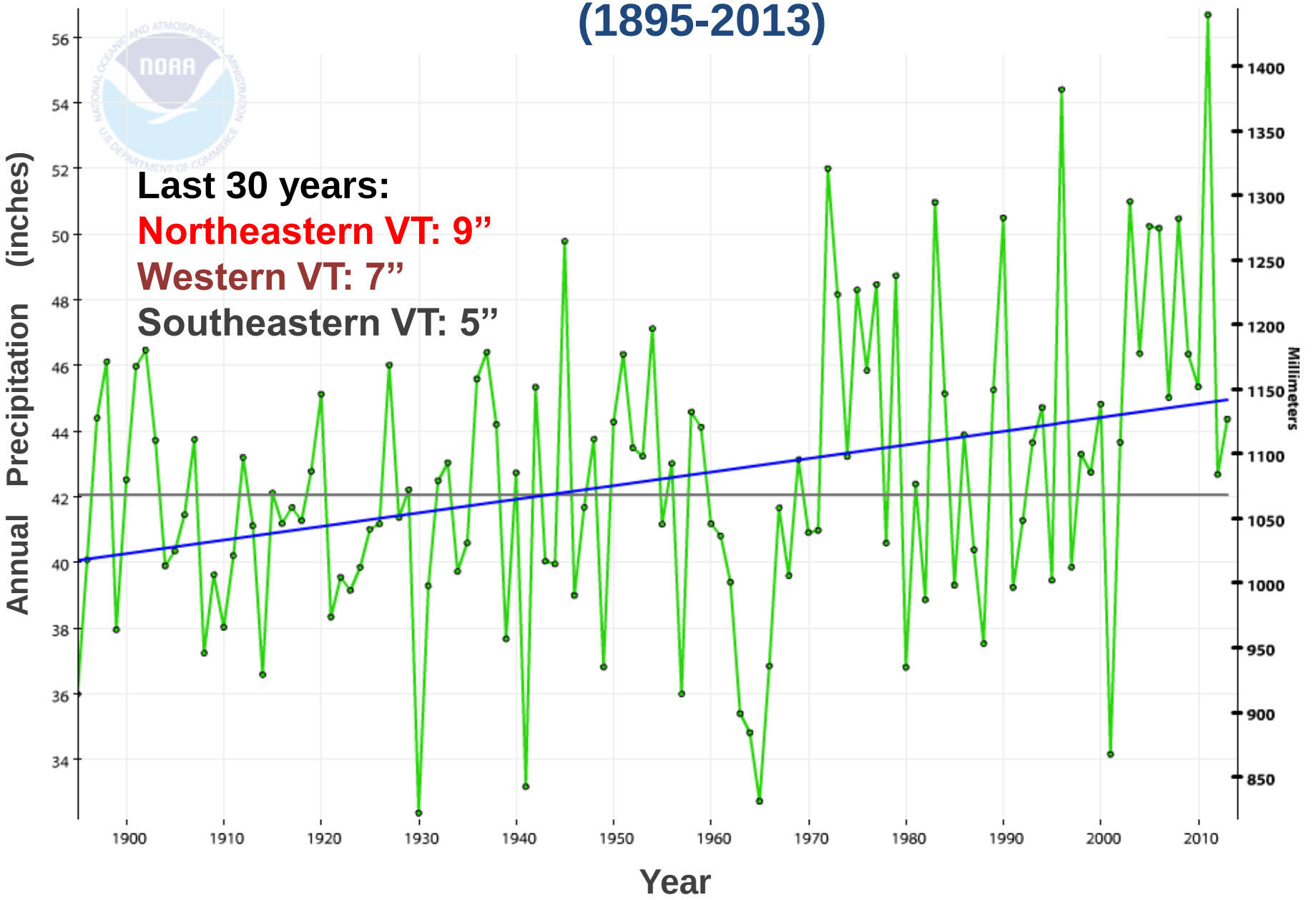
Understanding the Role that Farms and Farmers Play in the Water and Climate Conversation in Vermont

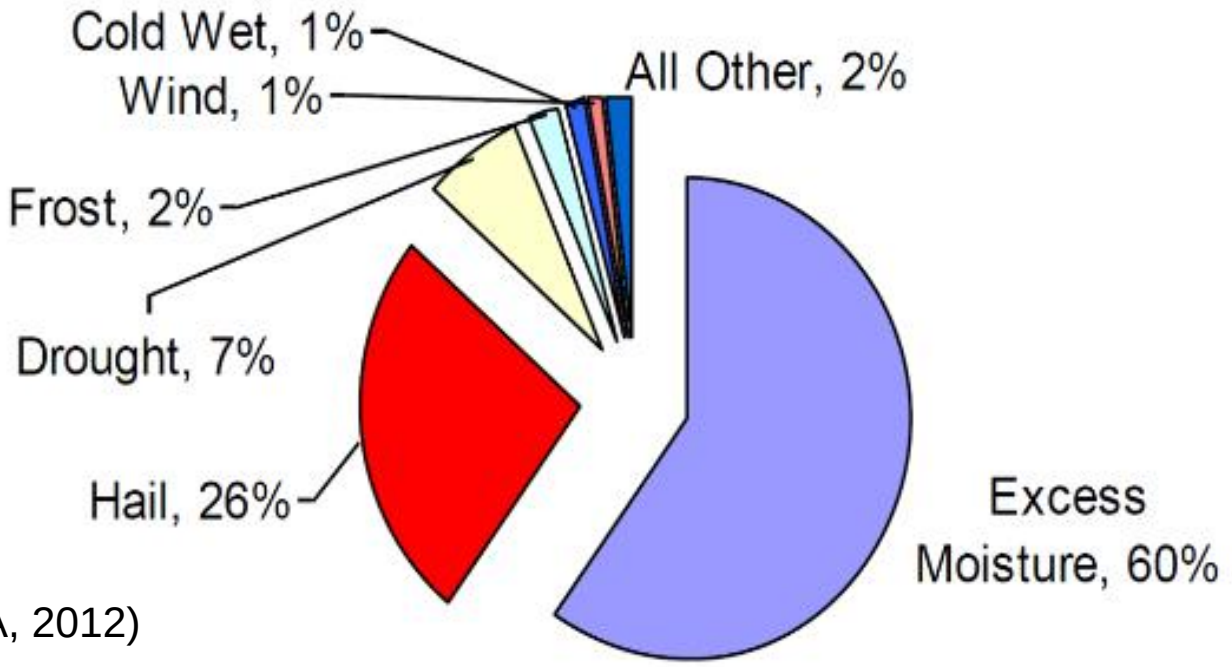
THE UNIVERSITY OF VERMONT EXTENSION

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



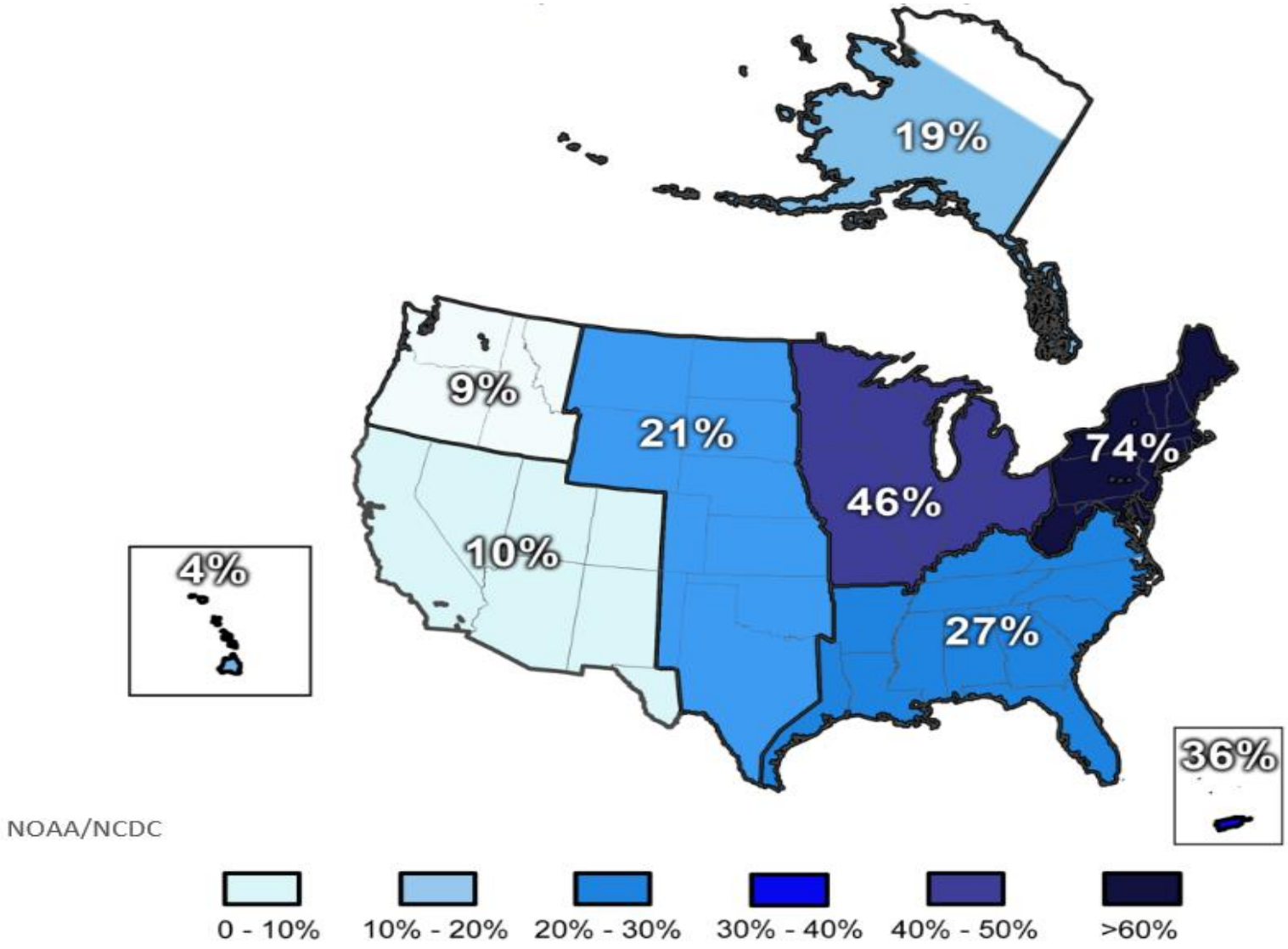
Why Vermont Crops Fail (2001-10)

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



(USDA RMA, 2012)

Trend in 1-day Very Heavy Precipitation
(1958-2010)



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

(Nearing et al., 2004)

