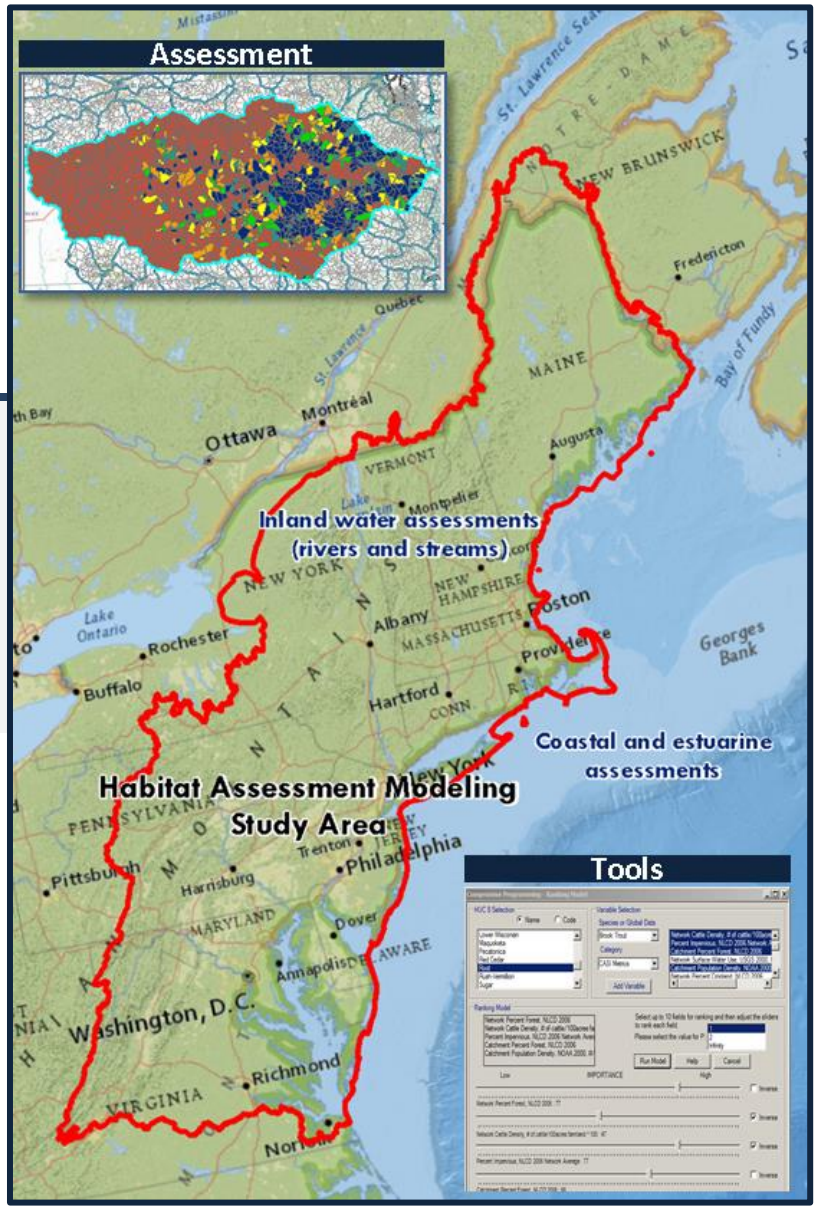
Habitat Assessment Models and Decision Support Tools for Aquatic Habitats

July 17, 2013



North Atlantic LCC
North Atlantic Landscape Conservation Cooperative

Downstream Strategies

West Virginia University
CRITIGEN

Atlantic Coastal Fish Habitat Partnership
Working together to conserve coastal, estuarine-dependent, and diadromous fish habitat

Watershed Assessment Models

Data

- Hydrologic model
- Landscape characteristics
- Stream characteristics
- Biological endpoints

Model

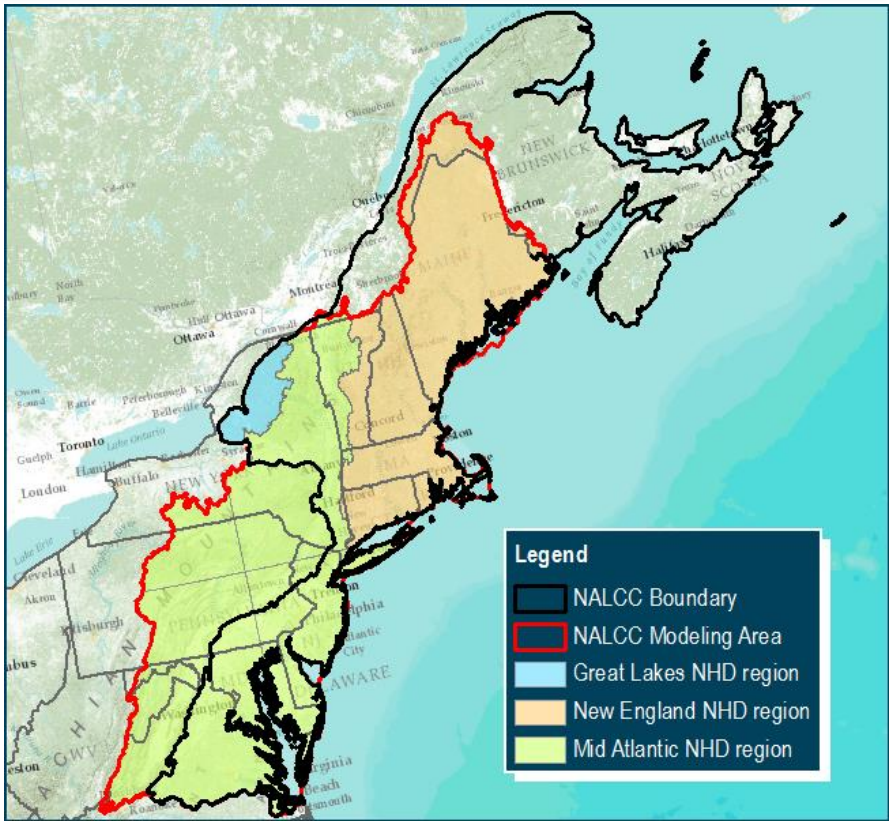
- Boosted regression trees
- Predicted conditions
- Functional relationships
- Anthropogenic stress
- Natural quality

Apply

- Visualize conditions
- Determine priorities
- Make decisions
- Run future scenarios

Modeling Area

- National Hydrography Dataset V2
- Catchment level assessments
- Decision Support Tool



Assessment Outputs

Technical Reports

- Project background
- Overview of assessment process
- Modeling inputs
- Modeling process
- Post-modeling
- Mapped results

