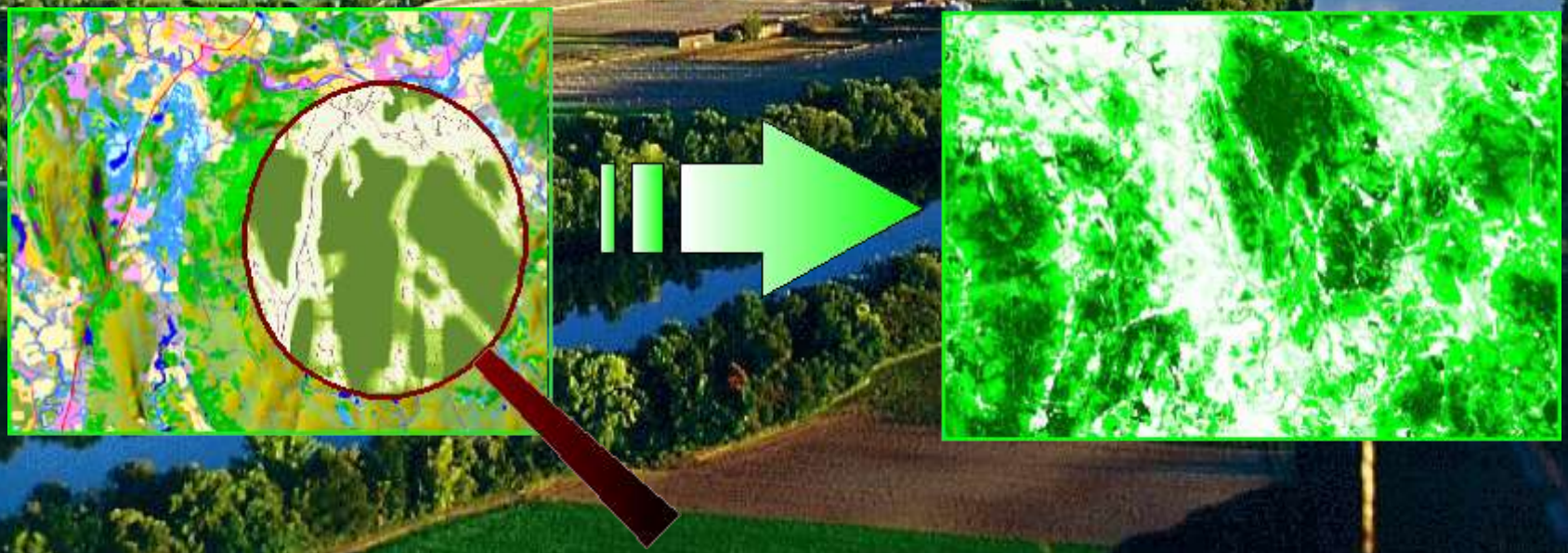
Designing Sustainable Landscapes in the Northeast

A project of the North Atlantic Landscape Conservation Cooperative & Northeast Climate Science Center

Landscape Conservation Design

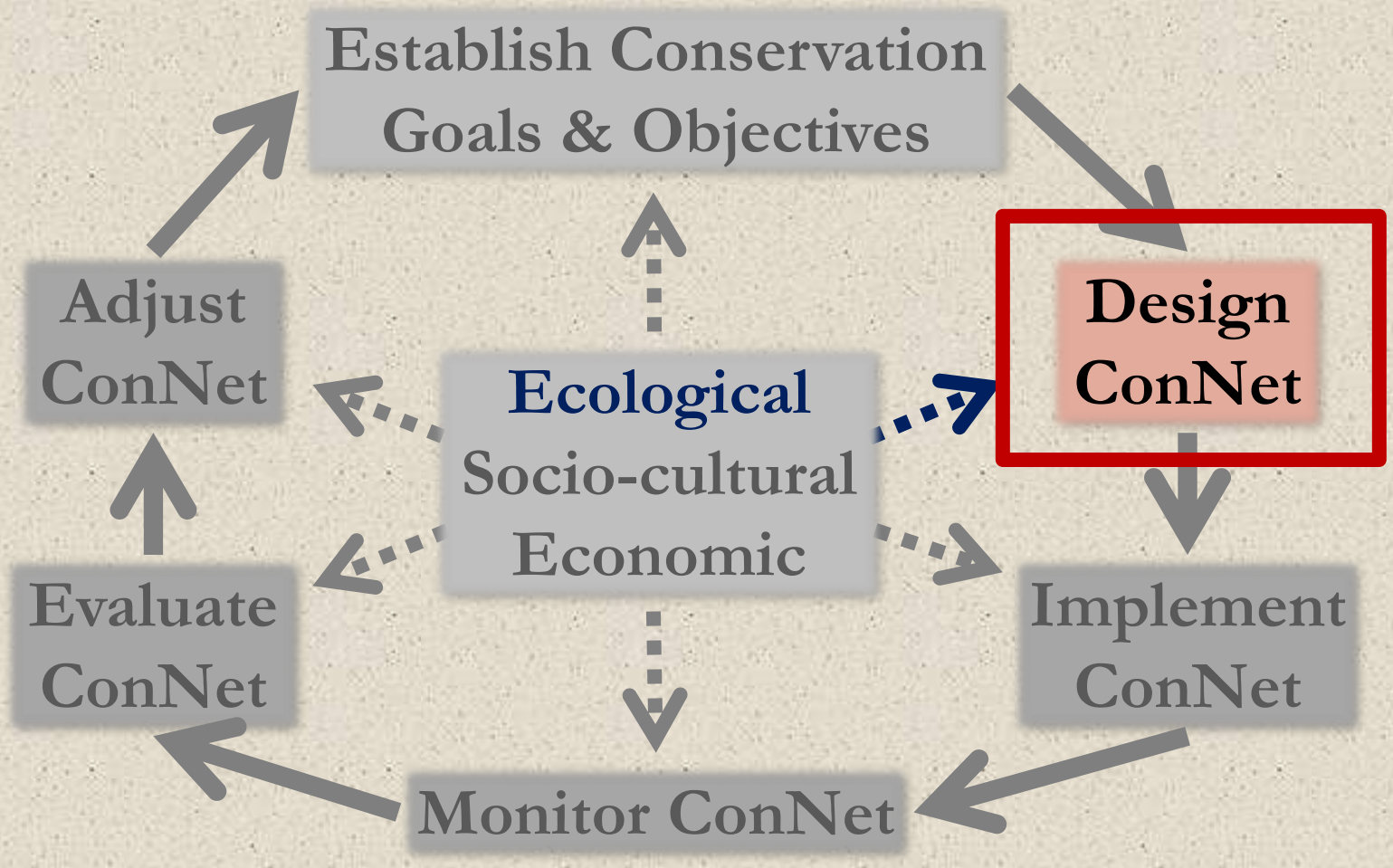
May, 2014



Landscape Conservation Design

Step 2: Design Conservation Network

Adaptive Landscape Conservation Design



Landscape Conservation Design

Step 2: Design Conservation Network

Design Steps:

1. Select (tiered) *core* areas **Current focus**
2. Prioritize within/among cores
3. Create core area *buffers*
4. Delineate *corridors* among cores
5. Prioritize within/among corridors
6. Determine *management* needs
7. Identify *restoration* opportunities

- Field verification at all steps
- Socio-cultural and economic considerations at all steps

Landscape Conservation Design

Step 2: Design Conservation Network

1. **Select (tiered) core areas**

Three scenarios:

- Ecosystem approach (coarse filter)…
  based solely on ecosystem conditions

Quick follow up

- Species approach…
  based solely on focal species considerations
- Combined ecosystem-species approach…
  based on the complement of ecosystems and species

Landscape Conservation Design

Step 2: Design Conservation Network

1. Select (tiered) core areas

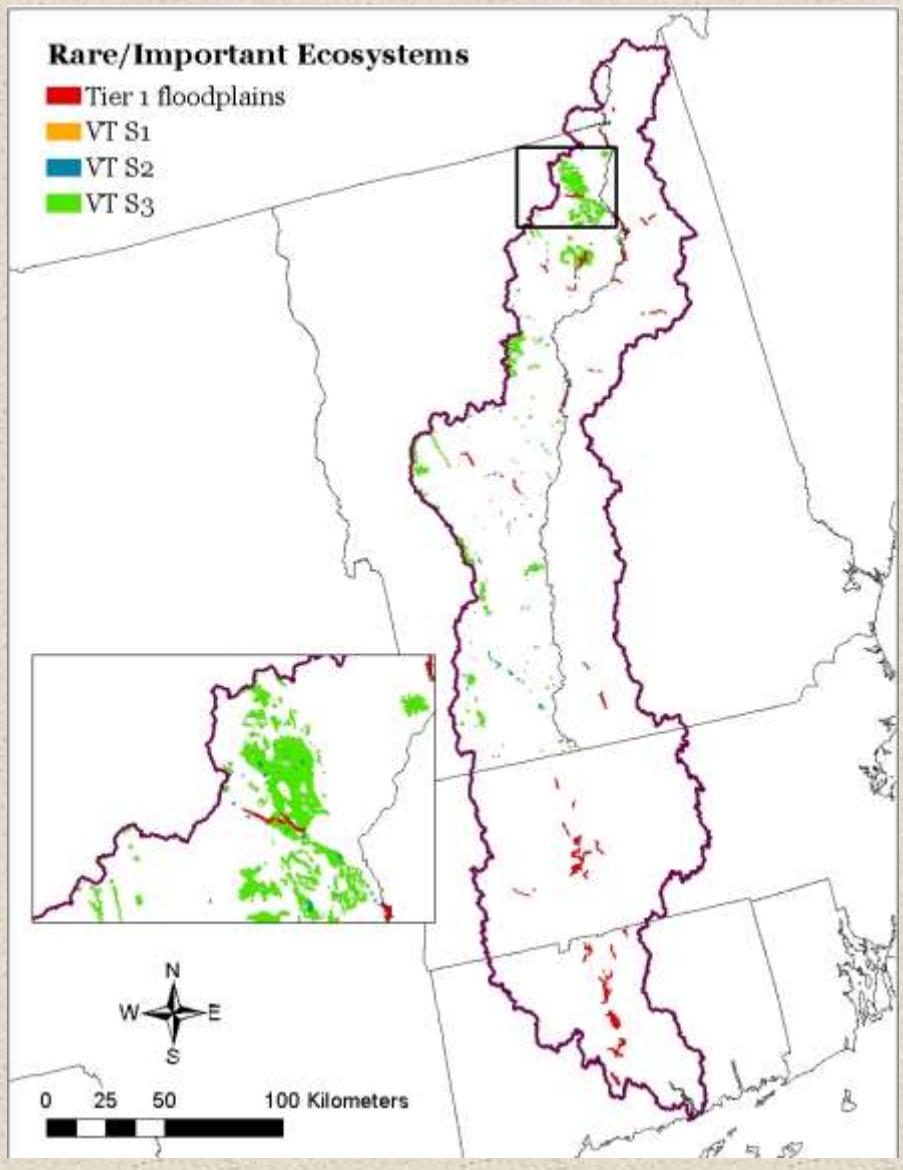
   Ecosystem approach:

   a) Rare/Important systems

   b) DSL Index of Ecological Integrity (IEI)

   c) TNC Resiliency

   d) USGS headwater stream temp sensitivity



Landscape Conservation Design

Step 2: Design Conservation Network

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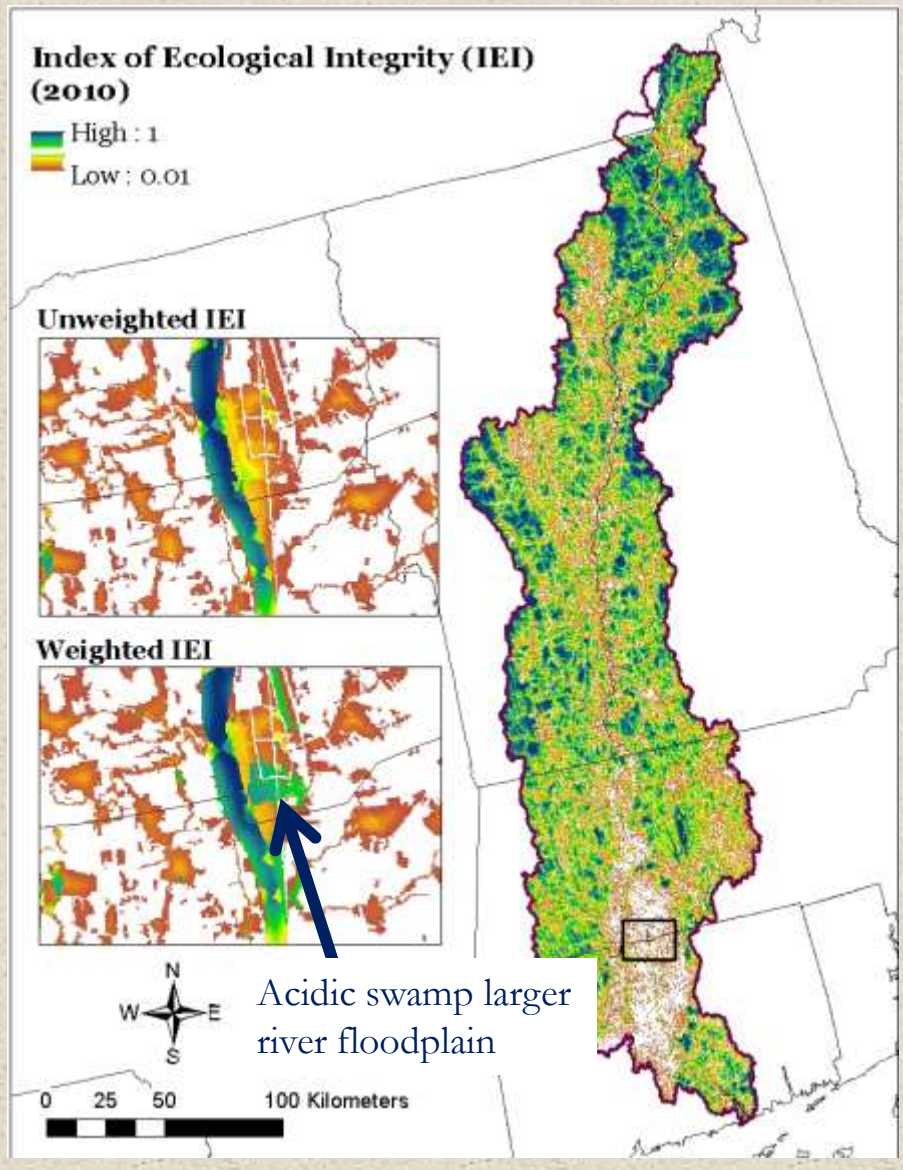

