Annual Report 2022

Massachusetts Division of Fisheries & Wildlife

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An agency of the Department of Fish & Game

MASSWILDLIFE

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Connor Fleming, a technician with MassWildlife's Southeast Wildlife District, prepares an eaglet for banding in Plymouth. Photo by Troy Gipps/MassWildlife

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A fawn, during its first week, hides in the forest while awaiting the return of its mother so it can nurse. Photo by Troy Gipps/MassWildlife

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1 The Board Report

Joseph S. Larson, Ph.D., Chair

Overview

The Massachusetts Fisheries and Wildlife Board consists of seven persons appointed by the Governor to 5-year terms. By law, the individuals appointed to the Board are volunteers, receiving no remuneration for their service to the Commonwealth. Five of the seven are selected on a regional basis, with one member, by statute, representing agricultural interests. The two remaining seats are held by a professional wildlife biologist or wildlife manager and one representative with a specific interest in the management and restoration of wildlife populations not classified as game species. The Board oversees the operations of MassWildlife; reviews the agency's programs; approves all personnel appointments; sets policy and regulations pertinent to wildlife in the Commonwealth; and votes to accept care, custody, and control of wildlife lands acquired through the Department of Fish and Game's Land Protection Program.

The COVID-19 pandemic that began in early 2020 and forced Governor Baker to execute various executive orders to protect staff and public health and safety continued to be of concern into FY 2022, though most of the mandated COVID restrictions had been eased or lifted by the end of the fiscal year. The modifications to portions of the state's Open Meeting laws that enabled municipal and state boards, including the Fisheries and Wildlife Board, to hold public meetings via open conference calls and virtual meeting video platforms (i.e., Zoom) were effective throughout the fiscal year, and only three meetings were held in person during the fiscal year, in July 2021, May 2022, and June 2022. The Board also held several virtual public hearings on proposed regulatory changes during the year; details of those hearings are below. The Open Meeting law provisions enacted by Governor Baker were renewed before the end of the fiscal year by the legislature to continue through July 15, 2022.

While many different matters and issues are brought before the Board each year, most of its meeting time is spent in review and scrutiny of proposals for regulatory changes; of agency programs and policies; and of possible land and conservation-restriction acquisitions, usually, given the confidential nature of land-purchase negotiations, in executive session. Anyone interested in the details of the monthly meetings of the Fisheries and Wildlife Board is referred to the archive of approved Board meeting minutes the staff maintains on MassWildlife's website (Mass.Gov/Service-Details/Fisheries-and-Wildlife-Board-Meeting-Minutes).

This report is organized topically, then roughly chronologically within each topic. This predictable structure allows relatively easy searching and comparison of the Board's annual reports year over year.

Fiscal Year Highlights

The highlight of FY 2022 was the approval of MassWildlife's first license, stamp, and permit fee-structure increase in 25 years. Following a thorough review by MassWildlife Director Mark S. Tisa, his staff, and the Fisheries and Wildlife Board and an extensive, 6-month public engagement effort in the second half of FY 2021 that allowed the agency to gather feedback from hunters, anglers, and trappers, the Executive Office of Administration and Finance approved increases proposed by MassWildlife for freshwater fishing, hunting, and trapping licenses and associated permits and stamps. In response to feedback received from the sporting community, many of the fees will be phased in over 5 years. The approved fee structure, effective in calendar year 2022, is designed to address MassWildlife's revenue shortfall; sustain the Inland Fish and Game Fund for approximately 8-10 years; fund core operations; and

maintain MassWildlife's popular, high-quality programs and services. The Chair and the entire Board were very grateful to have the benefit of Director Tisa's financial and business acumen in the analysis of the agency's present and future finances to determine the appropriate fee levels to sustain agency operations now and into the future, and his leadership through the protracted process of presenting and advocating for the necessary fees. Details of the extensive public-outreach and regulatory process conducted by MassWildlife in this effort were given in the FY 2021 report.

Administrative Matters

Board Elections

The Board held its annual election of officers during the November business meeting, reelecting Joseph S. Larson to the Chair, Mr. Michael Roche as the Vice Chair, and Ms. Bonnie Booth as the Secretary of the Board.

Adopted Regulations and Other Votes of the Board

Vote of Support: License Fee Proposal

During the July business meeting, Director Tisa thanked the members for the trust, confidence, and support the Board has given him throughout the long process of reaching a final proposal and completing the public hearing process on the proposed license fee increases for the agency (see "Fiscal Year Highlights," above). The Director recapped the length and depth of the process, the number of meetings and hearings, and the intense participation of sportsmen and -women across the state. He reported that the sporting community really appreciated the public process and the fact that the Board and the agency listened to their comments and, working with the administration, were able to reduce the proposed increase for permits and stamps as well as phase in the license fee increases over the following 5 years. The Director stressed that the agency could not have done it without the sporting community. He also thanked the state's sporting leaders for all their work and engagement with the agency throughout the process. The Director reminded the members that the fees are not in MassWildlife's regulations; rather, all fees charged in the state are codified in the ANF regulations. Nevertheless, he requested a vote of support for the final fee structure. The Board voted unanimously to endorse the proposed fee structure and to move the package to EEA and ANF for final approval and promulgation.

Proposed Pheasant and Quail Regulations

Also, during the July meeting, Director Tisa outlined the staff's proposal to amend the pheasant and quail hunting regulations, including to create a pheasant and quail permit, a formal step required now that a permit fee is being established, and requested that the Board direct staff to develop specific proposed regulations and move to a public hearing.

The proposal outlined by Director Tisa included, along with the establishment of a pheasant and quail permit:

- eliminating the season bag limit for pheasant and quail;
- removing antiquated rooster-only restrictions where they exist; and
- eliminating the hunter registration process for pheasant hunting at Martin Burns WMA, which has not been necessary for many years.

After a brief discussion, the Board voted unanimously to direct staff to develop the regulations as outlined by the Director and take them to a public hearing.

The hearing was held during the September meeting. Director Tisa reported that the vast majority of the comments received before and during the hearing were in support of the proposed regulations and that staff recommended no changes to the regulations as proposed. Due to the timing of filings required before the regulations could be promulgated, the public hearing notice had stipulated that there would be no written comment period after the close of the public hearing and the Board would vote immediately on the proposals. After a brief discussion in which staff addressed at the request of Board members certain tangential comments made during the hearing, the Board voted unanimously to adopt the regulations as proposed.

2022-2023 Migratory Game Bird Season Regulations: Public Hearing, Comment Review, and Vote

In February, the Board heard the staff's proposals for the 2022-2023 Migratory Game Bird hunting seasons, which as always were based on the federal frameworks for migratory bird hunting and the input and preferences of Massachusetts bird hunters.

In April, the staff held the public hearing and, at the close of the hearing, the Board voted to adopt the final regulation package as recommended. There was no written comment period after the hearing (which is normal for these regulations) because federal regulations require that states report their seasons by April 30, so that they can be recorded in the Federal Register by the end of May. For the final regulations, see the Waterfowl sub-report in the Wildlife Section of this Annual Report on page XX).

2021 Deer Review and 2022 Antlerless Deer Permit Allocations

Deer and Moose Project Leader Martin Feehan presented the annual Deer Review to the Board at its June meeting. He also presented the 2022 Antlerless Deer Permit (ADP) allocations, which were unchanged from the previous year and were endorsed by the Board. Please refer to **page** Error! Bookmark not defined. in the Wildlife Section of this Annual Report for the details of the 2021 deer hunting season and of the ADP allocations for 2022.

Proposals for New, Updated, or Amended Regulations

Pheasant and Small Game Regulations (321 CMR 3.00)

During the January meeting, Director Tisa gave the meeting a brief recap of recent actions that had led to the regulation changes that were being proposed by Upland Game Biologist David Scarpitti. When the Board had voted the previous July to endorse the license fee increases, the Director had explained that the pheasant and quail permit would need to be created after ANF approved the fee, because only the Board has the authority to create permits. After the Director's July presentation, the Board members had asked him to research the possibility of extending the pheasant hunting season through the end of the year, to give hunters the opportunity to take holdover pheasants while deer hunting. Director Tisa stated at that time that his staff would research the matter to determine whether any existing regulations or laws would prohibit it.

Director Tisa then reported that his staff had now done its review. He made it clear that the proposal would involve no additional stocking but would only be an extended opportunity to take holdover birds not harvested during the regular season. Director Tisa reported that staff had also looked at existing small-game seasons, and the question arose whether there was anything that could be done about the existing sunrise-sunset hunting-hours limits on pheasant-stocked WMAs to increase opportunity for an archery deer hunter during the archery season, so staff also investigated that question.

Upland Game Biologist David Scarpitti reported that staff was recommending a simplification of the small game regulations to enhance hunting opportunities. Mr. Scarpitti introduced the following proposals:

- Create a late pheasant/quail season to overlap with primitive deer season, closing at the end of the calendar year, so that interested hunters could pursue previously stocked, unharvested birds. This change would also allow opportunistic harvest for hunters of cottontail, hare, etc. The staff's expectation is for low to moderate participation in this activity.
- Expand hunting hours on stocked WMAS and standardize hunting hours for pheasant/quail on all properties to between sunrise and sunset. All hunters are currently restricted to hunting from sunrise to sunset on stocked WMAs, though many stocked WMAs are large and comprise multiple parcels where many other hunting opportunities exist. Staff proposed to expand hunting hours for hunters pursuing archery deer, bear, turkey, waterfowl, etc., on stocked WMAs to the hunting hours specified for that particular season. Another proposed change would also specify statewide sunrise-sunset hunting hours for pheasant/quail on all properties, not just on stocked WMAs.
- Remove the WMA hunting implement restriction; standardize implements, i.e., shotgun and archery, for pheasant/quail. Currently, hunters can only use shotgun and

archery equipment on stocked WMAs during the pheasant/quail season. As noted earlier, many stocked WMAs are large, composed of multiple parcels, and offer many other hunting opportunities. Staff proposed to expand hunting implement options for hunters on stocked WMAs to allow the implements allowed for those respective seasons (e.g., bear and furbearers). In addition, the proposals would specify shotgun and archery equipment for pheasant/quail hunting on all properties statewide, not just on WMAs.

- Simplify and expand hare/cottontail/gray squirrel season and remove the black-tailed jackrabbit season. There are currently three different seasons and/or zone segments for hare, while gray squirrel and cottontail have two different season and/or zone segments. Staff proposed to create a single statewide season for each species and expand the gray squirrel season through February. Specifically:
    - Hare: October 15 – February 28
    - Cottontail: October 15 – February 28
    - Squirrel: September 6 – February 28

There has been no evidence of black-tailed jack-rabbit, an illegally introduced species, on Nantucket for years if not decades, so staff proposed to eliminate the black-tailed jackrabbit season currently in the regulations.

At the close of Mr. Scarpitti's report, the Board voted unanimously to direct staff to create draft regulations as outlined in the report and take them to a public hearing. Approval to schedule and hold the hearing had not been received by the close of the fiscal year.

Regulations for Field Trials on Wildlife Management Areas (321 CMR 2.01)

At the May meeting, Director Tisa introduced the topic, stressing the importance of maintaining the traditions of hunting with bird dogs. He reported that he himself has trained many people and helped them train their dogs. The Director had many opportunities to talk to these owners, many being women, and found a lot of interest among them to understand more about the opportunity to hunt or find out more about hunting. The Director always thought it was a great way to draw people in and engage them more in what MassWildlife does.

The Director reported that he and Commissioner Amidon had met with the presidents of eight major clubs that are interested in using WMAs for field trials for sporting dogs. He reported that staff was before the Board to advocate for adjusting regulations and giving District Managers more flexibility to permit these activities. The Director reported that Central Wildlife District Manager Todd Olanyk had participated in the meetings with the club owners and would give the presentation on the regulations staff would ask the Board to authorize them to develop and send to the public hearing process.

Field trials test a dog's training and hunting ability, and include Retriever Trials, Field Trials, and Hunt Tests. Noting that they have been permitted on WMAs for decades, Mr. Olanyk stated that field trials are a great vehicle that can contribute to MassWildlife's R3 and Relevancy efforts with some revisions to the existing regulations. When licensing field trials, the District Managers designate exactly where the activity can take place, thereby protecting sensitive habitat and creating a separate, safe space for it. The area is clearly marked so that other visitors to the WMAs will be aware of the permitted activity.

The last revision of these regulations was in September 2001. Mr. Olanyk provided a summary of the proposed changes, including to eliminate the named properties in the regulations, which is unnecessarily restrictive; allow the Director, through the District Manager, the discretion to approve times and locations for field trials in the respective districts; clarify the language regarding the use of horses in field trials; and eliminate outdated language barring trials from High Ridge WMA and Herm Covey WMA.

After a brief discussion and some questions, the Board voted unanimously to direct staff to finalize and send the proposed regulatory changes to a public hearing. The hearing had not been scheduled by the end of the fiscal year.

Regulations to Unify the Archery Deer Season Statewide by Extending it in Zones 1-9 to match Zones 10-14

After the 2021 Deer Review at the June meeting, staff proposed for the Board's consideration to unify the Archery deer season statewide by extending the

Archery season 2 weeks earlier in zones 1-9, to match that already established in zones 10-14, with the change to begin with the 2023 season, or as soon as possible. The proposed change simplifies the regulations, the seasons, and enforcement; would allow hunters to spread out their effort and therefore creates more hunting opportunity; and addresses feedback staff receives from many Archery hunters wanting more hunting opportunity. Discussing the impact of the existing extended Archery season in zones 10-14, Mr. Feehan reported and showed with a graph that the extended season in zones 10-14 did not increase the harvest beyond the established trajectory but rather redistributed the harvest based on hunter preference and was very popular with Archery hunters who don't want to overlap with pheasant season.

The Board voted unanimously to direct staff to develop specific draft regulations to extend the Archery deer season statewide and take them to a public hearing to solicit comments. Due to the timing of the decision, the hearing had not been scheduled by the close of the fiscal year.

Agency Program Reviews

Wild Trout Evaluation for Conservation and Management

In August, Coldwater Fisheries Resource Project Leader Adam Kautza reported on the Fisheries Program's work to identify wild trout streams and to classify them into categories to better study and then promote the best of them to trout anglers. He began by noting the broad-scale classification of wild trout streams as Coldwater Fisheries Resources (CFR) according to the regulations at 321 CMR 5.00, which defines CFRs as waterbodies that contain coldwater fish. He listed the 11 coldwater fish in Massachusetts, which include brook, brown, and rainbow trout, and posed the question of whether staff could make a category that was wild-trout specific, to make it more meaningful and useful to anglers, and perhaps aid in targeting wild trout streams for land acquisition, for example.

When fully developed, this wild trout stream classification system will be used to promote angling and inform anglers of the special opportunities the best streams can provide, including through the GoFishMA! interactive map. It will also enable staff to better prioritize future actions, including possible land acquisition, stream conservation and/or restoration, possible survey and climate-change refugia locations, and actions that will promote aquatic biodiversity.

MassFishHunt Modernization

The search for and development process with the new vendor for the MassFishHunt licensing system was almost as extensive as that for the license fees. The entire effort was a Department (DFG) project because the Division of Marine Fisheries (DMF) would also be using the new system. During the September Board meeting, Assistant Director of Operations Trina Moruzzi led a team presentation on the process and on DFG's expectations for the new system.

Assistant Director Moruzzi stressed that this is not a MassWildlife system but rather a department-wide system, and its development has been a team effort with MassWildlife, DMF, and DFG. She reported that the current online licensing contract would expire, and the new system would come online on December 1, 2021, and she provided an overview of the process the Department's MassFishHunt team went through to develop its performance criteria, solicit ideas for required and desired functionality, solicit bids for the new system, and finalize the contract with Kalkomey Enterprises, the new contract vendor. Assisting the Assistant Director with the presentation were DFG Project Lead Dan Koch and Kalkomey VP Mitch Strobl, Project Manager Chet Van Dellen, and customer service team leader Zack Lambert.

Wildland Fire Update: MassWildlife Activities at Home and Abroad

Director Tisa introduced Prescribed Fire Program Manager Caren Caljouw, Seasonal Prescribed Fire and Habitat Restoration Ecologist Alex Entrup, and Habitat Biologist Ben Mazzei to the October meeting. The Director reported how proud the agency is of its staff that engages in wildland fire and prescribed fire. They are highly skilled employees who do this arduous and demanding work out of love for the resource. These staff play incredibly important roles in maintaining and improving biodiversity and landscape-level habitat availability. They do a great job, making all their colleagues and the Board members very proud.

Ms. Caljouw began the presentation with a brief overview of the operations and objectives of the MassWildlife Prescribed Fire Program. She reported that the MassWildlife Prescribed Fire Policy, which was adopted by the Fisheries and Wildlife Board in the spring of 2017, takes a comprehensive approach to fire management that recognizes the relationships between ecosystem health and safety, sound planning, science-based management, and the importance of public and private partnerships. Starting with definitions, Ms. Caljouw explained that prescribed fire is planned and intentionally ignited under prescription parameters set by managers to meet land management objectives. Wildfire is unplanned and may be caused by lightning or other natural causes, by accident or arson-caused human ignitions, or by an escaped prescribed fire. MassWildlife's Prescribed Fire Program's large-scale objectives are 1) to build climate-resilient landscapes to enhance the ability of Wildlife Management Areas to endure stresses and disturbances and adapt to climate change and 2) to enhance habitat for game species, for Species of Greatest Conservation Need, and to effectively manage important natural communities in Massachusetts.

Mr. Entrup reported in some detail on burns the agency has conducted across the state to improve and restore habitat, noting that prescribed fire planning is underway or completed for over twenty WMAs statewide, totaling more than 7,000 acres. He discussed the use of prescribed fire to maintain or restore many different types of habitat, such as in grasslands and savannahs, heathlands, pitch pine and scrub oak barrens, oak forests and woodlands, fens, marshes, wet meadows, and Atlantic white cedar swamps.

Mr. Mazzei reported on his and other staff's recent deployments in the American West to help combat the wildland fires that had been such a management challenge across the country during the 2021 fire season, offering details of MassWildlife staff deployments with the DCR Interagency hand crew, composed of DCR Fire Control, local fire department staff, and MassWildlife's Aaron Best, Dan Bove, and Connor Fleming. Federal efforts to quell the Richard Springs Fire and the Pine Grove Fire in Montana and the Trestle Creek Fire in Idaho were assisted by the DCR Interagency crew. MassWildlife's Chris Connors was deployed to Minnesota for the John Ek Fire and the Greenwood Fire in a small crew of National Park Service, USFWS, and Bureau of Indian Affairs firefighters. Mr. Mazzei was himself deployed with MassWildlife's Dan Bove to the Dixie Fire, which spanned five counties in California starting in July. It was the largest fire in the United States in 2021 at over 963,000 acres. That 20-person interagency hand crew consisted of MassWildlife, DCR, National Park Service, and Bureau of Indian Affairs employees, and worked with municipal, state, and contract firefighters from Oregon, Washington, Colorado, California, Arizona, Montana, Nevada, Idaho, and South Dakota. Mr. Mazzei stressed that national deployments greatly improve MassWildlife's Prescribed Fire Program because they build staff's skills and qualifications with experience that can be had in no other way. Deployed staff use the training and interagency cooperation they experience to create an even stronger foundation for habitat management in Massachusetts.

Swift River Trout Study

During the December meeting, Connecticut Valley Wildlife District Aquatic Biologist Brian Keleher and Coldwater Fisheries Biologist Adam Kautza reported that the Fisheries Program and the Connecticut Valley Wildlife District have proposed a project to study the wild brook trout fishery in the Swift River tailwater between Quabbin Reservoir and the Swift River impoundment above the Bondsville Dam. The project is designed to answer long-standing questions about seasonal movement patterns and habitat use by adult brook trout using PIT [Passive Integrated Transponder] tags in conjunction with a series of fixed PIT-tag readers placed at important habitat and/or angling regulation boundaries within the tailwater. The project also seeks to quantify population abundance, individual growth rates, and age and size structure of the wild brook trout population in the Swift River using mark-recapture methods. Dr. Kautza stated that continuous water-temperature and water-level loggers will also be deployed in conjunction with the PIT-tag readers, to assess movement and habitat use in association with environmental changes that are likely to influence coldwater fish, now and especially into the future under changing climate conditions. Please see the Fisheries Program Report on page 36 for more details about this very interesting study.

How Widely Can We Cast the Net? Diversity, Equity, Inclusion, Justice (DEIJ) and MassWildlife

At the March meeting, Director Tisa reported that diversity, equity, inclusion, and environmental justice (DEIJ) activities are critically important if state fish and wildlife agencies want to scale wildlife conservation and be relevant to people in Massachusetts and around the country. The Director stressed that these activities are vitally important to continue working on for the entire agency. He introduced retired I&E Chief Marion Larson, who provided the Board with a report on MassWildlife's efforts and activities related to DEIJ.

After reviewing MassWildlife's conservation and public responsibilities and offering brief definitions of the terms, diversity, equity, inclusion, and environmental justice, Ms. Larson reported that DEIJ applies both internally, in MassWildlife's workplace culture, and externally, in the agency's public engagement and outreach. She highlighted the inherently inclusive vision behind the Public Trust Doctrine, which says that wildlife is a public resource, and we manage all wildlife on behalf of all people. She stressed the relevance of fish and wildlife conservation to DEIJ, noting that conservation is essential and connected to important aspects of people's lives, such as their physical, mental, and spiritual health and well-being; their access to clean air and water; protection from severe weather; and the economic prosperity of their communities.

Ms. Larson acknowledged that despite the natural biodiversity and the rich human diversity of Massachusetts, MassWildlife itself is not as diverse as its staff would wish. She pointed out that overcoming conservation challenges requires diverse approaches, values, and perspectives. Some of the benefits to embracing diversity, equity, inclusion, and justice internally are better problem solving, a deeper connection to the agency's mission, having different skill sets among employees, and increased innovation in approaches and strategies. Ms. Larson also emphasized that diversity in our workforce is a better reflection of the people we serve and observed that one area where great strides have been made is in the number of women in technical positions within the agency, which has risen dramatically in recent decades. Externally, Ms. Larson pointed out that working to create greater diversity in our constituency will enhance conservation through broader engagement, increased relevancy to people's lives, and greater support for our mission. She stressed that it's always good and healthy for state fish and wildlife agencies to be as diverse, welcoming, and inclusive as they can.

Ms. Larson then detailed MassWildlife's internal DEIJ efforts, which include using the National Relevancy Roadmap to identify barriers and strategies for agencies to serve broader communities; employing best practices for recruiting and retaining a diverse, inclusive, and equitable workforce at all levels; staff training devoted to unconscious bias, diversity, inclusion, and disability awareness; and committing to diverse partnerships with new partners in the community.

MassWildlife's external efforts to create diversity, equity, and inclusion include its outdoor skills clinics, wildlife education workshops, presentations, and online resources, which are all designed to provide everyone a greater understanding of and appreciation for wildlife conservation. She reported that, historically, I&E sections have been the focus of public outreach as agencies tried to cast a wide net by organizing DEIJ-related efforts such as meetings, programs, and workshops from time to time. What is different at this time, she noted, are the recent events in the nation and the fact that fish and wildlife directors and other leaders at top levels are focused on DEIJ both internally and externally. This leadership commitment will help agencies learn from and build new constituencies, with the goal of increasing understanding of and support for wildlife conservation, on the one hand, and welcoming new perspectives and partners with their own goals for their communities on the other.

Ms. Larson then turned her focus to MassWildlife's work to support and enhance environmental justice (EJ), and she began by noting that in Massachusetts EJ is a principle that pertains to communities that meet specific criteria. She stated that EJ essentially says that all people have a right to be protected from environmental pollution, and to live in and enjoy a clean and healthful environment. This principle is a natural outgrowth of and highly relevant to the missions and priorities of state fish and wildlife agencies. EJ is also a process to enhance meaningful community involvement in decision-making and to maintain or enhance environmental

quality in negatively impacted neighborhoods. These neighborhoods are identified in Massachusetts through criteria relating to median household income, minority populations, and/or a lack of English-language proficiency. Ms. Larson explained that in many cases these neighborhoods or population blocks are in areas where environmental degradation is high and access to greenspace is limited. She showed a map of the state indicating communities that contain EJ blocks, and demonstrated that MassWildlife's core functions of wildlife management, research, and monitoring; land protection and habitat management; outdoor recreation; education and outreach efforts; and regulation development are carried out throughout the state, including in many communities with EJ populations.

Ms. Larson closed her analysis by summarizing that DEIJ is receiving elevated attention nationwide, that MassWildlife is benefitting from the Relevancy Roadmap and the work of others on strategies to address the internal and external barriers to relevance and DEIJ, that much work remains to be done, and that MassWildlife has assembled a team of staff to prioritize efforts that effectively engage and serve broad constituencies.

Other Presentations on Topics of Interest to the Board

Water Chestnut Removal Project on Three Mile Pond

During the November meeting, Western Wildlife District Aquatic Biologist Leanda Fontaine reported on a major effort by staff from throughout the agency to eradicate water chestnut from the Three Mile Pond WMA in Sheffield. The pond is 165 acres, and its shoreline lies completely within the boundaries of the WMA. Water chestnut was first discovered at Three Mile Pond in 2011, and brief removal efforts began in 2013. Ms. Fontaine reported that staff revisited the pond in 2017 and found that the water chestnut had exploded into an invasion along the northern shore around the existing boat ramp, with more sparce areas of plants at the southern end near the dam that forms the pond.

Annual removal efforts began in 2017, with a more intensive removal program from 2018 to the present. Ms. Fontaine reported that the best removal method is hand-pulling, a very physically demanding and time-consuming process, and that research showed that the best time to do it is in early July, before the plants set their seed, which can lie dormant in the substrate of the pond for a decade or more. Since 2017, approximately 10 truckloads of plants were removed by staff from the Western District and the Field Headquarters working in kayaks and canoes. Ms. Fontaine tracked over 25 hours spent hand-pulling on over 12 acres that are being closely monitored, with about 2 solid acres of dense patches removed. She showed dramatic before and after photos of two areas of the pond where dense patches of water chestnut had been removed that are already supporting an abundance of native pond plants.

Moving forward, the plan is to continue annual monitoring and removal of sprouted plants and to continue reconnaissance of the remaining shoreline with annual efforts through 2027 and biennial monitoring for reemergent plants after 2028. Ms. Fontaine closed by thanking her many colleagues who helped with the tremendous and successful effort to control this invasive plant.

Staff-assisted Summer Fishing Program

Also in November, Aquatic Education Coordinator Jim Lagacy reported to the Board on an R3 effort he spearheaded in 2021 to engage staff in R3 through teaching fishing programs at a time when most of the program's longtime volunteers were not quite ready to hold in-person events. Mr. Lagacy reminded the Board that the Aquatic Education Program has many different kinds of events where staff and volunteers teach basic fishing skills, aquatic ecology, fish anatomy, outdoor ethics, etc., from family fishing clinics and festivals to adult fishing programs, including fly fishing, ice fishing, and Becoming an Outdoorswoman, in addition to the rod-and-reel loaner program that he administers for agencies and organizations around the state.

The program goal was to have up to 15 agency staff that were willing to run clinics: ideally, a minimum of two clinics per district for the 2021 summer. The programs were held in targeted areas based on last year's license data showing where newly licensed anglers reside, in an effort to retain those license buyers, especially in urban/suburban areas. Clinic

locations were selected by staff in coordination with Mr. Lagacy and R3 Coordinator Astrid Huseby, and desirable locations had ample open shoreline access as well as known populations of sunfish. The courses were advertised through email and targeted social media and consisted of two parts, an online tutorial of basic information that was taped by Mr. Lagacy and his I&E colleagues that participants viewed prior to the fishing event, and that is still available on the MassWildlife website as an online learning tool.

Reporting the results, Mr. Lagacy stated that 22 staff members signed up and were trained from four district offices, three hatcheries, and the Field Headquarters. Consequently, he was able to run 12 staff-assisted summer fishing programs, reaching a total of approximately 250 people, which averaged out to about 20 people per clinic. He received a lot of positive feedback from both attendees and staff, and he thanked his colleagues by name for their willingness to help in this pilot outreach effort.

Massachusetts Fisheries and Wildlife Board

Joseph S. Larson, Pelham (Chair)
Michael Roche, Orange (Vice Chair)
Bonnie Booth, Spencer (Secretary)
Brandi Van Roo, Douglas
Ernest W. Foster IV, Scituate
Stephen A. Sears, Dalton
Bob Durand, Marlborough

2 The Fisheries Program

Todd Richards, Assistant Director of Fisheries

Overview

The Fisheries Program had a productive fiscal year by both completing important projects and starting new ones. From site-specific projects designed to understand fish survival and movement to large scale efforts to understand biodiversity statewide, the Fisheries Program staff, with support from Districts, Hatcheries, and other MassWildlife program personnel, made several important contributions in FY 2022.

Program goals focus on three major categories: providing excellent recreational angling; restoring waterbodies for the benefit of all fish and wildlife resources; and monitoring fish communities for research, prioritization for restoration actions, and technical assistance.

We provide excellent recreational angling using a variety of tools. Hatcheries are often thought of as the primary tool and when it comes to providing high quality trout fishing, this is certainly true. Our five facilities continued to grow trout and salmon for lakes, ponds, streams, and rivers across the state, including more than 80 locations in Environmental Justice Communities. Trout fishing, especially in our lakes and ponds, would simply not exist without this program. The fish we grow provide not only recreation, but hundreds of thousands of pounds of healthy food for Massachusetts anglers.

High-quality recreation is not just a construct of the hatcheries, however. Our waters continue to provide excellent fishing for more than 20 self-sustaining (not stocked) game species in addition to stocked trout and salmon. We spent considerable time this year helping to revise a Practical Guide to Lake and Pond Management to try to ensure that these waters can continue to provide great fishing and great habitat into the future. This year saw 8 new state records through the Sportfish Awards Program, which included more than 1800 trophy fish caught and submitted to the Program. Over the past several years, the popularity of the catch and release category has increased dramatically, accounting for nearly 90% of the awards.

Our last tool for providing and promoting excellent recreational fishing is information. For example, the trout stocking map at mass.gov/trout continues to be one of the most trafficked pages on all of Mass.gov and contributes to the program's popularity by making information about local fishing opportunities and stocking accessible to more people. Working with the Outreach and Education Program, we have continued to add products to our GoFishMA! Fishing map and have increased our efforts to get that information in the hands of anglers, boaters, paddlers, and campers. More pond maps, more bathymetry, and more information were added with plans for additional improvements. The internet is not the only place to find great information about freshwater fishing or MassWildlife's Fisheries Program. For the first time in 25 years, Massachusetts Wildlife magazine created an issue dedicated entirely to aquatic resources. Issue #1 of the 2022 magazine provides detailed articles about fish, mussels, biodiversity, habitat, trout stocking and many other projects ongoing in the Fisheries Program and in our Districts, Hatcheries, and Natural Heritage and Endangered Species Program.

Our fish community monitoring efforts continued this year with a focus on wild trout streams, assistance with dam removal monitoring projects, and evaluating some of our most heavily fished rivers. These efforts and those of past years have resulted in a better understanding of trout populations and the relative contribution of wild fish to important fisheries, the completion of a categorization of wild trout streams, and publications on dam removal restoration. This was also an important year for using our fish community information to develop measures of biodiversity and

fish condition in streams and lakes, priorities for land acquisition, and a variety of climate-related projects.

Climate was also at the forefront of the Fisheries Program activities with our involvement in the Massachusetts Climate Assessment, our work on climate change refugia, and staff involvement in the American Fisheries Society Climate Ambassador Program.

Finally, the Fisheries Program is taking steps to increase our involvement in MassWildlife's Habitat Restoration Program by conducting assessments on our lands and with private partners, in search of specific high priority projects for aquatic habitat restoration. Past efforts have focused on using fisheries information to help other practitioners prioritize restoration actions but current efforts focus on restoring the waters important to MassWildlife and its partners to create a more holistic approach to restoration and management.

Aquatic Habitat Conservation

Rebecca Quiñones in collaboration with Jason Stolarski, Todd Richards, and Jason Carmignani.

Evaluating Aquatic Biodiversity

The over 5,000 freshwater habitats in Massachusetts support more species relative to surrounding landscapes. These areas provide both habitat and migration corridors to a myriad of species, including a variety of plants, fishes, amphibians, birds, mammals, and insects, including 290 (51%) Species of Greatest Conservation Need (SGCN). Recent research shows that an even greater number of species are growing dependent on aquatic habitats and adjacent forests as climate change alters temperature and precipitation patterns. These trends point to an increasingly urgent need to protect aquatic habitats to ensure long-term persistence of both terrestrial and aquatic species. For these reasons, identification, conservation, and restoration of habitats important to aquatic biodiversity are paramount. In FY 2022, we developed metrics based on species abundances and distributions, and habitat characteristics to assess the integrity of aquatic biodiversity in Massachusetts.

Methods

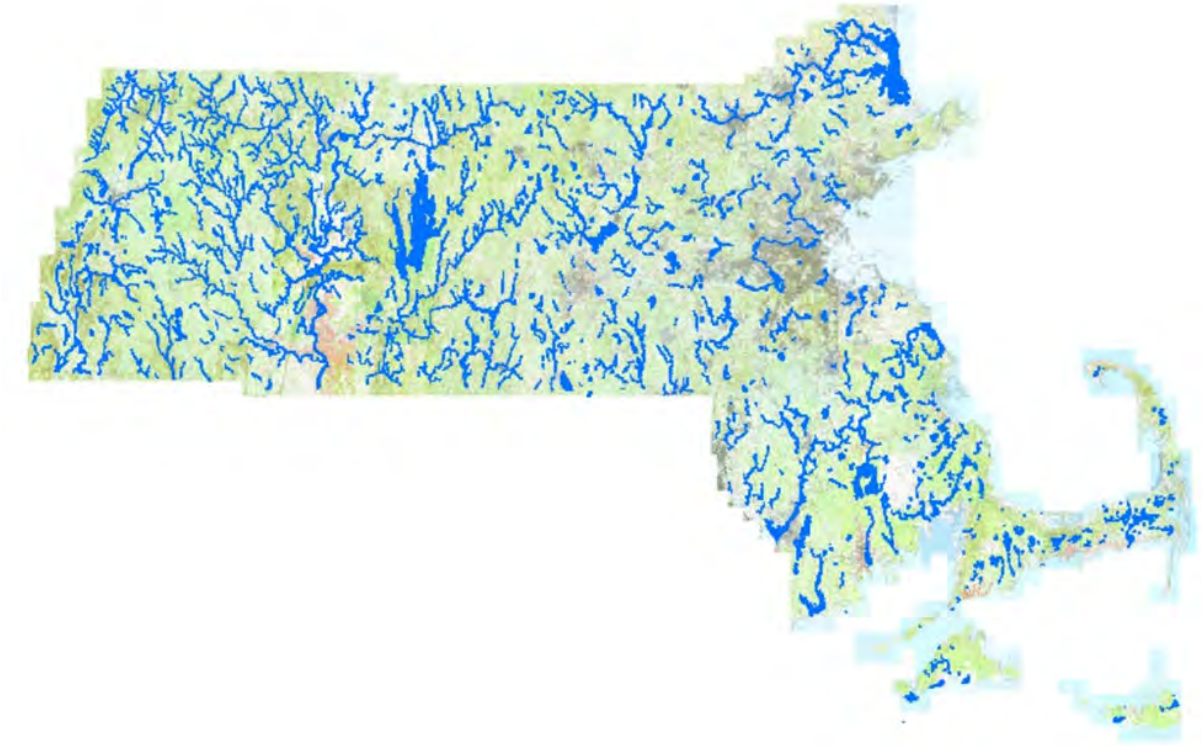
We looked at more than 7,000 surveys to generate conservation units at state and municipal scales. River and stream units were mapped to the extent of the floodplain and in both downstream and upstream directions for 2 km or until a known barrier. Lake and pond units were mapped to the extent of connected wetlands where appropriate. Units within watersheds projected as most resistant to warming summer temperatures were also identified as potential climate change refugia, using models developed by US Geological Survey (USGS; J. Walker, pers. comm.). Conservation units represent freshwater habitats as identified by the following metrics:

- Lentic native species richness: The total number of native fish species collected from each lake and pond.
- Lentic condition factor: Species' length-weight relationships in lakes and ponds.
- Two-story ponds: Lakes and ponds that maintain cold, oxygenated hypolimnion and support coldwater fishes.
- Mussel richness: Habitats with at least two species of freshwater mussels or at least 1 mussel SGCN.
- Eastern Brook Trout/Slimy Sculpin complex: Eastern Brook Trout and Slimy Sculpin abundances in streams.
- Lotic native fish biodiversity: A measure of how closely native fish species assemblages in streams (orders 1-4) resembled their expected native species assemblage. Specific calculations of this metric (% Similarity Index) are described in the FY 2021 annual report.
- Large river native species richness: Number of native species in large rivers (stream order > 4).

The top percentiles of these metrics, along with outstanding wild trout streams (A. Kautza, MassWildlife, unpublished data), essential anadromous fish habitat (B. Chase, pers. comm. 2022), and individually mapped rare species habitats, were used to identify approximately 410,000 acres critical for preserving aquatic biodiversity statewide in BioMap (2022; Figure F 1). Additional habitats were prioritized for protection at the municipal scale; these habitats were often less intact than those at the state scale but represented the highest quality habitat within each municipality. Iterations of BioMap have been used by the Massachusetts Division of Fisheries and Wildlife

(MassWildlife) as a framework to protect biodiversity in Massachusetts. To date, the framework has largely used observations of imperiled species and their habitats as the spatial footprint to prioritize land protection. In FY 2022, we expanded the framework to also include aquatic habitats with high biodiversity or unique attributes (e.g., two-story ponds).

Figure F 1. Aquatic habitats identified as important to the conservation of aquatic biodiversity in Massachusetts.



Aquatic Buffers

Buffers were added around units to create Critical Natural Landscapes (CNL). These areas are critical to supporting healthy aquatic habitats. They were identified by a variable width methodology which could extend a maximum distance of 500 m from water's edge. Approximately 650,000 acres were identified as CNL statewide. Additional aquatic buffers were identified proximate to priority habitats identified at the municipal level.

Habitat management and restoration

Restoration guidelines were also recommended for specific aquatic habitats. The first step in this process was to classify aquatic habitats using environmental conditions like those used in the Northeast Stream Classification (TNC 2008). TNC's efforts identified more than 100 stream habitat types based on drainage size, stream gradient, geology, and mean summer temperatures. Their efforts did not extend to the classification of lakes and ponds. Tasked with developing a simpler classification system that also considered lakes and ponds, we used drainage size, gradient, and temperature to classify habitats in rivers and streams, and watershed position, hydrologic connectivity (or isolation), and maximum depth for lakes and ponds. Our scheme yielded 13 aquatic habitats:

1. Deep Drainage Lakes/Ponds
2. Deep Headwater and Isolated Lakes/Ponds
3. Shallow Drainage Lakes/Ponds
4. Shallow Headwater and Isolated Lakes/Ponds
5. Large High Gradient Cold Rivers
6. Large High Gradient Cool Rivers
7. Large Low Gradient Cold Rivers
8. Large Low Gradient Cool Rivers
9. Large Low Gradient Warm Rivers
10. Small High Gradient Cold Streams
11. Small High Gradient Cool Streams
12. Small Low Gradient Cold Streams
13. Small Low Gradient Cool Streams

Fact sheets were completed to describe the physical and biological characteristics of each habitat and include examples of existing waterbodies and associated biota. An important component of the fact sheets was the inclusion of restoration and management actions that would most benefit the integrity of each habitat type. Furthermore, a universal set of management recommendations were identified to the benefit of all aquatic habitats: 1. instream habitat restoration, including protection of water quality and quantity; 2. floodplain restoration; 3. aquatic connectivity (up- and downstream, across floodplain); and 4. watershed restoration. BioMap (2022) is a living document that will be presented in a web interface. Consequently, our results and recommendations may change as new information is made available.

Protection of Aquatic Biodiversity at the Regional Scale

While working on BioMap (2022), we identified additional analyses that could enhance protection of aquatic biodiversity. Two critical components missing from the analysis in BioMap were an in-depth evaluation of downscaled climate change projections on habitats, and consideration of habitat connectivity and species status beyond state lines. In 2021, we wrote a grant proposal to the Northeast Climate Adaptation Science Center (NECASC) in collaboration with the UMass-Amherst Cooperative Extension Unit (Graziella DiRenzo, Allison Roy) to fulfill these needs. Funding was granted in summer 2021 and was allocated primarily to hire a postdoctoral researcher (Jennifer Rogers) to lead the project over the course of two years.

The aim of the project is to incorporate existing climate change research into a framework that evaluates the conservation of aquatic biodiversity under a suite of land protection and restoration scenarios. Components of biodiversity evaluated are fish, freshwater mussel, and macroinvertebrate species and assemblages. The goal of this work is to identify land protection and restoration actions that optimize aquatic biodiversity protection into the future.

The project will be completed in two phases over the course of two years. In Phase I, objectives are to 1. gather and translate all NECASC research applicable to aquatic ecosystems and 2. define standardized aquatic biodiversity metrics (e.g., species richness, community evenness) for New England states. Phase II will evaluate the amount and location of biodiversity protected by alternate scenarios of land protection and habitat restoration in the face of climate change.

The proposed project is innovative in that it would evaluate:

1. common species alongside at-risk species, including ESA-listed species (e.g., dwarf wedgemussel) and state and regional SGCN (e.g., bridle shiner, little bluet),
2. aquatic biodiversity conservation at multiple scales (major basin, state, regional),
3. downscaled climate change projections and ecosystem (thermal, hydrologic, biotic) responses,
4. alternative scenarios of management actions, such as land acquisition, instream flow retention, culvert upgrades, dam removal, and riparian canopy cover restoration, and
5. standardized biodiversity metrics across adjoining states.

Increasing the geographic scope of existing statewide evaluations will be particularly useful for understanding ecosystem responses across a range of conditions. For instance, conditions in southernly states (Massachusetts, Connecticut) could act as analogs for warmer, future conditions in more northernly states (New Hampshire, Vermont). A regional evaluation also allows for comparisons between assemblages dominated by widely distributed species vs. assemblages dominated by state endemics (species only found in one state). Ongoing research proposes that some species distributions will need to shift poleward and upslope to keep pace with climate-driven changes. By increasing our evaluation beyond state boundaries, we can test the role that habitat connectivity is likely to play in the conservation of aquatic biodiversity. Lastly, the project may provide broader inferences of ecosystem health at the regional scale, because aquatic habitats are linked to terrestrial systems across large landscapes.

Rebecca Quiñones in collaboration with Jason Stolarski, Todd Richards, and Jason Carmignani.

Resilient Massachusetts

MassWildlife is one of the many state agencies that meet quarterly with the Resilient Massachusetts Action Team, the group tasked with updating and implementing the State Hazard Mitigation and Climate Adaptation Plan (SHMCAP). This fiscal year, MassWildlife has given feedback to consultants developing and writing the state's Climate Assessment. The assessment will evaluate the impact of climate change on different state sectors (e.g., economy, built environment, natural environment). Our primary recommendation is that consultants evaluate natural resource components (e.g., forests, waterbodies, imperiled species) as rigorously as infrastructure and public health. State documents have traditionally deemphasized potential impacts to, and investments needed for, the conservation of the state's natural resources. MassWildlife has also provided input to updates proposed for the 2023 State Hazard Mitigation and Climate Adaptation Plan.

Allocated from SHMCP funds, MassWildlife was awarded capital funding for work related to BioMap (E. Schluter) but this time to complete the web interface and outreach materials. Two other projects were awarded funds for a subsequent year, continued work on climate change refugia (R. Quiñones) and continued restoration of the Great Marsh (P. Huckery).

Climate change refugia in collaboration with Matt O'Donnell, USGS

Climate change refugia are areas altered by changing conditions at a much slower pace than surrounding landscapes and are important components of conservation strategies. In FY 2021, we began a collaboration with USGS to study the use of coldwater climate change refugia by brook trout (> 120 mm). The goal then was to quantify the size, connectivity and temperature ranges associated with refugia. Because summer 2021 was an unusually wet season, we documented entire stream reaches providing coldwater habitat rather than just the specific microhabitats mapped earlier in the year. The size of coldwater reaches expanded and shrank along with air temperatures and precipitation. In FY 2022, trout were collected from the same sites as in the previous year and tagged with thermal tags. Data collected from tags will document water temperatures fish held in as well as internal body temperatures. Tagged fish will be collected in fall and exposed to different temperature regimes in the laboratory to measure the potential adaptive capacity of fish to warming temperatures.

Working Groups

MassWildlife continues to participate in several climate adaption working groups. At the national level, the National Fish, Wildlife, and Plants Climate Adaptation Network is continuing progress to update the 2015 [National] Climate Adaptation Strategy. Members of this group have also come together to update the Association of Fish and Wildlife Agencies' (AFWA) Voluntary Guidance for States to Incorporate Climate Adaptation into State Wildlife Action Plans and other Management Plans, completed in 2022. MassWildlife also participates in meetings of AFWA's Climate Adaption Committee. At the regional level, the Northeast Climate Change Working Group brings together practitioners to share climate-smart projects and discuss challenges. Lastly, at the state level, the Massachusetts Ecosystem Climate Adaptation Network provides managers with tools to facilitate coordination across disciplines, primarily through an annual conference and monthly newsletters.

Other climate projects

MassWildlife continued to collaborate with other agencies on several efforts, including the role of Regional Director-elect for the Instream Flow Council and participation in the American Fisheries Society's (AFS) Climate Ambassador Program.

AFS Climate Ambassador Program

From September 2021 to June 2022, Dr. Quiñones participated in the AFS' Climate Ambassador Program. Participants met twice a week, once as part of a student-led working group and another to work with communications professionals. The program had the format of a class with assignments to be completed each week. The goal was for each student to develop a story board, pamphlet or video that effectively messaged a specific climate-related topic to the public. Emphasis was placed on creating vibrant, clear messaging. MassWildlife developed a draft storyboard to convey the importance of dam

removal to the protection of water quality, fishes, and freshwater mussels ("Partners for Clean Water"; Figure F-2).

Instream Flow Council (IFC)

In FY 2022, MassWildlife participated in focus groups making formal recommendations to reform the Federal hydropower relicensing process, and the use of the Public Trust Doctrine in legal arbitration to protect instream flows. Dr. Quiñones also transitioned into the role of Regional Director-elect for the northeast region after four years as the Council's Secretary.

Dam removal (led by Katherine Abott)

MassWildlife continues to collaborate on dam removal research in Massachusetts. In FY 2022, Dr. Quiñones continued participating as a member of Katherine (Kate) Abbott's dissertation committee (Ecology Program, UMass-Amherst). Over the last five years, Kate has been evaluating pre and post dam removal impacts on abiotic conditions, macroinvertebrates, and fishes at 16 sites. She has completed the first phase of data analysis and is now writing scientific manuscripts. Our primary role this year was to review methods and initial results. She will be submitting formal technical reports detailing her work to USGS in the next few months.

Hydropower relicensing

In FY 2022, consultation continued regarding the relicensing of the hydropower project at Pawtucket Dam in Lowell, MA. The participating parties, including several state and federal agencies, worked with the dam owner on a settlement agreement detailing upgrades to infrastructure and changes to operations post-relicensing to enhance river herring, American shad, and American eel passage.

Environmental Review

Dr. Quiñones continues to provide input to projects in, and adjacent to, rivers and streams requiring environmental review. Projects in FY 2022 included urban developments, invasive plant treatments, culvert upgrades, landfill operations, and water withdrawals.

Hamant Brook study

In FY 2022, MassWildlife entered its third year of monitoring potential impacts of water withdrawal from Town well #4 on conditions in Hamant Brook, Sturbridge. The town hired a consultant to monitor water level and temperature at four sites; the Town Dept. of Public Works (contact Shane Moody) also monitored staff gage levels at three sites near the well. This monitoring was required in Sturbridge's Water Management Act permit to evaluate the potential adverse impacts of pumping on the brook. To further evaluate these impacts, the Town, after consultation with staff from MA Department of Environmental Protection (MA DEP) and the MassWildlife, was granted a waiver on the operational limitations on the use of Well #4. The waiver allowed Sturbridge to use Well #4 during stream monitoring conducted June 1, 2022 – October 1, 2022, under the following conditions:

1. Once a rainfall event stops, Well #4 pumping shall cease for the following 5 days.
2. During the 5 days Well #4 is off, if there is less than 0.1 inches of rain per day, Well #4 may be turned on during the 6th day. Well #4 withdrawals should run at a consistent rate (volume extracted) for the length of the study. Well #4 will stay on until the next rainfall event stops and the process is repeated.
3. If rain falls during the 5-day waiting period, Well #4 will stay shut off for an additional three days and turned on during the 9th day.
4. The town will collect the following data each day from June 1 thru October 1, at generally the same time of day:
    - Amount of extraction (pump rate), time on/off.
    - Rainfall at the pump station's gage (note date, time, inches).
    - Water level at each staff gage (note upstream or downstream gage, date, time, level).

Dr. Quiñones developed these pumping criteria after reviewing hydrographs for streams in the local area (https://waterdata.usgs.gov/ma/nwis/rt). The graphs suggested that a five-day period was usually sufficient for flows to stabilize after each rainfall event. The goal of the criteria was to isolate pumping effects on water levels from precipitation. Data analysis and recommendations to MA DEP and the town will be completed in winter 2022. Results will be based on a rating curve for streamflow developed by MassWildlife at each site. MassWildlife collected streamflow data at a minimum of 20 points along a transect placed at each site in June, July, August and September. Additional analysis will evaluate correlations between water temperature, water level, and precipitation time series.

Presentations

MassWildlife continues to share its mission and work with interested groups. In FY 2022, presentations were given with climate adaptation and big river management as central themes to: UMass-Amherst, Ecology class, East Quabbin Land Trust, Nashua River Watershed Association, Blackstone Collaboration, Worcester State training, and Instream Flow Council.

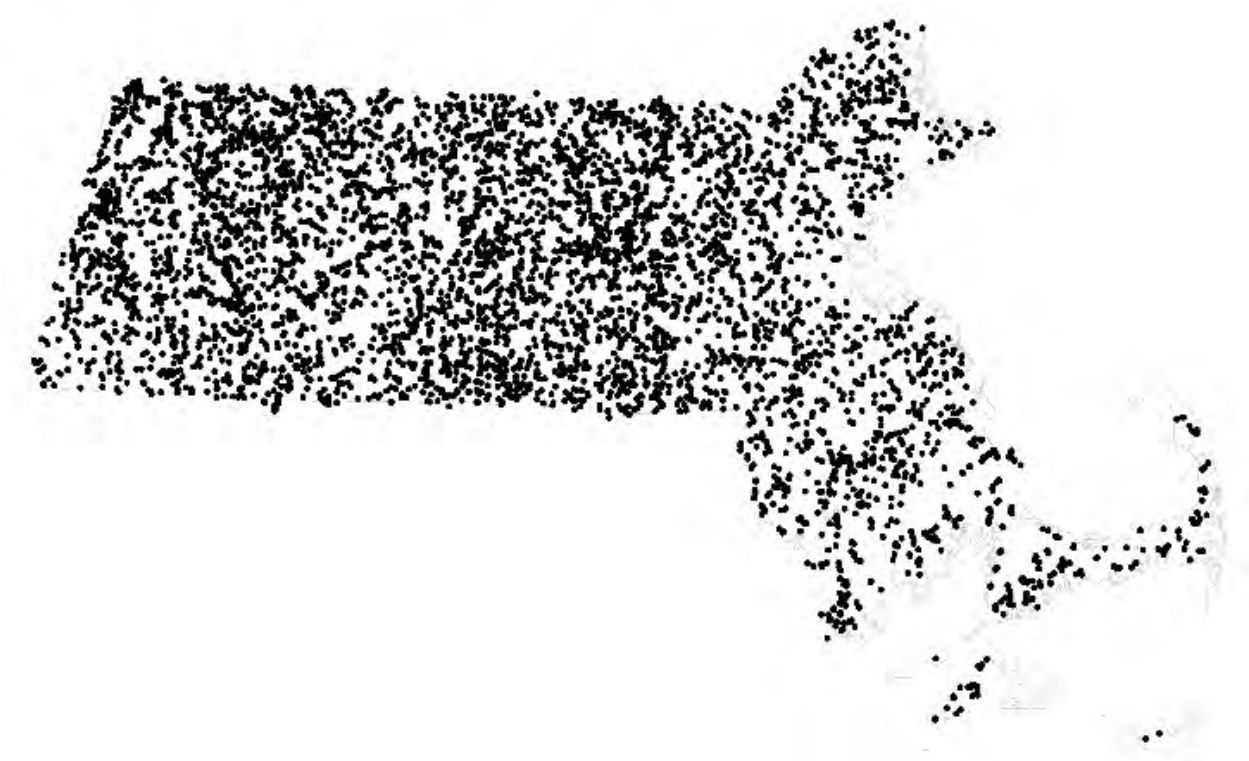
Fisheries Sampling

Jason Stolarski and Adam Kautza

Biological Data

Each year MassWildlife fisheries biologists and district staff collect fish community data from lakes, ponds, streams, and rivers throughout the commonwealth. These data serve to keep biologists abreast of current conditions, address project specific needs, and facilitate statewide statistical analyses examining factors affecting fish populations. Since 1996 when sampling methodologies were largely standardized, fisheries staff have conducted approximately 8,250 fisheries samples in 3,005 unique waterbodies encompassing over 900,000 individual fish records (Figure F 2).

Figure F 2. MassWildlife fisheries sampling locations conducted 1996 to 2021.



With over 2,700 named streams and rivers encompassing over 48,000 miles and 3,158 lakes and ponds in Massachusetts, maintaining current records with limited time and resources is difficult. Each year priority sampling sites are distributed to district personnel for visitation and data collection. Sampling sites are selected based upon revisit intervals calculated from past efforts, discovery of previously unsampled streams, project specific needs, and public and partner requests. Sites are assembled, coordinates and access double checked, separated by district, and released to regional fish biologists. In FY 2022, 296 unique sampling sites were prioritized across the five MassWildlife districts. Sites included streams with active and planned dam removals, unsampled waters, coldwater fisheries and suspected coldwater fisheries, and sites that had not been visited recently.

Fisheries samples in streams and medium sized rivers are typically executed between June 1st and

August 31st and conducted primarily using backpack electrofishing. Electrofishing is a standard technique whereby an electric current is applied to the water creating a small field. The field is moved through the water as the biologist walks upstream and any fish that is encountered is temporarily immobilized and netted. Biologists typically traverse 100m of stream collecting immobilized fish using 1-4 backpack electrofishing units (depending on stream width) and placing them into buckets. Once the entire reach has been passed through once, fish are identified to species, measured for length, or otherwise enumerated then released back close to the point of capture. Accessory data including GPS coordinates, effort, efficiency and habitat comments, average stream width, water temperature, conductivity, and pH are also recorded onto paper data sheets.

Lake, pond, and larger river samples are primarily conducted using boat electrofishing. This technique is similar to backpack electrofishing except the field is much larger and centered around and moved by a boat. Stunned fish are collected over 15-minute timed runs as the boat moves through littoral areas of a waterbody. Additional passive and active fish capture gears such as gill nets and seines may also be employed depending on the habitat available in the lake or pond. Fish are measured and enumerated as in other waterbodies and weights are collected on selected game and forage fish.

Results of this year's fish community sampling efforts are further discussed in the Data Management section of the report.

Fishing Access Data

GoFishMA! is an online map application which provides the public with information on locations to fish throughout the commonwealth. The initial data included in the application was driven by Office of fishing and boating access sites which are limited to developed or otherwise improved boat ramps. While expansive, these data lacked specific information such as any special regulations pertaining to the waterbody, information on shore access, and pictures. Furthermore, smaller shore and kayak access sites on public land and less frequented or well-known boat ramps were not included. Each year, additional fishing access sites are visited and documented for ultimate inclusion in the online application. In FY 22 an additional 40 access sites from 24 unique waterbodies were added to databases including narratives of access, pictures, and documentation of special regulations pertinent to the particular access point (Table F 1).

Table F 1. Waterbodies where fishing access was documented and visited in FY 2022 for inclusion in the GoFishMA! web application.

Waterbody	Town	District	Watershed
Lake Rohunta	Athol, New Salem, Orange	Conn. Valley	Millers
Peppers Mill Pond	Ware	Conn. Valley	Chicopee
Lake Wyola	Shutesbury	Conn. Valley	Connecticut
Spectacle Pond	Wilbraham	Conn. Valley	Chicopee
Lake George	Wales	Conn. Valley	Quinebaug
Sherman Pond	Brimfield	Conn. Valley	Quinebaug
Highland Lake	Goshen	Western	Connecticut
Plainfield Pond	Plainfield	Western	Deerfield
Pelham Lake	Rowe	Western	Deerfield
Deerfield River	Conway, Shelburne, Buckland, Charlemont	Western, Conn. Valley	Deerfield
Norwich Pond	Huntington	Western	Westfield
Ashmere Lake	Hinsdale, Peru	Western	Housatonic
Westfield River	Montgomery, Huntington, Russell	Western, Conn. Valley	Westfield
West Lake	Sandisfield	Western	Farmington
Threemile Pond	Sheffield	Western	Housatonic
Benedict Pond	Great Barrington, Monterey	Western	Housatonic
Mansfield Lake	Great Barrington	Western	Housatonic

Laurel Lake	Lenox, Lee	Western	Housatonic
Otis Reservoir	Tolland, Otis	Western	Farmington
Big Benton Pond	Otis	Western	Farmington
Cheshire Reservoir	Cheshire, Lanesborough	Western	Housatonic
Lake Mattawa	Orange	Conn. Valley	Chicopee
Jacobs Pond	Hanover, Norwell	Southeast	South Coastal
Stockbridge Bowl	Stockbridge	Western	Housatonic

Bathymetry Data

Beginning in 2015 MassWildlife began to update its pond maps with new bathymetry. Bathymetry data are collected using a combined GPS depth sounder which collects paired depth and GPS locations at predetermined intervals as an operator navigates a grid pattern on a waterbody using a small boat. Typically, between 5,000 and upwards of 40,000 datapoints (depending on the size of the waterbody) will be collected during the course of a bathymetry survey. In FY 2022 bathymetry data were collected on six new waterbodies (Table F 2).

Table F 2. Lakes and ponds surveyed for bathymetry in FY 22

Waterbody	Town	District	Watershed
Johnsons Pond	Raynham	Southeast	Taunton
Nashawanuck Lake	Easthampton	Connecticut Valley	Connecticut
Berry Pond	Hancock	Western	Kinderhook
Winnings Pond	Billerica	Northeast	Concord
Pontoosuc Lake NE	Lanesborough	Western	Housatonic
Pontoosuc Lake NW	Lanesborough	Western	Housatonic

Data and database management and GIS extension of fisheries data

Jason Stolarski

Biological and water quality data

Following the cessation of field activities for the season, biological and water quality field data are entered into custom excel spreadsheets by district staff. The spreadsheets have built in validation and are structured to automate quality control and compilation into the fisheries database. Data are prescreened for incorrect species information, inaccurate GPS coordinates, lengths, and weights in exceedance of three times the interquartile range of statewide averages, water quality outliers and general completeness. Raw datasheets are electronically scanned, and paper copies filed at field headquarters and electronically on the MassWildlife network. In FY 2022 a total of 204 new fisheries samples were added to the fisheries database.

Weight and length data are post processed using linear modeling to estimate the relationship between log-transformed weight and length for each species within and among (statewide) waterbodies. Residuals from statewide regressions for each species are used to eliminate outliers using quartile ranges. Relative weight is calculated from statewide quadratic weight-length regressions for each species and waterbody and exported as a separate table within the fisheries database.

Bathymetry data

Bathymetry data are prescreened using custom R scripts that delete erroneous depth points and identify and remove duplicate data. GPS and depth data are exported as .csv files for entry in the Arc pro where they are projected and examined for errors manually. Fast turns, dense weed beds, and otherwise rough conditions can cause the GPS depth sounder to lose the bottom which can result in erroneous depths. Visual examination is the best way to locate and exclude these points.

Depth data are interpolated to a continuous depth surface using two methods: inverse distance weighting (IDW) and triangular Irregular networks (TIN). The former method combined with a

smoothing kernel creates flowing depth contours which are visually pleasing but generalized relative to the more chaotic but accurate TIN surfaces. As such, IDW bathymetry surfaces are used primarily for mapping applications such as MassWildlife Pond maps and online mapping applications while TIN surfaces are used for the estimation of lake statistics such as lake volume and littoral habitat area which compliment internal statistical analyses.

Spatial extension of fisheries data

Once tabular data are entered into access databases information is tied to spatial attributes such as sampling locations, stream centerlines, and watersheds using Arc GIS pro. Custom R scripts are used to create a table of summary data for each sampling point (MassWildlife Annual Report 2018; Appendix B) including, species, abundances, sample type, date, presence of coldwater fish, hyperlinks to scanned raw datasheets and scanned historical documents and other information that biologists can use to rapidly access the character of a stream or waterbody. These data are exported from the database and imported as points into ArcGIS where they are cross-referenced with National Hydrography dataset (NHD) stream linework and waterbody polygons that have been sampled by MassWildlife in the past. Using the unique identifier of each stream and waterbody, the sampling point data and stream and waterbody line and polygon data are rectified. Errors are identified as instances where the unique identifier of a point is not in agreement with the unique identifier of the closest line or polygon to that point. Via this process, errors in coordinates or identifiers are found and resolved, and streams and waterbodies that have not been previously sampled are added to the hydrography dataset and assigned a unique identifier. Finally, sampling points are snapped to stream center lines and polygons, and snapped coordinates are exported from ArcGIS and imported back to the fisheries database via R scripts (MassWildlife Annual Report 2018; Appendix B). Once the fisheries data are plotted and errors are fixed, value-added spatial data layers and products such as the coldwater fisheries resource layer may be easily generated by sub-setting these master layers using simple queries in ArcGIS.

