

FISH & WILDLIFE DEPARTMENT PERFORMANCE-BASED BUDGET 2021 REPORT



DEPARTMENT OVERVIEW

We are biologists, game wardens, educators and support staff.

Our MISSION is conserving fish, wildlife, plants, and their habitats for the people of Vermont.

Administration: Provides policy, legal, personnel, and financial leadership for the department. The division oversees license sales and more than 15 other permits related to resource protection. The division also promulgates rules and regulations via the Commissioner and the Fish & Wildlife Board.

Fisheries: Conserves and manages the state's fish populations and aquatic habitats. This includes: operating five fish hatcheries; maintaining more than 196 fishing access areas; controlling the spread of fish diseases, invasive fish and aquatic nuisance species; restoring populations of fish such as muskie, lake sturgeon and salmon; and protecting aquatic species and critical aquatic habitat through technical assistance of regulatory processes such as Act 250, Section 248, hydroelectric dam relicensing, stream alteration and shore land protection permits, and aquatic organism passage.

Division of Warden Service: Protects Vermont's fish and wildlife from poaching and illegal trade, in addition to ensuring that the state's 180,000 resident licensed hunters, anglers, and trappers are compliant with rules and regulations. State Game Wardens respond to human-wildlife conflicts, animal damage complaints, potentially diseased animals and remove

dead big game animals from roadsides. They also perform standard law enforcement duties such as search and rescue, assistance to other law enforcement agencies, and boating, snowmobile, and ATV operation enforcement.

Outreach and Education: Provides quality information and education about Vermont's fish and wildlife to ensure greater understanding and safe, responsible enjoyment of these resources. This includes operating the department's two Green Mountain Conservation Camps and offering a variety of public education programs such as mandatory hunter education, Lets Go Fishing and Project WILD.

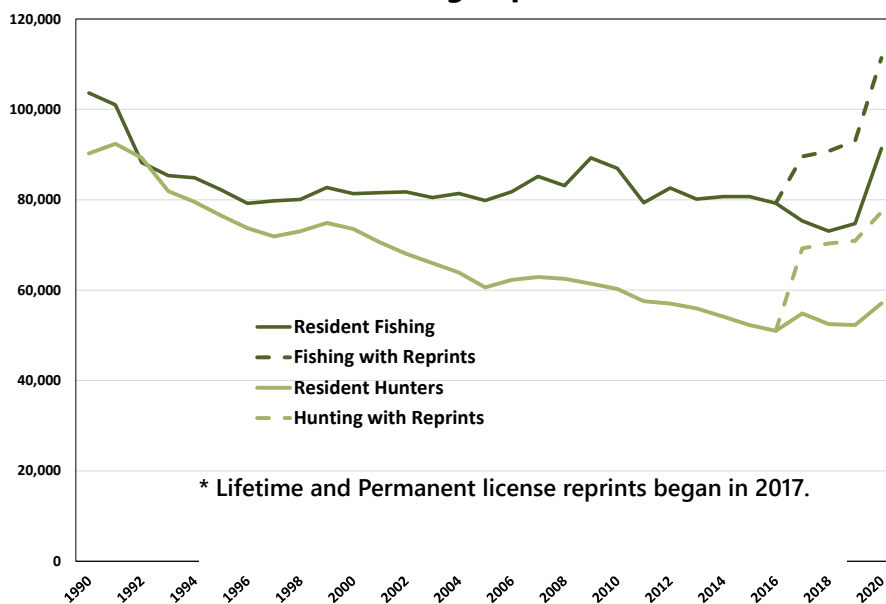
Wildlife: Protects, manages, and restores all wildlife, plants, and their habitats throughout Vermont. Division staff work on three main areas—management and conservation of hunted or trapped species; public and private land and habitat conservation, management, and restoration; and the protection and recovery of rare, threatened, and endangered species. This includes the oversight of 100 Wildlife Management Areas and participating in the protection of necessary wildlife habitat through the Act 250 and Act 248 processes, among others.

PARTICIPATION IN HUNTING, FISHING AND TRAPPING



Performance measure: Maintain the number of Vermonters participating in hunting, fishing and trapping, as measured by active licenses.

Resident Hunting and Fishing License Sales Including Reprints*



*License sales are recorded by calendar year. 2021 licenses sales will be reported in next year's report.

License sales surged during the COVID-19 pandemic. In 2020, almost all resident license types exceeded their five-year averages and resident fishing, up a whopping 27 percent, saw its highest sales since 1991. Some increase was expected. Surveys have repeatedly found that "not enough time" and "family/work obligations" are the biggest barriers to hunting and fishing participation. However, the magnitude of the increase was not.

The pandemic clearly provided thousands of Vermonters the time they said they needed to get outdoors. As a bonus, hunting and fishing were ideal for the moment: socially distanced, meditative, and relatively inexpensive with a chance to bring home fresh, local food. Unfortunately, there's no indication that license buying habits have changed permanently, but 2020 underscores the importance of hunting and fishing to the state, even if yearly sales don't always show it.

The department's capacity to conserve fish and wildlife as well as the viability of businesses that depend on wildlife-related recreation are linked to sporting license sales and hunting, fishing and trapping participation.

Yearly license sales are not equivalent to the number of hunters and anglers in the field. Youth under the age of 15 fish for free, and landowners do not need licenses to hunt and fish on their own land if their property is not posted. More importantly, many resident hunters hold permanent and lifetime licenses—license types that are not considered sales after the first year of purchase.

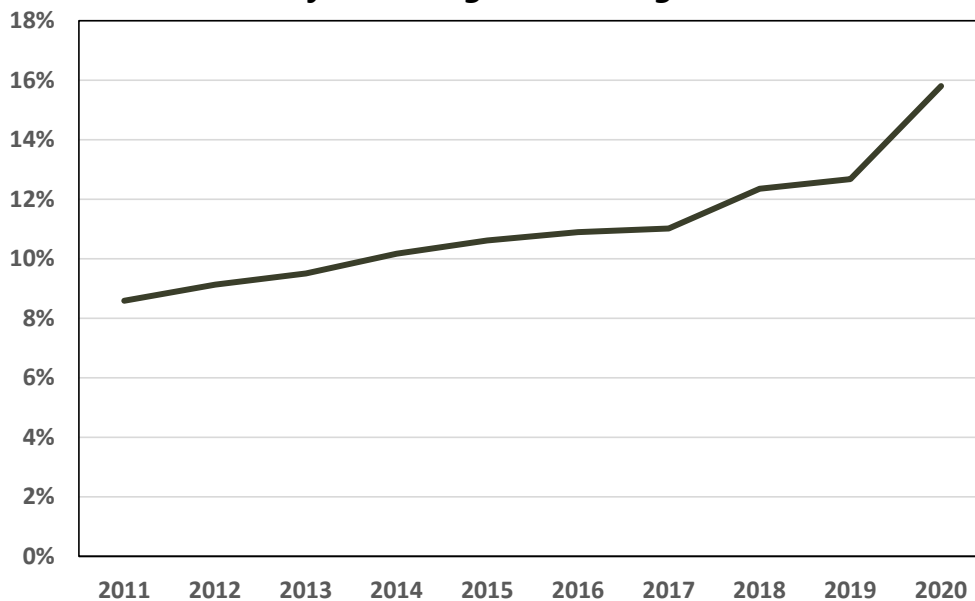
As of 2017, the department has required yearly 'reprints' of permanent and lifetime licenses from those hunters planning to use them. When added to license sales data, the totals show a smaller decline in participation than license sales alone had previously suggested. Reprints, however, are directly related to the state's demographics. As Vermont ages, they will likely decrease over time.

WOMEN IN THE OUTDOORS



Performance measure: Increase the number of women participating in hunting, trapping and fishing in Vermont, as measured by license sales.

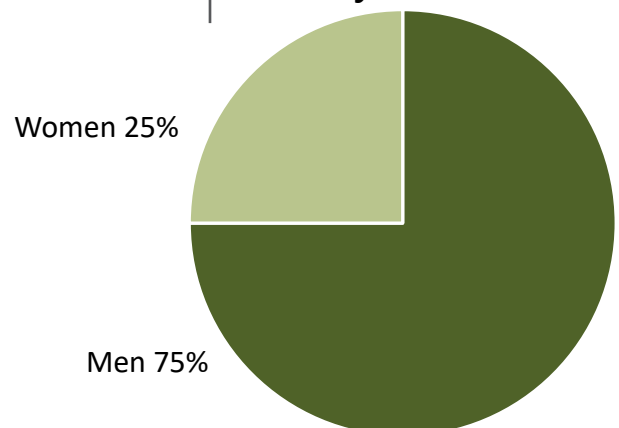
Women by Percentage of Hunting License Sales



The percentage of female hunters in the hunting population has risen as the number of male hunters has declined.

