

# Vermont Clean Water Initiative

## Phosphorus Tracking & Accounting Methods

To: House Committee on Environment

From: Emily Bird & Claire Madden, VT Department of Environmental Conservation

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# Clean Water Project Phosphorus Accounting Methods

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# Outline

- Background and context
- Approach to tracking & accounting
- Practice specific accounting methods

# Tracking, Accounting, and Reporting

- Accountability requirements established by Vermont Clean Water Act (Act 64 of 2015)
- Transparency on progress under the Clean Water Service Delivery Act (Act 76 of 2019)
- Basin specific reporting to show how Vermont's regulatory and non-regulatory programs are driving progress towards achieving the phosphorus reduction targets in the Lake Champlain and Lake Memphremagog TMDLs





**Investment** measures show how Vermont invests in clean water projects from identification and planning through design, implementation, and maintenance.



**Education** measures summarize outreach and technical assistance to support, identify, develop, and maintain clean water projects.

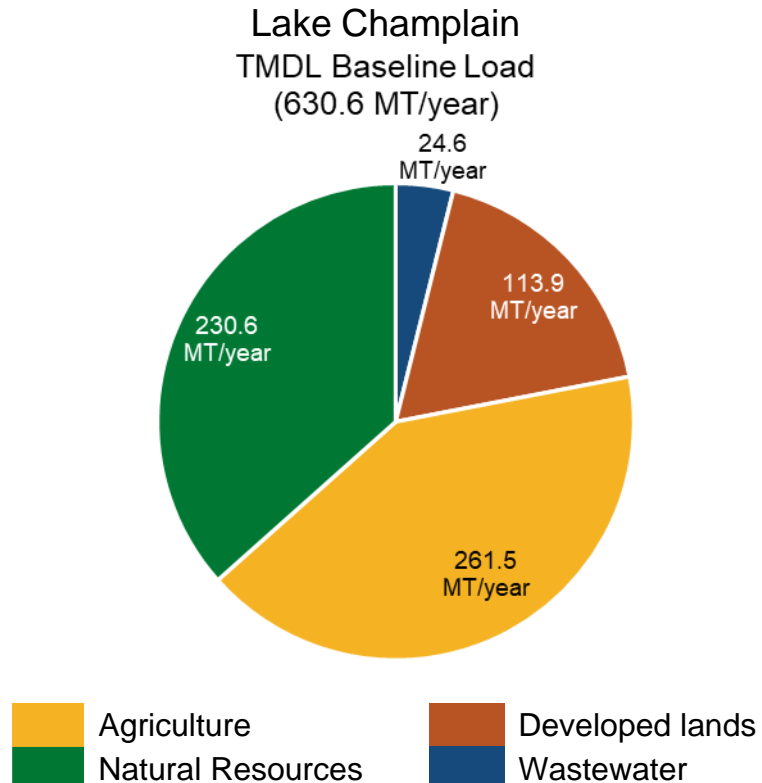


**Project output** measures quantify the results of clean water projects.



**Pollutant reduction** measures are estimated nutrient load reductions achieved by clean water projects.

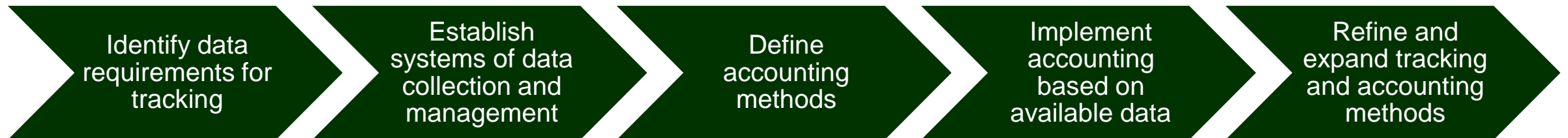
# TMDL Modeling



- TMDL modeling established baseline load & targets
- Soil & Water Assessment Tool (SWAT) modeling established land use loading rates (kg/acre/year)
- Scenario Tool developed based on SWAT modeling to demonstrate targets set by TMDL are achievable based on universe of project opportunities
- BMP Accounting & Tracking Tool (BATT) established practice efficiency for some agricultural and stormwater BMPs
- Standard Operating Procedures for Tracking & Accounting formalize accounting methods and expand on BATT

