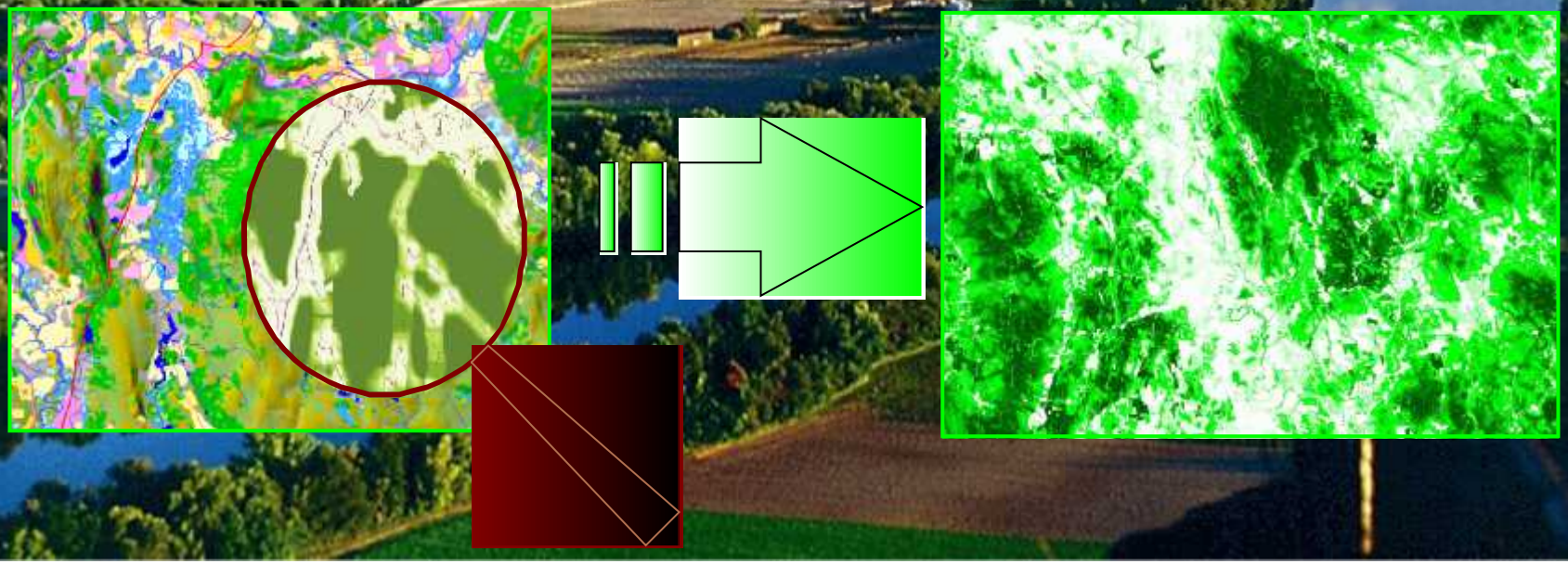
Designing Sustainable Landscapes in the Northeast

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

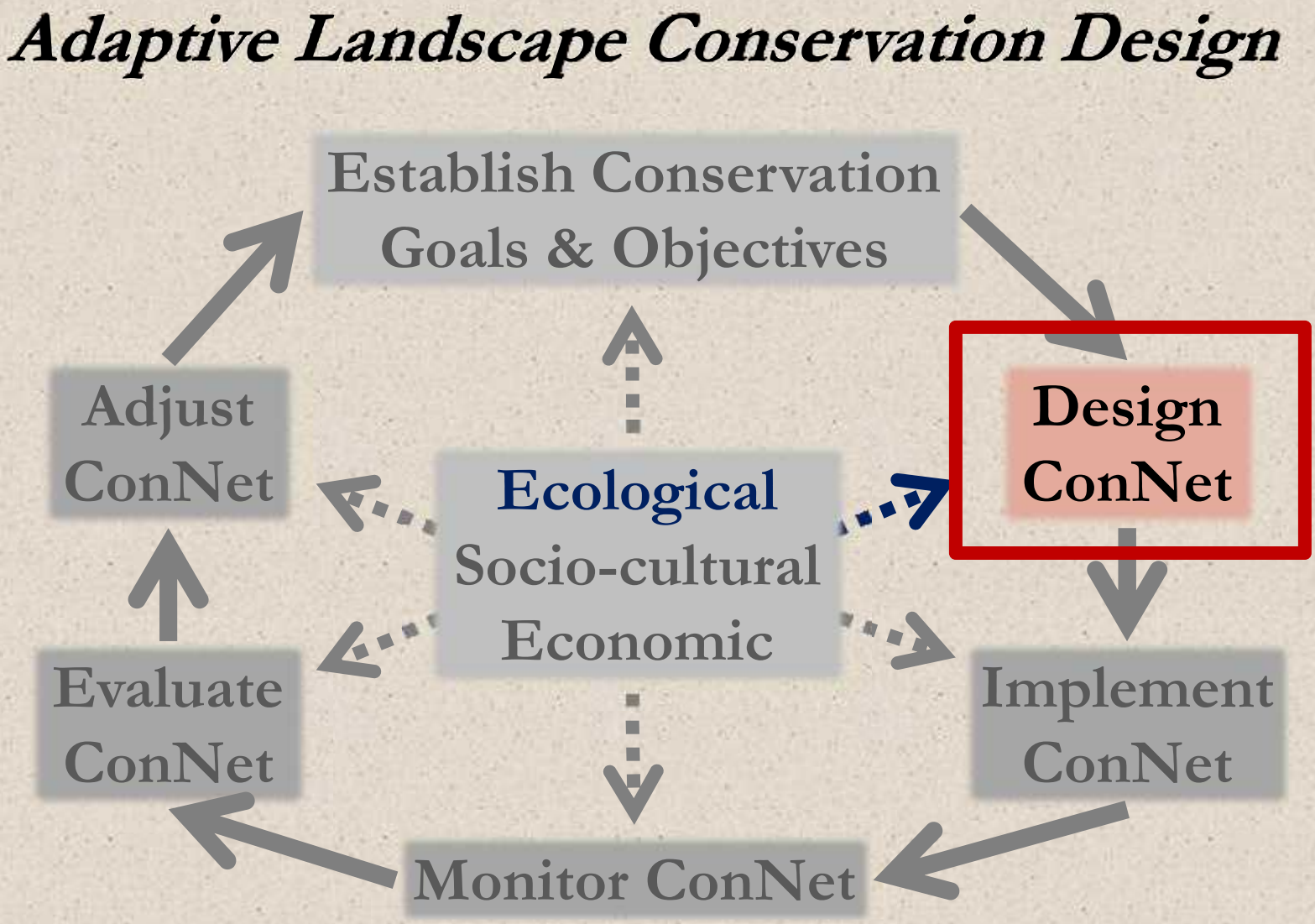
Landscape Conservation Design

June, 2014



Landscape Conservation Design

Step 2: Design Conservation Network



Landscape Conservation Design

Step 2: Design Conservation Network

Design Steps:

Current focus

1. Select (tiered) *core* areas
2. Create core area *buffers*
3. Prioritize within buffered cores
4. Assess *connectivity* among cores
5. Prioritize among core areas
6. Prioritize among linkages
7. Prioritize within linkages
8. Identify *restoration* opportunities
9. Determine *management* needs

- 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

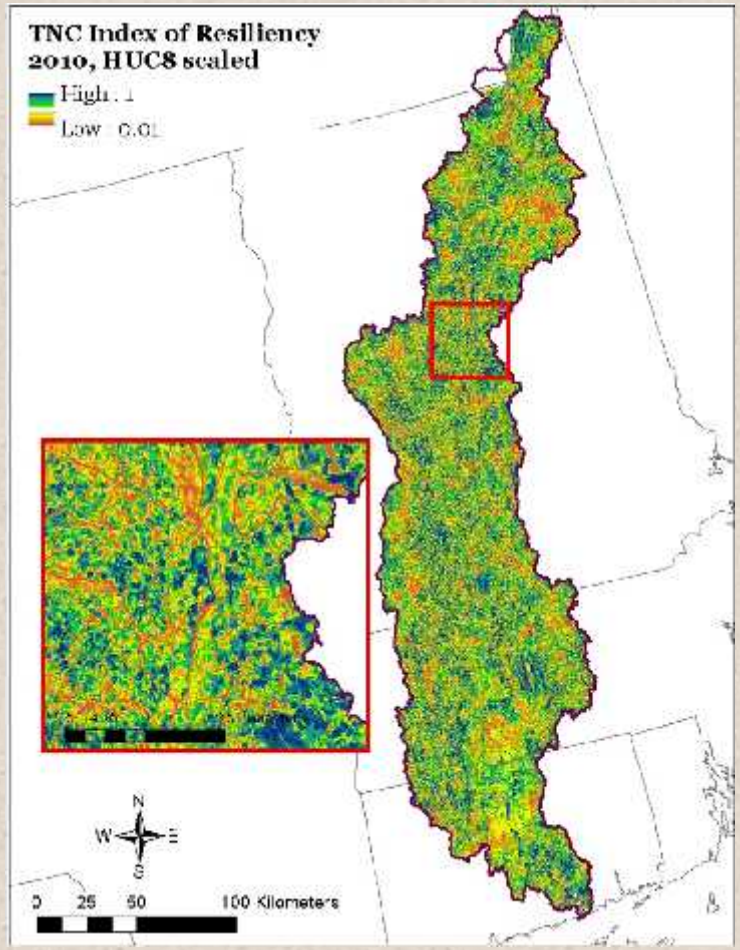
Three scenarios:

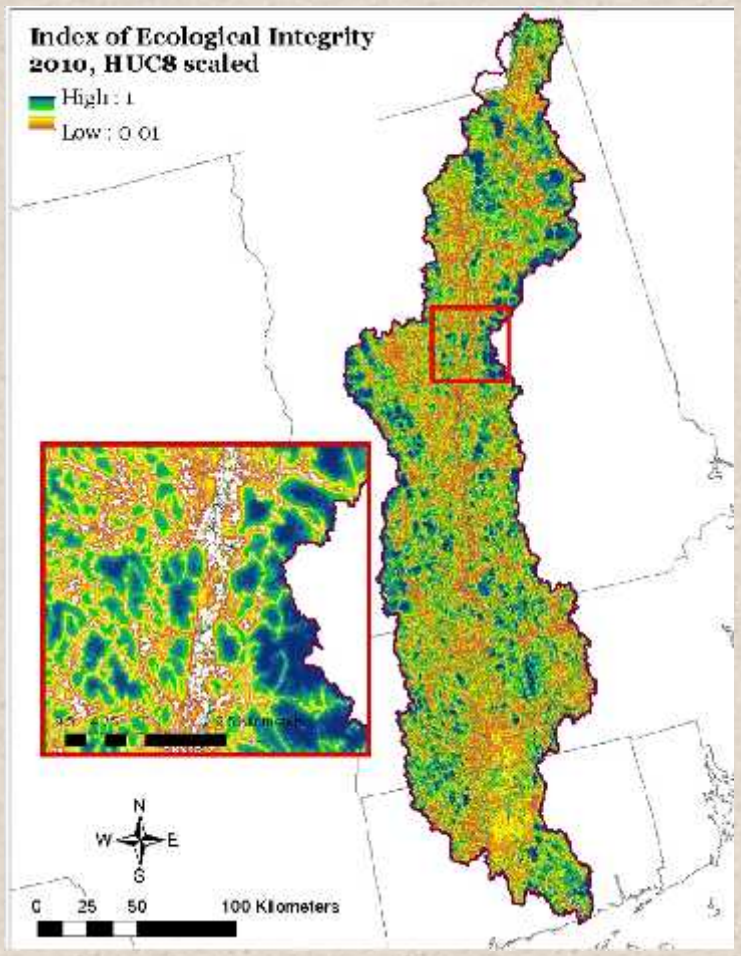
- Ecosystem approach (coarse filter)…
  based solely on ecosystem conditions
- Species approach…
  based solely on focal species considerations
- Combined ecosystem-species approach…
  based on the complement of ecosystems and species

Landscape Conservation Design

Step 2: Design Conservation Network

Q1. TNC resiliency vs DSL IEI?





Landscape Assessment

Ecological integrity

"*Ecological integrity* is a multi-faceted and multi-scale concept comprised of several inter-related components that operate at multiple scales (in space and time)"

- ***Ecological integrity***…refers to the capability of an area to sustain ecological functions; in particular, the ability to support biodiversity and the ecosystem processes necessary to sustain biodiversity over the short and long term, especially in the face of disturbance and stress.

Landscape Assessment

Local ecological integrity

"An *integral site* is intact, highly connected and resilient"

- ***Intactness***…refers to the freedom from human impairment (anthropogenic stressors)
- ***Connectivity***…refers to the propensity to conduct ecological flows (including individuals) across the landscape
- ***Resiliency***…refers to the capacity to recover from or adapt to disturbance and stress

Landscape Assessment

Local ecological integrity

"*Resiliency* is a complex, multi-faceted concept comprised of several inter-related components that operate at multiple scales (in space and time)"

- ***Similarity***…refers to the ecological similarity of the neighborhood
- ***Connectedness***…refers to the ecological similarity and accessibility of the neighborhood

Short term

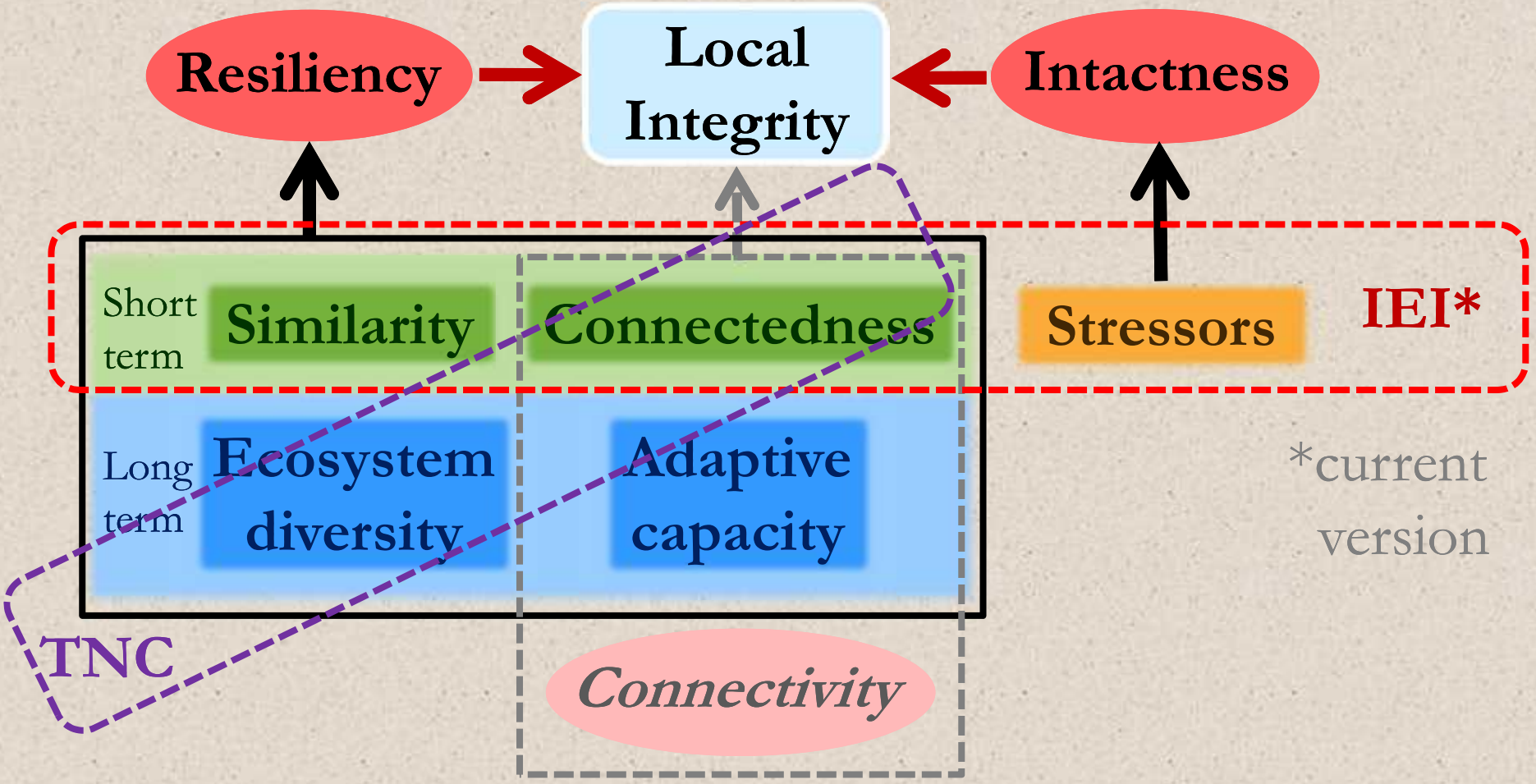
- ***Ecosystem diversity***…refers to the ecological diversity of the neighborhood
- ***Adaptive capacity***…refers to the ecological diversity and accessibility of the neighborhood

Long term

Landscape Assessment

Local ecological integrity

"An *integral site* is intact, highly connected and resilient"



Landscape Conservation Design

Step 2: Design Conservation Network

Q1. TNC resiliency vs DSL IEI?

