CLIMATE CHANGE ADAPTATION

VERMONT
AGENCY OF NATURAL RESOURCES

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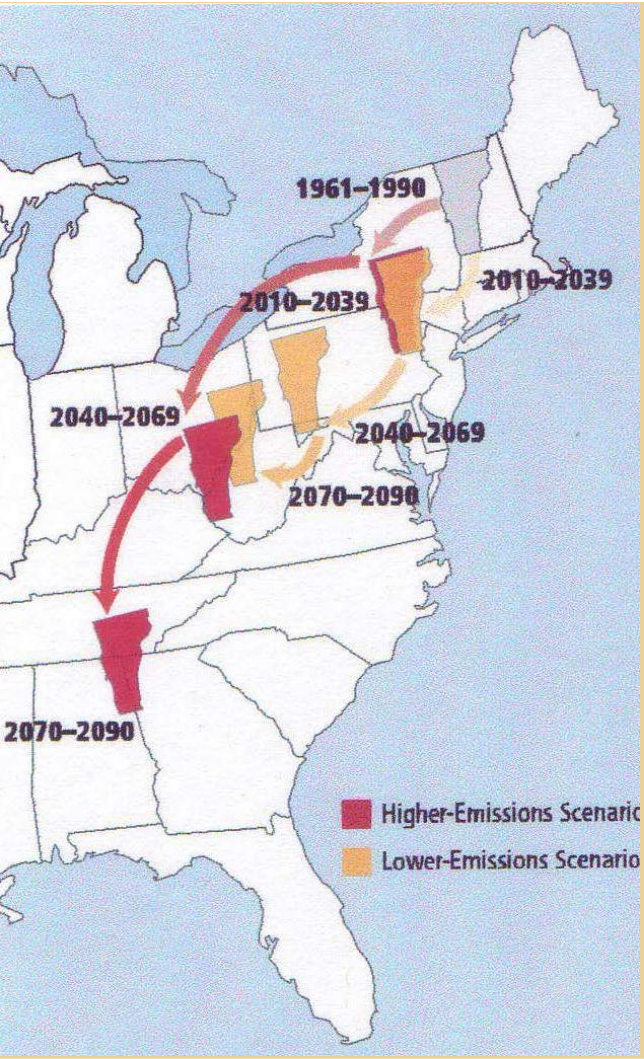
Climate Change Forecasts

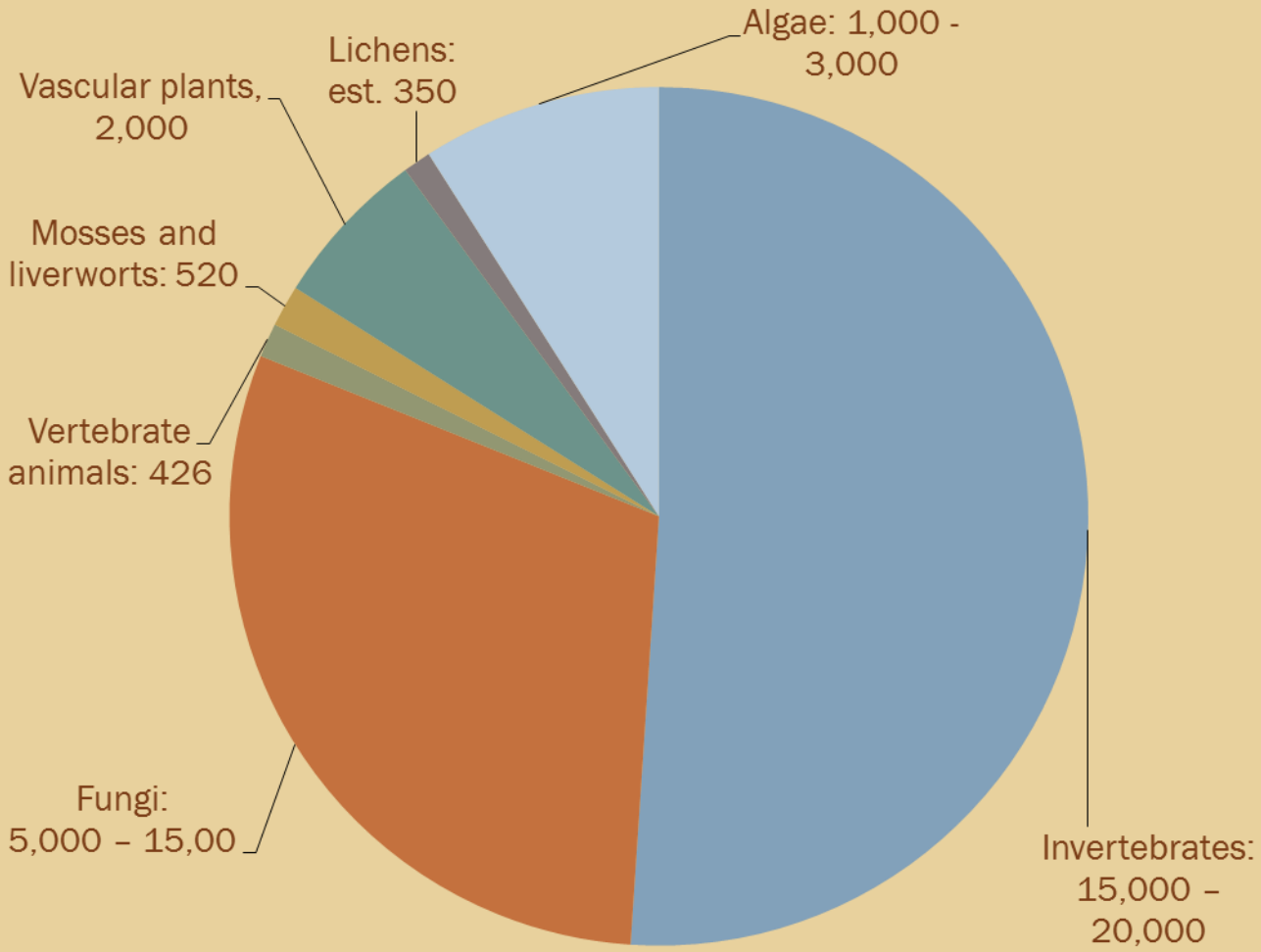


- **Current:** Temperatures have increased 1.8°F since 1970, with winter rising faster.
- **Projected:** Average temperatures are projected to rise 9°F to 13° F in winter by late-century.
- **Current:** Precipitation has increased 15-20% over the past 50 years with 67% of this falling in heavy precipitation events.
- **Projected:** Winter precipitation will increase on the order of 20-30% with less snow - more rain.
- **Projected:** Short-term summer droughts are projected to occur 2x as often

