



Assessing New Hampshire's Tidal Crossings for Coastal Resilience

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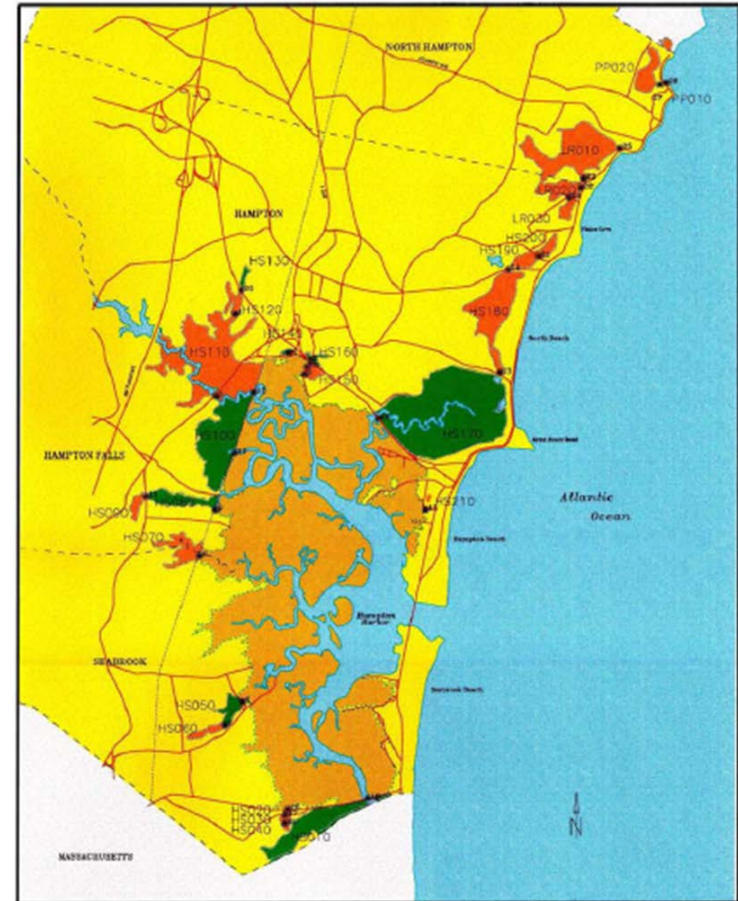
The Nature Conservancy



