Salt Marsh Restoration

Coastal Ecosystem Restoration Workshop

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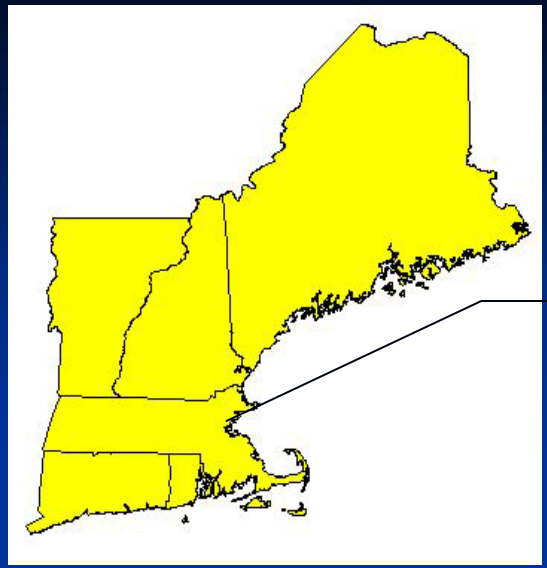
New England District

Corps of Engineers

Overview

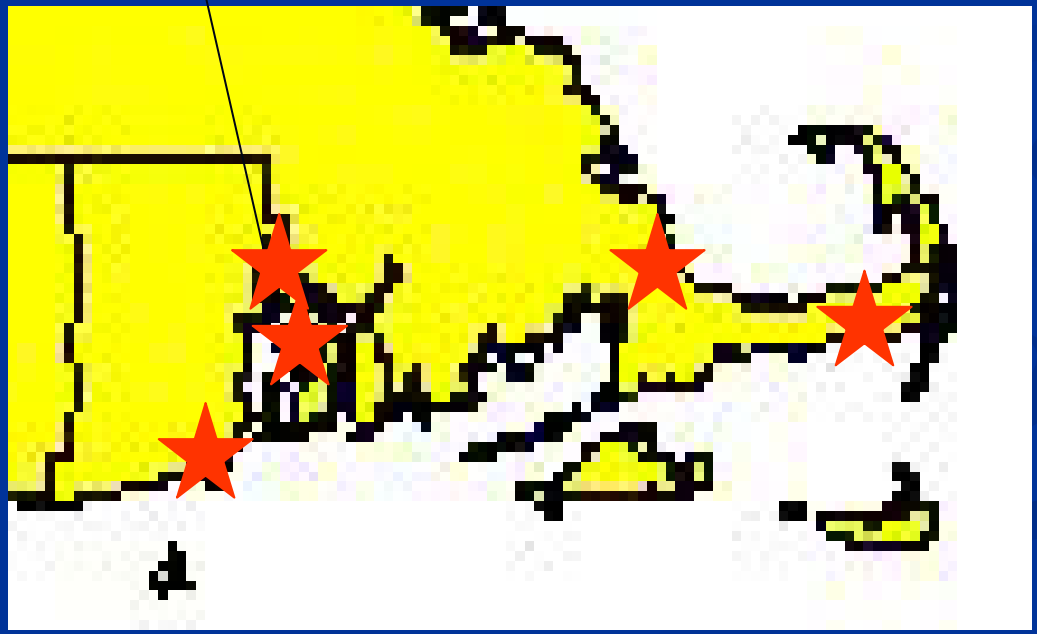
- New England District Approach to Salt Marsh Restoration
- Examples from Four Projects:
  - Galilee Salt Marsh Restoration
  - Sagamore Salt Marsh Restoration
  - Town Pond Salt Marsh/Pond Restoration
  - Stewarts Creek Salt Marsh/Pond Restoration
  - Allin's Cove

Project Locations



Boston, MA

Providence, RI



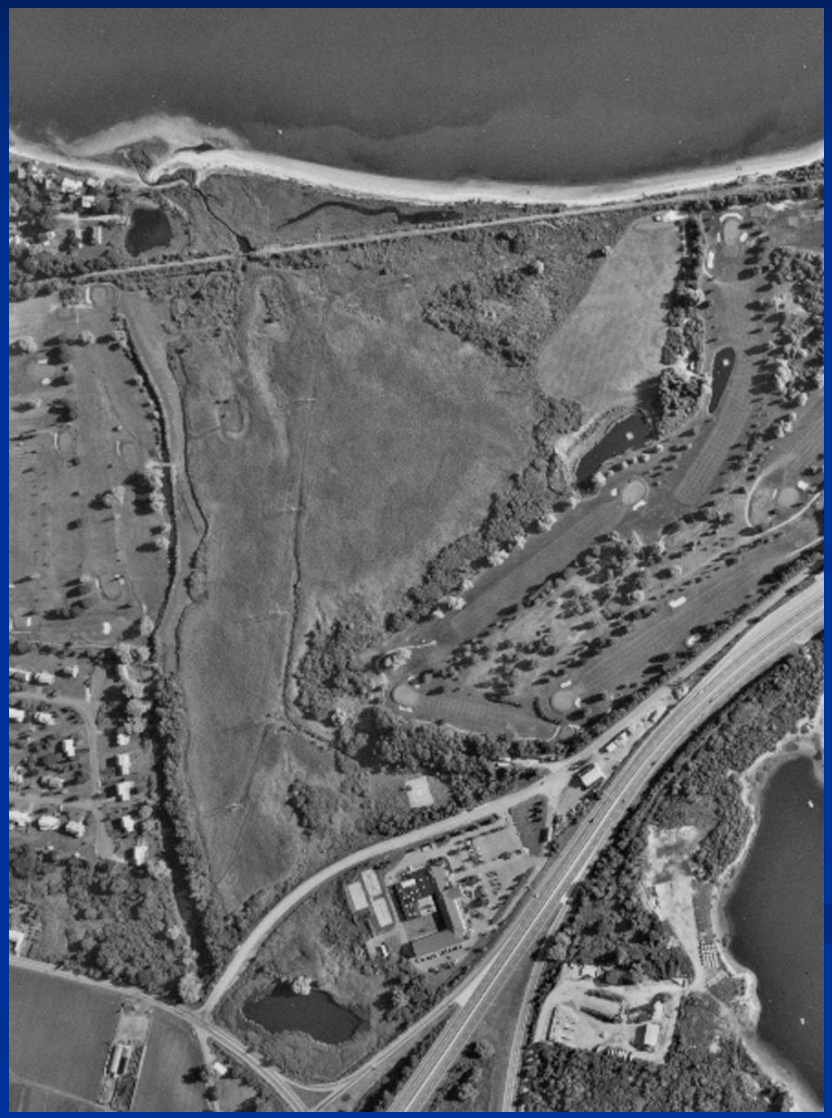
Problems and Opportunities

- Establish Restoration Goals and Objectives
- Constraints
- Historic aerial photography
- Existing information