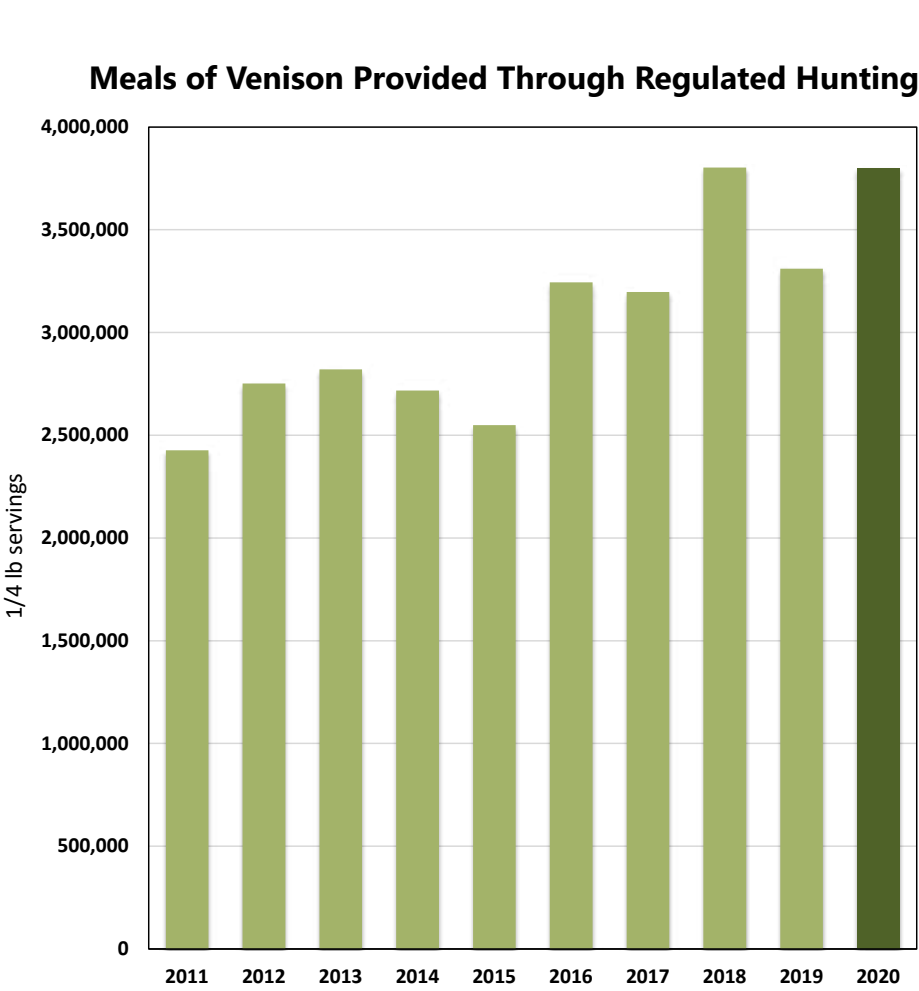
In calendar year 2020, 34 percent of all hunter education graduates were female, suggesting further increases may occur. Meanwhile, women make up 1 in 4 anglers, a ratio that has remained stable for decades.

Resident Fishing by Gender





Performance measure: The amount of meat, fish and other resources from fish and wildlife, taken annually, during regulated seasons shall be maintained at sustainable levels.



Hunting and fishing provide Vermonters with free-range, local, sustainable, and affordable food sources.

Vermont is a leader in ‘Farm to Table’ and eating locally is a primary motivation for first-time hunters, especially those who are not from hunting backgrounds. Among experienced hunters, meat ranks among the top reasons to hunt. Anecdotally, the importance of meat increased during the pandemic due to food security concerns.

Fishing is mostly associated with relaxation and spending time with friends and family, though some species like yellow perch, walleye and crappie owe most of their popularity to their taste. Keeping fish is particularly common during the winter when cold temperatures both in and out of the water keeps fillets firm and fresh.

CONSUMER SPENDING AND WILDLIFE-RELATED RECREATION



Performance measure: Maintain consumer spending related to wildlife-recreation.

Long hunting and fishing seasons are a testament to the sustainability of carefully managed fish and game species while the steady, off-season traffic they create provides reliable income to rural general stores, restaurants, gas stations, and retailers.

The economic benefits of wildlife extend beyond hunting and fishing. Vermont is home to a number of wildlife-watching hotspots that draw both residents and nonresidents, all of whom must eat, sleep and be outfitted. Dead Creek Wildlife Management Area (WMA), for instance, is known throughout Vermont, even among the most casual observers, for its up-close views of snow geese each fall. In contrast, serious birders from New England and beyond visit Wenlock Wildlife Management Area and the surrounding area for its accessible opportunities for boreal birds, such as black-backed woodpeckers, gray jays and spruce grouse.

As immeasurable as wildlife's cultural importance may be to the state, wildlife-related recreation generates significant economic activity and the sum of this passion quickly adds up and represents a significant contribution to the economy.

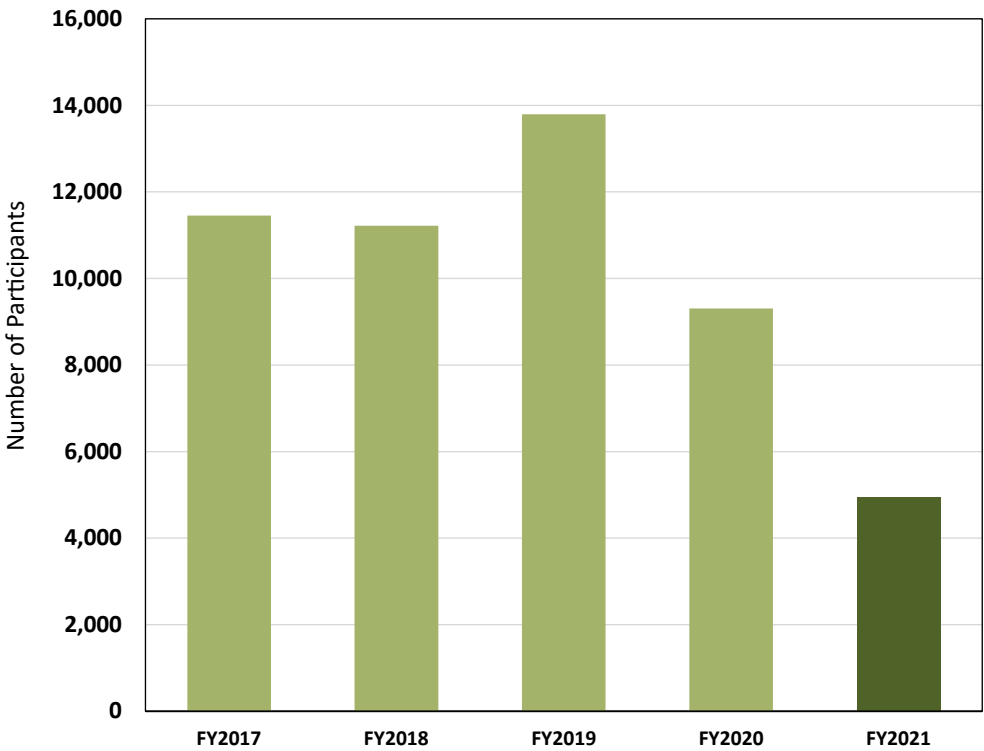
- ➔ A US Department of Commerce, Bureau of Economic Analysis found only snow sports topped hunting, shooting and trapping in total, value-added economic impact in Vermont with boating and fishing coming in fourth. The recreational activities examined ran the gamut from the conventional (camping, hiking and climbing) to agritourism, outdoor concerts and even gardening.
- ➔ Wildlife-related spending is particularly important to rural areas and often coincides with the 'off-season' for other tourism.
- ➔ Anglers make a significant contribution to tourism; the bulk of their spending is on food, lodging and related trip expenses.
- ➔ According to survey conducted by UVM's Center for Rural Studies, Lake Champlain generates an average expenditure of \$88 per angler, per day.
- ➔ Vermont draws dedicated wildlife watchers from around the region, not counting casual viewing by residents and tourists.
- ➔ The economic impact of bird feeding in Vermont cannot be overstated. The US Fish and Wildlife Service estimates almost half of Vermont households feed birds.



CONSERVATION EDUCATION AND OUTREACH PROGRAMS

Performance measure: Maintain or increase the public’s support for, and knowledge of, fish and wildlife conservation and land stewardship.

Fish & Wildlife Education Program Participation (in person)



These programs are affordable. Other than the Green Mountain Conservation Camps and educator’s course, all programs are free. Camp tuition is a fraction of the cost of almost any other week-long, residential camp. Plus, there are an ample number of scholarships available for those in need. All applicants that demonstrate need receive financial support.

The department works to maintain Vermonters’ strong connection to the land.

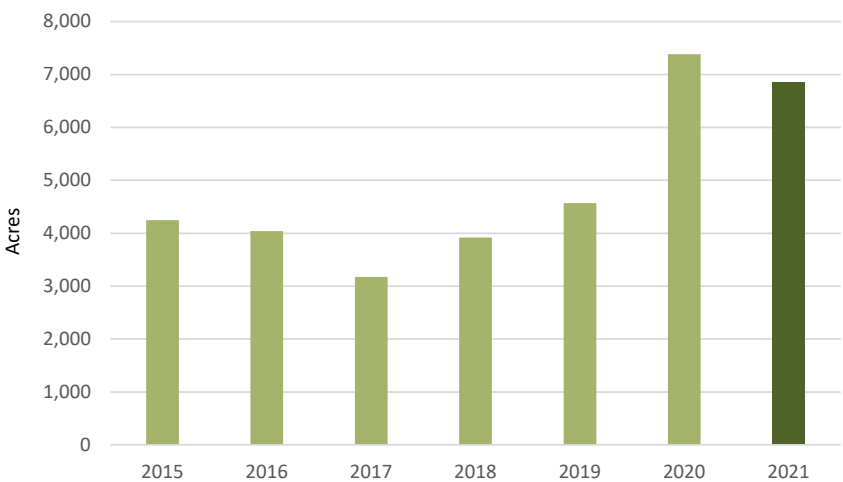
The department’s education programs strengthen an understanding of ecology, build support for conservation and teach the outdoor skills needed to responsibly enjoy our woods and waters. As expected, COVID severely limited in-person participation in FY2021. In response, the department continued to expand virtual and online educational opportunities, including fishing clinics, game cooking seminars and wildlife tracking. Basic firearm and bowhunter hunter education courses were adapted to allow for remote certification. In all, this content reached 85,000 people.



