Vermont Lake Champlain Phosphorus TMDL Phase I Implementation Plan

The Vermont Department of Environmental Conservation (VDEC) staff prepared the slides contained in this presentation to describe the policy commitments contained in the Lake Champlain Phosphorus TMDL Phase I Implementation Plan. The Plan was submitted to the U.S. Environmental Protection Agency on May 29, 2014.

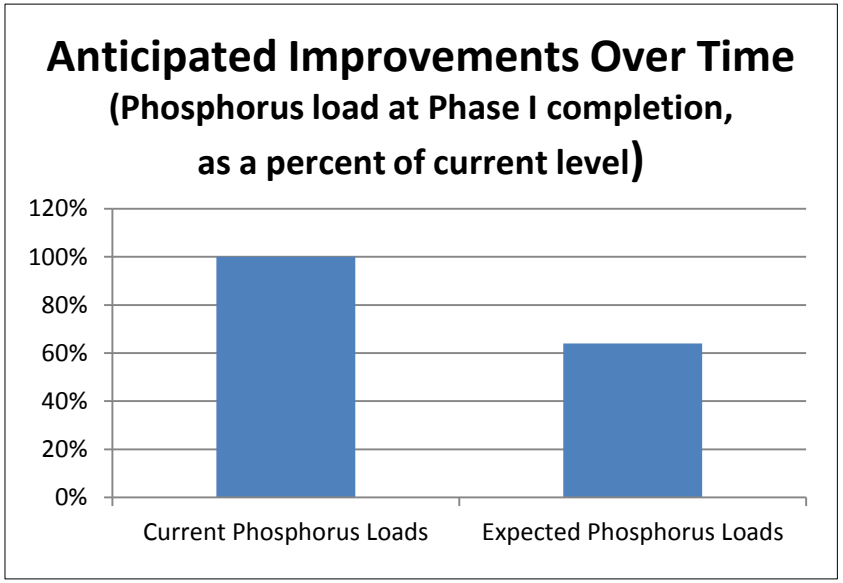
Data contained in this presentation came from a variety of sources and agencies. Some of the data are preliminary, undergoing review, and thus, are subject to possible change.

VERMONT
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

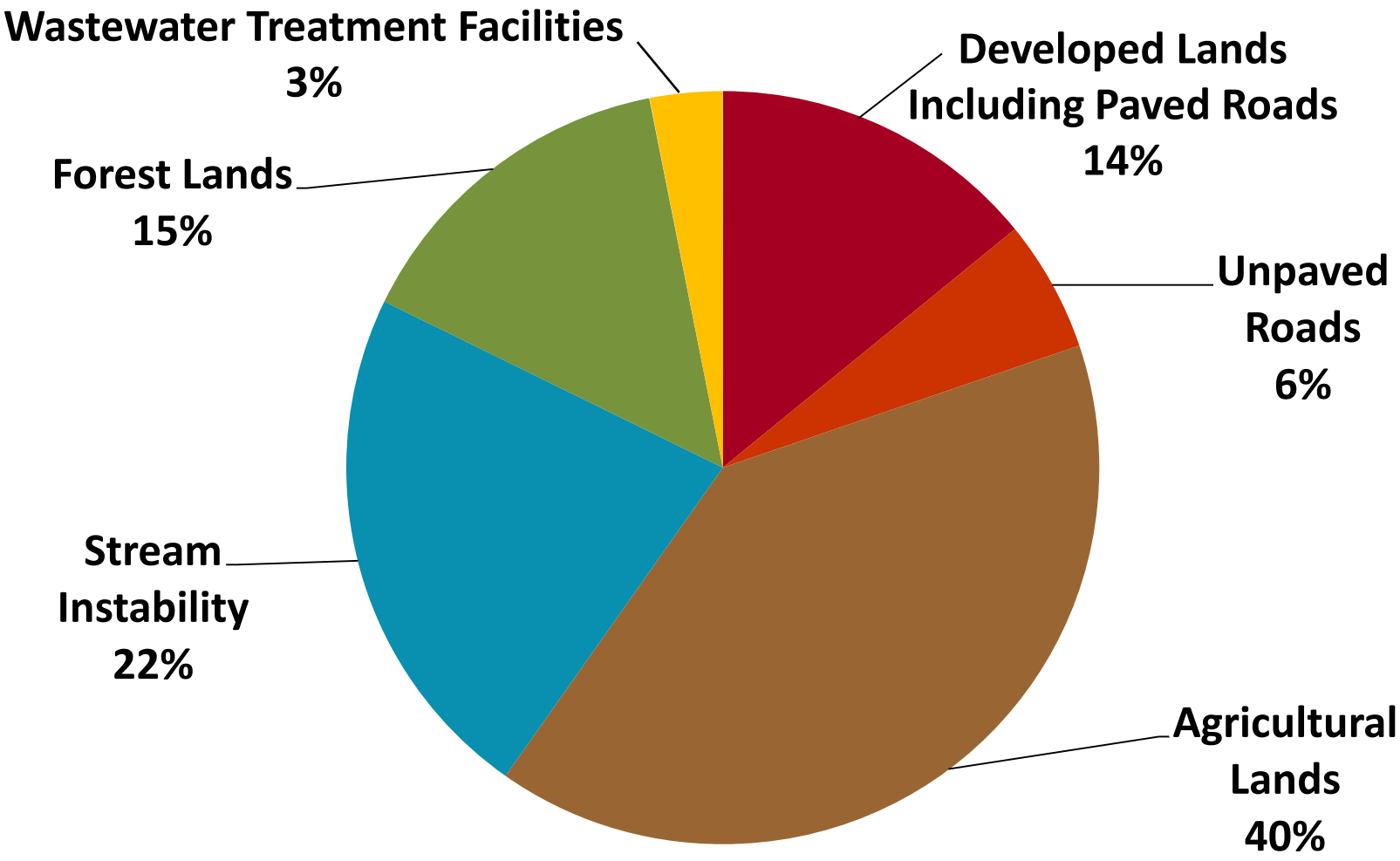
Expected Outcomes from the TMDL Phase I Plan

Summary of Phase I Plan

- Plan expected to reduce phosphorus loading by 36% over 20 years to meet State Water Quality Standards
- Plan targets major source areas using cost-effective actions