Landscape Conservation Design

Step 2: Design Conservation Network

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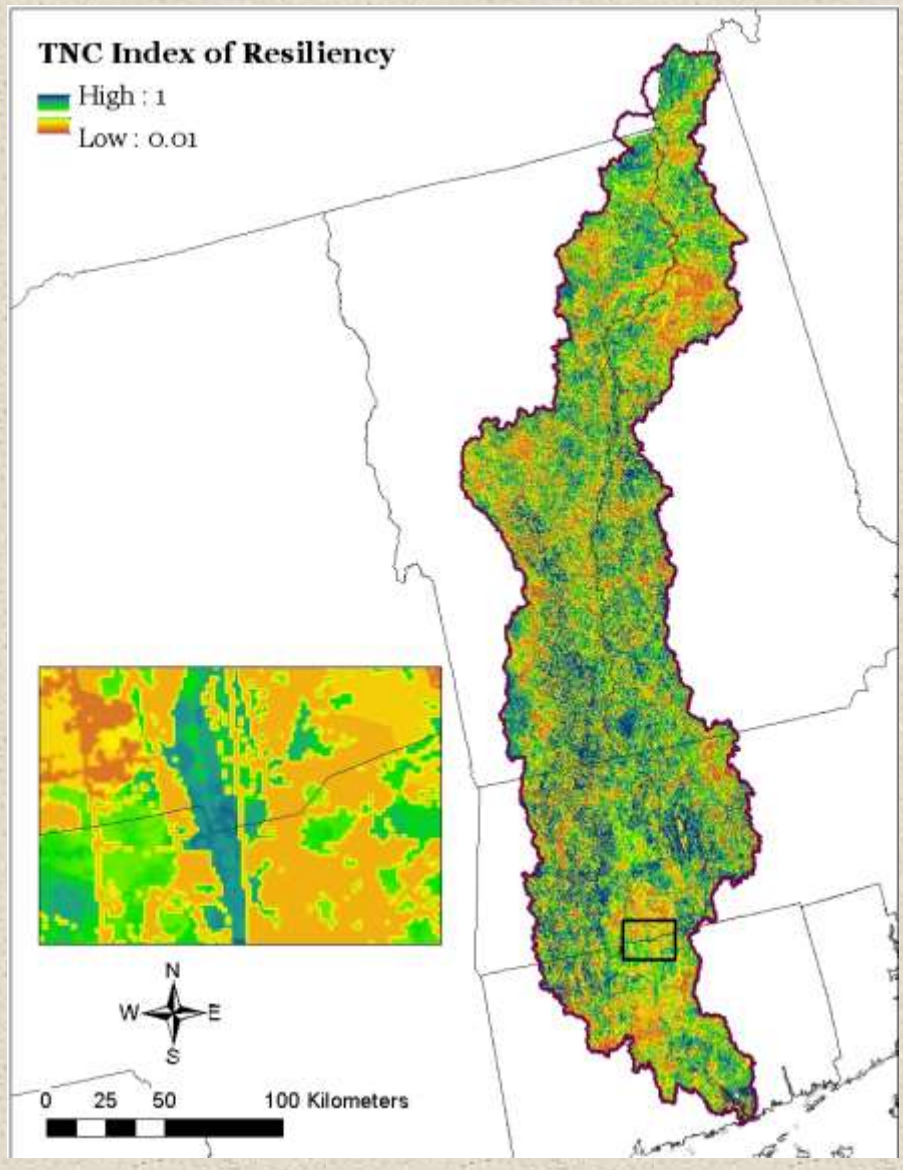

Landscape Conservation Design

Step 2: Design Conservation Network

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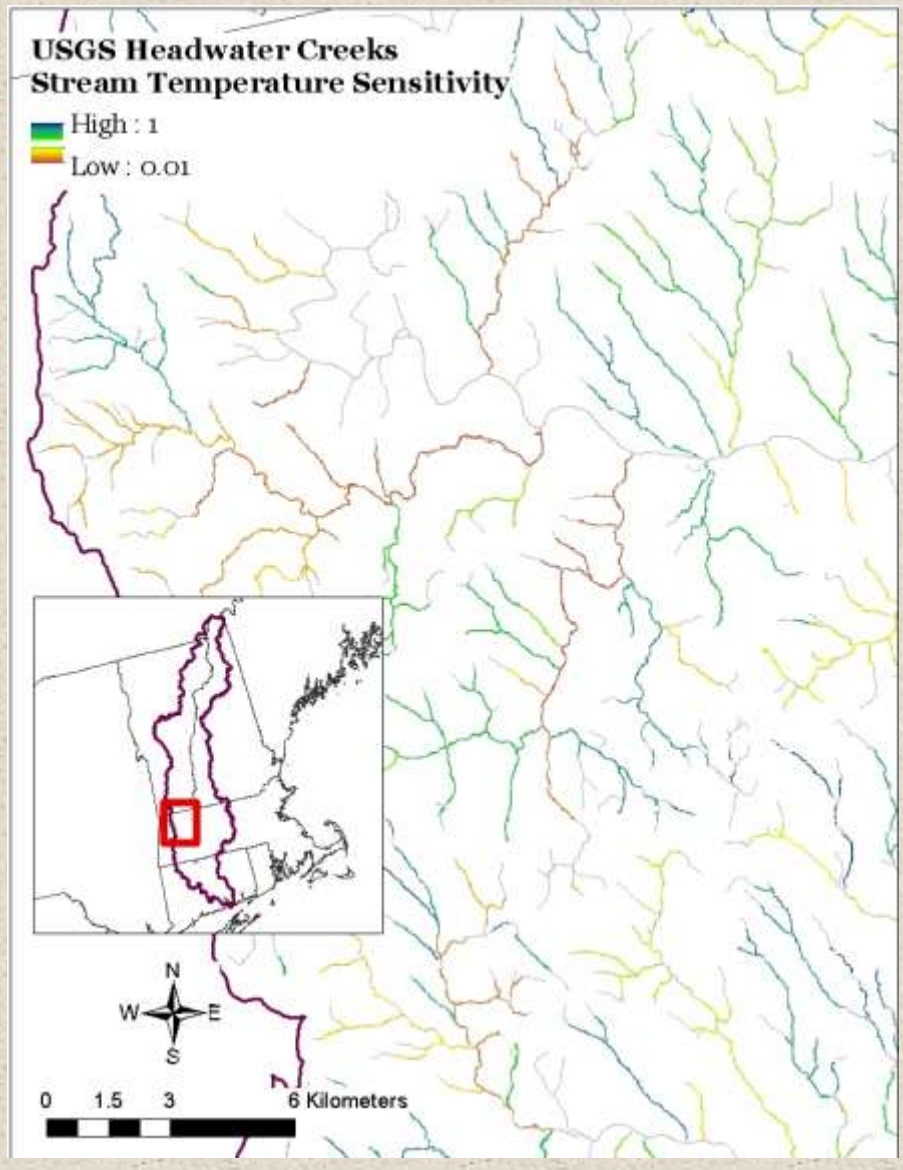


Landscape Conservation Design

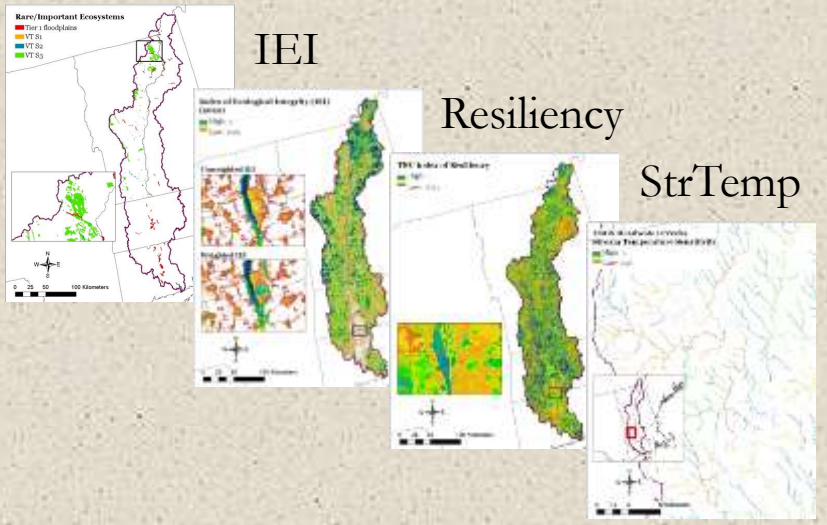
Step 2: Design Conservation Network

1. Select (tiered) core areas

Ecosystem approach:

