The Jamaica Bay Eelgrass Restoration Project

or

The Trials and Tribulations of Planting a Cold Water Species in an Ever Warming and Highly Urban Estuary…

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THE TEAM

Vision
Jamaica Bay Watershed
Project Plan
Funding

Project Administration

Overall Project Management & Administration
Hydrological Modeling
Logistical Support

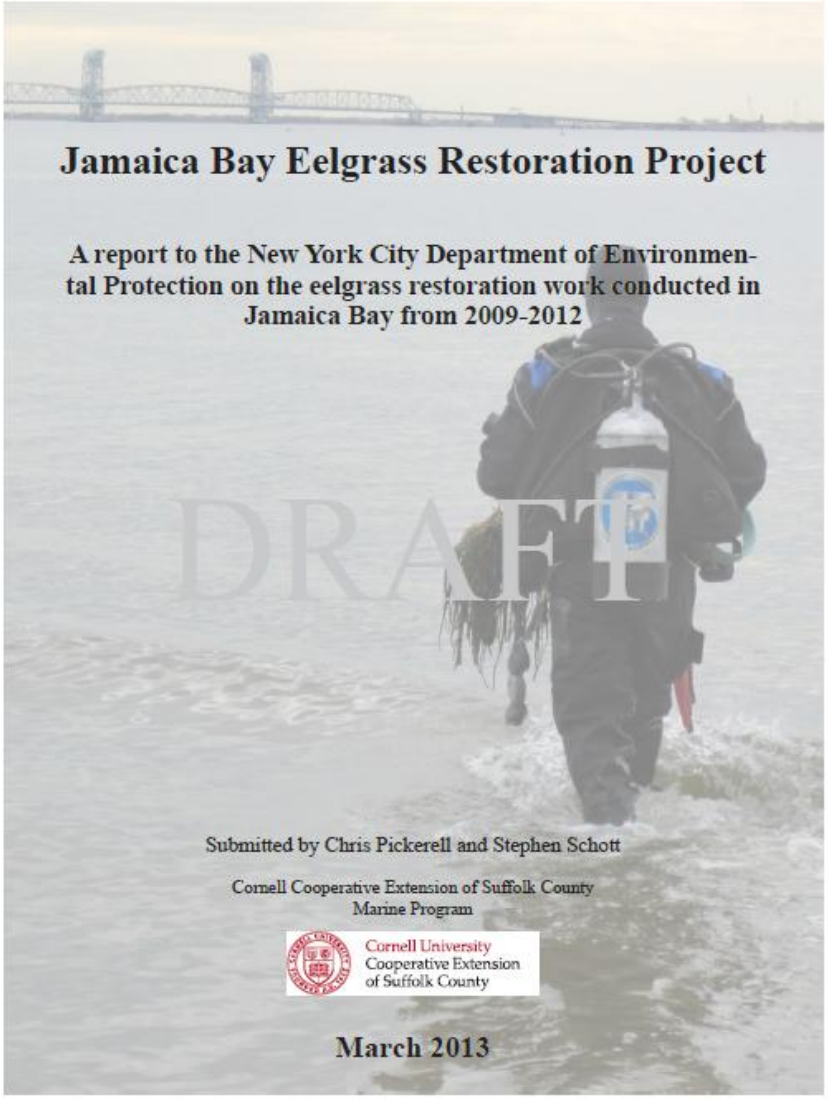
Logistical Support
Post-Planting Monitoring

Project Design
Permitting
Planting collection, processing and planting
Monitoring Assessment

Logistical Support

Special thanks to: Steve Zahn of the NYSDEC and George Frame and Doug Adamo from Gateway. Without permits we couldn't do any of this work!

Final DRAFT Report (March 2013)



Jamaica Bay Eelgrass Restoration Project

A report to the New York City Department of Environmental Protection on the eelgrass restoration work conducted in Jamaica Bay from 2009-2012

DRAFT

Submitted by Chris Pickerell and Stephen Schott

Cornell Cooperative Extension of Suffolk County
Marine Program

Cornell University
Cooperative Extension
of Suffolk County

March 2013

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Project Overview

GOALS:

To determine whether it is possible to re-introduce eelgrass (*Zostera marina* L.) into Jamaica Bay, NYC and if so establish a population there.

