



Farming the floodplain: New England river governance in a changing climate

Rachel E. Schattman, Ph.D.

November 9, 2017



United States Department of Agriculture
Climate Hubs



The University of Vermont

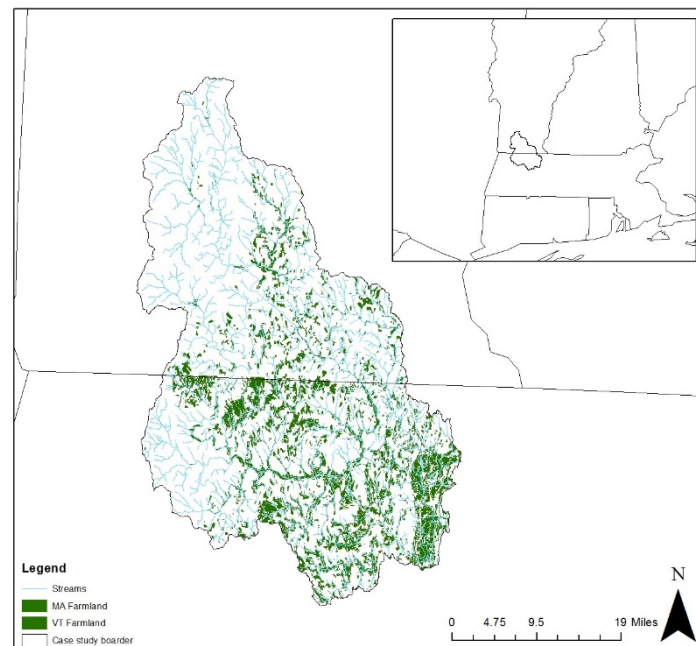
Background

- River governance is notoriously complex.
- Climate change will alter how people interact with rivers.
- Will current river governance structures serve us in the future? Or is it time to reconsider our current rules and regulations?



Objectives

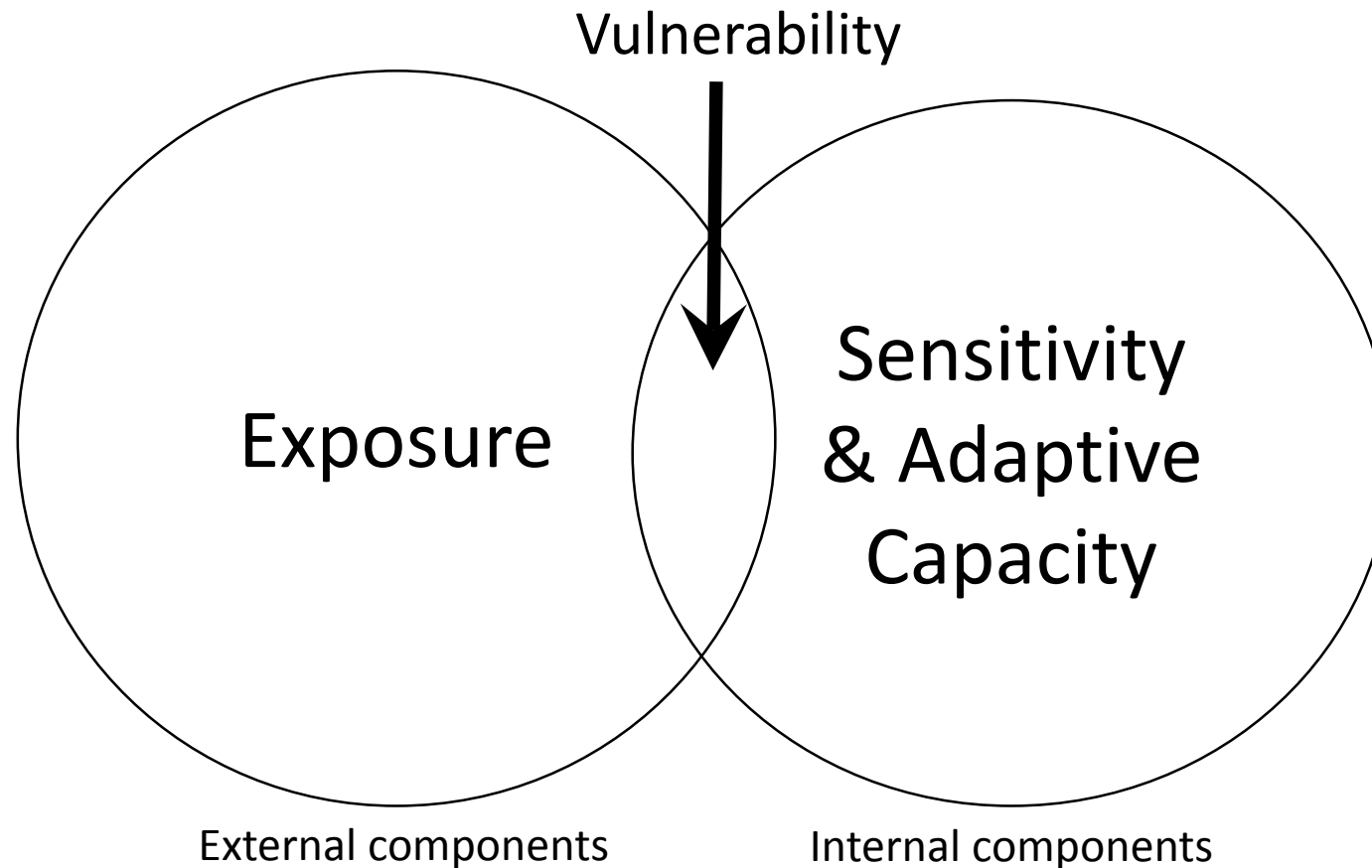
1. Introduce theoretical frames: Vulnerability, adaptation, river governance
2. Review case study: **New England river governance in a changing climate**
3. In class role-playing activity



