

Northeast Regional Conservation Framework Workshop

“Albany II”



June 14-16, 2011
Crowne Plaza Hotel, Albany, New York

Hosted by
Northeast Association of Fish & Wildlife Agencies
North Atlantic Landscape Conservation Cooperative





Session 2: Habitat Mapping

Session Hosts: Eric Palmer and Helen McMillan



Objectives:

1. Understanding of terrestrial, aquatic and coastal regional habitat classification and mapping projects, how the results/data/tools produced by each of them can be used, and how they fit into the framework;
2. Identification of priority mapping needs; and
3. Ideas to improve the utility and access to mapping products.

Northeast Conservation Framework

Habitat Mapping Informs
Entire Framework

GOAL-SETTING

*Which species to conserve?
At what levels?
Who decides?*

BIOLOGICAL ASSESSMENT

*What do we know about the
status of priority wildlife?*

CONSERVATION DESIGN

*What should landscapes look
like to conserve all species at
levels that society wants?*

PRIORITIES

*Which species demand
immediate attention?*

INFORMATION MANAGEMENT

*How will we manage the
demand for and creation
of data?*

SCIENCE TRANSLATION TOOLS

*How do we make science
solutions useful?*

MONITORING, EVALUATION, RESEARCH

*What new information will we
gather to support conservation?*

CONSERVATION

ADOPTION

*How do we get communities and
landowners engaged in conservation?*

CONSERVATION DELIVERY

*How will we most efficiently put
conservation on the ground?*

Relationship to the Framework



- Habitat mapping depends upon other components of the framework:
 - Monitoring of species and habitat distributions
 - Information Management is needed organize and disseminate spatial data

Relationship to the Framework



- Habitat Mapping informs other components of the framework:
 - Inform monitoring efforts;
 - Provide a context for multi-species conservation design;
 - Forms the basic unit for assessing landscape conditions;
 - Are effective as translation tools to engage partners and stakeholders;
 - are a standard medium of communication for resource managers of all kinds (conservation adoption and delivery)

Featured Projects

RCN Projects all under RCN Topic on Regional Habitat Maps (RCN 1)



- **Terrestrial projects:**

- Northeast Terrestrial Habitat Classification System (*Doris Duke, PI: Sue Gawler and Leslie Sneddon, NatureServe*)
- Creation of Regional Habitat Cover Maps: Application of the NETHCS (*RCN 2007-1, PI: Mark Anderson, TNC*)
- Secured Lands of the Northeast 2007 (*Doris Duke, PI: Melissa Clark and Mark Anderson, TNC*)
- Designing Sustainable Landscapes (*NA LCC, PI: Kevin McGarigal, UMASS*)

- **Aquatic projects:**

- Northeast Aquatic Habitat Classification System (*Doris Duke, PI: Arlene Olivero Sheldon, TNC*)

- **Coastal and marine projects:**

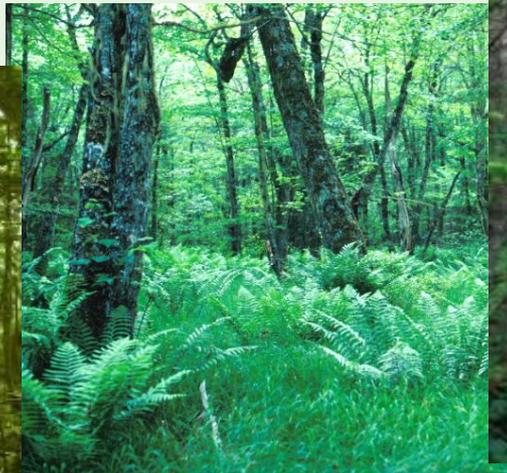
- Develop Regional Coastal and Marine Base Maps for Analyses of NE SGCN Data (*RCN 2011 RFP*)
- Coastal and Marine Spatial Planning (*NOAA, regional ocean partnerships*)
- Coastal Change Analysis Program (C-CAP) Land Cover Atlas (*NOAA Coastal Services Center*)