From Union of Concerned Scientists – *Confronting Climate Change in the Northeast* (NECIA 2007)

Biological Diversity in Vermont

- There are between 24,000 – 43,000 species in Vermont.
- Most species we know **little** about



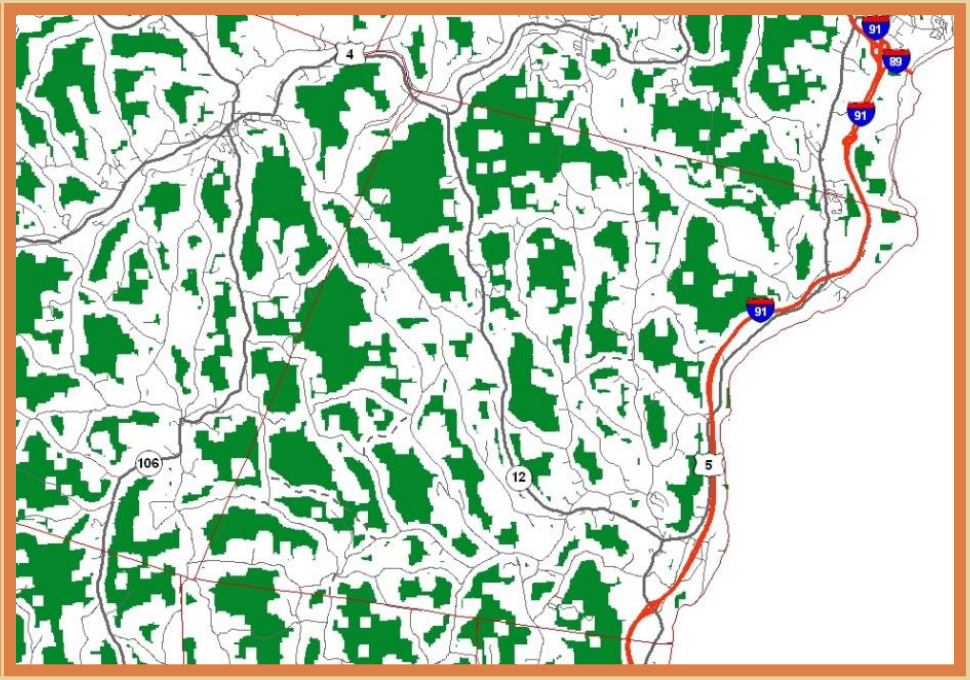
Wildlife present in Forest Patches

Tier 1 *Undeveloped*	Tier 2 *500-2500 acre blocks*	Tier 3 *100-500 acre blocks*	Tier 4 *20-100 acre blocks*	Tier 5 *1-20 acre blocks*
Raccoon	Raccoon	Raccoon	Raccoon	Raccoon
Hare	Hare	Hare	Hare	
Coyote				
Small rodent	Small rodent	Small rodent	Small rodent	Small rodent
Porcupine	Porcupine	Porcupine	Porcupine	
Bobcat				
Cottontail	Cottontail	Cottontail	Cottontail	Cottontail
Beaver	Beaver	Beaver	Beaver	
Black bear				
Squirrel	Squirrel	Squirrel	Squirrel	Squirrel
Weasel	Weasel	Weasel	Weasel	
Mink	Mink	Mink		
Fisher				
Woodchuck	Woodchuck	Woodchuck	Woodchuck	
Deer	Deer	Deer		
Muskrat	Muskrat	Muskrat	Muskrat	Muskrat
Moose	Moose			
Red fox	Red fox	Red fox	Red fox	Red fox
Songbirds	Songbirds	Songbirds	Songbirds	Songbirds
Sharp-shinned hawk	Sharp-shinned hawk	Sharp-shinned hawk		
Bald eagle	Bald eagle			
Skunk	Skunk	Skunk	Skunk	Skunk
Cooper's hawk	Cooper's hawk	Cooper's hawk		
Harrier	Harrier	Harrier		
Broad-winged hawk	Broad-winged hawk	Broad-winged hawk		
Goshawk	Goshawk			
Kestrel	Kestrel	Kestrel		
Red-tailed hawk	Red-tailed hawk			
Horned owl	Horned owl	Horned owl		
Raven	Raven			
Barred owl	Barred owl	Barred owl		
Osprey	Osprey	Osprey		
Turkey vulture	Turkey vulture	Turkey vulture		
Turkey	Turkey	Turkey		
Reptiles	Reptiles	Reptiles	Most Reptiles	Most Reptiles
Garter snake	Garter snake	Garter snake	Garter snake	
Ring-neck snake	Ring-neck snake	Ring-neck snake	Ring-neck snake	
Amphibians	Amphibians	Most Amphibians	Most Amphibians	Most Amphibians
Wood frog	Wood frog	Wood frog		

From Above and Beyond." Campoli, J., Humstone, E., & MacLean, A. 2002.

