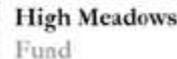
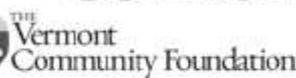




Participant Orientation Webinar: Climate Change Resilient Farming in Vermont Program

October 2014 – March 2015

*Hosted by the University of Vermont
Vermont Farm Resilience in a Changing Climate Initiative*





Program Facilitators

- UVM Agroecology & Rural Livelihoods Group
 - ◆ V. Ernesto Mendez, PhD., Associate Professor
 - ◆ Kate Westdijk, M.S., Food Systems Research Specialist
- UVM Center for Sustainable Agriculture
 - ◆ Joshua Faulkner, PhD., Farming & Climate Change Coordinator
 - ◆ Jennifer Colby, M.S., Pasture Program Coordinator
 - ◆ Juan Alvez, PhD., Pasture Technical Coordinator
 - ◆ Ginger Nickerson, PhD., GAPS Program Coordinator



Program Orientation Webinar

- Participant Introductions
- Welcome, Program Overview and Background
- Observed and Projected Climate Impacts in VT
- Participant Perspectives on Farm Resilience:
 - ◆ *What does it look like?*
 - ◆ *How do we assess it?*
- CC Resilient Farming Program Components
- October 30th Field Day: Details and Preparation

Climate Change Resilient Farming in Vermont Program 2014-15

Participant Introductions

- ◆ Name, affiliation, primary expertise
- ◆ What do you hope to get out of participating in this program?





Climate Change Resilient Farming in Vermont Program 2014-15

Background

- ◆ USDA Climate Hubs: support agriculture and land managers with technical support, assessments, regional forecasts, and education.
- ◆ 2012 VT stakeholder survey: majority believe farmers lack information and support for responding to climate change
- ◆ High Meadows Fund interest and investment



Climate Change Resilient Farming in Vermont Program 2014-15

Our Goals for Participants

- ◆ Deepened relationships with peers
- ◆ Increased ability to:
 - conduct holistic farm climate change resilience assessment including recommendations for the farm and a tool kit of strategies
 - assess farmer knowledge and desire to learn about CC implications for their farm
- ◆ Increased understanding of climate change adaptation and/or mitigation strategies
- ◆ Increased number of farms they serve implementing recommended strategies



Climate Change Resilient Farming in Vermont Program 2014-15

Our Goals

- ◆ Increased understanding of participant goals- specifically what they need to be better able to serve farmers.
- ◆ Validate perceived outcomes that participants want based on past research with stakeholders.
- ◆ Broaden network of service-providers aware of our initiative and prepared to translate our findings to on-farm management decisions.
- ◆ Evaluate and improve program for future offering.



Climate Change Resilient Farming in Vermont Program 2014-15

Our Goals for Vermont Farmers

Farmers served by program participants, not farm field day hosts

- ◆ Increased adoption of appropriate farm management practices by VT farmers to enhance climate change resilience (*requires understanding their farm context and which BMPs are a good fit*)
- ◆ Increased understanding of climate change adaptation and/or mitigation strategies



Climate Change Resilient Farming in Vermont Program 2014-15

- Webinar
- Farm Day (10/30)
- November- March: Attend self-identified professional development opportunities (mini-grants available)
- Workshop (TBD March 2015)
- Share with Farmers (Season 2015 and beyond)



The Vermont Farm Resilience in a Changing Climate Initiative

An action-oriented approach.

*Working with farmers, extensionists and researchers
to face the challenges of climate change.*



Lessons from Irene



Photo credit: Vern Grubinger

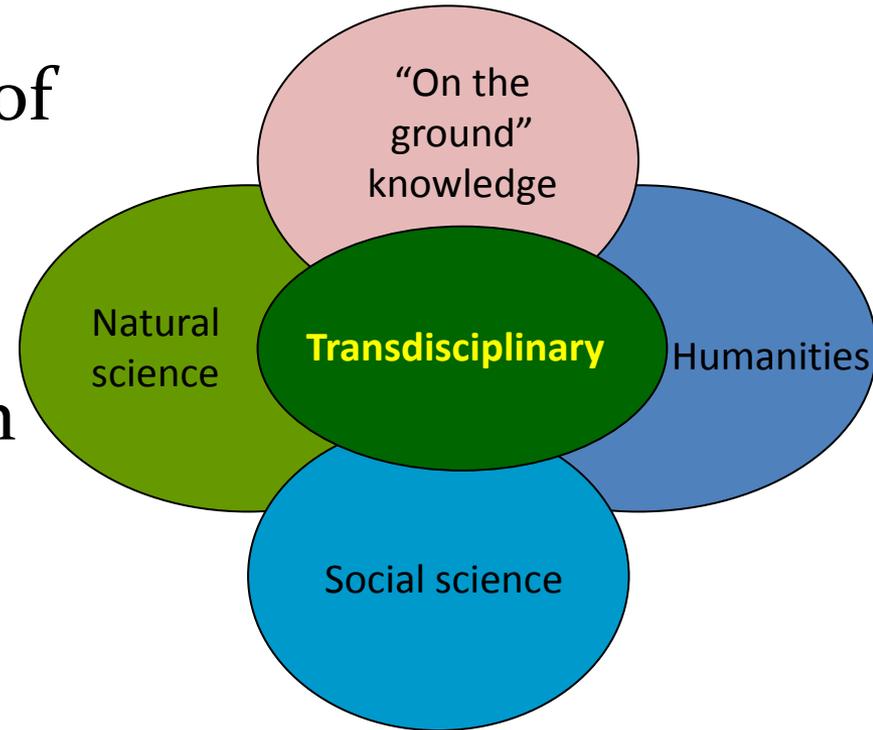
A photograph of a paved road curving through a rural landscape. The road is asphalt and curves to the right. On the left side of the road, there is a grassy area with some trees and a building with a corrugated metal roof. In the background, there are more trees and a hillside. The sky is blue with some light clouds. The overall scene is a typical rural setting.

How do we move from
**Disaster Relief to
Agricultural Resilience?**



Our Approach

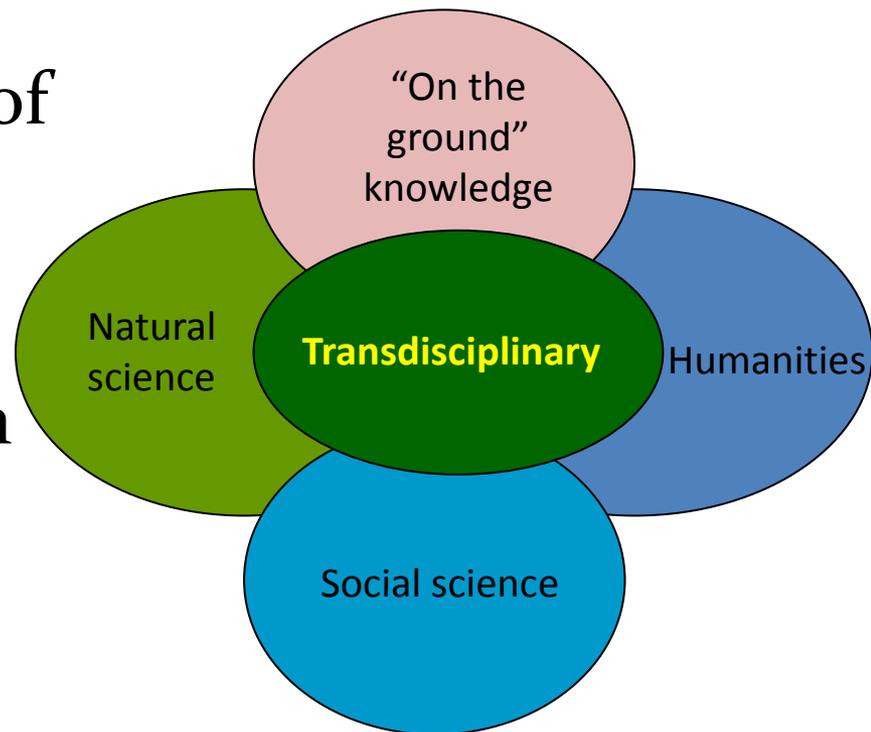
- Research for Action
 - ◆ Validation/enhancement of existing VT farm practices
 - ◆ Policy change
 - ◆ Farmer to farmer outreach





Our Approach

- **Research for Action**
 - ◆ Validation/enhancement of existing VT farm practices
 - ◆ Policy change
 - ◆ Farmer to farmer outreach
- **Participatory**
 - ◆ Stakeholder involvement
 - ◆ Ensures:
 - Simultaneous & Shared Learning
 - Accuracy & Relevance





Initiative Collaborators

Agroecology & Rural Livelihoods Group (ARLG), Dept. of Plant & Soil Science Department (PSS)

- V. Ernesto Mendez, PhD
- Kate Westdijk, MS
- Martha Caswell, MPP
- Rachel Schattman , PhD student