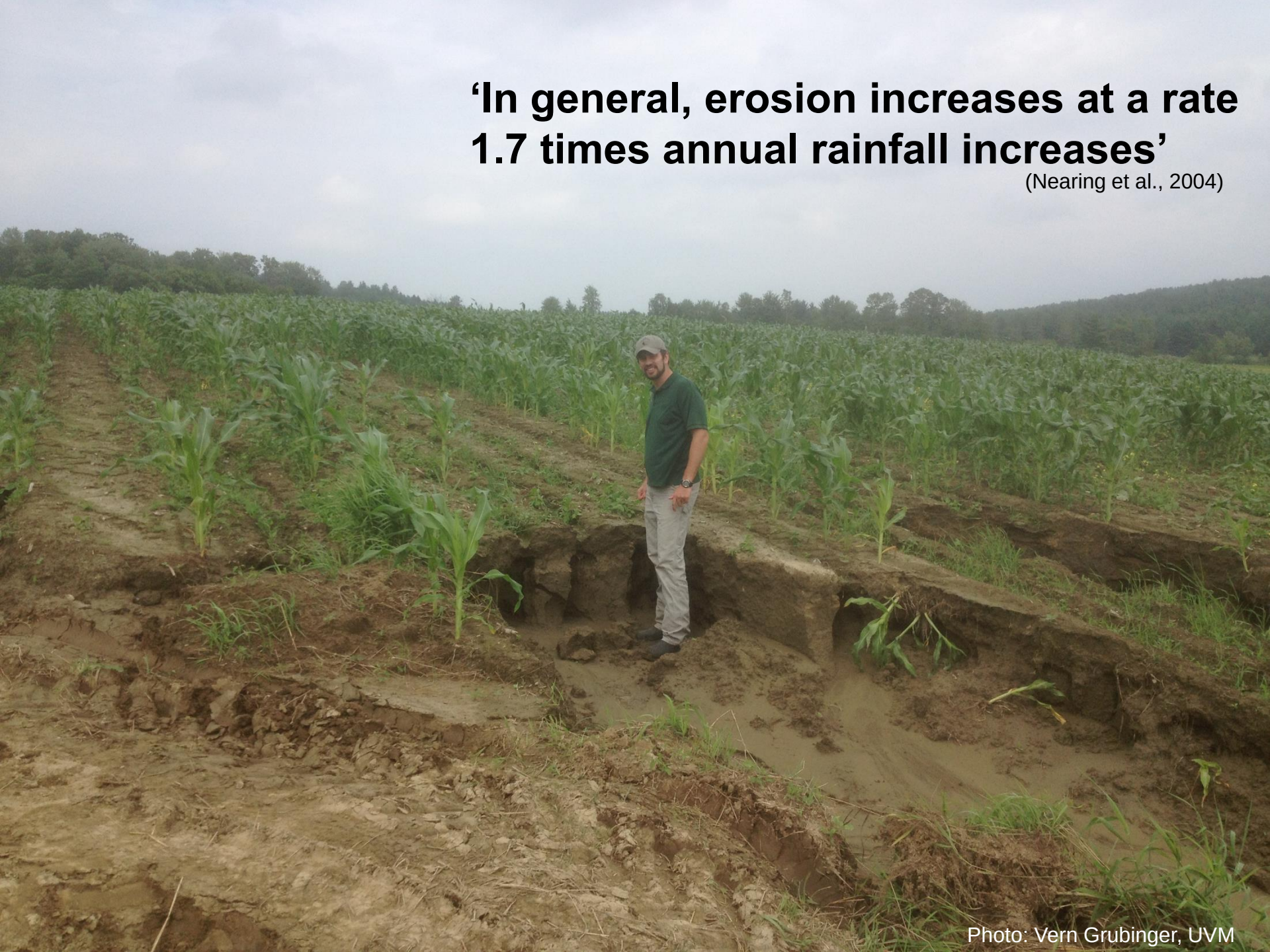
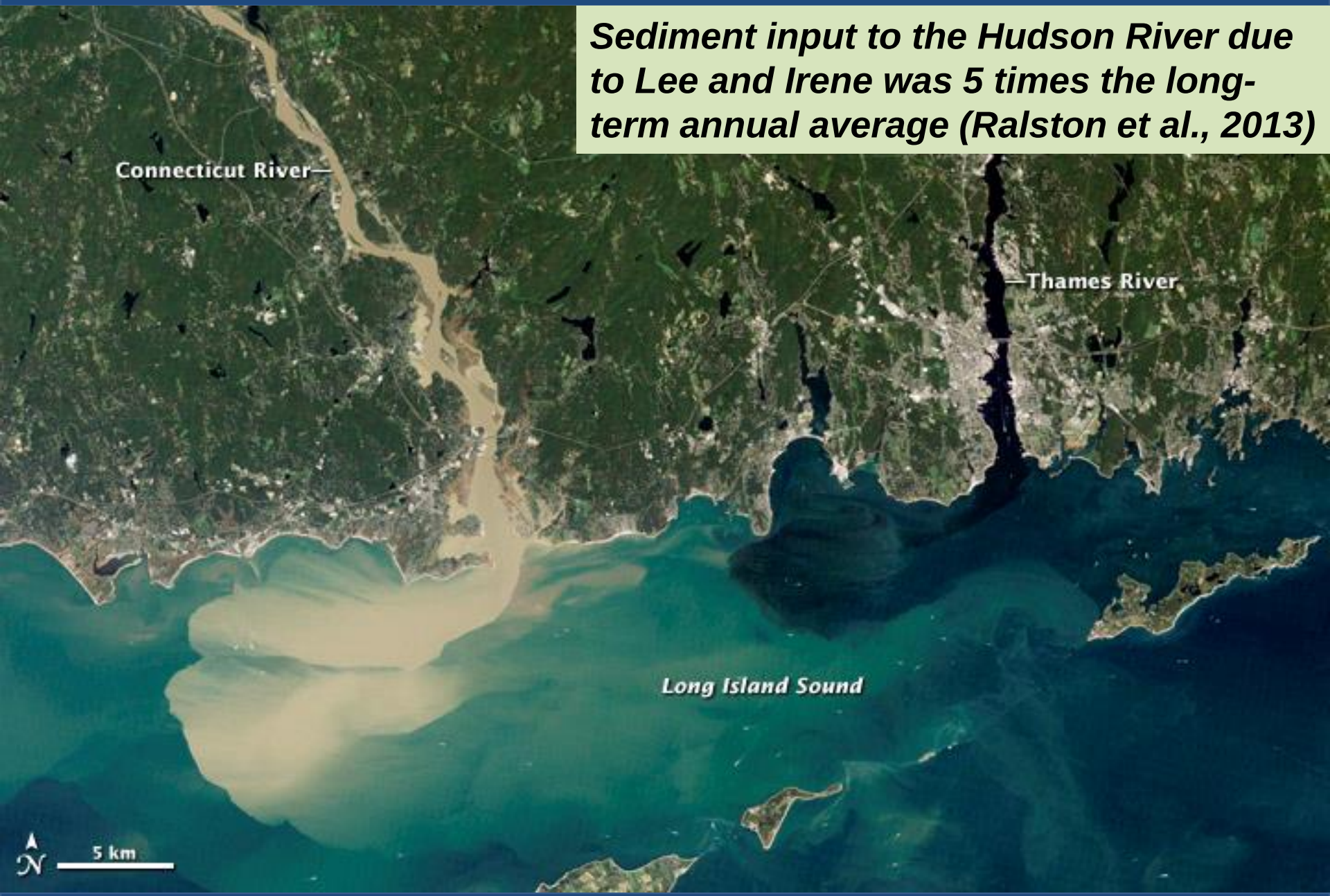


Photo: Vern Grubinger, UVM

Flooding and Downstream Impacts

Photo: Vern Grubinger, UVM

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



(Source: earthobservatory.nasa.gov))

2018 Field Crop BMP Conservation Practices

Jeff Carter
Middlebury, VT

THE UNIVERSITY OF VERMONT
EXTENSION

Field Practice BMPs

Improve Soil Health
&
Reduce Nutrient Losses

Reduced Tillage
No-Till Planting

Field Practice BMPs

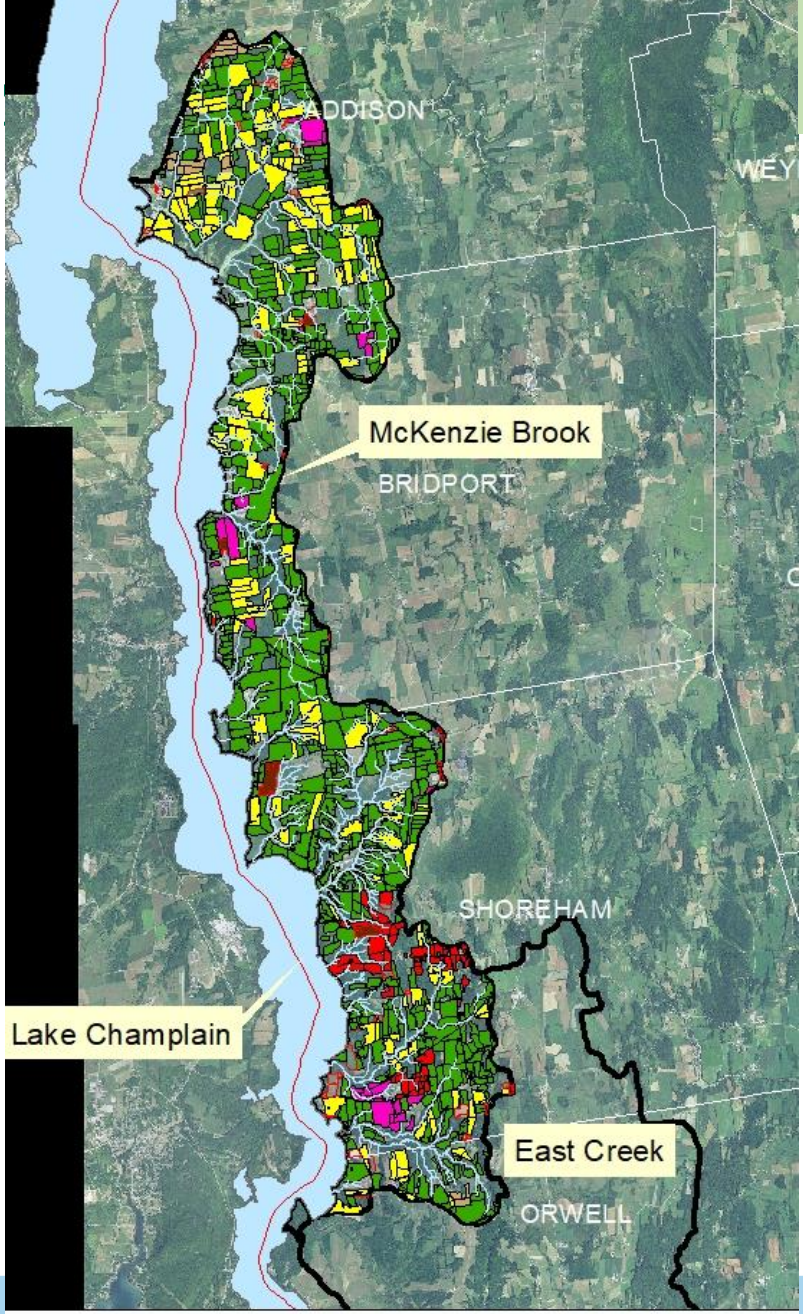
Improve Soil Health
&
Reduce Nutrient Losses

Reduced Tillage
No-Till Planting
Cover Crops

Field Practice BMPs

Improve Soil Health
&
Reduce Nutrient Losses

Reduced Tillage
No-Till Planting
Cover Crops
Manure Injection



South Lake A
2018 Field Practices Survey

- Goal 63% P reduction / year

McKenzie Brook Watershed

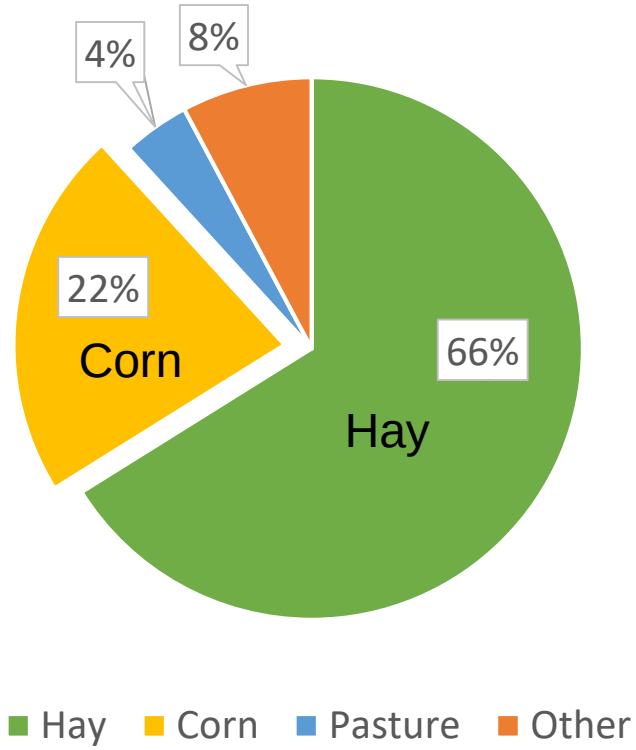
- 76% in Agriculture
- 26 Farms
- 962 Fields
- 14,542 Crop acres

