Vermont's Water Quality Programming & PES Working Group

Ryan Patch
Water Quality Division Deputy Director
Vermont Agency of Agriculture, Food and Markets
House Committee on Agriculture & Forestry
April 6, 2021

VERMONT
AGENCY OF AGRICULTURE, FOOD & MARKETS
WATER QUALITY DIVISION

Agenda:

- WQ Update
- Soil Health Background
- PES & Soil Health Working Group
- Vermont Pay-For-Performance Program

Vermont Context

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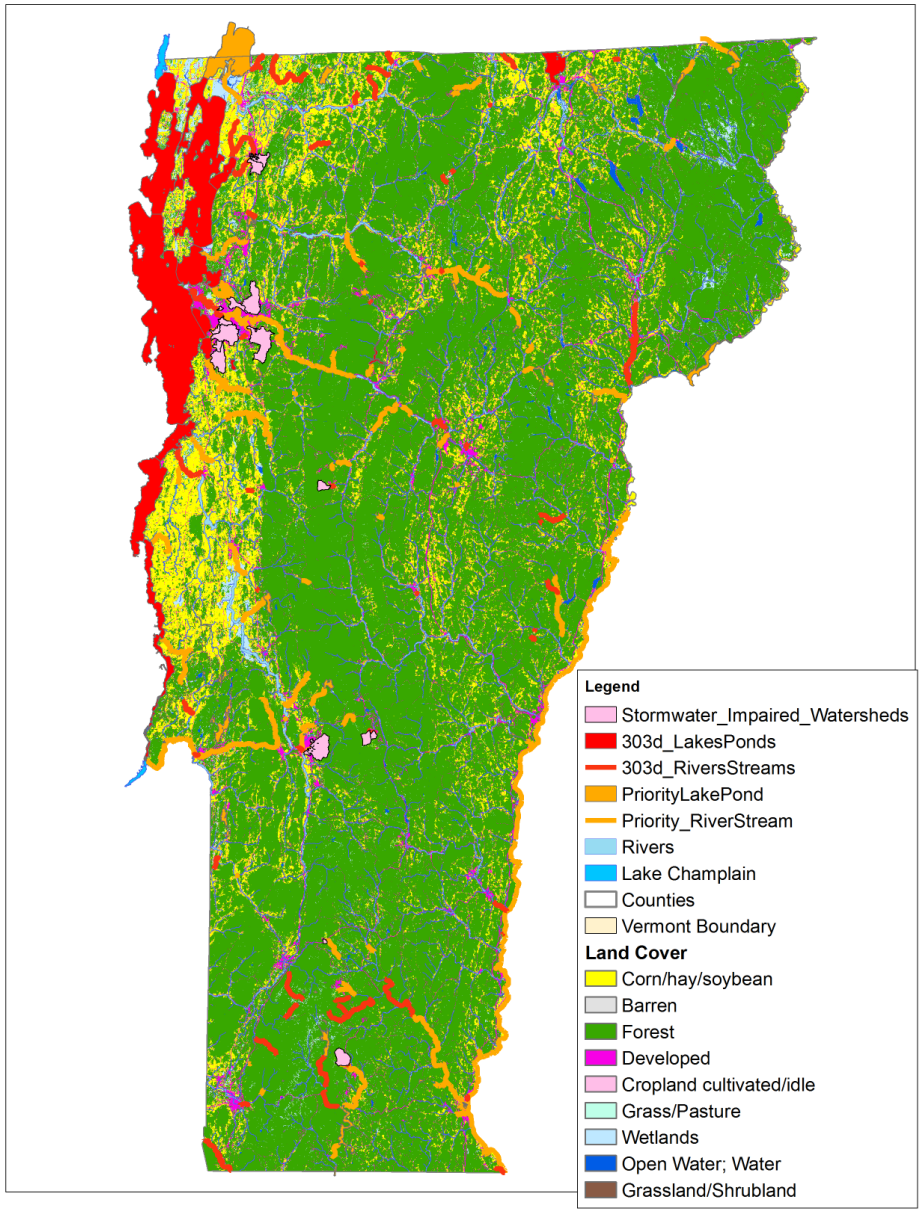

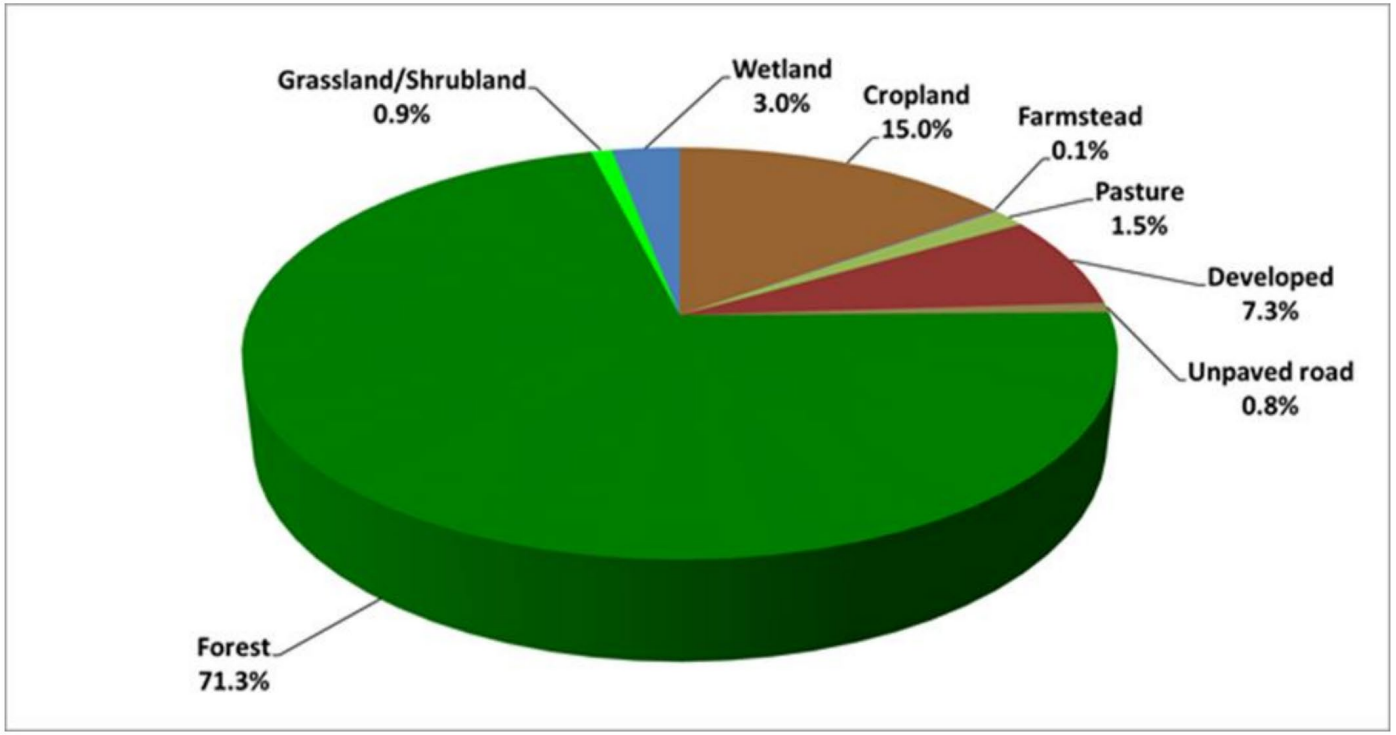

From: Eric Smeltzer, The Lake Champlain TMDL, by the Numbers. 2014. Retrieved from: https://www.vectogether.org/wp-content/uploads/2013/10/Eric-Smeltzer-VEC-6-4-14.pdf

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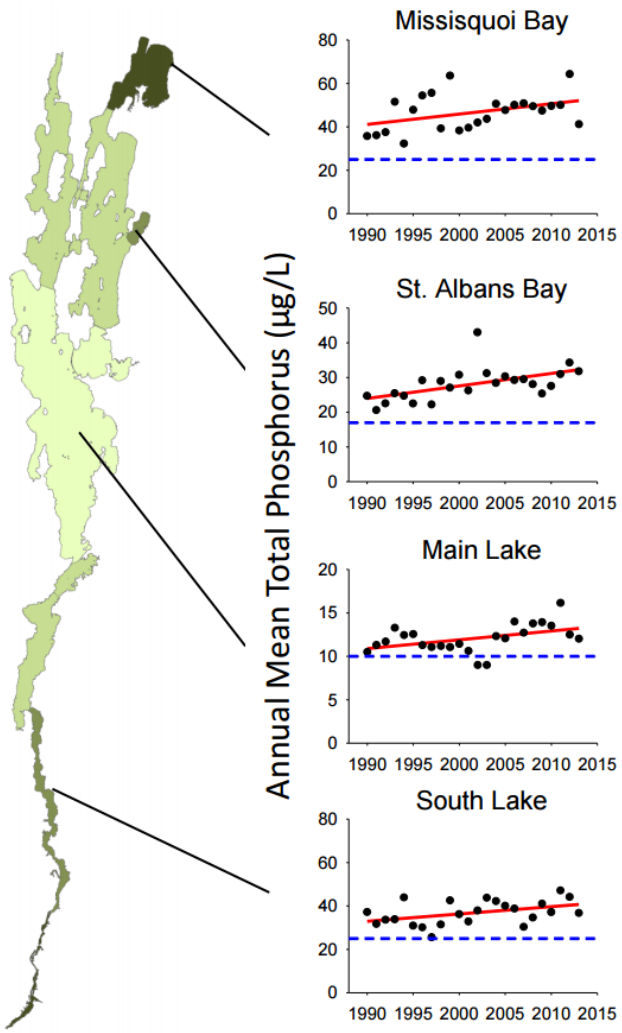


Trend line
Water quality standard

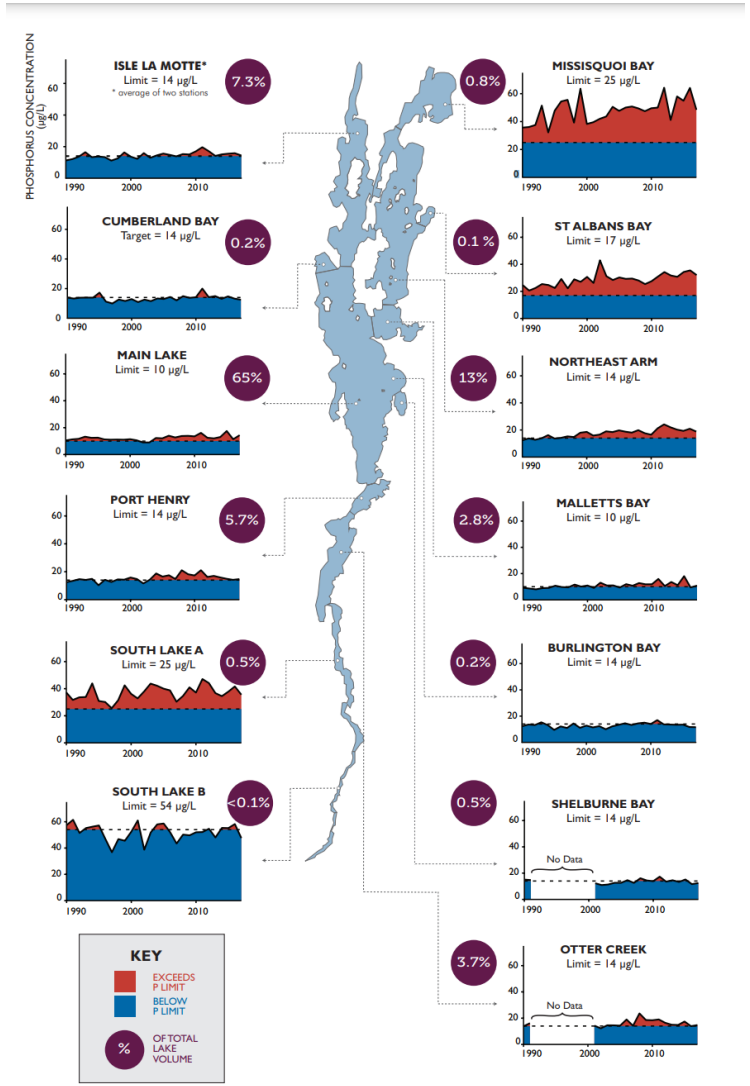
Lessons learned from the past 20 years

Phosphorus levels in the lake are above the allowable standards.

Vermont has taken many important actions, especially in the last 10 years.

Cleaning up the lake ecosystem is complex and recovery will take time.

We need to do a lot more.



