Climate Change & Land Use Change Patterns and Their Impacts on Missisquoi Bay's Blue Green Algae Problem:

A Workshop for Vermont's Water Quality Managers and Regional Planners

Livak Ballroom, 4th floor,

Davis Center, UVM Campus

May 11, 2016

8:30 am to 1 pm

RACC Research on Adaptation to Climate Change

VERMONT EPSCoR

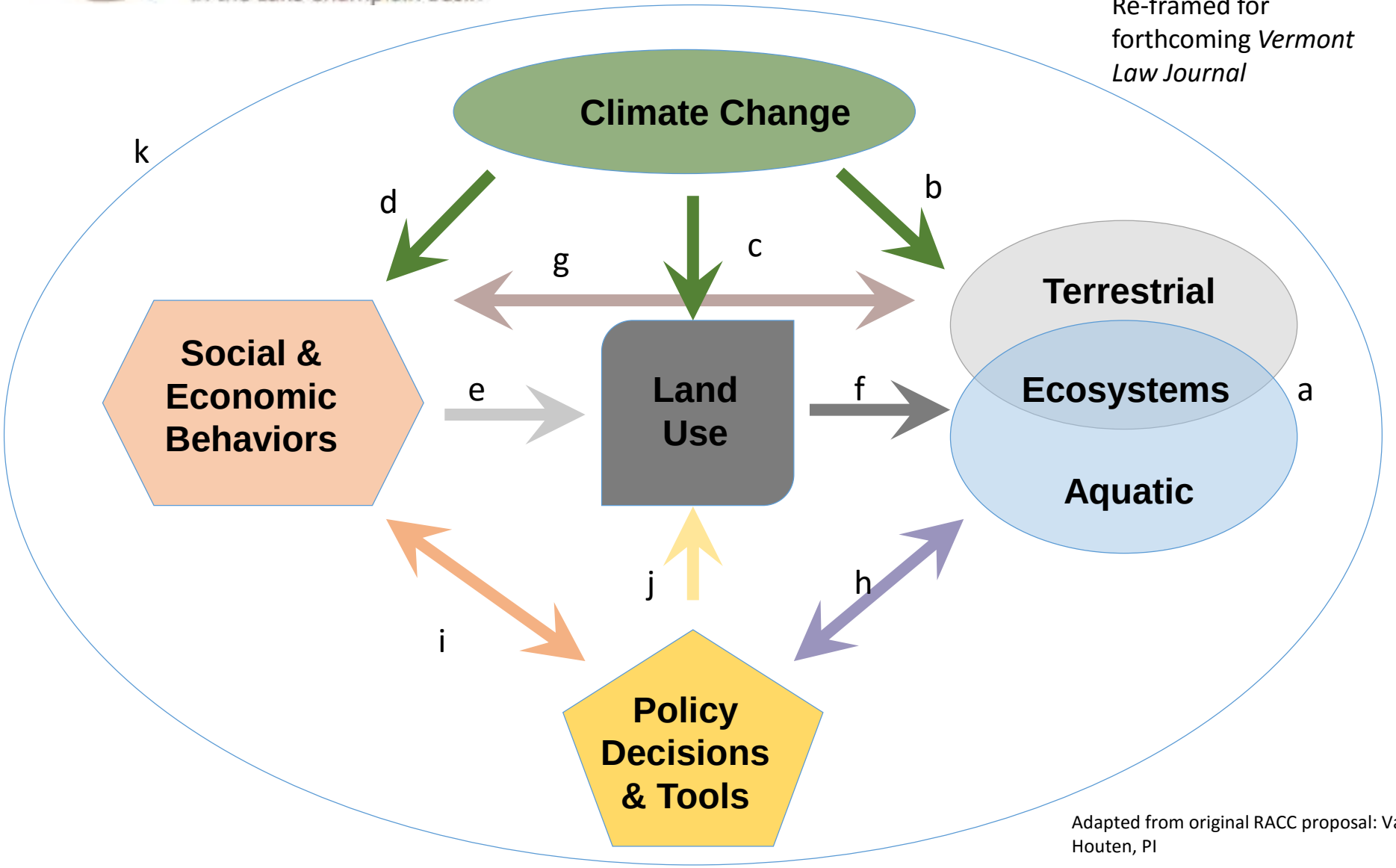
NEWRnet Delaware • Rhode Island • Vermont North East Water Resources Network