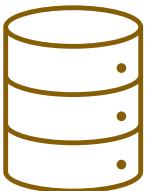
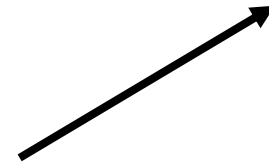
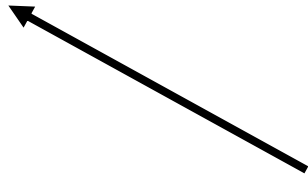
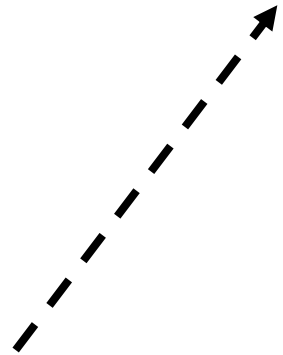
# TMDL Tracking & Accounting

- **Tracking:** collecting, standardizing, and storing data on implemented clean water projects
  - Ex: project location, land use, design specifications, area treated, etc.
- **Accounting:** estimating nutrient and sediment reductions for clean water projects
  - Ex: land use loading rate \* acres of drainage area \* practice efficiency

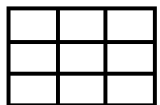




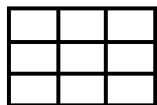
Clean Water Reporting Framework (CWRF) & Centralized BMP Accounting & Tracking Tool (BATT)



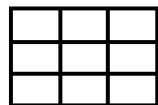
VTDEC Watershed Projects Database (WPD)



