



Seal Beach National Wildlife Refuge Thin Layer Salt Marsh Sediment Augmentation Project Construction and Lessons Learned

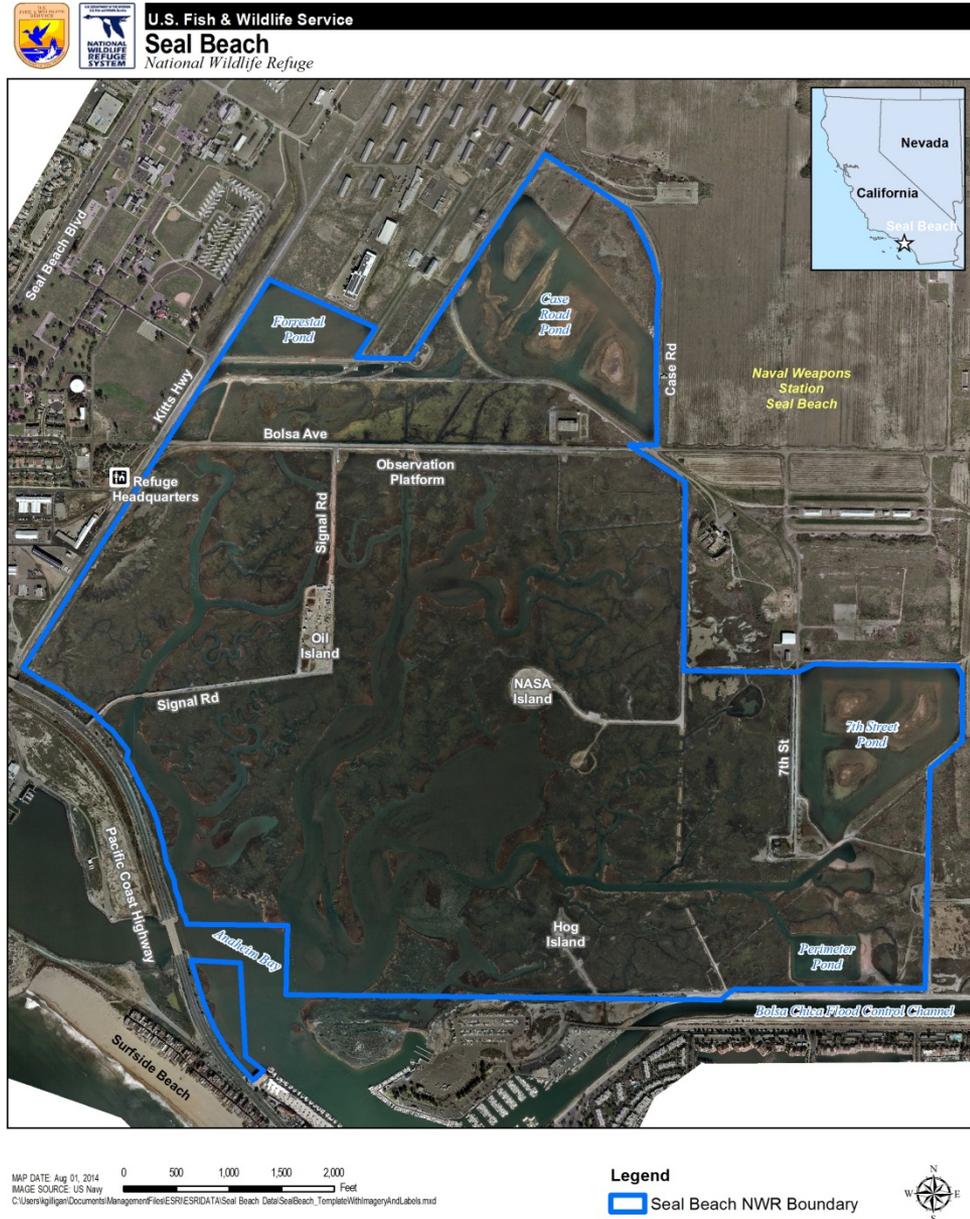


Rick Nye - Refuge Biologist - Seal Beach NWR



Problem

- 965 acre refuge
- 59% (565 acres)
intertidal salt marsh
- Subsidence rate:
- 4.13mm/yr
(SE \pm 1.21 mm/yr)
- Relative Sea Level Rise
6.23 mm/yr
- Subtidal in 60 years