Robust GIS analyses require accurate boundaries from which to calculate physical habitat metrics. Watershed boundaries of lotic systems are typically delineated using digital elevation models. While this approach can be used for lentic systems as well, anthropogenic effects proximal to the shorelines may also be important in structuring fish communities in these systems. To capture shoreline habitat data effectively, accurate shorelines are paramount. Current shorelines contained within the National hydrography dataset were delineated from topographic maps and are not precise. Following the initial efforts to redelineate all the lake and pond shorelines in 2017, efforts are ongoing to continue to update shorelines where appropriate. Furthermore, watershed boundaries continue to be delineated for all sampling points as needed and land use characteristics and impervious cover summarized. To date, sub-watersheds have been delineated for all samples conducted between 2000 and 2021, which equates to more than 7,000 unique polygons. Subwatershed boundaries are used to extract land use characteristics upstream of each fish sampling point. National land cover data (2001, 2006, 2011, 2016) are clipped for each subwatershed and expressed as percentages of watershed area. Finally, estimates of percentage change of each land cover class are computed between years.

In addition to land use statistics reported above, finer scale metrics such as structure and parcel density, and shoreline sinuosity are calculated for lakes in ponds. Furthermore, lakes and ponds with bathymetry and water quality data permit the calculation of lake volume, coldwater and anoxic volume, littoral habitat area, and numerous drawdown exposure statistics.

Lake Trout Sampling

Jason Stolarski and Brian Keleher

Lake Trout were initially stocked in Quabbin Reservoir in 1952 and began to enter the creel in 1956. Since then, populations have expanded into Wachusett Reservoir, and comprise arguably one of the most popular sport fisheries in the Commonwealth. Since the initial stocking, Lake Trout in Quabbin Reservoir have been monitored almost continually using various mark recapture methods most recently employing passive integrated transponder (PIT) tags beginning in 2006. Similar

efforts commenced in Wachusett Reservoir in 2014. Each fall, spawning Lake Trout are sampled using 100 ft experimental gillnets set at night over known spawning locations. Nets fish for approximately 30 minutes and captured Lake Trout are gently removed from the net and scanned for the presence of a PIT tag using a PIT tag reader. If no tag is present, a 10mm PIT tag is implanted within the pelvic girdle of the fish. The unique tag number is recorded along with the length, and weight of the fish. Prior to release, the adipose fin is clipped to serve as a visual secondary mark.

Data are entered into a database, checked for consistency and general linear modeling is used to determine the relationship between log transformed weight and length within waterbodies and sexes. Relative weight is then calculated among waterbodies and sexes and used to evaluate and track changes in condition over time in both waterbodies. Growth rates are calculated from length changes garnered from recaptured fish and expressed as relative and absolute annual growth. However, because fall gill netting captures predominately male fish analysis of growth and condition data are restricted to mature male lake trout.

In FY 2022, a total of 223 Lake trout were captured: 89 within Quabbin Reservoir and 134 within Wachusett Reservoir of which a total of 81 and 127 were tagged (Table F 3). Growth rates from recaptured Lake Trout continue to indicate that these fish grow very slowly. Over the past 10 years Lake Trout grow on average 7.8mm and 11.8 mm a year in Quabbin and Wachusett reservoirs, respectively.

Table F 3. Quabbin and Wachusett reservoir Lake Trout tag and recapture data from 2006 to 2021

	Quabbin Reservoir			Wachusett Reservoir		
Year	**Tagged**	**Recaptured**	**Total**	**Tagged**	**Recaptured**	**Total**
2006	279	NA	279			
2007	55	2	57			
2008	102	7	109			
2009	178	13	191			
2010	147	30	177			
2011	6	0	6			
2012	0	0	0			
2013	238	16	254			
2014	276	14	290	110	NA	110
2015	366	32	398	155	6	161
2016	286	32	318	64	3	67
2017	158	29	187	74	9	83
2018	133	30	163	66	5	71
2019	146	23	169	156	6	162
2020	94*	NA	94	114*	NA	114
2021	81	8	89	127	7	134
Total	**2451**	**236**	**2781**	**752**	**36**	**902**

Lake trout length at catch and condition had remained relatively stable for the last 4 years but dropped significantly in 2021. Over the long term, mean length at catch and relative condition have declined from historical highs in the 1970s but within decades oscillate regularly (Figure A 1 and Figure A 2, Appendix A.). Interdecadal oscillations in these measures are likely a function of changes in forage fish abundance within Quabbin Reservoir, specifically Rainbow Smelt. For example, one qualitative measure of forage fish abundance decreased 10-fold between 2009 and 2011, which corresponds to a dramatic swing in Lake Trout relative condition during that time. Similar patterns

observed in the number of landlocked salmon submitted to the Sportfishing Awards Program suggest this species responds to forage fish abundance as well. This decline in length at catch and condition observed in 2021 is likely the inflection of another cycle in these metrics which tend to recycle every six to eight years. The overall decline in lake trout size at capture and condition across the period of record is likely a result of a combination of factors including declining reservoir productivity, reductions in rainbow smelt densities potentially born through anthropogenic alterations to spawning strategies and increasing lake trout densities.

Within Wachusett Reservoir, Lake Trout length at capture and condition remained relatively stable relative to years past (Appendix A, Figure 3 and Figure 4. Tagging efforts began in Wachusett in 2014 and thus does not have the benefit of the long-term perspective witnessed in the Quabbin Lake Trout data which stretch back to the initial plantings in the 1950s.

Quabbin Salmon Marking

Jason Stolarski and Dan Marchant

Each spring, approximately 10,000 salmon smolts are reared at the Palmer Hatchery and stocked into Quabbin Reservoir by MassWildlife staff. In past analyses, these fish reach 15 inches (legal size) within 2 to 4 years after stocking and are a popular recreational species in the Quabbin Reservoir. Mature salmon are also known to reproduce successfully in tributary and shoal habitats in the reservoir. Juvenile salmon spend 1 to 3 years rearing in tributary habitats before out-migrating as smolts in unknown numbers. Thus, landlocked salmon entering the creel are an unknown ratio of hatchery-reared and naturally produced fish. In spring 2016, the Fisheries Program began a project marking (adipose fin clip) all salmon stocked into the reservoir. Once all non-marked hatchery reared salmon leave the population, creel data will be collected to determine the ratio of tagged to untagged fish in the creel. These data will inform hatchery personnel about the relative contribution of stocked fish to the creel which over time could inform future stocking actions and provide anglers a means to identify naturally produced fish. Otoliths of legal fish continue to be obtained via incidental mortalities during Lake Trout netting to update our understanding of the age that salmon enter the creel and the maximum age of fish in the population. Efforts continue to extend a creel survey conducted on Wachusett Reservoir initiated by DCR Wachusett office of watershed protection and aided by MassWildlife to the Quabbin Reservoir.

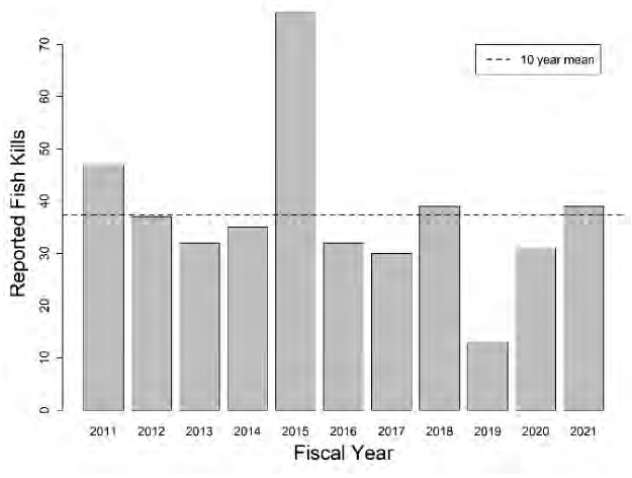
Fish Kill Response

Jason Stolarski and FHQ Fisheries Staff

MassWildlife responded to 39 fish kills in FY 2022, which is slightly above the 10-year average of 37 (Figure F 3).

All of the reported kills were of natural origin and were caused by a mix of low dissolved oxygen, disease, and physiologically stressful behaviors, such as spawning.

Figure F 3. Number of fish kills reported to MassWildlife between 2011 and 2021, with the 10-year running average.



BioMap Aquatic Core development

Jason Stolarski and FHQ Fisheries staff

MassWildlife evaluated lotic and lentic fish and mussel populations to estimate aquatic biodiversity throughout the commonwealth. Areas of exceptional biodiversity were identified by using multiple metrics calculated from over 7000 unique scientific samples conducted by the fisheries section and NHESP over the past 20 years. Metrics were calculated independently for lotic and lentic habitats due to gear selectivity, sample assumptions, and sample size. In most instances metrics were converted to percentiles and data in the top 90th and 50th percentile were selected for inclusion into the statewide and municipal BioMap coverages.

Metrics

Lentic Richness

Lake and pond fisheries sampling data collected from 1978 to present day were used to calculate lentic fish richness as the number of unique native fish species present within each waterbody. Fish data were collected using multiple methods and were restricted to samples where a complete census of the lake or pond was conducted. Stocked fish and hybrid species were removed prior to analysis and data were pooled with waterbodies among years. statewide and municipal data were selected as lakes and ponds that resided in the top 90th (statewide) and 50th (municipal level) percentile for species richness.

Lentic Condition Factor

Relative condition was calculated from lentic fish data collected as part of updated sampling protocols developed and implemented beginning in 2016. Individual fish length and weight were used to develop statewide species-specific log weight -log length polynomial regression equations for game and selected forage fishes with adequate sample size. Relative condition for any one individual was calculated as the residual from the statewide species-specific regressions, corrected for seasonality using analysis of covariance and averaged within species and lakes. Statewide and municipal data were selected as sites that resided in the 90th percentile (statewide) and in the top 50th percentile (municipal level) for average seasonally adjusted relative condition factor.

Two story ponds

Two story ponds were identified as ponds with an area of the water column less than 20°C and with greater than 5mg\liter of oxygen and thus capable of supporting coldwater fish. Determinations were made using temperature and oxygen profiles collected in the last two weeks of August and the first two weeks in September by MassWildlife and the Department of Environmental Protection from 1998 – present day.

Mussel Richness

Freshwater mussels are one of the most diverse yet imperiled group of freshwater organisms in North America because of their sensitivity to anthropogenic stressors (e.g., hydrological and sediment alteration) imposed on their sessile and filter-feeding nature. Of the 12 native mussel species found in Massachusetts, 6 are listed under the Massachusetts Endangered Species Act, and an additional 4 are identified as species of greatest conservation need (SGCN) in the Massachusetts 2015 State Wildlife Action Plan. We aimed to select suitable mussel habitat as defined by the presence of multiple mussel species, and to select sites that can support diverse habitat for a given mussel species. To identify areas that support viable mussel habitat, we selected sites with ≥2 mussel species or with at least 1 mussel SGCN observed after 1970 from NHESP's mussel database. At the statewide scale, sites with ≥ 1 mussel SGCN were retained along with sites with ≥2 mussel species added to the municipal scale. Mussel data encompass sampling efforts in streams, lakes, and pond ecosystems from routine monitoring or directed project efforts. Mussel observations within a 50-m buffer were grouped to form sites to calculate richness.

Eastern Brook Trout/Slimy Sculpin Complex

Brook Trout and/or Slimy Sculpin dominated samples were identified from MassWildlife fisheries sampling data collected using backpack electrofishing from 1998 to present day. Prior to analysis, data were screened, and selective samples (i.e., samples where only some members of the available community were collected) were removed as well as all but the most recent sample from long-term sampling locations which are typically visited annually and thus redundant. Fish data from these samples were screened and all but fish captured on

the first electrofishing pass at each site were retained. Hybrid species, anadromous species, stocked trout, and young-of-the-year (<40mm) were removed. Statewide and municipal data were selected as sites that resided in the 90th percentile (statewide) and the top 50th percentile (municipal level) for both proportional abundance and total abundance of brook trout and slimy sculpin.

Anadromous fish

Streams, rivers, lakes, and ponds which receive substantial anadromous fish runs were supplied by Massachusetts Division of Marine Fish. Stream centerlines and lake polygons for these waterbodies were selected and set aside for further analysis.

Class A and B wild Trout streams

Wild Trout are any Rainbow Trout, Brown Trout, or Brook Trout which were produced naturally (not a result of stocking) within Massachusetts waters. Classes of wild Trout streams were identified as stream reaches which exhibited wild trout abundances (individuals/km) within the 90th (Class A; statewide) and the 75th (Class B; municipal) relative to all streams of the same order which support natural production of Trout in the commonwealth. Centerlines of these streams were selected and set aside for further analysis.

Percent Similarity Index

The Percent Similarity Index (PSI) seeks to provides a relative measure of how closely existing native fish assemblages resemble the collective native fish assemblage measured over streams of similar size and within adjacent or otherwise similar watersheds of Massachusetts. Fish assemblages more closely resembling reference assemblages (>PSI) measured over larger scales are assumed to be less altered and residing within intact habitat. Studies employing similar methodologies sometimes compute similarity relative to fish communities gathered from self-described pristine or otherwise intact habitats which are sometimes far removed from the study area in question (Novak and Bode 1992, Meixler 2008, 2011). In Massachusetts, centuries of anthropogenic disturbance including large scale land use change, dams, and more recently climate change have comprehensively altered aquatic habitats and fish communities therein to such an extent that pristine habitats and communities do not exist. Furthermore, comparisons to fish communities collected from pristine habitats out of state are complicated by regional differences in fish distributions and physiography. In lieu of such data, and in recognition of the presence and persistence of the extensive anthropogenic footprint in Massachusetts, comparisons of fish communities within individual streams to large scale collective communities was deemed most relevant. These collective communities best express the cumulative effect of the greatest range of habitat conditions that exist along streams of like kind and should not be considered idealized or pristine but reflective of the full range of current conditions present.

Data Preparation

Percent similarity index was calculated using statewide fisheries data collected by MassWildlife personnel between 1996 to 2019 (N = 7,335) using backpack, barge, or boat electrofishing. Prior to analysis selective fisheries samples (i.e., samples targeting particular species or habitats) and all but the most recent sample from long-term (repeated annually) sampling locations were removed. Fish data from the resulting 4,476 samples were screened and all but fish captured on the first electrofishing pass at each site were retained. Furthermore, hybrid species, stocked trout, pond-obligate species (>100mm) and diadromous species including American Shad, Herring, and Alewife which are only temporarily present in Massachusetts waterbodies were removed. Young-of-the-year were classified as individuals <40mm in length and were also excised due to the tendency of this age class to be highly variable in abundance over space and time which could add unnecessary noise to analyses. Finally, samples from larger rivers (stream order 5-8; discussed below) were removed due to small sample size. In total, 4,421 samples were included into the analysis.

Sampling points were tied to NHD stream segments via a unique saris number and stream orders from NHD PLUS were transferred to the NHD segments and sampling points in ARC GIS. 2500m stream reaches were created around each sampling point. When the reach encompassed a dam, it was clipped upstream of the dam closest to the sampling point but allowed to extend through any downstream dams. Reaches were dissolved within stream-order combinations when multiple sampling points resided on the same stream and within the same order. In total, 2,385 unique stream reaches were delineated

throughout the state, 56 within rivers (stream order 5-8) and 2,329 with smaller streams (orders 1-4).

Reference assemblages

Reference assemblages were created by pooling species within stream orders 1-4 and major basin groupings (Table F 4). Basic groupings were categorized based on geological history and past hydrologic connections with the exception of the Housatonic watershed which was added to group A and thought not hydrologically connected, shares similar habitats and borders watersheds in Group A (Hartel al. 2002). Relative species proportions were calculated as the total number of individuals of each species divided by the total number of individuals. Introduced species and pond dependent native species with proportional abundances less than .1 were removed and proportional abundances were recalculated. Species proportions were then ranked with the highest proportion receiving the lowest rank and ties receiving the minimum of the rankings and inversed. Percent inverse ranks were then calculated by dividing the individual inverse rank by the sum of the inverse ranks creating a species-specific reference proportion for each basin grouping and stream order 1-4 (Novak and Bode 1992, Meixler 2008, 2011).

Table F 4. Watershed grouping used in the calculation of core fish communities.

Group	Watersheds
A	Housatonic, Hoosic, Kinderhook, Bashbish
B	Deerfield, Westfield, Farmington
C	Connecticut, Millers, Chicopee
D	Quinebaug, French, Blackstone
E	Merrimack, Concord, Nashua, Shawsheen
F	Neponset, Mystic, Weymouth & Weir, Charles
G	Ipswich, Parker, North Coastal
H	South Coastal, Taunton, Ten Mile, Narragansett Bay, Buzzards Bay, Islands, Mt. Hope Bay, Cape Cod

Stream assemblages and PSI

For each individual sample, proportional abundances were calculated, introduced species and pond dependent natural species with abundances <.1 were removed as before; proportional abundances were recalculated. Species present in a particular stream-order combination not present in the core community specific to that stream and order were added back to the core communities on a case-by-case basis and assigned a zero percent abundance and rankings were recalculated. This scenario occurred when a pond dependent species exceeded 10% abundance at the level of the individual stream and order but not at the basin grouping level. The percent similarity index for a stream and order combination was calculated as the summed absolute difference of the species-specific reference proportions and species-specific relative proportions for the stream and order combination divided by 2 times 100.

Percent similarity scores of each sample were transferred to NHD stream reaches as the highest PSI calculated from any of the samples collected on that reach (i.e., within the same stream-order). Statewide data were selected as reaches that displayed PSI scores with the top 90th percentile of scores within their basin-order combination. Reaches within the top 80th percentile that shared a vertex with the afore mentioned streams were also added to the statewide data. Municipal data were selected as reaches that displayed PSI scores with the top 50th percentile of scores within their basin-order combination.

Large River Richness

Sample size deficiencies in large rivers (order>4) prevented calculation of PSI. These sampling sites were instead evaluated based upon fish species richness exclusively. Fisheries data collected from larger rivers statewide were prepared as described above and richness was calculated and converted to percentiles. Richness was tied to appropriate NHD stream segments as delineated for the PSI layer above and reaches exhibiting richness in the 90th (statewide) and 50th (municipal) were set aside for further analysis.

Buffering

Spatial data preparation: data collected within lotic environments were tied to NHD stream segments as described in the PSI section. Spatial data selected for inclusion in the statewide and municipal layers were combined using the Union function in ARC GIS and dissolved by saris and stream order. Stream and river linework were then cropped from lentic waterbodies greater than 20 acres in size as NHD linework by default extends through lakes and ponds to connect up- and downstream reaches. Shorelines of lotic habitats identified for inclusion in the statewide and

municipal layers were delineated from leaf-off satellite imagery and combined as above preserving a unique identifier for each polygon.

Buffer tool

Buffering was accomplished using the Conservation Assessment and Prioritization System (CAPS) developed at the University of Massachusetts (Compton et al. 2007). The Conservation Assessment and Prioritization System as used here, permits the creation of a flexible, variable width buffer whose size, and shape respond to elements of the adjacent landscape. The tool is implemented using the statistical software package R (R Core Development team 2021) and target areas are designated by point, line, or polygon features. In the simplest implementation, buffers are created by supplying the tool with a resistance surface, in this case a 30m statewide land use raster modified from 2016 NLCD data, a resistance table indicating the relative cost of occupying each 30m pixel in the resistance surface, and a bandwidth or currency with which the tool can spend as it spreads into the resistance surface. Specific resistance values (costs) associated with each land use classification (N=104) are supplied in **Table A 5** but are generally parametrized to encourage spread within natural habitats and prevent it within developed areas. Buffers grow in all directions from seeds which are placed along the outline of the target features at 30m intervals or in the case of a point directly overlapping it. The bandwidth (currency) is supplied to each seed at the onset and that bandwidth is reduced (spent) as it grows and spreads through each pixel of the idealized landscape until exhausted, resulting in an adaptive, variable width buffer.

Lotic Aquatic Core

Aquatic core habitats are areas critical to the continued structure and function of biota found therein. As the quantity and quality of many of these features are inherently linked to the dynamic nature of river and stream environments, protection of the flood plain is paramount to permit the river or stream to continually alter its course. As such, the resistance surface used to develop aquatic core habitats was modified to include additional land use classifications which reflect the presence of wetlands and the flood plain. Concordantly, resistance values assigned to these additional classes encouraged spread except for pixels identified as development or agriculture that reside within the floodplain or wetland. Pixels residing outside the floodplain or associated wetlands were assigned resistance values which prevented spread (**Table A 5**). Finally, developed pixels within the resistance surface were enhanced by using the buildings and structures layer to better assure the buffer would avoid or stop at developed pixels. Buffers were developed by supplying the tool a bandwidth of 150 units for stream orders <5 and 300 units for stream orders >4 to try to account for the tendency of larger rivers to have larger flood plains. This parametrization permits a maximum buffer width of 360m for stream orders <5, and 660m for stream orders >4. Following creation, each buffer was smoothed and inspected.

Lentic Aquatic Core

Aquatic core habitats for lentic environments reflect the importance of shoreline areas. Buffers were created using a land use raster that incorporated wetlands and the buildings and structures layer to enhance developed pixels. The same resistance values were used as within lotic habitats and the buffer tool was provided a bandwidth of 100 in all instances. Following creation, each buffer was smoothed and inspected.

Statewide aquatic core

Following the creation of the statewide and municipal aquatic core each layer was dissolved and manually edited. Manual edits were necessary to clean up the geometry of the core polygons, add tangent wetlands where the buffer ran out of currency, and correct errors. Most errors were the result of new development that was not reflected in the underlying land use grid or were a result of edge effects.

Critical Natural Landscape

Critical Natural Landscape (CNL) areas encompass aquatic core habitat and reinforce their function while providing further minimization of development impacts, habitat connectivity, and increased habitat breadth to permit constant restructuring amidst environmental stochasticity and episodic event. Aquatic Core elements created above were used as the target features to build CNL buffers using an unmodified statewide land-use raster and a bandwidth of 500. Resistance values were again parametrized to encourage spread into natural areas and limit/cease spread into developed pixels (**Table A 5**). Following creation, each buffer was smoothed and inspected.

Other relevancy projects

- Conducted electrofishing demonstrations for students at Framingham State and University of Massachusetts.
- Wrote and or collaborated on three articles in the *Massachusetts Wildlife* magazine.
- Interviewed 223 anglers over 20 survey days and logged 239 unique catches as part of the Wachusett Reservoir creel survey. The creel survey is conducted every 5 years by the Department of Conservation and Recreation Division of Water Supply to monitor catch, effort, and demographics of the Wachusett Reservoir fishery.
- Reviewed and commented on notices of intent for management of lake and ponds.

References

Compton, B.W., McGarigal, K., Cushman, S.A. and Gamble, L.R. 2007. A Resistant-Kernel Model of Connectivity for Amphibians that Breed in Vernal Pools. Conservation Biology. 21: 788-799.

Hartel, K.E., Halliwell, D.B. and Launer, A.E. 2002. Inland Fishes of Massachusetts. Massachusetts Audubon Society, Lincoln, MA.

Meixler, M.S.2008. A target fish community to guide river restoration. River Research Applications. 24, 453-458.

Meixler, M.S. 2011. Application of the target fish community model to an urban river system. Journal of Environmental Management. 92:4,1138-1147.

Novak, M.A. and Bode, R.W. 1992. Percent Model Affinity: A New Measure of Macroinvertebrate Community Composition. Journal of the North American Benthological Society. 11:1, 80-85.

MassWildlife Annual Report. 2018. Massachusetts Division of Fisheries and Wildlife, Westborough Ma. 145 pp.

R Core Team. 2021. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria

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Fisheries GIS

David Szczebak, Project Leader

Activities included in this project in FY2022 were focused primarily on the development and enhancement of fisheries-related online mapping and data applications. These applications included the MassWildlife trout-stocked waters application, the pond maps/bathymetry viewer, and the web-based fishing application, GoFishMA! Other efforts were not fisheries-specific, but benefited the division as a whole- the creation of maps to accompany free-standing kiosk displays at MassWildlife's Wildlife Management Areas, and the refinement of areas to include in the agency BioMap project.

Stocked Waters Application

In FY2022 there was a continued effort to improve our trout stocking web application. The internal component, an online Google-based database, was designed to house annual stocking schedules, orders, and allocations in one repository. Information from this database automatically populates the public stocking list accessible on the Division's website. The resulting system has eliminated much of the manually generated orders, lists, and emails that were previously used to generate the same stocking orders and schedules.

Improvements to the online stocking application in FY2022 included a review of all currently stocked waters by Westborough and District staff. The resulting revised lists were then included on both the website and hard copy lists circulated by the Districts. Every year there are a handful of waterbodies that are added or removed from stocking, usually due to issues of public access. We also updated a spatial data layer for internal use that depicts trout stocking since the inception of the new stocking application in 2016. This GIS layer shows stocking efforts by species, numbers, and seasons. Biologists can use this information to better inform aquatic surveys, and conduct management and protection efforts.

The web application on masswildlife.org/trout continued to garner a very positive reception from the public. For the periods of fall and spring trout stocking, from August 1, 2021 - June 30, 2022, the stocking application web pages received a total of 566,495 unique page views (this excludes people logging in from state accounts). This figure is consistent with the usage from previous years (591,000 in 2021 and 500,599 in 2020). Users spent over 4 minutes on the page, which represents very positive engagement with the page content. The consistently large number of visitors to the trout stocking map/list page (it usually ranks in the top-5 list of most popular /mass.gov pages) indicates a continued appreciation of the application by the public.

Pond Maps/Bathymetry

In FY2022 new bathymetric surveys were conducted of lakes and ponds across the state. Masswildlife began collecting new bathymetry in 2015, using the data to update publicly available pond maps as well as online web applications. In FY2022 bathymetric surveys were conducted on the following five ponds: Johnsons Pond in Raynham, Nashawanuck Lake in Easthampton, Berry Pond in Hancock, Winnings Pond in Billerica, and Pontoosuc Lake in Lanesborough.

Typically, between 5,000 and 40,000 depth readings (depending on the size of the waterbody) will be collected during the course of a bathymetry survey. Once new bathymetry is collected, the point depths are analyzed in a GIS system, and subsequently output as a depth surface map. In FY2022 Fisheries GIS recreated a statewide bathymetric datalayer for all of the 200 lakes and ponds for which we had updated data. This seamless dataset allows users, within and outside of MassWildlife, to view depth information, including labeled contours, in one location, and is useful internally for field survey planning, and by the public for both angling and boating. The statewide bathymetry datalayer is also used as a base map in both our GoFishMA! and Pond Maps viewers, enabling users to access depth data on both a computer and phone. Recent statistics indicate that over half of the uses of our GoFishMA! application accessed it on a phone or other mobile device. Both applications allow users to show their location, so now users with a smartphone out on the water (or ice) can get real-time information on lake and pond depth.

These depth surface maps are also used in our Pond Maps and Fact Sheets, which are produced to provide lake and pond information for anglers, whether shore-fishing, ice-fishing, or out in a boat. The fact sheets, which describe fisheries resources, aquatic habitat, and recreational access, were updated based on the most recent sampling data, as well as information provided by the MassWildlife District Offices. New pond maps for Nine Mile Pond in Wilbraham and Chapin (Haviland) Pond in Ludlow were posted to the MassWildlife website in FY2022.

The pond maps and new bathymetry are easily viewed by the public through the MassWildlife GoFishMA! application as well as the Pond Maps interactive map. There are now 200 lakes and ponds that have updated bathymetry accessible by the public.

In addition to the pond maps and fact sheets available to the public, we also updated the GIS layer of bathymetry collected during our surveys. This data was made available to the public as both an interactive and downloadable GIS layer. The downloadable bathymetric contour layer allows users to display the data at 5-foot contour intervals and is available from MassGIS.

The interactive bathymetry layer is called 'Inland Waters Bathymetry' and is available through the MassMapper application at:

https://maps.massgis.digital.mass.gov/MassMapper/MassMapper.html

Online Applications

In addition to the Trout Stocking web application mentioned in Section1., the Fisheries section maintains other online maps designed to guide the public to waters that offer good angling experiences and other recreational opportunities.

The web application called GoFishMA!, is the product of collaboration between the Fisheries section and our Information and Education section. The foundation of this online application is a layer of fishing sites, which is produced through input by both Westborough and District staff. This popular fishing web application is now available through the Division's website, in the Freshwater Fishing section-

https://www.mass.gov/service-details/find-freshwater-fishing-spots

In addition to the fishing sites datalayer, the application currently includes shaded bathymetry for lakes and ponds, where available, links to pond maps and writeups, indications of trout-stocking, and access, including both shore access and boat ramps, and catch and release areas. Users can also get driving directions to a large number of sites, which will open Google Maps when someone click on a given site. While some access is obvious (e.g., boat ramp), other access needed local input from the District offices, especially for shore fishing areas and carry-in access. In FY2022 we accurately mapped the locations of vendors that sell bait to the public, to include in the GoFishMA! application. In the next iteration of the application the bait stores will be added as an additional base layer. Users will be able to click on a bait store location and get driving directions as well as contact information for that store. In FY2022 we continued acquiring photos that represent access sites mapped in the GoFishMA! Application. In a future iteration of the application, the public will be able to click on a site and get photos of the ramp or other access site, to better determine whether they can launch a boat or fish from shore.

In FY2022 we also conducted an analysis of the locations represented in GoFishMA! in relation to Environmental Justice (EJ) Communities. EJ Communities are primarily defied by three criteria: proportion of minority population, median household income, or household English language isolation. MassWildlife, under the direction of the Executive Office of Environmental and Energy Affairs, is making a concerted effort to include these criteria throughout our operations, especially in the information put out to the public. To that end, we worked with staff from the District offices to examine the locations in GoFishMA! to include more points that are easily accessible to EJ Communities. While this initial effort was limited to 5 sites per District, the effort will be an ongoing one throughout the life of the web application.

Another popular online map the Fisheries section maintains is the Pond Map Viewer page. It is a very simple, user-friendly web application showing ponds where fact sheets/maps and digital bathymetry are available. As updated pond descriptions and bathymetry are available, they are posted to the application.

Once a year, Fisheries GIS updates the Coldwater Fisheries Resource (CFR) datalayer available to the public. CFRs are important habitat for a number of coldwater species, including trout. Coldwater species are typically more sensitive than other species to alterations to stream flow, water quality and temperature within their aquatic habitat. Once fish sampling data, collected annually by staff biologists and technicians, is filtered into the Fisheries Section database, the data points are tied to stream and pond segments represented in the National Hydrography Dataset (NHD). The NHD is a dynamic dataset, designed to be improved on an ongoing basis based on field surveys and imagery interpretation. Through the process of tying our sampling data to this dynamic NHD data, we can ensure that our derived datalayers, like Coldwater Fisheries Resources, are based on the best available information. Fifteen new CFRs were designated in FY2022, bringing the total number of CFRs in Massachusetts to 1,277. The CFR data can be accessed by the public via a web viewer: https://www.mass.gov/info-details/coldwater-fish-resources It is also available for download via MassGIS, for users that have access to a GIS mapping system.

The Coldwater Fisheries Resource data is also used internally to produce a number of derivative data. These include the Wild Trout Classification data, which depict the best remaining waterbodies that hold reproducing wild trout. Also spatially based on the CFR data is the Coldwater Refugia dataset, showing those critical coldwater habitats where CFR-dependent species can survive high temperatures, drought, and other unsuitable conditions.

Fisheries Agency Collaboration

In FY2022 MassWildlife embarked on a project to create free-standing information signs for our most-visited Wildlife Management Areas. The signs and kiosks consist of two panels- an informational section, and a separate map panel. Fisheries GIS was asked to produce the maps for these signs. Working with Information/Education staff and the MassWildlife District offices we identified candidate Wildlife Management Areas and then went through a process of identifying the spatial information to include. We wanted to include as much detail as possible in the maps, without having them be overwhelming. The final versions incorporated the most important information for the public, including vegetation, areas of active habitat management, and

features such as roads, trails, parking areas, and gates. There were a total of 17 WMA signs produced in FY21. For the next several years, the MassWildlife Districts will be identifying priority WMAs for which they would like kiosks/maps, and these will be produced on an ongoing basis. In FY2022, kiosk maps were produced for Delaney WMA, Townsend Hill, and Dunstable Brook in the Northeast District. Maps were also produced for Quashnet River WMA, Erwin Wilder, Mashpee Pine Barrens, Hockomock Swamp, Hyannis Ponds, and Haskell Swamp in the Southeast District, and Flat Brook WMA in the Western District. The maps were all edited in conjunction with District staff, with a focus on correct WMA boundaries, and areas that offer appropriate access for the public. Once the narratives and photos are finished for these areas, the maps will be incorporated with them, and the final kiosks produced and installed.

In FY 2022, the Fisheries section contributed general GIS support to the Division, with emphasis on the updating and support of aquatic data. Fisheries GIS is part of the National Hydrographic Dataset (NHD) network, and in FY2022 participated in collaborative working groups on the direction of hydrographic data development as well as adding new, field-verified streams that were incorporated into the national data. Since the NHD data were originally developed at a 1:24k scale, many smaller streams are missing from the data, some of which may be of conservation concern. As DFW Fisheries samples these new streams, they may be incorporated into the national data, providing better protection for these resources.

Fisheries GIS also participated in a team effort to edit and refine areas to be designated as important Local Landscapes in the new BioMap conservation planning tool. To be released to the public in the coming year, the latest version of BioMap is a total agency effort that incorporates expertise from throughout MassWildlife. The Local Landscapes component is just one element of conservation prioritization in BioMap, and Fisheries GIS helped to refine these areas to exclude unwanted development or other non-conservation priorities.

In FY 2022 Fisheries GIS was able to take much of the Fisheries-specific data we produce and begin maintaining it in an online portal called ArcGIS Onlne. ArcGIS Online is a web-based platform built by ESRI, our GIS software provider, designed to promote collaboration and seamless desktop to web publishing.

In the last several years we have sought out innovative ways to host our Fisheries data so staff can access, update, and edit it from a variety of locations. This was a good opportunity to identify data critical to the Fisheries workflow, including both Field Headquarters and District staff. To accomplish this, we created a Fisheries-specific section in ArcGIS Online for our spatial data. Accounts were then created for all of our users, and they were trained in accessing and editing this data. This investment will be valuable moving forward not only to streamline the fisheries section workflow but also to incorporate our data in inter-agency efforts that share our same priorities.

Hatchery/Trout Program

Caleb Slater

Trout Production and Stocking

The total number and pounds of each size category for each species of trout produced and stocked by MassWildlife's five hatcheries in FY 2022 are listed in Appendix A, **Table A 1** and **Table A 2**, respectively. Overall, a total of 500,654 Brook Trout, Brown Trout, Rainbow Trout and Tiger Trout with a combined weight of 403,446 pounds were stocked, meeting MassWildlife annual production goals. One particular challenge to production, Hurricane Henri (August 22-23, 2021), caused a seiche in the Quabbin Reservoir and the resulting temperature inversion allowed warm surface water to be drawn into the pipeline feeding the hatchery. The warm water resulted in some production loss and prompted further action by hatchery staff. A temperature monitor with alarm has been installed in the mixing basin so that any future dramatic pipeline temperature changes will be flagged in real time and staff will be able to respond and turn on wells to temper the water going out to the raceways.

The production goal is based on the rearing capacity of each hatchery, which is determined by a combination of the quantity and quality of the water supply, rearing space and limits imposed by the National Pollution Discharge Elimination System permits that each hatchery is issued by the Massachusetts Department of Environmental Protection and the Federal Environmental Protection

Agency. A second production goal of the hatchery trout program is for 50% of the fish that are stocked to be in the 12+ size category (average length of 12 inches). This goal was achieved in FY22 as well; 76% (379,028 fish) met or exceeded this goal, including 273,745 Rainbow Trout, 50,879 Brook Trout, 51,483 Brown Trout and 2,921 Tiger Trout.

MassWildlife has both a fall and a spring trout stocking season. During the FY2022 fall season, which ran from late September through mid-October 2021, 99 ponds and lakes, and 12 rivers and streams in 100 cities and towns across the 5 Wildlife Management Districts were stocked. A total of 64,012 trout comprised 28,099 14+ Rainbow Trout, 31,913 12+ Rainbow trout, and 4,000 9+ Brown Trout with a combined weight of 74,403 pounds were stocked. 94% of the fish stocked during the fall were in the 12+ or larger size category. The Western District also stocked 1,146 9+ Brook Trout and 330 12+ Brook Trout produced by the Berkshire National Fish Hatchery. These fish are not included in Appendix A, **Table A 1** and **Table A 2**.

In the spring stocking season, which ran from March through early June 2022, a total of 436,642 trout with a combined weight of 329,043 pounds were stocked in 179 lakes and ponds and 247 rivers and streams in 246 cities and towns. Overall, 73% of the fish that were stocked met or exceeded the 12+ size category.

All of the 213,733 Rainbow Trout stocked were in the 12+ category and 149,108 (70%) were 14+ and weighed an average of 1.2 pounds each. A few of the rainbows were over 16 inches long and weighed more than a pound and a half apiece.

A total of 94,134 Brook Trout were stocked in spring FY2022, of which 50,879 (54%) were in the 12+ size category or larger. More than 1,082 Brook Trout longer than 14 inches with some individuals weighing more than 2.5 pounds were stocked. The total poundage of Brook Trout stocked was 46,810 pounds.

A total of 125,854 Brown Trout between 6 inches and 18+ inches with a total weight of 80,803 pounds were also stocked. 42% (52,435 fish) of the Brown Trout were at least 2 ½ years old and 12 inches or larger with an average weight of 1.1 pound each. Over 1,000 of these Brown Trout were longer than 18 inches and weighed 4 pounds apiece.

Sandwich Hatchery produced 2,921 Tiger Trout which averaged 14+ inches and weighed an average of 1 pound apiece (Appendix A, **Table A 1** and **Table A 2).** Tiger Trout are a cross between a Brown Trout female and Brook Trout male and are called Tiger Trout because of their striking tiger-like stripes.

Sandwich Hatchery produced a total of 236,800 fertilized Brown Trout eggs, 223,758 fertilized Brook Trout eggs and 160,512 fertilized Tiger Trout eggs in FY2022 (Appendix A, **Table A 3**). During the spring season, the Sandwich Hatchery stocked a total of 952 Brown Trout and 611 Brook Trout surplus brood stock (Appendix A, **Table A 1**) with a total weight of 3,064 pounds and 1,572 pounds, respectively (Appendix A, **Table A 2**).

The Roger Reed Hatchery produced a total of 642,243 fertilized Brown Trout eggs and 881,910 fertilized Brook Trout eggs in FY2022 (Appendix A, **Table A 3**). During the spring season, the Roger Reed Hatchery stocked a total of 1,124 Brown Trout and 906 Brook Trout (Appendix A, **Table A 1**) surplus brood stock with a total weight of 2,738 pounds and 1,257 pounds, respectively (Appendix A, **Table A 2**).

A small collection of eggs from each of 219 mated pairs, from both hatcheries, were retained as a future brood line. The resulting fingerling from these eggs were incubated separately from production eggs at the Roger Reed Hatchery and remain on station for egg production in 2024.

McLaughlin Hatchery obtained 54,759 2022 Shasta Strain Rainbow Trout eggs and 1,132,624 2021 Erwin-Arlee Strain Rainbow Trout eggs from the USFWS in FY 2022. FedEx shipping delays caused high mortality in one shipment of the Erwin-Arlee eggs. Therefore, we purchased 159,066 Rainbow Trout eggs from Troutlodge, Inc. McLaughlin also obtained 266,935 Brown Trout eggs and 284,740 Brook Trout eggs from Roger Reed State Fish Hatchery.

After hatching at McLaughlin, 106,274 Brown Trout (475 lbs.) and 111,702 Brook Trout (397 lbs.) fingerlings were transferred to Sunderland Hatchery for grow out, and 109,060 Brown Trout (531 lbs.) and 79,829 Brook trout (280 lbs.) fingerlings were transferred Bitzer for grow out.

Landlocked Salmon Production and Stocking

The Roger Reed Hatchery produced a total of 13,360 landlocked Atlantic Salmon in FY2022 (Appendix A, **Table A 3**). 3,170 of these salmon that weighed a total of 197 pounds were transferred in September 2021 to the New Jersey Division of Fish and Wildlife Hackettstown Hatchery in exchange for Northern Pike fingerlings. The remaining 10,190 salmon which averaged 8.8 inches and weighed a total of 2,311 pounds were stocked in Quabbin Reservoir in May 2022. Landlocked salmon eggs for the 2023 production lot were obtained from Enfield State Hatchery (ME) as eyed eggs in February 2022. The egg source was a domestic strain of West Grand Lake salmon reared in Enfield since 2019. The resulting fish will remain on station for stocking in the spring of 2023.

Northern Pike Stocking

In September 2021, approximately 2,000 Northern Pike yearlings averaging 10.8 inches long were stocked in Quaboag Pond and Cheshire Reservoir. The usual April stocking of Northern Pike fry did not take place in 2022 due to COVID-19 travel restrictions. The Northern Pike were obtained from the New Jersey Division of Fish and Wildlife's Charles Hayford State Fish Hatchery in Hackettstown, NJ.

Fish Health Monitoring

MassWildlife has maintained an active fish health monitoring program for its five hatcheries since the 1980s. Since that time, the MassWildlife's Fish Pathologist conducts an annual comprehensive fish health examination of each species of fish at each hatchery following the protocols of the American Fisheries Society and the Northeast Fish Health Committee (NEFHC) (NEFHC 2015). MassWildlife is an active participant in the NEFHC. The fish are screened for fish pathogens that the NEFHC committee considers a risk to trout and salmon (NEFHC 2015). In addition, diagnostic examinations were performed as needed on any hatchery fish that exhibited symptoms of illness.

Results of the fish health inspections and diagnostic testing conducted in FY 2022 are in Appendix A, **Table A 4**. No NEFHC listed pathogens were diagnosed in FY 2022. Cold water disease (Flavobacterium psychrophilum) was diagnosed in the Erwin/Arlee, Trout Lodge, & Shasta strains of Rainbow Trout at McLaughlin Hatchery (**Table A 4)**. Cold water disease is a ubiquitous pathogen of trout throughout much of the United States, but it is not listed by the NEFCH (NEFCH 2015). The CWD-infected Rainbow Trout at McLaughlin Hatchery were successfully treated with a Food and Drug Administration-approved antibiotic for CWD that was prescribed by a veterinarian in accordance with the Food and Drug Administration's Veterinary Feed Directive (VFD).

Teaching with Trout Program

The hatchery program produced approximately 12,000 eyed eggs for the Teaching with Trout Program. More information is provided on program details in the Coldwater Project Annual Report as TWT is coordinated through Dan Marchant of the Roger Reed Hatchery and Adam Kautza, Coldwater Fishery Project Leader.

Capital Improvement Projects

MassWildlife was awarded $21,860 in capital funding in FY 2022 for infrastructure improvements at hatcheries to improve efficiency and maintain our overall coldwater fish production goals.

Hatchery capital projects conducted in FY2022 included:

Roger Reed Hatchery: $1,070 Parts for automatic fish feeders.

McLaughlin Hatchery: $10,790 PVC ball valves to replace the corroded iron valves in the hatch house.

Bitzer Hatchery: $10,000 Replacement anti-bird netting, wood and PVC supports to install it.

Roger Reed Hatchery: $80,000 design, engineering, and permit work by Tighe & Bond to repair/replace the hatchery reservoir dam and reservoir water supply pipeline. This project was funded through the annual $1.5M in capital funds directed by DFG to MassWildlife for dam repair and removal. We have awarded a construction contract for this project in FY 2023 for $737,000.

References in Dr. Slater's Report

Northeast Fish Health Committee. 2015. Guidelines for Fish Health Management in Northeastern States. 67 pp.

Deerfield River Wild Brown Trout

Adam Kautza in collaboration with Western District

Background

The Deerfield River tailwater in northwestern Massachusetts is the largest and one of the most popular river trout fisheries in the state. The current project was instituted several years ago in part to direct our management of this important fishery, as well as in response to concerns that the current flow regime out of Fife Brook Dam was impacting the wild Brown Trout population.

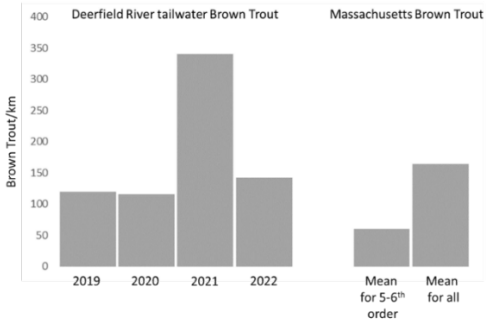
We began this project in 2018 with marking all the Brown Trout that were stocked into this section of the Deerfield River with an adipose fin clip. This marking scheme was repeated for each stocking cohort through 2022 to distinguish hatchery from wild Brown Trout in our surveys. Beginning in 2019 we used raft electrofishing to do mark-recapture surveys across approximately 11 km of the Deerfield River tailwater downstream of the Fife Brook Dam. These surveys were designed to assess the relative proportion of wild and hatchery Brown Trout and to develop estimates of population abundance of Brown Trout in our study area. In addition to raft electrofishing, we used backpack electrofishing to survey 4 100-m bankside transects to track the abundance of young-of-the-year Brown Trout more explicitly.

Results (to date)

Through FY 2022, we have tagged 374 Brown Trout (>150 mm) and collected 405 in total. Of the Brown Trout collected over this period only 77 had an adipose fin clip – meaning that the Brown Trout fishery in the Deerfield River tailwater consists of over 80% wild fish and is therefore a predominantly wild trout fishery. These results were somewhat unexpected given the relatively limited number of successful self-sustaining wild Brown Trout fisheries in Massachusetts and especially in the Deerfield River watershed.

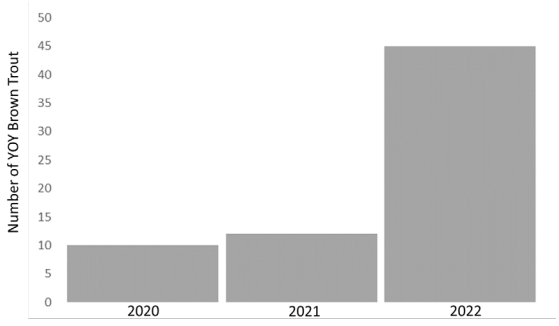
Overall, abundance of Brown Trout has been somewhat lower than anticipated given the size and quality of habitat and the water temperatures present in the tailwater. Although, relative to wild Brown Trout populations in other similarly sized Massachusetts waters, as well as all wild Brown Trout waters of any size, abundance in the Deerfield tailwater is generally above the average (Figure F 4).

Figure F 4. Mean abundance (number of Brown Trout/km) for each of the first four years of our Deerfield River tailwater surveys relative to mean abundance for all 5-6th order Brown Trout streams (n=8) and all Brown Trout streams regardless of order (n=193).



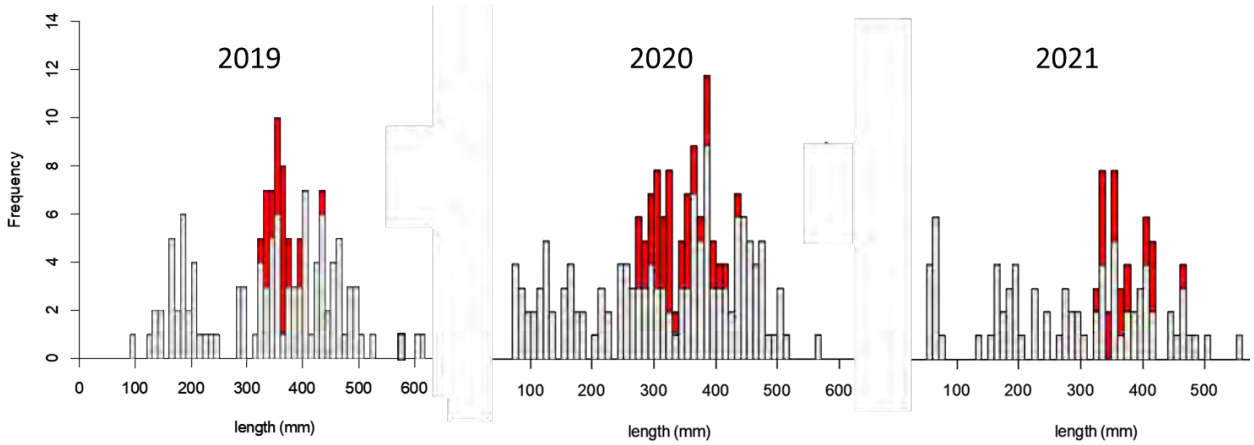
Young-of-the-year Brown Trout abundance in the Deerfield River tailwater has been exceptionally low in previous years of this project, however, we observed a four-fold increase in YOY Brown Trout in our 2022 surveys (Figure F 5). Looking back at the previous fall and winter we observed that the flows in this section of the river were consistently higher than current required minimum baseflow (125 cfs) and were more in line with the new minimum baseflow requirements (250 cfs) set to begin in the next couple years. Previous years fall-spring minimum flows were in line with existing baseflow requirements. Although this is only one year of data and may be anomalous, it is at least encouraging that higher winter flows correlated with increased YOY Brown Trout survival. In the future, the higher minimum baseflows required for Fife Brook Dam may allow the Brown Trout fishery to increase in abundance with better survival and recruitment.

Figure F 5. Total number of young-of-the-year (YOY) Brown Trout from surveys in the Deerfield River tailwater 2019-2022.



Although recruitment appears to be limited by the low abundance of YOY Brown Trout, survival seems to be relatively consistent once individuals make it past their first year until they reach the limit of their longevity in the system (Figure F 6).

Figure F 6. Length-frequency of Brown Trout surveyed in the Deerfield River tailwater 2019-2021. Adipose-clipped hatchery Brown Trout are highlighted in red.



The first phase of this project is to be completed in fall 2022 (FY 2023). Data from the first phase of this project will be used to direct our management of the fishery and as baseline data for later comparison. The second phase will begin following the mandated shifts in flow regime from Fife Brook Dam (e.g., higher minimum baseflows over fall, winter, and spring, and ramping up and down of daily hydropeaking flows) in 2023 or 2024. This second phase of the project will allow us to track changes in the Brown Trout population to assess the impacts of the modified flow regime.

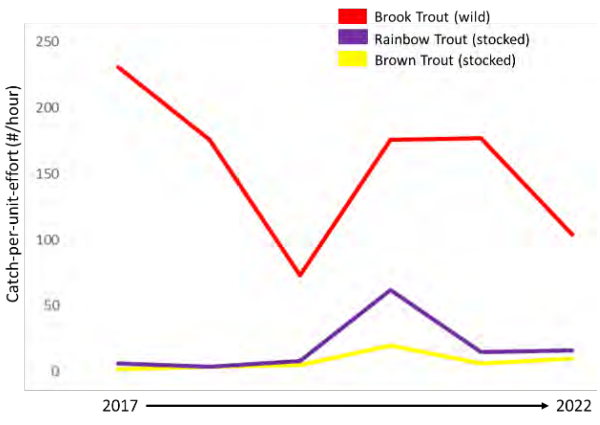
Swift River

Adam Kautza in collaboration with Connecticut Valley District

Comprehensive surveys

In FY 2022, we continued with our annual comprehensive fisheries surveys of the Swift River tailwater. To monitor long term trends in relative abundance and species composition of this important fishery, we survey the entire tailwater section of the river, from Windsor Dam at Quabbin Reservoir downstream through the impoundment created by the first Bondsville Dam. Relative abundance expressed here as catch-per-unit-effort (i.e., number of fish surveyed per hour of electrofishing), has fluctuated somewhat over the past six years of surveys (Figure F 7). Wild Brook Trout relative abundance has also fluctuated somewhat over the course of the period of record, which is to be expected given the vagaries of natural conditions and the density-dependent factors that the wild fish face each year. We have not examined the factors that dictate wild Brook Trout abundance in the Swift River tailwater but that is a long-term goal with this dataset. Relative abundance of stocked Rainbow Trout and Brown Trout has fluctuated much less given that we stock a similar number of fish each year. However, 2020 did see an increased number of both species stocked into the tailwater and that is reflected in the figure.

Figure F 7. Relative abundance (catch-per-unit-effort; number of fish caught per hour of electrofishing) of Brook, Brown, and Rainbow Trout in the Swift River tailwater 2017-2022.



Brook Trout young-of-the-year (YOY) surveys

In addition to the general comprehensive surveys done each year, we also survey 4 50-m bankside transects explicitly for Brook Trout YOY monitoring. Specific YOY surveys have become necessary to account for the bias against small fish and shallow habitat that affects the current boat/raft electrofishing methods employed in our comprehensive surveys. In addition, ongoing long-term tracking of YOY abundance can lead to insights into the dynamics structuring the wild Brook Trout population as a whole and tracking any concerning developments in the wild Brook Trout population such as consistently low recruitment. Similar to relative abundance measures for adult Brook Trout, the YOY Brook Trout relative abundance fluctuates from year to year in the Swift River tailwater (Figure F 8). It appears that some trends are emerging (e.g., low abundance followed by high abundance) indicating a density-dependent driver of YOY abundance, but more data are needed to identify potential influences, both density-dependent and density-independent, on Swift River wild Brook Trout recruitment.

Figure F 8. Relative abundance (catch-per-unit-effort; number of fish caught per hour of electrofishing) of young-of-the-year (YOY) Brook Trout in the Swift River tailwater 2017-2022.

Stocked Trout Survival and Movement Project

Adam Kautza

In FY 2022, we completed a project designed to better understand the survival and movement of Rainbow Trout and Brown Trout that are stocked into the Swift River tailwater. We created a webpage (with the help of Emily Stolarski, Outreach and Education) to house a summary of these findings for anglers and other interested parties to access. A version of this summary is provided here.

Introduction

The Swift River tailwater is clearly an extremely popular coldwater fishery, all one needs to do is look at the Y-Pool parking lot on any day of the week or try to get to the river early enough for a coveted spot near the Bubbler Pipe at the outlet of Quabbin Reservoir. This popularity should come as no surprise given the incredible number of wild Brook Trout, some to absolutely trophy size classes, the abundance of stocked Brown Trout and potentially massive size of holdover browns, and the frequent and abundant stocking of large Rainbow Trout. In addition to the exceptional fish resources, the tailwater is also relatively close to major population centers, is bounded by large areas of public land, and offers simple, straightforward access and easy paddling or wading opportunities for all ages and abilities. The Swift River has it all and as a result is one of our most popular and heavily fished rivers.

After several years of observation, monitoring, and preliminary investigation of the Swift River fishery we had enough background and insight to begin with a series of more specific research projects. The first project was to take a closer look at the fate of stocked Rainbow Trout and Brown Trout in the tailwater. In our monitoring, and our frequent discussions with anglers, we observed that the abundance of stocked trout in the river post-stocking did not necessarily meet expectations based on the number of trout that had been stocked. While this seemed to be the case for the entire 5.5 miles of the tailwater it was even more evident in the year-round Catch-and-Release Area upstream of Route 9.

Methods

To answer our questions, we developed a simple mark-recapture survey methodology. All stocked trout in 2021 were marked with a small elastomer mark just under the skin behind the left eye (Figure F 9).

Figure F 9. Elastomer mark being injected under the skin behind the left eye of a soon to be stocked hatchery Rainbow Trout. In this case the mark color is blue indicating that this fish was marked and stocked in March 2021.

Each stocking cohort was marked with a different colored mark – March/Blue, April/Red, May/Orange, June/Yellow, and October/Green [See www.mass.gov/swift-trout for additional details on the project, including elastomer marking methods and map of the Swift River tailwater]. In addition, to account for potential loss of abundance in the year-round Catch-and-Release Area via emigration, we further marked all trout stocked upstream of Route 9 with an adipose fin clip. Recapture surveys were done using a combination of raft and boat electrofishing. We surveyed the entire tailwater from Windsor Dam downstream to near the first Bondsville Dam one-week, one-month, and three-months post-stocking for each stocking cohort. Not all scheduled surveys lined up perfectly, so the river was actually surveyed relatively frequently over the course of the study. This will be reflected in the figures. All Rainbow and Brown Trout that were collected in our surveys were inspected for colored elastomer marks and adipose fin clips and released unharmed.

To quantify population estimates we used a simple capture efficiency multiplier based on capture efficiency estimates done in 2020. When quantifying fish population in the wild it is always an estimate because only in very rare cases can we capture each and every fish in a waterbody. In this case, in May 2020, we marked all hatchery trout with an adipose fin clip, stocked them into the river, and returned the following day to recapture them and calculate our efficiency. Our capture efficiency estimates were calculated at 10% on average. Meaning that we captured 1 out of every 10 trout that were stocked on the previous day. There are inherent assumptions to this method, for example that the trout survived and stayed in the system for the approximately 24 hours since stocking. In addition, capture efficiency can change from survey to survey for various reasons, including weather and water levels, presence of anglers, etc. That is why population size is an estimate.

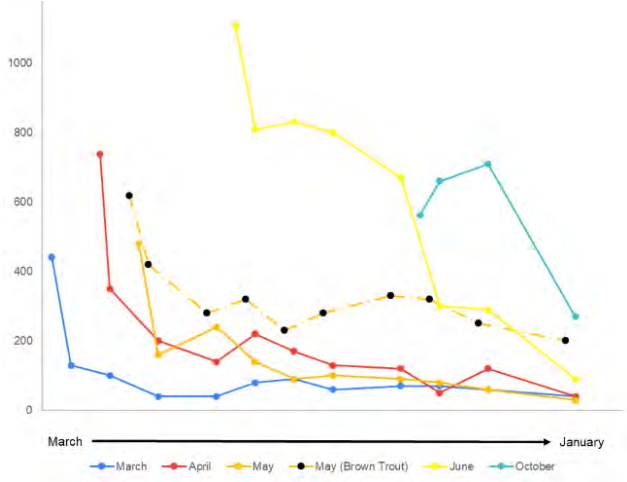
Results and Discussion

Trends in abundance post-stocking

Our results clearly indicate that for all stocking cohorts, except for October rainbows, there is a precipitous drop-off in abundance within one-week after stocking (Figure F 10). The noted decline in abundance, while still obvious, is less pronounced for Brown Trout than for Rainbow Trout.

Following this initial drop-off there is only a gradual decline leading to a relatively stable, although low, level of abundance by mid-summer for the spring stocked rainbows (March/April/May). The summer stocked Rainbow Trout, the single most abundant cohort of stocked trout, remained the most abundant cohort in our surveys throughout the summer and early fall even though their abundance continued to decline at a fairly rapid rate across the entire study period. The October rainbows were an anomaly in that they appeared to actually increase in abundance for a month post stocking. This is of course impossible and was simply an artifact of our abundance calculations which took into consideration a capture efficiency multiplier (see Methods section above for further clarification). Fall rainbows did not increase in abundance but they certainly did not show the rapid initial decline as seen in all of the other stocking cohorts. The decline in fall rainbows did ultimately occur but was delayed relative to other stocking cohorts. The less than rapid decline in fall stocked Rainbow Trout may have occurred for a variety of reasons including higher capture efficiency and/or reduced fishing pressure during the fall season, or characteristics unique to the particular strain of Rainbow Trout that are stocked in the fall.

Figure F 10. Estimated abundances of different cohorts of stocked Rainbow Trout and Brown Trout from March 2021 through January 2022. Only one cohort of Brown Trout was stocked in May 2021.



Overall, we observed that for a variety of potential reasons a relatively large proportion of hatchery Rainbow Trout (~50%) and, to a lesser degree, Brown Trout (~33%), were unaccounted for within one week post-stocking. This was especially true for Rainbow Trout stocked earlier in spring. Rainbow Trout stocked in summer and fall fared better for longer but by the third month post stocking their abundance had declined substantially as well. By the end of the study only 14% of 3326 Rainbow Trout stocked into the Swift River tailwater were accounted for. In contrast, 32% of the 619 Brown Trout were still present and accounted for.

The number of stocked trout in the Swift River tailwater is expected to continue to decline throughout the remainder of the winter and into spring before the population is replenished beginning in March with Rainbow Trout and in May with Brown Trout. Based on our initial surveys in March 2021, we estimated that there were approximately 590 unmarked Rainbow Trout and approximately 320 unmarked Brown Trout in the study area. This would mean that only about 13% of the rainbows and 11% of the browns stocked in 2020 carried over into spring of 2021. The actual proportion of holdovers is likely less given that some of these fish may be from previous years, especially in the case of Brown Trout that tend to have the ability to hold over for multiple years in some cases.

At this point, we are unable to explicitly determine what the fate of these fish are – it could be any number of things including natural mortality (e.g., from simple inability to survive outside of the hatchery environment, intense competition, or predation), angler harvest, catch-and-release mortality, or movement. Without a creel survey, we cannot fully assess how many stocked trout are harvested. But we did try to address one piece of this puzzle by looking at the movement of stocked trout into and out of the year-round Catch-and-Release Area.

For the most part, Rainbow Trout tended to stay put after they were stocked, at least early on during spring and summer (Figure F 11). This was somewhat of a surprise given their reputation as wanderers. It was not until later in the summer and into the fall that we observed a moderate number of rainbows ranging outside of their initial stocking locations. The majority of Rainbow Trout that were surveyed outside of their initial stocking locations were individuals stocked upstream of Route 9, in the year-round Catch-and-Release Area, but found downstream. Very few individuals moved in the opposite direction. We do not have the ability to explicitly point to the mechanisms driving these observed movement patterns but we suspect it might have to do with increasing competition for resources forcing fish to move downstream in search of more space and food. Based on our November surveys, there was a slight increase in rainbows moving upstream into the Catch-and-Release Area. This was presumably for spawning (sidebar: most of the Rainbow Trout raised in our hatcheries are actually fall spawning variants).

Similar to Rainbow Trout, Brown Trout tended to stay put or move from upstream stocking locations to downstream habitat (Figure F 12). Presumably, this downstream movement of Brown Trout was in response to increasing competition in the Catch-and-Release Area or simply a movement to find more suitable habitat preferred by the species (e.g., greater water depth, more cover). There were a few individuals that made the move from downstream to upstream haphazardly over the course of the study period. There was no obvious coordinated movement of Brown Trout into the area upstream of Route 9, even during the fall spawning season.

