

VERMONT FORESTS

HISTORY, FUNCTIONS, AND LANDSCAPE PLANNING

Forest Integrity Study
Committee

August 18, 2016



Kim Royar, John Austin, and Eric Sorenson
VT Fish and Wildlife Department

















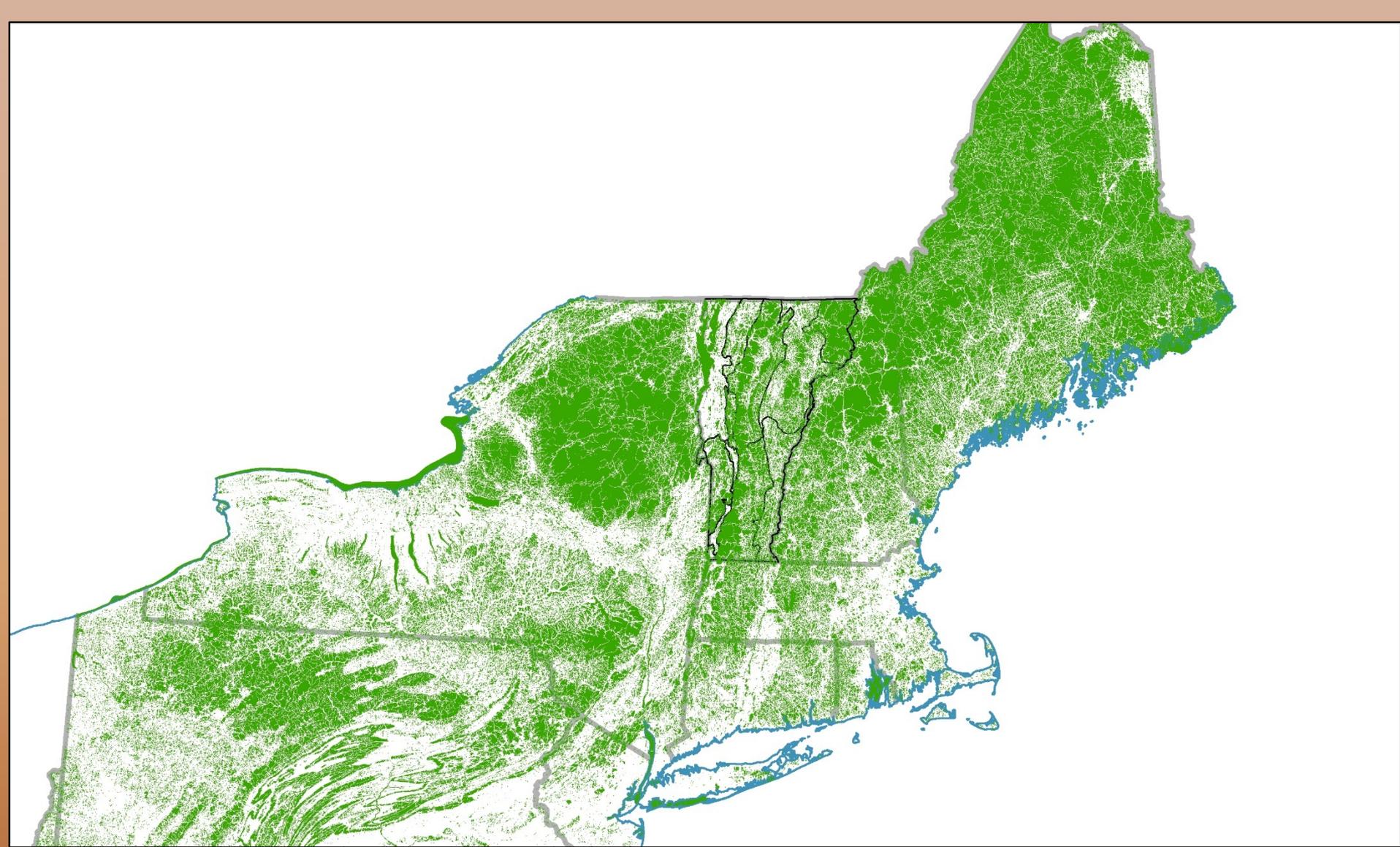




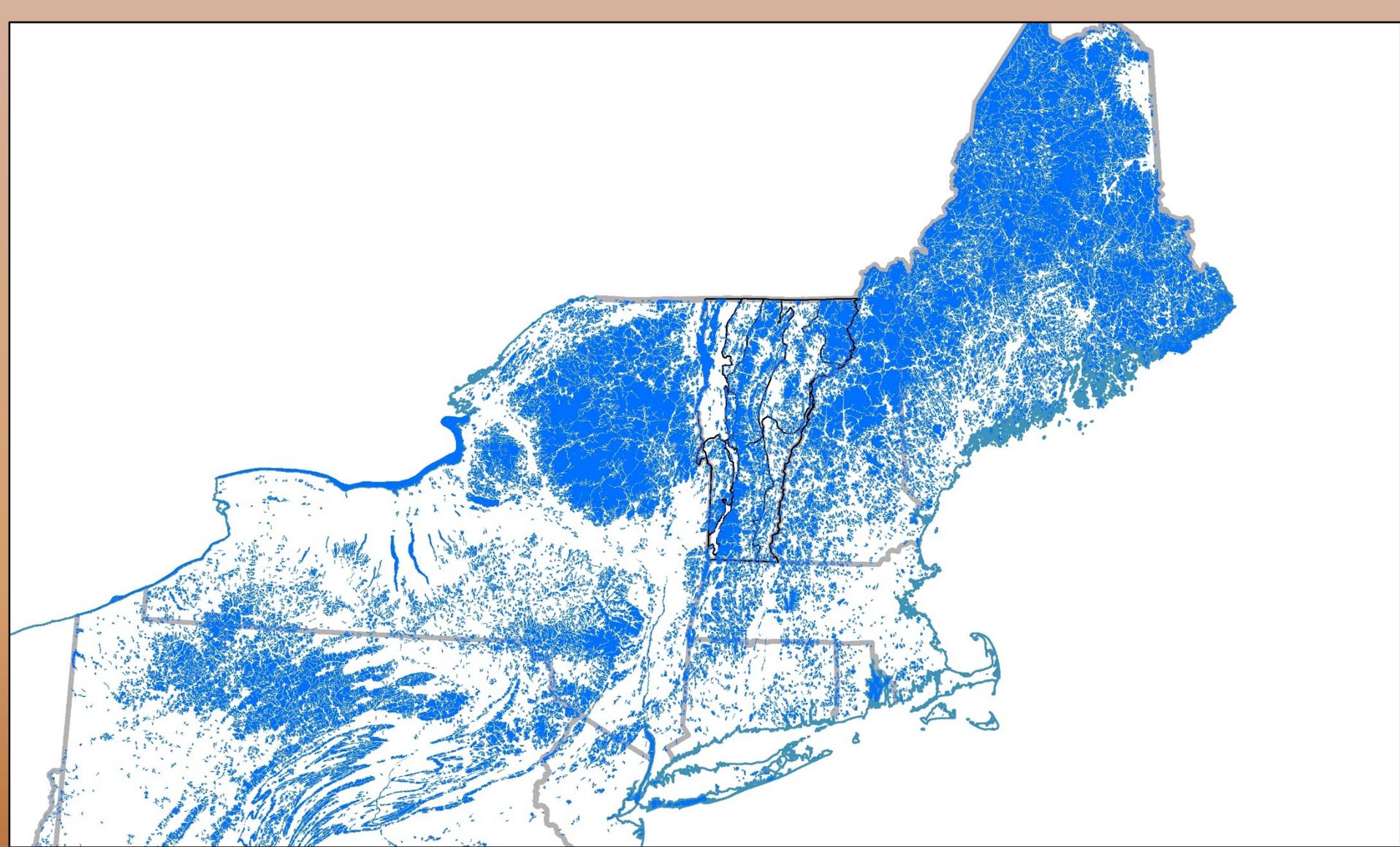


Keeping Forests as Forests maintains:

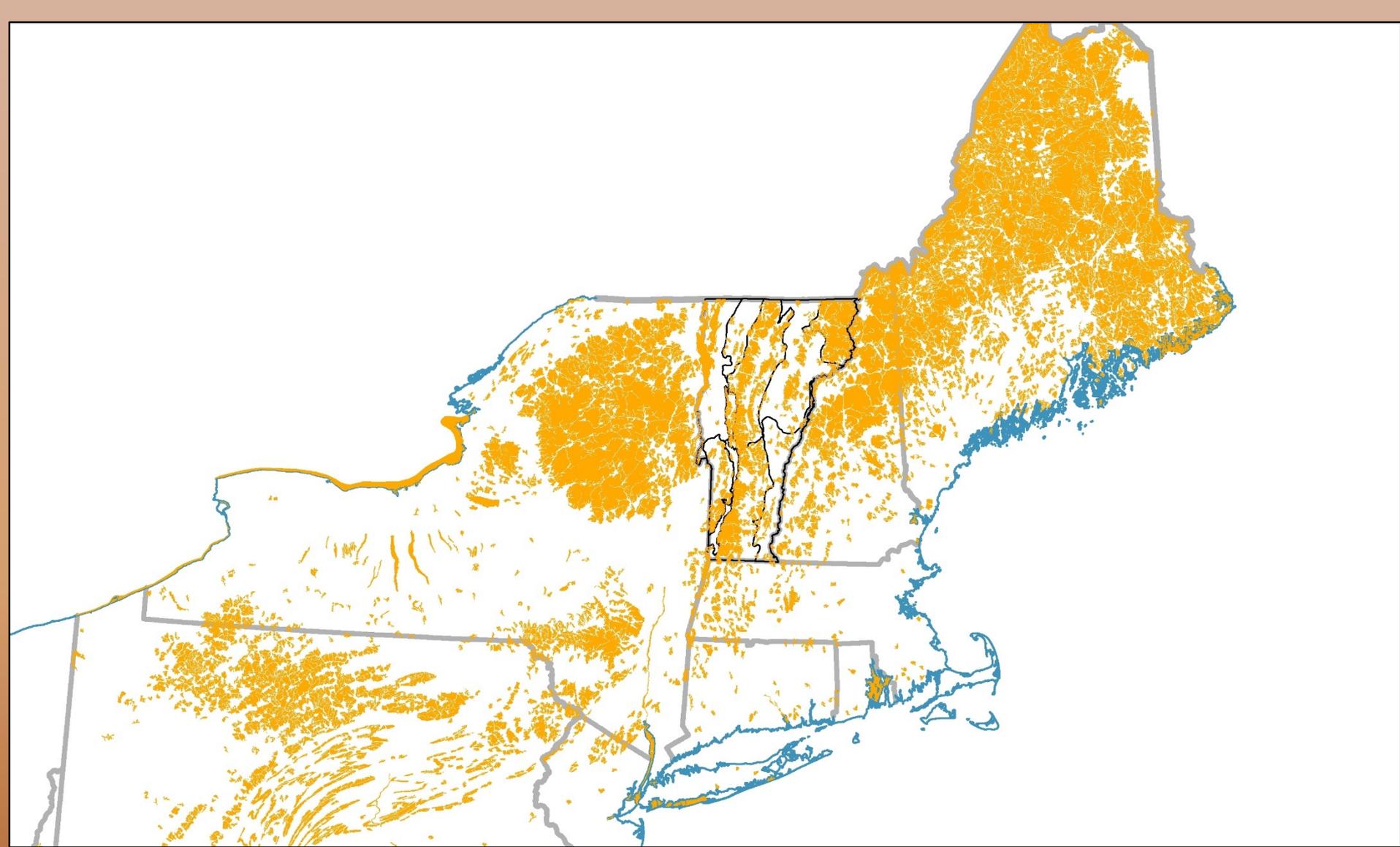
- **ecological functions and services**
- **climate change adaptation and resilience**
- **wildlife habitat**
- **biological diversity – species and communities**
- **forest management opportunities**
- **products we need**
- **forest economies**
- **cultural aesthetic**
- **recreation**
- **sense of place – Vermont's identity**



