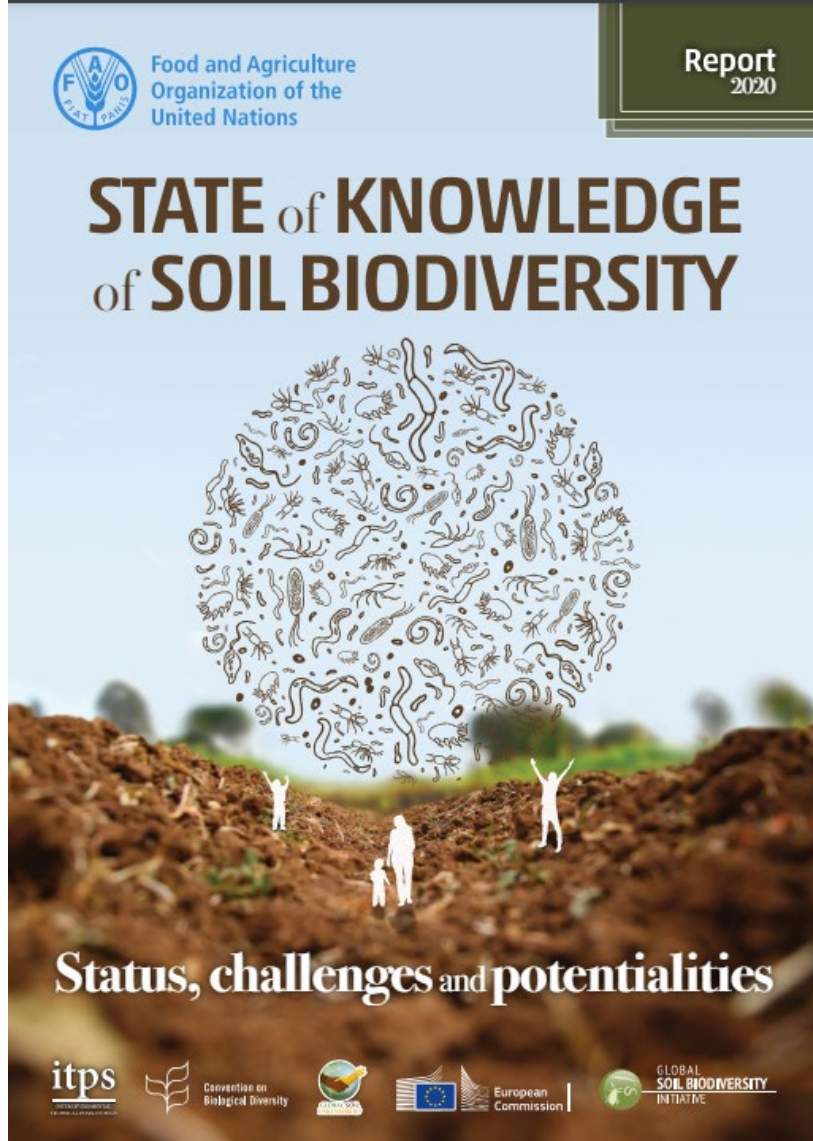


Vermont Agricultural Land Use & Soil Health

Ryan Patch
Agriculture Climate and Land Use Policy Manager
Vermont Agency of Agriculture, Food and Markets
Presentation to: House Committee on Environment & Energy
May 9, 2024

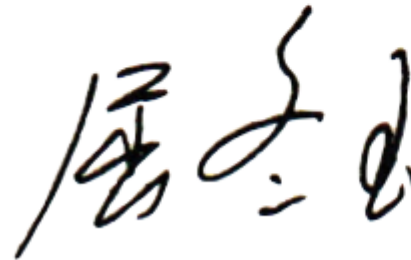


Foreword

Soil biodiversity could constitute, if an enabling environment is built, a real nature-based solution to most of the problems humanity is facing today, from the field to the global scale. Therefore efforts to conserve and protect biodiversity should include the vast array of soil organisms that make up more than 25% of the total biodiversity of our planet.

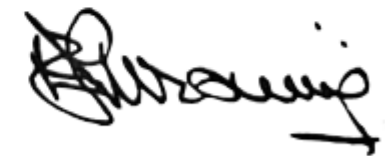
FAO Director-General

QU Dongyu

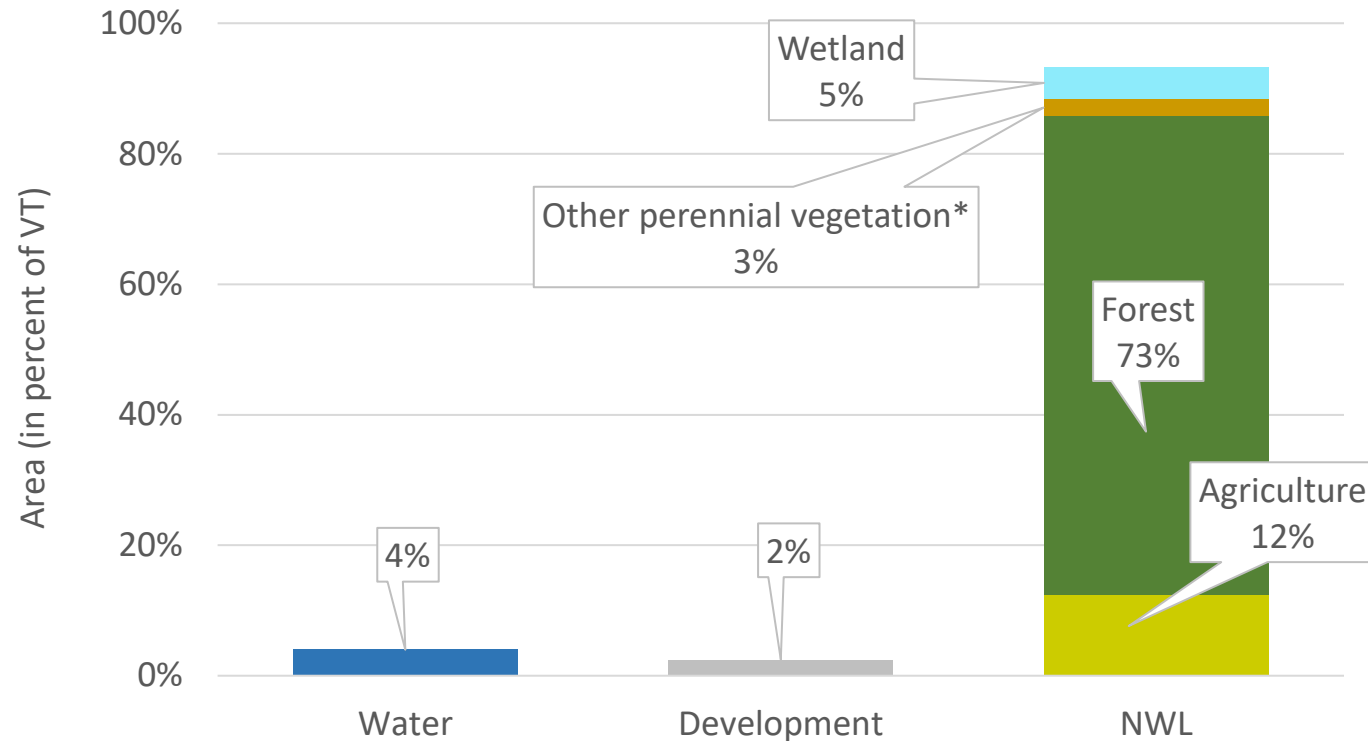


Executive Secretary of CBD

Elizabeth Maruma Mrema



Natural & Working Lands (NWL) cover 94% of Vermont



*Other perennial vegetation includes grasslands, shrub/scrublands, and turf



From: State Curator's Office, BGS. Circa 1870 – 1880s Retrieved from:

https://curator.vermont.gov/sites/curator/files/styles/slideshow_image_only/public/images/image_only_slides/historic-state-house-780x450.jpg?itok=IXOLbhmj

