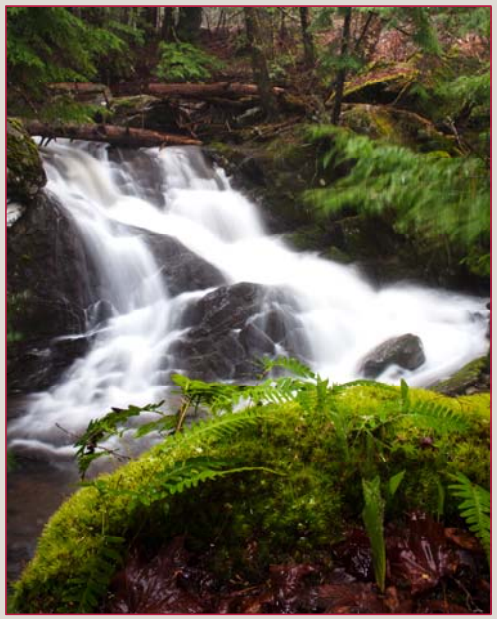
WINOOSKI TACTICAL BASIN PLANNING PROCESS

TIMELINE: 2017-2019

PURPOSE OF TACTICAL BASIN PLANNING

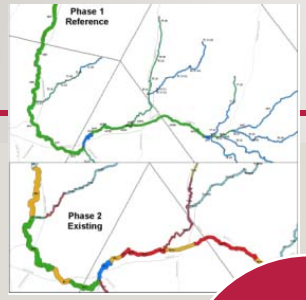
- **Protect the Best**



- **Restore the Rest**

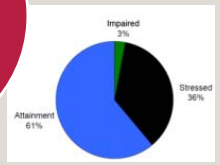
As required by the Vermont Water Quality Standards

MONITORING, ASSESSMENT, AND PLANNING



Monitor (test water)

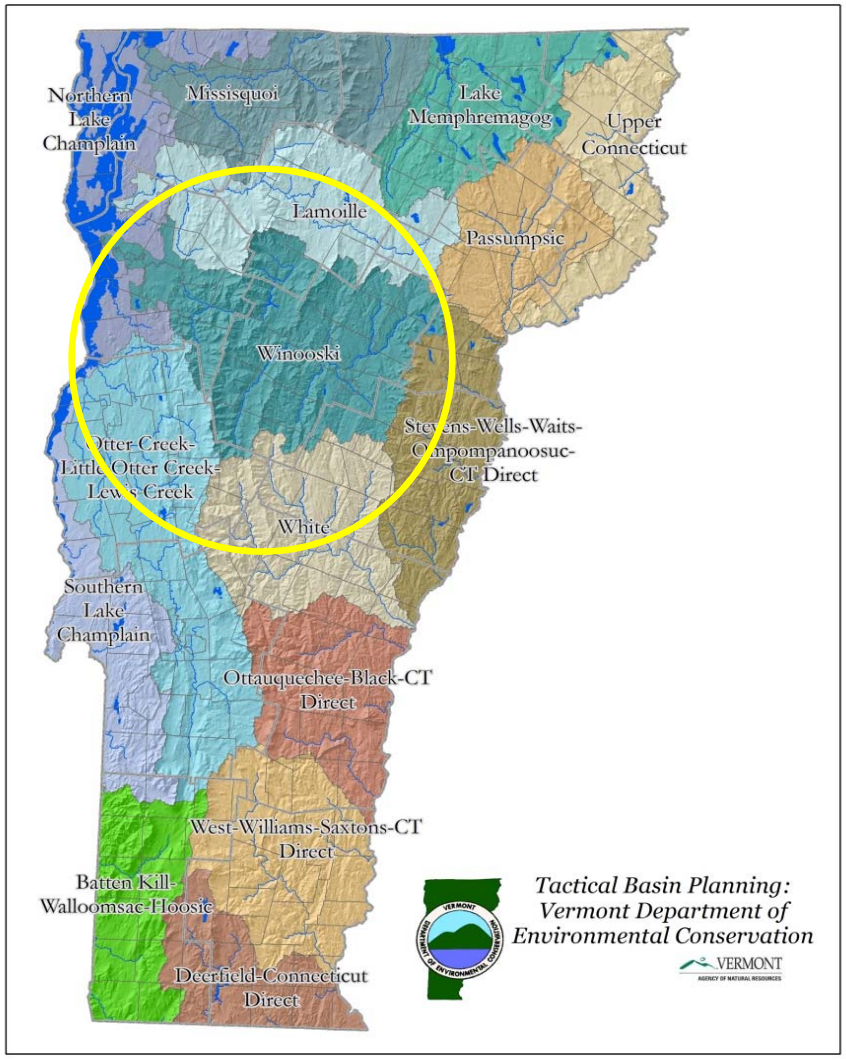
Assess (what's it mean)