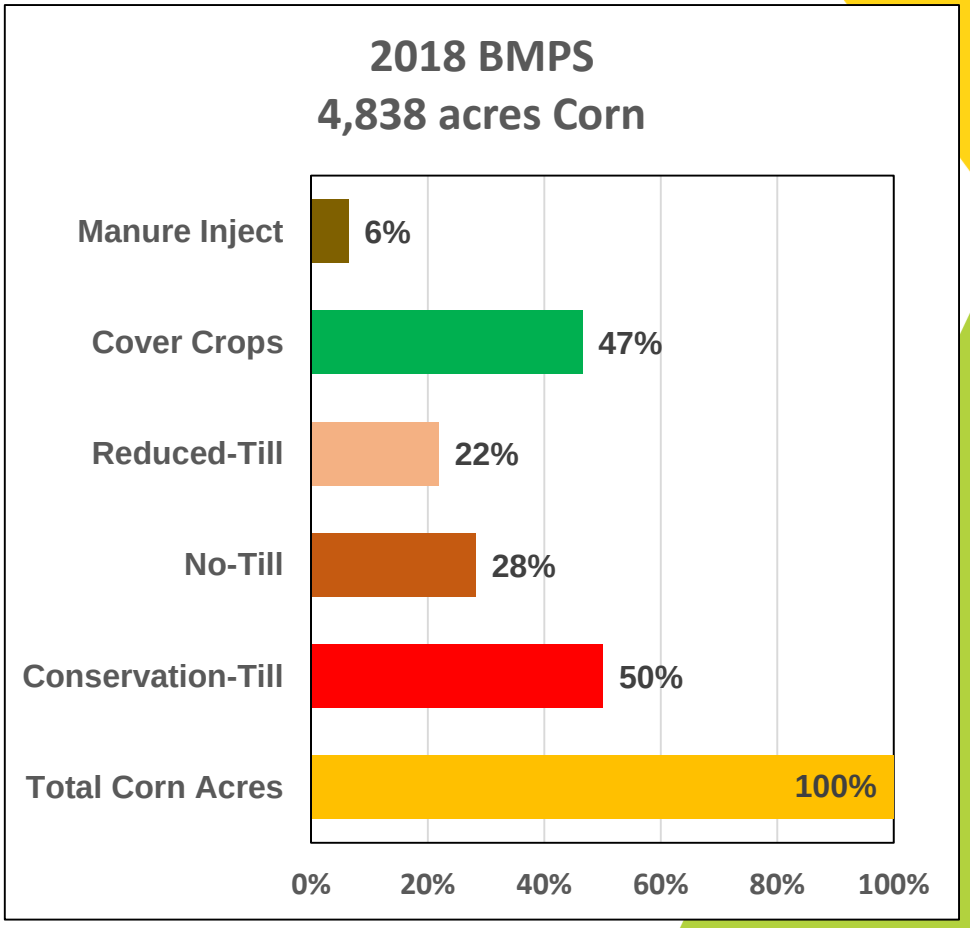
East Creek Watershed

- 46% in Agriculture
- 24 Farms
- 558 Fields
- 7,414 acres

McKenzie Brook & East Creek Watersheds – 50 Farms

21,893 acres Cropland

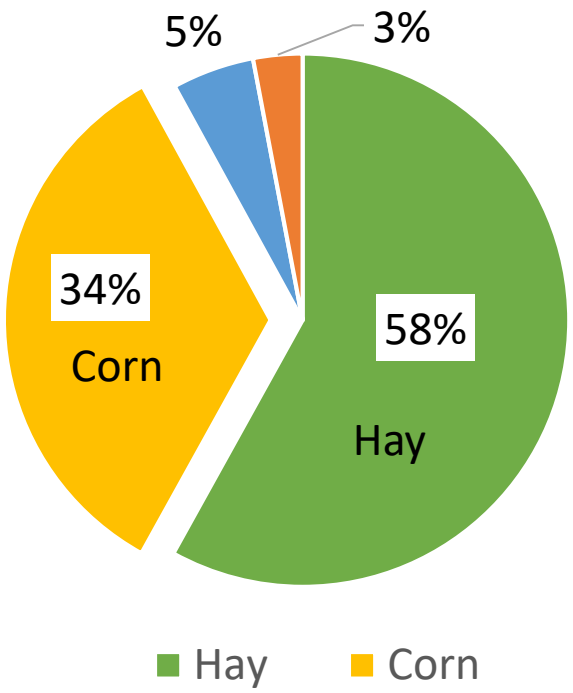


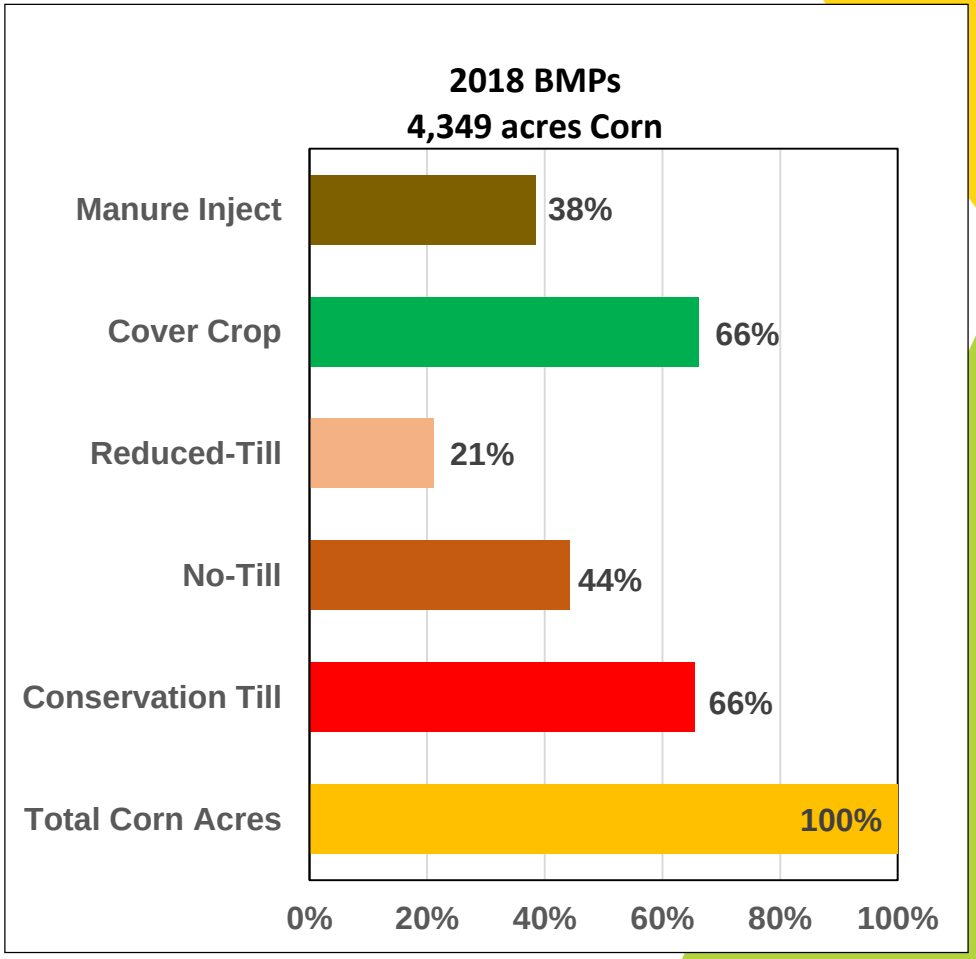


The University of Vermont

CVFC – Board of Directors - 13 Farms

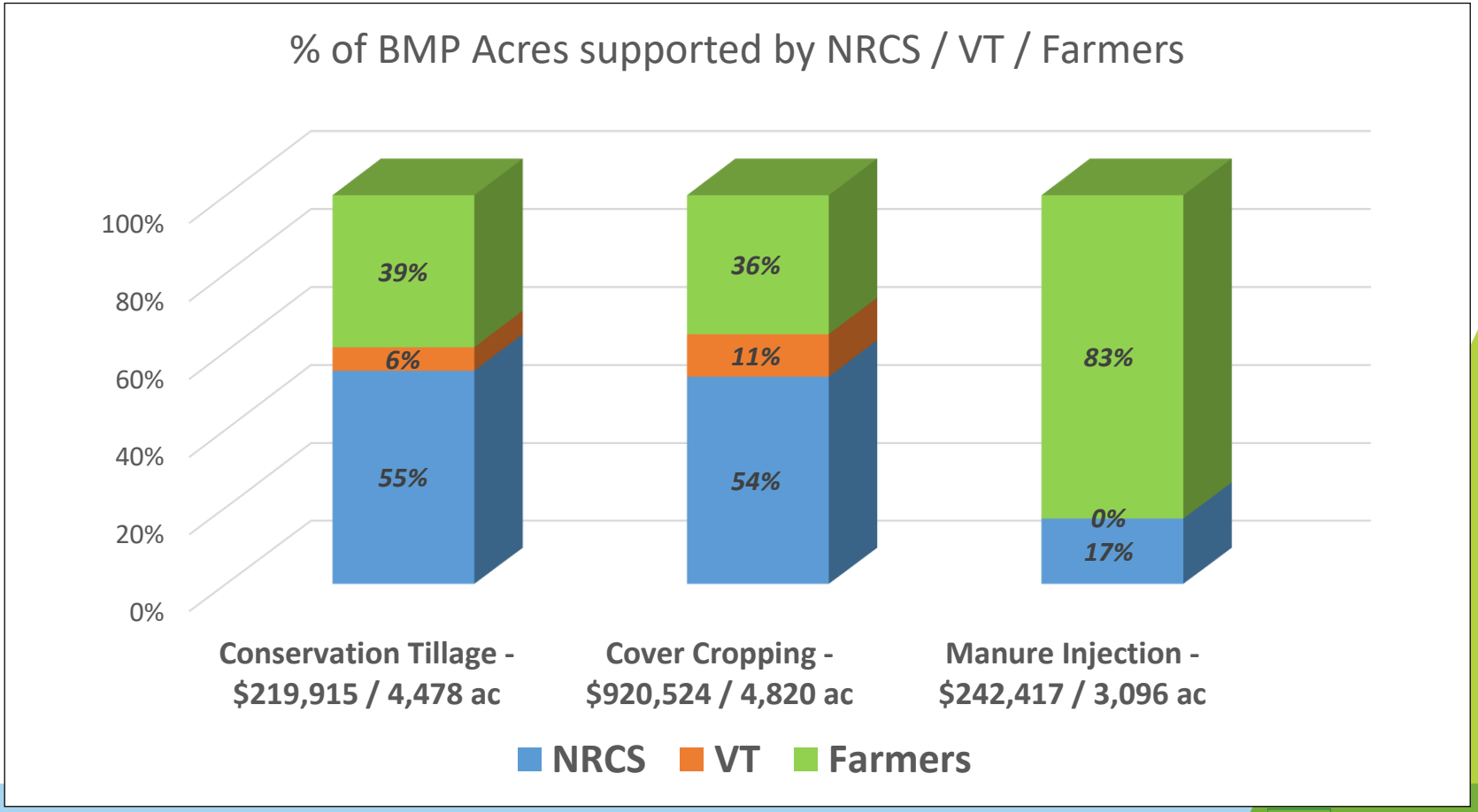
19,527 acres Cropland



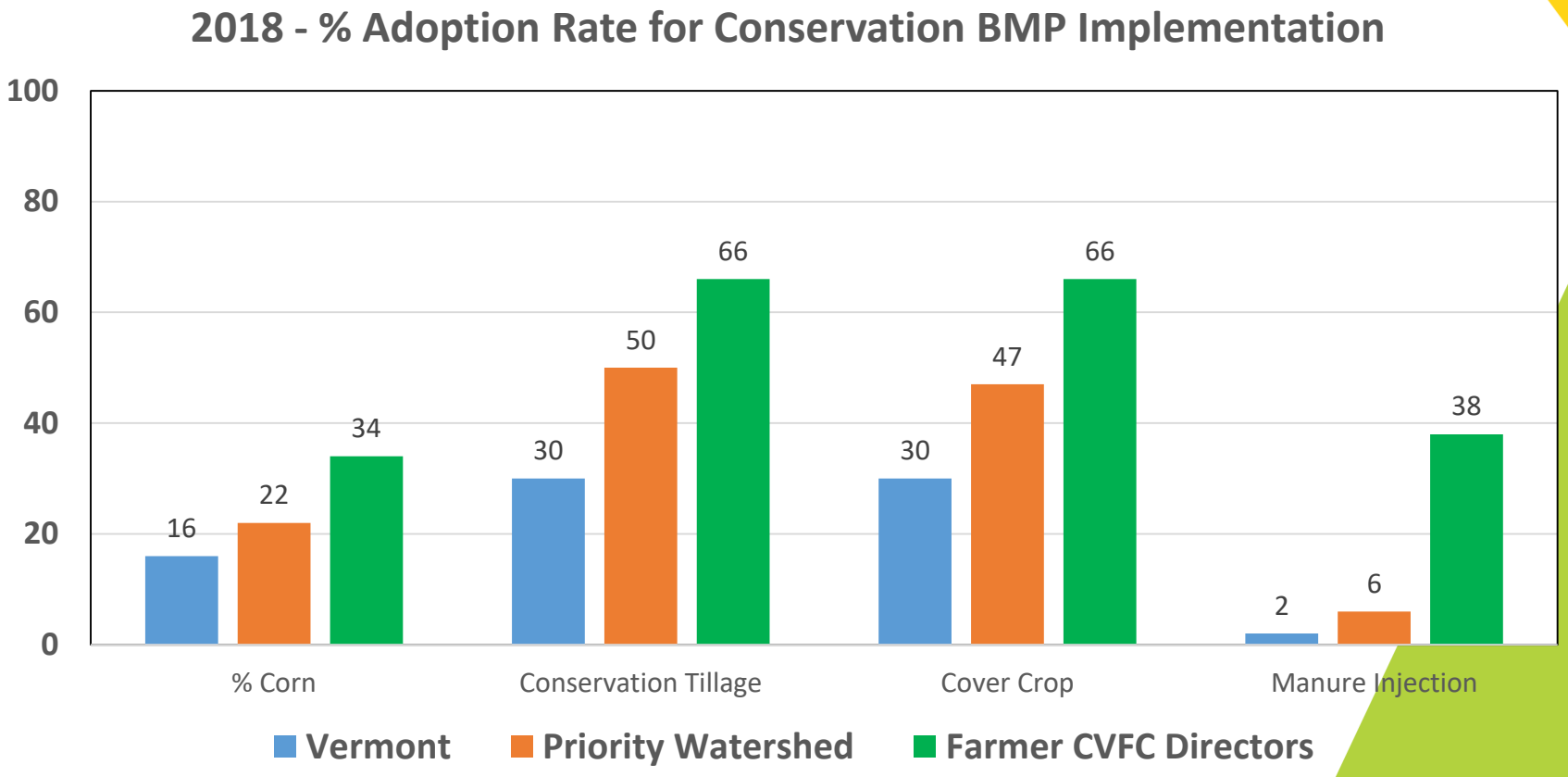


THE UNIVERSITY OF VERMONT EXTENSION

CVFC Director Farms – 19,529 acres
Field BMP Implementation for P Reduction



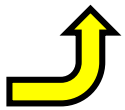