Graph 1

VERMONT FARM TRENDS 1920 - 1975

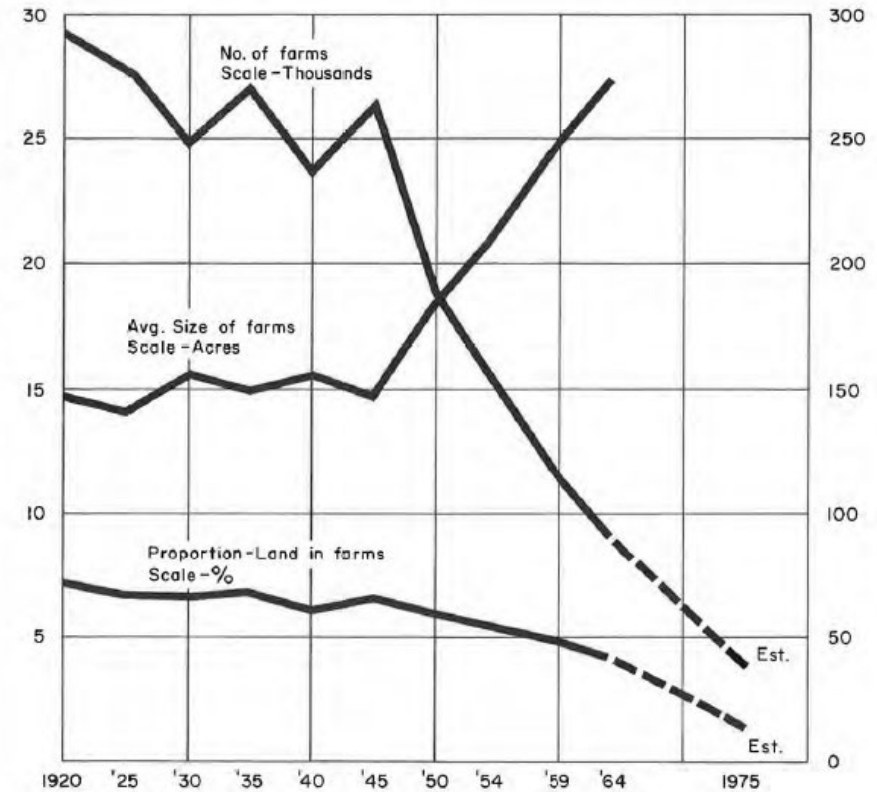


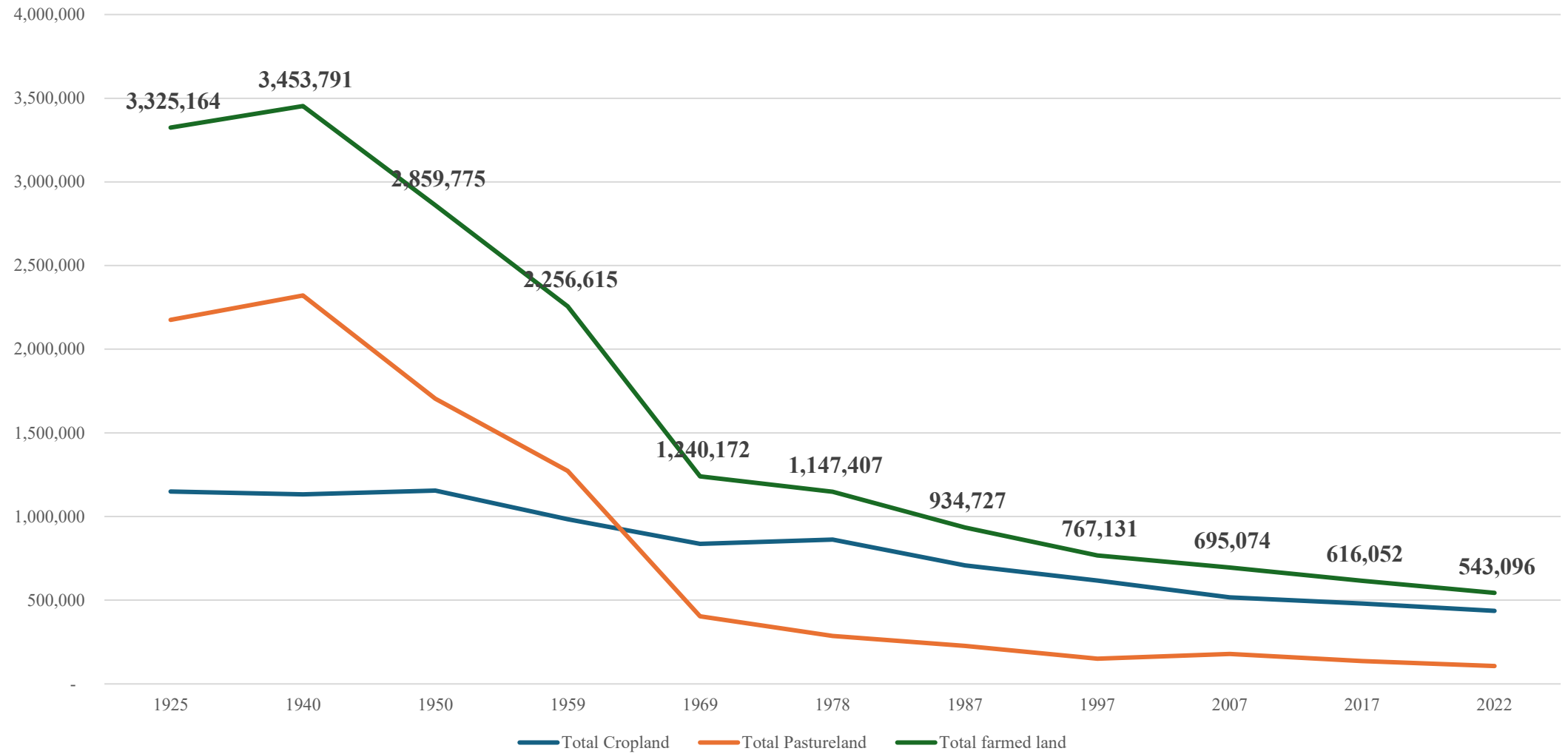
TABLE I

TRENDS IN VERMONT FARMING

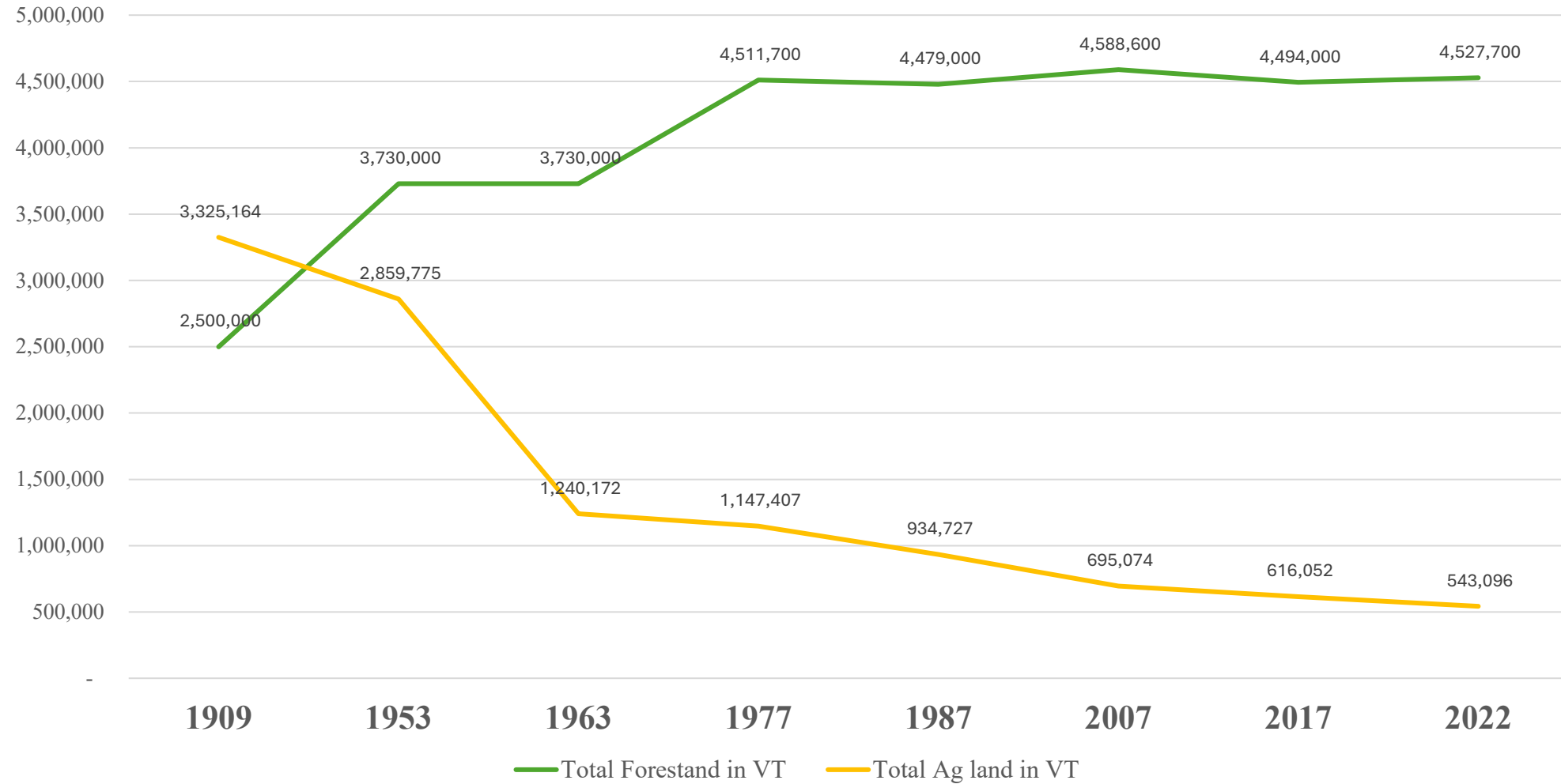
YEAR	NUMBER	AVERAGE SIZE OF FARMS PER ACRE	PROPORTION OF LAND IN FARMS
1850	29,763	139	71%
1860	31,556	136	73%
1870	33,827	134	78%
1880	35,522	138	84%
1890	32,573	135	75%
1900	33,104	143	81%
1910	32,709	143	80%
1920	29,075	146	72%
1925	27,786	141	67%
1930	24,898	156	67%
1935	27,061	149	69%
1940	23,582	156	62%
1945	26,490	148	66%
1950	19,043	185	59%
1954	15,981	208	56%
1959	12,099	243	50%
1964	9,247	273	43%

Source: Central Planning Office, Montpelier, Vermont

Agricultural Land Use In Vermont



Forest & Agriculture Land Use - Vermont



Vermont is Getting Warmer and Wetter: Climate Change Study

The Green Mountain State has warmed nearly 2°F, with a 21% jump in precipitation

Key findings



Climate change is here – and impacting communities across Vermont.



Vermont is getting warmer. Winters are warming more quickly. Snow season is getting shorter.



Vermont is getting wetter. Heavy rain events happen more often, contributing more flooding and water quality problems.



Multiple, complex impacts could lead to surprises.

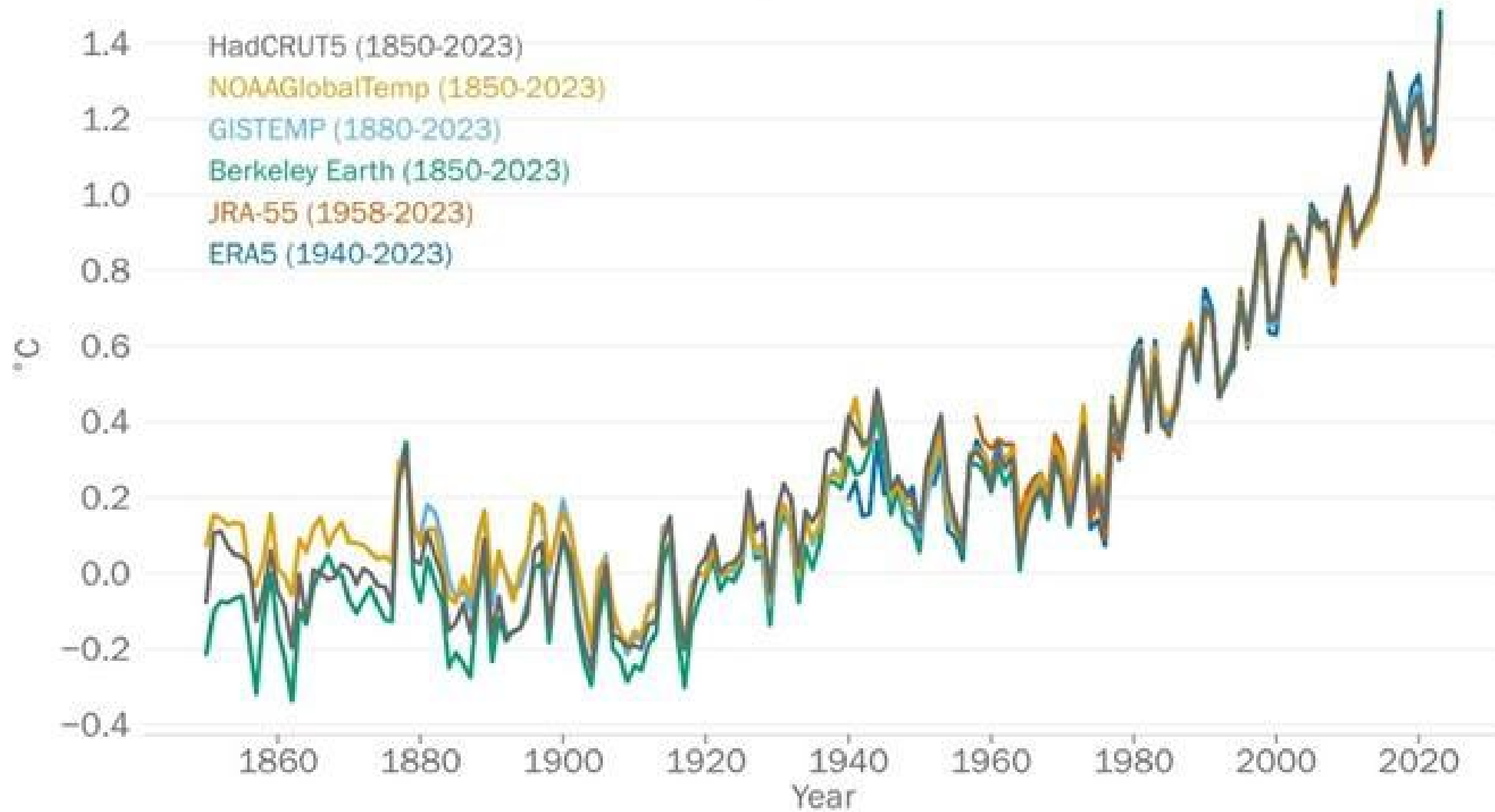


Climate impacts and risks will increase without action.



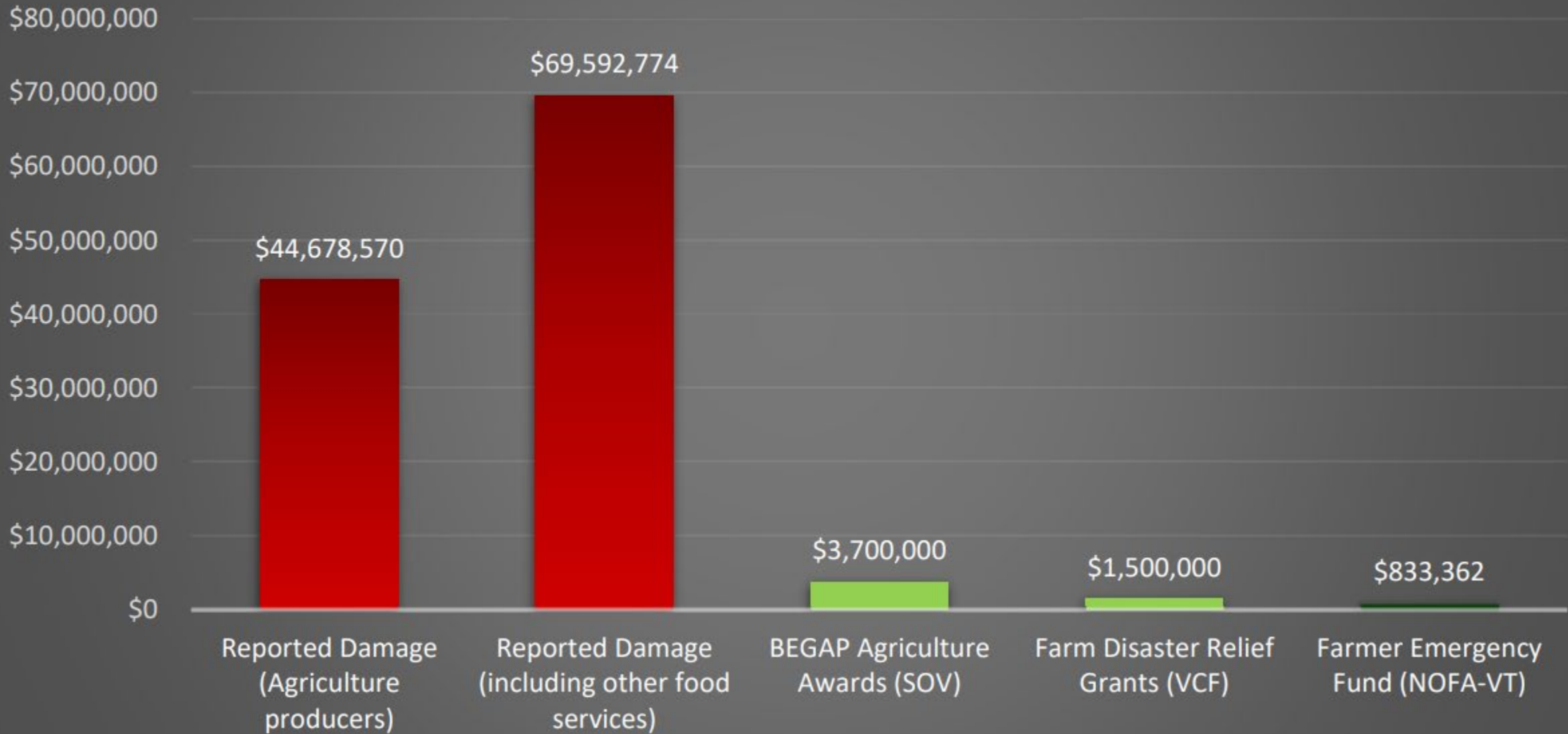
[Dig in to learn more...](#)

Global Mean Temperature Difference (°C) Compared to 1850-1900 average



Created: 2024-02-18 15:42:33

Damage vs. Funding



Source: Vermont Agriculture Recovery Task Force Report, 2024.

<https://agriculture.vermont.gov/sites/agriculture/files/documents/Ag%20Recovery%20Task%20Force%20Report.pdf>

Federal Disaster Declarations: 13 months

Disaster Declarations	117	5/9/2024					
Common Disaster Name	Interval Between Disasters (Days)	Incident Period Start	Incident Period End	Major Disaster Declared	FEMA Disaster Declaration	FEMA Disaster Map	USDA Disaster Declaration for Agriculture?
January Wind Storm (2024)	21	1/9/2024	1/13/2024	4/19/2024	Vermont Severe Winter Storm DR-4770-VT	https://www.fema.gov/disaster/4770/designated-areas	Need USDA FSA reporting on ECP / EFRP
December Flooding	135	12/18/2023	12/19/2023	3/2/2024	Vermont Severe Storms and Flooding (DR-4762-VT)	https://www.fema.gov/disaster/4762/designated-areas	Need USDA FSA reporting on ECP
Addison Microburst / Flooding	13	8/3/2023	8/5/2023	10/6/2023	Vermont Severe Storms and Flooding DR-4744-VT	https://www.fema.gov/disaster/4744/designated-areas	Need USDA FSA reporting on ECP / EFRP
July Flooding Disaster Declaration	50	7/7/2023	7/21/2023	7/14/2023	Vermont Severe Storms, Flooding, Landslides, and Mudslides DR-4720-VT	https://www.fema.gov/disaster/4720/designated-areas	Yes
<u>July Flooding Emergency Declaration</u>	-	<u>7/9/2023</u>	<u>7/17/2023</u>	<u>7/10/2023</u>	Vermont Flooding EM-3595-VT	https://www.fema.gov/disaster/3595/designated-areas	-
May Freeze	52	5/17/2023	5/18/2023	Not DR	Not DR	Not DR	Yes
December Wind Storm (2022)	-	12/22/2022	12/24/2022	3/20/2023	Vermont Severe Storm and Flooding DR-4695-VT	https://www.fema.gov/disaster/4695/designated-areas	Need USDA FSA reporting on ECP / EFRP

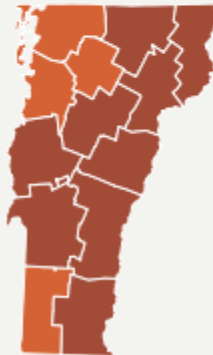
» Projected Climate Risks

HIGH
 MEDIUM
 LOW
 NO RISK

EXTREME RAIN



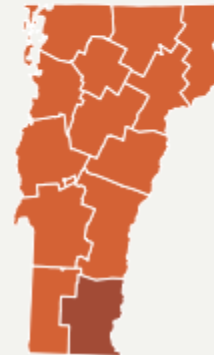
Annual precipitation and extreme precipitation events in Vermont have been above average in recent years.



