Taking Action: Building Resiliency in Our Lakes

The Process of Climate Change Adaptation in the Community

11th Annual Lake Links
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Key Issues Associated with Climate Change

1. Gradual increase in average annual temperatures
2. Changes in average precipitation amounts and patterns
3. Increase in frequency and severely of ‘extreme events’
4. Increased variability

Who Should Adapt?

Adaptation is needed at all levels

- Government agencies (Federal, provincial, municipal, etc.)
- Conservation Authorities (watershed)
- Your community – local organizations such as lake associations
  - On-shore (riparian and beyond)
  - In waterways
- You
  - Take measures on your property and in your community

You are important!

Governments play a role in supporting research, distributing information, and carrying out local level action on climate change adaptation

But…

Implementation of climate change adaptation measures cannot be carried out effectively without the participation of local organizations and individuals

Local Champions

- It is important in every community to have local "champions" who;
  - understand the importance of taking adaptive measures, *and*
  - are willing to work with the community to bring about necessary changes

Local champions are usually a small group of individuals from government, industry, and the public who understand the importance of a **cooperative approach** to working towards adaptation

Identifying Objectives when Developing Adaptation Plans

Overall objectives of community Climate Change Adaptation Plans should aim for the protection of:

- ecosystems as a whole
- those species that may already be stressed or will not have the ability to adapt at the projected rate of change
- 'free' functions that natural systems provide
- community infrastructure and individual properties
- other community values

Our goal is to decrease vulnerability and increase resilience of our natural and built systems to changing conditions

Approaches to Adaptation

…Various types of adaptation can be distinguished, including **anticipatory and reactive** adaptation, **private and public** adaptation, and **autonomous and planned** adaptation." *(IPCC)*

What type of adaptation should we, as a community be involved in?

The Case for Proactive Adaptation

Anticipatory, private and public, planned adaptation provides us with the opportunity to be preventative, which has a number of advantages

- **Reduce vulnerabilities and risks**, plan instead of reacting
- **Ability to consult**, collect broad base of information
- **Spread costs out** over longer period of time
- **Monitor and adjust** adaptive measures over time for effectiveness

Learning from Others

- As humans, we tend to react to threats and issues ***after*** we experience them directly
- We also tend to respond to extremes – biggest, smallest, fastest, etc.

We will be better positioned if we look at others' experiences and take away lessons learned.

