

Penobscot River Restoration IBI Study Background and Status Update



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Biological criteria to evaluate restoration projects:



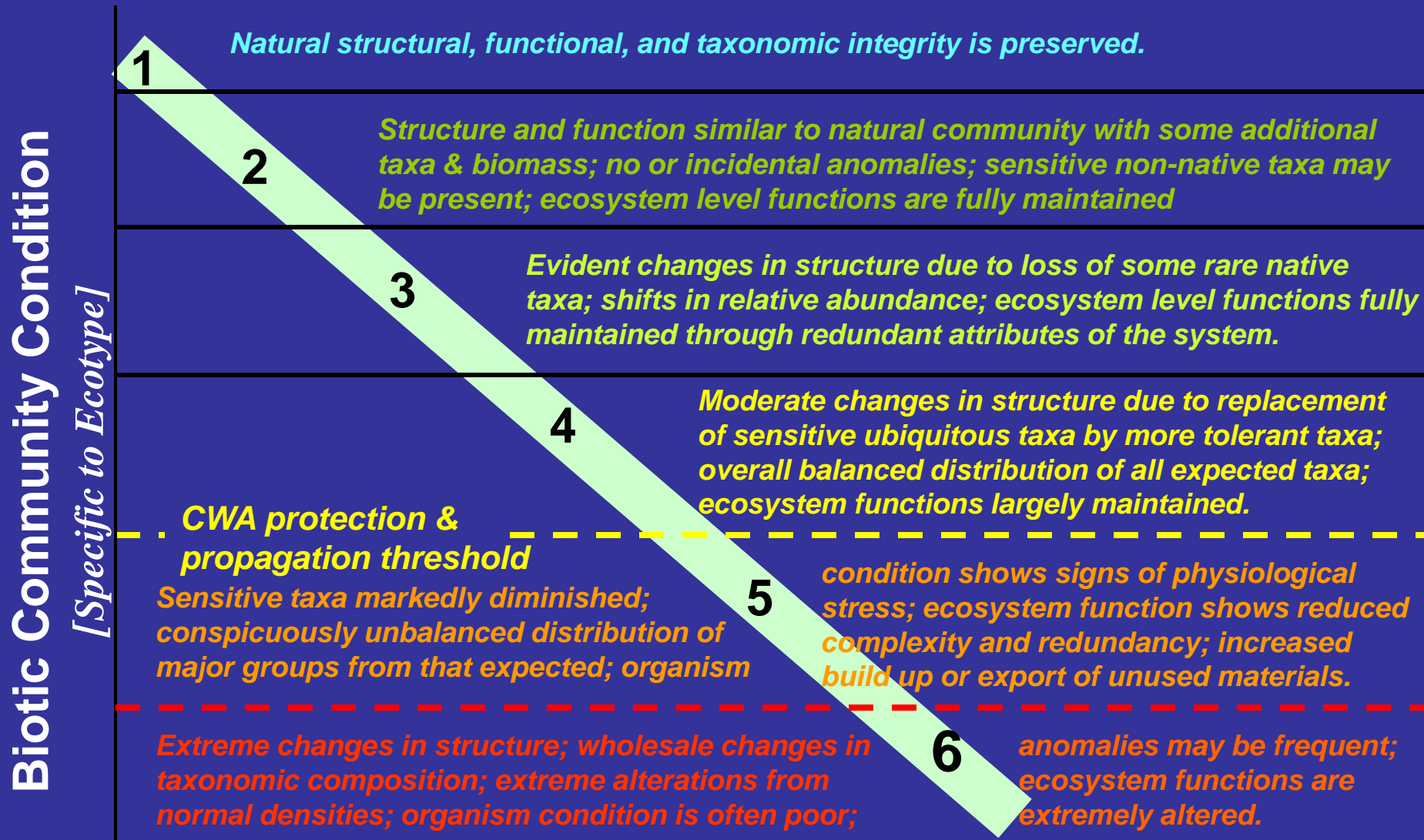
August 2003 after Restoration (Before Planting)



