

Science, Service, Stewardship

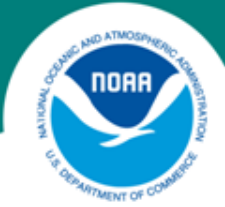


Improving Implementation and Effectiveness Monitoring at Dam Removal Sites:

Integration with project and program planning

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Presentation Map

- Consider why we monitor dam removal sites
- Review NOAA Restoration Center's (RC) relatively new monitoring program design and basic elements
- Present RC dam removal monitoring network in Northeast U.S.
- Questions



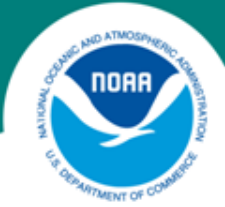
Acknowledgements

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 - *Tisa Shostik, Leah Mahan, Jason Lehto, Kerry Griffin, John Ferguson, David Landsman*
- NOAA's Northwest Fisheries Science Center
 - *George Pess*



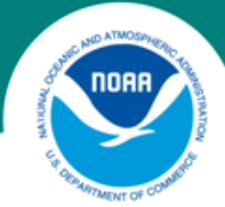
Why monitor dam removals?

- Without systematic monitoring our understanding of project effectiveness and outcomes is limited
- Our knowledge of process is also limited
- Practical difficulties:
 - evaluating performance of individual removals;
 - communicating project results to stakeholders/public;
 - anticipating effects of future dam removal projects;
 - assessing long-term ecological response of regional restoration efforts;
 - advancing restoration techniques;



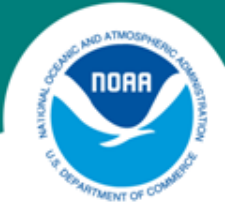
Why does NOAA RC monitor dam removals?

- NOAA Fisheries aims to improve diadromous fish habitat quality and access
- NOAA RC provides funding and technical assistance for dam removals
- Thus a direct interest in project outcomes:
 - implementation quality (short-term)
 - ecological effectiveness (long-term)



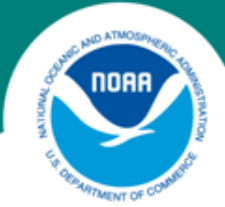
NOAA RC monitoring program: three organizing principles

1. Tiered monitoring
 - improves cost-effectiveness
 - evaluates short and long-term outcomes
2. Monitoring integrated with program planning
3. Partnerships to accomplish

