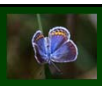



Representative Species and Conservation Design

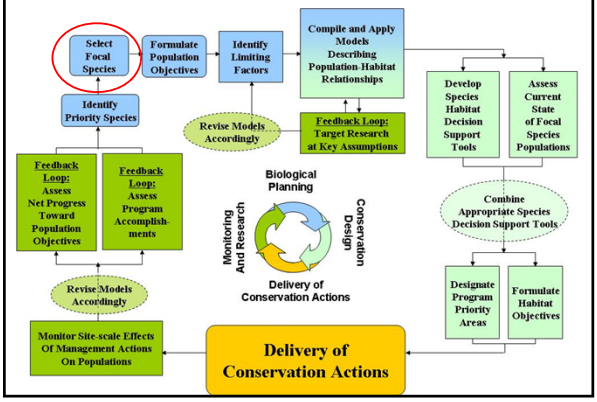
Background, Purpose, Methods and Applications

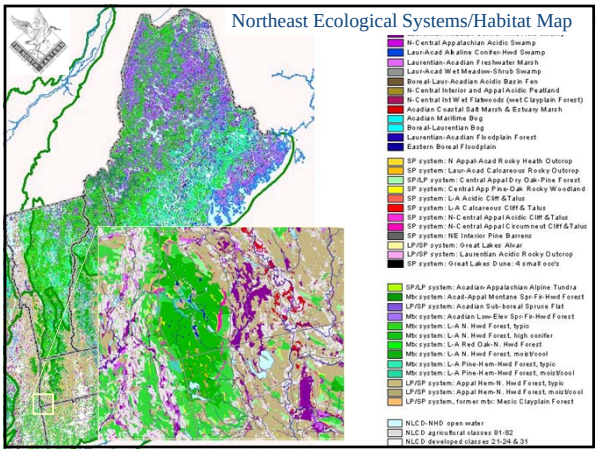
Andrew Milliken
North Atlantic LCC
U.S. Fish and Wildlife Service Northeast Region

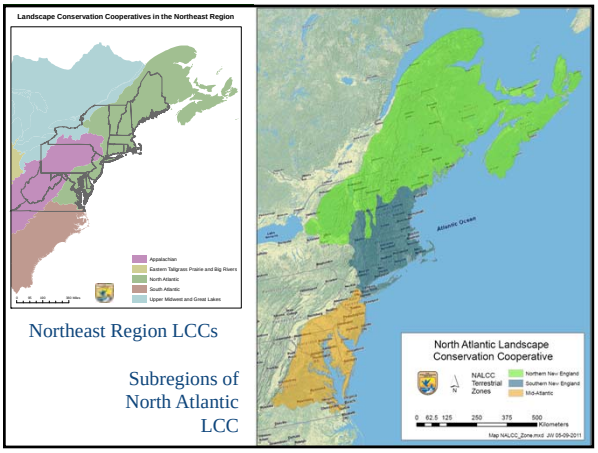
Why do we need Representative Species?

- To help develop maps, tools and landscape designs focused on providing habitat for multiple species
- To help understand the current and future capability of landscapes to support fish and wildlife populations
- To help guide strategic decisions about how much of what habitat conservation actions are needed where to sustain populations


Strategic Habitat Conservation Framework





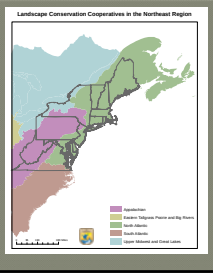


Selecting Representative Species for Conservation Planning in the North Atlantic Landscape Conservation Cooperative (NALCC)

USFWS Region 5 Strategic Habitat Conservation Team

University of Massachusetts Amherst

U.S. Forest Service



R5 SHC Steering Committee

- Andrew MacLachlan - ES
- Andrew Milliken – Mig. Birds /Science Applications
- Bridgett Costanzo – ES
- David Stilwell – ES
- Greg Breese – ES
- Herb Bergquist - ES
- Jan Taylor - NWRS
- Jed Wright - ES
- Ken Sturm – NWRS
- Mark McCollough – ES
- Meredith Bartron - Fisheries
- Mike Millard – Fisheries
- Mitch Hartley – Mig. Birds
- Randy Dettmers – Mig. Birds
- William Ardren - Fisheries

Multitude of other FWS, FS, USGS, State, Natural Heritage & University biologists who provided expert peer review of species-habitat matrices and input at workshops

Why This Process?