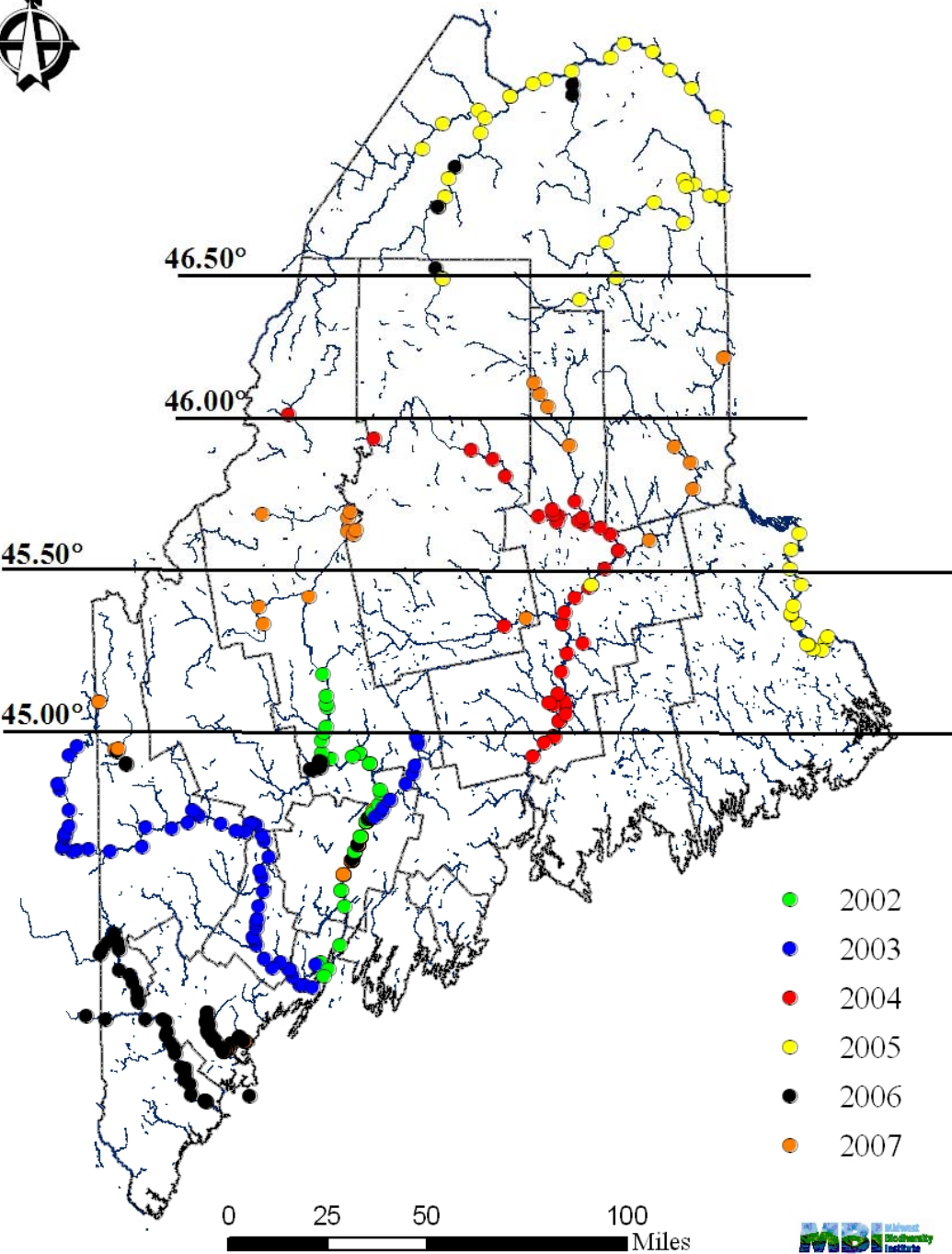
- *Water quality*
- *Riparian buffers*
- *Habitat connectivity/dam removal*
- *Habitat restoration*

Bio-Condition Gradient Conceptual Model

(Davies and Jackson, 2006)