HURRICANES



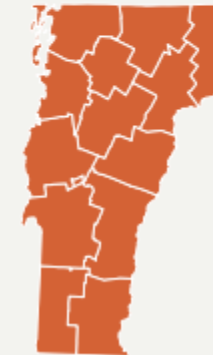
Hurricanes Irene (2011), Floyd (1999), and Gloria (1985), were all billion-dollar disasters that impacted Vermont.



WATER STRESS



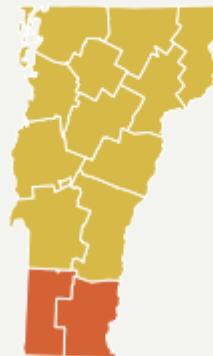
Vermont has experienced more abnormally dry days during the past 10 years than it did in the early 2000s.



WILDFIRE



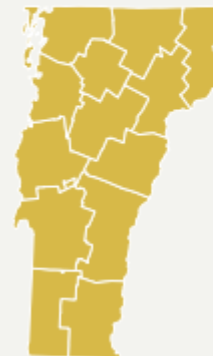
Large wildfires are not very common in Vermont, but 200-400 small fires (1.5-2 acres) occur per year.



HEAT STRESS



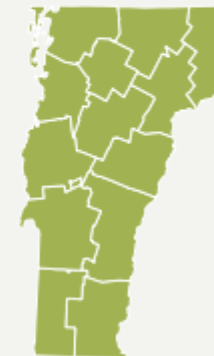
Temperatures have risen about 3.0°F since the beginning of the 20th century, resulting in warmer nights, shorter freeze-free seasons, and longer growing seasons.



SEA LEVEL RISE

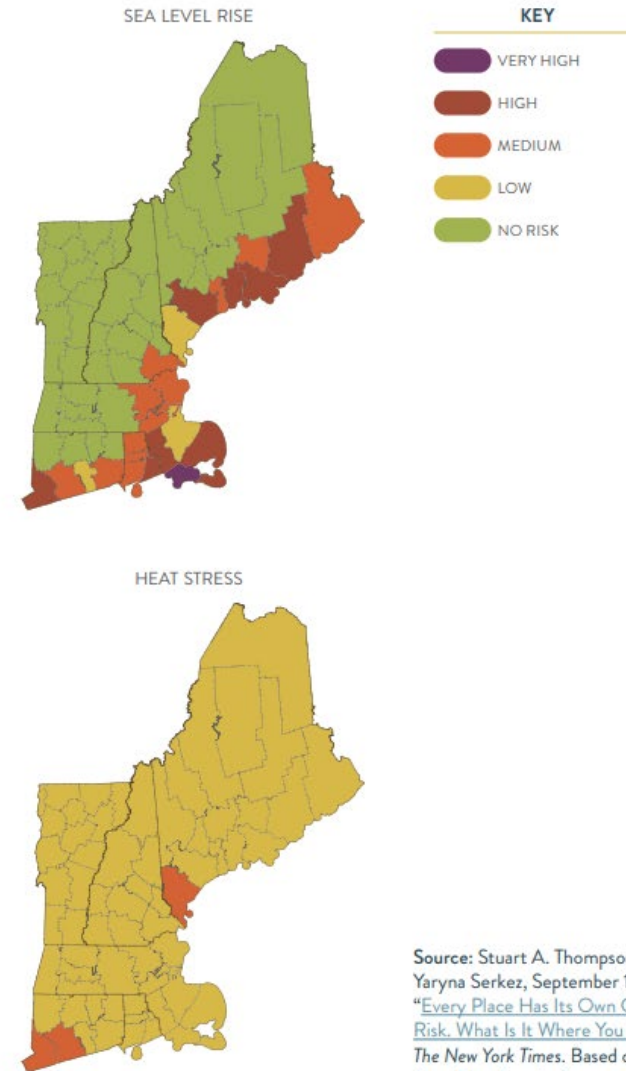
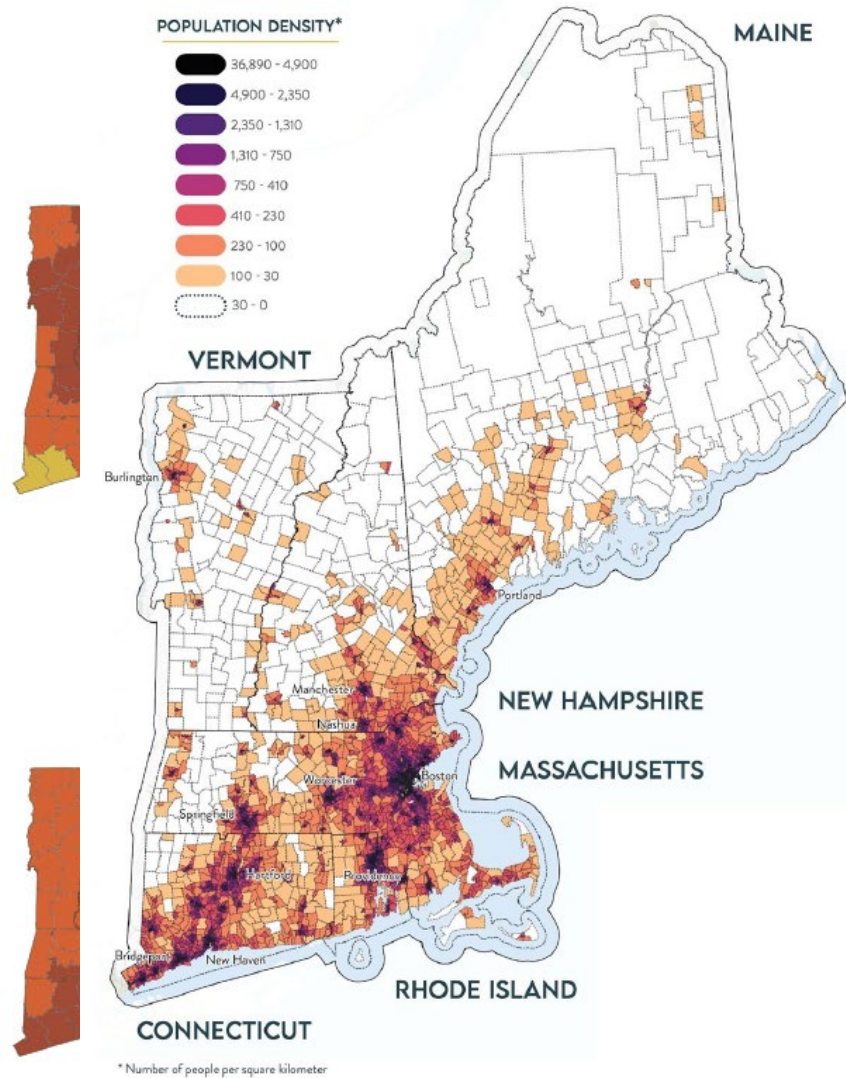


With no ocean coastline, Vermont is spared the direct impacts of sea level rise.



FIGURE

FIGURE 3: New England Population Density by Town/City



Source: Stuart A. Thompson and Yaryna Serkez, September 18, 2020, "Every Place Has Its Own Climate Risk. What Is It Where You Live?," *The New York Times*. Based on data from Four Twenty Seven.

» Projected Changes in Land in Agriculture, Business as Usual Scenario

TOTAL
1,193,437 ACRES EXISTING ACREAGE
-41,200 ACRES BUSINESS AS USUAL SCENARIO

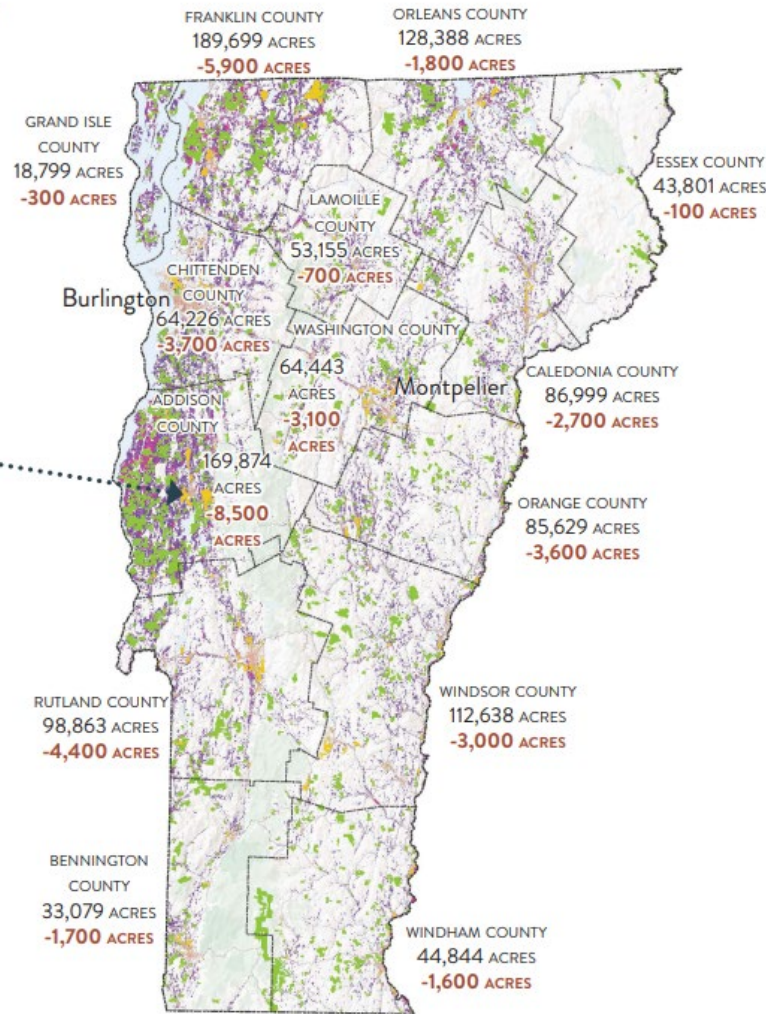
- LAND USES**
- CULTIVATED CROPS
 - PASTURE/HAY
 - EASEMENT
 - DEVELOPED LAND
 - PROJECTED URBAN AND HIGHLY DEVELOPED AND LOW-DENSITY RESIDENTIAL

An analysis from the American Farmland Trust (AFT) estimates that Vermont could lose an additional **41,200 acres** by 2040 under a “Business as Usual” development scenario and **61,800 acres** under a “Runaway Sprawl” scenario.

AFT projects that **Addison, Franklin, and Rutland** counties will experience the biggest decreases in land in agriculture.

Source: American Farmland Trust, [Farms Under Threat 2040: Choosing an Abundant Future](#)

20.5% Vermont has the highest percentage of agricultural land as a percentage of total land area, 20.5%, of any state in New England, but only a small percentage of agricultural land is used for crops to directly feed people.



On recent trends, from 2016 to 2040:

Vermonters will pave over, fragment, or compromise

41,200 acres of farmland.

That's the equivalent of losing

200 farms,
\$24 million
 in farm output, and
700 jobs

based on county averages.¹

60% of the conversion will occur on Vermont's best land.²

Hardest-hit counties:

- ▶ **Addison**
- ▶ **Franklin**
- ▶ **Rutland**

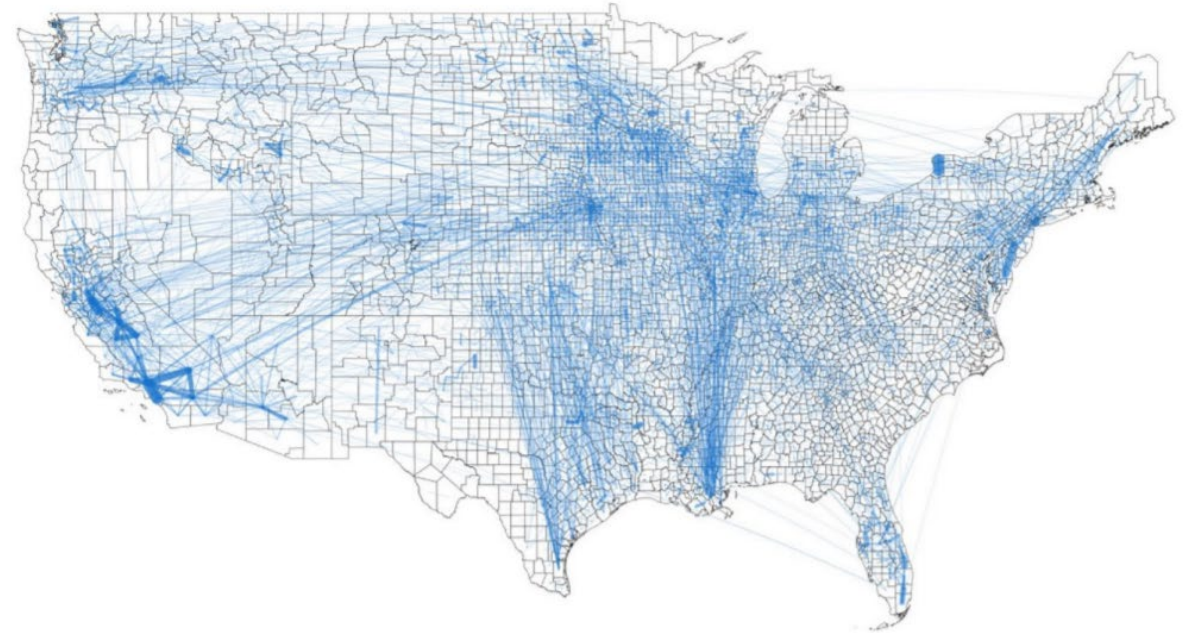
¹ Census of Agriculture 2017
² Freedgood et al. 2020

