



North Carolina  
Coastal Federation  
*Working Together for a Healthy Coast*



[learnnc.org](http://learnnc.org)

# Lake Mattamuskeet Watershed Restoration Plan

*Virtual Public Meeting*

September 27, 2021

# Housekeeping

- Mics of attendees will be muted throughout the presentations
- Meeting will be recorded and made available for viewing on the project webpage
- Use Q&A feature throughout the meeting
- Question and Comment period at end of meeting
  - Use “Raise Hand” feature to request you mic be unmuted

# Zoom Functionality



**Please use the chat function if you need technical support.**

# Zoom Functionality



**Please use the Q&A function to type questions or comments during the presentations.**



# Zoom Functionality



Use the raise hand function if you would like to speak during the question and comment period at the end of the meeting.

# Agenda Overview

- 6:00 p.m. Welcome
- 6:05 p.m. Watershed Restoration Plan Overview
- 6:10 p.m. Updates from Technical Working Group
- 6:20 p.m. Agricultural Cost Share Programs
- 6:30 p.m. Engineering Active Water Management
- 7:15 p.m. Question & Comment Period
- 7:30 p.m. Adjourn



# Welcome

*Bill Rich, Hyde County Economic Development*



# Lake Mattamuskeet Watershed Restoration Plan

*Michael Flynn, North Carolina Coastal Federation*

# In 2017, a partnership was formed



North Carolina  
Coastal Federation  
*Working Together for a Healthy Coast*

# to develop a watershed restoration plan



# Plan Goals

## **Protect the way of life in Hyde County:**

Maintain existing land uses and industries in the watershed (residential, farming, fishing and tourism) and enhance and maintain the health of the lake's natural resources (waterfowl and wildlife).

# Plan Goals

## **Actively manage the lake water level:**

Minimize flooding of residential, business, and farm properties. Allow for annual drawdowns as appropriate and in compliance with the Refuge's management objectives defined in its Comprehensive Conservation Plan to establish and maintain submerged aquatic vegetation within the lake, and to establish and maintain a zone of emergent vegetation around the lake periphery.

# Plan Goals

## **Restore water quality and clarity:**

Reduce nutrients, sediments, and phytoplankton blooms, promote the growth of submerged aquatic vegetation and remove the lake from the NC 303(d) list of impaired waters.

# Desired State of the Lake and Watershed

1. Active management of lake level in addition to tide gates
  - Less frequent flooding of residential property
  - Fewer septic system failures & adequate drainage of croplands
2. Clear and mesotrophic water (moderate nutrient levels)
  - Fewer phytoplankton & cyanobacteria blooms
3. Increased SAV abundance along lakebed
4. Increased emergent vegetation
5. Reduced common carp populations
6. Increased game fish and blue crab populations
7. Removal from the NC 303(d) list of impaired waters
  - Chl-*a*, pH, and turbidity within federal and state guidelines

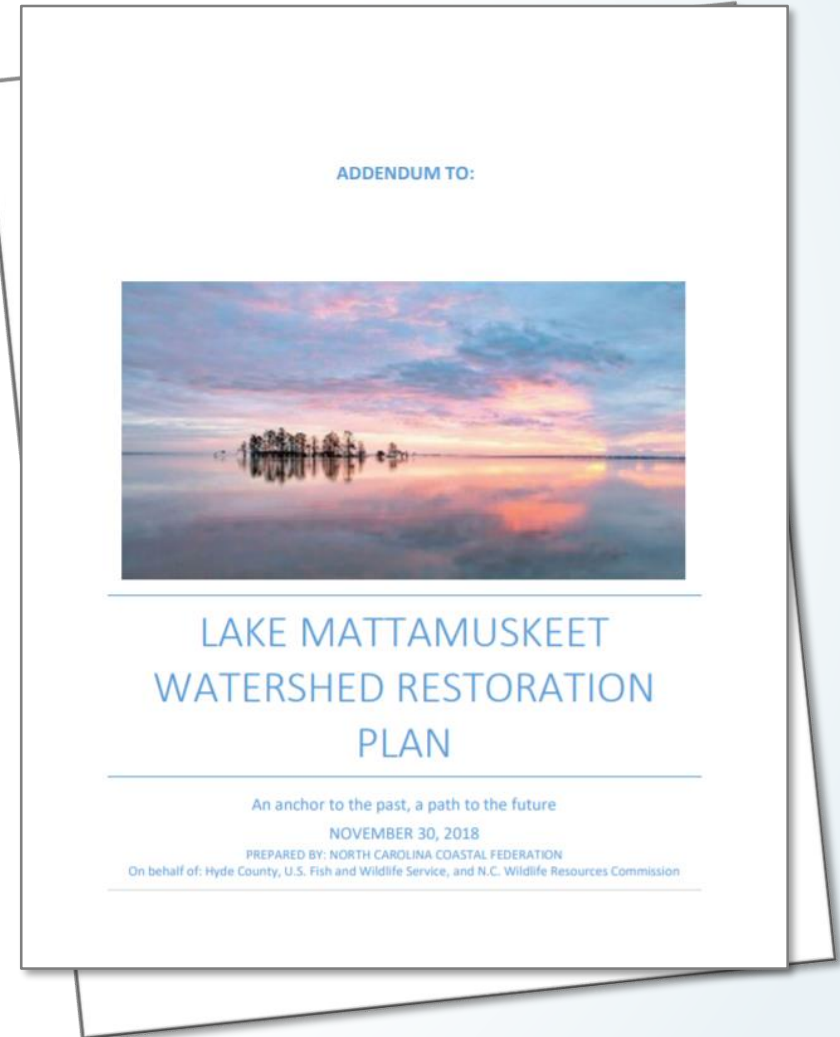
# Priority Actions

- Create a formal body that provides managing authority for active water management within the watershed in close coordination with the Refuge, which would be excluded as party to the formal body since USFWS cannot cede management authority.
- Perform hydrologic study of the watershed.
- Design engineered plans for active water management within the lake watershed
  - Infrastructure Improvements
  - Additional Outlet Evaluation
  - Potential Sheet Flow Sites



# Implementing the Watershed Restoration Plan

- Pursuing funding to implement the priority management actions has been the focus of partners over the past year.
- **Funding awarded from:**
  - Clean Water Management Trust Fund
  - N.C. General Assembly
  - National Science Foundation





REQUEST FOR QUALIFICATIONS:

ENGINEERING ACTIVE WATER MANAGEMENT WITHIN THE LAKE MATTAMUSKEET WATERSHED

HYDE COUNTY, NORTH CAROLINA

Issued by the  
NORTH CAROLINA COASTAL FEDERATION  
in partnership with  
HYDE COUNTY  
and  
EAST CAROLINA UNIVERSITY

APRIL 15, 2020



**Geosyntec Consultants**

**and**

**Coastal Protection  
Engineering (CPE)**

**selected as the  
engineering firm**

# Stakeholder Team

Bill Rich - Hyde County Economic Development

Daniel Brinn - Hyde County Water and Flood Control

Rebekah Martin – U.S. Fish and Wildlife Service

John Stanton – U.S. Fish and Wildlife Service

Kendall Smith - U.S. Fish and Wildlife Service

Wendy Stanton – U.S. Fish and Wildlife Service

Doug Howell - N.C. Wildlife Resources Commission

Michael “Slim” Cahoon - Farming Community

Wilson Daughtry – Mattamuskeet Association

Andrea Gibbs – NC Cooperative Extension

Art Keeney - Residential Community

Ben Simmons - Farming Community/Fairfield Drainage

Pat Simmons - Hospitality Industry

J.W. Spencer - Hyde County Soil and Water Board

James “Booboo” Topping - Residential Community

Joey Ben Williams - Impoundments

MEMORANDUM OF UNDERSTANDING

Between

NORTH CAROLINA WILDLIFE RESOURCES COMMISSION

And

COUNTY OF HYDE, NORTH CAROLINA

And

U.S. DEPARTMENT OF THE INTERIOR  
U.S. FISH AND WILDLIFE SERVICE

**I. Authority:**

This Memorandum of Understanding (MOU) is entered into between the Department of the Interior, U.S. Fish and Wildlife Service (hereinafter referred to as the Service), the North Carolina Wildlife Resources Commission (hereinafter referred to as the Commission), and the County of Hyde, North Carolina (hereinafter referred to as the County) pursuant to the legal authorities vested to the agencies.