Dredge Material Opportunity





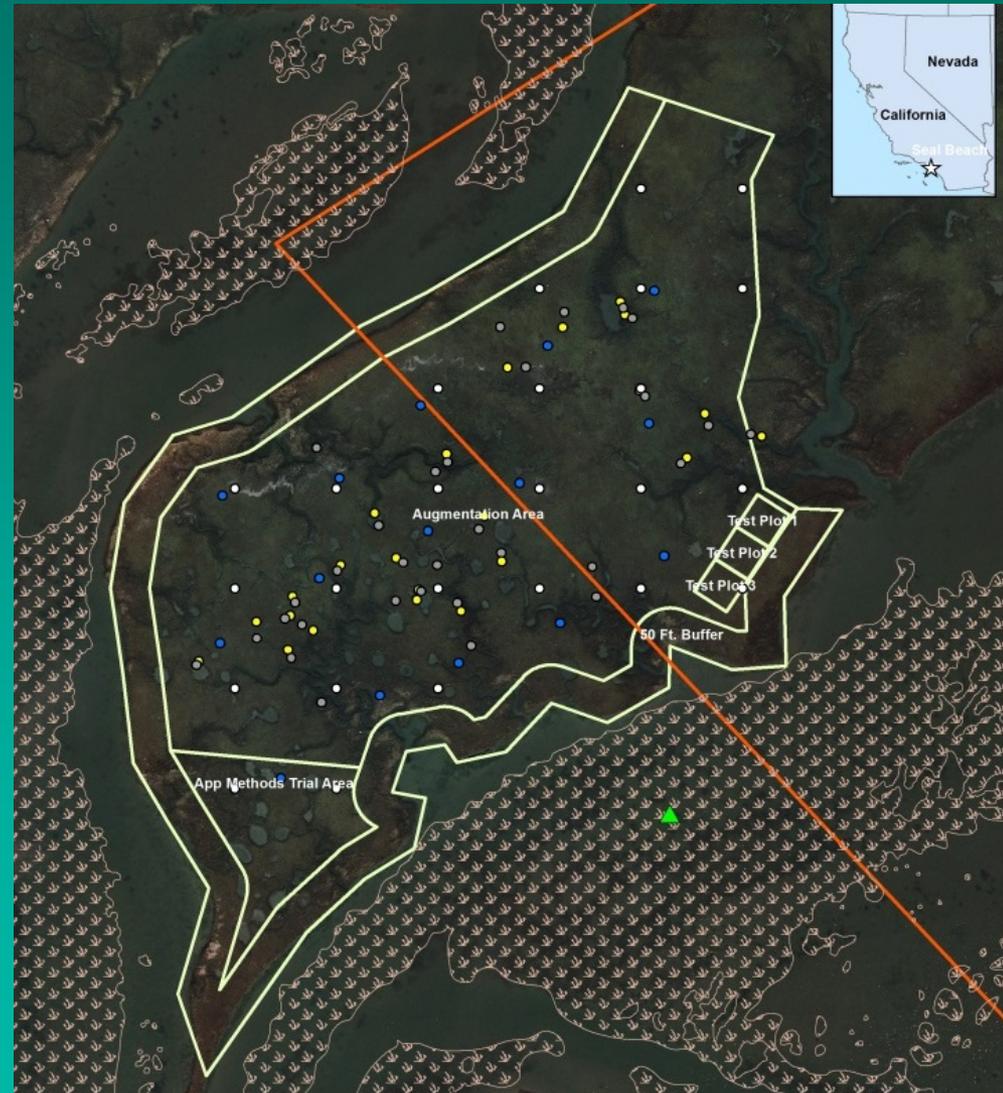
Too much perhaps?