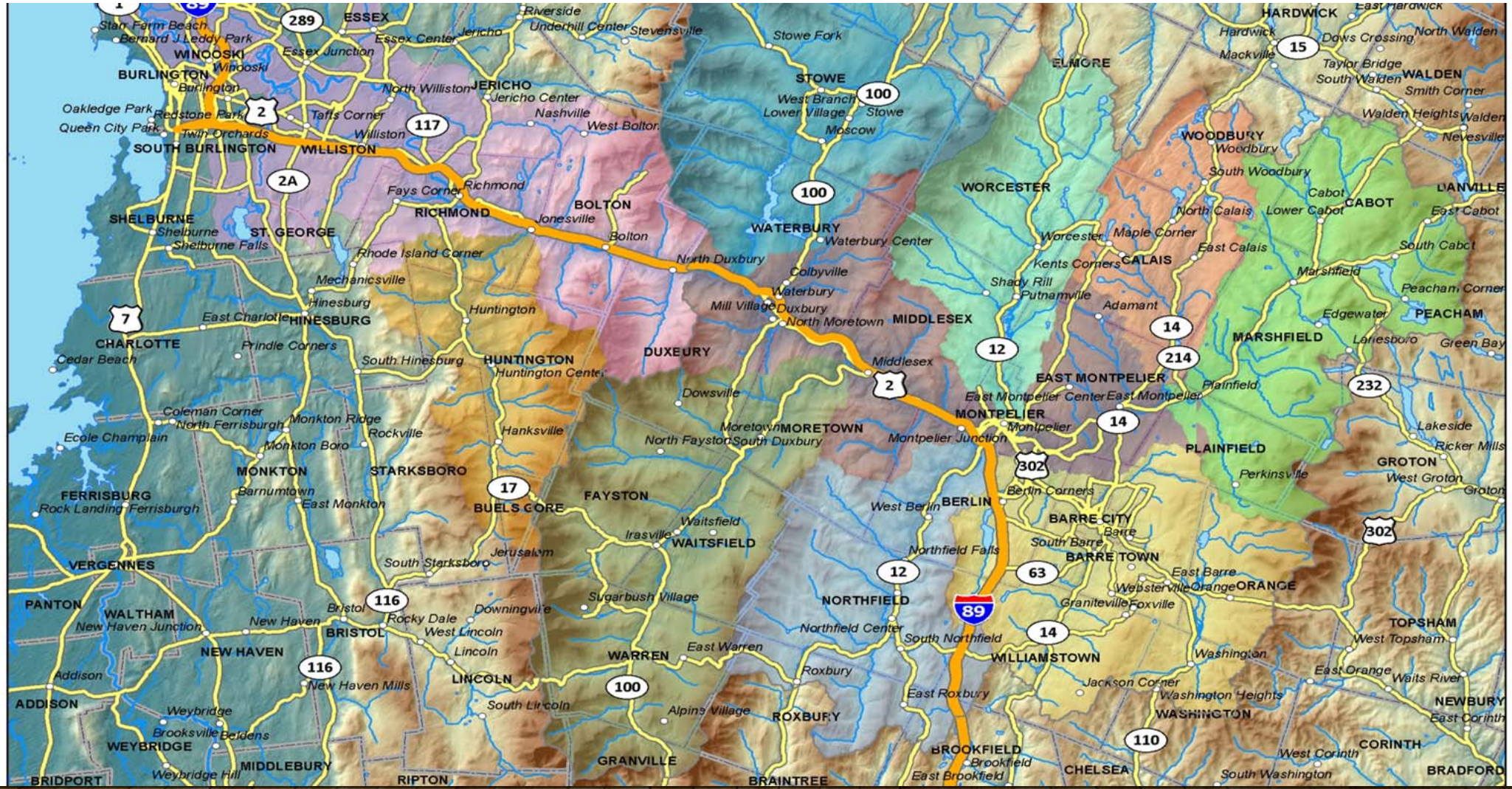
Plan for remediation and protection

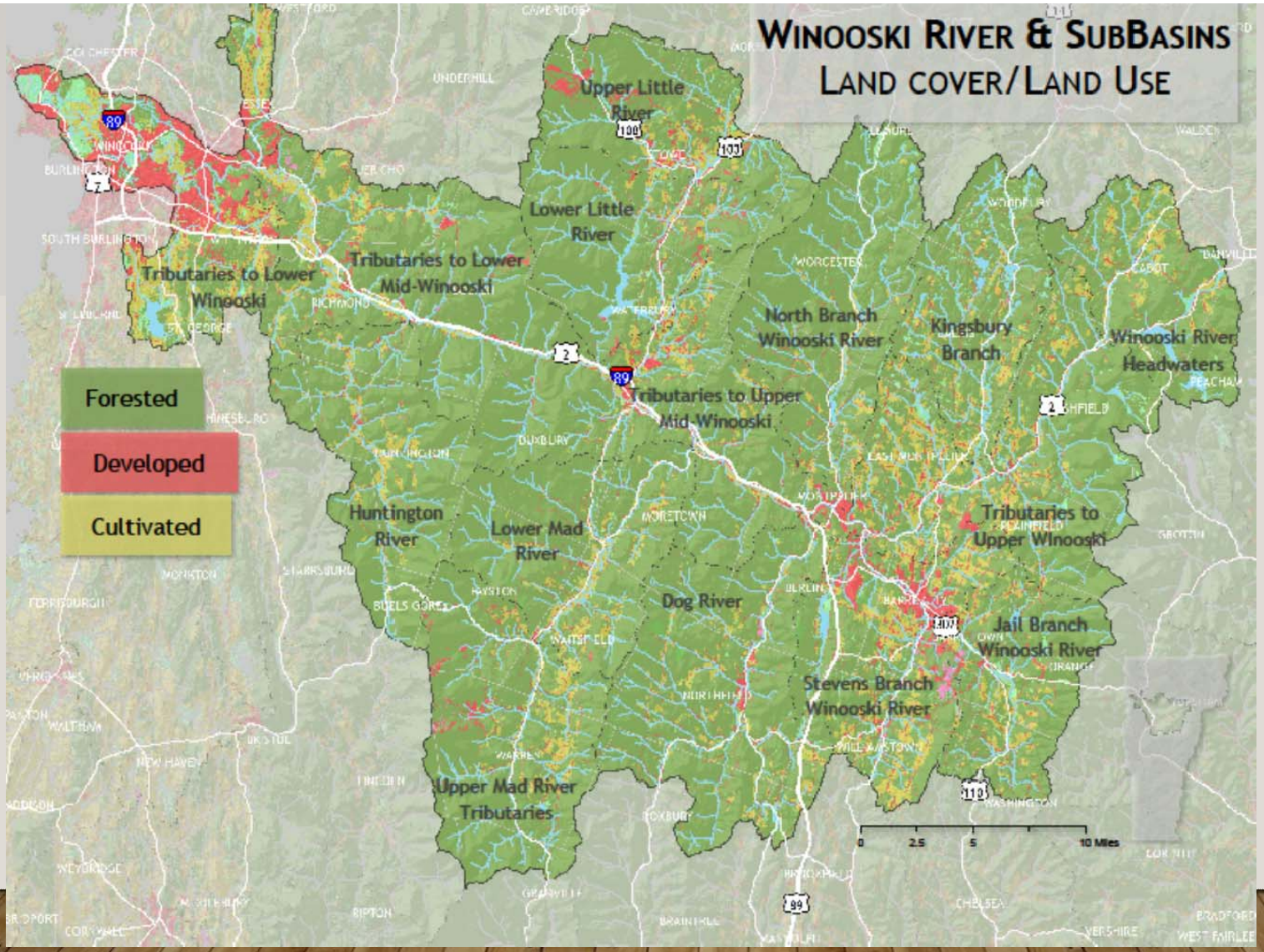
Outreach to public

Implement



Vermont Surface Water Management Strategy


Starr Farm Beach
Bernard J Leddy Park
WINOOSKI
Winooski
BURLINGTON
Burlington
289
ESSEX
Essex Junction
Essex Center
Jericho
Riverside
Underhill Center
Stevensville
Stowe Fork
HARDWICK
East Hardwick
Hardwick
Dows Crossing
North Walden
Mackville
15
Taylor Bridge
South Walden
WALDEN
Smith Corner
Walden Heights
Walden
Nevesville
ELMORE
STOWE
100
West Branch
Lower Village
Stowe
Moscow
JERICHO
Jericho Center
Nashville
West Bolton
North Williston
Oakledge Park
Redstone Park
Queen City Park
Twin Orchards
2
Tafts Corner
Williston
117
SOUTH BURLINGTON
WILLISTON
2A
WOODBURY
Woodbury
South Woodbury
WORCESTER
Cabot
CABOT
DANVILLE
East Cabot
South Cabot
North Calais
Lower Cabot
Fays Corner
Richmond
BOLTON
Jonesville
RICHMOND
SHELBURNE
Shelburne
Shelburne Falls
ST. GEORGE
WATERBURY
Waterbury Center
Bolton
Worcester
Maple Corner
East Calais
Kents Corners
CALAIS
Marshfield
Rhode Island Corner
North Duxbury
Colbyville
Waterbury
Shady Rill
Putnamville
Peacham Corner
Mechanicsville
Hinesburg
Huntington
Mill Village
Duxbury
Adamant
Edgewater
PEACHAM
7
East Charlotte
HINESBURG
North Moretown
MIDDLESEX
14
MARSHFIELD
Lanesboro
Green Bay
CHARLOTTE
Cedar Beach
Prindle Corners
South Hinesburg
HUNTINGTON
Huntington Center
DUXBURY
12
214
Middlesex
EAST MONTPELIER
Plainfield
232
2
Dowsville
East Montpelier Center
East Montpelier
Coleman Corner
North Ferrisburgh
Monkton Ridge
Rockville
Hanksville
MORETOWN
Moretown
South Duxbury
North Fayston
MONTPELIER
Montpelier
Montpelier Junction
14
Lakeside
Ricker Mills
Ecole Champlain
Monkton Boro
PLAINFIELD
GROTON
Perkinsville
West Groton
Groton
MONKTON
STARKSBORO
302
Barnumtown
East Monkton
17
FERRISBURG
Rock Landing
Ferrisburgh
BUELS GORE
FAYSTON
Berlin Corners
West Berlin
BERLIN
BARRE CITY
Barre
302
Waitsfield
Irasville
WAITSFIELD
South Barre
Jerusalem
Northfield Falls
BARRE TOWN
VERGENNES
South Starksboro
12
63
East Barre
Websterville
ORANGE
Orange
Granitville
Foxville
PANTON
WALTHAM
New Haven Junction
116
Bristol
Rocky Dale
Downingville
Sugarbush Village
NORTHFIELD
89
TOPSHAM
West Topsham
New Haven
BRISTOL
West Lincoln
Northfield Center
South Northfield
14
NEW HAVEN
Lincoln
East Warren
WARREN
WILLIAMSTOWN
Washington
Addison
116
New Haven Mills
LINCOLN
Roxbury
East Orange
Waits River
Jackson Corner
Washington Heights
East Roxbury
100
ADDISON
Weybridge
South Lincoln
Alpine Village
ROXBURY
WASHINGTON
NEWBURY
East Corinth
Brooksville Beldens
WEYBRIDGE
110
CORINTH
West Corinth
MIDDLEBURY
GRANVILLE
BROOKFIELD
Brookfield
East Brookfield
CHELSEA
South Washington
BRADFORD
BRIDPORT
Weybridge Hill
RIPTON
BRAINTREE

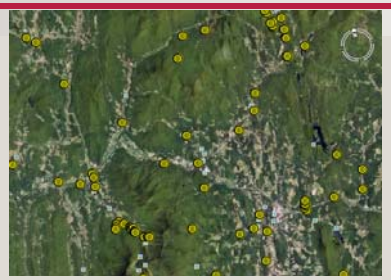

WINOOSKI RIVER & SUBBASINS
LAND COVER/LAND USE
Upper Little River
Lower Little River
Tributaries to Lower Mid-Winooski
Tributaries to Lower Winooski
North Branch Winooski River
Kingsbury Branch
Winooski River Headwaters
Tributaries to Upper Mid-Winooski
Huntington River
Lower Mad River
Dog River
Tributaries to Upper Winooski
Jail Branch Winooski River
Stevens Branch Winooski River
Upper Mad River Tributaries
Forested
Developed
Cultivated
0 2.5 5 10 Miles

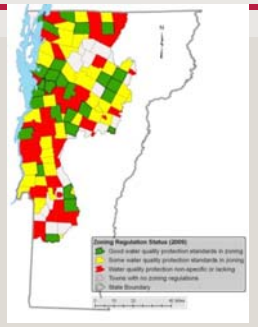
BASIN 8- SUB-WATERSHEDS AND PARTNERS

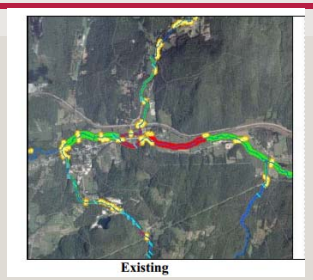
Subbasin	CCRPC	CVRPC	LRPC	WNRCD	LNRCD	FWinooskiR	FMadR	FHuntingtonR
Lower Winooski (urban areas)	x			x		x		
Alder Brook, Mill River	x			x		x		
Huntington	x			x		x		X
Mid Winooski Direct tribs (joiner brook, etc)	x			x		x		
Little River			x	x	x	x		
Mad River		x		x		x	x	
Dog River		x		x		x		
Stevens Branch		x		x		x		
Kingsbury and E. Mtplr		x				x		
North Branch and Middlesex		x		x		x		
Headwaters		x		x		x		

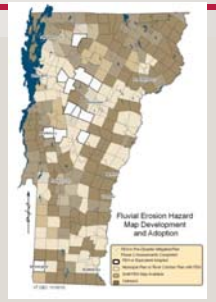
TACTICAL PLANNING

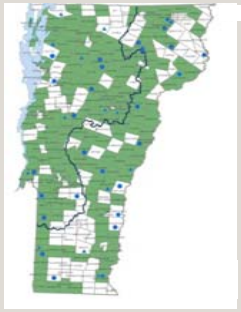
Use of Monitoring and Assessment Data and Indicators to integrate priorities for protection, restoration, and TMDL implementation.



