



AGENCY OF NATURAL RESOURCES
Department of Environmental Conservation

Vermont Environmental Indicators and Performance
Trends Report

Presented in Support of the Fiscal Year 2020 Proposed Budget

February 2019

VISION

We envision a Vermont where people live in harmony with diverse and healthy natural systems; appreciate and enjoy our natural resources; work together responsibly to reduce waste and risks to human health and the environment; and prosper without significant degradation of natural systems. We envision a Vermont where people breathe clean air; drink clean water; eat safe food; and live in a sustained and healthy environment.

MISSION

Preserve, enhance, restore, and conserve Vermont's natural resources, and protect human health for the benefit of this and future generations.

OVERVIEW

The Department of Environmental Conservation launched an effort beginning in 2014 to improve the performance of our programs and processes through the application of two continuous improvement frameworks: Results Based Accountability (RBA) and Lean. The former provides a mechanism for measuring and monitoring the success of our programs while the latter provides a means for improving the effectiveness and efficiency of our processes. Both are now widely used in the administration and management of the Department, which has resulted in the inclusion of performance measures in grants and contracts, the streamlining of various Department regulatory programs, and the incorporation of RBA into our strategic planning and FY20 budget development. In alignment with Act 186, the following report provides information on a number of Results Based Accountability indicators and performance measures associated with the Department. Information about the Department's recent Lean efforts can be found [here](#).

DEVELOPMENT OF THIS DOCUMENT

The information contained in this document was pulled together by an internal "Performance Management" team with members representing a diverse cross-section of the Department's programs. Members of the Performance Management Team work with technical staff and managers in their respective divisions to gather the data and develop content for the informational sheets which highlight some of the measurable results delivered by the Department. In support of the FY20 budget proposal, all performance measures in this document and associated text have been updated with the most recent data, trends and program activities.

NEXT STEPS

The Department is in the final phase of completing a strategic plan for FY19-FY21. It will follow the RBA framework of our previous plan with a focus on tracking performance measures and results. As we continue to implement Lean process improvement throughout the Department, we will align these efforts with higher level planning efforts, budgeting and RBA. Strategic planning sets the goals and desired trends, Lean moves our programs towards increased effectiveness and efficiency by focusing on outcomes, and identifying opportunities to improve our work flow and business processes.

Each page includes next steps which outline what actions the Department will undertake to maintain current trends or "turn the curve" and change the direction of an undesired trend to move towards our goals and targeted outcomes. The measures presented in this document are the highest level measures and indicators we currently track as a Department. Over the next year, the Performance Management team will align program-level performance measures with the FY19-FY21 Department Strategic Plan and aims to reduce the overall number of performance measures and indicators that are regularly tracked and reported.

USING THIS DOCUMENT

This document can be used in its entirety, or each page can stand alone to describe our performance in a specific area. The indicators and performance measures presented in this document are organized by category rather than by program, division or appropriation. These categories are as follows:

Our Water

Surface water and groundwater resource management, drinking water program

Our Air

Air quality, pollution emissions, climate change, greenhouse gas reduction programs

Our Land

Waste management

Our Communities

Financial resources, environmental assistance and risk assessment

Our Customers

Administration and innovation, continuous improvement, enforcement

KEY DEFINITIONS

Outcome - A condition of well-being for children, adults, families, communities or the environment.

Indicator - A measure that helps quantify the achievement of an outcome.

Performance Measure - A measure of how well a program or agency is working.

Table of Contents

Introduction



Our Water

INDICATORS

1. Ensure Public Drinking Water System Compliance
2. Water Quality of Vermont's Rivers and Lakes
3. Reduce Lake Champlain Phosphorus Pollution

PERFORMANCE MEASURES

4. Easements and Designations to Protect Surface Water Quality
5. Education and Training to Increase Knowledge and Stewardship of Vermont's Waters
6. Technical Assistance and Permitting to Protect Water Quality
7. Natural Resource Projects to Improve Water Quality
8. Protecting Groundwater in Trust for the Public
9. Protect Public Health Through Aquifer Characterization



Our Air

INDICATORS

10. Greenhouse Gas Emissions by Vermont
11. Number of Days Air Quality Moderate or Worse

PERFORMANCE MEASURE

12. Reduce Mobile Source Air Pollution



Our Land

INDICATORS

13. Promote the Sustainable Management of Waste
14. Support the Redevelopment of Vermont's Underdeveloped Properties

PERFORMANCE MEASURES

15. Minimize Exposure to Hazardous Materials
16. Transition Contaminated Sites Back to Productive and Beneficial Use
17. Reduce Hazardous Waste and Toxic Chemical Use

Our Communities

INDICATORS

18. Percent of Dams Receiving an Upgrade in Condition

PERFORMANCE MEASURES

19. Finance Water Infrastructure Upgrades
20. Ensure Sustainable Environmental Infrastructure
21. Village Wastewater Solutions Initiative
22. Identify Vulnerability to Geologic Hazards

Our Customers

INDICATORS

23. Improve Business Practices to Gain Efficiencies

PERFORMANCE MEASURES

24. Deliver Quick and Easy Access to Information
25. Support Implementation and Use of Online Permitting
26. Effective Issuance of Potable Water and Wastewater Permits
27. Resolving Environmental Violations

Indicator



Our Water

Ensure Public Drinking Water System Compliance

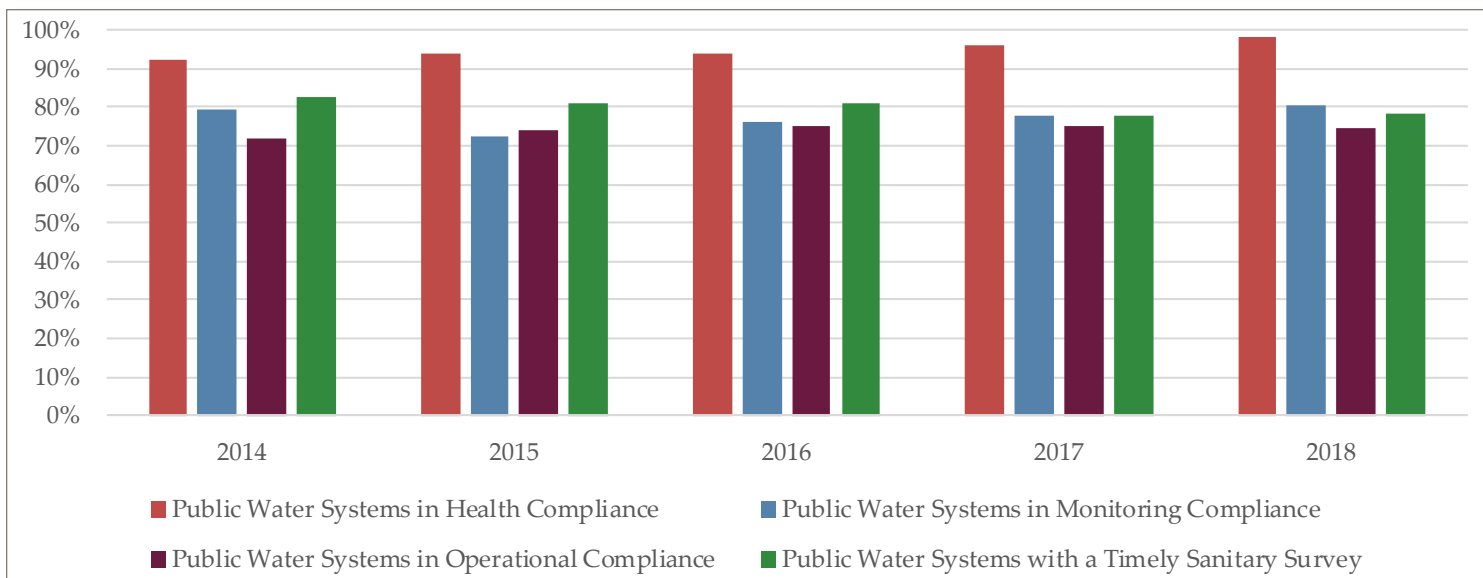
Provide safe drinking water to Public Water System users

98%

of public drinking water systems are in compliance with health-based standards

PERFORMANCE TREND

Compliance with health standards and monitoring requirements



DATA ANALYSIS

Public Drinking Water is regulated by both state and federal rules, and public drinking water systems throughout the state must meet established standards of water quality and system construction and operation. Three broad categories of compliance are identified in the figure above:

- Health compliance: compliance with the health-based standards of the regulations;
- Monitoring compliance: sampling for all required potential chemical and biological contaminants at required times; and
- Operational compliance: operating the water system in a safe and sanitary manner and addressing any identified operational deficiencies or other compliance directives in a timely fashion.

Common reasons for health-based non-compliance include detections of coliform bacteria, and detections of naturally occurring (ex: arsenic or radionuclides) or human-

introduced (ex: disinfection byproducts) contaminants that exceed established standards.

As can be seen in the figure, public drinking water systems in Vermont maintain a high level of compliance with health, monitoring, and operational guidelines. As of the close of fiscal year 2018, 98% of Vermont's public water systems were in compliance with health-based standards.

The Public Drinking Water Program focuses on proactively encouraging compliance before non-compliance occurs. This is accomplished through permitting of source, construction, and operational changes. In addition to assessing health and monitoring compliance, the Division conducts regular sanitary surveys of water systems to assess operational compliance status. Program staff provide extensive technical and compliance assistance to systems to avoid compliance issues down the road.

NEXT STEPS

- Continue to assess whether water systems meet operational standards and require compliance with these standards via the operating permit.
- Continue to assess whether water systems meet federal Maximum Contaminant Levels, monitoring, reporting, and treatment technique standards.
- Improve the source protection program with policy and rule changes.
- Continue to provide technical assistance to water systems.
- Encourage water systems to use asset management as a tool to prioritize improvements and maintain compliance.

Indicator



Our Water

Water Quality of Vermont's Rivers and Lakes

Vermont's rivers and lakes are healthy overall and support fishing and swimming activities for residents' enjoyment and tourism.

80%

healthy for fishing

85%

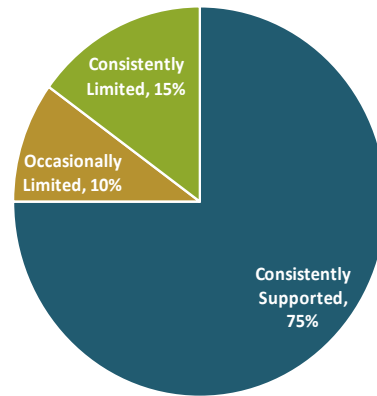
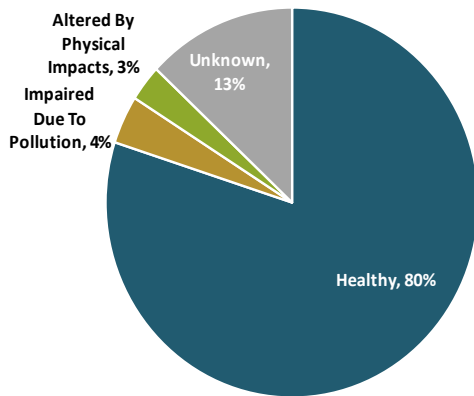
support swimming

PERFORMANCE TREND

Quality of rivers and streams for fishing

Quality of lakes for swimming

(excluding Lake Champlain)



NEXT STEPS

Through a variety of approaches and legislative tools, such as the 2015 Vermont Clean Water Act (Act 64), WSMD has the authority to broaden its mitigation of pollutant sources. New sources of water pollution are limited, and existing sources will continue to be reduced. Specific next steps include:

- Work with stakeholders to revise the designation and petition process available to conserve critical surface waters and wetlands.
- Utilize priority lists (also called "implementation tables") within tactical basin plans to identify and prioritize projects across the state.
- Host continuing education workshops that teach pollution prevention and mitigation practices and implementation techniques to contractors and consultants.
- Improve the process for applicants to receive jurisdictional determinations and apply for permits that set construction or operational conditions to reduce potential impacts.
- Utilize biomonitoring to assess wetland water quality.

DATA ANALYSIS

The majority (more than 80%) of Vermont's rivers, streams, and lakes are swimmable and fishable. Only a small proportion are severely impacted by human activities on the land or in the water. Examples include nutrient and sediment pollution from runoff, eroding streambanks caused by instream-activities, and introduction of invasive species.

Eighty percent of Vermont's rivers and streams support healthy communities of aquatic organisms and are considered fishable under the Vermont Water Quality Standards. This has held stable from the previous year. Only 7% of total river/stream miles are impaired due to pollution or altered by physical impacts, such as water level fluctuations from dam operations. The remaining 13% of waters are qualified as "unknown" condition because there is insufficient data to classify them.

There are 435 lakes greater than 10 acres in Vermont, totaling 56,532 acres. Excluding Lake Champlain, 85% of Vermont's lakes are swimmable. Swimming is occasionally limited in up to 10% of those lakes due to aquatic

invasive species or cyanobacteria (blue-green algae) blooms. In the remaining 15%, swimming is consistently limited for these reasons. The small increase in the percentage of lakes that support swimming/recreational since 2017 is largely attributable to phosphorus reductions in Ticklenaked Pond and aquatic invasive species management efforts.

The Watershed Management Division uses science-based decision making and adaptive management to continually evaluate how we can be most effective in achieving our goals to protect, maintain, enhance, and restore Vermont's surface waters.

To protect Vermont's existing high-quality waters and restore impaired waters, we utilize five core strategies:

- Protective easements and designations
- Implementation of pollution-reducing practices and projects
- Education and training
- Technical assistance and permitting
- Monitoring, assessment, planning

DATA SOURCE: Watershed Management Division

PREPARED BY: Watershed Management Division: (802) 828-1535: <http://dec.vermont.gov/watershed>

Indicator

Our Water

734

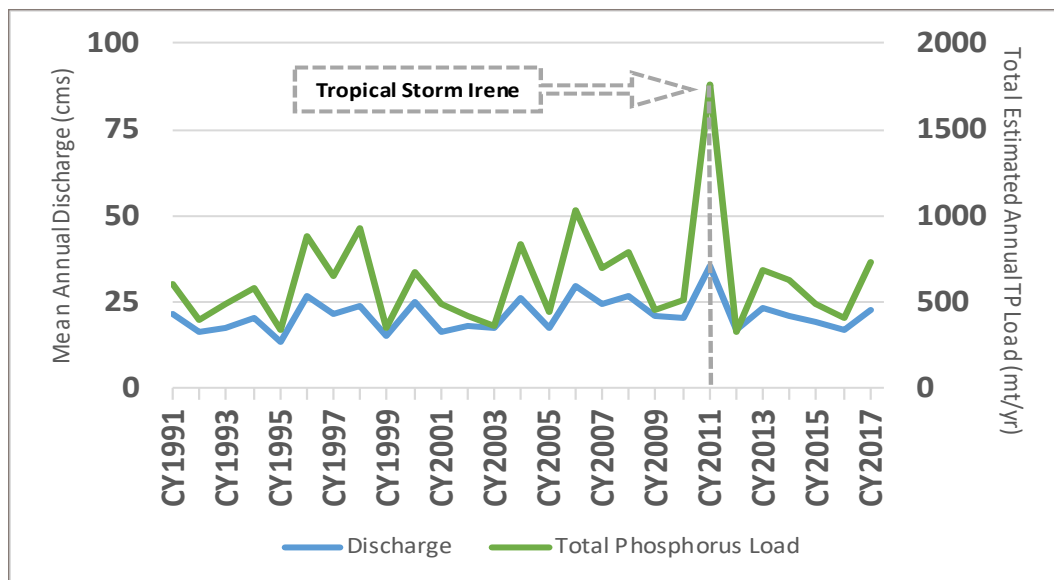
metric tons per year of total phosphorus loading to Lake Champlain

Reduce Lake Champlain Phosphorus Pollution

The Vermont Clean Water Act targets reducing the total phosphorus pollution reaching Lake Champlain from Vermont sources.