Research & Monitoring

- Site elevations
- Sediment depth overtime
- Compaction rate
- Tidal creek reformation
- Vegetation % cover
- Species composition
- Biomass
- Cordgrass assessment
- Plant Physiology
- Invertebrate species
- Eelgrass health
- Ridgeway's Rails
- other avian activity
- Carbon sequestration

Timeline:

6-mos Pre-augmentation to
5-yrs Post-augmentation



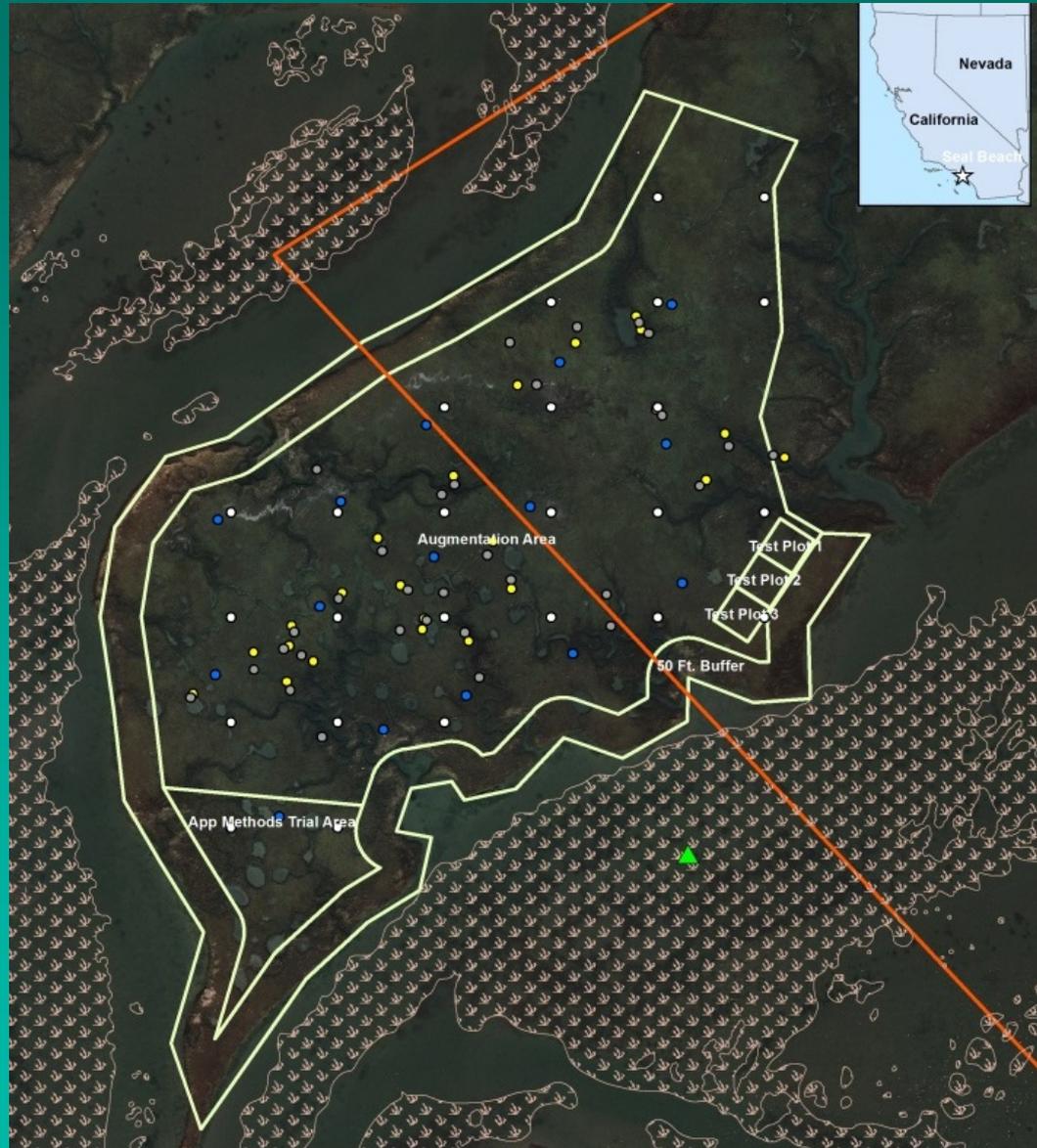


Mitigation Measures

- Relocate rail nesting platforms
- Haze birds off project site
- Minimize avian predator perching
- Patrol pipeline for leaks, sea turtles, and marine mammals
- Conduct eelgrass surveys (pre, 1 year, 2 year)
- Vegetated “Buffer zone” of 50 ft. from waters edge
- Silt barriers on augmentation site
- In-water silt curtains for dredge operations
- Monitor turbidity
- Minimize eelgrass impact
- Keep bio-monitor on site



Construction Requirements



- Pre-augmentation RTK survey
- Install 10m grid
- Implement mitigation measures
- Test application methods
- Install sediment barrier
- Install silt fencing
- Maintain 50 ft. buffer
- Apply 10" sediment
 - ± 1" at grid poles
 - ± 1.8" between poles
- Respond to unexpected issues
- Post-augmentation photogrammetry survey



