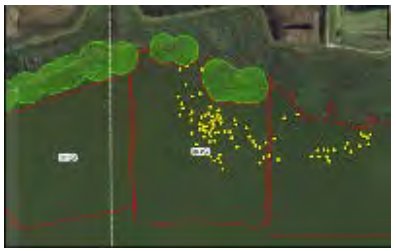
Lake Apopka Unconsolidated Flocculent Sediments Dredging & Material Placement

St. Johns River Water Management District, Florida





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Mr. Wagner is an associate dredging engineer with nearly 20 years of experience planning, designing, permitting, and implementing various dredging engineering projects, including developing long-range dredged material management plans; designing upland dredged material containment facilities; creating dredging templates, performing economic evaluations, and assessing various alternate dredging technologies.

A Condensed History

'Angler's Paradise' to 'A Turbid Hypereutrophic Horror'

Brief History of Lake Apopka

Figure 1. Lake Apopka Location Map
(Courtesy Friends of Lake Apopka)

Brief History of Lake Apopka (continued)

- 1940's and before – SAV dominated, clear water, abundant sportfish
- 1940's to 1950's – Ditching/draining for agriculture, Dike construction
- 1960's to 1990's – P loading, hypereutrophication, loss of SAV
- Legislative actions in 1985, 1987 and 1996 directed at restoration
- Farmlands acquired for restoration (1996-1999)
- Bird mortality, ecotoxicological studies, remediation (1998-2009)
- 2018 – SJRWMD transitions to active management of LANS

Lake Apopka's Silent ~~Spring~~ Summer – DDT & DDE

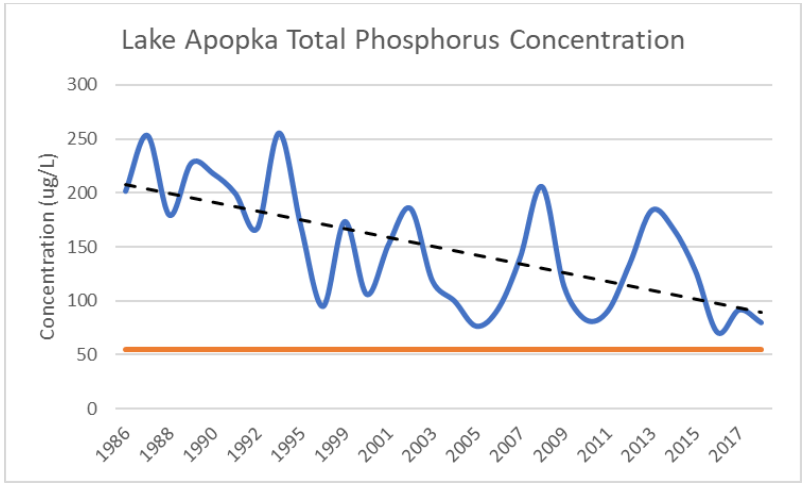
- Alligator Abnormalities
  - Population dramatically declined b/w 1980 and 1987
  - Eggs would crack under the weight of nest material
- Tower Chemical Company
  - Town of Clermont
  - Southwest of the Lake
- Site of massive DDT "leaks" b/w 1957 to June 1987
- Among the 1st hazardous-waste sites eligible for Superfund *$$*
- Cleanup began in 1983 but has not been completed

