Atlantic Coast Whole System
Diadromous Fish Prioritization

emartin@tnc.org

Photos: Taunton River, © Alison Bowden /TNC  Alewife © Margaret Pizer /TNC
Objective: Identify priority areas for potential diadromous fish restoration & protection activities

- Alewife
- Blueback herring
- American shad

Treated separately, not included in this analysis
- Atlantic sturgeon
- Shortnose sturgeon
River herring / shad: Unit of Analysis

- **Unit of analysis – river herring / shad**
  - subwatersheds (HUC12)
  - ~100 km²
  - Fine enough to narrowly focus efforts
  - Feasible unit for a coastwide analysis

- **Potential activities not limited to connectivity**
  - Wetland restoration
  - SAV
  - Riparian buffers
  - Connectivity / fish passage
River herring / shad: Study Area

- Subwatersheds (HUC12) within Basins (HUC8) with current or historical presence of:
  - Alewife
  - Blueback herring
  - American shad

- Based on Nature Serve data
Conceptual Approach

- Each subwatershed assessed for a suite of abiotic & biotic variables – “metrics”

- Understand the suitability for each subwatershed for sustaining & restoring river herring and shad populations

- Develop a relative prioritization
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| Population                  | Integrated presence / run count metric. Separate metric for each spp using spp specific data where: 0 = none documented  
1 = historical presence documented  
2 = current presence (no count) and count <=10,000  
3 = count: >10,000                                                                                   |
| Habitat Quantity & Access   | Area of Lakes and Ponds with no dams associated within each HUC                                                                                       |
| Habitat Quantity & Access   | % of reaches within HUC12 that have connectivity (no barriers) to the ocean                                                                             |
| Habitat Quantity & Access   | % of Active River Area within each HUC that is occupied by NWI wetlands (any)                                                                           |
| Habitat Quantity & Access   | Area of estuarine emergent marsh within each HUC                                                                                                       |
| Habitat Quantity & Access   | Average anadromous scenario result for NE Aquatic Connectivity / SEACAP dams within HUC 12. HUC12s with no dams are assigned a mean score (10), to neither "help" nor "hurt" their score. |
| Water Quality               | % of reaches in HUC whose cumulative watershed % impervious surface is >8%                                                                               |
| Water Quantity              | Dam storage - mean annual flow: % of flowlines within each HUC i>= 30%                                                                              |
Population

- Alewife
  - None documents
  - Historically documented
  - Current (no count or <10,000)
  - Current (Count >10,000)
Population

- Blueback herring
  - None documents
  - Historically documented
  - Current (no count or <10,000)
  - Current (Count >10,000)

@flickr Creative Commons user Mary Chaffee
Population

- **American shad**
  - None documents
  - Historically documented
  - Current (no count or <10,000)
  - Current (Count >10,000)
Habitat Quantity & Access

- Spawning habitat – slow water
  - Area of lakes and ponds
  - Glaciated areas

![Spawning habitat map](https://via.placeholder.com/150)

©flickr Creative Commons Dana Moos
Habitat Quantity & Access

- Spawning habitat – slow water
  - % of Active River Area occupied by wetlands
Habitat Quantity & Access

- Connectivity to the ocean

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Percent of Reaches with unrestricted connectivity to ocean

100%
0%

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Habitat Quantity & Access

- **Area of estuarine emergent marsh**
  - Juvenile habitat
  - Habitat complexity

©flickr Creative Commons user US Fish & Wildlife Service NE Region
Habitat Quantity & Access

- **Dams**
  - Average anadromous fish scenario result from:
    - Subwatersheds with high priority dam passage projects

[Map images from NE Aquatic Connectivity Assessment Project and SE Aquatic Connectivity Assessment Project (draft)]
Water Quality

- Percent impervious surface

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Percent of Reaches Whose Impervious Surface >8%

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Water quantity

- Flow alteration
  - Metric used in FW resilience study (Anderson et al 2013)
Combine Metrics

Hypothetical ‘best’ would have:
- No flow alteration
- No impervious surface
- Large runs
- 100% ocean connectivity
- The most wetlands
- Etc, etc...

Not all metrics are of equal importance.
### Assign Metric Weights

<table>
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<td>Sum of weights</td>
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Metric weighting as iterative process – calibrate draft results for each scenario to known priorities
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Sum of weights: 100, 100, 100

Metric weighting as iterative process – calibrate draft results for each scenario to known priorities
Example Output

- Subwatersheds prioritized 1 – n
- Binned into 5% Tiers
- Warm colors – greater opportunities for restoration and protection
  - based on the metric & weights selected
- Is it ‘fair’ to compare a subwatershed in Maine to one in Florida?
Stratification

- **Alewife**

- Derived from population structure described in:
  - Modified to align with our data
Stratification

- Blueback Herring

- Derived from population structure described in:

- Modified to align with our data
Stratification

- American shad

- Derived from population structure described in:
  - Modified to align with our data
Results - Alewife

Derived from population structure described in:
Combining genetic and demographic information to prioritize conservation efforts for anadromous alewife and blueback herring,
Evolutionary Applications, 7: 212–228. doi: 10.1111/eva.12111

Higher Priority

Lower Priority
Results – Blueback - NNE

Results – American Shad - NE

*Derived from population structure described in:
Results - Alewife

- Stratified by alewife genetic populations (Palkovacs et al)

- Binned into 5% Tiers

- Top Tier (red) = more restoration potential

- Lower Tiers (blue) = less restoration potential
Results - Blueback

- Stratified by blueback herring genetic populations (Palkovacs et al)
- Binned into 5% Tiers
- Top Tier (red) = more restoration potential
- Lower Tiers (blue) = less restoration potential
Results – American Shad

- Stratified by American shad genetic populations (Hassleman et al)

- Binned into 5% Tiers

- Top Tier (red) = more restoration potential

- Lower Tiers (blue) = less restoration potential
Results – Alewife – Top Tier (5% Bin)
Results - Blueback – Top Tier (5% Bin)
Results – American Shad – Top Tier (5% Bin)
Presentation of Results
Combined Result

- Alewife + blueback herring + American shad
- Top 5% for 1 or more of the three species
Caution: these results...

- Are **not** a replacement for site-specific knowledge and field work
- Do **not** incorporate every possible aspect of diadromous fish needs
- **Are** a screening-level tool
- Use the **best available** data
- **Help** inform on-the-ground decision making
Atlantic Coast Diadromous Fish Prioritization

- http://arcg.is/1Pgnqut
Questions?

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