UVM Research & Extension Departments

- Stephanie Hurley, DDes (PSS)
- Carol Adair, PhD (Rubenstein School of Environment & Natural Resources)
- Linda Berlin, PhD (Extension Center for Sustainable Ag & Nutrition and Food Sciences)
- David Conner, PhD (Community Development & Applied Economics-CDAE)
- Chris Koliba, PhD (CDAE)
- Asim Zia, PhD (CDAE)
- Heather Darby, PhD (UVM Extension- Crops & Soils)
- **Including staff and students within each**

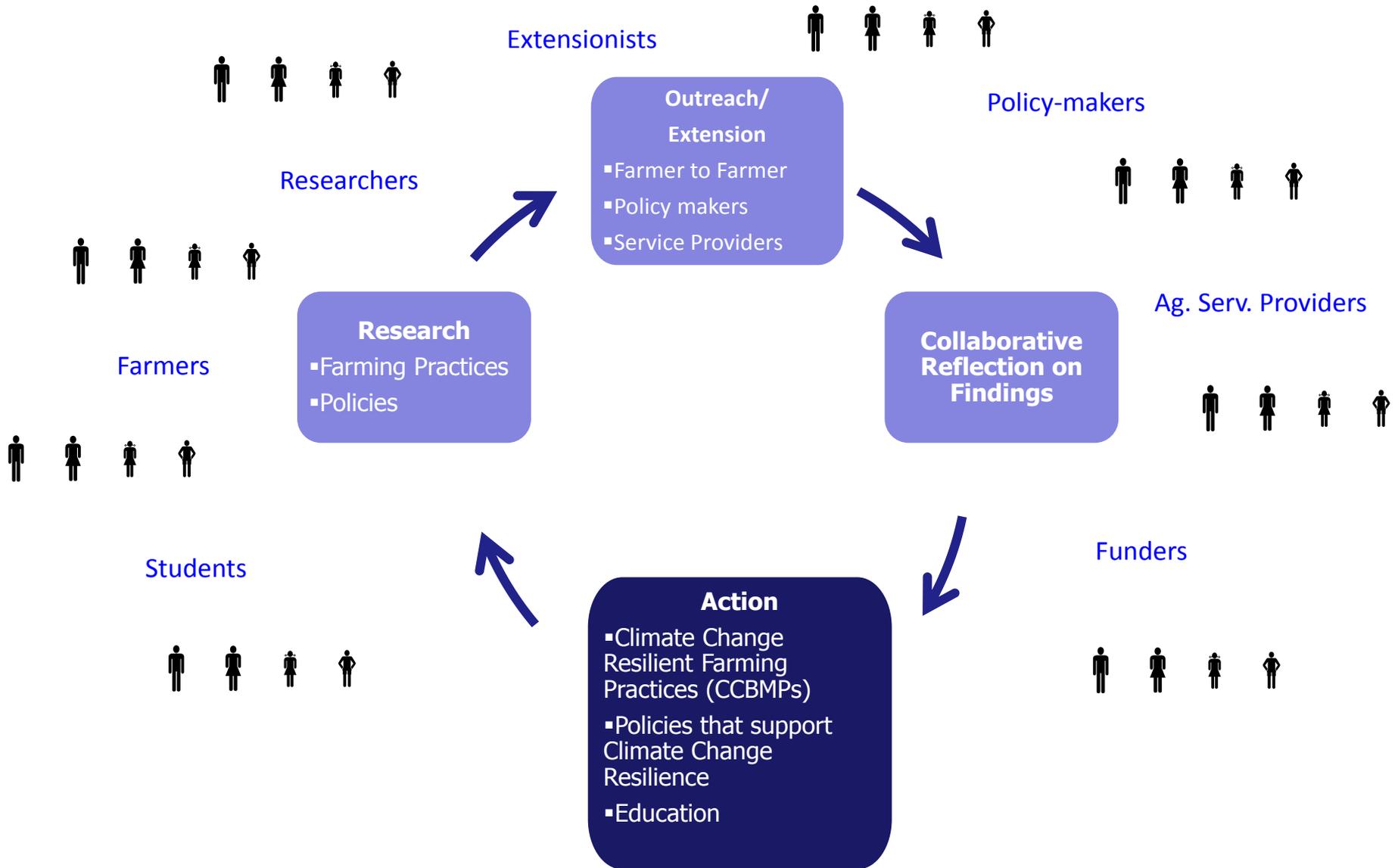
▪ **UVM student research assistants**

▪ **UVM Food Systems Research Spire**

▪ **UVM Gund Institute for Ecological Economics**

▪ **Advisory Committee**

- The Vermont Grass Farmers Association
- The Vermont Vegetable and Berry Association
- Vermont Agency of Agriculture
- SARE/Extension- Vern Grubinger
- Vermont NRCS
- Stone Environmental
- Vermont Farm to Plate Initiative
- Vermont State Climatologist
- UNH Assistant Professor of Agroecology (Richard Smith)



Vermont Farm Resilience in a Changing Climate Initiative

General Objectives

- 1) Identifying existing farming practices that contribute to climate change mitigation and/or adaption (CCBMPs)
- 2) Assessing farmers' interest in pursuing farm management strategies under different climate change and policy scenarios
- 3) Improving existing practices through agroecology, outreach and policy innovations
- 4) Providing decision support for policy makers and farmers- directly and through extension and outreach programs

Farm Practices Being Evaluated:

▶ Focus for Farm Sampling:

1. Cover Crops
2. No Till
3. Stormwater runoff management
4. Wetland conservation
5. Rotational grazing



▶ Considering broadly:

1. Hoop houses/high tunnels
 2. Green manure
 3. Timely manure incorporation
 4. Pest/disease management
 5. Invasive species management
 6. Irrigation
 7. Nutrient Management Plans
 8. Conservation buffer strips
 9. Drainage tile
 10. Animal diversity
 11. Animal feed management
 12. Agroforestry
 13. Alternative energy
 14. Insurance
-

Climate Change and Agriculture in Vermont

Joshua Faulkner, PhD
Farming and Climate Change Program Coordinator
UVM Center for Sustainable Agriculture