Problems and Opportunities

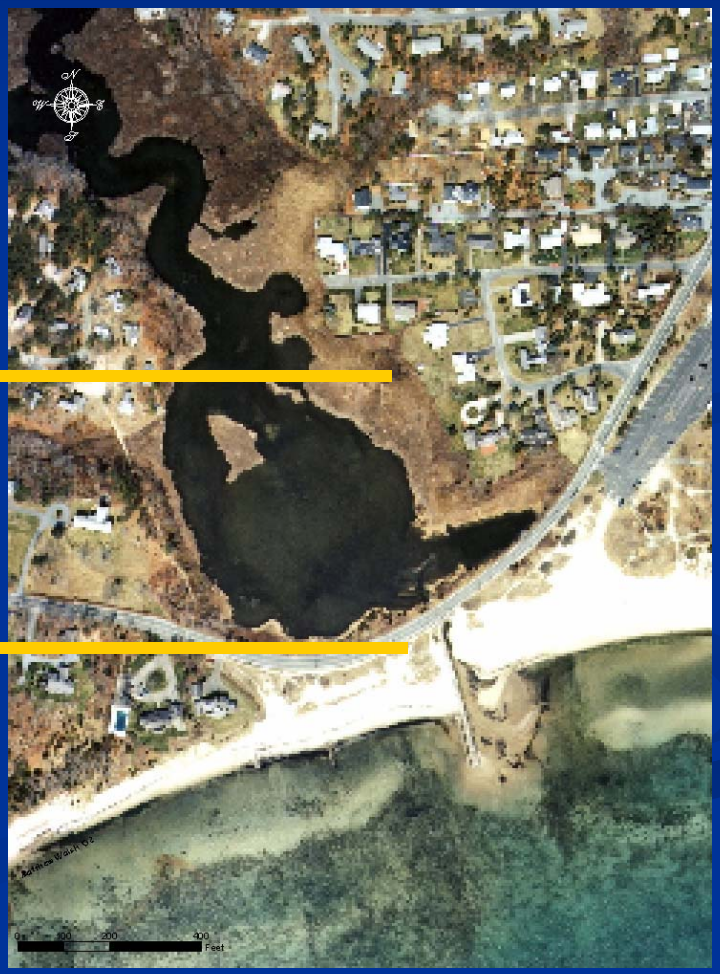
Galilee Culverts Pre-Project

Town Pond 1939/1990



Town Pond – Pre-restoration

Stewarts Creek 1960/1990s

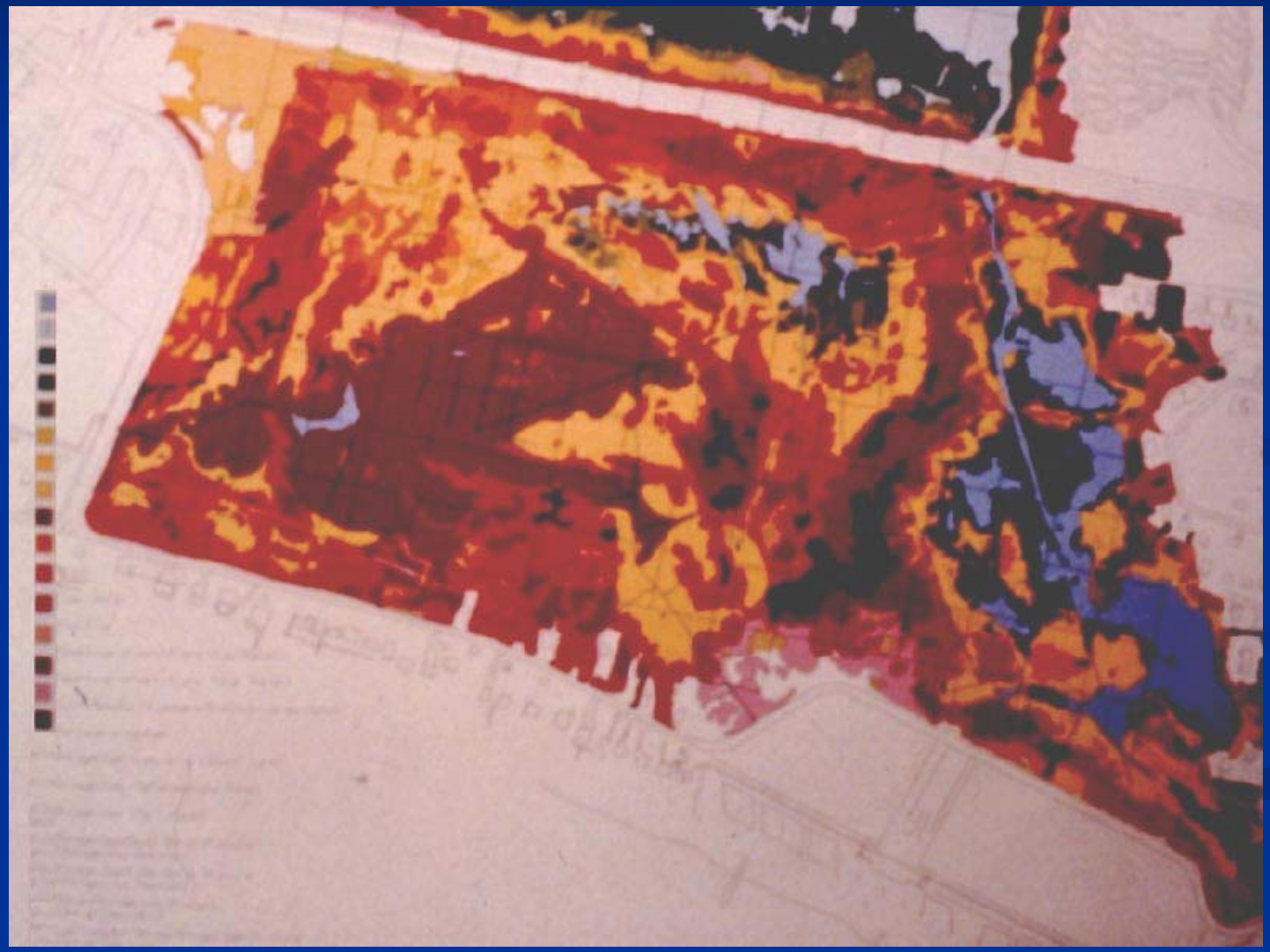