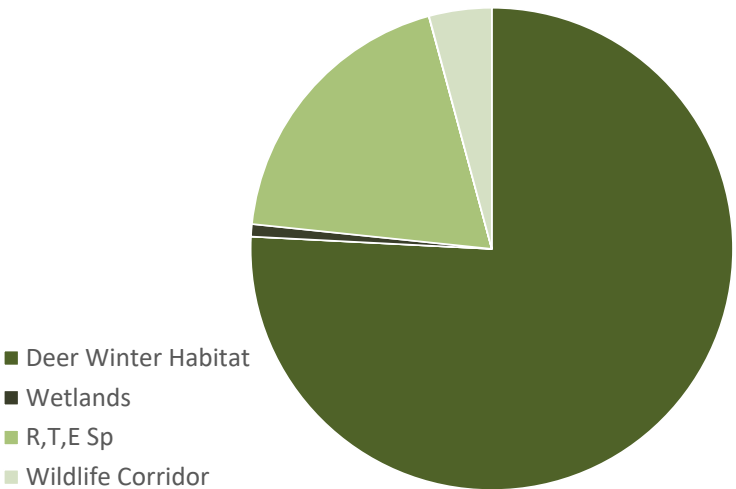
HABITAT CONSERVATION THROUGH ACT 250

Performance measure: Increase the number of acres of habitat and miles of shoreline protected through the regulatory process.

Habitat Conserved through Act 250 and Section 248



Habitat Impacted by Regulated Development Projects in 2021



Act 250 works to protect important habitats for fish and wildlife.

The department plays a critical role in the protection of ecologically important fish and wildlife habitats through Act 250 and Section 248. In 2021, this included reviewing 350 projects and protecting 6,849 acres of habitat. In addition, staff also assessed 6,577 acres of forestland through a review process with the Vermont Public Utility Commission and Burlington Electric Department and Ryegate Associates biomass energy facilities. Habitat is the key to healthy populations of fish and wildlife, and the department's technical support to these regulatory processes is key to that success.

Only 3 to 5 percent of all development projects in Vermont are regulated by Act 250. As a result, the state loses roughly 6,500 acres of undeveloped land every year, an area roughly the size of Montpelier. As part of its strategic plan, the department pursues alternate solutions to minimize habitat loss and fragmentation such as advising town and regional planning commissions and assisting private landowners with conservation practices.

LAND ACQUISITION AND CONSERVATION EASEMENTS

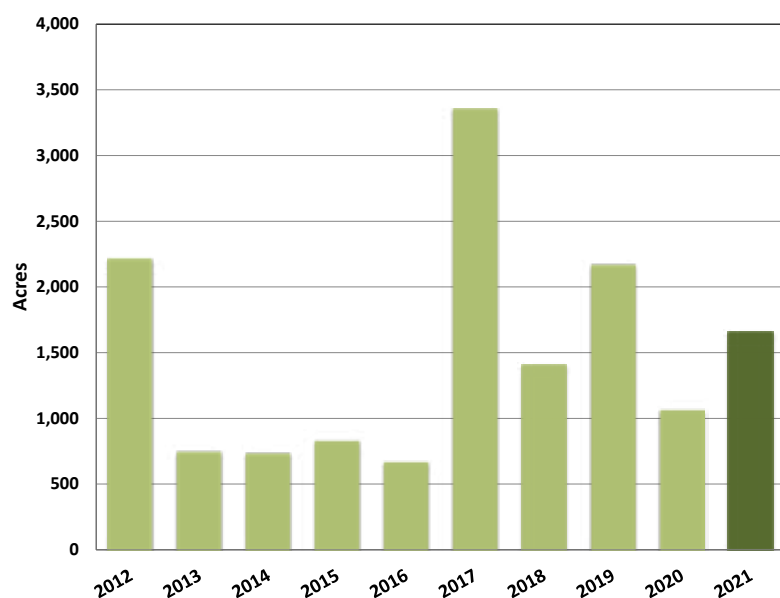


Performance measure: Increase the cumulative number of acres of high-value habitats and natural communities conserved through acquisition or easements.

Strategically targeting critical habitats for conservation.

Working with many partners, the department is safeguarding important fish and wildlife habitat through acquisitions, easements, and management agreements. The department closed on seven real estate transactions in the fiscal year totaling 1,660 acres.

Wildlife Habitat Conserved through Acquisitions and Easements Wetlands, Forest Blocks, Forest Connectivity



The department's public lands are open to hunting, fishing, trapping, wildlife watching or for just connecting with nature.

Most notably, the department celebrated the addition of its 100th Wildlife Management Area (WMA) with the creation of the 527-acre Town Farm WMA in Shrewsbury. Assisted by a substantial fundraising effort by the town, this acquisition conserves a significant wildlife corridor and provides the community with a large tract of public land for wildlife-based recreation. Additionally, through the purchase of three parcels in Vernon, the department added 446 acres to Roaring Brook WMA. These parcels greatly improved public access and conserved critical habitat for several important plant and animal species, including the federally threatened Northern long-eared bat and Northeastern bulrush.

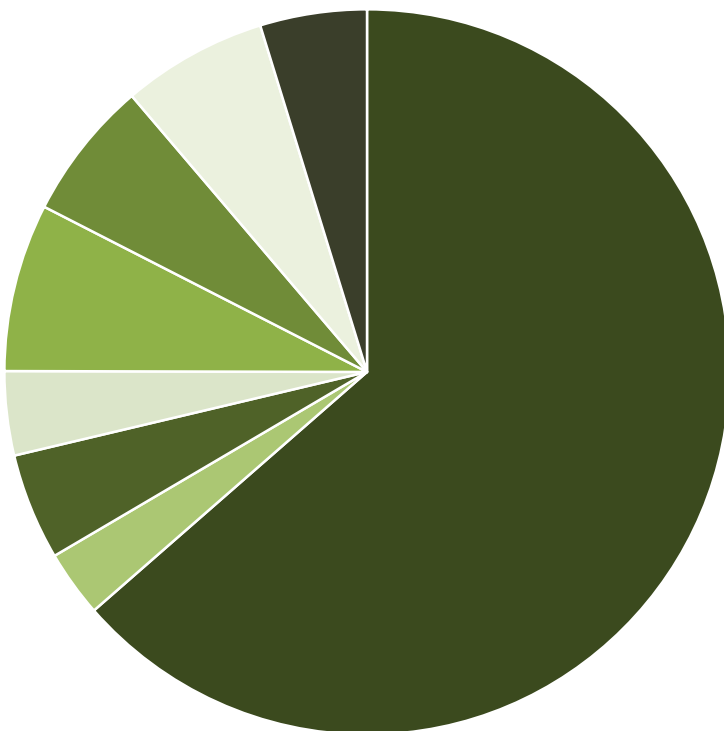
Other FY2021 projects included: a 76-acre addition to the Black Creek WMA in St Albans, a 132-acre addition to the Dead Creek WMA in Panton, and a 428-acre addition to the Lemon Fair WMA in Bridport. These three acquisitions, all in the Lake Champlain Basin, will enhance water quality through wetland restoration and add wildlife habitat to some of our most popular WMAs. They were a result of the Environmental Protection Agency Wetland Acquisition and Restoration grant. Ten additional projects, also being funded by this grant, are in various stages of development.

HABITAT ASSISTANCE FOR PRIVATE LANDOWNERS



Performance measure: Increase the cumulative number of acres of high-value habitats improved through private lands technical assistance.

Wildlife Habitat Improved on Private Lands through Fish & Wildlife Staff Technical Assistance



- Invasive Species Control / Herbaceous Weed Control
- Mast Tree Release
- Forest Stand Improvement
- Young Forest Habitat Created
- Delayed Mowing or Brush Hogging
- Early Successional Habitat
- Apple Tree Release
- Other

Approximately 80 percent of Vermont land is privately owned, working with landowners is essential to wildlife habitat.

Despite COVID-related restrictions on field work during part of the fiscal year, department staff conducted 618 site visits in a safe manner to provide wildlife habitat technical services to more than 450 Vermont landowners. The primary focus of these visits was to familiarize landowners with potential habitat management activities and funding sources, and, more broadly, to introduce a ‘conservation-based’ way of thinking about the future of their property.

However, these visits also resulted in direct improvement to 1,282 acres of important wildlife habitat through the federal Natural Resources Conservation Service (NRCS) Environmental Quality Incentive Program (EQIP) program. In addition, department staff worked closely with 21 partnering organizations, attending meetings to coordinate landowner habitat technical assistance efforts across the state with other groups. Department biologists also presented workshops to conservation organizations, natural resource professionals, and students.



WILDLIFE DAMAGE AND CONFLICT

Performance measure: Minimize the total number of negative interactions occurring between wildlife and Vermonters to achieve acceptable levels of human safety and tolerance and to protect critical wildlife habitats.

Record numbers of bear-human interactions are challenging the department's capacity to provide direct and effective assistance.

Since 1990, the bear population has doubled but reports of bears causing damage or being killed by means other than hunting has increased 20 to 30-fold. From 2019 to 2020 alone, the number of cases doubled, and 2019 was the previous record. Dealing with these complaints falls mainly on the shoulders of game wardens and bear project staff.