Construction Equipment



Photo by Rick Nye//USFWS

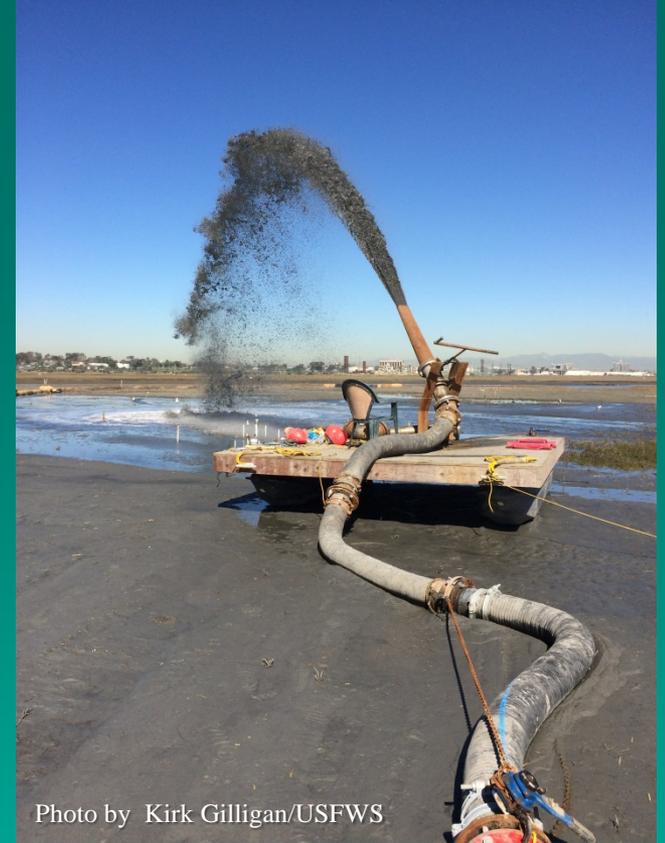


Photo by Kirk Gilligan/USFWS



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