Map of case study area

Theoretical Frame

$$\text{Vulnerability} = [\text{Exposure} * \text{Sensitivity}] - \text{Adaptive Capacity}$$





Theoretical Frame

Tools to reduce vulnerability in agroecological food systems

Buffer

Low cost.

Maintain operations,
form and function of
the business.



Theoretical Frame

Tools to reduce vulnerability in agroecological food systems

Buffer

Low cost.
Maintain operations,
form and function of
the business.

Adapt

Medium cost.
Shift operations, but
maintain form and
function of the
business.



Theoretical Frame

Tools to reduce vulnerability in agroecological food systems

Buffer

Low cost.
Maintain operations,
form and function of
the business.

Adapt

Medium cost.
Shift operations, but
maintain form and
function of the
business.

Transform

High cost.
Dramatically alter the
form and function of
the business.

Theoretical Frame

Scenario 1: Increasing ocean acidity over several decades negatively impacts lobster populations

Buffer

Low cost.
Maintain operations,
form and function of
the business.

Adapt

Medium cost.
Shift operations, but
maintain form and
function of the
business.

Transform

High cost.
Dramatically alter the
form and function of
the business.

Theoretical Frame

Scenario 2: Increasingly long and severe seasonal droughts

Buffer

Low cost.
Maintain operations,
form and function of
the business.