What to call climate change where you live

Intensity shows risk level from low (lighter) to very high (darker)



Food Flows: Downscaled to All Counties



Source: Ellen Kahler, VSJF Presentation to House Agriculture:

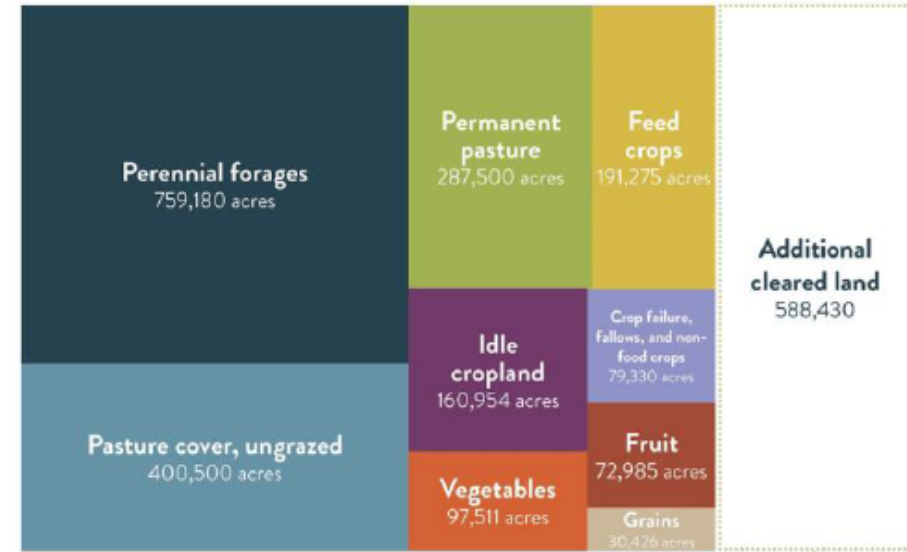
<https://legislature.vermont.gov/Documents/2022/WorkGroups/House%20Agriculture/Food%20Security/W~Ellen%20Kahler~New%20England%20Feeding%20New%20England-%20Cultivating%20a%20Reliable%20Food%20Supply~1-26-2021.pdf>

To achieve 30% regional production available for consumption (in servings), **400,000** in existing underutilized cropland and **590,000** in new cropland would need to be brought into production.

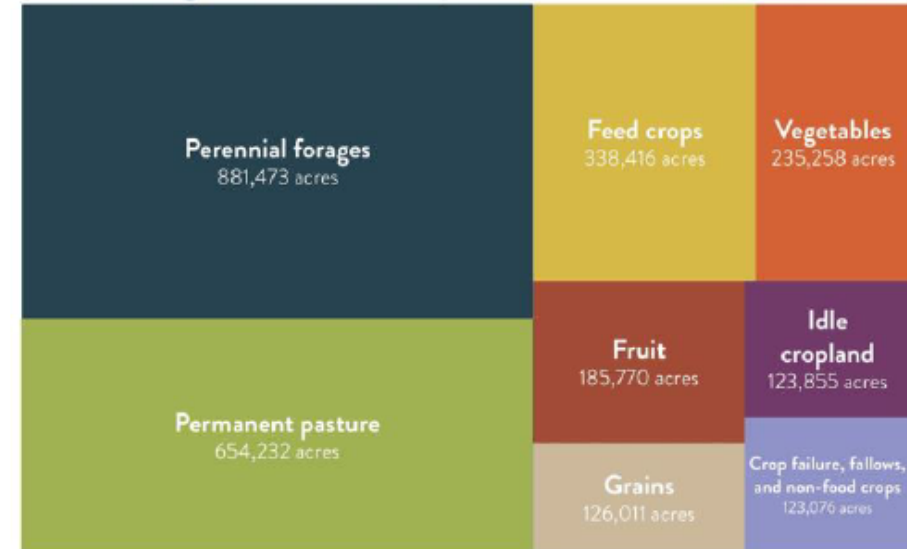
2022 USDA Ag Census Vermont: 543,096 acres of land used for farming



Land in Agriculture (2017): 2,079,661 acres



Estimated Agricultural Land Required for 30% RSR: 2,668,092 acres

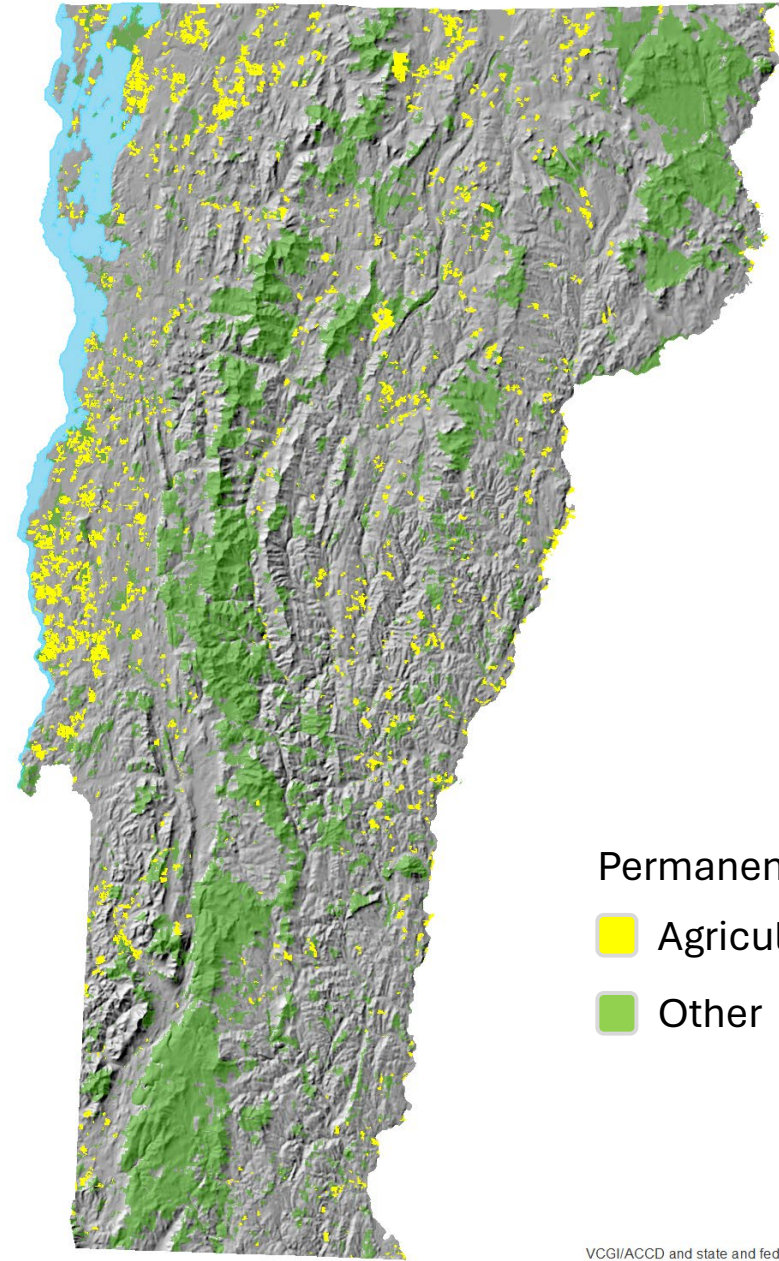




Summary

- **226,623 acres** of Agricultural Easements in Vermont
- “Permanently Secured for Agriculture” (yellow)

Methods

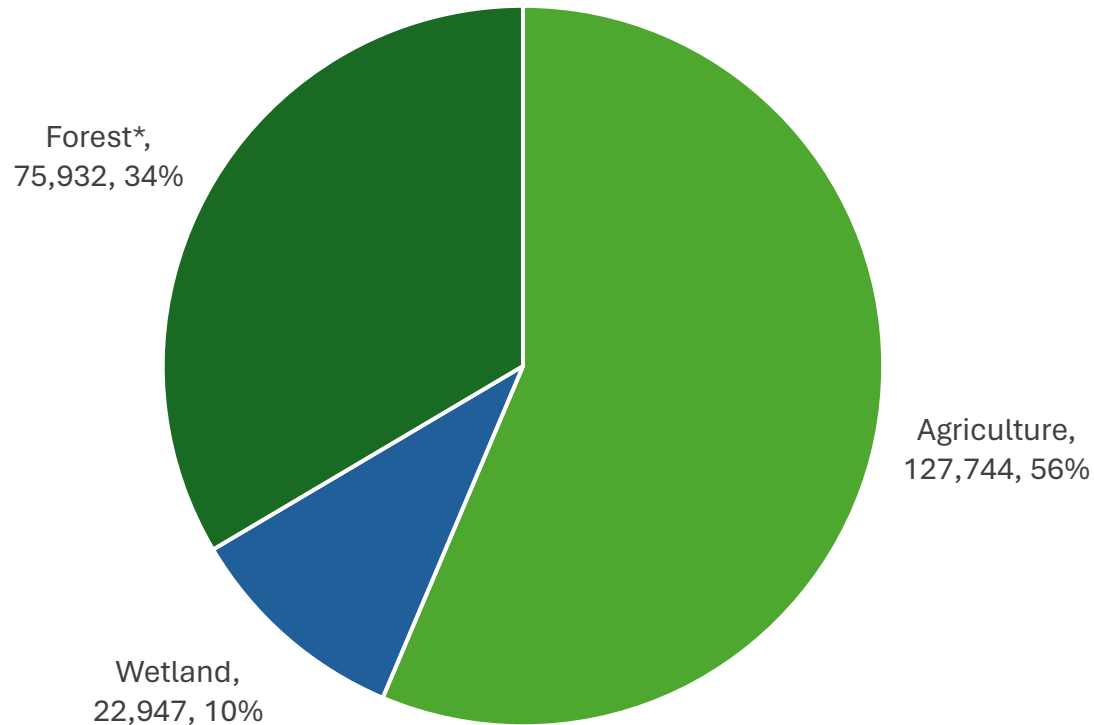
- Agricultural Easements “contain”
= area within (acres)
- Geospatial overlay



Permanently Secured for
 Agriculture
 Other

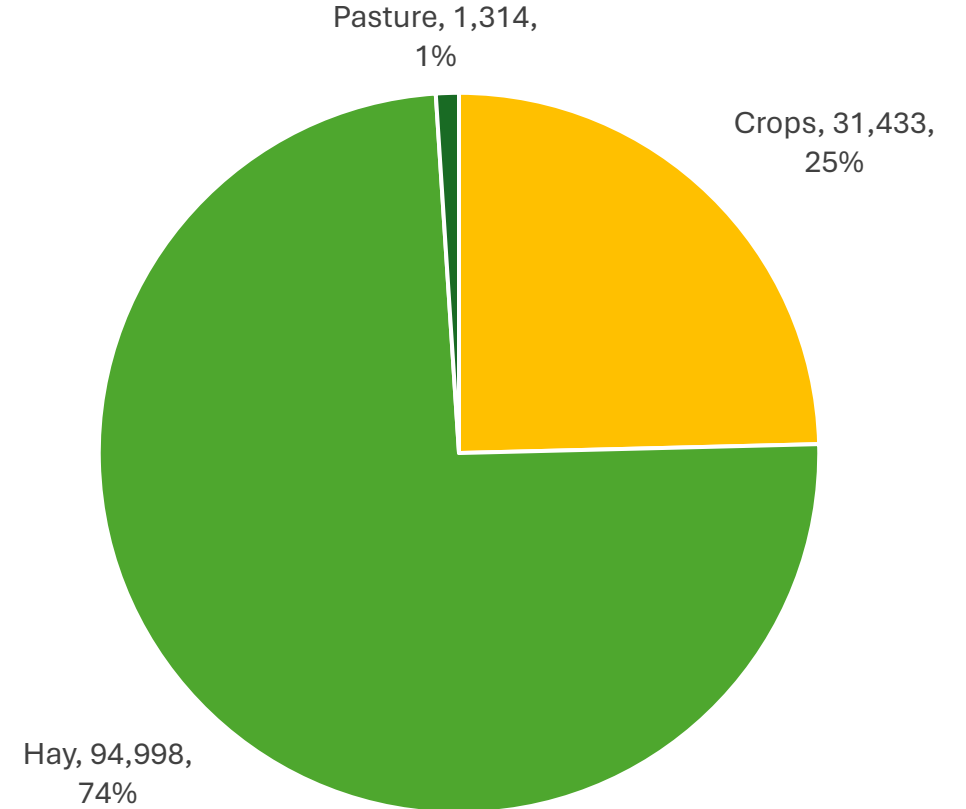
Agricultural Easements Contain

Agricultural Easement Landcover



*Forest not geospatially determined, difference from agricultural and wetland landcovers