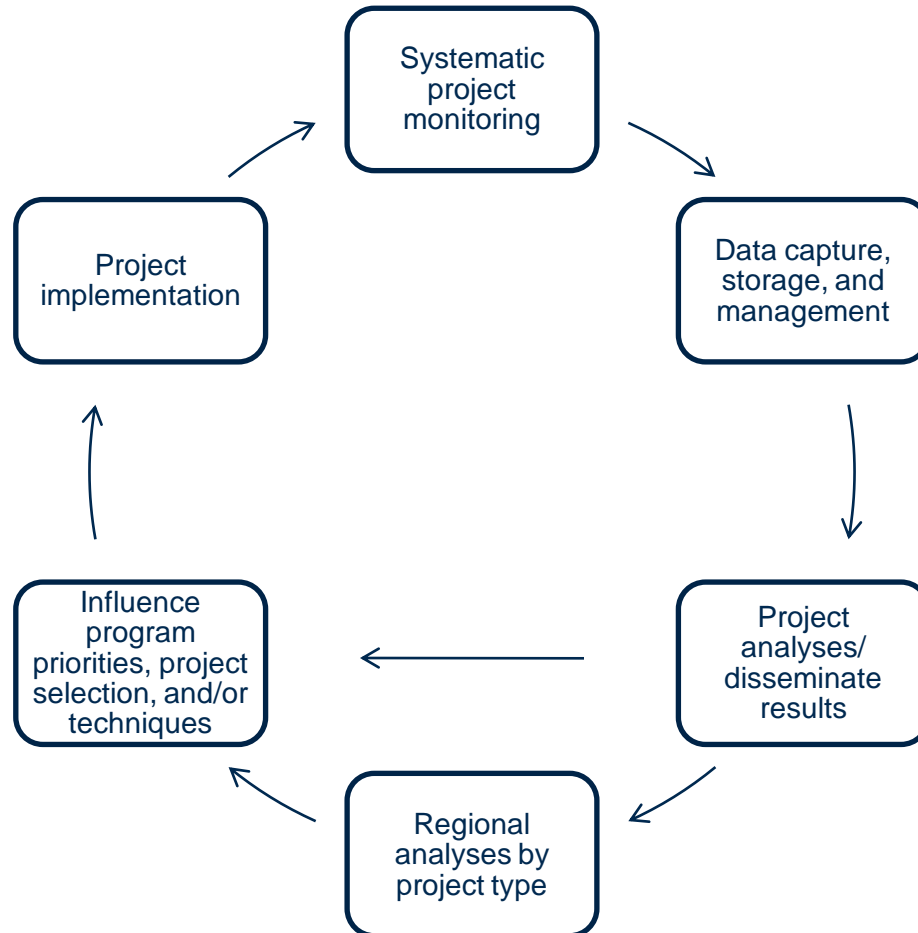


Principle 1: tiered monitoring

- Tier 1
 - *implementation monitoring*
 - short-term
 - provides basic project QA/QC
 - ALL PROJECTS
- Tier 2
 - *effectiveness monitoring*
 - long-term
 - addresses questions of regional importance
 - provides science base to advance restoration program
 - SELECTED PROJECTS



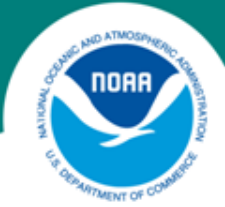
Principle 2: integrated monitoring





Principle 3: partnerships

- NOAA staff not accomplishing all integrated monitoring tasks
 - doing some tasks for some sites (e.g., field work, analyses, reporting/dissemination, etc.)
 - managing all of it closely
- Partnerships critical to accomplish all tasks
 - Tier 1: typically project partners
 - Tier 2: can be project partners, often not
- Tier 2 partners:
 - usually competitively bid
 - have **interest** and expertise in the applied research
 - reasonable capability to deploy to field site rapidly
 - ability to attract external funding



Tier 1 dam removal monitoring

- All NOAA RC-funded dam removals (since 2009)
- Primary ecological metrics:
 - site passability (as-built survey)
 - upstream presence/absence of target species
- Socioeconomic metrics too
- Before-After (BA) design
- Evaluated within 1 year post-project