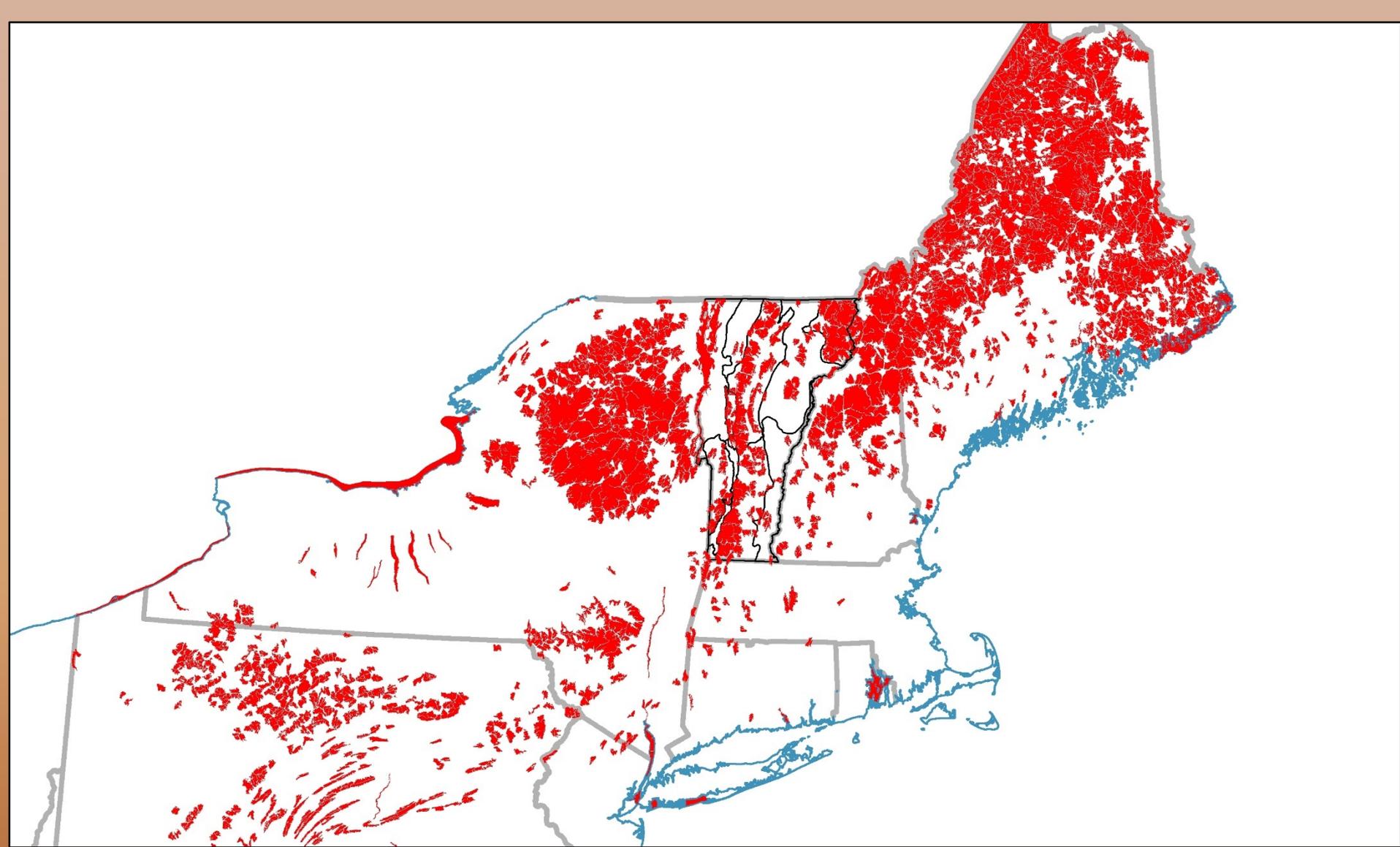
**Blocks of Forest and other Natural Cover
greater than 20 acres**



**Blocks of Forest and other Natural Cover
greater than 500 acres**

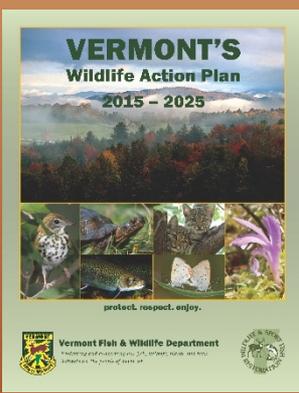
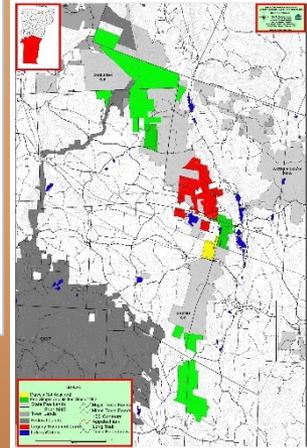
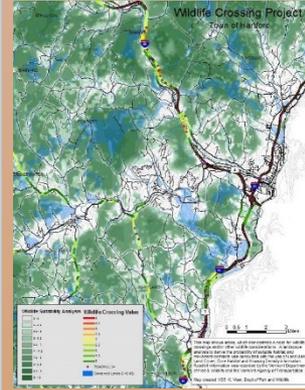
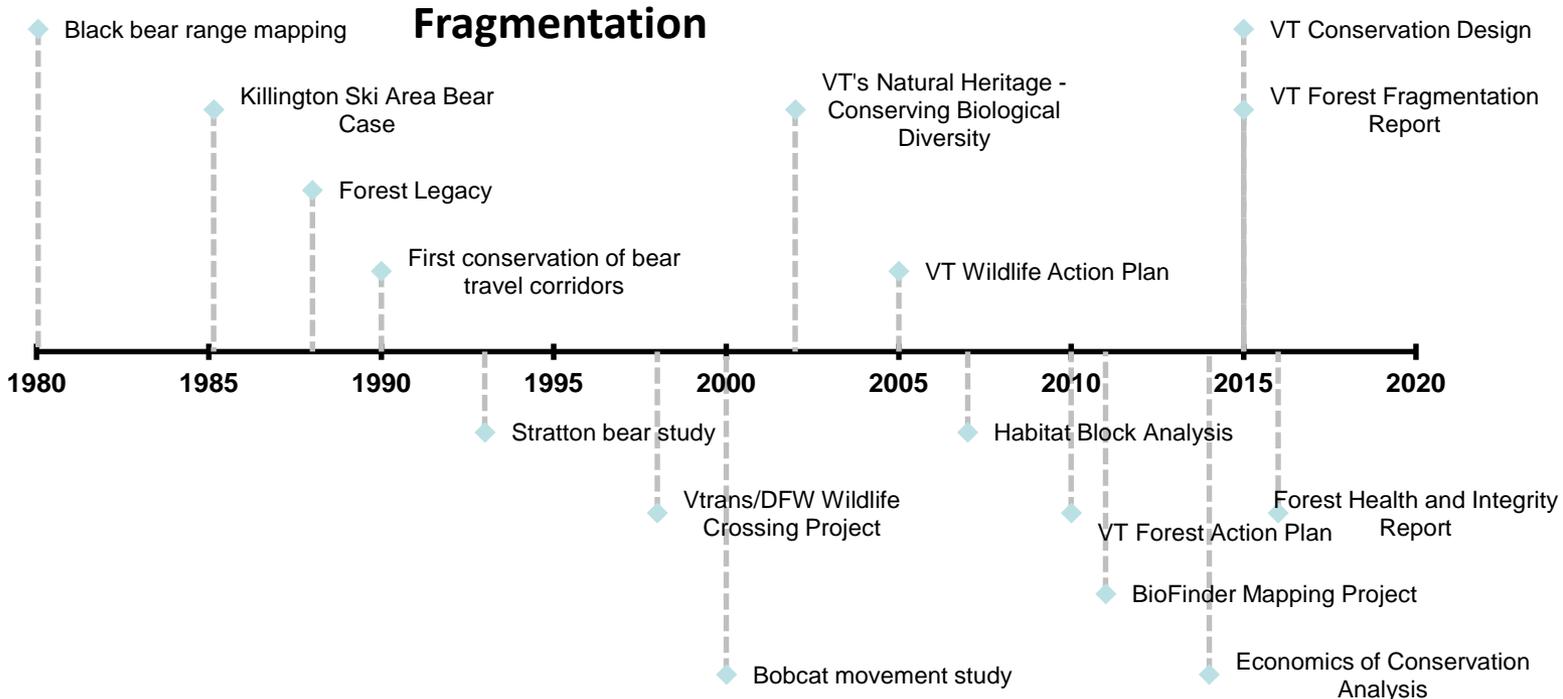


**Blocks of Forest and other Natural Cover
greater than 2,000 acres**



**Blocks of Forest and other Natural Cover
greater than 5,000 acres**

Progression of Knowledge & Information about Forest Fragmentation



Terminology

Habitat Fragmentation: *dividing land with naturally occurring vegetation and ecological processes into smaller and smaller areas as a result of roads, land clearing, and development.*



Terminology

Landscape Connectivity: *the degree to which blocks of suitable habitat are connected to each other, allowing movement of species and functioning of ecological processes.*