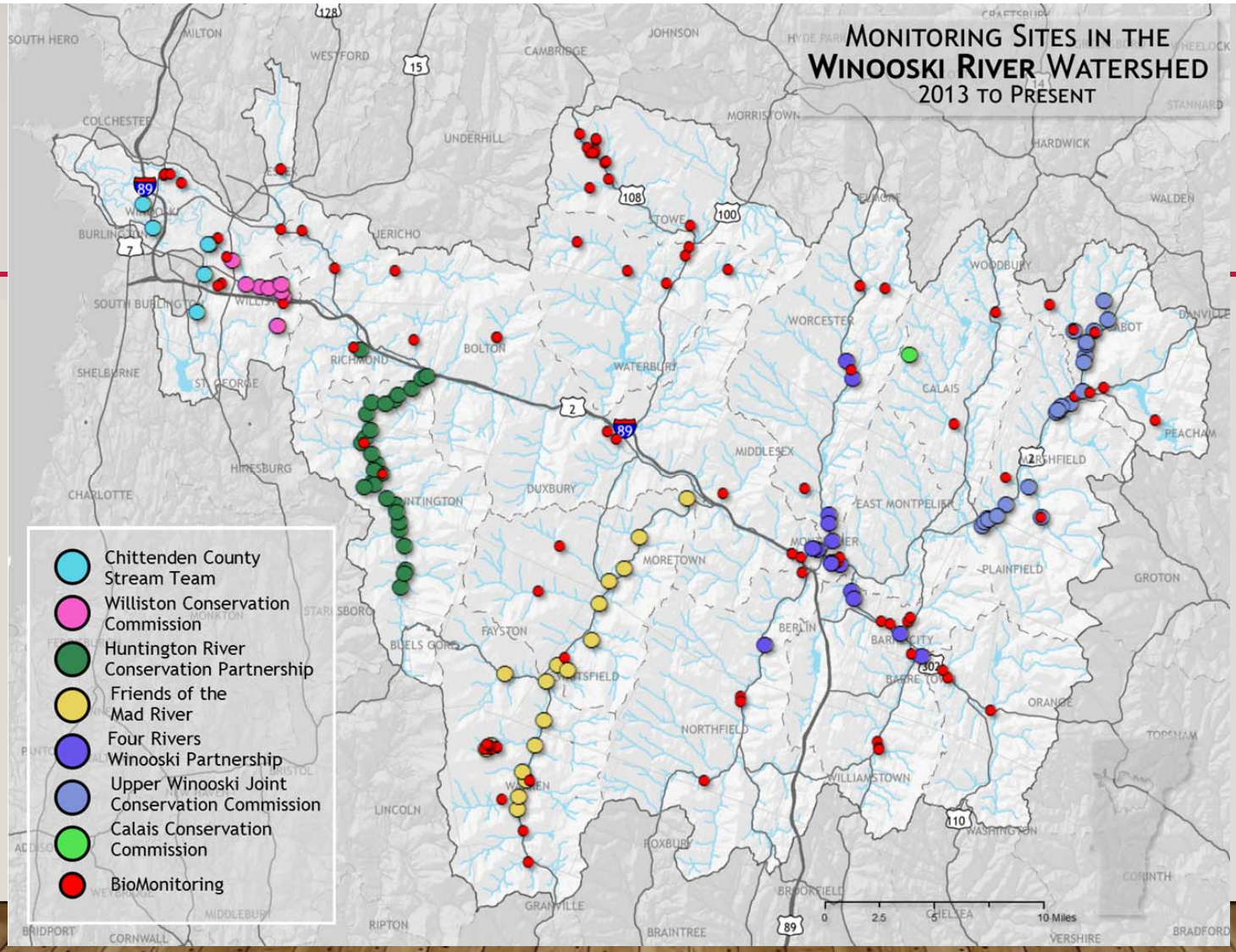








Monitoring results SGA IDDE Town Plans & Zoning
SW Master Planning Backroads Cap Inv. FEH


Monitoring Sites in the
Winooski River Watershed
2013 to Present
Chittenden County Stream Team
Williston Conservation Commission
Huntington River Conservation Partnership
Friends of the Mad River
Four Rivers Winooski Partnership
Upper Winooski Joint Conservation Commission
Calais Conservation Commission
BioMonitoring
0 2.5 5 10 Miles
SOUTH HERO
MILTON
WESTFORD
CAMBRIDGE
JOHNSON
COLCHESTER
UNDERHILL
MORRISTOWN
HARDWICK
WALDEN
BURLINGTON
JERICHO
STOWE
WOODBURY
SOUTH BURLINGTON
WILLISTON
WORCESTER
SHELBURNE
ST. GEORGE
RICHMOND
BOLTON
WATERBURY
CALAIS
PEACHAM
MIDDLESEX
HINESBURG
CHARLOTTE
DUXBURY
EAST MONTPELIER
MORETOWN
PLAINFIELD
GROTON
FAYSTON
BERLIN
NORTHFIELD
ORANGE
WILLIAMSTOWN
LINCOLN
ROXBURY
GRANVILLE
BRAINTREE
BRADFORD
CORNWALL
RIPTON
BRIDPORT

OUTCOMES OF TACTICAL PLANS

- **Restoration**
- **Protection**

AND

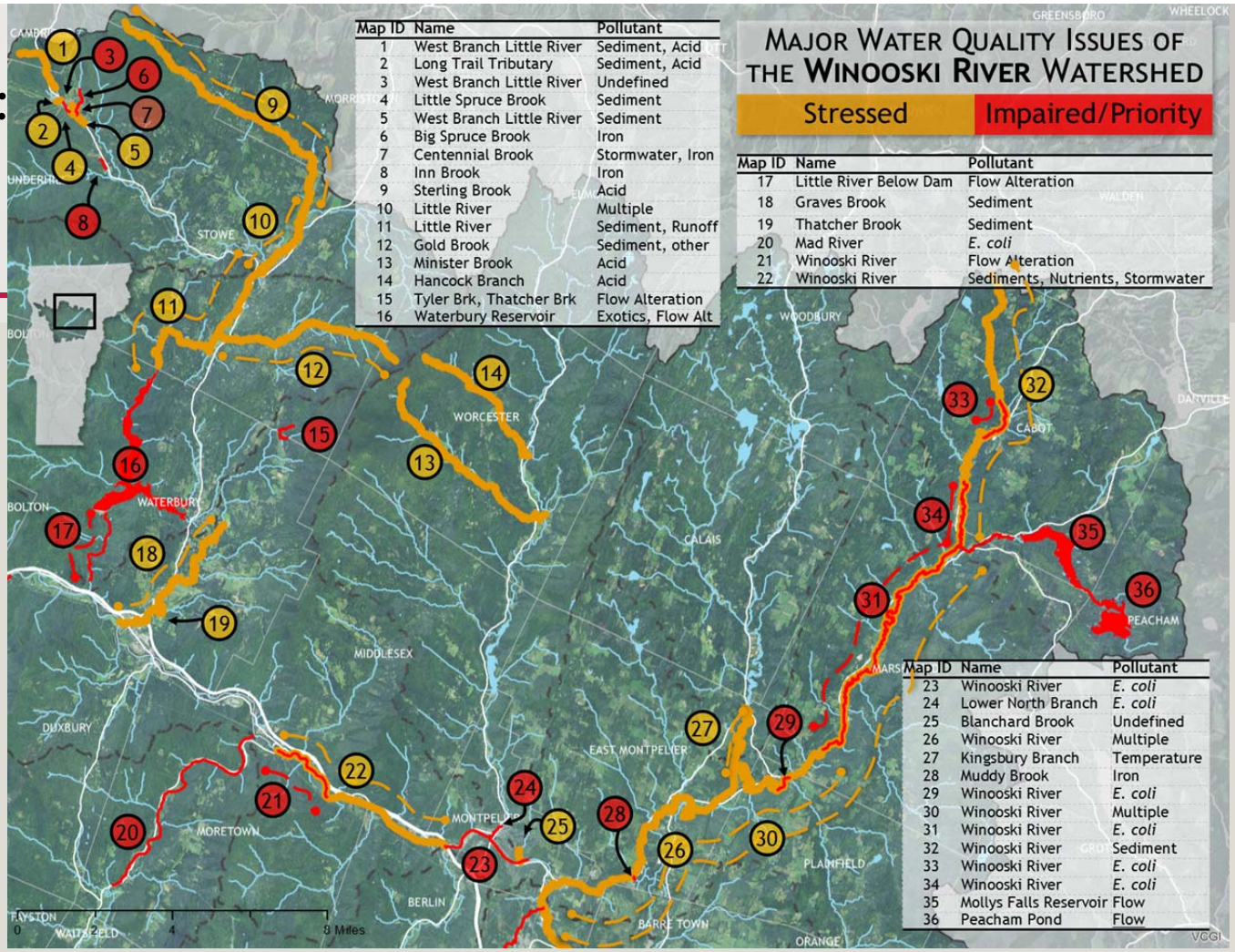
- **Allocations for the Lake Champlain Phosphorus TMDL**

