Atlantic Coast Whole System Diadromous Fish Prioritization

emartin@tnc.org

Photos: Taunton River, © Alison Bowden /TNC Alewife © Margaret Pizer /TNC

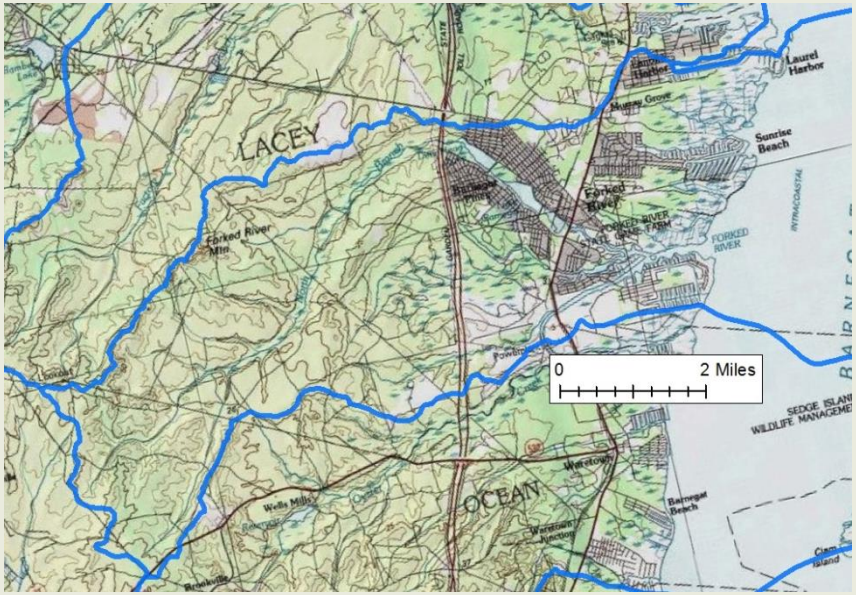
Methods Overview

- 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

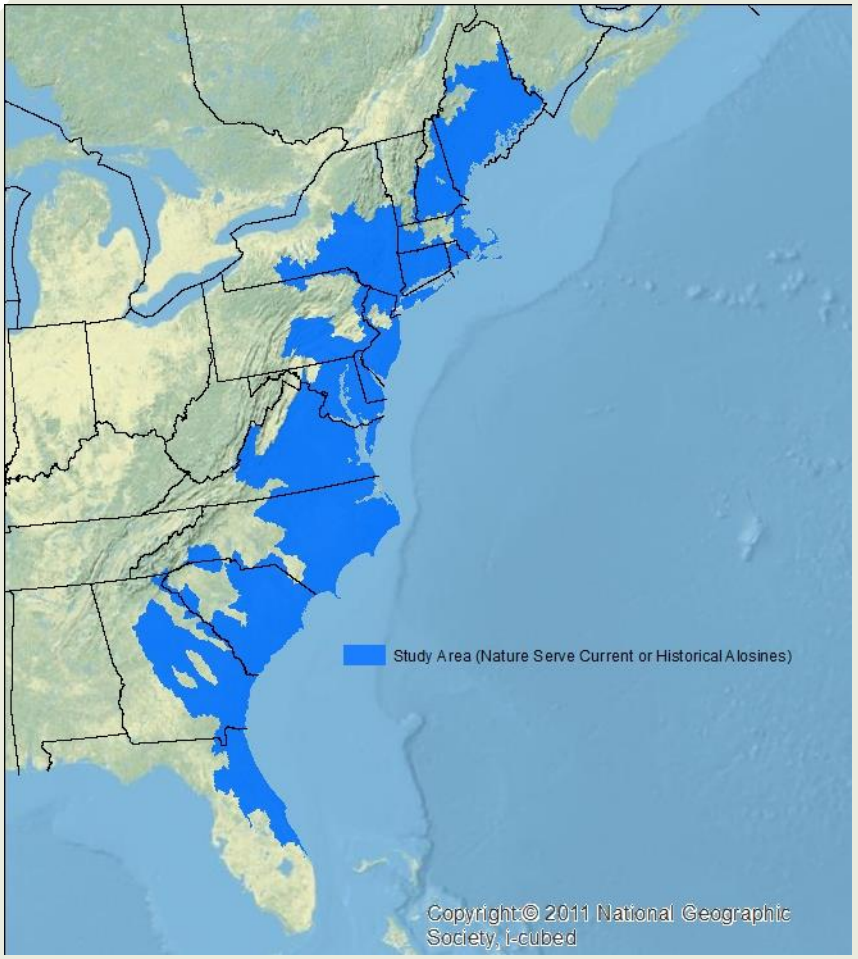
- Unit of analysis – river herring / shad
  - subwatersheds (HUC12)
  - ~100 km²
  - Fine enough to narrowly focus efforts
  - Feasible unit for a coastwide analysis

- Potential activities not limited to connectivity
  - Wetland restoration
  - SAV
  - Riparian buffers
  - Connectivity / fish passage



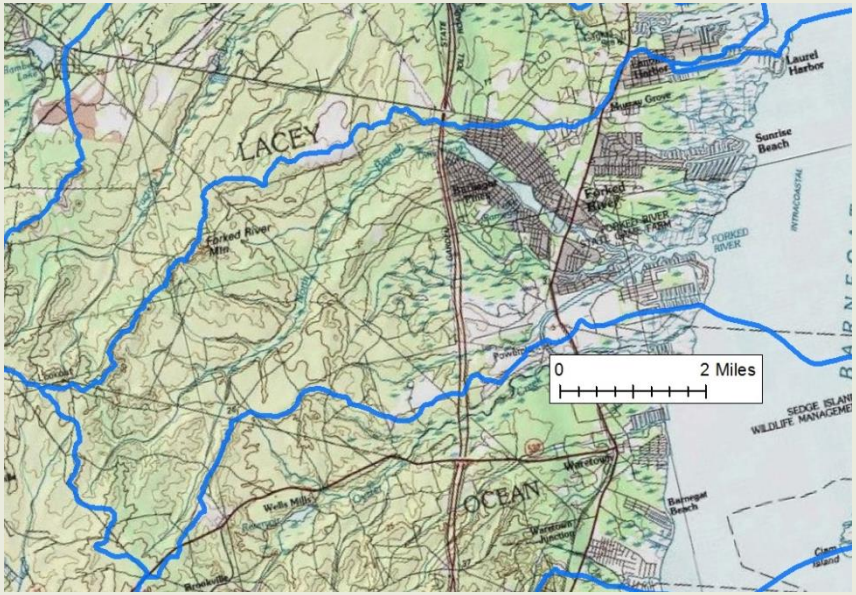
River herring / shad: Study Area

- 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



Metrics

Metric Category	Metric Description
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)

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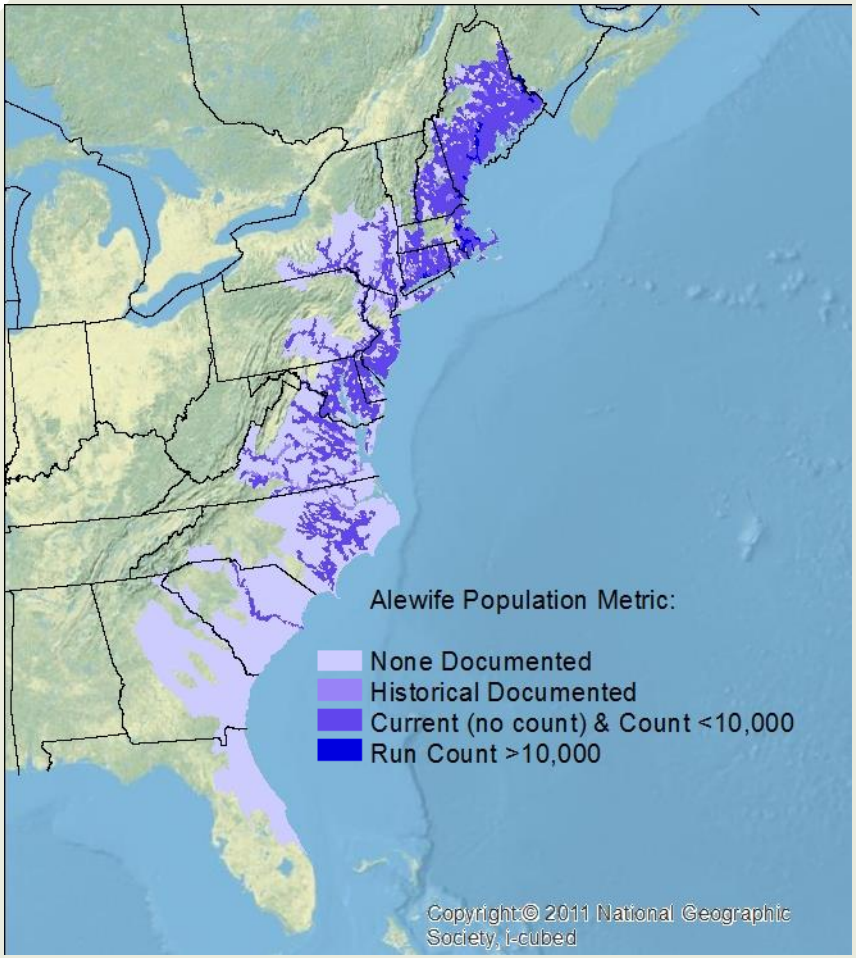

Population

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

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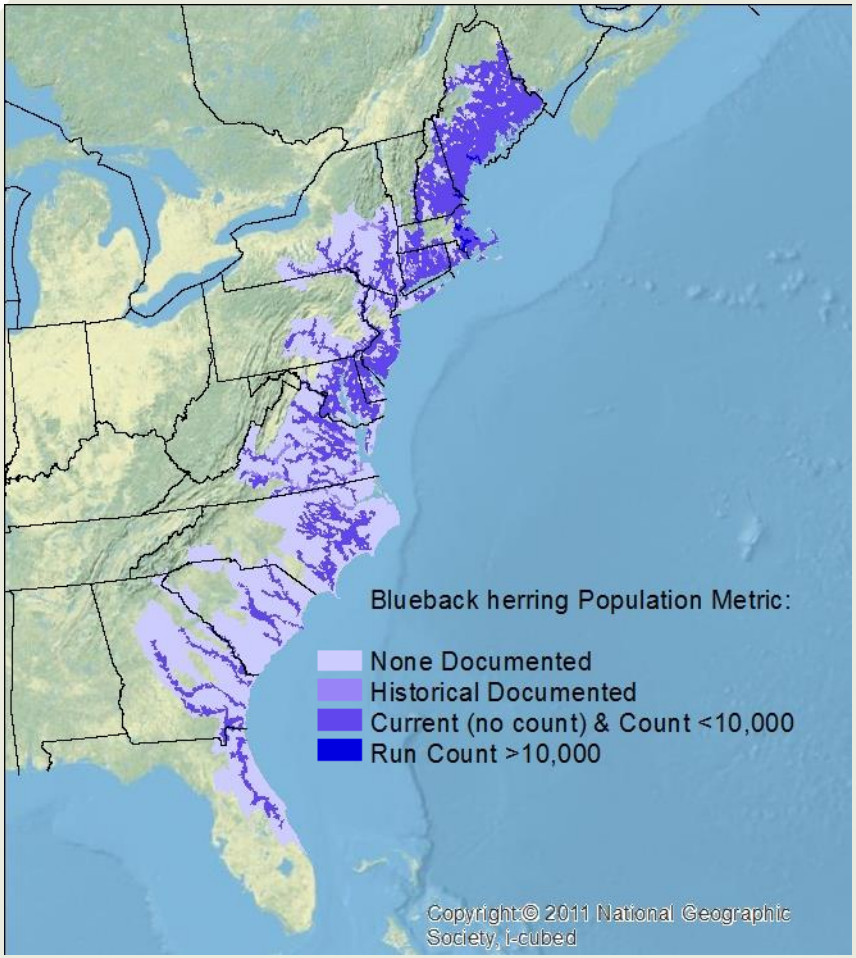