Data and Maps

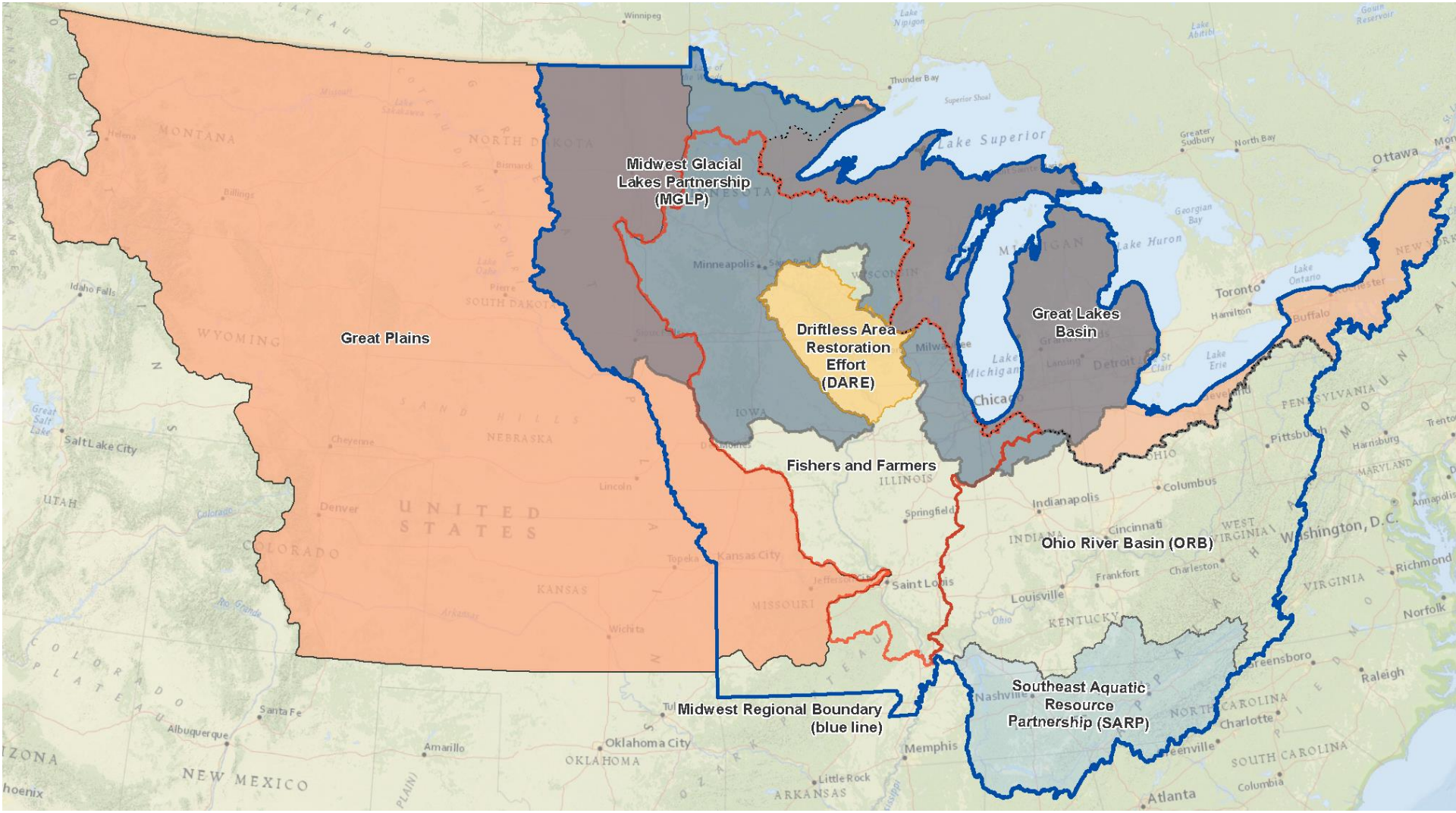
- Geodatabase of model inputs and outputs
- Metadata and data dictionaries
- Processing notes and documentation
- Response (fish) database
- HUC-8 Mapbooks of prediction maps, at the catchment scale

GIS Decision Support Tool

- Integrate ArcMap 10.1 toolbar
- Visualization and Zoom-to features
  - Landscape variables
  - Predictor datasets
  - CASI and CNQI metrics
  - Predictions
  - Socioeconomic data
- Ranking model
  - Weight datasets based on criteria or preference
  - Comprise programming model
  - Identify catchments most / least like criteria
- Futuring tool (new for 2013)
  - Change current conditions at the local level
  - Propagate changes downstream
  - Visualize the impact of that change, locally and downstream

Past Assessments

Seven FHP/Partnership Assessments (2010-2013)



Seven FHP/Partnership Assessments

35 Separate Models

- Ohio River Basin/Southeast Aquatic Resource Partnership (7)
- Driftless Area Restoration Area (5)
- Great Lakes (5)
- Midwest Glacial Lakes (5)
- Fishers and Farmers (5)
- Great Plains(5)
- Midwest Regional (3)

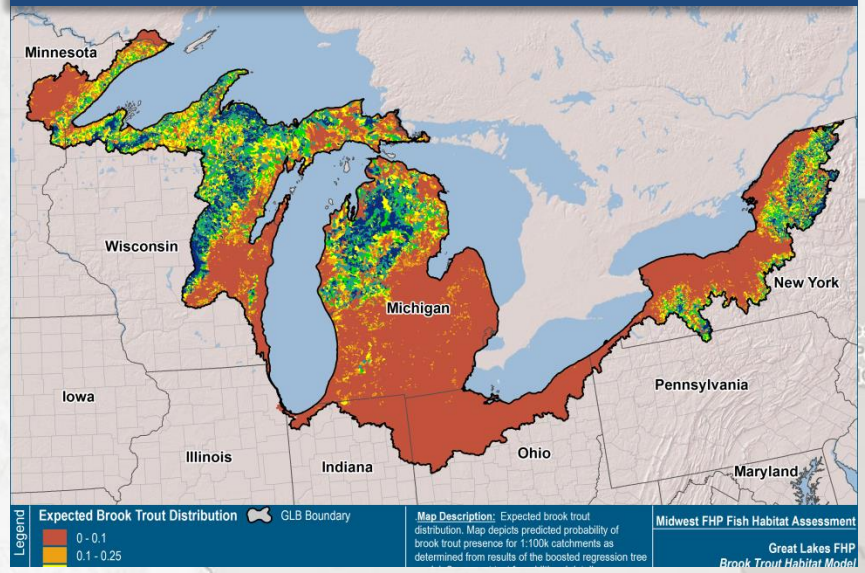
Species Model Examples

- Brook trout
- Walleye
- Smallmouth bass
- Large river species
- Intolerant mussels
- Redhorse
- Long nose dace

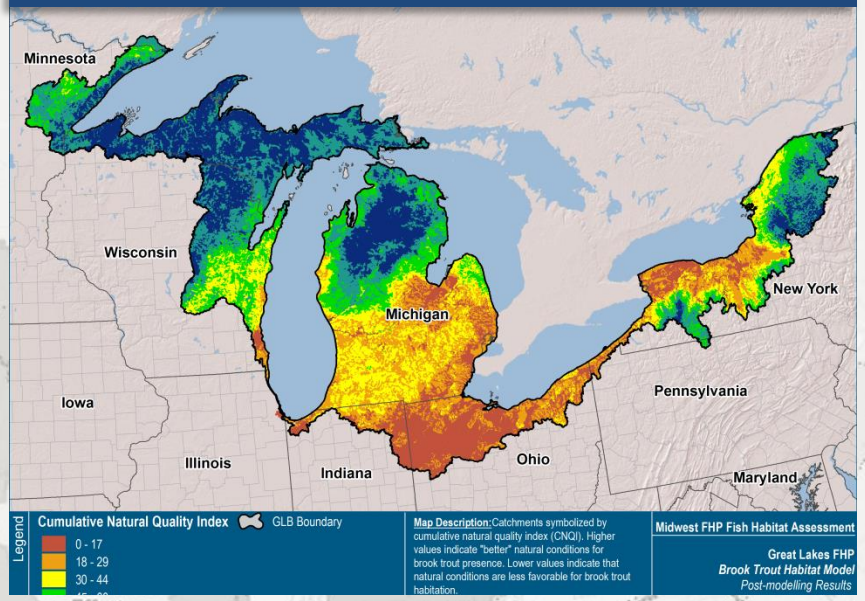
Aquatic Endpoint Examples

- Coldwater index
- Water quality (total summer phosphorous)
- Species richness
- Lithophilic species richness
- Modified index of centers of diversity score
- Small streams signature fish index score