PERFORMANCE TREND

Lake Champlain tributary data, Calendar Years 1991-2017



NEXT STEPS

- Continue to implement pollution-reducing practices and projects.
- Expand classroom and online education and training to increase knowledge of behaviors that protect and provide stewardship of our waters.
- Provide technical assistance and improve permit process to prevent pollution from degrading our surface waters.
- Continue to utilize the Tactical Basin Planning process to address nonpoint source loading.

DATA ANALYSIS

The amount of phosphorus reaching Lake Champlain must be reduced to meet water quality standards and improve overall lake health. Phosphorus loading to the lake fluctuates annually due to changes in land use as well as weather and precipitation patterns. Higher amounts of precipitation, as was seen in 2017, move more phosphorus from the land to flowing waters where it is carried downstream to the lake by our rivers. As a result, annual phosphorus loading patterns closely follow annual river flow, or “discharge,” patterns. The graph above reflects how closely these are correlated.

The graph shows the annual fluctuation in total phosphorus (TP) loads as well as the average annual river flows that are precipitation, or “discharge”, driven. The target total phosphorus loading is 418 metric tons per year reflecting the maximum amount of phosphorus the lake can receive per year in order to meet the targets set for Vermont segments of Lake Champlain in the Total Maximum Daily Load (TMDL). When the Total Phosphorus Load is less than 418 the discharge

annual average has been less than 17.5 cubic meters per second. The Total Phosphorus Load for calendar year 2018 was 734 metric tons for the year, an amount that was directly related to the high rainfall that year with a discharge of 22 cubic meters per second.

With the passage of the Vermont Clean Water Act (Act 64) in 2015, the Watershed Division gained additional permitting and funding tools to implement projects to reduce phosphorus loads to our lakes, rivers, and streams. It is expected that decreased loading will be first measurable at a local level in individual smaller rivers and streams. While targets may be met at the local scale, it will take many years before the cumulative improvements are observable in larger tributaries and subsequently in Lake Champlain. Incremental reductions to phosphorus loading at the watershed level have been observed, such as in the LaPlatte River. Further performance metrics to reflect Watershed Division progress to protect, maintain, enhance, and restore Vermont water quality can be found in the Watershed Division’s Annual Report.

DATA SOURCE: Watershed Management Division

PREPARED BY: Watershed Management Division; (802) 828-1535; <http://dec.vermont.gov/watershed>

Our Water

5,495

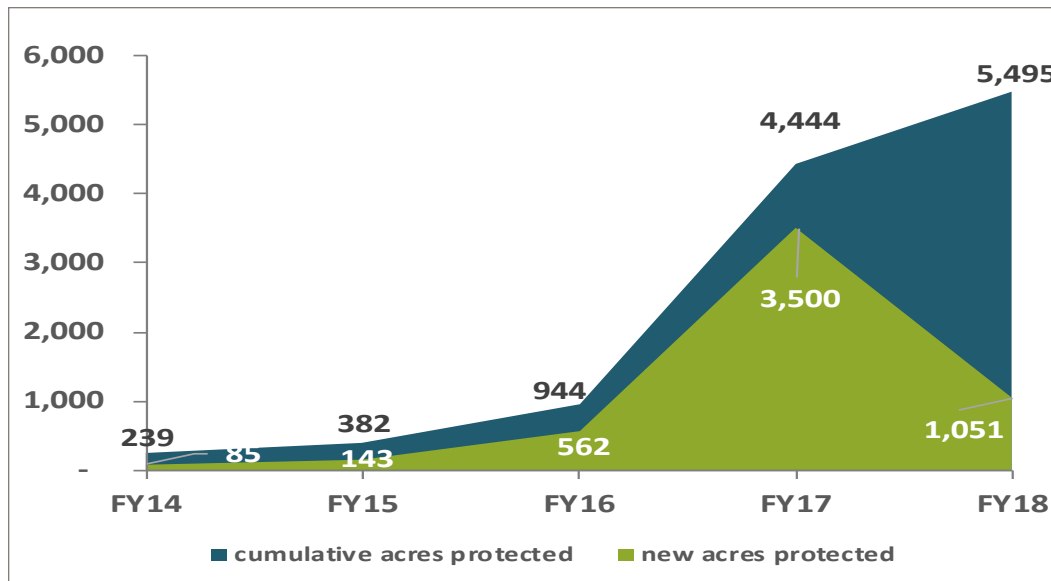
acres protected by easements and designations over the past 5 years

Easements and Designations to Protect Surface Water Quality

Protecting water quality and increasing flood resilience, recreational opportunities, and wildlife habitat.

PERFORMANCE TREND

Number of acres protected



NEXT STEPS

Strategies to better utilize easements and designations to protect water resources include:

- Increasing the number of surface water reclassifications under the Vermont Water Quality Standards.
- Increasing the number of wetlands designated as Class I under the Vermont Wetland Rules.
- Providing tools and technical assistance to municipalities and other partners so they can better protect designated and conserved waters.
- Refining our methods for identifying conservation priorities.
- Finalizing the procedure for designating Outstanding Resource Waters (ORW).
- Initiating ORW designation candidates through tactical basin planning.

DATA ANALYSIS

Vermont’s natural aquatic ecosystems, and the functions and values they provide are irreplaceable. They provide clean drinking water, places to swim, fish, and boat, and homes for wildlife. The Watershed Management Division (WSMD) has a primary responsibility to ensure these water resources remain healthy for this, and future generations.

Designations and easements are among the most effective tools for safeguarding natural systems from degradation. Because these tools place restrictions on activities that would harm our natural resources, they can help us reduce flood hazards, protect water quality, and restore wetland and riparian habitat.

Easements and designations include:

- River corridor easements and floodplain protection measures
- Parcel buy-outs
- Reclassification of surface waters
- Outstanding Resource Water designations

- Reclassification of wetlands (Class I Designation)

Over the past five years, the WSMD has used easements and designations to directly protect more than 5,400 acres with 1,051 of new protections in FY18. This far exceeds the cumulative goal of 850 acres, and 50 additional acres per year. A spike seen in FY17 is partially a result of Wetland Rule revisions that designated three wetlands as Class 1 that protected 2,500 acres.

In 2018, the Laplatte River wetland and Peacham bog protected 576 acres through Class I designations. Class I designations protect wetlands that are determined to be irreplaceable or exceptional in their contribution to Vermont’s natural heritage.

Easements and designations such as Class I wetlands help to protect water quality and increase our State’s flood resilience, recreational opportunities, and wildlife habitat.

Our Water

Education and Training to Increase Knowledge and Stewardship of Vermont's Waters

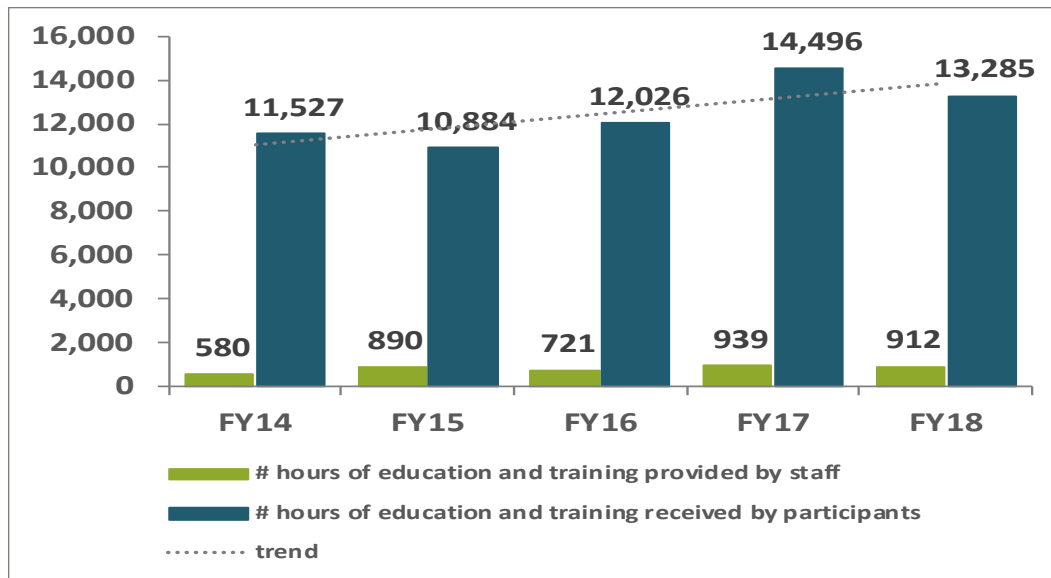
Empowering Vermonters to protect and enjoy our water resources.

13,000+ hours

of education and training received by participants

PERFORMANCE TREND

Hours of education and training



NEXT STEPS

As we implement the Clean Water Act (Act 64) and the WSMD strategic plan, we anticipate expanding education and training efforts through the effective use of technology and train-the-trainer models. This approach maximizes the impact of staff time devoted to this work.

Strategies to increase and improve our education and training efforts include:

- Increasing the diversity and frequency of classroom and online trainings to promote WSMD core goals to protect, maintain, enhance, and restore Vermont’ surface waters.
- Identifying and addressing skills needed by staff to enhance outreach and education offerings and outcomes.
- Utilizing ECO AmeriCorps members to assist with updating education and outreach materials and broadening the reach of trainings offered to diverse audiences across Vermont.

DATA ANALYSIS

Reducing the amount of pollution reaching our lakes, rivers, and wetlands requires sound land use policies and practices. All Vermonters – governmental agencies, commercial and agricultural businesses, municipalities, and individuals – have a responsibility to minimize their impact on our shared water resources. Learning why this is important and how to identify and implement the best management practices (BMPs) to reduce pollution is essential.

Education and training about our water resources and the BMPs and pollution prevention tools that will protect them is integral to achieving our water quality goals. Participating in a workshop or training can change individual behavior and promote environmental stewardship.

In 2018, more than 900 hours of education and training were provided by the Watershed Management Division (WSMD) staff – 13,000 hours of education and training received by participants. This exceeds the targets of 850 staff training hours, and 12,500 hours of training

received by participants. Note that these hours do not include technical assistance provided for project review.

These education and training opportunities (both in the classroom and online) included:

- Rivers and Roads trainings on smart road maintenance and culvert design
- Natural Shoreland Erosion Control Certification courses
- Training on wetland habitats and functions
- Workshops to help prevent the spread of aquatic invasive species
- Vermont Lake Wise workshops lake-friendly shoreland management
- Story maps and blog posts that inform and engage Vermonters in our water resource protection efforts

For additional details on education and training accomplishments, refer to the Vermont Clean Water Initiative - Annual Investment Report at <https://dec.vermont.gov>.

DATA SOURCE: Watershed Management Division

PREPARED BY: Watershed Management Division; (802) 828-1535; <http://dec.vermont.gov/watershed>

Our Water

Technical Assistance and Permitting to Protect Water Quality

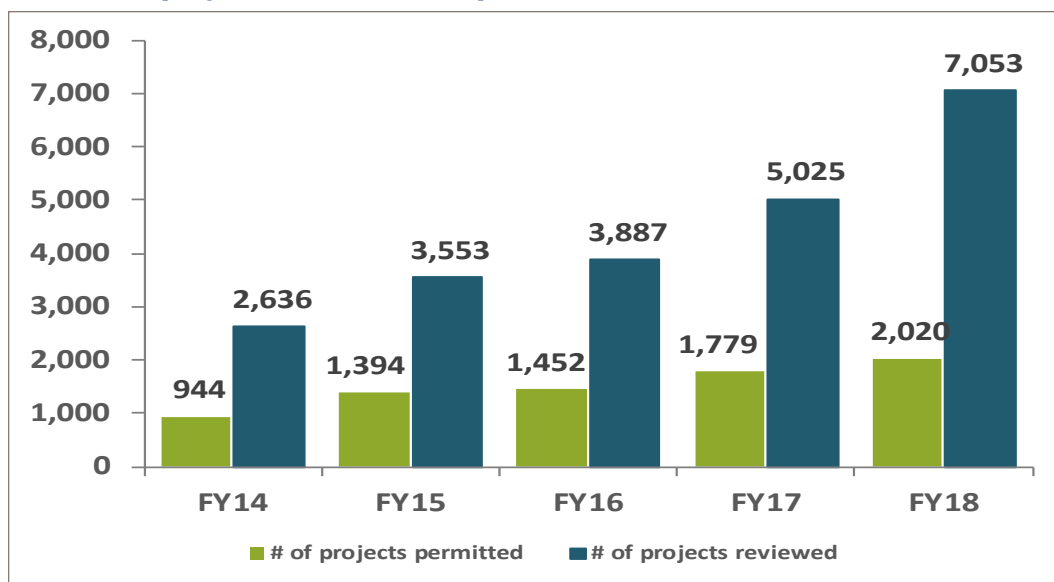
Preventing pollution from degrading surface waters and preventing wetland loss.

3:1

three projects are reviewed for every one permitted

PERFORMANCE TREND

Number of projects reviewed and permits issued



NEXT STEPS

Given the increase in regulatory authority granted by the Clean Water Act (Act 64 in 2015), it is critical that we find ways to standardize technical assistance and streamline permit issuance. Actions to achieve this include:

- Continue to meet public notice requirements through following a standard process, primarily through the Environmental Notice Bulletin.
- Digitize application and compliance forms for online completion, payment, and submittal.
- Improve jurisdictional determination outreach and follow up process.
- Streamline compliance review by automating business processes.
- Address backlog of mapping issued permits to ANR Atlas for increased transparency and coordination across sectors.

DATA ANALYSIS

The Watershed Management Division (WSMD) utilizes a combination of technical assistance and permitting approaches to prevent pollution from degrading surface waters. This two-pronged approach gives WSMD staff an opportunity to work with potential permit applicants to avoid or mitigate project impacts. These activities represent a large portion of the Division’s workload. Currently there are 5 programs providing technical assistance and issuance of permits (Rivers, Lakes, Wetlands, Stormwater, and Wastewater).

- Activities requiring permits include:
- Construction and operational stormwater management
- Wastewater discharges
- Aquatic nuisance control, and Shoreland development
- Stream alterations
- Activities in wetlands and their buffer zones

WSMD regularly provides technical assistance to municipalities, landowners, developers, and partner organizations to ensure that water quality standards are met, and ecological functions maintained or enhanced. Examples include:

- Redirecting project design to fall outside protected areas of wetlands, shorelands, river corridors, and floodplains
- Consultation regarding road designs to avoid impacting river or stream flows
- Next flood measure technical review to address streams and rivers compromised due to a flood event

Where activities create potential impacts to water quality, general permitting conditions guide applicants to design projects in a way that reduces potential discharges or practices that would contribute to runoff or natural resource loss. When impacts cannot be completely avoided, individual permits with conditions to minimize impacts to water quality and protect wetland function and value may be issued.

In FY18, WSMD staff provided technical assistance to over 7,000 projects. This is an increase of over 2,000 projects reviewed from FY17. Beginning January 1, 2018 the majority of permits that WSMD issued were noticed through the Environmental Notice Bulletin, an updated online public notice platform. During FY18, this amounted to over 1,400 permits.