Population

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

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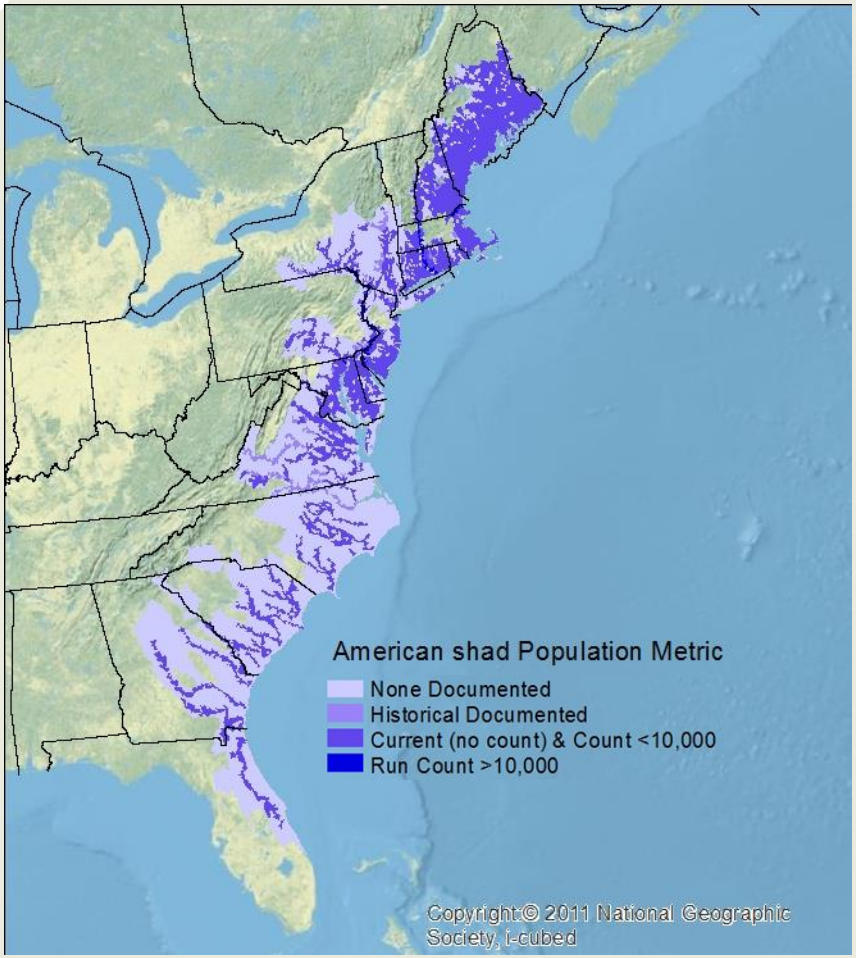

Habitat Quantity & Access

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

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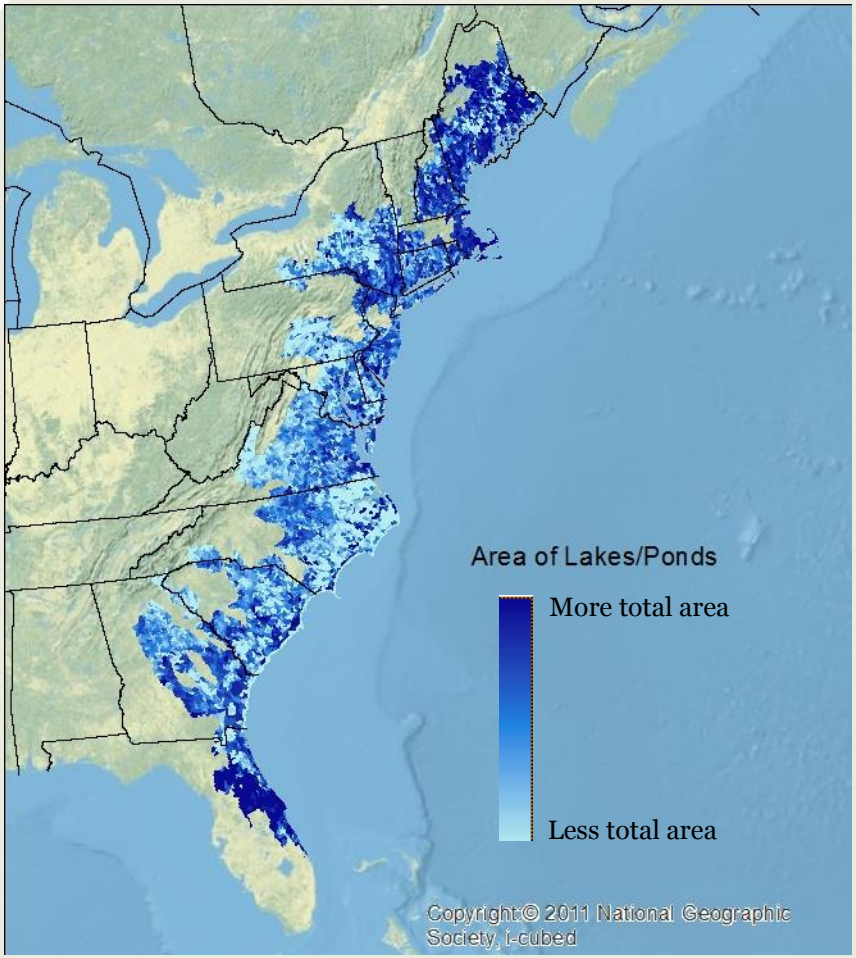

Habitat Quantity & Access

- Spawning habitat – slow water
  - % of Active River Area occupied by wetlands

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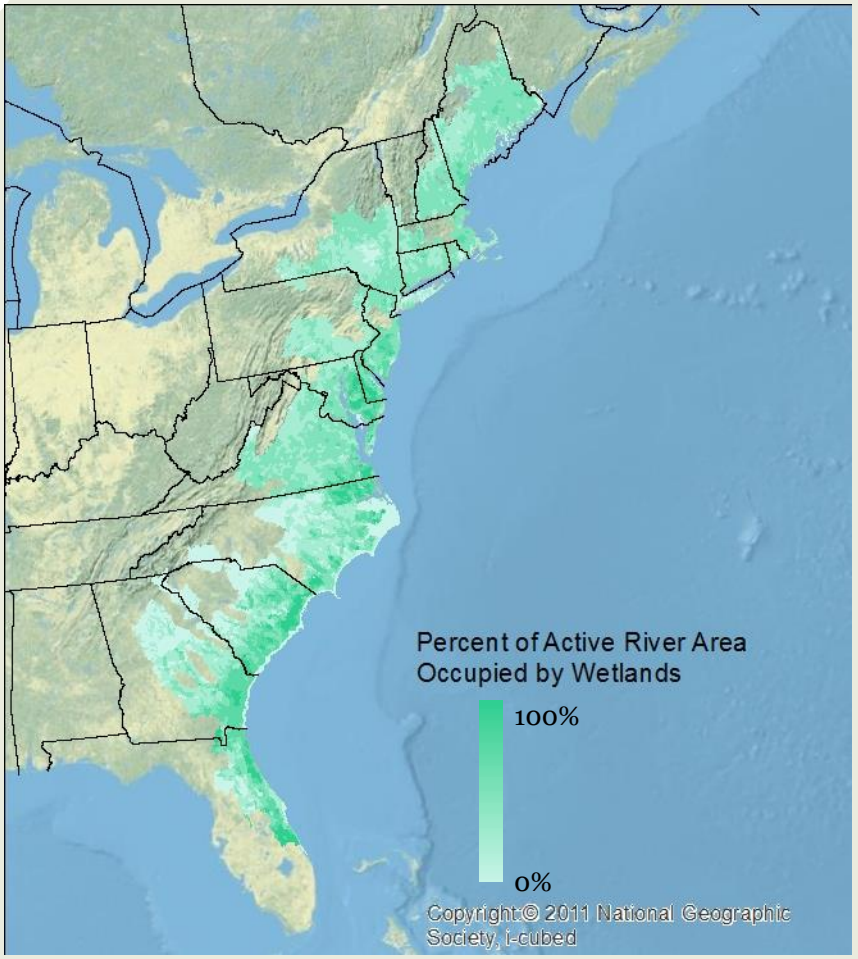