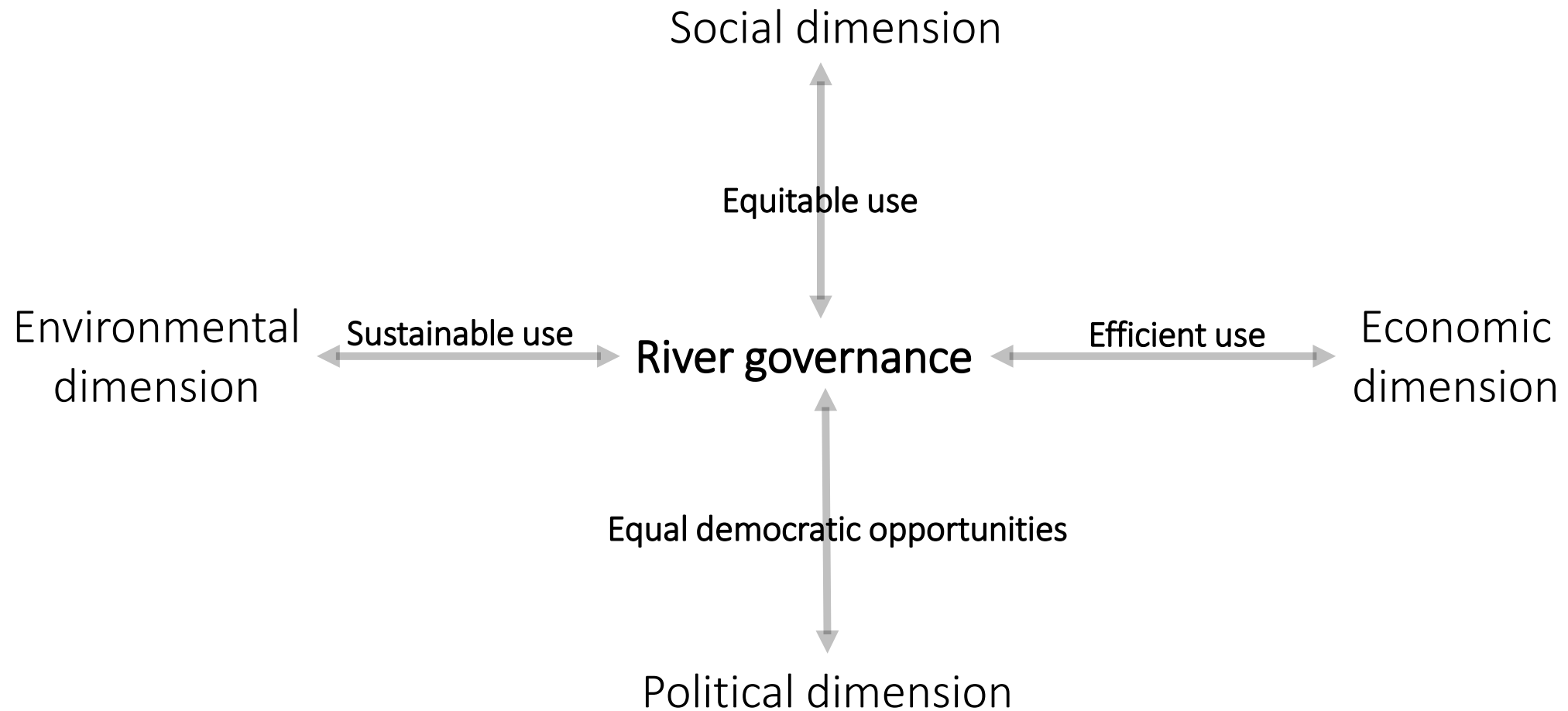
Adapt

Medium cost.
Shift operations, but
maintain form and
function of the
business.

Transform

High cost.
Dramatically alter the
form and function of
the business.