SEGS Lab Social Ecological Gaming & Simulation

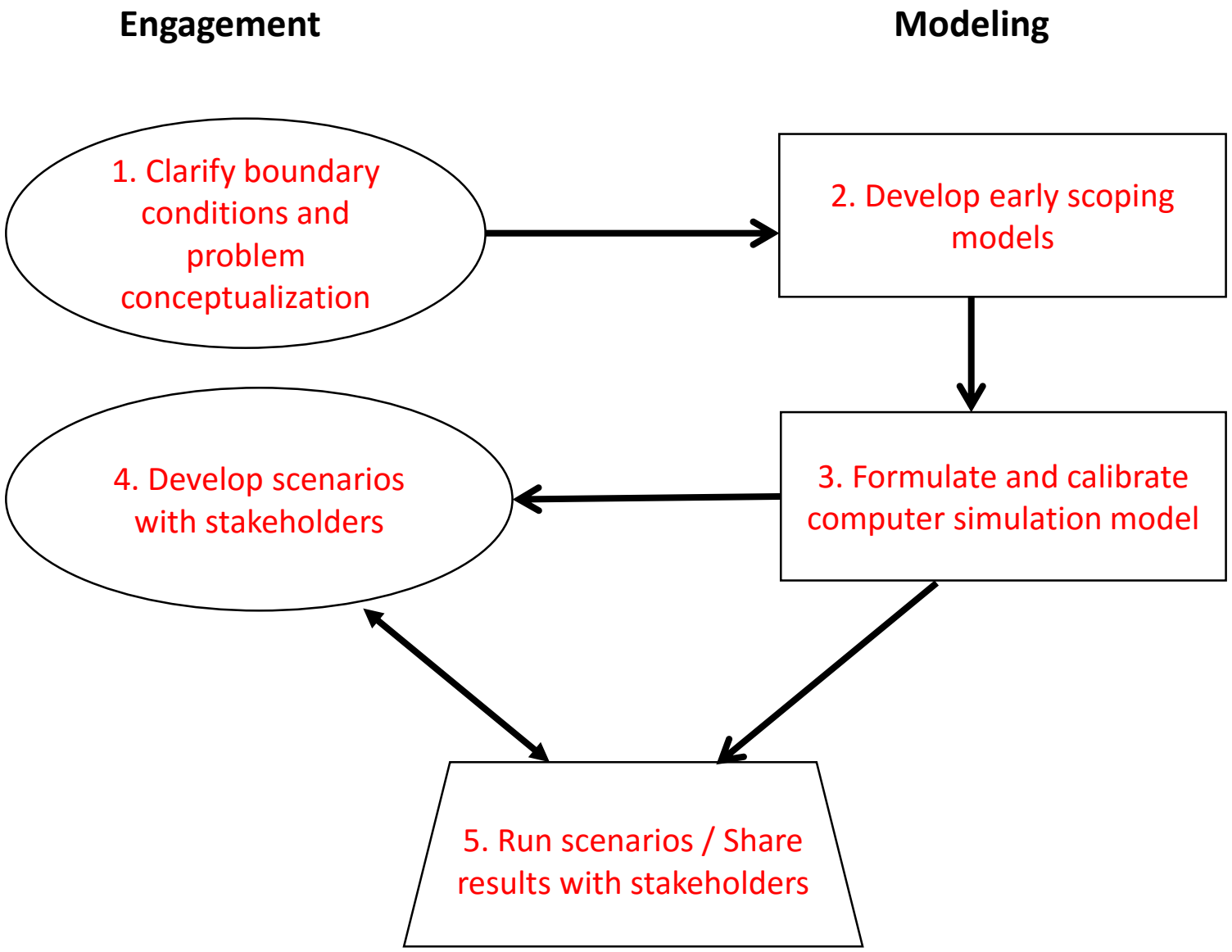
RACC
Research on Adaptation to Climate Change in the Lake Champlain Basin

RACC Model: LCB as
Complex Adaptive System

Re-framed for forthcoming *Vermont Law Journal*



Adapted from original RACC proposal: Van Houten, PI


Engagement
Modeling
1. Clarify boundary conditions and problem conceptualization
2. Develop early scoping models
3. Formulate and calibrate computer simulation model
4. Develop scenarios with stakeholders
5. Run scenarios / Share results with stakeholders

“Mediated Modeling” Workshops :

