



NROC
Northeast Regional
Ocean Council



**Gulf of Maine Council
on the Marine Environment**
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for a healthy environment



North Atlantic LCC
North Atlantic Landscape
Conservation Cooperative

Tidal Crossings Assessments Workshop

September 10, 2015

New Hampshire DES
222 International Drive, Suite 175
Portsmouth, NH 02801

Action Items and Minutes

Action Items

- A summary of the meeting, presentations made available
- Regroup of NROC, LCC, etc. to determine next steps given the input

Roundtable of Tidal Crossing Initiatives Underway

Maine (ppt) – Judy Gates, Maine DOT and Matt Craig, Casco Bay Estuary Project

They did a big project in 1999-2002 with volunteers; mostly freshwater; started differentiating tidal crossings in 2012, so far are 160+, Maine Road Stream Crossing Manual - Alex Abbott

ME's stream habitat and database viewer doesn't have all the info necessary for restoration prioritization for tidal streams

State doesn't have funding/capacity to have a tidal restoration staff, nor do they prioritize projects, etc.
Casco Bay Estuary Program did assessment of tidal restrictions in 2012

Need – state wide restoration program to assess and prioritize tidal restrictions and their restoration – & to build relationships with landowners to foster interest in investment

Massachusetts (ppt) - Steve Block, NOAA Restoration Center

All tidal restrictions are mapped in an atlas (inc. ownership, size of potential upstream habitat to be restored, maps, field verification)

Restored 85 salt marshes by replacing undersized culverts

Frequent challenges (septic systems, regulatory compliance, low-lying property, protection of species, erosion of creek channels, abutter impact, invasive species, tide gate function)

Deed restrictions in 1970s for salty wetlands - no changes in hydrology, even w. ecological benefit. Needs to go through courts, not just wetlands act.

Lisa Berry Engler- MA CZM doing tide gate assessment and inventory for NOAA/NOS/OCM from NH to Provincetown (not South coast) done by spring 2016. Will have web tool.

Much assessment can happen in office given wealth of info (LIDAR, tide gauge info, etc.)

Rhode Island (pdf) - Caitlin Chafee, Coastal Resources Management Council

Their efforts have been spearheaded by Save the Bay, focused on habitat restoration, created a rapid assessment protocol (Save the Bay method on Habitat Restoration Portal)

Have a state restoration trust fund (\$4M/yr?); great for providing state match; 250K/yr for restoration

Have done marsh migration modeling, using SLAMM and LIDAR, statewide; both with protection off and on to estimate marsh migration potential

STORMTOOLS can also be used to identify at risk culverts and crossings

Lessons learned: Roadblocks- elevation, subsidence, conversion of marsh to open water (Gooseneck Cove), plan for SLR, public safety risks w structures

RI lacks a detailed database on tidal crossings; this is a gap for the state

Connecticut - Pete Francis, Department of Energy and Environmental Protection

No coordinated program across the state

Mosquito program, DOT, Enviros all have different databases

Municipalities don't want to restore b/c they don't believe the hydrological predictions re: post-restoration water levels- concerns re: low lying streets

Bigger structure size isn't always better. Perspective was provided by SLAMM results so careful evaluations of marsh capital prior to any restoration is essential. Rate of return of the tides must also be controlled.

New York - Nicole Maher, The Nature Conservancy

TNC has some internal funds for tidal crossing inventory assessment, so want to sync up with any regional efforts.

Previously have used Maine's Return to Tides protocol

They are looking for overlap in municipal interests w. marsh migration.

Primarily focused on marsh migration, not fish passage – but looking to include fish passage

Roadblocks – landowners concerns with higher sea levels, storm surge, increased flooding

Nova Scotia (ppt) - Steve Conway, Nova Scotia Department of Environment

They moved to a notification system (after the fact of construction) instead of a permit system

Huge portion of NS is tidally influenced, no where is >30 mi from coast

Watercourse Alteration Program has no specific consideration of tidal influence

DOT biggest client, for road infrastructure and tidal impacts/storm surge

They are focused on preventing erosion

NS has >5X tidal restrictions as New England

Tidal hydropower structures were ripped apart – inadequate design for their conditions

New Brunswick (on phone) - Peter McLaughlin - Department of Environment and Local Government

Now have ice-free zones and the roads are not as protected from waves during winter as previously