DATA SOURCES: Long Term Monitoring Program (LCBP, VT ANR, NYSDEC)

Figure 4 | Annual mean phosphorus concentration by lake segment, 1990–2017

From: Eric Smeltzer, The Lake Champlain TMDL, by the Numbers. 2014. Retrieved from: https://www.vectogether.org/wp-content/uploads/2013/10/Eric-Smeltzer-VEC-6-4-14.pdf.
Lake Champlain Basin Program, 2018 State of the Lake Report, 2018. Retrieved from: https://sol.lcbp.org/wp-content/uploads/2018/06/2018-State-of-the-Lake_web.pdf

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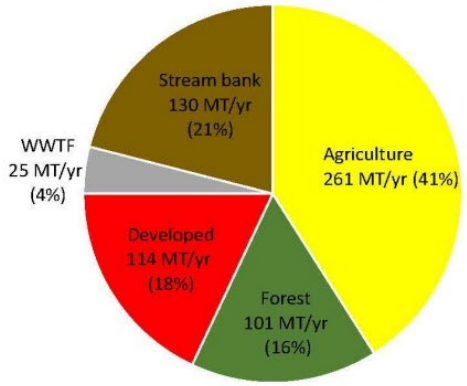
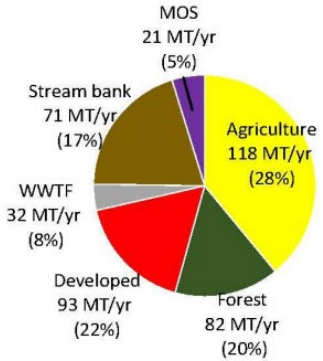
Base Load
631 Metric Tons/year



Vermont Reduction
Required=213 mt/yr (34%)



TMDL Loading Capacity and Allocations
418 Metric Tons/yr

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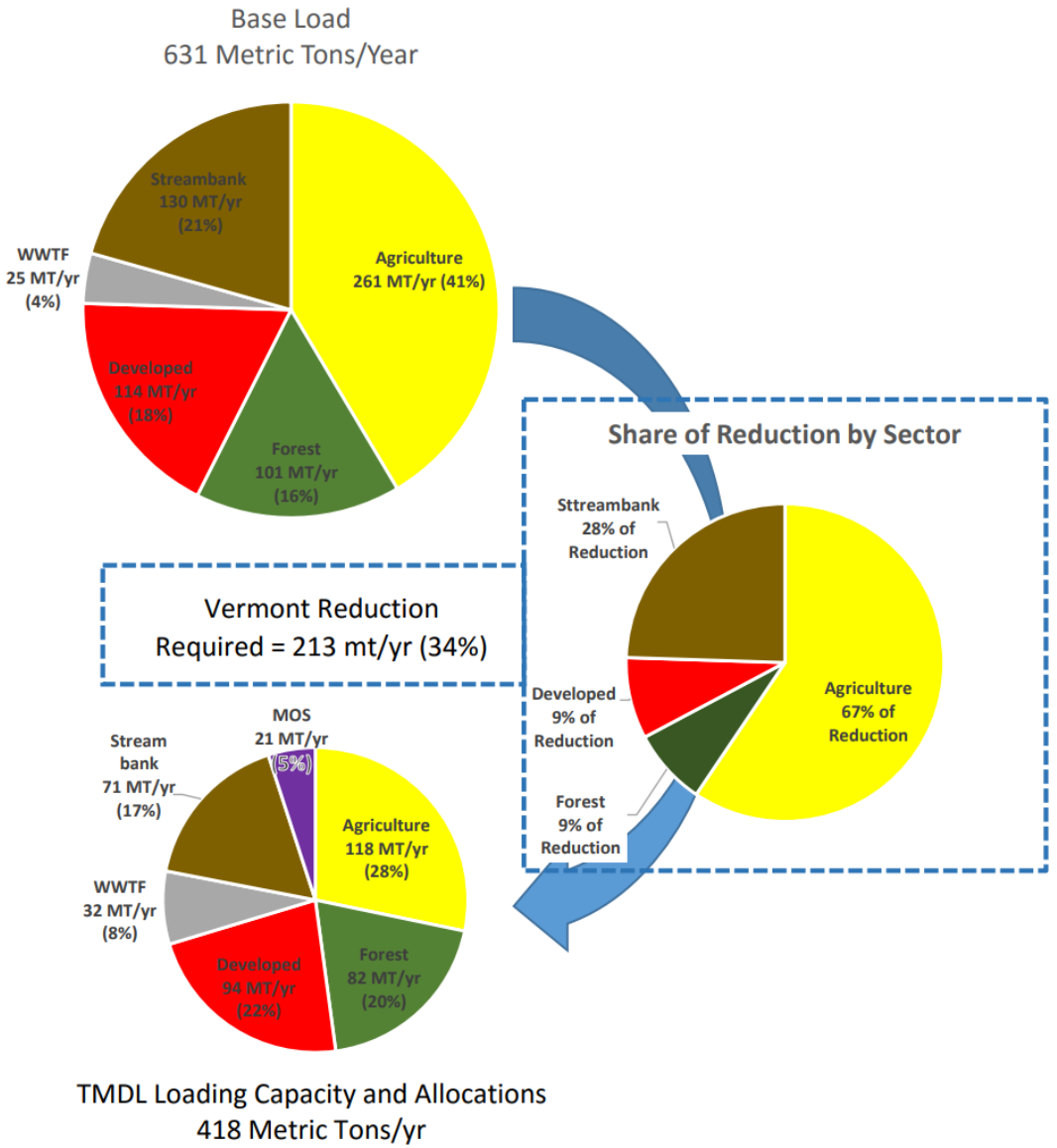

TABLE 1 - VERMONT PHASE 1 TMDL PLAN SUMMARY OF VERMONT COMMITMENTS.
** Tasks correspond with the Gantt Chart.*

Task *	Description	Start Year	End Year
A. AGRICULTURE			
Water Quality Permitting Programs – LFO, MFO, CAFO			
Inspect potential CAFOs	Inspect medium and large farms that could potentially be CAFOs with newly developed VT CAFO permit Inspect 75 potential CAFOs annually	2014 2019	2018 2036
Inspect MFOs and LFOs	MFOs currently inspected a minimum of every 3 years and LFOs annually. MFO inspections increase to a minimum of every 3 years	2014 2016	2016 2036
Update agricultural enforcement MOU	Update the MOU between DEC and AAFM regarding enforcement of agricultural regulations and program coordination	2015	2016
Accepted Agricultural Practice Rule Update and Compliance			
Amend the Accepted Agricultural Practices	Amend the AAPs to become the Required Agricultural Practices through rulemaking. Rules changes will include: • Develop small farm certification program • Increased and consistent buffer sizes to 25' (from 10') • Increased erosion tolerances to all farms to T (from 2T) • 10' buffer requirements for field ditches • Required stabilization of field gully erosion • Strengthening the livestock exclusion requirements. • Develop and require certification of custom manure applicators and ongoing training Develop and require educational trainings for farmers	2015	2016
Expand RAP education and outreach	Begin extensive education and outreach and enforcement of revised Required Agricultural Practices.	2014	2018
Develop the Small Farm Inspection program	Hired first SFO inspector (2014) focusing on Missisquoi Bay and St. Albans Bay Hire three additional inspectors	2013 2015	2014 2016
Increase SFO dairy inspections	Complete evaluation of all farms in Missisquoi Bay and St. Albans Bay watersheds and require BMP installation where needed Complete evaluation of all small dairies in South Lake and require BMP installation where needed Complete evaluation of all small dairies and significant livestock operations in the Lake Champlain Basin and require BMP installation where needed	2015 2016	2015 2019 2020
Require small farm certification	Require small farms to submit annual certification forms	2017	2036
Nutrient Management Planning			
Increase NMP efforts	Develop small farm NMP matrix and small farm template Provide increased cost-share funds for NMP development Expand small farm NMP development courses and workshops, trainings for farmers, manure applicators and technical service providers	2016 2018 2016	2017 2036 2036
Mandate manure applicator certification	Mandate certification of custom manure applicators	2016	2036
Improve field practice implementation	Support partners focusing on key areas of field practices Support farmer groups Increase participation in CREP program	2017	2036
Revise RAPs to address tile drains	Revise RAPs to include requirements to reduce nutrients from tile drains	2018	2036
Additional Efforts in Critical Watersheds			
Increase inspections in critical watersheds	Target CAFO and SFO inspections Conduct North Lake Farm Survey in Missisquoi Bay and St. Albans Bay watersheds Expand this comprehensive evaluation to other critical watersheds	2014 2015 2016	2036 2015 2020
Increase implementation in critical watersheds	Prioritize personnel in these areas for water quality improvement projects. Use $16M RCPP grant funding to implement high priority practices primarily in these watersheds	2014 2015	2036 2020
Increase technical assistance	Hire consultants on retainer to immediately work with farmers following site-specific farm assessment Target education and support for farmer groups	2015	2017
Develop and pilot ESP	Develop and pilot the Environmental Stewardship Program to incentivize additional practice adoption	2015	2020
Develop and pilot nutrient trading program	Evaluate feasibility of nutrient trading and pilot a trading program	2016	2018
Create grassed waterways program	Target funding to critical source areas in coordination with partners	2016	2036
Tile drain research	NRCS grant funding testing of two treatment media for tile drain outflows on farms in Franklin county. Encouraging farmers to utilize NRCS *Edge of Field Monitoring* practice to test additional tile treatment options	2015	2017

Title 6: Agriculture

Chapter 215: Agricultural Water Quality

Subchapter 1: General Provisions

§ 4801. Purpose; State policy

It is the purpose of this chapter to ensure that agricultural animal wastes do not enter the waters of this State. Therefore, it is State policy that:

(1) All farms meet certain standards in the handling and disposal of animal wastes, as provided by this chapter, and the cost of meeting these standards shall not be borne by farmers only, but rather by all members of society, who are in fact the beneficiaries. Accordingly, State and federal funds shall be made available to farms, regardless of size, to defray the major cost of complying with the requirements of this chapter. State and federal conservation programs to assist farmers should be directed to those farms that need to improve their infrastructure to prohibit direct discharges or bring existing water pollution control structures into compliance with U.S. Department of Agriculture (U.S.D.A.) Natural Resources Conservation Service standards. Additional resources should be directed to education and technical assistance for farmers to improve the management of agricultural wastes and protect water quality.

(2) Officials who administer the provisions of this chapter:

(A) shall educate farmers and other affected citizens on requirements of this chapter through an outreach collaboration with farm associations and other community groups;

(B) shall, in the process of rendering official decisions, afford farmers and other affected citizens an opportunity to be heard and give consideration to all interests expressed; and

(C) may provide grants from a program established under this chapter to eligible Vermont municipalities, local or regional governmental agencies, nonprofit organizations, and citizen groups in order to provide direct financial assistance to farms in implementing conservation practices. (Added 2003, No. 149 (Adj. Sess.), § 2, eff. June 3, 2004; amended 2013, No. 83, § 10, eff. June 10, 2013.)

VERMONT

REQUIRED AGRICULTURAL PRACTICES RULE

FOR

THE AGRICULTURAL NONPOINT SOURCE POLLUTION CONTROL PROGRAM

(Effective November 23, 2018)

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WATER QUALITY DIVISION

116 STATE STREET
MONTPELIER, VERMONT 05620-2901
phone: (802) 828-2431; fax (802) 828-1410
AGR.RAP@Vermont.gov

How's it going?

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
5 POST OFFICE SQUARE SUITE 100
BOSTON, MASSACHUSETTS 02109-3912

September 3, 2020

Julia S. Moore, Secretary
Vermont Agency of Natural Resources
1 National Life Drive, Davis Bldg.
Montpelier VT 05620-3901

Anson Tebbetts, Secretary
Vermont Agency of Agriculture, Food and Markets
116 State Street
Montpelier, VT 05620-2901

Peter Walke, Commissioner
Vermont Department of Environmental Conservation
1 National Life Drive, Davis Bldg.
Montpelier VT 05620-3520

Re: Lake Champlain TMDL Implementation Final Report Card for Phase 1 Milestones

Dear Secretary Moore, Secretary Tebbetts, and Commissioner Walke:

EPA committed to periodically evaluate Vermont's progress toward completion of its Lake Champlain Phosphorus TMDL Phase 1 implementation obligations. As you know, the 2016 TMDL includes an Accountability Framework containing 28 Phase 1 milestones to be completed by the end of 2017. EPA issued the State a provisional pass in April 2018 based on the successful completion of 25 of the 28 milestones and the State's commitment to complete the remaining three milestones the following year. **With its recent issuance of the Three-Acre Stormwater Permit, Vermont has successfully completed all Phase 1 Accountability Framework milestones.**

The completion of the Phase 1 milestones (as documented in the attachment) sets the wheels in motion for restoration of the Lake in the years to come. These milestones are key foundational building blocks, including, among other things, the adoption of new Required Agricultural Practices to reduce phosphorus from agricultural sources, the issuance of a series of new stormwater permits to reduce phosphorus from developed land, the establishment of a long-term

Vermont's Clean Water Investments

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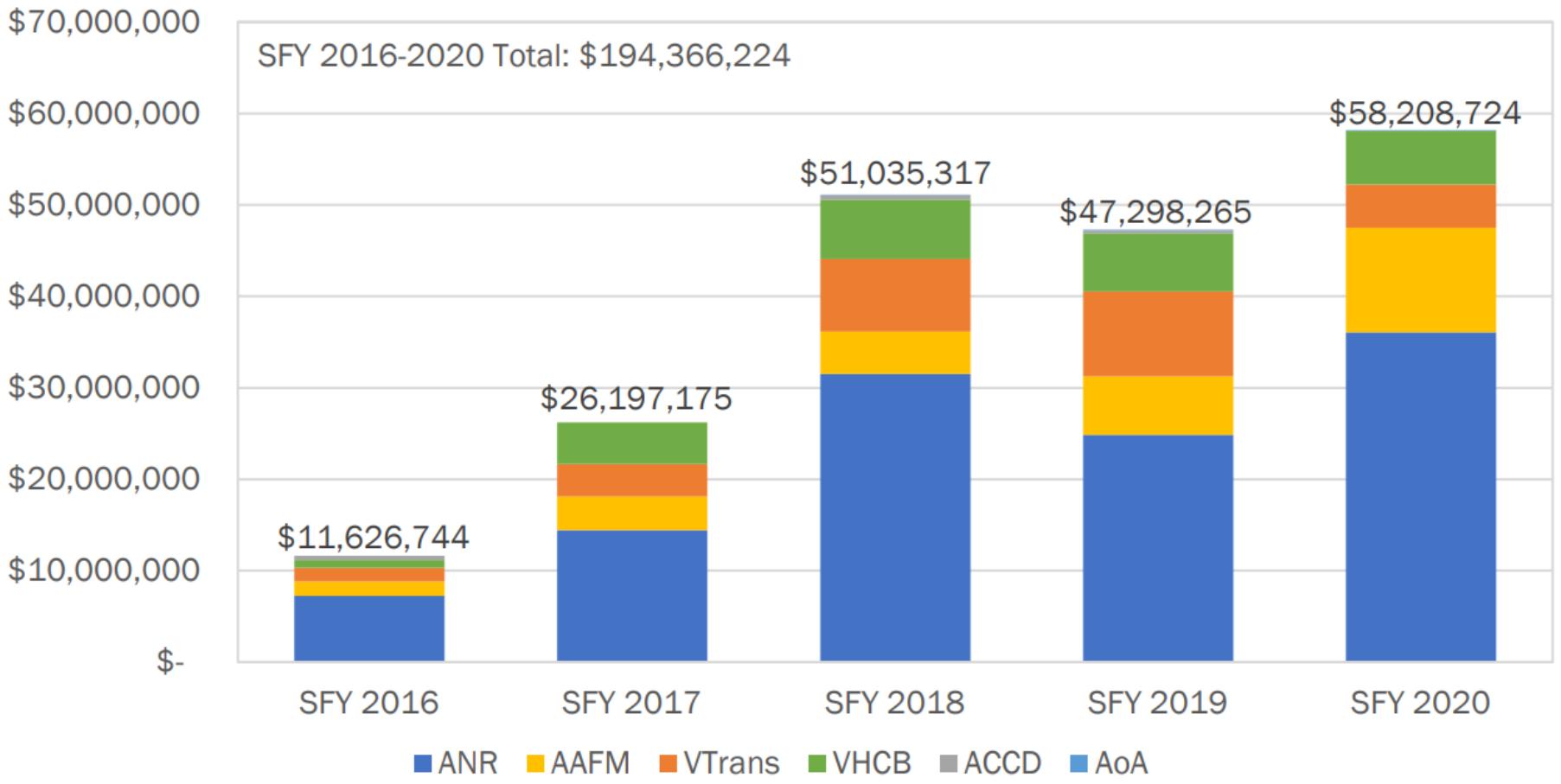