Agricultural Easement Crop Type

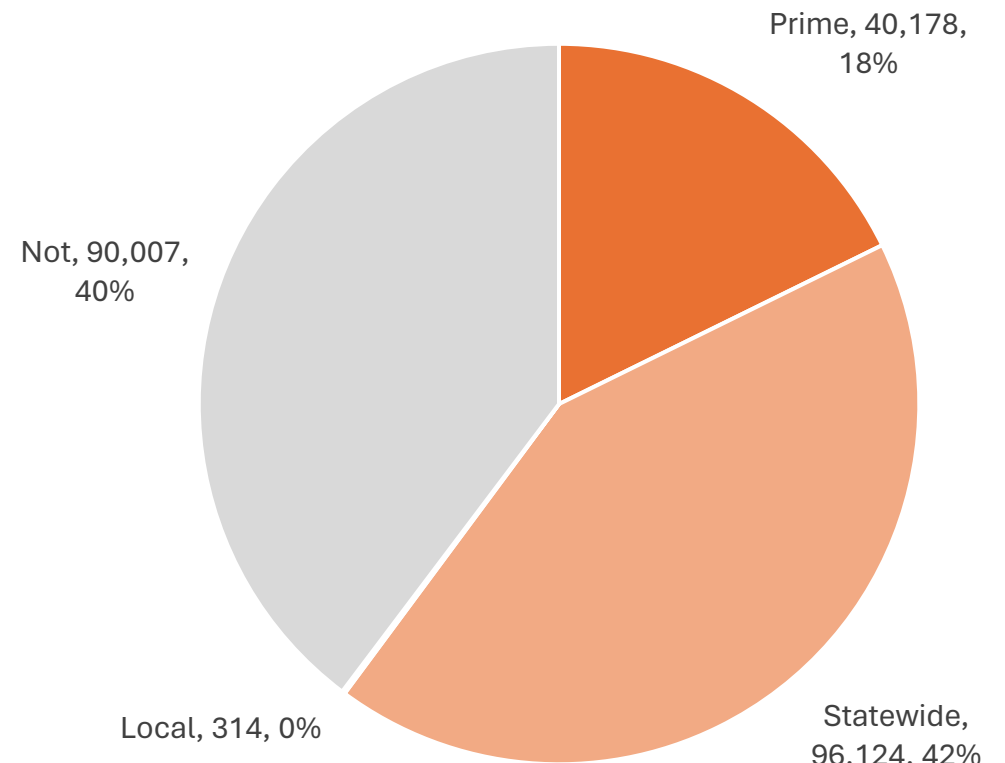


*Agricultural landcover/crop type from 2016 (UVM Spatial Lab)

Prime Soils

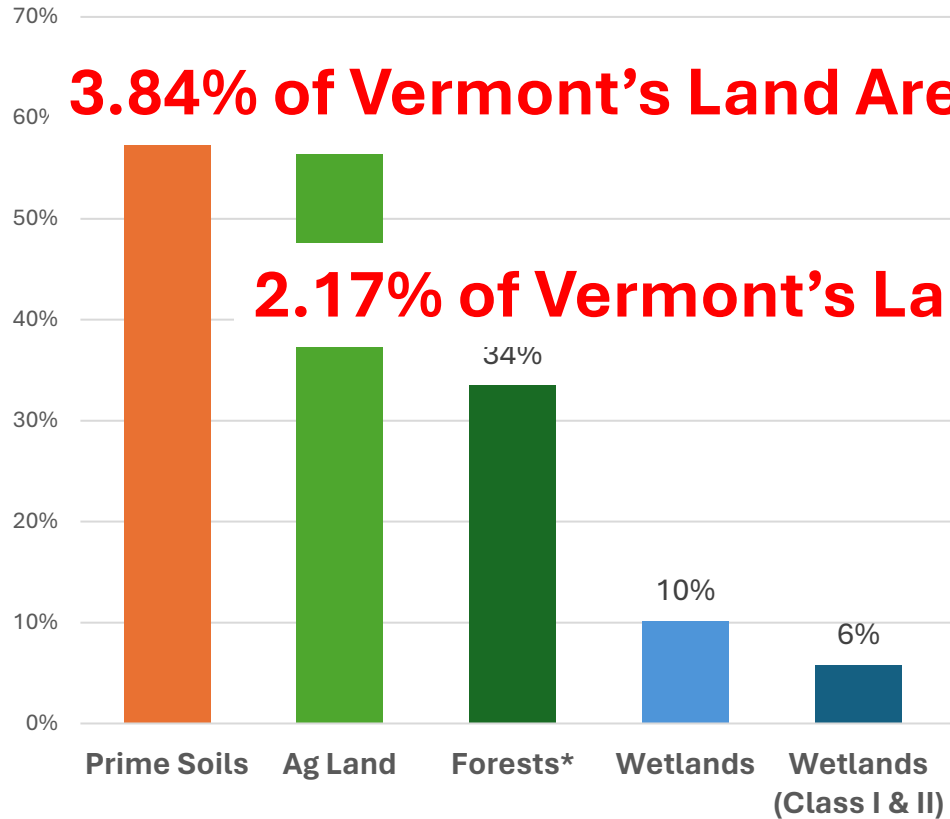
- “best combination of physical and chemical characteristics for producing food, feed, forage”
- “soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed according to acceptable farming methods”
 - Prime
 - Statewide
 - Local
- **60% of Agricultural Easements are on Prime Soils**

Agricultural Easement Prime Soils

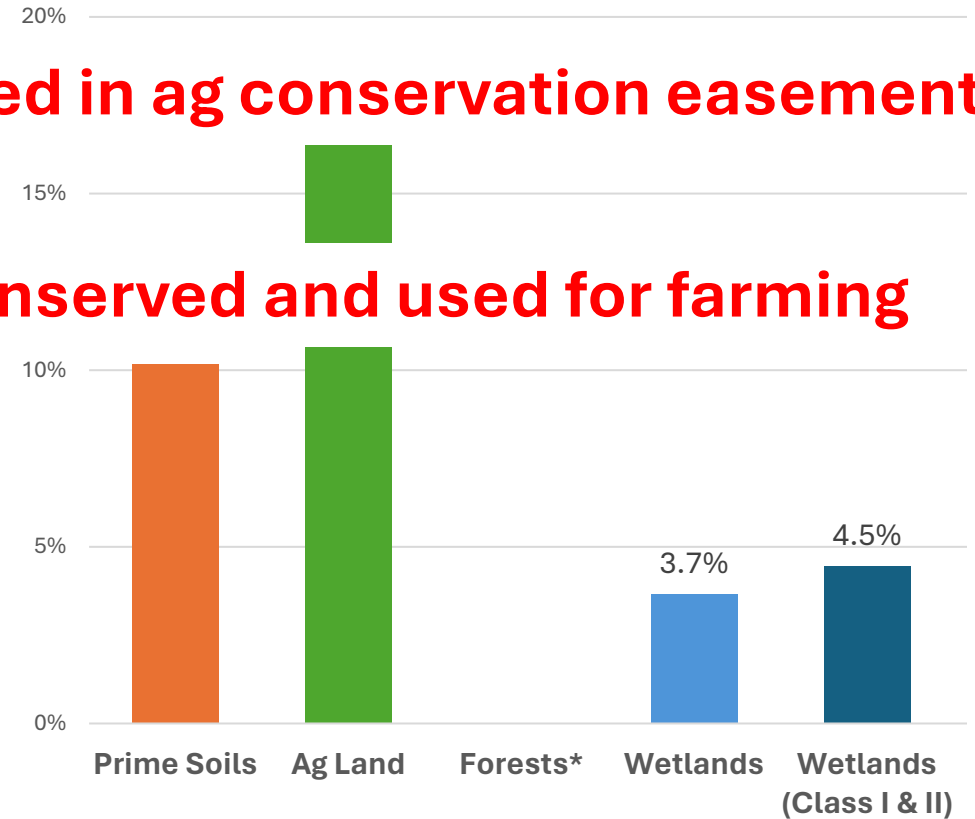


Agricultural Easements

Agricultural Easements Contain



Statewide Land in Agricultural Easements



*Agricultural Land is **56%** of Agricultural Easements in Vermont

*Agricultural Easements are **18%** of Agricultural Land in Vermont

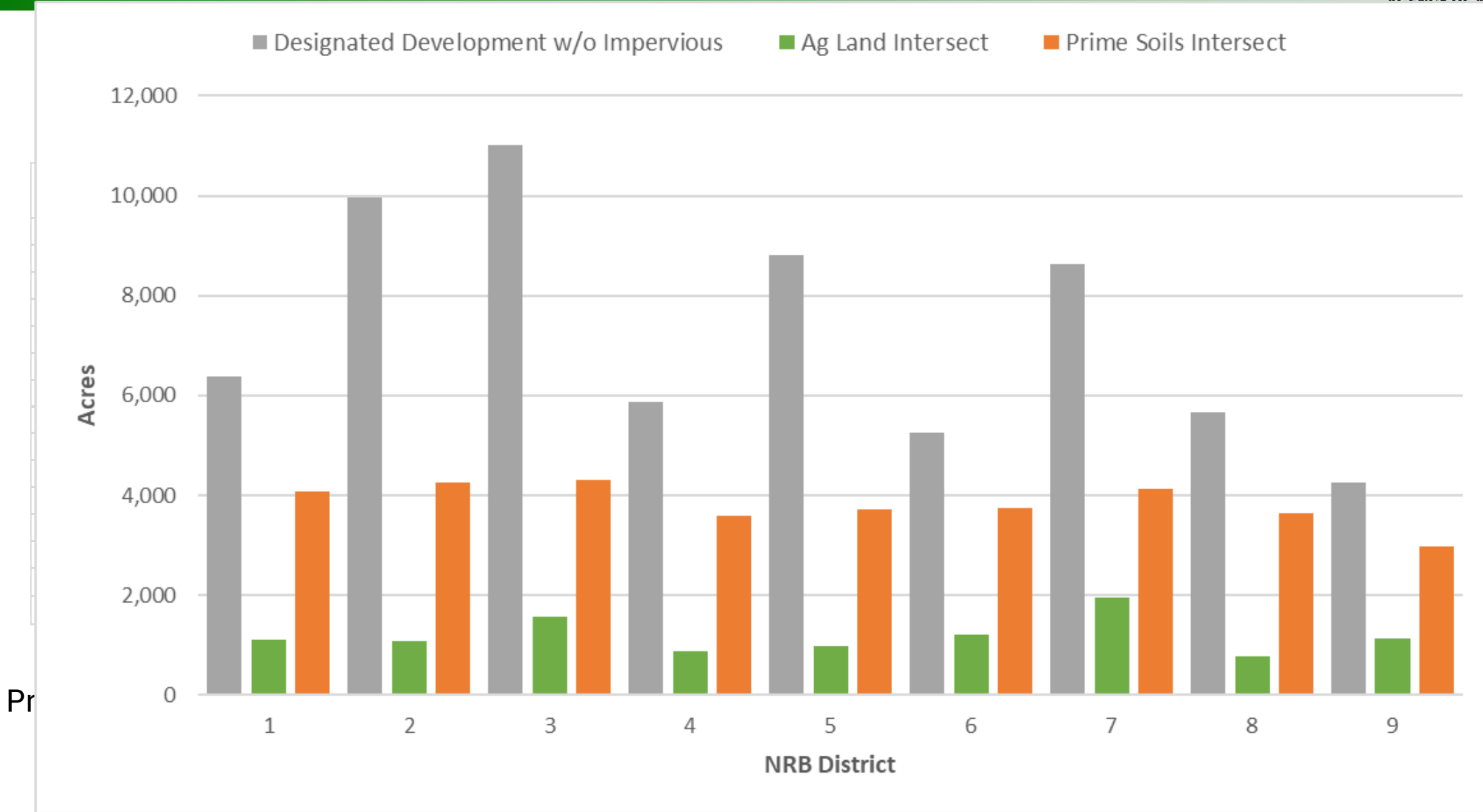
GIS Layers

- Agricultural Easements
 - TNC's Protected Lands Layer: NE_Secured_Areas_2022_Public
- Vermont Open Geodata Portal (<https://geodata.vermont.gov/>):
 - Vermont Agriculture Land Cover 2016
 - Vermont Wetlands Land Cover 2016
 - VSWI Wetlands Class Layer
 - Agricultural Important Soil Units

Judson Peck (judson.peck@vermont.gov)

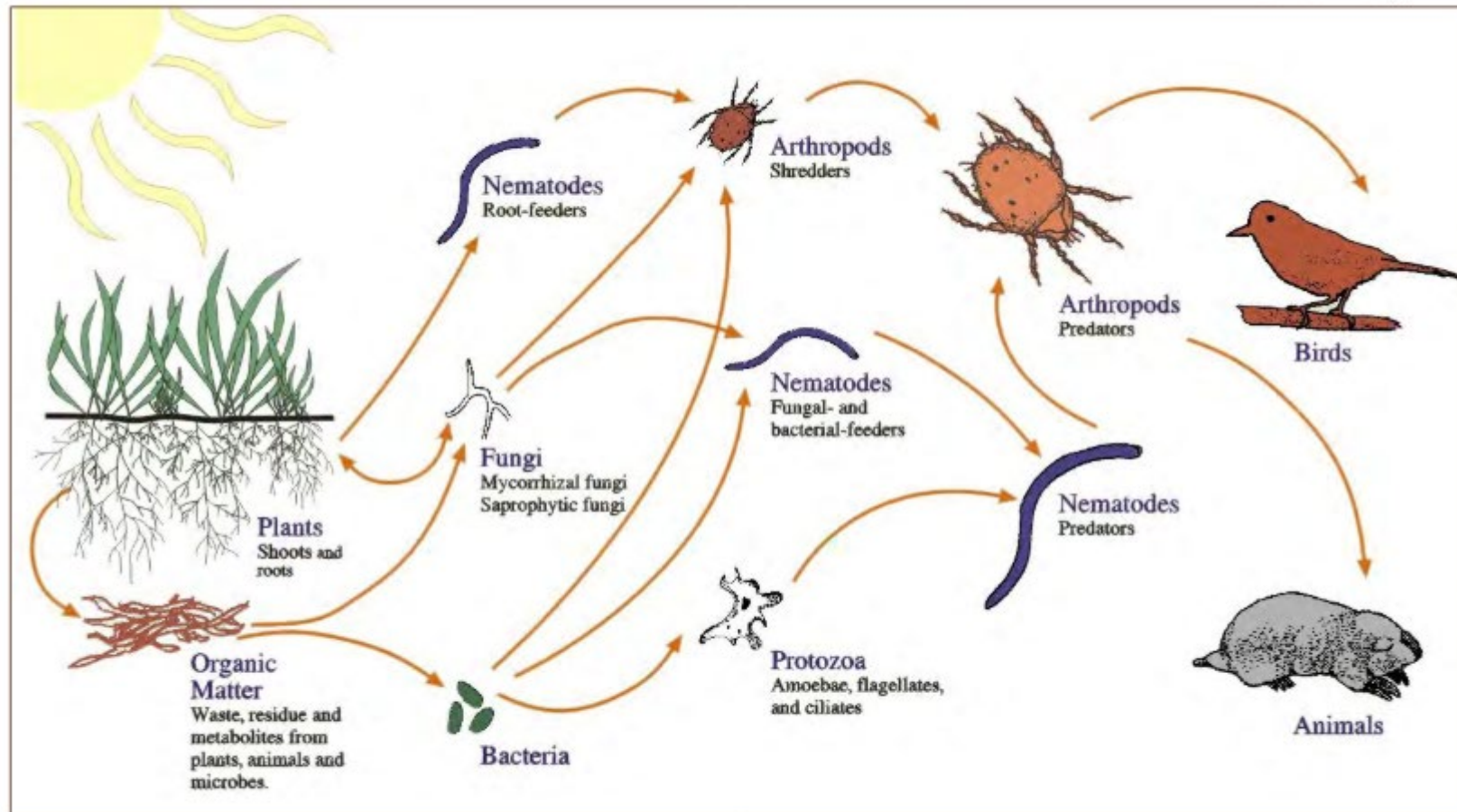
Agriculture Data Analyst | Water Quality Division

Vermont Agency of Agriculture, Food and Markets



69% of mapped impervious surfaces in Chittenden County (NRB District 4) are built on Prime and Statewide soils

USDA Soil Biology Primer



...y of soil to function
tem that sustains
umans - NRCS

Figure 2. Physical, Chemical, and Biological Soil Health initiative.