DATA SOURCE: Watershed Management Division

PREPARED BY: Watershed Management Division; (802) 828-1535; <http://dec.vermont.gov/watershed>

Our Water

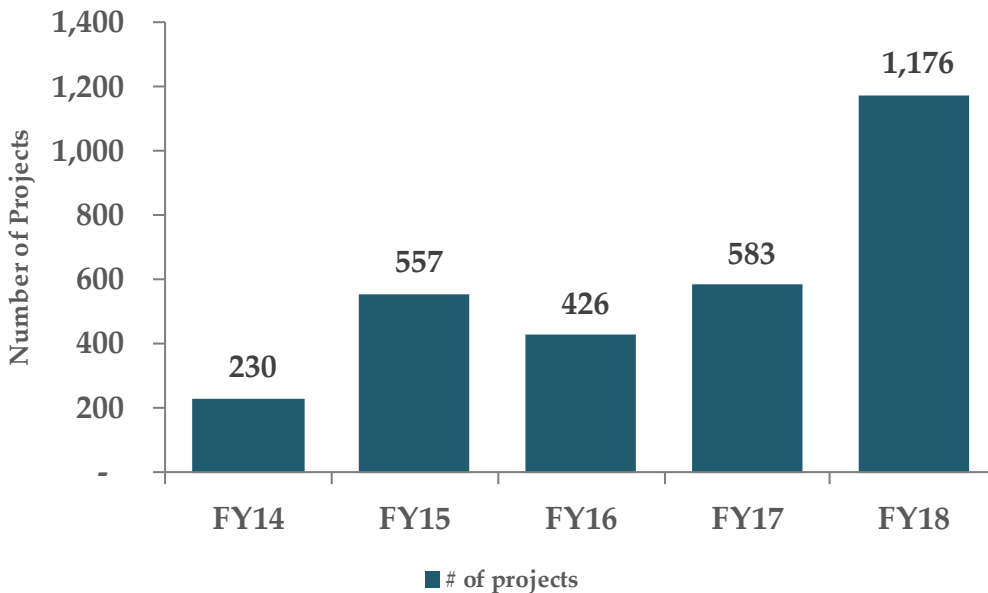
Natural Resource Projects to Improve Water Quality

Restoring and enhancing water quality in our rivers, lakes, and wetlands through coordinating and funding project implementation.

1,176
water quality improvement projects initiated in FY18.

PERFORMANCE TREND

Number of water quality improvement projects initiated



DATA ANALYSIS

Pollutants that degrade Vermont’s water quality include both point and nonpoint sources. Point source pollution are discharges directly from a pipe. Nonpoint sources, often called “runoff,” transport pollutants from land to surface water by rain and snowmelt. Pollutants carried off the land via runoff include sediment from eroded or disturbed lands, heavy metals from roads, and nutrients collected from lawns and farmlands.

Pollution from nonpoint sources – neighborhoods, downtown and commercial areas, roads, farmland, and logging sites cause the majority of impacts to surface waters in Vermont. Protecting and restoring Vermont’s waters requires us to utilize best management practices across diverse land uses prevent and mitigate nonpoint source pollution.

To accomplish this, the Watershed Management Division (WSMD) takes a multi-faceted approach – financial assistance through Clean Water Initiative Program grants, technical assistance, and administration of regulatory programs to improve Vermont’s water quality. Project examples include:

- Implementation of best management practices on riparian and lake-shore properties, such as planting buffers
- Stream and floodplain restoration to achieve stream stability and connectivity
- Installation of green stormwater infrastructure practices that infiltrate stormwater runoff
- Wetland restoration and protection to slow or trap runoff carrying nutrients

In FY18, WSMD facilitated nearly 1,200 unique improvement projects exceeding the target of 525 projects. Of these projects, 124 received over 6.6 million dollars of funding assistance through Ecosystem Restoration Grants supported by the Vermont Clean Water Fund and other funding sources. All state investments in clean water projects and results of project implementation are summarized in the Vermont Clean Water Initiative - Annual Investment Report.

NEXT STEPS

When projects are properly constructed and maintained, they play a critical role in achieving Vermont Water Quality Standards (DEC, 2017) to ensure that they are fishable and swimmable for all to enjoy. WSMD relies heavily on its Tactical Basin Planning process and partner organizations to identify, prioritize, develop, and implement projects.

The WSMD plans to expand and improve on these efforts by:

- Continuing to update all Tactical Basin Plans on a 5-year cycle, providing the best data available to identify and prioritize projects.
- Enhancing project prioritization methodologies with GIS mapping tools that can be referenced by all stakeholders.
- Enhancing grant programs to provide clarity to process and eligibility of projects to receive funding.
- Increase participation in voluntary measures and leverage media and awards to provide recognition for assisting WSMD attain its goals to protect, maintain, enhance, and restore Vermont waters.
- Revising the Vermont Wetland Rules to clarify wetland protections.

DATA SOURCE: Watershed Management Division

PREPARED BY: Watershed Management Division; (802) 828-1535; <http://dec.vermont.gov/watershed>

Our Water

Protecting Groundwater in Trust for the Public

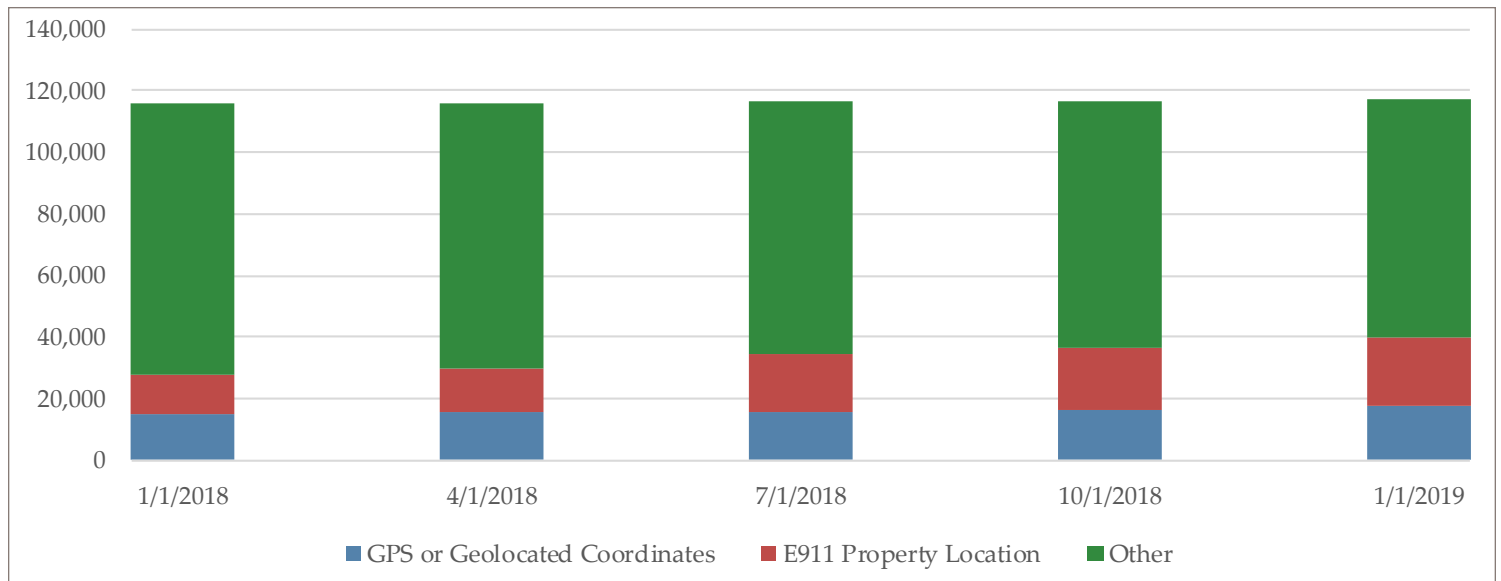
Improving well location data to better protect groundwater as a public resource

34%

of groundwater wells have E911 or GPS locations

PERFORMANCE TREND

Well locational data improvements in 2018



DATA ANALYSIS

Background Information on Groundwater Management

Groundwater protection law under Title 10 Chapter 48 states that groundwater resources are held in trust for the public. A comprehensive groundwater management program has been developed that includes the Groundwater Protection Rule and Strategy (GWPRS), the Vermont Groundwater Management Plan, and the long-standing Groundwater Coordinating Committee. The GWPRS is being revised to include aspects of the public trust test, petition and reclassification process for groundwater and updated values for Groundwater Enforcement Standards.

Well Location Improvement Project

Accurate well locations are an important part of groundwater protection because state agencies and the consulting community use this information to provide adequate well

protection in their work.

In 2005, the Drinking Water and Groundwater Protection Division began requiring well drillers to supply GPS or geolocated coordinates for well locations. In order to improve the accuracy of older well locations, the Department obtained a USGS grant in 2017 to improve E911 well location data. Staff have been conducting a systematic review and update of well locations.

As can be seen in the figure above, these efforts are already making an impact. The green bars represent old locational data with unknown accuracy. The blue and red bars represent GPS/geolocated and E911 location data, respectively. As location accuracy continues to improve, we expect to see the number of wells with E911 or GPS/geolocated locations increase. As of the end of calendar year 2018, 34% of wells were either GPS/geolocated or E911 located.

NEXT STEPS

Continuing Implementation

As work continues on revising and implementing the Groundwater Protection Rule and Strategy (GWPRS), the Division intends to pursue several next steps:

- Integration of the GWPRS into DEC permitting programs.
- Publicizing well location tools, including a Well Location Improvement Tool on the ANR Atlas to be used by the public to update information.
- Continued implementation of the Groundwater Management Plan.
- Work to evaluate groundwater supplies and promote reclassification of groundwater to protect public health.

Our Water

24

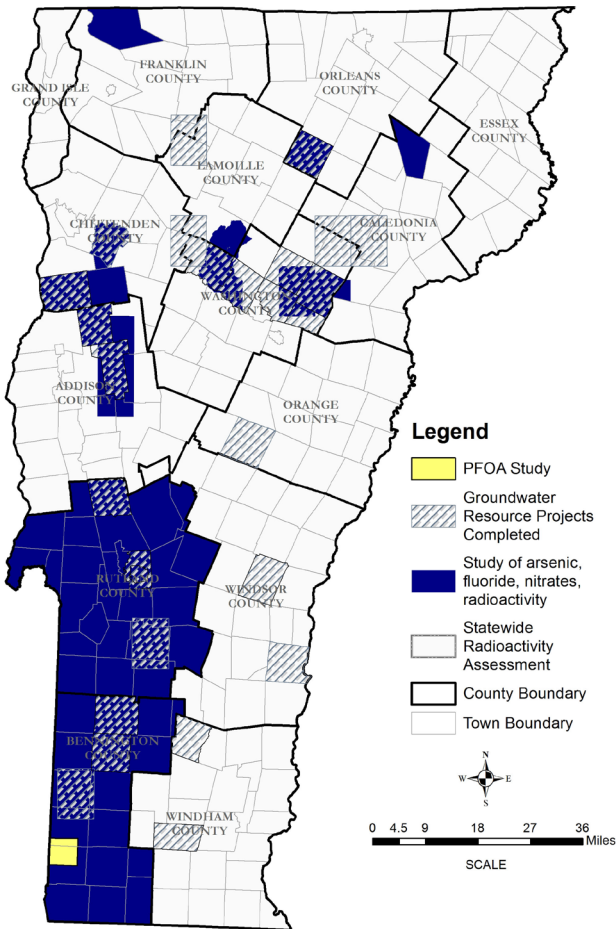
Town groundwater projects completed since 2001

Protect Public Health Through Aquifer Characterization

By providing essential geoscience for Vermont communities

PERFORMANCE TREND

Regions benefiting from geologic solutions



understand the groundwater system. This type of work provides reliable data to assist in reducing exposure to chemical and mineralogical contaminants, thereby serving to protect human health and the environment.

Another component of VGS's work is the collection and compilation of datasets used to support planning and protection of groundwater drinking supplies. Data from drilled water wells, geologic maps and anthropogenic information is used to develop aquifer favorability maps for counties and to identify priority areas for more detailed groundwater resource mapping. In 2017, with funding through a federal grant, the VGS initiated a project to upgrade datasets and evaluate statewide water use. This work will improve understanding of local groundwater recharge and water budgets and will better inform planning for drinking water supply.

VGS provides support to communities and state agencies through sampling, research and mapping. As seen in the map above, a variety of groundwater resource projects have been completed, but there is still significant work to be accomplished. Active collaboration with the Drinking Water and Groundwater Protection and Waste Management Divisions in DEC, university partners, non-profit organizations and federal partners (EPA and USGS) are key to our success.

NEXT STEPS

- Prioritize projects and document the extent of naturally occurring and human induced contamination through well water sampling, data analyses, monitoring and field studies. This includes continuing investigative work in the Bennington area to address PFAS contamination.
- Collaborate with partners, to increase awareness of geologic influences on groundwater and provide information for source protection.
- Build statewide databases for groundwater and produce GIS maps as planning tools for public water supplies.
- Complete Phase 1 of the 3-phase statewide water use project.
- Maintain funding for mapping programs and their application to groundwater resources.
- Develop water resource maps for two (2) towns in 2019-2020 for use in informing local groundwater protection and planning.

DATA ANALYSIS

Vermont's geology, characterized by deformed rock and unconsolidated glacial deposits, holds our valuable groundwater resources. Groundwater chemistry, including naturally occurring contaminants (ex. arsenic, radioactivity) is directly related to regional geology. By collecting data, interpreting the geochemistry from drinking water wells, and determining the influence of the local geologic materials, the Geologic

Survey (VGS) can inform the public about potential risk.

The Division also investigates groundwater contamination from non-geologic sources, such as per- and polyfluoroalkyl substance (PFAS) contamination in the state. Geologic maps provided the base information for an intense effort by staff and partners in the Bennington area to characterize the aquifer, develop three-dimensional and temporal models, and

Indicator

Our Air

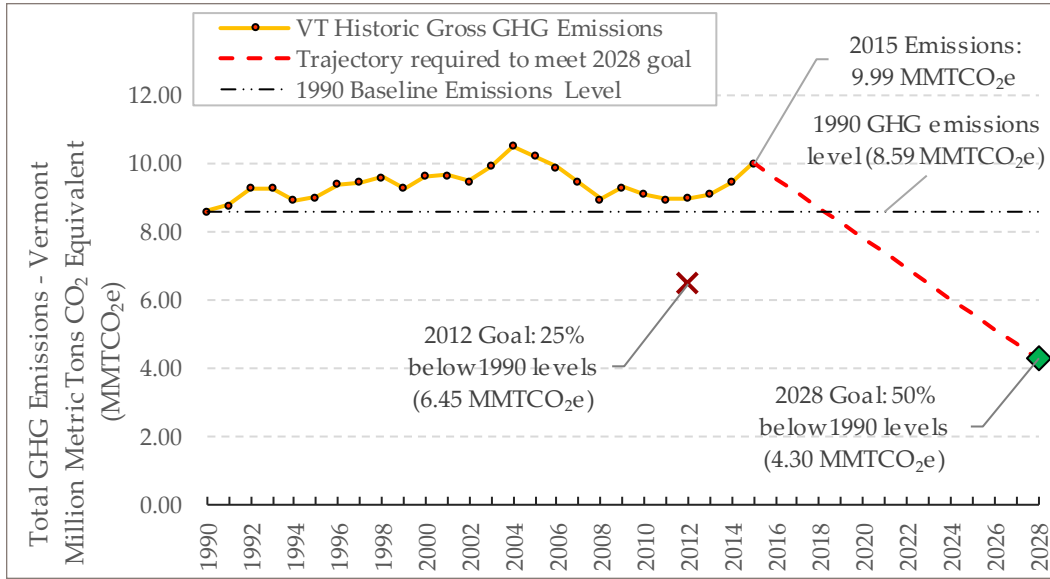
Greenhouse Gas Emissions by Vermont

Quantifying tons of greenhouse gases emitted

16
metric tons
of GHGs emitted per
capita in 2015

PERFORMANCE TREND

Vermont greenhouse gas emissions inventory, 1990-2015



NEXT STEPS

Strategies to reduce GHG emissions

Continue to support lower vehicle emissions standards through the low and zero emission vehicle program (LEV and ZEV), enhance public transportation, and promote electric vehicle (EV) adoption. Expand on building weatherization and heating efficiency improvement efforts for the residential-commercial-industrial (RCI) sector. Push toward demand-side efficiencies and low carbon, appropriately-sited, renewable generation sources for the electricity sector.

