

Clean Water Roadmap (CWR) – Introductory Information for Public Outreach Version

Last Revised: April 2017

Getting Started: Home Page

The current version of the Clean Water Roadmap is available at the following web address:

<https://anrweb.vt.gov/DEC/CWR/Home>

The screenshot shows a web browser window with the URL <https://anrweb.vt.gov/DEC/CWR/Home>. The page features a dark green navigation bar with links for Home, Documents, Contact, Clean Water Roadmap Tool, and Log In, alongside the Vermont state logo. Below the navigation bar is a light green banner with the text "Clean Water Roadmap for Vermont". The main content area includes a large photograph of a lake with a rocky shore and a small building in the distance. To the right of the photo is a sidebar with two sections: "Clean Water Roadmap Links" and "Other Relevant Links". The sidebar links include Home Page, Clean Water Roadmap Tool, Documents, Contact Information, EPA Lake Champlain TMDL Website, DEC's Restoring Lake Champlain Website, and The Nature Conservancy's Water Quality Blueprint. A footer at the bottom of the page contains the copyright notice: "Copyright © 2017 State of Vermont. All rights reserved."

Clean Water Roadmap for Vermont

Click the "Clean Water Roadmap Tool" link at the top of the page to access the map



The [Clean Water Roadmap](#) is a suite of tools specifically designed to support Vermont DEC's planning and outreach efforts related to implementation of the Total Maximum Daily Loading (TMDL) for phosphorus in the Lake Champlain basin.

If you are a DEC Planner, you can access the TMDL planning tool by logging in to the site by clicking [here](#) or via the "Log In" link provided at the top of this page.

DEC planners and approved stakeholders can access the planning tool using account information

Clean Water Roadmap Links

- Home Page
- Clean Water Roadmap Tool
- Documents
- Contact Information

Other Relevant Links

- EPA Lake Champlain TMDL Website
- DEC's Restoring Lake Champlain Website
- The Nature Conservancy's Water Quality Blueprint

Clicking these links will open the web pages indicated in a new browser tab

CWR User Agreement

After clicking the "Clean Water Roadmap Tool" link you must first read the User Agreement and click the "I Agree" button to enter the map-based interface.

Clean Water Roadmap for Vermont

Welcome! The Clean Water Roadmap (CWR) is a web-based tool developed to support tactical basin planning and outreach efforts for the Vermont Lake Champlain Phosphorus Total Maximum Daily Load (TMDL). The CWR allows users to map and interact with watershed modeling results related to non-point total phosphorus loading sources, including "baseline" total phosphorus loading rates, at various watershed scales within the Vermont portion of the Lake Champlain Basin. Components of The Nature Conservancy's Water Quality Blueprint, which highlight areas of greatest importance for conservation and water quality benefits, have also been integrated into the CWR. The CWR also contains one expression of USEPA's Reasonable Assurance Scenario, which is one of many possible combinations of management practices necessary to achieve the Lake Champlain TMDL. The CWR presents results for non-point sources of phosphorus, but does not present results for direct wastewater discharges, nor in-channel erosion sources of phosphorus.

User Agreement: This website contains a compilation of modeling results and data intended for informational purposes only. The Vermont Department of Environmental Conservation (DEC) and the CWR developers do not warrant or guarantee the quality of the content on this website, and changes may have occurred since the information was posted to the CWR website. DEC shall not

VERMONT
KEURIG GREEN MOUNTAIN
LimnoTech
The Nature Conservancy

I Agree Decline

Catchment Dashboard

NHDPlus Catchment (ComID)
n/a

HUC-12 Basin
n/a

Tactical Basin Name
n/a

About the dashboard...