Stewarts Creek Culvert

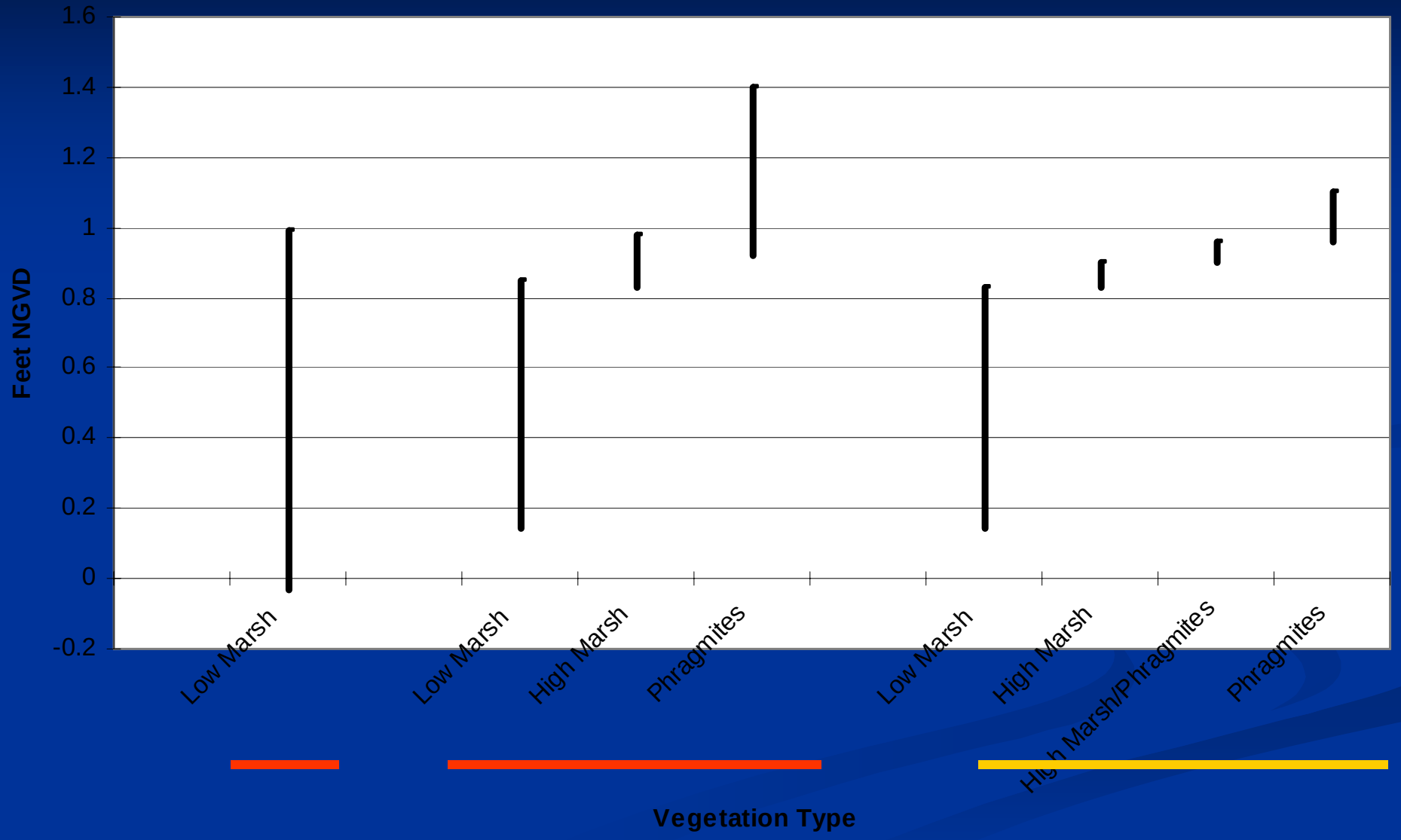
Good Reasons to Restore Salt Marsh

Inventory and Forecast

Galilee Vegetation Map



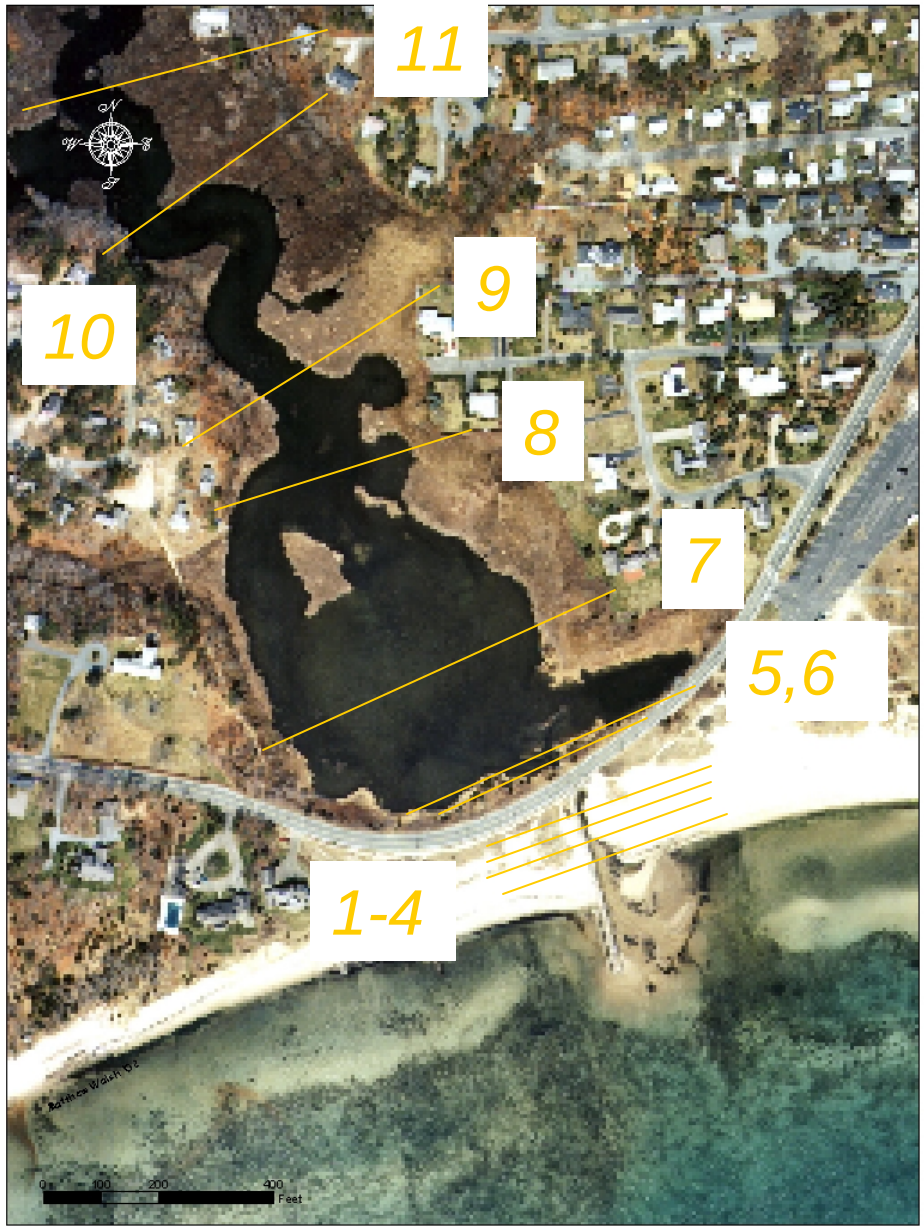
Town Pond Actual and Predicted Vegetation Ranges