- Combine the products into a single selection index

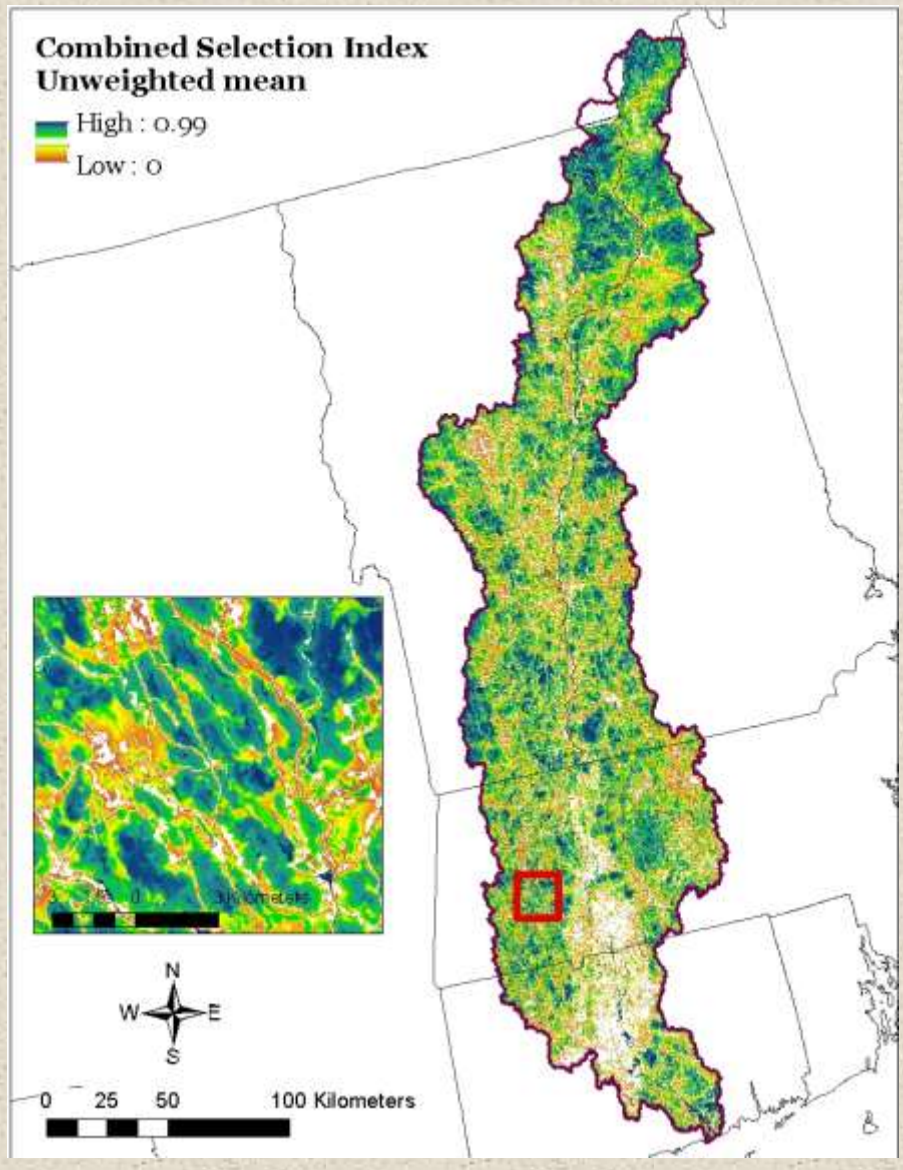
Rare



IEI

Resiliency

StrTemp



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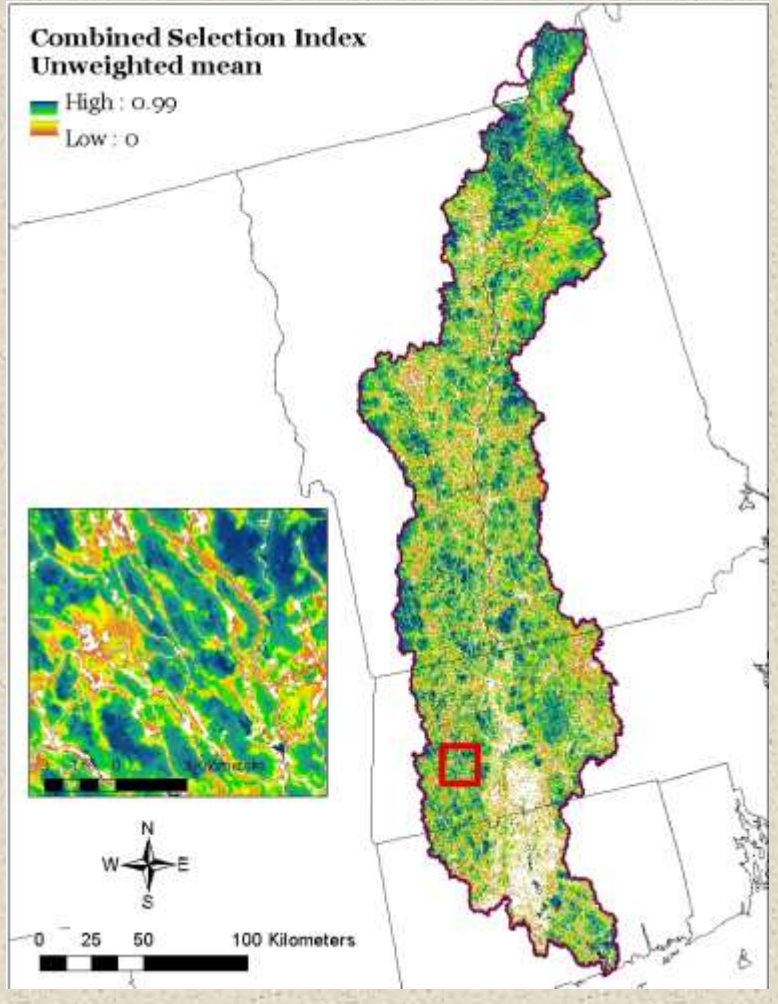
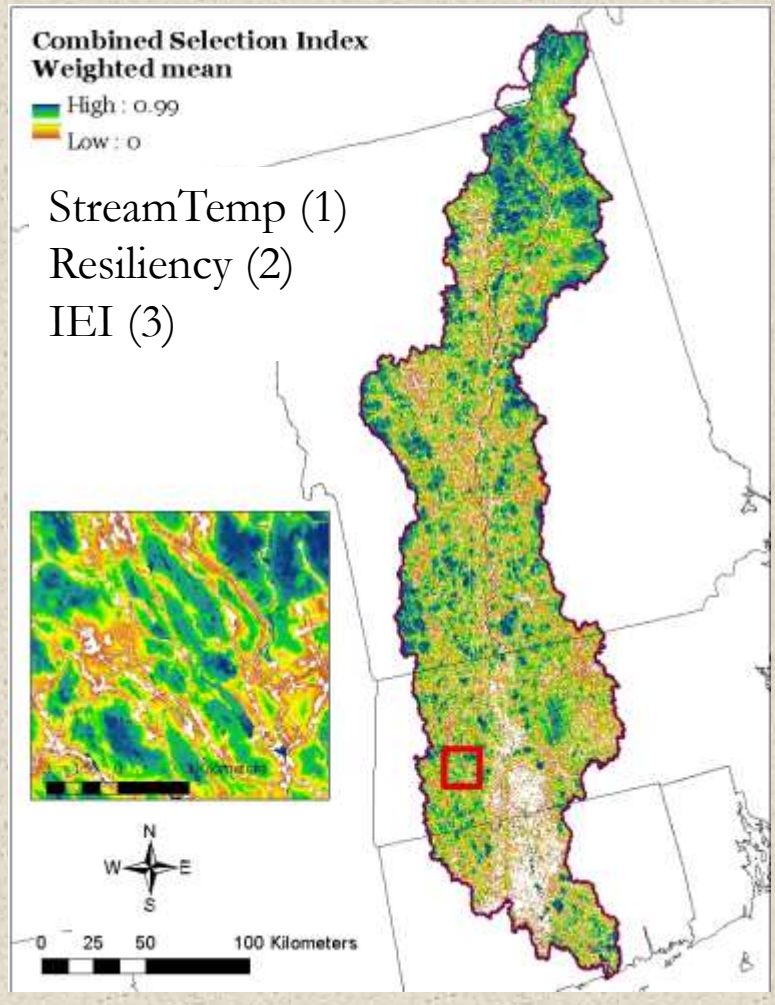
Step 2: Design Conservation Network

- Selection index: unweighted versus weighted





Landscape Conservation Design

Step 2: Design Conservation Network

1. **Select (tiered) core areas**

Ecosystem approach:

Key decisions remaining:

1. Weight aquatic systems/macrogroups?
2. Weight geo-physical settings (for Resiliency)?
3. Weight components of core area selection index?
4. How much land area to allocate to core areas?
5. Should there be a minimum core area size?
6. How to delineate core area for aquatics?

Landscape Conservation Design

Step 2: Design Conservation Network

1. **Select (tiered) core areas**

Three scenarios:

- Ecosystem approach (coarse filter)…
  based solely on ecosystem conditions
- Species approach…
  based solely on focal species considerations
- Combined ecosystem-species approach…
  based on the complement of ecosystems and species

Today's focus!

Landscape Conservation Design

Step 2: Design Conservation Network

1. **Select (tiered) core areas**

Focal species approach:

a) Establish targets based on objectives*

b) Create selection index

c) Select core areas to meet targets

- Translate each species' objective into percentage of current *Landscape Capability (LC)*

Under the assumption that species objectives can be translated into landscape capability units

Landscape Conservation Design

Step 2: Design Conservation Network

Representative species:

- American woodcock
- Black bear
- Blackburnian warbler
- Blackpoll warbler
- Brook trout*
- Eastern meadowlark
- Louisiana waterthrush
- Marsh wren
- Moose
- Northern waterthrush
- Ruffed grouse
- Wood duck
- Wood turtle
- Wood thrush
- American black duck (B)
- American black duck (NB)
- American oystercatcher
- Bicknell's thrush
- Box turtle
- Brown-headed nuthatch
- Cerulean warbler
- Common loon
- Diamondback terrapin
- Ovenbird
- Prairie warbler
- Red-shouldered hawk
- Saltmarsh sparrow
- Sanderling – migratory
- Snowshoe hare
- Snowy egret
- Virginia rail

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Other species:

- **Terrestrial/wetland species:**
  - ✓Bat hibernacula
  - ✓Puritan and Cobblestone tiger beetles
  - Others?
- **Aquatic species:**
  - Diadromous fish
  - Others?

Contingent on availability of extant digital data (i.e., existing maps)

Landscape Conservation Design

Step 2: Design Conservation Network

Information to inform representative species targets:

- Extent… total current *landscape capability* (*LC*) for each species within the region and landscape.
- Landscape importance… proportion of each species' regional *LC* contained within the landscape.
- Climate change vulnerability… proportional change in *landscape capability* (*LC*) due to climate change within the region and landscape.
- Landscape change vulnerability… proportional change in *landscape capability* (*LC*) within the region and landscape.
- Others? (population trends, limiting factors)

Landscape Conservation Design

Step 2: Design Conservation Network

Information to inform species targets:

Species	Current (2010) Landscape Capability (LC)		Ct River Importance (%)	Landscape Change Vulnerability (2080) (%)				Weight
				Climate		Climate & Land use		
	NE	CTR		NE	CTR	NE	CTR	
Blackpoll warbler	1,830,296	278,649	**15.2**	**-94.3**	**-93.7**	tbd	tbd	
Eastern meadowlark	7,335,627	53,807	**0.7**	17.4	43.7	tbd	tbd	
…	…	…	…	…	…	…	…	

Weights specified in terms of percent of current LC within the CTR?

Landscape Conservation Design

Step 2: Design Conservation Network

1. **Select (tiered) core areas**

   Focal species approach:

   a) Establish targets based on objectives

   b) Create selection index

   c) Select core areas to meet targets

- Which products do we include and how do we weight them?

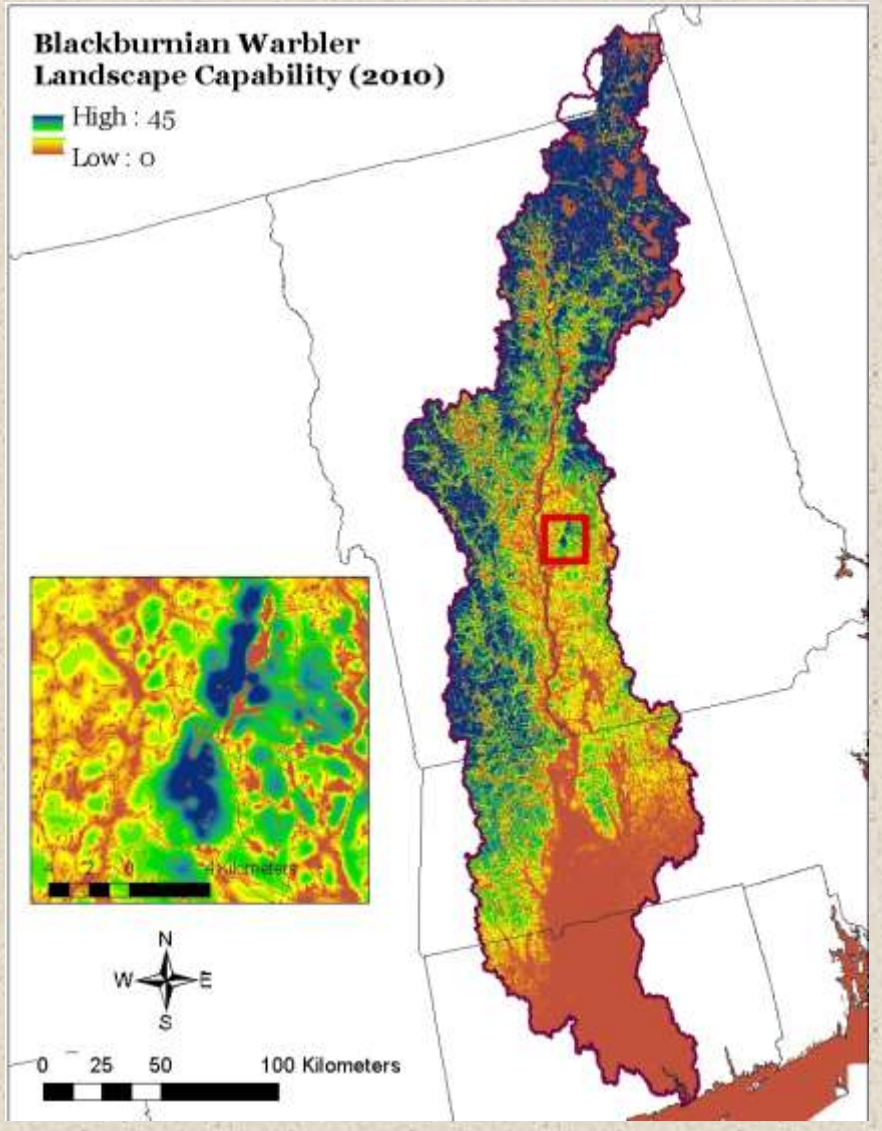
Landscape Conservation Design

Step 2: Design Conservation Network

1b) Create selection index

For each representative species:

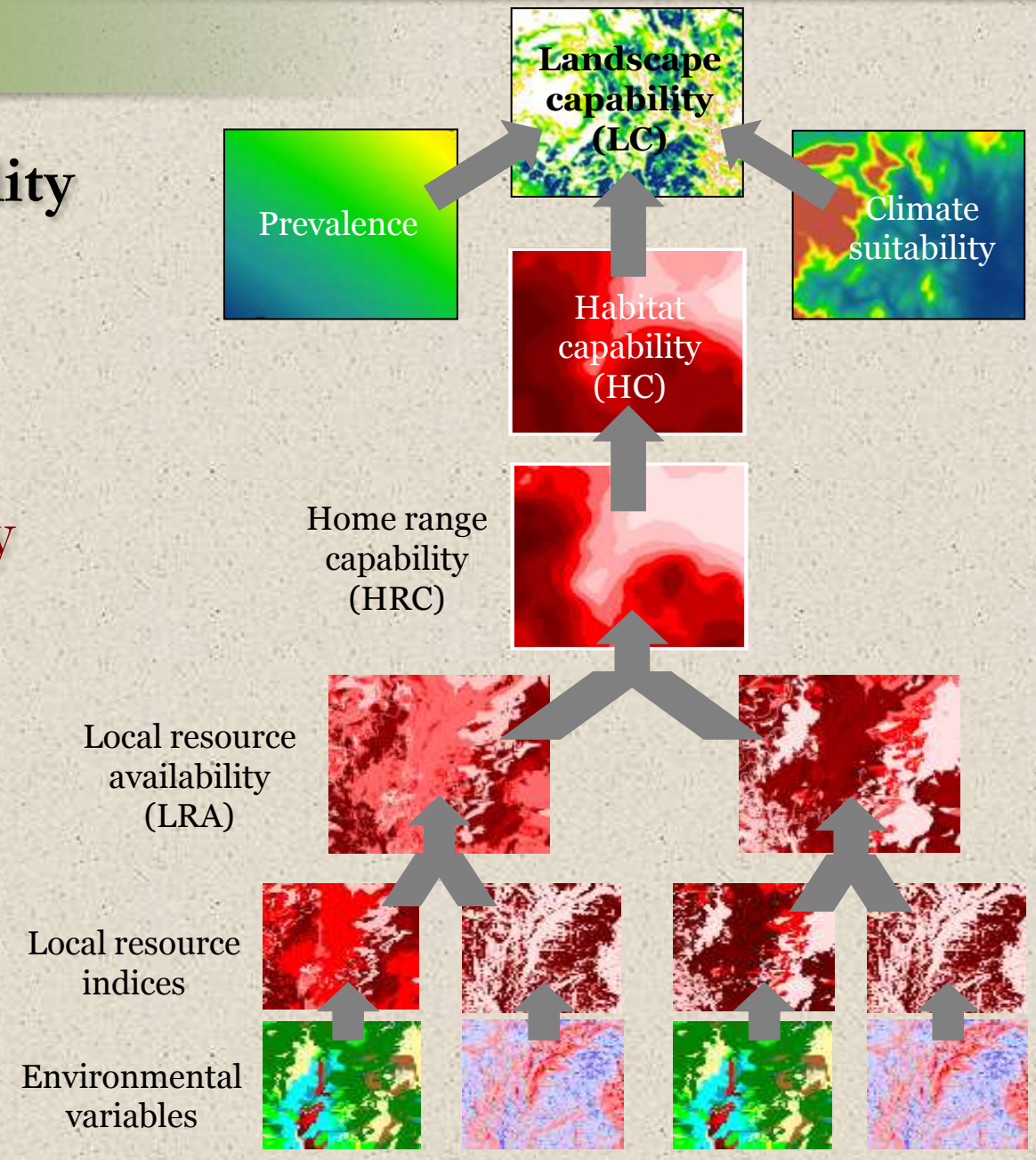
- Current (2010) *landscape capability* (*LC*)
  - 0-100 index
  - 30 m resolution



Landscape Assessment

Species

- **Landscape capability index**
  - Spatially-explicit
  - Multi-scale
  - Expert/empirically -derived
  - Synthesis of habitat capability, climate suitability, and prevalence
  - Statistically validated



