Forest Fragmentation

Oliver Pierson, Department of Forests, Parks and Recreation
Bob Zaino, Fish and Wildlife Department
4/16/2026

Overview

- **Context**
- State of Vermont's Forests
- Forest Conservation and Management
- Recommendations to Promote Forest Health and Integrity

DEPARTMENT MISSION

The Department of Forests, Parks and Recreation (FPR) is responsible for the conservation and management of **Vermont's forest** resources, the operation and maintenance of the **State Park** system, and the promotion and support of **outdoor recreation** for Vermonters and our visitors.

Photos: Erica Housekeeper, VSJF

Context

- **Forest conversion** and **forest fragmentation** are different challenges
- **Forest fragmentation** is an issue requiring attention
- Goal of the 2017 State Forest Action Plan is to **minimize the loss of forest cover to conversion to other uses**
- FPR also **tracking emerging threats** such as climate change, weak regeneration, & forest health challenges (introduced invasive species, adverse weather events)
- **Supporting a working landscape** and **forest conservation** are FPR's principal actions to protect the health & integrity of forests

2015 Vermont Forest Fragmentation Report

VERMONT DEPARTMENT OF FORESTS, PARKS AND RECREATION

AGENCY OF NATURAL RESOURCES

APRIL 2015

Submitted to House and Senate Committees on Natural Resources and Energy and the House Committee on Fish, Wildlife, and Water Resources

Report to the Vermont Legislature

FORESTS, PARKS & RECREATION VERMONT
AGENCY OF NATURAL RESOURCES

Recommendations in support of

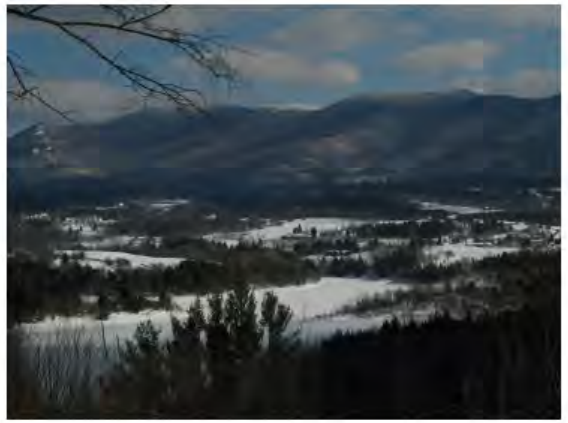
Forest Health and Integrity

In response to Act 61 of 2015

VERMONT DEPARTMENT OF FORESTS, PARKS AND RECREATION

AGENCY OF NATURAL RESOURCES

MARCH 2016



FORESTS, PARKS & RECREATION VERMONT

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AGENCY OF NATURAL RESOURCES

SUBMITTED TO:

THE SENATE AND HOUSE COMMITTEES ON NATURAL RESOURCES AND ENERGY

AND

THE HOUSE COMMITTEE ON FISH, WILDLIFE, AND WATER RESOURCES

VERMONT

Overview

- Context
- **State of Vermont's Forests**
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FORESTS OF VERMONT

State of Vermont's Forests:

- **4th** most forested state
- **4.5** million acres of forest
- **76%** forest cover

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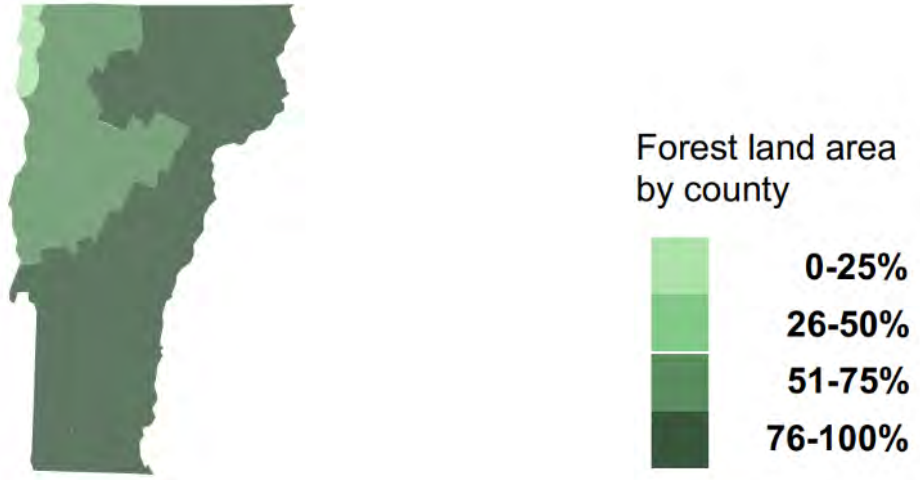
VERMONT

FORESTS OF VERMONT

Forest Area, 2024

Forest land area: 4,500,116 acres

Timberland area: 4,272,673 acres



Forest Composition, 2024

Most common forest-type groups by stand size class

Small Medium Large

Maple / beech / birch group
71.3% of forest land (3,207,652 acres)

White / red / jack pine group
8.7% of forest land (389,326 acres)

Spruce / fir group
6.8% of forest land (303,887 acres)