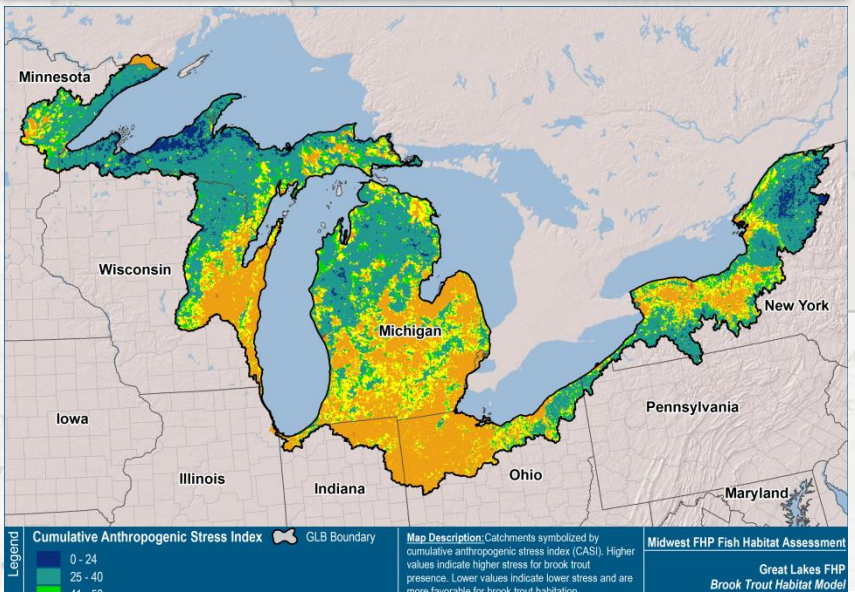
Predictions



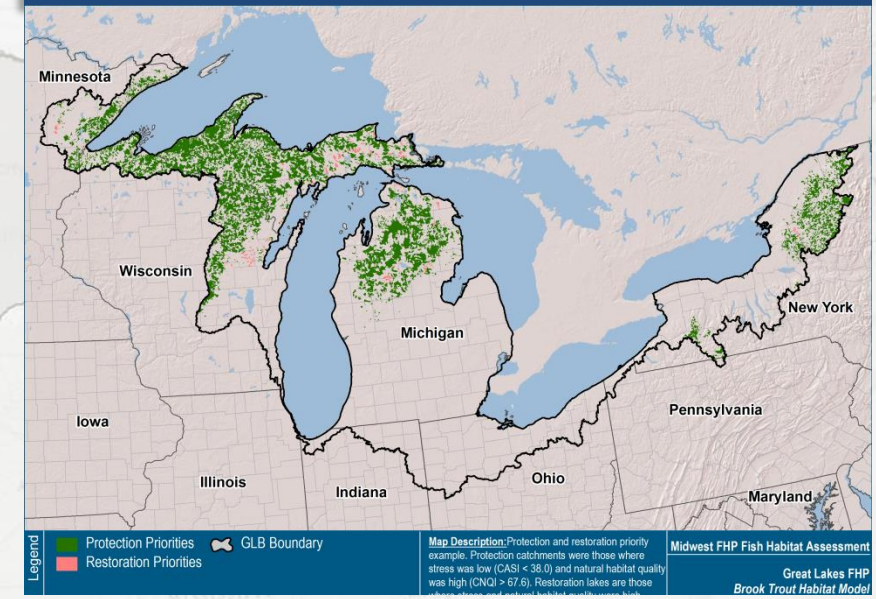
Natural Quality Index



Anthropogenic Stress Index

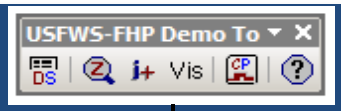


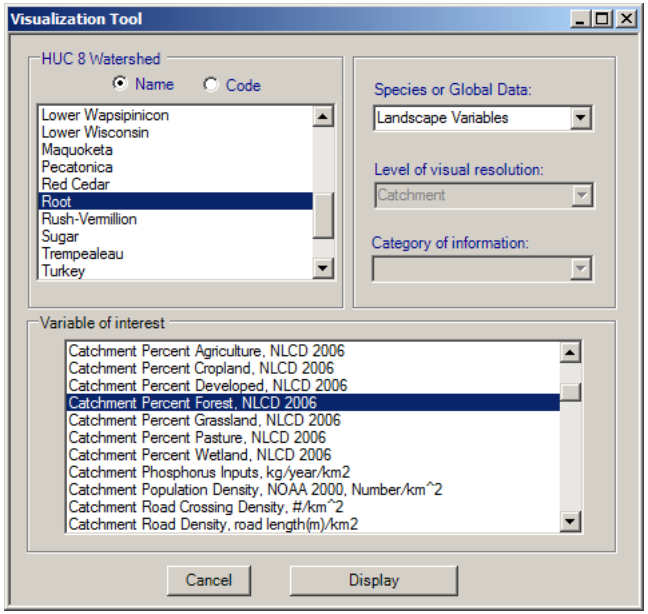
Restoration Protection Priorities

