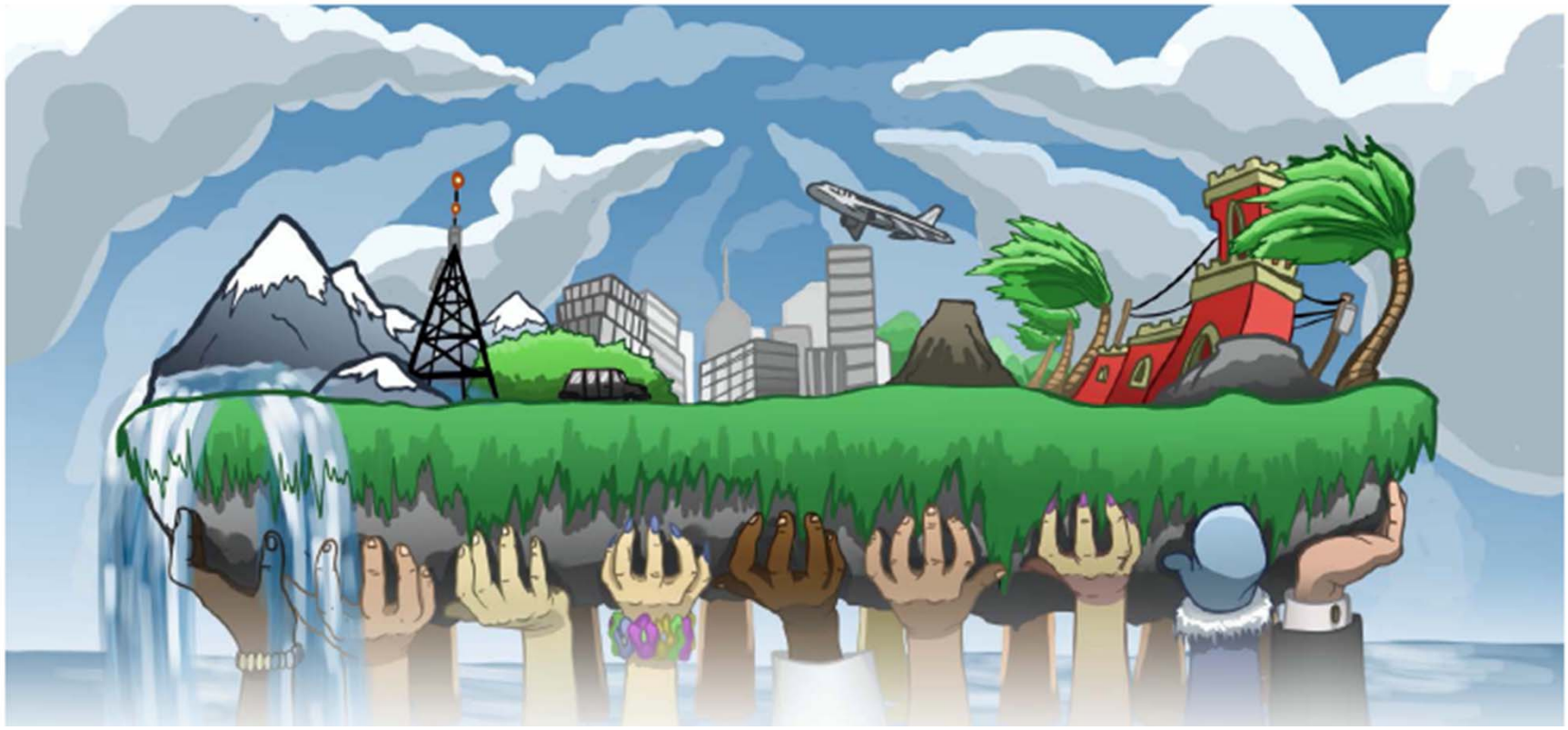
EPSCoR and the Science of Social-Ecological Systems

A Report from the Living on Earth III Conference

NSF EPSCoR
Living on Earth III:
Social-Ecological Systems Workshop 2012

St. Thomas, US Virgin Islands
October 23 – 26, 2012



National Science Foundation EPSCoR Social-Ecological Systems Workshop

LIVING ON EARTH

NSF

Alaska EPSCoR

May 10-13, 2009
Anchorage, Alaska

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Virgin Islands EPSCoR | Living on Earth Event

Virgin Islands EPSCoR | Living o...

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Living on Earth 2012

Living on Earth III (LOE III) will address the need for effective integration of processes linking scientific knowledge and analytical approaches in social-ecological systems (SES) research. This workshop will continue the important work of the two previous workshops (LOE I and II) organized and hosted by Alaska EPSCoR, between 2009-2011, including among others, building science and research capacity in sustainability science and coupled human-natural/socio-ecological systems science across EPSCoR jurisdictions and facilitating the formalization and functionality of a LOE-SES scientific network that will promote cutting-edge and transformative science ideas. LOE III will focus on conceptualizing SES science in the context of small, yet critical ecosystems with challenging human dimensions. Specifically, the workshop will emphasize three focal themes, namely, promoting *science to inform our knowledge and understanding* of critical coupled human-natural system transformations; the role of *social emergence in addressing vulnerability while promoting ecosystem stewardship* across multiple social-ecological transformations, and; deepening scientific *integration at nested multiple scales* promoting sustainable and resilient outcomes.

LOE III will run four days, during which the first day will be devoted to strengthening participant understanding of SES science via

Conference Themes

Core Theme 1: Promoting transdisciplinary science to inform our understanding of critical challenges in social-environmental systems with an emphasis on small communities with critical ecological systems.

Core Theme 2: The emerging role of social systems in addressing vulnerability and promoting ecosystem stewardship in social-ecological transformations.

Core Theme 3: Deepening integration at multiple scales (temporal, spatial, and jurisdictional) and the role of integrated land and coastal systems science in promoting sustainability and resilience.