Catchment Baseline Summary

Metric	Value	Per (Tact)
TP Load (kg/y)		
Mean Yield (kg/ha/y)		
Area (ha)		
WQB Conserv. Value		
WQB WQ Impact		
WQB Combined Score		

Introduction to Interface

After clicking the "I Agree" button you will enter the map-based interface where you can visualize baseline conditions or work in scenario mode to learn about potential phosphorus reductions

The screenshot shows the 'Clean Water Roadmap' web application. The interface includes a navigation menu at the top with 'Home', 'Documents', 'Contact', and 'Log In'. The main content area is divided into several sections:

- Clean Water Roadmap Tools:** Contains 'Overview Topics', 'Visualize Basin Results', 'Select map options', and 'Select Scenario'.
 - Select map options:** Includes dropdowns for 'Map type' (Baseline), 'Basin scale' (None), 'Land type(s)' (All Land Types), 'Variable' (TP Yield (kg/ha/y)), and 'Color scheme' (Green to red).
 - Select Scenario:** Includes radio buttons for 'Baseline mode' and 'Scenario mode'.
- Map Layers:** A list of layers with checkboxes: Streams, Village Boundaries, Town Boundary, County Boundary, Lake Champlain Basin (checked), Tactical Basins (checked), HUC-12 Basins, NHDPlus Catchments, Water Quality Blueprint (WQB): Conservation Value, and Water Quality Blueprint.
- Map:** A map of the Lake Champlain Basin with various callouts:
 - Zoom in/out buttons (+/-) and a note: "Use these buttons to zoom in/out or use mouse scroll wheel".
 - A note: "Toggle map layers on/off with these check boxes and then expand to get more information".
 - A note: "Change basemap to imagery, streets, topographic, etc." with a 'Switch Basemap' button.
 - A note: "To drag the map click, hold, and move the mouse" with a four-way arrow icon.
 - A note: "Click the small arrows to make any window pane contract / expand" pointing to small arrows on the map frame.
- Catchment Dashboard:** Includes 'NHDPlus Catchment (ComID)' (n/a), 'HUC-12 Basin' (n/a), and 'Tactical Basin Name' (n/a). It also features a 'Catchment Baseline Summary' table.

Metric	Value	Percent Rank (Tactical)	Percent Rank (C Basin)
TP Load (kg/y)			
Mean Yield (kg/ha/y)			
Area (ha)			
WQB Conserv. Value			
WQB WQ Impact			
WQB Combined Score			

Additional callouts include: "Work in baseline mode or scenario mode" pointing to the 'Select Scenario' section, and "Click on any of these icons to bring up a window with more information" pointing to an information icon in the 'Catchment Baseline Summary' table.

Visualizing Baseline Information: Overview

Click on one of three options under "Basin scale" to start visualizing results

Use the search box to quickly identify and zoom to a Town, HUC-12 Basin, or NHDPlus Catchment

Expand a map layer to display the legend, change opacity, or get more information

Use additional drop-down menus to limit results to certain land types, change variable being mapped, or change color scheme

Catchment Dashboard

Tactical Basin Name
n/a

About the dashboard...

Catchment Baseline Summary

Metric	Value	Percent Rank (Tactical Basin)	Percent Rank (LC Basin)
TP Load (kg/y)			
Mean Yield (kg/ha/y)			
Area (ha)			
WQB Conserv. Value			
WQB WQ Impact			
WQB Combined Score			

Visualizing Baseline Information: Catchment Dashboard

Click on a catchment to view more detailed information

Upon clicking a Tactical Basin, HUC-12 Basin, or NHDPlus catchment, information will be displayed in the *Catchment Dashboard*

Pie chart breakdown of annual TP load

Pie chart breakdown of land areas

HUC-12 Basin
Moon Brook-Otter Creek
(041504020109)

Tactical Basin Name
Otter Creek - Little Otter Cr. - Lewis Cr.