LOW ——— **Human Disturbance Gradient** ———→ **HIGH**



Maine-wide IBI Program Over 300 sampling sites 2002-2007

Major watersheds:

- **Penobscot 2004 & 2007**
- *Kennebec*
- *Androscoggin*
- *Saco*
- *St Croix*
- *St John/Allagash*
- *Presumpscot*

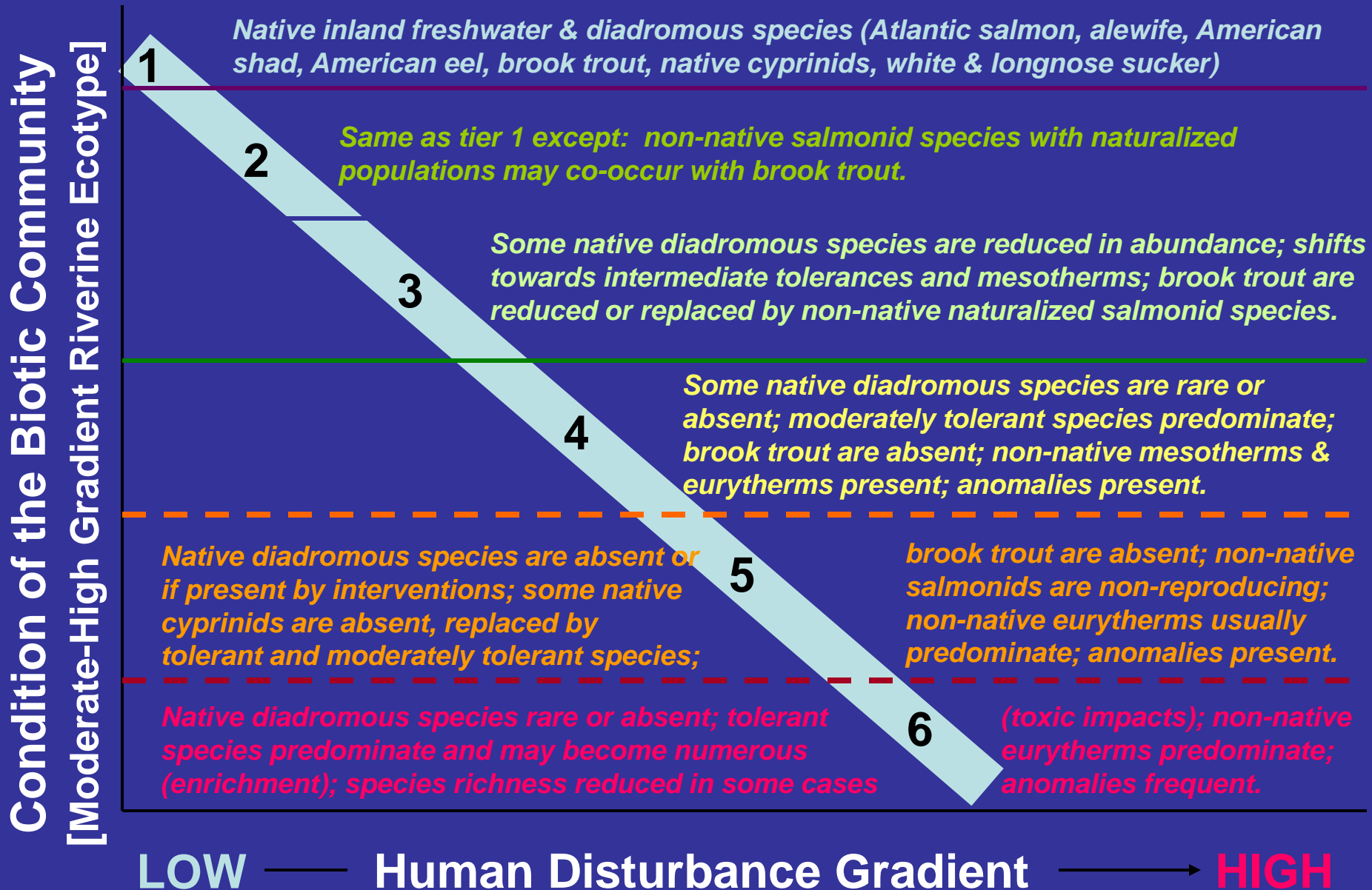


IBI model for cold water assemblages

Currently developed; undergoing peer review



Conceptual Model: Maine Coldwater Rivers



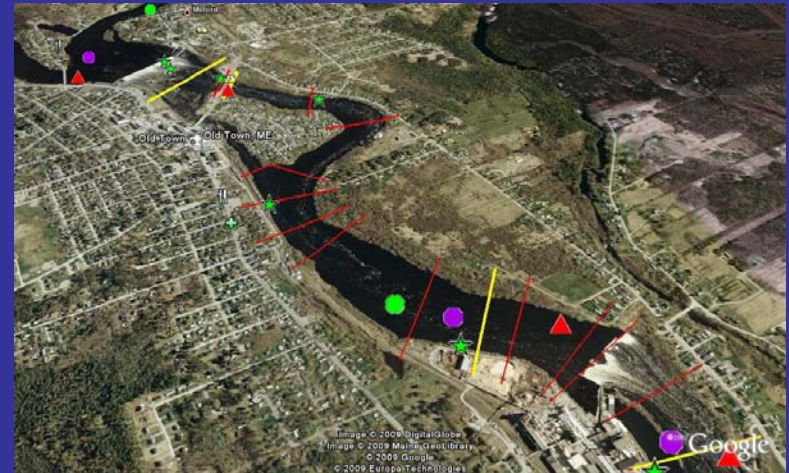
• Upper River & tributaries

- Oligotrophic
- Cold water (brook trout/salmon) ecosystem
- Forested
- high gradient geomorphology
- Relatively pristine



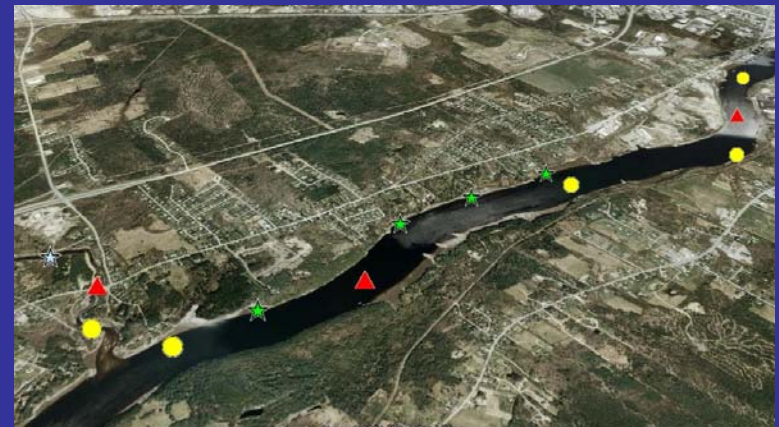
• Middle river

- Mesotrophic
- warmwater ecosystem
- Alosid and eel nursery habitat
- Low gradient / floodplain geomorphology
- Urban – industrial-hydropower
- Large tributaries



• Tidal-Freshwater river

- Mesotrophic
- Freshwater & estuarial ecosystem
- Coastal lowland geomorphology
- Rural





Warm water and tidal freshwater assemblages

Still require further Biological Condition Gradient calibration



Penobscot IBI Goals

- Customize methodology for the Penobscot Restoration
- Collect data for IBI metrics & further index development
- Collect data to document ecological response to restoration
- Collateral support of other studies and management

