Forest Adaptation Vermont State Lands

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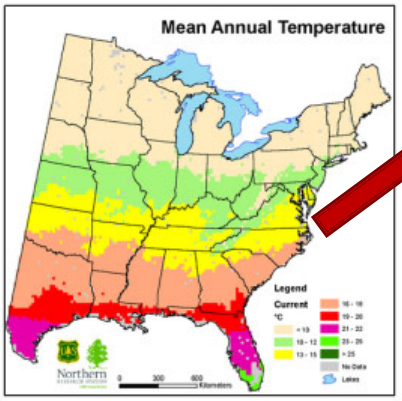
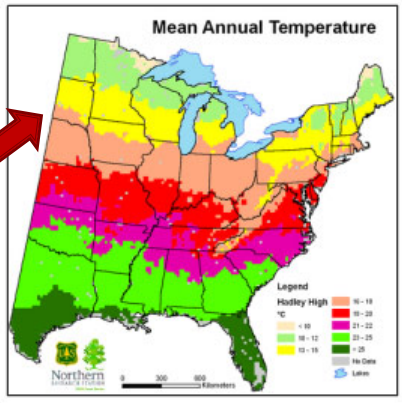
VT Department of Forests, Parks & Recreation

Annual Temperature Change

Current

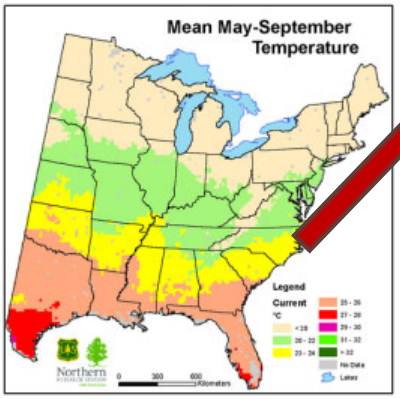


Projected

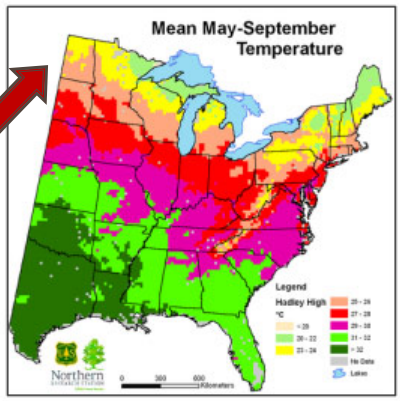


Growing Season Temperature Change

Current



Projected



Down wood

Poor regeneration

Deer browse

Invasive plants

Sensitive plants

Climate Change

Beech sprouting

Wetlands

Riparian protection

Snags

Wildlife

Winter harvest

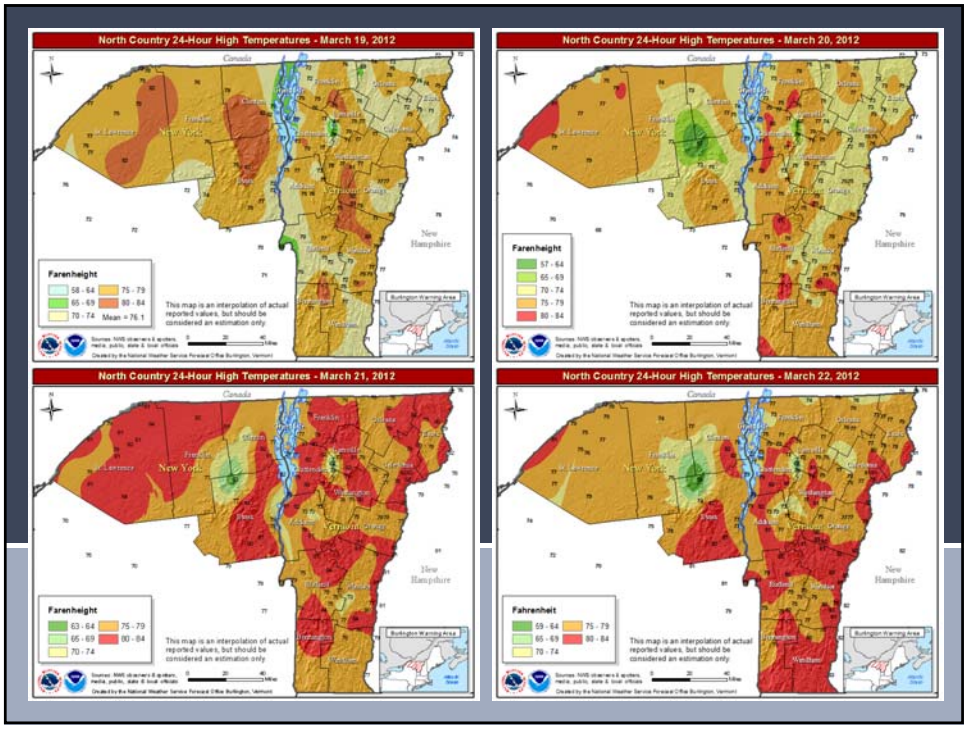
Off site

Ferns

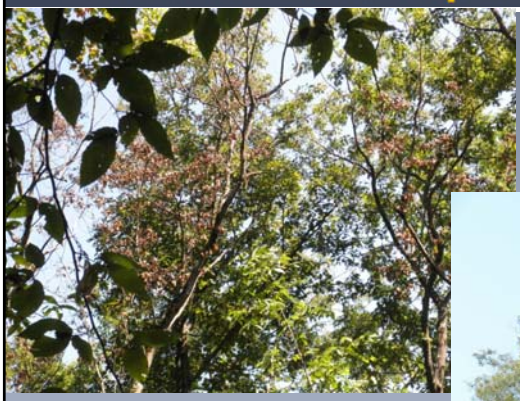
Aren't we already practicing good forestry?

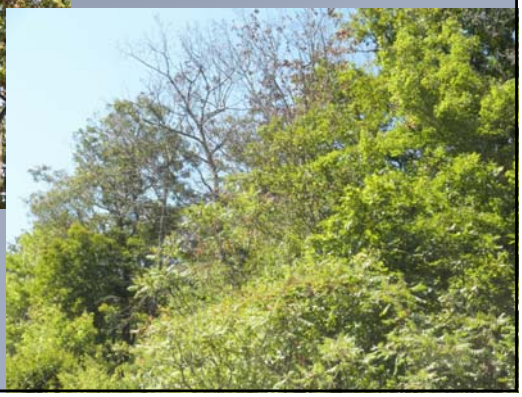
Hinesburg Town Forest

December 1, 2010 - 32 acres wind event


North Country 24-Hour High Temperatures - March 19, 2012
North Country 24-Hour High Temperatures - March 20, 2012
North Country 24-Hour High Temperatures - March 21, 2012
North Country 24-Hour High Temperatures - March 22, 2012
Farenheight
Fahrenheit
This map is an interpolation of actual reported values, but should be considered an estimation only.

Oak decline
Extreme warm spring





Operational Issues

Heavy Precipitation Is New "Normal"

