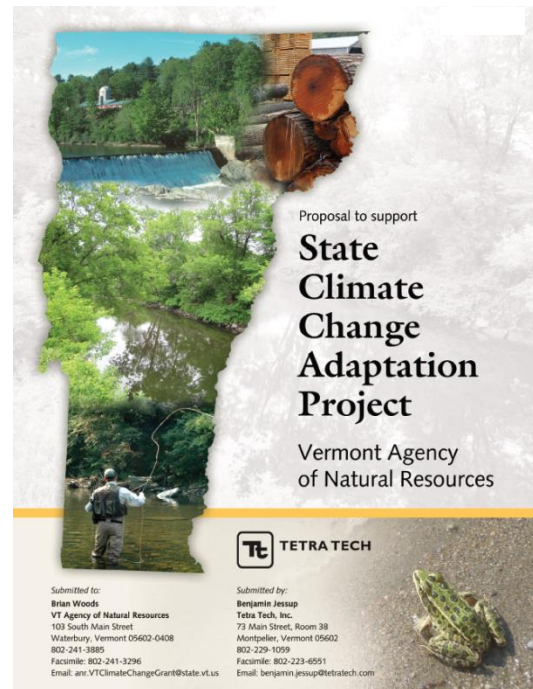


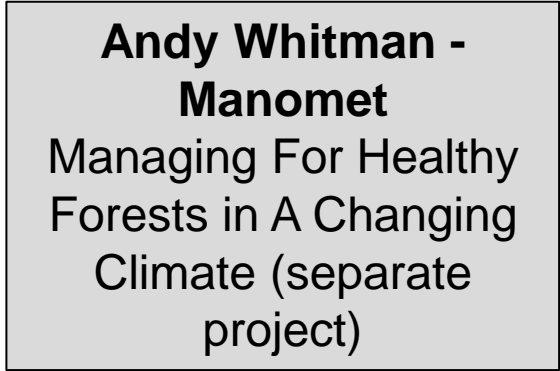
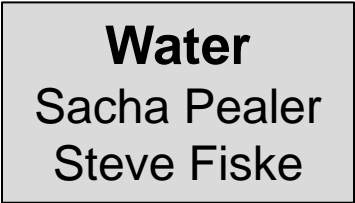
A strategic framework for climate change vulnerability assessments and action planning for the wildlife, fisheries, forestry and water resources sectors within the Vermont ANR



The views expressed in this talk are those of the author and they do not necessarily reflect the views or policies of the Vermont Agency of Natural Resources



Chris Hilke - **NWF**



- Other related (but separate projects):
- NEAFWA's regional vulnerability assessments
 - UVM's RACC team

Major Tasks

Write Report

- Summarize **historic climatic trends & future projections**
- Summarize information from climate change **vulnerability assessments**
- Identify **information gaps**
- Develop a State climate change **adaptation strategy framework**