Online atlas for tidal crossings, DOT using it

Inventory, 76 control structures, 2 dams, lots of agricultural land being protected

Eric Hutchins- lots of the dikes in NB and NS are in agricultural reserve that may convert to salt marsh w. SLR- may have an increase in migratory bird habitat value

Have lots of infrastructure that is very old, may need replacement

North Atlantic Aquatic Connectivity Collaborative (NAACC) - Scott Jackson, University of Massachusetts, Amherst

LCC has been working to bring state reps together to collaborate on their parallel developed methodologies that are used in each state

Have been working on the aquatic connectivity issue since 2000

Alex Abbott evaluated New England crossing assessment protocols and NAACC merged them to become the NAACC protocol which is rapid, field based, and primarily focused on aquatic organism passage after feedback from core group

Working group, advisory committee, 80 participants from 13 states

Existing non-tidal module aims to characterize typical low flow conditions (challenge for tidal systems is when in the tidal cycle to assess)

How to deal w. vastly different systems- tidal creeks (little freshwater influence), vs freshwater tidal systems (e.g. Hudson is tidally influenced up to Albany) vs streams that flow to the ocean directly (CT River, Merrimack Rivers?)

For their existing protocol, there is a system - online database, score for connectivity value, map viewer, crossings data available for download, system of coordination and prioritization, way to centrally house the data to connect the 13 states

Washington- Doris Small and Padraic Smith, Department of Fish and Wildlife

Large river systems here- Columbia R, Puget Sound, 3000 mi coastline

Ecosystem restoration is the goal

Juvenile salmon move in and out of salt marshes w just inches of water depth (at lead of flood and tail end of ebb tides)

26 fish species are listed, their focus is entirely on *passage*, not fish access to habitats

Current criteria are based on capabilities of a 6" trout

Elwha R. restoration (dam removal) have restored 70 acres of marsh so far

They can't regulate tide gates

They don't yet have standards for tidal culvert crossings

Judicial ruling that they must repair/replace culverts that impair salmon runs- does not include bridges or other crossing structures beyond culverts

978 culverts, need 340M a year to assess culverts, got 36M from state funds

State lands in the Columbia R watershed must be done by Oct 2016

Have had agreement btwn state DFW and DOT to use the same numerical ranking system since 1991 (failure to meet fish passage criteria are the first cut in the prioritization process)

Prioritization scheme is greatest benefit projects get done first w available funding

Have an equation for fish passage that is species dependent, scoring that includes percent barrier, cost modifier (inexpensive can compete w really expensive ones), ESA status, production potential of upstream habitat to produce fish

Have exceedance flow criteria but didn't know how to deal w. it wrt constantly changing water levels in tidal vs non-tidal systems.

Have used proxies of MLLW and MHHW as their 10% exceedance values

Correigh Greene has done their literature review, have over 100 refs thus far and are looking to add gray literature. Looking to collaborate on lit review and determine information gaps

Always good to maintain a wish list of restoration sites based on ecological integrity but recognize that most restorations are based on infrastructure concerns

In-Depth Look at Evaluation Criteria and Assessment Parameters for Four Tidal Crossings

(See related workshop materials prepared by NH TNC and Coastal Program for description of each crossing as well as a table of draft assessment criteria)

1. Crossing Ratio

- a. This is a very quick and dirty assessment
- b. Scour holes don't always indicate restriction
- c. No correlation btwn indicators observed from aerial photos and whether a restriction exists or not
- d. Channel width are difficult to measure and not necessarily indicative of restriction
- e. Can be hard to find source for – but include natural river width vs. channel, thread width/flood plain
- f. Note impact to upstream restrictions
- g. You might not want to do channel width at this site – the mathematical # might not give the meaning you want – would need to measure un-restricted marshes, at ~100 sites before being able to develop a meaningful number
- h. What is the equivalent for “bankful width”? Can MHW be used as a surrogate for bankful?
- i. Cross section may not work if there is a lot of scouring, but also how do you define /categorize scouring?
- j. In freshwater culvert assessment protocols, the size of a scour pool is quantified. For instance a scour pool is ‘large’ if its twice as wide or twice as deep.