Photo by Brian Harris

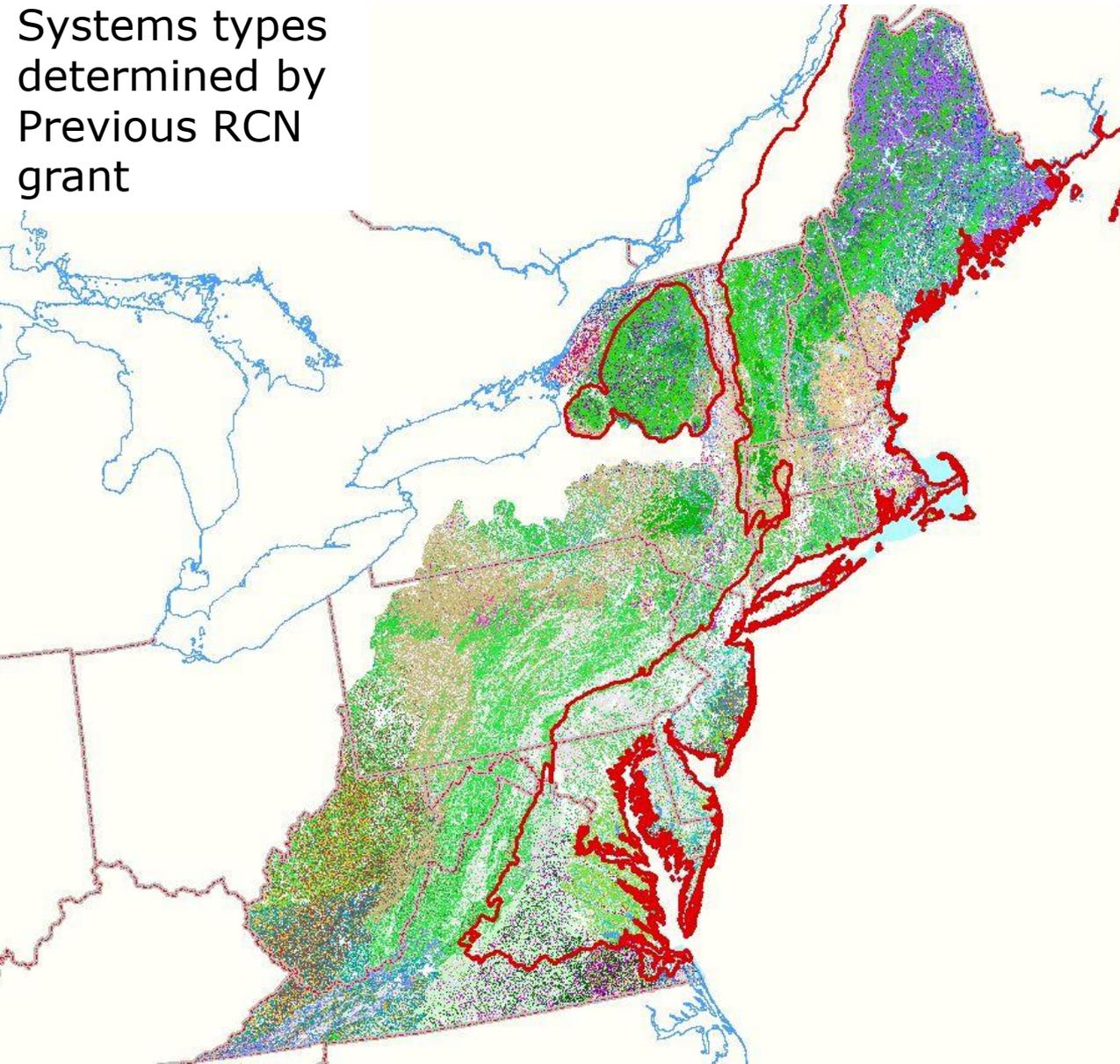
Mapping Terrestrial Habitats

Base on NatureServe Ecological Systems



Terrestrial Habitats

Systems types determined by Previous RCN grant



Ecological Systems/Habitats: Wetland, U

- Laurentian-Acadian Conifer-Hwd Acid Swamp
- N-Central Appalachian Acidic Swamp
- Laur-Acad Alkaline Conifer-Hwd Swamp
- Laurentian-Acadian Freshwater Marsh
- Laur-Acad Wet Meadow-Shrub Swamp
- Boreal-Laur-Acadian Acidic Basin Fen
- N-Central Interior and Appal Acidic Peatland
- N-Central Int Wet Flatwoods (wet Clayplain Forest)
- Acadian Coastal Salt Marsh & Estuary Marsh
- Acadian Maritime Bog
- Boreal-Laurentian Bog
- Laurentian-Acadian Floodplain Forest
- Eastern Boreal Floodplain
- SP system: N Appal-Acad Rocky Heath Outcrop
- SP system: Laur-Acad Calcareous Rocky Outcrop
- SP/LP system: Central Appal Dry Oak-Pine Forest
- SP system: Central App Pine-Oak Rocky Woodland
- SP system: L-A Acidic Cliff & Talus
- SP system: L-A Calcareous Cliff & Talus
- SP system: N-Central Appal Acidic Cliff & Talus
- SP system: N-Central Appal Circumneut Cliff & Talus
- SP system: NE Interior Pine Barrens
- LP/SP system: Great Lakes Alvar
- LP/SP system: Laurentian Acidic Rocky Outcrop
- SP system: Great Lakes Dune: 4 small occ's
- SP/LP system: Acadian-Appalachian Alpine Tundra
- Mbx system: Acad-Appal Montane Spr-Fir-Hwd Forest
- LP/SP system: Acadian Sub-boreal Spruce Flat
- Mbx system: Acadian Low-Elev Spr-Fir-Hwd Forest
- Mbx system: L-A N. Hwd Forest, typic
- Mbx system: L-A N. Hwd Forest, high conifer
- Mbx system: L-A Red Oak-N. Hwd Forest
- Mbx system: L-A N. Hwd Forest, moist/cool
- Mbx system: L-A Pine-Hem-Hwd Forest, typic
- Mbx system: L-A Pine-Hem-Hwd Forest, moist/cool
- LP/SP system: Appal Hem-N. Hwd Forest, typic
- LP/SP system: Appal Hem-N. Hwd Forest, moist/cool
- LP/SP system, former mbx: Mesic Clayplain Forest
- NLCD-NHD open water
- NLCD agricultural classes 81-82
- NLCD developed classes 21-24 & 31



Background

14 State Steering committee,
18 months, monthly call

Builds on NatureServe ecological
system classification
(Gawler 2008).

Data driven but uses existing data
only, no field check component

Consistent with Landfire – SE GAP
(Alexa McKerrow)

Performed by Ecoregion or Groups of
ecoregions

Product is one regionally consistent
map

**Field Key to the Ecological Systems and Habitat Systems
of the Northeastern United States**

**NatureServe**
A Network Connecting Science With Conservation

Susan C. Gawler
Regional Vegetation Ecologist
NatureServe
Boston, Massachusetts
December 2008



Northeast Terrestrial Habitat Classification (NETHCS)

State habitat types crosswalked to Habitat Systems

Pennsylvania: Dry Oak-Pine Forest crosswalks to Central Appalachian Dry Oak-Pine Forest habitat system

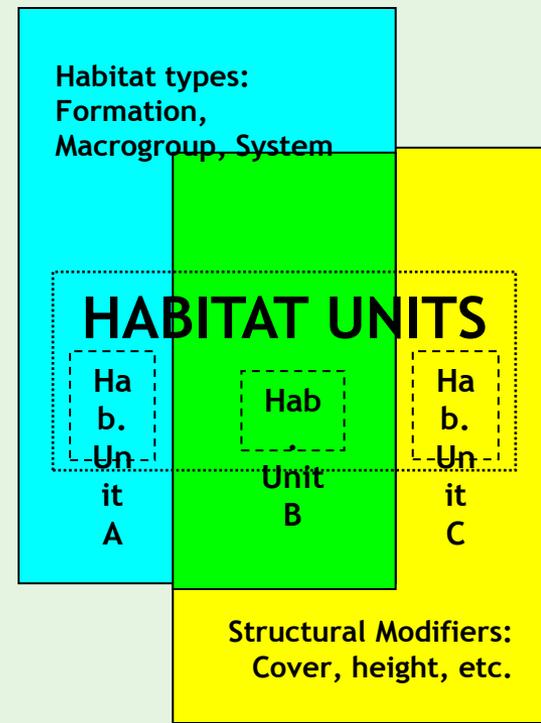


Habitat systems arranged in hierarchy:

Formation Class
Formation
Macrogroup
Habitat System

Habitat System characterized by

- habitat system (or higher level), or
- structural characteristics, or
- combination of both approaches