Pattern Matters

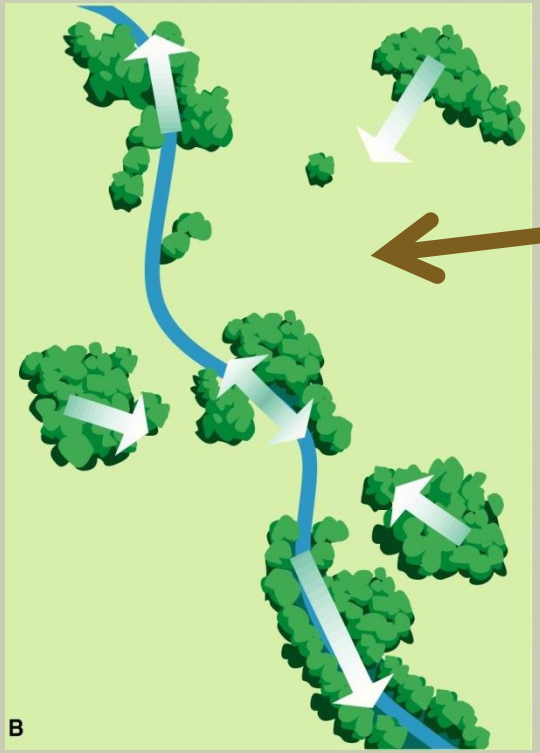
Forest Fragmentation



Less fragmented forest in a rural community

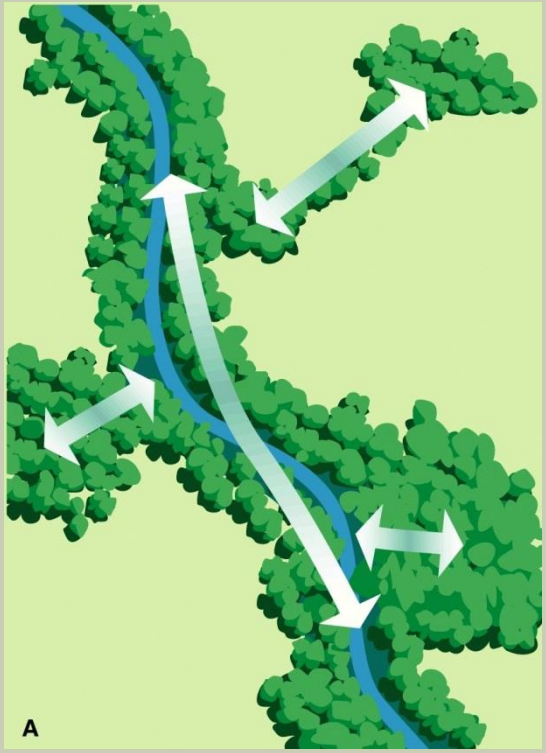
More intense fragmented forest in a rural community

Connectivity: Wildlife



Barriers to animal movement

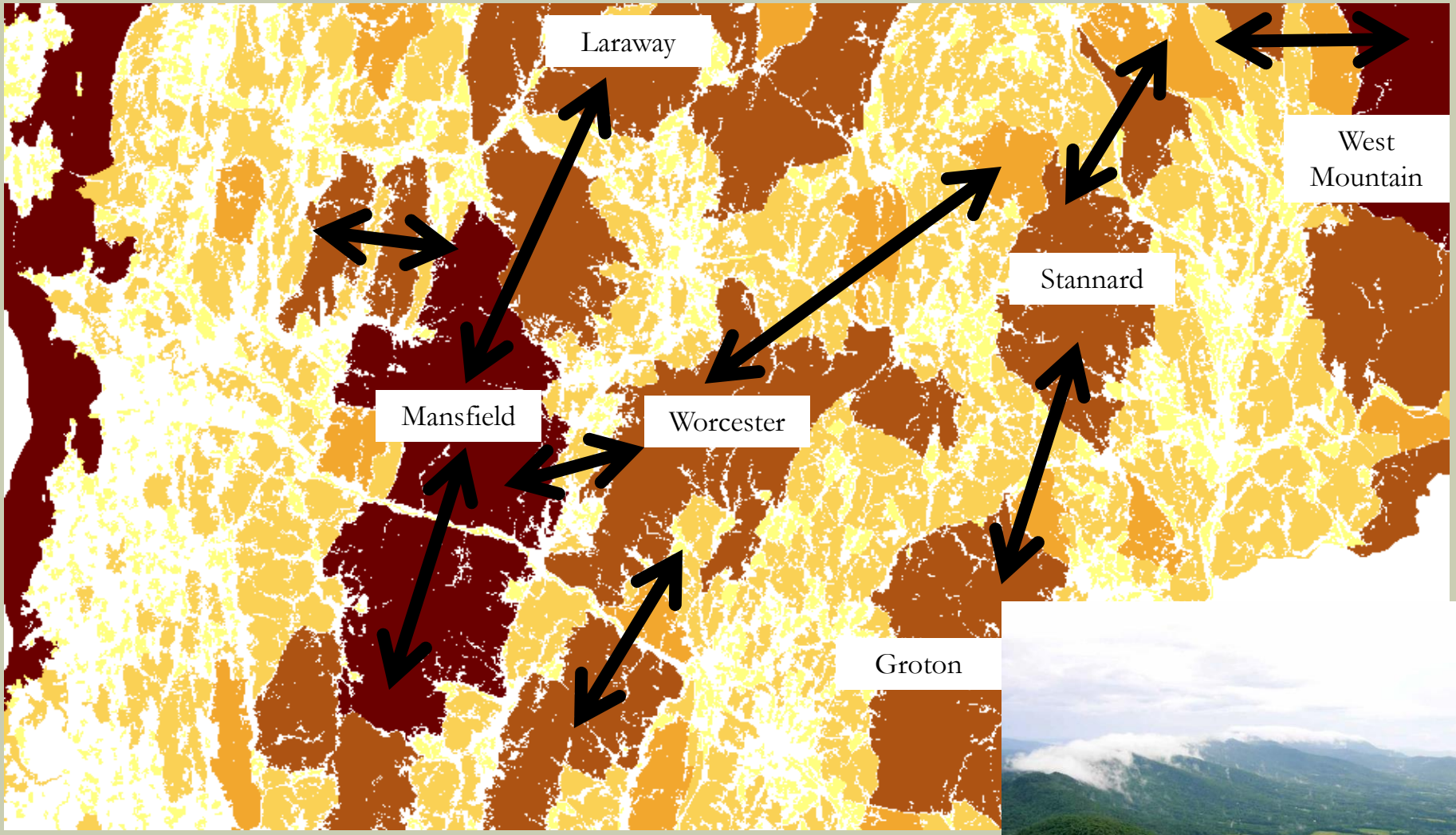
- Roads
  - Traffic Volume
  - Traffic Speed
- Development
- Agriculture