UPPER WINOOSKI: PREDOMINANT WATER RESOURCE CONCERNS IN

- E. coli/Pathogens
- Sediment
  - River channel adjustments
  - Roads, developed areas, agricultural and silvicultural activies
- Altered Flows
  - Hydrodams
  - Snow making
- Developed shoreline lakes and ponds

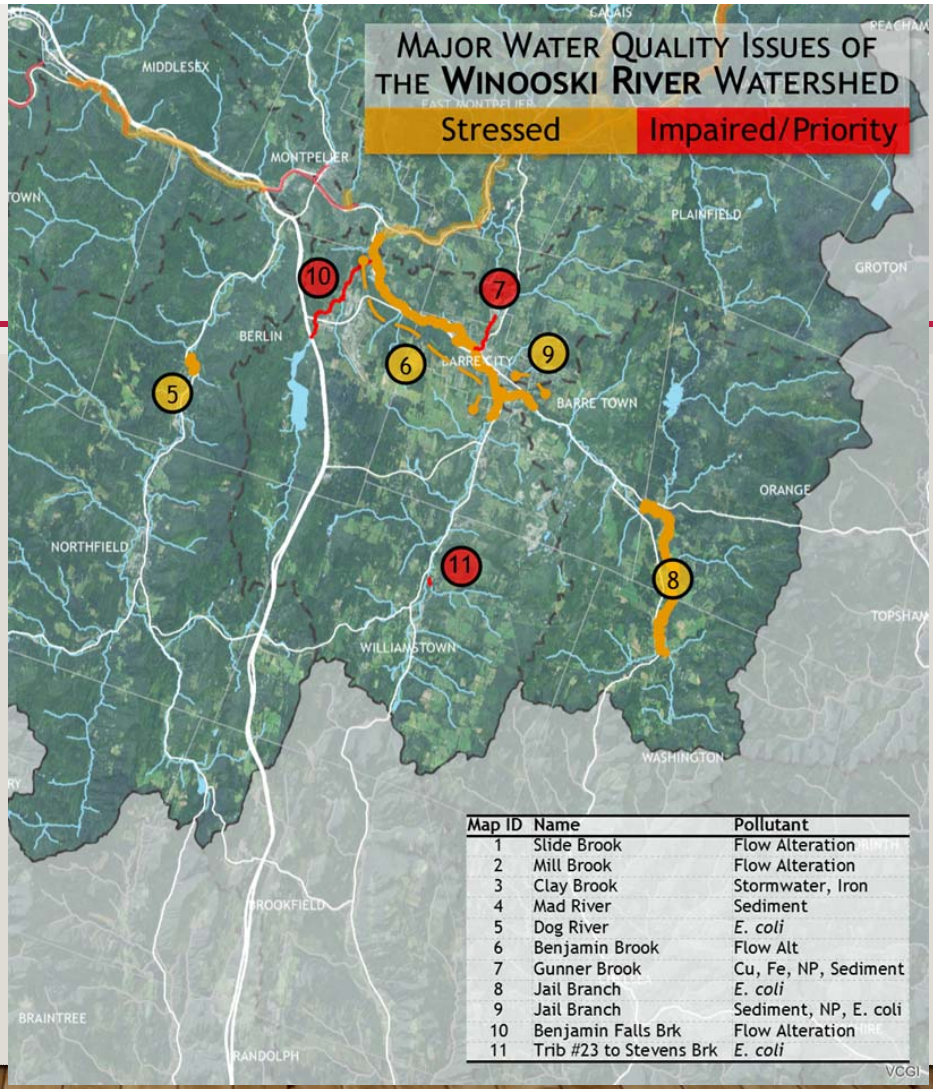
WATER RESOURCE ISSUES:

WINOOSKI, NORTH BRANCH, MAD



WATER RESOURCE ISSUES:

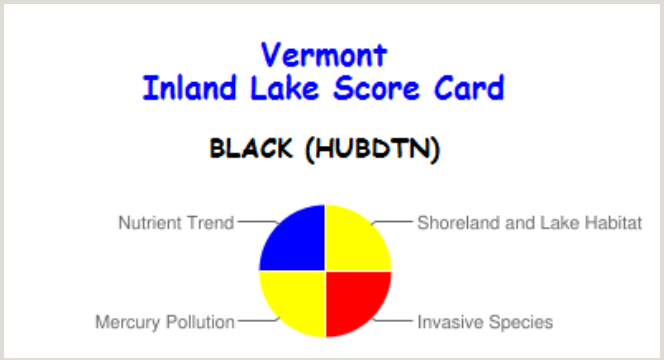
STEVENS, JAIL, DOG

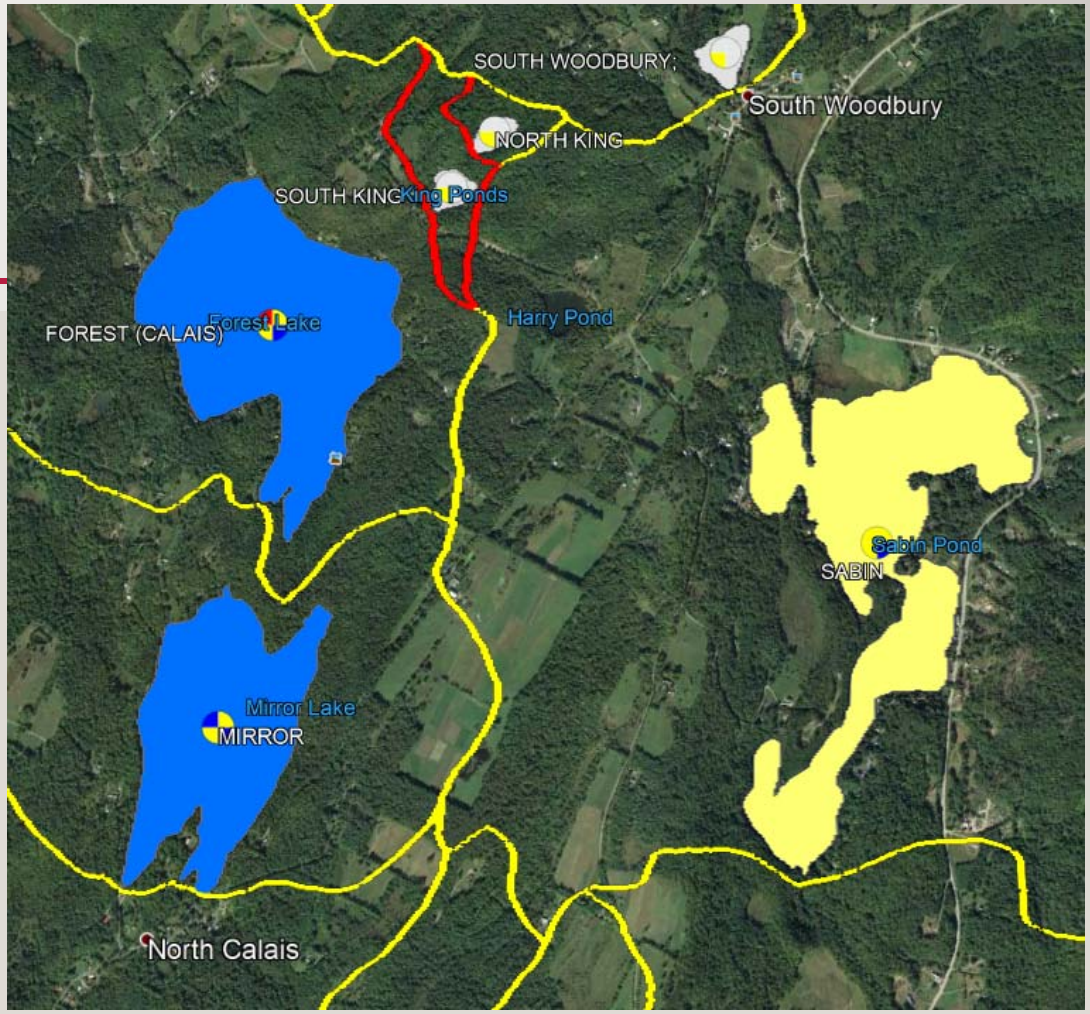


Map ID	Name	Pollutant
1	Slide Brook	Flow Alteration
2	Mill Brook	Flow Alteration
3	Clay Brook	Stormwater, Iron
4	Mad River	Sediment
5	Dog River	*E. coli*
6	Benjamin Brook	Flow Alt
7	Gunner Brook	Cu, Fe, NP, Sediment
8	Jail Branch	*E. coli*
9	Jail Branch	Sediment, NP, E. coli
10	Benjamin Falls Brk	Flow Alteration
11	Trib #23 to Stevens Brk	*E. coli*