Figure F 11. Capture location of hatchery Rainbow Trout relative to stocking location.

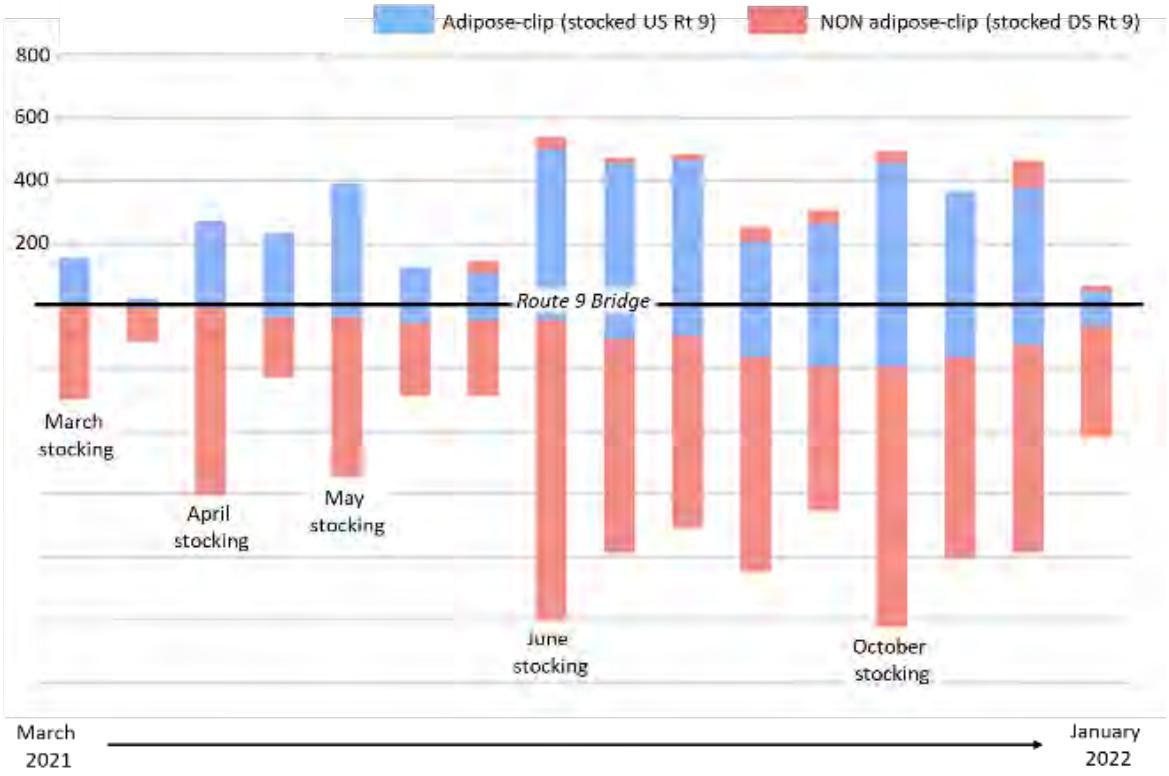
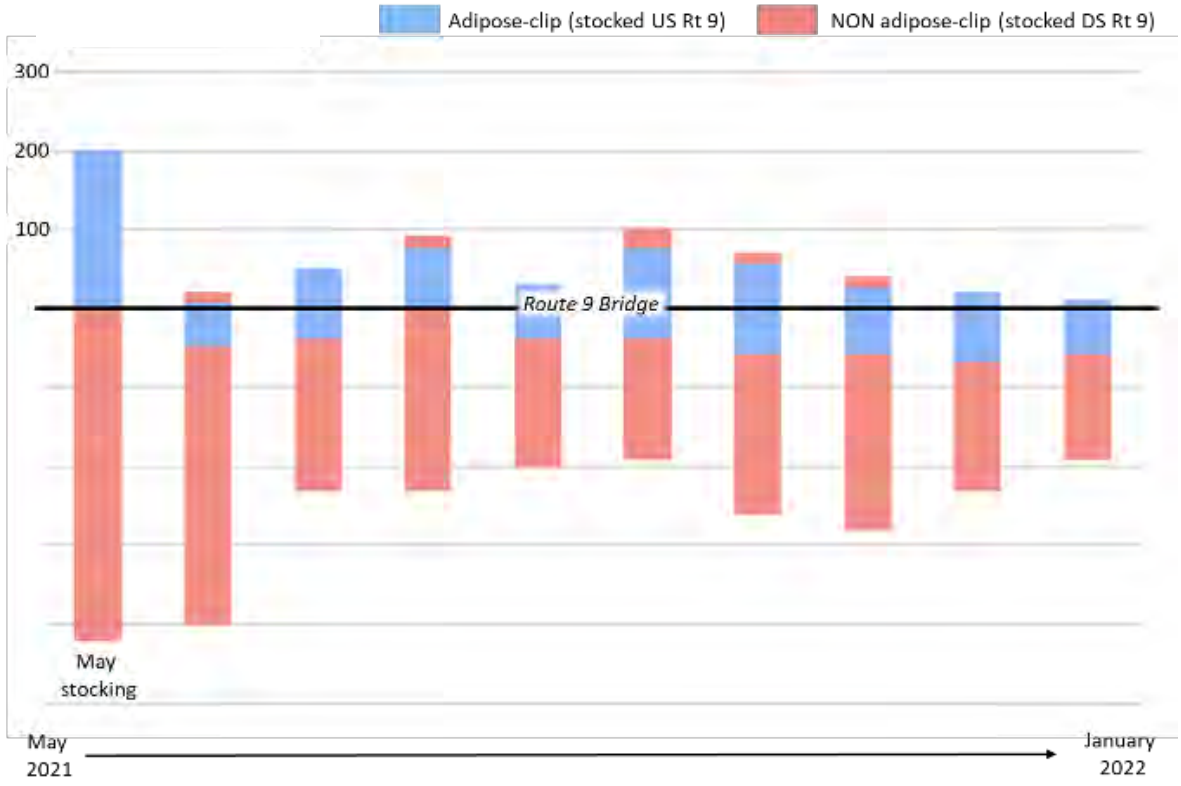


Figure F 12. Capture location of hatchery Brown Trout relative to stocking location.



We fully understand the potential drawbacks of this coarse approach at trying to understand movement patterns of stocked trout in the Swift River tailwater. One of the most obvious shortcomings is that we only surveyed at relatively wide-ranging time intervals. Fish could very well be moving into and out of the Catch-and-Release Area on a much shorter timescale than we captured with our survey methodology. If angler harvest has a significant effect on abundance, then this could be one potential explanation why we observed similar declines in abundance both inside and outside of the Catch-and-Release Area – trout moved out of the protected area and were harvested before we were able to survey them and account for their movement. There may also be important movement patterns across other habitat or regulatory boundaries, not just across the Route 9 boundary, that we did not capture. Many of these shortcomings we hope to address in future research.

Future Plans

In an effort to address some of the shortcomings of this initial study, as well as to expand our scope into the prolific and popular wild Brook Trout population, we recently proposed a more rigorous study on the Swift River using PIT (Passive Integrated Transponder) Tag arrays. PIT Tags are individually identifiable internal RFID (Radio Frequency Identification) transmitters that, in this instance, can be read continuously by several semi-permanent in-stream antennae placed at meaningful locations in the Swift River tailwater. One of the primary benefits of this approach over past mark-recapture efforts is the continuous data collection at the arrays, as opposed to prescheduled recapture events. Tracking fish individually rather than in cohorts will also allow for much more robust data analysis, including research into growth and survival. The project is in the initial planning stages, more information will be available in the coming years.

We have applied for funding from the Massachusetts Outdoor Heritage Foundation and the Pioneer Valley Chapter of Trout Unlimited for this project. The project timeline is on track for a FY 2023 start.

Wild Trout Stream Surveys

Adam Kautza in collaboration with district staff from all districts, Division of Ecological Restoration [DER]

In FY 2022 there were approximately 124 individual electrofishing surveys on 95 wild trout streams spread across the 5 districts. Most of these were done solely by district staff as part of the annual survey priorities list, whereas I was involved with other surveys that 1) were done in conjunction with DER as part of ongoing monitoring for dam removal and culvert replacement projects, 2) were done in conjunction with the Southeast District as part of long-term monitoring projects or before/after restoration monitoring projects for sea-run Brook Trout, or 3) were done in conjunction with district staff as part of the Wild Trout Management Plan call for assessment of “Premier” wild trout streams.

Teaching with Trout

Adam Kautza in collaboration with Dan Marchant

Participation in the Teaching with Trout program rebounded to pre-pandemic levels with 72 teachers at 53 schools participating in 2021-2022. We continued with a virtual, rather than in-person, orientation. The virtual orientation seems to work better in general because we can hold it in the evening and more teachers are able to attend.

We also formally requested and were granted funding from the Massachusetts Outdoor Heritage Foundation to purchase an additional 3 water chillers to loan to teachers who would like to participate in the program but are unable to secure all the necessary funds to secure this particular piece of required equipment.

Collaborations and agency representation

Adam Kautza

MassWildlife continued to collaborate with other agencies and outside groups on several efforts, including as a member of the Massachusetts Drought Management Task Force (DMTF), Eastern Brook Joint Venture, and as a Coldwater Fisheries consultant for Water Management Act permit renewals. This past fiscal year began with very few indicators of drought conditions in Massachusetts. Only Cape Cod experienced mild drought for a short period in late summer of 2021. However, conditions deteriorated rapidly beginning in late spring/early summer of 2022 whereby 6 of the 7 drought monitoring regions were experiencing at least mild drought with the Connecticut River Valley, Central, Northeast, and Southeast regions all experiencing significant drought by this time. My role with the DMTF involves discussion of drought conditions, in particular our observations in the field on the impacts that drought is having on fish and wildlife, and working with other task force members to decide on drought level declarations during monthly meetings. Though it was too early to see any substantial impacts of the drought on aquatic wildlife by the end of this fiscal year, the fact that significant drought conditions were already being observed so early in the summer does not bode well for late summer streamflow and water temperatures.

Environmental review of select infrastructure construction and repair, and development projects is another important aspect of my role with MassWildlife. In the past year MassWildlife has worked with some other state agencies (e.g., DEP, DOT, NHESP) in reviewing the potential environmental impacts to coldwater streams for over 30 proposed projects ranging from culvert repairs and replacements, bridge repairs, dam removals, roadway construction, and housing and commercial developments. Dr. Kautza is currently chairing the Northeast Fisheries Administrators Association Rivers and Streams Technical Committee. A major task for that committee during this fiscal year has been to compile data and information from all of the 13 member states and provinces on policies, practices, and rationale for stocking hatchery trout into water bodies that already support populations of wild trout. This document is in progress.

Dr. Kautza has also contributed an article on wild trout and wild trout management to the *Massachusetts Wildlife* magazine special Aquatics issue and assisted with developing the trout angler survey with Jody Simoes and other MassWildlife colleagues.

Meetings and Presentations

MassWildlife continues to share its mission and work with interested groups. In FY 2022, presentations were given with wild trout management, coldwater fisheries conservation and management, and the Deerfield River and the Swift River fisheries as central themes.

- Eastern Brook Trout Joint Venture
- Trout Unlimited (Taconic/Hoosic River Chapter, Pioneer Valley Chapter, Squann-a-Tissit Chapter)
- Crossroads Anglers
- Berkshire County Sportsmen's League
- Native Fish Coalition
- Western Massachusetts Flyfishers

Connectivity and Migratory Fish

Steven Mattocks

Westfield River Fishway

During 2021, the Westfield River Fish Ladder, located at the A&D Hydroelectric Dam in West Springfield, MA, was watered from April 1 - July 1, 2021.

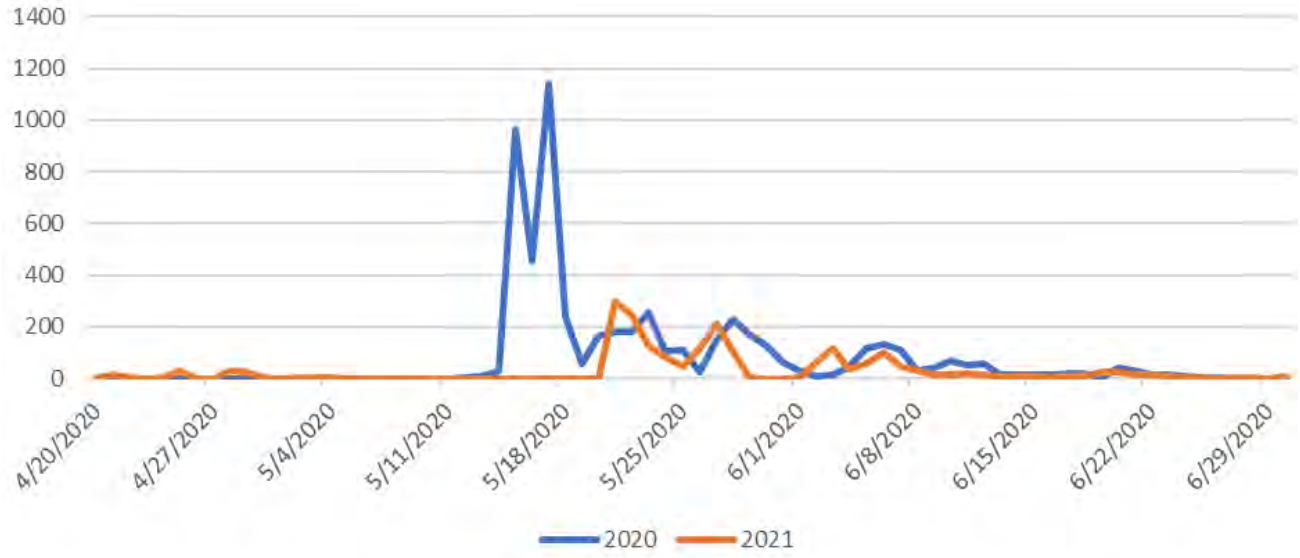
During 2021, the fishway was not staffed with technicians. For the third consecutive year, fish passing by the observation window were digitally recorded and enumerated from video footage. Motion detection video was in operation 24 hours a day with the aid of a near-infrared camera and infrared illuminator.

Anadromous Fish

A camera outage occurred from 5/5/2021 – 5/20/2021 due to computer hard-drive failure. Unfortunately, this outage occurred during the peak of the Shad run (Figure F 13). Thus, we do not have an accurate and complete count for 2021 fish passage season.

The total shad count for 2021 was 1,962 fish. 50% of the 2021 American Shad passage had occurred by May 25th (Figure F 13). The run size and timing appear to be comparable to the 2020 run season, aside from the missing data from the camera outage (Figure F 13).

Figure F 13. Timeline of American Shad run in 2020 and 2021 season.



Non-anadromous Fish

Sea Lamprey, White Sucker, Brook Trout, Brown Trout, Rainbow Trout, Tiger Trout, and Smallmouth Bass were observed passing upstream through the West Springfield Fish Passage Facility in 2021 but not enumerated.

Connecticut River Juvenile Shad Monitoring

FY22 marked the 5th year of Juvenile Shad monitoring in the Connecticut River. The fall boat electrofishing survey is a collaborative effort between MassWildlife and the U.S. Fish and Wildlfie Service. The survey seeks to provide information on the impacts of mainstem dams, adult passage, and habitat on the growth and productivity of juvenile American Shad.

Taunton River

The Taunton River Habitat Management Plan was completed by Massachusetts Division of Marine Fisheries (Brad Chase), and the Taunton River Monitoring Plan was completed by the MassWildlife Connectivity and Outreach Biologist. Both documents were completed as part of a Taunton River Shad Restoration Project, where MassWildlife, Division of Marine Fisheries, and U.S. Fish and Wildlife Service will stock the Taunton River with juvenile American shad for 5 years to re-establish the historical shad population. The goal is to establish a self-sustaining shad population which can eventually be opened for recreational fisheries.

CRMA Grant Review Team

The Fisheries Outreach and Connectivity Biologist participated in the CRMA grant review led by the Division of Ecological Restoration (DER). Meetings were held in spring 2022 to discuss and rank project applications aimed at improving crossing infrastructure and aquatic organism passage.

Dam Removals

The Aquatic Connectivity Biologist has participated in ongoing dam removal projects such as the Quinapoxet and Wheelwright Dams, as well as provided comments on numerous other dam removal projects throughout the state.

Outreach

Steven Mattocks

Westfield River Fishway Open House

The Westfield River Watershed Association hosted the Westfield River Fishway and Dam Open House this year on June 5th, 2022. The Connectivity Biologist operated an informational table located on the causeway near the fishway and above the counting room and handed out various MassWildlife brochures and informational documents. The Connectivity Biologist answered questions about various aspects of the facility and anadromous fish life history and run status. The event was open to the public, and about 70-100 visitors toured the fishway facility during the open house.

Connectivity Article in MassWildlife Magazine

The Fisheries Connectivity and Outreach Biologist published an article in the MassWildlife Magazine July edition (No.2 2022) titled "Migrating Fish, Changing Rivers". The article discusses migratory fish and industrialization in colonial New England and describes many of the landscape and societal changes that occurred with changes rivers and fish populations.

Outreach Events and Sportsman Shows

Many of the events MassWildlife planned to attend such as Sportsman Shows were either canceled or not attended due to COVID-19.

Sportfish Awards Program

The Sportfish Awards Program awarded 1,875 pins among all 22 eligible species in FY 2022 (Table F 5). The most popular category was the Catch and Release Category, which awarded 1,632 pins, followed by the Adult Catch and Keep Category, which awarded 126 pins, and the Youth Catch and Keep Category, which awarded 114 pins (Table F 6). The most popular species was Largemouth Bass (373 pins), followed by Black Crappie (218 pins) and Sunfish (185).

Table F 5. Approved bronze pins awarded in FY22 for the Freshwater Sportfishing Awards Program

Fish Species	Number of Pins
Bowfin	15
Brook Trout	57
Brown Trout	40
Bullhead	40
Carp	163
Chain Pickerel	116
Channel Catfish	73
Crappie	218
Lake Trout	2
Landlocked Salmon	100
Largemouth Bass	373
Northern Pike	41
Rainbow Trout	40
Shad	14
Smallmouth Bass	153
Sunfish	185
Tiger Muskellunge	1
Tiger Trout	21
Walleye	31
White Catfish	42
White Perch	43
Yellow Perch	107
Grand Total	**1,875**

Table F 6. Approved pins during FY22 by category

Category	Number of Pins
Adult Catch and Keep	126
Catch and Release	1,631
Special Order	4
Youth Catch and Keep	114
Grand Total	**1,875**

The Sportfish Awards Ceremony honoring catches from the 2021 (calendar year) fishing season was held virtually on March 5, 2022. The event was open to award recipients and their family members. 2021 was a successful year for anglers and the program, and nine new state records were set (Table F 7).

Table F 7. Gold Pin winners for calendar year 2021, honored at the Sportfish Awards Ceremony

Species	Category	Name	lbs	oz	Length	Comments
Bowfin	Youth Catch and Keep	Philip Prieur	6	13		
	Catch and Release	David DeSimone			32	New State Record
Brook Trout	Adult Catch and Keep	Emily Larouche	4	2		
	Youth Catch and Keep	Gabriel Christman	3	0		
	Catch and Release	David DeSimone			20.75	New State Record
Brown Trout	Adult Catch and Keep	James Pollard	15	13		
	Youth Catch and Keep	Gabriel Christman	10	0		
	Catch and Release	David DeSimone			28	
Bullhead	Adult Catch and Keep	Roger Aziz, Jr.	4	11		New State Record
	Youth Catch and Keep	Colten Andras	2	0		
	Catch and Release	Roger Aziz, Jr.			21.5	
Carp	Adult Catch and Keep	Joshua Christman	29	13		
	Youth Catch and Keep	Carter Flagg	20	10		
	Catch and Release	Kenneth Langdon			44	New State Record
Chain Pickerel	Adult Catch and Keep	Todd Matera	5	12		
	Youth Catch and Keep	Cooper Shepardson	5	10		
	Catch and Release	James Leary			28.25	
Channel Catfish	Adult Catch and Keep	Cam Tucker	12	6		
	Youth Catch and Keep	Carter Flagg	6	12		
	Youth Catch and Keep	Philip Prieur	6	12		
	Catch and Release	Kenneth Langdon			33.5	

Crappie	Adult Catch and Keep	Dennis Rochon	2	13		
	Youth Catch and Keep	Philip Prieur	2	0		
	Catch and Release	Donald Schofield			17	
Lake Trout	Adult Catch and Keep	Robert Mikolajczyk	19	9		
	Youth Catch and Keep	Matthew Telega	5	0		
	Catch and Release	Marc Aijala			33	
Landlocked Salmon	Adult Catch and Keep	Kelly Kemp	6	6		
	Youth Catch and Keep	Chase Talbot	4	13		
	Catch and Release	Mark Laflamme			26.5	
Largemouth Bass	Adult Catch and Keep	Joshua Christman	7	8		
	Youth Catch and Keep	Gabriel Christman	7	13		
	Catch and Release	Joshua Scaife			24.75	
Northern Pike	Adult Catch and Keep	Jeffrey Klammer	23	8		
	Youth Catch and Keep	Caesen Kendall	16	5		
	Catch and Release	Craig Strong			45.5	State Record (tie)
Rainbow Trout	Adult Catch and Keep	Andrew Langley	4	2		
	Youth Catch and Keep	James Bowe	3	8		
	Catch and Release	David DeSimone			27.25	New State Record
Shad	Youth Catch and Keep	Philip Prieur	3	10		
	Catch and Release	Michael Taylor			23.75	
Smallmouth Bass	Adult Catch and Keep	Gedalia Blank	5	7		
	Youth Catch and Keep	Gabriel Christman	4	6		
	Catch and Release	George Dias			22.5	
	Catch and Release	Marc Mahoney			22.5	
	Catch and Release	Matthew Menard			22.5	

Sunfish	Adult Catch and Keep	Todd Matera	1	5		
	Youth Catch and Keep	Gabriel Christman	0	14		
	Catch and Release	Griffin Sabolevski			13	New State Record
Tiger Muskellunge	Catch and Release	David DeSimone			34	New State Record
Tiger Trout	Adult Catch and Keep	Clarence Andersen	3	3		
	Youth Catch and Keep	Colten Andras	1	8		
	Catch and Release	David DeSimone			25.5	New State Record*
Walleye	Adult Catch and Keep	Edward Brozo	7	8		
	Catch and Release	Dustin Patrick			27	
White Catfish	Adult Catch and Keep	Todd Matera	5	13		
	Youth Catch and Keep	Philip Prieur	6	4		
	Catch and Release	David DeSimone			24	
White Perch	Adult Catch and Keep	Vinny Percuoco	2	8		
	Youth Catch and Keep	Nathan Bessette	1	11		
	Youth Catch and Keep	Gabriel Christman	1	11		
	Catch and Release	Paul McNealy			16.5	
	Catch and Release	Dawn Metcalf			16.5	
Yellow Perch	Adult Catch and Keep	Peter Krzyzewski	2	4		
	Youth Catch and Keep	Liam Webb	1	12		
	Catch and Release	Stephen McPherson			15.75	
	Catch and Release	Clayton Sydla			15.75	
	Catch and Release	Thomas Yarra			15.75	

*Beat his own previous record

Lands Committee

The Fisheries Connectivity and Aquatic Outreach Biologist attended Fall and Winter Parcel meetings for MassWildlife Lands Committee.

Fisheries Program Staff

Westborough Field Headquarters

Todd A. Richards, M.S., Assistant Director
Adam Kautza, Ph.D., Coldwater Fishery Resource Project Leader
Steven Mattocks, M.S., Fisheries Operations/Aquatic Connectivity Biologist
Rebecca Quiñones, Ph.D., Stream and River Project Leader
Caleb Slater, Ph.D., Hatchery Supervisor
Jason Stolarski, Ph.D., Watershed Project Leader
David Szczebak, M.S., Fisheries GIS Project Leader
Brian Fay, Seasonal Technician
Steven Humphries, Seasonal Technician

McLaughlin Hatchery

Kurt Palmateer, Manager
Jennifer Ayre, Fish Pathologist
Mark Coughlin, Technician
Jeremy Davis, Technician
Jeremy Jachym, Technician
Christopher Marsden, Technician
Jacob Rawlings, Technician
John Sousa, Assistant Manager
Chet Thomas, Assistant Manager

Montague (Bitzer) Hatchery

Holly Hubert, Manager
Ryan Cleveland, Technician
Brian Guerin, Assistant Manager
Chester Hall, Technician
Joseph Kendall, Technician

Palmer (Roger Reed) Hatchery

Daniel Marchant, Manager
Kevin Magowan, Assistant Manager
Cameron Young, Technician

Sandwich Hatchery

Adam Davies, Manager
Michael Clark, Technician
Gregory McSharry, Assistant Manager
Keith Wernert, Technician

Sunderland Hatchery

Charles Bell, Manager
Megan Cruz, Technician
Kalina Flood, Technician
Andrew Ostrowski, Technician
Timothy Nye, Assistant Manager
Vacant, Wildlife Technician

3 The Wildlife Program

Michael Huguenin, Assistant Director of Wildlife

Overview

The primary goal of the Wildlife Section is to promote and maintain healthy wildlife populations that will persist in perpetuity for the benefit of the public. The Section is responsible for the research, conservation, and management of wildlife populations within the Commonwealth of Massachusetts, and further works to enhance wildlife-based recreations and reduce negative interactions between people and wildlife. The Section is led by the Assistant Director of Wildlife Research and consists of seven Game Biologists, one Population Ecologist/GIS Specialist, one Ornithologist, five Habitat Biologists under the supervision of the Habitat Program Supervisor.

We accomplish our goals by conducting research and utilizing the best available science to develop and implement management strategies such as, setting regulations, conducting public surveys and outreach, implementing habitat management practices, acquiring land, etc. Specifically, Game Biologists (4 Project Leaders and 3 Wildlife Biologists) in the Wildlife Section are responsible for the management and conservation of dozens of species that include, but are not limited to black bears, white-tailed deer, wild turkey, waterfowl, cottontail rabbit, furbearers, woodcock, ruffed grouse, and moose.

Wildlife Section biologists develop, conduct, and maintain research projects in collaboration with staff from our five district offices, and in collaboration with partners such as, the USGS Coop Unit at UMASS Amherst, NGOs (Mass Audubon, TNC, The Trustees), regional partners, other state agencies, municipalities, etc. Section biologists utilize the information they collect and analyze, along with the best available science to develop management strategies. Section biologists employ adaptive strategies to effectively conserve, protect, and manage wildlife populations to ensure those populations persist in perpetuity to benefit the public. Habitat biologists in the Wildlife Section are responsible for developing and implementing habitat management plans to maintain and enhance biodiversity (of both game and nongame species) on state Wildlife Management Areas (WMA).

Habitat staff use the best available science, and collaborate with other staff from across our agency, other agencies, and with outside partners to develop habitat management plans, consult and develop strategies with the intent of representing, and setting the standard amongst our partners. Habitat staff directly conduct management in the field as well as supervise contractors hired to conduct habitat management. Habitat staff also consult with private landowners on habitat management strategies, and spend significant time developing management and conservation strategies, consulting on land acquisition, and conducting public outreach.

Wildlife Section staff also coordinate the Large Animal Response Team (LART), response to human-wildlife conflicts, the agency's pheasant stocking program, and permitting for falconry, crossbows, and problem animal control. partner with federal, state, municipal and private organizations, represent the agency on the Northeast Association of Fish and Wildlife Agencies' various technical committees and Northeast Association of Wildlife Administrators. Staff also provide presentations to the public and Universities, fulfill public records requests, and conduct media interviews.

Habitat Program

Brian Hawthorne

Overview

FY 2022 saw more than a doubling of acres of habitat managed with prescribed fire, due in no small part to the hiring of a full-time prescribed fire Burn Boss, Alex Entrup, the ongoing work of the Prescribed Fire Program Manager, Caren Caljouw, and the entire MassWildlife prescribed fire crew. In addition, the efforts of our in-house vegetation control crew and vendors also increased the acres of habitat with invasive plant control, under the leadership of Restoration Ecologist Dan Bove.

Staffing

The Habitat Program staff at the conclusion of FY 2022 included the habitat program manager, five habitat biologists from MassWildlife's Wildlife Section (not including two positions left unfilled after promotions), as well as the Prescribed Fire Program Manager and three restoration ecologists from the Natural Heritage and Endangered Species Program (NHESP). Staff members from the Fisheries Program collaborate on aquatic habitat issues, and the habitat program works closely with MassWildlife District staff on local Wildlife Management Area issues, O&E staff on outreach related to habitat management, NHESP environmental review biologists, and DFG Realty and the DFG Lands Committee on acquisition and protection of new lands across the Commonwealth. The Habitat Program is involved in cooperative habitat management and monitoring projects with the DCR and with the joint MassWildlife-MassDOT Linking Landscapes project, and staff also assist with reviewing and prioritizing applications for funding under the MassWildlife Habitat Management Grant Program.

Goals

The Habitat Program facilitates ecological restoration and adaptive habitat management of native habitat types and natural communities across a range of upland, wetland, and aquatic sites on both public and private lands to conserve the full diversity of birds, mammals, fish, and other wildlife, especially those identified as species of greatest conservation need (SGCN) in the Massachusetts State Wildlife Action Plan (SWAP). SGCN includes species listed under the Massachusetts Endangered Species Act (MESA). Upland sites include grasslands, shrublands, barrens, woodlands, and forestlands. Wetland sites include marshes, fens, shrub swamps, and forested swamps. Aquatic sites include cold-water fisheries and their adjacent wetlands and uplands.

Private lands habitat biologists within the Habitat Program work under contract with the USDA Natural Resource Conservation Service (NRCS) to conduct public outreach, provide technical assistance, and apply habitat management for rare and declining species on cooperating private lands through programs such as Working Lands for Wildlife, Northeast Turtles, the Young Forest Regional Conservation Partnership Program, and the Massachusetts Collaborative for Private Forestland Regional Conservation Partnership Program (RCPPs).

Objectives

The Habitat Program's objectives are to:

- Provide a spatial and temporal distribution of habitats for birds, mammals, and other species of conservation concern (including but not limited to grassland, marshland, shrubland, barrens, young forest, and biologically mature forest habitats) on WMA and WCE lands throughout Massachusetts, by restoring and maintaining appropriate natural communities.
- Provide technical assistance to other public and private landowners and conservation organizations on management of natural communities and habitat types such as grassland, marshland, shrubland, barrens, and young forest. Public and private landowners and conservation organizations include, but are not limited to, the U.S. Army Corps of Engineers (USACE), the Massachusetts Department of Conservation and Recreation (DCR) state forest and state watershed lands, town conservation lands, and private conservation lands (e.g., land trusts).
- Promote the benefits of habitat management and restoration as a necessary component of improving climate resiliency and protecting biodiversity in the Commonwealth.

The Habitat Program applies landscape composition goals for WMAs approved by the Massachusetts Fisheries and Wildlife Board that include 20-25% open habitats (consisting of 1-2% grassland, 8-9%

shrubland, and 11-14% young forest habitat ≤30 years old), 65-75% closed canopy forest habitat between 30-150 years old, and 10-15% biologically mature forest habitat over 150 years old. The specific management practices applied at any given site are based on an analysis of the natural communities present and/or desired, based on factors such as bedrock, soils, moisture regime, topography, and existing vegetation.

Actions

Habitat Program staff conduct, contract, and administer tree cutting, mowing, mulching, stumping, harrowing, seeding, prescribed fire, and invasive plant control to restore and enhance grassland, shrubland, barrens, and young forest habitats on WMAs with MassWildlife staff, and through existing statewide contracts and procurement procedures in compliance with all local, state, and federal permitting requirements. Staff also contract and administer tree cutting designed to create young forest habitat or other forested habitats through wood products sales through a public, competitive bidding process in compliance with all local, state, and federal permitting requirements.

Habitat Program staff conduct, contract, and administer these practices across more than 175,000 acres of Wildlife Management Areas (WMAs) and provide technical assistance to other public and private landowners interested in applied management to conserve wildlife. In addition, Habitat Program staff members assist the MassWildlife Realty Program and District offices with their monitoring of more than 150 Wildlife Conservation Easements (WCEs) on over 50,000 acres of private lands.

Project Administration

Habitat Program staff administered, contracted, and directed biological monitoring, management planning, and applied management practices at more than a dozen sites in FY 2021 to help achieve landscape composition goals for a spatial and temporal diversity of habitats at the landscape level (Appendix B, Table B 1 and Table B 2). Activities included preparation and/or updating of habitat site plans and prescribed burn plans, administration of habitat management contracts with private vendors, and conducting or contracting biological monitoring. Habitat Program staff also maintained GIS databases of management and monitoring data for all sites.

Biological Monitoring

Regular monitoring is essential for practicing adaptive natural resource management and includes surveys such as:

- vegetation sampling to determine the relative abundance of all vascular plants in the forest understory and overstory and to determine regeneration success of desired tree species on harvested sites and trajectory towards desired natural communities;
- identification and location of invasive plants for subsequent control efforts and to evaluate the success of past control efforts;
- identification and location of rare plants in order to design appropriate mitigation during habitat activities and to determine success of restoration efforts;
- photo documentation of pre- and post-treatment conditions;
- wildlife sampling to determine habitat use (e.g., breeding birds, butterflies/moths, pollinators).

In FY 2022, Habitat Program staff contracted and oversaw monitoring of grassland breeding birds, plant communities, and vegetation assessments on 2,226 acres at a total of 23 sites (**Table B 1**).

Program Accomplishments

The program exceeded its goals in FY 2022, completing biological monitoring at 23 sites totaling over 2,226 acres, writing habitat and fire plans for 5 sites covering over 2,500 acres, and applying habitat management practices at 46 sites on over 3,700 acres.

Habitat Planning

Habitat Site Plans are prepared for all MassWildlife properties where active habitat management will occur. In addition to these habitat plans, those properties that include fire-associated natural communities such as native warm-season grasslands or scrub oak barrens also have Prescribed Burn Unit Plans developed as required by the MassWildlife Prescribed Fire Policy and Handbook (https://www.mass.gov/files/documents/2017/09/20/fire-policy-handbook-4-19-17.pdf). Unit plans provide details on fuel types, fuel loads, fuel breaks, and required fire prescription parameters such as

wind speed and direction, relative humidity, fuel moisture content, crew composition and fire equipment. For the small subset of MassWildlife properties that both support fire-associated natural communities and occur within a regional landscape where human safety and development are at risk due to additional fire-associated natural communities that occur nearby but outside the WMA, Fire Management Plans are prepared to coordinate prescribed burning on MassWildlife lands with wildfire control on adjacent fire-prone lands and associated development. Initial restoration concept and preliminary restoration design plans provide an overview of the resource values at a site and are incorporated into Habitat Site Plans.

Habitat Management Practices

Over 3,000 acres were treated with one or more management practices across 46 different sites by Habitat Program staff and contractors in FY 2022 (**Table B 3** through Table B 8).

Prescribed Fire

Caren Caljouw, Prescribed Fire Program Manager

MassWildlife promotes the safe use of prescribed fire as an important habitat management tool. This includes using prescribed fire to manage wildlife habitats and restore natural communities and landscapes where fire has been absent for many years. A great diversity of wildlife and plants, including game and non-game species as well as numerous rare and declining species benefit from prescribed fire. Over 40% of the 570 taxa documented as "Species of Greatest Conservation Need" in the Massachusetts State Wildlife Action Plan are known to occur in fire-influenced habitats during part of their life cycle and many species benefit from the careful application of prescribed fire to restore and maintain important habitats. The sound application of prescribed fire can also significantly enhance opportunities for recreational activities, such as hunting, birdwatching, hiking, and nature photography.

Application of prescribed fire requires detailed planning, awareness, and coordination and a thorough knowledge of weather, fuels, and terrain. Prescribed fire implementation requires specialized equipment, trained and capable staff, and strong working relationships with fire management partners. It involves on-going risk assessment and mitigation, and comprehensive strategies to obtain successful outcomes for wildlife management. Thoughtful use of prescribed fire also decreases threats to life and property posed by wildfire through active fuels management on wildlife management areas and wildlife conservation easements. The MassWildlife Prescribed Fire Policy was approved by the Fish and Wildlife Board in 2017 and the Prescribed Fire Handbook outlines goals and objectives for the use of prescribed fire on MassWildlife lands (https://www.mass.gov/files/documents/2017/09/20/fire-policy-handbook-4-19-17.pdf).

To ensure personnel are qualified and use safe working practices while participating on prescribed burns, MassWildlife offered several trainings and workshops throughout FY 2022. MassWildlife also worked collaboratively with DCR Bureau of Forest Fire Control and conducted an annual fireline safety refresher in spring of 2022 for over 100 participants including MassWildlife Prescribed Burn Crew, DCR Fire Control and Watershed staff, and numerous volunteers. This refresher was offered virtually with online prework, a virtual live presentation, and followed by fitness and fire shelter practices around the state to ensure COVID-19 protocols were followed in mitigate risk and exposure. Habitat and the NHESP staff served as cadre for this training and facilitated the successful completion of the refresher.

As prescription parameters for weather and fuels improved in the spring 2021, MassWildlife engaged in prescribed fire activities on 15 wildlife management areas. A total of 32 prescribed burns occurred on our wildlife management areas and 1392 acres were treated with prescribed fire from March through June 2021 (Appendix B, **Table B 6**), Prescribed Fires completed by MassWildlife in FY 2021, for more details regarding the schedule of prescribed fires, habitats targeted, and acres burned. Prescribed burns were carefully timed and sequenced with other habitat management activities such as mowing, invasive species control, and forestry operations to maximize the effectiveness of these important treatments, and to reduce fuel loads and potential for extreme fire behavior. Prescribed burns were also carefully planned and timed to meet ecological objectives, avoid impacts to sensitive wildlife and plants, and allow for hunting and seasonal recreational activities occurring at wildlife management areas. In many cases only a

certain percentage of available habitat received prescribed fire treatment to accommodate multiple uses and protect sensitive species. MassWildlife also provided technical prescribed fire assistance to fire management partners including the Mass Department of Conservation and Recreation at Barre Heath, Manuel Correllus State Forest, Myles Standish State Forest, and SE Mass Bioreserve, the National Park Service at Cape Cod National Seashore, the Massachusetts Army National Guard at Camp Edwards, and the US Fish and Wildlife Service at Mashpee National Wildlife Refuge.

Technical Assistance and Coordination to Private Landowners

Marianne Piché and Patrick Conlin

Private Lands Habitat Biologists contracting with NRCS conducted outreach and facilitated management planning and implementation on numerous ownerships. Most projects involved creation of young forest habitat or maintenance of shrubland habitats that support both declining songbirds and game species.

Eighty percent of the land base in Massachusetts is privately owned, and many Massachusetts State Wildlife Action Plan (SWAP) Species occur on these lands. The SWAP identifies habitat restoration and management as a strategy essential to the conservation of these species. The United States Department of Agriculture's Natural Resources Conservation Service (NRCS) provides financial and technical assistance to landowners to address natural resource concerns including wildlife habitat. To ensure that Massachusetts NRCS activities and resources result in maximum benefits to SWAP Species, MassWildlife and NRCS have developed strong partnerships. Because MassWildlife is the state agency responsible for the restoration, conservation, and management of fish and wildlife resources in Massachusetts, and NRCS has financial assistance programs that can enhance wildlife habitat, both agencies benefit.

Under cooperative agreements, MassWildlife provides NRCS with the services of one full-time and one contract Habitat Biologist, who are responsible for preparing site specific habitat management recommendations for NRCS staff to develop conservation plans benefitting State Wildlife Action Plan Species. The full-time Habitat Biologist is responsible for assisting NRCS staff in the development of funding applications for Farm Bill Programs, and the contract Habitat Biologist works under a NRCS Regional Conservation Partnership Programs (RCPP): the Massachusetts Collaborative for Private Forestland RCPP (RCPP-1734). In coordination with other MassWildlife staff, these biologists bring a range of taxonomic, habitat management, and species protection expertise to NRCS. In addition, staff provide guidance and technical assistance to NRCS in the development of programmatic materials specific to habitat management aimed at benefitting State Wildlife Action Plan species and incorporating BioMap2.

Technical Assistance and Outreach Coordination with Other State Agencies

Habitat Program staff also provided direct technical assistance to DCR by reviewing 12 proposed harvesting operations totaling 2,342 acres on state forest lands across Massachusetts in FY 2022 (Appendix B, **Table B 8**). MassWildlife Habitat Program staff advocated for inclusion of young forest openings greater than 2 hectares (approximately 5 acres) to meet the needs of additional young-forest-dependent wildlife species, for retention of young ash trees in salvage and sanitation cuts, and for consideration of barrens and pitch pine-oak woodlands restoration efforts where appropriate.

In FY 2022, the Habitat Program also continued working with representatives from DCR, Ruffed Grouse Society, National Wild Turkey Federation, and Mt. Grace Land Trust on a coordinated outreach program for dynamic forest habitat management aimed at increasing the diversity of age classes and native species in Massachusetts forests, from biologically mature forest stands to regenerating young forest stands.

Upland Game Program

Dave Scarpitti

Wild Turkey

Hunter participation

Hunting participation for wild turkey was quite varied during the 2021-2022 fiscal year. In the fall of 2021, 4,609 fall-only turkey permits (turkey permit purchased after the spring season closed) were issued, a slight decline from the record number of fall permits issued in 2020 (5133). The spring 2022 season saw a decline in the number of turkey permits, approximately 18225 were sold. This was lowest number of turkey permits sold since the beginning on on-line licensing in 2012.

Fall 2020 Harvest

New regulations promulgated during 2020 changed and expanded the structure of the fall season. Now, hunters have a 12 day fall wild turkey hunting season where shotguns and archery equipment were allowed, in addition to either 4 weeks (Zones 1-9) or 6 weeks (Zones 10-13) of additional archery only fall turkey hunting. Previously, the season length was expanded from a 6-day to a 12-day season shotgun/archery season statewide and expanded into WMZ's 10-12 in 2012. A total of 201 wild turkeys were harvested in 2021, which is the 4th highest total since 2004.

There were 96 female and 105 male wild turkeys harvested during the 2021 fall hunting season. The proportion of females harvested in 2021 was slightly lower (47.8%) compared to recent years (53.7% average over past 10 years). However, it is likely that due to the difficulties of sex identification of juvenile turkeys in the fall some hunters may not accurately report the sex for fall harvested turkeys.

Archery hunters (including crossbow under special permit) continued to contribute a significant portion of the total harvest, accounting for a record 62.2% of the total fall harvest. The past 2 fall season are the first to have more turkeys harvested with archery equipment versus shotguns since 1990 when fall turkey hunting began in Massachusetts. A large portion of this archery harvest can likely be attributed to archery deer hunters who are opportunistically harvesting turkeys, and particularly in 2020-2021, when a new expanded archery-only season was created that provided 4-6 extra weeks of archery only fall turkey hunting. Survey data indicates that approximately 50% of fall turkey hunting occurs concurrently with archery deer hunting. The high prevalence of archery harvest during the fall season, and the substantial amount of fall permits issued indicates continued high demand for fall turkey hunting opportunities albeit not to the same level as spring turkey hunting which ranks as the second most popular hunting season in the Commonwealth.

Hunter participation, weather conditions, and food availability may all influence the fall turkey harvest. Overall turkey population size, distribution, and particularly poult production and survival during the preceding summer months are factors that also greatly influence fall wild turkey harvest.

Spring 2022 Harvest

The 4-week spring wild turkey hunting season occurred from April 25 – May 21, 2022. A total of 2,837 wild turkeys were harvested during the regular spring season, nearly equaling the 10-year average spring reported harvest of 2878. The strong spring season harvest occurred despite a greater than 20% decline in turkey permit sales. New regulations introduced during the 2020 season allowed hunters to harvest their season limit of 2 spring birds on the same day, yet despite the change the proportion of hunters who harvested 2 turkeys during the spring season was similar to that in previous years.

Bearded hens perennially account for less than 1% of the total spring wild turkey harvest; 7 hens were reported during the spring season. Approximately 4.52 adult turkeys were harvested per juvenile male turkey which was higher than previous years.

In spring 2021, harvest was highest in Worcester (n = 689), Franklin (n = 438), and Berkshire (n = 365 counties). Suffolk County (4 towns) is nominally within the open zone but is heavily urbanized and many areas are closed to hunting and firearm discharge by local ordinances. Spring turkey hunting season is open for 4 weeks statewide, except for Nantucket which lacks evidence of wild turkeys and is closed to spring turkey hunting.

Spring turkey hunters continue to make use of archery equipment; approximately 6.6% harvested turkeys with archery equipment in 2022; archery hunting for wild turkeys and other big game

continues to be popular particularly in areas of eastern Massachusetts where many towns and properties will only allow archery equipment as an acceptable means of take.

Overall, wild turkey hunting opportunities remain excellent across the state, as the relatively high turkey population statewide continues to offer quality hunting experiences.

2022 Spring Youth Turkey Hunt

The annual mentored youth wild turkey hunt was held on 23 April 2022, on the Saturday immediately preceding the opening date of the spring hunting season. In order to participate, youths (ages 12-17) were required to complete a standardized training program and field exercise (pre-hunt workshop) conducted by participating sportsmen clubs and National Wild Turkey Federation chapters. Online and in-person youth seminars were held in 2022.

An estimated 220 youths received permits for the youth turkey hunt day. Youths harvested a total of 98 turkeys (26 immature male, 71 adult male, 1 bearded hen) on youth day, representing a success rate of approximately 45%. Youth success rates are typically greater than regular spring season hunter success rates that average approximately 15-17%.

Ruffed Grouse Drumming Surveys

In order to assess the statewide/regional abundance of Ruffed Grouse, a spring-time survey to detect their conspicuous drumming sounds is conducted each year by MassWildlife staff. In 2022, 25 drumming survey routes were surveyed across the state. Numerous "constant zero" routes were not surveyed and consist of routes where no grouse had been recorded in 5 consecutive years. All routes were surveyed between April 15 – May 5. All constant zero route occurred in either the Northeast, Southeast, or Central wildlife district. Two types of routes are surveyed, "random" routes are surveys randomly located in suitable habitat across the state, whereas "subjective" routes are ones that are intentionally placed in areas of high-quality habitat.

Overall, the average number of drums heard per stop (ANDS) per route on all random routes statewide has been slightly declining over the past several years; however, in 2022 the ANDS increased slightly to 0.10 (0.07 in 2021). The ANDS per route in the Western District in 2022 decreased slightly to 0.11 (0.14 in 2021) and increased slightly to 0.10 in the Conn. Valley district (0.08 in 2021). ANDS also increased 4x in the Central district to 0.08, up from 0.02 in 2021). Overall, the statewide ANDS increased to 0.10, the highest since 2017.

While the breeding grouse index on random routes increased in 2022, the ANDS on subjective routes completed continued to decline. Subjective route ANDS was 0.13 in 2022, the lowest ever recorded value. Grouse continue to be detected on subjective routes in the Southeast District and anecdotal observations still indicate grouse exist in the Northeast district; grouse are not widespread in these districts but can be locally abundant in areas with suitable habitat. It's possible that subjective routes that have been surveyed for decades are suffering from the eventual decline in habitat quality, particularly in light of increased drumming activity on random routes in 2022. Continued and renewed emphasis on young forest management is critical to the long-term sustainability of grouse populations statewide. Although grouse populations are substantially lower than several decades ago, they remain abundant in heavily forested landscapes of central and western Massachusetts, particularly those areas where natural disturbance and/or forest management results in high quality young forest habitat that is critical to the success of grouse and numerous of species of conservation need.

American Woodcock Singing-Ground Survey

Woodcock singing ground surveys are conducted from April 20– May 10 each year. Routes all are 3.6 miles long and consist of 10 stops that are surveyed each for 2 minutes. Survey routes are sampled approximately 15-22 minutes after sunset within the survey period and must be completed within 38 minutes.

Currently, there are 19 randomized singing-ground survey routes in Massachusetts. Of those 9 were actively surveyed in 2022. The average number of woodcock heard peenting per route (including constant zero routes) in 2022 was 1.42, slightly above the 3 year average (1.29). Overall, woodcock are located statewide, and although most constant zero routes exist in the eastern portion of the state, numerous productive surveys are conducted in other developed landscapes.

The U.S. Fish and Wildlife Service publishes an annual report utilizing data from the Harvest Information Program (HIP) in addition to the Singing Ground Survey. Results from the 2021 report (2022 report not yet available) indicate an increase in woodcock harvest (2,500), hunter numbers (1,600), and days afield (9,000) compared to 2020.

New England Cottontail/Eastern Cottontail

Fecal pellet samples were collected from wild cottontail rabbits on 32 sites across areas of Barnstable, Plymouth, and Berkshire counties From January – April 2022. All areas were surveyed 1-2 times within a 3-week period with 0–20 samples collected per site. Approximately 269 samples were collected in total; results (species identification) of the 2022 winter sampling period are still pending, but overwhelmingly most samples were collected from sites on Cape Cod (>90%), with an abundance of samples also prioritized within the Berkshire County survey area.

Live trapping of rabbits resumed in 2022 and occurred from January 4- 27 with the purpose of contributing founding rabbits for zoo-based husbandry as part of the New England cottontail conservation initiative. Over that time, 22 cottontail rabbits were live-trapped in wooden box traps; 15 New England cottontail, 5 eastern cottontail, and 3 undetermined species were recorded during 306 trap-nights. Of those rabbits, 8 (7 females and 1 male) were transferred to Roger Williams Park Zoo in Providence, Rhode island for inclusion in their captive breeding program.

Waterfowl Program

H W Heusmann

Wood Duck Nest Success Project

Division personnel conducted nest-box checks on 47 of 50 study sites used to monitor wood duck populations across the state. The winter of 2020-21 was relatively mild. Wood ducks and hooded mergansers began nesting earlier than normal with some merganser nest initiated by late March. April was cooler than normal and with periods of rain throughout the month with precipitation on 26 or 30 days, a trend that continued into May.

Overall box usage was 82%, down from 88% last year. However, wood duck success rate was 75% which was better than last year's 68%. Hooded merganser success rate was 70%, below average. There were 249 Wood duck nesting attempts of which 186 were successful and 106 hooded merganser nest starts with 74 hatches in the 434 available boxes. Wood duck use of boxes continues to decline in the western third of the state with most box use being by hooded mergansers.

Canada Goose Population Trends

After suspension of Canada goose banding in 2020 due to COVID 19 pandemic restrictions, goose banding resumed in 2021. Between June 14 and June 30, district and Westborough HQ staff banded 747 geese at 62 sites in 54 municipalities from the Berkshires to Cape Cod. The total included 378 goslings and 369 adults. Also captured were 144 previously banded geese.

Pre-season Waterfowl Banding

The 2021 air-boating season got back to near normal after the COVID 19 restrictions imposed in 2020, such as only one person per vehicle, were relaxed and a 3-person crew could be sent out from Westborough's Field HQ in a single vehicle. However, unlike 2020 when air-boating was limited by drought conditions that meant low water hindered or eliminated some sites, in 2021 record rainfall in July meant high water which flooded roosting cover and thus hindered or eliminated some sites. The start of the season was delayed due to the need to replace both airboat batteries. While we were able to boat on 14 nights between August 5 and September 30, we only captured 426 birds of which 397 were newly banded. The bulk of those were wood ducks (288) followed by mallards (95). See Appendix B, **Table B 9** for details. We also took feather samples for an isotope study being conducted by a researcher at SUNY and blood samples for a genetics study for a researcher at Univ. Texas, El Paso. We also collected oral and cloacal swabs for Avian Influenza sampling in western MA for USDA's APHIS-WS.

Mallard Population Trends

In an effort to band resident mallards, we used a tub net launcher borrowed from USDA APHIS-WS to band ducks at sites where they were used to being fed at 17 sites during 8 days of effort in our Northeast, Southeast, Central, and Connecticut Valley Districts. We captured 124 additional mallards by that method.

Migratory Gamebird Hunting Regulations

During the period of September 1-24, Massachusetts conducted a state-wide resident Canada Goose hunting season, with a daily bag of 15. Duck-hunting seasons in the Atlantic Flyway continued with the liberal option of 60-day seasons and a six-bird bag limit. The Canada Goose season was 60 days with a two-bird daily bag limit in the Central and Coastal waterfowl hunting zones as we have moved into the moderate hunting season package for North Atlantic Population (NAP) geese and a restrictive season of 30 days with a one-bird bag limit in the Berkshire zone for Atlantic Population (AP) geese.

During the period January 15—February 15, 2022, Massachusetts held a late, resident Canada Goose season in the Central Zone while the season ran January 31 – February 15 in the North Coastal Zone with a five-bird daily bag in each zone.

American Black Duck and Mallard GPS Study

Throughout January and February Massachusetts participated in a study using GPS-ACC tracking units on hen American black ducks and hen mallards to monitor movements, timing of migration and nesting efforts and success. Previously, we participated in a pilot study on black ducks last winter, deploying 3 units. This year we were assigned 9 devices for black ducks and 6 for mallards.

All the black duck devises were placed on hens wintering in the Southeast District. Units from hens that experienced winter mortality were retrieved and placed on additional hens. For mallards, one hen from each Wildlife District was marked with the 6th device going on a hen in the Boston Metro area. All the devices functioned and are being tracked by researchers with the University of Saskatchewan.

During the course of the black duck capture efforts, 127 black ducks were banded while 24 previously banded birds handled.

The bulk of postseason banding of wintering concentrated on mallards. Primarily using the tub net launcher, we targeted sites where ducks were being fed by visitors. We made 26 shots at 23 sites with captures ranging from 3 to 63 and averaging 17. In addition, bait traps were used on 4 sites and accounted for 61 banded mallards. In total, 409 mallards, 1 mallard plumaged hybrid, 1 black plumaged hybrid were banded, and 23 previously banded birds captured. Mallards captured in the Connecticut River Watershed and in Berkshire County were swabbed for Avian Influenza testing by APHIS-WS.

Waterfowl Breeding Surveys

The 2022 Northeast Waterfowl Breeding survey was conducted by all 11 Northeastern states from Vermont to Virginia. The survey is of randomly selected 12km plots, primarily by ground. In 2022 1,211 plots were checked with estimates of 487,853 mallards;52,466 black ducks; 423,288 wood ducks; and 1,018,688 Canada geese.

Common Eider Population Trends

We resumed banding of nesting eiders, visiting islands off Cape Ann, Boston Harbor, and Buzzards Bay. Thirty-one hens were banded on Thacher Island NWR plus 1 hen recaptured, 20 new hens and 2 previously banded bird on Calf Island, and 29 new birds plus 11 previously banded hens on Penikese.

Permitting

Massachusetts issues individual egg-addling permits for resident Canada goose control under a federal program begun in March 2007. In 202, we issued 66 such permits. The permittees reported addling 1,459 eggs in 315 nests, while USDA/APHIS Wildlife Services addled 481 eggs in102 nests under their statewide permit.

Atlantic Flyway Council

This year the summer meeting of the Atlantic Flyway Council technical and council meetings was held virtually August 23-26. In addition, the various committees of the Technical Section held virtual meetings in advance of the official meeting because of limited time available at the actual meetings. The winter meeting of the Technical Section was held in Burlington, VT, after a 2-year postponement, August 2-28. The project leader is a member on the Mallard, Black Duck, and Canada goose committees as well as voting representative for Massachusetts.

Black Bear Program

Dave Wattles

Black Bear Distribution and Harvest Investigations

A record of 16,387 bear-hunting permits were issued for the 2021 hunting season. In 2021, 218 bears were taken during the 48-day season, including 112 during the 17-day September segment, 48 during the 18-day November segment, and 58 during the 12-day deer shotgun season segment (Figure W 1 and Figure W 2). One hundred and eleven males, 103 females and 4 unknown bears were taken in Berkshire (n=81), Franklin (n=55), Hampden (n=35), Hampshire (n=28), Worcester (n=18), and Middlesex (n=1) counties. Ninety two percent of bears were reported through the online system in 2021, compared to 97% in 2020, 79% in 2019, 82% in 2018, 70% in 2017, 76% in 2016, 66% in 2015, 74% in 2014, and 69% in 2013; this large increase is likely attributable to the closure of many check stations due to COVID-19 restrictions.

Black Bear Research

MassWildlife continues to monitor collared female black bears as part of a cooperative research project with the Massachusetts Cooperative Fish and Wildlife Research Unit and the University of Massachusetts Amherst. The primary objectives of this research project are as follows: (1) to refine the population model for evaluating population trends of bears in Massachusetts; (2) to document black bear habitat use and movements in a fragmented landscape and to determine the effects of human-associated food sources on bears, (3) to assess the public's attitudes and perceptions of the bear population and bear management options, (4) to develop a comprehensive bear management plan to guide black bear management in Massachusetts. As of June 30, 2022, 16 female bears were being monitored with GPS collars and another 20 females with VHF collars. To date, 80 female bears have been monitored with GPS collars, of which most have been monitored for at least 2 reproductive seasons. Ten females are being monitored with GPS collars

Figure W 1. Historical black bear harvest by season, 1972 to 2021.

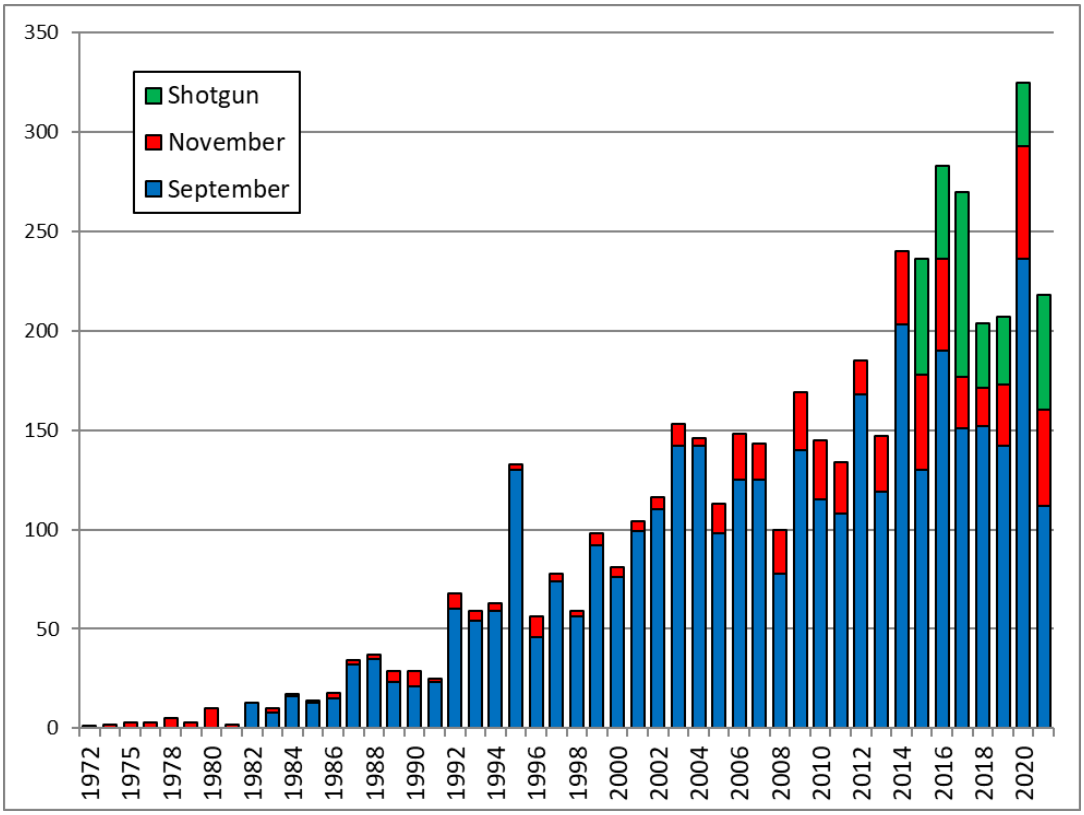
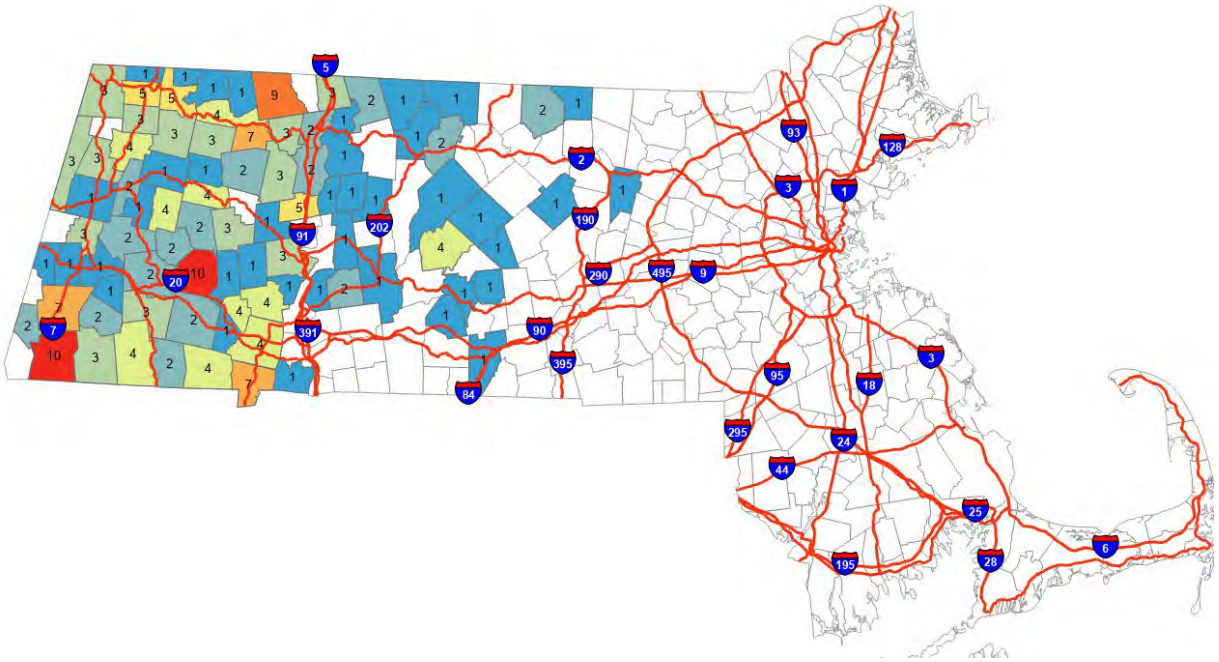


Figure W 2. Distribution of 2021 black bear harvest by town.



for the first time this year. Additionally, 4 male bears have been monitored with GPS collars. In 2017, we began collaring bears in our Western Wildlife Management District. From July 2021 to June 30, 2022, 3 collared females were killed, all three by vehicle collision. MassWildlife monitored cub production/yearling survival at all successful winter dens or through encounters with sows/yearlings. In the winter of 2021-22 MassWildlife successfully captured 26 females during den checks, including 4 two-year-olds, 10 females with yearling cubs, 1 female with no cubs, and 11 females with newborn cubs. Females average 2.54 newborn cubs (1 cub n=1, 2 cubs n=4, 3 cubs n=5, cubs 4 n=1). Sows with yearlings successfully raised 21 of 26 cubs from the previous winter.