Specifically to the Service under the authority of the:

- **National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997.** This Act defines the National Wildlife Refuge System, establishes the responsibilities of the Secretary of the Interior for managing and protecting the System, and establishes the legitimacy and appropriateness of the six priority public uses.
- **Refuge Recreation Act of 1962 (16 U.S.C. § 460k et seq.).** This Act allows the use of refuges for recreation when such uses are compatible with the refuge's primary purposes and when sufficient funds are available to manage the uses.
- **Fish and Wildlife Act of 1956 (16 U.S.C. 742 et seq.).** This Act grants the Secretary broad authority to, "take such steps as may be required for the development, advancement, management, conservation, and protection of fish and wildlife resources. ..." The statute specifically authorizes the acceptance of gifts and the services of volunteers for programs and projects that benefit the mission of the U.S. Fish and Wildlife Service. Further, the act specifically authorizes the Secretary to enter into cooperative agreements for programs and projects to benefit specific units of the National Wildlife Refuge System.

Specifically to the Commission under the authority of North Carolina § 143-239 (1947) which enables the Commission to enter into cooperative agreements:

*... the Commission is hereby authorized and empowered to enter into cooperative agreements pertaining to the management and development of the wildlife resources with federal, State, and other agencies, or governmental subdivisions.*

## Purpose

The Service, the Commission, and the County individually and collectively have major responsibilities for management and protection of the watershed surrounding Lake Mattamuskeet.

In consideration of the mutual benefits to be derived, the agencies agree to cooperate and collaborate to achieve mutual and individual agency goals and objectives identified in the Lake Mattamuskeet Watershed Restoration Plan.

# Review the Plan and Addendum

## Restoring the Lake Mattamuskeet Watershed

### Lake Mattamuskeet Watershed Restoration Plan

Lake Mattamuskeet, the largest lake in North Carolina, is a vital part of Hyde County's amazing natural and cultural heritage. Coastal residents and visitors alike value this national treasure.

However, declining water quality and elevated water levels are threatening the future of this natural wonder. In 2017, Hyde County, N.C. Wildlife Resources Commission, and the U.S. Fish and Wildlife Service formed a partnership and contracted the Coastal Federation to develop a watershed restoration plan. This plan aims to address both poor water quality within the Lake as well as chronic and persistent flooding on the surrounding landscape.

The partners embarked on an 18-month planning process that involved stakeholder and public engagement, and on August 7, 2019 the Lake Mattamuskeet Watershed Restoration Plan was officially approved by the N.C. Department of Environmental Quality. Since then the partners transitioned from developing the plan, to implementing the plan. In 2020, three grants were awarded from state and national funders to advance the implementation of the Lake Mattamuskeet Watershed Restoration Plan.

The goals of the plan are to:

- Protect the way of life in Hyde County;
- Actively manage the lake water level; and
- Restore water quality and clarity.

The grant awards allow the partners to advance several of the priority management actions for the watershed. Throughout 2020 and 2021, the partners will host a series of public meetings and seek input on different implementation ideas.

### Upcoming Events

#### Lake Mattamuskeet Watershed Restoration Plan Virtual Public Meeting

Monday, September 27, 2021

6:00 pm – 7:30 pm

[Meeting Agenda](#)

[Register Here](#)

### Resources

- 1 Lake Mattamuskeet Watershed Restoration Plan
- 2 Addendum
- 3 Timeline of changes to the lake



### Meeting Agendas and Presentations

- 1 Meeting Agenda – Apr. 15, 2021
- 2 Meeting Agenda – Aug. 26, 2020
- 3 Meeting Presentation – Aug. 26, 2020
- 4 Meeting Recording – Aug. 26, 2020



# Subscribe for Updates/Submit Comments Online

## Lake Mattamuskeet Watershed Restoration Plan

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Click on the link below to receive meeting announcements and ongoing updates regarding the watershed restoration plan.

CLICK HERE TO SUBSCRIBE FOR UPDATES/SUBMIT COMMENTS

## Protect Water Quality

You can protect and restore water for fishing, swimming and working.

Support Clean Water

## Upcoming Events

Next Public Meeting – April 15, 2021

[Register Here](#)

## Resources

- 1 Lake Mattamuskeet Watershed Restoration Plan
- 2 Addendum
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## In The News

- 1 Lake's Health Requires Ridding It of Carp: <https://www.coastalreview.org/2020/10/lakes-health-requires-ridding-it-of-carp/>
- 2 Lake Mattamuskeet Finalizes Restoration Plan: <https://www.publicradioeast.org/post/lake-mattamuskeet-finalizes-restoration-plan>
- 3 "Restoring Lake Mattamuskeet In North Carolina" — June 29, 2017. U.S. Fish and Wildlife Service.
- 4 "Secrets of Lake Mattamuskeet" — NC Science Now | UNC-TV



# Updates from Mattamuskeet Technical Working Group



*Wendy Stanton, U.S. Fish and Wildlife Service*  
*Doug Howell, N.C. Wildlife Resources Commission*

# Updates for Carp Removal Project

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## Communication & Outreach:

- Compliance documentation has been completed (compatibility determinations, NEPA including 30 day public review, etc...)
- Information bulletin about the Carp Removal Project has been published by local newspapers on August 30, 2021.
- The Coastal Review will be publishing an additional article their next issue.



# Updates for Carp Removal Project

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## Congressional Support:

- **Congressman Dr. Murphy supports the project.**



### **Murphy** Announces \$1M Grant for Lake Mattamuskeet Carp Removal

FOR IMMEDIATE RELEASE

September 9, 2021 | [Permalink](#)

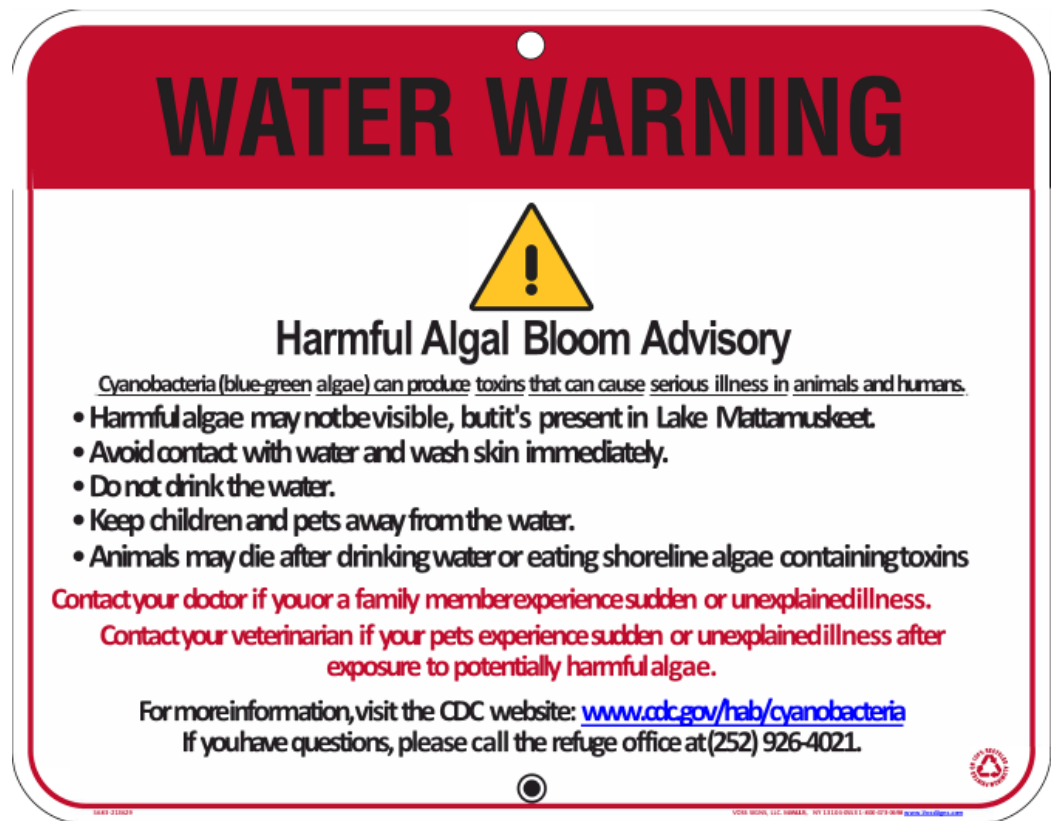
Contact: [Kate Currie](#)

Greenville, N.C. – Rep. Greg **Murphy**, M.D. (NC-03) released this response following the news that Mattamuskeet National Wildlife Refuge and the North Carolina Wildlife Resources Commission have been awarded a \$1 million dollar grant to remove invasive Common Carp from Lake Mattamuskeet. This grant was awarded by the U.S. Fish and Wildlife Service's Large Invasive Species grant program and will go into effect in FY2023.