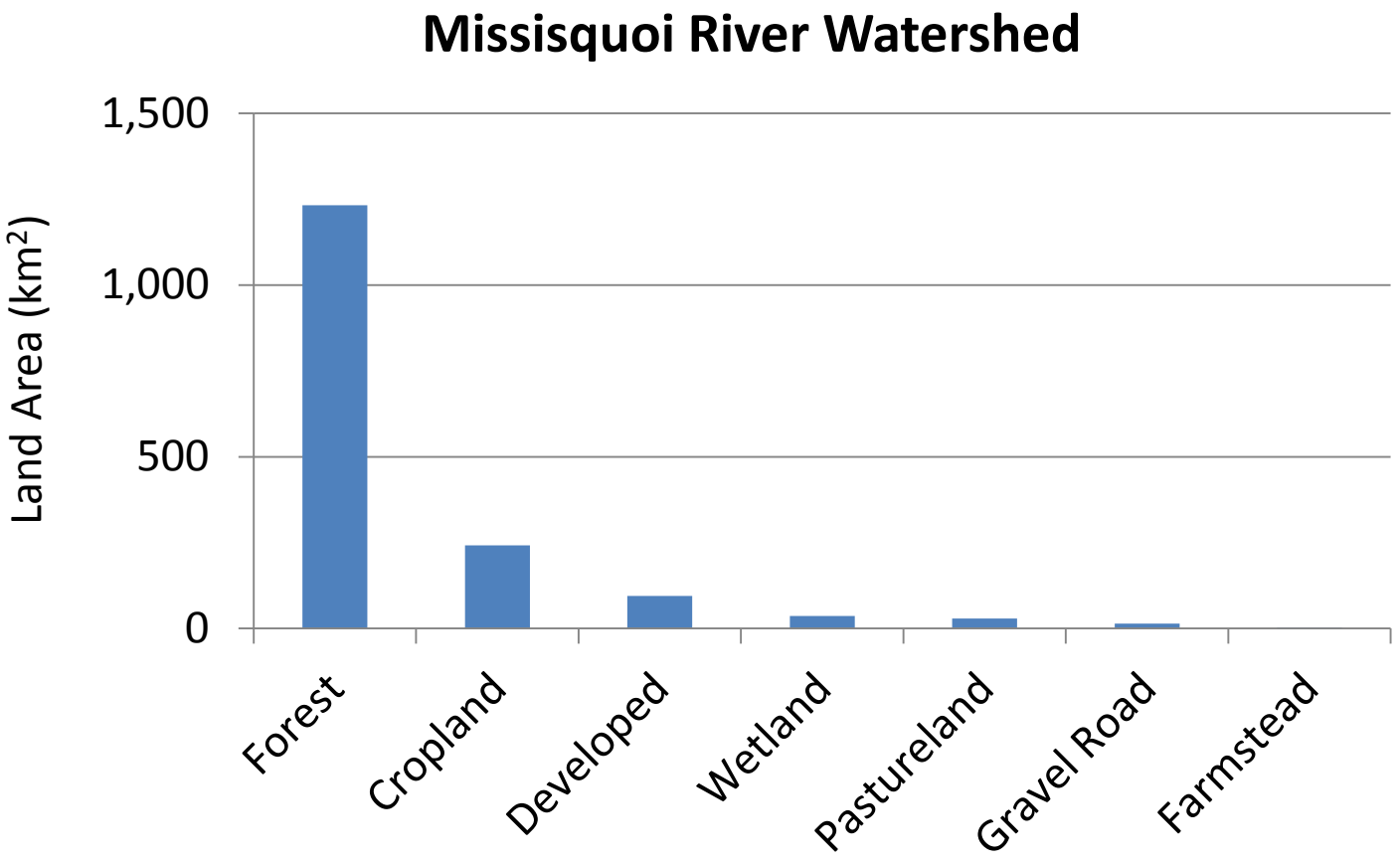


Phosphorus Sources in the Vermont Portion of the Lake Champlain Basin

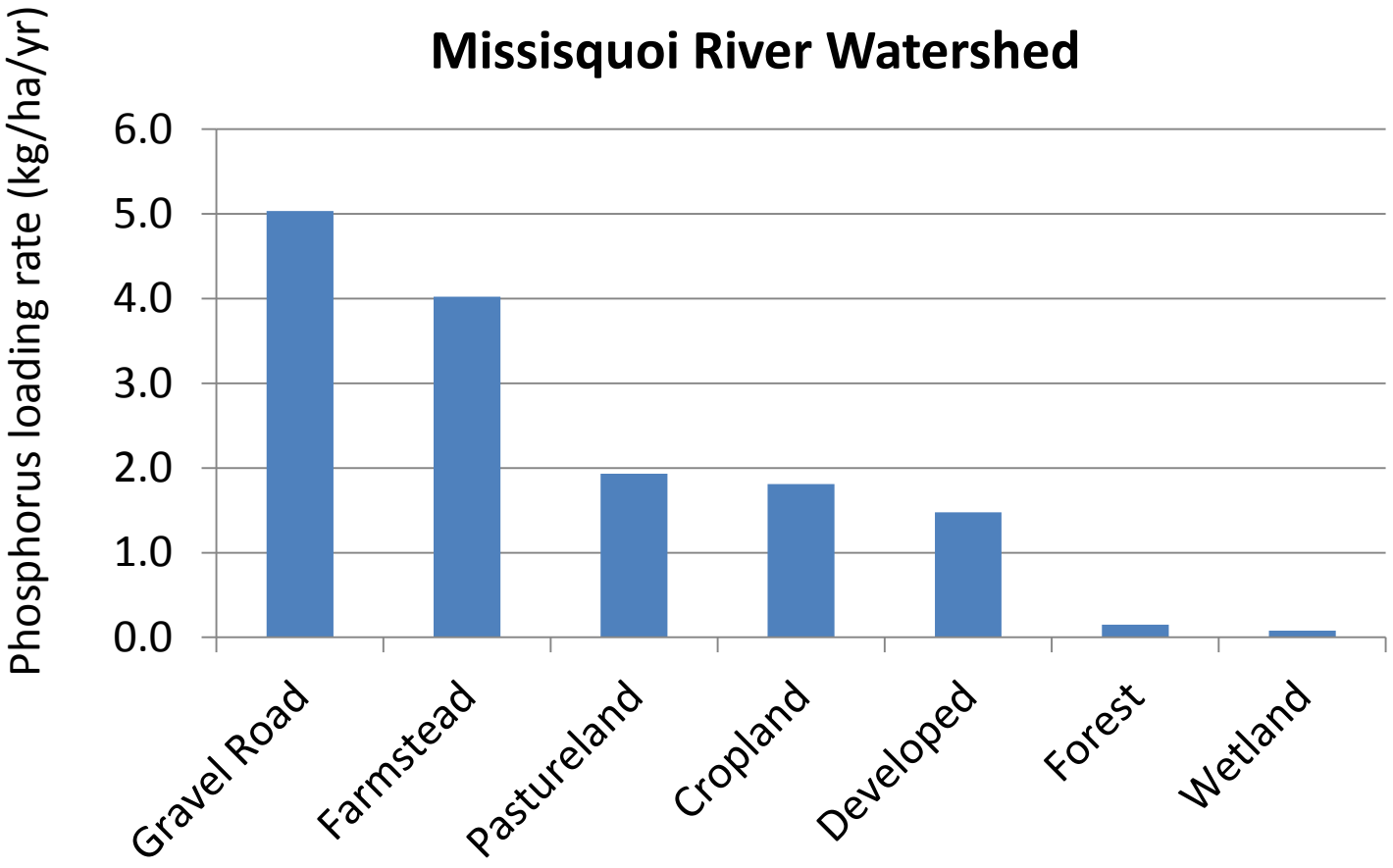


EPA, 2013

Watershed Land Area of Land Use Categories



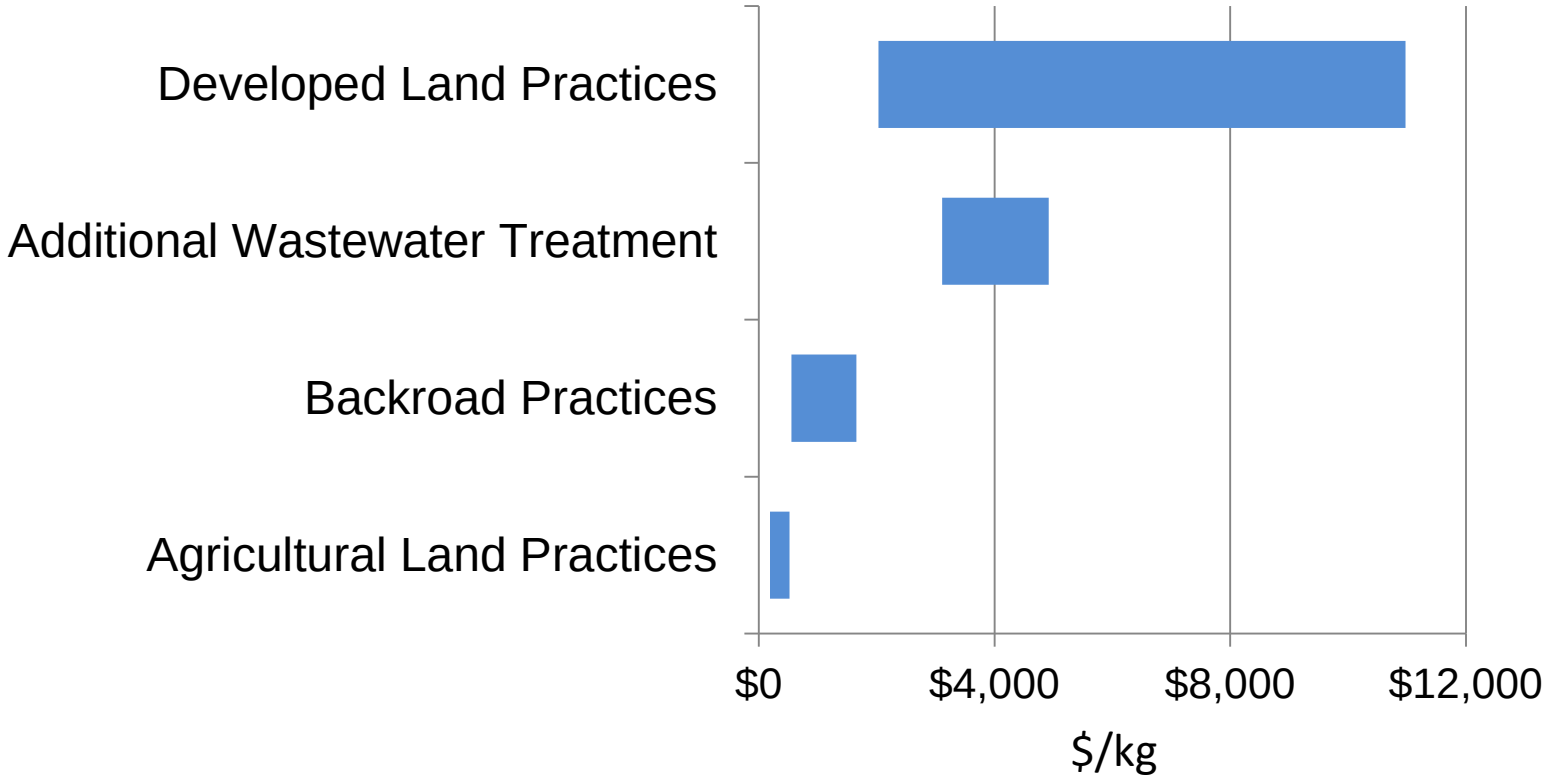
TMDL Plan's Strategic Focus is based on Relative Ranking of Critical Sources of Phosphorus (per unit of land area)