Continue to publish GHG emissions inventory updates on an annual basis to track progress and inform climate policy.

DATA ANALYSIS

Vermont fell far short of meeting the statutory goal for 2012 (10 V.S.A. § 578) to reduce greenhouse gas (GHG) emissions to 25% below 1990 levels. The next goal on the horizon is to attain 50% of 1990 levels by 2028. Emissions levels from applicable contributing sectors are estimated in the Vermont Greenhouse Gas Emissions Inventory reports and historical estimates are made to track progress.

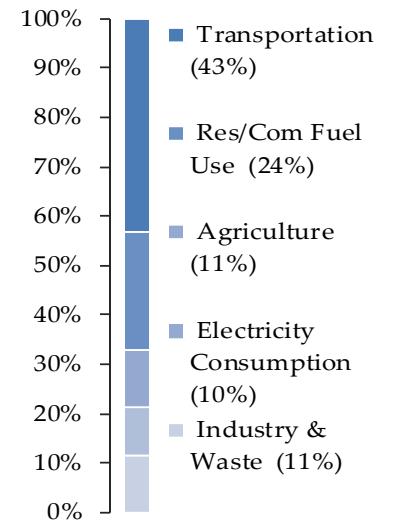
The Vermont Greenhouse Gas Emissions Inventory is released on an annual basis, with a delay of approximately 3 years from the year that emissions are being calculated. This is due to the staggered availability of multiple data sources at state and federal levels, from which this report is compiled. The most recent emissions inventory is for calendar year 2015 with the planned release of the inventory for 2016 later in 2019.

Unfortunately, the GHG emissions inventory reports show that emissions in Vermont actually increased from 2011 through 2015. In the 2015 report, emissions were estimated to

be approximately 16% above the 1990 baseline levels. Emissions increases between the 2013 and 2015 inventories were driven mainly by the Transportation, Residential/Commercial & Industrial fuel use (RCI), and electricity sectors. These sectors comprise three of the top four contributing sectors in the inventory. If substantial progress is going to be made toward meeting the 2028 emissions reduction goal, significant and immediate action must be taken in multiple sectors.

Vermont's participation in the U.S. Climate Alliance has led to a greater understanding and focus on short-lived climate pollutants (SLCPs) in recent months. These gases have high warming potentials (more potent than CO₂) and short atmospheric lifetimes and include methane (CH₄), black carbon (BC), and hydrofluorocarbons (HFCs). Reducing emissions of these gases is considered a necessary mitigation "quick-fix" which must be coupled with longer term initiatives and strategies to reduce emissions of longer lasting CO₂.

Vermont GHG emissions by sector



Indicator

 Our Air

Number of Days Air Quality Moderate or Worse

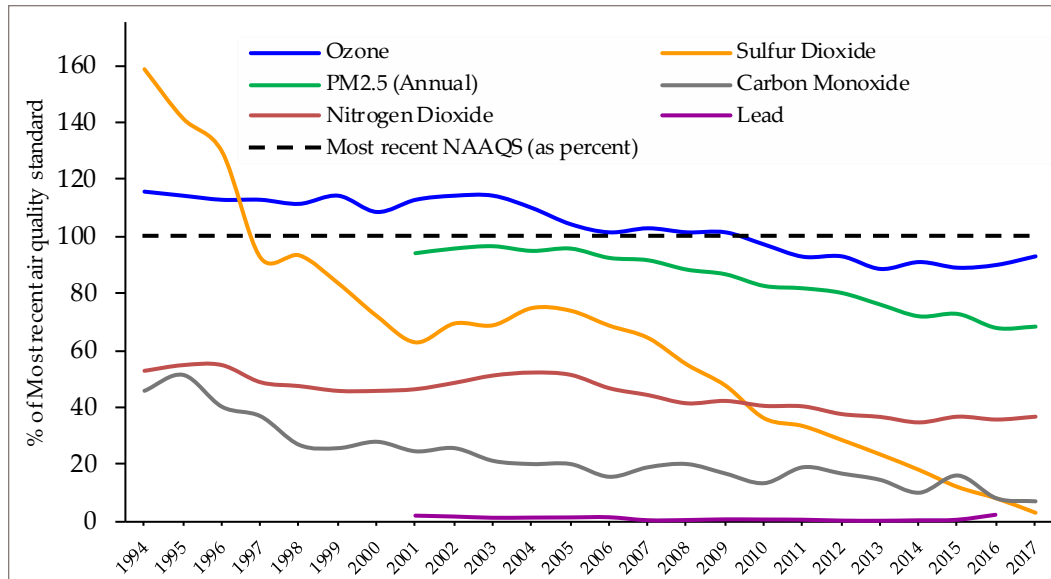
Monitoring Vermont's air pollutant concentrations

69

days in 2017, ambient air quality posed a moderate or greater risk to sensitive populations

PERFORMANCE TREND

Ambient air quality trends for Criteria Air Pollutants in Vermont



DATA ANALYSIS

Vermonters' health, welfare and environment are affected by exposures to many different pollutants present in our air that result from a combination of local and out-of-state sources. The US EPA sets and periodically revises National Ambient Air Quality Standards (NAAQS) for six of the most common air pollutants, illustrated in the graph above.

The monitored concentrations of common air pollutants in Vermont's ambient air provide an indication of the effectiveness of the integrated efforts of the entire Air Quality and Climate Division (AQCD) program to reduce air pollution emissions, in combination with parallel efforts from upwind states and national programs in the US and Canada.

Concentrations of the pollutants plotted above are based on the highest concentrations measured in Vermont, and are expressed as percentages of the current health standards, or NAAQS. All six pollutants have been

declining over time, and are below the threshold for what is considered healthy (based on the NAAQS, illustrated by the dashed line). Although the standards are being met, there are times when elevated pollutant concentrations are unhealthy. The AQCD produces daily air quality forecasts and issues alerts to the public when pollution levels are expected to be unsafe. In 2017, there were 69 days when air pollution posed a moderate or greater risk to sensitive groups such as people with heart or lung disease, older adults, children, and teenagers. Concentrations of ozone or particulate matter were classified as moderate or above in at least one area of Vermont on each of those days.

Continued reductions of these pollutants will be needed to meet future, more stringent, standards.

NEXT STEPS

- Vermont's ground level ozone concentrations are heavily influenced by transport from upwind states, and active participation in regional organizations such as the multi-state Ozone Transport Commission is essential to achieve future progress.
- Vermont's in-state contributions to ozone come primarily from mobile sources. These emissions will also need to be reduced to assure the health of future generations.
- Vermont's summer particulate matter pollution is heavily influenced by interstate transport, and will benefit from regional programs like EPA's Cross State Air Pollution Rule.
- Vermont's winter particulate levels are often dominated by local emissions, especially in mountain valley towns where reductions from local sources like wood stoves will be needed to meet more protective future standards.

Our Air

Reduce Mobile Source Air Pollution

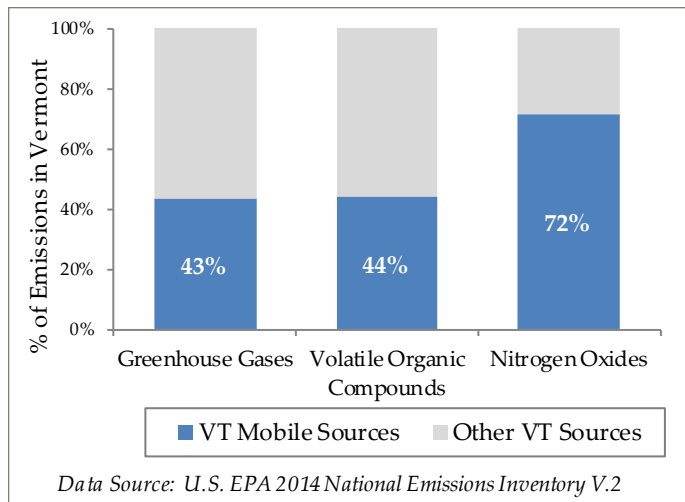
Promoting electric and other low emission vehicles in Vermont will reduce air pollution emissions

72%

of NO_x emissions in Vermont are from mobile sources

PERFORMANCE TREND

Proportion of air pollutants from mobile sources



registered in Vermont has increased by nearly 60%.

Cleaner conventional vehicles and alternatively fueled vehicles such as plug-in hybrid and all-electric vehicles are necessary to help offset potential increases in vehicle population and VMT.

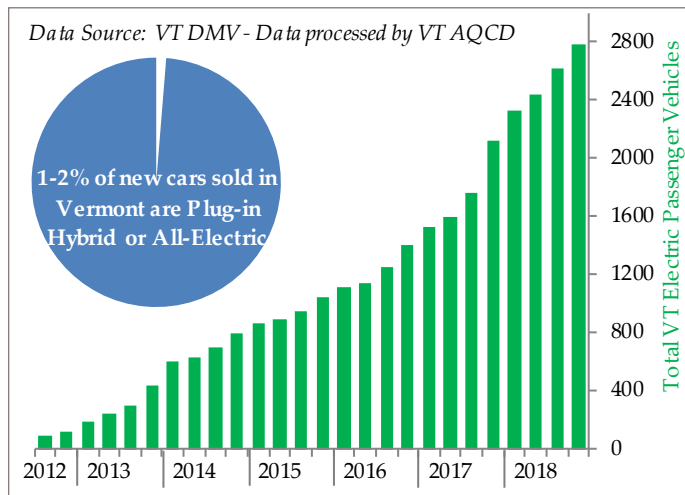
While the continuous growth rate of new electric vehicles registered in Vermont is encouraging, these vehicles are still only a very small fraction of the total new vehicles registered. In order to improve air quality and meet our greenhouse gas emission reduction goals, alternative fueled vehicles will need to be a much larger fraction of total new vehicles registered in Vermont.

At the same time, efforts to reduce air pollution from conventional vehicles must continue. These include continued adoption of California vehicle emissions standards, inspection and maintenance of vehicle emission control systems, and enhancement of emissions control technology upgrade programs for diesel engines.

NEXT STEPS

- Implement Vermont’s Zero Emission Vehicle (ZEV) Action Plan which identifies actions to expand the ZEV market in Vermont, and continue to participate in Multi-State ZEV Action Plan.
- Continue to adopt California vehicle emissions standards, including ZEV requirements.
- Enhance Vermont’s vehicle emissions inspection and maintenance program to maximize benefits from investments in emissions control technology.
- Reduce diesel emissions through technical support and funding for vehicle and equipment replacement, and installation of idling reduction technologies.
- Provide information and training to Vermont automotive technicians to ensure effective maintenance and repair of vehicle emission control systems.

Registered plug-in hybrid & all-electric vehicles



DATA ANALYSIS

Mobile sources (i.e. vehicles, engines, and equipment) are the largest source of many air pollutants in Vermont, including greenhouse gases and the ozone-forming volatile organic compounds (VOCs) and nitrogen oxides (NOX), as well as hazardous air

pollutants which contribute to human health impacts ranging from respiratory diseases to cancer.

Vehicle miles traveled (VMT) in Vermont are nearly twice as high as they were thirty years ago. During that time, the number of cars and trucks

DATA SOURCE: U.S. EPA and Vermont Department of Motor Vehicles; see above.

PREPARED BY: Air Quality and Climate Division; (802) 828-1288

Indicator

 **Our Land**

Promote the Sustainable Management of Waste

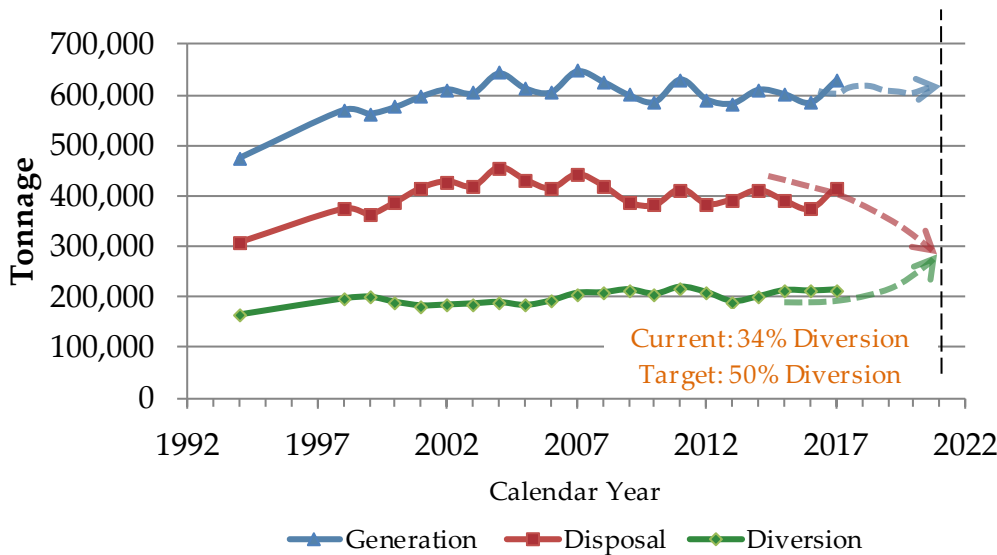
Increasing the statewide diversion rate of all solid waste generated by Vermonters

3.67 lbs

the amount of waste disposed of by an average Vermonter each day

PERFORMANCE TREND

Tons of solid waste generated, diverted and disposed of by Vermonters



NEXT STEPS

- Provide outreach and education on what, where, and how materials can be recycled, donated, and composted.
- Support market development for recyclables and compost products through communication and collaboration between states, internal arms of Vermont state government, and private and nonprofit sectors.
- Conduct direct business outreach in collaboration with Solid Waste Management Entities (SWMEs) to ensure compliance with Universal Recycling Law.
- Encourage the use of the Food Recovery Hierarchy by supporting source reduction, providing food to people and feeding animals.
- Implement updated Solid Waste Implementation Plans by regional solid waste management entities.
- Enforce the landfills ban on recyclables and leaf and yard debris, and mandatory diversion of food scraps by commercial/industrial generators.
- Evaluate the initial impacts of the recycling, food scraps, and leaf and yard debris landfill bans by compiling 2018 diversion and disposal data and completion of the 2018 Waste Composition Study.

DATA ANALYSIS

Parallel to national trends, Vermonters have continued to discard more and more materials over the past few decades. Vermont residents, businesses, and institutions also continue to send reusable, recyclable, and compostable materials to the landfill. When Vermonters keep these valuable materials out of the landfill it saves fuel and energy, conserves resources, reduces greenhouse gases and creates new business opportunities.

Implementation of the Universal Recycling Law began in 2013 as an innovative and encompassing change to the State’s solid waste management program. Largely focused on keeping recyclables and organics (i.e. wasted food, leaf and yard debris) out of, or “diverted” from the landfill, by making recycling and composting convenient. In 2017 Vermonters composted more than any time in the last ten years with the amount of organic material reported as being managed by Vermont facilities increasing 9% from 2016 to 2017. Also, according to several recent (2018) surveys, over 50% of Vermonters are separating some, or all, of their food waste for feeding animals or backyard composting. Between 2014 and 2017

the amount of food collected from businesses for redistribution by the Vermont Foodbank has almost tripled as a result prioritizing the prevention of wasted food. Correspondingly, the weight (in tons) of materials recycled (e.g. plastics, papers, glass, etc.) increased in 2017 which is an indication of Vermont’s recycling program success, given the ongoing decreases in the manufactured weights of packaging materials.