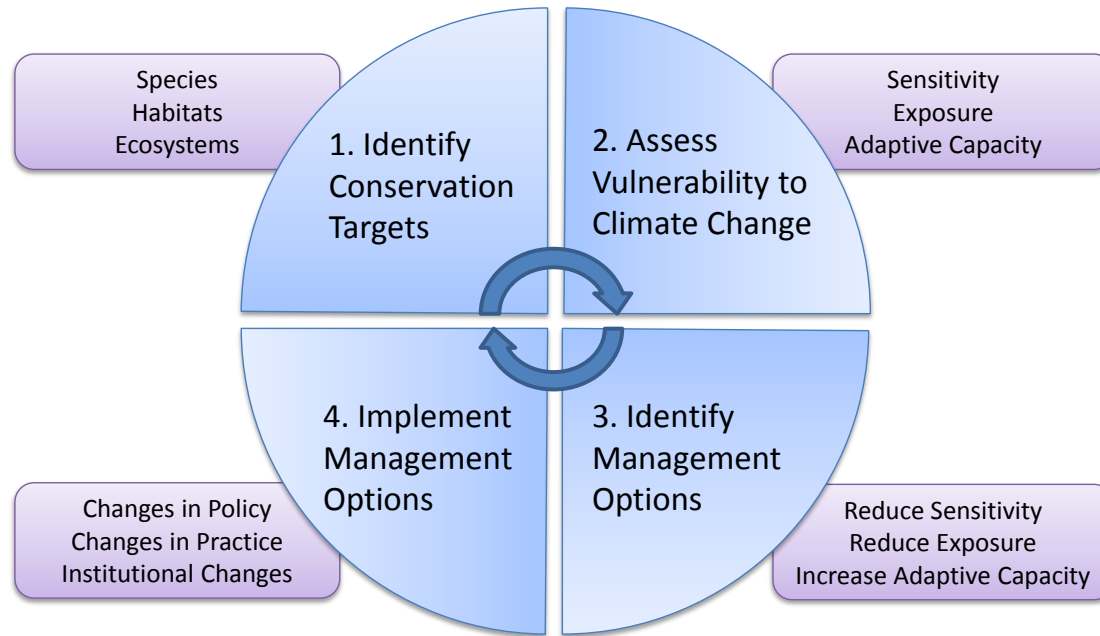
Held 2 workshops in 2012

1. Vulnerability assessments (July)
2. Adaptation strategies (December)

Main objectives:

- ***Educate*** participants on what other states have done/are doing with natural resource-based vulnerability assessments and adaptation strategies.
- ***Elicit expert opinion***
- ***Find points of coordination among VANR departments and actions***

Framework for developing climate change adaptation strategies

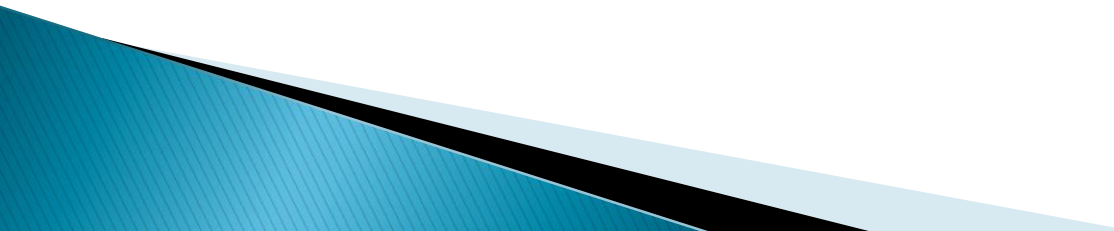


Glick P, Stein BA, and Edelson N. 2011. Scanning the conservation horizon: a guide to climate change vulnerability assessment. Washington, DC: National Wildlife Federation. Available at: www.nwf.org/vulnerabilityguide

ADAPTATION FRAMEWORK

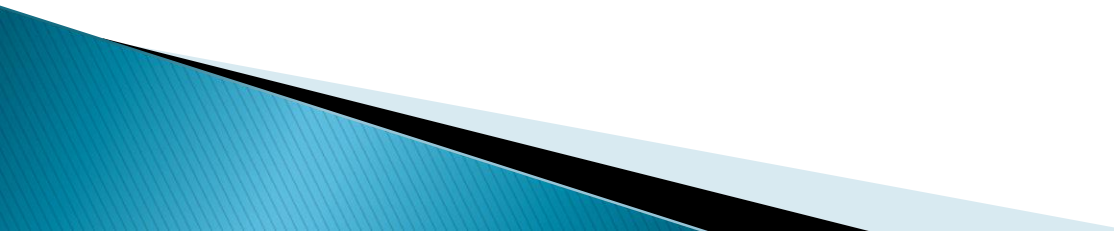
- Create a strategic framework for climate change vulnerability assessment and action planning
- Focus on four habitat groups:
 - Lakes ☿ Rivers☿ Wetlands☿ Uplands
- Find points of coordination among VANR departments and actions

DEVELOPING ADAPTATION STRATEGIES

- ▶ What actions or strategies could increase the beneficial impact of mediating factors, reduce vulnerability to exposures/effects, and create greater resilience for the habitat type?
 - ▶ What are the specific steps and investments needed to implement those strategies?
- 

The ensuing slides are initiatives/focus areas that were identified as important cross-sector themes at the adaptation strategies workshop.