OBJECTIVES:

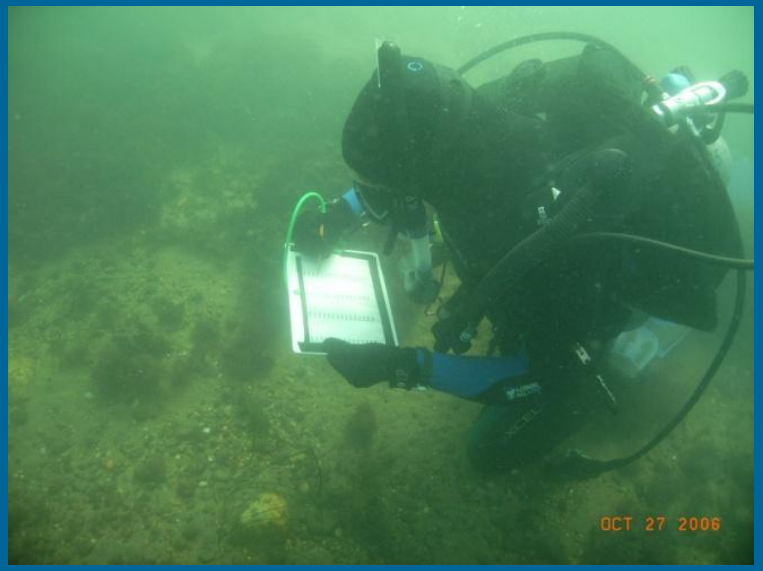
Identify appropriate sites/site selection parameters

Identify limiting factors to establishment and growth

Identify the most effective planting method(s)

Identify appropriate donor material

Identify the optimal planting season



What makes this project unique?

LOCATION:

Jamaica Bay is in an urban Watershed. There are obvious water quality implications…This is unlike any area we have worked in previously.

LOGISTICS:

Land access to our sites can be difficult and Just getting to the sites takes us ~2hrs so ~4+h is spent on travel.

LACK OF INFORMATION:

There is no documentation on the extent historic meadows.
Even if there was, the Bay has been so drastically altered that this information would be almost meaningless.

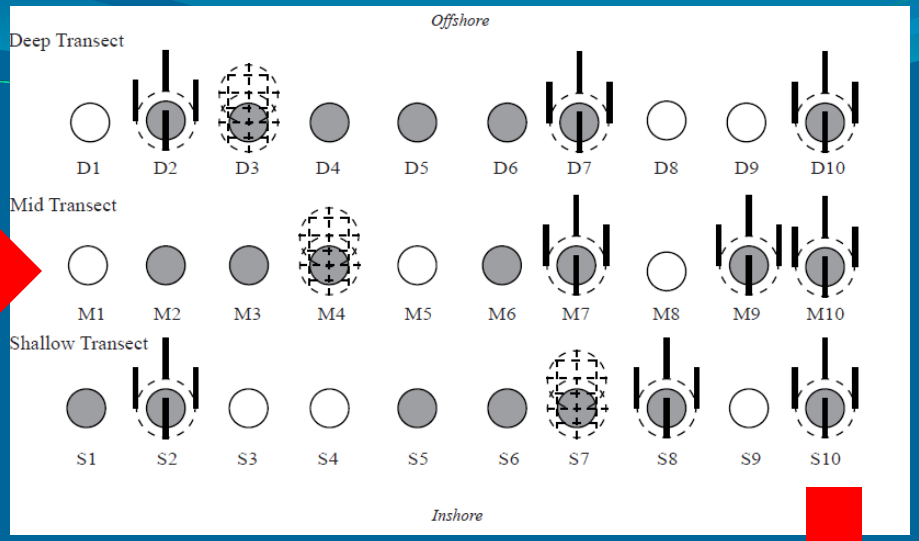
OTHER CHALLENGES:

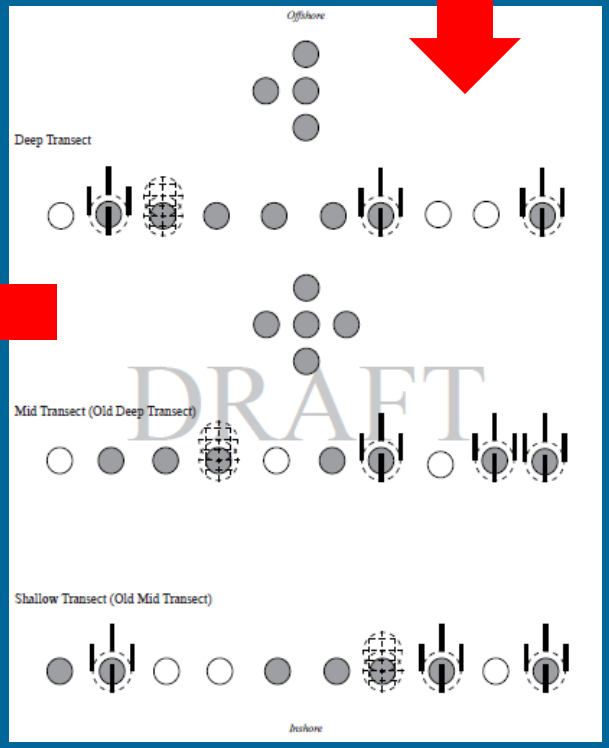
Bioturbation was a MAJOR concern here due to brant and horseshoe crabs.