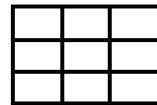
Other ANR Programs



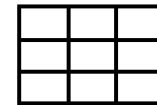
Agency of Transportation



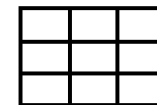
Vermont Housing & Conservation Board



Agency of Administration

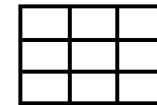


Agency of Commerce & Community Development

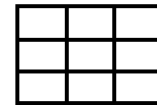


Agency of Agriculture, Food & Markets

Federal Datasets



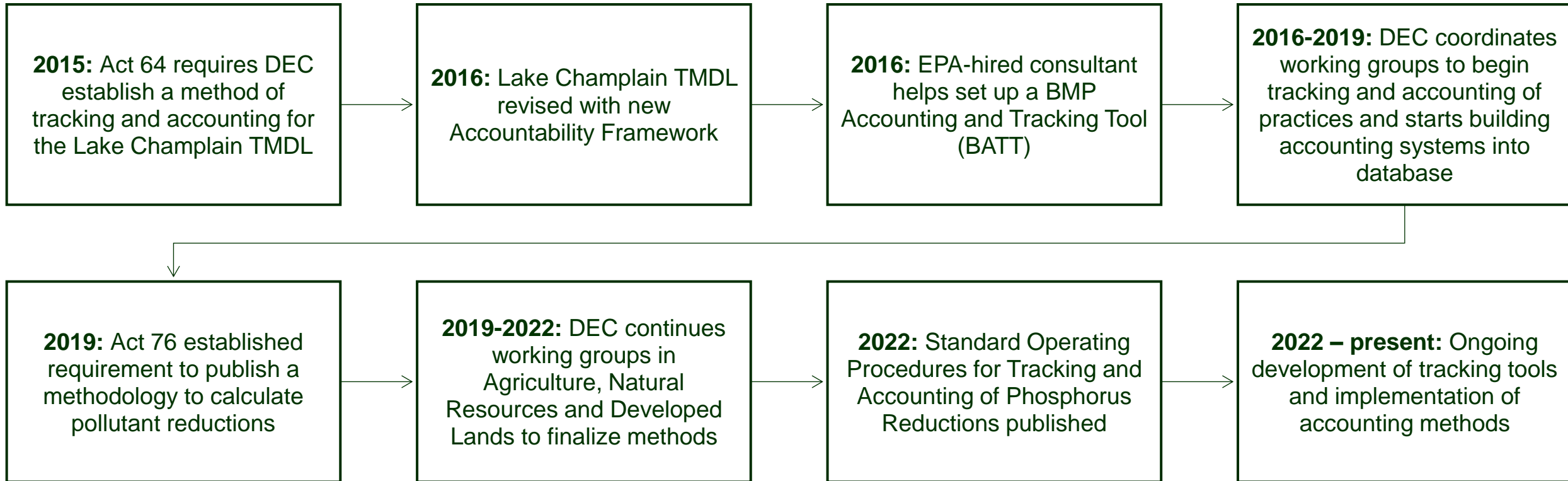
Lake Champlain Basin Program



Natural Resources Conservation Service



# Development and Implementation Process



Documentation of methods can be found on our Tracking and Accounting Website:  
<https://dec.vermont.gov/water-investment/cwi/projects/tracking-accounting>

# Tracking & Accounting Workgroups

- Establish & implement mechanisms for tracking & accounting
  - Tracking - data collection systems
  - Accounting - estimating phosphorus reductions
- Build tools/resources to support effective use of tracking & accounting procedures
  - Trainings, user guides, FAQs
  - Assessment and data collection tools
- Update documentation
  - Review recent scientific research
  - Revise Tracking & Accounting SOPs

## Agriculture

- Review current accounting systems
- Refine methods

## Forests

- Establish assessment & tracking systems
- Refine prioritization & accounting

## Streams & Floodplains

- Operationalize tracking & accounting tools
- Develop supporting guidance for partners

## Developed Lands

- Re-assess loading rates based on new data availability
- Streamline systems for tracking & reporting

LAND USE SECTOR	PROJECT OBJECTIVES	EXAMPLE PROJECTS	
 <b>AGRICULTURE</b>	Reduce pollution by slowing and controlling rain or snowmelt runoff and soil erosion from farm production areas and farm fields		
 <b>STORMWATER</b>	Reduce pollution by slowing and controlling rain or snowmelt runoff from developed lands, such as parking lots, sidewalks, and rooftops		
 <b>NATURAL RESOURCES</b>	Reduce pollution by restoring functions of natural infrastructure — river channels, floodplains, lakeshores, wetlands, and forests		
 <b>TRANSPORTATION RELATED STORMWATER</b>	Reduce pollution by slowing and controlling rain or snowmelt runoff and erosion from roads		
 <b>WASTEWATER</b>	Reduce pollution by improving wastewater infrastructure		



Modeled estimates of phosphorus load reduction following Standard Operating Procedures for Tracking & Accounting

Measured discharges

Sector	Project or Practice Type	Status of Phosphorus Accounting
Agriculture	Conservation crop rotation	Implemented
	No-till and reduced till	Implemented
	Cover crop	Implemented
	Crop to hay planting	Implemented
	Manure injection	Implemented
	Manure incorporation	Implemented
	Grazing management	Implemented
	Agricultural riparian buffer	Implemented
	Grassed waterways and filter strips	Implemented
	Livestock exclusion	Implemented
	Production area compliance	Implemented (regulatory only)
	Nutrient management	Implemented
	Easements with water quality protections	Not yet established
Gully erosion in agricultural settings	Not yet established, in progress	
Stormwater	Structural stormwater treatment	Implemented
	Non-structural stormwater treatment	Implemented (regulatory only)
	Outlet and gully stabilization	Implemented
	Tree canopy expansion	Implemented
	Native revegetation ('no-mow zones')	Implemented
Transportation Related Stormwater	Public road erosion remediation (MRGP and TS4)	Implemented
	Private road erosion remediation	Not yet fully implemented, in progress
Natural Resources	Forested riparian buffer	Implemented
	Bioengineered lakeshore stabilization	Implemented
	Forest road & trail erosion remediation	Not yet fully implemented, in progress
	Use Value Appraisal program enrollment	Implemented
	Floodplain and stream restoration	Not yet fully implemented, in progress
	River corridor easements	Not yet fully implemented, in progress
	Wetland restoration	Not yet fully implemented, in progress
	Wetland easements	Not yet fully implemented, in progress
Land conservation easements	Not yet established	
Wastewater	Wastewater treatment facility (WWTF) upgrades	Measured discharges from permitted WWTFs
	Private wastewater system upgrades	Not yet established
	Combined sewer overflow (CSO) abatement	Not yet established