The slides also include recommendations on next steps that VANR could take if it decides to pursue any of these focus areas.

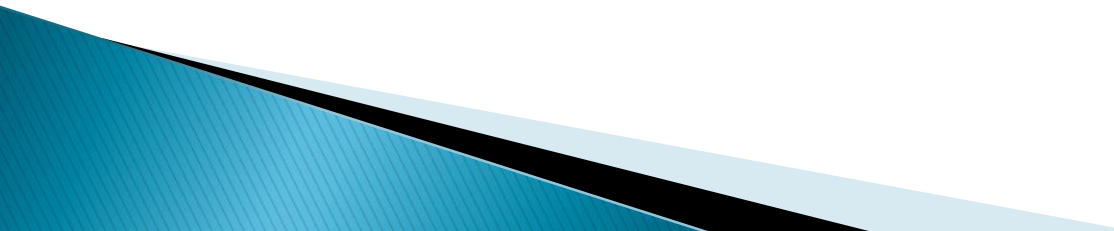


Initiatives/focus areas that were identified as important cross-sector themes at the adaptation strategies workshop

Promoting resilience and resistance by reducing other stressors

- Reducing impacts from nonpoint source pollution
- Providing better support at the town and community level
- Reducing impacts from invasives, pests and disease
- Wetland restoration
- Target areas with high chances of recoverability

Potential next steps:

- Conduct an **inventory** of ANR actions and planning efforts aimed at reducing existing stressors
 - Assess these actions in light of climate-related impacts and vulnerabilities (do these actions **adequately protect** the environment and human populations from the **additional stresses of climate change**?)
- 

Initiatives/focus areas that were identified as important cross-sector themes at the adaptation strategies workshop

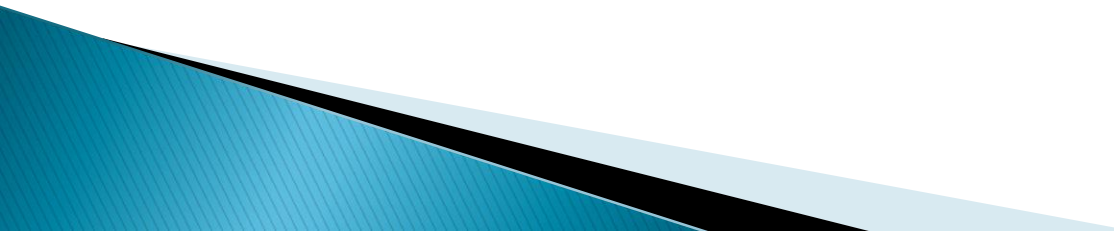
Conserving refugia

Potential next steps:

- Develop a **methodology** (with a sound scientific basis) for defining and identifying refugia within each major habitat group
- Identify **indicators** to track
- **Identify** refugia
- **Prioritize**
- **Protect**
 - Education and outreach
 - Alignment of resources
 - Regulatory
- **Monitor** (are hypotheses holding true? are organisms responding as expected?)
- **Adapt** as necessary