- ***Technical comparison***

- ***Components:***
  - Landscape complexity: f(landform variety, elevation variability, wetland density), 30 m resolution
  - Connectedness: static, natural vs developed, 90m resolution

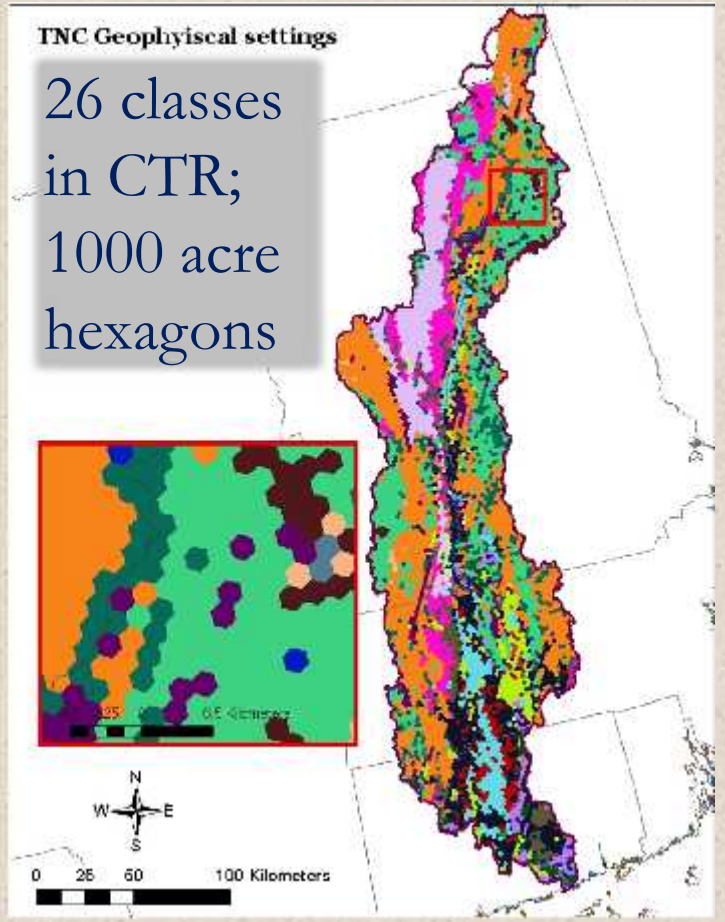
- ***Components:***
  - Stressor metrics: 19 metrics, terrestrial vs aquatic, kernels, 30 m resolution
  - Similarity
  - Connectedness: dynamic, unique settings, 30m resolution

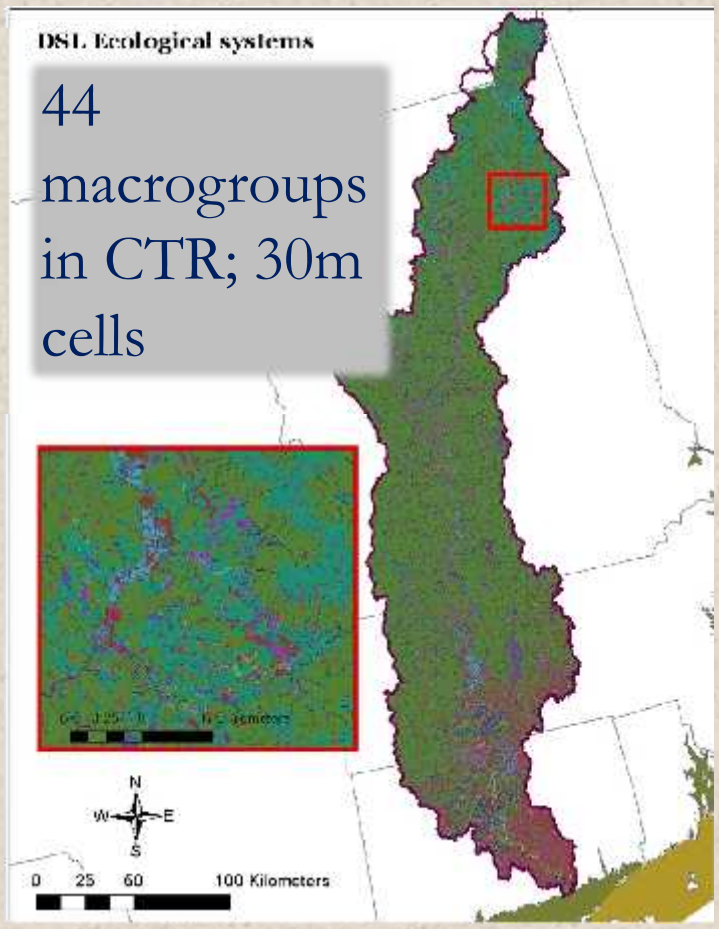
Landscape Conservation Design

Step 2: Design Conservation Network

Q1. TNC resiliency vs DSL IEI?

- *Scaling of index*





Landscape Conservation Design

Step 2: Design Conservation Network

Q1. TNC resiliency vs DSL IEI?

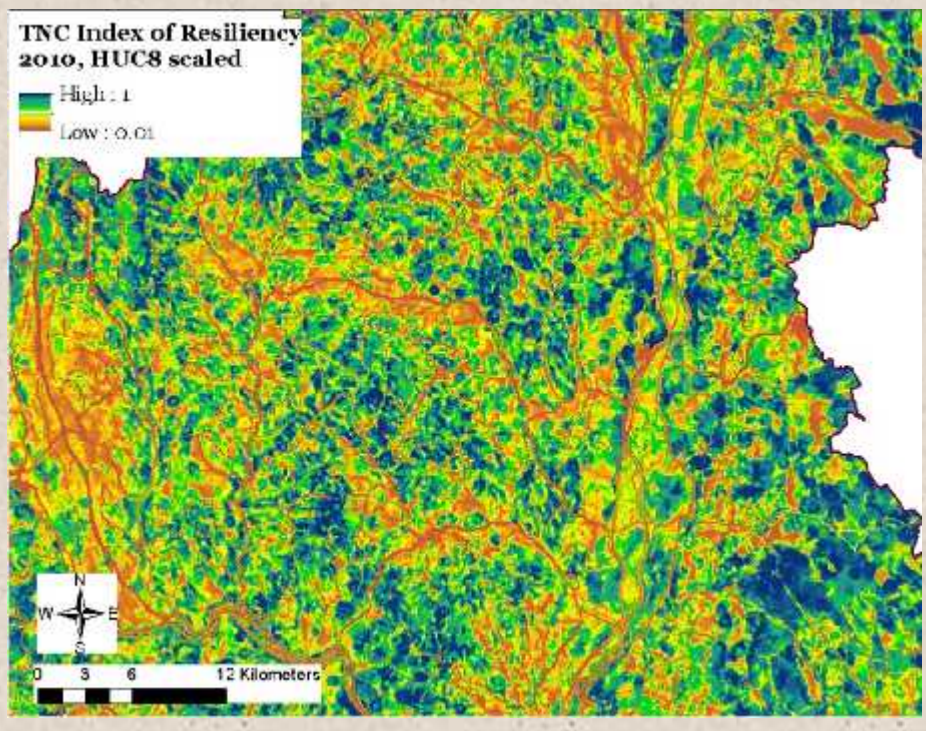
- TNC resiliency emphasizes connectivity with diverse geophysical settings
- DSL IEI emphasizes intactness and connectivity with similar ecological settings
- TNC resiliency is scaled by coarse-grained geophysical settings (geology and elevation)
- DSL IEI is scale by fine-grained ecological systems (macrogroup level)

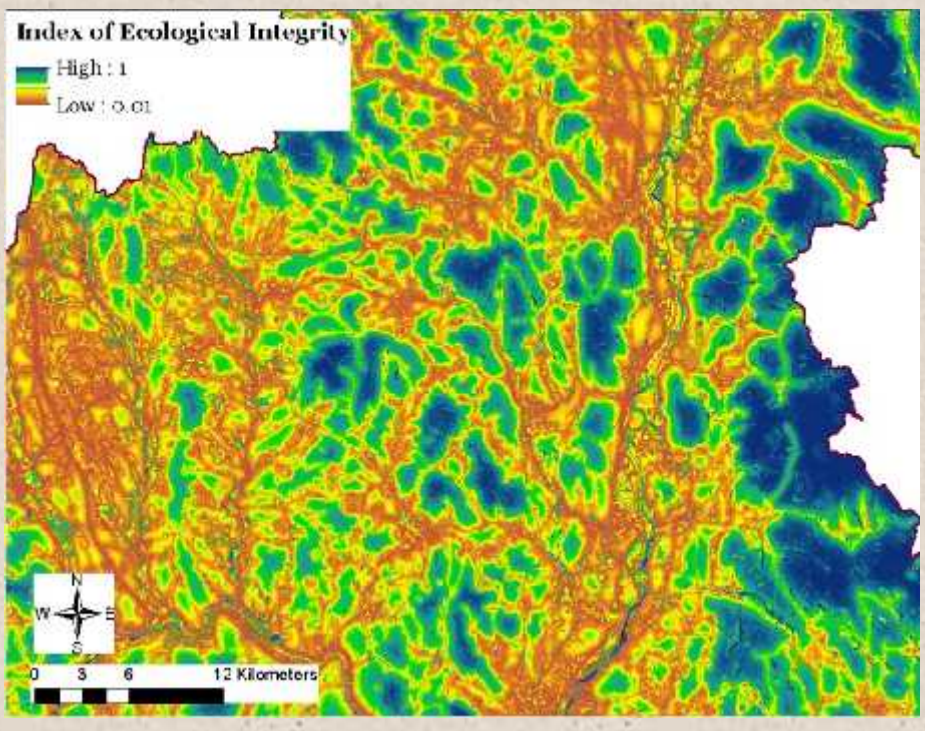
Landscape Conservation Design

Step 2: Design Conservation Network

Q1. TNC resiliency vs DSL IEI?

- *Scaling of index*

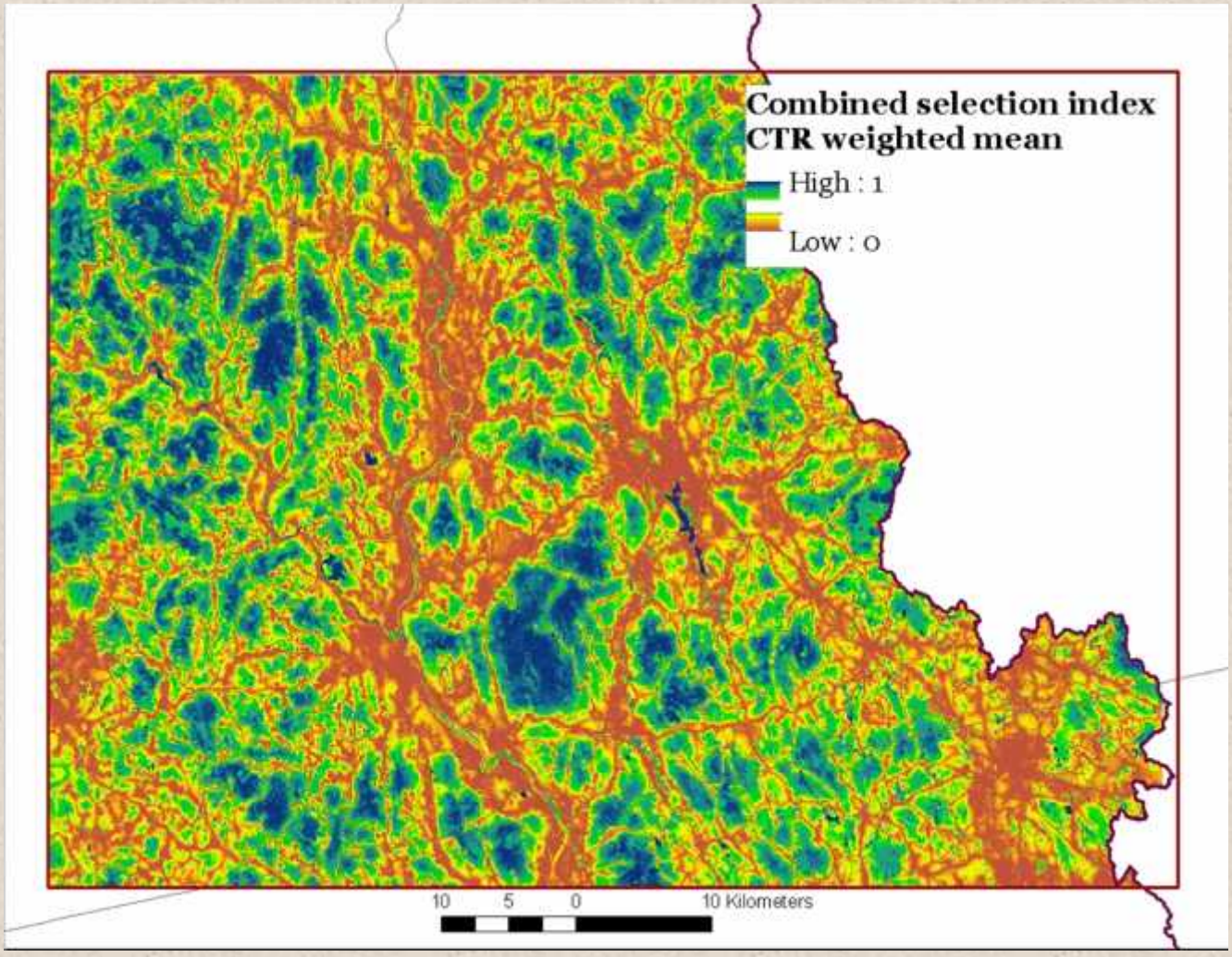




Landscape Conservation Design

Step 2: Design Conservation Network

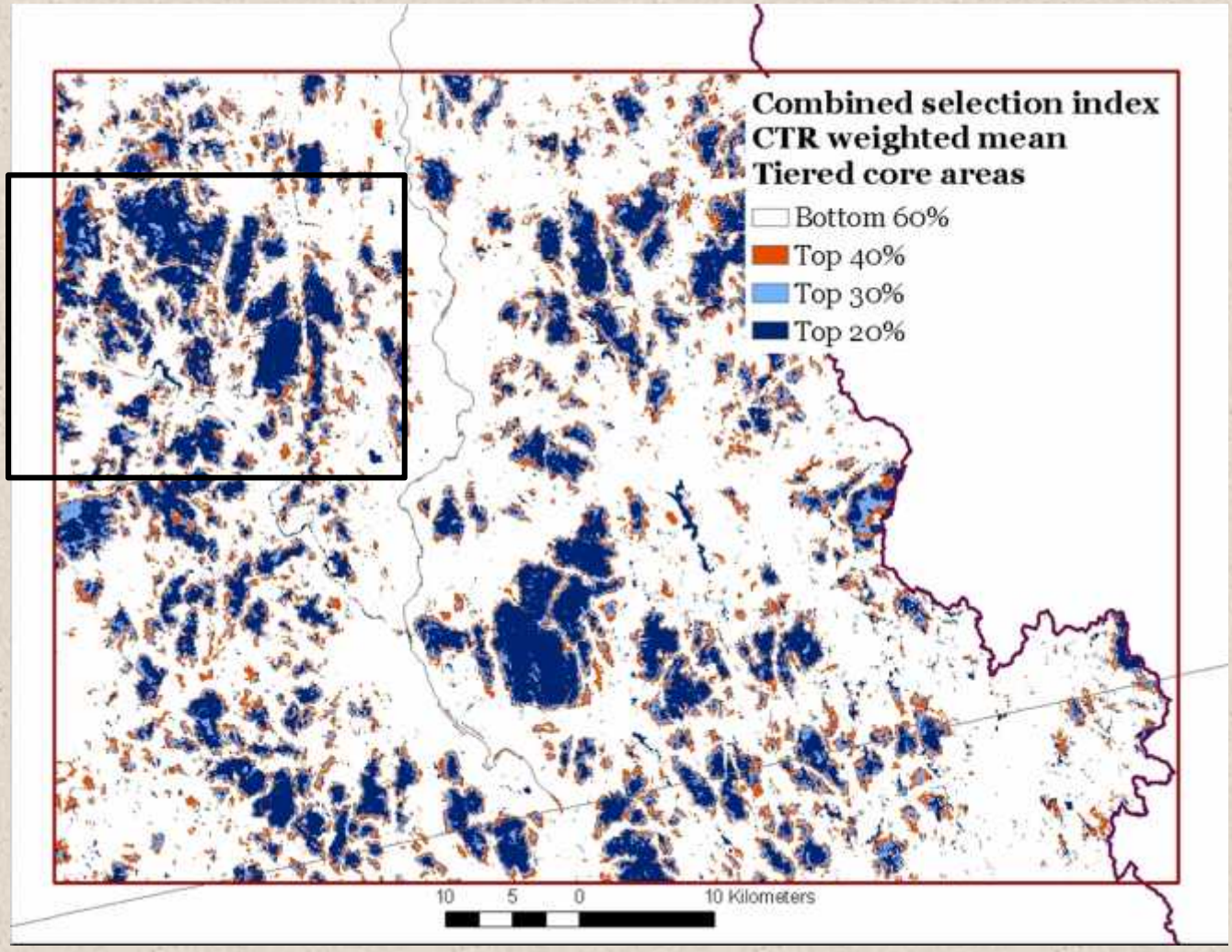
Q2. What does the *Top x%* mean?



