



RACC

Integrated Assessment Model (IAM) Scenario Development Workshop

Davis Center

University of Vermont

October 26, 2015

Our goals for the workshop

- To garner stakeholder input into the design and execution of the RACC IAM
- To assess, as a group, the state of modeling and data collection for the management of water quality (and more specifically nutrient loading) for the LCB
- To generate a set of scenarios to run as simulations in the RACC IAM
- To set the stage for our final Delphi forum and workshop in the spring of 2016 in which scenarios results will be shared)

Agenda

Morning:

- Presentations and discussions about modeling and data collection work completed by RACC to date

Afternoon:

- Presentations and discussions about other modeling and data management efforts being conducted to manage water quality in the LCB
- Scenario Development Exercise to Guide Simulations for RACC IAM

In the face of uncertainties about climate change, land use and lake response scenarios, how can adaptive management interventions (e.g. regulation, incentives, treaties) be *designed*, valued and implemented in the multi-jurisdictional Lake Champlain



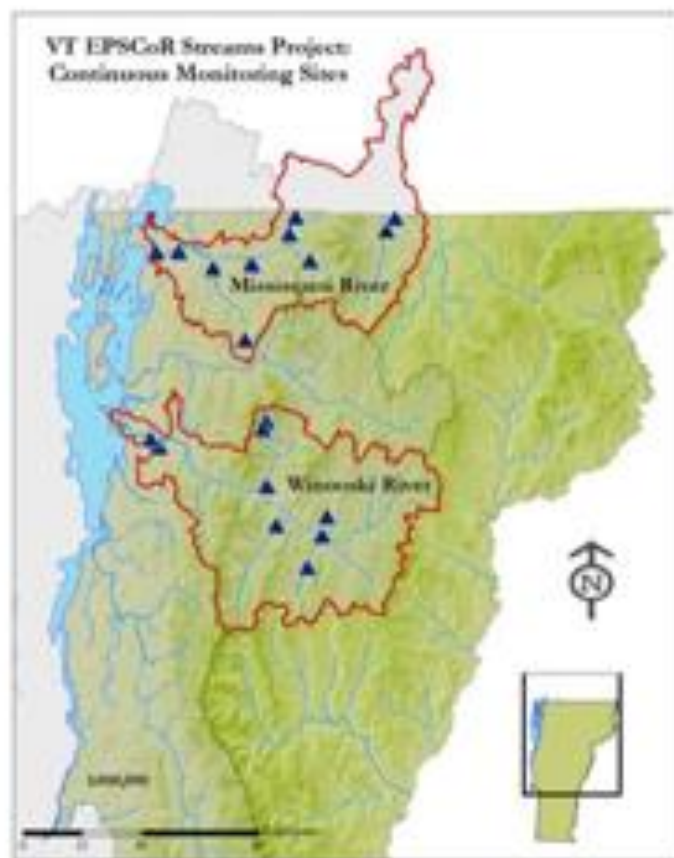
EPS 1101317

Experimental Program to
Stimulate Competitive
Research (EPSCOR)



Project components:

- Regional Climate Downscaling
- Q1: In lake processes
- Q2: To lake processes
- Q3: Land use, policy & governance decision making
- Integrated Assessment Modeling (IAM)



Adaptive management is a systematic process for improving management policies and practices by **learning from the outcomes of management strategies** that have already been implemented. Adaptive water management aims to increase the adaptive capacity of the water system by putting in place both learning processes and the conditions needed for learning processes to take place (Geldof 1995, Pahl-Wostl 2004, 2007).

RACC was, in part, conceived to better understand the **UNCERTAINTY, CONFLICTING VALUES AND MULTIPLE SCALES/COMPLEXITY** of the nonpoint source pollution problems facing the Lake Champlain Basin.