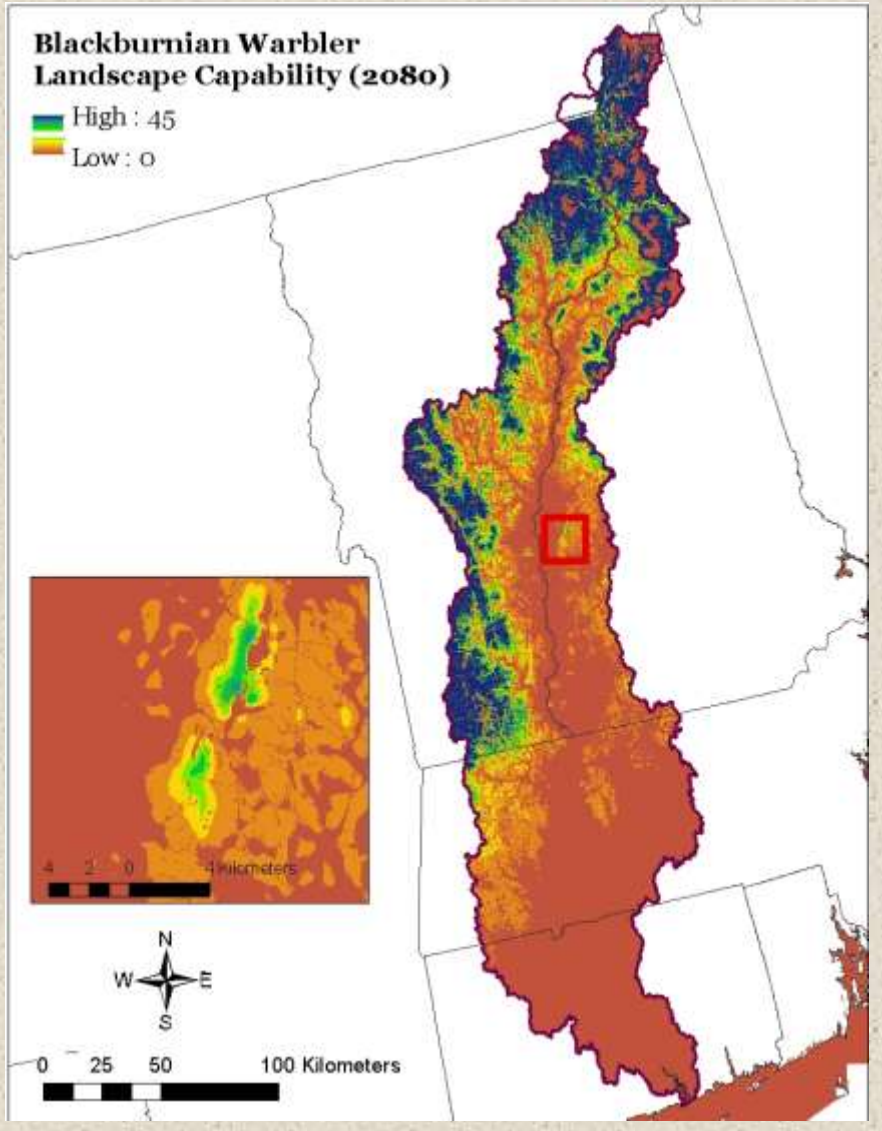
Landscape Conservation Design

Step 2: Design Conservation Network

1b) Create selection index

For each representative species:

- Future (2030 or 2080) *landscape capability* (*LC*)
  - 0-100 index
  - 30 m resolution



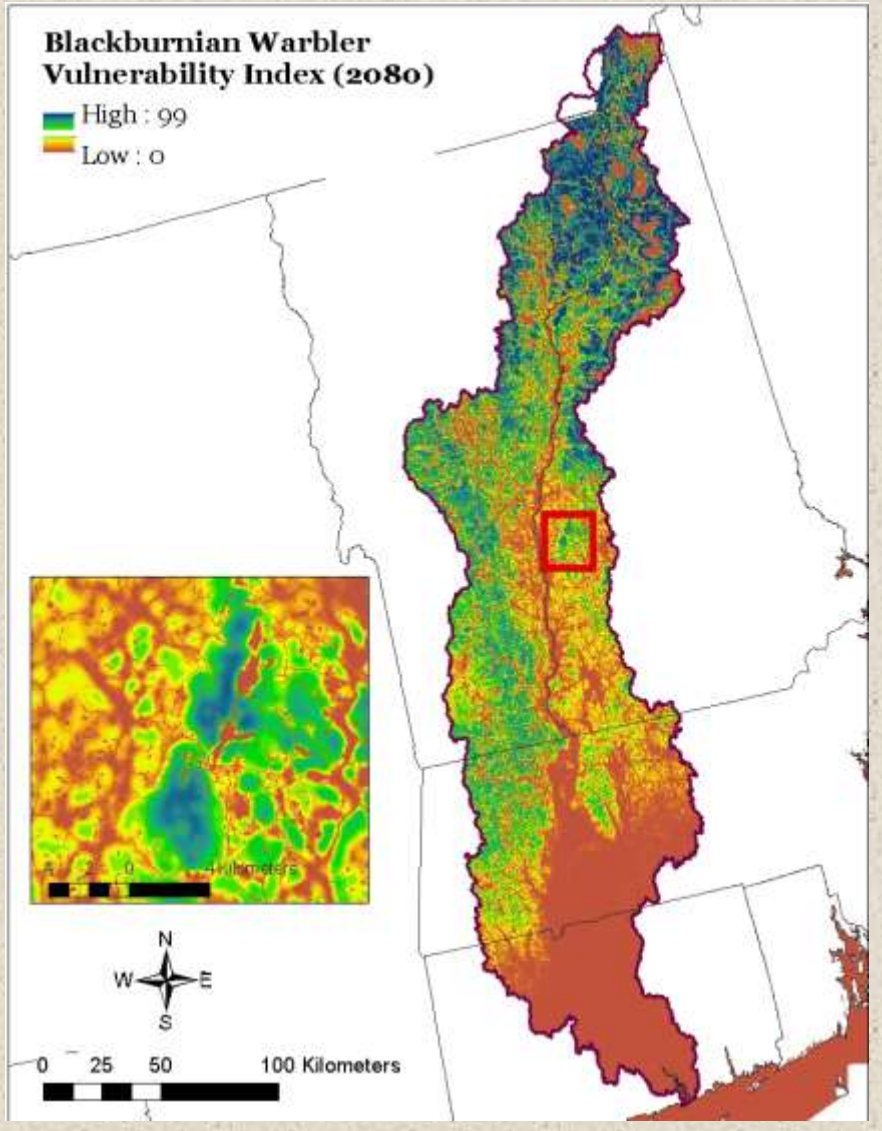
Landscape Conservation Design

Step 2: Design Conservation Network

1b) Create selection index

For each representative species:

- Vulnerable *landscape capability (LC)*
  - Delta LC times current LC
  - 0-100 index
  - 30 m resolution



"High vulnerability" areas

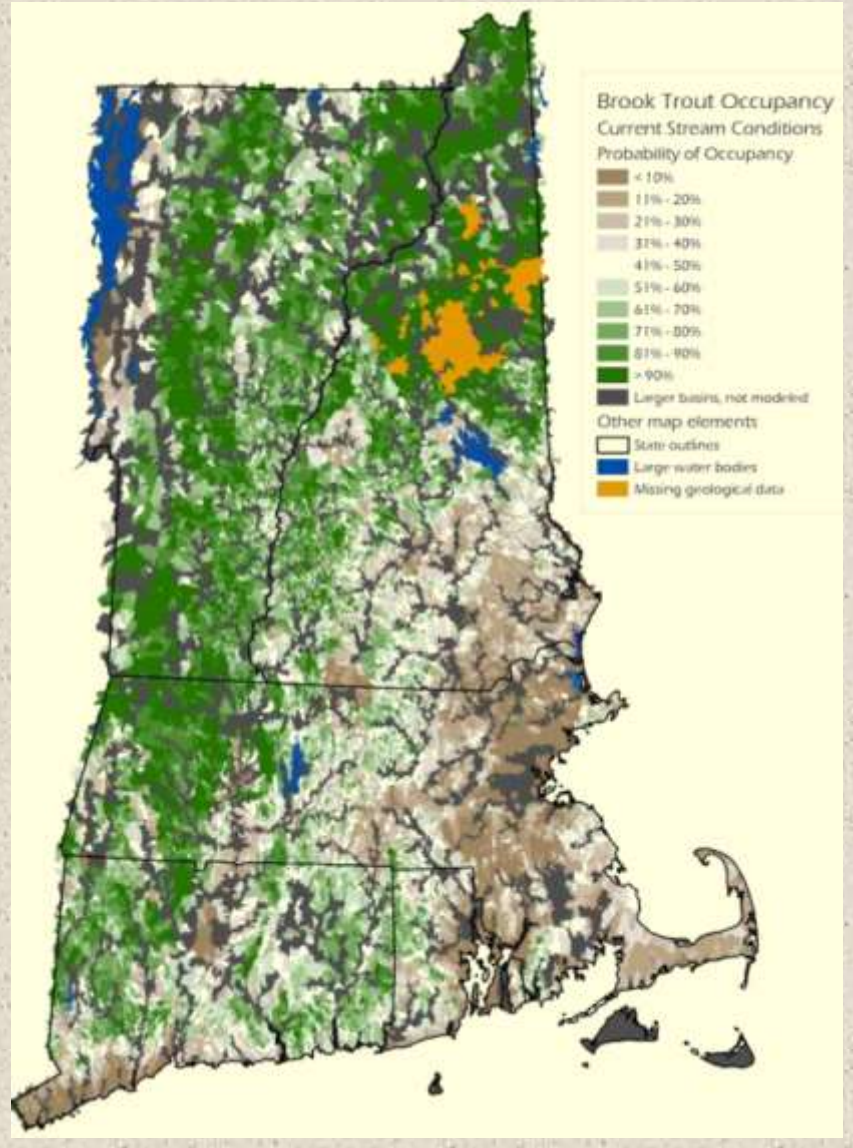
Landscape Conservation Design

Step 2: Design Conservation Network

1b) Create selection index

For brook trout:

- Current (2010) occupancy
  - Probability of occupancy (0-1)
  - Catchment resolution
  - Headwater creeks



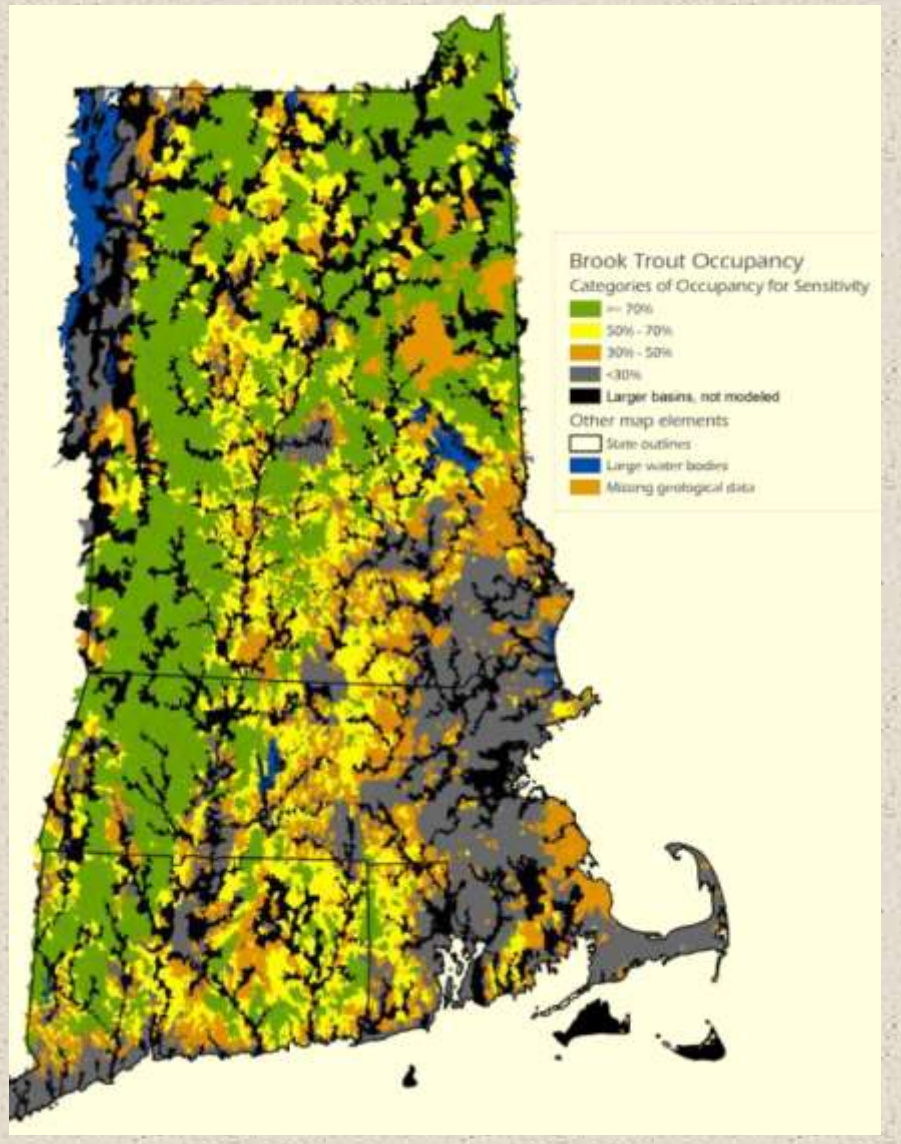
Landscape Conservation Design

Step 2: Design Conservation Network

1b) Create selection index

For brook trout:

- Future occupancy sensitivity
  - Probability of occupancy (0-1) under future climate conditions
  - Catchment resolution
  - Headwater creeks