Figure 7. Total dollars awarded to clean water projects through State of Vermont agencies, SFY 2016-2020 by agency[4]

Vermont Clean Water Initiative 2020 Performance Report, Page 17: https://dec.vermont.gov/sites/dec/files/wsm/erp/docs/2021-01-15_CleanWaterPerformanceReport_SFY2020-FINA-PDF-A.pdf

Results of Lake Champlain Basin Cleanup to Date

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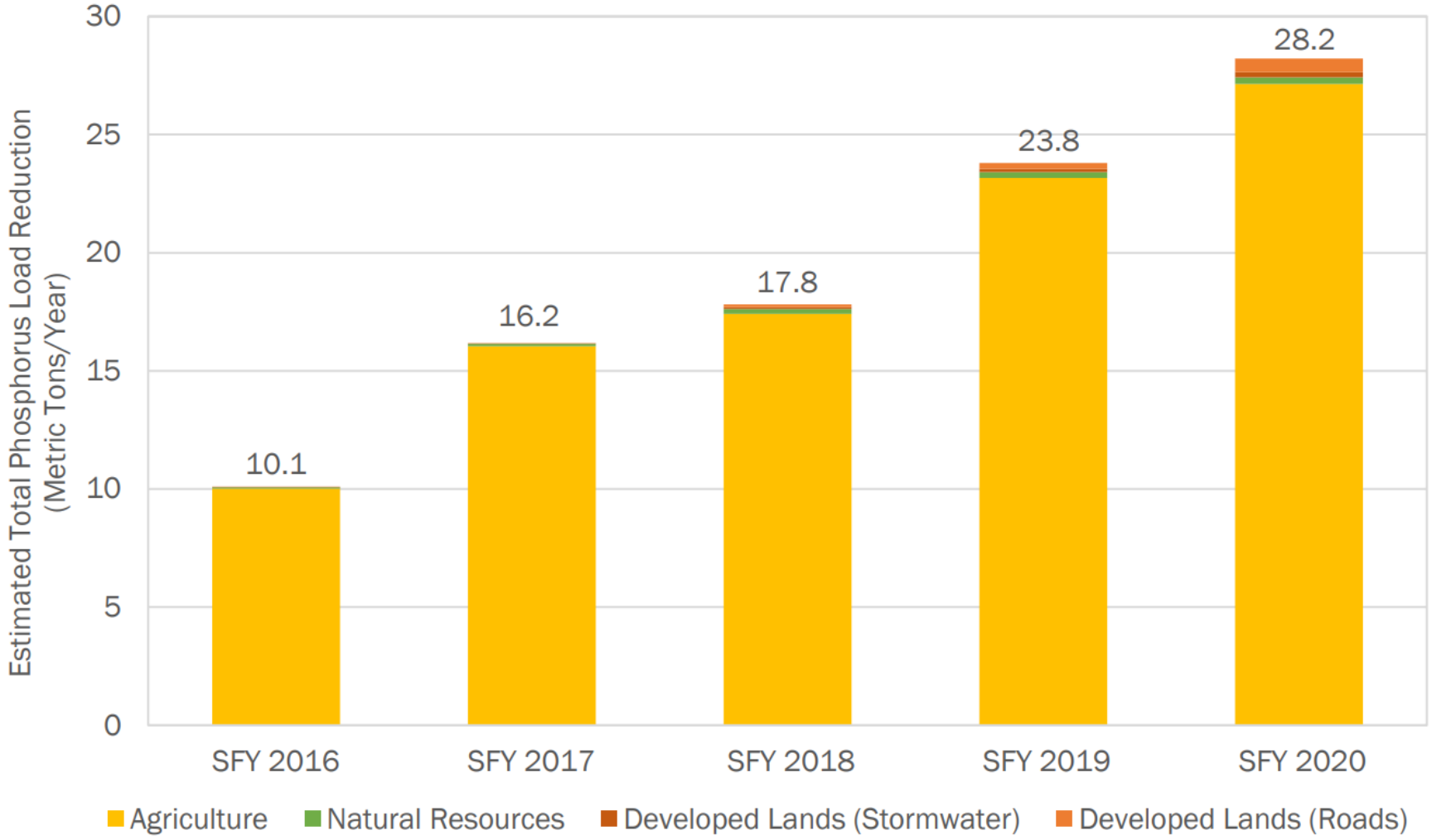
Estimated Total Phosphorus Load Reductions by Land Use Sector



Vermont Clean Water Initiative 2020 Performance Report, Page 59: https://dec.vermont.gov/sites/dec/files/wsm/erp/docs/2021-01-15_CleanWaterPerformanceReport_SFY2020-FINA-PDF-A.pdf

Results of Lake Champlain Basin Cleanup to Date

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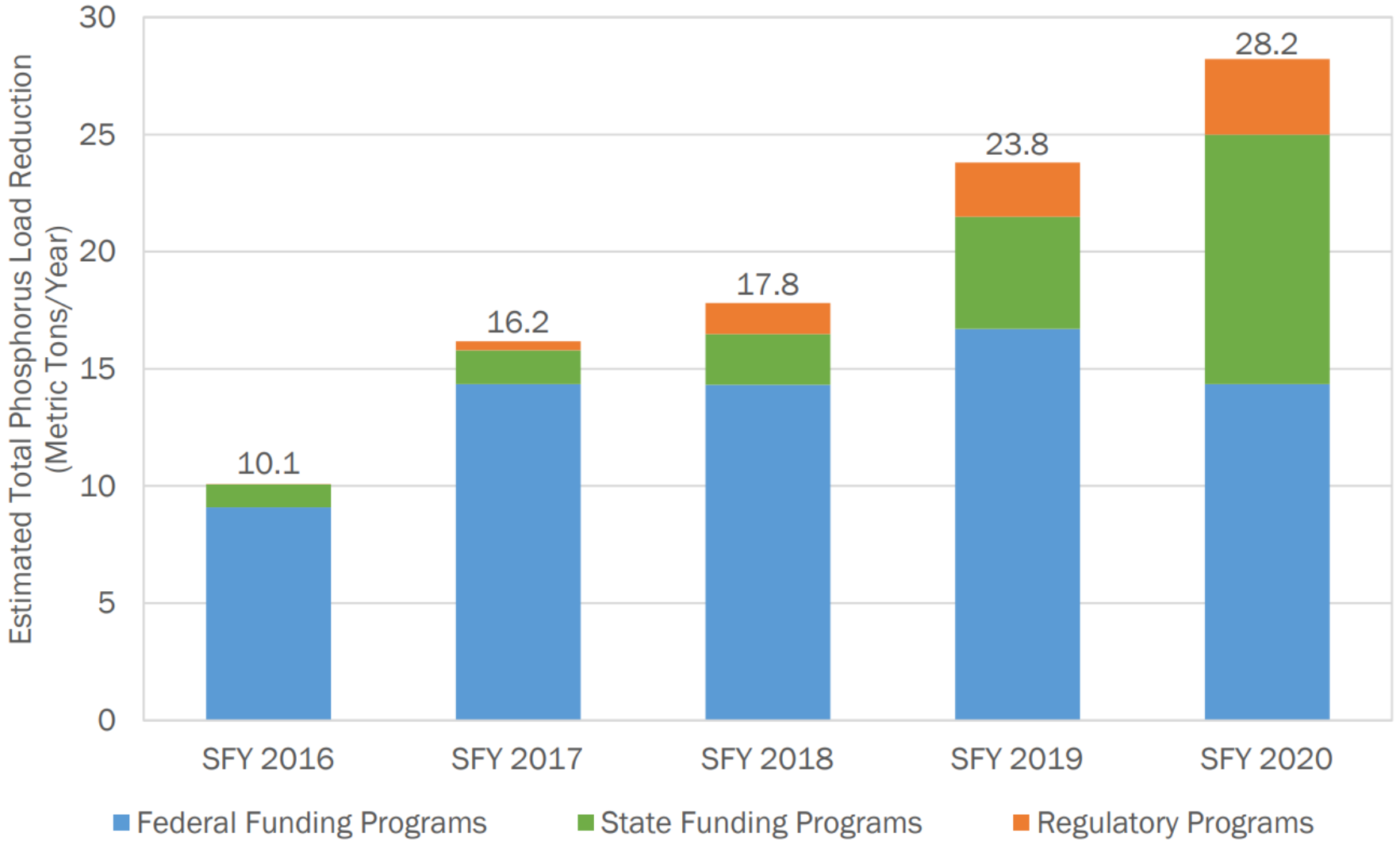
Estimated Total Phosphorus Load Reductions by Program Category



Vermont Clean Water Initiative 2020 Performance Report, Page 58: https://dec.vermont.gov/sites/dec/files/wsm/erp/docs/2021-01-15_CleanWaterPerformanceReport_SFY2020-FINA-PDF-A.pdf

Cost Effectiveness of State Clean Water Investments

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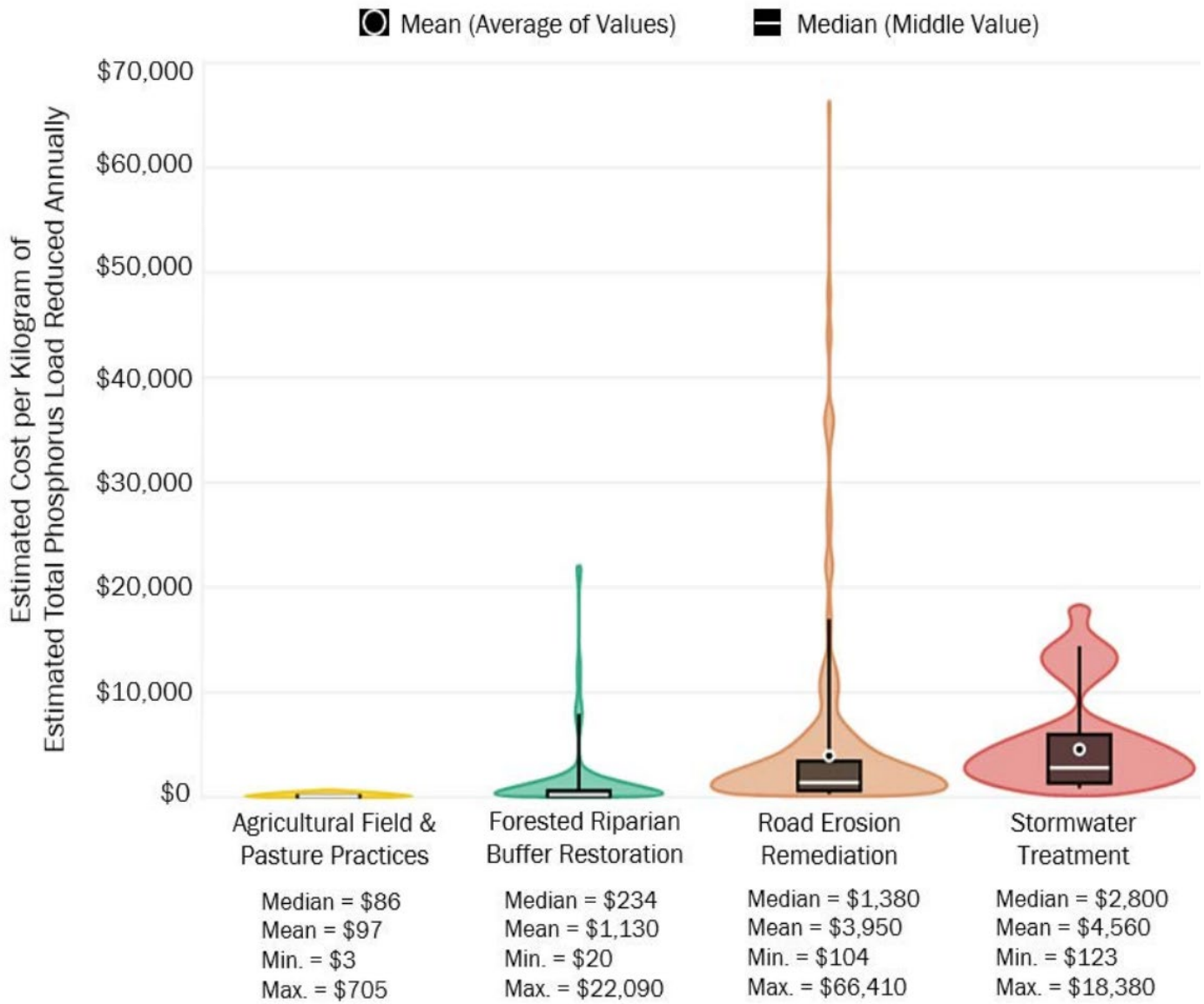