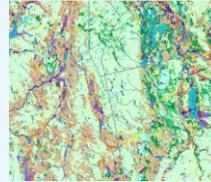


Data Driven: INPUTS

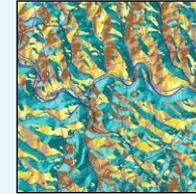
Wall to wall grids



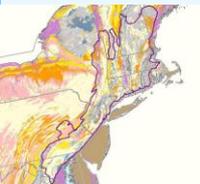
Elevation



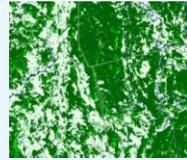
NWI
Wetland



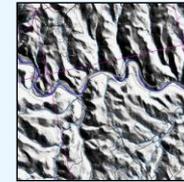
Categorical
Aspect



Geology



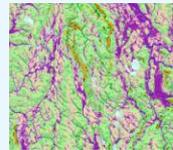
Canopy
closure



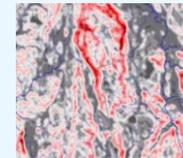
Shaded
Relief



Landcover



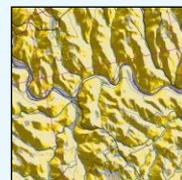
Landforms



Rugosity



Solar
radiation



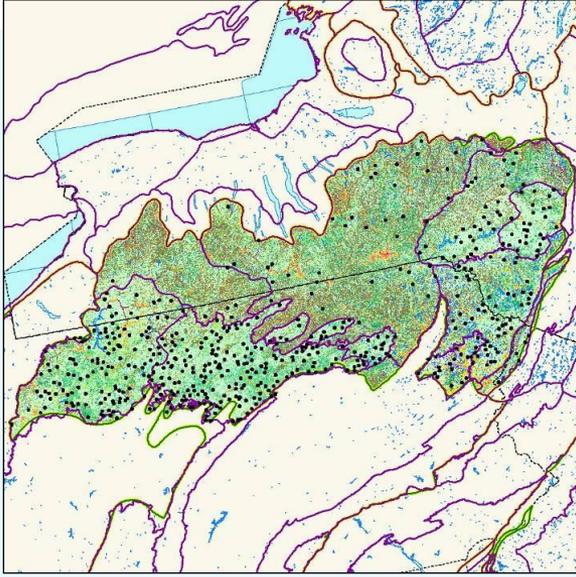
Aspect



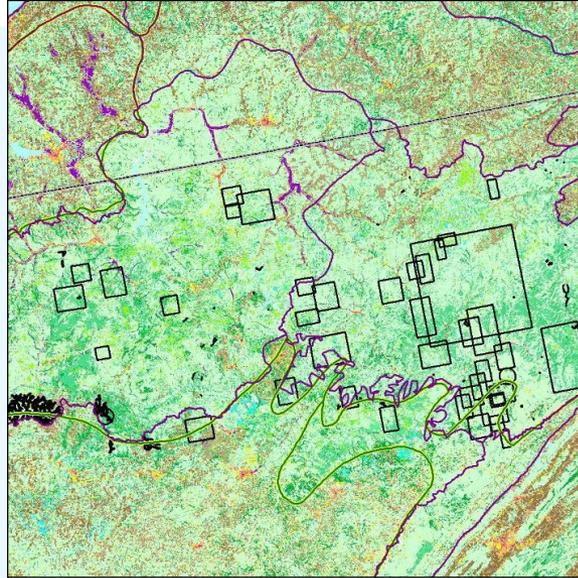
Precipitation

Over 10,000
FIA and NHP
data points

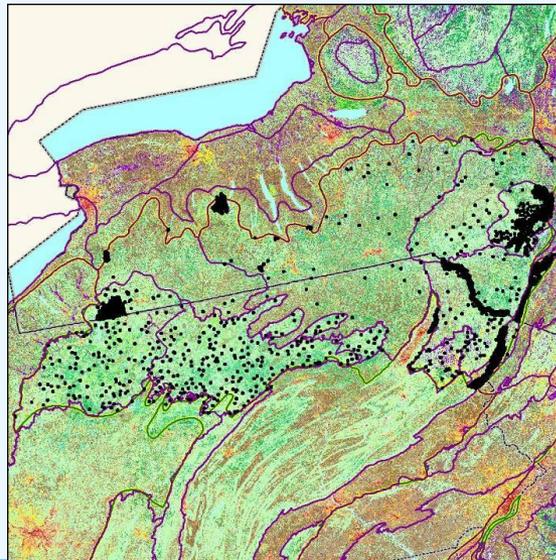
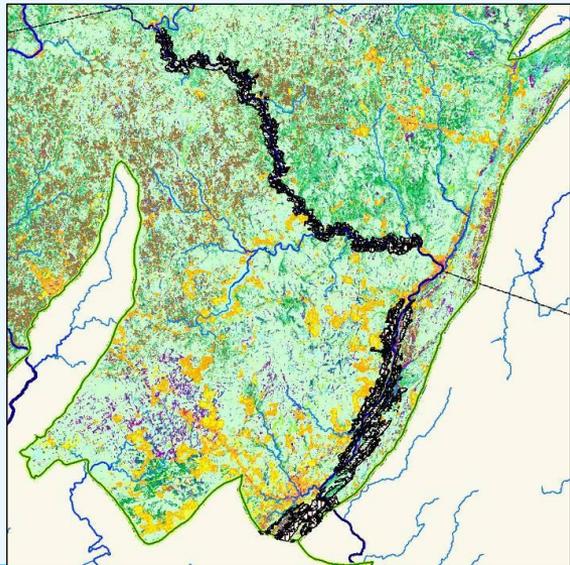
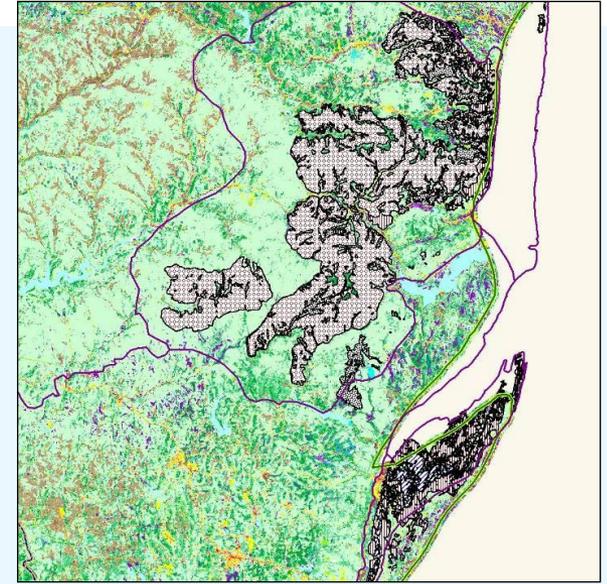
Data Inputs: Confirming Points



NVC mapping



NHP Natural Communities



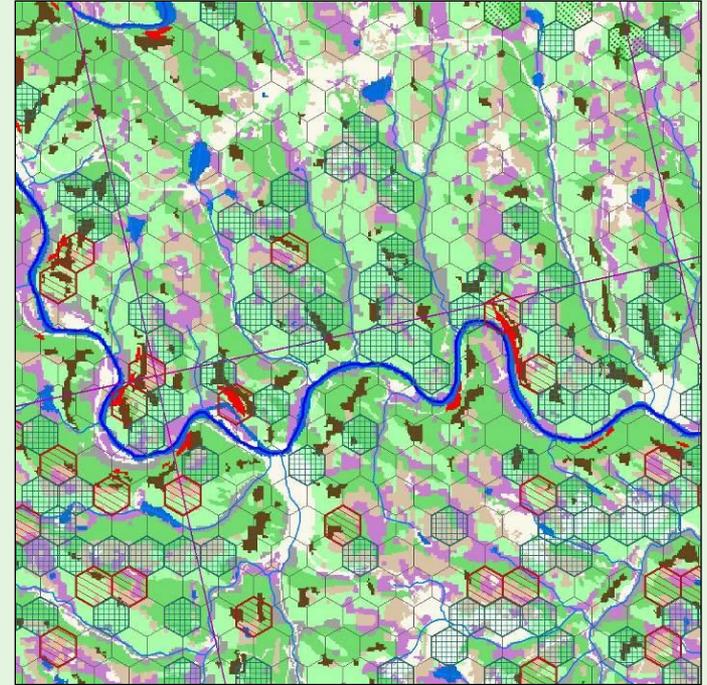
These data sets, and others, are collected for the region



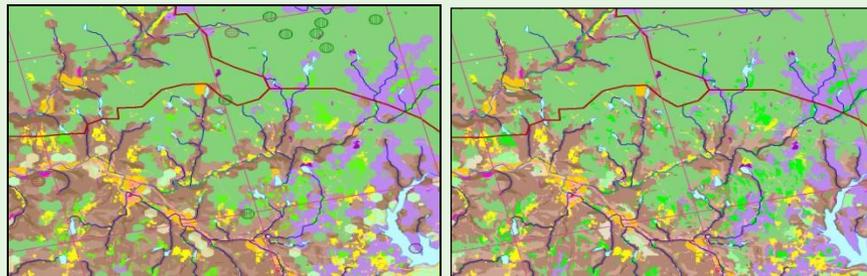
Methods

Matrix forest: Used RANDOM FOREST and CART models to identify key variables associated with major forest types, then used the classification tree to model the full extent.

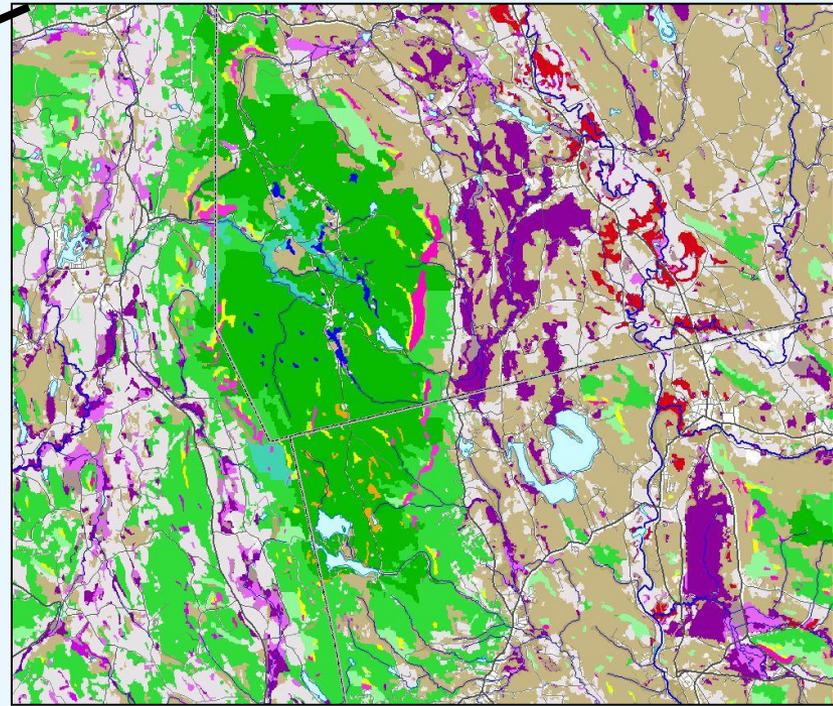
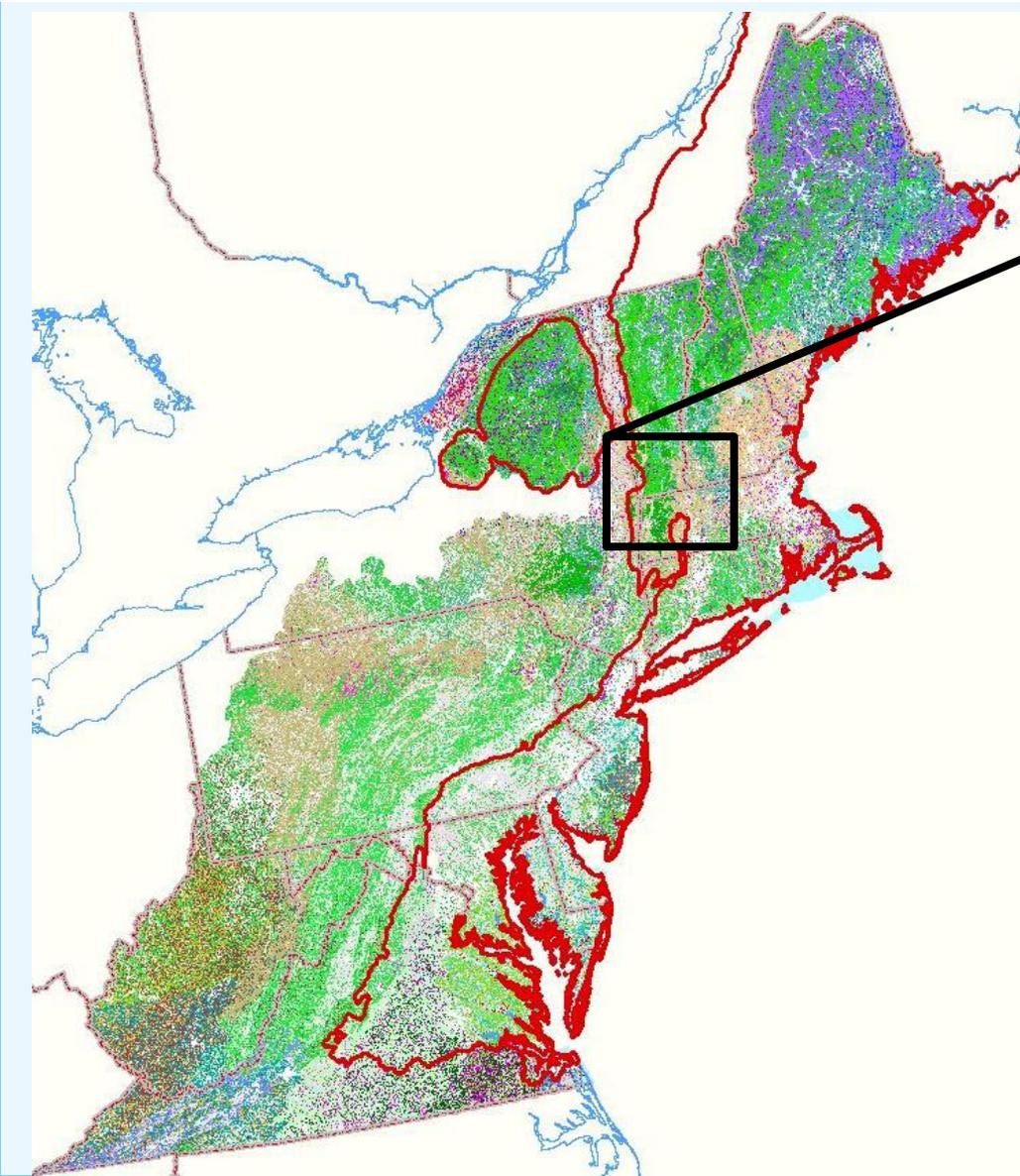
Patch communities: individual models created for each system based on the ecological signature of the known occurrence.