# Agriculture – Field Practices

*Derived from TMDL modeling – based on land use, slope, soil type*

Baseline phosphorus loading rate (kg/acre/year)



Area treated (acres)

*Tracked as a data input*



Phosphorus load (kg/year)

*Calculated via CWRP*

Phosphorus load (kg/year)



BMP phosphorus reduction efficiency (%)



Estimated phosphorus reduction (kg/year)

*Established based on scientific research and/or industry standard (e.g., NRCS)*

*Reported in Clean Water Initiative Annual Performance Report*

# Agriculture – Production Areas



AAFM inspection confirms compliance with Required Agricultural Practices (RAPs)

*Frequency determined by farm size*

Production area (acres)



Farmstead loading rate (kg/acre/year)



Phosphorus load (kg/year)

Phosphorus load (kg/year)



Phosphorus reduction efficiency (%)



Estimated phosphorus reduction (kg/year)

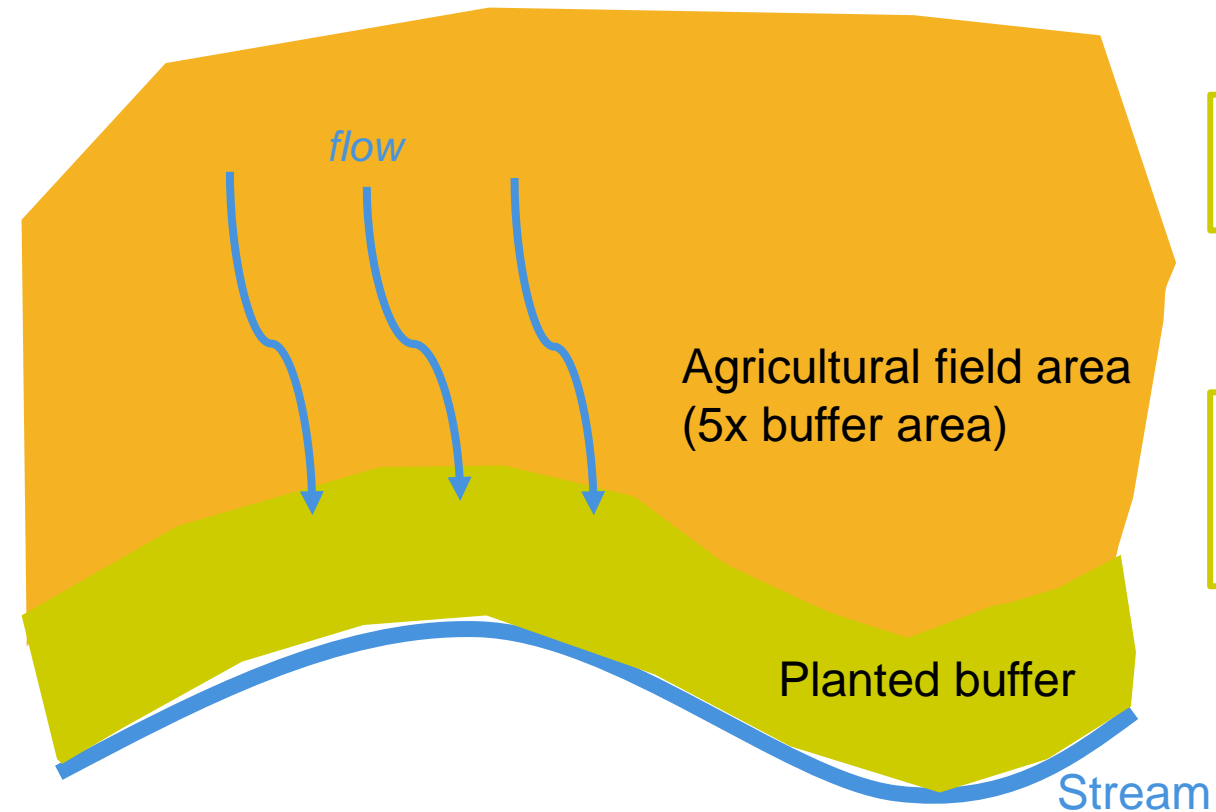
*Reported in Clean Water Initiative Annual Performance Report*