Theoretical Frame



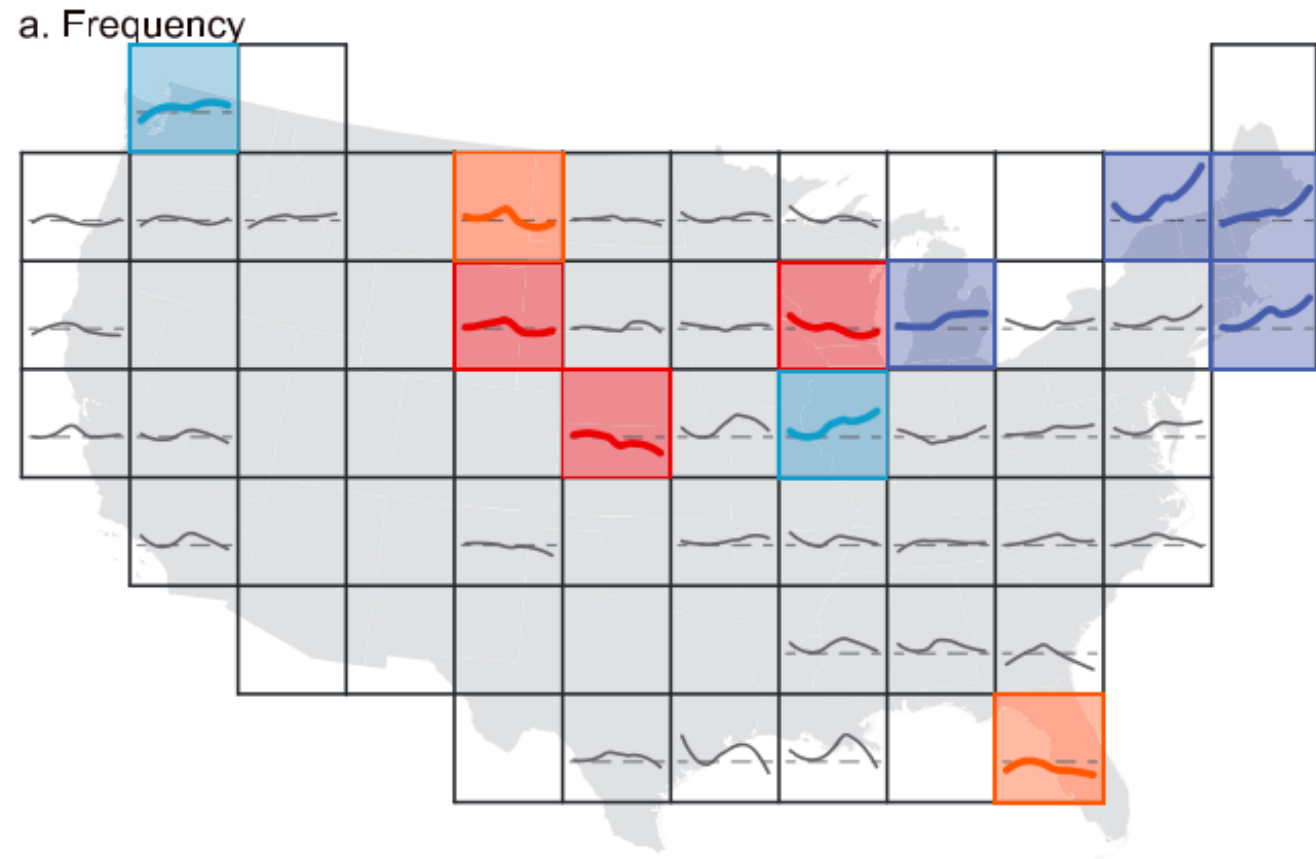
Case study

Farming in the floodplain



Case study

Increasing flood frequency reported in New England between 1940 - 2013

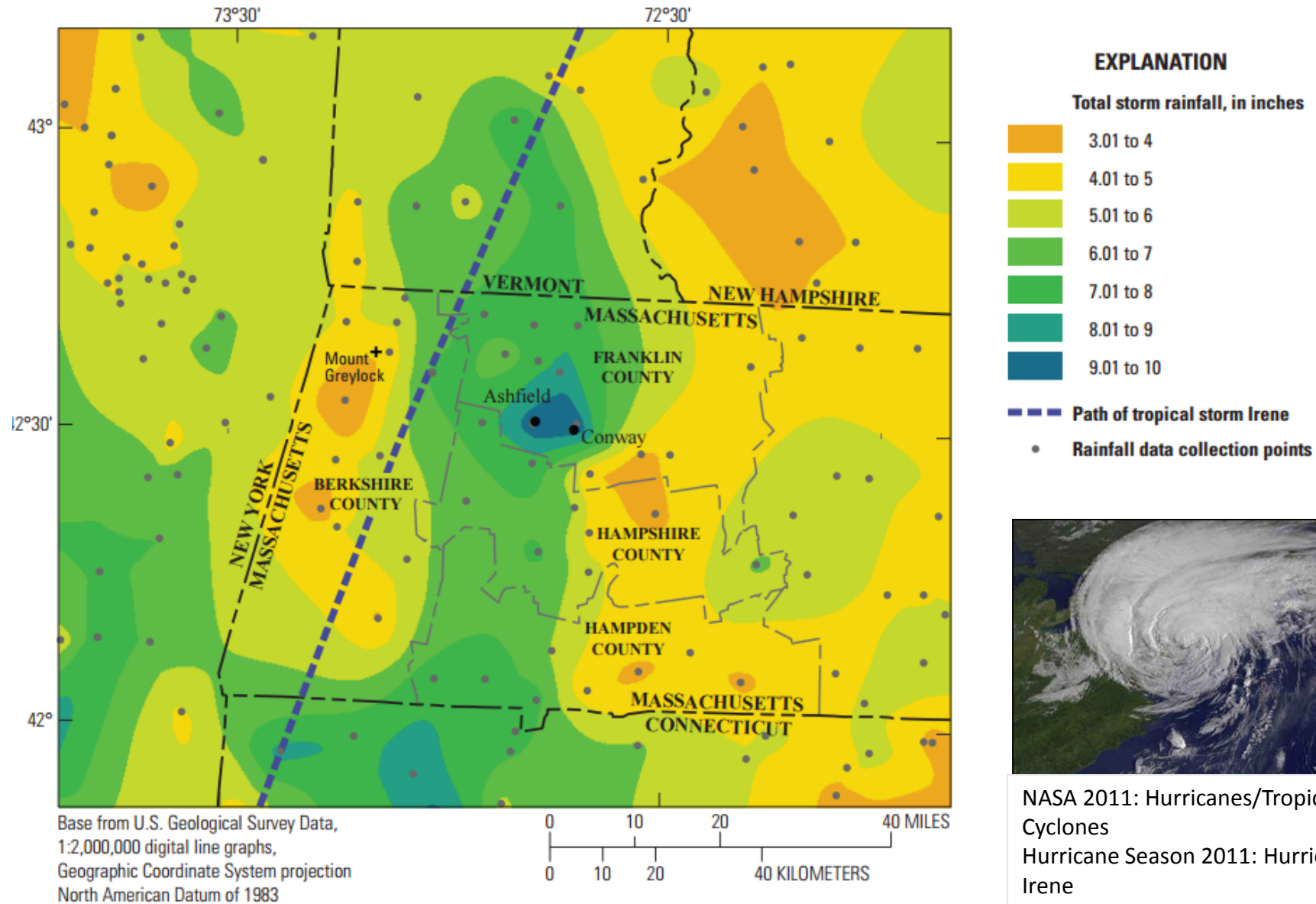


Case study



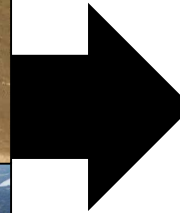
Flood damage to farm in Western MA after flood event in August, 2011.