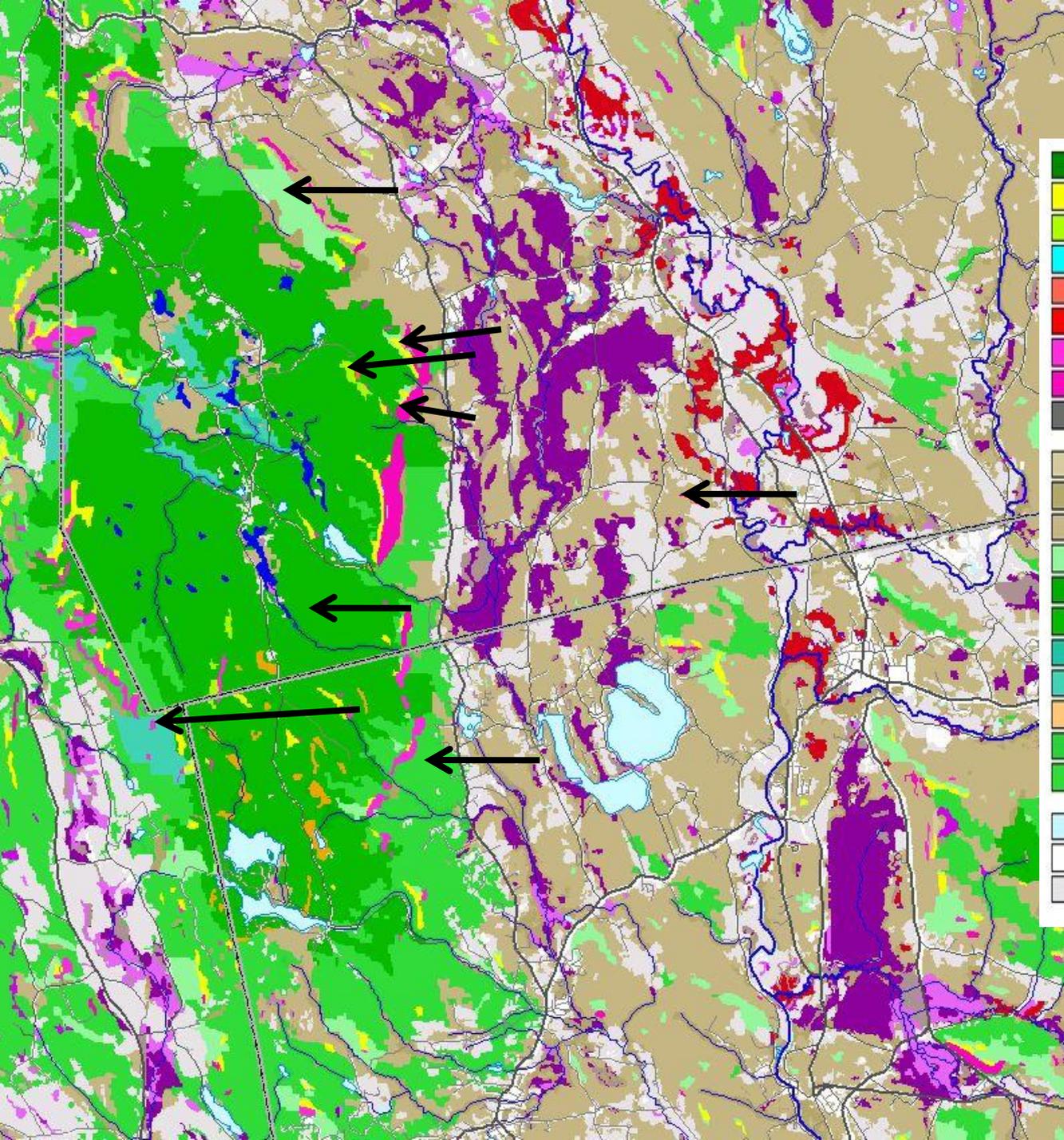
We used image objects based on Landform to translate the hex information