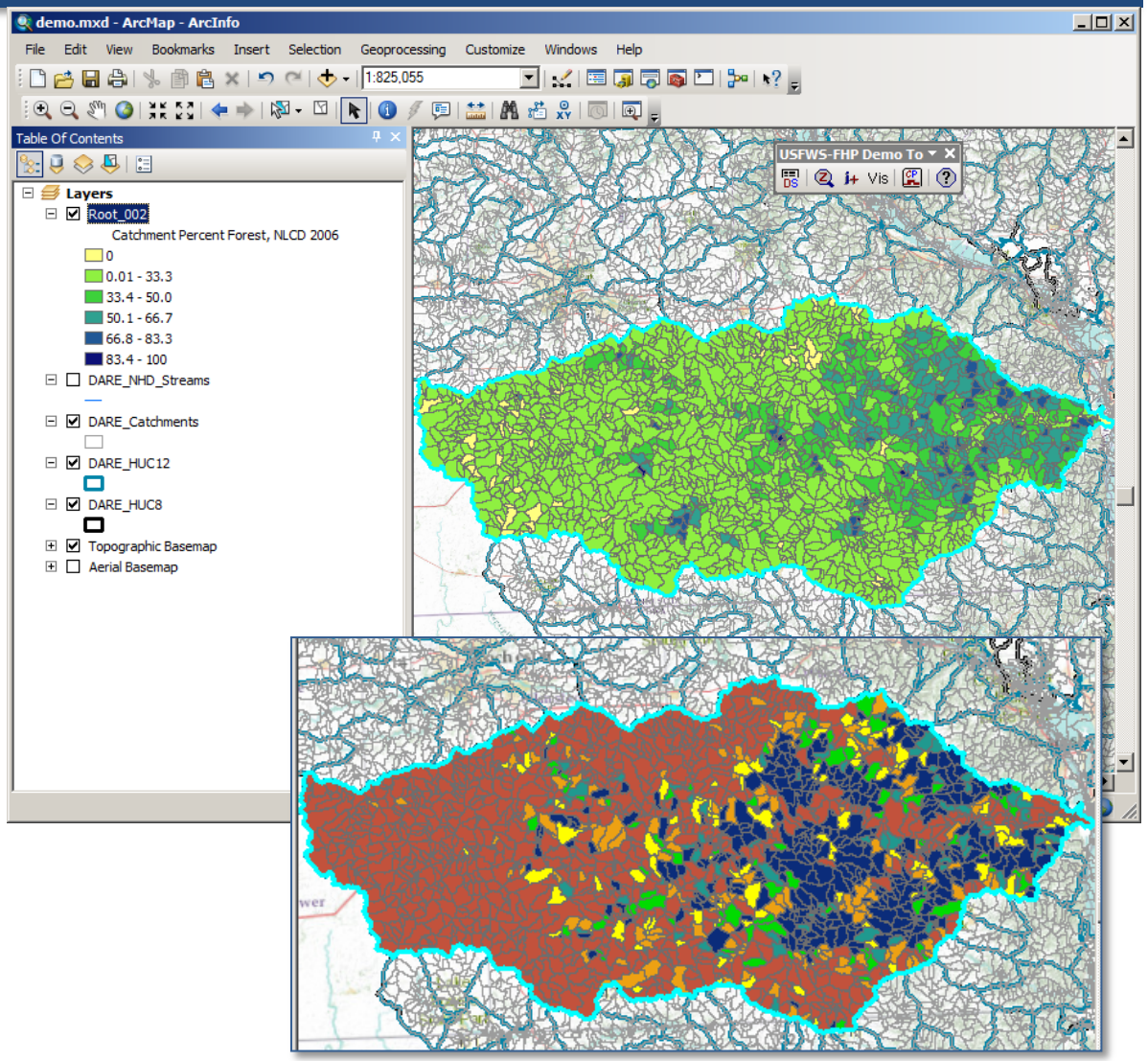


Decision Support Tools (v1)

Visualize the data

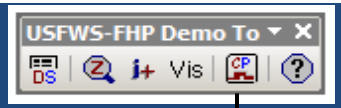


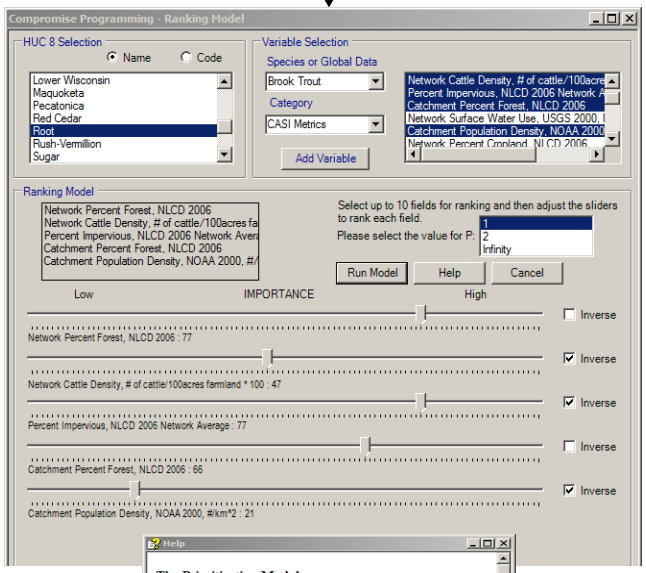


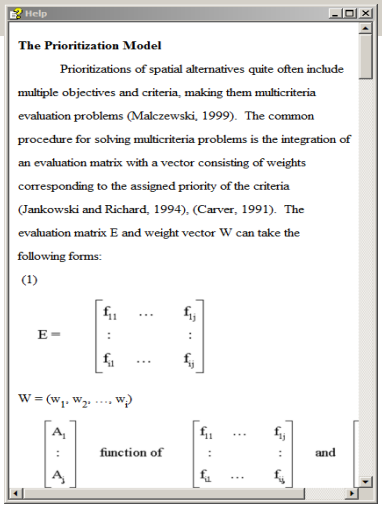


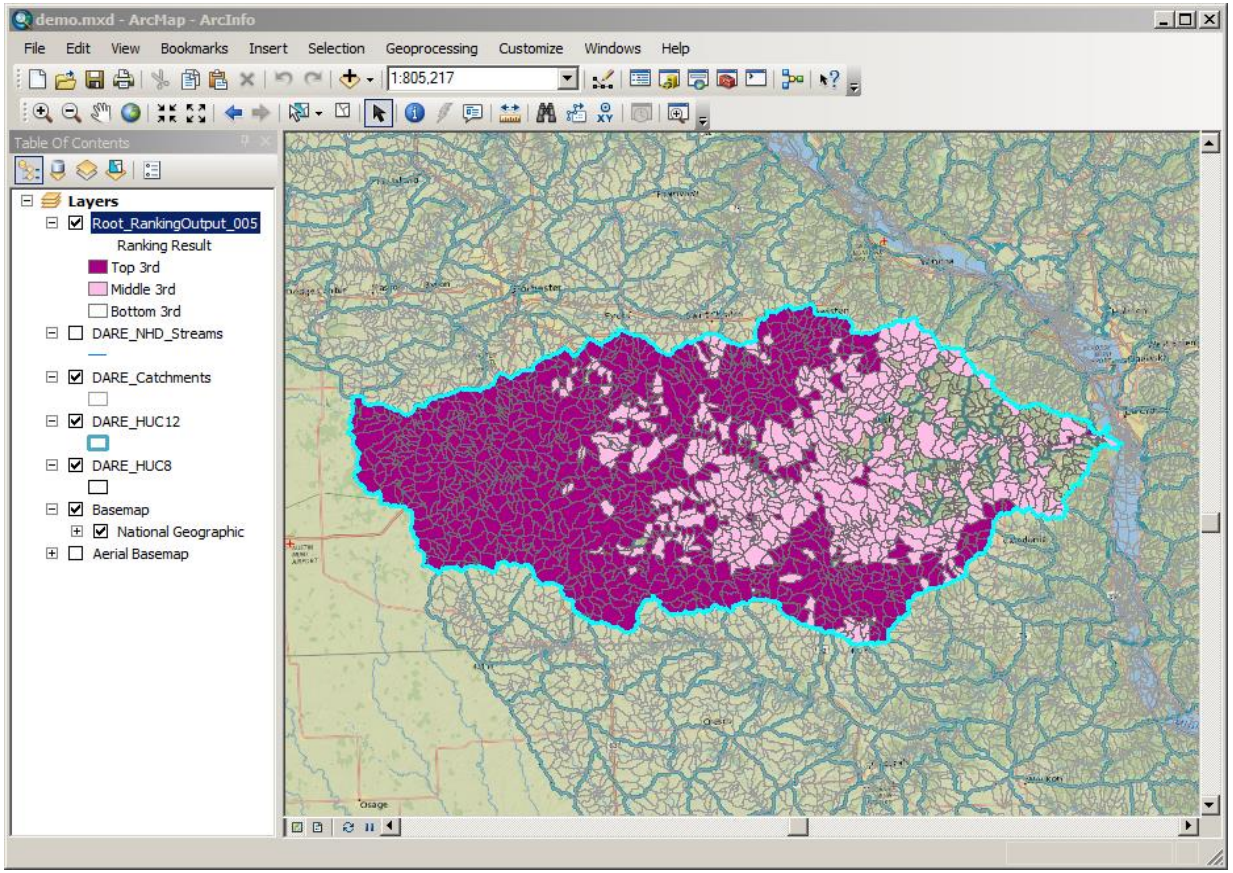
Decision Support Tools (v1)