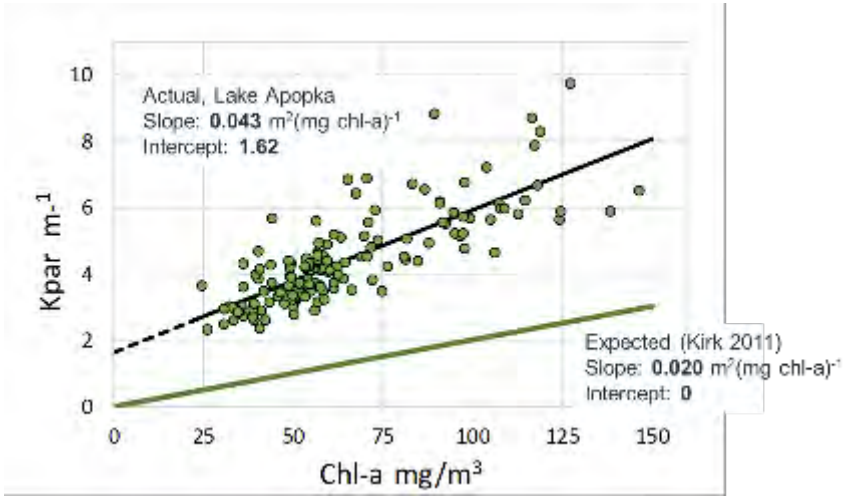
Long Overdue Lake Apopka Restoration

SJRWMD Project-Specific Objectives

Building on Initial Success

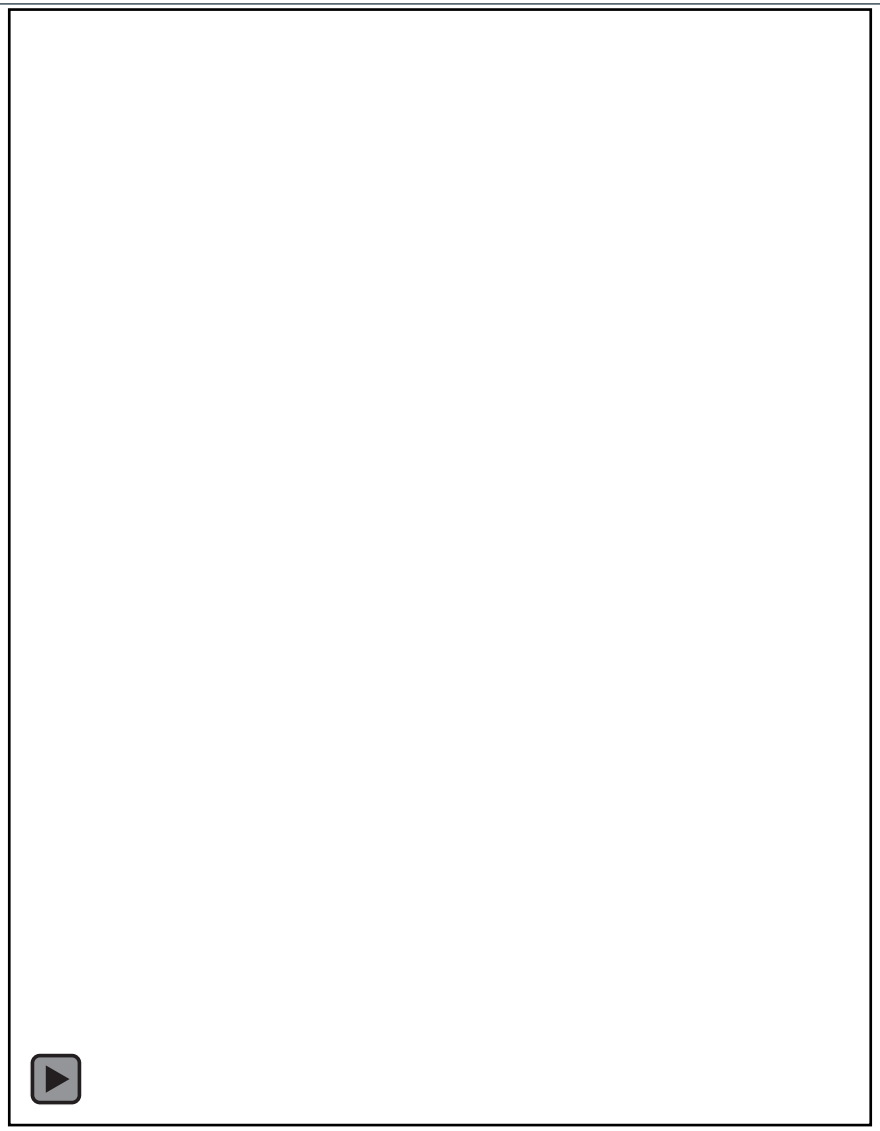
- Ongoing
  - Lake Apopka North Shore nutrient load management
  - Marsh Flow-Way
  - Shad harvesting
- New Approaches (Wood)
  - Sump dredging
  - Unconsolidated Flocculent Sediments (UCF) - Targeted Dredging





Unconsolidated Flocculent Sediments (UCF)

The Dirty Snow-Globe Effect



SJRWMD Restoration Project-Specific Objectives

- Improve lake water clarity
  - Improve light climate for SAV
  - Reduce turbidity
  - Improve aesthetics
- Improve wetland restoration
  - Cover contaminated soils to reduce exposure to wildlife
  - Reduce exposure to hasten future human recreation opportunities
  - Offset subsidence to help reduce open water areas and augment functional wetland habitat