Local Connectivity

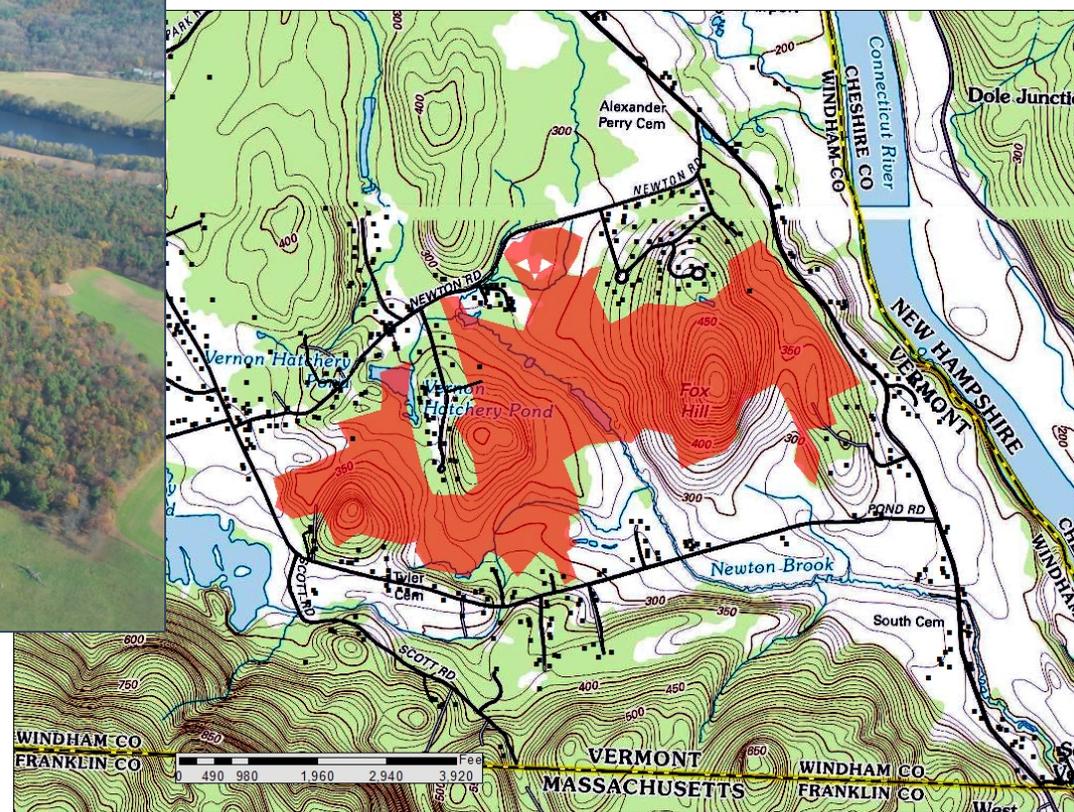


Regional Connectivity



Terminology

Habitat Blocks: *areas of contiguous forest and other natural habitats (wetlands, ponds, cliffs,...) that are unfragmented by roads, development, or agriculture.*



Terminology

Wildlife Corridors: *habitat that links or connects larger patches of habitat within the landscape, allowing the movement, migration, and dispersal of animals and plants. Defined by a variety of conditions and settings.*

Spotted Salamander



Bobcat

Marten



Scale and conditions vary by species

Terminology

Wildlife Road Crossings: *locations where wildlife are likely to or known to cross roads. These locations are determined by habitat conditions along the road and in adjacent habitat blocks.*



VERMONT CONSERVATION DESIGN

MAINTAINING AND ENHANCING AN ECOLOGICALLY FUNCTIONAL LANDSCAPE



E. Sorenson, R. Zaino
J. Hilke & E. Thompson



Collaborators:

VT Fish and Wildlife Department

Vermont Land Trust

The Nature Conservancy

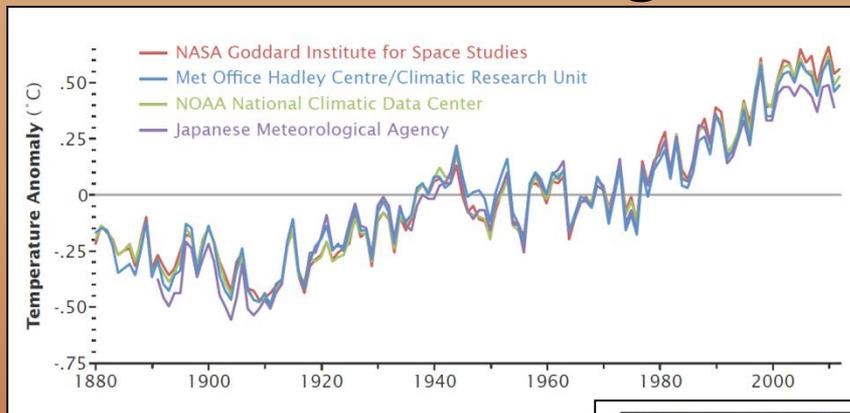
VT Department of Forests, Parks & Recreation

NorthWoods Stewardship Center



Primary Threats to Biological Diversity

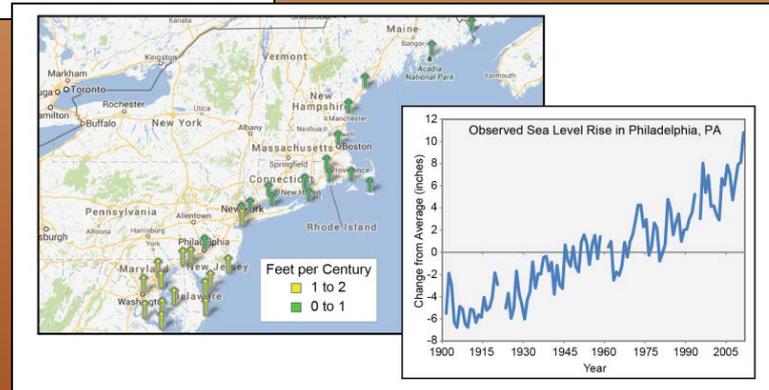
- Population growth
- Habitat loss
- Habitat fragmentation
- Non-native, invasive species
- Climate change – direct and compounding effects



Climate Change Impacts in the US, 2014



NASA



VERMONT CONSERVATION DESIGN

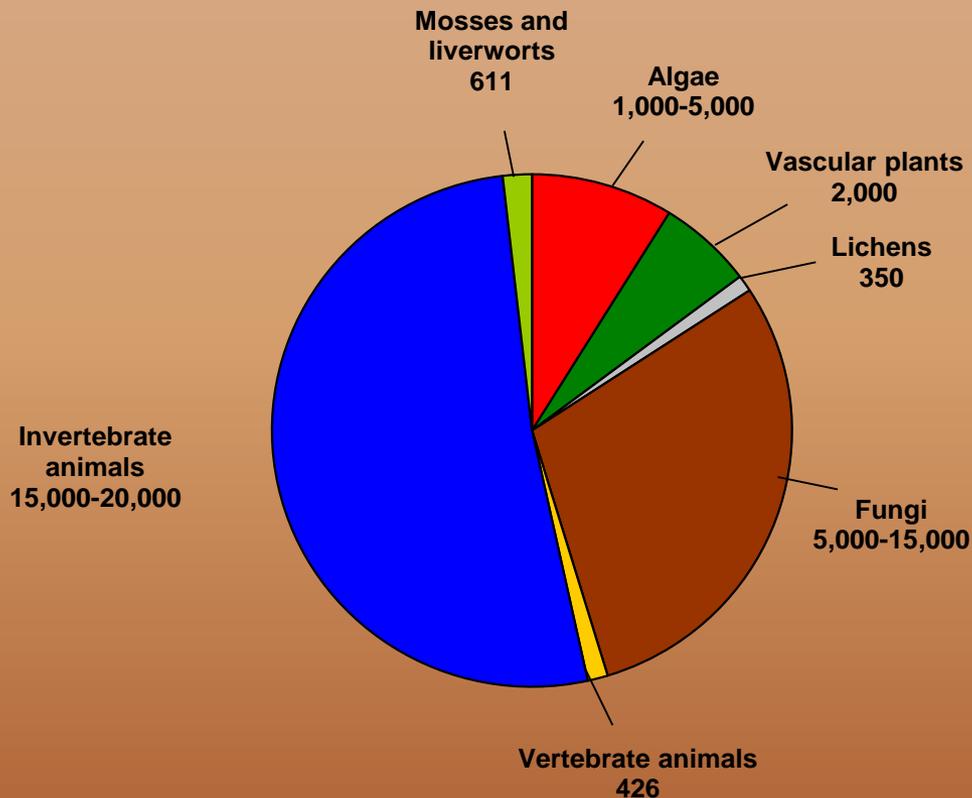
A practical approach to protecting and enhancing an ecologically functional landscape into the future.

- Uses two key landscape features: forest blocks and riparian areas.
- Applies the coarse filter-fine filter approach to conservation.



Given a broad goal of conserving biological diversity in Vermont...

And, an estimated 24,000 to 43,500 species in Vermont!



How do we protect them all?



Elfin Skimmer

Coarse filter/fine filter approach to conservation

If examples of all coarse-filter elements are conserved at the scale at which they naturally occur, most of the species they contain – trees, mammals, birds, insects – will also be conserved. Some species will always need special attention.