Habitat Quantity & Access

- Connectivity to the ocean

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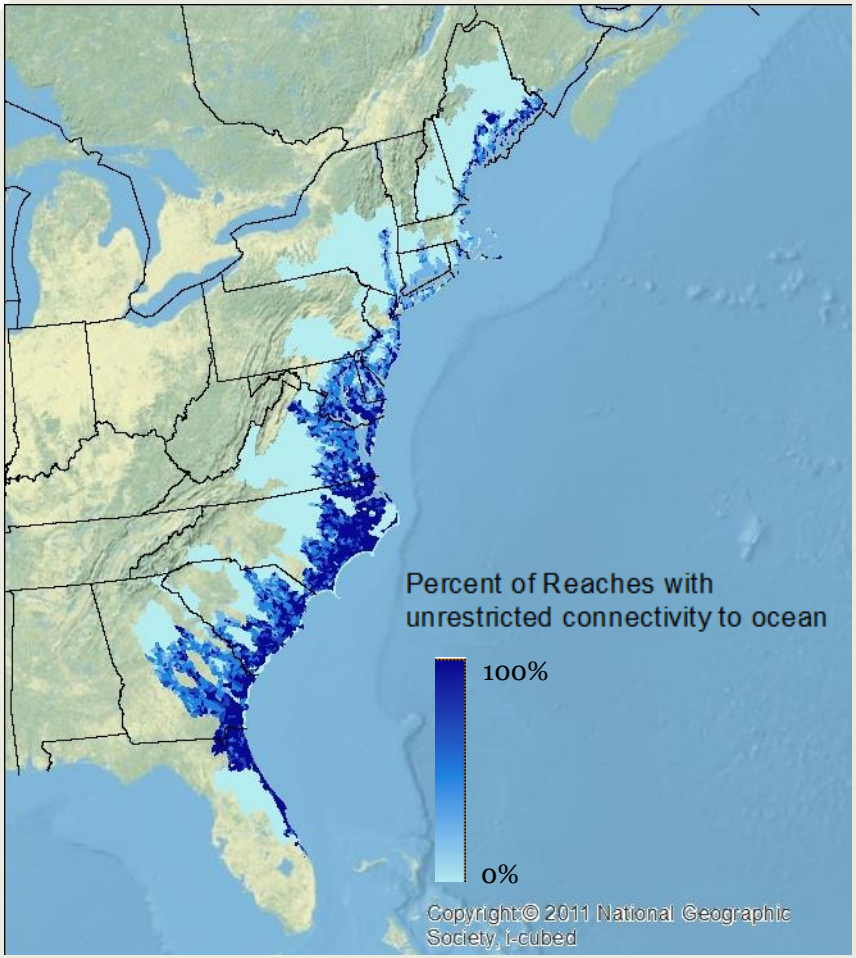

Habitat Quantity & Access

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

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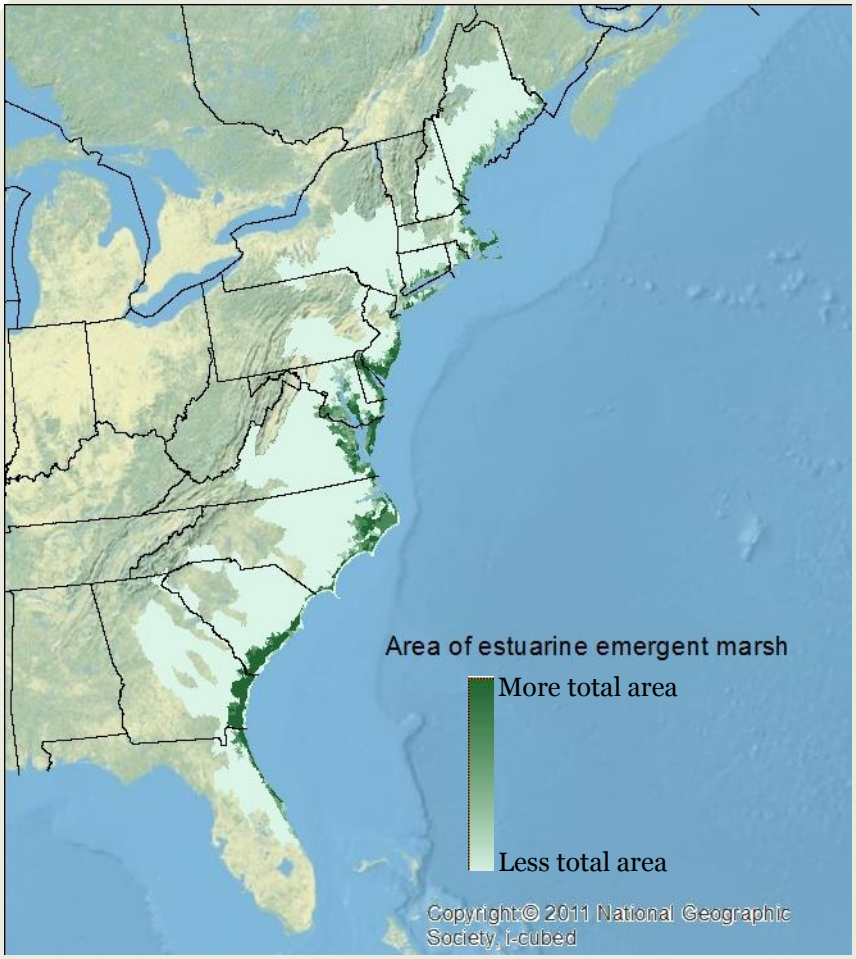
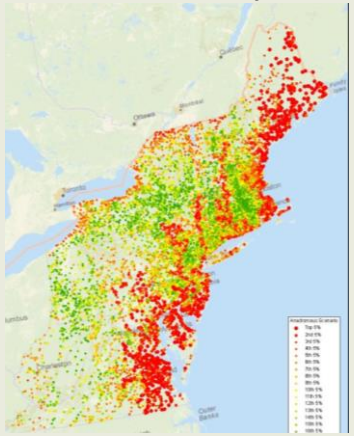


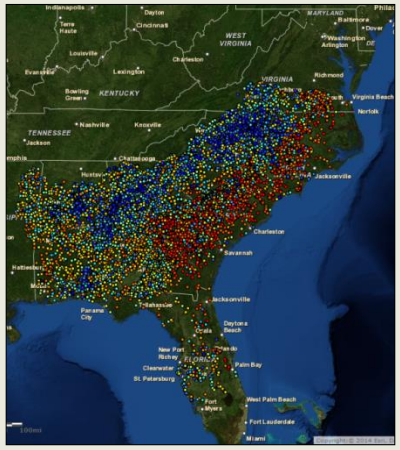
Habitat Quantity & Access

- Dams
  - Average anadromous fish scenario result from:

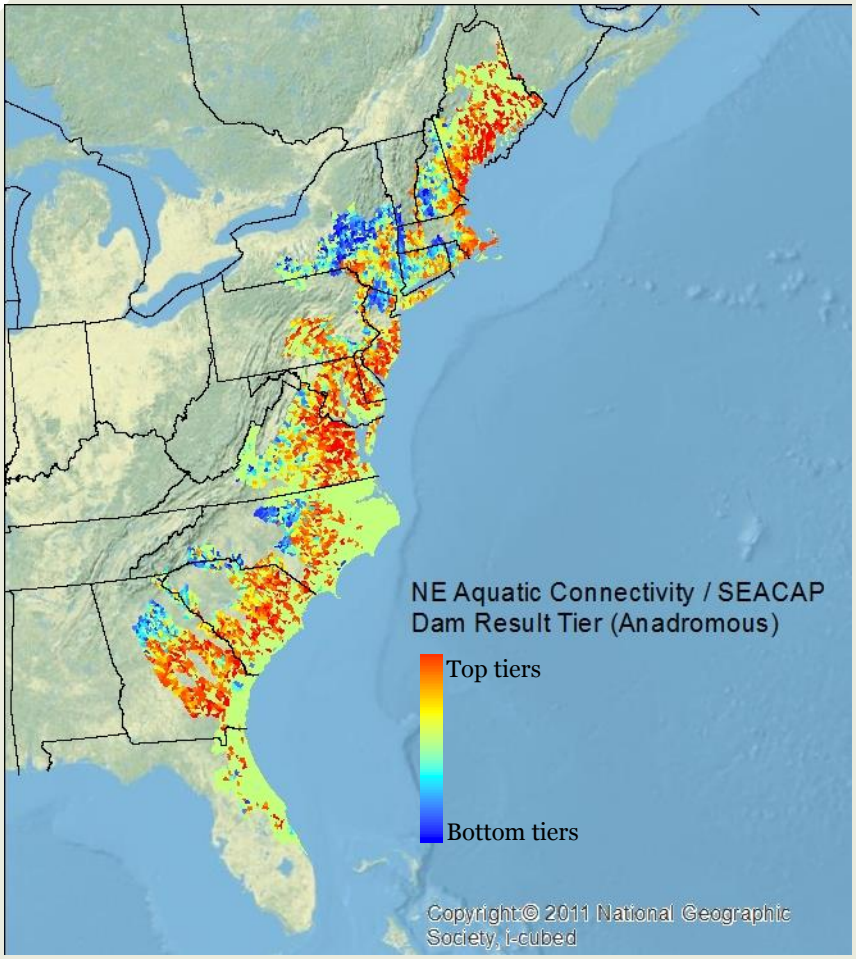
NE Aquatic Connectivity Assessment Project



SE Aquatic Connectivity Assessment Project (draft)