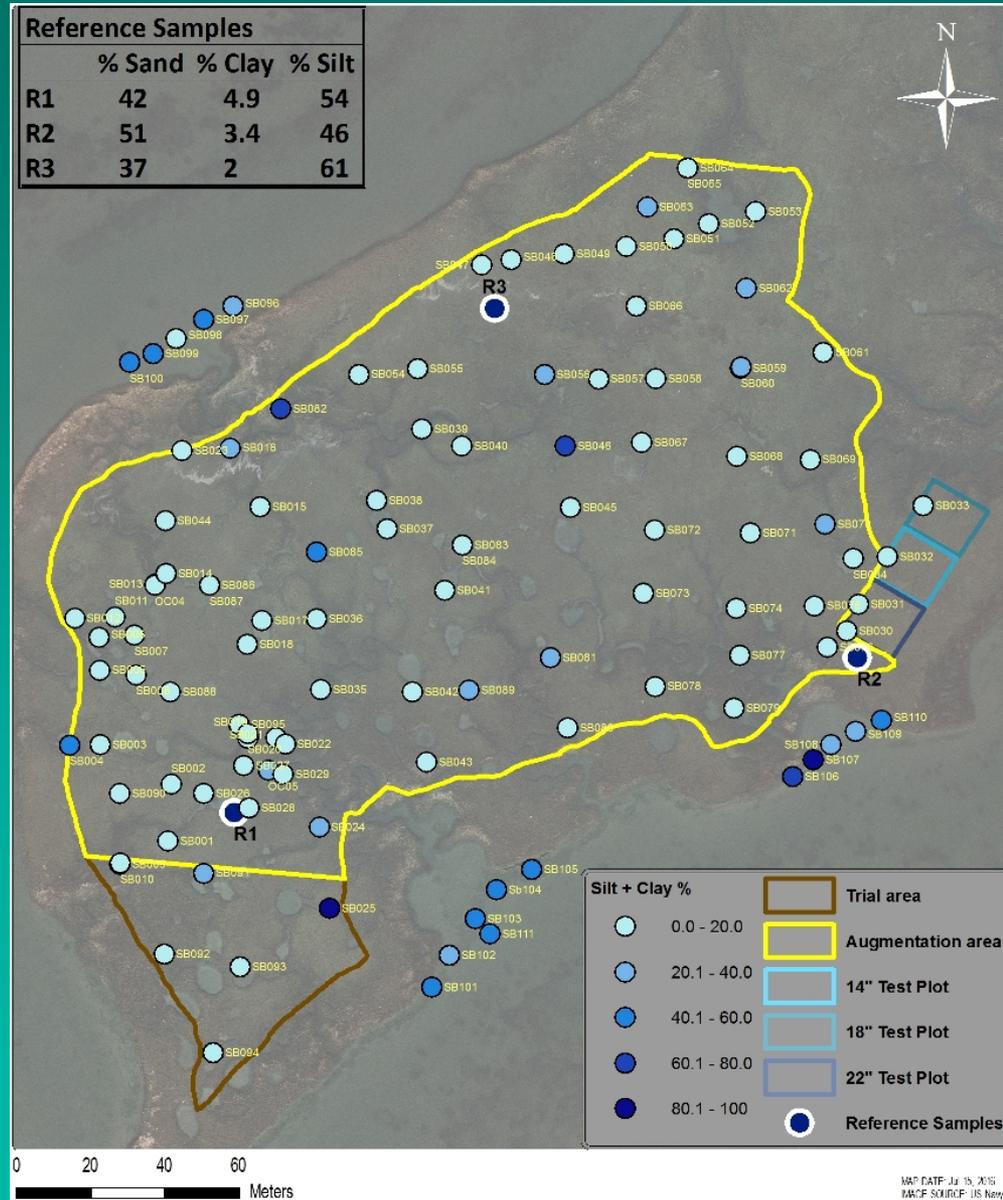


Source Material

- Better sampling of grain size
- Avoid pockets of garbage
- Contract required trash pick-up