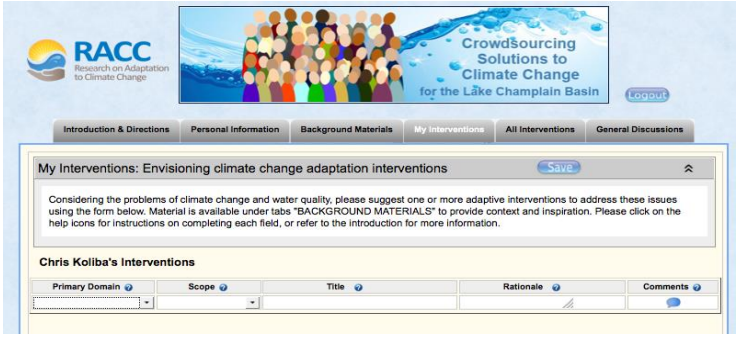
older scenario generation

CLIMATE CHANGE IMPACTS:
November 2012

WATER QUALITY INTERVENTION DEVELOPMENT:
March -May 2014

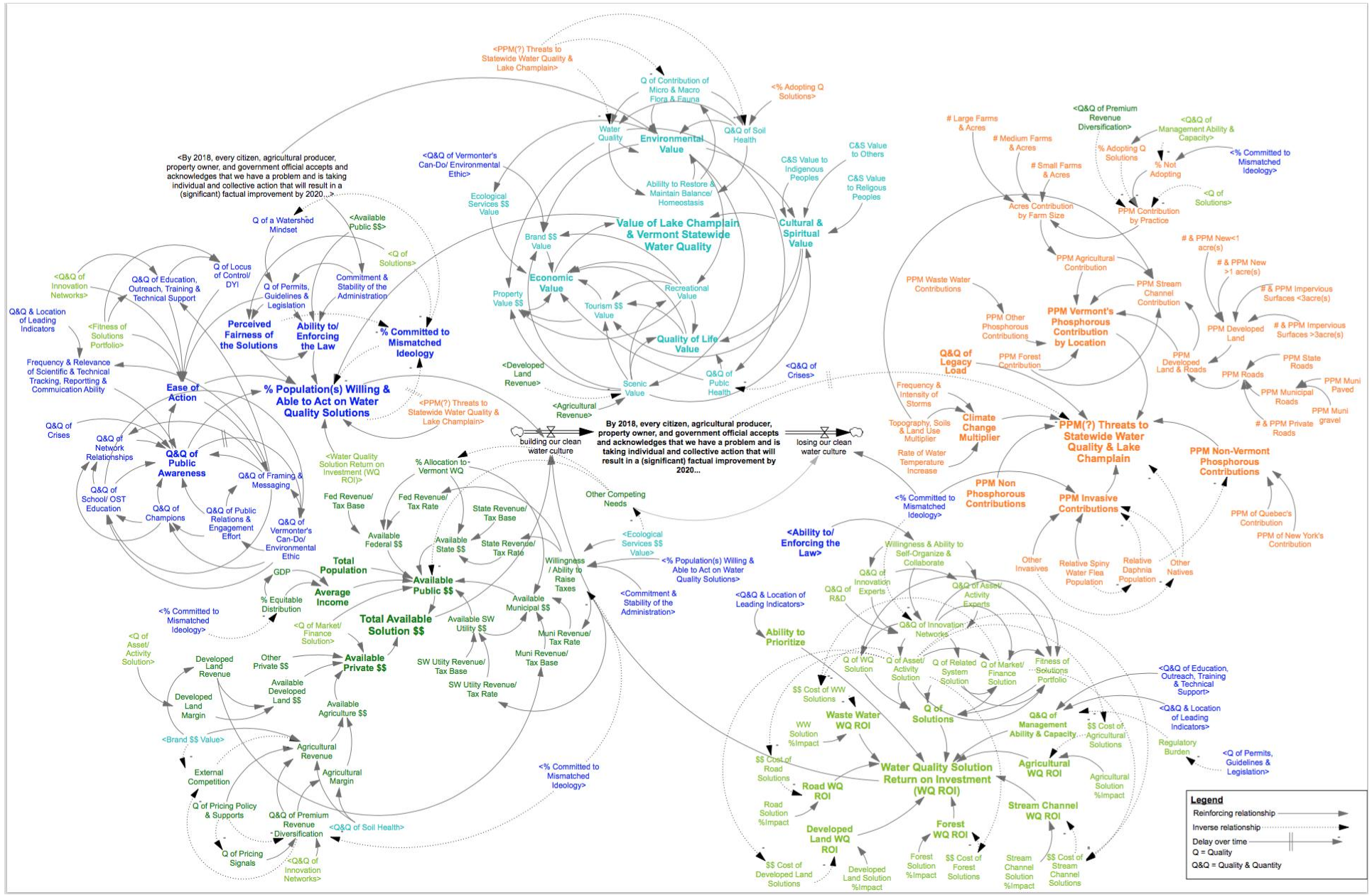
WATER QUALITY SCENARIO DEVELOPMENT:
October 2015