H&H Evaluations

- Evaluate existing tidal conditions
  - Tide survey
  - Invert elevations (culvert, channels, etc.)
- Consider project constraints
  - Elevation of surrounding properties
  - Erosion and sedimentation concerns
  - Public safety concerns

Elevation Transects



Water Elevation Gauges

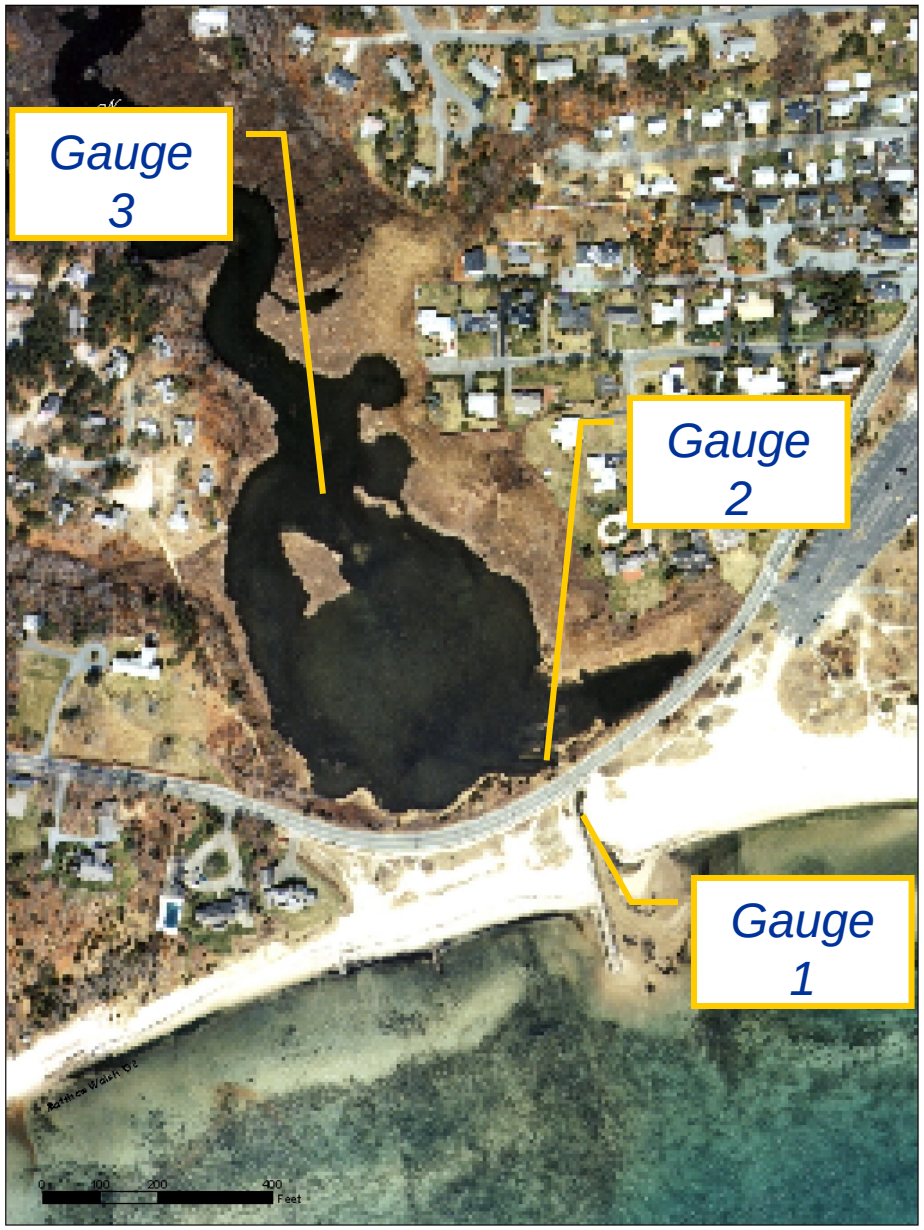
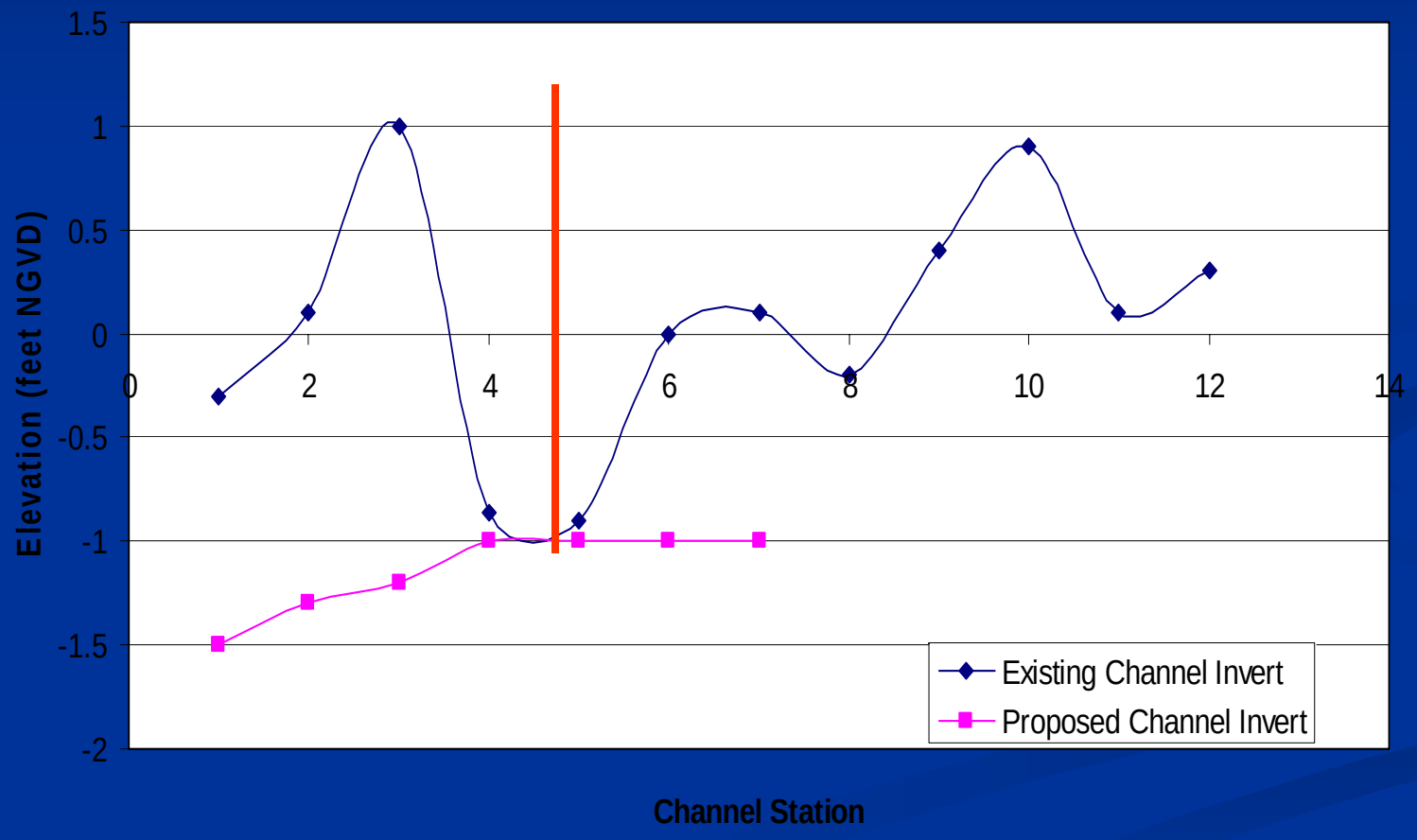