Furbearer Program

Dave Wattles

Overview

The Furbearer Program is responsible for the management and research of 14 species of wildlife in the Commonwealth. The group of species called furbearers includes beaver, muskrat, bobcat, eastern coyote, red and gray fox, river otter, fisher, striped skunk, mink, long-tailed and short-tailed weasel, raccoon, and opossum.

Massachusetts' furbearers are abundant and widely distributed throughout the state. The populations of these species are scientifically managed and are secure. None are listed as Threatened or Endangered. The value of the Commonwealth's furbearer resource is very diverse and includes economic, ecological, cultural, biological, aesthetic, and educational opportunities for individuals in the state.

The Furbearer Management Program presents many challenges to wildlife managers in the state and employs various options, including habitat manipulation, public education, and regulated hunting and trapping as tools in the management of these renewable resources. A combination of techniques is used to control problem animals, regulate wildlife populations, reduce habitat degradation, reduce crop and property damage, and allow a sustainable harvest of renewable furbearer resources.

Harvest and Population

Harvest activities provide recreational and economic opportunities for citizens and households in the

state. A total of 1,833 furbearers were tagged at MassWildlife check stations during the 2021-22 season. The harvest (a combination of hunted, trapped, and/or salvaged) of tagged species included 820 beaver, 102 bobcat, 608 coyote, 87 fisher, 31 gray fox, 13 mink, 30 river otter, and 67 red fox. Trapper survey results indicated that a minimum of 55 raccoons, 17 muskrat, 26 skunks, 17 opossum, and 0 weasel were trapped during the 2021-22 season (Appendix B, **Table B 10**).

MassWildlife staff conducted a hunter survey of a random sample of license buyers that provided an email address in 2021. Coyote is the most popular furbearer that is hunted. Nineteen percent of respondents indicated that they hunted coyote, and 37.3% of those respondents specifically targeted coyotes, 5.0% percent of all respondents hunted fox, 4.7% hunted bobcat, 2.2% hunted raccoon, and 0.5% hunted opossum.

Regulated trapping is an important component of wildlife management programs. It is the most feasible and effective method to control furbearer population growth. Regulated trapping conducted by a trained and licensed public is used by state wildlife professionals to regulate wildlife populations and can reduce negative effects associated with high wildlife populations and allow for a sustainable use of a valuable natural resource. Regulated trapping allows residents of the state to reduce the expenses associated with the property damage furbearers cause, which can also in turn reduce the need for residents to pay Problem Animal Control (PAC) Agents.

MassWildlife carefully regulates the harvest of furbearing animals. The Commonwealth has complex laws and regulations that govern the activity of trapping. These include mandatory licensing of trappers and trapper training, restrictions on the size of traps and on types of traps, restricted seasons for trapping and areas for trapping, and mandatory regular checking of traps and tagging of traps to identify the owner.

Wetland/Beaver Management

Between 1996 and 2000, the beaver population tripled as a result of a ban on certain types of traps enacted through a referendum in 1996. Complaints about flooding increased. Typical complaints included flooded septic systems, wells, roads, driveways, and railroad tracks. In July 2000, the Massachusetts Legislature passed, and the Governor signed, a new law that modified the restrictions on beaver and muskrat traps to provide relief for people suffering from flooding impacts caused by beaver or muskrat. An emergency permitting system was created at the town level with certain non-emergency permits for specific traps available from MassWildlife.

Licensed trappers tagged 820 trapped beaver during the 2021-22 trapping season, of which 266 were reported as taken under emergency permits. PAC Agents reported taking 186 beaver outside the trapping season (April 15, 2021 - October 31, 2021) and 110 beaver during the trapping season under emergency permit that were not tagged. Licensed trappers reported through the voluntary trapper survey that 480 beaver were taken under the local Board of Health 10-day Emergency Permit, which includes beaver taken outside the season (n=391) and only beaver taken during the season that were not sealed at a MassWildlife check station (n=27). In total, a minimum of 577 beaver were taken outside of the trapping season as nuisance animals (there is an unknown amount of overlap between the PAC and trapper survey respondents). A minimum of 1.042 beaver were taken under emergency permits (either inside or outside the trapping season) for which conibear traps are legal to use and are the preferred trap type for beaver trapping.

Public education, regulated harvest, and the installation of flow devices are major components of beaver management in Massachusetts. MassWildlife management goals for beaver include managing beaver for their wetland values, regulating beaver populations within available habitat, and minimizing economic damage to public and private property by beaver.

Furbearer Depredation and Damage

MassWildlife personnel responded to complaints about furbearer species causing the loss of domestic livestock and pets. Specific furbearer species causing concern are eastern coyotes, red foxes, gray foxes, fishers, raccoons, and skunks. (See also the “Human-Wildlife Conflict Trends Project” section, below.)

Deer Management Program

Martin Feehan

The statewide 2020 harvest of 14,757 is a new record Massachusetts deer harvest, breaking the record set in 2018. This was a 6% increase over the 2017-2019 average harvest (Figure W 3).

There were new records set during the archery and primitive seasons. The shotgun season did increase over 2019 but is within the stabilized range that has existed since 2009, with the exception of 2018. The recent high harvests can be attributed to rising deer numbers and the influence of increased archery harvests in eastern zones. We have kept antlerless deer permits at a low level for over 10 years in zones 1-8 to allow deer numbers to slowly rise, which they have. We are now making adjustments in many of these zones to increase antlerless deer permits to stabilize deer numbers, leading to higher harvests. Additionally, we have been issuing an increasing number of antlerless deer permits in zones 9-14 to slow the deer population growth, which is mostly caused by lack of hunting access in much of this range (Figure W 3).

Currently, the deer population statewide is estimated to be over 100,000 deer. Density estimates (from harvest data, so estimates only apply to lands that are hunted) range from 12-18 deer per square mile of forest in western and central Massachusetts to over 40 deer per square mile on the islands of Martha's Vineyard and Nantucket and in many suburban Boston areas. Areas with little to no hunting access anywhere in the state can see deer numbers above our estimates.

As in previous years, the Antlerless Deer Permit (ADP) system required a hunter to have an antlerless deer permit to harvest an antlerless deer in any deer season. The ADP system regulates female harvest across all Wildlife Management Zones (WMZ; Figure W 4). Overall, we are close to our deer density management range of 12-18 deer per square mile of forest in the western and central parts of the state (Figure 19). Conversely, deer densities in the eastern part of the state are still above our management range, so antlerless permit allocations have remained high in an effort to increase the harvest of females. However, challenges still remain in eastern Massachusetts because of the lack of hunter-access, which limits our ability to reduce deer numbers.

Figure W 3. Total 2020 white-tailed deer harvest by season and year in Massachusetts.

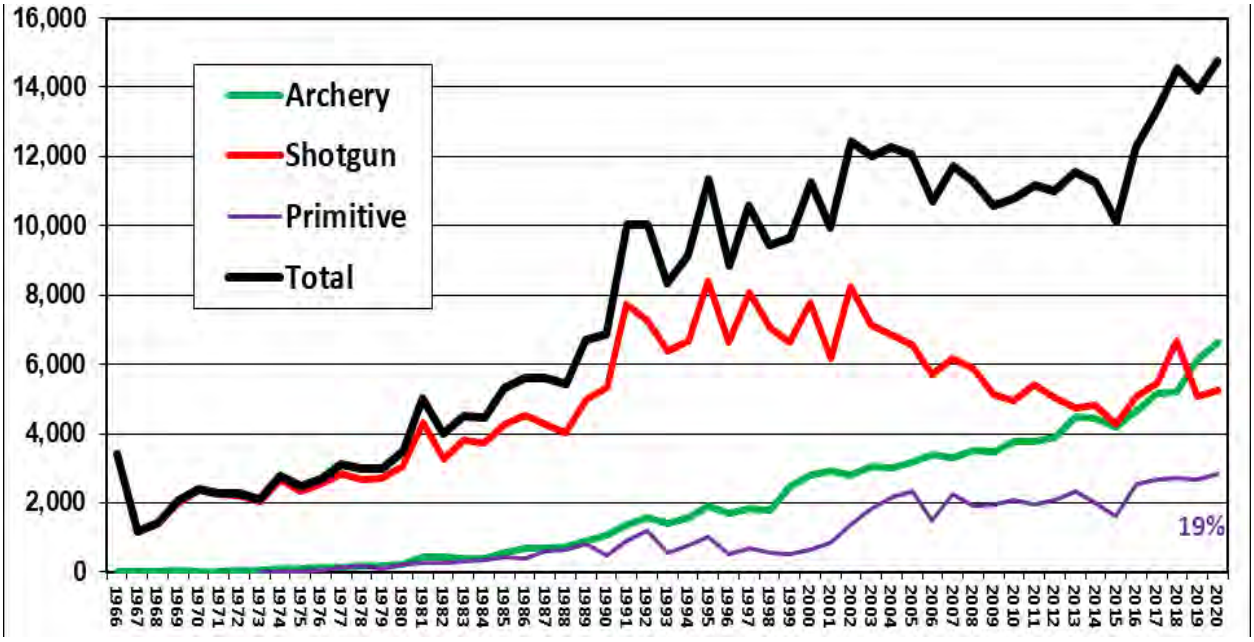


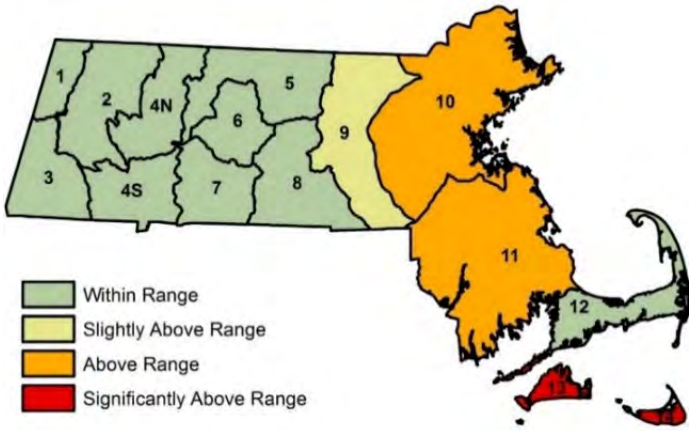
Table W 1. The 2019 white-tailed deer harvest by season and sex/age class in Massachusetts, including Quabbin harvest.

Season	Adult Male	Female	Button Buck	Total	Percent Harvest
Paraplegic/Youth	51	64	16	131	1%
Archery	4,415	1,855	394	6,664	45%
Shotgun	2,791	1,871	462	5,124	35%
Primitive	1,246	1,322	270	2,838	19%
State	8,503	5,112	1,142	14,757	100%

The ADP allocation for 2020 was 47,300 permits. However, only 44,783 permits (95% of allocated) were purchased/issued (Appendix B, **Table B 11**). We determined that the new online system (which started in 2012) and the free convenient way of applying for an antlerless deer permit led to more hunters applying and fewer returning to purchase than in previous years. Prior to 2012, we were typically issuing above 95% of the allocated permits in most zones. The solution adopted, beginning in 2014, was to adjust the antlerless permit allocation model to compensate for the significant proportion of applicants that do not come back to purchase and the under-harvest associated with the permit under-issuance. However, this adjustment can also mean selling slightly more than the allocation if more hunters than expected return to purchase the permits.

Map depicting how the current deer densities (from harvest data, which is only applicable to hunted areas) relate to the desired management range of 12-18 deer per square mile of forest for the 15 Wildlife Management Zones in Massachusetts. The statewide deer management goal is to keep deer densities below the level where major impacts are seen to the habitat, but in balance with social desires and tolerance. (Figure W 4).

Figure W 4. Current deer densities



Research

We assisted with a multi-university collaboration focusing on managing suburban wilds and impacts of urban deer. The research team includes staff from Boston University, University of Wisconsin, Colorado State University, and Texas A&M. During FY 2021, the primary contribution of MassWildlife was assisting with contact information for stakeholders and permitting for field work.

Chronic Wasting Disease

MassWildlife applied for funding from USDA APHIS to study perceptions and knowledge about CWD among Massachusetts deer-ungulate stakeholders. We were successful in being awarded funds for this research, which will be a focus of the next fiscal year.

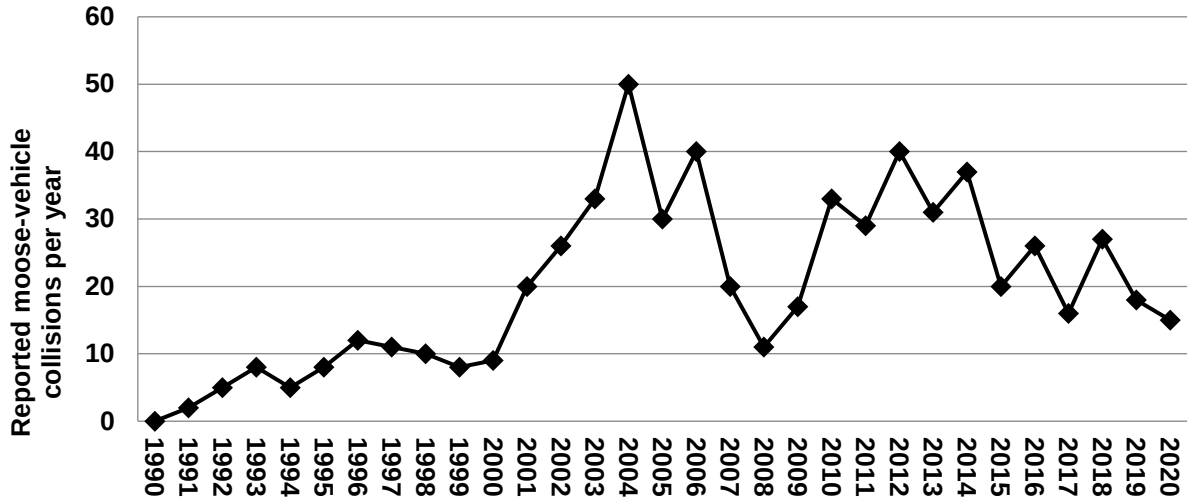
Moose Program

Martin Feehan

Traditionally, MassWildlife has collected reported data of moose-vehicle accidents (MVA). In 2020, 15 MVAs were reported. However, MVAs are not always reported to MassWildlife or to the Massachusetts Environmental Police; thus, these reports make up an unknown fraction of the actual human-moose interactions that occur in the state. For example, many are discovered indirectly through newspaper reports or verbally from staff that drove by a dead moose along the road. Further, caution must be used when looking at the number of collisions reported from year to year because

reporting rates can vary from year to year depending on many factors, e.g., in Figure W 5, the reporting rate was likely low in 2007-2009. Nonetheless, these indices can be useful for biologists to use, along with other population trends, to monitor moose relative abundance and trends in Massachusetts.

Figure W 5. Total moose-vehicle accidents reported per year from 1980 to 2020 in Massachusetts.



The number of reports per town can be useful when making decisions about areas to focus on with signage on highways (Figure W 6). Starting in 2015, we worked with MassDOT to have large variable-message boards placed along the road in many of the moose-vehicle collision hotspots during the months of September and October, when moose activity spikes related to breeding. This action may have reduced the number of collisions independent of moose population trends. The 2020 total of 15 MVAs was the lowest since 2008 when reporting was likely lower. This decrease is consistent with trends seen since 2015, but it may be further impacted by the COVID-19 pandemic. Lower vehicle traffic during shutdown periods likely lowered the chances for MVAs. Reporting rates may also have been impacted by the pandemic.

The current moose population in Massachusetts is estimated to be around 1,000 animals. We have used a basic population model that incorporates standardized sighting rates from an annual deer hunter survey (we ask a random sample of deer hunters how many moose sightings they had per hour of deer hunting) and available moose habitat in the 12 WMZs that we feel have the potential for moose (we exclude Cape Cod and the Islands in our estimate as they do not represent potential moose habitat).

Additionally, the observation data from our hunter surveys can be used to map general moose distribution across the state (Figure W 7). The two maps, Figure W 6 and Figure W 7, were created from completely independent sources of information, yet show very similar spatial trends, thus providing more confidence in these methods.

For Figure W 7, it should be noted that the 2018 or 2019 moose sighting data by town from the hunter survey had not been mapped at time of publication, but trends are similar.

Figure W 6. Total moose-vehicle accidents reported by town from 1980 to 2019 in Massachusetts.

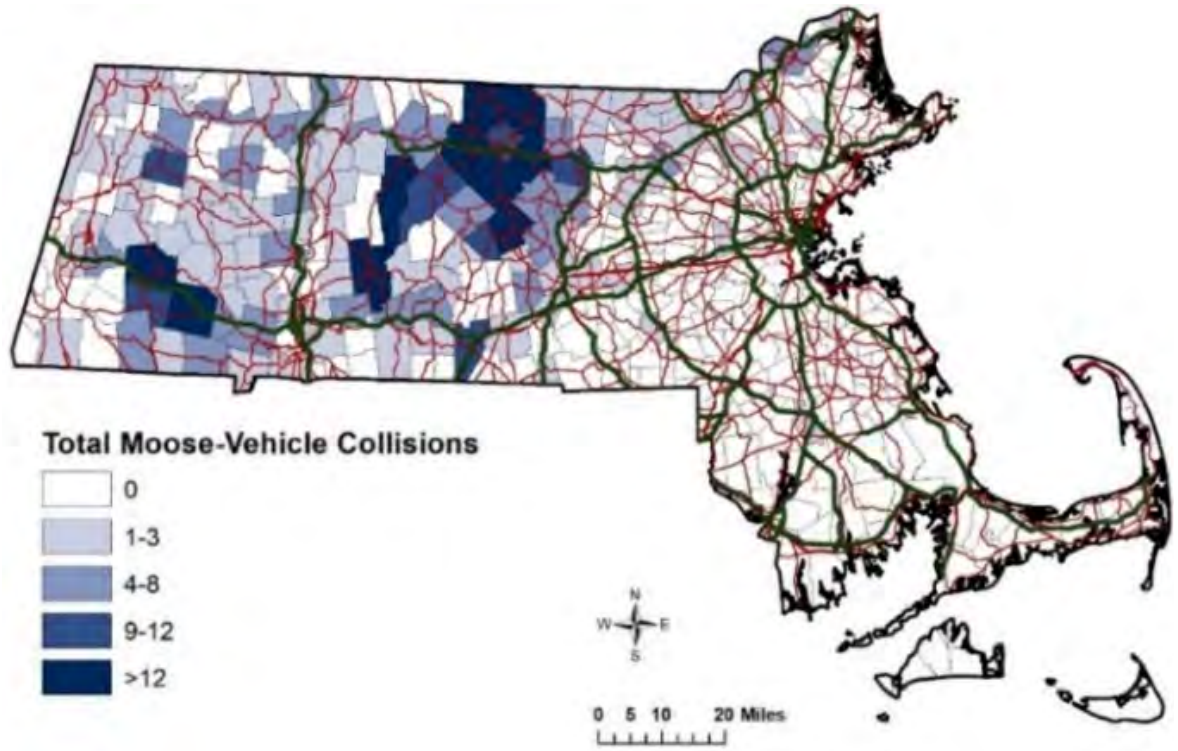
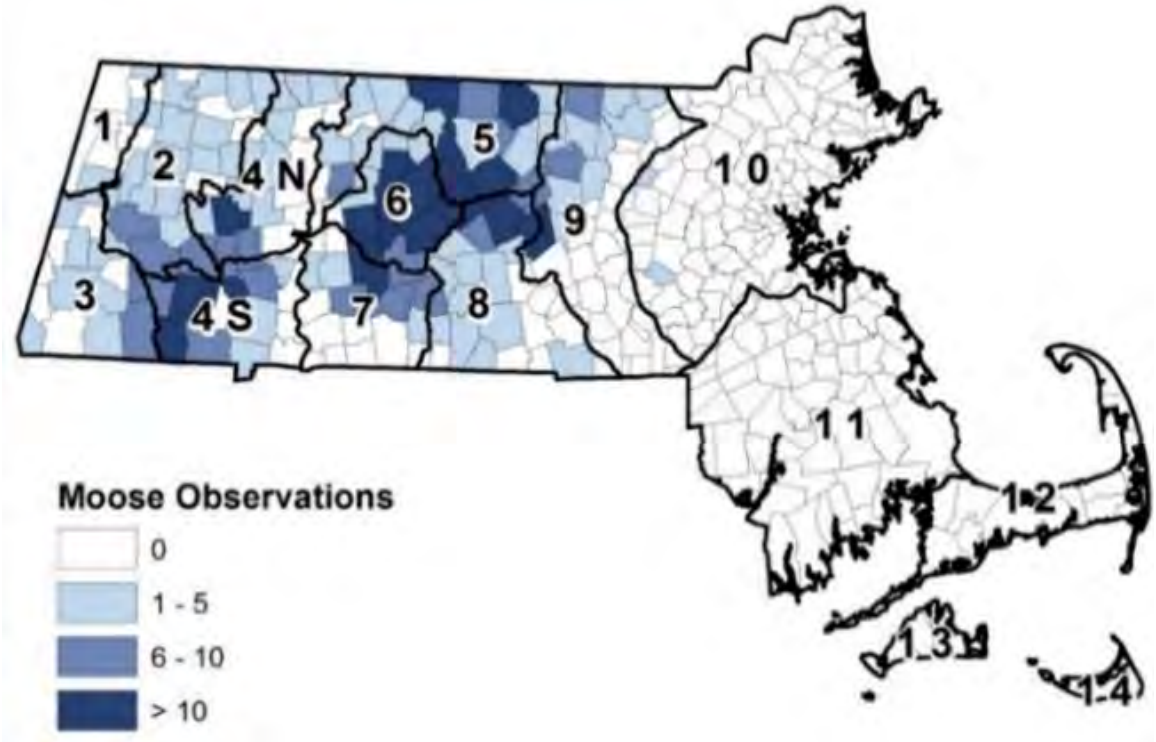


Figure W 7. Observations of moose by town reported in the 2017 hunter survey in Massachusetts.



The Human-Wildlife Conflict Trends Project

Susan McCarthy

Overview

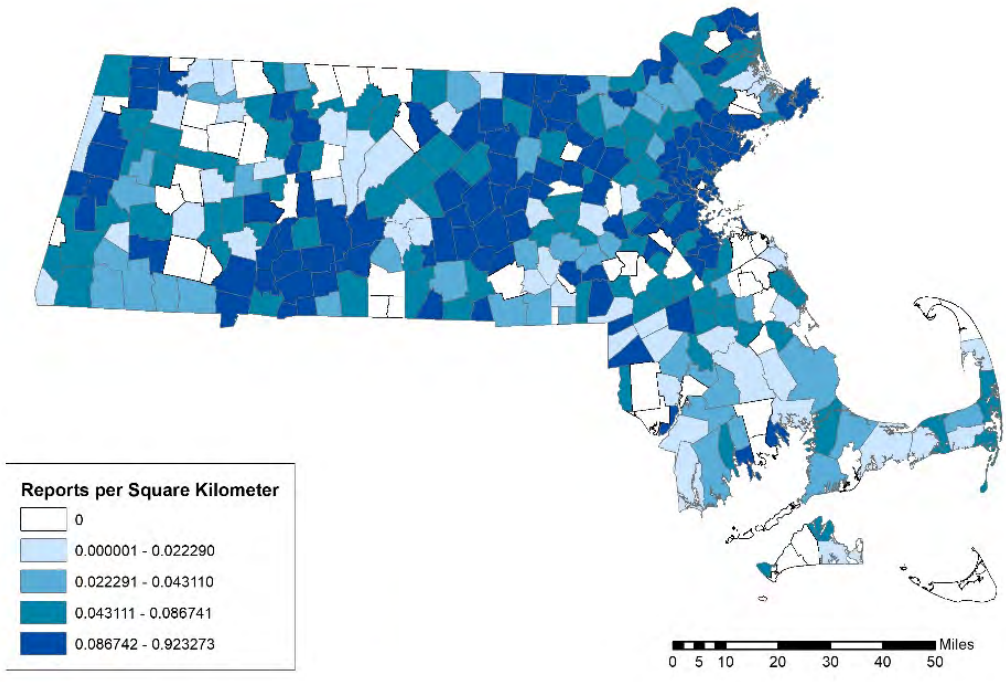
Animal report data are collected at MassWildlife offices via the Massachusetts Division of Fisheries and Wildlife Animal Report Form. The data collected include date, species, town, and report type (sick or injured animal, aggressive animal, property damage, depredation, etc.). Reports come in the form of phone calls and emails from the general public. Reports are recorded as given by the individual, therefore, are not considered accurate with regards to species identification or the circumstances of the incident. In other words, the data collected are meant to represent the public's perception of a conflict or interaction with wildlife.

In 2015, a new online data collection system was developed to emphasize the importance of rigorous data collection. This data collection system allows us to better categorize reports by providing the collector with a set of standard report types from which to choose. We are also able to collect data on the type of concern associated with the report. This system has made data collection and data entry more efficient by requiring the collector to subjectively interpret and categorize the report type. Additionally, we have emphasized the importance of collecting data for all reports regardless of species, location, report, or concern.

Summaries include, but are not limited to, graphs displaying differences in volume of report type, concern type, species, and season. Maps are developed using Massachusetts Geographic Information Systems (MassGIS) to geographically display the distribution of reports by type and species. These summaries are meant to provide Field Headquarters and district biologists with information to assist them when providing advice and management options to the general public regarding human-wildlife interactions and conflicts.

The purpose of this study is to produce information that can be used to develop proactive management strategies effective at resolving human-wildlife interactions and, more specifically, human-wildlife conflicts. This is accomplished by analyzing wildlife report data, generated through unsolicited phone calls and emails from the public received at each of the six MassWildlife offices regarding a variety of wildlife-related issues.

Figure W 8. Total Reports of Human-Wildlife Interactions per Square Kilometer for FY 2022.



Summaries

Human-wildlife interactions were recorded in 294 of 351 towns across Massachusetts, amounting to 1,642 total reports submitted during the fiscal year (Figure W 8). Ninety-nine percent of records (1,637) contained one or more species (7 reports contained more than one species recorded), 99% (1,638) contained a report type, 91% (1,500) contained a concern type other than "no concern," and 95% (1,567) contained a town.

We received reports of 55 different species, of which 12 made up 80% of all reports (Figure W 9). We received more reports in June (310 1;9%) than any other month followed by May (201; 12%), July (195, 12%), and August (189, 12%; Figure W 10). Of the 1638 reports containing a report type, the highest number of reports were animal sightings and/or requests for general information (1353, 82%), the second highest number of reports were of wildlife using and/or damaging property (859, 52%), and the least number of reports were those regarding public safety (87, 5%). Reports regarding threats to public safety included: wildlife approaching humans and/or pets on a leash, aggression toward humans, and human attacks. Of the 87 reports of threats to public safety, twelve were reported as a human attack involving bear (1), birds of prey (2), coyote (7), fox (1), and wild turkey (1). It is important to note that these data represent the reporters' perception of an "attack" and that physical contact and resulting injuries sustained by people were not confirmed or documented by MassWildlife staff.

Figure W 9. Top 12 species that were reported to MassWildlife offices as being involved in human-wildlife interactions in Massachusetts between July 1, 2021, and June 30, 2022.

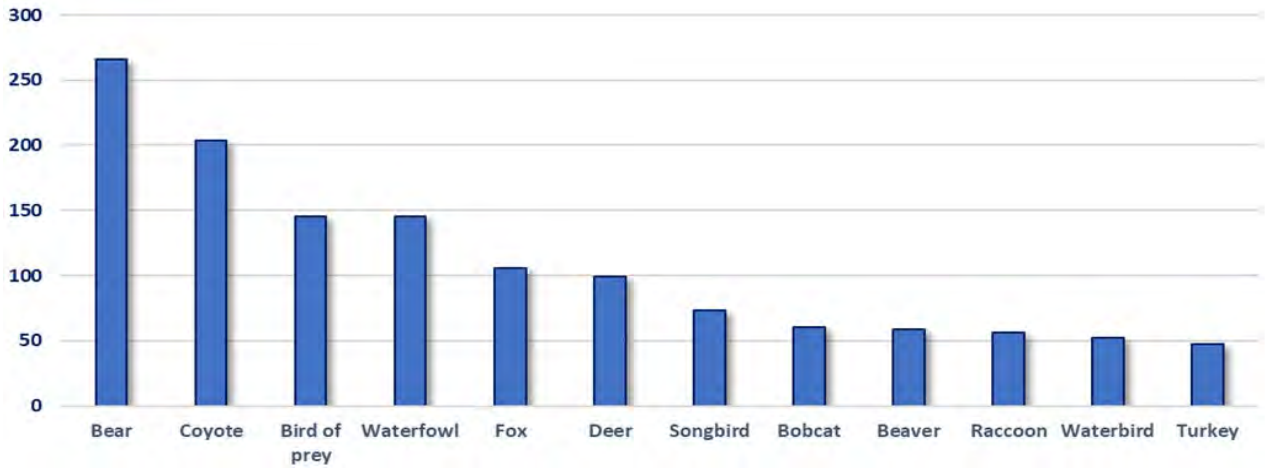


Figure W 10. Total reports of human-wildlife interactions by month in Massachusetts between July 1, 2021, and June 30, 2022.

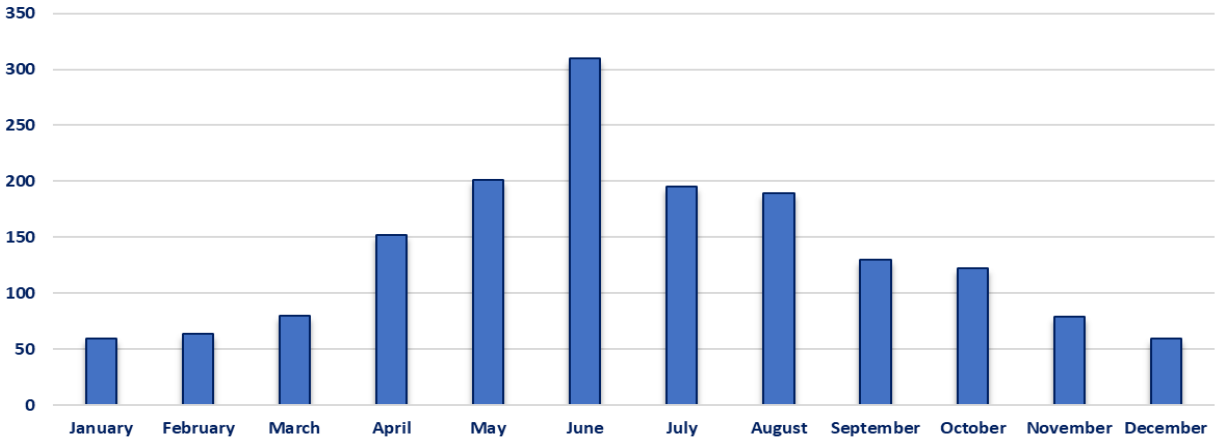
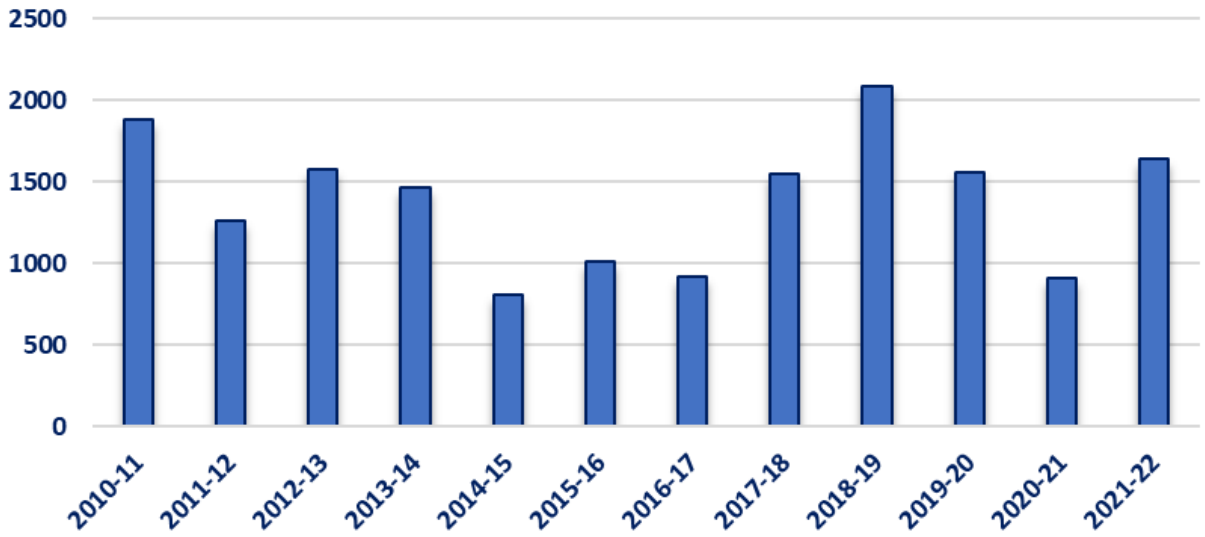


Figure W 11. Total reports of human-wildlife interactions, 2010 to 2022.



Conclusion

Summarizing reports of interactions gives us the power to better inform both the public and MassWildlife biologists. Summary information can also be used to detect trends in interactions both spatially and temporally. Total report density across towns has remained relatively consistent over time. In general, major metropolitan areas (Pittsfield, Springfield, Worcester, Fitchburg, and Boston) tend to report more interactions between humans and wildlife than do more rural settings.

We can, at the very least, use these data and these results to attempt to predict the occurrence of human-wildlife interactions on both a temporal and spatial scale. Beyond that, we can advise the use of proactive education and intervention at specific times of year and in key areas of the state where a high volume of human-wildlife interactions is likely to occur. Specifically, we will utilize summaries of past years' data to inform I&E staff about the type(s) of interactions the public should expect. I&E staff can then proactively provide information to the public on the species they can expect to interact with at specific times of year in certain areas of the state. Staff can further proactively educate the public on animal behavior (breeding seasons, feeding preferences, activity cycles, etc.) based on our ability to predict the timing of influxes of specific reports of interactions. It is likely that many of the negative interactions between humans and wildlife reported to our agency are accurate portrayals. That said, it is equally as likely that many of those interactions can be prevented through educating the public on what to expect and how to prevent the interaction (e.g., blocking off denning sites, eliminating food sources, and securing pets).

Ornithology

Andrew Vitz

Kestrel Research and Management

The DFW and partners continued the American Kestrel project that was initiated in 2013 in hopes of reversing their rapid decline in the state. Kestrels nest across Massachusetts and are most common in the Connecticut River Valley and other regions with extensive agriculture or open habitats. The focus of the project is to promote breeding productivity by deploying and monitoring nest boxes to document breeding success. Collaborators on this project have increased kestrel nesting opportunities by deploying nest boxes and include the Massachusetts Audubon Society, Keeping Company with Kestrels, Kestrel Land Trust, MA Department of Transportation, MA Department of Conservation and Recreation, The Trustees of Reservation, Essex County Ornithological Club, East Quabbin Land Trust, Grafton Land Trust, The 300 Committee, the University of Massachusetts, Green Berkshires, private land owners, and dedicated volunteers.

In May-June of 2022, MassWildlife and partners collected data on kestrel box occupancy and nesting success. In the Connecticut River Valley, the Kestrel Land Trust (KLT) monitors numerous nest boxes. Of the boxes they maintain and monitor, 11/24 (38%) were occupied by nesting kestrels. Of these, 9 pairs (82% of occupied boxes) successfully fledged kestrel chicks, and 42 chicks were banded prior to fledging, which is the second highest total for their program. This represented a good year for the KLT kestrel box program that was initiated in 2013. Kestrels also seemed to have a good nesting season in central Massachusetts where at least 14 nest boxes were used with a minimum of 11 producing kestrel fledglings. These boxes were managed by MassWildlife, East Quabbin Land Trust, DCR, Grafton Land Trust, and private landowners. In southeastern Massachusetts, Keeping Company with Kestrels reported 9 occupied kestrel boxes, producing 28 fledglings that were banded. Additionally, at least 2 boxes were used by nesting kestrels in wildlife management areas in our Southeast District. There are numerous other kestrels that nest in areas of Massachusetts that we do not regularly monitor, including birds that nest in our urban landscapes.

In addition to documenting nesting productivity by monitoring boxes and banding young, we deployed radio-transmitters on 14 kestrels (12 adults, 2 independent juveniles) to document movement patterns and survivorship throughout the annual cycle. These radio-transmitters, manufactured by Cellular Tracking Technologies, are designed to communicate with Motus tracking stations that are deployed throughout North America to automatically detected animals when flying within approximately 15 kilometers from the station. All detections will be made available to use through our Motus account, and we will record any detections to learn about their migration pathways and wintering locations.

Kestrels remain a species of conservation concern, and we will continue to work with partners towards conserving this species by maintain, installing, and monitoring nest boxes in suitable nesting habitat and banding young, when possible, to support population tracking. Additionally, as part of a multi-state Competitive State Wildlife Grant, we will continue to deploy tracking units on kestrels in 2023 to better understand their survival and movements to inform state-wide and regional conservation efforts for the species.

Motus Receiving Station Network Project

The Massachusetts Division of Fisheries and Wildlife is a partner agency on a Competitive State Wildlife Grant to deploy and maintain a network of inland Motus receiving stations throughout New England. New Hampshire is the lead state on the project with the New Hampshire Audubon Society being the lead organization working with New Hampshire Fish and Game. The goal of the project is to establish 50 strategically sited inland automated telemetry receiver stations in Maine, New Hampshire, Vermont, New York, Massachusetts, Connecticut, and Rhode Island. This project will close a major geographic gap in the current Motus Wildlife Tracking System (motus.org) and complement the partner effort undertaken in the mid-Atlantic states under a separate Competitive State Wildlife Grant.

After reviewing numerous possible locations for Motus stations, the team selected sites based on geography, access, and permissions to deploy a station. In total, 10 sites were selected to host a Motus receiving station in Massachusetts. Of these, six have been deployed (locations confirmed for 2 others), and each station includes a receiver (SensorStation, Cellular Tracking Technologies) and a small tower with up to eight directional antennas pointed at different angles to detect the two types of radio frequencies used on small animals (e.g., birds, bats, insects). When a transmitter is detected, data is automatically updated to the internet over the cellular network where biologists and the public can view at least some of the results. All data are made available to the project leaders and those managing a given station. The three stations in Massachusetts that were deployed in 2021 all registered detections of radio-tagged birds during the year. These stations detected 2 American Kestrels, 2 Blackpoll Warblers, 2 Bobolink, 2 Red Knot, 1 Rusty Blackbird, 6 Swainson's Thrush, 2 Bank Swallow, 2 Least Sandpiper, 1 Semipalmated Sandpiper, and 3 White-throated Sparrow. All deployed stations are incorporated into the Motus Tracking Network and are available for use by any biologist (e.g., agency, academic, nonprofit biologists) by deploying the appropriate radio-transmitters on animals and registering the transmitters in the Motus system.

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4 Natural Heritage and Endangered Species Program

Eve Schlüter, Ph.D., Assistant Director of Natural Heritage and Endangered Species

Overview

MassWildlife's Natural Heritage and Endangered Species Program (NHESP) conserves and protects the most vulnerable native animal and plant species of Massachusetts and the habitats upon which they depend.

NHESP currently has a total of 26 staff members distributed primarily among three sections: Conservation Science, Information Management, and Regulatory Review. Conservation Science staff are responsible for determining the abundance and distribution of rare species in Massachusetts through field inventories and biological research and the planning and implementation of conservation efforts for rare species and their habitats. The Information Management Staff are responsible for the development and management of biological data in the NHESP's expansive tabular and spatial databases. The Regulatory Review staff assesses the potential impacts of proposed projects or activities to federally- and state-listed species and their habitats and provides guidance on avoidance, minimization, and mitigation measures.

The NHESP's highest priority is protecting the native species that are listed as Endangered, Threatened, or of Special Concern in Massachusetts pursuant to the Massachusetts Endangered Species Act (MESA; M.G.L. c. 131A) and its implementing regulations (321 CMR 10.00).

Changes to the Massachusetts List of Endangered, Threatened, and Special Concern Species

The Massachusetts Endangered Species Act ("MESA," M.G.L. c. 131A) and its implementing regulations (321 CMR 10.00) require review and updating of the List of Endangered (E), Threatened (T), and Special Concern (SC) Species ("the MESA list," 321 CMR 10.90) at least once every five years. In recent years, the MESA list has been updated approximately every four years. There are three main categories of change: (1) listing (addition of a species to the list); (2) delisting (removal of a species from the list); and (3) change in listing status of a species on the list (SC ↔ T ↔ E). Needed changes are proposed on a species-by-species basis. The process leading to an update of the MESA list involves many steps and takes up to two years to complete. The list change process, and associated information, are detailed in the document titled, "Listing Endangered Species in Massachusetts: The Basis, Criteria, and Procedure for Listing Endangered, Threatened, and Special Concern Species," available at: https://www.mass.gov/files/documents/2016/08/qd/listing-criteria.pdf

The most recent update to the MESA list occurred with official publication on January 10, 2020. This update was the culmination of the most recent comprehensive review of the MESA list, which began in November 2017.

The current comprehensive review of the MESA list will begin in September 2022. Completion of review and update of the MESA list (official publication) is anticipated to occur in April 2024.

Linking Landscapes for Massachusetts Wildlife

In 2008, MassWildlife and the NHESP entered into an interagency service agreement (ISA) with the Massachusetts Department of Transportation (MassDOT), Highway Division, to improve the efficiency of state-level environmental project review. This nationally recognized model of cooperation between state agencies has resulted in faster reviews, cost savings, and protection of endangered species and their habitats. As part of the ISA, both agencies agreed to pursue proactive projects to reduce wildlife-vehicle collisions and improve public safety where feasible. Transportation infrastructure affects wildlife through direct mortality due to vehicle collisions and by

fragmenting and degrading habitats. In addition, vehicle collisions with wildlife often result in property damage and sometimes personal injury.

In conjunction with the University of Massachusetts (UMass) Amherst, the agencies launched Linking Landscapes for Massachusetts Wildlife (LLMW), a long-term and multifaceted volunteer-based monitoring program and planning collaboration to be implemented throughout the state. Utilizing expertise from various state departments, along with collaboration with the public, LLMW's objectives are to 1) reduce wildlife-vehicle collisions and improve public safety; 2) enhance, protect, and restore habitats impacted by roads; 3) control invasive species along road rights-of-ways; 4) incorporate conservation priorities into transportation planning; and 5) implement wildlife and transportation related research.

In 2010, four research projects were developed to collect information through volunteer participation designed to gather information on wildlife mortality along roadways. Three separate databases available on the LLMW website serve as a central location for compiling observations of vernal pool amphibians during spring migration, turtle crossing hotspots, and all other species of wildlife. LLMW has also coordinated a monitoring program for freshwater turtle mortality associated with the nesting season. From 2010 to the end of FY 2022, over 520 volunteers participated in these projects. They documented over 6,450 mortalities (representing 82 species) at 2,301 locations throughout the state, including mortality for nine currently and formerly state-listed salamander and turtle species.

In FY 2022, LLMW installed improved crossing structures and wildlife barriers to enhance public safety and protect endangered species; implemented invasive species control and habitat restoration at hotspots for biodiversity; engaged with community organizations; installed nesting structures for cliff swallows, a declining species; installed and monitored nine Peregrine Falcon (a state-listed species) nest boxes on bridges; and maintained an interactive website. Finally, MassWildlife collaborated with MassDOT Highway Division on the development of design specifications to improve aquatic and terrestrial connectivity at stream crossing structures. Besides improving landscape connectivity, it will support a resilient transportation network.

Birds

Piping Plover; Federally Threatened

Observers reported breeding pairs of Piping Plovers (*Charadrius melodus*) present at 188 sites; 158 additional sites were surveyed at least once, but no breeding pairs were detected at them. The population increased 21.7% relative to 2020. The Index Count (statewide census conducted 1-9 June) was 948 pairs, and the Adjusted Total Count (estimated total number of breeding pairs statewide for the entire 2021 breeding season) was 967 pairs. A total of 1,017 chicks were reported fledged in 2021, for an overall productivity of 1.06 fledglings per pair, based on data from 99.3% of pairs.

American Oystercatcher (Haematopus palliates)

MassWildlife coordinated annual monitoring and protection efforts for American Oystercatchers conducted by a coastwide network of cooperators. Approximately 199 sites were surveyed during May and early June 2021. Preliminary results indicate that Massachusetts supported an estimated 184 breeding pairs of oystercatchers in 2021.

Terns, Laughing Gulls, and Black Skimmers

Cooperators in Massachusetts surveyed approximately 140 coastal sites in 2021 for the presence of breeding Roseate Terns (*Sterna dougallii*), Common Terns (*Sterna hirundo*), Arctic Terns (*Sterna paradisaea*), Least Terns (*Sternula antillarum*), Laughing Gulls (*Larus atricilla*), and Black Skimmers (*Rhynchops niger*). Compilation of final census results is still underway. Preliminary tallies include: Roseate Terns, 3,146 pairs; Arctic Terns, 1.5 pairs; Least Terns, 5,122 pairs; and Black Skimmers, 19 pairs. Common Terns and Laughing Gulls in the largest colony were not counted, so no meaningful abundance estimates are available.

Buzzards Bay Tern Restoration Project

In 2021, numbers of Common and Roseate terns increased substantially (40 – 70%) on both Bird and Ram Islands. Common Terns numbered 3,148 pairs on Bird and 4,080 pairs on Ram, records for both sites. Roseate Terns numbered 1,773 pairs on Bird and 1,318 on Ram, the second-highest numbers on record for both sites. Common Tern productivity was

0.16 and 0.34 fledglings/nest at Bird and Ram, respectively, reflecting very poor food availability. For Roseate Terns, productivity was lower than average at 0.93 and 0.95, respectively. On Penikese Island, Common Terns were stable at 1,507 pairs. Roseate Terns decreased to 3 pairs. One pair of Arctic Terns nested, and a single unpaired adult was active in the colony. For Common Terns, hatching success was 52%, fledging success was 23%, and productivity was 0.38 fledglings/pair; nesting success was limited by heavy predation by gulls and Black-crowned Night Herons. Roseate Tern hatching success was 40%, fledging success was 100%, and productivity was 0.80 fledglings/pair. An estimated 1,080 pairs of Herring Gulls and 218 pairs of Great Black-backed Gulls nested. Mean clutch size for Herring Gulls was 2.5 eggs/nest and apparent hatching success was 83.3%. Mean clutch size for Great Black-backed Gulls was 2.75 eggs/nest and apparent hatching success was 87.3%. Twelve pairs of Great Egrets, 33 pairs of Snowy Egrets, four pairs of Glossy Ibis, 274 pairs of Double-crested Cormorants, 168 pairs of Common Eiders, five pairs of American Oystercatchers, and one pair of Leach's Storm-petrels nested. No nesting Black-crowned Night Herons were detected.

Common Loon (Gavia immer)

State-wide monitoring of nesting loons was a collaborative effort among staff at MassWildlife, Massachusetts Department of Conservation and Recreation (DCR), and Biodiversity Research Institute (BRI). Prior to the nesting season, MassWildlife staff deployed a nesting raft at Cleveland Brook Reservoir (Dalton). Rafts also were deployed at the Quabbin and Wachusett Reservoirs (DCR staff), the Pine Hill Reservoir (Worcester Watershed staff), and the Assawompset Pond Complex (APC) in Lakeville (BRI staff). Surveys were conducted at waterbodies throughout the state suitable for loon nesting to determine if they were being used by loons during the breeding period. Sites were surveyed by a single observer by walking the shoreline and/or by kayak. When a loon was sighted, time was spent watching the bird through binoculars and/or a spotting scope to try and identify the bird by reading any color bands. Once territorial loons were identified, the birds were monitored to locate nests and determine nesting and fledging success.

During the 2021 nesting season, MassWildlife staff and collaborators surveyed 137 waterbodies for nesting loons. In total, 51 territorial pairs of loons were documented on 26 waterbodies. Three pairs were observed in the southeast portion of the state and three pairs, including one nesting pair, were recorded in western Massachusetts (Berkshire County). The remaining 45 pairs (88%) were in the region extending from Concord to Springfield. Of the total number of territorial pairs, 30 of them (59%) attempted nesting, which is a little lower than average. Number of nesting attempts was particularly low in the Quabbin Reservoir where density-dependent factors are thought to be interrupting loon nesting behavior. For the entire state population, reproductive success was relatively low (0.29 chicks surviving/territorial pair) and below the level thought to support a sustainable population (0.48). Productivity was higher on the non-DCR waterbodies with lower loon densities (0.43 successful chicks/territorial pair) compared to the high loon densities on DCR waterbodies (0.18 successful chicks/pair). Chick survival was high with 68% (15/22) of those hatching surviving to fledging.

Much of the loon population in the state nest on the Quabbin (22 territorial pairs) and Wachusett Reservoirs (five territorial pairs), and these birds are monitored by DCR staff. Nests were documented for 12/22 pairs on the Quabbin, and these nests produced three hatchlings with one surviving to fledging. Nesting productivity was better on the Wachusett Reservoir withfive5 territorial pairs producing five nests, six hatchlings, and four fledglings. MassWildlife and BRI staff monitored loon pairs on waterbodies not managed by DCR and primarily located on lakes, ponds, and reservoirs in central Massachusetts. Of these, nesting was documented at 12 sites, producing at least 13 hatchlings and 10 fledglings.

As part of the restoration efforts supported by the Bouchard 120 Oil Spill Settlement Fund, BRI partnered with MassWildlife to continue their loon translocation project in Massachusetts. In 2021, BRI translocated a total of 11 Common Loon chicks from Maine to southeastern Massachusetts. Chicks were translocated at approximately 6-11 weeks of age. Of the 11 translocated chicks, four were reared in aquatic enclosures for 15-21 days before being released and seven older chicks were directly released onto waterbodies in southeastern Massachusetts.

Bald Eagle (Haliaeetus leucocephalus)

The 2021 Spring Nesting Eagle Survey took place on April 9, when agency staff and volunteers checked known eagle territories and explored areas with potential eagle habitat to verify continued use of "old" eagle nests and try to locate "new" nests. The elevated effort on this day helps with the increasingly difficult effort to monitor the state's growing numbers of breeding Bald Eagles and provides much of the information that we gather on the numbers of nesting Bald Eagles in Massachusetts. In addition to the single day count, information on nesting eagles is gathered opportunistically throughout the year. Any reports of nesting eagles are investigated by MassWildlife staff to document new nesting pairs. When possible, these nests are monitored throughout the breeding season and staff band chicks in the nest.

During the summer of 2021, there were 78 known territorial pairs of Bald Eagles in Massachusetts. The highest concentrations of nesting eagles were along the Connecticut River (16 territories) and Quabbin Reservoir (>8 territories). The total number of nests on the Quabbin Reservoir was likely low due to a reduced monitoring effort in that area. The Merrimack River, Westfield River, and the Assawompset Pond Complex also had multiple pairs of nesting eagles, and single nests were reported from numerous waterbodies throughout the state. New nests were documented in Harvard, Shutesbury, Deerfield, Beverly, and Wareham. In total, at least 36 successful nests fledged a minimum of 66 eagle chicks. Due to the pandemic and the increasing eagle population, the agency decided to reduce the eagle monitoring effort this year, and many pairs were not monitored throughout the season. Therefore, 14 known eagle territories from prior years were never visited to determine activity, 38 known active nests had unknown fates, and only 18 nestlings were banded with a USGS federal band and a field readable state color band uniquely identifying each individual.

This is the 33rd year that Bald Eagles have raised young in Massachusetts since their restoration. During these 33 years, at least 942 wild-born chicks are known to have fledged, along with an additional eight chicks that were captive-born and fostered into wild nests and another 18 that were captive-born and directly released.

Peregrine Falcon (Falco peregrinus)

Peregrine Falcons use the same nesting sites for many years and known falcon nests are monitored during the nesting period. MassWildlife also follows up on reports of new nesting locations to verify these observations. Additionally, MassWildlife coordinates a volunteer network of Peregrine Falcon monitors who assist with population monitoring of this species in Massachusetts. When possible, MassWildlife staff band chicks in the nests.

Nesting Peregrine Falcons continue to increase in Massachusetts. Although the majority of nest sites are now on artificial structures (e.g., buildings, bridges), there are several at quarries and an increasing number of historic cliff sites are now being used for nesting.

During the 2021-2022 nesting season (July 1, 2021-June 30, 2022), 43 total pairs likely nested, but another 19 pairs were not confirmed, and six confirmed pairs were not monitored closely enough to know their outcome. At least 33 pairs laid eggs (eight pairs failed), 25 pairs (76%) are known to have hatched eggs and all 25 pairs fledged at least one chick (totaling 68 fledged chicks). Forty chicks (23 males, 17 females) were banded from 15 nests (60% of known successful nests). Five chicks, one of which was banded, are known to have died near the nest site shortly after fledging. These include chicks from Westfield, Winthrop, and Russell. This is the 36th year that Peregrine Falcons have raised young in Massachusetts since their restoration. During these 36 years, at least 1,006 wild-born chicks are known to have fledged.

Eastern Whip-poor-will (Antrostomus vociferus)

MassWildlife staff and collaborators at the Worcester Polytechnic Institute (WPI) analyzed data from a multi-year study (2018-2020) examining the migratory and wintering ground movement patterns of the Eastern Whip-poor-will. Specifically, data from 31 miniature GPS loggers (Lotek, Pinpoint) that had been deployed on Eastern Whip-poor-wills were analyzed. Data from these tags revealed that Massachusetts nesting Eastern Whip-poor-wills had a broad wintering range extending from South Carolina to Guatemala. However, most of the birds spent the winter on small territories (~5 acres) in the mountainous region of central Mexico. For their territories, the birds selected forested areas and

avoided places with extensive agriculture. These results were published in the scientific journal Avian Conservation and Ecology. As for migration patterns, all birds that spent the winter south of the United States border (all but two birds) took a land-based route around the Gulf of Mexico rather than flying over the large waterbody. This highlighted the Texas coast as being a migratory hotspot for the Eastern Whip-poor-will as it is for other migrant birds. On average, birds departed the nesting area in mid-September and arrived on the winter grounds in early November. This is the first study in the Northeast to link breeding and wintering populations of Eastern Whip-poor-will, and this information will facilitate strategies for developing full annual-cycle conservation plans for the species.

The statewide nightjar survey project based on the Nightjar Survey Network's protocol continued into its 11th consecutive year. Approximately 21 (still awaiting some reports) routes were run in 2022. Surveys once again took place in all the Massachusetts core Eastern Whip-poor-will areas (Correllus SF, Montague Plains, Joint Base Cape Cod, Myles Standish State Forest), as well as many important secondary sites. Unlike past years, few Chuck-wills-widow were detected, and as usual, no detection of Common Nighthawk occurred anywhere in the state. The information gathered from these routes is being used to inform regulatory, habitat management, and general conservation decisions.

Reptiles and Amphibians

Northern, Red-bellied Cooter; Federally Endangered

MassWildlife biologists continued to manage and supervise a headstart program for the Northern Red-bellied Cooter (Pseudemys rubriventris), which is restricted to portions of Plymouth and Bristol Counties in southeastern Massachusetts and has been federally-listed as Endangered since 1980. It is now clear that the headstart program, which has run continuously since 1984–1985, has stabilized the species' populations in the Commonwealth. For the past five years, the headstart program has been authorized by a recovery subpermit from the U.S. Fish and Wildlife Service (USFWS). In anticipation of the subpermit's expiration, MassWildlife applied for a new recovery permit in June 2022. MassWildlife biologists worked with landowners in Lakeville and Plymouth to protect nests at known residential nesting areas, and distributed the hatchlings to participating institutions, schools, and individuals to care for during the 2021–2022 winter season. Here we report the key statistics from the 2021–2022 headstart season as well as the 2022 nesting season.

2022 Headstart Release

Throughout the early summer nesting season in June 2022, MassWildlife worked with landowner partners in Lakeville and Plymouth to identify and protect nests of Northern Red-bellied Cooter. Eighteen nests were protected at a residential nesting area in Lakeville, and nine nests were protected at one residential site in Plymouth. State Herpetologist Mike Jones worked closely with both landowners to review appropriate protocols for nest protection. Wire cages were placed over the nests to protect them and prevent predation by red foxes, coyotes, raccoons, and skunks. Beginning in August, nests were checked daily to evaluate the emergence of hatchlings. Hatchlings were brought to MassWildlife where they were prepared for transport to headstarting facilities. Hatchlings were transported to 14 headstarting facilities in September 2021, where they remained until May 2022. During the headstarting period, turtles were raised by partners following a standardized protocol.

Species Status Assessment (SSA)

MassWildlife's State Herpetologist assisted the USFWS in the completion of a Species Status Assessment (SSA) for the Northern Red-bellied Cooter. The SSA team consisted of biologists from MassWildlife, and several sections of the USFWS, including the Massasoit National Wildlife Refuge, New England Field Office, Ecological Services program, and the New Jersey Field Office. The SSA was published by the USFWS became publicly available in November 2021 (U.S Fish and Wildlife Service 2021; www.fws.gov/node/267654).

Bog Turtle; Federally Threatened

The Bog Turtle (Glyptemys muhlenbergii) is the most imperiled freshwater turtle in New England and has been federally-listed as Threatened in the northern part of its range (Massachusetts, New York, Connecticut, New Jersey, Delaware, Pennsylvania, and Maryland) since 1997. The Bog Turtle remains

one of MassWildlife's highest-priority focal species. In 2021 and 2022, MassWildlife expanded a significant new study of this species in partnership with the Cooperative Fish and Wildlife Research Unit (CRU) at UMass Amherst. A Master of Science student, Julia Vineyard, completed a second year of distributional surveys, population assessments, and radiotelemetry of approximately 20 adult Bog Turtles at two sites for a fourth year throughout 2021 and she continued tracking these turtles into the summer of 2022. Additionally, a new contract with biologist John Garrison was initiated to assess the habitat use and abundance of Bog Turtles in the context of ongoing habitat management. Six promising areas of suitable fen habitat were visually searched and/or trapped to locate new populations, but none were found. At present, Bog Turtles are known only from two disparate areas in the state and are of critical concern.

MassWildlife staff continued to work with state wildlife agencies in Pennsylvania, New Jersey, Connecticut, and New York to implement the regional conservation plan for the Bog Turtle with funding from the Competitive State Wildlife Grant (CSWG) program. The focus in the next two years will be on distributional surveys to locate new populations, intensive radiotelemetry to determine Bog Turtles' response to habitat management, and their use of new fen areas. This CSWG-funded effort will end in 2022.

Wood Turtle (Glyptemys insculpta)

The Wood Turtle has been extirpated from many areas in eastern Massachusetts in recent decades. It is a Regional Species of Greatest Conservation Need (RSGCN) and is petitioned for federal listing. The 13 northeastern States have been working together to conserve this species for about 11 years, supported by two CSWGs and three Regional Conservation Needs (RCN) grants. Having completed a Conservation Plan for the species from Maine to Virginia in 2018 (Jones et al. 2018), MassWildlife is serving as the lead state on a CSWG to implement the regional Conservation Plan. Eight partner state agencies in the Northeastern United States are partnering in this initiative. MassWildlife biologists also continued to co-chair the RCN "Turtles" program, which included a Wood Turtle-focused effort led by Lori Erb, former MassWildlife Turtle Conservation Biologist, to implement portions of the 2018 Conservation Plan. In this context, MassWildlife's State Herpetologist contributed to the completion of a new book, Biology and Conservation of the Wood Turtle, which was electronically published by the Northeast Association of Fish and Wildlife Agencies in December 2021. In May 2022, MassWildlife also established a contract with H. Patrick Roberts to conduct population analyses and surveys and to plan a symposium for the species in 2023. This ongoing partnership resulted in two significant publications on the status of the Wood Turtle in 2022 (Roberts et al. 2022; Willey et al. 2022a).

MassWildlife staff worked with staff from Zoo New England to study, restore, and manage impaired Wood Turtle populations in the several basins of eastern Massachusetts. As part of this project, 20 adult Wood Turtles were radiotracked in Middlesex and Essex Counties to locate and protect nests. More than 50 headstarted Wood Turtles were released into occupied stream basins to augment the local populations and were radiotracked.

Eastern Box Turtle (Terrapene carolina)

MassWildlife staff continue to assist with the implementation of an enhanced offsite mitigation program for the Eastern Box Turtle statewide. MassWildlife's State Herpetologist and Chief of Regulatory Review worked throughout the year with partners from The Nature Conservancy to coordinate habitat conservation for the Eastern Box Turtle using mitigation funds for offsite conservation established through MESA Conservation and Management Permits.