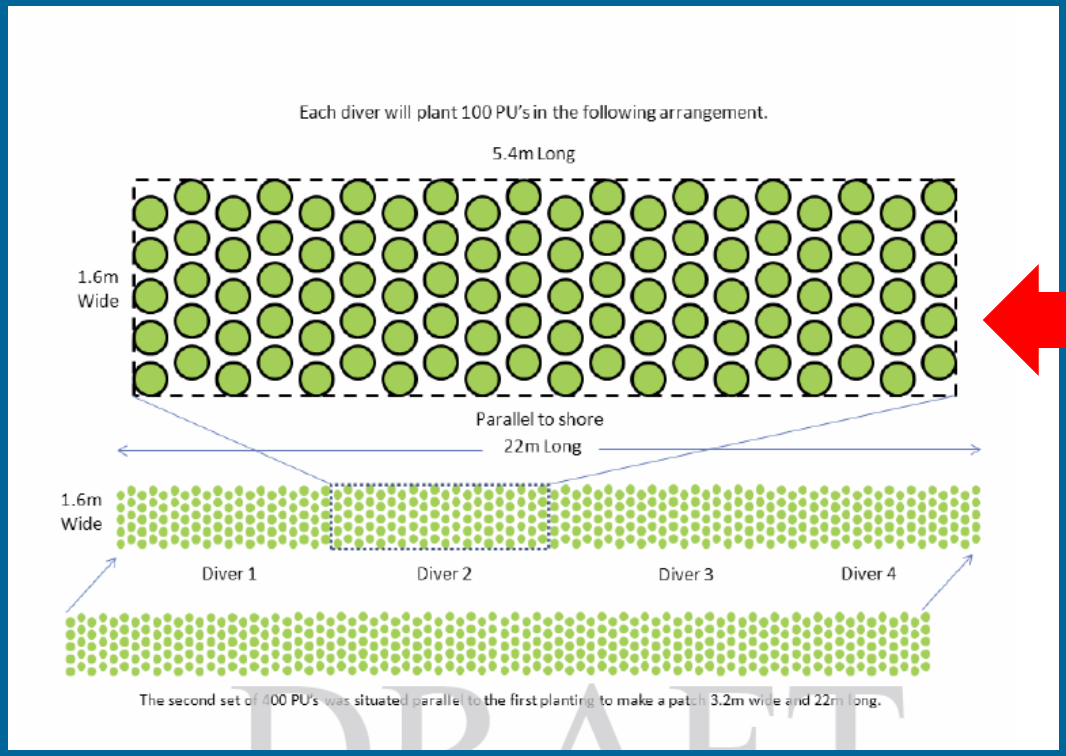
Project Progression…

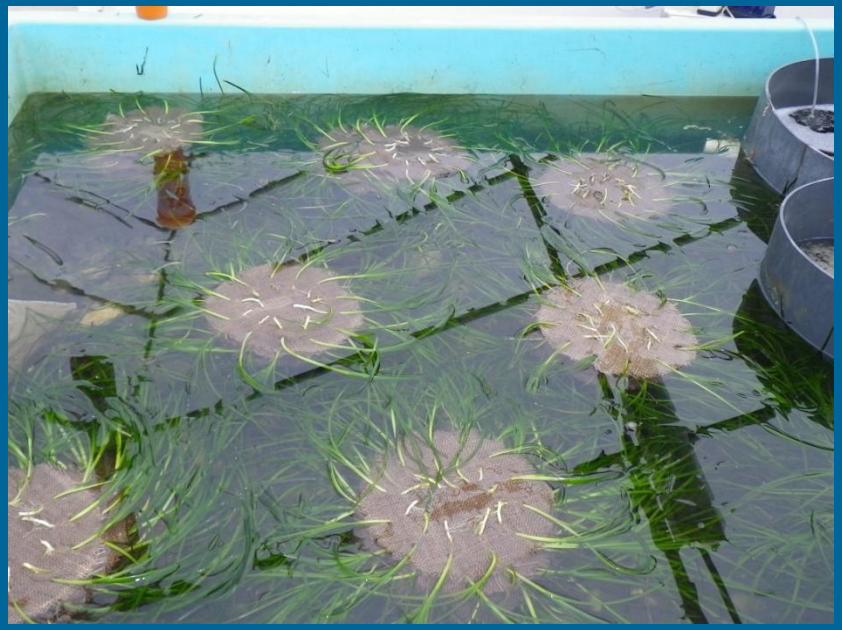
YEAR 1	YEAR 2	YEAR 3	YEAR 4
Small Scale Test Plantings	Test Diff. Planting Methods	Site Selection Continued	Scale-Up Plantings
Begin Site Selection	Site Selection Continued	Trial Spring vs. Fall Plantings	