Reported conflicts decreased in 2021. This was expected. Beechnuts, acorns, berries, and apples were abundant in most of the state and conflict numbers rise and fall with natural food availability. However, the drop was relative since 2021 reports still surpassed 2019. Based on the nature of the complaints, two factors stood out. One was Vermont's first-in-the-nation universal recycling and composting law (Act 148). Compost can be a powerful attractant when done incorrectly and many Vermonters were composting for the first time. Though less direct, the other factor was COVID-19. A large number of second-

home owners chose to live full-time in the state, and anecdotally, a high percentage of these new residents were inexperienced on how to coexist with bears. A pandemic-related uptick in bird feeding and backyard chicken flocks also contributed to the problem.

Pandemic or not, the department believes bear-human conflicts will likely remain high into the foreseeable future as bears continue their range expansion into towns and neighborhoods that, until recently, had little history of living with bears.

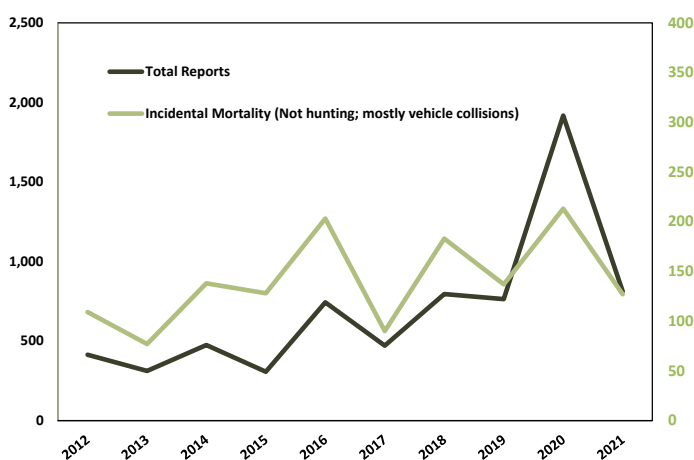
Changing human behavior is key. The department's expanded outreach and education efforts include presentations on living with bears, online content, social media posts, and television and radio spots. Some of this outreach is statewide, but in recent years staff have focused messaging on hotspot communities, such as Stowe and Killington. The department also increased coordination with Department of Environmental Conservation solid waste program, solid waste districts and trash haulers, and USDA (APHIS) Wildlife Services.

Beaver Baffle Program

Beaver-created wetland habitats are valuable to many species of fish, wildlife, and plants. However, they can also flood roads, yards and septic systems. To help resolve conflicts while still maintaining these critical wetland habitats, the department established the beaver baffle program.

Since the project's inception in 2000, a total of 314 structures (191 baffles and 123 exclusion fences) have been installed statewide, impacting 3,453 acres of beaver-created wetland habitats. In FY2021 project staff also responded to more than 250 emails and 150 phone calls and conducted 52 site evaluations. It is important to note that baffles are not effective for all situations and do not replace the need to manage the beaver population.

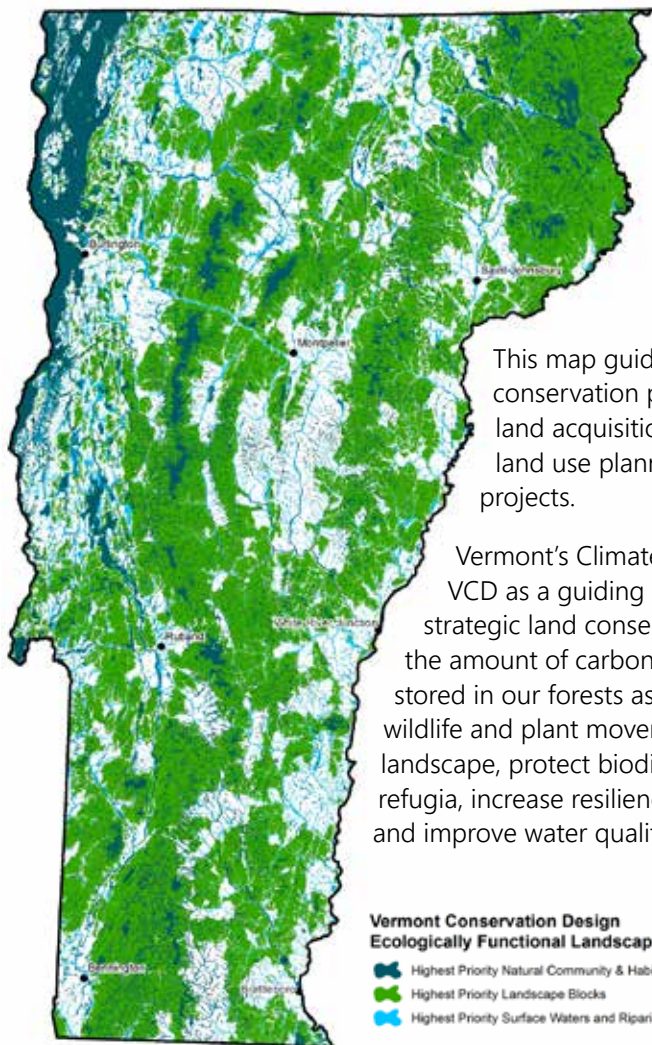
Bear-Human Complaints Reports



MAINTAINING ECOLOGICAL FUNCTION THROUGH VERMONT CONSERVATION DESIGN



Performance measure: Increase the percentage of lands and waters containing the highest priority forest blocks and riparian areas identified in Vermont Conservation Design in some form of protection, conservation, improvement or restoration.



This map guides department conservation programs including land acquisition, land management, land use planning and other projects.

Vermont's Climate Action Plan identified VCD as a guiding framework for strategic land conservation to "increase the amount of carbon sequestered and stored in our forests as well as allow for wildlife and plant movement across the landscape, protect biodiversity, protect climate refugia, increase resilience to extreme weather and improve water quality."

**Vermont Conservation Design
Ecologically Functional Landscape**

- Highest Priority Natural Community & Habitat Features
- Highest Priority Landscape Blocks
- Highest Priority Surface Waters and Riparian Areas

Vermont Conservation Design (VCD) is a science-based vision to sustain our forests, waters, and wildlife for future generations.

VCD identifies the intact, connected, and diverse lands and waters that are highest priority for ecological function. Thoughtful management and conservation of these places helps maintain a healthy environment and all the benefits it provides to fish, wildlife, plants and people.

As a result, VCD informs land acquisition, land management, land use planning and other conservation efforts. In 2021, the department used this design to encourage landowners, towns, and partner organizations to voluntarily focus conservation and stewardship in high priority areas. It was also used to help identify species that need specific conservation attention for biological or social reasons.

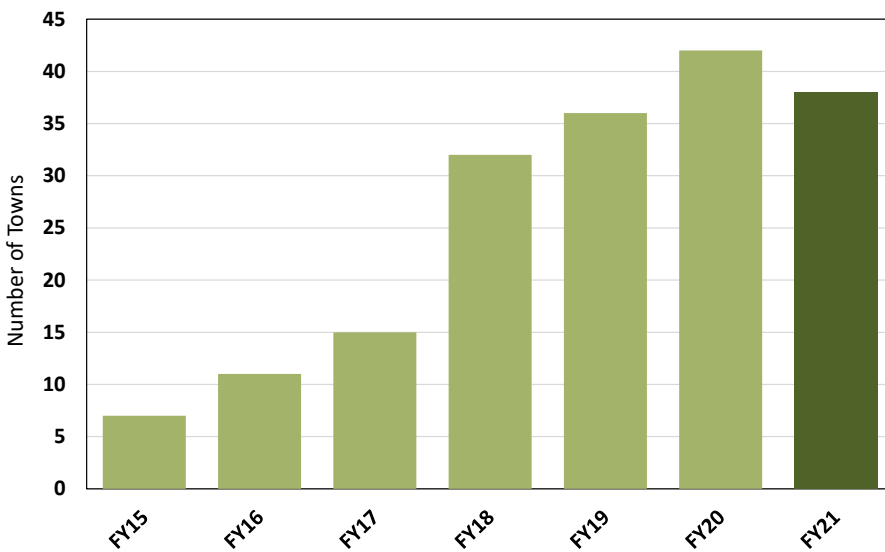
Find VCD at vtfishandwildlife.com/conserve/vermont-conservation-design

COMMUNITY WILDLIFE PROGRAM



Performance measure: Provide technical planning assistance to all Vermont municipalities

Direct Technical Assistance to Towns by Fiscal Year



In FY2021, Community Wildlife Program staff focused efforts on online events, hosting a well-attended series of webinars, trainings and meetings for towns and municipal officials. This enabled staff to be more efficient in offering technical assistance by reducing drive time and limiting in-person contact due to COVID. Staff served 83 towns totaling 753 hours of technical assistance. This includes 38 towns that received in-depth assistance, which resulted in 666 hours of the total hours of assistance.

In addition, the program worked with 10 Regional Planning Commissions, engaged 38 partner organizations, participated in 10 collaborative partnerships, and offered 332 technical assistance events (Presentations, meetings, trainings, webinars).

The Community Wildlife Program serves Vermont municipalities with technical assistance for conservation planning. The program uses Vermont Conservation Design as the scientific basis for its land use planning recommendations.

Before the pandemic, the Community Wildlife Program focused its efforts on in-person meetings. This model has since broadened to include new, innovative ways of reaching Vermonters, and some of these new tools will continue to be used after in-person meetings return. For instance, in FY21, staff hosted online Community Values Mapping events in Johnson, Guilford, Westminster, Monkton, and Woodbury to hear from residents on what they care about and, more importantly, where these assets are. The resulting information—generated from maps posted on an interactive, virtual whiteboard—are being overlaid with ecological priorities to help town planners find consensus and move forward with all manner of conservation efforts.