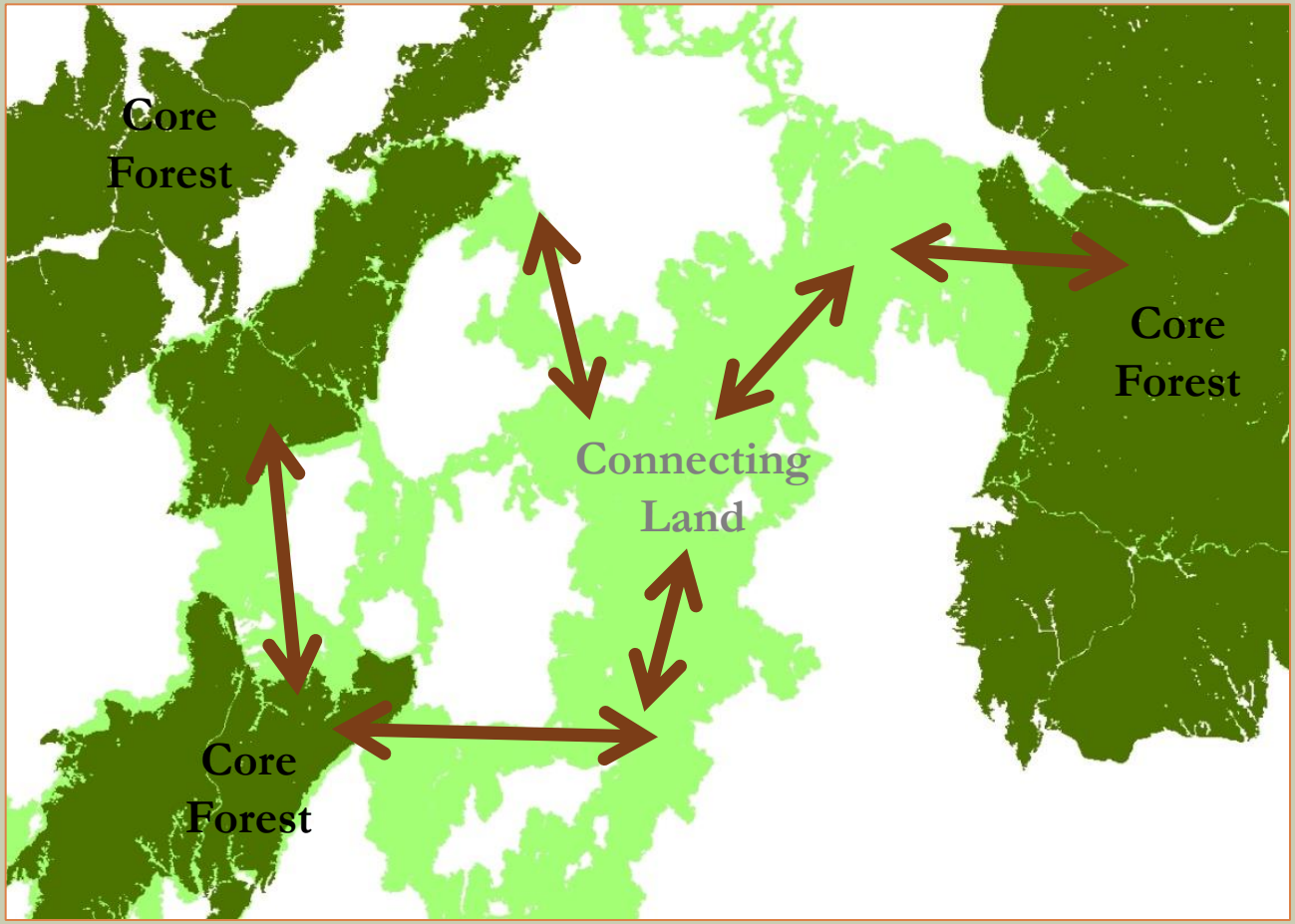
- Islands of habitat are isolated
- River banks don't allow for animal movement

- Islands of habitat are connected (Uplands to Lowlands)
- River banks are travel corridor