Rank criteria and results



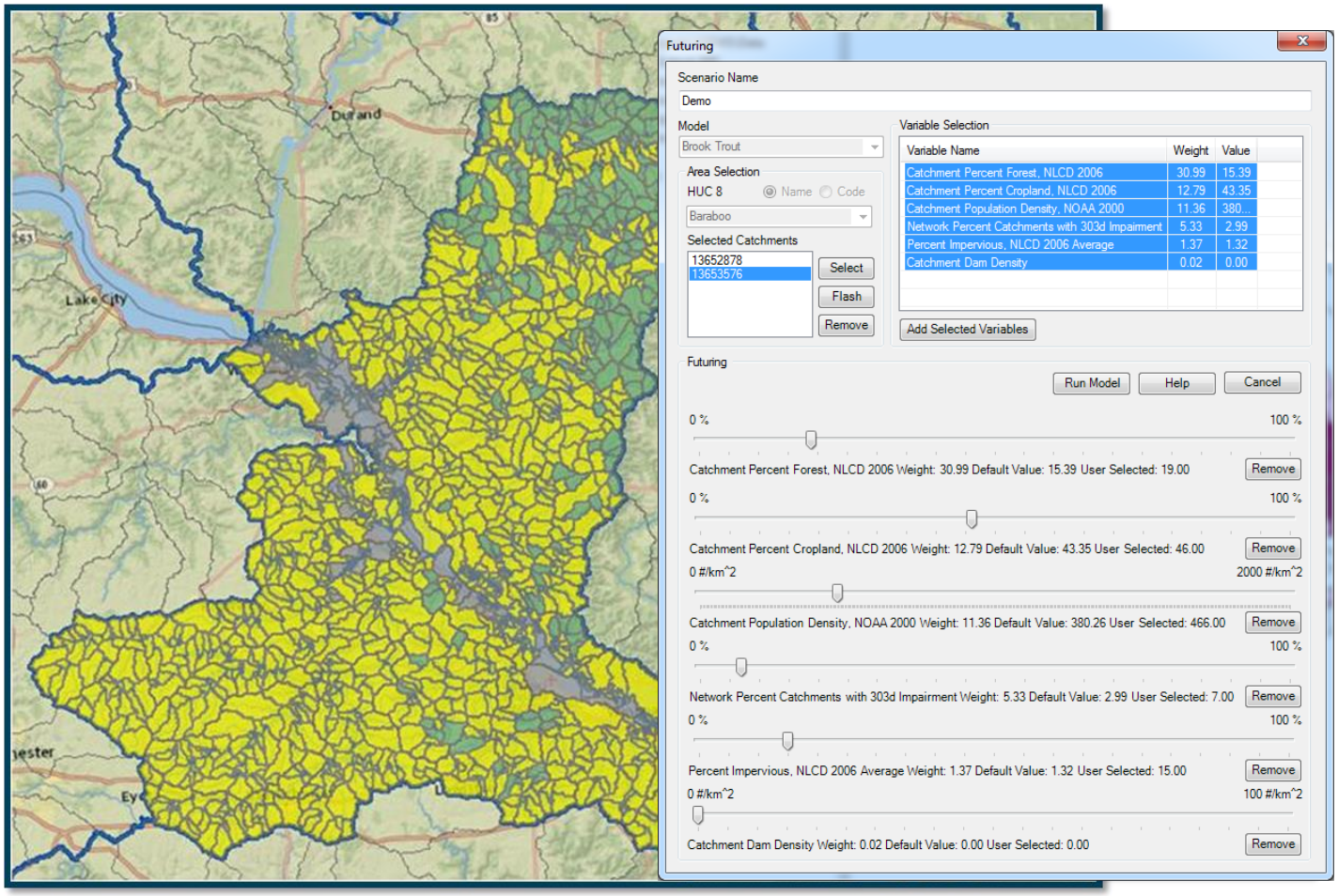


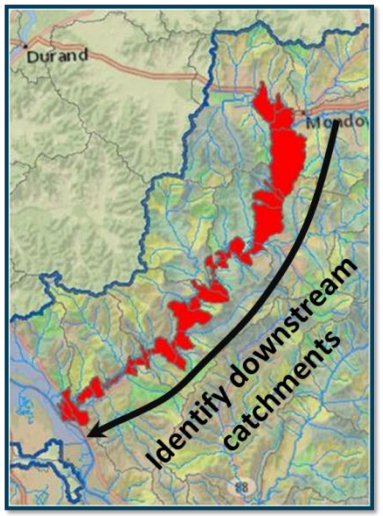


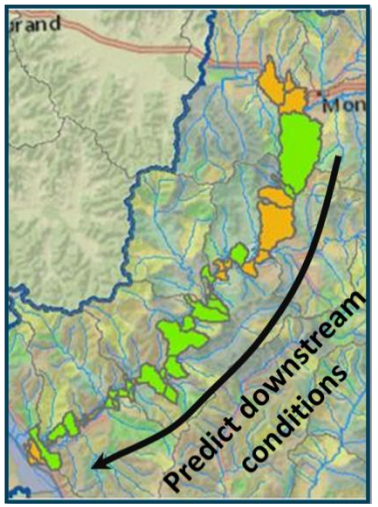


Decision Support Tools (v2)