OWNERSHIP OF FORESTS IN VERMONT

FORESTS, PARKS & RECREATION
VERMONT
AGENCY OF NATURAL RESOURCES

FAMILY AND INDIVIDUALS 70%

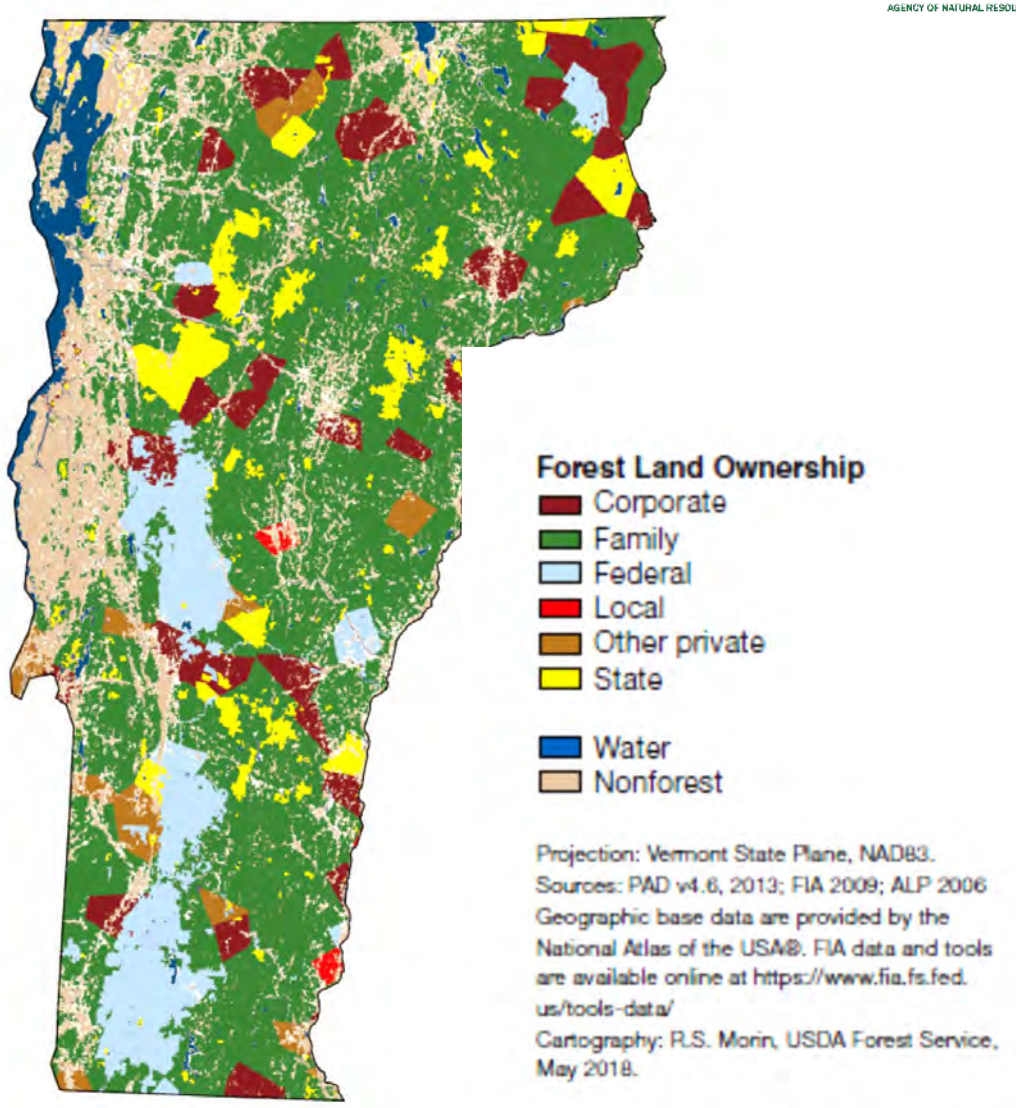
OTHER PRIVATE 10%

FEDERAL 10%

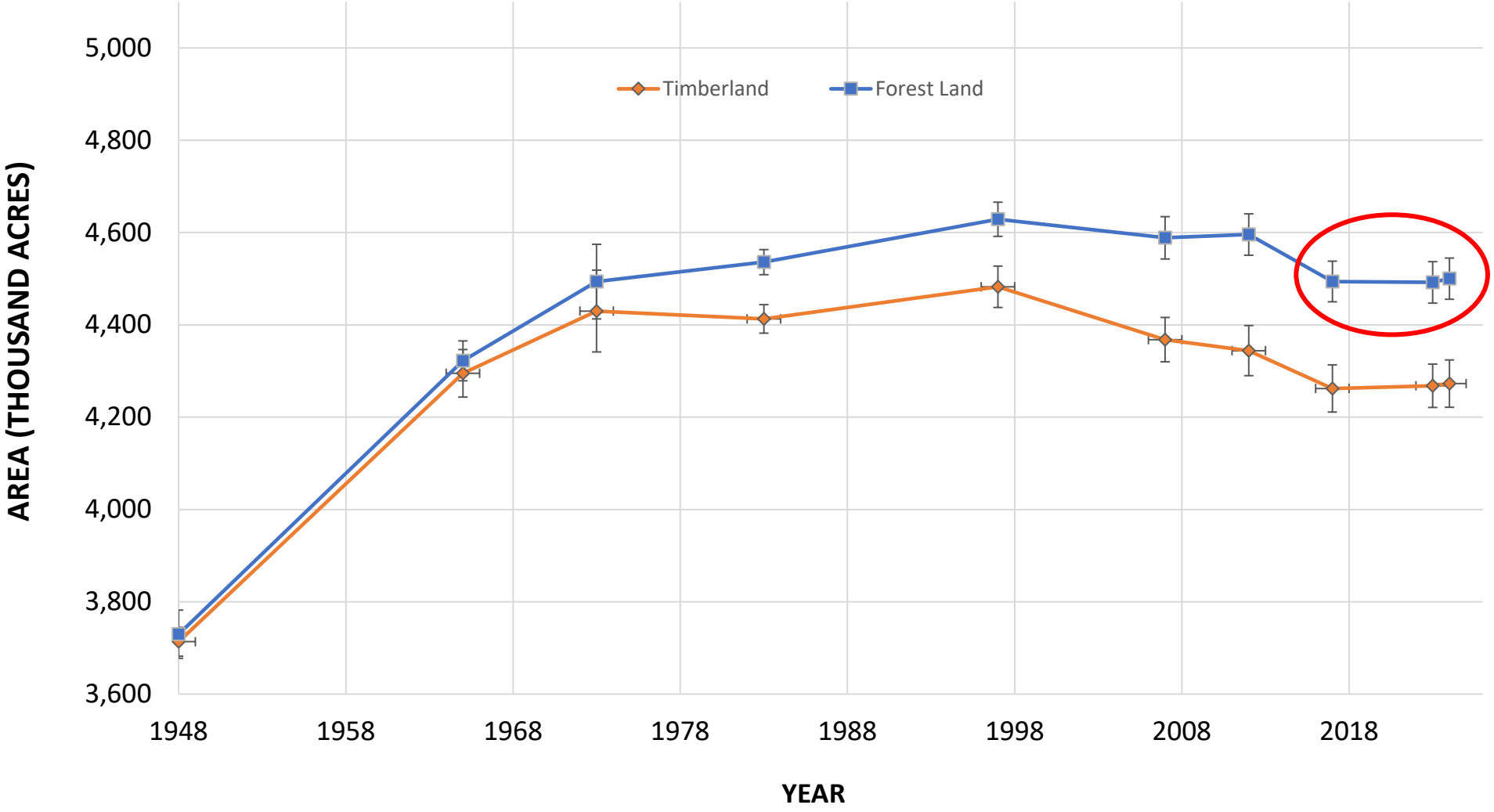
STATE 8%

LOCAL 2%

Private landowners own 3.6M acres or 80%

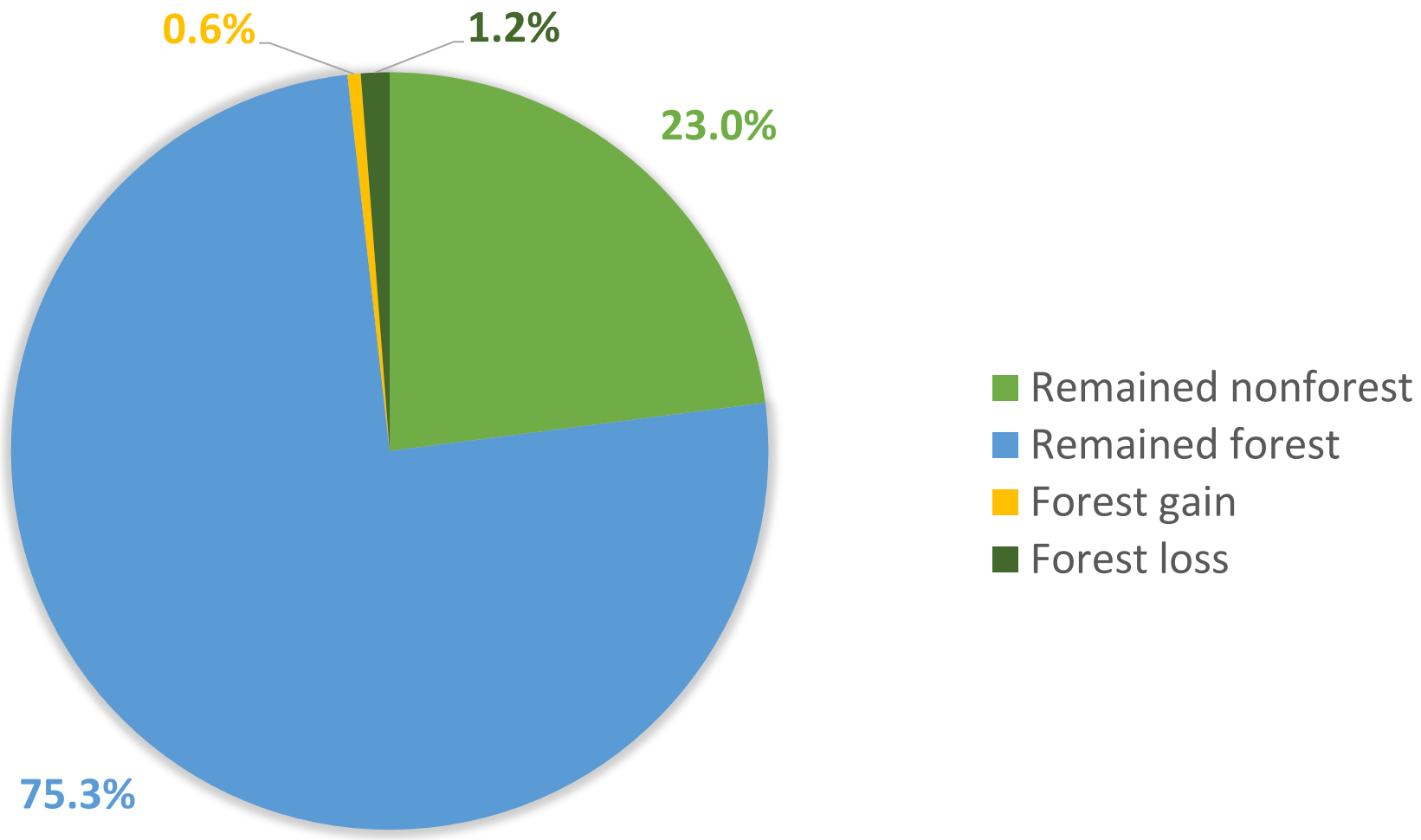


AREA OF FOREST LAND & TIMBERLAND BY INVENTORY YEAR



Stable Forest Area from 2017 to 2024

LAND USE CHANGE - 2017-2023

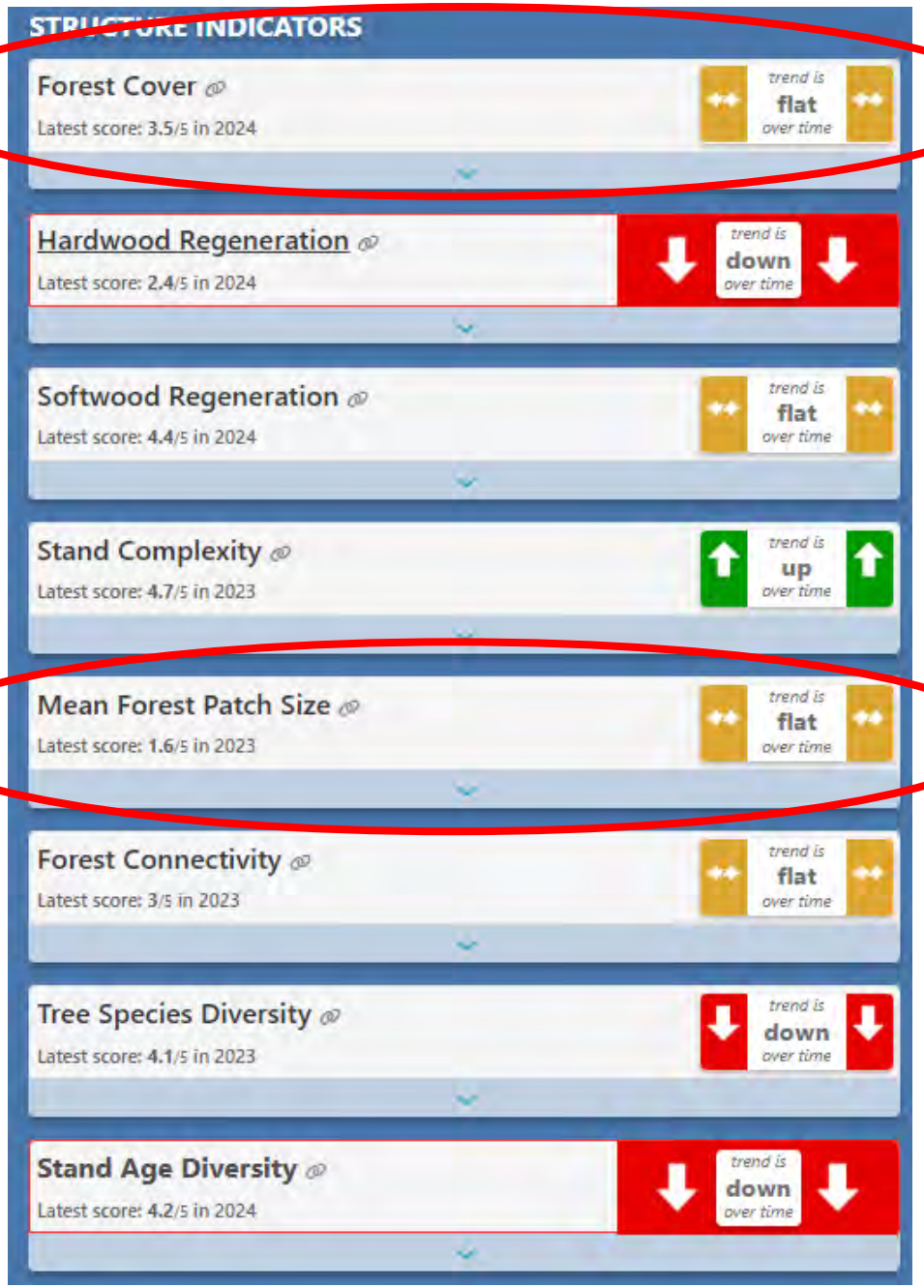


Net loss of 0.6% or 27,000 acres over 7 years; ~ 4,000 acres / year

Vermont Forest Indicators Dashboard

Combining dozens of key datasets into a snapshot of the overall status of Vermont's forests

- **Easy-to-use indicators** about the state of Vermont's forests in four categories: ***Structure***, *Condition*, *Services*, and *Stressors*.
- **Annual scores** on a scale of 1-5; higher scores suggests a higher functioning or healthier forest condition.
- Assessment of the **long-term trends**



Growth, Removals, and Mortality on Forestland, 2012-2024

Growth to harvest removal ratio of 3.1 to 1 shows that forests adding 3X as much volume annually as is being removed via harvesting

SUMMARY OF FOREST CONDITIONS

Positive News

- Stocking levels **increasing and improving**
- Trees are getting **bigger** and adding **volume**
- **Forest carbon stocks** will increase as stands mature and accumulate carbon above and below ground
- Timber resources are at **highest levels since 1948**, currently totals nearly 9.7 billion cubic feet
- 2023 Mortality rate (**0.8 percent**) is similar to 2012 and 2017 inventories, slightly lower than 2007

SUMMARY OF FOREST CONDITIONS

Forest Health Challenges

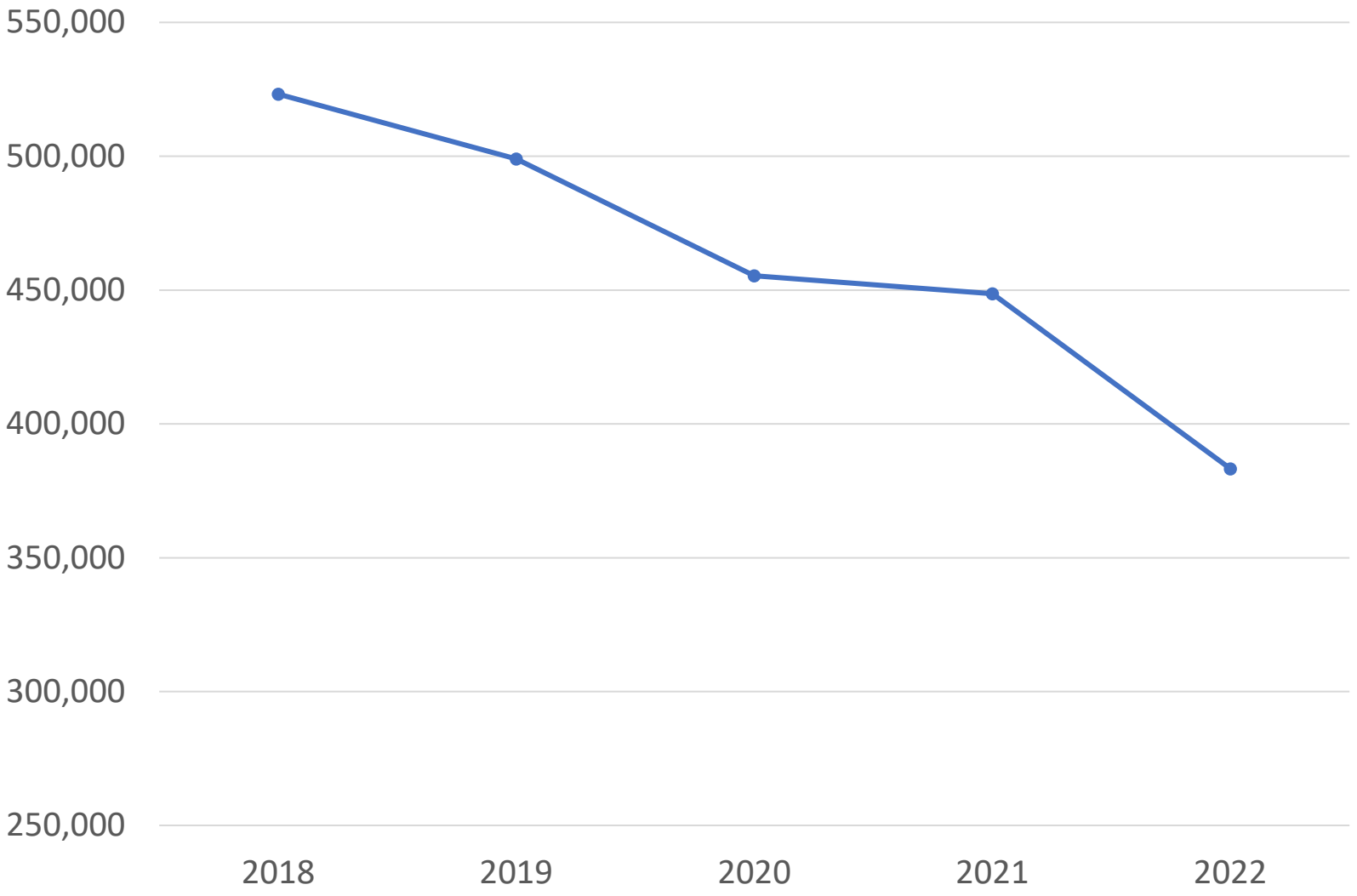
- **Introduced invasive plant species** increased coverage: 1.9% in 2018 to 3.2% in 2023
- **Insect pests** are negatively impacting trees (HWA, EAB, BLD)
- **Regeneration challenges**: White pine and red oak nearly absent in smaller size classes; deer browse and mature forest structure (limited sunlight penetration) are factors
- **Frequent tree damage** (35%) and disease or decay on 12% of trees may be an indication of reduced tree health and timber quality
- 1M acres of VT forests in **Wildland – Urban Interface**, growing, prone to disturbance
-
- **Aging Trees**: 71% of forest land consists of large diameter trees, 24% contains medium diameter trees, and 5% percent contains small diameter trees

SUMMARY OF FOREST CONDITIONS

Timber Quality, Market, and Land Tenure Challenges

- **Standing timber volumes** at record levels, rate of growth has leveled off as forest matures
- **Dominance of beech & noncommercial tree species** in the sapling size class raises concern
- Trend towards more area of **large diameter and less area of small/medium diameter trees**
- **Changes in species composition** reducing sawtimber quality
- **Forest products industry struggling**, marked by sawmill closures, unpredictable markets, aging workforce, and decreased access to forests due to climate change
- **2020 Study**: Overall economic impact of the forest products industry included 9,107 direct jobs, 13,816 total jobs and a total economic contribution of $2.1 billion. Today?
- **Transfer of 1.5M acres of forestland**, foreshadowed by the advanced age of many owners

Annual Harvest Data 2018-2022 (mbf)



Decrease in harvest amounts from 2018-2022, trend has continued due to pandemic impact on demand, flooding, and mill closures

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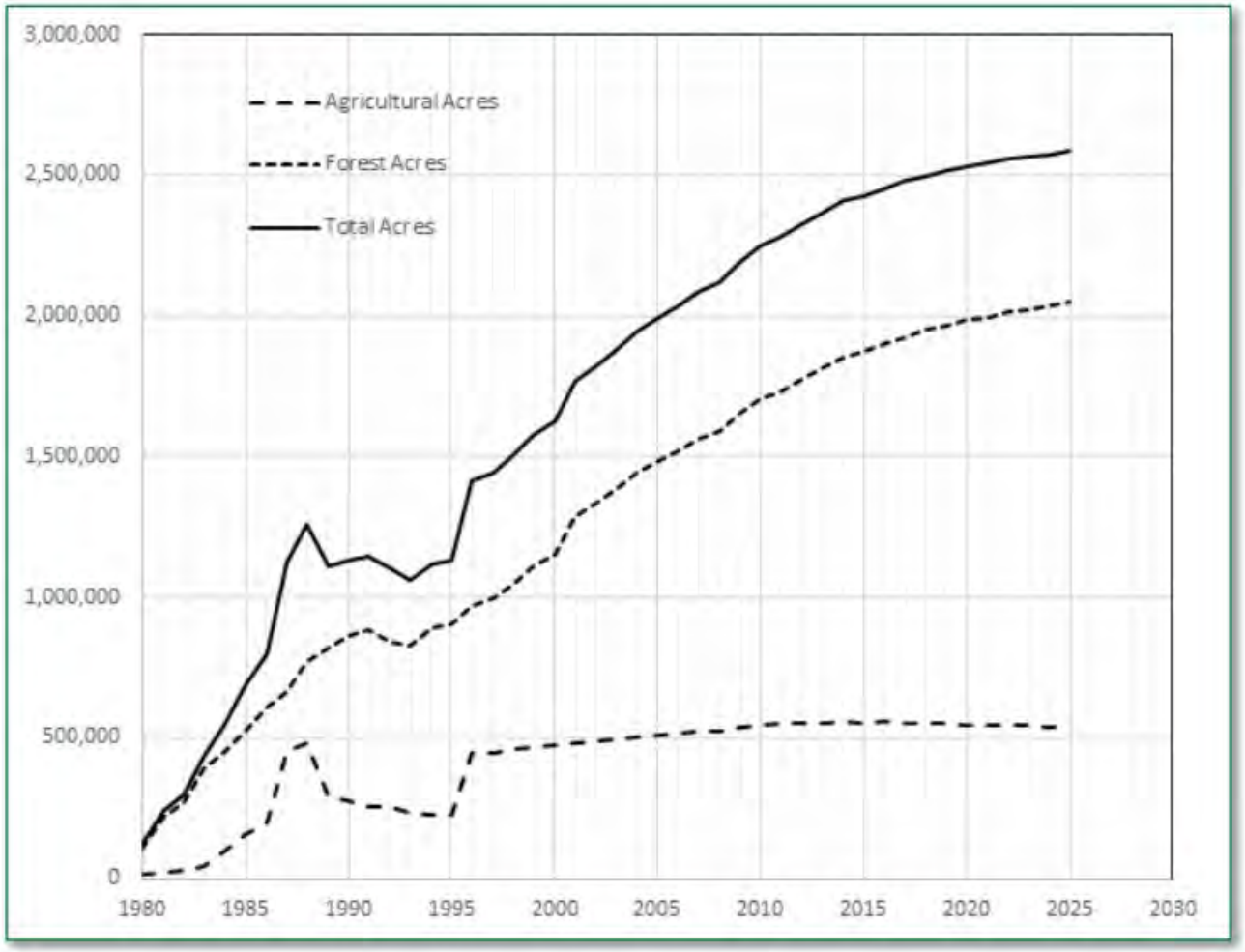
Use Value Appraisal: A Forest Conservation Success Story

- **Keeps forests as forests**
  Enables landowners **practicing long-term forest management** to be taxed based on forest use—not development value.

- **Growing participation is working**
  Enrollment continues to increase, **reducing the conversion of forestland to other uses**.

- **A program at scale**
  Nearly **2 million acres** of forestland enrolled across **16,000 parcels** statewide.

- **Reserve Forestland Enrollment**
  Currently includes **55 parcels (11,378 acres)**—**0.6%** of enrolled land.



Acreage enrolled in UVA

Permanent Land Protection

- **Since 2015, ANR has permanently conserved over 38,659 acres**
  - Forests kept intact, open to the public, and managed for multiple benefits
  - ~23,000 acres added to State ownership
  - ~16,000 acres protected through conservation easements; private ownership
  - 5,000 + acres to be conserved by the end of FY26, with strong pipeline of additional projects in process
- **Highly collaborative model:**
  - ANR works with non-profit conservation organizations, multiple funders, and local governments
  - **Willing landowners:** all projects rely on willing landowners who voluntarily conserve their land.
- **Leveraging state and federal investment:**
  - The Vermont Housing & Conservation Board is a critical state funding partner
  - FPR has **secured over $20 million** in federal Forest Legacy funding since 2015

Permanent land protection is one of the most effective tools Vermont has to prevent forest fragmentation before it happens—while supporting working lands, ecological function, recreation, and local economies.

Planning and Management of State-Owned Lands

- ANR owns approximately **370,000 acres** of land in **200 towns** across Vermont
- ANR Lands are managed via **Long-Range Management Plans** that balance ecological health, resource protection, recreational access, wildlife needs, & sustainable forestry
- Management focuses on **ecosystem-based approaches** that incorporate public input and **interdisciplinary review** from state specialists
- Forest management on state lands uses **exemplary practices** to promote forest health, enhance wildlife habitat, support the forest economy and promote climate resiliency
- LRMPs use **Land Management Classifications** to designate where active and passive management strategies occur

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Sustainable Forestry and the Vermont Forest Economy

- Support & Improve Training for Loggers
- Protect and improve infrastructure that supports the local wood industry
- Expand modern wood heating in Vermont
- Expand markets for Vermont wood products
- Recognize and promote the value of forests in outdoor recreation and tourism

Increase Landowner Incentives to Keep Forests Forest

- Support Use-Value Appraisal (UVA or “Current Use”)
- Modernize Vermont's property tax system
- Reduce tax burdens during intergenerational land transfer
- Monetize ecosystem services

Invest in Strategic Forestland Conservation

- Create a robust funding source for forestland conservation
- Establish a common goal and clear conservation priorities
- Enhance Forestland Conservation Tools and Programs

Support Outreach and Education on Forest Values and Benefits

- Support landowner assistance and education
- Provide technical assistance to towns, regional commissions and watershed groups
- Promote livable downtowns
- Engage schoolchildren

Active Harvests in Craftsbury

by: ~~Gus Stott~~ Rohen Joseph and Willa Kenzie

diagram

authors

title

caption

text

illustration

image

venn diagram

timeline

sidebar

Dot Key

- 1 dot = 1 log truck
- 2 dots = 2 log trucks
- 3 dots = 3 log trucks
- 4 dots = 4 log trucks

People we met:

- loggers (1)
  - Travis
  - Seth
- Forester (1)
  - Rick
  - Jared
- Landowner (1)
  - MS. Jen
- Logger (2)
  - Justin
- Forester (2)
  - tyler