Results: zoom in



UPLAND



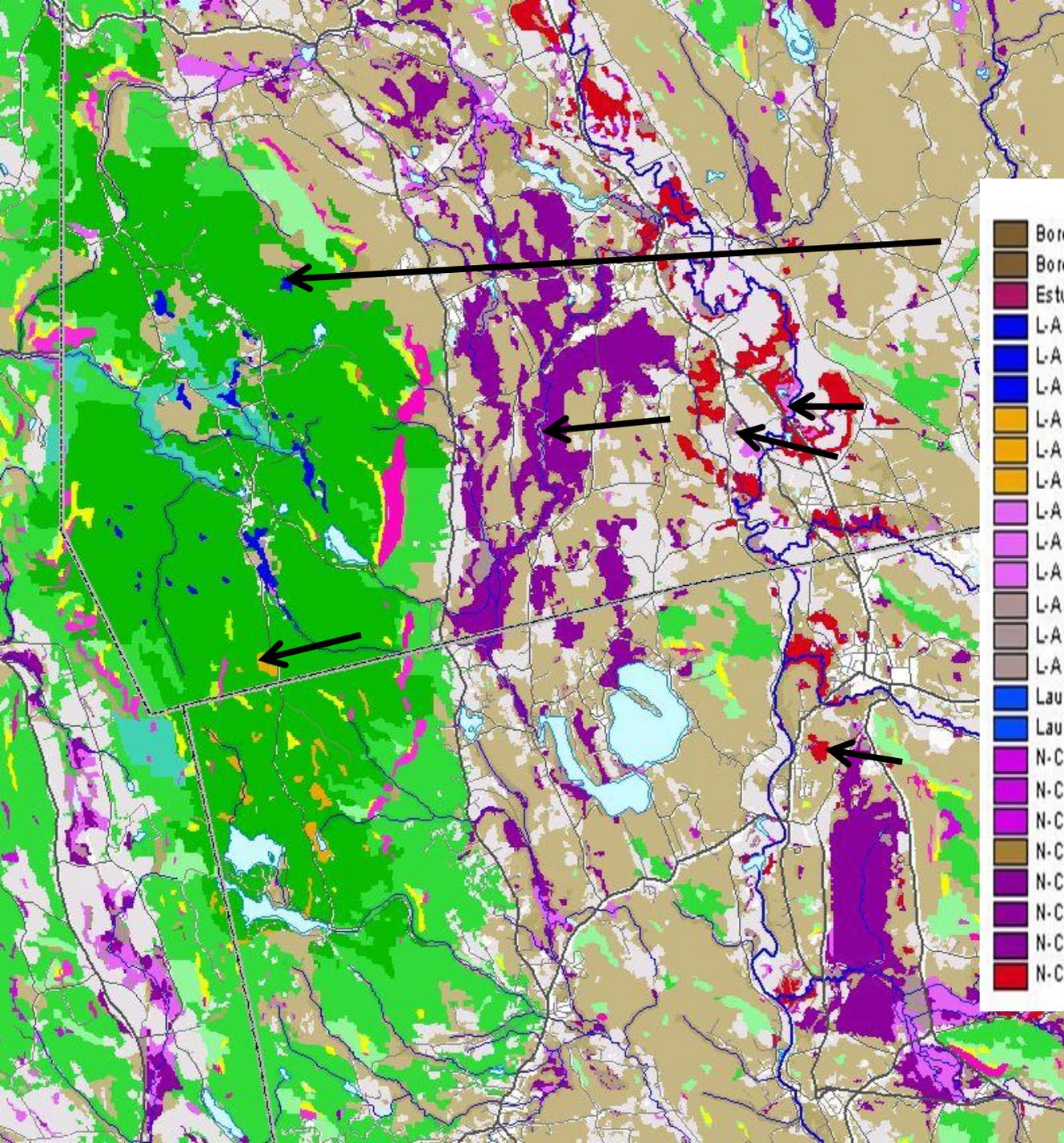
- SP system: Acad-Appal Montane Spruce-Fir-Hwd Forest: 201.566
- SP system: Central App Pine-Oak Rocky Woodland: 202.600
- SP system: N Appal-Acad Rocky Heath Outcrop: 201.571
- SP system: Eastern Serpentine Woodland: 202.347
- SP system: L-A Acidic Cliff and Talus: 201.569
- SP system: L-A Calcareous Cliff & Talus: 201.570
- SP system: N-Central Appal Acidic Cliff and Talus: 202.601
- SP system: N-Central Appal Circumneut Cliff & Talus: 202.603
- SP system: NE Interior Pine Barrens: 202.590

- mbx system: Appal Hem-N. Hwd Forest, drier
- mbx system: Appal Hem-N. Hwd Forest, moist/cool
- mbx system: Appal Hem-N. Hwd Forest, typic
- mbx system: Central Appal Dry Oak-Pine Forest
- mbx system: Laurentian-Acadian N. Hwd Forest, moist/cool
- mbx system: Laurentian-Acadian N. Hwd Forest, typic
- mbx system: Laur-Acad Pine-Hem-Hwd Forest, moist/cool
- mbx system: Laur-Acad Pine-Hem-Hwd Forest, typic
- mbx system: NE Coastal & Interior Pine-Oak Forest
- mbx system: NE Interior Dry-Mesic Oak Forest, moist/cool
- mbx system: NE Interior Dry-Mesic Oak Forest, typic

- Water
- Developed
- Agriculture

Underlying patterns
Related to
physical
Features.

WETLAND



- Boreal-Laurentian-Acadian Acidic Basin Fen: isolated
- Boreal-Laur-Acad Acidic Basin Fen: smaller stream riparian
- Estuarine units (185) along brackish shores in NY/NJ/MD
- L-A Alkaline Conif-Hwd Swamp: bigger river fldpln
- L-A Alkaline Conif-Hwd Swamp: isolated
- L-A Alkaline Conif-Hwd Swamp: smaller stream riparian
- L-A Conif-Hwd Acid Swamp: bigger river fldpln
- L-A Conif-Hwd Acid Swamp: isolated
- L-A Conif-Hwd Acid Swamp: smaller stream riparian
- L-A Freshwater Marsh: bigger river fldpln
- L-A Freshwater Marsh: isolated
- L-A Freshwater Marsh: smaller stream riparian
- L-A Wet Meadow-Shrub Swamp: bigger river fldpln
- L-A Wet Meadow-Shrub Swamp: isolated
- L-A Wet Meadow-Shrub Swamp: smaller stream riparian
- Laur-Acad Alkaline Fen: isolated
- Laur-Acad Alkaline Fen: smaller stream riparian
- N-Central Appal Acidic Swamp: bigger river fldpln
- N-Central Appal Acidic Swamp: isolated
- N-Central Appal Acidic Swamp: smaller stream riparian
- N-Central Int and Appal Acidic Peatland
- N-Central Int and Appal Rich Swamp: bigger river fldpln
- N-Central Int and Appal Rich Swamp: isolated
- N-Central Int and Appal Rich Swamp: smaller stream riparian
- N-Central Interior Wet Flatwoods

Next Step: A Geospatial Condition Analysis of each Habitat

Terrestrial Systems

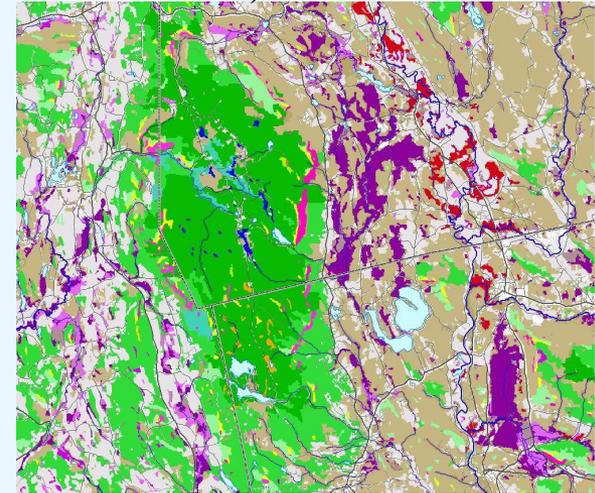
- Land cover and Canopy closure (MRLC 2001)
- Large unfragmented landscapes and forest blocks (TNC 2007)
- Conservation land parcels (TNC 2008)
- Housing density projections through 2050 by census block (Theobald 2006)
- Roads and fragmenting features (Various sources) ,
- Existing and proposed infra-structure features (TBD)
- Changed in canopy cover (CCAP)(
- Patch size and distribution (FRAGSTATS McGarigal 200)

Patch diversity metrics

- Number and type of rare species locations (NHP 2009)
- Bedrock and Surficial Geology types (TNC 2007)
- Landform diversity base on a topographic model (TNC 2007)
- Climate and elevation zones (WORLDCLIM)
- Regional Habitat maps, Streams networks, Lakes, Ponds (Various sources)
- Regionally compiled Wetlands (NWI)

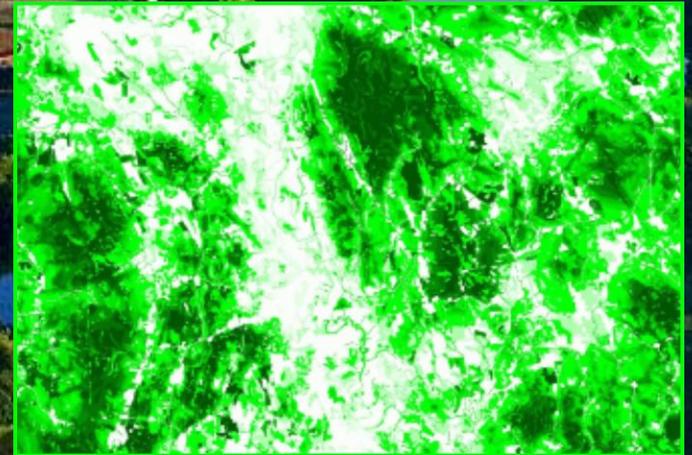
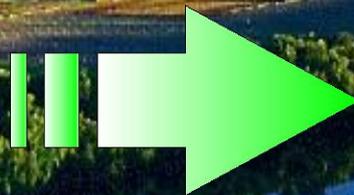
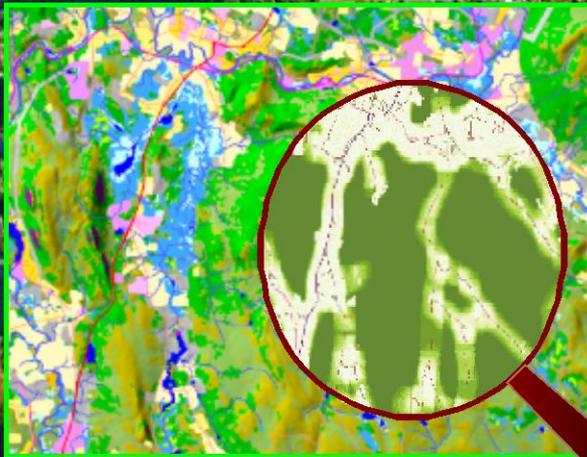
Landscape context and natural land units