Plate 3
Channel Elevations between Hyannis Harbor and Stewarts Creek Station 12
Stewarts Creek, Barnstable, Massachusetts



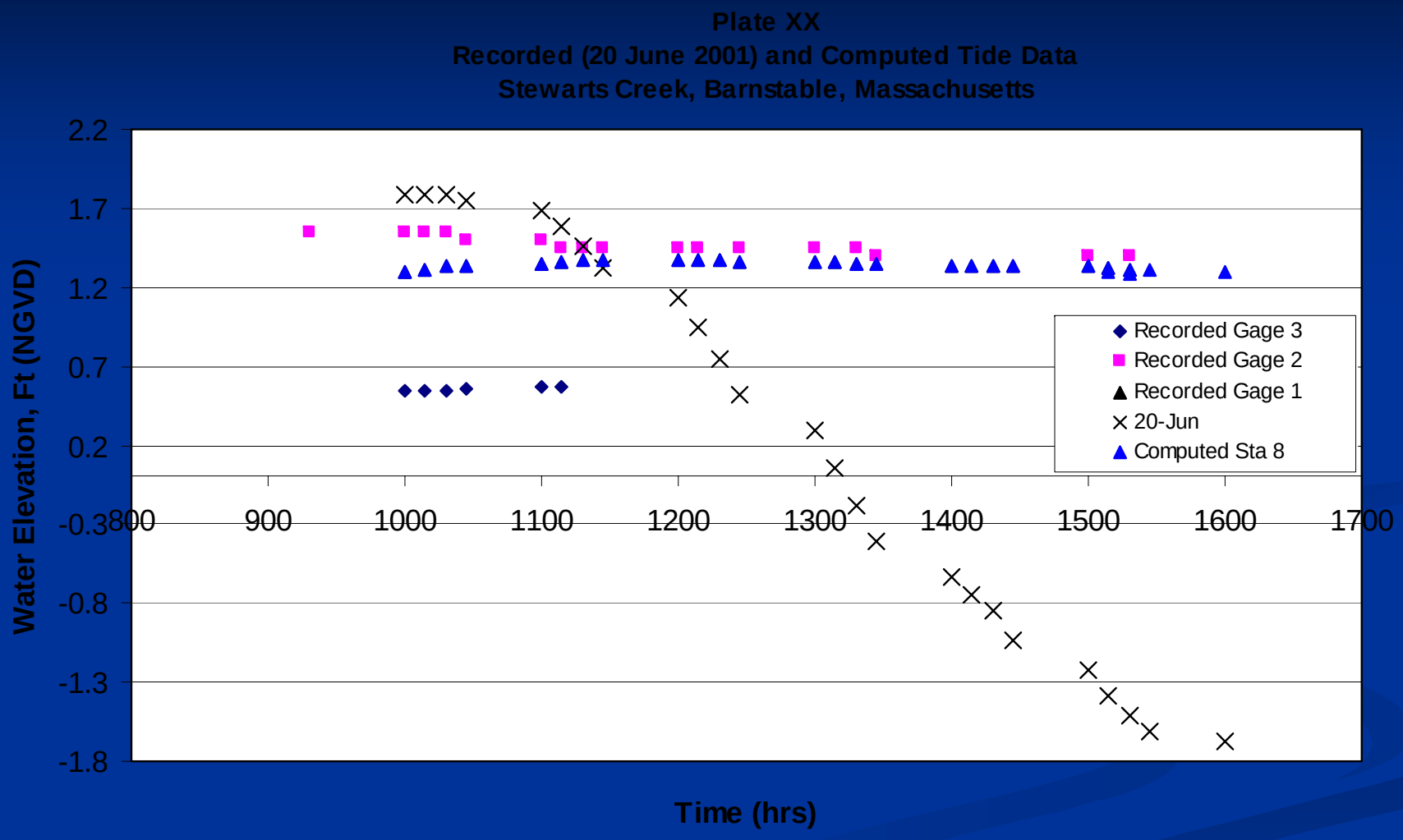
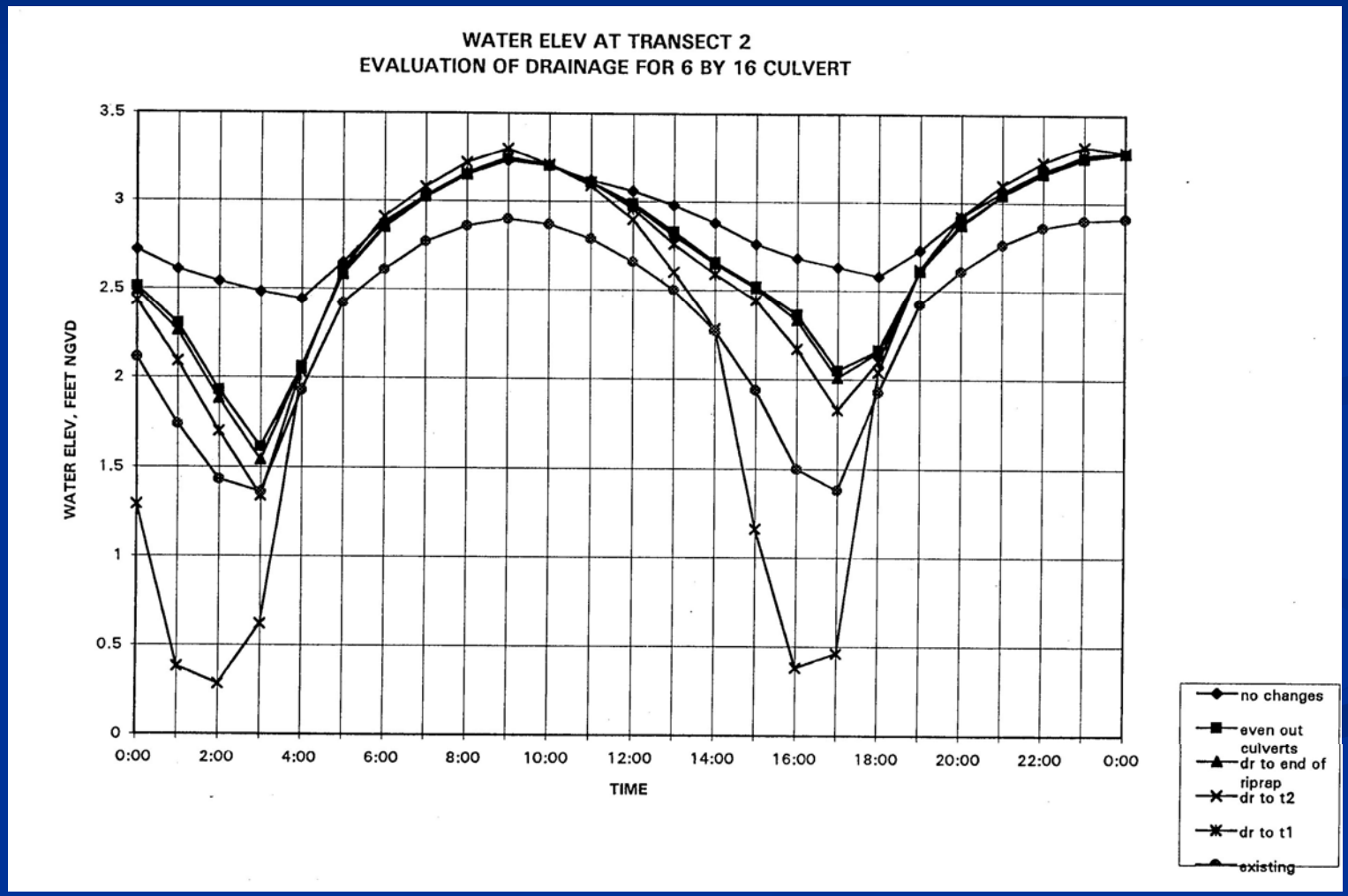