VCGI

LAKE SCORE CARD





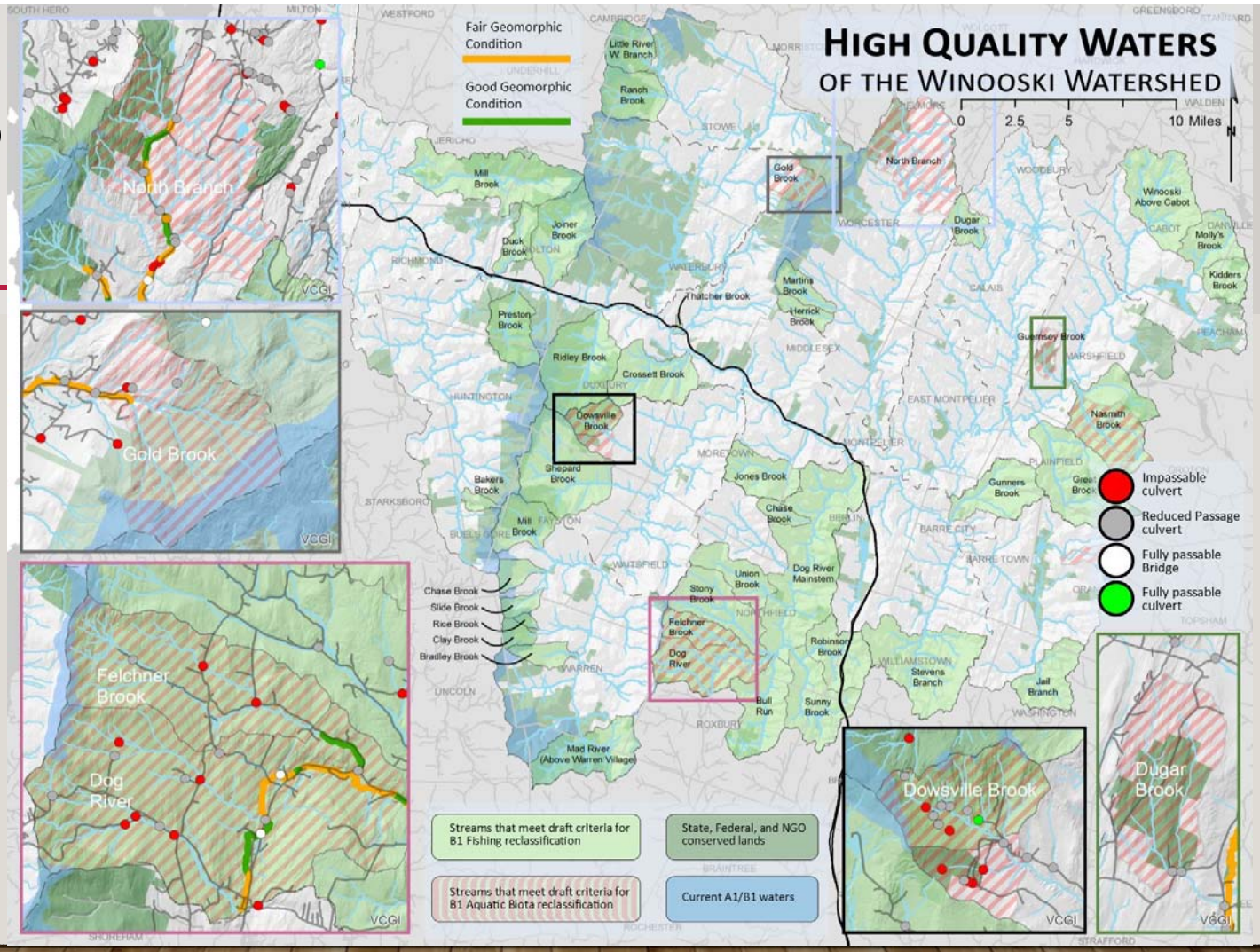
Top Objectives and Strategies

- **Protect river corridors and floodplains to increase flood resilience and allow rivers to reach equilibrium** through conservation easements and municipal adoption of appropriate bylaws, focusing on assisting towns to adopt corridor protection as well as implement VDEC river corridor plans.
- **Increase knowledge of water quality conditions in the basin, including the identification of high quality lakes** through the establishment and/or continuation of short-term intensive and long-term monitoring programs**.**
- **Implement agricultural Best Management Practices (BMPs)** in areas that are a significant source of phosphorus and where BMPs are best suited to conditions with a focus on areas of high phosphorus loading.
- **Resolve E. coli impairments in along Winooski between Plainfield and Cabot, Huntington, Mad Rivers and Allen Brook** by addressing discernable bacteria sources from agriculture and residential sources to meet bacterial TMDL.
- **Manage stormwater from developed areas through the development and implementation of stormwater master plans and Flow Restoration Plans in MS4 communities**.

Top Objectives and Strategies Continued

- **Improve littoral zone habitat along Lake Champlain, and ponds in the Kingsbury Branch** through direct outreach with landowners to encourage participation in the Lake Wise Program that promotes implementation of lakeshore BMPs.
- **Inventory and prioritize municipal road erosion features that discharge into surface water and implement high priority actions in existing road erosion inventoried sites**
- **Provide technical and as available, financial assistance to wastewater treatment facilities** in meeting Lake Champlain Phosphorus TMDL goals
- **Prioritize wetland and floodplain restoration projects** in appropriate locations for phosphorus retention and sediment attenuation with a focus on the watersheds X
- **Prioritize remediation of forest roads and log landings with high erosion risks,** including sugaring operations and areas of high phosphorus loading.
- **Assist municipalities in identifying areas of landslide hazards for benefit of future development** including Jericho, Williston, Essex, Duxury, Plainfield, Marshfield, and Barre Town.

WHAT'S GOOD


HIGH QUALITY WATERS
OF THE WINOOSKI WATERSHED
0 2.5 5 10 Miles
Fair Geomorphic Condition
Good Geomorphic Condition
Impassable culvert
Reduced Passage culvert
Fully passable Bridge
Fully passable culvert
North Branch
Gold Brook
Felchner Brook
Dog River
Dowsville Brook
Dugar Brook
Streams that meet draft criteria for B1 Fishing reclassification
State, Federal, and NGO conserved lands
Streams that meet draft criteria for B1 Aquatic Biota reclassification
Current A1/B1 waters
VCGI

SURFACE WATER CLASSIFICATION

Classification (2016)	Applicable Uses
Class A(1)	One or more of Aquatic Biota and Wildlife, Aquatic Habitat, Aesthetics, Fishing, Boating, or Swimming may be classified to Class A(1) if the Secretary finds that it is in the public interest, pursuant to 10VSA1253d.
Class A(2)	Public Water Source
Class B(1)	One or more of Aquatic Biota and Wildlife, Aquatic Habitat, Aesthetics, Fishing, or Boating may be classified to Class B(1) when that use is demonstrably and consistently attained.
Class B(2)	Aquatic Biota and Wildlife, Aquatic Habitat, Aesthetics, Fishing, Boating, Swimming, and Irrigation are all to be supported at Class B(2) for all waters in the State not presently classified to a higher class.

[1] Class B(2) management objectives and supporting criteria are the same as with the former Class B.

Surface Water	*Location (Town/Lat.Long)*	*Former Water Supply Owner*	*Comment*
Unnamed tributary to Alder Brook	Essex	**Winooski, Essex Center, Essex Jct., and Pinewood manor**	**No longer used**
Martin Brook, Reservoir & Tributaries	Williamstown	**City of Barre**	**No longer used and not owned by city. Thurman Dix reservoir is water supply with Jail branch as an emergency source.**
Bolster reservoir and tributaries, excluding Pecks Pond	Barre Town (South Barre)	**City of Barre**	**See above. No longer used and not owned by city**
Unnamed brook and tributary	Barre Town	**Old village of East Barre/East Barre Fire district #4**	**Use of Reservoir with dam is not feasible. Town uses wells.**
Little John and Milne quarries (located **southwest of East Barre Village).**	Barre Town	**Barre Town District #1 for Village of East Barre**	**Water was piped from quarries to above unnamed tributary. See above**
Old granite quarry (Standard Quarry) located south of Websterville	Barre Town	**Graniteville Fire District**	**Water was piped from quarries to above unnamed tributary. See above**

CLASS A2 NO LONGER USED FOR WATER SUPPLIES

ANR WOULD SUPPORT RECLASSIFICATION TO CLASS B1 OR CLASS B2

CLASS B(2) TO B(1) (FOR FISHING) SURFACE WATERS

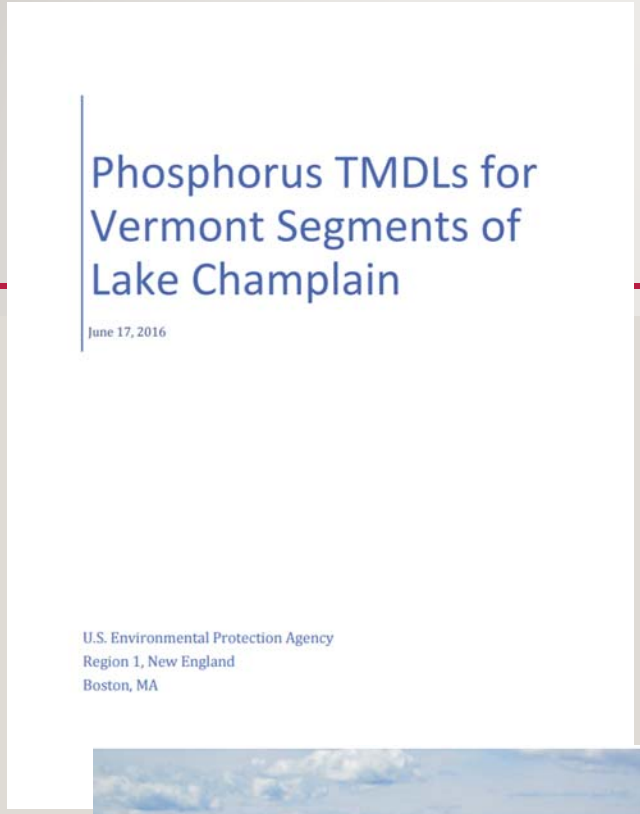
River	Town
Dowsville Brook	**Duxbury**
Dog River – rm 14.8	**Northfield**
Guernsey Brook	**Marshfield**
Nasmith Brook	**Marshfield**
Gold Brook	**Stowe/Worchester**
Nelson Brook	