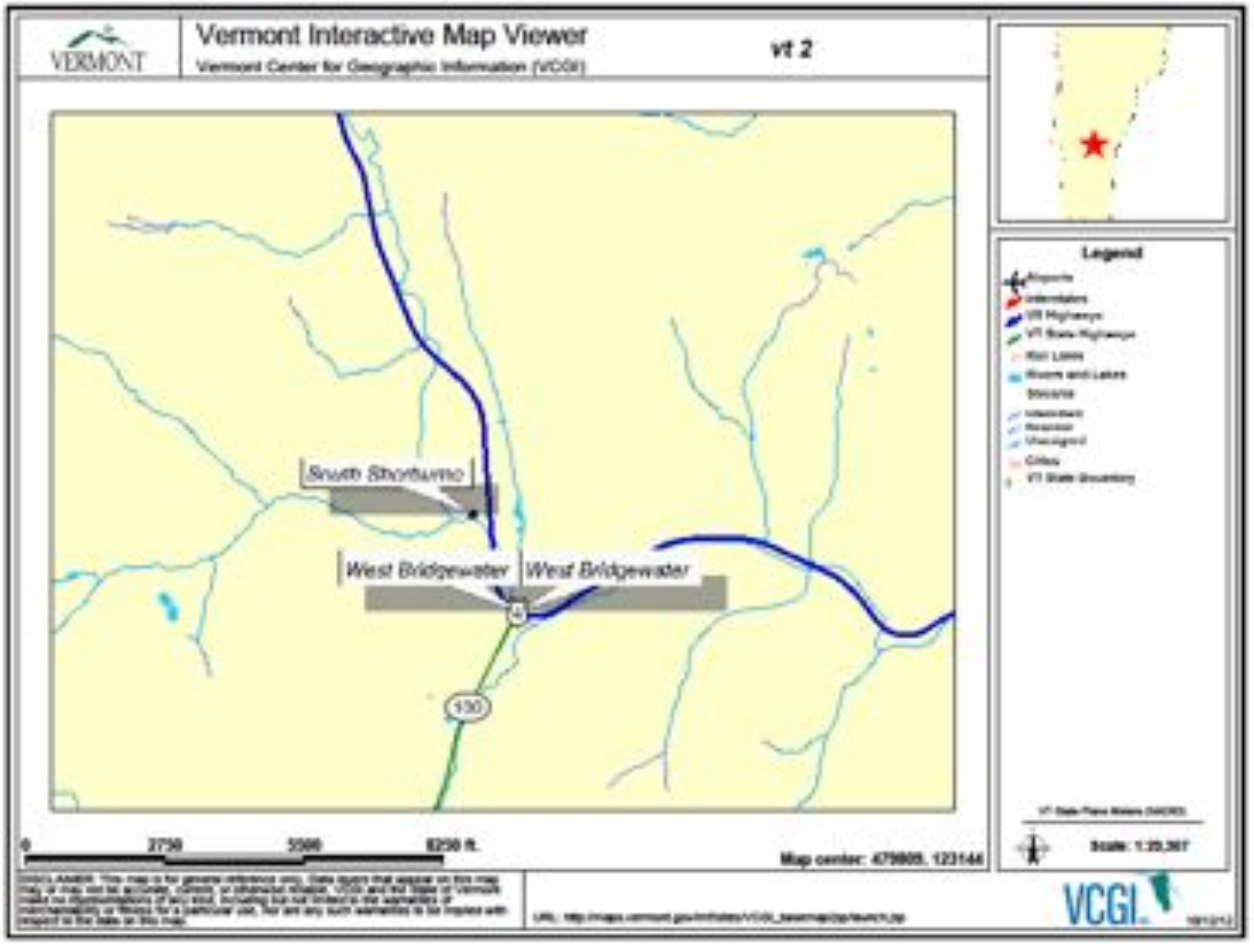
Climate change adaptation is an issue where, for a number of health, safety, and economic reasons, we should be proactive in preparing for both extreme events and smaller, long-term impacts.

Map of Killington Area – Central Vermont

Note*

- Numerous river and stream crossings – some intermittent, some perennial flows
- Hwy #4 (dark blue) adjacent to Ottauquechee River
- Hwy #100 (green) adjacent to Reservoir Brook

Map courtesy of Vermont Center for Geographical Information



An Extreme Event and its Impacts

Hurricane Irene hit the State of Vermont on Aug. 28 & 29, 2011

- State-wide average **3-5** inches (76-127 cm) rainfall
- **>7** inches (178 cm) on some eastern slopes

225 municipalities affected

Source: Vermont Agency of Natural Resources Climate Change team (http://www.anr.state.vt.us/anr/climatechange/irenebythenumbers.html)

Hurricane Irene River flood damage – Green Mountains near Killington, VT

Vermont and Hurricane Irene, August 2011

- Vermont Agency of Natural Resources Climate Change Team listed damage to;
  - **>500** miles (>800 km) of state road
  - > **2000** segments of municipal roads
  - **480** bridges
  - **960** culverts
  - **>200** miles (>320 km) of railroad

Flood debris near Killington, Vermont

Impacts of Flooding on Surface and Ground Water - Irene

Overtopping of wells

- **30** public water systems issued Boil Water Notices
  - Affected ~**16,590** people

Hazardous spill reports increased by **14x**

- many home fuel tank spills

17 municipal waste water facilities compromised

Source: Vermont Agency of Natural Resources Climate Change team (http://www.anr.state.vt.us/anr/climatechange/irenebythenumbers.html)

Home damaged by flood near Killington, Vermont

Other Flooding Impacts

Source: VT ANR Solid Waste Section

- In the month after Irene, **32,000-42,000 tons** of waste related to the storm received by landfills
- After the flood, wild trout populations in studied streams were reduced to **33-58%** of pre-flood levels.
- High flows and saturated ground conditions undermined tree roots, and floating debris injured tree stems
- **The disaster response headquarters had to be relocated**