EPA, 2013

Relative Cost-Effectiveness of Actions by Source

Range of Annualized Cost
(per kilogram of Phosphorus Reduced)

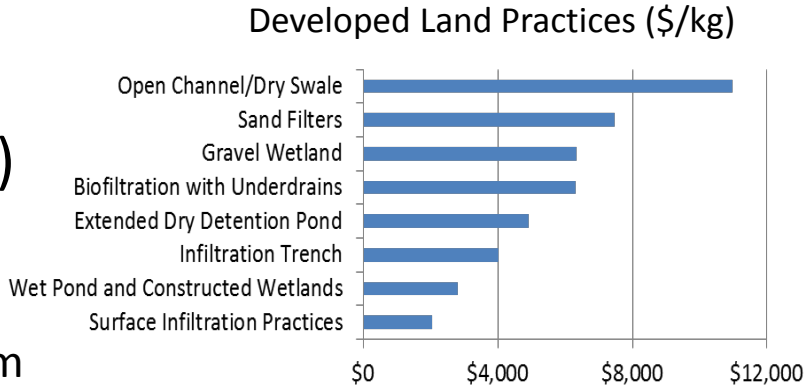


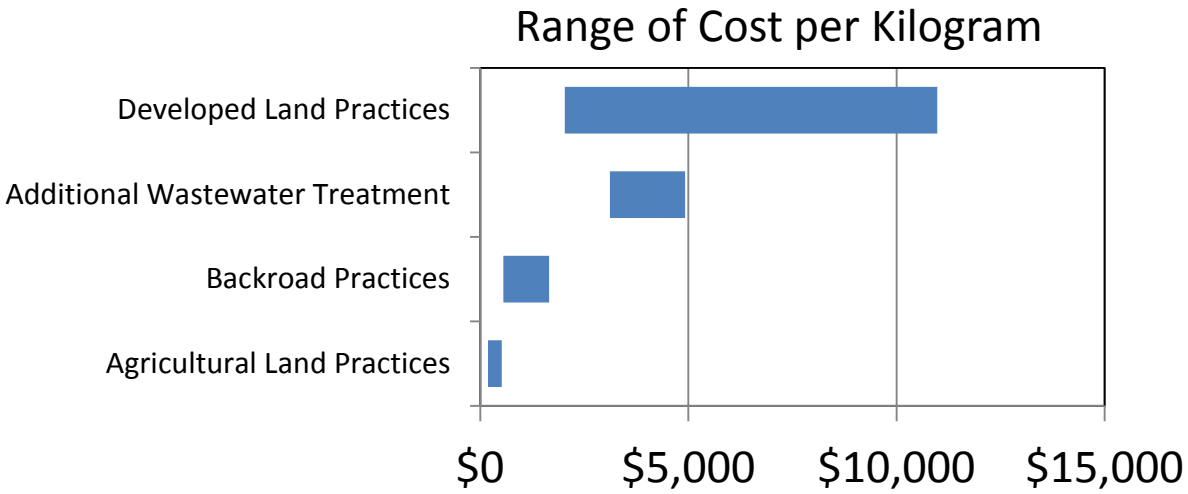
EPA, 2014; VTDEC, 2014

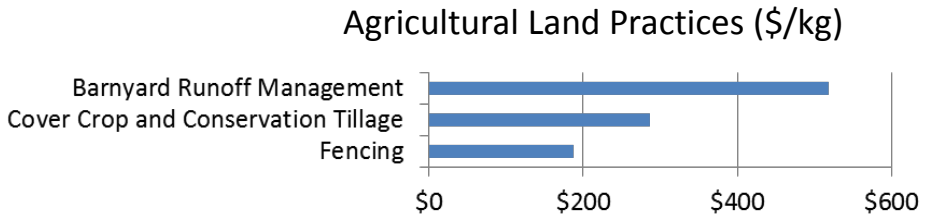
Relative Cost-Effectiveness of Actions by Source

Annualized Cost

(per kilogram of Phosphorus Removed)



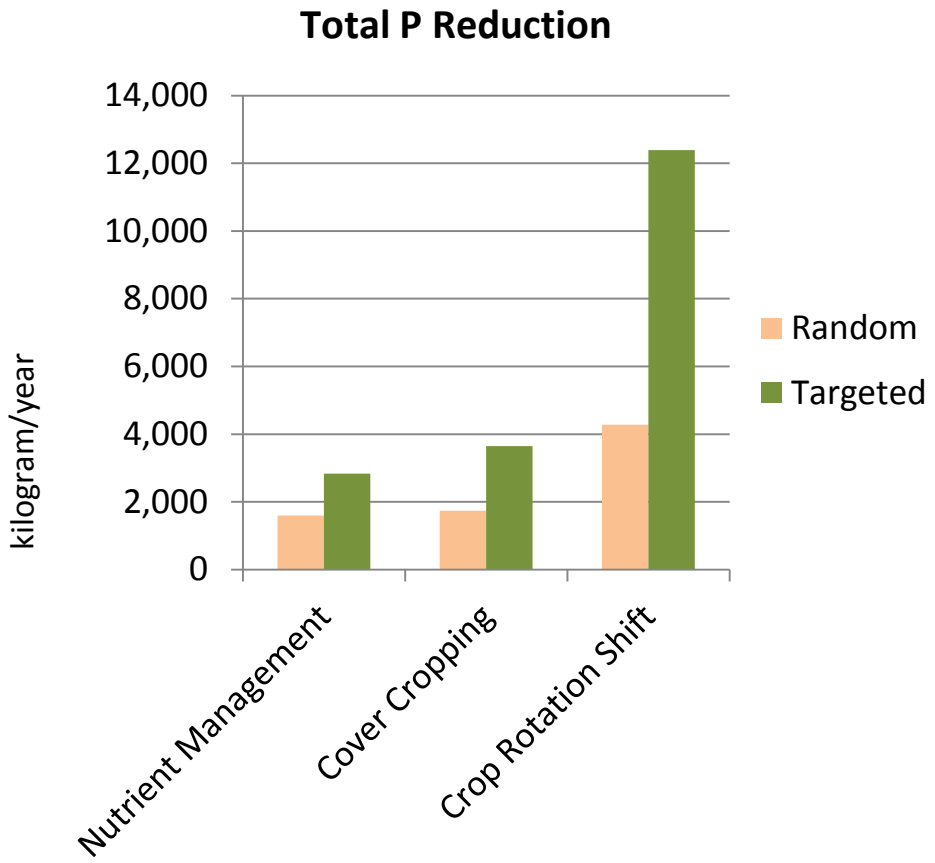




Strategic Investment

Critical Source Area Targeting

Critical Source Area Study in Missisquoi Bay Basin found that program effectiveness increases 1.5 to 3 times with targeting

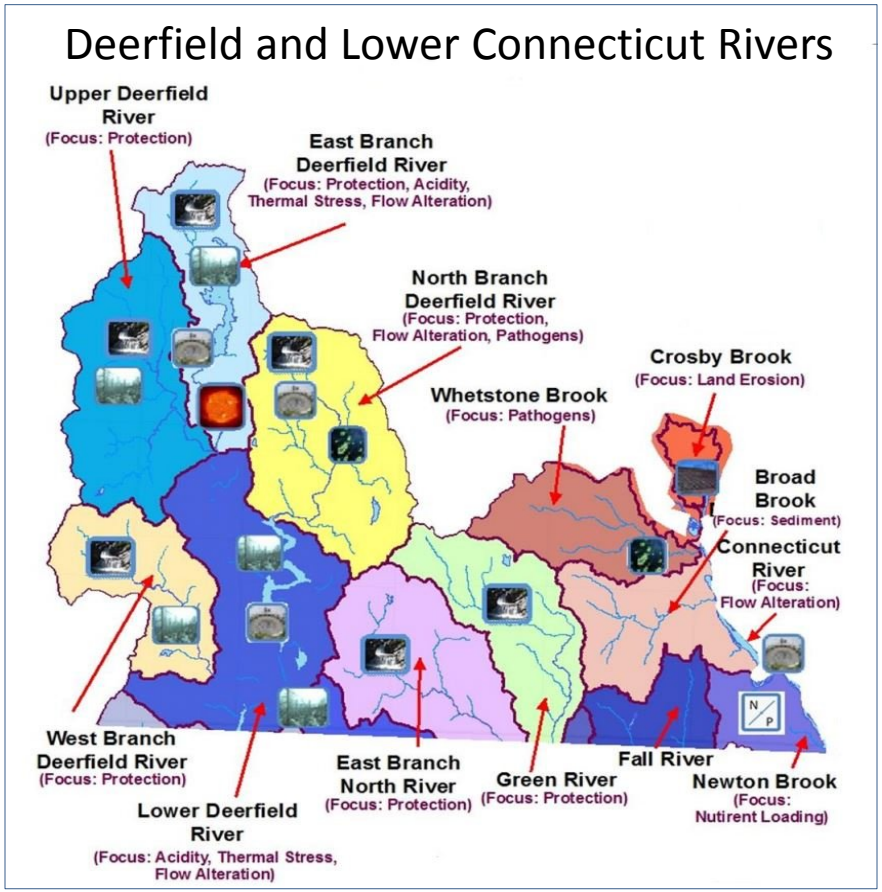


LCBP, 2011

Strategic Investment

Tactical Basin Planning

- Targets priority stressors to restore and protect water quality
- Informed by assessment data