Plate XX
Recorded (20 June 2001) and Computed Tide Data
Stewarts Creek, Barnstable, Massachusetts
Water Elevation, Ft (NGVD)
2.2
1.7
1.2
0.7
0.2
-0.3
-0.8
-1.3
-1.8
800
900
1000
1100
1200
1300
1400
1500
1600
1700
Time (hrs)
Recorded Gage 3
Recorded Gage 2
Recorded Gage 1
20-Jun
Computed Sta 8

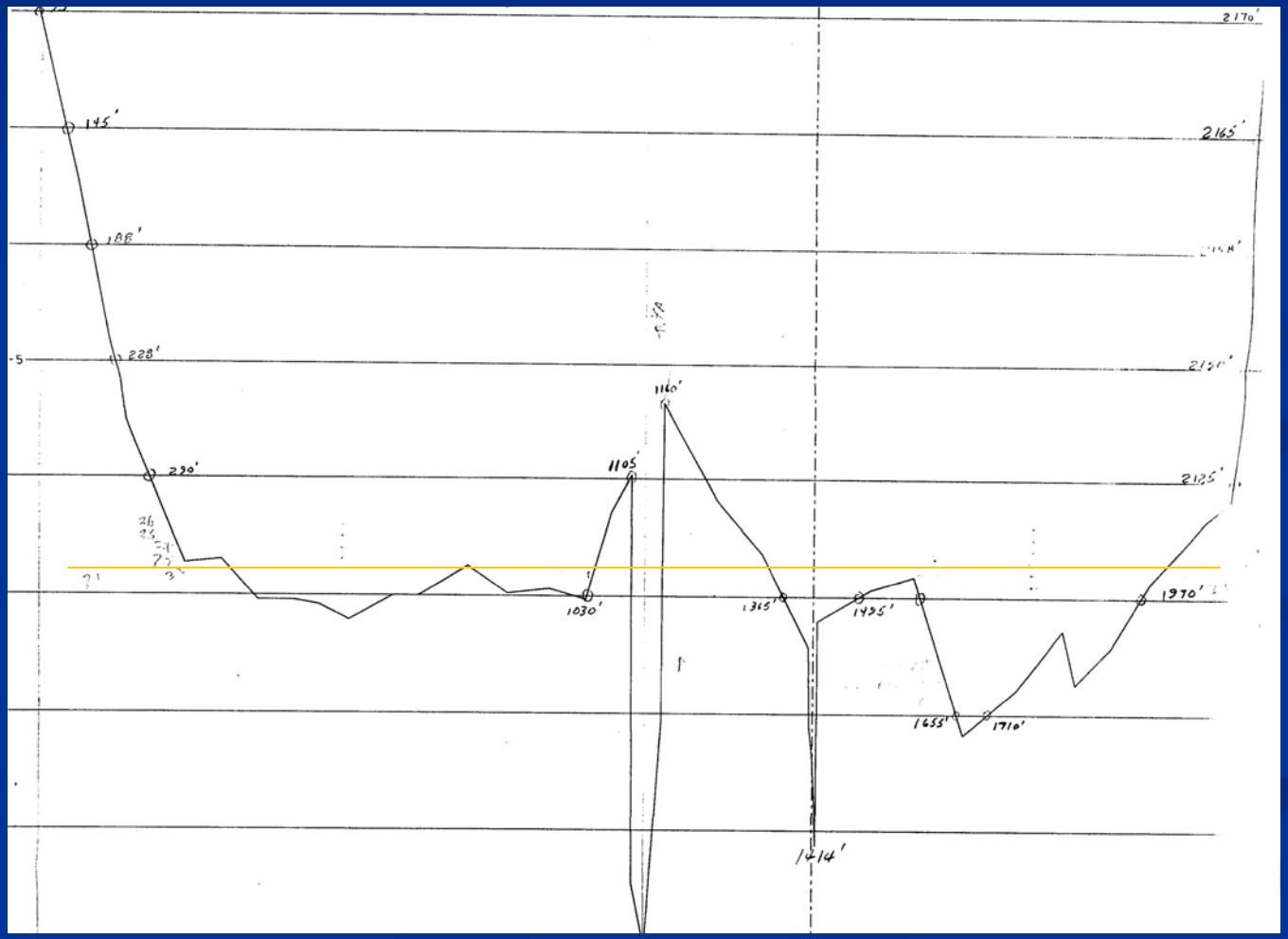
Model Existing Conditions

- Develop HEC-RAS and calibrate to existing conditions and recorded tide survey
- Use calibrated model to evaluate restoration alternatives (i.e. culvert sizes, inverts, channel sizes)