Impacts to Properties - Irene

- Approx. **1,500** residences had significant damage
- **450** farms filed Farm Loss claims with USDA, roughly 20,000 acres of farmland affected
- **7,215** individuals and families registered for FEMA assistance

Source: Vermont Agency of Natural Resources Climate Change team (http://www.anr.state.vt.us/anr/climatechange/irenebythenumbers.html)

Flood debris near Killington, Vermont

Costs of Irene

Some estimated costs of the storm (examples)

- **~$140 million** in FEMA reimbursements will likely be needed by Vermont towns
- **~$50 - $85.4 million** to rebuild/upgrade state buildings
- **> $45.9 million** in grants and low interest loans – FEMA
- **$15 million** loaned to businesses and farms by the State (Vermont Economic Development Authority)
- **$1.75 million** to clean up oil tank spills

Source: Vermont Agency of Natural Resources Climate Change team (http://www.anr.state.vt.us/anr/climatechange/irenebythenumbers.html)

Insurance Claims in Canada

The Insurance Bureau of Canada and the Institute for Catastrophic Loss Reduction released a report in June 2012 titled *Telling the Weather Story*

> *"Within Canada, recent trends have seen an increase in property insurance claims resulting from catastrophic weather-related events.* ***Catastrophic events over the past three years have cost roughly $1B a year.*** *Most of these insured losses were caused by extreme weather events."*

> *"Canada's home and business insurers are also seeing an* ***increase in claims resulting from weather-related events that fall below the threshold for the definition of "catastrophe,"*** *but nevertheless result in significant property damage for consumers."*

Beyond the Numbers

- The impact on communities and individuals' lives is more difficult to measure

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We must remember that the disruption in people's lives is an important reason in itself for spending the time and effort needed for climate change adaptation

5 Steps to Implementing Actions on Climate Change Adaptation

1. Starting the Process
2. Understanding the Impacts
3. Developing the Plan
4. Now Do It!
5. Measuring Progress & Effectiveness

Oak leaves in July 2012

“Why don’t you just tell us what to do?”

- A variety of approaches is possible
  - one size does not fit all
- Each community and ecosystem has a large number of variables which affect it
  - The importance (weighting) of the variables is often very different from one area to another

Remember – you know your property, your lake, your community and local vulnerabilities, build on that knowledge base

1. Starting the Process

- Determine scope
  - Overall community strategy
  - Individual projects

- Identify who you need in initial and longer-term discussions and planning meetings
  - Local experts
  - Local drivers
  - Champions
  - Preferable to have broad representation, wide range of ideas during consultations

Building the Team

1. Consider developing the overall working group with concentric circles of involvement
   - Core planners and organizers
   - Teams who implement specific projects and provide relevant skills
   - Broader group of stakeholders and partners

Building the Team (cont'd)

2. Draw specific skill sets for each project
   - Organizational skills
   - Field skills
   - Educating the community
   - Documenting the project in a meaningful way, including outcomes and lessons learned

Building the Team (cont'd)

3. Expect and plan for the long-term
   - Some projects may be completed quickly, others extend over a number of years
     - Plan for turn-over of committee members to ensure continuity

Collecting background information

- Identify key resources for information – reliable, applicable
  - Initiate process of understanding general impacts of climate change
  - Learn about work which has been done locally
  - Draw on experts in the field

The time spent on understanding the issue and how it relates to your community is time well spent

2. Understanding the Impacts of a Changing Climate

Dunrobin Road near Constance Bay

A. Identifying the issues
B. Recognizing Changing Vulnerabilities and Risks
C. Identifying priorities
D. Determining which Issues to Address

A. Issue Identification – Applying it Locally

Dry wetland, Dunrobin

We have learned that climate change is occurring through;

- Increased temperatures
- Changing precipitation patterns
- Events
- Variability

How will these changes affect the community?