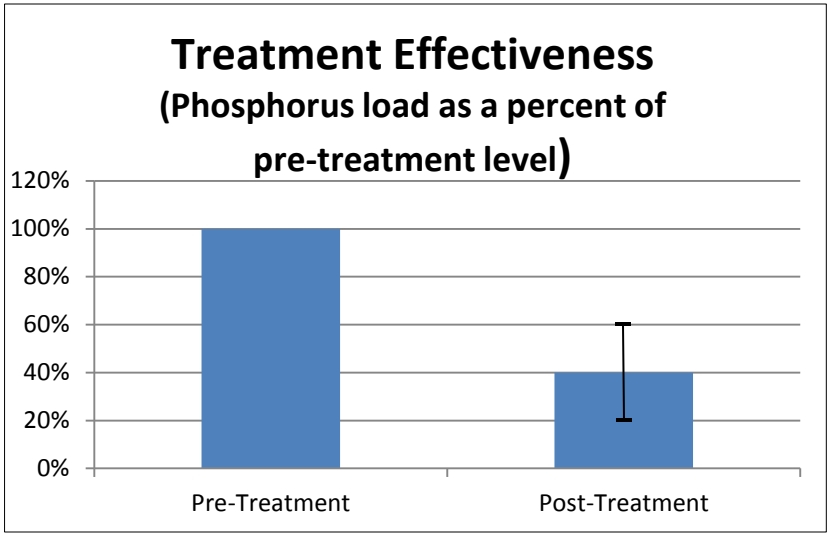
Lake Champlain Phosphorus TMDL
Draft Phase I Implementation Plan

Program Area
Agricultural Programs
Stormwater Management
Rivers Management
Wetlands Management
Lakes Management
Forest Management

Agricultural Programs

Proposed Rule Update: State Accepted Agricultural Practices (AAPs) and Technical Assistance

Example: Increase buffer size and crop rotation



- Achieves 40%-80% reduction in Total Phosphorus
- Estimated project cost = $6,000 (100 acres treated)

Corn crop showing bare soil & no buffer, increasing erosion and phosphorus loading

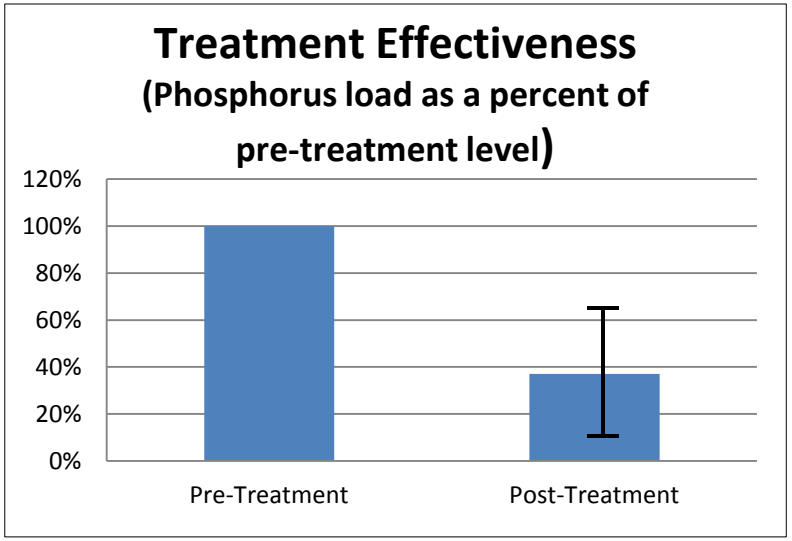
Hay crop & buffer reduce erosion and phosphorus delivery to streams

Agricultural Programs

<u>Proposed Rule Update: State Accepted Agricultural Practices</u>

Example: Grassed waterway to stabilize field gully

- Achieves 35%-90% reduction in Total Phosphorus
- Estimated project cost = $24,000 (2 acres treated)



Gully erosion from concentrated water

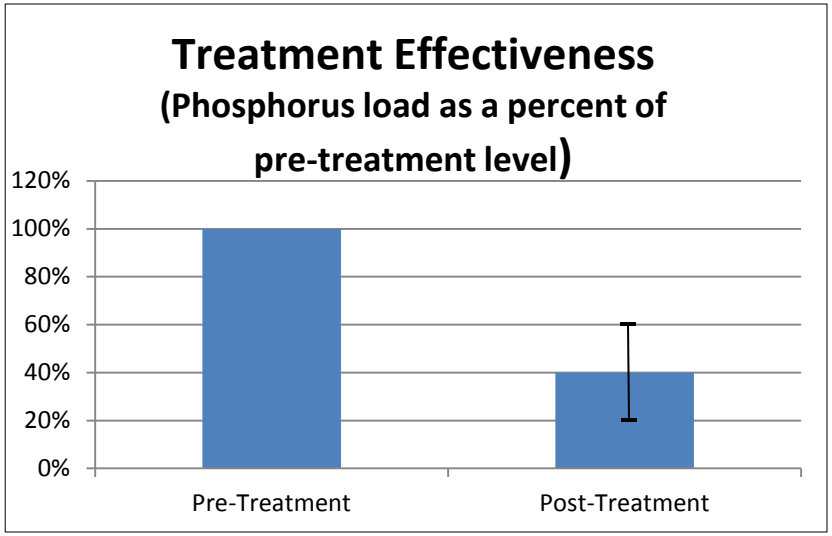
Grassed waterway to prevent gully formation

Agricultural Programs

Proposed Rule Update: State Accepted Agricultural Practices

Example: Livestock Exclusion and Vegetated Buffer

- Achieves 40%-80% reduction in Total Phosphorus
- Estimated project cost = $20,000 (fencing, stream crossing, 1 acre of buffer)



Uncontrolled livestock access to stream

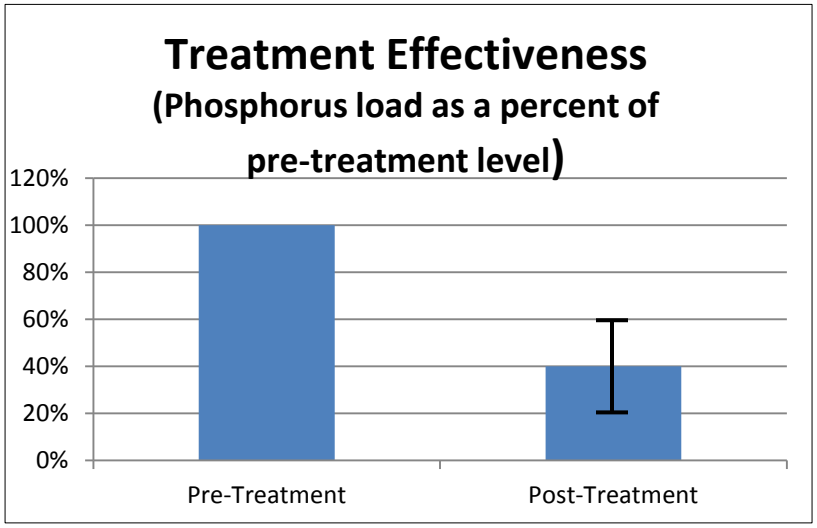
Installation of livestock fencing & buffer

Agricultural Programs

Proposed Rule Update: State Accepted Agricultural Practices

Example: Vegetated buffer on Field and Roadside Ditches

- Achieves 40%-80% reduction in Total Phosphorus
- Estimated project cost = $1,350 (3 acres treated)