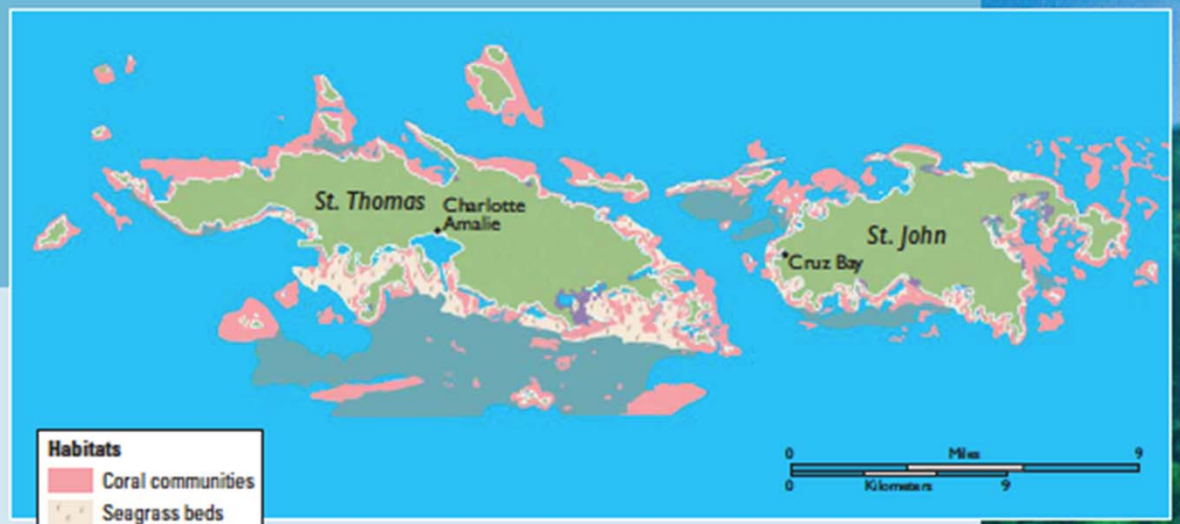
The Ocean Conservancy

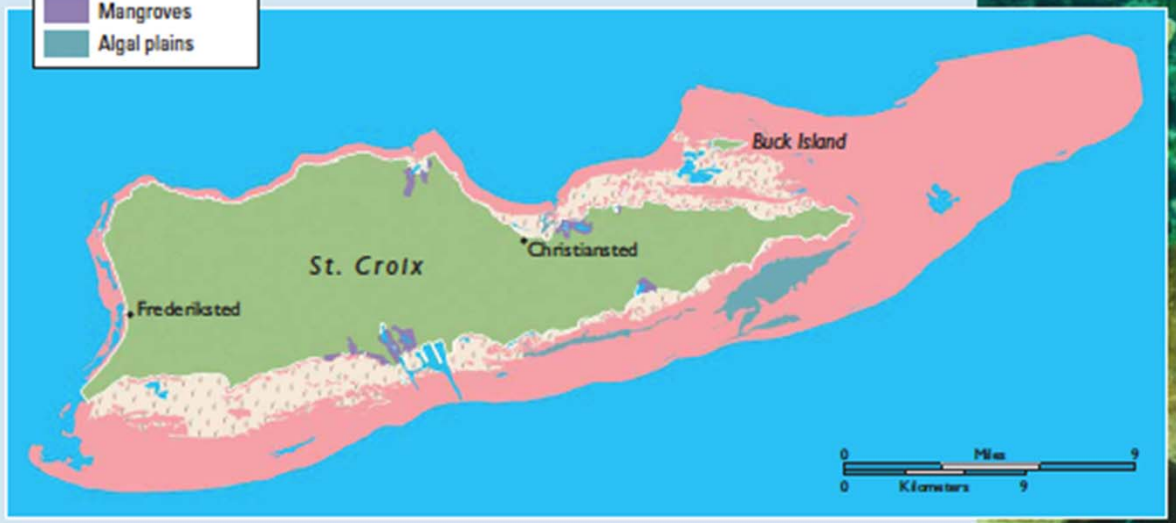
Advocates for Wild, Healthy Oceans

THE STATE OF THE

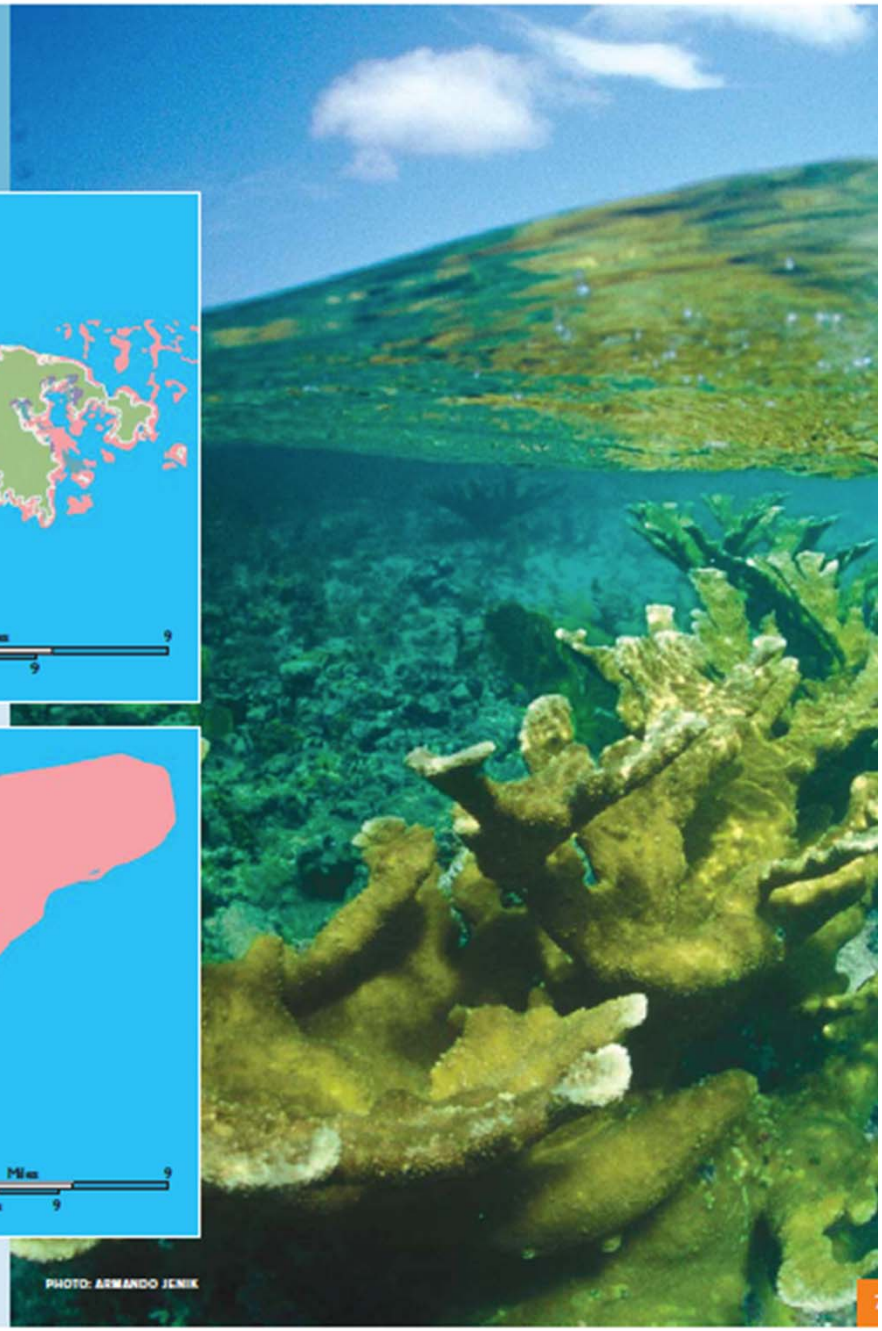
CORAL REEFS

OF THE U.S. VIRGIN ISLANDS





MAP: JEROME COOKSON / DATA: NOAA



RIGHT: *Elkorn coral in East End Marine Park*

PHOTO: ARMANDO JENIK

PHOTO: DAVID E. GUGGENHEIM

LEFT: *Cruise ships bring millions of visitors to the USVI each year. But ships, and the people they bring, can cause undue stress to the reefs.*

BELOW: *Sediment that runs off the land creates another stress for coral reefs, blocking the light that they need to thrive and changing the chemical composition of the water.*

PHOTO: BARRY DEVINE

SEDIMENT RUNOFF

During the construction of houses, hotels, and other structures in the Virgin Islands, vegetation—trees, grasses, and shrubs—is often removed. This leaves the topsoil exposed, with nothing to hold it in place. During periods of heavy rainfall, large amounts of topsoil are washed into coastal waters, some of which settles on reefs. This provides a double stress for the corals; the tiny coral polyps are smothered by sediment, and the sunlight required by the microscopic algae that live in harmonious association with the corals, is blocked out, reducing the amount of energy available to the corals. The same effects result from coastal dredging; increased sediment settles on the reefs and clouds the water.

OVERFISHING

Coral reefs, along with mangroves and seagrass beds, provide a significant portion of the seafood consumed by both Virgin Islanders and tourists. The increasing demand for seafood has created excessive fishing pressure on many of the coral reefs in the Virgin Islands. Fishermen have tried to keep up with demand by using fishing gear that ensures the greatest catches possible. Gear types such as fish traps and seine nets can cause physical damage to the reefs, and they indiscriminately catch a wide variety of reef fish, many of which are not marketable, and are discarded as "trash fish."

Fewer fish on the reef creates its own form of stress, diminishing the diversity and the resilience of the coral reef system. The decline in the number and size of plant-eating fish, for example, allows the algae that compete with the corals to grow more successfully. The massive die-off of the long-spined black sea urchin (*Diadema antillarum*) in the early 1980s also contributed to the increase in algae and decrease in coral cover. The loss of many of these algae-eaters may in fact be playing a significant role in preventing the recovery of many of our reefs.

TOURISM AND RECREATION

Tourism and recreation can affect coral reefs directly and indirectly. The spectacular beauty of the Virgin Islands coral reefs attracts divers and snorkelers from all over the world, but inexperienced or careless divers can harm the reefs by breaking coral colonies with their dive fins. When divers and snorkelers collect specimens from the reef, they can help to deplete reef species and threaten their survival locally.

PHOTO: BARRY DEVINE

LEFT: *Salt pond after a heavy rain.*

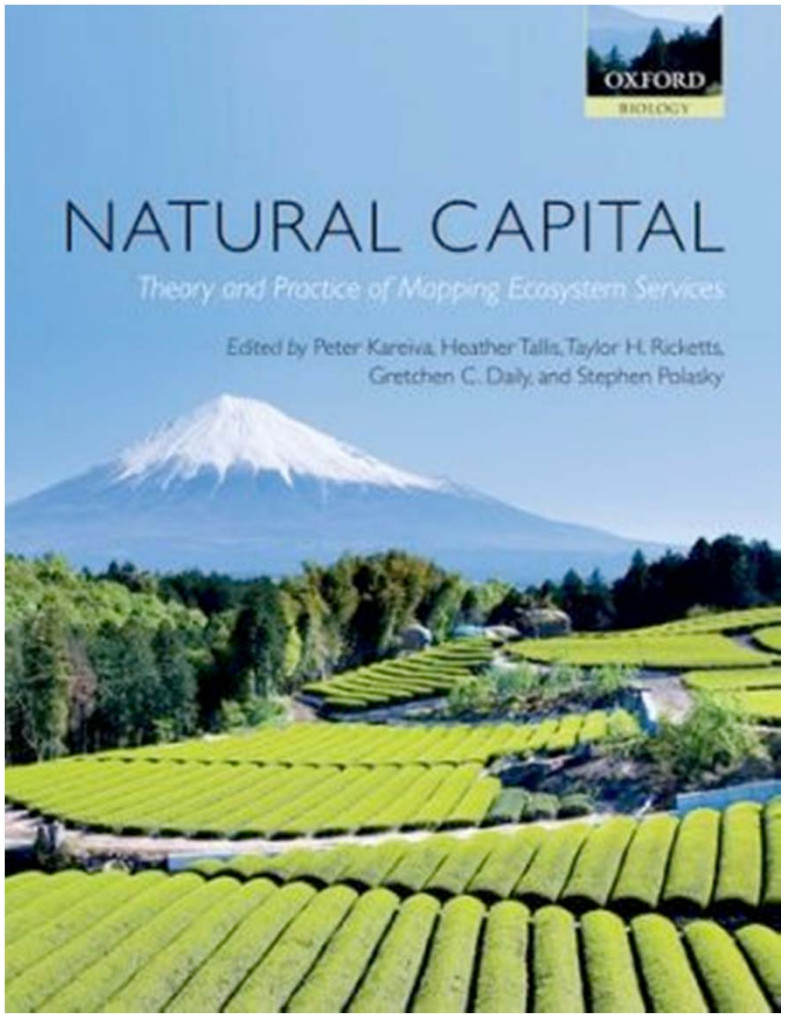
Fisheries Challenges

The creation of marine reserves and territorial parks, seasonal closed areas for spawning aggregations, and the expansion of national monuments has dramatically reduced the fishable waters of the U.S. Virgin Islands. Areas where development or industrial impacts have degraded water quality have reduced these areas even more. As a result, there are now too many fishermen for the limited resources available. As the fishable areas have decreased, competition for the fish available in those limited areas has increased. Many good management regulations exist to protect our reef fish resources, but the ability to enforce these regulations is lacking.

Still, conserving reef fish is not simply the responsibility of government; it is the responsibility of everyone—fishermen, consumers, divers, and all those who use or affect the coral reef ecosystems. Managers and decision makers have a responsibility to make informed decisions based on the best available science. But citizens, too, have a right—and a responsibility—to speak out on fishery management decisions. We must all recognize our responsibility to conserve and manage our marine resources so that successive generations of Virgin Islanders can experience, appreciate, and enjoy them.