"I am glad that we are receiving this grant to remove common carp from Lake Mattamuskeet," said **Murphy**. "Lake Mattamuskeet is the largest naturally-formed lake in North Carolina, and has been a wonderful landmark for Hyde County residents and visitors over the past 200 years. As such, it is critical that we provide necessary resources to protect and conserve the landscape and improve water quality for wildlife. Removing harmful and invasive species from Lake Mattamuskeet is part of a larger Watershed Restoration Plan that aims to better water management and increase lake vegetation coverage, as well as address persistent flooding in the surrounding area. I applaud our community efforts to keep Eastern North Carolina beautiful for years to come!"

# Updates for Carp Removal Project

- Local signage





# Updates for Carp Removal Project

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Carp barriers are working at the tide gates!



Video credit NCWRC Fisheries Biologist Kevin Dockendorf

# Updates for Carp Removal Project

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Carp barriers are working at the tide gates!



Video Credit NCWRC  
Officer Robert Wayne

# Updates for Carp Removal Project

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Challenges: Debris buildup in front of carp barriers.



Carp barriers cut in half are easier to lift to flush debris

Boom across canal helps direct debris for easier removal.

# Updates for Carp Removal Project

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Two new ECU Capstone Student Projects started in August.

- 1) Carp Deterrent Team: Senior Engineering Students: Travis Autry, Jackson Gardner, Hamza Omar Bhatti, Kenneth Blais, under Professor Dr. Sunhan Kim
- 2) Biosecurity Barrier Team: Senior Engineering Students: Tawana Warren, Kelcie Bennett, Nick Baldwin, Mohammed Issa Alzghbi, Tyler McRae House, under Professor Dr. Jeff Foeller



# Updates for Carp Removal Project

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## Upcoming Team Actions:

Begin contacting local commercial fisherman for assistance with designing pound nets and other nets to use in the lake.

Considering a carp market analysis to identify markets locally and nationally

Retrofit additional carp barriers (cut in half) to enhance debris removal.





*Many thanks to all our  
partners and collaborators*





# Agricultural Cost Share Programs

*Cruise Gibbs, Hyde Soil & Water Conservation District*



## 2021-2022 FISCAL YEAR FUNDS

- Agriculture Cost Share Program (ACSP) - \$34,535
- Agriculture Water Resources Assistance Program (AgWRAP) - \$7,500
- Impaired & Impacted (II) - \$7,348

# PRECISION NUTRIENT MANAGEMENT

- 3 yr contract
- 100% - \$16.47/ac
- 250 acre cap
- Goals
  - Water quality
    - Nitrogen
    - Phosphorus
    - Lime
    - Other nutrients





# Soil Test Report

GROWER: Educational Sample-Swine Waste  
4300 Reedy Creek Rd.  
Raleigh, NC 27607

Copies to: County Extension Director

Farm:

1/26/96

SERVING N.C. CITIZENS FOR OVER 50 YEARS

Agronomist Comments:

C - 12

| Field Information |           | Applied Lime |    |     | Recommendations          |      |         |                               |                  |    |    |    |   |    |          |
|-------------------|-----------|--------------|----|-----|--------------------------|------|---------|-------------------------------|------------------|----|----|----|---|----|----------|
| Sample No.        | Last Crop | Mo           | Yr | T/A | Crop or Year             | Lime | N       | P <sub>2</sub> O <sub>5</sub> | K <sub>2</sub> O | Mg | Cu | Zn | B | Mn | See Note |
| NB1               | Bahagrass |              |    |     | 1st Crop: Berm Hay/Pas,E | 1.7T | 60-80   | 90-110                        | 40-60            | 0  | 0  | 0  |   | 0  | 12       |
|                   |           |              |    |     | 2nd Crop: Berm Hay/Pas,M | 0    | 180-220 | 80-100                        | 120-140          | 0  | 0  | 0  |   | 0  | 12       |

| Test Results |      |      |     |      |     |     |     |     |      |      |      |           |           |      |       |      |     |      |                    |                    |     |
|--------------|------|------|-----|------|-----|-----|-----|-----|------|------|------|-----------|-----------|------|-------|------|-----|------|--------------------|--------------------|-----|
| Soil Class   | HM%  | W/V  | CEC | BS%  | Ac  | pH  | P-I | K-I | Ca%  | Mg%  | Mn-I | Mn-Al (1) | Mn-Al (2) | Zn-I | Zn-Al | Cu-I | S-I | SS-I | NO <sub>3</sub> -N | NH <sub>4</sub> -N | Na  |
| MIN          | 0.41 | 0.84 | 3.8 | 53.0 | 1.8 | 4.5 | 21  | 44  | 34.0 | 13.0 | 2089 | 1263      | 1263      | 48   | 48    | 77   | 78  | 24   |                    |                    | 0.1 |

| Field Information |           | Applied Lime |    | Recommendations |                          |      |       |                               |                  |    |    |    |   |    |          |
|-------------------|-----------|--------------|----|-----------------|--------------------------|------|-------|-------------------------------|------------------|----|----|----|---|----|----------|
| Sample No.        | Last Crop | Mo           | Yr | T/A             | Crop or Year             | Lime | N     | P <sub>2</sub> O <sub>5</sub> | K <sub>2</sub> O | Mg | Cu | Zn | B | Mn | See Note |
| W2                | Bahagrass |              |    |                 | 1st Crop: Berm Hay/Pas,E | 1.2T | 60-80 | 0                             | 0-20             | 0  | 0  | 0  |   | 0  | 12       |
|                   |           |              |    |                 | 2nd Crop: Alfalfa, E     | 0    | 10-30 | 0                             | 50-70            | 0  | 0  | 0  | 3 | 0  | 12       |

| Test Results |      |      |     |      |     |     |     |     |      |      |      |           |           |      |       |      |     |      |                    |                    |     |
|--------------|------|------|-----|------|-----|-----|-----|-----|------|------|------|-----------|-----------|------|-------|------|-----|------|--------------------|--------------------|-----|
| Soil Class   | HM%  | W/V  | CEC | BS%  | Ac  | pH  | P-I | K-I | Ca%  | Mg%  | Mn-I | Mn-Al (1) | Mn-Al (2) | Zn-I | Zn-Al | Cu-I | S-I | SS-I | NO <sub>3</sub> -N | NH <sub>4</sub> -N | Na  |
| MIN          | 0.36 | 0.82 | 3.8 | 66.0 | 1.3 | 4.9 | 870 | 71  | 44.0 | 13.0 | 2353 | 1421      | 1421      | 683  | 683   | 1492 | 60  | 17   |                    |                    | 0.1 |

# WATER CONTROL STRUCTURES

- 10 YR O&M
- 75% or 90%
- Dependent on design/specs
- Goals
  - Water management
    - Direction
    - Tide
    - Flow
  - Nitrogen
  - Phosphorus
  - Salt water intrusion