  - Subwatersheds with high priority dam passage projects



Water Quality

- Percent impervious surface

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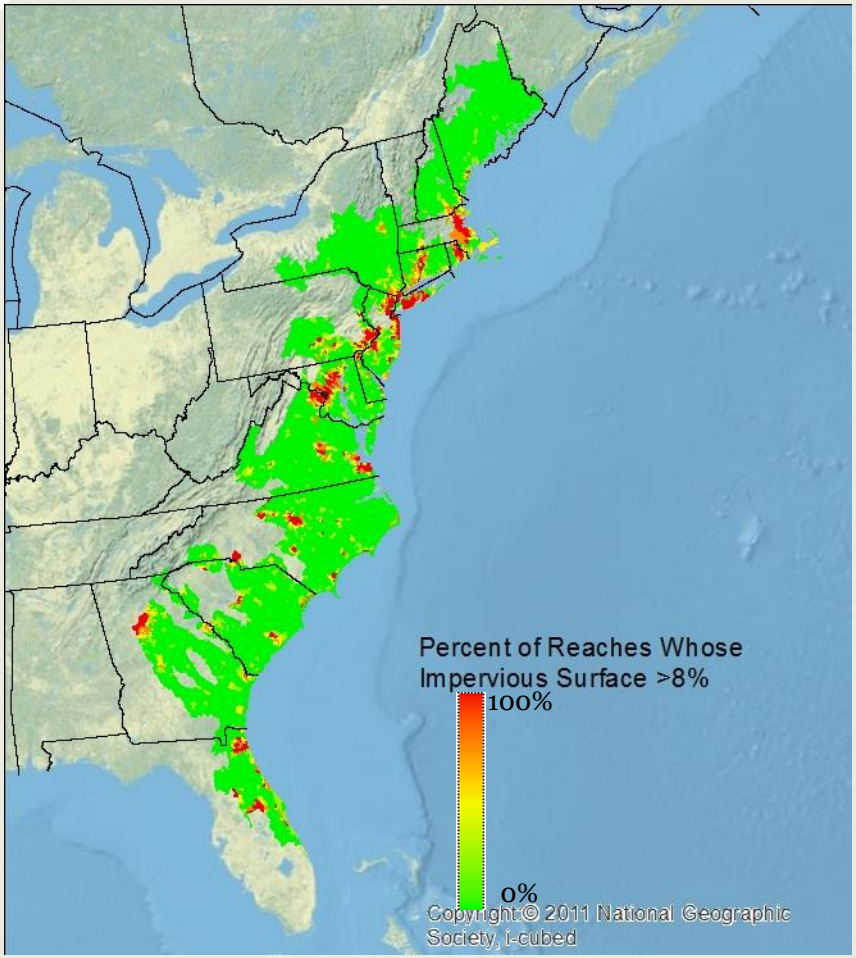
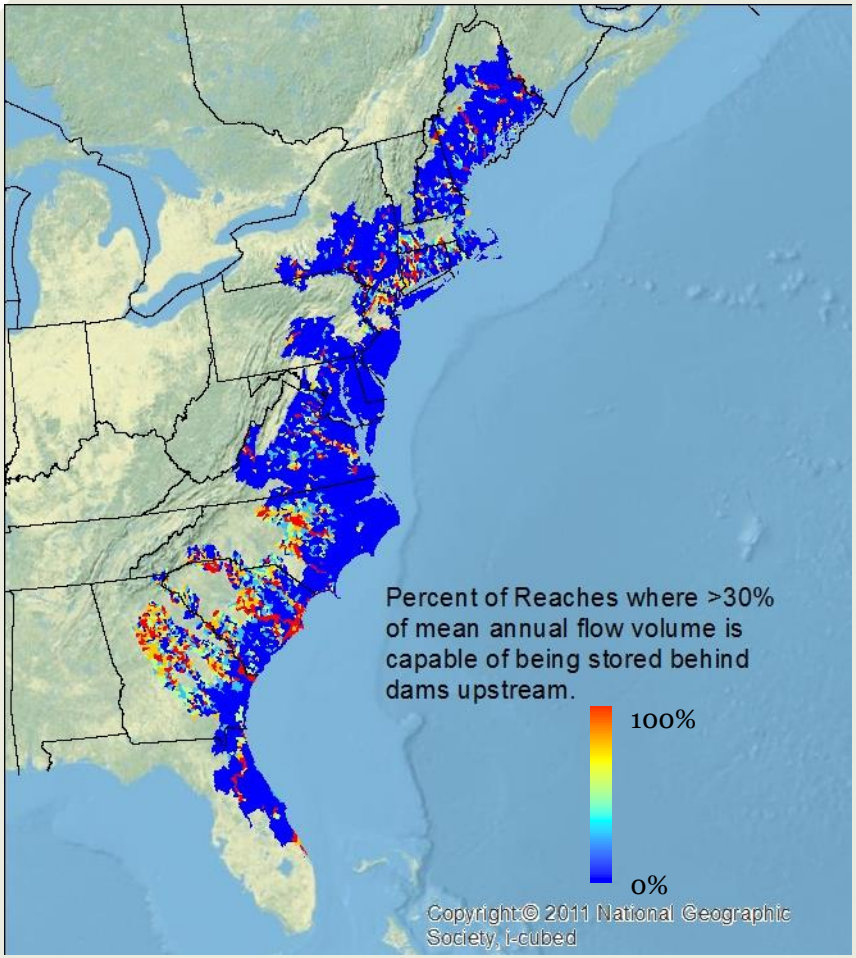


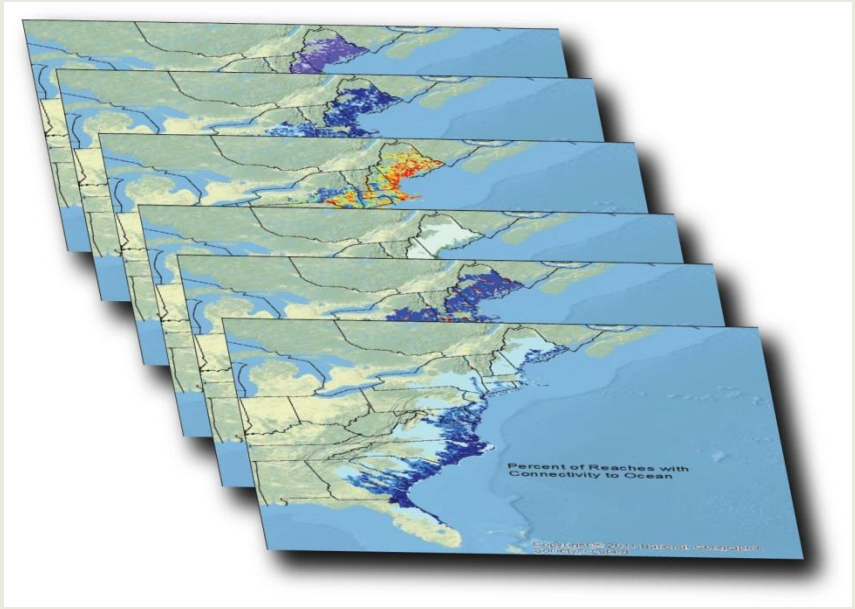
Water quantity

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



Combine Metrics

- 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

Metric Category	Metric Description	Alewife Scenario Weight
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	25
Habitat Quantity & Access	Area of Lakes and Ponds with no dams associated within each HUC	10
Habitat Quantity & Access	% of reaches within HUC12 that have connectivity (no barriers) to the ocean	10
Habitat Quantity & Access	% of Active River Area within each HUC that is occupied by NWI wetlands (any)	20
Habitat Quantity & Access	Area of estuarine emergent marsh within each HUC	10
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.	10
Water Quality	% of reaches in HUC whose cumulative watershed % impervious surface is >8%	10
Water Quantity	Dam storage - mean annual flow: % of flowlines within each HUC i>= 30%	5
	Sum of weights	100

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

Assign Metric Weights

Metric Category	Metric Description	Alewife Scenario Weight	Blueback Scenario Weight
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	25	35
Habitat Quantity & Access	Area of Lakes and Ponds with no dams associated within each HUC	10	0
Habitat Quantity & Access	% of reaches within HUC12 that have connectivity (no barriers) to the ocean	10	10
Habitat Quantity & Access	% of Active River Area within each HUC that is occupied by NWI wetlands (any)	20	20
Habitat Quantity & Access	Area of estuarine emergent marsh within each HUC	10	10
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.	10	10
Water Quality	% of reaches in HUC whose cumulative watershed % impervious surface is >8%	10	10
Water Quantity	Dam storage - mean annual flow: % of flowlines within each HUC i>= 30%	5	5
	Sum of weights	100	100

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

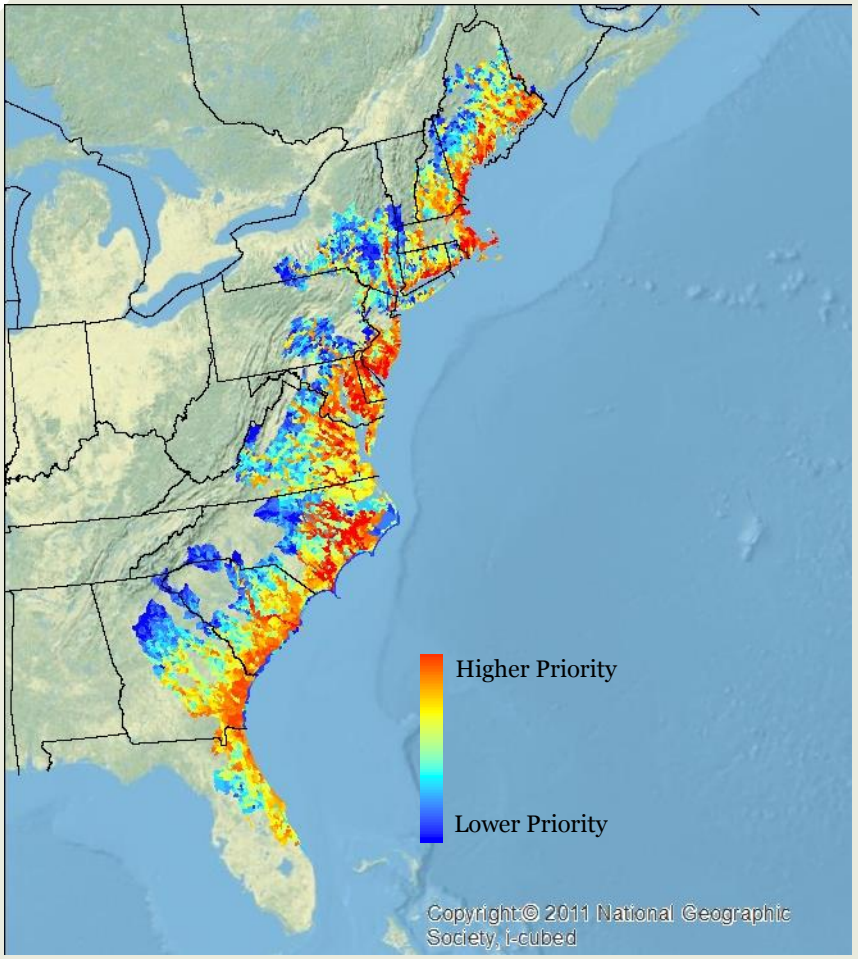
Assign Metric Weights

Metric Category	Metric Description	Alewife Scenario Weight	Blueback Scenario Weight	American Shad Scenario Weight
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	25	35	45
Habitat Quantity & Access	Area of Lakes and Ponds with no dams associated within each HUC	10	0	0
Habitat Quantity & Access	% of reaches within HUC12 that have connectivity (no barriers) to the ocean	10	10	5
Habitat Quantity & Access	% of Active River Area within each HUC that is occupied by NWI wetlands (any)	20	20	20
Habitat Quantity & Access	Area of estuarine emergent marsh within each HUC	10	10	5
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.	10	10	10
Water Quality	% of reaches in HUC whose cumulative watershed % impervious surface is >8%	10	10	10
Water Quantity	Dam storage - mean annual flow: % of flowlines within each HUC i>= 30%	5	5	5
	Sum of weights	100	100	100