Vermont Clean Water Initiative 2020 Performance Report, Page 53: https://dec.vermont.gov/sites/dec/files/wsm/erp/docs/2021-01-15_CleanWaterPerformanceReport_SFY2020-FINA-PDF-A.pdf

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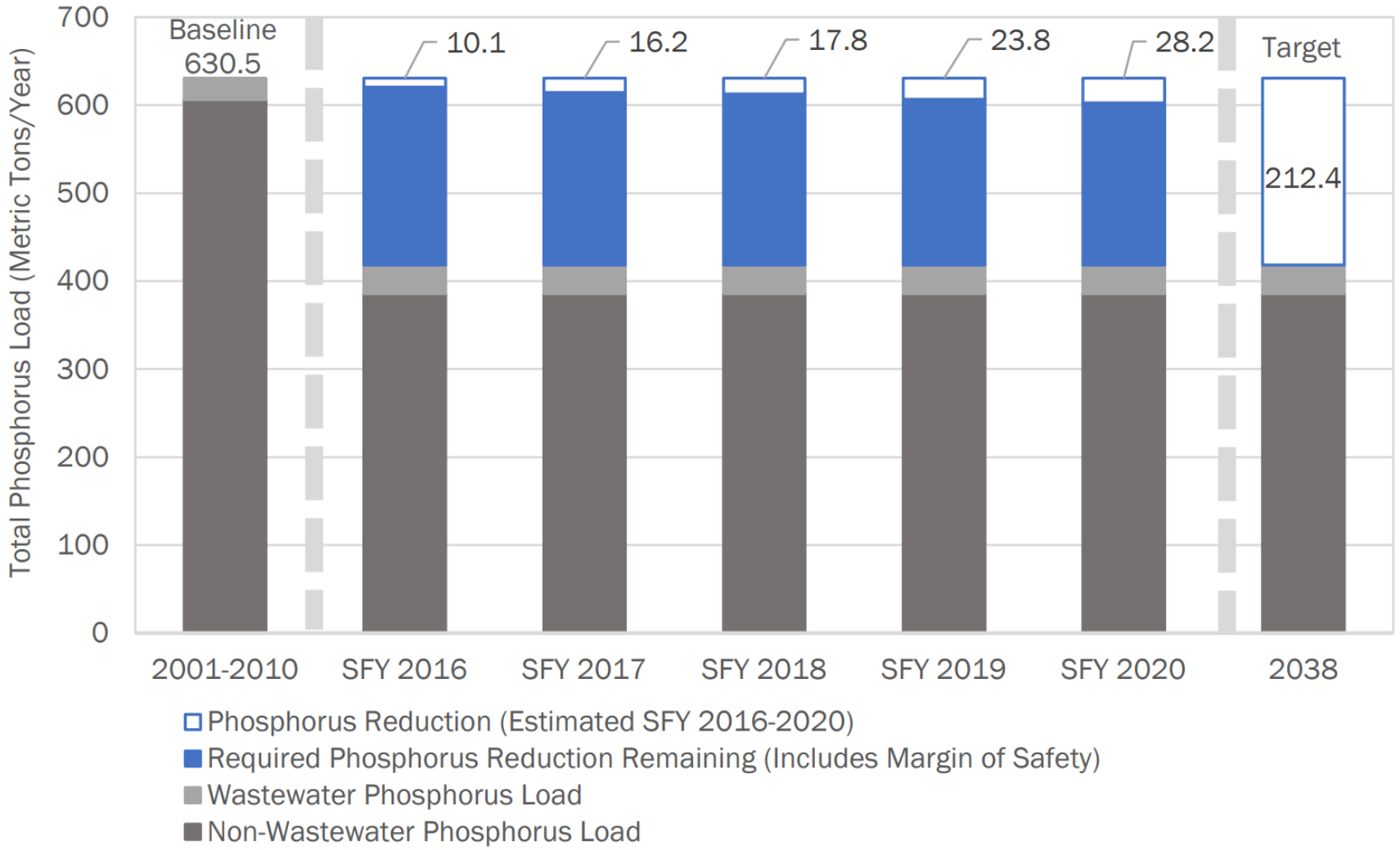
Estimated Total Phosphorus Load Reductions Relative to TMDL Baseline and Target



Vermont Clean Water Initiative 2020 Performance Report, Page 60: https://dec.vermont.gov/sites/dec/files/wsm/erp/docs/2021-01-15_CleanWaterPerformanceReport_SFY2020-FINA-PDF-A.pdf

Pay For Practice

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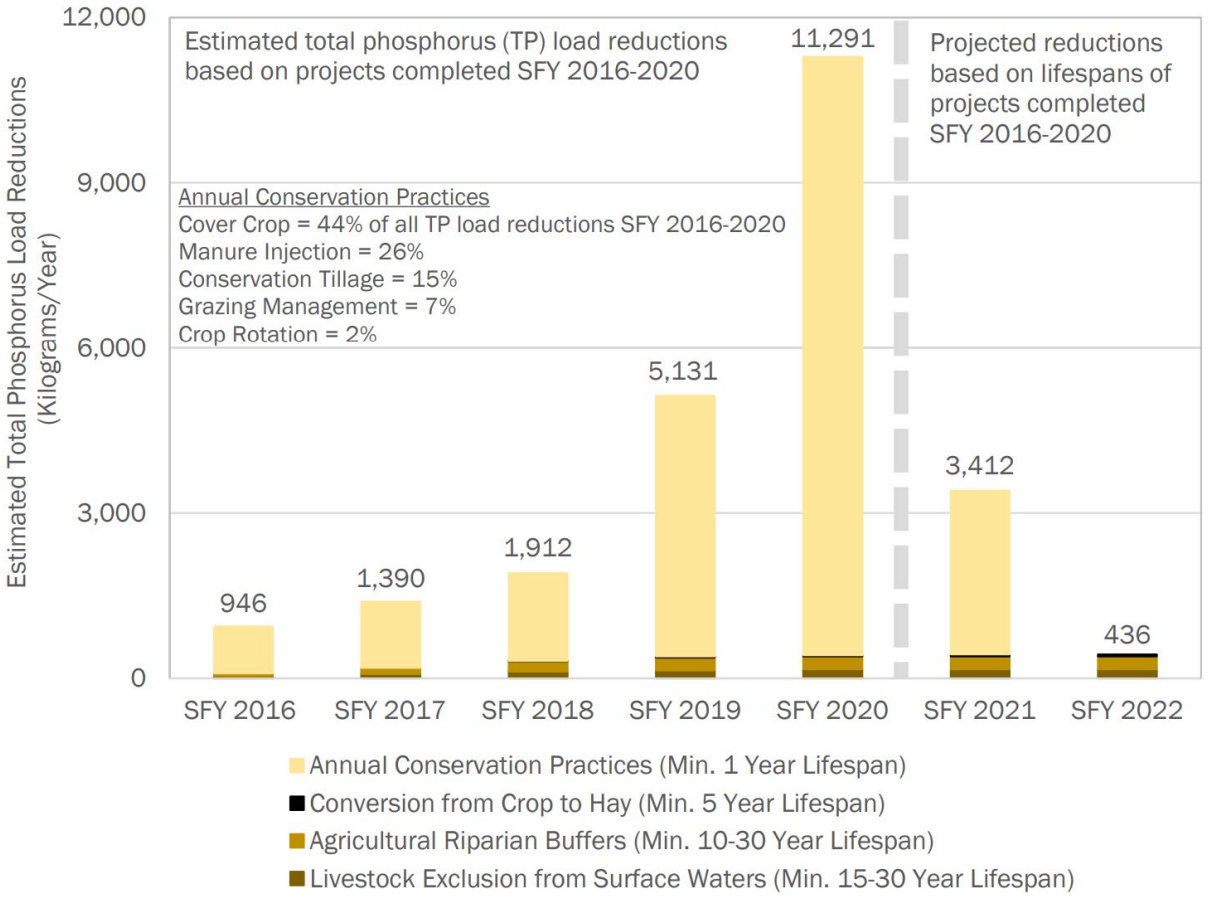
Project Output Measures[11]	2016	2017	2018	2019	2020	Total
Acres of agricultural conservation practices implemented (excluding other practices listed below)	5,466	3,261	7,908	14,566	19,619	50,820
Acres of agricultural land treated through innovative equipment	–	2,043	5,415	14,022	14,521	36,001
Acres of agricultural land treated by forest and grass buffers adjacent to surface waters (i.e., riparian areas)	258	200	228	0	0	686
Acres of pasture with livestock excluded from surface waters	258	117	97	47	15	534
Acres of water quality protections within newly conserved agricultural lands	–	116	200	513	250	1,079
Acres of agricultural conservation practices reported through technical assistance[12]	–	–	17	1,556	1,689	3,262
Number of barnyard and production area practices installed	59	86	96	77	119	437



Vermont Clean Water Initiative 2019 Performance Report, Page 32, 34, : https://dec.vermont.gov/sites/dec/files/wsm/erp/docs/2021-01-15_CleanWaterPerformanceReport_SFY2020-FINA-PDF-A.pdf

Results of Ag Nonpoint Source Program

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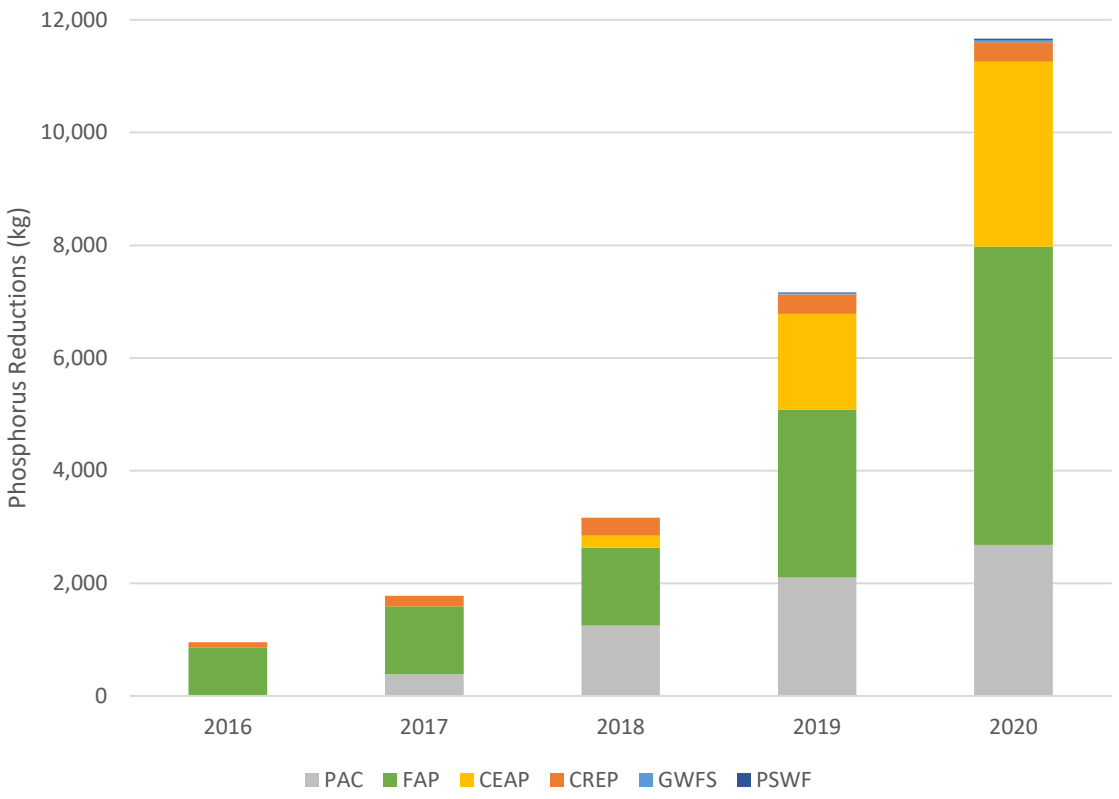
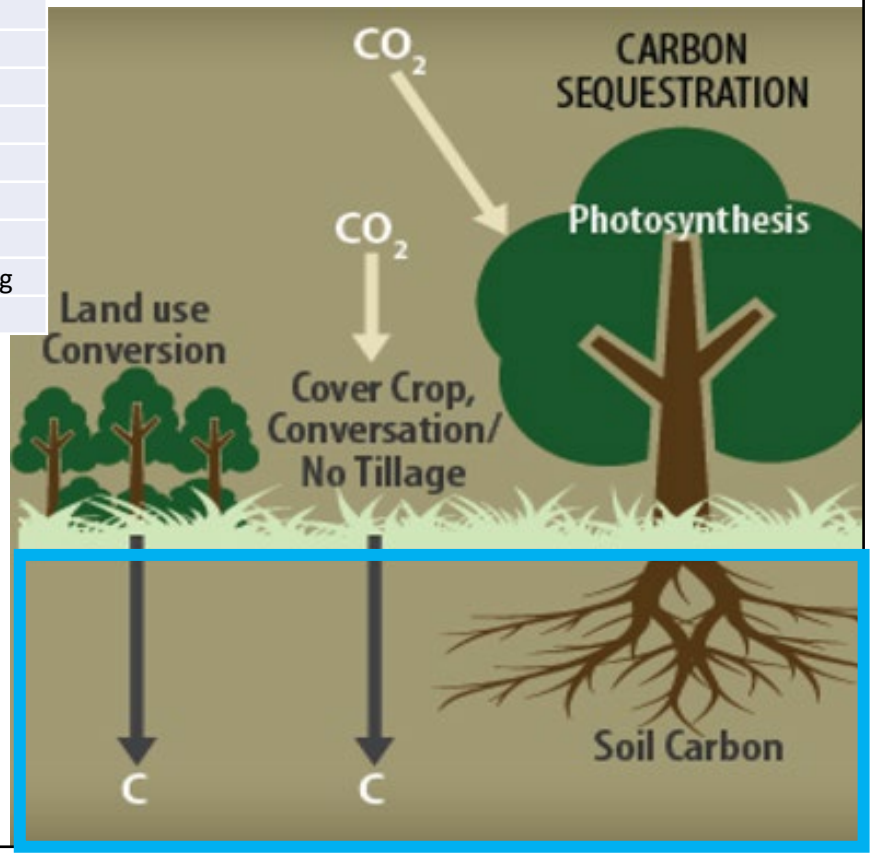
Ag Phosphorus Reductions FY2020 = 11,670 kg



Ag Carbon Sequestration Equivalents FY2020 = ??