CLASS B (2) TO A(1)

Subbasin	River	Town	
Mad River	**Bear Wallow Brook (.2 miles located 100 meters above Forest Service Road crossing)**	**Granville**	

IDENTIFY OUTSTANDING RESOURCE WATERS, CLASS I WETLANDS

- **Huntington Gorge, North Branch – ORW for aesthetics, swimming?**
- **Chickering Bog – already a Class I, are there more?**



- Sets pollution load limits for each segment of the Lake
- Establishes required phosphorus reductions, by land use sector
- Basin plan presents estimates of phosphorus reduction, by land use sector in Winooski Basin.

Table 8. Percent reductions needed to meet TMDL allocations.

Lake Segment	Total Overall	Wastewater[1]	CSO	Developed Land[2]	Agricultural Production Areas	Forest	Streams	Agricultural Nonpoint
01. South Lake B	41.4%	0.0%		21.1%	80.0%	40.0%	46.7%	62.9%
02. South Lake A	55.5%	0.0%		18.1%	80.0%	5.0%		62.9%
03. Port Henry	55.4%			7.6%	80.0%	5.0%		62.9%
04. Otter Creek	23.6%	0.0%		15.0%	80.0%	5.0%	40.1%	46.9%
05. Main Lake	20.5%	61.1%		20.2%	80.0%	5.0%	28.9%	46.9%
06. Shelburne Bay	11.6%	64.1%		20.2%	80.0%	5.0%	55.0%	20.0%
07. Burlington Bay	31.2%	66.7%	11.8%	24.2%	0.0%	0.0%		0.0%
09. Malletts Bay	17.6%	0.2%		20.5%	80.0%	5.0%	44.9%	28.6%
10. Northeast Arm	12.5%			7.2%	80.0%	5.0%		20.0%
11. St. Albans Bay	24.5%	59.4%		21.7%	80.0%	5.0%	55.0%	34.5%
12. Missisquoi Bay	64.3%	51.9%		34.2%	80.0%	50.0%	68.5%	82.8%
13. Isle La Motte	11.7%	0.0%		8.9%	80.0%	5.0%		20.0%
TOTAL	33.7%	42.1%	11.8%	20.9%	80.0%	18.7%	45.4%	53.6%

[1]Percent change from current permitted loads

[2] Includes reductions needed to offset future growth

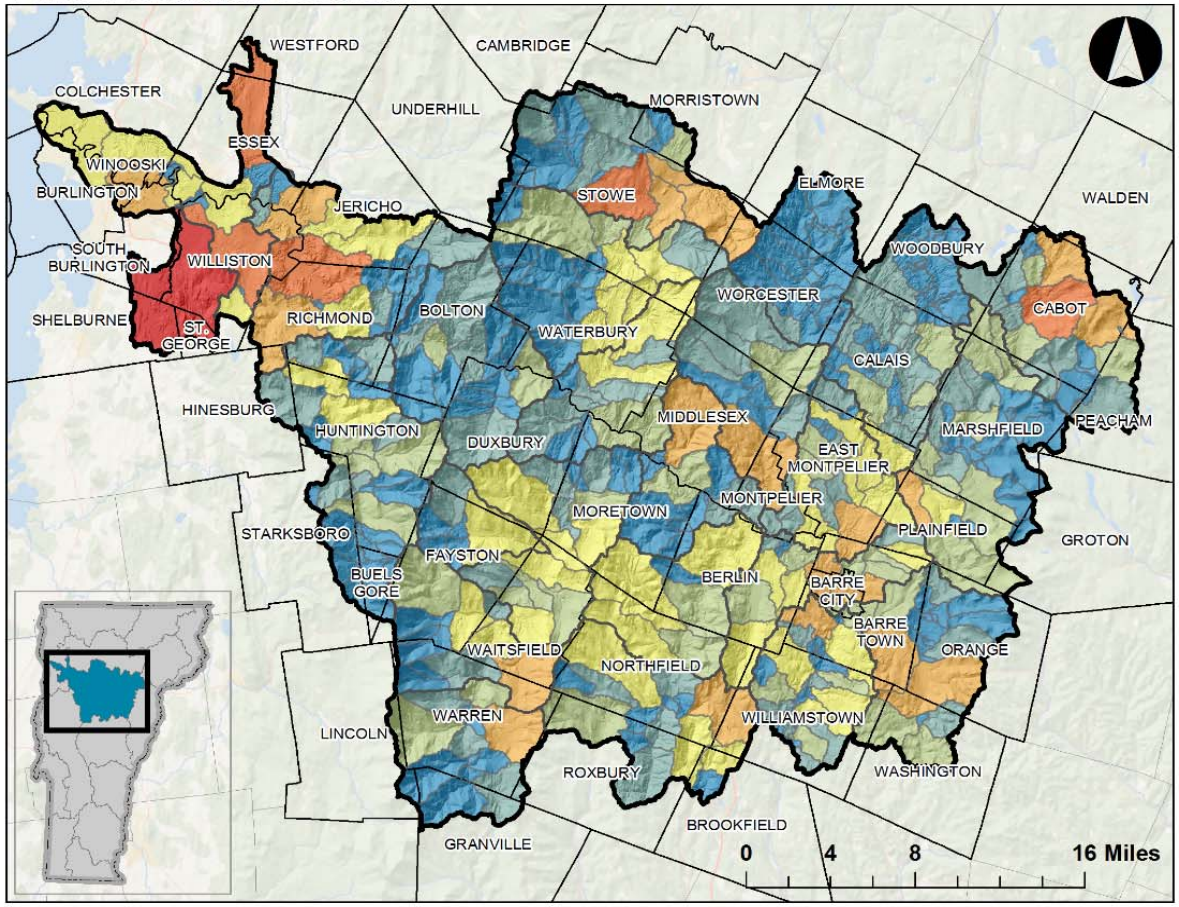
PHOSPHORUS ALLOCATIONS FOR WINOOSKI BASIN BY SECTOR

Source	*Category*	*Allocation category*	*Total allocation for basin (MT/yr.)*	*Percent reduction required for basin*
Forest	All lands	Load	30.90	5.0%
Stream Channels	All streams	Load	35.66	28.9%
Agriculture	Fields/pastures	Load	16.22	46.9%
	Production Areas	Wasteload	0.43	80.0%
Developed Land[2]	Summary		28.02	20.2%
	VTrans owned roads and developed lands	Wasteload		
	Roads MRGP	Wasteload		
	MS4	Wasteload		
	Larger unregulated parcels	Wasteload		
Wastewater[1]	WWTF discharges	Wasteload	9.85	61.1%
	CSO discharges	Wasteload	NA	NA