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

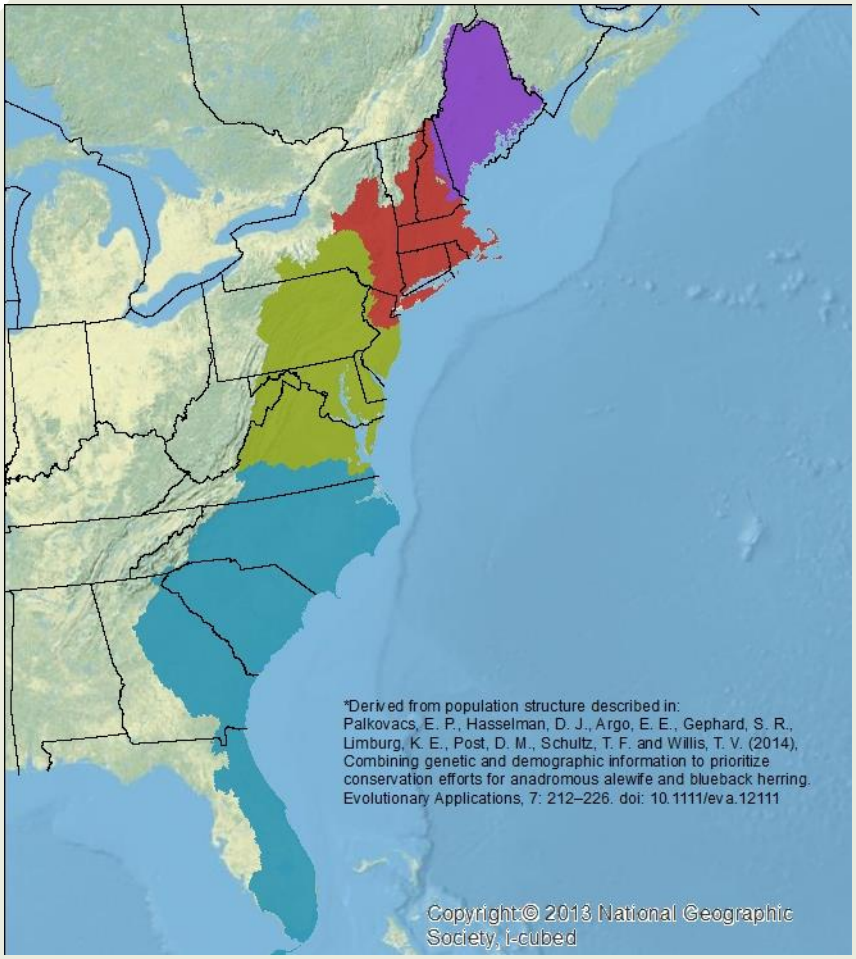
Example Output

- 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?



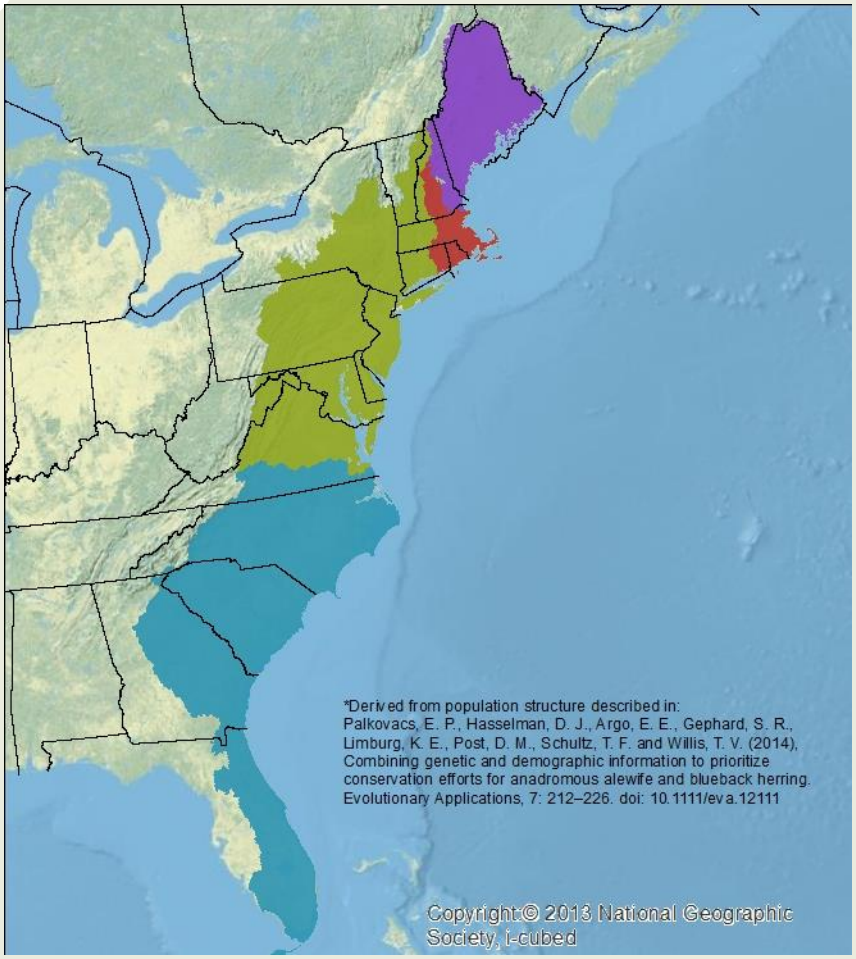
Stratification

- Alewife
- Derived from population structure described in:
  - Palkovacs, E. P. et al (2014)
  - Modified to align with our data



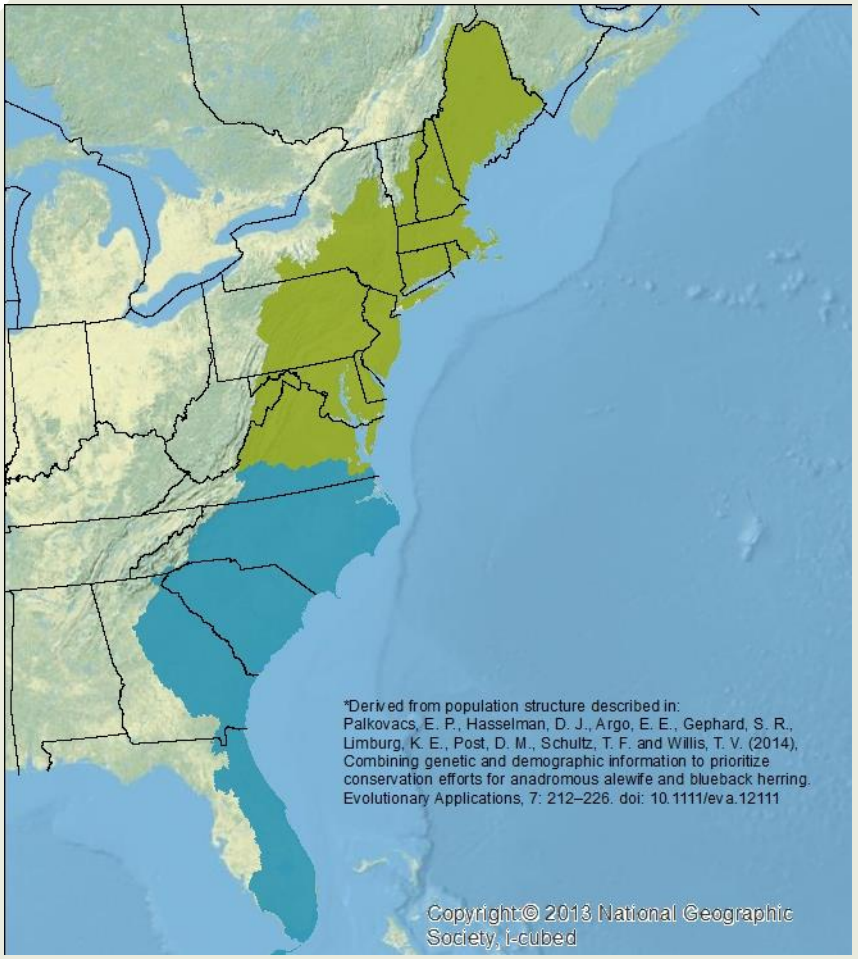
Stratification

- Blueback Herring
- Derived from population structure described in:
  - Palkovacs, E. P. et al (2014)
  - Modified to align with our data