October 9, 2014



AP Photo: Toby Talbot



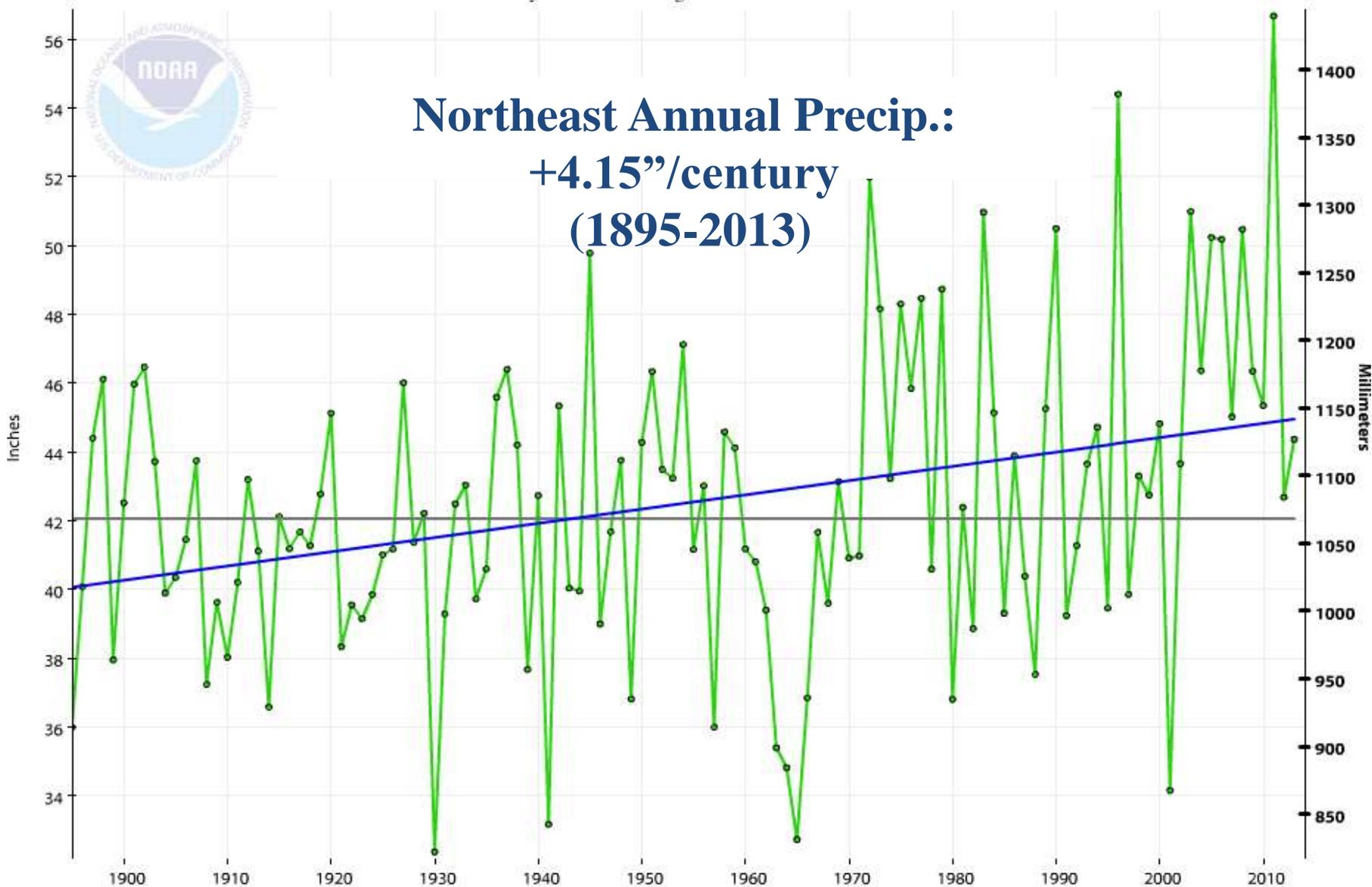
Center for
Sustainable
Agriculture

Northeast, Precipitation, January-December

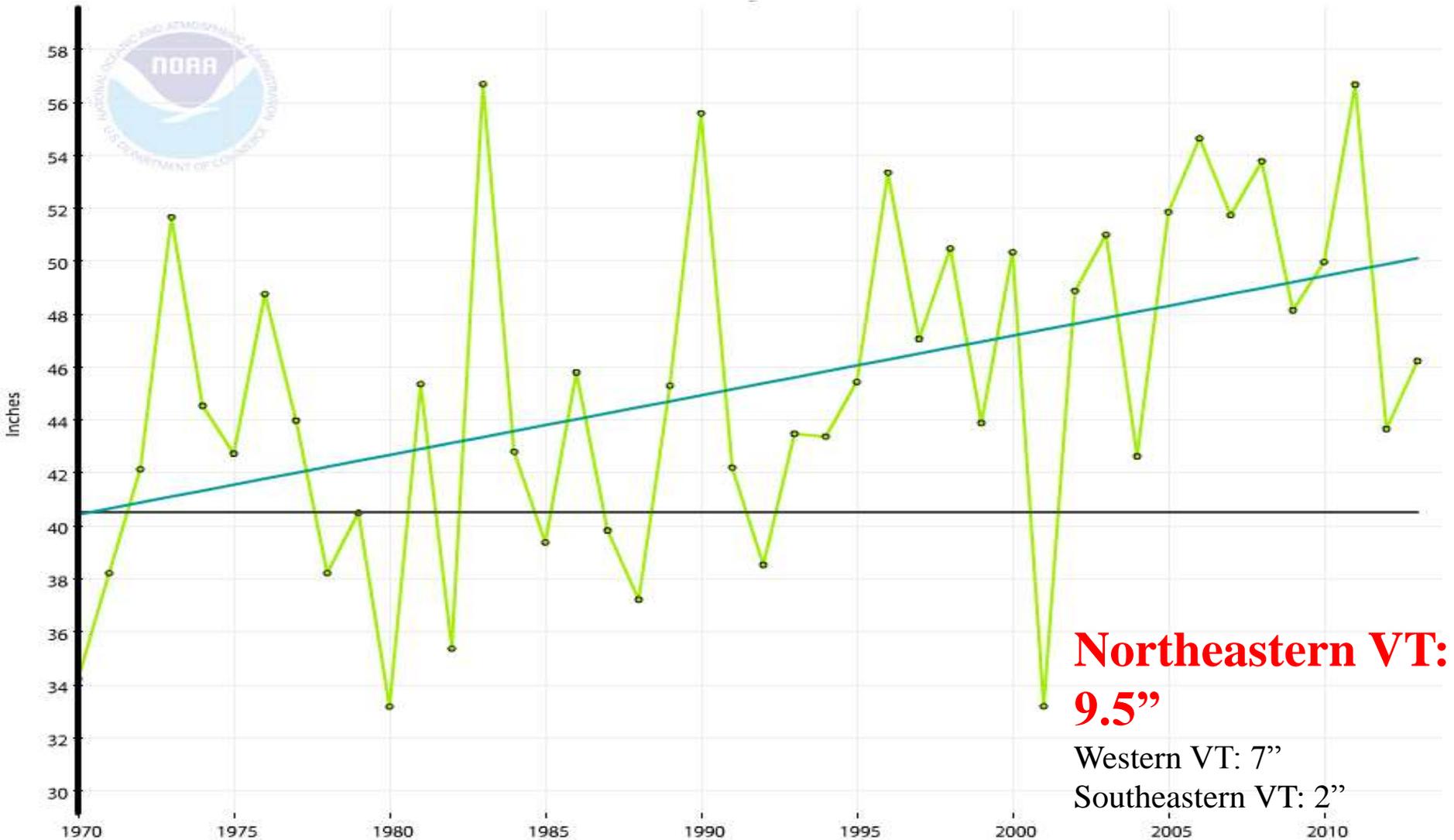
1895-2013 Trend +4.15"/Century 1901-2000 Avg: 42.04" Precip



Northeast Annual Precip.: +4.15"/century (1895-2013)

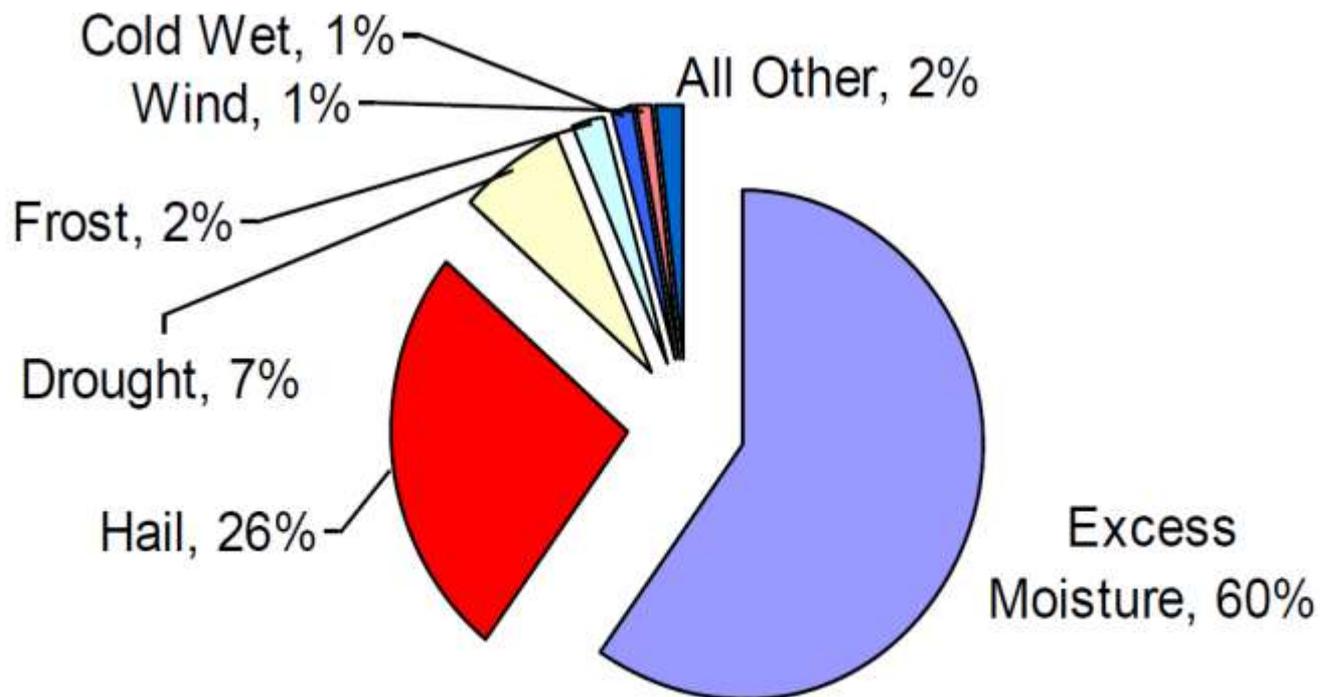


Precipitation in Northeastern Vermont (1970-2013)