Conservation Design at Three Scales

Landscapes



Champlain Valley

Natural Communities



Dry Oak-Hickory-Hophornbeam Forest

Species



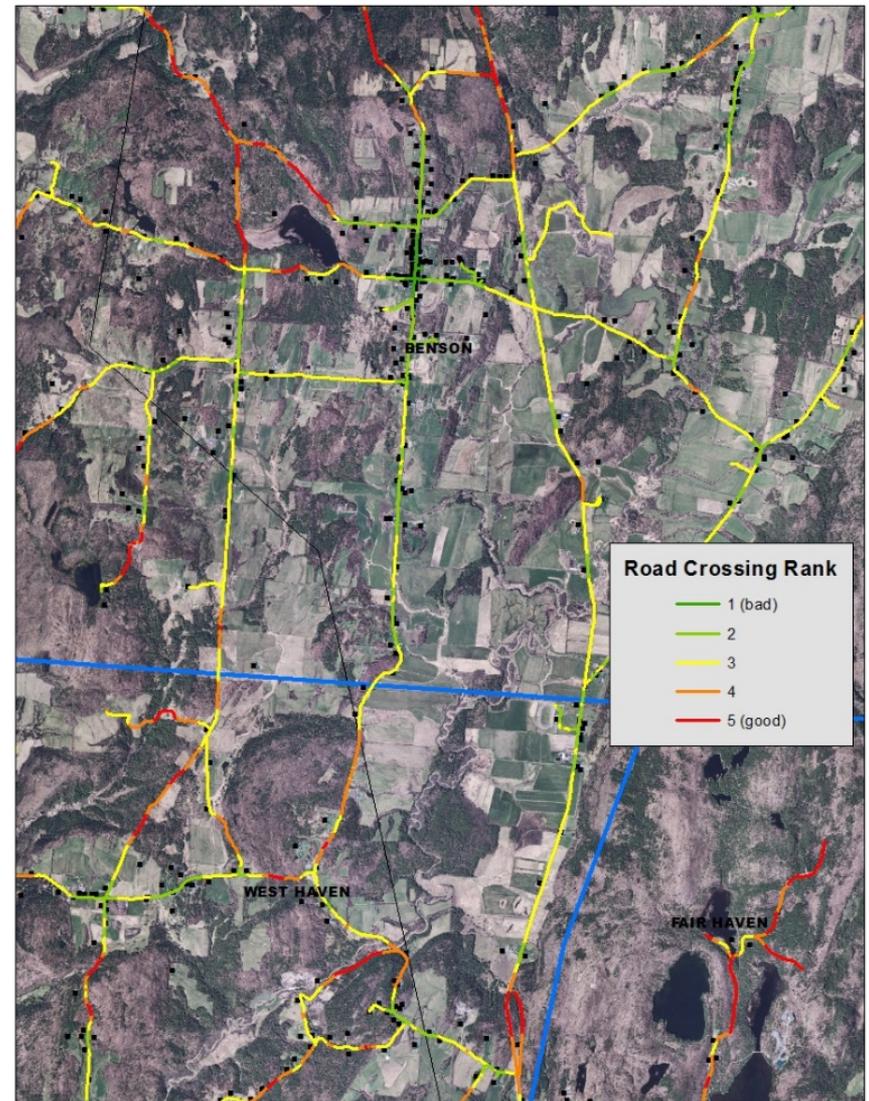
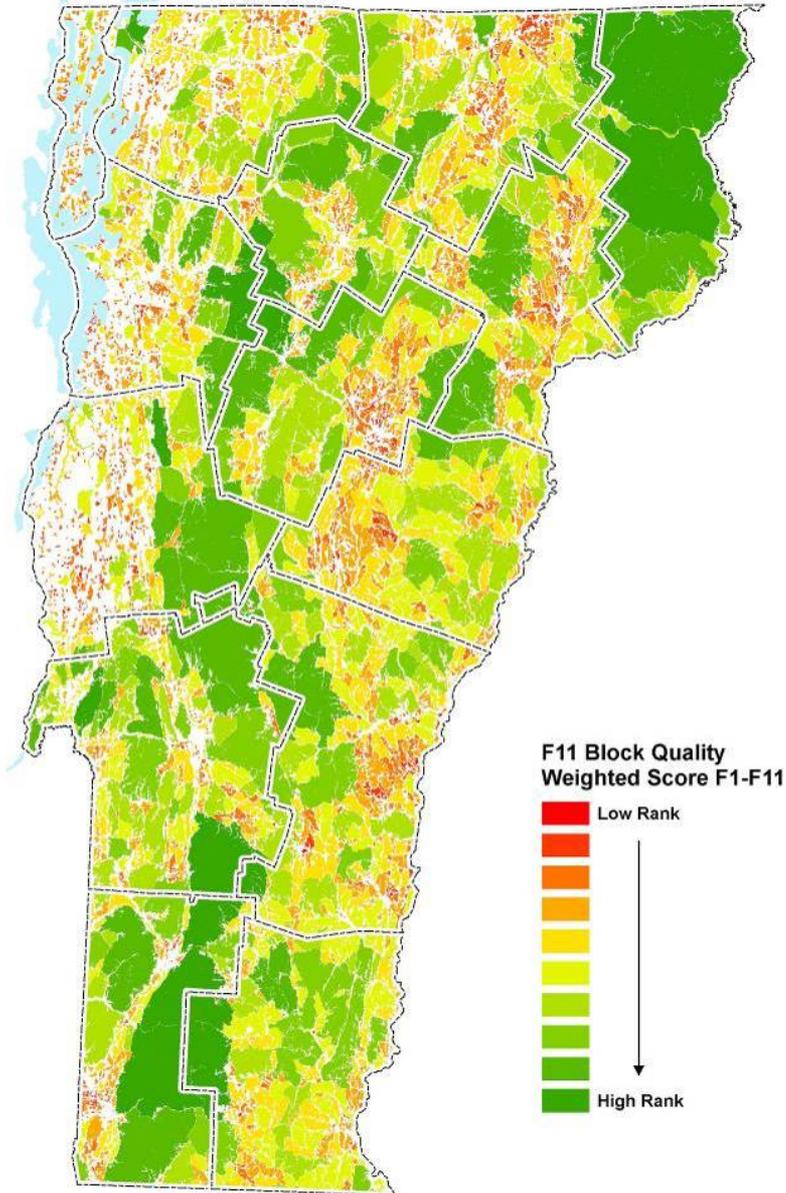
Southern Twayblade (*Listera australis*)

Interior Forest Blocks
Connectivity Blocks
Surface Waters and Riparian Areas
Riparian Areas for Connectivity
Physical Landscape Diversity Blocks
and Wildlife Road Crossings

Upland and Wetland
Aquatic
Vernal Pools...
Old Forest
Young Forest
(next two years)

Rare Species
Grasslands
Spp of Greatest Cons. Need
Deer
Pollinators...
(next two + years)

Forest Block project



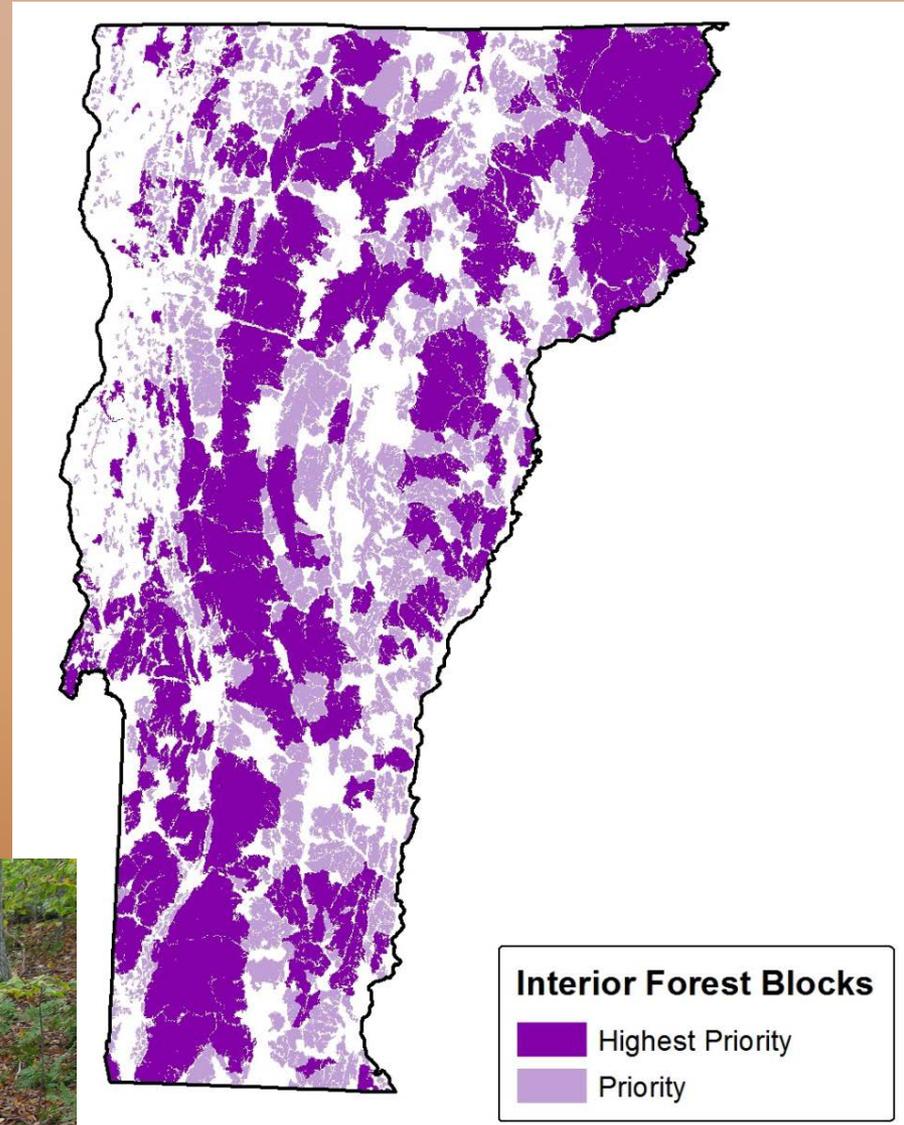
- 4,055 forest blocks identified
- Each block ranked for 11 biological and physical factors and total weighted score

Interior Forest Blocks

Definition: Areas of contiguous forest and other natural communities and habitats that are unfragmented by roads, development, or agriculture.

Ecological Function:

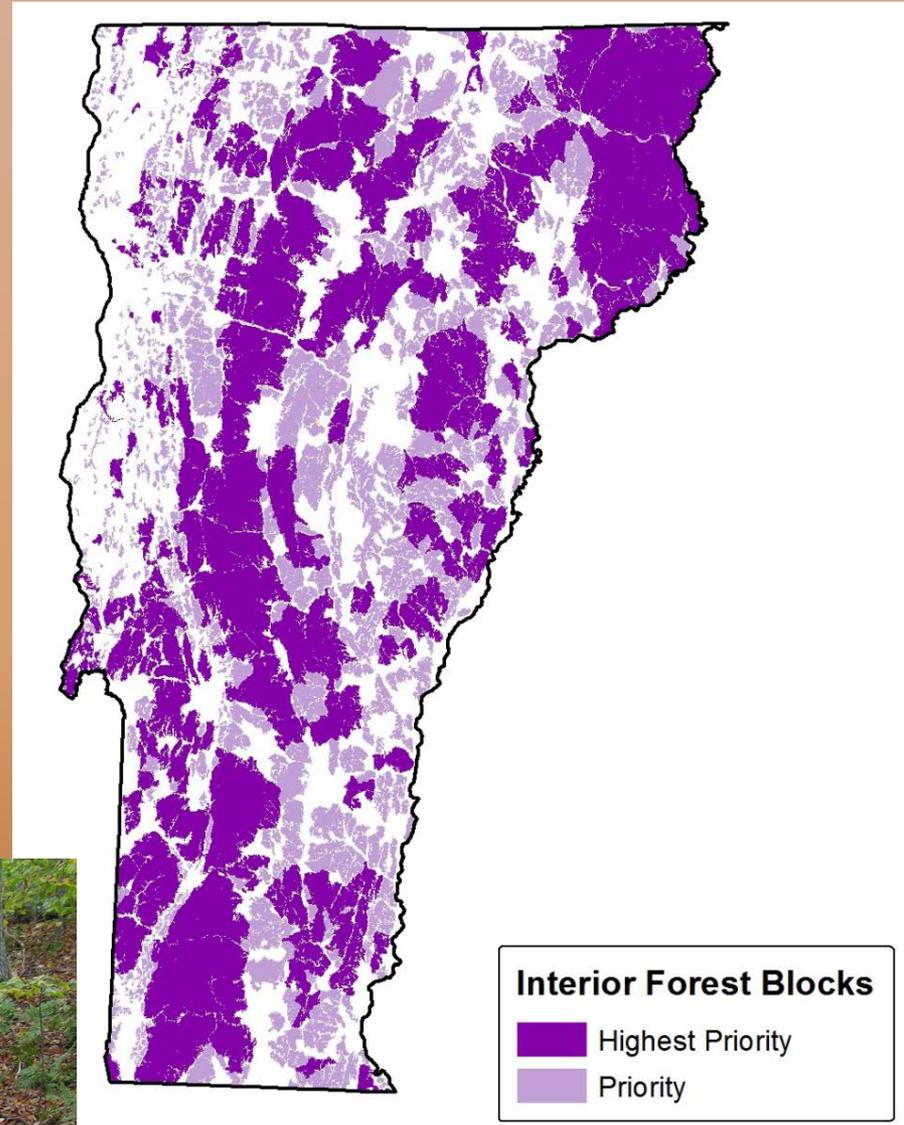
- Ecological processes
- Air and water quality
- Flood resilience;
- Interior forest species
- Wide-ranging mammals
- Source populations
- Large, topographically diverse forest blocks allow species to shift in response to climate change.