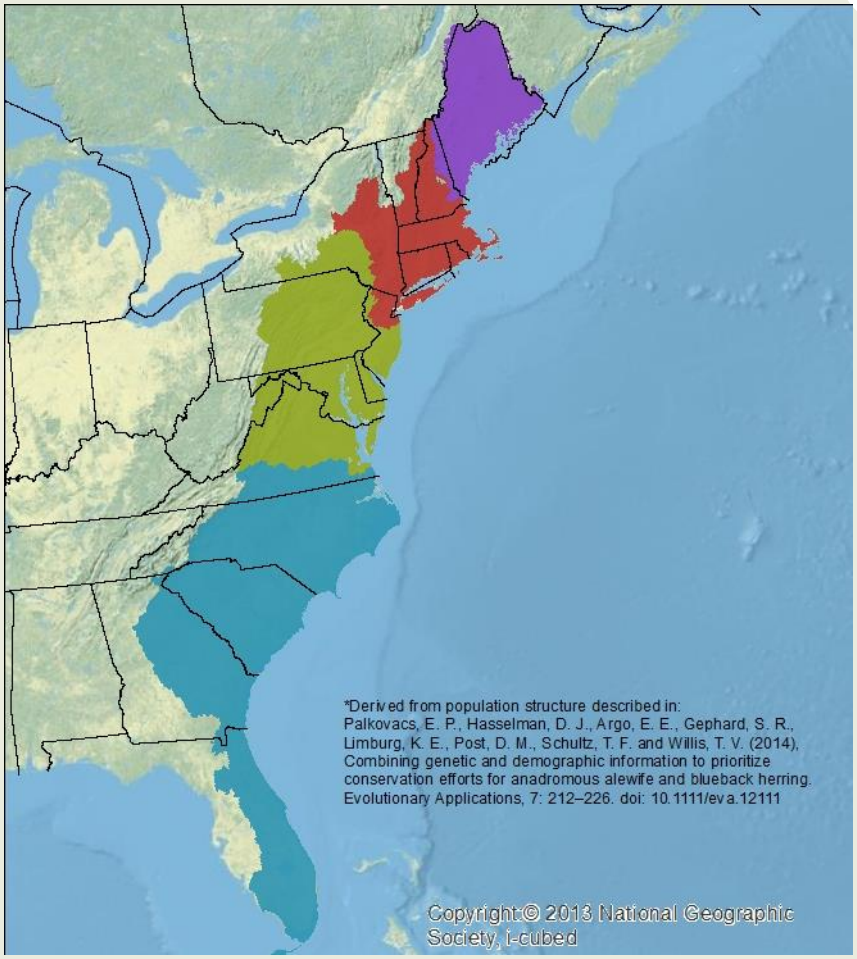


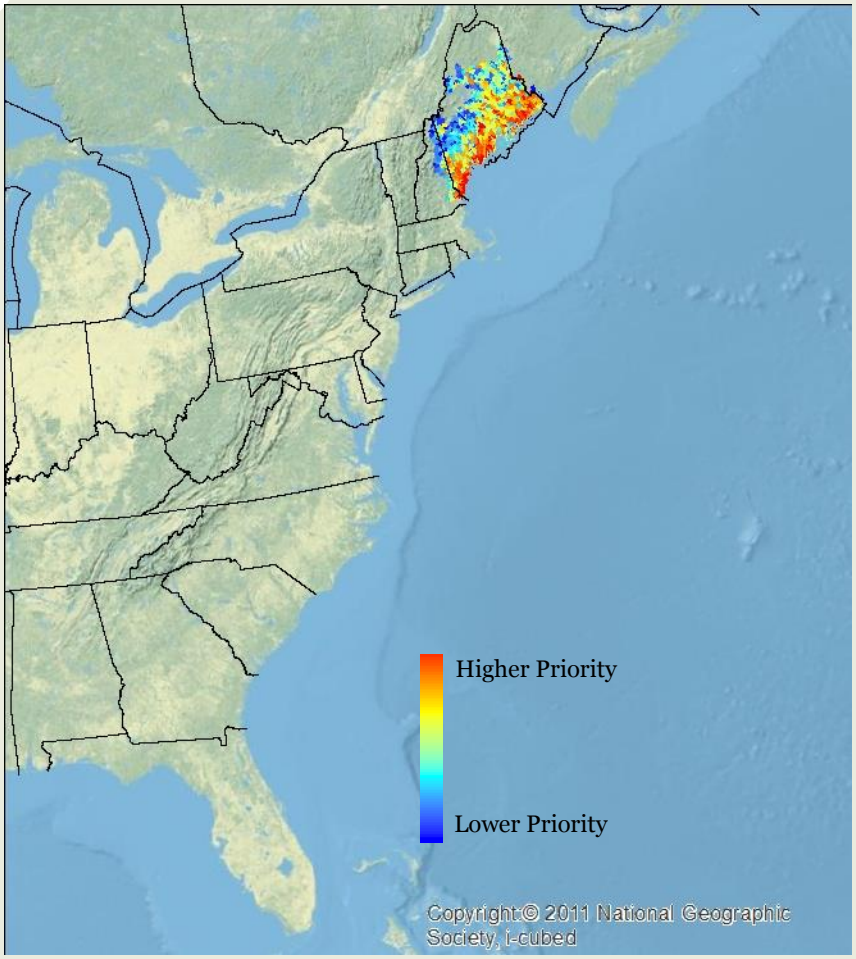
Stratification

- American shad
- Derived from population structure described in:
  - Hassleman, D.J., et al (2013)
  - Modified to align with our data