Log Truck

FORESTS, PARKS & RECREATION

VERMONT

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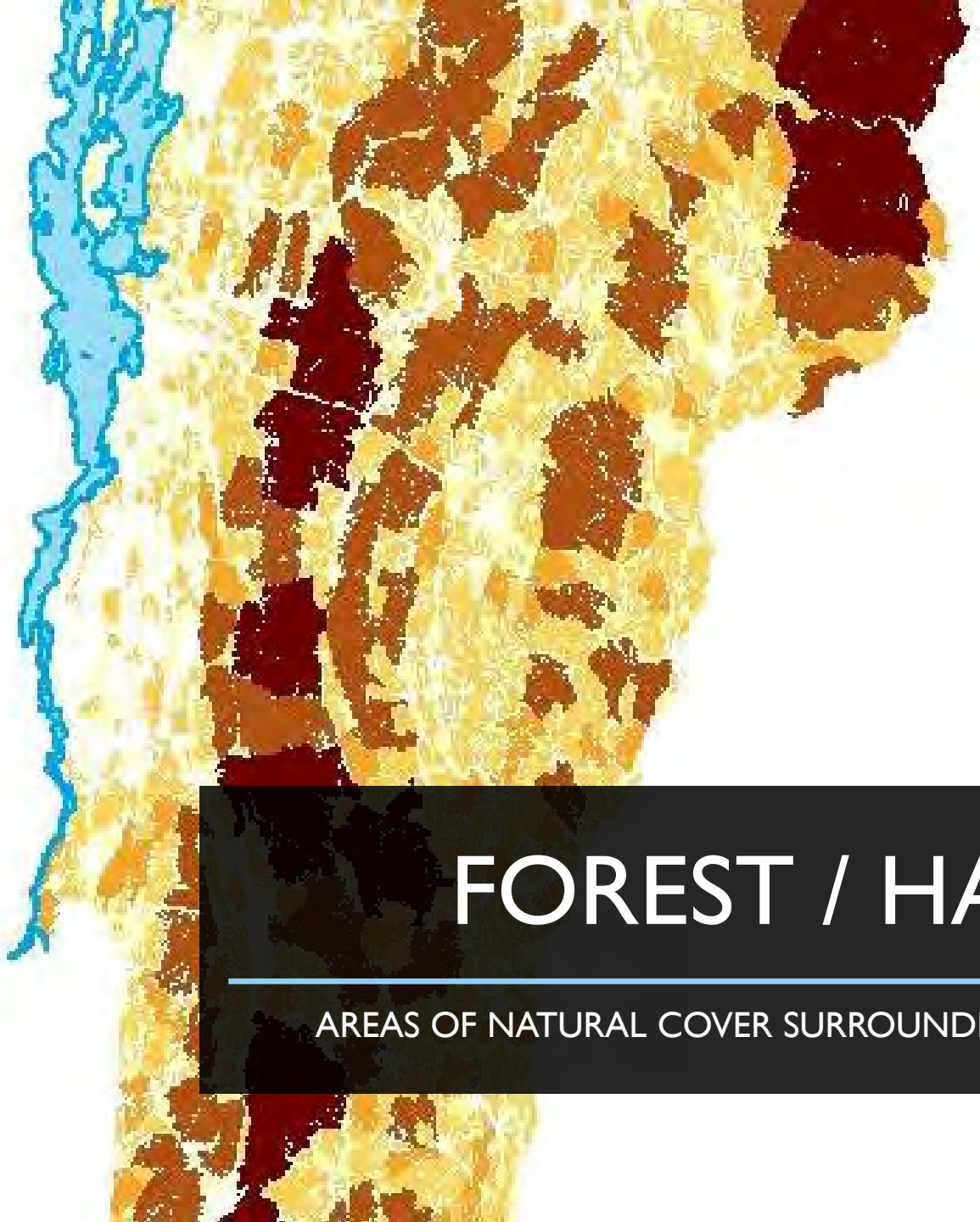
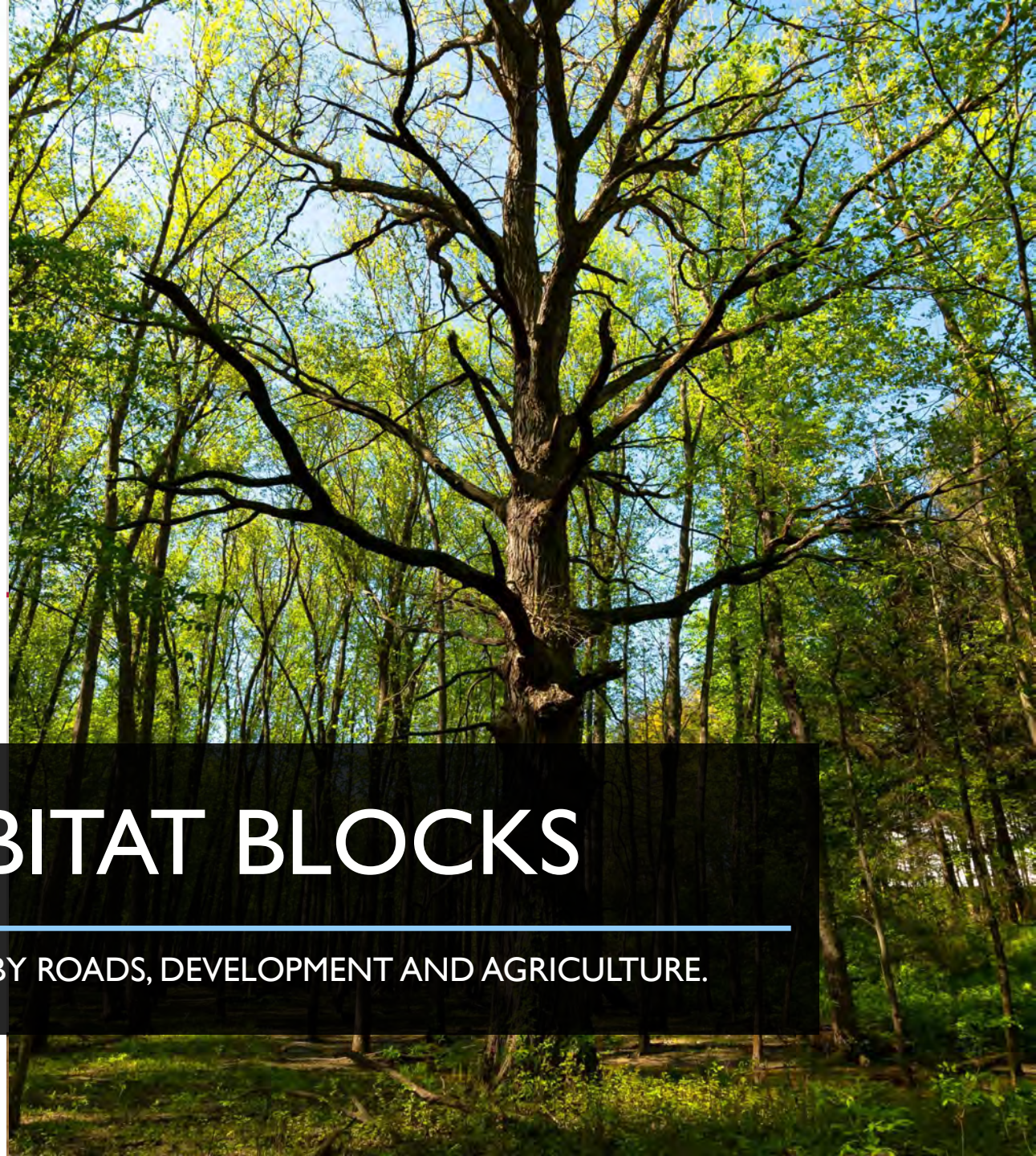
VERMONT

The Vermont Fish & Wildlife Department

The mission of the Vermont Fish & Wildlife Department is the conservation of our fish, wildlife, plants and their habitats for the people of Vermont



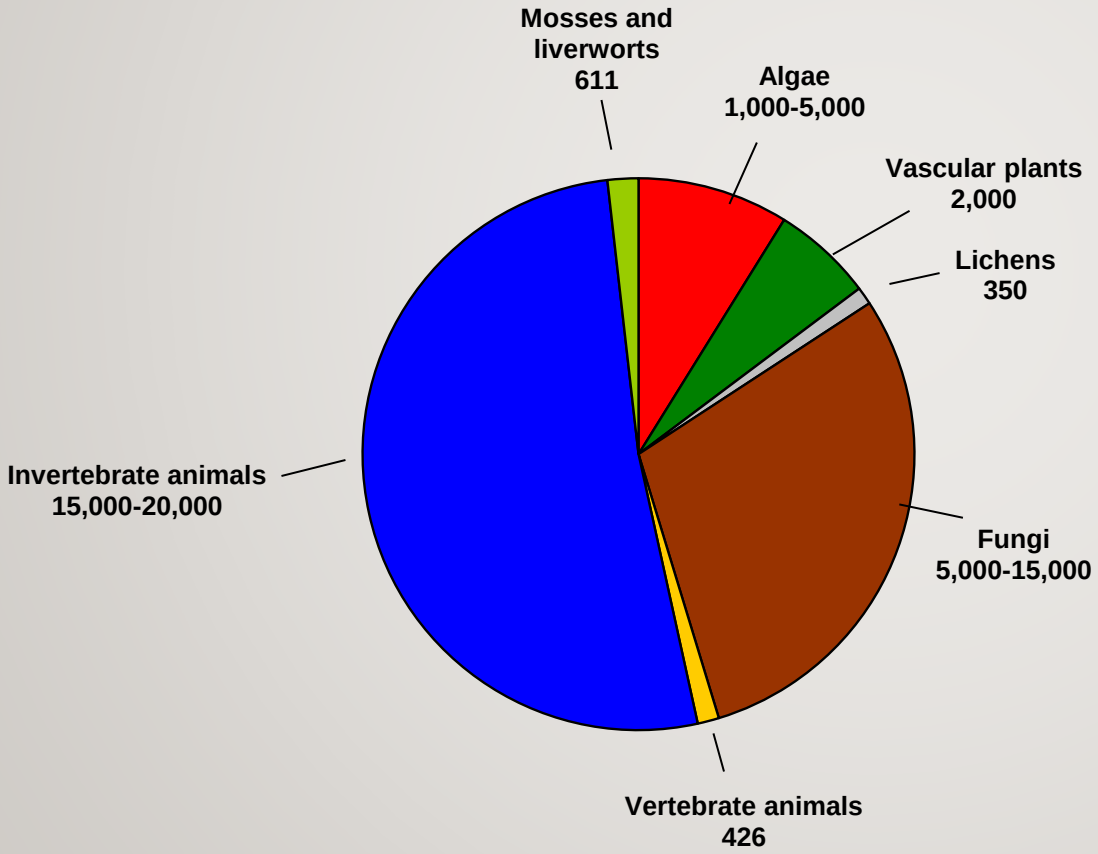


FOREST / HABITAT BLOCKS

AREAS OF NATURAL COVER SURROUNDED BY ROADS, DEVELOPMENT AND AGRICULTURE.

An estimated 24,000 to 43,500 species in Vermont!

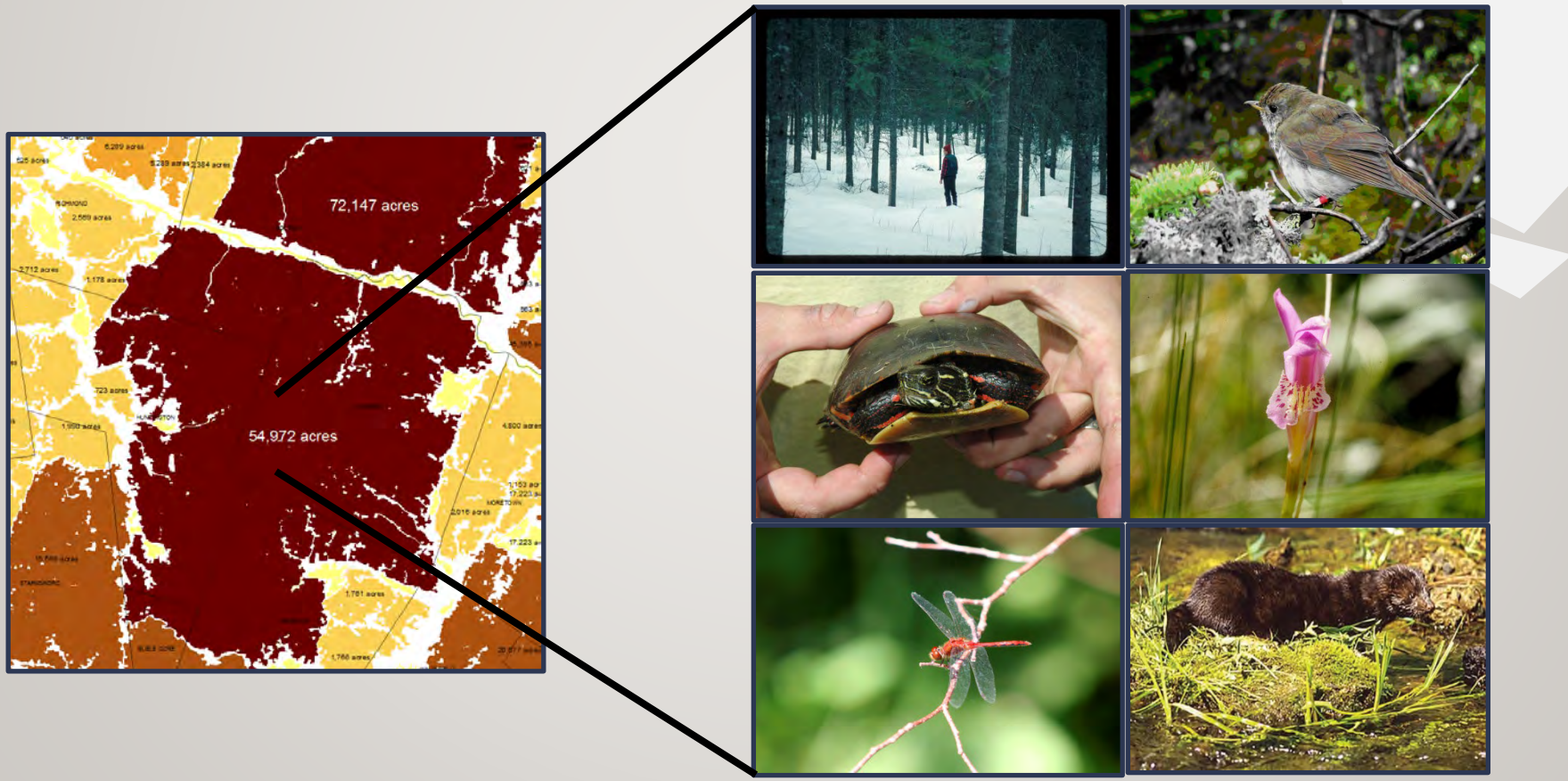
How do we protect them all?



Elfin Skimmer

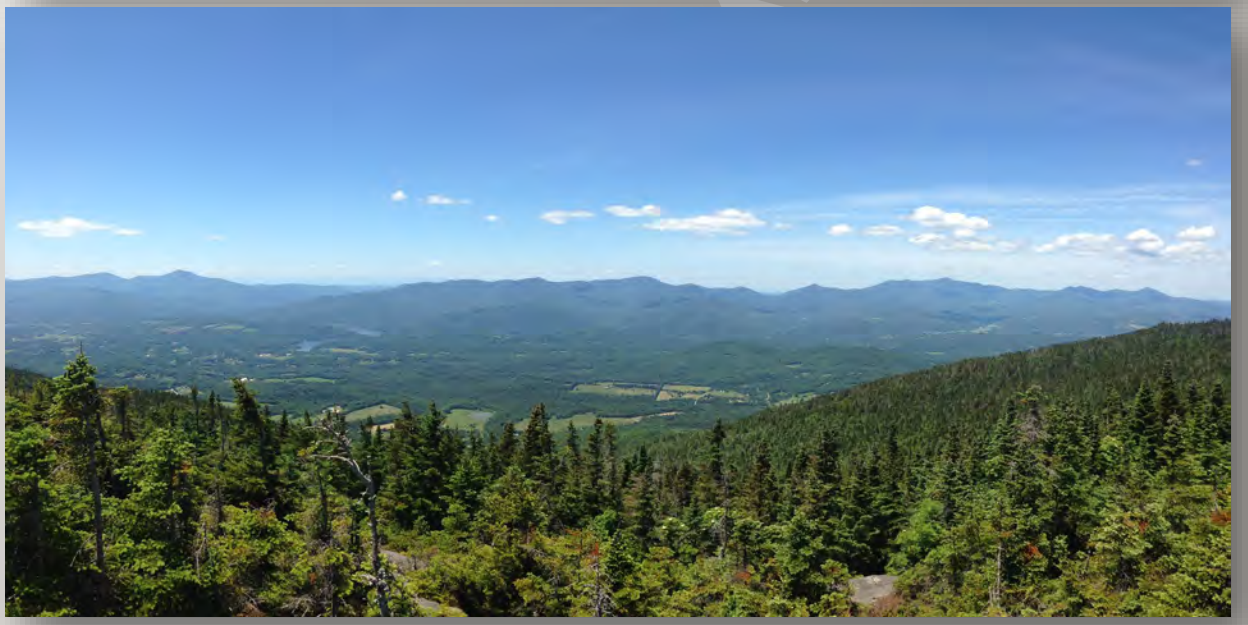
Coarse filter

If examples of all coarse-filter elements are conserved at the scale at which they naturally occur, most of the species they contain—from the largest trees and mammals to the smallest insects—will also be conserved.