- Cover Crop
- Conservation Tillage
- Manure Injection
- Rotational Grazing
- Manure Incorporation
- Riparian Forest Buffer
- Livestock Exclusion
- Crop Rotation
- Aeration
- Precision Agriculture
- No Till Pasture Renovation
- Grassed Waterway/Buffer
- Forage and Biomass Planting
- Filter Strip



Source: Congressional Research Service: Greenhouse Gas Emissions and Sinks in U.S. Agriculture, September 17, 2018

Ecosystem Services

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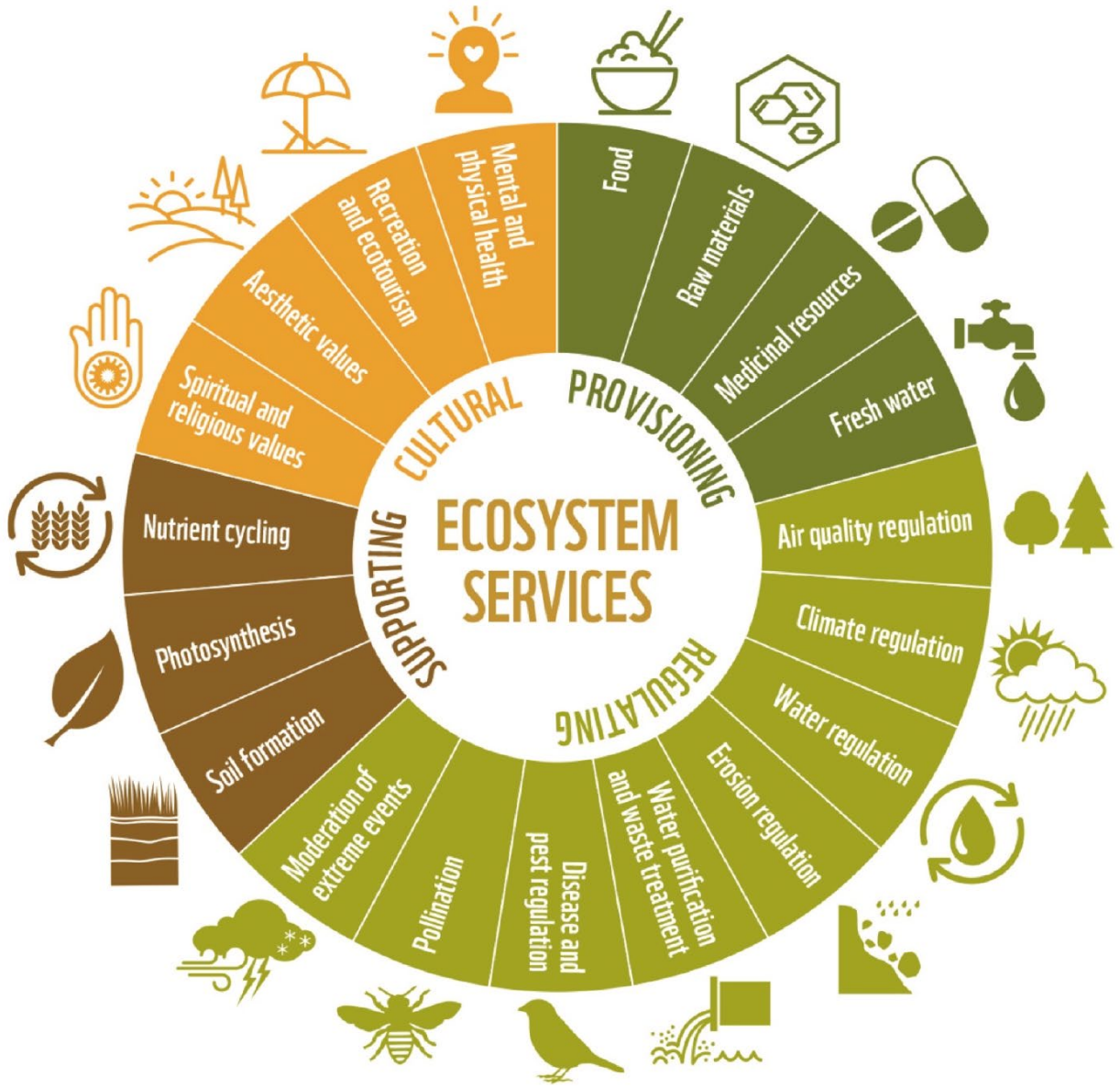

Vermont's Definitions

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6 V.S.A. § 4962(2) "**Regenerative farming**" means a series of cropland management practices that:

(A) contributes to generating or building soils and soil fertility and health;

(B) increases water percolation, increases water retention, and increases the amount of clean water running off farms;

(C) increases biodiversity and ecosystem health and resiliency; and

(D) sequesters carbon in agricultural soils.

6 V.S.A. § 4802(4) "**Healthy soil**" means soil that has a well-developed, porous structure, is chemically balanced, supports diverse microbial communities, and has abundant organic matter.

1. Disturb the soil as little as possible
2. Grow as many different species of plants as practical
3. Keep living plants in the soil as much as possible
4. Keep the soil covered year-round

Examples of Soil Health Practices - Mitigation

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What is it?		What does it do?	How does it help?
Conservation Crop Rotation Growing a diverse number of crops in a planned sequence in order to increase soil organic matter and biodiversity in the soil.		• Increases nutrient cycling • Manages plant pest (weeds, insects, and diseases) • Reduces sheet, rill, and wind erosion • Holds soil moisture • Adds diversity so soil microbes can thrive	• Maximize nutrients • Decreases use of pesticides • Improves water quality • Conserves water • Improves plant production
Cover Crop An un-harvested crop grown as part of planned rotation to provide conservation benefits to the soil.		• Increases soil organic matter • Prevents soil erosion • Conserves soil moisture • Increases nutrient cycling • Provides nitrogen for plant use • Suppresses weeds • Reduces compaction	• Improves crop production • Improves water quality • Conserves water • Maximize nutrients • Decreases use of pesticides • Improves water efficiency to crop
No Till A way of growing crops without disturbing the soil through tillage.		• Improves water holding capacity of soils • Increases organic matter • Reduces soil erosion • Reduces energy use • Decreases compaction	• Improves water efficiency • Conserves water • Improves crop production • Improves water quality • Saves renewable resources • Improves air quality • Increases productivity

Source: USDA NRCS

Examples of Soil Health Practices - Mitigation

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Mulch Tillage

Using tillage methods where the soil surface is disturbed but maintains a high level of crop residue on the surface.

- Reduces soil erosion from wind and rain
- Increases soil moisture for plants
- Reduces energy use
- Increases soil organic matter

- Improves water quality
- Conserves water
- Saves renewable resources
- Improves air quality
- Improves crop production

Mulching

Applying plant residues or other suitable materials to the soil surface to compensate for loss of residue due to excessive tillage.

- Reduces erosion from wind and rain
- Moderates soil temperatures
- Increases soil organic matter
- Controls weeds
- Conserves soil moisture
- Reduces dust

- Improves water quality
- Improves plant productivity
- Increases crop production
- Reduces pesticide usage
- Conserves water
- Improves air quality

Nutrient Management

Managing soil nutrients to meet crop needs while minimizing the impact on the environment and the soil.

- Increases plant nutrient uptake
- Improves the physical, chemical, and biological properties of the soil
- Budgets, supplies, and conserves nutrients for plant production
- Reduces odors and nitrogen emissions

- Improves water quality
- Improves plant production
- Improves air quality

Source: USDA NRCS

Importance of Organic Matter – Mitigation, Adaptation, Resilience

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Source: USDA NRCS
Source: North Dakota State University, Soil Health Minute: Rainfall Simulator; https://youtu.be/Y4pwNIPX4AA

Why Soil Health is Important

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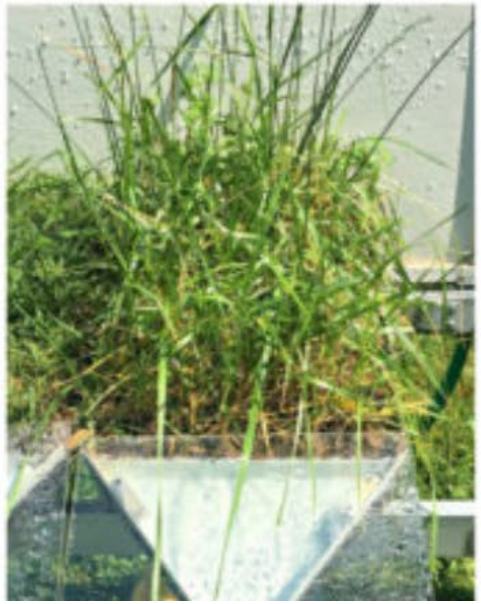
Continuously Grazed Pasture

Rotationally Grazed Pasture



Tilled Soil

Multi-species Covercrop

Source: USDA NRCS

Why Soil Health is Important

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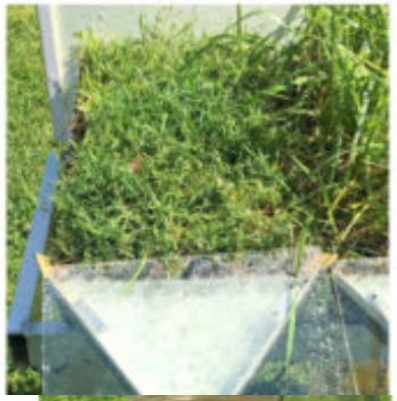
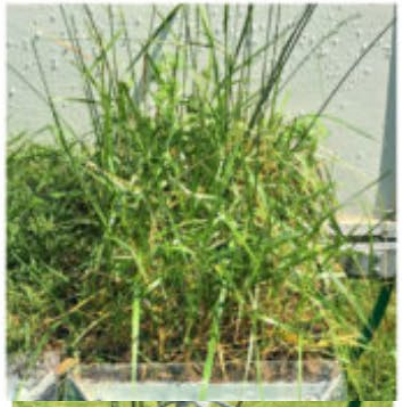
Continuously Grazed Pasture	Rotationally Grazed Pasture	Tilled Soil	Multi-species Covercrop
			
			
Runoff from continuously grazed pasture	Runoff from rotationally grazed pasture	Runoff from tilled soil	Runoff from multi-species cover crop