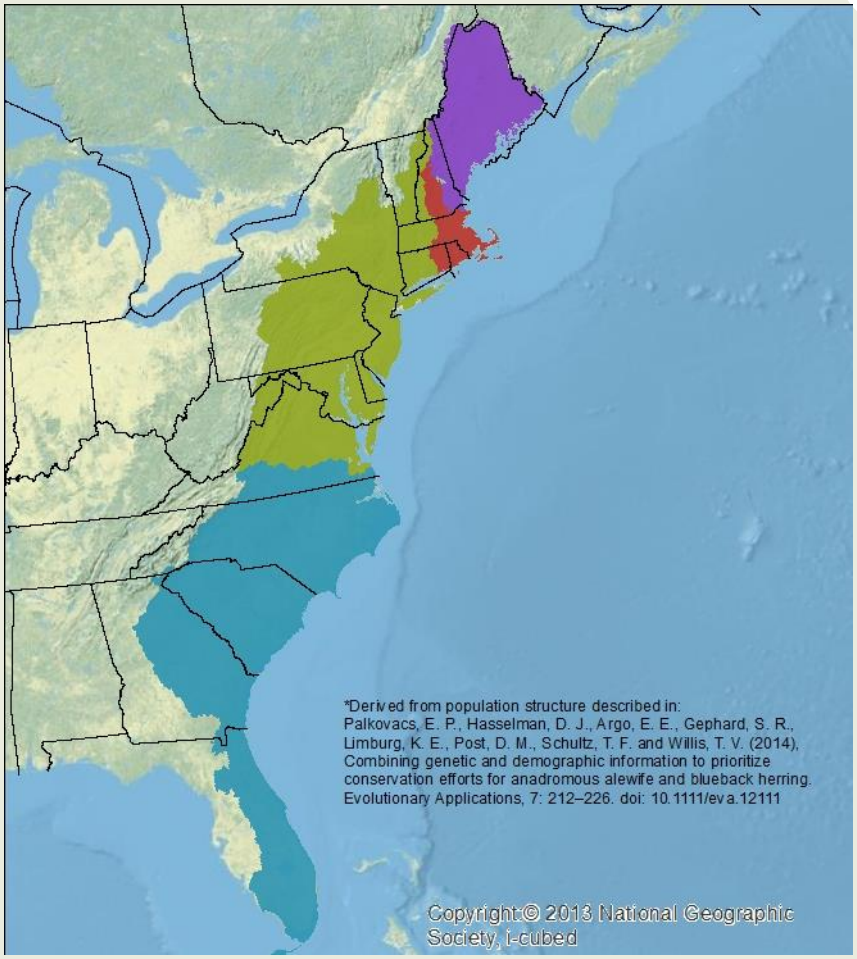


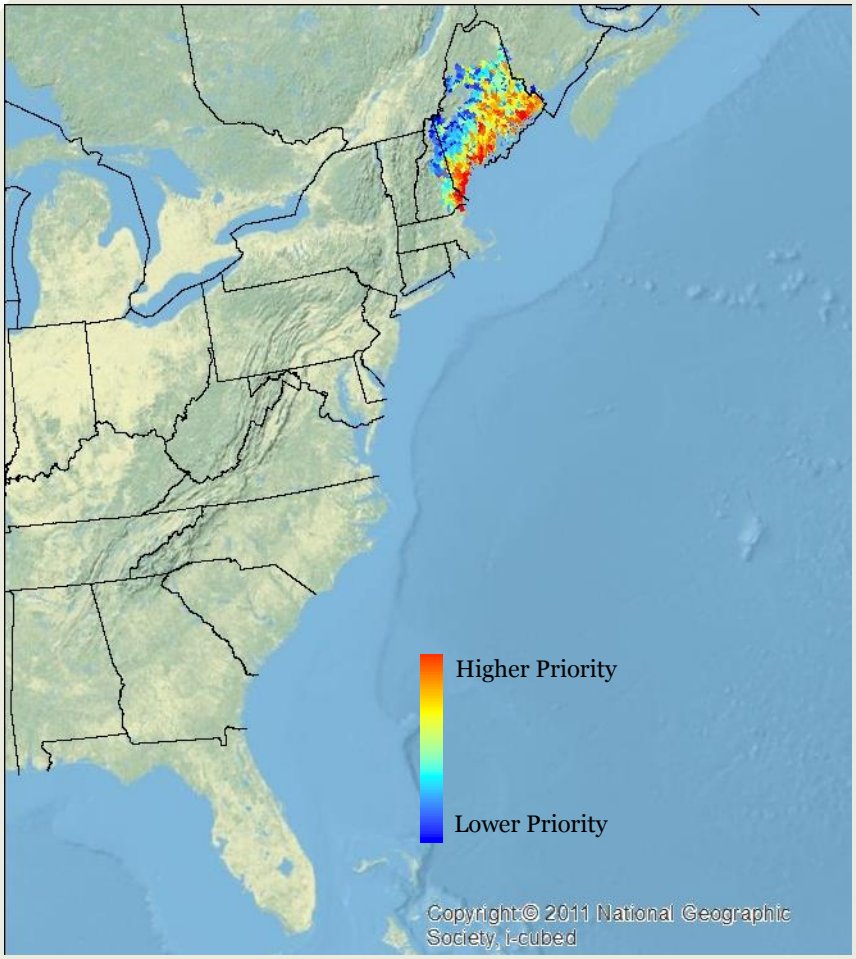
Results - Alewife



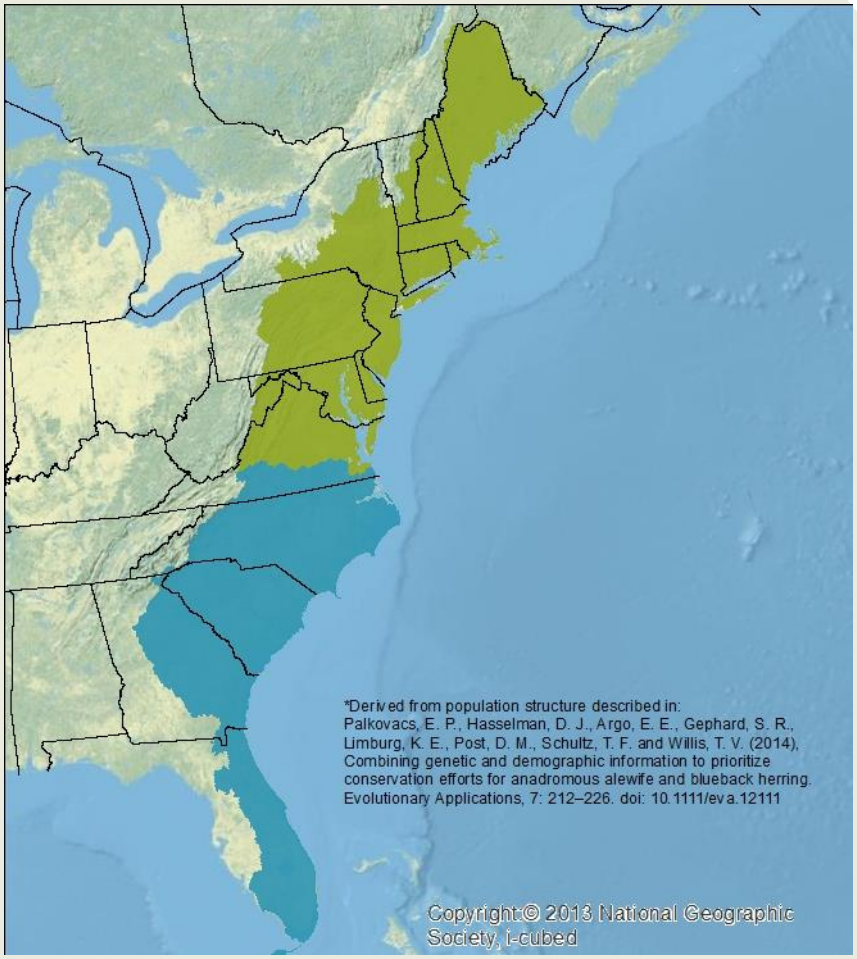


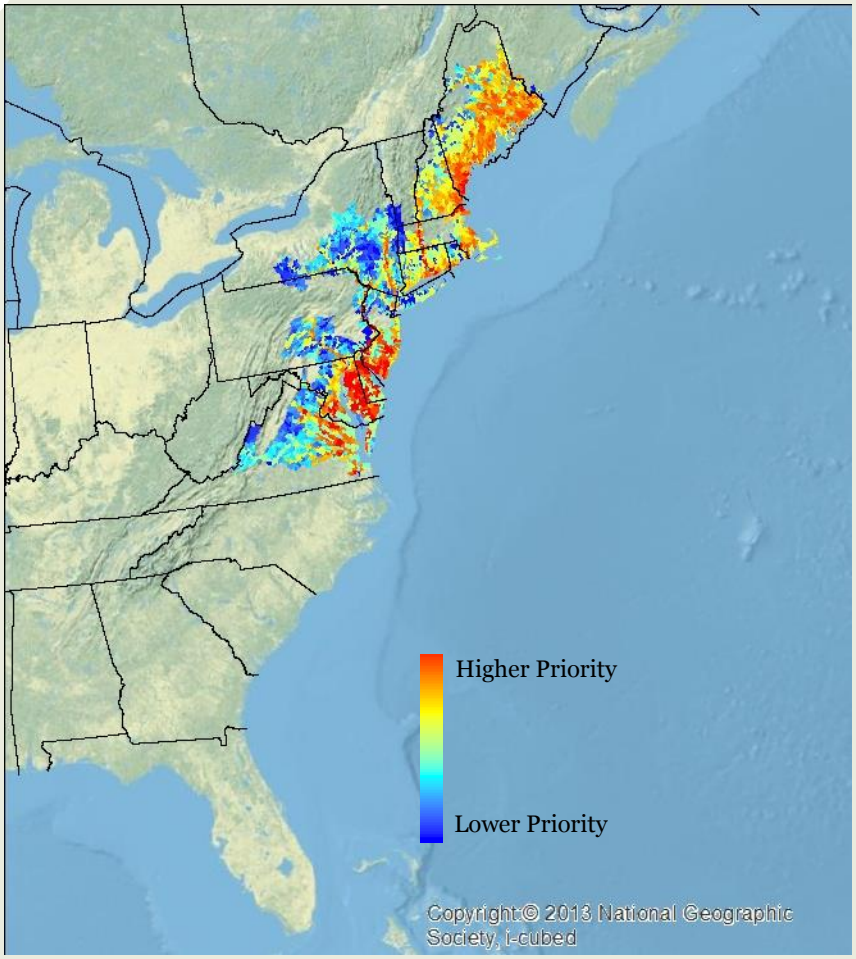
Results – Blueback - NNE





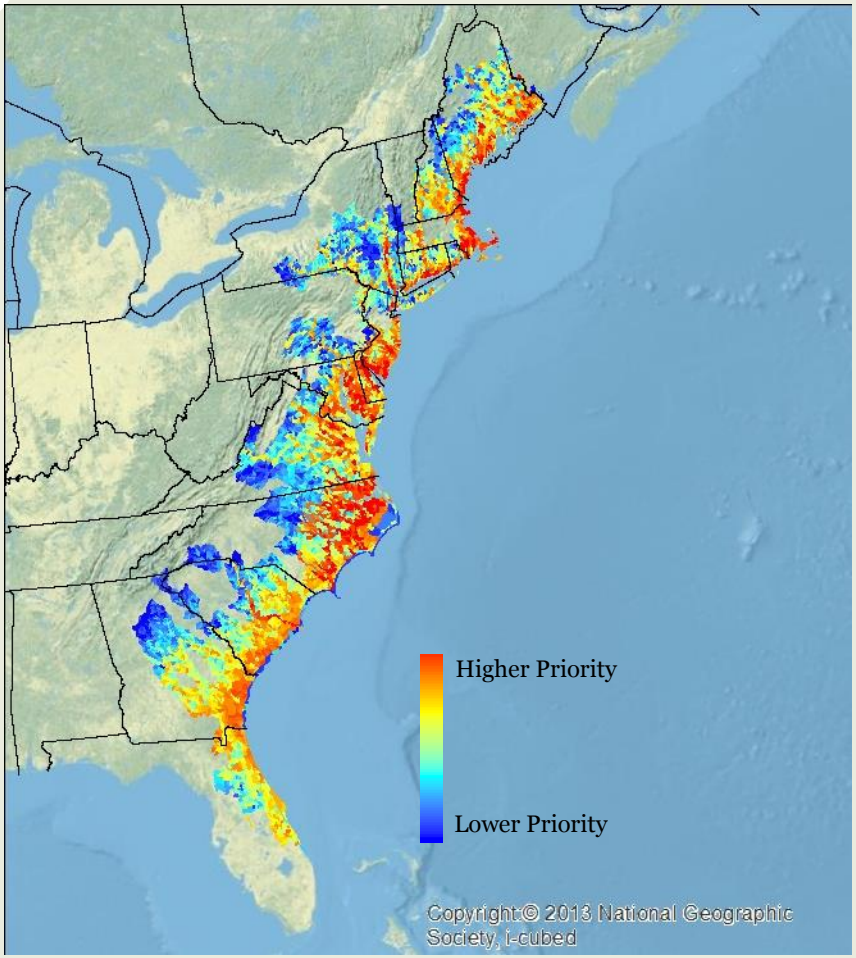
Results – American Shad - NE





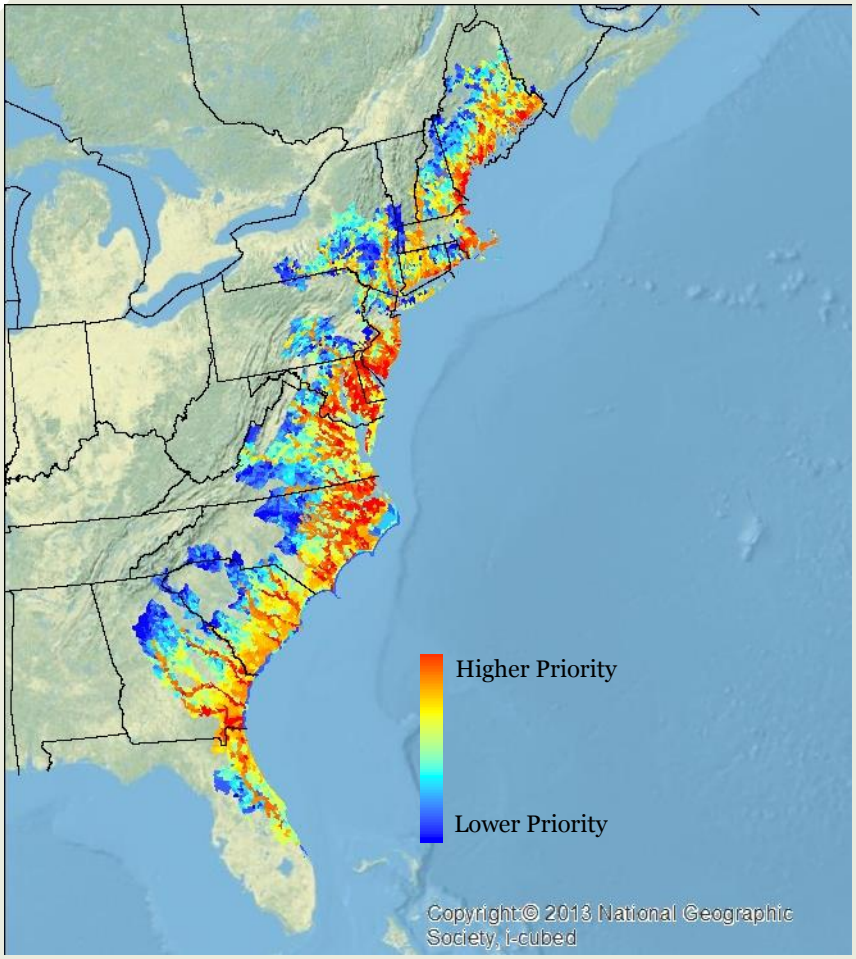
Results - Alewife

- Stratified by alewife genetic populations (Palkovacs et al)
- Binned into 5% Tiers
- Top Tier (red) = more restoration potential
- Lower Tiers (blue) = less restoration potential