Tier 2 dam removal monitoring

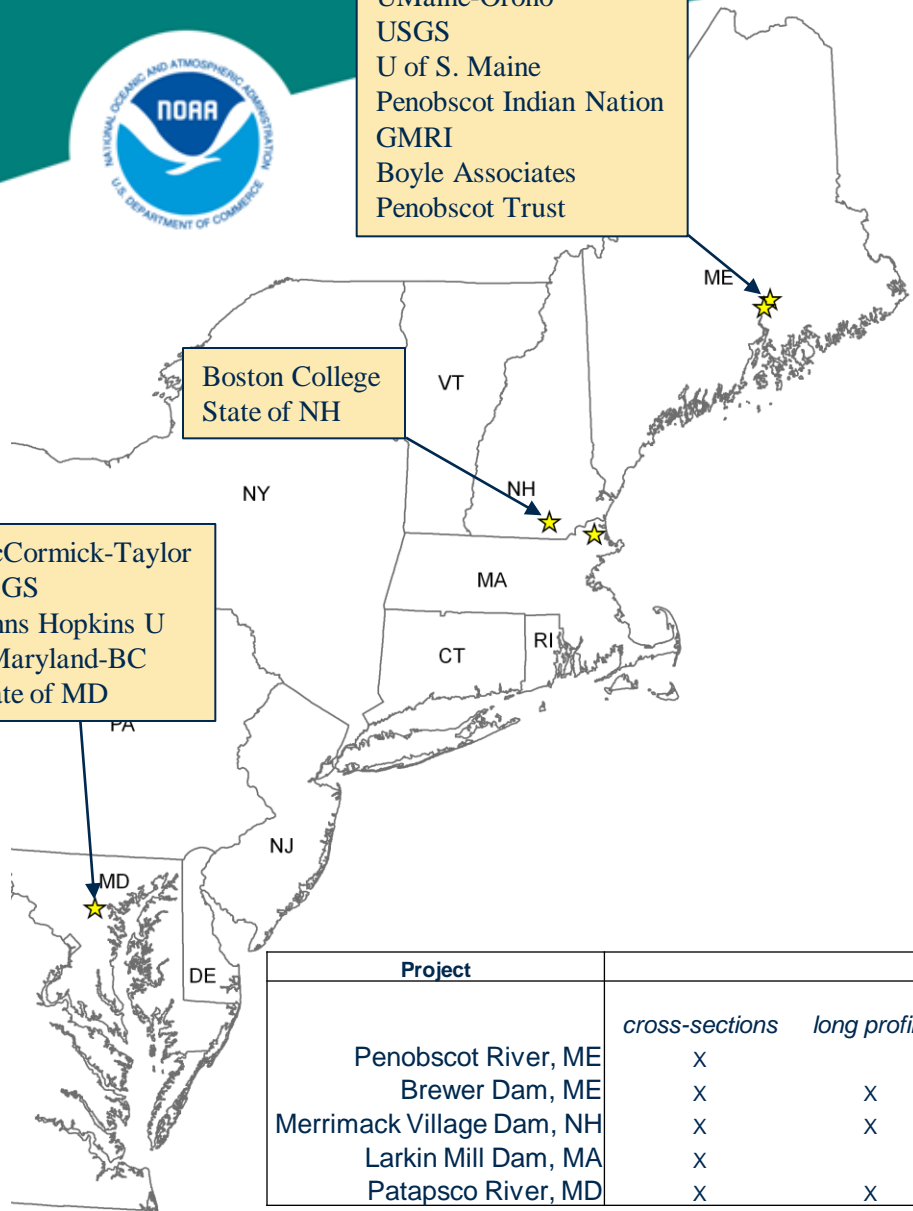
- Selected sites
- Question-driven to evaluate more sophisticated ecologic recovery and/or implementation issues
- Standard metrics and methods—some flexibility for site requirements
- Before-After, Control Impact (BACI) design