BALANCING WILDLIFE WITH RENEWABLE ENERGY

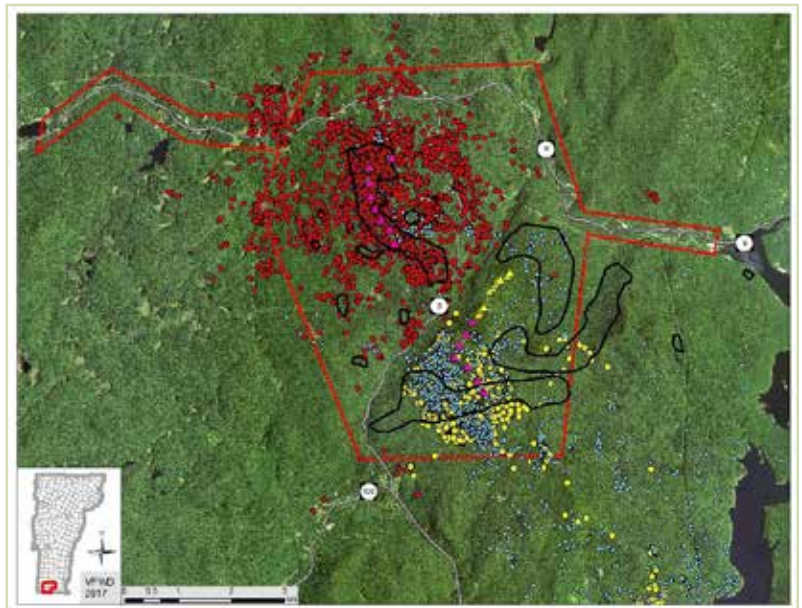


Performance measure: Maintain the functionality of high-value habitat in areas targeted for renewable energy development.

Wind and solar are essential components of Vermont's carbon-free future. However, energy development must be balanced with needs of wildlife, particularly irreplaceable habitat, natural communities and travel corridors.

Since 2011, the department has been researching the effects of a large wind energy project on black bears in southern Vermont. This is the first industrial-sized wind project on United States Forest Service (USFS) lands and the only research project investigating the potential effects of wind energy on black bears, specifically their use of critical foraging habitat.

The primary objective is to determine how bears respond to disturbances associated with the construction and operation of the turbines. The research area includes extensive concentrations of American beech trees that are used seasonally by bears as a critical source of high caloric food. Forty-six bears were fitted with satellite GPS collars to track their movements and habitat use. Data was also collected from uncollared bears using 40 wildlife trail cameras. Field work was completed in 2021 and department staff are currently analyzing the data.



Locations of three study bears during 2015 near the future Deerfield Wind Energy Project (pink triangles). The red circles and yellow circles represent the locations of two different female bears and the blue circles are the locations of a male bear. The black polygons are mapped stands of bear scarred beech concentrations. The red polygon is the virtual fence – collars within the fence collect one location every 20 minutes. Construction of the wind facility did not begin until the fall of 2016.

RESEARCHING THE DECLINE IN VERMONT'S MOOSE POPULATION



Performance measure: Monitor and minimize the impact of disease on wildlife populations.

Shorter winters and abundant moose are increasing winter tick densities in the heart of Vermont's moose range.

The department recently completed a three-year study in the Essex County area to understand the impacts of winter ticks on Vermont moose. Beginning in 2017, 60 eight-month-old moose calves and 36 adult cows were captured and outfitted with radio/GPS collars.

Overall, winter ticks killed almost half of all the moose calves. Collared cows fared much better (87% winter survival), but they produced fewer calves than would be expected. This was likely due to poor body condition because of winter tick infestations. Additionally, lungworm, another parasite, was found in 70 percent of the dead calves. While usually not fatal, lungworms can increase the risk of death from blood loss due to winter ticks.

Results of the study clearly indicated that ticks remain at high enough levels to limit moose population growth. As a result, the department reinstated a limited hunt in 2020 designed to reduce the moose density in Essex County to, in turn, reduce winter tick density and allow moose to persist.

The 2019 Big Game Survey found the majority (65%) of Vermonters support the use of hunting to manage for a smaller moose population if it reduces the number of moose that die from ticks.



Winter tick infestation

THE DEPARTMENT'S APPROACH TO FISH & WILDLIFE DISEASES



Performance measure: Maintain or restore fish and wildlife populations at healthy and sustainable levels.

The department actively works to identify and monitor fish and wildlife diseases to ensure sustainable and diverse wildlife populations in the future.

One of the earliest discoveries about COVID-19 was its ability to be transmitted between humans and wild and domestic animals. In response, department biologists have been working with experts from across the country to assist with the latest research and to determine what measures are needed to safeguard the safety of both humans and native wildlife. Department staff coordinated with the state's sole bat rehabilitator to submit samples to Tufts University for research on SARS-CoV-2 and enacted immediate restrictions on wildlife research and handling protocols.

COVID-19 is just one of a long list of fish and wildlife diseases that staff are currently monitoring. Others include: Chronic Wasting Disease (deer and moose), avian influenza variants (particularly waterfowl), White-Nose Syndrome (bats), Whirling Disease (trout), rabies and canine distemper virus (particularly furbearers), Viral Hemorrhagic Septicemia (all fish species), and the emerging threat of Rabbit Hemorrhagic Disease Virus 2, another new, highly contagious and often fatal virus that is spreading rapidly in multiple species of domestic and wild rabbits and hares in the western United States.

The department's multi-disciplinary approach to disease includes:

- Two Fish Health Biologists stationed at the Fish Health Lab at the Vermont Agriculture and Environmental Laboratory in Randolph.

- Three wildlife disease response teams (mammals, birds and reptiles and amphibians) operating under the guidance of disease surveillance plans.
- A contract with a wildlife veterinarian to provide technical guidance and hands-on assistance.
- Membership, training and communications with the Northeast Wildlife Disease Cooperative and Northeast Fish Health Committee, as well as state, regional and federal agencies.

Vermont's Fish Health Program

Vermont's Fish Health program helps protect wild fish populations and fish reared at fish culture stations by preventing and managing serious fish diseases. Its fish health laboratory is equipped to diagnose many parasitic, bacterial and viral fish pathogens. The program:

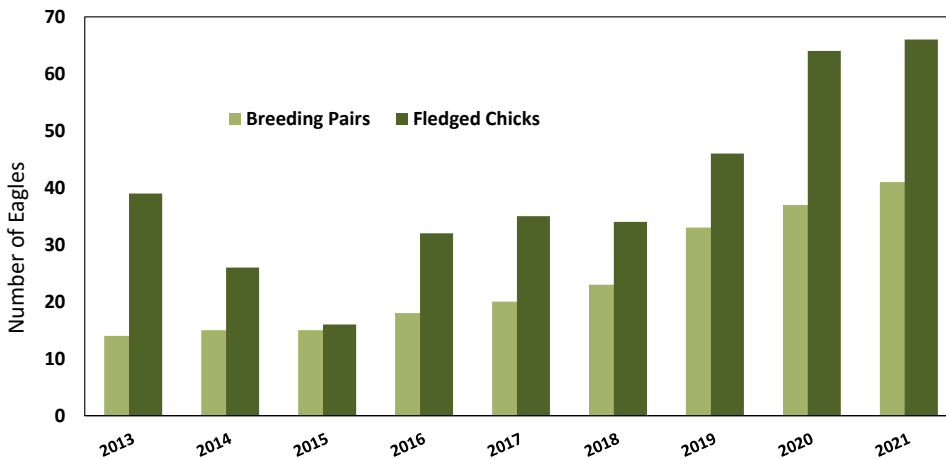
- Conducts annual fish health inspections on all state owned and private fish culture stations and investigates specific diseases when they occur on facilities.
- Develops statutes and regulations designed for preventing and managing serious fish diseases.
- Administers Vermont's fish importation, baitfish dealer and fish propagation permit programs.
- Investigates fish kills and study fish disease agents in the natural environment.
- Provides technical assistance in fish health related matters to fisheries staff and the public.



THREATENED AND ENDANGERED SPECIES

Performance measure: Maintain or restore fish and wildlife populations at healthy and sustainable levels.

Vermont Bald Eagle Recovery Area Monitoring Results for Breeding Pairs and Fledged Eagles



In 2021, 41 nesting pairs of bald eagles successfully fledged 66 chicks. Vermont's delisting criteria regarding number of nesting pairs (14 pairs over a 5-year average) has been met for the past six consecutive years and the criteria for fledglings (28) has been met since 2019. As a result, the state's Endangered Species Committee is recommending they be removed from the state's Threatened and Endangered Species list. This is a remarkable achievement; the first successful nest in more than 60 years occurred in Vermont only thirteen years ago in 2008.

Two other once endangered bird species had successful nesting seasons:

- 38 nesting pairs of peregrine falcons fledged 65 chicks (*the lower reported numbers are a result of not every nest being monitored as in previous years*)
- 109 nesting common loon pairs successfully fledged 84 chicks

The department works strategically to keep common species common and prevent vulnerable species from becoming threatened and endangered.

The Wildlife Action Plan is a 10-year framework designed to assess the health of Vermont's fish and wildlife species, identify the problems they face, and outline the actions needed for long-term conservation. Some species such as moose, spruce grouse, and marten may be at risk due to climate change. Many species, from the Jefferson salamander to the Northern goshawk, are at-risk due to habitat loss and fragmentation from development.