Interior Forest Blocks

Guidelines for Maintaining Ecological Function:

- Maintain interior forest conditions;
- Avoid development that creates interior forest fragmentation;
- Limit development to the margins of existing forest blocks in areas not critical for connectivity;
- Manage forests to maintain forest structure, distribution of age classes, and minimize invasive species;

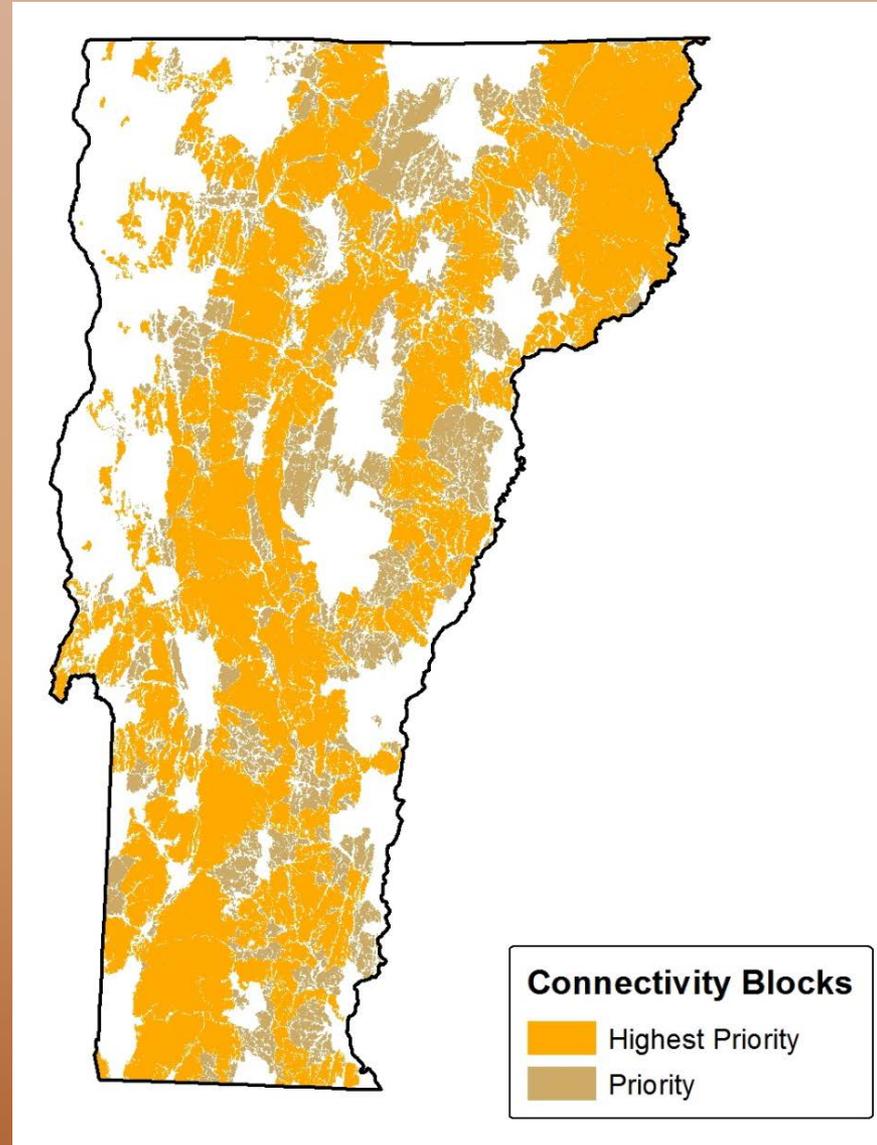
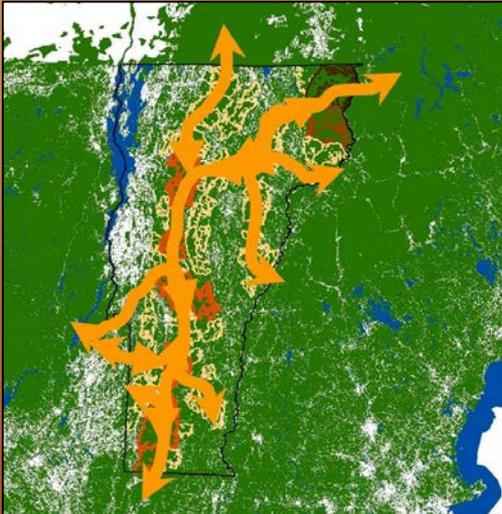


Connectivity Blocks

Definition: The network of forest blocks that together provide terrestrial connectivity at the regional scale (across Vermont and to adjacent states and Québec) and connectivity between all Vermont biophysical regions.

Ecological Function:

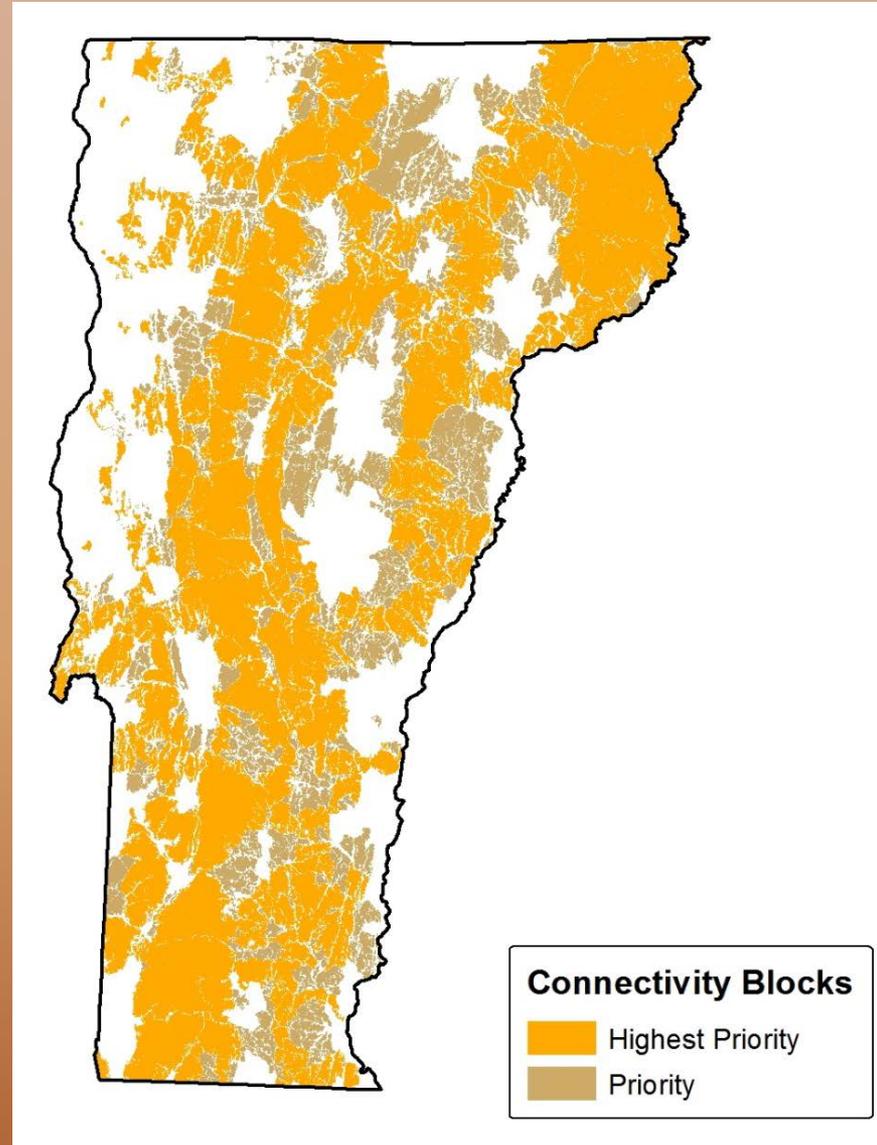
- Wide-ranging animal ranges
- Daily and annual habitat needs
- Young animal dispersal
- Plant and animal species range shift with climate and land uses change
- Genetic exchange and other processes