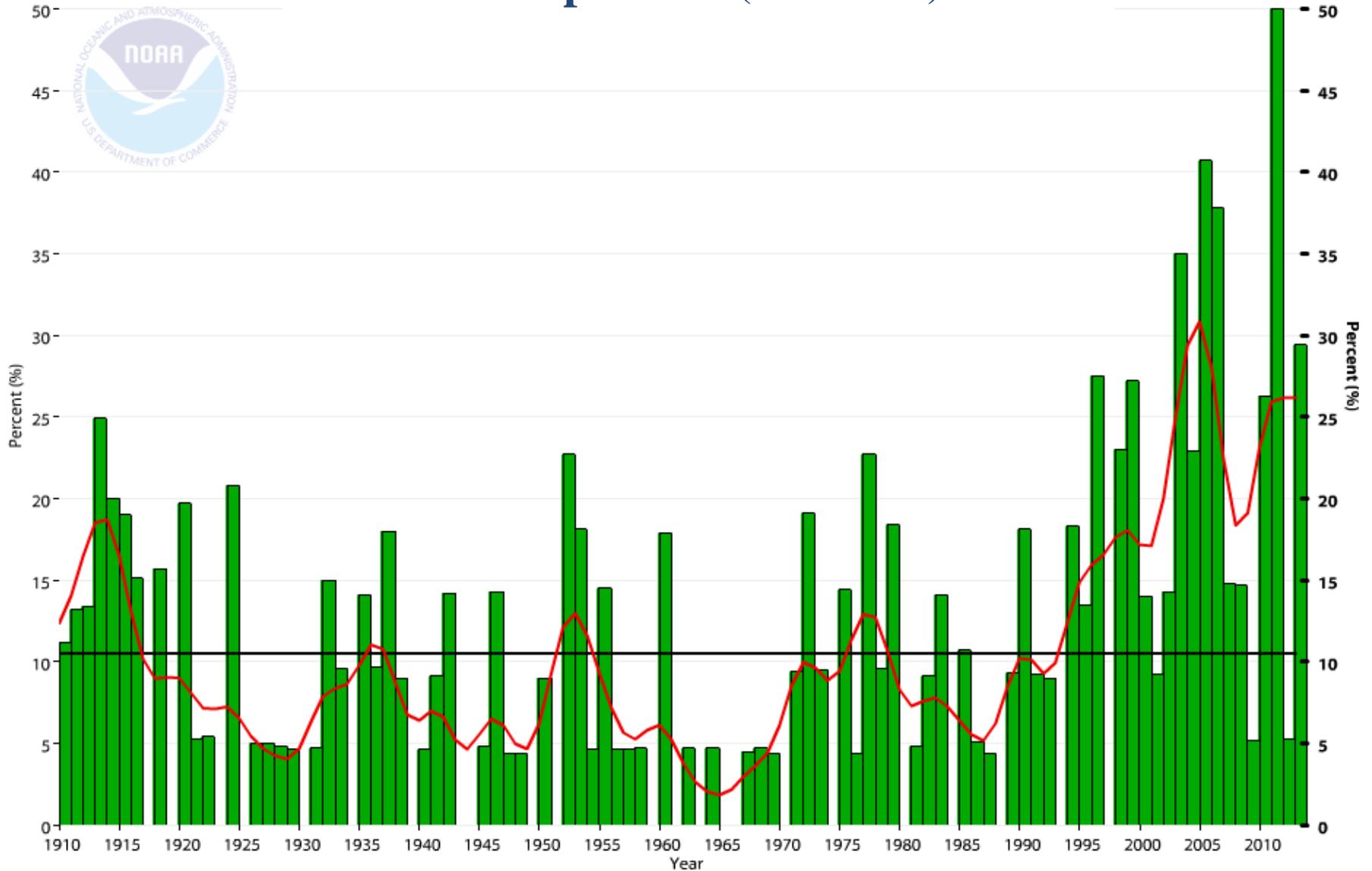


Why Vermont Crops Fail (2001-10)

Since 1988, Crop Ins. provided
\$213 Bil. of Protection and Paid \$15 Million
in Loss Payments to VT Farmers



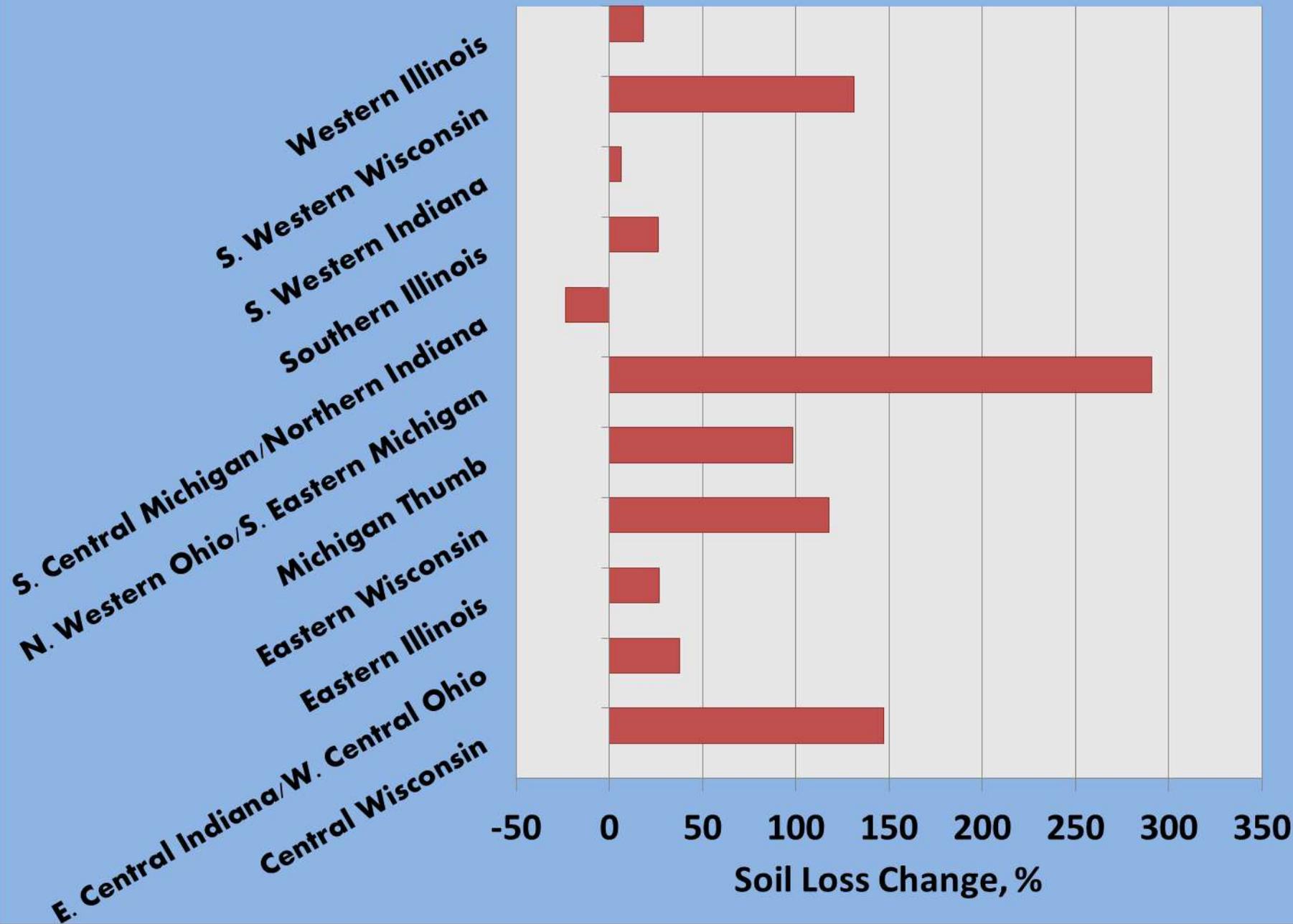
Northeast Extremes in 1-Day Precipitation (1910-2013)