PHOTO: NICOLAS DEATTON

Heather Tallis



Creation and Sustainable Governance of New Commons through Formation of Integrated Local Environmental Knowledge (ILEK project)

Project Leader
SATO Tetsu RIHN

Professor Tetsu Satc
behavior of cichlid fi
and Malawi for 20 ye
expanded his resear
community-based cc
resource manageme
career, including as
University of Malawi
Director of WWF Jap
creating scientific kn
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Ecology and Environ
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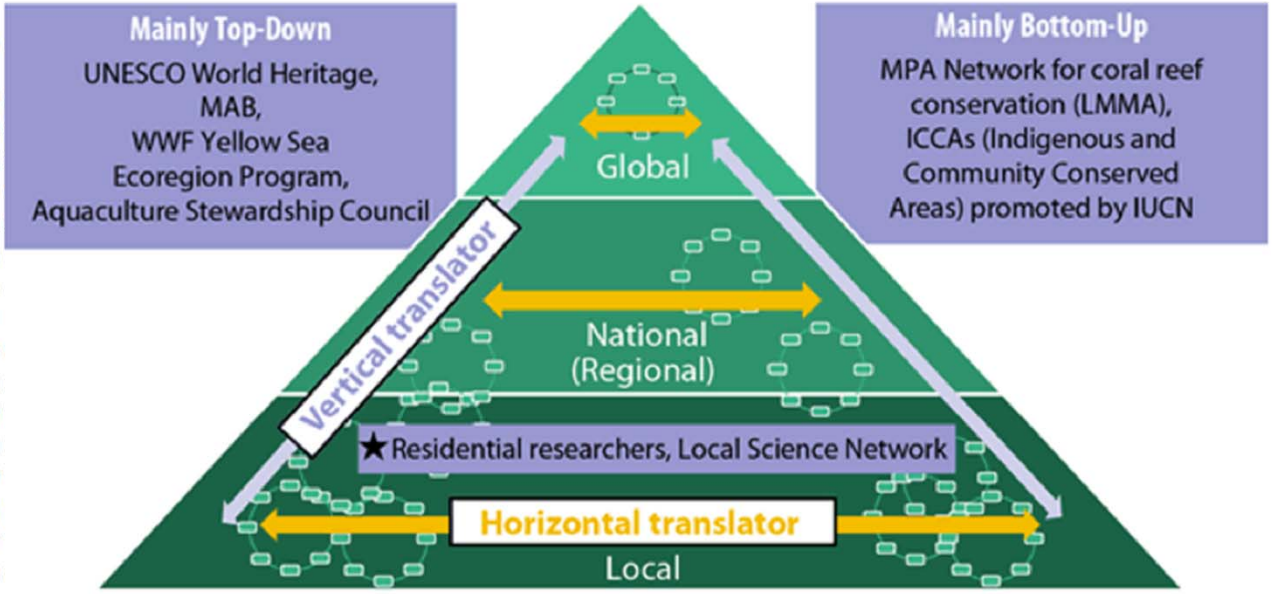
leading a project to
scientists producing
Environmental Know



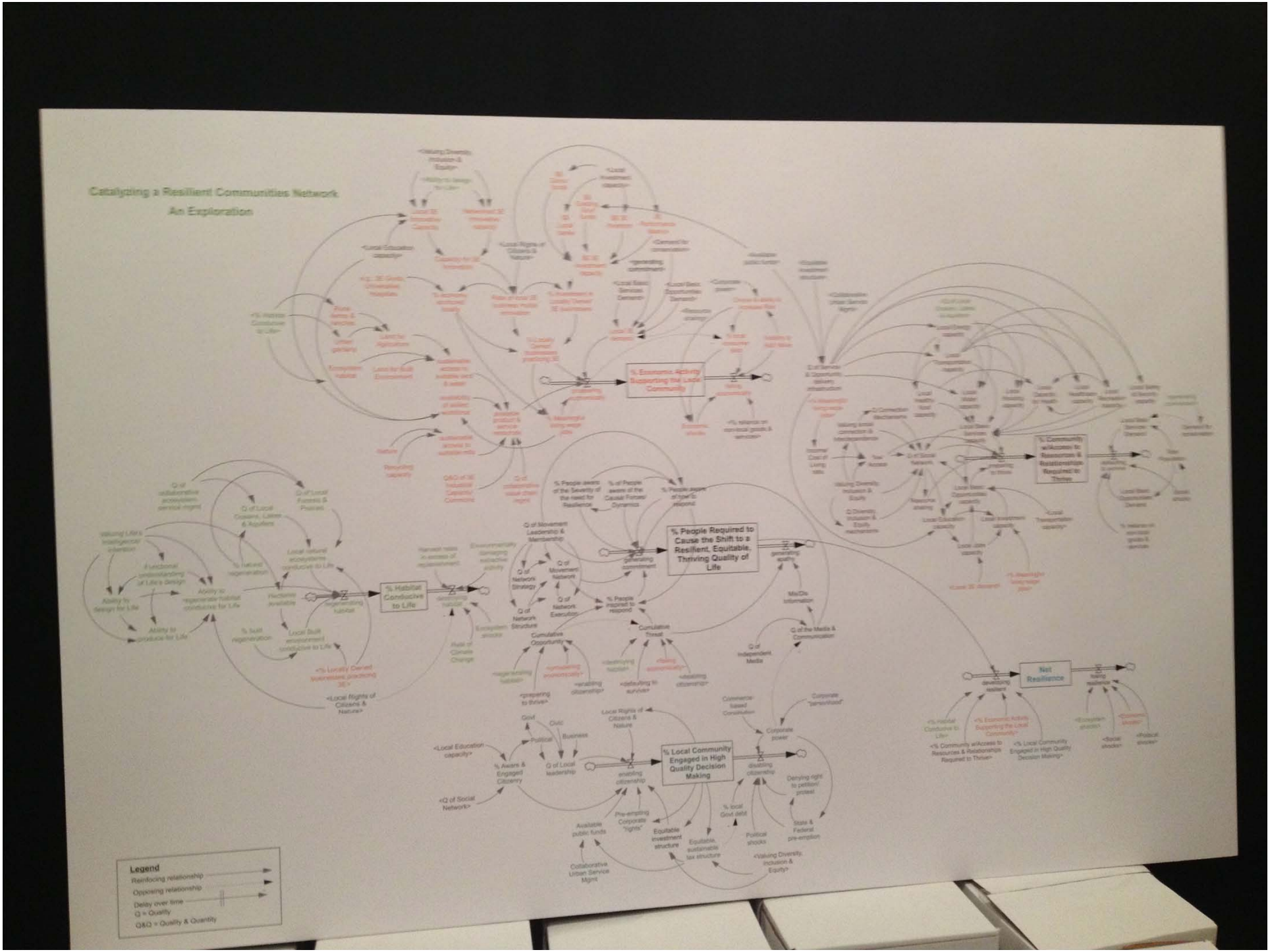
Each scale level has characteristic networks of knowledge producers and users, and bilateral knowledge translators facilitate both horizontal and vertical translation of knowledge. Analysis of framingand knowledge flow across the scales will clarify multi-scale governance systems.

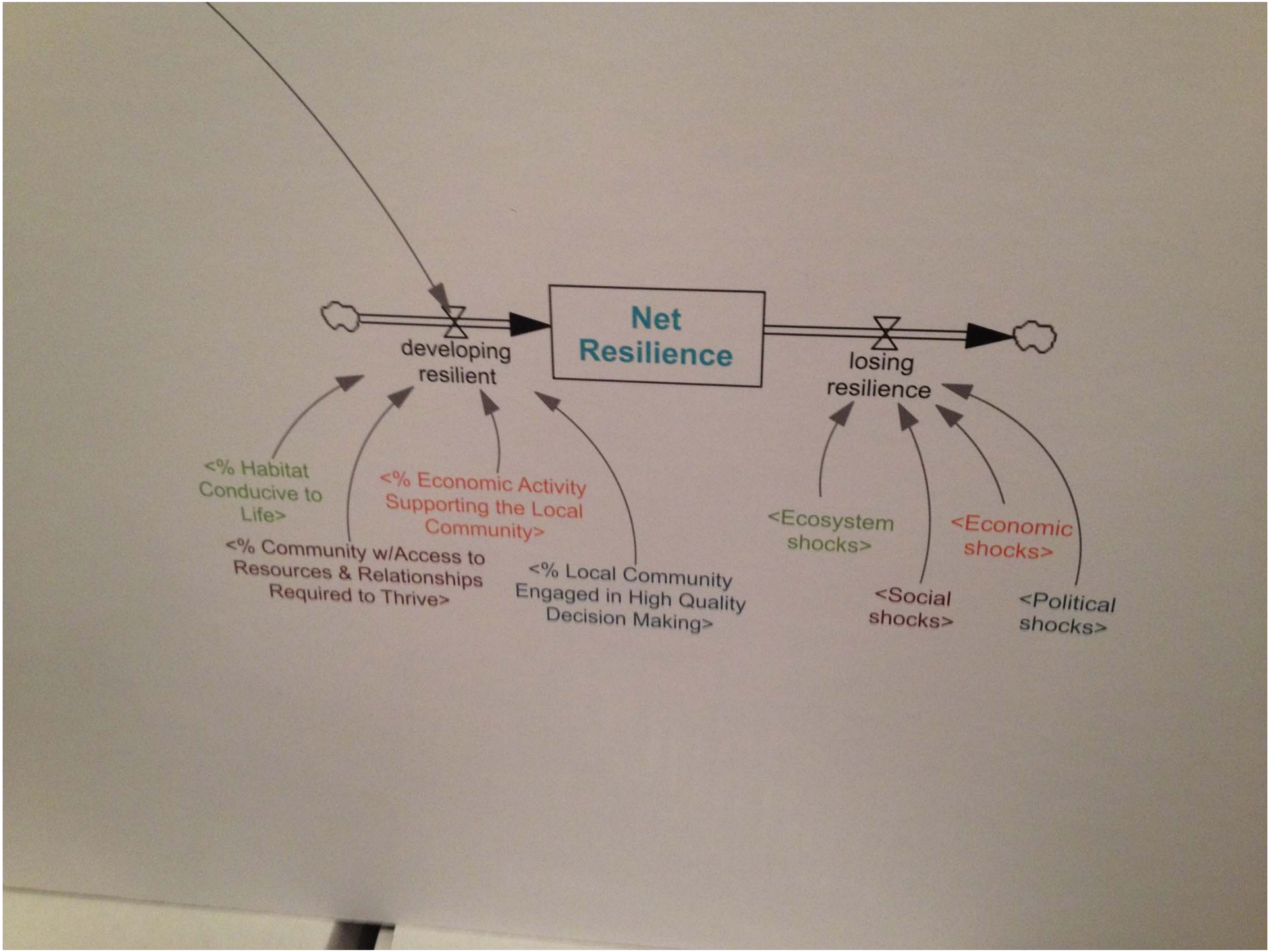
Figure 2 Hypothetical framework of multi-scale analyses
This framework will be used to analyze the role of bilateral knowledge translators in supporting knowledge flow and adaptive governance across different scales from local to global.