APR 9 2009


Offshore
Deep Transect
D1 D2 D3 D4 D5 D6 D7 D8 D9 D10
Mid Transect
M1 M2 M3 M4 M5 M6 M7 M8 M9 M10
Shallow Transect
S1 S2 S3 S4 S5 S6 S7 S8 S9 S10
Inshore


Offshore
Deep Transect
Mid Transect (Old Deep Transect)
Shallow Transect (Old Mid Transect)
Inshore
DRAFT


Each diver will plant 100 PU's in the following arrangement.
5.4m Long
1.6m Wide
Parallel to shore
22m Long
1.6m Wide
Diver 1
Diver 2
Diver 3
Diver 4
The second set of 400 PU's was situated parallel to the first planting to make a patch 3.2m wide and 22m long.
DRAFT



Treatment I
13 MAY 2010

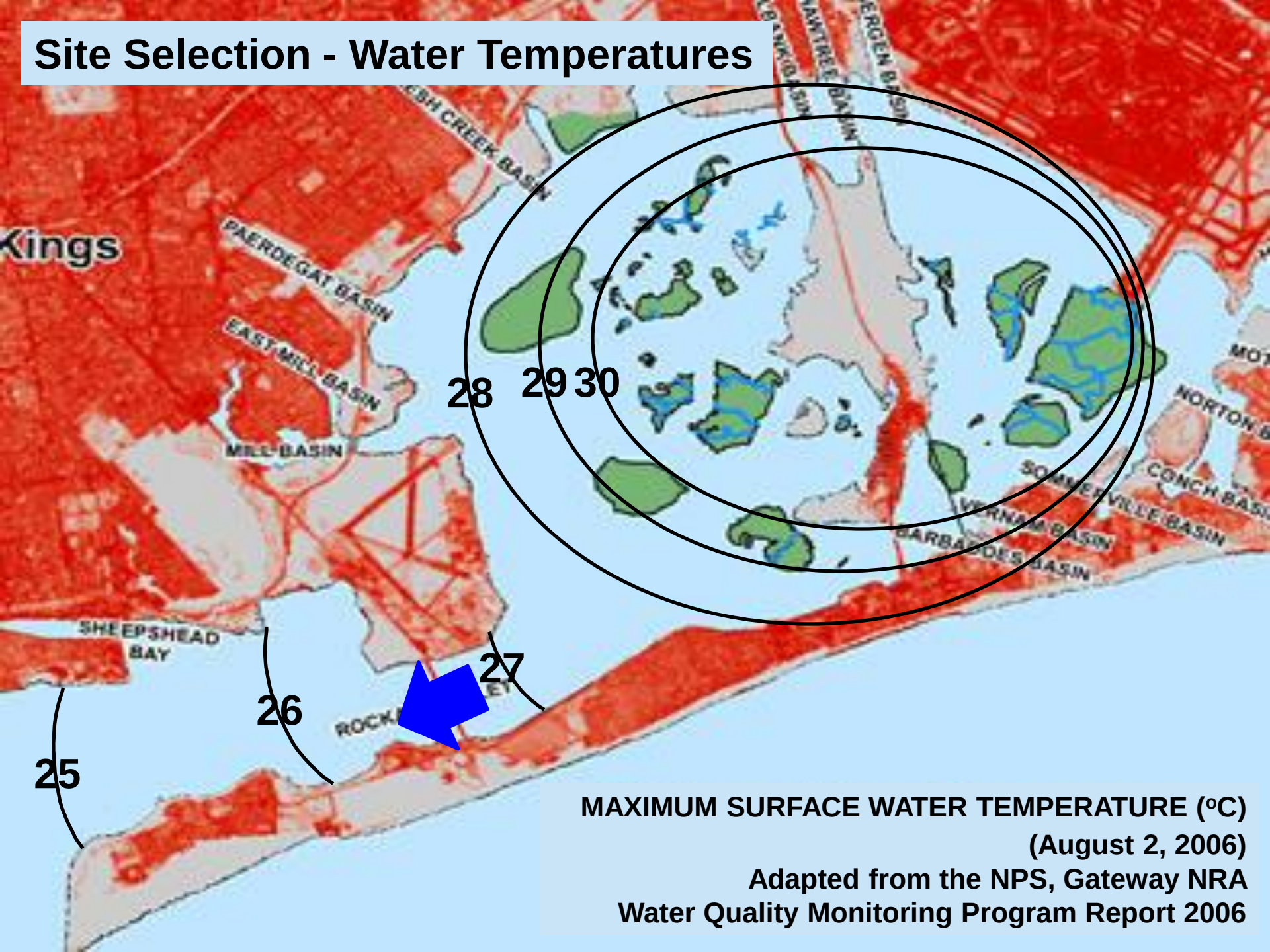
Treatment II
13 MAY 2010

Treatment III
13 MAY 2010

Treatment IV
13 MAY 2010

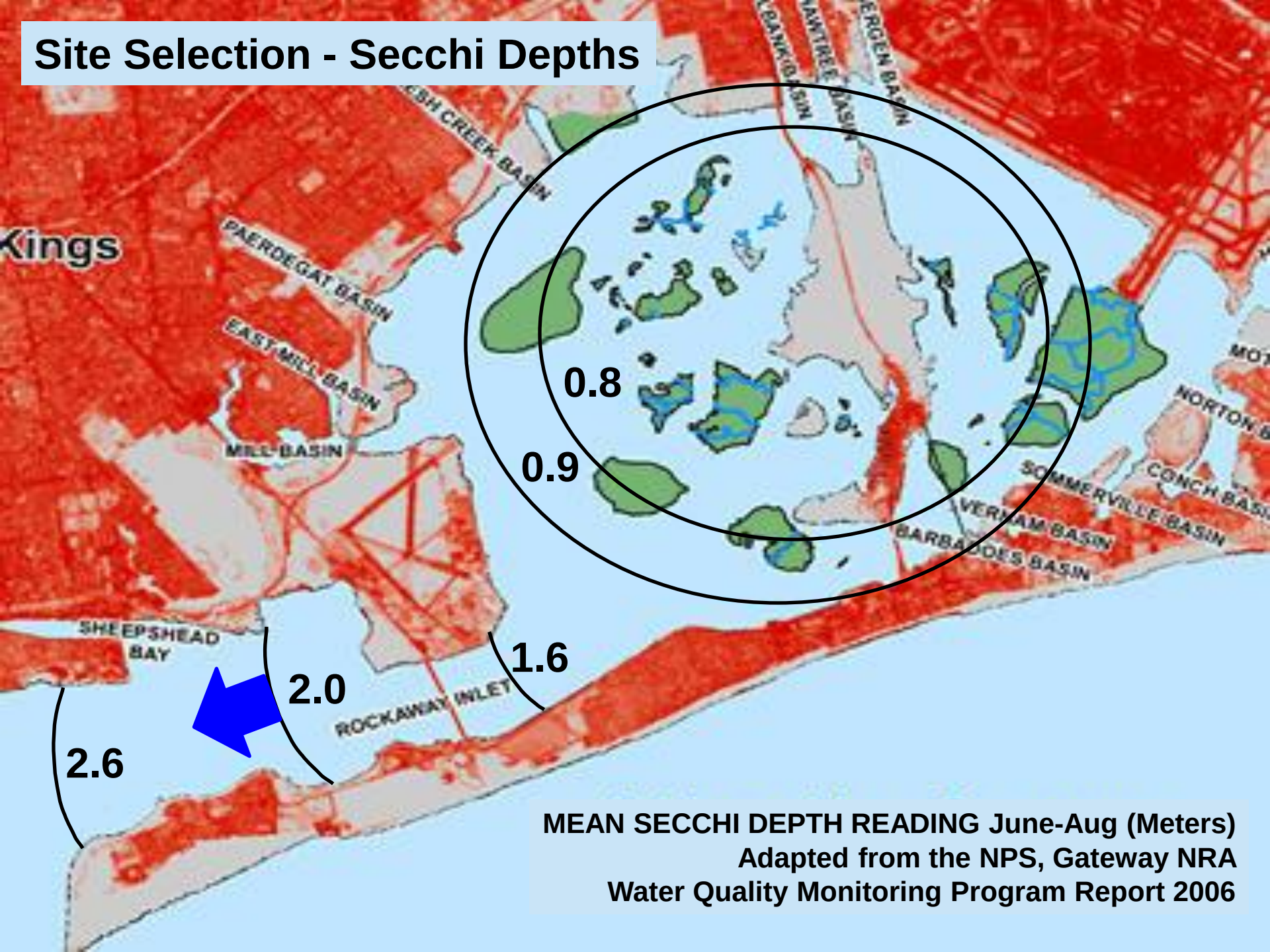
Parameters (General)	Optimal	Minimum/Threshold	Maximum
Light (Kd)	<0.46	<0.60	0.75
Light (Secchi) (July/August)	Visible to bottom	Visible to 0.5m above bottom at high tide	N/A
Light (PAR) (July/August)	Measurements of PAR at the planting site should meet or exceed simultaneous measurements of PAR at a nearby reference site. Comparisons can be made based on total Moles per day or similar measured using continuous PAR light sensor/data loggers.		
Total Nitrogen	<0.029mg/L	N/A	0.05mg/L
Phosphorous	<0.071mg/L	N/A	0.08mg/L
Water Temperature (Peak Average)	<25C	N/A	27C
Wind Exposure/Fetch	Complete protection from NW winds	Some protection from seasonal winds	N/A