Farmer Adoption of Field BMP Practices



What is it Worth ? CVFC Directors - 13 Farms

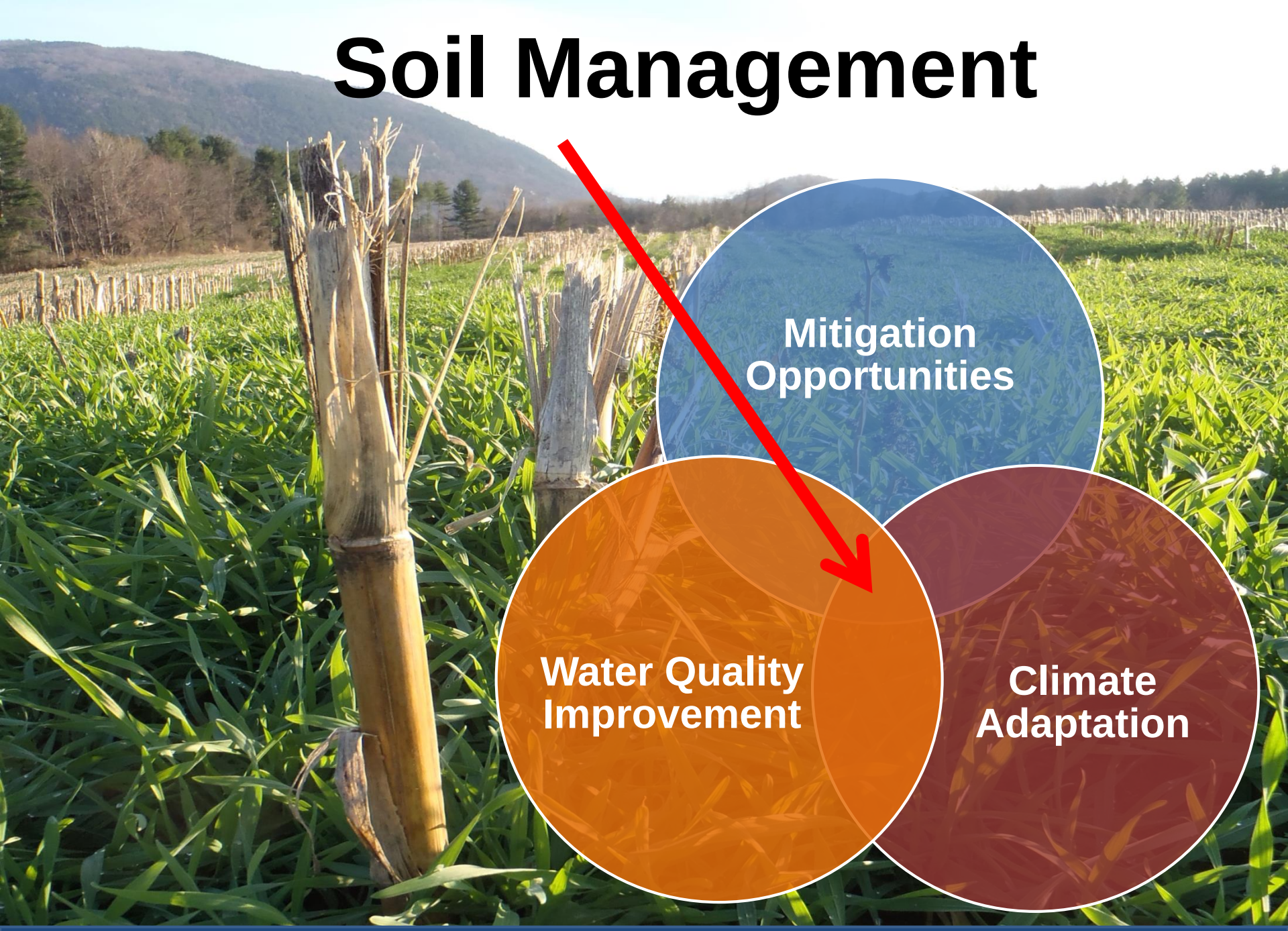
	Acres	BMP Cost*	P Reduction lb/yr	Soil Carbon Increase	Energy Use Reduction	GHG / Other
Conservation Tillage	4,478	$ 219,915	7,137	--	--	-
Winter Cover Crop	4,820	$ 920,524	5,750	--	--	--
Manure Injection	3,096	$ 242,417	331	--	--	--
Total		**$1.38 M**	**13,218**	**?**	**?**	**?**

Ecosystem Services



* BMP Cost from NRCS BMP Scenario Tool for TMDL reduction planning

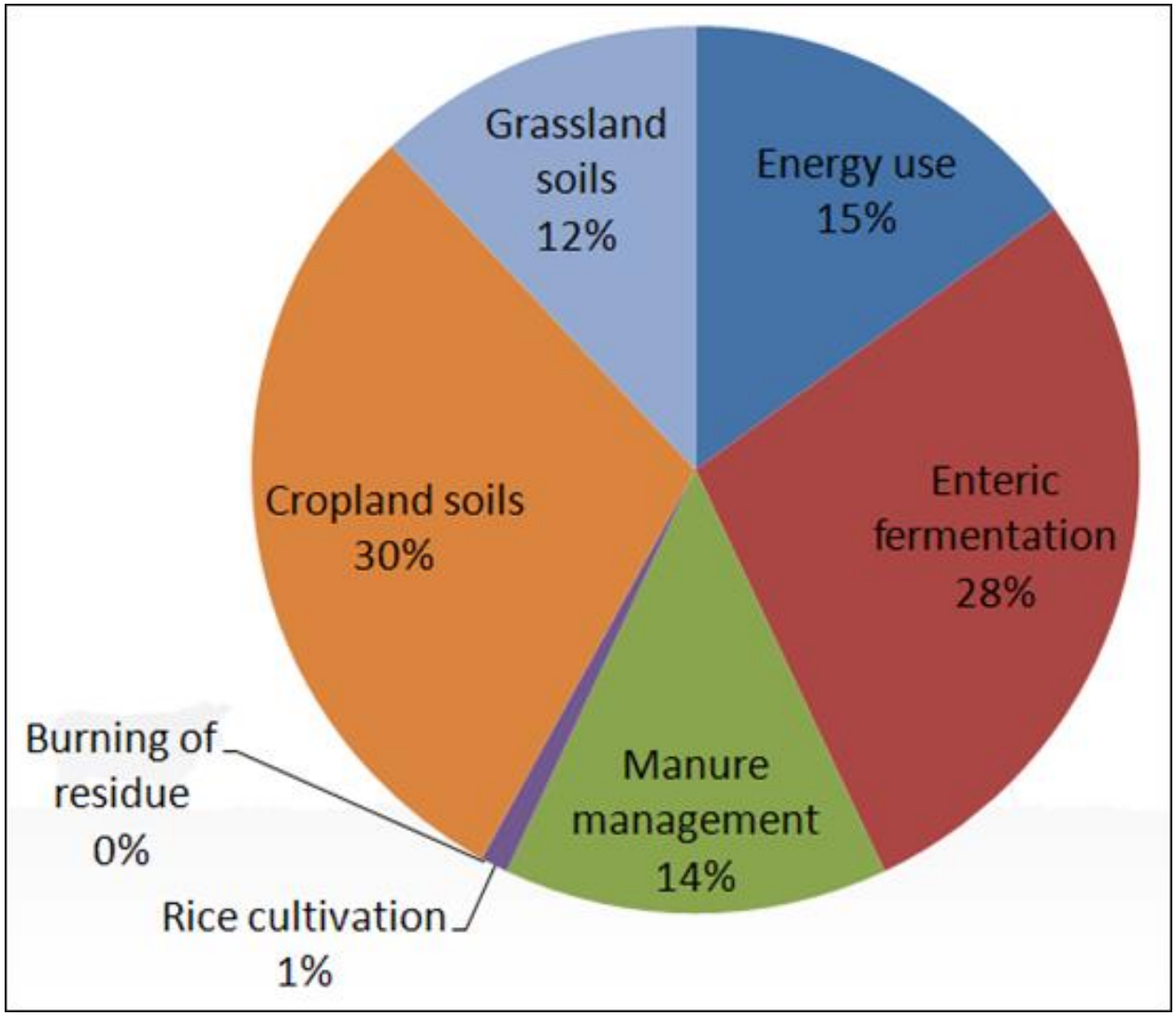
Soil Management



(Photo: Kirsten Workman)

How does agriculture impact climate change?