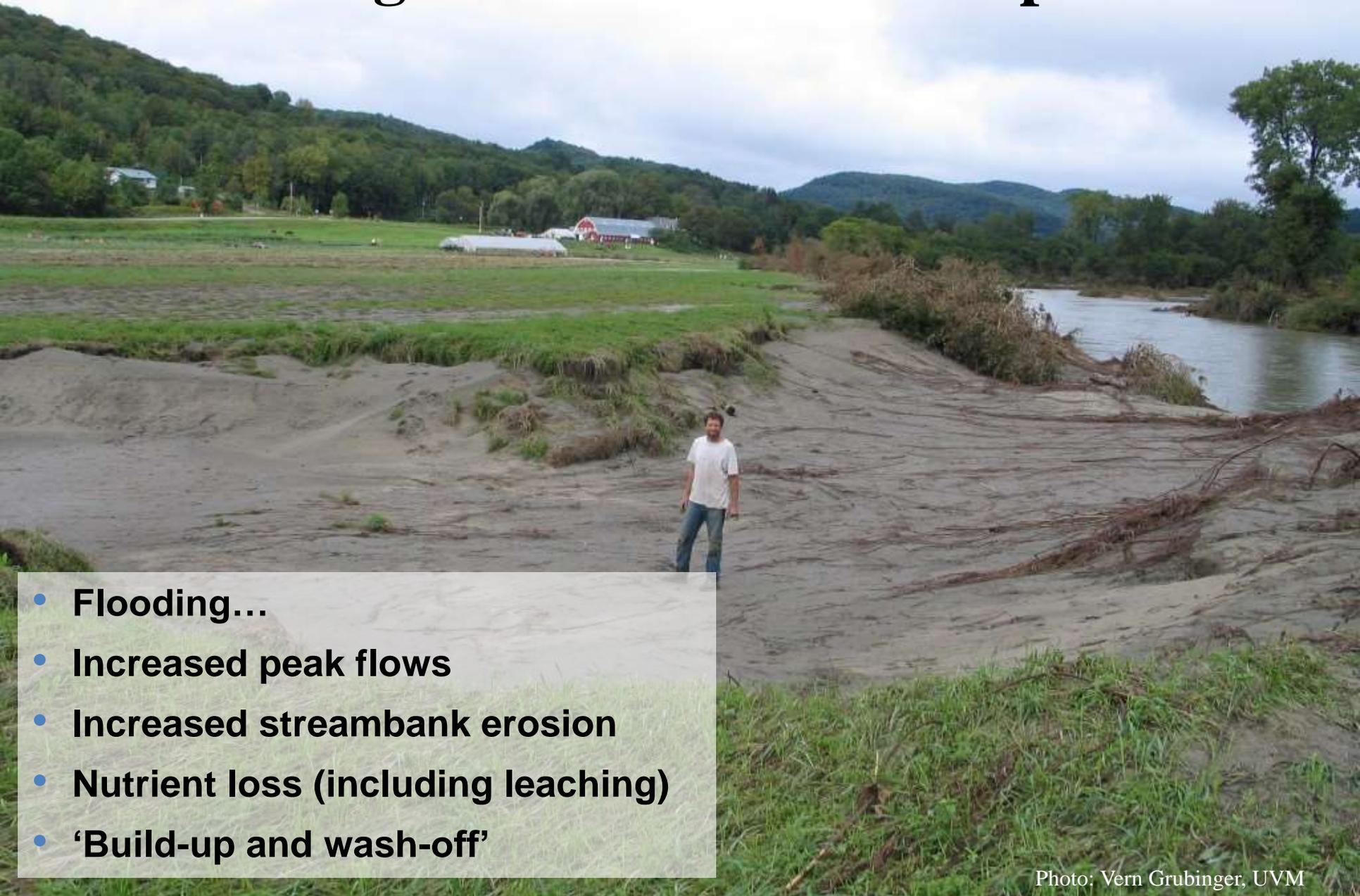
‘In general, erosion increases at a rate 1.7 times annual rainfall increases’

(Nearing et al., 2004)





Flooding and Downstream Impacts



- **Flooding...**
- **Increased peak flows**
- **Increased streambank erosion**
- **Nutrient loss (including leaching)**
- **‘Build-up and wash-off’**

Sediment input to the Hudson R. due to Lee and Irene was 5 times long-term annual average (Ralston et al., 2013)