		Degree of Consensus among Stakeholders	
		Low	High
Degree of Understanding of the System Dynamics	Low	<p>Status Quo Typical result: Confrontational debate and no improvement</p>	<p>Mediated Discussion Typical result: Consensus on goals or problems but no help on how to achieve the goals or solve the problems</p>
	High	<p>Expert Modeling Typical result: Specialized model whose recommendations never get implemented because they lack stakeholder support</p>	<p>Mediated Modeling Typical result: Consensus on both problems/goals and process leading to effective and implementable policies</p>

Source: Van den Belt, 2004, p.18

RACC Stakeholder Engagement Activities

- Climate Change Impact Assessment Workshop: March 2012
- Water Quality Climate Change Adaptive Intervention Online Delphi and Workshop: March to May 2014
- RACC IAM Scenario Development Workshop: October 2016
- RACC IAM Scenario Valuation and Analysis Online Delphi and Workshop: Spring 2016

Adaptive management

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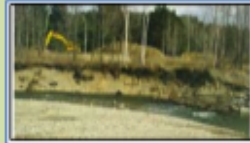
(Geldof 1995, Pahl-Wostl 2004, 2007)

#1: Climate Change Impact Assessment, November 2012

SELECTED CLIMATE CHANGE SCENARIOS AND ADAPTATION STRATEGIES



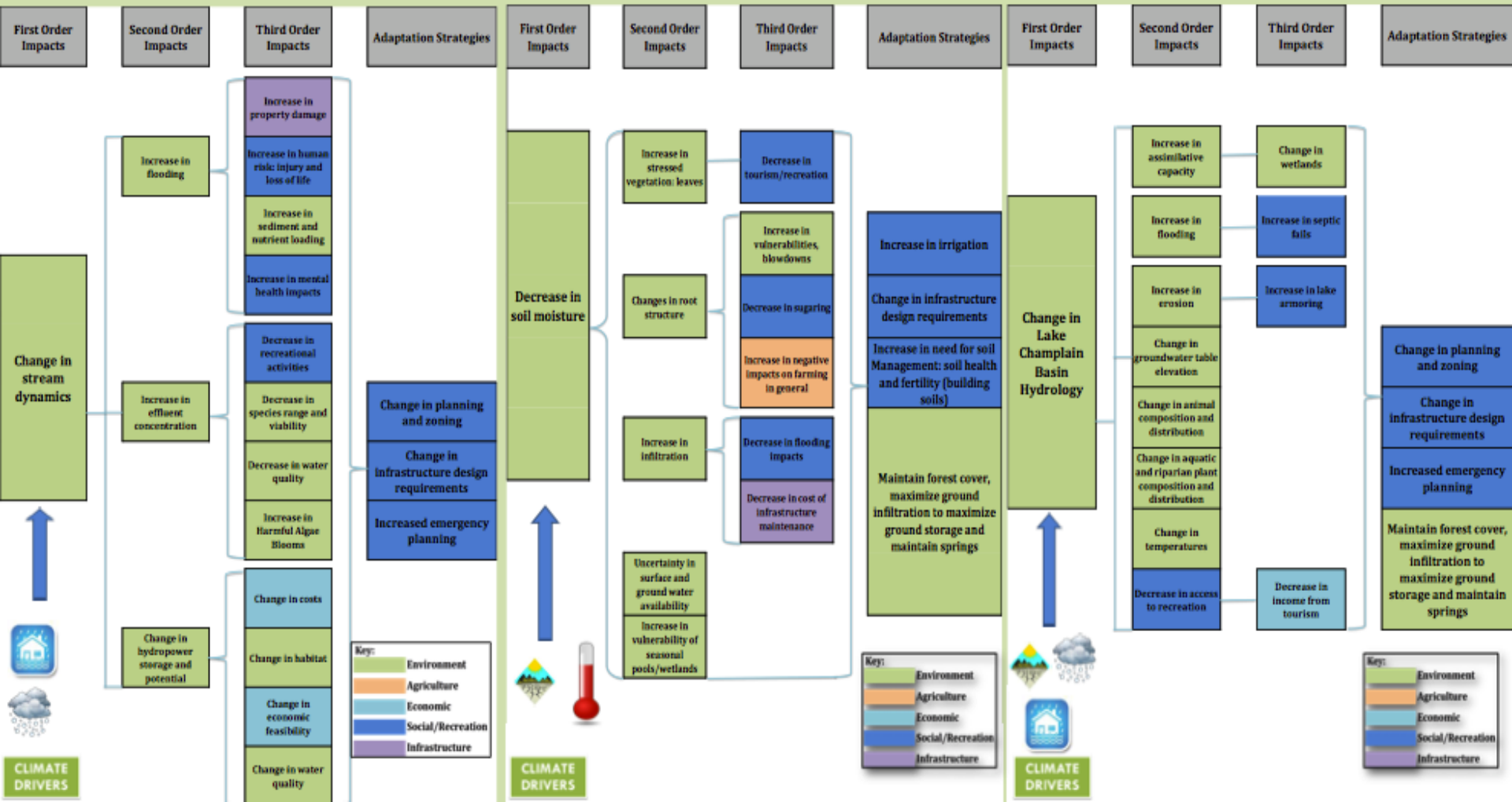
RIVER AND STREAM SCENARIOS



SOIL DYNAMICS SCENARIOS



LAKE HYDROLOGY SCENARIOS





css2cc.org

2 Water Quality Climate Change Adaptation Online Delphi Forum and Workshop: March to May , 2014

Goals

- To **deepen our capacity** as a region to adapt to human-induced climate change, and in particular to secure our region's water quality for the long term.
- To **envision a wide array of intervention strategies** for ensuring water quality for the Lake Champlain Basin
- To develop **adaptation scenarios for stakeholder groups** using a variety of simulation tools.

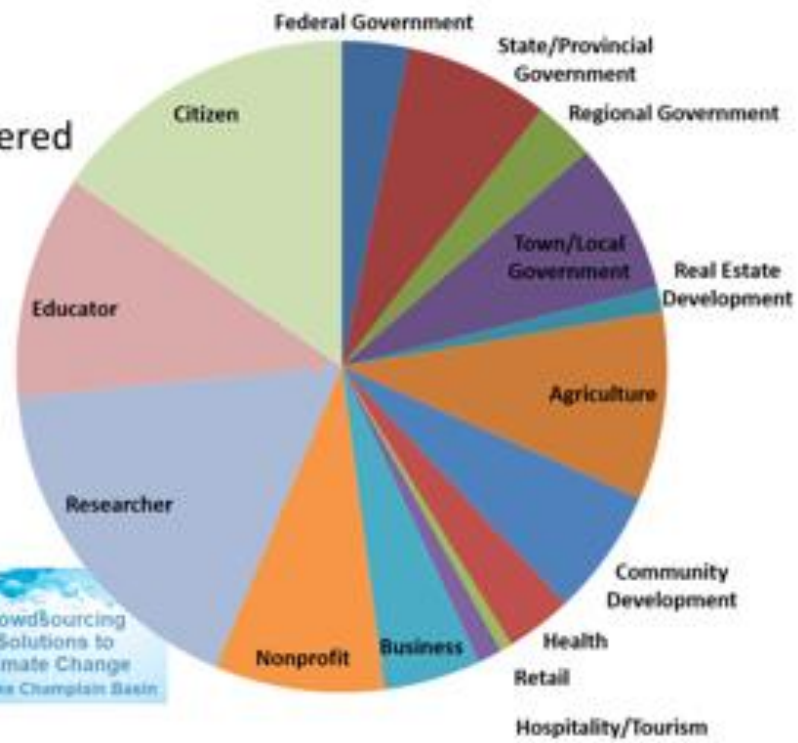
Stakeholders Identified 104 Adaptive Actions to Build Resilience in Lake Champlain in the Face of Climate Change