Connecting the Blocks



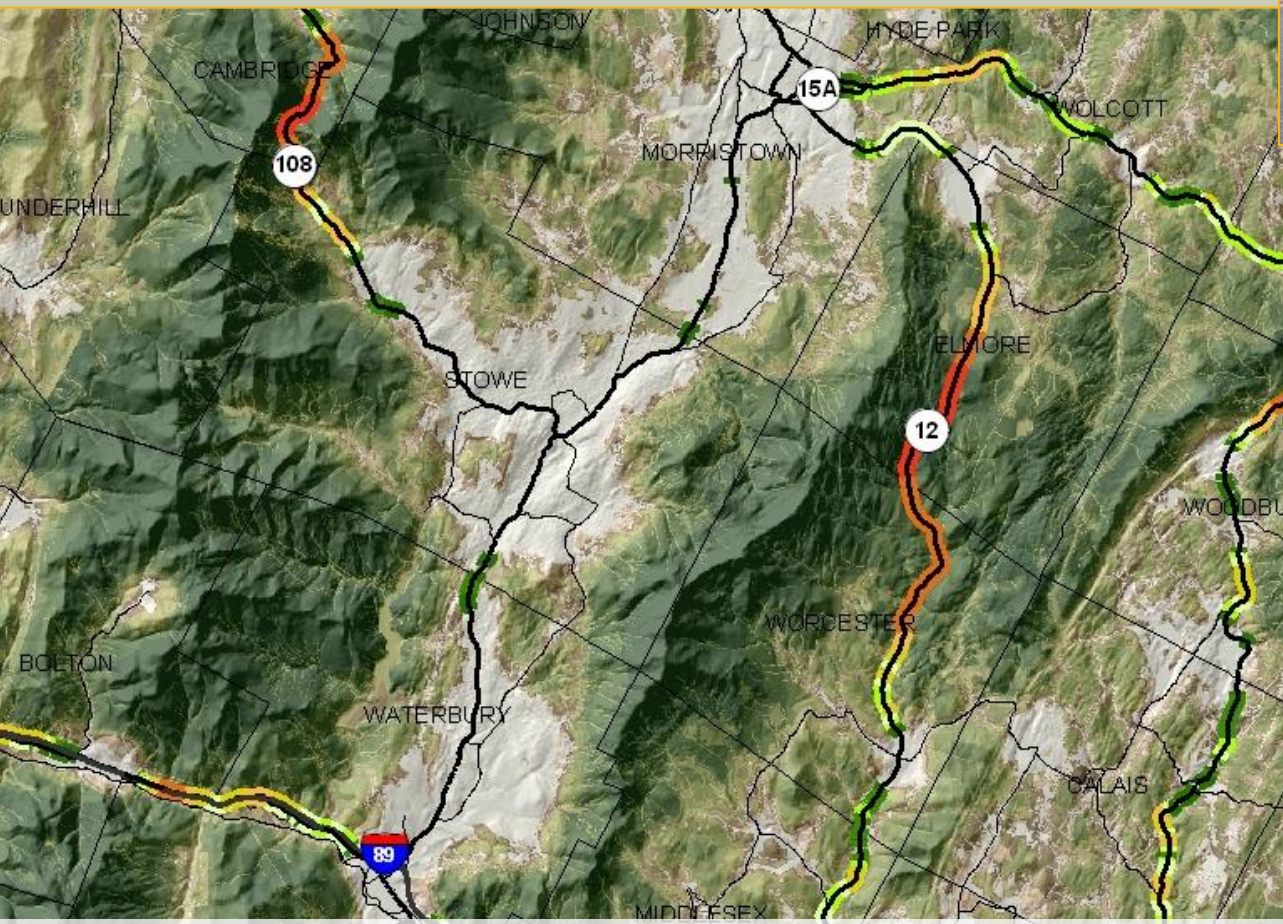
Connectivity: Ecosystem Resiliency



- Plants & Animals are adjusting their ranges
- Many will use this network

Maintaining & Enhancing habitat connectivity allows for plant and animal migration

Wildlife Crossings



Where are wildlife likely to cross?

Based on trees, wetlands on both sides of a road

Connectivity: Aquatic

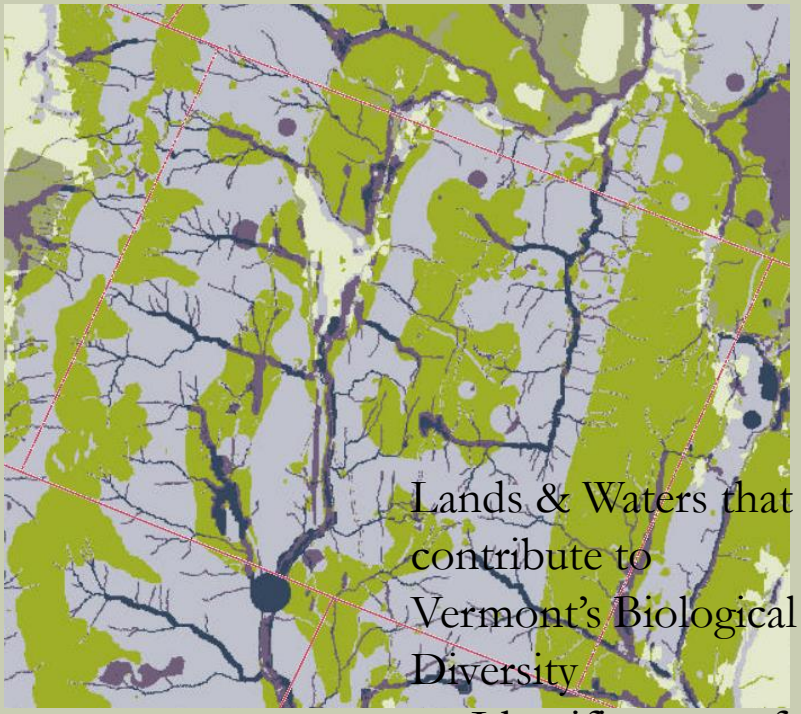
Culvert is a barrier

Culvert allows for
Aquatic Organism Passage

- Poorly installed crossing structures fragment aquatic habitats
- Limit recreational opportunity
- Disequilibrium in sediment transport