Landscape Conservation Design

Step 2: Design Conservation Network

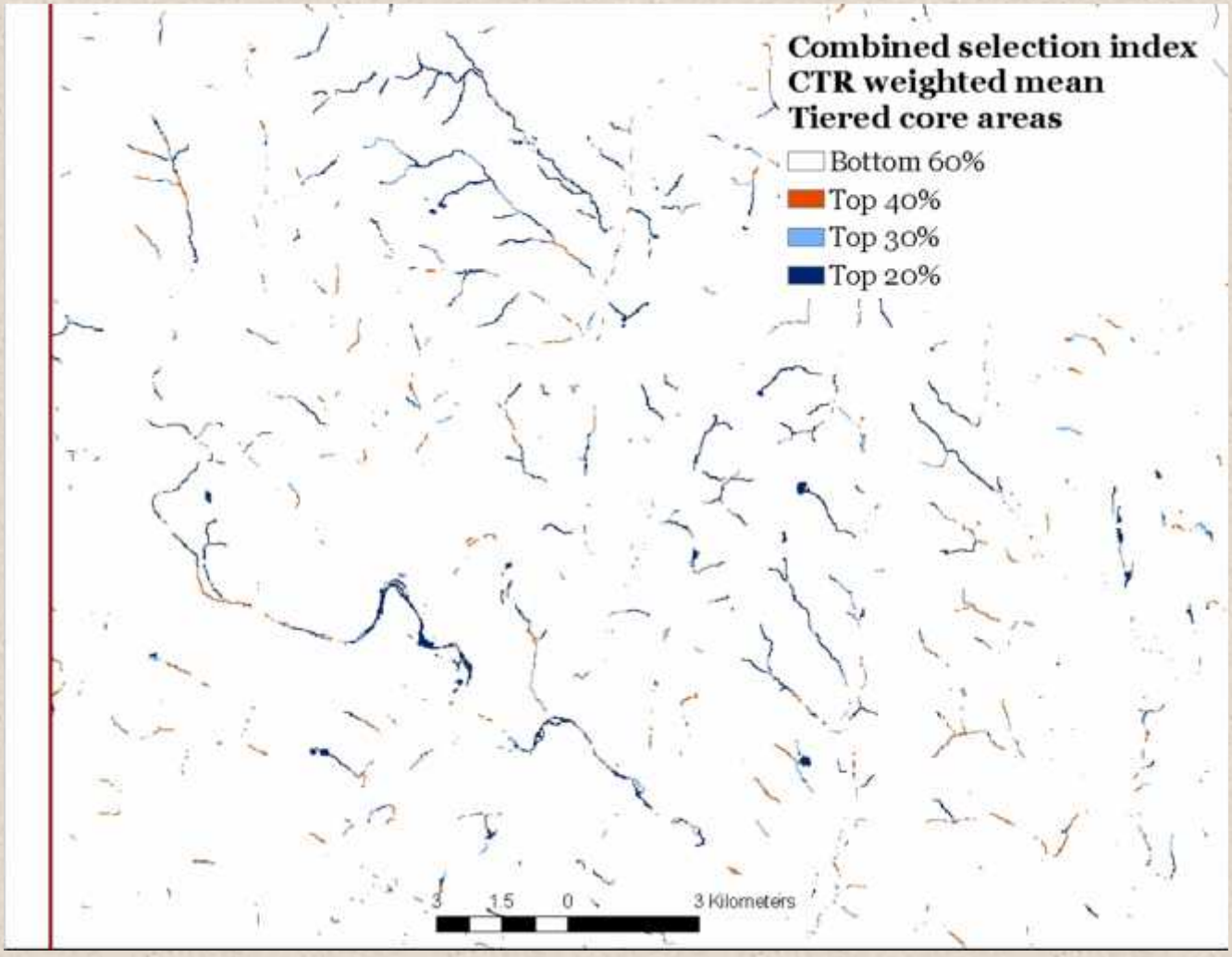
Q2. What does the *Top x%* mean?



Landscape Conservation Design

Step 2: Design Conservation Network

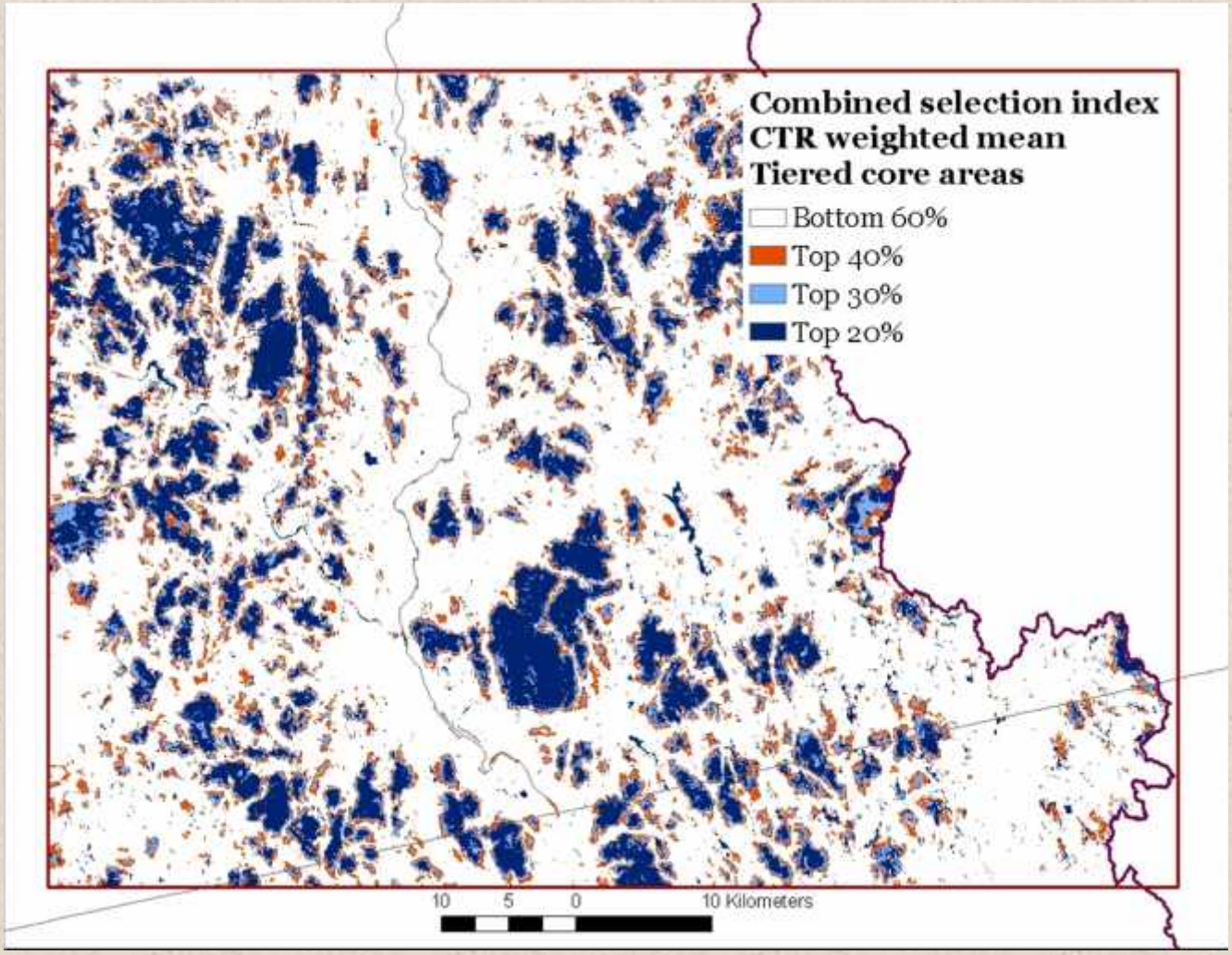
Q2. What does the *Top x%* mean?



Landscape Conservation Design

Step 2: Design Conservation Network

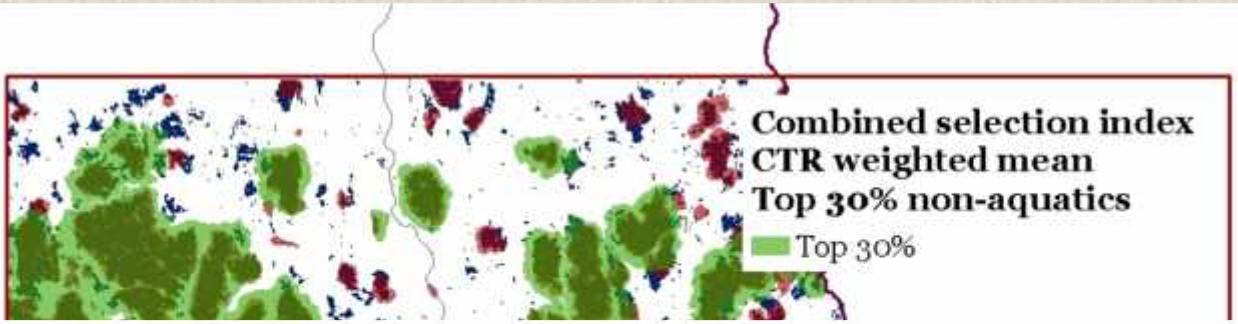
Q3. Tradeoffs between *slice* and *algorithmic* approach?



Landscape Conservation Design

Step 2: Design Conservation Network

Q3. Tradeoffs between *slice* and *algorithmic* approach?

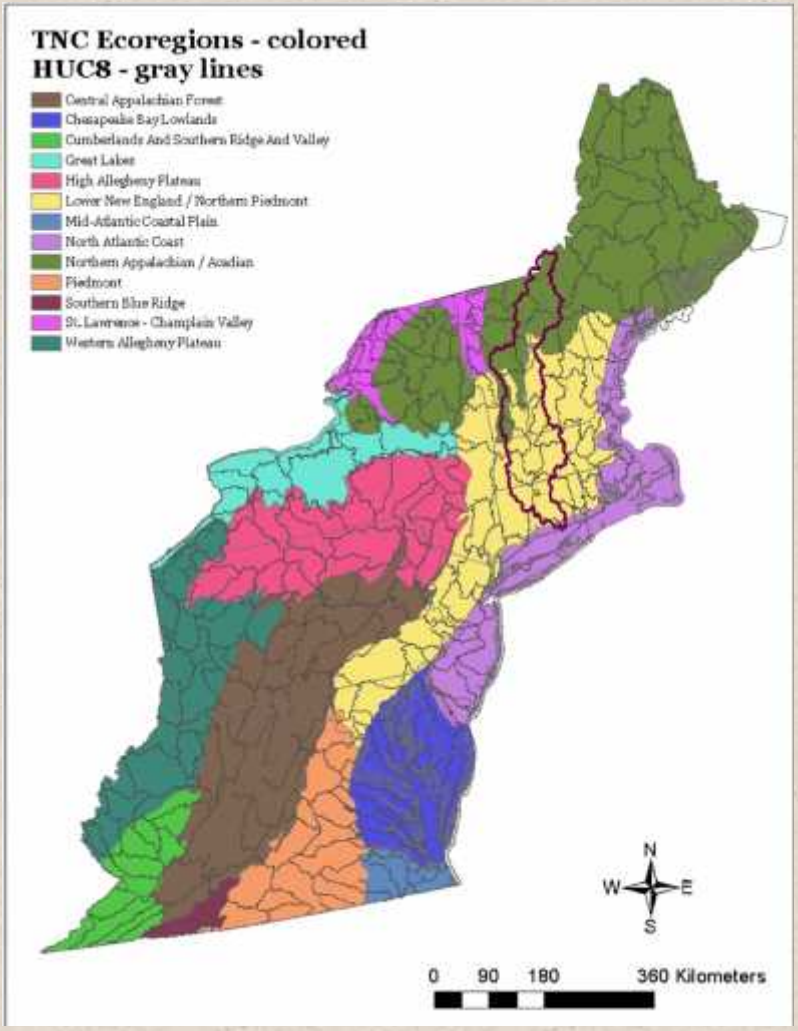


	More, smaller core areas ⟷ Fewer, larger core areas	
	Core areas are only the "best" examples of ecosystems ("slice" of the highest values) ⟷	Core areas are "grown out" from a "seed" of a small amount of high value areas to create more consolidated units
Diversity	Best examples of ecosystem diversity are retained	Some loss of high value ecosystems, but functions and services may be more intact
Condition	On average, core areas are smaller and less intact	Core areas are larger and more intact; complexes of ecosystems are retained together
Connectedness	More "stepping stones" for greater long-distance connectivity	Greater connectedness within core areas

Landscape Conservation Design

Step 2: Design Conservation Network

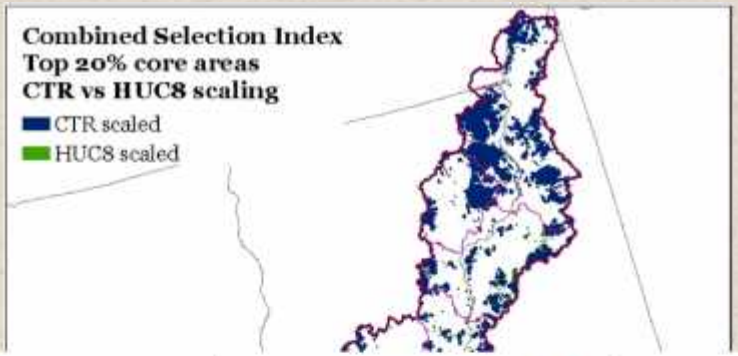
Q4. Best way to ensure distribution of core areas?

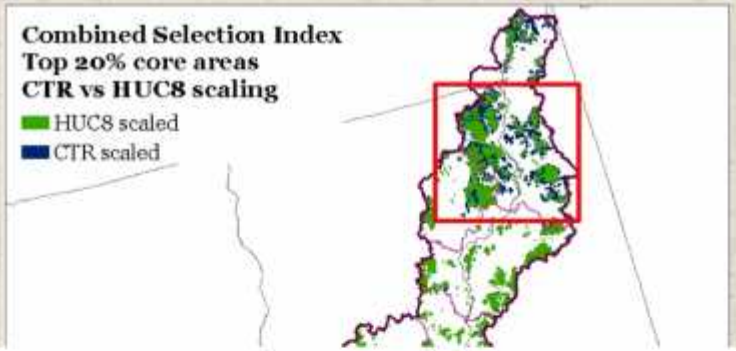


Landscape Conservation Design

Step 2: Design Conservation Network

Q4. Best way to ensure distribution of core areas?



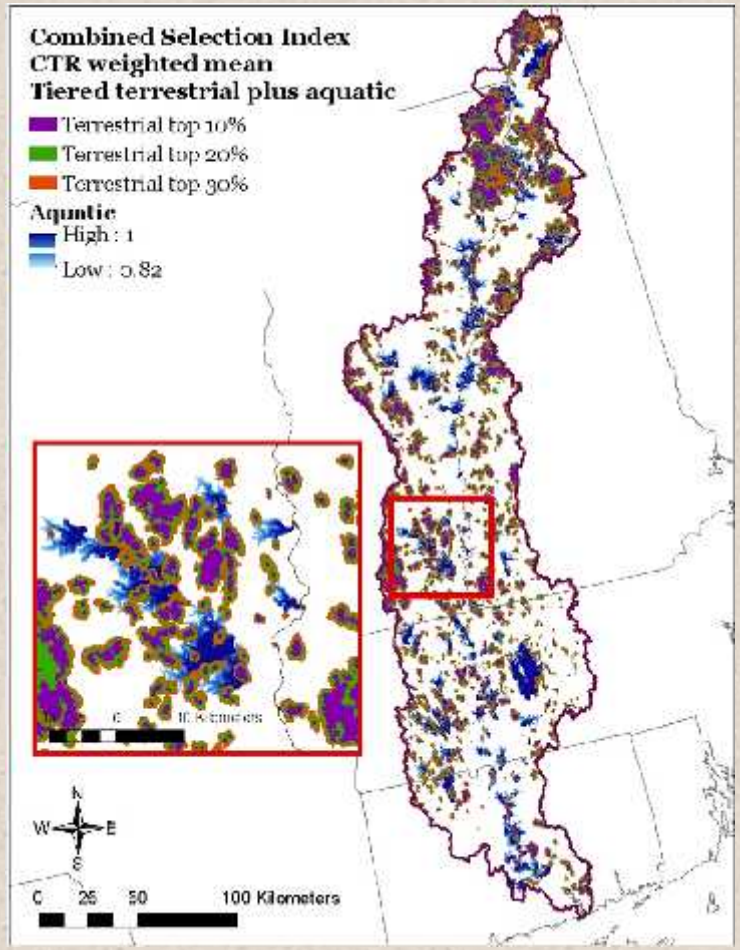


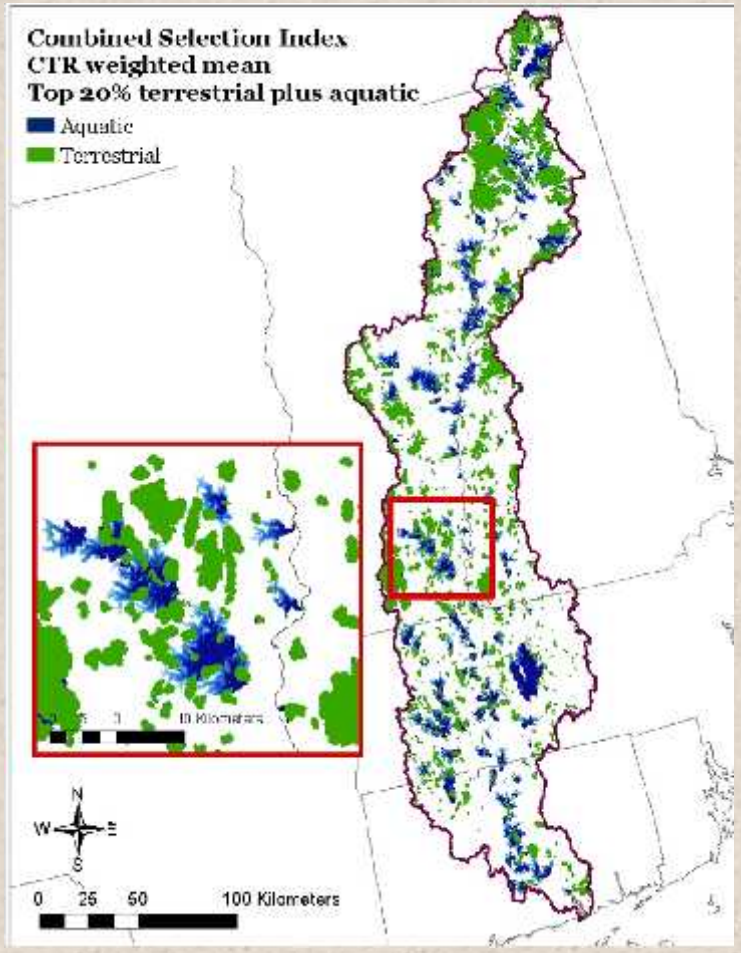
	To select core areas, ecosystem results are scaled by: Subwatershed (e.g., HUC 8) ⟷ Full Connecticut River Watershed	
Diversity	By ensuring more uniform representation, may enhance overall genetic and species diversity	Likely that best examples of diversity represented, with more intact functions and processes
Condition	On average, core areas may be in lesser condition and less resilient	Larger, more intact areas likely to be in better condition and more resilient
Connectedness	Greater network-wide connectivity because core areas are more evenly distributed	Greater short-distance connectivity where core areas are clustered but less connectivity where core areas are sparser

Landscape Conservation Design

Step 2: Design Conservation Network

Q5. Display of aquatic vs. terrestrial buffered cores?