Case study



NASA 2011: Hurricanes/Tropical Cyclones
Hurricane Season 2011: Hurricane Irene

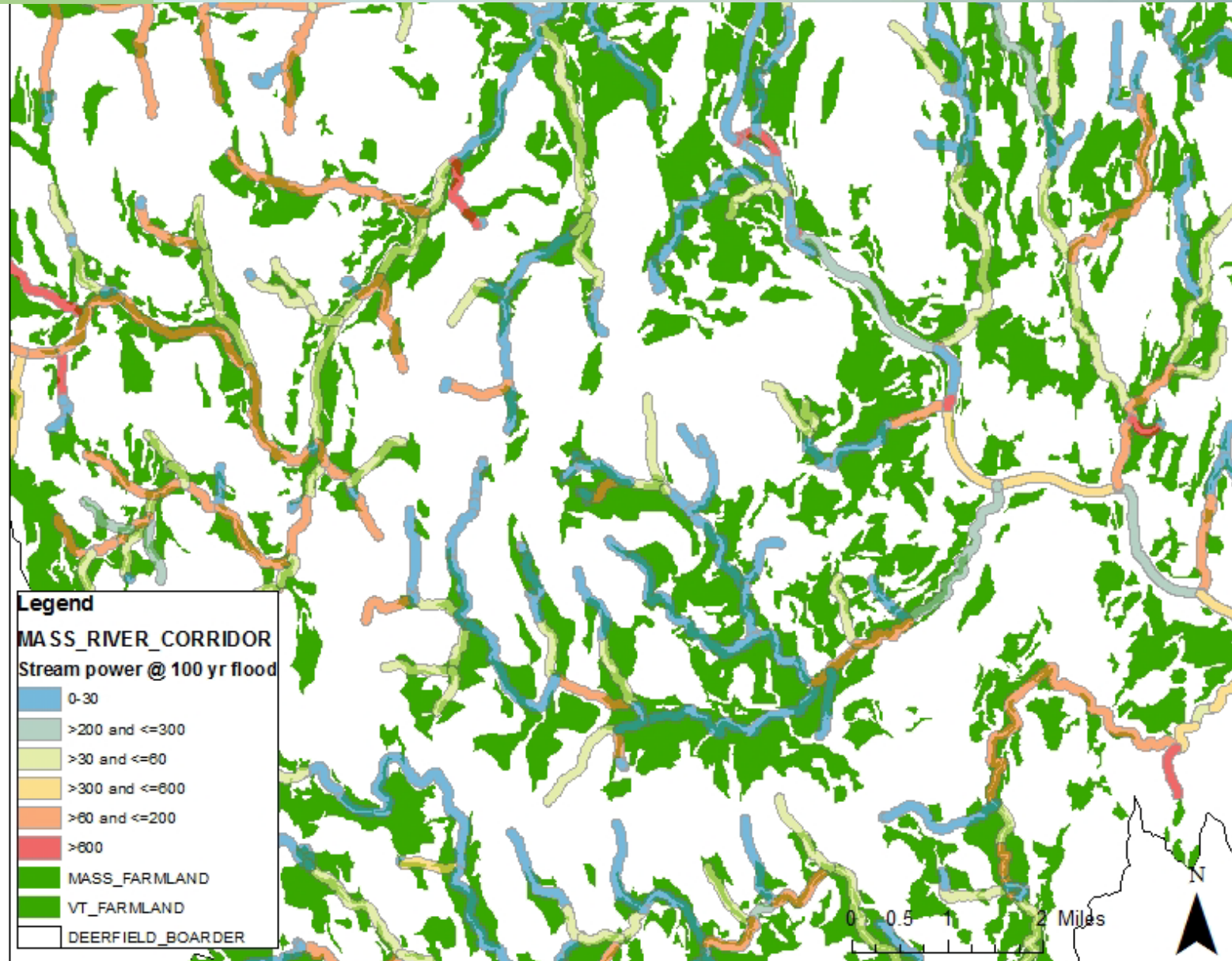
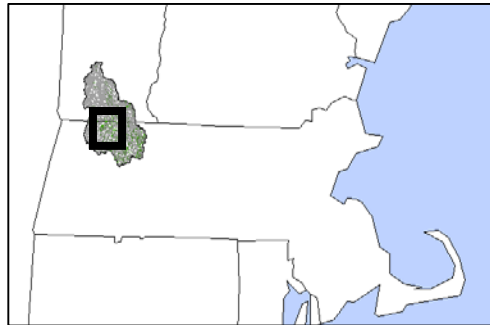
Case study