Riparian Habitats

Tiered Contribution to Biodiversity



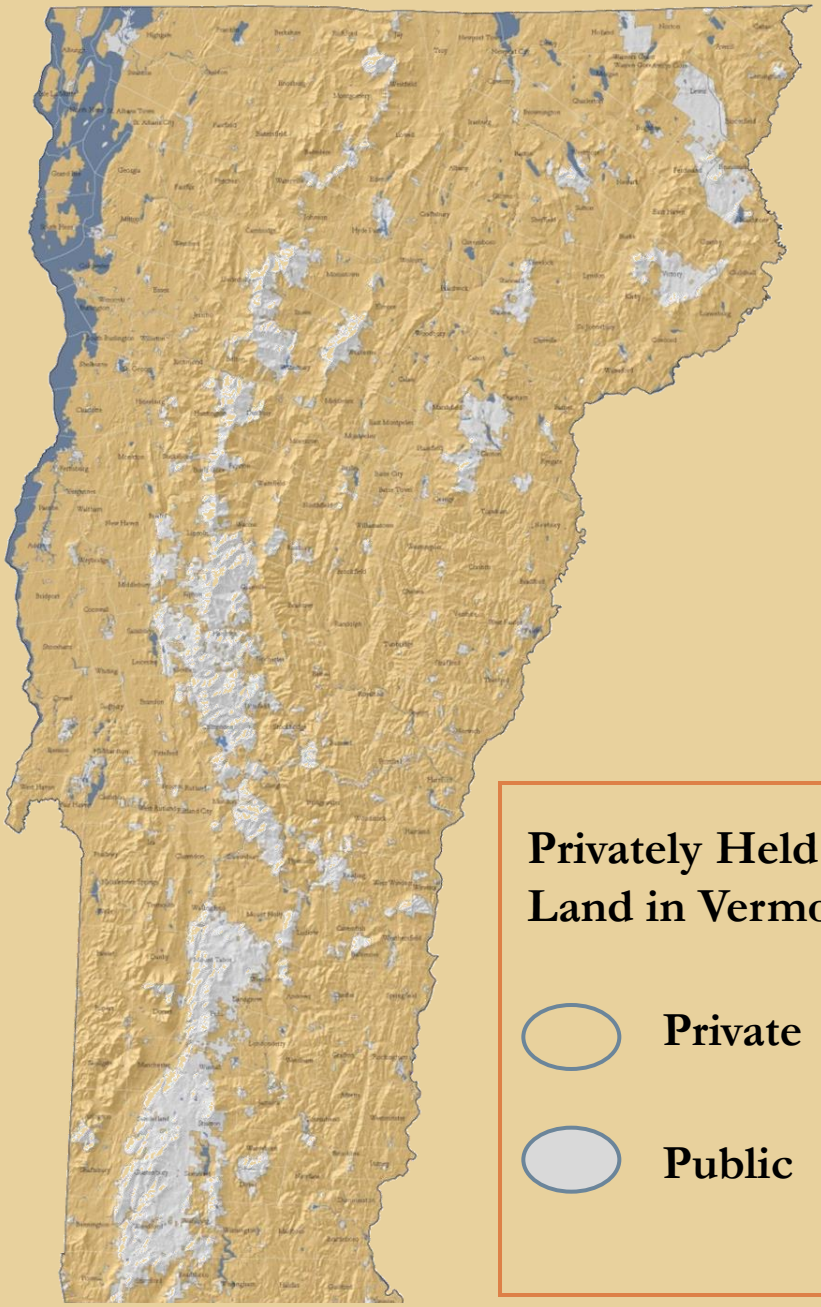
Roxbury, VT

Lands & Waters that contribute to Vermont's Biological Diversity

- Identifies area of overlap btwn 21 components

Tier 1-Greatest	5%
Tier 2-Very High	8%
Tier 3-High	46%
Tier 4-Moderate	39%
Tier 5-Low	1%
Tier 6: Insufficient data	2%