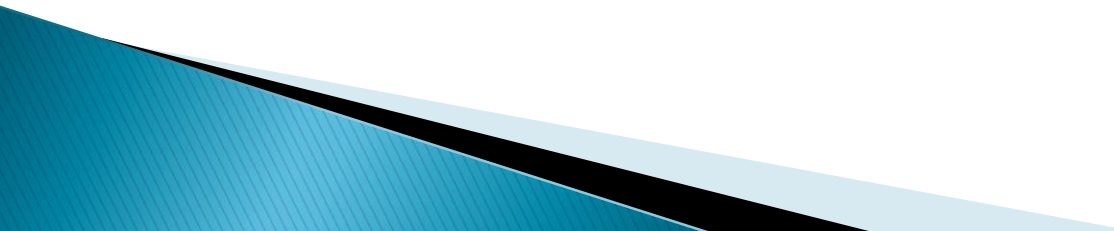
Initiatives/focus areas that were identified as important cross-sector themes at the adaptation strategies workshop

Monitoring and assessment - will take on added importance and different forms in light of climate change

- Climate change response/adaptation monitoring
 - Sentinel monitoring networks
 - Citizen science
 - Airborne and satellite remote sensing
 - Invasives
- 

Monitoring and assessment continued...

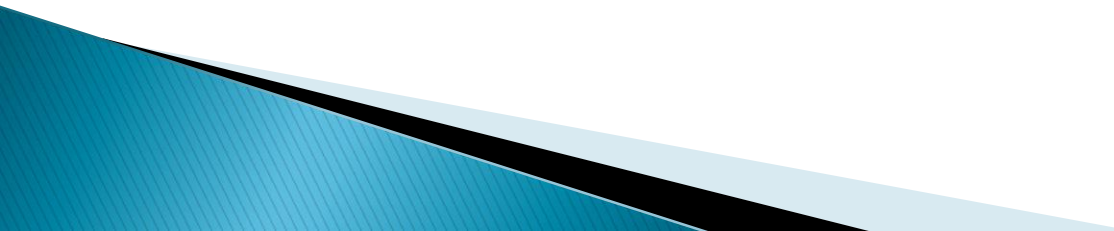
Potential next steps:

- Conduct an **inventory** of existing citizen, university, government and NGO monitoring efforts, including budgets, geographic coverage, information gathered, and staffing
 - **Evaluate** whether these data and methods are sufficient in light of climate-related exposures, impacts and vulnerabilities
 - **Explore additional monitoring possibilities**, including the potential for volunteer or crowd-sourced data and for creating a collaborative data clearinghouse.
 - Identify and **prioritize needs**
 - Conduct periodic literature searches to **stay abreast of the latest information** and **monitoring tools** that are becoming available
 - **Track initiatives** being carried out at the national, regional, state and local levels that pertain to each habitat group
 - Identify and pursue **funding** opportunities
- 

Initiatives/focus areas that were identified as important cross-sector themes at the adaptation strategies workshop

Data infrastructure - create platform for sharing, accessing and disseminating information.


Potential next steps:

- **Evaluate what is currently being done** with monitoring and assessment data
 - What type of information is currently being collected?
 - Who is collecting the information?
 - Where are those data being housed?
 - What types of new information does the ANR and its partners want to collect?
 - How will these data be used?
 - Is the current system adequate?
 - **Conceptualize options for storing and sharing information**
 - **Track data infrastructure initiatives** being carried out at the national, regional, state, local levels
 - Identify potential **funding** opportunities
- 

Initiatives/focus areas that were identified as important cross-sector themes at the adaptation strategies workshop

Landscape-level planning - climate change will increase the likelihood and magnitude of shifts in the distributions of species, habitats, and ecosystems