Even with this marked success in recycling, food donation, and composting, 11% more materials went to the trash in 2017 than in 2016. This increased the per capita disposal from 3.3 to 3.7 pounds per person per day and reverses the previous two-year trend of decreasing disposal rates.

Many factors influence the total waste generated each year, including population size, economic activity, and changing materials types within the waste stream. Regardless of the cause, the 2017 increase in waste disposal shows there is more work to be done to encourage waste reduction, recycling, and composting.

DATA SOURCE: Solid Waste Management Program

PREPARED BY: Waste Management and Prevention Division; (802) 828-1138

Indicator



Our Land

Support the Redevelopment of Vermont's Underdeveloped Properties

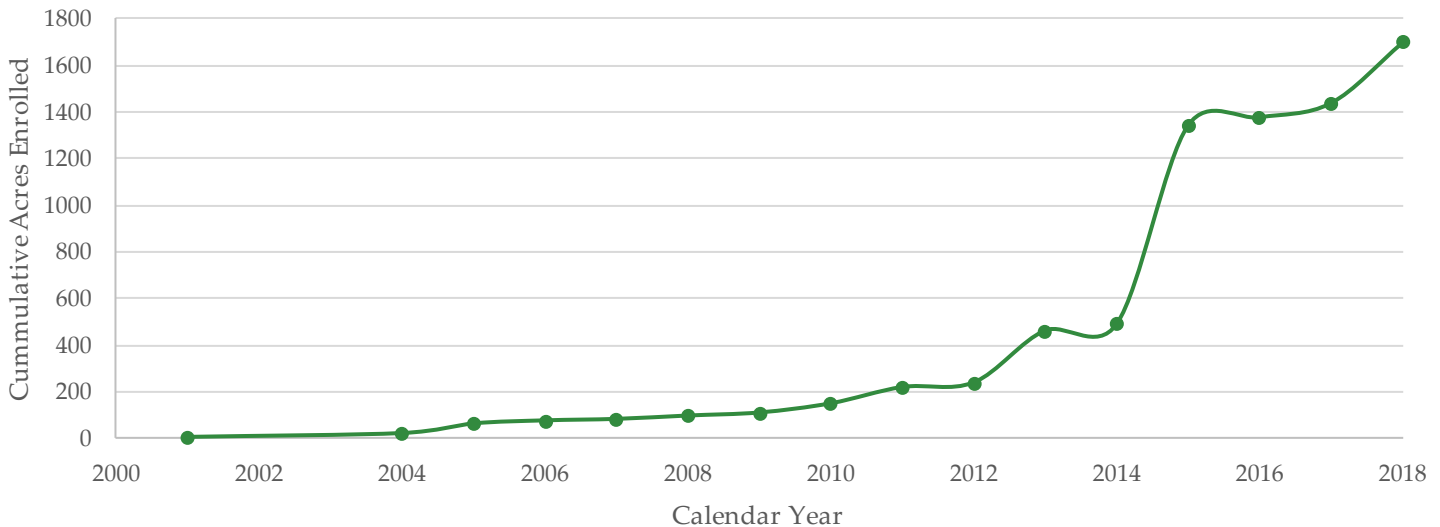
Safely clean-up and sustainably reuse brownfields

1,696

acres enrolled in the Brownfield Reuse Initiative

INDICATOR TREND

Acres enrolled in the Brownfield Reuse Initiative



DATA ANALYSIS

The Brownfield Program provides developers interested in developing a contaminated property, or brownfield site, with state support to do so in a safe, timely and cost-effective manner. This is accomplished by providing technical assistance, financial assistance and liability protections related to environmental liability. While the Department (DEC) provides the bulk of direct assistance, the projects often could not be completed without collaboration from partners at the Agency of Commerce and Community Development (ACCD), and regional planning commissions.

Brownfields in Vermont are defined as property on which expansion, redevelopment, or reuse may be complicated by the release or threatened release of a hazardous material. Brownfield redevelopment advances sound land-use practices while promoting community and economic growth by removing impacts to the environment and public health. Brownfields are also consistent with other state goals including redevelopment of downtowns, providing affordable housing, cleaning up hazardous waste sites and the environment,

increasing property values and tax revenue, and supporting municipal and non-profit organizations.

The Brownfields program has been very successful in cleaning up a combined 674 acres cleaned up since the beginning of the program in the late 1990s. In total, there have been 164 projects enrolled in the Brownfields Reuse and Environmental Liability Limitation Act Program. In 2018 the Program enrolled a record number of new projects since its inception. With 22 projects enrolled during 2018, the Program has significantly surpassed the previous high of 16 projects in 2014. The total number of acres enrolled in the program is now 1,696 acres.

With the increasing popularity of the program, current funding allocations are insufficient to meet the demand. Each year DEC and ACCD request funds from the US EPA to support the Program in assisting with the investigation and cleanup of brownfields. Over time the amount awarded has either remained level or decreased.

NEXT STEPS

- Based on projected funding needs, observed increase in annual enrollment, and declining federal funds, the Brownfields Program needs to explore additional funding mechanisms.
- Continue to promote the benefits of the Brownfields Program to landowners, municipalities, and developers by publishing success stories and conducting outreach and education events.

DATA SOURCE: Sites Management Section

PREPARED BY: Waste Management and Prevention Division; (802) 828-1138

Our Land

310

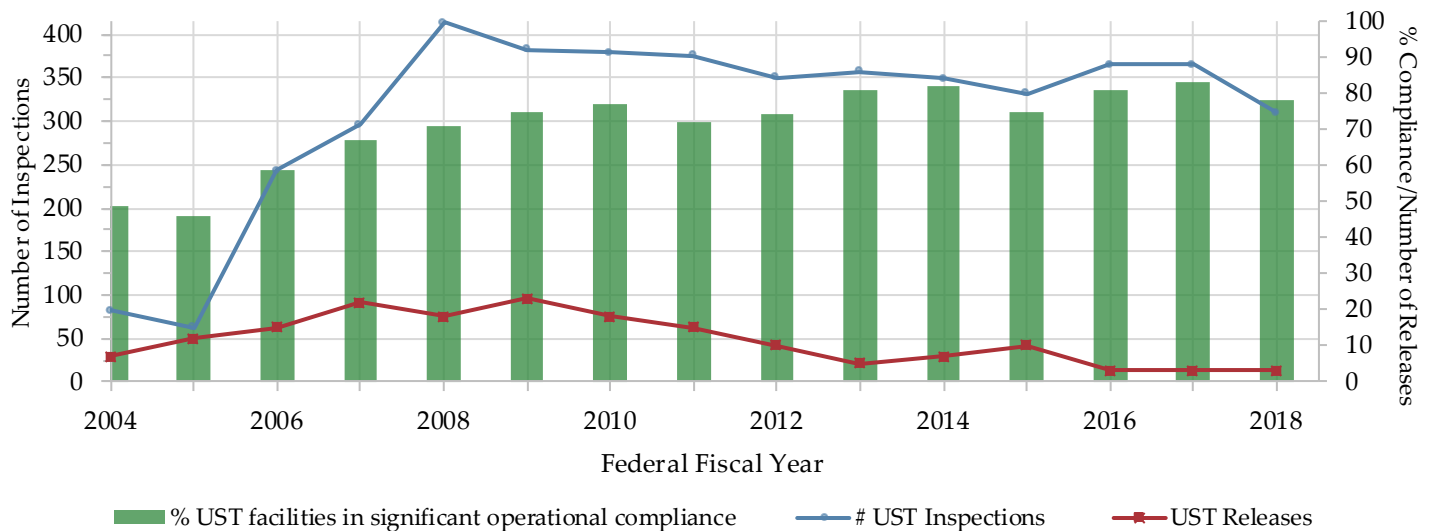
underground storage tank facilities were inspected in 2018

Minimize Exposure to Hazardous Materials

Ensuring proper management of hazardous materials to prevent releases and site contamination

PERFORMANCE TREND

Underground storage tank (UST) inspections reduce the number of new sites



DATA ANALYSIS

Many waste management activities aim to identify hazardous materials and dangerous practices. Once potential problems are identified, staff work with individuals or businesses to guide appropriate management and containment of hazardous materials and ensure regulatory compliance. This minimizes potential exposure or release of these materials before a property becomes contaminated.

The Underground Storage Tank (UST) program work reduces hazardous materials exposures and soil and groundwater contamination. In 2005, this program streamlined their inspection process and dramatically increased the number of annual inspections completed at petroleum UST facilities. This increased site presence resulted in a nearly 30% increase in the number of facilities found to be in significant operational compliance (SOC) with relevant management practices. During fiscal year 2018, the SOC rate was 78%, which remains slightly below the targeted 85% SOC rate that the program aims to attain in coming years.

These continued efforts have directly decreased the number of emergency spill responses and the number of UST facilities listed as a contaminated site and needing to complete clean-up efforts each year. Vermont has

required installation of double-wall UST's since 1987, which means that the newest single wall UST's are now 30 years old and being required to complete closure in the coming years. While it is a phased deadline, the greatest number of these tanks were permanently closed by January 1, 2018. It was expected that many of these tanks would exhibit contamination from previously undetected spills and minor leaks that there would be a corresponding increase in the number of discoveries. It was welcomed news by Department and the UST owners to learn that very few were found to have caused a serious release to the environment and the total number of releases in 2018 remains below 10; a number that has been steady the past three years.

Last year the UST Program revised the Underground Storage Tank Regulations to incorporate stricter federal standards for the demonstration of significant operational compliance. Adoption and implementation of these new standards will likely influence the percentage of facilities achieving significant operational compliance in the future.

NEXT STEPS

- Continue inspecting every Category One UST at least once every three years.
- Implement the updated 2018 Underground Storage Tank Regulations.
- Complete closure of remaining 48 single-walled USTs.
- Support the former single-walled tank owners that have transitioned to double-walled tanks in attaining the management and compliance requirements appropriate to their new systems.
- Continue publishing and distributing the semi-annual UST Talk Newsletter which provides a valuable method of communicating to UST owners and operators on requirements, recommendations and guidance.

DATA SOURCE: Underground Storage Tank Program

PREPARED BY: Waste Management and Prevention Division, (802) 828-1138

Our Land

Transition Contaminated Sites Back to Productive and Beneficial Use

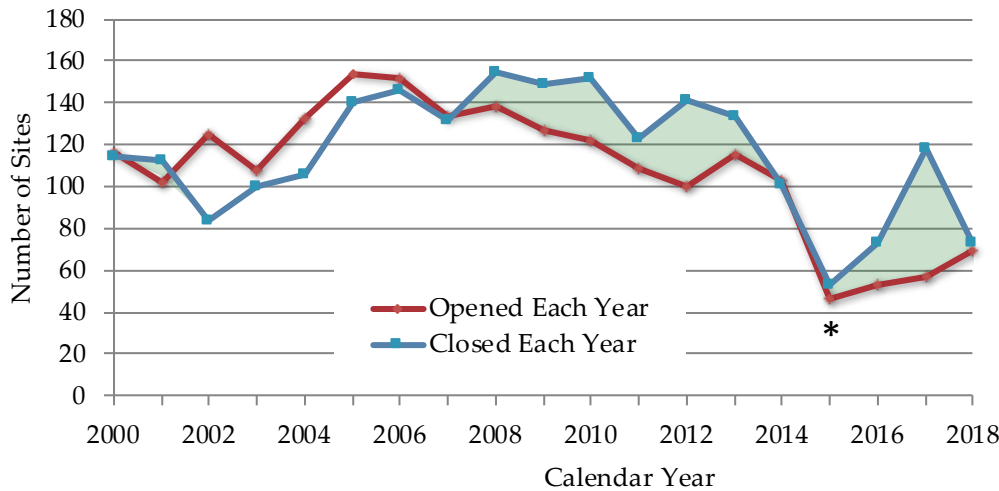
Facilitating efficient clean-up and closure processes for contaminated sites

PERFORMANCE TREND

73

sites were cleaned-up in 2018

Contaminated sites opened and closed (cleaned) each year



*Residential heating oil releases began being treated as spills in 2015

NEXT STEPS

- **New Staff** - The ongoing PFAS response has placed significant demands on capacity and the ability to cleanup and close conventional sites. Hiring new staff to assist with managing PFAS and other emerging contaminant challenges would greatly assist in completing additional site cleanups throughout Vermont.
- **Reduce petroleum releases** – prevention work is critical for reducing the number of new releases requiring investigation and clean-up. Petroleum tank releases comprise over half of the open sites and so the implementation of two updated rules should serve to reduce the number of new sites in coming years:

· Aboveground Storage Tank Rules
These rules include a tank inspection requirement, phased in over three years (ends August 2020), and prohibits deliveries to non-compliant tanks that are high risk of release. These new rules have resulted in hundreds of tank upgrades and replacements and should result in a significant drop in new releases by mid-2020.

· Underground Storage Tank Rules
These new rules, adopted in the fall of 2018, require inspection and testing of spill containment, piping and overfill devices that lack secondary containment, at least once every three years, starting by September 2020, for commercial motor fuel underground storage tanks.

DATA ANALYSIS

Many factors contribute to successful remediation of contaminated sites, including the extent and type of contamination, financial capability of the property owner, and degree of impact on the environment or human health. The Sites Management Section (SMS) contributes to supporting successful clean-up of these properties by providing technical and financial assistance for site assessment and implementation of clean-up remedies. In all cases, the ultimate goal is to be protective of human health and the environment while returning impacted property to a beneficial use.

In 2018, the SMS continued rigorous response to wide-spread contamination by per- and polyfluoroalkyl substances (PFAS), such as PFOA, throughout Bennington county. The contamination has been found at significant levels in drinking water within North Bennington and Bennington and within groundwater at various other locations across the state. This contamination has impacted over 400 private water supplies within North Bennington/Bennington alone. Over 300 of these water supplies have been impacted at levels above the Vermont Health Advisory for PFOA. The SMS has coordinated ongoing response and testing of over 600 drinking

water supplies, has facilitated the installation and ongoing operation and maintenance of point-of-entry treatment systems, has coordinated with the potentially responsible parties, and has assisted with the ongoing installation of water line extensions for the area. This wide-spread contamination will require active management and significant resources for many years to come.

Despite the significant time commitment that the PFAS response required, the SMS has continued to manage over 1,200 active sites. In 2018 SMS added 69 new sites into the program (12 more than in 2017), five of which were high priority sites that typically involve either widespread impacts (e.g., Elmwood Avenue and Southern Vermont Regional Airport, or larger releases such as the Interstate-89 Middlesex spill of 9,200 gallons of gasoline). In 2018 SMS successfully supported the remediation and closure of 73 sites, resulting in a net decrease of four sites from the active sites listing. The ability to remain a viable program despite the stresses on resources is due in part to business process improvements that the SMS has adopted in recent years.