# COVER CROP

- Annual or 3 yr contract
- 75% - \$38/ac      90% - \$45/ac
- 150 acre cap
- Goals
  - Rain infiltration
  - Soil health & organic matter
    - Wind & water erosion
    - Nitrogen
    - Phosphorus
    - Other nutrients
  - Water quality







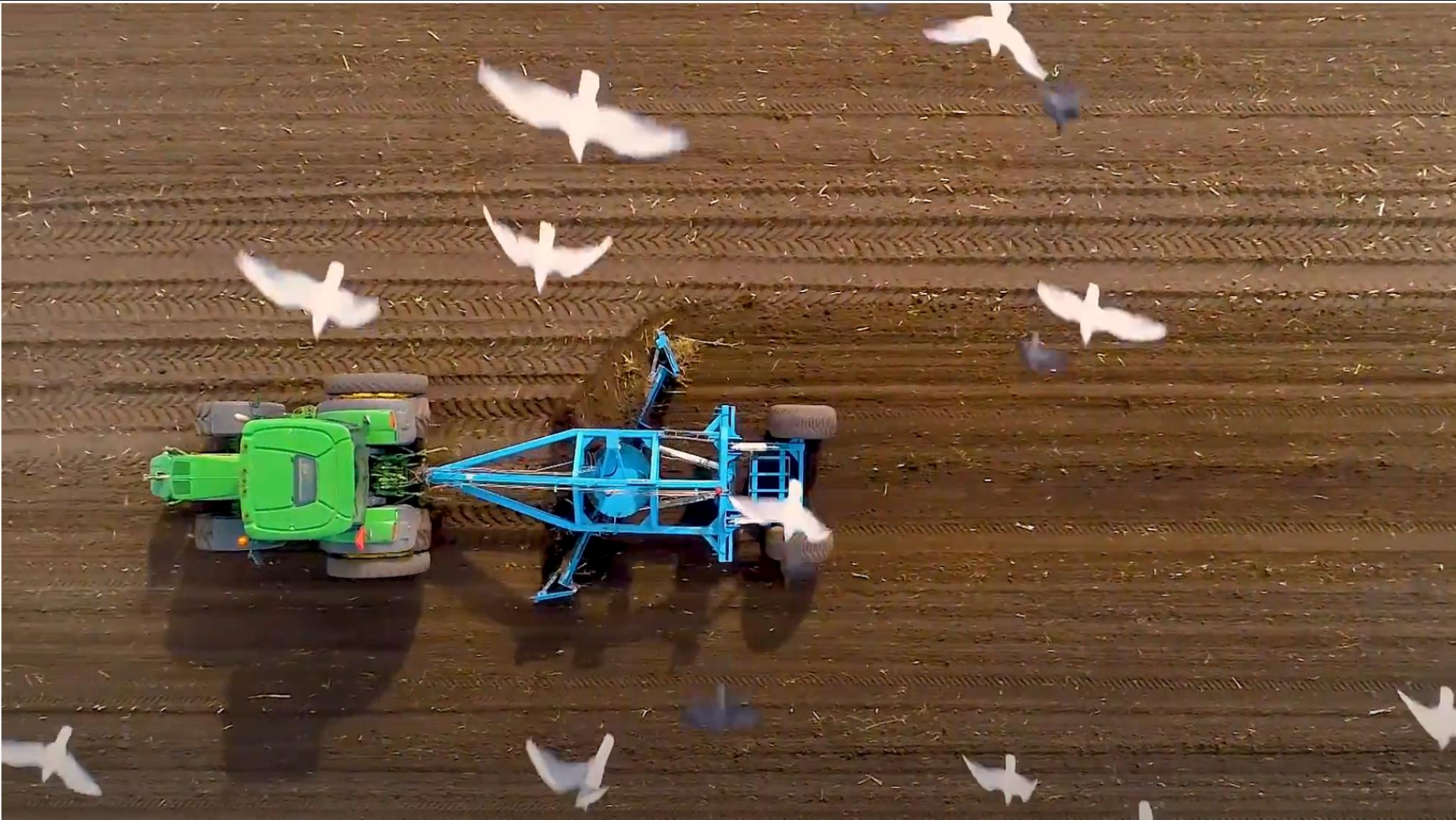
# LAND SMOOTHING

- 5 YR O&M
- 75% - \$205.88/ac    90% - \$247.05/ac
- 40 acre cap
- Goals
  - Water quality
    - Reduced nutrient loss
    - Reduced concentrated flow of water
    - Improved infiltration

















# FILTER STRIPS

- 10 YR O&M
- 75% or 90%
- Dependent on design/specs
- 2 acre cap using only II funding
- Goals
  - Water quality
    - Sediment deposits
    - Nitrogen
    - Phosphorus
    - Other Nutrients

























North Carolina  
Coastal Federation  
*Working Together for a Healthy Coast*



# Engineering Active Water Management

*Alessa Braswell, PhD, PE, Geosyntec Consultants of NC, P.C.*

# Engineering Active Water Management Updates

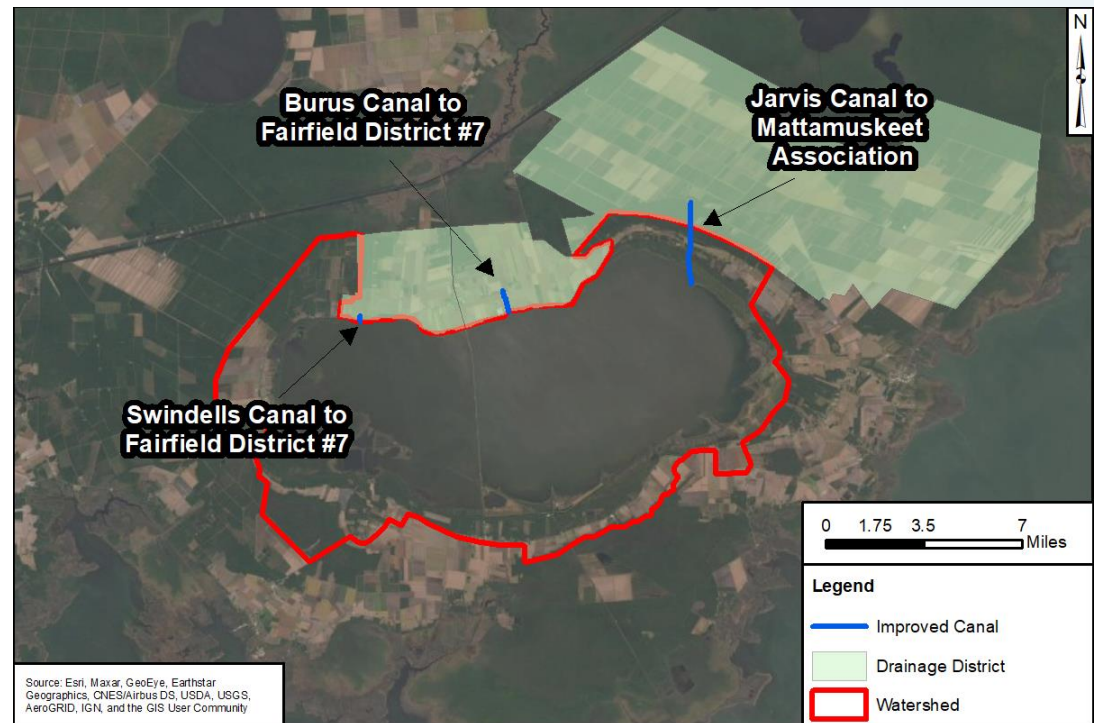
- Review study goals and objectives
- Review selected alternative
  - Gravity-drained canals to drainage districts
- Preliminary Engineering Design
  - Permit-level Plans
  - Environmental Impact Analysis
  - Active Water Management Plan
- Additional Bathymetric Surveys
- Next Steps

# Study Goals and Objectives

- Develop H&H model
- Calibrate to Hurricanes Matthew and Joaquin
- Simulate calibrated model under various design storm scenarios in existing and future sea level rise
- Evaluate engineered options to actively manage lake levels during 10-year design storms
- Evaluate two alternatives for all design storms under existing and future sea level rise
- Progress one preferred alternative to permit-level plans