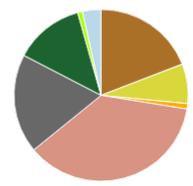
[About the dashboard...](#)

HUC-12 Basin: Baseline Summary [\[show subbasins\]](#)

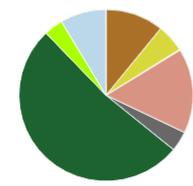
Metric	Value	Percent Rank (Tactical Basin)	Percent Rank (LC Basin)
TP Load (kg/y)	4,047	65	55
Mean Yield (kg/ha/y)	0.37	65	53
Area (ha)	10,950	54	55
WQB Conserv. Value	38.22	42	69
WQB WQ Impact	26.32	85	93
WQB Combined Score	28.00	4	1

- Cropland
- Pasture / Hay
- Farmsteads
- Developed
- Roads
- Forest
- Grass/Shrub Land
- Wetlands

Annual TP Load by LULC Group



Land Area (ha) by LULC Group



Visualizing Baseline Information: Subbasin Inventory & Prioritization

Clean Water Roadmap

Home Documents Contact Log In VERMONT

Clean Water Roadmap Tools

- Overview Topics
- Visualize Basin Results

Select map options:

Map type: Baseline

Basin scale: HUC-12

Land type(s): All Land Types

Variable: TP Yield (kg/ha/y)

Color scheme: Green to red

Select Scenario

Map Layers

- Streams
- Village Boundaries
- Town Boundary
- County Boundary
- Lake Champlain Basin
- Tactical Basins
- HUC-12 Basins
- NHDPlus Catchments
- Water Quality Blueprint (WQB): Conservation Value

Search for catchment or town

Subbasin Inventory for HUC-12 Unit: 041504020109

NHDPlus ID	NHDPlus Name	Area (ha)	Base TP Load (kg/y)	Base TP Yield (kg/ha/y)	WQB Cons. Value	WQB WQ Impact	WQB Combined
22220901	Unnamed	429.51	97.82	0.230	14.30	18.41	31.87
22220907	Otter Creek	58.12	32.78	0.560	52.67	21.24	35.63
22220909	Unnamed	375.28	344.27	0.920	11.86	14.52	33.12
22220911	Moon Brook	243.93	65.33	0.270	13.02	6.69	32.63
22220913	Moon Brook	105.71	69.91	0.660	19.02	10.69	31.46
22220915	Moon Brook	102.83	127.51	1.240	20.85	22.62	37.90
22220917	Mussey Brook	313.97	53.83	0.170	15.22	11.14	39.76
22220919	Moon Brook	56.41	59.15	1.050	24.85	19.68	44.95
22220921	Otter Creek	115.76	71.05	0.610	42.84	28.68	45.70
22220923	Mussey Brook	98.30	112.62	1.150	18.15	16.76	39.12
22220925	Mussey Brook	1.51	0.51	0.340	10.13	11.69	20.25
22220927	Unnamed	155.96	19.80	0.130	17.59	5.73	29.06

Export Table Close

Legend: Farmsteads, Developed, Roads, Forest, Grass/Shrub Land, Wetlands

Catchment Dashboard

HUC-12 Basin: Baseline Summary [show subbasins](#)

Metric	Value	Percent Rank (Tactical Basin)	Percent Rank (LC Basin)
TP Load (kg/y)	4,047	65	55
Mean Yield (kg/ha/y)	0.37	65	53
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WQB WQ Impact	26.32	85	93
WQB Combined Score	28.00	4	1

HUC-12 Basin: Moon Brook-Otter Creek (041504020109)

Tactical Basin Name: Otter Creek - Little Otter Cr. - Lewis Cr.

About the dashboard...

Click on the "show subbasins" link to open a list of all subcatchments within the Tactical Basin or HUC-12 Basin selected. (Not available when viewing a NHD Plus catchment)

Sort any column to quickly identify the subcatchment(s) with the highest/lowest TP yield, conservation value, etc.