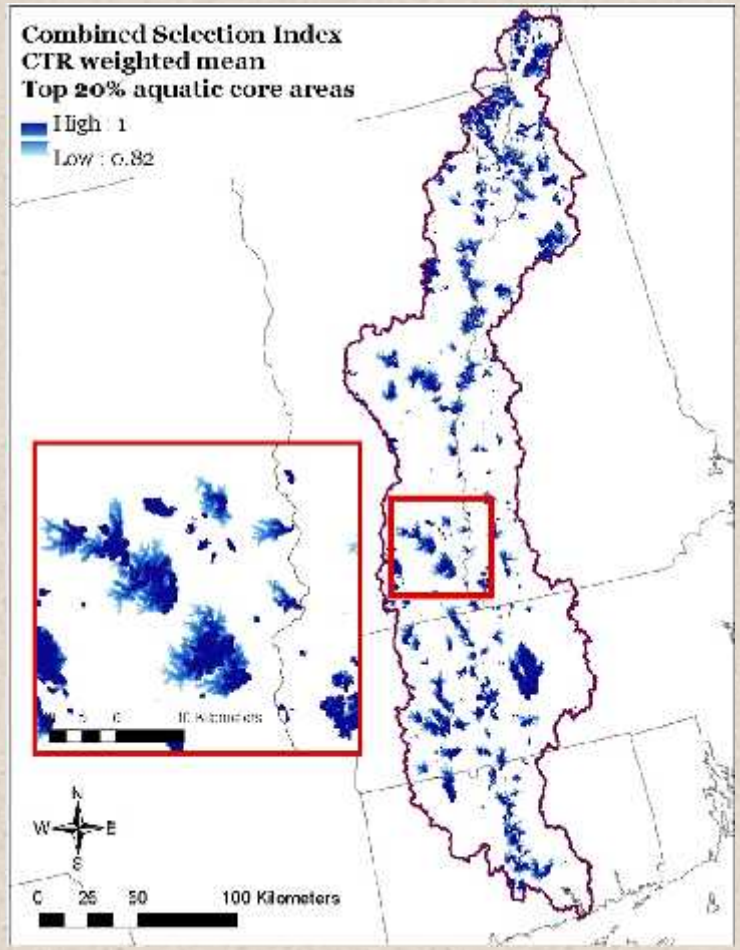


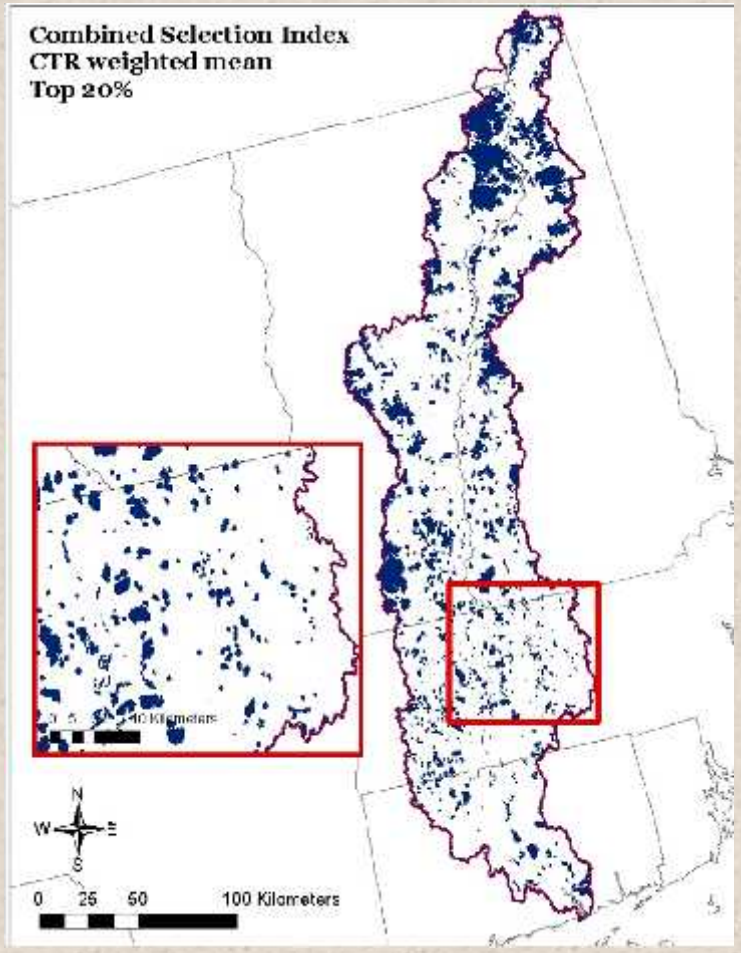


Landscape Conservation Design

Step 2: Design Conservation Network

Q5. Display of aquatic vs. terrestrial buffered cores?

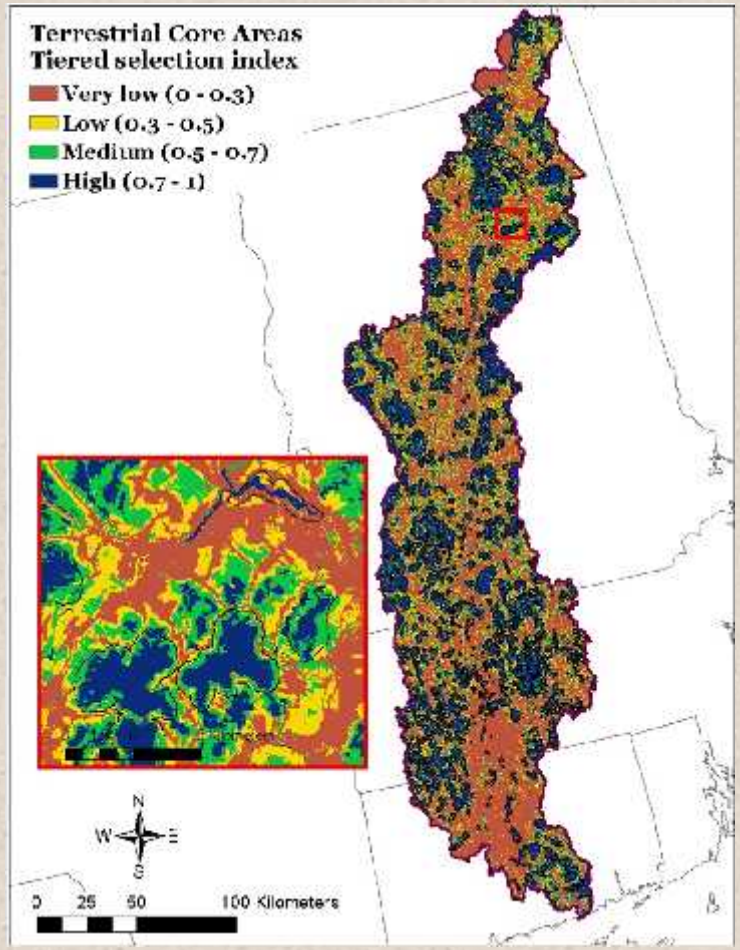


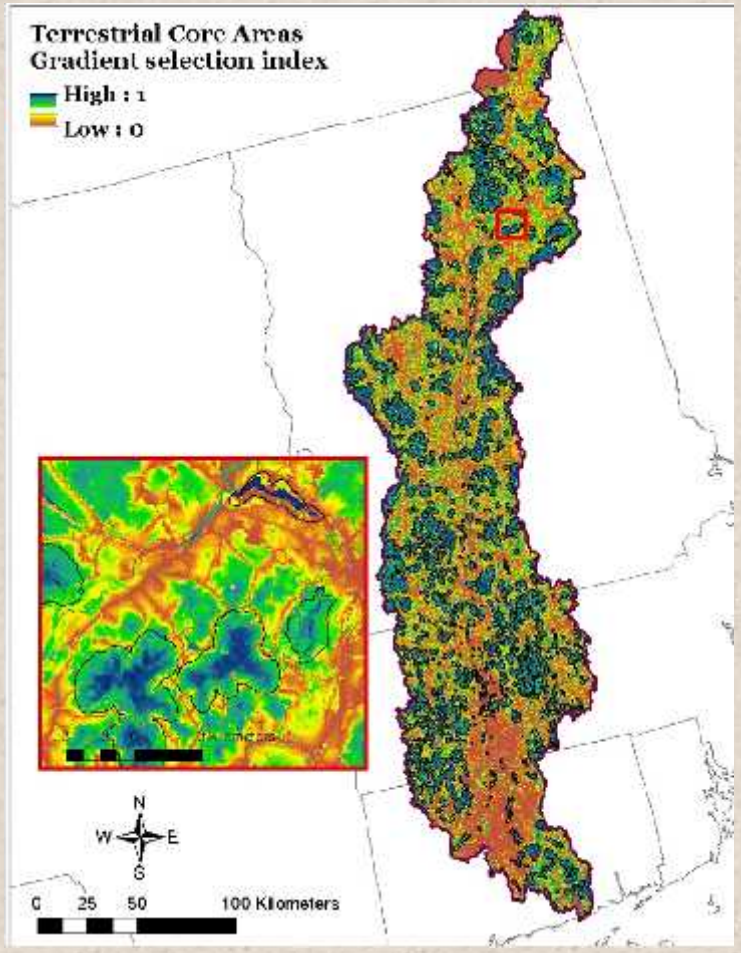


Landscape Conservation Design

Step 2: Design Conservation Network

Q6. Tiered vs. continuous matrix?

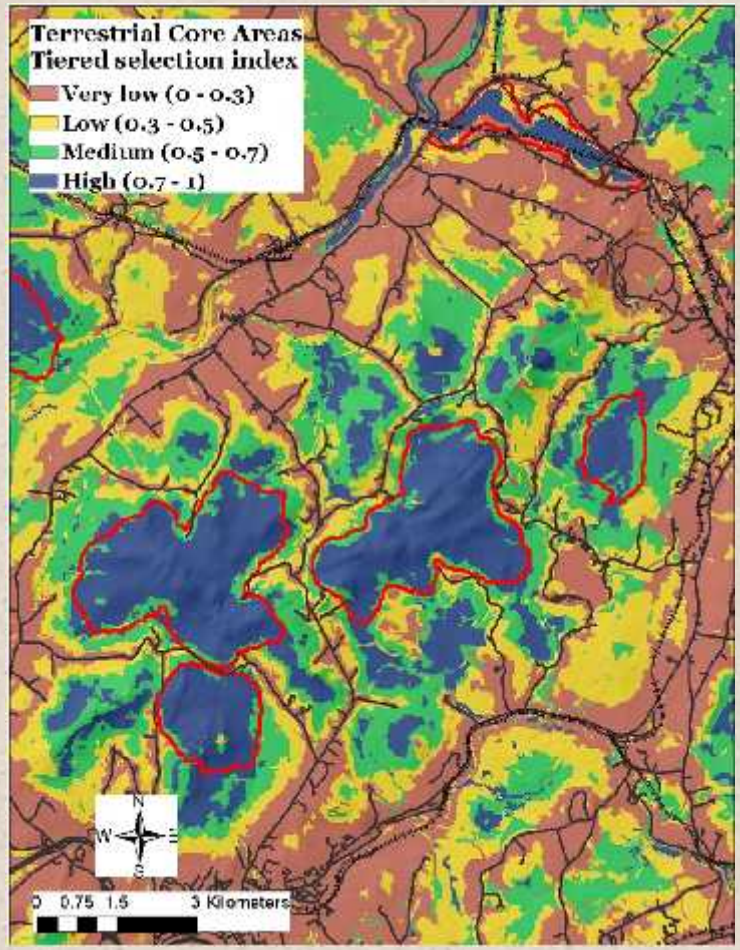


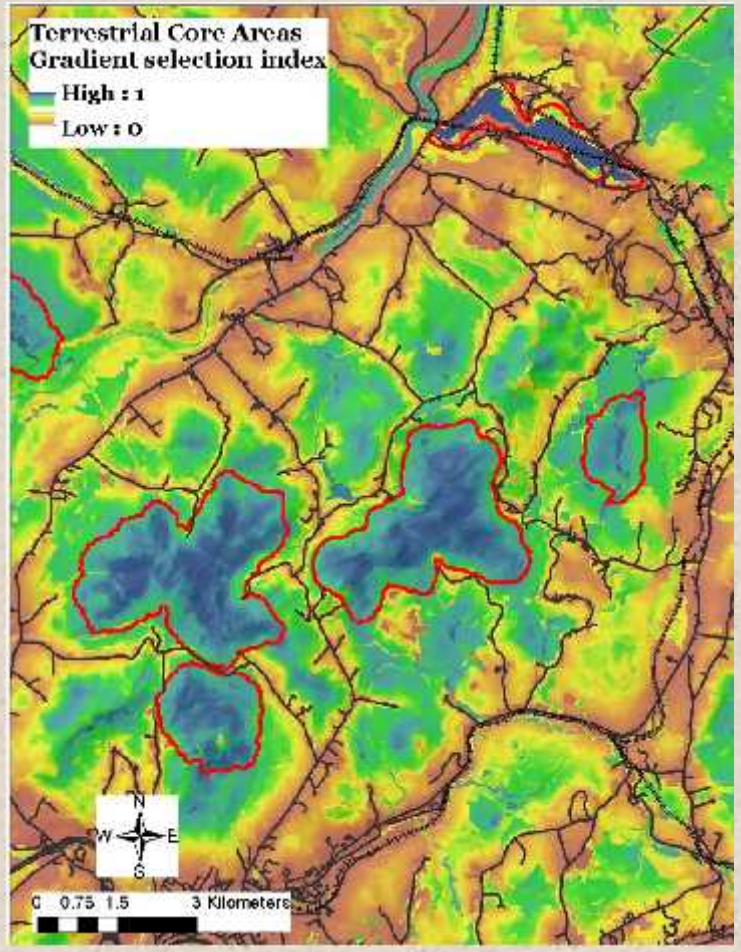


Landscape Conservation Design

Step 2: Design Conservation Network

Q6. Tiered vs. continuous matrix?

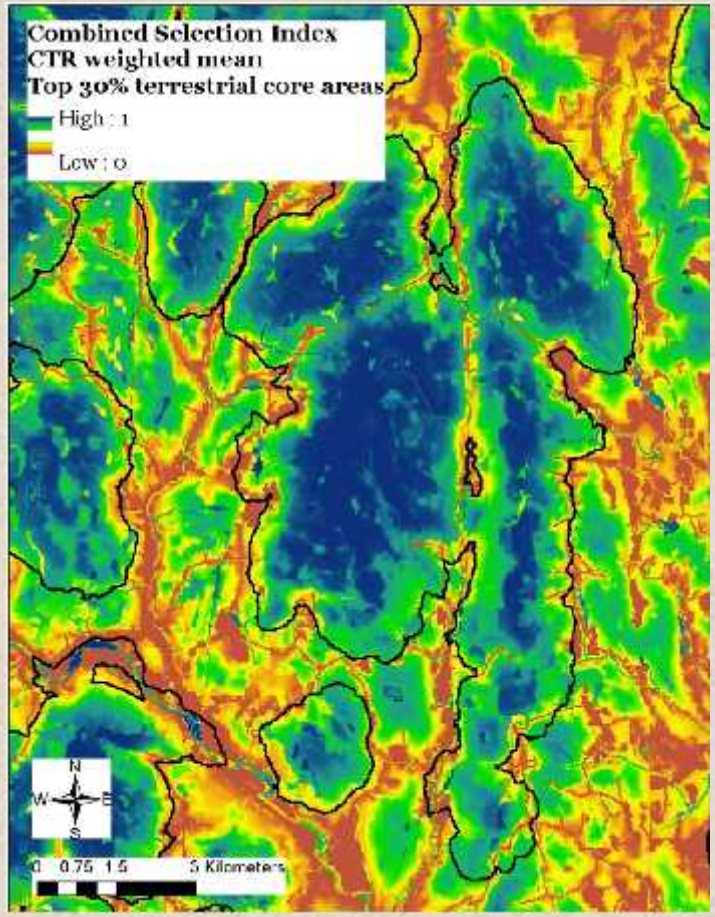


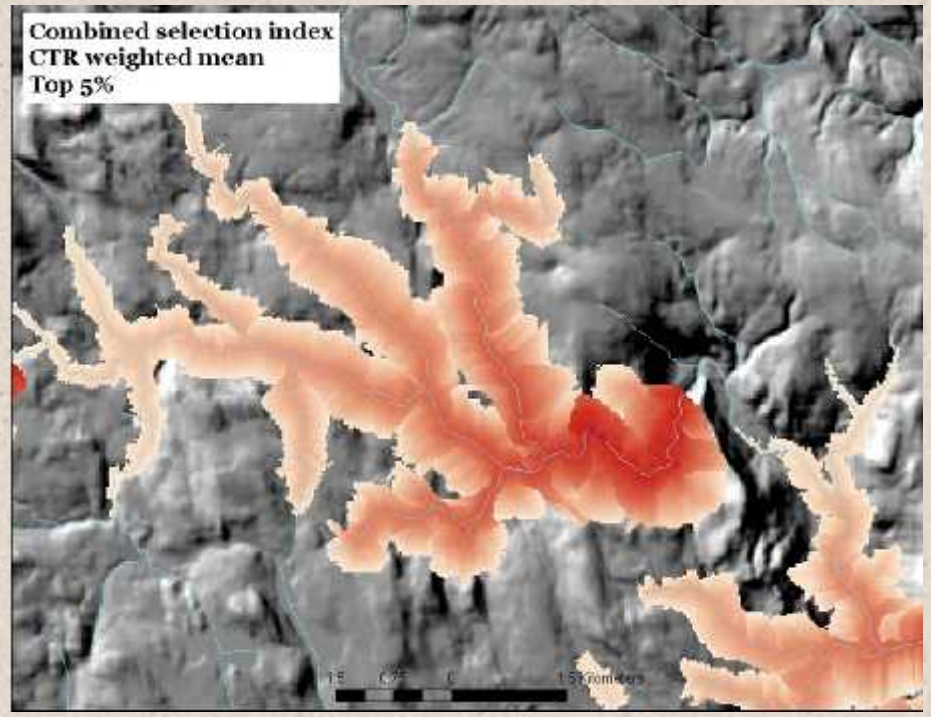


Landscape Conservation Design

Step 2: Design Conservation Network

Q7. Terminology?