Photo by Rick Nye/USFWS





Nozzle Selection



Photo by Curtin Maritime



Photo by Rick Nye//USFWS



Photo by Kirk Gilligan/USFWS

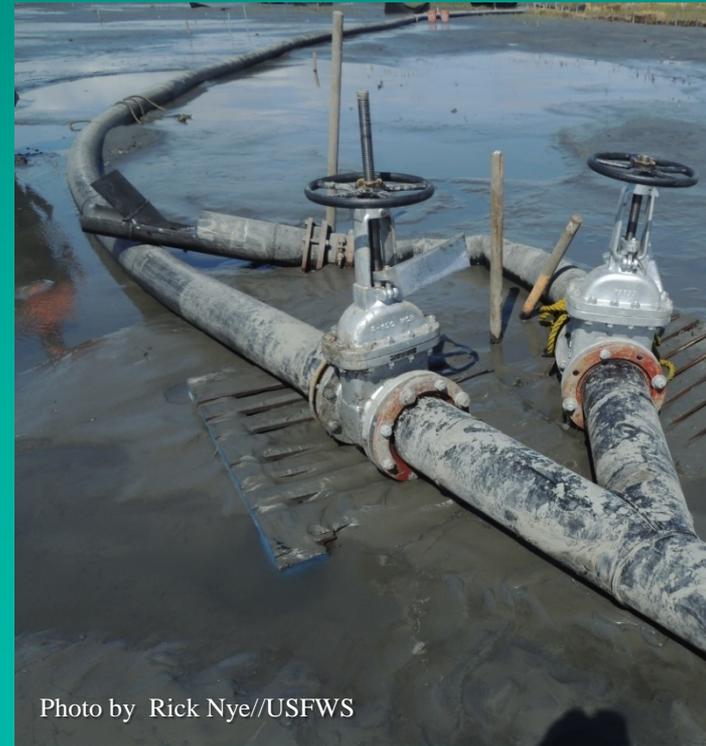


Photo by Rick Nye//USFWS



Spraying Impacts

- Birds relatively undeterred
- Noise level ~60dB
- Ridgeway's rail hiding near equipment



Photo by Rick Nye//USFWS



Photo by Rick Nye//USFWS



Photo by Rick Nye//USFWS



Sediment Barriers



Photo by Rick Nye//USFWS



Photo by Curtin Maritime



Photo by Kirk Gilligan/USFWS



Estimating Depths During Construction

- New sediment compaction
 - 20% to 30% during 1st 72 hrs
- Variances in underlying marsh compaction
- Coring verification
 - Access
 - Labor intensive
- Bathtub/Lava effect
- Consistent pole installation standards
 - Research Team
 - Contractor
 - >500 grid + research poles