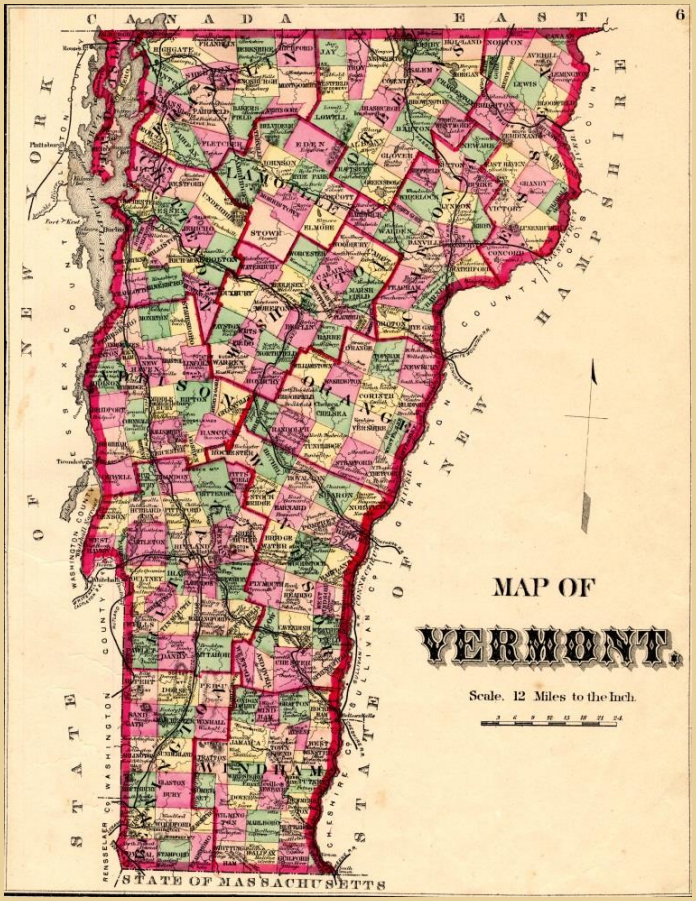
Planning for Development



Privately Held Land in Vermont

Private

Public



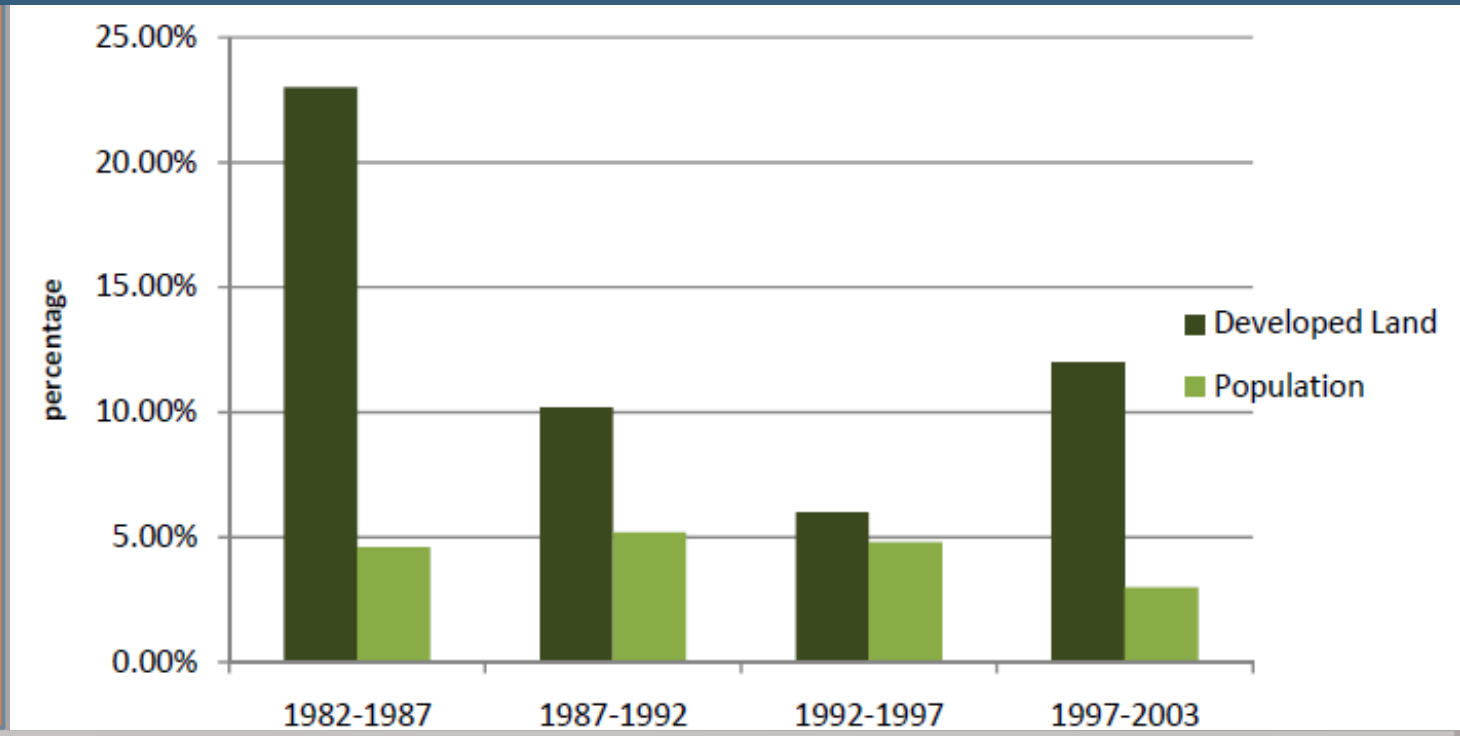
81% of Land in Vermont is Privately Owned

Population and Housing Trends

By 2030, Vermont's population is expected to increase by **14%** with an additional **86,000** residents.