Farms in Western MA, Sept. 2011, post Tropical Storm Irene

Case study

New England agriculture is vulnerable to flooding



Case study

In Massachusetts, management of river corridors and vegetative buffers is highly regulated



Case study

Flood impacts to farms and some farmers' perceptions of them

Exposure type	Vulnerability	Degree of sensitivity	Farmer descriptions
Inundation	Equipment loss	High	"I lost some equipment. It flooded an out building of mine that was closer to the river and some equipment and materials that I had in there were just swept downstream. They're probably somewhere in the Atlantic by now."
Inundation	Crop loss	High	"We had about five or six acres that was just flattened and destroyed; the impact of the Irene was total loss of 40 acres of corn."
Inundation	Soil moisture	Medium	"The big issue was the land drying out, so I could get to it."
Erosion	Tree damage	Low	"We probably lost 50-75 big pine trees. They got pushed right over in sort of a line. I was afraid I was going to be my whole sugar bush, and I'd be out of maple sugaring!"
Erosion	Soil erosion (riverbank)	High	"Oh Christ, I probably lost 2-4 acres in that ... [Hurricane] Irene, probably 2-4 acres, it's gone."

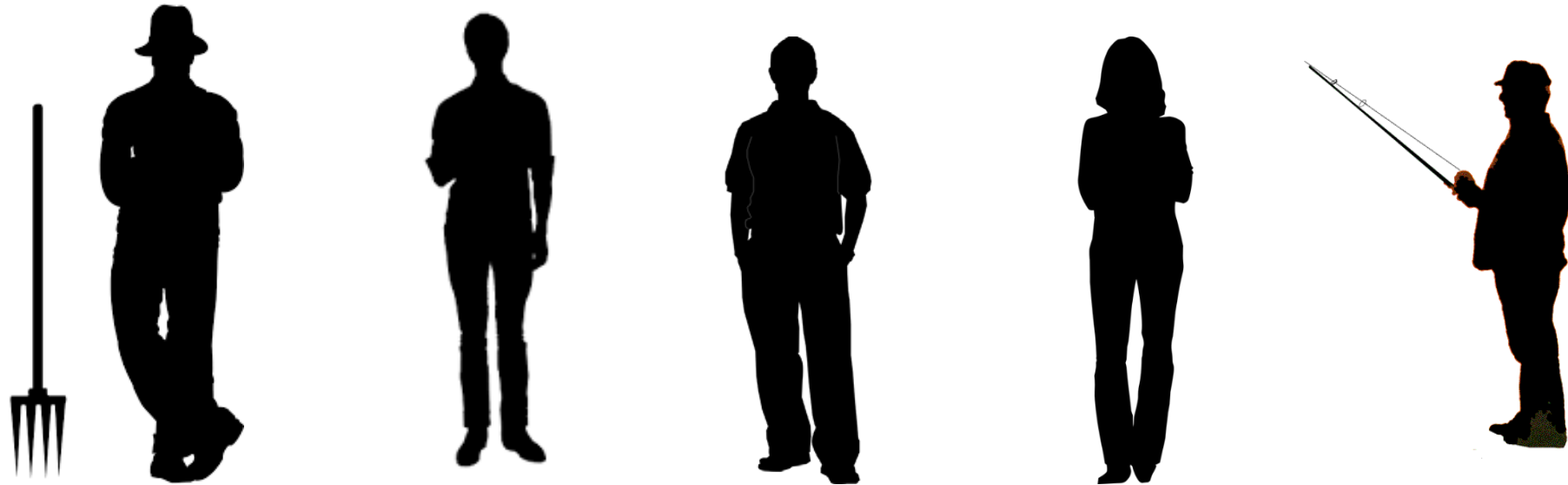
Case study

Flood impacts to farms and some farmers' perceptions of them

Adaptation practice	Reason	Tradeoffs	Farmer descriptions
Bank stabilization/dredging	Protect crop and pasture lands from erosion; protect critical infrastructure	Increases downstream flood impacts; degrades river ecosystems	"I hired a fellow with a mini excavator and brought in stone and they built up the bank...it probably cost ten thousand dollars or more."
Land use change	Protect productivity of croplands by preventing soil erosion	Reduces diversity of local agriculture	"By '85 it was hay. Since then it's been hay. We plowed it that one time and we've never plowed it again, just for that risk [of flooding], because in the spring, the roots aren't deep enough if it floods in the spring. I don't need a 12-foot ditch in the center of the field."
Levee/block flood water	Protect crops/fields from multiple flood impacts	Increase downstream flood impacts	"The farmer who had it before piled huge stones on the embankment up there ... Gosh, they've got to be 20 to 30 feet from the water. It's forming that barrier [between the river and the field]."