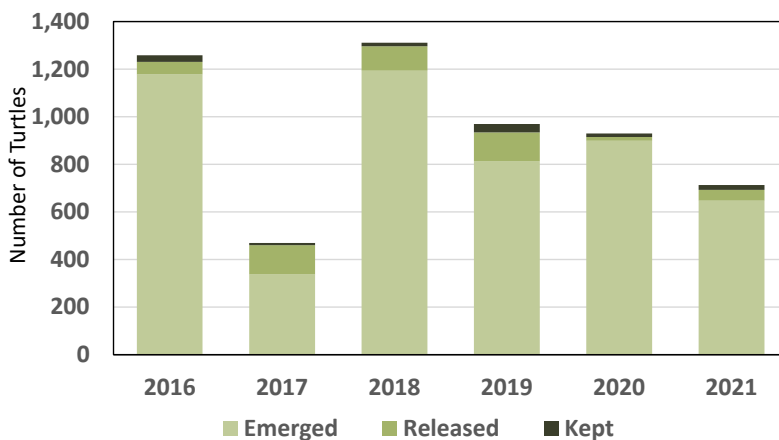


THREATENED AND ENDANGERED SPECIES



Performance measure: Monitor and minimize the impact of disease on wildlife populations.

Spiny Softshell Turtle Nesting Success



Spiny softshell turtles are a state-threatened species. In Vermont, they are only found in Lake Champlain, and nesting-related problems are a primary reason why they are imperiled. Threats to nesting include habitat loss due to development and competing vegetation, depredation by raccoons, foxes and skunks, and periodic flooding of nesting sites due to high lake levels.

The department is working to minimize these threats by:

- Covering known nesting sites with wire mesh after females have laid their eggs to prevent predation.
- Employing USDA APHIS Wildlife Services to reduce nest predator abundance at the most sensitive nesting beaches.
- Removing any live eggs/young from hatched nests, then incubating them and raising the hatchlings in captivity for release back into Lake Champlain the following spring.
- Increasing public awareness and outreach by partnering with the ECHO Leahy Center for Lake Champlain and conducting annual volunteer turtle beach cleanups.

Conserving Vermont's diversity of species involves protecting important habitats and reducing other threats that impact survival.

The Northeastern bulrush (*Scirpus ancistrochaetus*) was first described in scientific literature in 1962. It was known from only two sites and both were in Vermont. At the time, its habitat was best described as a Connecticut River backwaters and, for several years, this is where the department searched for the federally endangered species.

However, in 1993 two populations were discovered in beaver flowages away from the river. The search was repeated in 1994 and two additional populations were found. Since then, improved surveillance has located more than two dozen new populations, mostly in beaver-influenced wetlands in Windham and southern Windsor Counties. There are now approximately thirty known populations in Vermont.

Additional populations have been found in other northeastern states and Quebec, bringing the total known population to 120. As a result, the US Fish and Wildlife Service has recently proposed to remove the Northeastern bulrush from the federal endangered species list. The department's botanist has been requested to be on the recovery team and assist in developing a post delisting monitoring plan.

WILDLIFE MANAGEMENT AREAS



The department manages 100 Wildlife Management Areas (WMAs) and many Streambank Management Areas (SMAs) totaling 135,000 acres.

These properties showcase quality habitat management for all wildlife species and ensure public access for hunting, fishing, trapping and wildlife watching. While WMAs and SMAs are open to all, their acquisition and maintenance is primarily funded through sporting license sales and federal funds derived from excise taxes on hunting equipment with additional assistance from Habitat Stamp donations.

Highlights from FY2021 include:

- ➔ 5,216 acres of direct habitat management including grassland mowing, controlled burns and invasive plant control.
- ➔ 65 acres of timber harvested where young forest habitat was needed.
- ➔ 3,800 trees planted for habitat restoration.
- ➔ 488 waterfowl nesting structures and boxes were installed and maintained.
- ➔ 27 dams and dikes were maintained to actively manage 800 acres of wetland.
- ➔ 11 bridges and culverts were repaired or replaced.
- ➔ Infrastructure maintenance, vital for public access, included work on 12 miles of roads, 19 kiosks, 12 miles of boundary lines, 40 parking areas and 5 gates.

100 WMAs in 100 Years

2020 marked the 100th anniversary of WMA conservation and ownership in Vermont. Socially distanced, commemorative ceremonies were held at Sandbar, Dead Creek and Town Farm WMAs. In fiscal year 2021, the 526-acre Town Farm property became the department's 100th WMA, the purchase of which involved critical partnerships with the Vermont Land Trust, the town of Shrewsbury and local landowners.



Celebration of Town Farm WMA, the department's 100th WMA.

LAKE CHAMPLAIN WETLAND CONSERVATION AND RESTORATION INITIATIVE



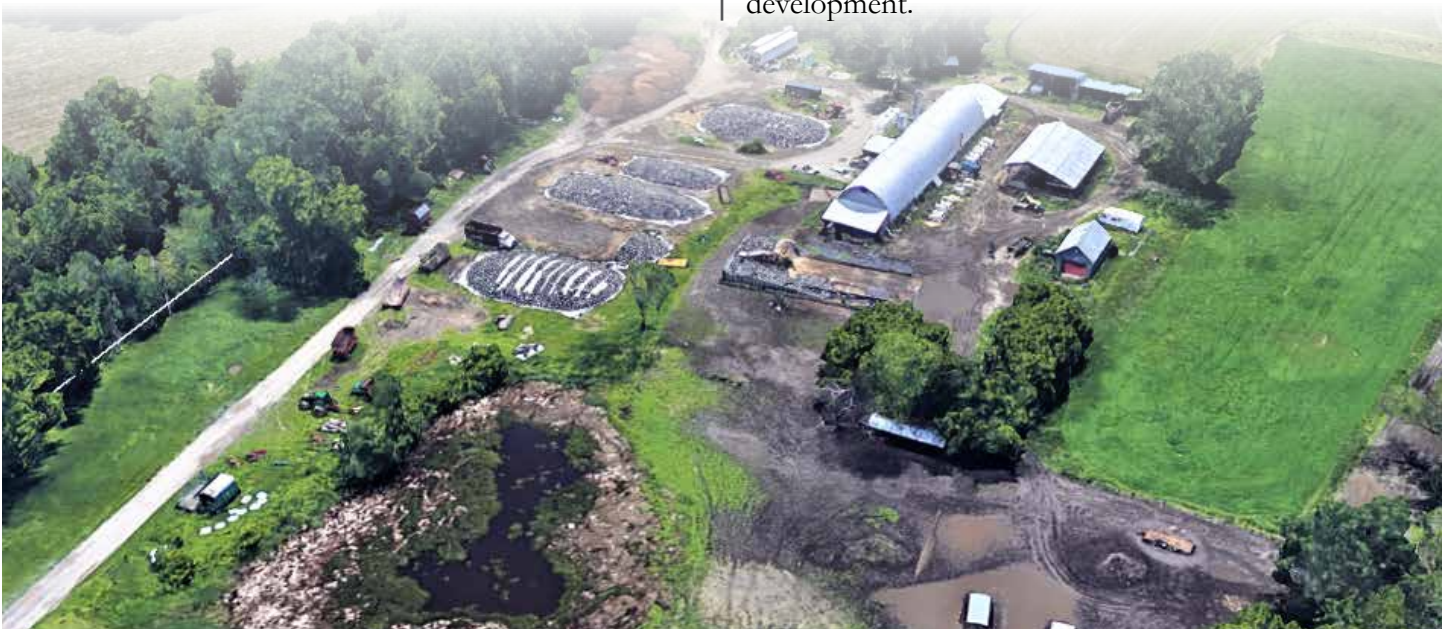
The department has a long, successful history of conserving, managing and restoring wetland habitat.

Sandbar Wildlife Management Area (WMA), established as a refuge for migratory waterfowl in Milton in 1920, was the first state-owned WMA in the eastern United States. To date, the department has conserved almost 30,000 acres of essential wetlands and is the largest owner of wetlands in the state.

In keeping with this tradition, a wetland conservation and restoration initiative was created in 2019 to accelerate conservation and restoration in the Lake Champlain drainage basin. This initiative is funded by the EPA (\$1.75 million for three years) with support

from the Department of Environmental Conservation (DEC) and Lake Champlain Basin Program and is focusing on improving water quality and fish and wildlife habitat in Champlain and its tributaries.

In FY2021, the department secured four acquisitions with these funds at critical locations in the Lake Champlain Basin to enhance water quality through wetland restoration and add onto our marquis WMAs, such as Dead Creek WMA in Addison County. These four acquisitions total just over 674 acres. Ten other wetland restoration projects are in various stages of development.





RESTORATION OF STURGEON AND OTHER FISH AND AQUATIC ORGANISMS

Performance measure: Maintain or restore fish and wildlife populations at healthy and sustainable levels.

The department works to conserve a diversity of aquatic species.

This includes well known fish like lake trout, salmon, muskie and sturgeon as well as lesser known species such as channel darters and dwarf wedgemussels.

Lake sturgeon populations had declined precipitously in Lake Champlain by the mid-1900s due to dams, pollution and commercial fishing and sea lamprey likely pushed them over the edge.

In 2016, the department released a new lake sturgeon recovery plan and stepped up its efforts to restore this state endangered fish to Lake Champlain and its tributaries. The plan was initiated with the knowledge that full recovery could take generations since it takes 25 years for the ancient, long-lived fish to even mature.

In 2021 department biologists expanded efforts to better understand sturgeon behavior and habitat use in the Missisquoi River and surrounding area. No fish were found during spring electrofishing in the Missisquoi River and one fish was captured and tagged near North Hero during fall gillnetting efforts. Biologists also continued public outreach efforts to remind anglers that sturgeon cannot be legally targeted and to report any incidental catches. Five were reported in 2021, although there were informal reports of a few others. Efforts in 2022 will include continued assessment of tagged fish near the Winooski and Lamoille rivers, as well as sampling in Missisquoi River and Otter Creek to help better understand the population.