Prepare roads and waterways, implement AMPs

Windstorms

Ice storms

Spring phenology out of sync

Spring Frost

The magnitude of change is greater than we think – we need to…

- Rely on good science.
- Err on the conservative side when weighing forest benefits vs economic benefits.
- Be flexible in planning operations.
- Monitor outcomes and respond to change.

#	Project
1	The Narrows Wildlife Management Area
2	Okemo State Forest
3	Victory Basin Wildlife Management Area
4	Mount Philo State Park
5	Lewis Creek Wildlife Management Area
6	Putnam State Forest

State Lands Forest Adaptation Projects

Public Land Management

- Plan, public input, plan, public input
- New Policy
- Public input
- Action
- Include some placeholder for forest adaptation strategies.

Climate Change Demonstration Area

- The Narrows Wildlife Management Area
  - West Haven
  - [illegible] Acres

- 51 RTE
- Invasive plants
- Browse

The Narrows Wildlife Management Area – Champlain Valley

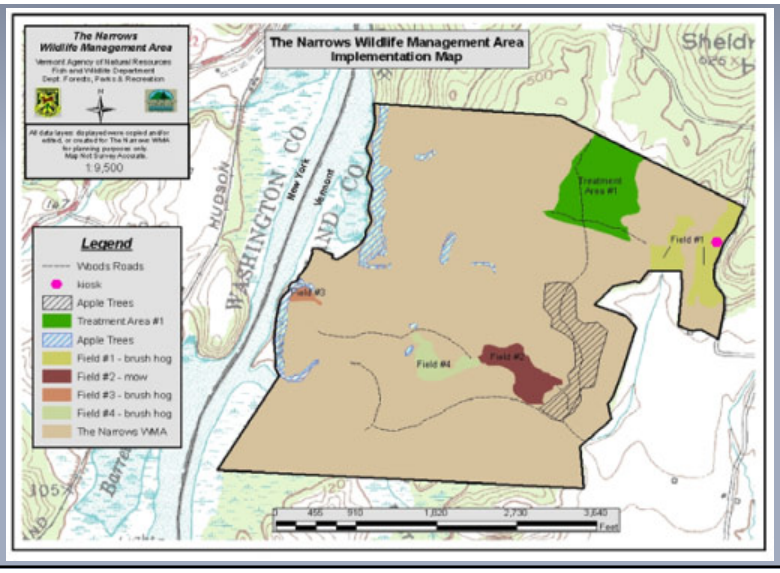
- The Narrows contains the highest known concentration of rare, threatened and endangered species than any other site in Vermont.
- 429 acres in size, 92% forested with the remaining 8% in openings
- Was created to conserve high quality wildlife habitat