Futuring tool



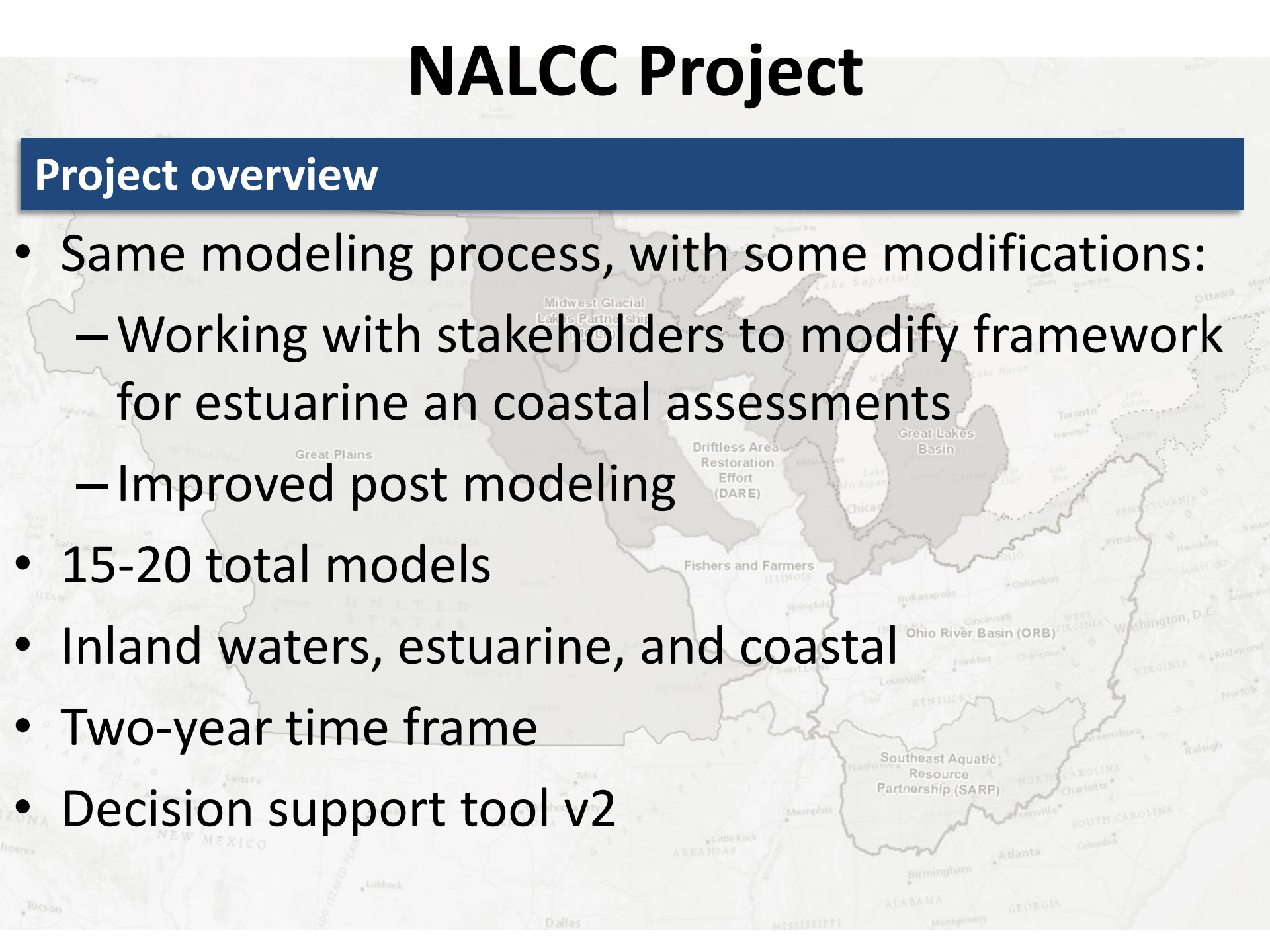




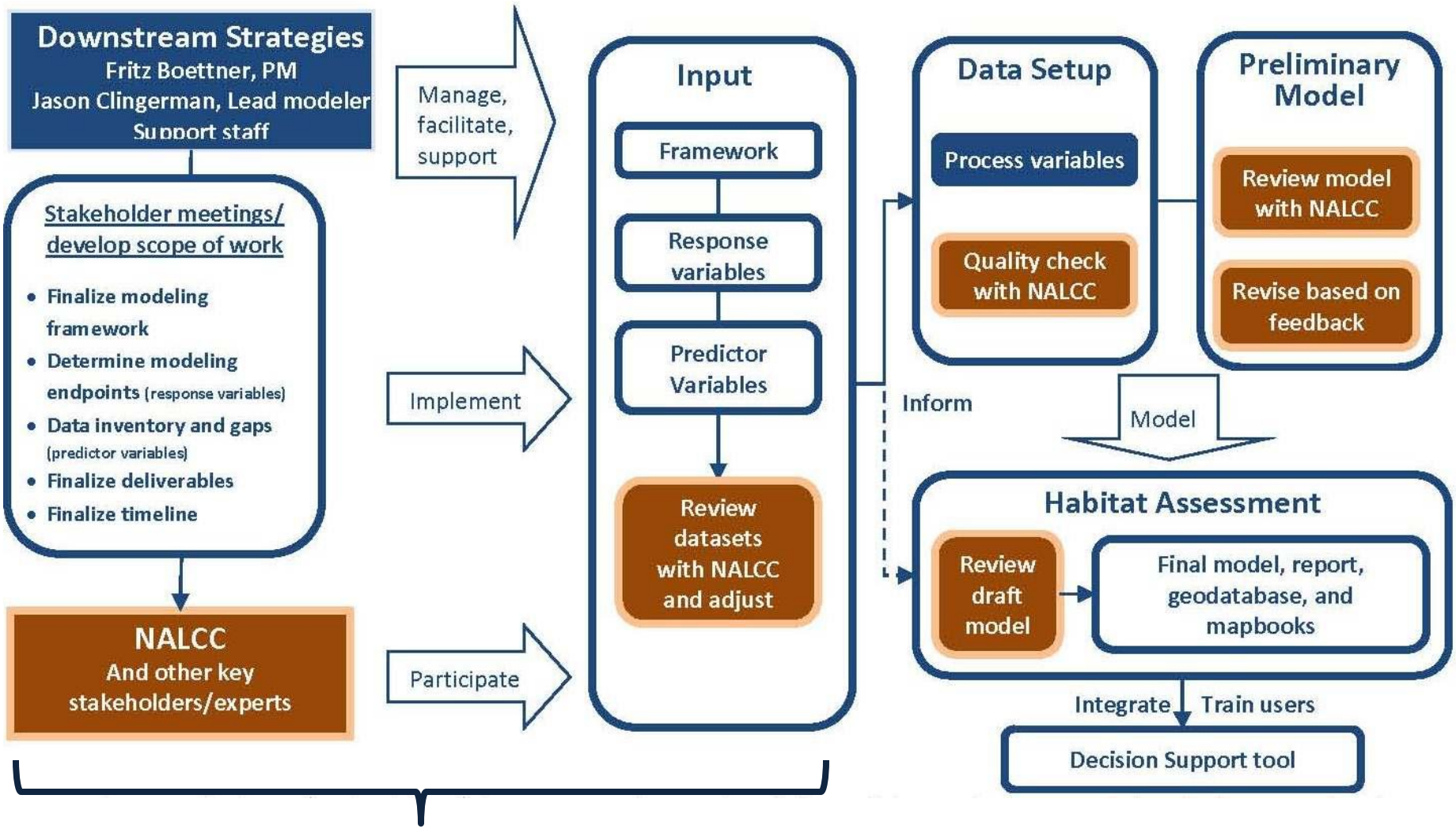
NALCC Project

Project overview

- Same modeling process, with some modifications:
  - Working with stakeholders to modify framework for estuarine an coastal assessments
  - Improved post modeling
- 15-20 total models
- Inland waters, estuarine, and coastal
- Two-year time frame
- Decision support tool v2