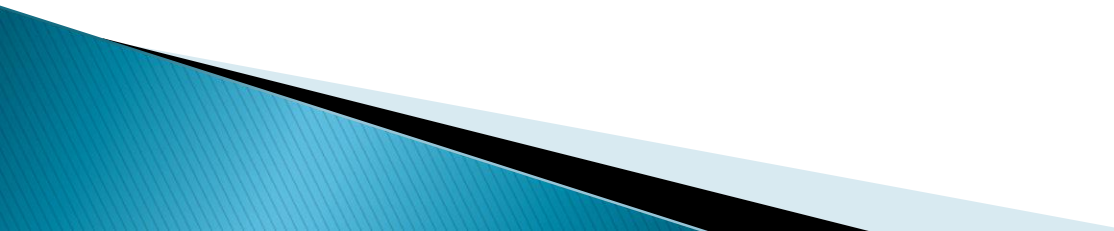
Potential next steps

- Identify and preserve movement corridors, noting where this could also provide greater connectivity for the spread of invasives
 - Improve habitat connectivity to facilitate movement of displaced organisms
 - Improve buffering to safeguard core, high-quality habitats or natural systems function
 - Conserve large blocks of habitat where large areas can facilitate adaptation and resilience
-
- *VT Natural Heritage Program*
 - *The Staying Connected Initiative (SCI)*
 - *Anderson et al. 2012 - Resilient Sites for Terrestrial Conservation in the Northeast and Mid-Atlantic Region*
- 

Initiatives/focus areas that were identified as important cross-sector themes at the adaptation strategies workshop

Groundwater - very important yet poorly understood resource

Potential next steps

- Find **funding** for the “Comprehensive Groundwater Characterization of Targeted Watersheds” modeling exercise
 - General need for **developing a better understanding of groundwater resources** (extent, source and movement) in Vermont
 - **Integrating** groundwater into the **Surface Water Management Strategy**
 - Establishing a **sentinel groundwater monitoring network**
 - Developing a **better understanding of the linkages** between groundwater and biota
 - Evaluate **groundwater regulations** in light of climate change
- 

Initiatives/focus areas that were identified as important cross-sector themes at the adaptation strategies workshop

Sustainable flows – projections for extended summer low flow periods; will affect water supply, water quality and habitat functions

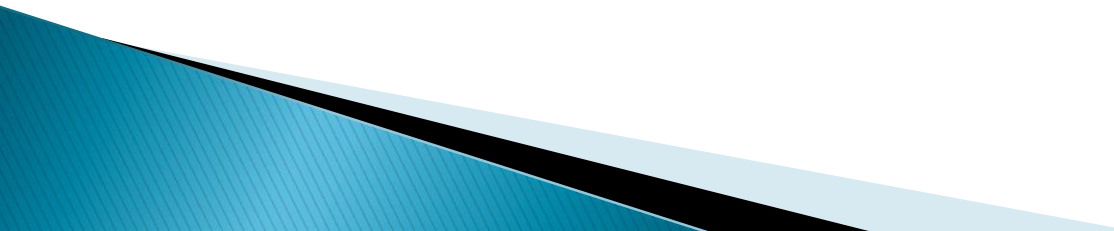
Potential next steps

- Assess Vermont's current **flow regulations** in light of climate-related impacts and vulnerabilities
- Evaluate whether the **flow statistics** that typically constitute design flows for water quality planning (e.g. 7Q10s - the lowest 7-day average flow that occurs (on average) once every 10 years) will still be adequate under future climate scenarios
- Explores **proactive actions** that could be taken to ensure that drinking water and wastewater systems (water sector) are sustainable and can fulfill their public health and environmental mission
- Track national and regional **initiatives** and potential **funding** opportunities.

Initiatives/focus areas that were identified as important cross-sector themes at the adaptation strategies workshop

Ecosystem services - resources and processes that are supplied by ecosystems that humans benefit from

Potential next steps

- **Review existing resources**
 - Work on **developing language/information** on ecosystem services that could potentially be **integrated into planning documents and educational materials**
 - Conduct **periodic literature searches** to stay abreast of the latest information and tools
 - **Track the international and national initiatives** (IPBES and QuEST)
- 