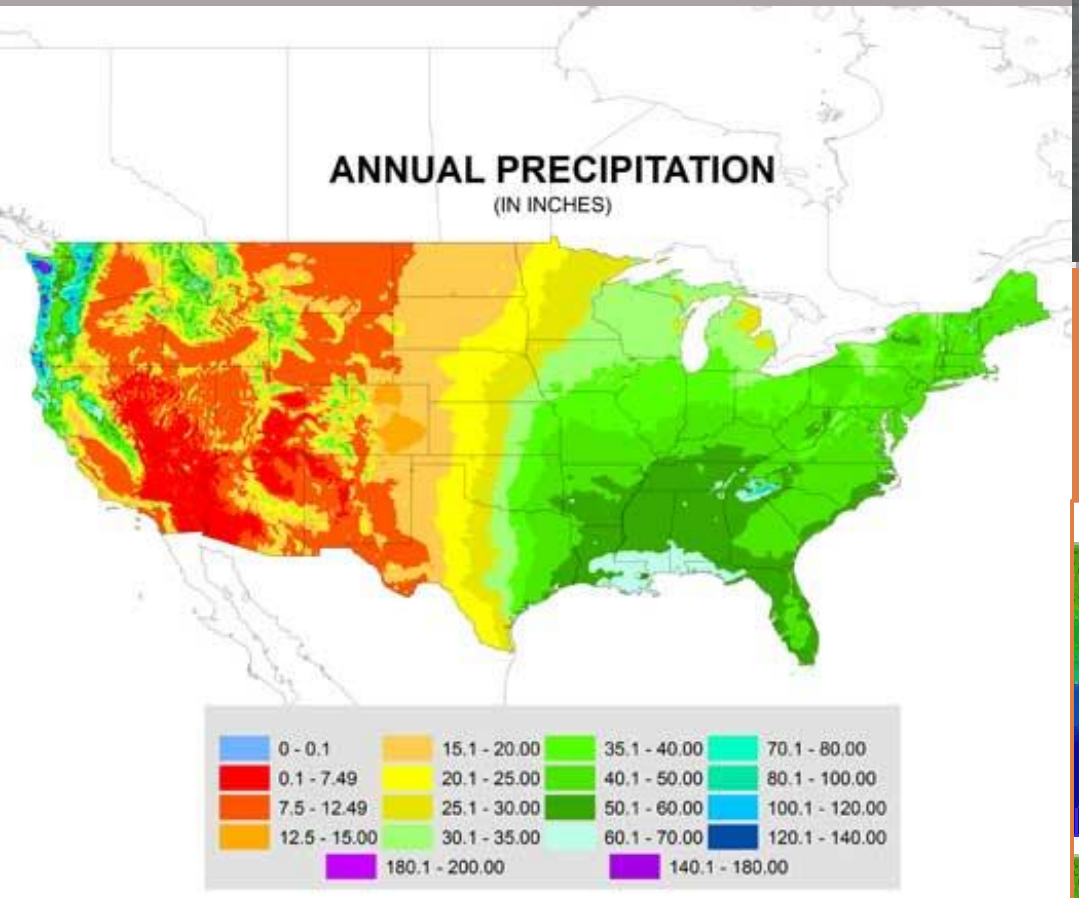
Development Outpaces Population

Since 2000, there have been approximately 1,400 new households annually.



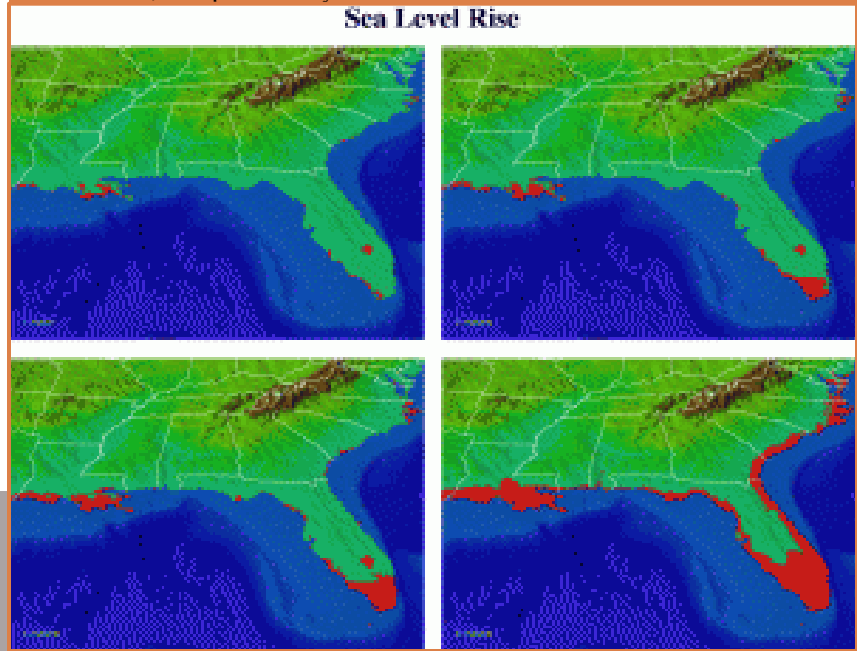
U.S. Census, 2010. Vermont Housing Finance Agency, 2009. Transition Vermont, 2009

Climate Refugees?



Above: Tuckerton, NJ on Oct. 30 2013 after Hurricane Sandy

Below: Red areas indicate regions of the southeastern US that would be below sea level for rises of 1, 2, 4 and 8 meters, respectively. Photo credit NOAA

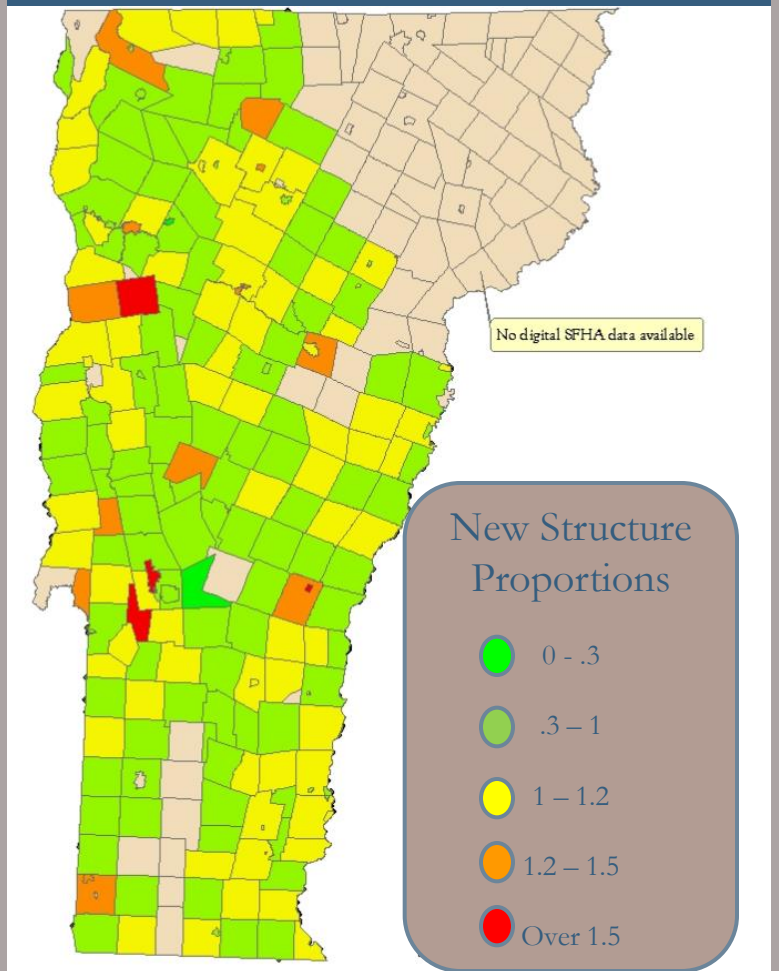


Poor Land Use Planning

COSTS US ALL

Tropical Storm Irene 2011

Changes in the # of structures in floodplains from 2008 to 2010




Thank You!