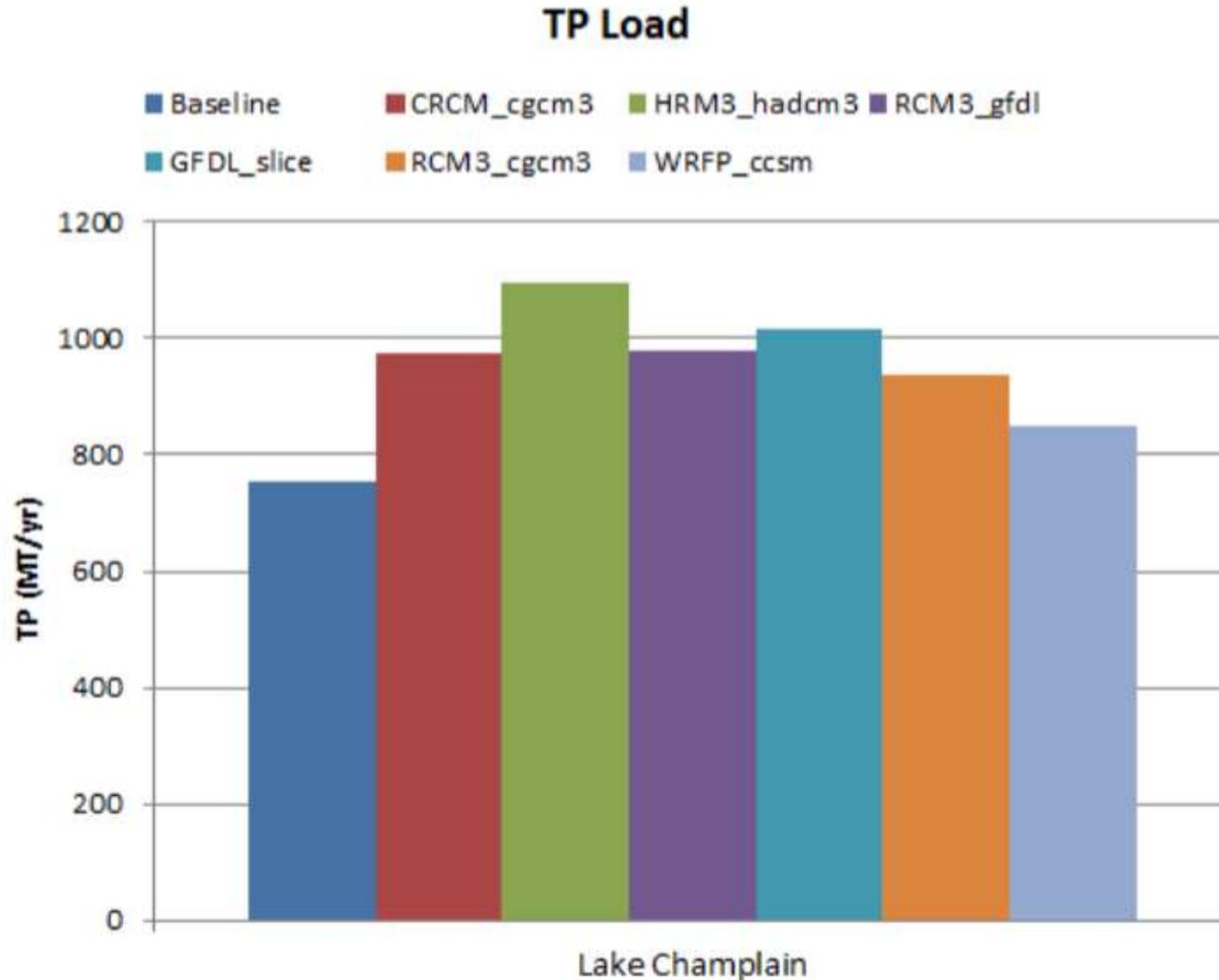
Connecticut River

Thames River

Long Island Sound



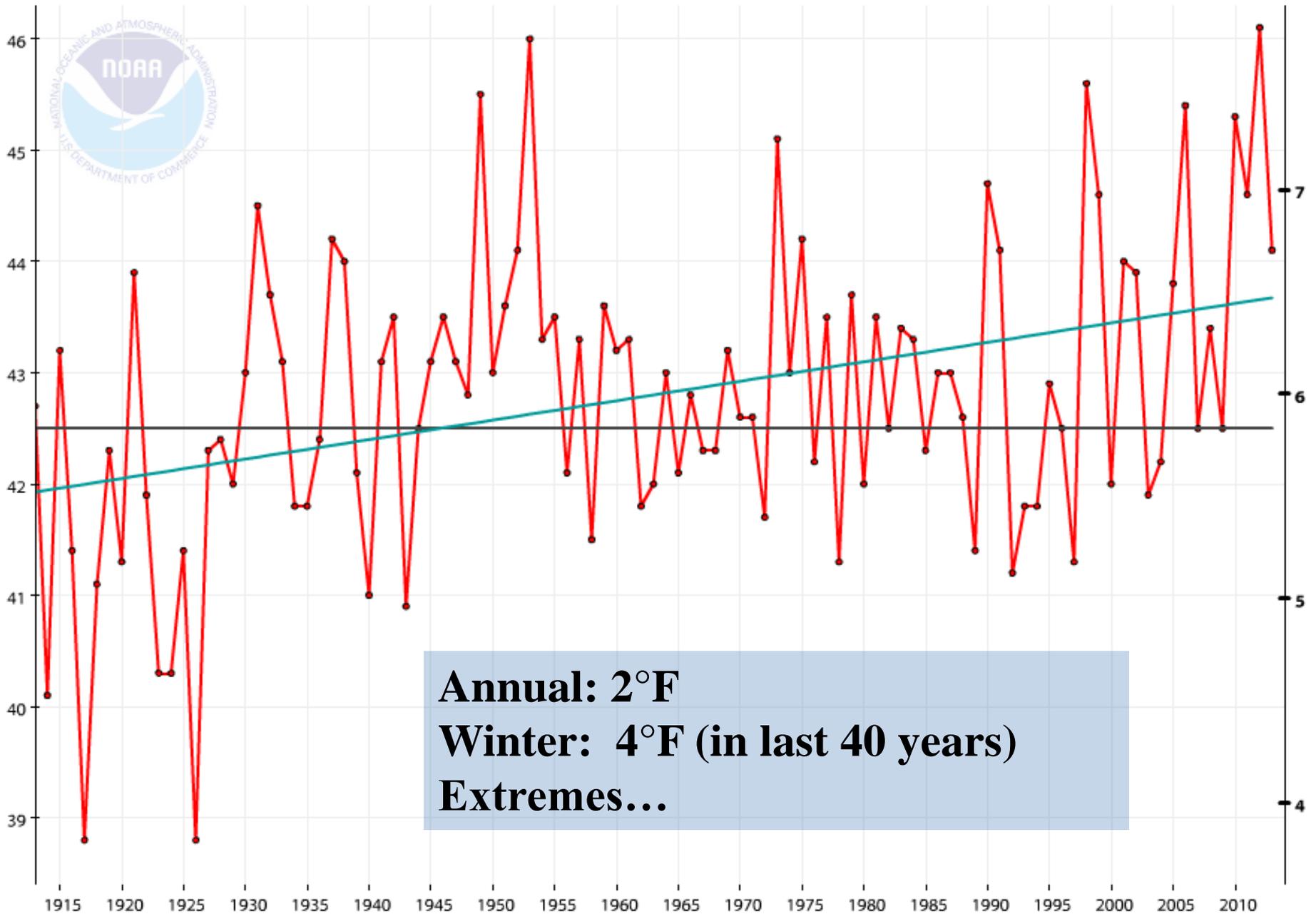
Modeled Total P: Six Climate Scenarios



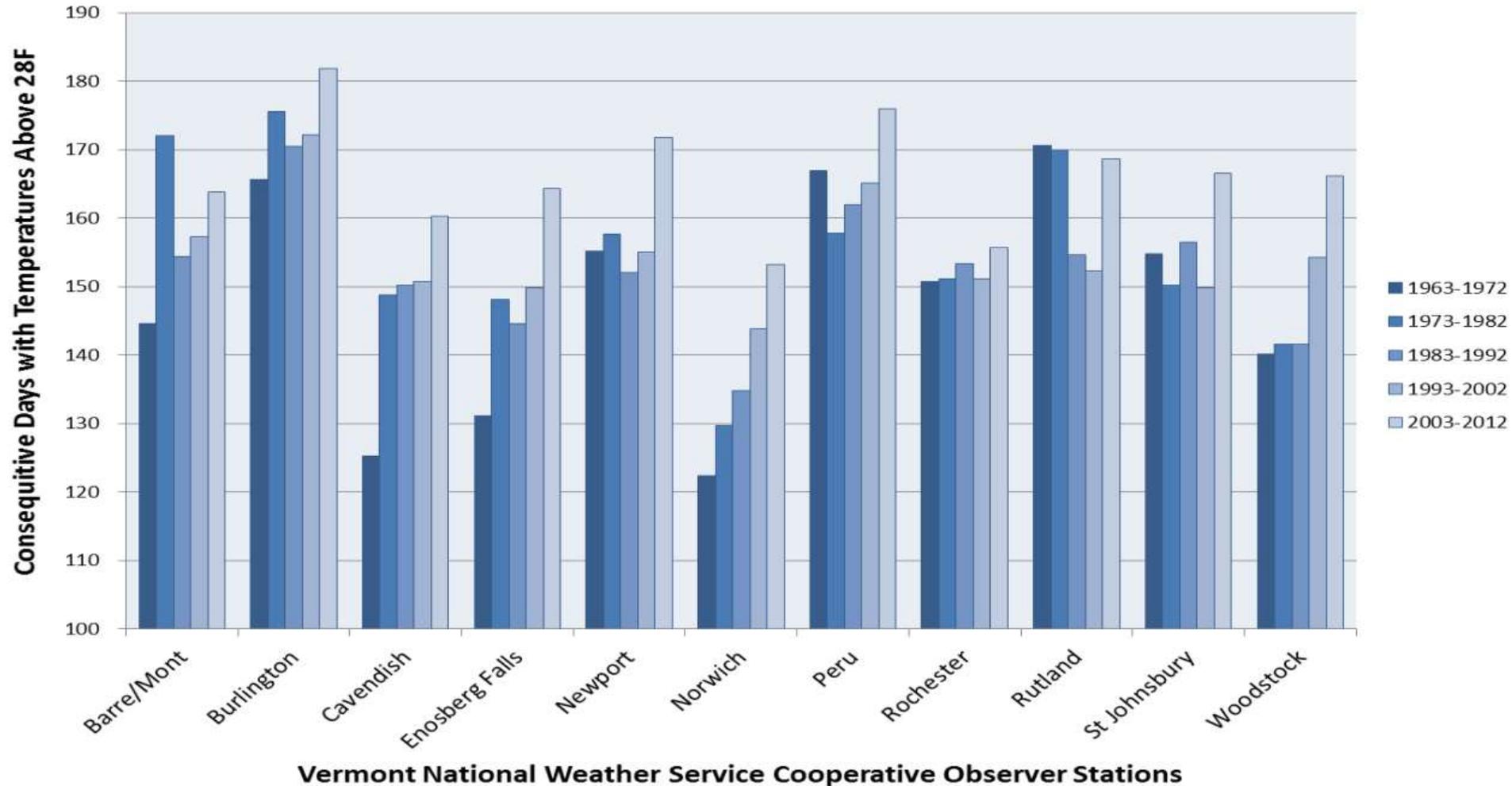
(Tetra Tech, 2013)

Vermont, Temperature, January-December

1913-2013 Trend +0.2°F/Decade 1901-2000 Avg: 42.5°F Temperature



Vermont Growing Season 1963-2012



(Galford et al., 2014. Vermont Climate Assessment)

Growing season increasing by 3.7 days/decade

Projections in Vermont (LCB)

Metric	Season	Base Avg	2040–69			2070–99		
			2.5%	50%	97.5%	2.5%	50%	97.5%
Freezing days (day)	Annual	117	83	85	87	69	72	74
	Nov–Dec	38	25	26	27	20	21	22
	Jan–Feb	53	43	45	46	38	39	41
	Mar–Apr	24	13	14	15	11	11	12
Snowfall (cm)	Annual	676	413	432	450	321	340	359
	Autumn	68	29	32	35	18	21	23
	Winter	477	305	328	351	242	263	285
	Spring	131	64	72	80	48	56	63
Above 32.2°C (day)	Annual	6	23	24	25	35	37	40
Heat index (°C day ⁻¹)	Annual	130	449	475	501	540	553	555
	Summer	118	389	416	442	597	642	687
Growing season (day)	Annual	141	166	169	171	181	184	186
Maple sap production (day)	Annual	60	52	53	54	48	49	50
	Autumn	19	12	12	13	9	9	10
	Winter	14	20	21	23	22	23	24
	Spring	27	18	19	20	15	16	17
Heating requirements (°C day ⁻¹)	Annual	5294	4216	4307	4398	3785	3885	3985
	Autumn	1153	897	916	935	778	800	823
	Winter	2527	2159	2197	2235	1992	2033	2074
	Spring	1395	1078	1106	1133	965	995	1024
Cooling requirements (°C day ⁻¹)	Annual	0	11	13	15	35	40	46
	Spring	0	0	0	0	1	1	1
	Summer	0	10	12	14	32	37	43
	Autumn	0	0	0	1	1	2	3
rPPET (ratio)	Summer	1.14	1.10	1.15	1.20	1.06	1.11	1.16

How does climate change impact crops? (VT)

- Cool-season crops will be of lower yield or quality
 - Sweet corn
- Reduced grain yield (rapid maturation and moisture)
 - Field corn, nutrient content...
- Reduced vernalization lower some fruit yields; increased frost risk?
 - Apples
- New pests are able to over-winter, emerge early; increased pesticides
 - Flea beetle, SWD?
- Some warmer season crops will do better
 - Red wine grape, peaches, watermelon
- Water stress in crops...