Export the list to an Excel file

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Visualizing Baseline Information: Baseline TP Loading Information

Clean Water Roadmap

https://anweb.vt.gov/DEC/CWR/cwr-tool.vbhtml#

HUC-12 Basin Baseline TP Loading

HUC-12 Basin Load (4,047 kg/y)

- Cropland (773 kg/y, 19.1%)
- Pasture / Hay (302 kg/y, 7.5%)
- Farmsteads (40.3 kg/y, 1.0%)
- Developed (1,477 kg/y, 36.5%)
- Roads (754 kg/y, 18.6%)
- Forest (526 kg/y, 13.0%)
- Grass/Shrub Land (35.8 kg/y, 0.9%)
- Wetlands (139 kg/y, 3.4%)

Cropland

- Total Load: 773 kg/y (19.1%)
- Total Area: 1,178 ha (10.8%)
- Mean Yield: 0.66 kg/ha/y

Baseline Annual TP Load

- General Agricultural Land
- Corn (non-clay)
- Soybeans (non-clay)
- Fallow/Idle Cropland
- Corn/Hay (non-clay)
- Corn (clay)
- Soybean (clay)
- Corn/Hay (clay)

Click on this icon to print or download any chart

HUC-12 (1 of 2)

HUC-12 ID: 041504020109
HUC-12 Name: Moon Brook-Otter Creek

Zoom to

Click any pie wedge to view more detailed loading information for the land types present in the selected catchment

A new window will appear with two panels: a tree-view panel on the left with a list of land use groups and a pie chart panel on the right with a breakdown for the selected row

Catchment Dashboard

HUC-12 Basin
Moon Brook-Otter Creek
(041504020109)

Tactical Basin Name
Otter Creek - Little Otter Cr. - Lewis Cr.

About the dashboard...

HUC-12 Basin: Baseline Summary

Metric	Value	Percent Rank (Tactical Basin)	Percent Rank (LC Basin)
TP Load (kg/y)	4,047	65	55
Mean Yield (kg/ha/y)	0.37	65	53
Area (ha)	10,950	54	55
WQB Conserv. Value	38.22	42	69
WQB WQ Impact	26.32	85	93
WQB Combined Score	28.00	4	1

Legend:

- Cropland
- Pasture / Hay
- Farmsteads
- Developed
- Roads
- Forest
- Grass/Shrub Land
- Wetlands

Visualizing Baseline Information: Potential Best Management Practices

Clicking the "BMPs" tab while in baseline mode will display a list of appropriate best management practices for the selected land group

Each land group row in the tree-view panel can be selected and lists the estimated total phosphorus load as both an annual average and as a percent of the total load for the selected catchment

HUC-12 Basin Baseline TP Loading

- Cropland (773 kg/y, 19.1%)
- Pasture / Hay (302 kg/y, 7.5%)
- Farmsteads (40.3 kg/y, 1.0%)
- Developed (1,477 kg/y, 36.5%)**
- Roads (754 kg/y, 18.6%)
- Forest (526 kg/y, 13.0%)
- Grass/Shrub Land (35.8 kg/y, 0.9%)
- Wetlands (139 kg/y, 3.4%)

Baseline | **BMPs**

The following best management practice (BMP) types are typically appropriate for the selected land use/land cover (LU/LC) group:

- Ban on P Fertilizer Use on Turf
- Biofiltration with Underdrains
- Extended Dry Detention Pond
- Gravel Wetland
- Impervious Area Disconnection
- Impervious Area Removal
- Infiltration Trench
- Open Channel/Dry Swale
- Rooftop Runoff Disconnection
- Sand Filter
- Surface Infiltration Practices

Catchment Dashboard

HUC-12 Basin: Baseline Summary [\[show subbasins\]](#)

Metric	Value	Percent Rank (Tactical Basin)	Percent Rank (LC Basin)
TP Load (kg/y)	4,047	65	55
Mean Yield (kg/ha/y)	0.37	65	53
Area (ha)	10,950	54	55
WQB Conserv. Value	38.22	42	69
WQB WQ Impact	26.32	85	93
WQB Combined Score	28.00	4	1

Annual TP Load by LULC Group

- Cropland
- Pasture / Hay
- Farmsteads
- Developed
- Roads
- Forest
- Grass/Shrub Land
- Wetlands

Land Area (ha) by LULC Group

Visualizing in Scenario Mode

In scenario mode, you will be able to view total phosphorus load and yield reductions for management scenarios developed and shared by DEC planners. A scenario will typically include one or more land group specific best management practices (BMPs) applied to various catchments.