Evaluation of Restorable Salt Marshes in New Hampshire



October 1994
Reissued October 2001



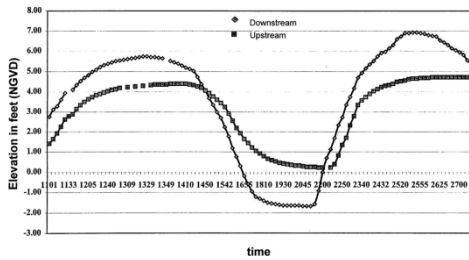
OUTCOME

18 PRO-ACTIVE TIDAL RESTRICTION REMOVAL PROJECTS SINCE 1994

635 ACRES OF SALT MARSH RESTORED (10% of existing salt marsh)

Complex Decision Making at Tidal Crossings

Bi- Directional Flow



Salt Marsh Functions and Values



Low Lying Infrastructure



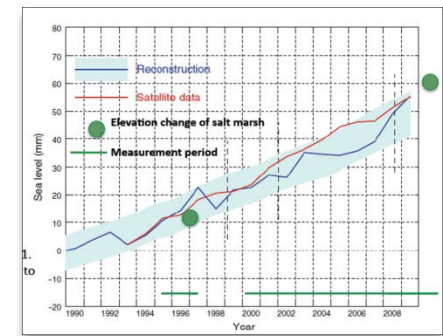
Increased Storm Intensity



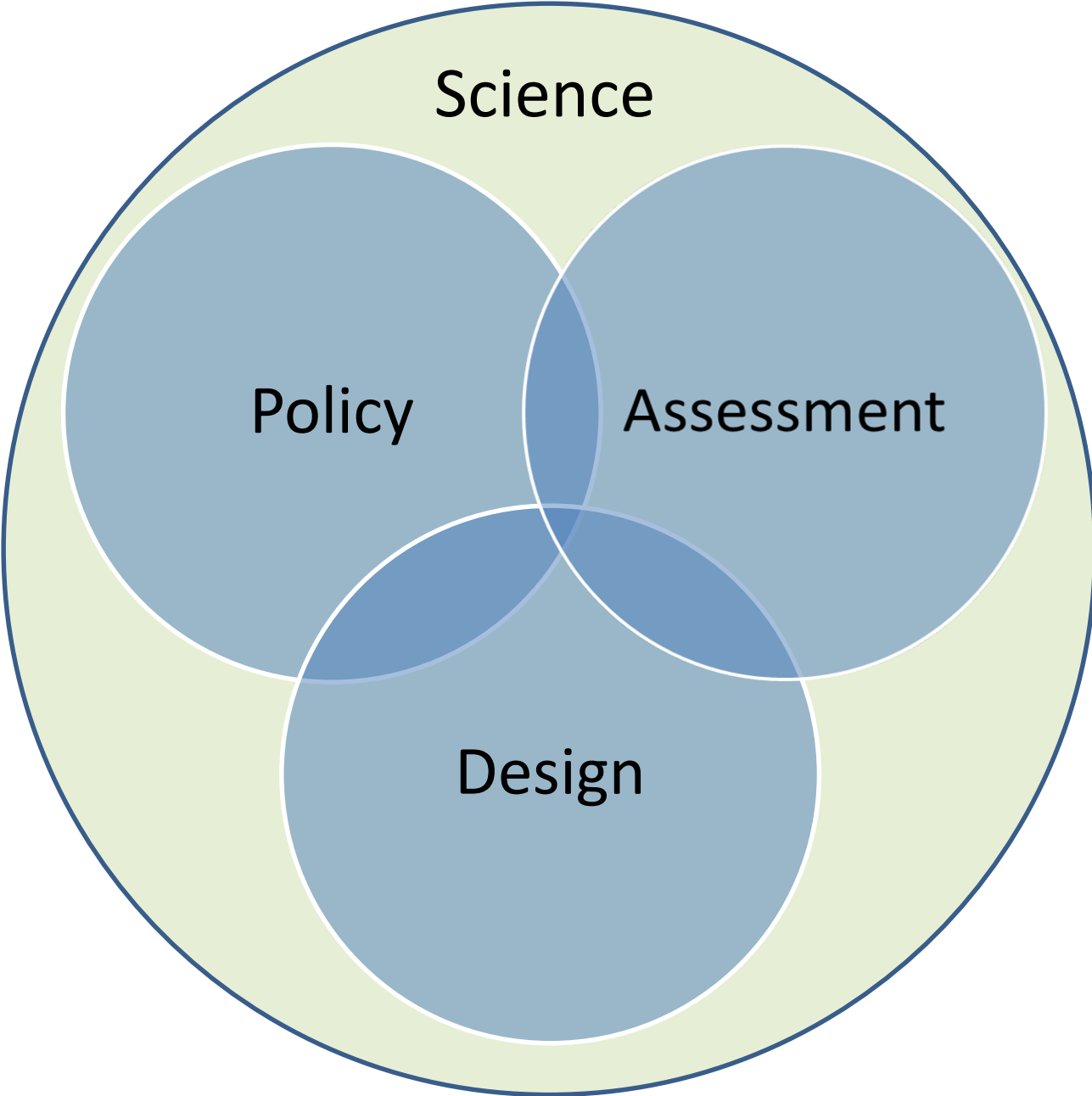
Operations & Maintenance



Rising Sea Levels



NEEDS FOR IMPROVED MANAGEMENT AT TIDAL CROSSINGS



POLICY

- Tidal stream crossings are not covered by stream crossing rule ENV-WT 900
- NHDES regulates tidal stream crossing projects on a case-by-case basis.

MA Department of Environmental Protection Rules

- **new tidal crossing:** does not restrict tidal flow over the full natural tidal range.
- **existing tidal crossing:** tidal restriction will be eliminated to the maximum extent practicable.

Tidal Crossings Assessments Workshop

September 10, 2015



NROC
Northeast Regional
Ocean Council



Management
Objectives



Assessment
Parameters



Evaluation
Criteria

What are the possible decisions that could be made from a tidal crossing inventory?

What attributes of a site should we measure?

How do we evaluate the field data to make conclusions about the adequacy and effects of each crossing?