Spotted Turtle (Clemmys guttata)

MassWildlife completed a three-year CSWG with Virginia and other states from Maine to Florida. MassWildlife State Herpetologist co-edited a regional Conservation Plan for the species (Willey et al. 2022b). MassWildlife coordinated additional field sampling for the Spotted Turtle in Dukes, Essex, and Barnstable Counties, with a major emphasis on islands in Dukes County.

Finally, MassWildlife biologists assisted with the organization and planning of a range-wide genetic study and conservation plan for the species and collected additional samples from these three counties to support the regional effort.

Northern Diamondback Terrapin (Malaclemys terrapin)

MassWildlife's State Herpetologist worked with UMass Ph.D. candidate Patricia Levasseur and others to convene a working group of Massachusetts terrapin researchers and managers and continued to coordinate and standardize key methodology elements of terrapin monitoring in Cape Cod, to Buzzards Bay, to the Taunton Watershed, the three primary areas of terrapin occurrence in Massachusetts. Partners have converged on a standardized approach to PIT-tagging and are field-testing standardized and quantitative population assessment techniques first established in Wellfleet. To date, more than 1,000 terrapins have been PIT tagged in Massachusetts by MassAudubon, UMass Amherst, MassWildlife, Bristol County Agricultural High School, and New England Coastal Wildlife Alliance. A graduate study by Patricia Levasseur was expanded to a Ph.D. at UMass Amherst with the support of funds established through MESA Conservation and Management Permits. Levasseur's work with MassWildlife's State Herpetologist and others was published in the Journal of Herpetology (Levasseur et al. 2022).

Timber Rattlesnake (Crotalus horridus)

Massachusetts' rattlesnakes have dwindled to five isolated populations, several of which appear to be declining. MassWildlife continues to coordinate necessary conservation actions, such as trail closures, signage, and outreach, through three regional working groups in Berkshire County, Connecticut Valley, and the Blue Hills. MassWildlife also coordinates three "response" teams, similar to groups in Vermont and Connecticut, to assist landowners in these regions relocate rattlesnakes from yards. Additionally in early 2022, MassWildlife initiated population studies through contracts with Oxbow Associates, James Condon, and Tom Tyning in the Connecticut Valley and eastern Massachusetts to evaluate size, demography, and trend of remaining rattlesnake populations.

Copperhead (Agkistrodon contortrix)

In early 2022, MassWildlife initiated population studies through contracts with Oxbow Associates and Tom Tyning to evaluate size, demography, and trend of remaining copperhead populations in eastern Massachusetts and the Connecticut Valley.

Eastern Spadefoot (Scaphiopus holbrookii)

With the help of partners and volunteer monitors, MassWildlife continued implementation of Year 6 of a statewide monitoring plan for Eastern Spadefoot during July–October 2021. Although widespread drought had occurred during the preceding spring, many substantial rain events occurred during the summer, including remnant tropical systems associated with named storms Elsa (July 9), Henri (August 21), and Ida (September 1). Spadefoot breeding activity was detected at numerous sites across the state in July (Southwick, Westfield, East Longmeadow/Wilbraham, Sunderland, Wayland, Plum Island), at two sites in August (Plum Island, Rehoboth), and at one site in September (Rehoboth – the second such breeding event at that site). Some breeding events were undoubtedly missed due to incomplete monitoring coverage. Notably, the first-ever breeding efforts at the Southwick Wildlife Management Area were documented following egg, tadpole, and metamorph introductions there in 2017–2019. There was a single, distinct breeding effort at each of two pools at the site – one on July 2, the other on July 9. The first event produced at least several thousand tadpoles and scores (likely hundreds) of metamorphs. The second event involved ≥30 adults and produced tadpoles, but survival to metamorphosis was unable to be confirmed (predation by a heron was a suspected factor). The Sunderland event is also noteworthy, as it marked discovery of a breeding site not known previously. Remote surveys (via a programmed audio recorder) detected at least 4–5 calling males there. Based on timing of rain events and observations of pool hydrology at several sites, monitors either confirmed or presumed successful reproduction for most (if not all) July breeding events. The two breeding events at the Rehoboth site produced limited numbers of metamorphs. Most tadpoles from the early August event perished during pool drawdown to critical levels before rains refilled the pool sufficiently to sustain remaining survivors. At least 100 tadpoles from the September event had developed forelimb buds by the end of the month, but some of approximately 50 remaining tadpoles observed on October 5 appeared to be symptomatic for disease (ranavirus suspected).

The statewide monitoring plan was extended to a "Year 7" during April–June 2022, but the season was marked by another spring drought. Breeding was not detected at any of the usual native populations monitored; breeding pools at most sites were dry by

mid-May. The introduced population at Mass Audubon's Ashumet Holly Wildlife Sanctuary (Falmouth) did engage in a small breeding effort June 9, but most of the approximately 40 egg masses observed appeared to be inviable, according to Mass Audubon staff. They later reported several hundred tadpoles and suspected (but were unable to confirm) that some survived to metamorphosis prior to the pool drying a little over two weeks following egg deposition. No breeding events were documented (or reported) elsewhere during the period.

Marbled Salamander (Ambystoma opacum)

It is presumed that Marbled Salamanders had a challenging and, therefore, relatively weak breeding season in summer 2021. Frequent and heavy rains filled or saturated wetland basins at many sites before the peak breeding period in early September, as observed during preliminary surveys the last several days of August in Mansfield, Swansea, and Fall River, and as implied by flooded Eastern Spadefoot pools the last 10 days of August through mid-September across much of the state. An adult male was observed migrating toward a breeding wetland in Dartmouth during the heavy rains of Tropical Storm Ida the night of September 1. Subsequent larval surveys at known sites detected Marbled Salamanders in zero of three wetlands in Mendon (October), three of 10 wetlands in South Hadley (December), and one of four wetlands in Fall River (April). No additional surveys were conducted the remainder of the fiscal year.

Jefferson Salamander and Blue-spotted Salamander Complex (A. laterale)

MassWildlife continued its annual, exploratory surveys for pure populations of Blue-spotted Salamander in northern Bristol County. This year's effort focused on a population in Plympton to (a) identify its primary breeding habitat and (b) improve understanding of its geographic extent. The site was trapped widely and intensively the last week of February through the third week of March 2022, documenting salamander use of cattail and sedge marshes along two riparian corridors. Interestingly (but consistent with results from other sites in the region), the species was not detected in nearby vernal pools. In Bristol County, and perhaps elsewhere in the Commonwealth, Blue-spotted Salamander appears to prefer riparian marshes over vernal pools for breeding when both habitats are available. The Plympton survey confirmed a substantial population spanning a relatively extensive area of unbroken habitat, signifying perhaps the second most important population of Blue-spotted Salamander in the state, and warranting immediate land-protection efforts.

MassWildlife also conducted routine egg-mass surveys during April and early May 2022 to renew occurrence records, follow up on leads, and improve knowledge of breeding wetland distribution for Jefferson Salamander and Blue-spotted Salamander. Visiting scores of wetlands, egg masses of the salamander complex were documented at 20 wetlands among nine sites in the towns of Danvers, Hawley, Northborough, Plainfield, Sudbury, Wayland, Westfield, and Westford; 13 of those wetlands were previously undocumented breeding areas. The species complex was not detected at the scores of wetlands surveyed among 11 other sites in the towns of Boxford, Concord, Dunstable, Groton, Lexington, Lincoln, North Andover, Wayland, and Westborough (though an adult Blue-spotted Salamander was found beneath a log at the Westborough site). A three-day trapping effort near the end of March failed to detect a predicted population in Grafton. Road surveys at two nearby sites in Grafton failed to confirm continued existence of previously known populations.

Terrestrial Invertebrates

Survey of Historic Element Occurrences

In 2021, field surveys at the sites below (and others) were conducted with the primary goal of updating historic "element occurrences" ("EOs," or local populations). The Massachusetts Endangered Species Act ("MESA," M.G.L. c. 131A) and its implementing regulations (321 CMR 10.00) consider EOs without an observation documenting the presence of a listed species during the past 25 years to be "historic," and therefore not subject to regulation under the MESA. Therefore, it is important to re-document species presence (if indeed still present) at historic or soon to-be historic EOs. In addition to regulation under MESA, updating of historic EOs keeps the NHESP database current, thus enabling: (1) evaluation of species status statewide, informing needed changes to the MESA list; (2) conservation planning efforts such as the BioMap; and (3) informed land protection and habitat management efforts at particular sites.

Bolton Flats Wildlife Management Area (WMA)

The "Pine Hill" section of Bolton Flats WMA, adjacent to the southeast side of Fort Devens in Lancaster and Bolton, consists of rare inland pitch pine scrub oak barrens and sandplain grassland habitat for a suite of state-listed terrestrial invertebrates, birds, and other taxa listed under MESA. These habitats at Pine Hill are a priority for ongoing habitat restoration and management by MassWildlife.

State-listed terrestrial invertebrates at the Pine Hill section of Bolton Flats WMA include: (1) Purple Tiger Beetle (Cicindela purpurea, SC); (2) Scrub Euchlaena Moth (Euchlaena madusaria, SC); (3) Twilight Moth (Lycia rachelae, E); (4) Pink Sallow Moth (Psectraglaea carnosa, SC); (5) Pine Barrens Speranza Moth (Speranza exonerata, SC); and (6) the Pine Barrens Zanclognatha Moth (Zanclognatha martha, SC). Purple Tiger Beetle was last documented in 2020. In 2021, both the Scrub Euchlaena Moth and the Pine Barrens Zanclognatha Moth were found for the first time in 29 years (both last documented in 1992). Neither the Pine Barrens Speranza Moth (last documented in 1992) nor the Pink Sallow Moth (last documented in 1993) were found in 2021; both will be targeted again during surveys in 2022. The Twilight Moth was last documented in 2002 and is a survey priority prior to 2027.

Hentz's Red-bellied Tiger Beetle (Cicindela rufiventris hentzii) at Blue Hills State Reservation

Hentz's Red-bellied Tiger Beetle (Cicindela rufiventris hentzii, T) had not been documented at Blue Hills State Reservation since 1991 (30 years). In 2021, this population was redocumented, with eight beetles observed in the western part of the Reservation in Canton and Milton, and an additional six beetles observed in the eastern part of the Reservation in Quincy (not seen there since 1988, 33 years).

Bog Elfin (Callophrys lanoraieensis) at Blood Swamp

The Bog Elfin butterfly (Callophrys lanoraieensis) is listed as Threatened in Massachusetts, with only three known populations in the state. In 2017, Blood Swamp in Rutland was resurveyed since the Bog Elfin had not been documented since its initial discovery there in 2001. Not only was the Bog Elfin not found at Blood Swamp in 2017, but it was discovered that its larval host plant, Black Spruce (Picea mariana) had experienced near complete (>99%) mortality at this site. Based on the condition of the dead trees, subsequent examination of aerial photos taken between 2001 and 2014, and later discovery of beaver dam remains along the stream draining the swamp, it was concluded that the Black Spruce mortality at Blood Swamp was likely the result of severe (deep and long term) flooding by beaver between 2008 and 2013. Blood Swamp was resurveyed in 2021, but the Bog Elfin was not found, and no significant recovery of Black Spruce was observed.

Acadian Hairstreak butterfly (Satyrium acadica) Surveys

The Acadian Hairstreak butterfly (Satyrium acadica), never a common species in Massachusetts, has been declining in recent decades and is under review for potential listing under MESA. To inform this review, Garry Kessler (in consultation with Mike Nelson, NHESP Invertebrate Zoologist) coordinated a volunteer survey effort by 19 members of the Massachusetts Butterfly Club (MBC). Forty-five sites in 32 town across the state were surveyed in 2021 by MBC members. Most of the sites surveyed were formerly known to be inhabited by the Acadian Hairstreak, but new sites with suitable habitat were also surveyed. The Acadian Hairstreak was found at only two of the 45 sites, suggesting that it may no longer occur at a most of its former sites. Surveys will be conducted again in 2022 to account for annual fluctuations in population size and resulting probability of detection.

Northeastern Beach Tiger Beetle (Cicindela dorsalis) Monitoring

The Northeastern Beach Tiger Beetle is state-listed as Endangered, in addition to its listing as Threatened under the federal Endangered Species Act. Population monitoring of this species on Martha's Vineyard was conducted in 2019, but not in 2020 or 2021. Monitoring is planned to resume in 2022.

Puritan Tiger Beetle (Cicindela puritana) Cooperative Recovery Initiative

The Cooperative Recovery Initiative (CRI) for the state Endangered and federally Threatened Puritan Tiger Beetle is led by the USFWS. Threats to the single population in Massachusetts, inhabiting Rainbow Beach on the Connecticut River, include adverse, artificial hydrology over the past decade, as

well as loss of beach habitat to vegetation encroachment. Summer counts of adult beetles at Rainbow Beach remain low, and persistence of the population of Puritan Tiger Beetle at this site seems unlikely unless adverse hydrology (frequency and extent of beach inundation due to daily dam releases from late June through early September) is attenuated. Nevertheless, in 2021 the additional threat of excessive growth of vegetation at Rainbow Beach was mitigated by vegetation control efforts by NHESP staff (Chris Buelow and Daniel Bove), in consultation with Chris Davis and Neil Kapitulik (contract biologists for the CRI) and Mike Nelson (NHESP Invertebrate Zoologist).

Plants

During the 2021 field season, the State Botanist and Plant Conservation Biologist searched for, discovered, or verified over 335 plant population occurrences. A new system, called the Heritage Hub, was put in place for processing incoming records from other parties. Using the new platform, 1,390 rare plant observations were processed through the new platform, with 1,379 Accepted, six were kept as Leads as they couldn't be confirmed, and six were Not Accepted.

During an aquatic survey, the State Botanist found and collected a new species native to the state, autumn water-starwort (Callitriche hermaphroditica). For a small state that has been thoroughly botanized for three centuries by many of the nation's leading botanists, new species discoveries are not expected and are quite valuable and important in assessing rare species distribution. In addition, the State Botanist relocated a population of livid sedge, Carex livida, that had not been seen in 38 years.

Significant finds this year by other botanists in the state include three new populations of a species ranked as State Historical Willdenow's Sedge, Carex willdenowii, last verified in the state in 1897. All were found in appropriate habitats for this species which suggests these populations will remain viable and that more may yet be discovered.

Other important discoveries include:

- Pink pyrola, (Pyrola asarifolia) was discovered in a new and strong population after 38 years since the last known observation, part of which occurs on one of our WMAs.
- Southern twayblade, Neottia bifolia, also on one of our WMAs. This rare and diminutive orchid had only been known from Martha's Vineyard. This is the first ever mainland record, only the third in all of New England, and is likely the largest population in New England.
- Four new populations of three federally listed species were discovered during this field season and are listed below. To have four new populations discovered in one year is very significant and unusual.

The following actions were accomplished for the four federally listed plants:

Sandplain Gerardia (Agalinis acuta); Federally Endangered

Population censuses or sampling procedures were conducted at nine sites, four locations on Martha's Vineyard and five on Cape Cod. The census in Barnstable is an organized count, with a large group of volunteers using transects and quadrats, resulting in a count of 18,277plants, down from previous counts. A brand-new population of Agalinis was located on Martha's Vineyard by two local botanists and consisted of about 140 plants. It is on protected land and will be counted again in the next report.

Small Whorled Pogonia (Isotria medeoloides); Federally Threatened

The numbers at the previously known sites were similar to those in past years. Surveys are being conducted at nine locations. A brand-new population in a new town in western Massachusetts was discovered during this field season and consisted of four plants. This expands the known statewide range of Massachusetts' populations.

Northeastern Bulrush (Scirpus ancistrochaetus); Federally Endangered

Two new populations of this species were located in Hampshire County. One had only a few plants but the second one had 40 mature plants.

American Chaffseed (Schwalbea americana); Federally Endangered

The one large population is holding steady. It was censused with a group of volunteers using transects, resulting in a count of over 11,500 stems, approximately half in bloom.

General Habitat Management Projects

The Program continued its emphasis on habitat management projects for rare plants during 2021. Rare plant populations were monitored where actions had been completed in the past, with little change in the populations, but at least no declines were observed in populations.

A large forestry thinning operation and invasive species control continued in 2021, with an additional population receiving thinning. This project began in 2019 to enhance habitat for state Endangered Hairy Honeysuckle, Lonicera hirsuta, a native honeysuckle vine in Williamstown, in cooperation with Williams College. Some improvement to the plant population did occur but more is expected in FY 2023. A study was initiated to determine the species of leaf-miners that are attacking the early seedlings of this species. Habitat management also took place at a second population in Williamstown including forest thinning and invasive species removal. This population is expected to benefit as well.

Aquatic Species

During FY 2022, NHESP's Aquatic Ecologist conducted surveys for odonates, freshwater mussels, and other rare aquatic taxa in MassWildlife's Western, CT Valley, Northeast, and Southeast districts. Below is a summarization of FY 2022's survey efforts and presentations.

Dragonflies and Damselflies

Scarlet Bluet (Enallagma pictum); State Threatened

Updated at eight ponds and detected at eight new ponds including the most westward population in Massachusetts (Ashburnham).

Ringed Boghaunter (Williamsonia lintneri)

State Threatened: Updated at six wetlands and detected at two new wetlands.

Harpoon Clubtail (Phanogomphus descriptus); State Endangered)

Updated at one site and discovered at one new site in one river.

Brook Snaketail (Ophiogomphus aspersus); State Threatened

Updated at one site in one river.

Dragonfly exuviae surveys performed in May and June 2022 are awaiting species identification.

Freshwater Mussels

MassWildlife is the lead agency on a multistate effort to evaluate the conservation and restoration needs of the State Endangered Brook Floater. NHESP's Aquatic Ecologist worked with the UMass Cooperative Fish and Wildlife Research Unit to coordinate partner meetings, identify conservation priorities, and to investigate habitat needs of Brook Floater range-wide. The initiative and associated surveys have resulted in updates to other SGCN freshwater mussels.

Brook Floater (Alasmidonta varicosa); State Endangered

Updated presence at three sites in two streams. Ten Brook Floater were translocated from Sucker Brook to the Nissitissit River before dam removal on Sucker Brook. Follow-up mark-recapture monitoring was conducted at two sites in the Nissitissit to evaluate translocation success. However, detection rates were low because of high streamflows throughout late summer and fall limiting evaluation of translocation success.

Dwarf Wedgemussel (Alasmidonta heterodon); Federally and State Endangered

Targeted sampling effort at two sites in the Fort River yielded non-detection samples of Dwarf Wedgemussel following weak positive detection of eDNA.

Creeper (Strophitus undulatus); State Special Concern

Updated at one site in one river.

Eastern Pondmussel (Ligumia nasuta); State Special Concern

Updated at nine sites in three ponds and detected at one new stream site.

Tidewater Mucket (Leptodea ochracea); State Special Concern
Updated at seven sites across three ponds and detected at one new stream site. Additional effort evaluated Tidewater Mucket response to a cyanobacteria bloom in Great South Pond, Plymouth.

Triangle Floater (Alasmidonta undulata); SGCN
Fifty Triangle Floater were translocated from Sucker Brook to the Nissitissit River before a dam removal on Sucker Brook. Follow-up mark-recapture monitoring was conducted at two sites in the Nissitissit to evaluate translocation success. However, detection rates were low because of high streamflows throughout late summer and fall limiting evaluation of translocation success.

Eastern Pearlshell (Margaritifera margaritifera); SGCN
Updated presence at eight sites in two rivers. Quadrat surveys were performed downstream of the Sucker Brook dam and several control sites in three rivers to estimate Eastern Pearlshell densities in response to dam removal.

Freshwater Fish
Bridle Shiner (Notropis bifrenatus); State Special Concern
Updated at seven sites representing three streams and two ponds.

Regulatory Review

Table NH 1. Categories of data processed by NHESP in FY 2021

Review Type	Count
CMP Application Received	22
Forest Cutting Plan	94
MESA Information Requests/Data Releases	276
MEPA Reviews	70
MESA Project Reviews	637
Notices of Intent	452
Scientific Collection Permits	145
Other	96
Total	1,792

Data Management and Data Products

In FY 2022, NHESP processed a total of 140 new rare species, natural community, and certified vernal pool records, and updated 305 existing records (Table NH 2).

Table NH 2. Categories of data processed by NHESP in FY 2021.

FY 2021 Totals	New Records	Updates to Existing Records
Vertebrates	20	89
Invertebrates	7	42
Plants	28	157
Communities	0*	0*
CVPs	85	17
Total	140	305

*The NHESP Community Ecologist retired from the Program on June 30, 2016, and no work has been done on the Natural Communities in the database since that time.

*One of the three Conservation Data Specialist positions was vacant for FY 2022.

Vernal Pool and Rare Species Information System (VPRS)
(The VPRS system was retired in December 2020).

For the FY 2022 alone, a total of 15 observation reports were submitted, including 1 vernal pool certification forms, five plant observation forms, and nine animal observation forms.

MassWildlife's Heritage Hub (Heritage Hub)

(MassWildlife's Heritage Hub was launched in January 2021. See Other Data Projects below for more information).

In FY 2022 alone, 533 new people signed up for Heritage Hub and a total of 3016 observation reports were submitted, including 164 vernal pool certification forms, 1,211 plant observation forms, 1,635 animal observation forms, and six Natural Community forms.

Once submitted through Heritage Hub, the information is reviewed by NHESP using standard data acceptance criteria for inclusion in our database, and the accepted records are entered into the database by NHESP Data staff.

Other Data Projects

For FY 2022, the NHESP continued to explore methods to improve and advance data collection, enhance collaboration with external groups, as well as streamline internal workflows and processes. These projects have included the use of technologies and databases such as Collector and Survey123 mobile applications, ArcGIS Pro, PowerBI, and the PIPLODES/TERNODES database.

This year, NHESP's focus has been on the replacement of its Environmental Review Access database. A new online system, MassWildlife's Heritage Hub, was developed with EEA-IT and released in January 2021 to capture observation reporting to NHESP. Development has continued on MassWildlife's Heritage Hub to build out MESA online filing capabilities. This is in an effort to streamline the Environmental Review processes and provide greater transparency to the public. Environmental Review components of the Heritage Hub are expected to be released in FY 2023.

Natural Heritage and Endangered Species Program Advisory Committee

Full Members

Mark Mello (Chair)
Timothy Flanagan (Vice Chair)
Kevin Powers (Secretary)
William Brumback
Joseph Larson
Wayne Petersen
Dave Small

Associate Members

Andy Finton
Russ Hopping

Natural Heritage and Endangered Species Program Staff Presentations to the Committee

(The Committee moved to quarterly meetings as of January 2021)

- Prescribed Fire: Statewide Priorities and Spring Accomplishments: Caren Caljouw (Prescribed Fire Program Manager) and Alex Entrup (Seasonal Prescribed Fire and Habitat Restoration Ecologist)
- BioMap Update: Eve Schlüter, James DeNormandie, Jason Stolarski, Andy Finton, Brian Hawthorne
- Linking Landscapes for Massachusetts Wildlife: A Model Partnership for Interagency Coordination: Dave Paulson (Senior Endangered Species Review Biologist).

Natural Heritage and Endangered Species Program Staff

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Tara Boswell, GIS Manager
Daniel Bove, Restoration Ecologist
Chris Buelow, Senior Restoration Ecologist
Caren Caljouw, Prescribed Fire Program Manager
Jason Carmignani, Aquatic Ecologist
Melany Cheeseman, Endangered Species Review Assistant
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Lauren Glorioso, Endangered Species Review Biologist
Amy Hoenig, Endangered Species Review Biologist
Emily Holt, Senior Endangered Species Review Assistant
Tara Huguenin, Conservation Data Specialist
Michael Jones, Ph.D., State Herpetologist
Jacob Kubel, Conservation Scientist
Jesse Leddick, Chief of Regulatory Review
Jennifer Longsdorf, Natural Heritage Program Coordinator
Lisa MacGillivray, Habitat Mapping Biologist/Data Specialist
Sarah Maier, Information Manager
Misty-Anne Marold, Senior Endangered Species Review Biologist
Carolyn Mostello, Coastal Waterbird Biologist
Michael Nelson, Ph.D., Invertebrate Zoologist
David Paulson, Senior Endangered Species Review Biologist
Amanda Veinotte, NHESP Project Coordinator
Andrew Vitz*, State Ornithologist
Bob Wernerehl, Ph.D., State Botanist
Rebekah Zimmerer, Endangered Species Review Biologist (part-year)
*Wildlife section staff

5 The Outreach and Education Program

Nicole McSweeney, Acting Assistant Director of Outreach and Education (partial year)

Marion Larson, Retired Chief of Information and Education (partial year)

Overview

During this fiscal year, the Information and Education (I&E) section went through significant changes, following the retirement of I&E Chief Marion Larson in March of 2022. Since Marion's retirement, I&E has been restructured and renamed Outreach and Education (O&E). The Outreach and Education section (formerly I&E) has been renamed to reflect MassWildlife's focused attention on R3 and Relevancy as agency priorities because 'Outreach' more accurately conveys our recognition that staff efforts should lead to active engagement and give-and-take interactions with our many constituencies. The Outreach and Education section includes hunter and angler education, wildlife education, R3 and relevancy, human dimensions, publications, media relations, customer service, and other communications.

The O&E Program has the responsibility of keeping the public apprised of laws, policies, and management practices related to wildlife conservation. Outdoor skills clinics, wildlife education workshops, conservation presentations, publications, and digital platforms provide the public with experiences that lead to a greater understanding, appreciation, and support of Massachusetts wildlife conservation. Staff lead a variety of outreach efforts to connect the public with nature, and promote hunting, fishing, and other wildlife-based recreation opportunities.

R3 and Relevancy

In Massachusetts and throughout the nation, our society is in the midst of a rapid and unprecedented change which has profound implications for wildlife conservation and the future of state fish and wildlife agencies. Urbanization, technology, and demographic change are leading to shifting values and perspectives related to conservation. The number of hunters and anglers—the historic base of financial support for MassWildlife and other state fish and wildlife agencies—is declining and disconnection from nature is increasing. While all Massachusetts residents and visitors benefit from MassWildlife's work to conserve wildlife, protect open space, and preserve clean air and water, MassWildlife currently relies heavily on funds generated by hunters, anglers, and trappers. In response, MassWildlife has prioritized efforts to increase participation in and support for hunting, fishing, and the shooting sports through recruitment, retention, and reactivation (R3), while also deploying strategies to better engage with all residents including those who will never hunt, fish, shoot, or trap (relevancy). Understanding public values and ensuring the public appreciates how MassWildlife's efforts are relevant to them is key to increasing broad support for conservation.

In March 2022, MassWildlife completed a public attitudes survey with the support of partners (see Human Dimensions section below). The survey results provide important information about residents' attitudes regarding conservation and outdoor activities and provide a basis for tracking changes in attitudes and opinions over time. The survey found that Massachusetts residents across demographics and from every part of the state overwhelmingly support public funding for land conservation and outdoor recreation. More than two-thirds of residents surveyed think we need to do more to conserve land, water, and wildlife habitat. Protecting water, air, and endangered species; ensuring all communities can access the outdoors; and using nature to reduce climate risk were ranked as the most important priorities for investment.

R3 Plan Development

An R3 team drafted a Massachusetts R3 Plan identifying priority activities and actions associated with the five R3 strategies. The R3 Plan focuses on activities that MassWildlife intends to complete with the help of partners. It is written as an overall summary, not a detailed accounting of all planned MassWildlife and partner R3 efforts. Considered a living document, as R3 partnerships evolve and activities are initiated and evaluated, new recommendations may be developed. This R3 Plan will be coupled with the development of Annual R3 Work Plans that will contain the key implementation step, team members, and timelines for each priority activity addressed each year. The planning process and R3 projects fall under the calendar year. In FY 2022, MassWildlife piloted the R3 planning process implementing 9 projects for Calendar year 2021, reviewed the planning process and completed the reviewed planning process for Calendar year 2022 R3 projects. The projects identified and have started to be implemented for calendar year 2022 are listed below:

1. Plan R3 Summit
2. Identify barriers of new hunters and anglers
3. Promote fishing in urban communities
4. Develop hunting and fishing videos and resources
5. Identify public fishing spots in prioritized urban areas
6. List all WMAs on Google Maps
7. Deliver pheasant hunting outreach campaign
8. Launch Hunters Share the Harvest venison donation program
9. Organize WMA Cleanups

Human Dimensions

The Human Dimensions Coordinator continued to lead the agency's efforts to better understand the constituents it serves. Information about the general public and the angling and hunting community is critical for tailoring messaging and developing communication strategies. Primary and secondary research of Massachusetts' residents will inform data-driven decision making related to programs, management, and policies. A comprehensive understanding of the behaviors and cognitions of the sporting community will inform recruitment, retention, and reactivation strategies. Baseline and continuing research will provide a means for informing and evaluating the agency's outreach efforts and progress.

Human Dimensions Research

During FY 2022, data mining and primary and secondary research has focused largely on (1) license database inquiries related to angling and hunting customers (2) the development and execution of surveys to document hunter behaviors and cognitions (3) establishing a strategy and mechanism to document general public attitudes, opinions and interests (4) serving as a subject matter expert to improve the licensing system (5) providing input and data support to R3 planning and R3 program evaluation, and (6) developing long-term planning for agency Human Dimensions research, and coordinating MassWildlife's participation in regional and national research.

License Database Inquiries

Numerous data requests from staff typically require multi-year data exports via MassWildlife's database management system (SQL). Typically, larger data exports are then queried further to develop distinct angler and hunter customer segments. During this period, data exports were used to support or inform marketing campaigns; campaign evaluations; press requests; donor and subscriber purchasing behaviors; efforts to reach BOW participants; estimate churn rates; harvest estimates, financial analysis, quarterly sales, and targeted outreach and communication efforts. Many of these efforts are detailed elsewhere in this report. Similarly, license data requests were used to generate sample frames for MassWildlife's annual hunter survey as well as other focused survey efforts of other customers.

Hunter and Angler Surveys

Multiple hunter surveys were conducted during this grant period. In addition to generating sample frames, the work also included guidance and support of questionnaire development and survey implementation strategy. Survey instruments were developed or refined to capture the behaviors, attitudes, opinions and preferences of deer hunters, pheasant hunters, turkey hunters, lapsed anglers and other customers. Work during this period also included advising on Blue Hills data analysis.

A new angler survey was developed and executed during this period. The survey focused on capturing

anger behaviors, motivations, site preferences, species preferences, and catch disposition with additional focus on trout fishing behavior and preferences. The survey will support warmwater and coldwater fisheries management plans as well as information needs and communication preferences. Over-sampling of new lapsed anglers was conducted to inform the R3 Barriers Project described below.

Public Attitudes

During this period, the Massachusetts Public Attitudes Survey was finalized and executed. This statewide, representative survey is a direct outcome of agency Relevancy efforts and provides baseline information about residents' activities and attitudes toward the outdoors, wildlife conservation and the agency, and will inform agency communications and programs.

The phone survey of 850 Massachusetts residents was conducted in March 2022 by Responsive Management, an independent non-partisan survey organization. The survey results provide important information about residents' attitudes regarding conservation and outdoor activities and provide a basis for tracking changes in attitudes and opinions over time. It was funded by the Massachusetts Division of Fisheries and Wildlife, Mass Audubon, The Nature Conservancy in Massachusetts, Trout Unlimited, and The Trustees of Reservations.

A significant amount of time during this period was dedicated to finalizing the instrument and coordinating with partners on the details of a full release of the information generated by this survey. The full report and summary results were developed with significant input from O&E staff and shared with Administrators and members of the Public Attitudes Survey committee, a subcommittee of the Relevancy Committee. Preparation for communicating these results began at the end of this period and will include an agency wide release in the next month.

Licensing System Improvements

A significant portion of time has been dedicated to providing input and actively testing the new MassFishHunt system, with particular focus on the MassFishHunt Outreach system and data dashboard functionalities. Additionally, a significant amount of time was spent attempting to connect to and developing SQL queries to extract license data.

R3 Plan & Programmatic Evaluations

Support of the narrative and data analysis appearing in MassWildlife's R3 plans, reports and presentations continued during this period. R3 support included participation and leadership for various R3 Annual Projects to document barriers to fishing and hunting, understand information and communication needs and the spatial distribution of hunters. As part of annual R3 planning efforts, in-depth analysis of license buyers was provided to the Planning Committee. Massachusetts continues to take a leadership role in Regional R3 Program Evaluation efforts. This included standardizing participant data collection and conducting formal evaluation of R3 program data from participating states in the NEAFWA region. Results were presented at multiple NEAFWA Regional R3 meetings. Planning for the R3 Summit began during this period, with focus on an R3 Program Gap analysis- a survey of state and national partners to assess current R3 program offerings and capacity.

Agency Human Dimensions Plan

The development and communication of a comprehensive plan for agency human dimensions research continued during this period. The plan describes MassWildlife's current activities, future needs, and priorities related to human dimensions research for the next 3-5 years. Meetings were held with Fisheries and Wildlife Section staff to discuss the purpose of the plan and key findings. A HD Microsoft Teams Channel was developed to help coordinate and disseminate relevant research efforts.

Participation in Regional and National Research

Several projects with partner organizations were executed during this grant period. These regional and national research efforts aimed to improve hunter education, evaluate the effectiveness of R3 programs, retain the recent surge of hunters and anglers, and understand avidity.

Website

Website Analytics

MassWildlife web pages were viewed about 5.8 million times, consistent with recent years. Visitors spent an average of about two minutes and 20 seconds on each page. Males accounted for about 66% of website visitors; 34% were female. Agency web content was visited most often by users aged 25–34 (22%) followed by users aged 35–44 (20%), 55–64 (18%),45–54 (17%), 65+ (12%) and 18–24 (11%). Device usage totals continue to show that most users (66%) access our content using a mobile device. All digital media created by MassWildlife is designed with a mobile user in mind. Work is being done to improve the mobile experience. For example, content that can be moved from pdf format to html format is being migrated as time allows.

Just over 75% of traffic to the MassWildlife website originates from a search engine or from the search tool within Mass.gov. About 14% of users come to our content directly. Traffic is counted as direct when users do one of the following: use a bookmark in their web browser, copy and paste a URL, or type in a shortened URL from an agency print or digital publication or that they heard about from a friend (Figure OE 1) or MassWildlife staff over the phone. A smaller proportion of users make their way to our website by way of social media (6%) and links on other websites (3%). Top referring websites were: ma.wildlifelicense.com (MassFishHunt), wildlife.tufts.edu, stepoutside.org, boston.gov, massaudubon.org, mass-eoeea.maps.arcgis.com (attributed to several of our web maps), reserveamerica.com (Massachusetts campground reservations), savebuzzardsbay.org, takemefishing.org, and onthewater.com.

The website is large, and it can be difficult to fully report on all pages. By evaluating MassWildlife pages that received least 1,000 pageviews accounts for nearly 95% of website traffic. The following is summary of the 342 pages that received at least 1,000 views throughout the reporting period. To get a sense of the structure of the website, first look at the quantity of pages separated by topic. (Figure OE 1) With multiple species-specific regulation pages hunting-related content accounts for the most pages, followed by general wildlife pages, fishing, news, NHESP, licensing, and then Hunter Education. Assessing these same topics based on the volume of pageviews is also helpful because it shows how often the public is using the content. Fishing (including trout information) accounts for 27% of visitor traffic. Trout stocking information is contained within 5 web pages yet accounts for 17.5% of all MassWildlife pageviews. The hunting category accounts for about 24% of pages and about 19% of the volume of traffic. Not surprisingly, deer hunting content was the most popular, followed by content related to wild turkey hunting, and “where to hunt” content. General wildlife content accounts for 12% of traffic. Within this category, wildlife rehabilitation information was viewed most often, followed by “Wildlife as Pets.” Many “Learn about Wildlife” pages were also very popular—bobcat, coyote, bats, and black bear, as well as content for people wondering if there are mountain lions in Massachusetts—received the most traffic. Popular NHESP content included MESA information, regulatory maps, and reporting vernal pools.

Figure OE 1. MassWildlife web pages receiving at least 1,000 pageviews grouped by topic and sorted by quantity of pages (A) and by volume of pageviews (B)

MassFishHunt

MassWildlife launched a new MassFishHunt online licensing system on December 1, 2021. O&E staff are heavily engaged in the ongoing development of the site. O&E staff continue to provide feedback on overall system functionality, user experience, outreach tools, data reporting and visualization, and event management.

Social Media and Digital Communications

Facebook

In FY 2022, MassWildlife continued utilizing its Facebook page (Facebook.com/masswildlife) to engage with its constituents. As the most-used social media platform in the world, Facebook has been a useful tool in helping MassWildlife share information about fish and wildlife issues in the Commonwealth; communicate about research projects; and promote agency events, programs, job openings, and donation opportunities. MassWildlife posts to its Facebook page several times a week with a variety of content. MassWildlife continued to see an increase in followers in FY 2021, closing the year with 59,000 followers (up from 55,000 followers at the close of FY 2021). MassWildlife also uses Facebook to listen to what constituents are saying and engage with the public by responding to their comments and questions. Facebook is a primary tool for the agency to deliver high-quality customer service and answer constituent inquiries.

Instagram

MassWildlife uses its Instagram account (@mass.wildlife) to engage with the public. The number of followers has been steadily growing over time (2,800 in FY 2018; 9,600 in FY 2019; 15,200 in FY 2020, 18,100 in FY 2021; and 20,100 in FY 2022). Instagram is a widely used, fast-growing social media platform, especially among younger audiences. A new reporting feature reveals that 90% of MassWildlife's Facebook followers do not follow us on Instagram; signaling an opportunity to engage different people on different social media platforms.

YouTube

MassWildlife publishes video content to our YouTube channel (Youtube.com/MassWildlife). Videos are then embedded back onto our Mass.Gov website. As MassWildlife increases efforts to develop self-learning resources for hunters and anglers, we continue to add video content to our YouTube channel. In FY 2022, we created videos like how to use our GoFishMA! map to find a fishing location and how to set a tip-up for ice fishing.

Newsletter

Eleven issues of the electronic "MassWildlife Monthly" newsletter was published this fiscal year around the first of each month (no issue was sent in December 2021). Over the past year, the number of newsletter subscribers continued to grow; in July 2021, 96,052 received the newsletter, and by June 2022, that number had risen to 134,951. This represents a substantial increase in the number of subscribers from 5 years ago (22,930 in June 2017). A check box to subscribe on the MassFishHunt online licensing system has been the main driver of increased subscribers. Other sign-up tools like links to subscribe on the MassWildlife website and social media, as well as signage at fairs and shows have also increased the number of subscribers.

The newsletter is sent using Constant Contact, an email marketing service. Press releases to media and advisories alerting subscribers and license holders of new regulations, special events, public meetings, and hearings were also sent out through Constant Contact. On average, 38% of subscribers opened the MassWildlife Monthly email this year, which is considered an "above industry average" open rate. (The average open rate across all industries using Constant Contact is 22.6%.) This is also up from MassWildlife's open rate in FY 2021 (32% open rate). Improvements to subject line headers may have caused the improvement. MassWildlife's average newsletter click rate was 6.8%, which is well above the average of 1.4% for Constant Contact users, indicating that MassWildlife is producing high quality, engaging content that subscribers want to read.

Agency Emails

The number of agency emails declined slightly after several years of steady increase. In FY 2022, a total of 4,907 agency email messages were received and managed (Figure OE 2). Public inquires sent through email are primarily directed to mass.wildlife@mass.gov. In February, masswildlife.news@mass.gov was created to manage media inquiries more easily. General inquiries from the public are starting to come into the new email address and have been included in the fiscal year total.

Figure OE 2. Number of emails received by MassWildlife in the last four fiscal years.

Marketing

Fishing and Hunting Promotions

MassWildlife works to recruit, retain, and reactivate hunters and anglers through innovative communication techniques. Targeted emails were used to retain and reactivate hunters and anglers throughout the year with license renewal reminders, and emails also delivered important information such as regulation changes, notices about education opportunities, and hunting and fishing tips. Social media also plays an important role in marketing for R3 through regular posts about hunting and fishing tips, game and fish recipes, and tips, and places to enjoy hunting and fishing.

Digital Marketing for Fishing

Significant efforts to promote fishing through digital marketing were continued in FY 2022. In spring of FY 2022, MassWildlife received a competitive RBFF R3 Program Grant to launch a digital marketing campaign in the spring and summer of 2022 focused on retention and reactivation of current anglers, and the recruitment of new audiences. This project addressed RBFF's grant focus areas by 1) employing digital marketing strategies to retain and reactivate customers, and 2) implementing outreach tactics to promote fishing to new audiences, with added focus on Spanish-speaking communities in urban and suburban areas. A key R3 goal in Massachusetts is to continue engaging our existing customer bases, while also intentionally working to make outdoor spaces more welcoming to underserved and non-traditional audiences. For the first time ever, MassWildlife offered promotions and new resources in Spanish as well as English, engaging hundreds of thousands of Bay State residents who use Spanish as their first language. Using email, social media, display, and search ads, the primary objective of the retention and reactivation campaigns was to drive license renewals. The primary objectives of the recruitment campaign were to elevate the relevance of fishing to new audiences, increase interest and awareness of local fishing opportunities, and promote learn-to-fish skills trainings. The recruitment campaign utilized social media, display, and search ads, as well as outreach through news media and local partners such as state parks, city and town departments, and non-profit organizations across Massachusetts.

- MassWildlife contracted with a local marketing firm, Tomo 360, to manage its spring/summer campaign. MassWildlife coordinated with Tomo 360 to implement a strategy for the campaign, select images, write ad copy, define target audiences, place ads, and evaluate performance.
- From April through August, MassWildlife utilized emails, social media (Facebook and Instagram), Google search and display, and YouTube ads targeting lapsed anglers and prospective new anglers. Audiences were identified using lookalikes and demographic- and interest-based targeting. Engagement with these groups included simple license reminders, invitations to participate in learn-to-fish classes, and ads promoting resources like how to find fishing locations near home. To support this campaign and allow ads to

drive traffic to in-language landing pages, we identified the most popular fishing pages on our website, including our learn-to-fish class calendar, regulations, and fishing location resources, and manually translated them into Spanish. MassWildlife also added internal capacity through contract employees to support larger crowds at fishing classes, including participants who speak Spanish, and added on-demand simultaneous interpretation through a state contracted service.

- In addition to driving sales, our ads increased awareness of and interest in fishing. Social media ads resulted in 4.1M impressions, reached 749K people, and generated 39K clicks to our website. Google search ads resulted in 225K impressions and 111K clicks to our website. Google display and YouTube ads resulted in 602K impressions and generated 2K clicks to our website.
- MassWildlife held 17 Learn-to-Fish events in targeted urban and suburban communities, such as Boston, Springfield, Worcester, and Pittsfield, teaching over 500 people new fishing skills.
- This campaign allowed MassWildlife to continue to learn about the content our customers are most interested in, allowing us to continually improve and update our resources to meet demand. For example, as we began to resume more in-person learn-to-fish classes this year, we were able to streamline our calendar of events and offer it in both English and Spanish. More district staff were trained to help assist with these classes, enabling us to offer classes in new locations using our fishing trailer. For the first time ever, we delivered advertisements in Spanish, and those ads performed extremely well in comparison to our English ads, by engaging new audiences we weren't previously reaching and driving high amounts of traffic to our website at lower costs.

NHESP Fundraising

State Income Tax Donation Promotion

An article about donations through Line 32A ("Endangered Species Conservation") of the state income tax return was featured in both the February and March editions of our monthly newsletter, which was sent to over 110,000 subscribers. The tax-form donation was also promoted on social media during the spring.

Media Relations

Current media protocol procedures allowing EEA agencies to interact directly with media have strengthened long-established media relationships and resulted in valuable connections with new media contacts. The protocol has also expanded the I&E Chief's ability respond to the media in a timely fashion and to proactively pitch stories to the news media.

For years, MassWildlife has utilized a media service to collect news coverage that mention the Division or other related key words. This service primarily reports on print newspaper sources with some information on television and digital coverage. The service provides reporting on reach and value of the articles mentioning MassWildlife.

To supplement the media service, internet alerts are used to monitor mentions of the Agency on digital platforms. These alerts can provide insight on the number of articles mentioning the Agency, but cannot provide detail on audience, reach, or media value. Used together, the media service and internet alerts capture the majority of MassWildlife-related coverage in the news.

Media Outreach Efforts

MassWildlife maintains a media contact list and sends monthly e-newsletters to those contacts. There are 891 contacts on the list from media outlets across Massachusetts (664 at the end of FY 2021). Reporters are given the option to be added to the list whenever they contact MassWildlife about a story. Contacts on the media list received 11 e-newsletters from MassWildlife over the course of the year. In addition, MassWildlife sent out or collaborated on the following advisories that were sent either statewide or at a local scale:

- South Shore Bear Dead (local media advisory, 7/21)
- Remove Bird Feeders to Prevent Spread of Mystery Bird Disease (MassWildlife Advisory, 7/21)

- Becoming an Outdoors-Woman Fishing Clinic (local media outreach, 7/21)
- Eaglet Dies from Rodenticide (MassWildlife Advisory, 8/21)
- Tully Trail Agreement Celebration (local media advisory, 8/21)
- Habitat Management Grants awarded (EEA press release, 11/21)
- Alligator Captured in the Westfield River (local media advisory, 12/21)
- Climate Change Habitat Resilience Grants Awarded (EEA press release, 1/22)
- Peregrine Falcon banding event photo release (EEA press release with MassWildlife and MassDOT)
- Suburban coyote problems (Press Release sent by Arlington Police Department, MassWildlife collaborated, 6/22)
- Highly Pathogenic Avian Influenza/Shore Birds (EEA press release along with MDAR, 6/22)

Media Outreach Results

As in previous years, a variety of media outlets published or aired stories utilizing content from MassWildlife's monthly e-newsletter, Media Advisories, collaborative press releases, and social media posts. MassWildlife outreach can result in a request for more information or for an interview with staff. Some media outlets summarize MassWildlife content in recurring outdoor segments or calendars, some outlets reprint the original content exactly as written. The following is a list of topics promoted by MassWildlife that resulted in the most media coverage in FY 2021:

- Remove Bird Feeders/Bird Illness (55)
- South Shore Bear Dead (34)
- Highly Pathogenic Avian Influenza (33)
- Steller's Sea Eagle on Taunton River (27)
- Celebrate Bat Week (23)
- Eaglet Dies from Rodenticide (16)
- MassWildlife License Increases Approved (16)
- Schools Out, Stock Trout (16)
- Alligator Captured from Westfield River (14)
- Fall hunting and fishing information (14)
- Trout stocking (10)
- Bears Emerging, Remove Bird Feeders (10)
- Snakehead Caught in Canton (9)
- Monitoring Juvenile Shad (7)
- Bird Illness Update (6)
- Habitat Management Grants Awarded (6)
- Planting a bee- and bird-friendly garden (6)
- Bears: Winter Denning (5)
- Young wildlife/fawns (5)
- Ice Safety Tips (5)
- Turkey brood survey (5)
- Peregrine Falcons (5)

MassWildlife staff responded to requests for information and/or interviews from reporters on a wide variety of topics. These interactions with the media resulted in many other articles that were not a direct result of agency outreach. Topics generating the greatest volume of articles included:

- Bears (in eastern MA towns, orphaned bear cub, in homes in western MA) (22)
- Coyotes in eastern towns (12)
- Piping plovers and fireworks (8)
- Coverage, Impressions, and Value

News coverage is calculated using information from the current news clip service, as well as from articles found and recorded by staff. MassWildlife was mentioned 675 times (457 print, 218 online), averaging 56 articles per month. Agency mentions appeared in 78 different newspaper, digital, radio, and television outlets. These outlets ranged from small community papers to major regional and even national media outlets, including the Boston Globe, the Boston Herald, the Berkshire Eagle, the Lowell Sun, the Springfield Republican, the Athol Daily News, the Worcester Telegram and Gazette, the New York Times, WGBH radio, WBUR radio, Boston.com, MassLive, Patch, Wicked Local, Boston25, NBC Boston, WWLP TV, and Spectrum 1.

The number of people who had the opportunity to read each of the articles mentioning the Agency (impressions) was 62,748,002. This translates to a media value of $11,436,306. Note: Impression and media value data come from the news clip service. Since the service does not account for the full breadth of digital coverage, we can use it as a relative measurement, but it is not complete.

Media Inquiries

MassWildlife fields requests from the media on a variety of topics throughout the year. Some requests are sparked by agency outreach, while others arise organically—often from a wildlife situation that readers or viewers are noticing locally. In FY 2022,

the agency responded to 273 inquiries from the following media types:

Table OE 1. Media inquiries by type

Media Type	Number of Inquiries
Newspaper many have a digital component	121
Television all have a digital component	68
Radio most have a digital component	61
Digital Only	11
Magazine	8
News Service	4
Total	273

Photography

Key Projects

Troy Gipps, Magazine Editor and Publications Manager, has spent a portion of his time on photography for both magazine articles as well as other publications, web, and social media use. In FY 2022, he conducted 37 photo shoots, covering a wide variety of subjects, to include still image and video shoots of ice fishing and deer check station activities in support of GoFishMA! angler outreach and hunter outreach, respectively. Without a full-time photographer, it continues to be ongoing challenge to keep up with the demand for fresh images.

Signage And Publications

Massachusetts Wildlife Magazine

MassWildlife's most visible publication is Massachusetts Wildlife, a 40-page, full-color, quarterly magazine with approximately 18,000 subscribers and a standard publication printing of 23,000 copies, which provides surplus for handouts and promotions at programs, shows, and fairs. Editor and Publications Manager Troy Gipps produced four issues of Massachusetts Wildlife (Number 3, 2021 – Number 2, 2022) covering a wide variety of fisheries, wildlife, and outdoor-related subjects, including wildlife research, rare and endangered species, general nature interest, and how-to articles for the hunter, angler, and nature observer.

Continuing a long tradition of producing articles that will be useful as references on various subjects for many years to come, this year's feature articles included:

Issue Number 3, 2021:

- Lending a Helping Hand (Water chestnut removal) by Leanda Fontaine (Staff)
- ACE: Hunting Dog by H W Heusmann (Staff)
- Duck Hunting Nirvana (Short Story) by Troy Gipps (Staff)
- June's First Pheasant (Short Story) by Emma Ellsworth
- Then There Were Two (Short Story) by Emma Ellsworth
- Thank Goodness for Technology by H W Heusmann (Staff)

Issue Number 4, 2021:

- Black Vulture by Bracken Brown and David Barber
- Burning for Wildlife by Alex Entrup and Caren Caljouw (Staff)
- Getting Your Feet Wet Fly-fishing by Jim Lagacy (Staff)

Issue Number 1, 2022, Special Issue–Fisheries & Aquatics (All authors on staff)

- The World Aquatic (Introduction) by Todd Richards
- Data Driven Conservation by Jason Stolarski
- Biodiversity: Every Cog and Wheel by Rebecca Quinones and Jason Stolarski
- Aquatic Hitchhikers by Jason Carmignani
- Wild Trout Management by Adam Kautza
- School of brookies (Teaching with Trout) by Dan Marchant
- Wood is Good by Steve Hurley and Travis Drudi
- Well-Traveled Trout (Hatcheries/Stocking) by Caleb Slater
- Fish Weight and Habitat Health by Jason Stolarski
- Big Rivers, Big Rewards by Rebecca Quinones
- Sportfishing Awards by Steven Mattocks

Issue Number 2, 2022:

- A Migration to Birding by Eugene Ellison
- Back in the Stand (Bowhunting White-tailed Deer) by Troy Gipps (Staff)
- Migrating Fish, Changing Rivers by Steven Mattocks (Staff)
- Strange but True: A Tale from the Upland by Nick King

Magazine Subscription Promotion Efforts

MassWildlife contracts with a vendor (Infonet) for magazine subscription fulfillment and promotion. The beginning of the fiscal year, July 1, 2021, showed 21,558 subscribers for the magazine; by June 30, 2022, there were 18,666 magazine subscribers. One-year subscriptions account for 62% of the total, 38% of subscriptions are for two or more years. In FY 2022, a total of 11,872 new and renewal subscriptions were sold.

During FY 2022, Infonet sent 11,267 regular renewal mailings to 6,057 subscribers whose subscriptions were about to expire. The total cost of these mailings was $4,056 and they resulted in revenue of $25,921 from 2,375 renewals. There was no nominee promotions mailed in FY 2022.

Cash acknowledgements

Any person who sent in a 1-year paid subscription on their own (Not a "Bill Me" sign up) is mailed an acknowledgement, thanking them for the subscription. The subscriber is invited to "step up" to receive a special 7 for $7 offer. In FY 2022, 3,357 cash acknowledgements were sent out at a cost of $1,208. There were 892 1-year subscribers who stepped up, resulting in revenue of $6,244.

Gift Subscription promotions

A fall/winter 2021 4 effort gift subscription renewal promotion mailing of 5,278 pieces to 1,947 donors who have given gifts, at a cost of $1,900 resulted in revenue of $17,484. A smaller promotional mailing at a cost of $1,459 went out to 4,054 subscribers who did not have a history of giving gift subscriptions. The results were 472 orders for $2,832 in revenue.

Other Magazine Outreach/Distribution Efforts

Magazine subscriptions are available for purchase through the MassFishHunt licensing system. A guest account, for those people who are not purchasing licenses offers subscribers the convenience of purchasing with a credit card. During FY 2022, 138 one-year subscriptions and 756 two-year subscriptions were sold through the MassFishHunt system.

Magazines at Meetings, Conferences, Exhibits, Fairs, and Education Workshops

Copies of back issues of magazines are made available at a variety of events where MassWildlife may have a display table or present a session or other public event. Magazines are distributed at all Project WILD teacher workshops, wildlife education programs, and Hunter Education courses.

Regulations

The Guide to Hunting, Freshwater Fishing, and Trapping

The 2022 Guide to Hunting, Freshwater Fishing and Trapping was again produced in cooperation with J. F. Griffin Publishing Co., as part of a multi-year contract with this publisher. The full-color, glossy-stock, 56-page booklet includes a digest presentation of the fishing- and hunting-related laws and regulations and other information of interest to the sporting community. 140,000 copies were printed in FY 2022 and distributed at MassWildlife offices and license vendor locations, as well as at fairs, shows, and events.

Migratory Game Brochure

Troy Gipps also worked closely with the Wildlife Section to update, publish, and distribute the 2022–2023 Migratory Game Bird hunting regulations brochure. The brochure contains season dates and bag limits, which are not available for release when the Guide to Fishing, Hunting, and Trapping Laws is published.

Wildlife Management Area Signage

No new signs were produced during this reporting period.

Fact Sheets and Related Publications

MassWildlife created a new fact sheet promoting the benefits of hunting for deer management. This fact sheet has been a useful resource when consulting with towns or other landowners that are considering opening access for deer hunting. In addition, Troy Gipps and Emily Stolarski provided design, editing, and photography support to NHESP to assist with the development of a comprehensive freshwater mussel identification brochure that will be completed in FY 2023.

Outreach Events

MassWildlife staff interacted with the public at a variety of outreach events during this fiscal year. In addition to exhibits and events directly organized by MassWildlife, MassWildlife's O&E Section coordinated with other agency staff on outreach events by providing support with event promotion and registration; helping to staff the agency's display at events; and developing targeted display and presentation materials such as images or other graphics for use in presentations, posters, and handouts.

Events

MassWildlife staff represented the agency at a variety of events. Staff provided publications, answered questions from the public at the following venues: Marshfield Fair, Northeast Fishing and Outdoor Expo, Townsend's Earth Day Celebration, Westfield River Fish Ladder Open House, Groton Greenway River Festival, Mashpee Wampanoag Science Camp, Worcester Polytechnic Institute Career Day. To celebrate Earth Week, MassWildlife hosted family trout stocking events in Boston, Plymouth, Worcester, Woburn, Westfield, and Pittsfield.

Informational Public Presentations

MassWildlife staff gave presentations on a variety of topics to organizations, clubs, and municipalities across the Commonwealth. Fisheries presentations were given to the following groups: City of Worcester, NE Fly Tyers, Pioneer Valley Chapter of Trout Unlimited, Western Mass Fly Fishing Club, Crossroads Anglers Fly Fishing Club, and the Berkshire County Sportsmen's League. Coexisting with wildlife talks were given in the towns of Arlington, Roxbury, Lowell/Lawrence, Amherst, and the Berkshires (virtual). Presentations focusing on MESA species or NHESP programs were given to: Daughters of the American Revolution, Town of Mount Washington, Lancaster Garden Club, Martha's Vineyard Bird Club, Ware River Nature Club, Town of Andover, Zoo New England, and several virtual presentations.

Guest Lectures

MassWildlife staff presented to classes at college and university including: UMASS Amherst (MESA 101, habitat restoration), Clark University (agency overview), The Conway School (habitat restoration), Tufts University (agency overview), Williams College (fire ecology).

Land and Habitat Events

A variety of events and guided walks took place at MassWildlife and partner properties that highlighted land acquisition or habitat management projects. Events and walks were held at: Tully Mountain WMA (trail event), Muddy Brook WMA (tour for MA BHA), Frances Crane WMA, Montague Plains WMA, Mashpee Pine Barrens, Blue Hills Reservation site walk (with DCR), Mill Brook Bog WMA (with DER), Squannacook River WMA, Moose Brook WMA (tour for NRCS), Williamstown Rural Lands, and Helfand Farm.

Professional Meetings and Conferences

MassWildlife staff collaborate with colleagues at local, state, and national organizations and are invited to present at professional meetings and conferences. During this reporting period, staff presented on the following topics: Wildlife Update (MA Environmental Police); Techniques and Challenges for Restoration of Fire Influenced Oak Woodlands in North Central MA (New England Society of American Foresters); BioMap (MA Land Conservation Conference, MA Association of Conservation Commission, Interagency Lands Committee, DCR Lands Committee, SE Mass Land Trust Coalition); Woody Wetland Plants, Conducting Site Visits and Reading Plans, and Invasive Species in Massachusetts Lakes and Rivers: Regulation and Permitting(MA Association of Conservation Commissions); Digital strategies to retain anglers beyond 2020 (Recreational Boating and Fishing Foundation State Marketing Workshop); High Pathogenic Avian Influenza in MA (MDAR and Animal Control Officers, and Wildlife Rehabilitators Association of MA); Rodenticide and raptor workshop (Animal Control Officers); Regional Wildland Fire Engine Workshop (Forest Guild in Maine); Prescribed Fire in Grasslands (Sandplain Grassland Network); MassWildlife programs (Massachusetts Association for Health, Physical Education, Recreation, and Dance); The role of forests in carbon sequestration (Forest carbon panel discussion, virtual).

Wildlife Conservation Education Programs

Due to the ongoing COVID-19 pandemic, in-person education programs were limited during FY 2022. The in-person programs and events that did take place were with adherence to relevant state and local COVID-19 guidelines. Numbers in this report reflect a few in-person and virtual hybrid programs offered during the fiscal year.

Project WILD in Massachusetts

Project WILD is one of the most widely used wildlife-focused conservation and environmental education programs among educators of students in kindergarten through high school. Project WILD addresses the need for human beings to develop as responsible citizens of our planet and fosters responsible actions toward wildlife and related natural resources. Using balanced curriculum materials and professional training workshops, Project WILD accomplishes its goal of developing awareness, knowledge, skills, and commitment. In Massachusetts, K-12 educators are trained as facilitators to offer workshops for other educators from across the Commonwealth. Project WILD and Growing Up WILD: Exploring Nature with Young Children was developed by the Council for Environmental Education (CEE), is administered by the Association of Fish and Wildlife Agencies (AFWA) and sponsored in Massachusetts by the Massachusetts Division of Fisheries and Wildlife (MassWildlife) with support from the Massachusetts Sportsmen's Council.

Project WILD and Aquatic WILD (K-12)

These workshops are targeted for educators working with children in grades K-12. The Project WILD activities are terrestrial ecosystem based while the Aquatic WILD curriculum focuses on aquatic ecosystems. There are strong connections in these curricula to Science, Technology, Engineering, and Math (STEM). One hybrid Project WILD/Aquatic WILD combination workshop was offered at Bridgewater State College and one in-person combination workshop was offered in the city of Pittsfield. The annual in-person facilitator gathering & recognition, scheduled to be held outdoors, was cancelled due to weather related issues. The Project WILD Coordinator remained connected to and supported facilitators by meeting in-person for outdoor field sessions and discussions.

Growing Up WILD: Exploring Nature with Young Children

This early-childhood (ages 3-7 years) education program for educators, caregivers, teachers, and families builds on children's sense of wonder about nature and invites them to explore wildlife and the world around them through a wide range of activities and experiences. Growing Up WILD (GUW) is a tool for helping fish and wildlife agencies meet their conservation goals through recognizing children start developing attitudes towards wildlife and nature at an early age and providing knowledge and skills to early childhood educators so they may teach about nature. GUW provides suggestions for outdoor nature-based recreation, conservation suggestions for each activity, and activities that families can do together. This lays a foundation for acquiring increased scientific knowledge and problem-solving skills. There is a continued strong focus on connecting Growing Up WILD to STEM. In FY 2022, one Growing Up WILD workshop was offered online through Elms College and two in-person workshops were offered.

Junior Duck Stamp Program (JDS): Connecting Youth with Nature through Science and Art

JDS provides a curriculum for students, educators, home school, and non-formal groups designed to spark youth interest in habitat conservation through science, art, math, and technology, made available to student artists and educators upon request. In Massachusetts, the Junior Duck Stamp Program is sponsored by MassWildlife and U.S. Fish and Wildlife Service, with support from the Massachusetts Sportsmen's Council.

Students in grades K-12 from across the Commonwealth submitted 199 pieces of artwork to this "Conservation through the Arts" program. Entries were received from public, private, and home-schooled students; individuals; and private art studios. The in-person judging took place with modifications.

An acrylic painting of a Common Eider by Andrew Lui, Apple-Leaf Studio, was selected as Best of Show and represented Massachusetts at the National Competition. The state awards ceremony was cancelled due to the ongoing pandemic. The statewide traveling exhibit, comprised of a combination of the top 100 pieces of art, resumed

during this timeframe with three venues hosting the artwork.