Source: USDA NRCS

Why Soil Health is Important

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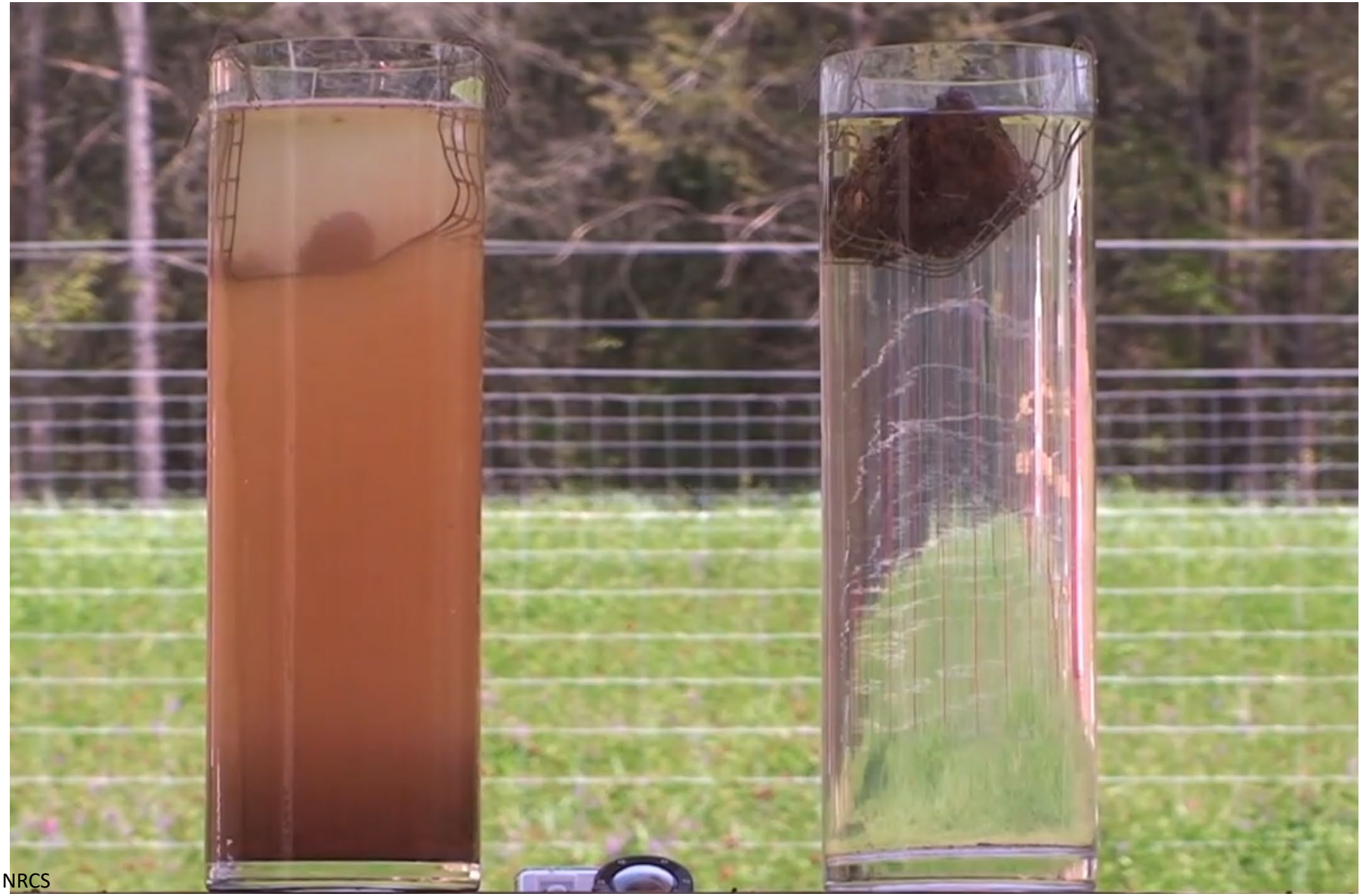
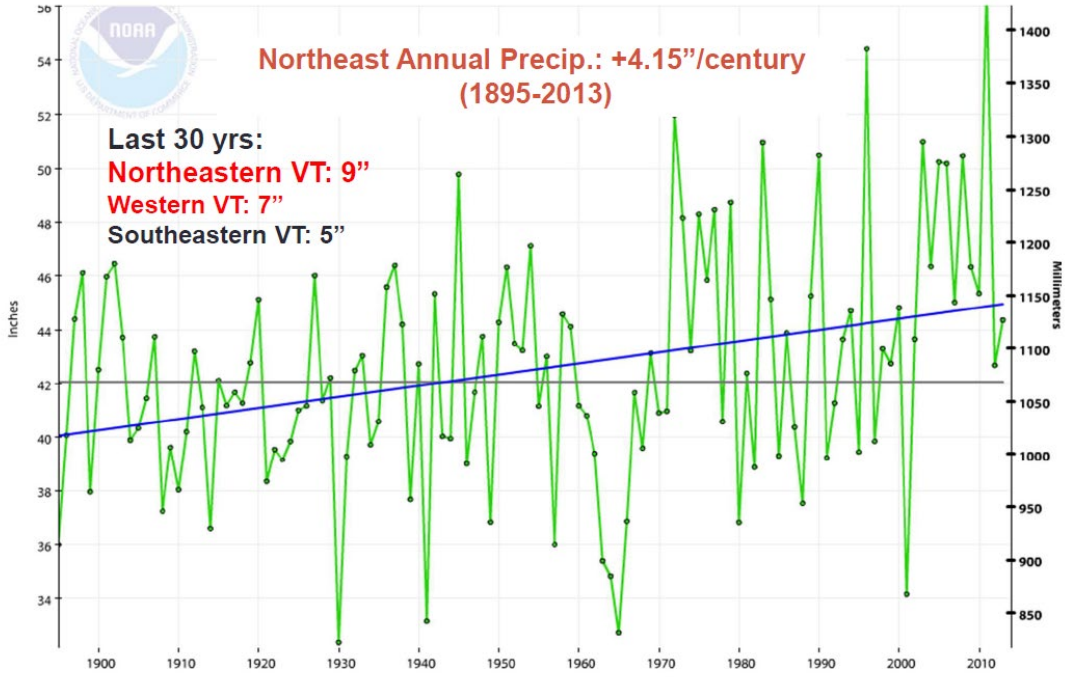


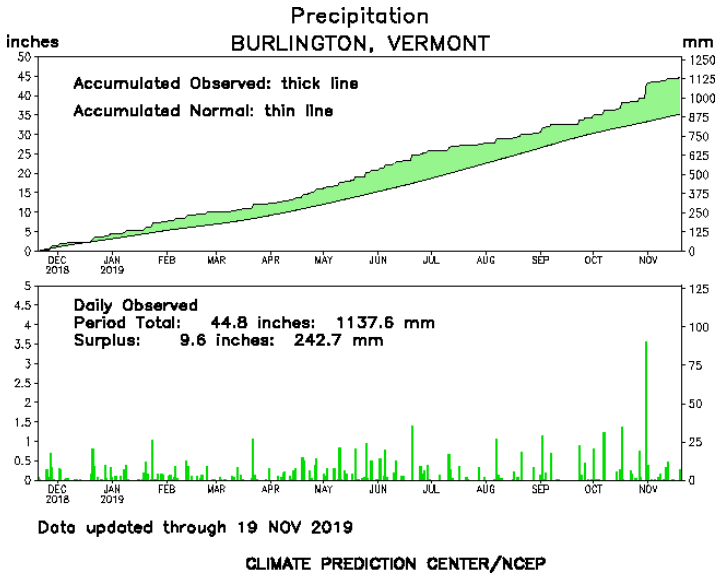
Source: USDA NRCS

Climate Change in Vermont: Impacts, Risks and Adaptation

Current vs. Revised: Avg. Precipitation



	FIPS	County	State	Design	Designati	DROUGHT
3491	50017	Orange	Vermont	2	S4474	1
3492	50027	Windsor	Vermont	2	S4474	1

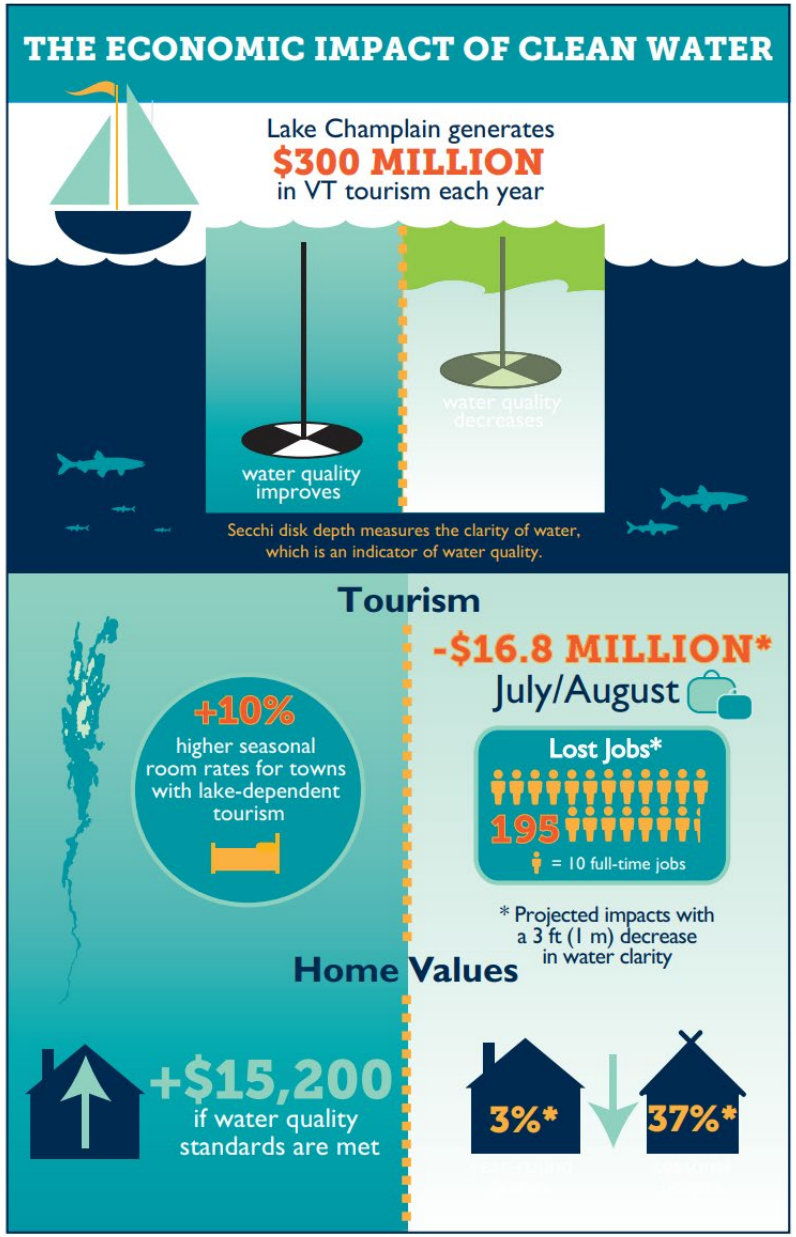


USDA Designates Nine Vermont Counties as Primary Natural Disaster Areas

Contact: FPAC.BC.Press@usda.gov

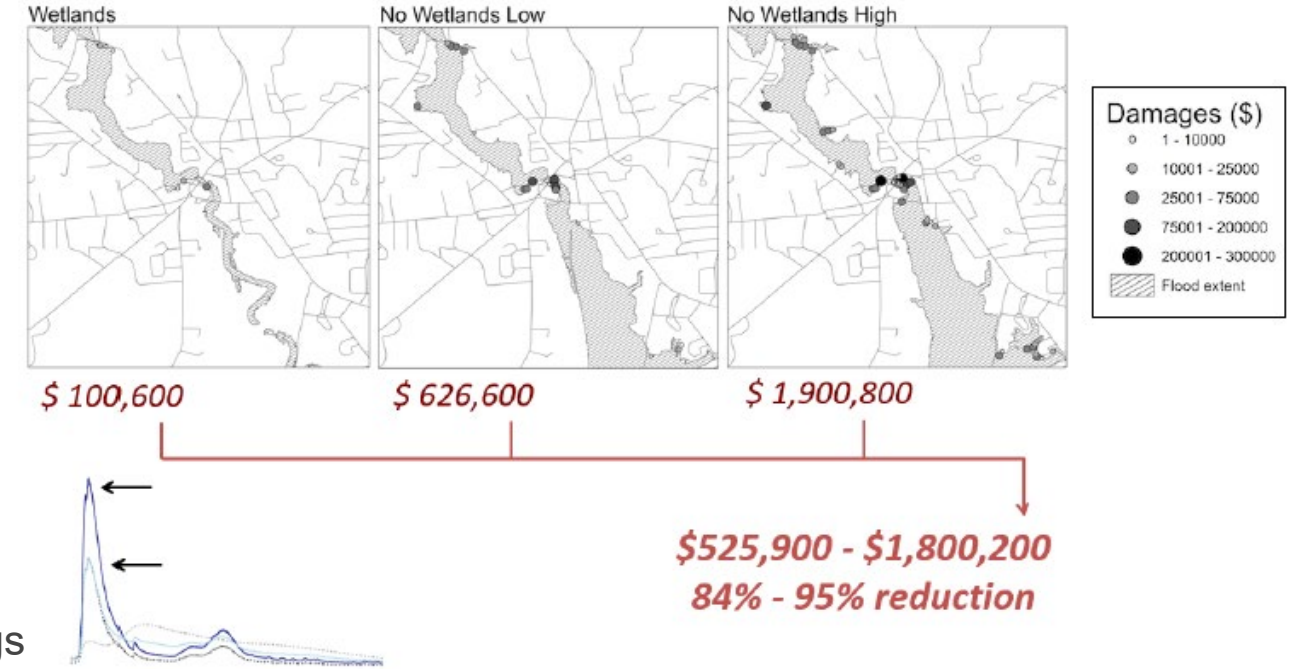
Emergency Support to Producers in Surrounding Counties/Border States Also Available

WASHINGTON, Nov. 18, 2020 — Agriculture Secretary Sonny Perdue designated nine Vermont counties as primary



DATA SOURCE: *An Assessment of the Economic Value of Clean Water in Lake Champlain*. Brian Voigt, Julia Lees, Jon Erickson, University of Vermont, Gund Institute for Ecological Economics. September 2015.

Middlebury - economic damages



Key findings

•During Tropical Storm Irene in 2011, floodplains and wetlands diminished damages in Middlebury, VT, by 84 to 95 percent – saving potentially as much as $1.8 million in flood damages.

•Middlebury saves an annual average of $126,000 to $450,000 in damages due to the Otter Creek floodplain, which reduced damages by 54 to 78 percent, on average, across 10 flooding events.