Connectivity between patches of habitat (Resistant kernel analysis –Compton 2007)



Assessment of Landscape Change in the North Atlantic Landscape Conservation Cooperative: Decision-Support Tools for Conservation

Kevin McGarigal, Brad Compton, Ethan Plunkett,
Liz Willey, Bill Delucca, Joanna Grand, Scott Schwenk



Mapping Rivers Systems



Objective and Anticipated Uses

- ❖ Provide common definitions and mapping of aquatic habitats across state lines
- ❖ Facilitate a new understanding of aquatic biota on a regional scale
- ❖ Create a new opportunity to assess condition and prioritize habitats
- ❖ Facilitate more effective and efficient habitat conservation

Product was not intended to override state classifications, but was meant to complement state classifications and provide a means for looking at patterns across the region

Process

- ❖ Formed a workgroup of representatives from all states and some federal partners (>30 participants)
- ❖ Compiled and crosswalked the existing aquatic classification systems used by each state
- ❖ Used monthly workgroup calls to review potential classification variables, lines of evidence to support use and thresholds in these variables, and reach consensus on an agreed upon regional taxonomy
- ❖ Created a stream reach GIS habitat dataset linked to regional taxonomy

Thank you to the team!

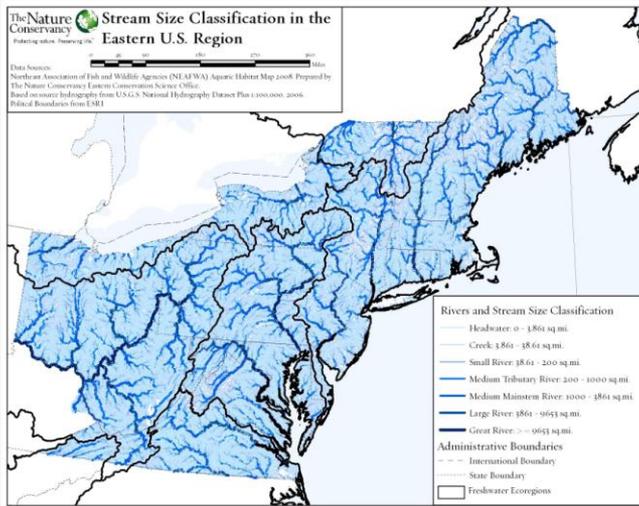
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MA/NE	Ken Sprankle	Ken_Sprankle@fws.gov	USFWS - Wildlife & Sport Fish Restoration Program, Region 5
MA/NE	Willi Nehlsen	Willi_Nehlsen@fws.gov	U.S. Fish & Wildlife Service - Regional Fisheries Program

Workgroup
Participants
35+

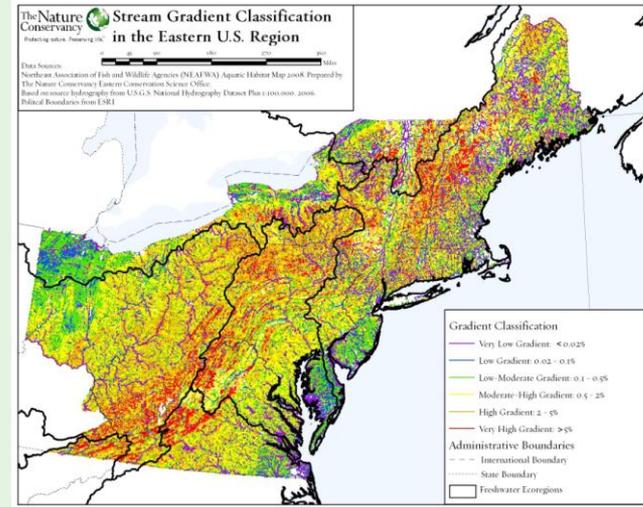
State Fish and
Wildlife Agency,
DEP, Natural
Heritage
Program,
Federal Agency,
University, NGO
Partners....

Key Habitat Variables

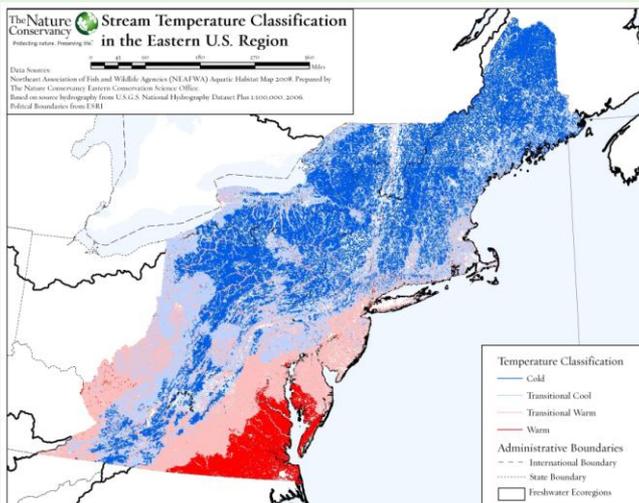
Size (Drainage Area)



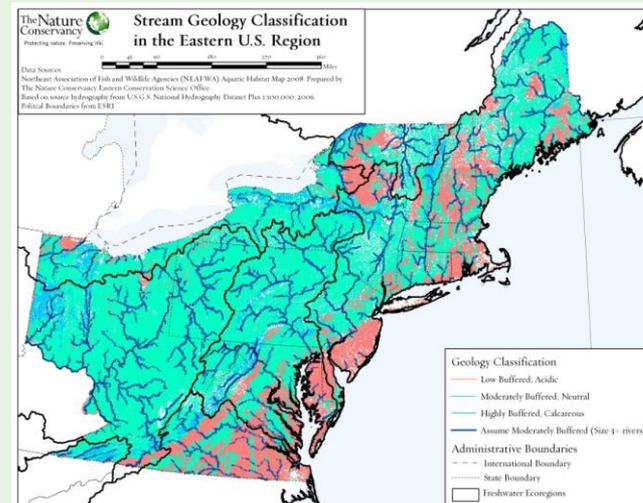
Gradient



Temperature



Geology (pH)