Runoff draining into ditch

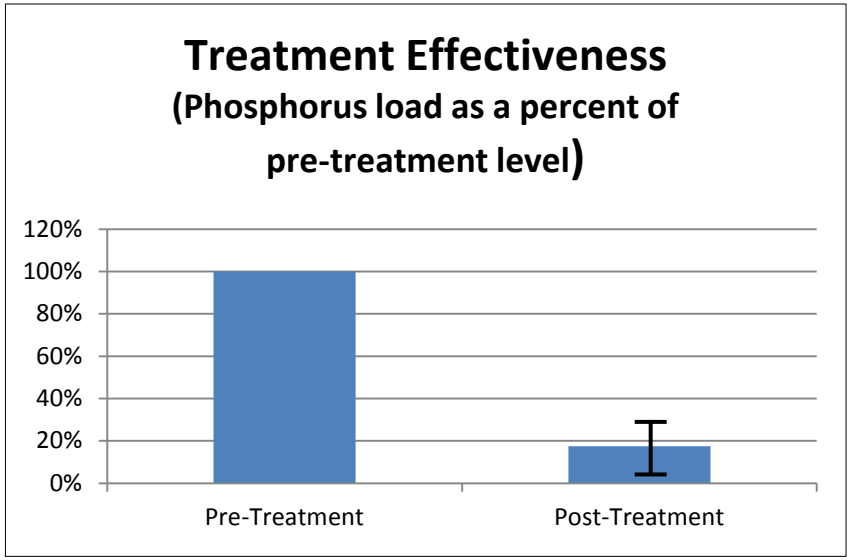
Vegetated buffer along ditch

Agricultural Programs

Technical Assistance: Nutrient Management

Example: Manure Injection

- Achieves 71%-94% reduction in Total Phosphorus
- Equipment price = $250,000
- Estimated project cost = $6,000 (100 acres treated)



Land-applied manure is subject to runoff

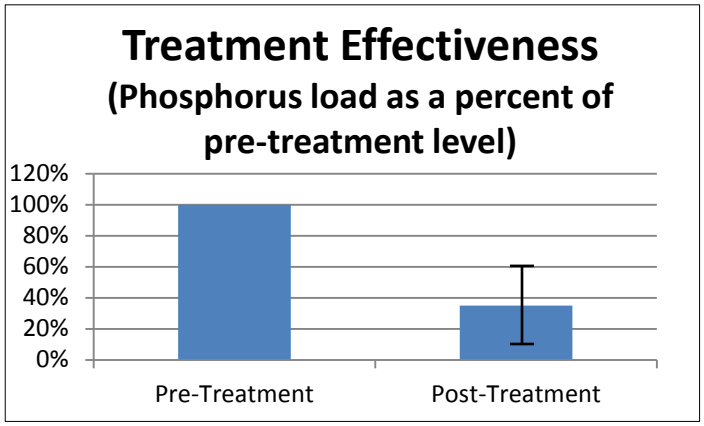
Manure injection reduces runoff

Agricultural Programs

Technical Assistance: Nutrient Management

Example: Cover Cropping

- Achieves 40%-90% reduction in Total Phosphorus
- Estimated project cost = $8,000 (100 acres treated)



Gully formation & runoff on bare soils

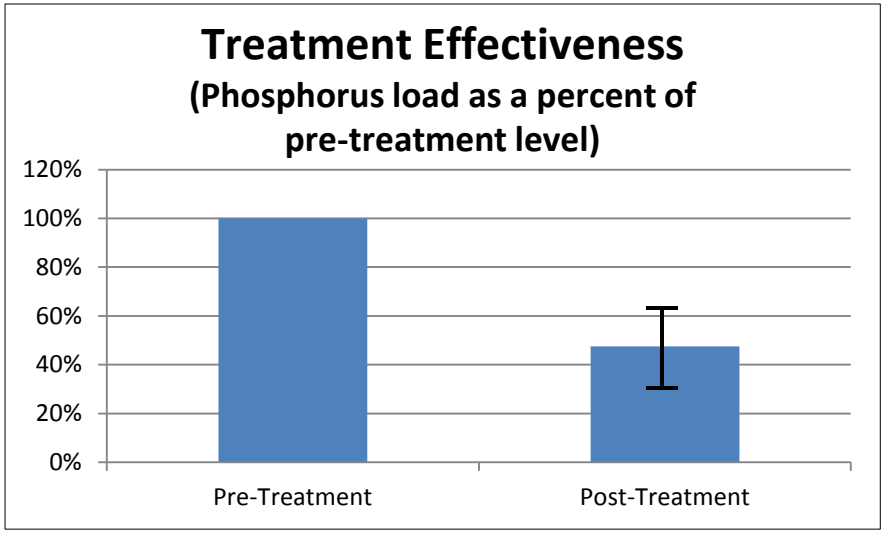
Cover crop protecting soils from weathering

Agricultural Programs

<u>Increase Inspections</u>

Barnyard Runoff Management

- Achieves 35%-70% reduction in Total Phosphorus
- Estimated project cost = $35,000-$50,000



Phosphorus-laden silage leachate discharging to stream

Silage leachate treatment

Agricultural Programs

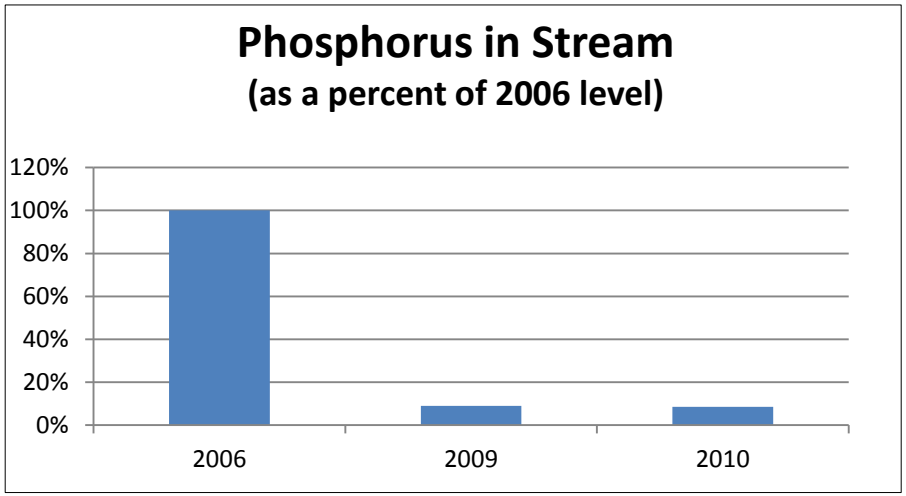
<u>Water Quality Permitting</u>

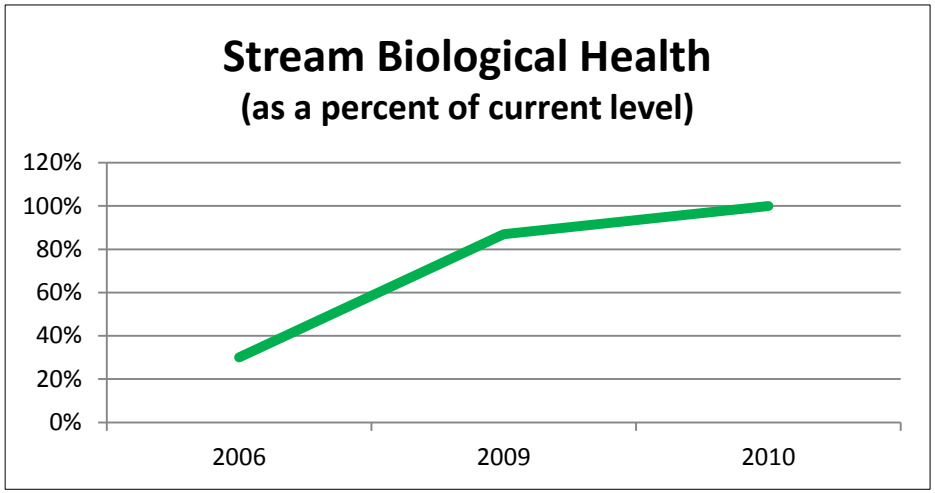
Example: Animal Waste Systems

Crystal Brook, Orleans County

- Replaced failed manure pit with larger, sealed lagoon
- Over 80% reduction in Phosphorus
- Estimated project cost = $70,000-$150,000