Lake Apopka Sump Dredging

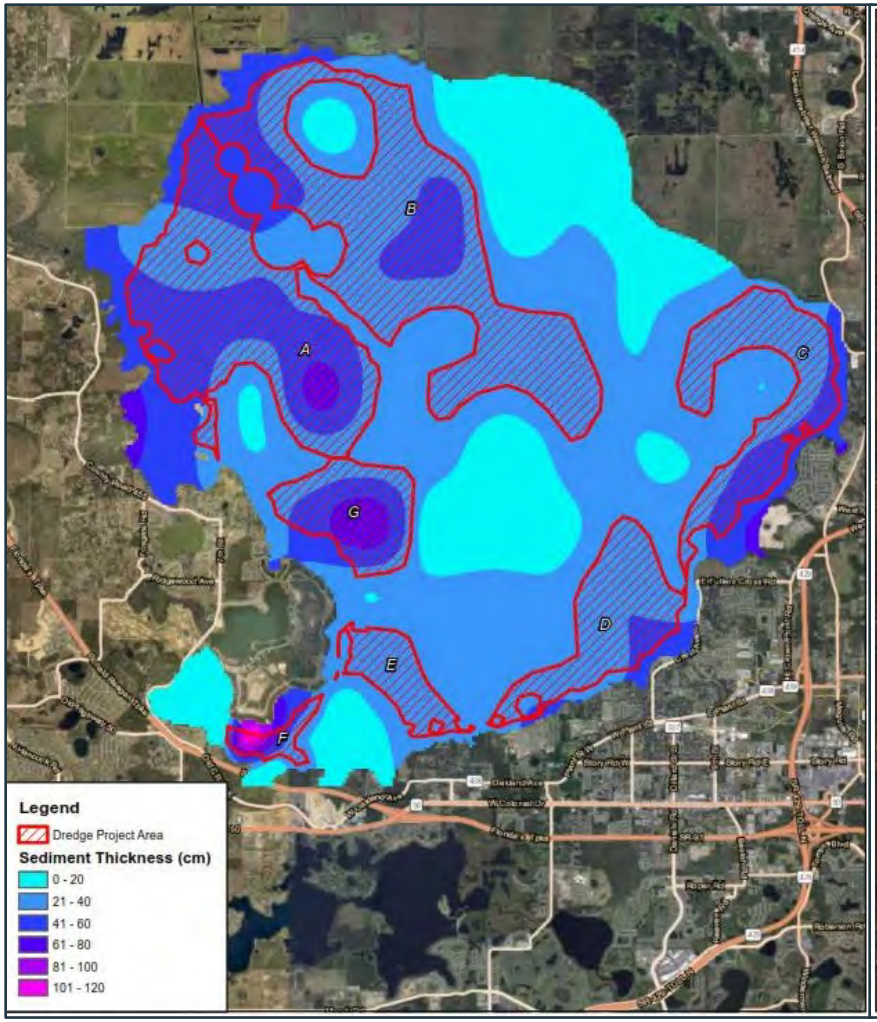
Sump, Pump, and lump (placement)