CICEET
COLLA
Guide for E
Values & Ethics
Citizen & Business Stewardship
Values & Ethics
Local Governance & Policy
Values & Ethics
Drinking Water & Source Water
Best Practices
Values & Ethics
Land Conservation
Values & Ethics
Engineering & Public Works
Best Practices
Best Practices
Values & Ethics
Planning & Land Management
Values & Ethics
Education, Training, Outreach
Values & Ethics
Regulatory & Enforcement
VALUES OF CLEAN WATER
Economic
Public Health & Safety
Farming & Fishing
Recreation & Tourism
Wildlife & Habitat

Activities

- **Experiential Social Learning Field Trip**
- **Fishbowl Facilitated Exercise**
- **Stewardship-Building Facilitated Exercise**
- **Creative Problem-Solving**
- **World Café Exercise on Workshop Core Themes**
- **Interactional Discourse Social Network**
- **“FaBa FaBa” Facilitated Exercise**


Catalyzing a Resilient Communities Network
An Exploration
% Economic Activity Supporting the Local Community
% People Required to Cause the Shift to a Resilient, Equitable, Thriving Quality of Life
% Habitat Conducive to Life
% Local Community Engaged in High Quality Decision Making
% Community w/Access to Resources & Relationships Required to Thrive
Net Resilience
Legend
Reinforcing relationship
Opposing relationship
Delay over time
Q = Quality
Q&Q = Quality & Quantity


Net Resilience
developing resilient
losing resilience
<% Habitat Conducive to Life>
<% Community w/Access to Resources & Relationships Required to Thrive>
<% Economic Activity Supporting the Local Community>
<% Local Community Engaged in High Quality Decision Making>
<Ecosystem shocks>
<Social shocks>
<Economic shocks>
<Political shocks>

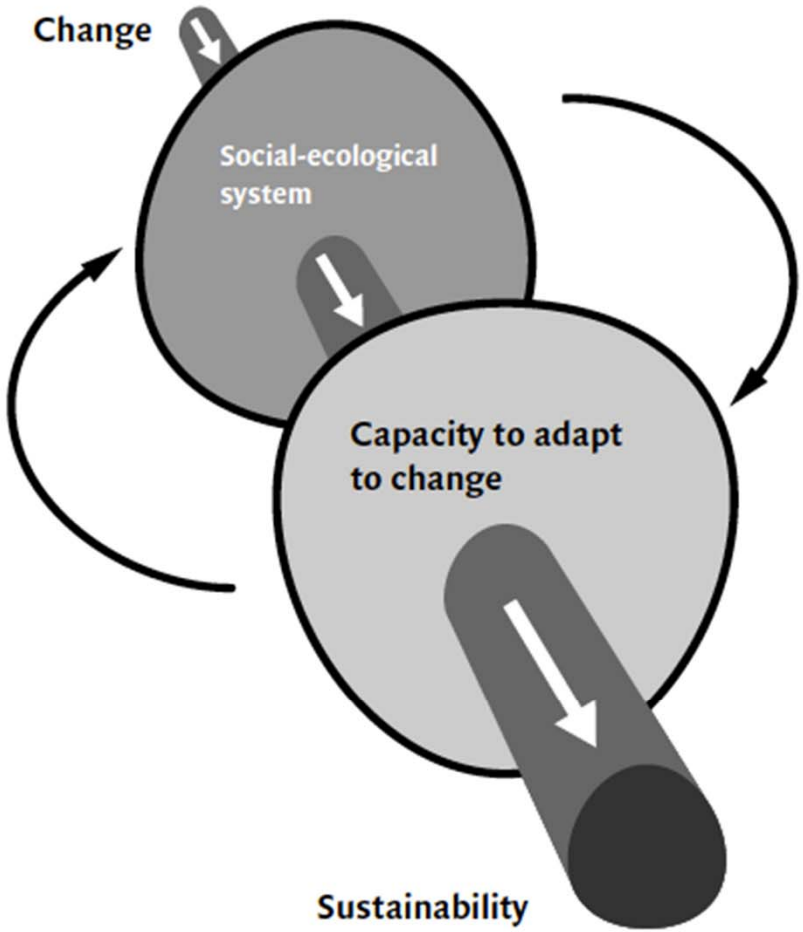
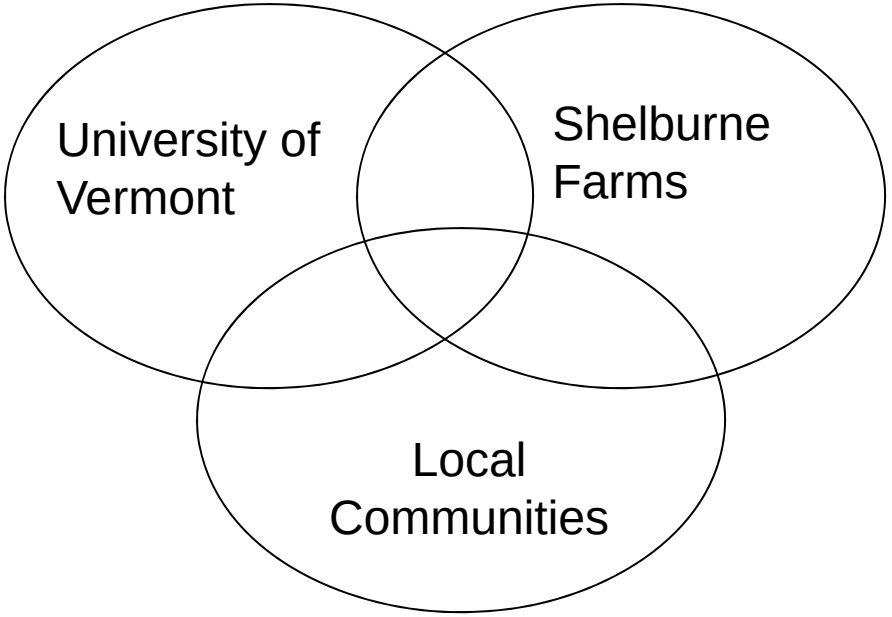


Figure 1.1 The focus on adaptive capacity for sustainability. Sustainability is viewed as a process, rather than an end-product, a dynamic process that requires adaptive capacity in resilient social–ecological systems to deal with change.

PLACE Program Mission

The mission of the PLACE Program is to deepen, celebrate, and revitalize the relationships between community and landscape.

PLACE Program Partnerships



PLACE Program Goals

➢**Encourage exploration and understanding of the local landscape** by providing an engaging and accessible framework for residents to learn more about their town's natural and cultural heritage

➢To foster opportunities for people to actively steward the land, improve the well being of their community, and **practice the skills of relocalization**

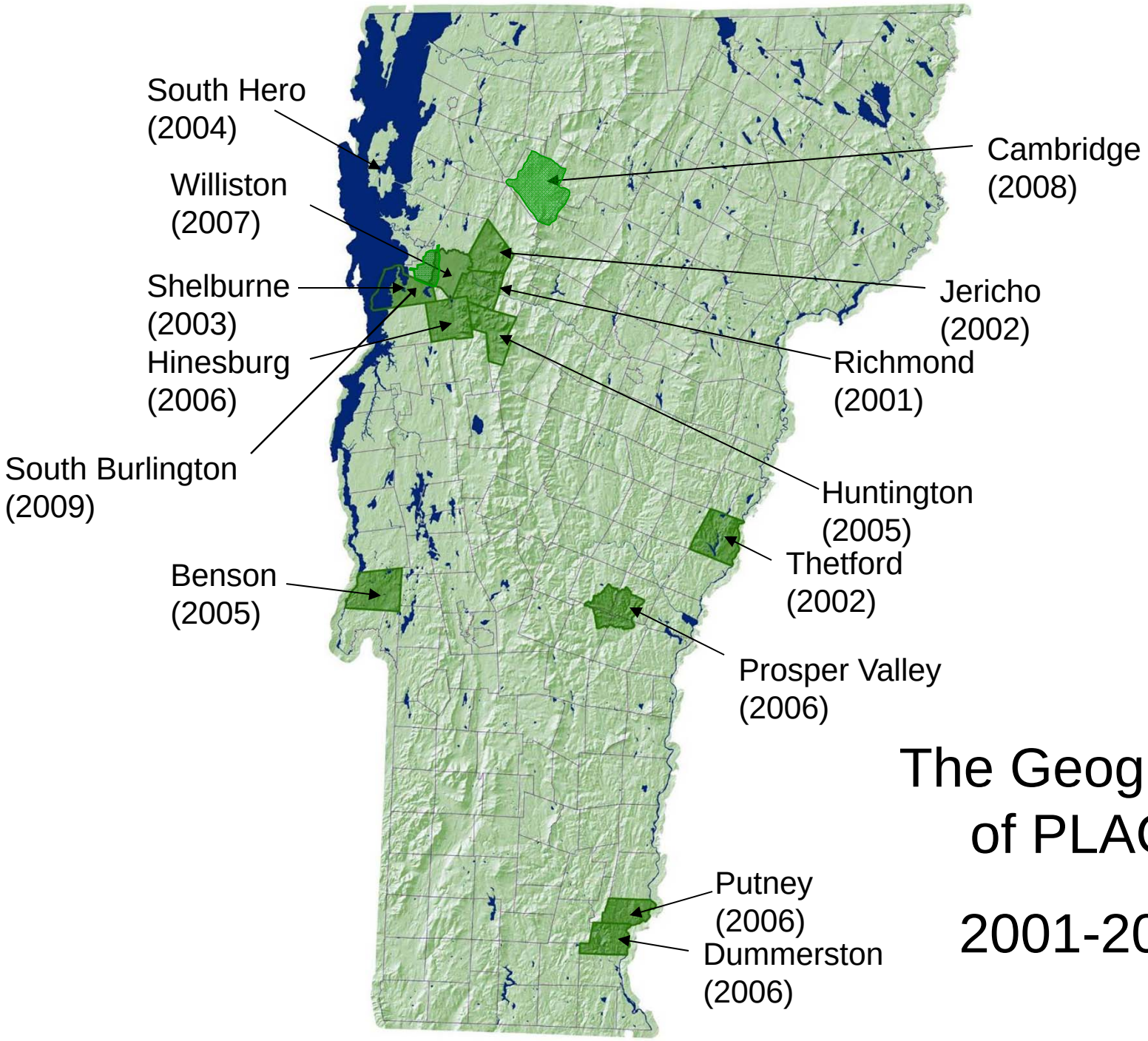
➢**Showcase local knowledge** and the efforts of individuals and organizations involved in local landscape stewardship and interpretation

➢Facilitate the integration of **place-based learning into schools** by providing local educators with information, resources, and curriculum development support

➢Support an informed and participatory **community visioning process** that builds upon an integrated interpretation of town landscapes and their transformation through time

➢Provide meaningful **service-learning opportunities for graduate students** involved in landscape analysis

➢Strengthen the **sense of place** and the connection between the past, present, and a sustainable future