Case study

Other stakeholder perspectives on farmer adaptation to flooding:

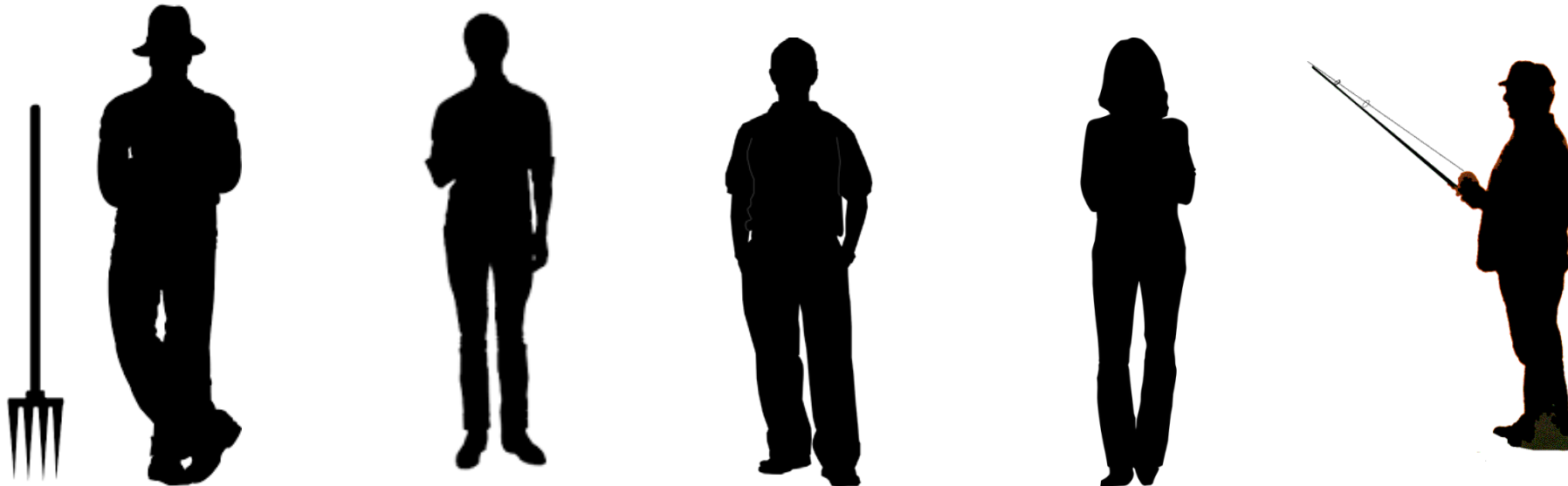


An aerial photograph of a small town, heavily overlaid with a semi-transparent green filter. The town is situated along a river that flows from the top right towards the bottom center. The landscape is a mix of dense green trees and open fields. Several buildings are visible, including a prominent white church with a steeple in the upper right quadrant. The overall scene is peaceful and rural.

Stretch break

Role play activity

1. Divide into groups based on assigned role; develop a list of what your group wants from a new river governance structure. What may you be willing to compromise on? What are your key priorities for negotiation? (10 minutes)
2. Come back together as a class to develop the best possible river management plan using the river governance framework. (20 minutes)
3. By the end of the activity, all five stakeholders have been heard and have agreed in a common strategy.



Role play activity

RIVER MANAGER

You are a Massachusetts river manager, and your goal is to promote mixed-use management of rivers. You are to ensure that any new management scheme is both environmentally and socially conscious. Your responsibility in your group is to facilitate and to ensure that all members of the group are able to share their ideas and contribute to the development of a new plan. Ultimately, you must ensure that any proposed plan includes all elements of the sustainable governance framework provided in the case study.

Role play activity

FARMER

You farm 40 acres of vegetable fields in northwest Massachusetts. Your family has farmed this land for six generations. Very recently, you have experienced major losses of farmland and topsoil due to flooding of the river that runs through your property. In the past you have used your tractor to dredge the river and have placed large stones along its banks to reduce erosion. While this protects your field, it also increases the velocity of the water. This is a problem because you are directly upstream of a small town. You must work with residents, fishers, and other stakeholders to develop a management plan that may meet your needs and the needs of the other stakeholders.

Role play activity

FISHER/RECREATIONALIST

You have fly-fished trout in Western Massachusetts and Southern Vermont for most of your adult life. You consider it more than a hobby as you describe it as a lifestyle. Recently, you have noticed that the number fish in local rivers are decreasing because trout habitat—which is essentially wild, unaltered stretches of river—is being reduced. This reduction is being caused as people who live and work along the river try to protect themselves from floods by building levees, shoring up riverbanks with rocks, or dredging the rivers to make more space for water. You side with the Environmentalist in that the solution would be to move all people and human activities away from rivers. But, you must work with those people in your group to develop a plan to meet all your river management needs.