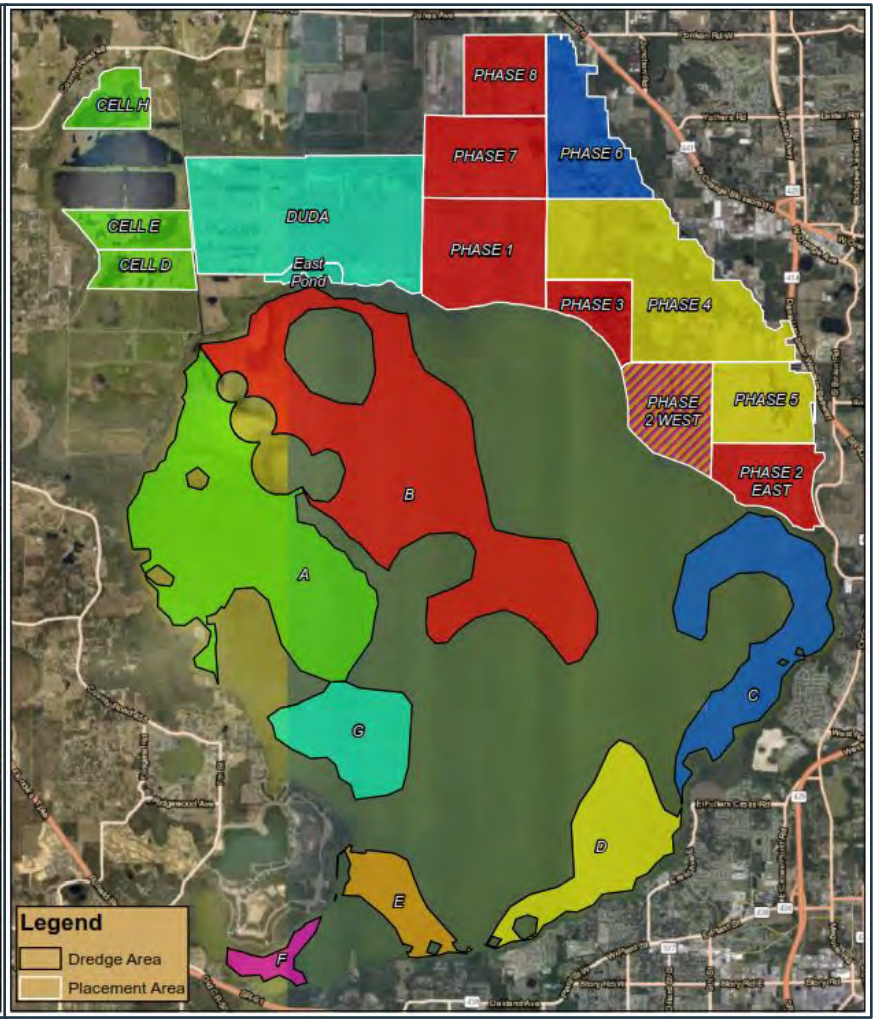
Targeted Dredging vs. Sump Pumping

Dredge operator & support crew
Booster pumps
Multiple Permits