Landscape Conservation Design

Step 2: Design Conservation Network

Design Steps:

1. Select (tiered) *core* areas
2. Create core area *buffers*
3. Prioritize within buffered cores
4. Assess *connectivity* among cores
5. Prioritize among core areas
6. Prioritize among linkages
7. Prioritize within linkages
8. Identify *restoration* opportunities
9. Determine *management* needs

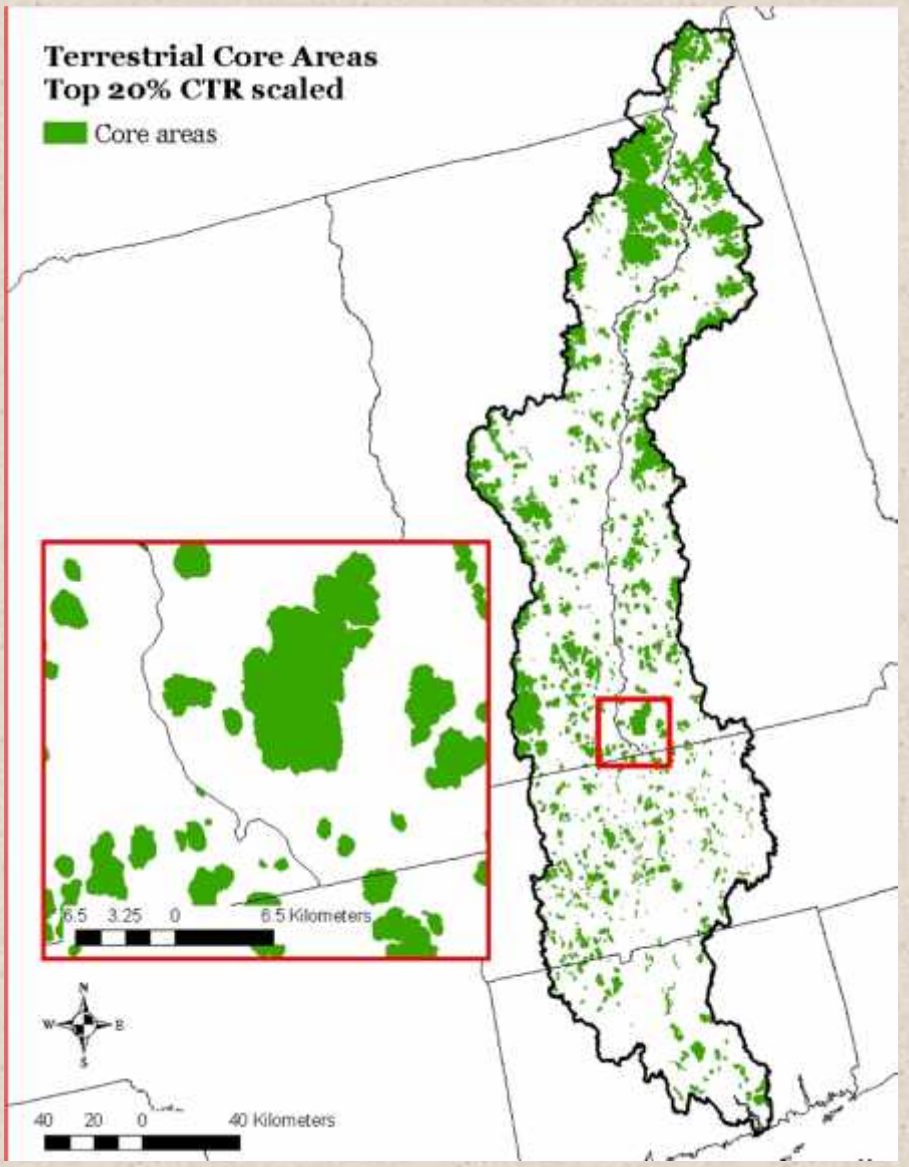
Current focus

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

Landscape Conservation Design

Step 2: Design Conservation Network

4. Assess connectivity among terrestrial core areas

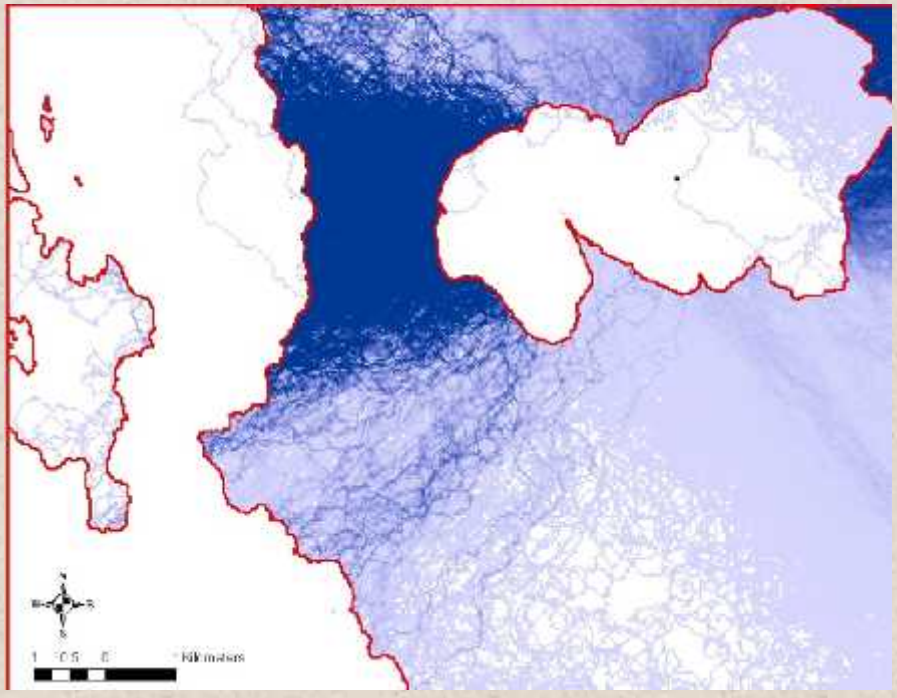


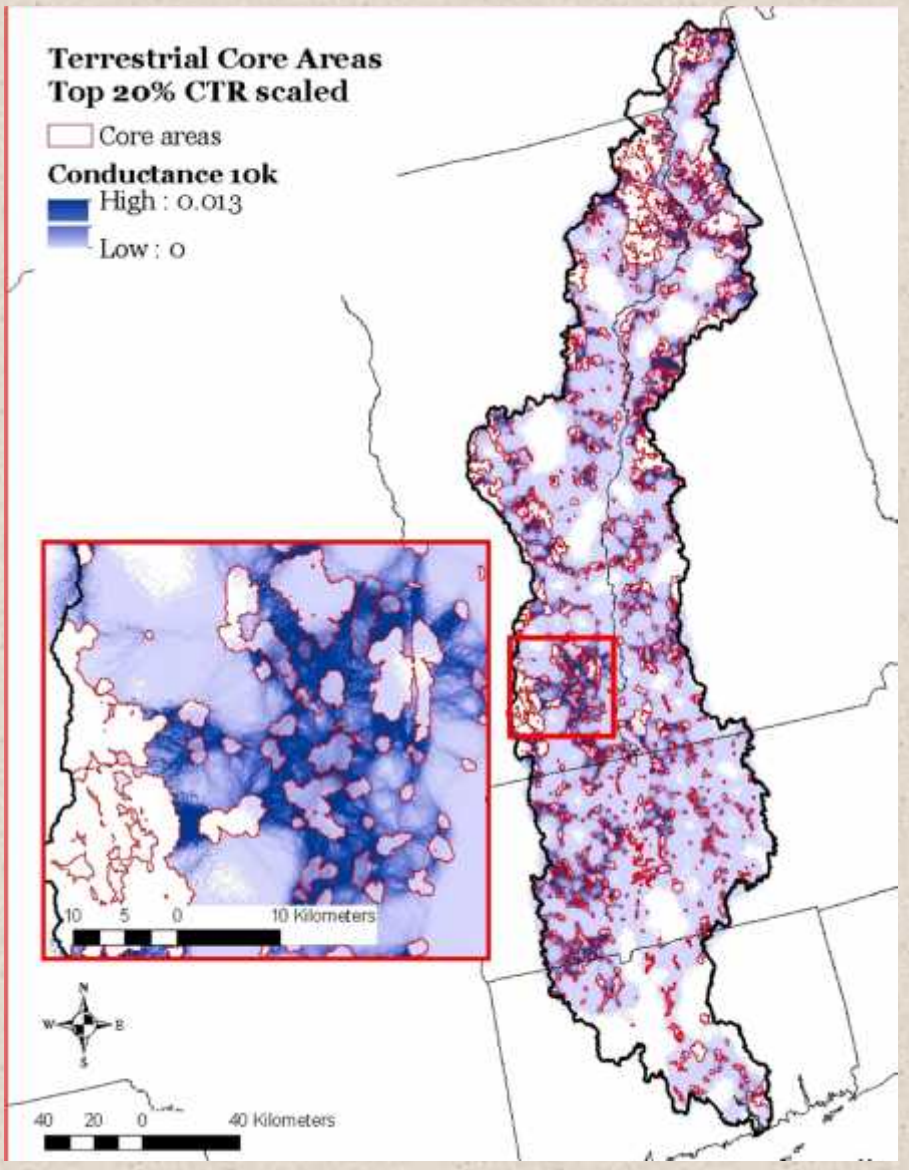
Landscape Conservation Design

Step 2: Design Conservation Network

4. Assess connectivity among core areas

a) Build random low cost paths between cores



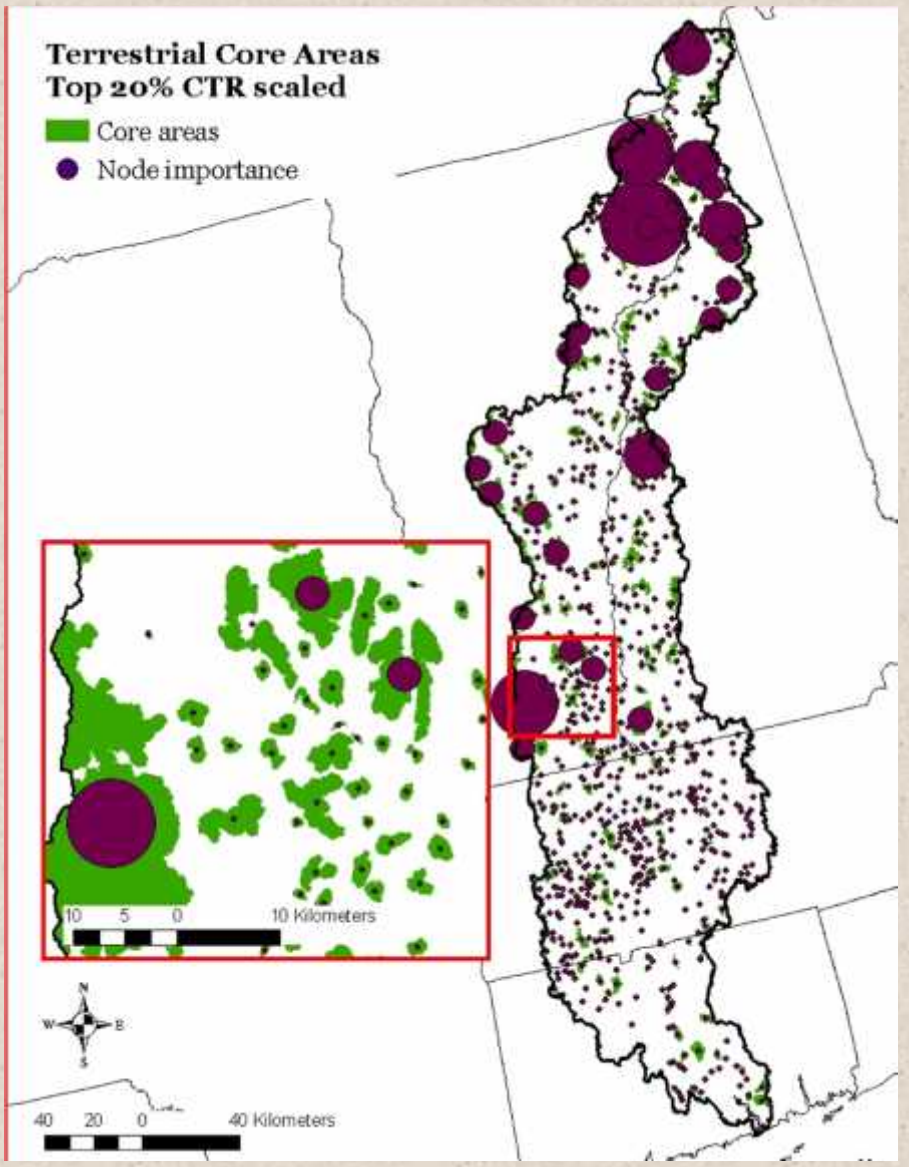


Landscape Conservation Design

Step 2: Design Conservation Network

5. Prioritize among core areas

- *Node* importance index
  - Based on node contribution to the probability of connectivity (PC) of the network

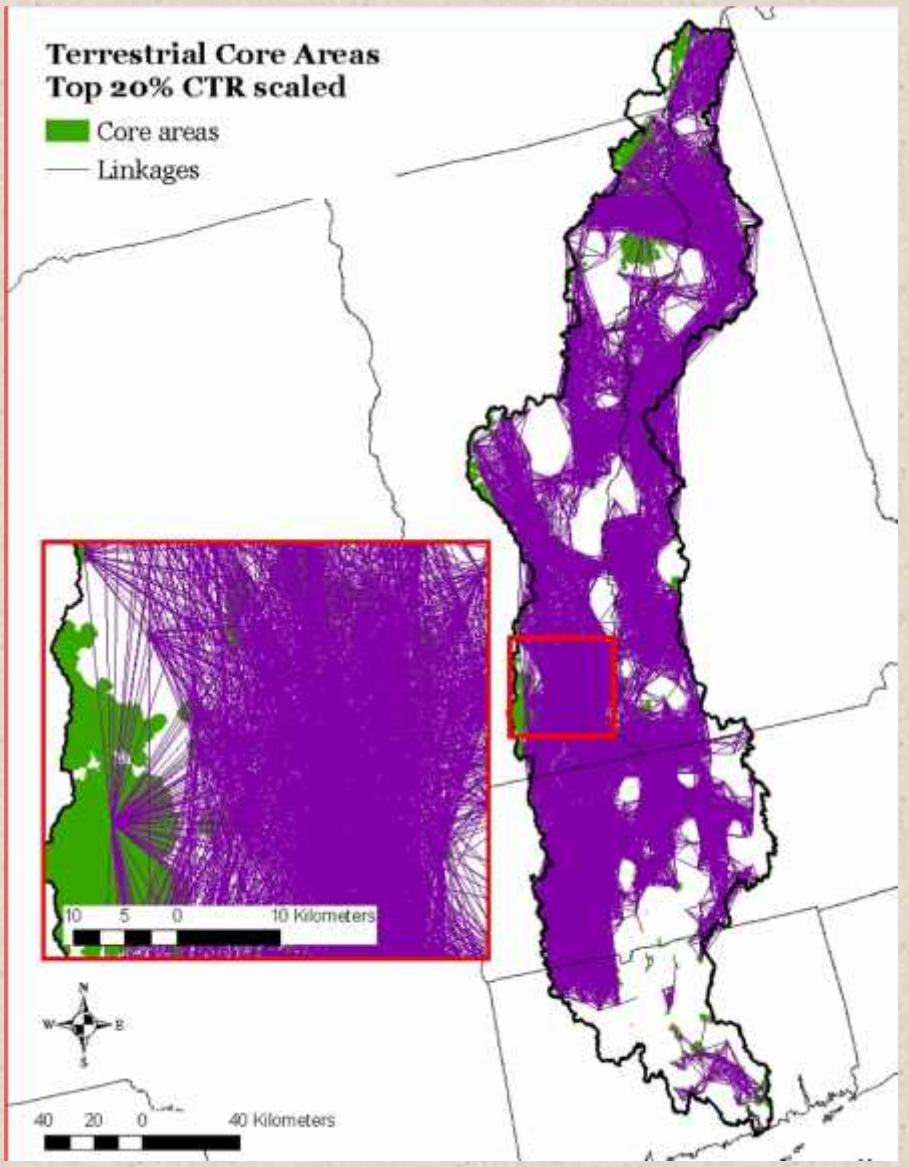


Landscape Conservation Design

Step 2: Design Conservation Network

6. Prioritize among linkages

- *Link* importance index
  - Based on link contribution to the probability of connectivity (PC) of the network