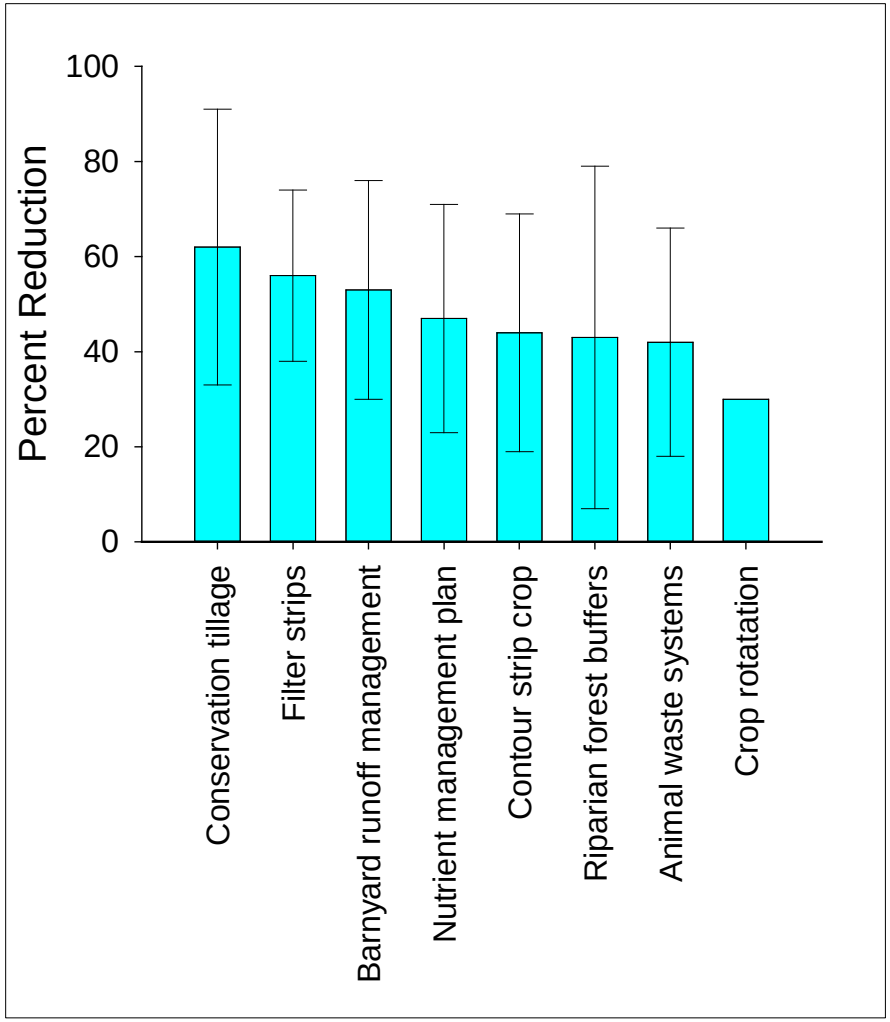
Improved manure storage





Agricultural Programs

Summary: Agricultural Practices Reduce Phosphorus Pollution



Gitau, Gburek, Jarrett, 2005

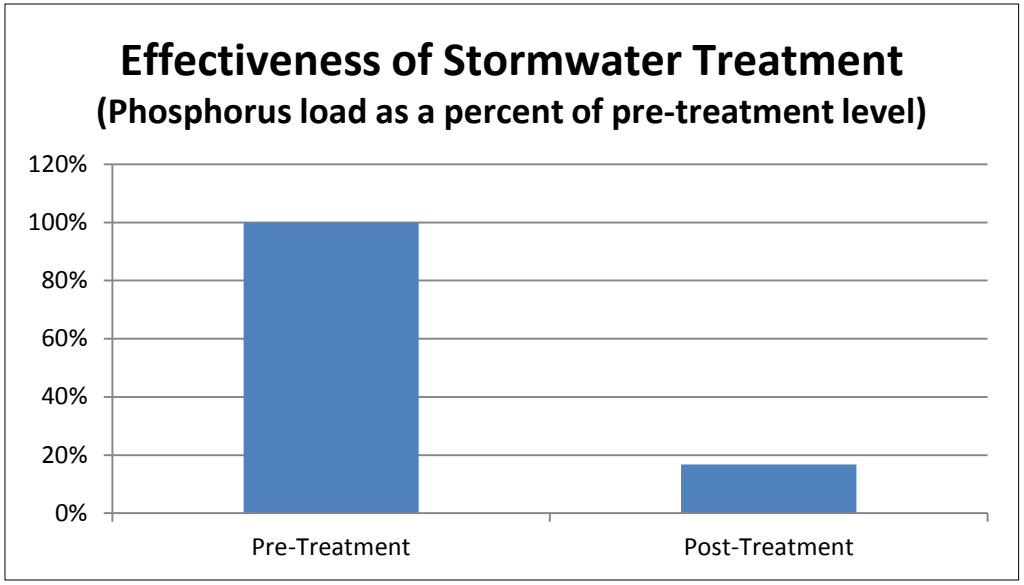
Stormwater Management

<u>Stormwater Runoff from Existing Developed Lands</u>

Englesby Brook, Blanchard Beach

Burlington & South Burlington

- Stormwater treatment achieved over 80% reduction in Phosphorus
- Estimated cost for stormwater treatment for land already developed = $30,000 per acre of impervious surface



Expanded stormwater treatment pond

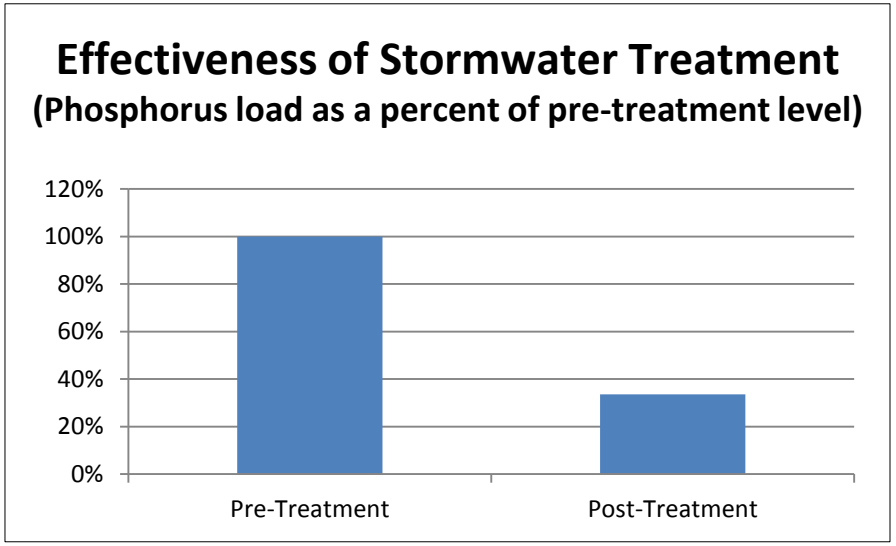
Stormwater Management

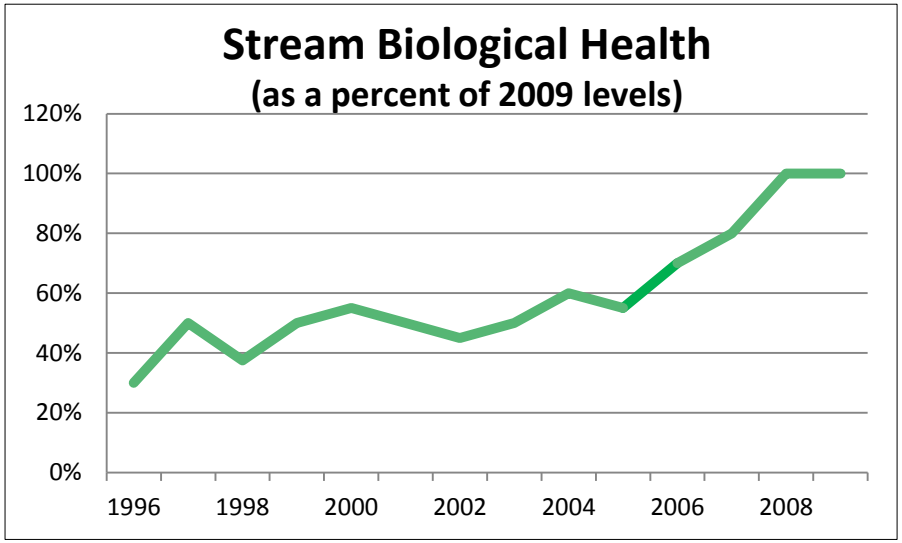
<u>Stormwater Runoff from Existing Developed Lands</u>

Rice Brook, Sugarbush Ski Resort

- Reduced annual phosphorus and sediment concentrations by nearly 30%
- Restored Water Quality Standards