Avoidance areas
Navigational hazards

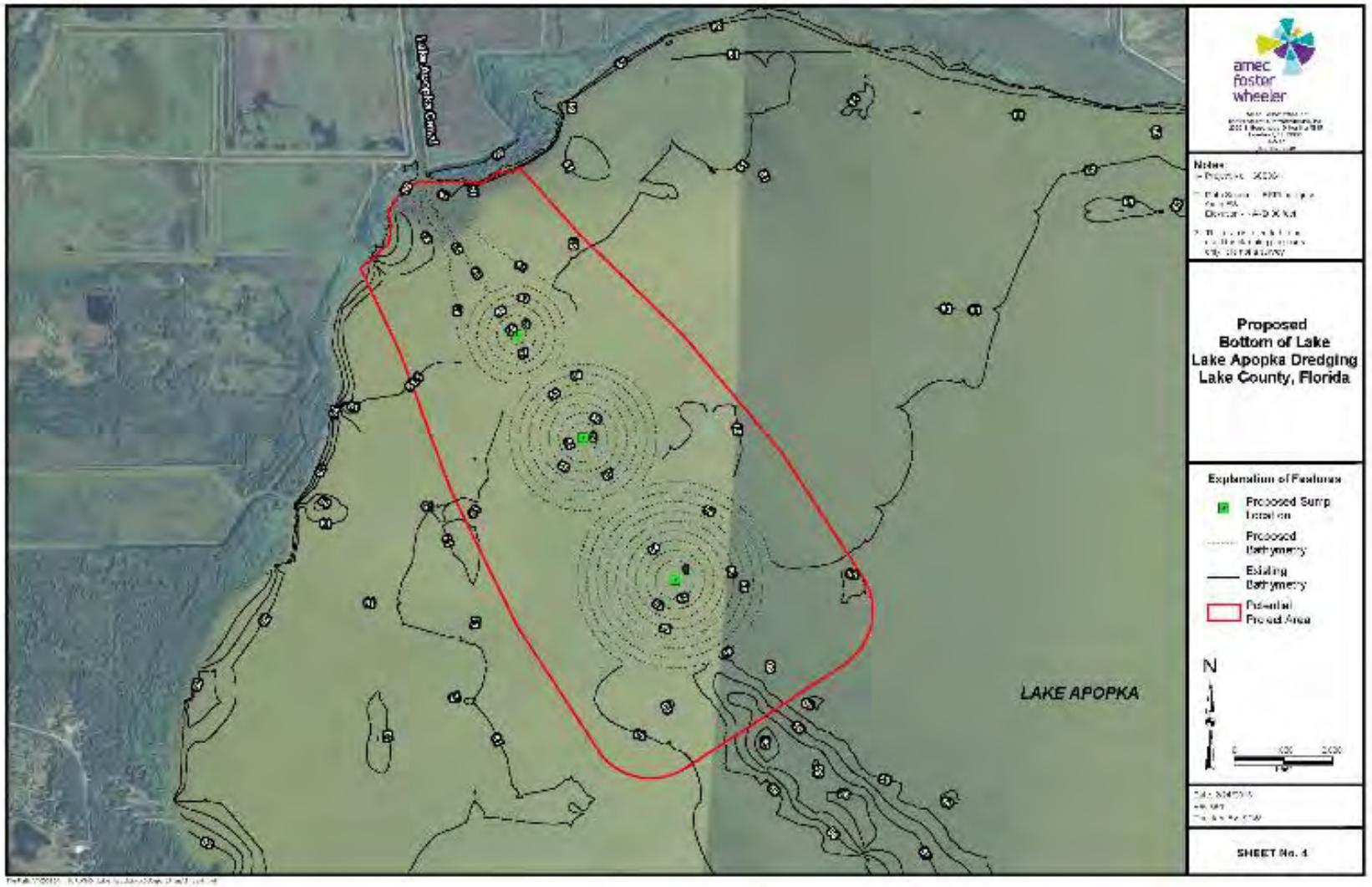
Traditional dredging initially
Automation
Fixed location
One permit

