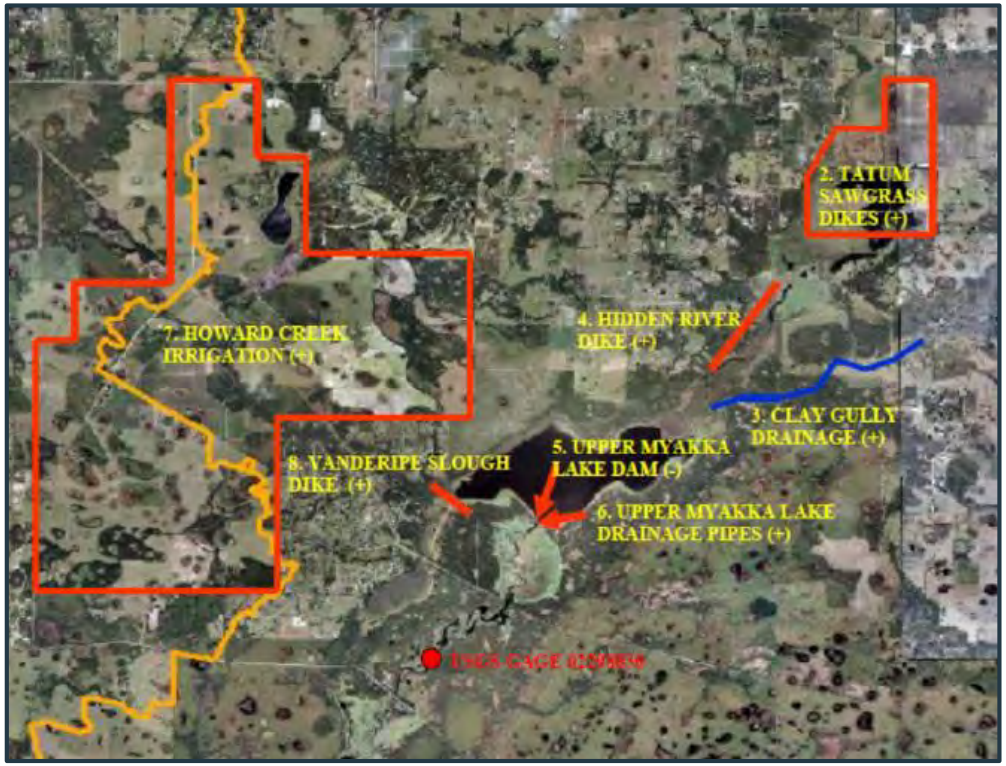
12/31/03 @ 11.12

SHWL

3/27/04 @ 12.42

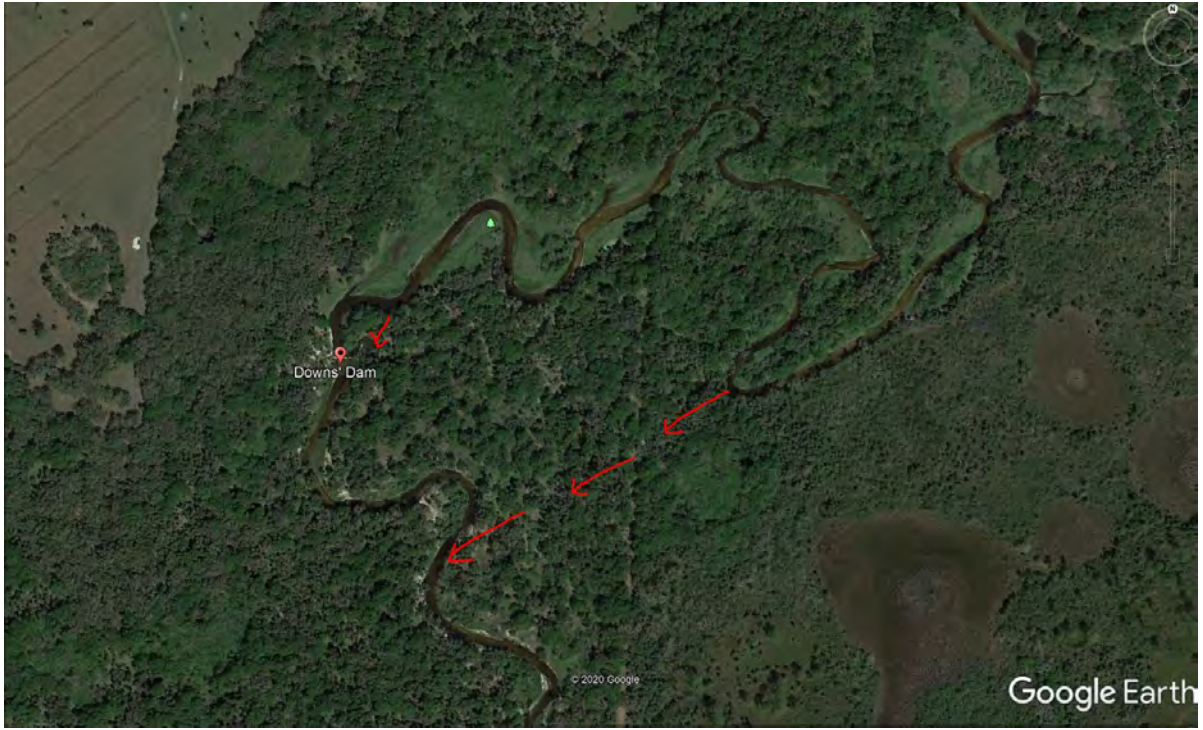
Additional Information: Hydrologic Alterations in Myakka Area