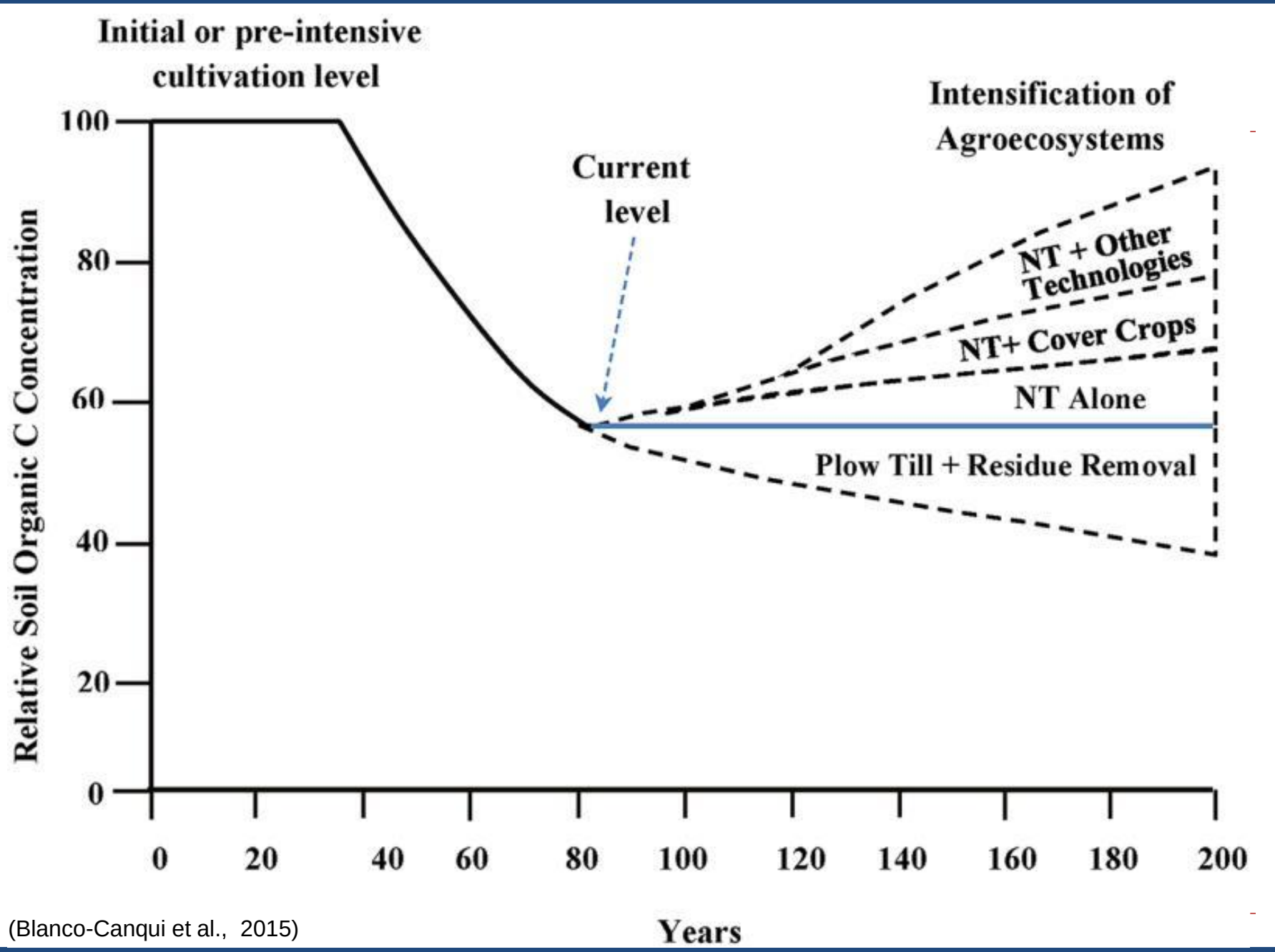
Agriculture = 9% of Total U.S. GHG Emissions



U.S. agricultural greenhouse gas sources (Adapted from Archibeque et al., 2012)

Conservation Tillage

Reduced erosion of carbon
Reduced gaseous loss of carbon



(Blanco-Canqui et al., 2015)

Cover Crops

Reduced erosion of carbon
Additions of carbon to the soil
Other ecosystem services…

(Photo: Kirsten Workman)

Based on most recent estimates, cover crops on Vermont cornfields could sequester:

Estimate level	Carbon sequestered (ton CO_2 eq/yr)	Equivalent passenger vehicles (per year)	Current value in carbon market (per year)
Medium	44,800	**9,600**	**$688,000**
High	240,000	**51,200**	**$3,700,000**

*Sequestration estimates from Tellatin and Myers, 2018
**Carbon pricing as of 1/22/19 from CA (calcarbondash.org); $15.35/ t CO_2 eq.
***Does not include value of other ecosystem services

(Photo: Kirsten Workman)

Perennial Forage

- 338,000 acres, <u>not</u> including pasture
- Carbon sequestration, wildlife habitat, and pollination services
- Ecosystem services of $33.90 per acre per year (The Trust for Public Land, 2018)
- Total of $11.46 million/year value to Vermont

(Image: www.nrcs.usda.gov)

Facebook Twitter Share Print Email

First-Ever Rice Farming Carbon Credits Sold to Microsoft

JUNE 14, 2017 01:56 PM

Like 4 Share Twee

FOOD

Save the climate, pay a farmer

By Nathanael Johnson on Oct 16, 2014

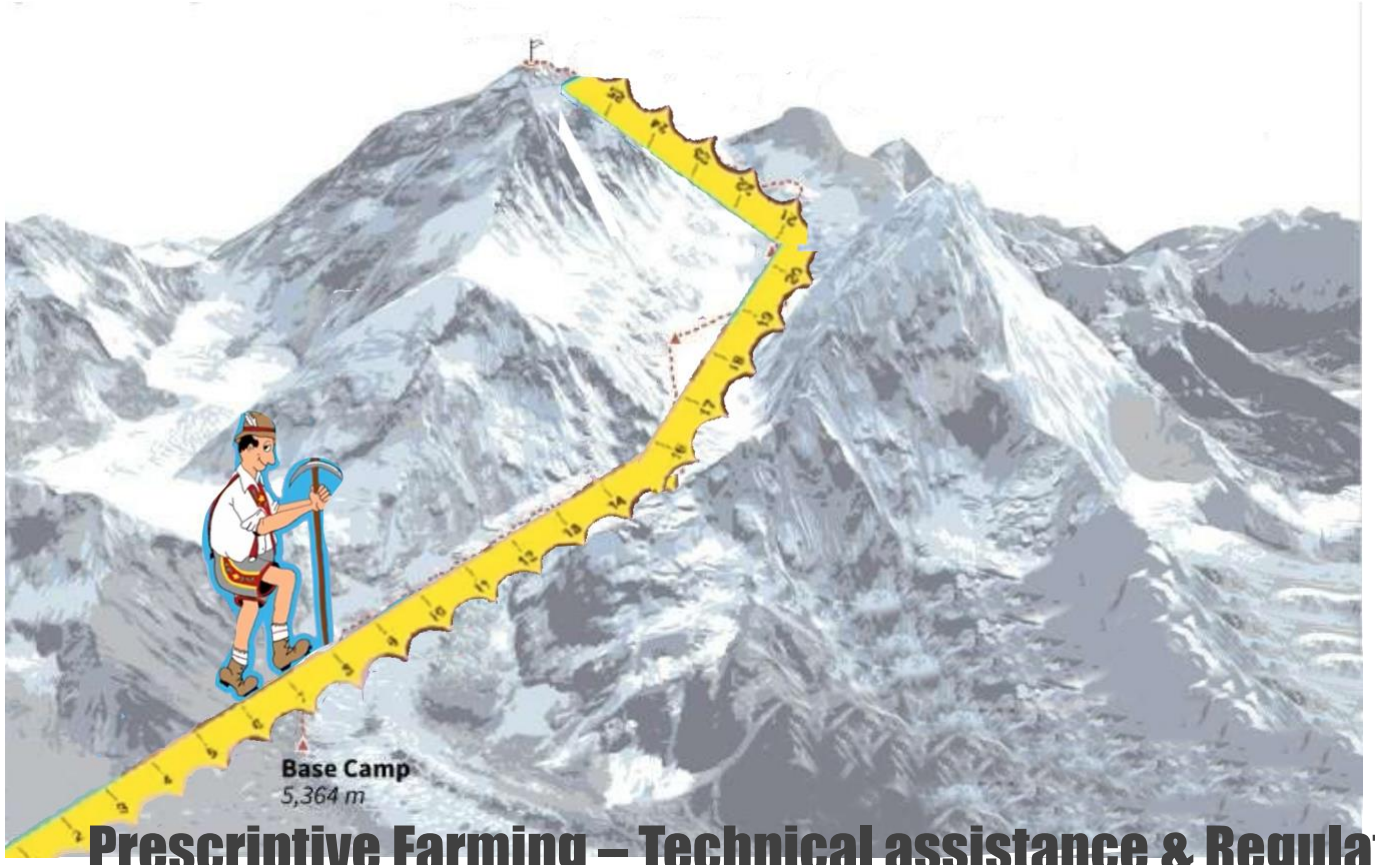
Tweet Share

e speed toward

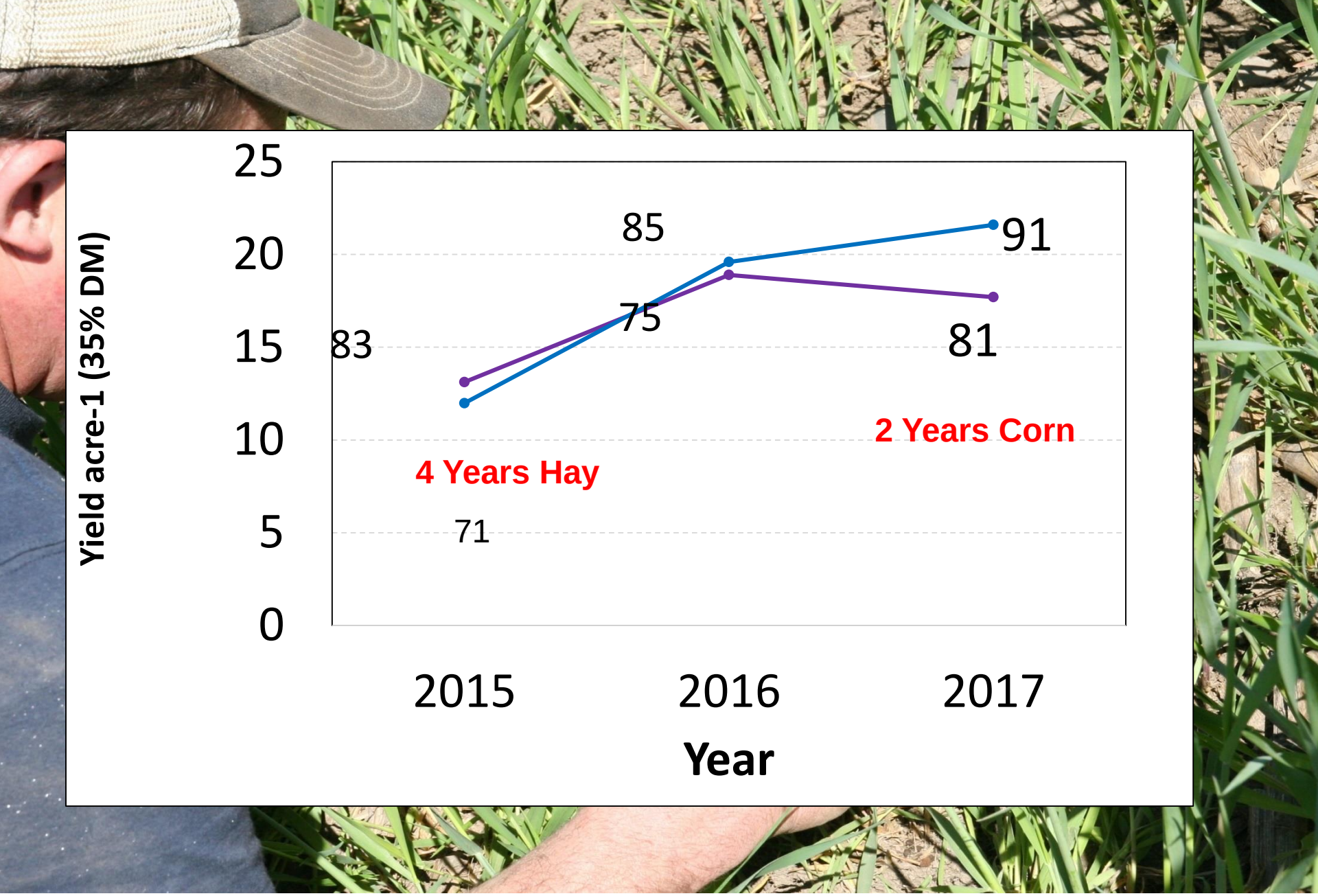
ENERGY & ENVIRONMENT | SPECIAL REPORT: FOOD FOR TOMORROW