- Long-term data collection (i.e., > 5 years post-project)



UMaine-Orono
USGS
U of S. Maine
Penobscot Indian Nation
GMRI
Boyle Associates
Penobscot Trust

Boston College
State of NH

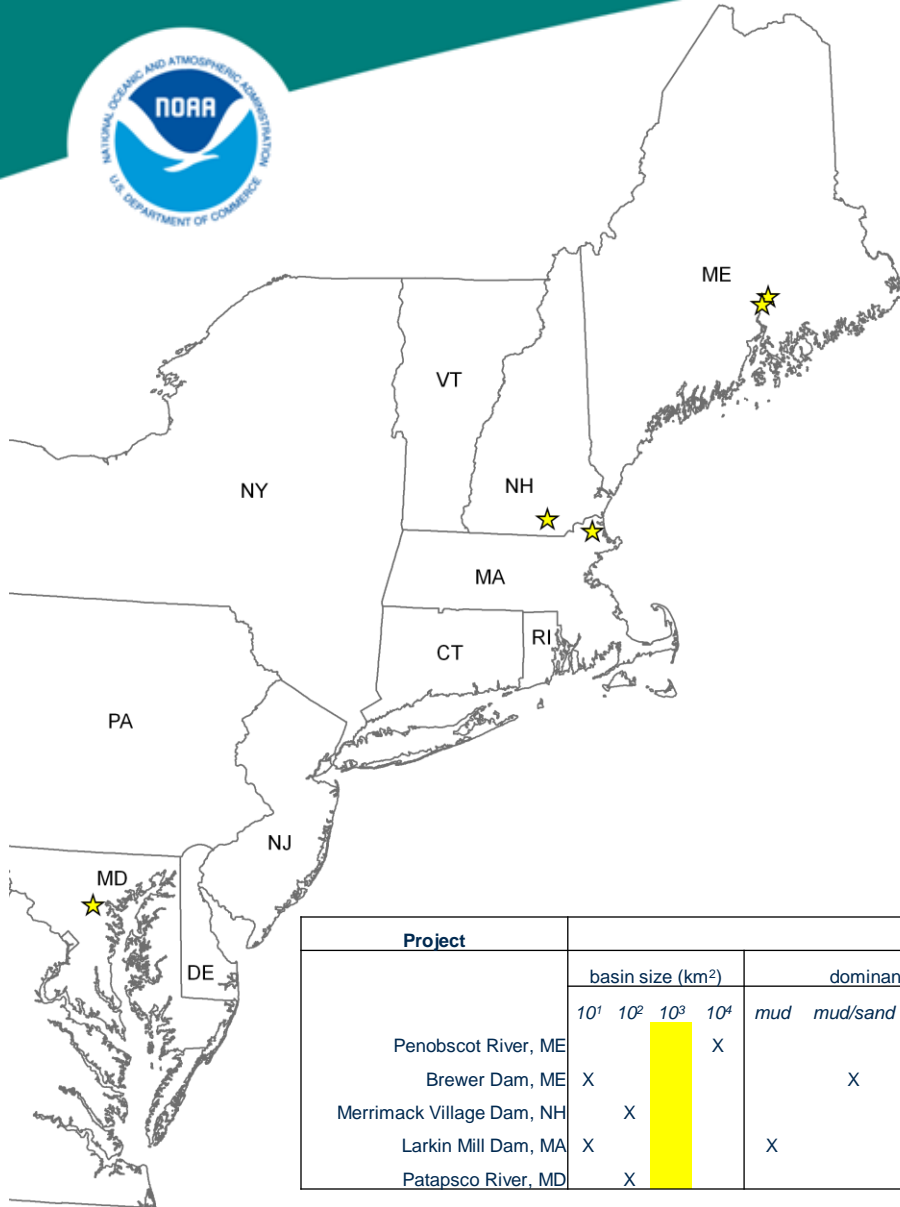
McCormick-Taylor
USGS
Johns Hopkins U
UMaryland-BC
State of MD