*Quantified during AAFM inspection process*

*Derived from TMDL modeling – based on land use, slope, soil type, farmstead size*

*Established based on scientific research and industry standard (e.g., NRCS)*

# Agriculture – Buffers & Grassed Waterways



Phosphorus load (kg/year)



BMP phosphorus reduction efficiency (%)

*Established based on scientific research and/or industry standard*

Previous land use load (kg/year)



Current land use load (kg/year)



Estimated phosphorus reduction (kg/year)

*Reported in Clean Water Initiative Annual Performance Report*

# Stormwater – Structural BMPs

*Derived from TMDL modeling – based on land use, slope, soil type*

*Acres draining to and treated by the practice, tracked as a data input*

*Calculated via CWRP*

Baseline phosphorus loading rate (kg/acre/year)



Drainage area (acres)



Phosphorus load (kg/year)

Phosphorus load (kg/year)



BMP phosphorus reduction efficiency (%)



Estimated phosphorus reduction (kg/year)

*Established based on scientific research and/or industry standard (EPA), varies by practice type, storage volume, and infiltration rate*

*Reported in Clean Water Initiative Annual Performance Report*



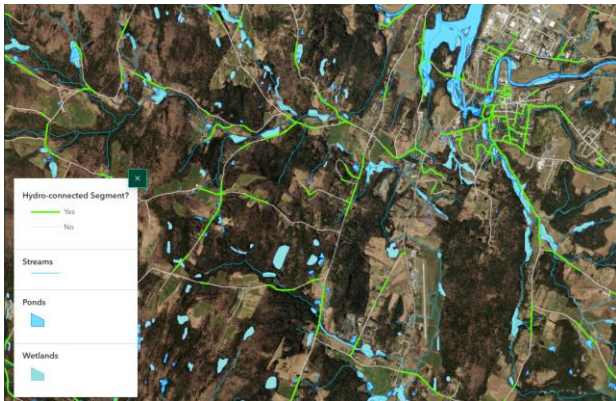
# Transportation Related Stormwater



MRGP Road Erosion Inventory (REI) determines segment score based on permit standards/suite of BMPs:

- Does not meet
- Partially meets
- Fully meets

Hydrologically connected segments prioritized for improvements



*Derived from TMDL modeling – adjusted based on road type, slope, baseline segment score*

Baseline phosphorus loading rate (kg/km/year)

*Collected via REI*

Segment length (km)

*Calculated via CWRP*

Phosphorus load (kg/year)

Phosphorus load (kg/year)

Phosphorus reduction efficiency (%)

Estimated phosphorus reduction (kg/year)

*Based on change in segment score with implementation of suite of BMPs, derived from VT specific study (Wemple & Ross, 2015)*

*Reported in Clean Water Initiative Annual Performance Report*

# Natural Resources – Forestry

## Use Value Appraisal (Current Use)

Baseline phosphorus load (kg/acre/year)

Derived from TMDL



Enrollment (acres)

Acres enrolled and inspected for compliance with Acceptable Management Practices (AMPs) are tracked in FPR database



Phosphorus load (kg/year)