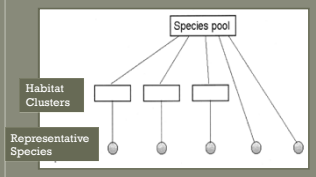
- FWS has responsibility to manage and conserve all trust species
- Subset of trust species & state species of greatest conservation need (SGCN) were identified as "Priority Species"
- List of "Priority Species" exceeded the resources available for moving forward into SHC and LCC planning efforts (n=411)
- Need to identify a suite of "Representative Species" that can represent the larger group of Priority Species

What Is a Representative Species?

- ..a species whose habitat needs, ecosystem function, or management responses are similar to a group of other species.
  - other species in that group are expected to respond to conservation actions in a similar way as the representative species
- ..also need to consider stand-alone species if they have unique habitat or ecosystem function, are needed to prioritize management actions, or their addition helps achieve a more comprehensive suite of species for biodiversity conservation.

Representative Species Process: Overview

- Phase I
  - Compile list of priority species
- Phase II
  - Develop species-habitat association database
- Phase III
  - Conduct cluster & indicator species analyses
- Phase IV
  - Develop ranking criteria
- Phase V
  - Conduct region-wide workshops and select species



Phase I - Priority Species List

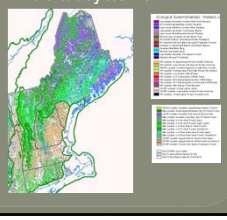
- Priority species lists provided by FWS & state partners (total = 411)
  - terrestrial (341)
  - aquatic (70)
  - threatened and endangered (106)
  - SGCN (32 not included above)
- Dropped 120 species for various reasons
  - extirpated from NALCC
  - does not occur in NALCC
  - exclusively marine
  - of concern only in BCR 27 (southern boundary of NALCC)
  - occurs only in BCR 27 and/or 28
  - distribution too localized or no threats
  - unreviewed or incomplete review by experts

Phase II – Species-Habitat Terrestrial Database

TNC - NEAFWA Wildlife Habitat Classification & Mapping Project

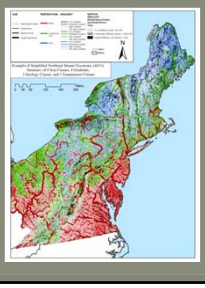
NLCD	# of Habitat systems
21 - Developed, Open Space	2
22 - Developed, Low Intensity	2
23 - Developed, Medium Intensity	1
24 - Developed, High Intensity	1
31 - Barren Land	17
32 - Unconsolidated Shore	3
41 - Deciduous Forest	15
42 - Evergreen Forest	14
43 - Mixed Forest	11
52 - Scrub/Shrub	15
72 - Grassland/Herbaceous	6
81 - Pasture/Hay	1
82 - Cultivated Crops	1
90 - Woody Wetlands	40
95 - Emergent Herbaceous Wetland	9
96 - Palustrine Emergent Wetland (Persistent)	5

- Hierarchical classification
  - formation
  - macrogroups
  - habitat systems n=144



Phase II – Species-Habitat Aquatic Database

TNC – NEAFWA Aquatic Habitat Classification



- 92 simplified aquatic habitat types
  - size
  - gradient
  - geologic setting & buffering capacity
  - temperature
- No lake habitat classification developed (size dataset)
- No marine/estuarine systems