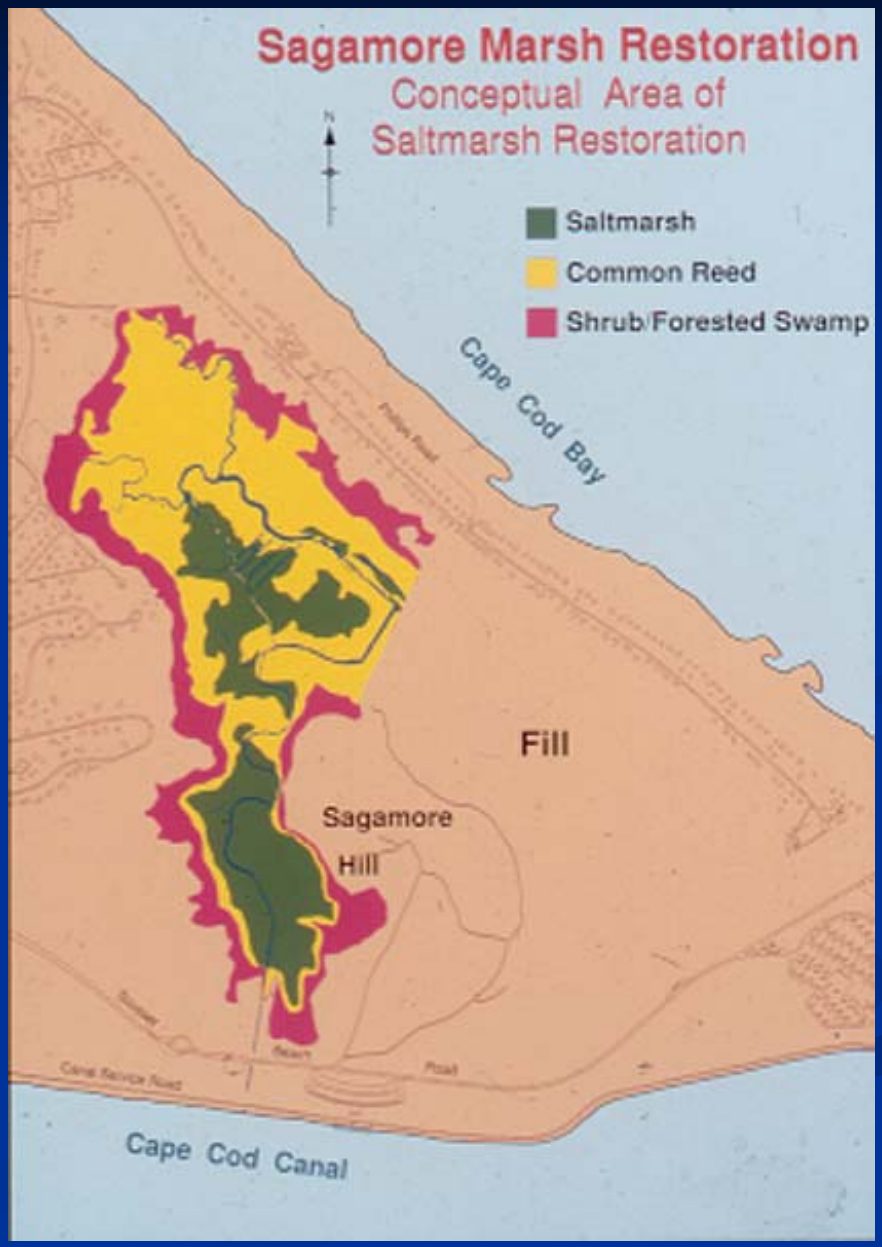
Sagamore UNET Model Output



Profile View of Substrate and Surface Water Elevations



Conceptual Restoration Area



Flood Analysis

- Model historic flood events (i.e. 2-yr, 10-yr, 100-yr) for proposed alternatives to estimate increases to flooding in combination with stormwater runoff
- Assess need for stop logs or gates
  - goal is no increase to flooding