Our Land

Reduce Hazardous Waste and Toxic Chemical Use

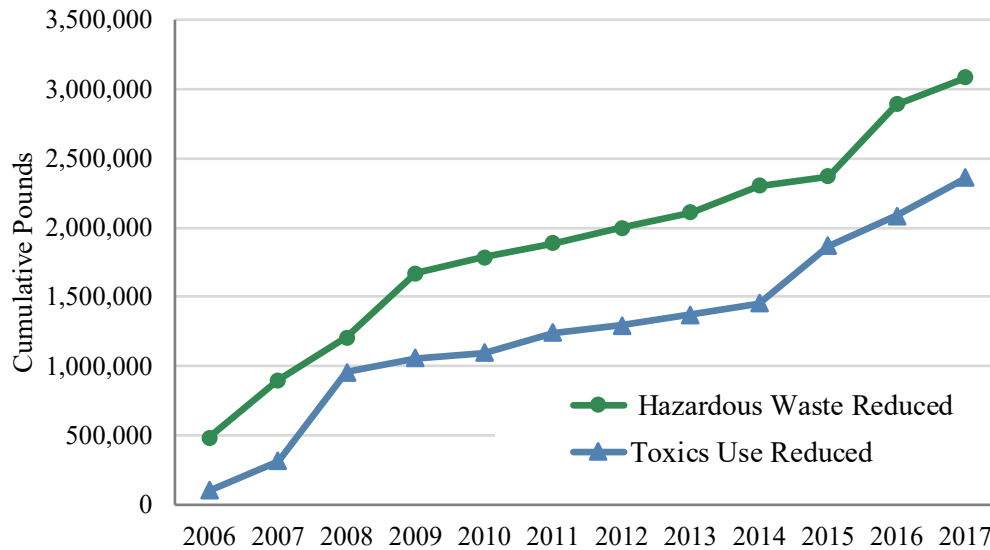
By working with businesses to promote and support pollution prevention

5.3 million lbs

of hazardous waste and toxic chemical use reduced since 2006

PERFORMANCE TREND

Reduction in hazardous waste and toxic chemical use



DATA ANALYSIS

Vermont's largest users of toxic chemicals and generators of hazardous waste are required to develop three-year plans to identify opportunities for reducing use of toxic chemicals and generation of hazardous waste in industrial processes. Many Vermont facilities have been subject to these planning requirements since 1994. The graph above shows that planners continue to reduce toxics use and hazardous waste. The program's success is further evidenced by numerous facilities that have reduced their toxics use and hazardous waste generation to below the thresholds required for planning.

The Environmental Assistance Office reviews plans, analyzes annual progress report data, and provides technical assistance in identifying and implementing reduction measures.

Planning facilities are visited at least once during each three-year planning cycle to review progress in planning, assist in identifying new reduction opportunities, and evaluate technical and economic feasibility of these opportunities.

By implementing toxics use and hazardous waste reduction strategies, Vermont businesses:

- protect the environment
- save money
- reduce liability
- reduce worker exposure to hazardous chemicals
- minimize regulatory obligations
- satisfy customer demand for safer products

NEXT STEPS

Information-sharing and technical assistance are important to sustaining reductions in toxics and hazardous waste use. Efforts to support this will include:

- Host a planner conference in 2019 to provide training and networking opportunities.
- Develop and publicize case studies of successful toxics use and hazardous waste reduction efforts that are transferable to other facilities.
- Identify new planners and help them develop effective pollution prevention plans.

Additional efforts will focus on updating and enhancing the effectiveness of the planning requirements, including:

- Providing input and recommendations for ways to modernize the program's enabling statute.
- Connecting the program to other agencies and efforts to evaluate chemical use in Vermont such as the Interagency Committee on Chemical Management.
- Improving efficiency in administration of the program to increase capacity of program staff to provide even more direct outreach and assistance.

Indicator



Our Communities

Percent of Dams Receiving an Upgrade in Condition

Taking actions necessary to reduce potential failure and risk from dams

4

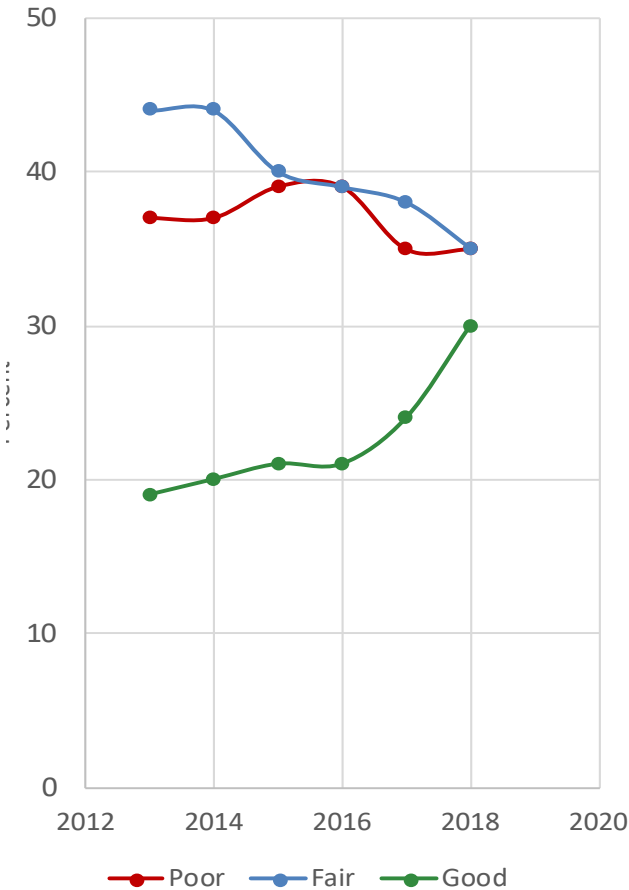
dams upgraded and

5

dams removed in 2018

PERFORMANCE TREND

Percent of dams in each condition class (n=413)



The reported condition of a dam is based on field observations at the time of inspection and any other data available to the Dam Safety Program. Only through continued care and regular inspection can there be any chance that unsafe conditions be detected and remedied. Annually, a small number of dam owners complete repair, rehabilitation, or operation and management activities sufficient to receive an upgrade in condition upon re-inspection. There are currently 413 registered dams capable of impounding more than 500,000 cubic feet that are in the Program’s jurisdiction and inspected on a regular schedule.

The Department may also undertake unsafe dam proceedings and find that a dam is unsafe and a menace to people or property above or below the dam. In these instances, the dam owner may access the Unsafe Dam Revolving Fund which can provide funding to nonprofit, private, or municipal dam owners for the reconstruction, repair, removal, breaching, draining, or other actions necessary to reduce the threat of a dam, or portion of a dam, determined to be unsafe.

NEXT STEPS

- Continue to educate dam owners through the inspection program. Communicating with and educating dam owners will improve their understanding of the risk, liabilities, and responsibilities of dam ownership.
- Perform public outreach and educational efforts through mailings to dam owners, public information meetings on dam safety topics, and development of fact sheets posted on the website that detail current Dam Safety Program methods and polices.
- The Dam Safety Program was recently given authority to develop rules for the administration of 10 VSA Chapter 43, with requirements that phase one (administrative, hazard class, inspections) of the rules be adopted by July 1, 2020 and phase two (design standards) be adopted by July 1, 2022.

DATA ANALYSIS

The assignment of dam hazard classification is based on the potential for damage or loss of life downstream if a dam were to fail. It is not related to the potential for failure or the condition of the dam. For this reason, the Dam Safety Program assigns a condition rating to each dam they inspect. The inspection program focuses on dams

that impound greater than 500,000 cubic feet of water, liquid, and sediments that require authorization by the program to repair, rehabilitate, replace, or remove. However, the program does perform inspections on dams that impound less than 500,000 cubic feet if requested by the owner.

DATA SOURCE: Facilities Engineering Division

PREPARED BY: Facilities Engineering Division, dec.vermont.gov/facilities-engineering



Our Communities

Finance Water Infrastructure Upgrades

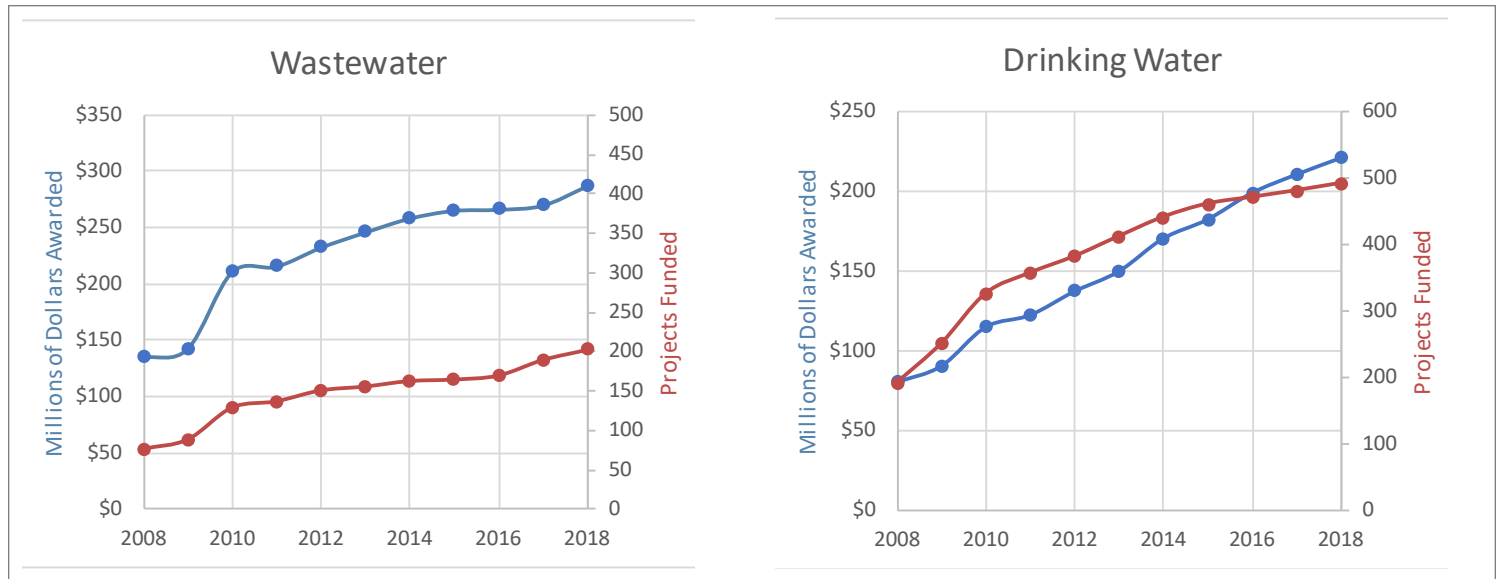
Providing low-cost loans and grants to municipalities

\$293
million

invested in infrastructure upgrades in the past 10 years

PERFORMANCE TREND

Investments for wastewater and drinking water infrastructure upgrades



DATA ANALYSIS

Municipalities and certain private entities are eligible to apply for low interest loans from the Clean Water (CWSRF) and Drinking Water (DWSRF) State Revolving Loan Funds. These funds are made available by the US EPA, with matching funds from state capital appropriations. The CWSRF provides low cost loans to municipalities for projects such as wastewater collection and treatment system upgrades, stormwater conveyance and/or treatment, and combined sewer overflow abatement. In 2018, Act 185 was signed into law, which expanded CWSRF eligibility to private entities, additional project types, and created a public/private partnership aimed at funding natural resource projects.

The DWSRF provides low-cost loans to municipal and some privately-owned public water systems for capital improvements that increase public health protection and facilitate compliance with the Safe Drinking Water Act. There are over 400 public community drinking water systems in Vermont that include both municipally and privately owned water

systems serving residential units. Additionally, non-profit, non-community systems qualify for this funding, which are systems serving non-residential uses, such as schools. Vermont has had great success at awarding loans to small water systems, with 89% of funding awarded to systems serving less than 10,000 people.

DEC oversees the application, selection, coordination for financing, construction oversight, and engineering review for these projects. In 2018, the CWSRF secured 17 loan commitments totaling \$17 million and the DWSRF secured 10 loan commitments totaling \$11 million. On average, there have been more drinking water projects per year with a lower cost per project than clean water projects.

Upgrading Vermont’s aging water infrastructure is critical to supporting a vibrant economy by investing in safe drinking water and protecting our rivers, lakes, and ponds. Some of Vermont’s most vulnerable populations benefit from these low-cost loans that help maintain affordability of public drinking water and wastewater infrastructure.

NEXT STEPS

- Implement the Municipal Pollution Control Priority System Rule using a new funding formula
- Improve accuracy of the 20-year municipal clean water needs projection to enhance capital budget planning
- Fully implement the expanded eligibilities for the CWSRF, including building relationships with private entities to assist with their water infrastructure needs.
- Explore innovative funding strategies for stormwater including co-funding, public/private partnerships, and impact fee-based trading

DATA SOURCE: State records on funds available, annual requests for funding and forecasted trends.

PREPARED BY: Facilities Engineering Division; dec.vermont.gov/facilities-engineering

Our Communities

146

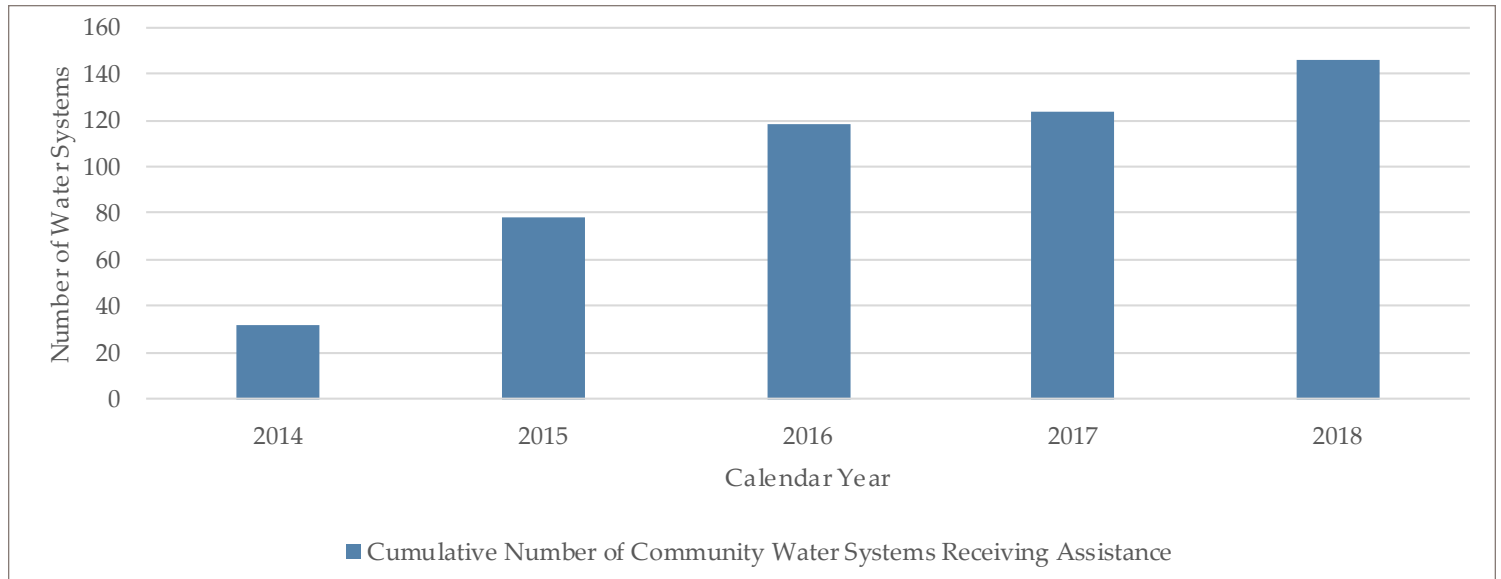
public drinking water systems have utilized Asset Management programs since 2014

Ensure Sustainable Environmental Infrastructure

Helping public drinking water systems plan for the future

PERFORMANCE TREND

Public Community Drinking Water System Receiving Asset Management Assistance



DATA ANALYSIS

Money from utility reserves and public financing is not enough to address Vermont’s drinking water infrastructure needs. This financial shortfall is the greatest challenge for most public community water systems. The Drinking Water program developed a strategy to help systems meet this challenge by encouraging systems to create and use an Asset Management Program.