Species-Habitat Matrices

- Supplementary habitats added to fill in gaps in TNC classifications
- Many species assigned to terrestrial & aquatic guilds
- Designated breeding and non-breeding habitats
- Preferred and utilized habitat use values
- Utilized online databases and current literature
- Extensive review by partners

Species	Habitat System		
	A	B	C
Species X	0	.5	0
Species Y	.5	0	1

0 = not utilized, 0.5 = utilized, 1 = preferred

Guilds

Terrestrial

- Area-sensitive
- Forest interior
- Edge specialists
- Shrubland-dep.
- Grassland-dep.
- Wetland-dep.
- Riparian-dep.
- Near-shore
- Pelagic
- Colonial nester
- Temporarily-flooded

Aquatic

- Orientation
- Body size
- Trophic level
- Spawning time
- Migration strategy
- Tolerance
- Hosts for mussels

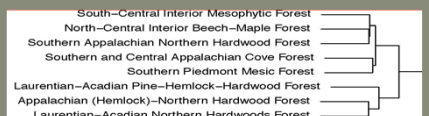
Guilds & modifiers not used in cluster analyses, but some will be used as supplementary data for ranking species

Phase III Conduct Cluster Analyses

- separate analyses for terrestrial and aquatic species
- used NEAFWA habitat systems and supplementary habitats only
- species were divided into separate breeding and non-breeding 'species' for those that use different suites of habitats seasonally
- divided NALCC into 3 sub-regions

Cluster Analyses

- Cluster the habitat systems based on similarity of species composition



8 habitat systems clustered with 19 species

Indicator Value

- Those species most commonly associated with the habitat systems & preferred use in the habitat systems within that cluster

Perfect indicator species (1.0) = the species only occurs in those habitats within a cluster, and all of those habitats are preferred

Species & Indicator Status

Species	*I*	*P*
Broad winged Hawk	0.88	0.001
Black and white Warbler	0.45	0.001
Pogonia, small whorled	0.43	0.001
Yellow bellied Sapsucker	0.34	0.001
Black throated Green Warbler	0.34	0.002
Cerulean Warbler	0.34	0.001
Chestnut sided Warbler	0.32	0.003
Baltimore Oriole	0.32	0.001

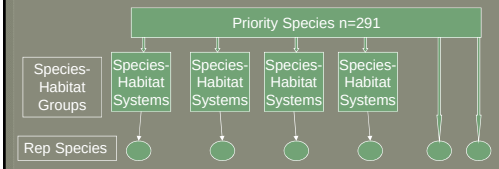
Phase IV Ranking Criteria for Selecting Representative Species

GOAL: Identify a list of representative species for designing conservation & management strategies that will most effectively sustain the identified fish and wildlife populations in the face of land use change, climate change, and other stressors occurring within the North Atlantic LCC.

- How representative within NALCC?
- Sensitivity to climate & habitat changes
- How practical to monitor?
- Availability of baseline data

Phase V Selecting Representative Species through Workshops

- Review the clusters of priority species & habitat systems
- Identify suites of representative species for biological planning & conservation design



Representative Species Workshops

- 3 workshops with FWS biologists, representative species steering committee, partners, and species experts to choose which species can serve as representative for each habitat cluster.

Role of Expert Input

- Initial selection of species
- Input on process – suggestions for future iterations
- Involvement in future work of conservation planning using these species (pilot areas)

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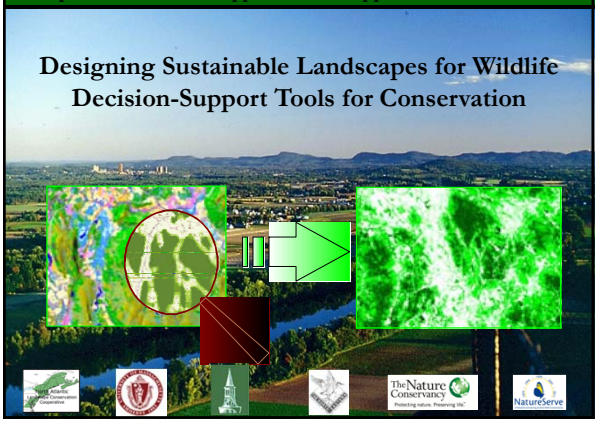
Results and Next Steps