Role play activity

RESIDENT

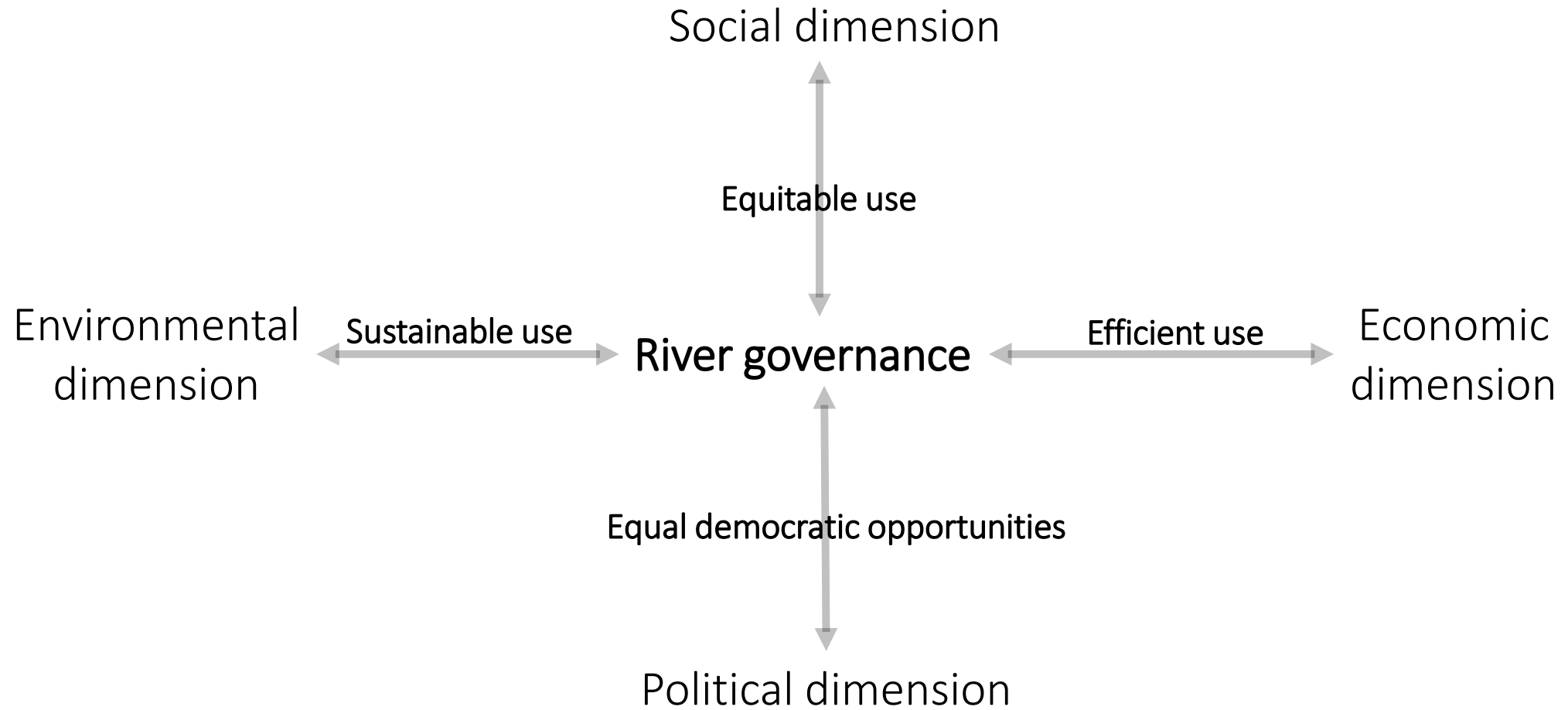
You are worried about flood impacts from the river that borders your property. While you have considered building a levee and placing stones along the bank to protect your land and house from erosion, you do not have the equipment or expertise to do so. Additionally, you have seen water velocity in the river increase because the farmer upstream has channeled the river. You blame the farmer for putting your land and house at greater flood risk. You think that upstream land should be allowed to flood to slow water velocity and absorb floodwaters; this would protect you and your neighbors from future floods.

Role play activity

ENVIRONMENTALIST

You have dedicated your life to protecting wild places across New England. You have recently joined with fishers in advocating for the protection of rivers in Western Massachusetts and Vermont. You advocate for a buy-out program in which the states allocate money to purchase all land along certain rivers to remove people and human activities. You see any manipulation of the river as uncalled for.

Role play activity





Thank you

This teaching case study was adapted from one written by Benjamin P. Warner and Rachel E. Schattman at the 2016 Case Studies for Teaching Workshop hosted by the National Socio-Environmental Synthesis Center (SESYNC)