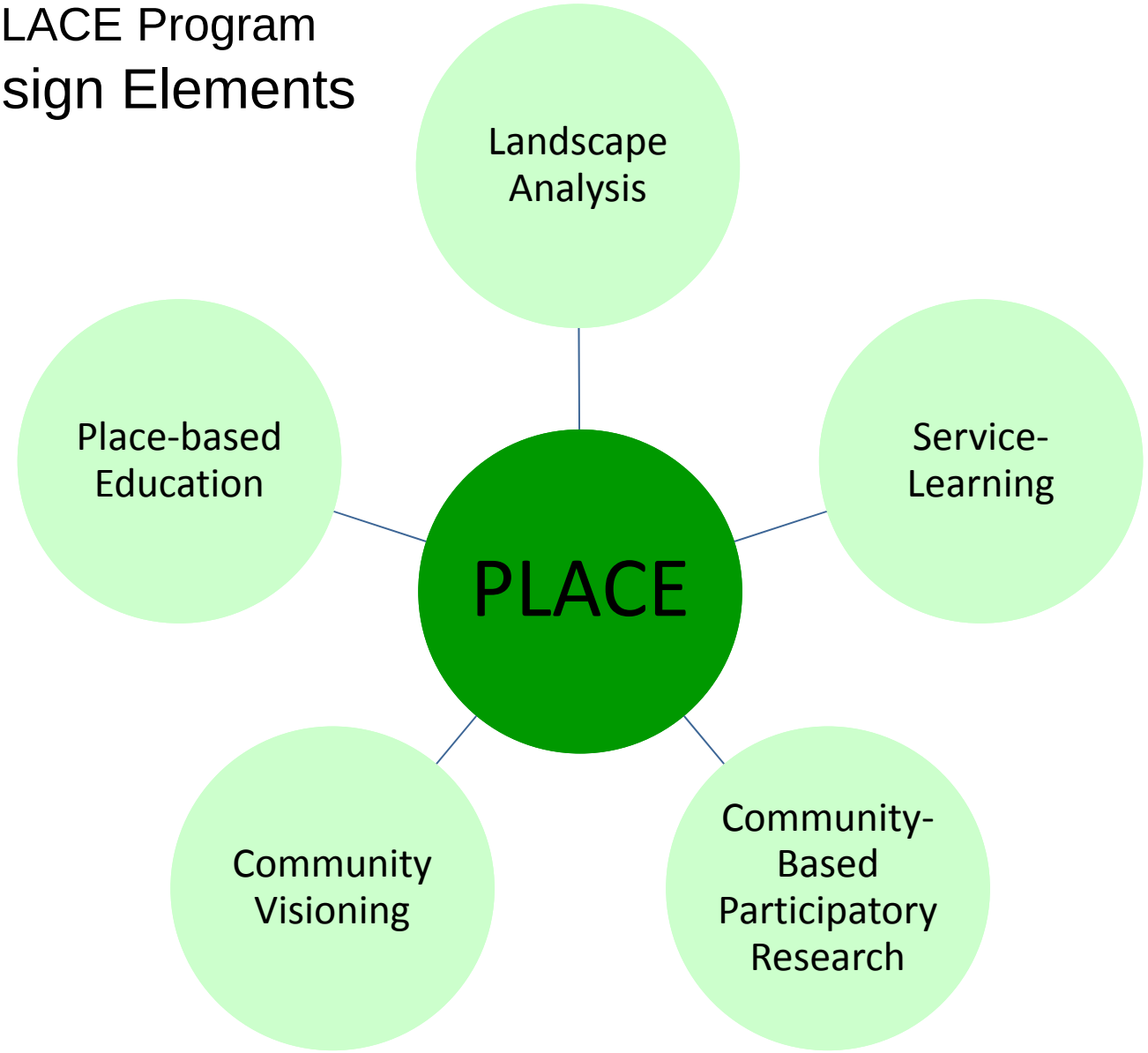


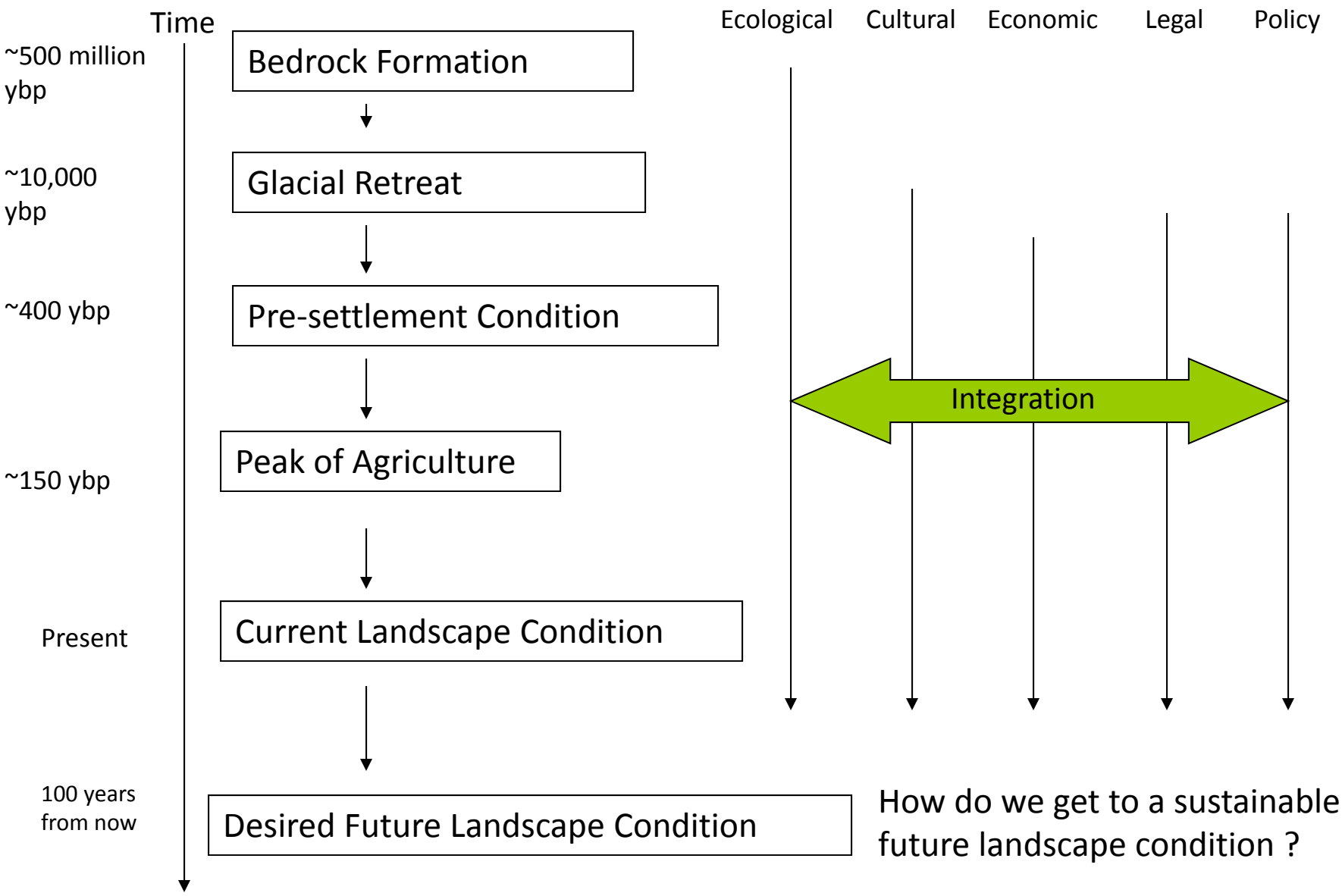
The Geography of PLACE

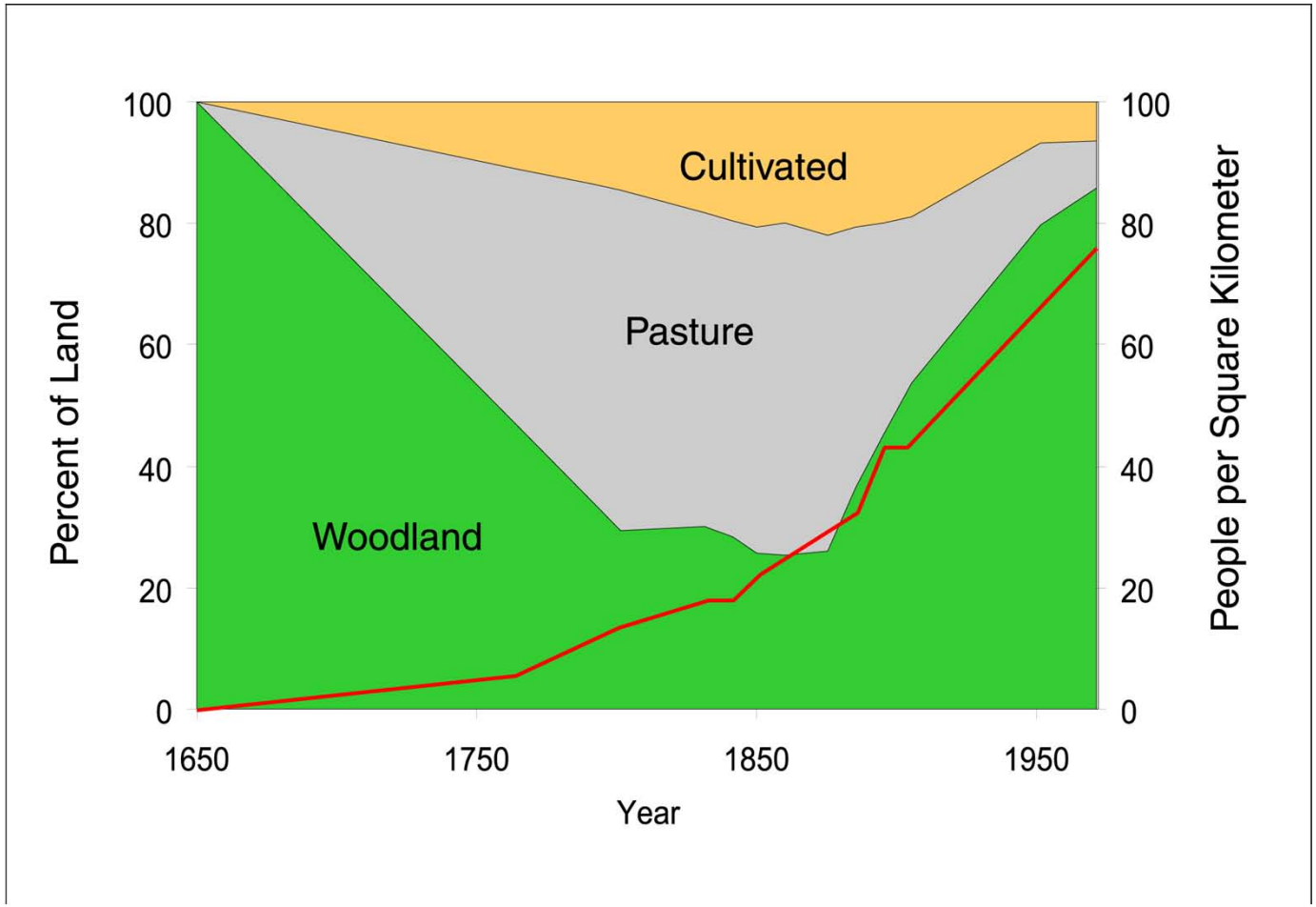
2001-2010

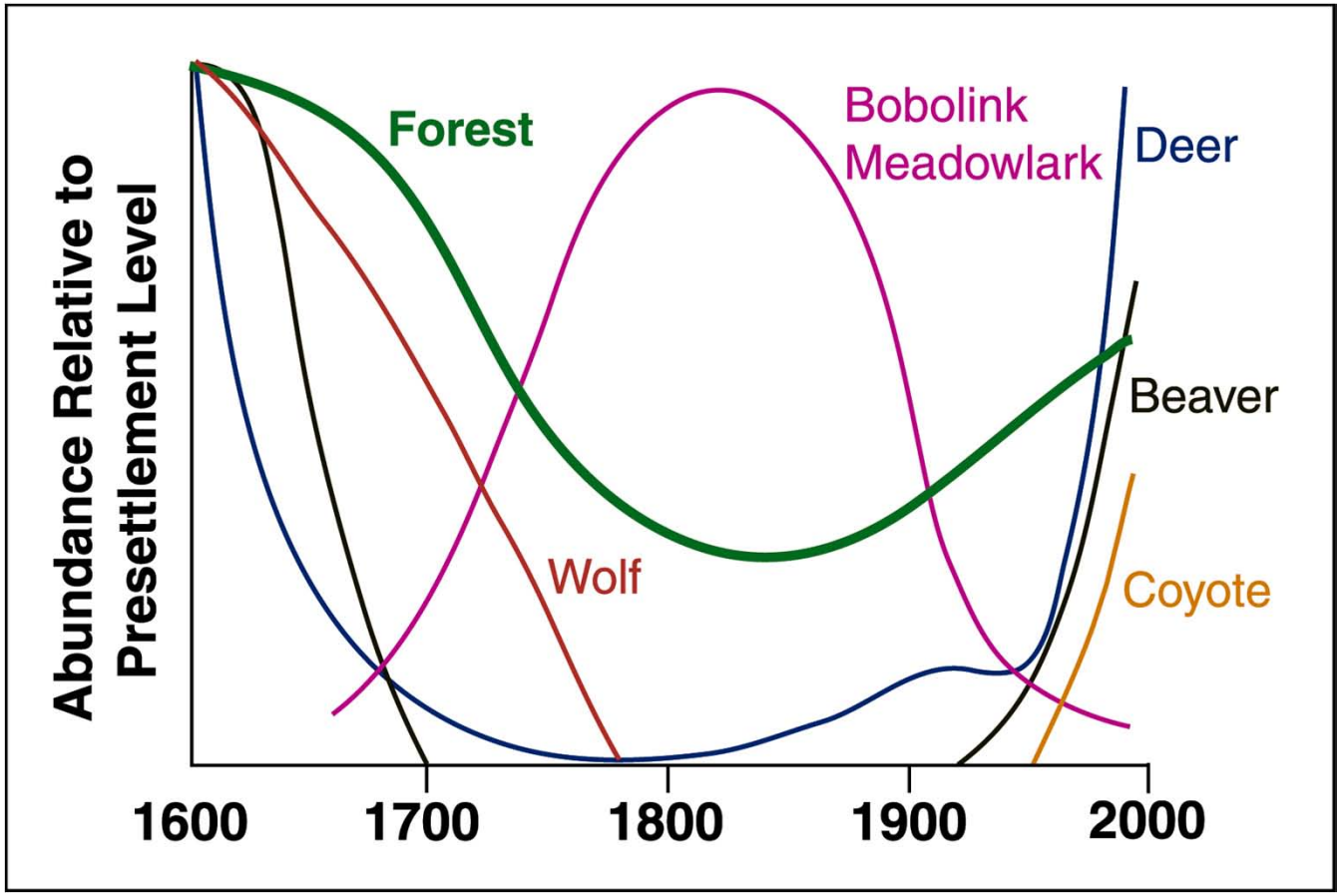
PLACE Program

Design Elements




Time
~500 million ybp
Bedrock Formation
~10,000 ybp
Glacial Retreat
~400 ybp
Pre-settlement Condition
~150 ybp
Peak of Agriculture
Present
Current Landscape Condition
100 years from now
Desired Future Landscape Condition
Ecological
Cultural
Economic
Legal
Policy
Integration
How do we get to a sustainable future landscape condition ?


100
80
60
40
20
0
Percent of Land
Cultivated
Pasture
Woodland
1650
1750
1850
1950
Year
People per Square Kilometer


Abundance Relative to Presettlement Level