Northeast Region Tier 2 sites: dam removal

- 5 sites to date
- Evaluating parameters recommended in regional monitoring guidance (*Collins et al., 2007*)

Project	Parameter							
	<i>cross-sections</i>	<i>long profile</i>	<i>grain size</i>	<i>photo points</i>	<i>vegetation</i>	<i>WQ</i>	<i>macroinvertebrates</i>	<i>fish</i>
Penobscot River, ME	X		X	X	X	X	X	X
Brewer Dam, ME	X	X	X	X		X		X
Merrimack Village Dam, NH	X	X	X	X	X	X	X	X
Larkin Mill Dam, MA	X		X	X				
Patapsco River, MD	X	X	X	X		X	X	X



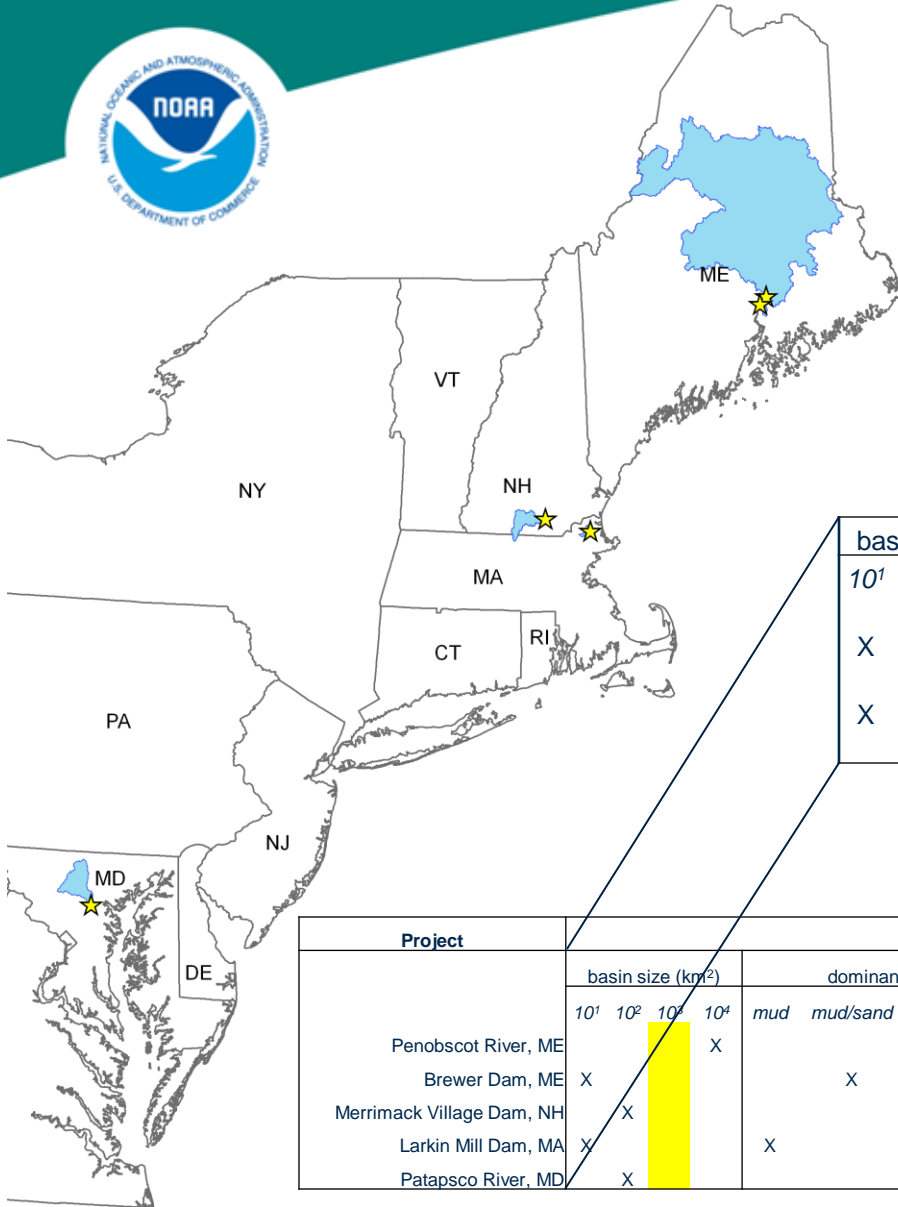
Northeast Region Tier 2 sites: dam removal