Clean Water Roadmap Tools

Map type: Baseline

Basin scale: Tactical Basin

Land type(s): All Land Types

Variable: [dropdown]

Color scheme: [dropdown]

Select: [dropdown]

Baseline mode
 Scenario mode

Select scenario: [dropdown menu]

- RA Scenario
- Select a scenario...
- RA Scenario
- WQBL Reasonable Ass...

Created: 10/28/2016 8:56 AM
Last revised: 1/23/2017 11:58 AM

Map Layers

- Streams
- Village Boundaries
- Town Boundary
- HUC-12 Basins
- NHDPlus Catchments
- Water Quality Blueprint (WQB): Conservation Value
- Water Quality Blueprint (WQB): Water Quality Impact

Catchment Dashboard

Tactical Basin Name: n/a

About the dashboard...

Catchment Baseline Summary

Metric	Value	Percent Rank (Tactical Basin)	Percent Rank (LC Basin)
TP Load (kg/y)			
Mean Yield (kg/ha/y)			
Area (ha)			
WQB Conserv. Value			
WQB WQ Impact			
WQB Combined Score			

Switch to scenario mode with this radio button to learn about potential phosphorus reductions

An existing management scenario can be loaded by selecting the name from the drop down list

Visualize in Scenario Mode

Two additional options become available under map type when visualizing in scenario mode. "Scenario" will display the total phosphorus load or yield realized as a result of management practice implementation. "Reduction" will display the difference in load or yield between the baseline and scenario.

Catchment Dashboard

HUC-12 Basin
n/a

Tactical Basin Name
n/a

About the dashboard...

Catchment Baseline Summary

Metric	Value	Percent Rank (Tactical Basin)	Percent Rank (LC Basin)
TP Load (kg/y)			
Mean Yield (kg/ha/y)			
Area (ha)			
WQB Conserv. Value			
WQB WQ Impact			
WQB Combined Score			

Visualizing in Scenario Mode: Overview

Click on a catchment to view more detailed information

Clean Water Roadmap Tools

- Overview Topics
- Visualize Basin Results

Select map options:

Map type: Reduction
 Basin scale: Tactical Basin
 Land type(s): All Land Types

Tactical Basin Scenario TP Loading

Tactical Basin Load (89,195 kg/y, -44.2%)

- Cropland (22,672 kg/y, -67.8%)
- Pasture / Hay (22,006 kg/y, -36.5%)
- Farmsteads (406 kg/y, -72.0%)
- Developed (5,314 kg/y, -53.9%)
- Roads (12,398 kg/y, -10.9%)
- Forest (21,803 kg/y, -5.0%)
- Grass/Shrub Land (1,713 kg/y)
- Wetlands (2,885 kg/y)

Compare (selected) | Baseline | Scenario | BMPs

Cropland Annual TP Load Comparison

Annual TP Load (kg/y)

80k
60k
40k
20k
0

Baseline Scenario

Tactical Planning Basin

Basin Name: Otter Creek-Little Otter Creek-Lewis Creek

Zoom to

Catchment Dashboard

Tactical Basin Name
 Otter Creek - Little Otter Cr. - Lewis Cr.