Examples of what to consider

Will these changes in climate affect;

1. local ecosystems?
   - Species' tolerance to change
   - Changes in ecosystem composition
   - Species abundance and balance in system
     - **Ecosystem Restructuring (ECO)**

       http://www.eco.on.ca/uploads/Reports Annual/2011_12/Losing%20Our%20Touch.pdf

2. infrastructure which might impact seasonal and/or permanent residents in the community?
   - Access issues

Using Scenarios - Examples

Impacts of Drought

(High Temperatures and Low Rainfall)

- High surface water temperatures
- Low water levels
- Low river flows

Impacts of Warmer Winter

(Higher temperatures, similar amount of precipitation)

- Shorter period between ice-on and ice-off dates
- More rain, less snow
- Higher winter water levels

Comparing Events to Scenarios

Where possible, compare real life experiences with projected impacts to "ground-truth"

Example - Summer of 2012

- Low water levels, higher water temps.
  - Algae
  - Dry creeks and streams
  - Dry wells
- Many trees dropped leaves in July, other vegetation browned
- Crops stunted
- Wildlife stressed – road kill as wildlife (e.g. frogs) leaving dry ponds and wetlands

Beaver baffle, Thomas Dolan Pkwy

Rating Current Risks & Vulnerabilities

Consider how local green and gray infrastructure in your community responds to weather now.

Examples

- Are there areas that you can identify which may flood regularly during thunderstorms?
- Are there forested or open areas which may dry out quickly during periods of hot weather?
- When ice is on the lake are there areas that regularly have thin ice when there are winter rains?

- Assess current risks and vulnerabilities using experience and knowledge of the area

- Assign High, Medium, Low ratings

Appleton G.S.

B. Changing Vulnerabilities and Risks

We want to;

- understand how current vulnerabilities and risks will increase or decrease as the climate changes
- Identify new ones

Using your scenarios determine;

- Will risks increase or decrease?
- Under what conditions?
- Where?
- Will there be new risks and vulnerabilities under these scenarios?

Example - Changing Vulnerabilities & Risks

Consider how risks and vulnerabilities will change under new conditions

- e.g. areas which traditionally flood during spring

Points for consideration in e.g.

- Flooding in non-traditional times
  - summer, fall, winter
- What will change if vulnerable areas flood at non-traditional times?
- Rate vulnerability & risks under new conditions

City of Ottawa

C. Identifying Priorities

Risk and vulnerability assessments should help you develop a list of potential local impacts within your community

- Identify key issues from this list
- List in order of importance
- Consult!
  - Modify to address consultation outcomes

Example – Identifying priority issues

Potential Water Quantity and Quality Issues

- **List, then assign priorities**
  - Warmer water (5)
  - Fewer cool water fish (8)
  - Algae (6)
  - Bacteria (4)
  - High water levels (1)
  - Low water levels (2)
  - Sedimentation in smaller creeks (7)
  - Increased variability in water levels (3)

D. Determining which Issues to Address

- Climate change is often only one of multiple stressors
- Understand cumulative impacts
  - Identify information/data gaps
- Addressing only one factor may not provide the desired outcome
- Do more background work, fill data and information gaps prior to addressing issues which are not well understood

Determining which Issues to Address

Focus on projects which;

- Have *no regrets* outcomes
- Fit into a larger strategy
- Have a visual, concrete, measurable result
- Are less likely to encounter 'bottlenecks', especially early projects
- Are sustainable, when considering long-term or more complex projects

Constance Creek

Ways to Address Issues

Addressing an issue may be through;

- Individual action
- Association/group action
- Working with other partners, such as CAs or municipalities
- Advocacy

Consultation is important!

- Share issues you have identified, priorities, and proposed solutions
  - CAs, other water managers
  - Government agencies
  - Community and broader public

Example – How Issues may be Addressed

Water Quantity and Quality Issues

- High water levels (1)
- Low water levels (2)
- Increased variability of water levels (3)
- High bacteria counts at beaches (4)
- Warmer water (5)
- Algae (6)
- Sedimentation in smaller creeks (7)
- Fewer cool water fish (8)

How Issues may be Addressed

1. Through adapting to new regimes
   - 1,2,3,5
2. Through actively implementing changes in land and water use
   - 4,5,6,7,8

3. Developing the Plan

1. Identify:
   - priority and long-term issues
   - Information/knowledge gaps
   - Clear, specific objectives (outcomes)
   - Resources needed
   - Key individuals and organizations for implementation
   - Timelines