- 87 terrestrial species were selected as representative species for the three subregions of the LCC
  - 66 birds, 9 reptiles, 4 mammals, 4 amphibians, 2 plants and 2 invertebrates
- 13 initial aquatic species for 6 habitat system clusters selected
  - Concerns about aquatic approach (too many systems not enough species)
  - Alternate approaches and inclusion of additional species will be explored
- Summary report produced and distributed
- Species-habitat models being developed for terrestrial spp.
- Information on existing population goals or population-based habitat goals will be compiled
- Work with SHC team and LCC to revise or develop additional goals

Designing Sustainable Landscapes for Wildlife Decision-Support Tools for Conservation



Designing Sustainable Landscapes for Bird Populations in the Eastern United States

Alabama Cooperative Fish and Wildlife Research Unit

USGS science for a changing world

Objective is to enhance the ability of programs and partners to make informed conservation decisions for sustaining biodiversity at the landscape scale under current and **predicted future conditions.**

- Design landscapes to ensure connectivity

- Protect, manage & restore habitat in the right places

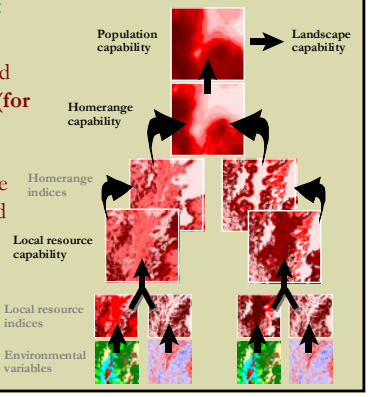
- Minimize forces of habitat degradation

Utilizing complementary **fine-** and **coarse-filtered approaches**

Fine filter assessment

- Capability models

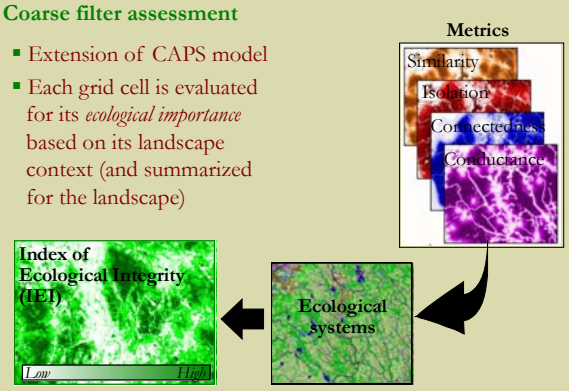
Each grid cell is evaluated for its habitat capability **(for each representative species)** based on its composition & landscape context (and summarized for the landscape)



Purpose & Need | **Approach** | Applications | Outlook

Coarse filter assessment

- Extension of CAPS model
- Each grid cell is evaluated for its *ecological importance* based on its landscape context (and summarized for the landscape)



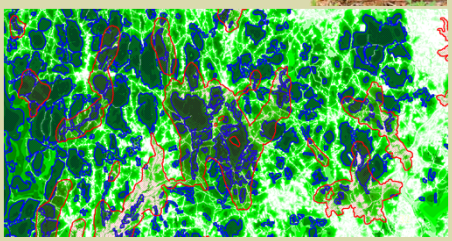
Purpose & Need | Approach | **Applications** | Outlook

Model outcomes: *Coarse-fine filter* evaluation/comparison

- Identify a strategy for maximizing the complementarity of the coarse and fine filters