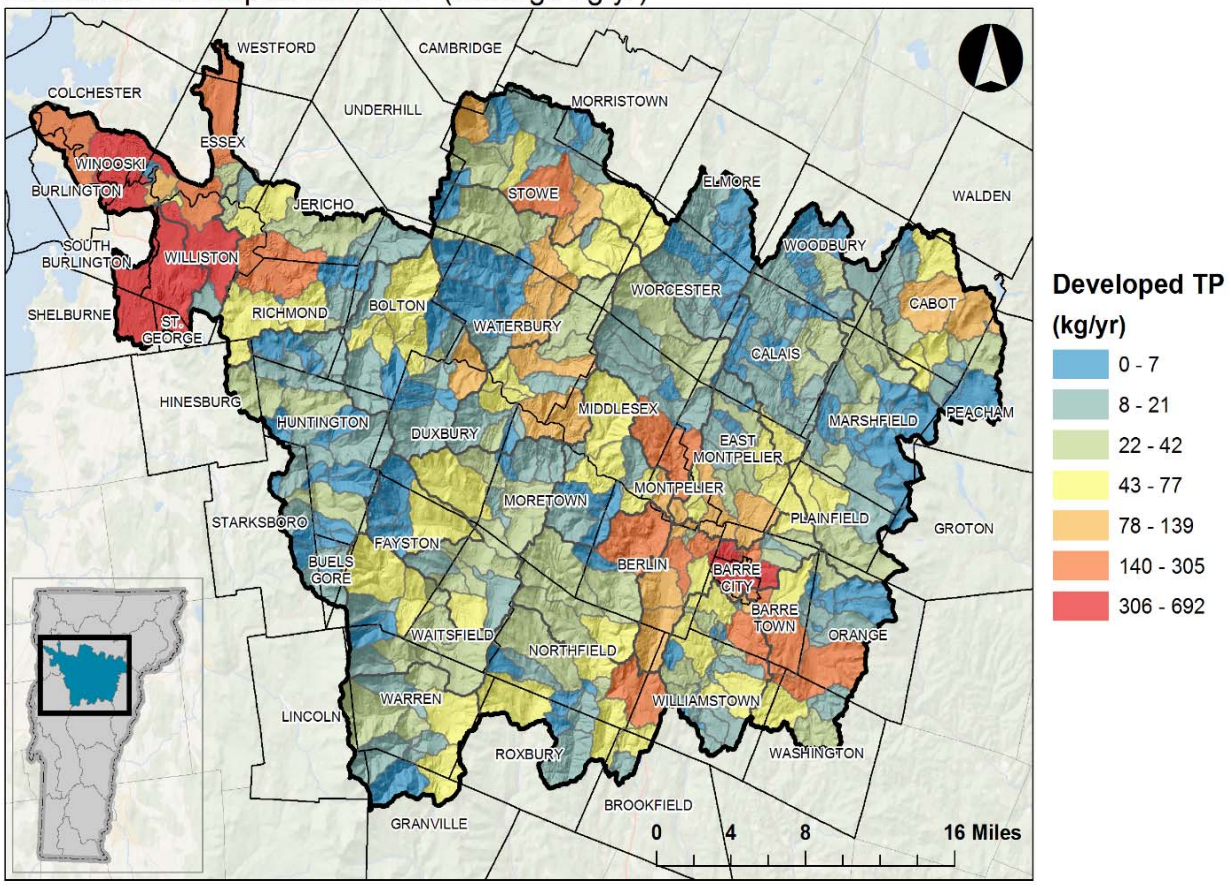
VERMONT CLEAN WATER ACT

- Agriculture
- Roads
  - State
  - Local
- Developed Lands
- Planning
- Clean Water Funding

TMDL Reduction Potential



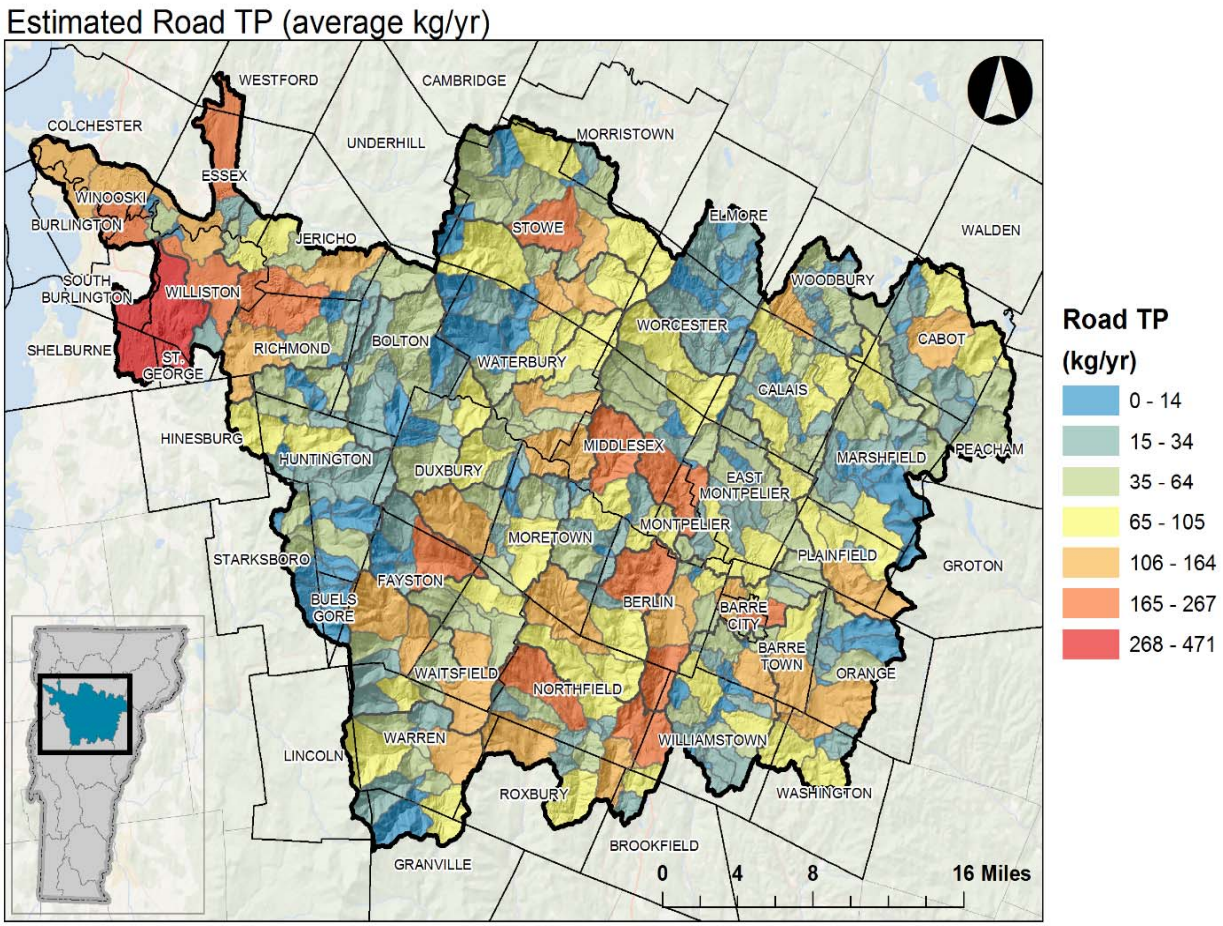
Estimated Developed Lands TP (average kg/yr)



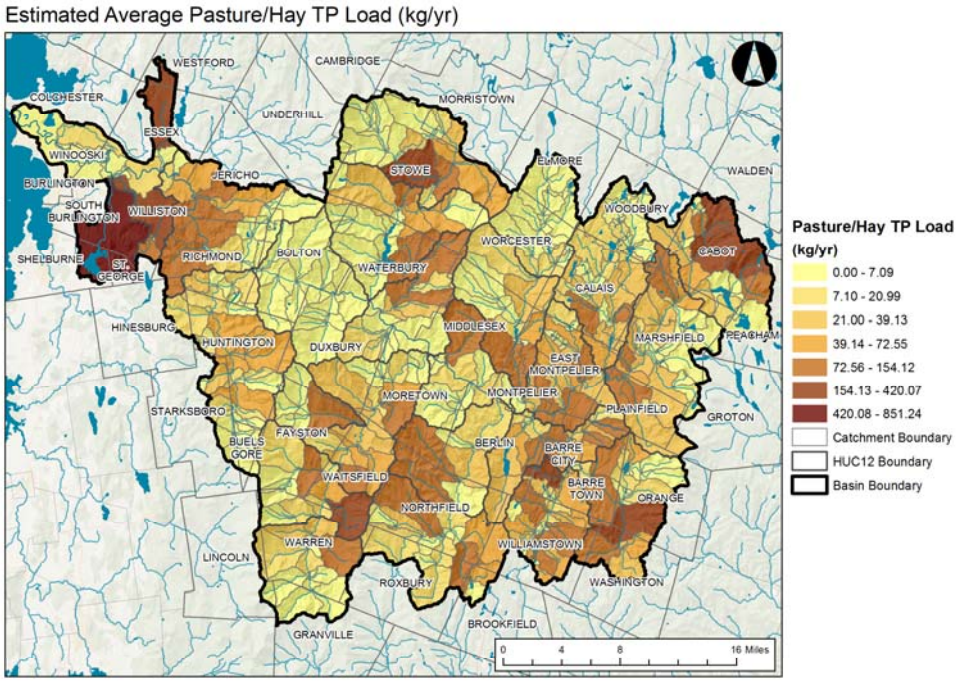
Developed TP (kg/yr)

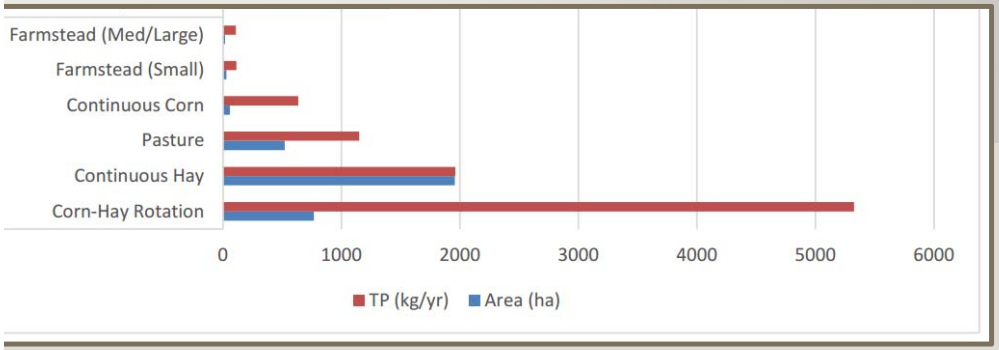
- 0 - 7
- 8 - 21
- 22 - 42
- 43 - 77
- 78 - 139
- 140 - 305
- 306 - 692