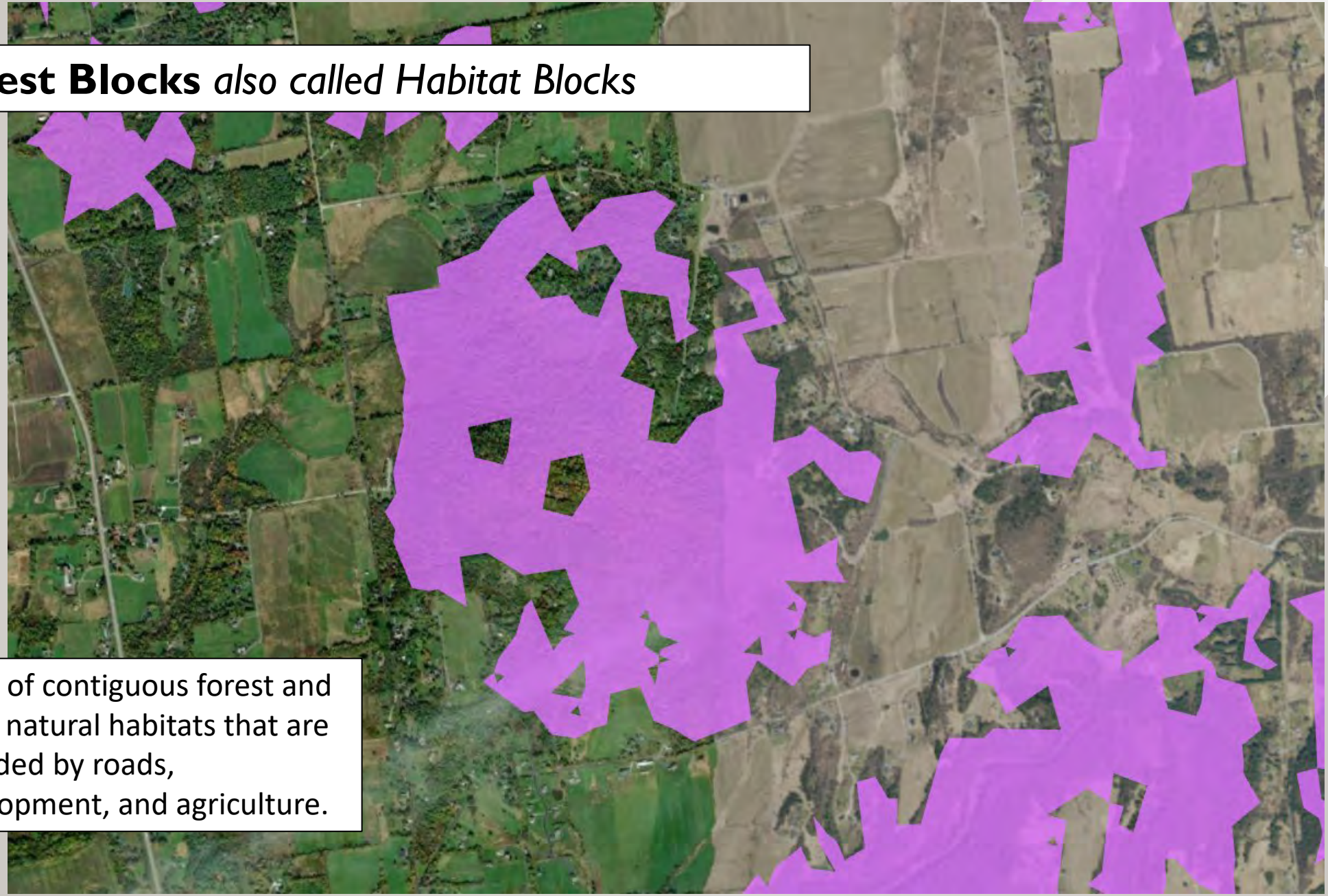


Three basic principles:

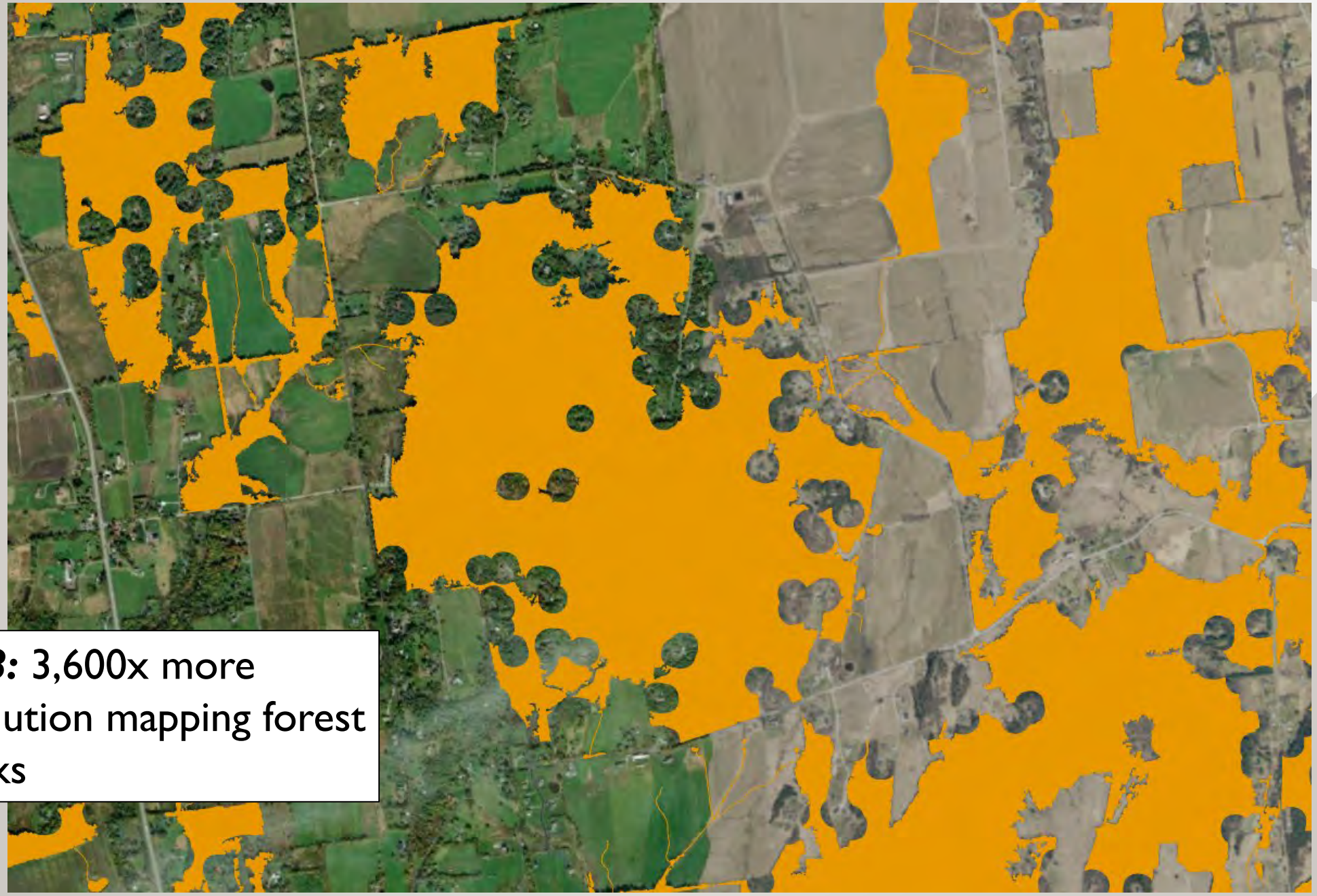
- Larger areas support more species
- Small, genetically isolated populations are more likely to become extirpated or extinct
- Connections between populations allow for genetic exchange, effectively making areas larger and reducing the likelihood of extinction



Forest Blocks *also called Habitat Blocks*

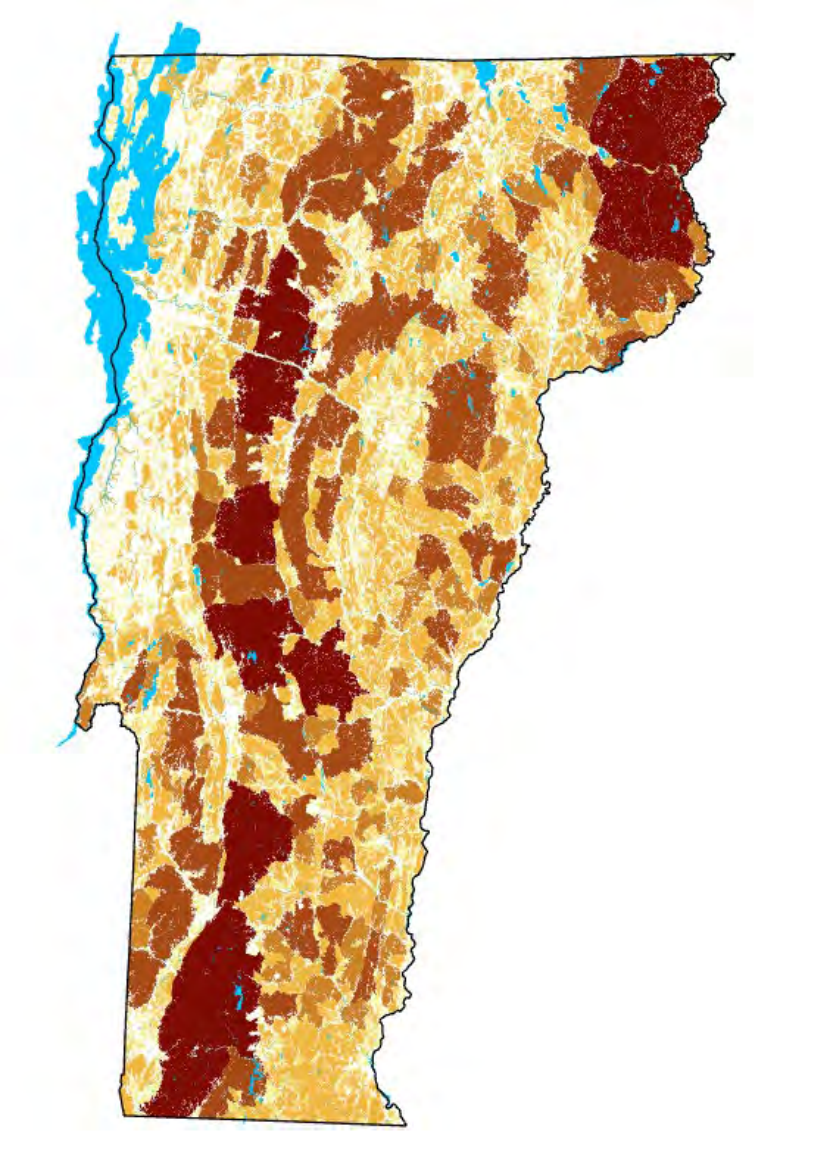


Areas of contiguous forest and other natural habitats that are bounded by roads, development, and agriculture.



2023: 3,600x more resolution mapping forest blocks

FOREST / HABITAT BLOCKS

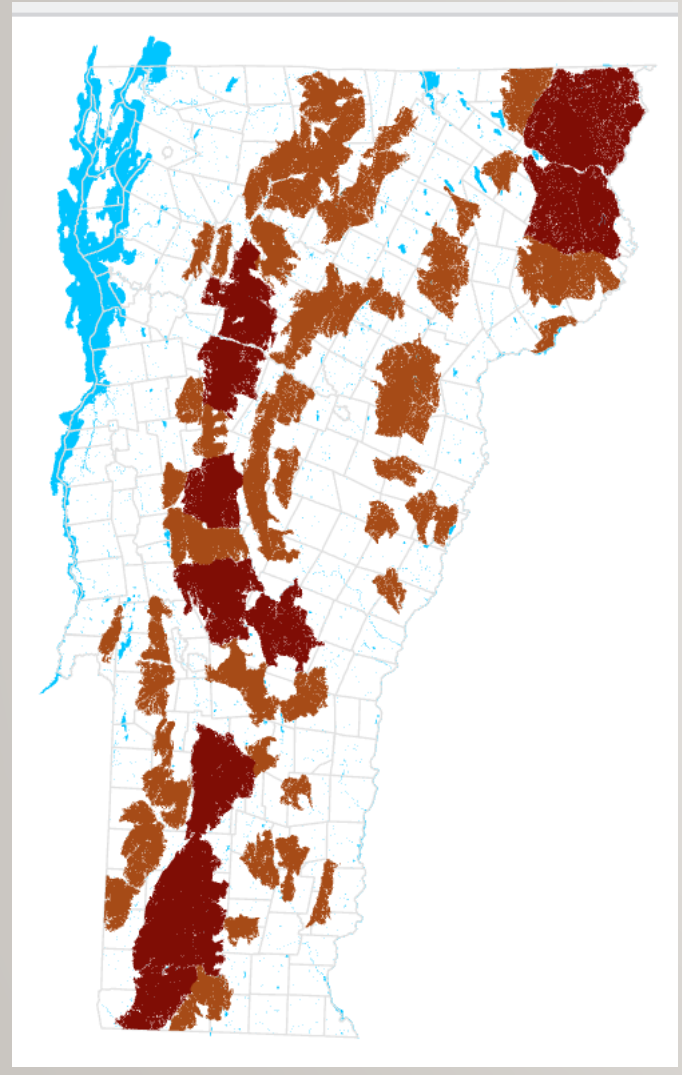


Areas Of Natural Cover Surrounded By Roads, Development And Agriculture.
Range in size from 20 to 156,000 acres
Average size is 1,000

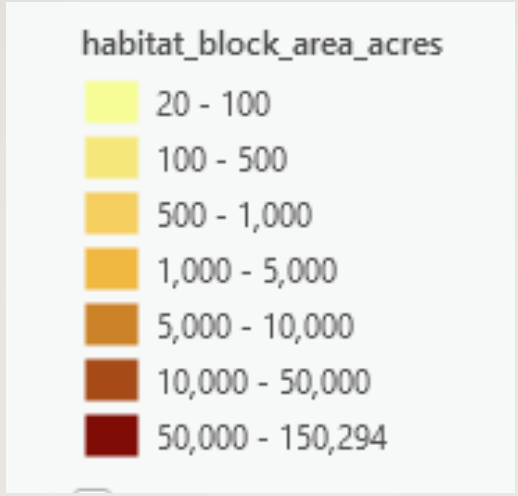
habitat_block_area_acres

- 20 - 100
- 100 - 500
- 500 - 1,000
- 1,000 - 5,000
- 5,000 - 10,000
- 10,000 - 50,000
- 50,000 - 150,294

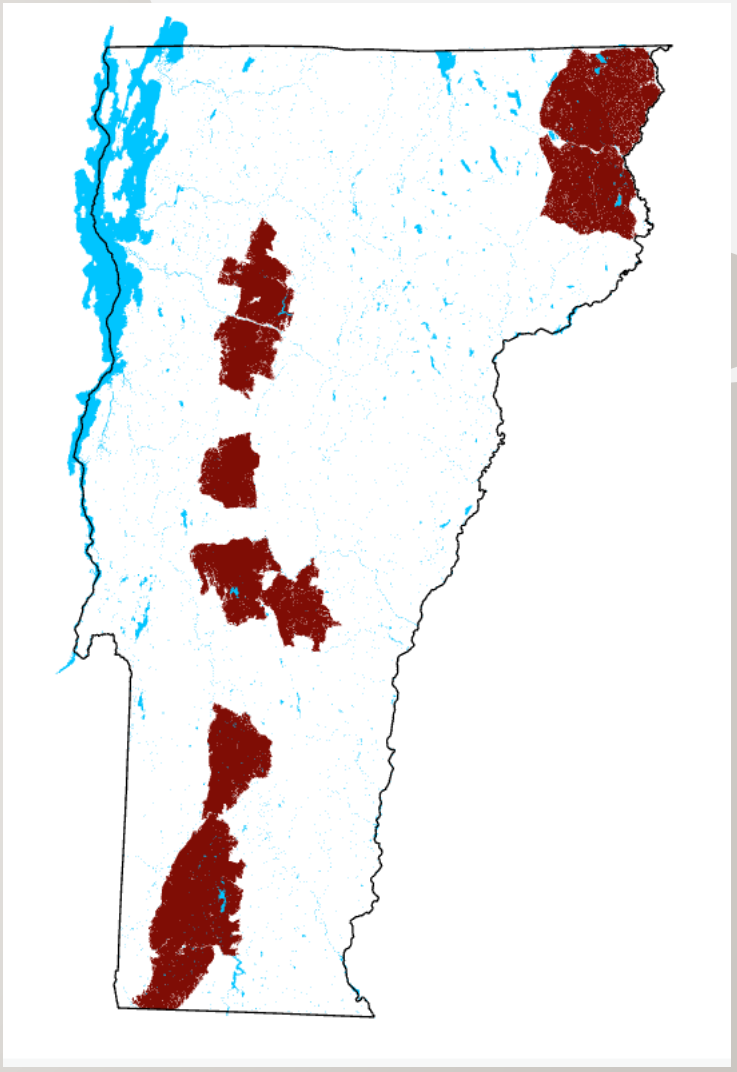
FOREST / HABITAT BLOCKS



bigger than 10,000ac (40 km^2)



69 blocks bigger than 10,000ac (40 km^2)
11 blocks bigger than 50,000ac (202 km^2)
Only Two blocks bigger than 100,000ac (404 km^2)



bigger than 50,000ac (202 km^2)

HABITAT BLOCKS CHANGE 2011-2026

2011 (*2006 data*)