2. Erosion classification

- a. Downstream lobe of marsh indicated there aren't any velocity issues
- b. Sometimes scour is needed to keep the culvert from filling in where you have eroding banks or beaches
- c. Need to look at in field to determine depth of pool
- d. Definition of numbers are unclear (significant vs. major)
- e. Do you need a lot of detail or can you just say “dumbbell effect” to qualify?
- f. Need guidance on what is considered pooling – how much wider than a reference stream? (ex. 2X the normal width?)
- g. Add in sediment transport/sediment source

3-1. Fish passage (mid-tide velocity classification)

- a. Openness criteria are important for turtles
- b. ? re: velocities based on mummichog access to high marsh
- c. Velocity should be based on fish species that are/should be present and regionally specific (e.g. not focused on salmonids as the WA literature review likely is).
- d. Assessment should be over time: impact of moon, conducted at mid-tide
- e. Check speed outside crossing to determine which fish species to include (which fish could be there to start with) based on flow regime
- f. How is mid-tide defined? – what to measure, where in the water column? Maybe there should be a desktop assessment of the timing of tides first since multiple trips to the site may not be realistic

3-2. Fish passage (mid-tide velocity indicators)

- a. Suggest measuring depth of water thru culvert at low and mid-tide
- b. Assess whether invert perched at multiple tides (spring, neap)?
- c. Obtain representative depths up and down stream
- d. Describe sediment layering (add descriptive classification criteria for this?)

4. Vertical capacity of crossing structure

- a. ? Do we want these values to scale with tidal range (if primarily basing our assessment on habitat value)
- b. When basing primarily on transportation/structural considerations, leave this estimate as a empirical value
- c. Use percent related to size instead of absolute numbers – need more space when close to coast to accommodate storm surge
- d. Need to know side of opening and type
- e. For prioritizing – use scores obtained at mean high tide
- f. Should look at percent of structure that is submerged instead of just meters

5. Inundation risk to roadway

- a. Take out wrack lines from criteria, use staining to look for MHW
- b. Add in 100 yr storm event (w. various SLR scenarios)
- c. Need a classification system on staining
- d. Verify with local knowledge
- e. Think about potential access alternatives – rerouting
- f. Consider impact of changes to other structures
- g. Need to consider both upstream and downstream risk
- h. Both the velocity and the amount of water matter for inundation risk, scouring vs. small erosion (may be result of inundation, maybe storm water, maybe both?)

- i. Might want to add a measure for other transportation inundated (more than just roads) / # of structures inundated

6. Inundation risk to low lying non-transportation infrastructure

- a. Hard to assess impacts to septic systems w. aerials
- b. Add category for the \$ value of the property, broaden categories for a higher # of structures (0-2, 2-5, 6-10 etc.) or *alternatively* simplify categories to None/Some/Many.
- c. Change wording to infrastructure/property when considering septic, salt marsh hay harvest etc. - Change heading to “Inundation Risk to Low-Lying, non-Transportation Developed Environment”
- d. This is difficult to assess in the field, add a desktop component w. LIDAR to make a first cut
- e. Add criteria for impacts to the developed environment (e.g. score 0 for public ownership, 1 for private). Also add multiplier for property value from tax maps
- f. What about non-road transportation infrastructure (ex. rail) , where are they considered (#5 considers roads, this one considers non-transportation
- g. How to evaluate, current risk vs. risk if structure was removed
- h. Identify number of abutting property owners. NHDES can't issue a permit for restoration if it will affect abutting properties.
- i. In a Phase II, conduct a complete site reconnaissance

7. Salt marsh migration potential

- a. Want to know if there is accommodation (elevation) space w. SLR btwn the structure and upstream habitat
- b. Change categories to no, little, ample migration opportunity
- c. Multiply by elevation of the restored habitat w. higher weights for high marsh habitat vs low marsh habitat as a phase II
- d. Understand present condition
- e. Septic issues related to dealing with restoration
- f. Tradeoffs in tidal flow – long and short term
- g. Need to assess in the field as well (not just SLAMM), actual conditions or monitoring overtime may prove to be different than what the model output said
- h. Are their marsh tipping points to look for?
- i. Also want to ground truth the NWI information if that is being used, NWI may be too coarse and not accurate for the site
- j. Use both acreage and percent increases

8. Vegetation comparison

- a. Expand to include more than veg, need some criteria for wildlife, other organisms
- b. Unclear if the terminology refers to expansion of unvegetated pannes due to waterlogging
- c. Need separate scoring for fresh water vs salt tolerant veg
- d. Change categories to similar, different, much different
- e. Add in field verification to classification