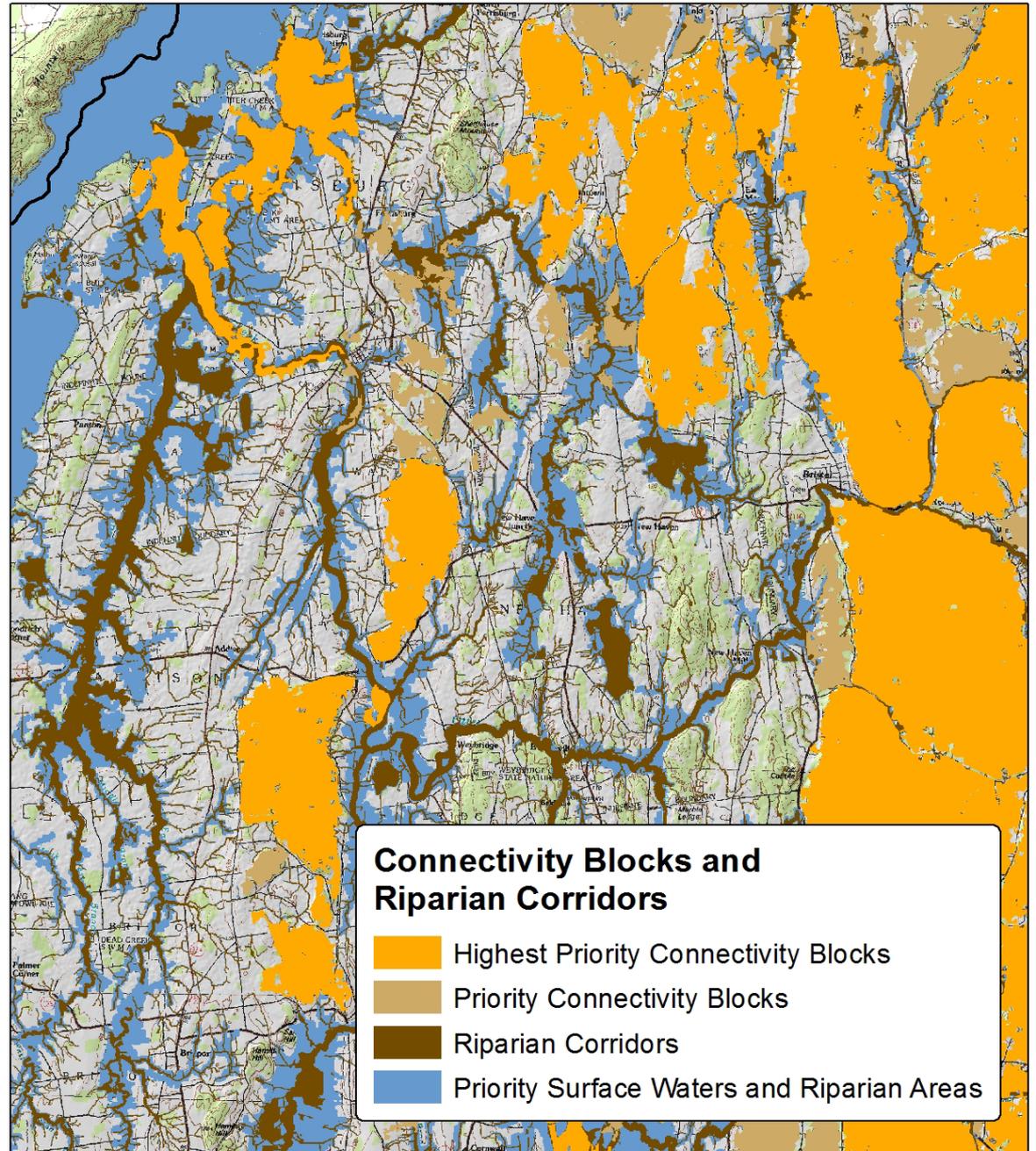
Connectivity Blocks

Guidelines for Maintaining Ecological Function:

- Maintain interior forest conditions as with interior forest blocks;
- Avoid development that creates interior forest fragmentation;
- Maintain or enhance structural and functional connectivity at block margins where they border other connectivity blocks;
- Limit development in these areas of block-to-block connectivity and maintain forest cover.



Connectivity Blocks and Riparian Corridors showing how the two landscape elements function together to provide connectivity in the fragmented Champlain Valley.

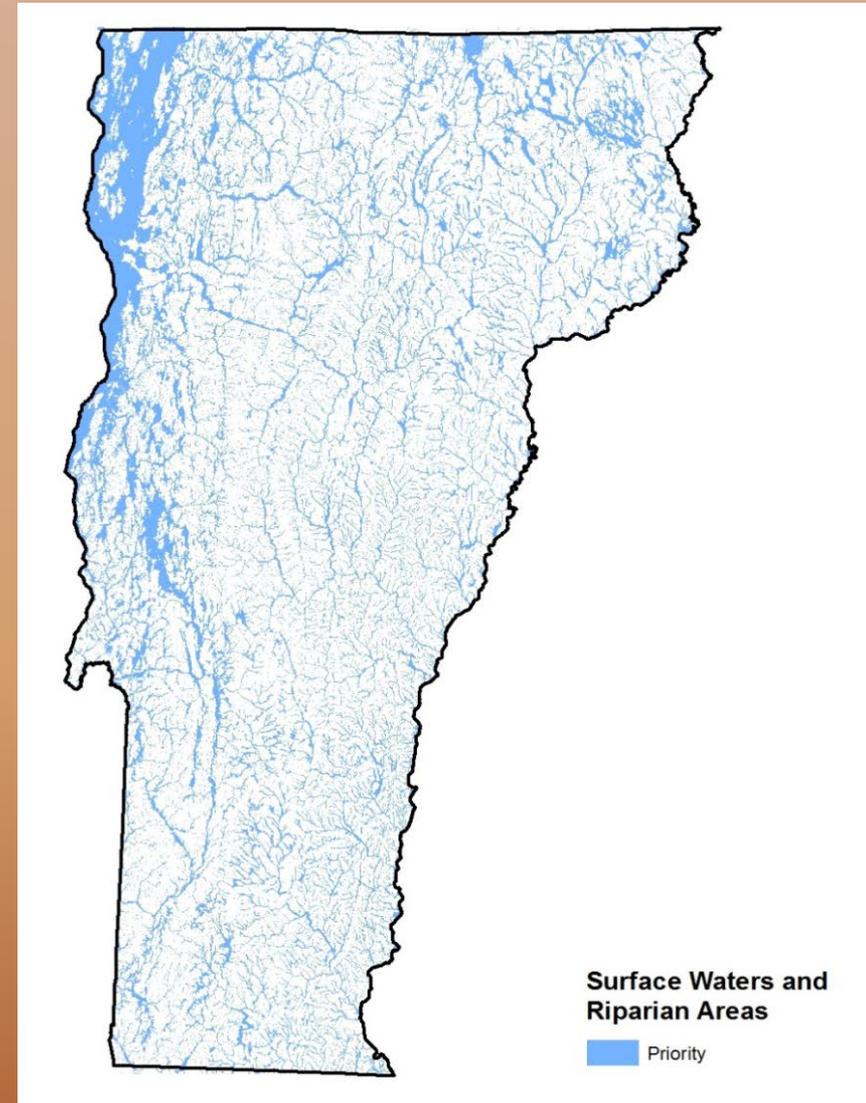


Surface Waters and Riparian Areas

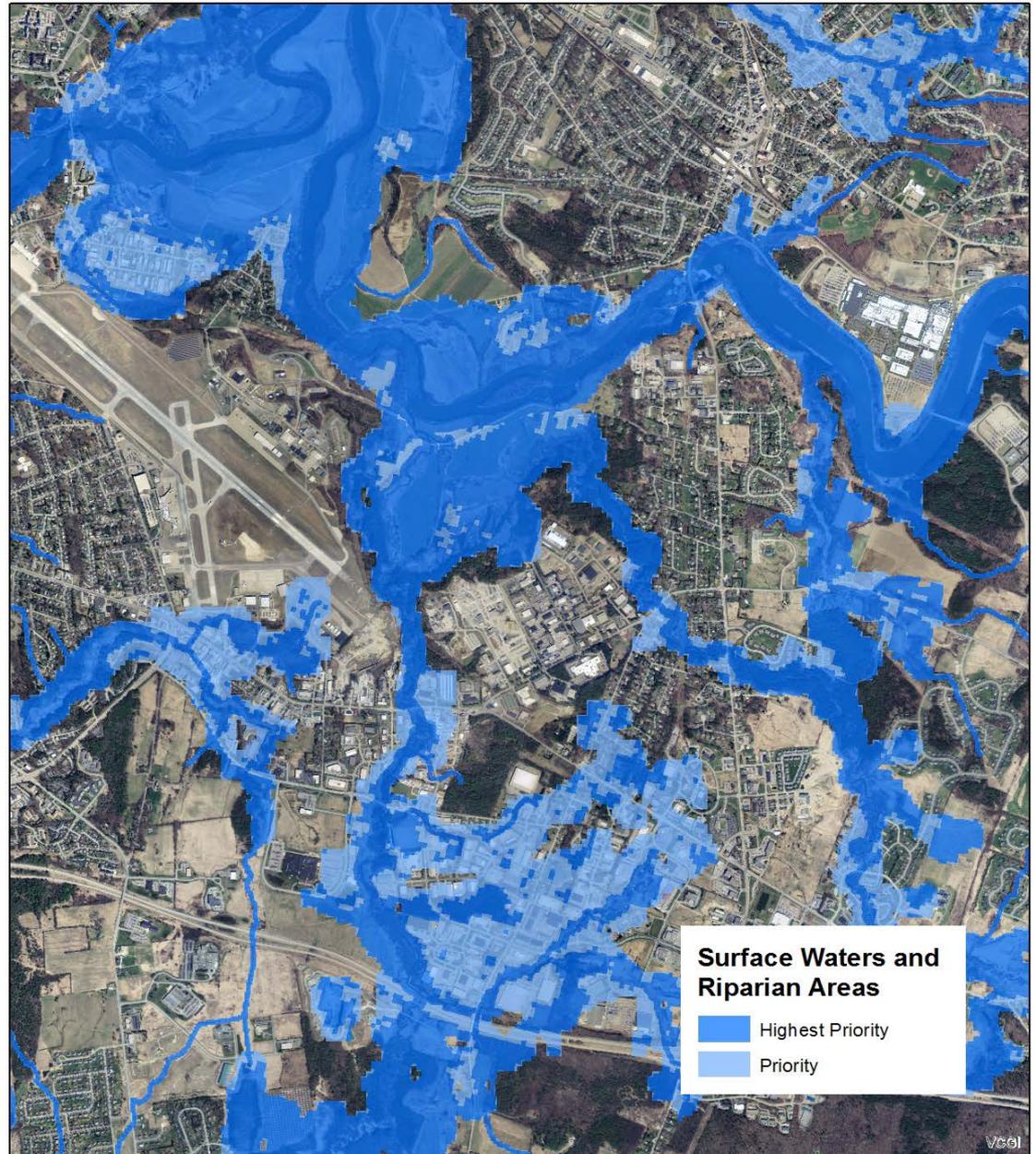
Definition: The network of all lakes, ponds, rivers, and streams, their associated riparian zones and valley bottoms in which geophysical processes occur.

Ecological Function:

- Aquatic species habitat
- River geomorphic stability and floodplain access
- Stabilize shorelines, store flood waters, filter and assimilate sediments and nutrients, shade adjacent surface water, and contribute organic matter
- Biodiversity – species and communities
- Wildlife corridors
- Plant and animal range shifts in response to climate change



Surface Waters and
Riparian Areas for the
South Burlington, Essex,
and Williston area.