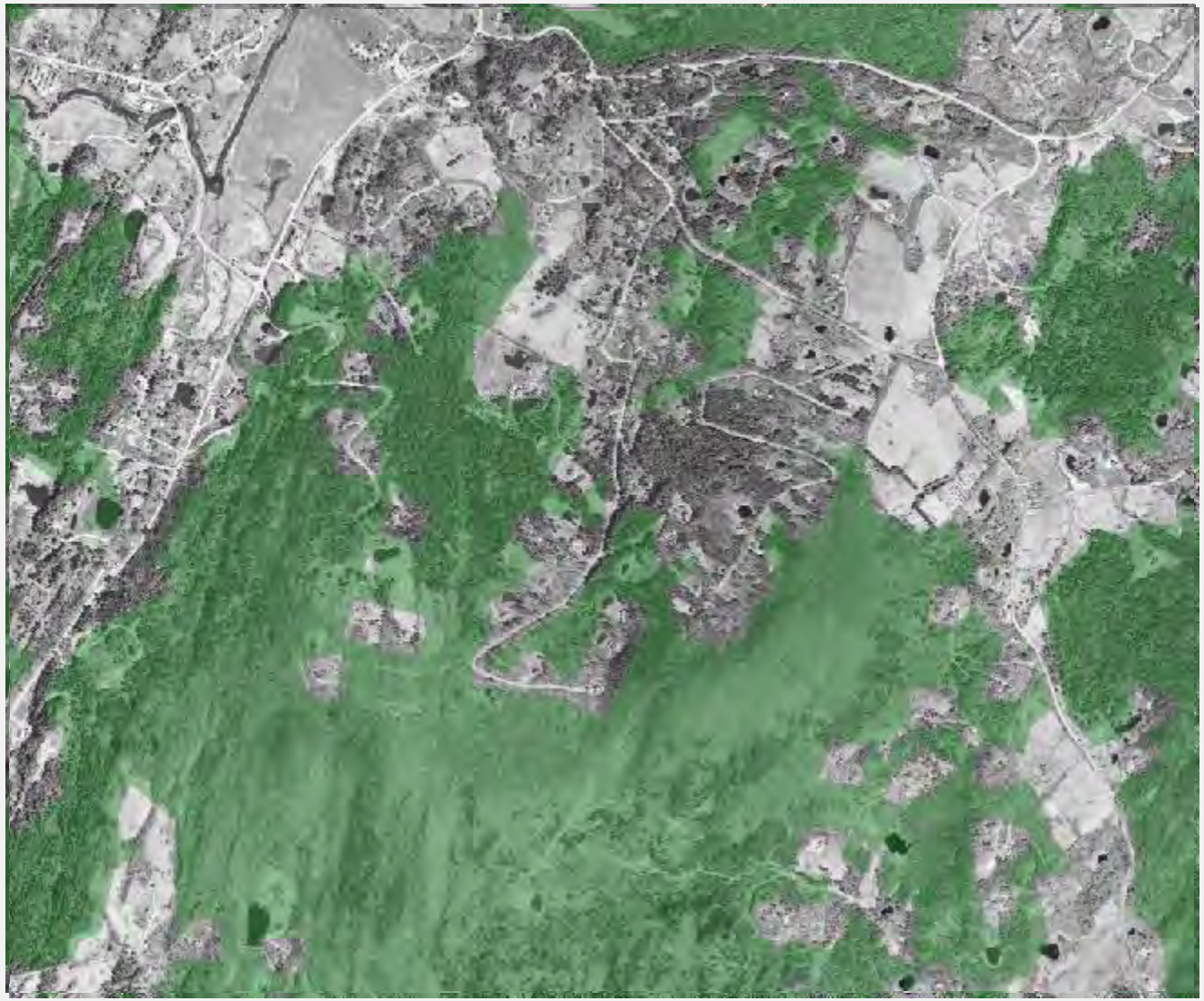
2023 (*2016 data*)

	2011	2023
# of Blocks	4,056	4,215
Average block size	1,091 ac	1,078 ac
Largest Block	154,564 ac	150,294 ac
Total area in Blocks	4,427,124 ac = 71.9% of VT	4,544,203 ac = 73.85 % of VT

- **Forest blocks are fundamentally similar at the statewide scale**
- **It is not possible to make comparisons between old & new data because of different inputs**

FOREST LOSS OVER TIME

1961

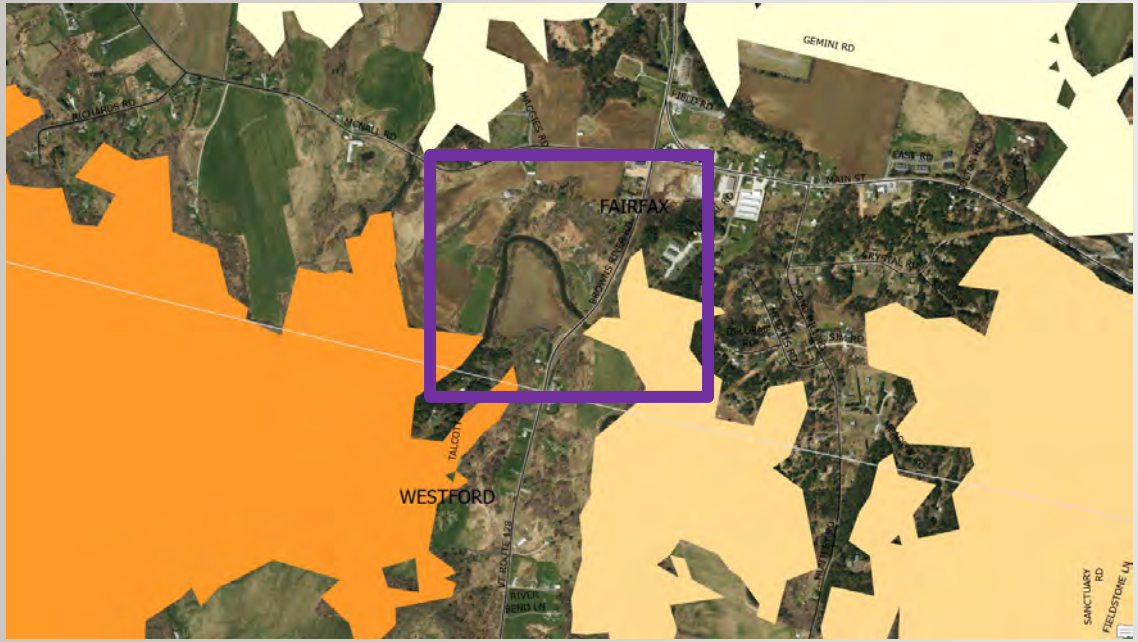


FOUNDATIONAL CONNECTIVITY SCIENCE

Leads to better Wildlife Road Crossings

2023

Ability to detect connecting land



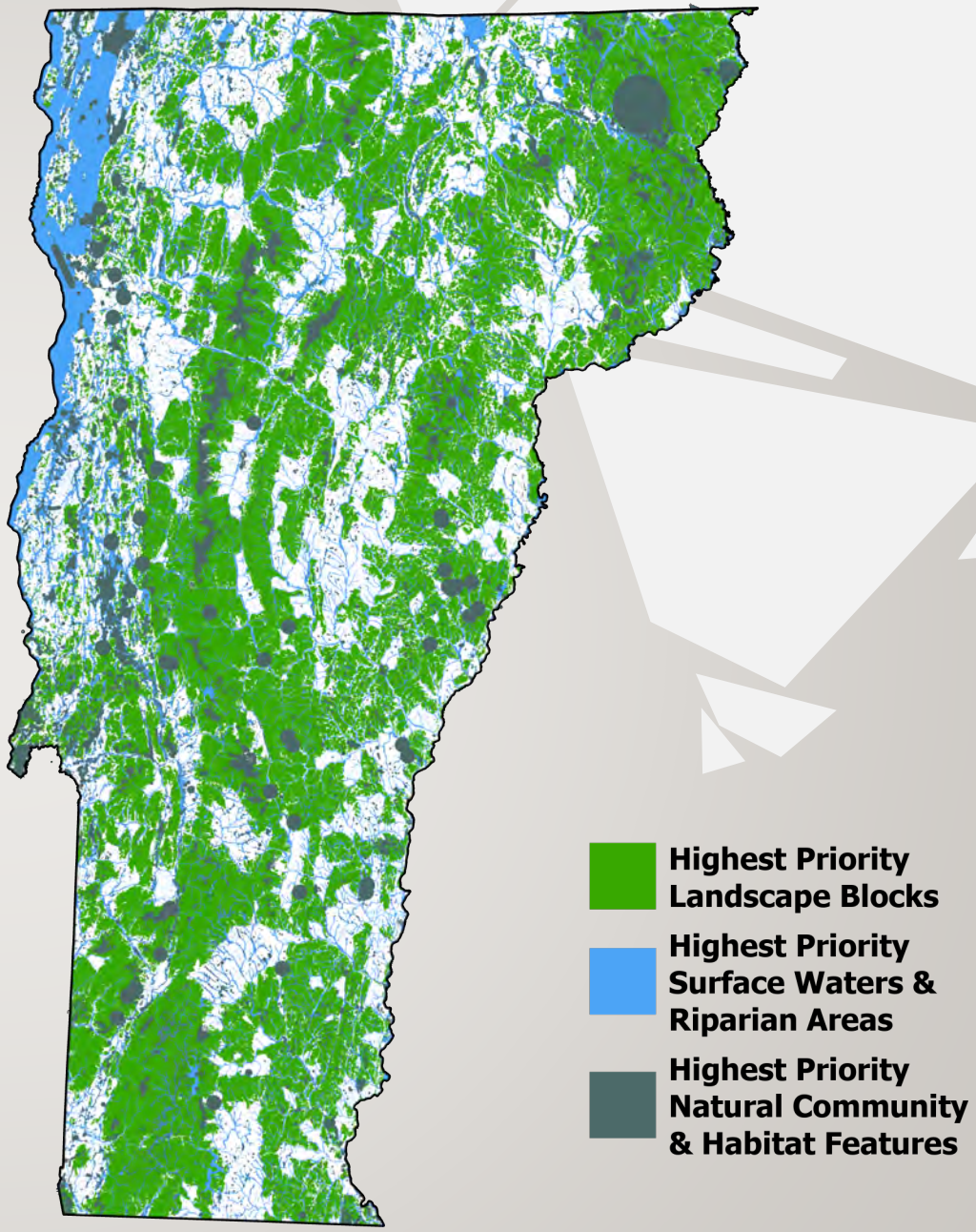
2011

2023

VERMONT CONSERVATION DESIGN

ECOLOGICALLY FUNCTIONAL LANDSCAPE

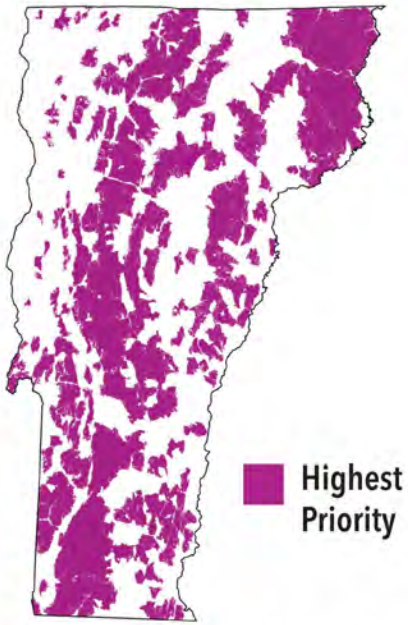
- *Intact*
- *Connected*
- *Diverse*



LANDSCAPE SCALE

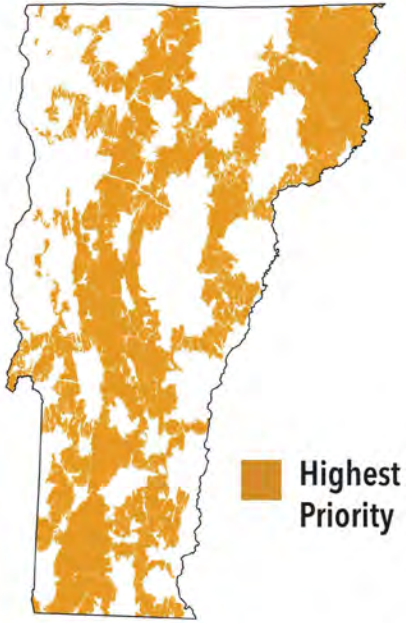
COMPONENTS

INTERIOR FOREST



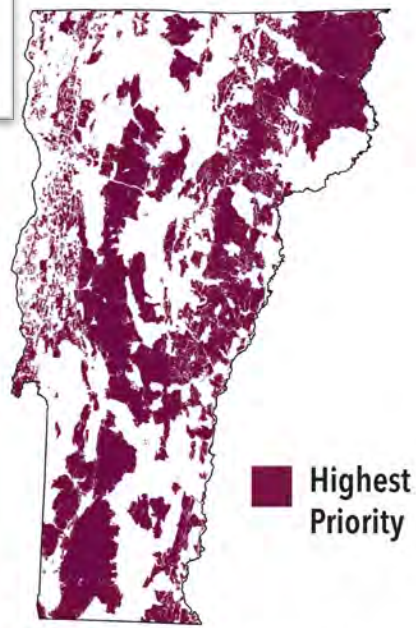
The largest forest blocks in each biophysical region. These are areas of contiguous forest and other natural communities and habitats (such as wetlands, ponds, and cliffs) that are unfragmented by roads, development, or agriculture.

CONNECTING FOREST



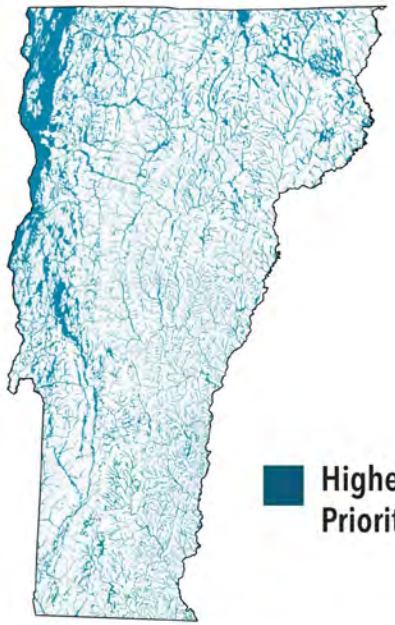
The network of forest blocks that together provide terrestrial connectivity at the regional scale (across Vermont and to adjacent states and Québec) and connectivity with surface waters and areas of geological diversity.

GEOLOGICAL DIVERSITY



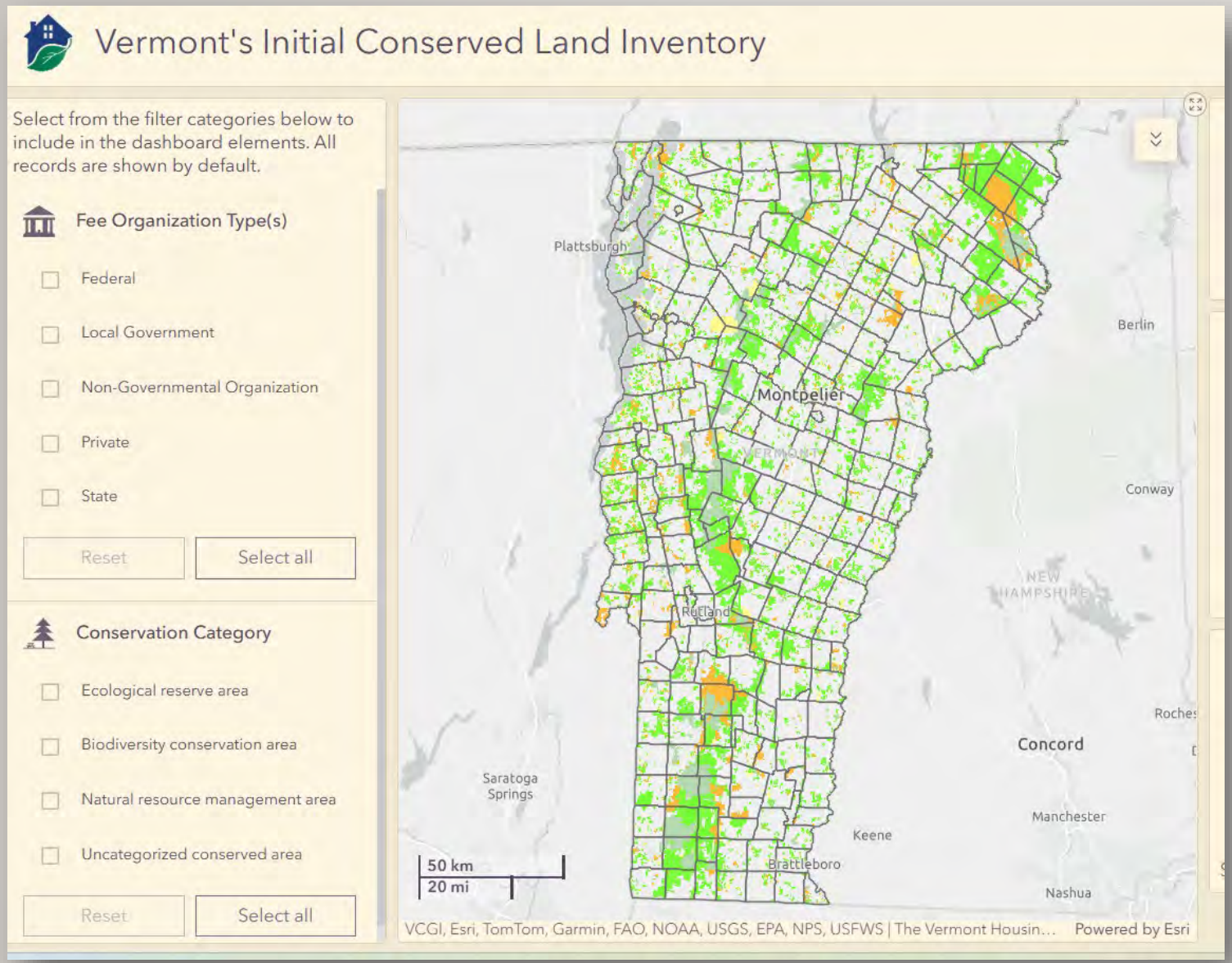
A set of forest blocks that reflect the full diversity of Vermont's bedrock, soils, elevations, and landforms (features such as slopes, ridges, flats, and coves). Diversity in the physical landscape is linked to biological diversity, and places that contribute to physical diversity will be important for biological diversity even as the climate changes.