A Boon for Soil, and for the Environment

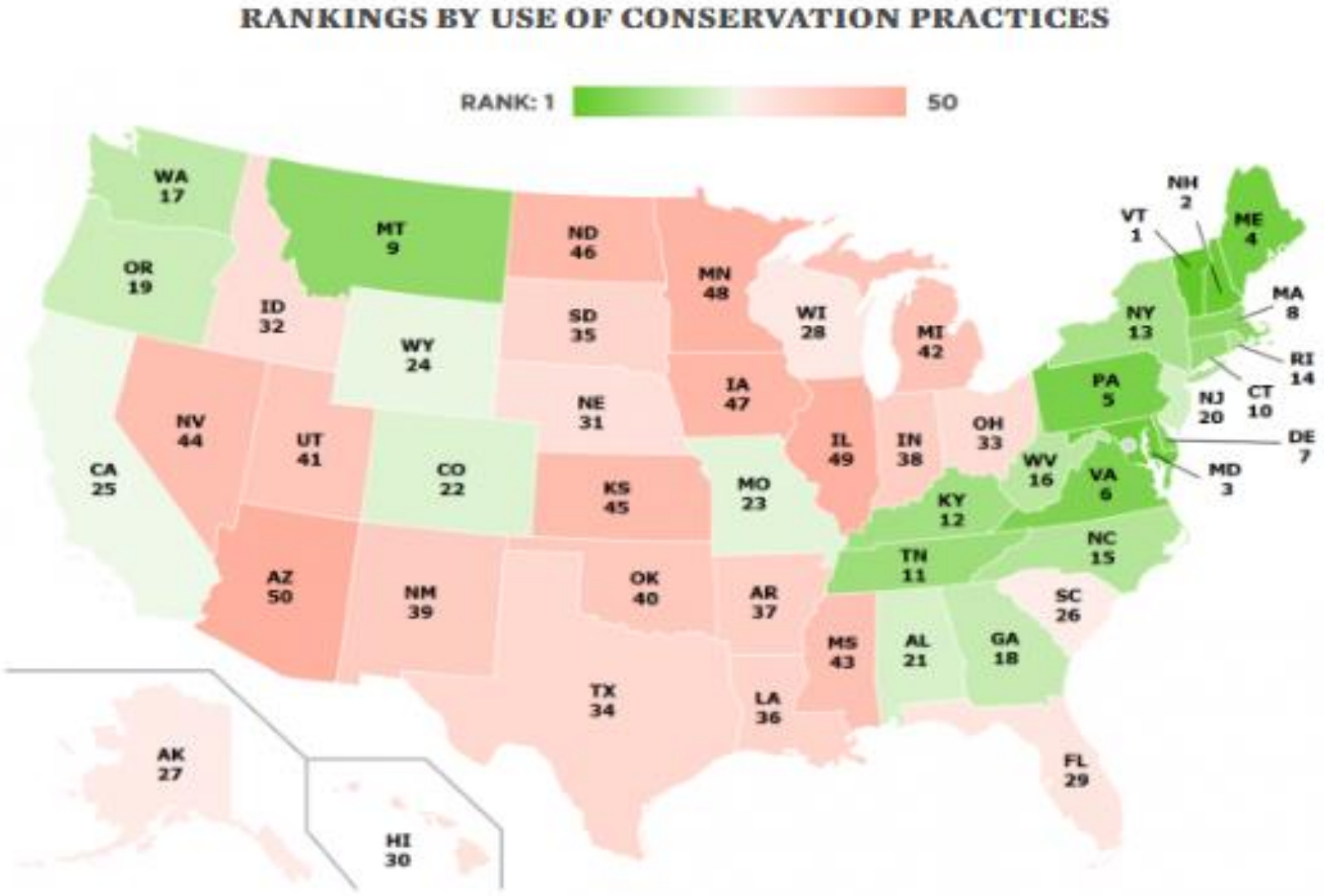
By BETH GARDINER MAY 17, 2016



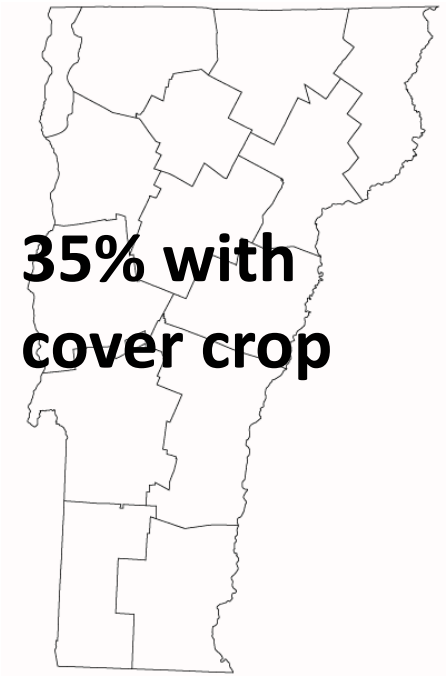
Prescriptive Farming – Technical assistance & Regulation
Increased Buffers, cover crops, no-till


Yield acre-1 (35% DM)
25
20
15
10
5
0
85
91
75
83
81
2 Years Corn
4 Years Hay
71
2015
2016
2017
Year