Estimated loadings from paved and unpaved roads



AGRICULTURE P LOAD ALLOCATION BY "HUC 12," WITH PRACTICES



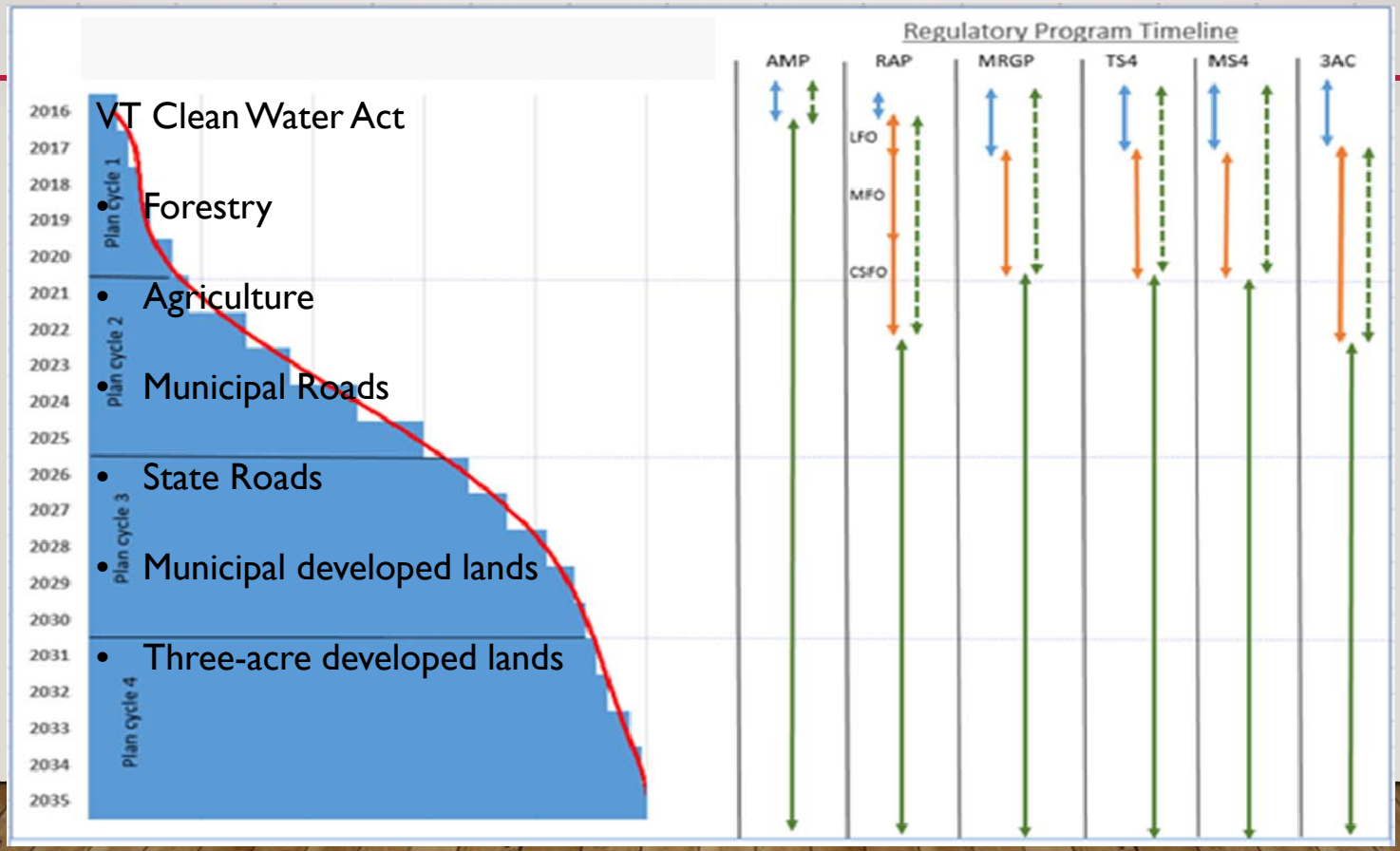


BMP Type	*Minimum % Efficiency*	*Maximum % Efficiency*	*Average % Efficiency*	*Efficiency Source*
Barnyard Management	80.00	80.00	80.00	Literature
Change in crop rotation	19.49	28.11	25.26	SWAT
Conservation tillage	10.00	50.00	27.50	SWAT
Cover crop	25.00	30.00	28.33	SWAT
Crop to Hay	0.00	80.00	64.17	SWAT
Ditch buffer	51.00	51.00	51.00	Literature

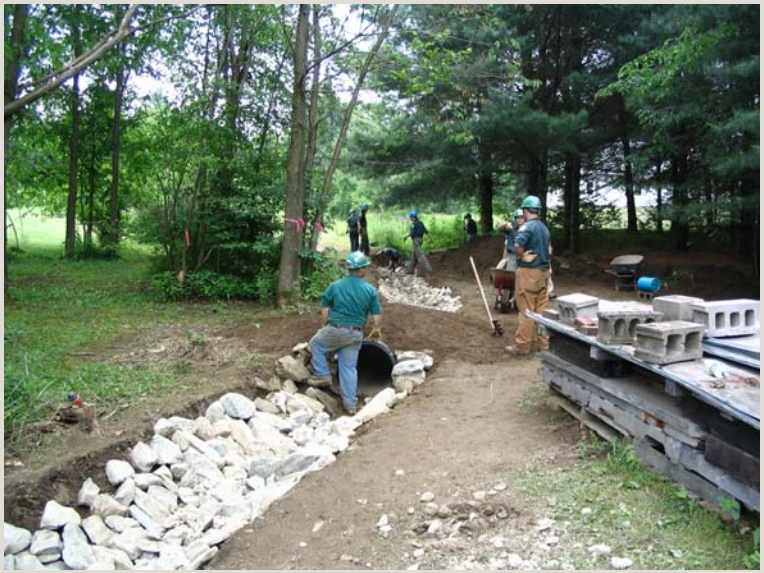
LAKE CHAMPLAIN PHOSPHORUS CLEAN UP - FUNDING

- Beginning 2018 – $50 million annual investment committed by State, businesses, nonprofits and municipalities
- Presently State government - $25 million annual contribution for 2 years

STAGING IMPLEMENTATION OF REGULATORY PROGRAMS



TACTICAL BASIN PLAN: PROJECTS

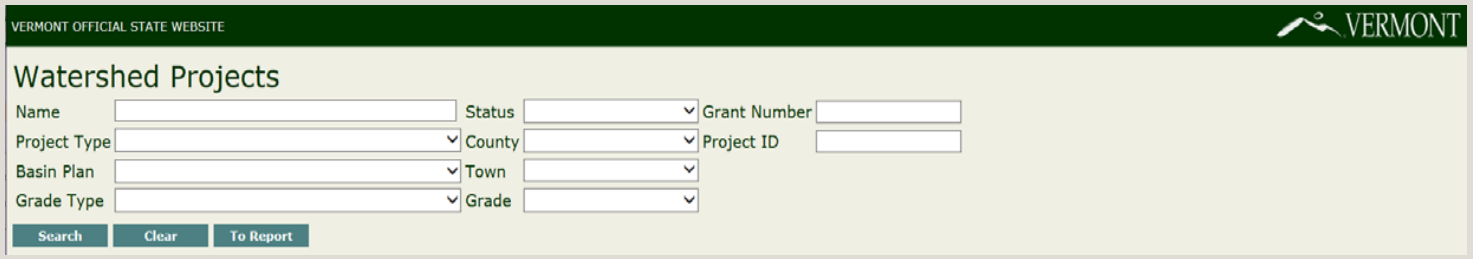


WHO DOES WHAT IN THE WINOOSKI : ADDRESSING EACH SECTOR

- **Agriculture – There are over 2,000 small farms, and with a recent revision of RAP, not as many will be covered. Could be good focus for VACD, UVM extension and other partners?**
- **Roads – the RPCs support assessment work. Partners help town remediate roads**
- **Stormwater – developed land –help landowners get a headstart on meeting 3 acre permit. Could focus on schools and municipal property first.**
- **Forestry –community help identify old logging roads causing erosion**
- **Rivers – prioritizing dams for removal, floodplain restoration, buffer planting**

FUNDING, IMPLEMENTATION & TRACKING

Table #	Waterbody	Project Description	Town(s)	Stream segment	Activity/ Stressor addressed	Source	Current or Potential Partners
LOWER LAMOILLE							
C34	Browns River	Scope, prioritize and implement projects identified in the Browns River Corridor Plan	Underhill, Jericho, Essex, Westford	from west of Jericho/Essex line up 7.5 miles and fluvial erosion hazard areas	Land erosion, channel erosion, thermal stress	Browns River Corridor Plans, 2016 Stressed Waters List, Chittenden County and Municipal Hazard Mitigation Plans	CCRPC, WNRCD, VDEC - Rivers



WINOOSKI BASIN TIMELINE: DEC AND RPC

- January – August 2017: Complete modeling for targeting P reduction, Work with partners to collect on the ground information to identify priority areas, download identified projects in database
- Fall 2017: Meet with Towns, partners, interested groups to discuss proposed priority areas and needed practices
- Spring 2018 – draft working draft basin plan to share with RPCs and NRCDs
- Spring – Summer 2018 – review draft plans with towns and partners
- Fall 2018 – Public hearings on Plan
- End of 2018 – Basin Plan signed

CONTACT INFORMATION

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