General Wildlife Education Programs

General wildlife education programs presented by the Wildlife Education Coordinator focused on diverse audiences: educators, students, and general adult audiences, ranging from pre-school to retired adults. The Wildlife Education Coordinator was the Naturalist-in-Residence for the preschool at Nashoba Brooks School offering experiential nature-based education aimed at inspiring wonder and stewardship of the local wildlife and ecosystems.

Massachusetts Envirothon

MassWildlife's involvement in this 35th annual natural resource (wildlife, soil, water, forest) program, which until the pandemic, reached over 500 urban and rural high school students representing over 50 communities annually, continues through the efforts of Wildlife Education Coordinator Pam Landry. She hosts teacher and student workshops, serves on the education subcommittee of the steering committee, prepares the wildlife exam, provides wildlife-related information to the Current Issue question, and attends the competition. In FY 2022, an outdoor in-person Envirothon was held at Quabbin Reservoir for 100 urban and rural high school students representing 14 Massachusetts communities.

The North American Conservation Education Strategy (CE Strategy)

An array of tools developed by state fish and wildlife agencies support conservation educators who offer fish and wildlife-based programs that guide students in grades K-12 on their way to becoming involved, responsible, conservation minded citizens. The CE Strategy delivers unified research-based Core Concepts and messages about fish and wildlife conservation, translated into K-12 academic standards to shape students' environmental literacy, stewardship, and outdoor skills. Resources included in the toolkit included: landscape investigation, schoolyard biodiversity, field investigation, fostering outdoor observation skills, using technology in field investigations, applying systems thinking, and much more. Material was directly distributed to educators when applicable or they could download resources at www.fishwildlife.org (focus area, conservation education, tool kit).

Massachusetts Junior Conservation Camp

In August 2021, the Conservation Camp held its 2-week session at Boy Scout Camp Moses in Russell. Facilities at this location are an improvement from the past location. Approximately 100 campers attended. As in the past, MassWildlife staff assisted by providing support through advertisement, providing instructors, and coordinating arrangements with other state-based instructors. MassWildlife staff and MassWildlife program volunteers offered Basic Hunter Education and Bow Hunter Education courses to the campers; provided instruction in wildlife management, fisheries management, game preparation, and cooking skills; conducted the information quiz that evaluates the participant's comprehension of outdoor information and skills presented during the camp session; and participated in the graduation ceremonies.

Northeast Wildlife Trackers Conference

The Northeast Wildlife Trackers are a group of enthusiasts who share a passion for collaborative exchanges on all aspects of wildlife tracking in the Northeastern United States. Their mission is to convene, network, motivate, and inspire wildlife trackers across the Northeast. As a representative on the annual conference planning committee, the Wildlife Education Coordinator hosted an in-person conference at Rowe Conference Center.

Teaching with Trout

Conducted by the Coldwater Fisheries Project Leader and the Fish Culturist at Roger Reed Hatchery, Teaching with Trout is a popular school-aged education program. See the Fisheries Report for program details in FY 2022.

Hunter Education Program

It is the mission of the Massachusetts Hunter Education Program to protect the lives and safety of the public, promote the wise management and ethical use of our wildlife resource, and encourage a greater appreciation of the environment through education.

The Hunter Education Program is a public education effort providing instruction in the safe handling of firearms and other outdoor activities related to hunting and firearm use. The Massachusetts Hunter Education Program evolved from a survey conducted in 1954 indicating that 75% of Massachusetts hunting accidents officially involved minors. In that same year, the State Legislature enacted a law establishing a Hunter Education Program providing instruction in basic hunter education. The program is administered by the Massachusetts Division of Fisheries and Wildlife, and courses are taught by MassWildlife staff and certified volunteer instructors. Courses are open to everyone, and no one shall be denied access to the course because of age, sex, race, color, religion, or country origin. All courses are offered free of charge.

Hunter Education Courses

In Fiscal Year 2022, four of the six disciplines were offered including Basic Hunter Education, which is mandated to qualify for a first-ever hunting license, and Trapper Education, which is mandated to apply for a trap registration number.

The Hunter Education program was greatly affected by the COVID-19 pandemic. For the past two years, we were unable to deliver courses in our customary teaching strategies and we did not have access to our established classroom locations. These limitations started to ease in FY 2022. We resumed previously established teaching formats, regained access to several locations, and the volunteer corps were able to resume their own course offerings.

A total of 64 courses were successfully offered across the state with 2,240 students participating in the Hunter Education Program in FY2022. Course offerings increased by 30% and student involvement increased by 38% percent from the previous year participation levels. Students are asked to volunteer information on age, gender, and ethnic background. The following is a summary of course offerings and statistics on student participation in FY 2022.

Basic Hunter Education

Starting January 1, 2007, anyone 18 years of age or older who wishes to hunt for any bird or mammal in the Commonwealth must successfully complete a basic hunter education course, unless such person has held a license to hunt before January 1, 2007. The basic hunter education course is a standardized curriculum that provides information on the safe handling and storage of hunting arms and ammunition, hunting laws and ethics, wildlife identification, wildlife management, care and handling of game, basic survival skills, and first aid. The Certificate of Completion issued to graduates is recognized in all U.S. states, Canada, and Mexico. Forty-seven courses were offered in FY 2022. A total of 1,849 students participated and 1,611 successfully completed the course including 509 minors (under 18 years of age), 59 minorities and 250 women.

Trapper Education

The Trapper Education curriculum standards were revised in May 2018 by the IHEA in cooperation with the Association of Fish and Wildlife Agencies. Trapper Education is mandatory in Massachusetts for Problem Animal Control (PAC) agents and first-time trappers to apply for a trap registration certificate. This course includes both classroom work and field training and focuses on the best management practices for trapping. Students learn the proper use of traps, the identification of furbearing animals and their habitats, trapping laws, ethical trapper behavior with an emphasis on the responsible treatment of animals and landowner relations. Three courses were offered, with a total of 151 participants. One hundred and thirty-one participants successfully completed the course including 7 minors (under 18 years of age), 7 minorities and 12 women.

Bowhunter Education

The Bowhunter Education curriculum standards were revised in May 2017 by the IHEA in cooperation with the National Bowhunter Education Foundation. This course is designed for both the experienced and novice hunter. Course topics include the selection of equipment, safety, ethics, bow-hunting methods, and care and handling of game. Bowhunter Education is not required in Massachusetts and a Bowhunter Education certificate does not qualify a person to purchase a Massachusetts Hunting or Sporting license. A Massachusetts Bowhunter

Education Certificate is accepted, however, in other jurisdictions that do mandate the successful completion of the course. Eight courses were conducted. A total of 148 students participated and 143 successfully completed the course including 20 minors (under 18 years of age), 11 minorities and 18 women.

Waterfowl Identification and Hunting
This course teaches the identification of migratory waterfowl. It emphasizes the importance of distinguishing waterfowl in flight and includes identifying fall and winter plumage patterns and the size, shape, and flight characteristics of the birds. This course also covers hunting safely from boats and blinds and waterfowl hunting techniques. This course was not offered in FY 2022.

Black Powder (Muzzleloader) Education
This course was revised and piloted in FY2018. The course includes the identification and selection of hunting equipment, state laws and regulations regarding muzzleloader hunting and the safe handling of muzzleloaders. A live-fire segment has been added. This course was not offered in FY 2022.

Map, Compass & Survival
This 1-day course includes both classroom work and field training. Topics include instruction on the use of a compass and topographical map for land navigation as well as wilderness survival. Six courses were offered. Ninety-two students participated and 86 successfully completed the course including 8 minors (under 18 years of age) and 27 women.

Hunting and Shooting Skills Programs

National Archery in the Schools Program in Massachusetts
This program offers international-style target archery training with a nationally standardized education package in cooperation with state fish and wildlife agencies across the country. The National Archery in the Schools Program and the Archery Trade Association have partnered with MassWildlife and the Massachusetts Outdoor Heritage Foundation to promote student education and lifelong interest and participation in the sport of archery in Massachusetts.

The National Archery in the Schools Program (NASP) is a part of the in-school curriculum, generally a physical education class. The NASP curriculum is designed for students in grades 4-12, and includes social studies, mathematics, and physical education. This provides all students with an opportunity to try archery, including many who may not otherwise show an interest in the sport. MassWildlife provides a 1-day Basic Archery Instructor training for physical education teachers within schools/districts that plan to participate in NASP. In addition, MassWildlife coordinates the ordering and delivery of program equipment for the schools. To receive training, schools must obtain the NASP equipment kit, at a cost of about $3,500. The kit includes 11 Matthew Genesis bows, 122 arrows, 5 targets, 1 arrow curtain, and 1 tool/repair kit.

Five trainings were held in FY 2022 to train 29 physical education teachers from 12 different schools. Archery loaner kits were used at 19 different schools and 2 organizations across the commonwealth. 9,591 students across Massachusetts participated in NASP as part of their in-school curriculum.

Young Adult Pheasant Program
The Massachusetts Young Adult Pheasant Hunt Program was developed by MassWildlife to provide an opportunity for 12-17-year-old Hunter Education graduates to practice firearms safety, develop shooting skills, and participate in a special pheasant hunt with an experienced pheasant hunter in a friendly environment. The program is run by participating local sportsmen's clubs. This program is a comprehensive, three-part recreational program. Shooting instruction and practice take place during the summer or early fall; the pre-hunt workshop is held a week or two before the youth pheasant hunt; the actual hunt is scheduled by the individual clubs for any one of the six Saturdays prior to the mid-October start of the regular pheasant hunting season.

The Young Adult Pheasant Program was run at six different clubs across the state in FY 2022. A total of 41 youth participated in the event.

Youth Turkey Hunt Program
This program was developed by MassWildlife in cooperation with the Massachusetts Chapter of the National Wild Turkey Federation (NWTF) to provide an opportunity for 12-17-year-old Hunter Education

graduates to practice firearms safety and turkey-hunting techniques, develop shooting skills, and participate in a special 1-day turkey hunt under the one-on-one guidance of an experienced turkey hunter. The Recruitment and Retention Specialist coordinates the Youth Turkey Hunt.

The program is offered by participating local sportsmen's clubs in partnership with local chapters of the NWTF. It is a comprehensive, three-part outdoor education program designed to give young hunters an opportunity to acquire some of the specialized skills associated with the activity. Hunter safety is emphasized to help build the confidence of the inexperienced hunters so that they will feel comfortable when in the field.

The Youth Turkey Hunt Program takes place in the spring. Shooting instruction, practice, and the pre-hunt workshop take place two or three weeks prior to the day of the hunt. The actual turkey hunt takes place on the Saturday prior to the last Monday in April.

A new online youth turkey format was offered in FY 2022 that included an online course through Kalkomey along with an online field day webpage was created with MassWildlife and NWTF content including written content and videos. In FY 2022, 101 students completed the online course.

In addition to the online course, in-person seminars were also offered. Due to the high number of online participants clubs were offered to either keep the in-person seminar as they have been in the past which was youth turkey seminars, or they could make them learn to hunt seminars that included anyone interested in learning more about turkey hunting ages 12+. This would allow a bigger reach for learn to hunt classes while also meeting the youth turkey requirement. Six clubs held in-person seminars. Of the six clubs, four of the clubs turned their seminar into a learn to turkey hunt seminar, while two kept them as a youth turkey seminar. A total of 14 adults and 20 youth participated at a turkey seminar.

Learn to Hunt Program

The Learn to Hunt program, which is geared to target new hunter education graduates who need more information before they were comfortable hunting for a particular species, held a combination of virtual and in-person classes in FY 2022. Below is a summary of the learn to hunt classes that were offered:

- Deer Hunting 101 Online Course: 28 registered*
- Deer Hunting 101 In-Person Course: 35 registered*
- Scouting for Deer Online Course: 325 registered*
- Fall Turkey Online Course: 269 registered*
- Spring Learn to Hunt Turkey Seminars (see youth turkey)

*This number indicates the number of registered participants. We were not able to collect the number of attended participants. Typically, our no-show rate for online courses is 50% and 20% for in-person courses.

Becoming an Outdoors Woman Program

Becoming an Outdoorswoman (BOW) is a program designed for women ages 18 and older, providing basic outdoor skills sessions.

Two BOW events were held, the mentored deer program which included two online classes, an in-person field day and a mentored hunt and a hybrid turkey seminar that included an online class followed by an in-person field day. 17 women participated in the deer program and 9 women participated in the turkey program.

Fishing Skills Programs

The Angler Education Program is the main component of the Aquatic Resource Education Program. The other component is Aquatic Project WILD, overseen by the Wildlife Education Specialist. The Angler Education Program has several components designed to introduce people to fishing and the outdoors, including family fishing festivals, fishing clinics, fishing classes, and our own Fishing Tackle Loaner Program. Due to the ongoing COVID-19 pandemic our numbers for FY 2022 were still somewhat reduced as we did not conduct as many in-person public programs from July 2021 through June 2022.

The Angler Education Program operates with the cooperation of trained volunteers. All instructors

complete a volunteer application and undergo a background check through the Criminal Offender Record Information (CORI) system. Volunteers are given pertinent information about MassWildlife and the Angler Education Program, and then begin apprenticing at program events. Instructors are recruited mostly from fishing events, positive publicity, and word of mouth. There are currently 101 volunteer instructors on the books of which approximately 45% were active during FY 2022.

Virtual and Online Fishing Content

The COVID-19 pandemic forced us all to approach almost all elements of the program differently to find a way to deliver quality fishing education programming to the public in a safe, effective manner. We developed and offered virtual programming utilizing platforms such as Zoom, Facebook Live, and WebEx. We offered 1- and 2-hour "learn to fish" programs throughout the year covering both beginner and advanced fishing themes. We will no doubt continue to offer these programs in some capacity post-pandemic as these appear to be useful tools we can employ in certain circumstances. We also improved our online learning content by filming a few short segments on basic fishing techniques, as well as longer Beginners Fishing and ice fishing tutorials. In FY 2022, there were 10 virtual fishing programs attended by approximately 222 viewers.

Family Fishing Festivals

Weekend family fishing events are set up as an introduction to fishing, where we make available rod-and-reel combinations, terminal tackle, and bait at no charge, and when the manpower allows, instruction in casting, fish identification, knot tying, baiting, cleaning, and filleting. For FY 2022 we were still well under pre-pandemic numbers. There were 13 family fishing events totaling 1,406 people attending.

Family Fishing Clinics

Fishing clinics, while short in duration, are a very popular program component. These clinics are typically co-sponsored by town recreation departments, sporting clubs, Boy or Girl Scouts groups, summer camps, and or other state or federal agencies. Clinics are generally two to three hours, involving a short overview of fish, fishing, safety, and ethics, followed by casting instruction and a healthy dose of fishing. Fishing educational handouts are generally provided, and clinic participation is kept small enough to allow the instructors to work with participants one-on-one. For FY 2022, we ran 64 fishing clinics totaling 1,770 participants.

Fishing Classes

In pre-covid years, a small handful of fishing classes were conducted annually (typically 12 to 15). These are generally specialty fishing skills classes like fly tying, adult-only "learn to fish" classes, and a few school-based fishing classes. However, due to the ongoing COVID-19 pandemic, only a small handful of classes were conducted. For FY 2022 there were four classes totaling approximately 80 students.

Fishing Tackle Loaner Program

The Angler Education Program keeps and maintains fishing equipment onsite for loan to various groups throughout the state. Loaner equipment includes basic spin casting rods, spinning rods, saltwater rods, as well as fly rods and fly-tying equipment and even ice fishing gear. Equipment was loaned to various groups and agencies, including the DCR, the U.S. Army Corp of Engineers, the USFWS, various sporting clubs, scout troops, and church groups. Along with the fishing gear, the necessary terminal tackle and various fishing education program handouts are also provided. In FY 2022, 37 groups requested equipment totaling 1,065 pieces of fishing equipment.

Cooperative Programs

Trout-stocking programs are performed mostly in the spring (April and May) with various school groups around the state. With the ongoing pandemic there were just two trout stocking programs run during FY 2022 totaling approximately 125 people.

Outreach and Education Staff

Nicole McSweeney, Acting Assistant Director (partial year)
Marion Larson, Chief (partial year; retired)
Timothy Bradbury, Hunter Education Specialist
Bert Comins, Learn to Fish and Hunt Programs and Outreach Specialist (partial year)
Jill Durand, Clerk
Steve Foster, Hunter Education Program Logistics
Troy Gipps, Magazine Editor and Publications Manager
John Gutzeit, Learn to Fish and Hunt Programs and Outreach Specialist (partial year)
Colleen Hubbard, Clerk
Astrid Huseby, R3 Coordinator
Jim Lagacy, Angler Education Coordinator
Pam Landry, Education Coordinator
Susan Langlois, Hunter Education Program Administrator
Edward McKenna, Outreach and Communications Specialist (partial year)
Jody Simoes, Human Dimensions Project Leader
Emily Stolarski, Communications Coordinator

6 Districts and Wildlife Lands Report

Trina Moruzzi, Assistant Director of Operations
Patricia Huckery, Northeast Wildlife District Supervisor
Jason Zimmer, Southeast Wildlife District Supervisor
Todd Olanyk, Central Wildlife District Supervisor
Joseph Rogers, Connecticut Valley Wildlife District Supervisor
Andrew Madden, Western Wildlife District Supervisor

Overview

Trina Moruzzi

Most people who interact with MassWildlife do so through one of the agency's five Wildlife Districts. The District offices are this agency's field stations, administering wildlife lands, conducting on-site monitoring and management, enhancing recreational opportunities, and addressing the wildlife issues pertinent to their regions.

District personnel sell hunting, fishing, and trapping licenses; stamps; and selected permits as well as distribute the Guide to Massachusetts Hunting, Freshwater Fishing, and Trapping and other materials related to the sale of hunting, fishing, and trapping licenses to vendors throughout their District.

District Supervisors are the agency's point persons, spending many hours with civic and conservation groups, including sportsmen's clubs and county leagues, and responding to inquiries from interested citizens. They provide technical advice on wildlife matters, particularly on matters pertaining to the handling of nuisance animals. In this context, District staff serve to educate the public and deal with a large number of bear complaints, deer damage complaints, questions about coyotes, and other issues dealing with the impact of wildlife on human activities, and vice versa. They also assist officers from the Massachusetts Environmental Police (MEP) to ensure public adherence to wildlife laws and regulations.

District staff participate in a wide variety of biological survey and monitoring programs initiated by MassWildlife's fisheries and wildlife section staff based at the Westborough Field Headquarters (FHQ); see the individual section reports for the status of these projects. Among the biological survey projects conducted by District staff were the black bear habitat study, rare turtle surveys, a bald eagle breeding survey, whip-poor-will surveys, New England cottontail surveys, and stream and lake surveys. District personnel also conduct census counts of wild turkey, woodcock, ruffed grouse, and bobwhite quail.

District staff members continued to enhance recreational opportunities throughout the state by stocking Brown Trout, Eastern Brook Trout, Rainbow Trout, Tiger Trout, and brood stock Salmon into waters scheduled to receive them. Prior to releasing trout, they monitor the water quality of the designated lakes and streams.

Districts also provide additional upland gamebird hunting opportunities by releasing ring-necked pheasants on WMAs and in open covers (i.e., suitable habitat on public land).

Land stewardship is an important MassWildlife priority and has become a large part of District activities. District stewardship biologists assist the wildlife land acquisition effort to prioritize lands to be acquired by locating titles, landowners, and boundaries, and walk prospective sites with DFG Land Agents to assess natural resource values and identify any issues that may present stewardship challenges on particular parcels. Stewardship biologists are responsible for communicating with members of the public, abutters, landowners, and other stakeholders on stewardship activities, including monitoring lands under Conservation

Restrictions (CR) and stewardship of the Division's WMAs. They also work to mitigate encroachments by adjacent landowners on our WMAs. Staff have also been assisting the Habitat program by participating in prescribed burns as part of the Biodiversity Initiative on several WMAs throughout the state. They also participate in habitat restoration and management work on the WMAs in their region by cutting brush, mowing, trimming trails, assisting with forest cutting operations, planting shrubs, performing herbicide treatments on invasive vegetation, and maintaining roads and parking areas. They emplace gates, erect signs, and make other arrangements related to the protection and management of the agency's lands.

Staff worked diligently this year to ensure acquisition, maintenance, and stewardship of the thousands of acres of wildlife lands acquired and managed by MassWildlife remain protected wildlife habitat. Wildlife lands stewardship staff based in Westborough coordinated stewardship efforts with the five districts in the form of habitat management, boundary marking, survey contracts, and signage to improve access to wildlife lands.

Conservation Restriction (CR) landowner relationships and CR monitoring are a large part of land stewardship. Annual letters were sent to each CR landowner inviting them to attend the annual monitoring visit of their property. This letter was also used to inform landowners of technical assistance and potential funding sources available to them to update forest management plans or to conduct habitat management. Stewardship staff conducted in-person monitoring visits across the state to ensure compliance with the terms and conditions of the CR. Staff also discussed and reviewed management plans for forestry, habitat, passive recreation, and agriculture if permitted. Staff from headquarters coordinated with Districts to communicate with landowners and their consultants to ensure wildlife habitat, natural resources, and public recreation remain protected on land subject to a CR.

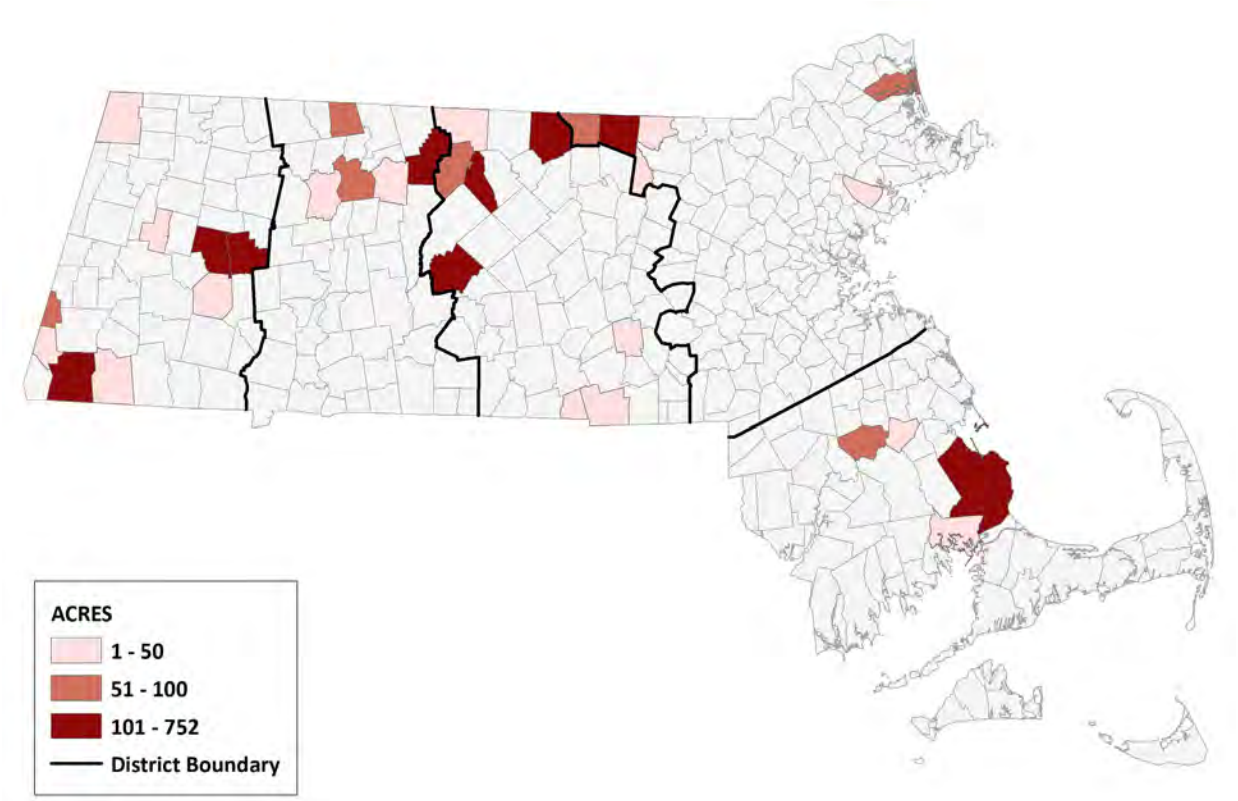
As detailed below, MassWildlife's continued focus on strategic land acquisition and long-term stewardship underscores its commitment to protecting the best land for wildlife, biodiversity, and wildlife-dependent recreation in Massachusetts. Each of the five District Supervisors as well as the Wildlife Lands Stewardship Coordinator are part of the DFG Lands Committee, ensuring land acquisition and conservation of DFW lands. The DFG land acquisition team look forward to another productive year of conserving land for habitat biodiversity as well as hunting, fishing, trapping, wildlife viewing and other nature-based recreation.

Land and Conservation Restriction Acquisitions in FY 2022

The Department of Fish and Game (DFG) and MassWildlife work together to protect the Commonwealth's most important fish and wildlife habitat and to expand the public's access to land and inland waters for hunting, trapping, and fishing and compatible passive recreation. To accomplish this dual mission, DFG's Land Protection Program uses funding from the Environmental Bond and the Wildlands Fund to purchase land and conservation restrictions (CRs) from willing landowners who seek to conserve their property. Some landowners donate their land or a CR on it to DFG, which may result in an income tax deduction for the landowner.

FY 2022 was another successful year for protecting land across the Commonwealth, yielding a multitude of public benefits. Land agents in each of the five districts completed a total of 34 projects covering 2,962.52 acres for a total cost of $6,067,100 (Figure DL 1; Table DL 1). Land acquired in fee and through a CR improves Massachusetts' climate-change resiliency by protecting forests that absorb carbon dioxide and wetlands that work to absorb floodwaters in extreme weather events, and by connecting large tracts of wildlife habitat to allow plants and animals the ability to adapt to changing weather conditions. A current inventory of all MassWildlife properties is listed in Appendix C, the Wildlands Tables, Table C 1.

Figure DL 1. FY 2022 Acquisitions by Town and Acreage



DL 2. FY 2022 Summary of Land Acquisitions

Town(s)	Property Name	District	Acres
ATHOL	Millers River WMA	Central District	52.5
GRAFTON	Quinsigamond Marsh Access	Central District	1.5
HARDWICK	Raccoon Hill WMA	Central District	108.25
ORANGE	Fish Brook WMA	Central District	103
ORANGE,ROYALSTON	Fish Brook WMA	Central District	79
PHILLIPSTON	Millers River WMA	Central District	165
WEBSTER,DOUGLAS	Mine Brook WMA	Central District	31.8
BERNARDSTON	Satan's Kingdom WMA	Connecticut Valley District	69
DEERFIELD	Great Swamp WMA	Connecticut Valley District	8.61
MONTAGUE	Montague WMA	Connecticut Valley District	70.16
MONTAGUE	Montague Plains WMA	Connecticut Valley District	6
WENDELL	Wendell WMA	Connecticut Valley District	11.59
ASHBURNHAM,ASHBY	Ashby WMA	Northeast District	186
NEWBURY	William Forward WCE	Northeast District	61
PEABODY	Ipswich River Access – Peabody	Northeast District	22.23
PEPPERELL	Squannacook River WMA	Northeast District	16.87

SHIRLEY	Mulpus Brook WMA	Northeast District	3.65
SHIRLEY	Mulpus Brook WMA	Northeast District	39
TOWNSEND	Squannacook River WMA	Northeast District	94.6
TOWNSEND	Squannacook River WMA	Northeast District	40.37
BRIDGEWATER	Taunton River WMA	Southeast District	58.5
HALIFAX	Peterson Swamp WMA	Southeast District	7.32
PLYMOUTH,WAREHAM	Camp Cachalot WMA	Southeast District	789
ALFORD	Elizabeth's Woods WCE	Western District	86
CHESTER	Hiram H. Fox WMA	Western District	26
CHESTERFIELD	Ram Hill WMA	Western District	80.77
CHESTERFIELD	Tower Brook WMA	Western District	210
EGREMONT	Jug End State Reservation and WMA	Western District	19.33
HINSDALE	Hinsdale Flats WMA	Western District	15.66
NEW MARLBOROUGH	Konkapot River Access	Western District	7.6
SHEFFIELD	Soda Creek WCE	Western District	301.58
WILLIAMSTOWN	Misery Mountain WMA	Western District	5.04
WORTHINGTON	Fox Den WMA	Western District	10.13
WORTHINGTON	Jackson Swamp WCE	Western District	175.46
		Total Acreage	**2962.52**

Land Acquisition Highlights

In the Northeast District one wildlife conservation easement (WCE) and seven fee acquisitions were completed in FY 2022, conserving 463 additional acres within 8 communities. Five of the projects involved gifts, either with partners like Essex County Greenbelt or extracted land required as part of development projects. Two of the largest projects in the NE District involved Federal Land and Water Conservation Fund (LWCF) grants that provided half the purchase price. The first LWCF project protected 95 acres on West Meadow Rd in Townsend. It involved the cleanup & permanent protection of an old gravel pit, hay fields and woods at the headwaters of the Squannacook River, adjacent to the Squannacook River WMA. It will provide hunting, hiking and birding opportunities and will protect rare species habitat. It will also provide a crucial buffer to the headwaters of one of the premier cold-water streams in eastern MA. The second highlight was the protection of the 186-acre South Peak of Watatic in Ashby and Ashburnham. This parcel includes a large barn that can be used to store maintenance equipment, a pond that can be used to teach fishing, & hiking trails that connect to Watatic Mountain State Wildlife Area and Mt. Watatic Reservation. It also includes a parking area on Route 119. North County Land Trust pre-acquired the land while some old buildings were removed. They will retain an additional 15 acres at the end of Hardy Rd and will grant a Conservation Restriction over that land to the Department of Fish and Game.

In the Southeast District Camp Cachalot is a singularly significant property, sharing 3 miles of common boundary with Myles Standish State Forest (Plymouth/Carver) and Maple Springs WMA (Wareham). Its ecologically critical pine barrens habitat supports two dozen rare & endangered species of birds, insects, reptiles, and plants. The acquisition of the 780-acre Camp Cachalot comes with unique opportunities for environmental education. As co-owners, DFG and DCR will collaborate in creating environmentally sensitive recreation areas and an interpretive area focusing on education about globally rare natural communities and the value and purpose of ongoing habitat restoration work. The property completely encompasses a number of coastal plain ponds and provides hunting, hiking, and other passive recreational pursuits.

In FY 2022, the Central District proposed several parcels for possible acquisition, and the committee

approved and provided funding for seven totaling 541.05 acres. A 100-acre parcel in Hardwick known as the "Robinson" parcel which is in close proximity to both Racoon Hill and Muddy Brook WMAs; a 175-acre parcel in Phillipston known as the "Sturbinsky" parcel which will be incorporated into the Millers River WMA complex; and we received a donation of 1.5 acres from the North Grafton Fish, Game & Bird Club in Grafton that added to our existing property in Quinsigamond Marsh. DFW also purchased a 52.5-acre addition to the Millers River WMA in Athol from the Zack Family Trust, and a 108.25-acre addition to the Mine Brook WMA in Webster and Douglas. Rounding out FY22, a total of 182 acres were added to the Fish Brook WMA due to a larger Valley District land project; Fish Brook WMA boarders the Valley District.

A total of five land projects were completed in the Connecticut River Valley District this year resulting in 165.36 acres of land protected. The largest and most notable acquisition within the district this year where two new parcels acquired in town of Montague adding 76.16 acres to the existing Montague Plains WMA. These acquisitions add to existing properties owned by MassWildlife, assuring continued preservation of the state-owned lands in this District.

The Western District was able to complete eleven acquisition projects to protect over 937 acres of land. However, instead of highlighting just one project I would like to highlight the three projects in which the Western District worked cooperatively with three separate non-profit groups to protect over 562 acres. The first project was completed with the Alford Land Trust to protect 86 acres of land on North Egremont Road. These 86 acres contained a sloping calcareous fen, which is a priority natural community with several State listed (MESA and SWAP) species. The second project was completed with Berkshire Natural Resources Council and protected 301.58 acres in Sheffield on Water Farm Road. This property contained 8000 feet of frontage along Soda Creek Brook. This property included riparian habitats, wetland habitats and upland and ridge top habitats. All the habitat types had calcareous features with several State listed (MESA and SWAP) species. The third project protected 174.9 acres in the cooperation of the Hilltown Land Trust along Huntington Road in Worthington. This property abuts the Hiram Hy Fox Wildlife Management Area and protected 1195 feet along the Little River, a cold-water fishery. It also included a portion of Jackson Swamp, BioMap Wetland Core, and Eagle Ridge. This project protected a number of diverse habitats. Each of the three cooperative acquisitions had DFG-MassWildlife acquire a Conservation Restriction (CR) over the non-profit's restricted fee ownership. The CR ensures the lands will remain undeveloped and open to public for passive recreation. All three non-profits share our conservation values which will allow MassWildlife to work cooperatively with the non-profit to manage these protected lands in the best possible manner. Moreover, partnering with non-profit allowed DFG-MassWildlife to protect each of these parcels at below appraised value and while allowing MassWildlife the flexibility to pursue US Fish and Wildlife Federal Aid Reimbursement. Certainly, a win, win, win scenario for permanent land protection, habitat management -stewardship and fiscal responsibility.

Northeast Wildlife District

Patricia Huckery

Administration

The Northeast District staff continues to broaden their work skills becoming more knowledgeable and self-sufficient as new projects are developed and implemented.

The Office of Fishing and Boating Access and Central District Office loaned NED dump trucks to move gravel to parking areas and roads in need of work. A draft proposal was submitted to the Assistant Director of Operations for extensive building repairs including replacement of sills, siding, windows, walls, and insulation at the district office. Title 5 plans for a septic system upgrade at the district office are in process.

As built survey plans for Kent's Island Bridge were filed at the Registry of Deeds. Range Permits were issued. Proposed pheasant regulation changes were reviewed. Stewardship and capital fund requests were provided.

Required training by all staff included cyber security, harassment in the workplace, and ethics. Zoom,

Teams, and live meetings and trainings were attended, including Fisheries & Wildlife Board, Senior staff, District Supervisor, District, Stewardship, R3 Hunting Access, MVP (Municipal Vulnerability Preparedness), MFH, Agency Relevancy Engaging Staff, Lands Committee, MA Permitting Group, The Wildlife Society, MassWildlife's Wildlife section, Coastal Waterbird Cooperator's, Conservation Commission, Wild and Scenic River Stewardship Council, Mt. Watatic Advisory Committee meetings, the regional Salt Marsh Working Group, as well as Great Marsh manager and regulatory groups. A highlight was attending the NEAFWA conference remotely. LART training was attended. Deer review and biological deer check meetings were attended. Also, staff listened to webinar trainings for the National Coastal Resiliency Fund and America the Beautiful Act fund.

The dam replacement at Upper Flint Pond WMA was completed with project oversight handled by the Office of Fishing and Boating Access engineers, Westborough, and District staff.

Land acquisition projects in Townsend, Ashby, Shirley, Salisbury, and Dunstable, were reviewed.

Stewardship, Management, and Habitat Restoration

Stewardship priorities focused on boundary marking of new land acquisitions, blocking ATV access, and small habitat restoration projects. Regular stewardship meetings were held with the Stewardship Biologist and District Supervisor, and several meetings with the Stewardship Coordinator.

Boundary marking was brought up to date, while research and development of survey projects continued. Completion of a small survey in Groton resolved a boundary dispute at Squannacook River WMA. Two Federal Taking surveys went out to bid for Crane Pond WMA. One was successfully completed, while the Ash Street survey was not. The Ash Street survey will be reposted with additional information, maps, and weekly status check-ins, to ensure a successful outcome.

There were multiple ATV trespasses that were blocked at Ashby, Townsend Hill, Unkety and Squannacook WMAs. Mowing trespass at Delaney WMA and Nissitissit River WMA were addressed. Gates were installed at Ashby and Dunstable WMAs.

A large trespass from 2010 in Pepperell found the landowner making progress alleviating the last remaining encroachments. The landowner engaged a building contractor to move a section of barn and large shed. Several site visits with the contractor, District Supervisor and Assistant Director of Operations set the schedule of actions needed.

New updated WMA signs were installed at Dunstable Brook, Nissitissit River, and Delaney WMAs. A new kiosk was installed at the Nissitissit River WMA. The parking area at Dunstable Brook WMA was improved with several layers of gravel.

Staff prepared affidavits for the Attorney General's office regarding the Comley case. A judgement was received allowing the state's motion and found in MassWildlife's favor on all counts. In this case, three access roads are blocked, woods roads were enlarged, illegal trails were created, a vernal pool was partially filled, lands owned by MassWildlife were recovered, as well as other damages.

Staff worked with Senator Tarr's office to address a WMA abutter's concerns about hunters. Nineteen set-back signs were posted around the property, and the nearby public access parking area, with assistance from the MA Environmental Police. A Townsend Conservation Commission hearing was attended regarding a proposal for a spur trail on Old Meeting House Road. Project comments were coordinated with the Natural Heritage & Endangered Species Program.

Conservation Restriction monitoring was coordinated with Westborough Wildlife Land Stewardship staff, with special attention to In Lieu Fee parcels in the Parker River Connector WMA as required by grant funding. Staff met with National Grid representatives to review ROW road damage at Martin Burns WMA and discuss remedies.

District staff conducted several habitat reclamation projects on three Wildlife Management Areas. Dozens of apple trees were released and pruned, and several acres of shrubs and saplings were removed from overgrown fields and grasslands on Martin Burns WMA, Dunstable Brook WMA and Ashby WMA. Staff coordinated with the Southeast District Office to bring the T-rex, with milling head, to the latest Ashby WMA acquisition to mow encroaching white pines, which will maintain grouse and snowshoe hare habitats.

The Squannacook WMA Barrens Restoration project was renamed the Oak Woodland Restoration project based on additional information collected by MassWildlife's forester. Notices of Intent were submitted in Townsend and Shirley.

Landscape-level projects were submitted to the Director in the anticipated passage of the Recovering America's Wildlife Act (RAWA). Projects included expanding conservation work for Blanding's Turtles (*Emydoidea blandingii*) to increase nesting habitat, improve road passage, and boost population assessments. Other proposed projects include an urban black bear conservation plan, full implementation of the Great Marsh Ecosystem Recovery Plan, and early successional and barrens habitat restoration projects. Priority habitat projects for the Northeast District were submitted to the Biodiversity Initiative staff.

A final report was submitted to EOEEA to satisfy the requirements of a State Hazard Mitigation & Climate Adaptation Plan (SHMCAP) grant for $180,000 which was awarded to implement Phase II of the MassWildlife Great Marsh Ecosystem Recovery Project (GMERP). Grant funds were used to complete 2,000 acres of preliminary salt marsh restoration design work using nature-based techniques. Results were shared with MA Coastal Zone Management, Great Marsh Partners, and managers. A SHMCAP grant request for $270,000 was submitted for GMERP Phase III, which would advance 3,000 additional acres of preliminary salt marsh restoration design in Great Marsh. A National Coastal Resiliency Fund was submitted for $795,000 to the National Fish & Wildlife Federation to complete final designs and permitting for 3,278 acres of salt marsh in Great Marsh and remove two tidal restrictions.

A portion of Martin Burns WMA was cut to maintain early successional habitat as well as improve upland game hunter access. Ashby, Salisbury Marsh, Dunstable Brook, and William Forward WMAs were mowed to maintain grassland habitat.

Repair of the Mid-State Trail through Mt. Watatic Sanctuary was initiated, after being delayed by the pandemic. The experienced AMC trail crew began the arduous task of restoring a badly damaged trail. The Department of Conservation and Management provided a camp site at nearby Willard Brook State Forest for crew members, as well as regular oversight of the reconstruction.

Research and Conservation

Wildlife

Northeast District completed annual spring surveys including one woodcock peenting survey (Haverhill), one nightjar survey (Townsend/Shirley), and one biodiversity initiative bird point count survey (Squannacook WMA). Multiple bluebird and kestrel boxes were checked and serviced on various WMAs while 6 blue bird boxes were erected on 2 WMAs.

District staff assisted the Waterfowl Biologist in checking and/or maintaining 111 wood duck nesting boxes at 12 locations including study and non-study sites. Staff conducted annual winter duck banding through trapping and tub launching methods. A total of 208 mallards and 1 American black duck were captured and banded, and one GPS solar powered transmitter was deployed on one hen mallard. Twelve previously banded mallards were captured including three from New Hampshire. In July 2022, district staff with assistance from Westborough staff captured and banded our annual quota of 250 geese from numerous sites distributed throughout 4 counties (Middlesex, Essex, Suffolk, and Norfolk).

The black bear research project ran from the beginning of April to mid-June 2022. Nine bait sites were established and three barrel traps were set. Two male bears were captured, ear-tagged and released on site, no females were captured or detected on trap camera. During winter den checks, the GPS collar was removed from the district's only female sample as she had not returned to Massachusetts from her movement into New Hampshire in 2019.

Deer check stations were staffed to collect biological data during the first week of shotgun season.

Fisheries

Stream surveys were conducted in eight watersheds and 26 streams. There were some high water and equipment problems which slowed progress. Staff continued to find native brook trout at known locations. Two stream restorations were completed in the district at Sucker Brook in Pepperell, and Traphole Brook in Walpole/Norwood. Access to White's Pond in Concord was blocked due to construction of road and drainage upgrades.

One fish kill was documented at Horn Pond in Woburn where 9 sunfish were found dead.

Natural Heritage and Endangered Species
District staff completed salt marsh sparrow surveys (*Ammospiza caudacuta*) in Essex County in coordination with MassAudubon Society and USFWS. They attended training at Rachel Carson NWR in Maine, where SHARP (Saltmarsh Habitat & Avian Research Program) staff taught attendees required bird and vegetation survey methodologies. Basically, each surveyor had to navigate to set points, play a 10-minute recording, and record all birds heard and seen within set distances.

Bald eagle surveys were conducted on 30 nests in April 2022 and district staff continued to monitor 19 active nests. Several nests were not successful due to egg predation, destruction from rival, hatch failure, and injuries from falling out of the nest. Eagle banding was accomplished in May and June 2022; a pair of eaglets were banded from a nest in Amesbury and another pair were banded from a nest in Arlington.

Six Blanding's Turtle nesting sites were maintained. The largest, at 5 acres, required significant weeding by staff prior to nesting season.

Wildlife Technicians assisted NHESP with freshwater mussel surveys on the Nissitissit River as part of a long-term study. Fields were mowed to maintain milkweed for monarch butterflies.

Enhancement of Outdoor Recreation
The Northeast District stocked 4,956 pheasants on 5 WMAs, 3 privately owned hunter-accessible properties, 2 DCR-owned properties, and 1 town-owned property. The WMAs stocked with pheasant include Martin Burns, Crane Pond, William Forward, Ashby, and multiple parcels of Squannacook. This year, the district added an additional cover from Squannacook WMA which was a newly acquired parcel in 2020. However, the Northeast District lost two more private covers, one due to a change in property ownership and another due to a confrontational issue between owner and hunters.

One hunter took part in the paraplegic hunt held at Fort Devens, where two deer were harvested. Eleven waterfowl blinds were maintained at Delaney WMA.

There were 90,090 trout stocked in the spring and 12,450 rainbow trout and 1,000 brown trout stocked in the fall. The angler trail to the Merrimac River was maintained at Salisbury Salt Marsh WMA.

A License Agreement was issued to the Town of Westford for bridge work at the Beaver Brook access ramp for storing materials and accessing a wetland replication area. In the process, the ramp will be improved to provide safer car-top boat access. District-wide, roads and parking lots were made safer with new gravel upgrades.

Target range permits at Martin Burns WMA were issued, after being closed during the pandemic. Four clubs were issued field trial permits for Delaney WMA, as well as one mock fox hunt. A mock fox hunt was approved at Surrenden Farm WCE.

Outreach and Education
NED staff contributed to the Aquatic Special Addition of the MassWildlife magazine on a "Wood is Good" piece. An Earth Day booth has staffed in Townsend. Earth Day trout stocking at Horn Pond in Woburn was well-attended by the public, who were joined by legislators and the DFG Commissioner.

Meetings regarding a proposed Oak Woodland project at the Squannacook River WMA were held with the Nashua River Watershed Association, The Nashua River Wild & Scenic Stewardship Council, and Shirley and Townsend Conservation Commissions.

Staff participated in a "Learn to Hunt" webinar, as well as a family fishing clinic in Lowell.

Technical Assistance
There were numerous wildlife calls regarding general questions, sightings, and conflicts. Many calls were received from the town of Peabody on all manner of wildlife concerns and questions. Coyote inquiries remained one of the most frequent calls, as well as turkeys. People called about avian influenza, dead bald eagles, and black bears roaming through suburbia. Seemingly abandoned baby wildlife kindled concern for wildlife.

Help was provided with new MassFishHunt system upgrades. Wildlife rehabilitator and animal control agent tests were administered.

Southeast Wildlife District

Jason Zimmer

Administration

There were no personnel changes in the Southeast District in FY 2022.

As was the case in FY21, the pandemic continued to affect District Operations well into this fiscal year. However, we were able to reopen the office to the public in June and, in a controlled fashion with specific protocols in place, we were able to resume many normal operations.

District staff acquired the materials to construct a new ADA access ramp and entry steps on the District main office, replacing the existing ramp and stairs that had deteriorated into an unsafe condition. All work was completed by our own staff and in full compliance with existing ADA codes and standards. Staff also acquired materials to complete significant repairs to the house on our Red Brook WMA including replacement of all soffit and fascia boards, repairs to the roof, removal of an old chimney and repairs to several windowsills.

District staff cooperated with the Division of Marine Fisheries on the use and operation of the Old Sullivan Fish Hatchery property in Sandwich.

The District Supervisor sent letters to the Army Corps of Engineers Section 206 Program to request that they consider both Burrage Pond WMA and the Red Brook WMA for restoration funding. ACOE got back to the agency and is moving forward with Federal Interest Determinations on both sites, which involves a large team of ACOE engineers, hydrologists, etc., visiting the site and evaluating the potential for restoration of wetlands on the property.

The Hyannis water issue ultimately reached a conclusion in FY22, with the Town's contracted water source report indicating that the quantity and quality of water available at the Hyannis Ponds WMA was not suitable as a new source. The Town is now focusing on other lands to establish a new municipal water supply well.

The proposed land swap between MassDOT and MassWildlife near the Canoe River WMA did not materialize in FY22 likely due to complications identified on the site associated with some old gas tanks and an abandoned car being documented on the DOT land following a site visit conducted by the District Supervisor and Stewardship Biologist.

The District, working with others in the agency, completed the review of the Camp Edwards Integrated Natural Resource Management Plan. Further, District staff worked closely with our habitat program and natural heritage and endangered species program to review a required cleanup of a historic dummy grenade range on our Frances A. Crane WMA. The cleanup was completed by the Remediation Program at Joint Base Cape Cod. Staff worked with them to ensure that the project, which involved some extensive tree clearing and digging up of any underground metal items detected, was completed in a manner that would result in the habitat left after the project was a net benefit to wildlife. The project was started this FY and is expected to be completed, with final grading and seeding completed by Spring of 2023.

Staff also worked extensively with the Department's legal counsel and citizens in the Town of Brewster to address concerns relative to a proposed hunting bylaw covering the Punkhorn Parklands. After nearly a year of ongoing discussions, a bylaw was ultimately passed that opened the property to controlled deer hunting.

Another hunting-related issue was addressed in FY22 having to do with complaints about hunting at the DCG Gooseberry Island property. There were a few different issues that had to be dealt with stemming from complaints from non-hunting users about both waterfowl and deer hunting in the area. The District worked with DCR to enhance signage at the property and better educate the public regarding legal hunting activities.

District staff worked with the EEA IT Department to have a new phone system installed at the District Office. The new MassVoice system is an internet-based system that allows for direct call transfer/forwarding between all state government offices that have the system. Eventually all offices will have this system, which will improve efficiency and collaboration.

Staff worked with our Natural Heritage and Endangered Species Program, Camp Edwards personnel and DCAM on a complicated land swap issue associated with the construction of a new switching station on the base in Bourne. The Division permitted the project through MESA and worked with all parties involved to swap a few parcels as required under the Conservation and Management Permit to achieve a net benefit to rare species under the Massachusetts Endangered Species Act. The swap required Article 97 legislation.

District staff participated and provided input on several regulatory and/or administrative matters this fiscal year including the ongoing evaluation and troubleshooting associated with the MassFishHunt online licensing system, the review of PFAS issues in both fish and wildlife populations, and a review and eventual regulatory changes to pheasant and small game hunting seasons which included an extension of the pheasant season to December 31 and expansion and simplification of rabbit and squirrel season regulations,

District staff remained heavily engaged and involved in the agency's R3 and Relevancy efforts with numerous staff on a variety of different project working groups. Most notably, staff made significant progress in getting a venison donation program progress (expected to be finalized for the Fall 2022 hunting season) and were instrumental in successfully holding three Urban Angler Education Programs in the District.

Two District employees, Aaron Best and Connor Fleming, deployed with the Massachusetts Interagency Wildfire Crew and helped contain/battle two different wildfires in Montana and one wildfire in Idaho. Both staff gained valuable experience on these fires that will help them continue to build their knowledge in skills and further the agency's prescribed fire program.

District staff attended several trainings/conferences in FY 22 including all fire crew members successfully completing their annual prescribed fire refresher course and work capacity test, Connor Fleming attended a prescribed fire engine course, the District Supervisor attended an Environmental Justice course, the District Supervisor and Wildlife Biologist completed their annual LART training, all field staff updated their hoisting licenses and several staff attended the Northeast Fish and Wildlife Conference virtually.

The District Supervisor and District Fisheries Biologist worked with several other agency staff and outside partners to prepare and submit an application for an America the Beautiful Grant through the National Fish and Wildlife Federation. If awarded, the grant will fund major conservation work throughout the Southeast Pine Barrens ecosystem including the restoration of Century Bog at our Red Brook WMA, habitat improvement work at over 100 coastal plain ponds and a variety of projects and initiatives to further prescribed fire in pine barrens habitats throughout southeastern MA.

Stewardship, Management, and Habitat Restoration

The District Stewardship Biologist completed annual monitoring visits and reports on all District Conservation Restrictions (CRs) that were his responsibility in FY 2022. A special, more intensive monitoring was completed at a portion of the Taunton River WMA as required by the In Lieu of Fee Program funding.

Surveys of difficult boundary lines were completed at the Hockomock Swamp WMA and Fox Island WMA. A lingering boundary issue, an incorrectly marked line at Camp Edwards where it abuts Army Corps of Engineers land, was addressed this FY with a site visit by our Stewardship Biologist and ACOE staff where the boundary was reviewed and making adjustments to the satisfaction of both parties.

Gates were installed and/or maintained at several properties including 5 gates at the Mashpee Pine Barrens WMA, 1 gate at the Sippican Headwaters WMA, 1 gate at the Maple Springs WMA, 1 relocated gate at the Noquochoke WMA and 1 gate at the Rocky Gutter WMA. There was also a gate related issue dealt with also at the Rocky Gutter WMA where an abutter was building a new house and had illegally gated one of our access roads. We worked with the abutter to allow a gate to be installed at a mutually beneficial location, while still making public access down the roadway available to the public.

Another gate issue, this one at our Dartmoor Farms WMA, was also dealt with this FY. This issue involves a gate across an old woods road that crosses both the WMA and several private inholdings. One of the

inholdings was claiming legal access on the roadway, but the Division has proven through a former lawsuit in our favor, that the private lands in this area do not have legal access. The District Supervisor worked with the abutter to allow for reasonable access for firewood cutting and camping under a license agreement that contains specific language that the abutter does not have legal access that the abutter agrees to by signing the document.

Fire breaks were created and/or maintained at a number of Division properties including the Mashpee Pine Barrens WMA, Camp Cachalot WMA, SE Pine Barrens WMA, Hyannis Ponds WMA and Frances A. Crane WMA. Prescribed fires were conducted at the Frances A. Crane WMA, Mashpee Pine Barrens WMA, SE Pine Barrens WMA and Penikese Island Wildlife Sanctuary. Additionally, staff assisted with prescribed fires at the Falmouth Rod & Gun Club and in the Valley District at the Southwick WMA.

District staff helped review and edit burn plans for the Maple Springs WMA and SE Pine Barrens WMA.

Herbicide applications to treat invasive species were completed at the Burrage Pond WMA (21 acres), Frances A Crane WMA (15 acres) and the Erwin Wilder WMA (21 acres).

New composite WMA signs were installed at the Halfway Pond WMA, Haskell Swamp WMA Frances A Crane WMA and Burrage Pond WMA. New informational kiosks with high quality maps were also installed at the Frances A. Crane WMA and Burrage Pond WMA.

The District followed up on improvements made at Noquochoke WMA last FY and removed dozens of old concrete pipes from the grassland, allowing for additional grassland habitat management/restoration and facilitating easier mowing and prescribed fire operations on the WMA.

Ongoing wetland restoration and management continued this FY at the Burrage Pond WMA with many hours of District staff time put towards maintenance of water control structures and flooding of 250 acres of former cranberry bog to support emergent wetland habitats for wildlife.

Some developments on the ongoing issues with illegal parking and misuse of the Plymouth Town Forest CR occurred this FY. MassWildife worked with DFG legal and the Town of Plymouth to consider a request by the Town to amend the Conservation Restriction to allow for a new formal parking area on Rocky Pond Road which would provide better legal access to the ponds. Negotiations on this issue continued through the end of the FY.

A major trails request from the Trustees on the Copicut Woods WCE was reviewed in cooperation with our Wildlife Laands Stewardship team and DCR, who co-holds the CR with MassWildlife. The request was for an accessible nature trail that included some nature based play structures. The agency had some significant concerns about the trail and whether or not it fit within the terms and conditions of the CR and if the type of structures would make it be considered active as opposed to passive recreation. Negotiations on the trail request continued through the end of the FY with many issues remaining unresolved.

The first phase of the Mill Brook Bogs WMA restoration project was completed this FY including the removal of white pines and some other species to restore an oak heathland in the eastern portion of the WMA. The project contractors were overseen by District staff and the project required the closure of the main parking area. The wetland restoration portion of the project has continued to move through design and permitting phases and is expected to begin in FY23.

The District stewardship biologist, after receiving a call from a concerned abutter to the Hockomock Swamp WMA about a tree, conducted a site visit and determined that we should contact professional tree companies to evaluate the potential hazard tree. The tree companies all agreed the tree was a hazard, so we obtained quotes from them and proceeded to have the tree removed to protect the abutters home.

After many years of work and coordination with the USEPA and design and permitting with the local conservation commission, the wetland restoration project at the former Dyer property at the Taunton River WMA was completed. The project involved removing two concrete flumes and replacing them with fixed elevation stone weirs, excavating several sections of former bog dike, grading of the tailwater recovery reservoir and seeding with native wetland plants. District staff oversaw the entirety of the

project and completed the wetland plant seeding. The completion of this project closes out a USEPA and Department of Justice enforcement case and will allow the site to revert to natural wetland habitat to benefit wildlife.

Research and Conservation

Wildlife

Bears and beavers continued to be an ever-increasing aspect of District wildlife conservation operations in FY22. We had two significant bear issues this year. One was the so -called South Shore Bear that made the rounds across much of the District including many south shore towns that had never had or dealt with the presence of bears in the past. Happily, through some proactive education and working closely with many local police departments, the communities that the bear passed through all handled the situation perfectly and took necessary precautions (took bird feeders in, stored trash properly, etc.) and allowed the bear to go about his business. Unfortunately, the bear eventually got hit and killed on I-195 in Marion. However, unfortunate as that was, the bear did a lot of good in the time he spent in the District in terms of the public learning how to effectively coexist with bears, which is something that will be necessary as the bear population continues to expand into southeastern MA.

The second bear that paraded through the District unfortunately ended with a similar result, however this time when the bear was struck on I-495 he was not immediately killed and MassWildlife and the Environmental Police had to respond, in cooperation with the State Police who had to temporarily shut down the highway, while we darted the bear and removed it from the site. Sadly, upon inspection of the bear, it was determined he had sustained severe injuries that required him to be euthanized.

It is clear that the beaver population is exploding in the District with calls and complaints from dozens of Towns this FY including Hanson, Halifax, West Bridgewater, Middleborough, Norwell, Pembroke and Easton, among others. The District did assist some towns with trapping of problem beavers, but mostly handled the situation with education and referring to PAC agents when and if warranted. Beavers continued to present management issues at and around the Burrage Pond WMA this FY and we had to trap and remove a number on the WMA, as well as in Stump Brook as they were threatening the City f Brockton water supply/dam.

Southeast District staff completed multiple annual spring surveys including two ruffed grouse drumming surveys (Joint Base Cape Cod, Myles Standish State Forest), one nightjar survey (Mashpee/Falmouth), six breeding waterfowl plot surveys (Eastham, Barnstable, Chatham, Truro, Falmouth, Joint Base Cape Cod) and two woodcock peenting surveys (Rochester, Brewster).

Our annual waterfowl banding efforts were completed again this FY. Through a combination of baited traps and tub launching, we banded 237 new American black ducks and recaptured 31 previously banded birds. Additionally, we continued to work with a graduate student out of the University of Saskatchewan to affix GPS transmitters to 9 hen black ducks and 1 mallard hen as part of her study to look at brood production and survival. We also successfully summer banded 97 park mallards and recaptured another 23 previously banded birds. A total of 30 common eiders were banded on Penikese Island Wildlife Sanctuary and 11 previously banded eiders were recaptured. A total of 200 Canada geese were banded at 22 sites spread throughout Plymouth, Bristol and Barnstable counties. A variety of duck species were also banded using the agency airboat on New Bedford Reservoir.

Staff continued to maintain wood duck nesting boxes and collect data on box usage at 53 boxes spread across 12 sites in the District.

New England cottontail trapping resumes this FY and over a dozen rabbits were trapped and we provided all of the adult rabbits needed for the captive breeding programs at Roger Williams Zoo, the Queens Zoo and Bristol County Agricultural School.

District staff resumed manning biological deer check stations this year following a year off due to the pandemic. All of the typical data was collected, but this year we also took samples of both nasal swabs and blood to test for active covid virus as well as antibodies to the virus that would indicate past exposure.

Staff from the District assisted with a graduate student project looking at the black bear population in Massachusetts by installing and taking down bear

hear snare traps in central and western Massachusetts.

The outbreak of highly pathogenic avian influenza in the bird populations in the US was a major issue in this FY. Staff assisted with calls from the public and provided information and technical assistance, they assisted with the collection of a variety of dead/dying bird species and submitted them to labs for testing and collected samples from birds handled as part of ongoing research projects.

Staff conducted routine annual inspections of permitted commercia deer farms in the District in March 2022. During the inspections, fencing, food and water, shelter, ear tags and number, species and sex of all animals is collected. This is primarily done to ensure the health and safety of our native white-tailed deer population.

Fisheries

The Southeast District Fisheries Biologist spent a considerable amount of time this year with technical assistance and oversight on stream restoration projects he has been involved with for over a decade. The Childs River restoration, which broke ground in FY21 was completed this year. The Fisheries Biologist played a critical role in all aspects of the project.

The Fisheries Biologist continued ongoing monitoring and maintenance of the White Island Pond dam and fish ladder this FY. Routine visits were made to the site to adjust boards and conduct instream manipulations to ensure fish passage during spring and fall migrations. The biologist and District supervisor also worked with the Division of Marine Fisheries to develop and finalize a formal Operations and Maintenance Plan for the site, which will assist greatly with establishing consistent management of the fishway well into the future.

Stream surveys were conducted in consultation with the Fisheries Section in Westborough on a number of streams in the District in the Towns of Raynham, Middleborough, Bourne, Taunton, Pembroke, Marshfield, Hanson, Bridgewater and Westport, among others. Pond surveys were also conducted in a number of District waterbodies.

The annual spring and fall PIT tagging of wild Brook Trout continued this fiscal year at Red Brook, the Quashnet River and the Childs River. PIT tagging also occurred at Third Herring Brook and a tributary.

The District continued our excellent relationship with the Sandwich Fish Hatchery. We assisted with a variety of day-to-day projects, helping to unload feed truck deliveries, inventories of trout, relocation of trout to other raceways and assisting with fall trout spawning.

The District Fisheries Biologist continued our efforts to monitor stream temperature in many southeastern Massachusetts systems including Quashnet River, Mashpee River, Santuit River, Coonamesset River, Red Brook, Weir River, Indianhead River, Childs River, Jones River, Eel River, Wellingsley Brook, Town Brook, Marshfield Fairgrounds Brook, Beaver Dam Brook, Third Herring Brook, Phillips Brook, Furnace Brook, Pocasset River, Rattlesnake Brook, Iron Mine Brook, Marstons Mills River in order to better manage these systems, warn of dangers or issues, and provide a baseline set of data.

As part of ongoing research and monitoring of wild salter brook trout populations, Passive Integrated Transponder (PIT) antennae were monitored and maintained at Red Brook, Quashnet River, Santuit River, Childs River, Coonamesset River and Third Herring Brook and additional surveys and tagging were completed.

The Coonamessett River and Quashnet River was surveyed with the United States Geological Survey, in part to evaluate PFAS in our fisheries resources. Ashumet Pond fish were also sampled for PFAS with USGS.

The Fisheries Biologist worked closely with the Fisheries Section in Westborough on the Wild Trout Management Plan.

The Fisheries Biologist also continued to provide technical assistance to DEP and others associated with the cleanup of the former fireworks site on Factory Pond in Hanover. He worked closely with them to ensure that cleanup activities will impact the fisheries resource as little as possible.

Natural Heritage and Endangered Species Program

The district cooperated with the Natural Heritage and Endangered Species Program (NHESP) staff on a

variety of projects this fiscal year. The most significant NHESP project that is supported by District staff is our coastal waterbird programs including the Buzzards Bay tern project, piping plover monitoring and management and coastal waterboard monitoring and surveys.