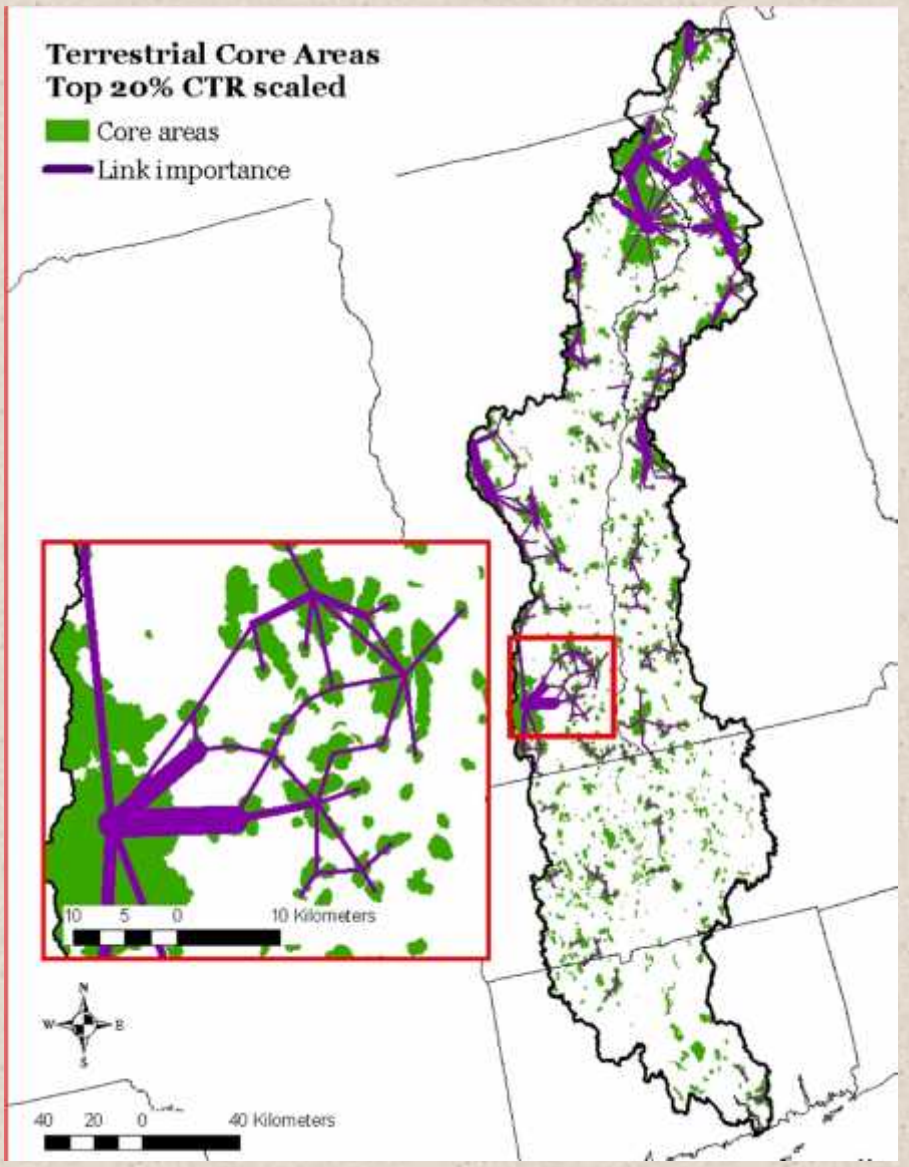


Landscape Conservation Design

Step 2: Design Conservation Network

6. Prioritize among linkages

- *Link* importance index
  - Based on link contribution to the probability of connectivity (PC) of the network



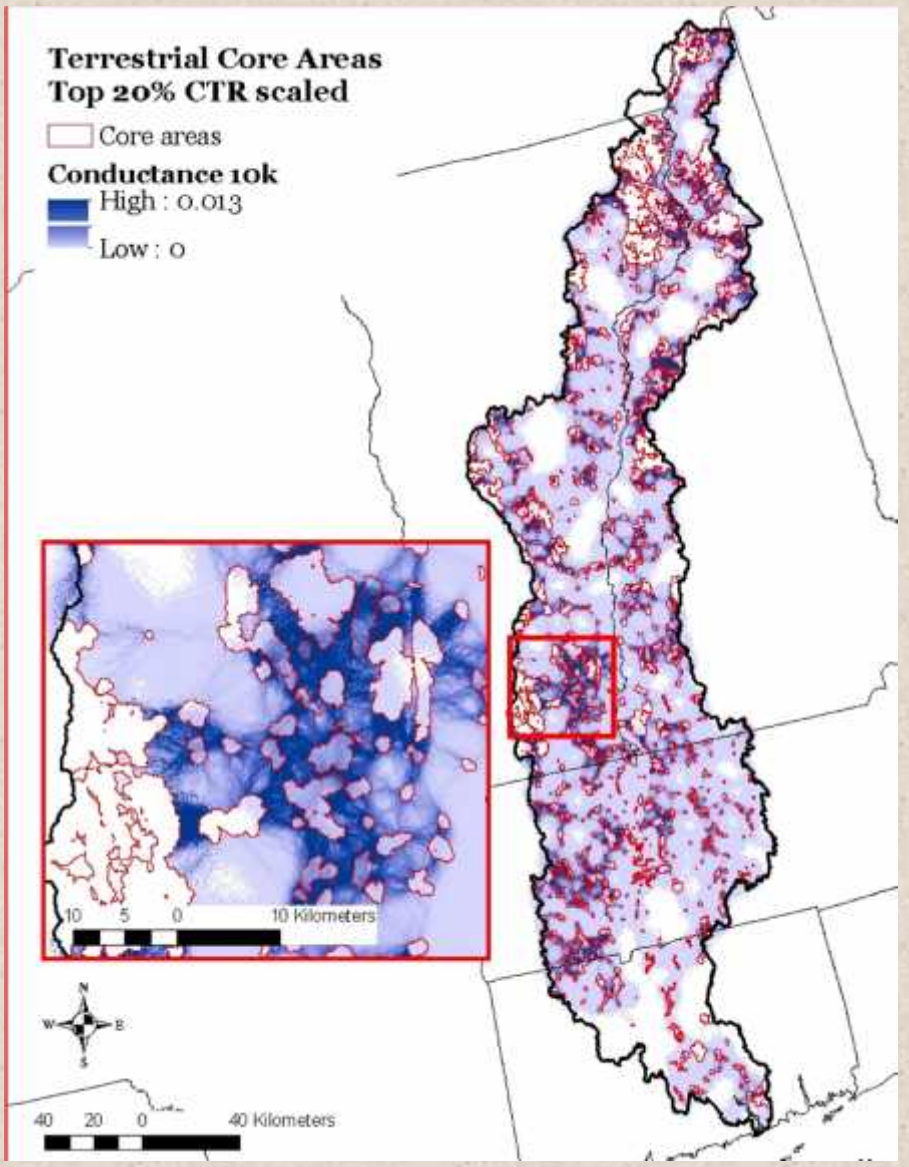
Landscape Conservation Design

Step 2: Design Conservation Network

7. Prioritize within linkages

- Conductance index
- Irreplaceability index
- Vulnerability index

- Relative probability of flow through a call (function of local resistance, node size, quality and proximity)



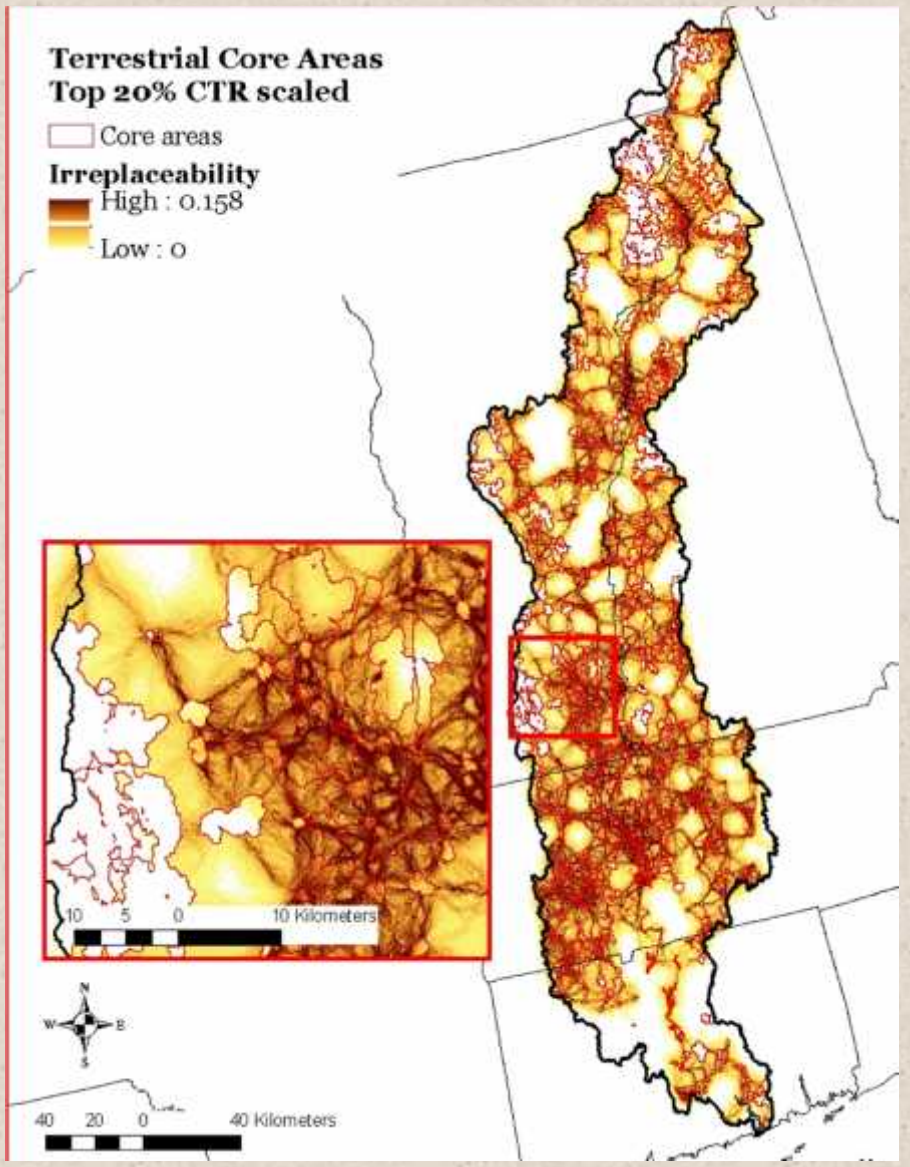
Landscape Conservation Design

Step 2: Design Conservation Network

7. Prioritize within linkages

- Conductance index
- Irreplaceability index
- Vulnerability index

- Relative concentration of paths through a call (function of local resistance and path irreplaceability)



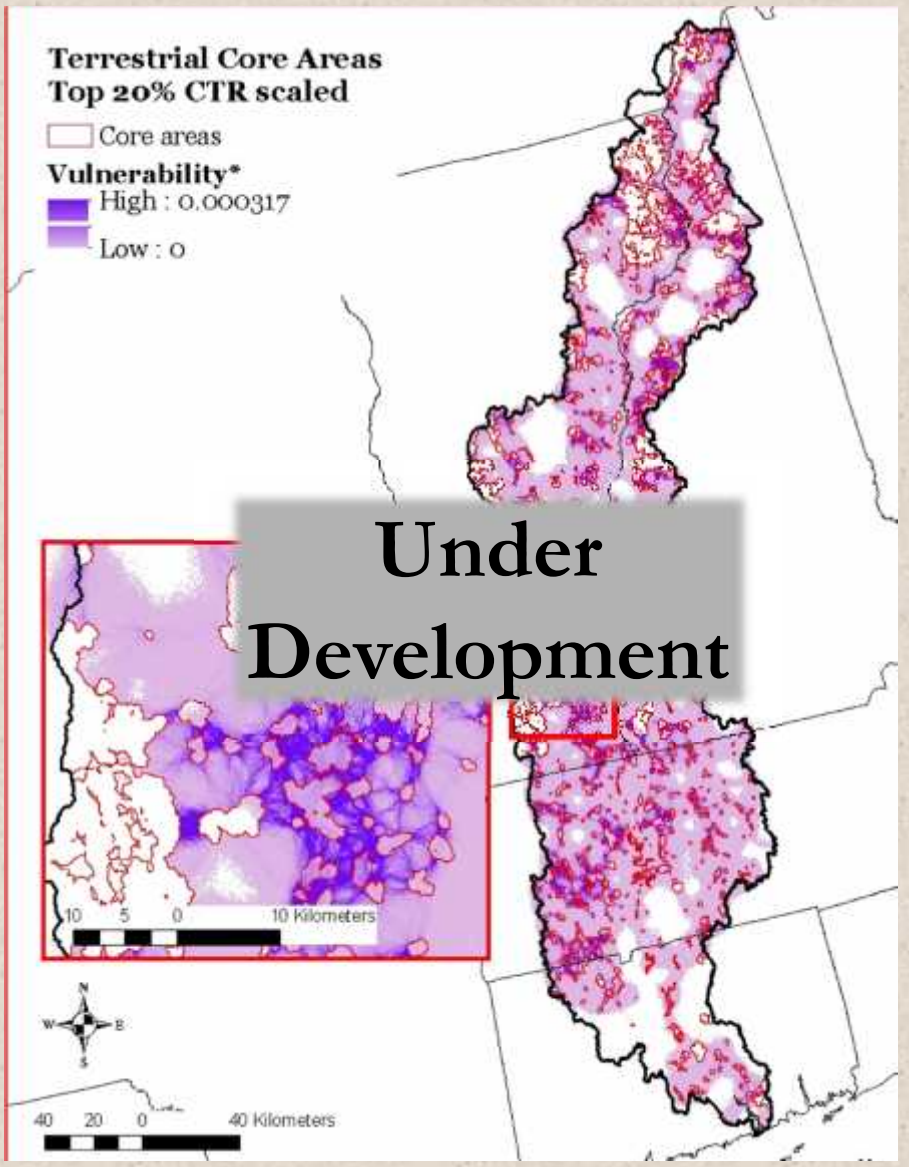
Landscape Conservation Design

Step 2: Design Conservation Network

7. Prioritize within linkages

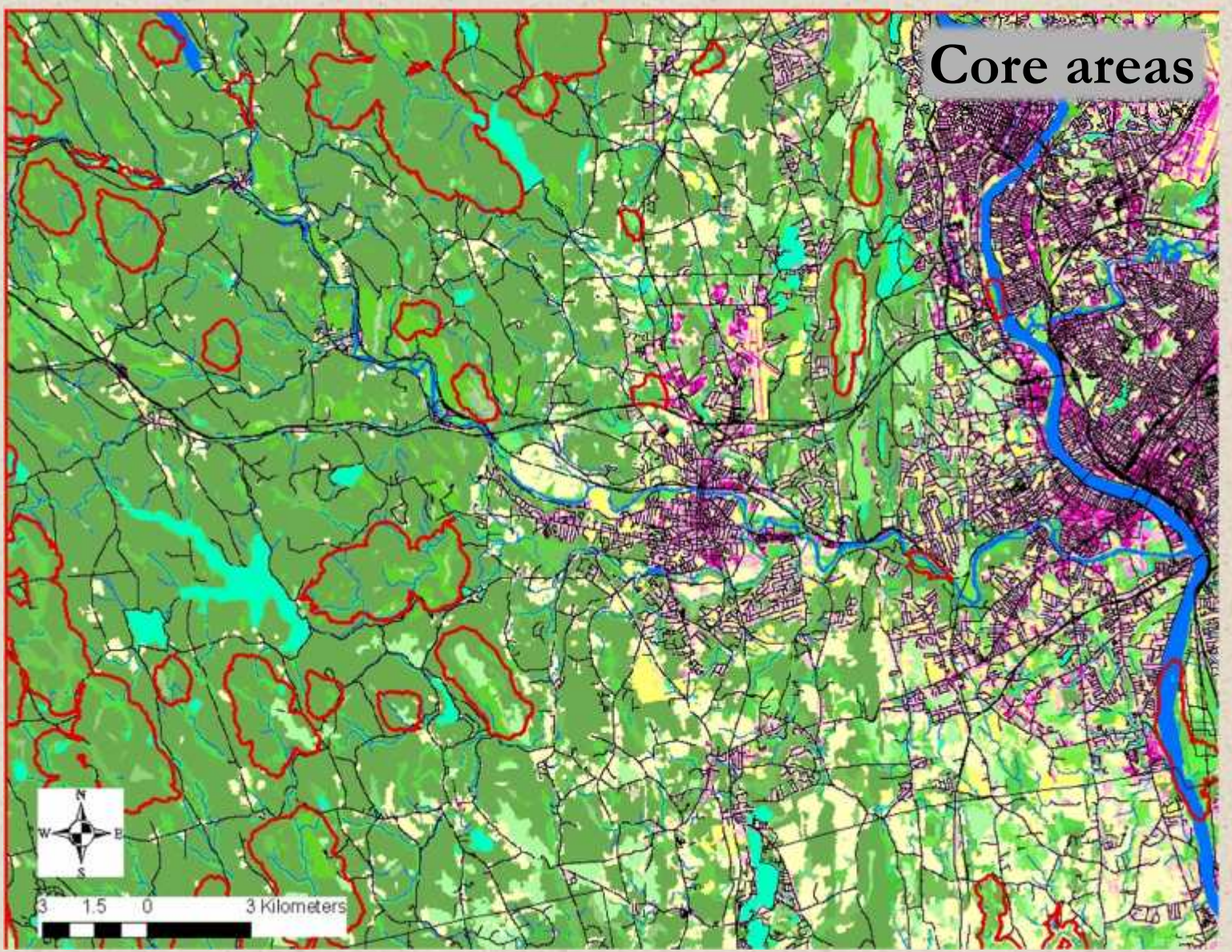
- Conductance index
- Irreplaceability index
- Vulnerability index