- Chosen to answer ecological recovery or implementation-oriented questions of interest
- Chosen to represent regional fluvial habitat variability

Project	Fluvial Habitat Variability																							
	basin size (km ²)				dominant impounded sediment					reach gradient (%)				physiography			glaciated		climate					
	10 ¹	10 ²	10 ³	10 ⁴	mud	mud/sand	sand	sand/gravel	gravel	<<1	<1	1-2	2-5	PU	PL	CP	NU	SL	HV	Y	N	Dfb	Dfa	Cfa
Penobscot River, ME			X	X					X	X	X		X	X	X	X		X	X			X		
Brewer Dam, ME	X					X					X						X			X			X	
Merrimack Village Dam, NH		X					X				X	X					X			X			X	
Larkin Mill Dam, MA	X				X						X						X			X			X	
Patapsco River, MD		X							X		X			X	X	X	X	X		X				X



Northeast Region Tier 2 sites: dam removal

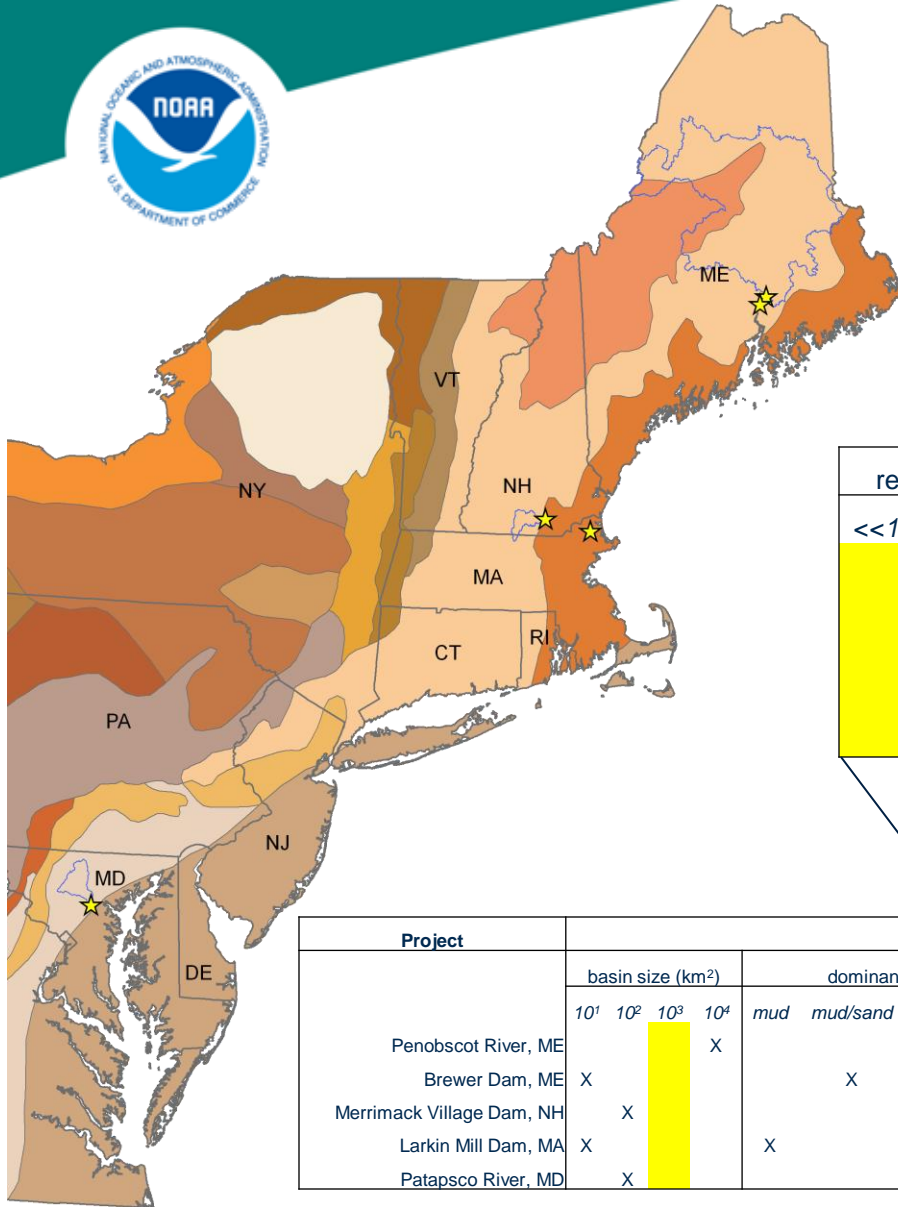


basin size (km ²)				dominant impounded sediment				
10 ¹	10 ²	10 ³	10 ⁴	mud	mud/sand	sand	sand/gravel	gravel
			X					X
X					X			
X	X					X		
	X			X				X

Project	Fluvial Habitat Variability																							
	basin size (km ²)				dominant impounded sediment					reach gradient (%)				physiography			glaciated		climate					
	10 ¹	10 ²	10 ³	10 ⁴	mud	mud/sand	sand	sand/gravel	gravel	<<1	<1	1-2	2-5	PU	PL	CP	NU	SL	HV	Y	N	Dfb	Dfa	Cfa
Penobscot River, ME				X					X		X						X		X			X		
Brewer Dam, ME	X					X					X						X			X			X	
Merrimack Village Dam, NH		X					X				X	X					X			X			X	
Larkin Mill Dam, MA	X				X						X						X			X			X	
Patapsco River, MD	X							X			X			X							X			