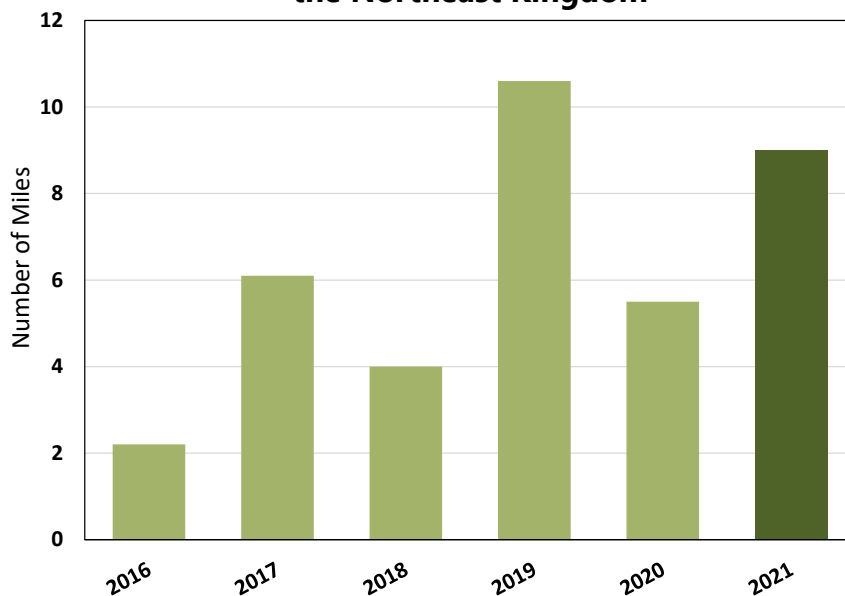


TROUT HABITAT MANAGEMENT



Performance measure: The number of stream-miles restored.

Miles of Wild Trout Stream Restored in the Northeast Kingdom



Fisheries biologists, in cooperation with Trout Unlimited, have been strategically adding woody material to streams in the Northeast Kingdom. Brook trout population monitoring reveals that brook trout abundance has more than doubled in treated areas.

Fisheries biologists work with Trout Unlimited and other partners to improve trout habitat on the East Branch Nulhegan River.

Department biologists recently completed a decade-long survey of wild brook trout and found that present day populations are comparable to those from more than 50 years ago.

This is a remarkable conclusion for Vermont's favorite fish given that populations of wild brook trout have declined significantly across much of the species' historic range in the eastern United States.

While most measures were similar, significantly higher densities of young brook trout were found. This may reflect the improved environmental protections put in place since the 1950s, particularly legislation and programs focusing on water quality and aquatic habitat protection.

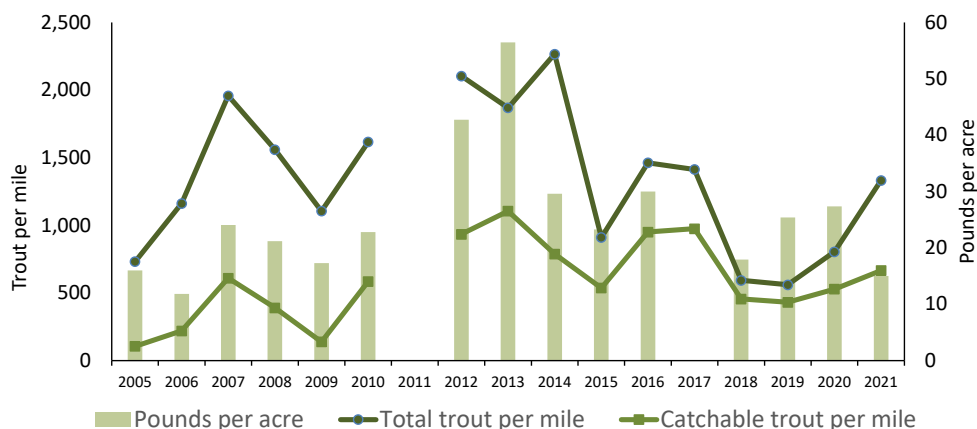
The survey included sampling of 138 streams within 17 watersheds between 2005 and 2016, each of which were originally sampled between 1952 and 1960 by former biologist James MacMartin.

WILD TROUT FISHERIES RESTORATION



Performance measure: The number of catchable trout per mile.

**Trout Numbers at the Twin Rivers Project Site
on the Batten Kill**



The department is working to provide quality trout fishing opportunities by restoring and maintaining self-sustaining wild trout fisheries.

Vermont's finest wild trout rivers include the Batten Kill and the Dog River, and the department is working to improve a number of other streams too, including in the Northeast Kingdom.

The size and age composition of Vermont's trout populations increase when instream habitat is restored by strategically felling mature trees along the streambank into the water. The "Twin Rivers" project site on the Batten Kill in Arlington was the river's first instream habitat restoration project. Work started in 2006 and the stretch's trout population has increased in the years that followed. But felling trees isn't enough. The vegetated streambanks must also be restored if they are going to be a source of instream habitat. Biologists are working with partners and private landowners to restore wood both in and alongside streams to benefit trout populations today and in the future.

On the Batten Kill, the department's message is getting out. Anglers are spreading the news that large wood is where the fish are, partners are encouraging landowners to leave fallen trees where they fall, and neighbors of restoration projects are taking advantage of opportunities to have trees planted on their streamside properties.



PROTECTING AND RESTORING STREAMBANK HABITAT AND AQUATIC ORGANISM PASSAGE



Performance measure: Miles and acres of streambank habitat enhanced or restored, and miles of river connected.

The department works with state and federal agencies and non-profits to protect and restore habitat for fish and other aquatic creatures.

Trout depend on cold, clean, complex and connected rivers and streams with unconstrained flow. These conditions occur naturally when: trees grow along the banks are left after they fall in; stream channels are given room to meander and flood their banks; bridges and culverts are appropriately sized; and dams are removed. To put it another way, it is cheaper and more effective to protect and restore habitat than it is to create it. Healthy aquatic habitat is also essential to water quality and flood resilience. In FY2021, among many accomplishments, staff:

- Worked with 11 aquatic connectivity working groups removing 5 dams and working on designs for 10 more dams and 8 culvert enhancements.
- Measured 87 dams to assess their condition and potential for aquatic organism passage.
- Worked with the Vermont Natural Resources Council to design the removal of the department-owned Pelletier Dam in Castleton on a tributary of the Castleton River, which once removed will restore access for brook and brown trout to 30 miles of habitat.
- Used mark-recapture to assess fish passage at eleven culverts that were retrofitted with baffles and weirs to enhance upstream aquatic organism passage.
- Compiled and analyzed stream temperature data. Unfortunately, in 2020, the most recent year for which data are available, stream temperatures continued to increase in July, August and September.

- Co-taught a Rivers and Roads trainings with DEC. This course provides technical assistance to state and municipal staff and consultants who design and maintain road infrastructure.
- Designed and implemented a 4.6 acre experimental tree planting on the Otter Creek WMA to test riparian forest restoration in the presence of beavers, a significant source of early tree mortality at many riparian restoration sites in the state.
- Worked with a partner to restore 10 acres of forested floodplains on two department parcels and adjacent private lands in the White River watershed.
- Planted 0.5 acres at an emergency bank stabilization on the Dog River headwaters.
- Worked with partners on the Missisquoi National Wildlife Refuge, Hinesburg Town Forest and department lands on an experimental restoration of fields dominated by invasive reed canary grass to forested riparian areas.
- Provided \$201,000 in funding, \$87,000 in leveraged federal, state and private dollars and in-kind match, and over 100 hours of non-regulatory technical assistance towards the design or removal of five deadbeat dams and designs for the enhancement of four aquatic organism passage compliant culverts on important brook trout streams. Combined these projects will increase access to over 11.8 miles of stream for brook trout and other aquatic species.
- Awarded \$65,000 in watershed grants to 16 watershed organizations, conservation districts and regional planning commissions to plan, implement and educate the public on water quality and aquatic habitat projects.

TROUT PRODUCTION FOR RECREATION AND RESTORATION



Performance measure: Meet the management request for cultured fish (+/- 10%) to support recreation and restoration goals.



ROXBURY FCS FOLLOWING TROPICAL STORM IRENE

Vermont's fish culture facilities are operating at full capacity again.

The completely reconstructed Roxbury Fish Culture Station is back in operation, ten years after being devastated by Tropical Storm Irene. The station, originally built in 1891, can produce 60,000 brook and rainbow trout a year and the first yearling trout stocking is planned for the spring of 2022. Having Roxbury back online relieves the pressure on the department's other facilities that had to increase production after the loss of Roxbury.

The station and the outside grounds are open to the public, with detailed display boards and fish observation sites

A grand reopening ceremony, postponed due to COVID-19, was held in September. It included a local artisan who created a commissioned granite brook trout sculpture to commemorate the reopening. The event was well attended and highlighted the many years of hard work that were needed to bring back this iconic facility.