# Selected Alternative: Gravity-Drained Canals to Drainage Districts

- Improve Jarvis Canal to Mattamuskeet Association
- Improve Burus Canal and Swindells Canal (adjacent to Oyster Nest Campground) to Fairfield District #7
- Draw down lake using adjustable water control structure
- Upgrade pump capacity at drainage districts to handle additional volume

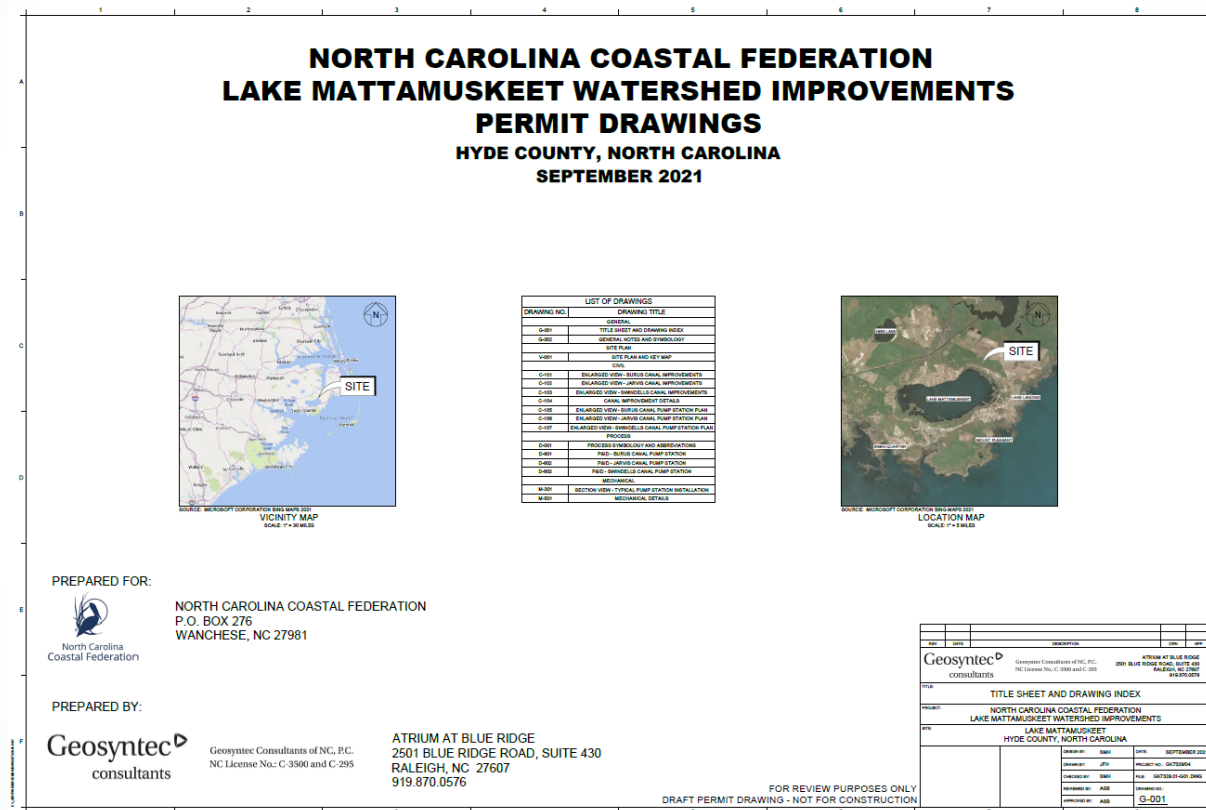




# Preliminary Engineering Design

- Permit-level Plans
  - General (2 sheets)
  - Site Plan (1 sheet)
  - Civil (7 sheets)
  - Process (4 sheets)
  - Mechanical (2 sheets)
- Preliminary Ecological Impact Analysis
- Preliminary Water Management Plan

# Preliminary Engineering Design: Permit Level Plans



# Preliminary Engineering Design: Permit Level Plans

| LIST OF DRAWINGS |   |
|------------------|---|
| DRAWING NO.      | DRAWING TITLE                                     |
| GENERAL          |   |
| G-001            | TITLE SHEET AND DRAWING INDEX                     |
| G-002            | GENERAL NOTES AND SYMBOLOGY                       |
| SITE PLAN        |   |
| V-001            | SITE PLAN AND KEY MAP                             |
| CIVIL            |   |
| C-101            | ENLARGED VIEW - BURUS CANAL IMPROVEMENTS          |
| C-102            | ENLARGED VIEW - JARVIS CANAL IMPROVEMENTS         |
| C-103            | ENLARGED VIEW - SWINDELLS CANAL IMPROVEMENTS      |
| C-104            | CANAL IMPROVEMENT DETAILS                         |
| C-105            | ENLARGED VIEW - BURUS CANAL PUMP STATION PLAN     |
| C-106            | ENLARGED VIEW - JARVIS CANAL PUMP STATION PLAN    |
| C-107            | ENLARGED VIEW - SWINDELLS CANAL PUMP STATION PLAN |
| PROCESS          |   |
| D-001            | PROCESS SYMBOLOGY AND ABBREVIATIONS               |
| D-601            | P&ID - BURUS CANAL PUMP STATION                   |
| D-602            | P&ID - JARVIS CANAL PUMP STATION                  |
| D-603            | P&ID - SWINDELLS CANAL PUMP STATION               |
| MECHANICAL       |   |
| M-301            | SECTION VIEW - TYPICAL PUMP STATION INSTALLATION  |
| M-501            | MECHANICAL DETAILS                                |

Grading plan and location of water control structure and culverts (as needed)

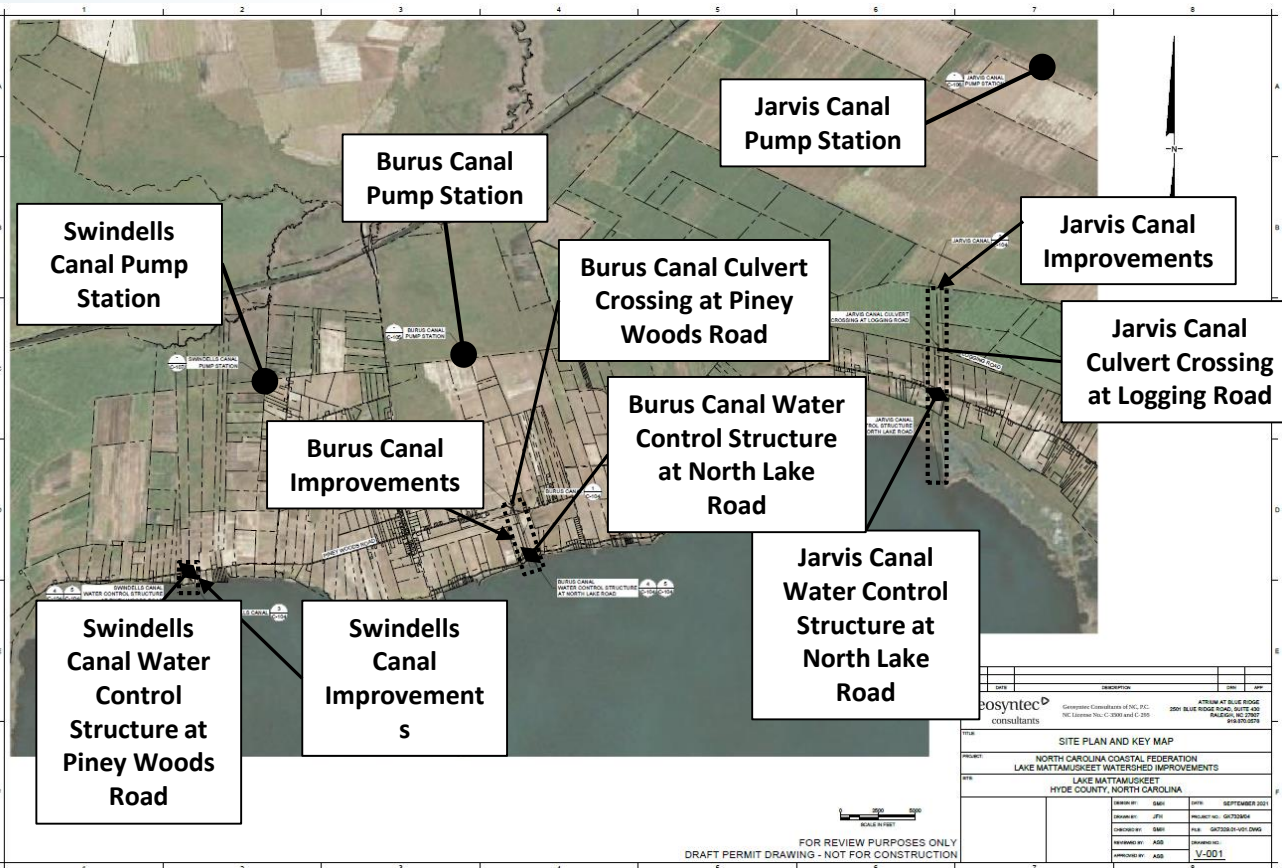
Dimensions of water control structures, channel cross-sections, and other details