Stormwater Treatment Pond



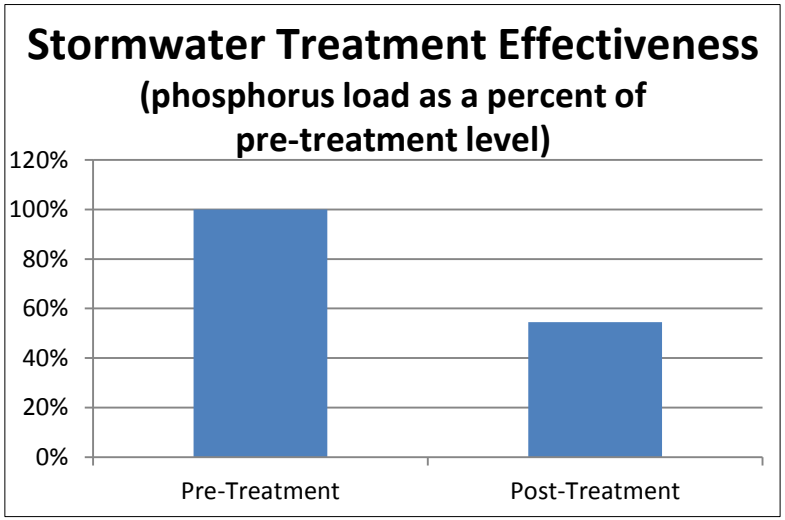


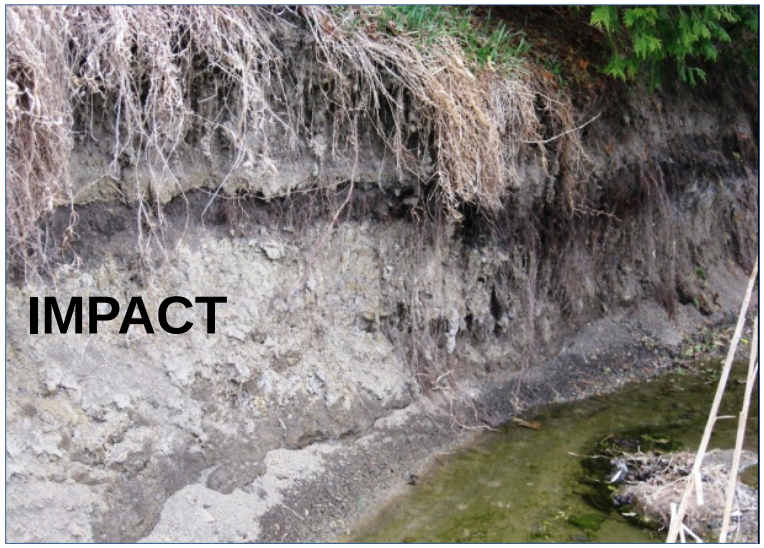
Stormwater Management

<u>Stormwater Runoff from Existing Developed Lands</u>

Potash Brook tributary, So. Burlington

- Runoff causing water quality degradation, stream instability
- Reduced phosphorus load by 45%
- Reduced sediment load by 70%





Streambank erosion from stormwater runoff

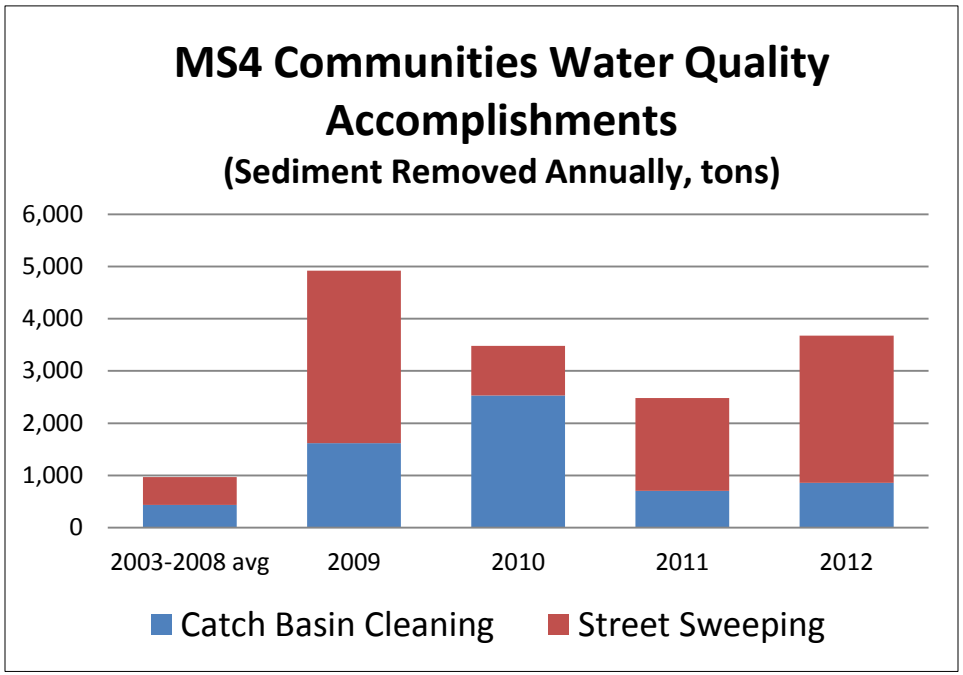
Stormwater treatment ponds

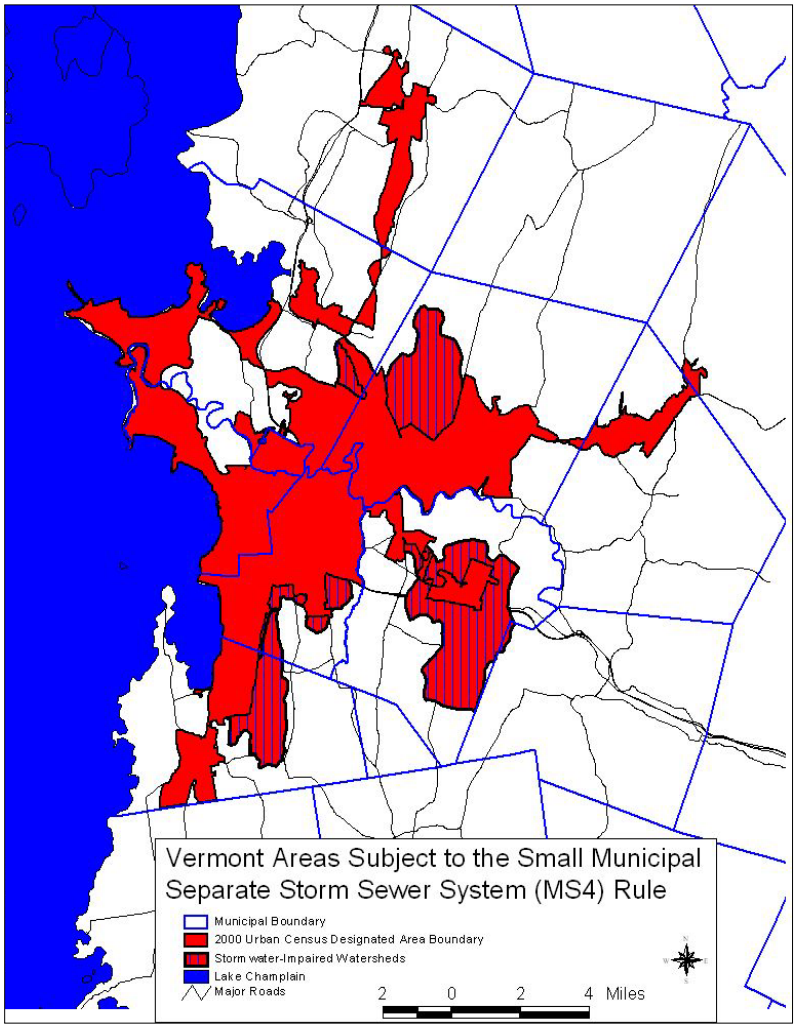
Stormwater Management

Stormwater Runoff - Existing Developed Lands

Municipal Stormwater Management

- 2 actions prevent 2,000-4,000 tons of sediment from reaching State waters annually





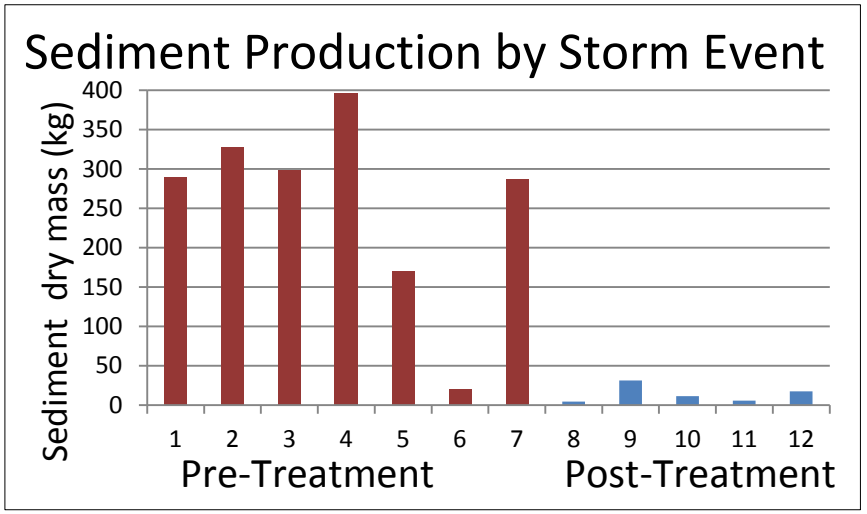
Stormwater Management

Stormwater Runoff - Municipal Roads

Sediment and Erosion Control

Washington County

- UVM Controlled Study found a dramatic reduction in polluted runoff from Best Practices such as rock-lining ditches on steep roads
- Estimated project cost = $3,000 (1,000 linear feet treated)