Calculated via CWRP

Phosphorus load (kg/year)



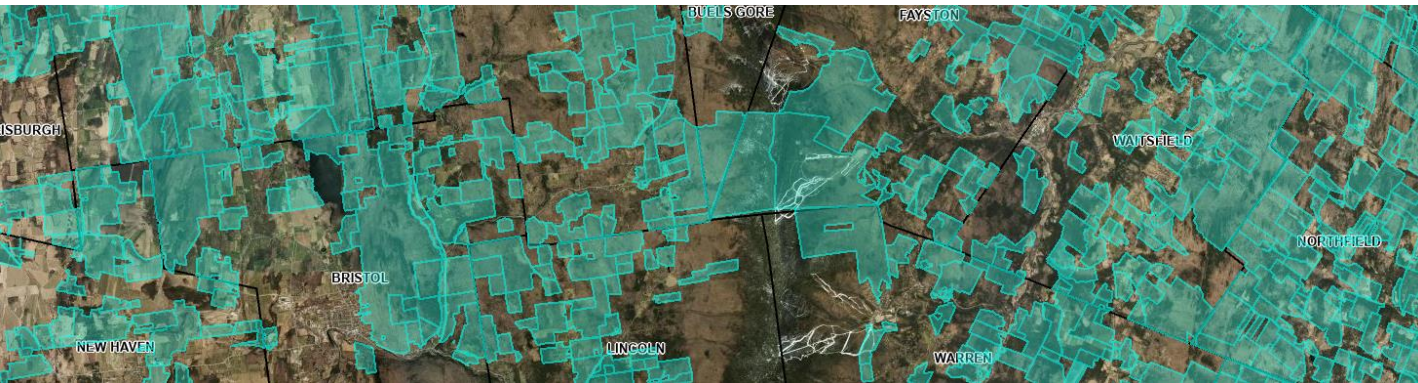
Phosphorus reduction efficiency (%)

Established based on scientific research and industry standard (e.g., Chesapeake Bay Program)



Estimated phosphorus reduction (kg/year)

Reported in Clean Water Initiative Annual Performance Report



# Natural Resources – Forestry

## Forest Roads & Trails

Forest Road Erosion Inventory (REI) determines segment score based on compliance with AMP standards:

- Does not meet
- Partially meets
- Fully meets



Hydrologically connected segments prioritized for improvements



*Derived from TMDL modeling – adjusted based on road type, slope, baseline segment score*

Baseline phosphorus loading rate (kg/km/year)

*Collected via REI*

Segment length (km)

*Calculated via CWRP*

Phosphorus load (kg/year)



Phosphorus load (kg/year)

Phosphorus reduction efficiency (%)

Estimated phosphorus reduction (kg/year)