Landscape Conservation Design

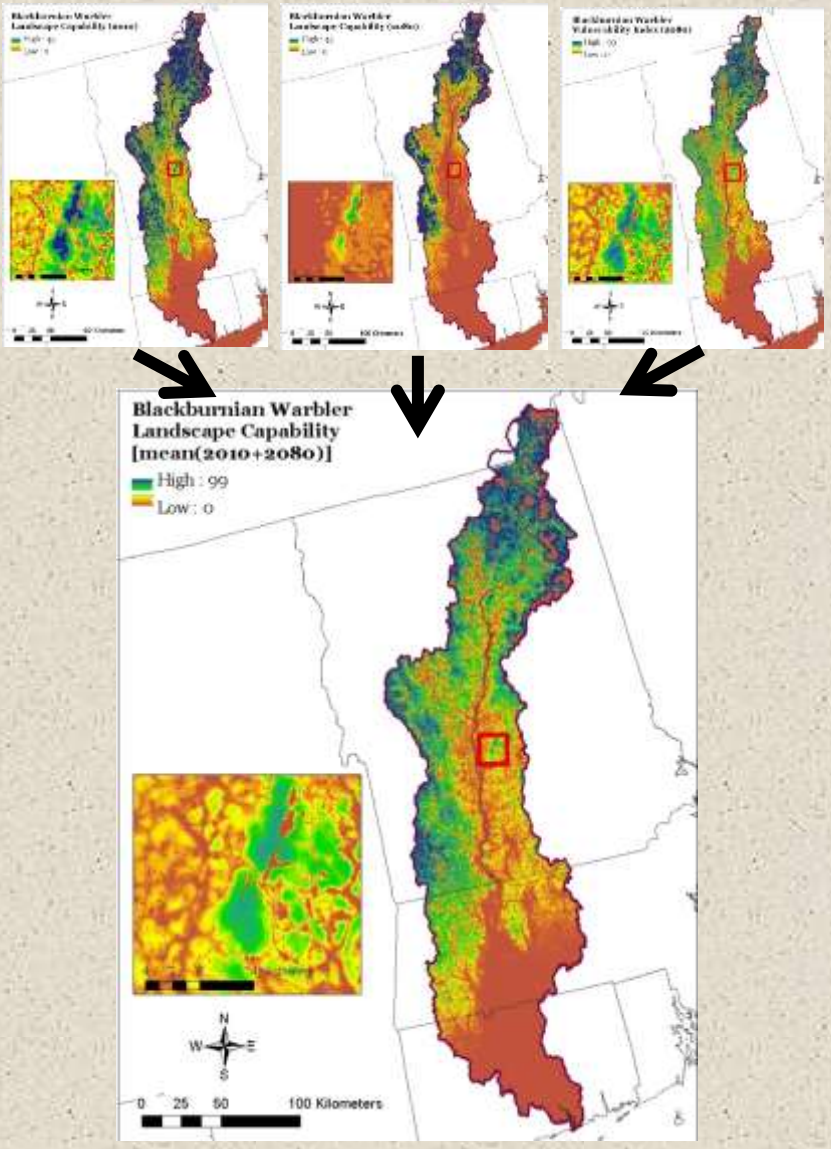
Step 2: Design Conservation Network

1b) Create selection index

For each species:

- Combine products (mean/ weighted mean?):
  - Current LC
  - Future LC
  - Persistent LC
  - Vulnerable LC

- Quantile scale final result (to facilitate selecting top x%)



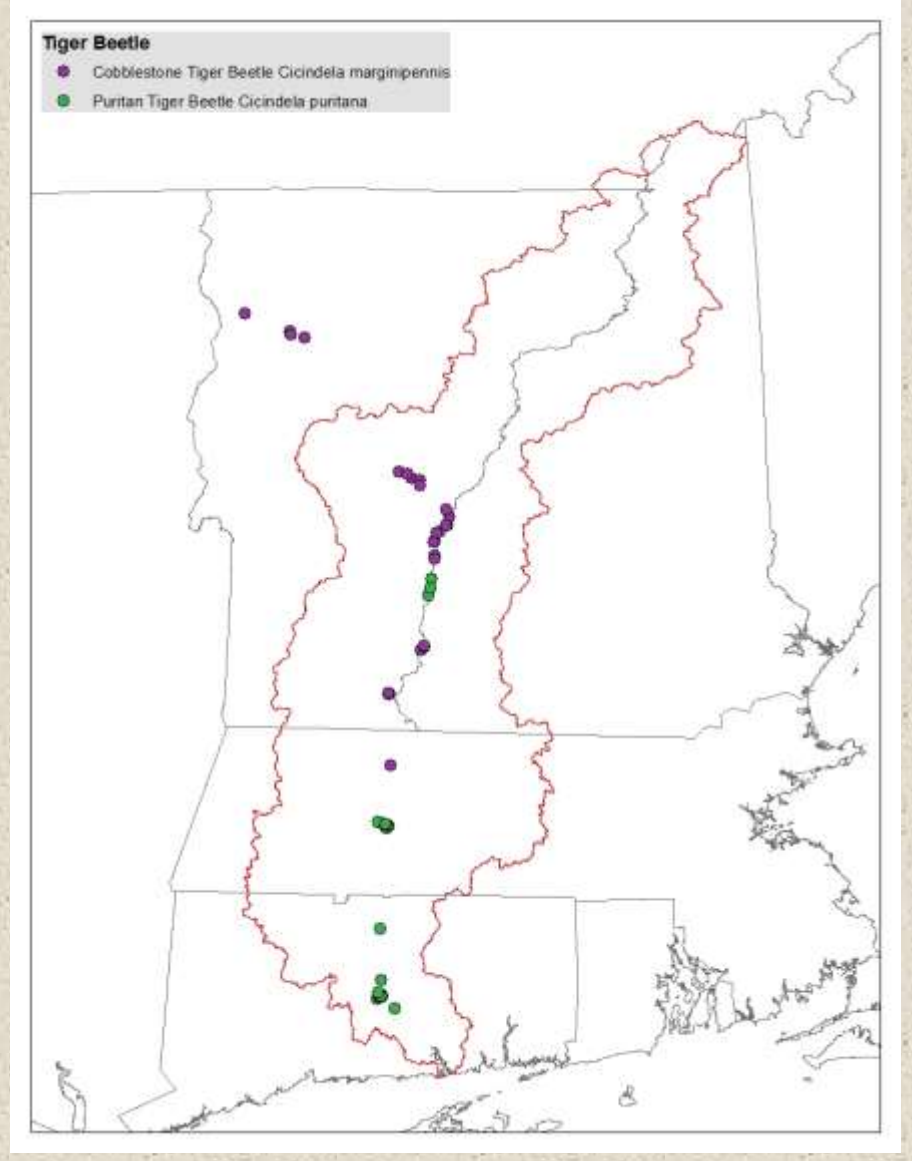
Landscape Conservation Design

Step 2: Design Conservation Network

1b) Create selection index

For rare species:

- Binary (0 vs 1) maps of critical habitat?



Landscape Conservation Design

Step 2: Design Conservation Network

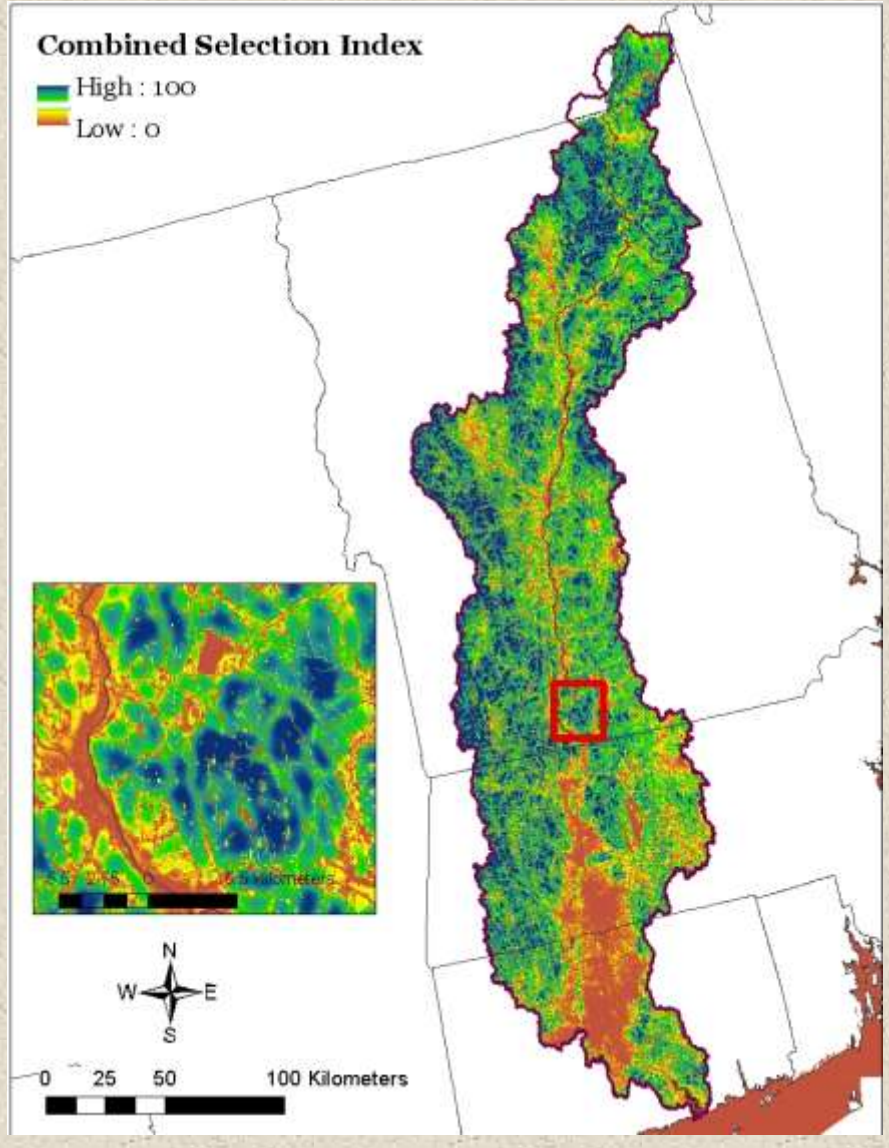
1. Select (tiered) core areas

   Focal species approach:

   a) Establish targets based on objectives

   b) Create selection index

   c) Select core areas to meet targets



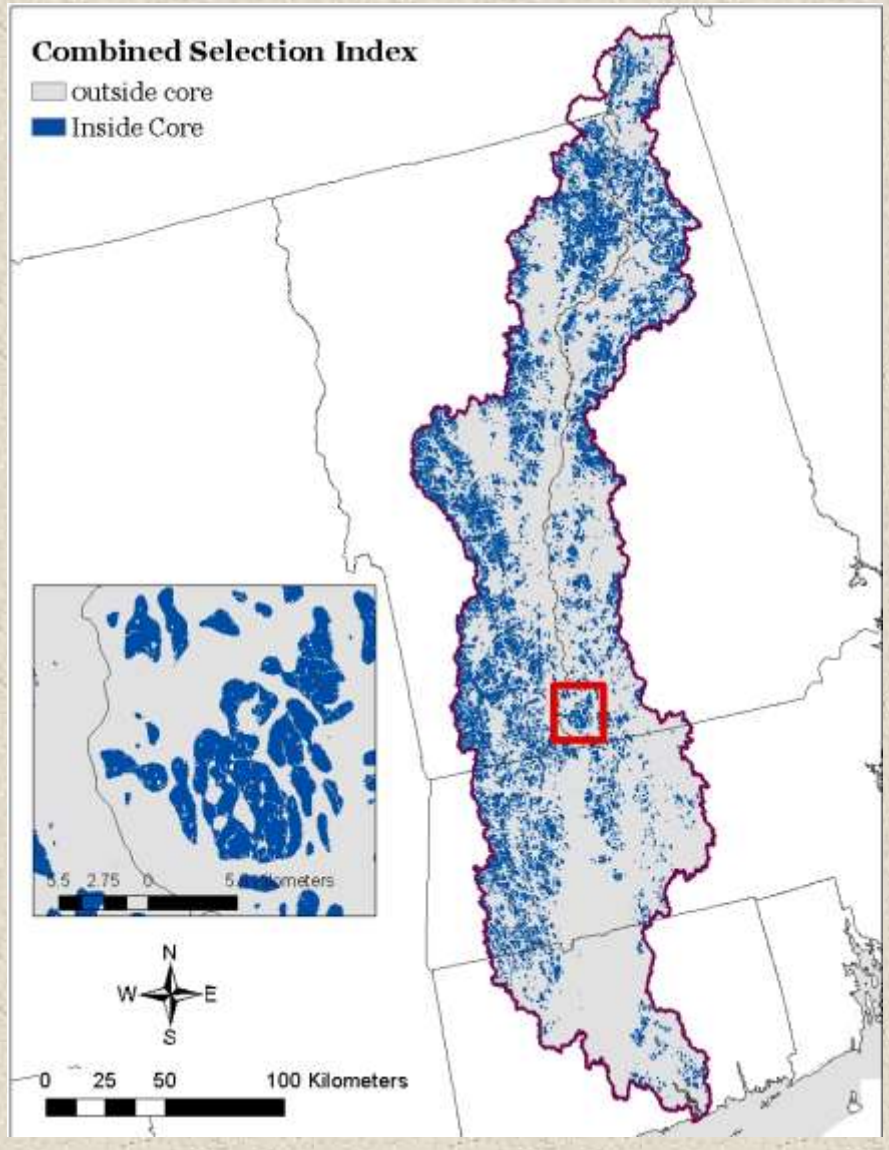
Landscape Conservation Design

Step 2: Design Conservation Network

1c) **Select core areas to meet targets**

Issues:

- How much area do we include? Do we constrain by the total area in cores or the individual species' objectives?



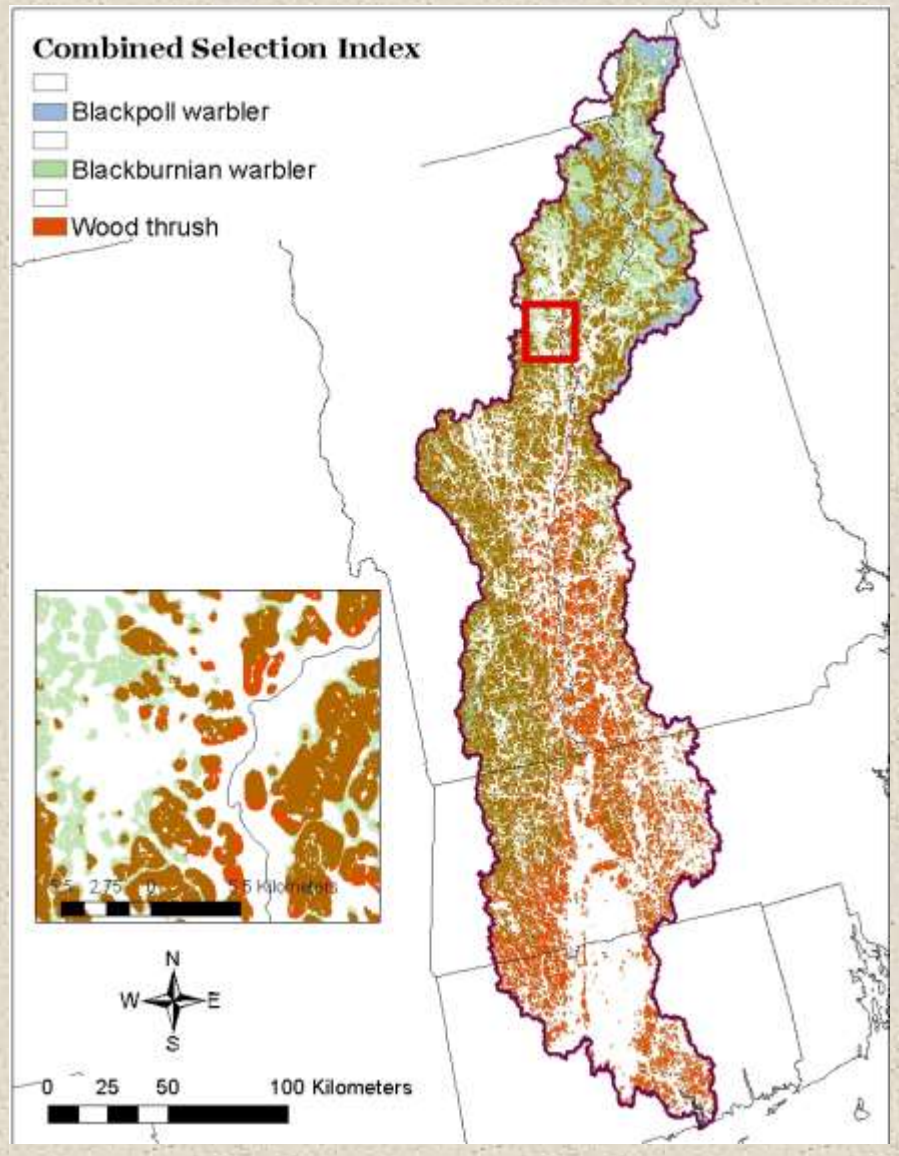
Landscape Conservation Design

Step 2: Design Conservation Network

1c) **Select core areas to meet targets**

Issues:

- How do we optimally combine species' habitat needs?