Integrating physical, chemical, and biological soil health is important for sustained productivity and environmental quality. - Cornell Soil Health Lab

Even though it may not be obvious at first, soil is full of life. Complex food webs exist in the soil ecosystem that help to cycle nutrients.

USDA-NRCS SOIL HEALTH INFOGRAPHIC SERIES #002



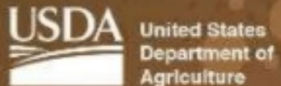
what's underneath

healthy soil has amazing water-retention capacity.



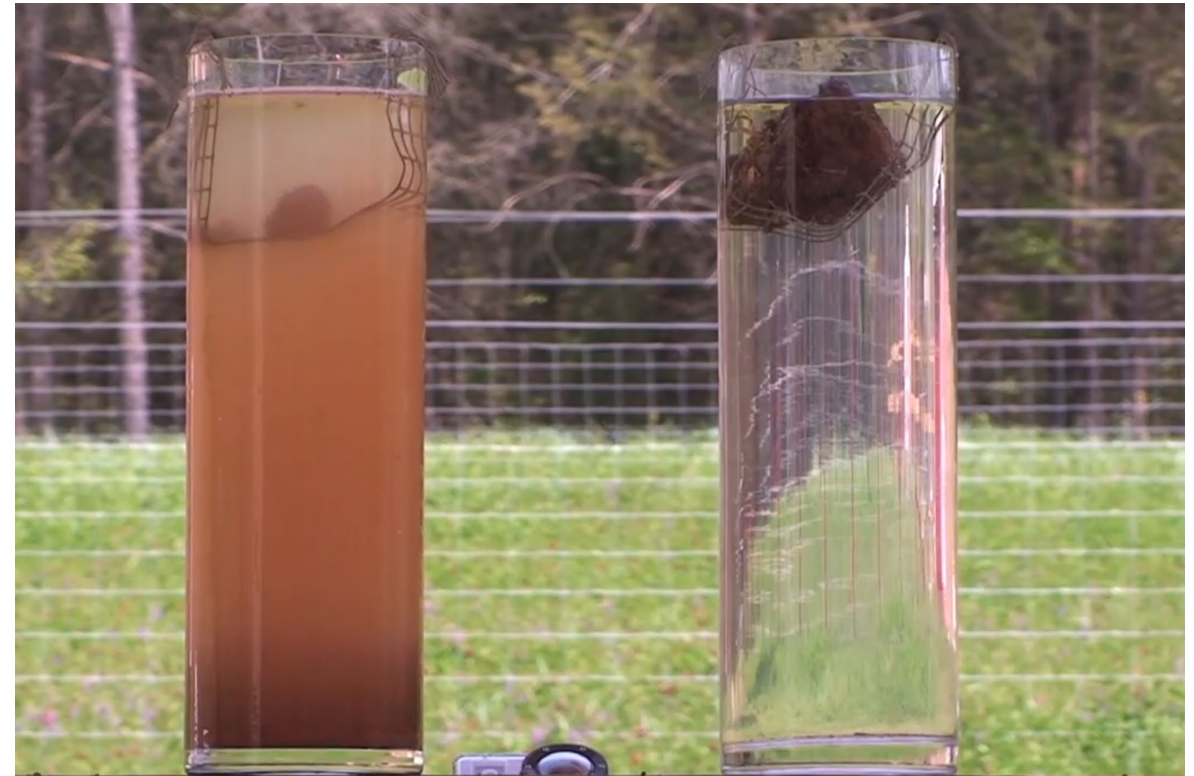
Every **1%** increase in organic matter results in as much as **25,000** gal of available soil water per acre.

Source: Kansas State Extension Agronomy e-Updates, Number 357, July 6, 2012

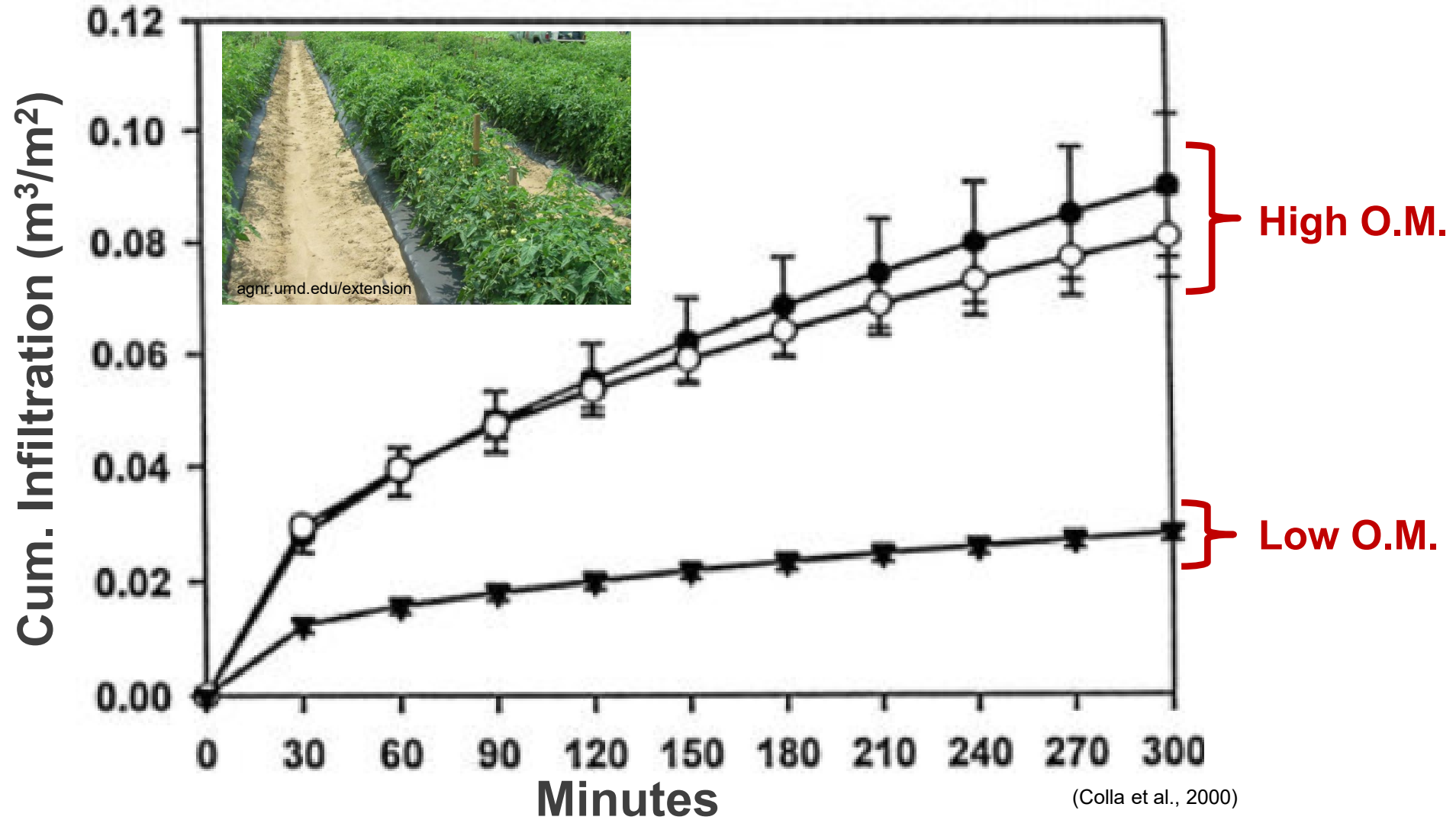


Want more soil secrets?
Check out www.nrcs.usda.gov

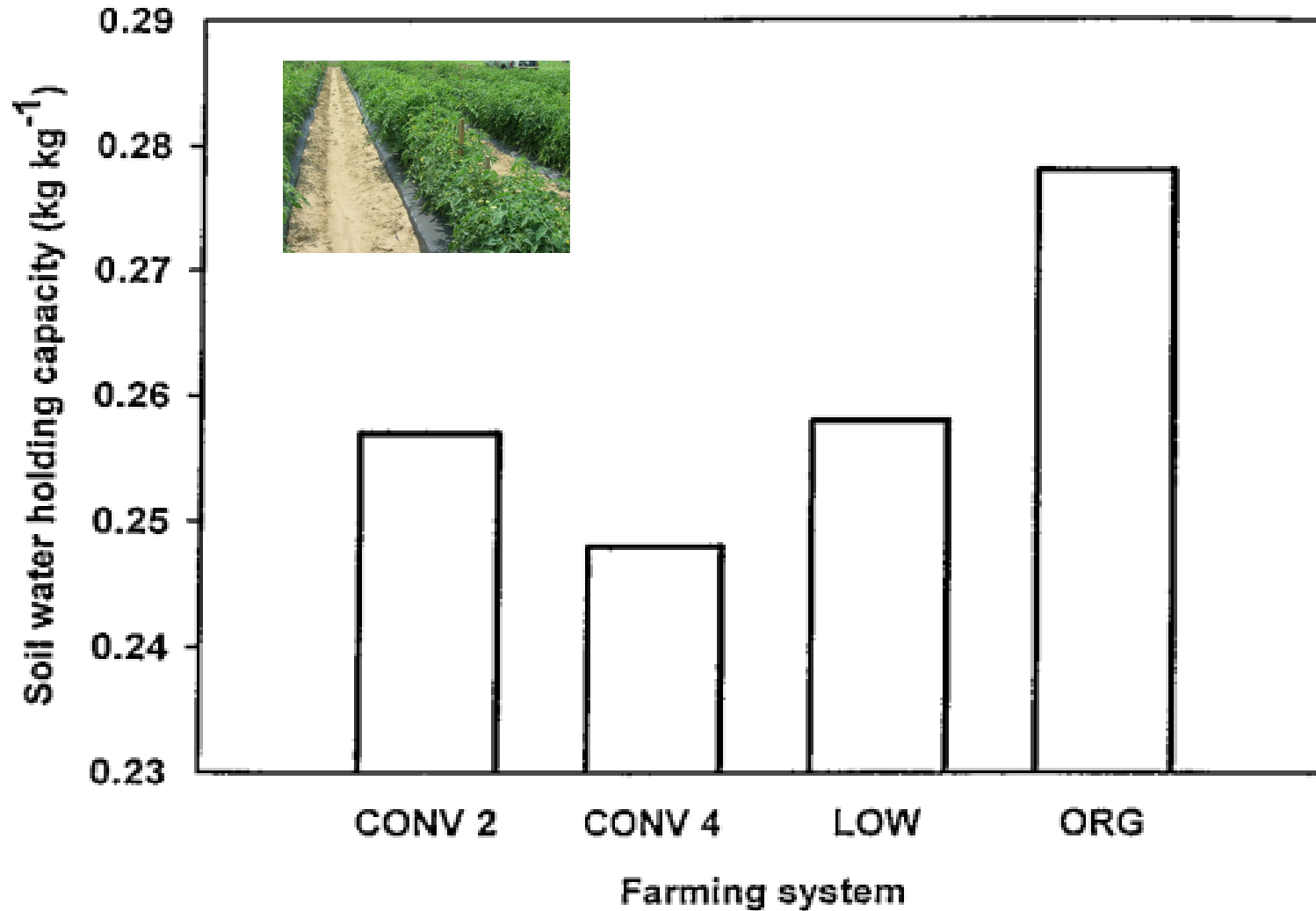
USDA is an equal opportunity provider and employer.