Approximate pump station siting

Process & instrumentation design

Typical section view and installation options

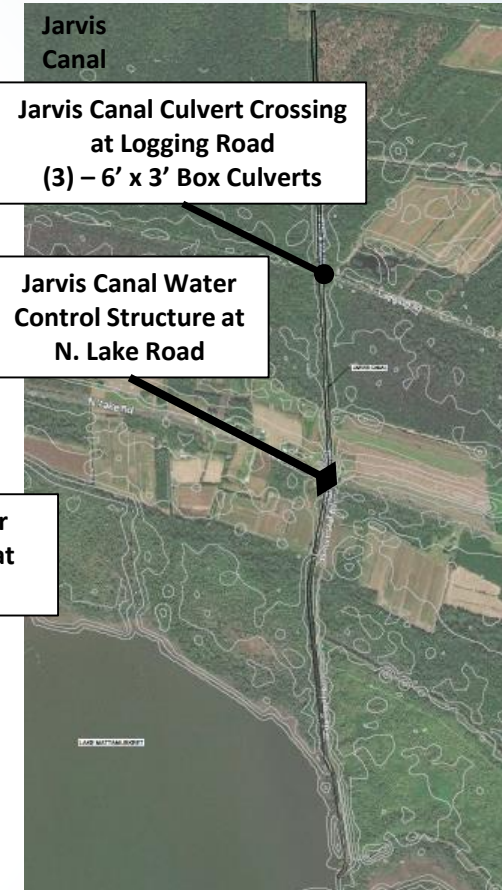
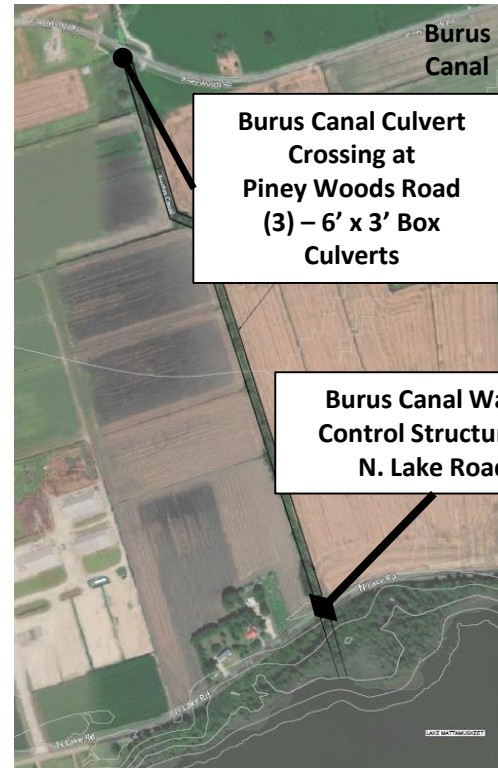
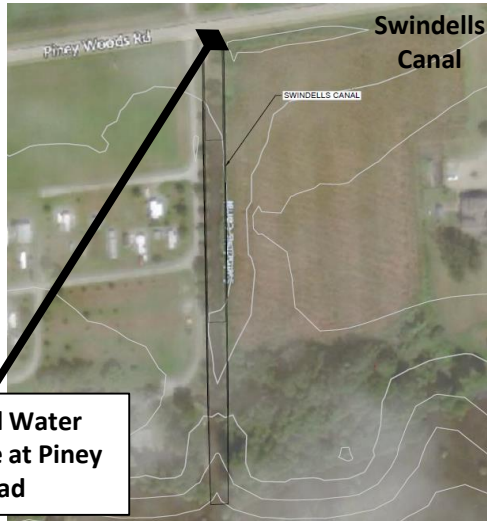
# Preliminary Engineering Design: Site Plan



- Canal Improvements
  - Burus Canal: ~ 3,500 LF
    - Culvert crossing at Piney Woods Road
  - Jarvis Canal: ~ 13,000 LF
    - Culvert crossing at Logging Road
  - Swindells Canal: ~800 LF
- Water Control Structures
  - Series of adjustable weir gates, width based on canal
- Pump Stations
  - Three (3) 48" axial flow pumps at each pump station



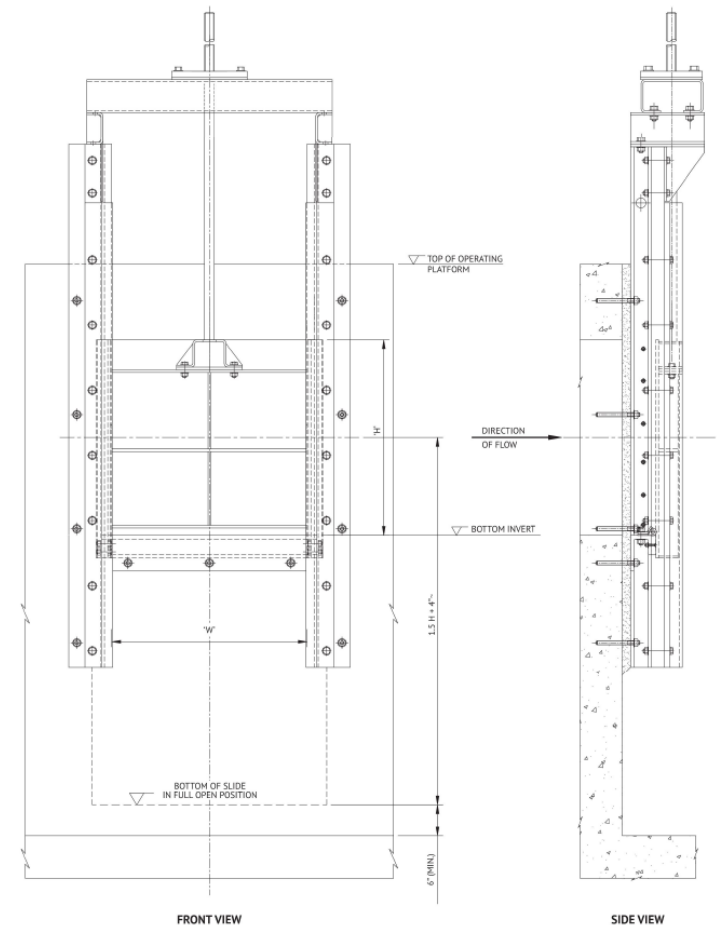
# Preliminary Engineering Design: Canals



| Improved Canal  | Bottom Width (ft) | Side Slopes (H:V) | Depth (ft) | U/S Invert Elevation (ft, gauge) | D/S Invert Elevation (ft, gauge) |
|-----------------|-------------------|-------------------|------------|----------------------------------|----------------------------------|
| Jarvis Canal    | 50                | 1:1               | Varies     | 0                                | -4.0                             |
| Burus Canal     | 40                | 1:1               | Varies     | 0                                | -3.7                             |
| Swindells Canal | 30                | 1:1               | Varies     | 0                                | -2.5                             |