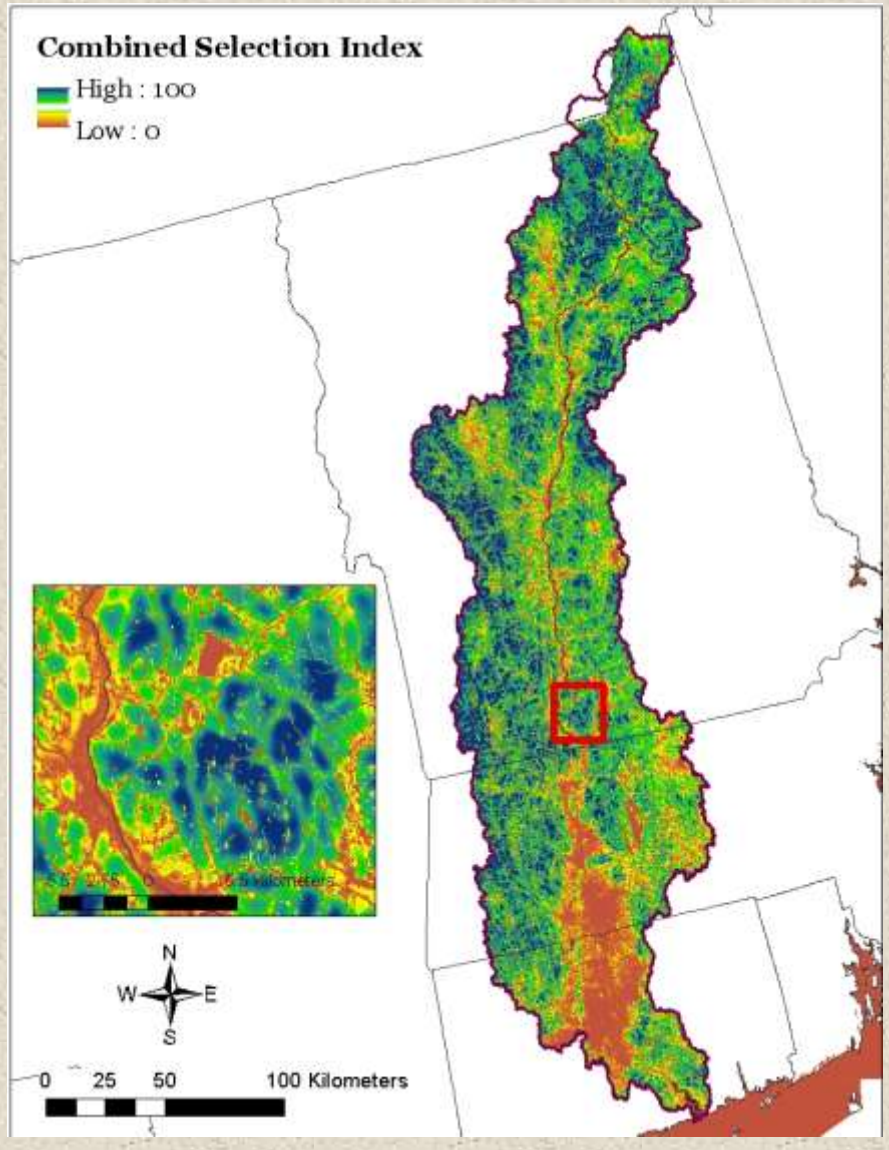
Landscape Conservation Design

Step 2: Design Conservation Network

1c) **Select core areas to meet targets**

Issues:

- Should we enforce a minimum size for core areas?



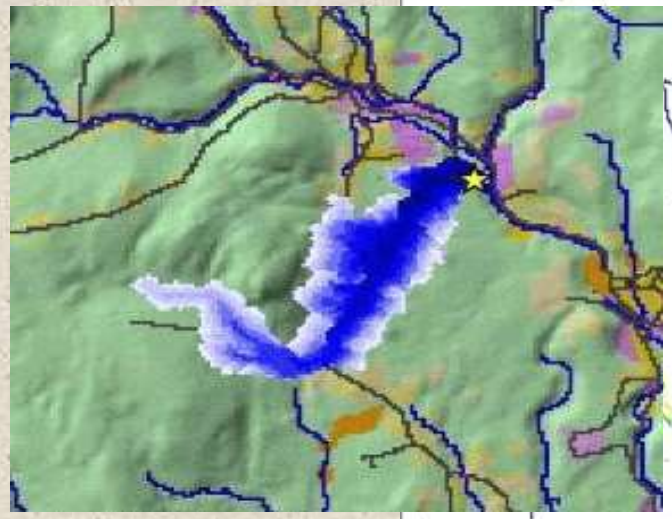
Landscape Conservation Design

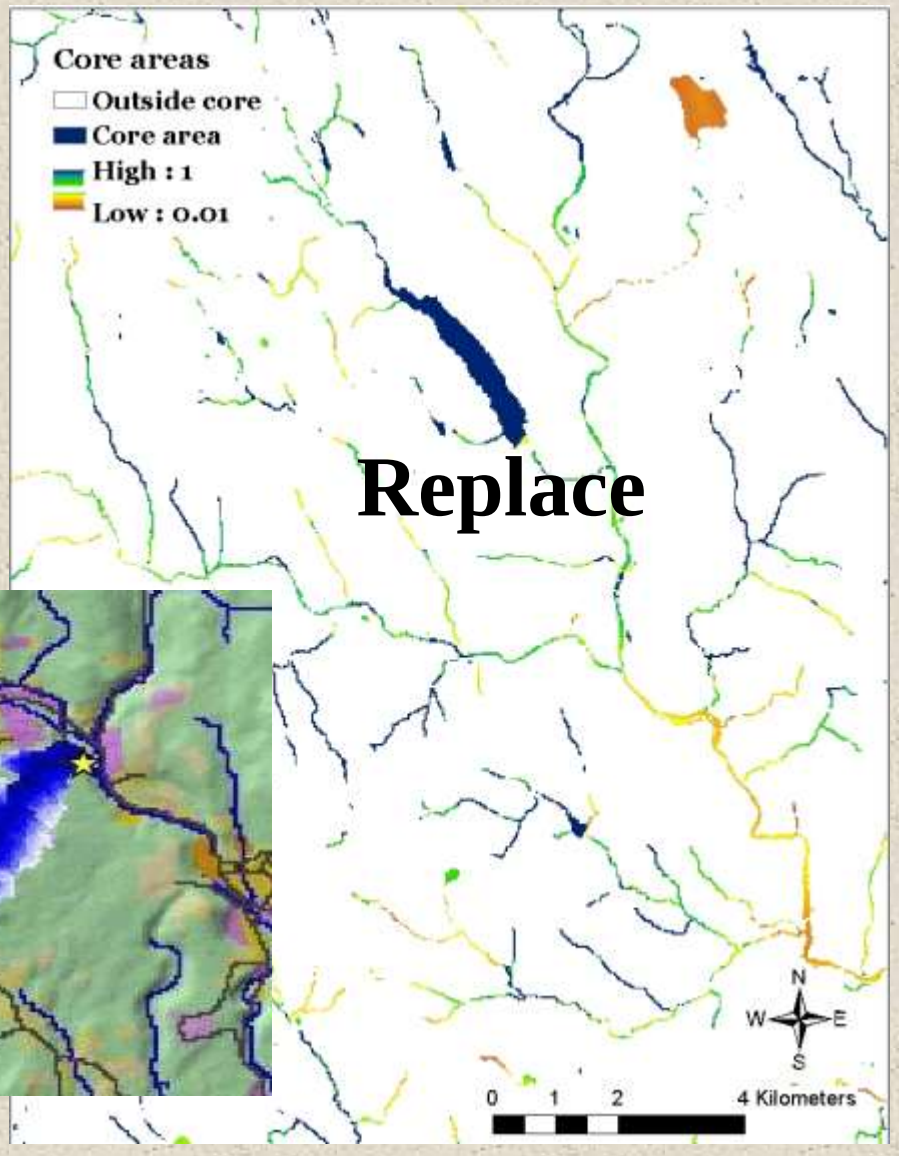
Step 2: Design Conservation Network

1c) **Select core areas to meet targets**

Issues:

- How do we delineate core areas for aquatic species?





Landscape Conservation Design

Step 2: Design Conservation Network

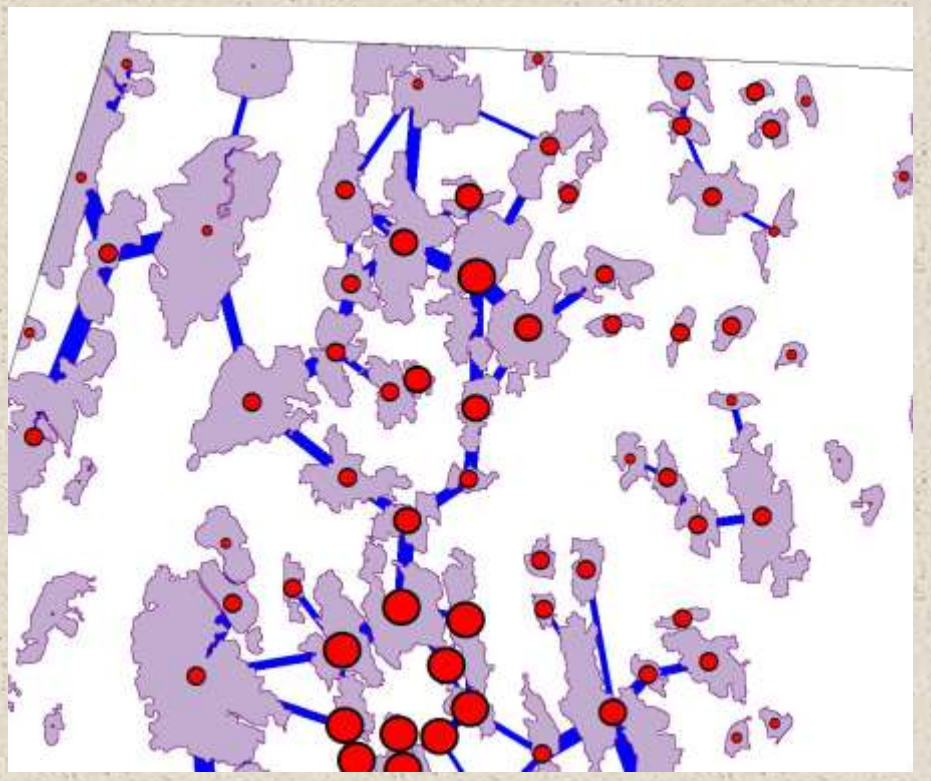
2. Prioritize *core areas*

a) Prioritize among core areas

b) Prioritize within core areas

- Based on importance to regional connectivity
- Other considerations?

Node importance index



Landscape Conservation Design

Step 2: Design Conservation Network

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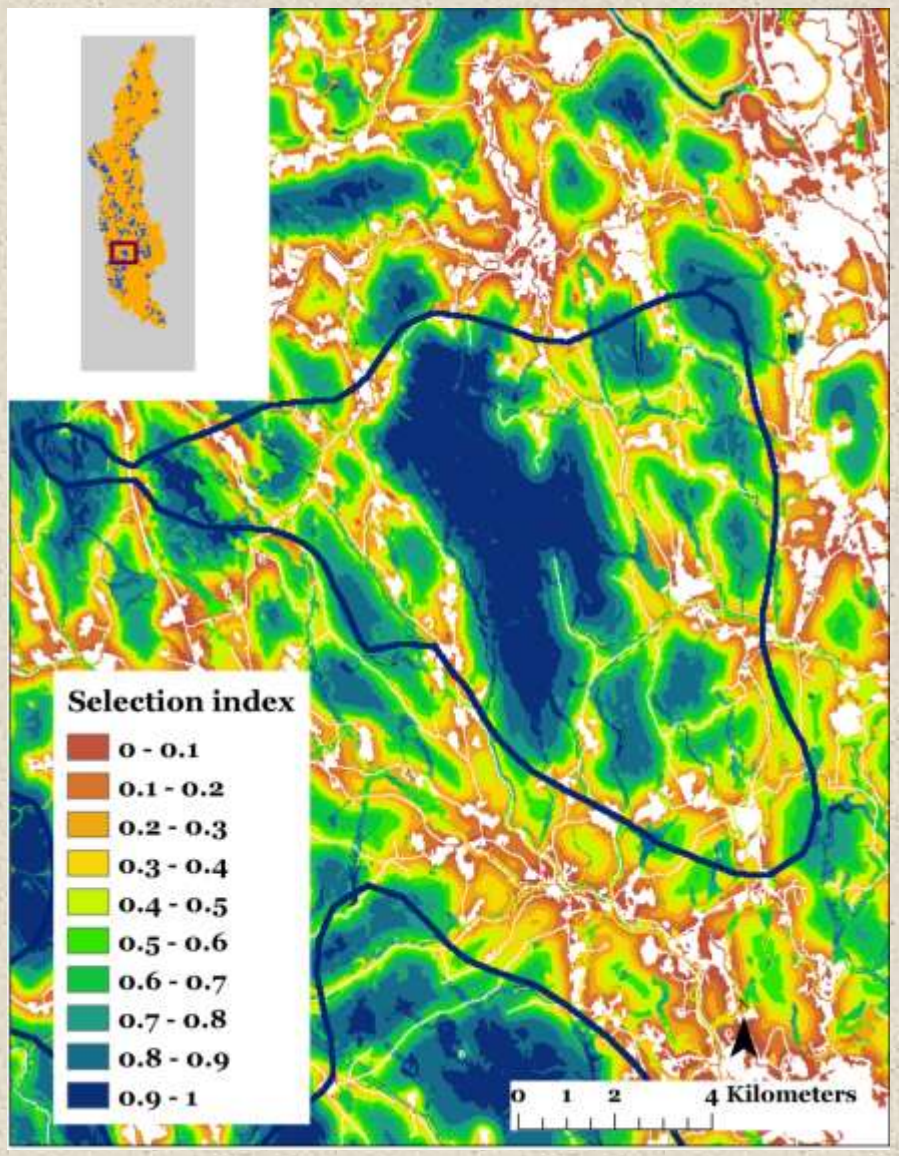
- Based on core area selection index
- Other considerations?