UCF Thickness & Proposed Dredging & Placement

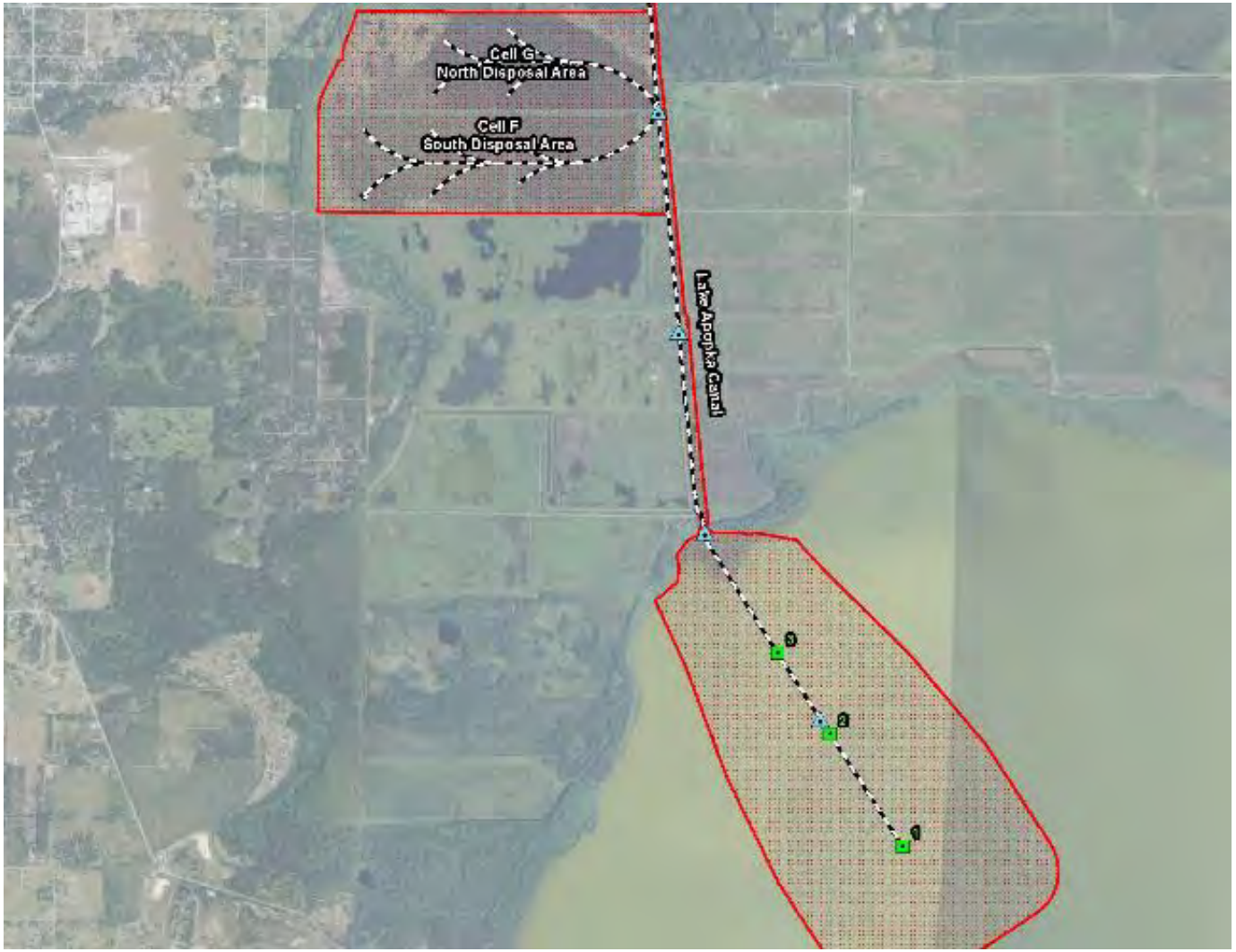




3 Sumps Designed – First sump is nearly complete



Pipeline Route to F & G Cells



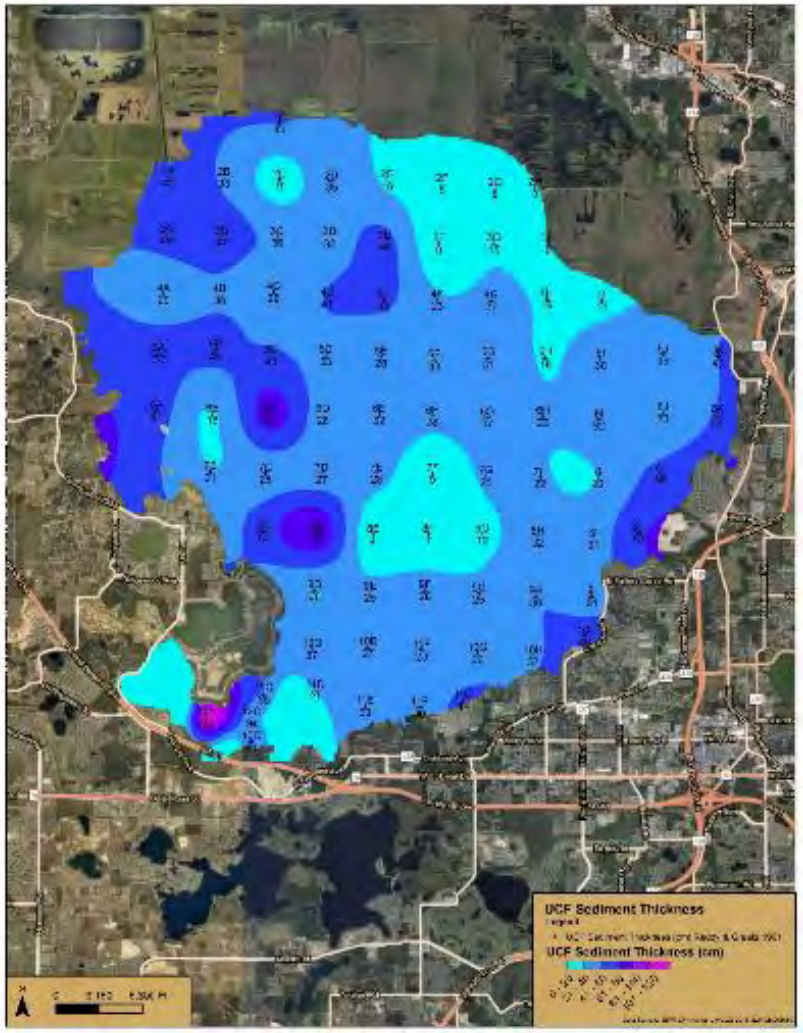
Dredge Material Placement

UCF Sediment Pumping

Removing Lake Apopka's Fluid Mud problem

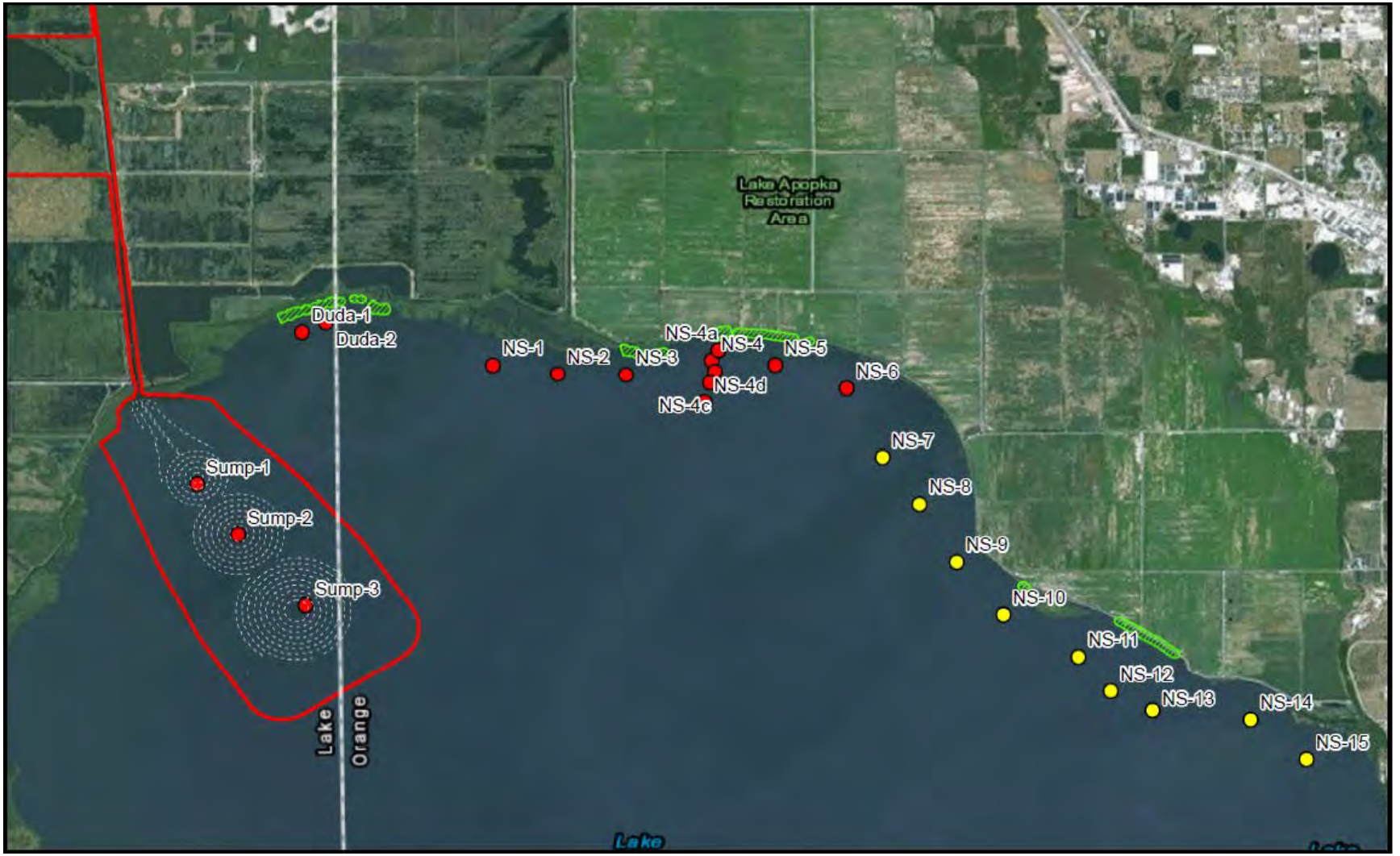
Targeted UCF Sediment Removal

- Studies suggest that UCF sediment has a significant impact on PAR
- UCF volume makes up only a fraction of the soft sediments in Lake Apopka
- Targeted removal of UCF could address resuspension, result in less material disposal and avoid increasing littoral zone depth compared to conventional dredging