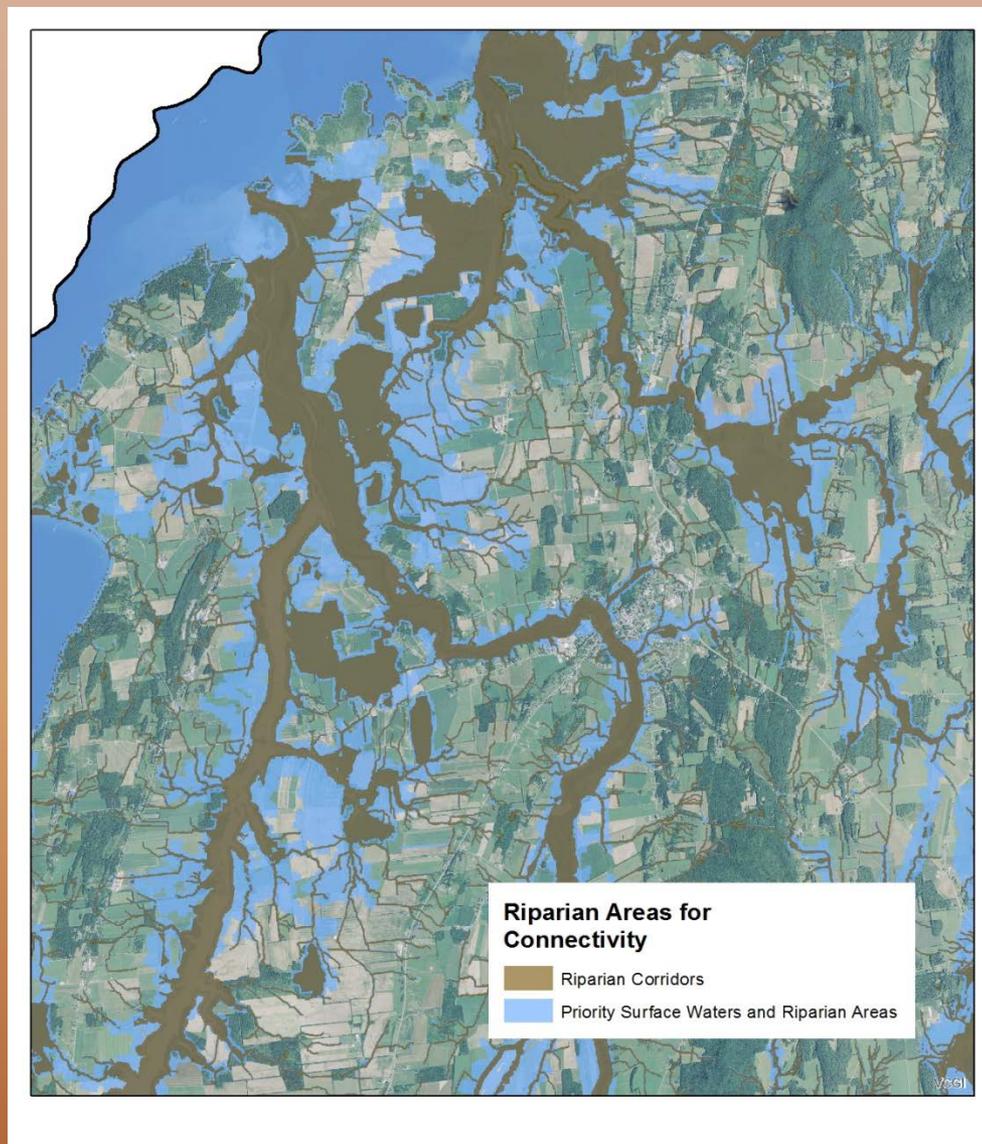


Riparian Areas for Connectivity (Riparian Corridors)

Definition: The connected network of riparian areas in which **natural vegetation occurs**, providing natural cover for wildlife movement and plant migration.

Ecological Function:

- Integrity of the lakes, ponds, rivers, and streams
- Wildlife cover movement
- Obligate habitat for mink, otter, beaver, and wood turtle
- Riparian areas and Connectivity Blocks together form a functional network.



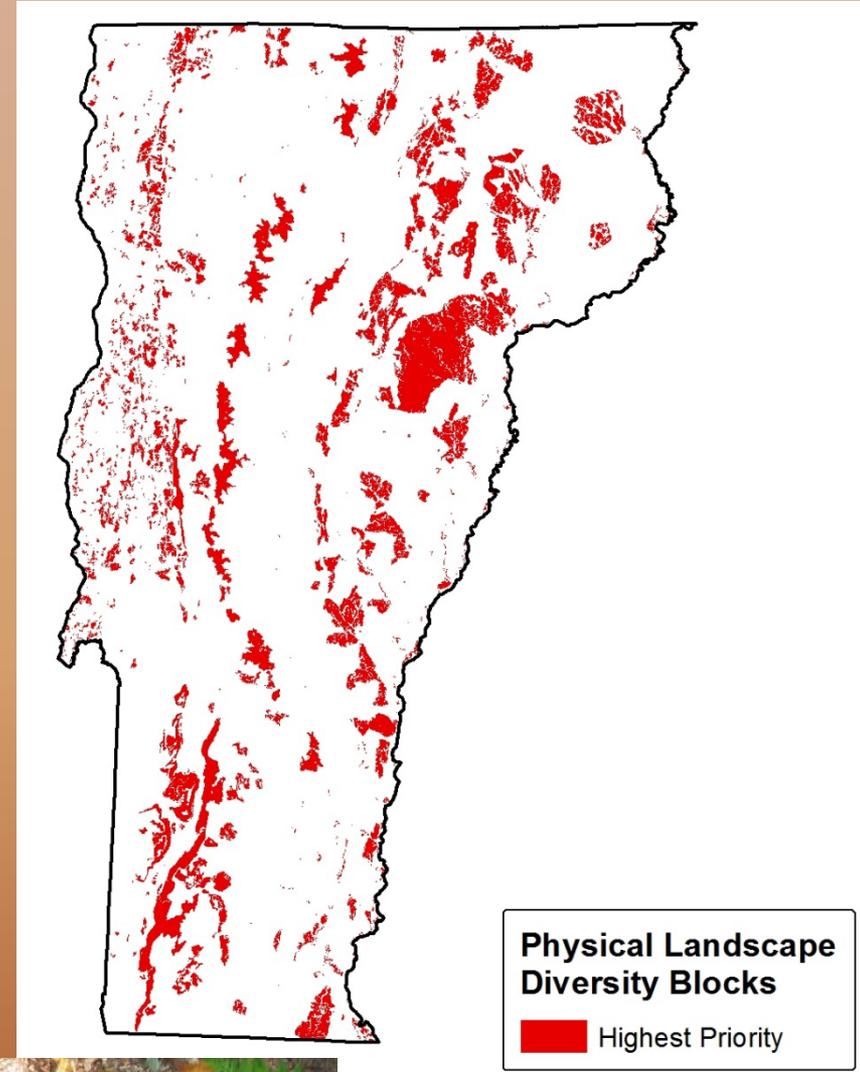
Vicinity of Ferrisburgh, Panton, and Vergennes.

Physical Landscape Diversity

Definition: A set of forest blocks and other areas of natural vegetation that include physical landscape diversity features that are either rare in Vermont or under-represented in the other landscape elements.

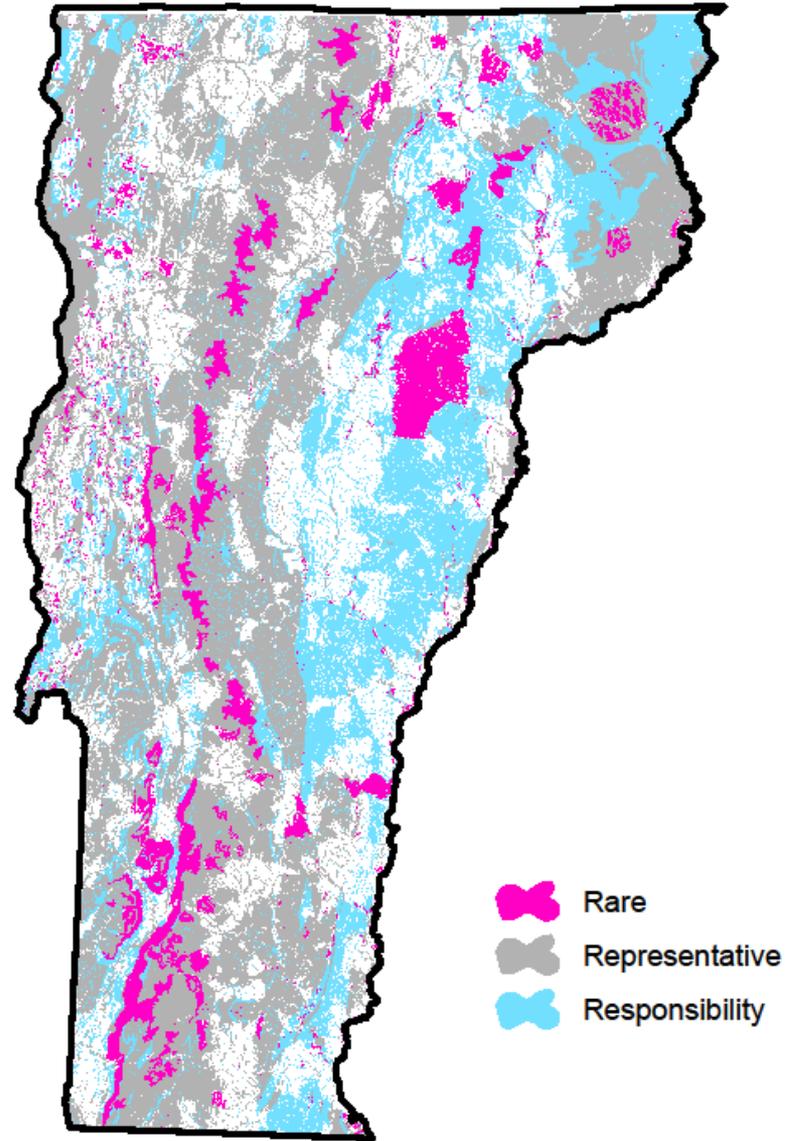
Ecological Function:

- Physical landscape diversity (bedrock, soils, elevation, landform,...) represents potential biological diversity.
- “Conserving Nature’s Stage” – representing all elements of physical landscape diversity in a conservation design will conserve biological diversity and *the capacity to adapt to climate change*.



Physical Landscape Diversity Blocks

All of the landscape components categorized by whether they are rare, representative, or responsibility physical landscape features.