Formulation and Evaluation

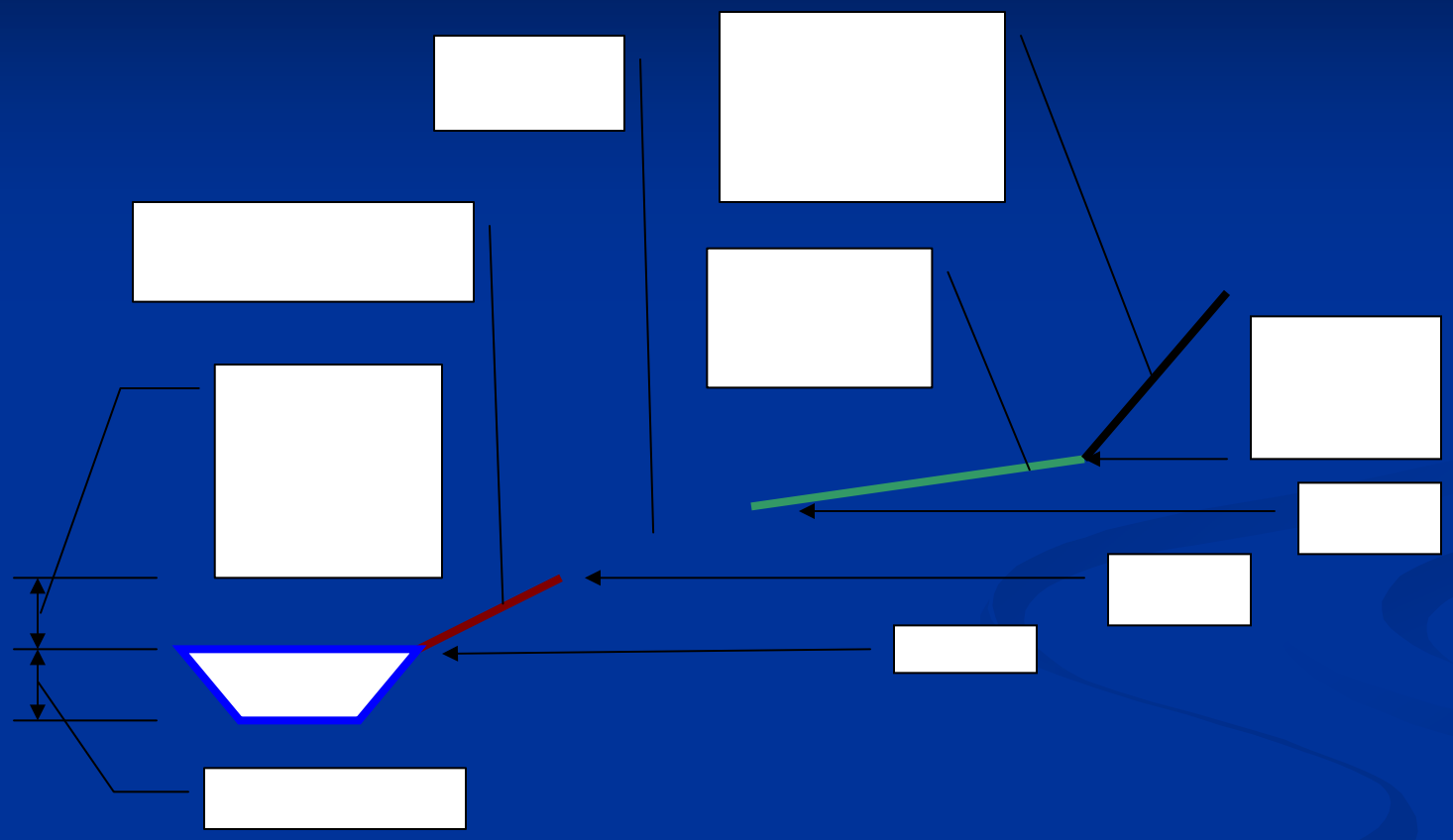
Formulate Alternative Plans

Goals and objectives

- Specific to project

Criteria

- Flooding 8 x per month
- Salinity > 20ppt



Evaluation

- Generally two types of salt marsh restoration
  - Tidal restriction (drying or flooding)
    - acres for benefits units
  - Filled marsh
    - Habitat Units (HU)

Habitat Evaluation Procedures - HEP

- Uses species models to measure the quality of habitat
- Model predicts Habitat Units
- Used 4 bird species
- Species habitats also represent fish and other animals

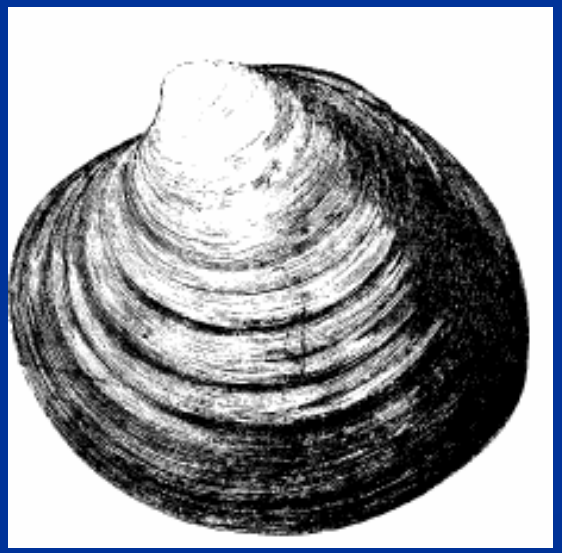
Red Winged Blackbird Model

- Represents: Perching birds that use reeds and similar vegetation for roosting and open water areas for feeding

Clapper Rail Model

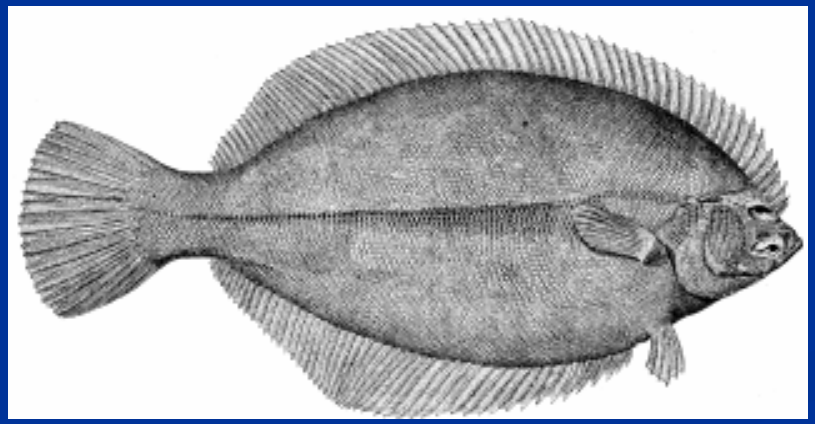
- Represents: Birds and animals that use tall salt marsh cordgrass for cover or nesting and wading birds

Wintering Black Duck Model



- Represents: Dabbling ducks and animals that feed in the salt marsh, tidal flats, and shallow water; and fish and invertebrates that live in flats and shallow water

Lesser Scaup Model



- Represents: Diving birds, clams and other invertebrates, and fish

Develop Combined Habitat Suitability Index

Alternative	Red Winged Black Bird	Clapper Rail	Wintering Black Duck	Wintering Lesser Scaup	Overall
1	0.15	0.00	0.00	0.00	0.15
2	0.02	0.99	0.28	0.00	1.28
3	0.10	0.79	0.75	0.76	2.39
4A	0.01	0.69	0.74	0.68	2.13
4B	0.01	0.69	0.74	0.94	2.38

Implementation

Sagamore Culvert Installation - 1936

Sagamore Culvert Installation - 2000

Sagamore Channel Widening

Galilee Channel Construction

Vegetation Stockpile

Low Ground Pressure Excavator

Post Construction

Downstream Side of Culverts

SRT Gates Open Position

SRT Gates Closed Position

Sagamore – 6’x6’ Culverts and Grates

Effects

Post-Planting Vegetation

Salicornia Colonizing Galilee Salt Marsh – July 2000

Vegetation July 2000

Galilee Vegetation - 2002

Results of URI Study at Galilee

- Decrease in *Phragmites* height and density; increase in salt marsh and estuarine habitat
- Number and diversity of waterbirds increased after restoration
- Shorebirds, rails increased; waders, waterfowl about the same
- Sharp-tailed sparrows decreased

Allin's Cove Salt Marsh Restoration

Allin's Cove Planting

Town Pond Salt Pond/Marsh Restoration

Town Pond – Opening Day

Town Pond – Opening Day

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Town Pond Restoration

New England District

Salt Marsh Restoration

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