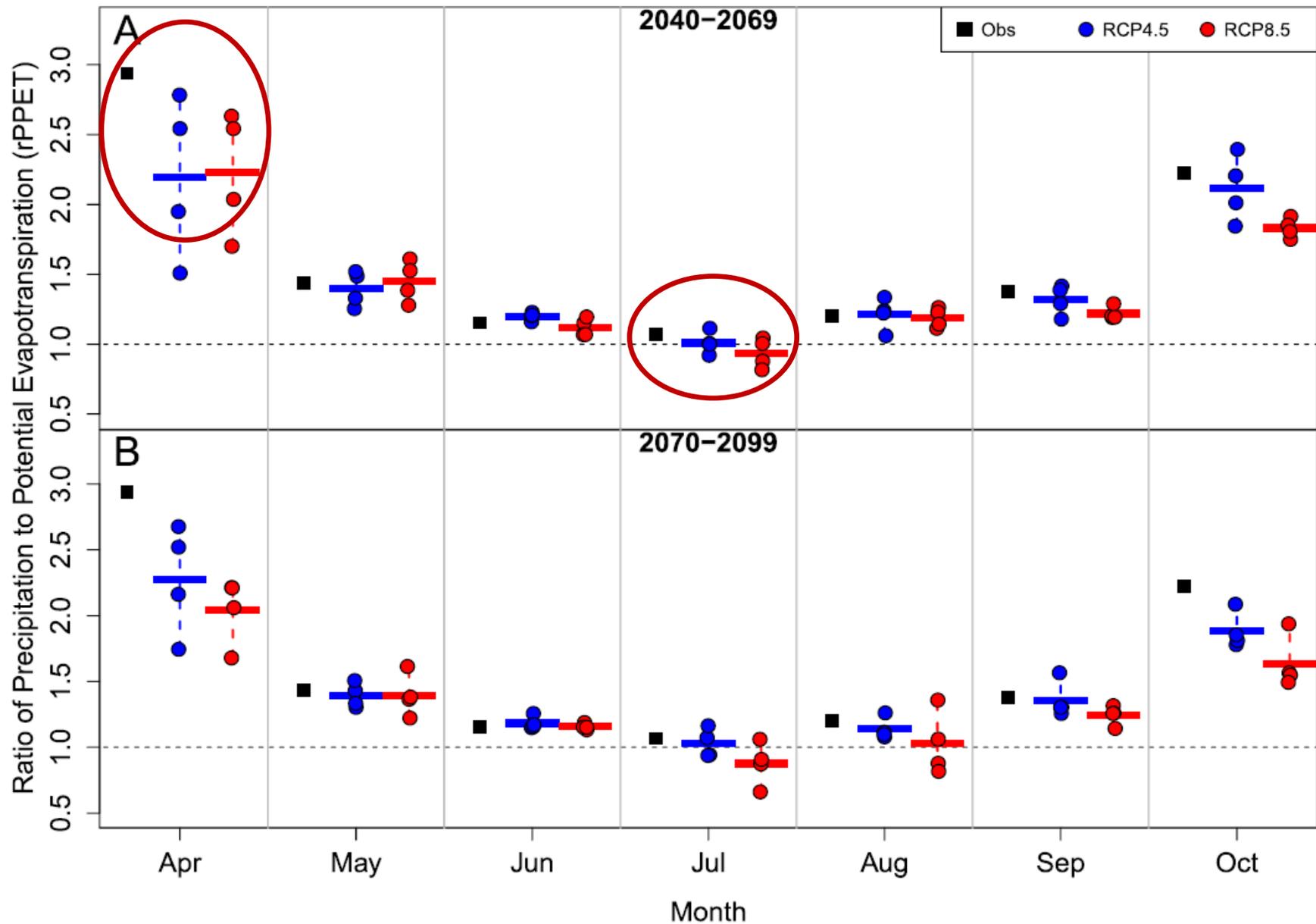
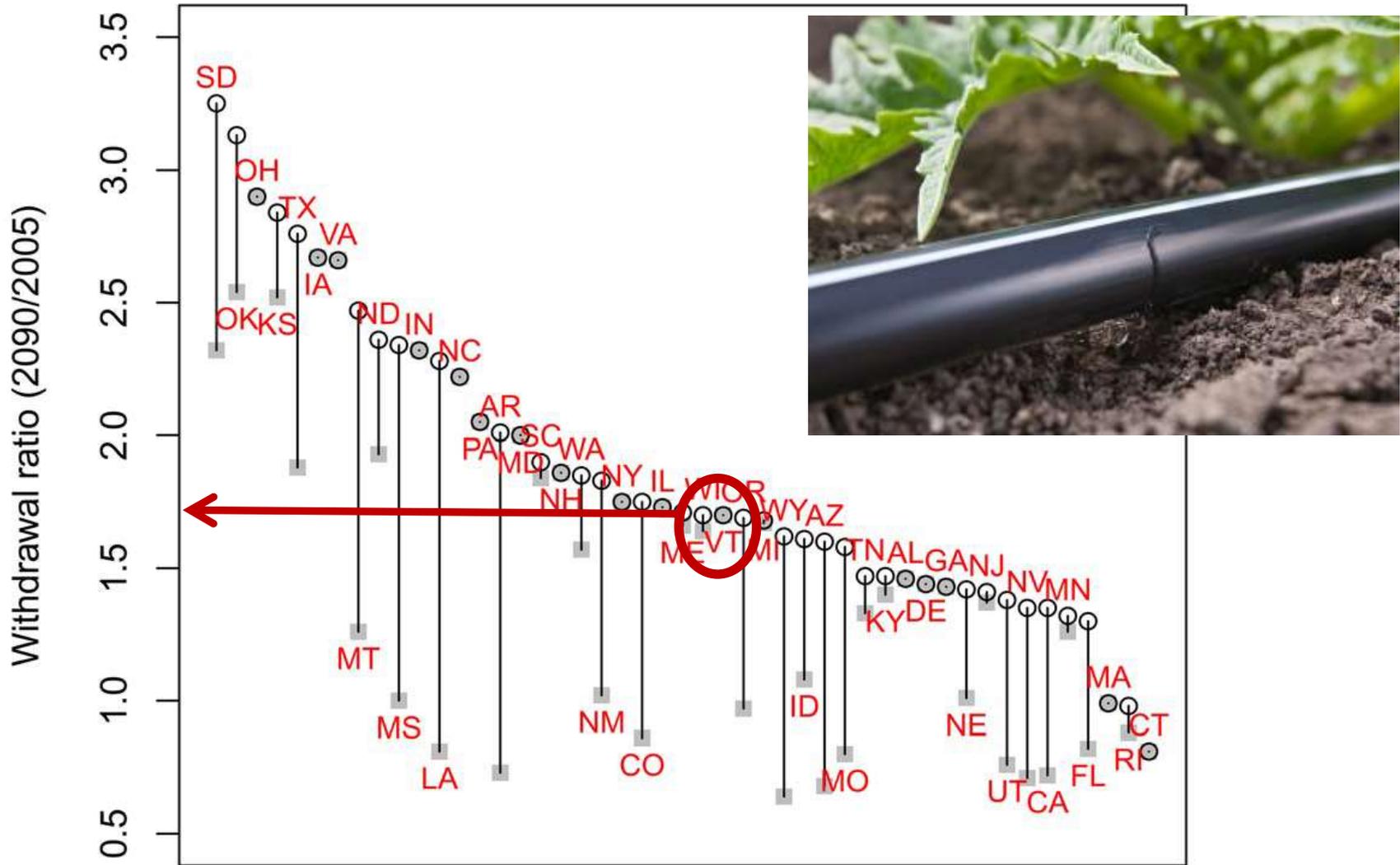


FIG. 12. Projected rPPET for (a) 2040–69 and (b) 2070–99 for RCP 4.5 and 8.5 relative to the 1970–99 base period.