**Do the Evaluation Criteria
inform/satisfy the Management
Objectives?**

Crossing Type & Condition

Draft February 2017
New Hampshire's Tidal Crossing Assessment Protocol Data Sheet

CROSSING TYPE & CONDITION (field evaluation)

Crossing Type: _____ Structure Materials: _____ Structure of at Crossing

- Round Culvert
- Elliptical Culvert
- Box Culvert
- Embedded Round Culvert
- Open Bottom Arch
- Bridge with Abutments
- Bridge with Side Slopes
- Bridge w/ S. Slopes and Abutment:
- Ford

- Concrete
- Plastic-Corrugated
- Plastic-Smooth
- Tank
- Stone
- Steel-Corrugated
- Steel-Smooth
- Aluminum-Corrugated
- Wood
- Other

Crossing Dimensions (feet):

	Upstream	Downstream
Dimension A:		
Dimension B ^{CB} :		
Dimension B ^{LT} :		
Dimension C:		

	Upstream	Downstream
Low Tide Perch:		
High Tide Perch:	N/A	

Angle of Stream Flow Approaching Structure:	
Upstream	Downstream
Sharp Bend (>45°)	Sharp Bend (>45°)
Mild Bend (5-45°)	Mild Bend (5-45°)
Naturally Straight	Naturally Straight
Channelized Straight	Channelized Straight

SKETCH OF STRUCTURE

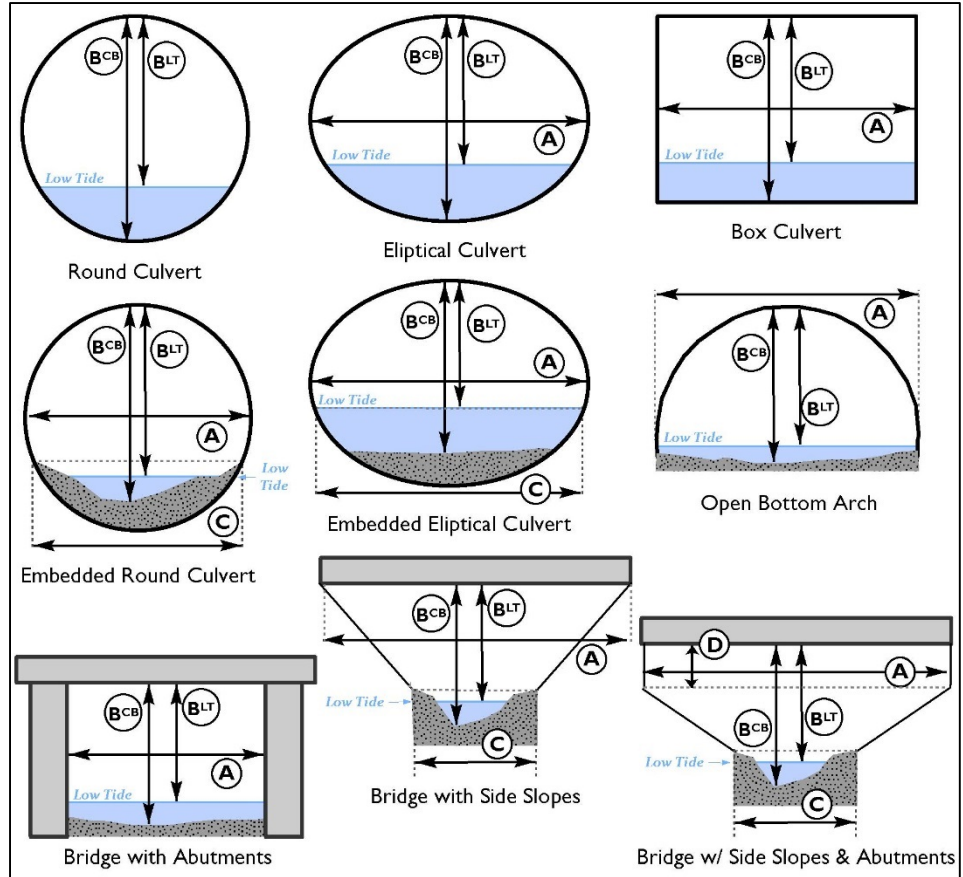
Crossing Condition:	Pipe Corrosion Severity:	Pipe Deformation:	Spalling Severity:	Joint Separation
Good	None	None	None	None
Eroding	Low	Low	Low	Partial
Collapsing	Medium	Medium	Medium	< 1"
Rusted	High	High	High	1 - 3"
	N/A	N/A	N/A	> 3" or piping
				N/A joints

Headwall Materials:	Headwall Condition:	
	Upstream	Downstream
Metal	Excellent	Excellent
Concrete	Good	Good
Masonry	Fair	Fair
Gabion	Poor	Poor
Dry Fit Stone	N/A	N/A
Plastic		
Other		
None		

Scour at Structure (circle all applicable):		
Upstream	In Structure	Downstream
None	None	None
Culvert	Culvert	Culvert
Footer	Footer	Footer
Wing Walls	Abutment	Wing Walls
Abutment	Channel	Abutment
Headwall	Armoring	Headwall
Armoring	Armoring	Armoring