Staff completed annual surveys for piping plover and American oystercatcher nesting surveys on a number of mainland shore sites, as well as on the Elizabeth islands and several other offshore locations. The data from these surveys was entered into an online mast3er database that helps the agency keep track of these species populations. Routine monitoring visits were conducted at several piping plover nesting beaches to ensure compliance with the State and Federal guidelines/regulations.

In July of 2021, District staff assisted with the cleanup of Ram Island, consisting of brush cutting, raking and the collection and storage of tern nesting structures.

In December of 2022, several District staff assisted with annual brush cutting, raking and other cleanup activities on Bird Island, which is home to one of our important tern colonies.

Staff continued our ongoing work associated with the recovery of the American bald eagle in Massachusetts by monitoring all of our known/active nests and investigating a number of leads on potential new nest locations in the District.

While eagle banding efforts have been scaled back in recent years, we do still conduct some banding to continue to monitor the population and provide for exceptional opportunities for public outreach and education associated with eagle banding events. In Spring of 2022 District staff successfully banded young eagles at Billington Sea in Plymouth and at the Bristol County Agricultural School near Split Rock on the Taunton River in Dighton. A number of politicians and photographers were involved in the Plymouth event and the Natural Resources educators and students at Bristol Aggie were involved in the Dighton banding event. District staff also assisted the Central District in a banding event at Wickaboag Lake in West Brookfield, providing staff to climb the tree and man ropes.

In July of 2021, an eaglet from a nest on Sabbatia Lake ended up on the ground by the shore and was taken to Tufts Veterinary Clinic in Grafton to be evaluated and rehabbed. District staff picked up the bird at Tufts a couple weeks later and banded it and successfully released it back at the nest site where it flew up and joined its sibling in a tree.

A bald eagle mortality event was also investigated this FY in the Town of Wareham. A caller reported what appeared to be a large raptor entangled in electrical wires atop a utility pole. District staff responded to the scene and determined that the bird, that had clearly expired, was in fact a juvenile bald eagle. The District contacted the utility company who responded to the scene and removed the bird from the wires. Upon closer inspection, the bird had died from electrocution. Its remains were bagged, frozen and provided to the Native American Bald Eagle repository.

The District also participated in the annual Spring Bald Eagle Survey (Figure DL 3).

DL 3. Eagle nesting data for the Southeast District FY-2022

Town	Location of Nest	Results
Lakeville	Anuxanon Island	2 chicks fledged
Plymouth	Halfway Pond	3 chicks fledged
Plymouth	Billington Sea	2 chicks fledged
Plymouth	Big Sandy Pond	Activity observed, no incubation
Middleboro	Pocksha Pond	2 chicks fledged
Carver	Sampson Pond	1 chick fledged
Pembroke	Silver Lake	1 chick fledged
Wareham	Tihonet Pond	Nest taken back over by ospreys

Barnstable	Mystic Lake	Incubation, no success observed
Fall River	Cook Pond	2 chicks fledged
Fall River	North Watuppa Reservoir	1 chick fledged
Scituate	North River (middle island)	Activity observed, no incubation
Dighton	Bristol Agricultural High School	2 chicks fledged
Taunton	Lake Sabbatia	No activity observed at nest

Enhancement of Outdoor Recreation

Thankfully in FY22, with COVID-19 protocols easing and operations returning to normal, District trout stocking was able to proceed in our routine manner and not in the condensed manner it was last fiscal year. District staff successfully stocked our fall 2021 allocation of 13,000 trout into 24 ponds. Our spring allocation of 90,000 trout was stocked out into 51 ponds and 13 streams.

A significant issue related to fishing access came up this fiscal year, wherein the City of North Attleborough had instituted fees for access that were not in line with our trout stocking policy. Consequently, we immediately ceased the stocking of trout and the Fisheries Biologist worked with the city on a solution that would bring the access back into compliance with our policy.

The staff provided birds for another safe and successful upland game bird hunting season, stocking 7,936 pheasants on six WMAs and over 12 open covers throughout the district. WMAs stocked with pheasant include Erwin Wilder, Frances A. Crane, Freetown State Forest, Marconi (CCNS), Myles Standish State Forest, Hockomock Swamp and Noquochoke. Open local covers include Sandy Neck Beach and Town Conservation Land off Popple Bottom Road in Barnstable, Crowes Pasture Conservation Area in Dennis, Scusset Beach State Park, South Cape Beach State Park, the Shawme Fish and Game Club grounds, the Falmouth Rod and Gun Club grounds, private agricultural land off River Street in Halifax and Middleboro, private agricultural land off Cedar Street and North Central Street in East Bridgewater, and two other portions of the CCNS, near the Provincetown Airport and the eastern edge of Griffin Island in Wellfleet. Also, Waskosim's Rock Reservation, Sepiessa Point Reservation, Manuel Correlus State Forest and Katama Farm are stocked on Martha's Vineyard and 8 locations are stocked on Nantucket.

In addition to Pheasants, staff also stocked 3,500 Bobwhite Quail, split evenly between the Frances A. Crane WMA and Myles Standish State Forest WMA. Eight-week-old pheasants were again delivered to the Samoset Rod and Gun Club and the Shawme Fish and Game Club as part of the DFW's Club Bird Program. The District also provided pheasants to the Carver Sportsmen's Club and the Falmouth Rod and Gun Club for use in the DFW's Young Adult Pheasant Hunt.

The District operated and managed safe and successful controlled-access hunting opportunities for white-tailed deer and wild turkey at Camp Edwards on Joint Base Cape Cod. These efforts provided hundreds of sportsmen with the opportunity to hunt on roughly 9,500 acres of open territory on the base and resulted in the harvest of 71 deer, 2 coyotes and 21 turkeys. The paraplegic deer hunt was particularly successful this year with all participants seeing multiple deer and two of them successfully harvesting deer. Further, the District worked closely with base personnel to offer MassWildlife's annual paraplegic deer hunt, with all participants seeing deer. The district also worked with base staff to again provide very successful youth deer and youth turkey hunting programs.

The District once again cooperated with the Trustees to help manage the controlled deer hunting program at the World's End Reservation in Hingham. According to Trustees staff, their surveys have indicated a reduction in the deer herd on the reservation and they are seeing some positive response by native vegetation.

The District Supervisor issued permits for a total of 26 special winter game bird hunts, 4 at the Erwin Wilder WMA and 22 at the Frances A. Crane WMA. A total of 240 pheasant and 850 bobwhite quail were stocked during these hunts. Four field dog trials and four additional training days were reviewed and permitted by the District Supervisor at the Frances A. Crane WMA. Further, eight individual dog training

permits for using captive-reared mallards were issued to interested sporting dog owners/trainers.

Capital stewardship funding was again utilized to crate, maintain and improve recreational access to our lands this FY. Brand new parking lots were finished at the Sippican Headwaters WMA on Spruce Street, Black Brook WMA on Highland Street and Mashpee Pine Barrens off Great Hay Road near Degrass Way. New parking lots were also constructed at the Burrage Pond WMA at Elm Street and at the Sly Pond WMA on the corner of Jaynes Street and Lancaster Avenue.

Parking lots were improved/maintained at many WMAs including Burrage Pond, Hockomock Swamp (at the former Black Mallard Club location), Erwin Wilder, Black Brook, Rocky Gutter, Noquochoke, Mashpee Pine Barrens and Dartmoor Farms.

The District continued ongoing maintenance and mowing at the Agawam Mill Pond Access and worked with the Office of Fishing and Boating Access to address a dangerous sinkhole issue that developed this FY.

District staff participated in several significant projects or efforts to enhance hunting opportunities and experiences in Massachusetts this FY. Staff contributed significantly to the agency's boat ramp access project providing information, photos and GPS coordinates used to provide the public with more and better information on water access points in the state. Further, staff participated in several online Learn to Scout classes, helped draft and edit Deer, bear and Turkey hunting information for our website and participated in live, interactive Learn to Hunt programs held on Facebook.

The District Supervisor conducted a thorough review of dog training regulations and provided a summary of findings to the Assistant Director of Operations and the DFG Commissioner. The information was used to provide interested sporting dog groups/individuals with what their options were for training. Later in the FY, District staff reviewed and provided input on a proposed minor revision to field trial regulations to further enhance sporting dog training opportunities on our lands.

Related to the above information, District staff mowed and maintained the open field habitats and access trails within the portions of Myles Standish State Forest where we stock pheasant and quail. Specialized mowing was also completed at our Frances A. Crane WMA in support of permitted field trials on the property.

Staff participated in the ongoing DCR Huntable Lands Project by reviewing DCR lands in our District, reviewing existing DCR regulations pertaining to hunting and providing our local knowledge of the areas to help formulate the GIS layers that will become an online resource for hunters.

The District Supervisor continued to work closely with the DFG Commissioner and the City of Fall River on a long-standing effort to improve hunter access to parts of the Southeastern Massachusetts Bioreserve. The new pilot gate access program appeared to work well, with many hunters being provided with keys to gates to aid in hunting and recovery of deer.

District staff safely and successfully distributed our annual Guide to Hunting, Fishing and Trapping to all license vendor locations in the District, as well as to many other locations (visitor centers, DCR facilities, Town Police Departments, sporting goods stores, etc.).

Outreach and Education

District personnel continued to provide information and educate the general public, as well as a wide variety of other agencies and organizations, through publications and presentations and by attending meetings and events throughout the region.

Southeast District personnel prepared and staffed displays at the Marshfield Fair, Boxborough Fishing Show and the Boston Bowhunters Group annual BBQ event and several other environmental career days and youth events. Staff also initiated discussions with the organizer of the Huntstock event to be held in FY23 to establish a MassWildlife presence there and go over some programming ideas.

District staff gave presentations on a variety of topics this year including an American bald eagle talk to the Chatham Women's Club and an otter talk through the Harwich Conservation Trust.

The District Supervisor worked with Town officials on Nantucket, as well as staff from the Nantucket Conservation Foundation to organize an educational outreach effort pertaining to the proper and

responsible field dressing of deer during the hunting season in an attempt to reduce complaints and other issues surrounding deer being field dressed in or adjacent to parking areas and major trails.

As mentioned earlier, several staff were heavily involved in online/virtual outreach and education programs including Learn to Hunt workshops on online scouting, deer hunting, bear hunting and turkey hunting.

District staff assisted with multiple hunter education courses this year, teaching both in-person at Westborough courses and at the Southeast District HQ.

The National Archery in the Schools kit was delivered to the Old Colony Regional School and the Monomoy High School for their use in running the curriculum through their physical education programs. Further, the District Supervisor supported the NASP program by helping instruct at the Governor Winslow Elementary School.

The District Supervisor served as an instructor as part of training for new Environmental Police Officers, providing information on deer hunting and assisting with role playing in staged hunting situations for officers.

The District Fisheries Biologist participated in the Earth Day Trout Stocking Event, stocking fish at Little and Long Ponds in Plymouth and giving a brief presentation on trout stocking and fisheries management to the public in attendance.

The Fisheries Biologist also attended regular meetings of the River Herring Network, Eastern Brook Trout Joint Venture and Sea Run Brook Trout.

The Fisheries Biologist attended a celebration and awards event for the Coonamesset River Restoration Project.

Several staff remained heavily involved with the agency's R3 and Relevancy projects including the project to create MassWildlife educational YouTube videos on a variety of hunting and fishing topics.

Staff supported the Angler Education program helping to organize and run three urban angler education events in the District, one at Lake Rico, one at Buttonwood Park and one at Lake Waldo.

The District Supervisor attended virtual and in-person monthly meetings of the Barnstable, Bristol, and Plymouth County leagues of sportsmen, providing them with information on MassWildlife activities and answering fish and wildlife questions.

Technical Assistance

District staff provided technical advice and support to many local Animal Control Officers, police departments, boards of health, and conservation commissions, as well as to the MEP on issues dealing with fish, wildlife, and their habitats. Many of these issues relate to the review of the potential impacts of proposed development projects on fish and wildlife. Others dealt with suburban wildlife and conflicts with humans and with other public health and safety concerns related to fish and wildlife, particularly nuisance or damage complaints and reports of sick or injured wildlife. The district responded to a variety of problem animal calls this fiscal year, predominantly dealing with coyotes and aggressive wild turkeys.

District staff, primarily the Wildlife Biologist, dealt with a number of aggressive/nuisance hawk issues this FY. Two particular ones that stand out were aggressive hawks in the Town of Plymouth and Kingston where the adult females were very aggressively attacking residents in their yards. In both instances, these nests were climbed by staff and the chicks fostered into other nests not in yards through Norm Smith. After removing the chicks, the nests were also removed, and limbs cut to hopefully prevent future nesting in the trees/yards.

Aggressive turkeys remained a mainstay of Southeast District operations this FY with birds being dealt with in Westport and Attleboro, among other towns.

District staff worked with Westborough biologists to provide technical advice and assistance to individuals, town officials and other conservation organizations pertaining to the songbird die offs that were observed throughout the region. Numerous dead or dying birds were collected and submitted for a variety of tests. Staff made sure to follow up with involved parties to convey test results and updated/new information.

District staff were involved in two unusual coyote issues this FY, both cases where coyotes had somehow gotten objects stuck on their heads. The

first instance was in the Town of Plymouth where what looked like the top of a plastic jug was stuck around the coyote's head. Staff worked with the Town Natural Resources staff and the landowner to set a large cage trap in the yard and successfully captured the individual. The animal was sedated, and the item was cut off its head. The animal was inspected for any signs of serious injury and, finding none, it was allowed to slowly recover in the trap and was later released on site.

The second coyote issue was in Stoughton, where the animal appeared on a resident's security camera and appeared to have what looked like a clear plastic cheeseballs container stuck over its head, which unfortunately rendered it completely unable to eat/drink. Similar to the Plymouth situation, staff worked with local officials and the resident to set a trap, but we were never successful in capturing the individual. However, it was never seen/reported again with the contained on its head, so we are hopeful that it came off on its own.

Problem/nuisance coyote issues were very common this FY, with residents in many towns in the District calling with concerns and complaints about coyotes in yards/neighborhoods. Most of these calls can be handled with simple technical advice, but a few necessitated site visits and additional suggestions. Two notable areas were Falmouth near Elm Road and the Shining Sea Bike Path and a residential subdivision in Cataumet. Site visits were conducted in both cases, and, in the Falmouth case, local law enforcement staff were advised to try and remove the individual. Several attempts were made but proved unsuccessful.

District staff witnessed an increase in osprey nest issues this FY and had to work closely with a number of towns, primarily on Cape Cod and southern Bristol County, as well as the US Fish and Wildlife Service, USDA, residents and PAC agents to provide technical assistance and advice to facilitate the eventual removal and relocation of several nests.

There was one notable deer related issue that required technical assistance and advice this year involving a deer eating birds out of mist nets at the Manomet Center for Conservation Sciences. Manomet has operated songbird mist netting stations for decades at their property in Plymouth and apparently one of the local deer had learned that picking birds from the netting provided an easy source of protein. The District Supervisor worked with Manomet staff to come up with a plan to target the specific deer involved through the regulated hunting season by a licensed hunter. The plan, which worked well, solved the problem they were having while allowing a licensed hunter to take advantage of a valuable natural resource.

The District worked with a collaborative of conservation organizations to evaluate several locations on our lands in southeastern Massachusetts to install a new avian radar unit that is part of an international research project and can collect data from tagged birds. The site that was selected was a small field at our Erwin Wilder WMA. The District Supervisor worked with the collaborative to issue a license agreement allowing the unit on the WMA and worked through various forms of outreach to educate the public using the WMA about the unit/project.

The district had staff that served as the MassWildlife representative on a variety of management teams and efforts including the Santuit Pond Preserve Management Team, the Assawompset Pond Complex Management Team, the Lyman Reserve/Red Brook Management Team, the Buzzards Bay Restoration Committee, the Southeastern Massachusetts Bioreserve Management Team and the Mashpee National Wildlife Refuge Management Team. The Fisheries Biologist was actively involved in monitoring the Massachusetts Military Reserve (MMR) cleanup activities as a member of the Plume Containment Team and served on the Buzzards Bay Restoration Committee. He also continued to provide technical advice and support on the Child's River Restoration Project.

Central Wildlife District

Todd Olanyk

Administration

The Central District had its first staff turnover in several years with the retirement of longtime Fisheries Biologist Mark Brideau. After a 40-year career with MassWildlife, Mark retired on October 22, 2021. Mark started his career working at the former Ayer Game Farm raising pheasants before transitioning to Central District Fisheries when the game farm closed over 20 years ago. He also worked for the agency through the Youth Conservation Corps prior to getting hired as a regular MassWildlife employee. We want to thank Mark for his years of dedication to the agency and wish him well in retirement. After an exhaustive search, the agency hired a replacement in June of 2022. Our new Central district Aquatic Biologist is Dr. Rebecca Colby. Dr. Colby has been a fisheries professional for seven years and received her Bachelors of Science and Doctoral (Ph.D.) degrees from the University of Connecticut. Dr. Colby has worked on the management and conservation of multiple fish species in Connecticut, Michigan, and Alaska. She has particular interest in research-informed management practices, especially related to mitigating the impacts of climate change, as well as diverse stakeholder engagement and outreach efforts. Dr. Colby has been formally recognized as an outstanding researcher, supervisor, and educator in her previous roles.

All district staff were due for re-certification in First Aid/CPR/AED this fiscal year. This training was conducted by an authorized in-house instructor during May and June, and all staff passed the course.

There were eight agricultural parcels that were up for re-bid in FY22. Bid packages were mailed out to interested farmers in early 2022, and we received bids on all properties. These agreements accounted for a total of 140 acres of active farmland on WMAs. The Central District manages 31 properties that have agricultural parcels open for licensing. This land management strategy allows the for the maintenance of open space by cooperative farmers which frees district staff to attend to land management duties on non-agricultural lands.

In addition to agricultural License Agreements, the District Office issued three licenses for authorized snowmobile trails. While motorized vehicle access is generally not allowed, concessions were made in these instances to allow access on three pre-existing trail routes that connect to the main stem Snowmobile Association of Massachusetts trail system. Access is only allowed under certain snow-pack conditions which protect the underlying resources.

Stewardship, Management, and Habitat Restoration

One of the more time consuming and significant habitat maintenance activities we engage in annually is seasonal mowing. There are several hundred acres of open fields that our staff mow each year to maintain them as grassland. Although we visit these properties every year, the goal is never to mow them completely flat, but to remove pioneering woody plants that are beginning to establish themselves in the open field areas. To accomplish this, we have staff operating 2-4 tractors daily from July 16th (to protect ground-nesting birds to complete their breeding cycle and allow nestlings to fledge) through the end of September and beyond. Prescribed Fire is another habitat treatment activity that we use to augment or sometimes replace seasonal mowing on some of our properties.

Central District has five staff members who are certified members of the prescribed fire team, and they actively participate in fire events across the state. Within the District there were a total of five prescribed fire treatments: two on the Pine Hill Rd. section of Bolton Flats WMA, and one at the Muddy Brook WMA. These events treated approximately 200 acres of land. At Bolton Flats WMA, the area is being managed as grassland habitat, and at Muddy Brook WMA we are maintaining a reclaimed Pitch Pine, Scrub Oak Barrens community. Aside from the prescribed fire events themselves, District staff spent time cutting in fire breaks, and fire roads in preparation for continued treatment activities. Outside of the Central District, our staff members also traveled to participate in prescribed fire work at several other locations including Southwick, Herman Covey and Francis Crane WMAs. These staff members maintain their preparedness by participating in Wildfire Certification Training and Fire Shelter Training.

The Central District annually contracts boundary marking / re-marking work for new acquisitions and in areas that have particularly complex boundary lines, some of which are not surveyed. In FY22 we contracted this work on MacCallum, Poutwater Pond, Wolf Swamp, Quacumquassitt, and Muddy Brook WMAs, and the Quinapoxet River Access. In addition to this contracted work, our Land Stewardship Biologist routinely restores boundary marking in established areas throughout the year.

The District Supervisor wrote, in consultation with staff, bid specifications for two major purchases this fiscal year. One request for bids was for more than 3000 tons gravel to be delivered to five different sites through the district. This gravel is utilized by our staff to make access improvements on our WMAs. The second major bid specification package was for a new tractor to replace aging equipment. We successfully purchased a Massey Ferguson 4707, which was immediately put to work in the field when we took delivery at the end of June 2022.

One of the realities of land stewardship is the ongoing need for monitoring and removal of illegal trash dumping from the WMA's. While this is something that is routine for our staff, we also are grateful for community minded organizations who volunteer to lend a hand. In FY22 we were approached by and Eagle Scout candidate who organized and completed a clean-up and maintenance project at an old cemetery on the Merrill Ponds WMA. In addition, a big thanks goes out to the New England Chapter of Backcountry Hunters and Angler's for conducting a volunteer cleanup day at the Bolton Flats WMA in September. They filled several large trash bags of loose trash, a tire, a twenty-pound propane tank, and a car fender from the property.

The timber harvest off Long Hill Rd. in Brookfield at the Quaboag WMA was completed during the winter of 2022 and final sight work including reconditioning the logging roads and installation of water bars was finished the following summer.

Another exciting project that has been in the planning stages for some time made a big advancement toward the end of FY22; We have a signed license agreement with the Army Corps of Engineers (ACOE) for land management activities on ACOE controlled land at Birch Hill. This will allow us to plan and conduct timber harvesting/habitat restoration operations and prescribed fire events, as well as any other needed land management for the next 5 years. Just to the north of this ACOE land, our staff has been conducting habitat treatments on MassWildlife owned land along New Boston Road for the last few years. We are planning, in coordination with ACOE and DCR staff at a landscape level for this larger area. First phase timber harvesting should begin during the winter of 2023. Ultimately, over the five-year period, we hope to treat between 4-5,000 acres and revert it back to pine barrens habitat. This is a rare, fire dependent, habitat type globally and we have very few examples of it in interior Massachusetts.

Research and Conservation

Wildlife

The Central District Wildlife Biologist and staff worked with our agency Black Bear Biologist, David Wattles, to conduct winter black bear den survey work in February and March. All eight of the collared sows in Central District were successfully captured to replace/update their collars, conduct health-checks, and assess cubs if they were present. Of the 8 female study bears in the Central District, we anticipated that 3 would have newborn cubs this winter and 1 would still have her yearlings. Our survey work found that there were 8 cubs produced by these bears: 5 females, and 3 males. Barrel-trapping for black bears was conducted in May and June until temperatures got too warm. We trapped a total of 128 trap nights and although a few "new" bears were seen on camera at the trap sites, only one small male was captured in the FY22 season.

Ice conditions in the winter of 2022 were favorable for the maintenance if wood duck nesting boxes. We were able to access almost all sites in the district and several nest boxes have been added/upgraded. The district maintains approximately 140 wood duck nesting boxes at 31 sites, and we assist the agency Waterfowl Biologist, H Heusmann, with an additional 60 boxes at 8 study sites within Central District.

Banding of Canada geese began on June 14th and was finished June 17 with our annual District total of 150 bands put out across Worcester County. In addition to goose banding, our staff also participated in breeding plot surveys for other waterfowl, ruffed grouse drumming surveys and a woodcock peenting survey.

Upland bird season wrapped up just after the Thanksgiving holiday. Central District stocked over 13,000 pheasants at 15 different properties over the course of the 6-week season.

The district manned seven biological check stations during the first week of shotgun deer season.

The Central District Wildlife Biologist and District Supervisor continue to maintain their training and certification for wildlife immobilization. We are members of the state Large Animal Response Team (LART), and work with the Environmental Police in our district whenever moose, bear, or deer wander into areas that impact public safety. Fortunately, there were few calls in FY22 that required immobilization; most of these situations resolve themselves when the animals make their own way back to adjacent open spaces.

Fisheries

In the summer and fall of 2021 District staff conducted stream surveys targeting cold water resources looking primarily for the presence of wild Eastern Brook Trout. Efforts were hampered by high water levels during the early part of the season when we experienced unusually large rainfall totals. Ultimately, we were able to survey 36 sites throughout the county. Wild populations of Eastern Brook Trout were found to be doing well.

Fall trout stocking concluded on October 14th as planned. Over 14,000 trout were stocked over the course of two weeks at more than 15 locations across the district. Unlike the previous season, the heavy summer rains allowed us to stock in some of the larger rivers and streams this fall as well as the traditional pond and lake locations.

Our technicians annually participate in the Quabbin, and Wachusett Reservoir Lake Trout survey work conducted by our fisheries project leaders. Each year we go out to the spawning grounds and gill net as many nights as is necessary to capture 100 trout at each waterbody. This information gives us an idea of age structure, reproductive success, and survivorship of the population. Some individuals are known to have been recaptured multiple years in a row. The trout are returned to the water unharmed once the data is collected.

Spring trout stocking for Central District began on Monday, March 21st, 2022, and continued through May 19th with two trucks running nearly every day of the week. The total spring stocking allotment for the Central District this year was nearly 90,000 fish, and these were distributed in 46 cities and towns, and 75 different waterbodies throughout the district. In addition to our regular allotment, we also received a few hundred large brood stock Eastern Brook Trout, Brown Trout and Rainbow Trout from our hatchery in Sandwich the week of April 18th. These fish were distributed at Lake Quinsigamond, Big Alum Lake, Webster Lake, Asnacomet (Comet) Pond, Quacumquasit (South) Pond and Browning Pond.

Natural Heritage and Endangered Species Program

A bald eagle banding event was held at Lake Wickaboag in West Brookfield in conjunction with the DFG Commissioner's Office and state representatives. One of the three chicks was brought down from the nest, banded, and then returned. The chicks were larger than expected, so the decision was made to only handle one of them to reduce the chance of injury (to chicks and climber). A big "thanks" goes out to the Southeast District for providing climbers for the banding day.

Enhancement of Outdoor Recreation

The District Supervisor, Land Stewardship Biologist, Director, and Commissioner met with a group of people representing several hunting dog Retriever Clubs at High Ridge and did a site tour of High Ridge WMA. The clubs expressed an interest in conducting Field Trials and training events at High Ridge and we reviewed several potential locations within the WMA. This discussion led to a review and update of the regulations governing these events on MassWildlife properties. This update is intended to streamline the process for permitting these types of events during the off season and giving greater access to properties.

As part of the agency-wide commitment to improve access and property recognition, several new WMA signs have been installed in the district, and new kiosks were installed at the High Ridge WMA in Westminster; these include a map and description of the property. Gates were installed at MacCallum, and Winnimusset WMAs replacing damaged equipment at those locations. Parking lot improvements were completed at Quaboag, Muddy Brook, Winnimusset, and Birch Hill WMAs with loads

of gravel brought in and placed. The Birch Hill project included the grading and restoration of eight miles of roads within that complex of lands owned by MassWildlife, DCR, and Army Corp of Engineers. The parking lot improvement at Quacumquasit/South Pond is completed as the final section of guardrail is now installed and new signs were installed there as well.

Outreach and Education

District staff partnered with the Angler Education Program to conduct Learn-To-Fish clinics during the summer of FY22. These clinics are designed to provide an opportunity to introduce fishing to people with little experience. Inner city areas were targeted for the events to demonstrate to participants that fishing is a fun activity that can be enjoyed close to home regardless of where you live.

The District Supervisor participated as an instructor in a Bow Hunter Education course at the Mass Junior Conservation Camp. This two-week annual summer camp introduces young people to a wide variety of outdoor skills and activities, and district staff have participated in conducting camp in some capacity for many years.

District staff worked with I&E to conduct a Facebook/Instagram Pheasant Stocking event where we streamed video of our staff stocking birds and answering questions that were sent in by the public. This event was very popular with the public and we have plans to repeat this format in the future.

Central District staff participated in operating the agency booth at the Fall 2021 Huntstock event in Westminster. This event brings together constituents and vendors from the hunting industry. We were able to interact face-to-face with outdoors people, answer questions, and through demos and educational displays we help people engage with the agency directly.

As a component of our overall outreach efforts, the District Supervisor continues to disseminate monthly activities reports, and is a guest speaker at several meetings throughout the year keeping constituents informed and answering inquiries.

Technical Assistance

The Central District staff handle numerous wildlife calls regarding general questions, sightings, and conflicts. These inquiries are wide ranging, from question about how to protect property and livestock from wildlife predation, to simply identifying specific species.

With black bears range expanding eastward through the Central District, we find ourselves providing information to the public regarding how to live cohesively with these large animals. Many callers have no experience with bears and are only beginning to see them for the first time in some parts of the district.

Many callers contact us looking for information on how to handle injured wildlife. Sometimes we can refer them to a wildlife rehabilitator listed on our website, in other instances its best to allow nature to take its course. In at least two instances in FY22 we responded to transport injured raptors to the Tufts Wildlife Clinic in Grafton. While we are not able to respond in every case, we will make the effort when there is a good chance for survival.

Connecticut Valley Wildlife District

Joseph Rogers, District Supervisor

Administration

There were two changes in personnel this year at the Connecticut Valley District Office included the retirement of the DFG Land Agent Christina Petersen and the transfer of Josh Freniere from the Sunderland Fish Hatchery to fill a technician position vacated by Chris Connors.

Agricultural licensing agreements were issued on three Wildlife Management Areas (WMAs) in FY 2022. These agreements are allowed and maintained when they provide a benefit to wildlife by maintaining open space habitat in places that would otherwise not be actively managed due to staffing, equipment, and time constraints.

Working collaboratively with the Department of Conservation and Recreation (DCR), the Conn. Valley District staff sold 1,972 Quabbin one-day fishing Licenses, 835 of these were from credit card sales. The licenses were issued at the three boat launch areas on the Quabbin Reservoir and totaled $59,860 this fiscal year.

The Swift River primitive camping area remained closed for FY 2022.

There were no Field Trial permits or Special Pheasant Hunt permits issued for events in the Connecticut Valley District this year.

Valley District staff participated in professional development and training throughout the year including prescribed fire certifications, pesticide applicator's license, Large Animal Response and Safe Capture training and attended workshops and conferences.

Stewardship, Management, and Habitat Restoration

Boundary marking of WMAs continues to be a priority throughout the district. This year in the Connecticut Valley District the focus was to solve several boundary conflicts and discrepancies through surveys and title research at Mount Toby WMA and Montague WMA. A total of 5.57 miles of WMA property boundary lines were confirmed by the Stewardship Biologist and then surveyed by contracted surveyors.

Annual monitoring visits and reports were conducted on Conservation Restrictions (CRs) throughout the district in FY 2022. Annual monitoring is a legal obligation under the terms of each CR and is also critical to protecting the conservation values of these properties. Landowners were contacted via letter and invited to participate. Participants who decided to come along for the site visits provided a good perspective on the land's history and current use, as well as a chance to build relationships with these landowners.

Under the agency's current Walking Trails Policy, proposed trails and maintenance of existing trails must undergo an in-depth application and approval process. The Valley District completed the trail license for the New England Trail on East Mountain WMA and the Tully Brook Access, in agreement with the Appalachian Mountain Club. Work continues with Kestrel Land Trust to bring sections of the Robert Frost Trail into compliance with this policy.

Frequent monitoring was completed on the Tully Trail with supervision of the main trail relocation off Tully Road onto the Tully Mountain WCE in agreement with North Quabbin Trails Association. Issues arising from management conflicts along the trail were addressed.

Use of WMAs continued to see a marked increase from previous years and several new issues stemming from the influx of new user groups to the properties continues to be a challenge. Dumped materials continue to be removed from WMAs and monitoring of these areas has increased in FY22. Parking areas and access points were improved by district staff at several of the WMAs throughout the district. Parking lot maintenance continues to be a focus for stewardship and staff, with a new parking area created at Herm Covey WMA in Belchertown from the forestry landing and several new gates installed at the same.

Improvements and maintenance included widening existing parking areas, improving surfaces with gravel, boulder exclusions to limit illegal off-road access, installation of new gates, repair and/or maintenance of existing gates, and motorized vehicle trespass deterrence. All WMAs were posted with rules and regulations. Signs are posted at public access entrance points at 35 WMAs throughout the district.

Approximately 193 acres of fields were mowed at nine WMAs (25 acres at Southwick WMA, 20 acres at Southampton WMA, 78 acres at Herman Covey WMA, 5 acres at Poland Brook WMA, 46 acres at Leyden WMA, 18 acres Montague Plains WMA, and 1 acre at Great Swamp Whately (WMA).

A total of 368 acres of grasslands and shrublands were burned under prescribed fire plans at four WMAs (13 acres at Leyden WMA, 59 acres at Montague Plains WMA, 35 acres at Herman Covey WMA, and 261 acres at Southwick WMA). Two District staff were trained as fire fighter type 1 and were able to assist with prescribed fires though out the state to improve wildlife habitat.

District staff spot treated 174 acres of herbicide on seven WMAs (13 acres at Leyden WMA, 1 acre at Montague Plains WMA, 115 acres at Herman Covey WMA, and 45 acres Southwick WMA).

Also, staff collected and planted 650 Sandplain Lupine seeds on Montague Plains WMA as part of a Lupine and Frosted Elfin restoration project. Several firebreaks were mowed and/or maintained at Montague Plains WMA, Southwick WMA, Herm

Covey, and Leyden WMA for prescribed fire management on those properties.

Research and Conservation

Wildlife

Valley District staff contributed to the statewide wildlife survey efforts by completing 8 Ruffed Grouse drumming survey routes and conducted Wild Turkey brood surveys. Staff also banded 100 Canada Geese at seven sites. A total of 113 Wood Duck boxes were checked and maintained at 24 sites. Blue Bird and Kestrel nesting boxes were maintained at several WMAs as well.

Valley District staff monitored the survival and reproduction of 20 radio-collared female black bears during this reporting period. Two collared females were struck and killed by vehicles this reporting period. Attempts were made to capture 15 collared females in their dens to determine reproductive success and first-year cub survival, 13 of the females were successfully immobilized and handled in dens. It was determined that 6 females had newborn cubs, 8 had yearling cubs, and one adult female was barren. One yearling female captured with its mother in the Den was radio collared. Global Positioning System (GPS) collars were affixed to bears to monitor locations every 45 minutes. Bear traps were set in the spring and early summer to recapture a female bear with a GPS collar that malfunctioned and to add new females to sample size. In total this year eight new bears were captured during trapping (5 males, 3 females).

All check stations in the district were willing to check hunter harvested animals this year and all biological deer check occurred, after the year of 2020 when COVID-19 limited the number willing to be open.

Valley District staff stocked 10,000 pheasants on 10 agency owned WMAs, 6 government town owned properties, and 10 privately owned hunter accessible properties prior to and during the 6-week long pheasant hunting season. The WMAs stocked by district staff this year included: Herman Covey WMA, Poland Brook WMA, Leyden WMA, Montague Plains WMA, Connecticut River WMA, Bennet Meadows WMA, Pauchaug Brook WMA, Southampton WMA, Southwick WMA and Whately Great Swamp WMA. Towns stocked within the district included: Amherst, Belchertown, Brimfield, Conway, Deerfield, Hadley, Hatfield, Holland, Brimfield, Leverett, Leyden, Montague, Northfield, Northampton, South Hadley, Southampton, Southwick and Whately. A complete list of pheasant stocked properties within the district can be found on MassWildlife's website at: https://www.mass.gov/service-details/pheasant-stocking-connecticut-valley-district.

Fisheries

The Fall 2021 and Spring 2022 trout stocking seasons are covered by this reporting period. In Fall of 2021, the Connecticut Valley District stocked a total of 12,944 trout weighting 13,205 pounds, 92% if which were 14-inch Rainbow Trout. Trout stocked in this district were raised at McLaughlin, Bitzer, and Sunderland hatcheries. 31 waterbodies were stocked, 24 lakes and ponds, and 7 rivers over the course of 16 loads between 09/29/2021 and 10/13/2021. On 10/12/21 and 10/13/21 the final cohort of Visible Implant Elastomer marked fish was stocked in the Swift River as part of an ongoing mark-recapture project. Further details on this project can be found in both the previous year's annual report and the Fisheries section of this report.

The Spring Trout stocking season in the Connecticut Valley District started off on 3/21/2022 and concluded on 5/25/2022, with one final load in the summer on 07/01/2022 to the Swift River. In total 84,484 fish, weighing 62,432 pounds were stocked into 92 waterbodies. Stocked fish were comprised of 45.75% Rainbow Trout, 32.55% Brown Trout, 21.01% Brook Trout, and 0.69% Tiger Trout. 69.99% of these fish were greater than 12 inches, with an overall average weight of 0.74lbs per fish. 87 loads of fish were stocked by both District and Hatchery staff, across approximately 438 individual stocking locations on the 92 different waterbodies.

This reporting period included the conclusion of the previous year's ongoing mark-recapture project on the Swift River tailwater. The final of 5 Visual Implant Elastomer marked cohorts was stocked in October 2021, marked behind the left eye with green elastomer. Recapture events continued through the fall and winter, utilizing both raft and motorized electrofishing craft, with the final trip concluding in January of 2022. Data were processed and a full report was shared on mass.gov/swift-trout as well as condensed information to social media. The District Fisheries Biologist and state Coldwater Fisheries Project Leader gave numerous talks throughout the spring with angling and sportsman's groups to

present the findings of this project. An expanded project focusing on wild Brook Trout, with more sophisticated equipment, is in the planning process and will be covered in future reports.

The Quabbin Lake Trout sampling project carried out in the district returned to a more normal pre-Covid19 set up. Five night sampling trips were conducted in November with the help of staff from across the Division. 89 Lake Trout were sampled, 12 recaptures and 77 newly implanted PIT tags. 17 Atlantic Salmon were sampled, all of which were adipose fin clipped indicative of hatchery-origin.

In addition to the larger scale research projects outlined in the sections above, the district staff also completed numerous smaller scale electrofishing surveys utilizing backpack, boat, raft electrofishing gear, as well as minnow traps, seines, gillnets, trap nets, and snorkeling gear. The reporting period splits the summer field season in half. For the purposes of this report. In total 57 surveys were conducted across streams and ponds by district staff with often collaboration with staff from field headquarters as well as other districts. Additionally, district staff had the opportunity to conduct four snorkel mussel surveys in this reporting period with the Natural Heritage program.

Natural Heritage and Endangered Species Program

The Valley District staff continued its efforts to monitor and band eagle census covering Hampshire, Hampden and Franklin counties. District staff identified and monitored 40 breeding Bald Eagle territories.

The district cooperated with NHESP staff on a variety of projects throughout the district this year. Valley District staff also assisted FHQ staff with four whip-poor-will surveys within the district.

The district continues to help and learn more regarding the identification and sampling protocols for surveying listed freshwater mussels. For this reporting period, district staff assisted with four mussel snorkel surveys in local waterways.

Enhancement of Outdoor Recreation

Valley District staff cleared and maintained approximately 1.25 miles of access trails and four

duck blinds for the annual Ludlow WMA controlled duck hunt.

Five sportsmen's clubs within the Valley District participated in the Club Pheasant Program this year. District staff received and distributed 1,120 seven-week-old pheasants to these clubs in July. These birds will be released on properties open to public hunting during the regular hunting season for sportsmen and sportswomen to enjoy. Valley District staff administered the annual controlled waterfowl hunt at Ludlow WMA. Twelve hunters applied for this year's raffle style permits and all those who applied were drawn to participate in the hunt.

Outreach and Education

Numerous public events were held during the 2022 trout stocking season, and often included participation from the whole stocking crew. Several events were held during Earth Week, which is also the spring vacation week for many local schools. The largest of these events was held at Hampton Ponds in Westfield. Public attendance was very high for the event and included local newspapers. At these events the public is given a brief presentation and then participates in the stocking effort using buckets. These continue to be a very positive experience and we hope to include more each season.

Technical Assistance

Our District offices are often our first line of contact to the public. The Valley District office was open to the public and district staff answered hundreds of calls requesting technical assistance regarding wildlife and fisheries concerns. Staff addressed the needs of callers ranging from hunting and fishing license sales, requests for information, aided with nuisance-animal complaints, assistance with injured wildlife and hunter harvest reports for hunters without access to computers.

Western Wildlife District

Andrew Madden, District Supervisor

Administration

The Western District continued to deal with the challenges of Covid-19's impact on operations in FY22. All District Staff reported to the workplace daily except when sickness prevented working together. District Biologists and Technicians deserve credit for demonstrating dedication to the Agency and constituents by continuing to provide on-the-ground conservation and public service despite the elevated risk. Offices reopened to the public early in FY22. With the onset of a new licensing system in December 2021, calls and walk-in customers increased.

The District welcomed Heather Sadler, Wildlife Technician III to the office in October 2021. Heather transferred from the Sunderland Hatchery where she had worked for 13 years before joining the Western District. The District hosted an intern (Brianna Tooley) from Westfield State University for the spring semester. She assisted District staff one or two days each week, learning conservation while earning credit towards her degree.

Capital funding provided opportunity to improve security and energy efficiency at Dalton headquarters where new windows were installed throughout the building.

Large Animal Response Team (LART) cases in FY22 included an injured yearling bear in Otis, an emaciated deer in Pittsfield, an injured bear in Lenox, 2 deer trapped in Flood Chutes in North Adams, 2 deer entangled in a fence in Worthington, and injured deer in Clarksburg, a small yearling bear in Williamstown, 2 trapped fawns in Pittsfield, a large female bear in Pittsfield, and an injured deer in Adams. Outcomes of these call varied depending on the health and safety of the animals and the public. In addition to these in-person cases, District staff responded to numerous large animal calls and questions.

The District Supervisor continued working on issues related to snowmobile trails on Wildlife Management Areas. This included trail assessment and numerous meetings with Snowmobile Association of Massachusetts officials. Agricultural License Agreement issues also required substantial time from the District Supervisor and Wildlife Biologist.

District staff completed all state mandated trainings as well as instruction in CPR. The District Supervisor and Wildlife Biologist completed chemical immobilization training required for participation in the Large Animal Response Team.

Stewardship, Management, and Habitat Restoration

The Stewardship Biologist is responsible for coordinating efforts on boundary marking, encroachments, access, Conservation Restriction (CR) monitoring, and other land management activities. The Stewardship Biologist was the point of contact for contractors working on boundary marking and surveys. A total of 37 miles of property boundaries were marked in FY22. Contractors marked 28 of those miles while District staff marked the remaining 9 miles. Marking efforts were spread throughout the District prioritizing new acquisitions and previously unmarked properties. The Western District has responsibility for close to 70,000 acres between Wildlife Management Areas and Conservation Restrictions including hundreds of miles of boundaries.

The Stewardship Biologist completed 55 monitoring visits to Conservation Restrictions. He reviewed multiple forest management plans, in conjunction with the Wildlife Lands Stewardship Coordinator and Habitat Program.

The District continued to add new signage at WMAs including welcome signs at parking areas and new routered signs along roadsides. New Kiosks were installed at the Eugene Moran, George Darey, and Hinsdale Flats WMAs.

District staff maintained parking areas at 12 WMAs and 4 Public Access ramps. Stone was added to improve parking at Stafford Hill WMA and Fairfield Brook WMA. Staff maintained water flow at the Eugene Moran WMA protecting the road and access for pheasant stocking and management.

District staff maintained an 800-foot earthen dam at the Three Mile Pond WMA. This included clearing vegetation from the dam top and making sure the outlet was clear.

District staff renewed training in prescribed fire. In FY22, six members of the District staff were part of the prescribed fire team. In April 2022, the prescribed fire crew burned roughly 3 acres of field at the Stafford Hill Wildlife Management area in Cheshire. This represented the first prescribed fire in the Western District under MassWildlife's modern fire program.

Research and Conservation

Wildlife

Annual surveys for Woodcock (3), Ruffed Grouse (7) and waterfowl indicated pair surveys (5) were conducted in the district. Staff also cleaned, constructed, and installed nesting boxes for wood ducks, bluebirds and kestrels. The District participated in duck banding at Cheshire Lake.

Western District personnel implemented multiple habitat projects including annual brush mowing over 300 acres across 13 different WMAs and pruning apple trees and creating young forest habitat at Chalet and Savoy WMAs. Staff also coordinated with the Habitat Section on projects, including management plan review, site visits, and logistical support.

The District deployed loon rafts at Cleveland Reservoir in Hinsdale and Ashley Reservoir in Pittsfield. The District Supervisor and Wildlife Biologist coordinated with the Biodiversity Research Institute on planning for a loon relocation project in FY23. One-hundred Canada Geese were banded throughout the District in June 2021.

The District had continued success with the bear trapping and collaring program. Four new bears were collared and many others ear tagged. Bear trapping requires substantial effort but has provided some very important local data which has been directly relevant in explaining and, in some cases, reducing bear conflicts in the region. Staff removed bear hair snares that were deployed in FY21 as part of a UMass research project on bear distribution.

The District Supervisor and Wildlife Biologist conducted numerous site visits related to bear activity. In most cases the issues were resolved with education and information. Intentional bear feeding continued to be an issue in the Western District causing harm to animals and disruption to neighbors.

Fisheries

A total of 16 streams were surveyed by Western District staff in FY22. The surveys focused on updating records in cold-water fisheries habitats primarily in the Deerfield and Westfield watersheds. District staff also assisted the fisheries section with trout collection surveys in the Deerfield River. Lake and pond fish community sampling was completed on 7 waterbodies: Clam Lake, Laurel Lake, Plunkett Reservoir, West Lake, Windsor Lake, Yokum Pond, and York Lake. The Laurel Lake effort (which included gill nets, seining and electrofishing) is a continuation of District sampling after the introduction of zebra mussels to the lake.

The Fisheries Biologist assisted the Fisheries Section in adipose clipping of Brown Trout for stocking in the Deerfield River, as part of an ongoing assessment of wild Brown Trout.

One day was spent removing Water Chestnut from Three Mile Pond in Sheffield on July 7, 2021, to control the plant's spread to other parts of the waterbody. The District Fisheries Biologist and Seasonal Field Technician pulled all emergent plants by hand from kayaks. Removal of emerged plants took just over 2 hours total. Less than 1 pickup truck bed (Ford F-250) of Water Chestnut plants were removed from the site. This continues to be a great success with decreasing number of plants found each year.

The District Supervisor and Fisheries Biologist worked with the fisheries section in response to proposed lake management actions at Pontoosuc Lake. This included submitting written comments and attending Conservation Commission meetings. District Staff also monitored water levels in Berkshire Ponds with winter drawdowns.

Natural Heritage and Endangered Species

District Staff participated in the Bald Eagle Nesting Survey. There are 9 confirmed active nests known in the Western District: Russell, Pittsfield, Lee, Monterey, Buckland, Great Barrington, Richmond, Williamstown, and Otis. The district banded eagle chicks at the nests in Cheshire, Williamstown, and Monterey.

District Biologists and Wildlife Technicians partnered with NHESP to manage and enhance habitat for endangered bog turtles by conducting surveys,

clearing vegetation, and maintaining water levels. The District Supervisor attended monthly meetings of the Berkshire Fens working group with The Nature Conservancy.

The Western District continued work on bat hibernacula. In addition to annual winter bat counts, the Stewardship Biologist placed temperature/humidity sensors in a number of caves and mines where bats overwinter. The sensors collected data throughout the winter months and were retrieved in the spring. The District also completed a contract for a repair weld to the existing bat gate at the upper Chester mine at the J.J. Kelly Wildlife Management Area. This contract was funded by MassDOT and presented substantial logistical challenges to execute.

The District Supervisor oversaw a contract to install beaver flow devices downstream of Kampoosa bog. The high-water level at the Bog was threatening several listed plant species. The contract was completed in FY22, and water level was stabilized.

District staff assisted with peregrine banding at Tekoa WMA and continued efforts to curtail illegal climbing at that area.

The District Supervisor responded to two Eastern Timber rattlesnake calls and District Technicians assisted with a rattlesnake radiotelemetry project which was initiated in late FY22.

Enhancement of Outdoor Recreation

Enhancement of outdoor recreation is a core function of the district office. Pheasants were stocked 3 days per week throughout the season. The Western District distributes 4,000 birds, released on nine WMAs: Stafford Hill (Cheshire), Eugene Moran (Windsor), George Darey Housatonic Valley (Lenox), Hop Brook (Lee), Knightville (Huntington), Hinsdale Flats (Hinsdale), Three Mile Pond (Sheffield), Flat Brook (West Stockbridge), and Peru (Peru) and 13 covers across the towns of Ashfield, Lee, Lenox, Williamstown, Hawley, Great Barrington, and Pittsfield. Overall, Pheasant stocking requires about 40 personnel days to complete each year. Pheasant chicks were provided to the Lee and Ashfield sportsmen's clubs in early FY22.

The Western District hosted two sites for paraplegic sportsmen to participate during the designated three-day hunt. District staff attended all hours of the hunt and, with the help of volunteers, ensured safe and successful hunting.

The Fisheries Biologist and District Supervisor met with the Town of Russell and other officials to improve angler access along the Westfield River where parking prohibitions have impacted fishing.

Fall trout stocking commenced on September 27 and concluded on October 7, for a total of 9 stocking days. Sixteen waterbodies were stocked: 16 lakes and ponds and 2 rivers (Deerfield River and East Branch Westfield River). The total number of trout stocked in Western District waters in the fall was 13,530 fish, the majority of which came from Bitzer and McLaughlin hatcheries.

Spring Stocking commenced on March 23, 2022. A total of 102,398 fish were stocked during the spring season in 77 waterbodies: 23 lakes and ponds, 54 rivers and streams. Stocking concluded on May 26, 2022, for a total of 46 stocking days.

Outreach and Education

Because they are in the field daily, District staff (particularly Wildlife Technicians) communicate with the public daily. These interactions are an important part of direct outreach for agency programs.

The District Supervisor attended monthly meetings and provided updates to the Berkshire County League of Sportsmen.

The Fisheries Biologist participated in development of the Fisheries Special Edition of MassWildlife magazine, submitting an article on Water Chestnut removal. She also presented information at the Massachusetts Junior Conservation Camp.

District Biologists and Technicians participated in several R3 working groups to promote hunting, fishing, and shooting activities. A fishing clinic was held at Pontoosuc Lake as part of the Urban Angling Program. The District also hosted a public trout stocking event at Onota Lake which was attended by hundreds of people.

The District continued our excellent relationship with Wahconah Regional High School in Dalton. Staff hosted students multiple times and demonstrated biological deer check, fish stocking, and electrofishing. Science classes from Berkshire Community College and Westfield State University

joined Western District Biologists collecting data at deer check stations.

Technical Assistance

The District Office re-opened to the public in FY22. Staff fielded phone calls and walk-in customers. This was particularly challenging in the latter half of FY22 when the new licensing system went into effect. The District Clerk answered a high volume of calls and provided technical advice on the new system. She also provided back up phone answering for the field headquarters.

The District Fisheries Biologist served as an alternate to the Westfield River Wild and Scenic Committee and attended the Huntington Municipal Vulnerability Workshop.

The Western District responded to numerous wildlife situations in FY22. We picked up multiple hawks and owls over the course of the year. We provided daily technical advice on living with bears throughout the spring and early summer.

The District Supervisor and Fisheries Biologist investigated a reported spill of material in the Hoosic River and participated in case review.

District staff worked with Green Berkshires to establish a bird banding station at the Jug End Wildlife Management Area and Reservation. This banding station will help inform management actions and provide regionally important information on migrating birds.

The District Supervisor and Fisheries Biologist participated in a technical review of the Practical Guide for Lake and Pond Management; a document designed to assist users with decisions on managing lentic systems.

Wildlife District and Lands Staff

Field Headquarters

Trina Moruzzi, Assistant Director of Operations
Elizabeth Newlands, Wildlife Lands Stewardship Coordinator

Northeast Wildlife District

Patricia Huckery, District Supervisor
Chalis Bird, Wildlife Biologist
Travis Drudi, Stewardship Biologist
Leslie Gabrilska, Clerk
Anne Gagnon, Land Agent (DFG)
Joshua Gahagan, Wildlife Technician
Tim Mathews, Wildlife Technician
Derek McDermott, Wildlife Technician
John Sheedy, Fisheries Biologist

Southeast Wildlife District

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Aaron Best, Stewardship Biologist
Jeff Breton, Wildlife Technician
Daniel Fortier, Wildlife Technician
John Garofoli, Wildlife Technician
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Central Wildlife District

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Rebecca Colby, Fisheries Biologist
Scott Kemp, Stewardship Biologist
Ethan LaPlante, Wildlife Technician
Mike Morelly, Wildlife Biologist
Debra Manty, Clerk
Jessi Manty, Wildlife Technician
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Ian Sypek, Wildlife Technician
Bruce Walker, Wildlife Technician

Connecticut Valley Wildlife District

Joseph Rogers, District Supervisor
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Joshua Freniere, Wildlife Technician
David Fuller, Wildlife Biologist
Brian Keleher, Fisheries Biologist
Jennifer Jones, Stewardship Biologist
Christina Petersen, Land Agent (DFG)
Kevin Pelosky, Wildlife Technician
Shasta Slade, Wildlife Technician
Walter Tynan, Wildlife Technician

Western Wildlife District

Andrew Madden, District Supervisor
Ray Bressette, Wildlife Technician
Nathan Buckhout, Wildlife Biologist
Leanda Fontaine, Fisheries Biologist
Debra Lipa, Clerk
Peter Milanesi, Land Agent (DFG)
Jacob Morris-Siegel, Stewardship Biologist
Eli Pease, Wildlife Technician
Heather Sadler, Wildlife Technician

7 Federal Aid Program Administration

Lori Cookman, Federal Aid and Compliance Manager

Overview

The Federal Aid and Compliance Manager implements MassWildlife's Federal Aid Program, including oversight of documentation, reporting, compliance with acts and regulations, and other requirements for the administration of federal grants. The position also serves as the liaison between the grantee and Federal agencies – including the grant administrator of the Legacy Region 5 office of the U.S. Fish and Wildlife Service (USFWS) for the U.S. Department of the Interior and the Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture.

Federal Aid

Wildlife Restoration (Pittman-Robertson)

MassWildlife's Wildlife Restoration Act apportionment, $11,403,050, was an increase from last year's apportionment. These funds are available for wildlife restoration projects and hunter education. The following projects were reimbursed with these funds: hunter education, wildlife population trends and harvest surveys, waterfowl research and management, wildlife habitat management, wildlife outreach and communication, expanding hunter opportunities, land acquisition, and program coordination.

Sport Fish Restoration (Dingell-Johnson and Wallop-Breaux)

Massachusetts' Sport Fish Restoration Act apportionment, $3,761,525, was a decrease from last year's apportionment. These funds were divided as follows: The Department of Fish and Game's Office of Fishing and Boating Access (OFBA), which is responsible for constructing and maintaining motorboat access facilities, received $564,229 (15%); and the balance of $3,197,296 was equally divided between the Division of Marine Fisheries and MassWildlife ($1,598,648 each).

MassWildlife activities reimbursed under the Sport Fish Restoration Program include aquatic resources education, hatchery operations, hatchery maintenance, fish distribution, and boat accommodations. The OFBA, in cooperation with MassWildlife, had five boat accommodation grants active in FY 2022.

State Wildlife Grant Program (SWG)

MassWildlife's State Wildlife Grant apportionment of $817,081 was a slight increase from the previous year. The SWG funds were applied to six projects. Activities reimbursed under those projects include fish community research, anadromous fish restoration, biodiversity impact review, biodiversity inventory and research, biodiversity conservation mapping and planning, habitat evaluation, regional conservation needs, and in the development and implementation of the Massachusetts State Wildlife Action Plan.

MassWildlife served as the lead state and was awarded $402,545 through the FY 2016 national State Wildlife Grant Competitive program to fund the Brook Floater Rangewide Conservation and Restoration Initiative. MassWildlife partnered with the states of Maine, New Hampshire, and Virginia to complete this cooperative project during FY 2022.

Also in FY 2016, MassWildlife was awarded $101,000 through the national State Wildlife Grant competitive program to fund the Northeast Blanding's Turtle Initiative. MassWildlife partnered with the states of New Hampshire, Maine, and Pennsylvania on this cooperative project to expand upon a previous grant that was completed in FY

2016. Implementation of the Blanding's Turtle grant was completed during FY 2022.

MassWildlife was awarded $161,673 through the FY 2019 national State Wildlife Grant competitive program to fund the Implementation of the Bog Turtle Conservation Plan for the Northern Population, With Benefits to Associated Headwater Wetland Species of Greatest Conservation Need. MassWildlife is partnering with Pennsylvania, Maryland, New Jersey, and Connecticut. This cooperative project expands upon a previous grant that was completed in FY 2019. Implementation of the new Bog Turtle grant began in FY 2020 and will continue through FY 2025.

Also in FY 2019, MassWildlife was awarded $115,206 through the national State Wildlife Grant competitive program to fund the project entitled Using Nanotag Technology to Identify Landscape-scale Habitat Use of Multiple Species of Greatest Conservation Need in New England. MassWildlife is partnering with the states of New Hampshire, Maine, and Pennsylvania. Implementation of this grant began in FY 2021 and will continue through FY 2023.

MassWildlife was awarded $52,000 through the FY 2020 national State Wildlife Grant competitive program to fund the project entitled Testing Salt Marsh Restoration Practices to Advance Saltmarsh Sparrow Conservation. MassWildlife is partnering with the states of Connecticut, Maine, Maryland, Rhode Island, and Virginia. This project will continue into FY 2026

MassWildlife will serve as the lead state and was awarded $124,200 through the FY 2020 national State Wildlife Grant Competitive program to fund the Regional Conservation for Wood Turtles and Related Emydine Turtles. MassWildlife is partnering with the states of Connecticut, Maine, Maryland, New Hampshire, New Jersey, Pennsylvania, Rhode Island, and Virginia. This cooperative project will continue into FY 2023.

MassWildlife will serve as the lead state and was awarded $392,362 through the FY 2021 national State Wildlife Grant Competitive program to fund the Advancing Conservation and Restoration of Brook Floater and Associated Freshwater Mussels. MassWildlife is partnering with the states of New Jersey, South Carolina, and Virginia. This cooperative project will continue into FY 2025.

The Endangered Species Act (Section 6)

In FY 2022, MassWildlife received $75,000 in Section 6 funding from the USFWS. Funds will be used to reimburse habitat restoration activities to maintain a resilient frosted elfin population, northern red-bellied cooter adaptive management, and the implementation of regional conservation plans for at-risk turtle.

Regional Conservation Partnership Program

During FY 2017, MassWildlife was awarded $286,520 in Natural Resources Conservation Service Funds through a cooperative agreement with the Wildlife Management Institute to provide technical assistance to private landowners interested in conducting habitat management on their property. This agreement concluded in early FY 2022.

During FY 2019, MassWildlife was awarded $150,000 in RCPP funds through a cooperative agreement with the Natural Resources Conservation Service Funds. The agreement will help to provide technical assistance to private landowners interested in conducting habitat management on their property. Implementation of this cooperative agreement will continue into FY 2024.

Miscellaneous Federal Grant Funds

In FY 2020, MassWildlife received $20,000 through a cooperative agreement with the USFWS to partially fund Habitat Restoration for Roseate Terns on Penikese Island. A portion of these funds will be used for habitat management practices to improve habitat suitability and expand nesting habitat to higher elevations more resilient to sea level rise. The remaining funds will be used to conduct tern monitoring on the island. Implementation of this cooperative agreement will continue into FY 2023.

In FY 2022, MassWildlife received $75,451.07 through a cooperative agreement with the USDA-APHIS to develop a Chronic Wasting Disease (CWD) risk assessment, communication strategy and educational materials to help prevent and/or control the spread of CWD in MA. Implementation of this cooperative agreement will continue into FY 2024.

In FY 2022, MassWildlife received $20,000 through a cooperative agreement with the Recreational Boating and Fishing Foundation to continue marketing efforts to promote fishing with a special focus on Spanish speaking communities in urban and suburban areas.

Audits

MassWildlife received its final OIG audit report and corrective action plan for the audit which began in late FY 2020. These federal audits are conducted every five years.

Other Matters

The Federal Aid Coordinator responded to requests for information and public inquiries, managed MassWildlife's inventory, oversaw project performance and financial reporting, provided project assistance (both field and office), conducted field visits, and served as the liaison between all Federal Aid personnel and MassWildlife.