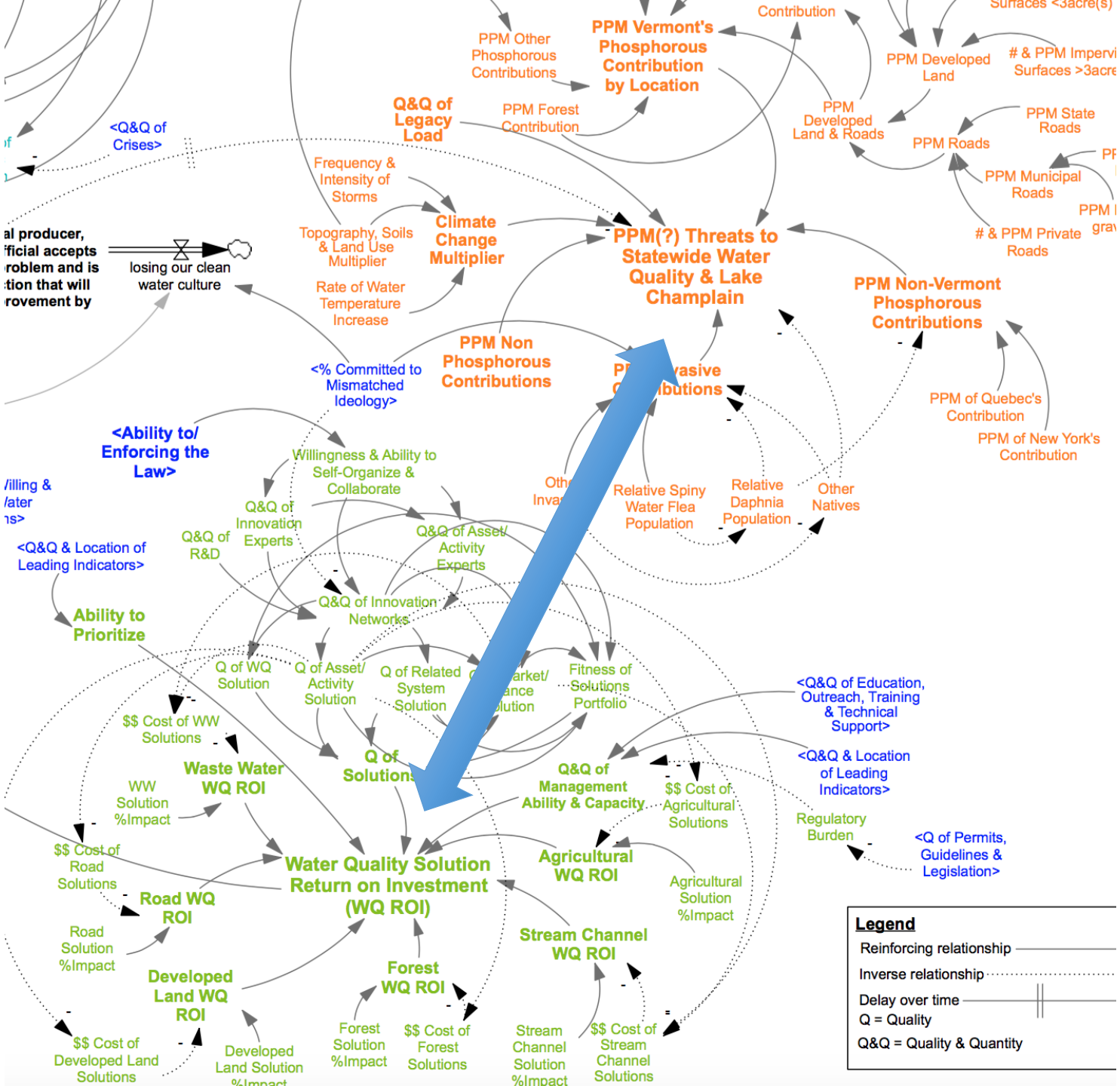
WATER QUALITY INTEGRATED ASSESSMENT MODEL REVEAL: May 2016



Scenario A:
In the midst of resource scarcity, with little political will or financial capacity to regulate for clean water protection, states and local governments operating in parallel rely heavily on market-based incentives and what federally-sourced incentives are available for clean water protection in the Lake Champlain Basin .