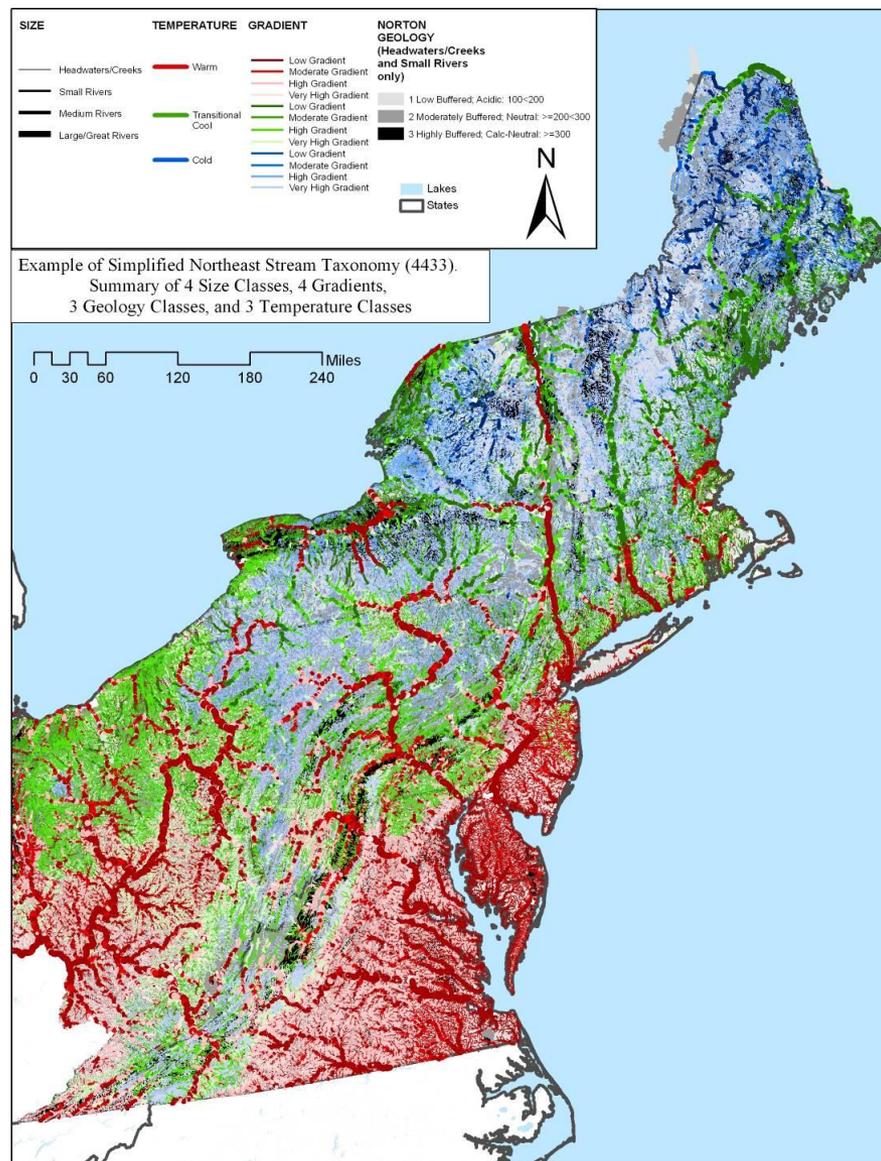
Results: NEAFWA Stream Classification

The result included 259 unique types.

This simplified map groups them into 92 types.

From
Very high gradient, acidic, cold
headwater creek
(1a_6_1_1)

To
Very low gradient, calcareous,
warm Great River
(5_1_3_3)



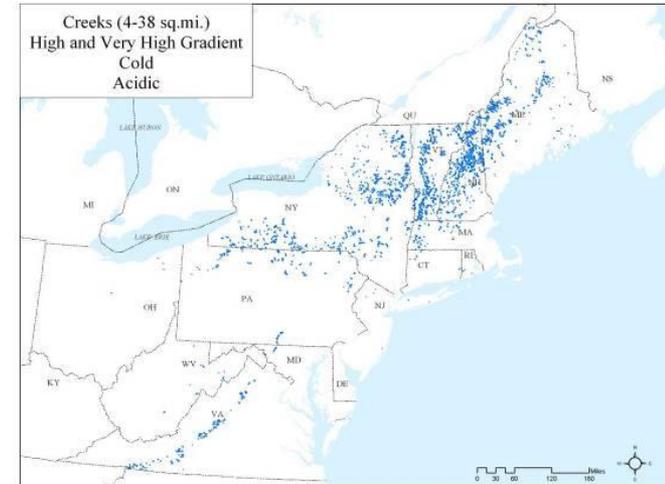
Type: 1b511:

Regional Size Class (1b): Northeast Headwaters

Regional Gradient Class (5): High Gradient

Regional Geology Class (1): Low Buffering

Regional Temperature Class (1): Cold



Linked State Name: MA Small Streams, VT Cold headwater acidic streams, NY Coldwater Stream, CT Coldwater Stream,

Habitat Description: Cascade and step-pool habitats where channels are narrowly confined; bed materials of bedrock, boulders, and cobbles; coldwater habitats with fast moving water; low elevation/coastal variants rare

Linked Biota

Fish: Brook trout; Brook-trout Slimy sculpin, Blacknose dace

Macroinvertebrates: acid tolerant leaf shredders, low species diversity: Caddisflies (*Parapsyche*, *Palegapetus*)-Stoneflies (*Capniidae*)-Non-biting midges (*Eukiefferella*), Mayflies (*Eurylophella*). Other preferential taxa Caddisflies? (*Symphitpsyche*), Stoneflies (*Leuctridae*, *Taenionema*, *Chloroperlidae*, *Peltoperla*), Water strider (pools). Possible taxa Alder flies, Beetles (*Psephenidae*), Mollusca (*Elliptio*), Mayflies (*Heptagenidae*).

Plants: acid tolerant bryophytes, algae, macrophytes



100+ Additional Habitat Descriptors for Each Stream.....



Size (stream order, mean annual flow)

Geology types

Landforms

Elevation, Slope, Sinuosity

Upstream and Downstream Network (e.g. is the reach draining out of a lake, is the reach connected downstream to a very large river etc.)

Land Cover types

Model air temperature and precipitation

How it is being used?

- ❖ North Atlantic LCC project to relate diadromous species to habitat types
- ❖ Diadromous Species Restoration Research Network Workshop on Natural Variability: Habitat Subgroup
- ❖ New York State Freshwater Blueprint
- ❖ NEAFWA RCN Northeast Habitat Indicators and Measures
- ❖ NEAFWA RCN Northeast Freshwater Connectivity Assessment
- ❖ NEAFWA RCN An interactive, GIS-based application to estimate target fish communities in Northeastern streams
- ❖ TNC Freshwater Resilience Analysis



Next steps

- ❖ Work with partners to use the classification and link types to biota
- ❖ Develop Lake Dataset into a regional Lake Classification.

This project did not include a full lake habitat classification. Lake polygons were coded with a few simple available habitat descriptors such as size, geology, elevation, shoreline sinuosity, and connectivity.

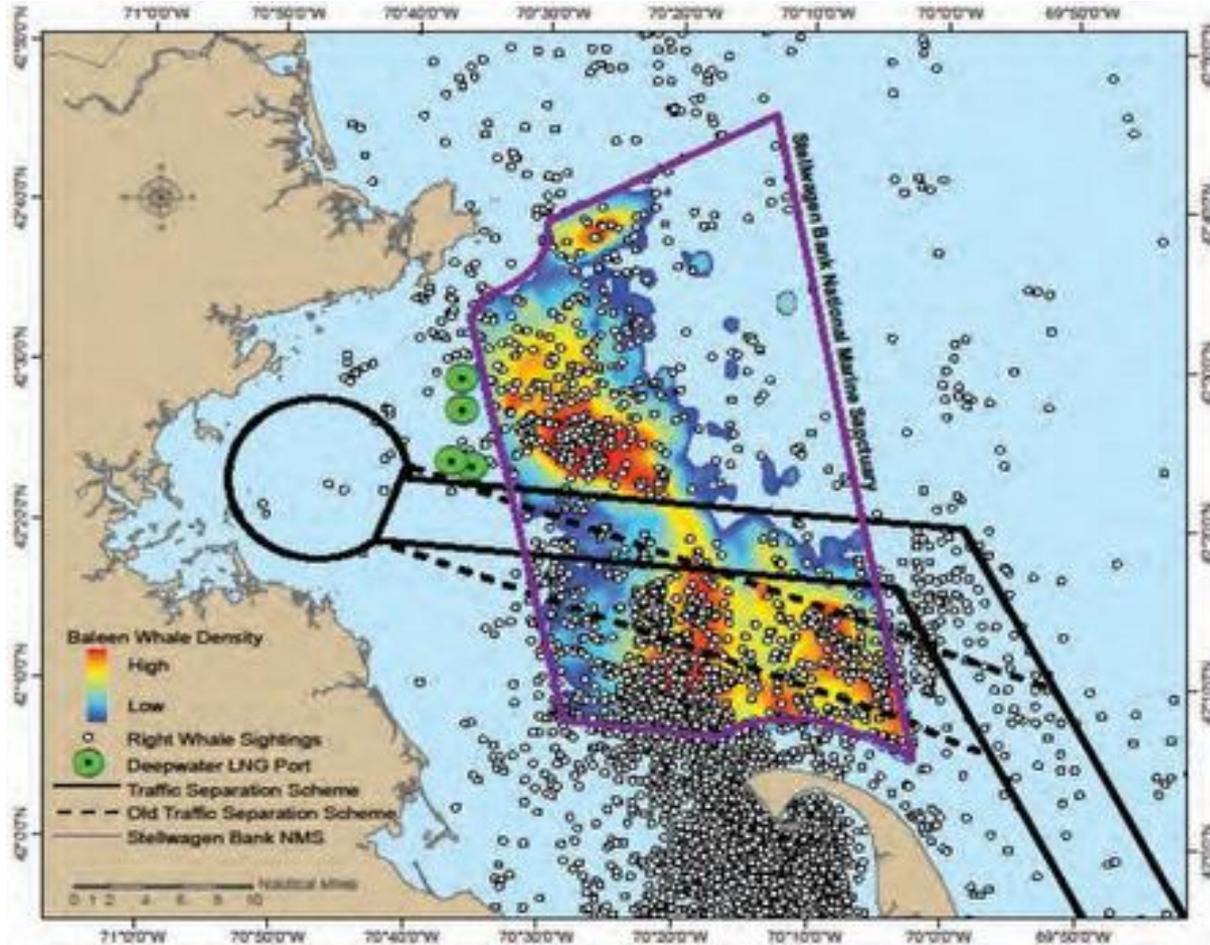


Coastal and Marine Habitat Mapping



- RCN 2011 Priority Topic Area 1
 - Purpose: To develop digital regional base maps and create a regional GIS platform needed for analyses of NE SGCN data
 - 2011 Goal: build on the Coastal and Marine Ecological Classification Standard (CMECS) to integrate coastal and marine habitats into the Northeast Regional Habitat Classification System
 - Projects selected fall 2011