Bedform Characteristics	No sand waves or ripples	N/A	Small sand ripples
Sediment Grain Size	<2% silt & clay	N/A	15% silt & clay
Sediment % Organics	<0.5%	N/A	2%
Attached Macroalgae (If suitable substrates/structure exist)	Multiple species- *Saccharina* or *Chondrus* preferred	Only if hard structure is present	Presence of *Codium* considered negative
Drift Macroalgae	None	Some scattered	N/A
Boating/Mooring/Marina areas	Any marinas, mooring fields or other active boating areas are generally excluded from consideration		
Historical eelgrass presence	Within 100m of an historical eelgrass bed if applicable		
Beneficial Fauna	Presence of at least 1 of the following species: *Lacuna vincta, Illyanassa obsoleta, Bittium alternatum, Bittiolum varium, Mitrella lunata, Gammarus mucronatus, Elisia catulus, Hippolyte zosterae, Palaemonetes spp*. Note: the presence of *Mytilus edulis* is usually indicative of temps <25C		
Bioturbation	Signs of excessive sediment mixing including clean shell fragments (free of an algae/diatom coating) on the sediment surface may indicated feeding activity by Horse shoe crabs or other crab species.		
Species of Concern/ Bioturbators	Significant presence of any of these spp. may exclude this site from consideration: Libinia spp., Carcinus maenas, Ovalipes ocellatus, Busycon carica, Busycotypus canaliculatus, Cygnus olor, Branta canadensis, Lunatia heros, Limulus polyphemus		