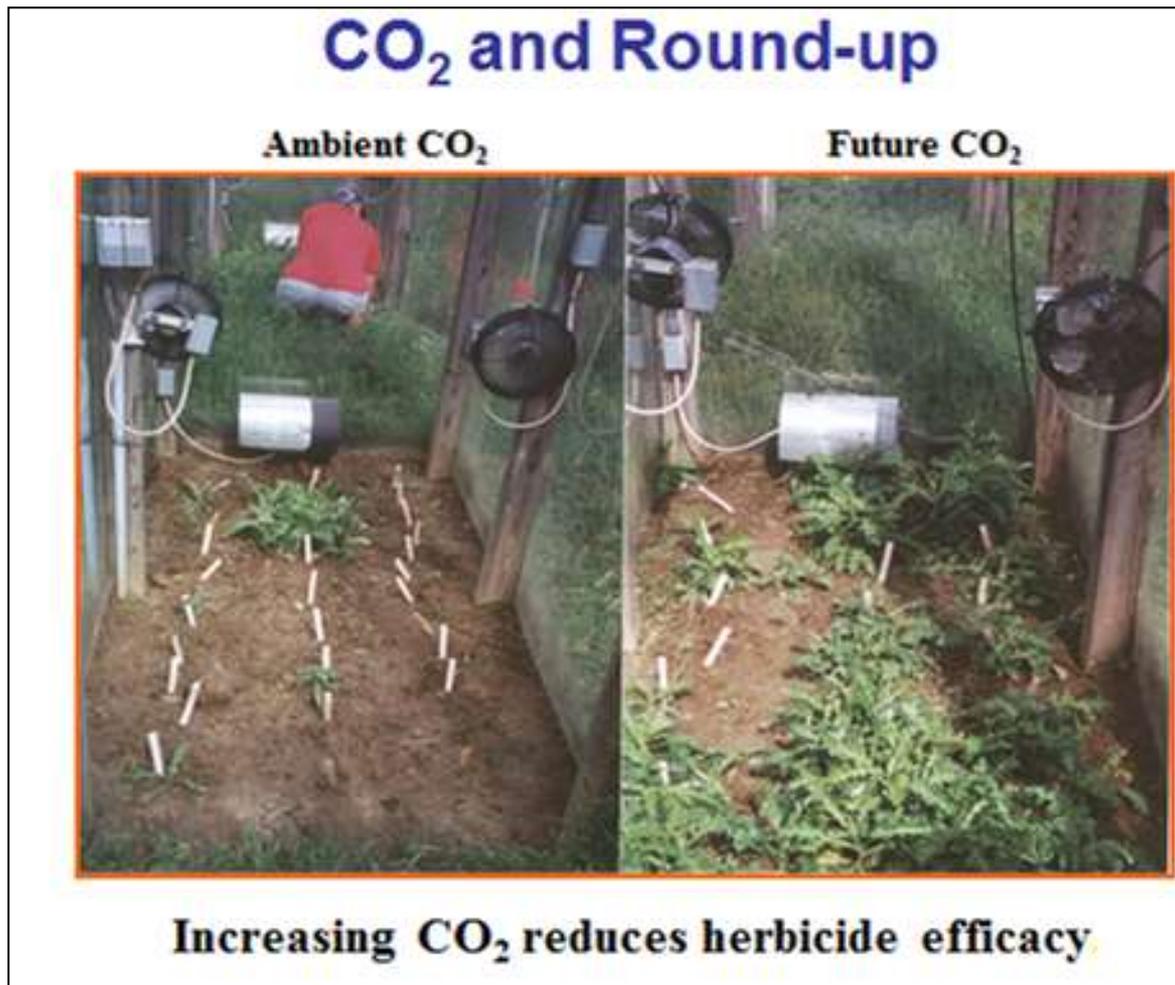
(Guilbert et al., 2014)

Water Management for Production



Climate change and potential impact on VT ag

- Increased CO₂ in air
 - Crops can have higher yields but optimum conditions are rare
 - **Weeds!**

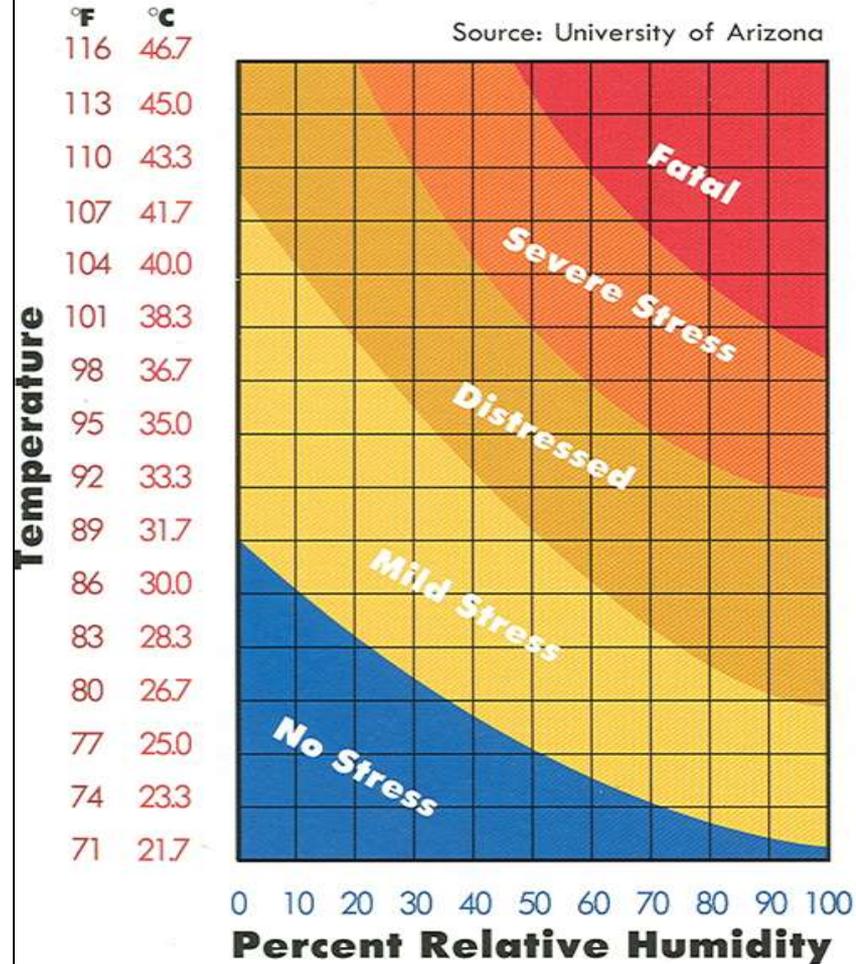


How does climate change impact livestock?

- Warming Temperatures
 - Livestock
 - Heat stress in dairy cattle
 - Higher body temperatures
 - Increased respiration rates
 - Less activity
 - Increased water intake
- Performance
 - Dry matter intake down by 10-20%
 - Milk production down by 10-25%
 - Reproductive processes decrease

Dairy Heat Stress Chart

Source: University of Arizona



To use this chart: Simply match up the temperature on the vertical scale with the day's relative humidity on the horizontal scale.



Questions?



Joshua.faulkner@uvm.edu

Additional Resources:

<http://www.uvm.edu/~susagctr/>





Vermont Farm Resilience in a Changing Climate

1. Given these weather and climate projections, what does resilience look like for you in your work?

Please take a few moments to consider, then raise your hand to speak (look for icon) or type your response into the chat box.



Vermont Farm Resilience in a Changing Climate

1. Given these weather and climate projections, what does resilience look like for you in your work?
2. How would you measure it on a farm?

Please take a few moments to consider, then raise your hand to speak (look for icon) or type your response into the chat box.



Climate Change Resilient Farming in Vermont Program 2014-15

- Webinar
- Farm Day (10/30)
- November- March: Attend self-identified professional development opportunities (mini-grants available)
- Workshop (TBD March 2015)
- Share with Farmers (Season 2015 and beyond)

Reading the Farm: On-Farm Resilience Assessment

Goals

- ▶ Look at farms with a new eye (resilience)
 - ▶ Connect trainees with University researchers
 - ▶ Structured discussion, work as a team
 - ▶ Shared learning
 - ▶ Useful product for the farmer
-

October 30th Farm Visits

- ▶ Day long: 9:30 to 4:00 pm, South Hero

 - ▶ Farm 1 9:30-11:30
 - ▶ Welcome & intros
 - ▶ Assessment orientation
 - ▶ Farm tour
 - ▶ Team data collection
 - ▶ Regroup to discuss recommendations

 - ▶ Farm 2 11:30-4:00
 - ▶ Working lunch, complete SWOT for Farm 1
 - ▶ Farm tour
 - ▶ Data collection
 - ▶ Regroup to discuss and prep recommendations
 - ▶ Complete SWOT for Farm 2
-

1. SWOT Analysis of Farm's Climate Change Resilience

Farm Name: _____
Type of farm: _____

Strengths

Weaknesses

--	--

Opportunities

Threats

--	--

2. Assessing Strategies to Build Your Climate Change Resilience

Impact on...	Infrastructure Resilience (Land, buildings, equipment, etc.)	Natural Resource Resilience (Cropland, forests, wetlands, rivers, etc.)	Your (and Crew/Family's) Resilience (Skills, labor, communication, quality of life)	Production Resilience (Types of enterprises, timing, markets)	Finances	
					Costs	Benefits
Strategy 1:						
Strategy 2:						
Strategy 3:						



3. Climate Change Resilience Action Plan

Strategy 1: _____

To Do	Who will do this?	When will this happen?	Resources needed	Sources of funding, information, etc.	Barriers

Comments:

Logistics

- ▶ Lunch choices

- ▶ A: Meat
- ▶ B: Vegetarian
- ▶ C: Gluten free meat
- ▶ D: GF vegetarian

- ▶ File sharing preferences?

- ▶ A: Email
 - ▶ B: Shared website (Dropbox or Google docs)
 - ▶ Other?
-

▶ Reading:

- ▶ Farm 1 Packet
- ▶ Farm 2 Packet
- ▶ Agriculture section of Vermont Climate Assessment
 - ▶ All documents will be e-mailed to participants soon

▶ Optional Reading:

- ▶ Research Brief of 2012 VT Stakeholder Survey
-