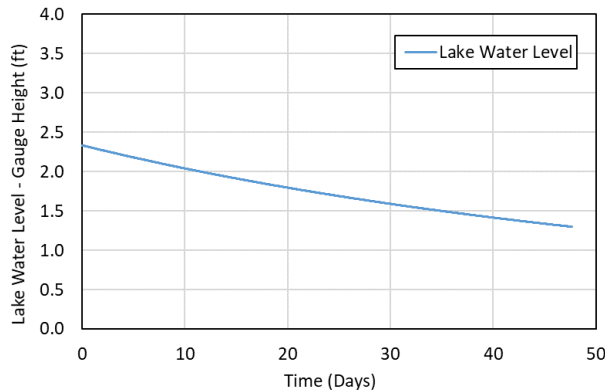
# Preliminary Engineering Design: Water Control Structures

- Adjustable Weir Gate Design and Operating Considerations
  - Conveyance capacity of receiving canal (250,000 gpm+)
  - Pump capacity of downstream pump stations (150,000 gpm – 180,000 gpm if all three pumps operating)

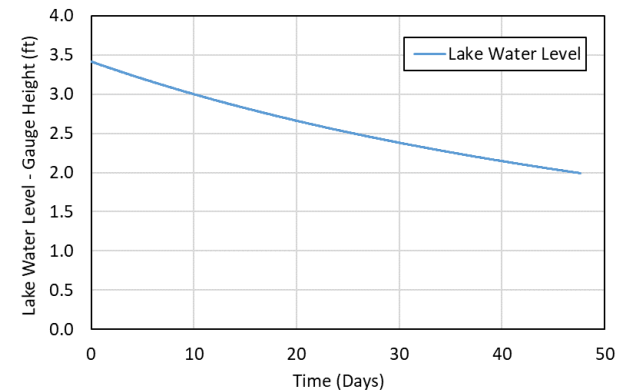


# Preliminary Engineering Design: Water Control Structures

| Improved Canal  | Starting Water Level: 2.5 ft gauge (approx. 2-year storm peak) |                        |                        | Starting Water Level: 3.5 ft gauge (approx. 50-year storm peak) |                        |                        |
|-----------------|--|------------------------|------------------------|---|------------------------|------------------------|
|                 | Total Weir Width (ft)  | Maximum Weir Head (ft) | Maximum Flowrate (gpm) | Total Weir Width (ft)   | Maximum Weir Head (ft) | Maximum Flowrate (gpm) |
| Burus Canal     | 20   | 2.5                    | 105,000                | 20  | 3.5                    | 180,000                |
| Jarvis Canal    | 30   | 2.5                    | 160,000                | 30  | 2.7                    | 180,000                |
| Swindells Canal | 15   | 2.5                    | 80,000                 | 15  | 3.5                    | 130,000                |



Approx. 20 days to drawdown 0.5 ft



Approx. 12 days to drawdown 0.5 ft



# Preliminary Engineering Design: Pump Stations

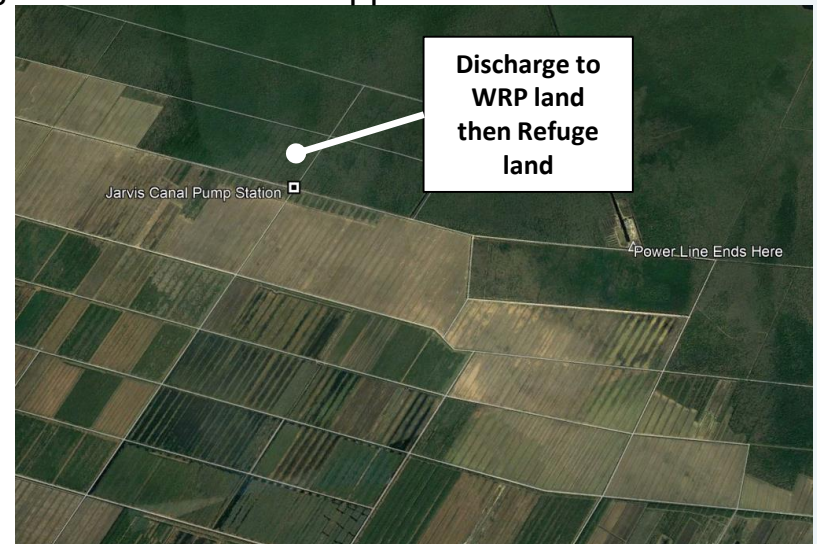
- Pump Station Siting
  - All locations can be either powered by diesel generators or three-phase power (with power line extension ranging from 0.75 miles to 2.75 miles)

Discharge locations could utilize surrounding land for sheet flow application

Discharge to  
Mill Ditch or  
Simmons and  
Williams  
properties

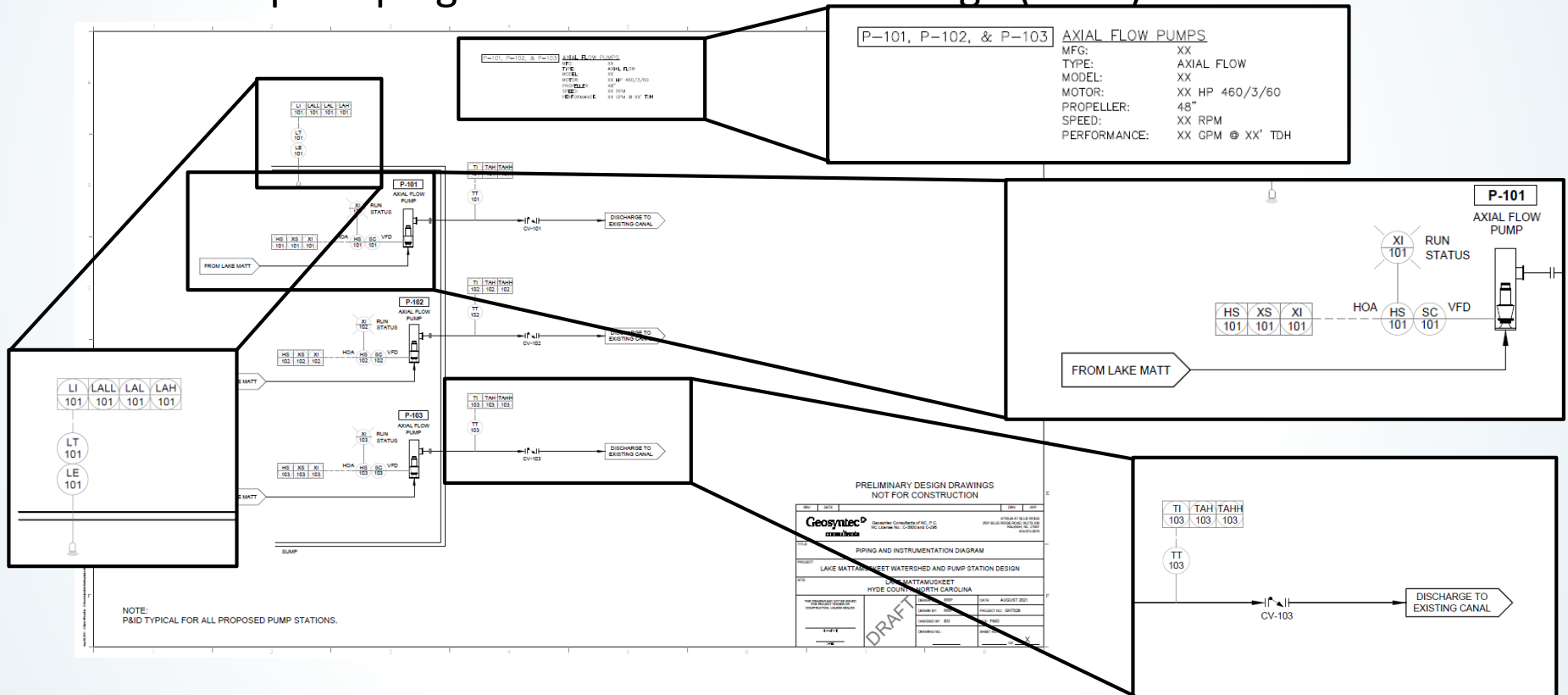


Discharge to  
WRP land  
then Refuge  
land



# Preliminary Engineering Design: Pump Stations

- Example Piping and Instrumentation Design (P&ID)