Forest Management Objectives

- Wildlife Management
- Protection of RTE species

- Treatment Area- 2 Stands
  (Regeneration fair to poor)
  - White pine stand (83% white pine)
  - Oak/hardwood stand(26% sugar maple, 19% white pine, 7% red oak, <1% shagbark hickory)

The Narrows Wildlife Management Area



The Narrows – Management Objectives

1. Protect and enhance rare, threatened and endangered species and their habitat.
2. Enhance the quality of natural community condition.
3. Enhance wildlife habitat.
4. Demonstrate exemplary wildlife management practices to serve as a model for private lands.
5. Provide sustainable, periodic timber harvesting to promote wildlife habitat and forest productivity.

Heavy deer browse

Long-term biological legacies of herbivore density in a landscape-scale experiment: forest understoreys reflect past deer density treatments for at least 20 years.

Nuttle et al, Journal of Ecology, 2014, 102:221-228

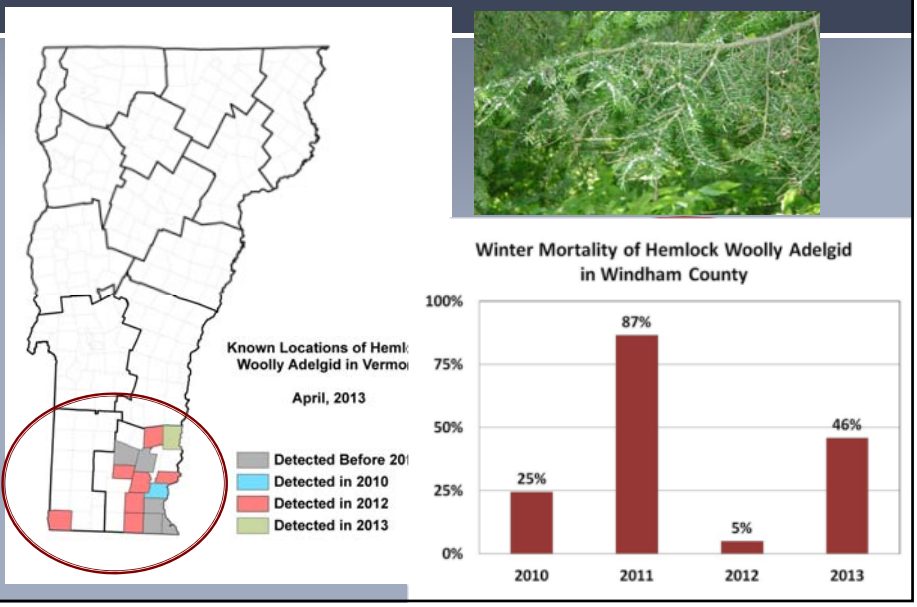
- 30 year experiment
- Elevated deer densities cause significant, profound legacy effects on understory vegetation persisting at least 20 years.
- Deer avoidance of ferns allows them to expand and dominate sites for years following reduced deer densities.

Fern Cover Impeding Regeneration

Invasive plants where canopy gaps

Invasive Plants Will Do Well

Hemlock Woolly Adelgid



Prescription

- Stand 1– white pine stand but natural community type: Hemlock Forest.
- Release regeneration, reduce UGS, and release mast.
- Thin to maintain stand vigor and value as winter cover.
- Gradually convert to hemlock.
  - Maintain hemlock on best soils
  - Maintain hardwood component

Prescription

- Stand 5 – oak/hardwood stand (natural community: Mesic Maple-Ash-Hickory-Oak Forest).
- Uneven-aged silvicultural treatment including single tree and groups to stimulate regeneration and to release mast species.
  - Group and crop tree release
  - Scarification for oak regeneration
  - Deer exclosures in small patches
- Groups will be limited in size due to invasive species issues.
  - Treat invasive species

Added Investment

- Deer Browse
- Assess deer impacts on regeneration at Year 0, 1, 5, 10 & 15
- Install small enclosures to protect patches of regeneration in harvest gaps
- Cost for labor = $750
- Enclosures (33X33 ft)= $500-$2,000/enclosure