- f. Indicator of other stressors
- g. Change question to specifics (e.g. noting dominant vegetation and indicators)
- h. Remove slightly different class (score 2)

9. Crossing condition

- a. Are bridges adequate for emergency vehicles
- b. Measure width of cracks?
- c. Model hydrology for bridge deck, there are requirements for water to come no closer than 1m to bridge deck – also measuring to mean high? What about storms?
- d. Categories could reflect good vs. bad and then how bad –there is no difference if it is good vs. excellent – if its not rated critical or poor, its OK
- e. Need to consider alignment /angle –especially in replacement, increasing or decreasing size at the same angle/alignment (vs. a different one) could affect the impacts
- f. Looking a deposit of wrack material could be an indicator but it would be tough to develop indices, also *Phragmites* vs. wrack?
- g. Ice impoundments also a consideration but not sure how it would be an indicator
- h. Scott Jackson recommended using the Federal Highways Photographic Indication of Condition

10. Landscape position

- a. Proximity to septic (and impact of SLR)
- b. Location in regional landscape

Larger Discussion/Take Home Points

Lots of back office GIS work (phase 1) should take place in advance of fieldwork (phase 2) and classification

#1 issue is the inundation risk parameter (#6) from criteria table

Method using DEMs to determine whether a tidal restriction occurs is w. existing conditions on and off in SLAMM?

Channel widths are difficult to measure, hard to be consistent w. measurements, so may not be as indicative of tidal restriction; most of the sites have been manipulated, so they aren't really looking at an equilibrium system, so it's hard to tell if the current conditions are from the crossing or from some historical event

Add more factors, storm surge (saltwater), 100 yr storm event (freshwater), and sediment dynamics (marsh migration)

Deal w. issues of fish access vs passage- adults returning to spawn have better swimming capabilities than juveniles

-Add unknown to each classification criteria and if checked, it bumps the value to the next highest level (more weight toward replacement)

Wrap up

How do we move forward? Pursue a regional protocol?

NALCC will facilitate regional approaches, NAACC will help with this

Eric Hutchins offered to be on review team for NH protocol

Nicole- anticipate engaging stakeholders at each site, local municipalities may have a list of needs before they buy in

Ellen- DOTs have a different list of criteria (evacuation routes etc.). Check w. them thru this process.

Matt- likes the buffet style approach re: diff parameters to assess dependent on objectives, make sure to revisit our list to see how they feed into mgmt. objectives (a la the GPAC process) and reference the GPAC protocols when thinking about what and how to assess

Share the different protocols that were mentioned today to the group (e.g. Megan will share salt marsh integrity index)

Scott- suggested technical working groups: salt marsh restoration, aquatic organism passage, public health and safety for infrastructure resilience), since the larger list of assessment criteria is overwhelming, then come back together as the larger group.

Didn't touch on tide gates today, but that will be an increasing problem in the future, they have a huge failure rate- 9 of 10 gates fail. Parts break and there are no repairs, operations and maintenance plans need to be part of discussion

Who was not here? More DOT folks, Emergency mgmt. community, engineers, hydrologists, climate modelers, sedimentologists, fisheries engineers

- Bare minimum – have this group look at what is being developed in NH
- NH is working with DOT to make sure they are gathering the necessary criteria (is it an evacuation route?, etc.)
- If we help develop risk assessments for emergency management community, that would help with funding, and it achieves some of the mutually beneficial goals for habitat quality and infrastructure resilience.
 - So that leads to focusing on SLR, 1% storms, etc.
 - The reality is that DOT priorities are going to remain focused on structure condition; and appreciate that people in other sectors are as aware of the issues as we are
 - So look for sites where the two intersect...a structure is falling apart and it would provide a benefit to coastal management. But need to do the protocols/assessments to be ready to find those intersections.
- DOT has 3 yr work plans online, where you want to insert yourself is “at or before preliminary engineering”. Appreciate that people in other sectors are as aware of the issues as DOT community is- it's more than habitat restoration

Suggested Resources

- Purinton, T.A. and D.C. Mountain. 1996. Tidal Crossing Handbook: A Volunteer Guide to Assessing Tidal Restrictions. Parker River Clean Water Association. 69 p.
- American Fisheries Society Fish bioengineering committee
- American Society of Civil Engineer's Environmental and Water Resource Institute database