- Relative probability of developing an irreplaceable cells that has a high relative probability of use



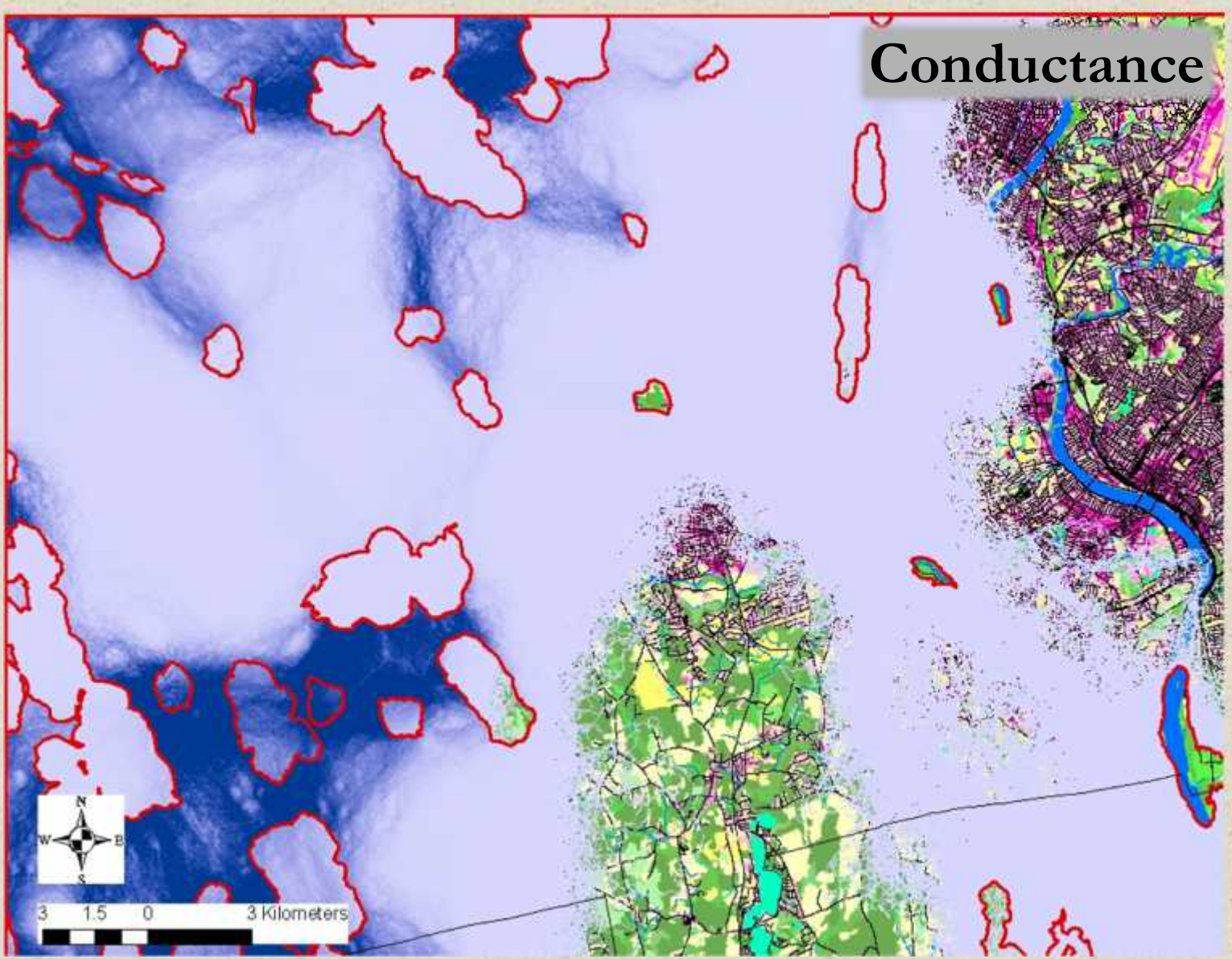
Landscape Conservation Design

Step 2: Design Conservation Network



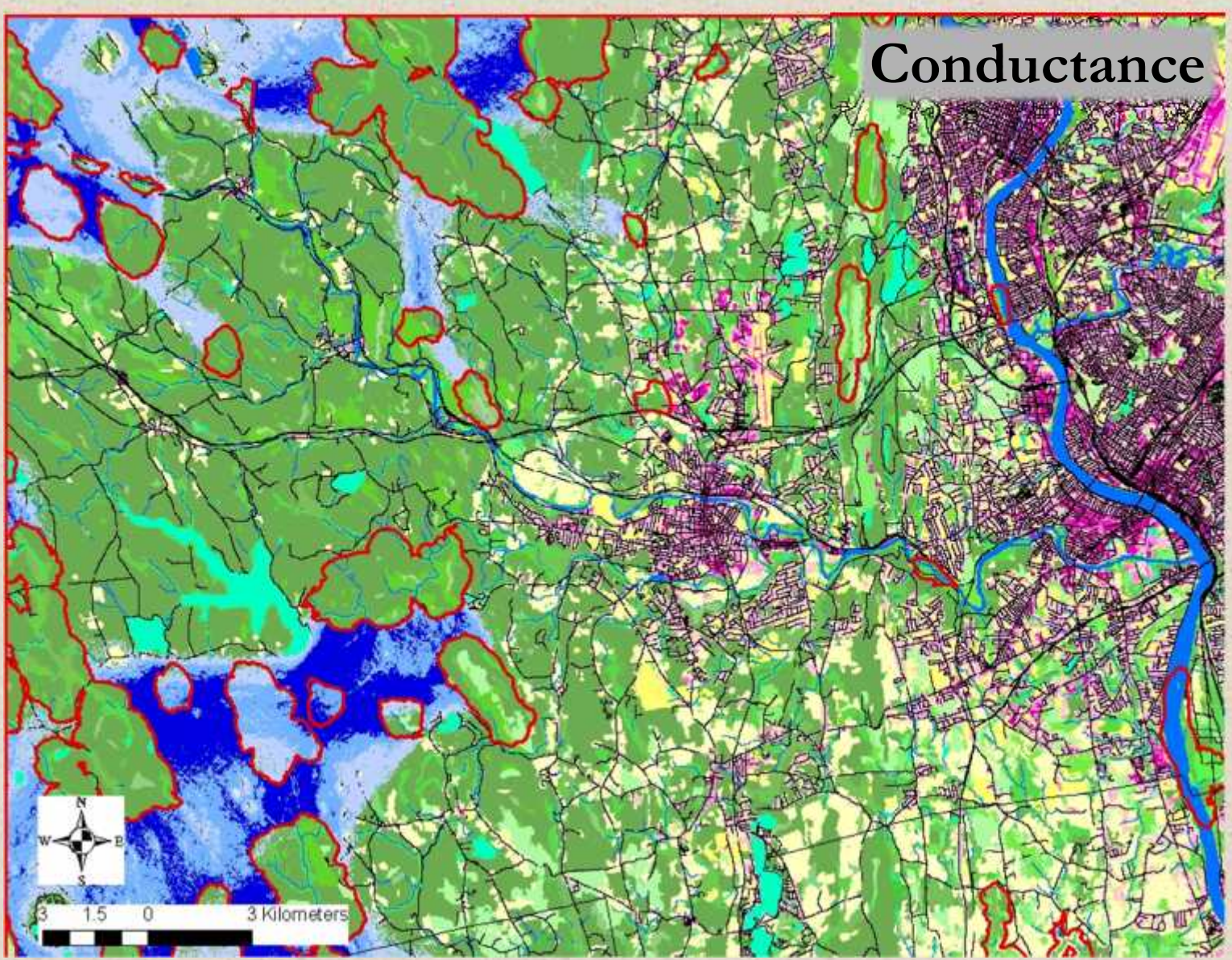
Landscape Conservation Design

Step 2: Design Conservation Network



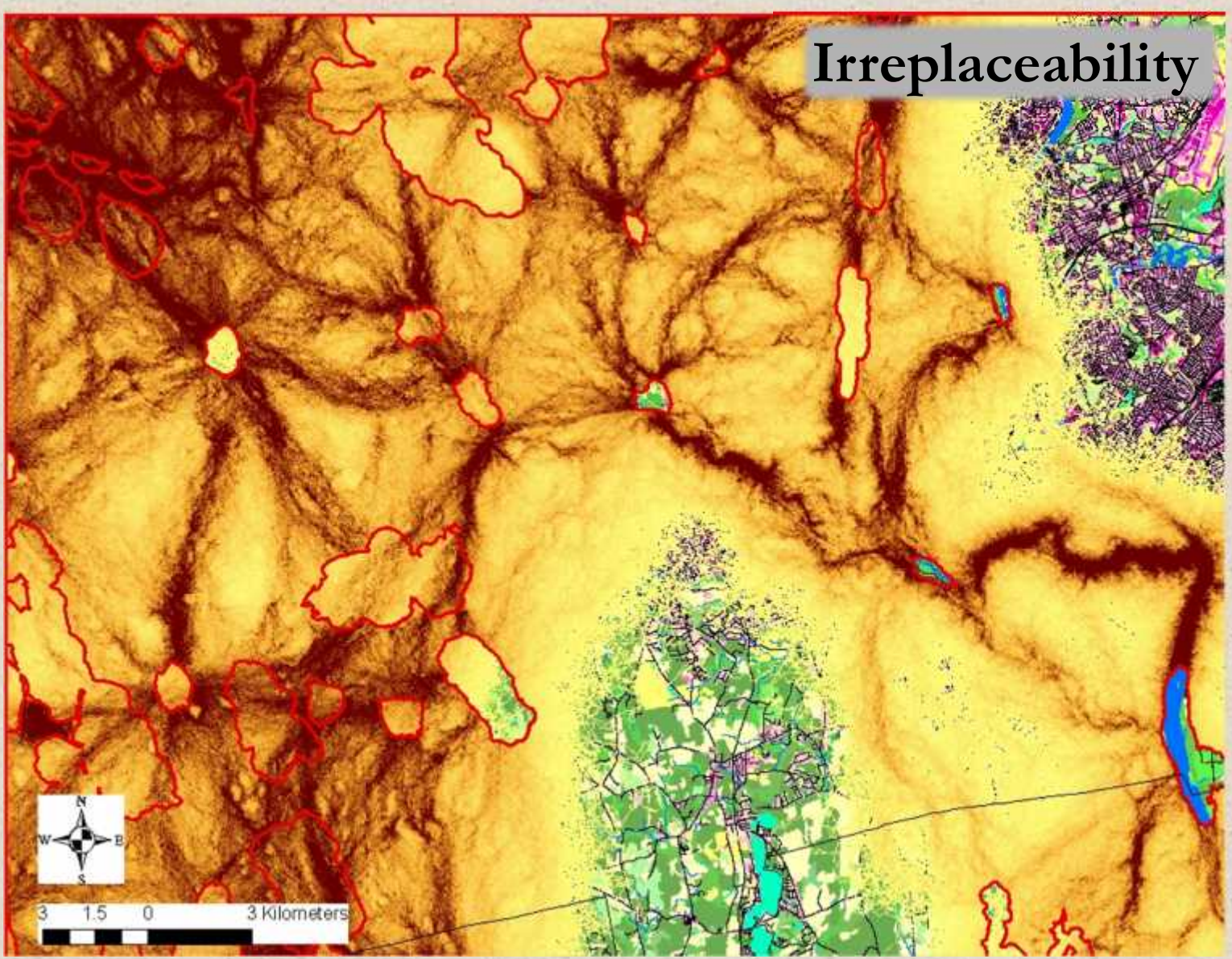
Landscape Conservation Design

Step 2: Design Conservation Network



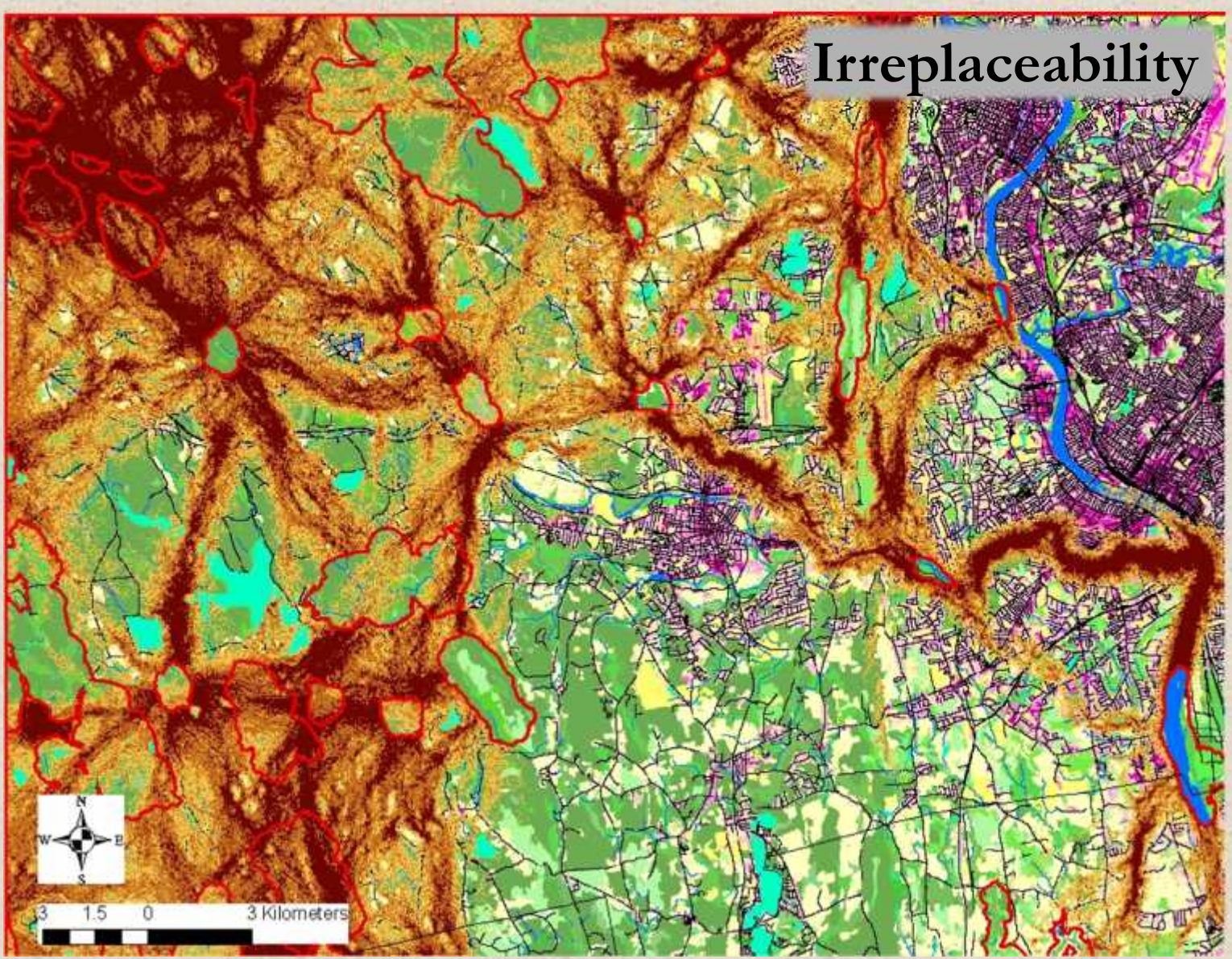
Landscape Conservation Design

Step 2: Design Conservation Network



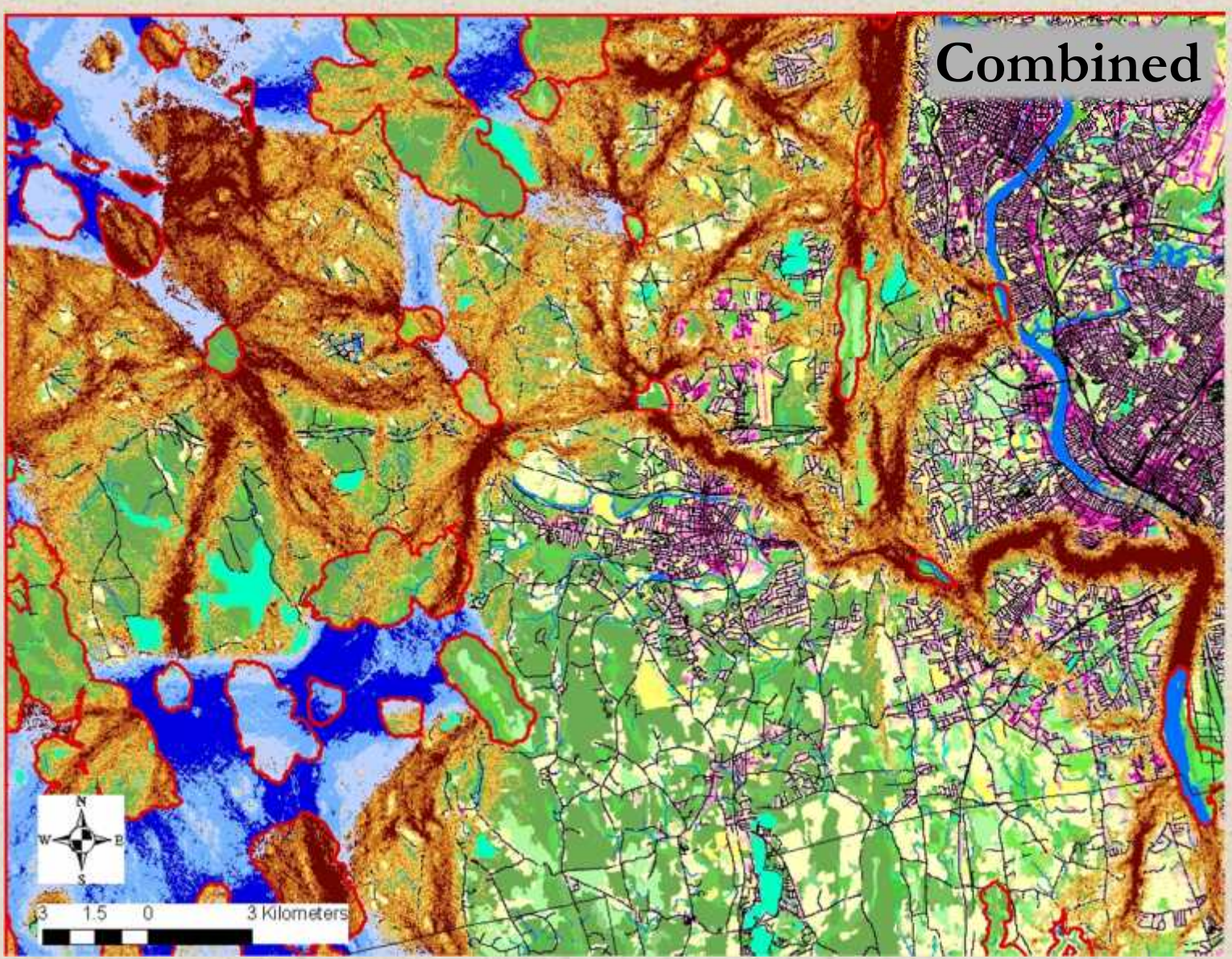
Landscape Conservation Design

Step 2: Design Conservation Network



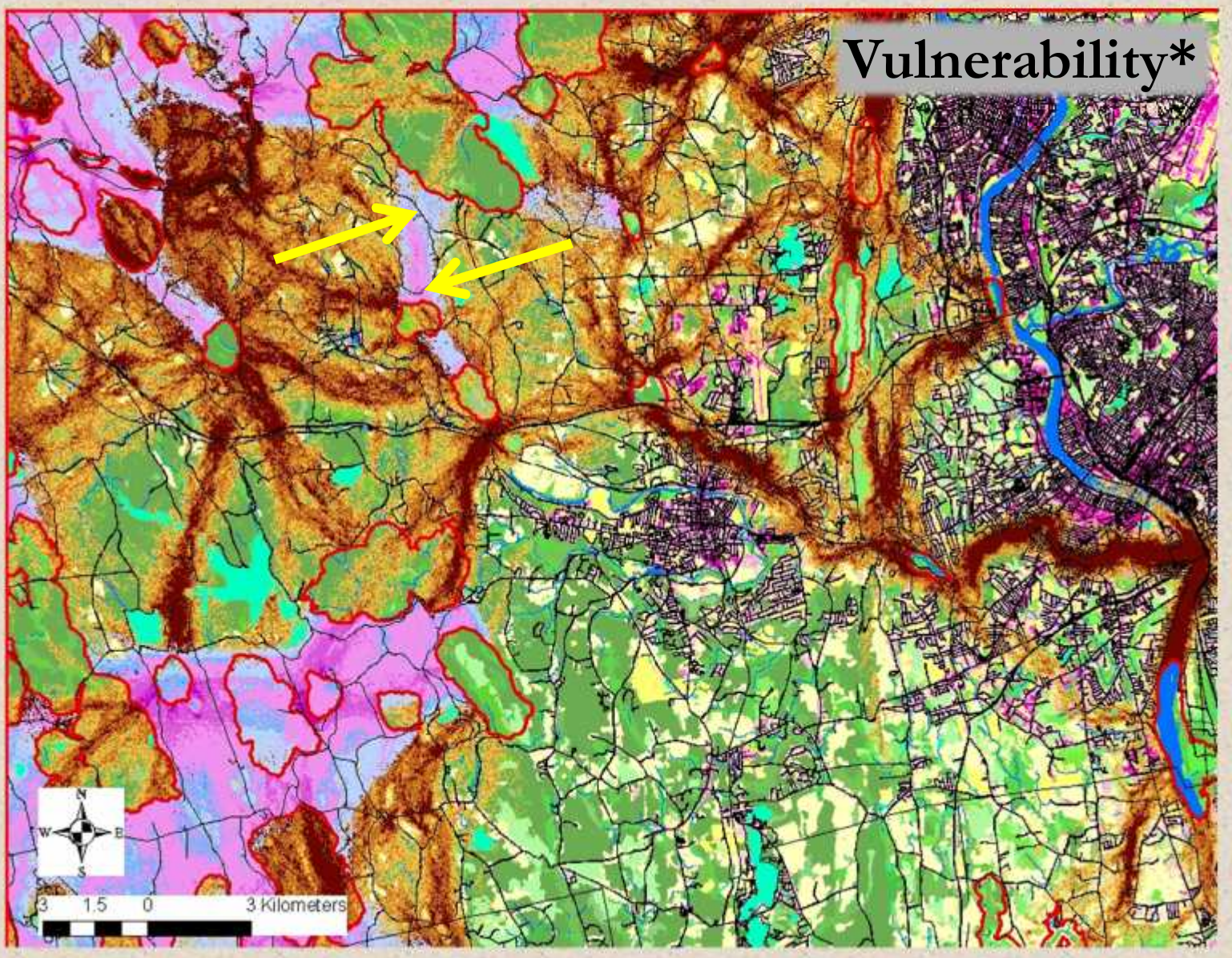
Landscape Conservation Design

Step 2: Design Conservation Network



Landscape Conservation Design

Step 2: Design Conservation Network

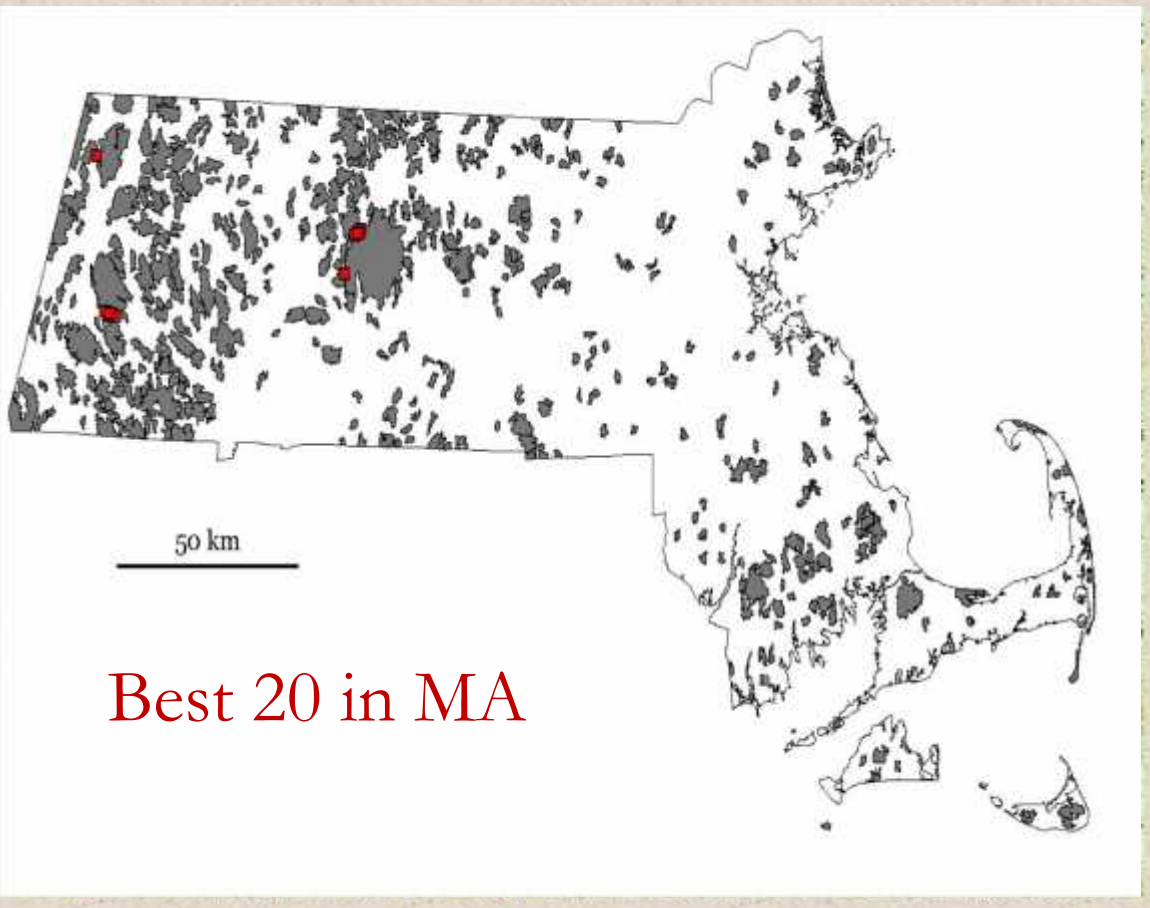


Landscape Conservation Design

Step 2: Design Conservation Network

8. Identify *restoration* opportunities

- Road passage structures
- Road-stream crossings
- Dams
- Wetland/forest restoration (phase 3)

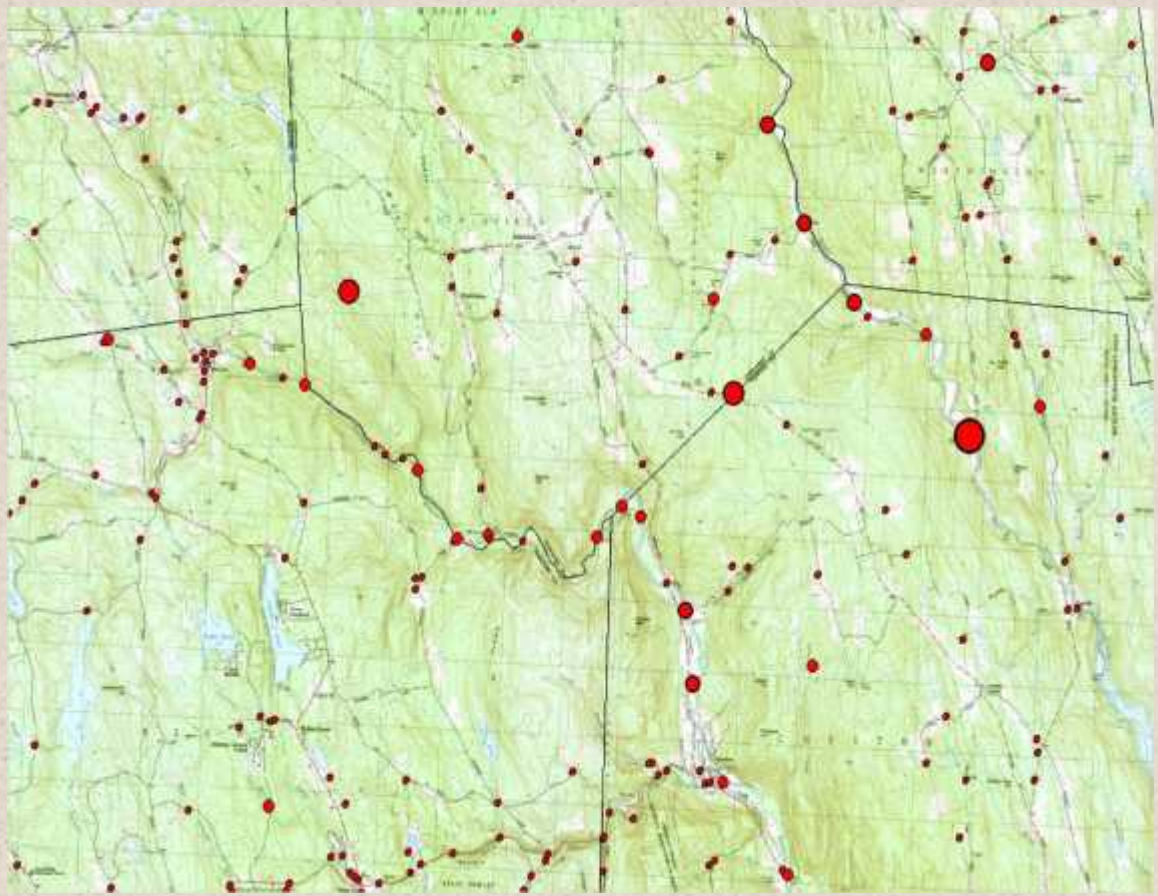


Landscape Conservation Design

Step 2: Design Conservation Network

8. Identify *restoration* opportunities

- Road passage structures
- Road-stream crossings
- Dams
- Wetland/forest restoration (phase 3)

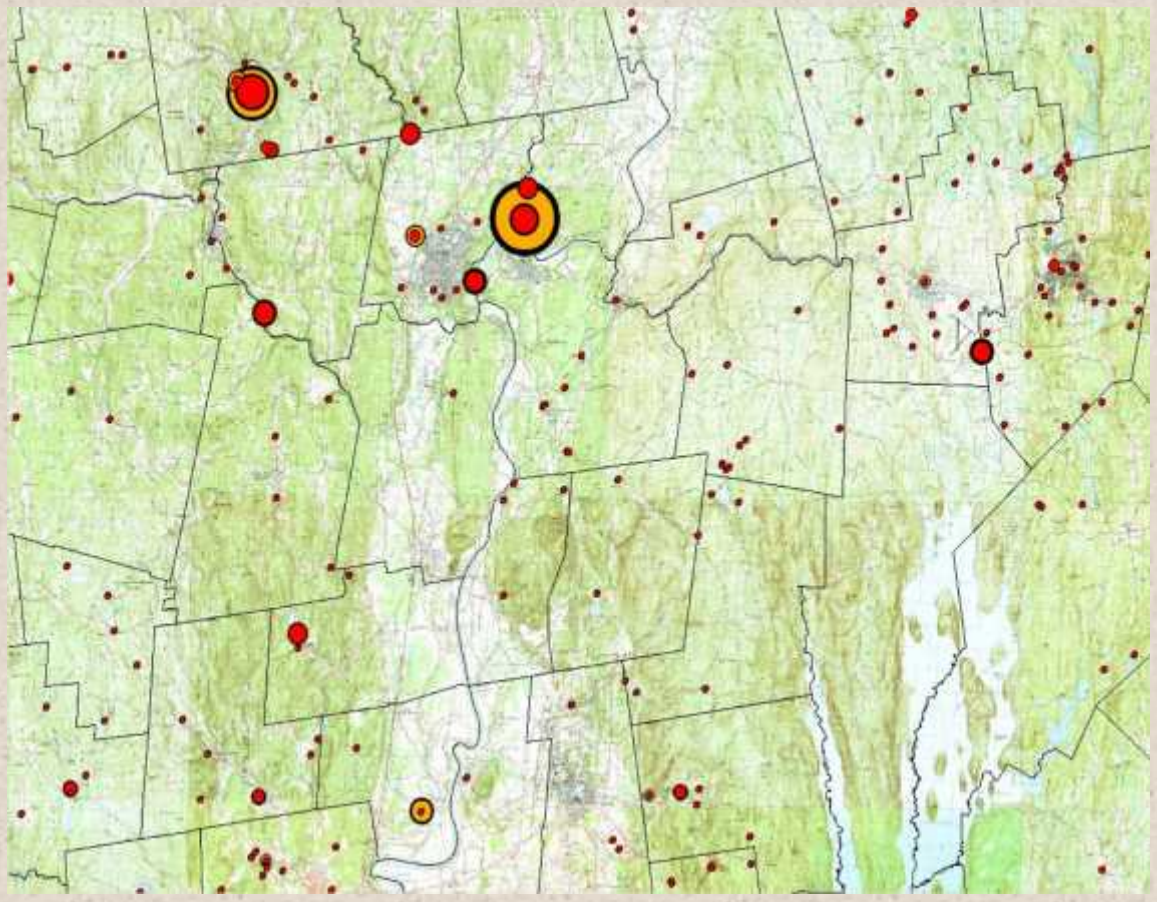


Landscape Conservation Design

Step 2: Design Conservation Network

8. Identify *restoration* opportunities

- Road passage structures
- Road-stream crossings
- Dams
- Wetland/forest restoration (phase 3)



Landscape Conservation Design

Step 2: Design Conservation Network

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

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

Landscape Conservation Design

Step 2: Design Conservation Network

Key Decisions:

1. Terrestrial buffer-core area selection and delineation
   a) Slice or algorithmic approach?
   b) Size and configuration (min size; fewer larger vs more smaller)?
   c) Spread barriers?
   d) CTR vs HUC8 (or other) scaling?
2. Aquatic buffer-core area selection and delineation
   a) What spatial units to use?
   b) What method for delineating buffers?
3. How much area to allocate to buffer-cores?
4. What's the best way to display the core area results?

For More Information

- **Project website:**

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

Feedback:

- **Manager online survey**


North Atlantic Landscape Conservation Cooperative Designing Sustainable Landscapes (DSL) Project

Manager Feedback and Questionaire

Criteria for Feedback

General topics

Links to products:

- **Overview**
- **Technical docs**
- **Presentations**
- **Results**

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