Tactical Basin: Baseline Summary [show subbasins]

Metric	Value	Percent Rank (Tactical Basin)	Percent Rank (LC Basin)
TP Load (kg/y)	159,729	n/a	n/a
Mean Yield (kg/ha/y)	0.56	n/a	n/a
Area (ha)	283,948	n/a	n/a
WQB Conserv. Value	n/a	n/a	n/a
WQB WQ Impact	n/a	n/a	n/a
WQB Combined Score	n/a	n/a	n/a

Annual TP Load (kg/y) by LULC Group

- Cropland
- Pasture / Hay
- Farmsteads
- Developed
- Roads
- Forest
- Grass/Shrub Land
- Wetlands

Land Area (ha) by LULC Group

The land group rows in the tree-view panel now display the estimated total phosphorus load under the management scenario and a percent reduction relative to the baseline condition

Two additional tabs are available in the panel on the right when in scenario mode. The "Compare" tab contains stacked bar charts that break down the total phosphorus loads by land use land cover types under the baseline condition and management scenario

Click any pie wedge return to the detailed loading information window for the selected catchment

Visualizing in Scenario Mode: TP Load Reduction & BMP Summary

Clicking the "BMPs" tab while in scenario mode will display the list of best management practices that were assumed to be applied under the current scenario as well as an approximate areal coverage for the selected land group

Clean Water Roadmap Tools

- Overview Topics
- Visualize Basin Results
- Select map options:
 - Map type: Reduction
 - Basin scale: Tactical Basin
 - Land type(s): All Land Types
 - Variable: TP Load (kg/y)
 - Color scheme: Green to red
- Select Scenario
 - Baseline mode
 - Scenario mode**
 - Select scenario: RA Scenario

Tactical Basin Scenario TP Loading

Tactical Basin Load (89,195 kg/y, -44.2%)

- Cropland (22,672 kg/y, -67.8%)
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- Forest (21,803 kg/y, -5.0%)
- Grass/Shrub Land (1,713 kg/y)
- Wetlands (2,885 kg/y)

BMPs

The following best management practices (BMPs) have been applied to the selected land use/land cover (LU/LC) group for the current scenario and basin (approximate areal coverage is indicated in parentheses):

- Roadside Erosion Control (5%)
- Catch Basin Cleaning (45%)
- Mechanical Broom Sweeper (2/year) (45%)
- Surface Infiltration Practices (0.5") (6%)

Tactical Planning Basin

Basin Name: Otter Creek-Little Otter Creek-Lewis Creek

Zoom to

Catchment Dashboard

Tactical Basin Name: Otter Creek - Little Otter Cr. - Lewis Cr.

Tactical Basin: Baseline Summary [\[show subbasins\]](#)

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Annual TP Load by LULC Group

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- Wetlands

Land Area (ha) by LULC Group

Additional Information

List of Acronyms

- BMP - Best Management Practice
- CWR - Clean Water Roadmap
- DEC - Department of Environmental Conservation
- HUC - Hydrologic Unit Code
- LC - Lake Champlain
- LULC - Land Use Land Cover
- NHD - National Hydrography Dataset
- RA - Reasonable Assurance
- TMDL - Total Maximum Daily Loading
- TP - Total Phosphorus
- WQ - Water Quality
- WQB - Water Quality Blueprint

List of LULC Codes

AGRR	General Agricultural Land
CRCL	Corn (clay)
CRNC	Corn (non-clay)
CHCL / HCCL	Corn/Hay (clay)
CHNC / HCNC	Corn/Hay (non-clay)
SCCL	Soybean (clay)
SCNC	Soybeans (non-clay)
SPAS	Fallow/Idle Cropland
HAY	Hay
PAST	Pasture
FRML	Medium/Large Farmstead
FRTS	Small Farmstead
URLD	Residential - Low Density
URMD	Residential - Medium Density
URHD	Residential - High Density
UIDU	Industrial/Commercial
RDDT	Unpaved Roads
RDPV	Paved Roads
DRWY	Driveways
FRSD	Deciduous Forest
FRSE	Evergreen Forest
FRST	Mixed Forest
RNGB	Shrubland
RNGE	Grassland
WETF	Woody Wetlands
WETN	Herbaceous Wetlands

Catchment Dashboard

HUC-12 Basin: Baseline Summary [\[show subbasins\]](#)

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- Wetlands

Contact Information

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