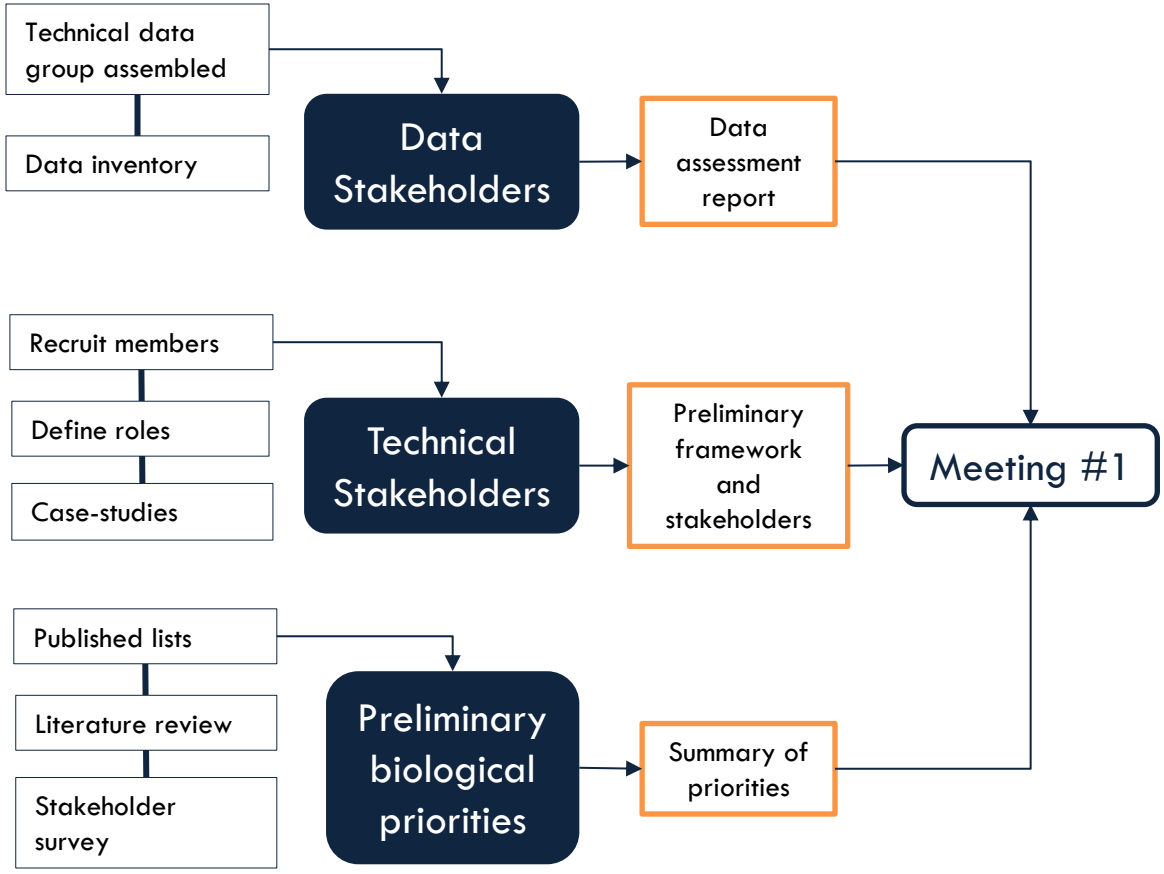


Project Process



NALCC Project Status

Phase 1 – Spring/Summer 2013



- Form stakeholder and advisory groups
- Case studies
- Research methods, data, and priorities
- Webinars, committee meetings, set actions
- Face-to-face stakeholder meeting early fall

NALCC Project Status

Phase 1 progress

- **Project management website:** http://www.northatlanticlcc.org/projects/downstream-strategies-project
- **Documents:** Briefs and information related to the project
  - Preliminary framework (inland models)
  - Data summaries (Midwest and Great Plains)
  - Example Report
  - Case study
    - Case Study: Analysis of scale on boosted regression tree fish habitat models
    - Incorporating future climate and land use changes into aquatic habitat assessments

NALCC Project Status

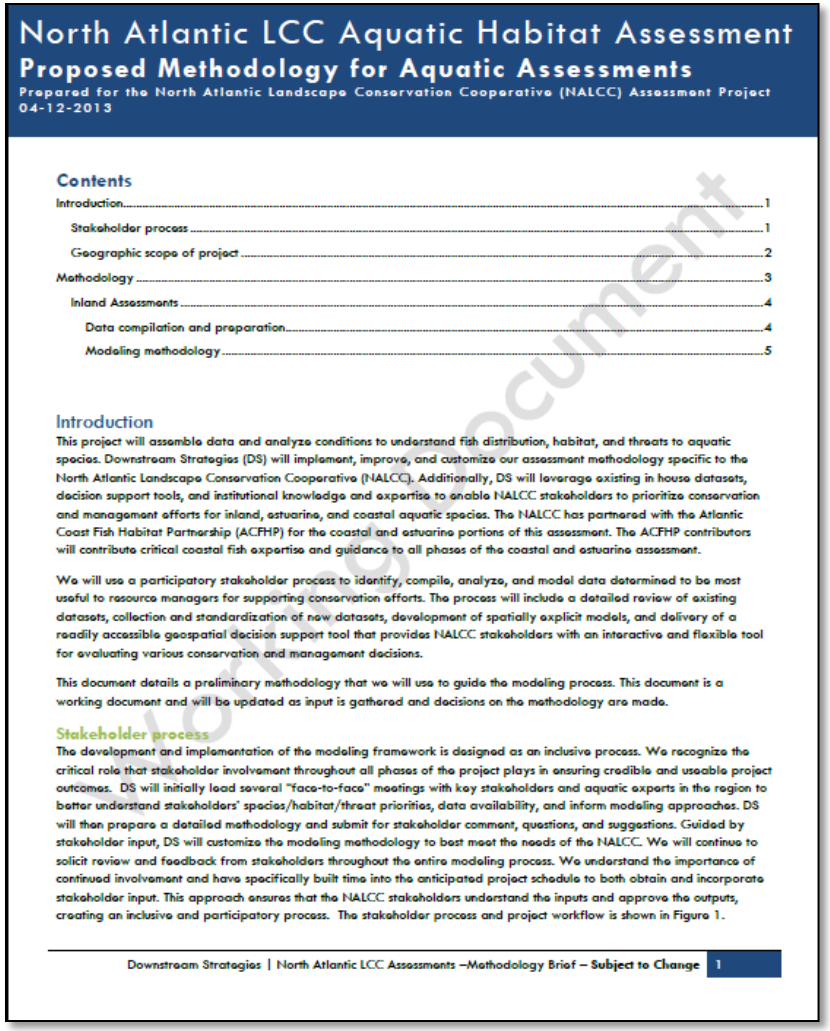
Forming stakeholder groups

- **Technical review committees:**
  - Local knowledge of species and existing habitat conditions.
  - Provide feedback to the modeling team in the development of one or more models.

- **Data development and acquisition committees:**
  - identify key datasets response variables (fish species/biological endpoints) and predictor datasets (landscape data/ in-stream measurements/other conditions)
  - Assist with processing datasets and provide expertise on model inputs and outputs.

NALCC Project Status

Developing and refining methodology



North Atlantic LCC Aquatic Habitat Assessment

Proposed Methodology for Aquatic Assessments

Prepared for the North Atlantic Landscape Conservation Cooperative (NALCC) Assessment Project
04-12-2013

Contents

Introduction

This project will assemble data and analyze conditions to understand fish distribution, habitat, and threats to aquatic species. Downstream Strategies (DS) will implement, improve, and customize our assessment methodology specific to the North Atlantic Landscape Conservation Cooperative (NALCC). Additionally, DS will leverage existing in house datasets, decision support tools, and institutional knowledge and expertise to enable NALCC stakeholders to prioritize conservation and management efforts for inland, estuarine, and coastal aquatic species. The NALCC has partnered with the Atlantic Coast Fish Habitat Partnership (ACFHP) for the coastal and estuarine portions of this assessment. The ACFHP contributors will contribute critical coastal fish expertise and guidance to all phases of the coastal and estuarine assessment.