Coastal and Marine Spatial Planning (CMSP)



Stellwagen Bank National Marine Sanctuary (NOAA)

CMSP: Current Status



- State efforts: Massachusetts, RI, Maine
- Regional efforts:
 - NROC (data portal and map viewer)
 - MARCO (GIS mapping and planning portal)
- NOAA and BOEMRE likely Fed leads
- Offshore wind is key issue in many areas
- National Ocean Policy structure:
 - Listening sessions scheduled this month
 - CMSP outline currently out for review
 - Still determining amount of coastal focus

Coastal Change Analysis Program (C-CAP) Land Cover Atlas--NOAA



C-CAP Land Cover Atlas
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Maryland | Talbot

Date Range: 1996 | 2001 | 2006

General | Developed | Forests | Wetlands | Search

General Statistics | Print Full County Report

Talbot County, Maryland
1996 to 2006

What's on the map?
All changes from 1996 and 2006

Percent of Talbot County that changed

2.49%

Distribution of land cover by type

Land Cover Class	1996 (Square Miles)	2006 (Square Miles)
HID	~5	~5
LID	~5	~5
OSD	~5	~5
GRS	~5	~5
AGR	~160	~160
FOR	~40	~40
SCB	~5	~5
WDW	~5	~5
EMW	~5	~5
BAR	~5	~5
WTR	~200	~200

Distribution of change (losses and gains) by land cover

Scale: 1:1288,895 | Lat: 38.8278 | Long: -76.6045

United States Department of Commerce | National Oceanic and Atmospheric Administration | National Ocean Service

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<http://www.csc.noaa.gov/digitalcoast/data/ccapregional/>

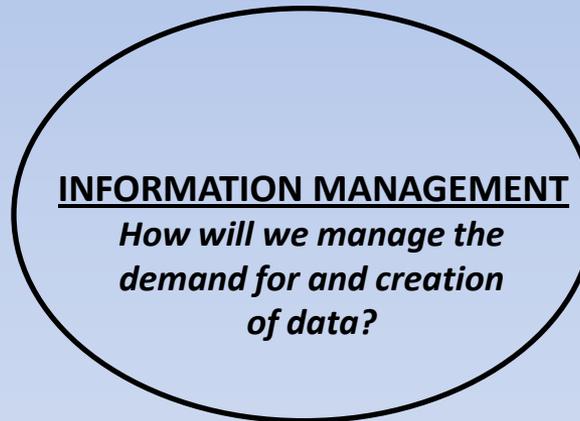
Northeast Conservation Framework

GOAL-SETTING
*Which species to conserve?
At what levels?
Who decides?*

BIOLOGICAL ASSESSMENT
*What do we know about the
status of priority wildlife?*

CONSERVATION DESIGN
*What should landscapes look
like to conserve all species at
levels that society wants?*

PRIORITIES
*Which species demand
immediate attention?*



SCIENCE TRANSLATION TOOLS
*How do we make science
solutions useful?*

**MONITORING, EVALUATION,
RESEARCH**
*What new information will we
gather to support conservation?*

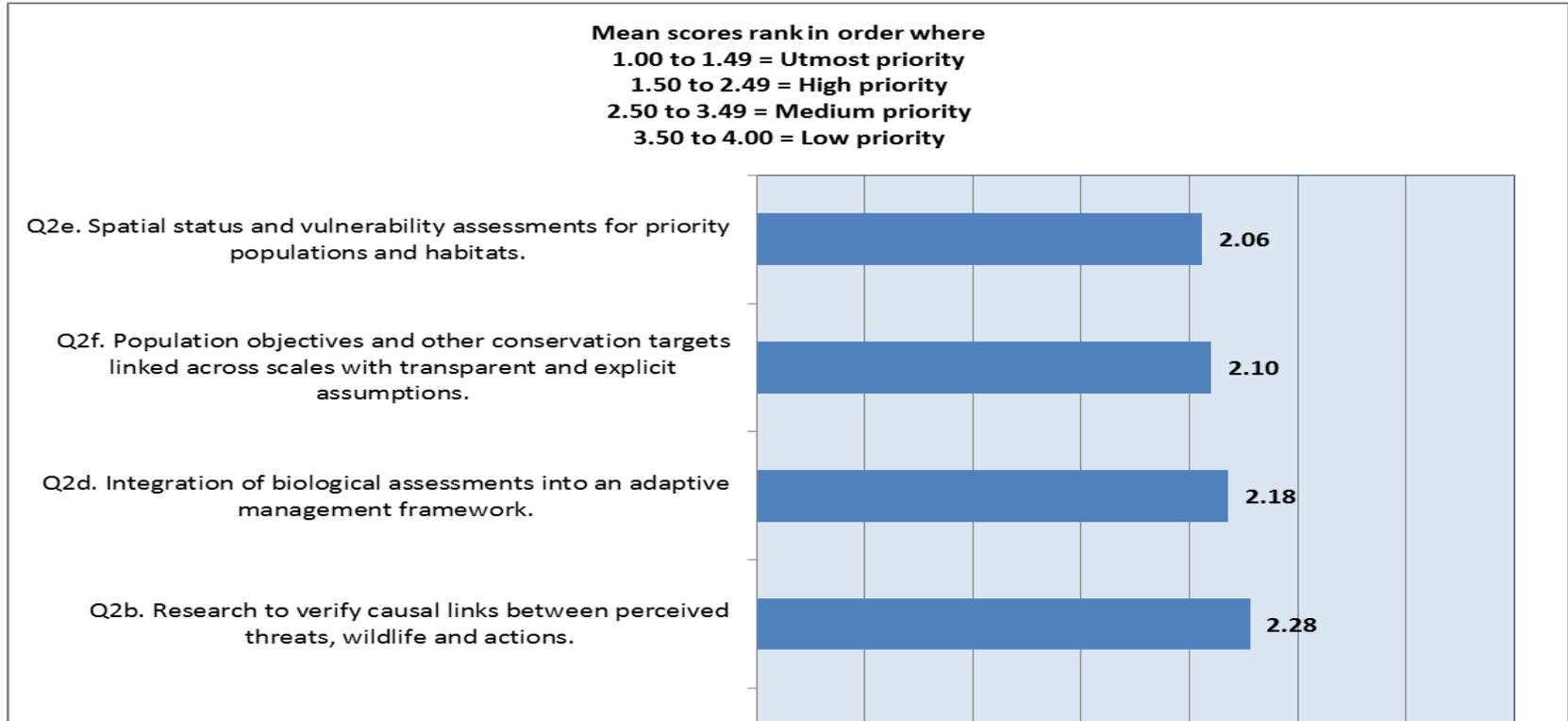
**CONSERVATION
ADOPTION**
*How do we get communities and
landowners engaged in conservation?*

CONSERVATION DELIVERY
*How will we most efficiently put
conservation on the ground?*



Priority Needs for the Future

Survey Question: What priority do you think should be given to each of the following biological assessment activities to achieve regional conservation in the Northeast?



Priority Needs for the Future



- LCC Science Needs:
 - Habitat mapping and modeling of marine bird distributions and coastal migration of birds and bats (NALCC)
 - Species-habitat modeling and mapping of terrestrial and wetland species (NALCC)



Discussion Questions:

1. What are the highest priority additional projects or needs for advancing habitat mapping?
2. Who are the key members of the conservation community who can address these priorities and what roles are best suited to RCN and LCCs?
3. What is value added of regional classification and mapping?
4. How often do we need to update regional maps, and how can we build a system to make updating more efficient?

Questions?