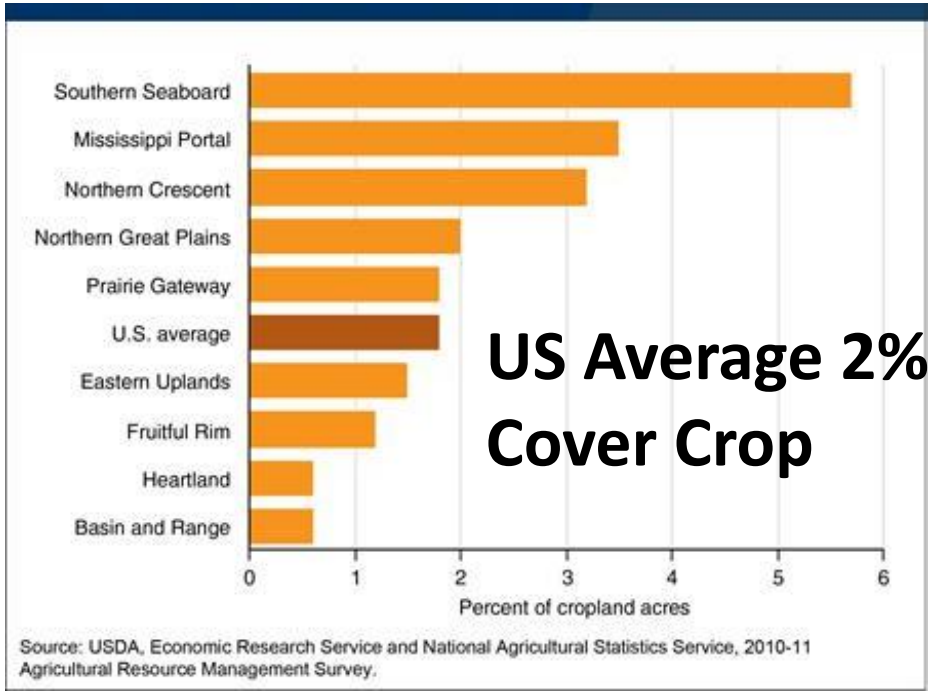
+1.3% with improved grazing management



https://www.ucsusa.org/food-agriculture/food-system-scorecard#.XEqaJs17k2w

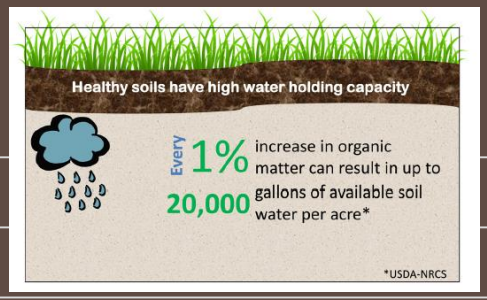


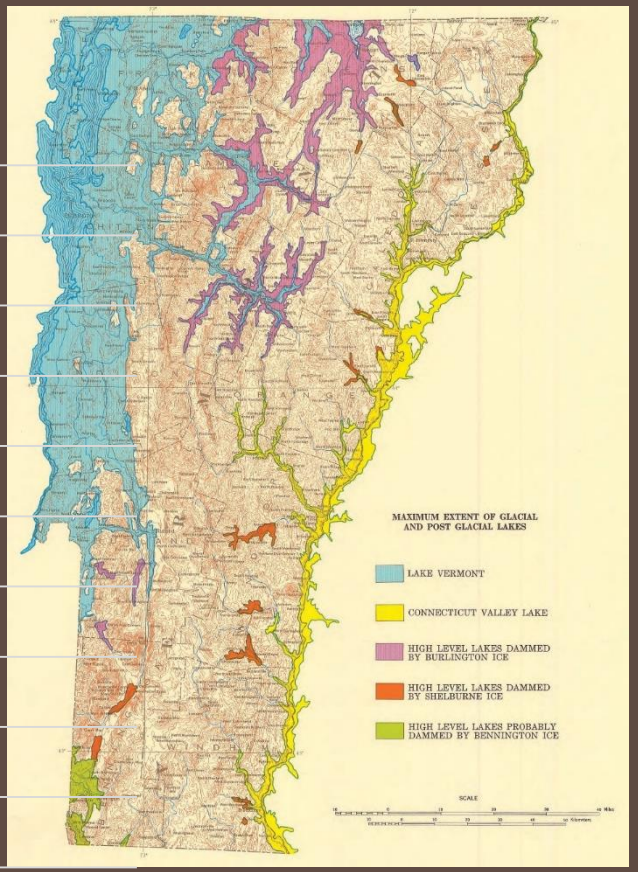
35% with cover crop



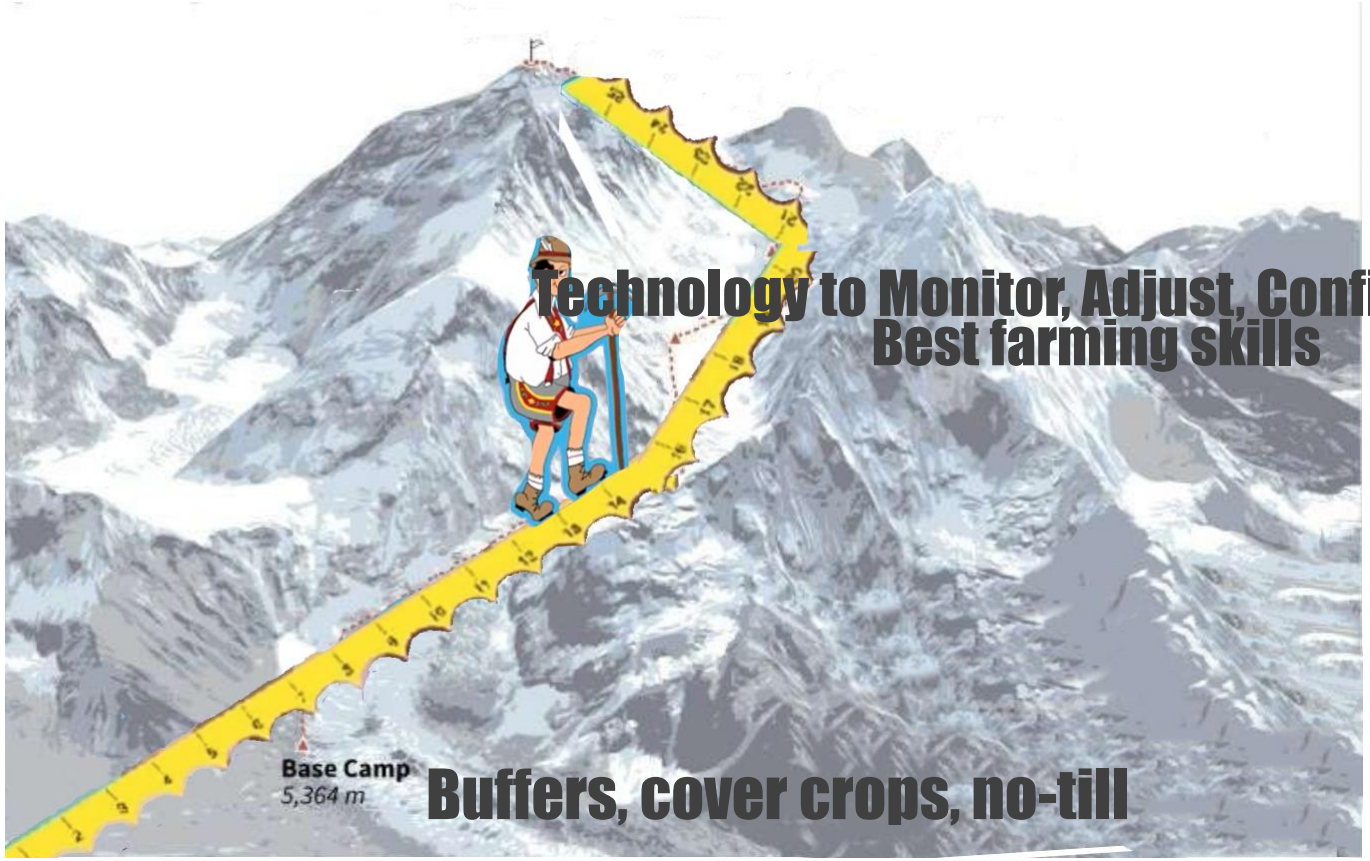
US Average 2% Cover Crop

Vermont Soil Health Database

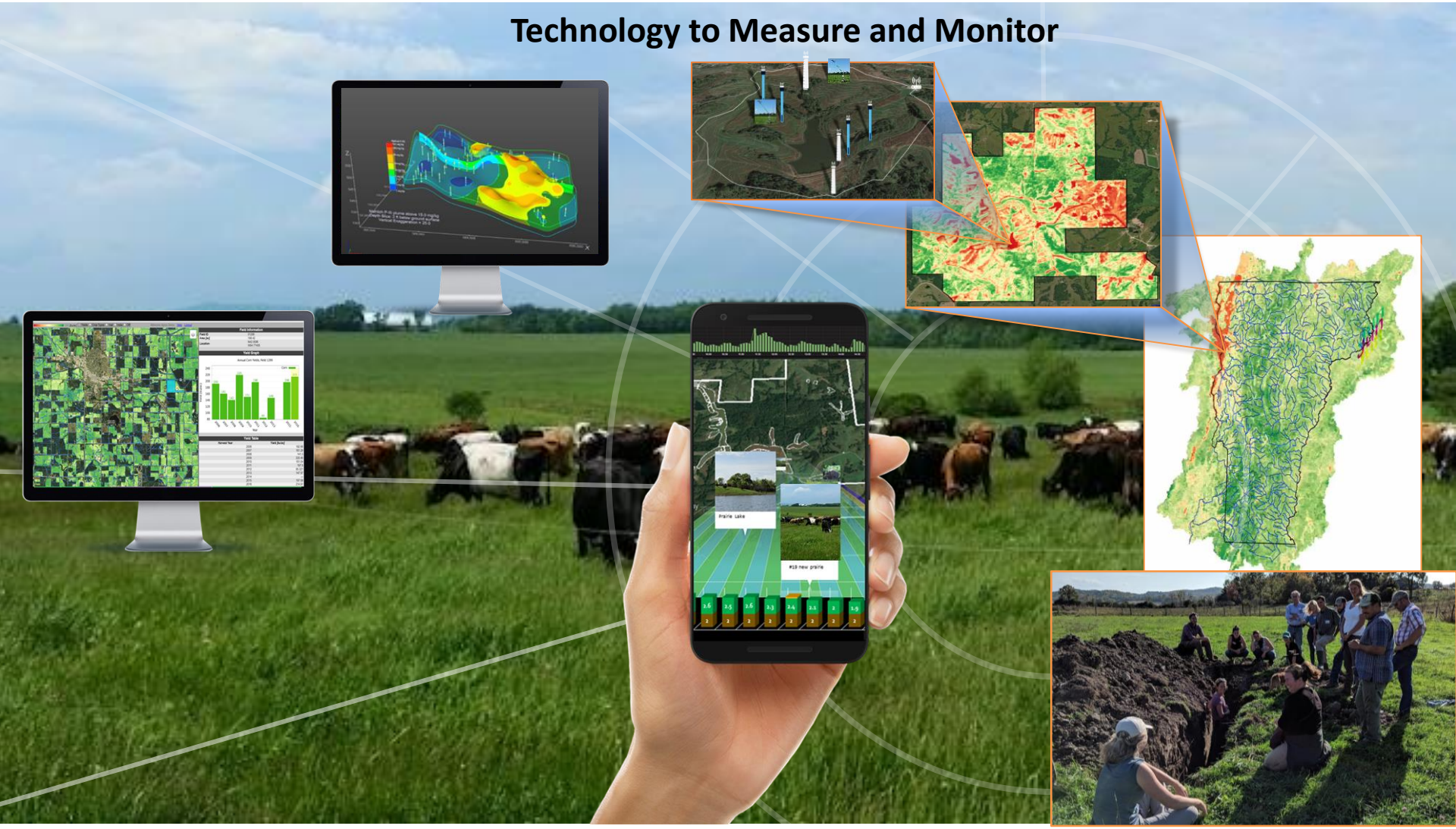




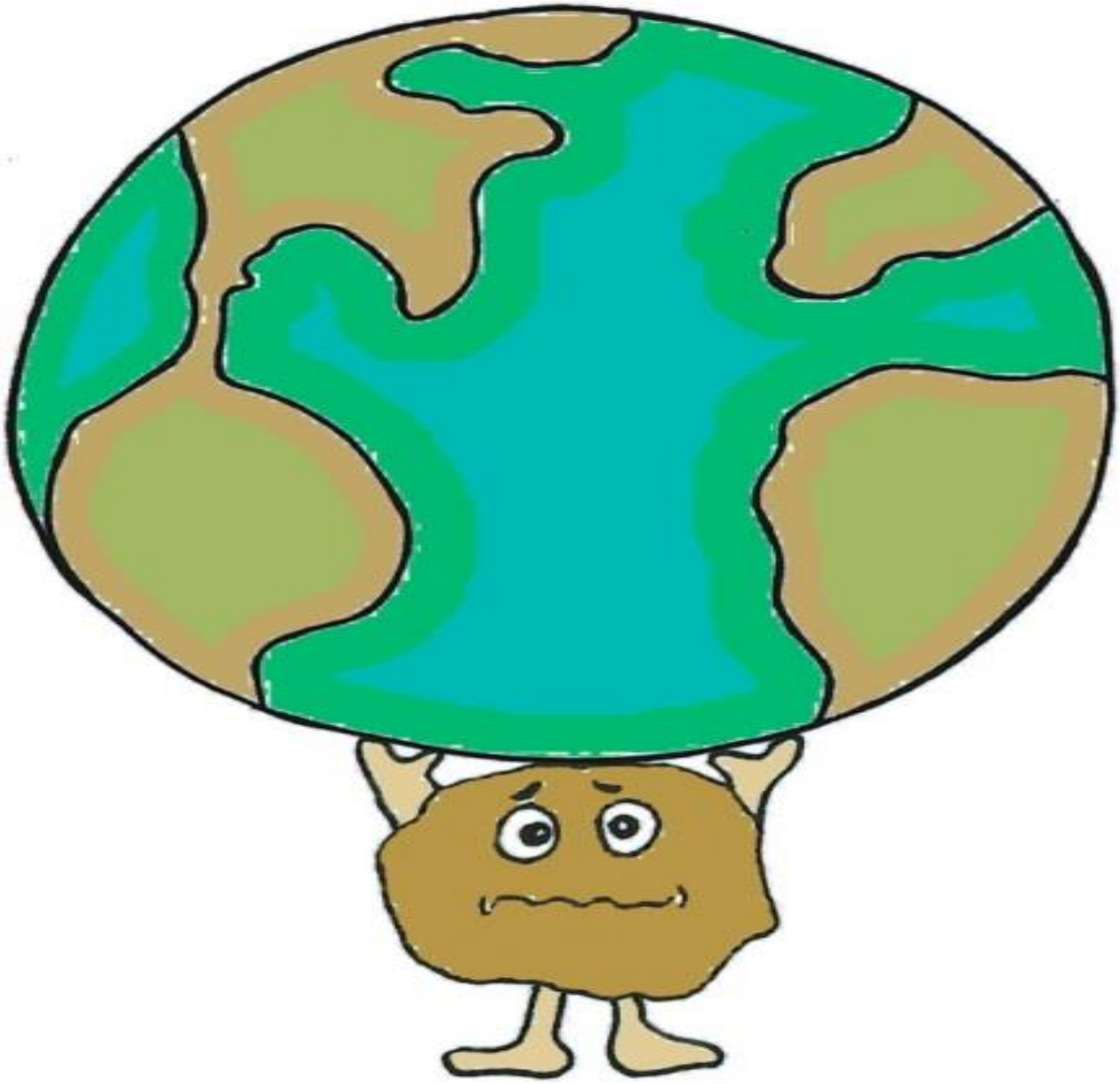
Winter 2018
Joseph Amsili


Technology to Monitor, Adjust, Confirm, Achieve
Best farming skills
Base Camp
5,364 m
Buffers, cover crops, no-till