Crossing Type/Condition Comments:
(Note obstructions at structure openings and road surface conditions)

Severity of Scour		
Upstream	In Structure	Downstream
None	None	None
Low	Low	Low
Medium	Medium	Medium
High	High	High



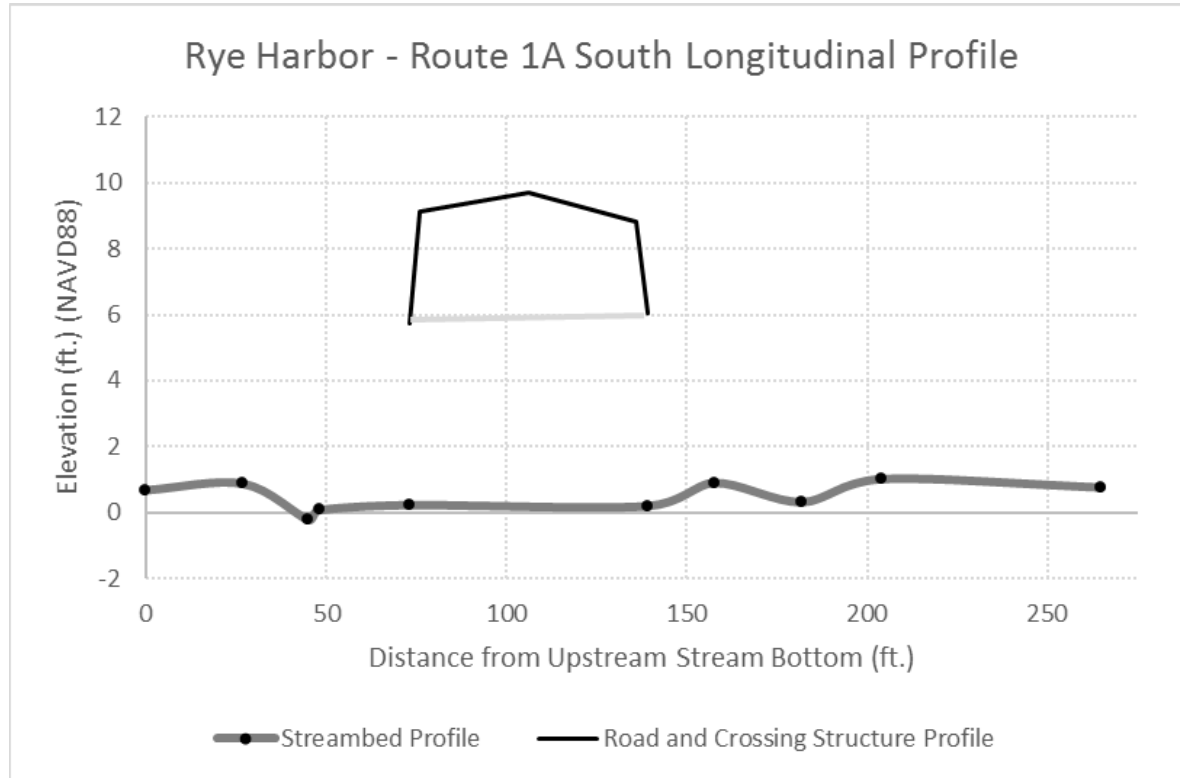
Benefits of a Longitudinal Profile

Understand...