Reviewing resources

- There are a number of case studies available from across Canada which may provide insight into how other communities have developed community climate change adaptation plans or strategies
- When reviewing case studies for relevance to your situation, keep in mind the 5 questions
  - Why
  - What
  - Who
  - Where
  - How

Developing the Plan (cont'd)

2. Build on existing work, or into existing processes, where possible
3. Implement plan in manageable phases
4. Determine how you will know if you are successful

Examples of Actions

Individual actions

- Shoreline and near-shore naturalization and shading
- Remove structures and toxic storage in flood plains wherever possible
- Ensure docks designed for fluctuating water levels (winter removal?)
- Understand and be tolerant of wildlife
- Plant native species in gardens and natural areas
- Change fishing habits (based on abundance)

Examples of Actions

Group Actions

- Foster ties with local government, other community organizations
- Develop a community sustainability and adaptation plan
- Share information on sustainable practices
- Protect natural corridors through cooperation of the community
  - Recognition programs
- Protect water quality and quantity
  - Shade shorelines, naturalize riparian areas

4. Now, Do It! Implementing the Plan

- Ensure some visible outcomes
  - Continued community support and buy-in
- Try to keep on timelines
- Take the time to properly document efforts, lessons learned
  - Include templates in planning pha
  - Clear and concise
  - Ensures sustainability of effort
- Communicate *and celebrate* progress with community and partners

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5. Measuring Progress & Effectiveness

Measuring Progress

- Timelines
- Identify 'bottlenecks' or barriers before they happen
- Address issues as they arise

Measuring Effectiveness

- Expected outcomes?
- Unexpected outcomes? (positive or negative)
- Be Flexible
  - Be prepared to modify plans and actions as necessary

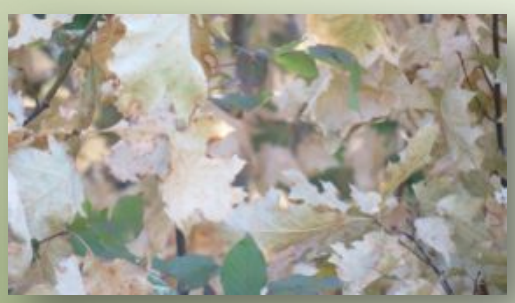
Summary

Be Proactive – Begin the Process Now!

- 5 Steps
  - Choose your team carefully
  - Take time to do your homework!
    - Understand potential climate change impacts and how they relate to your community
  - Identify vulnerabilities and risks and determine how this will change
    - Set priorities and identify which issues you can address
  - Incorporate adaptive measures into existing systems and processes where possible

Summary (cont'd)

- Document your work, progress, and lessons learned
- Consult, consult, consult
- Assess both progress and outcomes on a regular basis
  - This is new ground, be flexible!
    - Expect to modify your plans as more information becomes available



The Bottom Line

A healthy ecosystem will be more resilient to climate change and all it brings.

Protecting the functionality and integrity of ecosystems in the community will contribute to the ability of both natural and built systems to adapt to a changing climate.

Thanks!

Osprey at Constance Creek

Examples of Information Sources

- Federal - NRCan
  - From Impacts to Adaptation: Canada in a Changing Climate (2008)

    http://www.nrcan.gc.ca/earth-sciences/climate-change/community-adaptation/assessments/487

  - Guide to Writing Community Climate Change Adaptation Case Studies (2011)
    http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca.earth-sciences/files/pdf/collab/pdf/100_e.pdf

- Provincial – OCCIAR and MNR
  - OCCIAR http://www.climateontario.ca/publications.php

  - MNR http://www.mnr.gov.on.ca/en/Business/ClimateChange/index.html

Examples of Information Sources (cont'd)

- Municipal
  - ICLEI
    http://www.icleicanada.org/resources/publications/adaptation/20-changing-climate-changing-communities
- Watersheds – CAs and Source Protection
  - MVC
    http://www.mvc.on.ca/conservation-education/climate-change
  - MRSPR
    http://www.mrsourcewater.ca/assessment_report/Text/MV%20Chapter%207.pdf