An effective Asset Management Program uses detailed asset inventories, operation and maintenance tasks, life-cycle cost analyses, and long-range financial planning to build capacity and make systems more sustainable. It can help systems operate more efficiently, prolong asset life, plan and pay for future repairs and replacements, inform decisions, justify system needs, and make the best use of limited resources. Drinking Water State Revolving Fund set-aside funds are

used to provide programs that support the development of Asset Management Plans, as well as Asset Maintenance Programs such as water loss control programs, stand-by power evaluations, and lead reduction strategies grants. Since 2014, approximately 146 out of 414 community water systems have utilized one or more of these programs.

Through proactive communication and outreach, in collaboration with water systems, partners, and other stakeholders, the DWGWPD continues to seek innovative approaches to Asset Management and new technologies to help Vermont’s water systems plan for the future.

NEXT STEPS

- Continue to offer asset management workshops, water loss control programs, and lead reduction strategies grants.
- Continue to offer 100% forgivable asset management planning loans to five community water systems each year.
- Begin offering valve condition and location assessment programs and water rate evaluation services to continue to support Community Water Systems’ Asset Management Programs.



Our Communities

9

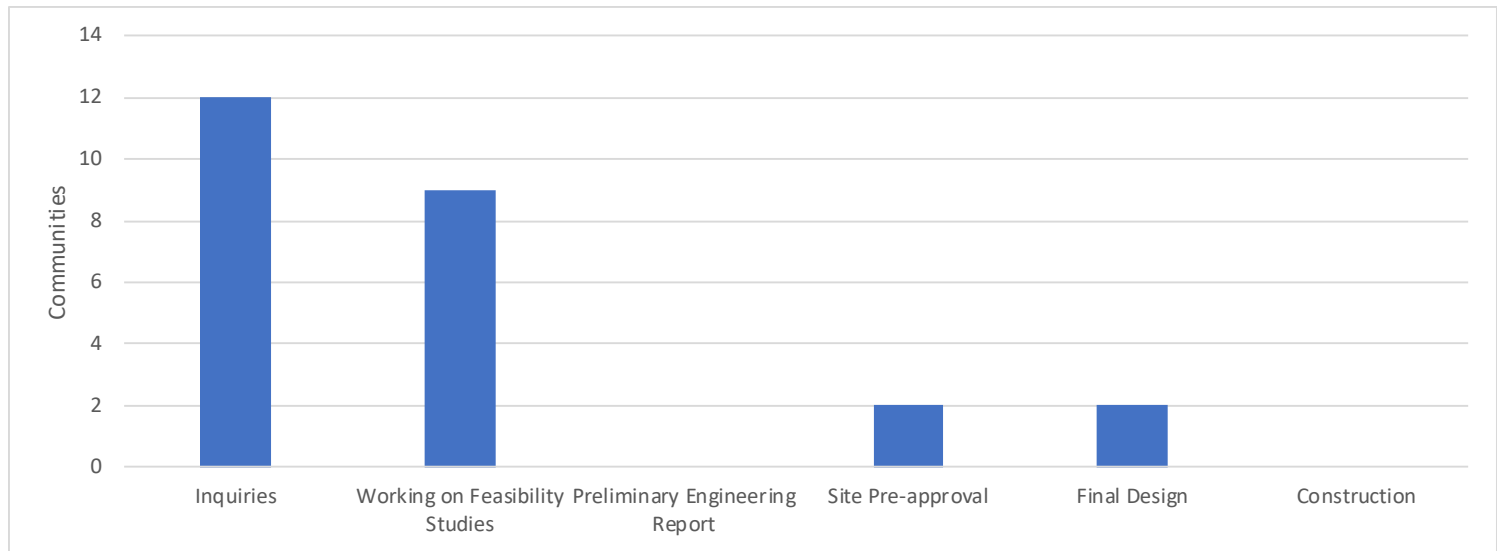
Number of communities pursuing feasibility studies in 2018

Village Wastewater Solutions Initiative

Supporting communities with their water infrastructure planning and financing

PERFORMANCE TREND

Communities working on water and/or wastewater projects in 2018



DATA ANALYSIS

The Department has a strategic goal of supporting drinking water and wastewater infrastructure in Vermont’s unserved and underserved communities. Staff from the Agency of Commerce and Community Development (ACCD) and Department of Health collaborated to form an interagency work group to support to rural communities interested in the feasibility of public water or wastewater infrastructure. Partners include: RCAP Solutions, USDA-Rural Development, VT Council on Rural Development, VT Rural Water Association, and Windham Area Regional Commission. Formed in the summer of 2018, the workgroup has already made significant strides. The group has held feedback sessions with communities that have completed feasibility studies, created a workplan and website, and drafted an workbook for how to form a project committee. Staff attended public informational events and held several individual meetings with municipalities. The Department has received a grant from the Northern Border Regional Commission, in the

amount of \$219,213, with a match of \$112,000 from DEC and \$40,000 in volunteer time. The grant will support village infrastructure feasibility work in East and West Burke and Wolcott. There is interest among Vermont’s communities in exploring water or wastewater infrastructure projects. The support and resources that are available from the group have been helpful in jump-starting the process. Nine communities are pursuing feasibility studies: East Burke, Grafton, Jamaica, Marlboro, Montgomery, West Burke, West Dummerston, Westminster West, and Wolcott. Twelve other communities have expressed interest. Two systems (Westford and Bromley Mountain) have been pre-approved by the indirect discharge program. The rules allow an applicant to submit a partial application for approval of a site for a future community wastewater system. The preapproval helps villages applying for a Village Center designation from ACCD, which offers financial incentives, training and technical assistance.

NEXT STEPS

- Post a Request for Proposals to hire consultants for implementation of the NBRC grant
- Conduct outreach events across a spectrum of stakeholders and potentially interested parties; continue to refine and improve the initiative’s website
- Evaluate existing policies and procedures for infrastructure and permitting, for efficiency and effectiveness
- Develop and evaluate tools for assisting in rural infrastructure project development
- Promote the indirect discharge pre-approval process

DATA SOURCE: Facilities Engineering Division and Drinking Water and Groundwater Protection Division

PREPARED BY: Facilities Engineering Division, dec.vermont.gov/facilities-engineering

Our Communities

3

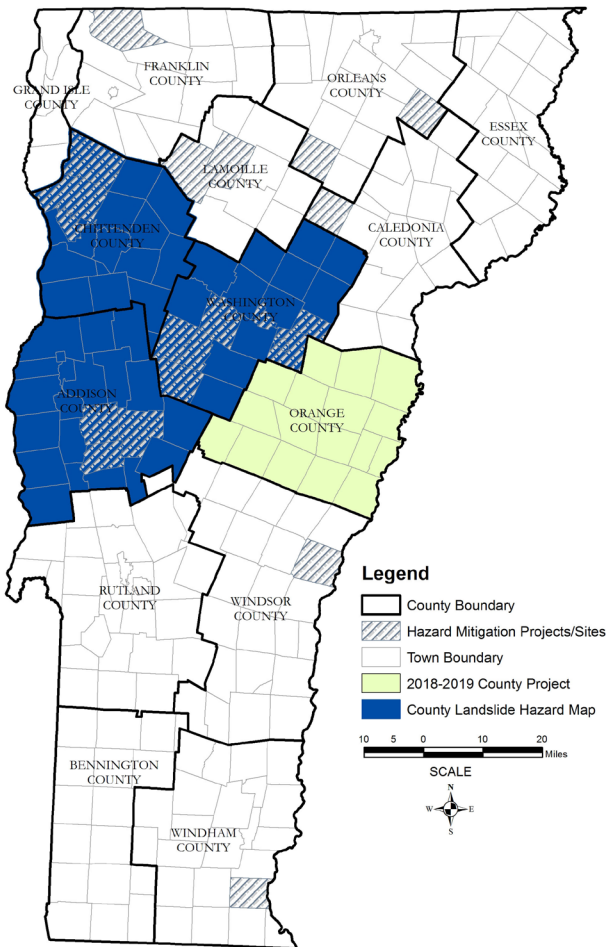
county hazard maps completed since 2016

Identify Vulnerability to Geologic Hazards

Geologic assessments of landslide, erosion, drought, and seismic hazards

PERFORMANCE TREND

Hazard mitigation sites and completed assessment projects



The map to the left shows where studies have been conducted, including local landslide sites and regional seismic hazard analyses. Sites of concern are often identified while mapping bedrock and glacial deposits; they are also identified through community reports. LIDAR and GIS are the primary tools used for landslide hazard mapping. In 2015, the VGS began a program to provide landslide hazard maps for Vermont counties, completing Addison County in 2016, Washington County in 2017, and Chittenden County in 2018. Data, compiled as a statewide landslide hazard inventory, is posted on the Open Geodata Portal. The maps help Vermont prepare for safer growth and development, develop mitigation and hazard avoidance strategies, avoid economic loss, and be prepared to respond to events.

By identifying regions sensitive to physical hazards and utilizing a scientific assessment to characterize the risks, the VGS provides a tool to protect Vermonters in vulnerable areas and guide land use planning. Communication of physical hazards and avoidance is facilitated through our hazards web pages which include a new online Report a Landslide feature in which the public can add to our landslide inventory. Information developed for landslides, earthquakes, flood, and drought contributes to mitigation and preparedness for these low frequency, high impact events.

NEXT STEPS

- In partnership with Norwich University, assess hazards and produce a landslide hazard inventory map for Orange County.
- Plan for mapping of the fifth (5th) county in the state.
- Respond to and monitor landslide and rockfall events.
- Conduct surficial geologic mapping and identify areas prone to erosion and landslides.
- Conduct regional groundwater studies for drought resiliency and response.
- Continue coordination with Vermont Emergency Management, the Northeast States Emergency Consortium (NESEC), Regional Planning Commissions and universities to create hazard mitigation information and communicate hazards to the public.

DATA ANALYSIS

The Vermont Geological Survey (VGS) collects and interprets data about landslides, earthquakes, flood, and drought to inform mitigation efforts and preparedness for these low frequency, high impact events. The VGS provides reliable, science-based information regarding frequency, magnitude, extent, and consequences of physical

hazards, and when possible, hazard avoidance strategies. Hazard maps identify areas of higher risk and are the primary tool for hazard avoidance and mitigation.

The VGS works with towns, Regional Planning Commissions, and Vermont Emergency Management to implement the landslide hazard mapping protocol.

Indicator



Our Customers

Improve Business Practices to Gain Efficiencies

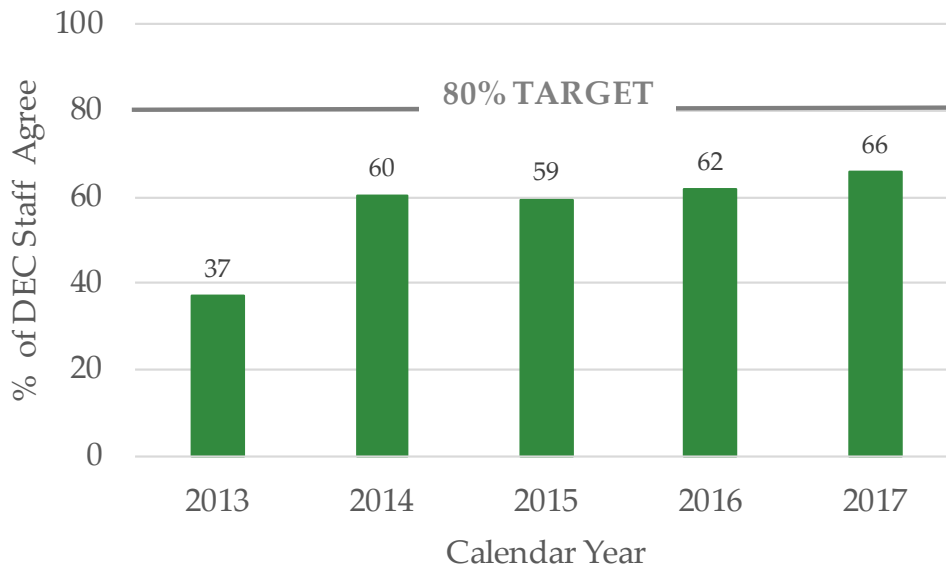
Developing a culture of continuous improvement through Lean

66%

DEC Employees feel encouraged to share improvement ideas

PERFORMANCE TREND

Percent of staff who feel encouraged to share improvement ideas



NEXT STEPS

- Build upon successes to date and expand utilization of principles and tools across the Department.
- Encourage and support everyday improvements at the operational level.
- Provide assistance to managers in their efforts to improve program performance.
- Track performance of ongoing and completed projects to ensure they're meeting performance goals.
- Continue to build staff capacity through training and practical application.
- Bolster communication about Lean efforts internally and externally.
- Support staff facilitation training through participating in the white, yellow and green belt trainings, and expanded facilitation and data tracks offered by the Agency of Administration

DATA ANALYSIS

The Department of Environmental Conservation (DEC) adopted Lean in 2013 to better serve the Vermont public through more efficient, timely and transparent processes and to build a culture of continuous improvement. Lean is a term used to describe a management philosophy and set of practices developed by Toyota that helps organizations improve the speed, transparency and quality of processes while minimizing cost.

Twelve different Lean business process improvement projects were started in 2018, seven of which focused on the processes within DEC. Forty six staff were engaged across the Agency of Natural Resources in these Lean events. In 2018, 16 projects were in ongoing implementation and 6 projects have been completed.

DEC currently has 27 active Green Belts, the highest level of facilitator certified through the Agency of Administration. The DEC also maintains the highest number of Green Belt facilitators than any other Department in state government. By leveraging staff resources through all of the DEC's divisions, there is a large array of expertise for a variety of

facilitation needs. Training and involving staff in Continuous Improvement and Lean training and events has led to an improved culture of continuous improvement. The Annual Employee Engagement survey indicates a steady increase in the percent of staff who feel encouraged to share improvement ideas increasing from 37 percent in 2013 and steadily climbing to a peak of 66% in 2018.

Example accomplishments in 2018 include:

DEC's Public Notice System - Launched the new Environmental Notice Bulletin, an interactive one-stop public facing website that provides capability for the public to view and comment on permit applications and receive email notifications on specific permits or topics of interest.

New Air Quality and Climate Division Database - This project reduced the number of locations of facility information from 10 separate permit databases to one facility information database. The new database has allowed the division to now make all active permits available to customers online.