“CULTURE OF CLEAN WATER” SYSTEMS ANALYSIS




PPM Other Phosphorous Contributions
PPM Vermont's Phosphorous Contribution by Location
Contribution
PPM Developed Land
& PPM Impervi Surfaces >3acre
Surfaces <3acre(s)
Q&Q of Legacy Load
PPM Forest Contribution
PPM Developed Land & Roads
PPM State Roads
PPM Roads
PPM Municipal Roads
& PPM Private Roads
<Q&Q of Crises>
Frequency & Intensity of Storms
Topography, Soils & Land Use Multiplier
Climate Change Multiplier
Rate of Water Temperature Increase
losing our clean water culture
PPM(?) Threats to Statewide Water Quality & Lake Champlain
PPM Non-Vermont Phosphorous Contributions
PPM of Quebec's Contribution
PPM of New York's Contribution
PPM Non Phosphorous Contributions
<% Committed to Mismatched Ideology>
<Ability to/ Enforcing the Law>
Willingness & Ability to Self-Organize & Collaborate
Relative Spiny Water Flea Population
Relative Daphnia Population
Other Natives
Q&Q of Innovation Experts
Q&Q of R&D
Q&Q of Asset/ Activity Experts
<Q&Q & Location of Leading Indicators>
Q&Q of Innovation Networks
Ability to Prioritize
Q of WQ Solution
Q of Asset/ Activity Solution
Q of Related System Solution
Fitness of Solutions Portfolio
<Q&Q of Education, Outreach, Training & Technical Support>
<Q&Q & Location of Leading Indicators>
$$ Cost of WW Solutions
Waste Water WQ ROI
Q of Solutions
Q&Q of Management Ability & Capacity
$$ Cost of Agricultural Solutions
WW Solution %Impact
Regulatory Burden
<Q of Permits, Guidelines & Legislation>
$$ Cost of Road Solutions
Water Quality Solution Return on Investment (WQ ROI)
Agricultural WQ ROI
Agricultural Solution %Impact
Road WQ ROI
Road Solution %Impact
Stream Channel WQ ROI
Developed Land WQ ROI
Forest WQ ROI
$$ Cost of Developed Land Solutions
Developed Land Solution %Impact
Forest Solution %Impact
$$ Cost of Forest Solutions
Stream Channel Solution %Impact
$$ Cost of Stream Channel Solutions
Legend
Reinforcing relationship
Inverse relationship
Delay over time
Q = Quality
Q&Q = Quality & Quantity

Small group tasks:

- **How:**
  - How best should IAM and other related results be visualized?
- **What:**
  - What decision criteria should be used to evaluate scenarios?
- **Who:**
  - Who should be involved in evaluating and processing scenarios?

Today's agenda

- 8:30-8:45 a.m. **Welcome & Opening Remarks**
- 8:45-9:45 a.m. **Overview of Cascading IAM structure, scenarios, findings and development plan**
- Drs. Asim Zia, Science Leader, Integrated Assessment Model and Andrew Schroth, Science Leader, Lake Processes
- 9:45-10:00 a.m. **Q&A**
- 10:00-10:15 a.m. **Coffee/Tea Break/Networking**
- 10:15-11:30 a.m. **Scenario visualization & risk and uncertainty communication focus**
- 8-10 breakout groups
  - What are the three most effective ways to visualize climate and land management projection scenarios and communicate their uncertain impacts on watershed hydrology and lake water quality?
  - What is the single best method to make available 3TB of data generated by each scenario to water quality managers and regional planners?
- Brief reports (3-5 minutes for each group)
- 11:30 a.m.-12:45 p.m. **Scenario evaluation & Decision Support System focus**
- 8-10 breakout groups ***[working lunch served at Noon]***
  - Which (mutually exclusive) decision criteria must be used for evaluating adaptive land management intervention scenarios?
  - Which indicators should be used to measure the decision criteria?
  - How can cascading IAM be used as a Decision Support System in the long run?
- Brief reports (3-5 minutes for each group)
- 12:45-1:00 p.m. **Concluding Thoughts**

BREE
Basin Resilience to Extreme Events
in the Lake Champlain Basin