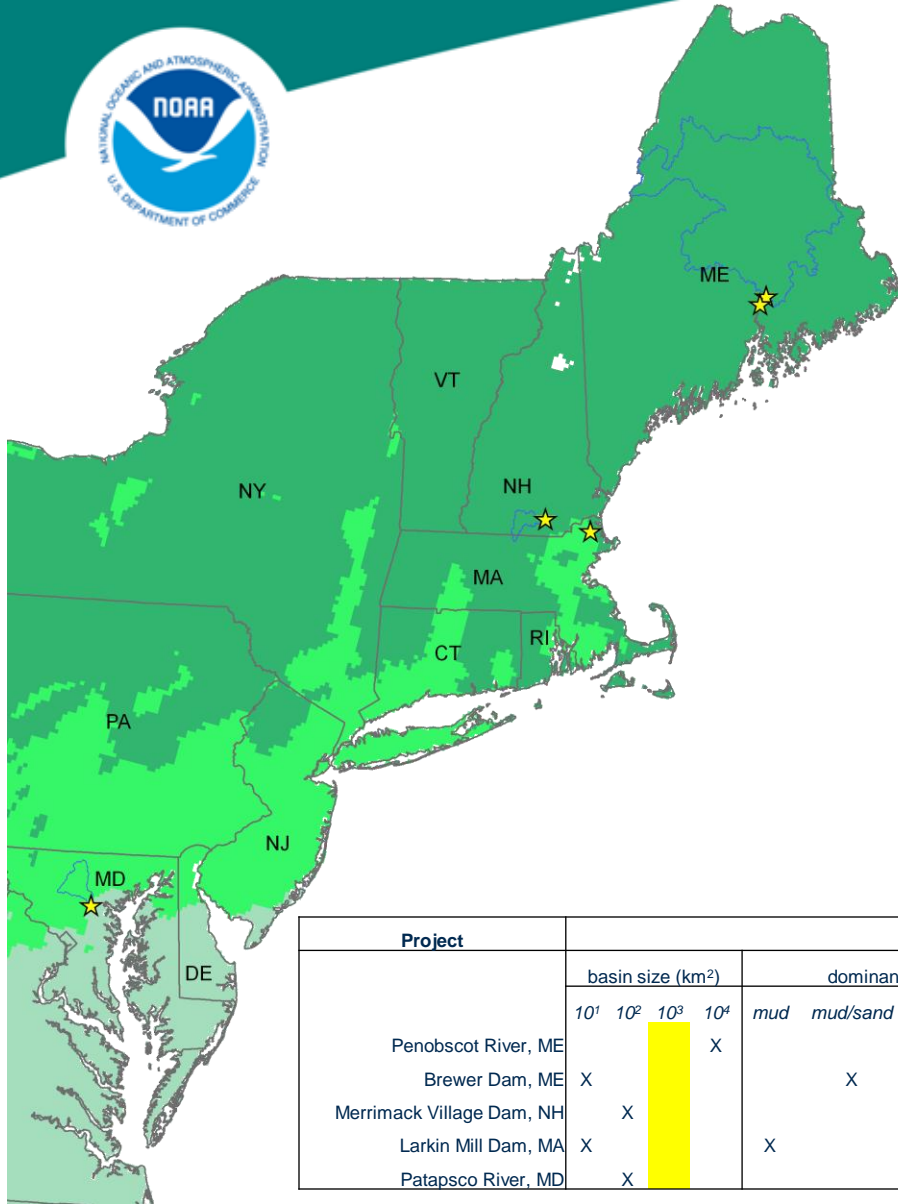


Northeast Region Tier 2 sites: dam removal



reach gradient (%)				physiography					glaciated		
<<1	<1	1-2	2-5	PU	PL	CP	NU	SL	HV	Y	N
	X						X			X	
	X						X			X	
	X	X						X		X	
	X							X		X	
	X			X							X

Project	Fluvial Habitat Variability																							
	basin size (km ²)				dominant impounded sediment					reach gradient (%)				physiography					glaciated		climate			
	10 ¹	10 ²	10 ³	10 ⁴	mud	mud/sand	sand	sand/gravel	gravel	<<1	<1	1-2	2-5	PU	PL	CP	NU	SL	HV	Y	N	Dfb	Dfa	Cfa
Penobscot River, ME				X					X		X						X			X			X	
Brewer Dam, ME	X					X					X						X			X			X	
Merrimack Village Dam, NH		X					X				X	X					X			X			X	
Larkin Mill Dam, MA	X				X						X						X			X			X	
Patapsco River, MD		X						X			X			X							X			X



Northeast Region Tier 2 sites: dam removal

climate		
<i>Dfb</i>	<i>Dfa</i>	<i>Cfa</i>
X		
X		
X		
	X	
		X

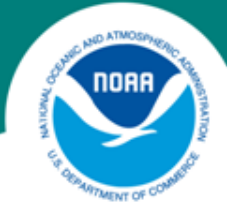
Project	Fluvial Habitat Variability																							
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Penobscot River, ME			X	X					X	X				X			X		X			X		
Brewer Dam, ME	X					X				X						X			X			X		
Merrimack Village Dam, NH		X					X			X	X					X			X			X		
Larkin Mill Dam, MA	X				X					X						X			X			X		
Patapsco River, MD		X						X		X			X	X					X			X		X



Further Work

- Improve Tier 2 network's representation of regional habitat variability
- Formalize a process for identifying research questions of programmatic importance
- Strengthen many components of the integrated monitoring process

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Questions?