- Tatum Sawgrass Dikes (1974)
- Clay Gulley Drainage (1900)
- Hidden River Dike (1958)
- Upper Myakka Lake Weir (1938)
- Upper Myakka Lake Bypass (1974)
- Howard Creek Irrigation (1990)
- Vanderipe Slough Dike (1940)



River Dynamics

- Potential avulsions



Parameter	Alternative 1 - Removal	Alternative 2 - Modification	Alternative 3 - Rebuild
Water Quantity	Restores a more natural lacustrine and riverine flow regime. No adverse offsite impacts in regard to flooding.	Detains water during the dry season; does not impact wet season flows. No adverse offsite impacts in regard to flooding.	Detains water during the dry season; does not impact wet season flows. No adverse offsite impacts in regard to flooding.
Natural Systems	Restores ~13.5 acres of floodplain marsh wetlands within the lake by lowering seasonal low water level in lake by 0.3 ft. Reduces seasonal high water inundation by 1 acre.	Detains water during the dry season, inundating areas that historically would have been floodplain marsh. Increases seasonal high water inundation by 1 acre.	Detains water during the dry season, inundating areas that historically would have been floodplain marsh. Increases seasonal high water inundation by 1.5 acres.
Sediment	Reduces accumulation of organic material. Restores sediment transport regime.	Artificially increases sedimentation in lake and river by holding back water.	Artificially increases sedimentation in lake and river by holding back water.
Water Quality	Improves water quality through: - reduced lake volumes associated with dry season algal blooms and DO depletion - creation of additional areas of EAV and SAV which will provide nutrient uptake and storage and contribute additional color	Artificially increases residence time and associated nutrient retention within the lake, which may extend beyond expected natural conditions to a point of saturation, thus converting the lake from being a sink to potentially a source of nutrient loading downstream.	Artificially increases residence time and associated nutrient retention within the lake, which may extend beyond expected natural conditions to a point of saturation, thus converting the lake from being a sink to potentially a source of nutrient loading downstream.
Environmental Considerations	Greater drawdown aids weed control programs, habitat restoration, and fire program. Reduces biomass of exotic species.	Detains water during the dry season hinders park maintenance activities such as weed control and burning.	Detains water during the dry season hinders park maintenance activities such as weed control and burning.
Fish/Wildlife Passage	Removes barrier/hazard to the upstream migration of manatees and fish.	Reduces barrier/hazard to manatee and fish passage	Maintains barrier/hazard to manatee and fish passage
Recreation/Culture	Removes barrier/hazard to paddlers - will require increased patrol/enforcement. Removes cultural icon for the area and congregating point. Removes short (2 week) desirable fishing window when water just overtopping the dam.	Reduces barrier/hazard to paddlers. Maintains cultural icon and congregating point. Maintains short (2 week) desirable fishing window when water just overtopping the dam.	Maintains barrier/hazard to paddlers. Maintains cultural icon and congregating point. Maintains short (2 week) desirable fishing window when water just overtopping the dam.
Permitting	Federal (USACE) – Nationwide Permit 27 (habitat restoration) State/Local (SWFWMD) – General Permit. Must show no adverse impacts. Should be exempt from Myakka River Wild and Scenic River Rule	Federal (USACE) - may fall within Nationwide Permit 3 (Maintenance), 25 (Structural Discharges), or 42 (Recreational Facilities). May require a Standard Permit. State (SWFWMD) - Individual Permit.	Federal (USACE) – may fall within Nationwide Permit 3 (Maintenance), 25 (Structural Discharges), or 42 (Recreational Facilities). May require a Standard Permit. State (SWFWMD) – Individual Permit.
Cost Estimate	Total Estimate: $427,715 (O&M not required). Potential funding available from FWS and FWC since this is a restoration project.	Total Estimate: $519,632 (O&M required)	Total Estimate: $546,480 (O&M required)