Source: Keri Bryan Watson , Gund Institute, UVM

Ecosystem Services

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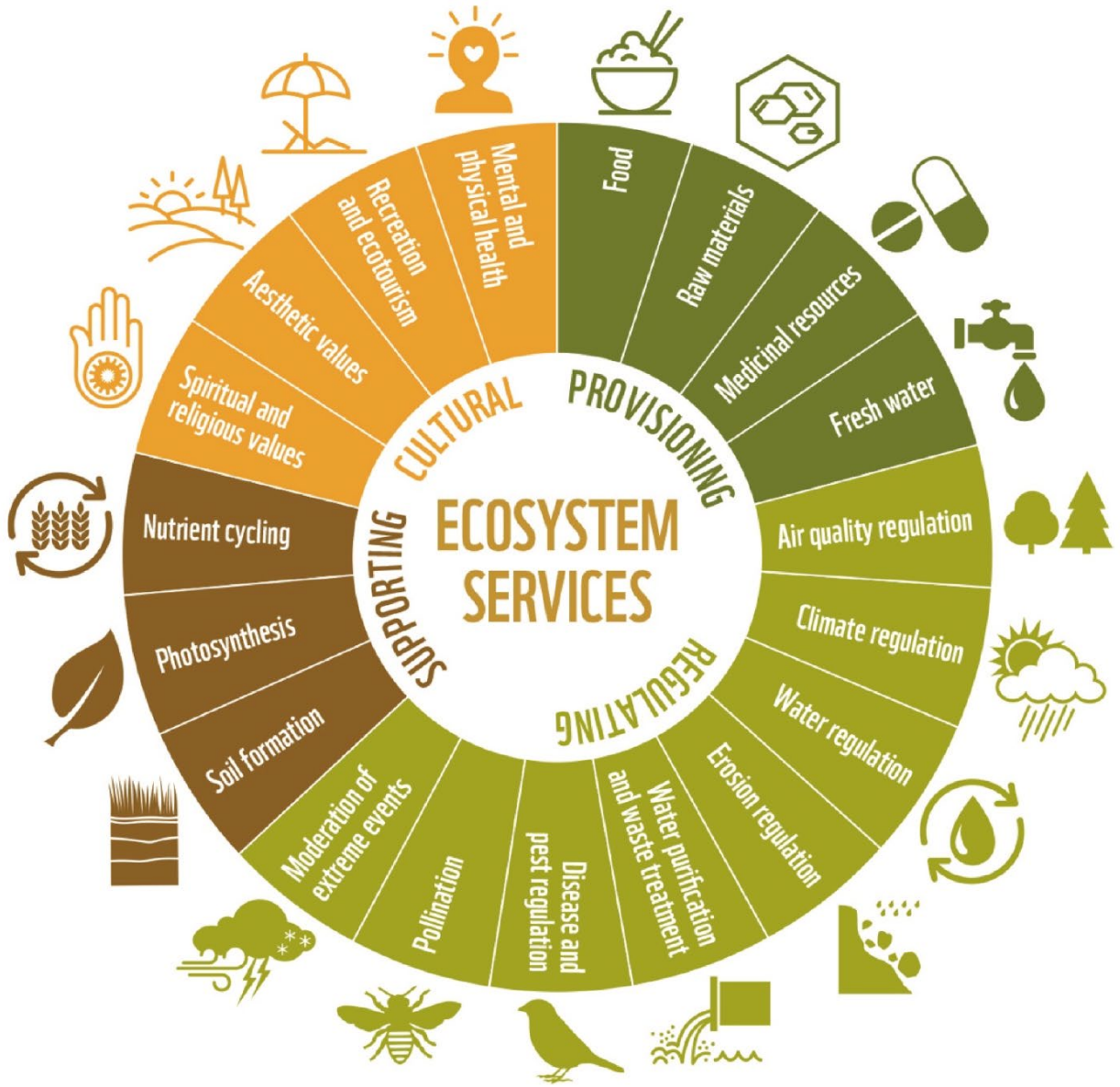
WATER QUALITY DIVISION



Economic Development

Ecosystem Services Market Consortium Credits Farmers for Caring for the Environment

The Ecosystem Services Market (ESM) will enable farmers to use improvements in soil health —the key to water conservation and soil carbon sequestration—to generate ecosystem-service credits that they will be able to sell.

Indigo Agriculture's bold plan to reward farmers for burying 1 trillion tons of CO2 in soil

Meg Wilcox
Thursday, June 13, 2019 - 2:00am

ambitious goal is to remove 1 trillion tons of carbon dioxid

Successful Farming

WEATHER MACHINERY CROPS TECHNOLOGY FARM MANAGEMENT LIVESTOCK FAMILY SUBSCRIBE

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NEW MARKET PLANNED TO PAY FARMERS FOR SOIL CARBON, WATER QUALITY

By Virginia Gewin
3/6/2019

General Mills, ADM, Cargill, McDonald's, and The Nature Conservancy are among 10 companies and nonprofit organizations that are forming a national market by 2022 to incentivize the adoption of farming practices that build soil carbon and improve water conservation.

NO-TILL FARMER
The No-Till Authority Since 1972

NEWS & NOTES RESOURCES NO-TILLAGE CONFERENCE COVER CROP SUMMIT DRYLAND NO-TILLER

FFAR Joins Consortium to Establish Ecosystem Markets for Agriculture

November 19, 2019

WASHINGTON – Climate change is threatening food security and farmer livelihoods, however, implementing climate-smart farming practices that reduce emissions will help farmers thrive—not just survive. The Foundation for Food and Agriculture Research (FFAR) contributed $10.3 million to the Ecosystem Services Market Research Consortium (ESMRC) to establish a $20 million research arm for the Ecosystem Services Market Consortium, an innovative collaboration that is creating a functional ecosystem services market that will launch and be fully operational in 2022. The ecosystems market will pay and recognize farmers and ranchers who adopt conservation management practices that improve soil health and water usage and reduce greenhouse gas emissions; this research consortium will provide the research necessary to create a scaled, efficient, cost-effective marketplace that works for farmers and ranchers.

A Proposal to Explore how to Value Agriculture Ecosystem Services in Vermont

To develop a system which monitors, evaluates, and monetizes Ecosystem Services (ES) provided by agriculture and delivers both environmental and food security to the Vermont community well into the future.

Brian Kemp
CVFC President
info@champlainvalleyfarmercoalition.com

Larry Gervais
FWA President
farmerswatershedalliancenw@gmail.com

Paul Doton
CRWFA President
pdoton@gmail.com

Source: 2/13/19
https://agriculture.vermont.gov/sites/agriculture/files/documents/Water_Quality/PES/Brief_A%20Proposal%20to%20Explore%20how%20to%20Value%20Agriculture%20Ecosystem%20Services%20in%20Vermont.pdf

State of Vermont Payment for Ecosystem Services Working Group

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AGENCY OF AGRICULTURE, FOOD & MARKETS
WATER QUALITY DIVISION

* * * Soil Conservation * * *

Sec. 3. SOIL CONSERVATION PRACTICE AND PAYMENT FOR ECOSYSTEM SERVICES WORKING GROUP

(a) The Secretary of Agriculture, Food and Markets shall convene a Soil Conservation Practice and Payment for Ecosystem Services Working Group to recommend financial incentives designed to encourage farmers in Vermont to implement agricultural practices that exceed the requirements of 6 V.S.A. chapter 215 and that improve soil health, enhance crop resilience, increase carbon storage and stormwater storage capacity, and reduce agricultural runoff to waters. The Working Group shall:

VT LEG #342623 v.1

State of Vermont Payment for Ecosystem Services Working Group

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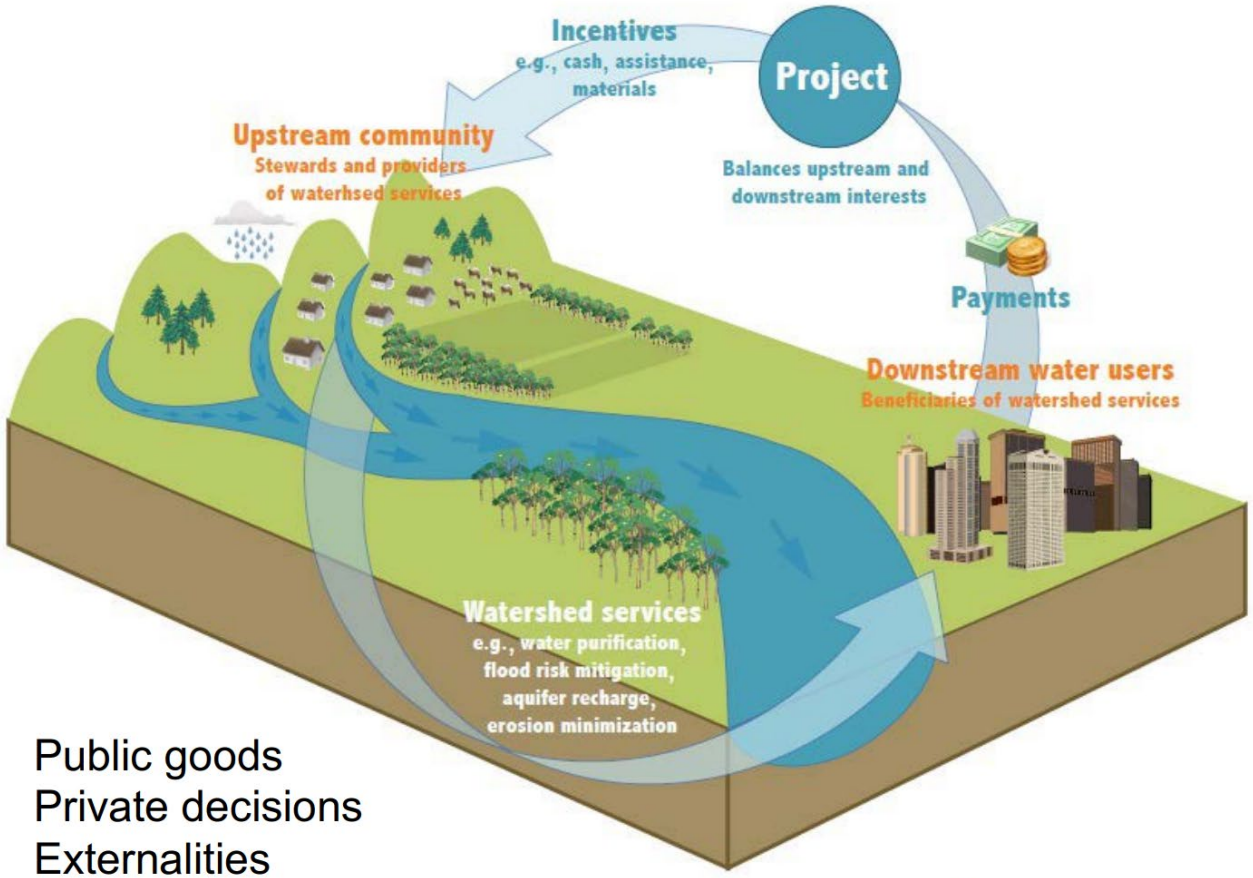
WATER QUALITY DIVISION

Section 24 of Act 129 of 2020
The Working Group shall include the following members:

1) the Secretary of Agriculture, Food and Markets or designee;
   a) Deputy Secretary Alyson Eastman
2) the Secretary of Natural Resources or designee;
   a) Marli Rupe (DEC)
3) a representative of the Vermont Housing and Conservation Board;
   a) Stacy Cibula
4) a member of the former Dairy Water Collaborative;
   a) Brian Kemp (CVFC)
5) two persons representing farmer's watershed alliances in the State;
   a) Paul Doton (CRWFA)
   b) Scott Magnan; (FWA)
6) a representative of the Natural Resources Conservation Council;
   a) Jill Arace (VACD)
7) a representative of the Gund Institute for Environment of the University of Vermont;
   a) Alissa White
8) a representative of the University of Vermont (UVM) Extension;
   a) Joshua Faulkner
9) two members of the Agricultural Water Quality Partnership;
   a) Matt Vaughan (LCBP)
   b) Vicky Drew (NRCS-VT)
10) a representative of small-scale, diversified farming;
   a) Maddie Kempner (NOFA-VT)
11) a member of the Vermont Healthy Soils Coalition
   a) Cat Buxton / Didi Pershouse
12) a person engaged in farming other than dairy farming;
   a) Ed Pitcavage (Philo Ridge Farm)
13) a representative of an environmental organization with a statewide membership that has technical expertise or fundraising experience;
   a) Heather Furman, The Nature Conservancy in Vermont
14) an agricultural economist from a university or other relevant organization within the State;
   a) David Conner, University of Vermont
15) an ecosystem services specialist from UVM Extension; and
   a) Juan Alvez
16) a soil scientist
   a) Meredith Albers (NRCS-VT)

Program vs. Market Mechanism



Public goods
Private decisions
Externalities

Mongabay.com

https://agriculture.vermont.gov/pes

Illustration 1: Description of Practices, Natural Capital, Eco Services and Benefits

Example AG Practices	Example Natural Capital	Example Eco Services	Example Benefits
Cover crops	Native perennial vegetation	Reduce floods	Farmer income
Riparian buffers	Healthy soils	Reduce nutrient loss	Flood resilience
Manure incorporation/injection	Functional wetlands	Retain soils	Water quality
Reduced tillage	Floodplains & riparian areas	Sequester carbon	Climate mitigation
Crop rotation		Improve yields	Climate resilience

Existing programs pay for this	*We want to invest in this*	*We want to value these*	*We want these results*

Working Group Charge

1. a recommended payment for ecosystem services approach the State should pursue that benefits water quality, flood resilience, and climate stability, including ecosystem services to prioritize and capital or funding sources available for payments;
2. a recommended definition of healthy soils, a recommended method or systems for measuring soil health and other indicators of ecosystem health, and a recommended tool for modeling and monitoring soil health;
3. a recommended price, supported by evidence or other justification, for a unit of soil health or other unit of ecosystem service or benefit provided;
4. proposed eligibility criteria for persons participating in the program;
5. proposed methods for incorporating the recommended payment for ecosystem services approach into existing research and funding programs;
6. an estimate of the potential future benefits of the recommended payment for ecosystem services approach, including the projected duration of the program;
7. an estimate of the cost to the State to administer the recommended payment for ecosystem services approach; and
8. proposed funding or sources of funds to implement and operate the recommended payment for ecosystem services approach.