Forest
Bobolink
Meadowlark
Deer
Beaver
Wolf
Coyote
1600
1700
1800
1900
2000

Place-based Education

- Landscape analysis content
- Focuses on both youth and adults
- Links schools with communities
- Evening presentations
- Saturday field trips
- Professional development for teachers

Service-Learning

•UVM Graduate Students play central role

•Reciprocity is key

•**Service:** Landscape analysis brought to residents, planners and educators

•**Learning:** Landscape is the classroom. Community mentors, professors, and professionals serve as teachers.

•K-12 Students can also be service-learners

Community-Based Participatory Research

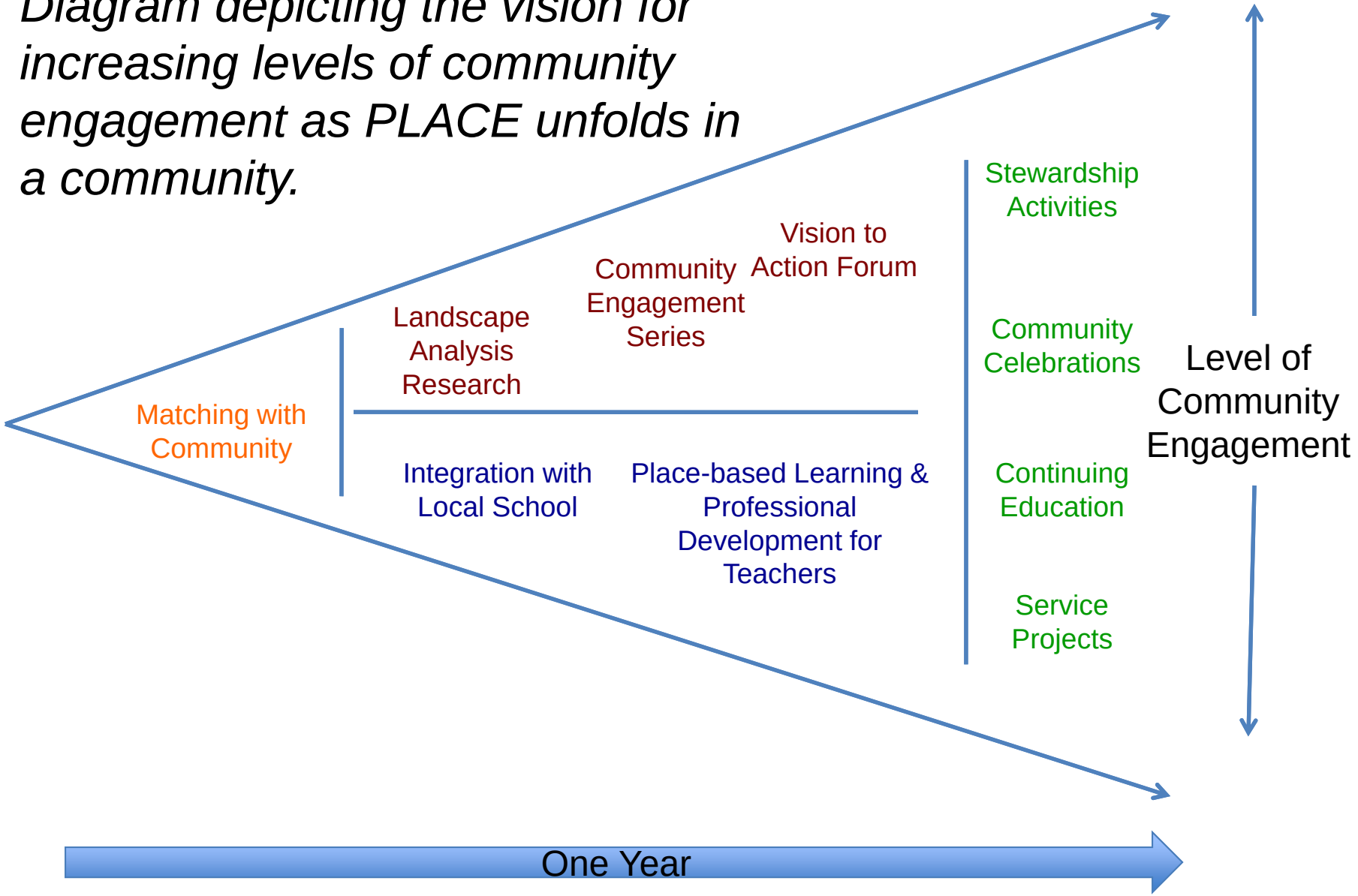
The Community:

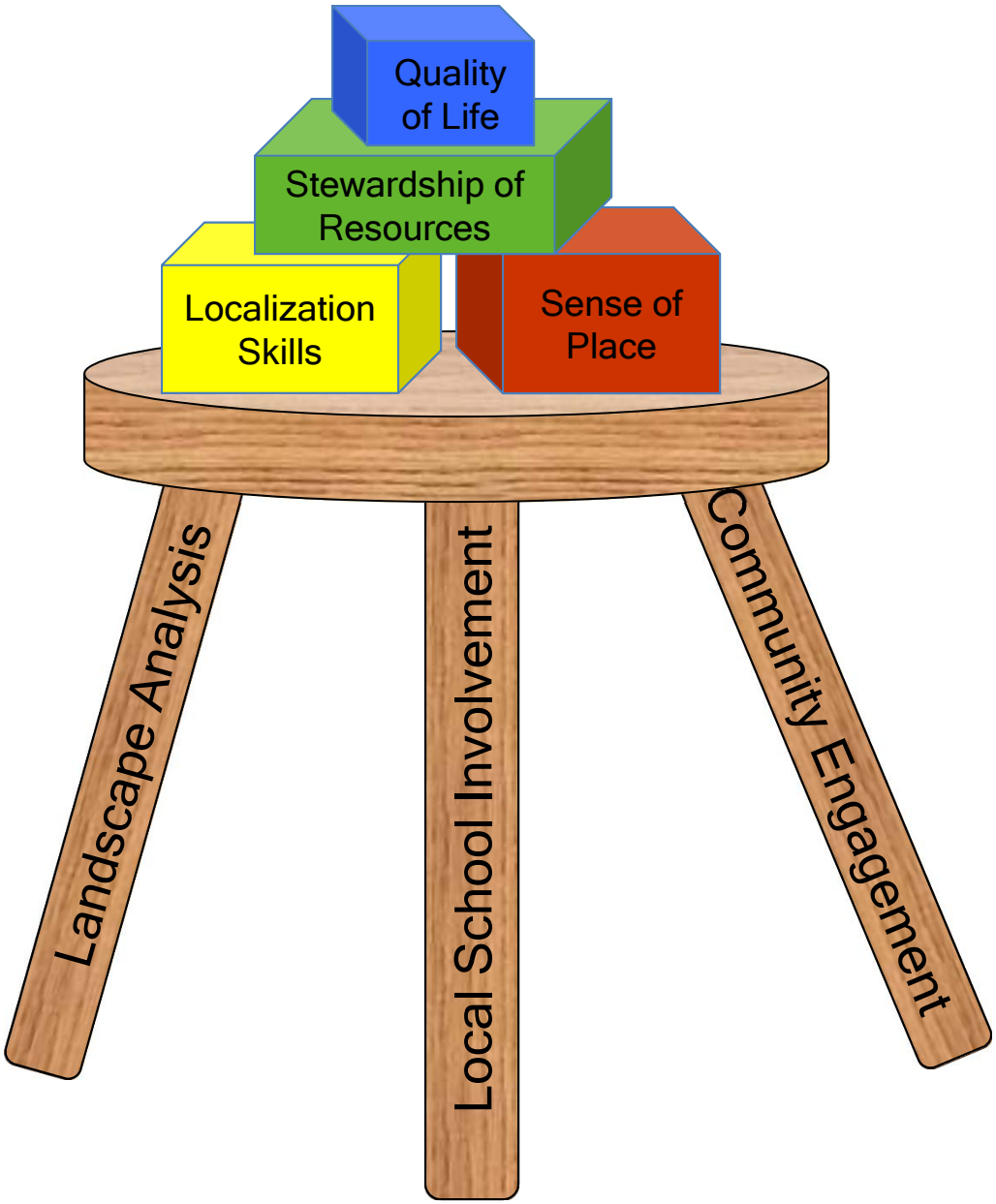
- drives the questions
- participates in research
- owns the data
- interprets and presents
- Provides local expertise

Community Visioning

- 1½ day Vision to Action Forum
- Community members share ideas and hopes for their community's future
- Identify problem areas and opportunities
- builds on ecological and historical analysis from education series

Diagram depicting the vision for increasing levels of community engagement as PLACE unfolds in a community.




Quality of Life
Stewardship of Resources
Localization Skills
Sense of Place
Landscape Analysis
Local School Involvement
Community Engagement

Burlington Geographic

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ww.uvm.edu/place/burlingtongeographic/

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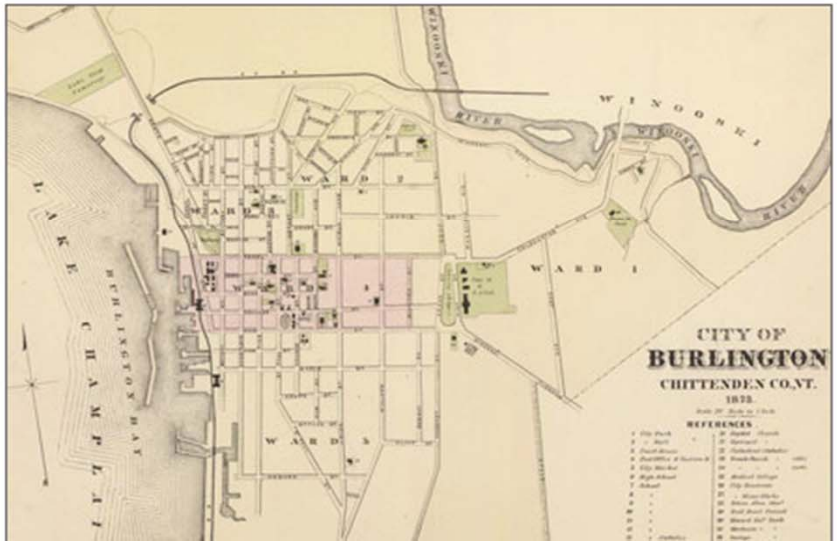
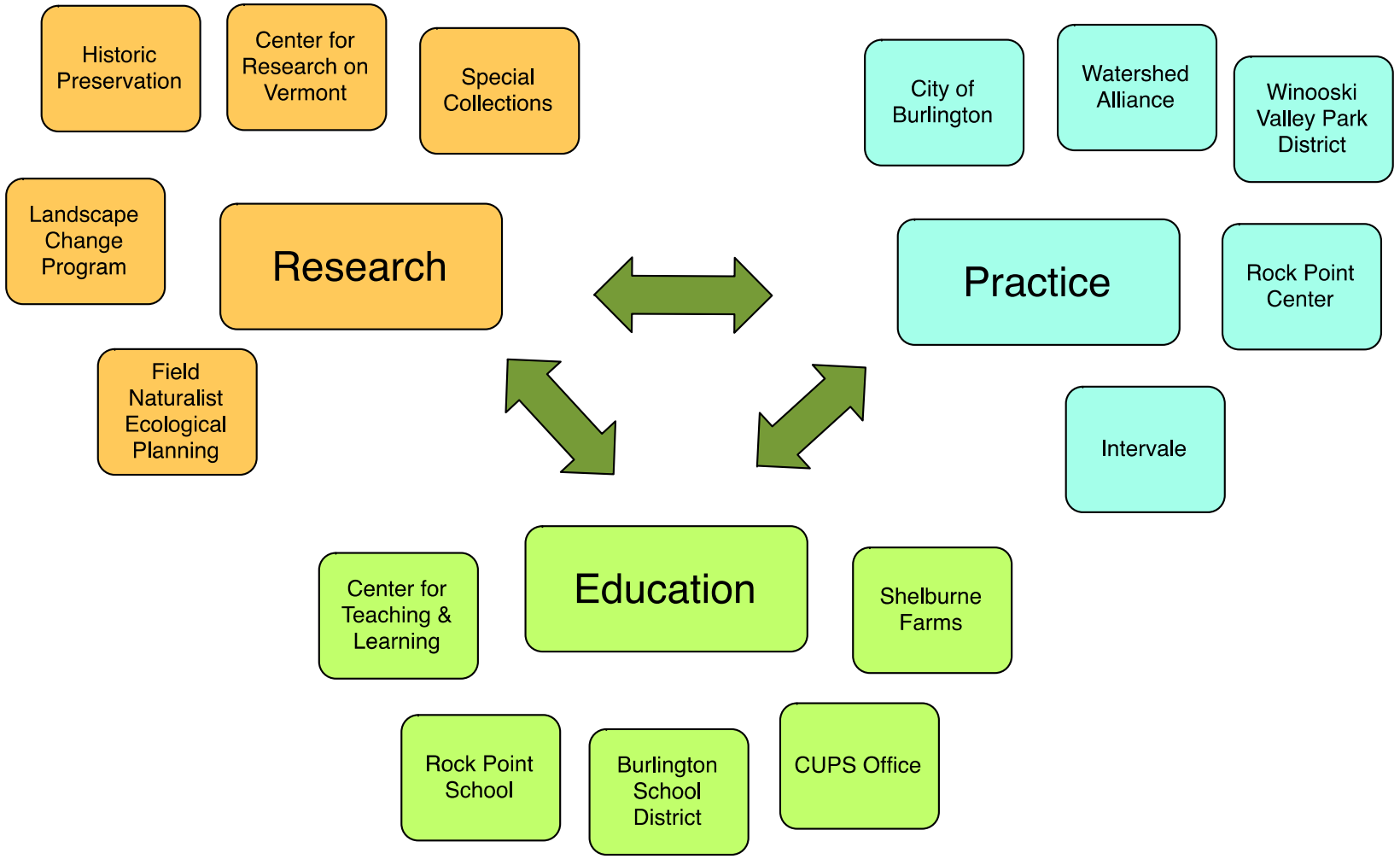
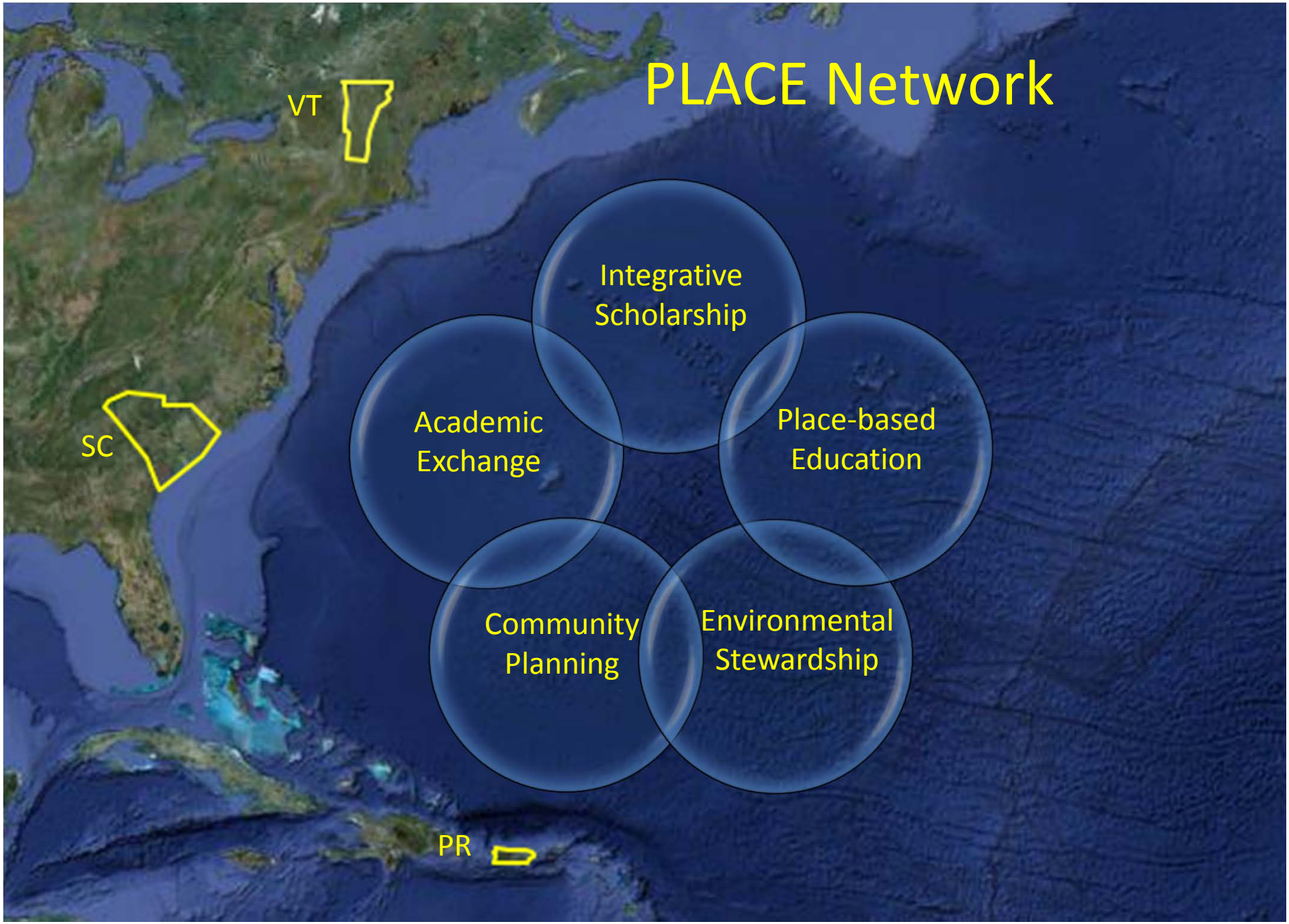
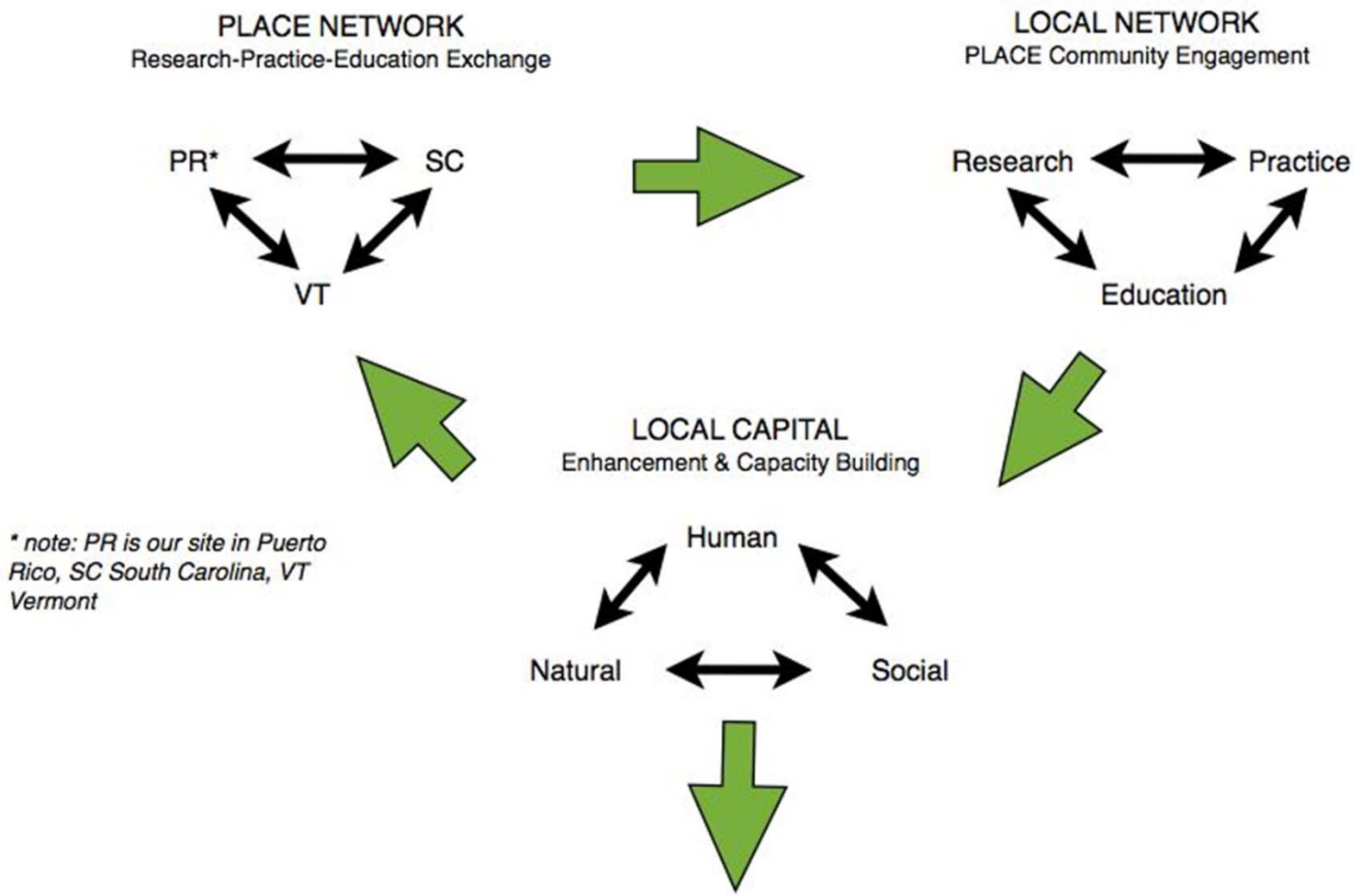
Overview