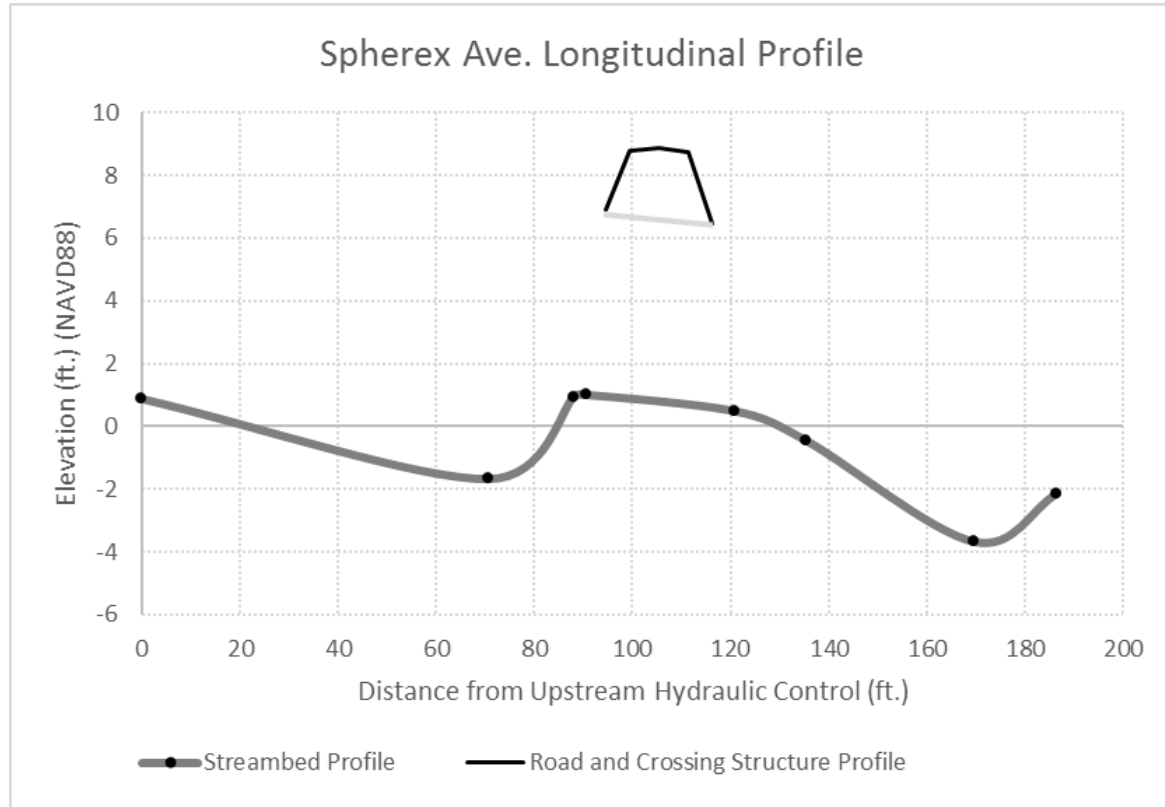
- Compatibility of the Crossing Structure with the Tidal System
- Tidal Range and Aquatic Organism Passage
- Inundation Risk to the Structure and Roadway
- And more!