SURFACE WATERS & RIPARIAN AREAS

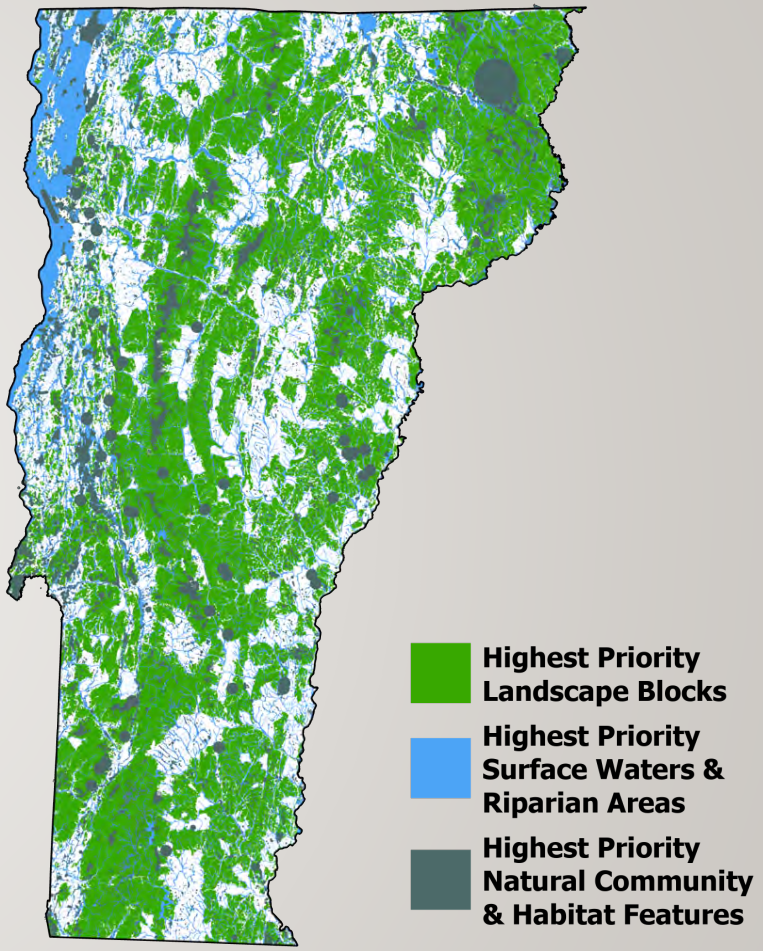


The network of all lakes, ponds, rivers, and streams, their associated riparian zones, valley bottoms, and river corridors in which geophysical processes occur.

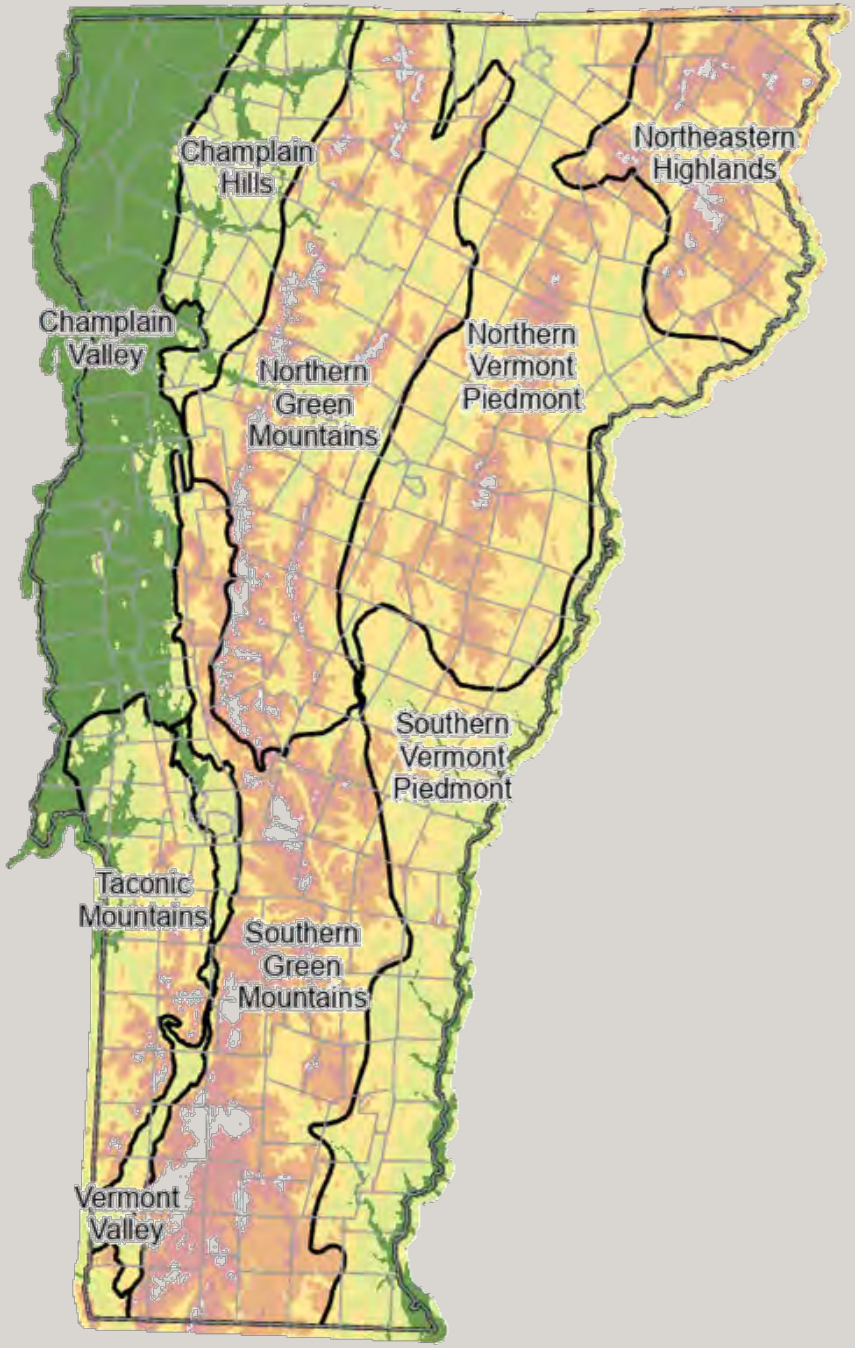
Act 59 30 x 30



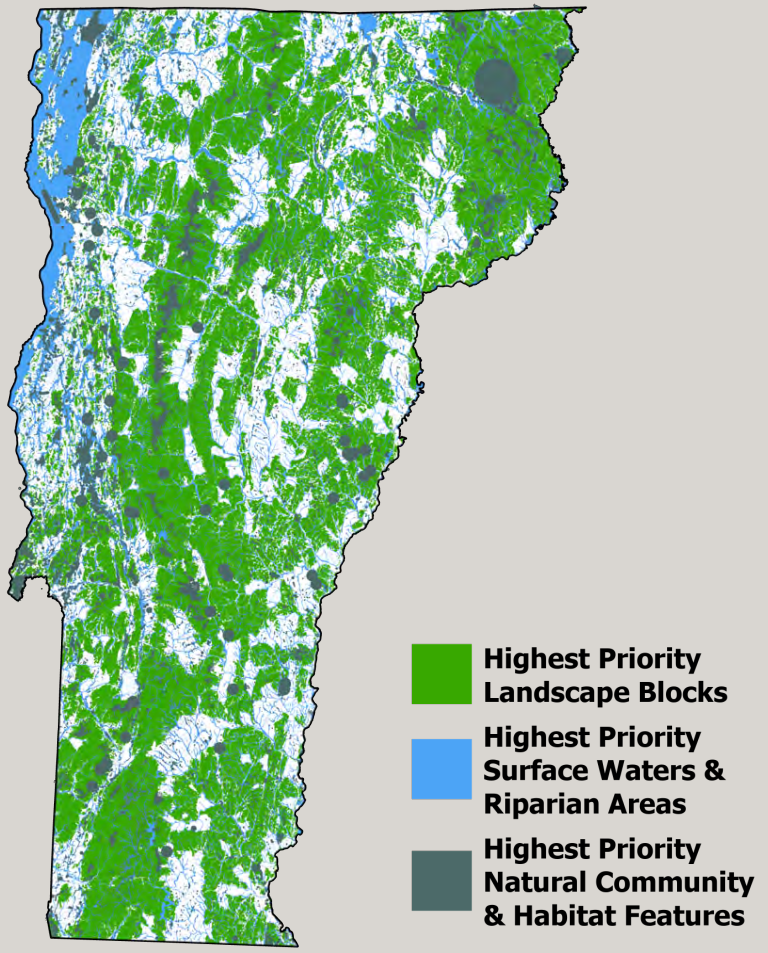
VERMONT CONSERVATION DESIGN



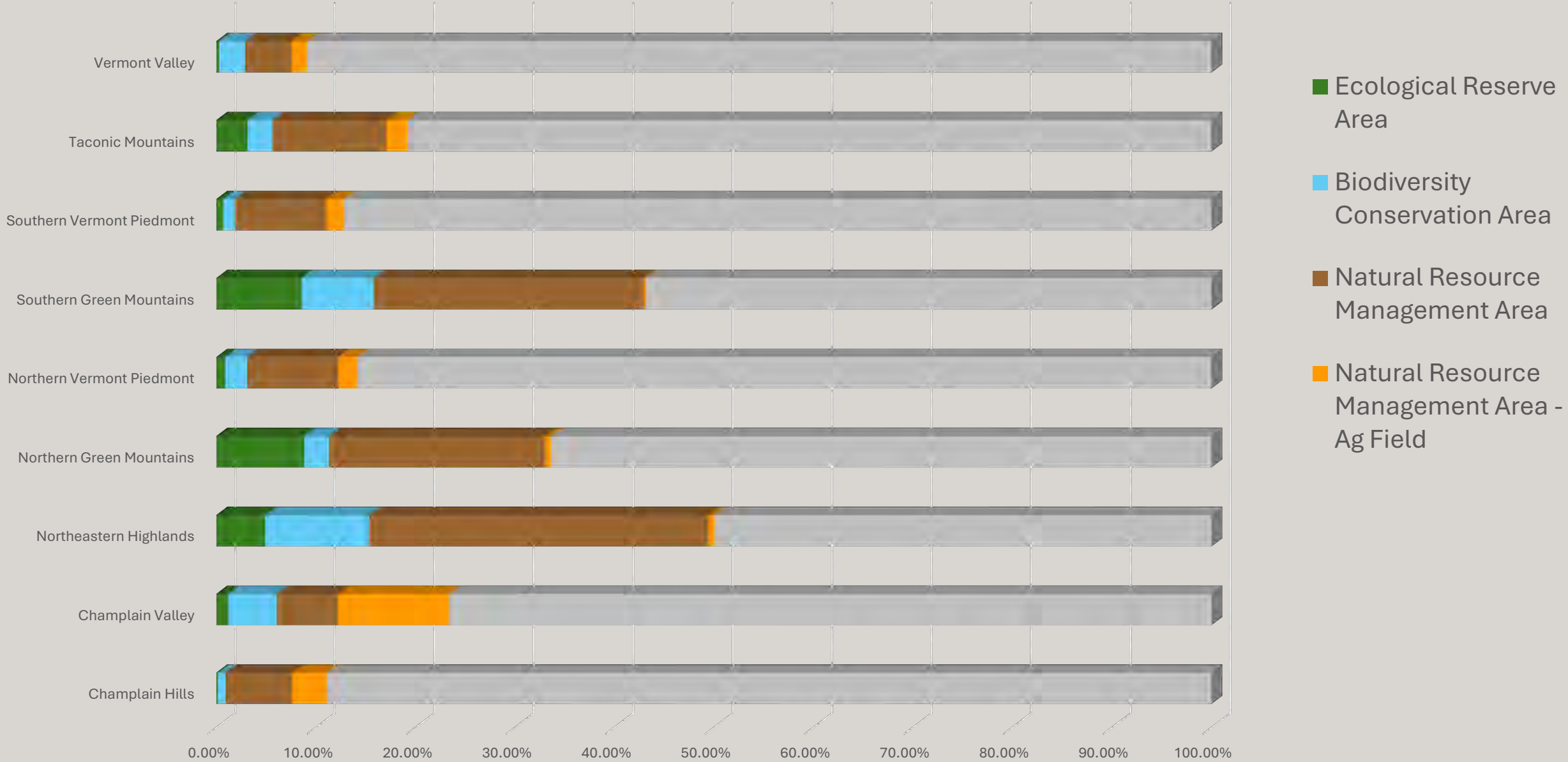
(Remember permanent land conservation is just one of many tools for achieving VCD.)