Landscape Conservation Design

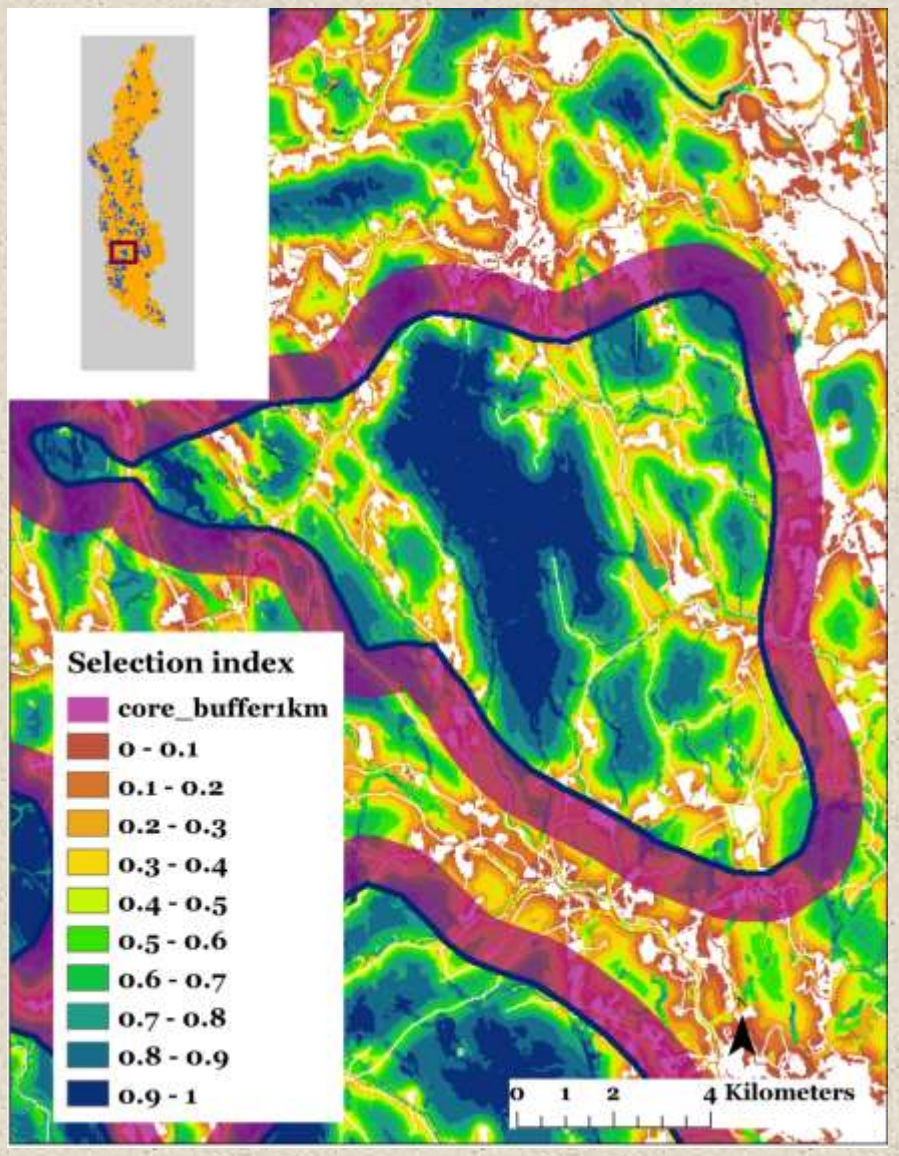
Step 2: Design Conservation Network

3. Create core area
   Buffers

   a) Buffer terrestrial and wetland habitat core areas

   b) Buffer aquatic habitat core areas

- Perhaps the buffer = 2nd tier core?



Landscape Conservation Design

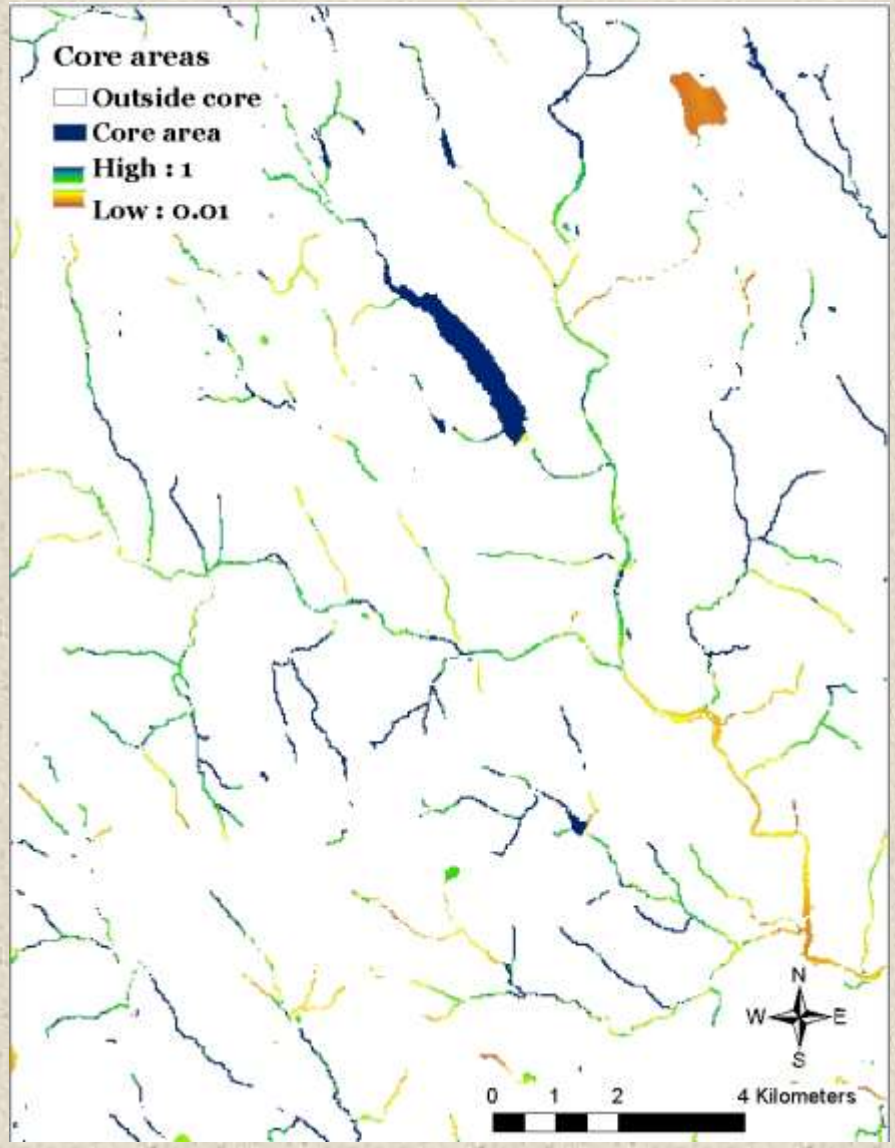
Step 2: Design Conservation Network

3. Create core area *Buffers*

a) Buffer terrestrial and wetland habitat core areas

b) Buffer aquatic habitat core areas

- Perhaps the buffer = core for aquatics?



Landscape Conservation Design

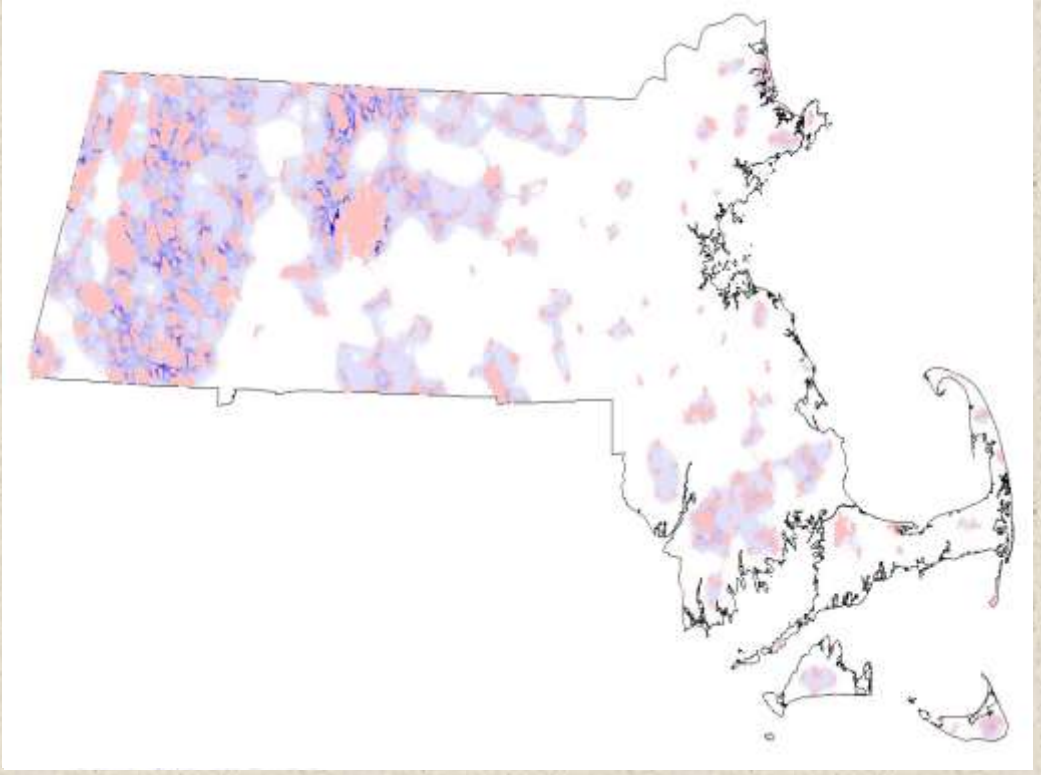
Step 2: Design Conservation Network

4. Delineate *Corridors*

a) Find links between core areas (random low-cost paths)

b) Compute conductance index

c) Delineate corridors



Landscape Conservation Design

Step 2: Design Conservation Network

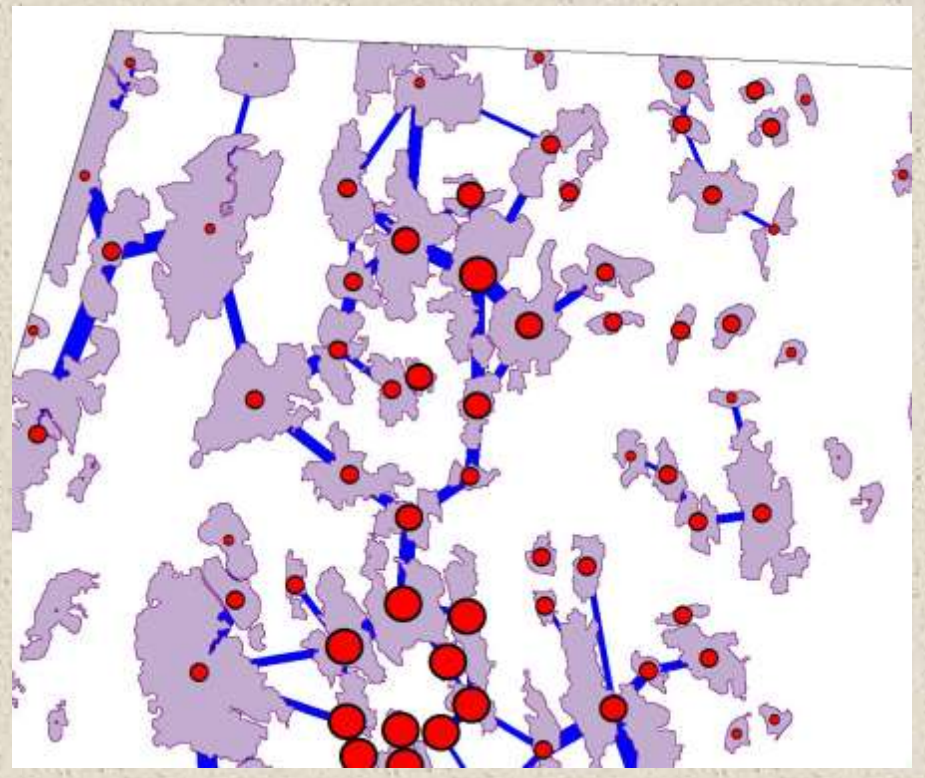
5. Prioritize *Corridors*

a) Prioritize among corridors

b) Prioritize within corridors

- Based on importance to regional connectivity
- Other considerations?