Crossing Structure Compatibility



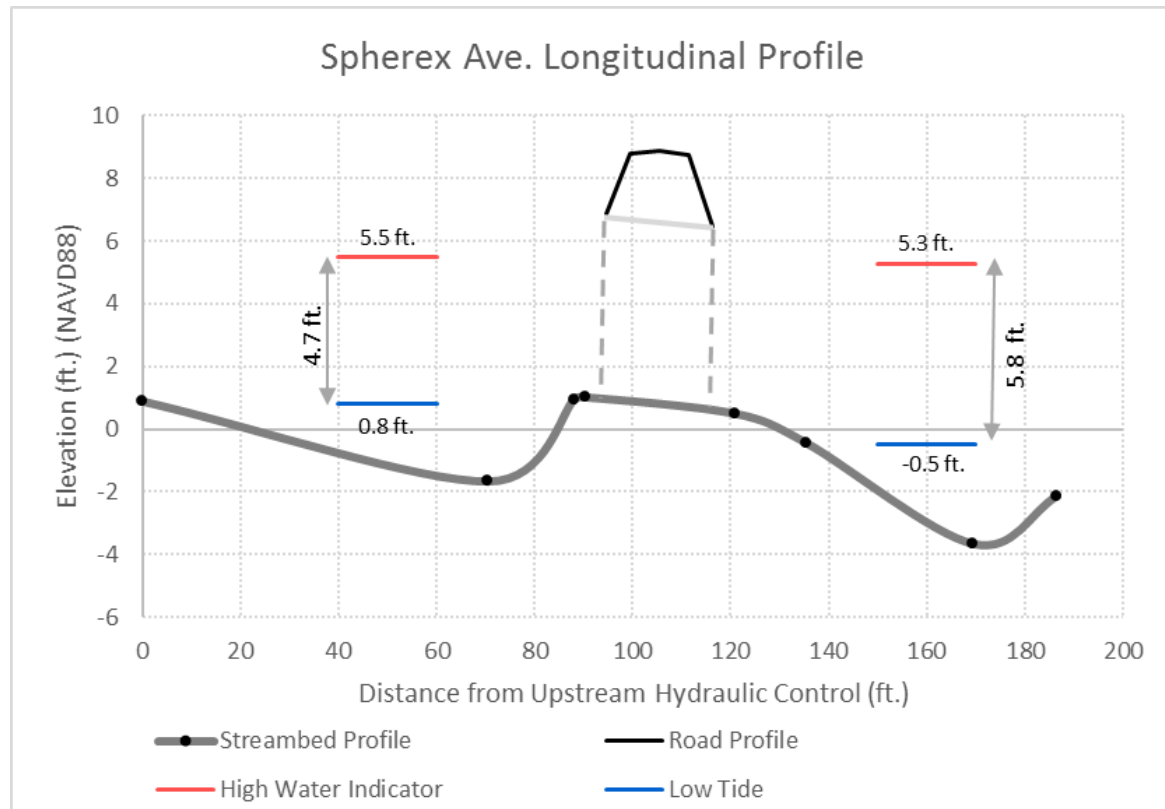
Crossing Structure Compatibility



Tidal Restriction Evaluation

Tidal Range Ratio: An Indicator for Aquatic Organism Passage

SCORE	Classification Criteria
1	No perch at low tide; stream grade through the crossing matches that of the natural system (<10% difference)
2	Tidal range downstream is between 10 and 20 percent greater than upstream
3	Tidal range downstream is between 20 and 30 percent greater than upstream
4	Tidal range downstream is between 30 and 50 percent greater than upstream
5	Downstream invert is perched at high tide, or tidal range downstream exceeds upstream tidal range by more than 50 percent

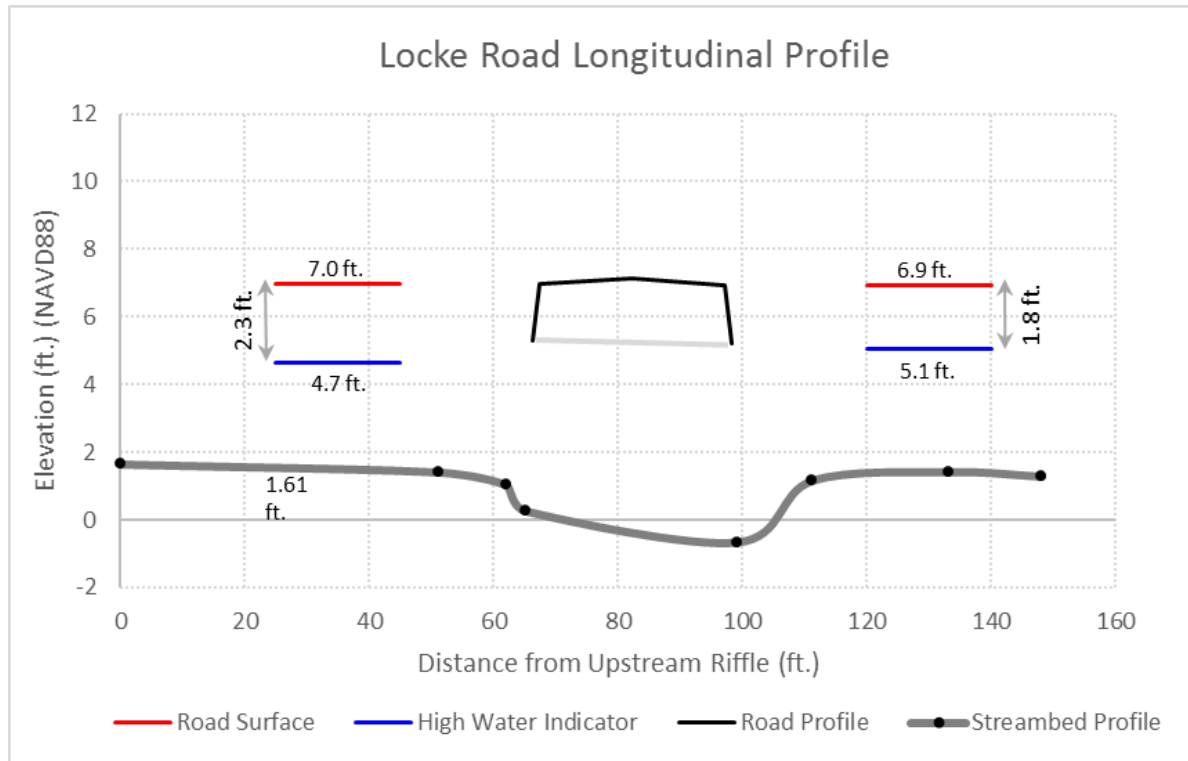


High Water Indicators?