Our Customers

Deliver Quick and Easy Access to Information

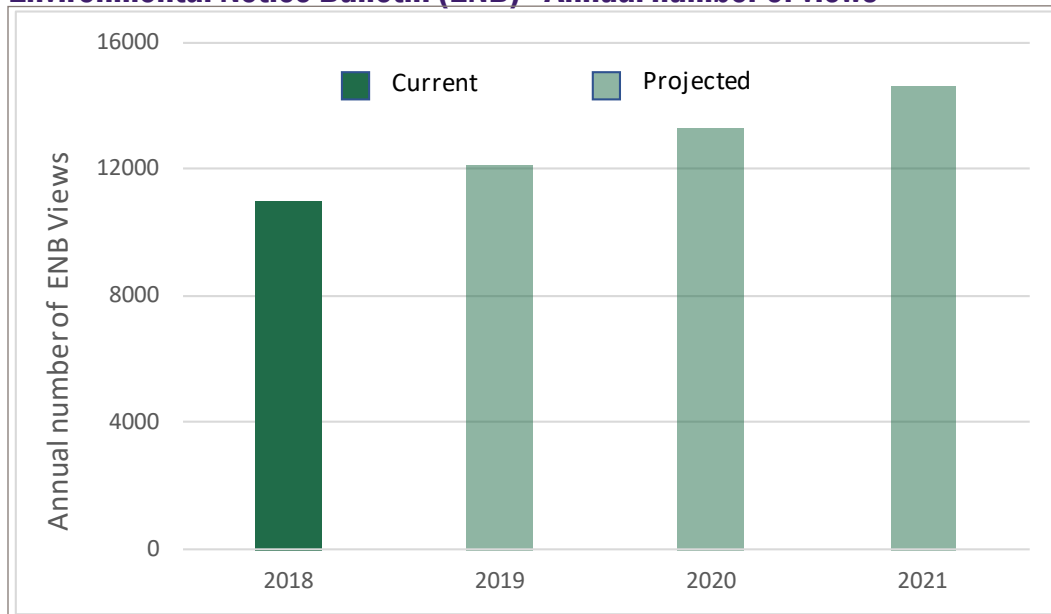
Providing real-time information on permit applications under review

10,999

Views of Environmental Notice Bulletin in 2018

PERFORMANCE TREND

Environmental Notice Bulletin (ENB) - Annual number of views



DATA ANALYSIS

In 2018, the Department launched the Environmental Notice Bulletin Version 2 (ENB) to publicize most notices and documents related to permits being processed through the Department. This new online system replaced an existing tool that was out of date and provided limited information to the public. New features available on the ENB include an email subscription service for the public, consultants, and other interested parties enabling them to receive all public notice updates for selected regions, activities or permits. In addition, ENB allows public users to provide public comments and request public meetings. These efforts all serve to improve accessibility, transparency and user satisfaction.

At the end of 2018, 2,454 permitting activities have been posted, and the Department has received 71 public comments online through the ENB. The number of individual subscribers from the general public interested in permitting activities continues to increase.

At the end of 2018, there were 469 subscribers and 10,999 views of the database. In addition, the system sent out over 55,000 email notifications to interested parties regarding permit approval activities.

The enhanced ENB was created as a result of a business process improvement project that focused on the number of different public notice requirements used across all permitting program in the Department. Through detailed analysis, the number of unique notice processes was reduced from 85 to 5. In early 2016, Act 150 was passed into law directing the Department to develop this online system with a launch date of January 1, 2018. The system integrates data from 13 databases and 20 Department programs. All internal staff who manage permitting activities have been trained and all programs are successfully posting information on the ENB.

NEXT STEPS

- Further develop the Environmental Notice Bulletin to provide more accurate permit project locations for large and linear projects for improved user interface.
- Support the current system and troubleshoot database compatibility issues.
- Provide technical assistance to external users through individual support to applicants over the phone. Continue to offer training to internal staff and external users through formal training at conferences and events.



Our Customers

Support Implementation and Use of Online Permitting

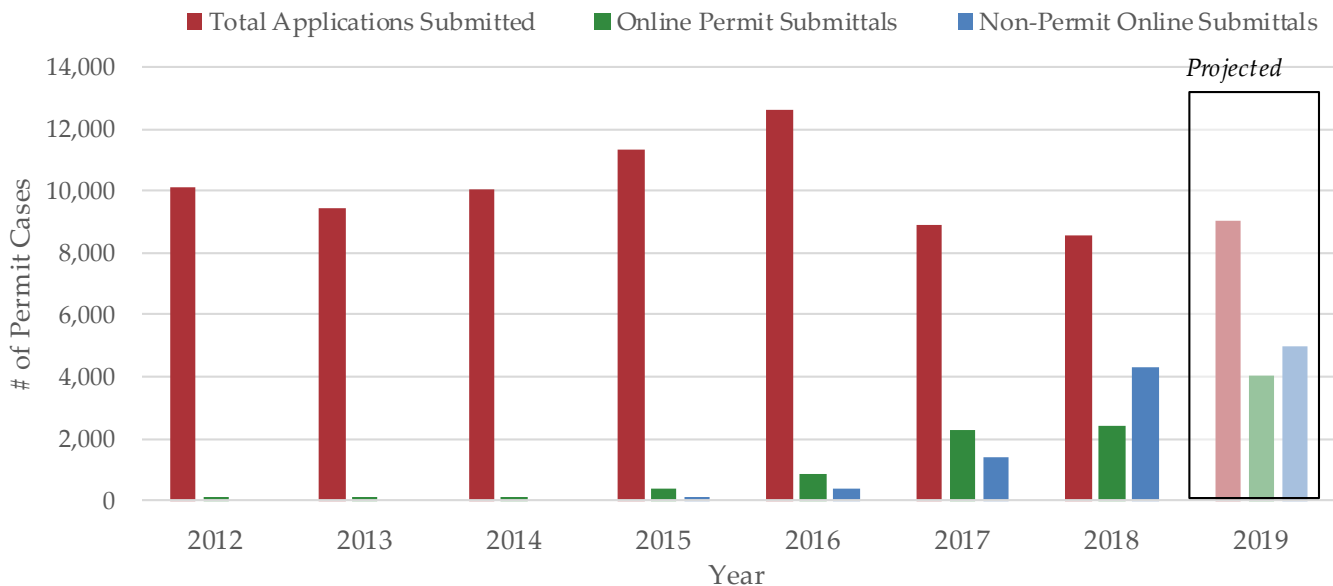
Increasing use of technology for a web-based submittal system

28%

of permit applications submitted online

PERFORMANCE TREND

ANR Online electronic submittals



DATA ANALYSIS

Programs across the Department have numerous permitting programs which include construction, treatment, discharge, operations, certifications, registrations, and licensing. These programs necessitate technical assistance and regulatory oversight to ensure compliance with state and federal law. In February 2015, the Department launched a web-based submittal system known as ANR Online. The system allows permitting and other programs to accept online applications and data.

In State fiscal year 2018 (SFY18), approximately 8,586 permitting cases were received, 28% of which were submitted electronically. This is a slight increase from 26% of application submitted electronically in state fiscal year 2017 (SFY17).

The percentage of online permit applications is not increasing as quickly as previously anticipated because the Department has put a larger emphasis on other non-permit related electronic transactions including submitting online compliance reports. Data entry associated with these manual reports often creates a larger administrative burden

than processing paper permit applications.

Most of the increase in online reporting was from a Discharge Monitoring Report (DMR) form that was launched in 2017 in the Wastewater Management Program. During SFY17, the Department received 245 DMR submissions online, in SFY18 that grew to 1,835 submissions. The rest of the increase was primarily related to three Stormwater Permit Reporting forms that were launched in late SFY17. In SFY18, the total number of Stormwater Permit Reporting forms received was 1,364. Approximately 43 forms have been completed and are currently available in ANR Online with additional forms currently under development.

In addition to online permit applications, the Department received 4,430 online reporting and other submissions during SFY18, compared to about 1,560 in SFY17 indicating a three-fold increase in the number of online reports received in SFY18.

NEXT STEPS

- Grow capabilities for a web based permit application, data submittal system, and payment process
- Train program staff to create online forms
- Build capacity by reducing the need for data entry and satisfy customer request for online submission and payment
- Work to eliminate paper processes to simplify information requests.



Our Customers

Effective Issuance of Potable Water and Wastewater Permits

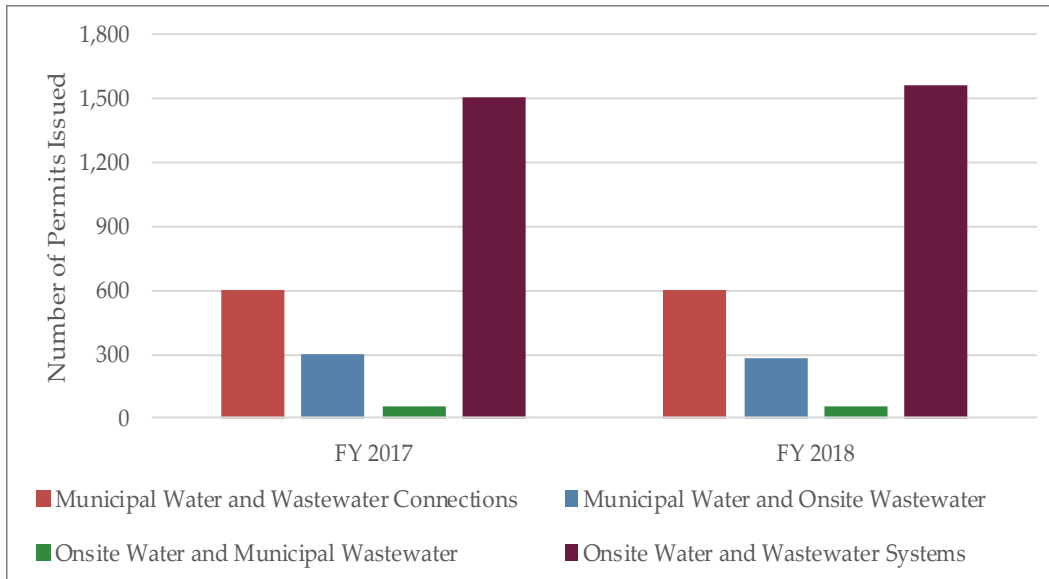
Quality customer service through permitting, technical support, and outreach.

PERFORMANCE TREND

2,501

Potable water and wastewater permits issued in 2018.

Number of potable water and wastewater permits issued



DATA ANALYSIS

The Regional Office Water/Wastewater Program in the Drinking Water and Groundwater Protection Division permits drinking water and wastewater disposal for subdivisions, new buildings, changes to existing buildings, and replacement of water supply or septic systems. As can be seen in the graph above, the majority of the 2,501 permits issued by the program in 2018 are for onsite water supply (well) and onsite soil-based wastewater disposal (septic system). About 62% of the permits issued in Fiscal Year 2018 (SFY18) were for an onsite well and onsite septic system, while 24% permitted connections to municipal water and wastewater infrastructure. The remaining 14% of permits authorized connection to municipal infrastructure for either water or wastewater, with the other utility onsite.

The Regional Office Program provides quality customer service by issuing permits within a

standard amount of review time (30 to 45 days depending on project size). In SFY18, 92% of permits issued met this standard.

Permitting a replacement wastewater system for failed systems is a priority for Regional Engineers. In 2017, approximately 450 failed wastewater systems were required to be replaced and certified. Of these, 320 installation certifications were received on time; following outreach and compliance action by the Program, 99% of required installation certifications were received. In 2018, 350 permits were issued for a failed wastewater system with a specified installation deadline.

In addition to direct site-specific permitting, the Regional Office Program supports licensed designers. This is especially important given the high proportion of permits issued for onsite water and wastewater. The program conducts wastewater/water system designer exams and conducts and endorses designer continuing

education. For the first time in 2018, exam preparation workshops were provided prior to exams. Over 20 continuing education events were endorsed for 150 currently active designers, and more than 100 designers and Professional Engineers participated in training organized by the Regional Office Program.

The Regional Office Program engages with the owners and users of onsite systems through realtor workshops, lakeshore septic socials, and Septic Smart Week media events. The Program also collaborates with internal and external scientists on phosphorus studies and groundwater software development, and approves Innovative/Alternative treatment systems. The Program offers ongoing specialist hydrogeological review and technical advice to support designers.

NEXT STEPS

- Expand the Wastewater Tracking System database to enable compliance tracking.
- Adopt and implement the updated Wastewater System and Potable Water Supply Rule.
- Continue training and outreach for owners and designers of onsite systems.

DATA SOURCE: Wastewater Tracking System database, Division staff

PREPARED BY: Drinking Water and Groundwater Protection Division, 802-585-4900



Our Customers

Resolving Environmental Violations

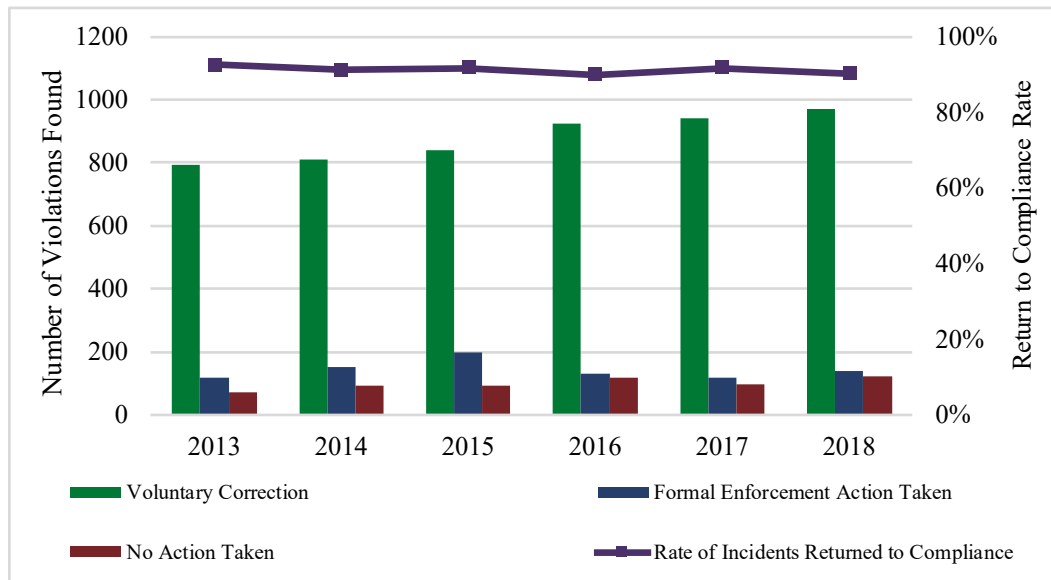
Through investigations and enforcement actions

90%

of incidents were returned to compliance after a violation was found in 2018

PERFORMANCE TREND

Outcomes for incidents with a violation found



NEXT STEPS

- Deliver and expand trainings offered to the Department staff members on enforcement basics and case documentation including the three new trainings on inspections, photos, and reports.
- Continue and improve collection of program incident data related to enforcement.
- Strategically prioritize investigations and cases by the potential and/or actual impact to human health and the environment.
- Implement the 2019 DEC Compliance Procedure.

DATA ANALYSIS

The Department of Environmental Conservation is responsible for the investigation and documentation of all alleged violations (including citizen complaints) of environmental permits, rules, regulations, and statutes that are under the jurisdiction of the Departments of Environmental Conservation, Forest Parks and Recreation, and for coordination on violations relating to the Natural Resources Board, the Agency of Agriculture, Food and Markets, and the Department of Public Service. Based on recommendations from the State Auditor, the data has been updated to include the Incident Tracking Database data as well as other available program data, such as the Spills Database. For the available data, the Department investigated and closed over 2,000 incidents in 2018.

About 50% of these incidents were found to have a violation. The rate of incidents returned to compliance has remained steady since 2013.

The goal is to return the incident to compliance when a violation is found. Obtaining compliance can be sought through a variety of methods including: voluntary correction, requiring a permit to be obtained, or pursuing formal enforcement through a case or citation. Infrequently, when a violation is found returning the incident to compliance may not be achieved. This may be due to a lack of resources, lack of evidence, or the violation may have minimal impact on human health or the environment.

When a violation is found, the majority are successfully returned to compliance. Most compliance is attained through voluntary correction.

If an incident is particularly egregious, threatens program integrity, or voluntary compliance is unable to be achieved, formal enforcement action is pursued. Formal enforcement action typically involves directives to return the incident to compliance and a monetary penalty to deter both the respondent and regulated community from committing future violations.

To deliver services more efficiently and consistently, the Enforcement Section has developed and continues to develop trainings on enforcement basics and case documentation to offer to ANR staff members. In 2019, three new trainings will be offered on inspections, photos, and reports. Employee training has assured rapid response and helped maintain a strong return to compliance rate.