Added Investment

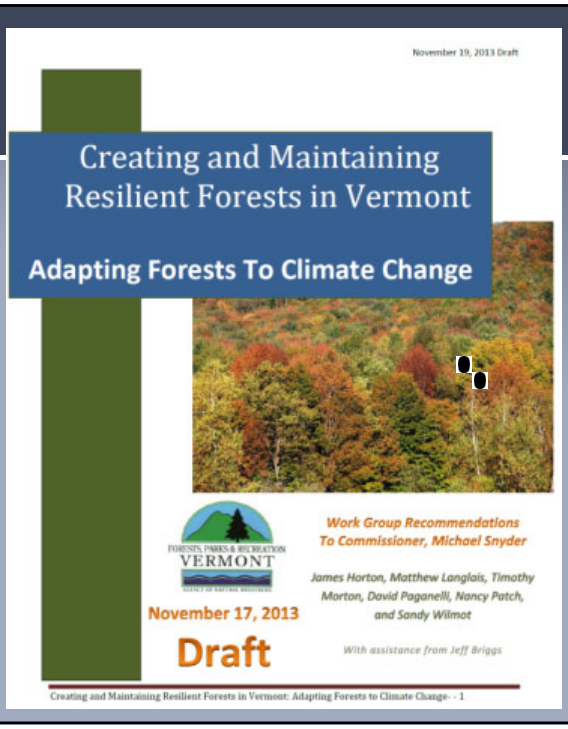
- Invasive plant species
- Assess regeneration and invasive plant species impacts on regeneration at Year 0, 1, 5, 10 & 15
- Apply herbicides using backpack sprayer to control non-native invasive plants, with bucket covers to protect sensitive species. Pre- and post-treatment trials will be tested.
- Cost for labor = $750
- Herbicide = $35-245/acre

Added Investment

- Hemlock woolly adelgid
- Assess presence/absence of insect and health of hemlock at year 7 & 15.
- Cost of labor = $600

Project Credits

- Andy Whitman, Manomet
- Lisa Thornton, VT Stewardship Forester
- John Lones, VT State Land Forester
- Bob Zaino, VT F&W Natural Heritage Ecologist
- Rutland State Land Stewardship Team



Adaptive Silviculture Work Group

David Pagenelli
Jim Horton
Matt Langlais
Nancy Patch
Tim Morton
Sandy Wilmot

The Process

- Where to start depends on your style.
- Checklist of options.
- Guided worksheets.
- The art and science canvas.

Management Goals

- Identify the overall management goal(s) for the property and specific management objectives for each stand or area to be managed
- What is a successful outcome and how could you determine this?

Victory Basin Wildlife Management Area

- Mature spruce-fir stand
- Rich wildlife habitat
- Deer wintering area

Climate Change Impacts

- How will climate change predictions affect this parcel?
- What are the most and least adaptive features of the site and species?
- Are their pre-existing management problems?
- Are these short term or long term impacts?

Climate factors to consider

- Higher summer temperature
- Higher winter temperature
- Winter freeze/ thaw cycle
- Current Range – north/south
- Longer growing season
- Drought
- Heavy precipitation
- Wind storms
- Ice storm & Heavy snow pack
- Increase insects or diseases
- Non-native invasive plants
- Increase carbon dioxide
- Increase ozone

Other stress factors

Acid deposition
Browse susceptibility
Disease organisms
Fire susceptibility
Forest management
Insect pests
Invasive plant susceptibility
Ozone sensitivity
Wind and drought sensitivity

Climate Factors At Victory Basin

- Windthrow
  - Wetter fall, winter spring exacerbate windthrow
- Warmer winters, wetter summers
  - Decrease operational window

Climate Change Effects on Management Objectives

- For each management objective, assess how climate change will affect your ability to reach a successful outcome.
- Consider modifying your management objectives if needed.

Specific objectives and strategies at Victory Basin

- Promote softwood regeneration
  - Moisture issues
  - Windthrow gaps
- Maintain overstory softwoods
  - Favor red spruce over balsam fir
- Maintain travel corridors for wildlife
  - Increase buffer width of corridors

Choose Adaptation Strategies

- Diversify species and structural features
- Protect soils from disturbances
- Reduce unwanted competition
- Pay attention to regeneration requirements of each species
- Build resistant stands
- Identify areas for refugia
- Assist species transitions
- Consider the wider landscape values

Other adaptation strategies at Victory Basin

- Improve wildlife habitat for resilience
  - Uneven age management
  - Increase structural complexity
- Hydrology improvements
  - Improve roads – locations were inherited
  - This will be expensive
- Cleaning/TSI to promote regeneration in gaps
  - Guide species composition early in stand development
  - Too expensive to implement

Learn From Every Action

- Keep records of your adaptation tactics
- Visit the site to learn how successful your actions were (monitor)
- Develop a list of measurements that help you learn of specific outcomes (indicators)
- Consider follow up actions if your outcome was unexpected (adaptive management)

Monitor at Victory Basin

- Softwood regeneration
  - Stems/acre softwood after 5 years
- Maintain softwood canopy
  - Crown coverage
  - Goal of 70% canopy closure