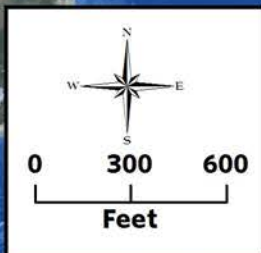
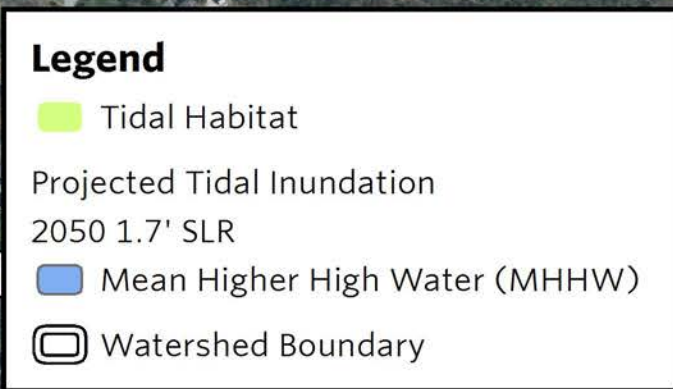
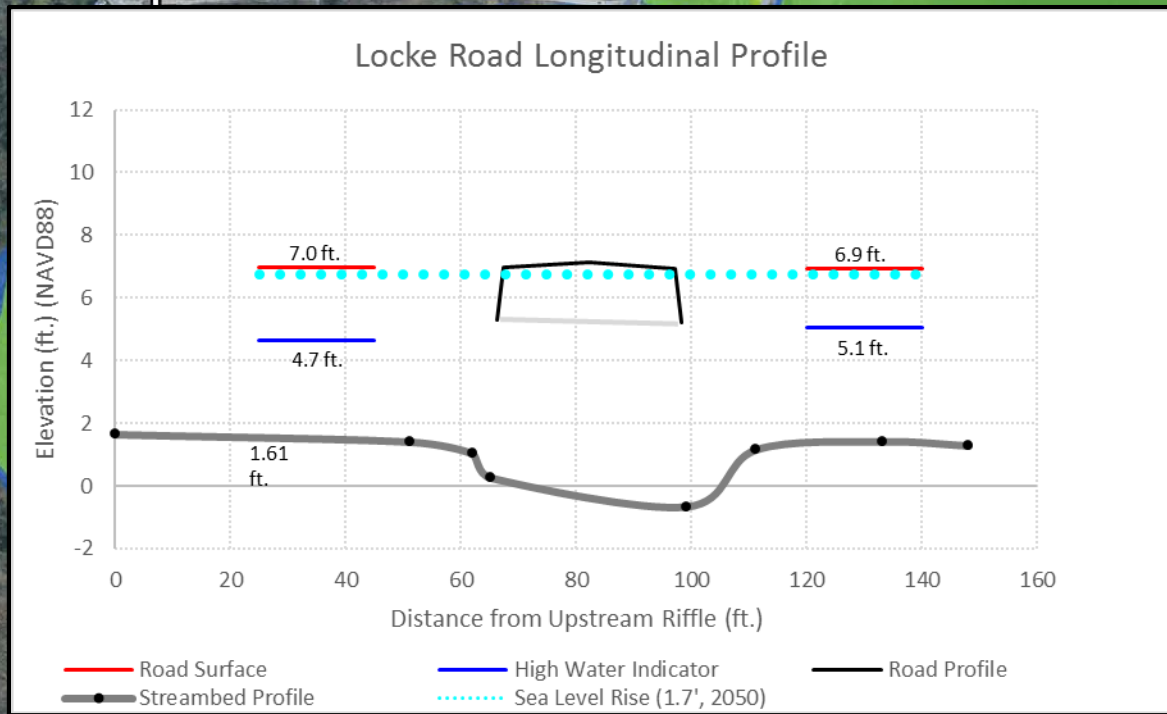
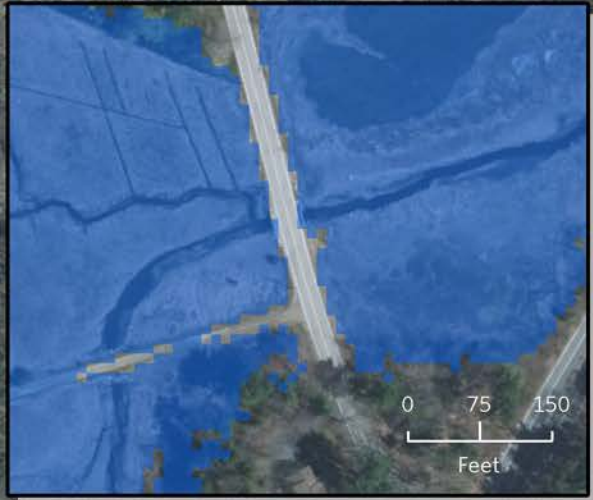