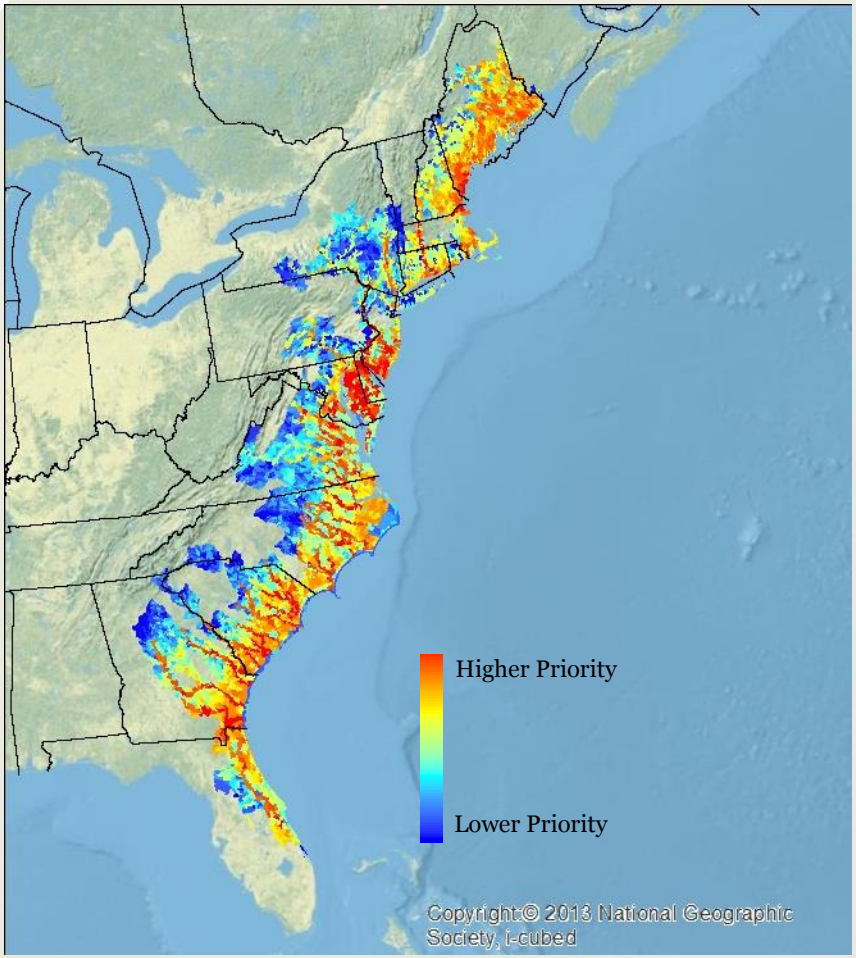
Results - Blueback

- 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

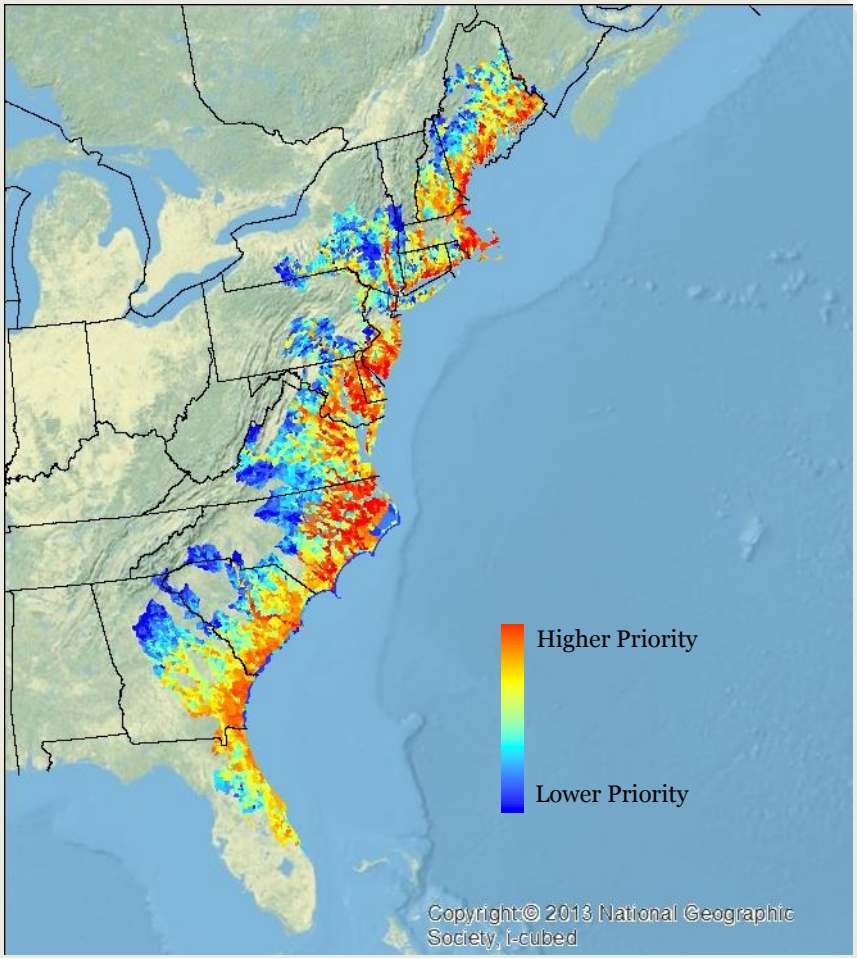


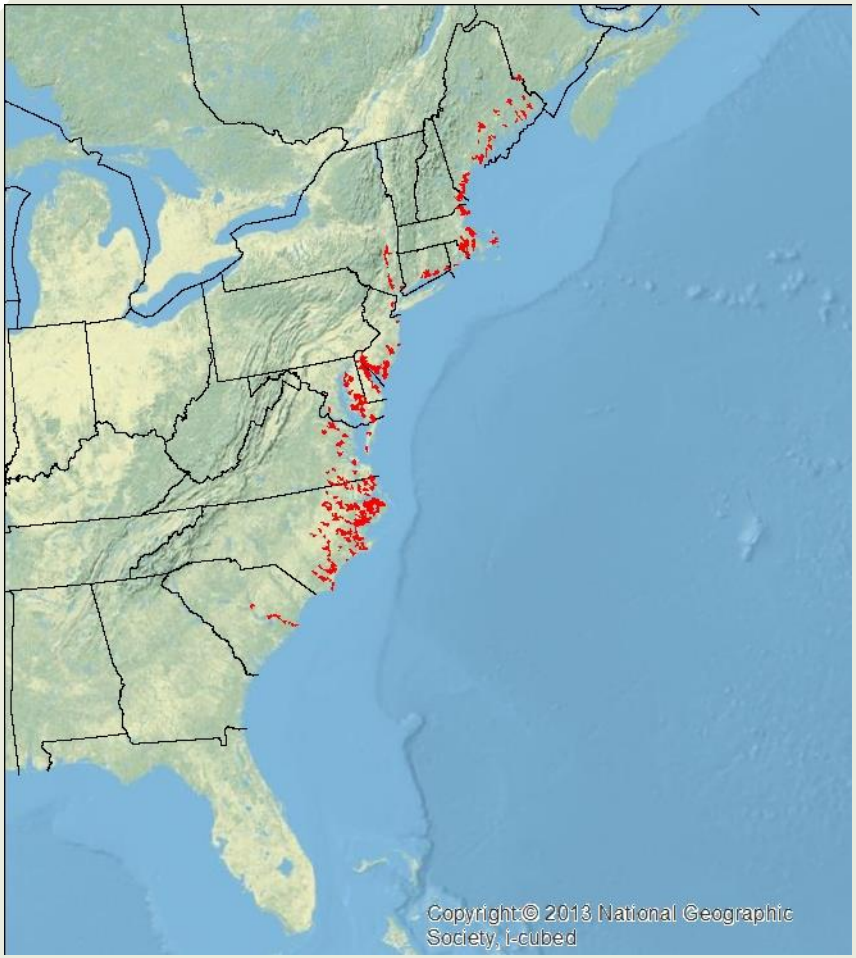
Results – American Shad

- 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

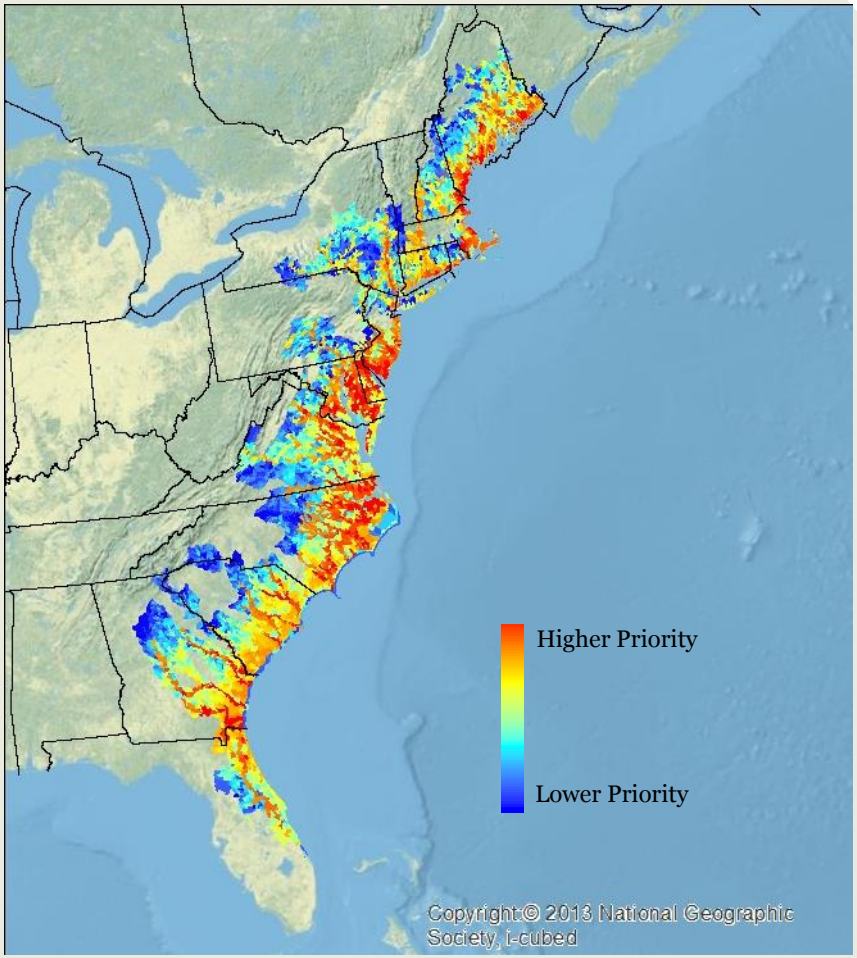


Results – Alewife – Top Tier (5% Bin)

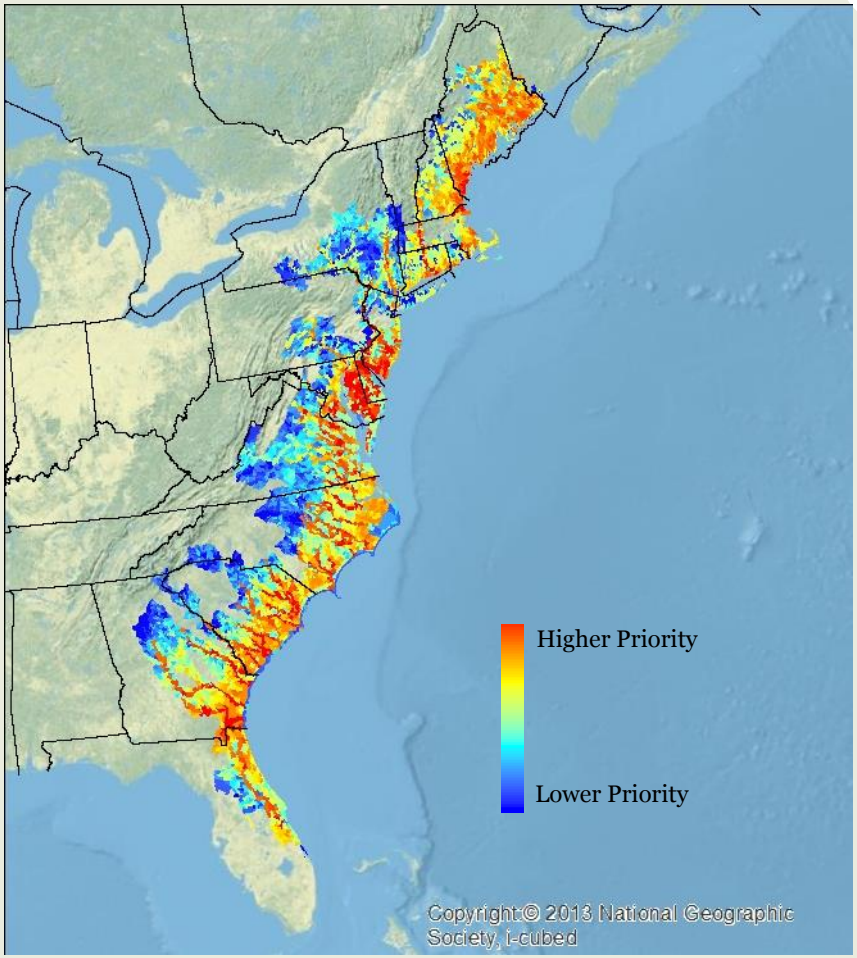




Results - Blueback –Top Tier (5% Bin)



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?

Erik Martin
emartin@tnc.org