# Preliminary Engineering Design: Ecological Impact Analysis

- Narrative of project, including need for project and new service provided to project
- Location Map
- Summary of alternatives screening rationale
- Summary of anticipated permits (e.g., Section 404 Individual Permit, CAMA Major Permit)
- Review of publicly available data sets
- Summary of changes to environmental features: water volumes, rates, and salinity

**RESULT: An opinion of potential adverse impacts and known informational gaps.**



# Preliminary Engineering Design: Active Water Management Plan

- Narrative of conceptual design
  - Summary of components of design (grading, water control structures, pump sizing, etc.)
  - Brief description of construction methods
- Engineer's Opinion of Probable Cost
  - Class 5 Capital Construction costs
  - Annual operation costs

## Preliminary Engineering Design: Opinion of Probable Capital Costs (AACE Class 5 Estimate) and Annual Operation Costs

| Category  | Cost                       |
|---|----------------------------|
| Total Capital Costs with 30% Contingency                          | \$5,740,000 - \$10,950,000 |
| Annual Operation Costs (1,000 to 1,750 of annual operation hours) | \$475,000 - \$675,000      |

# Preliminary Engineering Design: Annual Operation Costs

| Potential Annual Operating Budget | \$/acre | Average Single Pump Operational Capacity (gpm) | Average Number of Pumps Operating | Average Total Pump Operational Capacity (gpm) | Time to Draw Down Volume Discharged to Lower Lake Level 0.5 ft (days) | Operational Hours (hours) | Annual Drawdown Volume (acre-ft) |
|-----------------------------------|---------|--|-----------------------------------|---|---|---------------------------|----------------------------------|
| \$475,000                         | \$25    | 30,000   | 6                                 | 180,000                                       | 28  | 1,000                     | 33,000                           |
| \$575,000                         | \$30    | 40,000   | 6                                 | 240,000                                       | 21  | 1,350                     | 60,000                           |
| \$675,000                         | \$35    | 60,000   | 6                                 | 360,000                                       | 14  | 1,750                     | 120,000                          |

**Assumptions:** 48-inch axial flow pumps (maximum capacity of 60,000 gpm @ 250 hp each). Assumed to be fueled by diesel generators running at full load. Annual costs include fuel consumption at specified hours of operation/year + 5% of capital pump/generator/water control structure costs on an annual basis for maintenance + 5% contingency for replacement costs every 20 years.



# Additional Topo/Bathy Surveys

- Proposal to collect additional topographic and bathymetric surveys, beginning with Outfall Canal with combo of RTK GPS and rod & level methods
- Refine DEM and model grid along canals & refine estimates of volume for removal to return to original design dimension
- Cross sections at approximately 1,000 – 2,000 ft intervals along canal with options for reducing span between cross sections

AWAITING APPROVAL  
OF STATE BUDGET  
FOR FUNDING

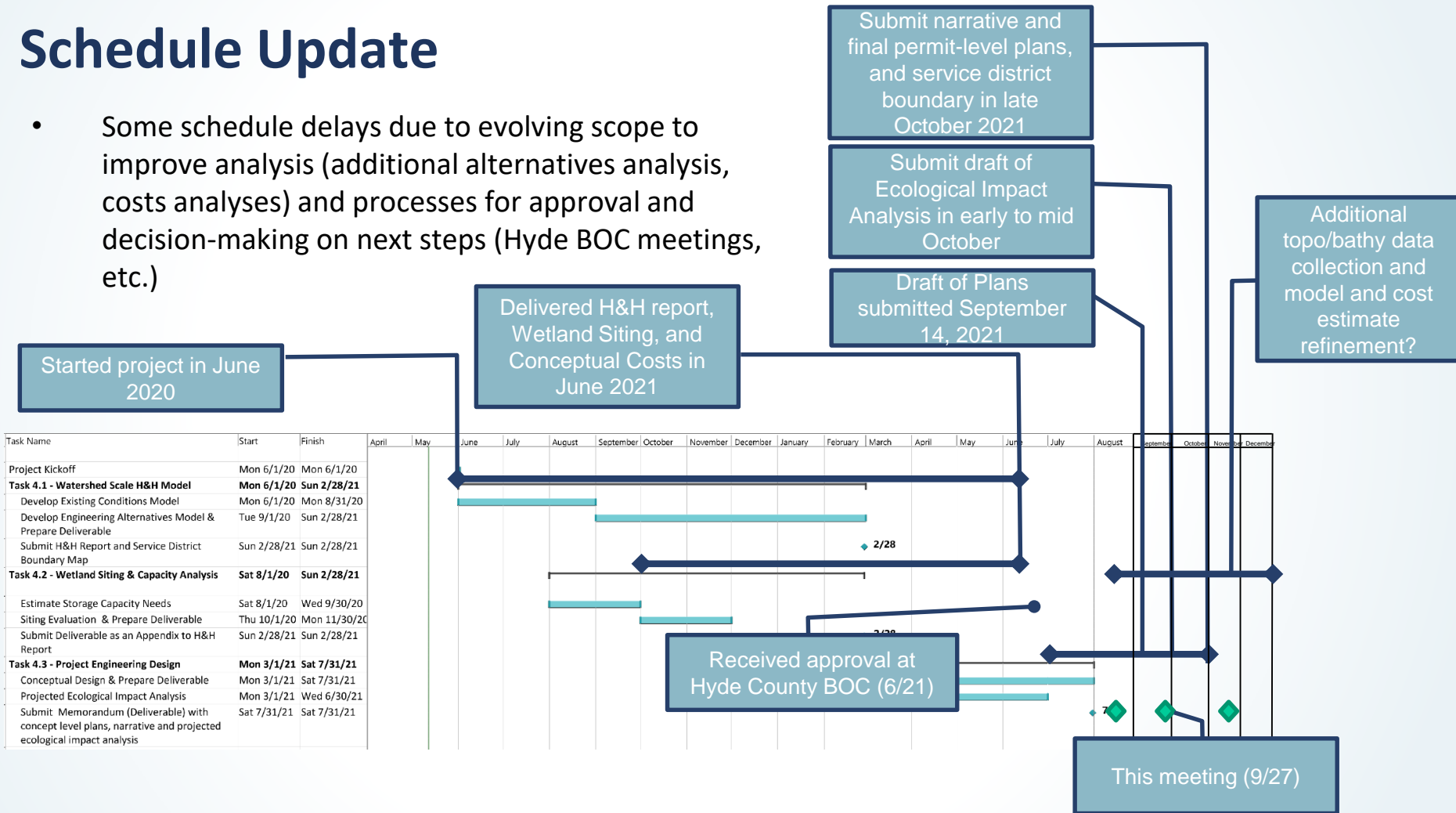


## Next Steps

- Finalize plans, EIA, and design narrative
- Potentially collect additional bathymetric data to improve cost estimates for sediment removal in existing outlet canals, pending funding
- Finalization of service district boundary, potentially with additional bathymetric data

# Schedule Update

- Some schedule delays due to evolving scope to improve analysis (additional alternatives analysis, costs analyses) and processes for approval and decision-making on next steps (Hyde BOC meetings, etc.)







# Questions?

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# Question and Comment Period

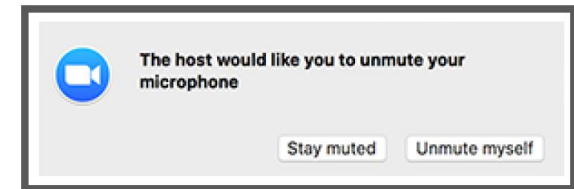
# Zoom Functionality



**Please use the Q&A  
function to type questions  
or comments**



# Zoom Functionality



**Mute/Unmute**

**Use the raise hand function if you would like to speak during the question and comment period at the end of the meeting.**



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# Question and Comment Period



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## Thank you for attending!