Federal Aid Program Personnel

Kris McCarthy, Chief Fiscal Officer/Associate Director of Administration and Finance

Lori Cookman, Federal Aid and Compliance Manager

Debra Chamberlain, Assistant to the Federal Aid Coordinator

Debbie McGrath, Federal Aid Bookkeeper

8 The Personnel Report

Paige Jones, EEA Deputy Human Resources Director/Department of Fish and Game

July 1, 2021 – June 30, 2022

New Hires: Employees			
Name	***Title***	***Date***	***Comment***
Thomas, Chet	Fish Culturist II	8/29/2021	
Wernert, Keith	Wildlife Technician II	4/10/2022	
Pratt, Cynthia	Program Coordinator I	5/8/2022	
Colby, Rebecca	Aquatic Biologist III	6/5/2022	
Flood, Kalina	Wildlife Technician II	6/19/2022	
Jachym, Jeremy	Wildlife Technician II	6/19/2022	
New/Rehires: Seasonals and Contractors			
Name	***Title***	***Date***	***Comment***
McKenna, Edward	Program Coordinator	12/19/2021	New
Gutzeit, John	Program Coordinator	2/27/2022	New
Bryant, Jessica	Scientist	3/27/2022	New
Comins, Albert	Program Coordinator	4/10/2022	New
Liljesthrom, Marcela	Scientist	5/8/2022	Rehire
Baran, Mark	Scientist	5/8/2022	New
Naras, Julia	Seasonal Employee	5/31/2022	New
Fay, Brian	Seasonal Employee	6/5/2022	New
Terminations: Employees			
Name	***Title***	***Date***	***Comment***
St. Andre, Jesse	Game Biologist I	8/12/2022	
Brideau, Mark	Aquatic Biologist III	10/22/2021	Retired
Lui, Man	Accountant I	9/11/2021	Retired
McMorrow, Conor	Wildlife Technician II	12/10/2021	
Basso, Kim	Program Coordinator I	12/16/2021	
Zimmerer, Rebekah	Conservation Biologist III	1/14/2022	
Connors, Christopher	Wildlife Technician III	1/21/2022	
Blajda, Andrew	Wildlife Technician II	2/9/2022	
Larson, Marion	Program Manager V	3/4/2022	Retired
Terminations: Seasonals and Contractors			
Name	***Title***	***Date***	***Comment***
Gardner, Jasper Kirk	Wildlife Technician I	12/3/2021	
Scanlon, John	Scientists	3/31/2022	Contract Expired

Transfers			
Name	***Title***	***Date***	***Comment***
Sadler, Heather	Wildlife Technician III	9/26/2021	Internal Transfer
Cruz, Megan	Wildlife Technician III	10/3/2021	Internal Transfer
Freniere, Joshua	Wildlife Technician II	6/5/2022	Internal Transfer
Promotions			
Name	***Title***	***Date***	***Comment***
Cookman, Lori	Program Manager V	2/27/2022	From Program Coordinator III
Marsden, Christopher	Wildlife Technician III	3/27/2022	From Wildlife Technician II
Reclassifications			
Name	***Professional Titles***	***Date***	***Comment***
[None]			

9 The Financial Report

Kris McCarthy, Chief Fiscal Officer

George L. Darey Inland Fish and Game Fund

Summary Revenue and Fund Equity: July 1, 2021—June 30, 2022

DEPARTMENTAL REVENUES		
Fishing, Hunting, and Trapping Licenses	$	5,932,144
Archery Stamps	$	274,600
Primitive Firearm Stamps	$	275,998
Waterfowl Stamps	$	80,660
Pheasant Stamps	$	35,146
Wildlands Stamps	$	986,860
Trap Registrations	$	2,871
Antlerless Deer Permits	$	228,485
Bear Permits	$	110,470
Turkey Permits	$	206,910
Special Licenses, Tags and Posters	$	38,835
Magazine Subscriptions	$	79,006
Timber Sales, Other	$	174,659
Fines and Penalties	$	92,535
Rents	$	47,105
Prior Year Refunds	$	–
Donations	$	27,285
Miscellaneous Income	$	12,711
Problem Animal Control (PAC)	$	30,851
NSF Charge/Debt. Collection	$	180
Total	**$**	**8,637,312**
FEDERAL AID REIMBURSEMENTS		
Dingell-Johnson (Fisheries)	$	2,992,043
Pittman-Robertson (Wildlife)	$	7,863,042
Total	**$**	**10,855,085**
TAXES		
Gasoline Tax Apportionment	$	929,679
OTHER FINANCIAL SOURCES		
Reimbursement for Half-Price Licenses	$	253,046
Reimbursement for free Licenses	$	1,151,417
Investment Earnings	$	3,630
Total	**$**	**1,408,093**
TOTAL REVENUE	**$**	**21,830,169**

FUND EQUITY AS OF JUNE 30, 2022	**$**	**13,681,486**

License and Stamp Sales: July 1, 2021—June 30, 2022

CODE	TYPE OF LICENSE	COST	QUANTITY	AMOUNT
F1	CY21 Resident Citizen Fishing	$ 22.50	21,989	$ 494,752.50
	CY22 Resident Citizen Fishing	$ 26.00	93,500	$2,431,000.00
F2	CY21 Resident Citizen Minor Fishing	FREE	1,838	$ –
	CY22 Resident Citizen Minor Fishing	FREE	5,427	$ –
F3	CY21 Resident Citizen Fishing (Age 65-69)	$ 11.25	1,462	$ 16,447.50
	CY22 Resident Citizen Fishing (Age 65-69)	$ 13.00	9,781	$ 127,153.00
F4	CY21 Resident Cit. Fishing (Over 70)	FREE	2,230	$ –
	CY22 Resident Cit. Fishing (Over 70)	FREE	15,422	$ –
F4	CY21 Resident Cit. Fishing (Disabled)	FREE	0	$ –
	CY22 Resident Cit. Fishing (Disabled)	FREE	196	$ –
F6	CY21 Non-Res. Citizen/Alien Fishing	$ 32.50	3,564	$ 115,830.00
	CY22 Non-Res. Citizen/Alien Fishing	$ 36.00	10,05	$ 361,836.00
F7	CY21 Non-Res. Citizen/Alien Fishing (3 day)	$ 18.50	2,322	$ 42,957.00
	CY22 Non-Res. Citizen/Alien Fishing (3 day)	$ 20.90	1,212	$ 25,330.80
F8	CY21 Resident Fishing (3 day)	$ 7.50	1,846	$ 13,845.00
	CY22 Resident Fishing (3 day)	$ 10.00	933	$ 9,330.00
F9	CY21 Non-Resident (Citizen) Minor Fishing	$ 6.50	282	$ 1,833.00
	CY22 Non-Resident (Citizen) Minor Fishing	$ 6.80	273	$ 1,856.40
F10	CY21 Quabbin 1-Day Fishing	$ 5.00	1,837	$ 9,185.00
	CY22 Quabbin 1-Day Fishing	$ 5.00	351	$ 1,755.00
T1	CY21 Resident Citizen Trapping	$ 30.50	98	$ 2,989.00
	CY22 Resident Citizen Trapping	$ 32.00	60	$ 19,424.00
T2	CY21 Resident Citizen Minor Trapping	$ 6.50	0	$ –
	CY22 Resident Citizen Minor Trapping	$ 6.50	23	$ 149.50
T3	CY21 Resident Citizen Trapping (Age 65-69)	$ 15.25	9	$ 137.25
	CY22 Resident Citizen Trapping (Age 65-69)	$ 16.00	77	$ 1,232.00
	CY22 Trapping non-resident	$ 203.00	38	$ 7,714.00
H1	CY21 Resident Citizen Hunting	$ 22.50	8,844	$ 198,990.00
	CY22 Resident Citizen Hunting	$ 26.00	5,593	$ 145,418.00
H2	CY21Resident Citizen Hunting (Age 65-69)	$ 11.25	571	$ 6,423.75
	CY22 Resident Citizen Hunting (Age 65-69)	$ 13.00	626	$ 8,138.00
H3	CY21 Resident Citizen Hunting (Paraplegics)	FREE	2	$ –
	CY22 Resident Citizen Hunting (Paraplegics)	FREE	2	$ –
H4	CY21 Resident Alien Hunting	$ 22.50	100	$ 2,250.00
	CY22 Resident Alien Hunting	$ 26.00	7	$ 182.00
H5	CY21 Non-Res. Cit./Alien Hunting (Big Game)	$ 94.50	2,257	$ 213,286.50
	CY22 Non-Res. Cit./Alien Hunting (Big Game)	$ 98.00	1,866	$ 182,868.00
H6	CY21 Non-Res. Cit./Alien Hunting (Sm. Game)	$ 60.50	917	$ 55,478.50
	CY22 Non-Res. Cit./Alien Hunting (Sm. Game)	$ 64.00	681	$ 43,584.00
H8	CY21 Resident (Citizen) Minor Hunting	$ 6.50	577	$ 3,750.50
	CY22 Resident (Citizen) Minor Hunting	$ 6.50	602	$ 3,913.00
S1	CY21 Resident Citizen Sporting	$ 40.00	4,797	$ 191,880.00
	CY22 Resident Citizen Sporting	$ 47.00	23,359	$1,097,873.00
S2	CY21 Resident Citizen Sporting (Age 65-69)	$ 20.00	441	$ 8,820.00
	CY22 Resident Citizen Sporting (Age 65-69)	$ 23.50	3,604	$ 84,694.00

CODE	TYPE OF LICENSE	COST	QUANTITY	AMOUNT
S3	CY21 Resident Citizen Sporting (Over 70)	FREE	1,736	$ –
	CY22 Resident Citizen Sporting (Over 70)	FREE	9,387	$ –
S4	CY21 Resident Sporting Paraplegic	FREE	11	$ –
	CY22 Resident Sporting Paraplegic	FREE	33	$ –
	TOTAL LICENSE SALES (GROSS)		**241,381**	**$5,932,306.20**

CODE	TYPE OF STAMP	COST	QUANTITY	AMOUNT
M1	CY21 Archery Stamps	$ 5.10	10,026	$ 51,132.60
	CY22 Archery Stamps	$ 10.00	22,350	$ 223,500.00
M2	CY21 Waterfowl Stamps	$ 5.00	3,123	$ 15,615.00
	CY22 Waterfowl Stamps	$ 10.00	6,505	$ 65,050.00
M3	CY21 Primitive Firearm Stamps	$ 5.10	11,014	$ 56,171.40
	CY22 Primitive Firearm Stamps	$ 10.00	21,982	$ 219,820.00
W1	CY21 Wildlands Stamps	$ 5.00	39,059	$ 195,295.00
	CY22 Wildlands Stamps	$ 5.00	134,850	$ 674,250.00
W2	CY21 Non-Resident Wildlands Stamps	$ 5.00	9,260	$ 46,300.00
	CY22 Non-Resident Wildlands Stamps	$ 5.00	14,203	$ 71,015.00
	CY22 Pheasant and Quail permit (resident)	$ 4.00	8,410	$ 33,640.00
	CY22 Pheasant and Quail permit (non-resident)	$ 6.00	251	$ 1,506.00
	TOTAL STAMP SALES (GROSS)		**281,033**	**$1,653,295.00**

FEES AND ADJUSTMENTS	
Fees Retained and Adjustments by Clerks	$771.95
Refunds	-$965.30
Total	**-$193.35**
TOTAL LICENSE/STAMP SALES (NET)	**$7,585,407.85**

Expenditures: July 1, 2021—June 30, 2022

Administration		**%**
Administration	$ 1,855,498	
Information-Education	$ 1,228,668	
DCAMM Field Headquarters ISA	$ 89,464	
Total	**$ 3,173,629**	**17%**
Fisheries and Wildlife Programs		
Hatcheries	$ 2,901,700	
Game Bird Program	$ 677,062	
Seasonals	$ 5,712	
Cooperative Units	$ 145,571	
Fisheries and Wildlife Management	$ 5,903,719	
Total	**$ 9,633,765**	**53%**
Other Programs		
Land Acquisitions	$ 1,385,794	
Waterfowl Management Program	$ 38,512	
Hunter Safety Program	$ 267,336	
Total	**$ 1,691,642**	**9%**
Other Assessments		
Payroll Taxes	$ 195,432	
GI and Other Fringe Benefits	$ 3,464,324	
Total	**$ 3,659,756**	**20%**

TOTAL EXPENDITURES	$ 18,158,793	100%

Natural Heritage and Endangered Species Fund

Summary Revenues, Expenditures, and Fund Equity: July 1, 2021—June 30, 2022

REVENUES	FY 2022
Natural Heritage and Endangered Species Tax Checkoff Donations	$ 384,119
Sales	$ 3,862
NRCS/Wildlife Habitat Incentives Program (WHIP)	$ 40,066
Section 6	$ 8,714
State Wildlife Grant (SWG)	$ 1,129,390
Bog Turtle	$ 17,893
Massachusetts Endangered Species Act Fees	$ 384,300
Contracts	$ 646,057
Direct Donations	$ 219,552
Interest	$ 325
Total Revenues	**$ 2,834,277**
EXPENDITURES	
Natural Heritage and Endangered Species Program	$ 2,378,514
Housatonic Natural Resource Damage	$ 40,316
Total Expenditures	**$ 2,418,830**
FUND EQUITY AS OF JUNE 30, 2022	$ 2,559,853

Other Expenditures

July 1, 2021—June 30, 2022

Capital Outlay Funds	FY 2022
Land Protection; Habitat Management; CR Stewardship	$ 1,029,348
Staffing for Land and Infrastructure Programs	$ 567,014
Hatchery/District/Westborough Field Headquarters Repairs	$ 51,744
Habitat Grant Program	$ 323,804
Dam Safety and Repair	$ 1,603,490
TOTAL CAPITAL EXPENDITURES	**$ 3,575,400**
Interdepartmental Service Agreements	
Massachusetts Highway Department (MassDOT)	$ 232,613
Massachusetts Department of Conservation and Recreation	$ 89,127
Executive Office of Energy and Environmental Affairs	$ 480,478
Total ISA	**$ 802,217**
Natural Heritage and Endangered Species Line Item:	**$ 1,394,999**
Other Trust Accounts	
Federal Duck Stamp (e-stamp)	**$ 179,658**

Appendix A The Fisheries
Tables and Figures

Table A 1. Number of trout produced at each of MassWildlife's five fish hatcheries in FY 2022 (fall 2021 and spring 2022).

		Number of Fish					
Species	Size Category (inches)	Bitzer	McLaughlin	Palmer	Sandwich	Sunderland	Total Number of Fish
Rainbow	6+						-
Trout	9+						-
	12+	21,447			27,900	47,191	**96,538**
	14+		166,597		10,610		**177,207**
	Sub-total	**21,447**	**166,597**	**-**	**38,510**	**47,191**	**273,745**
Brook	6+					42,820	**42,820**
Trout	9+			435			**435**
	12+	31,530			10,067	8,200	**49,797**
	14+			471			**471**
	18+				611		**611**
	Sub-total	**31,530**	**-**	**906**	**10,678**	**51,020**	**94,134**
Brown	6+	18,220					**18,220**
Trout	9+	4,000	23,259	480		31,460	**59,199**
	12+	19,932			10,620	20,287	**50,839**
	14+			511			**511**
	18+			133	952		**1,085**
	Sub-total	**42,152**	**23,259**	**1,124**	**11,572**	**51,747**	**129,854**
Tiger	14+				2,921		
Trout	**Sub-total**				**2,921**		**2,921**
Total		**95,129**	**189,856**	**2,030**	**63,681**	**149,958**	**500,654**

Table A 2. Pounds of trout produced at MassWildlife's five fish hatcheries in FY2022 (fall 2021 and spring 2022).

		Weight of Fish in Pounds					
Species	Size Category (inches)	Bitzer	McLaughlin	Palmer	Sandwich	Sunderland	Total Weight of Fish
Rainbow	6+						-
Trout	9+						-
	12+	20,710			18,857	47,514	**87,081**
	14+		173,721		10,347		**184,068**
	Sub-total	**20,710**	**173,721**		**29,204**	**47,514**	**271,149**
Brook	6+					7,801	**7,801**
Trout	9+			311			**311**
	12+	22,836			8,478	4,866	**36,180**
	14+			946			**946**
	18+				1,572		**1,572**
	Sub-total	**22,836**		**1,257**	**10,050**	**12,667**	**46,810**
Brown	6+	4,295					**4,295**
Trout	9+	1,798	10,897	192		8,327	**21,214**
	12+	18,680			10,613	22,189	**51,482**
	14+			1,714			**1,714**
	18+			832	3,064		**3,896**
	Sub-total	**22,975**	**10,897**	**2,738**	**13,677**	**22,189**	**82,601**
Tiger	14+				2,886		**2,886**
Trout	**Sub-total**				**2,886**		**2,886**
Total		**66,521**	**184,618**	**3,995**	**52,931**	**82,370**	**403,446**

Table A 3. Summary of landlocked salmon, Brook Trout eggs, Brown Trout eggs, and Tiger Trout eggs produced in FY2022.

Hatchery	Species	Size Category (inches)	Number	Weight (Pounds)
Palmer	Landlocked salmon	8+ inches	10,190	2,311
	Landlocked salmon	Fall Fingerlings	3,170	197
	Brook Trout	eggs	223,758	N/A
	Brown Trout	eggs	642,243	N/A
Sandwich	Brook Trout	eggs	223,758	N/A
	Brown Trout	eggs	236,800	N/A
	Tiger Trout	eggs	160,512	N/A

Table A 4. Results of fish health tests conducted at the MassWildlife's five fish hatcheries in FY2022. NEG signifies negative test results.

			Pathogen[1]							
									Protozoa	
Hatchery	Species[2]	Number of Fish Tested	IPNV	VHSV	OMV	IHNV	BF	BRM	WD	Other[3]
Bitzer	BK (SA)	60	NEG	NEG	NEG	NEG	NEG	NEG		
	BK (SL)	60	NEG	NEG	NEG	NEG	NEG	NEG		
	BT (SA)	60	NEG	NEG	NEG	NEG	NEG	NEG		
	RT (E/A)	60	NEG	NEG	NEG	NEG	NEG	NEG	NEG	
McLaughlin	BT (SA)	60	NEG	NEG	NEG	NEG	NEG	NEG		
	RT (E/A)	60	NEG	NEG	NEG	NEG	NEG	NEG	NEG	
	RT (SH)	60	NEG	NEG	NEG	NEG	NEG	NEG		
	BK (SL)	30	NEG	NEG	NEG	NEG	NEG	NEG		
	RT (E/A)	10					NEG	NEG		+CWD
	RT (TL)	10					NEG	NEG		+CWD
	RT (SH)	10					NEG	NEG		+CWD
Palmer	LLS (GL)	60	NEG	NEG	NEG	NEG	NEG	NEG	NEG	
	BK (SA)	15	NEG	NEG	NEG	NEG	NEG	NEG		
	BK (SA)	140[4]	NEG	NEG	NEG	NEG	NEG	NEG		
	BT (SA)	15	NEG	NEG	NEG	NEG	NEG	NEG		
	BT (SA)	88[4]	NEG	NEG	NEG	NEG	NEG	NEG		
Sandwich	BK (SA)	60	NEG	NEG	NEG	NEG	NEG	NEG		
	BK (SA)	100[4]	NEG	NEG	NEG	NEG	NEG	NEG		
	BT (SA)	60	NEG	NEG	NEG	NEG	NEG	NEG		
	BT (SA)	100[4]	NEG	NEG	NEG	NEG	NEG	NEG		
	RT (E/A)	60	NEG	NEG	NEG	NEG	NEG	NEG	NEG	
	RT (SH)	60	NEG	NEG	NEG	NEG	NEG	NEG		
	TT (SA)	30	NEG	NEG	NEG	NEG	NEG	NEG		
Sunderland	BK (SA)	60	NEG	NEG	NEG	NEG	NEG	NEG		
	BT(SA)	60	NEG	NEG	NEG	NEG	NEG	NEG		
	RT (E/A)	60	NEG	NEG	NEG	NEG	NEG	NEG		
	RT (SH)	60	NEG	NEG	NEG	NEG	NEG	NEG	NEG	

[1]Fish were tested following the Northeast Fish Health Guidelines and the American Fisheries Society – Fish Health Section "Suggested Procedures for the Detection and Identification of Certain Finfish and Shellfish Pathogens". IPNV – Pancreatic Necrosis Virus, VHSV – Viral Hemorrhagic Septicemia virus, OMV – *Oncorhynchus masou* virus, IHNV – Infectious Hematopoietic Necrosis virus, BF – *Aeromonas salmonicida,* BRM – *Yersinia ruckeri*, WD – *Myxobolus cerebralis*

[2]Species codes: BK (SA) – brook trout (Sandwich strain), BK (SL) – brook trout (Soda Lake strain), BT (SA) – brown trout (Sandwich strain), RT (E/A) – rainbow trout (Erwin Arlee strain), RT (TL) – rainbow trout (Trout Lodge strain), RT (SH) – rainbow trout (Shasta strain), LLS (GL) – landlocked salmon (Maine Grand Lake strain), TT – tiger trout (Sandwich strain)

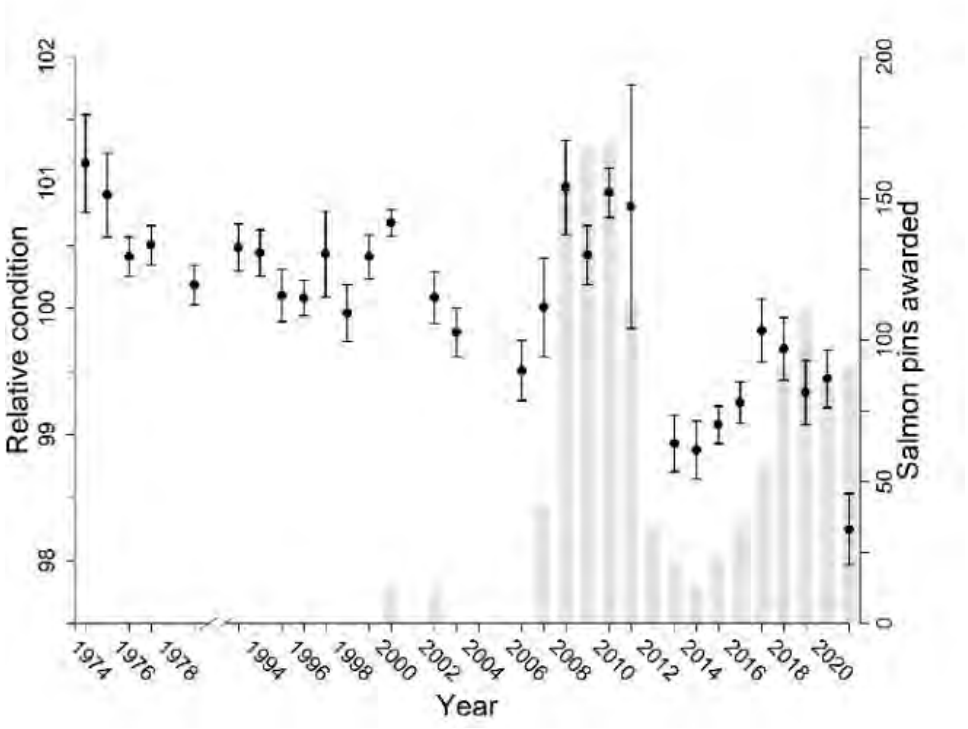
[3]Other included examinations and diagnostic tests performed on fish that showed symptoms of a specific disease or parasitic infection. NDT = no addition diagnostic testing necessary; CWD = Coldwater disease caused by the bacteria *Flavobacterium psychrophilum*.
[4]Female ovarian fluid samples

Table A 5. Resistance values used in the creation of aquatic core and critical natural landscape (CNL) buffers.

	Resistance			Floodplain Resistance	
Cover Type	**Aquatic Core**	**CNL**		**Aquatic Core**	**CNL**
Commercial building	1000	1000		1000	1000
Industrial building	1000	1000		1000	1000
Agricultural building	1000	1000		1000	1000
Residential building	1000	1000		1000	1000
Recreational building	1000	1000		1000	1000
Public building	1000	1000		1000	1000
Pavement	1000	1000		1000	1000
Developed open space	1000	1000		1000	1000
Expressway	1000	1000		1000	1000
Primary highway	1000	1000		1000	1000
Secondary highway	1000	1000		1000	1000
Light duty road	1000	1000		1000	1000
Unpaved road	1000	1000		1000	1000
Railroad	1000	1000		1000	1000
Abandoned railbed	1000	1000		1000	1000
Rail trail	1000	1000		1000	1000
Bridge or culvert	1000	1		1	1
Dam	1000	1		1	1
Forest	1000	2		1	2
Shrubland	1000	2		1	2
Cropland	1000	10		1000	10
Pasture	1000	2		1	2
Grassland	1000	2		1	2
Bare land	1000	2		1	2
Forested wetland	1000	1		1	1
Shrub swamp	1000	1		1	1
Marsh	1000	1		1	1
Vernal pool	1000	1		1	1
Pond	1000	1		1	1
Lake	1000	1		1	1
Stream (1st) low	1000	1		1	1
Stream (1st) high	1000	1		1	1
Stream (2nd) low	1000	1		1	1
Stream (2nd) high	1000	1		1	1
Stream (3rd) low	1000	1		1	1
Stream (3rd) high	1000	1		1	1

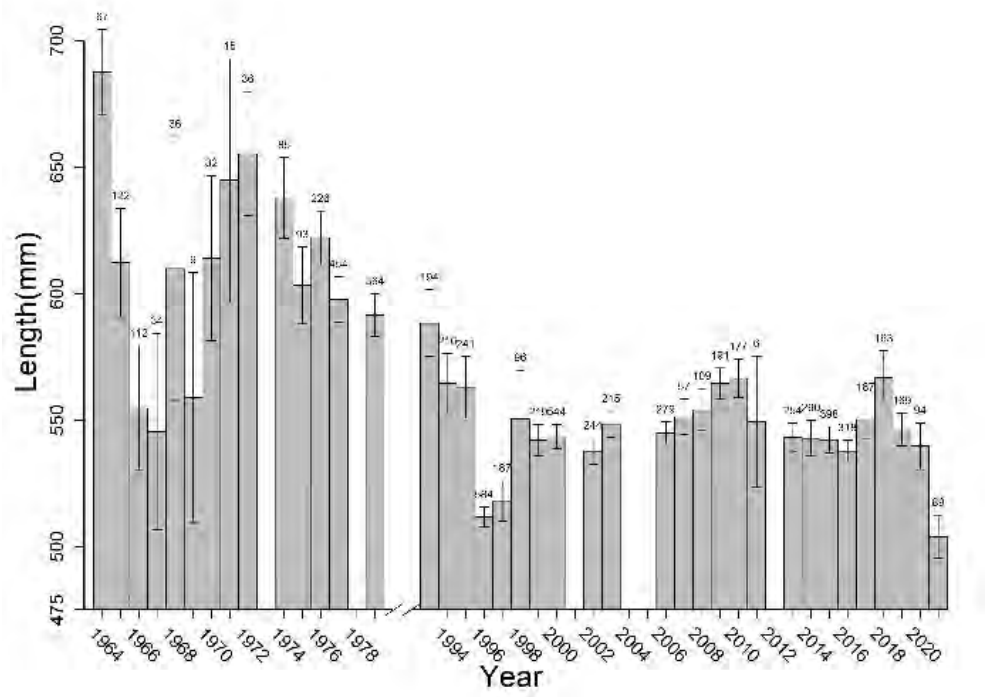
Stream (4th) low	1000	1		1	1
Stream (4th) high	1000	1		1	1
Stream (5th) low	1000	1		1	1
Stream (5th) high	1000	1		1	1
Salt marsh	1000	1		1	1
Beach or mudflat	1000	1		1	1
Coastal dune	1000	2		1	2
Estuarine forested wetland	1000	1		1	1
Estuarine shrub swamp	1000	1		1	1
Salt pond or bay	1000	1		1	1
Estuary (1st)	1000	1		1	1
Estuary (2nd)	1000	1		1	1
Estuary (3rd)	1000	1		1	1
Estuary (4th)	1000	1		1	1
Estuary (5th)	1000	1		1	1
Ocean	1000	1000		1000	1000

Figure A 1: Mean relative condition of male Lake Trout collected from Quabbin Reservoir from 1974-2020.



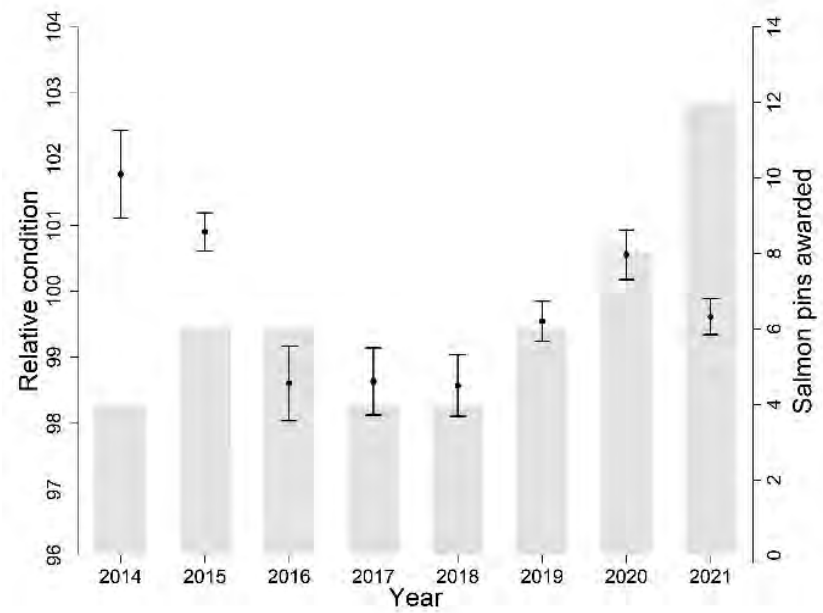
Note the axis break. Grey bars on secondary Y-axis depict the number of landlocked salmon submitted to the Massachusetts Sportfishing Awards Program over the same time interval that met minimum size requirements.

Figure A 2: Mean length (mm) at catch with sample sizes of male Lake Trout collected from Quabbin Reservoir from 1964-2020.



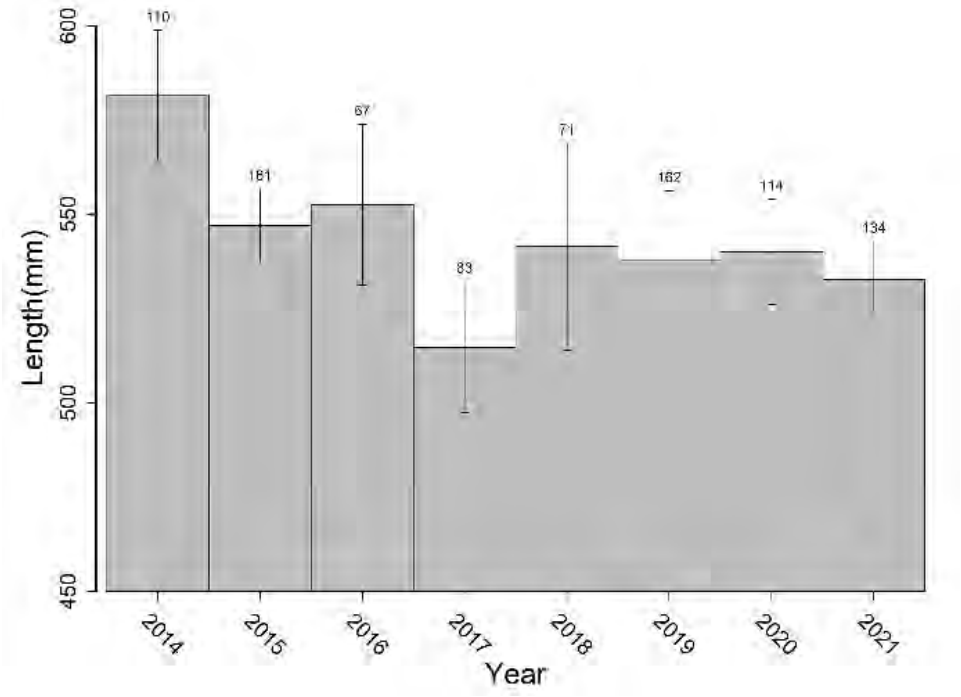
Note the axis break.

Figure A 3: Mean relative condition of male Lake Trout collected from Wachusett Reservoir from 2014-2020.



Black points represent the mean relative condition. Grey bars on secondary Y-axis depicts the number of landlocked salmon submitted to the Massachusetts Sportfishing Awards Program over the same time interval that met minimum size requirements.

Figure A 4: Mean length (mm) at catch, with sample sizes, of male Lake Trout collected from Wachusett Reservoir from 2014-2020.



.

Appendix B The Wildlife Tables

Table B 1. FY 2022 biological monitoring sites

Site Name	Town	Type of Monitoring	Acres
Birch Hill ACOE	Templeton/ Winchendon	Forest Inventory	175
Birch Hill WMA	Templeton/ Winchendon	Post-fire Vegetation Assessment	11
Bolton Flats WMA	Bolton	Post-fire Vegetation Assessment	125
Eugene Moran WMA	Windsor		140
Falmouth Rod & Gun Club	Falmouth	Post-fire Vegetation Assessment	40
Frances A. Crane WMA	Falmouth	Post-fire Vegetation Assessment	5
Herman Covey WMA	Belchertown	Bird Transect, Plant Community Survey, Vegetation Assessment	23
Hop Brook WMA	Lee	Post-fire Vegetation Assessment	462
Karner Brook WMA	Egremont	Post-fire Vegetation Assessment	458
Katama Plains WMA	Edgartown	Post-fire Vegetation Assessment	62
Leyden WMA	Leyden	Post-fire Vegetation Assessment	22
Mashpee Pine Barrens WMA	Mashpee	Post-fire Vegetation Assessment	111
Mill Brook Bogs WMA	Freetown	Forest Inventory	26
Montague Plains WMA	Montague	Post-fire Vegetation Assessment	190
Muddy Brook WMA	Hardwick	Post-fire Vegetation Assessment, Forest Inventory	0
Myles Standish SF/WMA	Plymouth	Forest Inventory	4
Noquochoke WMA	Dartmouth	Post-fire Vegetation Assessment	55
Penikese Island Sanctuary	Gosnold	Post-fire Vegetation Assessment	93
SE Pine Barrens WMA	Plymouth	Post-fire Vegetation Assessment	54
Southwick WMA	Southwick	Post-fire Vegetation Assessment	10
Stafford Hill WMA	Cheshire	Post-fire Vegetation Assessment	68
Three Mile Pond WMA	Sheffield	Forest Inventory	85
Unkety Brook WMA	Dunstable	Forest Inventory	7
Total			2,226

Table B 2. FY 2022 habitat management and prescribed fire planning sites

Site Name	Town	Plan Type	Acres
Birch Hill ACOE	Templeton/Winchendon	Annual Management Plan	140
Eugene Moran WMA	Windsor	Site Plan	1870
Montague Plains WMA	Montague	Prescribed Fire	69
Satan's Kingdom WMA	Bernardston	Site Plan	120
SE Pine Barrens WMA	Plymouth	Prescribed Fire	350
Total Acres			2,549

Table B 3. FY 2022 summary of habitat management sites, by practice

Habitat Practice	Acres
Access improvement	1
Field mowing	410
Shrub mowing	336
Prescribed Fire	1392
Tree Cutting	349
Vegetation control	1229
Total	3,717

Table B 4. FY 2022 invasive plant control sites

Site Name	Town	Habitat Type, Vegetation, or Fuels	Acres
Bird Island Sanctuary	Marion	Coastal Beach and Dune Complex	2
Bitzer Hatchery	Montague	Control poison ivy, bittersweet	0.5
Bullock Ledge WMA	Williamstown	Rock Outcrops, Cliffs, and Talus	5
Burrage Pond WMA	Hanson/Halifax	Marshes and Wet Meadows	27
Frances Crane WMA	Falmouth	Sandplain Grasslands and Heathlands, Oak Forests and Woodlands	585
Herman Covey WMA	Belchertown	Sandplain Grasslands and Heathlands, Oak Forests and Woodlands	151
Karner Brook WMA	Egremont	Calcareous Wetlands	5
Leyden WMA	Leyden	Ridgetop Heathland	63
Montague Plains WMA	Montague	Oak Forests and Woodlands	172
Muddy Brook WMA	Hardwick	Oak Forests and Woodlands	35
Noquochoke WMA	Dartmouth	Sandplain Grasslands and Heathlands	52.5
Penikese Island Sanctuary	Gosnold	Sandplain Grasslands and Heathlands	41
Poland Brook WMA	Conway	Cultural Grasslands	3
Rainbow Beach WMA	Northampton	Riparian and Floodplain	1
Ram Island Sanctuary (South)	Mattapoisett	Coastal Beach and Dune Complex	4
Southwick WMA	Southwick	Oak Forests and Woodlands	75
Stafford Hill WMA	Cheshire	Calcareous Wetlands	7
Wayne F. Maccallum WMA	Westborough	Cultural Grasslands	1

Table B 5. FY 2022 mow/mulch management sites

Site Name	Town	Habitat Type	Acres
Eugene Moran WMA	Windsor	Cultural Shrublands	45
George L. Darey Housatonic Valley WMA	Lenox/Pittsfield	Cultural Shrublands	29
Jug End WMA & SR	Egremont	Cultural Shrublands	109
Montague Plains WMA	Montague	Oak Forests and Woodlands	90
Noquochoke WMA	Dartmouth	Oak Forests and Woodlands	10
Peru WMA	Peru	Cultural Shrublands	6
Stafford Hill WMA	Cheshire	Marshes and Wet Meadows	3
Winimusset WMA	New Braintree	Oak Forests and Woodlands	14

Table B 6. Prescribed fires completed by MassWildlife in FY 2022

Date	Site Name	Vegetation/Fuels	Acres
2021-09-20	Frances A. Crane WMA	Sandplain Grasslands and Heathlands	21
2021-09-21	Southwick WMA	Sandplain Grasslands and Heathlands	53
2021-10-01	Herman Covey WMA	Sandplain Grasslands and Heathlands	8
2021-10-13	Leyden WMA	Barrens	7
2021-10-14	Leyden WMA	Barrens	5
2021-10-20	Mashpee Pine Barrens WMA	Oak Forests and Woodlands	26
2021-10-21	SE Pine Barrens WMA	Oak Forests and Woodlands	24
2021-11-05	Muddy Brook WMA	Oak Forests and Woodlands	50
2021-11-10	Katama Plains WMA	Sandplain Grasslands and Heathlands	55
2021-11-16	Fort Devens	Sandplain Grasslands and Heathlands	216
2022-03-23	Penikese Island Sanctuary	Sandplain Grasslands and Heathlands	68
2022-03-30	Mashpee Pine Barrens WMA	Sandplain Grasslands and Heathlands	24
2022-04-05	Mashpee Pine Barrens WMA	Sandplain Grasslands and Heathlands	43
2022-04-11	Frances A. Crane WMA	Sandplain Grasslands and Heathlands	114
2022-04-13	Frances A. Crane WMA	Sandplain Grasslands and Heathlands	55
2022-04-15	Falmouth Rod & Gun Club	Sandplain Grasslands and Heathlands	26
2022-04-18	Southwick WMA	Sandplain Grasslands and Heathlands	174
2022-04-21	SE Pine Barrens WMA	Oak Forests and Woodlands	61
2022-04-22	Stafford Hill WMA	Calcareous Wetlands	7

2022-04-25	Herman Covey WMA	Marshes and Wet Meadows	7
2022-05-01	Birch Hill WMA	Sandplain Grasslands and Heathlands	3
2022-05-06	Birch Hill WMA	Sandplain Grasslands and Heathlands	19
2022-05-11	Bolton Flats WMA	Sandplain Grasslands and Heathlands	17
2022-05-12	Herman Covey WMA	Sandplain Grasslands and Heathlands	
2022-05-20	Bolton Flats WMA	Sandplain Grasslands and Heathlands	
2022-05-24	Montague Plains WMA	Oak Forests and Woodlands	
2022-05-25	Montague Plains WMA	Sandplain Grasslands and Heathlands	
2022-05-26	Herman Covey WMA	Sandplain Grasslands and Heathlands	
2022-06-06	Bolton Flats WMA	Sandplain Grasslands and Heathlands	
2022-06-07	Frances A. Crane WMA	Sandplain Grasslands and Heathlands	
2022-06-14	Frances A. Crane WMA	Oak Forests and Woodlands	
2022-06-15	Frances A. Crane WMA	Oak Forests and Woodlands	

Table B 7. FY 2022 Tree Cutting

Site Name	Town	Habitat Type	Acres
Bullock Ledge WMA	Williamstown	Rock Outcrops, Cliffs, and Talus	20
Farmington River WMA	Becket/Otis	Young Forests	108
Mill Brook Bogs WMA	Freetown	Sandplain Grasslands and Heathlands	23
Muddy Brook WMA	Hardwick	Oak Forests and Woodlands	40
Myles Standish SF/WMA	Plymouth	Sandplain Grasslands and Heathlands	104
Noquochoke WMA	Dartmouth	Oak Forests and Woodlands	10
Southwick WMA	Southwick	Oak Forests and Woodlands	33
Unkety Brook WMA	Dunstable	Oak Forests and Woodlands	11

Table B 8. FY 2022 DCR Harvest Proposal Reviews

Property	Parcel	Town	Acres
Bryant Mt.	Forest Slalom	Cummington	234
October Mountain SF	Ant Lot	Washington	447
Warwick SF	Bass Road West	Warwick	123
Savoy Mountain SF	LSR	Savoy	629
Otis SF	Geisler Swamp	Otis	88
Sandisfield SF	Hyde Karlson Lot	Sandisfield	234
Dubuque SF	Scott Road	Savoy	175
Dubuque SF	Transfer Station Lot	Savoy	102
Townsend SF	Old Turnpike Road	Townsend	112
F. Gilbert Hills SF	SE Home Fuelwood – Pine Hill	Foxborough	6
Manuel Correllus sF	Plantation Removal & Restoration	Edgartown	175
Myles Standish SF	Settler's Green Fuels Reduction	Carver	17

Table B 9. 2021 Airboat Night-lighting Results

Location	Date	MALL	ABDU	X	WODU	AGWT	BWTE	MISC	Total	P.B.[1]
New Bedford Res	7/27	9			32				39	
Nashua River	8/1	10			44				54	4
Otter River.	8/2	10			47			1[4]	58	6
Quaboag River	8/3	2			5			1[3]	8	
Lackey Pond	8/12				73				73	5
Housatonic River	8/19		2		64				66	1
Lake Warner	8/24				41				41	1
Turkey Hill Brook	9/21	2			5	2			9	
Lackey Pond	9/23	11	1		45	2		7[2]	66	2
Totals	9 trips	42	3		356	4		9	397	29

[1] Previously banded
[2] sora
[3] Virginia rail
[4] hooded merganser

Table B 10. Historical furbearer harvest 1992/1993 to 2021/2022

Season	River Otter [a,d]	Mink [a,d]	Muskrat [b,d]	Beaver [a,d]	Gray Fox [a,c]	Red Fox [a,c]	Weasel [b,c]	Skunk [b,c]	Opossum [b,c]	Raccoon [b,c]	Coyote [a,c]	Bobcat [a,c]	Fisher [a,d]
1992/1993	149	591	9,474	1,086	19	118	0	31	66	2,150	95	10	111
1993/1994	151	593	9,595	1,017	10	92	0	31	54	1,438	92	16	120
1994/1995	165	559	11,341	2,083	19	78	4	52	87	1,471	107	12	158
1995/1996	171	502	7,873	1,135	36	83	15	41	54	640	153	14	226
1996/1997	147	441	7,062	623	20	65	1	11	44	998	166	9	278
1997/1998	13	49	712	98	43	31	5	99	113	559	86	8	340
1998/1999	15	49	1,017	114	54	27	2	64	75	368	97	8	395
1999/2000	11	63	747	312	26	17	1	67	32	123	84	15	220
2000/2001	16	59	667	558	37	27	0	55	24	300	95	14	124
2001/2002	38	49	917	1,172	50	36	0	60	52	399	91	18	197
2002/2003	25	39	649	495	43	24	0	85	27	717	85	23	303
2003/2004	72	25	1,419	717	49	40	0	110	54	720	176	47	215
2004/2005	97	34	1,063	564	37	42	4	111	53	403	191	51	339
2005/2006	119	30	543	791	38	33	7	119	37	178	188	45	342
2006/2007	97	36	679	730	45	46	1	8	25	234	242	38	582
2007/2008	72	40	976	848	33	48	3	25	79	344	530	53	486
2008/2009	64	49	709	702	45	31	0	23	38	239	513	63	521
2009/2010	78	34	1,066	509	46	53	1	15	30	186	599	53	262
2010/2011	79	35	947	548	49	55	6	12	74	237	489	67	321
2011/2012	88	38	1,174	828	38	42	9	15	43	287	449	81	214
2012/2013	156	51	967	711	57	47			3	77	470	103	415
2013/2014	166	60	110	969	65	65	8	8	28	55	420	103	459
2014/2015	102	30	61	562	56	58	1	12	32	26	468	81	398
2015/2016	57	12	518	727	24	27	0	21	16	71	532	79	286
2016/2017	101	8	34	534	56	70	0	15	10	46	486	100	280
2017/2018	62	22	115	667	45	81	1	30	18	59	522	87	244
2018/2019	35	18	32	567	32	126	2	23	20	97	759	109	109
2019/2020	22	17	89	672	50	103	0	39	36	101	626	118	152
2020/2021	30	11	99	594	33	65	2	19	30	82	574	94	118
2021/2022	28	7	17	816	26	63	0	26	17	55	597	97	84
Past 5-year Average	35.4	15	70.4	663.2	37.2	87.6	1	27.4	24.2	78.8	615.6	101	141.4

a: number of animals reported at official check stations or via online check system

b: number of animals reported from voluntary trapper survey

c: both hunting and trapping seasons

d: trapping season only

Table B 11. The 2021 white-tailed deer harvest by deer sex/age and the number of antlerless deer permits allocated and issued, by WMZ, for Massachusetts (Quabbin excluded).

Zone	Adult Male	Female	Buck Fawn	Total	Goal of Allocation	2021 Allocation	2021 Issued
1	266	75	15	356	Stabilize	600	580
2	478	47	6	531	Stabilize	300	289
3	390	142	17	549	Stabilize	1,600	1,500
4N	448	114	12	574	Stabilize	600	590
4S	297	62	5	364	Stabilize	500	488
5	507	166	34	707	Stabilize	1,500	1,458
6	185	39	6	230	Stabilize	300	284
7	378	196	38	612	Stabilize	2,400	2,256
8	518	202	33	753	Stabilize	2,600	2,487
9	725	476	119	1,320	Stabilize	5,500	5,170
10	1,286	994	206	2,486	Reduce	12,000	11,782
11	1,842	1,142	254	3,238	Reduce	13,000	12,798
12	148	81	15	244	Stabilize	1,000	938
13	276	302	91	669	Reduce	2,700	2,260
14	299	324	112	735	Reduce	2,700	1,749
Statewide	8,043	4,362	963	13,368		47,300	44,629

** Antlerless deer permits are functionally unlimited in Zones 10, 13, and 14*

Appendix C The Wildlife Lands

Table C 1. The Wildlife Lands as of the end of FY 2022.

Central District	***51,245***
Ashburnham WMA	272
Bare Hill Pond Access	1.45
Benjamin Hill WCE	87.5
Bennett WMA	281.2
Birch Hill WMA	4560.55
Blackstone / West River Access	28
Bolton Flats WMA	1319.88
Breakneck Brook WCE	526
Breakneck Brook WCR	176
Breakneck Brook WMA	707
Burnshirt River WCE	100
Carter Pond WCE	300.5
Chockalog Swamp WMA	52.5
Clinton Bluff WMA	42
Coy Hill WMA	1137.5
Cusky Pond Access	23
E. Kent Swift WMA	157
Fish Brook WCE	75
Fish Brook WMA	324.5
Fitchburg Watershed WCE	1875
Five Mile River Access	178.52
Five Mile River WCR	17.27
Four Chimneys WMA	200
Glen Echo Lake Access	1
High Ridge WMA	2240.87
Hitchcock Mountain WCE	110.5
Hitchcock Mountain WCR	499.5
Hitchcock Mountain WMA	268.41
Lackey Pond WMA	174.54
Lawrence Brook WCE	462.6
Lawrence Brook WMA	295.5
Leadmine Mountain WCE	826.37
Leadmine Pond Access	0.05
Leadmine WMA	826
Long Pond WCE	8.85
Long Pond WMA	5.6
Martha Deering WMA	232.58
McKinstry Brook WCE	31
McKinstry Brook WCR	26
McKinstry Brook WMA	291.3
Merrill Pond WMA	1037.06
Millers River WCE	194.22
Millers River WMA	4019.26
Mine Brook WMA	1197.4
Moose Brook Access	20.13
Moose Brook WCE	125
Moose Brook WMA	849.195
Moose Hill WMA	695.6
Moosehorn Pond Access	9
Mossy Pond Access	17
Mount Watatic Sanctuary	228
Mt. Pisgah WCE	19.12
Mt. Pisgah WMA	88.8
Muddy Brook WCE	575.69
Muddy Brook WMA	1888.92
Natty Brook Access	95.17
Newton Reservoir WCE	622
Nineteenth Hill WCE	623.75
Nineteenth Hill WMA	293.6
Norcross Hill WMA	464.93
North Pond Access	0.18
Oakham WMA	911.2
Phillipston WMA	3224.03
Popple Camp WMA	1459.91
Potter Hill WCE	90.8
Poutwater Pond WMA	391.74
Prince River WMA	838.95
Quaboag WMA	1822.53
Quacumquasit WMA	179.82
Quag Pond Bog Access	31
Quinapoxet River Access	32

Quinsigamond Marsh Access	60.5
Quinsigamond River Access	18.6
Quisset WCE	247
Quisset WMA	424.69
Raccoon Hill WCR	22
Raccoon Hill WMA	754.41
Richardson WMA	467.22
Savage Hill WCE	234
Savage Hill WMA	930.96
Scripture Hill WMA	121
Secret Lake WCE	311.3
Sevenmile River Access	77
Slater Woods WCE	73.9
South Meadow Pond Access	0.25
Sputtermill Pond Access	58.5
Stone Bridge WMA	505.17
Stuart Pond WCE	28.7
Sucker Brook WMA	102.6
Susan B. Minns Sanctuary	139.91
Taft Hill WCE	394.6
Thayer Pond WMA	131
Tully River Access	1
Ware River Access - Barre	40
Ware River WMA	185.36
Wayne F. MacCallum WMA	894.58
Webster Lake Access	1.7
Wekepeke WCE	564
West Hill Dam WMA	350
Whitmanville WCE	118.1
Whortleberry Hill WMA	334.355
Williamsville Pond WCR	5.64
Winchendon Springs WMA	854.06
Winimusset WCE	100
Winimusset WMA	670.17
Wolf Swamp WMA	1233.88
Connecticut Valley District	***32,782***
Amethyst Brook WCE	36.9
Bachelor Brook WMA	93.7
Bennett Meadows WMA	201
Bitzer Fish Hatchery	74.54
Brewer Brook WMA	456.69
Brushy Mountain WCE	78
Brushy Mountain WMA	181.38

Catamount WMA	413
Chestnut Hill WCE	175.4
Connecticut River Access	94.8
Darwin Scott WMA	27.3
Deerfield River Access	23
East Mountain WMA	604.45
Facing Rock WCE	190
Facing Rock WMA	1388.89
Flagg Mountain WCE	345
Flagg Mountain WMA	223.69
Forest Lake Access	34.8
Great Swamp WCE	0.94
Great Swamp WMA	733.46
Green River WMA (Valley District)	558.85
Herman Covey WMA	1505.94
Honey Pot WCE	52.74
Honey Pot WMA	178.42
Lake Lorraine Access	0.26
Lake Quinsigamond Access	6.49
Lake Rohunta Access	2.49
Lake Rohunta WCE	59
Lake Warner WMA	98
Leyden WMA	759
Little Alum Pond Access	0.5
Little Tully Mountain WCE	461.38
Ludlow Reservoir WCE	1750
Mill River Access	14.15
Millers River Access	73.5
Montague Plains WMA	1983.589
Montague WMA	2074.45
Mt. Esther WMA	328.95
Mt. Toby WMA	739.1
Mt. Tom WMA	79.9
Orange WCE	877.97
Orange WMA	388.5
Packard Pond Access	0.54
Palmer WMA	1541.4904
Pauchaug Brook WMA	161.3
Paul C. Jones Working Forest WCE	3486
Poland Brook WMA	707.53
Rainbow Beach WMA	45.9
Reed Fish Hatchery	316
Satan's Kingdom WCE	123.5

Satan's Kingdom WMA	2403.77
Sawmill River Access	52
Shattuck Brook WMA	178.8
Southampton WMA	170.6
Southwick WCE	61.31
Southwick WMA	348.28
Sunderland Fish Hatchery	45.59
Sunderland Islands WMA	15
Tully Brook Access	154.88
Tully Mountain WCE	692.87
Tully Mountain WMA	704
Wales WMA	207.15
Walter Cowls Jones Working Forest WCE	2038.78
Ware River Access	39
Warwick WMA	379
Wendell WCR	2.39
Wendell WMA	602.78
Westfield River Access	79.4
Westfield WMA	234.03
Whately WMA	388.59
Wilbraham Nature and Cultural Center	143.09
Williamsburg WMA	88
Northeast District	***19,382***
Ashby WMA	1132.76
Ayer Game Farm	90.72
Baddacook Pond Access	0.16
Boxborough Station WMA	124.1
Carr Island Sanctuary	110.5
Castle Neck River WMA	54.67
Charles River WMA	
Concord River Access	0.25
Concord River WCE	18.9
Cow Pond Brook WCE	127
Crane Pond WMA	2623.21
Devil's Den WCE	28
Dunstable Brook WMA	177.35
Eagle Island WMA	5
Elbow Meadow WMA	210.33
Fessenden Hill WMA	21
Flagg Swamp WMA	54
Flint Pond Access	89.18
Gov. Thos. Dudley Park	4.5
Great Marsh North WCE	426.13

Great Marsh North WMA	459.12
Great Meadows WCE	16
Great Swamp Brook WCE	106
Groton Town Forest WCE	513
Hauk Swamp WMA	61
Henry Cabot Lodge Bird Sanctuary (Egg Rock)	2
Hunting Hills WCE	84.59
Hunting Hills WMA	430.02
Ipswich River Access	1.79
Ipswich River Access – Peabody	22.23
J. C. Phillips Sanctuary	390.98
King Phillip Woods	87.2
Knops Pond Access	0.6
Lake Attitash Access	6.03
Long Sought For Pond Access	1
Martin H. Burns WCE	113.44
Martin H. Burns WMA	1576.7
Mascuppic Lake Access	0.25
Meadow Pond WCE	81.9
Milk Island Sanctuary	29
Mill Creek WCR	59
Mount Watatic Reservation	280
Mulpus Brook WMA	541.05
Nashua River Access - Dunstable	15
Nashua River Access - Groton	10.1
Nashua River Access - Pepperell	11.2
Nashua River Access - Shirley	31.2
Nissitissit River WMA	428.06
Northeast District HQ	15.7
Pantry Brook WMA	449.95
Pepperell Springs WCE	255
Ram Island Sanctuary (North)	20
Salisbury Salt Marsh WMA	865.87
Squannacook River WCE	348.51
Squannacook River WCR	68
Squannacook River WMA	1910.56
Sucker Brook WCE	12
Sudbury River Access	51.86
Surrenden Farm West WCE	169.7
Throne Hill WCE	177.5
Townsend Hill WMA	724.3
Trapfall Brook WMA	45.38

Unkety Brook WCE	137.78
Unkety Brook WMA	826.137
Upper Parker River WMA	208.89
Weymouth Back River Access	16.5
Whittier WMA	42
William Forward WCE	274.75
William Forward WMA	1957.56
Wright Ponds WCE	148
Southeast District	***57,505***
Acushnet River WCE	30.2
Agawam Mill Pond Access	1.4
Agawam Mill Pond Access WCE	0.5
Agawam River WCE	3.98
Angeline Brook WCE	100.7
Assawompsett Pond Complex WCE	3065
Atwood Reservoir WMA	511.07
Bakers Pond Access	1.75
Barnstable Harbor Access	2.78
Bearse Pond WMA	5.8
Bettys Neck WCE	329.22
Big Sandy Pond Access	0.2
Billingsgate Island Sanctuary	12
Billington Sea WCE	69.74
Bird Island Sanctuary	3.1
Black Brook WMA	411.32
Blueberry Pond WMA	1.5
Brandt Island Cove WCE	109.52
Brayton Point WMA	2.2
Bread and Cheese Brook WCE	5.52
Burrage Pond WMA	1842.17
Camp Cachalot WMA	789
Camp Edwards WMA	15013.16
Canoe River WMA	116.6
Chase Garden Creek WMA	56.4
Childs River Access	0.25
Clapps Pond WMA	68.35
Cook Pond Access	3
Cooks Pond WMA	69.18
Copicut WCE	486.22
Copicut WMA	3992.56
Dartmoor Farm WMA	473
Dennis Grassy Pond WMA	7.24
Dogfish Bar Beach Access	2.4

Eastham Salt Marsh WMA	7.44
English Salt Marsh WMA	288.5
Erwin S. Wilder WMA	540.95
Fisk Forestdale WMA	235
Fox Island WMA	71.1
Frances A. Crane WMA	2302.31
Gosnold WMA	3.45
Great Herring Pond Access	1.06
Halfway Pond WCE	28
Halfway Pond WMA	122.64
Hartley Reservoir WMA	70
Haskell Swamp WMA	3111.22
Head Of The Plains WMA	2
Hockomock Swamp WMA	4552.54
Hog Ponds WMA	24.5
Hyannis Ponds WMA	365
Johns Pond Access	0.52
Katama Plains WMA	18.57
Lake Nippenicket WCE	8.35
Lobster Hatchery	14.8
Maple Springs WCE	156.25
Maple Springs WCR	466.24
Maple Springs WMA	774.57
Marconi WMA	1211
Mashpee Pine Barrens WMA	198.35
Mashpee River WMA	55.8
Mashpee-Wakeby Pond Access	25
Mattapoisett River WMA	163
Meetinghouse Swamp WMA	123
Miacomet Heath WMA	3.83
Mill Brook Bogs WMA	584.52
Muddy Pond WMA	72
Nemasket River Access	0.46
Noquochoke WMA	204.5
North Attleborough WMA	36.46
Old Sandwich Game Farm WMA	93.13
Olivers Pond WMA	12
Penikese Island Sanctuary	60
Peterson Swamp WMA	264.99
Pickerel Cove WCE	78.3
Pickerel Cove WMA	15.9
Pilgrim Springs WCE	17.05
Plymouth Grassy Pond WCR	33.9

Plymouth Grassy Pond WMA	25.5
Plymouth Pine Hill WCE	240.7
Plymouth Town Forest WCE	296
Poor Meadow Brook WCE	101
Poor Meadow Brook WMA	161.61
Popponesset Beach Access	1.5
Provincetown Corridor WMA	122
Purchade Brook WMA	106
Quashnet River WCE	14.1
Quashnet River WMA	51.54
Quashnet Woods State Reservation & WMA	360
Ram Island Sanctuary (South)	2
Red Brook WMA	683.2
Robbins Pond Access	1
Rocky Gutter WMA	3318.56
Sandwich Fish Hatchery	69.76
Sandwich Hollows WMA	224.2
Santuit Pond WCE	293
Scorton Creek Access	5.48
SE Massachusetts Bioreserve	5.94
SE Pine Barrens WMA	436.84
Shubael Pond Access	0.35
Sippican Headwaters WMA	336.73
Sippican Woods WCE	390.14
Sly Pond WMA	192
Snipatuit Pond Access	0.5
South Shore Marshes WMA	22.4
South Triangle Pond WCE	47.5
South Triangle Pond WMA	10.26
South Watuppa Pond Access	5.26
Southeast District HQ	29.8
Spectacle Pond Access	0.5
Stump Brook Reservoir WCE	174
Tarpaulin Cove Sanctuary	4.5
Taunton River WCE	290.07
Taunton River WCR	4
Taunton River WMA	743.22
Tispaquin Pond Access	6
Triangle Pond WMA	81.9
Wasque Point WMA	99.5
Watuppa Reservation WCE	4300
West Meadows WMA	231.72

Weweantic River WCE	10.08
Western District	***68,405***
Abbott Brook WCE	1782
Abbott Brook WMA	18
Agawam Lake WMA	785.75
Alford Spring WCE	889.82
Allen Mountain WCE	208
Ashfield Hawley WMA	284
Barton's Ledge WMA	88.6
Boulders WCE	642.53
Bullock Ledge WMA	15.5
Chalet WMA	7804.33
Cold Brook WCE	405
Cole Meadow WCE	101
Cummington WMA	288.97
Day Mountain WMA	387.54
Deerfield River Access - Charlemont	0.62
Dolomite Ledges WMA	389.87
E. Howe Forbush Sanctuary	365.5
Elizabeth's Woods WCE	86
Eugene D. Moran WMA	1870.427
Fairfield Brook WMA	164.9
Farmington River WMA	1901.1
Fisk Meadows WMA	638.17
Flag Rock WCE	41.38
Flat Brook WMA	273.15
Fox Den WMA	5697.077
George L. Darey Housatonic Valley WMA	812.93
Grace A. Robson Sanctuary	62
Green River WMA (Western District)	489.12
Hawks Brook WCE	23.19
Hawks Brook WMA	509.83
Hinsdale Flats WMA	1940.631
Hiram H. Fox WMA	3781.19
Hoosic River Access	5.9
Hop Brook WMA	527.53
Housatonic River Access	17
Housatonic River East Branch WCE	123.83
Housatonic River East Branch WMA	27.5
Hubbard Brook WMA	195.93
Jackson Swamp WCE	175.46
John J. Kelly WMA	342
Jug End State Reservation and WMA	1169.8

Jug End WCE	262.48
Kampoosa Fen WMA	72
Karner Brook WCE	81.57
Karner Brook WMA	265.97
Knightville Dam WMA	296
Knightville WCE	676
Konkapot River Access	16.4
Lilly Pond WMA	395.7
Long Mountain WMA	1014.46
Maple Hill WMA	687.99
Maxwell Brook WMA	168.19
Meadow Brook WCE	126.04
Meadow Brook WMA	50
Misery Mountain WMA	1346.94
Mt. Darby WCE	319.29
Mt. Plantain WCE	1337.44
North Egremont WCE	21.5
North Egremont WMA	25.96
North River West Branch WCE	250.2
Oak Hill WMA	712.3
Peru WMA	5143.47
Powell Brook WMA	404.58
Ram Hill WMA	549.6
Richmond Fen WMA	22.9
Rockhouse Mountain WCE	78
Savoy WMA	1985.37
Scout Pond WCE	175.9

Shales Brook WCE	5.6
Shales Brook WMA	234
Shaw Brook WMA	153.33
Silver Brook WCE	162
Soda Creek WCE	301.58
Stafford Hill WMA	904.6
Stage Brook WCE	581
Stage Brook WMA	148.3
Steadman Pond WCE	1178.71
Swift River WMA	867.461
Tekoa Mountain WMA	1383.3
Thorpe Brook WCE	266.2
Three Mile Pond WMA	1141.82
Tom Ball Mountain WCE	625
Tower Brook WMA	789.61
Tracy Pond WMA	323.12
Umpachene River WCE	239
Upper Westfield River WMA	328.72
Walnut Hill WMA	988.7
Western District - Old HQ	2.35
Westfield River Access - Chester	3.5
Westfield Watershed WCE	2300
Widow White's Peak WCE	244
Williams River WMA	60.5
Windsor Brook WCE	3284.43
Windsor Brook WCR	69.4
Grand Total as of June 30, 2022	***229,320***