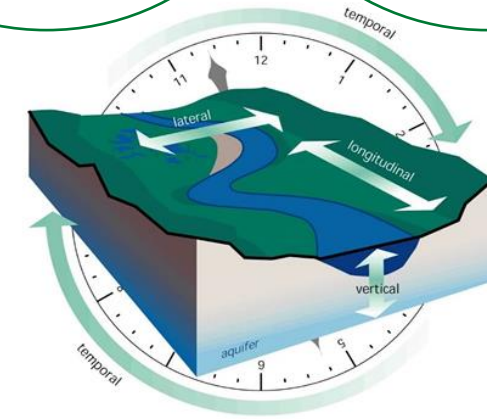
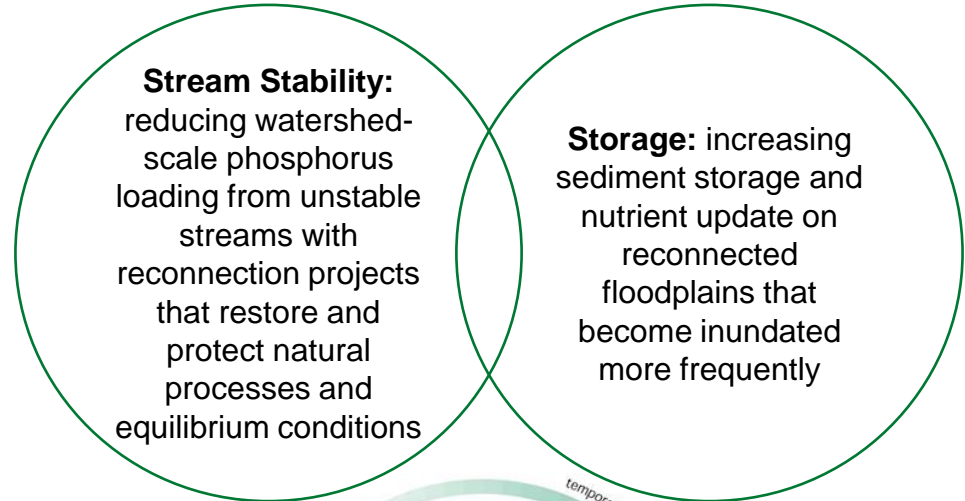
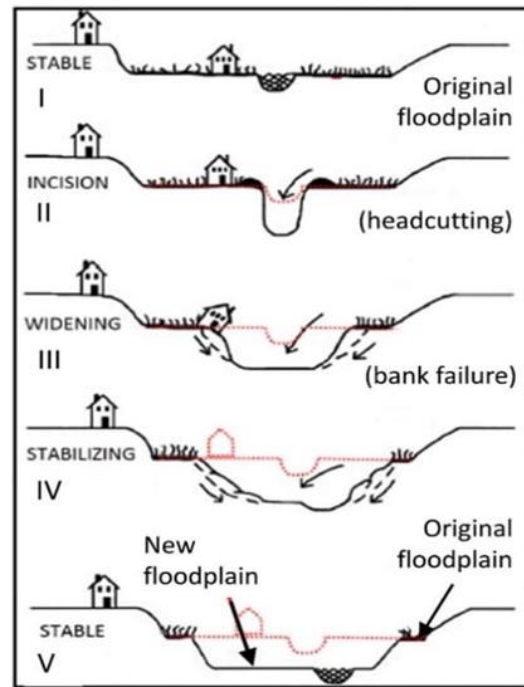
*Based on change in segment score with implementation of suite of AMPs, adapted from MRGP (Wemple & Ross, 2015)*

*Reported in Clean Water Initiative Annual Performance Report*

# Natural Resources – Floodplains & Streams

Baseline phosphorus load (kg/year)

Reallocated to segments and structures on mapped rivers based on location/order, gradient, connectivity/departure



# Tools & Resources

- [Standard Operating Procedures for Tracking & Accounting](#)
  - [Agriculture](#)
  - [Natural Resources](#)
  - [Developed Lands](#)
- [Clean Water Project Data Reporting Standards](#)
- Practice specific guidance (under development)
- Recorded trainings
- [Guide to Phosphorus Accounting Eligibility](#)
- [Interim Phosphorus Reduction Calculator Tool](#)
- [Functioning Floodplains Initiative Web Application](#)
- Forest Roads & Trails Assessment Protocol in Survey123 (pilot)
- Private Residential Road Assessment Protocol (under development, expected 2027)
- Wetland phosphorus retention web tool (under development, expected 2028)

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	No-till and reduced till	Implemented
	Cover crop	Implemented
	Crop to hay planting	Implemented
	Manure injection	Implemented
	Manure incorporation	Implemented
	Grazing management	Implemented
	Agricultural riparian buffer	Implemented
	Grassed waterways and filter strips	Implemented
	Livestock exclusion	Implemented
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	Nutrient management	Implemented
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Transportation Related Stormwater	Public road erosion remediation (MRGP and TS4)	Implemented
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Natural Resources	Forested riparian buffer	Implemented
	Bioengineered lakeshore stabilization	Implemented
	<b>Forest road &amp; trail erosion remediation</b>	<b>Not yet fully implemented, in progress</b>
	Use Value Appraisal program enrollment	Implemented
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