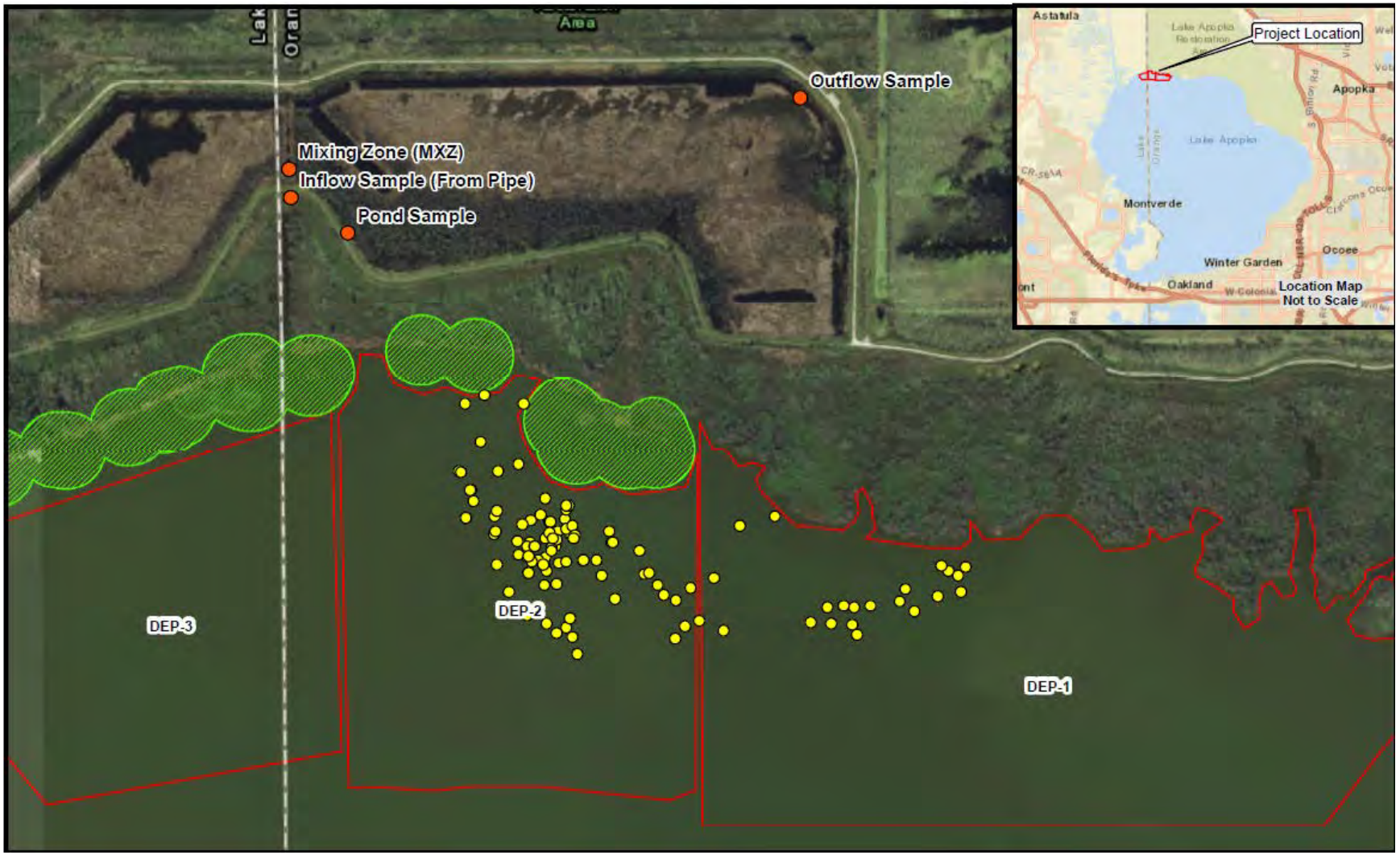
Emergent and submersed vegetation (2016)

Sediment Sampling and Characterization



Targeted UCF Removal Areas

Actual Pumping Locations



Targeted UCF Pumping Challenges and Solutions

- Challenges
  - UCF sediment does not flow like water
  - Dredges aren't precision instruments
  - Performance criteria for UCF removal
  - Difficult to tell if dredge is removing UCF or CF
- Solutions
  - Optimize dredge speed and positioning
  - Utilize special suction head design
  - Real time pipe-end turbidity feedback to operator
  - Operator training
  - Core sampling and new methods

Real Time TSS Monitoring at Pipe End

- Long-term permit for Apopka dredging
- Targeted lakewide removal of UCF sediment
- Thin layer placement
- Additional revegetation (Apopka and LANS)
- Sump pumping
- Additional sump construction
- Additional studies


wood.