Organic Matter and Infiltration

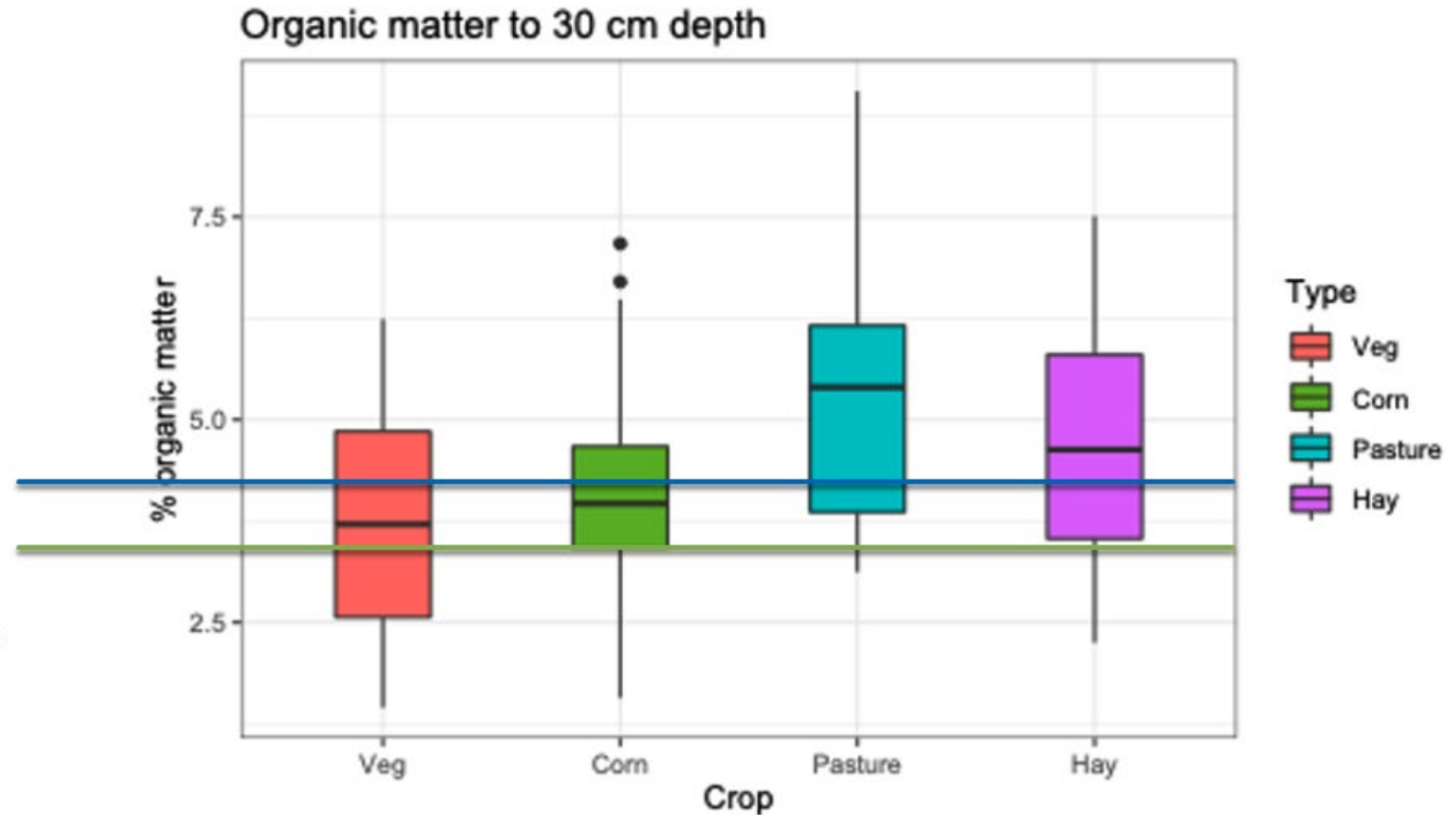


Organic Matter and Drought Resilience



4.3% is the Vermont farm field average (2021)

3.2% is the national average (NRCS RACA)



From 221 farm fields, sampled in 2021 for the State of Soil Health in Vermont project

- **99%** believe improvements in soil health have **benefits for the environment** off their farm.
- **95%** believe they should take additional steps beyond required practices to **protect soil health**.
- **90%** believe they have a responsibility to **be part of climate solutions**
- **94%** believe they have the **knowledge and technical skill to enhance soil health** on their farm, yet only **58%** have the **financial capacity to do so**

Vermont farmers have:

- High level of stewardship ethic & motivation
- High level of knowledge and skill
- Need for financial capacity to adopt

Ultimately the limiting factor is the economic question: *is it worth it for my farm?*

Methods for Growing Crops have different outcomes

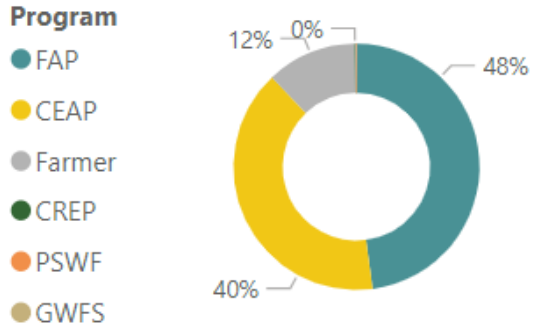


Management:
Full width tillage
No Nutrient Management
No Field specific conservation practices

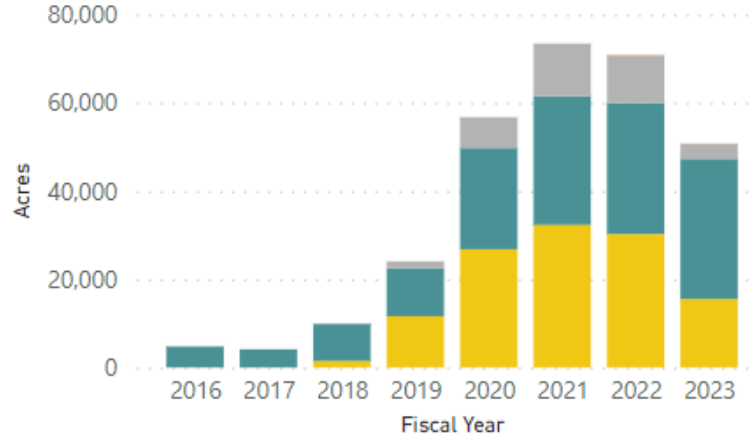


Management:	Avg. P reduction	USDA COMET ERCs:
Cover crop	0.42 kg/ac/yr	0.15 tons CO ₂ e/ac/yr
Reduced and No-Till technology	0.51 kg/ac/yr	0.19 tons CO ₂ e/ac/yr
Nutrient Management	0.06 kg/ac/yr	0.37 tons CO ₂ e/ac/yr
Riparian Buffers	0.47 kg/ac/yr	0.74 tons CO ₂ e/ac/yr
Crop Rotation	0.33 kg/ac/yr	0.22 tons CO ₂ e/ac/yr

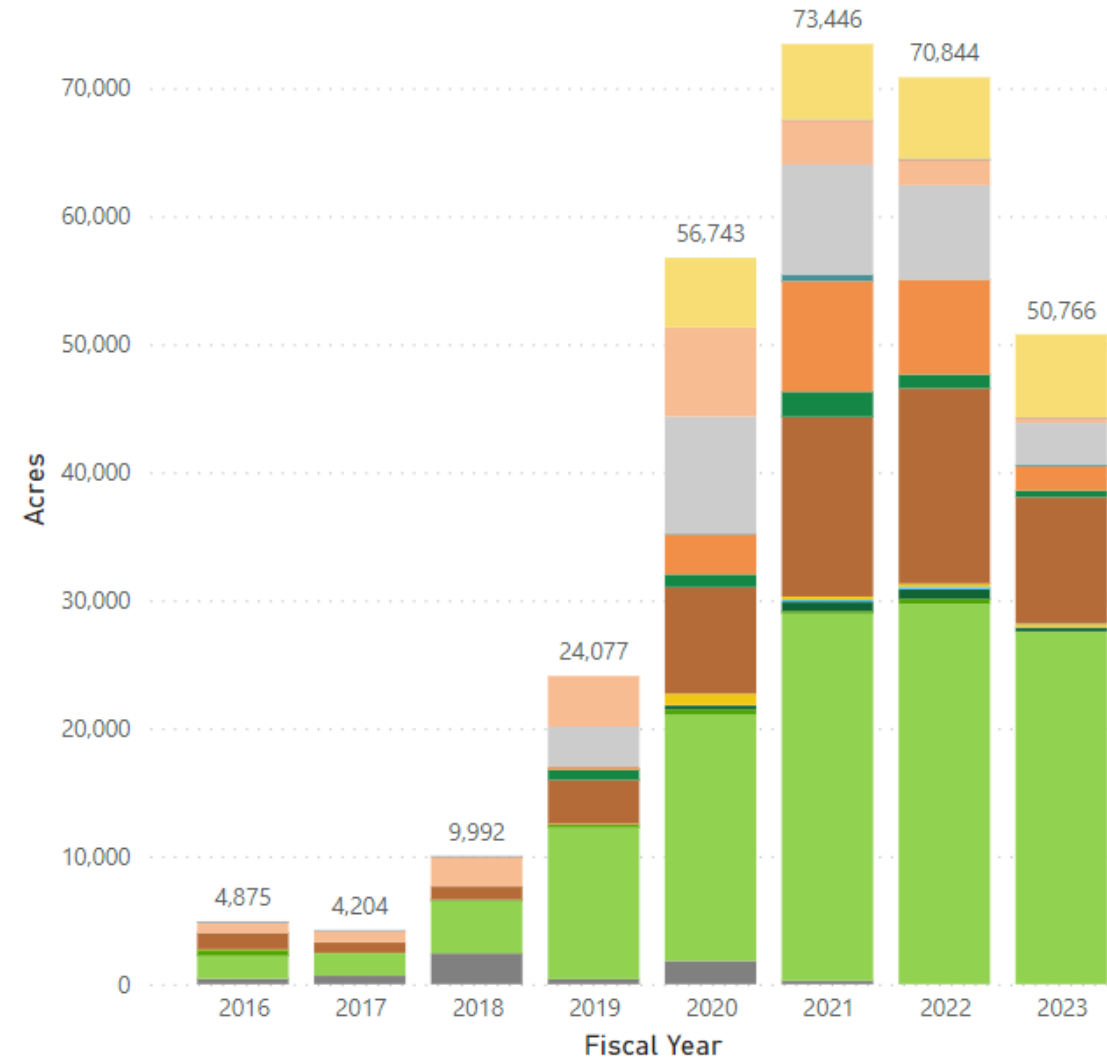
Acres by Program



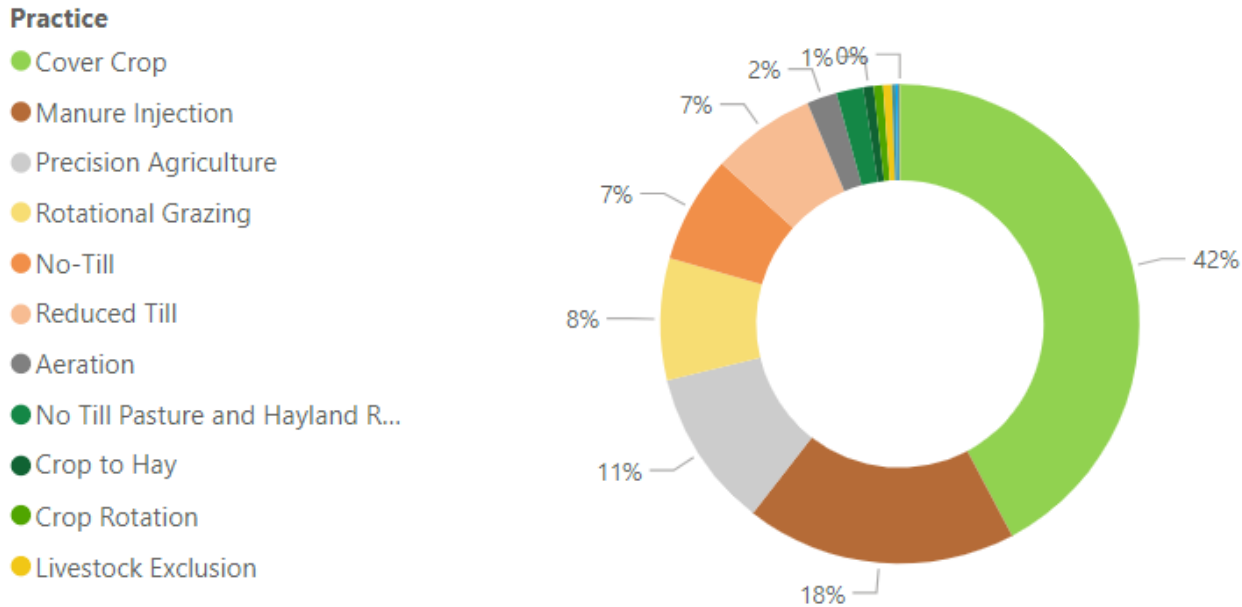
Acres by Fiscal Year and Program



Acres by Fiscal Year and Practice

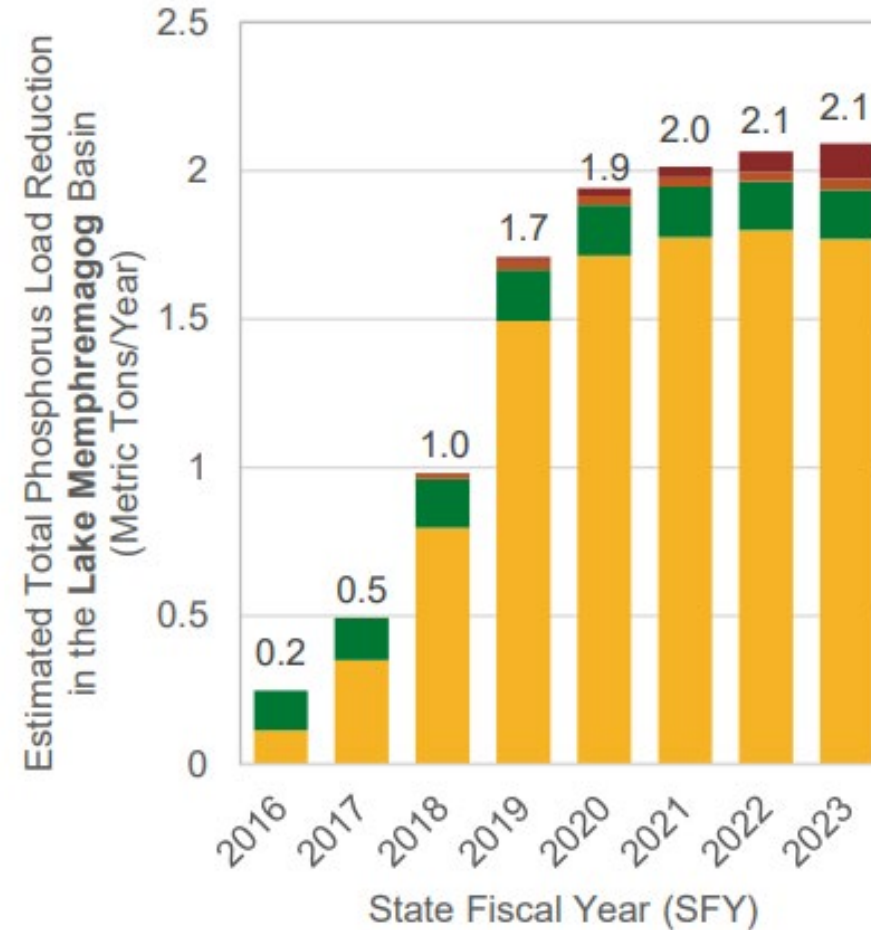
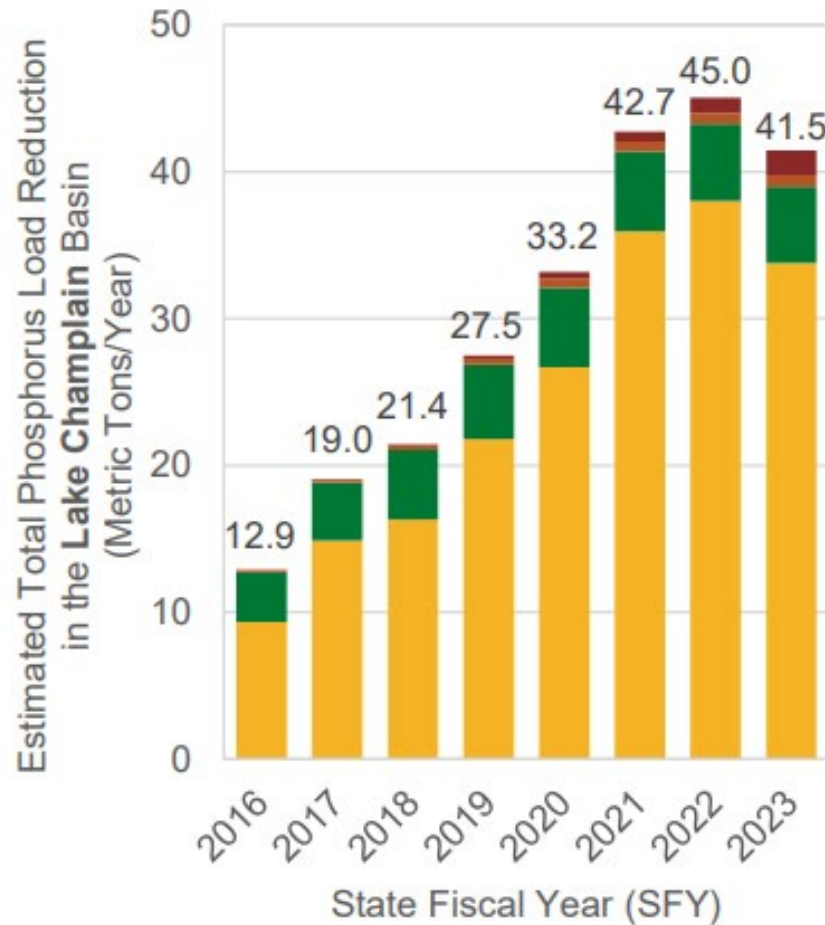