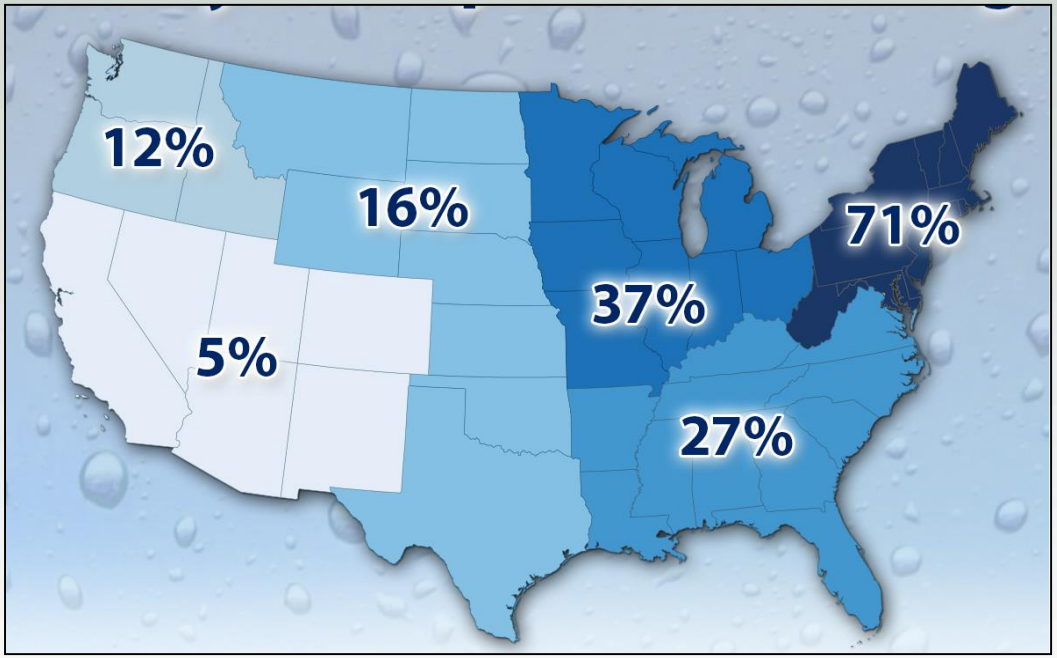
Technology to Measure and Monitor




$$$
Viability
Best farming skills
Proper Direction
Base Camp
5,364 m
Buffers, cover crops, no-till

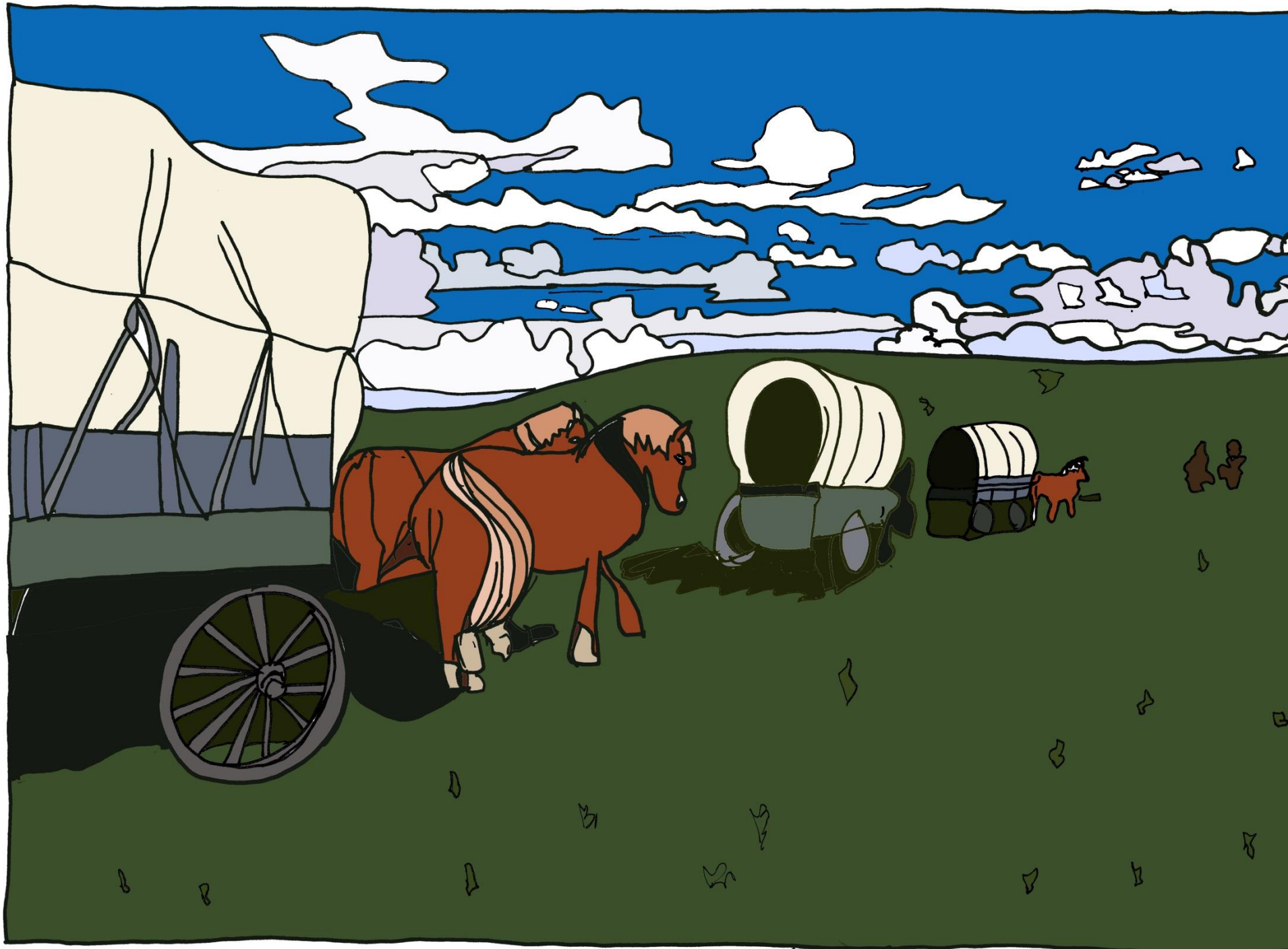


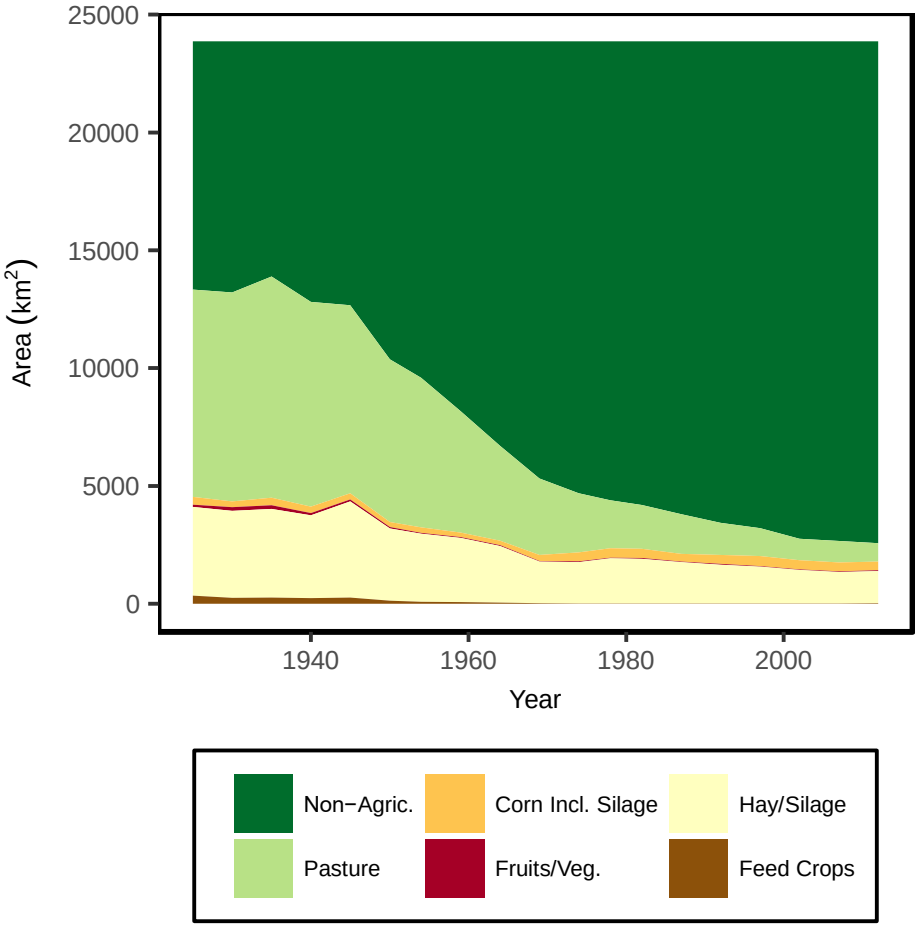
Trends in Extreme Precipitation

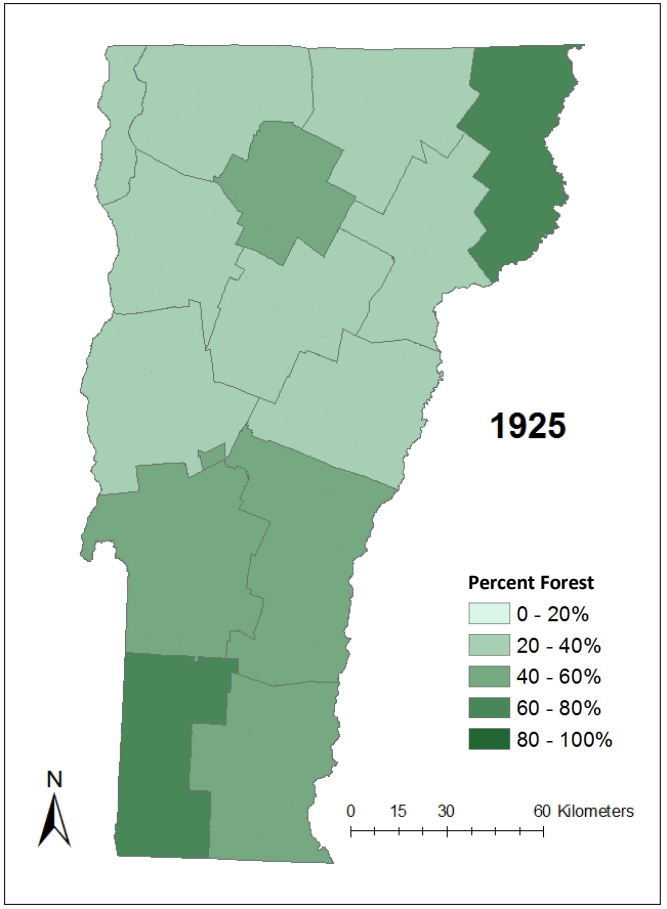


Increase in the number of 2” rainfalls per year from 1958 to 2011


Some People Wake Up to
an Alarm




25000
20000
15000
10000
5000
0
Area (km^2)
1940
1960
1980
2000
Year
Non−Agric.
Corn Incl. Silage
Hay/Silage
Pasture
Fruits/Veg.
Feed Crops


1925
Percent Forest
0 - 20%
20 - 40%
40 - 60%
60 - 80%
80 - 100%
N
0
15
30
60 Kilometers

- Food and forage
- Increased soil-water-holding-capacity
- Water-purification
- Groundwater recharge
- Increased stream-baseflow
- Increased soil-carbon
- Reduced:
  - Flooding
  - Drought
  - Eutrophication and water-pollution
  - Infrastructure damage

TABLE A1. ESTIMATED ANNUAL PER-ACRE VALUE OF NATURAL GOODS AND SERVICES BY LAND COVER TYPE

Land cover type*	Natural goods and services	Annual value per acre (2018$)
Deciduous Forest	Air pollution removal, carbon sequestration, carbon storage, erosion control/water quality	$180.00
Mixed Forest	Air pollution removal, carbon sequestration, carbon storage, erosion control/water quality	$174.00
Pasture/Hay	Carbon sequestration, habitat/biodiversity, livestock/ livestock products, and pollination services	$58.80
Evergreen Forest	Air pollution removal, carbon sequestration, carbon storage, erosion control/water quality	$168.00
Cultivated Crops	Food production, pollination services	$63.10
Woody Wetland	Flood protection, habitat	$590.00
Shrub/Scrub	Habitat/biodiversity, carbon sequestration	$19.40
Emergent Herbaceous Wetland	Flood protection, habitat	$590.00

477,000 Acres Hay & Pasture

Compliments of the Livestock Industry

Trust for Public Land, 2018

Farmers have met changing market-demand through history

Timber. Potash. Sheep. Syrup. Horse-hay. Cheese. Butter. Milk. Birdsfoot Trefoil Seed.

Next: ECOSYSTEM SERVICES