Top 20% (plus buffer) wood turtle habitat

Top 20% ecological integrity

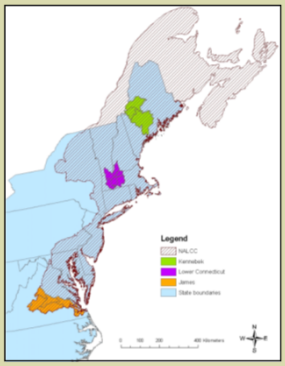


Purpose & Need | **Approach** | Applications | Outlook

Now building a **landscape change model** to predict changes in *ecological integrity* and *habitat capability* driven by urban growth, climate change and other anthropogenic (e.g. timber harvest) and natural disturbances (e.g., fire)

Piloted in 3 watersheds:

- Kennebec (15,264 km^2)
- Lower Connecticut (8,579 km^2)
- James (16,747 km^2)



Purpose & Need | Approach | Applications | **Outlook**

Project outlook

- Pilot study complete May 2012
- Next steps:
  - Expand to full NALCC
  - Develop additional modules (drivers)
  - Upgrade wildlife models to occupancy/population
  - Sustainable landscape design algorithms for decision support(scenario analysis)
    - **www.umass.edu/landeco/research/nalcc/nalcc.html**
    - **www.northatlanticlcc.org**

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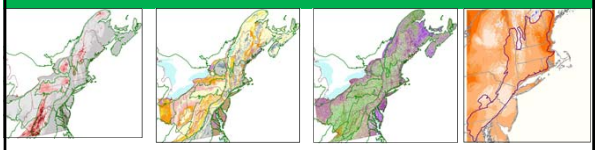
Physical and Climatic Factors



Elevation
Max
Min
Range

Area
Latitude

# of Geology classes
Amount of each:
Sedimentary
Shale
Calcareous
Mod Calc
Granite
Mafic
Ultramafic
Coarse sand
Fine silt

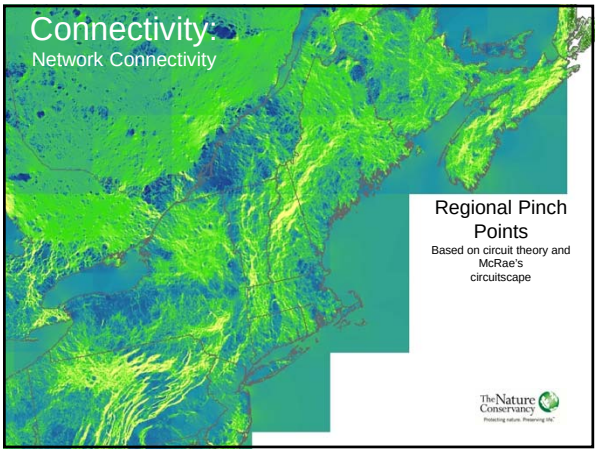
# of Landforms
Amount of each:
Cliff
Upper slope
Summit
Side slope
Cove
Valley
Wet flat
Dry flat

Mean diurnal temp. range,
Mean annual temp. range,
Mean annual temp.
Mean annual precip.
Precip. warmest quarter,
Min temp. coldest month,
Mean temp. coldest quarter.

The Nature Conservancy

Connectivity:

Network Connectivity



The Nature Conservancy

Complementary Approaches

- Expert driven (and subsequent data-driven) assessments of vulnerable species and habitats
- Species-habitat based approaches
  - Consistent habitat maps
  - Species-habitat models for **representative species**
  - Projections of changes to habitats and capability of supporting populations
- Coarse Filter/Ecological integrity
  - Landscape context
- Geophysical approaches to resiliency
- Connectivity

Landscape Conservation Cooperatives Fundamental Objective

To define, design, and deliver landscapes that can sustain natural and cultural resources at desired levels nation-wide

Thank You

andrew_milliken@fws.gov

http://www.northatlanticlcc.org/