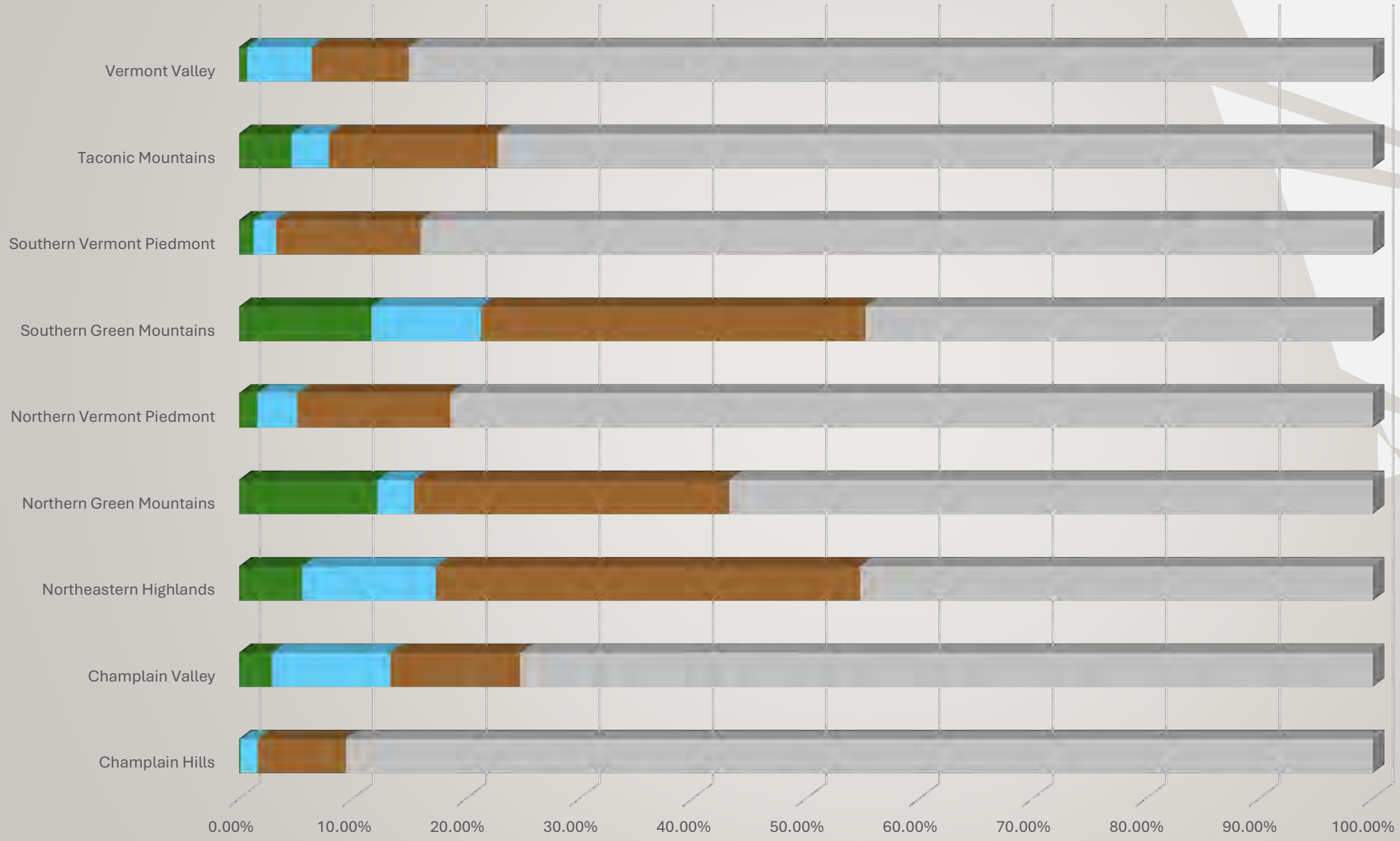
VERMONT CONSERVATION DESIGN



Percent of each Biophysical Region that is conserved, by Conservation Category

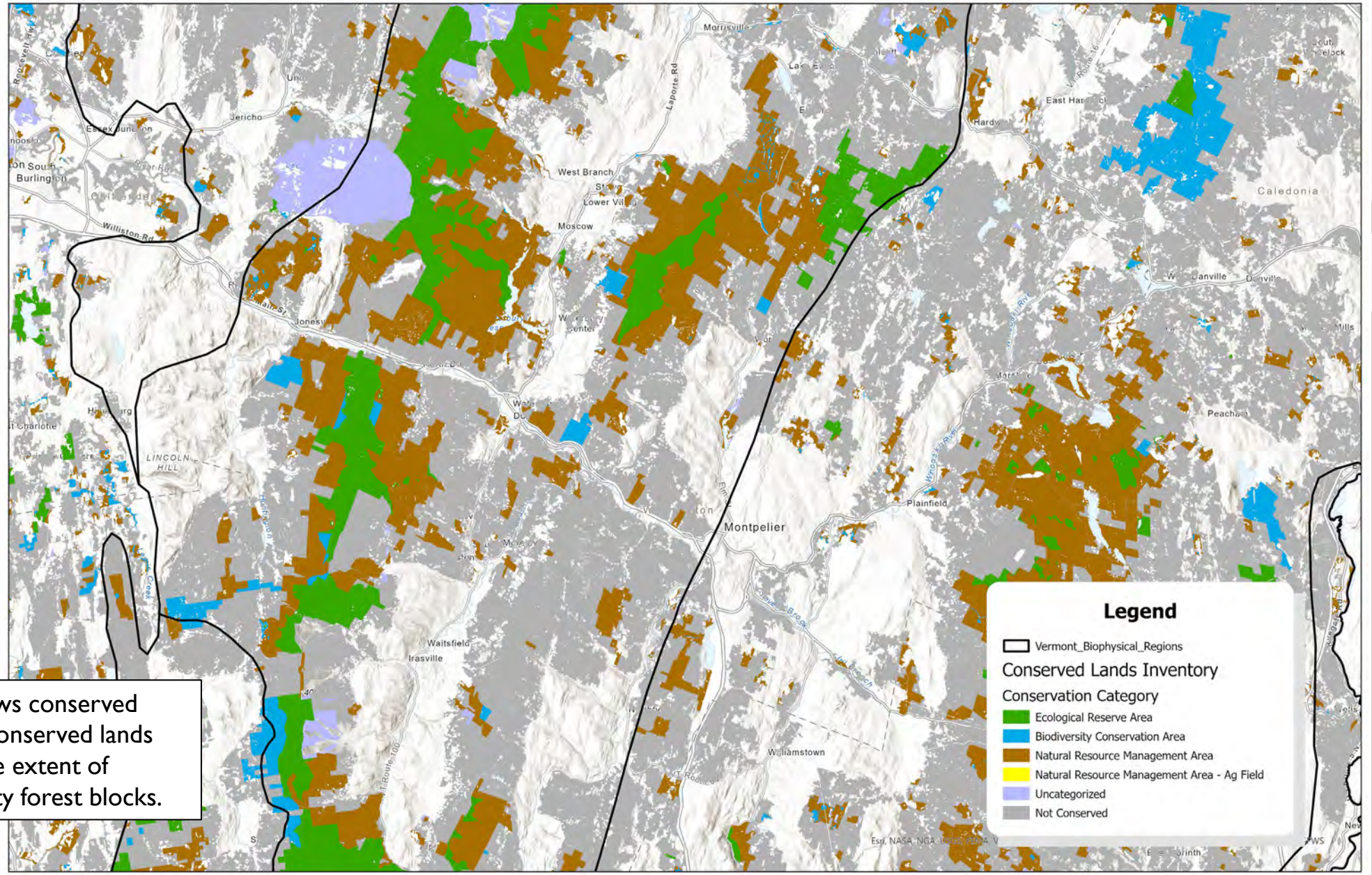


Conservation status of **all VCD Highest Priority Forest Blocks**,* by category, in each Biophysical Region



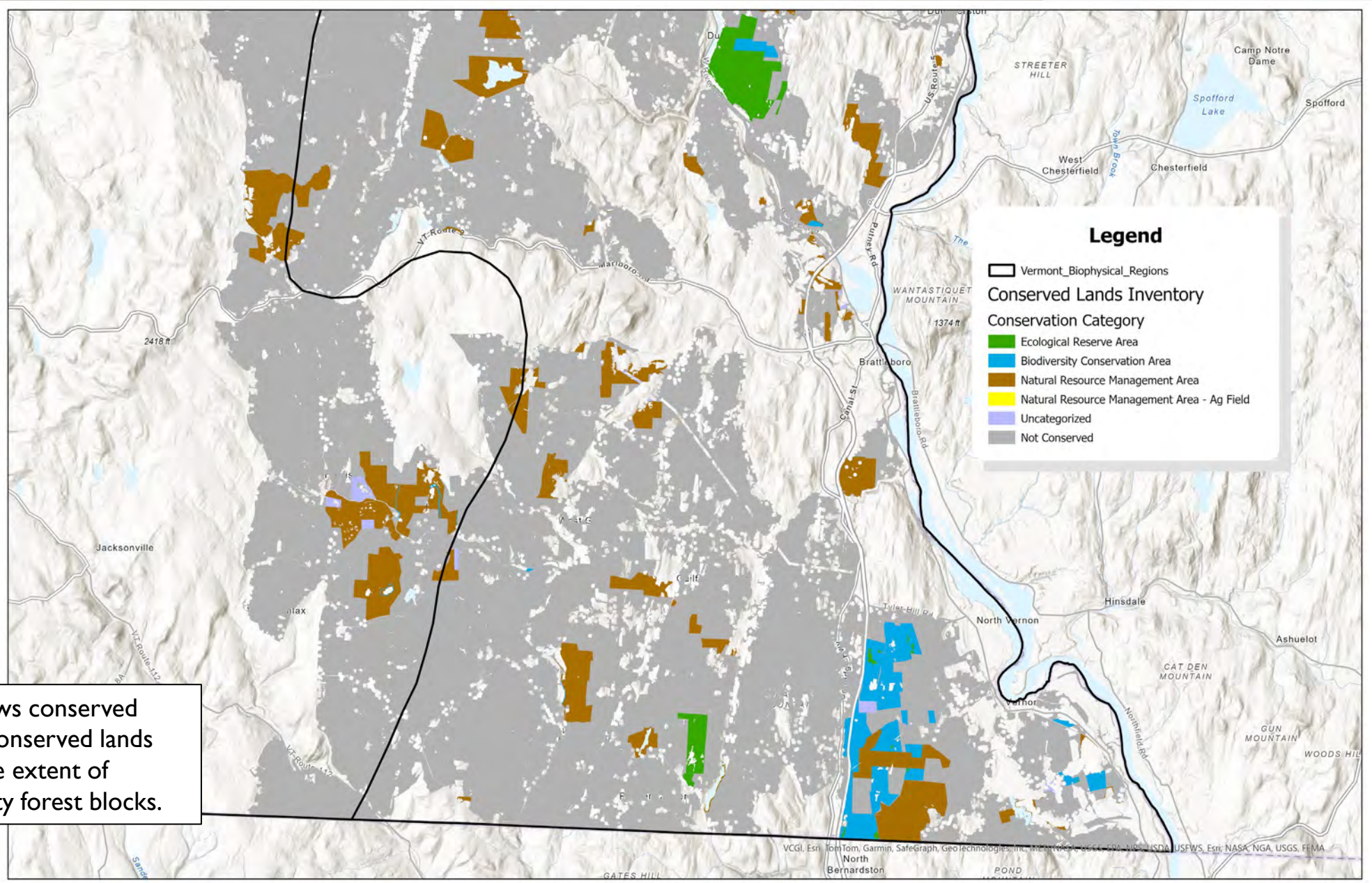
*includes Interior Forest Blocks, Connectivity Blocks, and Geological Diversity Blocks

Example Map of **all VCD Highest Priority Forest Blocks**, by Conservation Category, in central Vermont

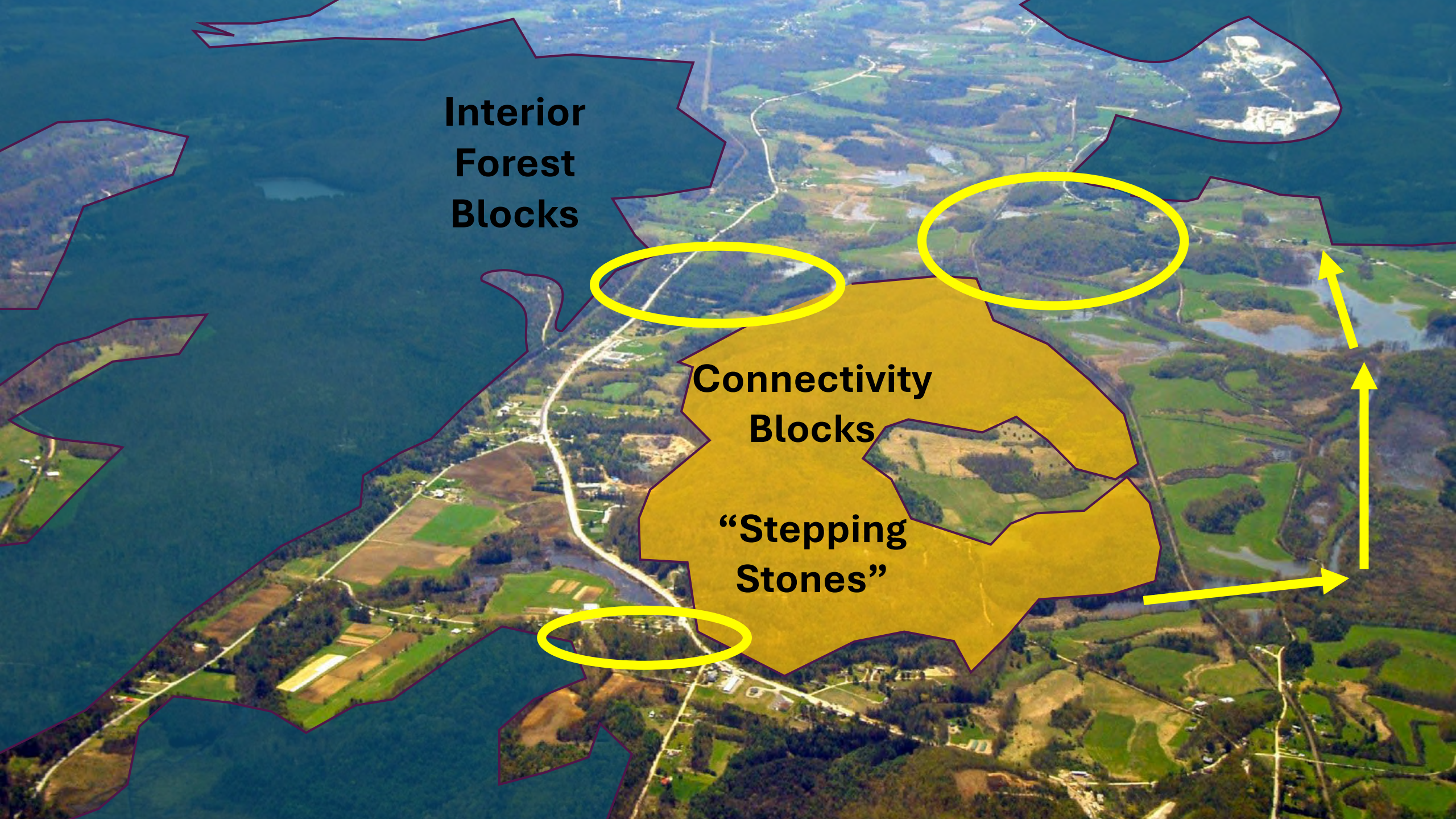


This map shows conserved lands and unconserved lands *only* within the extent of highest priority forest blocks.

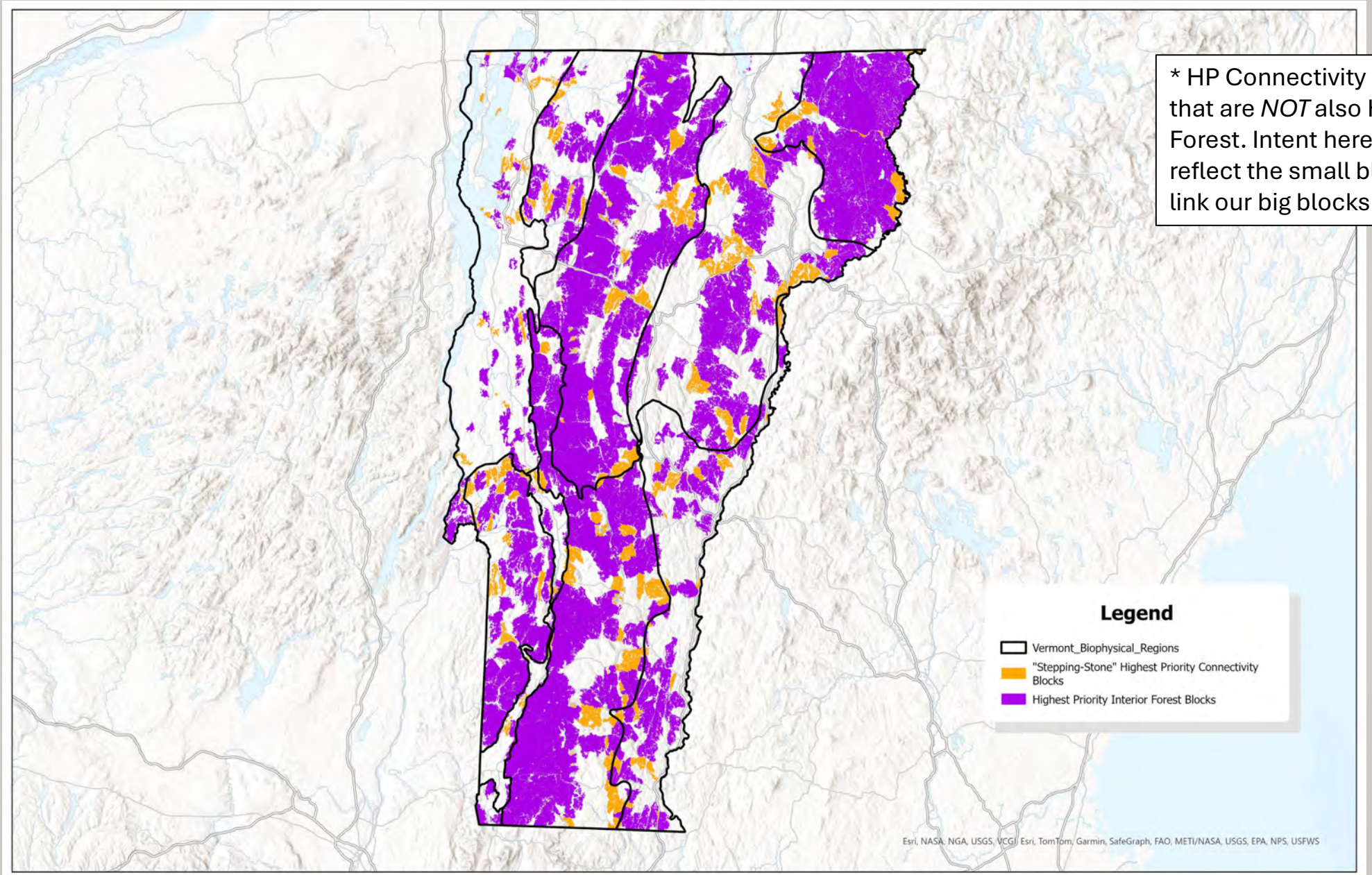
Example Map of **all VCD Highest Priority Forest Blocks**, by Conservation Category, near Brattleboro



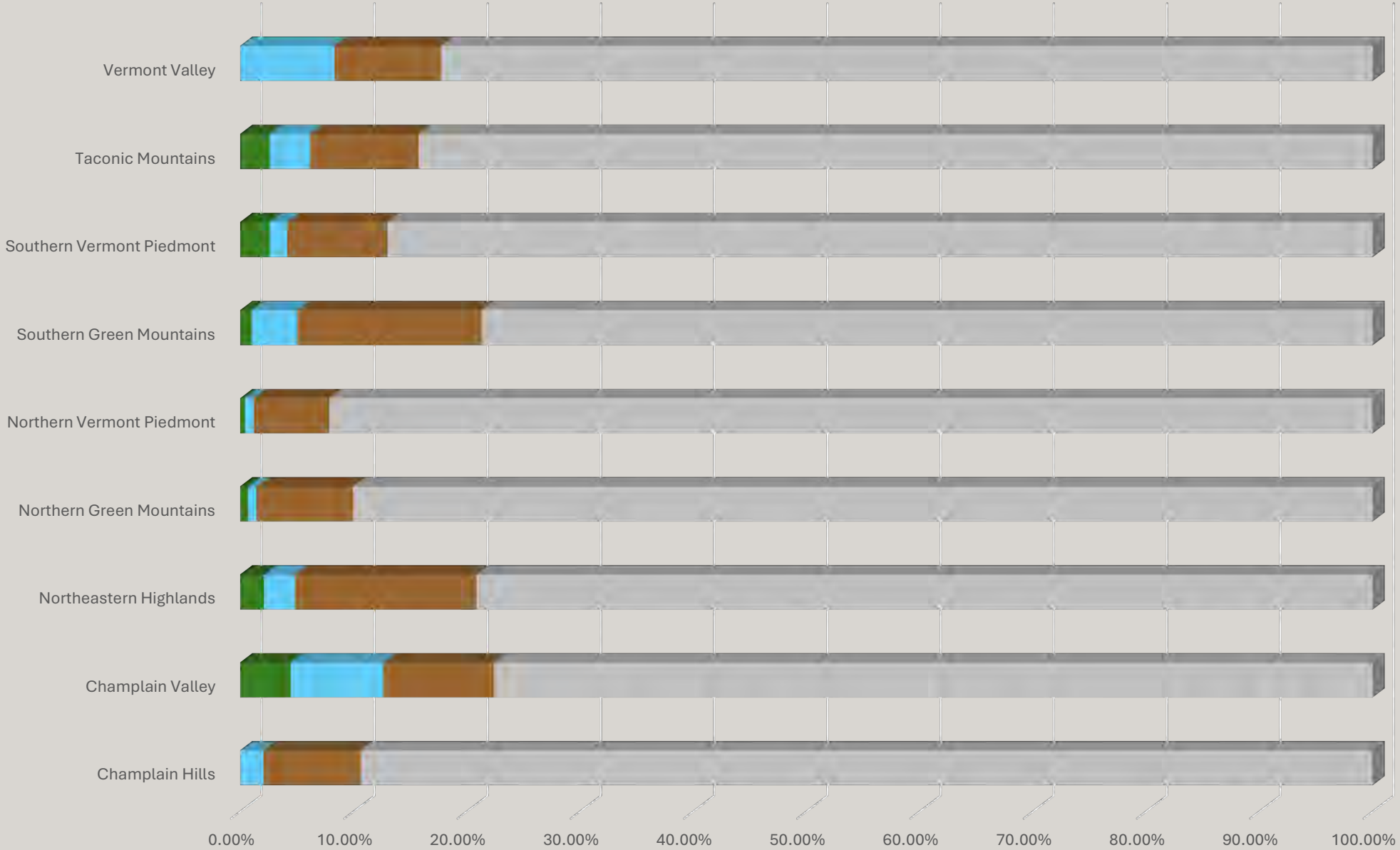
This map shows conserved lands and unconserved lands *only* within the extent of highest priority forest blocks.