- 204 participants registered in www.CSS2CC.org

- 53 participants entered interventions or comments to www.CSS2CC.org

Professions of CSS2CC.org Registered Participants



(Coleman et al., 2014)

104 discrete interventions were identified

Popular Discussions

<p>Created by member: #69 2014-03-04 08:57:26</p> <p>Domain</p> <p>Increasing soil health Comments (6)</p> <p>☆☆☆☆☆</p>  <p>Agriculture</p>	<p>Created by member: #69 2014-03-04 08:59:39</p> <p>Domain</p> <p>Proper, targeted channel stabilization Comments (5)</p> <p>☆☆☆☆☆</p>  <p>River Mgt.</p>	<p>Created by member: #179 2014-03-09 22:47:49</p> <p>Domain</p> <p>Fence Livestock Out of Streams Comments (5)</p> <p>☆☆☆☆☆</p>  <p>Agriculture</p>
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Newest Discussions

<p>Created by member: #229 2014-03-24 14:56:13</p> <p>Domain</p> <p>Public Bioremediation Project for the Pi ... Comments (0)</p> <p>☆☆☆☆☆</p>  <p>Development and Land Use</p>	<p>Created by member: #231 2014-03-24 12:55:33</p> <p>Domain</p> <p>Encourage composting Comments (0)</p> <p>☆☆☆☆☆</p>  <p>Agriculture</p>	<p>Created by member: #228 2014-03-24 00:30:34</p> <p>Domain</p> <p>Ski Mountain Water Management Comments (1)</p> <p>☆☆☆☆☆</p>  <p>River Mgt.</p>
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or



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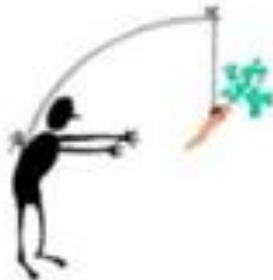
or



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or



Policy, resource and
governance scenario
testing

Scenario C:
In the midst of resource scarcity, regionalized watershed-level coordination brings together citizen groups, nonprofits and regional planning groups in concert with their state and local governments rely heavily on market-based incentives for clean water protection in the Lake Champlain Basin.

RACC Workshop #2:
May 12, 2014 Generated
Scenarios Based on Resource
Availablely, Governance
Config. & Policy Preferences

Final List of Adaptive Interventions Surfaced During Crowdsourcing Solutions to Climate Change Forum and Workshop Spring 2014

Highlighted interventions = Can be simulated in current iteration of RACC IAM



Ecological Design / Technological Interventions	
1.	Bioremediation, phytoremediation, brownfields clean-up to reduce pollution and improve quality of existing developed areas
2.	Change fuel pump designs and gas station runoff management to reduce flow of oil/gas into water bodies
3.	Edible forest gardens as a way to increase forest cover
4.	Employ erosion control measures on targeted <u>streambanks</u>
5.	Employ smart growth principles and low-impact development practices in planning and design of development and transportation
6.	Encourage/allow separation of grey water from sewage and reuse of grey water in appropriate settings
7.	Improve function of and harvest/remove phosphorus from on-site septic systems
8.	Increase energy efficiency in buildings, infrastructure, and transportation systems
9.	Increase soil organic matter on farms to improve water storage and soil fertility
10.	Manage barriers to water flow (causeways) in Lake Champlain to mitigate sediment and nutrient accumulation
11.	Manage floodplains to give rivers room to move
12.	Plant vegetated buffers in riparian zones and along lakeshores
13.	Retrofit existing commercial and industrial sites with green <u>stormwater</u> infrastructure
14.	Size culverts with up-to-date precipitation data to prevent washouts

We will draw on 16 of the strategies identified during the Delphi process this afternoon...

- *Crop and land management BMPs (crop rotation; cover cropping; reduced tillage; riparian buffers)*
- *Taxing fertilizers and animal feed*
- *Transitioning dairy to pasture*
- *Steer development patterns (Smart growth; Act 250; flood plain development; wetland preservation; easements)*