The unfolding story of the landscape and community of Burlington will be the focus of the PLACE Program starting in January 2012. Burlington Geographic will bring together a variety of community members, educators, students, city departments, businesses, and non-profit organizations in an exploration and celebration of the natural and cultural history of Vermont's largest city. The project will feature community-based participatory research projects, field trips, workshops, lectures, and discussions over the next two years, with the goal of applying whole systems thinking to fostering a deeper sense of place and a



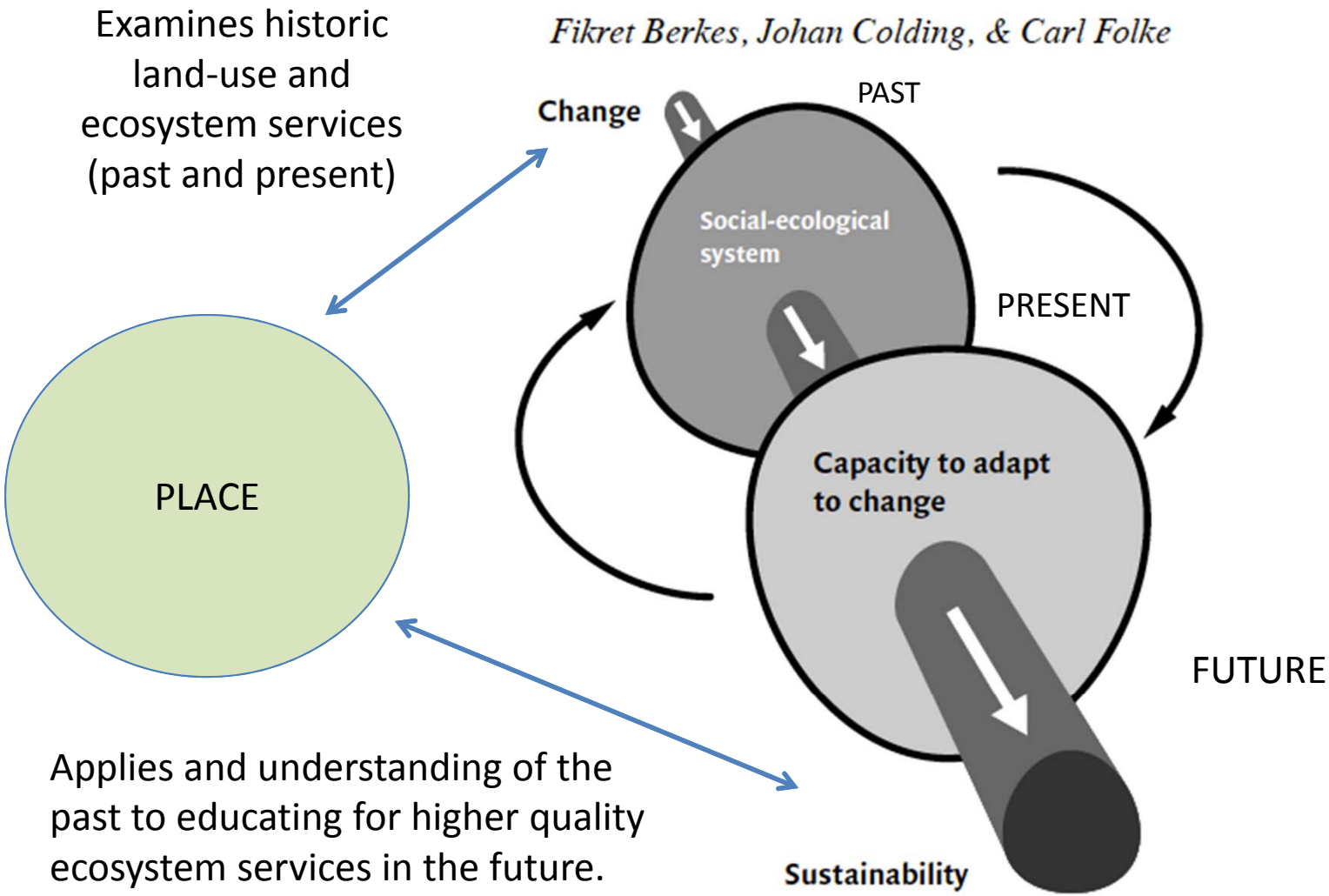

Historic Preservation
Center for Research on Vermont
Special Collections
Landscape Change Program
Research
Field Naturalist Ecological Planning
City of Burlington
Watershed Alliance
Winooski Valley Park District
Practice
Rock Point Center
Intervale
Education
Center for Teaching & Learning
Shelburne Farms
Rock Point School
Burlington School District
CUPS Office


PLACE Network
VT
SC
PR
Integrative Scholarship
Academic Exchange
Place-based Education
Community Planning
Environmental Stewardship



** note: PR is our site in Puerto Rico, SC South Carolina, VT Vermont*

Examines historic land-use and ecosystem services (past and present)



Applies and understanding of the past to educating for higher quality ecosystem services in the future.

Figure 1.1 The focus on adaptive capacity for sustainability. Sustainability is viewed as a process, rather than an end-product, a dynamic process that requires adaptive capacity in resilient social–ecological systems to deal with change.