Interior
Forest
Blocks
Connectivity
Blocks
“Stepping
Stones”

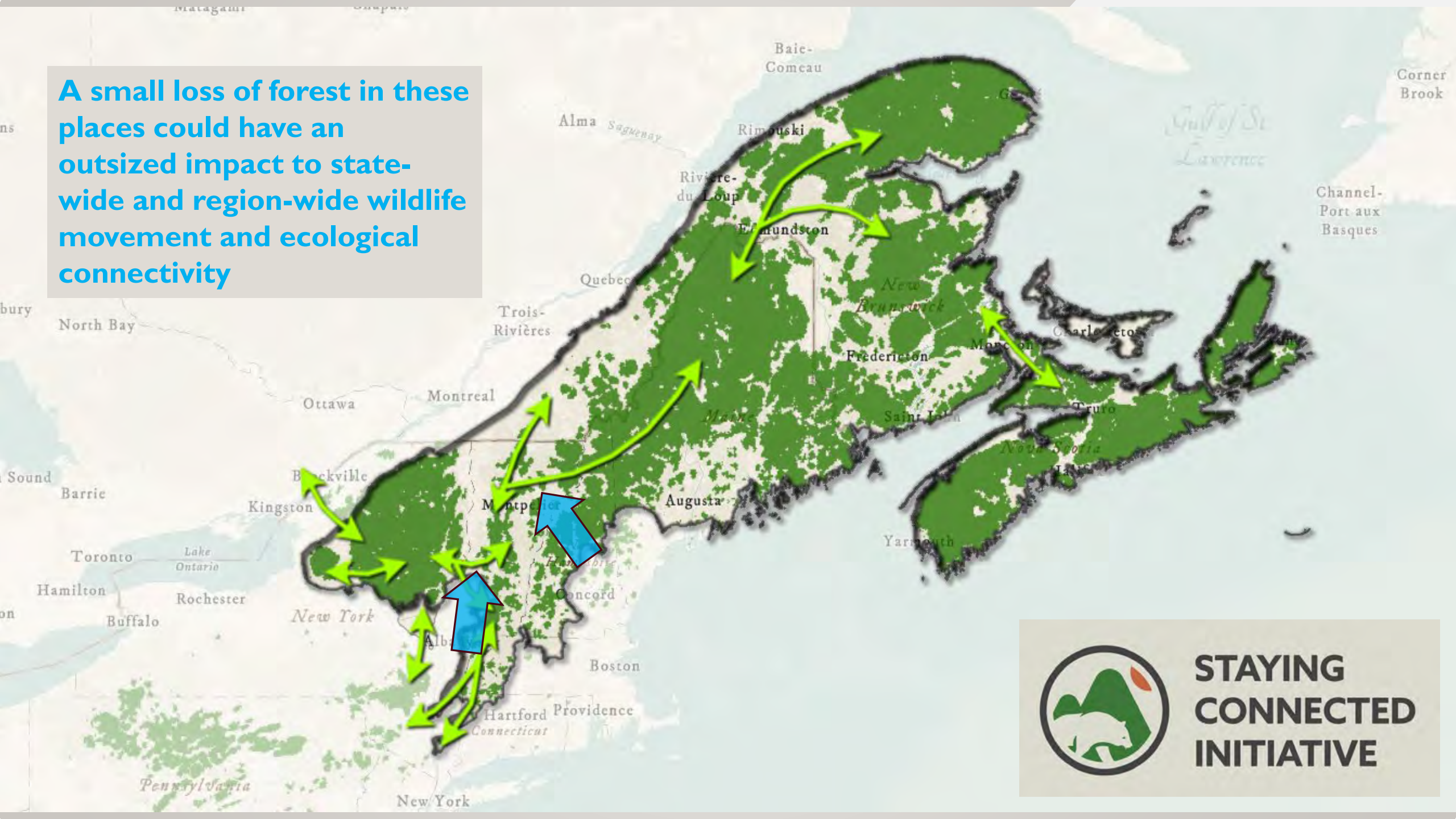
“Stepping-Stone”* Highest Priority Connectivity Blocks (shown in orange)



Conservation status of "***Stepping-Stone***"* Highest Priority Connectivity Blocks, by category and region



* HP Connectivity Blocks that are *NOT* also HP Interior Forest. Intent here is to reflect the small blocks that link our big blocks together


A small loss of forest in these places could have an outsized impact to state-wide and region-wide wildlife movement and ecological connectivity
Baie-Comeau
Alma
Saguenay
Rimouski
Rivière-du-Loup
Edmundston
Quebec
Trois-Rivières
North Bay
Ottawa
Montreal
Fredericton
Moncton
Charlottetown
Truro
Saint John
Nova Scotia
New Brunswick
Maine
Corner Brook
Gulf of St Lawrence
Channel-Port aux Basques
Barrie
Kingston
Augusta
Yarmouth
Toronto
Lake Ontario
Hamilton
Rochester
Buffalo
New York
Concord
Boston
Hartford
Providence
Connecticut
Pennsylvania
New York
STAYING CONNECTED INITIATIVE

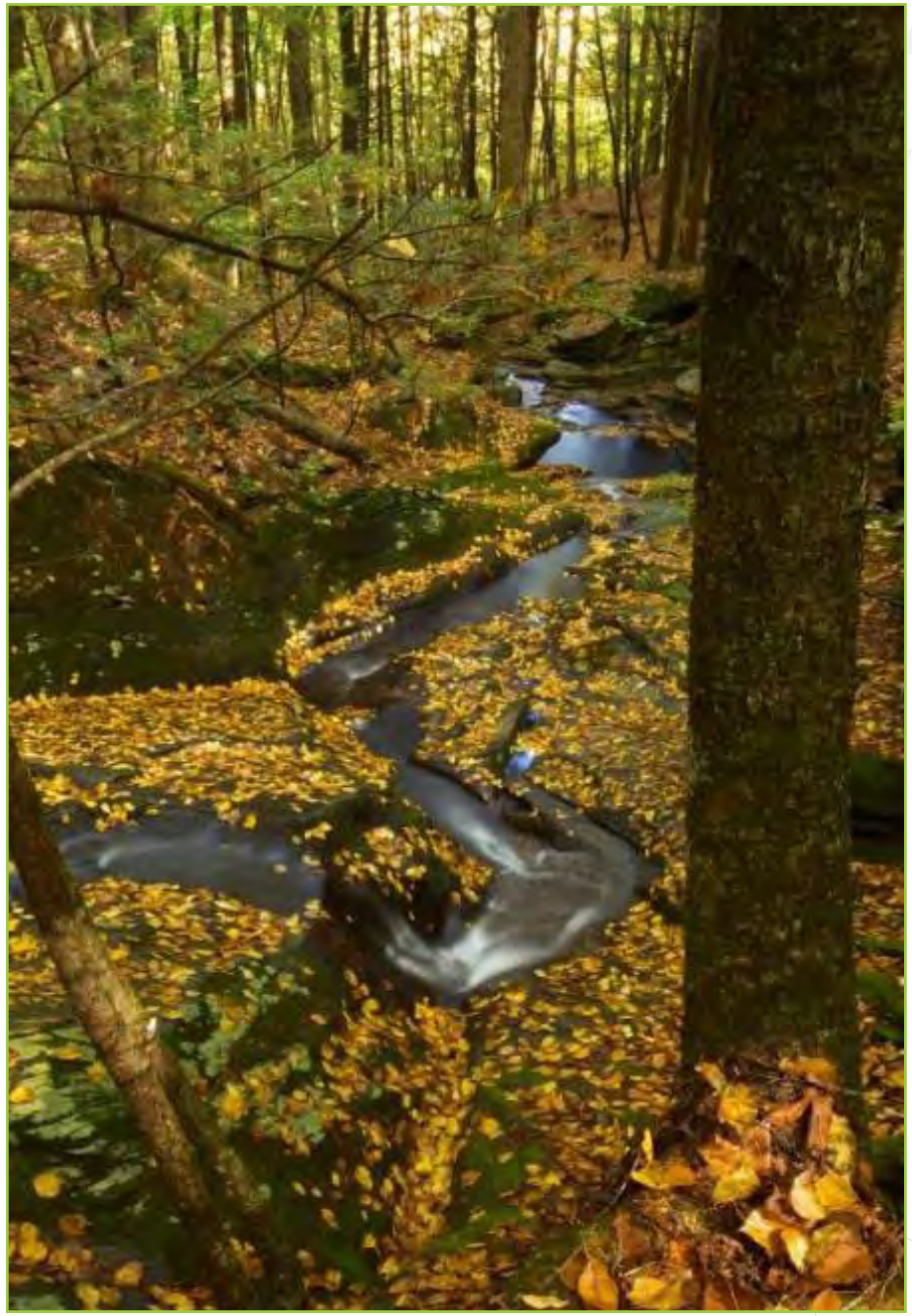
Planning Provisions of Act 171

(*Went into effect Jan 1, 2018*)

"manage Vermont's forestlands so as to maintain and improve forest blocks and habitat connectors."

Requires town and regional plans to:

- Identify important areas forest blocks and habitat connectors,
- plan for land development in those areas to minimize forest fragmentation

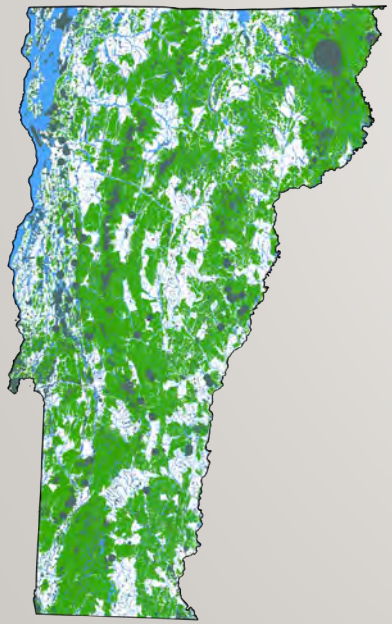


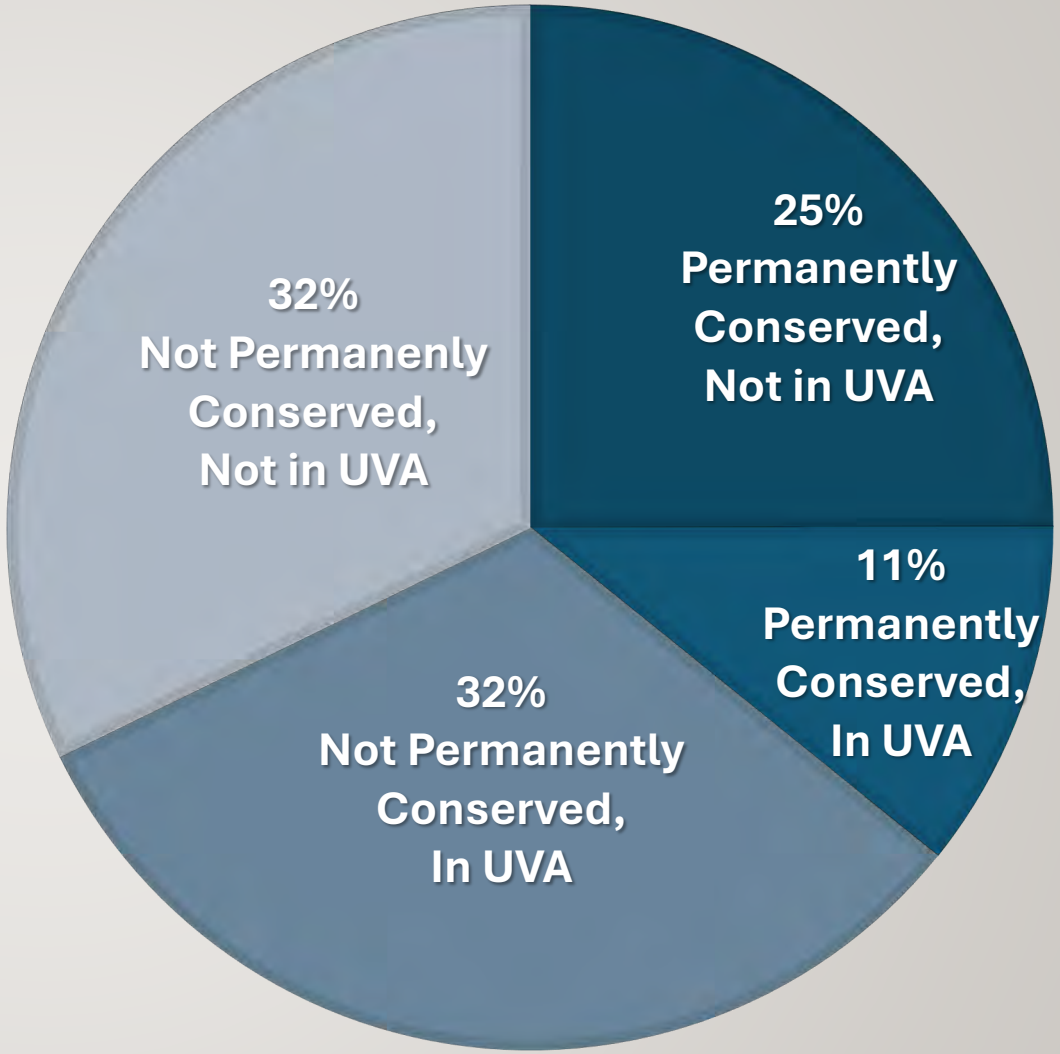
A. Blake Gardner

The role of

Use Value Appraisal - Forestland

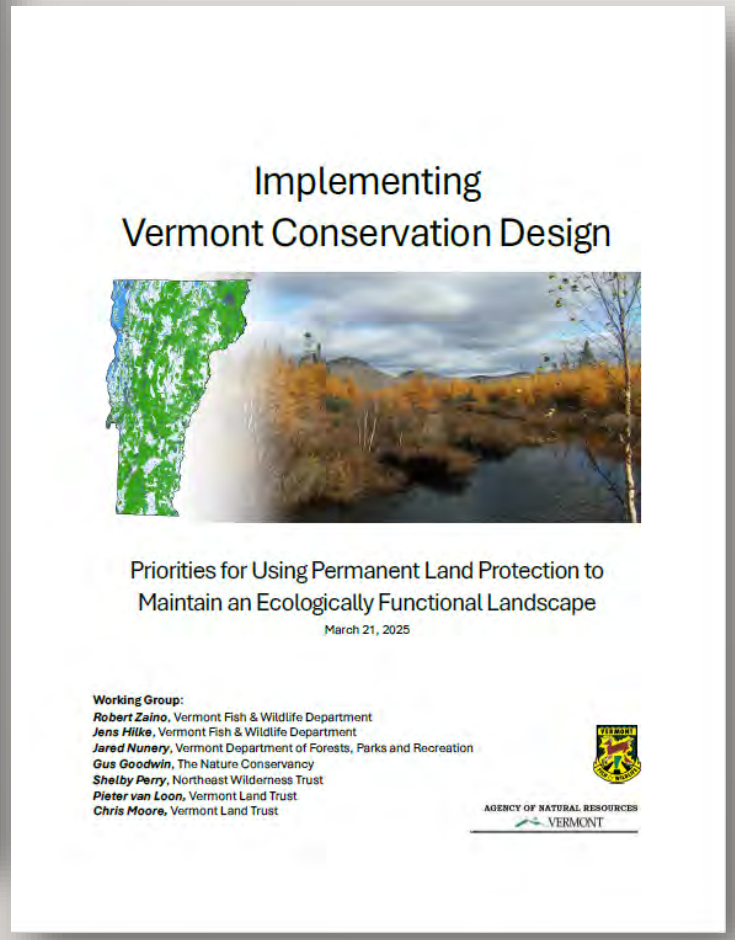
in maintaining 3.5 million acres of VCD Highest Priority Forest Blocks. Preliminary analysis conducted by VFWD.





Enhanced Forestland Conservation

Act 59: 30 x 30



Birdseye Mountain WMA


THANK YOU