Final Elevations

Photogrammetry survey –

- 0.1 - 0.05 ft accuracy

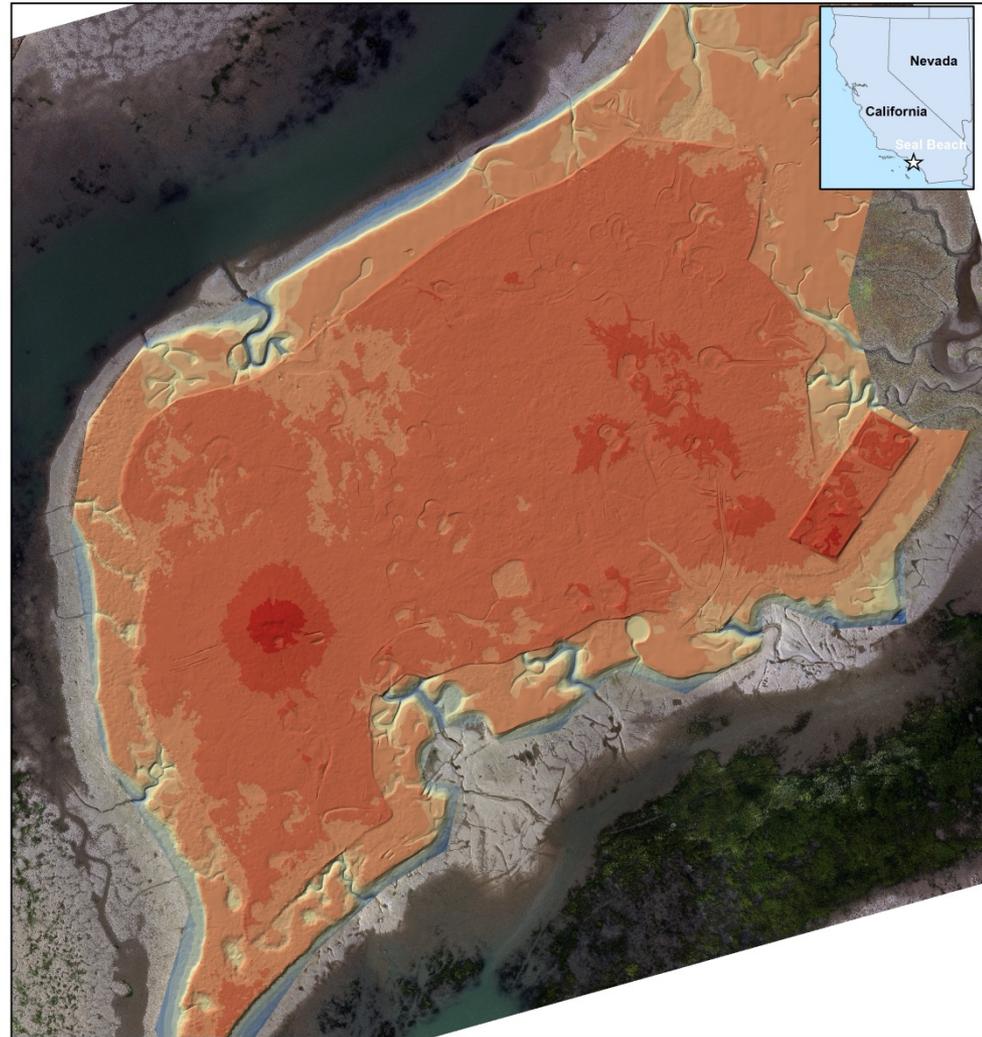
Calculated sediment depth –

- 9.6" on average
- 40% of poles were 10" + 1"
- 63% of poles were 10" + 2"
- Large depth variance across 40% of the site



U.S. Fish & Wildlife Service
Seal Beach
National Wildlife Refuge

Salt Marsh Sediment Augmentation Project - April 2016



MAP DATE: Jun 01, 2016
 IMAGE SOURCE: US Navy
 C:\Users\kgilgan\Documents\Management\files\ESRI\ESRDATA\Seal Beach Data\SealBeachSedimentAugmentation\Project\SealAugmentation.mxd



Legend
SealBeachSedimentPostAugmentationDTM

Elevation
1.650 - 2.061
1.729 - 1.886
1.563 - 1.729
1.387 - 1.563
1.22 - 1.387
1.064 - 1.22
0.888 - 1.064
0.732 - 0.888
0.566 - 0.732
0.4 - 0.566
0.234 - 0.4
0.068 - 0.234





Estimation Errors

Construction timeline –

Estimated: 1 month

Actual: 1st third - 2 mos

Remainder: 2 wks

- Equipment breakdowns
- Sediment barrier maintenance

Sediment volume –

Estimated:

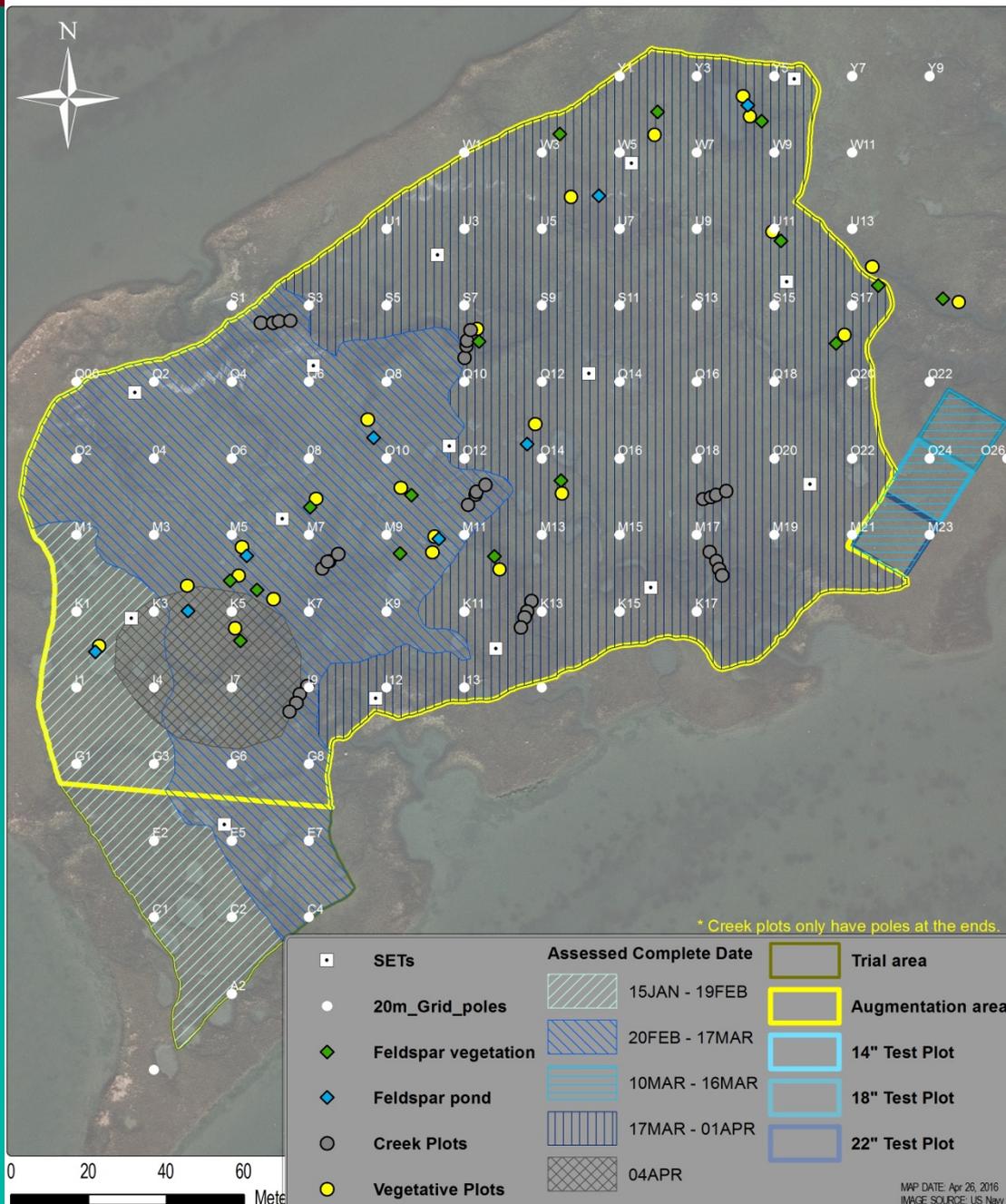
13,500 yd³ for 10.0 ac

Actual:

16,875 yd³ for 7.87 ac

Better estimate would be:

22,000 yd³ for 10.0 ac





Funding and Timelines

- Actual cost of dredging and placement:
 - \$1.35 million
- Time for planning, funding requests and permitting:
 - 2.5 years
- Post-augmentation research and evaluation:
 - 5 years
 - \$1.5 million



Data Dissemination & Outreach

- Publish post-construction monitoring reports annually
- Refuge webpage to provide quarterly updates, reports, photos, & time lapse video
- Conduct a workshop/webinar to present monitoring results
- Prepare a final report with lessons learned and recommendations for future projects
- Research team regularly present their efforts at conferences



Big picture

Implement and evaluate thin layer placement as a regional sea level rise and climate change adaptation strategy.

Be able to use this strategy at regular intervals for long term sustainability of Pacific coast marshes.

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Reports and time lapse videos:

www.fws.gov/refuge/seal_beach/what_we_do/resource_management/Sediment_Pilot_Project.html