HIGHER LEVEL QUESTIONS

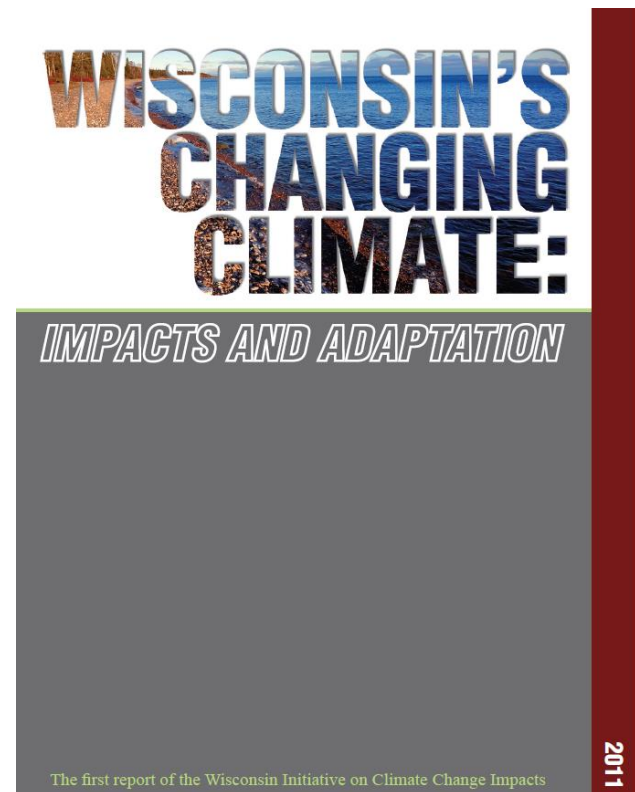
What management approach will the VANR take to address climate change & its associated uncertainty?

Process for integrating climate change into planning and implementation

- Vermont Forest Resources Plan (FRP)
- Wildlife Action Plan
- Surface Water Management Plan

End product?

- Report like Wisconsin's?



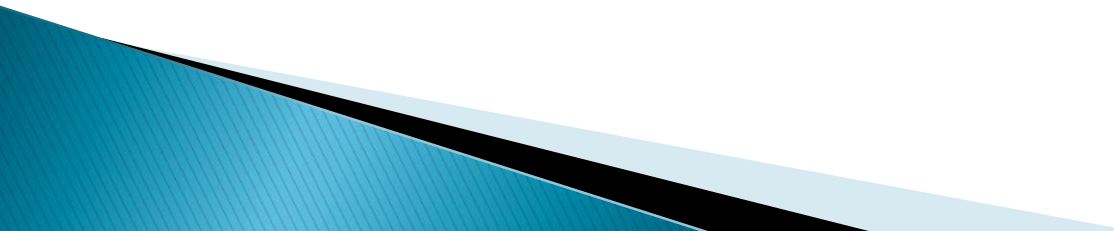
TIMEFRAMES FOR ACTION THAT OTHER ENTITIES HAVE ADOPTED

Actions	Timeframe	Situations in which commonly applied
no regrets	within the next 5 years	when the climate change factors relate to the stressors that are best known and are currently being addressed within managed areas; considered relatively robust to uncertainty in how climate change will play out in a given location
anticipated	over the coming 5-15 years	where indirect effects stressors are less well known, and/or interactions with climate change are less clear; additional information will be required to move forward, but participants could foresee their implementation
wait and watch	anticipate over a 15-30 year timeframe	limited amount of current knowledge; research questions are specified, investment will be required over upcoming decades in order to determine appropriate management actions

Comer et al. 2012

INVOLVEMENT FROM STAKEHOLDERS

Seeking a wide array of stakeholders in the process, including **local experts, state, federal and private organizations, other state agencies (e.g., VTrans and ACCD), interested public audiences, and natural resource-based industries** whose interests will be affected by climate change (e.g. agriculture, forestry, hunting, fishing, wildlife viewing, skiing/snowmobiling, tourism and other recreational user groups).



QUESTIONS? COMMENTS?



Jen Stamp (Jen.Stamp@tetrattech.com)