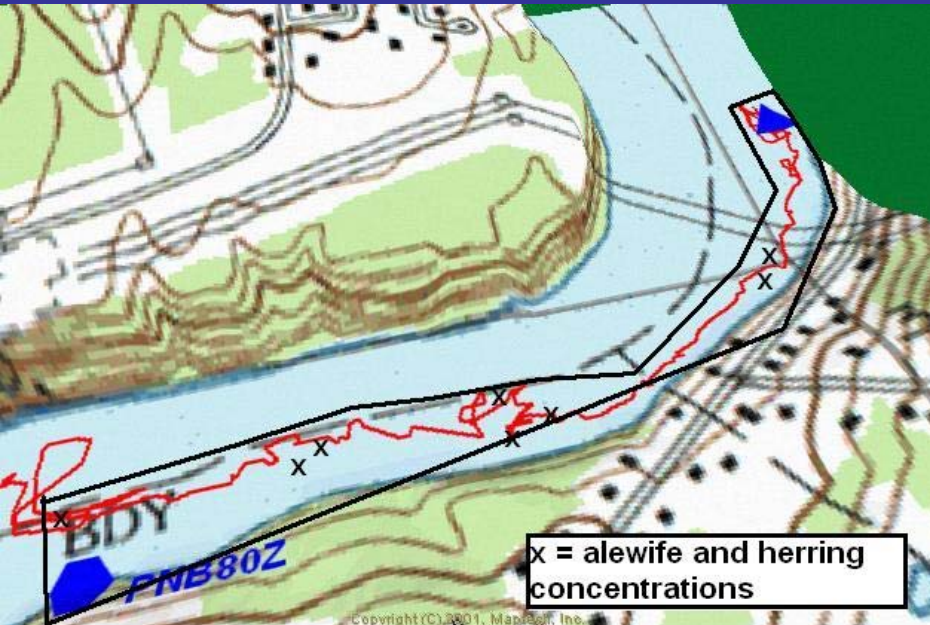


Sampling Methods

An aerial photograph of a river with a rocky bed. A small motorboat is positioned in the middle of the river, with three people on board. One person is using a long-handled net to sample the water. The boat is equipped with various gear, including a large bucket and a motor. The surrounding landscape is rugged with large rocks and some vegetation.

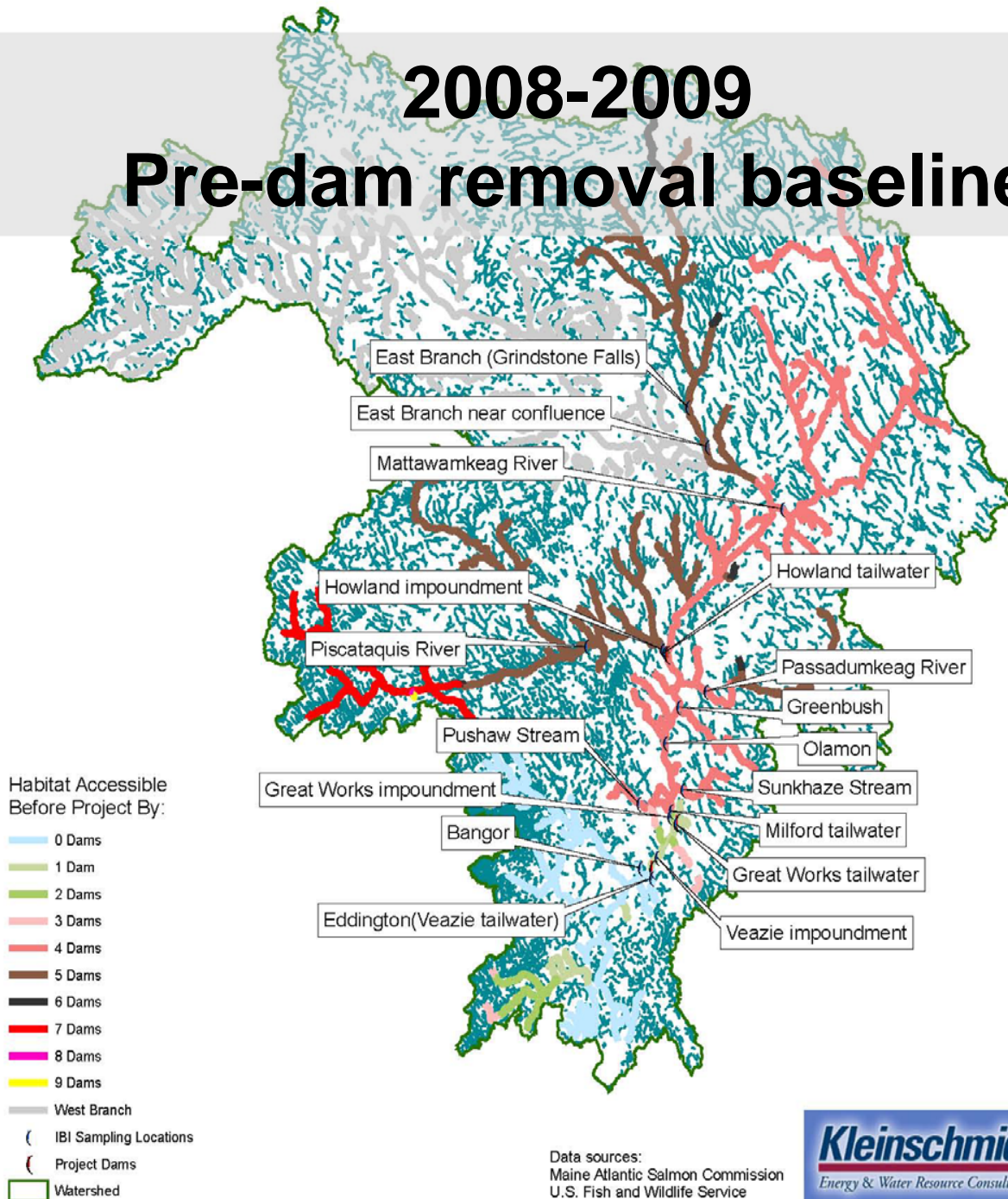
Standardized Approach:

- Highly mobile, cost-effective watershed-scale coverage
- Pulsed D.C. boat electrofishing – *minimizes gear bias*
- Custom built survey craft adapted to Maine river conditions
- Consistently repeatable sampling
- Benchmarked sampling stations



- Sampling guided by a QAPP
- Species-rich habitat types
- 1,000 m-long stations
- Boat maneuvered to thoroughly sample each site
- Geo-referenced sample site location and sample track
- Late spring and summer
- Fish identified to species and lifestage, enumerated, and weighed

2008-2009 Pre-dam removal baseline



Data sources:
 Maine Atlantic Salmon Commission
 U.S. Fish and Wildlife Service

Status

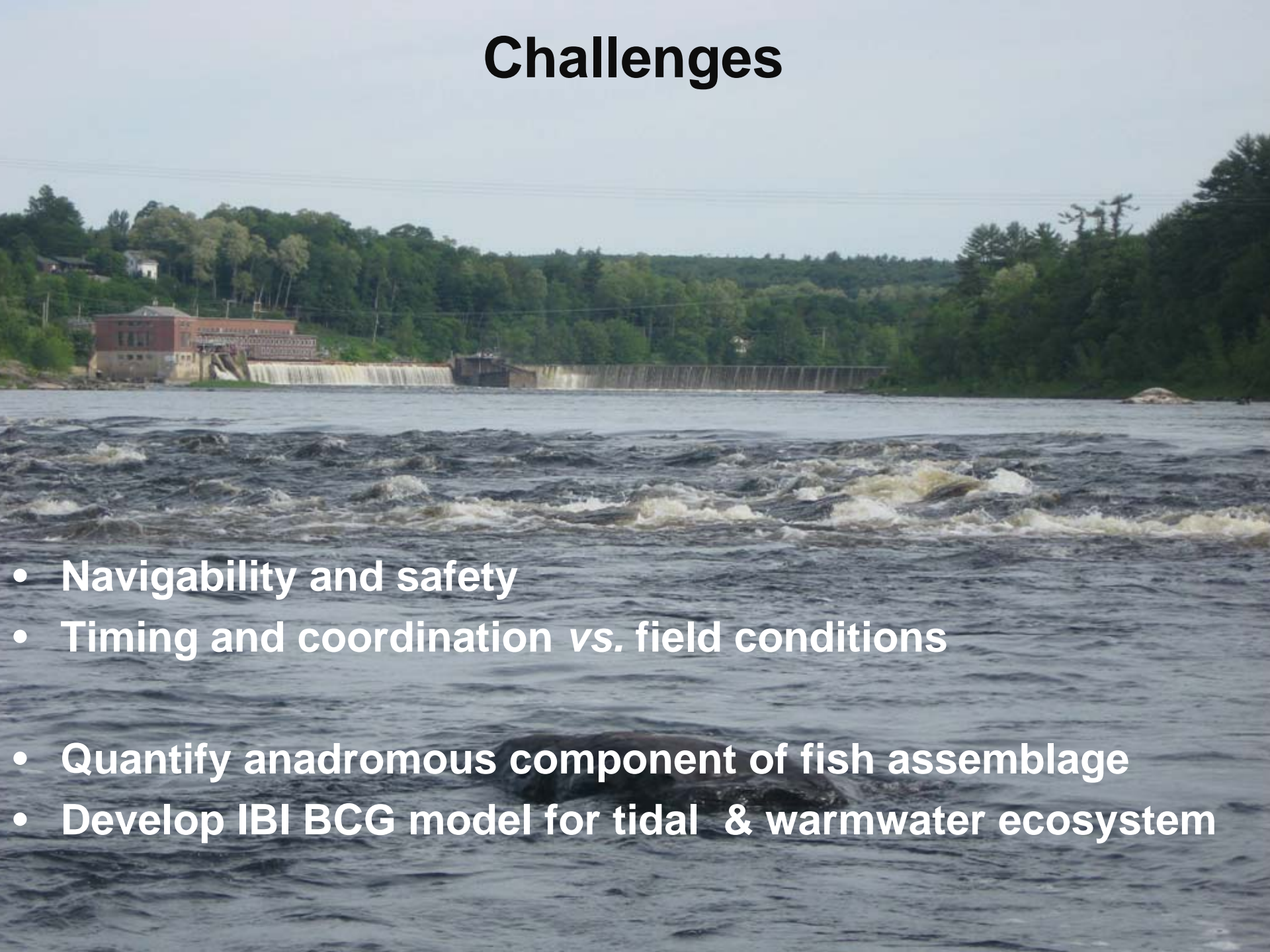
- **Methodology Refinement:**


- Tributary vs. mainstem sampling
- Spring and fall survey timing
- Diurnal and tide stage issues below Veazie
- Cathode and anode configuration
- Site access

- **Data Collection**

- 19 permanent monitoring stations established (2 added in 2009)
- Data gathered successfully at each station
- Collateral support for other research & management
 - *Anadromous population genetics*
 - *Stable isotopes analysis*
 - *Size spectral analysis*
 - *Spatial distribution of American eel*
 - *Radio tagging of American shad*
 - *Monitoring for invasive species*
- Abundance and distribution of restoration and invasive species

Challenges

- 
- **Navigability and safety**
 - **Timing and coordination vs. field conditions**
 - **Quantify anadromous component of fish assemblage**
 - **Develop IBI BCG model for tidal & warmwater ecosystem**



Baseline observations thus far

- **Diadromous fish**
 - *Relict populations consistently detectable*
 - *Most abundant below Veazie; but detectable throughout study area*
- **Greatest bio-productivity and diversity**
 - *below Veazie*
 - *in fluvial vs. impounded habitats*
- **Constraints evident due to existing habitat fragmentation**
- **Non-indigenous species**
 - *smallmouth bass widespread*
 - *largemouth bass increasingly common*
 - *no northern pike (yet)*

FUNDING AND COLLABORATION

- *The Nature Conservancy*
- *NOAA Fisheries*
- *Penobscot River Restoration Trust*
- *US EPA*
- *ARRA*



- Penobscot Indian Nation
- Maine DMR
- Maine DIFW
- University of Maine
- DSSRN
- Midwest Biodiversity Institute





Questions ?

Thank You!