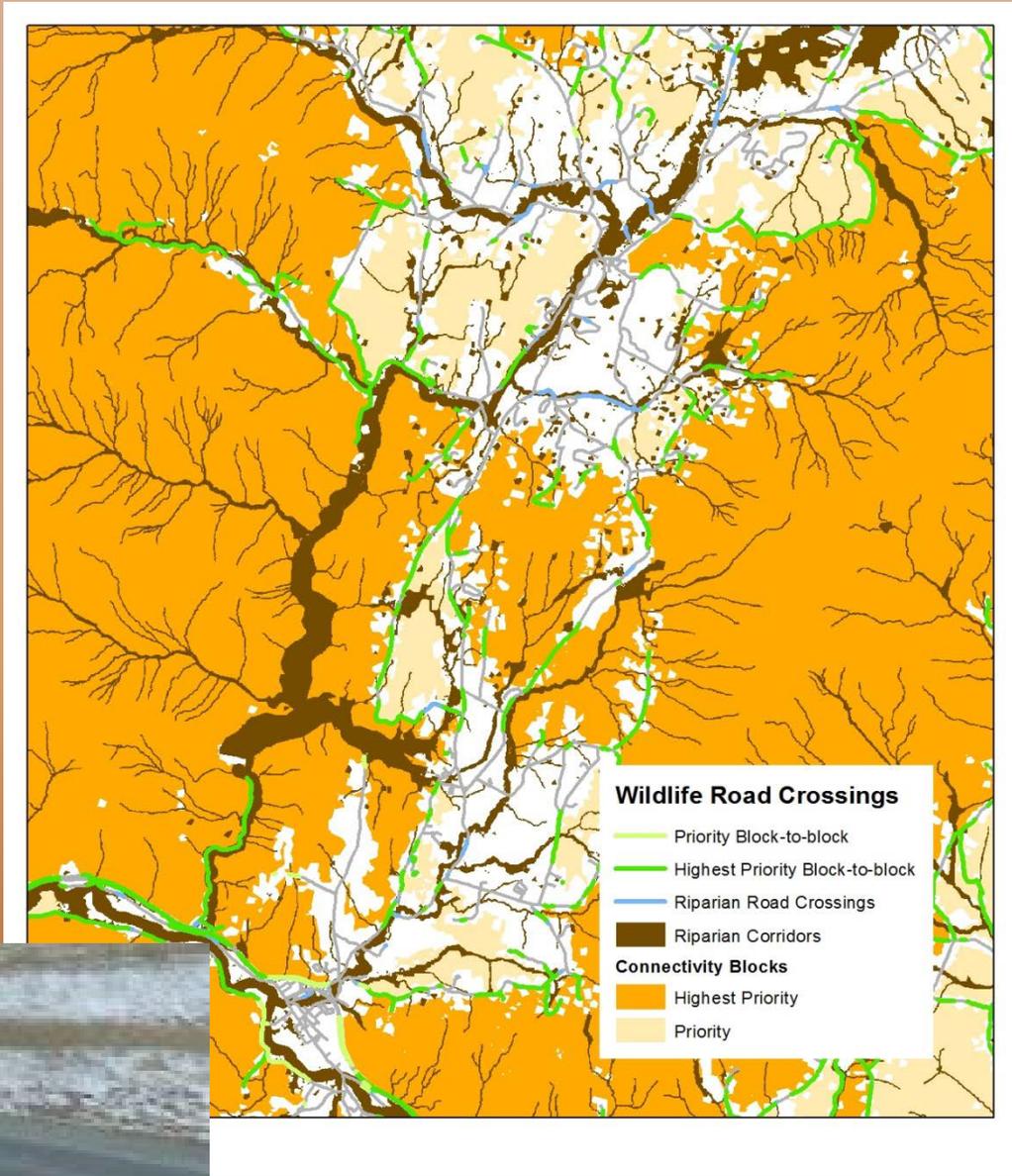


Wildlife Road Crossings

Definition: A section of road with high structural connectivity between two forest blocks or along a riparian corridor.

Ecological Function:

- Provide the best opportunity for wildlife movement and dispersal of other species across roads
- Wildlife road crossings over or under roads are critically important between adjacent forest blocks and along linear riparian area networks.



Waterbury-Stowe area



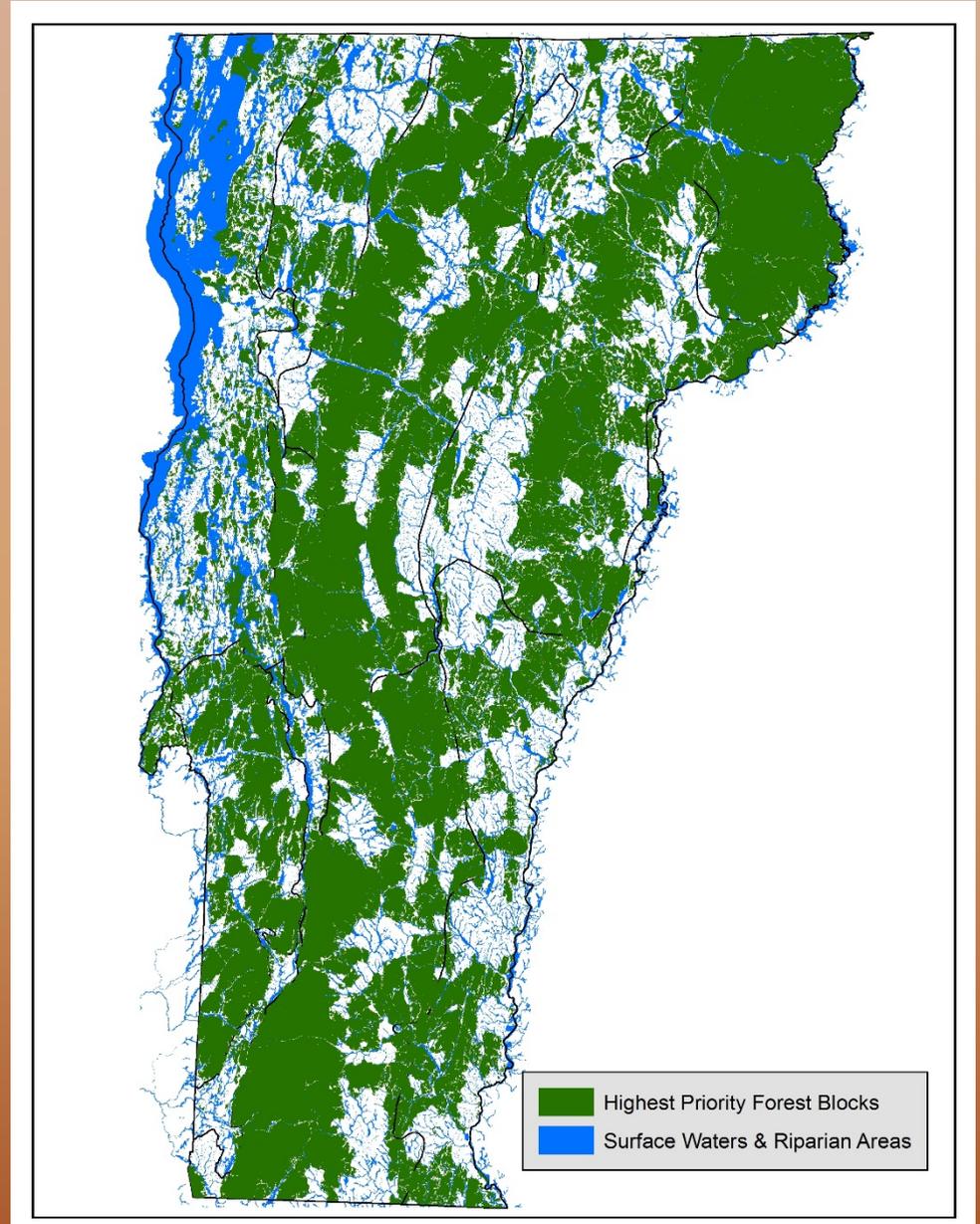
Putting it All Together: The Ecologically Functional Landscape

Requires conservation of all the landscape elements together.

A connected landscape of large and intact forested habitat, healthy aquatic and riparian systems, and a full range of physical features.

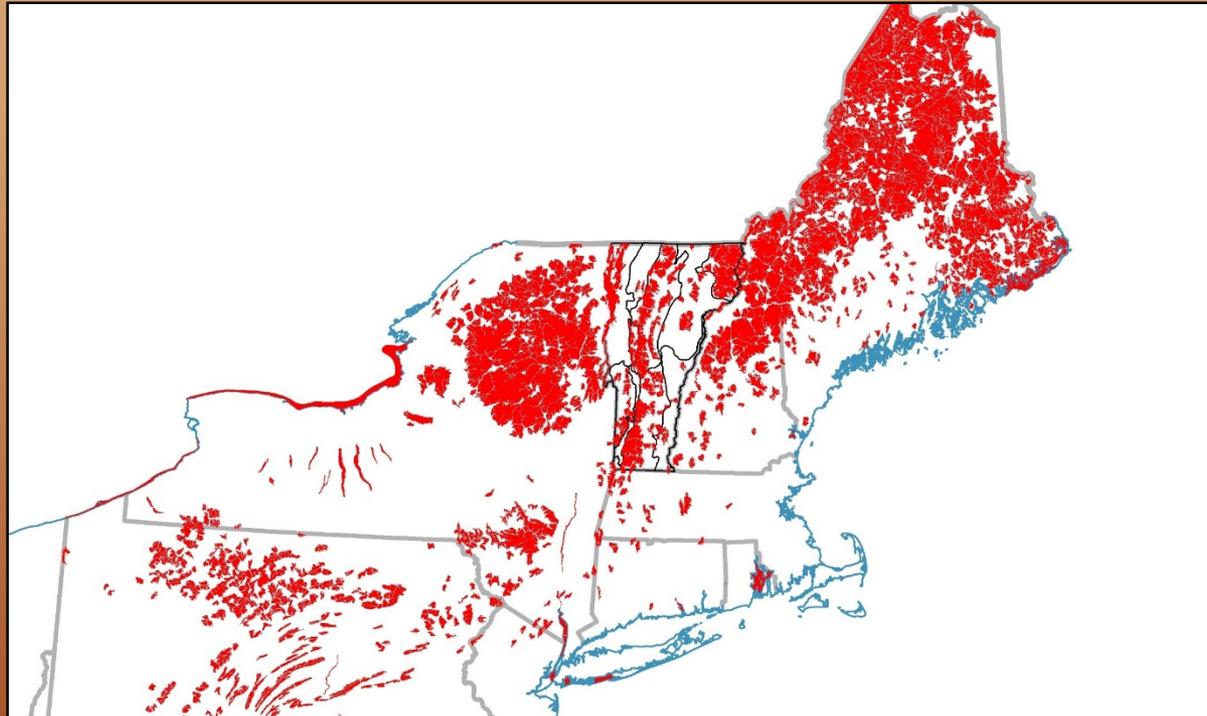
Long term conservation of much of Vermont's biological diversity and the capacity of species and natural communities to adapt to climate change.

“Conservation” in all its forms.



Some Thoughts and Perspectives

- We should expect some decline in function – we cannot conserve it all.
- 80 percent of Vermont is privately owned. Landowners decisions on management and stewardship hold the key.
- Can focus permanent conservation on key features.



Thank you... Questions?