Acres by Practice

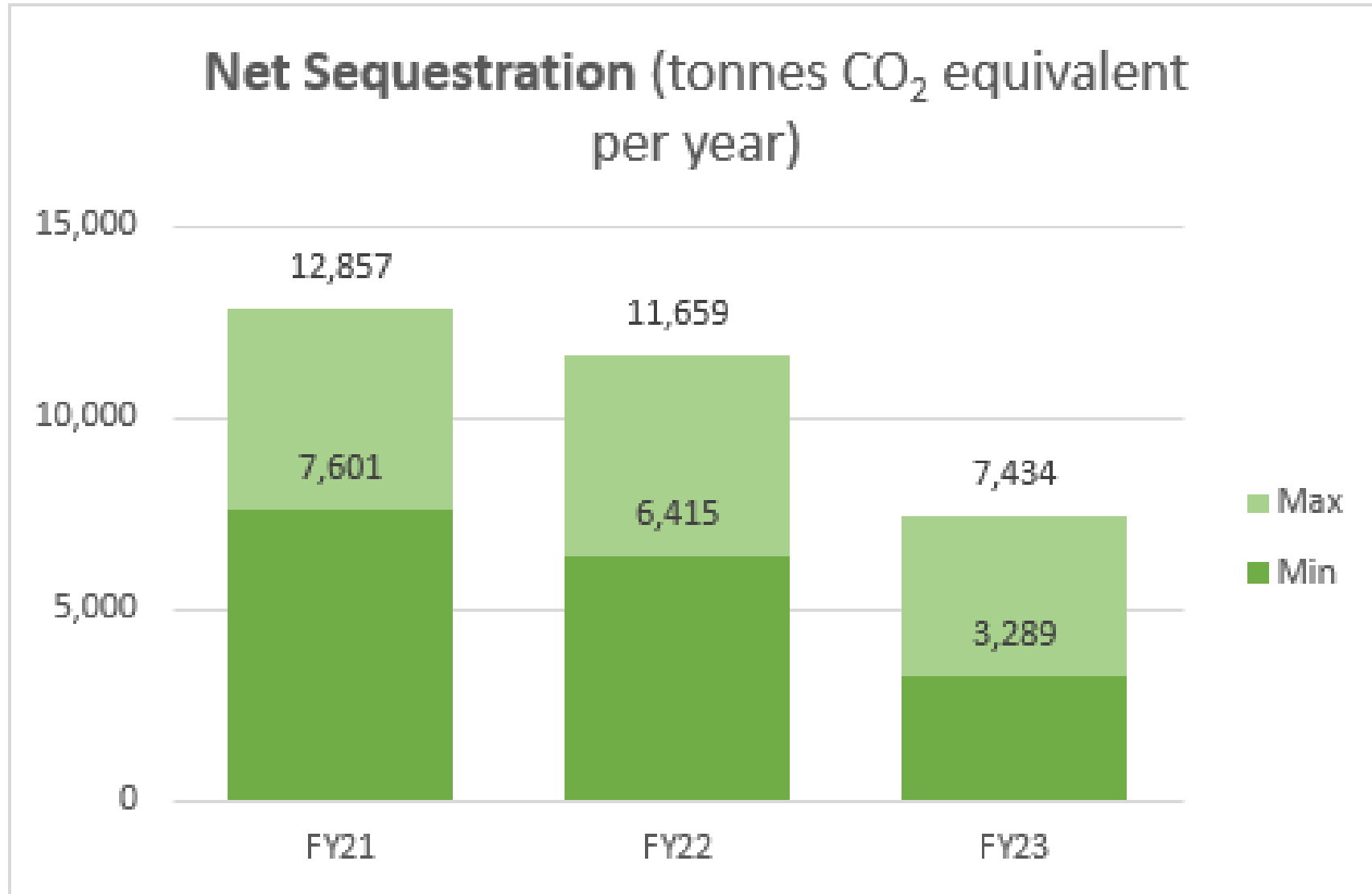


Due to ongoing projects, data reported in the most recent fiscal year is not complete until the following fiscal year, i.e. fiscal year 2023 data is not complete.

VT Agriculture = 85% of P reductions for LCB & Memph.



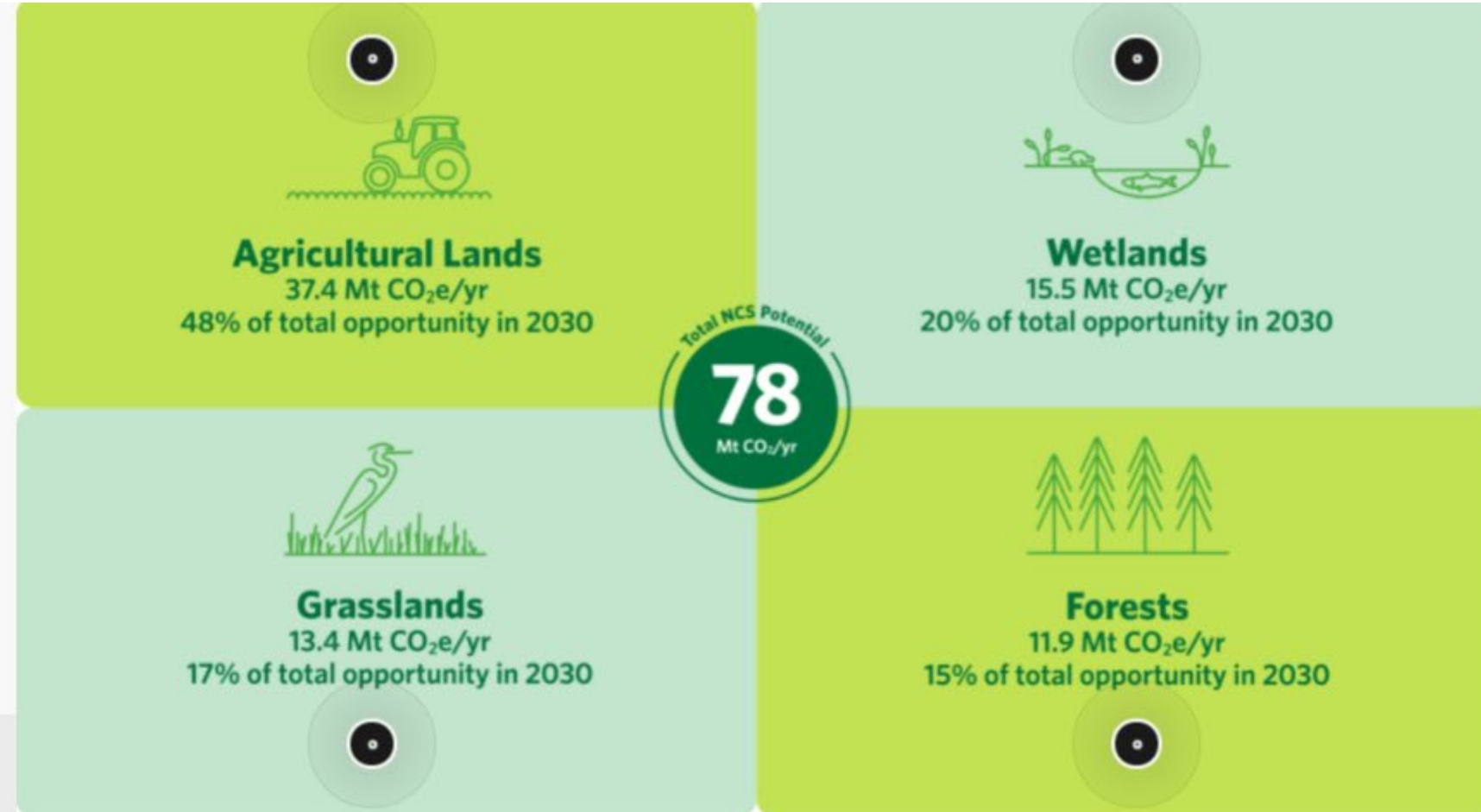
■ Agriculture ■ Natural Resources ■ Stormwater ■ Transportation Related Stormwater



Natural Climate Solutions in Action

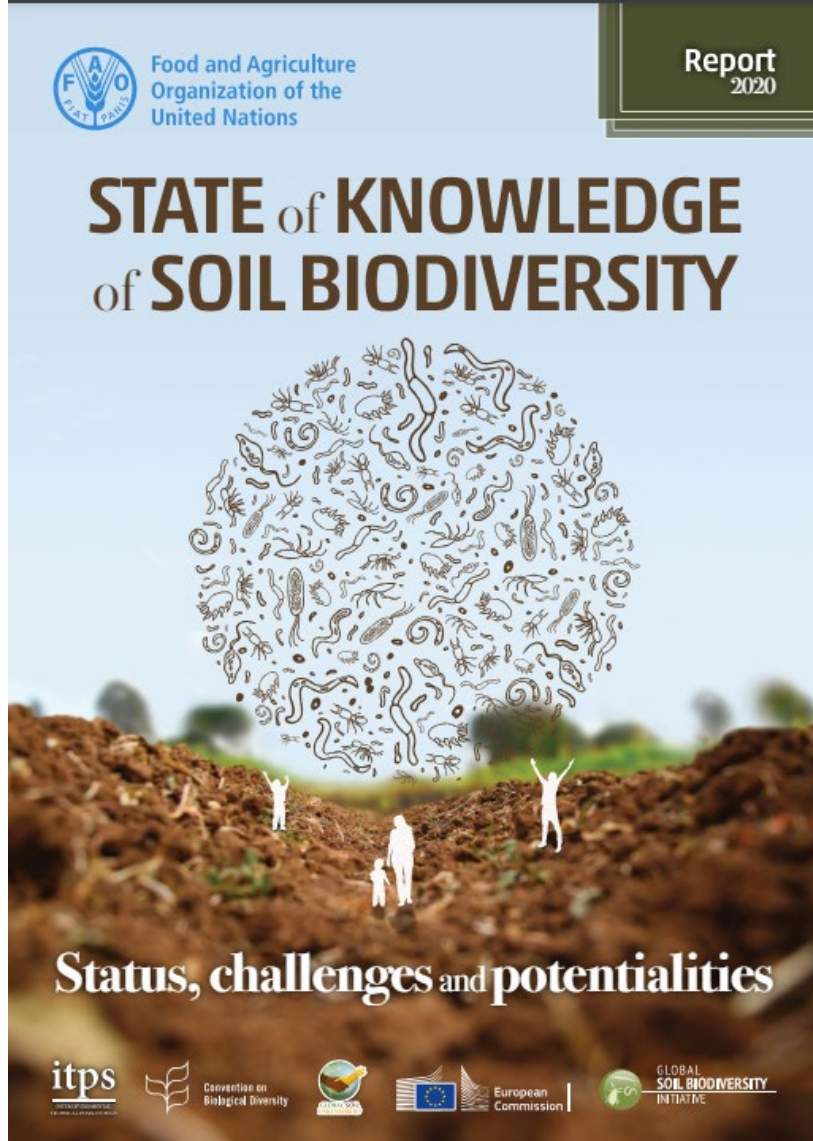
The study examined four ecosystems and 24 pathways that, undertaken in the next decade, have the potential to cut Canada's greenhouse gas emissions by an amount equal to 11% of our current annual emissions.

EXPLORE →



Source: C Ronnie Drever et al., *Natural Climate Solutions for Canada*, 7 *Science Advances* 1 (2021)

Source: <https://www.natureunited.ca/what-we-do/our-priorities/innovating-for-climate-change/natural-climate-solutions/>

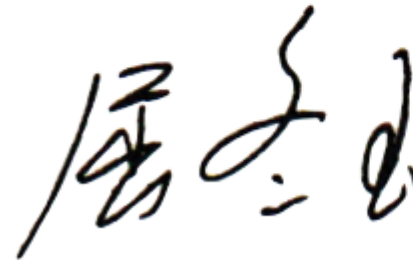


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FAO Director-General

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Executive Secretary of CBD

Elizabeth Maruma Mrema