Wemple, 2013

Eroding roadside ditch

Ditch stabilization saves road and reduces erosion

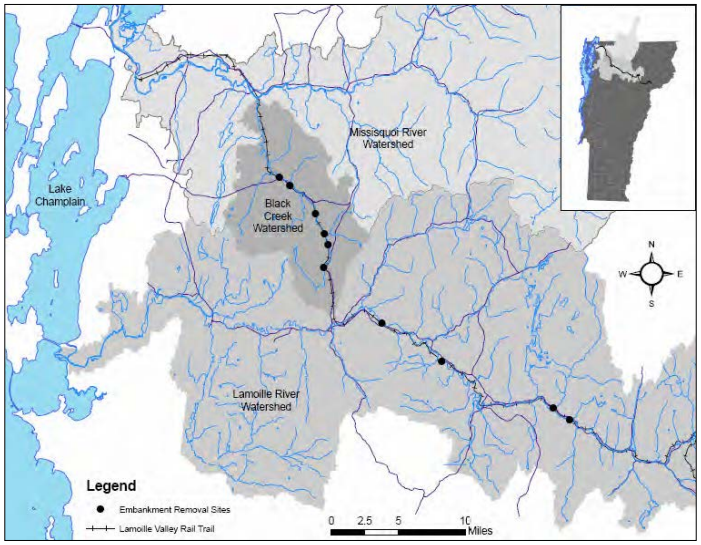
Rivers Channel Stability

Floodplain Restoration

Lamoille River, Black Creek

Franklin County

- Reconnected 200 acres of floodplain
- Monitored 3 of the 11 sites (21 acres)
- 3 sites captured 1.3 metric tons of total phosphorus
- Estimated cost for levee removal = $50,000/mile



11 Floodplain Restoration Sites

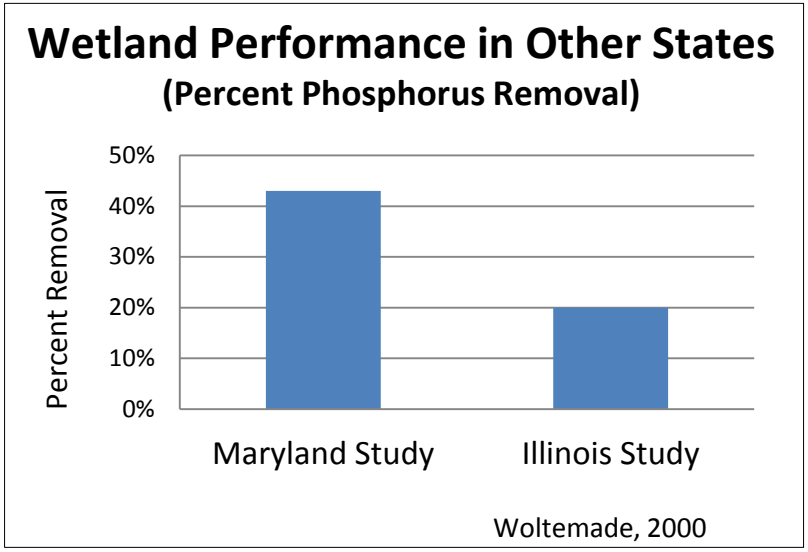
Removal of elevated railroad embankment

Restored floodplain

Wetlands Management

Wetland Protection & Restoration

- 2,700 acres of Champlain wetlands have been restored or conserved over the past 10 years
- UVM study found that wetland protection helps to reduce phosphorus loading to the Lake
- Estimated project cost = $4,000/acre



Flooded cornfield, former wetland

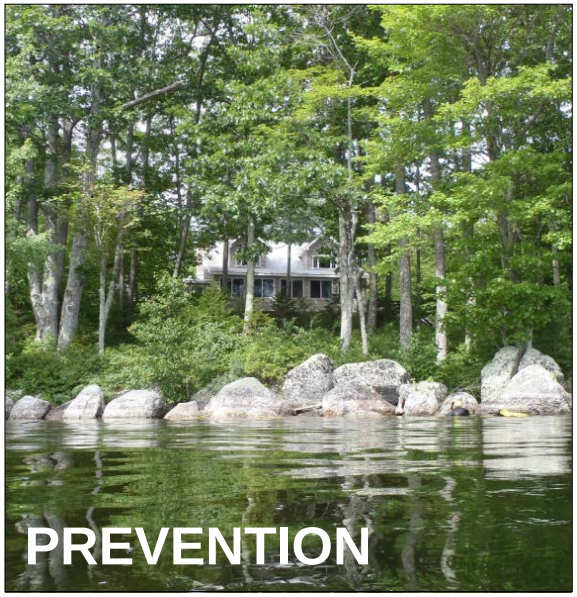
Restored wetland, former farmland

Lake Shoreland Management

Shoreland Protection

- 80% of VT lakes have shoreland in fair or poor condition due to clearing
- On a per-acre basis, developed land can contribute more phosphorus loading than agricultural land

Disturbed lake shoreland

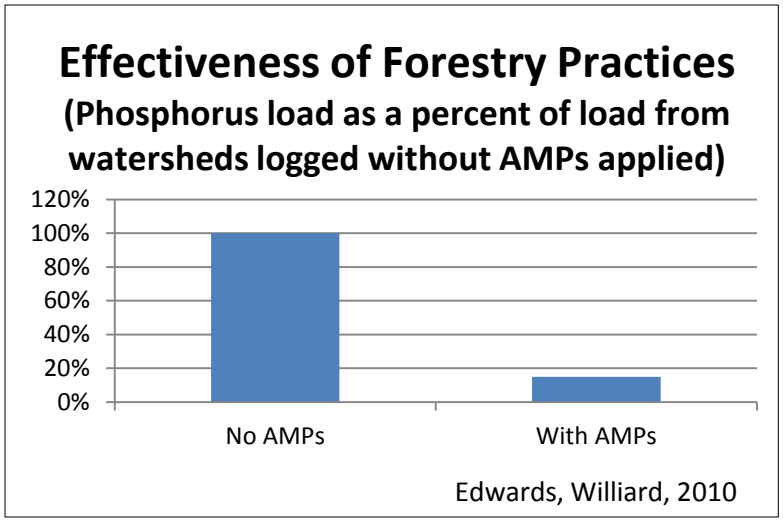


Preserved lake shoreland

Forest Management

Acceptable Management Practices (AMPs)

- Can reduce phosphorus loading by 85%
- 60% of VT forests are subject to AMP compliance or equivalent, as required under Current Use Program and public land management practices
- Estimated project cost = $3,000 (per crossing)

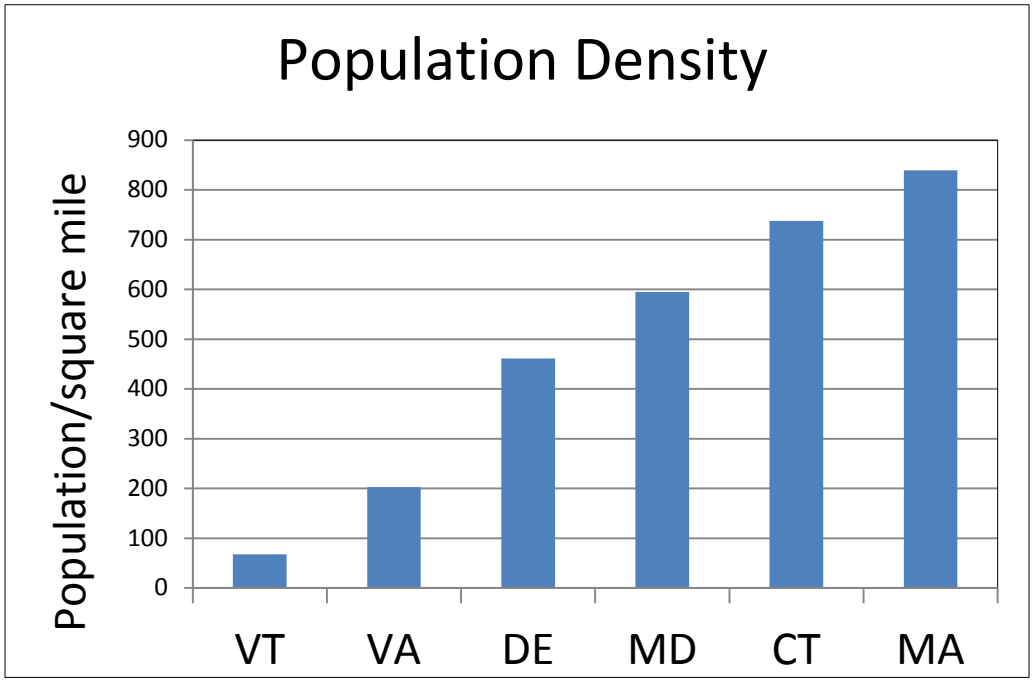


Unmanaged stream crossing at logging site

Temporary skidder bridge

Vermont: A Small State Facing Big Challenges to Implement Plan

- Vermont's small population makes paying for clean water particularly challenging due to its small revenue base, compared with southern New England and Chesapeake states
- However, Vermont's rural landscape means that the State has more cost-effective opportunities to reduce phosphorus loads than urbanized regions



U.S. Census, 2010

Vermont: A Small State Facing Big Challenges to Implement Plan

State will need to tap into existing & new sources to implement plan