Site Selection - Water Temperatures

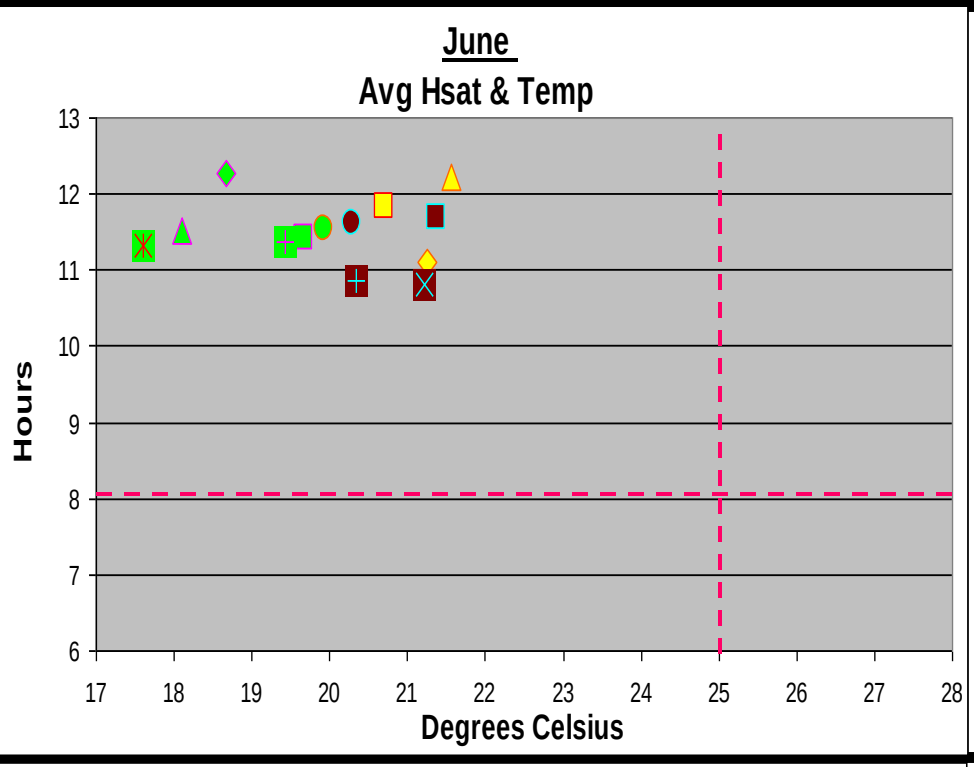


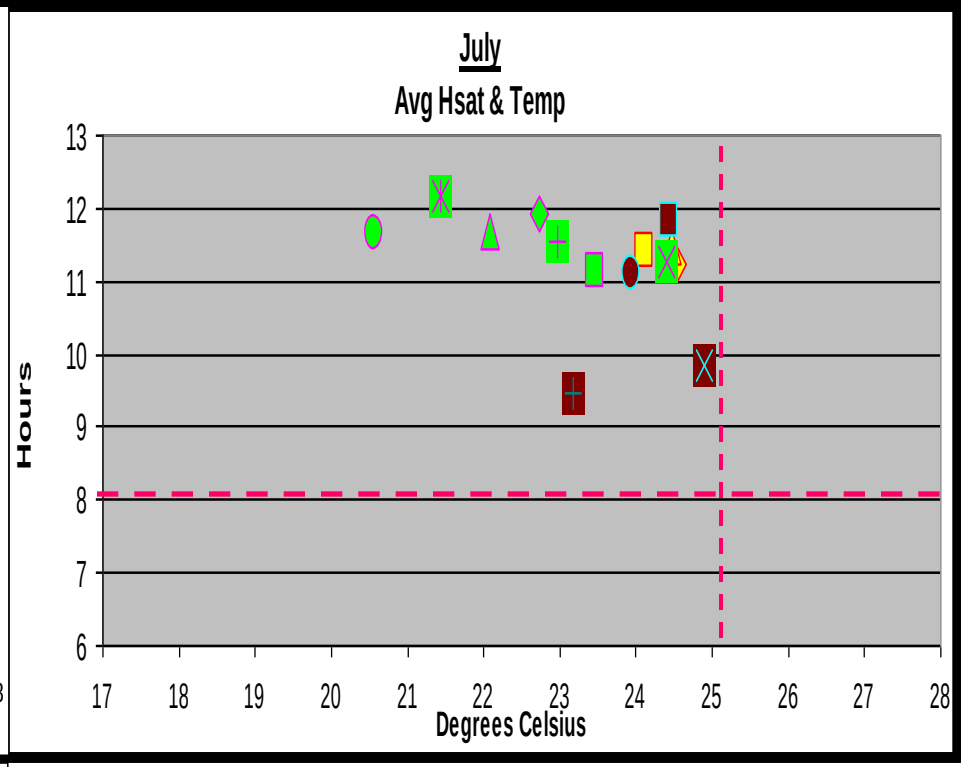
MAXIMUM SURFACE WATER TEMPERATURE (°C)
(August 2, 2006)
Adapted from the NPS, Gateway NRA
Water Quality Monitoring Program Report 2006