Link importance index



Landscape Conservation Design

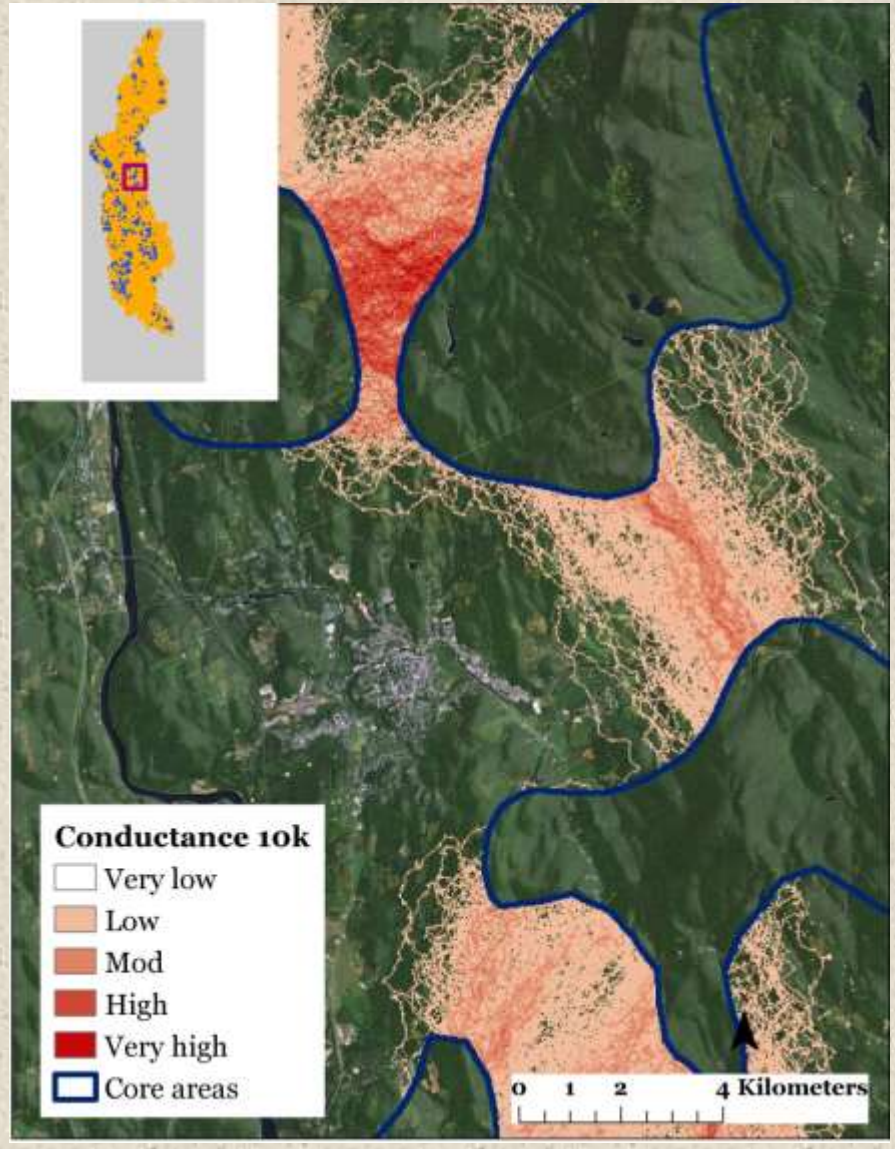
Step 2: Design Conservation Network

5. Prioritize *Corridors*

a) Prioritize among corridors

b) Prioritize lands within corridors

- Based on local conductance index
- Other considerations?



Landscape Conservation Design

Step 2: Design Conservation Network

6. Determine *management* needs (and prioritize within core areas, buffers and corridors)

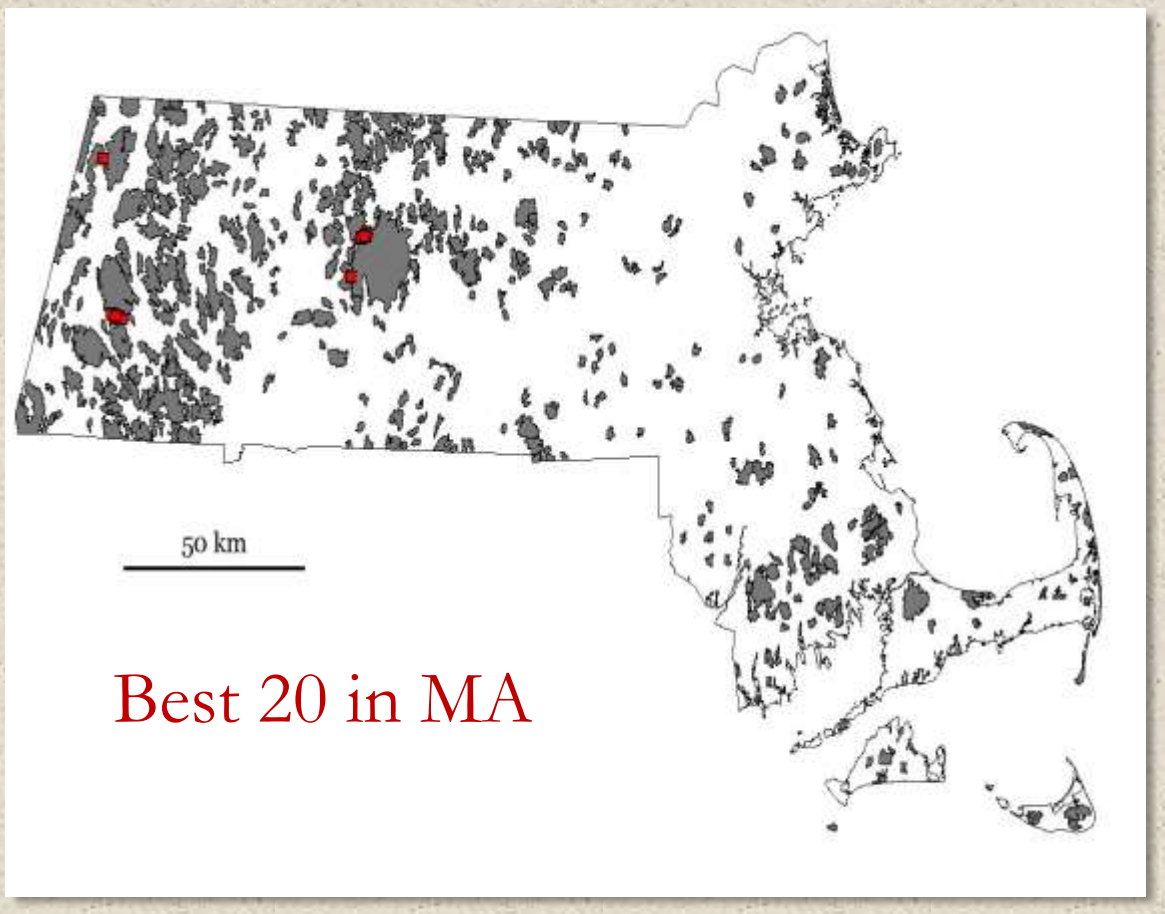
- Are there habitat management needs for particular species?
- If so, what are they?
- Is this best handled outside of the conservation design?

Landscape Conservation Design

Step 2: Design Conservation Network

7. Identify *restoration* opportunities

- Road passage structures
- Road-stream crossings
- Dams
- Wetland restoration?



Landscape Conservation Design

Step 2: Design Conservation Network

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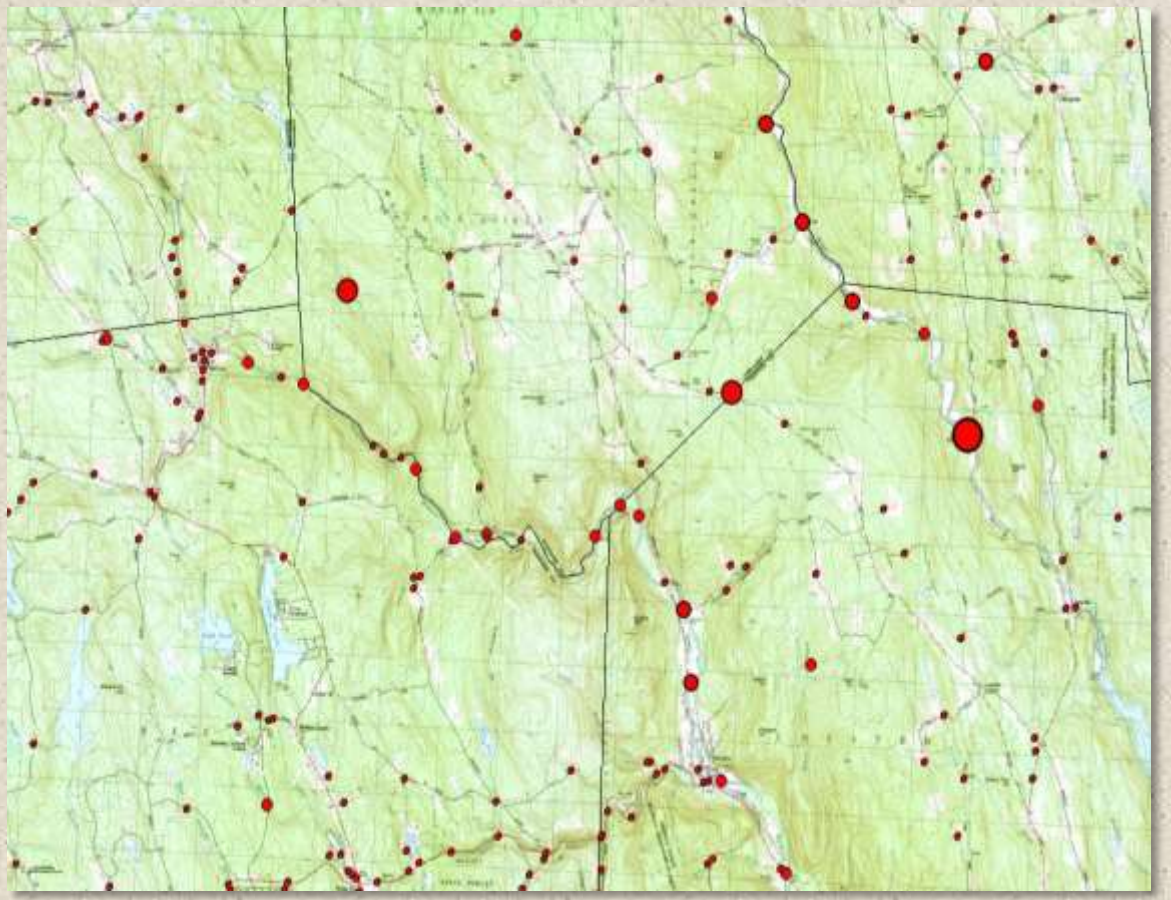

Landscape Conservation Design

Step 2: Design Conservation Network

7. Identify *restoration* opportunities

- Road passage structures
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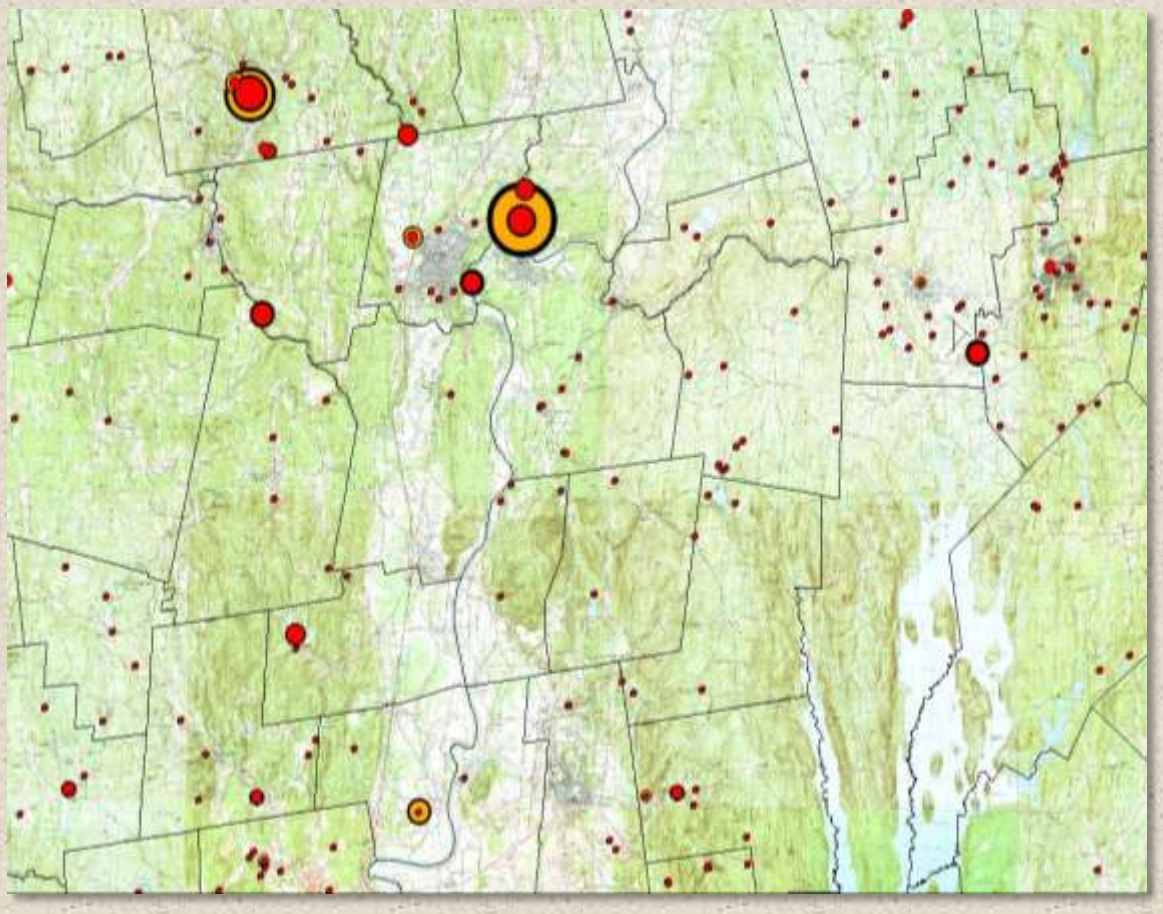

Landscape Conservation Design

Step 2: Design Conservation Network

Design Steps:

1. Select (tiered) *core* areas
2. Prioritize within/among cores
3. Create core area *buffers*
4. Delineate *corridors* among cores
5. Prioritize within/among corridors
6. Determine *management* needs
7. Identify *restoration* opportunities

Landscape Conservation Design

Step 2: Design Conservation Network

Key Decisions:

1. Establish species' objectives and targets
2. Weight current versus future landscape capability
3. Weight components of core area selection index
4. How much land area to allocate to core areas
5. Should there be a minimum core area size
6. How to delineate core area for aquatic species
7. How to identify management priorities

For More Information

- **Project website:**

  www.umass.edu/landeco/research/nalcc/nalcc.html

Feedback:

- Manager online survey

Links to products:

- Overview
- Technical docs
- Presentations
- Results

- **Personal contact:** mcgarigalk@eco.umass.edu 413-577-0655