Work Planning

Work calendar:

- 2 more meetings this spring
- Mid-summer update meeting on progress on research topics
- 3 meetings in fall, culminating in report to Legislature

Given the charge outlined by the Legislature, share your feedback on priorities to lean into, issues or research questions to be addressed to accomplish this goal, or other considerations to ensure we meet this charge

... we will use your feedback to inform a workplan that we will share with you at next meeting

CBI
CATALYZING COLLABORATION

CURRENT RESEARCH RELATED TO PES WG

Title	Principle Investigators	Timeframe	Value	Description	Relevance to PES WG
Future of Work at the Human-Technology Frontier	University of Vermont and University of South Dakota	Jan 2021 – Dec 2024	$3 m	This project will use real farms in South Dakota and Vermont as living laboratories for developing and testing new precision agriculture tools (intelligent decision support system), sensor driven performance-based incentives for implementation of sustainable agriculture practices, and workforce training initiatives that can enhance farm workers' trust and confidence in precision agriculture tools	Precision Tools for on-Farm ESG measurement
Vermont Soil Health Investment Trust (NRCS CIG)	John Winsten	Completed	$75K	Helping Vermont farmers move toward greater soil health to deliver ecosystem services and improved financial performance and resilience. Proposed model of a Trust that includes a loan-driven Farm Transformation Fund and a Outcome Fund that can aggregate funding from multiple streams for different ESG.	Framework (skeleton) for multi-ESG PES approach
Managing pasture for health farms and soils across Vermont (NRCS CIG)	Vermont Land Trust, Biological Capital, UVM, UVM Extension	Jan 2021 – Dec 2025	$2.64 m	Implement on-the-ground conservation and evaluate their impact on soil health. Using no-till, compost and soil amendments, non-invasive mechanical soil improvement and rotational grazing, seek to: 1) measure impact on soils and ecosystems; 2) calculate financial cost/benefit; 3) understand social outcomes; 4) predict potential for VT-wide implementation.	Soil Health measures, payments, and programs
Vermont PES for Phosphorus (NRCS RCCP -Alternative Funding Arrangement)	VT Agency for Agriculture, Food and Markets	Jan 2021 – Dec 2025	$7 m	The VPFP Program will use an innovative 'pay-for-performance' approach to compensate farmers for voluntary and verified phosphorus load reductions in agricultural crop fields that exceed phosphorus reductions set by state and federal standards on a farm-by-farm basis. This new and innovative program will build on the existing agricultural water quality clean-up framework and will accelerate the pace of implementation and clean water work occurring with farmers, partners, and the state.	P pricing, PES program design
Linking FarmPREP to TMDL Modeling and Phosphorus Reduction Valuation Analysis	VT Agency for Agriculture, Food and Markets	2020-2022	$250K	(1) Modify FarmPREP to model phosphorus reductions from a modeled TMDL Base Load.(2) Recruit 10-12 farms statewide of diverse sizes and types to input their land management data. (3) Evaluate the opportunity for payments for phosphorus reductions from the TMDL Base Load.	PES Tools for P

Amended Estimated 18-month Working Group Budget 2021-2023

Rec #	Line Item	Value
1a	Travel and Honorarium for non-paid WG members	$ 15,000
1b	Facilitation, coordination, and farmer and public outreach and engagement	$ 75,000
2	Soil health and Ecosystem Services Evidence Based Review	$ 30,000
3b	Comparison and review of existing and emerging tools, real-time monitoring and PES Programs	$ 30,000
4	Research pool for advancing the needed tools to create an evidence-based, innovative multi-ecosystem services approach for VT	$ 50,000
5	Economic valuation study of natural capital, identified ecosystem services, current externalities and identification of potential markets	$ 50,000
	Total	$ 250,000
	**Assumes 18-month budget, starting July 2021 through January 2023*	

VPFP Vermont Pay-For-Phosphorus Program

USDA NRCS Awarded $7million in 2020 to VAAFM to implement the VPFP Program

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Vermont Agency of Agriculture, Food & Markets
Water Quality Division

USDA
Program funded by
United States Department of Agriculture
Natural Resources Conservation Service

Pay-For-Phosphorus is an innovative pay-for-performance approach that pays farmers for the pounds of phosphorus reduced by implementing conservation practices, as opposed to paying farmers a portion of the cost to install a practice.

- **Pays on results** improving cost-effectiveness and accelerating implementation
- **Flexibility for farms** to manage fields how they choose
- **Complements** existing State and Federal assistance programs (e.g. EQIP, FAP)
- **Statewide** voluntary program available to eligible farms
- **Incentive payments** for program enrollment regardless of farm performance

Goals:

- TMDL **reductions** and **stewardship**
- Farmer **buy-in**
- Verifiable, measurable, location-specific **outcomes**
- **Equity** and **Efficiency** of program funding
- **Additionality** of stewardship
- **Sufficiency** of payment

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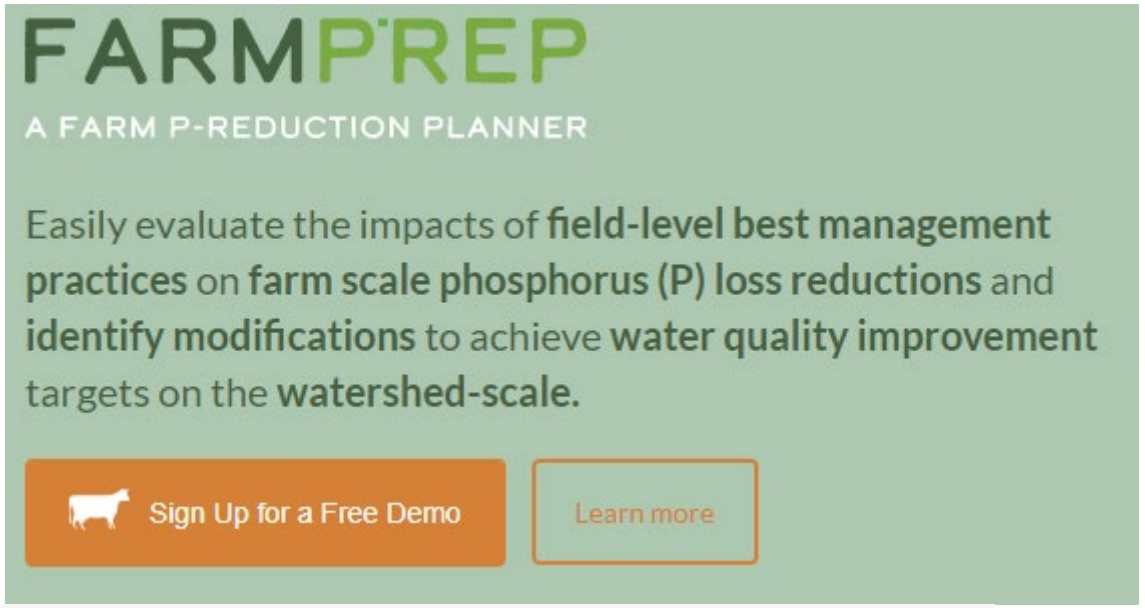
Lake Champlain Basin Program

TECHNICAL REPORT NO. 97

Implementation of a Farm Phosphorus ManagementOptimization Web-based Tool inthe Vermont Portion of the Lake Champlain Basin



Farm Practices Scenario	Total P Reduction from Baseline (%)	Total P Reduction from Current (%)	Total P (lbs/ac)	Soluble P (lbs/ac)	Sediment P (lbs/ac)	Tile P (lbs/ac)	P Input Reduction (%)	Compare
Baseline:			2.67	1.92	0.75	0	0	
Current:	7.24		2.48	1.76	0.72	0	0	

	Total P Reduction from Baseline (%)	Total P Reduction from Current (%)	Total P (lbs/ac)	Soluble P (lbs/ac)	Sediment P (lbs/ac)	Tile P (lbs/ac)	P Input Reduction (%)
F1_Corn	13.76		4.01	2.52	1.49	0	0
F2_Corn	0		3.55	2.71	0.85	0	0
F3_Hay	0		0.49	0.36	0.13	0	0
F4_CornHay	0		1.62	1.39	0.22	0	0
F5_CornHay	0		1.62	1.3	0.32	0	0

Pay-for-Performance Program Overview

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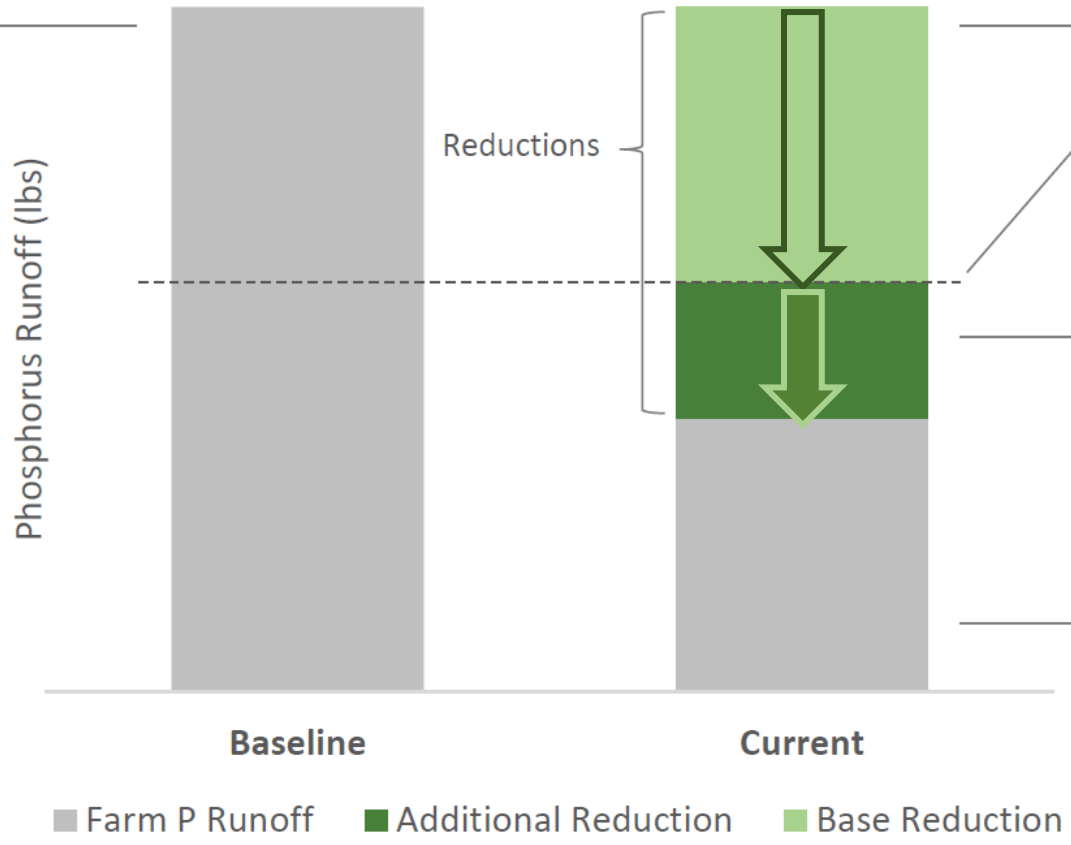
Base Farm P Runoff will be modeled based on historic TMDL management scenarios and will act as the baseline from which P runoff reductions are calculated.

Reductions can be achieved via improved nutrient management or conservation practices.



Base Reductions / Threshold corresponds to the P reductions that are estimated to be met based on TMDL assumptions.

Additional Reductions beyond the threshold will be paid through the VPFP program based on a set price per pound of P.

Current Farm P Runoff based on a farm's current management.

Year-by-Year Timeline

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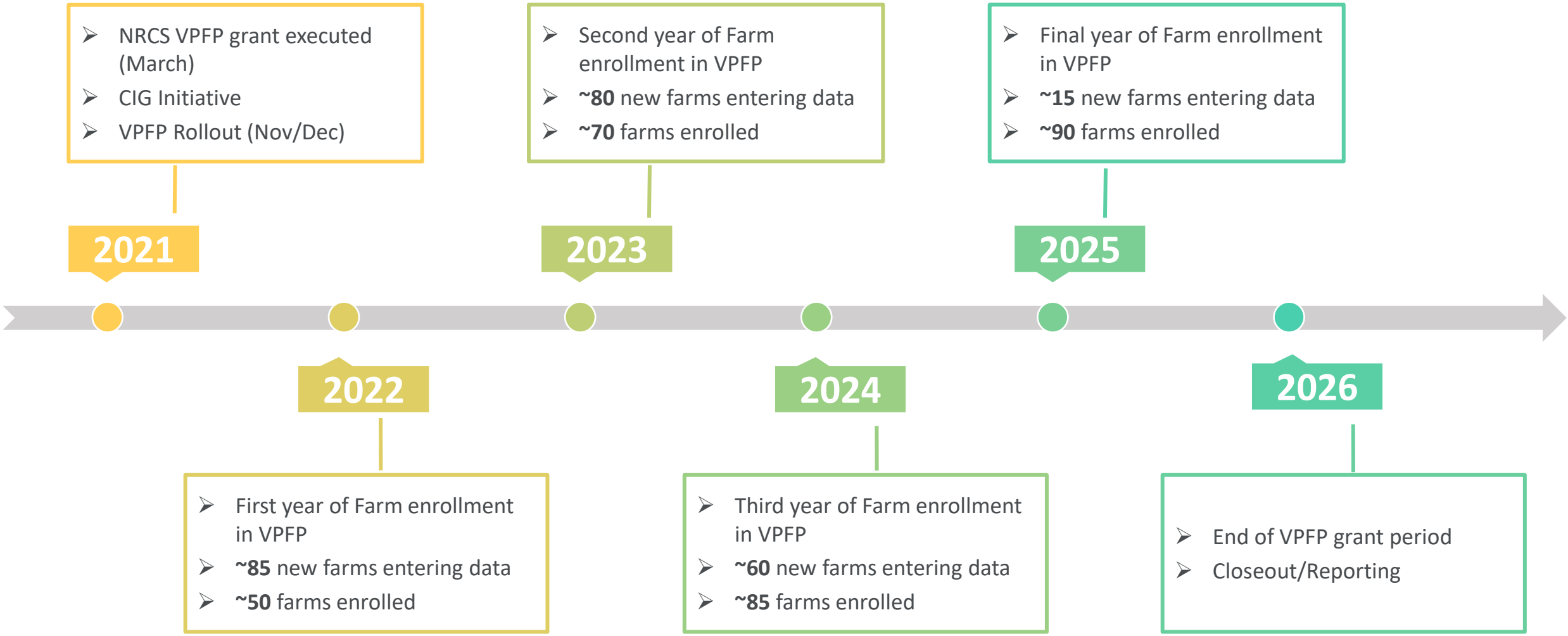

AAFM Pay-for-Performance webpage:

https://agriculture.vermont.gov/vpfp

Contact:

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802-272-0323 | Ryan.Patch@Vermont.gov