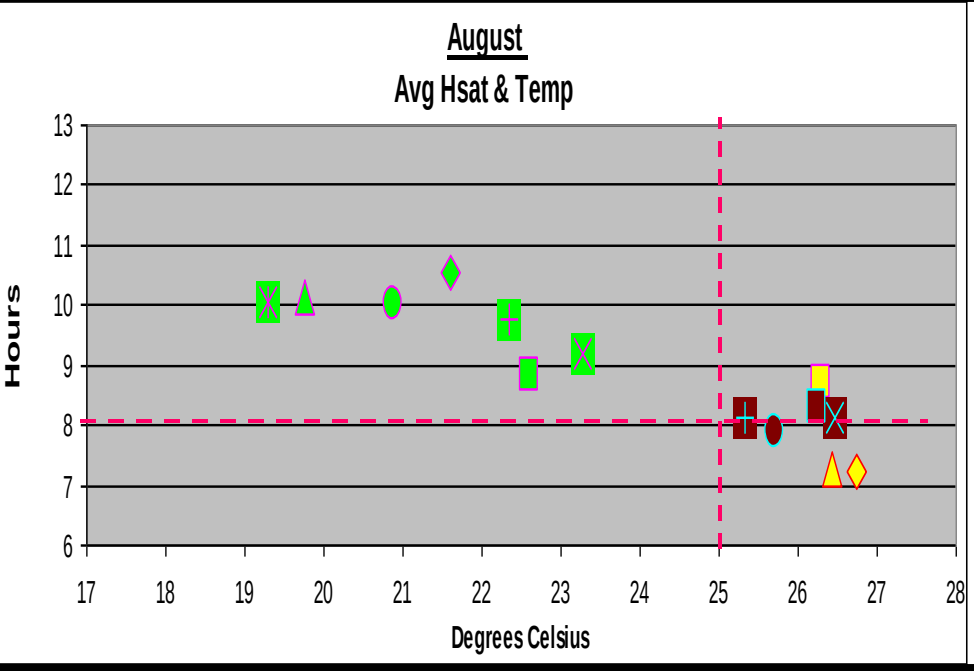
Site Selection - Secchi Depths

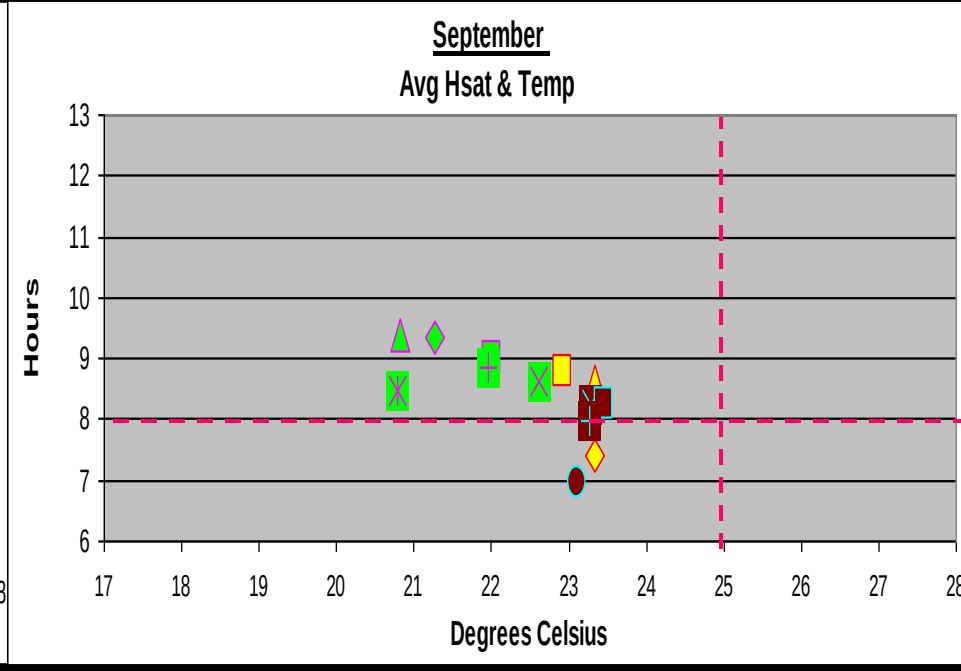


MEAN SECCHI DEPTH READING June-Aug (Meters)
Adapted from the NPS, Gateway NRA
Water Quality Monitoring Program Report 2006


June
Avg Hsat & Temp
Hours
Degrees Celsius


July
Avg Hsat & Temp
Hours
Degrees Celsius


August
Avg Hsat & Temp
Hours
Degrees Celsius


September
Avg Hsat & Temp
Hours
Degrees Celsius

Brooklyn
Forest P
Prospect Park
Spring Creek
Green-Wood Cemetery
Light
Temp
Owl's Head Park/ Shore Road
Jamaica Bay Wildlife Refuge
Marine Park/ Gerritsen Creek
Floyd Bennett
Arverne Piping Plover Site
Riis Park
Fort Tilden
Energy
Point
B
Elder's Marsh (East & West)
QUEENS COUNTY
KINGS COUNTY (BROOKLYN)
Canarsie Pol
Rulers Bar Hassock
Jamaica Bay
Yellow Bar Hassock
Little Egg Marsh
Rockaway Inlet
Rockaway Penninsula
0
1
2 Miles
Spring 2009
Spring 2010
Fall 2010
Fall 2011

Relative Water Quality

Results

THE BAD NEWS:
All plantings to date have failed (not immediately, but eventually). Reasons included WQ, Light and Bioturbation.

This is unlike our work in Long Island Sound where planting survival is regularly 90% or better and we have been very successful in creating large meadows.

THE GOOD NEWS:
We have learned many things about what does and doesn't work in JB and how to plant there.

We have also determined the WQ does not appear to be limiting to growth of eelgrass at Breezy Point and possibly Kingsborough (Hydrodynamics and Bioturbation appear to be limiting here at times).

Results – Site Selection

PARAMETERS

WQ (better towards inlet)
Temperature (cooler towards inlet)
Water Clarity (better towards inlet)
Bioturbation (plant deeper >0.75m MLW and in Fall to avoid brant/HSC's)
Hydrodynamics (avoid areas where sandwaves form)

WHAT DOES THIS MEAN?

It appears that much of if not all of the inner parts of JB are unsuited to survival of eeglrass at this time due to the parameters described above.

Fine-tuning of site selection near the inlet may lead to eventual establishment of eelgrass if we can overcome high currents and waves and we do not experience another extreme mussel set.

Results – Planting Methods

SIMPLER IS BETTER!

The disks worked great and were a very effective as a labor-saving tool that allowed us to reduce SCUBA time in the field. This system has since be adopted by for use in all of our plantings around LI (even Brooklyn!).

On the other hand, none of the protection/exclosure methods we used proved effective in improving long-term survival of our plantings.

Pier 5, Brooklyn

Photos: Bart Chezar/Harbor School Students