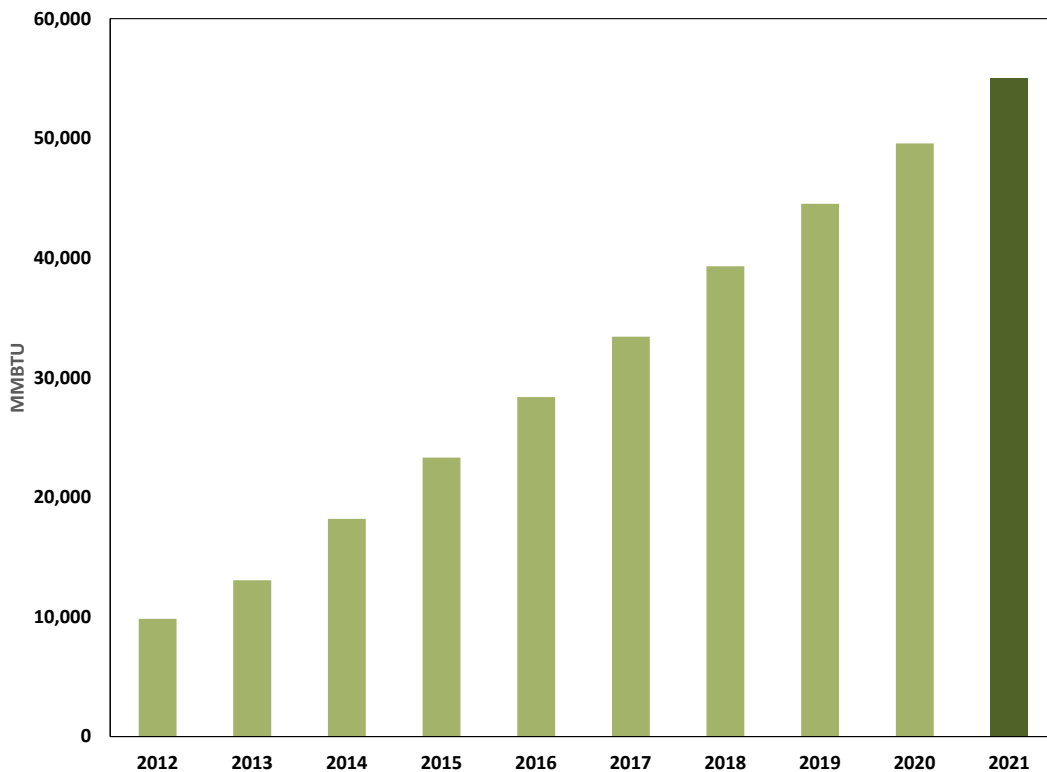
ROXBURY FCS REBUILT AND OPERATIONAL

ENERGY EFFICIENCY UPDATES AT FISH HATCHERIES



Performance measure: Increase management effectiveness and efficiency.

**Cumulative Energy Savings (MMBTU) Over Time
Vermont Fish Hatchery Energy Efficiency Projects**



The department is a conscientious steward of energy resources and constantly works to increase its efficiency and reduce costs.

Switching fish hatchery energy use to solar power saves enough energy every year to power the entire town of Grand Isle for a year. This not only saves money, but also reduces our carbon footprint. In 2021, total energy savings at the fish hatcheries is expected to exceed \$125,000.

PUBLIC ACCESS FOR BOATING AND SHORE FISHING



The department's access area program provides the state's 28,000 registered motorboat owners and 149,000 resident and nonresident licensed anglers with safe and reliable access to 130 unique bodies of water at 196 locations.

All access areas are free and include:

- ➡ 143 with concrete or gravel boat ramps
- ➡ 39 sites with at least one courtesy dock
- ➡ 30 with non-motorized boat access
- ➡ 22 with accessible shore fishing platforms

Fishing access areas are funded through state and federal sources. Motorboat registration fees, capital funds, and a small amount of general funds are used to leverage federal dollars derived from excise taxes on fishing tackle and the federal marine fuel tax. Non-motorized watercraft and non-anglers are welcome to use the sites, provided they follow access area rules.

Over the past decade, the department has completed 148 infrastructure improvement projects, including 59 ramp upgrades and 40 dock upgrades replacements. These improvements were made possible by a combination of capital appropriations, state motorboat registration fees, Federal Aid in Sport Fish Restoration, and more recently federal COVID stimulus and general funds.

Fishing access areas were vital recreation outlets in 2020 and 2021 and were likely never used more. General maintenance of the sites is usually conducted by Department of Corrections work crews. COVID-19 restrictions, however, prevented their participation. In response, department staff from across the state adopted their local access areas, ensuring the sites remained clean, safe and welcoming to users all season long.

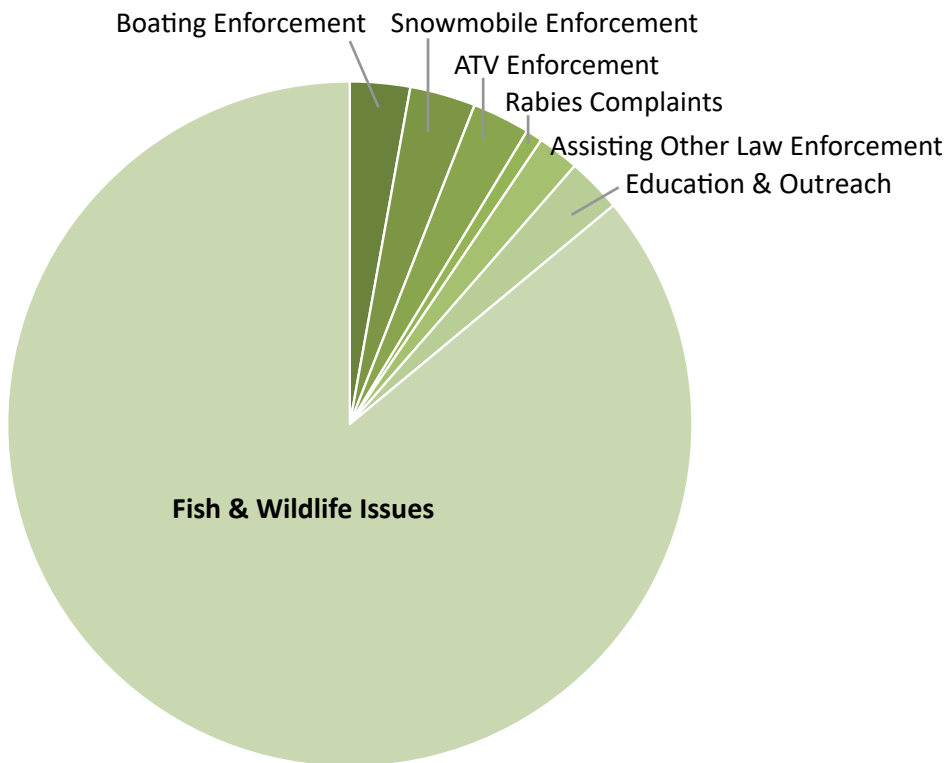


WARDENS SERVE THE PUBLIC



Performance measure: Decrease human-wildlife conflicts while increasing safety for outdoor recreationists.

Warden Activities Benefiting the Public



COVID-19-related patrols accounted for a significant percentage of warden time in FY2021. With the extraordinarily high numbers of people fishing, hunting, boating or just spending time outside, and many other agencies occupied with direct response to the crisis, wardens spent the majority of their time in the field serving the public. Wardens also conducted major search and rescue operations and state park patrols, assisted with general law enforcement, and provided social distancing reminders where large groups of people gathered.

Wardens apply their broad range of skills and expertise to provide a wide variety of services that Vermonters increasingly rely on.

Conservation law enforcement is, and will remain, the Division of Warden Service's highest priority. However, it's not their only mandate. Wardens also respond to rabid animal calls and human-wildlife conflicts, enforce boating, ATV and snowmobiling laws, participate in outreach and education programs, conduct search and rescue operations, collect vital biological data used to monitor wildlife populations and diseases, and provide mutual assistance to other agencies. Mutual assistance calls have almost doubled in the last decade due to strained law enforcement budgets around the state.

COMMUNITY-BASED LAW ENFORCEMENT



Performance measure: Increase positive interactions with the public to improve law enforcement capabilities.

Effective law enforcement is the result of building trust and credibility within the community through positive interactions and strong individual relationships.

Wardens are some of the original community police, each with a home office and publicly listed phone.

Fishing Outreach and Education

Outreach and education are mission central to the warden service, but COVID submarined standard venues like hunter education courses and Let's Go Fishing events. In response, the "Fish with a Warden" series was developed in 2020 to safely connect anglers

with wardens at shore fishing sites across the state. More than simply fishing, the sessions also included an overview of the lake's ecology, regulations and tips and techniques. The programs proved so popular that wardens were incorporated into standard Let's Go Fishing clinics when in-person programming returned in the second half of FY2021.



Connecting with Students

During the past six years, the Division of Warden Service has been collaborating with UVM's Environmental Problem Solving and Impact Assessment course. The course, a capstone for Rubenstein School of Environment and Natural Resources undergraduates, connects students with community partners to solve real world problems. For the students, this means valuable experience. For the warden service, the course is more than just a way to gain a fresh perspectives on issues. It is a recruitment strategy to introduce the service to a more diverse group of future natural resource professionals, many of whom are unfamiliar with state fish & wildlife agencies. In 2021, the service hired the first Warden Trainee who applied as a direct result of taking the course.

Making the Most of Roadkill

Wardens have lists of people in their districts who are in of need deer, bear, and moose meat. And while wardens regularly obtain road-killed game, only a handful of the people who want the meat can actually accept a carcass. They don't have the time or place to process the animal, the carcass is recovered too late at night, or the weather is too hot to prevent the meat from spoiling. To address these challenges, wardens have been working with local butchers who donate their time and wrapping materials to ensure these animals are not wasted. The wardens drop the carcasses off at the processors, deliver the meat to a local food shelf and then dispose of the left-over carcasses. In districts where processing is unavailable, some wardens are even processing the meat themselves. In 2020 alone, 3,149 lbs of meat were distributed. This is equivalent to 14,000 individual meals.