Inundation Risk to the Roadway

SCORE	Classification Criteria
1	High water indicator is greater than 6' from road surface
2	High water indicator is between 3 and 6' from road surface
3	High water indicator is between 1.5 and 3' from road surface
4	High water indicator is less than 1.5' from road surface
5	High water indicator suggests road is occasionally inundated

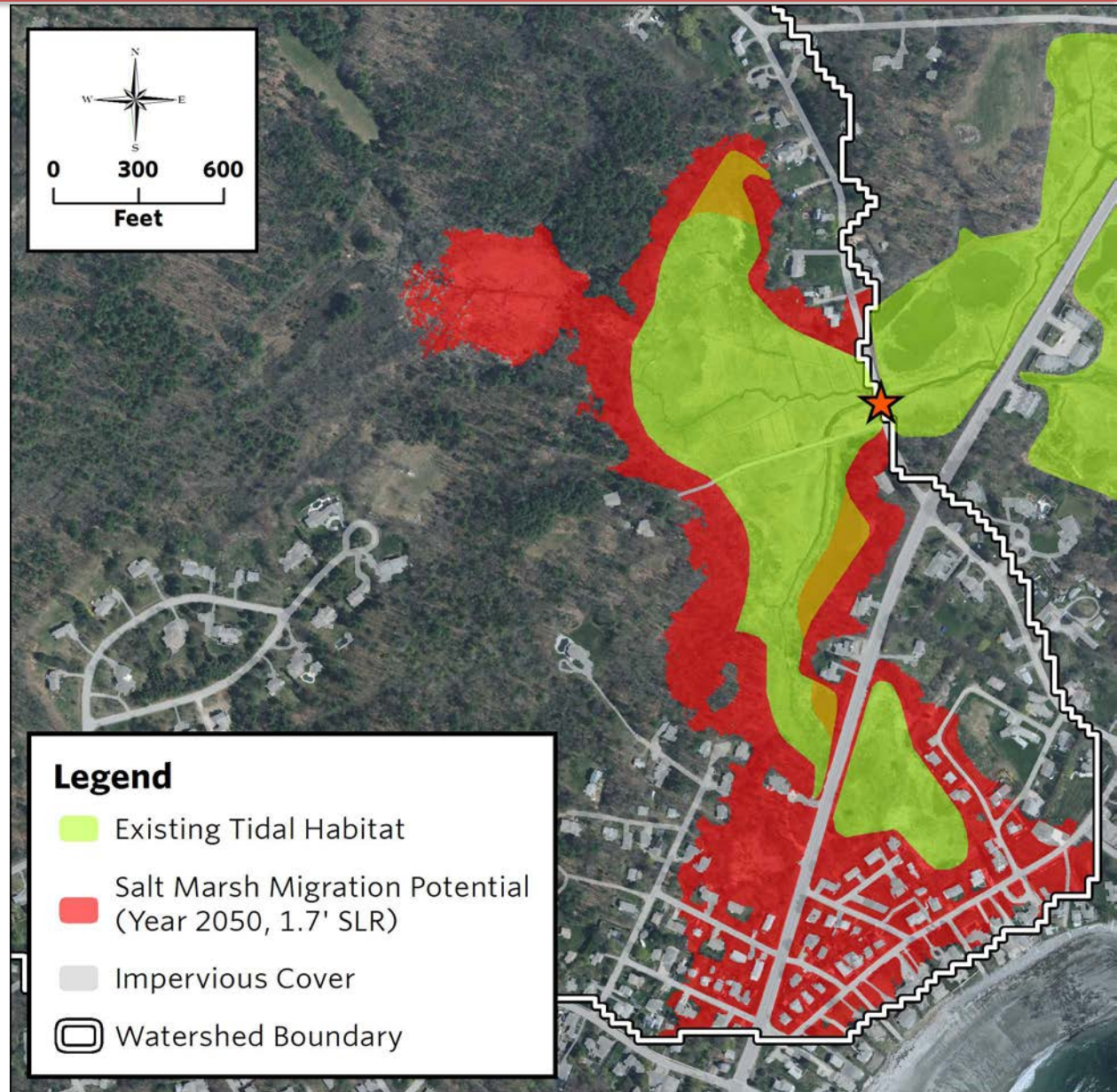


Inundation Risk



Salt Marsh Migration

SCORE	Classification Criteria
1	0-1 acre increase
2	1-2 acre increase
3	2-5 acre increase
4	5-10 acre increase
5	>10 acre increase (35 ac.!)



Scoring & Prioritization

Theme Scores

- Crossing Condition
- Tidal Restriction
- Ecological (marsh migration, vegetation comparison, aquatic organism passage)
- Inundation Risk



Plus an “Overall Score”

Next Steps & Questions?