We will use a participatory stakeholder process to identify, compile, analyze, and model data determined to be most useful to resource managers for supporting conservation efforts. The process will include a detailed review of existing datasets, collection and standardization of new datasets, development of spatially explicit models, and delivery of a readily accessible geospatial decision support tool that provides NALCC stakeholders with an interactive and flexible tool for evaluating various conservation and management decisions.

This document details a preliminary methodology that we will use to guide the modeling process. This document is a working document and will be updated as input is gathered and decisions on the methodology are made.

Stakeholder process

The development and implementation of the modeling framework is designed as an inclusive process. We recognize the critical role that stakeholder involvement throughout all phases of the project plays in ensuring credible and useable project outcomes. DS will initially lead several "face-to-face" meetings with key stakeholders and aquatic experts in the region to better understand stakeholders' species/habitat/threat priorities, data availability, and inform modeling approaches. DS will then prepare a detailed methodology and submit for stakeholder comment, questions, and suggestions. Guided by stakeholder input, DS will customize the modeling methodology to best meet the needs of the NALCC. We will continue to solicit review and feedback from stakeholders throughout the entire modeling process. We understand the importance of continued involvement and have specifically built time into the anticipated project schedule to both obtain and incorporate stakeholder input. This approach ensures that the NALCC stakeholders understand the inputs and approve the outputs, creating an inclusive and participatory process. The stakeholder process and project workflow is shown in Figure 1.

- **Work with stakeholders and technical advisors to integrate coastal and estuarine assessments into the framework**
- **Refine inland methodology and approach**

NALCC Project Status

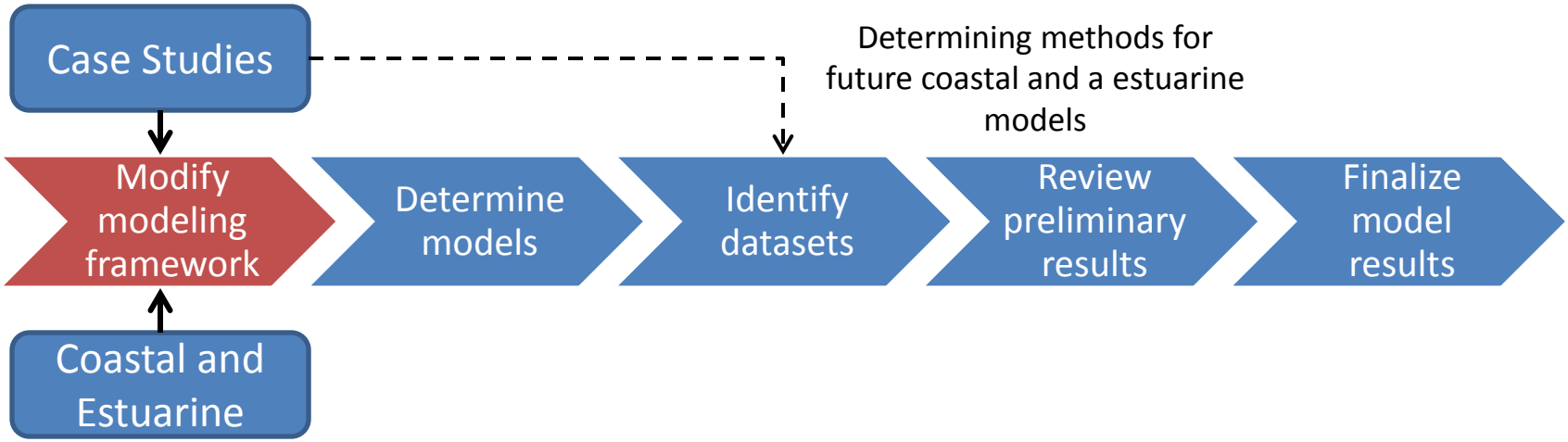
Case-studies

Image courtesy of NOAA

- **Case Studies**
  - Walk stakeholders through the modeling process
  - Develop coastal and estuarine modeling framework
- **Coastal/ estuarine**
  - Winter Flounder
    - Questions submitted to stakeholder group
  - River Herring (alewife and blue back herring)

Coastal/Estaurine Case Study

Process



- **Question 1:** Geographic extent
- **Question 2:** Analysis scale
- **Question 3:** Accounting for harvest
- **Question 4:** Measure of habitat quality
- **Question 5:** Key predictor variables
- **Question 6:** Management endpoints and threats

NALCC Project Status

Next steps

- **Develop case-studies**
  - Inland – Need stakeholders
  - Coastal (Complete) – Need stakeholders
- **Develop priorities**
  - Literature review of listed priority species
  - Administer survey to respondents for stakeholder recruitment and the development of priorities
- **Recruit Stakeholders**
  - Assist the project team with gathering data, finalizing priorities, and providing technical review(s) of the modeling process.
- **Webinars and face-to-face meeting**
  - Several webinars to explain the process and organize stakeholders
  - 2-day workshop to set modeling endpoints and methodology for coastal/estuarine assessments

NALCC Project Status

Developing priority species

Common Name	ACFHP	Federal	ME	NH	VT	MA	RI	CT	NY	NJ	PA	DE	MD	DC	VA	WV	TOTAL
Shortnose Sturgeon		E	X	X		X	X	X	X	X	X	X	X	X	X		IIIIIIIIIII
Atlantic Sturgeon*	X	IF	X	X		X	X	X	X	X	X	X	X	X	X		IIIIIIIIIII
American Eel		IF	X	X	X	X	X	X	X		X			X	X	X	IIIIIIIIII
American Brook Lamprey*				X	X	X	X	X		X	X	X	X		X	X	IIIIIIIIII
American Shad		IF	X	X	X	X	X	X	X				X	X	X		IIIIIIIII
Banded Sunfish*				X		X	X	X	X	X	X	X	X		X		IIIIIIIII
Bridle Shiner*				X	X	X	X	X		X	X	X	X		X		IIIIIIIII
Brook Trout		SS	X	X	X	X	X	X	X	X			X			X	IIIIIIIII
Alewife		IF		X		X	X	X	X		X			X	X		IIIIIIII
Blueback Herring		IF		X	X	X	X	X	X					X			IIIIIII
Rainbow Smelt			X	X			X	X	X	X	X						IIIIIII
Atlantic Salmon	X	E	X	X	X	X	X	X	X								IIIIIII
Hickory Shad		IF						X		X	X	X	X	X			IIIIII
Slimy Sculpin				X		X		X		X					X	X	IIIIII
Swamp Darter			X	X		X		X	X				X				IIIIII
Ironcolor Shiner									X	X	X	X	X		X		IIIIII
Longnose Sucker			X			X		X			X		X				IIIII
Least Brook Lamprey											X	X	X		X	X	IIIII
Burbot			X	X		X		X			X						IIIII
Comely Shiner									X	X		X	X			X	IIIII
Sum	*2*	*9*	*10*	*15*	*7*	*15*	*12*	*17*	*13*	*11*	*13*	*9*	*13*	*7*	*11*	*6*	